
Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 1989

Twenty Second Annual Report

U.S. Nuclear Regulatory Commission

Office of Nuclear Regulatory Research

C. T. Raddatz, D. Hagemeyer



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PREVIOUS REPORTS IN SERIES

WASH-1311	A Compilation of Occupational Radiation Exposure from Light Water Cooled Nuclear Power Plants, 1969-1973, U.S. Atomic Energy Commission, May 1974.
NUREG-75/032	Occupational Radiation Exposure at Light Water Cooled Power Reactors, 1969-1974, U.S. Nuclear Regulatory Commission, June 1975.
NUREG-0109	Occupational Radiation Exposure at Light Water Cooled Power Reactors, 1969-1975, U.S. Nuclear Regulatory Commission, August 1976.
NUREG-0323	Occupational Radiation Exposure at Light Water Cooled Power Reactors, 1969-1976, U.S. Nuclear Regulatory Commission, March 1978.
NUREG-0482	Occupational Radiation Exposure at Light Water Cooled Power Reactors, 1977, U.S. Nuclear Regulatory Commission, May 1979.
NUREG-0594	Occupational Radiation Exposure at Commercial Nuclear Power Reactors, 1978, U.S. Nuclear Regulatory Commission, November 1979.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1979, Vol. 1, U.S. Nuclear Regulatory Commission, March 1981.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1980, Vol. 2, U.S. Nuclear Regulatory Commission, December 1981.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1981, Vol. 3, U.S. Nuclear Regulatory Commission, November 1982.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1982, Vol. 4, U.S. Nuclear Regulatory Commission, December 1983.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1983, Vol. 5, U.S. Nuclear Regulatory Commission, March 1985.
NUREG-0713	Occupational Radiation Exposure At Commercial Nuclear Power Reactors and Other Facilities 1984, Vol. 6, U.S. Nuclear Regulatory Commission, October 1986.
NUREG-0713	Occupational Radiation Exposure At Commercial Nuclear Power Reactors and Other Facilities 1985, Vol. 7, U.S. Nuclear Regulatory Commission, April 1988.
NUREG-0713	Occupational Radiation Exposure At Commercial Nuclear Power Reactors and Other Facilities 1986, Vol. 8, U.S. Nuclear Regulatory Commission, August 1989.
NUREG-0713	Occupational Radiation Exposure At Commercial Nuclear Power Reactors and Other Facilities 1987, Vol. 9, U.S. Nuclear Regulatory Commission, November 1990.
NUREG-0713	Occupational Radiation Exposure At Commercial Nuclear Power Reactors and Other Facilities 1988, Vol. 10, U.S. Nuclear Regulatory Commission, July 1991.
Previous reports in the NUREG-0714 series, which are now combined with NUREG-0713, are as follows:	
WASH-1350-R1 through WASH-1350-R6	First through Sixth Annual Reports of the Operation of the U.S. AEC's Centralized Ionizing Radiation Exposure Records and Reporting System, U.S. Atomic Energy Commission.
NUREG-75/108	Seventh Annual Occupational Radiation Exposure Report for Certain NRC Licensees - 1974, U.S. Nuclear Regulatory Commission, October 1975.
NUREG-0119	Eighth Annual Occupational Radiation Exposure Report for 1975, U.S. Nuclear Regulatory Commission, October 1976.
NUREG-0322	Ninth Annual Occupational Radiation Exposure Report for 1976, U.S. Nuclear Regulatory Commission, October 1977.
NUREG-0463	Tenth Annual Occupational Radiation Exposure Report for 1977, U.S. Nuclear Regulatory Commission, October 1978.
NUREG-0593	Eleventh Annual Occupational Radiation Exposure Report for 1978, U.S. Nuclear Regulatory Commission, January 1981.
NUREG-0714	Twelfth Annual Occupational Radiation Exposure Report for 1979, Vol. 1, U.S. Nuclear Regulatory Commission, August 1982.
NUREG-0714	Occupational Radiation Exposure, Thirteenth and Fourteenth Annual Reports, 1980 and 1981, Vols. 2 and 3, U.S. Nuclear Regulatory Commission, October 1983.
NUREG-0714	Occupational Radiation Exposure, Fifteenth and Sixteenth Annual Reports, 1982 and 1983, Vols. 4 and 5, U.S. Nuclear Regulatory Commission, October 1985.

ABSTRACT

This report summarizes the occupational exposure data that are maintained in the U.S. Nuclear Regulatory Commission's Radiation Exposure Information and Reporting System (REIRS). The bulk of the information contained in the report was extracted from the 1989 annual statistical reports submitted by six of the seven categories¹ of NRC licensees subject to the reporting requirements of 10 CFR § 20.407. Since there are no geologic repositories for high level waste currently licensed, only six categories will be considered in this report. These six categories of licensees also submit personal identification and exposure information for terminating employees pursuant to 10 CFR § 20.408, and some analysis of this "termination" data is also presented in this report.

Annual reports for 1989 were received from a total of 448 NRC licensees, 112 of which were operators of nuclear power reactors. Compilations of the 448 reports indicated that 216,294 individuals were monitored, 111,153 of whom received a measurable dose (Table 3.1). The collective dose incurred by these individuals was calculated to be 39,997 person-rem (person-cSv)² which represents a decrease of 0.9% from the 1988 value. The number of workers receiving a measurable dose increased, and the collective dose decreased, resulting in the average measurable dose decreasing from 0.41 rem (cSv) in 1988, to 0.36 rem (cSv) in 1989. About 11% of the monitored individuals were found to have received doses greater than 0.50 rem (cSv), which is down from the 1988 value of 14%.

Some 113,535 termination reports (Table 5.1) were submitted to the NRC which contained personnel identification and exposure information for 79,394 individuals who had completed their work assignment or employment with a covered category of NRC licensees during 1989. The total number of monitored individuals for whom personal identification and exposure information has been incorporated into REIRS during the 21 years that it has been operating is now about 640,000, 566,159 of whom terminated from nuclear power facilities. Analyses of these termination data indicate that 10,344 individuals completed work assignments at two or more nuclear reactor facilities during calendar year 1989 and received an average dose of 0.64 rems (cSv). Approximately 3,545 of these individuals worked at two or more reactor facilities during one calendar quarter and received an average quarterly dose of 0.21 rem (cSv). These termination reports can also be used to analyze career dose data of occupational exposure. This analysis has been performed for individuals terminating from reactors from 1977 through 1989 and is presented by dose, career length, sex, and age in Sections 5.6 and 5.7. Of the 506,092 individuals monitored, 299,170 received measurable dose with an average career dose of 1.44 rems (cSv) and an average career length of 3.27 years.

¹ Commercial nuclear power reactors; industrial radiographers; fuel processors, fabricators, and reprocessors; manufacturers and distributors of byproduct material; independent spent fuel storage installations; facilities for land disposal of low-level waste; and geologic repositories for high-level waste.

² In the International System of Units the sievert (Sv) is the name given to the units for dose equivalent. One centisievert (cSv) equals one rem; therefore, person-rem becomes person-cSv.

EDITOR'S NOTE

The NRC currently has a three-year contract with Science Applications International Corporation (SAIC) to assist the NRC Staff in the preparation of the NUREG-0713 series. SAIC will be suggesting changes in the presentation of certain data in these reports. Readers should be alert to these changes, and the NRC welcomes responses, especially where these changes can be improved upon. Comments should be directed to Charleen T. Raddatz, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 (301)492-3745.

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PREFACE

A number of NRC Licensees have inquired as to how the occupational radiation exposure data that are extracted from the annual statistical summary reports required by § 20.407, the termination reports required by § 20.408, and the annual dose data reported by work function in accordance with Subsection 6.9.1.5 of the standard technical specifications for nuclear power plants are used by the NRC staff. This is a very appropriate inquiry that may be of importance to many affected licensees. In combination with other sources of information, the principal uses of the data are to provide facts regarding routine occupational exposures to radiation and radioactive material that occur in connection with certain NRC-licensed activities. These facts are used by the NRC staff as indicated below:

1. The data permit evaluation, from the viewpoint of trends, of the effectiveness of the overall NRC/licensee radiation protection and ALARA efforts by certain licensees. They also provide for the identification (and subsequent correction) of unfavorable trends.
2. The external dose data assist in the evaluation of the radiological risk associated with certain categories of NRC-licensed activities and are used for comparative analyses of radiation protection performance: US/foreign, BWRs/PWRs, civilian/military, plant/plant, nuclear industry/other industries, etc.
3. The data provide for the monitoring of transient workers who may affect dose distribution statistics through multiple counting, or who may exceed regulatory limits on radiation exposure due to the accumulation of exposure at multiple sites per calendar quarter or calendar year.
4. The data help provide facts for evaluating the adequacy of the current risk limitation system (e.g., are individual lifetime dose limits, worker population collective dose limits, and requirements for optimization needed?).
5. The data permit comparisons of occupational radiation risks with potential public risks when action for additional protection of the public involves worker exposures.
6. The data are used in the establishment of priorities for the utilization of NRC health physics resources: research, standards development, and regulatory program development.
7. The data provide facts for answering Congressional and Administration inquiries and for responding to questions raised by public interest groups, special interest groups, labor unions, etc.
8. The data provide information that may be used in the planning of epidemiological studies.

Occupational Radiation Exposure
at Commercial Nuclear Power Reactors and Other Facilities
Twenty-second Annual Report, 1989

1 INTRODUCTION

One of the basic purposes of the Atomic Energy Act and the implementing regulations in Title 10, Code of Federal Regulations, Chapter I, Part 20, is to protect the health and safety of the public, including the employees of the licensees conducting operations under those regulations. Among the regulations designed to ensure that the standards for protection against radiation set out in 10 CFR Part 20 are met, is a requirement that licensees provide individuals likely to be exposed to radiation with devices to monitor their exposure. Each licensee is also required to maintain indefinitely records of the results of such monitoring. However, there was no initial provision that these records or any summary of them be transmitted to a central location where the data could be retrieved and analyzed.

On November 4, 1968, the U.S. Atomic Energy Commission (AEC) published an amendment to Part 20 requiring the reporting of certain occupational radiation exposure information to a central repository at AEC Headquarters. This information was required of the four categories³ of AEC licensees that were considered to involve the greatest potential for significant occupational doses and of AEC facilities and contractors exempt from licensing. A procedure was established whereby the appropriate occupational exposure data were extracted from these reports and entered into the Commission's Radiation Exposure Information Reporting System (REIRS), a computer system that was maintained at the Oak Ridge National Laboratory Computer Technology Center in Oak Ridge, Tennessee, until May 1990. At that time the data were transferred to a database management system at Science Applications International Corporation (SAIC) at Oak Ridge, Tennessee. The computerization of these data ensure that they are kept indefinitely and facilitate their retrieval and analysis. The data maintained in REIRS have been summarized and published in a report every year since 1969. Annual reports for each of the years 1969 through 1973 presented the data reported by both AEC licensees and contractors and were published in six documents designated as WASH-1350-R1 through WASH-1350-R6.

³

Commercial nuclear power reactors; industrial radiographers; fuel processors, fabricators, and reprocessors; manufacturers and distributors of specified quantities of byproduct material.

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. The annual reports published by the NRC on occupational exposure for calendar year 1974 and subsequent years do not contain information pertaining to ERDA facilities or contractors. Comparable information for facilities and contractors under ERDA, now the Department of Energy (DOE), is collected and published by DOE's Division of Operational Safety at Germantown, Maryland.

In 1982 and 1983, paragraph 20.408(a) of Title 10 of the Code of Federal Regulations was amended to require three additional categories of NRC licensees to submit annual statistical exposure reports and individual termination exposure reports. The new categories are (1) geologic repositories for high-level radioactive waste, (2) independent spent fuel storage installations, and (3) facilities for the land disposal of low-level radioactive waste. Therefore, this document presents the exposure information that was reported by NRC licensees representing two of these new categories. (There are no geologic repositories for high-level waste currently licensed.)

This report and each of the predecessors summarizes information reported during previous years. However, more licensee-specific data, such as the annual reports submitted by each commercial power reactor pursuant to 10 CFR § 20.407 and their technical specifications, may be found in those documents listed on the inside of the front cover of this report. Additional operating data and statistics for each power reactor for the years 1973 through 1982 may be found in a series of reports, "Nuclear Power Plant Operating Experience" [Refs. 1-9]. These documents are available for viewing at all NRC public document rooms, or they may be purchased from the National Technical Information Service, as shown in the Reference section.

2 LIMITATIONS OF THE DATA

All of the figures compiled in this report relating to exposures and doses are based on the results and interpretations of the readings of various types of personnel monitoring devices employed by each licensee. This information obtained from routine personnel monitoring programs is sufficient to characterize the radiation environment in which individuals work and is used in evaluating the radiation protection program.

Monitoring requirements are based, in general, on 10 CFR § 20.202, which requires licensees to monitor individuals who receive or are likely to receive a dose in any calendar quarter in excess of 25% of the applicable quarterly limits. For most adults the quarterly limit for the whole body is 1.25 rems (cSv), so 0.312 rem (cSv) per quarter is the level above which monitoring is required. Depending on the administrative policy of each licensee, persons such as visitors and clerical workers may also be provided with monitoring devices for identification or convenience, although the probability of their being exposed to measurable levels of radiation is extremely small. Licensees are given the option of reporting the dose distribution of only those individuals for whom monitoring is required, or the dose distribution of all those for whom monitoring is provided. Many licensees elect to report the latter; however, this may increase the number of individuals that one could consider to be radiation workers. In an effort to account for this, the number of individuals reported as having "no measurable exposure" has been subtracted from the total number of individuals monitored in order to calculate an average dose per individual receiving a measurable dose, as well as the average dose per monitored individual (for example, see Table 3.1).

One source of error that is present in the calculation of the annual collective dose (i.e., the summation of each monitored person's whole body dose) incurred by workers is the assumption that the midpoint of the dose range is the mean dose of the individuals reported in each dose range (dose ranges are shown in Table 3.2). This allows the collective dose to be calculated without knowing each person's actual annual dose. Past experience has shown that the actual mean dose of the individuals reported in each range is usually less than the midpoint. Thus, the collective doses presented for categories of licenses shown in this report may be 10% higher than the sum of the actual individual doses. However, nearly 70% of the nuclear power reactors reported the actual collective dose in 1989 so the total collective dose used in this report is more accurate than if the collective dose would have been calculated for each site.

The average dose per individual, as well as the dose distributions shown for groups of licensees, also could have been affected by the multiple reporting of individuals who were monitored by two or more licensees during the year. Since individuals are not identified in the annual reports, an individual who was monitored by five different licensees would have been counted once on each report. Therefore, when the data were summed to determine the total number of individuals monitored by a group of licensees, this person would be counted as five individuals rather than as one. This could also affect the distribution of doses because the individual has been counted five times in the lower dose ranges rather than one time in the higher range corresponding to the actual accumulated dose (the sum of the doses incurred at each facility). This source of error has the greatest potential impact on the data reported by power reactor facilities since they employ many short-term workers. Further discussion of this point is provided in Section 5.

Another fact that should be kept in mind when examining the annual statistical data is that all of the personnel included in the report may not have been monitored throughout the entire year. Many licensees such as radiography firms and nuclear power facilities may monitor numerous individuals for periods much less than a year. The average doses calculated from these data, therefore, are less than the average dose that an individual would receive if involved in that activity for the full year.

Considerable attention should also be given when referencing the collective totals presented in this report. The differences between the totals presented for all licensees that reported versus only those licensees that are required to report should be noted. Likewise, one should pay close attention to the differences between all power reactors (including the high temperature gas reactor, HTGR), all pressurized water reactors (PWRs), all boiling water reactors (BWRs), and all light water reactors (LWRs). The totals may be inclusive or exclusive of those licensees that were in commercial operation for less than one full year. These parameters vary throughout the tables and appendices of this report in order to provide the most comprehensive analysis of all the data available. The apparent discrepancies among the various tables are a necessary side-effect of this endeavor.

Also, it should be again pointed out that this report contains information reported by NRC licensees only. Since the NRC licenses all commercial nuclear power reactors, fuel processors, fabricators and reprocessors, and independent spent fuel storage facilities, information shown for these categories reflects the U.S. experience. This is not the case, however, for the remaining categories of industrial radiography, manufacturing and distribution of specified quantities of by-product material, and low-level waste disposal.

Companies that conduct these types of activities in Agreement States⁴ are licensed by the state and are not required to submit occupational exposure reports to the NRC. Therefore, information shown for these categories does not reflect the total U.S. experience.

⁴ States that have entered into an agreement with the NRC that allows each state to license organizations using radioactive materials for certain purposes. There are now 29 Agreement States.

3 ANNUAL PERSONNEL MONITORING REPORTS - 10 CFR § 20.407

3.1 Definition of Terms and Sources of Data

3.1.1 Statistical Summary Reports

On February 4, 1974, 10 CFR § 20.407 was amended to require certain categories⁵ of licensees to submit an annual statistical report indicating the distribution of the whole body doses incurred by individuals whom they monitored for exposure to radiation. Since the regulations do not require these licensees to report the collective dose incurred by the individuals shown on the statistical reports, the dose distributions are used as the basis for the staff's calculation of the collective dose (see Section 3.1.4).

3.1.2 Number of Monitored Individuals

This is the total number of individuals that the NRC licensees covered by 10 CFR § 20.407 reported as being monitored for exposure to external radiation during the year. This number must include all individuals for whom monitoring is required, and may include visitors, service representatives, contract workers, clerical workers and any other individuals for whom the licensee feels that monitoring devices should be provided. Most licensees submit the dose distribution of the total number of persons for whom monitoring was provided in their annual § 20.407 reports, but a few report only those for whom monitoring was required.

3.1.3 Number of Workers with Measurable Doses

The number of workers with measurable doses is obtained from the annual dose distribution reports submitted by NRC licensees pursuant to 10 CFR § 20.407 by subtracting the number of individuals having less than measurable doses from the total number of monitored individuals. This figure is used to calculate the average measurable dose per worker because it deletes those individuals who received exposures too small to be detected by personnel monitoring devices, many of whom probably did not routinely work in radiation areas (and were monitored for convenience or for identification purposes).

5

Commercial nuclear power reactors; industrial radiographers; fuel processors, fabricators and reprocessors; manufacturers and distributors of by-product material; independent spent fuel storage installations; and facilities for land disposal of low-level radioactive waste.

3.1.4 Collective Dose

The concept of collective dose is used in this report to denote the summation of the whole body external doses received by all monitored individuals and has the units person-rem (person-cSv)⁶. The collective dose is not usually provided in the annual dose distribution reports submitted pursuant to 10 CFR § 20.407, but NRC staff calculated it from the reports by summing the products obtained by multiplying the number of individuals reported in each of the dose ranges by the midpoint of the corresponding range. This assumes that the midpoint of the range is equal to the arithmetic mean of the individual doses in the range. Past experience has shown that the actual mean dose of individuals reported in each dose range is less than the midpoint of the range, and the collective doses shown in this report for these may be about 10% too high. In 1981, a few power reactor licensees began reporting the actual collective dose (as determined from official personnel dosimetry results) on the § 20.407 annual reports, and, when provided, the NRC staff used these doses instead of the above-described calculations. The staff would prefer to use the actual collective dose and encourages more licensees to make it available.

3.1.5 Average Individual Dose

The average individual dose is obtained by dividing the collective dose by the total number of individuals reported as being monitored. This figure is usually less than the average measurable dose because it includes the number of those individuals who received zero or less than measurable doses.

3.1.6 Average Measurable Dose

The average measurable dose is obtained by dividing the collective dose by the number of workers that received a measurable dose. This is the average most commonly used in this and other reports when examining trends and comparing doses received by workers in various segments of the nuclear industry because it reflects the deletion of those individuals receiving zero or minimal doses, many of whom were monitored for convenience.

⁶

In the International Systems of Units, the sievert (Sv) is the name given to the units for dose equivalent. One centisievert (cSv) equals one rem; therefore person-rem becomes person-cSv.

3.1.7 Number of Licensees Reporting

This is the number of NRC licenses issued to companies to use radioactive material for certain activities that would place them in one of the six categories that are required to report pursuant to 10 CFR § 20.407. The third column in Table 3.1 shows the number of licensees that have filed such reports during the last several years. State licensees do not submit such reports to the NRC.

3.1.8 CR

One of the parameters that the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) recommends be calculated for occupational dose distributions to aid in the comparison of exposure data is a ratio "CR." CR is defined to be the ratio of the annual collective dose incurred by individuals whose annual doses exceed 1.5⁷ rems to the total annual collective dose. One UNSCEAR report [Ref. 10] states that normal values of CR should be between 0.05 and 0.50. This means that, usually, no more than 50% of the collective dose should be due to individual doses that exceed 1.5 rems. The last column in Table 3.1 shows the values of CR for the different types of licensees; one can see that most categories now have a CR that is less than 0.50 and that 1989 is the fifth year in a row the CR for commercial LWRs and the grand total for all licensees has dropped below 0.50.

3.2 Annual Whole Body Dose Distributions

Table 3.2 is a compilation of the statistical summary reports currently being submitted by six categories of licensees. In nearly every category a large number of the doses are less than measurable, and very few doses exceed 4 or 5 rems (C_{sv}). About 90% of the reported individuals continue to be monitored by nuclear power facilities where they receive about 90% of the total collective dose.

It should be pointed out that annual exposures that exceed five rems (cSv) are not necessarily classified as personnel overexposures. Although 1.25 rems (cSv) is the quarterly limit set forth in paragraph (a) of 10 CFR § 20.101, paragraph (b) permits licensees, under certain conditions, to allow a worker

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The collective dose of workers with doses exceeding 1.5 rems (cSv) was calculated by assuming that half of the collective dose incurred by workers with doses between one and two rems (cSv) was due to doses greater than 1.5 rems (C_{sv}). This value was then added to the collective dose incurred by workers in the higher ranges.

TABLE 3.1
ANNUAL EXPOSURE DATA FOR CERTAIN CATEGORIES OF LICENSEES
1980-1989

License Category*	Calendar Year	Number of Licensees Reporting	Number of Monitored Individuals	Number of Workers With Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Individual Dose (rem or cSv)	Average Measurable Dose per Worker (rem or cSv)	CR*
Industrial Radiography	1989	276	6,745	4,352	2,067	0.31	0.47	0.42
	1988	286	6,878	4,223	1,981	0.29	0.47	0.43
	1987	312	7,236	4,454	1,835	0.25	0.41	0.36
	1986	335	7,952	5,130	2,108	0.26	0.41	0.39
	1985	340	8,476	5,550	2,374	0.28	0.43	0.45
	1984	361	8,458	5,446	2,490	0.30	0.46	0.46
	1983	340	8,624	5,131	2,384	0.28	0.46	0.45
	1982	353	9,235	6,160	2,998	0.32	0.49	0.46
	1981	266	9,938	5,486	2,652	0.27	0.48	0.48
	1980	292	11,102	6,556	2,979	0.27	0.45	0.45
Manufacturing and Distribution	1989	48	4,554	2,345	770	0.17	0.33	0.53
	1988	16	2,177	868	343	0.16	0.40	0.62
	1987	24	3,589	2,317	716	0.20	0.31	0.54
	1986	33	4,042	2,065	745	0.18	0.36	0.49
	1985	33	3,958	2,250	755	0.19	0.34	0.50
	1984	40	5,076	1,977	671	0.13	0.34	0.46
	1983	33	5,051	2,003	824	0.16	0.41	0.54
	1982	34	5,453	2,199	890	0.16	0.40	0.51
	1981	29	4,846	2,395	904	0.19	0.38	0.52
	1980	29	5,119	2,460	1,033	0.20	0.42	0.61
Low-Level Waste Disposal	1989	2	925	119	35	0.04	0.29	0.17
	1988	2	864	171	27	0.03	0.16	0.06
	1987	2	778	173	24	0.03	0.14	0.00
	1986	2	996	175	31	0.03	0.18	0.05
	1985	2	1,240	252	70	0.06	0.28	0.24
	1984	2	925	297	72	0.08	0.24	0.16
	1983	1	612	358	71	0.12	0.20	0.14
	1982	1	680	251	53	0.08	0.21	0.20
Independent Spent Fuel Storage	1989	2	190	102	33	0.17	0.33	0.09
	1988	2	217	57	25	0.12	0.44	0.27
	1987	2	129	64	41	0.32	0.64	0.60
	1986	1	32	32	34	1.06	1.06	0.46
	1985	1	32	32	34	1.06	1.06	0.51
	1984	1	32	32	13	0.41	0.41	0.06
	1983	1	33	27	8	0.24	0.30	0.00
	1982	1	35	32	9	0.26	0.28	0.00
Fuel Fabrication and Processing	1989	8	11,583	2,992	243	0.02	0.08	0.00
	1988	10	11,994	3,869	455	0.04	0.12	0.01
	1987	10	10,370	3,994	514	0.05	0.13	0.01
	1986	10	8,017	3,790	466	0.06	0.12	0.01
	1985	11	8,596	5,032	643	0.07	0.13	0.05
	1984	14	9,488	5,772	818	0.09	0.14	0.04
	1983	15	9,023	5,013	835	0.09	0.17	0.19
	1982	16	9,808	5,433	831	0.08	0.15	0.20
	1981	18	10,552	5,942	940	0.09	0.16	0.09
	1980	18	10,204	5,900	1,111	0.11	0.19	0.12
Commercial Light Water Reactors***	1989	112	192,297**	101,243**	36,849	0.19	0.36	0.33
	1988	113	197,918**	97,831**	41,076	0.21	0.42	0.38
	1987	106	209,100**	99,493**	40,947	0.19	0.41	0.36
	1986	101	194,048**	99,502**	42,982	0.22	0.43	0.44
	1985	93	180,254**	94,873**	43,624	0.24	0.46	0.47
	1984	88	165,803**	95,224**	55,353	0.33	0.58	0.57
	1983	80	139,885**	83,546**	56,758	0.41	0.68	0.60
	1982	79	127,904**	80,871**	52,227	0.41	0.65	0.57
	1981	73	123,978**	80,664**	54,271	0.44	0.67	0.58
	1980	70	124,250**	77,903**	53,810	0.43	0.69	0.59
Grand Totals and Averages	1989	448	216,294**	111,153**	39,997	0.18	0.36	0.34
	1988	429	220,048**	107,019**	43,906	0.20	0.41	0.38
	1987	456	232,779**	112,097**	44,079	0.19	0.39	0.37
	1986	482	215,087**	110,694**	46,366	0.22	0.42	0.43
	1985	480	202,556**	107,989**	47,474	0.23	0.44	0.46
	1984	506	189,782**	108,748**	59,421	0.31	0.55	0.56
	1983	470	163,238**	96,878**	60,880	0.37	0.63	0.59
	1982	482	153,118**	94,946**	57,008	0.37	0.60	0.56
	1981	385	149,314**	94,490**	58,767	0.39	0.62	0.56
	1980	410	150,675**	92,819**	58,933	0.39	0.63	0.57

* These categories consist only of NRC licensees. Agreement State licensed organizations do not report occupational exposure data to the NRC. (see Section 2 for categories)

*CR is the ratio of the annual collective dose delivered at annual doses exceeding 1.5 rem to the total annual collective dose. (see Section 3.1.8)

**These figures are adjusted to account for the multiple counting of transient reactor workers (see Section 5).

***Includes all LWRs that reported, although all of them may not have been in commercial operation for a full year.

TABLE 3.2
DISTRIBUTION OF ANNUAL WHOLE BODY DOSES BY LICENSE CATEGORY
1989

LICENSE CATEGORY (# reporting)	*Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)															TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE (Person- rem)
	No Mea- surable	Meas. <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 2.00	2.00- 3.00	3.00- 4.00	4.00- 5.00	5.00- 6.00	6.00- 7.00	7.00- 8.00	8.00- 9.00	9.00- 12.00			
INDUSTRIAL RADIOGRAPHY																		
Single Location (72)	665	234	55	25	7	1	2										989	324
Multiple Locations (204)	1,728	1,580	704	591	336	237	418	113	38	4	5	1			1		5,756	4,028
Total (276)	2,393	1,814	759	616	343	238	420	113	38	4	5	1			1		6,745	4,352
MANUFACTURING AND DISTRIBUTION																		
"A"-Broad (11)	1,661	1,198	327	112	61	36	117	62	32	11							3,617	1,956
Limited (37)	548	315	37	13	12	7	3	2									937	389
Total (48)	2,209	1,513	364	125	73	43	120	64	32	11							4,554	2,345
LOW-LEVEL WASTE DISPOSAL																		
Total (2)	806	64	16	13	13	5	8										925	119
INDEPENDENT SPENT FUEL STORAGE																		
Total (2)	88	42	17	21	11	7	4										190	102
FUEL FABRICATION																		
Total (8)	8,591	2,408	493	83	7	1											11,583	2,992
**COMMERCIAL POWER REACTORS																		
Boiling Water (38)	42,896	19,374	7,887	6,323	3,753	2,544	3,962	515	33								87,287	44,391
Pressurized Water (74)	56,721	29,924	11,680	9,404	5,112	3,042	4,883	775	88	11							121,640	64,919
High Temperature Gas (1)	316	47	6	2													371	55
Total																		3
GRAND TOTALS																		
	114,020	55,186	21,222	16,587	9,312	5,880	9,397	1,467	191	26	5	1			1		233,295	119,275
																		40,000

*Dose values exactly equal to the values separating ranges are reported in the next higher range.

**Includes all reactors that reported although all of them may not have been in commercial operation, and these values have not been adjusted for the multiple counting of transient reactor workers.

to receive a whole body dose of three rems (cSv) per calendar quarter (up to 12 rems (cSv) annually.) The conditions are that the licensee must have determined and recorded the worker's prior accumulated occupational dose to the whole body and that the worker's whole body dose when added to his accumulated occupational dose does not exceed $5(N - 18)$ rems (cSv), where N equals the individual's age in years. Although there is currently no annual limit, annual exposures that exceed 12 rems (cSv) indicate that an over exposure has occurred.

In 1989, one individual employed by an industrial radiographer was reported to have received a dose in excess of 12 rems. A report was provided to the NRC and a discussion of the incident is included in Section 6. Any quarterly exposure in excess of the applicable quarterly limits must also be reported. A discussion of various types of occurrences in which the limits have been exceeded is given in Section 6.

A summary of the annual whole body exposures reported to the Commission by certain categories of NRC licensees required to submit reports pursuant to 10 CFR § 20.407 is presented in Table 3.3, which shows that about 95% of the exposures have consistently remained less than two rems (cSv) between 1967 and 1984. For the past three years the percentage of workers with less than 2 rems (cSv) has been greater than 98%. The number of individuals receiving an annual exposure in excess of five rems (cSv) has been gradually declining since 1971 and has been less than 0.01% since 1985.

3.2.1 Log Probability Plots

Since personnel monitoring data has been found to have log-normal distributions [Ref. 11], trends in the data reported by licensees may be observed from log probability plots⁸ of data. Figure 3.1 displays such a plot of the doses incurred by workers monitored by certain NRC licensees (see Section 3.1.1) for the year 1989. There are a few characteristics of these distributions readers should keep in mind. First, each single plotted point represents the total cumulative percent of all workers with measurable doses up to the plotted value. All measurable doses up to 0.1 rem are included in the value plotted at 0.1 rem, and the values shown on the "Annual Dose" axis are derived from the dose ranges specified in 10 CFR § 20.407(b). Second,

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If the data have a log-normal distribution, the data points will form a straight line when plotted on log probability paper on which cumulative probabilities are laid off on the vertical axis at distances proportional to the corresponding number of standard deviations above or below the median and the dose is plotted on the horizontal axis with a logarithmic scale.

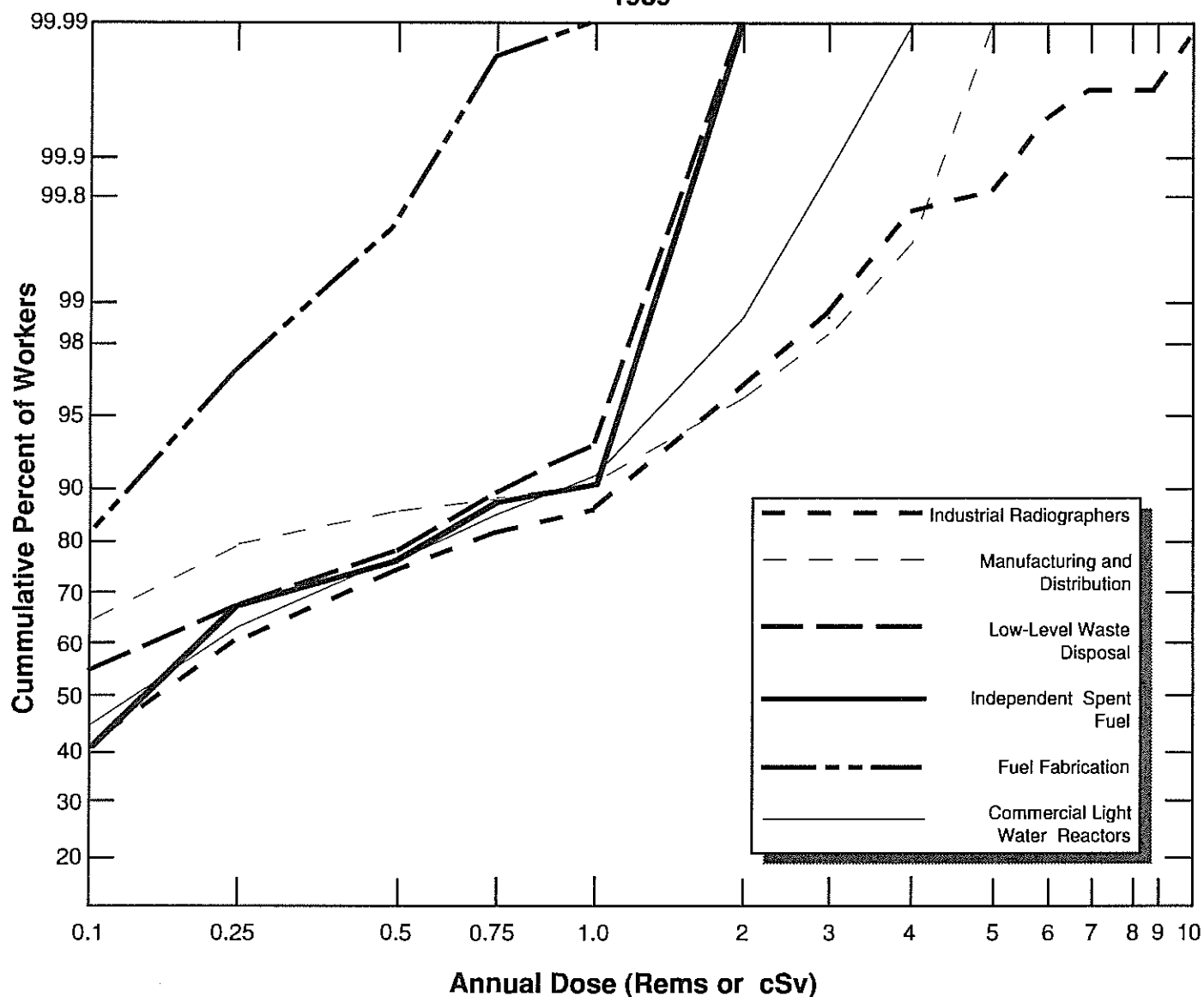
TABLE 3.3
SUMMARY OF ANNUAL DOSE DISTRIBUTIONS FOR CERTAIN NRC LICENSEES
1968-1989

Year	Total Number of Monitored Persons		Percent of Individuals With Doses <2 rems*	Percent of Individuals With Doses <5 rems*	Number of Individuals With Doses >12 rems*
	Reported Number	Corrected Number*			
1968	36,836		97.2%	99.5%	3
1969	31,176		96.5%	99.5%	7
1970	36,164		96.1%	99.4%	0
1971	36,311		96.3%	99.3%	1
1972	44,690		95.7%	99.5%	8
1973	67,862		95.0%	99.5%	1
1974	85,097		96.4%	99.7%	1
1975	78,713		94.8%	99.5%	1
1976	92,773		95.0%	99.6%	3
1977	98,212	93,438	93.8%	99.6%	1
1978	105,893	100,818	94.6%	99.8%	3
1979	131,027	125,316	95.2%	99.8%	1
1980	159,177	150,675	94.6%	99.7%	0
1981	157,874	149,314	94.6%	99.8%	1
1982	162,456	154,117	94.9%	99.9%	0
1983	172,927	164,239	94.6%	99.9%	0
1984	204,136	191,401	95.9%	99.9%	0
1985	215,197	204,319	96.9%	>99.99%	2
1986	227,943	215,378	98.0%	>99.99%	0
1987	246,953	231,404	98.8%	>99.99%	0
1988	234,857	219,285	98.6%	>99.99%	0
1989	233,295	216,665	98.0%	>99.99%	1

* Data for 1977-1989 are based on the distribution of individual doses after adjusting for the multiple counting of transient reactor workers (see Section 5).

because it is not possible to plot 100% on these figures, the data for the highest dose group are plotted at 99.99%, and can be said to account for all of the workers.

Figure 3.1
Annual Dose Distribution of Workers at Certain NRC Licensees
1989



License Category	Average Meas. Dose (Rem or cSv)	CR*
Industrial Radiographers	0.47	0.42
Manufacturing and Distribution	0.33	0.53
Low-Level Waste Disposal	0.29	0.17
Independent Spent Fuel	0.33	0.09
Fuel Fabrication	0.08	0.00
Commercial Light Water Reactors	0.34	0.28

*CR is the ratio of the dose delivered at individual doses exceeding 1.5 rems to the annual collective dose.

Note: Each point on the curves represents the cumulative percentage of workers with measurable doses who received doses less than the indicated annual dose.

Another feature of these types of graphs is that several comparisons of various dose distributions can be quickly made. For example, one can easily see in Figure 3.1 that in 1989, about 91% of the workers monitored by firms licensed for independent spent fuel storage received doses that were less than 1.00 rem (cSv), while all of the workers monitored at fuel-fabrication facilities received doses less than 1.00 rem (cSv). One should also note that the doses at which the 50 percentile line crosses the plot corresponds to the median dose, i.e. the dose below which half of the dose fell and above which half fell. For industrial radiography, independent spent fuel storage, low-level waste disposal, and commercial light water reactors, the median dose is near 0.10 rem (cSv) while for manufacturing and distribution, and fuel fabrication facilities, the median measurable dose is considerably less.

The relative positions and curvature of the graphs are indicative of certain characteristics of the dose distributions. The positions of the 1989 plots of the dose distribution of workers at fuel fabrication facilities above that of the other plots indicate smaller values of the average doses and CR (as shown in the chart at the bottom of the graph). This is due to the lower number of workers with doses that exceeded 1.5 rems (cSv) in 1989 as compared to other licensed activities.

The tendency of the plots to curve upward for doses greater than one rem (cSv) is typical of distributions having several workers with doses in the higher dose ranges [Refs. 10, 11], and indicates that the entire distribution is not a log-normal one. Another theoretical analysis of occupational dose distributions [Ref. 12] has found that these data may be fitted by a hybrid log-normal distribution. At low doses, this distribution is log-normal, but at higher doses, where radiation control programs very closely monitor each worker's total dose so that the frequency of doses approaching the dose limits is reduced, the distribution is normal.

An example of this "feedback" mechanism which reduces exposures reported at higher doses can be seen in the plot for independent spent fuel storage and low-level waste disposal facilities. The relatively low points on the curve between 0.10 and 1.00 rem (cSv) indicate a large percentage of individuals receiving dose in this range, while the curve takes a steep upwards turn at 1.00 rem (cSv) indicating tighter controls limiting exposure above this level. This distribution characteristic is further reflected in the relatively high average measurable dose of about 0.30 rem (cSv), but a relatively low CR value for these facilities.

3.3 Summary of Occupational Exposure Data by License Category

3.3.1 Industrial Radiography Licenses, Single and Multiple Locations

These licenses are issued to allow the use of sealed radioactive materials, usually in exposure devices or "cameras," that primarily emit gamma rays for nondestructive testing of pipeline weld joints, steel structures, boilers, air craft and ship parts, and other high-stress alloy parts. Some firms are licensed to conduct such activities in one location, usually in a permanent facility which was designed and shielded for radiography, and others perform radiography at multiple, temporary sites in the field. The radioisotopes most commonly used are cobalt-60 and iridium-192. As shown in Table. 3.1, annual reports were received for 270 radiography licensees in 1989, which is 10 less than that reporting in 1988.

Table 3.4 summarizes the reported data for the two types of radiography licenses for 1989 and for the previous two years for comparison purposes. For single location facilities, the table shows that in 1989, the number of

TABLE 3.4
ANNUAL EXPOSURE INFORMATION FOR INDUSTRIAL RADIOGRAPHERS
1987-1989

Year	Type of License	Number of Licenses	Number of Monitored Individuals	Workers with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Measurable Dose (rem or cSv)
1989	Single location	72	989	324	38	0.12
	Multiple locations	204	5,756	4,028	1,990	0.50
	Total	276	6,745	4,352	2,028	0.47
1988	Single location	77	1,182	395	60	0.15
	Multiple locations	209	5,696	3,828	1,921	0.50
	Total	286	6,878	4,223	1,981	0.47
1987	Single location	83	1,318	415	44	0.11
	Multiple locations	229	5,918	4,039	1,791	0.44
	Total	312	7,236	4,454	1,835	0.41

workers receiving measurable doses (324) decreased by 18% over last year's value, while the collective dose decreased to 39 person-rem (cSv). This resulted in the average measurable dose decreasing from 0.15 in 1988 to 0.12 rem (cSv) in 1989.

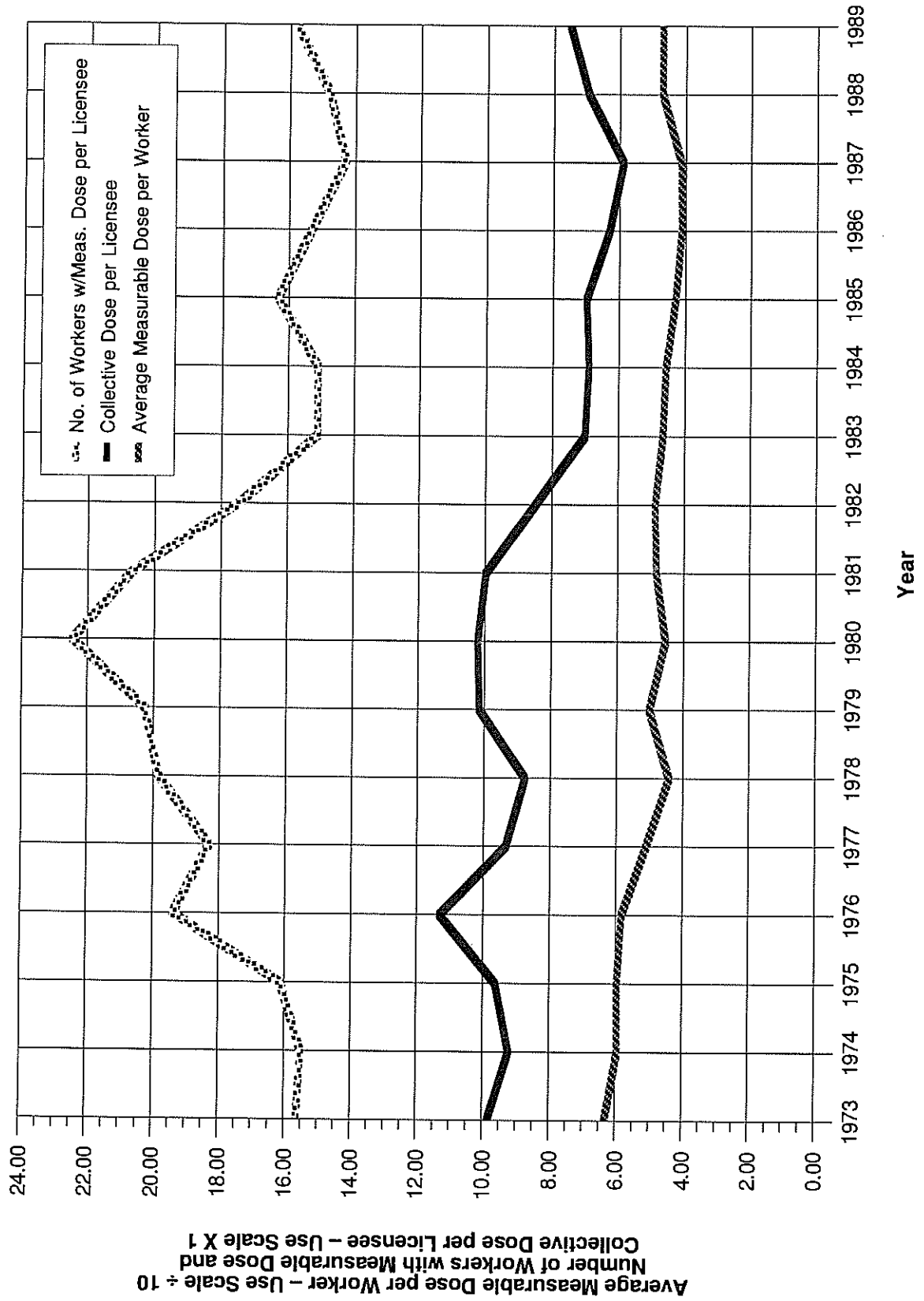
At firms having multiple-location licenses in 1989, the number of monitored workers with measurable dose increased by 5%, and the collective dose increased by 4% from the 1988 values. This resulted in the average measurable dose remaining at 0.50 rem (cSv). However, the average dose for workers performing radiography at a single location was one-fourth that amount. This was probably due to the fact that it is more difficult for workers to avoid exposure to radiation in the field, where conditions are not the best and may change every day. In order to see the contribution that each radiography licensee made to the total collective dose, a summary of the information reported by each of these licensees in 1989 is presented in Appendix A in descending order of average measurable dose.

Figure 3.2 shows the number of personnel with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose for both types of industrial radiography facilities from 1973 through 1989. All three parameters have remained fairly stable since 1983 with a slight increase in 1988 and 1989 due primarily to an increase in the total collective dose and a decrease in the number of licensees.

3.3.2 Manufacturer and Distributor Licenses, Type "A" Broad and Limited

Manufacturer and distributor licenses are issued to allow the manufacture and distribution of radionuclides in various forms for a number of diverse purposes. The products are usually distributed to persons specifically licensed by the NRC or an Agreement State. Type "A" Broad licenses are issued to larger organizations who may use many different radionuclides in many different ways and who have a comprehensive radiation protection program. The Limited licenses are usually issued to smaller firms requiring a more restrictive license. Some firms are medical suppliers that process, package, or distribute such products as diagnostic test kits, radioactive surgical implants, and tagged radiochemicals for use in medical research, diagnosis, and therapy. Limited firms are suppliers of industrial radionuclides and are involved in the processing, encapsulation, packaging, and distribution of the radionuclides that they have purchased in bulk quantities from production reactors and cyclotrons. Major products include gamma radiography sources, cobalt irradiation sources, well-logging sources, sealed sources for gauges

Figure 3.2
Average Annual Values at Industrial Radiography Facilities 1973 – 1989



and smoke detectors, and radiochemicals for nonmedical research. However, only those NRC licensees that possess or use at any one time specified quantities of the nuclides listed in paragraph 20.408(a)(6) are required to submit annual (10 CFR § 20.407) and termination (10 CFR § 20.408) reports.

Table 3.5 presents the annual data that were reported by the two types of licensees for 1989 and the previous two years. The total number of workers receiving measurable doses as reported by these types of licensees decreased dramatically by about 63% to 868 workers in 1988 but increased to a value of 2,345 in 1989. The collective dose also increased to the highest value in six years resulting in an average dose of 0.33 rem (cSv). Looking at the information shown separately for the Type "A" Broad and Limited licensees, one can see that the values of all of the parameters remain higher for the Broad licensees, probably because this type of license allows the possession of larger quantities of radioactive materials than do the Limited licenses. However, when attempting to examine trends in the data presented for this category of licensees, one should note that the types and quantities of radionuclides may fluctuate from year to year, and even during the year, so that some licensees may report dose data one year and not the next and may be

TABLE 3.5
ANNUAL EXPOSURE INFORMATION FOR MANUFACTURERS AND DISTRIBUTORS
1987-1989

Year	Type of License	Number of Licenses	Number of Monitored Individuals	Workers with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Measurable Dose (rem or cSv)
1989	M & D-"A"-Broad	11	3,617	1,956	721	0.37
	M & D-Limited	37	937	389	49	0.13
	Total	48	4,554	2,345	770	0.33
1988	M & D-"A"-Broad	10	2,119	837	340	0.41
	M & D-Limited	6	58	31	3	0.10
	Total	16	2,177	868	343	0.40
1987	M & D-"A"-Broad	11	3,212	2,095	661	0.32
	M & D-Limited	13	377	222	55	0.25
	Total	24	3,589	2,317	716	0.31

included as a Broad licensee one year and a Limited licensee at other times. Since the number of reporting licensees is quite small, these fluctuations may have a significant impact on the values of the parameters. For example, the increase in the total collective dose in 1989 is a result of more licenses reporting, whereas the collective dose per licensee continues to decrease as shown in Figure 3.3.

Figure 3.3 also shows the number of personnel with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose for both Type "A" Broad and Limited manufacturing and distribution facilities. While the collective dose per licensee has decreased considerably from a value of 62.5 person-rems (cSv) in 1975 to a value of 16.0 person-rems (cSv) in 1989, the number of workers with measurable dose per licensee has fluctuated greatly over the years with the largest yearly decrease occurring between 1987 and 1988. This value decreased again in 1989 to a value of 47.1 which is the lowest value recorded since before 1973.

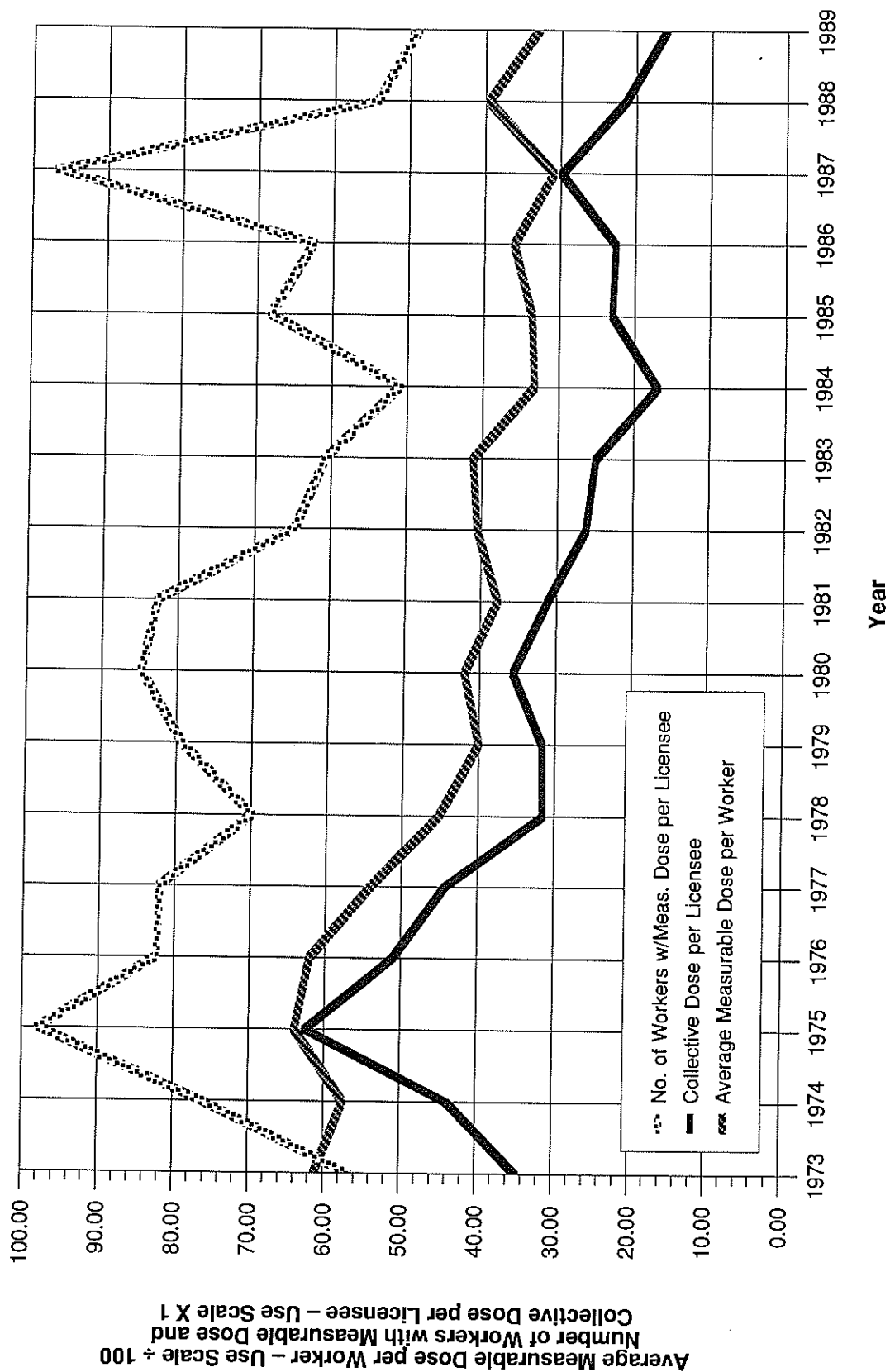
In order to see the contribution that each of these licensees made toward the total values of the number of persons monitored, number of workers, and collective dose, Appendix A lists the values of these parameters for each licensee in descending order of average measurable dose for 1989.

3.3.3 Low-Level Waste Disposal Licenses

These licenses are issued to allow the receipt, possession, and disposal of low-level radioactive wastes at a land disposal facility. The licensee has the appropriate facilities to receive wastes from such places as hospitals and laboratories, store them for a short time and dispose of them in a properly prepared burial ground. The licensees in this category are located in and licensed by Agreement States that have primary regulatory authority over its activity. However, they also have an NRC license that covers certain special nuclear material they might receive. The annual dose reports submitted by these licensees include all doses received during the year regardless of whether they were due to NRC or Agreement State licensed material.

The requirement for this category of NRC licensee to file annual reports became effective in January 1983. While in 1982 and 1983 there was only one licensee in this category, there have been two licensees in this category since 1984. Table 3.1 summarizes the data reported for 1982 through 1989.

Figure 3.3
Average Annual Values at Manufacturing and Distribution Facilities 1973 – 1989



In 1989, the number of workers receiving measurable doses (119) decreased 30% from last year (171), while the collective dose increased from 27 to 35 person-rem (-cSv). The average measurable dose, therefore, increased from 0.16 person-rem (-cSv) to 0.29 person-rem (-cSv). Appendix A summarizes the exposure information reported by these two licensees in 1989.

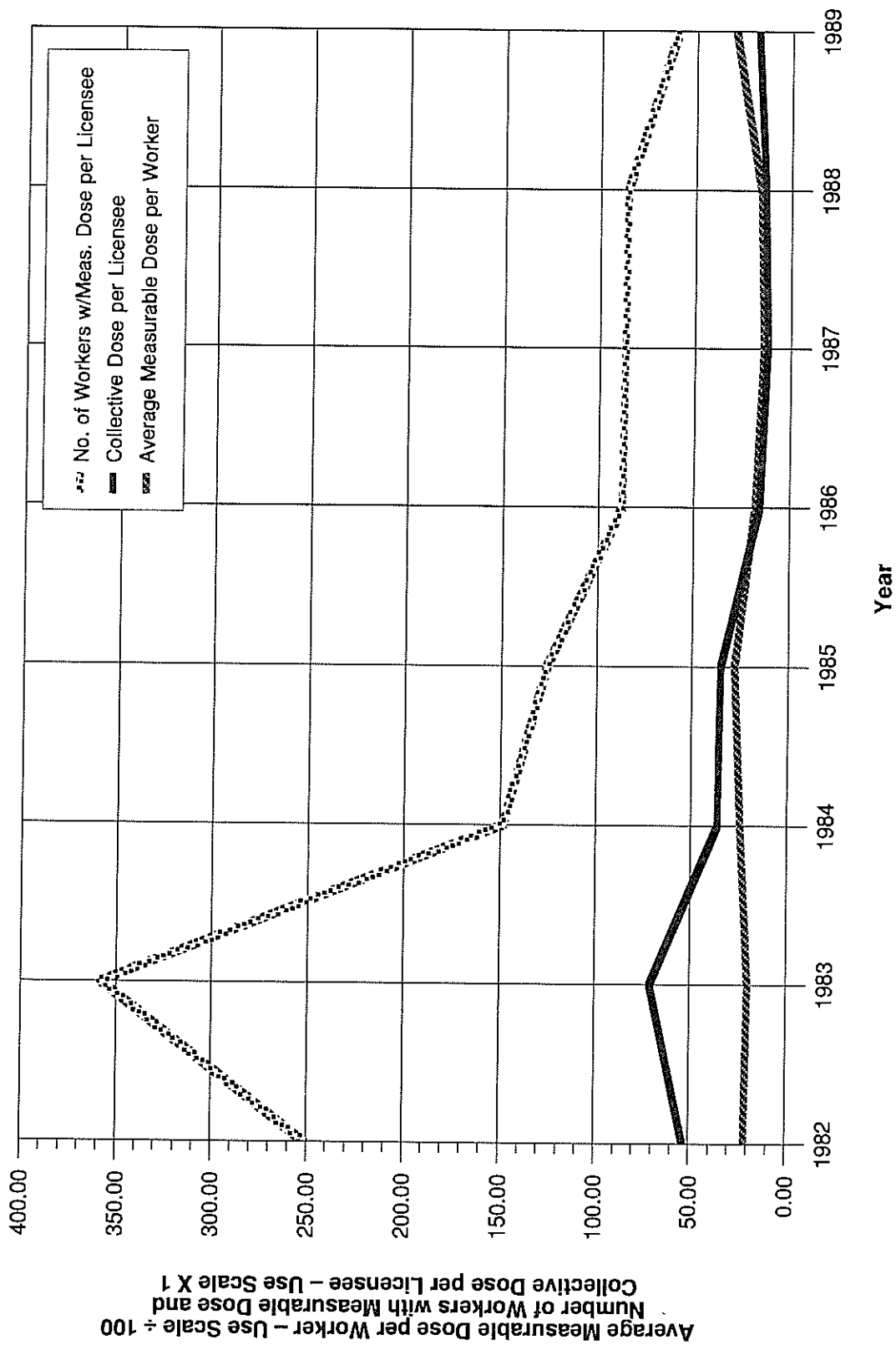
Figure 3.4 shows the number of personnel with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose for low-level waste disposal facilities from 1982 through 1989. As one would expect, since only two licensees have been involved in this activity over the past six years, the numbers have remained fairly stable from 1984 through 1989.

3.3.4 Independent Spent Fuel Storage Installation Licenses

These licenses are issued to allow the possession of power reactor spent fuel and other associated radioactive materials for the purpose of storage of such fuel in an independent spent fuel storage installation (ISFSI). Here, the spent fuel, which has undergone at least one year of decay since being used as a source of energy in a power reactor, is provided interim storage, protection, and safeguarding for a limited time pending its ultimate disposal. There have been three licenses issued for these activities, two at nuclear power plants and one at an independent facility. In 1987, one reactor licensee began reporting the dose distribution information for the spent fuel storage activities separately, while the other reactor licensee combined the data with the report for all activities at the site. Only those two licensees (one reactor and one independent) that reported dose distribution information separately are included in this analysis of independent spent fuel storage installation facilities for 1989.

Table 3.1 summarizes the data submitted for 1982 through 1986 by the only ISFSI that is separate from a nuclear power plant and shows the sum of this facility with the one located at the power plant for 1987 through 1989. The number of individuals receiving measurable dose in 1989 was 102, a significant increase from the 57 individuals reported in 1988. The collective dose also increased from a value of 25 person-rem (-cSv) in 1988 to a value of 30 person-rem (-cSv) in 1989. The average measurable dose, however, decreased for the third year in a row to a value of 0.33 rem (cSv). The value of CR has decreased also to a value of 0.09 which is one third of the value of 0.27 calculated for 1988. A contributing factor to the relatively high average dose reported in previous years was that the licensees reported the doses of only those workers required to be monitored for exposure to radiation, unlike

Figure 3.4
Average Annual Values at Low-Level Waste Disposal Facilities 1982 – 1989



most other licensees which report the doses of all individuals for whom monitoring was provided. This had a tendency to result in the calculation of a higher average dose.

Figure 3.5 shows the number of personnel with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose per worker for independent spent fuel storage facilities. While the average measurable dose per worker decreased in 1989, the number of personnel with measurable dose per licensee increased from 28.5 in 1988 to 51 in 1989 along with an increase in the collective dose per licensee from 12.5 person-rem (cSv) in 1988 to a value of 16.5 person-rem (cSv) in 1989. The average measurable dose per worker decreased from 0.44 rem (cSv) in 1988 to 0.33 rem (cSv) in 1989. This is a significant improvement over the data for the years 1985 and 1986, where the average measurable dose for both years was 1.06 rem (cSv). Appendix A summarizes the exposure information reported by the two installations that reported in 1989.

3.3.5 Fuel Fabrication and Reprocessing Licenses

The fuel fabrication licenses are issued to allow the processing and fabrication of reactor fuels. In most uranium facilities where light water reactor fuels are processed, uranium hexafluoride enriched in the isotope U-235 is converted to solid uranium dioxide pellets and inserted into zirconium alloy tubes. The tubes are fabricated into fuel assemblies which are shipped to nuclear power plants. Some facilities also perform chemical operations to recover the uranium from scrap and other off-specification materials. On a much smaller scale, fuel assemblies containing plutonium oxide pellets can be similarly fabricated and used in reactors for experimental purposes. However, there are no NRC licensees engaged in this activity at this time.

Table 3.6 shows that the number of fuel fabrication facilities has dropped to 8 in 1989. A number of licensees were involved in decontamination and decommissioning of their plutonium facilities, and for several years, the data for these licensees were shown in the "Decommissioning" category in Table 3.1. Since these facilities have ceased to fabricate plutonium fuel, they are not required to file annual reports and are no longer shown in the tables.

Table 3.6 also shows that in 1989, the collective dose decreased by about 47% to 243 person-rem (cSv) (the lowest dose yet reported), down from 455 person-rem (cSv) in 1988. The number of workers with measurable external doses also decreased, resulting in the average measurable dose dropping to 0.08 rem (cSv) in 1989.

Figure 3.5
Average Annual Values at Independent Spent Fuel Storage Facilities 1982 – 1989

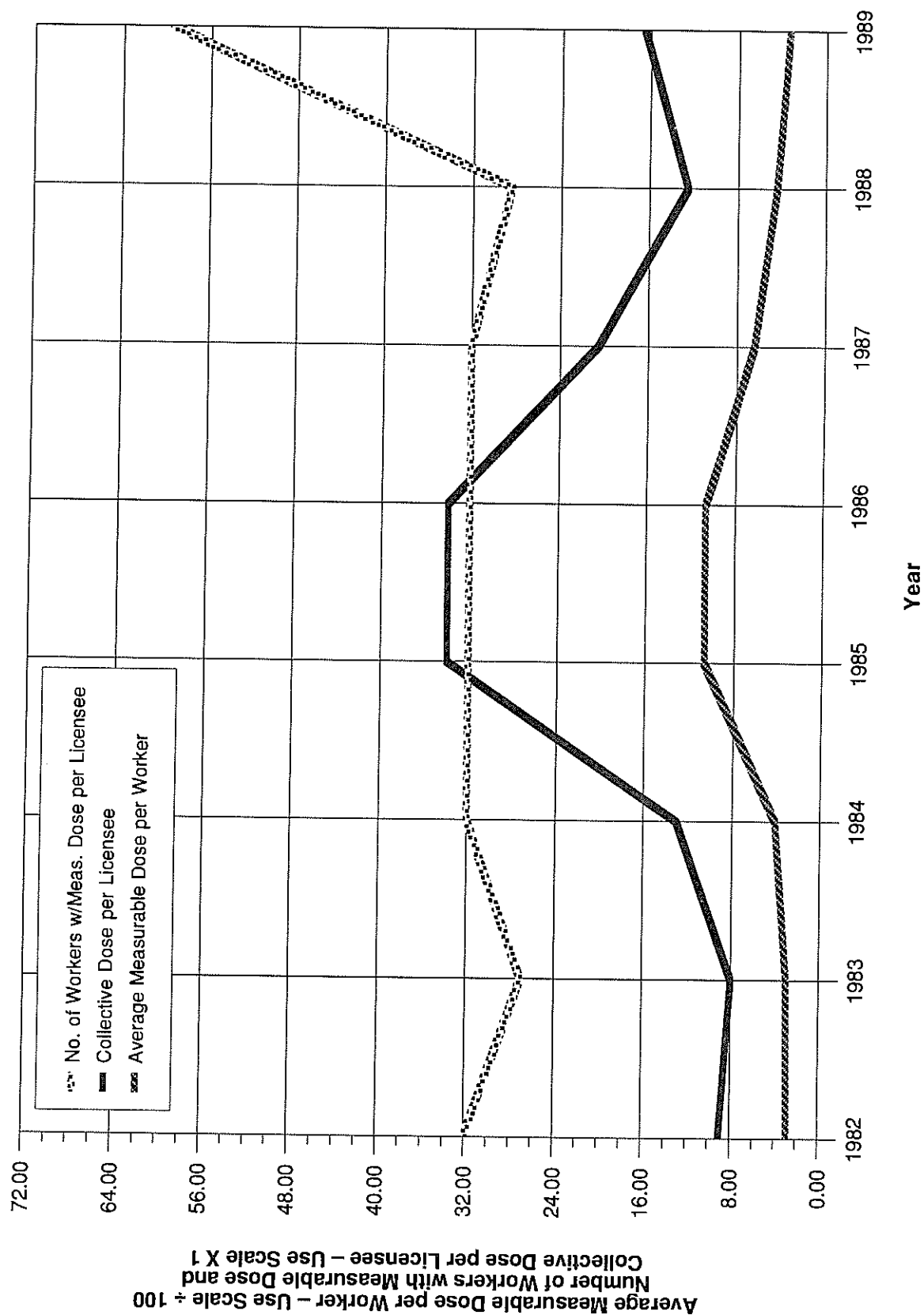


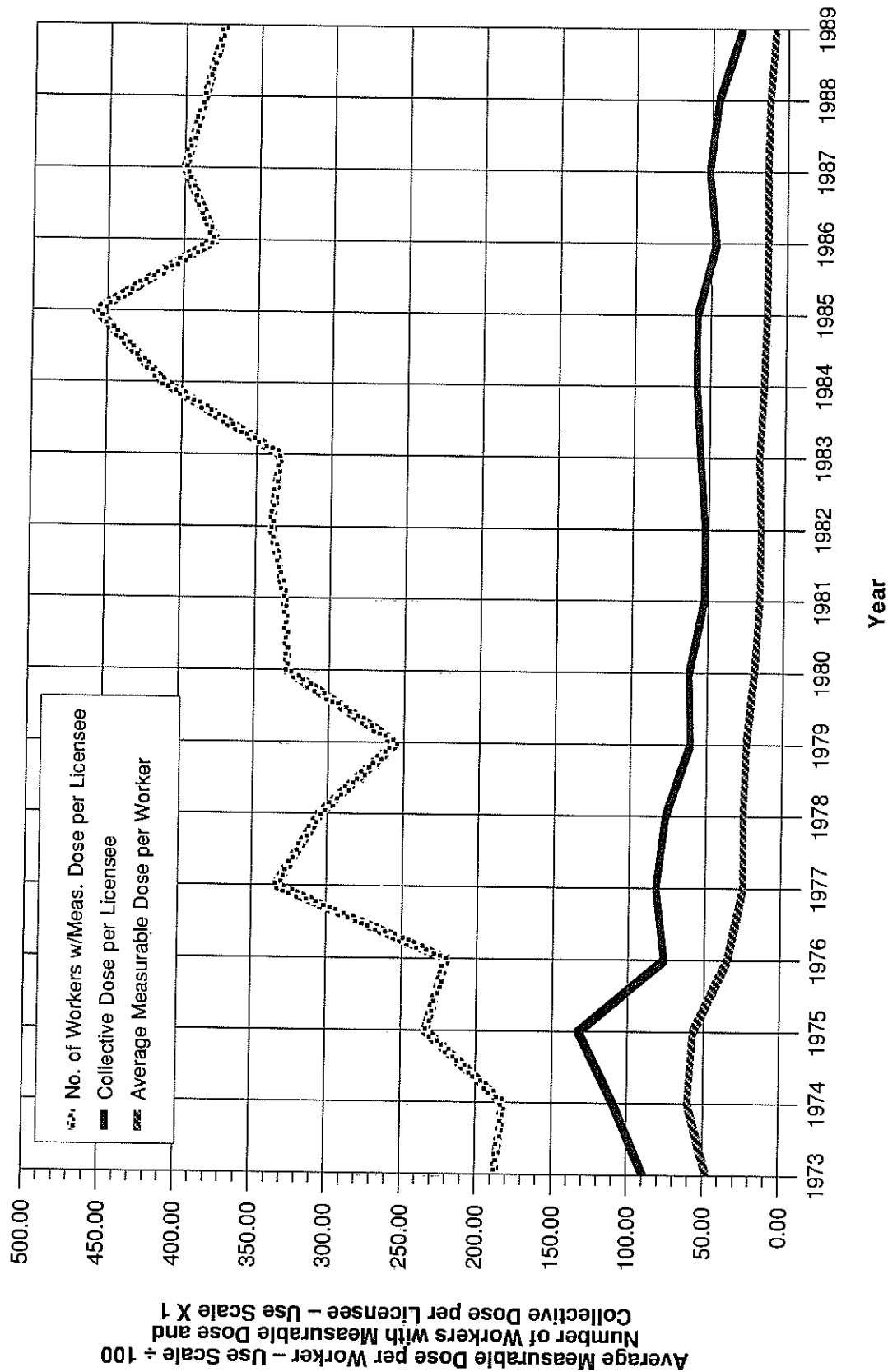
TABLE 3.6
ANNUAL EXPOSURE INFORMATION FOR FUEL FABRICATORS
1987-1989

Year	Type of License	Number of Licenses	Number of Monitored Individuals	Workers with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Measurable Dose (rem or cSv)
1989	Uranium Fuel Fab	8	11,583	2,992	243	0.08
1988	Uranium Fuel Fab	10	11,994	3,869	455	0.12
1987	Uranium Fuel Fab	10	10,370	3,994	514	0.13

Figure 3.6 shows the number of personnel with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose for fuel fabrication licensees. For the past two years the number of personnel with measurable dose per licensee, collective dose per licensee, and average measurable dose has experienced a gradual decreasing trend. Appendix A lists each of the eight licensees reporting in 1989, with the number of persons monitored, the number of workers receiving measurable external doses, and the collective dose for each licensee in descending order of average measurable dose.

Fuel reprocessing licenses are issued to allow the separation of usable uranium and plutonium from spent nuclear fuel. There was only one commercial facility that was ever licensed to reprocess fuel, and it has been shut down since 1972. However, the licensee did some decontamination work and stored radioactive waste at the facility for several years, and the annual report that was submitted each year was usually grouped with those of the fuel fabricators. In February 1982, the Department of Energy assumed possession and control of the reprocessing facility to conduct waste solidification activities necessary for final decommissioning. During this period, the NRC license will, in effect, be suspended, and no reports will be filed with the NRC.

Figure 3.6
Average Annual Values at Fuel Fabrication and Processing Facilities 1973 – 1989



3.3.6 Light Water-Cooled Power Reactor (LWR) Licenses

These licenses are issued to utilities to allow them to use special nuclear material in a reactor which produces heat and generates electricity to be sold to consumers. There are two major types of commercial LWRs in the United States - pressurized water reactors (PWRs) and boiling water reactors (BWRs) - each of which uses water as the primary coolant.

As shown in Table 3.1, annual reports were received from nuclear power facilities for 112 licensed LWRs where 192,297 individuals were monitored for exposure to radiation in 1989. Of this number, 101,243 workers received a measurable dose and incurred a collective dose of 36,849 person-rem (person-cSv). This is 10% lower than the collective dose of 41,076 reported for 1988. The number of workers with measurable doses has increased somewhat which has resulted in the average measurable dose of 0.36 rem (cSv) in 1989. It is important to note that these figures have been adjusted for the multiple counting of transient reactors workers (see Section 5). The reported dose distribution of workers monitored at each plant site is presented in alphabetical order by site name in Appendix B.

More detailed presentations and analyses of the annual exposure information reported by nuclear power facilities can be found in Sections 4 and 5.

3.3.7 High-Temperature Gas-Cooled Power Reactor (HTGR) Licenses

A license to operate a power reactor is issued to utilities to allow them to use special nuclear material in a reactor to produce heat to generate electricity to be sold to consumers. In the HTGR, a gas, usually helium, is used as the primary coolant. Fort St. Vrain near Greeley, Colorado, was the only such reactor in operation in the U.S. but has not been in commercial operation since 1988. As shown in Table 3.7, annual whole body doses incurred by workers at the plant have been minimal.

No one exceeded an annual dose of 0.25 rem (cSv) until 1985 when the highest annual dose was between 1 and 2 rem (cSv). In 1986 the average dose per worker dropped back down to 0.03 rem (cSv) along with a large decrease in the number of workers at the site. In 1989 the number of workers with measurable doses was 55 with an average measurable dose of 0.05 rem. Although the 1986 maintenance activities resulted in the largest collective and average annual doses in the history of the plant, these doses remain much smaller than those for PWRs and BWRs.

TABLE 3.7
ANNUAL EXPOSURE INFORMATION FOR FORT ST. VRAIN
1974-1989

Year	No. of Individuals with Annual Doses in Ranges (rems or cSv)				Total No. of Individuals Monitored	Annual Collective Dose (person-rems or person-cSv)	Gross Electricity Generated (MW-yr)	Average Measurable Dose per Worker (rem or cSv)
	No Meas'ble Dose	Meas'ble Dose <0.10	0.10- 0.25	0.25- 2.00				
1974	1,597	63	1	0	1,661	3.3	0.0	0.05
1975	1,263	0	0	0	1,263	0.0	0.0	0.00
1976	1,362	25	0	0	1,387	1.3	2.8	0.05
1977	946	55	1	0	1,002	2.9	29.8	0.05
1978	896	34	0	0	930	1.7	75.7	0.05
1979	1,149	120	2	0	1,271	6.4	28.6	0.05
1980	902	57	1	0	960	3.0	83.2	0.05
1981	1,096	31	0	0	1,127	1.0	93.6	0.03
1982	978	22	0	0	1,000	0.4	72.6	0.02
1983	965	48	0	0	1,013	1.0	94.4	0.02
1984	1,616	62	8	0	1,686	3.0	10.9	0.04
1985	1,929	370	40	33	2,372	35.0	3.8	0.08
1986	221	66	4	0	291	1.8	9.7	0.03
1987	155	52	2	0	209	1.2	23.8	0.02
1988	238	24	0	0	262	0.7	81.8	0.03
1989	316	47	6	2	371	2.7	0.0	0.05

4 COMMERCIAL LIGHT WATER REACTORS - FURTHER ANALYSIS

4.1 Introduction

General trends in occupational radiation exposures at nuclear power reactors are best evaluated within the context of other pertinent information. In this chapter, some of the tables and appendices that summarize exposure data also show the type, capacity, and age of the reactor; the amount of electricity generated; the types of workers being exposed; and the sort of tasks being performed. Exposure data is then presented as a function of these data.

4.2 Definitions of Terms and Sources of Data

4.2.1 Number of Reactors

The *number of reactors* shown in Tables 4.1, 4.2, and 4.3 is the number of BWRs, PWRs, and LWRs, respectively, that had been in commercial operation for at least one full year as of December 31 of each of the indicated years. This is the number of reactors on which the *average number of workers with measurable dose* and *average collective dose per reactor* is based. Excluded are those reactors that may have been in commercial operation for only a few months during the first year and reactors that have been defueled and declared that they will not be commercially operated again. This yields conservative values for many of the averages shown in the tables. The date that each reactor was declared to be in commercial operation was found in Reference 14.

In prior years Three Mile Island 2 has been included in the compilation of data for commercially operating reactors. The reactor has been shut down since the 1979 accident and has been in the process of defueling and decommissioning since that time. Three Mile Island 2 is not included in the data analysis for 1989, and will no longer be included in the operational data analysis presented in this report. Data for this reactor, however, will be listed in Appendices B, C, D and E for reference purposes.

4.2.2 Electric Energy Generated

The electric energy generated in gross megawatt-years (MW-yr) each year by each facility is shown in Appendix C and graphically represented in Appendix E. This number was obtained by dividing the gross megawatt-hours of electricity annually produced by each facility by 8,760, the number of hours in the year, except for leap years when the number is 8,784 hours. The gross megawatt-years of generated electricity that are presented in Tables 4.1, 4.2, and 4.3 are the sums of that produced by the number of reactors included in

TABLE 4.1

SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL BOILING WATER REACTORS+

1973-1989

Year	Number of Reactors Included	Annual Collective Doses (person-rem or person-cSv)	No. of Workers With Measurable Doses	Gross Electricity Generated (MW-yr)	Average Dose Per Worker (rem or cSv)	Average Collective Dose Per Reactor (person-rem or person-cSv)	Average No. Personnel With Measurable Doses Per Reactor	Average Collective Dose per MW-yr (person-rem/MW-yr)	Average Electricity Generated Per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)
1973	12	4,564	5,340	3,393.9	0.85	380	445	1.3	283	438
1974	14	7,095	8,769	4,060.2	0.81	507	626	1.7	290	485
1975	18	12,611	14,607	5,786.4	0.86	701	812	2.2	321	595
1976	23	12,626	17,869	8,435.1	0.71	549	777	1.5	367	637
1977	23	19,041	21,388	9,102.5	0.89	828	930	2.1	396	637
1978	25	15,273	20,278	11,856.0	0.75	611	811	1.3	474	660
1979	25	18,325	25,245	11,671.0	0.73	733	1,010	1.6	467	660
1980	26	29,530	34,094	10,868.2	0.87	1,136	1,311	2.7	418	663
1981	26	25,471	34,755	10,899.2	0.73	980	1,337	2.3	419	663
1982	26	24,437	32,235	10,614.6	0.76	940	1,240	2.3	408	663
1983	26	27,455	33,473	9,730.1	0.82	1,056	1,287	2.8	374	663
1984	27*	27,097	41,105	10,019.2	0.66	1,004	1,522	2.7	371	754
1985	29**	20,573	38,237	12,284.0	0.54	709	1,319	1.7	424	775
1986	30	19,570	37,928	12,102.1	0.52	652	1,264	1.6	403	786
1987	32***	16,870	41,737	15,109.0	0.40	527	1,304	1.1	472	832
1988	34	17,986	40,305	16,665.4	0.45	529	1,185	1.1	490	845
1989	36	15,674	44,360	17,543.5	0.35	435	1,232	0.9	487	857

+Includes only those reactors that had been in commercial operation for at least one full year as of December 31 of each of the indicated years, and all figures are uncorrected for multiple reporting of transient individuals.

The following plants have ceased operation and were removed from the list of commercially operating reactors in each of the years indicated:

*In 1984, Humboldt Bay, shut down since 7/76.

**In 1985, Dresden 1, shut down since 10/78.

***In 1987, LaCrosse, shut down since 4/30/87.

TABLE 4.2

SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL PRESSURIZED WATER REACTORS⁺

1973-1989

Year	Number of Reactors Included	Annual Collective Doses (person-cSv)	No. of Workers With Measurable Doses	Gross Electricity Generated (MW-yr)	Average Dose Per Worker (rems or cSv)	Average Collective Dose Per Reactor (person-rems or person-cSv)	Average No. Personnel With Measurable Doses Per Reactor	Average Collective Dose per MW-yr (person-rems/MW-yr)	Average Electricity Generated Per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)
1973	12	9,398	9,440	3,770.2	1.00	783	787	2.5	314	544
1974	19	6,555	9,370	6,530.7	0.70	345	493	1.0	344	591
1975	26	8,268	10,884	11,982.5	0.76	318	419	0.7	461	647
1976	30	13,807	17,588	13,325.0	0.79	460	586	1.0	444	701
1977	34	13,467	20,878	17,345.8	0.65	396	614	0.8	510	688
1978	39	16,528	25,700	19,840.5	0.64	424	659	0.8	509	706
1979	42	21,657	38,828	18,255.0	0.56	516	924	1.2	435	746
1980	42	24,265	46,237	18,289.3	0.52	578	1,101	1.3	435	746
1981	44	28,673	47,351	20,553.7	0.61	652	1,076	1.4	467	752
1982	48	27,753	52,146	22,140.6	0.53	578	1,086	1.3	461	777
1983	49	29,017	52,173	23,195.5	0.56	592	1,065	1.3	473	785
1984	51	28,138	56,994	26,478.4	0.49	552	1,118	1.1	519	809
1985	53*	22,469	54,633	29,470.7	0.41	424	1,031	0.8	556	820
1986	59	23,083	62,994	33,095.9	0.37	391	1,068	0.7	561	873
1987	64	23,720	62,593	37,007.3	0.38	371	978	0.6	578	862
1988	68	22,786	62,922	42,929.7	0.36	335	925	0.5	631	885
1989	71	20,478	63,893	44,679.5	0.32	288	900	0.5	629	897

⁺Includes only those reactors that had been in commercial operation for at least one full year as of December 31 of each of the indicated years, and all figures are uncorrected for multiple reporting of transient individuals.

*In 1984 it was decided that Indian Point 1, a plant that has been shut down since 10/78, would not be put in commercial operation, and it is no longer included in the count of reactors.

TABLE 4.3

SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL LIGHT WATER COOLED REACTORS+

1973-1989

Year	Number of Reactors Included	Annual Collective Doses (person-rem or person-cSv)	No. of Workers With Measurable Doses	Gross Electricity Generated (MW-yr)	Average Dose Per Worker (rem or cSv)	Average Collective Dose Per Reactor (person-rem or person-cSv)	Average No. Personnel With Measurable Doses Per Reactor	Average Collective Dose per MW-yr (person-rem/MW-yr)	Average Electricity Generated Per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)
1973	24	13,962	14,780	7,164.1	0.94	582	616	1.9	299	491
1974	33	13,650	18,139	10,590.9	0.75	414	550	1.3	321	546
1975	44	20,879	25,491	17,768.9	0.82	475	579	1.2	404	626
1976	53	26,433	35,457	21,760.1	0.75	499	669	1.2	411	673
1977	57	32,508	42,266	26,448.3	0.77	570	742	1.2	464	667
1978	64	31,801	45,978	31,696.5	0.69	497	718	1.0	495	688
1979	67	39,982	64,073	29,926.0	0.62	597	956	1.3	447	714
1980	68	53,795	80,331	29,157.5	0.67	791	1,181	1.8	429	714
1981	70	54,144	82,106	31,452.9	0.66	773	1,173	1.7	449	719
1982	74	52,190	84,381	32,755.2	0.62	705	1,140	1.6	443	737
1983	75	56,472	85,646	32,925.6	0.66	753	1,142	1.7	439	743
1984	78*	55,235	98,099	36,497.6	0.56	708	1,258	1.5	468	790
1985	82**	43,042	92,870	41,754.7	0.46	525	1,133	1.0	509	804
1986	89	42,653	100,922	45,198.0	0.42	479	1,134	0.9	508	844
1987	96***	40,590	104,330	52,116.3	0.39	423	1,087	0.8	543	852
1988	102	40,772	103,227	59,595.1	0.39	400	1,012	0.7	584	871
1989	107	36,152	108,253	62,223.0	0.33	338	1,012	0.6	582	883

+Includes only those reactors that had been in commercial operation for at least one full year as of December 31 of each of the indicated years, and all figures are uncorrected for multiple reporting of transient individuals.

The following plants have ceased operation and were removed from the list of commercially operating reactors in each of the years indicated:

*In 1984, Indian Point 1 and Humboldt Bay, shut down since 10/74 and 7/76 respectively.

**In 1985, Dresden 1, shut down since 10/78.

***In 1987, LaCrosse, shut down since 4/30/87.

each year. These sums are divided by the number of those reactors included in each year to yield the average amount of electric energy generated (MW-yr) per reactor, which is also shown in Tables 4.1, 4.2, and 4.3. The number of gross megawatt-hours of electricity produced each year was found in Reference 14.

4.2.3 Collective Dose per Megawatt-Year

The number of megawatt-years of electricity generated was used in determining the ratio of the average value of the annual collective dose to the number of megawatt-years of electricity generated. The ratio was calculated by dividing the total collective dose in person-rem (cSv) by the gross electric energy generated in megawatt-years and is a measure of the dose incurred by workers at power plants in relation to the gross electric energy produced. This ratio was also calculated for each reactor site and is presented in Tables 4.1, 4.2, and 4.3 and Appendix C.

4.2.4 Average Maximum Dependable Capacity

Average maximum dependable capacity, shown in Tables 4.1, 4.2, and 4.3 was found by dividing the sum of the net maximum dependable capacities of the reactors in megawatts (net MWe) by the number of reactors included each year. The net maximum dependable capacity is defined as the gross electrical output as measured at the output terminals of the turbine generator during the most restrictive seasonal conditions, less the normal station service loads. This "capacity" of each plant was found in Reference 14, and it is shown for each site in Appendix C.

4.3 Annual Whole Body Dose Distributions

Table 4.4 summarizes the distribution of the annual whole body doses received by workers at all commercial LWRs during each of the years 1977 through 1989. This distribution is the sum of the annual dose distributions reported by each licensed LWR each year. As previously mentioned, the distribution reported by each LWR site for 1989 is shown in Appendix B. Table 4.4 shows that the number of monitored individuals continues to increase while the collective dose, after leveling off through the years 1980-1984, declined sharply in 1985. The collective dose has continued to decline and reached a ten-year low of 36,158 person-rem (-cSv) in 1989. The values of CR (see Section 3.1.8) show that the fraction of the collective dose due to individual doses greater than 1.5 rem (cSv) has also decreased to a value of 0.33, less than 0.50 for the fifth year in a row. The distributions shown in Table 4.4 for 1977-1989 have been corrected for the number of transient individuals that may have been reported by more than one site (see Section 5). Appendix F provides

TABLE 4.4

SUMMARY DISTRIBUTION OF ANNUAL WHOLE BODY DOSES AT COMMERCIAL LIGHT WATER REACTORS*

1977 - 1989

Year	No Meas'ble Exposure	Meas'ble <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.0	1.0- 2.0	2.0- 3.0	3.0- 4.0	4.0- 5.0	5.0- 6.0	6.0- 7.0	7.0- 8.0	8.0- 9.0	9.0- 10.0	10.0- 12.0	>12.0	Total Number Monitored	Number with Measurable Exposure	Collec- tive Dose** (person- rems or cSv)	CR***
1977	23,562	12,395	6,030	4,518	2,890	2,220	5,649	2,856	1,288	661	186	89	47	23	6			62,420	38,858	32,508	0.65
1978	28,372	15,101	6,342	4,998	3,088	2,247	5,995	3,034	1,197	514	109	37	9	0	1	0	2	71,046	42,674	31,801	0.61
1979	43,330	22,508	8,985	7,469	4,797	3,259	7,572	3,404	1,400	545	117	42	17	3	1			103,449	60,119	39,982	0.57
1980	50,873	26,903	10,676	8,904	5,570	4,134	10,671	4,607	1,816	831	235	119	29	7	1			125,376	74,503	53,795	0.59
1981	39,265	26,836	11,226	9,330	6,042	4,497	11,170	4,811	1,999	533	103	93	9	3	1	0	1	115,919	76,654	54,144	0.57
1982	41,713	29,225	11,713	9,903	6,229	4,420	10,220	4,716	2,066	596	97	31	5	0	1			120,936	79,223	52,190	0.58
1983	47,048	29,107	11,195	9,344	5,851	4,276	11,345	5,332	2,269	716	121	38	8	2				126,652	79,604	56,472	0.60
1984	54,670	36,296	13,427	10,275	6,336	4,804	11,283	5,206	2,122	487	52	22						144,980	90,310	55,235	0.57
1985	59,634	36,831	13,008	11,041	6,627	4,547	10,040	3,575	1,001	157	1							146,462	86,828	43,042	0.48
1986	68,050	41,463	14,573	11,843	7,016	4,692	10,241	3,062	868	146								161,954	93,904	42,653	0.45
1987	85,959	41,222	15,833	12,838	7,586	5,331	10,611	2,191	477	69								182,117	96,158	40,590	0.38
1988	88,467	40,226	15,913	13,153	7,903	5,461	10,310	2,442	511	26		1						184,413	95,946	40,772	0.39
1989	85,881	45,279	17,308	13,809	7,974	5,156	8,674	1,604	350	32								186,067	100,186	36,152	0.33

*Summary of reports submitted in accordance with 10 CFR 20.407 by plants that had been in commercial operation for at least one full year as of December 31 of each of the indicated years. Figures shown have been adjusted for the multiple reporting of transient individuals (see Section 5).

**The collective dose, when not reported by the utilities, was calculated by the NRC staff using methods described in this document.

***CR is the ratio of annual collective dose delivered at individual doses exceeding 1.5 rems (cSv) to the total annual collective dose.

uncorrected dose distributions for BWRs and PWRs separately for the years 1983 through 1989.

4.4 Average Annual Whole Body Doses

Some of the data presented in Tables 4.1, 4.2, and 4.3 are graphically displayed in Figure 4.1, where it can be seen that the average collective dose and average number of workers per BWR have been higher than those for PWRs since 1974 and that the values of both parameters, in general, continued to rise at both types of facilities until 1983. At that time, the average collective dose per reactor appeared to begin leveling off or decreasing slightly. After a sharp decrease in 1985, the collective dose has continued the decreasing trend in 1989 with collective doses per reactor of 435 person-rem (-cSv) and 288 person-rem (-cSv) at BWRs and PWRs, respectively. The number of workers with measurable dose per reactor has increased to 1232 for BWRs and decreased to 900 for PWRs in 1989.

Figures 4.2 and 4.3 are plots of most of the other information that is given in Tables 4.1, 4.2, and 4.3. The value for the total collective dose for all light-water reactors dropped sharply from a value of 40,772 person-rem (-cSv) in 1988 to 36,152 person-rem (-cSv) in 1989. Together with the drop in the number of workers with measurable dose, this created a decrease in the average measurable dose from 0.39 rem (cSv) in 1988 to 0.33 rem (cSv) in 1989. Power generation indicators such as gross electricity and average maximum dependable capacity net continued to increase for the ninth straight year, while the average collective dose per reactor and average collective dose per megawatt-year were seen to drop to less than half the 1980 values during the same time period.

The fluctuations in the parameters for the years following the accident at the Three Mile Island plant in 1979 may reflect some of the impact that this incident had on the nuclear power industry. The decrease seen in dose trends since 1983 may be attributable to several factors. Utilities have completed most of the tasks initiated as a result of the lessons learned from the Three Mile Island accident and they are increasing efforts to avoid and reduce exposure. The importance of exposure control and the concept of keeping exposures as low as reasonably achievable (ALARA) is continually being stressed, and programs to collect and share information relative to tasks, techniques, and exposures have been established.

Figure 4.1
Average Collective Dose and Number of Workers per Reactor
1973 – 1989

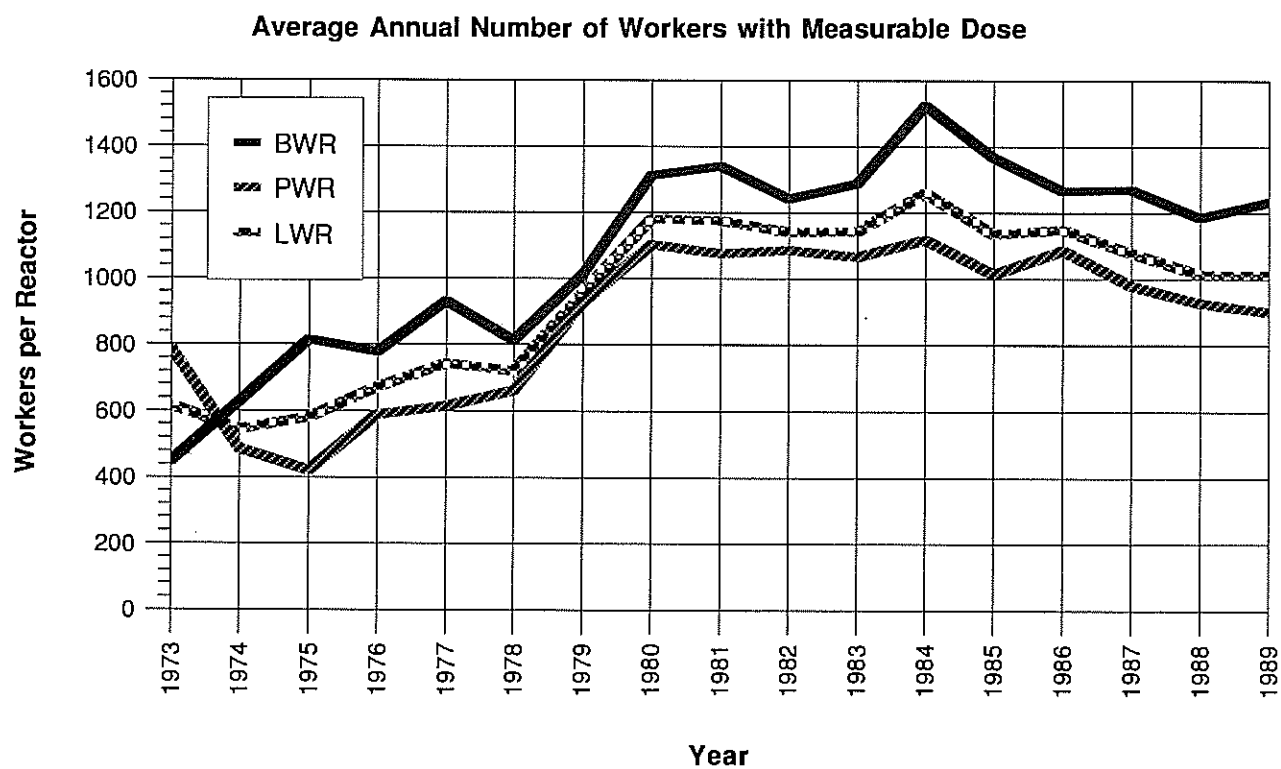
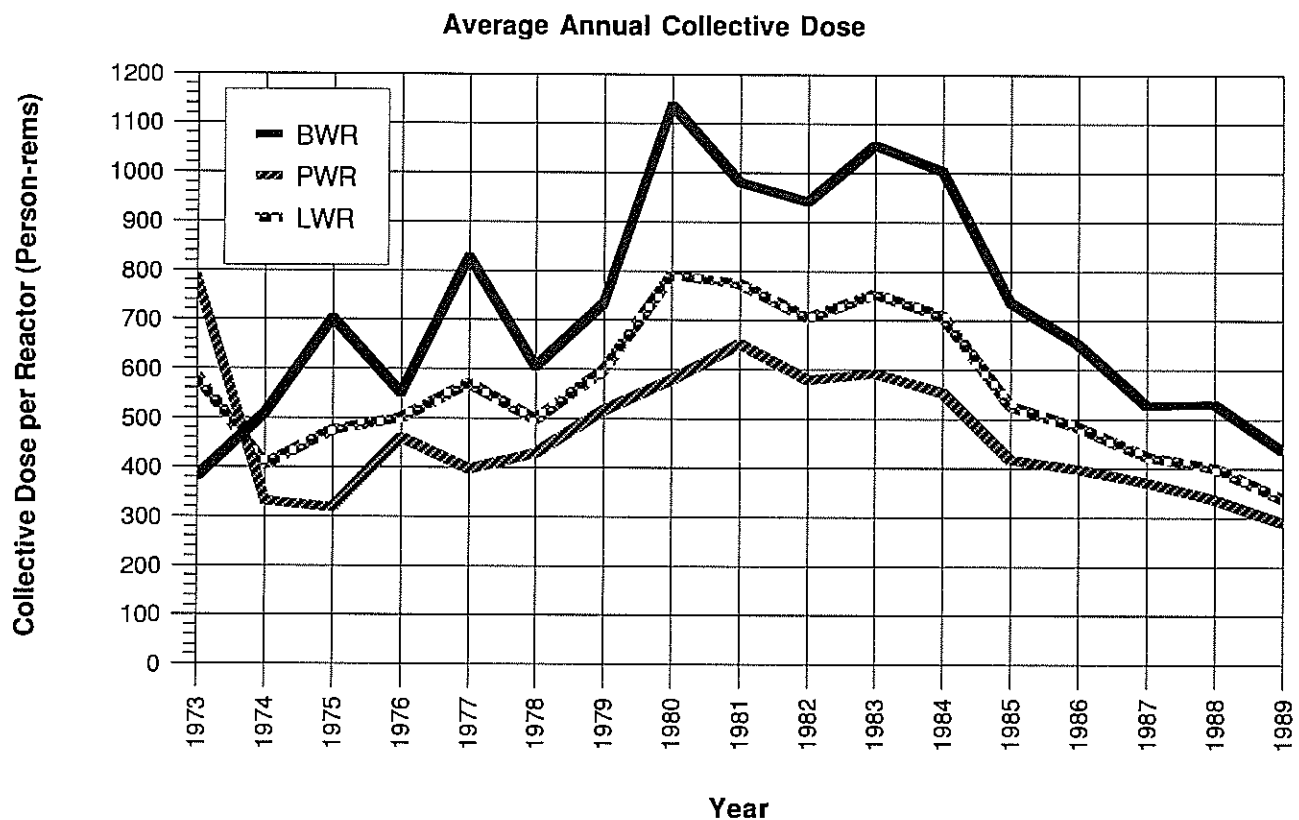


Figure 4.2
Number of Operating Reactors and Gross Electricity Generated
1973 – 1989

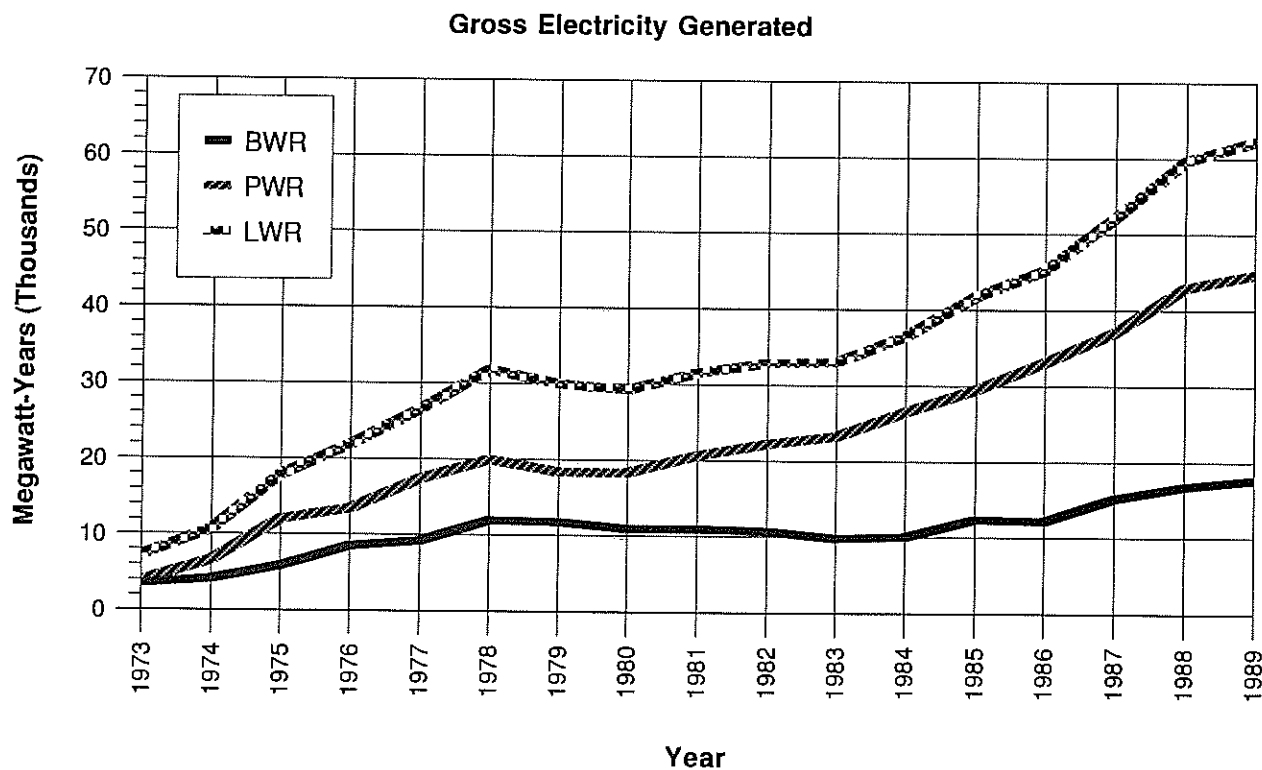
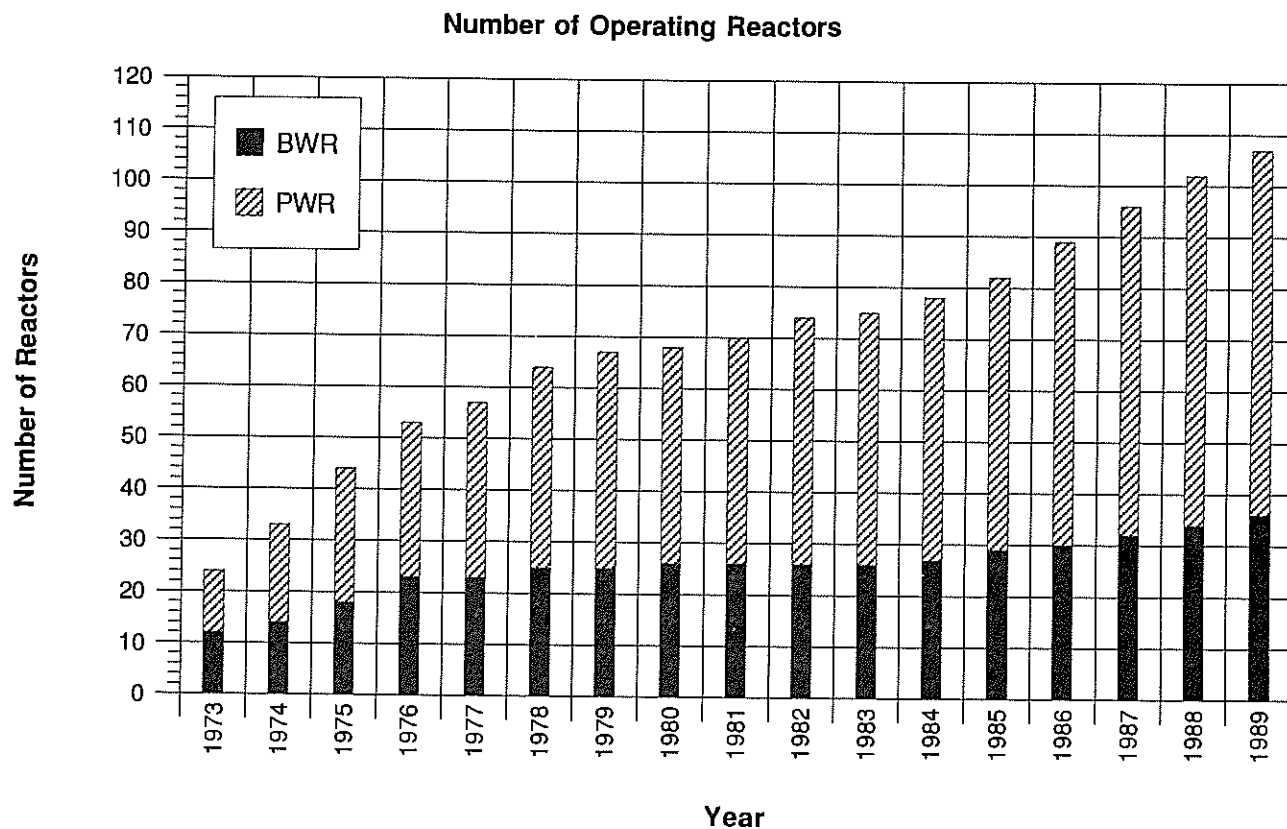


Figure 4.3
Average Measurable Dose and Collective Dose per Megawatt-Year
1973 – 1989

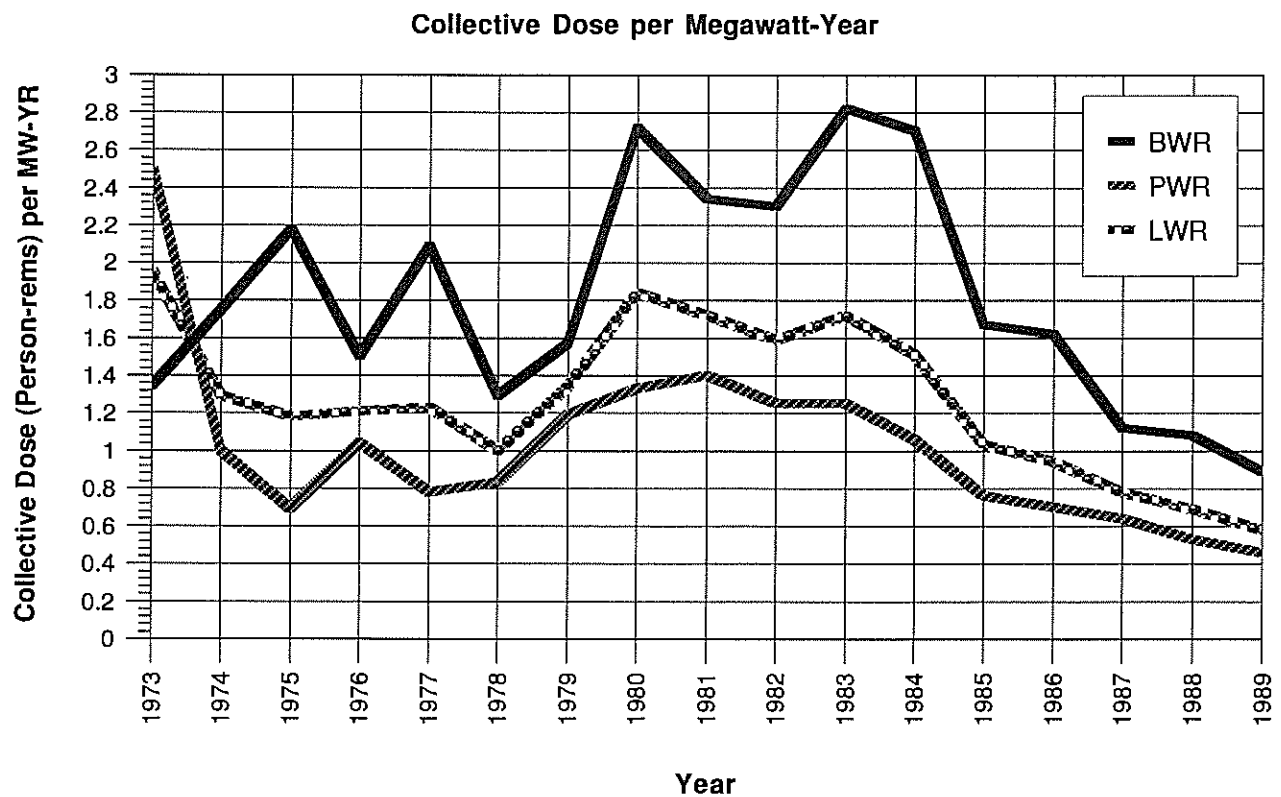
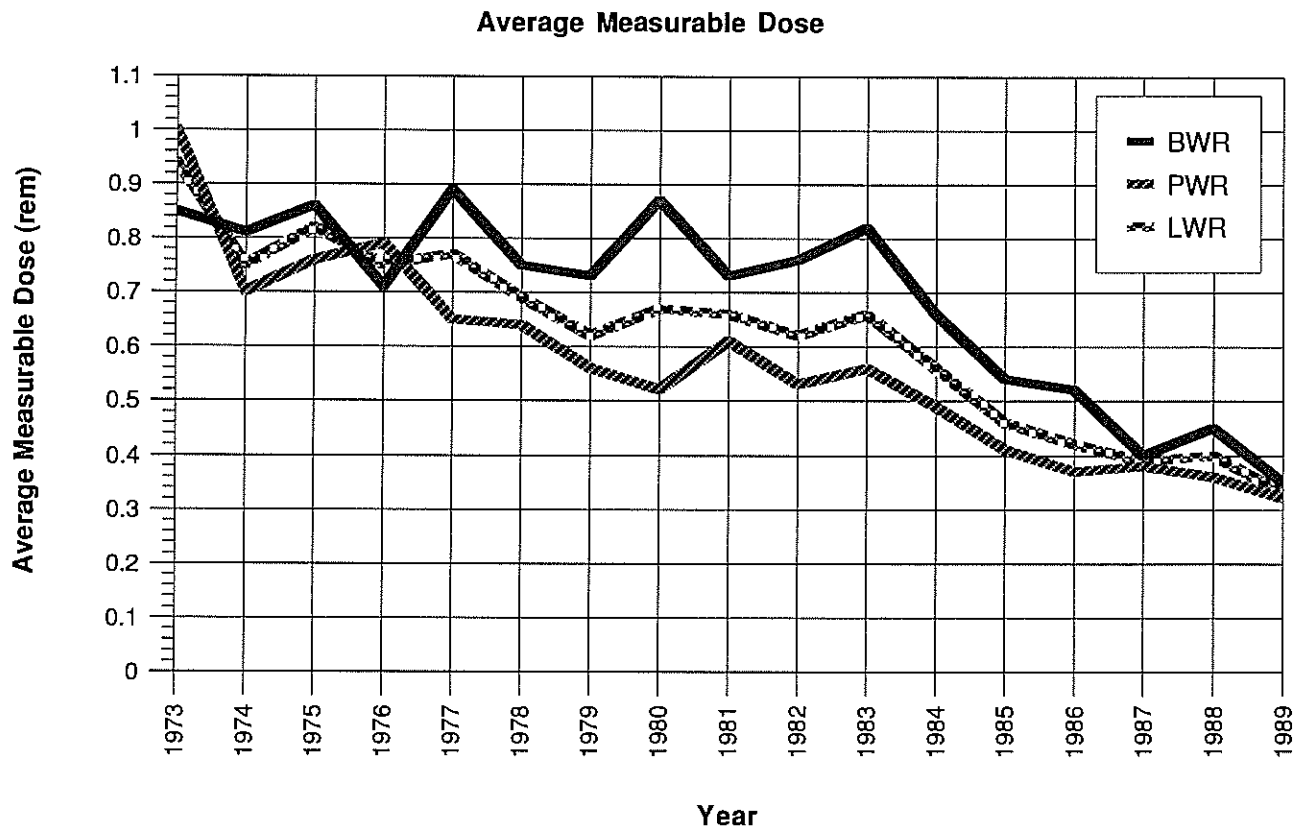
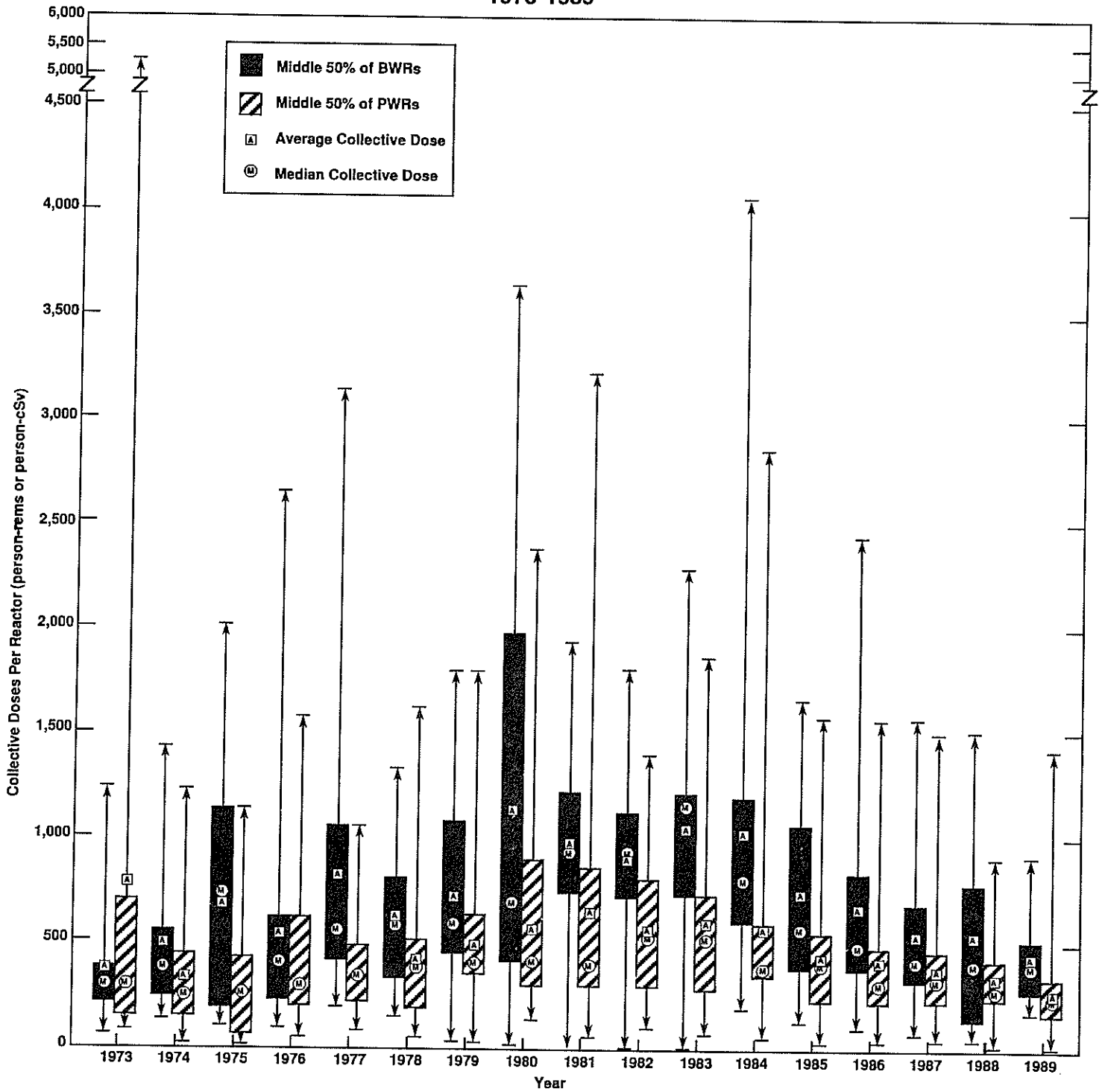


Figure 4.4
Average, Median and Extreme Values of
the Collective Dose Per Reactor
1973-1989



To further assist in the identification of any trends that might exist, Figure 4.4 displays the average and median⁹ values of the collective dose per reactor for BWRs and for PWRs for the years 1973 through 1989. The ranges of the values reported each year are shown by the vertical lines with a small bar at each end marking the two extreme values. The rectangles indicate the range of values of the collective dose exhibited by those plants ranked in the twenty-fifth through the seventy-fifth percentiles. Since the median values usually are not as greatly affected by the extreme values of the collective doses, they do not normally fluctuate as much from year to year as do the average values. The median collective dose for PWRs experienced a decrease from 278 person-rem (-cSv) in 1988 to 239 person-rem (-cSv) in 1989. At BWRs the median fluctuates more from year to year, but in 1989 the median collective dose remained at the 1988 value of 392 person-rem (-cSv). Figure 4.4 also shows that in 1989 fifty percent of the PWRs reported collective doses between 167 and 342 person-rem (-cSv) while fifty percent of the BWRs reported collective doses between 278 and 507 person-rem (-cSv). Nearly every year, the median collective dose is less than the average, which indicates that the collective dose for most plants is less than the average collective dose per reactor (the value that is widely quoted).

4.5 Plant Rankings by Collective Dose per Reactor

The number of reactors from which data have been collected is still rather small, and the information reported by a few reactors where unusual conditions or problems may have occurred could have a large impact on some of the statistics presented in this report. In an effort to identify those plants, Tables 4.5 and 4.6 list the BWRs and PWRs in ascending order of collective dose per reactor for each of the five years from 1985 through 1989. The total collective dose per site is listed in the tables even though the dose per reactor was used for all ranking. Two other parameters, average measurable dose per worker and collective dose per megawatt-year, are also given for each plant and could have been used in ranking the plants as well. Also shown is a parameter "CR" which is defined as the ratio of the annual collective dose delivered at individual doses exceeding 1.5 rem (cSv) to the total annual collective dose. In 1989 the value of CR continued to decline for most plants, and for the first year of this analysis, all of the U.S. LWRs fell between 0.05 to 0.50, the range recommended by the UNSCEAR [Ref. 10].

In 1989, the five BWR sites with the highest collective doses all exceeded 560 person-rem (person-cSv) per reactor (Table 4.5). Although the eight reactors

⁹

The value at which 50% of the reactors reported greater collective doses and the other 50% reported smaller collective doses.

TABLE 4.5
BOILING WATER REACTORS LISTED IN ASCENDING ORDER OF COLLECTIVE DOSE PER REACTOR
1985 - 1989

1985 1986 1987

1985	1986	1987		
Site Name	Coll. Dose per Site*	Dose per Worker (rem or cSv)	Col. Dose per MW-Yr	CR**
Washington Nuclear 2	119	0.16	0.2	0.11
La Crosse	173	0.46	4.4	0.68
Nine Mile Point 1	265	0.26	0.5	0.25
Big Rock Point	291	0.67	6.6	0.61
Monticello	327	0.56	0.6	0.42
La Salle 1, 2	685	0.42	0.7	0.35
Browns Ferry 1, 2, 3	1,159	0.42	3.1	0.30
Hatch 1, 2	818	0.29	0.7	0.19
Quad Cities 1, 2	990	0.84	0.8	0.58
Susquehanna 1, 2	1,106	0.30	0.8	0.20
Millstone Point 1	608	0.83	1.1	0.64
Oyster Creek	748	0.32	1.7	0.33
Dresden 2,3	1,685	0.60	1.9	0.39
Pilgrim	893	0.40	1.5	0.39
Fitzpatrick	1,051	0.57	2.1	0.53
Vermont Yankee	1,051	0.76	2.9	0.42
Duane Arnold	1,112	0.79	4.7	0.56
Cooper Station	1,333	0.67	10.5	0.59
Brunswick 1,2	2,804	0.69	3.4	0.65
Peach Bottom 2,3	3,354	0.80	4.9	0.59

1986	1987			
Site Name	Coll. Dose per Site*	Dose per Worker (rem or cSv)	Col. Dose per MW-Yr	CR**
Big Rock Point	84	0.42	1.4	0.33
Millstone Point 1	150	0.39	0.2	0.30
Duane Arnold	187	0.39	0.5	0.22
Washington Nuclear 2	222	0.22	0.4	0.14
La Crosse	290	1.12	14.8	0.89
Cooper Station	320	0.36	0.7	0.34
Browns Ferry 1,2,3	1,050	0.35	0.6	0.32
Fitzpatrick	411	0.35	0.6	0.16
Susquehanna 1,2	828	0.28	0.6	0.23
Grand Gulf	436	0.29	0.9	0.37
La Salle 1,2	949	0.59	1.0	0.44
Quad Cities 1,2	992	0.68	0.9	0.36
Peach Bottom 2,3	1,080	0.44	0.8	0.52
Monticello	596	0.67	1.5	0.32
Hatch 1,2	1,497	0.43	1.7	0.31
Pilgrim	874	0.33	7.2	0.31
Brunswick 1,2	1,909	0.57	1.8	0.56
Vermont Yankee	1,188	0.86	4.8	0.58
Nine Mile Point 1	1,275	0.68	3.4	0.59
Dresden 2,3	2,796	0.90	3.8	0.58
Oyster Creek	2,436	0.65	15.5	0.58

1987	1988			
Site Name	Coll. Dose per Site*	Dose per Worker (rem or cSv)	Col. Dose per MW-Yr	CR**
Cooper Station	103	0.19	0.2	0.17
Hope Creek 1	117	0.20	0.1	0.31
Nine Mile Point 1	141	0.12	0.3	0.04
Limerick 1	174	0.08	0.3	0.00
Big Rock Point	222	0.88	4.9	0.57
Vermont Yankee	303	0.37	0.7	0.17
Susquehanna 1,2	621	0.24	0.4	0.07
River Bend 1	378	0.30	0.6	0.17
Quad Cities 1,2	775	0.54	0.7	0.31
Browns Ferry 1,2,3	1,181	0.38	—	0.31
Washington Nuclear 2	406	0.34	0.6	0.25
Hatch 1,2	816	0.37	0.6	0.30
Grand Gulf	420	0.31	0.5	0.14
Oyster Creek	522	0.27	1.4	0.31
Monticello	568	0.60	1.3	0.32
Dresden 2,3	1,245	0.61	1.3	0.35
Duane Arnold	667	0.61	2.2	0.37
Millstone Point 1	684	0.43	1.3	0.28
La Salle 1,2	1,394	0.80	1.4	0.54
Brunswick 1,2	1,419	0.46	1.2	0.43
Fitzpatrick	940	0.60	1.9	0.50
Peach Bottom 2,3	2,195	0.50	6.0	0.35
Pilgrim	1,579	0.34	—	0.34

1988	1989			
Site Name	Coll. Dose per Site*	Dose per Worker (rem or cSv)	Col. Dose per MW-Yr	CR**
Limerick 1	52	0.05	0.1	0.00
Perry	105	0.13	0.1	0.02
River Bend 1	107	0.21	0.1	0.08
Monticello	110	0.29	0.2	0.27
Vermont Yankee	124	0.33	0.3	0.15
Clinton	130	0.17	0.2	0.14
Millstone Point 1	144	0.44	0.2	0.36
Grand Gulf	147	0.21	0.1	0.28
Big Rock Point	170	0.56	3.7	0.45
Cooper Station	251	0.27	0.5	0.17
Susquehanna 1,2	516	0.27	0.2	0.06
Hope Creek	287	0.17	0.3	0.08
Washington Nuclear 2	353	0.34	0.5	0.29
Browns Ferry 1,2,3	1,155	0.35	0.5	0.26
Pilgrim	392	0.19	—	0.16
Quad Cities 1,2	827	0.56	0.4	0.34
Duane Arnold	614	0.54	1.6	0.29
Hatch 1,2	1,401	0.56	0.7	0.41
Dresden 2,3	1,409	0.58	0.7	0.40
Fitzpatrick	786	0.51	1.5	0.44
Nine Mile Point	854	0.33	—	0.48
Brunswick 1,2	1,747	0.66	0.9	0.51
Peach Bottom 2,3	2,330	0.55	—	0.44
Lasalle 1,2	2,471	0.90	0.9	0.58
Oyster Creek	1,504	0.52	3.6	0.49

1989	1990			
Site Name	Coll. Dose per Site*	Dose per Worker (rem or cSv)	Col. Dose per MW-Yr	CR**
Big Rock Point	177	0.42	3.5	0.41
Duane Arnold	194	0.46	0.5	0.25
Pilgrim	207	0.12	1.0	0.05
Browns Ferry 1,2,3	656	0.24	—	0.15
Fermi 2	255	0.20	0.4	0.04
Limerick 1	266	0.15	0.4	0.04
Hatch 1,2	556	0.41	0.4	0.23
Nine Mile Point 1,2	564	0.21	1.1	0.27
Vermont Yankee	288	0.35	0.7	0.10
Cooper Station	343	0.29	0.6	0.19
Susquehanna 1,2	704	0.34	0.4	0.17
Clinton	372	0.31	1.1	0.18
Fitzpatrick	377	0.37	0.5	0.28
Peach Bottom 2,3	783	0.34	1.6	0.17
Millstone Point 1	482	0.54	0.8	0.39
Hope Creek 1	465	0.25	0.6	0.21
Quad Cities 1,2	971	0.56	0.8	0.31
Washington Nuclear 2	492	0.38	0.7	0.27
Grand Gulf	498	0.25	0.5	0.17
Monticello	507	0.46	1.6	0.31
River Bend 1	558	0.36	1.0	0.15
Dresden 2,3	1,130	0.50	1.0	0.34
Lasalle 1,2	1,386	0.56	0.9	0.41
Perry	767	0.41	1.2	0.18
Brunswick 1,2	1,786	0.46	1.8	0.45
Oyster Creek	910	0.38	3.2	0.43

* For sites with more than one operating reactor, the collective dose per reactor is obtained by dividing the collective dose for the site by the number of reactors.

** CR is the ratio of the annual collective dose delivered at individual doses exceeding 1.5 rems (cSv) to the total collective dose.

* For sites with more than one operating reactor, the collective dose per reactor is obtained by dividing the collective dose for the site by the number of reactors.

** CR is the ratio of the annual collective dose delivered at individual doses exceeding 1.5 rem (cSv) to the total collective dose.

TABLE 4.6
PRESSURIZED WATER REACTORS LISTED IN ASCENDING ORDER OF COLLECTIVE DOSE PER REACTOR
1985 - 1989

1985					1986					1987				
Site Name	Coll. Dose per Site*	Dose per Worker (rems or cSv)	Col. Dose per MW-Yr	CR**	Site Name	Coll. Dose per Site*	Dose per Worker (rems or cSv)	Col. Dose per MW-Yr	CR**	Site Name	Coll. Dose per Site*	Dose per Worker (rems or cSv)	Col. Dose per MW-Yr	CR**
Callaway 1	36	0.04	0.0	0.00	Summer 1	23	0.06	0.0	0.00	Davis-Besse	47	0.08	0.1	0.00
Beaver Valley	60	0.10	0.1	0.00	Yankee-Rowe	45	0.12	0.3	0.05	Prairie Island 1,2	135	0.23	0.1	0.09
Davis-Besse	71	0.10	0.3	0.04	Fort Calhoun	74	0.10	0.2	0.17	Wolf Creek 1	134	0.20	0.2	0.05
Haddam Neck	101	0.26	0.2	0.28	Maine Yankee	100	0.20	0.1	0.17	Three Mile Island 1	149	0.12	0.2	0.05
Salom 1, 2	204	0.18	0.1	0.15	Byron 1	104	0.10	0.1	0.04	Waterford 3	156	0.16	0.2	0.05
Arkansas 1, 2	266	0.23	0.2	0.10	Davis-Besse	124	0.13	37.8	0.03	Diablo Canyon 1,2	336	0.29	0.2	0.15
Kewaunee	178	0.34	0.4	0.15	Prairie Island 1,2	255	0.31	0.3	0.27	Arkansas 1,2	382	0.34	0.3	0.23
San Onofre 1	189	0.07	0.6	0.06	Wolf Creek 1	142	0.21	0.2	0.03	Calvert Cliffs 1,2	412	0.30	0.3	0.22
Indian Point 2	192	0.27	0.2	0.20	Kewaunee	169	0.34	0.4	0.21	Beaver Valley	210	0.16	0.3	0.04
Prairie Island 1, 2	416	0.38	0.5	0.31	Calvert Cliffs 1,2	347	0.27	0.2	0.19	Sequoyah 1,2	420	0.20	-	0.12
Yankee-Rowe	211	0.32	1.5	0.24	Point Beach 1,2	402	0.61	0.5	0.33	Yankee Rowe	217	0.37	1.6	0.22
Point Beach 1, 2	482	0.72	0.6	0.43	Indian Point 3	202	0.34	0.3	0.20	Catawba 1,2	449	0.24	0.3	0.10
San Onofre 2, 3	533	0.17	0.5	0.18	Three Mile Island 1	213	0.18	0.4	0.10	Kewaunee	228	0.30	0.5	0.17
Robinson 2	311	0.23	0.5	0.28	Waterford 3	223	0.18	0.3	0.17	San Onofre 1,2,3	896	0.33	0.4	0.21
Calvert Cliffs 1, 2	694	0.43	0.6	0.37	Callaway 1	225	0.21	0.3	0.04	Millstone Point 2,3	505	0.35	0.3	0.34
Trojan	363	0.43	0.4	0.26	St. Lucie 1,2	491	0.38	0.3	0.23	Point Beach 1,2	554	0.77	0.6	0.46
Fort Calhoun 1	373	0.38	1.0	0.92	Zion 1,2	498	0.51	0.3	0.27	Farley 1,2	598	0.32	0.4	0.23
Summer 1	379	0.32	0.6	0.34	Sequoyah 1,2	526	0.30	-	0.24	Rancho Seco	300	0.20	-	0.10
McGuire 1, 2	771	0.35	0.5	0.29	San Onofre 1,2,3	824	0.23	0.5	0.15	Salem 1,2	600	0.24	0.4	0.25
Farley 1, 2	799	0.31	0.6	0.30	Catawba 1	288	0.17	0.4	0.04	Cook 1,2	688	0.39	0.6	0.21
North Anna 1, 2	838	0.34	0.6	0.31	Salem 1,2	599	0.17	0.4	0.21	Palo Verde 1,2	669	0.37	0.4	0.41
Ginna	426	0.50	1.0	0.37	Diablo Canyon	304	0.24	0.5	0.18	Ginna	344	0.45	0.7	0.29
Three Mile Island 1, 2	857	0.45	8.3	0.50	Oconee 1,2,3	949	0.38	0.5	0.30	Zion 1,2	893	0.66	0.5	0.37
Oconee 1, 2, 3	1,304	0.48	0.6	0.42	Ginna	357	0.40	0.6	0.27	Surry 1,2	712	0.27	0.6	0.36
Cook 1, 2	945	0.48	1.0	0.31	North Anna 1,2	722	0.26	0.5	0.40	Trojan	363	0.30	0.7	0.13
Palisades	507	0.37	0.8	0.27	Cook 1,2	745	0.42	0.6	0.27	Oconee 1,2,3	1,142	0.43	0.6	0.29
Sequoyah 1, 2	1,071	0.58	0.9	0.47	Trojan	381	0.29	0.4	0.15	Fort Calhoun	388	0.31	1.1	0.35
Indian Point 3	570	0.52	1.0	0.33	Rancho Seco	402	0.27	-	0.22	Callaway 1	393	0.38	0.5	0.22
Zion 1, 2	1,166	0.78	1.0	0.55	Farley 1,2	858	0.37	0.6	0.35	Palisades	456	0.41	1.4	0.24
Turkey Point 3, 4	1,253	0.66	1.2	0.48	Crystal River 3	472	0.45	1.5	0.38	St. Lucie 1,2	951	0.47	0.7	0.35
St. Lucie 1, 2	1,344	0.68	0.9	0.50	Turkey Point 3,4	948	0.52	1.3	0.30	Crystal River 3	488	0.35	1.1	0.21
Crystal River 3	689	0.35	2.0	0.20	McGuire 1,2	1,015	0.44	0.7	0.37	Robinson 2	499	0.38	1.0	0.29
Maine Yankee	700	0.69	1.1	0.49	Robinson 2	539	0.34	0.9	0.26	Indian Point 3	500	0.38	0.9	0.20
Rancho Seco	756	0.43	3.2	0.27	Arkansas 1,2	1,141	0.53	1.1	0.47	McGuire 1,2	1,043	0.36	0.6	0.31
Surry 1, 2	1,815	0.57	1.6	0.58	Beaver Valley	627	0.40	1.1	0.35	Summer 1	560	0.52	0.9	0.42
Millstone 2	1,581	0.83	3.8	0.64	Palisades	672	0.47	0.6	0.44	Turkey Point 3,4	1,371	0.69	3.2	0.42
					Three Mile Island 2	915	0.61	-	0.59	Maine Yankee	722	0.66	1.5	0.39
					Millstone Point 2	993	0.41	1.2	0.30	Haddam Neck	750	0.43	2.5	0.38
					Surry 1,2	2,356	0.63	2.2	0.64	North Anna 1,2	1,521	0.58	1.4	0.54
					Indian Point 2	1,250	0.65	2.7	0.45	Byron 1	789	0.42	1.2	0.33
					Haddam Neck	1,567	0.81	5.3	0.53	Three Mile Island 2	977	0.71	-	0.59
										Indian Point 2	1,217	0.61	2.0	0.37

1988					1989				
Site Name	Coll. Dose per Site*	Dose per Worker (rems or cSv)	Col. Dose per MW-Yr	CR**	Site Name	Coll. Dose per Site*	Dose per Worker (rems or cSv)	Col. Dose per MW-Yr	CR**
Callaway 1	27	0.08	0.0	0.00	Wolf Creek 1	18	0.10	0.0	0.00
North Anna 1,2	112	0.11	0.1	0.05	Vogtle 1	32	0.07	0.0	0.00
Crystal River 3	64	0.11	0.1	0.00	Davis-Besse	38	0.09	0.0	0.04
Rancho Seco	78	0.11	0.2	0.03	Prairie Island 1,2	99	0.21	0.1	0.04
Indian Point 3	93	0.21	0.1	0.10	Summer 1	52	0.14	0.1	0.01
Prairie Island 1,2	189	0.27	0.2	0.16	Three Mile Island 1	54	0.08	0.1	0.10
Vogtle 1	138	0.12	0.2	0.01	Yankee-Rowe	62	0.13	0.4	0.11
Calvert Cliffs 1,2	291	0.22	0.2	0.14	Rancho Seco	81	0.13	0.5	0.06
Harris	169	0.23	0.3	0.08	Byron 1,2	185	0.17	0.1	0.03
Point Beach 1,2	410	0.56	0.5	0.31	Fort Calhoun	93	0.08	0.2	0.02
Kewaunee	210	0.30	0.4	0.17	Maine Yankee	99	0.26	0.1	0.13
Three Mile Island 1	210	0.21	0.3	0.11	Harris	156	0.17	0.2	0.10
Yankee-Rowe	227	0.31	1.7	0.20	Braidwood 1,2	320	0.22	1.2	0.03
Byron 1,2	459	0.38	0.3	0.17	South Texas 1	161	0.18	0.2	0.02
Indian Point 2	235	0.26	0.3	0.19	Catawba 1,2	334	0.20	0.2	0.04
Haddam Neck	237	0.32	0.6	0.28	Salem 1,2	330	0.11	0.2	0.17
Salom 1,2	503	0.31	0.3	0.02	Calvert Cliffs 1,2	348	0.19	1.0	0.13
Waterford 3	259	0.21	0.3	0.06	San Onofre 1,2,3	567	0.25	0.3	0.20
San Onofre 1,2,3	781	0.34	0.4	0.28	Robinson 2	195	0.18	0.6	0.10
Beaver Valley 1,2	530	0.30	0.4	0.21	Turkey Point 3,4	433	0.27	0.6	0.14
Fort Calhoun	272	0.17	0.9	0.12	Oconee 1,2,3	684	0.31	0.3	0.19
Farley 1,2	552	0.30	0.4	0.24	Diablo Canyon 1,2	465	0.28	0.2	0.07
Catawba 1,2	556	0.28	0.3	0.15	Crystal River 3	234	0.27	0.7	0.15
Oconee 1,2,3	871	0.33	0.4	0.16	Kewaunee	239	0.42	0.5	0.21
Ginna	295	0.33	0.7	0.18	Palo Verde 1,2,3	720	0.28	0.7	0.14
Wolf Creek 1	297	0.29	0.4	0.19	Cook 1,2	493	0.31	0.3	0.18
St. Lucie 1,2	611	0.42	0.4	0.20	St. Lucie 1,2	495	0.35	0.3	0.19
Davis-Besse	307	0.26	2.1	0.14	Point Beach 1,2	504	0.68	0.6	0.47
Sequoyah 1,2	678	0.28	1.4	0.14	Waterford 3	285	0.20	0.3	0.05
Palo Verde 1,2	688	0.32	0.4	0.29	Callaway 1	283	0.27	0.3	0.09
Turkey Point 3,4	738	0.40	0.9	0.17	McGuire 1,2	620	0.31	0.3	0.22
Trojan	401	0.28	0.5	0.14	Palisades	314	0.31	0.7	0.15
Millstone Point 2,3	804	0.44	0.5	0.36	Sequoyah 1,2	857	0.33	0.4	0.23
Cook 1,2	867	0.38	0.7	0.33	Zion 1,2	684	0.53	0.5	0.33
Diablo Canyon 1,2	877	0.48	0.6	0.33	Arkansas 1,2	711	0.34	0.7	0.17
Summer 1	511	0.45	0.8	0.28	Farley 1,2	749	0.34	0.5	0.25
McGuire 1,2	1,104	0.39	0.8	0.28	Surry 1,2	836	0.27	1.7	0.37
Robinson 2	584	0.42	1.5	0.25	Trojan	421	0.31	0.6	0.23
Zion 1,2	1,260	0.65	0.8	0.40	Millstone Point 2,3	1,079	0.54	0.8	0.39
Arkansas 1,2	1,387	0.57	1.3	0.48	Haddam Neck	598	0.41	1.7	0.32
Maine Yankee	725	0.69	1.2	0.40	Ginna	805	0.48	1.8	0.33
Palisades	730	0.50	1.8	0.44	Beaver Valley 1,2	1,378	0.59	1.4	0.47
Surry 1,2	1,542	0.48	2.1	0.50	North Anna 1,2	1,471	0.51	1.2	0.47
Three Mile Island 2	917	0.74	-	0.66	Indian Point 3	876	0.49	1.5	0.31
					Indian Point 2	1,436	0.69	2.7	0.44

* For sites with more than one operating reactor, the collective dose per reactor is obtained by dividing the collective dose for the site by the number of reactors.
 ** CR is the ratio of the annual collective dose delivered at individual doses exceeding 1.5 rems (cSv) to the total collective dose.

at these five sites represented only 22% of the 34 BWRs, they contributed 38% of the total collective dose incurred at BWRs in 1989. Some of the activities which contributed to the collective dose accumulated at the BWR site with the highest collective dose per reactor (910 person-rem (person-cSv)) were observation, inspection, minor maintenance activities, radiation exposure controls, recirculation pump seal maintenance, reactor refueling and internals inspection, and auxiliary cleanup pump repair.

At PWRs, the five sites with the highest collective doses all exceeded 600 person-rem (person-cSv) per reactor (Table 4.6). Although representing 10% of the 71 PWRs included in 1989, they contributed 28% of the total collective dose at PWRs. Much of the collective dose accumulated at the plant with the highest dose per reactor (1,436 person-rem (person-cSv)) in 1989 was attributed to steam generator work, including girth weld crack and feedwater nozzle repair, eddy current testing, and sludge lancing. Refueling activities and plant modifications also contributed to the collective dose.

Tables 4.7a&b list the sites that had been in commercial operation for at least five years as of December 31, 1989, and show the values of several parameters for each of the sites. They also give a number of averages for the two types of reactors. Based on the 141 reactor-years of operation accumulated by the 29 BWRs listed, the average annual collective dose per reactor was found to be 601 person-rem (person-cSv), the average measurable dose was 0.48 rem (cSv), and the average collective dose per megawatt-year was 1.4.

Based on the 261 reactor-years of operation at the 54 PWRs listed, the average annual collective dose per reactor, average measurable dose, and average collective dose per megawatt-year were found to be 383 person-rem (person-cSv), 0.38 rem (cSv) and 0.6 person-rem/megawatt-year, respectively. All of these values, at both types of facilities, are lower than those found for the five year period ending in 1988.

In general, the plants having the lower values of most of the parameters shown are usually the newer plants. Some of the older, smaller plants also appear near the top of the listings since they report small collective doses; however, the ratio of their collective dose to the number of megawatt-years of electricity generated will be higher because of their limited power generation capacity. In the case of PWRs, this generalization does not always apply. For example, Prairie Island 1 and 2 and Kewaunee, three reactors that have been operating for 15 or 16 years, continued to experience lower collective doses than many newer reactors.

TABLE 4.7a

FIVE-YEAR TOTALS AND AVERAGES LISTED IN ASCENDING
ORDER OF COLLECTIVE DOSE PER RWR

1985-1989

BWRs	*Total Collective Dose per Site	Workers with Measurable Doses	Average Dose per Worker (rem or cSv)	Total Mega- watt- years	Average Collective Dose per MW-yr
**Site name					
BIG ROCK POINT	944	1,609	0.59	246.4	3.8
WASHINGTON NUCLEAR 2	1,592	5,318	0.30	3,305.9	0.5
BROWNS FERRY 1,2,3	5,201	14,880	0.35	368.2	14.1
SUSQUEHANNA 1,2	3,775	13,180	0.29	7,810.0	0.5
MILLSTONE POINT 1	2,048	3,888	0.53	2,912.1	0.7
MONTICELLO	2,108	3,899	0.54	2,195.7	1.0
QUAO CITIES 1,2	4,555	7,271	0.63	5,857.8	0.8
COOPER STATION	2,350	5,568	0.42	2,317.3	1.0
HATCH 1,2	5,088	12,388	0.41	5,650.9	0.9
DUANE ARNOLO	2,774	4,545	0.61	1,685.1	1.6
VERMONT YANKEE	2,954	4,819	0.61	1,958.0	1.5
LASALLE 1,2	6,885	10,205	0.67	5,768.5	1.2
FITZPATRICK	3,565	7,188	0.50	2,941.2	1.2
PILGRIM	3,945	13,424	0.29	913.8	4.3
ORESDEN 2,3	8,266	12,653	0.65	4,776.3	1.7
NINE MILE POINT 1,2	3,099	9,438	0.33	2,022.0	1.5
BRUNSWICK 1,2	9,665	16,971	0.57	5,007.6	1.9
PEACH BOTTOM 2,3	9,742	17,531	0.56	2,934.4	3.3
OYSTER CREEK	6,120	13,284	0.46	1,681.5	3.6
Grand Totals and Averages	84,676	178,059	0.48	60,352.7	1.4
Averages Per Reactor-Year	601	1,263		428.0	

*For sites with more than one operating reactor, the collective dose per reactor is obtained by dividing the collective dose for the site by the number of reactors.

**Sites where not all reactors had completed five full years of commercial operation as of 12/31/89 are not included.

TABLE 4.7b
FIVE-YEAR TOTALS AND AVERAGES LISTED IN ASCENDING
ORDER OF COLLECTIVE DOSE PER PWR

1985-1989

PWRs **Site name	*Total Collective Dose per Site	Workers with Measurable Doses	Average Dose per Worker (rem or cSv)	Total Mega- watt- years	Average Collective Dose per MW-yr
PRAIRIE ISLAND 1,2	1,104	3,701	0.30	4,716.6	0.2
DAVIS-BESSE	587	3,911	0.15	1,883.7	0.3
YANKEE-ROWE	762	2,864	0.27	748.5	1.0
CALLAWAY 1	964	4,506	0.21	4,661.1	0.2
KEWAUNEE	1,020	3,051	0.33	2,301.4	0.4
CALVERT CLIFFS 1,2	2,090	7,360	0.28	5,658.4	0.4
SALEM 1,2	2,244	11,762	0.19	7,887.2	0.3
POINT BEACH 1,2	2,352	3,525	0.67	4,294.8	0.5
SAN ONOFRE 1,2,3	3,590	16,035	0.22	8,886.1	0.4
FORT CALHDUN	1,200	5,789	0.21	1,876.0	0.6
THREE MILE ISLAND 1	1,483	6,191	0.24	2,831.8	0.5
SUMMER 1	1,525	4,169	0.37	3,357.8	0.5
RANCHO SECO	1,617	6,106	0.26	774.4	2.1
OCONEE 1,2,3	4,950	12,777	0.39	10,412.0	0.5
SEQUOYAH 1,2	3,352	10,115	0.33	3,493.8	1.0
FARLEY 1,2	3,556	10,782	0.33	7,117.9	0.5
COOK 1,2	3,716	9,295	0.40	6,025.5	0.6
TROJAN	1,929	6,150	0.31	3,632.4	0.5
CRYSTAL RIVER 3	1,947	5,866	0.33	2,142.7	0.9
ST. LUCIE 1,2	3,892	8,124	0.48	7,575.1	0.5
ARKANSAS 1,2	3,907	9,004	0.43	5,765.3	0.7
BEAVER VALLEY 1,2	2,805	7,589	0.37	4,386.6	0.6
GINNA	2,027	4,670	0.43	2,121.3	1.0
ROBINSON 2	2,108	6,777	0.31	2,438.3	0.9
ZION 1,2	4,301	6,719	0.64	7,050.1	0.6
INDIAN POINT 3	2,241	5,240	0.43	3,176.7	0.7
NORTH ANNA 1,2	4,664	11,744	0.40	7,113.5	0.7
MAINE YANKEE	2,346	4,037	0.58	3,262.2	0.7
TURKEY POINT 3,4	4,741	9,159	0.52	3,720.0	1.3
MCGUIRE 1,2	4,553	12,210	0.37	7,584.0	0.6
PALISADES	2,679	6,413	0.42	1,916.9	1.4
MILLSTONE POINT 2,3	4,962	9,550	0.52	5,882.1	0.8
HADDAM NECK	3,251	6,282	0.52	1,909.3	1.7
SURRY 1,2	7,261	15,928	0.46	4,619.3	1.6
INDIAN POINT 2	4,330	7,597	0.57	3,112.1	1.4
Grand Totals and Averages	100,164	264,998	0.38	154,334.9	0.6
Averages Per Reactor-Year	383	1,015		591.3	

*For sites with more than one operating reactor, the collective dose per reactor is obtained by dividing the collective dose for the site by the number of reactors.

**Sites where not all reactors had completed five full years of commercial operation as of 12/31/89 are not included.

Usually, the combination of a large annual collective dose and a large collective dose to megawatt-year ratio for a plant indicates that extensive maintenance or modifications were undertaken during the year. For example, maintenance jobs that were large contributors to BWR doses in 1989 included recirculation pipe replacement/crack repair, installation and removal of scaffolding and shielding, intergranular stress corrosion cracking related in-service inspection, and refueling work.

At PWR facilities, the major contributors to the collective dose were steam generator related work, refueling operations, installation and removal of scaffolding and shielding, and in-service inspection work. Even with the use of better techniques and robots, these tasks continue to be responsible for a major percentage of the collective dose. It should be noted that the differences in nuclear plant designs and the ages of the plants [Ref. 15], even between plants of a given type, affect the nature of these parameters. Therefore, care should be exercised when attempting to draw conclusions from these data.

4.6 Collective Dose by Work Function and Employee Type

A second type of annual statistical report that is required by each plant's technical specifications provides the collective dose of workers monitored at each plant site by employee type (plant, utility, or contractor) and by work and job functions. A copy of the report submitted for each reactor site is provided in Appendix D, and much of the data are graphically represented for each site in Appendix E. Tables 4.8 through 4.13 summarize the 1989 data for BWRs, PWRs and LWRs. Table 4.8 shows that at both BWR's and PWR's about 65-70% of the collective dose is incurred during routine and special maintenance activities. Also, the portion of the collective dose incurred during most of the other activities is similar at the two types of plants. One should note that the collective doses obtained from these reports are not used in any other tables in this document for the following reasons: the technical specifications of each plant requires only 80% of the plant's collective dose be accounted for, and some utilities may use the results of self-reading pocket dosimeters instead of the results of the official dosimeter (usually thermoluminescent dosimeters) in compiling the data. Also, when examining the number of personnel shown on these reports, it should be kept in mind that individuals who perform tasks in more than one category may be counted more than once.

Table 4.9 shows that workers performing special maintenance have historically incurred the largest portion (35%-45%) of the collective dose and that workers performing routine maintenance activities usually incurred between 30% and 35%

TABLE 4.8
ANNUAL COLLECTIVE DOSE
BY WORK FUNCTION AND PERSONNEL TYPE
1989

WORK AND JOB FUNCTION	STATION EMPLOYEES PERSON-REM	% OF TOTAL	UTILITY EMPLOYEES PERSON-REM	% OF TOTAL	CONTRACT WORKERS PERSON-REM	% OF TOTAL	TOTAL PER WORK FUNCTION PERSON-REM	% OF TOTAL
<u>BOILING WATER REACTORS</u>								
REACTOR OPS & SURV	1,633	10.5%	64	0.4%	761	4.9%	2,459	15.8%
ROUTINE MAINTENANCE	2,164	13.9%	340	2.2%	3,076	19.7%	5,580	35.8%
IN-SERVICE INSPECTION	136	0.9%	121	0.8%	1,303	8.4%	1,560	10.0%
SPECIAL MAINTENANCE	930	6.0%	287	1.8%	3,355	21.5%	4,572	29.3%
WASTE PROCESSING	245	1.6%	10	0.1%	277	1.8%	532	3.4%
REFUELING	290	1.9%	58	0.4%	530	3.4%	878	5.6%
TOTAL	5,398	34.6%	880	5.7%	9,301	59.7%	15,580	100.0%
<u>PRESSURIZED WATER REACTORS</u>								
REACTOR OPS & SURV	1,205	5.6%	69	0.3%	790	3.7%	2,065	9.6%
ROUTINE MAINTENANCE	2,663	12.3%	514	2.4%	4,696	21.7%	7,874	36.4%
IN-SERVICE INSPECTION	270	1.2%	168	0.8%	1,548	7.2%	1,986	9.2%
SPECIAL MAINTENANCE	1,332	6.2%	625	2.9%	5,133	23.7%	7,090	32.8%
WASTE PROCESSING	321	1.5%	31	0.1%	400	1.8%	752	3.5%
REFUELING	644	3.0%	132	0.6%	1,080	5.0%	1,855	8.6%
TOTAL	6,435	29.8%	1,539	7.1%	13,647	63.1%	21,622	100.0%
<u>ALL LIGHT WATER REACTORS</u>								
REACTOR OPS & SURV	2,839	7.6%	134	0.4%	1,551	4.2%	4,524	12.2%
ROUTINE MAINTENANCE	4,827	13.0%	854	2.3%	7,773	20.9%	13,454	36.2%
IN-SERVICE INSPECTION	406	1.1%	289	0.8%	2,850	7.7%	3,545	9.5%
SPECIAL MAINTENANCE	2,262	6.1%	912	2.5%	8,488	22.8%	11,662	31.3%
WASTE PROCESSING	566	1.5%	41	0.1%	677	1.8%	1,283	3.4%
REFUELING	934	2.5%	190	0.5%	1,610	4.3%	2,734	7.3%
TOTAL	11,833	31.8%	2,420	6.5%	22,949	61.7%	37,202	100.0%

TABLE 4.9
PERCENTAGES OF ANNUAL COLLECTIVE
DOSE AT LWRs BY WORK FUNCTION
1979 - 1989

WORK FUNCTION	PERCENTAGE OF COLLECTIVE DOSE EACH YEAR										
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
REACTOR OPERATIONS AND SURVEILLANCE	12.2%	9.5%	8.9%	9.4%	10.1%	11.4%	12.8%	12.8%	11.9%	11.0%	12.2%
ROUTINE MAINTENANCE	29.2%	35.5%	36.1%	27.9%	29.7%	26.9%	34.6%	33.2%	35.0%	37.7%	36.2%
INSERVICE INSPECTION	9.0%	5.5%	5.3%	6.5%	7.6%	6.3%	8.6%	8.3%	8.0%	8.7%	9.5%
SPECIAL MAINTENANCE	39.4%	40.6%	40.5%	46.8%	43.9%	45.4%	32.5%	35.5%	33.2%	30.1%	31.3%
WASTE PROCESSING	3.6%	3.0%	4.2%	5.0%	4.6%	3.6%	5.1%	4.0%	3.9%	3.6%	3.4%
REFUELING	6.6%	6.1%	5.0%	4.4%	4.1%	6.4%	6.5%	6.2%	8.1%	8.8%	7.3%

of the total each year since 1979. However, for the past three years in a row, the percentage of collective dose attributed to routine maintenance has been greater than that of special maintenance. This may be indicative of a trend showing a reduction in TMI-related activities and a greater emphasis on steady-state routine maintenance. Overall, figures have been fairly stable over the years with these two categories, special maintenance and routine maintenance, always accounting for the majority of the collective dose. Some of the fluctuations shown in the percentage of the dose incurred during refueling activities (particularly in 1987 and 1988 when it increased to over 8%) is due to the fact that some sites include doses other than those directly associated with fuel movement in this category.

Figure 4.5 graphically shows the trends in the collective dose by work function and type of personnel for the years 1985 through 1989 for BWRs and PWRs separately. Contractor personnel still incur most of the collective dose during special maintenance and in-service inspection, but, at least in recent years, the collective dose is more equally divided between contractor and plant and utility personnel during routine maintenance, reactor operations, waste processing, and refueling activities. The general decrease in collective dose is also apparent among most of these activities.

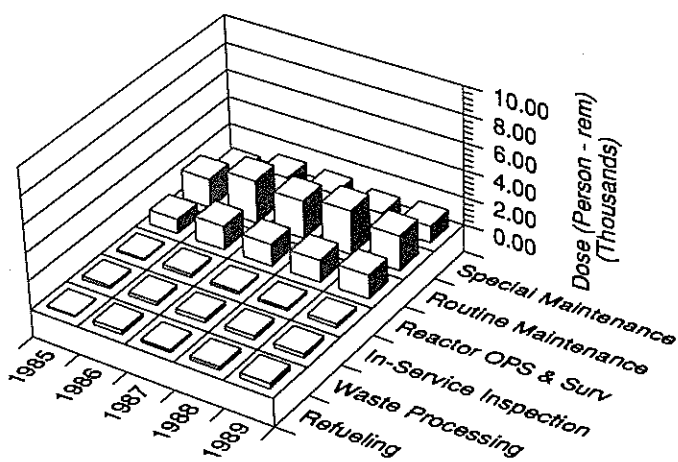
Table 4.10 presents the distribution of the collective dose for 1989 at all LWRs among five occupational categories. As expected, maintenance personnel incurred the majority (65%) of the collective dose with contractor maintenance personnel receiving about twice as much as the station and utility maintenance employees combined. This is about the same as that reported for 1986, 1987, and 1988. Supervisory personnel received 3.5% of the dose, compared to 2.5% in 1988, while workers in the remaining three occupations--operations, health physics, and engineering--received 8.8%, 14.1%, and 8.8% respectively, of the collective dose. None of these values changed significantly from those found for 1986, 1987, and 1988. The collective doses shown in Tables 4.8 and 4.10 do not equal those shown in other tables in the report because they are the sum of the doses taken from the type of annual reports shown in Appendix D rather than the collective dose that was obtained or calculated from the annual reports required to be submitted pursuant to 10 CFR Part 20.407.

Another use made of the reports given in Appendix D is in proportioning the collective dose obtained from the § 20.407 annual reports into the work functions and personnel types shown in Appendix C. This was done in the following way:

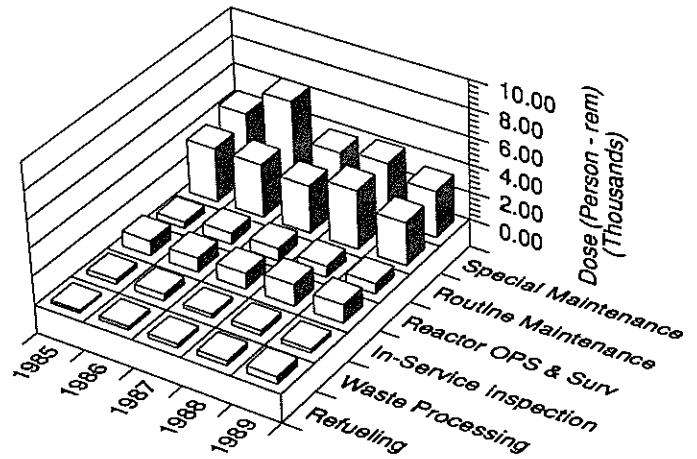
- (1) The collective dose incurred by workers in the work function "Reactor Operations and Surveillance" on each plant's annual report submitted

Figure 4.5
Collective Dose by Work Function and Personnel Type
1985 – 1989

Boiling Water Reactors

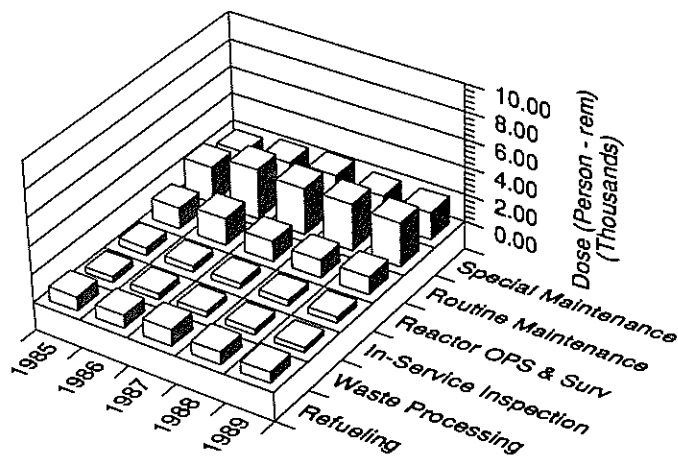


Plant

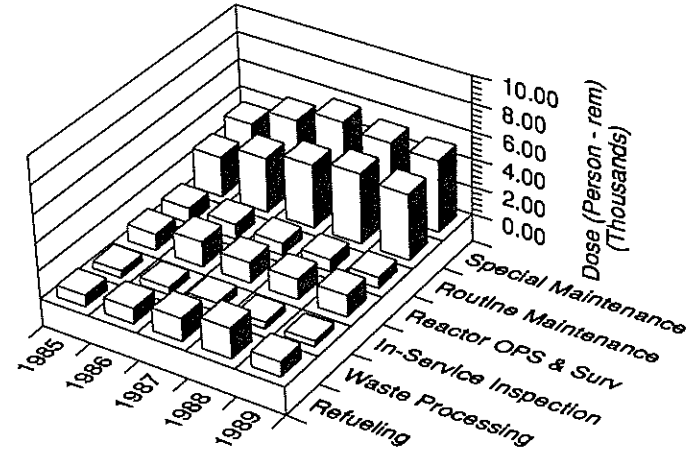


Contract

Pressurized Water Reactors



Plant



Contract

TABLE 4.10
ANNUAL COLLECTIVE DOSE
BY OCCUPATION AND PERSONNEL TYPE
1989

OCCUPATION	STATION EMPLOYEES		UTILITY EMPLOYEES		CONTRACT WORKERS		TOTAL PER WORK FUNCTION	
	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL
<u>BOILING WATER REACTORS</u>								
MAINTENANCE	2,712	17.4%	756	4.9%	6,855	44.0%	10,323	66.3%
OPERATIONS	1,170	7.5%	15	0.1%	295	1.9%	1,480	9.5%
HEALTH PHYSICS	918	5.9%	5	0.0%	966	6.2%	1,889	12.1%
SUPERVISORY	294	1.9%	18	0.1%	174	1.1%	486	3.1%
ENGINEERING	303	1.9%	87	0.6%	1,011	6.5%	1,402	9.0%
TOTAL	5,398	34.6%	880	5.7%	9,301	59.7%	15,580	100.0%
<u>PRESSURIZED WATER REACTORS</u>								
MAINTENANCE	3,479	16.1%	1,047	4.8%	9,229	42.7%	13,754	63.6%
OPERATIONS	1,138	5.3%	117	0.5%	524	2.4%	1,779	8.2%
HEALTH PHYSICS	1,140	5.3%	74	0.3%	2,161	10.0%	3,375	15.6%
SUPERVISORY	329	1.5%	62	0.3%	440	2.0%	830	3.8%
ENGINEERING	349	1.6%	240	1.1%	1,294	6.0%	1,883	8.7%
TOTAL	6,435	29.8%	1,539	7.1%	13,647	63.1%	21,622	100.0%
<u>ALL LIGHT WATER REACTORS</u>								
MAINTENANCE	6,191	16.6%	1,802	4.8%	16,084	43.2%	24,077	64.7%
OPERATIONS	2,308	6.2%	132	0.4%	819	2.2%	3,259	8.8%
HEALTH PHYSICS	2,058	5.5%	79	0.2%	3,127	8.4%	5,264	14.1%
SUPERVISORY	623	1.7%	79	0.2%	614	1.7%	1,316	3.5%
ENGINEERING	653	1.8%	327	0.9%	2,305	6.2%	3,285	8.8%
TOTAL	11,833	31.8%	2,420	6.5%	22,949	61.7%	37,202	100.0%

pursuant to their technical specifications (the first number in the last column in Appendix D) was determined.

- (2) The ratio of this dose to the total collective dose (the last number in the last column in Appendix D) was calculated and multiplied by the total collective dose that had been calculated or obtained from the 10 CFR 20.407 annual report. This product is the collective dose shown in the column headed "Operations" in Appendix C.
- (3) The collective dose shown in the column headed "Maintenance and Others" in Appendix C was determined by first summing the collective doses incurred by workers in the five remaining functions given in Appendix D and then calculating the fraction that this dose is of the total collective dose. This fraction was multiplied by the total collective dose calculated from the § 20.407 annual reports to yield the collective dose shown in this column of Appendix C.
- (4) A similar procedure was followed in determining the collective dose for the columns headed "Contractor" and "Station & Utility" in Appendix C.

4.7 Number of Personnel by Work Function and Employee Type

Half of the information presented in the statistical annual reports shown in Appendix D concerns the number of various types of personnel that performed certain work functions. Tables 4.11 and 4.12 sum this information to show the percentage of personnel by work function and occupation. The major problem in interpreting the figures shown in these tables is the fact that the same person may perform several work functions during the year so that the total number of personnel obtained by summing those shown in the various work functions would be inflated. However, Table 4.11 is still useful in showing the percentage of personnel associated with each of the six work functions shown. About 57% of the personnel performed routine or special maintenance functions, about 18% were involved with reactor operations and surveillance, and the remaining 25% were divided among the other three work functions.

Table 4.12 shows the percentage of personnel in each of five occupational categories at BWRs, PWRs, and LWRs. The workers were similarly distributed at BWRs and PWRs, the largest difference occurred in the maintenance and health physics categories with 61% and 11% at BWRs and 54% and 16% at PWRs, respectively. A large part of these two categories were contractor personnel whereas station and utility personnel formed the majority of the "operations" category. Overall, 59.4% of the personnel were contractors, 33.4% were station employees, and 7.2% were utility employees in 1989.

TABLE 4.11
NUMBER OF PERSONNEL*
BY WORK FUNCTION AND PERSONNEL TYPE
1989

WORK AND JOB FUNCTION	STATION EMPLOYEES NUMBER % OF TOTAL	UTILITY EMPLOYEES NUMBER % OF TOTAL	CONTRACT WORKERS NUMBER % OF TOTAL	TOTAL PER WORK FUNCTION NUMBER % OF TOTAL
<u>BOILING WATER REACTORS</u>				
REACTOR OPS & SURV	9,387	842	5,977	16,206
ROUTINE MAINTENANCE	11,850	1,479	15,095	28,424
IN-SERVICE INSPECTION	1,384	326	9,740	11,450
SPECIAL MAINTENANCE	3,711	1,220	11,534	16,465
WASTE PROCESSING	2,620	230	1,924	4,774
REFUELING	1,406	387	2,406	4,199
TOTAL	30,358	4,484	46,676	81,518
<u>PRESSURIZED WATER REACTORS**</u>				
REACTOR OPS & SURV	6,597	1,594	3,979	12,170
ROUTINE MAINTENANCE	9,633	2,240	14,395	26,268
IN-SERVICE INSPECTION	1,627	904	4,102	6,633
SPECIAL MAINTENANCE	4,850	1,836	10,267	16,953
WASTE PROCESSING	2,216	282	1,790	4,288
REFUELING	2,725	557	3,400	6,682
TOTAL	27,648	7,413	37,933	72,994
<u>ALL LIGHT WATER REACTORS**</u>				
REACTOR OPS & SURV	15,984	2,436	9,956	28,376
ROUTINE MAINTENANCE	21,483	3,719	29,490	54,692
IN-SERVICE INSPECTION	3,011	1,230	13,842	18,083
SPECIAL MAINTENANCE	8,561	3,056	21,801	33,418
WASTE PROCESSING	4,836	512	3,714	9,062
REFUELING	4,131	944	5,806	10,881
TOTAL	58,006	11,897	84,609	154,512

* Workers may be counted in more than one category. The number of personnel in Table 4.12 should be considered to be more accurate than Table 4.11, because the actual total number of individuals in each profession was provided by some plants in an attempt to correct for the multiple counting of individuals.

** Table 4.11 does not include the number of personnel from the PWRS at Point Beach 1,2 (531 people), because the data were not submitted in the suggested format.

TABLE 4.12
NUMBER OF PERSONNEL*
BY OCCUPATION AND PERSONNEL TYPE
1989

OCCUPATION	STATION EMPLOYEES NUMBER	% OF TOTAL	UTILITY EMPLOYEES NUMBER	% OF TOTAL	CONTRACT WORKERS NUMBER	% OF TOTAL	TOTAL PER WORK FUNCTION NUMBER	% OF TOTAL
<u>BOILING WATER REACTORS</u>								
MAINTENANCE	6,020	14.4%	1,961	4.7%	17,533	41.9%	25,514	61.0%
OPERATIONS	3,162	7.6%	135	0.3%	1,283	3.1%	4,580	11.0%
HEALTH PHYSICS	1,960	4.7%	49	0.1%	2,793	6.7%	4,802	11.5%
SUPERVISORY	1,106	2.6%	89	0.2%	535	1.3%	1,730	4.1%
ENGINEERING	1,429	3.4%	916	2.2%	2,828	6.8%	5,173	12.4%
TOTAL	13,677	32.7%	3,150	7.5%	24,972	59.7%	41,799	100.0%
<u>PRESSURIZED WATER REACTORS</u>								
MAINTENANCE	7,397	14.0%	1,919	3.6%	19,049	36.1%	28,365	53.8%
OPERATIONS	4,140	7.8%	315	0.6%	2,057	3.9%	6,512	12.3%
HEALTH PHYSICS	2,711	5.1%	170	0.3%	5,277	10.0%	8,158	15.5%
SUPERVISORY	2,061	3.9%	396	0.8%	1,011	1.9%	3,468	6.6%
ENGINEERING	1,595	3.0%	835	1.6%	3,810	7.2%	6,240	11.8%
TOTAL	17,904	33.9%	3,635	6.9%	31,204	59.2%	52,743	100.0%
<u>ALL LIGHT WATER REACTORS</u>								
MAINTENANCE	13,417	14.2%	3,880	4.1%	36,582	38.7%	53,879	57.0%
OPERATIONS	7,302	7.7%	450	0.5%	3,340	3.5%	11,092	11.7%
HEALTH PHYSICS	4,671	4.9%	219	0.2%	8,070	8.5%	12,960	13.7%
SUPERVISORY	3,167	3.3%	485	0.5%	1,546	1.6%	5,198	5.5%
ENGINEERING	3,024	3.2%	1,751	1.9%	6,638	7.0%	11,413	12.1%
TOTAL	31,581	33.4%	6,785	7.2%	56,176	59.4%	94,542	100.0%

* Workers may be counted in more than one category. The number of personnel in this table is considered to be more accurate than Table 4.11 because the actual total number of individuals in each category was provided by some plants in an attempt to correct for the multiple counting of individuals. This table does include the number of personnel from Point Beach 1,2.

Table 4.13 presents the average annual dose incurred by workers in the five occupational categories in 1989. These averages were calculated by dividing the collective dose reported for these groups (see Table 4.10) by the number of individuals shown in Table 4.12. It shows that in most instances, the maintenance and health physics personnel incur the highest average doses and that supervisory and engineering personnel usually have the lowest. When examining the values of the averages that are given in Table 4.13, one should bear in mind the several sources of error to which they are subject: (1) the number of individuals may be inflated because the same plant contractor employee may work at several plants so that the employee would be counted more than once in a summary such as Table 4.13; (2) the occupations are not clearly defined so that workers performing certain tasks in one plant may be classified as being in one occupation and be included in a different one at another plant; (3) some plants count only those workers whose doses exceed 0.10 rem (cSv) while other plants count all workers regardless of the dose received. It is because of these reasons that the usefulness of the numbers of individuals obtained from the reports provided in Appendix D is rather limited, and they are not used to develop any other statistics in this document.

4.8 Graphical Representation of Dose Trends in Appendix E

Appendix E is a recent addition to this report series. Each page of Appendix E presents two types of graphs for one site. One graph plots certain dose-performance indicators from 1973 through 1989, and the other indicates the collective dose by job function for 1978 through 1989. The dose and performance indicators shown in the top graph illustrate the history of the collective dose for the site, the rolling three-year average collective dose per reactor, and the gross electricity generated at the site. These data are plotted, beginning with the plant's first full year of commercial operation, and continuing through 1989. However, any data reported prior to 1973 are not included. The three-year average collective dose per reactor data is included because it appears to provide a better overall indication of the plant's general trend in collective dose. This average is determined by summing the collective dose for the current year and the previous two years and then dividing this sum by the number of reactors in operation during those years. This reduces the sporadic effects of refueling operations and occasional high-dose maintenance activities, and gives a better idea of collective dose trends over the life of the plant. (One may note that for sites with more than one reactor, the plot of the three-year rolling average will lie below that of the plot of the annual collective dose for the site because it is calculated on a per-reactor basis.)

TABLE 4.13
AVERAGE DOSES BY OCCUPATION
AND PERSONNEL TYPE*
1989

OCCUPATION	STATION		UTILITY		CONTRACT		TOTAL	
	COLL. NUMBER OF DOSE	NUMBER OF AVERAGE EMPLOYEES DOSE	COLL. NUMBER OF DOSE	NUMBER OF AVERAGE EMPLOYEES DOSE	COLL. NUMBER OF DOSE	NUMBER OF AVERAGE EMPLOYEES DOSE	COLL. NUMBER OF DOSE	NUMBER OF AVERAGE EMPLOYEES DOSE
<u>BOILING WATER REACTORS</u>								
MAINTENANCE	2,712	6,020	0.45	1,961	0.39	17,533	0.39	25,514
OPERATIONS	1,170	3,162	0.37	135	0.11	1,283	0.23	4,580
HEALTH PHYSICS	918	1,960	0.47	49	0.09	2,793	0.35	4,802
SUPERVISORY	294	1,106	0.27	18	0.20	174	0.33	1,730
ENGINEERING	303	1,429	0.21	87	0.10	1,011	0.36	5,173
TOTAL	5,398	13,677	0.39	3,150	0.28	24,972	0.37	41,799
<u>PRESSURIZED WATER REACTORS</u>								
MAINTENANCE	3,479	7,397	0.47	1,919	0.55	19,049	0.48	28,365
OPERATIONS	1,138	4,140	0.27	315	0.37	2,057	0.25	6,512
HEALTH PHYSICS	1,140	2,711	0.42	170	0.44	5,277	0.41	8,158
SUPERVISORY	329	2,061	0.16	62	0.16	1,011	0.44	830
ENGINEERING	349	1,595	0.22	240	0.29	1,294	0.34	3,468
TOTAL	6,435	17,904	0.36	3,635	0.42	31,204	0.44	62,743
<u>ALL LIGHT WATER REACTORS</u>								
MAINTENANCE	6,191	13,417	0.46	3,880	0.46	36,582	0.44	53,879
OPERATIONS	2,308	7,302	0.44	450	0.29	3,340	0.25	11,092
HEALTH PHYSICS	2,058	4,671	0.20	219	0.36	8,070	0.39	12,960
SUPERVISORY	623	3,167	0.22	79	0.16	1,546	0.40	1,316
ENGINEERING	653	3,024	0.37	327	0.19	2,305	0.35	5,198
TOTAL	11,833	31,581	0.37	6,785	0.36	56,176	0.41	94,542

* Workers may be counted in more than one category, but the actual total number of individuals in each category was used when it was provided by the plant.

The second type of graph at the bottom of each page in Appendix E displays the breakdown of collective dose by job function and employee type for the years 1978 through 1989. The horizontal axis lists the six job functions of reactor operations, routine maintenance, in-service inspection, special maintenance, waste management and refueling operations and the vertical axis indicates collective dose at each site. This representation quickly shows the job functions where most of the dose was accumulated as well as the division of the collective dose among plant and contract workers. The data are taken from the submittals presented in Appendix D and therefore represent at least 80% of the collective dose at each site. Only those reactors that have completed at least one full year of commercial operation are presented in Appendix E.

4.9 Health Implications of Average Annual Doses

Studies of populations chronically exposed to low levels of radiation delivered over protracted periods have not shown consistent or conclusive evidence of an associated increase in the risk of cancer. Thus there is no evidence that the doses to workers recorded here cause harm.

The risk estimates presented below are based on extensive studies of Japanese A-bomb survivors and other populations exposed to large doses of radiation delivered in short periods of time. This information is supplemented by animal and *in vitro* studies, such as irradiation of cell cultures. These studies have confirmed that human cells have mechanisms that repair damaged chromosomes. The existence of this repair helps to explain the finding that lower doses of radiation delivered at lower dose rates produce less of an effect on a cell per unit dose than high-dose, high-dose-rate irradiations. Thus the estimates of risks to radiation workers are likely to be conservative.

Health effects due to radiation exposure fall into three groups: carcinogenic effects, genetic effects, and mental retardation. Mental retardation has been observed only in Japanese A-bomb survivors exposed at 8-15 weeks gestational age, and is consequently not applicable to the workplace except in the case of a pregnant female worker. Genetic effects have never been observed in man, though they have been observed in mice.

Risk of cancer induction is known to increase with increasing dose, but is hard to quantify as the risk varies with the site of the cancer, the age and sex of the exposed individual, the energy and nature of the radiation, the magnitude and duration of the dose, and exposure to other carcinogens. Since nearly 20% of all deaths in the United States occur from cancer, the estimated number of cancers attributable to occupational radiation exposure is a small

fraction of the total number that occur. (Those who do not succumb to cancer will perforce succumb to some other cause and in essentially the same time frame.)

The Committee on the Biological Effects of Ionizing Radiations (BEIR) of the National Academy of Sciences (NAS) National Research Council has been conducting an ongoing study of the health effects of ionizing radiation. Its latest report, BEIR V, was published in 1990. Based on this report, the workers receiving the average dose of 0.36 rem (cSv) or the maximum accidental dose of 93 rems (cSv) to the whole body during 1989 (see page 6-4) might expect an increased cancer death risk of about 10 chances in a thousand for the average dose and 72 chances per thousand for the maximum dose.¹⁰ Should a worker receive 0.36 rem (cSv) continuously during an entire working career (working from age 18 until age 65) the lifetime risk of dying from cancer is estimated to increase by less than 5%. Since the American Cancer Society estimates that an individual's risk of dying of cancer is about 20% (one in five) the risk to an individual receiving 0.36 rem (cSv) would be approximately 20.6%.

The potential genetic effects from a worker population receiving 39,997 person-rems (person-cSv) (Table 3.1) are small compared to genetic damages that normally occur spontaneously in a population of this size. Approximately 100,000 serious genetic defects occur normally in one million live births, i.e., an average of about one serious defect in every ten live births. Theoretically, the total genetic damage in the first generation children of the exposed workers would, according to the report NUREG/CR-4214 [Ref. 17], be an increase of about two or less cases (less than 0.02%) compared to the expected 10,000 cases that occur normally.¹¹ No significant increase in the number of genetic defects has been observed in the children of individuals exposed to much higher levels of ionizing radiation at Hiroshima and Nagasaki, Japan.

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These estimates were calculated from Table 4-2 of Ref. 16. The average dose risk estimate assumes continuous lifetime exposure (ages 18-65), while the acute dose risk estimate assumes a one-time, instantaneous, exposure. Note that these estimates are based on observations of individuals exposed to high doses of radiation over short periods of time. The BEIR committee, in its report, cautions that dose rate reduction factors (DREFs) will need to be applied to low-dose and low-dose-rate exposures. (see Ref. 16, pp. 171 and 174)

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Assuming that, on the average, each exposed person will have one live-born child in the future, i.e., children born to this worker population

5 TERMINATION DATA SUBMITTED PURSUANT TO 10 CFR § 20.408

5.1 Termination Reports, 1969-1989

In 1969, the Atomic Energy Commission (predecessor of the NRC) began requiring certain categories of licensees¹² to submit personal identification and exposure information upon the termination of each monitored person's employment or work assignment at their facilities. The appropriate information on each report has been manually coded and entered into the Commission's computerized Radiation Exposure Information Reporting System (REIRS) for permanent retention. The data are retrievable by several criteria - social security number, name, facility, etc. - which allows statistical analysis of the data as well as the tracing of individual dose histories. During the years that this information has been collected, nearly 1.5 million reports have been received for approximately 640,000 individuals who have been reported as having terminated their employment at facilities in one or more of the categories of covered licensees. The figures given for the number of reports and the number of individuals are different because thousands of individuals have worked at more than one facility over the years and a termination report was submitted to the NRC each time they left a facility. Table 5.1 provides a breakdown of this information for individuals terminating during each of these 21 years and, since the majority of termination reports are submitted by nuclear power facilities, the number of individuals terminating from power reactors is displayed separately. Primarily because of the need for workers at an increasing number of nuclear power plants, the number of individuals terminating employment or work assignment has increased nearly every year, and in 1989, 76,561 individuals terminated employment or work assignments at nuclear power plants.

5.2 Limitations of Termination Data

When examining or using the statistics that are based on the termination data, one should keep in mind that these data have various limitations: (1) some licensees submit a termination report for each monitoring period rather than waiting until the individual actually completes a work assignment at the facility; (2) the reports contain no indication of the tasks the workers may have performed nor of the type of employees (contractor, plant part-time, etc.) they were while monitored by the licensee; (3) the period(s) of exposure

¹²

Commercial nuclear power reactors; industrial radiographers; fuel processors, fabricators, and reprocessors; and manufacturers and distributors of specified quantities of by-product material. Three other types of NRC licensees are now required to submit reports pursuant to 10 CFR § 20.407 and § 20.408: geologic repositories for high-level radioactive waste; receivers of radioactive waste from other persons for land disposal; and independent installations for the storage of spent fuel.

that are reported for terminating individuals may indicate the monitoring period during which they may have been exposed to radiation rather than the actual dates of exposure; (4) some licensees report cumulative periods of exposure and doses rather than the actual periods and dose incurred during each period; and (5) licensees having more than one licensed facility sometimes include in the termination report, submitted when individuals leave the second facility, the dose that they incurred at the first facility, which may already have been reported. Although attempts have been made to correct for some of these problems, they are still a source of error in any statistics developed from the termination data.

TABLE 5.1 TERMINATION REPORTS SUBMITTED TO THE NRC 1969 - 1989				
YEAR	All Covered Categories*		Power Reactor Licensees	
	Number of Reports Submitted	Number of Terminating Individuals	Number of Reports Submitted	Number of Terminating Individuals
1969	4,194	3,917	576	531
1970	6,520	5,828	1,995	1,807
1971	8,872	8,181	2,070	1,938
1972	10,633	9,599	4,051	3,364
1973	17,366	15,240	9,533	7,860
1974	26,347	21,729	19,963	15,727
1975	36,154	27,680	30,632	22,680
1976	52,865	39,274	47,623	34,630
1977	56,516	41,885	50,807	37,209
1978	61,121	44,020	55,063	38,570
1979	78,176	57,903	71,802	52,432
1980	100,344	72,475	93,515	66,816
1981	107,592	74,510	101,656	69,115
1982	108,309	68,809	103,810	64,779
1983	114,997	78,089	110,982	74,510
1984	113,745	80,958	121,474	77,708
1985	117,264	81,605	112,831	77,742
1986	113,745	83,459	109,548	79,736
1987	127,842	92,492	124,592	89,636
1988	116,697	83,558	113,398	80,832
1989	113,535	79,394	110,084	76,561

* Commercial nuclear power reactors; industrial radiographers; fuel processors, fabricators, and reprocessors; manufacturers and distributors of specified quantities of byproduct materials; low-level waste disposal facilities; and independent spent fuel storage installations.

5.3 Transient Workers per Calendar Quarter

One use of the information contained in the termination reports is the examination of the doses being received by short-term workers. Since a large number of the termination reports indicated periods of exposure that were less than 90 days, it is possible that several thousand individuals could have been employed by two or more licensees during the same calendar quarter. Thus, in this report, a "quarterly transient" worker is defined to be an individual who began and terminated employment at two or more different licensed facilities within one calendar quarter. This allows one to examine the doses of those workers that move rapidly between facilities.

Table 5.2 displays some of the information gathered from these termination reports that were submitted by all covered licensees and by licensed nuclear power facilities, separately. One can quickly see that the vast majority of these individuals are monitored by nuclear power facilities. The number of these individuals has increased during the past ten years from 2,355 in 1980 to 3,545 in 1989. The average individual dose (which is approximately equal to a quarterly dose for these workers) has decreased over these years to an all-time low of 0.27 rem (cSv).

The bottom half of the table separates the information shown for power reactor licensees into that for reactor workers employed by two, three, and four or more different reactor licensees. The table shows that most of these transients were reported by two different licensees during a quarter and that their average quarterly dose has decreased from 0.45 rem (cSv) in 1980 to a value of 0.21 rem (cSv) in 1989. The average dose incurred by persons terminated by three or more plants increased to a value of 0.24 rem (cSv) in 1989. All of these average doses are considerably less than those incurred 10 years ago. This is believed to be a reflection of the industry's continuing efforts to reduce the exposure of all individuals working at their facilities and their efforts to limit the workers' annual doses to less than five rems regardless of the number of facilities at which they work during the year.

Examination of these records also revealed that some individuals have worked for as many as six different NRC licensees during one calendar quarter, and examination of their doses revealed no instances during the last eight years in which a worker exceeded the quarterly limit of three rems (cSv) as a result of working at two or more different licensed facilities within one calendar quarter. In most of the cases that were found in previous years, the doses that the workers had received while employed by the first utility were re-evaluated and revised upward later in the year. These late revisions

TABLE 5.2
TRANSIENT WORKERS PER CALENDAR QUARTER
1980 - 1989

All Covered Licensees				Power Reactor Facilities			
Year	No. of Persons Terminated by Two or more Licensees Within One Quarter	Collective Dose (person-rem or person-cSv)	Average Individual Dose (rem or cSv)	Year	No. of Persons Terminated by Two or more Licensees Within One Quarter	Collective Dose (person-rem or person-cSv)	Average Individual Dose (rem or cSv)
1980	2,355	1,063	0.45	1980	2,218	1,033	0.47
1981	2,344	955	0.41	1981	2,335	952	0.41
1982	2,428	935	0.39	1982	2,396	914	0.38
1983	2,774	913	0.33	1983	2,728	886	0.32
1984	3,414	1,123	0.33	1984	3,356	1,083	0.32
1985	2,791	700	0.25	1985	2,746	674	0.25
1986	3,069	921	0.30	1986	3,033	910	0.30
1987	3,543	1,022	0.29	1987	3,517	1,011	0.29
1988	3,840	1,019	0.27	1988	3,799	1,011	0.27
1989	3,545	743	0.21	1989	3,501	737	0.21

Power Reactor Facilities							
Year	No. of Persons Terminated by Two Licensees			No. of Persons Terminated by Three Licensees			No. of Persons Terminated by >Three Licensees
	Collective Dose	Average Dose		Collective Dose	Average Dose		
1980	1,896	856	0.45	140	0.54	63	36
1981	1,967	780	0.40	145	0.47	60	27
1982	2,047	789	0.39	113	0.39	61	12
1983	2,276	767	0.34	101	0.28	90	18
1984	2,782	901	0.32	147	0.34	143	35
1985	2,340	597	0.26	67	0.20	71	10
1986	2,612	785	0.30	115	0.32	59	10
1987	2,992	875	0.29	121	0.28	100	16
1988	3,081	826	0.27	162	0.28	145	23
1989	2,891	604	0.21	102	0.21	128	31

resulted in a few workers receiving quarterly doses that slightly exceeded three rems (cSv). However, because some facilities do not report the workers' doses in quarterly increments in the termination reports that are submitted to the NRC, it is not always possible to determine, from the data in REIRS, the portion of the dose received during each quarter. This inability could have allowed any of these doses that exceeded three rems to go undetected by the analyses presented in this document. Regulations require that each licensee take measures to ensure that such exposures do not occur, and if they do occur, they are reported to the Commission separately (see Section 6).

5.4 Transient Workers per Calendar Year at Nuclear Power Facilities

Since the number of transient workers per calendar quarter comprises only a small percentage of the total number of individuals terminating each year, it was decided to examine the data reported for workers who began and terminated two or more periods of employment with two or more different reactor facilities within one calendar year. An examination of these data would allow one to determine the number and average dose for these "annual transients." Since more than 95% of these transients are reported by nuclear power facilities, only the termination records of these individuals were examined in detail.

Table 5.3 summarizes the number and doses of the transients found among the individuals terminating during the ten years from 1980 through 1989. The number of these individuals increased from about 5,500 in 1980 to over 10,000 in 1989. The average dose remained at about 1 rem (cSv) until 1985 when the average dose decreased by about 30% to 0.77 rem (cSv). The average dose has continued to decrease to a value of 0.64 rem (cSv) in 1989.

The lower portion of Table 5.3 shows the number and doses of workers who were terminated by two, three, and four or more different licensees during each calendar year. The average dose of workers terminating from two plants has decreased to about 0.5 rem (cSv) and the average dose of workers terminating at three plants decreased to about 0.8, while the average dose of individuals terminating from three or more facilities remains at about 1 rem (cSv).

Another way in which the distribution of the doses received by transient workers can be useful is in the determination of the impact that the inclusion of these individuals in each of two or more licensees' annual reports had on the annual summary (Table 4.4) for all nuclear power facilities (one of the

TABLE 5.3

TRANSIENT WORKERS PER CALENDAR YEAR AT NUCLEAR POWER FACILITIES

1980 - 1989

Year	No. of Commercial Reactors	No. of Persons Terminated by Two or More Licensees	Collective Dose (person-rems person-cSv)	Average Dose (rems or cSv)
1980	69	5,463	6,028	1.10
1981	71	5,425	5,381	0.99
1982	75	5,303	5,610	1.06
1983	76	6,340	6,675	1.05
1984	79	7,760	8,045	1.04
1985	83	6,871	5,319	0.77
1986	90	7,816	5,954	0.76
1987	97	9,469	6,712	0.71
1988	103	9,295	5,875	0.63
1989	107	10,344	6,613	0.64

Year	No. of Persons Terminated by Two Licensees	Collective Dose	Average Dose	No. of Persons Terminated by Three Licensees	Collective Dose	Average Dose	No. of Persons Terminated by >Three Licensees	Collective Dose	Average Dose
1980	3,772	3,444	0.91	959	1,245	1.30	732	1,339	1.83
1981	3,745	3,033	0.81	924	1,172	1.27	756	1,176	1.56
1982	3,645	3,349	0.92	913	1,131	1.24	745	1,130	1.52
1983	4,203	3,624	0.86	1,256	1,694	1.39	881	1,357	1.53
1984	5,118	4,224	0.83	1,461	1,945	1.33	1,181	1,875	1.59
1985	4,584	3,000	0.65	1,357	1,400	1.03	930	920	0.99
1986	5,079	2,907	0.57	1,490	1,508	1.01	1,247	1,539	1.23
1987	6,107	3,339	0.55	1,852	1,693	0.91	1,510	1,680	1.11
1988	5,889	2,880	0.49	1,899	1,529	0.81	1,507	1,465	0.97
1989	6,666	3,335	0.50	2,060	1,704	0.83	1,618	1,574	0.97

problems mentioned in Section 2). Table 5.4a shows the correct distribution of transient worker doses as determined from the above-mentioned termination reports and compares it with the distribution of the doses of these workers as they would have appeared in a summation of the annual statistical reports submitted by each of the nuclear power facilities. During each of the years shown, each of the transient workers was counted an average of 2.6 times so that in 1989, the 10,344 transients would have been counted as 26,974 individuals. This was not surprising because some individuals were reported by as many as nine different facilities.

Table 5.4b illustrates the impact that the multiple reporting of these transient individuals had on the staff's summation of the annual statistical reports for the years 1983 through 1989. Since each nuclear power facility reports the distribution of the doses received by workers while monitored by the particular facility during the year, one would expect that a summation of these reports would result in individuals being counted several times in dose ranges lower than the range in which their total accumulated dose (the sum of the personnel monitoring results incurred at each facility during the year) would actually place them. Thus, while the total collective dose would remain the same, the number of workers, their dose distribution, and average dose would be affected by this multiple reporting. This was found to be true because too few workers were reported in the higher dose ranges. For example, in 1989, Table 5.4b shows that the summation of annual reports indicated that 108,308 workers received a measurable dose, 1,299 of whom received doses greater than two rems (cSv). After accounting for those individuals that were reported more than once, the corrected distribution indicated that there were really only 100,241 workers that received a measurable dose and that 1,986 of them received doses greater than two rems (cSv). Thus, some 2.0% of the workers with measurable dose received an annual dose greater than two rems rather than 1.2% that would have been computed from the "Reported Statistical Distribution" shown in the first row of Table 5.4b for each year.

Since the number of transient workers receiving measurable doses and the collective dose they receive are only about 5% and 15% of the total number of workers and of the total collective dose, respectively, each year, their impact on most of the statistics derived from compilations of the annual summary reports is not very great. However, when examining the number of annual doses in the higher dose ranges (Table 5.4b), one finds that the correct statistical distribution indicates that the number of workers who received doses greater than four rems (cSv) is usually about two to three times the number found in the reported statistical distribution. But there is still a clear trend for the number of higher doses to decrease; in 1989, there were only 382 annual doses that exceeded three rems, which is significantly

TABLE 5.4a
REPORTED AND CORRECT DOSE OF TRANSIENT WORKERS FOR CALENDAR YEAR AT POWER REACTORS*

Type of Distribution and Year	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)																Total Individuals	**Collective Dose (Person-rem or -cSv)	Avg. Meas. Dose (rem or cSv)
	Less than Measurable	Measurable <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.0	6.0-7.0	7.0-8.0	8.0-9.0	9.0-10.0	>10			
Correct Distribution of Transients - 1983	881	1,480	513	445	367	320	975	663	420	185	61	24	4	2			6,340	6,675	1.05
Reported Distribution of Transients - 1983	4,904	4,273	1,529	1,397	986	752	1,801	642	101	13	5	2					16,405	6,675	0.41
Correct Distribution of Transients - 1984	1,108	1,852	557	540	425	387	1,193	878	544	202	52	22					7,760	8,045	1.04
Reported Distribution of Transients - 1984	6,054	5,440	1,894	1,757	1,255	979	2,370	639	97	10							20,495	8,045	0.39
Correct Distribution of Transients - 1985	1,201	1,854	518	521	455	314	967	629	336	74	1						6,870	5,319	0.77
Reported Distribution of Transients - 1985	6,037	5,014	1,625	1,459	1,042	664	1,484	371	51	1							17,748	5,319	0.30
Correct Distribution of Transients - 1986	1,319	2,006	648	656	472	369	1,248	691	325	72							7,806	5,954	0.76
Reported Distribution of Transients - 1986	6,866	5,372	2,071	1,935	1,236	856	1,685	299	50	1							20,371	5,954	0.29
Correct Distribution of Transients - 1987	1,992	1,717	773	922	767	632	1,681	670	266	48							9,468	6,712	0.70
Reported Distribution of Transients - 1987	9,369	5,276	2,762	2,650	1,780	1,125	1,835	189	30	1							25,017	6,712	0.26
Correct Distribution of Transients - 1988	2,601	1,276	866	900	679	610	1,544	628	174	17							9,295	5,875	0.63
Reported Distribution of Transients - 1988	10,892	4,272	2,703	2,616	1,650	1,087	1,498	144	5								24,867	5,875	0.24
Correct Distribution of Transients - 1989	2,505	1,605	1,012	1,108	922	662	1,607	643	258	22							10,344	6,613	0.64
Reported Distribution of Transients - 1989	11,068	5,087	3,182	2,958	1,762	1,047	1,634	228	7	1							26,974	6,613	0.25

*Includes data from Fort St. Vrain.

**Collective dose found by summing the actual doses reported for those workers in their termination reports.

TABLE 5.4b
EFFECTS OF TRANSIENT WORKERS ON ANNUAL STATISTICAL COMPILATIONS*

Type of Distribution and Year	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)														Total Individuals	**Collective Dose (Person-rems or cSv)	Avg. Dose (rem or cSv)	Avg. Meas. Dose (rem or cSv)
	Less than Measurable	0.10-0.10	0.25-0.25	0.50-0.50	0.75-0.75	1.00-1.00	2.00-2.00	3.00-3.00	4.00-4.00	5.00-5.00	6.0-6.0	7.0-7.0	8.0-8.0	9.0-9.0	10.0 >10			
Reported Statistical Distribution - 1983	52,036	31,948	12,211	10,296	6,470	4,708	12,171	5,311	1,950	544	65	16	4		137,730	56,473	0.41	0.66
**Correct Statistical Distribution - 1983	48,013	29,155	11,195	9,344	5,851	4,276	11,345	5,332	2,269	716	121	38	8	2	127,665	56,473	0.44	0.71
Reported Statistical Distribution - 1984	61,232	39,946	14,772	11,492	7,166	5,396	12,453	4,967	1,675	295					159,394	55,238	0.35	0.56
**Correct Statistical Distribution - 1984	56,286	36,358	13,435	10,275	6,336	4,804	11,283	5,206	2,122	487	52	22			146,666	55,238	0.38	0.61
Reported Statistical Distribution - 1985	66,399	40,361	14,155	12,012	7,214	4,897	10,557	3,317	716	84					159,712	43,077	0.27	0.46
**Correct Statistical Distribution - 1985	61,563	37,201	13,048	11,074	6,627	4,547	10,040	3,575	1001	157	1				148,834	43,077	0.29	0.49
Reported Statistical Distribution - 1986	73,818	44,895	16,000	13,112	7,780	5,179	10,678	2,670	593	75					174,800	42,655	0.24	0.42
**Correct Statistical Distribution - 1986	68,271	41,529	14,577	11,833	7,016	4,692	10,241	3,062	868	146					162,235	42,655	0.26	0.45
Reported Statistical Distribution - 1987	93,491	44,833	17,824	14,566	8,599	5,824	10,765	1,710	241	22					197,875	40,591	0.21	0.39
**Correct Statistical Distribution - 1987	86,114	41,274	15,835	12,838	7,586	5,331	10,611	2,191	477	69					182,326	40,591	0.22	0.42
Reported Statistical Distribution - 1988	96,996	43,246	17,750	14,869	8,874	5,938	10,264	1,958	342	9	1				200,247	40,772	0.20	0.39
**Correct Statistical Distribution - 1988	88,705	40,250	15,913	13,153	7,903	5,461	10,310	2,442	511	26	1				184,675	40,772	0.22	0.42
Reported Statistical Distribution - 1989	94,760	48,808	19,484	15,661	8,814	5,541	8,701	1,189	99	11					203,068	36,161	0.18	0.33
**Correct Statistical Distribution - 1989	86,197	45,326	17,314	13,811	7,974	5,156	8,674	1,604	350	32					186,438	36,161	0.19	0.36

*Includes data from Fort St. Vrain.

**Distribution found by subtracting the correct from the reported distribution shown in Table 5.4a and then subtracting this difference from the reported statistical distribution shown in Table 5.4b.

less than the number for 1988 (538). Table 5.5 shows that no doses greater than five rems were reported in 1989 and that since 1985, there have been no additional transient workers identified as having received a dose of greater than five rems that would not have appeared on the annual reports received by the Commission. This reflects the industry's continuing concerted efforts to keep the total annual doses of all workers under five rems and shows that such reductions can be accomplished without increasing the collective dose.

Year	Reported Number >5 Rems (cSv)	Corrected Number >5 Rems (cSv)	Difference
1977	270	351	81
1978	103	158	55
1979	130	180	50
1980	311	391	80
1981	189	235	46
1982	74	135	61
1983	85	169	84
1984	0	74	74
1985	0	1	1
1986	0	0	0
1987	0	0	0
1988	1	1	0
1989	0	0	0

5.5 Temporary Workers per Calendar Year at Nuclear Power Facilities

To complete the examination of the doses received by the short-term workers employed at nuclear power facilities, Table 5.6 summarizes the data compiled on "temporary workers." For purposes of this report, temporary workers were defined to be those individuals who began and ended a period of employment or work assignment at only one nuclear power facility during the calendar year. Table 5.6 shows that the number of these temporary individuals increased by about 63% between 1978 and 1989 while the number of reactors increased by 67% during this time. The number of temporary workers receiving a measurable

TABLE 5.6
 TEMPORARY WORKERS PER CALENDAR YEAR
 AT NUCLEAR POWER FACILITIES
 (Individuals Terminated by Only One Employer)

Year	No. of Reactors	Number of Temps. Monitored	Number with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Dose (rem or cSv)	Average Measurable Dose (rem or cSv)
1978	64	28,864	17,110	9,821	0.34	0.57
1979	68	38,347	21,491	9,488	0.25	0.44
1980	69	48,383	28,305	16,168	0.33	0.57
1981	71	48,265	28,675	16,755	0.35	0.58
1982	75	44,503	25,646	14,266	0.32	0.56
1983	76	50,903	26,682	16,007	0.31	0.60
1984	79	53,438	29,988	15,856	0.30	0.52
1985	83	48,678	24,991	10,418	0.21	0.42
1986	90	47,108	22,911	8,014	0.17	0.35
1987	97	51,365	22,433	8,303	0.16	0.37
1988	103	44,812	20,575	7,618	0.17	0.37
1989	107	46,938	22,291	7,202	0.15	0.32

dose, however, increased by only 30%. The collective dose reached a high of nearly 17,000 person-rem (person-cSv) in the early eighties, but has declined to about 7,200 person-rem (person-cSv) in 1989. The average measurable dose remained at about 0.6 rem during the early eighties, but in 1985, all of the parameters listed in Table 5.6, except for the number of reactors, decreased significantly and the collective dose for these workers has continued to decrease since then. This has resulted in the average measurable dose of these workers falling to 0.32 rem (cSv) in 1989.

One apparent discrepancy in the above analysis of termination data is that not all of the individuals that terminated during each of the calendar year are included. When one compares the total number of persons terminating during a year (Table 5.1) to the sum of workers terminating from one facility (temporary workers, Table 5.6) and the number of individuals terminating from two or more facilities (transient workers, Table 5.3), one finds a considerable difference in these figures. This is because of the criteria that is used to determine which individuals should be included in the

"temporary" and "transient" worker groups. To be included in either of these groups in this analysis, the individuals' periods of employment must begin and end during the same calendar year. Any individual whose beginning or ending dates of employment overlap the beginning and ending dates of the calendar year are not included in these analyses. In 1989, for example, one finds that the number of individuals not included in these analyses is roughly 22,000. However, there is no indication that the exclusion of these individuals significantly impacts the statistics presented here.

5.6 Career Dose Statistics at Reactor Facilities, 1977 - 1989

Recently, the REIR System has been transferred to a relational database management system (RDBMS). The database has been restructured and designed to enhance the capabilities of the system to perform a more in-depth analysis of the data contained in the system in a considerably more cost-effective manner. These improvements have made it possible to analyze and present the data in new ways in this report. The following analysis is in response to heightened interest concerning career doses of individuals terminating from reactor facilities. Comments on these data are welcome and should be directed to the NRC as noted in the Editor's Note at the beginning of this report.

The reports containing the data for these analyses were submitted under 10 CFR § 20.408, which requires licensees to report the doses received by individuals terminating from NRC-licensed facilities. As stated previously, one use of these reports is to monitor compliance with regulatory dose limits. Another use is to correct the dose distributions reported under § 20.407 for the effects of the transient worker population on this distribution. In addition to these, the termination data may be used to analyze career information from workers who have terminated from NRC-licensed facilities. Since approximately 95% of the workers terminate from reactor facilities, these data were queried to produce reports containing information on career doses and career length broken down by the age and sex of the individual.

5.6.1 Compilation of the Data

The data was compiled from reports submitted by reactor licensees for each individual in the REIR System. The first recorded date of exposure monitoring was used as the "hire" date for that individual. Likewise, the last recorded date of exposure monitoring was used for the individual's "termination" date. In most cases, the actual hire and termination dates are not given, and in cases where they are given, these dates correspond to exposure dates in nearly all cases. All doses attributed to reactor licensees for an individual were summed during this "career" time period. Only those individuals who

terminated between 1977 and 1989 (inclusive) are considered in this report. For most of the data presented, only those workers receiving measurable doses were included in the statistics. This eliminates the majority of the individuals who were visitors or who were simply monitored for administrative purposes. In addition to the information on dose and length of employment, information on the individual's sex and birthdate was compiled from reports where such information was available.

All "overexposure" events reported to the NRC under 10 CFR § 20.403 and § 20.405 (see Section 6) are included in the career dose analysis. Each overexposure record was verified to ensure that doses attributed to overexposures were not already recorded in the termination exposure data for an individual.

The total numbers and percentages of workers in each category reflect the level of completeness of data presented in these analyses. The total number of individuals included in the career dose analysis was 506,092. Out of the total, 299,170 (59%) of the individuals received measurable doses. For this analysis, measurable dose is considered to be any recorded dose greater than or equal to 1 millirem. The birthdate, and therefore the age at termination, was known for 73% of the individuals with measurable doses. The sex was recorded for 64% of the individuals with measurable doses. The age and sex were known for 48% of the total number of workers with measurable doses.

5.6.2 Limitations of the Data

When analyzing and drawing conclusions from these data, it is important to note several limitations of the data. When possible, attempts have been made to minimize these limitations.

One limitation is that a large number of individuals may not have completed their careers. A number of licensees submit "termination" reports for individuals on a yearly basis, regardless of their actual employment status. Typically, an individual will have been reported as "terminating" on December 31st of the year in question and will appear to have been "hired" again on January 1st. In the following analysis, this practice does not significantly affect data for the years 1977 through 1988. However, a significant number of individuals (6,528) who were reported as "terminated" on December 31, 1989, are included in these analyses. It is logical to assume that an even larger number of individuals who were employed as temporary workers during 1989 will most likely be reported to have worked at other facilities in 1990. The probability that a worker recorded as terminated in 1988 or earlier would skip a year of work and begin working again in 1990 is much lower and, for this

analysis, can be considered insignificant. For this reason, the career data prior to 1989 is thought to be more complete, and therefore care should be taken when drawing conclusions from the 1989 data for career length and career dose.

In most cases the sex of the individual was assumed from the first name or sir title given in the submittal's letterhead or salutation. Where the first name was not indicative of the sex of the individual, or was unclear, a null value was recorded and it was treated as "unknown." In past years, these unknown records may have been assumed to be male and entered as such. A concerted effort to identify the sex of the individual has been undertaken recently (1989 data), and the current set of names identified as male or female were used to retro-actively update records that contained these names and were previously not identified by sex. The 1989 data for the sex of the worker is consequently more complete than for previous years. Due to the inherent uncertainties associated with these assumptions, care should be taken when drawing conclusions from the data broken down by sex.

Another problem has been the licensee's practice of reporting incremental periods of exposure and then reporting all or part of the individual's exposure history at that facility when the individual actually terminates employment, or as a correction to a previous report. This may cause an overlap for some periods of exposure and doubles the dose recorded for that individual at that facility during the overlapping time period. Considerable effort has been taken to eliminate this problem from the data, and new data entering the system is run through extensive verification procedures to identify data that overlaps or is otherwise inconsistent with data already in the system. However, such procedures were not applied to data in the past and it has proven difficult to identify and correct for overlapping exposure records. While this only affects a small percentage of the records, it is an additional source of error for any conclusions drawn from the termination data.

5.7 Career Dose Distributions by Dose and Career Length

Table 5.7 presents the career dose distribution data broken down by dose and length of career for individuals terminating from reactor facilities from 1977 to 1989. The upper table shows the number of individuals that accumulated a career dose for each of the dose ranges indicated. An individual whose career dose exactly equals one of the end-points of a range is included in the higher dose range. The lower table shows the total collective dose received by individuals in each dose range. The left-hand column of both tables indicates the "career length" or period of time the individual was monitored at a

reactor facility.

Table 5.7 shows data for over half a million workers (506,092) monitored during the period from 1977 to 1989. As stated previously, the number of these workers with measurable doses was 299,170. 88% of the total work force received career doses less than 2 rems (cSv), while 95% of these workers received career doses less than 5 rems (cSv). The percentages with less than 2 and 5 rems (cSv) for workers with measurable doses are 80% and 92%, respectively. This represents the vast majority for both categories of workers. It is important to note that this dose is received during the entire career of the worker and can be compared favorably to the current 3 rem (cSv) per calendar quarter regulatory limit. As anticipated, Table 5.7 shows that the longer the career, the higher the career dose for most workers.

Table 5.8 shows the average career dose, average annual dose, and average career length for the total monitored work force and for those with measurable dose. The highest career doses were accumulated by individuals who worked between 20 and 25 years. This category also had one of the highest values of average annual dose of 0.53 rem (cSv). The average annual dose was calculated from the total collective dose of individuals in each career length range divided by the total collective career length (in years) for these individuals. This resulted in an overall (1977 - 1989) average annual dose for workers with measurable dose of 0.44 rem (cSv). The average measurable dose calculated from § 20.407 submittals for all of the years 1977 through 1989 corrected for transient workers was found to be 0.57 rem (cSv) (see Table 4.4). This may be a further indication that the dose distribution model used to calculate total collective doses for reactors, and subsequently the average measurable dose, tends to overestimate the actual doses received by workers. However, the workers in Table 5.8 have been reported as having terminated their employment while workers included in Table 4.4 include all active workers, which may also contribute to the difference in these figures.

TABLE 5.7
CAREER DOSE DISTRIBUTIONS BY DOSE AND CAREER LENGTH AT REACTOR FACILITIES
1977 - 1989

Career Length	No Meas.	Number of Personnel in Dose Range (Rems)											Total with Measurable Dose		Total Monitored		
		.001-.1	.1-.5	.5-1	1-2	2-3	3-4	4-5	5-10	10-15	15-20	20-25	25-30	30-50		>50	
<=30 days	100,143	19,831	6,350	2,582	3,283	1,164	65	10	2	0	0	1	1	0	0	33,289	133,432
31 days - 6 mo.	46,556	28,772	18,311	8,047	7,655	2,793	1,287	315	46	1	1	0	0	0	1	67,229	113,785
6 mo. - 1 yr	16,521	10,992	6,417	2,746	2,765	1,443	792	354	248	1	0	0	0	0	0	25,758	42,279
1 - 2 yrs	17,154	12,934	8,180	3,983	4,107	2,141	1,274	757	925	36	2	1	0	0	0	34,340	51,494
2 - 3 yrs	8,702	8,459	5,802	2,815	3,147	1,905	1,151	748	1,296	120	13	0	1	0	0	25,457	34,159
3 - 4 yrs	5,336	6,025	4,370	2,218	2,452	1,597	981	681	1,380	267	45	3	1	1	3	20,024	25,360
4 - 5 yrs	3,906	5,081	3,699	1,958	2,102	1,281	919	626	1,392	341	72	15	3	0	0	17,489	21,395
5 - 10 yrs	6,719	10,816	9,737	5,322	6,484	4,338	3,120	2,308	6,123	2,327	896	301	111	45	3	51,931	58,650
10 - 15 yrs	1,619	3,077	3,192	1,844	2,220	1,560	1,207	934	2,805	1,348	673	336	175	169	18	19,558	21,177
15 - 20 yrs	182	420	589	333	381	271	225	170	524	268	152	95	57	87	16	3,588	3,770
20 - 25 yrs	23	27	34	30	22	19	15	10	47	31	26	17	7	31	10	326	349
> 25 yrs	61	44	35	16	14	7	8	2	18	8	7	5	0	12	5	181	242
Totals	206,922	106,478	66,716	31,894	34,632	18,519	11,044	6,915	14,806	4,748	1,887	774	356	345	56	299,170	506,092

Career Length	No Meas.	Total Collective Dose of Personnel in Dose Range (Rems)													Total Dose	Average Career Dose	
		.1-.5	.5-1	1-2	2-3	3-4	4-5	5-10	10-15	15-20	20-25	25-30	30-50	>50			
<=30 days	0	513	1,528	1,849	4,960	2,596	226	43	11	0	0	22	27	0	0	11,775	0.35
31 days - 6 mo.	0	997	4,546	5,752	11,043	6,672	4,421	1,367	274	11	19	0	0	0	61	35,163	0.52
6 mo. - 1 yr	0	364	1,559	1,974	3,970	3,514	2,734	1,552	1,470	11	0	0	0	0	0	17,148	0.67
1 - 2 yrs	0	437	2,048	2,872	5,913	5,233	4,407	3,372	5,851	406	32	25	0	0	0	30,594	0.89
2 - 3 yrs	0	295	1,466	2,050	4,521	4,665	3,985	3,334	8,687	1,384	212	0	27	0	0	30,626	1.20
3 - 4 yrs	0	215	1,108	1,617	3,584	3,922	3,403	3,042	9,348	3,102	731	69	25	38	997	31,202	1.56
4 - 5 yrs	0	183	937	1,413	3,055	3,160	3,184	2,784	9,601	4,090	1,206	330	82	0	0	30,024	1.72
5 - 10 yrs	0	419	2,482	3,871	9,496	10,709	10,840	10,320	43,558	28,285	1,563	6,650	3,024	1,529	764	133,510	2.57
10 - 15 yrs	0	126	822	1,349	3,260	3,846	4,186	4,170	19,990	16,412	11,587	7,509	4,777	6,134	1,129	85,296	4.36
15 - 20 yrs	0	17	157	235	558	666	783	766	3,772	3,268	2,621	2,133	1,569	3,309	954	20,807	5.80
20 - 25 yrs	0	1	9	22	31	47	52	45	346	385	450	384	189	1,224	614	3,799	11.65
> 25 yrs	0	2	9	11	19	16	27	8	126	97	125	114	0	457	335	1,346	7.44
Totals	0	3,569	16,672	23,015	50,409	45,046	38,249	30,803	103,033	57,452	18,544	17,234	9,720	12,692	4,853	431,291	1.44

TABLE 5.8
AVERAGE CAREER LENGTHS AND DOSES BY CAREER LENGTH
1977 - 1989

Career Length	Average Career Dose		Average Annual Dose		Average Career Length	
	Total Monitored (Rems)	Number w/ Measurable (Rems)	Total Monitored (Rem)	Number w/ Measurable (Rem)	Total Monitored (Years)	Number w/ Measurable (Years)
<=30 Days	0.09	0.35	--	--	0.03	0.04
31 Days - 6 Mo.	0.31	0.52	--	--	0.24	0.24
6 Mo. - 1 Yr	0.41	0.67	0.55	0.91	0.74	0.74
1 - 2 Yrs	0.59	0.89	0.41	0.61	1.46	1.47
2 - 3 Yrs	0.90	1.20	0.36	0.49	2.47	2.47
3 - 4 Yrs	1.23	1.56	0.35	0.45	3.48	3.49
4 - 5 Yrs	1.40	1.72	0.31	0.38	4.47	4.48
5 - 10 Yrs	2.28	2.57	0.32	0.36	7.15	7.18
10 - 15 Yrs	4.03	4.36	0.34	0.36	11.98	12.00
15 - 20 Yrs	5.52	5.80	0.33	0.35	16.57	16.57
20 - 25 Yrs	10.89	11.65	0.50	0.53	21.84	21.83
> 25 Yrs	5.56	7.44	0.14	0.18	40.69	40.94
Totals	0.85	1.44	0.37	0.44	2.29	3.27

5.8 Career Dose Distributions by Age and Sex

Table 5.9 presents the data for the 73% of workers with measurable doses for which the age of the worker is known. The data are broken down by age and year of termination for all workers with measurable dose from 1977 through 1989. The average values for age at termination, career length, and career dose are included to examine the trends over time for these workers. The data suggest a slightly aging population of workers with the average career length increasing from about 1 year in 1977 to over 5 years in 1988 and 1989. During this time period the average career doses have also increased, but at a slower rate, from 0.975 rem (cSv) in 1977 to 2.577 rems (cSv) in 1989. As previously discussed in Section 5.6.2, the 1989 termination data are considered incomplete and therefore it may be more prudent to note the increase from 0.975 rem (cSv) in 1977 to 1.650 rems (cSv) in 1988. Using the 1977 and 1988 data, the average career length has increased by 418%, while the average career dose has increased by 69%. Apart from the 1989 data, the average career dose has remained less than 2 rems (cSv) for each year. The average age at termination increased by only 6% from a value of 36.21 years in 1977 to 38.28 years in 1988.

TABLE 5.9
CAREER DOSE DISTRIBUTIONS BY AGE AND YEAR OF TERMINATION
FOR PERSONNEL WITH MEASURABLE DOSE
1977 - 1989

Year	Total Number of Personnel in Each Age Range										Average Age at Term. (Yrs)	Average Career Length (Yrs)
	18-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	>60	Total	
1977	178	1,353	1,395	1,129	769	575	543	528	448	360	7,278	36.21
1978	128	1,141	1,322	1,120	759	583	440	441	442	343	6,719	36.49
1979	141	1,578	1,766	1,566	1,020	685	611	570	443	344	8,724	35.63
1980	175	1,839	2,062	1,966	1,351	1,028	778	775	663	483	11,120	36.49
1981	195	2,531	2,820	2,495	1,755	1,158	985	840	696	563	14,038	35.66
1982	144	1,546	2,229	2,184	1,782	1,222	942	753	662	610	12,074	37.21
1983	154	1,795	2,570	2,406	1,990	1,427	947	807	644	595	13,335	36.67
1984	193	2,106	3,098	2,915	2,491	1,674	1,260	891	823	654	16,105	36.67
1985	176	1,800	3,065	2,970	2,638	1,937	1,337	983	816	726	16,448	37.32
1986	179	1,774	3,245	3,353	3,134	2,265	1,488	1,109	879	818	18,244	37.64
1987	247	2,137	3,900	4,441	4,189	3,264	2,268	1,445	1,153	909	23,953	37.89
1988	243	2,005	3,592	4,407	4,302	3,606	2,396	1,535	1,233	864	24,183	38.28
1989	364	3,120	6,356	8,907	8,684	7,463	5,172	3,426	2,294	1,464	47,250	38.80
												5.84

Year	Total Collective Dose of Personnel in Each Age Range (Rems)										Average Career Dose	
	18-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	>60		Total Dose
1977	93	1,444	1,489	1,234	738	532	497	424	365	279	7,094	0.975
1978	41	1,102	1,630	1,240	894	697	481	514	434	316	7,348	1.094
1979	60	1,181	1,629	1,407	880	592	498	446	342	383	7,416	0.850
1980	87	1,736	2,240	2,150	1,500	1,197	804	737	715	554	11,722	1.054
1981	89	2,912	3,494	3,139	2,159	1,336	1,167	907	870	664	16,738	1.192
1982	35	1,237	2,432	2,948	2,425	1,593	1,219	942	911	899	14,641	1.213
1983	56	1,834	3,259	3,583	2,986	1,753	1,265	923	934	1,029	17,622	1.321
1984	68	2,127	4,624	4,790	3,984	3,080	2,001	1,141	1,177	1,209	24,201	1.503
1985	31	1,546	4,176	4,603	4,459	2,821	1,899	1,329	990	1,127	22,980	1.397
1986	34	1,273	4,132	5,651	5,786	3,819	2,382	1,671	1,535	1,353	27,637	1.515
1987	52	1,054	4,808	7,163	7,426	5,542	3,670	2,248	1,915	1,695	35,573	1.485
1988	42	1,086	4,672	8,175	8,167	6,724	4,352	2,731	2,264	1,695	39,907	1.650
1989	95	2,800	13,666	26,079	26,676	21,364	13,943	8,564	5,469	3,085	121,740	2.577

Table 5.10 presents the average values of age at termination, career length, and career dose broken down by sex and year of termination for all workers receiving measurable doses from 1977 through 1989. The sex of the workers was determined as discussed in Section 5.6.2, and the sex and age was known for 144,424 (48%) workers with measurable doses. The table shows that female workers averaged 10 years younger than male workers in 1977 and about 6 years younger over the period from 1977 to 1989. The career doses of females have averaged about one third of the male career doses, while the career lengths have averaged about two thirds of the male career lengths. The percentage of females of the total workers in this group has increased from about 3% in 1977 to 6% in 1989. The average age of females has increased 21% from 1977 to 1989, while the male average age increased by only 6% and even decreased during the period 1977 to 1981 from a value of 37.34 years in 1977 to a low of 35.82 years in 1981.

The data for workers of known age and unknown sex are included in Table 5.10 to give some indication of the values for workers not included in the analysis by age and sex. It is found that, in most cases, the values lie between that for the male and female workers. There is no way of determining whether the analysis presented here would be significantly impacted if the sex and age were known for this group. The fact that the average career length for this group is considerably less each year than the value for males, and less than the total workers where age and sex are known, may indicate that this group contains a large number of female workers or a large number of short-term or temporary workers. It is known that a contributing factor in the number of workers in this category is the licensee's practice of reporting only the first initial of the first name of the individual (see Section 5.6.2). This is thought to be a more common practice among temporary workers where licensee personnel files may be less complete, and therefore supports the theory that this group may contain a slightly disproportionate number of short-term employees. However, the figures presented here for workers of known age and sex are believed to be representative of the overall population of workers with measurable dose.

TABLE 5.10
AVERAGE CAREER VALUES BY SEX AND YEAR OF TERMINATION
FOR PERSONNEL OF KNOWN AGE WITH MEASURABLE DOSE
1977 - 1989

Year	FEMALES OF KNOWN AGE					MALES OF KNOWN AGE					KNOWN AGE, SEX UNKNOWN					TOTAL PERSONNEL				
	Number with Meas'ble	Average Age at Term.	Average Career Length	Average Career Dose (rem)	Average Career Dose (rem)	Number with Meas'ble	Average Age at Term.	Average Career Length	Average Career Dose (rem)	Average Career Dose (rem)	Number with Meas'ble	Average Age at Term.	Average Career Length	Average Career Dose (rem)	Average Career Dose (rem)	Number with Meas'ble	Average Age at Term.	Average Career Length	Average Career Dose (rem)	Average Career Dose (rem)
1977	29	27.58	0.88	0.940	1.392	1,020	37.34	1.38	1.392	6,229	36.07	0.91	0.907	7,278	36.21	0.98	0.975			
1978	40	34.67	2.26	0.615	1.704	1,204	37.16	2.06	1.704	5,475	36.35	1.37	0.963	6,719	36.49	1.50	1.094			
1979	88	29.94	1.29	0.291	1.107	2,425	36.48	1.61	1.107	6,211	35.37	1.24	0.758	8,724	35.63	1.34	0.850			
1980	343	30.63	1.00	0.214	1.128	8,822	36.89	1.49	1.128	1,955	35.70	1.48	0.868	11,120	36.49	1.47	1.054			
1981	553	31.05	1.25	0.344	1.316	11,567	35.82	1.55	1.316	1,918	35.98	1.59	0.690	14,038	35.66	1.54	1.192			
1982	494	31.48	1.41	0.309	1.372	9,544	37.73	2.25	1.372	2,036	36.14	1.87	0.685	12,074	37.21	2.15	1.213			
1983	520	31.14	1.96	0.383	1.488	10,566	37.05	2.59	1.488	2,249	36.14	2.09	0.757	13,335	36.67	2.48	1.321			
1984	852	31.00	1.90	0.506	1.660	13,552	36.97	3.02	1.660	1,701	37.16	2.22	0.749	16,105	36.67	2.88	1.503			
1985	587	31.57	2.79	0.526	1.824	9,786	38.60	4.00	1.824	6,075	35.80	2.12	0.793	16,448	37.32	3.26	1.397			
1986	776	32.33	2.93	0.443	2.005	11,051	38.97	4.81	2.005	6,417	35.99	2.65	0.800	18,244	37.64	3.97	1.515			
1987	791	32.95	3.84	0.645	2.102	12,818	39.78	6.00	2.102	10,344	35.93	2.65	0.785	23,953	37.89	4.48	1.485			
1988	741	34.22	4.39	0.580	2.436	12,392	40.16	6.84	2.436	11,050	36.45	3.15	0.841	24,183	38.28	5.08	1.650			
1989	2,008	33.52	4.17	1.231	3.184	31,855	39.54	6.54	3.184	13,387	37.83	4.40	1.332	47,250	38.80	5.84	2.577			

6 EXPOSURES TO PERSONNEL IN EXCESS OF REGULATORY LIMITS

6.1 Control Levels

10 CFR 20.101 and 20.104, and 20.103, limit the external and internal exposure, respectively, of workers to ionizing radiation from licensed material and other sources of radiation within the licensee's control.¹ Section 20.101 sets limits on whole body, skin, and extremity exposures. Section 20.104 sets limits on exposures to minors. Whole-body dose is generally limited to 1.25 rems per calendar quarter. Licensees are permitted to allow workers to be exposed to doses not exceeding three rems per calendar quarter if they can show that the worker's cumulative dose since age 18 will not exceed five rems multiplied by the worker's age since his/her eighteenth birthday. [Cumulative dose $\leq 5(N-18)$ where N is the worker's age.] Form NRC-4 or its equivalent is used to record determinations of prior dose.

Exposures in excess of regulatory limits are sometimes referred to as "overexposures." The phrase "exposures in excess of regulatory limits" is preferred to "overexposures" because the latter suggests that a worker has been subjected to an unacceptable biological risk, which is usually not the case.²

10 CFR 20.403 and 20.405 require that all persons licensed by the NRC submit reports of all occurrences involving personnel radiation exposures that exceed certain control levels, thus providing for investigations and corrective actions as necessary. Based on the magnitude of the exposure, the occurrence may be placed into one of three categories:

(1) Category A

10 CFR § 20.403(a)(1) - Exposure of the whole body of any individual to 25 rems (cSv) or more; exposure to the skin of the whole body of any individual to 150 rems (cSv) or more; or exposure of the extremities (feet, ankles, hands or forearms) of any individual to 375 rems (cSv) or more. The Commission must be notified immediately of these events.

¹ These are the section numbers before they were changed by the revision of Part 20, 56 FR 23360, May 21, 1991.

² Limits on occupational exposure are set so that a worker may receive the maximum dose over a 50-year working lifetime without suffering unacceptable risk. A single exposure above this limit when the usual dose is considerably below the limit will not cause an unacceptable increase in risk to the worker.

(2) Category B

10 CFR § 20.403(b)(1) - Exposure of the whole body of any individual to 5 rems (cSv) or more; exposure of the skin of the whole body of any individual to 30 rems (cSv) or more; or exposure of the extremities to 75 rems (cSv) or more. The Commission must be notified within 24 hours of these events.

(3) Category C

10 CFR § 20.405 - Exposure of any individual to radiation or concentrations of radioactive material that exceeds any applicable quarterly limit in Part 20 [§§ 20.101, 20.104(b), 20.103(a)(1), or 20.103(a)(2)] or in the licensee's license, but is less than the values given above. This includes reports of whole body exposures that exceed 1.25 rems (cSv), or that exceed 3 rems (cSv), as discussed in § 3.2 of this document. Reports of skin exposures that exceed 7.5 rems (cSv) and extremity exposures that exceed 18.75 rems (cSv) are included, and reports of exposures of individuals to concentrations in excess of the levels given in 10 CFR § 20.103 and Appendix B (internal exposures) usually fall into this category as well. These reports must be submitted to the Commission in writing within thirty days of the occurrence. Written reports of events required to be reported under Category A or B must also be submitted within thirty days.

6.2 Summary of Exposures In Excess of Regulatory Limits

Table 6.1 summarizes all of the occupational exposures in excess of regulatory limits to external sources of radiation as reported by Commission licensees pursuant to §§ 20.403 and 20.405 during the years 1979 through 1989. For 1986, 1987, 1988, and 1989 it shows the number of individuals that exceeded various limits while employed by one of several types of licensees. For the years 1981 through 1985, only the exposures in excess of regulatory limits reported by licensed industrial radiography firms are shown separately. Most of the occurrences included in the "Others" category come from research facilities, universities, and measuring and well-logging activities. In 1989, seven individuals received external whole body doses that exceeded applicable quarterly limits. The highest external whole body dose was 93 rems (cSv). In each of the years from 1985 through 1989, the highest external whole body dose was 27.0, 4.2, 7.5, 14, and 93 rems (cSv), respectively.

In 1989 there were two incidents in which external exposures of the magnitude described as Category A or B were received by two individuals.

A radiographer failed to secure the ^{192}Ir source in the exposure device at the end of at least one exposure. The source apparently moved out of the shielded position when the radiographer moved the exposure device. A dose of 93 rems was measured by the radiographer's dosimeter. While this dose was probably received by part of the radiographer's body, reenactment of the incident and the absence of any blood changes suggest an average whole-body dose closer to five rems.

A researcher at a university handled material labeled with ^{125}I without proper precautions, thinking it was free of radioactivity, and contaminated his hands. He received a dose of 178 rems to part of a finger. His thyroid dose due to skin absorption of the radioiodine did not exceed regulatory limits.

TABLE 6.1
OCCUPATIONAL EXPOSURES IN EXCESS OF REGULATORY LIMITS
1981 - 1989

YEAR	LICENSE CATEGORY	PERSONS AND DOSES (REM)	TYPES OF OVEREXPOSURES AND DOSES							
			WHOLE BODY (REM)			SKIN (REMS)			EXTREMITY (REMS)	
			(<5)	(>5<25)	(>25)	(>7.5<30)	(>30<150)	(>150)	(>18.75<75)	(>75<375)
1989	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	3		1				1	
		SUM OF DOSES	8.1		93				72	
	POWER REACTORS	NO. OF PERSONS							1	
		SUM OF DOSES							55	
	MEDICAL FACILITIES	NO. OF PERSONS	3						1	
		SUM OF DOSES	5.3						50	
1988	MARKETING & MANUFACT.	NO. OF PERSONS								
		SUM OF DOSES								
	OTHER	NO. OF PERSONS	1			1				1
		SUM OF DOSES	1.3			9.2				178
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	3	1						1
		SUM OF DOSES	8.1	6.1						118
1987	POWER REACTORS	NO. OF PERSONS	6			3	1	1		
		SUM OF DOSES	15.7			52.8	61	278		
	MEDICAL FACILITIES	NO. OF PERSONS				1				1
		SUM OF DOSES				14.0				127
	MARKETING & MANUFACT.	NO. OF PERSONS	1						1	
		SUM OF DOSES	3.64						58	
1986	OTHER	NO. OF PERSONS								
		SUM OF DOSES								
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	1							1
		SUM OF DOSES	3.1							180
	POWER REACTORS	NO. OF PERSONS	1			2			1	
		SUM OF DOSES	1.3			34.8			30.3	
1985	MEDICAL FACILITIES	NO. OF PERSONS		1						
		SUM OF DOSES		7.5						
	MARKETING & MANUFACT.	NO. OF PERSONS							2	1
		SUM OF DOSES							41.7	650
	OTHER	NO. OF PERSONS	1			3				
		SUM OF DOSES	1.5			93.6				
1984	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	2							
		SUM OF DOSES	4.4							
	POWER REACTORS	NO. OF PERSONS	1							2
		SUM OF DOSES	3.3							930
	MEDICAL FACILITIES	NO. OF PERSONS	1							
		SUM OF DOSES	4.2							
1983	MARKETING & MANUFACT.	NO. OF PERSONS								
		SUM OF DOSES								
	OTHER	NO. OF PERSONS							1	1
		SUM OF DOSES							41.2	115
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	6	3	1					1
		SUM OF DOSES	10.7	32.6	27.0					288
1982	ALL OTHER	NO. OF PERSONS	7			1	1		3	1
		SUM OF DOSES	11.8			10.8	38.0		60.2	93
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	3	1					3	
		SUM OF DOSES	12.5	8.2					127.9	
	ALL OTHER	NO. OF PERSONS	6	1					5	
		SUM OF DOSES	15.0	5.2					110.7	
1981	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	1							1
		SUM OF DOSES	4.7							650
	ALL OTHER	NO. OF PERSONS	11	1*					27	2
		SUM OF DOSES	20.1	25					887	228
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	6	3						
		SUM OF DOSES	16.1	20.7						
1980	ALL OTHER	NO. OF PERSONS	5*	1					15	2
		SUM OF DOSES	12.5	9.4					569	206
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	7	1						
		SUM OF DOSES	12.2	7.1						
	ALL OTHER	NO. OF PERSONS	10	2*		1			4	
		SUM OF DOSES	24.1	30.9		8.1			102.9	

*This person simultaneously received an extremity overexposure of 61 rems (cSv) that is not shown.

*One of these persons simultaneously received skin overexposure of 15.2 rems (cSv) that is not shown.

*One of these persons simultaneously received an extremity overexposure of 21 rems (cSv) that is not shown.

7 REFERENCES

1. U.S. Atomic Energy Commission, *Nuclear Power Plant Operating Experience During 1973*, USAEC Report 00E-ES-004, December 1974.*
2. U.S. Nuclear Regulatory Commission, *Nuclear Power Plant Operating Experience 1974-1975*, USNRC Report NUREG-0227, April 1977.*
3. U.S. Nuclear Regulatory Commission, *Nuclear Power Plant Operating Experience 1976*, USNRC Report NUREG-0366, December 1977.*
4. M.R. Beebe, *Nuclear Power Plant Operating Experience - 1977*, USNRC Report NUREG-0483, February 1979.*
5. *Nuclear Power Plant Operating Experience - 1978*, USNRC Report NUREG-0618, December 1979.*
6. *Nuclear Power Plant Operating Experience - 1979*, USNRC Report NUREG/CR-1496, May 1981.*
7. *Nuclear Power Plant Operating Experience - 1980*, USNRC Report NUREG/CR-2378, ORNL/NSIC-191, October 1982.*
8. *Nuclear Power Plant Operating Experience - 1981*, USNRC Report NUREG/CR-3430, ORNL/NSIC-215, Vol. 1, December 1983.*
9. *Nuclear Power Plant Operating Experience - 1982*, USNRC Report NUREG/CR-3430, ORNL/NSIC-215, Vol. 2, January 1985.*
10. United Nations, *Report of the Scientific Committee on the Effects of Atomic Radiation*, Annex H, General Assembly of Official Records, United Nations, New York, 1982.
11. A. Brodsky, R. Specht, B. Brooks, et al., *Log-Normal Distributions of Occupational Exposure in Medicine and Industry*. Presented at the 9th Midyear Topical Symposium of the Health Physics Society, 1976.

* Report is available for purchase from the National Technical Information Service, Springfield, Virginia, 22161, and/or the NRC/GPO Sales Program, Division of Technical Information and Document Control, U.S. Nuclear Regulatory Commission, Washington, DC 20555

12. S. Kumazawa and T. Namakunai, *A New Theoretical Analysis of Occupational Dose Distributions Indicating the Effect of Dose Limits*, Health Physics, Vol. 41, No. 3, 1981.
13. S. Kumazawa and T. Namakunai, *A Method for Implementation of ALARA for Occupational Exposure Using the Hybrid Lognormal Model*. Presented at the 27th Annual Meeting of the Health Physics Society, July 1, 1982.
14. *Licensed Operating Reactors, Status Summary Report*, USNRC Report NUREG-0020, Vol. 15, No. 1, January 1991.*
15. L.A. Cross and A.P. Cross, *Trends in Nuclear Power Plant Man-Rem Per Megawatt-Year*. Presented to American Nuclear Society European Nuclear Society International Conference, Washington, DC, November 17-20, 1980.
16. National Research Council, *Health Effects of Exposure to Low Levels of Ionizing Radiation: BEIR V*, Committee on the Biological Effects of Ionizing Radiations, 1990. Available from the National Academy Press, 2101 Constitution Avenue NW., Washington, DC 20418.
17. *Health Effects Models for Nuclear Power Plant Accident Consequence Analysis, Part II: Scientific Basis for Health Effects Models*, USNRC Report NUREG/CR-4214, May 1989.

APPENDIX A

**Listing of Annual Exposure Data
Compiled for Certain NRC Licensees
In Descending Order of Average
Measurable Dose**

1989

APPENDIX A

INDUSTRIAL RADIOGRAPHERS Single Location - 1989

Licensee Name	Program Code - 03310	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
COPES-VULCAN		37-19530-01	1	1	0.625	0.63
MAYNARD ELECTRIC STEEL CASTING CO.		48-07080-01	4	4	2.225	0.56
BRIGHTON CORP.		34-21480-01	6	6	2.450	0.41
REFINERY PRODUCTS CORPORATION		48-03665-02	4	1	0.375	0.38
WISCONSIN CENTRIFUGAL, INCORPORATED		48-11641-01	5	5	1.900	0.38
CONNEX PIPE SYSTEMS		34-00850-02	5	5	1.475	0.30
LUCIUS PITKIN INC.		29-27816-01	17	10	2.875	0.29
DURALOY COMPANY (THE)		37-02279-02	9	9	2.325	0.26
AMERICAN FOUNDRY, NUCLEAR DIVISION		35-26893-01	6	4	0.850	0.21
DURIRON CO., INC FOUNDRY DIVISION		34-06398-01	4	4	0.850	0.21
MINNESOTA VALLEY ENGINEERING		22-24393-01	6	5	1.025	0.21
SOUTHWESTERN ENGINEERING CO.		24-19500-01	4	4	0.775	0.19
NAVY, DEPT. OF THE		59-45249-A1NP	11	11	1.375	0.13
NAVY, DEPT. OF THE		28-00102-A1NP	51	49	5.750	0.12
HARRISON STEEL CASTINGS COMPANY		13-02141-01	6	6	0.675	0.11
AIR PRODUCTS AND CHEMICALS INC.		37-05105-05	19	8	0.775	0.10
HIGH STEEL STRUCTURES, INC.		37-17534-01	17	7	0.600	0.09
QUAKER ALLOY		37-03671-01	17	7	0.600	0.09
ATLANTIC RESEARCH CORPORATION		45-02808-04	19	19	1.525	0.08
LYNCHBURG FOUNDRY COMPANY		45-17464-01	9	4	0.325	0.08
MANOIR - ELECTRO ALLOYS, INC.		34-24346-01	15	11	0.925	0.08
NATIONAL AERONAUTICS AND SPACE ADMIN.		34-00507-04	28	5	0.375	0.08
NAVY, DEPT. OF THE		59-45255-A1NP	6	5	0.375	0.08
NAVY, DEPT. OF THE		37-00151-A1NP	78	21	1.750	0.08
PELTON CASTEEL INC.		48-02669-02	4	4	0.325	0.08
ST. LOUIS STEEL CASTING, INC.		24-01587-01	4	4	0.325	0.08
CBI SERVICES		12-05639-01	8	6	0.425	0.07
AIR FORCE, ENGINEERING SERVICE CNTR.		09-15149-1AFP	5	5	0.250	0.05
ARMY, DEPT. OF THE		13-18235-01	19	3	0.150	0.05
ARROW TANK & ENGINEERING COMPANY		22-13253-01	5	2	0.100	0.05
BABCOCK & WILCOX COMPANY		34-02160-03	50	2	0.100	0.05
CONNECTICUT, STATE OF		06-06472-03	11	4	0.200	0.05
DAY & ZIMMERMAN, INC.		42-15051-02	4	4	0.200	0.05
EMPIRE STEEL CASTINGS, INC.		37-02448-01	5	3	0.150	0.05
GENERAL ELECTRIC CO.		45-24957-01	40	2	0.100	0.05
INGERSOLL-RAND COMPANY		29-02015-02	2	2	0.100	0.05
INTERIOR, DEPT. OF THE		24-02619-02	6	1	0.050	0.05
MASON & HANGER-SILAS CO., INC.		14-24479-01	112	24	1.200	0.05
MISSOURI PRECISION CASTINGS, INC.		24-15152-01	5	3	0.150	0.05
MISSOURI STEEL CASTINGS CO.		25-15152-01	5	3	0.150	0.05
MORTON THIOXOL		17-16380-01	53	6	0.300	0.05
NAVY, DEPT. OF THE		04-60258-A1NP	11	10	0.500	0.05

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Single Location - 1989

Licensee Name	Program Code - 03310	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
NAVY, DEPT. OF THE		46-00253-A1NP	4	3	0.150	0.05
NAVY, DEPT. OF THE		39-52903-A1NP	12	1	0.050	0.05
NILES STEEL TANK COMPANY		21-04741-01	4	1	0.050	0.05
PENNSYLVANIA SHIPBUILDING CO.		37-21067-01	3	1	0.050	0.05
PRYOR FOUNDRY, INC.		35-18099-01	3	1	0.050	0.05
SHAFFER VALVE CO.		34-21198-01	3	2	0.100	0.05
TAYLOR AND FENN COMPANY		06-02024-01	3	3	0.150	0.05
TRANS WORLD AIRLINES, INC.		24-05151-05	98	10	0.500	0.05
UNITED STATES PIPE AND FOUNDRY CO.		29-07262-01	1	1	0.050	0.05
VOLLRATH COMPANY, FOUNDRY DIV.		48-05395-01	3	1	0.050	0.05
WILLIAM POWELL COMPANY (THE)		34-02963-01	3	1	0.050	0.05
ABEX CORP. WAUKESHA FOUNDRY DIV.		48-13776-01	6	0	0.000	0.00
ARMY, DEPT. OF THE		35-19189-02	35	0	0.000	0.00
BUCKEYE STEEL CASTINGS		34-06627-01	2	0	0.000	0.00
DRESSER IND. WORTHINGTON PUMP DIV.		29-02210-02	3	0	0.000	0.00
E.I. DUPONT DE NEMOURS & CO.		07-00455-30	0	0	0.000	0.00
GENERAL ELECTRIC COMPANY		34-00499-10	3	0	0.000	0.00
GENERAL MOTORS CORPORATION		21-02392-01	3	0	0.000	0.00
GENERAL MOTORS CORPORATION		34-15315-02	15	0	0.000	0.00
GTE LABS, INC.		20-15610-02	4	0	0.000	0.00
NATIONAL FEEDSCREW & MACHINING, INC.		34-24500-01	0	0	0.000	0.00
NAVY, DEPT. OF THE		19-0464A-A1NP	4	0	0.000	0.00
NAVY, DEPT. OF THE		45-32732-A1NP	14	0	0.000	0.00
NAVY, DEPT. OF THE		45-60921-A1NP	0	0	0.000	0.00
NORTHWEST AIRLINES INC.		22-12080-01	32	0	0.000	0.00
P. X. ENGINEERING COMPANY INC.		20-15102-01	4	0	0.000	0.00
SAWYER RESEARCH PRODUCTS, INC.		34-02044-01	5	0	0.000	0.00
STRUTHERS WELLS CORPORATION		37-11152-01	16	0	0.000	0.00
WESTINGHOUSE ELECTRIC CORPORATION		37-05809-02	10	0	0.000	0.00
WORD INDUSTRIES PIPE FABRICATING INC.		35-15458-01	0	0	0.000	0.00
			989	324	38.825	0.12

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Multiple Location - 1989

Licensee Name	Program Code - 03320	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
INDEPENDENT INSPECTION CORP.		35-26824-02	4	4	12.875	3.22
GLITSCH FIELD SERVICES/NDE, INC.		34-14071-01	51	37	105.575	2.85
TRI-STATE INSPECTION & CONSUSTANTS		37-19640-01	4	4	8.550	2.14
H&H X-RAY SERVICES INC.		17-19236-01	7	7	13.625	1.95
COLBY & THIELMEIER TESTING CO.		24-13737-01	5	5	7.875	1.58
CAPITAL X-RAY SERVICE, INC.		35-11114-01	23	23	35.725	1.55
CTL ENGINEERING, INC.		34-08331-01	2	2	3.000	1.50
MONTANA X-RAY INC.		25-21134-01	1	1	1.500	1.50
MIDWEST INSPECTION SERVICES		35-27005-01	21	21	28.900	1.38
CLEVELAND X-RAY INSPECTION, INC.		35-15205-01	112	112	143.750	1.28
ABC TESTING		20-19778-01	12	9	10.975	1.22
QUALITY ENGINEERING SERV.& TESTS		35-26815-01	10	8	9.550	1.19
H&G INSPECTION CO., INC.		42-26838-01	12	11	12.925	1.18
ST. LOUIS TESTING LABORATORIES, INC.		24-00188-02	14	12	13.925	1.16
HIGH MOUNTAIN INSPECTION SERV., INC.		49-26808-01	63	48	53.025	1.10
NONDESTRUCTIVE INSPECTION SERVICE		47-11883-01	5	5	5.500	1.10
TULSA GAMMA RAY, INC.		35-17178-01	50	47	51.750	1.10
D & S TESTING, INC.		34-21458-01	14	13	13.775	1.06
H. R. INSPECTION SERVICE INC.		15-06209-01	8	7	7.300	1.04
PENN INSPECTION CO.		35-21144-01	15	15	15.525	1.04
WESTERN X-RAY COMPANY		35-19993-01	18	18	18.000	1.00
QUALITY SYSTEMS NDE, LTD.		37-28085-01	15	12	11.725	0.98
ALLIED INSPECTION SERVICES INC.		21-18428-01	5	5	4.850	0.97
INTERMOUNTAIN TESTING COMPANY		05-07872-01	21	18	17.475	0.97
NORTH AMERICAN INSPECTION, INC.		37-23370-01	50	46	43.350	0.94
AKRON INDUSTRIAL SERVICE, INC.		34-24673-01	3	3	2.750	0.92
CONSOLIDATED NDE, INC.		29-21452-01	99	98	87.525	0.89
MET-CHEM TESTING LABS OF UTAH, INC.		43-26821-01	28	22	18.800	0.85
PIPELINE INSPECTION & ENGINEERING		21-26060-01	6	6	5.050	0.84
EDWARDS PIPELINE TESTING, INC.		35-23193-01	60	56	45.100	0.81
O'CONNELL LIMITED PARTNERSH		35-13735-01	3	3	2.425	0.81
GLOBE X-RAY SERVICES, INC.		35-15194-01	27	27	21.500	0.80
TRI STATE ASSOCIATES, INC.		45-24967-01	4	4	3.175	0.79
TESTMASTER INSPECTION CO., INC.		34-24872-01	30	27	21.100	0.78
NDT SPECIALISTS, INC.		48-25917-01	2	2	1.500	0.75
SCIENTIFIC INSPECTION TECH., INC.		41-25027-01	25	24	18.075	0.75
WISCONSIN INDUSTRIAL TESTING INC.		48-17480-01	79	74	54.300	0.73
BOOTHE-TWINING, INC.		04-19522-01	41	34	23.925	0.70
BRAN-SHON INC.		34-25850-01	15	12	8.350	0.70
SIERRA TESTING, INC.		35-26950-01	51	49	34.225	0.70
ARROW NDE CO, INC.		35-23198-01	4	4	2.775	0.69
CENTURY INSPECTION, INC.		42-08456-02	76	70	48.125	0.69

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Multiple Location - 1989

Licensee Name	Program Code - 03320	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
CTI, INC.		50-19202-01	47	43	28.850	0.67
CALUMET TESTING SERVICES INC.		13-16347-01	40	28	18.125	0.65
EBASCO SERVICES, INC.		29-07056-03	33	23	15.000	0.65
JAN X-RAY SERVICE INC.		21-16560-01	59	59	37.525	0.64
TEI ANALYTICAL SERVICES, INC.		37-28004-01	55	53	33.775	0.64
AMERICAN INSPECTION CO. INC.		12-24801-01	77	66	41.700	0.63
FEWELL GEOTECHNICAL ENGINEERING, LTD.		53-23288-01	2	1	0.625	0.63
TUMBLEWEED X-RAY COMPANY		03-23185-01	48	33	20.750	0.63
ALLEGHENY LABS.		37-20734-01	10	9	5.575	0.62
BILL MILLER, INC.		35-19048-01	51	47	29.125	0.62
TWIN CITY TESTING AND ENGRG. LAB.		22-01376-02	25	19	11.150	0.59
INSPECTION SERVICES & TESTING		50-23257-01	26	16	9.300	0.58
TECHNICAL WELDING & INSPECTION SERVICE		16-24812-01	4	4	2.300	0.58
SAMSON INSPECTION TECH. SERVICES, INC.		34-25898-01	18	11	6.300	0.57
WESTERN STRESS, INC.		42-26900-01	111	72	39.225	0.54
ANR PIPELINE CO, LABORATORY SERVICES		21-24502-01	8	2	1.050	0.53
MOS INSPECTION		12-00622-07	634	477	252.975	0.53
DAYTON X-RAY COMPANY		34-06943-01	13	11	5.650	0.51
EASTERN TESTING AND INSPECTION, INC.		29-09814-01	25	23	11.675	0.51
MIDWEST INSPECTION SERVICE LTD.		48-16296-01	13	10	5.000	0.50
NOVA DATA TESTING LABS, INC.		45-24872-01	8	7	3.475	0.50
OLD DOMINION FABRICATORS		45-15581-01	4	4	2.000	0.50
INDUSTRIAL NDT CO., INC.		39-24888-01	15	14	6.800	0.49
HUNTINGTON TESTING LAB, INC.		47-23076-01	27	26	12.500	0.48
N.V. ENTERPRISES		49-26888-01	5	5	2.400	0.48
TESTING INSTITUTE OF ALASKA, INC.		50-17446-01	23	17	8.225	0.48
PROFESSIONAL SERVICES INDUSTRIES, INC.		37-00276-25	23	22	10.350	0.47
U.S. TESTING COMPANY		04-23240-01	30	20	9.375	0.47
Q.C. LABORATORIES, INC.		09-11579-03	30	28	13.000	0.46
SCIENTIFIC TECHNICAL, INC.		45-24882-01	7	6	2.775	0.46
TRUTOM LTD.		06-20755-01	21	9	4.175	0.46
ADVEX CORPORATION		45-16452-01	17	13	5.825	0.45
STANDARD TESTING & ENGINEERING CO.		35-17054-02	5	5	2.225	0.45
INSPECTION SERVICES, INC.		41-21154-01	30	19	8.275	0.44
MATTINGLY TESTING SERVICES, INC.		25-21479-01	9	9	3.875	0.43
ELPASO NATURAL GAS COMPANY		42-03201-02	5	5	2.050	0.41
INDUSTRIAL NDT SERVICES DIVISION		13-06147-04	19	15	6.075	0.41
BMY, DIV. OF HARSCO CORP.		37-20684-02	6	4	1.600	0.40
NAVY, DEPT. OF THE		04-68828-A1NP	8	1	0.375	0.38
TWIN PORTS TESTING, INC.		48-23476-01	35	26	10.000	0.38
WOS TESTING CO.		12-24959-01	2	1	0.375	0.38
INSPECTION SERVICE CORP.		37-11636-01	3	3	1.100	0.37

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Multiple Location - 1989

Licensee Name	Program Code - 03320	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
NDE SERVICES, INC.		05-19821-01	13	10	3.650	0.37
SPACE SCIENCE SERVICES, INC.		09-07550-01	85	64	22.725	0.36
X-RAY, INC.		46-03414-03	37	36	12.825	0.36
CRANE MIDWEST FITTINGS		24-00563-02	6	3	1.050	0.35
PUBLIC SERVICE OF INDIANA		13-15544-06	5	3	1.050	0.35
PROFESSIONAL WELDING ASSOC., INC.		48-25806-01	9	9	3.075	0.34
TESTING TECHNOLOGIES, INC.		45-25007-01	14	13	4.300	0.33
NONDESTRUCTIVE TESTING CORP.		29-19742-01	18	18	5.825	0.32
S&ME, INC./AIRPORT STA.		41-24965-01	33	19	6.025	0.32
FROEHLING & ROBERTSON INC.		45-08890-01	13	12	3.775	0.31
CONAM INSPECTION, INC		12-16559-01	44	38	11.550	0.30
PITT-DES MOINES, INC.		37-27878-01	11	10	2.850	0.29
WALASHEK ENTERPRISES, INC.		53-23225-01	14	8	2.325	0.29
ANCHOR/DARLING VALVE COMPANY		37-15476-01	8	3	0.850	0.28
COLUMBIA GAS TRANSMISSION CORPORATION		47-16060-01	6	2	0.550	0.28
NAVY, DEPT. OF THE		59-04696-A1NP	14	14	3.975	0.28
QUALITY ASSURANCE LABORATORIES, INC.		18-19078-01	8	5	1.400	0.28
UNIVERSAL TECHNICAL TESTING, INC.		37-00453-03	21	15	4.225	0.28
CERTIFIED TESTING LABORATORIES, INC.		29-14150-01	69	69	17.425	0.25
COMBUSTION ENGINEERING, NDE		06-04154-01	31	25	6.150	0.25
GENERAL DYNAMICS CORPORATION		06-01781-08	61	61	15.050	0.25
LEHIGH TESTING LABORATORIES, INC.		07-01173-03	8	6	1.525	0.25
ALONSO & CARUS IRON WORKS, INC.		52-21350-01	7	4	0.975	0.24
BRANCH RADIOGRAPHIC LABORATORIES, INC.		29-03405-02	21	21	5.050	0.24
POWER PIPING COMPANY		37-09945-01	7	5	1.200	0.24
ALASKA INDUSTRIAL X-RAY		50-16084-01	7	7	1.625	0.23
DEPT. OF NAVY		04-00221-A1NP	28	25	5.675	0.23
SPEC CONSULTANTS, INC.		37-27891-01	11	8	1.750	0.22
MATERIALS TESTING LABORATORIES, INC.		45-17151-01	18	10	2.100	0.21
NAVY, DEPT. OF THE		59-04720-A1NP	15	15	3.075	0.21
PARKER INDUSTRIAL X-RAY LAB. CORP.		06-01337-03	13	13	2.700	0.21
FOSTER WHEELER CONSTRUCTORS, INC.		29-28016-01	4	3	0.600	0.20
HERRON TESTING LABORATORY INC.		34-00681-03	14	12	2.375	0.20
VENEGAS INDUSTRIAL TESTING		28-14847-02	4	3	0.600	0.20
ATEC ASSOC. OF VA., INC.		45-16546-03	9	8	1.550	0.19
BAKER TESTING SERVICES INC.		20-19067-01	8	6	1.125	0.19
NEW YORK TESTING LABORATORIES, INC.		31-02933-01	5	5	0.950	0.19
CARROLL ENGINEERS, INC.		20-13042-02	4	1	0.175	0.18
LABARGE PIPE & STEEL CO.		35-26836-01	2	1	0.175	0.18
NEWPORT NEWS SHIPBUILDING		45-09428-02	77	76	13.300	0.18
QC SERVICES		04-14875-02	32	14	2.550	0.18
ARNOLD GREENE TESTING LABORATORIES		20-01074-02	31	16	2.725	0.17

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Multiple Location - 1989

Licensee Name	Program Code - 03320	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
CONSTRUCTION ENGINEERING CONSULTANT		37-18456-01	44	30	5.075	0.17
CONSUMERS POWER COMPANY		21-08606-03	20	12	2.000	0.17
NAVY, DEPT. OF THE		59-20635-A1NP	13	11	1.825	0.17
NAVY, DEPT. OF THE		59-05851-A1NP	9	8	1.350	0.17
CBI INDUSTRIES, INC.		42-13553-02	153	104	17.025	0.16
JACKSONVILLE SHIPYARDS INC.		09-15611-01	8	3	0.475	0.16
TENNESSEE VALLEY AUTHORITY		41-06832-06	25	15	2.428	0.16
LAW ENGINEERING TESTING COMPANY		10-00346-03	18	6	0.875	0.15
PRECISION COMPONENTS CORPORATION		37-16280-01	83	33	4.875	0.15
PROGRESS SERVICES, INC.		34-19592-01	18	15	2.175	0.15
ASTROTECH, INC.		37-09928-01	15	8	1.100	0.14
BRAUN ENGINEERING TESTING, INC.		22-16537-02	11	11	1.575	0.14
CRAMER & LINDELL ENGINEERS, INC.		06-20794-01	15	11	1.425	0.13
RELIANCE TESTING LABORATORIES INC.		19-17176-01	24	13	1.675	0.13
STONE & WEBSTER ENGINEERING CORP.		20-05600-02	13	4	0.525	0.13
NAVY, DEPT. OF THE		46-00251-A1NP	90	87	10.375	0.12
X-R-I TESTING DIV OF X-RAY, INC.		21-05472-01	157	77	9.075	0.12
INDESERV, INC.		45-25074-01	3	2	0.225	0.11
NAVY, DEPT. OF THE		39-00191-A1NP	61	53	5.800	0.11
NOOTER CORPORATION		24-03783-01	17	7	0.800	0.11
AMERICON, INC.		34-02160-04	52	6	0.625	0.10
NORFOLK SHIPBUILDING AND DRYDOCK CORP.		45-12042-01	20	11	1.050	0.10
AMOCO OIL COMPANY, YORKTOWN REFINERY		45-01378-02	13	3	0.275	0.09
BRIGGS ASSOCIATES INC.		20-16401-01	32	15	1.125	0.08
MAGNA CHEK, INC.		21-19111-02	32	23	1.925	0.08
NAVY, DEPT. OF THE		45-00181-A1NP	61	55	4.275	0.08
NAVY, DEPT. OF THE		59-08810-A1NP	26	4	0.325	0.08
AMERICAN OIL COMPANY (THE)		13-00155-10	27	22	1.550	0.07
BATH IRON WORKS CORPORATION		18-00828-04	20	6	0.425	0.07
OKLAHOMA TESTING LABORATORIES		35-10577-01	15	6	0.425	0.07
TENNESSEE GAS PIPELINE CO.		42-09073-02	22	19	1.400	0.07
AMERICAN AIRLINES, INC.		35-13964-01	38	12	0.725	0.06
EG & G FLORIDA, INC.		09-21233-01	46	16	0.925	0.06
NAVY, DEPT. OF THE		53-00311-A1NP	25	23	1.400	0.06
NAVY, DEPT. OF THE		59-68780-A1NP	15	15	0.875	0.06
ARMY, DEPT. OF THE		30-02405-05	9	6	0.300	0.05
BENJAMIN F. SHAW CO.		01-24890-01	3	1	0.050	0.05
C & R LABORATORIES		53-19179-01	6	5	0.250	0.05
FOSTER WHEELER ENERGY CORP.		31-01776-05	16	3	0.150	0.05
HOUSTON INSPECTION, INC.		42-26962-01	2	2	0.100	0.05
HUTCHINSON AREA VO-TECH INSTITUTE		22-15554-01	317	60	3.000	0.05
INTERNATIONAL TESTING LAB.		29-14027-01	6	6	0.300	0.05

APPENDIX A (cont.)

INDUSTRIAL RADIOGRAPHERS Multiple Location - 1989

Licensee Name	Program Code - 03320	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
NAVY, DEPT. OF THE		59-04639-A1NP	12	3	0.150	0.05
NAVY, DEPT. OF THE		59-04697-A1NP	18	5	0.250	0.05
NAVY, DEPT. OF THE		38-68829-A1NP	13	13	0.650	0.05
NAVY, DEPT. OF THE		82-62770-A1NP	23	9	0.450	0.05
NAVY, DEPT. OF THE		53-00314-A1NP	11	3	0.150	0.05
NAVY, DEPT. OF THE		06-68316-A1NP	19	17	0.850	0.05
NAVY, DEPT. OF THE		04-0581A-A1NP	89	7	0.350	0.05
NAVY, DEPT. OF THE		53-68251-A1NP	5	5	0.250	0.05
NAVY, DEPT. OF THE		04-65918-A1NP	28	27	1.350	0.05
NAVY, DEPT. OF THE		45-32770-A1NP	20	6	0.300	0.05
NAVY, DEPT. OF THE		46-68438-A1NP	47	33	1.650	0.05
NAVY, DEPT. OF THE		59-21047-A1NP	15	15	0.750	0.05
NAVY, DEPT. OF THE		59-21063-A1NP	19	9	0.450	0.05
NAVY, DEPT. OF THE		59-20132-A1NP	19	12	0.600	0.05
NAVY, DEPT. OF THE		59-45247-A1NP	16	10	0.500	0.05
NAVY, DEPT. OF THE		31-18096-01	12	4	0.200	0.05
NAVY, DEPT. OF THE		59-04628-A1NP	13	4	0.200	0.05
NAVY, DEPT. OF THE		59-04620-A1NP	14	3	0.150	0.05
NAVY, DEPT. OF THE		59-05837-A1NP	19	6	0.300	0.05
NAVY, DEPT. OF THE		59-04648-A1NP	18	10	0.500	0.05
NAVY, DEPT. OF THE		59-04638-A1NP	9	1	0.050	0.05
NAVY, DEPT. OF THE		59-08808-A1NP	12	3	0.150	0.05
NAVY, DEPT. OF THE		59-21046-A1NP	17	8	0.400	0.05
SPECTRUM LABORATORIES, INC.		29-07266-01	4	3	0.150	0.05
UNIVERSAL TESTING LABORATORIES, INC.		29-16397-01	21	8	0.400	0.05
VALLEY INSPECTION SERVICE, INC.		37-28385-01	4	3	0.150	0.05
VOITH HYDRO, INC.		37-16280-03	22	5	0.250	0.05
ANVIL CORP.		46-23236-01	0	0	0.000	0.00
CENTERIOR SERVICE CO - NDE		34-23406-01	6	0	0.000	0.00
FACTORY MUTUAL RESEARCH CORP.		20-04007-02	6	0	0.000	0.00
INDUSTRIAL TESTING LAB. SERVICES CORP.		37-16406-01	12	0	0.000	0.00
MCELROY DIVERSIFIED SERVICES		49-26947-01	0	0	0.000	0.00
NAVY, DEPT. OF THE		04-60036-A1NP	0	0	0.000	0.00
NAVY, DEPT. OF THE		59-04629-A1NP	17	0	0.000	0.00
NAVY, DEPT. OF THE		59-21098-A1NP	19	0	0.000	0.00
PULLMAN POWER PRODUCTS CORP.		37-08042-01	6	0	0.000	0.00
			5756	4028	2028.453	0.50

APPENDIX A (cont.)

MANUFACTURERS AND DISTRIBUTORS - 1989

Licensee Name	Program Type	Program Code	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
MALLINCKRODT, INC.	A-BROAD	03211	24-04206-01	332	194	240.900	1.24
MINNESOTA MINING & MANUFACTURING CO.	A-BROAD	03211	22-00057-06	109	55	35.825	0.65
AMERSHAM CORP.	A-BROAD	03211	20-12836-01	70	46	16.875	0.37
E. I. DUPONT DE NEMOURS & CO., INC.	A-BROAD	03211	20-00320-21	1262	939	350.775	0.37
TEXAS NUCLEAR CORPORATION	A-BROAD	03211	42-01485-04	105	92	17.925	0.19
OK TRACERS, INC.	A-BROAD	03211	35-21353-01	3	2	0.350	0.18
E. R. SQUIBB AND SONS, INC.	A-BROAD	03211	29-00139-02	621	249	37.575	0.15
COMBUSTION ENGINEERING	A-BROAD	03211	34-00255-03	402	156	8.675	0.06
NUCLEAR RESEARCH CORPORATION	A-BROAD	03211	29-04236-01	38	16	0.925	0.06
ENGLEHARD CORPORATION	A-BROAD	03211	34-06558-05	37	3	0.150	0.05
UPJOHN COMPANY	A-BROAD	03211	21-00182-03	638	204	10.775	0.05
				3617	1956	720.750	0.37
BEST IND, INC.	B-BROAD	03212	45-19757-01	62	25	5.475	0.22
OHMART CORPORATION	B-BROAD	03212	34-00639-01	98	58	11.425	0.20
APPLIED HEALTH PHYSICS, INC.	B-BROAD	03212	37-09135-01	15	7	0.800	0.11
FRONTIER TECHNOLOGY CORP.	B-BROAD	03212	SNM-1957	13	4	0.575	0.14
REUTER-STOKES INSTRUMENTS, INC.	B-BROAD	03212	34-18233-01	28	19	1.075	0.06
NORLAND CORP.	B-BROAD	03212	48-13403-01	16	14	0.700	0.05
VARIAN/BEVERLY MICROWAVE DIVISION	B-BROAD	03212	20-02237-04	20	8	0.400	0.05
CENTOCOR, INC.	B-BROAD	03212	37-19413-01	163	46	1.212	0.03
FISCHER TECHNOLOGY, INC.	B-BROAD	03212	06-19165-01	10	0	0.000	0.00
LEAR SIEGLER, INC.	B-BROAD	03212	21-07265-01	12	0	0.000	0.00
				437	181	21.662	0.12
ADVANCED MEDICAL SYS, INC.	OTHER	03214	34-19089-01	10	6	9.000	1.50
QUAL-X	OTHER	03214	34-16907-02	7	2	1.050	0.53
SEAMAN NUCLEAR CORP.	OTHER	03214	48-12016-01	13	12	4.725	0.39
BINAX, INC.	OTHER	03214	18-28167-01	15	15	2.225	0.15
NORDION INTERNATIONAL INC.	OTHER	03214	54-28275-01	8	8	0.900	0.11
THERATRONICS INTERNATIONAL LTD	OTHER	03214	54-28315-01	17	17	1.725	0.10
ACKER DRILL COMPANY INC.	OTHER	03214	37-28241-01	7	7	0.350	0.05
ACTION MFG CO	OTHER	03214	37-19104-01	5	5	0.250	0.05
ADVANCED MAGNETICS	OTHER	03214	20-20526-01	30	6	0.300	0.05
BRISTOL-MYERS SQUIBB	OTHER	03214	13-00772-02	85	5	0.250	0.05
CANBERRA INDUSTRIES, INC.	OTHER	03214	06-15099-01	41	7	0.350	0.05
DIAMED, INC.	OTHER	03214	18-20907-01	4	4	0.200	0.05
DOSIMETER CORP OF AMERICA	OTHER	03214	34-13477-01	43	1	0.050	0.05
ENSECO INCORPORATED	OTHER	03214	29-09801-02	1	1	0.050	0.05
FENWAL INC	OTHER	03214	20-15285-01	21	6	0.300	0.05
GENERAL NUCLEONICS, INC.	OTHER	03214	04-12071-02	11	4	0.200	0.05
LIXI, INC.	OTHER	03214	12-18215-01	11	11	0.550	0.05

APPENDIX A (cont.)
MANUFACTURERS AND DISTRIBUTORS - 1989

Licensee Name	Program Type	Program Code	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
PHARMACIA, INC.	OTHER	03214	29-13915-05	15	12	0.600	0.05
PYROTRONICS DIV. OF CERBERUS	OTHER	03214	29-08864-03	17	9	0.450	0.05
RADIATION MONITORING DEVICES, INC.	OTHER	03214	20-16325-01	26	4	0.200	0.05
RTS TECHNOLOGY, INC.	OTHER	03214	20-27966-01	3	2	0.100	0.05
STOCKER & YALE, INC.	OTHER	03214	20-16532-01	64	64	3.200	0.05
BIOQUANT, INC.	OTHER	03214	21-25897-02	7	0	0.000	0.00
LASERMIKE, INC.	OTHER	03214	34-25899-01	15	0	0.000	0.00
MICRO-DYNAMICS, INC.	OTHER	03214	20-13270-01	4	0	0.000	0.00
MIE, INC.	OTHER	03214	20-07875-01	4	0	0.000	0.00
WING CORPORATION	OTHER	03214	29-13180-01	16	0	0.000	0.00
				500	208	27.025	0.13
SYNCOR CORPORATION	PHARMACIES	02500	34-16654-01MD	26	9	2.100	0.23
SYNCOR CORPORATION	PHARMACIES	02500	24-19360-01MD	18	5	0.700	0.14
SYNCOR CORPORATION	PHARMACIES	02500	45-17769-01MD	14	5	0.375	0.08
SYNCOR CORPORATION	PHARMACIES	02500	34-18484-01MD	20	9	0.575	0.06
NUCLEAR PHARMACY, INC.	PHARMACIES	02500	20-21227-01MD	23	4	0.200	0.05
SYNCOR CORPORATION	PHARMACIES	02500	35-19583-01MD	9	1	0.050	0.05
SYNCOR CORPORATION	PHARMACIES	02500	29-19608-01MD	62	13	0.650	0.05
				172	46	4.650	0.10

APPENDIX A (cont.)

FUEL FABRICATORS AND PROCESSORS - 1989

Licensee Name	Program Code - 21210	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
COMBUSTION ENGINEERING, INC.		SNM-0033	106	83	11.275	0.14
GENERAL ELECTRIC CO.		SNM-1097	963	616	76.075	0.12
BABCOCK AND WILCOX CO., COMMERCIAL FUEL		SNM-1168	188	86	9.050	0.11
COMBUSTION ENGINEERING INC.		SNM-1067	535	146	16.000	0.11
ADVANCED NUCLEAR FUELS CORP.		SNM-1227	406	282	24.950	0.09
BABCOCK AND WILCOX CO., NAVAL FUEL		SNM-0042	3007	1041	63.175	0.06
NUCLEAR FUEL SERVICES INC.		SNM-0124	6136	698	40.525	0.06
UNITED NUCLEAR CORPORATION, INC.		SNM-0368	242	40	2.000	0.05
			11583	2992	243.050	0.08

INDEPENDENT SPENT FUEL STORAGE INSTALLATION - 1989

Licensee Name	Program Code - 23200	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
GENERAL ELECTRIC COMPANY		SNM-2500	38	33	12.250	0.37
CAROLINA POWER AND LIGHT CO.		SNM-2502	152	69	21.157	0.31
VIRGINIA ELECTRIC POWER*		SNM-2501	0	0	0.000	0.00
			190	102	33.407	0.33

*Reported with Surry 1,2 DPR-32,37

LOW LEVEL WASTE DISPOSAL FACILITIES - 1989

Licensee Name	Program Code - 03231	License Number	Total Individuals Monitored	Workers with Measurable Exposure	Collective Dose (person-rem)	Average Meas'ble Dose (rems or cSv)
U.S. ECOLOGY, INC.		16-19204-01	147	17	6.175	0.36
CHEM-NUCLEAR SYSTEMS		12-13536-01	778	102	29.200	0.29
			925	119	35.375	0.30

APPENDIX B

Annual Whole Body Doses at Licensed Nuclear Power Facilities

1989

APPENDIX B ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES CY 1989

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)														TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE (Person- rem,cSv)
		No Mea- surable	Meas. <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 2.00	2.00- 3.00	3.00- 4.00	4.00- 5.00	5.00- 6.00	6.00- 7.00	7.00- 12.00	>12.00			
ARKANSAS 1,2	PWR	1,598	728	428	365	253	146	135	7	1						3,661	2,063	711 **
BEAVER VALLEY 1,2	PWR	1,104	748	326	374	248	178	329	118	21	7					3,453	2,349	1,378 **
BIG ROCK POINT	BWR	51	206	63	48	21	17	50	11	2						469	418	177
BRAIDWOOD 1,2*	PWR	1,889	673	362	258	115	38	14								3,349	1,460	320
BROWNS FERRY 1,2,3	BWR	2,996	1,179	714	397	164	122	97	10							5,679	2,683	656 **
BRUNSWICK 1,2	BWR	798	1,771	517	395	274	215	506	156	10						4,642	3,844	1,786 **
BYRON 1,2	PWR	1,978	591	319	136	43	13	7								3,087	1,109	185
CALLAWAY 1	PWR	776	369	283	245	85	40	32	1							1,831	1,055	283 **
CALVERT CLIFFS 1,2	PWR	1,141	1,040	285	237	99	63	62								2,927	1,786	346 **
CATAWBA 1,2	PWR	1,392	748	429	303	127	33	20								3,052	1,660	334 **
CLINTON	BWR	1,346	479	222	203	119	92	78	3							2,542	1,196	372 **
COOK 1,2	PWR	834	620	327	290	139	91	101	6	1						2,409	1,575	493 **
COOPER STATION	BWR	2,207	566	213	161	114	60	88								3,409	1,202	343 **
CRYSTAL RIVER 3	PWR	890	360	249	159	52	22	34	4							1,770	880	234
DAVIS-BESSE	PWR	1,258	312	49	27	13	1	2								1,662	404	38 **
DIABLO CANYON 1,2	PWR	1,798	665	365	310	172	91	43								3,444	1,646	465
DRESDEN 2,3	BWR	1,474	746	364	313	182	191	441	18	4						3,733	2,259	1,130 **
DUANE ARNOLD	BWR	1,867	143	80	62	49	32	57	2							2,292	425	194
FARLEY 1,2	PWR	347	872	427	382	225	90	192	18							2,553	2,206	749 **
FERMI 2*	BWR	1,838	669	273	204	79	32	13								3,108	1,270	255
FITZPATRICK	BWR	709	450	155	126	116	60	113	5	2						1,736	1,027	377 **
FORT CALHOUN	PWR	267	968	139	76	14	10	3								1,477	1,210	93 **
GINNA	PWR	849	422	186	181	144	99	205	16	1						2,103	1,254	605 **
GRAND GULF	BWR	1,418	1,002	329	298	161	84	92	6							3,390	1,972	498 **
HADDAM NECK	PWR	811	567	234	227	147	97	154	28	1						2,266	1,455	596 **
HARRIS	PWR	835	597	130	106	52	23	21								1,764	929	156 **
HATCH 1,2	BWR	893	443	313	225	120	108	128	12	1						2,243	1,350	556
HOPE CREEK 1	BWR	1,020	1,019	282	258	135	74	93	12							2,893	1,873	465 **
INDIAN POINT 2	PWR	605	497	279	302	225	183	511	92	4						2,698	2,093	1,436 **
INDIAN POINT 3	PWR	871	531	300	301	228	147	263	29	1						2,671	1,800	876 **
KEWAUNEE	PWR	338	173	108	118	75	34	60	2							908	570	239 **
LASALLE 1,2	BWR	1,251	723	426	334	260	198	443	89	2						3,726	2,475	1,386 **
LIMERICK 1	BWR	5,534	1,026	439	259	57	25	11	1							7,352	1,818	266 **
MAINE YANKEE	PWR	397	208	56	43	29	22	17								772	375	99
MCGUIRE 1,2	PWR	1,505	841	383	347	166	91	160	6							3,499	1,994	620 **

* Indicates plants counted for the first time in 1989 after completing their first full year of operation.
 ** Indicates actual collective dose reported by facility, otherwise calculated by staff.

APPENDIX B (Continued) ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES CY 1989

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)												TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE (Person- rem, cSv)
		No Mea- surable	Meas. <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 2.00	2.00- 3.00	3.00- 4.00	4.00- 5.00	5.00- 6.00	6.00- 7.00	7.00- 12.00	>12.00	
MILLSTONE POINT 1	BWR	477	258	137	133	76	74	147	25	2				1,329	852	462 **
MILLSTONE POINT 2,3	PWR	1,112	603	318	309	176	173	342	59	4				3,096	1,984	1,079 **
MONTICELLO	BWR	1,292	366	184	161	144	85	141	20	1				2,394	1,102	507 **
NINE MILE POINT 1,2*	BWR	886	1,762	395	231	134	73	117	25					3,623	2,737	564 **
NORTH ANNA 1,2	PWR	1,235	1,308	256	309	239	166	450	114	16	3			4,096	2,861	1,471 **
OCONEE 1,2,3	PWR	1,285	861	441	423	243	104	117	14	2				3,490	2,205	684 **
OYSTER CREEK	BWR	285	1,249	257	277	166	108	263	70	5				2,680	2,395	910 **
PALISADES	PWR	621	434	212	175	112	36	54	3					1,647	1,026	314
PALO VERDE 1,2,3*	PWR	2,395	1,244	518	424	184	128	111	6					5,010	2,615	720
PEACH BOTTOM 2,3	BWR	4,516	858	541	393	221	128	152	8					6,817	2,301	783
PERRY	BWR	1,124	531	351	381	264	170	185	1					3,007	1,883	767 **
PILGRIM	BWR	1,794	1,337	192	164	70	21	13						3,591	1,797	207 **
POINT BEACH 1,2	PWR	342	205	100	117	72	52	142	40	7	1			1,078	736	504
PRAIRIE ISLAND 1,2	PWR	583	232	121	73	31	16	2	1					1,059	476	99
QUAD CITIES 1,2	BWR	1,314	492	271	260	189	182	295	30	2				3,035	1,721	971
RANCHO SECO	PWR	1,102	399	110	52	25	10	7						1,705	603	81 **
RIVER BEND 1	BWR	1,546	540	343	289	201	85	107	1					3,112	1,566	558
ROBINSON 2	PWR	1,328	610	225	129	62	46	26						2,426	1,098	195 **
SALEM 1,2	PWR	1,764	2,250	330	162	86	52	59	5					4,708	2,944	338 **
SAN ONOFRE 1,2,3	PWR	1,535	1,029	437	352	184	96	134	5					3,772	2,237	567 **
SEQUOYAH 1,2	PWR	2,111	825	437	299	164	100	174	8					4,118	2,007	657 **
SOUTH TEXAS 1*	PWR	1,803	507	266	165	30	16	5						2,792	989	161 **
ST. LUCIE 1,2	PWR	1,177	554	293	230	153	82	93	9					2,591	1,414	495
SUMMER 1	PWR	866	215	91	48	17	2	1						1,240	374	52 **
SURRY 1,2	PWR	1,037	1,928	336	282	163	123	208	53	7				4,137	3,100	836 **
SUSQUEHANNA 1,2	BWR	2,018	749	400	388	216	155	155						4,081	2,063	704 **
THREE MILE ISLAND 1	PWR	255	538	77	27	15	6	7						925	670	54 **
TROJAN	PWR	992	559	294	214	106	73	107	7					2,352	1,360	421 **
TURKEY POINT 3,4	PWR	1,886	731	316	269	142	84	83						3,511	1,625	433 **
VERMONT YANKEE	BWR	810	232	215	190	108	50	36	1					1,642	832	288
VOGTLE 1	PWR	2,682	330	76	20	1								3,109	427	32 **
WASHINGTON NUCLEAR 2	BWR	1,487	547	211	173	113	103	141	9	2				2,786	1,299	492 **
WATERFORD 3	PWR	1,218	616	367	204	82	21	16						2,524	1,306	265
WOLF CREEK 1	PWR	2,594	137	36	11	1								2,779	185	18
YANKEE-ROWE	PWR	410	346	80	45	13	5	6	1					906	496	62 **

* Indicates plants counted for the first time in 1989 after completing their first full year of operation.
** Indicates actual collective dose reported by facility, otherwise calculated by staff.

APPENDIX B (Continued) ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES CY 1989

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)													TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE (Person- rem,cSv)	
		No Mea- surable	Meas. <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 2.00	2.00- 3.00	3.00- 4.00	4.00- 5.00	5.00- 6.00	6.00- 7.00	7.00- 12.00				>12.00
ZION 1,2	PWR	1,677	427	190	210	109	94	230	22					2,959	1,282	684		
TOTALS:	71 PWRs	53,493	29,418	11,591	9,336	5,061	2,997	4,739	674	66	11			117,386	63,893	20,478		
TOTALS:	36 BWRs	40,951	19,343	7,887	6,323	3,753	2,544	3,962	515	33				85,311	44,360	15,674		
TOTALS:	107 LWRs	94,444	48,761	19,478	15,659	8,814	5,541	8,701	1,189	99	11			202,697	108,253	36,152		
FORT ST. VRAIN	HTGR	316	47	6	2									371	55	3 **		

* Indicates plants counted for the first time in 1989 after completing their first full year of operation.
 ** Indicates actual collective dose reported by facility, otherwise calculated by staff.

APPENDIX B (Continued)
ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES
FACILITIES NOT IN OPERATION OR IN OPERATION LESS THAN ONE YEAR
CY 1989

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rem or cSv)											TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE (Person- rem, cSv)
		No Mea- surable	<0.10	Meas. 0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-7.00	7.00-12.00	>12.00
COMANCHE PEAK	PWR	1,165	8										1,173	8	0
LACROSSE *	BWR	488	23	13	16	6	2						548	60	15
SEABROOK	PWR	1,828	4										1,832	4	0
SHOREHAM	BWR	1,457	8										1,465	8	0
THREE MILE ISLAND 2*	PWR	235	494	89	68	51	45	144	101	22			1,249	1,014	639 **
TOTALS:	8	5,173	537	102	84	57	47	144	101	22			6,267	1,094	654

* Indicates plants that are no longer in commercial operation.

** Indicates actual collective dose reported by facility, otherwise calculated by staff.

APPENDIX C*
Personnel, Dose and Power Generation Summary
1969-1989

* A discussion of the methods used to collect and calculate the information contained in this Appendix is given in Section 2.1.

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY

Reporting Organization	Year	Mega- Watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions & Others	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems (-cSv)/ or cSv)	Person rems (-cSv)/ MW-Yr
ARKANSAS 1,2 Docket 50-313; DPR-51; NPF-6 1st commercial operation 12/74 Type - PWRs Capacity - 836, 858 MWe	1975	588.0	76.5	147	21			0.14	0.0
	1976	464.6	56.6	476	289	27	100	0.61	0.6
	1977	610.3	76.8	601	256	28	111	0.43	0.4
	1978	627.2	77.5	722	189	32	109	0.26	0.3
	1979	397.0	55.3	1,321	369	54	252	0.28	0.9
	1980	452.8	63.7	1,233	342	81	213	0.28	0.8
	1981	1,104.7	68.3	2,225	1,102	130	843	0.50	1.0
	1982	905.4	58.6	1,608	803	97	505	0.50	0.9
	1983	915.0	54.7	2,109	1,397	97	1,145	0.66	1.5
	1984	1,289.1	77.4	1,742	806	89	533	0.46	0.6
	1985	1,192.3	73.6	1,262	286	61	148	0.23	0.2
	1986	1,070.3	66.9	2,135	1,141	194	881	0.53	1.1
	1987	1,366.1	87.9	1,123	382	92	205	0.34	0.3
	1988	1,070.3	67.5	2,421	1,387	138	1,094	0.57	1.3
	1989	1,066.3	70.7	2,063	711	36	522	0.34	0.7
BEAVER VALLEY 1,2 Docket 50-334, 50-412; DPR-66, NPF-73 1st commercial operation 10/76, 11/87 Type - PWRs Capacity - 810, 833	1977	355.6	57.0	331	87	8	58	0.26	0.2
	1978	304.2	40.8	646	190	11	152	0.29	0.6
	1979	221.0	40.0	704	132	22	67	0.19	0.6
	1980	39.8	6.8	1,817	553	76	477	0.30	13.9
	1981	573.4	73.6	1,237	229	38	142	0.19	0.4
	1982	326.7	41.6	1,755	599	126	481	0.34	1.8
	1983	561.2	68.2	1,485	772	158	615	0.52	1.4
	1984	576.7	71.8	1,393	504	125	302	0.36	0.9
	1985	717.7	91.9	619	60	17	12	0.10	0.1
	1986	581.3	70.7	1,575	627	82	456	0.40	1.1
	1987	684.1	83.6	1,282	210	43	137	0.16	0.3
	1988	1,386.1	86.7	1,764	530	90	438	0.30	0.4
	1989	1,017.4	68.9	2,349	1,378	197	1,151	0.59	1.4
BIG ROCK POINT Docket 50-155; DPR-6 1st commercial operation 3/63 Type - BWR Capacity - 67 MWe	1969	48.1		165	136			0.82	2.8
	1970	43.5		290	194			0.67	4.5
	1971	44.4		260	184			0.71	4.1
	1972	43.5		195	181			0.93	4.2
	1973	50.9		241	285		119	1.18	5.6
	1974	40.7	70.3	281	276	54	42	0.98	6.8
	1975	35.1	59.8	300	180	58	20	0.60	5.1
	1976	29.5	50.1	488	289	82	105	0.59	9.8
	1977	43.6	73.4	465	334	94	60	0.72	7.7

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions & Others	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
BIG ROCK POINT (Continued)	1978	48.5	77.9	285	160	93	9	0.56	3.6
	1979	13.0	23.5	623	455	89	102	0.73	35.0
	1980	48.9	79.0	599	354	16	91	0.59	7.2
	1981	56.9	90.6	479	160	58	38	0.33	2.8
	1982	43.6	70.8	521	328	129	68	0.63	7.5
	1983	42.3	71.0	493	263	32	55	0.53	6.2
	1984	50.3	78.6	297	155	37	20	0.52	3.1
	1985	43.8	73.5	435	291	54	60	0.67	6.6
	1986	61.0	95.5	202	84	34	17	0.42	1.4
	1987	45.3	70.0	251	222	45	35	0.88	4.9
	1988	46.1	71.4	303	170	34	25	0.56	3.7
	1989	50.2	78.5	418	177	38	32	0.42	3.5
BRAIDWOOD 1,2 Docket 50-456, 50-457; NPF-72, NPF-77 1st commercial operation 7/88, 10/88 Type - PWRs Capacity - 1120, 1120 MWe	1989	1,381.8	74.4	1,460	320	8	214	0.22	0.2
BROWNS FERRY 1,2,3 Docket 50-259, 50-260, 50-296 DPR - 33, - 52, - 68 1st commercial operation 8/74, 3/75, 3/77 Type - BWRs Capacity - 1065, 1065, 1065 MWe	1975	161.7	17.8	2,380	325	60	249	0.14	2.0
	1976	337.6	26.9	2,207	234	4	259	0.11	0.7
	1977	1,327.5	73.7	1,858	863	0	289	0.46	0.7
	1978	1,992.1	73.5	2,376	1,792	0	803	0.75	0.9
	1979	2,393.0	79.1	2,689	1,667	0	1,667	0.62	0.7
	1980	2,182.1	73.6	2,712	1,826	4	1,821	0.67	0.8
	1981	2,132.9	69.5	3,379	2,380	100	404	0.70	1.1
	1982	2,025.4	67.6	3,277	2,220	181	317	0.68	1.1
	1983	1,641.0	54.3	3,302	3,363	276	908	1.02	2.0
	1984	1,431.9	54.2	2,962	1,940	229	541	0.65	1.4
	1985	368.2	11.9	2,755	1,159	201	306	0.42	3.1
	1986	0.0	0.0	3,003	1,050	13	343	0.35	---
	1987	0.0	0.0	3,115	1,181	187	222	0.38	---
	1988	0.0	0.0	3,324	1,155	234	109	0.35	---
	1989	0.0	0.0	2,683	656	97	131	0.24	---

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Contractor	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Work Function	Station & Utility			
BRUNSWICK 1,2 Docket 50-324, 50-325; DPR-62, -71 1st commercial operation 3/77, 11/75 Type - BWRs Capacity - 790, 790 MWe	1976	297.2	56.0	1,265	326	15	222	104	0.26	1.1
	1977	291.1	55.7	1,512	1,120	48	782	337	0.74	3.8
	1978	1,173.1	83.7	1,458	1,004	99	695	309	0.69	0.9
	1979	810.0	60.1	2,891	2,602	97	2,074	528	0.90	3.2
	1980	687.2	52.2	3,788	3,870	111	3,759	772	1.02	5.6
	1981	925.2	56.9	3,854	2,638	159	1,890	748	0.68	2.9
	1982	540.3	50.3	4,957	3,792	162	2,841	951	0.76	7.0
	1983	636.7	44.3	5,602	3,475	152	2,428	1,047	0.62	5.5
	1984	761.3	51.5	5,046	3,260	143	2,363	897	0.65	4.3
	1985	822.2	58.4	4,057	2,804	121	2,078	726	0.69	3.4
	1986	1,051.3	69.1	3,370	1,909	232	761	1,148	0.57	1.8
	1987	1,152.4	79.1	3,052	1,419	144	861	558	0.46	1.2
	1988	990.8	67.7	2,648	1,747	219	1,051	696	0.66	1.8
	1989	990.9	64.7	3,844	1,786	181	1,295	491	0.46	1.8
BYRON 1 Docket 50-454; NPF-37 1st commercial operation 9/85 Type - PWR Capacity - 1105 MWe	1986	894.5	88.6	1,081	104	16	65	39	0.10	0.1
	1987	650.9	68.6	1,826	769	11	667	102	0.42	1.2
	1988	1,534.7	84.3	1,222	459	0	333	126	0.38	0.3
	1989	1,812.6	89.7	1,109	185	23	113	72	0.17	0.1
CALLAWAY 1 Docket 50-483; NPF-30 1st commercial operation 12/84 Type - PWR Capacity - 1118	1985	967.4	90.0	964	36	16	7	29	0.04	0.0
	1986	865.2	81.3	1,052	225	53	129	96	0.21	0.3
	1987	759.0	70.1	1,082	393	89	249	144	0.36	0.5
	1988	1,069.2	92.5	353	27	12	2	25	0.08	0.0
	1989	1,000.3	84.1	1,055	283	46	191	92	0.27	0.3
CALVERT CLIFFS 1,2 Docket 50-317, 50-318; DPR-53, -69 1st commercial operation 5/75, 4/77 Type - PWRs Capacity - 825, 825 MWe	1976	753.4	95.2	507	74	28	8	66	0.15	0.1
	1977	583.0	72.1	2,265	547	36	224	323	0.24	0.9
	1978	1,188.5	75.8	1,391	500	13	143	357	0.36	0.4
	1979	1,161.0	74.0	1,428	805	33	423	382	0.56	0.7
	1980	1,309.9	84.1	1,496	677	15	402	275	0.45	0.5
	1981	1,379.7	83.1	1,555	607	29	378	229	0.39	0.4
	1982	1,238.3	73.7	1,805	1,057	84	402	655	0.59	0.9
	1983	1,397.2	81.6	1,915	668	5	143	525	0.35	0.5
	1984	1,389.4	79.3	1,369	479	61	78	401	0.35	0.3
	1985	1,189.8	68.4	1,598	694	69	144	550	0.43	0.6

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- Watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions & Others Maint.	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
CALVERT CLIFFS 1,2 (Continued)	1986	1,530.0	87.2	1,296	347	2	101	0.27	0.2
	1987	1,207.3	69.1	1,384	412	29	110	0.30	0.3
	1988	1,397.7	80.2	1,296	291	30	90	0.22	0.2
	1989	333.6	19.8	1,786	346	11	216	0.19	1.0
CATAWBA 1,2 Docket 50-413, 50-414; NPF-35, NPF-52 1st commercial operation 6/85, 8/86 Type - PWR Capacity - 1129, 1129 MWe	1986	638.9	49.9	1,724	286	27	68	0.17	0.4
	1987	1,651.2	73.9	1,865	449	32	161	0.24	0.3
	1988	1,675.2	75.8	2,009	556	71	200	0.28	0.3
	1989	1,733.6	77.6	1,660	334	48	110	0.20	0.2
CLINTON Docket 50-461; NPF-62 1st commercial operation 11/87 Type - BWR Capacity - 946 MWe	1988	701.3	82.5	769	130	48	64	0.17	0.2
	1989	348.3	45.1	1,196	372	91	261	0.31	1.1
COOK 1,2 Docket 5-315; DPR-58, -74 1st commercial operation 8/75, 7/78 Type - PWRs Capacity - 1020, 1060 MWe	1976	807.4	83.1	395	116	13	71	0.29	0.1
	1977	573.0	76.1	802	300	21	138	0.37	0.5
	1978	744.8	73.6	778	336	49	139	0.43	0.5
	1979	1,373.0	65.3	1,445	718	45	454	0.50	0.5
	1980	1,552.4	74.1	1,345	493	46	323	0.37	0.3
	1981	1,557.3	73.4	1,341	656	48	442	0.49	0.4
	1982	1,461.6	69.8	1,527	699	67	472	0.46	0.5
	1983	1,456.5	71.2	1,418	658	50	467	0.46	0.5
	1984	1,526.0	75.3	1,559	762	42	597	0.49	0.5
	1985	925.4	47.6	1,984	945	93	758	0.48	1.0
	1986	1,307.1	73.4	1,774	745	22	585	0.42	0.6
	1987	1,199.5	69.5	1,696	666	79	525	0.39	0.6
	1988	1,160.4	63.2	2,266	867	52	762	0.38	0.7
	1989	1,433.1	71.9	1,575	493	50	421	0.31	0.3

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Contract- tor	Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Opera- tions	Work Function Maint. & Others				
COOPER STATION Docket 50-298; DPR-46 1st commercial operation 7/74 Type - BWR Capacity - 764 MWe	1975	456.4	83.6	579	117	30	87	19	98	0.20	0.3
	1976	433.3	75.5	763	350	39	311	210	140	0.46	0.8
	1977	538.2	86.2	315	198	50	147	66	131	0.63	0.4
	1978	576.0	91.0	297	158	40	118	58	100	0.53	0.3
	1979	591.0	87.6	426	221	50	171	89	132	0.52	0.4
	1980	448.3	71.2	785	859	70	789	644	215	1.09	1.9
	1981	457.1	71.2	935	579	63	516	382	197	0.62	1.3
	1982	622.3	84.6	743	542	66	476	361	181	0.73	0.9
	1983	396.6	63.3	1,383	1,293	57	1,236	1,081	212	0.93	3.3
	1984	411.9	67.2	1,598	799	46	753	635	164	0.50	1.9
	1985	127.3	21.5	1,980	1,333	49	1,284	1,104	229	0.67	10.5
	1986	480.0	74.7	895	320	49	271	115	205	0.36	0.7
	1987	652.3	94.7	549	103	26	77	11	92	0.19	0.2
	1988	493.4	67.1	942	251	40	211	118	133	0.27	0.5
	1989	564.3	75.3	1,202	343	40	303	228	115	0.29	0.6
CRYSTAL RIVER 3 Docket 50-302; DPR-72 1st commercial operation 3/77 Type - PWR Capacity - 821 MWe	1978	311.5	41.4	643	321	8	313	244	77	0.50	1.0
	1979	453.0	58.9	1,150	495	29	466	346	149	0.43	1.1
	1980	404.1	53.2	1,053	625	24	601	382	243	0.59	1.5
	1981	490.4	62.2	1,120	408	18	340	236	172	0.36	0.8
	1982	589.8	76.0	780	177	9	168	116	61	0.23	0.3
	1983	452.1	58.8	1,720	552	71	481	353	199	0.32	1.2
	1984	774.2	94.5	549	49	10	39	22	27	0.09	0.1
	1985	344.2	47.6	1,976	689	43	646	424	265	0.35	2.0
	1986	319.5	41.8	1,057	472	25	447	298	174	0.45	1.5
	1987	436.0	60.1	1,384	488	49	439	302	186	0.35	1.1
	1988	690.2	84.0	569	64	2	62	17	47	0.11	0.1
	1989	352.8	47.9	880	234	5	229	128	106	0.27	0.7
DAVIS-BESSE 1 Docket 50-346; NPF-3 1st commercial operation 11/77 Type - PWR Capacity - 860 MWe	1978	326.4	48.7	421	48	13	35	14	34	0.11	0.1
	1979	381.0	67.0	304	30	8	22	5	25	0.10	0.1
	1980	256.4	36.2	1,283	154	4	150	121	33	0.12	0.6
	1981	531.4	67.4	578	58	1	57	32	26	0.10	0.1
	1982	390.8	51.5	1,350	164	12	152	139	25	0.12	0.4
	1983	592.1	73.0	718	80	6	74	46	34	0.11	0.1
	1984	518.5	62.5	1,088	177	10	167	122	55	0.16	0.3
	1985	238.3	31.2	718	71	3	68	46	25	0.10	0.3
	1986	3.3	1.3	981	124	22	102	103	21	0.13	37.6
	1987	618.0	83.5	625	47	11	36	27	20	0.08	0.1

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSv)	Person-rems (-cSv) per Work Function	Person-rems (-cSv) per Station & Utility	Average Measurable Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
DAVIS-BESSE 1 (Continued)	1988	144.1	21.5	1,183	307	271	255	0.26	2.1
	1989	880.0	97.1	404	38	33	5	0.09	0.0
DIABLO CANYON 1,2 Docket 50-275, 50-323; DPR-80, DPR-82 1st commercial operation 5/85, 3/86 Type - PHRS Capacity - 1073, 1087 MWe	1986	641.5	80.6	1,260	304	300	206	0.24	0.5
	1987	1,688.6	80.5	1,170	336	331	226	0.29	0.2
	1988	1,386.1	66.3	1,826	877	873	593	0.48	0.6
	1989	1,899.0	86.5	1,646	465	462	329	0.28	0.2
DRESDEN 1*2,3 Docket 50-010, 50-237, 50-249; DPR-2, -19, -25 1st commercial operation 7/60, 7/70, 11/71 Type - BWRs Capacity - 197, 772, 773 MWe	1969	99.7			286				2.9
	1970	163.1			143				0.9
	1971	394.5			715				1.8
	1972	1,243.7			728				0.6
	1973	1,112.2		1,341	939	143	344	0.70	0.8
	1974	842.5	54.9	1,594	1,662	796	57	1.04	2.0
	1975	708.1	54.6	2,310	3,423	3,152	2,252	1.48	4.8
	1976	1,127.2	80.8	1,746	1,680	1,452	749	0.96	1.5
	1977	1,132.9	77.0	1,862	1,694	1,377	693	0.91	1.5
	1978	1,242.2	79.5	1,946	1,529	1,325	619	0.79	1.2
	1979	1,074.4	74.7	2,407	1,800	1,609	641	0.75	1.8
	1980	1,035.7	55.0	2,717	2,105	1,869	1,093	0.77	2.0
	1981	1,085.3	51.5	2,331	2,802	2,682	1,850	1.03	2.7
	1982	913.6	77.9	2,572	2,923	2,787	1,731	1.14	2.7
	1983	789.8	65.6	2,854	3,582	3,406	2,127	1.26	3.9
	1984	903.0	55.3	2,261	1,774	1,621	814	0.78	2.2
	1985	740.5	64.5	2,817	1,686	1,212	878	0.60	1.9
	1986	933.9	52.6	3,111	2,796	2,524	2,113	0.90	3.8
	1987	1,014.7	68.2	2,052	1,245	983	645	0.61	1.3
	1988	1,184.2	75.2	2,414	1,409	1,194	808	0.58	1.4
	1989		81.4	2,259	1,130	976	641	0.50	1.0

*Dresden 1 has been shut down since 1978, and in 1985 it was decided that it would not be put in commercial operation again. Therefore, it is no longer included in the count of commercial reactors.

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- Watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
DUANE ARNOLD Docket 50-331; DPR-49 1st commercial operation 2/75 Type - BWR Capacity - 538 MWe	1976	305.2	78.0	350	105	14	62	0.30	0.3
	1977	353.6	78.9	538	299	36	220	0.56	0.8
	1978	149.2	33.2	1,112	974	59	932	0.88	6.5
	1979	352.0	78.0	757	275	35	219	0.36	0.8
	1980	339.1	73.3	1,108	671	32	570	0.61	2.0
	1981	277.7	69.8	1,286	790	56	598	0.61	2.8
	1982	278.5	74.7	524	229	18	175	0.44	0.8
	1983	283.0	62.9	1,468	1,135	42	1,016	0.77	4.0
	1984	329.4	72.9	611	189	27	117	0.31	0.6
	1985	236.2	53.8	1,414	1,112	49	954	0.79	4.7
	1986	365.5	82.0	476	187	49	94	0.39	0.5
	1987	308.4	63.0	1,094	667	241	478	0.61	2.2
	1988	386.5	72.7	1,136	614	71	416	0.54	1.6
	1989	388.5	75.0	425	194	49	58	0.46	0.5
FARLEY 1,2 Docket 50-348, 50-364; NPF-2, -8 1st commercial operation 12/77, 7/81 Type - PWR Capacity - 824, 830 MWe	1978	713.8	86.5	527	108	39	34	0.20	0.2
	1979	211.0	28.6	1,227	643	108	460	0.52	3.0
	1980	557.3	69.3	1,330	435	106	185	0.33	0.8
	1981	310.2	41.4	1,331	512	96	270	0.38	1.6
	1982	1,271.5	79.2	1,453	484	155	196	0.33	0.4
	1983	1,356.5	83.0	1,938	1,021	241	479	0.53	0.8
	1984	1,447.0	86.6	2,046	902	177	504	0.44	0.6
	1985	1,368.2	81.1	2,551	799	157	443	0.31	0.6
	1986	1,409.3	83.8	2,314	858	148	464	0.37	0.6
	1987	1,369.7	83.3	1,871	598	105	347	0.32	0.4
	1988	1,567.7	91.9	1,840	552	74	340	0.30	0.4
	1989	1,402.9	83.2	2,206	749	88	516	0.34	0.5
FERMI 2 Docket 50-341; NPF-43 1st commercial operation 1/88 Type - BWR Capacity - 1093 MWe	1989	624.0	63.7	1,270	255	35	182	0.20	0.4

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSV)	Person-rems (-cSV) per Work Function		Person-rems (-cSV) per Contract	Person-rems (-cSV) per Station & Utility	Average Measurable Dose (rems or cSV)	Person rems (-cSV)/ MW-Yr
						Operations	Maint. & Others				
FLITZPATRICK Docket 50-333; DPR-59 1st commercial operation 7/75 Type - BWR Capacity - 757 MWe	1976	489.0	71.6	600	202	14	1,066	937	143	0.34	0.4
	1977	460.5	68.4	1,380	1,080	166	743	597	312	0.78	2.3
	1978	497.0	72.1	904	909	169	690	538	321	1.01	1.8
	1979	349.0	50.8	850	859	118	1,922	1,808	232	0.99	2.5
	1980	509.5	70.3	2,056	2,040	187	1,238	1,072	353	0.57	4.0
	1981	562.9	74.7	2,490	1,425	136	1,054	862	328	0.51	2.5
	1982	583.6	75.0	2,322	1,190	158	932	667	423	0.64	2.0
	1983	546.2	70.6	1,715	1,090	82	889	467	504	0.60	2.0
	1984	576.2	76.8	1,610	971	110	941	168	333	0.57	1.7
	1985	492.3	63.7	1,845	1,051	81	330	243	243	0.35	2.1
	1986	711.2	90.6	1,185	411	164	776	616	324	0.60	0.6
	1987	496.2	67.3	1,578	786	162	624	506	280	0.51	1.9
	1988	514.0	66.6	1,553	786	58	319	191	186	0.37	1.5
	1989	727.5	90.7	1,027	377						0.5
FORT CALHOUN Docket 50-285; DPR-40 1st commercial operation 9/73 Type - PWR Capacity - 478 MWe	1975	252.3	67.4	469	294	28	285	92	202	0.63	1.2
	1976	265.9	69.5	516	313	33	264	72	275	0.61	1.2
	1977	351.8	79.4	535	297	59	351	151	225	0.56	0.8
	1978	342.3	75.1	596	410	19	107	47	79	0.69	1.2
	1979	440.0	95.7	451	126	38	630	426	242	0.28	0.3
	1980	242.3	60.4	891	668	61	397	254	204	0.75	2.8
	1981	260.9	72.3	822	458	44	173	99	118	0.56	1.8
	1982	418.0	89.7	604	217	66	367	205	228	0.36	0.5
	1983	330.4	73.1	860	433	91	472	313	250	0.50	1.3
	1984	279.2	59.9	913	563	54	319	231	142	0.62	2.0
	1985	367.0	73.7	982	373	26	48	30	44	0.38	1.0
	1986	431.8	94.3	756	74	79	310	227	162	0.10	0.2
	1987	366.0	74.6	1,247	388	74	198	173	99	0.31	1.1
	1988	315.5	74.0	1,594	272	31	62	50	43	0.17	0.9
	1989	395.7	86.6	1,210	93					0.08	0.2
GINNA Docket 50-244; DPR-18 1st commercial operation 7/70 Type - PWR Capacity - 470 MWe	1971	327.8		340	430	69	361	108	322	1.26	1.3
	1972	293.6		677	1,032	71	961	278	754	1.52	3.5
	1973	409.5		319	224	55	169	84	140	0.70	0.5
	1974	253.7	62.4	884	1,225					1.39	4.8
	1975	365.2	76.7	685	538					0.79	1.5
	1976	248.8	58.2	758	636	29	607	210	426	0.84	2.6

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Personnel Type Contract- Station & tor Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Opera- tions	Work Function Maint. & Others			
GINNA (Continued)	1977	365.6	85.5	530	401	15	386	120	0.76	1.1
	1978	386.5	80.6	657	450	20	430	98	0.68	1.2
	1979	355.0	72.8	878	592	68	524	207	0.67	1.7
	1980	370.5	76.0	1,073	708	64	644	302	0.66	1.9
	1981	399.0	82.1	925	655	49	606	251	0.71	1.6
	1982	289.0	58.8	1,117	1,140	80	1,060	546	1.02	3.9
	1983	365.0	74.6	969	855	42	813	378	0.88	2.3
	1984	378.1	77.2	713	395	57	337	195	0.55	1.0
	1985	436.7	87.9	845	426	91	335	178	0.50	1.0
	1986	433.3	87.4	901	357	45	312	107	0.40	0.8
	1987	459.0	91.3	773	344	35	309	151	0.45	0.7
	1988	423.1	86.4	897	295	37	258	114	0.33	0.7
	1989	369.2	75.0	1,254	605	57	548	172	0.48	1.6
GRAND GULF Docket 50-416; NPF-29 1st commercial operation 7/85 Type - BWR Capacity - 1142 MWe	1986	494.7	60.9	1,486	436	68	368	329	0.29	0.9
	1987	920.7	81.1	1,358	420	106	314	303	0.31	0.5
	1988	1,136.6	93.9	692	147	57	90	52	0.21	0.1
	1989	932.6	77.8	1,972	498	93	405	333	0.25	0.5
HADDAM NECK Docket 50-213; DPR-61 1st commercial operation 1/68 Type - PWR Capacity - 565 MWe	1969	438.5		138	106			27	0.77	0.2
	1970	424.7		734	689			463	0.94	1.6
	1971	502.2		289	342			166	1.18	0.7
	1972	515.6		355	325			181	0.91	0.6
	1973	293.1		951	697			544	0.73	2.4
	1974	521.4	91.2	550	201				0.37	0.4
	1975	494.3	89.9	795	703	20	683		0.88	1.4
	1976	482.9	82.5	644	449	5	444	253	0.70	0.9
	1977	480.7	83.9	894	641	59	582	440	0.72	1.3
	1978	563.4	98.6	216	117	25	92	18	0.54	0.2
	1979	493.0	87.5	1,226	1,162	73	1,088	783	0.95	2.4
	1980	426.8	75.0	1,860	1,353	175	1,178	1,076	0.73	3.2
	1981	487.5	84.3	1,554	1,036	174	862	809	0.67	2.1
	1982	543.9	93.4	559	126	46	80	22	0.23	0.2
	1983	453.7	77.8	1,645	1,384	106	1,278	1,017	0.84	3.1
	1984	404.0	71.7	1,430	1,216	154	1,062	803	0.85	3.0
	1985	556.1	98.4	384	101	21	80	22	0.26	0.2

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MM-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Personnel Type	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MM-Yr
						Work Function	Maint. & Others	Contrac- tor	Station & Utility	
HADDAM NECK (Continued)	1986	294.8	53.6	1,945	1,567	179	1,388	1,274	293	5.3
	1987	304.6	53.7	1,763	750	106	314	303	117	0.5
	1988	397.4	68.8	735	237	43	194	107	130	0.6
	1989	356.4	66.9	1,455	596	68	528	472	124	1.7
HARRIS 1 Docket 50-400; NPF-63 1st commercial operation 5/87 Type - PHR Capacity - 860 MWe	1988	652.9	73.5	721	169	29	140	118	51	0.3
	1989	690.6	78.5	929	156	32	124	85	71	0.2
HATCH 1,2 Docket 50-321, 50-366; DPR-57; NPF-05 1st commercial operation 12/75, 9/79 Type - BWRs Capacity - 757, 768 MWe	1976	496.3	83.8	630	134	79	55	4	130	0.3
	1977	446.8	66.3	1,303	465	96	369	220	245	1.0
	1978	513.0	72.8	1,304	248	88	160	52	196	0.5
	1979	401.0	54.6	2,131	582	85	497	382	200	1.5
	1980	1,008.7	70.9	1,930	449	143	306	163	286	0.4
	1981	870.9	64.3	2,899	1,337	200	1,137	792	545	1.5
	1982	768.0	56.6	3,418	1,460	218	1,242	1,064	396	1.9
	1983	934.7	68.6	3,428	1,299	253	1,046	851	448	1.4
	1984	658.6	47.3	4,110	2,218	311	1,907	1,861	357	3.4
	1985	1,211.0	79.6	2,841	818	182	636	507	311	0.7
	1986	872.1	64.8	3,486	1,497	347	1,150	862	635	1.7
	1987	1,295.4	88.1	2,202	816	207	609	435	381	0.6
	1988	1,001.4	66.8	2,509	1,401	275	1,126	927	474	1.4
	1989	1,271.1	85.2	1,350	556	154	402	305	251	0.4
HOPE CREEK 1 Docket 50-354; NPF-57 1st commercial operation 12/86 Type - BWR Capacity - 1031 MWe	1987	869.2	85.1	589	117	21	96	40	77	0.1
	1988	832.7	78.4	1,734	287	38	249	163	124	0.3
	1989	791.1	76.7	1,873	465	40	425	292	173	0.6

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- Watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions & Others Maint.	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
HUMBOLDT BAY* Docket 50-133; DPR-7 1st commercial operation 8/63 Type - BWR Capacity - 63 MWe	1969	44.6		125	164	69	95	1.31	3.7
	1970	49.3		115	209	130	79	1.82	4.2
	1971	39.6		140	292	114	178	2.09	7.4
	1972	43.1		127	253	81	172	1.99	5.9
	1973	50.1		210	266	60	206	1.27	5.3
	1974	43.4	83.8	296	318	103	215	1.07	7.3
	1975	45.3	83.9	265	339	131	208	1.28	7.5
	1976	23.5	46.4	523	683	37	646	1.31	29.1
	1977	0.0	0.0	1,063	1,905	24	1,880	1.79	---
	1978	0.0	0.0	320	335	13	322	1.05	---
	1979	0.0	0.0	135	31	11	20	0.23	---
	1980	0.0	0.0	142	22	10	12	0.15	---
	1981	0.0	0.0	75	9	5	14	0.12	---
	1982	0.0	0.0	71	19	4	13	0.27	---
	1983	0.0	0.0	84	17			0.20	---
INDIAN POINT 1**, 2, 3*** Docket 50-3, 50-247, 50-286; DPR-5, -26, -64 1st commercial operation 10/62, 8/73, 8/76 Type - PWR Capacity - 0, 864, 965	1969	206.2			298			1.4	1.4
	1970	43.3			1,639			37.8	37.8
	1971	154.0			768			5.0	5.0
	1972	142.3			967			6.8	6.8
	1973	0.0		2,998	5,262	709	4,553	1.75	---
	1974	556.1	59.4	1,019	910			0.89	1.6
	1975	584.4	74.8	891	705	166	539	0.79	1.2
	1976	273.9	34.8	1,590	1,950	154	1,796	1.23	7.1
	1977	1,278.3	75.3	1,391	1,070	189	881	0.77	0.8
	1978	1,172.3	67.8	1,909	2,006	260	1,746	1.05	1.7

* Humboldt Bay has been shutdown since 1976 and in 1984, it was decided that it would not be placed in operation again. Therefore, it is no longer included in the count of commercial reactors.

** Indian Point 1 was defueled in 1975 and in 1984 it was decided that it would not be placed in operation again. Therefore, it is no longer included in the count of commercial reactors.

***Indian Point 3 was purchased by a different utility and now reports separately.

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions & Others	Person-rems (-cSv) per Personnel Type Contractor Station & Utility	Average Meas-able Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
INDIAN POINT 1**2	1979	574.0	71.4	1,349	1,279	209	612	0.95	2.2
	1980	510.8	64.8	1,577	971	181	398	0.62	1.9
	1981	367.5	46.0	2,595	2,731	237	1,595	1.05	7.4
	1982	532.4	65.4	2,144	1,635	343	883	0.76	3.1
	1983	702.6	84.0	1,057	486	200	217	0.46	0.7
INDIAN POINT 2 Docket 50-247; DPR-26 1st commercial operation 8/73 Type - PWR Capacity - 864 MWe	1984	416.7	51.9	2,919	2,644	650	1,863	0.91	6.3
	1985	791.4	95.7	708	192	123	95	0.27	0.2
	1986	457.5	56.2	1,926	1,250	350	349	0.65	2.7
	1987	611.4	72.3	1,980	1,217	128	805	0.61	2.0
	1988	719.3	82.5	890	235	51	117	0.26	0.3
	1989	532.5	63.5	2,093	1,436	208	813	0.69	2.7
	1979	574.0	66.5	808	636	63	482	0.79	1.1
	1980	367.3	53.2	977	308	47	210	0.32	0.8
	1981	367.5	59.8	677	364	46	255	0.54	1.0
INDIAN POINT 3*** Docket 50-286; DPR-64 1st commercial operation 8/76 Type - PWR Capacity - 965 MWe	1982	171.5	22.5	1,477	1,226	42	1,094	0.83	7.1
	1983	7.8	2.6	941	607	38	494	0.65	77.8
	1984	714.4	76.3	658	230	48	127	0.35	0.3
	1985	566.5	66.0	1,093	570	35	455	0.52	1.0
	1986	655.3	73.4	588	202	34	123	0.34	0.3
	1987	574.6	61.6	1,308	500	84	365	0.38	0.9
	1988	792.5	82.2	451	93	41	39	0.21	0.1
	1989	587.8	60.3	1,800	876	130	776	0.49	1.5
	1975	401.9	88.2	104	28	1	12	0.27	0.1
	1976	405.9	78.9	381	270	16	193	0.71	0.7
	1977	425.0	79.9	312	140	8	76	0.45	0.3
	1978	466.6	89.5	335	154	11	89	0.46	0.3
	1979	412.0	79.0	343	127	6	79	0.37	0.3
	1980	433.8	82.1	401	165	7	103	0.41	0.4
	1981	451.8	86.7	383	141	7	94	0.37	0.3
KEWAUNEE Docket 50-305; DPR-43 1st commercial operation 6/74 Type - PWR Capacity - 503 MWe	1982	458.4	87.6	353	101	5	51	0.29	0.2
	1983	444.1	83.7	445	165	10	119	0.37	0.4
	1984	455.3	85.7	482	139	7	90	0.29	0.3
	1985	443.1	82.4	519	176	4	118	0.34	0.4
	1975	401.9	88.2	104	28	1	12	0.27	0.1
	1976	405.9	78.9	381	270	16	193	0.71	0.7
	1977	425.0	79.9	312	140	8	76	0.45	0.3

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSv)	Person-rems (-cSv) per Work Functions	Person-rems (-cSv) per Station & Utility	Average Measurable Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
ROBINSON 2 (Continued)	1988	385.0	65.1	1,351	564	44	520	0.42	1.5
	1989	336.6	46.9	1,098	195	31	164	0.18	0.6
SALEM 1,2 Docket 50-272, -311; DPR-70, -75 1st commercial operation 6/77 Type - PWRs Capacity - 1106, 1106 MWe	1978	546.4	55.6	574	122	28	94	0.21	0.2
	1979	250.0	25.5	1,488	584	100	484	0.39	2.3
	1980	680.6	69.2	1,704	449	55	394	0.26	0.7
	1981	743.0	78.1	1,652	254	4	250	0.15	0.3
	1982	1,440.4	72.6	3,228	1,203	66	1,137	0.37	0.8
	1983	742.0	30.5	2,383	581	10	571	0.24	0.8
	1984	650.1	31.8	1,395	681	10	671	0.49	1.0
	1985	1,657.7	75.8	1,112	204	26	178	0.18	0.1
	1986	1,484.3	70.4	3,554	599	10	589	0.17	0.4
	1987	1,478.2	72.5	2,543	600	8	592	0.24	0.4
	1988	1,591.6	72.2	1,609	503	1	502	0.31	0.3
	1989	1,675.4	77.0	2,944	338	4	334	0.11	0.2
SAN ONOFRE 1,2,3 Docket 50-206, -361, -362; DPR-13, NPF-10, NPF-15 1st commercial operation 1/68, 8/83, 4/84 Type - PWR Capacity - 436, 1070, 1080 MWe	1969	314.1		123	42	10	32	0.34	0.1
	1970	365.9		251	155	13	142	0.62	0.4
	1971	362.1		121	50	12	38	0.41	0.1
	1972	338.5		326	256	29	227	0.79	0.8
	1973	273.7		570	353	40	313	0.62	1.3
	1974	377.8	86.1	219	71			0.32	0.2
	1975	389.0	87.4	424	292			0.69	0.8
	1976	297.9	70.2	1,330	880	147	733	0.66	3.0
	1977	281.2	63.7	985	847	77	770	0.86	3.0
	1978	323.2	80.2	764	401	25	376	0.52	1.2
	1979	401.0	90.2	521	139	23	116	0.27	0.3
	1980	97.3	22.3	3,063	2,386	219	2,168	0.78	24.5
	1981	95.9	26.7	2,902	3,223	100	3,123	1.11	33.6
	1982	61.6	15.7	3,055	832	81	751	0.27	13.5
	1983	0.0	0.0	1,701	155	31	124	0.09	---
	1984	670.4	34.2	7,514	986	105	879	0.13	1.5
	1985	1,381.8	66.5	5,742	722	58	664	0.13	0.5
	1986	1,698.2	61.1	3,594	824	86	738	0.23	0.5
	1987	1,983.0	77.8	2,138	696	113	583	0.33	0.4
	1988	1,982.3	67.4	2,324	781	99	682	0.34	0.4
	1989	1,840.8	63.3	2,237	567	23	544	0.25	0.3

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Contractor	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Work Function Opera- tions	Maint. & Others			
SEQUOIA 1,2 Docket 50-327, -328; DPR-77, -79 1st commercial operation 7/81, 6/82 Type - PWR Capacity - 1148, 1148 MWe	1982	583.5	52.8	1,965	570	67	503	57	0.29	1.0
	1983	1,663.7	75.1	1,772	491	74	417	46	0.28	0.3
	1984	1,481.9	69.0	2,373	1,117	153	964	111	0.47	0.8
	1985	1,151.3	51.3	1,854	1,071	118	953	243	0.58	0.9
	1986	0.0	0.0	1,735	526	101	425	70	0.30	---
	1987	0.0	0.0	2,080	420	55	365	101	0.20	---
	1988	490.8	30.6	2,439	678	73	605	115	0.28	1.4
	1989	1,851.7	84.1	2,007	657	71	586	140	0.33	0.4
SOUTH TEXAS 1 Docket 50-498; NPF-76 1st commercial operation 8/88 Type - PWR Capacity - 1250 MWe	1989	769.3	63.1	989	161	10	151	114	0.16	0.2
ST. LUCIE 1,2 Docket 50-335, -387; DPR-67; NPF-16 1st commercial operation 12/76, 3/83 Type - PWRs Capacity - 839, 839 MWe	1977	649.1	84.7	445	152	26	126	92	0.34	0.2
	1978	606.4	76.5	797	337	15	322	140	0.42	0.6
	1979	592.0	74.0	907	438	25	413	209	0.48	0.7
	1980	627.9	77.5	1,074	532	82	450	195	0.50	0.8
	1981	599.1	72.7	1,473	929	20	909	556	0.63	1.6
	1982	816.8	94.0	1,045	272	17	255	105	0.26	0.3
	1983	290.3	15.4	2,211	1,204	5	1,199	924	0.54	4.1
	1984	1,183.0	69.6	2,090	1,263	41	1,222	808	0.60	1.1
	1985	1,445.8	82.5	1,971	1,344	293	1,046	535	0.68	0.9
	1986	1,588.6	89.1	1,279	491	81	410	322	0.38	0.3
	1987	1,407.9	80.5	2,012	951	1	950	560	0.47	0.7
	1988	1,639.7	92.2	1,448	611	54	557	371	0.42	0.4
	1989	1,493.1	84.5	1,414	495	24	471	298	0.35	0.3
SUMMER 1 Docket 50-395; NPF-12 1st commercial operation 1/84 Type - PWR Capacity - 885 MWe	1984	504.6	61.1	1,120	295	29	266	202	0.26	0.6
	1985	627.7	71.6	1,201	379	74	305	241	0.32	0.6
	1986	853.7	95.3	392	23	5	18	12	0.06	0.03
	1987	618.7	70.1	1,075	560	34	526	454	0.52	0.9
	1988	605.3	67.8	1,127	511	35	476	403	0.45	0.8
	1989	652.4	80.8	374	52	11	41	27	0.14	0.1

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSv)	Person-rems (-cSv) per Work Function Operations	Person-rems (-cSv) per Maintenance & Others	Person-rems (-cSv) per Contractor	Person-rems (-cSv) per Station & Utility	Average Measurable Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
SURREY 1,2 Docket 50-280, 50-281; DPR-32, -37 1st commercial operation 12/72, 5/73 Type - PWRs Capacity - 781, 781 MWe	1973	420.6		936	152	72	812			0.16	0.4
	1974	717.4	49.8	1,715	884	27	1,622			0.52	1.2
	1975	1,079.0	70.8	1,948	1,649	444	2,721	1,065	584	0.85	1.5
	1976	930.7	60.4	2,753	3,165	348	1,959	1,380	1,292	1.15	3.4
	1977	1,139.0	72.2	1,860	2,307	726	1,111	1,029	808	1.24	2.0
	1978	1,210.6	77.2	2,203	1,792	173	3,411	2,975	609	0.81	1.5
	1979	343.0	42.3	5,065	3,584	353	3,483	3,117	719	0.71	10.4
	1980	568.2	40.3	5,317	3,821	428	3,816	3,040	1,204	0.72	6.8
	1981	907.6	59.3	3,753	4,244	399	1,091	506	984	1.13	4.7
	1982	1,323.3	88.5	1,878	1,460	571	2,649	1,786	1,434	0.79	1.1
	1983	916.2	61.3	2,754	3,220	536	1,711	1,575	672	1.17	3.5
	1984	1,026.7	71.0	3,198	2,247	508	1,307	1,232	583	0.70	2.2
	1985	1,166.4	78.2	3,206	1,815	192	1,926	1,677	387	0.57	1.6
	1986	1,080.5	69.0	3,763	2,356	68	520	325	425	0.63	2.2
	1987	1,132.7	71.8	2,675	712	27	1,474	1,117	306	0.27	0.6
	1988	750.4	49.1	3,184	1,542		809			0.48	2.1
	1989	489.3	31.8	3,100	836			530		0.27	1.7
SUSQUEHANNA 1,2 Docket 50-387, 50-388; NPF-14; NPF-22 1st commercial operation 6/83, 2/85 Type - BWR Capacity - 1032, 1038 MWe	1984	719.9	72.6	2,827	308	71	237	128	180	0.11	0.4
	1985	1,452.2	76.4	3,669	1,106	77	1,029	790	316	0.30	1.8
	1986	1,344.8	67.0	2,996	828	80	748	402	426	0.28	0.6
	1987	1,749.5	84.3	2,548	621	36	585	341	280	0.24	0.4
	1988	1,691.0	80.8	1,904	516	52	464	281	235	0.27	0.3
	1989	1,572.5	75.3	2,063	704	32	672	332	372	0.34	0.4
THREE MILE ISLAND 1,2 Docket 50-289, -320; DPR-50, -73 1st commercial operation 9/74, 12/78 Type - PWRs Capacity - 808, 880 MWe	1975	675.9	82.2	131	73	23	263	18	55	0.56	0.1
	1976	530.0	65.4	819	286	15	344	69	217	0.35	0.5
	1977	664.5	80.9	1,122	360	23	481	128	231	0.32	0.5
	1978	690.0	85.1	1,929	504	197	1,195	235	269	0.26	0.7
	1979	266.0	21.9	3,975	1,392	29	365	907	485	0.35	5.2
	1980	0.0	0.0	2,328	394	50	326	234	160	0.17	---
	1981	0.0	0.0	2,103	376	62	942	190	186	0.18	---
	1982	0.0	0.0	2,123	1,004	49	1,080	433	571	0.47	---
	1983	0.0	0.0	1,592	1,159	7	639	330	522	0.73	---
	1984	0.0	0.0	1,079	688		70		358	0.64	---
	1985	103.6	10.6	1,890	857			16	61	0.45	0.7

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per Work Function Opera- tions	Person-rems (-cSv) per Maintenance & Others	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
THREE MILE ISLAND 1*	1986	585.2	70.9	1,360	213	36	177	89	0.16	0.4
Docket 50-289; DPR-50	1987	610.7	72.5	1,259	149	40	109	50	0.12	0.2
1st commercial operation 9/74	1988	661.0	76.1	1,012	210	40	170	88	0.21	0.3
Type - PWR	1989	871.3	99.5	670	54	22	32	3	0.08	0.1
Capacity - 776 MWe										
THREE MILE ISLAND 2**	1986	0.0	0.0	1,497	915	152	763	613	0.61	---
Docket 50-320; DPR-73	1987	0.0	0.0	1,378	977	90	887	687	0.71	---
1st commercial operation 12/78	1988	0.0	0.0	1,247	917	31	886	691	0.74	---
Type - PWR	1989	0.0	0.0	1,014	639	266	373	37	0.63	---
Capacity - 880 MWe										
TROJAN	1977	792.0	92.6	591	174	30	144	105	0.29	0.2
Docket 50-344; NPF-1	1978	205.5	20.6	711	319	81	238	124	0.45	1.6
1st commercial operation 5/76	1979	631.0	58.1	736	258	74	183	113	0.35	0.4
Type - PWR	1980	727.5	72.5	1,159	421	77	344	305	0.36	0.6
Capacity - 1095 MWe	1981	775.6	74.1	1,311	609	113	496	363	0.46	0.8
	1982	579.5	60.8	977	419	76	343	168	0.43	0.7
	1983	494.2	62.4	969	307	35	272	129	0.32	0.6
	1984	567.0	54.4	1,042	433	40	393	230	0.42	0.8
	1985	829.1	76.7	852	363	31	332	210	0.43	0.4
	1986	852.4	79.7	1,321	381	46	335	274	0.29	0.4
	1987	525.5	52.9	1,209	363	66	297	266	0.30	0.7
	1988	758.6	66.7	1,408	401	108	293	311	0.28	0.5
	1989	666.8	60.4	1,360	421	37	384	317	0.31	0.6

* Three Mile Island 1 resumed commercial power generation 10/85 after being under regulatory restraint since 1979.

**Three Mile Island 2 has been shut down since the 1979 accident, but is still included in the count of reactors while dose is being accumulated to defuel and decommission the unit.

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Station & Utility	Average Measurable Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Work Functions	Maint. & Others			
TURKEY POINT 3,4 Docket 50-250, 50-251; DPR-31, -41 1st commercial operation 12/72, 9/73 Type - PWRs Capacity - 666, 666 MWe	1973	401.9		444	78				0.18	0.2
	1974	953.6		794	454	88	366	202	0.57	0.5
	1975	1,003.7	74.9	1,176	876	270	606	559	0.74	0.9
	1976	974.2	71.2	1,647	1,184	89	1,095	868	0.72	1.2
	1977	979.5	72.1	1,319	1,036	94	942	522	0.79	1.1
	1978	1,000.2	78.8	1,336	1,032	90	942	546	0.77	1.0
	1979	811.0	62.4	2,002	1,680	299	1,381	997	0.84	2.1
	1980	990.6	73.6	1,803	1,651	232	1,419	1,218	0.92	1.7
	1981	654.0	46.8	2,932	2,251	274	1,977	1,854	0.77	3.4
	1982	915.7	65.2	2,956	2,119	197	1,922	1,656	0.72	2.3
	1983	878.4	62.8	2,930	2,681	272	2,409	2,119	0.92	3.1
	1984	946.7	68.5	2,010	1,255	217	1,038	876	0.62	1.3
	1985	1,034.9	74.7	1,905	1,253	91	1,162	817	0.66	1.2
	1986	754.1	54.9	1,808	946	71	875	716	0.52	1.3
	1987	431.3	33.6	1,980	1,371	79	1,292	987	0.69	3.2
	1988	809.8	58.7	1,841	738	18	720	523	0.40	0.9
	1989	689.9	53.5	1,625	433	25	408	281	0.27	0.6
VERMONT YANKEE Docket 50-271; DPR-28 1st commercial operation 11/72 Type - BWR Capacity - 504 MWe	1973	222.1		244	85				0.35	0.4
	1974	303.5		357	216	24	192	103	0.61	0.7
	1975	429.0	87.8	282	153	70	83	63	0.54	0.4
	1976	389.6	77.1	815	411	36	375	246	0.50	1.1
	1977	423.5	85.1	641	258	83	175	90	0.40	0.6
	1978	387.5	75.9	934	339	78	261	158	0.36	0.9
	1979	414.0	82.1	1,220	1,170	546	624	528	0.96	2.8
	1980	357.8	71.5	1,443	1,338	141	1,197	926	0.93	3.7
	1981	429.1	84.6	1,264	731	121	610	408	0.58	1.7
	1982	501.0	96.0	481	205	60	145	80	0.43	0.4
	1983	346.1	69.3	1,316	1,527	215	1,312	787	1.16	4.4
	1984	398.1	79.0	954	626	80	523	307	0.66	1.5
	1985	361.4	71.8	1,392	1,051	164	887	898	0.76	2.9
	1986	248.1	48.9	1,389	1,188	44	1,144	1,092	0.86	4.8
	1987	423.6	83.2	827	303	37	266	226	0.37	0.7
	1988	492.1	94.9	379	124	27	97	67	0.33	0.3
	1989	432.8	84.2	832	288	43	245	220	0.35	0.7

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Contractor	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Work Function Opera- tions	Maint. & Others			
VOGTLE 1,2 Docket 50-424, 50-425; NPF-68, -81 1st commercial operation 6/87, 5/89 Type - PWRs Capacity - 1083, 1110 MWe	1988	820.4	74.8	1,108	138	13	125	107	0.12	0.2
	1989	1,045.8	94.5	427	32	7	25	13	0.07	0.0
WASHINGTON NUCLEAR 2 Docket 50-397; NPF-21 1st commercial operation 12/84 Type - BWR Capacity - 1095 MWe	1985	616.0	87.6	755	119	42	77	42	0.16	0.2
	1986	616.0	74.0	1,013	222	56	166	70	0.22	0.4
	1987	639.0	68.3	1,201	406	95	311	143	0.34	0.6
	1988	707.7	68.6	1,050	353	81	272	93	0.34	0.5
	1989	727.2	76.3	1,299	492	161	331	216	0.38	0.7
WATERFORD 3 Docket 50-382; NPF-38 1st commercial operation 9/85 Type - PWR Capacity - 1075 MWe	1986	875.7	79.1	1,244	223	62	161	178	0.18	0.3
	1987	891.8	80.9	959	156	33	123	106	0.16	0.2
	1988	784.3	73.7	1,246	259	79	180	207	0.21	0.3
	1989	909.8	81.5	1,306	265	70	195	231	0.20	0.3
WOLF CREEK 1 Docket 50-482; NPF-42 1st commercial operation 9/85 Type - PWR Capacity - 1135 MWe	1986	832.8	73.3	681	142	27	115	77	0.21	0.2
	1987	778.8	68.6	671	134	25	109	80	0.20	0.2
	1988	794.7	67.9	1,011	297	62	235	177	0.29	0.4
	1989	1,108.4	98.4	185	18	4	14	8	0.10	0.0
YANKEE ROWE Docket 50-29; DPR-3 1st commercial operation 7/61 Type - PWR Capacity - 167 MWe	1969	138.3		193	215	83	132	78	1.11	1.6
	1970	146.1		355	255	90	165	158	0.72	1.7
	1971	173.5		155	90	46	44	19	0.58	0.5
	1972	78.7		282	255	63	192	146	0.90	3.2
	1973	127.1		133	99			47	0.74	0.8
	1974	111.3		243	205			99	0.84	1.8
	1975	145.1	82.4	249	116	52	64	66	0.47	0.8
	1976	152.2	89.9	152	59	17	42	4	0.39	0.4
	1977	124.6	73.9	725	356	28	328	174	0.49	2.9
	1978	145.0	81.0	565	282	26	256	95	0.50	1.9
	1979	149.0	81.6	441	127	16	111	52	0.29	0.9

APPENDIX C PERSONNEL, DOSE AND POWER GENERATION SUMMARY (Continued)

Reporting Organization	Year	Mega- watt- Years (MW-Yr)	Unit Availa- bility Factor	Total Personnel With Measur- able Doses	Collective Dose (person- rems or cSv)	Person-rems (-cSv) per		Person-rems (-cSv) per Contractor	Average Meas'ble Dose (rems or cSv)	Person rems (-cSv)/ MW-Yr
						Work Function Opera- tions	Maint. & Others			
YANKEE ROWE (Continued)	1981	109.0	74.4	515	302	8	294	136	0.59	2.8
	1982	108.6	73.4	814	474	6	468	215	0.58	4.4
	1983	163.5	91.4	395	68	19	49	4	0.17	0.4
	1984	124.8	71.4	654	348	15	33	141	0.53	2.8
	1985	144.3	85.3	653	211	17	194	81	0.32	1.5
	1986	169.7	95.0	384	45	20	25	2	0.12	0.3
	1987	138.7	81.1	593	217	38	180	127	0.37	1.6
	1988	136.4	84.5	738	227	35	192	148	0.31	1.7
	1989	159.4	91.1	496	62	20	42	19	0.12	0.4
ZION 1,2 Docket 50-295, 50-304; DPR-39, -48 1st commercial operation 12/75, 9/74 Type - PWRs Capacity - 1040, 1040 MWe	1974	425.3	71.1	306	56	17	110	13	0.18	0.1
	1975	1,181.5	74.9	436	127	64	507	49	0.29	0.1
	1976	1,134.9	61.9	774	571	43	960	257	0.74	0.5
	1977	1,358.6	75.0	784	1,003	150	867	561	1.28	0.7
	1978	1,613.5	80.2	1,104	1,017	168	1,106	418	0.92	0.6
	1979	1,238.0	67.6	1,472	1,274	97	823	747	0.87	1.0
	1980	1,411.2	74.1	1,363	920	50	1,670	560	0.67	0.7
	1981	1,366.9	72.3	1,754	1,720	42	2,061	1,155	0.98	1.3
	1982	1,186.4	64.3	1,575	2,103	118	1,193	1,688	1.34	1.8
	1983	1,222.3	69.4	1,285	1,311	23	763	905	1.02	1.1
	1984	1,389.9	69.6	1,110	786	41	1,125	556	0.71	0.6
	1985	1,187.9	62.9	1,498	1,166	22	476	784	0.78	1.0
	1986	1,462.0	73.2	967	498	40	653	346	0.51	0.8
	1987	1,337.0	67.8	1,046	693	38	1,222	458	0.66	0.5
	1988	1,549.1	76.6	1,926	1,260	23	661	1,045	0.65	0.8
	1989	1,514.1	76.4	1,282	684			430	0.53	0.5

APPENDIX D

Number of Personnel and Person-rem by Work and Job Function

1989

APPENDIX D
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *ARKANSAS 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	7	0	1	8	1.235	0.000	0.135	1.370
OPERATIONS PERSONNEL	11	0	0	11	1.865	0.000	0.000	1.865
HEALTH PHYSICS PERSONNEL	34	3	56	93	7.059	0.475	14.973	22.507
SUPERVISORY PERSONNEL	2	0	0	2	0.550	0.000	0.000	0.550
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	54	3	57	114	10.709	0.475	15.108	26.292
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	80	11	259	350	29.230	2.416	83.915	115.561
OPERATIONS PERSONNEL	10	0	0	10	2.472	0.000	0.000	2.472
HEALTH PHYSICS PERSONNEL	39	4	158	201	9.000	1.130	35.444	45.574
SUPERVISORY PERSONNEL	4	0	2	6	1.202	0.000	1.055	2.257
ENGINEERING PERSONNEL	1	0	13	14	0.360	0.000	7.360	7.720
TOTAL	134	15	432	581	42.264	3.546	127.774	173.584
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	10	1	70	81	1.920	0.170	16.668	18.758
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	10	2	26	38	2.210	0.385	4.780	7.375
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	4	2	10	16	0.675	0.305	4.080	5.060
TOTAL	24	5	106	135	4.805	0.860	25.528	31.193
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	85	12	260	357	43.206	4.045	125.407	172.658
OPERATIONS PERSONNEL	3	0	0	3	0.865	0.000	0.000	0.865
HEALTH PHYSICS PERSONNEL	42	4	123	169	11.414	1.260	34.266	46.940
SUPERVISORY PERSONNEL	6	0	1	7	3.735	0.000	0.155	3.890
ENGINEERING PERSONNEL	5	0	21	26	1.111	0.000	5.180	6.291
TOTAL	141	16	405	562	60.331	5.305	165.008	230.644
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	1	0	0	1	0.190	0.000	0.000	0.190
HEALTH PHYSICS PERSONNEL	10	0	11	21	3.485	0.000	3.174	6.659
SUPERVISORY PERSONNEL	1	0	0	1	0.135	0.000	0.000	0.135
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	12	0	11	23	3.810	0.000	3.174	6.984
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	7	0	90	97	0.940	0.000	25.878	26.818
OPERATIONS PERSONNEL	23	0	0	23	4.191	0.000	0.000	4.191
HEALTH PHYSICS PERSONNEL	3	1	82	86	0.415	0.115	15.541	16.071
SUPERVISORY PERSONNEL	2	0	3	5	0.290	0.000	1.823	2.113
ENGINEERING PERSONNEL	3	0	12	15	0.450	0.000	2.535	2.985
TOTAL	38	1	187	226	6.286	0.115	45.777	52.178
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	189 (112)	24 (16)	680 (514)	893 (642)	76.531	6.631	252.003	335.165
OPERATIONS PERSONNEL	48 (38)	0 (0)	0 (0)	48 (38)	9.583	0.000	0.000	9.583
HEALTH PHYSICS PERSONNEL	138 (62)	14 (5)	456 (230)	608 (297)	33.583	3.365	108.178	145.126
SUPERVISORY PERSONNEL	15 (8)	0 (0)	6 (6)	21 (14)	5.912	0.000	3.033	8.945
ENGINEERING PERSONNEL	13 (8)	2 (2)	56 (45)	71 (55)	2.596	0.305	19.155	22.056
GRAND TOTALS	403 (228)	40 (23)	1198 (795)	1641(1046)	128.205	10.301	382.369	520.875

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *BEAVER VALLEY 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	5	0	29	34	1.830	0.000	17.275	19.105
OPERATIONS PERSONNEL	76	0	0	76	27.905	0.000	0.000	27.905
HEALTH PHYSICS PERSONNEL	29	0	101	130	9.635	0.000	86.295	95.930
SUPERVISORY PERSONNEL	33	0	52	85	10.170	0.000	23.065	33.235
ENGINEERING PERSONNEL	5	0	1	6	1.335	0.000	0.105	1.440
TOTAL	148	0	183	331	50.875	0.000	126.740	177.615
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	182	0	261	443	102.380	0.000	255.900	358.280
OPERATIONS PERSONNEL	4	0	0	4	1.490	0.000	0.000	1.490
HEALTH PHYSICS PERSONNEL	12	0	36	48	4.130	0.000	31.270	35.400
SUPERVISORY PERSONNEL	12	0	58	70	3.860	0.000	43.205	47.065
ENGINEERING PERSONNEL	1	0	0	1	0.190	0.000	0.000	0.190
TOTAL	211	0	355	566	112.050	0.000	330.375	442.425
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	134	135	1.095	0.000	149.476	150.571
OPERATIONS PERSONNEL	1	0	0	1	0.160	0.000	0.000	0.160
HEALTH PHYSICS PERSONNEL	0	0	27	27	0.050	0.000	29.950	30.000
SUPERVISORY PERSONNEL	8	0	57	65	4.455	0.000	58.370	62.825
ENGINEERING PERSONNEL	0	0	1	1	0.020	0.000	1.760	1.780
TOTAL	10	0	219	229	5.780	0.000	239.556	245.336
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	262	262	0.090	0.000	253.854	253.944
OPERATIONS PERSONNEL	0	0	0	0	0.095	0.000	0.000	0.095
HEALTH PHYSICS PERSONNEL	1	0	5	6	0.515	0.000	5.595	6.110
SUPERVISORY PERSONNEL	4	0	35	39	2.360	0.000	24.595	26.955
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	5	0	302	307	3.060	0.000	284.044	287.104
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	16	0	6	22	3.080	0.000	2.255	5.335
OPERATIONS PERSONNEL	8	0	0	8	3.040	0.000	0.000	3.040
HEALTH PHYSICS PERSONNEL	4	0	12	16	1.405	0.000	3.580	4.985
SUPERVISORY PERSONNEL	2	0	0	2	0.225	0.000	0.090	0.315
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	30	0	18	48	7.750	0.000	5.925	13.675
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	29	0	39	68	18.445	0.000	31.235	49.680
OPERATIONS PERSONNEL	4	0	0	4	1.200	0.000	0.000	1.200
HEALTH PHYSICS PERSONNEL	1	0	15	16	0.450	0.000	7.785	8.235
SUPERVISORY PERSONNEL	11	0	17	28	5.805	0.000	13.580	19.385
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	45	0	71	116	25.900	0.000	52.600	78.500
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	233	0	731	964	126.920	0.000	709.995	836.915
OPERATIONS PERSONNEL	93	0	0	93	33.890	0.000	0.000	33.890
HEALTH PHYSICS PERSONNEL	47	0	196	243	16.185	0.000	164.475	180.660
SUPERVISORY PERSONNEL	70	0	219	289	26.875	0.000	162.905	189.780
ENGINEERING PERSONNEL	6	0	2	8	1.545	0.000	1.865	3.410
GRAND TOTALS	449	0	1148	1597	205.415	0.000	1039.240	1244.655

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *BIG ROCK POINT

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	0	0	0.477	0.000	0.008	0.485
OPERATIONS PERSONNEL	29	0	0	29	21.020	0.148	0.018	21.186
HEALTH PHYSICS PERSONNEL	12	0	5	17	6.716	0.000	2.042	8.758
SUPERVISORY PERSONNEL	5	0	1	6	1.349	0.361	0.477	2.187
ENGINEERING PERSONNEL	1	0	0	1	0.509	0.000	0.000	0.509
TOTAL	47	0	6	53	30.071	0.509	2.545	33.125
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	27	6	0	33	9.463	2.940	0.005	12.408
OPERATIONS PERSONNEL	0	0	0	0	0.008	0.204	0.019	0.231
HEALTH PHYSICS PERSONNEL	3	0	1	4	0.962	0.004	0.327	1.293
SUPERVISORY PERSONNEL	0	0	0	0	0.196	0.183	0.000	0.379
ENGINEERING PERSONNEL	0	0	0	0	0.024	0.000	0.000	0.024
TOTAL	30	6	1	37	10.653	3.331	0.351	14.335
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	19	20	39	0.035	8.980	12.653	21.668
OPERATIONS PERSONNEL	0	0	0	0	0.005	0.069	0.003	0.077
HEALTH PHYSICS PERSONNEL	3	0	2	5	0.480	0.000	1.217	1.697
SUPERVISORY PERSONNEL	0	1	0	1	0.021	0.605	0.091	0.717
ENGINEERING PERSONNEL	2	0	0	2	0.849	0.000	0.000	0.849
TOTAL	5	20	22	47	1.390	9.654	13.964	25.008
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	23	46	20	89	22.347	27.289	5.222	54.858
OPERATIONS PERSONNEL	2	4	2	8	0.832	0.773	0.598	2.203
HEALTH PHYSICS PERSONNEL	13	0	8	21	7.880	0.000	3.903	11.783
SUPERVISORY PERSONNEL	2	6	0	8	0.723	2.096	0.071	2.890
ENGINEERING PERSONNEL	3	0	0	3	0.556	0.000	0.000	0.556
TOTAL	43	56	30	129	32.338	30.158	9.794	72.290
WASTE PROCESSING								
MAINTENANCE PERSONNEL	7	0	1	8	1.744	0.261	1.170	3.175
OPERATIONS PERSONNEL	0	0	0	0	0.242	0.116	0.000	0.358
HEALTH PHYSICS PERSONNEL	5	0	0	5	1.568	0.000	0.023	1.591
SUPERVISORY PERSONNEL	0	0	0	0	0.046	0.004	0.000	0.050
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	12	0	1	13	3.600	0.381	1.193	5.174
REFUELING								
MAINTENANCE PERSONNEL	5	0	0	5	1.196	0.045	0.000	1.241
OPERATIONS PERSONNEL	16	1	0	17	3.371	0.177	0.009	3.557
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.604	0.000	0.000	0.604
SUPERVISORY PERSONNEL	1	0	0	1	0.204	0.000	0.029	0.233
ENGINEERING PERSONNEL	1	0	0	1	0.322	0.000	0.000	0.322
TOTAL	25	1	0	26	5.697	0.222	0.038	5.957
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	62	71	41	174	35.262	39.515	19.058	93.835
OPERATIONS PERSONNEL	47	5	2	54	25.478	1.487	0.647	27.612
HEALTH PHYSICS PERSONNEL	38	0	16	54	18.210	0.004	7.512	25.726
SUPERVISORY PERSONNEL	8	7	1	16	2.539	3.249	0.668	6.456
ENGINEERING PERSONNEL	7	0	0	7	2.260	0.000	0.000	2.260
GRAND TOTALS	162	83	60	305	83.749	44.255	27.885	155.889

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *BRAIDWOOD 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	1	0	6	7	0.128	0.000	0.975	1.103
OPERATIONS PERSONNEL	28	0	46	74	3.529	0.000	0.305	3.834
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.195	0.000	0.168	1.363
SUPERVISORY PERSONNEL	8	0	3	11	0.284	0.000	0.020	0.304
ENGINEERING PERSONNEL	15	1	1	17	0.618	0.005	0.190	0.813
TOTAL	54	1	57	112	5.754	0.005	1.658	7.417
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	121	13	972	1106	33.404	0.036	148.223	181.663
OPERATIONS PERSONNEL	120	0	117	237	15.369	0.000	0.782	16.151
HEALTH PHYSICS PERSONNEL	29	0	67	96	15.332	0.000	21.761	37.093
SUPERVISORY PERSONNEL	156	0	18	174	5.677	0.000	0.116	5.793
ENGINEERING PERSONNEL	96	64	40	200	3.924	0.393	8.230	12.547
TOTAL	522	77	1214	1813	73.706	0.429	179.112	253.247
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	2	0	34	36	0.596	0.000	5.201	5.797
OPERATIONS PERSONNEL	1	0	1	2	0.022	0.000	0.001	0.023
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.282	0.000	0.526	0.808
SUPERVISORY PERSONNEL	1	0	1	2	0.011	0.000	0.002	0.013
ENGINEERING PERSONNEL	15	3	9	27	0.618	0.019	2.123	2.760
TOTAL	20	3	46	69	1.529	0.019	7.853	9.401
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	2	0	23	25	0.511	0.000	3.413	3.924
OPERATIONS PERSONNEL	2	0	0	2	0.238	0.000	0.000	0.238
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.095	0.000	0.191	0.286
SUPERVISORY PERSONNEL	1	0	0	1	0.052	0.000	0.000	0.052
ENGINEERING PERSONNEL	1	1	1	3	0.042	0.001	0.021	0.064
TOTAL	7	1	25	33	0.938	0.001	3.625	4.564
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	0	7	8	0.043	0.000	0.975	1.018
OPERATIONS PERSONNEL	6	0	86	92	0.779	0.000	0.573	1.352
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.050	0.000	0.239	1.289
SUPERVISORY PERSONNEL	18	0	0	18	0.653	0.000	0.000	0.653
ENGINEERING PERSONNEL	1	1	1	3	0.018	0.006	0.002	0.026
TOTAL	28	1	95	124	2.543	0.006	1.789	4.338
REFUELING								
MAINTENANCE PERSONNEL	28	0	24	52	7.925	0.000	3.738	11.663
OPERATIONS PERSONNEL	13	0	0	13	1.710	0.000	0.000	1.710
HEALTH PHYSICS PERSONNEL	2	0	3	5	1.140	0.000	1.028	2.168
SUPERVISORY PERSONNEL	54	0	1	55	1.978	0.000	0.001	1.979
ENGINEERING PERSONNEL	19	13	0	32	0.780	0.080	0.000	0.860
TOTAL	116	13	28	157	13.533	0.080	4.767	18.380
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	155	13	1066	1234	42.607	0.036	162.525	205.168
OPERATIONS PERSONNEL	170	0	250	420	21.647	0.000	1.661	23.308
HEALTH PHYSICS PERSONNEL	37	0	74	111	19.094	0.000	23.913	43.007
SUPERVISORY PERSONNEL	238	0	23	261	8.655	0.000	0.139	8.794
ENGINEERING PERSONNEL	147	83	52	282	6.000	0.504	10.566	17.070
GRAND TOTALS	747	96	1465	2308	98.003	0.540	198.804	297.347

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *BROWNS FERRY 1,2,3

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM															
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL												
REACTOR OPS & SURV																				
MAINTENANCE PERSONNEL	463	8	8	479	11.017	0.264	0.415	11.696												
OPERATIONS PERSONNEL	57	0	1	58	2.593	0.000	0.000	2.593												
HEALTH PHYSICS PERSONNEL	113	0	2	115	32.782	0.000	0.955	33.737												
SUPERVISORY PERSONNEL	28	0	1	29	6.709	0.000	0.083	6.792												
ENGINEERING PERSONNEL	71	12	88	171	2.587	0.219	10.936	13.742												
TOTAL	732	20	100	852	55.688	0.483	12.389	68.560												
ROUTINE MAINTENANCE																				
MAINTENANCE PERSONNEL	704	8	9	721	169.634	0.718	1.123	171.475												
OPERATIONS PERSONNEL	68	0	0	68	10.260	0.000	0.000	10.260												
HEALTH PHYSICS PERSONNEL	129	0	2	131	18.376	0.000	0.068	18.444												
SUPERVISORY PERSONNEL	8	0	1	9	0.486	0.000	0.144	0.630												
ENGINEERING PERSONNEL	75	16	123	214	8.172	2.199	54.727	65.098												
TOTAL	984	24	135	1143	206.928	2.917	56.062	265.907												
IN-SERVICE INSPECTION																				
MAINTENANCE PERSONNEL	125	0	3	128	23.767	0.000	0.230	23.997												
OPERATIONS PERSONNEL	3	0	0	3	0.005	0.000	0.000	0.005												
HEALTH PHYSICS PERSONNEL	43	0	0	43	0.330	0.000	0.000	0.330												
SUPERVISORY PERSONNEL	1	0	0	1	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	31	8	20	59	7.632	0.261	21.243	29.136												
TOTAL	203	8	23	234	31.734	0.261	21.473	53.468												
SPECIAL MAINTENANCE																				
MAINTENANCE PERSONNEL	363	2	6	371	48.122	0.984	0.607	49.713												
OPERATIONS PERSONNEL	3	0	0	3	0.000	0.000	0.000	0.000												
HEALTH PHYSICS PERSONNEL	76	0	1	77	1.980	0.000	0.005	1.985												
SUPERVISORY PERSONNEL	5	0	0	5	0.536	0.000	0.000	0.536												
ENGINEERING PERSONNEL	49	13	18	80	5.772	0.805	0.938	7.515												
TOTAL	496	15	25	536	56.410	1.789	1.550	59.749												
WASTE PROCESSING																				
MAINTENANCE PERSONNEL	29	0	0	29	0.514	0.000	0.000	0.514												
OPERATIONS PERSONNEL	35	0	1	36	4.453	0.000	0.248	4.701												
HEALTH PHYSICS PERSONNEL	67	0	0	67	7.704	0.000	0.000	7.704												
SUPERVISORY PERSONNEL	2	0	0	2	0.243	0.000	0.000	0.243												
ENGINEERING PERSONNEL	8	0	1	9	0.454	0.000	0.571	1.025												
TOTAL	141	0	2	143	13.368	0.000	0.819	14.187												
REFUELING																				
MAINTENANCE PERSONNEL	28	0	0	28	1.043	0.000	0.000	1.043												
OPERATIONS PERSONNEL	14	0	0	14	0.489	0.000	0.000	0.489												
HEALTH PHYSICS PERSONNEL	30	0	2	32	0.443	0.000	0.125	0.568												
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	17	4	2	23	0.172	0.010	0.145	0.327												
TOTAL	89	4	4	97	2.147	0.010	0.270	2.427												
TOTAL BY JOB FUNCTION																				
MAINTENANCE PERSONNEL	1712	(711)	18	(6)	26	(10)	1756	(727)	254.097	1.966	2.375	258.438								
OPERATIONS PERSONNEL	180	(68)	0	(0)	2	(1)	182	(69)	17.800	0.000	0.248	18.048								
HEALTH PHYSICS PERSONNEL	458	(88)	0	(0)	7	(2)	465	(90)	61.615	0.000	1.153	62.768								
SUPERVISORY PERSONNEL	44	(27)	0	(0)	2	(0)	46	(27)	7.974	0.000	0.227	8.201								
ENGINEERING PERSONNEL	251	(79)	53	(9)	252	(133)	556	(221)	24.789	3.494	88.560	116.843								
GRAND TOTALS									2645	(973)	71	(15)	289	(146)	3005	(1134)	366.275	5.460	92.563	464.298

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *BRUNSWICK 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	2	19	22	0.630	0.665	5.389	6.684
OPERATIONS PERSONNEL	87	0	43	130	56.661	0.000	17.715	74.376
HEALTH PHYSICS PERSONNEL	70	0	59	129	52.174	0.000	46.934	99.108
SUPERVISORY PERSONNEL	24	0	3	27	9.253	0.165	1.235	10.653
ENGINEERING PERSONNEL	3	0	7	10	1.723	0.050	2.796	4.569
TOTAL	185	2	131	318	120.441	0.880	74.069	195.390
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	235	62	454	751	217.955	44.424	242.154	504.533
OPERATIONS PERSONNEL	1	0	14	15	1.083	0.000	9.121	10.204
HEALTH PHYSICS PERSONNEL	16	0	26	42	6.803	0.000	10.468	17.271
SUPERVISORY PERSONNEL	9	1	5	15	3.795	0.355	5.071	9.221
ENGINEERING PERSONNEL	70	3	99	172	22.135	1.392	67.029	90.556
TOTAL	331	66	598	995	251.771	46.171	333.843	631.785
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	19	15	72	106	6.032	6.135	33.156	45.323
OPERATIONS PERSONNEL	0	0	1	1	0.060	0.000	0.515	0.575
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.310	0.000	0.500	0.810
SUPERVISORY PERSONNEL	0	0	0	0	0.185	0.000	0.008	0.193
ENGINEERING PERSONNEL	13	2	50	65	6.127	0.955	32.078	39.160
TOTAL	33	17	123	173	12.714	7.090	66.257	86.061
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	54	19	647	720	21.488	8.457	667.499	697.444
OPERATIONS PERSONNEL	0	0	15	15	0.090	0.000	6.688	6.778
HEALTH PHYSICS PERSONNEL	14	0	24	38	7.495	0.000	11.763	19.258
SUPERVISORY PERSONNEL	2	0	11	13	0.700	0.135	13.576	14.411
ENGINEERING PERSONNEL	26	5	183	214	14.974	3.310	165.076	183.360
TOTAL	96	24	880	1000	44.747	11.902	864.602	921.251
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	25	4	16	45	10.437	1.440	9.401	21.278
OPERATIONS PERSONNEL	0	0	0	0	0.005	0.000	0.058	0.063
HEALTH PHYSICS PERSONNEL	9	0	7	16	5.401	0.000	1.890	7.291
SUPERVISORY PERSONNEL	0	0	0	0	0.040	0.000	0.015	0.055
ENGINEERING PERSONNEL	0	0	4	4	0.185	0.012	3.061	3.258
TOTAL	34	4	27	65	16.068	1.452	14.425	31.945
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	11	19	72	102	7.896	6.577	32.535	47.008
OPERATIONS PERSONNEL	1	0	1	2	0.305	0.000	0.341	0.646
HEALTH PHYSICS PERSONNEL	4	0	4	8	1.776	0.000	1.774	3.550
SUPERVISORY PERSONNEL	0	0	0	0	0.350	0.000	0.000	0.350
ENGINEERING PERSONNEL	2	0	24	26	0.695	0.395	12.076	13.166
TOTAL	18	19	101	138	11.022	6.972	46.726	64.720
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	345	121	1280	1746	264.438	67.698	990.134	1322.270
OPERATIONS PERSONNEL	89	0	74	163	58.204	0.000	34.438	92.642
HEALTH PHYSICS PERSONNEL	114	0	120	234	73.959	0.000	73.329	147.288
SUPERVISORY PERSONNEL	35	1	19	55	14.323	0.655	19.905	34.883
ENGINEERING PERSONNEL	114	10	367	491	45.839	6.114	282.116	334.069
GRAND TOTALS	697	132	1860	2689	456.763	74.467	1399.922	1931.152

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *BYRON 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	2	8	11	0.013	0.056	0.865	0.934
OPERATIONS PERSONNEL	79	0	93	172	7.752	0.000	1.184	8.936
HEALTH PHYSICS PERSONNEL	21	0	8	29	8.128	0.000	0.663	8.791
SUPERVISORY PERSONNEL	64	15	2	81	1.121	0.017	0.085	1.223
ENGINEERING PERSONNEL	17	30	11	58	0.753	0.085	0.244	1.082
TOTAL	182	47	122	351	17.767	0.158	3.041	20.966
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	117	26	493	636	19.430	0.688	54.511	74.629
OPERATIONS PERSONNEL	42	0	1	43	4.045	0.000	0.007	4.052
HEALTH PHYSICS PERSONNEL	16	0	80	96	5.826	0.000	6.295	12.121
SUPERVISORY PERSONNEL	169	0	111	280	2.922	0.000	5.396	8.318
ENGINEERING PERSONNEL	32	48	49	129	1.469	0.131	1.113	2.713
TOTAL	376	74	734	1184	33.692	0.819	67.322	101.833
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	3	1	210	214	0.532	0.032	23.332	23.896
OPERATIONS PERSONNEL	1	0	0	1	0.045	0.000	0.000	0.045
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.266	0.000	0.000	0.266
SUPERVISORY PERSONNEL	9	4	2	15	0.153	0.005	0.119	0.277
ENGINEERING PERSONNEL	11	40	52	103	0.530	0.113	1.168	1.811
TOTAL	25	45	264	334	1.526	0.150	24.619	26.295
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	2	1	55	58	0.266	0.008	6.056	6.330
OPERATIONS PERSONNEL	13	0	36	49	1.206	0.000	0.455	1.661
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.485	0.000	0.000	0.485
SUPERVISORY PERSONNEL	7	4	1	12	0.108	0.005	0.011	0.124
ENGINEERING PERSONNEL	3	6	5	14	0.133	0.018	0.109	0.260
TOTAL	26	11	97	134	2.198	0.031	6.631	8.860
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	1	0	1	2	0.008	0.000	0.034	0.042
OPERATIONS PERSONNEL	8	0	147	155	0.838	0.000	1.858	2.696
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.706	0.000	0.000	0.706
SUPERVISORY PERSONNEL	3	0	0	3	0.051	0.000	0.000	0.051
ENGINEERING PERSONNEL	1	0	0	1	0.003	0.000	0.000	0.003
TOTAL	15	0	148	163	1.606	0.000	1.892	3.498
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	38	1	16	55	6.368	0.016	1.730	8.114
OPERATIONS PERSONNEL	9	0	0	9	0.824	0.000	0.000	0.824
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.250	0.000	0.021	0.271
SUPERVISORY PERSONNEL	77	0	1	78	1.330	0.000	0.068	1.398
ENGINEERING PERSONNEL	1	2	4	7	0.074	0.007	0.081	0.162
TOTAL	126	3	22	151	8.846	0.023	1.900	10.769
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	162	31	783	976	26.617	0.800	86.528	113.945
OPERATIONS PERSONNEL	152	0	277	429	14.710	0.000	3.504	18.214
HEALTH PHYSICS PERSONNEL	42	0	89	131	15.661	0.000	6.979	22.640
SUPERVISORY PERSONNEL	329	23	117	469	5.685	0.027	5.679	11.391
ENGINEERING PERSONNEL	65	126	121	312	2.962	0.354	2.715	6.031
GRAND TOTALS	750	180	1387	2317	65.635	1.181	105.405	172.221

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *CALLAWAY 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.313	0.000	0.670	0.983
OPERATIONS PERSONNEL	80	0	1	81	19.896	0.095	0.810	20.801
HEALTH PHYSICS PERSONNEL	26	0	44	70	8.068	0.000	11.430	19.498
SUPERVISORY PERSONNEL	10	0	0	10	3.111	0.100	0.000	3.211
ENGINEERING PERSONNEL	0	0	2	2	0.463	0.049	0.870	1.382
TOTAL	116	0	48	164	31.851	0.244	13.780	45.875
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	116	0	195	311	35.163	0.000	66.190	101.353
OPERATIONS PERSONNEL	2	0	1	3	1.068	0.000	0.220	1.288
HEALTH PHYSICS PERSONNEL	5	0	2	7	1.457	0.000	0.430	1.887
SUPERVISORY PERSONNEL	3	0	0	3	0.821	0.000	0.000	0.821
ENGINEERING PERSONNEL	0	0	13	13	0.281	0.013	3.870	4.164
TOTAL	126	0	211	337	38.790	0.013	70.710	109.513
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	40	41	0.874	0.000	10.030	10.904
OPERATIONS PERSONNEL	6	0	1	7	2.457	0.000	0.270	2.727
HEALTH PHYSICS PERSONNEL	0	0	12	12	0.028	0.000	2.720	2.748
SUPERVISORY PERSONNEL	4	0	0	4	1.897	0.000	0.000	1.897
ENGINEERING PERSONNEL	7	0	50	57	3.249	0.028	23.840	27.117
TOTAL	18	0	103	121	8.505	0.028	36.860	45.393
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	2	0	26	28	0.987	0.000	9.060	10.047
OPERATIONS PERSONNEL	2	0	0	2	0.872	0.000	0.120	0.992
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.108	0.000	0.150	0.258
SUPERVISORY PERSONNEL	0	0	0	0	0.152	0.045	0.000	0.197
ENGINEERING PERSONNEL	1	0	34	35	0.183	0.009	25.580	25.772
TOTAL	5	0	60	65	2.302	0.054	34.910	37.266
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.240	0.000	0.240	0.480
OPERATIONS PERSONNEL	16	0	5	21	4.870	0.000	2.180	7.050
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.523	0.000	0.280	0.803
SUPERVISORY PERSONNEL	1	0	0	1	0.356	0.000	0.000	0.356
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.300	0.300
TOTAL	17	0	6	23	5.989	0.000	3.000	8.989
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	7	0	75	82	2.340	0.000	29.740	32.080
OPERATIONS PERSONNEL	1	0	0	1	0.458	0.010	0.000	0.468
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.068	0.000	0.620	0.688
SUPERVISORY PERSONNEL	3	0	0	3	0.507	0.000	0.000	0.507
ENGINEERING PERSONNEL	3	0	3	6	0.811	0.017	0.300	1.128
TOTAL	14	0	81	95	4.184	0.027	30.660	34.871
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	126	0	337	463	39.917	0.000	115.930	155.847
OPERATIONS PERSONNEL	107	0	8	115	29.621	0.105	3.600	33.326
HEALTH PHYSICS PERSONNEL	31	0	61	92	10.252	0.000	15.630	25.882
SUPERVISORY PERSONNEL	21	0	0	21	6.844	0.145	0.000	6.989
ENGINEERING PERSONNEL	11	0	103	114	4.987	0.116	54.760	59.863
GRAND TOTALS	296	0	509	805	91.621	0.366	189.920	281.907

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *CALVERT CLIFFS 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	2	0	2	4	0.350	0.000	0.245	0.595
OPERATIONS PERSONNEL	25	1	0	26	6.107	0.126	0.000	6.233
HEALTH PHYSICS PERSONNEL	8	0	1	9	1.169	0.000	0.213	1.382
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.281	0.281
ENGINEERING PERSONNEL	2	0	0	2	0.256	0.000	0.000	0.256
TOTAL	37	1	4	42	7.882	0.126	0.739	8.747
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	12	1	12	25	3.651	0.238	2.574	6.463
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.000	0.000	0.691	0.691
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.107	0.107
TOTAL	12	1	16	29	3.651	0.238	3.372	7.261
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	5	10	64	79	0.923	3.488	23.323	27.734
OPERATIONS PERSONNEL	1	0	1	2	0.111	0.000	0.330	0.441
HEALTH PHYSICS PERSONNEL	3	0	32	35	0.610	0.000	7.128	7.738
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.455	0.455
ENGINEERING PERSONNEL	7	1	5	13	3.230	0.158	1.200	4.588
TOTAL	16	11	103	130	4.874	3.646	32.436	40.956
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	95	39	199	333	30.238	14.927	74.787	119.952
OPERATIONS PERSONNEL	8	0	1	9	1.040	0.000	0.218	1.258
HEALTH PHYSICS PERSONNEL	12	0	68	80	4.816	0.000	20.941	25.757
SUPERVISORY PERSONNEL	6	0	21	27	1.791	0.000	6.900	8.691
ENGINEERING PERSONNEL	9	0	14	23	1.765	0.000	3.312	5.077
TOTAL	130	39	303	472	39.650	14.927	106.158	160.735
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	1	13	22	36	0.104	5.667	6.333	12.104
OPERATIONS PERSONNEL	0	0	1	1	0.000	0.000	0.337	0.337
HEALTH PHYSICS PERSONNEL	20	1	17	38	6.874	0.694	4.449	12.017
SUPERVISORY PERSONNEL	2	0	1	3	0.582	0.000	0.416	0.998
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	23	14	41	78	7.560	6.361	11.535	25.456
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	25	5	21	51	10.552	0.801	4.283	15.636
OPERATIONS PERSONNEL	1	0	4	5	0.603	0.000	0.454	1.057
HEALTH PHYSICS PERSONNEL	11	1	61	73	2.808	0.288	17.053	20.149
SUPERVISORY PERSONNEL	4	0	0	4	1.876	0.000	0.000	1.876
ENGINEERING PERSONNEL	1	0	1	2	0.107	0.000	0.228	0.335
TOTAL	42	6	87	135	15.946	1.089	22.018	39.053
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	140	68	320	528	45.818	25.121	111.545	182.484
OPERATIONS PERSONNEL	35	1	7	43	7.861	0.126	1.339	9.326
HEALTH PHYSICS PERSONNEL	54	2	182	238	16.277	0.982	50.475	67.734
SUPERVISORY PERSONNEL	12	0	24	36	4.249	0.000	8.052	12.301
ENGINEERING PERSONNEL	19	1	21	41	5.358	0.158	4.847	10.363
GRAND TOTALS	260	72	554	886	79.563	26.387	176.258	282.208

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *CATAWBA 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM															
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL												
REACTOR OPS & SURV																				
MAINTENANCE PERSONNEL	221	213	114	548	3.930	2.720	0.940	7.590												
OPERATIONS PERSONNEL	66	27	36	129	19.735	0.285	0.730	20.750												
HEALTH PHYSICS PERSONNEL	56	23	109	188	10.000	0.175	13.210	23.385												
SUPERVISORY PERSONNEL	2	5	0	7	0.165	0.105	0.000	0.270												
ENGINEERING PERSONNEL	76	25	7	108	4.817	0.560	0.000	5.377												
TOTAL	421	293	266	980	38.647	3.845	14.880	57.372												
ROUTINE MAINTENANCE																				
MAINTENANCE PERSONNEL	219	199	67	485	62.730	26.621	7.940	97.291												
OPERATIONS PERSONNEL	64	26	41	131	0.750	2.290	21.058	24.098												
HEALTH PHYSICS PERSONNEL	55	22	106	183	8.709	1.465	9.605	19.779												
SUPERVISORY PERSONNEL	2	5	0	7	0.000	0.760	0.000	0.760												
ENGINEERING PERSONNEL	74	23	3	100	10.830	4.335	0.105	15.270												
TOTAL	414	275	217	906	83.019	35.471	38.708	157.198												
IN-SERVICE INSPECTION																				
MAINTENANCE PERSONNEL	78	114	87	279	6.070	19.840	36.835	62.745												
OPERATIONS PERSONNEL	8	22	18	48	0.105	4.275	0.745	5.125												
HEALTH PHYSICS PERSONNEL	23	12	80	115	1.965	1.290	11.530	14.785												
SUPERVISORY PERSONNEL	0	4	0	4	0.000	0.070	0.000	0.070												
ENGINEERING PERSONNEL	46	9	5	60	7.030	1.415	1.210	9.655												
TOTAL	155	161	190	506	15.170	26.890	50.320	92.380												
SPECIAL MAINTENANCE																				
MAINTENANCE PERSONNEL	195	193	71	459	14.550	27.355	12.495	54.400												
OPERATIONS PERSONNEL	24	23	35	82	0.885	1.975	5.336	8.196												
HEALTH PHYSICS PERSONNEL	43	19	83	145	3.115	2.865	5.600	11.580												
SUPERVISORY PERSONNEL	1	5	0	6	0.000	0.690	0.000	0.690												
ENGINEERING PERSONNEL	46	23	2	71	2.380	3.450	0.145	5.975												
TOTAL	309	263	191	763	20.930	36.335	23.576	80.841												
WASTE PROCESSING																				
MAINTENANCE PERSONNEL	15	17	1	33	0.495	0.230	0.000	0.725												
OPERATIONS PERSONNEL	2	2	37	41	0.015	0.130	3.705	3.850												
HEALTH PHYSICS PERSONNEL	28	6	17	51	5.190	0.270	1.770	7.230												
SUPERVISORY PERSONNEL	0	1	0	1	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	9	1	0	10	0.175	0.000	0.000	0.175												
TOTAL	54	27	55	136	5.875	0.630	5.475	11.980												
REFUELING																				
MAINTENANCE PERSONNEL	49	26	2	77	2.234	0.170	0.030	2.434												
OPERATIONS PERSONNEL	17	5	7	29	0.260	0.035	0.115	0.410												
HEALTH PHYSICS PERSONNEL	18	3	32	53	0.035	0.000	0.055	0.090												
SUPERVISORY PERSONNEL	0	1	0	1	0.000	0.005	0.000	0.005												
ENGINEERING PERSONNEL	22	7	0	29	0.080	0.020	0.000	0.100												
TOTAL	106	42	41	189	2.609	0.230	0.200	3.039												
TOTAL BY JOB FUNCTION																				
MAINTENANCE PERSONNEL	777	(222)	762	(218)	342	(121)	1881	(561)	90.009	76.936	58.240	225.185								
OPERATIONS PERSONNEL	181	(66)	105	(27)	174	(41)	460	(134)	21.750	8.990	31.689	62.429								
HEALTH PHYSICS PERSONNEL	223	(56)	85	(23)	427	(109)	735	(188)	29.014	6.065	41.770	76.849								
SUPERVISORY PERSONNEL	5	(1)	21	(5)	0	(0)	26	(6)	0.165	1.630	0.000	1.795								
ENGINEERING PERSONNEL	273	(78)	88	(24)	17	(6)	378	(108)	25.312	9.780	1.460	36.552								
GRAND TOTALS									1459	(423)	1061	(297)	960	(277)	3480	(997)	166.250	103.401	133.159	402.810

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *CLINTON

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	0	14	15	0.437	0.000	7.550	7.987
OPERATIONS PERSONNEL	36	0	12	48	20.248	0.000	5.743	25.991
HEALTH PHYSICS PERSONNEL	36	0	49	85	22.463	0.050	24.723	47.236
SUPERVISORY PERSONNEL	15	0	13	28	5.682	0.010	3.706	9.398
ENGINEERING PERSONNEL	7	0	8	15	2.092	0.000	2.507	4.599
TOTAL	95	0	96	191	50.922	0.060	44.229	95.211
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	95	0	298	393	56.600	0.000	174.276	230.876
OPERATIONS PERSONNEL	0	0	1	1	0.000	0.000	1.166	1.166
HEALTH PHYSICS PERSONNEL	0	0	2	2	0.000	0.000	1.110	1.110
SUPERVISORY PERSONNEL	0	0	2	2	0.000	0.000	0.439	0.439
ENGINEERING PERSONNEL	1	0	6	7	0.843	0.000	2.225	3.068
TOTAL	96	0	309	405	57.443	0.000	179.216	236.659
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.015	0.000	0.315	0.330
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.222	0.222
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.010	0.010
SUPERVISORY PERSONNEL	0	0	1	1	0.006	0.000	0.584	0.590
ENGINEERING PERSONNEL	0	0	0	0	0.022	0.000	0.002	0.024
TOTAL	0	0	2	2	0.043	0.000	1.133	1.176
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	53	53	0.000	0.000	23.474	23.474
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	4	4	0.000	0.000	2.623	2.623
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.036	0.036
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.629	0.629
TOTAL	0	0	58	58	0.000	0.000	26.762	26.762
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	19	0	5	24	7.242	0.000	2.688	9.930
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.002	0.002
TOTAL	19	0	5	24	7.242	0.000	2.690	9.932
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	34	34	0.008	0.000	11.719	11.727
OPERATIONS PERSONNEL	0	0	1	1	0.000	0.000	0.374	0.374
HEALTH PHYSICS PERSONNEL	0	0	5	5	0.000	0.000	2.200	2.200
SUPERVISORY PERSONNEL	0	0	4	4	0.000	0.000	1.161	1.161
ENGINEERING PERSONNEL	0	0	4	4	0.000	0.000	4.058	4.058
TOTAL	0	0	48	48	0.008	0.000	19.512	19.520
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	115 (119)	0 (0)	405 (416)	520 (535)	64.302	0.000	220.022	284.324
OPERATIONS PERSONNEL	36 (39)	0 (0)	14 (17)	50 (56)	20.248	0.000	7.505	27.753
HEALTH PHYSICS PERSONNEL	36 (37)	0 (1)	60 (58)	96 (96)	22.463	0.050	30.666	53.179
SUPERVISORY PERSONNEL	15 (16)	0 (0)	20 (20)	35 (36)	5.688	0.010	5.926	11.624
ENGINEERING PERSONNEL	8 (11)	0 (0)	19 (20)	27 (31)	2.957	0.000	9.423	12.380
GRAND TOTALS	210 (222)	0 (1)	518 (531)	728 (754)	115.658	0.060	273.542	389.260

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *COOK 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
<u>REACTOR OPS & SURV</u>												
MAINTENANCE PERSONNEL	0	0	15	15	0.000	0.000	3.209	3.209				
OPERATIONS PERSONNEL	55	0	23	78	13.233	0.000	4.694	17.927				
HEALTH PHYSICS PERSONNEL	11	1	68	80	1.591	0.120	22.112	23.823				
SUPERVISORY PERSONNEL	0	2	1	3	0.000	0.165	0.252	0.417				
ENGINEERING PERSONNEL	2	0	6	8	0.180	0.000	0.591	0.771				
TOTAL	68	3	113	184	15.004	0.285	30.858	46.147				
<u>ROUTINE MAINTENANCE</u>												
MAINTENANCE PERSONNEL	103	1	457	561	30.984	0.212	232.997	264.193				
OPERATIONS PERSONNEL	23	4	64	91	5.774	0.845	18.627	25.246				
HEALTH PHYSICS PERSONNEL	2	0	38	40	0.477	0.000	11.321	11.798				
SUPERVISORY PERSONNEL	1	1	1	3	0.098	0.128	0.167	0.393				
ENGINEERING PERSONNEL	9	16	17	42	1.729	2.295	3.222	7.246				
TOTAL	138	22	577	737	39.062	3.480	266.334	308.876				
<u>IN-SERVICE INSPECTION</u>												
MAINTENANCE PERSONNEL	4	0	50	54	0.544	0.000	16.568	17.112				
OPERATIONS PERSONNEL	2	1	15	18	0.332	0.098	3.893	4.323				
HEALTH PHYSICS PERSONNEL	0	0	6	6	0.000	0.000	0.917	0.917				
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.401	0.401				
ENGINEERING PERSONNEL	3	0	0	3	0.252	0.000	0.000	0.252				
TOTAL	9	1	72	82	1.128	0.098	21.779	23.005				
<u>SPECIAL MAINTENANCE</u>												
MAINTENANCE PERSONNEL	2	0	35	37	0.174	0.000	5.293	5.467				
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.000	0.000	0.109	0.109				
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.109	0.109				
TOTAL	2	0	37	39	0.174	0.000	5.511	5.685				
<u>WASTE PROCESSING</u>												
MAINTENANCE PERSONNEL	7	0	80	87	0.980	0.000	25.480	26.460				
OPERATIONS PERSONNEL	0	0	8	8	0.000	0.000	3.563	3.563				
HEALTH PHYSICS PERSONNEL	2	0	23	25	0.999	0.000	7.476	8.475				
SUPERVISORY PERSONNEL	1	0	0	1	0.270	0.000	0.000	0.270				
ENGINEERING PERSONNEL	2	0	1	3	0.418	0.000	0.214	0.632				
TOTAL	12	0	112	124	2.667	0.000	36.733	39.400				
<u>REFUELING</u>												
MAINTENANCE PERSONNEL	4	0	30	34	0.833	0.000	7.805	8.638				
OPERATIONS PERSONNEL	11	0	35	46	3.247	0.000	17.764	21.011				
HEALTH PHYSICS PERSONNEL	1	0	7	8	0.120	0.000	0.714	0.834				
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.189	0.189				
ENGINEERING PERSONNEL	1	0	0	1	0.086	0.000	0.000	0.086				
TOTAL	17	0	73	90	4.286	0.000	26.472	30.758				
<u>TOTAL BY JOB FUNCTION</u>												
MAINTENANCE PERSONNEL	120	(104)	1	(1)	667	(567)	788	(672)	33.515	0.212	291.352	325.079
OPERATIONS PERSONNEL	91	(77)	5	(4)	145	(133)	241	(214)	22.586	0.943	48.541	72.070
HEALTH PHYSICS PERSONNEL	16	(13)	1	(1)	143	(89)	160	(103)	3.187	0.120	42.649	45.956
SUPERVISORY PERSONNEL	2	(2)	3	(2)	4	(3)	9	(7)	0.368	0.293	1.009	1.670
ENGINEERING PERSONNEL	17	(16)	16	(16)	25	(22)	58	(54)	2.665	2.295	4.136	9.096
<u>GRAND TOTALS</u>												
	246	(212)	26	(24)	984	(814)	1256	(1050)	62.321	3.863	387.687	453.871

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *COOPER STATION

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM															
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL												
REACTOR OPS & SURV																				
MAINTENANCE PERSONNEL	5	0	9	14	0.284	0.000	0.960	1.244												
OPERATIONS PERSONNEL	46	0	0	46	16.343	0.000	0.000	16.343												
HEALTH PHYSICS PERSONNEL	24	0	24	48	5.668	0.000	5.158	10.826												
SUPERVISORY PERSONNEL	7	0	1	8	2.127	0.000	0.152	2.279												
ENGINEERING PERSONNEL	13	3	13	29	4.314	0.021	2.838	7.173												
TOTAL	95	3	47	145	28.736	0.021	9.108	37.865												
ROUTINE MAINTENANCE																				
MAINTENANCE PERSONNEL	74	0	353	427	49.999	0.000	163.089	213.088												
OPERATIONS PERSONNEL	1	0	0	1	0.001	0.000	0.000	0.001												
HEALTH PHYSICS PERSONNEL	21	0	25	46	13.947	0.000	7.722	21.669												
SUPERVISORY PERSONNEL	5	0	2	7	0.776	0.000	0.541	1.317												
ENGINEERING PERSONNEL	4	25	28	57	0.129	10.454	19.799	30.382												
TOTAL	105	25	408	538	64.852	10.454	191.151	266.457												
IN-SERVICE INSPECTION																				
MAINTENANCE PERSONNEL	0	0	21	21	0.000	0.000	13.575	13.575												
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
SUPERVISORY PERSONNEL	1	0	0	1	0.002	0.000	0.000	0.002												
ENGINEERING PERSONNEL	0	0	4	4	0.000	0.000	0.778	0.778												
TOTAL	1	0	25	26	0.002	0.000	14.353	14.355												
SPECIAL MAINTENANCE																				
MAINTENANCE PERSONNEL	5	0	1	6	0.374	0.000	0.009	0.383												
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
HEALTH PHYSICS PERSONNEL	5	0	1	6	0.318	0.000	0.017	0.335												
SUPERVISORY PERSONNEL	1	0	0	1	0.037	0.000	0.000	0.037												
ENGINEERING PERSONNEL	3	0	12	15	0.074	0.000	1.039	1.113												
TOTAL	14	0	14	28	0.803	0.000	1.065	1.868												
WASTE PROCESSING																				
MAINTENANCE PERSONNEL	2	0	6	8	0.017	0.000	0.219	0.236												
OPERATIONS PERSONNEL	5	0	0	5	2.725	0.000	0.000	2.725												
HEALTH PHYSICS PERSONNEL	7	0	1	8	0.395	0.000	0.004	0.399												
SUPERVISORY PERSONNEL	1	0	0	1	0.049	0.000	0.000	0.049												
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
TOTAL	15	0	7	22	3.186	0.000	0.223	3.409												
REFUELING																				
MAINTENANCE PERSONNEL	0	0	4	4	0.000	0.000	0.576	0.576												
OPERATIONS PERSONNEL	19	0	0	19	1.261	0.000	0.000	1.261												
HEALTH PHYSICS PERSONNEL	0	0	4	4	0.000	0.000	0.720	0.720												
SUPERVISORY PERSONNEL	1	0	0	1	0.083	0.000	0.000	0.083												
ENGINEERING PERSONNEL	2	0	0	2	0.146	0.000	0.000	0.146												
TOTAL	22	0	8	30	1.490	0.000	1.296	2.786												
TOTAL BY JOB FUNCTION																				
MAINTENANCE PERSONNEL	86	(74)	0	(0)	394	(373)	480	(447)	50.674	0.000	178.428	229.102								
OPERATIONS PERSONNEL	71	(48)	0	(0)	0	(0)	71	(48)	20.330	0.000	0.000	20.330								
HEALTH PHYSICS PERSONNEL	57	(24)	0	(0)	55	(25)	112	(49)	20.328	0.000	13.621	33.949								
SUPERVISORY PERSONNEL	16	(7)	0	(0)	3	(2)	19	(9)	3.074	0.000	0.693	3.767								
ENGINEERING PERSONNEL	22	(13)	28	(25)	57	(40)	107	(78)	4.663	10.475	24.454	39.592								
GRAND TOTALS									252	(166)	28	(25)	509	(440)	789	(631)	99.069	10.475	217.196	326.740

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *CRYSTAL RIVER 3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	6	6	0.063	0.381	2.039	2.483
OPERATIONS PERSONNEL	0	3	0	3	0.000	0.642	0.000	0.642
HEALTH PHYSICS PERSONNEL	0	0	2	2	0.000	0.112	0.709	0.821
SUPERVISORY PERSONNEL	0	0	0	0	0.019	0.023	0.054	0.096
ENGINEERING PERSONNEL	1	0	0	1	0.196	0.000	0.005	0.201
TOTAL	1	3	8	12	0.278	1.158	2.807	4.243
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	74	88	114	276	27.485	27.484	40.568	95.537
OPERATIONS PERSONNEL	1	22	0	23	0.102	5.782	0.035	5.919
HEALTH PHYSICS PERSONNEL	0	33	60	93	0.000	14.796	25.985	40.781
SUPERVISORY PERSONNEL	1	5	6	12	1.700	3.832	2.444	7.976
ENGINEERING PERSONNEL	5	1	37	43	2.697	0.434	26.224	29.355
TOTAL	81	149	217	447	31.984	52.328	95.256	179.568
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	12	5	1	18	4.339	1.622	7.246	13.207
OPERATIONS PERSONNEL	0	4	0	4	0.000	1.083	0.000	1.083
HEALTH PHYSICS PERSONNEL	0	1	5	6	0.000	0.424	2.191	2.615
SUPERVISORY PERSONNEL	0	0	2	2	0.048	0.029	0.532	0.609
ENGINEERING PERSONNEL	2	0	16	18	0.689	0.007	10.982	11.678
TOTAL	14	10	24	48	5.076	3.165	20.951	29.192
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	4	1	5	0.042	0.849	0.126	1.017
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.027	0.000	0.027
HEALTH PHYSICS PERSONNEL	0	6	0	6	0.000	2.423	0.019	2.442
SUPERVISORY PERSONNEL	0	1	0	1	0.005	0.770	0.000	0.775
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.218	0.218
TOTAL	0	11	2	13	0.047	4.069	0.363	4.479
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	86	97	122	305	31.929	30.336	49.979	112.244
OPERATIONS PERSONNEL	1	29	0	30	0.102	7.534	0.035	7.671
HEALTH PHYSICS PERSONNEL	0	40	67	107	0.000	17.755	28.904	46.659
SUPERVISORY PERSONNEL	1	6	8	15	1.772	4.654	3.030	9.456
ENGINEERING PERSONNEL	8	1	54	63	3.582	0.441	37.429	41.452
GRAND TOTALS	96	173	251	520	37.385	60.720	119.377	217.482

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *DAVIS-BESSE

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	6	0	2	8	0.462	0.000	0.010	0.472
OPERATIONS PERSONNEL	2	0	0	2	0.706	0.000	0.000	0.706
HEALTH PHYSICS PERSONNEL	32	0	4	36	1.947	0.000	0.413	2.360
SUPERVISORY PERSONNEL	3	0	0	3	0.224	0.000	0.000	0.224
ENGINEERING PERSONNEL	3	0	0	3	0.177	0.000	0.000	0.177
TOTAL	46	0	6	52	3.516	0.000	0.423	3.939
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	16	0	8	24	2.249	0.000	0.310	2.559
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	38	0	5	43	4.052	0.000	0.055	4.107
SUPERVISORY PERSONNEL	4	0	0	4	0.999	0.000	0.000	0.999
ENGINEERING PERSONNEL	2	0	0	2	0.002	0.000	0.000	0.002
TOTAL	60	0	13	73	7.302	0.000	0.365	7.667
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	2.174	2.174
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.398	0.398
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	2.572	2.572
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	15	0	12	27	2.928	0.000	0.001	2.929
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	35	0	5	40	6.215	0.000	0.011	6.226
SUPERVISORY PERSONNEL	4	0	0	4	1.464	0.000	0.000	1.464
ENGINEERING PERSONNEL	3	0	0	3	0.840	0.000	0.000	0.840
TOTAL	57	0	17	74	11.447	0.000	0.012	11.459
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	1	1	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	31	0	1	32	2.792	0.000	0.000	2.792
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	31	0	2	33	2.792	0.000	0.000	2.792
REFUELING								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	37	0	23	60	5.639	0.000	2.495	8.134
OPERATIONS PERSONNEL	2	0	0	2	0.706	0.000	0.000	0.706
HEALTH PHYSICS PERSONNEL	136	0	15	151	15.006	0.000	0.877	15.883
SUPERVISORY PERSONNEL	11	0	0	11	2.687	0.000	0.000	2.687
ENGINEERING PERSONNEL	8	0	0	8	1.019	0.000	0.000	1.019
GRAND TOTALS	194	0	38	232	25.057	0.000	3.372	28.429

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *DIABLO CANYON 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	1	1	0.000	0.000	0.116	0.116
OPERATIONS PERSONNEL	14	1	0	15	1.611	0.098	0.000	1.709
HEALTH PHYSICS PERSONNEL	7	0	0	7	0.750	0.000	0.000	0.750
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	21	1	1	23	2.361	0.098	0.116	2.575
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	19	11	24	54	2.574	1.289	3.404	7.267
OPERATIONS PERSONNEL	6	0	1	7	0.692	0.000	0.215	0.907
HEALTH PHYSICS PERSONNEL	27	1	29	57	4.875	0.122	4.575	9.572
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.109	0.109
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	52	12	55	119	8.141	1.411	8.303	17.855
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	3	13	17	33	0.424	4.692	4.878	9.994
OPERATIONS PERSONNEL	5	0	0	5	1.997	0.000	0.000	1.997
HEALTH PHYSICS PERSONNEL	0	1	1	2	0.000	0.577	0.112	0.689
SUPERVISORY PERSONNEL	0	1	1	2	0.000	0.481	0.197	0.678
ENGINEERING PERSONNEL	1	1	2	4	0.543	0.105	0.344	0.992
TOTAL	9	16	21	46	2.964	5.855	5.531	14.350
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	83	39	425	547	26.912	9.526	128.470	164.908
OPERATIONS PERSONNEL	21	2	8	31	3.053	0.276	2.078	5.407
HEALTH PHYSICS PERSONNEL	33	0	90	123	12.834	0.000	37.224	50.058
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.196	0.196
ENGINEERING PERSONNEL	5	7	18	30	0.933	2.038	6.898	9.869
TOTAL	142	48	542	732	43.732	11.840	174.866	230.438
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	1	3	5	0.087	0.151	0.701	0.939
OPERATIONS PERSONNEL	1	0	0	1	0.097	0.000	0.000	0.097
HEALTH PHYSICS PERSONNEL	6	0	7	13	2.262	0.000	1.973	4.235
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	8	1	10	19	2.446	0.151	2.674	5.271
REFUELING								
MAINTENANCE PERSONNEL	50	10	166	226	18.323	2.174	45.814	66.311
OPERATIONS PERSONNEL	11	1	1	13	2.648	0.105	0.397	3.150
HEALTH PHYSICS PERSONNEL	6	0	43	49	1.477	0.000	11.644	13.121
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	5	3	9	17	0.652	0.440	3.232	4.324
TOTAL	72	14	219	305	23.100	2.719	61.087	86.906
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	156 (109)	74 (59)	636 (590)	866 (758)	48.320	17.832	183.383	249.535
OPERATIONS PERSONNEL	58 (77)	4 (4)	10 (10)	72 (91)	10.098	0.479	2.690	13.267
HEALTH PHYSICS PERSONNEL	79 (74)	2 (2)	170 (129)	251 (205)	22.198	0.699	55.528	78.425
SUPERVISORY PERSONNEL	0 (0)	1 (1)	3 (4)	4 (5)	0.000	0.481	0.502	0.983
ENGINEERING PERSONNEL	11 (13)	11 (11)	29 (33)	51 (57)	2.128	2.583	10.474	15.185
GRAND TOTALS								
	304 (273)	92 (77)	848 (766)	1244 (1116)	82.744	22.074	252.577	357.395

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *DRESDEN 2,3

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	27	1	52	80	13.812	0.594	26.281	40.687
OPERATIONS PERSONNEL	125	0	2	127	63.999	0.000	0.796	64.795
HEALTH PHYSICS PERSONNEL	34	0	1	35	17.388	0.000	0.321	17.709
SUPERVISORY PERSONNEL	32	0	0	32	16.156	0.000	0.000	16.156
ENGINEERING PERSONNEL	20	2	6	28	10.349	1.031	2.872	14.252
TOTAL	238	3	61	302	121.704	1.625	30.270	153.599
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	386	3	682	1071	194.268	1.410	342.896	538.574
OPERATIONS PERSONNEL	84	0	18	102	41.886	0.000	10.657	52.543
HEALTH PHYSICS PERSONNEL	73	0	29	102	36.673	0.000	15.040	51.713
SUPERVISORY PERSONNEL	79	0	0	79	39.524	0.000	0.000	39.524
ENGINEERING PERSONNEL	29	2	237	268	15.161	1.441	119.856	136.458
TOTAL	651	5	966	1622	327.512	2.851	488.449	818.812
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	83	84	0.203	0.000	41.958	42.161
OPERATIONS PERSONNEL	1	0	1	2	0.441	0.000	0.007	0.448
HEALTH PHYSICS PERSONNEL	2	0	1	3	0.921	0.000	0.270	1.191
SUPERVISORY PERSONNEL	1	0	0	1	0.171	0.000	0.000	0.171
ENGINEERING PERSONNEL	2	1	34	37	0.995	0.755	17.235	18.985
TOTAL	7	1	119	127	2.731	0.755	59.470	62.956
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	2	7	81	90	0.928	3.548	41.035	45.511
OPERATIONS PERSONNEL	1	0	1	2	0.044	0.000	0.294	0.338
HEALTH PHYSICS PERSONNEL	2	0	2	4	1.036	0.000	1.268	2.304
SUPERVISORY PERSONNEL	1	0	0	1	0.708	0.000	0.000	0.708
ENGINEERING PERSONNEL	1	1	22	24	0.215	0.208	11.188	11.611
TOTAL	7	8	106	121	2.931	3.756	53.785	60.472
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	17	17	0.000	0.000	8.760	8.760
OPERATIONS PERSONNEL	1	0	1	2	0.552	0.000	0.477	1.029
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.633	0.000	0.000	0.633
SUPERVISORY PERSONNEL	1	0	0	1	0.106	0.000	0.000	0.106
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	3	0	18	21	1.291	0.000	9.237	10.528
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	34	0	2	36	17.208	0.000	0.138	17.346
OPERATIONS PERSONNEL	7	0	1	8	3.421	0.000	0.005	3.426
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.921	0.000	0.000	0.921
SUPERVISORY PERSONNEL	4	0	0	4	2.300	0.000	0.000	2.300
ENGINEERING PERSONNEL	1	1	1	3	0.161	0.012	0.030	0.203
TOTAL	48	1	4	53	24.011	0.012	0.173	24.196
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	450	11	917	1378	226.419	5.552	461.068	693.039
OPERATIONS PERSONNEL	219	0	24	243	110.343	0.000	12.236	122.579
HEALTH PHYSICS PERSONNEL	114	0	33	147	57.572	0.000	16.899	74.471
SUPERVISORY PERSONNEL	118	0	0	118	58.965	0.000	0.000	58.965
ENGINEERING PERSONNEL	53	7	300	360	26.881	3.447	151.181	181.509
GRAND TOTALS	954	18	1274	2246	480.180	8.999	641.384	1130.563

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *DUANE ARNOLD

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	8	0	7	15	6.932	0.000	2.918	9.850
OPERATIONS PERSONNEL	22	0	1	23	22.709	0.000	0.114	22.823
HEALTH PHYSICS PERSONNEL	6	0	1	7	4.789	0.000	0.386	5.175
SUPERVISORY PERSONNEL	3	0	2	5	0.667	0.000	0.178	0.845
ENGINEERING PERSONNEL	10	0	2	12	4.034	0.000	0.883	4.917
TOTAL	49	0	13	62	39.131	0.000	4.479	43.610
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	61	1	28	90	42.240	0.177	19.094	61.511
OPERATIONS PERSONNEL	3	0	0	3	1.484	0.000	0.093	1.577
HEALTH PHYSICS PERSONNEL	13	0	2	15	11.449	0.000	1.076	12.525
SUPERVISORY PERSONNEL	2	0	1	3	0.756	0.000	0.081	0.837
ENGINEERING PERSONNEL	10	0	2	12	4.035	0.000	0.355	4.390
TOTAL	89	1	33	123	59.964	0.177	20.699	80.840
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.021	0.000	0.120	0.141
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.017	0.000	0.000	0.017
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.042	0.000	0.000	0.042
TOTAL	0	0	1	1	0.080	0.000	0.120	0.200
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	7	0	22	29	5.789	0.000	16.672	22.461
OPERATIONS PERSONNEL	0	0	0	0	0.234	0.000	0.008	0.242
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.886	0.000	0.242	2.128
SUPERVISORY PERSONNEL	1	0	0	1	0.300	0.000	0.042	0.342
ENGINEERING PERSONNEL	7	0	2	9	4.012	0.000	0.963	4.975
TOTAL	17	0	25	42	12.221	0.000	17.927	30.148
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	7	1	5	13	3.835	1.258	5.872	10.965
OPERATIONS PERSONNEL	5	0	2	7	1.827	0.000	1.273	3.100
HEALTH PHYSICS PERSONNEL	4	0	3	7	2.903	0.000	1.292	4.195
SUPERVISORY PERSONNEL	0	0	2	2	0.098	0.000	0.186	0.284
ENGINEERING PERSONNEL	1	0	0	1	0.349	0.000	0.000	0.349
TOTAL	17	1	12	30	9.012	1.258	8.623	18.893
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	83	2	63	148	58.817	1.435	44.676	104.928
OPERATIONS PERSONNEL	30	0	3	33	26.254	0.000	1.488	27.742
HEALTH PHYSICS PERSONNEL	25	0	7	32	21.044	0.000	2.996	24.040
SUPERVISORY PERSONNEL	6	0	5	11	1.821	0.000	0.487	2.308
ENGINEERING PERSONNEL	28	0	6	34	12.472	0.000	2.201	14.673
GRAND TOTALS	172	2	84	258	120.408	1.435	51.848	173.691

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *FARLEY 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	75	1	17	93	1.580	0.020	0.340	1.940
OPERATIONS PERSONNEL	185	0	7	192	28.320	0.000	0.110	28.430
HEALTH PHYSICS PERSONNEL	86	0	157	243	12.120	0.000	35.690	47.810
SUPERVISORY PERSONNEL	46	19	13	78	1.370	0.370	0.370	2.110
ENGINEERING PERSONNEL	48	9	122	179	1.440	0.300	5.790	7.530
TOTAL	440	29	316	785	44.830	0.690	42.300	87.820
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	209	9	52	270	30.890	0.570	5.420	36.880
OPERATIONS PERSONNEL	75	0	60	135	17.080	0.000	3.710	20.790
HEALTH PHYSICS PERSONNEL	32	0	58	90	3.940	0.000	1.720	5.660
SUPERVISORY PERSONNEL	8	9	1	18	0.250	0.080	0.020	0.350
ENGINEERING PERSONNEL	18	5	299	322	0.180	0.100	23.040	23.320
TOTAL	342	23	470	835	52.340	0.750	33.910	87.000
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	33	0	15	48	0.500	0.000	1.920	2.420
OPERATIONS PERSONNEL	10	0	3	13	0.160	0.000	0.150	0.310
HEALTH PHYSICS PERSONNEL	8	0	15	23	0.200	0.000	0.430	0.630
SUPERVISORY PERSONNEL	2	3	2	7	0.010	0.270	0.790	1.070
ENGINEERING PERSONNEL	15	0	225	240	1.350	0.000	68.090	69.440
TOTAL	68	3	260	331	2.220	0.270	71.380	73.870
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	207	9	127	343	81.500	0.310	29.620	111.430
OPERATIONS PERSONNEL	86	0	24	110	8.600	0.000	2.780	11.380
HEALTH PHYSICS PERSONNEL	45	0	115	160	10.770	0.000	21.560	32.330
SUPERVISORY PERSONNEL	13	15	8	36	0.730	1.590	1.170	3.490
ENGINEERING PERSONNEL	31	15	905	951	1.770	0.850	304.620	307.240
TOTAL	382	39	1179	1600	103.370	2.750	359.750	465.870
WASTE PROCESSING								
MAINTENANCE PERSONNEL	24	1	0	25	0.450	0.020	0.000	0.470
OPERATIONS PERSONNEL	39	0	3	42	3.310	0.000	0.030	3.340
HEALTH PHYSICS PERSONNEL	23	0	17	40	1.780	0.000	1.530	3.310
SUPERVISORY PERSONNEL	2	0	0	2	0.210	0.000	0.000	0.210
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.010	0.010
TOTAL	88	1	21	110	5.750	0.020	1.570	7.340
REFUELING								
MAINTENANCE PERSONNEL	87	7	8	102	18.250	0.110	0.530	18.890
OPERATIONS PERSONNEL	35	0	34	69	0.700	0.000	4.370	5.070
HEALTH PHYSICS PERSONNEL	11	0	21	32	0.460	0.000	0.540	1.000
SUPERVISORY PERSONNEL	12	3	0	15	0.190	0.020	0.000	0.210
ENGINEERING PERSONNEL	9	0	27	36	0.250	0.000	1.260	1.510
TOTAL	154	10	90	254	19.850	0.130	6.700	26.680
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	635	27	219	881	133.170	1.030	37.830	172.030
OPERATIONS PERSONNEL	430	0	131	561	58.170	0.000	11.150	69.320
HEALTH PHYSICS PERSONNEL	205	0	383	588	29.270	0.000	61.470	90.740
SUPERVISORY PERSONNEL	83	49	24	156	2.760	2.330	2.350	7.440
ENGINEERING PERSONNEL	121	29	1579	1729	4.990	1.250	402.810	409.050
GRAND TOTALS	1474	105	2336	3915	228.360	4.610	515.610	748.580

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *FERMI 2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
<u>REACTOR OPS & SURV</u>												
MAINTENANCE PERSONNEL	1	0	1	2	1.002	0.012	1.574	2.588				
OPERATIONS PERSONNEL	48	0	2	50	13.954	0.000	0.951	14.905				
HEALTH PHYSICS PERSONNEL	22	0	14	36	6.423	0.000	3.183	9.606				
SUPERVISORY PERSONNEL	2	0	1	3	1.014	0.061	0.878	1.953				
ENGINEERING PERSONNEL	4	0	3	7	1.682	0.026	1.242	2.950				
TOTAL	77	0	21	98	24.075	0.099	7.828	32.002				
<u>ROUTINE MAINTENANCE</u>												
MAINTENANCE PERSONNEL	35	1	13	49	8.256	0.108	6.351	14.715				
OPERATIONS PERSONNEL	3	0	0	3	0.587	0.000	0.032	0.619				
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.034	0.000	0.841	0.875				
SUPERVISORY PERSONNEL	1	0	0	1	0.299	0.000	0.413	0.712				
ENGINEERING PERSONNEL	0	0	0	0	0.137	0.002	0.008	0.147				
TOTAL	39	1	16	56	9.313	0.110	7.645	17.068				
<u>IN-SERVICE INSPECTION</u>												
MAINTENANCE PERSONNEL	1	0	68	69	0.278	0.000	22.351	22.629				
OPERATIONS PERSONNEL	5	0	0	5	2.976	0.000	0.000	2.976				
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.100	0.000	0.117	0.217				
SUPERVISORY PERSONNEL	2	0	11	13	0.663	0.000	5.867	6.530				
ENGINEERING PERSONNEL	1	0	21	22	0.422	0.000	11.966	12.388				
TOTAL	9	0	100	109	4.439	0.000	40.301	44.740				
<u>SPECIAL MAINTENANCE</u>												
MAINTENANCE PERSONNEL	48	0	223	271	19.770	0.004	75.234	95.008				
OPERATIONS PERSONNEL	1	0	0	1	0.277	0.000	0.017	0.294				
HEALTH PHYSICS PERSONNEL	5	0	12	17	1.454	0.000	3.713	5.167				
SUPERVISORY PERSONNEL	4	0	16	20	1.132	0.004	3.234	4.370				
ENGINEERING PERSONNEL	2	0	3	5	0.598	0.008	0.493	1.099				
TOTAL	60	0	254	314	23.231	0.016	82.691	105.938				
<u>WASTE PROCESSING</u>												
MAINTENANCE PERSONNEL	0	0	2	2	0.014	0.000	0.417	0.431				
OPERATIONS PERSONNEL	0	0	2	2	0.049	0.000	0.658	0.707				
HEALTH PHYSICS PERSONNEL	6	0	23	29	1.322	0.000	6.468	7.790				
SUPERVISORY PERSONNEL	0	0	0	0	0.073	0.000	0.000	0.073				
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.004	0.004				
TOTAL	6	0	27	33	1.458	0.000	7.547	9.005				
<u>REFUELING</u>												
MAINTENANCE PERSONNEL	0	0	27	27	0.049	0.000	7.343	7.392				
OPERATIONS PERSONNEL	3	0	1	4	0.629	0.000	0.129	0.758				
HEALTH PHYSICS PERSONNEL	12	0	41	53	2.764	0.000	12.354	15.118				
SUPERVISORY PERSONNEL	3	0	0	3	0.814	0.000	0.008	0.822				
ENGINEERING PERSONNEL	1	0	1	2	0.316	0.000	0.499	0.815				
TOTAL	19	0	70	89	4.572	0.000	20.333	24.905				
<u>TOTAL BY JOB FUNCTION</u>												
MAINTENANCE PERSONNEL	85	(70)	1	(1)	334	(298)	420	(369)	29.369	0.124	113.270	142.763
OPERATIONS PERSONNEL	60	(55)	0	(0)	5	(4)	65	(59)	18.472	0.000	1.787	20.259
HEALTH PHYSICS PERSONNEL	45	(29)	0	(0)	93	(75)	138	(104)	12.097	0.000	26.676	38.773
SUPERVISORY PERSONNEL	12	(10)	0	(0)	28	(21)	40	(31)	3.995	0.065	10.400	14.460
ENGINEERING PERSONNEL	8	(5)	0	(0)	28	(27)	36	(32)	3.155	0.036	14.212	17.403
<u>GRAND TOTALS</u>												
210 (169) 1 (1) 488 (425) 699 (595) 67.088 0.225 166.345 233.658												

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *FITZPATRICK

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	87	3	16	106	8.362	0.040	0.398	8.800
OPERATIONS PERSONNEL	110	11	2	123	27.976	0.000	0.110	28.086
HEALTH PHYSICS PERSONNEL	43	9	44	96	9.276	0.000	4.367	13.643
SUPERVISORY PERSONNEL	19	8	20	47	0.519	0.331	0.299	1.149
ENGINEERING PERSONNEL	21	8	15	44	2.029	0.063	0.496	2.588
TOTAL	280	39	97	416	48.162	0.434	5.670	54.266
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	128	21	194	343	52.890	0.080	32.577	85.547
OPERATIONS PERSONNEL	88	13	8	109	4.736	0.000	0.215	4.951
HEALTH PHYSICS PERSONNEL	43	9	56	108	14.445	0.000	14.481	28.926
SUPERVISORY PERSONNEL	19	6	26	51	0.932	0.351	1.577	2.860
ENGINEERING PERSONNEL	25	10	29	64	0.659	0.713	0.551	1.923
TOTAL	303	59	313	675	73.662	1.144	49.401	124.207
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	64	7	125	196	5.443	0.370	34.591	40.404
OPERATIONS PERSONNEL	24	8	6	38	0.690	0.200	0.692	1.582
HEALTH PHYSICS PERSONNEL	21	4	29	54	1.311	0.000	3.699	5.010
SUPERVISORY PERSONNEL	15	11	33	59	1.766	0.399	5.025	7.190
ENGINEERING PERSONNEL	24	14	30	68	1.756	1.151	3.097	6.004
TOTAL	148	44	223	415	10.966	2.120	47.104	60.190
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	66	4	154	224	1.860	0.000	48.793	50.653
OPERATIONS PERSONNEL	8	3	3	14	0.242	0.000	0.238	0.480
HEALTH PHYSICS PERSONNEL	16	3	22	41	2.034	0.000	1.344	3.378
SUPERVISORY PERSONNEL	10	8	18	36	0.392	0.414	4.570	5.376
ENGINEERING PERSONNEL	21	9	23	53	1.278	0.178	1.880	3.336
TOTAL	121	27	220	368	5.806	0.592	56.825	63.223
WASTE PROCESSING								
MAINTENANCE PERSONNEL	99	48	93	240	17.883	0.010	3.430	21.323
OPERATIONS PERSONNEL	36	7	15	58	8.653	0.000	12.873	21.526
HEALTH PHYSICS PERSONNEL	33	8	43	84	4.309	0.260	3.977	8.546
SUPERVISORY PERSONNEL	8	5	12	25	0.061	0.025	0.412	0.498
ENGINEERING PERSONNEL	4	2	6	12	0.138	0.015	0.085	0.238
TOTAL	180	70	169	419	31.044	0.310	20.777	52.131
REFUELING								
MAINTENANCE PERSONNEL	6	0	0	6	0.049	0.000	0.000	0.049
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	2	0	4	6	0.239	0.000	0.202	0.441
SUPERVISORY PERSONNEL	0	0	2	2	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	1	0	0	1	0.000	0.000	0.000	0.000
TOTAL	9	0	6	15	0.288	0.000	0.202	0.490
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	450	83	582	1115	86.487	0.500	119.789	206.776
OPERATIONS PERSONNEL	266	42	34	342	42.297	0.200	14.128	56.625
HEALTH PHYSICS PERSONNEL	158	33	198	389	31.614	0.260	28.070	59.944
SUPERVISORY PERSONNEL	71	38	111	220	3.670	1.520	11.883	17.073
ENGINEERING PERSONNEL	96	43	103	242	5.860	2.120	6.109	14.089
GRAND TOTALS	1041	239	1028	2308	169.928	4.600	179.979	354.507

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *FORT CALHOUN

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	4	4	0.550	0.325	1.673	2.548
OPERATIONS PERSONNEL	20	0	5	25	9.005	0.030	2.438	11.473
HEALTH PHYSICS PERSONNEL	24	0	14	38	11.629	0.000	5.971	17.600
SUPERVISORY PERSONNEL	2	0	0	2	0.981	0.100	0.031	1.112
ENGINEERING PERSONNEL	6	0	20	26	2.698	0.303	8.608	11.609
TOTAL	52	0	43	95	24.863	0.758	18.721	44.342
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	25	4	23	52	8.756	1.259	16.734	26.749
OPERATIONS PERSONNEL	0	0	0	0	0.190	0.000	0.000	0.190
HEALTH PHYSICS PERSONNEL	4	0	15	19	1.260	0.000	5.079	6.339
SUPERVISORY PERSONNEL	0	0	0	0	0.052	0.030	0.002	0.084
ENGINEERING PERSONNEL	3	1	2	6	1.172	0.254	1.027	2.453
TOTAL	32	5	40	77	11.430	1.543	22.842	35.815
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	11	11	0.060	0.000	3.805	3.865
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.030	0.031	0.005	0.066
TOTAL	0	0	11	11	0.090	0.031	3.810	3.931
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	33	1	46	80	9.005	1.037	16.403	26.445
OPERATIONS PERSONNEL	2	0	0	2	0.793	0.000	0.010	0.803
HEALTH PHYSICS PERSONNEL	7	0	10	17	2.488	0.000	2.471	4.959
SUPERVISORY PERSONNEL	1	0	0	1	0.231	0.065	0.000	0.296
ENGINEERING PERSONNEL	4	1	5	10	1.251	0.294	1.364	2.909
TOTAL	47	2	61	110	13.768	1.396	20.248	35.412
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.234	0.135	0.040	0.409
OPERATIONS PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010
HEALTH PHYSICS PERSONNEL	9	0	13	22	2.355	0.000	4.640	6.995
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
ENGINEERING PERSONNEL	0	0	0	0	0.010	0.000	0.080	0.090
TOTAL	9	0	13	22	2.614	0.135	4.760	7.509
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	7	10	4	21	1.881	2.367	1.325	5.573
OPERATIONS PERSONNEL	0	0	0	0	0.035	0.000	0.000	0.035
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.050	0.000	0.055
ENGINEERING PERSONNEL	1	0	1	2	0.215	0.005	0.240	0.460
TOTAL	8	10	5	23	2.141	2.422	1.565	6.128
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	65	15	88	168	20.486	5.123	39.980	65.589
OPERATIONS PERSONNEL	22	0	5	27	10.033	0.030	2.448	12.511
HEALTH PHYSICS PERSONNEL	44	0	52	96	17.737	0.000	18.161	35.898
SUPERVISORY PERSONNEL	3	0	0	3	1.274	0.245	0.033	1.552
ENGINEERING PERSONNEL	14	2	28	44	5.376	0.887	11.324	17.587
GRAND TOTALS	148	17	173	338	54.906	6.285	71.946	133.137

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *FORT ST. VRAIN

TYPE: HTGR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.361	0.000	0.000	0.361
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	2	0	0	2	0.361	0.000	0.000	0.361
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	4	0	0	4	0.780	0.000	0.000	0.780
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	4	0	0	4	0.780	0.000	0.000	0.780
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	4	0	0	4	0.780	0.000	0.000	0.780
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.361	0.000	0.000	0.361
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
GRAND TOTALS	6	0	0	6	1.141	0.000	0.000	1.141

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *GINNA

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
<u>REACTOR OPS & SURV</u>												
MAINTENANCE PERSONNEL	223	42	135	400	2.887	4.371	1.620	8.878				
OPERATIONS PERSONNEL	2	31	0	33	0.189	13.822	0.000	14.011				
HEALTH PHYSICS PERSONNEL	54	14	3	71	27.899	5.480	0.530	33.909				
SUPERVISORY PERSONNEL	63	14	16	93	3.173	2.758	0.740	6.671				
ENGINEERING PERSONNEL	31	1	5	37	2.731	0.155	0.252	3.138				
TOTAL	373	102	159	634	36.879	26.586	3.142	66.607				
<u>ROUTINE MAINTENANCE</u>												
MAINTENANCE PERSONNEL	354	42	191	587	81.110	13.075	39.674	133.859				
OPERATIONS PERSONNEL	1	30	0	31	0.020	1.952	0.000	1.972				
HEALTH PHYSICS PERSONNEL	30	14	3	47	10.920	2.659	0.577	14.156				
SUPERVISORY PERSONNEL	77	13	16	106	11.758	1.876	5.249	18.883				
ENGINEERING PERSONNEL	28	1	5	34	2.263	0.007	0.479	2.749				
TOTAL	490	100	215	805	106.071	19.569	45.979	171.619				
<u>IN-SERVICE INSPECTION</u>												
MAINTENANCE PERSONNEL	99	22	55	176	10.808	0.738	5.311	16.857				
OPERATIONS PERSONNEL	1	14	0	15	0.085	0.455	0.000	0.540				
HEALTH PHYSICS PERSONNEL	14	4	1	19	0.287	0.803	0.000	1.090				
SUPERVISORY PERSONNEL	33	9	10	52	2.884	0.900	1.139	4.923				
ENGINEERING PERSONNEL	14	0	3	17	0.907	0.000	0.183	1.090				
TOTAL	161	49	69	279	14.971	2.896	6.633	24.500				
<u>SPECIAL MAINTENANCE</u>												
MAINTENANCE PERSONNEL	331	42	187	560	193.916	12.054	130.481	336.451				
OPERATIONS PERSONNEL	0	27	0	27	0.000	1.432	0.000	1.432				
HEALTH PHYSICS PERSONNEL	47	11	2	60	7.535	1.828	0.267	9.630				
SUPERVISORY PERSONNEL	73	13	14	100	27.198	2.610	5.711	35.519				
ENGINEERING PERSONNEL	29	1	4	34	12.402	0.005	0.210	12.617				
TOTAL	480	94	207	781	241.051	17.929	136.669	395.649				
<u>WASTE PROCESSING</u>												
MAINTENANCE PERSONNEL	80	20	24	124	8.026	0.911	0.772	9.709				
OPERATIONS PERSONNEL	0	13	0	13	0.000	0.265	0.000	0.265				
HEALTH PHYSICS PERSONNEL	27	12	2	41	5.763	0.705	0.760	7.228				
SUPERVISORY PERSONNEL	10	3	2	15	0.030	0.045	0.000	0.075				
ENGINEERING PERSONNEL	5	0	1	6	0.000	0.000	0.010	0.010				
TOTAL	122	48	29	199	13.819	1.926	1.542	17.287				
<u>REFUELING</u>												
MAINTENANCE PERSONNEL	64	27	34	125	14.235	1.135	4.528	19.898				
OPERATIONS PERSONNEL	0	7	0	7	0.000	1.953	0.000	1.953				
HEALTH PHYSICS PERSONNEL	8	6	0	14	1.310	1.746	0.000	3.056				
SUPERVISORY PERSONNEL	16	3	5	24	1.490	0.040	0.595	2.125				
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.835	0.835				
TOTAL	88	43	40	171	17.035	4.874	5.958	27.867				
<u>TOTAL BY JOB FUNCTION</u>												
MAINTENANCE PERSONNEL	1151	(359)	195	(42)	626	(191)	1972	(592)	310.982	32.284	182.386	525.652
OPERATIONS PERSONNEL	4	(2)	122	(31)	0	(0)	126	(33)	0.294	19.879	0.000	20.173
HEALTH PHYSICS PERSONNEL	180	(55)	61	(14)	11	(3)	252	(72)	53.714	13.221	2.134	69.069
SUPERVISORY PERSONNEL	272	(82)	55	(16)	63	(17)	390	(115)	46.533	8.229	13.434	68.196
ENGINEERING PERSONNEL	107	(31)	3	(1)	19	(5)	129	(37)	18.303	0.167	1.969	20.439
<u>GRAND TOTALS</u>												
	1714	(529)	436	(104)	719	(216)	2869	(849)	429.826	73.780	199.923	703.529

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *GRAND GULF

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	7	0	2	9	5.707	0.000	5.936	11.643
OPERATIONS PERSONNEL	55	0	2	57	29.150	0.000	0.744	29.894
HEALTH PHYSICS PERSONNEL	42	0	35	77	30.464	0.000	16.405	46.869
SUPERVISORY PERSONNEL	3	0	1	4	0.540	0.000	0.969	1.509
ENGINEERING PERSONNEL	1	0	2	3	0.753	0.000	0.576	1.329
TOTAL	108	0	42	150	66.614	0.000	24.630	91.244
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	129	0	374	503	72.473	0.000	168.658	241.131
OPERATIONS PERSONNEL	1	0	8	9	0.336	0.000	2.736	3.072
HEALTH PHYSICS PERSONNEL	16	0	17	33	8.438	0.000	8.012	16.450
SUPERVISORY PERSONNEL	1	0	10	11	0.174	0.000	3.274	3.448
ENGINEERING PERSONNEL	2	0	4	6	1.204	0.000	1.553	2.557
TOTAL	149	0	413	562	82.625	0.000	184.033	266.658
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	33	33	0.251	0.000	9.988	10.239
OPERATIONS PERSONNEL	11	0	3	14	3.831	0.000	1.062	4.893
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.005	0.005
SUPERVISORY PERSONNEL	5	0	76	81	1.991	0.000	42.067	44.058
ENGINEERING PERSONNEL	0	0	3	3	0.000	0.000	1.637	1.637
TOTAL	16	0	115	131	6.073	0.000	54.759	60.832
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	4	0	108	112	1.792	0.000	33.429	35.221
OPERATIONS PERSONNEL	2	0	1	3	0.368	0.000	0.265	0.633
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.090	0.000	0.169	0.259
SUPERVISORY PERSONNEL	0	0	0	0	0.045	0.000	0.447	0.492
ENGINEERING PERSONNEL	3	0	6	9	0.370	0.000	1.668	2.038
TOTAL	9	0	116	125	2.665	0.000	35.978	38.643
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	11	0	9	20	2.875	0.000	4.009	6.884
OPERATIONS PERSONNEL	0	0	1	1	0.040	0.000	1.055	1.095
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.065	0.000	0.045	0.110
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.030	0.030
TOTAL	11	0	10	21	2.980	0.000	5.139	8.119
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	34	34	0.235	0.000	10.171	10.406
OPERATIONS PERSONNEL	0	0	28	28	0.197	0.000	10.485	10.682
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	1	0	1	2	0.201	0.000	0.125	0.326
ENGINEERING PERSONNEL	1	0	2	3	0.340	0.000	1.224	1.564
TOTAL	2	0	65	67	0.973	0.000	22.005	22.978
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	151	0	560	711	83.333	0.000	232.191	315.524
OPERATIONS PERSONNEL	69	0	43	112	33.922	0.000	16.347	50.269
HEALTH PHYSICS PERSONNEL	58	0	53	111	39.057	0.000	24.636	63.693
SUPERVISORY PERSONNEL	10	0	88	98	2.951	0.000	46.882	49.833
ENGINEERING PERSONNEL	7	0	17	24	2.667	0.000	6.488	9.155
GRAND TOTALS	295	0	761	1056	161.930	0.000	326.544	488.474

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *HADDAM NECK

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	6	1	5	12	2.230	0.750	2.520	5.500
OPERATIONS PERSONNEL	32	1	0	33	20.520	0.400	0.430	21.350
HEALTH PHYSICS PERSONNEL	18	0	64	82	8.820	0.080	27.960	36.860
SUPERVISORY PERSONNEL	1	0	0	1	0.410	0.000	0.000	0.410
ENGINEERING PERSONNEL	1	3	6	10	0.770	1.720	1.880	4.370
TOTAL	58	5	75	138	32.750	2.950	32.790	68.490
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	49	9	116	174	32.970	3.650	54.450	91.070
OPERATIONS PERSONNEL	1	0	1	2	1.050	0.010	0.210	1.270
HEALTH PHYSICS PERSONNEL	16	1	26	43	4.390	0.120	8.500	13.010
SUPERVISORY PERSONNEL	0	0	0	0	0.020	0.000	0.000	0.020
ENGINEERING PERSONNEL	2	2	18	22	0.610	1.360	7.370	9.340
TOTAL	68	12	161	241	39.040	5.140	70.530	114.710
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	6	1	130	137	5.310	0.860	95.450	101.620
OPERATIONS PERSONNEL	1	0	0	1	0.150	0.000	0.020	0.170
HEALTH PHYSICS PERSONNEL	1	0	32	33	0.890	0.000	25.270	26.160
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	4	3	115	122	1.030	0.940	126.830	128.800
TOTAL	12	4	277	293	7.380	1.800	247.570	256.750
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	5	39	116	160	2.210	18.450	57.650	78.310
OPERATIONS PERSONNEL	0	0	0	0	0.060	0.070	0.080	0.210
HEALTH PHYSICS PERSONNEL	1	0	4	5	0.330	0.000	1.310	1.640
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	5	36	41	0.090	1.540	9.840	11.470
TOTAL	6	44	156	206	2.690	20.060	68.880	91.630
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.100	0.000	0.520	0.620
OPERATIONS PERSONNEL	1	0	0	1	0.280	0.000	0.000	0.280
HEALTH PHYSICS PERSONNEL	11	0	51	62	7.950	0.100	25.610	33.660
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.020	0.040	0.060
TOTAL	12	0	52	64	8.330	0.120	26.170	34.620
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	10	2	32	44	3.170	0.340	15.680	19.190
OPERATIONS PERSONNEL	0	0	0	0	0.360	0.000	0.010	0.370
HEALTH PHYSICS PERSONNEL	1	0	3	4	0.290	0.000	1.180	1.470
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	25	25	0.070	0.110	12.260	12.440
TOTAL	11	2	60	73	3.890	0.450	29.130	33.470
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	76	52	400	528	45.990	24.050	226.270	296.310
OPERATIONS PERSONNEL	35	1	1	37	22.420	0.480	0.750	23.650
HEALTH PHYSICS PERSONNEL	48	1	180	229	22.670	0.300	89.830	112.800
SUPERVISORY PERSONNEL	1	0	0	1	0.430	0.000	0.000	0.430
ENGINEERING PERSONNEL	7	13	200	220	2.570	5.690	158.220	166.480
GRAND TOTALS	167	67	781	1015	94.080	30.520	475.070	599.670

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *HARRIS

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	0	8	9	0.512	0.000	3.604	4.116
OPERATIONS PERSONNEL	32	0	8	40	8.818	0.000	3.483	12.301
HEALTH PHYSICS PERSONNEL	24	0	34	58	10.234	0.000	10.687	20.921
SUPERVISORY PERSONNEL	0	0	0	0	0.125	0.000	0.000	0.125
ENGINEERING PERSONNEL	1	0	0	1	0.454	0.000	0.143	0.597
TOTAL	58	0	50	108	20.143	0.000	17.917	38.060
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	13	7	5	25	4.538	2.452	4.478	11.468
OPERATIONS PERSONNEL	0	0	0	0	0.215	0.000	0.035	0.250
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.294	0.000	0.579	0.873
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	1	0	2	3	0.315	0.000	0.649	0.964
TOTAL	14	7	8	29	5.362	2.452	5.741	13.555
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	6	0	12	18	3.627	0.010	4.435	8.072
OPERATIONS PERSONNEL	1	0	1	2	0.345	0.000	0.430	0.775
HEALTH PHYSICS PERSONNEL	2	0	2	4	0.860	0.000	0.460	1.320
SUPERVISORY PERSONNEL	0	0	0	0	0.135	0.000	0.011	0.146
ENGINEERING PERSONNEL	3	0	6	9	1.922	0.002	3.849	5.773
TOTAL	12	0	21	33	6.889	0.012	9.185	16.086
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	6	0	13	19	2.814	0.528	4.084	7.426
OPERATIONS PERSONNEL	0	0	0	0	0.081	0.000	0.070	0.151
HEALTH PHYSICS PERSONNEL	2	0	5	7	0.974	0.000	1.332	2.306
SUPERVISORY PERSONNEL	0	0	0	0	0.001	0.000	0.000	0.001
ENGINEERING PERSONNEL	1	1	12	14	0.453	0.185	6.194	6.832
TOTAL	9	1	30	40	4.323	0.713	11.680	16.716
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.000	0.000	0.350	0.350
OPERATIONS PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.165	0.000	0.040	0.205
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	1	1	0.000	0.000	0.445	0.445
TOTAL	1	0	2	3	0.175	0.000	0.835	1.010
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	45	11	79	135	28.845	7.191	38.791	74.827
OPERATIONS PERSONNEL	0	0	0	0	1.025	0.000	0.380	1.405
HEALTH PHYSICS PERSONNEL	8	0	20	28	2.320	0.000	6.297	8.617
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.315	0.315
ENGINEERING PERSONNEL	13	0	20	33	5.888	0.078	10.730	16.696
TOTAL	66	11	119	196	38.078	7.269	56.513	101.860
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	71	18	118	207	40.336	10.181	55.742	106.259
OPERATIONS PERSONNEL	33	0	9	42	10.494	0.000	4.398	14.892
HEALTH PHYSICS PERSONNEL	37	0	62	99	14.847	0.000	19.395	34.242
SUPERVISORY PERSONNEL	0	0	0	0	0.261	0.000	0.326	0.587
ENGINEERING PERSONNEL	19	1	41	61	9.032	0.265	22.010	31.307
GRAND TOTALS	160	19	230	409	74.970	10.446	101.871	187.287

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *HATCH 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	85	3	130	218	32.573	0.778	59.588	92.939
OPERATIONS PERSONNEL	53	0	1	54	20.150	0.040	0.581	20.771
HEALTH PHYSICS PERSONNEL	47	1	33	81	26.348	0.177	16.185	42.710
SUPERVISORY PERSONNEL	23	0	6	29	11.233	0.413	2.860	14.506
ENGINEERING PERSONNEL	20	1	10	31	8.364	0.397	5.218	13.979
TOTAL	228	5	180	413	98.668	1.805	84.432	184.905
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	114	0	141	255	41.825	0.126	57.029	98.980
OPERATIONS PERSONNEL	22	0	0	22	9.389	0.000	0.000	9.389
HEALTH PHYSICS PERSONNEL	33	0	33	66	18.329	0.000	21.144	39.473
SUPERVISORY PERSONNEL	11	0	6	17	4.660	0.419	2.127	7.206
ENGINEERING PERSONNEL	9	0	21	30	3.384	0.186	7.379	10.949
TOTAL	189	0	201	390	77.587	0.731	87.679	165.997
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	16	0	83	99	6.316	0.083	33.651	40.050
OPERATIONS PERSONNEL	0	0	0	0	0.528	0.000	0.000	0.528
HEALTH PHYSICS PERSONNEL	13	0	5	18	6.600	0.000	1.655	8.255
SUPERVISORY PERSONNEL	1	0	1	2	0.612	0.231	0.559	1.402
ENGINEERING PERSONNEL	2	1	11	14	0.677	0.186	3.922	4.785
TOTAL	32	1	100	133	14.733	0.500	39.787	55.020
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	105	1	227	333	44.081	0.526	89.630	134.237
OPERATIONS PERSONNEL	41	0	0	41	15.271	0.000	0.000	15.271
HEALTH PHYSICS PERSONNEL	29	1	34	64	15.158	0.877	18.331	34.366
SUPERVISORY PERSONNEL	8	2	6	16	3.024	1.208	1.412	5.644
ENGINEERING PERSONNEL	8	0	16	24	3.001	0.041	5.193	8.235
TOTAL	191	4	283	478	80.535	2.652	114.566	197.753
WASTE PROCESSING								
MAINTENANCE PERSONNEL	20	0	32	52	5.965	0.083	13.782	19.830
OPERATIONS PERSONNEL	4	0	0	4	2.148	0.000	0.000	2.148
HEALTH PHYSICS PERSONNEL	9	0	6	15	4.821	0.000	2.539	7.360
SUPERVISORY PERSONNEL	0	0	0	0	0.354	0.231	0.189	0.774
ENGINEERING PERSONNEL	0	0	0	0	0.135	0.000	0.354	0.489
TOTAL	33	0	38	71	13.423	0.314	16.864	30.601
REFUELING								
MAINTENANCE PERSONNEL	21	0	41	62	5.514	0.083	16.432	22.029
OPERATIONS PERSONNEL	6	0	0	6	2.500	0.000	0.000	2.500
HEALTH PHYSICS PERSONNEL	5	0	10	15	1.163	0.000	4.341	5.504
SUPERVISORY PERSONNEL	2	0	0	2	0.616	0.231	0.189	1.036
ENGINEERING PERSONNEL	1	0	6	7	0.327	0.000	2.382	2.709
TOTAL	35	0	57	92	10.120	0.314	23.344	33.778
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	361	4	654	1019	136.274	1.679	270.112	408.065
OPERATIONS PERSONNEL	126	0	1	127	49.986	0.040	0.581	50.607
HEALTH PHYSICS PERSONNEL	136	2	121	259	72.419	1.054	64.195	137.668
SUPERVISORY PERSONNEL	45	2	19	66	20.499	2.733	7.336	30.568
ENGINEERING PERSONNEL	40	2	64	106	15.888	0.810	24.448	41.146
GRAND TOTALS	708	10	859	1577	295.066	6.316	366.672	668.054

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *HOPE CREEK 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	9	2	8	19	6.757	0.387	5.781	12.925
OPERATIONS PERSONNEL	46	2	2	50	17.301	0.474	0.803	18.578
HEALTH PHYSICS PERSONNEL	16	0	5	21	3.840	0.102	2.319	6.261
SUPERVISORY PERSONNEL	0	0	0	0	0.262	0.093	0.071	0.426
ENGINEERING PERSONNEL	1	0	0	1	1.357	0.159	0.102	1.618
TOTAL	72	4	15	91	29.517	1.215	9.076	39.808
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	6	0	6	12	3.618	0.181	3.240	7.039
OPERATIONS PERSONNEL	1	0	0	1	0.838	0.034	0.046	0.918
HEALTH PHYSICS PERSONNEL	11	0	3	14	3.149	0.064	1.529	4.742
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.002	0.012	0.014
ENGINEERING PERSONNEL	0	0	0	0	0.059	0.043	0.034	0.136
TOTAL	18	0	9	27	7.664	0.324	4.861	12.849
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	47	47	0.174	0.006	33.622	33.802
OPERATIONS PERSONNEL	0	0	0	0	0.026	0.000	0.000	0.026
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.379	0.000	0.199	0.578
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.046	0.046
ENGINEERING PERSONNEL	3	0	0	3	0.899	0.078	0.000	0.977
TOTAL	4	0	48	52	1.478	0.084	33.867	35.429
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	92	1	114	207	32.899	0.261	36.704	69.864
OPERATIONS PERSONNEL	13	0	0	13	5.663	0.007	0.066	5.736
HEALTH PHYSICS PERSONNEL	28	0	11	39	10.634	0.023	3.079	13.736
SUPERVISORY PERSONNEL	0	1	1	2	0.179	0.166	0.184	0.529
ENGINEERING PERSONNEL	1	2	0	3	0.570	0.649	0.041	1.260
TOTAL	134	4	126	264	49.945	1.106	40.074	91.125
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	4	4	0.348	0.003	1.280	1.631
OPERATIONS PERSONNEL	12	0	0	12	3.036	0.001	0.036	3.073
HEALTH PHYSICS PERSONNEL	12	0	4	16	3.170	0.018	1.447	4.635
SUPERVISORY PERSONNEL	0	0	0	0	0.034	0.009	0.042	0.085
ENGINEERING PERSONNEL	0	0	0	0	0.258	0.000	0.001	0.259
TOTAL	24	0	8	32	6.846	0.031	2.806	9.683
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	102	2	364	468	41.568	0.600	185.377	227.545
OPERATIONS PERSONNEL	27	1	0	28	7.734	0.145	0.103	7.982
HEALTH PHYSICS PERSONNEL	30	0	28	58	14.140	0.011	14.734	28.885
SUPERVISORY PERSONNEL	4	2	3	9	1.585	0.436	0.982	3.003
ENGINEERING PERSONNEL	6	8	2	16	2.128	6.637	0.546	9.311
TOTAL	169	13	397	579	67.155	7.829	201.742	276.726
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	209	5	543	757	85.364	1.438	266.004	352.806
OPERATIONS PERSONNEL	99	3	2	104	34.598	0.661	1.054	36.313
HEALTH PHYSICS PERSONNEL	98	0	52	150	35.312	0.218	23.307	58.837
SUPERVISORY PERSONNEL	4	3	4	11	2.060	0.706	1.337	4.103
ENGINEERING PERSONNEL	11	10	2	23	5.271	7.566	0.724	13.561
GRAND TOTALS	421	21	603	1045	162.605	10.589	292.426	465.620

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *INDIAN POINT 2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	112	169	320	601	22.489	7.225	80.959	110.673				
OPERATIONS PERSONNEL	67	0	1	68	52.479	0.000	0.000	52.479				
HEALTH PHYSICS PERSONNEL	23	0	23	46	20.199	0.000	9.967	30.166				
SUPERVISORY PERSONNEL	23	1	4	28	9.572	0.000	0.508	10.080				
ENGINEERING PERSONNEL	19	2	2	30	4.250	1.502	0.262	6.014				
TOTAL	244	179	350	773	108.989	8.727	91.696	209.412				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	56	77	81	214	2.801	6.297	7.263	16.361				
OPERATIONS PERSONNEL	4	0	0	4	0.000	0.000	0.000	0.000				
HEALTH PHYSICS PERSONNEL	2	1	3	6	0.394	0.168	0.100	0.662				
SUPERVISORY PERSONNEL	1	2	2	5	0.000	0.199	0.000	0.199				
ENGINEERING PERSONNEL	8	1	0	9	0.999	0.267	0.000	1.266				
TOTAL	71	81	86	238	4.194	6.931	7.363	18.488				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	77	181	220	478	3.689	18.758	54.902	77.349				
OPERATIONS PERSONNEL	10	0	1	11	0.725	0.000	0.220	0.945				
HEALTH PHYSICS PERSONNEL	2	0	7	9	0.249	0.000	0.364	0.613				
SUPERVISORY PERSONNEL	2	5	5	12	0.000	1.139	1.914	3.053				
ENGINEERING PERSONNEL	10	3	2	15	1.378	0.232	0.807	2.417				
TOTAL	101	189	235	525	6.041	20.129	58.207	84.377				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	159	402	725	1286	90.382	294.621	471.194	856.197				
OPERATIONS PERSONNEL	33	0	2	35	3.996	0.000	1.782	5.778				
HEALTH PHYSICS PERSONNEL	16	1	12	29	4.629	1.135	5.396	11.160				
SUPERVISORY PERSONNEL	18	5	9	32	3.211	2.137	4.131	9.479				
ENGINEERING PERSONNEL	21	8	4	33	4.226	3.984	2.590	10.800				
TOTAL	247	416	752	1415	106.444	301.877	485.093	893.414				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	96	68	279	443	17.629	4.015	71.170	92.814				
OPERATIONS PERSONNEL	13	0	2	15	0.998	0.000	0.000	0.998				
HEALTH PHYSICS PERSONNEL	20	0	24	44	4.775	0.000	5.032	9.807				
SUPERVISORY PERSONNEL	15	1	5	21	4.552	0.000	1.983	6.535				
ENGINEERING PERSONNEL	14	2	2	18	4.486	0.150	0.146	4.782				
TOTAL	158	71	312	541	32.440	4.165	78.331	114.936				
REFUELING												
MAINTENANCE PERSONNEL	44	67	296	407	4.642	9.352	92.385	106.379				
OPERATIONS PERSONNEL	28	0	0	28	2.987	0.000	0.000	2.987				
HEALTH PHYSICS PERSONNEL	16	0	20	36	1.377	0.000	3.185	4.562				
SUPERVISORY PERSONNEL	8	5	4	17	0.140	4.105	1.183	5.428				
ENGINEERING PERSONNEL	13	4	2	19	1.694	1.453	0.164	3.311				
TOTAL	109	76	322	507	10.840	14.910	96.917	122.667				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	544	(187)	964	(420)	1921	(830)	3429	(1437)	141.632	340.268	777.873	1259.773
OPERATIONS PERSONNEL	155	(76)	0	(0)	6	(3)	161	(79)	61.185	0.000	2.002	63.187
HEALTH PHYSICS PERSONNEL	79	(24)	2	(2)	89	(27)	170	(53)	31.623	1.303	24.044	56.970
SUPERVISORY PERSONNEL	67	(30)	19	(8)	29	(14)	115	(52)	17.475	7.580	9.719	34.774
ENGINEERING PERSONNEL	85	(32)	27	(15)	12	(4)	124	(51)	17.033	7.588	3.969	28.590
GRAND TOTALS									268.948	356.739	817.607	1443.294

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *INDIAN POINT 3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	7	0	8	15	1.350	0.000	1.550	2.900
OPERATIONS PERSONNEL	44	2	4	50	13.940	0.280	0.710	14.930
HEALTH PHYSICS PERSONNEL	21	0	103	124	19.220	0.000	80.170	99.390
SUPERVISORY PERSONNEL	8	0	0	8	2.850	0.000	0.000	2.850
ENGINEERING PERSONNEL	4	0	0	4	2.200	0.000	0.000	2.200
TOTAL	84	2	115	201	39.560	0.280	82.430	122.270
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	6	0	13	19	1.120	0.000	2.810	3.930
OPERATIONS PERSONNEL	10	0	8	18	1.440	0.000	2.120	3.560
HEALTH PHYSICS PERSONNEL	0	0	2	2	0.000	0.000	0.250	0.250
SUPERVISORY PERSONNEL	1	0	0	1	0.110	0.000	0.000	0.110
ENGINEERING PERSONNEL	3	0	2	5	0.480	0.000	0.260	0.740
TOTAL	20	0	25	45	3.150	0.000	5.440	8.590
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	53	53	0.000	0.000	15.200	15.200
OPERATIONS PERSONNEL	0	1	17	18	0.000	0.100	5.770	5.870
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	1	0	1	2	0.110	0.000	0.310	0.420
ENGINEERING PERSONNEL	0	0	2	2	0.000	0.000	0.730	0.730
TOTAL	1	1	73	75	0.110	0.100	22.010	22.220
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	45	2	697	744	20.260	2.170	482.500	504.930
OPERATIONS PERSONNEL	14	7	33	54	4.130	4.910	13.180	22.220
HEALTH PHYSICS PERSONNEL	2	0	4	6	0.410	0.000	0.470	0.880
SUPERVISORY PERSONNEL	11	0	11	22	3.180	0.000	9.120	12.300
ENGINEERING PERSONNEL	2	1	20	23	0.380	0.570	9.860	10.810
TOTAL	74	10	765	849	28.360	7.650	515.130	551.140
WASTE PROCESSING								
MAINTENANCE PERSONNEL	15	0	127	142	10.500	0.000	92.670	103.170
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	2	2	0.000	0.000	2.010	2.010
SUPERVISORY PERSONNEL	4	0	0	4	1.920	0.000	0.000	1.920
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	19	0	129	148	12.420	0.000	94.680	107.100
REFUELING								
MAINTENANCE PERSONNEL	6	0	35	41	0.770	0.000	6.940	7.710
OPERATIONS PERSONNEL	4	0	1	5	0.680	0.000	0.460	1.140
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	3	0	1	4	0.860	0.000	0.420	1.280
ENGINEERING PERSONNEL	1	0	0	1	0.130	0.000	0.000	0.130
TOTAL	14	0	37	51	2.440	0.000	7.820	10.260
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	79	2	933	1014	34.000	2.170	601.670	637.840
OPERATIONS PERSONNEL	72	10	63	145	20.190	5.290	22.240	47.720
HEALTH PHYSICS PERSONNEL	23	0	111	134	19.630	0.000	82.900	102.530
SUPERVISORY PERSONNEL	28	0	13	41	9.030	0.000	9.850	18.880
ENGINEERING PERSONNEL	10	1	24	35	3.190	0.570	10.850	14.610
GRAND TOTALS	212	13	1144	1369	86.040	8.030	727.510	821.580

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *KEWAUNEE

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	17	1	15	33	1.049	0.004	2.205	3.258
OPERATIONS PERSONNEL	17	0	0	17	4.635	0.000	0.000	4.635
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	5	2	1	8	0.941	0.044	0.004	0.989
ENGINEERING PERSONNEL	8	7	1	16	0.552	0.404	0.000	0.956
TOTAL	47	10	17	74	7.177	0.452	2.209	9.838
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	46	8	66	120	6.656	1.038	16.434	24.128
OPERATIONS PERSONNEL	12	0	6	18	1.330	0.000	1.003	2.333
HEALTH PHYSICS PERSONNEL	19	0	30	49	10.847	0.000	12.383	23.230
SUPERVISORY PERSONNEL	0	1	0	1	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	4	2	0	6	0.036	0.006	0.000	0.042
TOTAL	81	11	102	194	18.869	1.044	29.820	49.733
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	46	6	195	247	14.299	0.675	124.384	139.358
OPERATIONS PERSONNEL	9	0	7	16	0.874	0.000	1.667	2.541
HEALTH PHYSICS PERSONNEL	6	0	2	8	0.449	0.000	0.230	0.679
SUPERVISORY PERSONNEL	3	2	3	8	0.379	0.562	1.722	2.663
ENGINEERING PERSONNEL	10	11	3	24	3.470	2.750	1.523	7.743
TOTAL	74	19	210	303	19.471	3.987	129.526	152.984
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	19	3	6	28	0.253	0.060	0.571	0.884
OPERATIONS PERSONNEL	3	0	0	3	2.063	0.000	0.000	2.063
HEALTH PHYSICS PERSONNEL	4	0	1	5	0.815	0.000	0.236	1.051
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	26	3	7	36	3.131	0.060	0.807	3.998
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	15	3	19	37	2.170	0.777	8.544	11.491
OPERATIONS PERSONNEL	2	0	0	2	0.033	0.000	0.000	0.033
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	2	0	0	2	0.045	0.000	0.000	0.045
ENGINEERING PERSONNEL	1	2	0	3	0.067	0.213	0.000	0.280
TOTAL	20	5	20	45	2.315	0.990	8.544	11.849
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	143	21	301	465	24.427	2.554	152.138	179.119
OPERATIONS PERSONNEL	43	0	13	56	8.935	0.000	2.670	11.605
HEALTH PHYSICS PERSONNEL	29	0	34	63	12.111	0.000	12.849	24.960
SUPERVISORY PERSONNEL	10	5	4	19	1.365	0.606	1.726	3.697
ENGINEERING PERSONNEL	23	22	4	49	4.125	3.373	1.523	9.021
GRAND TOTALS	248	48	356	652	50.963	6.533	170.906	228.402

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *LACROSSE

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
GRAND TOTALS	0	0	0	0	0.000	0.000	0.000	0.000

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *LASALLE 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	26	3	159	188	26.679	0.087	20.634	47.400
OPERATIONS PERSONNEL	52	0	30	82	50.309	0.000	1.375	51.684
HEALTH PHYSICS PERSONNEL	14	0	9	23	21.173	0.000	2.251	23.424
SUPERVISORY PERSONNEL	24	0	0	24	10.008	0.000	0.000	10.008
ENGINEERING PERSONNEL	18	54	23	95	3.708	0.514	1.378	5.600
TOTAL	134	57	221	412	111.877	0.601	25.638	138.116
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	136	22	1399	1557	169.888	1.887	393.529	565.304
OPERATIONS PERSONNEL	55	0	3	58	51.552	0.000	0.303	51.855
HEALTH PHYSICS PERSONNEL	22	0	70	92	22.283	0.000	26.009	48.292
SUPERVISORY PERSONNEL	108	0	0	108	28.455	0.000	0.000	28.455
ENGINEERING PERSONNEL	78	225	118	421	20.781	3.487	11.830	36.098
TOTAL	399	247	1590	2236	292.959	5.374	431.671	730.004
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	94	95	0.179	0.000	92.251	92.430
OPERATIONS PERSONNEL	1	0	0	1	0.003	0.000	0.000	0.003
HEALTH PHYSICS PERSONNEL	1	0	4	5	0.235	0.000	3.541	3.776
SUPERVISORY PERSONNEL	2	0	0	2	0.437	0.000	0.000	0.437
ENGINEERING PERSONNEL	9	1	1	11	2.363	0.041	0.895	3.299
TOTAL	14	1	99	114	3.217	0.041	96.687	99.945
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	4	18	451	473	7.363	1.112	224.057	232.532
OPERATIONS PERSONNEL	1	0	8	9	1.601	0.000	0.248	1.849
HEALTH PHYSICS PERSONNEL	1	0	2	3	1.794	0.000	1.040	2.834
SUPERVISORY PERSONNEL	3	0	0	3	1.506	0.000	0.000	1.506
ENGINEERING PERSONNEL	7	15	86	108	2.475	0.595	8.105	11.175
TOTAL	16	33	547	596	14.739	1.707	233.450	249.896
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	1	1	180	182	0.948	0.002	15.737	16.687
OPERATIONS PERSONNEL	56	0	132	188	42.230	0.000	25.346	67.576
HEALTH PHYSICS PERSONNEL	10	0	1	11	9.076	0.000	0.099	9.175
SUPERVISORY PERSONNEL	27	0	0	27	3.359	0.000	0.000	3.359
ENGINEERING PERSONNEL	2	11	1	14	0.174	0.131	0.065	0.370
TOTAL	96	12	314	422	55.787	0.133	41.247	97.167
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	20	0	22	42	35.386	0.000	24.699	60.085
OPERATIONS PERSONNEL	3	0	0	3	2.201	0.000	0.000	2.201
HEALTH PHYSICS PERSONNEL	4	0	0	4	4.361	0.000	0.000	4.361
SUPERVISORY PERSONNEL	22	0	0	22	3.979	0.000	0.000	3.979
ENGINEERING PERSONNEL	1	0	3	4	0.234	0.000	0.159	0.393
TOTAL	50	0	25	75	46.161	0.000	24.858	71.019
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	188	44	2305	2537	240.443	3.088	770.907	1014.438
OPERATIONS PERSONNEL	168	0	173	341	147.896	0.000	27.272	175.168
HEALTH PHYSICS PERSONNEL	52	0	86	138	58.922	0.000	32.940	91.862
SUPERVISORY PERSONNEL	186	0	0	186	47.744	0.000	0.000	47.744
ENGINEERING PERSONNEL	115	306	232	653	29.735	4.768	22.432	56.935
GRAND TOTALS	709	350	2796	3855	524.740	7.856	853.551	1386.147

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *LIMERICK 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	131	150	580	861	9.073	4.445	22.184	35.702				
OPERATIONS PERSONNEL	158	23	107	288	11.227	0.960	3.869	16.056				
HEALTH PHYSICS PERSONNEL	52	2	84	138	6.483	0.062	6.589	13.134				
SUPERVISORY PERSONNEL	1	1	7	9	0.001	0.002	0.405	0.408				
ENGINEERING PERSONNEL	36	6	96	138	1.922	0.289	2.676	4.887				
TOTAL	378	182	874	1434	28.706	5.758	35.723	70.187				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	98	56	357	511	11.603	1.528	14.176	27.307				
OPERATIONS PERSONNEL	108	14	71	193	2.290	0.528	2.066	4.884				
HEALTH PHYSICS PERSONNEL	38	1	44	83	1.523	0.004	2.686	4.213				
SUPERVISORY PERSONNEL	1	0	4	5	0.010	0.000	0.234	0.244				
ENGINEERING PERSONNEL	21	3	34	58	0.438	0.048	0.749	1.235				
TOTAL	266	74	510	850	15.864	2.108	19.911	37.883				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	28	8	55	91	0.427	0.109	1.150	1.686				
OPERATIONS PERSONNEL	28	2	10	40	0.594	0.018	0.236	0.848				
HEALTH PHYSICS PERSONNEL	21	0	13	34	0.924	0.000	0.640	1.564				
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.001	0.001				
ENGINEERING PERSONNEL	1	2	15	18	0.002	0.014	1.493	1.509				
TOTAL	78	12	94	184	1.947	0.141	3.520	5.608				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	69	40	247	356	2.595	1.112	9.718	13.425				
OPERATIONS PERSONNEL	54	3	51	108	0.952	0.087	2.510	3.549				
HEALTH PHYSICS PERSONNEL	32	2	42	76	0.844	0.035	0.765	1.644				
SUPERVISORY PERSONNEL	1	0	3	4	0.002	0.000	0.192	0.194				
ENGINEERING PERSONNEL	7	1	42	50	0.156	0.018	3.364	3.538				
TOTAL	163	46	385	594	4.549	1.252	16.549	22.350				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	31	19	84	134	0.594	0.210	1.847	2.651				
OPERATIONS PERSONNEL	50	8	44	102	0.784	0.072	4.676	5.532				
HEALTH PHYSICS PERSONNEL	39	0	31	70	1.408	0.000	2.280	3.688				
SUPERVISORY PERSONNEL	1	0	2	3	0.014	0.000	0.028	0.042				
ENGINEERING PERSONNEL	6	0	7	13	0.048	0.000	0.052	0.100				
TOTAL	127	27	168	322	2.848	0.282	8.883	12.013				
REFUELING												
MAINTENANCE PERSONNEL	114	160	457	731	5.795	27.069	35.611	68.475				
OPERATIONS PERSONNEL	121	18	106	245	5.986	1.115	15.313	22.414				
HEALTH PHYSICS PERSONNEL	47	0	72	119	3.653	0.000	6.614	10.267				
SUPERVISORY PERSONNEL	0	1	5	6	0.000	0.018	0.068	0.086				
ENGINEERING PERSONNEL	31	6	81	118	2.137	1.018	13.839	16.994				
TOTAL	313	185	721	1219	17.571	29.220	71.445	118.236				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	471	(137)	433	(179)	1780	(683)	2684	(999)	30.087	34.473	84.686	149.246
OPERATIONS PERSONNEL	519	(168)	68	(26)	389	(156)	976	(350)	21.833	2.780	28.670	53.283
HEALTH PHYSICS PERSONNEL	229	(54)	5	(2)	286	(91)	520	(147)	14.835	0.101	19.574	34.510
SUPERVISORY PERSONNEL	4	(1)	2	(1)	22	(9)	28	(11)	0.027	0.020	0.928	0.975
ENGINEERING PERSONNEL	102	(42)	18	(8)	275	(137)	395	(187)	4.703	1.387	22.173	28.263
GRAND TOTALS									71.485	38.761	156.031	266.277

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *MAINE YANKEE

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	6	0	0	6	1.715	0.000	0.430	2.145
OPERATIONS PERSONNEL	38	0	1	39	16.829	0.000	0.495	17.324
HEALTH PHYSICS PERSONNEL	22	0	3	25	12.342	0.000	0.815	13.157
SUPERVISORY PERSONNEL	7	0	0	7	2.859	0.000	0.398	3.257
ENGINEERING PERSONNEL	5	0	1	6	2.085	0.000	0.450	2.535
TOTAL	78	0	5	83	35.830	0.000	2.588	38.418
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	30	0	19	49	16.577	0.000	13.447	30.024
OPERATIONS PERSONNEL	16	0	0	16	4.228	0.000	0.095	4.323
HEALTH PHYSICS PERSONNEL	12	0	6	18	3.079	0.000	5.192	8.271
SUPERVISORY PERSONNEL	17	0	5	22	5.299	0.000	1.475	6.774
ENGINEERING PERSONNEL	2	0	2	4	1.188	0.000	1.503	2.691
TOTAL	77	0	32	109	30.371	0.000	21.712	52.083
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
ENGINEERING PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010
TOTAL	0	0	0	0	0.015	0.000	0.000	0.015
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	1	1	0.315	0.000	0.170	0.485
OPERATIONS PERSONNEL	10	0	1	11	2.997	0.000	0.380	3.377
HEALTH PHYSICS PERSONNEL	5	0	0	5	2.007	0.000	0.210	2.217
SUPERVISORY PERSONNEL	7	0	0	7	3.275	0.000	0.027	3.302
ENGINEERING PERSONNEL	0	0	1	1	0.020	0.000	0.445	0.465
TOTAL	22	0	3	25	8.614	0.000	1.232	9.846
REFUELING								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	36	0	20	56	18.607	0.000	14.047	32.654
OPERATIONS PERSONNEL	64	0	2	66	24.054	0.000	0.970	25.024
HEALTH PHYSICS PERSONNEL	39	0	9	48	17.428	0.000	6.217	23.645
SUPERVISORY PERSONNEL	31	0	5	36	11.438	0.000	1.900	13.338
ENGINEERING PERSONNEL	7	0	4	11	3.303	0.000	2.398	5.701
GRAND TOTALS	177	0	40	217	74.830	0.000	25.532	100.362

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *MCGUIRE 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM															
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL												
REACTOR OPS & SURV																				
MAINTENANCE PERSONNEL	215	195	186	596	3.320	0.767	0.500	4.587												
OPERATIONS PERSONNEL	88	50	62	200	25.706	1.560	3.375	30.641												
HEALTH PHYSICS PERSONNEL	59	5	120	184	12.085	0.000	4.695	16.780												
SUPERVISORY PERSONNEL	2	1	0	3	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	66	83	21	170	1.525	0.125	0.000	1.650												
TOTAL	430	334	389	1153	42.636	2.452	8.570	53.658												
ROUTINE MAINTENANCE																				
MAINTENANCE PERSONNEL	220	203	195	618	68.085	45.140	43.630	156.855												
OPERATIONS PERSONNEL	67	47	69	183	5.710	10.480	32.000	48.190												
HEALTH PHYSICS PERSONNEL	58	6	118	182	13.185	1.095	37.995	52.275												
SUPERVISORY PERSONNEL	3	1	0	4	0.275	0.100	0.000	0.375												
ENGINEERING PERSONNEL	66	91	20	177	13.460	18.810	4.450	36.720												
TOTAL	414	348	402	1164	100.715	75.625	118.075	294.415												
IN-SERVICE INSPECTION																				
MAINTENANCE PERSONNEL	53	86	86	225	4.085	16.225	26.890	47.200												
OPERATIONS PERSONNEL	2	23	5	30	0.000	4.350	0.085	4.435												
HEALTH PHYSICS PERSONNEL	16	2	67	85	1.630	0.770	9.910	12.310												
SUPERVISORY PERSONNEL	0	1	0	1	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	50	49	17	116	10.560	14.000	4.505	29.065												
TOTAL	121	161	175	457	16.275	35.345	41.390	93.010												
SPECIAL MAINTENANCE																				
MAINTENANCE PERSONNEL	205	164	166	535	16.591	66.080	85.590	168.261												
OPERATIONS PERSONNEL	65	39	44	148	1.090	13.265	5.790	20.145												
HEALTH PHYSICS PERSONNEL	56	5	97	158	8.435	4.075	30.585	43.095												
SUPERVISORY PERSONNEL	1	1	0	2	0.000	1.380	0.000	1.380												
ENGINEERING PERSONNEL	50	81	21	152	6.565	32.340	9.070	47.975												
TOTAL	377	290	328	995	32.681	117.140	131.035	280.856												
WASTE PROCESSING																				
MAINTENANCE PERSONNEL	22	14	1	37	0.000	0.075	0.010	0.085												
OPERATIONS PERSONNEL	22	1	33	56	1.095	0.000	2.210	3.305												
HEALTH PHYSICS PERSONNEL	40	0	13	53	4.230	0.000	0.115	4.345												
SUPERVISORY PERSONNEL	2	0	0	2	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	9	4	1	14	0.000	0.030	0.000	0.030												
TOTAL	95	19	48	162	5.325	0.105	2.335	7.765												
REFUELING																				
MAINTENANCE PERSONNEL	70	29	22	121	5.960	7.920	1.900	15.780												
OPERATIONS PERSONNEL	7	8	20	35	0.140	1.635	1.740	3.515												
HEALTH PHYSICS PERSONNEL	29	2	26	57	2.845	0.920	3.005	6.770												
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000												
ENGINEERING PERSONNEL	27	11	3	41	0.775	1.420	0.460	2.655												
TOTAL	133	50	71	254	9.720	11.895	7.105	28.720												
TOTAL BY JOB FUNCTION																				
MAINTENANCE PERSONNEL	785	(220)	691	(210)	656	(232)	2132	(662)	98.041	136.207	158.520	392.768								
OPERATIONS PERSONNEL	251	(90)	168	(52)	233	(73)	652	(215)	33.741	31.290	45.200	110.231								
HEALTH PHYSICS PERSONNEL	258	(59)	20	(6)	441	(120)	719	(185)	42.410	6.860	86.305	135.575								
SUPERVISORY PERSONNEL	8	(2)	4	(1)	0	(0)	12	(3)	0.275	1.480	0.000	1.755								
ENGINEERING PERSONNEL	268	(67)	319	(97)	83	(31)	670	(195)	32.885	66.725	18.485	118.095								
GRAND TOTALS									1570	(438)	1202	(366)	1413	(456)	4185	(1260)	207.352	242.562	308.510	758.424

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *MILLSTONE POINT 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	19	1	9	29	5.200	1.010	4.290	10.500
OPERATIONS PERSONNEL	36	1	3	40	18.620	0.620	2.690	21.930
HEALTH PHYSICS PERSONNEL	18	1	6	25	5.190	0.230	2.580	8.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.160	0.160
ENGINEERING PERSONNEL	1	3	4	8	0.600	0.860	1.940	3.400
TOTAL	74	6	22	102	29.610	2.720	11.660	43.990
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	52	4	48	104	18.150	2.010	21.940	42.100
OPERATIONS PERSONNEL	4	0	4	8	1.450	0.070	0.990	2.510
HEALTH PHYSICS PERSONNEL	3	0	34	37	1.330	0.010	14.500	15.840
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	1	6	10	17	0.380	1.710	3.190	5.280
TOTAL	60	10	96	166	21.310	3.800	40.620	65.730
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	148	148	0.550	0.070	74.690	75.310
OPERATIONS PERSONNEL	0	0	0	0	0.050	0.110	0.140	0.300
HEALTH PHYSICS PERSONNEL	1	0	18	19	0.710	0.000	6.650	7.360
SUPERVISORY PERSONNEL	0	0	0	0	0.010	0.000	0.040	0.050
ENGINEERING PERSONNEL	3	4	32	39	1.960	3.320	28.520	33.800
TOTAL	4	4	198	206	3.280	3.500	110.040	116.820
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	57	14	262	333	39.700	3.780	144.230	187.710
OPERATIONS PERSONNEL	10	1	5	16	2.610	0.110	3.670	6.390
HEALTH PHYSICS PERSONNEL	12	0	53	65	5.690	0.200	15.920	21.810
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.080	0.080
ENGINEERING PERSONNEL	6	19	46	71	1.270	5.940	25.470	32.680
TOTAL	85	34	366	485	49.270	10.030	189.370	248.670
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	9	9	0.020	0.010	3.390	3.420
OPERATIONS PERSONNEL	8	0	2	10	2.420	0.000	0.440	2.860
HEALTH PHYSICS PERSONNEL	15	0	16	31	4.540	0.180	7.310	12.030
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.160	0.090	0.250
TOTAL	23	0	27	50	6.980	0.350	11.230	18.560
REFUELING								
MAINTENANCE PERSONNEL	2	1	2	5	1.090	0.240	0.730	2.060
OPERATIONS PERSONNEL	23	1	0	24	6.290	0.200	0.030	6.520
HEALTH PHYSICS PERSONNEL	0	0	4	4	0.050	0.000	0.840	0.890
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.010	0.010
ENGINEERING PERSONNEL	3	2	0	5	0.740	0.560	0.050	1.350
TOTAL	28	4	6	38	8.170	1.000	1.660	10.830
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	130	20	478	628	64.710	7.120	249.270	321.100
OPERATIONS PERSONNEL	81	3	14	98	31.440	1.110	7.960	40.510
HEALTH PHYSICS PERSONNEL	49	1	131	181	17.510	0.620	47.800	65.930
SUPERVISORY PERSONNEL	0	0	0	0	0.010	0.000	0.290	0.300
ENGINEERING PERSONNEL	14	34	92	140	4.950	12.550	59.260	76.760
GRAND TOTALS	274	58	715	1047	118.620	21.400	364.580	504.600

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *MILLSTONE POINT 2,3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	37	0	0	37	20.040	0.050	0.670	20.760
OPERATIONS PERSONNEL	27	0	8	35	7.450	0.090	2.630	10.170
HEALTH PHYSICS PERSONNEL	14	6	42	62	4.840	1.570	11.500	17.910
SUPERVISORY PERSONNEL	0	0	0	0	0.010	0.000	0.060	0.070
ENGINEERING PERSONNEL	0	1	0	1	0.320	0.400	0.320	1.040
TOTAL	78	7	50	135	32.660	2.110	15.180	49.950
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	102	7	439	548	47.090	1.990	232.500	281.580
OPERATIONS PERSONNEL	15	0	8	23	4.330	0.010	3.880	8.220
HEALTH PHYSICS PERSONNEL	27	4	112	143	9.240	0.880	40.330	50.450
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.470	0.470
ENGINEERING PERSONNEL	7	16	70	93	1.850	5.090	26.210	33.150
TOTAL	151	27	630	808	62.510	7.970	303.390	373.870
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	4	0	160	164	1.470	0.080	67.670	69.220
OPERATIONS PERSONNEL	1	0	4	5	0.210	0.000	1.620	1.830
HEALTH PHYSICS PERSONNEL	6	0	18	24	1.410	0.060	6.010	7.480
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.010	0.010
ENGINEERING PERSONNEL	4	4	58	66	2.030	5.090	29.450	36.570
TOTAL	15	4	240	259	5.120	5.230	104.760	115.110
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	62	1	434	497	40.540	0.080	385.260	425.880
OPERATIONS PERSONNEL	5	0	9	14	2.060	0.000	3.810	5.870
HEALTH PHYSICS PERSONNEL	13	0	60	73	6.560	0.060	23.770	30.390
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.040	0.040
ENGINEERING PERSONNEL	6	15	111	132	1.510	1.780	86.910	90.200
TOTAL	86	16	614	716	50.670	1.920	499.790	552.380
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	1	2	3	0.010	0.430	2.220	2.660
OPERATIONS PERSONNEL	1	0	0	1	0.940	0.000	0.000	0.940
HEALTH PHYSICS PERSONNEL	23	0	32	55	8.170	0.020	12.260	20.450
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.010	6.280	0.040	6.330
TOTAL	24	1	34	59	9.130	6.730	14.520	30.380
REFUELING								
MAINTENANCE PERSONNEL	72	0	136	208	35.350	0.110	35.880	71.340
OPERATIONS PERSONNEL	17	0	1	18	4.740	0.000	0.150	4.890
HEALTH PHYSICS PERSONNEL	8	1	44	53	3.660	0.040	11.520	15.220
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.010	0.010
ENGINEERING PERSONNEL	1	1	37	39	0.440	0.170	7.750	8.360
TOTAL	98	2	218	318	44.190	0.320	55.310	99.820
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	277	9	1171	1457	144.500	2.740	724.200	871.440
OPERATIONS PERSONNEL	66	0	30	96	19.730	0.100	12.090	31.920
HEALTH PHYSICS PERSONNEL	91	11	308	410	33.880	2.630	105.390	141.900
SUPERVISORY PERSONNEL	0	0	1	1	0.010	0.000	0.590	0.600
ENGINEERING PERSONNEL	18	37	276	331	6.160	18.810	150.680	175.650
GRAND TOTALS	452	57	1786	2295	204.280	24.280	992.950	1221.510

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *MONTICELLO

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	32	52	7	91	6.793	17.641	3.291	27.725
OPERATIONS PERSONNEL	53	0	23	76	28.644	0.019	8.788	37.451
HEALTH PHYSICS PERSONNEL	23	0	21	44	8.116	0.032	5.807	13.955
SUPERVISORY PERSONNEL	20	1	11	32	11.429	1.226	3.722	16.377
ENGINEERING PERSONNEL	8	1	0	9	3.007	0.319	0.000	3.326
TOTAL	136	54	62	252	57.989	19.237	21.608	98.834
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	44	216	24	284	26.738	89.830	9.020	125.588
OPERATIONS PERSONNEL	9	0	0	9	2.813	0.000	0.130	2.943
HEALTH PHYSICS PERSONNEL	13	0	22	35	3.976	0.066	8.539	12.581
SUPERVISORY PERSONNEL	13	3	26	42	3.748	1.224	7.984	12.956
ENGINEERING PERSONNEL	9	1	0	10	2.781	0.226	0.000	3.007
TOTAL	88	220	72	380	40.056	91.346	25.673	157.075
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	7	8	16	0.713	3.890	5.826	10.429
OPERATIONS PERSONNEL	1	0	0	1	0.873	0.000	0.011	0.884
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.075	0.000	1.249	1.324
SUPERVISORY PERSONNEL	0	3	18	21	0.061	0.494	12.455	13.010
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	2	10	29	41	1.722	4.384	19.541	25.647
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	25	280	33	338	9.519	116.999	15.562	142.080
OPERATIONS PERSONNEL	37	0	0	37	15.893	0.007	0.488	16.388
HEALTH PHYSICS PERSONNEL	14	0	24	38	5.282	0.025	18.904	24.211
SUPERVISORY PERSONNEL	19	10	20	49	5.791	2.680	8.988	17.459
ENGINEERING PERSONNEL	7	1	0	8	2.130	0.238	0.000	2.368
TOTAL	102	291	77	470	38.615	119.949	43.942	202.506
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	6	4	0	10	2.151	1.124	0.005	3.280
OPERATIONS PERSONNEL	0	0	0	0	0.535	0.000	0.000	0.535
HEALTH PHYSICS PERSONNEL	3	0	1	4	1.124	0.000	0.179	1.303
SUPERVISORY PERSONNEL	0	0	2	2	0.060	0.000	0.885	0.945
ENGINEERING PERSONNEL	0	0	0	0	0.021	0.000	0.000	0.021
TOTAL	9	4	3	16	3.891	1.124	1.069	6.084
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	8	27	0	35	1.684	7.289	0.037	9.010
OPERATIONS PERSONNEL	21	0	0	21	5.290	0.000	0.000	5.290
HEALTH PHYSICS PERSONNEL	3	0	2	5	0.461	0.000	0.941	1.402
SUPERVISORY PERSONNEL	0	0	0	0	0.144	0.024	0.000	0.168
ENGINEERING PERSONNEL	0	0	0	0	0.004	0.000	0.000	0.004
TOTAL	32	27	2	61	7.583	7.313	0.978	15.874
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	116	586	72	774	47.598	236.773	33.741	318.112
OPERATIONS PERSONNEL	121	0	23	144	54.048	0.026	9.417	63.491
HEALTH PHYSICS PERSONNEL	56	0	73	129	19.034	0.123	35.619	54.776
SUPERVISORY PERSONNEL	52	17	77	146	21.233	5.648	34.034	60.915
ENGINEERING PERSONNEL	24	3	0	27	7.943	0.783	0.000	8.726
GRAND TOTALS	369	606	245	1220	149.856	243.353	112.811	506.020

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *NINE MILE POINT 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM					
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL		
<u>REACTOR OPS & SURV</u>										
MAINTENANCE PERSONNEL	929	2	49	980	8.437	0.006	0.511	8.954		
OPERATIONS PERSONNEL	1546	0	1144	2690	17.044	0.000	3.858	20.902		
HEALTH PHYSICS PERSONNEL	1575	16	615	2206	11.477	0.059	4.717	16.253		
SUPERVISORY PERSONNEL	132	0	34	166	1.128	0.000	0.195	1.323		
ENGINEERING PERSONNEL	87	2	53	142	0.781	0.010	0.724	1.515		
TOTAL	4269	20	1895	6184	38.867	0.075	10.005	48.947		
<u>ROUTINE MAINTENANCE</u>										
MAINTENANCE PERSONNEL	3153	3	2712	5868	50.469	0.310	44.774	95.553		
OPERATIONS PERSONNEL	569	4	68	641	5.608	0.025	0.878	6.511		
HEALTH PHYSICS PERSONNEL	1669	30	1623	3322	23.617	0.384	26.368	50.369		
SUPERVISORY PERSONNEL	167	3	103	273	2.572	0.042	1.710	4.324		
ENGINEERING PERSONNEL	292	44	588	924	4.102	1.393	9.775	15.270		
TOTAL	5850	84	5094	11028	86.368	2.154	83.505	172.027		
<u>IN-SERVICE INSPECTION</u>										
MAINTENANCE PERSONNEL	282	0	4908	5190	7.595	0.000	152.599	160.194		
OPERATIONS PERSONNEL	21	0	41	62	0.093	0.000	0.319	0.412		
HEALTH PHYSICS PERSONNEL	66	1	132	199	0.438	0.005	1.408	1.851		
SUPERVISORY PERSONNEL	7	4	282	293	0.048	0.073	5.231	5.352		
ENGINEERING PERSONNEL	109	14	1132	1255	1.608	0.189	24.404	26.201		
TOTAL	485	19	6495	6999	9.782	0.267	183.961	194.010		
<u>SPECIAL MAINTENANCE</u>										
MAINTENANCE PERSONNEL	556	1	2614	3171	16.520	0.010	62.239	78.769		
OPERATIONS PERSONNEL	18	0	34	52	0.164	0.000	0.414	0.578		
HEALTH PHYSICS PERSONNEL	34	2	165	201	0.371	0.012	1.768	2.151		
SUPERVISORY PERSONNEL	15	0	176	191	0.195	0.000	2.826	3.021		
ENGINEERING PERSONNEL	126	29	508	663	2.056	0.353	9.866	12.275		
TOTAL	749	32	3497	4278	19.306	0.375	77.113	96.794		
<u>WASTE PROCESSING</u>										
MAINTENANCE PERSONNEL	2	0	6	8	0.005	0.000	0.038	0.043		
OPERATIONS PERSONNEL	1214	5	85	1304	7.687	0.014	1.200	8.901		
HEALTH PHYSICS PERSONNEL	106	1	33	140	1.123	0.003	0.339	1.465		
SUPERVISORY PERSONNEL	27	0	0	27	0.108	0.000	0.000	0.108		
ENGINEERING PERSONNEL	29	0	2	31	0.188	0.000	0.010	0.198		
TOTAL	1378	6	126	1510	9.111	0.017	1.587	10.715		
<u>REFUELING</u>										
MAINTENANCE PERSONNEL	61	0	2	63	2.074	0.000	0.055	2.129		
OPERATIONS PERSONNEL	27	0	0	27	0.220	0.000	0.000	0.220		
HEALTH PHYSICS PERSONNEL	14	0	9	23	0.145	0.000	0.165	0.310		
SUPERVISORY PERSONNEL	15	0	0	15	0.188	0.000	0.000	0.188		
ENGINEERING PERSONNEL	24	0	5	29	0.262	0.000	0.035	0.297		
TOTAL	141	0	16	157	2.889	0.000	0.255	3.144		
<u>TOTAL BY JOB FUNCTION</u>										
MAINTENANCE PERSONNEL	4983	(356)	6	(3)10291	(433)15280	(792)	85.100	0.326	260.216	345.642
OPERATIONS PERSONNEL	3395	(163)	9	(2) 1372	(49) 4776	(214)	30.816	0.039	6.669	37.524
HEALTH PHYSICS PERSONNEL	3464	(137)	50	(5) 2577	(93) 6091	(235)	37.171	0.463	34.765	72.399
SUPERVISORY PERSONNEL	363	(73)	7	(5) 595	(44) 965	(122)	4.239	0.115	9.962	14.316
ENGINEERING PERSONNEL	667	(152)	89	(36) 2288	(224) 3044	(412)	8.997	1.945	44.814	55.756
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GRAND TOTALS	12872	(881)	161	(51)17123	(843)30156	(1775)	166.323	2.888	356.426	525.637

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *NORTH ANNA 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	19	0	30	49	1.431	0.000	0.227	1.658
OPERATIONS PERSONNEL	78	0	2	80	33.130	0.000	0.012	33.142
HEALTH PHYSICS PERSONNEL	35	0	24	59	2.298	0.000	0.939	3.237
SUPERVISORY PERSONNEL	16	0	0	16	1.093	0.000	0.000	1.093
ENGINEERING PERSONNEL	2	1	2	5	0.020	0.041	0.006	0.067
TOTAL	150	1	58	209	37.972	0.041	1.184	39.197
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	211	41	1083	1335	159.410	27.857	342.744	530.011
OPERATIONS PERSONNEL	227	3	19	249	28.318	0.094	2.413	30.825
HEALTH PHYSICS PERSONNEL	71	10	359	440	40.127	1.751	159.140	201.018
SUPERVISORY PERSONNEL	71	7	11	89	9.511	0.076	2.696	12.283
ENGINEERING PERSONNEL	65	33	60	158	6.425	0.916	8.384	15.725
TOTAL	645	94	1532	2271	243.791	30.694	515.377	789.862
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	28	6	120	154	2.270	1.690	100.039	103.999
OPERATIONS PERSONNEL	30	0	2	32	4.054	0.000	0.030	4.084
HEALTH PHYSICS PERSONNEL	6	0	123	129	0.082	0.000	13.117	13.199
SUPERVISORY PERSONNEL	1	0	3	4	0.002	0.000	1.065	1.067
ENGINEERING PERSONNEL	15	0	4	19	0.395	0.000	0.189	0.584
TOTAL	80	6	252	338	6.803	1.690	114.440	122.933
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	12	1	797	810	0.243	0.058	535.910	536.211
OPERATIONS PERSONNEL	13	2	11	26	0.855	0.056	0.286	1.197
HEALTH PHYSICS PERSONNEL	18	0	186	204	0.714	0.000	42.361	43.075
SUPERVISORY PERSONNEL	8	1	1	10	0.213	0.044	2.550	2.807
ENGINEERING PERSONNEL	20	11	26	57	1.578	0.230	9.327	11.135
TOTAL	71	15	1021	1107	3.603	0.388	590.434	594.425
WASTE PROCESSING								
MAINTENANCE PERSONNEL	27	1	14	42	0.378	0.010	0.509	0.897
OPERATIONS PERSONNEL	54	0	0	54	4.445	0.000	0.000	4.445
HEALTH PHYSICS PERSONNEL	19	0	31	50	2.786	0.000	0.467	3.253
SUPERVISORY PERSONNEL	5	0	0	5	0.656	0.000	0.000	0.656
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	105	1	45	151	8.265	0.010	0.976	9.251
REFUELING								
MAINTENANCE PERSONNEL	37	3	201	241	5.168	1.153	44.452	50.773
OPERATIONS PERSONNEL	25	2	0	27	0.718	0.072	0.000	0.790
HEALTH PHYSICS PERSONNEL	20	0	121	141	0.517	0.000	5.237	5.754
SUPERVISORY PERSONNEL	18	1	1	20	1.091	0.030	0.031	1.152
ENGINEERING PERSONNEL	1	5	5	11	0.004	0.182	0.632	0.818
TOTAL	101	11	328	440	7.498	1.437	50.352	59.287
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	334	52	2245	2631	168.900	30.768	1023.881	1223.549
OPERATIONS PERSONNEL	427	7	34	468	71.520	0.222	2.741	74.483
HEALTH PHYSICS PERSONNEL	169	10	844	1023	46.524	1.751	221.261	269.536
SUPERVISORY PERSONNEL	119	9	16	144	12.566	0.150	6.342	19.058
ENGINEERING PERSONNEL	103	50	97	250	8.422	1.369	18.538	28.329
GRAND TOTALS	1152	128	3236	4516	307.932	34.260	1272.763	1614.955

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *OCONEE 1,2,3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	271	211	154	636	4.685	0.605	0.045	5.335				
OPERATIONS PERSONNEL	106	38	30	174	32.730	0.125	0.240	33.095				
HEALTH PHYSICS PERSONNEL	63	23	131	217	6.185	0.050	13.180	19.415				
SUPERVISORY PERSONNEL	7	1	0	8	0.175	0.000	0.000	0.175				
ENGINEERING PERSONNEL	78	128	15	221	5.465	1.000	0.490	6.955				
TOTAL	525	401	330	1256	49.240	1.780	13.955	64.975				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	295	235	206	736	160.053	101.478	44.520	306.051				
OPERATIONS PERSONNEL	96	41	59	196	11.000	24.200	46.388	81.588				
HEALTH PHYSICS PERSONNEL	63	26	135	224	13.698	6.710	45.136	65.544				
SUPERVISORY PERSONNEL	4	0	0	4	0.815	0.000	0.000	0.815				
ENGINEERING PERSONNEL	76	148	12	236	17.470	47.145	2.785	67.400				
TOTAL	534	450	412	1396	203.036	179.533	138.829	521.398				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	39	79	100	218	3.815	8.980	19.775	32.570				
OPERATIONS PERSONNEL	4	12	4	20	0.505	0.445	0.050	1.000				
HEALTH PHYSICS PERSONNEL	14	11	91	116	0.505	1.760	9.805	12.070				
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
ENGINEERING PERSONNEL	47	61	5	113	16.440	10.130	1.310	27.880				
TOTAL	104	163	200	467	21.265	21.315	30.940	73.520				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	144	176	123	443	5.730	21.600	34.780	62.110				
OPERATIONS PERSONNEL	13	33	47	93	0.500	2.355	3.720	6.575				
HEALTH PHYSICS PERSONNEL	33	20	118	171	0.990	4.085	9.180	14.255				
SUPERVISORY PERSONNEL	7	0	0	7	0.120	0.000	0.000	0.120				
ENGINEERING PERSONNEL	51	109	3	163	3.255	10.560	0.275	14.090				
TOTAL	248	338	291	877	10.595	38.600	47.955	97.150				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	52	29	2	83	1.185	2.615	0.000	3.800				
OPERATIONS PERSONNEL	47	8	53	108	5.340	1.810	3.695	10.845				
HEALTH PHYSICS PERSONNEL	42	1	10	53	2.840	0.270	0.365	3.475				
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
ENGINEERING PERSONNEL	6	10	1	17	0.000	0.275	0.000	0.275				
TOTAL	147	48	66	261	9.365	4.970	4.060	18.395				
REFUELING												
MAINTENANCE PERSONNEL	56	43	26	125	6.690	17.780	2.810	27.280				
OPERATIONS PERSONNEL	85	15	6	106	7.395	5.295	0.115	12.805				
HEALTH PHYSICS PERSONNEL	26	5	75	106	0.555	3.330	4.755	8.640				
SUPERVISORY PERSONNEL	1	1	0	2	0.125	0.000	0.000	0.125				
ENGINEERING PERSONNEL	25	40	14	79	2.625	13.615	3.810	20.050				
TOTAL	193	104	121	418	17.390	40.020	11.490	68.900				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	857	(295)	773	(238)	611	(224)	2241	(757)	182.158	153.058	101.930	437.146
OPERATIONS PERSONNEL	351	(121)	147	(55)	199	(60)	697	(236)	57.470	34.230	54.208	145.908
HEALTH PHYSICS PERSONNEL	241	(63)	86	(26)	560	(137)	887	(226)	24.773	16.205	82.421	123.399
SUPERVISORY PERSONNEL	19	(7)	2	(0)	0	(0)	21	(7)	1.235	0.000	0.000	1.235
ENGINEERING PERSONNEL	283	(88)	496	(136)	50	(26)	829	(250)	45.255	82.725	8.670	136.650
GRAND TOTALS												
	1751	(574)	1504	(455)	1420	(447)	4675	(1476)	310.891	286.218	247.229	844.338

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *OYSTER CREEK

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	173	0	132	305	25.053	0.000	5.643	30.696
OPERATIONS PERSONNEL	172	0	12	184	55.917	0.000	0.974	56.891
HEALTH PHYSICS PERSONNEL	70	0	101	171	20.778	0.000	39.863	60.641
SUPERVISORY PERSONNEL	35	0	10	45	0.804	0.000	0.267	1.071
ENGINEERING PERSONNEL	44	0	12	56	1.913	0.000	0.101	2.014
TOTAL	494	0	267	761	104.465	0.000	46.848	151.313
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	348	4	923	1275	71.074	0.038	158.683	229.795
OPERATIONS PERSONNEL	282	1	56	339	18.726	0.002	1.802	20.530
HEALTH PHYSICS PERSONNEL	76	0	59	135	2.682	0.000	2.020	4.702
SUPERVISORY PERSONNEL	123	3	71	197	6.378	0.002	1.890	8.270
ENGINEERING PERSONNEL	166	2	131	299	4.712	0.000	2.875	7.587
TOTAL	995	10	1240	2245	103.572	0.042	167.270	270.884
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	34	1	321	356	1.056	0.000	68.573	69.629
OPERATIONS PERSONNEL	28	0	7	35	1.251	0.000	0.342	1.593
HEALTH PHYSICS PERSONNEL	8	0	4	12	0.746	0.000	0.060	0.806
SUPERVISORY PERSONNEL	0	0	3	3	0.000	0.000	0.199	0.199
ENGINEERING PERSONNEL	14	0	23	37	0.288	0.000	5.341	5.629
TOTAL	84	1	358	443	3.341	0.000	74.515	77.856
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	182	1	694	877	88.934	0.075	251.658	340.647
OPERATIONS PERSONNEL	76	0	11	87	14.154	0.000	1.895	16.049
HEALTH PHYSICS PERSONNEL	32	0	53	85	7.490	0.000	6.744	14.234
SUPERVISORY PERSONNEL	34	0	25	59	5.265	0.000	5.266	10.531
ENGINEERING PERSONNEL	51	0	40	91	8.750	0.000	7.573	16.323
TOTAL	375	1	823	1199	124.593	0.075	273.136	397.804
WASTE PROCESSING								
MAINTENANCE PERSONNEL	85	0	143	228	0.978	0.000	36.445	37.423
OPERATIONS PERSONNEL	56	0	2	58	2.071	0.000	3.777	5.848
HEALTH PHYSICS PERSONNEL	27	0	33	60	1.384	0.000	3.876	5.260
SUPERVISORY PERSONNEL	2	0	4	6	0.144	0.000	0.941	1.085
ENGINEERING PERSONNEL	5	0	5	10	0.298	0.000	1.235	1.533
TOTAL	175	0	187	362	4.875	0.000	46.274	51.149
REFUELING								
MAINTENANCE PERSONNEL	88	1	161	250	30.345	0.717	11.151	42.213
OPERATIONS PERSONNEL	38	0	4	42	4.115	0.000	0.425	4.540
HEALTH PHYSICS PERSONNEL	4	0	11	15	0.885	0.000	0.450	1.335
SUPERVISORY PERSONNEL	6	0	3	9	0.820	0.000	0.796	1.616
ENGINEERING PERSONNEL	13	0	6	19	0.319	0.000	0.194	0.513
TOTAL	149	1	185	335	36.484	0.717	13.016	50.217
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	910 (354)	7 (4)	2374 (1030)	3291(1388)	217.440	0.830	532.153	750.423
OPERATIONS PERSONNEL	652 (310)	1 (1)	92 (57)	745 (368)	96.234	0.002	9.215	105.451
HEALTH PHYSICS PERSONNEL	217 (93)	0 (0)	261 (119)	478 (212)	33.965	0.000	53.013	86.978
SUPERVISORY PERSONNEL	200 (130)	3 (3)	116 (72)	319 (205)	13.411	0.002	9.359	22.772
ENGINEERING PERSONNEL	293 (177)	2 (2)	217 (143)	512 (322)	16.280	0.000	17.319	33.599
GRAND TOTALS								
	2272 (1064)	13 (10)	3060 (1421)	5345(2495)	377.330	0.834	621.059	999.223

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *PALISADES

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	18	1	16	35	4.630	0.531	7.286	12.447
OPERATIONS PERSONNEL	49	0	4	53	16.678	0.034	2.148	18.860
HEALTH PHYSICS PERSONNEL	26	0	37	63	10.847	0.000	14.500	25.347
SUPERVISORY PERSONNEL	11	0	3	14	3.351	0.092	0.787	4.230
ENGINEERING PERSONNEL	2	0	3	5	1.463	0.333	2.530	4.326
TOTAL	106	1	63	170	36.969	0.990	27.251	65.210
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	79	21	135	235	35.009	16.191	55.718	106.918
OPERATIONS PERSONNEL	5	0	2	7	2.096	0.009	0.379	2.484
HEALTH PHYSICS PERSONNEL	22	0	25	47	7.509	0.000	7.927	15.436
SUPERVISORY PERSONNEL	4	2	10	16	1.506	1.565	6.035	9.106
ENGINEERING PERSONNEL	4	3	29	36	1.661	1.382	12.209	15.252
TOTAL	114	26	201	341	47.781	19.147	82.268	149.196
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	1	0	1	0.074	0.158	0.003	0.235
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	1	0	7	8	0.437	0.000	1.623	2.060
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.000	0.000	0.011
ENGINEERING PERSONNEL	0	0	24	24	0.026	0.141	17.929	18.096
TOTAL	1	1	31	33	0.548	0.299	19.555	20.402
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	2	0	120	122	1.442	0.011	43.989	45.442
OPERATIONS PERSONNEL	1	0	3	4	0.490	0.000	1.150	1.640
HEALTH PHYSICS PERSONNEL	0	0	4	4	0.496	0.000	1.329	1.825
SUPERVISORY PERSONNEL	0	0	2	2	0.087	0.028	0.753	0.868
ENGINEERING PERSONNEL	0	2	5	7	0.141	0.481	1.655	2.277
TOTAL	3	2	134	139	2.656	0.520	48.876	52.052
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	2	2	0.030	0.000	0.318	0.348
OPERATIONS PERSONNEL	0	0	0	0	0.200	0.000	0.019	0.219
HEALTH PHYSICS PERSONNEL	9	0	0	9	6.905	0.000	0.007	6.912
SUPERVISORY PERSONNEL	0	0	0	0	0.007	0.000	0.000	0.007
ENGINEERING PERSONNEL	0	0	0	0	0.002	0.000	0.005	0.007
TOTAL	9	0	2	11	7.144	0.000	0.349	7.493
REFUELING								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	99	23	273	395	41.185	16.891	107.314	165.390
OPERATIONS PERSONNEL	55	0	9	64	19.464	0.043	3.696	23.203
HEALTH PHYSICS PERSONNEL	58	0	73	131	26.194	0.000	25.386	51.580
SUPERVISORY PERSONNEL	15	2	15	32	4.962	1.685	7.575	14.222
ENGINEERING PERSONNEL	6	5	61	72	3.293	2.337	34.328	39.958
GRAND TOTALS	233	30	431	694	95.098	20.956	178.299	294.353

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *PALO VERDE 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	0	4	5	1.955	0.000	3.760	5.715
OPERATIONS PERSONNEL	73	0	4	77	21.614	0.000	2.030	23.644
HEALTH PHYSICS PERSONNEL	38	0	105	143	11.658	0.000	32.935	44.593
SUPERVISORY PERSONNEL	1	0	0	1	0.650	0.000	0.190	0.840
ENGINEERING PERSONNEL	2	0	9	11	1.375	0.000	2.798	4.173
TOTAL	115	0	122	237	37.252	0.000	41.713	78.965
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	161	0	457	618	61.456	0.000	226.344	287.800
OPERATIONS PERSONNEL	30	0	40	70	11.511	0.000	14.642	26.153
HEALTH PHYSICS PERSONNEL	33	0	207	240	10.353	0.000	76.274	86.627
SUPERVISORY PERSONNEL	1	0	3	4	0.390	0.000	1.833	2.223
ENGINEERING PERSONNEL	2	0	41	43	2.492	0.000	22.084	24.576
TOTAL	227	0	748	975	86.202	0.000	341.177	427.379
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	90	90	0.170	0.000	59.400	59.570
OPERATIONS PERSONNEL	5	0	6	11	1.465	0.000	1.468	2.933
HEALTH PHYSICS PERSONNEL	0	0	25	25	0.085	0.000	7.635	7.720
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	0.645	0.645
ENGINEERING PERSONNEL	2	0	13	15	0.730	0.000	4.710	5.440
TOTAL	7	0	135	142	2.450	0.000	73.858	76.308
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.395	0.000	0.595	0.990
OPERATIONS PERSONNEL	0	0	0	0	0.025	0.000	0.075	0.100
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.140	0.140
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.040	0.040
TOTAL	0	0	0	0	0.420	0.000	0.850	1.270
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	2	0	2	4	1.055	0.000	1.645	2.700
OPERATIONS PERSONNEL	18	0	26	44	8.002	0.000	9.372	17.374
HEALTH PHYSICS PERSONNEL	4	0	11	15	3.070	0.000	5.360	8.430
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.030	0.030
ENGINEERING PERSONNEL	0	0	0	0	0.010	0.000	0.020	0.030
TOTAL	24	0	39	63	12.137	0.000	16.427	28.564
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	12	0	58	70	3.826	0.000	19.041	22.867
OPERATIONS PERSONNEL	7	0	7	14	3.192	0.000	2.685	5.877
HEALTH PHYSICS PERSONNEL	2	0	27	29	0.905	0.000	10.396	11.301
SUPERVISORY PERSONNEL	0	0	3	3	0.060	0.000	2.542	2.602
ENGINEERING PERSONNEL	2	0	3	5	0.320	0.000	1.079	1.399
TOTAL	23	0	98	121	8.303	0.000	35.743	44.046
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	176	0	611	787	68.857	0.000	310.785	379.642
OPERATIONS PERSONNEL	133	0	83	216	45.809	0.000	30.272	76.081
HEALTH PHYSICS PERSONNEL	77	0	375	452	26.071	0.000	132.740	158.811
SUPERVISORY PERSONNEL	2	0	7	9	1.100	0.000	5.240	6.340
ENGINEERING PERSONNEL	8	0	66	74	4.927	0.000	30.731	35.658
GRAND TOTALS	396	0	1142	1538	146.764	0.000	509.768	656.532

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *PEACH BOTTOM 2,3

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	134	291	502	927	4.368	11.605	26.045	42.018
OPERATIONS PERSONNEL	149	42	190	381	29.519	3.090	19.929	52.538
HEALTH PHYSICS PERSONNEL	110	2	135	247	38.338	0.227	34.592	73.157
SUPERVISORY PERSONNEL	6	3	10	19	0.092	0.044	0.549	0.685
ENGINEERING PERSONNEL	44	32	62	138	3.532	2.198	3.621	9.351
TOTAL	443	370	899	1712	75.849	17.164	84.736	177.749
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	115	206	394	715	10.729	5.429	29.977	46.135
OPERATIONS PERSONNEL	31	25	68	124	1.943	0.744	5.340	8.027
HEALTH PHYSICS PERSONNEL	46	1	65	112	1.990	0.009	8.583	10.582
SUPERVISORY PERSONNEL	5	1	1	7	0.323	0.012	0.054	0.389
ENGINEERING PERSONNEL	25	22	45	92	0.822	0.560	1.924	3.306
TOTAL	222	255	573	1050	15.807	6.754	45.878	68.439
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	25	41	123	189	0.247	0.670	7.124	8.041
OPERATIONS PERSONNEL	4	3	21	28	0.038	0.012	1.447	1.497
HEALTH PHYSICS PERSONNEL	7	1	9	17	0.217	0.039	0.797	1.053
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	4	4	6	14	0.082	0.064	0.233	0.379
TOTAL	40	49	159	248	0.584	0.785	9.601	10.970
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	137	363	748	1248	43.745	65.235	40.650	149.630
OPERATIONS PERSONNEL	69	41	200	310	5.607	3.993	26.025	35.625
HEALTH PHYSICS PERSONNEL	95	4	126	225	13.217	0.664	22.445	36.326
SUPERVISORY PERSONNEL	6	5	12	23	0.444	0.068	0.544	1.056
ENGINEERING PERSONNEL	42	28	89	159	3.396	1.170	9.200	13.766
TOTAL	349	441	1175	1965	66.409	71.130	98.864	236.403
WASTE PROCESSING								
MAINTENANCE PERSONNEL	56	79	168	303	3.841	2.867	11.481	18.189
OPERATIONS PERSONNEL	14	8	43	65	0.290	0.220	2.356	2.866
HEALTH PHYSICS PERSONNEL	46	1	46	93	1.859	0.039	3.498	5.396
SUPERVISORY PERSONNEL	3	2	8	13	0.036	0.034	0.179	0.249
ENGINEERING PERSONNEL	9	5	10	24	0.231	0.129	0.251	0.611
TOTAL	128	95	275	498	6.257	3.289	17.765	27.311
REFUELING								
MAINTENANCE PERSONNEL	21	102	22	145	0.424	3.630	0.458	4.512
OPERATIONS PERSONNEL	8	5	11	24	0.175	0.113	0.276	0.564
HEALTH PHYSICS PERSONNEL	10	1	38	49	0.169	0.006	0.850	1.025
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	6	2	16	24	0.175	0.030	0.851	1.056
TOTAL	45	110	87	242	0.943	3.779	2.435	7.157
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	488	(143)	1082	(369)	1957	(790)	3527	(1302)
OPERATIONS PERSONNEL	275	(150)	124	(47)	533	(262)	932	(459)
HEALTH PHYSICS PERSONNEL	314	(110)	10	(4)	419	(149)	743	(263)
SUPERVISORY PERSONNEL	20	(6)	11	(5)	31	(13)	62	(24)
ENGINEERING PERSONNEL	130	(46)	93	(42)	228	(107)	451	(195)
GRAND TOTALS	1227	(455)	1320	(467)	3168	(1321)	5715	(2243)
	165.849	102.901	259.279		528.029			

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *PERRY

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	130	4	225	359	10.409	0.520	5.909	16.838
OPERATIONS PERSONNEL	79	1	5	85	28.413	0.000	0.745	29.158
HEALTH PHYSICS PERSONNEL	48	0	172	220	22.514	0.000	57.464	79.978
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	27	22	41	90	1.024	0.500	0.933	2.457
TOTAL	284	27	443	754	62.360	1.020	65.051	128.431
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	151	6	741	898	10.377	0.197	38.583	49.157
OPERATIONS PERSONNEL	74	1	7	82	9.496	0.295	0.635	10.426
HEALTH PHYSICS PERSONNEL	45	0	186	231	2.559	0.000	19.604	22.163
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	28	25	62	115	3.462	2.670	3.306	9.438
TOTAL	298	32	996	1326	25.894	3.162	62.128	91.184
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	100	2	592	694	4.780	0.070	66.124	70.974
OPERATIONS PERSONNEL	46	1	4	51	0.645	0.015	0.070	0.730
HEALTH PHYSICS PERSONNEL	18	0	102	120	0.360	0.000	2.637	2.997
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	22	23	65	110	3.220	1.850	18.950	24.020
TOTAL	186	26	763	975	9.005	1.935	87.781	98.721
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	151	6	768	925	43.489	1.540	368.653	413.682
OPERATIONS PERSONNEL	70	1	10	81	5.461	0.025	2.625	8.111
HEALTH PHYSICS PERSONNEL	47	0	187	234	10.322	0.000	20.849	31.171
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	28	25	52	105	3.238	5.596	9.267	18.101
TOTAL	296	32	1017	1345	62.510	7.161	401.394	471.065
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	45	0	216	261	0.680	0.000	11.098	11.778
OPERATIONS PERSONNEL	22	0	3	25	2.220	0.000	1.380	3.600
HEALTH PHYSICS PERSONNEL	32	0	123	155	3.470	0.000	7.533	11.003
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	5	3	8	0.000	0.045	0.000	0.045
TOTAL	99	5	345	449	6.370	0.045	20.011	26.426
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	70	2	402	474	2.600	0.015	37.598	40.213
OPERATIONS PERSONNEL	35	1	4	40	0.480	0.000	2.825	3.305
HEALTH PHYSICS PERSONNEL	20	0	91	111	0.570	0.000	7.565	8.135
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	15	11	23	49	1.260	0.520	0.770	2.550
TOTAL	140	14	520	674	4.910	0.535	48.758	54.203
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	647	20	2944	3611	72.335	2.342	527.965	602.642
OPERATIONS PERSONNEL	326	5	33	364	46.715	0.335	8.280	55.330
HEALTH PHYSICS PERSONNEL	210	0	861	1071	39.795	0.000	115.652	155.447
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	120	111	246	477	12.204	11.181	33.226	56.611
GRAND TOTALS	1303	136	4084	5523	171.049	13.858	685.123	870.030

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *PILGRIM

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	115	7	23	145	36.723	1.985	7.171	45.879
OPERATIONS PERSONNEL	81	0	80	161	30.862	0.149	18.054	49.065
HEALTH PHYSICS PERSONNEL	35	0	0	35	13.561	0.055	0.007	13.623
SUPERVISORY PERSONNEL	45	1	9	55	16.036	0.475	3.376	19.887
ENGINEERING PERSONNEL	45	0	3	48	19.846	0.559	1.820	22.225
TOTAL	321	8	115	444	117.028	3.223	30.428	150.679
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	72	5	20	97	22.486	1.510	6.305	30.301
OPERATIONS PERSONNEL	2	0	0	2	2.261	0.038	0.035	2.334
HEALTH PHYSICS PERSONNEL	29	0	0	29	6.871	0.000	0.000	6.871
SUPERVISORY PERSONNEL	13	0	4	17	3.963	0.047	0.995	5.005
ENGINEERING PERSONNEL	7	0	1	8	3.455	0.080	0.264	3.799
TOTAL	123	5	25	153	39.036	1.675	7.599	48.310
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.003	0.000	0.000	0.003
TOTAL	0	0	0	0	0.008	0.000	0.000	0.008
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	28	2	13	43	7.246	0.520	4.035	11.801
OPERATIONS PERSONNEL	0	0	0	0	0.330	0.000	0.000	0.330
HEALTH PHYSICS PERSONNEL	3	0	0	3	1.470	0.000	0.000	1.470
SUPERVISORY PERSONNEL	7	0	1	8	2.093	0.065	0.210	2.368
ENGINEERING PERSONNEL	4	0	0	4	1.059	0.049	0.025	1.133
TOTAL	42	2	14	58	12.198	0.634	4.270	17.102
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	8	1	1	10	2.933	0.130	1.070	4.133
OPERATIONS PERSONNEL	10	1	1	12	4.324	0.120	0.265	4.709
HEALTH PHYSICS PERSONNEL	4	0	0	4	2.103	0.040	0.000	2.143
SUPERVISORY PERSONNEL	2	0	1	3	0.418	0.000	0.190	0.608
ENGINEERING PERSONNEL	0	0	0	0	0.047	0.000	0.000	0.047
TOTAL	24	2	3	29	9.825	0.290	1.525	11.640
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	223	15	57	295	69.388	4.145	18.581	92.114
OPERATIONS PERSONNEL	93	1	81	175	37.777	0.307	18.354	56.438
HEALTH PHYSICS PERSONNEL	71	0	0	71	24.010	0.095	0.007	24.112
SUPERVISORY PERSONNEL	67	1	15	83	22.510	0.587	4.771	27.868
ENGINEERING PERSONNEL	56	0	4	60	24.410	0.688	2.109	27.207
GRAND TOTALS	510	17	157	684	178.095	5.822	43.822	227.739

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *POINT BEACH 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	3.730	0.680	4.410
OPERATIONS PERSONNEL	0	0	0	0	26.780	0.000	0.000	26.780
HEALTH PHYSICS PERSONNEL	0	0	0	0	38.890	0.000	0.000	38.890
SUPERVISORY PERSONNEL	0	0	0	0	2.660	0.000	0.000	2.660
ENGINEERING PERSONNEL	0	0	0	0	0.200	0.000	0.000	0.200
TOTAL	0	0	0	0	68.530	3.730	0.680	72.940
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	57.370	18.260	0.000	75.630
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	57.370	18.260	0.000	75.630
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	3.240	2.760	19.300	25.300
OPERATIONS PERSONNEL	0	0	0	0	7.130	0.000	0.000	7.130
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	6.310	0.000	0.000	6.310
ENGINEERING PERSONNEL	0	0	0	0	0.100	0.000	0.000	0.100
TOTAL	0	0	0	0	16.780	2.760	19.300	38.840
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	5.740	1.860	236.900	244.500
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	5.740	1.860	236.900	244.500
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	10.080	10.080
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	2.510	0.000	0.000	2.510
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	2.510	0.000	10.080	12.590
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	17.100	9.500	0.000	26.600
OPERATIONS PERSONNEL	0	0	0	0	2.610	0.000	0.000	2.610
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.260	0.000	0.000	0.260
ENGINEERING PERSONNEL	0	0	0	0	0.420	0.000	0.000	0.420
TOTAL	0	0	0	0	20.390	9.500	0.000	29.890
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	0 (61)	0 (28)	0 (313)	0 (402)	83.450	36.110	266.960	386.520
OPERATIONS PERSONNEL	0 (65)	0 (0)	0 (0)	0 (65)	36.520	0.000	0.000	36.520
HEALTH PHYSICS PERSONNEL	0 (37)	0 (0)	0 (0)	0 (37)	41.400	0.000	0.000	41.400
SUPERVISORY PERSONNEL	0 (23)	0 (0)	0 (0)	0 (23)	9.230	0.000	0.000	9.230
ENGINEERING PERSONNEL	0 (4)	0 (0)	0 (0)	0 (4)	0.720	0.000	0.000	0.720
GRAND TOTALS	0 (190)	0 (28)	0 (313)	0 (531)	171.320	36.110	266.960	474.390

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *PRAIRIE ISLAND 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	4	0	0	4	2.098	0.395	0.206	2.699
OPERATIONS PERSONNEL	2	0	0	2	1.884	0.011	0.000	1.895
HEALTH PHYSICS PERSONNEL	7	0	1	8	2.510	0.000	0.542	3.052
SUPERVISORY PERSONNEL	2	0	1	3	0.747	0.110	0.227	1.084
ENGINEERING PERSONNEL	<u>2</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>0.364</u>	<u>0.000</u>	<u>0.000</u>	<u>0.364</u>
TOTAL	17	0	2	19	7.603	0.516	0.975	9.094
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	8	9	0	17	2.837	4.329	0.289	7.455
OPERATIONS PERSONNEL	0	0	0	0	0.103	0.000	0.000	0.103
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.022	0.000	0.149	0.171
SUPERVISORY PERSONNEL	1	1	1	3	1.054	0.277	0.354	1.685
ENGINEERING PERSONNEL	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0.627</u>	<u>0.068</u>	<u>0.000</u>	<u>0.695</u>
TOTAL	10	10	1	21	4.643	4.674	0.792	10.109
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	2	11	9	22	1.106	3.306	3.107	7.519
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	9	9	0.115	0.000	1.968	2.083
SUPERVISORY PERSONNEL	1	0	20	21	0.134	0.000	9.830	9.964
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
TOTAL	3	11	38	52	1.355	3.306	14.905	19.566
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	17	38	15	70	7.100	13.271	4.925	25.296
OPERATIONS PERSONNEL	1	0	0	1	0.380	0.000	0.000	0.380
HEALTH PHYSICS PERSONNEL	6	0	10	16	1.622	0.000	3.230	4.852
SUPERVISORY PERSONNEL	2	0	1	3	1.219	0.146	0.678	2.043
ENGINEERING PERSONNEL	<u>2</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>0.778</u>	<u>0.069</u>	<u>0.000</u>	<u>0.847</u>
TOTAL	28	38	26	92	11.099	13.486	8.833	33.418
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	9	0	0	9	4.650	0.063	0.091	4.804
OPERATIONS PERSONNEL	1	0	0	1	0.522	0.000	0.000	0.522
HEALTH PHYSICS PERSONNEL	3	0	0	3	2.778	0.000	0.072	2.850
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.000	0.013	0.018
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
TOTAL	13	0	0	13	7.955	0.063	0.176	8.194
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	15	15	0	30	4.946	4.675	0.000	9.621
OPERATIONS PERSONNEL	2	0	0	2	1.862	0.000	0.000	1.862
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.058	0.000	0.220	0.278
SUPERVISORY PERSONNEL	1	0	1	2	0.412	0.045	0.194	0.651
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
TOTAL	18	15	2	35	7.278	4.720	0.414	12.412
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	55	73	24	152	22.737	26.039	8.618	57.394
OPERATIONS PERSONNEL	6	0	0	6	4.751	0.011	0.000	4.762
HEALTH PHYSICS PERSONNEL	16	0	21	37	7.105	0.000	6.181	13.286
SUPERVISORY PERSONNEL	7	1	24	32	3.571	0.578	11.296	15.445
ENGINEERING PERSONNEL	5	0	0	5	1.769	0.137	0.000	1.906
GRAND TOTALS	89	74	69	232	39.933	26.765	26.095	92.793

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *QUAD CITIES 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	17	1	91	109	13.356	0.004	31.522	44.882
OPERATIONS PERSONNEL	100	0	76	176	44.115	0.000	5.011	49.126
HEALTH PHYSICS PERSONNEL	21	0	6	27	18.293	0.000	3.003	21.296
SUPERVISORY PERSONNEL	91	0	0	91	18.693	0.000	0.000	18.693
ENGINEERING PERSONNEL	60	25	20	105	5.007	0.432	3.638	9.077
TOTAL	289	26	193	508	99.464	0.436	43.174	143.074
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	108	4	652	764	87.407	0.914	225.585	313.906
OPERATIONS PERSONNEL	16	0	5	21	6.873	0.000	0.314	7.187
HEALTH PHYSICS PERSONNEL	20	0	21	41	16.622	0.000	11.236	27.858
SUPERVISORY PERSONNEL	69	0	0	69	14.278	0.000	0.000	14.278
ENGINEERING PERSONNEL	57	70	58	185	4.745	1.143	10.718	16.606
TOTAL	270	74	736	1080	129.925	2.057	247.853	379.835
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	107	108	1.168	0.000	37.040	38.208
OPERATIONS PERSONNEL	1	0	1	2	0.153	0.000	0.026	0.179
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.124	0.000	0.018	0.142
SUPERVISORY PERSONNEL	1	0	0	1	0.150	0.000	0.000	0.150
ENGINEERING PERSONNEL	6	17	221	244	0.673	0.280	41.137	42.090
TOTAL	10	17	330	357	2.268	0.280	78.221	80.769
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	4	35	621	660	2.985	7.536	214.837	225.358
OPERATIONS PERSONNEL	2	0	1	3	0.679	0.000	0.067	0.746
HEALTH PHYSICS PERSONNEL	3	0	13	16	2.146	0.000	6.771	8.917
SUPERVISORY PERSONNEL	3	0	0	3	0.694	0.000	0.000	0.694
ENGINEERING PERSONNEL	23	109	87	219	1.906	1.792	15.977	19.675
TOTAL	35	144	722	901	8.410	9.328	237.652	255.390
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	1	0	4	5	0.059	0.000	1.384	1.443
OPERATIONS PERSONNEL	25	0	99	124	11.297	0.000	6.652	17.949
HEALTH PHYSICS PERSONNEL	4	0	1	5	3.143	0.000	0.014	3.157
SUPERVISORY PERSONNEL	11	0	0	11	2.353	0.000	0.000	2.353
ENGINEERING PERSONNEL	1	2	1	4	0.061	0.036	0.008	0.105
TOTAL	42	2	105	149	16.913	0.036	8.058	25.007
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	12	0	1	13	9.769	0.000	0.250	10.019
OPERATIONS PERSONNEL	5	0	0	5	2.208	0.000	0.000	2.208
HEALTH PHYSICS PERSONNEL	2	0	0	2	1.417	0.000	0.000	1.417
SUPERVISORY PERSONNEL	8	0	0	8	1.657	0.000	0.000	1.657
ENGINEERING PERSONNEL	3	6	3	12	0.242	0.093	0.528	0.863
TOTAL	30	6	4	40	15.293	0.093	0.778	16.164
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	143	40	1476	1659	114.744	8.454	510.618	633.816
OPERATIONS PERSONNEL	149	0	182	331	65.325	0.000	12.070	77.395
HEALTH PHYSICS PERSONNEL	51	0	42	93	41.745	0.000	21.042	62.787
SUPERVISORY PERSONNEL	183	0	0	183	37.825	0.000	0.000	37.825
ENGINEERING PERSONNEL	150	229	390	769	12.634	3.776	72.006	88.416
GRAND TOTALS	676	269	2090	3035	272.273	12.230	615.736	900.239

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *RANCHO SECO

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	32	0	1	33	0.567	0.000	0.008	0.575
OPERATIONS PERSONNEL	20	0	0	20	2.064	0.000	0.000	2.064
HEALTH PHYSICS PERSONNEL	34	0	13	47	3.717	0.000	0.917	4.634
SUPERVISORY PERSONNEL	1	0	0	1	0.040	0.000	0.000	0.040
ENGINEERING PERSONNEL	8	0	4	12	0.144	0.000	0.137	0.281
TOTAL	95	0	18	113	6.532	0.000	1.062	7.594
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	55	0	40	95	8.013	0.000	5.073	13.086
OPERATIONS PERSONNEL	20	0	0	20	2.981	0.000	0.000	2.981
HEALTH PHYSICS PERSONNEL	39	0	16	55	7.276	0.000	3.946	11.222
SUPERVISORY PERSONNEL	1	0	0	1	0.111	0.000	0.000	0.111
ENGINEERING PERSONNEL	11	0	7	18	1.071	0.000	1.107	2.178
TOTAL	126	0	63	189	19.452	0.000	10.126	29.578
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	3	0	0	3	0.070	0.000	0.000	0.070
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.000	0.000	0.027	0.027
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	1	0	0	1	0.003	0.000	0.000	0.003
TOTAL	4	0	1	5	0.073	0.000	0.027	0.100
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	40	0	14	54	5.626	0.000	0.746	6.372
OPERATIONS PERSONNEL	3	0	0	3	0.012	0.000	0.000	0.012
HEALTH PHYSICS PERSONNEL	27	0	4	31	1.479	0.000	0.054	1.533
SUPERVISORY PERSONNEL	1	0	0	1	0.166	0.000	0.000	0.166
ENGINEERING PERSONNEL	7	0	2	9	0.485	0.000	0.673	1.158
TOTAL	78	0	20	98	7.768	0.000	1.473	9.241
WASTE PROCESSING								
MAINTENANCE PERSONNEL	40	0	15	55	5.385	0.000	0.423	5.808
OPERATIONS PERSONNEL	4	0	0	4	0.033	0.000	0.000	0.033
HEALTH PHYSICS PERSONNEL	38	0	13	51	10.318	0.000	1.098	11.416
SUPERVISORY PERSONNEL	1	0	0	1	0.349	0.000	0.000	0.349
ENGINEERING PERSONNEL	6	0	1	7	0.304	0.000	0.010	0.314
TOTAL	89	0	29	118	16.389	0.000	1.531	17.920
REFUELING								
MAINTENANCE PERSONNEL	9	0	6	15	0.211	0.000	0.841	1.052
OPERATIONS PERSONNEL	6	0	0	6	0.084	0.000	0.000	0.084
HEALTH PHYSICS PERSONNEL	4	0	4	8	0.085	0.000	0.190	0.275
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	5	0	2	7	0.126	0.000	0.253	0.379
TOTAL	24	0	12	36	0.506	0.000	1.284	1.790
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	179	0	76	255	19.872	0.000	7.091	26.963
OPERATIONS PERSONNEL	53	0	0	53	5.174	0.000	0.000	5.174
HEALTH PHYSICS PERSONNEL	142	0	51	193	22.875	0.000	6.232	29.107
SUPERVISORY PERSONNEL	4	0	0	4	0.666	0.000	0.000	0.666
ENGINEERING PERSONNEL	38	0	16	54	2.133	0.000	2.180	4.313
GRAND TOTALS	416	0	143	559	50.720	0.000	15.503	66.223

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *RIVER BEND 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	5	0	7	12	3.019	0.000	3.192	6.211
OPERATIONS PERSONNEL	43	0	1	44	20.849	0.000	0.230	21.079
HEALTH PHYSICS PERSONNEL	14	0	13	27	10.507	0.000	4.820	15.327
SUPERVISORY PERSONNEL	1	1	0	2	0.085	0.085	0.040	0.210
ENGINEERING PERSONNEL	<u>2</u>	<u>4</u>	<u>3</u>	<u>9</u>	<u>0.485</u>	<u>0.761</u>	<u>0.595</u>	<u>1.841</u>
TOTAL	65	5	24	94	34.945	0.846	8.877	44.668
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	16	0	38	54	7.725	0.000	17.271	24.996
OPERATIONS PERSONNEL	1	0	0	1	0.390	0.000	0.005	0.395
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.963	0.000	0.375	1.338
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.095	0.095
ENGINEERING PERSONNEL	<u>2</u>	<u>4</u>	<u>8</u>	<u>14</u>	<u>0.685</u>	<u>0.430</u>	<u>2.945</u>	<u>4.060</u>
TOTAL	20	4	47	71	9.763	0.430	20.691	30.884
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	65	65	0.420	0.000	50.619	51.039
OPERATIONS PERSONNEL	1	0	2	3	0.445	0.000	1.460	1.905
HEALTH PHYSICS PERSONNEL	3	0	6	9	2.490	0.000	3.855	6.345
SUPERVISORY PERSONNEL	0	0	3	3	0.000	0.005	1.210	1.215
ENGINEERING PERSONNEL	<u>3</u>	<u>0</u>	<u>32</u>	<u>35</u>	<u>0.820</u>	<u>0.000</u>	<u>59.452</u>	<u>60.272</u>
TOTAL	7	0	108	115	4.175	0.005	116.596	120.776
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	77	0	229	306	61.873	0.000	208.419	270.292
OPERATIONS PERSONNEL	9	0	0	9	5.239	0.000	0.170	5.409
HEALTH PHYSICS PERSONNEL	24	0	28	52	23.974	0.000	18.736	42.710
SUPERVISORY PERSONNEL	1	2	3	6	0.100	0.450	0.895	1.445
ENGINEERING PERSONNEL	<u>13</u>	<u>4</u>	<u>43</u>	<u>60</u>	<u>3.704</u>	<u>0.720</u>	<u>18.904</u>	<u>23.328</u>
TOTAL	124	6	303	433	94.890	1.170	247.124	343.184
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	20	20	0.230	0.000	9.339	9.569
OPERATIONS PERSONNEL	1	0	1	2	0.390	0.000	2.500	2.890
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.755	0.000	0.437	1.192
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
TOTAL	2	0	22	24	1.375	0.000	12.276	13.651
REFUELING								
MAINTENANCE PERSONNEL	0	0	16	16	0.095	0.000	6.695	6.790
OPERATIONS PERSONNEL	1	0	3	4	0.225	0.000	0.425	0.650
HEALTH PHYSICS PERSONNEL	0	0	4	4	0.115	0.000	1.075	1.190
SUPERVISORY PERSONNEL	0	1	2	3	0.000	0.078	0.380	0.458
ENGINEERING PERSONNEL	<u>1</u>	<u>0</u>	<u>10</u>	<u>11</u>	<u>0.125</u>	<u>0.005</u>	<u>2.915</u>	<u>3.045</u>
TOTAL	2	1	35	38	0.560	0.083	11.490	12.133
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	98	0	375	473	73.362	0.000	295.535	368.897
OPERATIONS PERSONNEL	56	0	7	63	27.538	0.000	4.790	32.328
HEALTH PHYSICS PERSONNEL	43	0	53	96	38.804	0.000	29.298	68.102
SUPERVISORY PERSONNEL	2	4	8	14	0.185	0.618	2.620	3.423
ENGINEERING PERSONNEL	21	12	96	129	5.819	1.916	84.811	92.546
GRAND TOTALS	220	16	539	775	145.708	2.534	417.054	565.296

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *ROBINSON 2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	2	0	0	2	1.820	0.045	0.306	2.171
OPERATIONS PERSONNEL	37	0	0	37	12.404	0.000	1.975	14.379
HEALTH PHYSICS PERSONNEL	22	0	0	22	9.670	0.000	0.565	10.235
SUPERVISORY PERSONNEL	0	0	0	0	0.055	0.000	0.000	0.055
ENGINEERING PERSONNEL	3	0	1	4	2.117	0.245	0.835	3.197
TOTAL	64	0	1	65	26.066	0.290	3.681	30.037
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	3	3	0.780	0.285	1.335	2.400
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.055	0.055
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.235	0.000	0.005	0.240
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.020	0.000	0.070	0.090
TOTAL	1	0	3	4	1.035	0.285	1.465	2.785
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	1	1	0.130	0.055	0.460	0.645
OPERATIONS PERSONNEL	0	0	0	0	0.015	0.000	0.075	0.090
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.030	0.000	0.000	0.030
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.015	0.000	0.015
ENGINEERING PERSONNEL	0	0	0	0	0.415	0.100	0.655	1.170
TOTAL	0	0	1	1	0.590	0.170	1.190	1.950
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	56	23	118	197	31.774	10.503	42.261	84.538
OPERATIONS PERSONNEL	0	0	0	0	0.511	0.000	0.135	0.646
HEALTH PHYSICS PERSONNEL	13	0	1	14	4.638	0.000	1.490	6.128
SUPERVISORY PERSONNEL	0	0	0	0	0.010	0.000	0.006	0.016
ENGINEERING PERSONNEL	12	0	22	34	5.717	0.485	6.849	13.051
TOTAL	81	23	141	245	42.650	10.988	50.741	104.379
WASTE PROCESSING								
MAINTENANCE PERSONNEL	3	0	8	11	0.785	0.050	2.675	3.510
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.170	0.170
HEALTH PHYSICS PERSONNEL	3	0	1	4	1.145	0.000	0.500	1.645
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	2	2	0.000	0.000	0.555	0.555
TOTAL	6	0	11	17	1.930	0.050	3.900	5.880
REFUELING								
MAINTENANCE PERSONNEL	26	17	36	79	7.500	4.770	14.430	26.700
OPERATIONS PERSONNEL	5	0	0	5	1.930	0.000	0.005	1.935
HEALTH PHYSICS PERSONNEL	17	0	11	28	4.205	0.000	3.850	8.055
SUPERVISORY PERSONNEL	0	0	0	0	0.030	0.000	0.000	0.030
ENGINEERING PERSONNEL	1	0	22	23	1.010	0.240	6.730	7.980
TOTAL	49	17	69	135	14.675	5.010	25.015	44.700
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	87	40	166	293	42.789	15.708	61.467	119.964
OPERATIONS PERSONNEL	42	0	0	42	14.860	0.000	2.415	17.275
HEALTH PHYSICS PERSONNEL	56	0	13	69	19.923	0.000	6.410	26.333
SUPERVISORY PERSONNEL	0	0	0	0	0.095	0.015	0.006	0.116
ENGINEERING PERSONNEL	16	0	47	63	9.279	1.070	15.694	26.043
GRAND TOTALS	201	40	226	467	86.946	16.793	85.992	189.731

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *SALEM 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	0	0	1.025	0.001	0.405	1.431
OPERATIONS PERSONNEL	0	0	0	0	1.059	0.000	0.101	1.160
HEALTH PHYSICS PERSONNEL	2	0	0	2	1.016	0.091	0.204	1.311
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.025	0.010	0.035
ENGINEERING PERSONNEL	0	0	0	0	0.108	0.008	0.007	0.123
TOTAL	2	0	0	2	3.208	0.125	0.727	4.060
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	2	0	0	2	3.855	0.140	3.144	7.139
OPERATIONS PERSONNEL	2	0	0	2	3.830	0.000	0.542	4.372
HEALTH PHYSICS PERSONNEL	23	0	1	24	5.823	0.209	0.963	6.995
SUPERVISORY PERSONNEL	0	0	0	0	0.014	0.388	0.020	0.422
ENGINEERING PERSONNEL	2	0	0	2	0.709	0.079	0.088	0.876
TOTAL	29	0	1	30	14.231	0.816	4.757	19.804
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.266	0.266
OPERATIONS PERSONNEL	0	0	0	0	0.009	0.000	0.000	0.009
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.004	0.000	0.002	0.006
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.002	0.000	0.002
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.013	0.002	0.268	0.283
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	4	0	17	21	3.704	0.092	5.804	9.600
OPERATIONS PERSONNEL	0	0	0	0	0.256	0.000	0.035	0.291
HEALTH PHYSICS PERSONNEL	4	0	0	4	2.417	0.001	0.144	2.562
SUPERVISORY PERSONNEL	0	1	0	1	0.001	0.175	0.000	0.176
ENGINEERING PERSONNEL	1	0	0	1	0.269	0.013	0.000	0.282
TOTAL	9	1	17	27	6.647	0.281	5.983	12.911
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	6	6	0.159	0.000	1.724	1.883
OPERATIONS PERSONNEL	1	0	0	1	0.289	0.000	0.012	0.301
HEALTH PHYSICS PERSONNEL	16	0	4	20	5.626	0.234	1.420	7.280
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.308	0.000	0.308
ENGINEERING PERSONNEL	0	0	0	0	0.247	0.000	0.000	0.247
TOTAL	17	0	10	27	6.321	0.542	3.156	10.019
REFUELING								
MAINTENANCE PERSONNEL	105	1	334	440	62.653	0.832	170.503	233.988
OPERATIONS PERSONNEL	22	0	1	23	5.845	0.010	0.236	6.091
HEALTH PHYSICS PERSONNEL	31	2	47	80	19.147	1.388	22.045	42.580
SUPERVISORY PERSONNEL	0	8	2	10	0.077	2.177	0.491	2.745
ENGINEERING PERSONNEL	8	2	3	13	3.122	0.843	0.818	4.783
TOTAL	166	13	387	566	90.844	5.250	194.093	290.187
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	111	1	357	469	71.396	1.065	181.846	254.307
OPERATIONS PERSONNEL	25	0	1	26	11.288	0.010	0.926	12.224
HEALTH PHYSICS PERSONNEL	76	2	52	130	34.033	1.923	24.778	60.734
SUPERVISORY PERSONNEL	0	9	2	11	0.092	3.075	0.521	3.688
ENGINEERING PERSONNEL	11	2	3	16	4.455	0.943	0.913	6.311
GRAND TOTALS	223	14	415	652	121.264	7.016	208.984	337.264

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *SAN ONOFRE 1,2,3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	1	0	1	2	0.436	0.000	0.261	0.697
OPERATIONS PERSONNEL	44	1	1	46	9.034	0.758	0.290	10.082
HEALTH PHYSICS PERSONNEL	45	0	41	86	5.523	0.000	5.615	11.138
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	10	2	2	14	1.014	0.157	0.199	1.370
TOTAL	100	3	45	148	16.007	0.915	6.365	23.287
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	173	21	430	624	63.722	11.455	134.290	209.467
OPERATIONS PERSONNEL	50	1	2	53	6.192	0.599	0.353	7.144
HEALTH PHYSICS PERSONNEL	88	2	199	289	45.910	0.757	95.864	142.531
SUPERVISORY PERSONNEL	3	0	4	7	2.113	0.000	1.455	3.568
ENGINEERING PERSONNEL	112	8	110	230	34.006	1.526	37.402	72.934
TOTAL	426	32	745	1203	151.943	14.337	269.364	435.644
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	30	2	172	204	1.507	0.012	13.265	14.784
OPERATIONS PERSONNEL	3	0	0	3	0.061	0.000	0.000	0.061
HEALTH PHYSICS PERSONNEL	5	0	2	7	0.145	0.000	0.117	0.262
SUPERVISORY PERSONNEL	1	0	1	2	0.004	0.000	0.029	0.033
ENGINEERING PERSONNEL	48	0	17	65	1.427	0.000	0.397	1.824
TOTAL	87	2	192	281	3.144	0.012	13.808	16.964
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	2	1	3	6	0.018	0.187	0.118	0.323
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	33	0	60	93	2.233	0.000	5.176	7.409
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	35	1	63	99	2.251	0.187	5.294	7.732
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	173	20	241	434	23.398	0.625	67.679	91.702
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	173	20	241	434	23.398	0.625	67.679	91.702
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	379 (173)	44 (21)	847 (430)	1270 (624)	89.081	12.279	215.613	316.973
OPERATIONS PERSONNEL	97 (53)	2 (1)	3 (2)	102 (56)	15.287	1.357	0.643	17.287
HEALTH PHYSICS PERSONNEL	171 (88)	2 (2)	302 (201)	475 (291)	53.811	0.757	106.772	161.340
SUPERVISORY PERSONNEL	4 (3)	0 (0)	5 (4)	9 (7)	2.117	0.000	1.484	3.601
ENGINEERING PERSONNEL	170 (112)	10 (8)	129 (110)	309 (230)	36.447	1.683	37.998	76.128
GRAND TOTALS	821 (429)	58 (32)	1286 (747)	2165(1208)	196.743	16.076	362.510	575.329

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *SEABROOK

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
GRAND TOTALS	0	0	0	0	0.000	0.000	0.000	0.000

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *SEQUOYAH 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	626	17	22	665	22.061	1.496	1.702	25.259				
OPERATIONS PERSONNEL	107	2	0	109	18.641	0.805	0.000	19.446				
HEALTH PHYSICS PERSONNEL	42	0	51	93	9.659	0.000	3.148	12.807				
SUPERVISORY PERSONNEL	71	27	17	115	2.508	0.668	0.698	3.874				
ENGINEERING PERSONNEL	76	18	59	153	6.610	1.862	2.713	11.185				
TOTAL	922	64	149	1135	59.479	4.831	8.261	72.571				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	626	14	38	678	121.065	1.554	4.038	126.657				
OPERATIONS PERSONNEL	96	2	3	101	2.513	0.025	0.029	2.567				
HEALTH PHYSICS PERSONNEL	42	0	50	92	9.986	0.000	10.577	20.563				
SUPERVISORY PERSONNEL	74	22	16	112	7.499	0.686	1.260	9.445				
ENGINEERING PERSONNEL	67	16	47	130	4.243	0.759	11.726	16.728				
TOTAL	905	54	154	1113	145.306	3.024	27.630	175.960				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	251	4	3	258	67.625	0.799	0.015	68.439				
OPERATIONS PERSONNEL	9	0	0	9	0.119	0.000	0.000	0.119				
HEALTH PHYSICS PERSONNEL	31	0	45	76	10.672	0.000	19.816	30.488				
SUPERVISORY PERSONNEL	28	24	26	78	6.696	10.878	17.983	35.557				
ENGINEERING PERSONNEL	10	13	22	45	0.928	17.346	28.658	46.932				
TOTAL	329	41	96	466	86.040	29.023	66.472	181.535				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	482	7	20	509	80.155	0.863	0.969	81.987				
OPERATIONS PERSONNEL	16	0	0	16	0.096	0.000	0.000	0.096				
HEALTH PHYSICS PERSONNEL	39	0	35	74	2.314	0.000	0.859	3.173				
SUPERVISORY PERSONNEL	49	8	6	63	4.195	0.403	0.060	4.658				
ENGINEERING PERSONNEL	48	5	35	88	3.948	0.040	19.616	23.604				
TOTAL	634	20	96	750	90.708	1.306	21.504	113.518				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	101	0	21	122	3.701	0.000	2.015	5.716				
OPERATIONS PERSONNEL	31	0	3	34	3.401	0.000	2.968	6.369				
HEALTH PHYSICS PERSONNEL	38	0	19	57	3.956	0.000	1.090	5.046				
SUPERVISORY PERSONNEL	12	0	1	13	0.406	0.000	0.003	0.409				
ENGINEERING PERSONNEL	7	0	0	7	0.396	0.000	0.000	0.396				
TOTAL	189	0	44	233	11.860	0.000	6.076	17.936				
REFUELING												
MAINTENANCE PERSONNEL	233	4	14	251	69.674	1.486	6.960	78.120				
OPERATIONS PERSONNEL	41	1	0	42	3.356	0.010	0.000	3.366				
HEALTH PHYSICS PERSONNEL	22	0	18	40	6.760	0.000	5.584	12.344				
SUPERVISORY PERSONNEL	36	5	2	43	9.790	0.500	0.365	10.655				
ENGINEERING PERSONNEL	18	0	2	20	3.450	0.000	0.020	3.470				
TOTAL	350	10	36	396	93.030	1.996	12.929	107.955				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	2319	(681)	46	(18)	118	(48)	2483	(747)	364.281	6.198	15.699	386.178
OPERATIONS PERSONNEL	300	(95)	5	(2)	6	(4)	311	(101)	28.126	0.840	2.997	31.963
HEALTH PHYSICS PERSONNEL	214	(42)	0	(0)	218	(50)	432	(92)	43.347	0.000	41.074	84.421
SUPERVISORY PERSONNEL	270	(72)	86	(31)	68	(29)	424	(132)	31.094	13.135	20.369	64.598
ENGINEERING PERSONNEL	226	(69)	52	(13)	165	(67)	443	(149)	19.575	20.007	62.733	102.315
GRAND TOTALS									486.423	40.180	142.872	669.475

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *SHOREHAM

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.010	0.000	0.000	0.010
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
GRAND TOTALS	0	0	0	0	0.010	0.000	0.000	0.010

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *SOUTH TEXAS 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	1	1	2	0.672	0.400	0.816	1.888
OPERATIONS PERSONNEL	9	0	0	9	2.559	0.000	0.000	2.559
HEALTH PHYSICS PERSONNEL	10	0	0	10	3.136	0.000	1.197	4.333
SUPERVISORY PERSONNEL	3	0	0	3	0.800	0.000	0.000	0.800
ENGINEERING PERSONNEL	1	0	0	1	0.475	0.000	0.038	0.513
TOTAL	23	1	1	25	7.642	0.400	2.051	10.093
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	27	0	57	84	7.792	0.330	19.809	27.931
OPERATIONS PERSONNEL	0	0	0	0	0.302	0.000	0.000	0.302
HEALTH PHYSICS PERSONNEL	15	0	15	30	4.087	0.000	4.526	8.613
SUPERVISORY PERSONNEL	3	0	0	3	1.500	0.014	0.056	1.570
ENGINEERING PERSONNEL	1	0	0	1	0.461	0.000	0.021	0.482
TOTAL	46	0	72	118	14.142	0.344	24.412	38.898
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	14	14	0.141	0.029	4.192	4.362
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.152	0.000	0.199	0.351
SUPERVISORY PERSONNEL	2	0	0	2	0.510	0.000	0.000	0.510
ENGINEERING PERSONNEL	1	0	0	1	0.891	0.000	0.000	0.891
TOTAL	3	0	15	18	1.694	0.029	4.391	6.114
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	29	1	202	232	7.755	0.235	65.692	73.682
OPERATIONS PERSONNEL	0	0	0	0	0.091	0.000	0.000	0.091
HEALTH PHYSICS PERSONNEL	11	0	15	26	3.536	0.000	4.674	8.210
SUPERVISORY PERSONNEL	6	0	0	6	1.446	0.000	0.062	1.508
ENGINEERING PERSONNEL	1	0	0	1	0.372	0.000	0.009	0.381
TOTAL	47	1	217	265	13.200	0.235	70.437	83.872
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.009	0.139	0.236	0.384
OPERATIONS PERSONNEL	0	0	0	0	0.015	0.000	0.000	0.015
HEALTH PHYSICS PERSONNEL	0	0	11	11	0.173	0.000	3.242	3.415
SUPERVISORY PERSONNEL	0	0	0	0	0.034	0.000	0.000	0.034
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	12	12	0.231	0.139	3.478	3.848
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	19	0	14	33	5.764	0.122	6.123	12.009
OPERATIONS PERSONNEL	0	0	0	0	0.791	0.000	0.000	0.791
HEALTH PHYSICS PERSONNEL	2	0	11	13	1.061	0.000	3.339	4.400
SUPERVISORY PERSONNEL	2	0	0	2	0.636	0.000	0.000	0.636
ENGINEERING PERSONNEL	0	0	0	0	0.120	0.000	0.005	0.125
TOTAL	23	0	25	48	8.372	0.122	9.467	17.961
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	75	2	289	366	22.133	1.255	96.868	120.256
OPERATIONS PERSONNEL	9	0	0	9	3.758	0.000	0.000	3.758
HEALTH PHYSICS PERSONNEL	38	0	53	91	12.145	0.000	17.177	29.322
SUPERVISORY PERSONNEL	16	0	0	16	4.926	0.014	0.118	5.058
ENGINEERING PERSONNEL	4	0	0	4	2.319	0.000	0.073	2.392
GRAND TOTALS	142	2	342	486	45.281	1.269	114.236	160.786

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *ST. LUCIE 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	2	0	3	5	0.935	0.030	1.172	2.137
OPERATIONS PERSONNEL	48	0	0	48	19.191	0.030	0.140	19.361
HEALTH PHYSICS PERSONNEL	5	0	9	14	1.410	0.000	3.038	4.448
SUPERVISORY PERSONNEL	4	0	0	4	2.243	0.070	0.280	2.593
ENGINEERING PERSONNEL	0	0	0	0	0.414	0.085	0.020	0.519
TOTAL	59	0	12	71	24.193	0.215	4.650	29.058
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	127	9	129	265	46.902	2.130	45.975	95.007
OPERATIONS PERSONNEL	6	0	32	38	2.151	0.111	16.304	18.566
HEALTH PHYSICS PERSONNEL	26	0	80	106	22.270	0.000	36.623	58.893
SUPERVISORY PERSONNEL	13	0	4	17	5.912	0.180	2.649	8.741
ENGINEERING PERSONNEL	1	0	0	1	0.515	0.301	0.845	1.661
TOTAL	173	9	245	427	77.750	2.722	102.396	182.868
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	1	25	26	0.260	0.140	7.433	7.833
OPERATIONS PERSONNEL	2	1	23	26	0.835	0.330	10.750	11.915
HEALTH PHYSICS PERSONNEL	0	0	5	5	0.060	0.000	1.140	1.200
SUPERVISORY PERSONNEL	3	0	8	11	0.950	0.085	3.012	4.047
ENGINEERING PERSONNEL	0	1	19	20	0.265	0.875	7.316	8.456
TOTAL	5	3	80	88	2.370	1.430	29.651	33.451
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	131	22	205	358	60.352	10.915	122.227	193.494
OPERATIONS PERSONNEL	4	0	87	91	3.800	0.090	64.182	68.072
HEALTH PHYSICS PERSONNEL	9	0	27	36	4.775	0.000	12.190	16.965
SUPERVISORY PERSONNEL	13	0	10	23	5.132	0.125	7.028	12.285
ENGINEERING PERSONNEL	0	2	22	24	0.340	0.615	21.305	22.260
TOTAL	157	24	351	532	74.399	11.745	226.932	313.076
WASTE PROCESSING								
MAINTENANCE PERSONNEL	3	0	0	3	1.605	0.000	0.000	1.605
OPERATIONS PERSONNEL	0	0	0	0	0.040	0.000	0.000	0.040
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.455	0.000	0.000	0.455
SUPERVISORY PERSONNEL	1	0	0	1	0.140	0.000	0.000	0.140
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	6	0	0	6	2.240	0.000	0.000	2.240
REFUELING								
MAINTENANCE PERSONNEL	60	14	3	77	24.135	8.355	1.110	33.600
OPERATIONS PERSONNEL	29	0	5	34	8.840	0.025	1.805	10.670
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.025	0.025
SUPERVISORY PERSONNEL	9	2	2	13	3.050	1.180	0.460	4.690
ENGINEERING PERSONNEL	0	1	2	3	0.345	0.340	0.690	1.375
TOTAL	98	17	12	127	36.370	9.900	4.090	50.360
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	323 (182)	46 (20)	365 (286)	734 (488)	134.189	21.570	177.917	333.676
OPERATIONS PERSONNEL	89 (50)	1 (1)	147 (111)	237 (162)	34.857	0.586	93.181	128.624
HEALTH PHYSICS PERSONNEL	42 (27)	0 (0)	121 (87)	163 (114)	28.970	0.000	53.016	81.986
SUPERVISORY PERSONNEL	43 (32)	2 (2)	24 (20)	69 (54)	17.427	1.640	13.429	32.496
ENGINEERING PERSONNEL	1 (0)	4 (2)	43 (38)	48 (40)	1.879	2.216	30.176	34.271
GRAND TOTALS	498 (291)	53 (25)	700 (542)	1251 (858)	217.322	26.012	367.719	611.053

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *SUMMER 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	2	2	0.744	0.000	0.470	1.214
OPERATIONS PERSONNEL	14	0	4	18	3.691	0.095	1.785	5.571
HEALTH PHYSICS PERSONNEL	7	0	11	18	1.894	0.000	3.072	4.966
SUPERVISORY PERSONNEL	0	0	0	0	0.295	0.005	0.083	0.383
ENGINEERING PERSONNEL	0	0	0	0	0.305	0.000	0.190	0.495
TOTAL	21	0	17	38	6.929	0.100	5.600	12.629
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	6	0	4	10	3.175	0.000	1.688	4.863
OPERATIONS PERSONNEL	0	0	4	4	0.442	0.015	1.626	2.083
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.385	0.000	0.490	0.875
SUPERVISORY PERSONNEL	0	0	0	0	0.157	0.000	0.030	0.187
ENGINEERING PERSONNEL	0	0	1	1	0.256	0.000	0.110	0.366
TOTAL	6	0	10	16	4.415	0.015	3.944	8.374
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	3	3	0.000	0.000	1.205	1.205
OPERATIONS PERSONNEL	3	0	0	3	0.910	0.000	0.125	1.035
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.125	0.000	0.135	0.260
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.120	0.120
TOTAL	3	0	3	6	1.040	0.000	1.585	2.625
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	30	0	47	77	9.741	0.000	13.983	23.724
OPERATIONS PERSONNEL	8	0	6	14	2.344	0.020	1.690	4.054
HEALTH PHYSICS PERSONNEL	7	0	9	16	2.225	0.000	3.037	5.262
SUPERVISORY PERSONNEL	2	0	0	2	1.023	0.000	0.000	1.023
ENGINEERING PERSONNEL	1	0	0	1	0.310	0.000	0.060	0.370
TOTAL	48	0	62	110	15.643	0.020	18.770	34.433
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.044	0.000	0.000	0.044
OPERATIONS PERSONNEL	0	0	5	5	0.015	0.000	1.083	1.098
HEALTH PHYSICS PERSONNEL	1	0	2	3	0.215	0.000	0.460	0.675
SUPERVISORY PERSONNEL	0	0	0	0	0.005	0.000	0.000	0.005
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	1	0	7	8	0.279	0.000	1.543	1.822
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	36	0	56	92	13.704	0.000	17.346	31.050
OPERATIONS PERSONNEL	25	0	19	44	7.402	0.130	6.309	13.841
HEALTH PHYSICS PERSONNEL	15	0	23	38	4.844	0.000	7.194	12.038
SUPERVISORY PERSONNEL	2	0	0	2	1.485	0.005	0.113	1.603
ENGINEERING PERSONNEL	1	0	1	2	0.871	0.000	0.480	1.351
GRAND TOTALS	79	0	99	178	28.306	0.135	31.442	59.883

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *SURRY 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	43	1	36	80	0.268	0.240	0.204	0.712
OPERATIONS PERSONNEL	120	14	11	145	23.238	0.043	0.070	23.351
HEALTH PHYSICS PERSONNEL	31	0	16	47	0.885	0.000	0.124	1.009
SUPERVISORY PERSONNEL	40	0	9	49	0.778	0.000	0.022	0.800
ENGINEERING PERSONNEL	53	32	73	158	1.229	0.284	1.002	2.515
TOTAL	287	47	145	479	26.398	0.567	1.422	28.387
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	185	27	858	1070	116.581	0.594	259.032	376.207
OPERATIONS PERSONNEL	376	52	222	650	65.708	3.642	26.144	95.494
HEALTH PHYSICS PERSONNEL	77	10	234	321	47.643	0.141	139.015	186.799
SUPERVISORY PERSONNEL	124	8	76	208	16.318	0.012	32.195	48.525
ENGINEERING PERSONNEL	66	41	132	239	7.039	1.330	18.633	27.002
TOTAL	828	138	1522	2488	253.289	5.719	475.019	734.027
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	5	1	77	83	0.015	0.000	0.084	0.099
OPERATIONS PERSONNEL	11	2	9	22	0.241	0.082	0.080	0.403
HEALTH PHYSICS PERSONNEL	5	0	9	14	0.036	0.000	0.003	0.039
SUPERVISORY PERSONNEL	2	0	3	5	0.008	0.000	0.002	0.010
ENGINEERING PERSONNEL	1	0	4	5	0.000	0.000	0.329	0.329
TOTAL	24	3	102	129	0.300	0.082	0.498	0.880
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	89	0	422	511	10.215	0.000	50.052	60.267
OPERATIONS PERSONNEL	56	12	58	126	3.249	0.196	3.345	6.790
HEALTH PHYSICS PERSONNEL	44	0	46	90	2.299	0.000	2.177	4.476
SUPERVISORY PERSONNEL	21	0	55	76	1.230	0.000	4.028	5.258
ENGINEERING PERSONNEL	50	23	70	143	1.024	0.120	1.430	2.574
TOTAL	260	35	651	946	18.017	0.316	61.032	79.365
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	9	0	14	23	0.025	0.000	0.065	0.090
OPERATIONS PERSONNEL	38	0	1	39	4.803	0.000	0.004	4.807
HEALTH PHYSICS PERSONNEL	34	0	12	46	3.059	0.000	0.470	3.529
SUPERVISORY PERSONNEL	10	0	3	13	1.204	0.000	0.046	1.250
ENGINEERING PERSONNEL	0	0	3	3	0.000	0.000	0.029	0.029
TOTAL	91	0	33	124	9.091	0.000	0.614	9.705
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	5	3	23	31	0.198	0.090	3.814	4.102
OPERATIONS PERSONNEL	14	8	16	38	0.684	0.262	5.417	6.363
HEALTH PHYSICS PERSONNEL	9	0	3	12	0.515	0.000	0.280	0.795
SUPERVISORY PERSONNEL	5	0	0	5	0.158	0.000	0.000	0.158
ENGINEERING PERSONNEL	1	0	0	1	0.230	0.000	0.000	0.230
TOTAL	34	11	42	87	1.785	0.352	9.511	11.648
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	336	32	1430	1798	127.302	0.924	313.251	441.477
OPERATIONS PERSONNEL	615	88	317	1020	97.923	4.225	35.060	137.208
HEALTH PHYSICS PERSONNEL	200	10	320	530	54.437	0.141	142.069	196.647
SUPERVISORY PERSONNEL	202	8	146	356	19.696	0.012	36.293	56.001
ENGINEERING PERSONNEL	171	96	282	549	9.522	1.734	21.423	32.679
GRAND TOTALS	1524	234	2495	4253	308.880	7.036	548.096	864.012

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *SUSQUEHANNA 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	2	0	0	2	0.285	0.000	0.000	0.285
OPERATIONS PERSONNEL	59	0	7	66	31.291	0.000	1.469	32.760
HEALTH PHYSICS PERSONNEL	3	0	2	5	1.389	0.000	0.000	1.389
SUPERVISORY PERSONNEL	1	0	0	1	0.140	0.000	0.350	0.490
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	65	0	9	74	33.105	0.000	1.819	34.924
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	74	270	252	596	63.483	151.078	118.089	332.650
OPERATIONS PERSONNEL	45	0	17	62	23.708	0.000	9.148	32.856
HEALTH PHYSICS PERSONNEL	32	0	187	219	21.522	0.000	114.127	135.649
SUPERVISORY PERSONNEL	21	0	0	21	6.211	0.000	0.000	6.211
ENGINEERING PERSONNEL	13	4	0	17	2.986	0.683	0.000	3.669
TOTAL	185	274	456	915	117.910	151.761	241.364	511.035
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	92	121	214	1.320	87.402	86.465	175.187
OPERATIONS PERSONNEL	1	0	0	1	0.238	0.000	0.000	0.238
HEALTH PHYSICS PERSONNEL	0	1	5	6	0.000	0.385	3.684	4.069
SUPERVISORY PERSONNEL	3	0	0	3	1.468	0.000	0.000	1.468
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	5	93	126	224	3.026	87.787	90.149	180.962
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	9	60	69	0.000	8.273	18.369	26.642
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.000	0.000	0.810	0.810
SUPERVISORY PERSONNEL	1	0	0	1	0.128	0.000	0.000	0.128
ENGINEERING PERSONNEL	0	1	0	1	0.000	0.105	0.000	0.105
TOTAL	1	10	63	74	0.128	8.378	19.179	27.685
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	3	2	1	6	0.850	0.885	0.204	1.939
OPERATIONS PERSONNEL	0	0	2	2	0.000	0.000	2.265	2.265
HEALTH PHYSICS PERSONNEL	3	0	9	12	0.465	0.000	5.045	5.510
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	6	2	12	20	1.315	0.885	7.514	9.714
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	6	6	0.000	0.000	0.979	0.979
OPERATIONS PERSONNEL	4	0	0	4	0.608	0.000	0.000	0.608
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	4	0	6	10	0.608	0.000	0.979	1.587
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	80	373	440	893	65.938	247.638	224.106	537.682
OPERATIONS PERSONNEL	109	0	26	135	55.845	0.000	12.882	68.727
HEALTH PHYSICS PERSONNEL	38	1	206	245	23.376	0.385	123.666	147.427
SUPERVISORY PERSONNEL	26	0	0	26	7.947	0.000	0.350	8.297
ENGINEERING PERSONNEL	13	5	0	18	2.986	0.788	0.000	3.774
GRAND TOTALS	266	379	672	1317	156.092	248.811	361.004	765.907

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *THREE MILE ISLAND 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	73	1	1	75	1.754	0.005	0.000	1.759				
OPERATIONS PERSONNEL	79	2	3	84	12.460	0.000	0.013	12.473				
HEALTH PHYSICS PERSONNEL	79	7	22	108	11.297	0.007	0.141	11.445				
SUPERVISORY PERSONNEL	119	10	5	134	3.604	0.017	0.051	3.672				
ENGINEERING PERSONNEL	40	8	3	51	1.644	0.009	0.030	1.683				
TOTAL	390	28	34	452	30.759	0.038	0.235	31.032				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	134	6	88	228	9.597	0.036	0.958	10.591				
OPERATIONS PERSONNEL	24	0	3	27	0.146	0.000	0.022	0.168				
HEALTH PHYSICS PERSONNEL	28	0	2	30	0.466	0.000	0.002	0.468				
SUPERVISORY PERSONNEL	148	34	27	209	1.443	0.026	0.349	1.818				
ENGINEERING PERSONNEL	60	24	26	110	0.827	0.086	0.150	1.063				
TOTAL	394	64	146	604	12.479	0.148	1.481	14.108				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	26	0	14	40	0.097	0.000	0.063	0.160				
OPERATIONS PERSONNEL	9	0	1	10	0.049	0.000	0.178	0.227				
HEALTH PHYSICS PERSONNEL	28	0	0	28	0.273	0.000	0.000	0.273				
SUPERVISORY PERSONNEL	18	2	16	36	0.023	0.000	0.041	0.064				
ENGINEERING PERSONNEL	7	0	4	11	0.037	0.000	0.010	0.047				
TOTAL	88	2	35	125	0.479	0.000	0.292	0.771				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	93	0	49	142	3.345	0.000	1.660	5.005				
OPERATIONS PERSONNEL	18	0	1	19	0.122	0.000	0.028	0.150				
HEALTH PHYSICS PERSONNEL	14	0	1	15	0.246	0.000	0.000	0.246				
SUPERVISORY PERSONNEL	21	0	11	32	0.343	0.000	0.338	0.681				
ENGINEERING PERSONNEL	11	1	5	17	0.131	0.000	0.059	0.190				
TOTAL	157	1	67	225	4.187	0.000	2.085	6.272				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	98	3	14	115	4.103	0.010	0.000	4.113				
OPERATIONS PERSONNEL	64	0	3	67	13.354	0.000	0.117	13.471				
HEALTH PHYSICS PERSONNEL	55	1	5	61	3.106	0.002	0.010	3.118				
SUPERVISORY PERSONNEL	58	17	13	88	1.487	0.031	0.025	1.543				
ENGINEERING PERSONNEL	11	3	7	21	0.011	0.000	0.028	0.039				
TOTAL	286	24	42	352	22.061	0.043	0.180	22.284				
REFUELING												
MAINTENANCE PERSONNEL	28	0	0	28	0.021	0.000	0.000	0.021				
OPERATIONS PERSONNEL	1	0	0	1	0.000	0.000	0.000	0.000				
HEALTH PHYSICS PERSONNEL	7	0	0	7	0.000	0.000	0.000	0.000				
SUPERVISORY PERSONNEL	6	0	2	8	0.014	0.000	0.002	0.016				
ENGINEERING PERSONNEL	4	1	0	5	0.004	0.000	0.000	0.004				
TOTAL	46	1	2	49	0.039	0.000	0.002	0.041				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	452	(196)	10	(8)	166	(126)	628	(330)	18.917	0.051	2.681	21.649
OPERATIONS PERSONNEL	195	(135)	2	(2)	11	(6)	208	(143)	26.131	0.000	0.358	26.489
HEALTH PHYSICS PERSONNEL	211	(87)	8	(8)	30	(27)	249	(122)	15.388	0.009	0.153	15.550
SUPERVISORY PERSONNEL	370	(229)	63	(55)	74	(47)	507	(331)	6.914	0.074	0.806	7.794
ENGINEERING PERSONNEL	133	(77)	37	(34)	45	(32)	215	(143)	2.654	0.095	0.277	3.026
GRAND TOTALS												
	1361	(724)	120	(107)	326	(238)	1807	(1069)	70.004	0.229	4.275	74.508

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *THREE MILE ISLAND 2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	55	0	152	207	8.883	0.000	34.424	43.307
OPERATIONS PERSONNEL	88	0	6	94	23.223	0.000	0.532	23.755
HEALTH PHYSICS PERSONNEL	82	4	40	126	11.671	0.049	9.971	21.691
SUPERVISORY PERSONNEL	55	17	36	108	0.619	0.363	4.750	5.732
ENGINEERING PERSONNEL	13	0	40	53	1.025	0.000	1.641	2.666
TOTAL	293	21	274	588	45.421	0.412	51.318	97.151
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	71	0	85	156	3.900	0.000	1.228	5.128
OPERATIONS PERSONNEL	55	0	8	63	7.827	0.000	0.010	7.837
HEALTH PHYSICS PERSONNEL	60	0	26	86	2.220	0.000	0.623	2.843
SUPERVISORY PERSONNEL	130	23	38	191	0.623	0.010	0.397	1.030
ENGINEERING PERSONNEL	19	1	36	56	0.037	0.000	0.223	0.260
TOTAL	335	24	193	552	14.607	0.010	2.481	17.098
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	4	0	12	16	0.159	0.000	1.016	1.175
OPERATIONS PERSONNEL	0	0	1	1	0.000	0.000	0.085	0.085
HEALTH PHYSICS PERSONNEL	6	0	2	8	0.481	0.000	0.125	0.606
SUPERVISORY PERSONNEL	47	0	3	50	0.009	0.000	0.305	0.314
ENGINEERING PERSONNEL	0	0	4	4	0.000	0.000	0.694	0.694
TOTAL	57	0	22	79	0.649	0.000	2.225	2.874
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	102	0	193	295	82.533	0.000	258.020	340.553
OPERATIONS PERSONNEL	105	0	10	115	73.237	0.000	2.994	76.231
HEALTH PHYSICS PERSONNEL	54	0	35	89	43.108	0.000	33.782	76.890
SUPERVISORY PERSONNEL	57	25	54	136	2.391	0.950	45.851	49.192
ENGINEERING PERSONNEL	11	2	55	68	1.907	0.070	19.441	21.418
TOTAL	329	27	347	703	203.176	1.020	360.088	564.284
WASTE PROCESSING								
MAINTENANCE PERSONNEL	52	0	59	111	1.959	0.000	4.961	6.920
OPERATIONS PERSONNEL	74	0	3	77	11.630	0.000	0.071	11.701
HEALTH PHYSICS PERSONNEL	61	0	24	85	3.709	0.000	1.394	5.103
SUPERVISORY PERSONNEL	114	9	24	147	2.547	0.010	1.113	3.670
ENGINEERING PERSONNEL	9	0	26	35	0.016	0.000	0.598	0.614
TOTAL	310	9	136	455	19.861	0.010	8.137	28.008
REFUELING								
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	284 (115)	0 (0)	501 (201)	785 (316)	97.434	0.000	299.649	397.083
OPERATIONS PERSONNEL	322 (119)	0 (0)	28 (15)	350 (134)	115.917	0.000	3.692	119.609
HEALTH PHYSICS PERSONNEL	263 (88)	4 (4)	127 (46)	394 (138)	61.189	0.049	45.895	107.133
SUPERVISORY PERSONNEL	403 (174)	74 (47)	155 (69)	632 (290)	6.189	1.333	52.416	59.938
ENGINEERING PERSONNEL	52 (30)	3 (3)	161 (73)	216 (106)	2.985	0.070	22.597	25.652
GRAND TOTALS								
	1324 (526)	81 (54)	972 (404)	2377 (984)	283.714	1.452	424.249	709.415

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *TROJAN

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM							
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL				
<u>REACTOR OPS & SURV</u>												
MAINTENANCE PERSONNEL	3	1	54	58	1.640	0.190	18.530	20.360				
OPERATIONS PERSONNEL	22	0	0	22	7.400	0.000	0.000	7.400				
HEALTH PHYSICS PERSONNEL	23	0	12	35	8.030	0.000	4.320	12.350				
SUPERVISORY PERSONNEL	6	2	3	11	2.060	0.440	1.670	4.170				
ENGINEERING PERSONNEL	9	0	2	11	3.120	0.000	0.520	3.640				
TOTAL	63	3	71	137	22.250	0.630	25.040	47.920				
<u>ROUTINE MAINTENANCE</u>												
MAINTENANCE PERSONNEL	134	16	289	439	48.780	6.720	222.090	277.590				
OPERATIONS PERSONNEL	2	0	0	2	0.620	0.000	0.000	0.620				
HEALTH PHYSICS PERSONNEL	40	0	73	113	21.050	0.000	69.340	90.390				
SUPERVISORY PERSONNEL	12	0	34	46	3.770	0.230	12.390	16.390				
ENGINEERING PERSONNEL	1	0	25	26	0.970	0.000	11.780	12.750				
TOTAL	189	16	421	626	75.190	6.950	315.600	397.740				
<u>IN-SERVICE INSPECTION</u>												
MAINTENANCE PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
OPERATIONS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
TOTAL	0	0	0	0	0.000	0.000	0.000	0.000				
<u>SPECIAL MAINTENANCE</u>												
MAINTENANCE PERSONNEL	0	0	0	0	0.010	0.000	0.020	0.030				
OPERATIONS PERSONNEL	0	0	0	0	0.010	0.000	0.000	0.010				
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.120	0.000	0.030	0.150				
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
ENGINEERING PERSONNEL	0	0	0	0	0.020	0.000	0.360	0.380				
TOTAL	0	0	0	0	0.160	0.000	0.410	0.570				
<u>WASTE PROCESSING</u>												
MAINTENANCE PERSONNEL	0	0	4	4	0.090	0.000	1.140	1.230				
OPERATIONS PERSONNEL	0	0	0	0	0.660	0.000	0.000	0.660				
HEALTH PHYSICS PERSONNEL	35	0	6	41	14.890	0.000	1.830	16.720				
SUPERVISORY PERSONNEL	0	0	0	0	0.130	0.000	0.050	0.180				
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000				
TOTAL	35	0	10	45	15.770	0.000	3.020	18.790				
<u>REFUELING</u>												
MAINTENANCE PERSONNEL	8	0	60	68	4.150	0.120	46.800	51.070				
OPERATIONS PERSONNEL	2	0	0	2	1.050	0.000	0.000	1.050				
HEALTH PHYSICS PERSONNEL	10	0	17	27	3.960	0.000	10.840	14.800				
SUPERVISORY PERSONNEL	9	0	13	22	1.860	0.070	5.410	7.340				
ENGINEERING PERSONNEL	2	0	5	7	0.990	0.000	1.100	2.090				
TOTAL	31	0	95	126	12.010	0.190	64.150	76.350				
<u>TOTAL BY JOB FUNCTION</u>												
MAINTENANCE PERSONNEL	145	(117)	17	(13)	407	(359)	569	(489)	54.670	7.030	288.580	350.280
OPERATIONS PERSONNEL	26	(22)	0	(0)	0	(0)	26	(22)	9.740	0.000	0.000	9.740
HEALTH PHYSICS PERSONNEL	108	(72)	0	(0)	108	(91)	216	(163)	48.050	0.000	86.360	134.410
SUPERVISORY PERSONNEL	27	(19)	2	(2)	50	(38)	79	(59)	7.820	0.740	19.520	28.080
ENGINEERING PERSONNEL	12	(11)	0	(0)	32	(28)	44	(39)	5.100	0.000	13.760	18.860
<u>GRAND TOTALS</u>												
	318	(241)	19	(15)	597	(516)	934	(772)	125.380	7.770	408.220	541.370

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *TURKEY POINT 3,4

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	9	1	0	10	3.695	0.955	0.835	5.485
OPERATIONS PERSONNEL	54	0	0	54	24.510	0.000	0.035	24.545
HEALTH PHYSICS PERSONNEL	2	0	0	2	0.990	0.000	0.410	1.400
SUPERVISORY PERSONNEL	2	0	2	4	0.890	0.010	0.840	1.740
ENGINEERING PERSONNEL	<u>3</u>	<u>0</u>	<u>1</u>	<u>4</u>	<u>0.825</u>	<u>0.030</u>	<u>0.770</u>	<u>1.625</u>
TOTAL	70	1	3	74	30.910	0.995	2.890	34.795
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	219	3	289	511	105.550	0.955	102.595	209.100
OPERATIONS PERSONNEL	53	0	0	53	15.335	0.000	0.080	15.415
HEALTH PHYSICS PERSONNEL	52	0	82	134	24.715	0.000	32.045	56.760
SUPERVISORY PERSONNEL	13	0	29	42	4.640	0.090	9.315	14.045
ENGINEERING PERSONNEL	<u>12</u>	<u>2</u>	<u>46</u>	<u>60</u>	<u>5.195</u>	<u>0.575</u>	<u>18.690</u>	<u>24.460</u>
TOTAL	349	5	446	800	155.435	1.620	162.725	319.780
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	1	0	67	68	0.715	0.015	27.810	28.540
OPERATIONS PERSONNEL	0	0	0	0	0.145	0.000	0.000	0.145
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.040	0.000	0.080	0.120
SUPERVISORY PERSONNEL	2	0	12	14	1.000	0.020	3.940	4.960
ENGINEERING PERSONNEL	<u>0</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>0.090</u>	<u>0.370</u>	<u>0.535</u>	<u>0.995</u>
TOTAL	3	1	80	84	1.990	0.405	32.365	34.760
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	31	0	293	324	9.910	0.065	127.635	137.610
OPERATIONS PERSONNEL	1	0	0	1	0.515	0.000	0.000	0.515
HEALTH PHYSICS PERSONNEL	10	0	11	21	2.325	0.000	2.885	5.210
SUPERVISORY PERSONNEL	1	0	27	28	0.790	0.010	10.900	11.700
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>20</u>	<u>20</u>	<u>0.365</u>	<u>0.160</u>	<u>7.345</u>	<u>7.870</u>
TOTAL	43	0	351	394	13.905	0.235	148.765	162.905
WASTE PROCESSING								
MAINTENANCE PERSONNEL	3	0	2	5	1.280	0.085	0.655	2.020
OPERATIONS PERSONNEL	1	0	0	1	0.345	0.000	0.000	0.345
HEALTH PHYSICS PERSONNEL	8	0	2	10	3.140	0.000	0.760	3.900
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0.265</u>	<u>0.000</u>	<u>0.040</u>	<u>0.305</u>
TOTAL	13	0	4	17	5.030	0.085	1.455	6.570
REFUELING								
MAINTENANCE PERSONNEL	1	0	44	45	0.730	0.060	37.040	37.830
OPERATIONS PERSONNEL	0	0	0	0	0.435	0.000	0.000	0.435
HEALTH PHYSICS PERSONNEL	0	0	8	8	0.125	0.000	2.485	2.610
SUPERVISORY PERSONNEL	1	0	1	2	0.320	0.000	0.380	0.700
ENGINEERING PERSONNEL	<u>0</u>	<u>0</u>	<u>7</u>	<u>7</u>	<u>0.100</u>	<u>0.045</u>	<u>3.320</u>	<u>3.465</u>
TOTAL	2	0	60	62	1.710	0.105	43.225	45.040
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	264 (225)	4 (3)	695 (463)	963 (691)	121.880	2.135	296.570	420.585
OPERATIONS PERSONNEL	109 (71)	0 (0)	0 (0)	109 (71)	41.285	0.000	0.115	41.400
HEALTH PHYSICS PERSONNEL	72 (55)	0 (0)	103 (87)	175 (142)	31.335	0.000	38.665	70.000
SUPERVISORY PERSONNEL	19 (14)	0 (0)	71 (38)	90 (52)	7.640	0.130	25.375	33.145
ENGINEERING PERSONNEL	16 (13)	3 (3)	75 (75)	94 (91)	6.840	1.180	30.700	38.720
GRAND TOTALS	480 (378)	7 (6)	944 (663)	1431(1047)	208.980	3.445	391.425	603.850

*Workers may be counted in more than one category. Numbers in parentheses are total numbers of individuals.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *VERMONT YANKEE

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	10	0	41	51	2.455	0.000	15.213	17.668
OPERATIONS PERSONNEL	41	0	5	46	14.385	0.000	1.794	16.179
HEALTH PHYSICS PERSONNEL	11	0	12	23	3.348	0.076	3.014	6.438
SUPERVISORY PERSONNEL	0	0	0	0	0.093	0.000	0.000	0.093
ENGINEERING PERSONNEL	0	0	0	0	0.170	0.000	0.289	0.459
TOTAL	62	0	58	120	20.451	0.076	20.310	40.837
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	28	1	190	219	7.650	0.109	56.618	64.377
OPERATIONS PERSONNEL	16	0	9	25	3.163	0.000	1.229	4.392
HEALTH PHYSICS PERSONNEL	5	0	17	22	1.598	0.030	4.098	5.726
SUPERVISORY PERSONNEL	1	0	1	2	0.236	0.000	0.287	0.523
ENGINEERING PERSONNEL	0	0	12	12	0.247	0.000	3.459	3.706
TOTAL	50	1	229	280	12.894	0.139	65.691	78.724
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	1	0	51	52	0.448	0.000	27.805	28.253
OPERATIONS PERSONNEL	0	0	0	0	0.096	0.000	0.000	0.096
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.010	0.000	0.094	0.104
SUPERVISORY PERSONNEL	0	0	0	0	0.060	0.000	0.000	0.060
ENGINEERING PERSONNEL	0	0	10	10	0.105	0.000	4.666	4.771
TOTAL	1	0	61	62	0.719	0.000	32.565	33.284
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	37	1	164	202	14.716	0.155	60.492	75.363
OPERATIONS PERSONNEL	4	0	1	5	1.606	0.000	0.226	1.832
HEALTH PHYSICS PERSONNEL	11	0	20	31	2.523	0.060	5.113	7.696
SUPERVISORY PERSONNEL	0	0	2	2	0.070	0.000	0.249	0.319
ENGINEERING PERSONNEL	0	0	13	13	0.205	0.000	3.601	3.806
TOTAL	52	1	200	253	19.120	0.215	69.681	89.016
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	4	0	8	12	1.245	0.000	3.362	4.607
OPERATIONS PERSONNEL	2	0	0	2	0.727	0.000	0.123	0.850
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.854	0.000	0.648	2.502
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	8	0	9	17	3.826	0.000	4.133	7.959
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	6	0	9	15	1.215	0.000	3.944	5.159
OPERATIONS PERSONNEL	1	0	0	1	2.236	0.000	0.076	2.312
HEALTH PHYSICS PERSONNEL	7	0	24	31	2.450	0.010	10.968	13.428
SUPERVISORY PERSONNEL	0	0	0	0	0.060	0.000	0.000	0.060
ENGINEERING PERSONNEL	3	0	2	5	0.430	0.000	0.520	0.950
TOTAL	17	0	35	52	6.391	0.010	15.508	21.909
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	86	2	463	551	27.729	0.264	167.434	195.427
OPERATIONS PERSONNEL	64	0	15	79	22.213	0.000	3.448	25.661
HEALTH PHYSICS PERSONNEL	36	0	74	110	11.783	0.176	23.935	35.894
SUPERVISORY PERSONNEL	1	0	3	4	0.519	0.000	0.536	1.055
ENGINEERING PERSONNEL	3	0	37	40	1.157	0.000	12.535	13.692
GRAND TOTALS	190	2	592	784	63.401	0.440	207.888	271.729

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *VOGTLE 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	2	0	0	2	1.401	0.009	0.504	1.914
OPERATIONS PERSONNEL	1	0	1	2	0.361	0.000	0.497	0.858
HEALTH PHYSICS PERSONNEL	3	0	6	9	1.172	0.015	2.590	3.777
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.002	0.005	0.018
ENGINEERING PERSONNEL	0	0	0	0	0.039	0.000	0.062	0.101
TOTAL	6	0	7	13	2.984	0.026	3.658	6.668
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	3	0	2	5	1.634	0.009	0.889	2.532
OPERATIONS PERSONNEL	0	0	0	0	0.418	0.000	0.100	0.518
HEALTH PHYSICS PERSONNEL	6	0	2	8	1.670	0.014	1.359	3.043
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.017	0.027	0.055
ENGINEERING PERSONNEL	0	0	0	0	0.055	0.000	0.139	0.194
TOTAL	9	0	4	13	3.788	0.040	2.514	6.342
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.848	0.085	0.649	1.582
OPERATIONS PERSONNEL	0	0	0	0	0.108	0.000	0.071	0.179
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.443	0.000	0.639	1.082
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.002	0.031	0.044
ENGINEERING PERSONNEL	0	0	0	0	0.077	0.000	0.143	0.220
TOTAL	0	0	0	0	1.487	0.087	1.533	3.107
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	8	0	2	10	3.569	0.029	0.830	4.428
OPERATIONS PERSONNEL	0	0	0	0	0.375	0.000	0.034	0.409
HEALTH PHYSICS PERSONNEL	3	0	2	5	1.386	0.058	1.273	2.717
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.002	0.005	0.018
ENGINEERING PERSONNEL	1	0	0	1	0.280	0.000	0.039	0.319
TOTAL	12	0	4	16	5.621	0.089	2.181	7.891
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.861	0.009	0.450	1.320
OPERATIONS PERSONNEL	0	0	0	0	0.114	0.000	0.079	0.193
HEALTH PHYSICS PERSONNEL	4	0	3	7	1.498	0.000	1.938	3.436
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.002	0.005	0.018
ENGINEERING PERSONNEL	0	0	0	0	0.300	0.000	0.039	0.339
TOTAL	4	0	3	7	2.784	0.011	2.511	5.306
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.890	0.009	0.450	1.349
OPERATIONS PERSONNEL	0	0	0	0	0.114	0.000	0.034	0.148
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.443	0.000	0.580	1.023
SUPERVISORY PERSONNEL	0	0	0	0	0.011	0.002	0.005	0.018
ENGINEERING PERSONNEL	0	0	0	0	0.030	0.000	0.039	0.069
TOTAL	0	0	0	0	1.488	0.011	1.108	2.607
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	13	0	4	17	9.203	0.150	3.772	13.125
OPERATIONS PERSONNEL	1	0	1	2	1.490	0.000	0.815	2.305
HEALTH PHYSICS PERSONNEL	16	0	13	29	6.612	0.087	8.379	15.078
SUPERVISORY PERSONNEL	0	0	0	0	0.066	0.027	0.078	0.171
ENGINEERING PERSONNEL	1	0	0	1	0.781	0.000	0.461	1.242
GRAND TOTALS	31	0	18	49	18.152	0.264	13.505	31.921

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *WASHINGTON NUCLEAR 2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	68	0	56	124	40.102	0.027	31.527	71.656
OPERATIONS PERSONNEL	43	0	0	43	32.471	0.000	0.000	32.471
HEALTH PHYSICS PERSONNEL	27	0	16	43	22.130	0.004	8.943	31.077
SUPERVISORY PERSONNEL	15	2	0	17	6.090	1.472	0.089	7.651
ENGINEERING PERSONNEL	14	9	14	37	4.036	4.399	6.090	14.525
TOTAL	167	11	86	264	104.829	5.902	46.649	157.380
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	24	0	24	48	14.824	0.054	11.054	25.932
OPERATIONS PERSONNEL	2	0	0	2	1.571	0.000	0.000	1.571
HEALTH PHYSICS PERSONNEL	8	0	1	9	3.803	0.000	1.213	5.016
SUPERVISORY PERSONNEL	2	0	0	2	0.980	0.000	0.103	1.083
ENGINEERING PERSONNEL	4	2	4	10	1.052	0.884	0.669	2.605
TOTAL	40	2	29	71	22.230	0.938	13.039	36.207
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	3	0	8	11	1.799	0.000	3.919	5.718
OPERATIONS PERSONNEL	2	0	0	2	1.512	0.000	0.000	1.512
HEALTH PHYSICS PERSONNEL	1	0	1	2	1.597	0.000	0.622	2.219
SUPERVISORY PERSONNEL	1	0	0	1	0.487	0.179	0.004	0.670
ENGINEERING PERSONNEL	3	3	10	16	1.222	1.120	2.316	4.658
TOTAL	10	3	19	32	6.617	1.299	6.861	14.777
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	116	2	161	279	89.675	0.747	99.971	190.393
OPERATIONS PERSONNEL	1	0	0	1	0.955	0.000	0.000	0.955
HEALTH PHYSICS PERSONNEL	4	0	31	35	6.723	0.000	30.502	37.225
SUPERVISORY PERSONNEL	3	0	3	6	2.484	0.000	1.857	4.341
ENGINEERING PERSONNEL	10	7	13	30	3.848	2.766	5.127	11.741
TOTAL	134	9	208	351	103.685	3.513	137.457	244.655
WASTE PROCESSING								
MAINTENANCE PERSONNEL	8	0	0	8	5.319	0.000	0.000	5.319
OPERATIONS PERSONNEL	0	0	0	0	0.022	0.000	0.000	0.022
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.523	0.000	2.797	3.320
SUPERVISORY PERSONNEL	0	0	1	1	0.000	0.000	1.902	1.902
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
TOTAL	8	0	4	12	5.864	0.000	4.699	10.563
REFUELING								
MAINTENANCE PERSONNEL	15	0	1	16	13.147	0.004	0.761	13.912
OPERATIONS PERSONNEL	1	0	0	1	0.714	0.000	0.000	0.714
HEALTH PHYSICS PERSONNEL	1	0	3	4	0.723	0.000	1.257	1.980
SUPERVISORY PERSONNEL	1	0	0	1	0.210	0.000	0.000	0.210
ENGINEERING PERSONNEL	1	1	0	2	0.358	0.206	0.067	0.631
TOTAL	19	1	4	24	15.152	0.210	2.085	17.447
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	234	2	250	486	164.866	0.832	147.232	312.930
OPERATIONS PERSONNEL	49	0	0	49	37.245	0.000	0.000	37.245
HEALTH PHYSICS PERSONNEL	41	0	55	96	35.499	0.004	45.334	80.837
SUPERVISORY PERSONNEL	22	2	4	28	10.251	1.651	3.955	15.857
ENGINEERING PERSONNEL	32	22	41	95	10.516	9.375	14.269	34.160
GRAND TOTALS	378	26	350	754	258.377	11.862	210.790	481.029

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION

1989

PLANT: *WATERFORD 3

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	1	1	0.429	0.000	1.654	2.083
OPERATIONS PERSONNEL	27	0	28	55	7.502	0.049	12.558	20.109
HEALTH PHYSICS PERSONNEL	11	0	83	94	2.908	0.000	23.684	26.592
SUPERVISORY PERSONNEL	4	0	10	14	1.182	0.000	2.904	4.086
ENGINEERING PERSONNEL	2	0	44	46	1.270	0.000	10.398	11.668
TOTAL	44	0	166	210	13.291	0.049	51.198	64.538
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	28	0	289	317	8.558	0.000	88.892	97.450
OPERATIONS PERSONNEL	1	0	11	12	0.702	0.000	3.537	4.239
HEALTH PHYSICS PERSONNEL	2	0	6	8	0.575	0.000	1.850	2.425
SUPERVISORY PERSONNEL	0	0	0	0	0.134	0.000	0.364	0.498
ENGINEERING PERSONNEL	0	0	0	0	0.026	0.000	0.118	0.144
TOTAL	31	0	306	337	9.995	0.000	94.761	104.756
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	1	0	8	9	0.310	0.000	3.180	3.490
OPERATIONS PERSONNEL	0	0	0	0	0.184	0.000	0.056	0.240
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.002	0.000	0.094	0.096
SUPERVISORY PERSONNEL	0	0	7	7	0.046	0.000	1.520	1.566
ENGINEERING PERSONNEL	0	0	4	4	0.115	0.000	1.088	1.203
TOTAL	1	0	19	20	0.657	0.000	5.938	6.595
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	7	0	23	30	1.350	0.000	14.144	15.494
OPERATIONS PERSONNEL	0	0	20	20	0.182	0.000	11.127	11.309
HEALTH PHYSICS PERSONNEL	0	0	3	3	0.041	0.000	1.477	1.518
SUPERVISORY PERSONNEL	0	0	0	0	0.017	0.000	0.353	0.370
ENGINEERING PERSONNEL	0	0	18	18	0.028	0.000	3.884	3.912
TOTAL	7	0	64	71	1.618	0.000	30.985	32.603
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	0	1	2	0.382	0.000	0.838	1.220
OPERATIONS PERSONNEL	10	0	55	65	2.444	0.000	17.829	20.273
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.318	0.000	0.433	0.751
SUPERVISORY PERSONNEL	0	0	0	0	0.016	0.000	0.008	0.024
ENGINEERING PERSONNEL	0	0	0	0	0.000	0.000	0.033	0.033
TOTAL	12	0	56	68	3.160	0.000	19.141	22.301
REFUELING								
MAINTENANCE PERSONNEL	5	0	6	11	1.789	0.000	2.614	4.403
OPERATIONS PERSONNEL	2	0	23	25	0.586	0.036	8.213	8.835
HEALTH PHYSICS PERSONNEL	0	0	1	1	0.040	0.000	0.904	0.944
SUPERVISORY PERSONNEL	0	0	0	0	0.043	0.000	0.277	0.320
ENGINEERING PERSONNEL	0	0	0	0	0.057	0.000	0.221	0.278
TOTAL	7	0	30	37	2.515	0.036	12.229	14.780
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	42	0	328	370	12.818	0.000	111.322	124.140
OPERATIONS PERSONNEL	40	0	137	177	11.600	0.085	53.320	65.005
HEALTH PHYSICS PERSONNEL	14	0	93	107	3.884	0.000	28.442	32.326
SUPERVISORY PERSONNEL	4	0	17	21	1.438	0.000	5.426	6.864
ENGINEERING PERSONNEL	2	0	66	68	1.496	0.000	15.742	17.238
GRAND TOTALS	102	0	641	743	31.236	0.085	214.252	245.573

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *WOLF CREEK 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.218	0.000	0.483	0.701
OPERATIONS PERSONNEL	0	0	0	0	0.085	0.000	0.044	0.129
HEALTH PHYSICS PERSONNEL	5	1	0	6	1.475	0.127	0.275	1.877
SUPERVISORY PERSONNEL	0	0	0	0	0.163	0.000	0.029	0.192
ENGINEERING PERSONNEL	0	0	0	0	0.030	0.000	0.049	0.079
TOTAL	5	1	1	7	1.971	0.127	0.880	2.978
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	2	2	0.463	0.000	1.298	1.761
OPERATIONS PERSONNEL	0	0	0	0	0.069	0.000	0.011	0.080
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.749	0.030	0.195	0.974
SUPERVISORY PERSONNEL	0	0	0	0	0.298	0.000	0.035	0.333
ENGINEERING PERSONNEL	0	0	0	0	0.048	0.000	0.034	0.082
TOTAL	0	0	2	2	1.627	0.030	1.573	3.230
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.063	0.000	0.445	0.508
OPERATIONS PERSONNEL	0	0	0	0	0.011	0.000	0.000	0.011
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.094	0.015	0.008	0.117
SUPERVISORY PERSONNEL	0	0	0	0	0.045	0.000	0.002	0.047
ENGINEERING PERSONNEL	0	0	0	0	0.003	0.000	0.013	0.016
TOTAL	0	0	1	1	0.216	0.015	0.468	0.699
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	7	7	0.394	0.000	2.323	2.717
OPERATIONS PERSONNEL	0	0	0	0	0.013	0.000	0.008	0.021
HEALTH PHYSICS PERSONNEL	1	0	0	1	0.697	0.015	0.055	0.767
SUPERVISORY PERSONNEL	0	0	0	0	0.095	0.000	0.054	0.149
ENGINEERING PERSONNEL	0	0	0	0	0.027	0.000	0.048	0.075
TOTAL	1	0	7	8	1.226	0.015	2.488	3.729
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	0	0	0.189	0.000	0.203	0.392
OPERATIONS PERSONNEL	0	0	0	0	0.015	0.000	0.006	0.021
HEALTH PHYSICS PERSONNEL	4	0	0	4	1.523	0.020	0.093	1.636
SUPERVISORY PERSONNEL	0	0	0	0	0.123	0.000	0.017	0.140
ENGINEERING PERSONNEL	0	0	0	0	0.008	0.000	0.018	0.026
TOTAL	4	0	0	4	1.858	0.020	0.337	2.215
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.370	0.000	0.465	0.835
OPERATIONS PERSONNEL	0	0	0	0	0.038	0.000	0.000	0.038
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.086	0.001	0.043	0.130
SUPERVISORY PERSONNEL	0	0	0	0	0.090	0.000	0.004	0.094
ENGINEERING PERSONNEL	0	0	0	0	0.012	0.000	0.015	0.027
TOTAL	0	0	1	1	0.596	0.001	0.527	1.124
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	0	0	12	12	1.697	0.000	5.217	6.914
OPERATIONS PERSONNEL	0	0	0	0	0.231	0.000	0.069	0.300
HEALTH PHYSICS PERSONNEL	10	1	0	11	4.624	0.208	0.669	5.501
SUPERVISORY PERSONNEL	0	0	0	0	0.814	0.000	0.141	0.955
ENGINEERING PERSONNEL	0	0	0	0	0.128	0.000	0.177	0.305
GRAND TOTALS	10	1	12	23	7.494	0.208	6.273	13.975

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *YANKEE-ROWE

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	4	0	1	5	1.707	0.000	0.958	2.665
OPERATIONS PERSONNEL	28	0	0	28	7.695	0.104	1.598	9.397
HEALTH PHYSICS PERSONNEL	10	0	2	12	3.807	0.012	0.780	4.599
SUPERVISORY PERSONNEL	3	0	0	3	1.687	0.013	0.000	1.700
ENGINEERING PERSONNEL	1	1	0	2	0.899	0.987	0.280	2.166
TOTAL	46	1	3	50	15.795	1.116	3.616	20.527
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	19	0	17	36	5.886	0.000	7.522	13.408
OPERATIONS PERSONNEL	7	0	0	7	2.868	0.000	0.147	3.015
HEALTH PHYSICS PERSONNEL	8	0	10	18	2.233	0.000	2.661	4.894
SUPERVISORY PERSONNEL	4	0	0	4	2.236	0.000	0.000	2.236
ENGINEERING PERSONNEL	4	0	0	4	2.040	0.742	0.048	2.830
TOTAL	42	0	27	69	15.263	0.742	10.378	26.383
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	0	0	6	6	0.005	0.000	1.409	1.414
OPERATIONS PERSONNEL	0	0	0	0	0.136	0.000	0.000	0.136
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.009	0.000	0.005	0.014
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	1	0	0	1	0.251	0.192	0.000	0.443
TOTAL	1	0	6	7	0.401	0.192	1.414	2.007
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	0	0	3	3	0.167	0.000	1.196	1.363
OPERATIONS PERSONNEL	0	0	0	0	0.004	0.000	0.000	0.004
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.057	0.000	0.077	0.134
SUPERVISORY PERSONNEL	0	0	0	0	0.000	0.000	0.000	0.000
ENGINEERING PERSONNEL	0	0	0	0	0.096	0.035	0.000	0.131
TOTAL	0	0	3	3	0.324	0.035	1.273	1.632
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	0	0	1	1	0.043	0.000	0.399	0.442
OPERATIONS PERSONNEL	4	0	0	4	1.092	0.000	0.000	1.092
HEALTH PHYSICS PERSONNEL	4	0	1	5	4.964	0.000	1.106	6.070
SUPERVISORY PERSONNEL	0	0	0	0	0.007	0.000	0.000	0.007
ENGINEERING PERSONNEL	1	0	0	1	0.465	0.138	0.000	0.603
TOTAL	9	0	2	11	6.571	0.138	1.505	8.214
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	2	0	1	3	0.825	0.000	1.138	1.963
OPERATIONS PERSONNEL	2	0	0	2	1.167	0.000	0.000	1.167
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.000	0.000	0.090	0.090
SUPERVISORY PERSONNEL	0	0	0	0	0.025	0.000	0.000	0.025
ENGINEERING PERSONNEL	1	0	0	1	0.146	0.000	0.000	0.146
TOTAL	5	0	1	6	2.163	0.000	1.228	3.391
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	25	0	29	54	8.633	0.000	12.622	21.255
OPERATIONS PERSONNEL	41	0	0	41	12.962	0.104	1.745	14.811
HEALTH PHYSICS PERSONNEL	22	0	13	35	11.070	0.012	4.719	15.801
SUPERVISORY PERSONNEL	7	0	0	7	3.955	0.013	0.000	3.968
ENGINEERING PERSONNEL	8	1	0	9	3.897	2.094	0.328	6.319
GRAND TOTALS	103	1	42	146	40.517	2.223	19.414	62.154

*Workers may be counted in more than one category.

APPENDIX D (Continued)
NUMBER OF PERSONNEL AND PERSON-REM
BY WORK AND JOB FUNCTION
1989

PLANT: *ZION 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	TOTAL	STATION	UTILITY	CONTRACT	TOTAL
<u>REACTOR OPS & SURV</u>								
MAINTENANCE PERSONNEL	3	0	2	5	2.334	0.000	0.637	2.971
OPERATIONS PERSONNEL	70	0	19	89	8.468	0.000	3.322	11.790
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.308	0.000	0.026	1.334
SUPERVISORY PERSONNEL	22	1	0	23	4.160	0.059	0.000	4.219
ENGINEERING PERSONNEL	7	0	1	8	0.848	0.000	0.080	0.928
TOTAL	104	1	23	128	17.118	0.059	4.065	21.242
<u>ROUTINE MAINTENANCE</u>								
MAINTENANCE PERSONNEL	103	24	661	788	85.118	0.783	198.260	284.161
OPERATIONS PERSONNEL	48	0	163	211	5.729	0.000	28.238	33.967
HEALTH PHYSICS PERSONNEL	28	0	52	80	28.016	0.000	17.953	45.969
SUPERVISORY PERSONNEL	86	55	31	172	17.251	5.537	5.335	28.123
ENGINEERING PERSONNEL	63	0	22	85	6.761	0.000	5.200	11.961
TOTAL	328	79	929	1336	142.875	6.320	254.986	404.181
<u>IN-SERVICE INSPECTION</u>								
MAINTENANCE PERSONNEL	4	1	228	233	2.562	0.010	68.688	71.260
OPERATIONS PERSONNEL	12	0	17	29	1.402	0.000	2.847	4.249
HEALTH PHYSICS PERSONNEL	2	0	1	3	2.102	0.000	0.228	2.330
SUPERVISORY PERSONNEL	9	7	7	23	2.015	0.706	1.187	3.908
ENGINEERING PERSONNEL	9	0	31	40	1.025	0.000	6.749	7.774
TOTAL	36	8	284	328	9.106	0.716	79.699	89.521
<u>SPECIAL MAINTENANCE</u>								
MAINTENANCE PERSONNEL	8	1	96	105	6.130	0.026	28.963	35.119
OPERATIONS PERSONNEL	10	0	1	11	1.312	0.000	0.086	1.398
HEALTH PHYSICS PERSONNEL	2	0	1	3	1.336	0.000	0.254	1.590
SUPERVISORY PERSONNEL	7	1	17	25	1.515	0.118	2.839	4.472
ENGINEERING PERSONNEL	4	0	1	5	0.401	0.000	0.045	0.446
TOTAL	31	2	116	149	10.694	0.144	32.187	43.025
<u>WASTE PROCESSING</u>								
MAINTENANCE PERSONNEL	1	1	22	24	0.054	0.005	6.615	6.674
OPERATIONS PERSONNEL	1	0	1	2	0.002	0.000	0.070	0.072
HEALTH PHYSICS PERSONNEL	1	0	1	2	0.835	0.000	0.004	0.839
SUPERVISORY PERSONNEL	1	1	1	3	0.140	0.005	0.010	0.155
ENGINEERING PERSONNEL	1	0	1	2	0.005	0.000	0.007	0.012
TOTAL	5	2	26	33	1.036	0.010	6.706	7.752
<u>REFUELING</u>								
MAINTENANCE PERSONNEL	31	1	13	45	25.815	0.025	3.728	29.568
OPERATIONS PERSONNEL	45	0	1	46	5.500	0.000	0.025	5.525
HEALTH PHYSICS PERSONNEL	2	0	21	23	1.960	0.000	8.004	9.964
SUPERVISORY PERSONNEL	22	49	1	72	4.405	4.810	0.039	9.254
ENGINEERING PERSONNEL	5	0	11	16	0.587	0.000	2.329	2.916
TOTAL	105	50	47	202	38.267	4.835	14.125	57.227
<u>TOTAL BY JOB FUNCTION</u>								
MAINTENANCE PERSONNEL	150	28	1022	1200	122.013	0.849	306.891	429.753
OPERATIONS PERSONNEL	186	0	202	388	22.413	0.000	34.588	57.001
HEALTH PHYSICS PERSONNEL	37	0	77	114	35.557	0.000	26.469	62.026
SUPERVISORY PERSONNEL	147	114	57	318	29.486	11.235	9.410	50.131
ENGINEERING PERSONNEL	89	0	67	156	9.627	0.000	14.410	24.037
GRAND TOTALS	609	142	1425	2176	219.096	12.084	391.768	622.948

*Workers may be counted in more than one category.

APPENDIX E

**Graphical Representation of Collective Dose Trends
by Year and Job Function for Each Site**

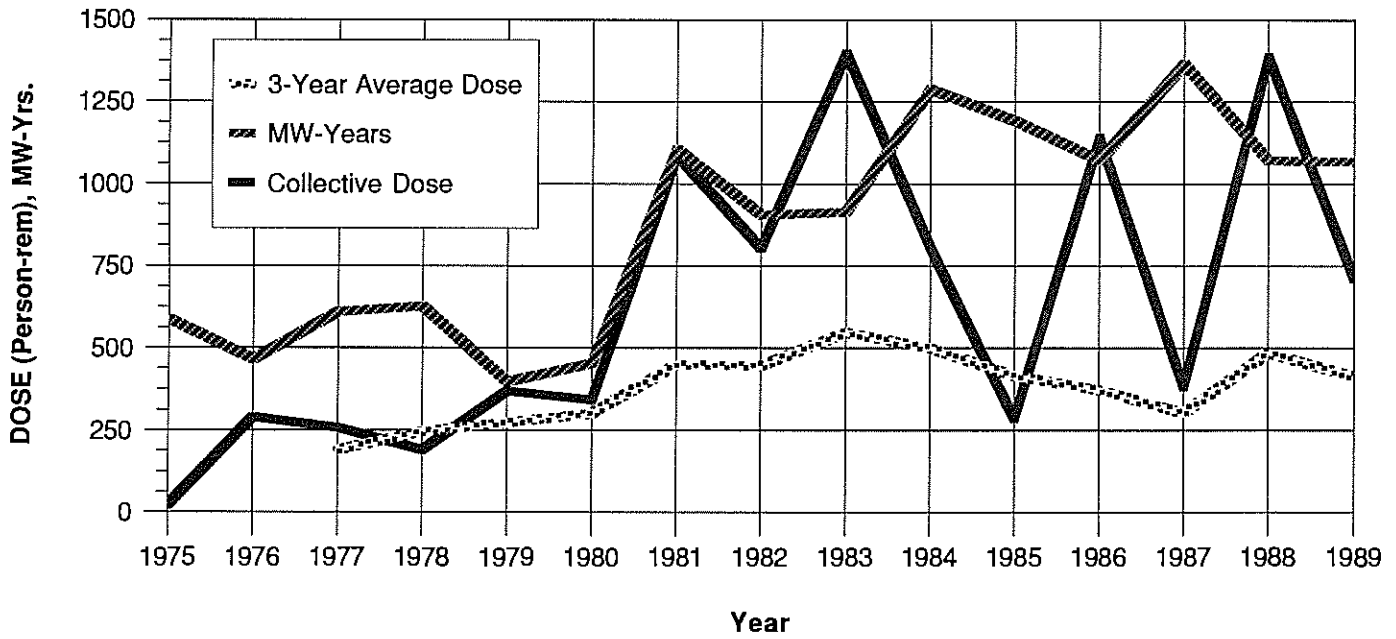
1973-1989

APPENDIX E

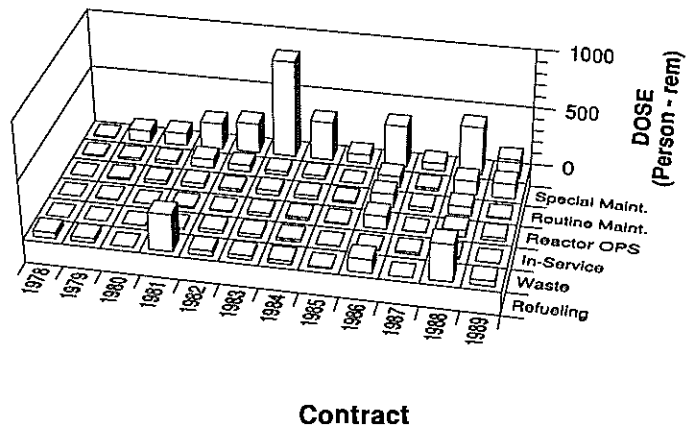
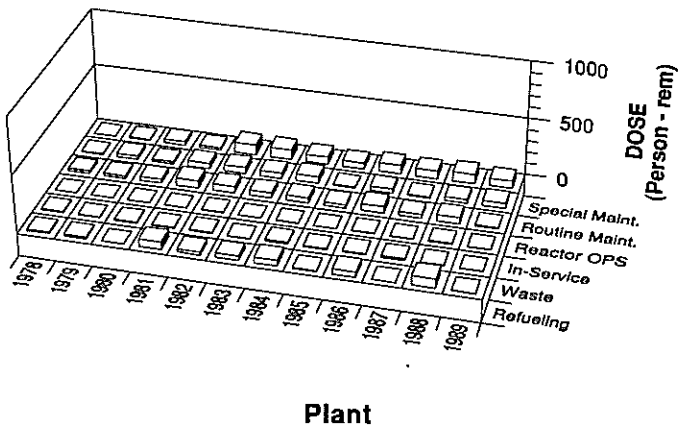
ARKANSAS 1, 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

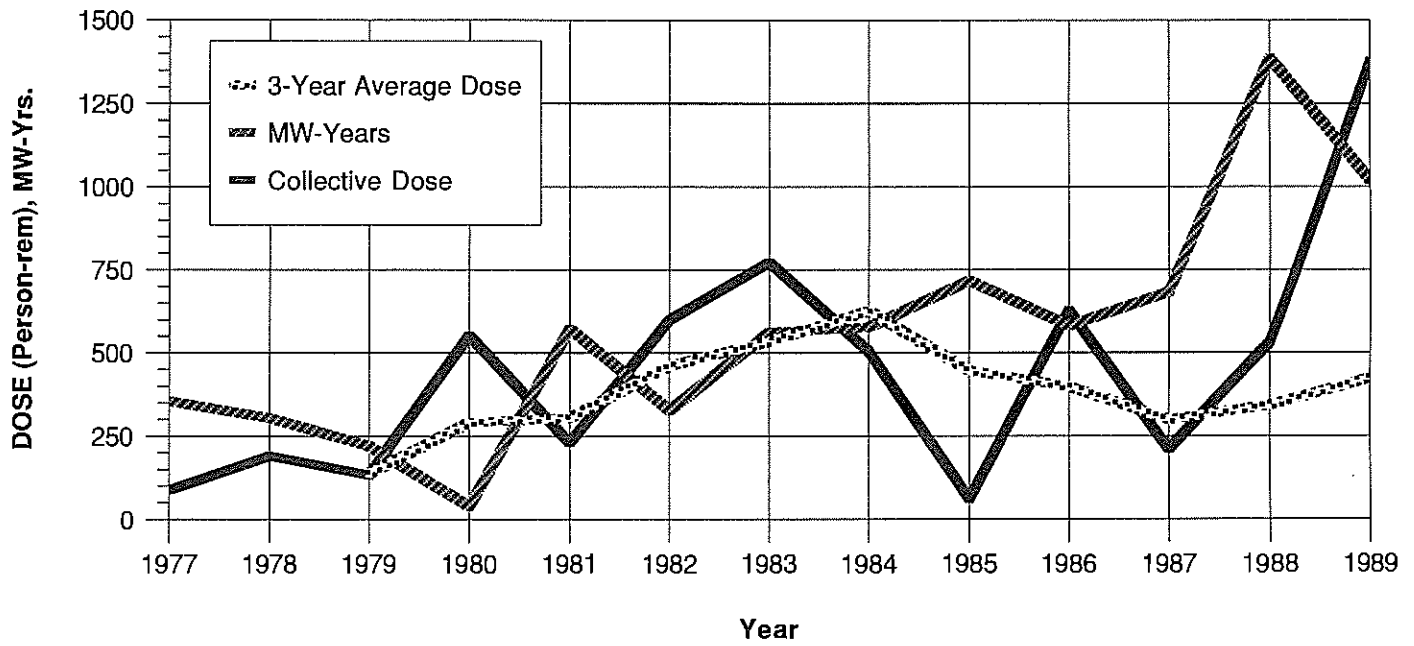


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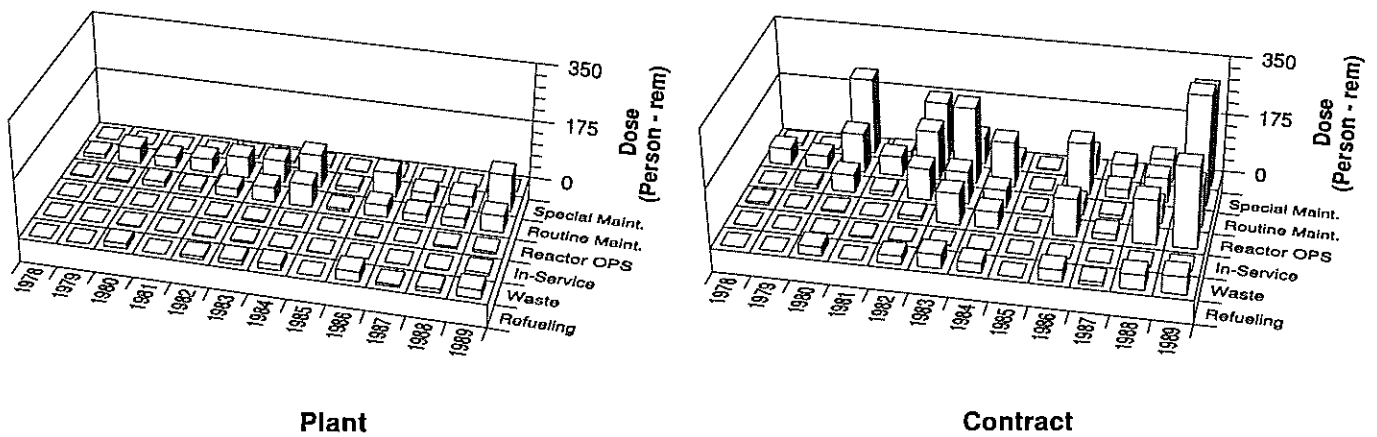
BEAVER VALLEY 1, 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

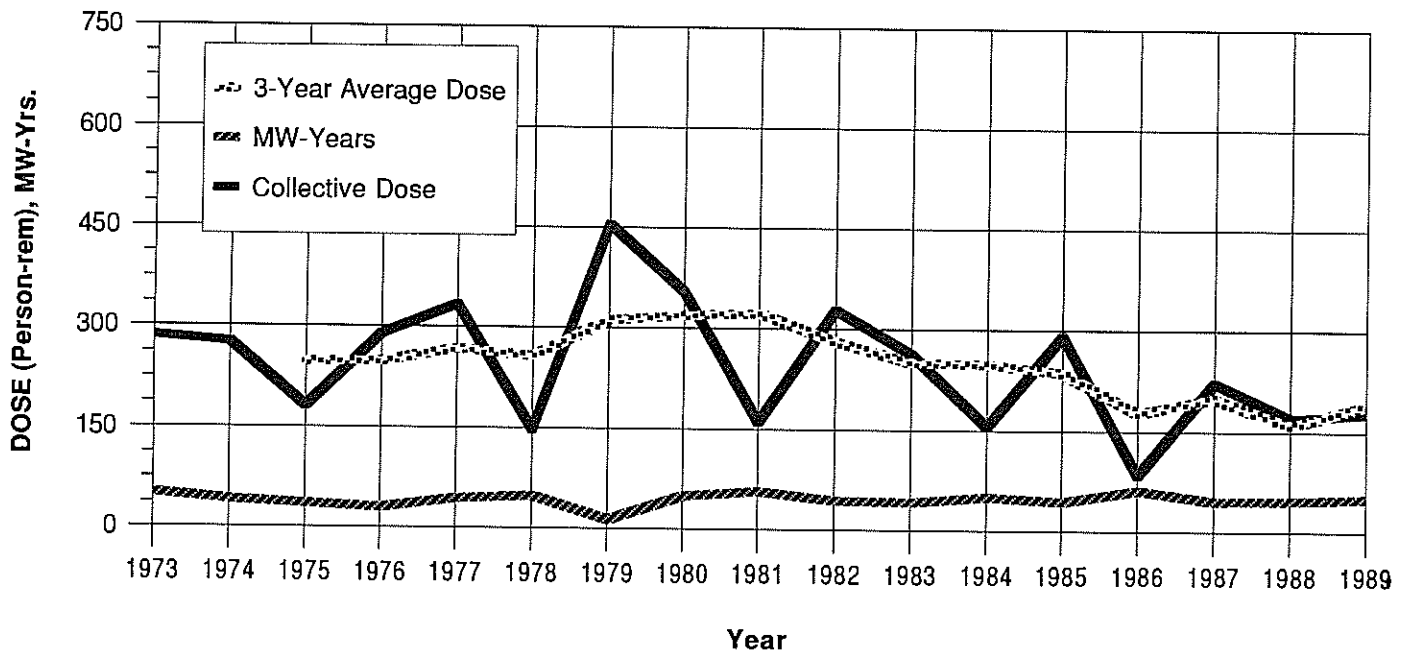


APPENDIX E (continued)

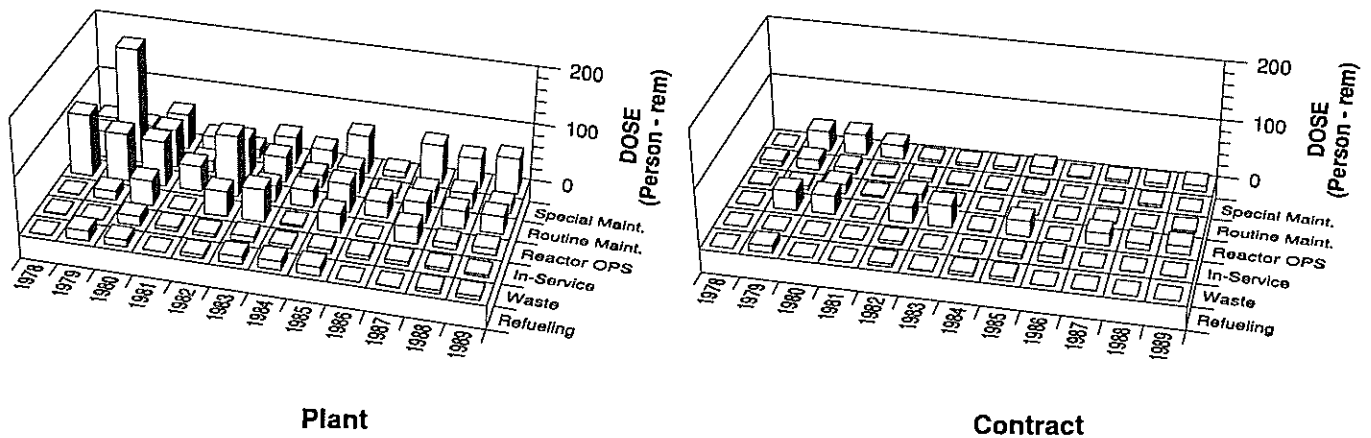
BIG ROCK POINT

BWR

Dose-Performance Indicators



Breakdown By Job Function

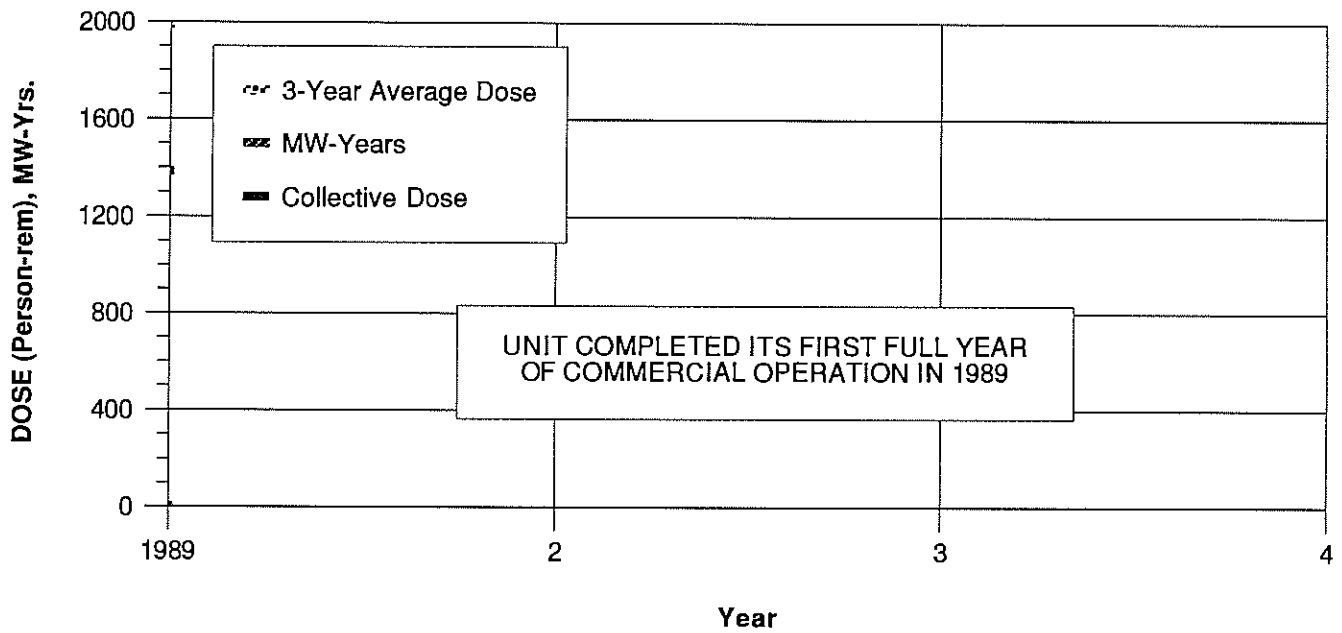


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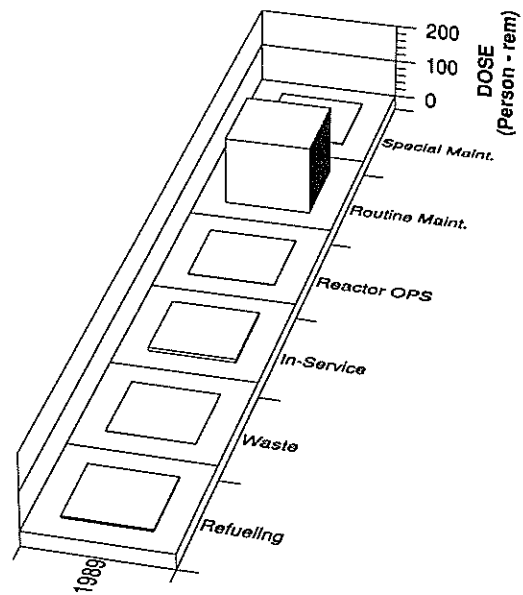
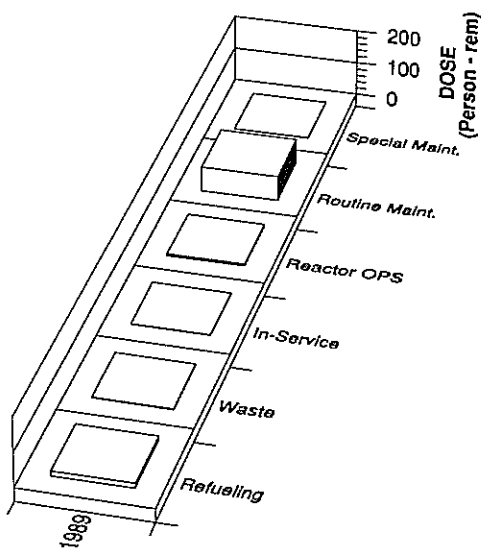
BRAIDWOOD 1, 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

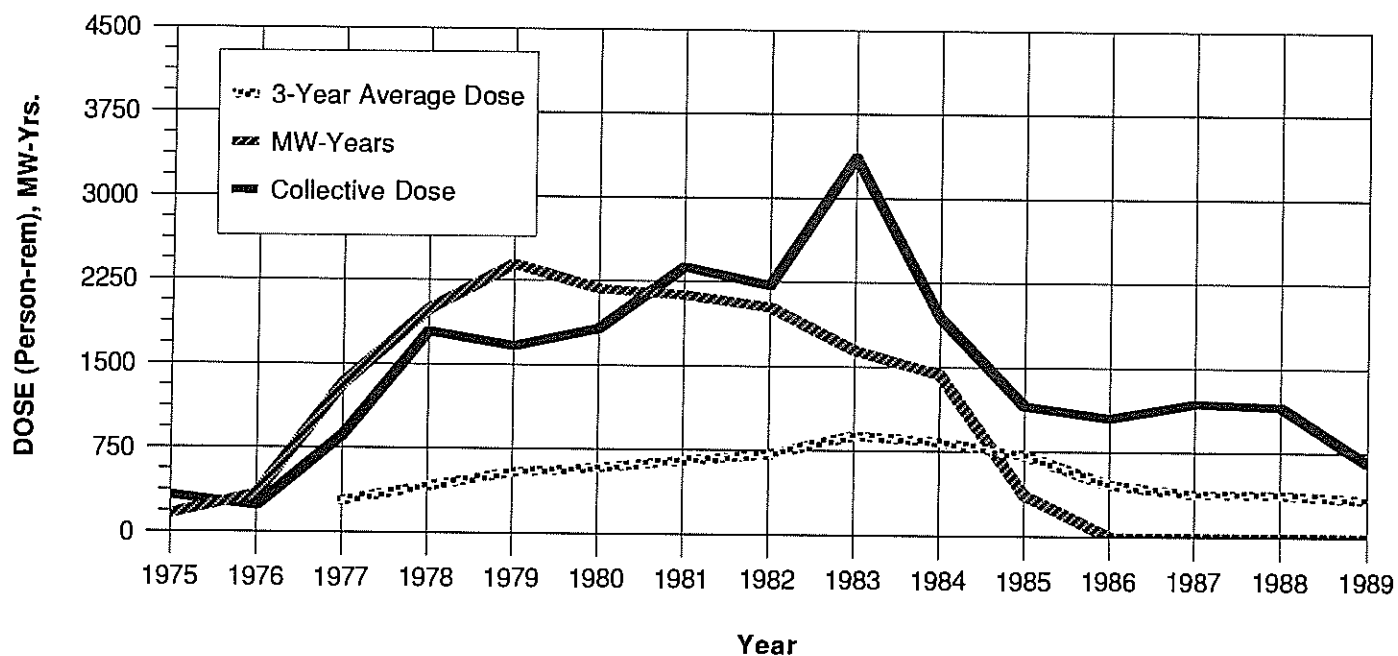


APPENDIX E (continued)

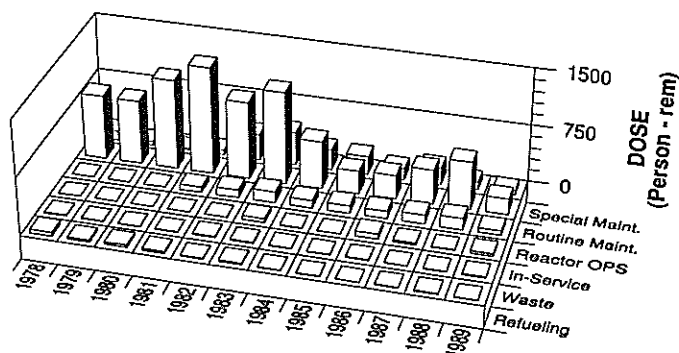
BROWNS FERRY 1, 2, 3

BWR

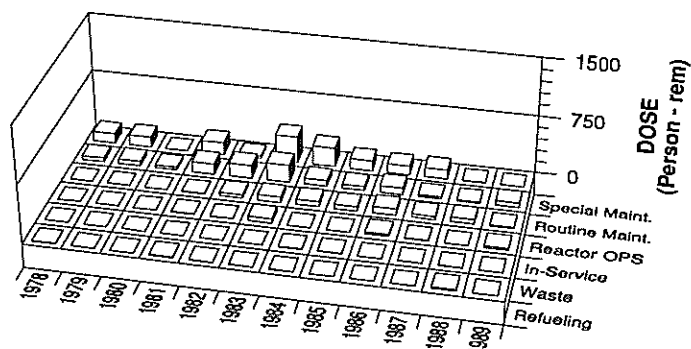
Dose-Performance Indicators



Breakdown By Job Function



Plant



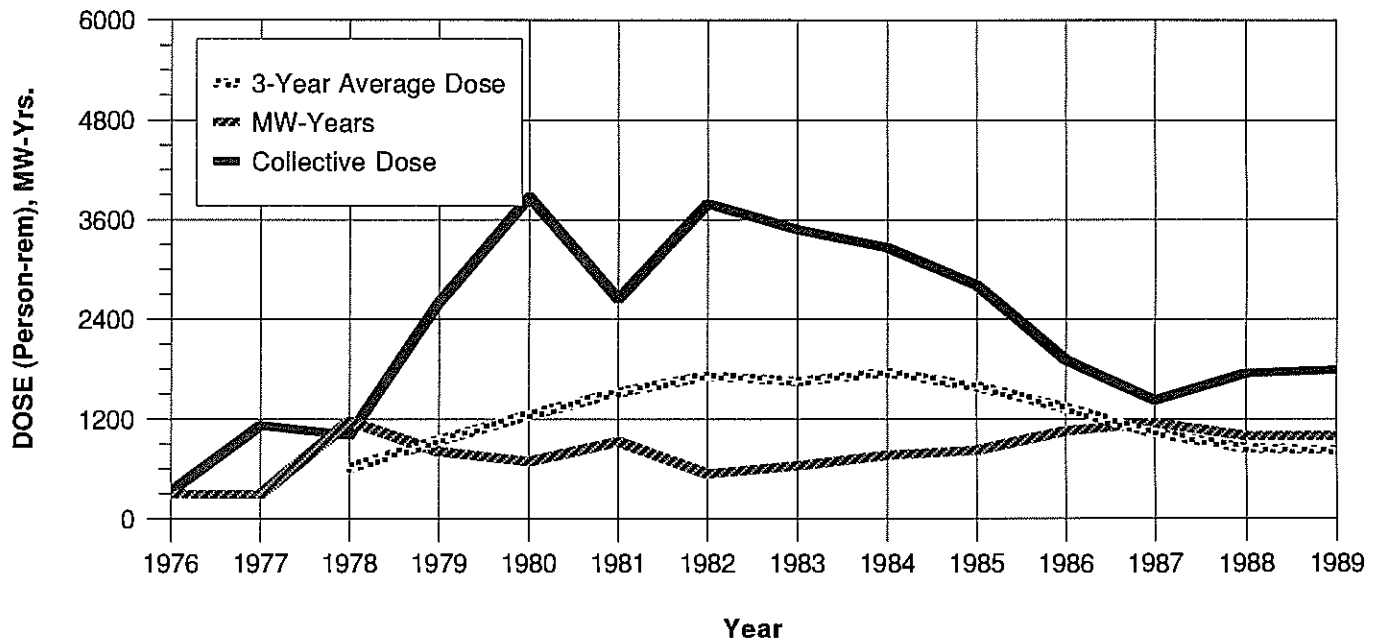
Contract

APPENDIX E (continued)

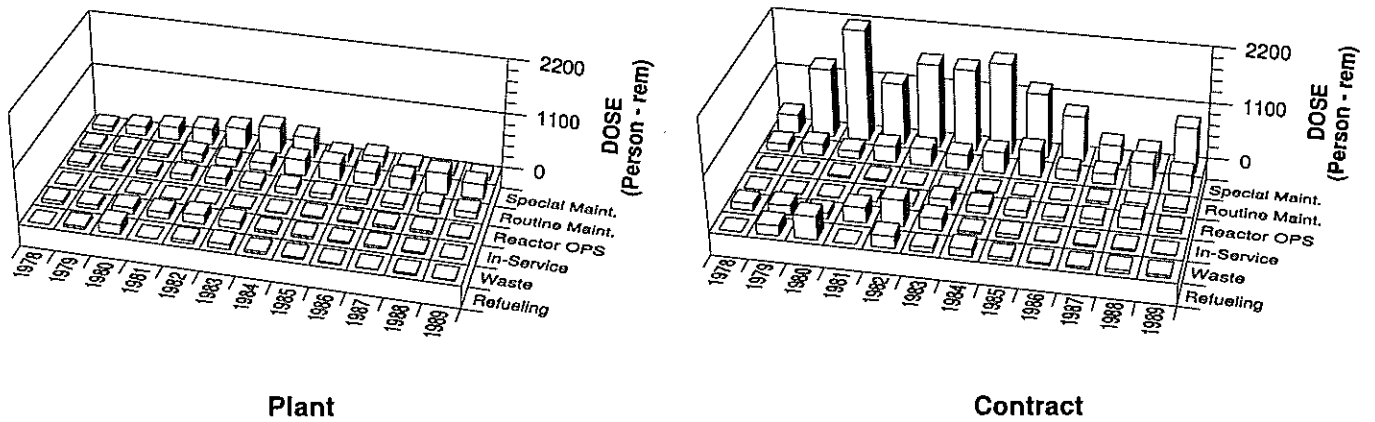
BRUNSWICK 1, 2

BWR

Dose-Performance Indicators



Breakdown By Job Function

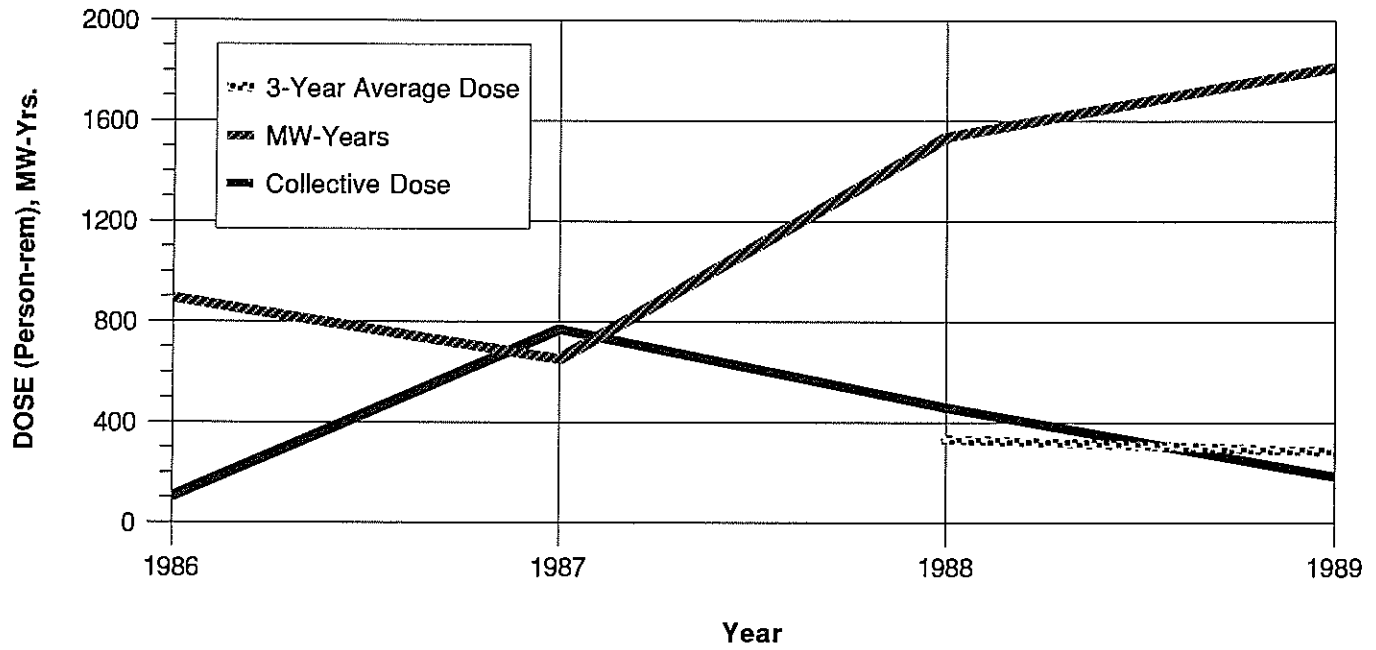


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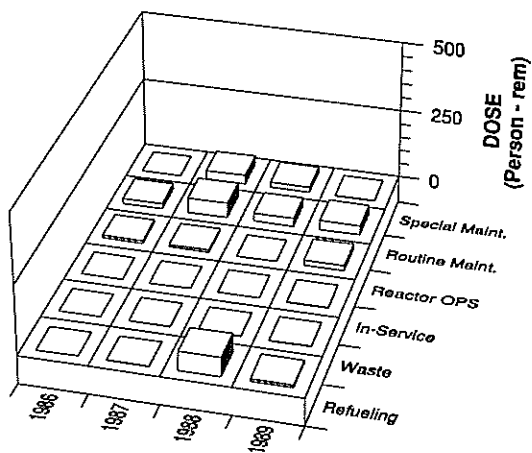
BYRON 1, 2

PWR

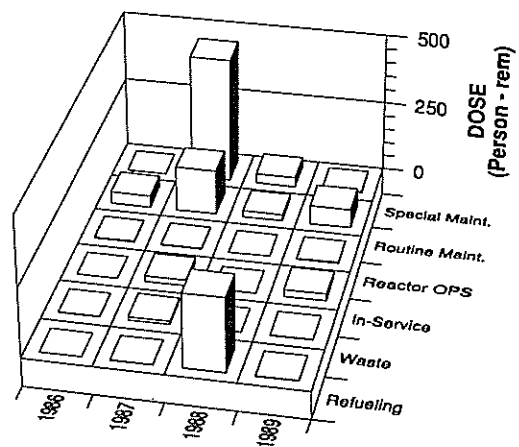
Dose-Performance Indicators



Breakdown By Job Function



Plant



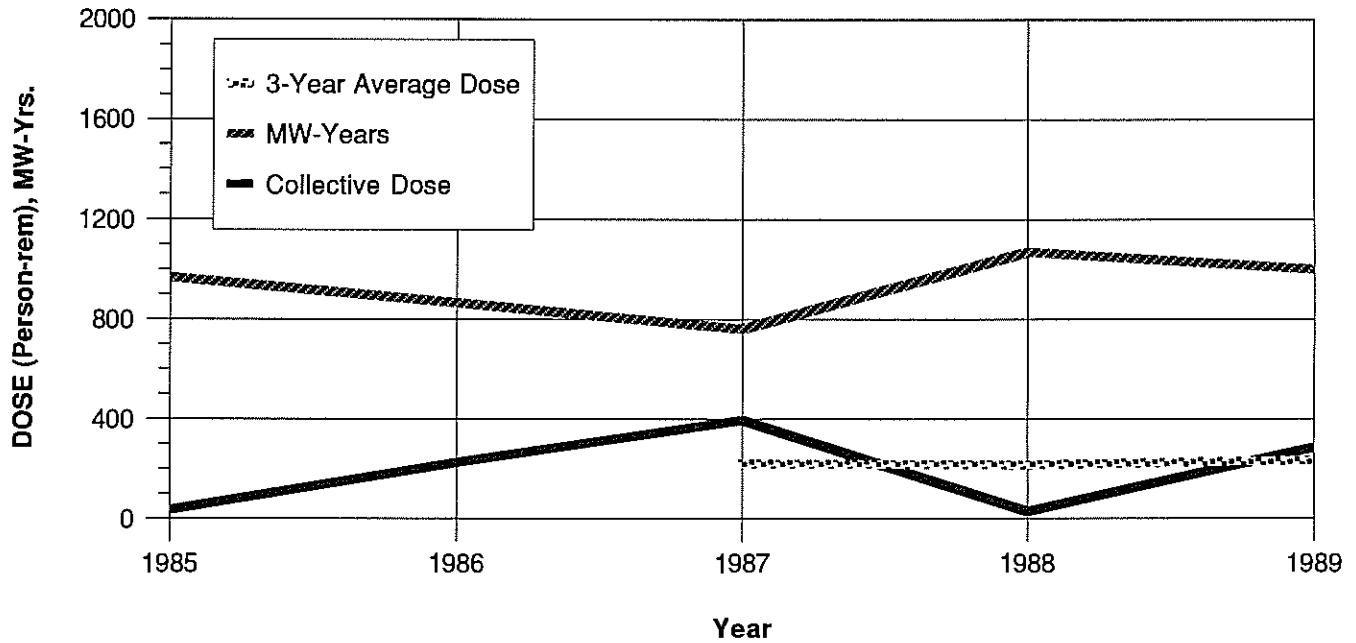
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APPENDIX E (continued)

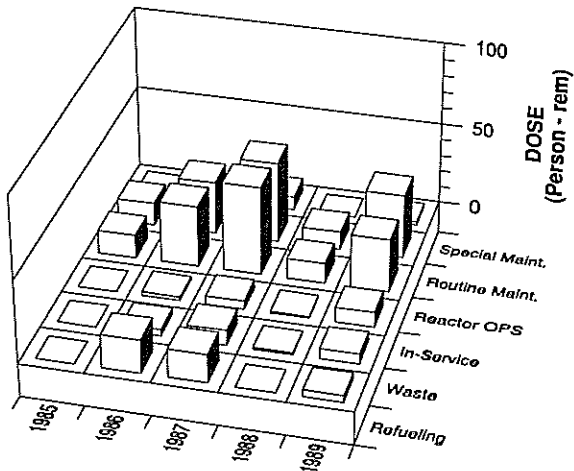
CALLAWAY 1

PWR

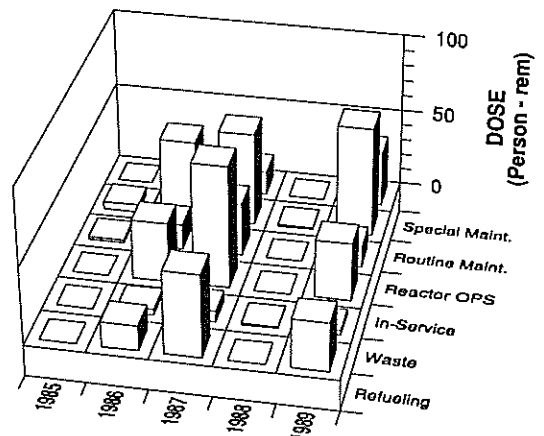
Dose-Performance Indicators



Breakdown By Job Function



Plant



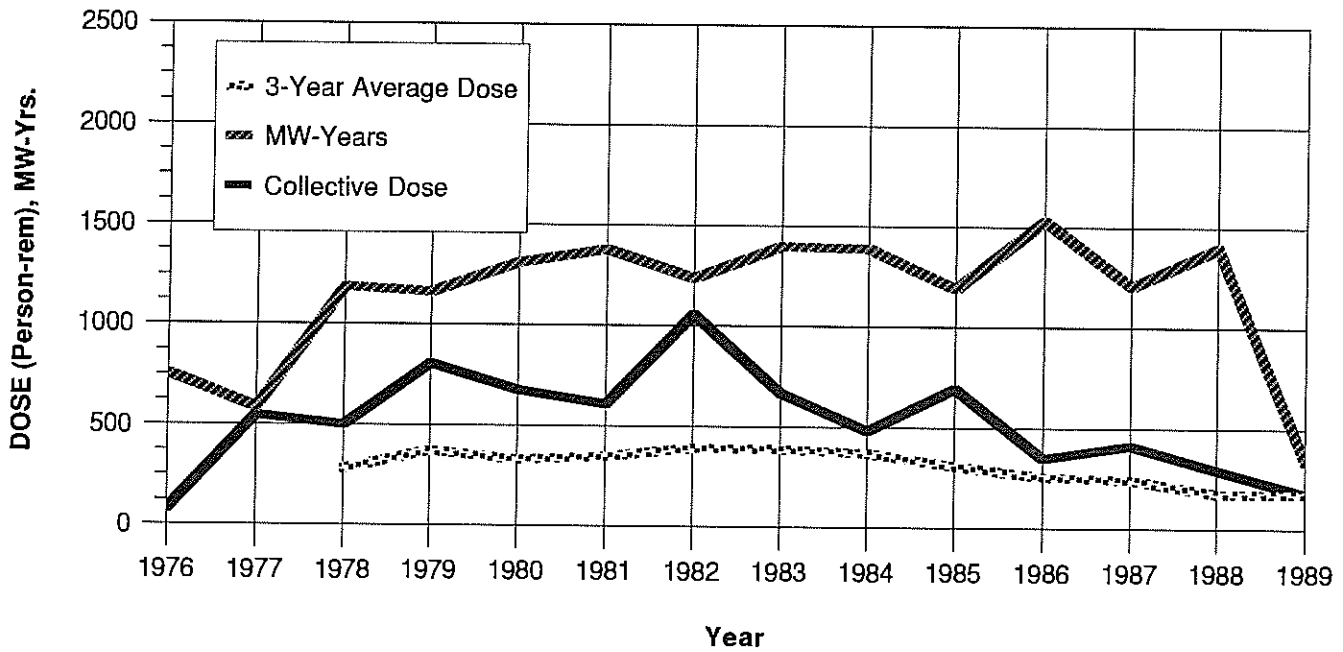
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APPENDIX E (continued)

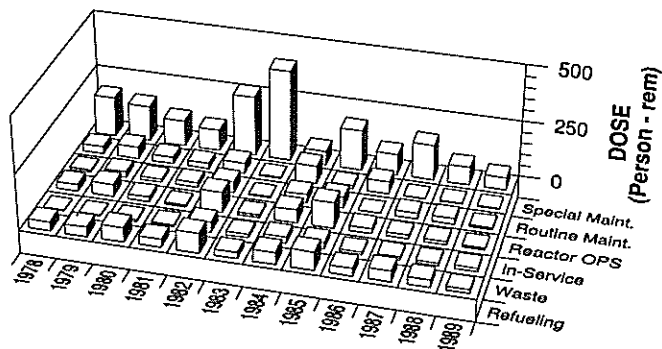
CALVERT CLIFFS 1, 2

PWR

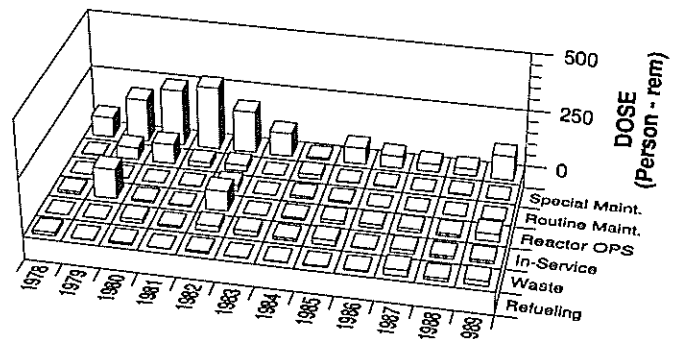
Dose-Performance Indicators



Breakdown By Job Function



Plant



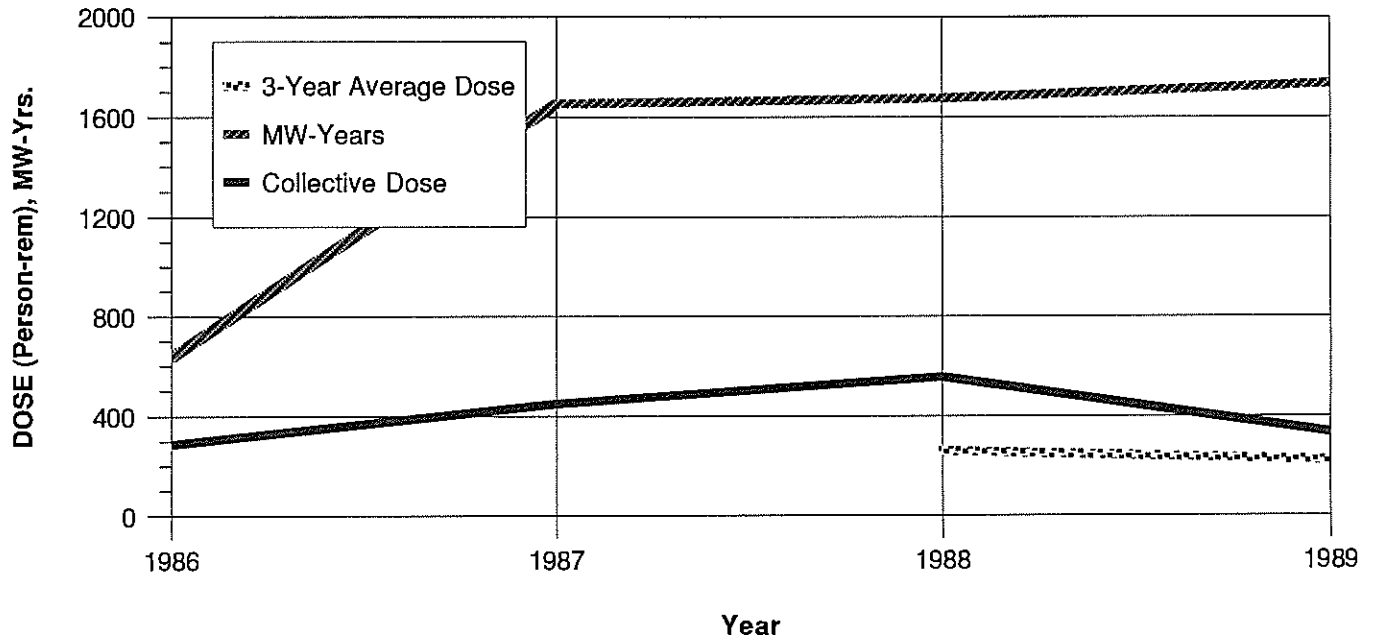
Contract

APPENDIX E (continued)

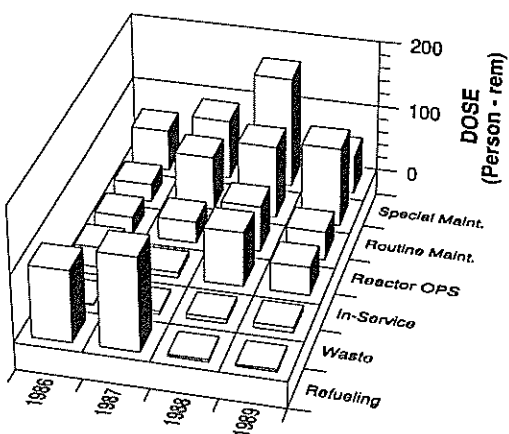
CATAWBA 1, 2

PWR

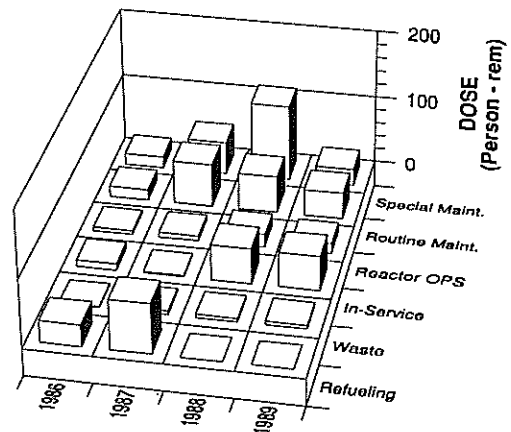
Dose-Performance Indicators



Breakdown By Job Function



Plant



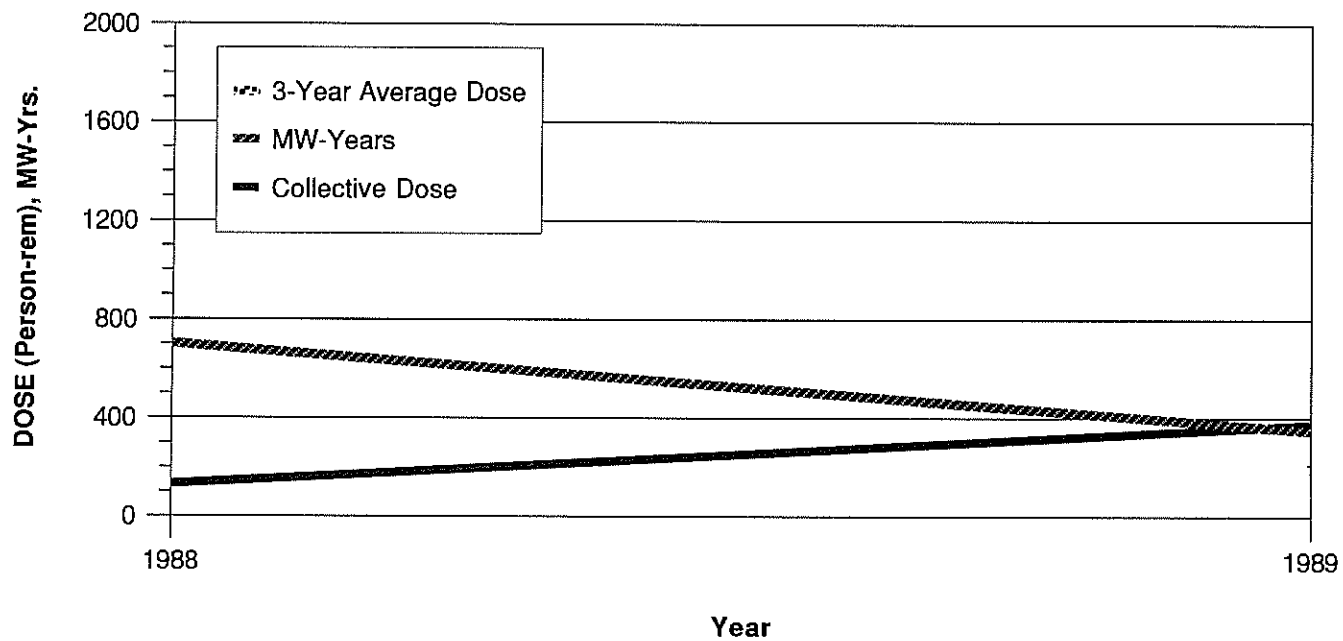
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APPENDIX E (continued)

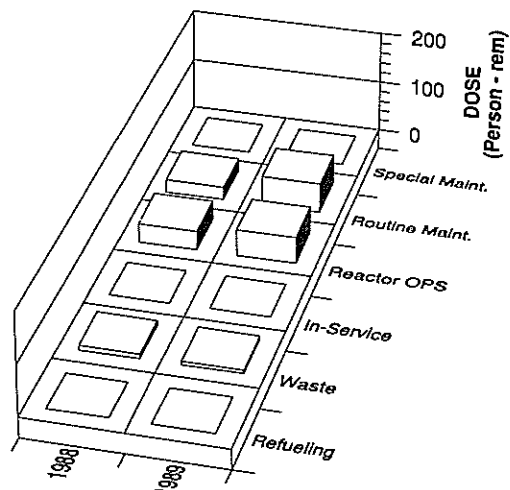
CLINTON

BWR

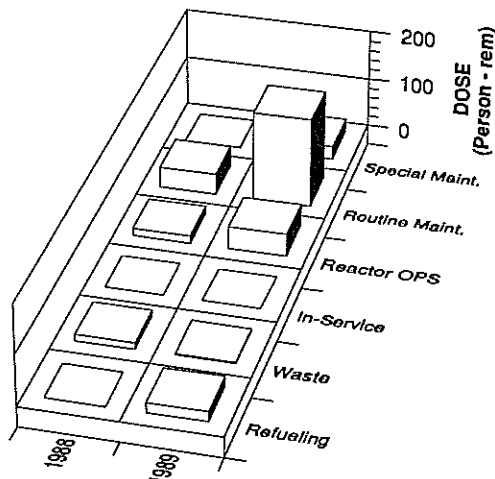
Dose-Performance Indicators



Breakdown By Job Function



Plant



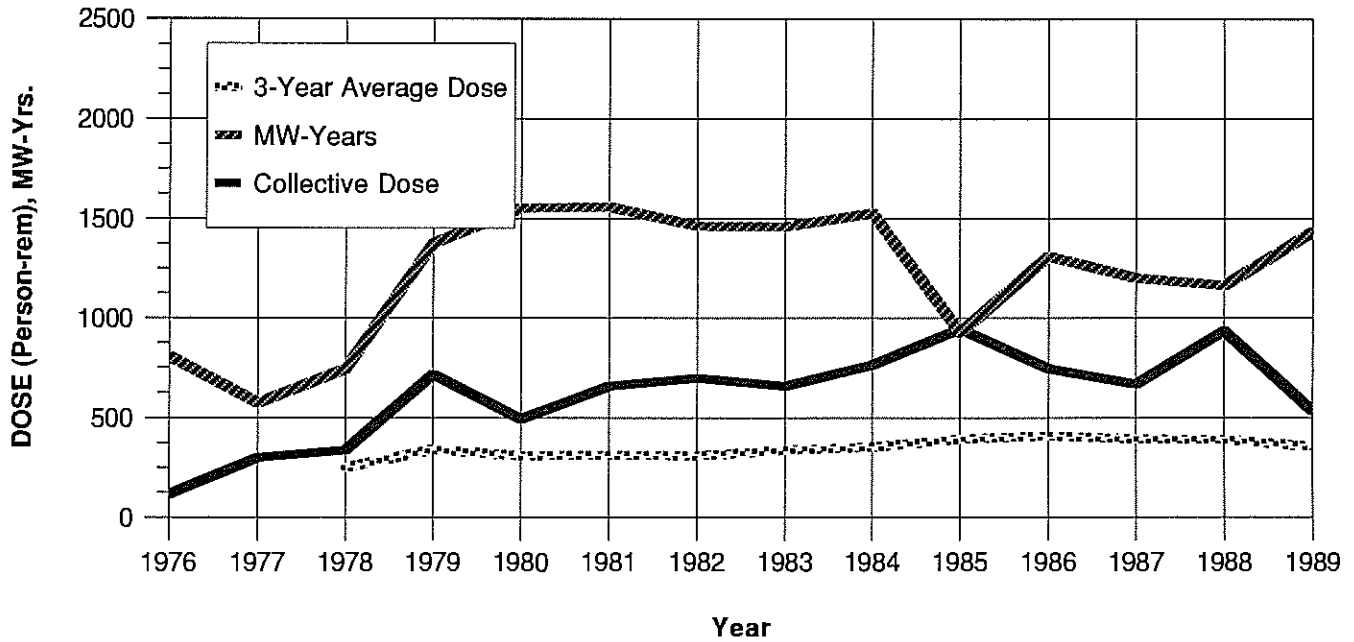
Contract

APPENDIX E (continued)

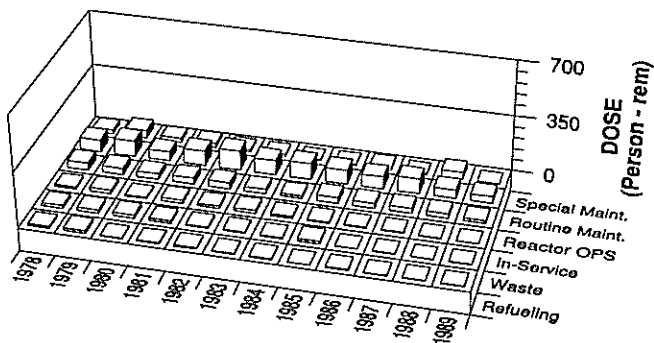
COOK 1, 2

PWR

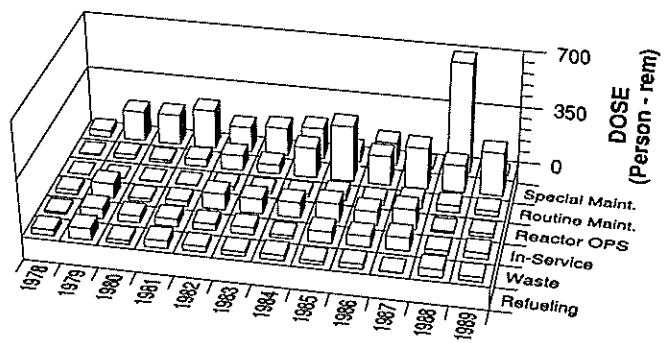
Dose-Performance Indicators



Breakdown By Job Function



Plant



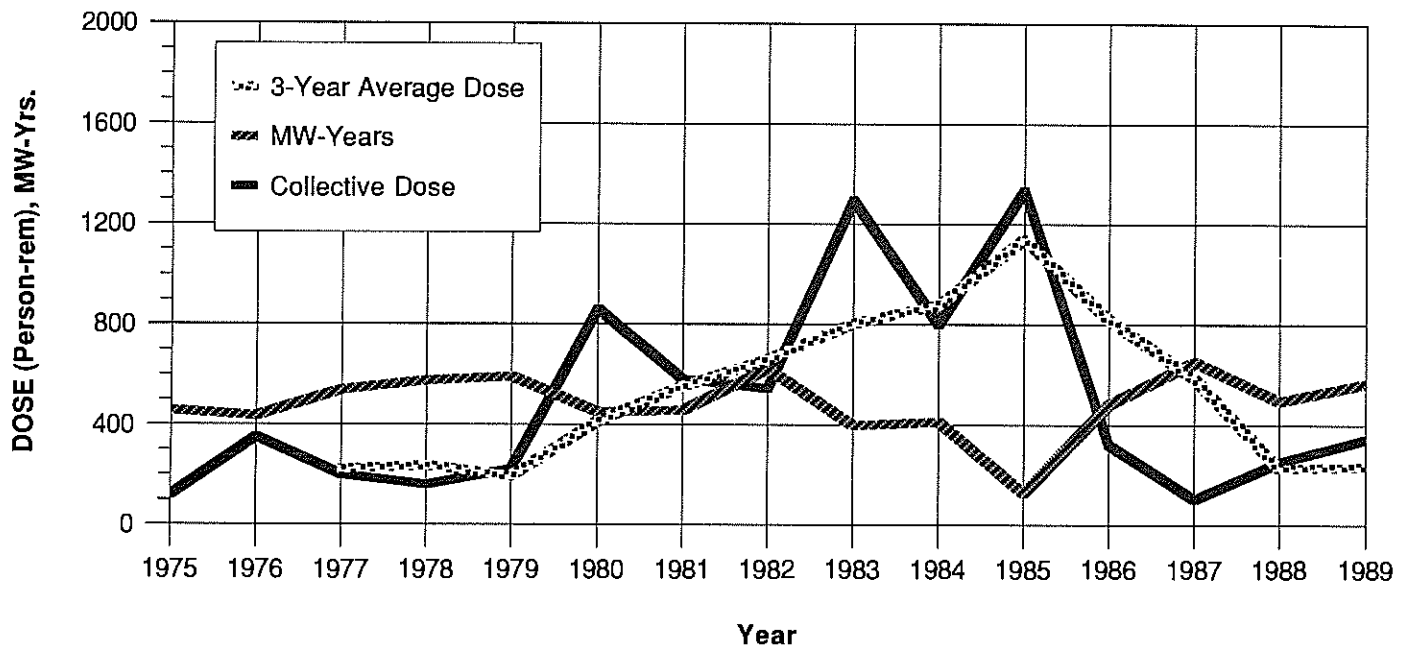
Contract

APPENDIX E (continued)

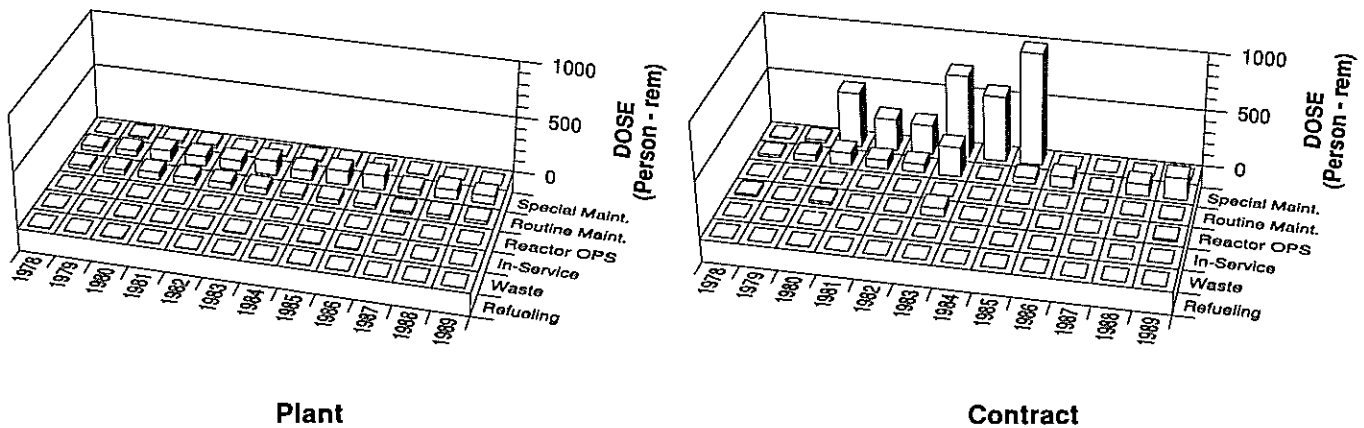
COOPER STATION

BWR

Dose-Performance Indicators



Breakdown By Job Function

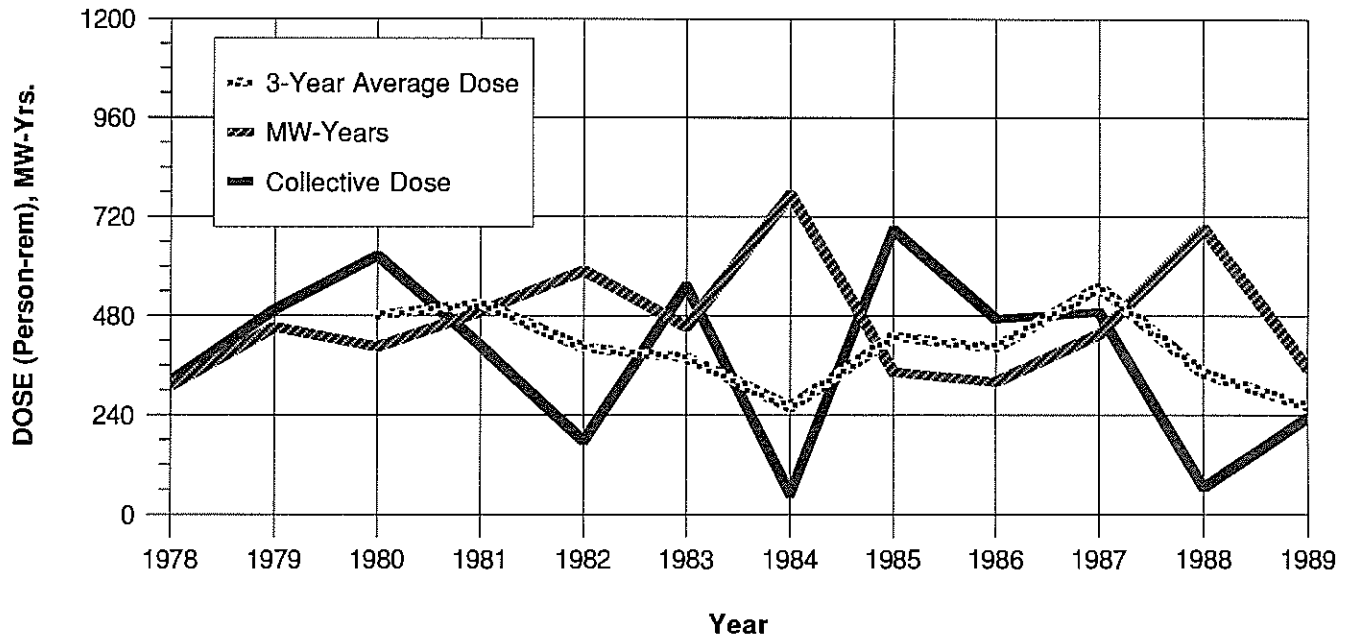


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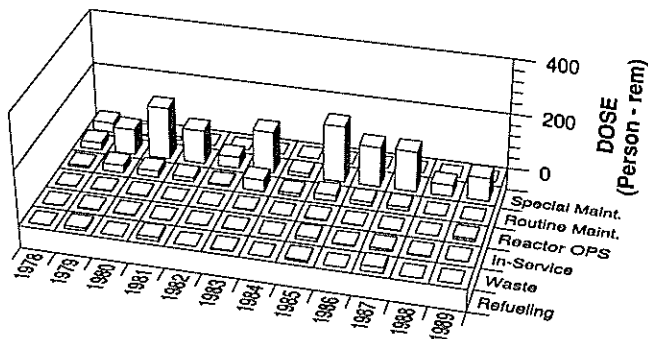
CRYSTAL RIVER 3

PWR

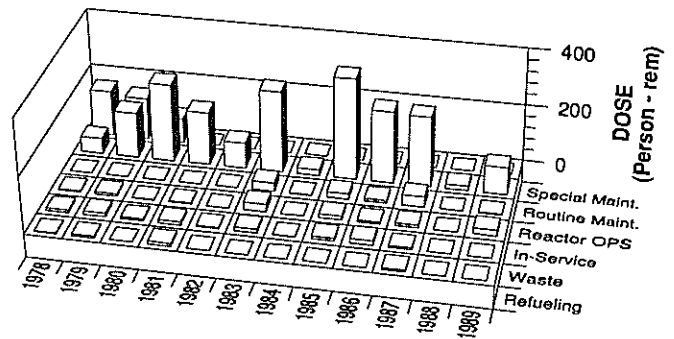
Dose-Performance Indicators



Breakdown By Job Function



Plant



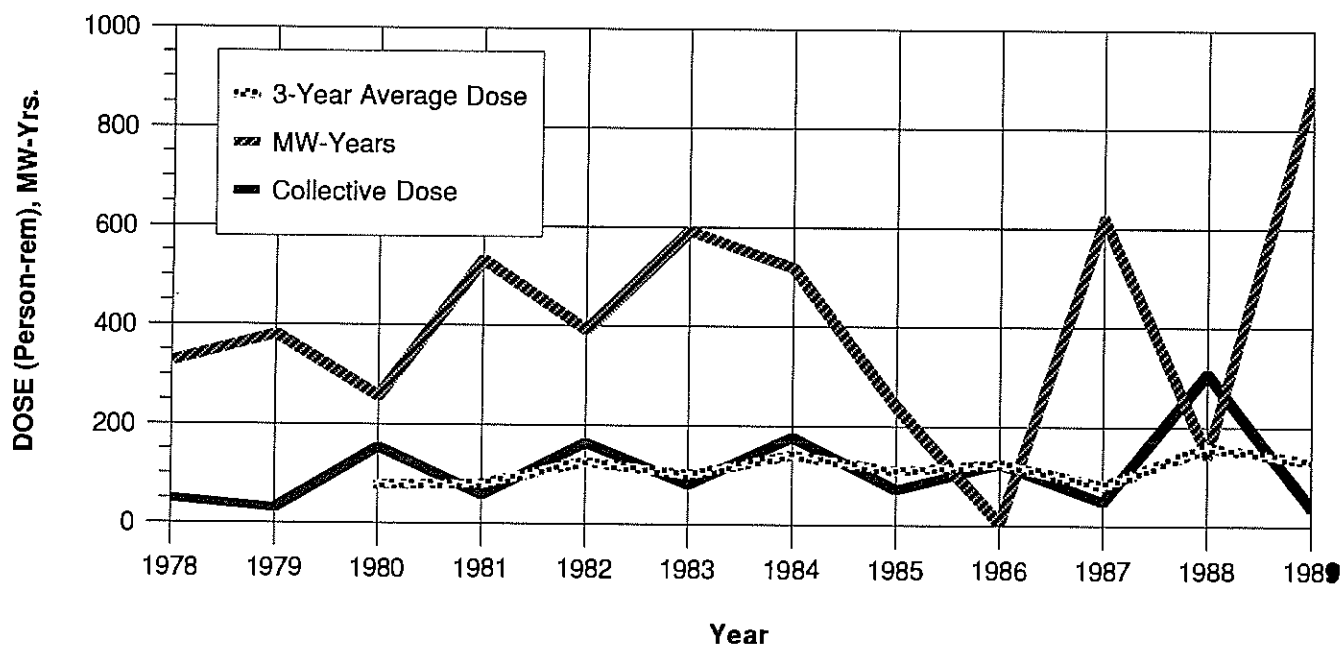
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APPENDIX E (continued)

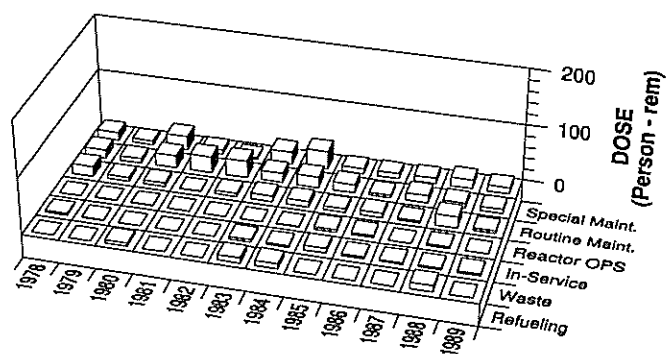
DAVIS-BESSE

PWR

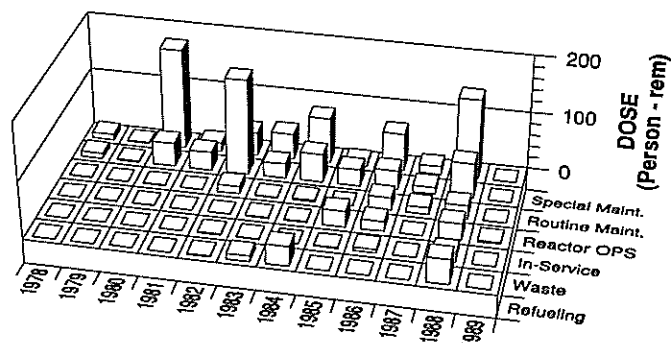
Dose-Performance Indicators



Breakdown By Job Function



Plant



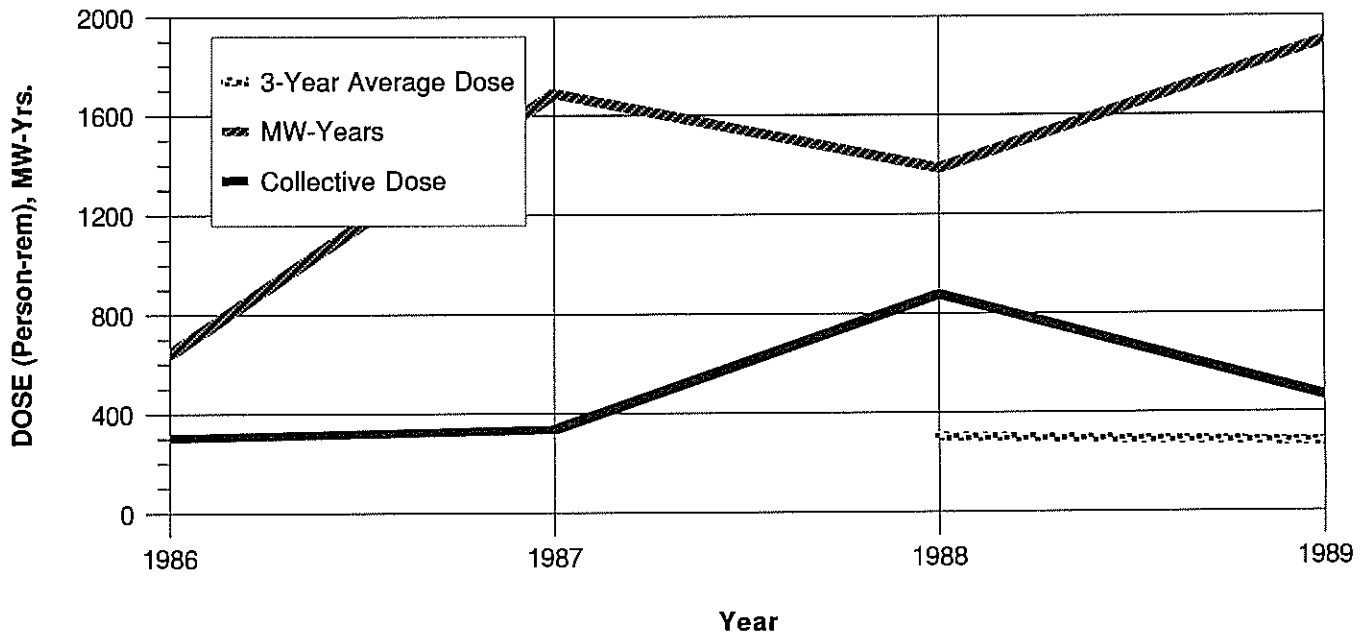
Contract

APPENDIX E (continued)

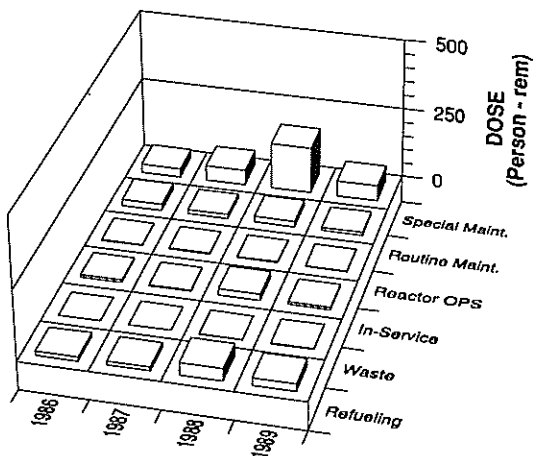
DIABLO CANYON 1, 2

PWR

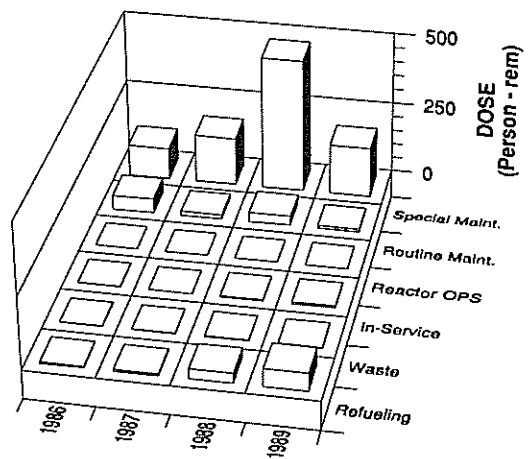
Dose-Performance Indicators



Breakdown By Job Function



Plant



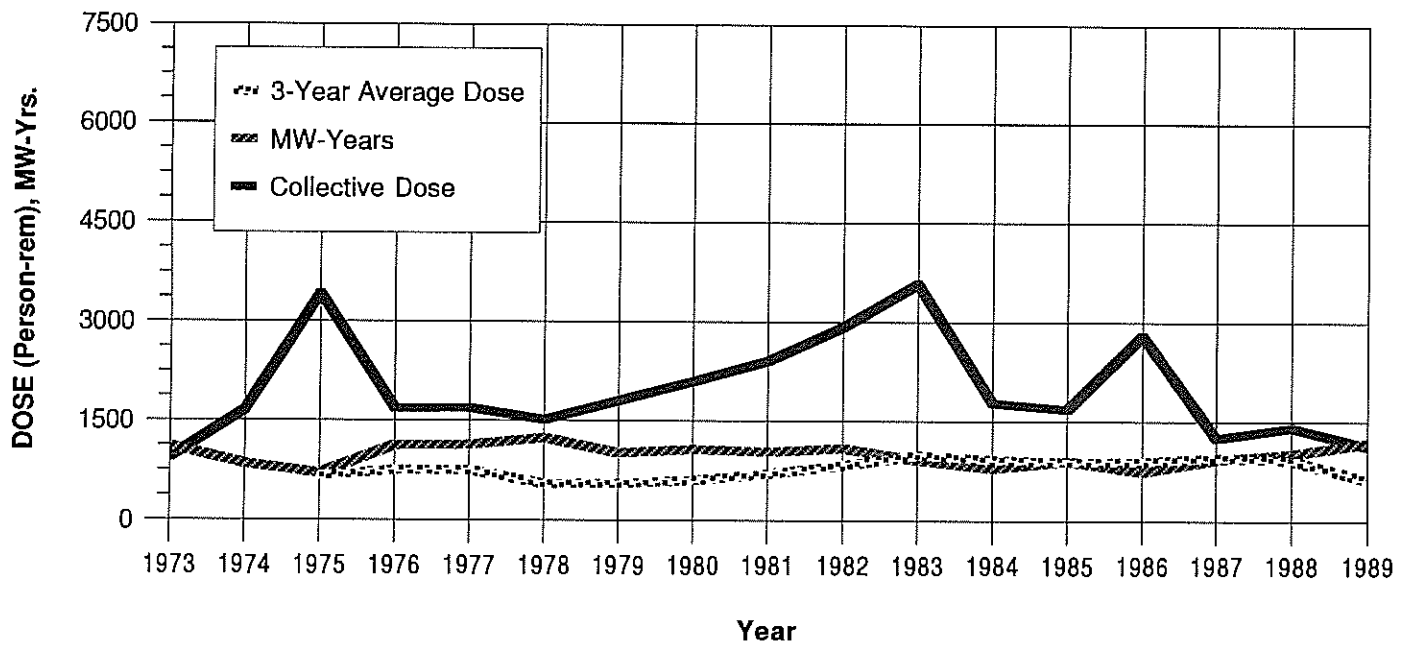
Contract

APPENDIX E (continued)

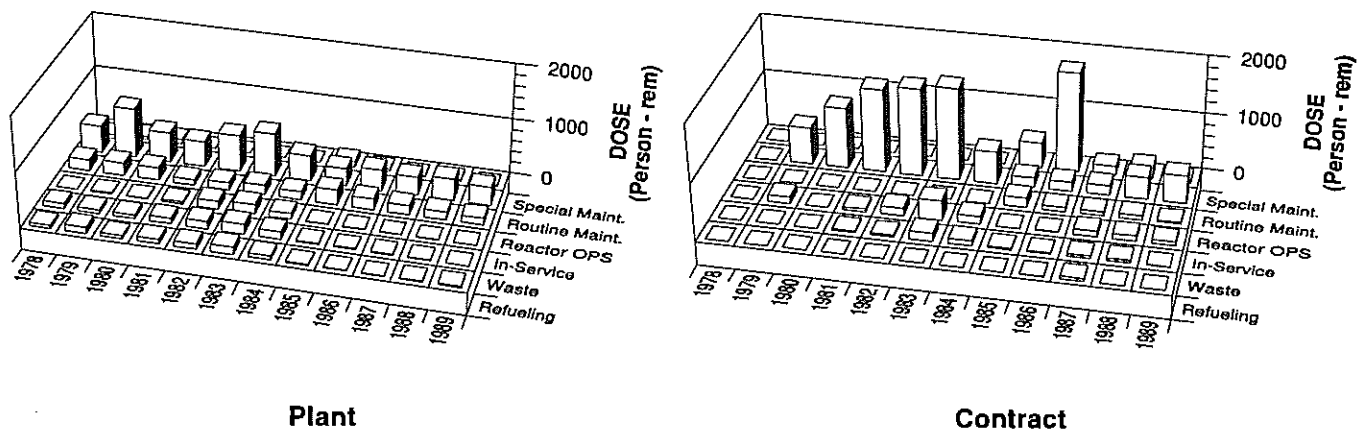
DRESDEN 2, 3

BWR

Dose-Performance Indicators



Breakdown By Job Function

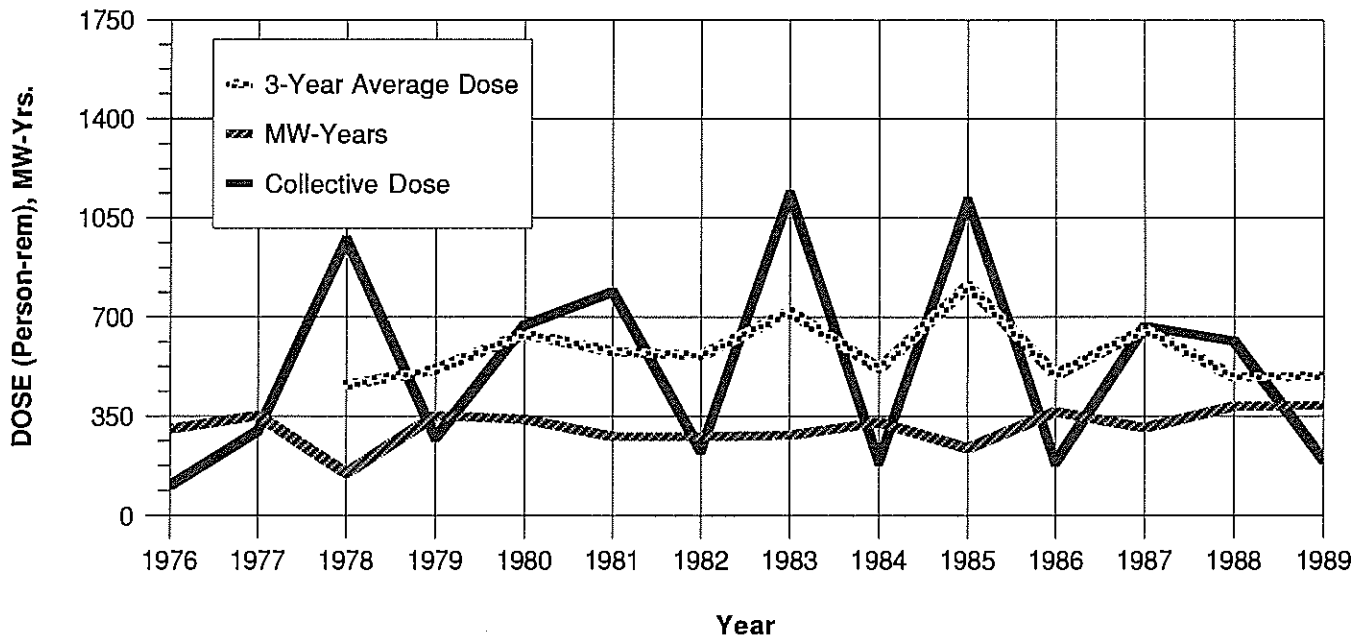


APPENDIX E (continued)

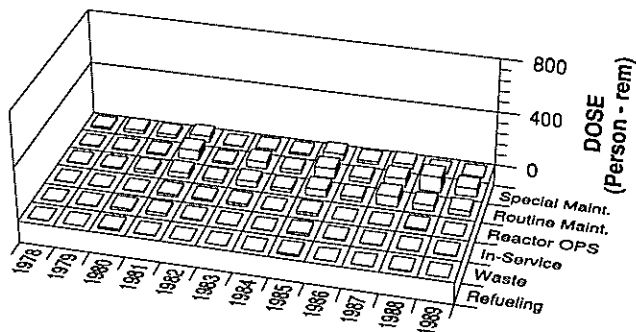
DUANE ARNOLD

BWR

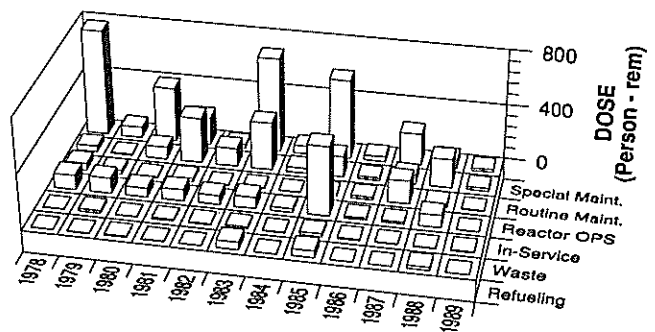
Dose-Performance Indicators



Breakdown By Job Function



Plant



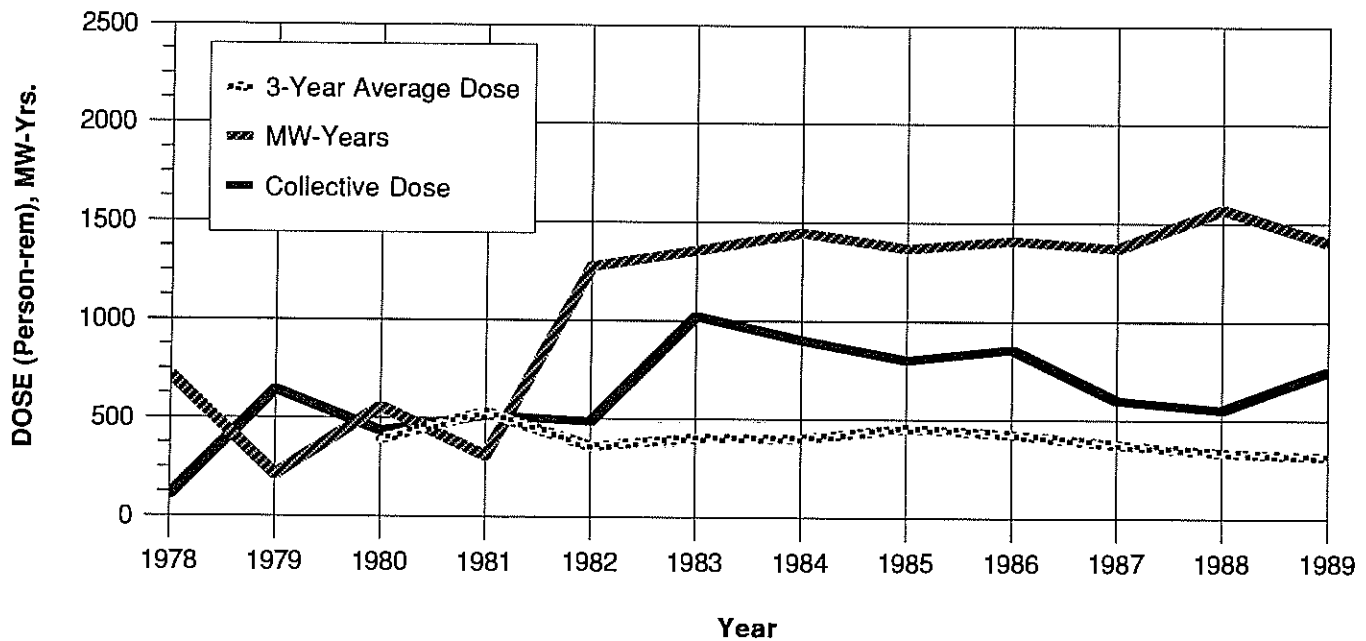
Contract

APPENDIX E (continued)

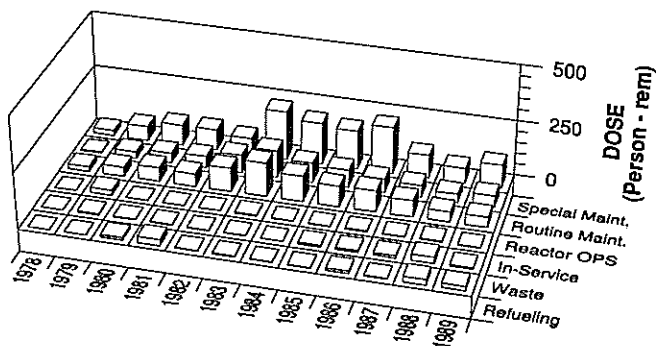
FARLEY 1, 2

PWR

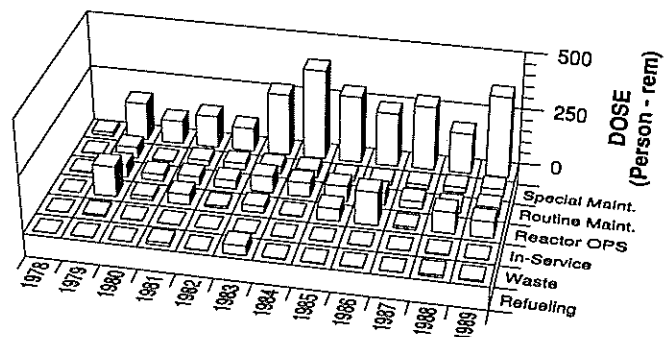
Dose-Performance Indicators



Breakdown By Job Function



Plant



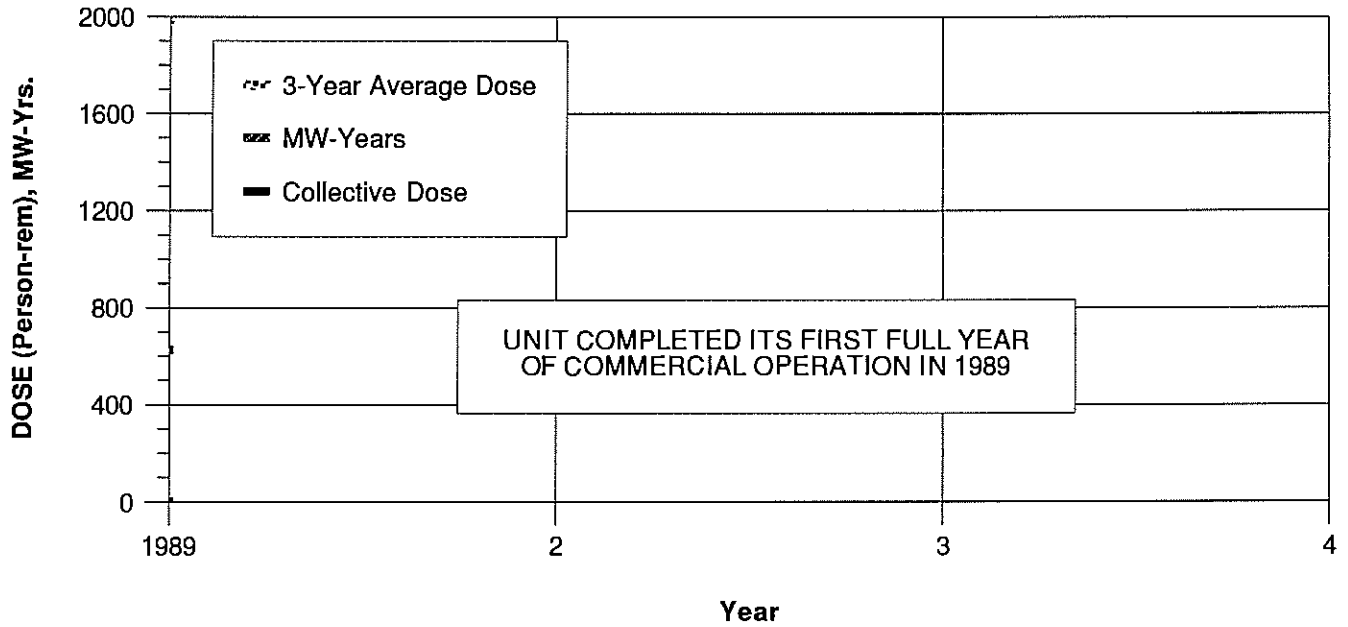
Contract

APPENDIX E (continued)

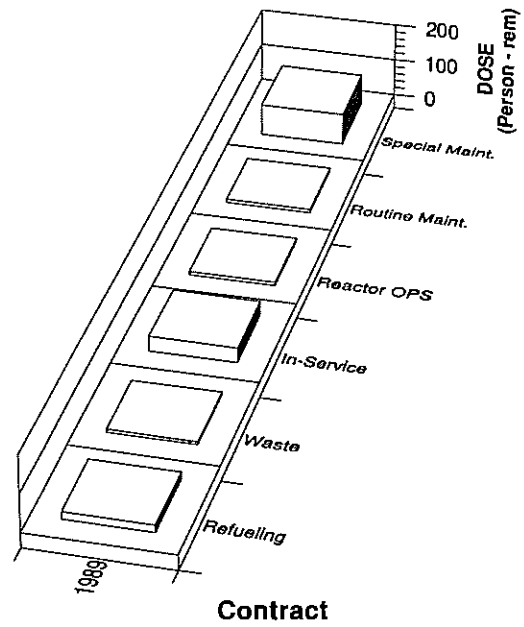
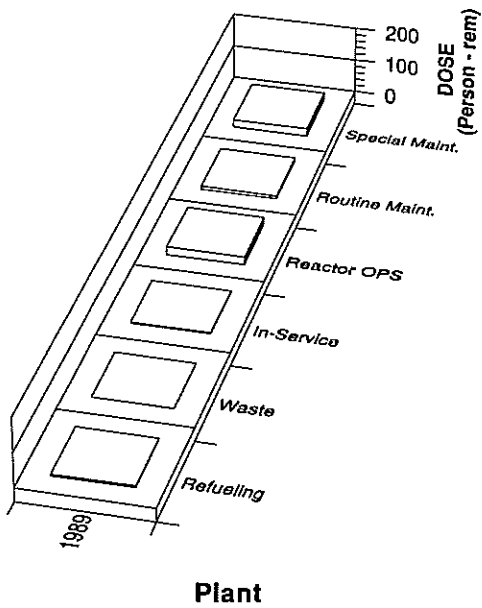
FERMI 2

BWR

Dose-Performance Indicators



Breakdown By Job Function

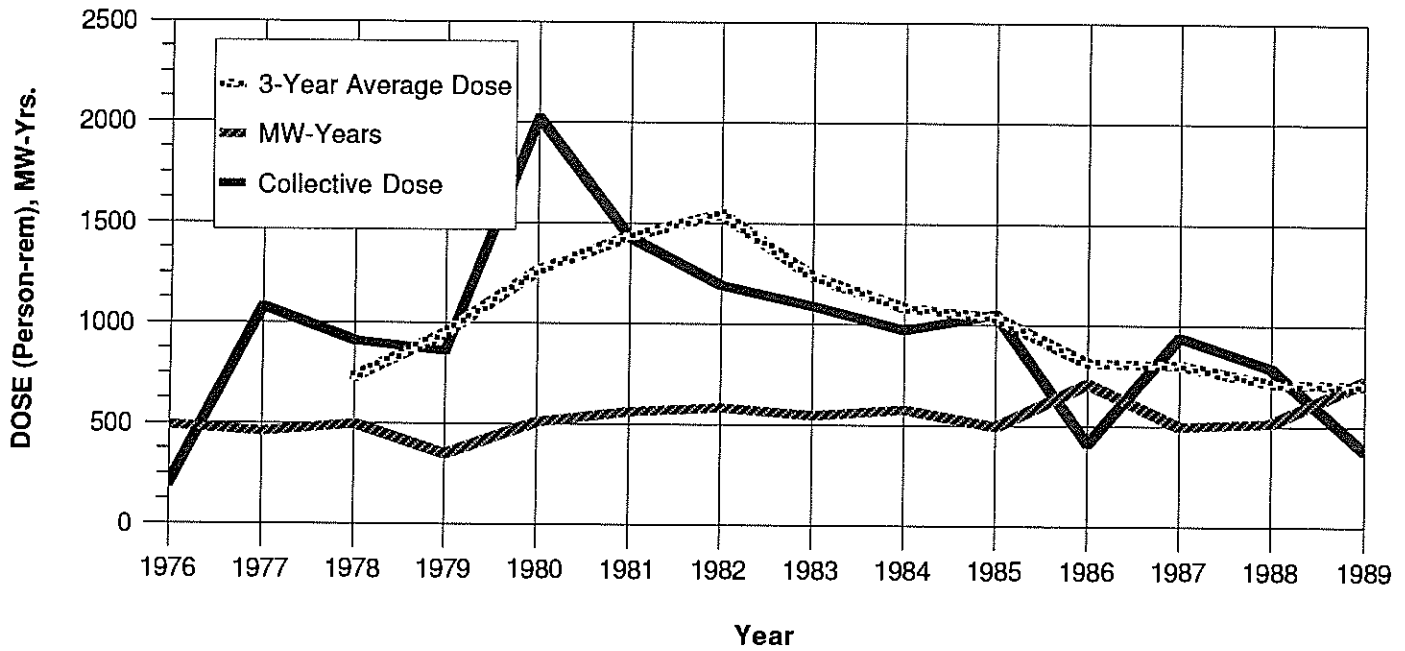


APPENDIX E (continued)

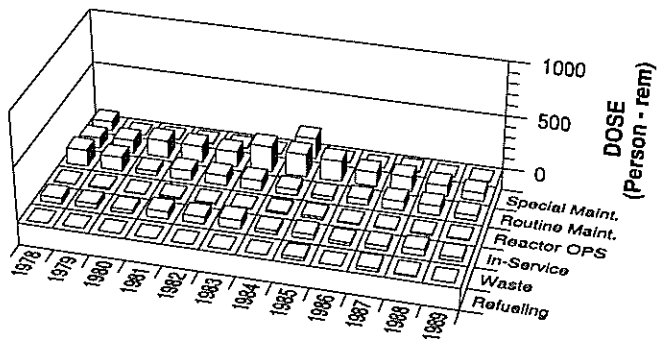
FITZPATRICK

BWR

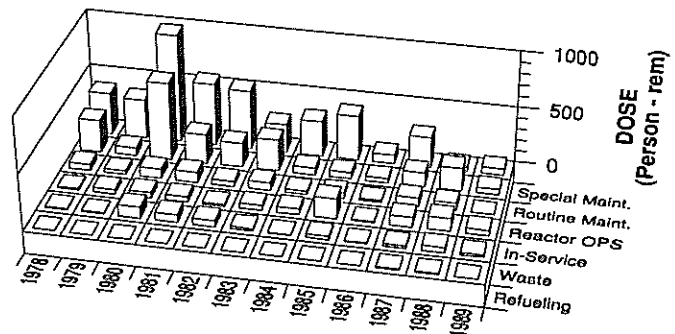
Dose-Performance Indicators



Breakdown By Job Function



Plant



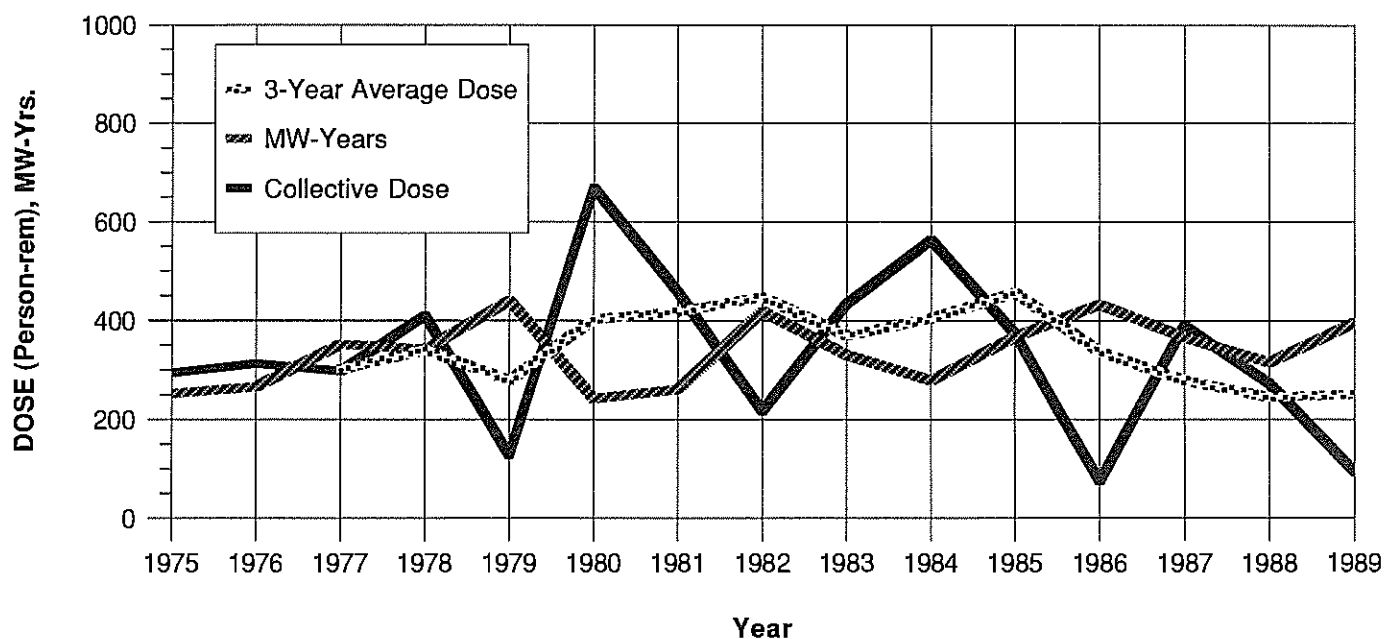
Contract

APPENDIX E (continued)

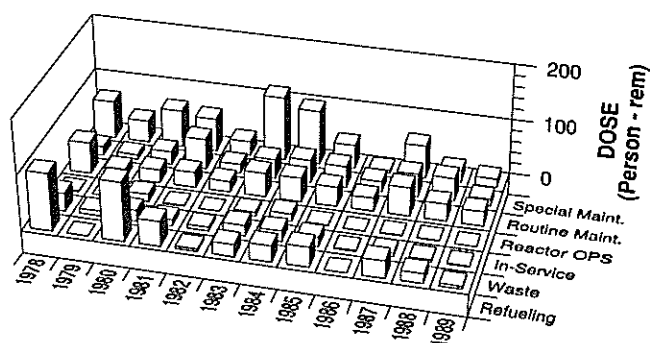
FORT CALHOUN

PWR

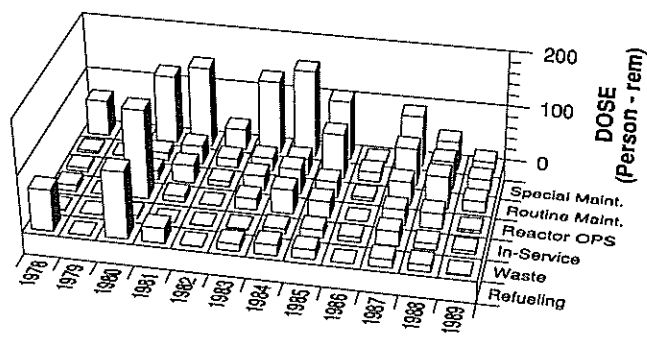
Dose-Performance Indicators



Breakdown By Job Function



Plant



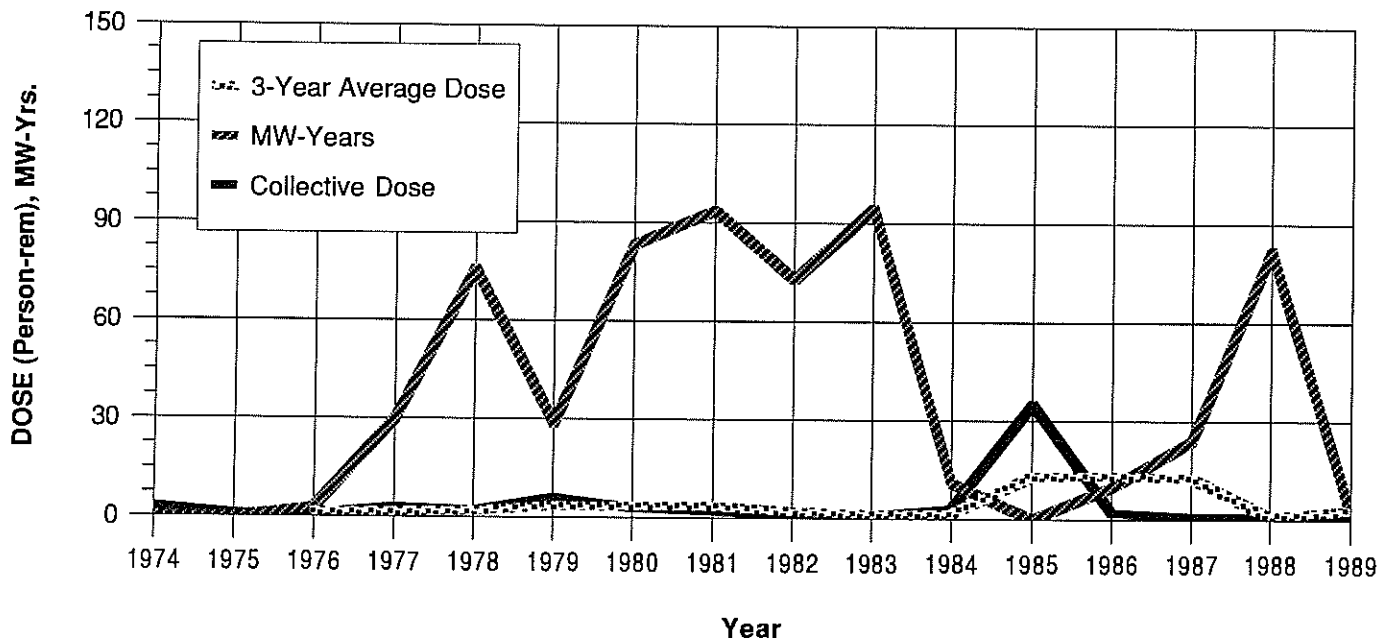
Contract

APPENDIX E (continued)

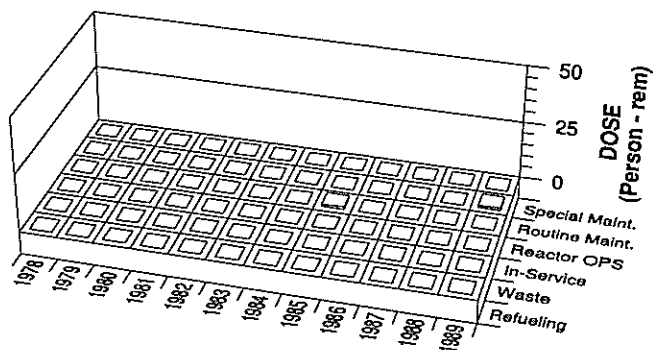
FORT ST. VRAIN

HTGR

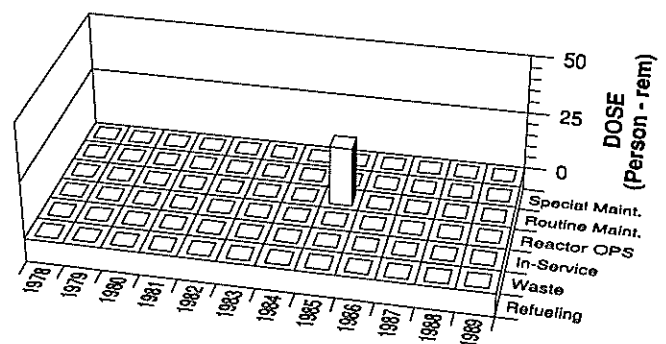
Dose-Performance Indicators



Breakdown By Job Function



Plant



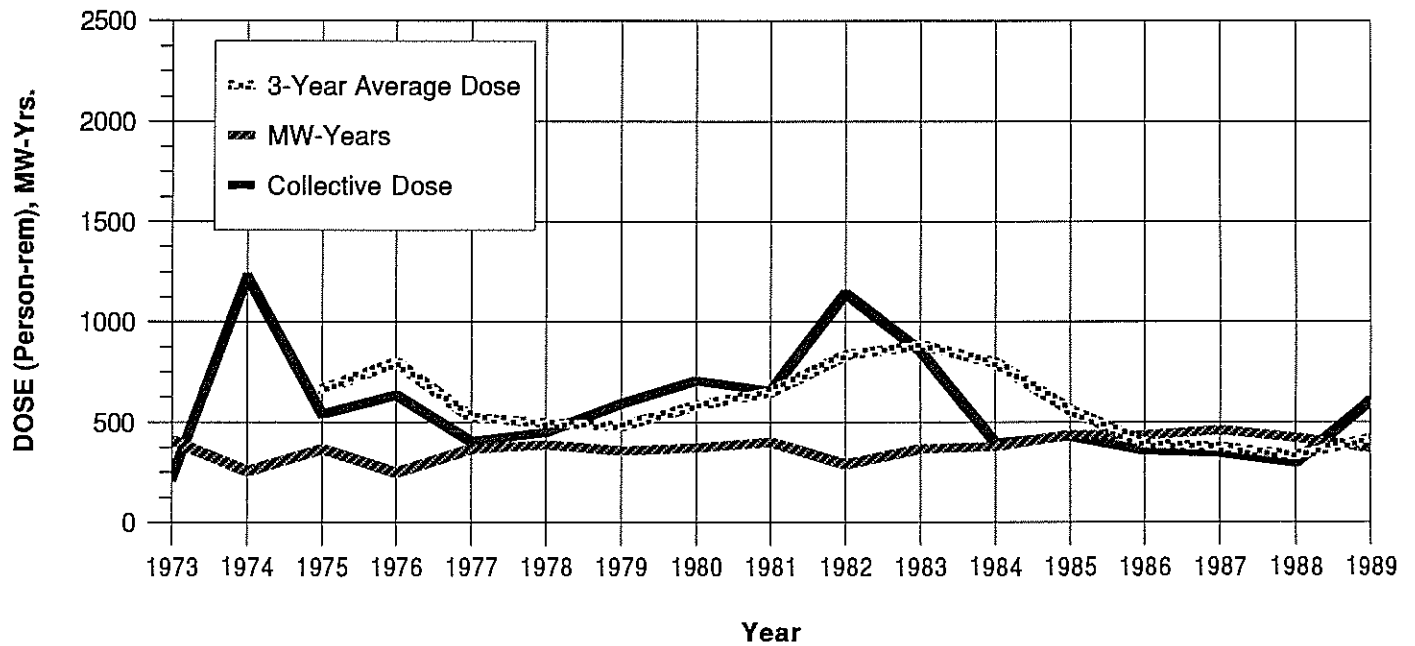
Contract

APPENDIX E (continued)

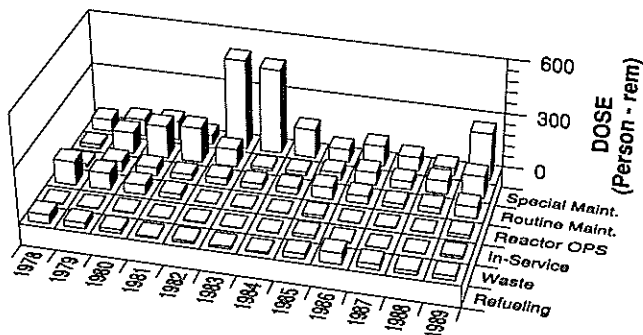
GINNA

PWR

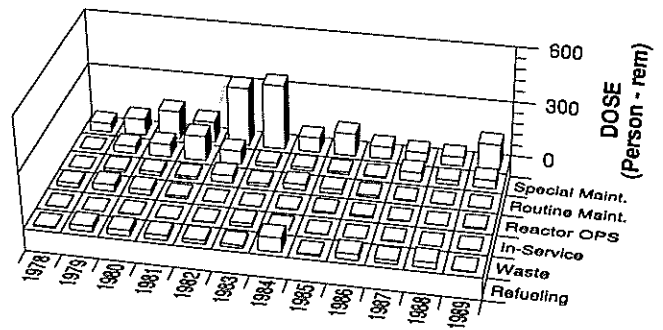
Dose-Performance Indicators



Breakdown By Job Function



Plant



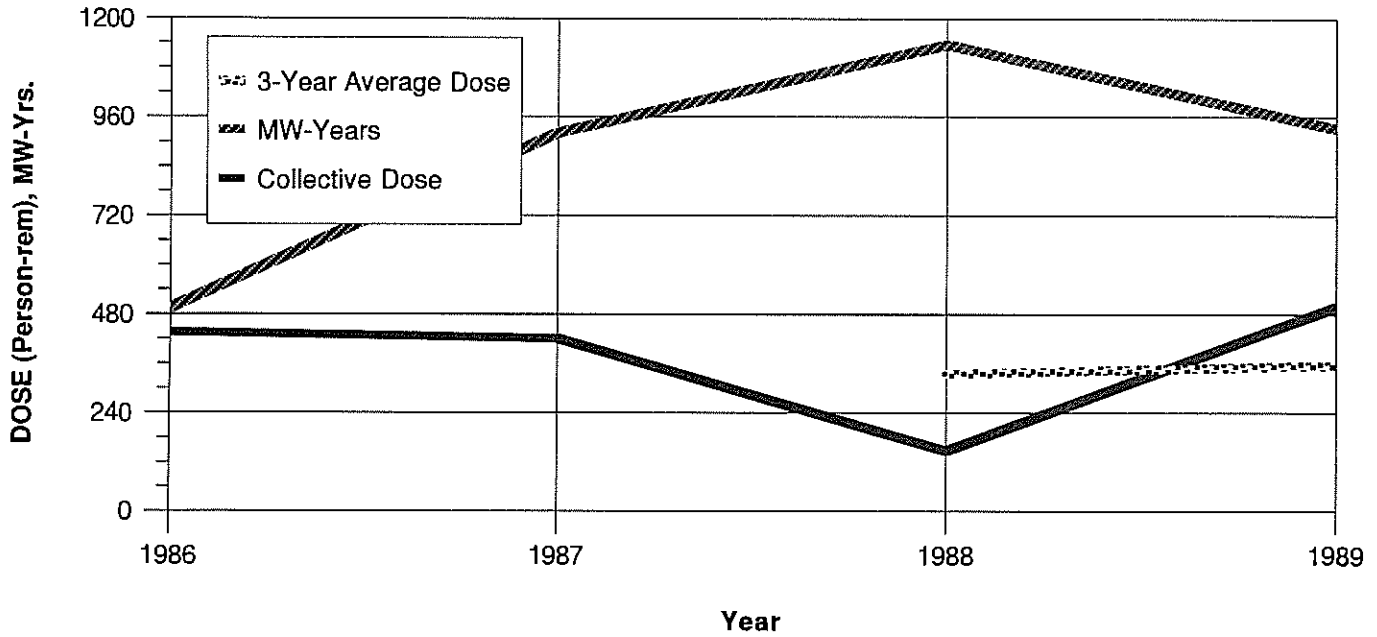
Contract

APPENDIX E (continued)

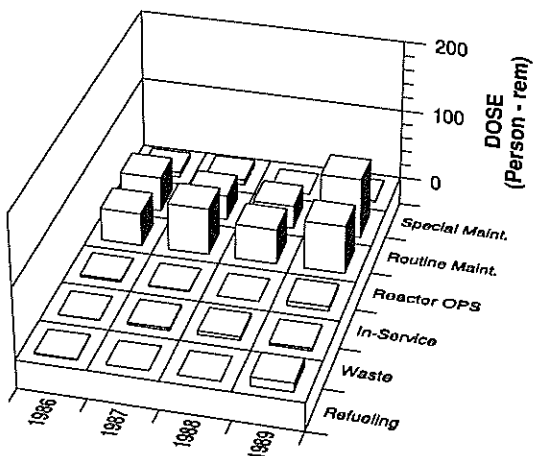
GRAND GULF

BWR

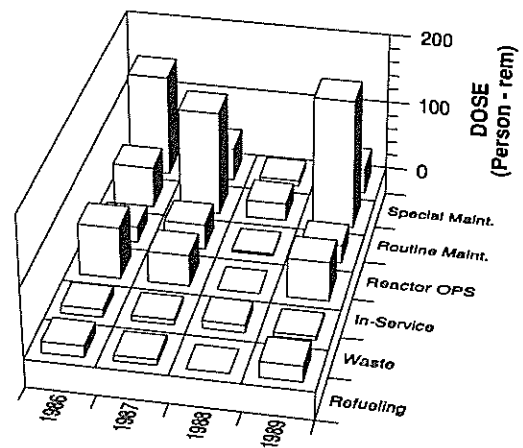
Dose-Performance Indicators



Breakdown By Job Function



Plant



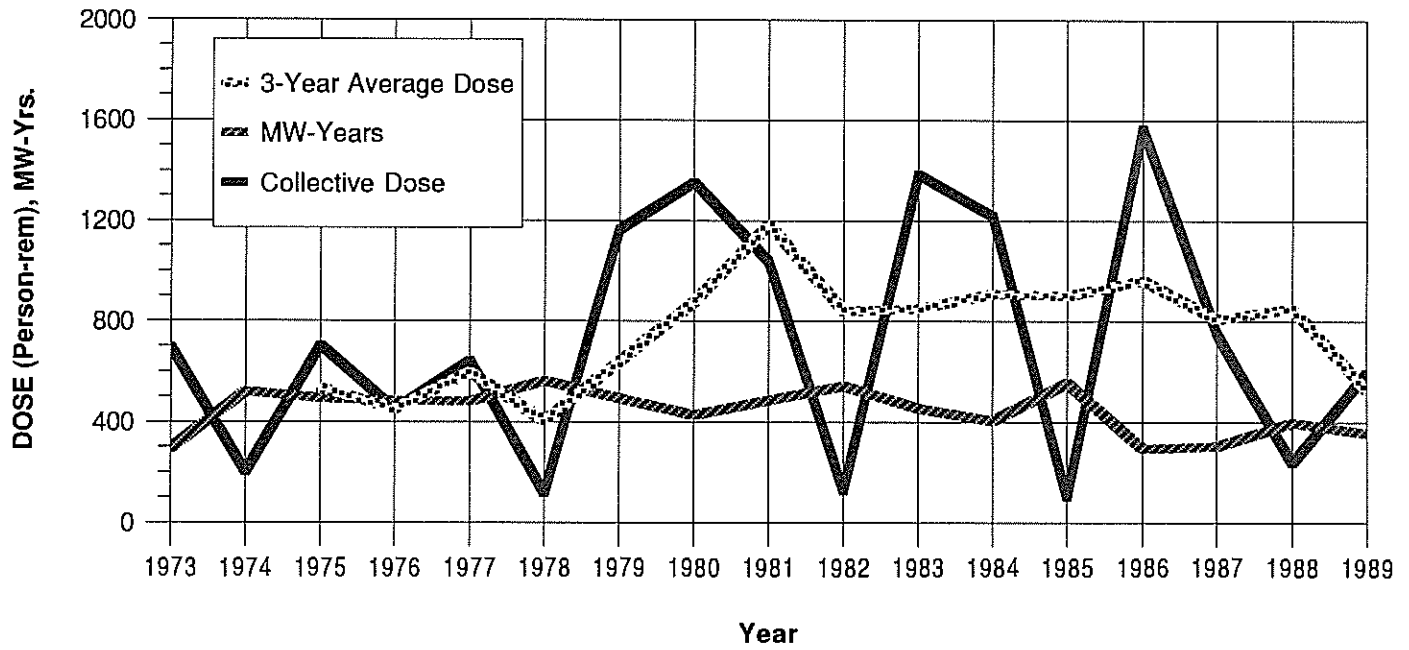
Contract

APPENDIX E (continued)

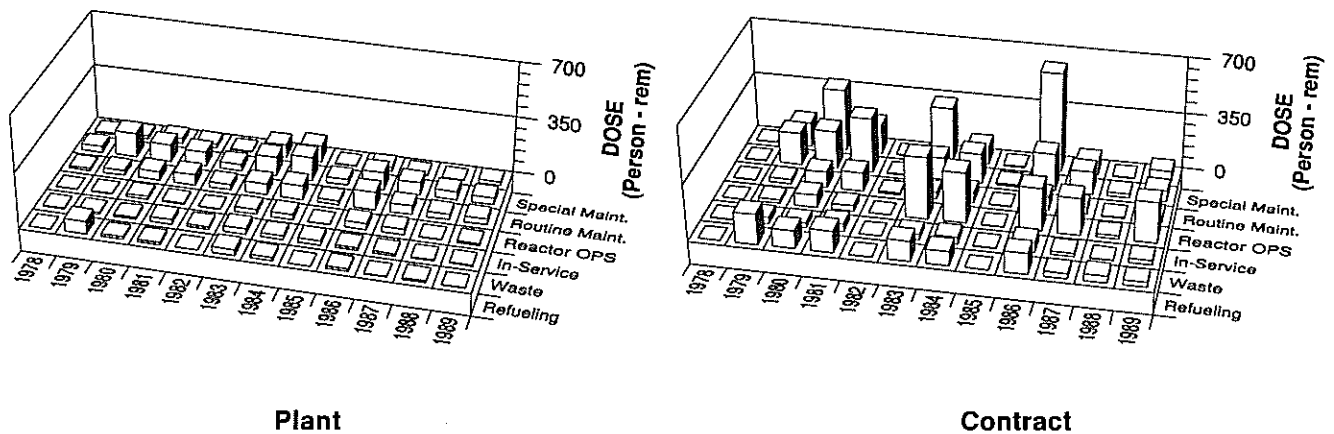
HADDAM NECK

PWR

Dose-Performance Indicators



Breakdown By Job Function

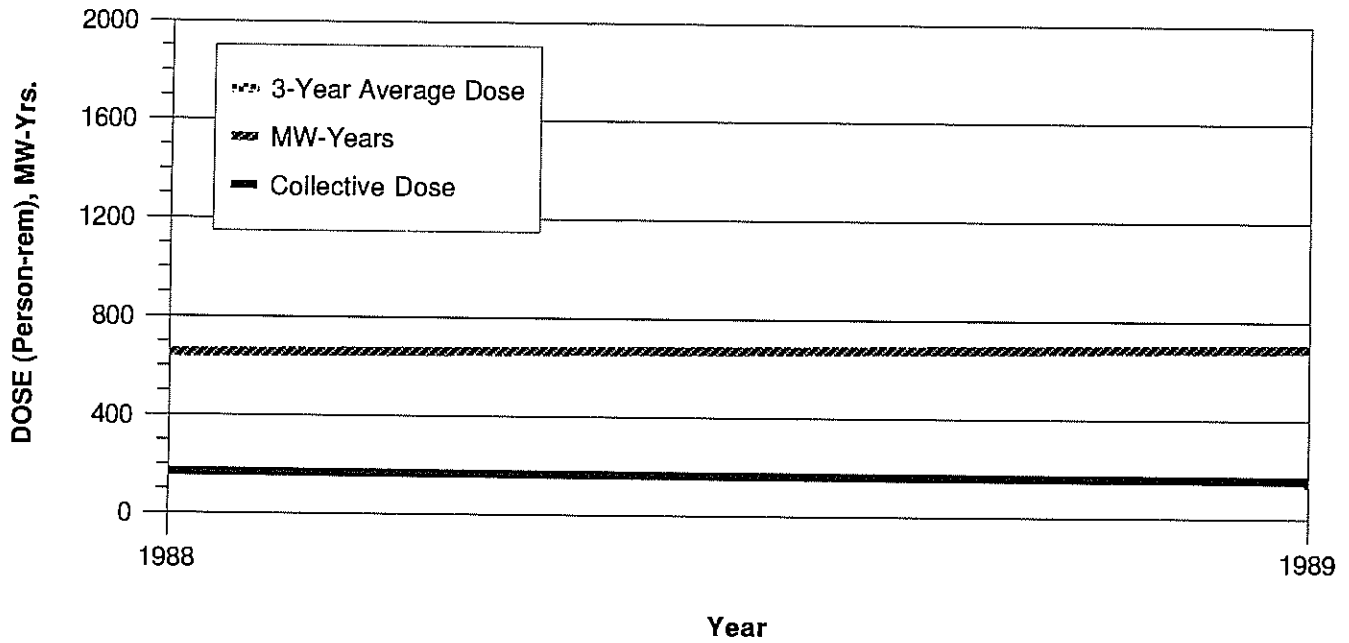


APPENDIX E (continued)

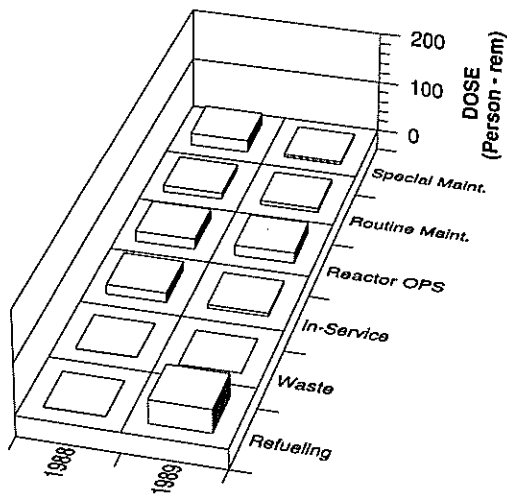
HARRIS

PWR

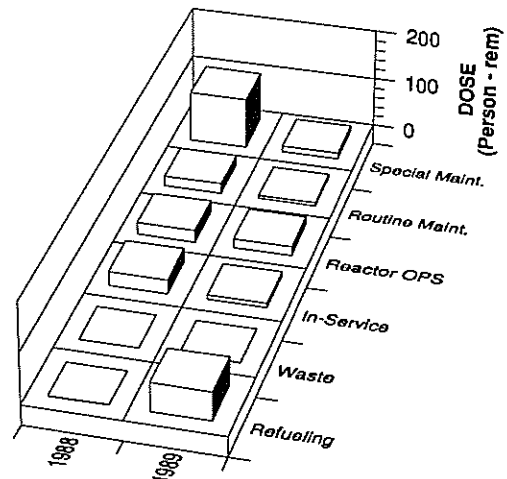
Dose-Performance Indicators



Breakdown By Job Function



Plant



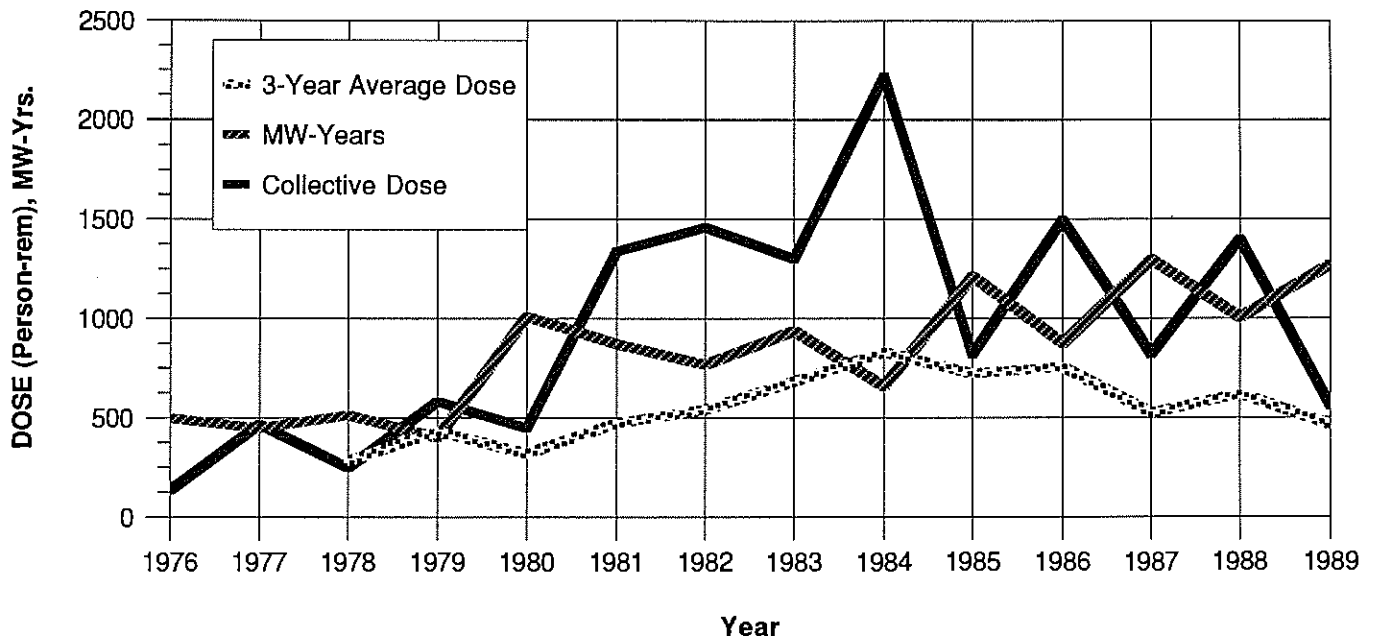
Contract

APPENDIX E (continued)

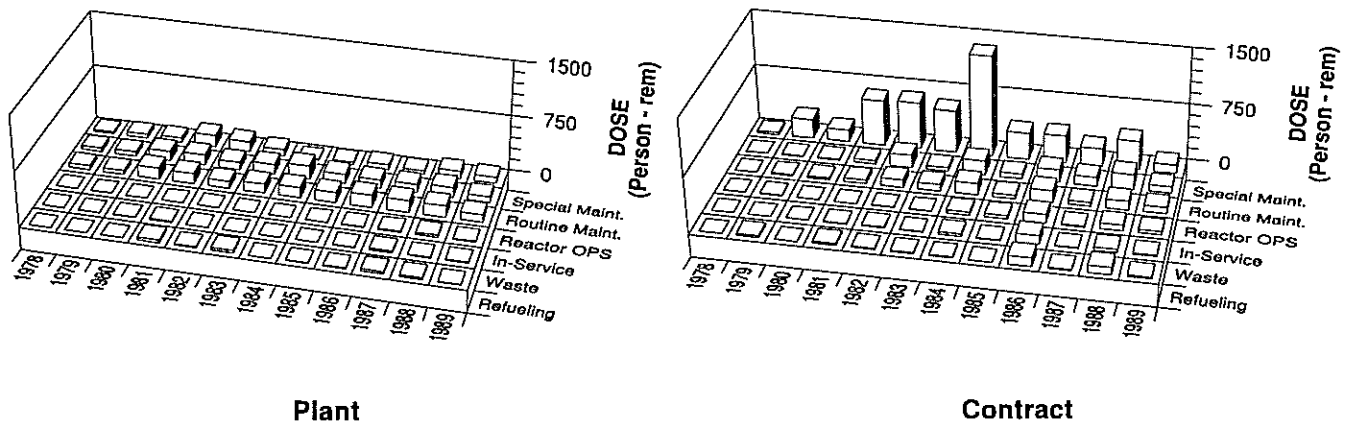
HATCH 1, 2

BWR

Dose-Performance Indicators



Breakdown By Job Function

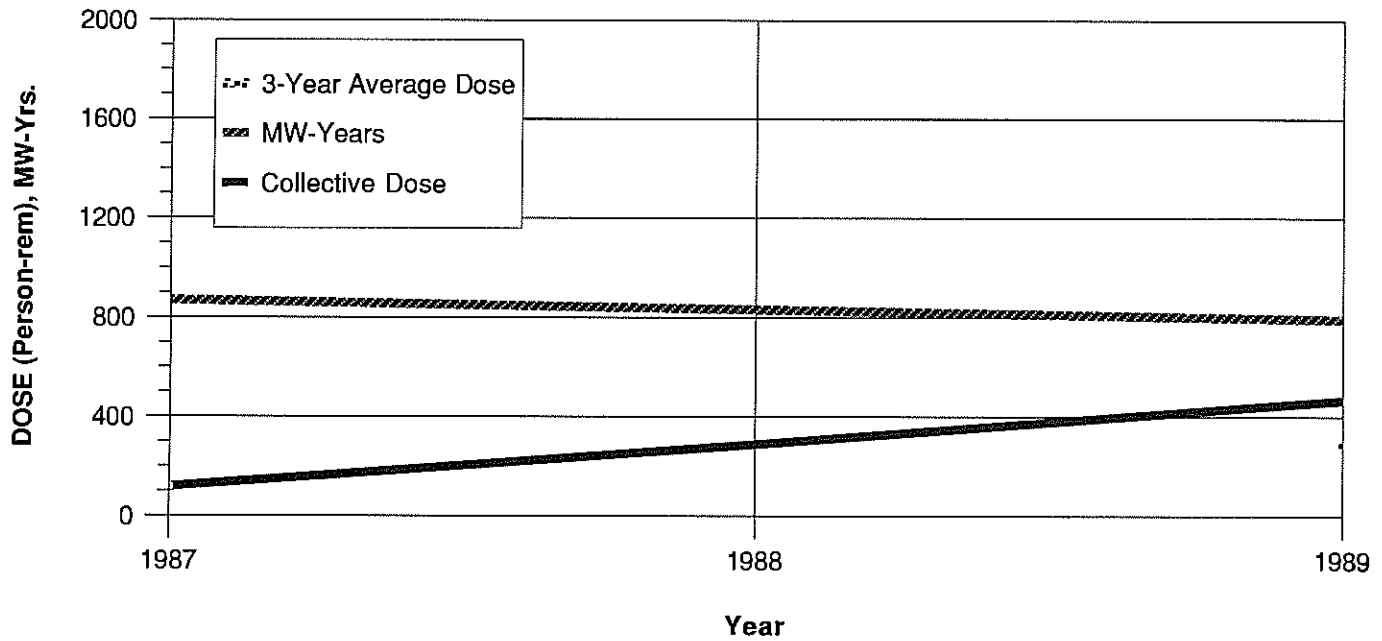


APPENDIX E (continued)

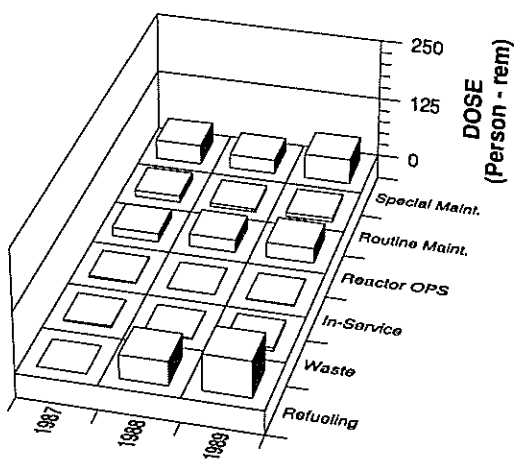
HOPE CREEK 1

BWR

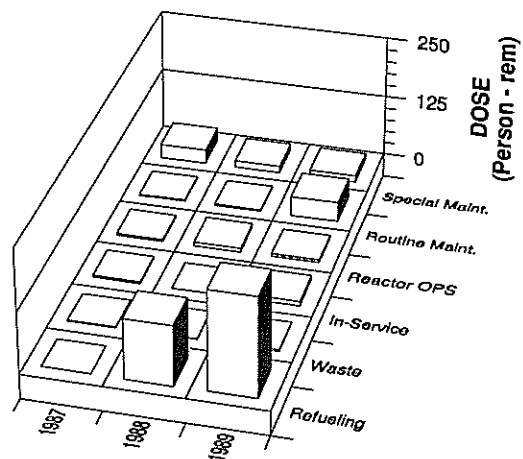
Dose-Performance Indicators



Breakdown By Job Function



Plant



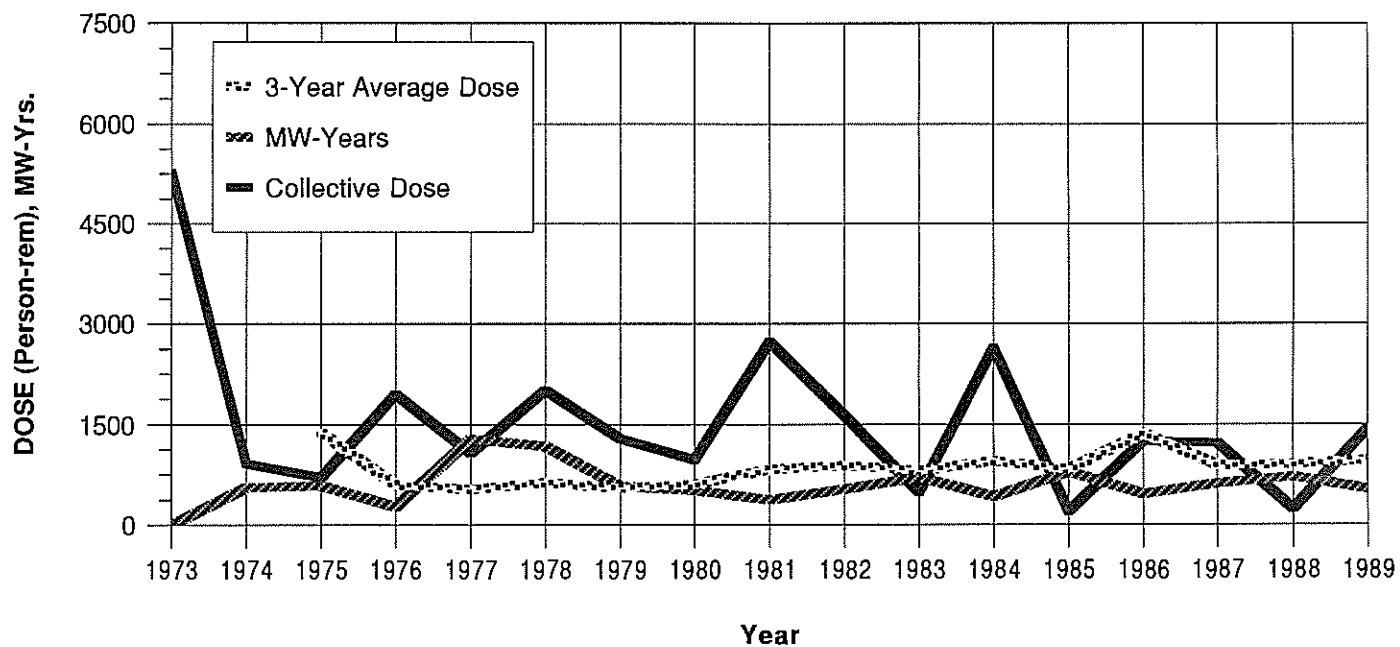
Contract

APPENDIX E (continued)

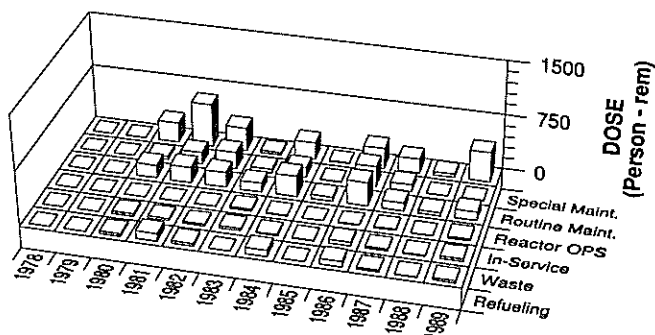
INDIAN POINT 2

PWR

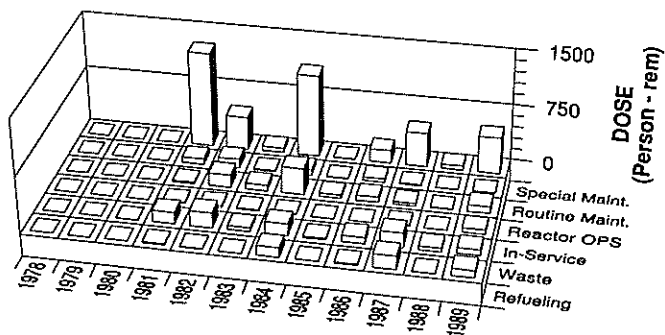
Dose-Performance Indicators



Breakdown By Job Function



Plant



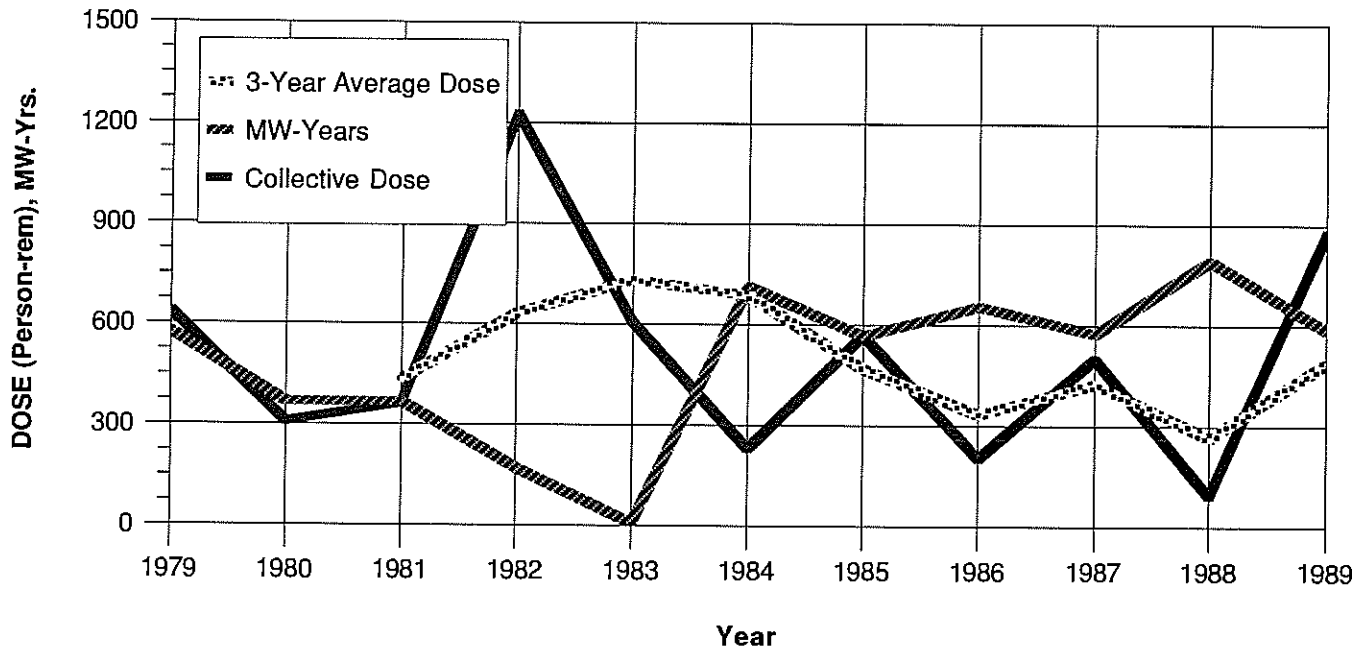
Contract

APPENDIX E (continued)

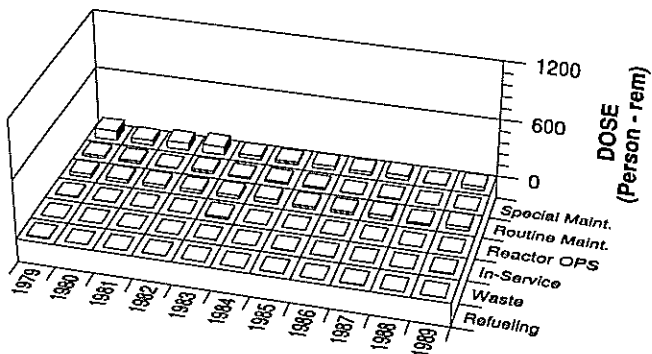
INDIAN POINT 3

PWR

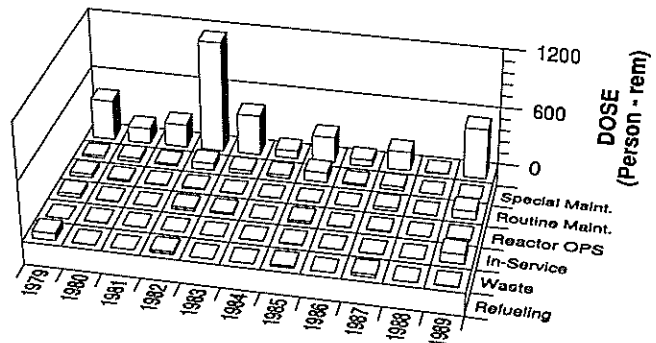
Dose-Performance Indicators



Breakdown By Job Function



Plant



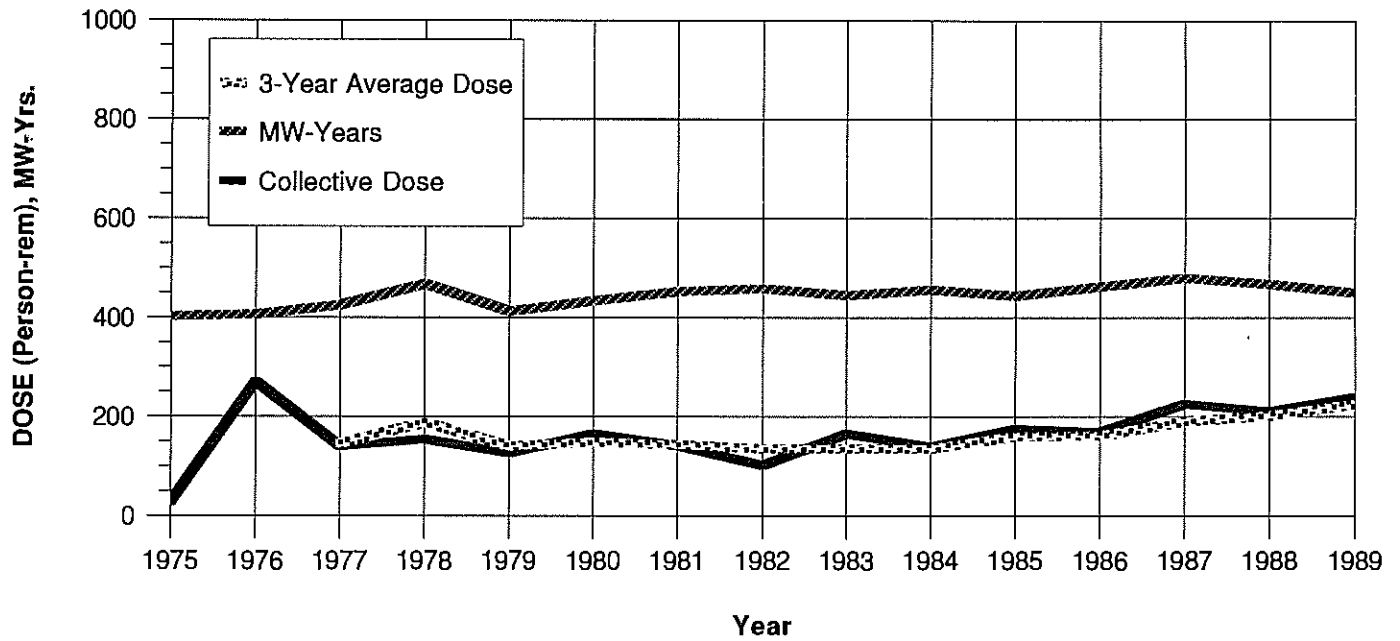
Contract

APPENDIX E (continued)

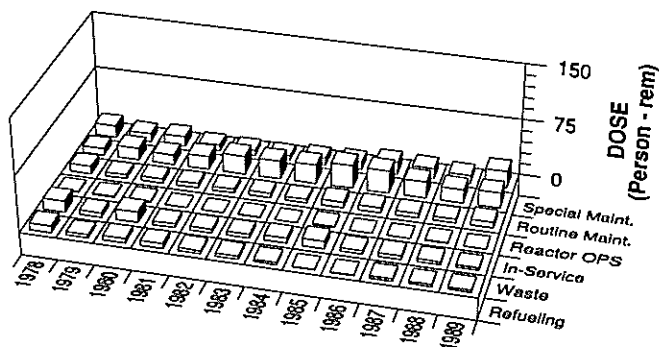
KEWAUNEE

PWR

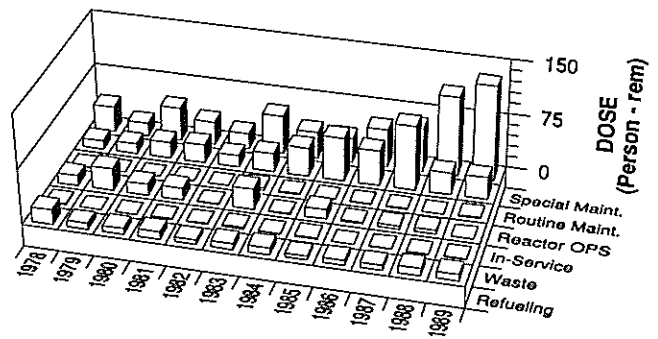
Dose-Performance Indicators



Breakdown By Job Function



Plant



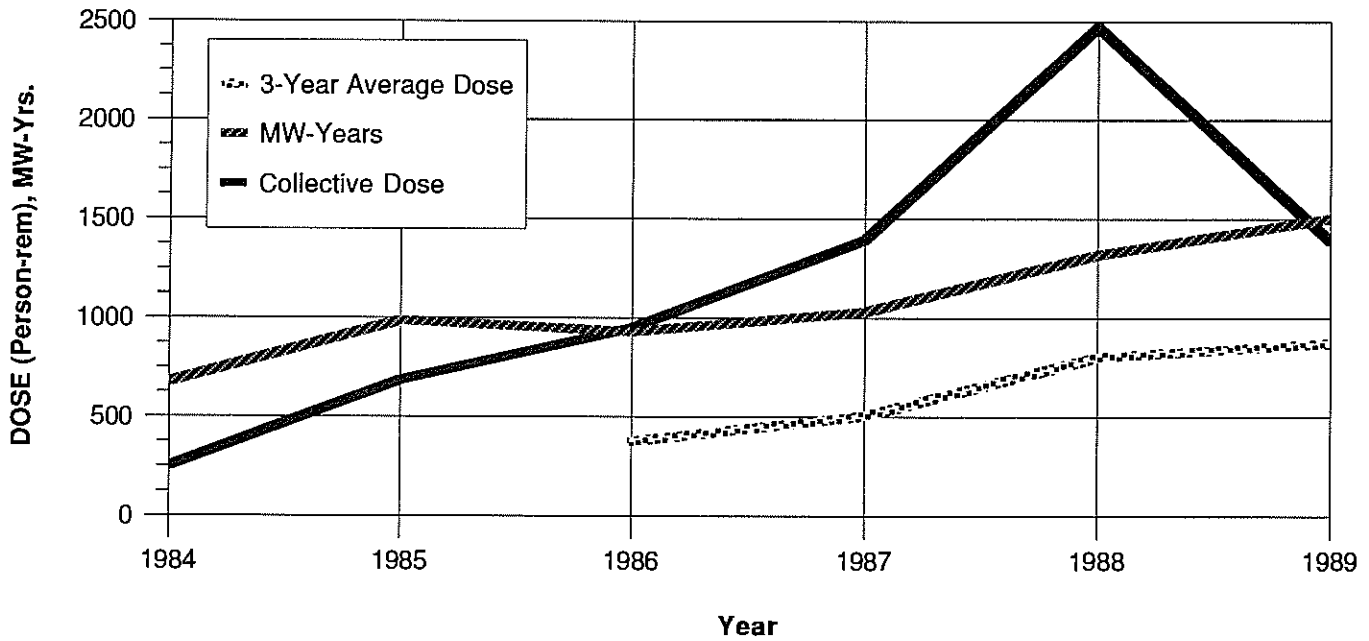
Contract

APPENDIX E (continued)

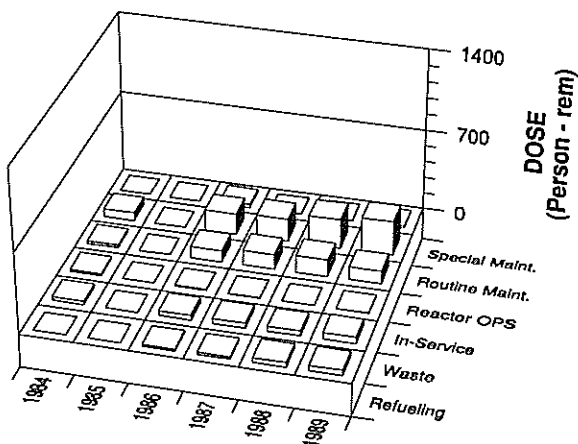
LASALLE 1, 2

BWR

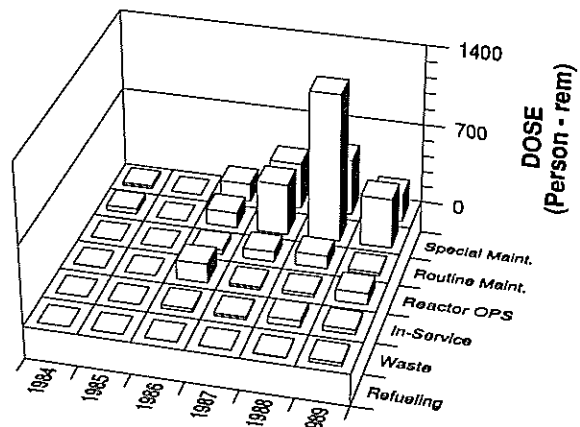
Dose-Performance Indicators



Breakdown By Job Function



Plant



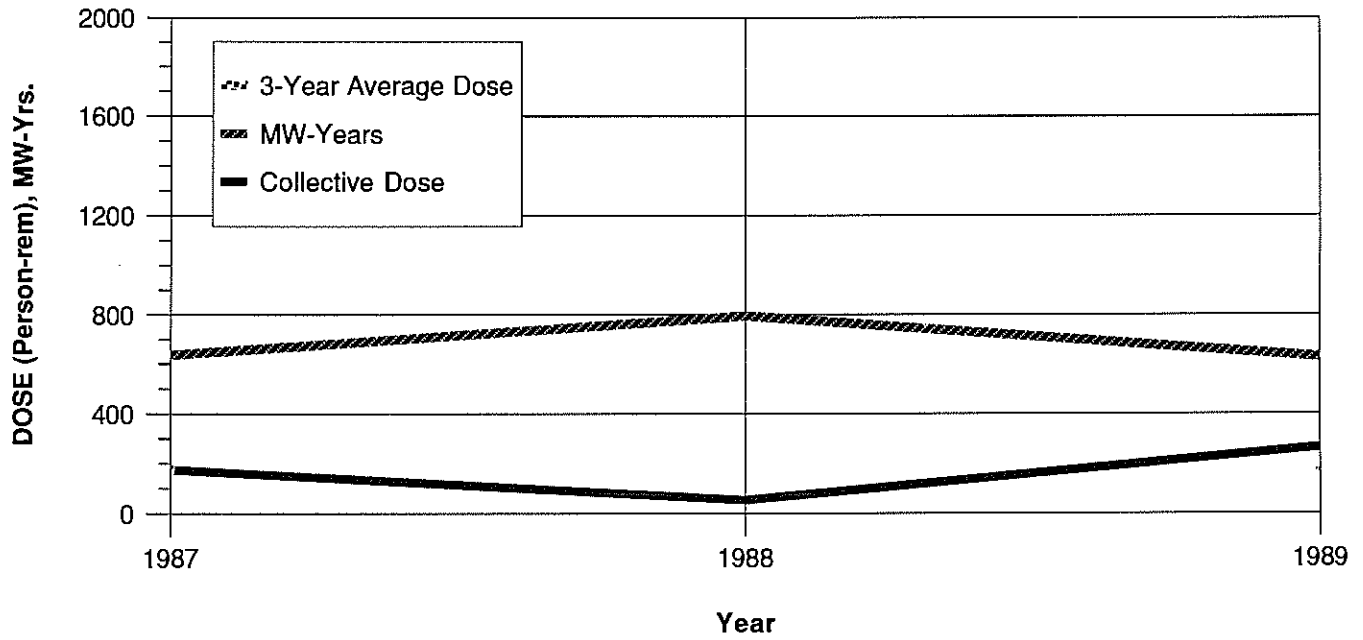
Contract

APPENDIX E (continued)

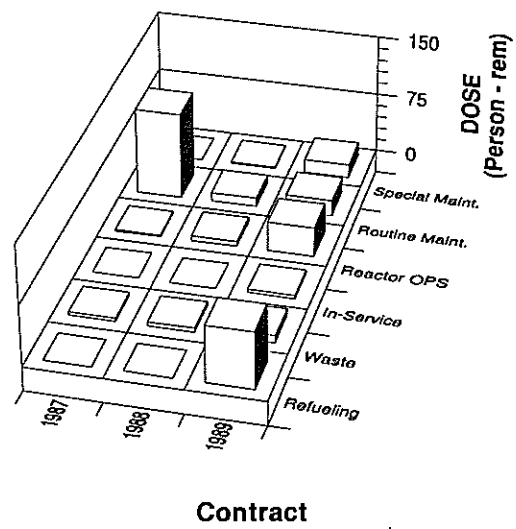
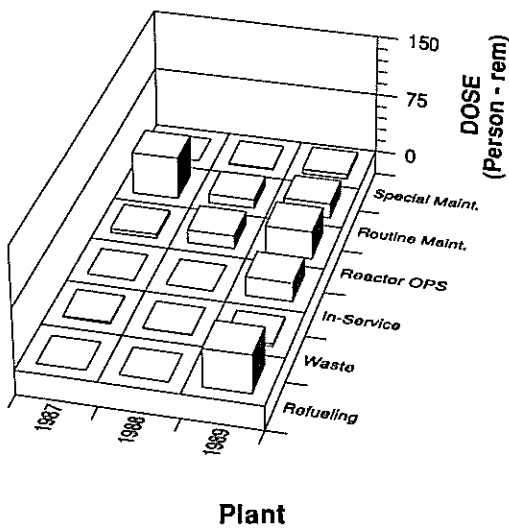
LIMERICK 1

BWR

Dose-Performance Indicators



Breakdown By Job Function

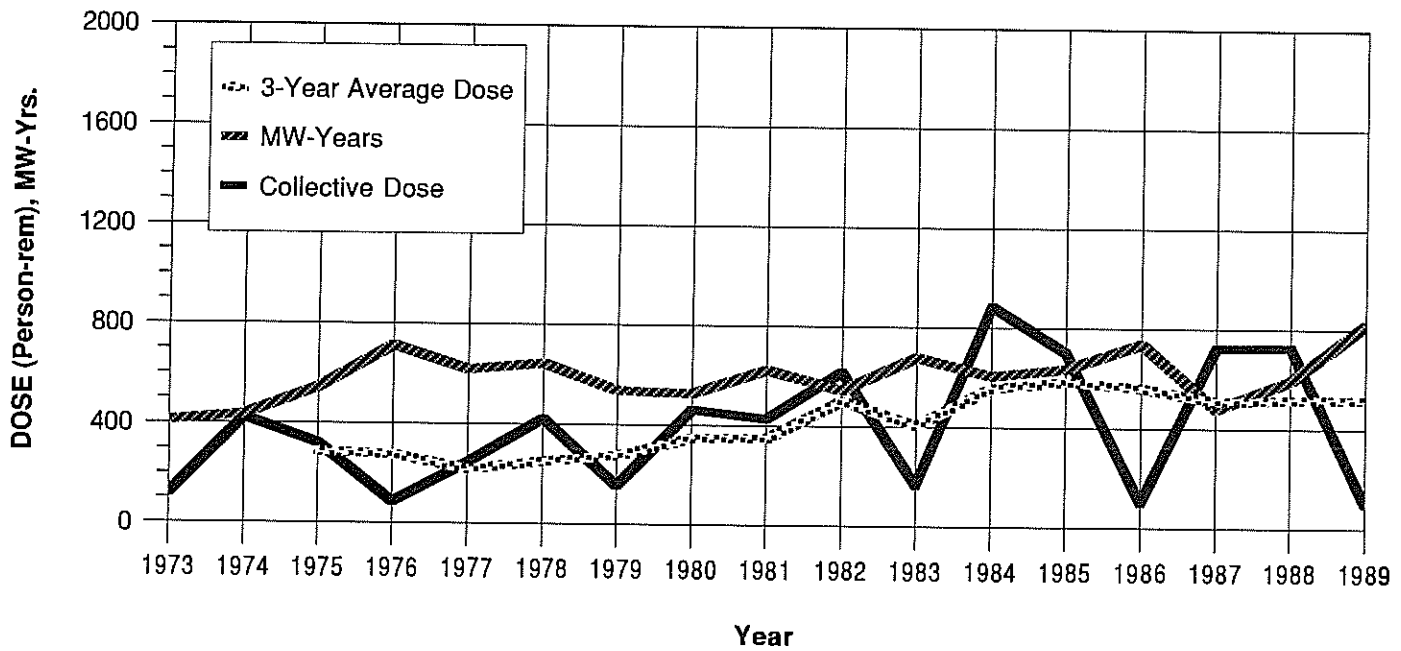


APPENDIX E (continued)

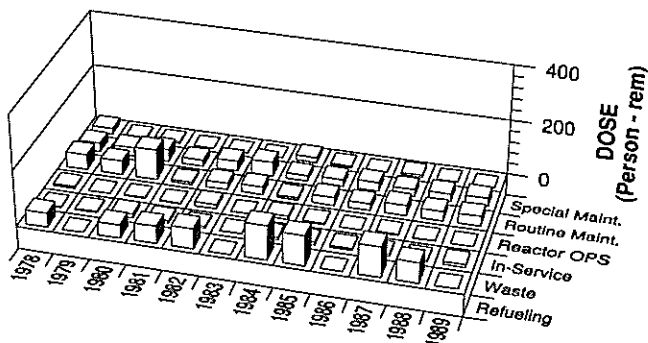
MAINE YANKEE

PWR

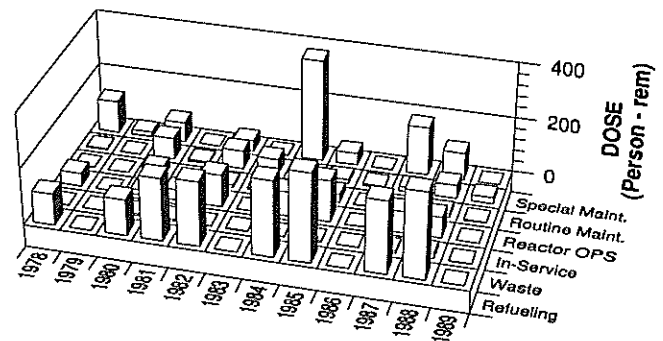
Dose-Performance Indicators



Breakdown By Job Function



Plant



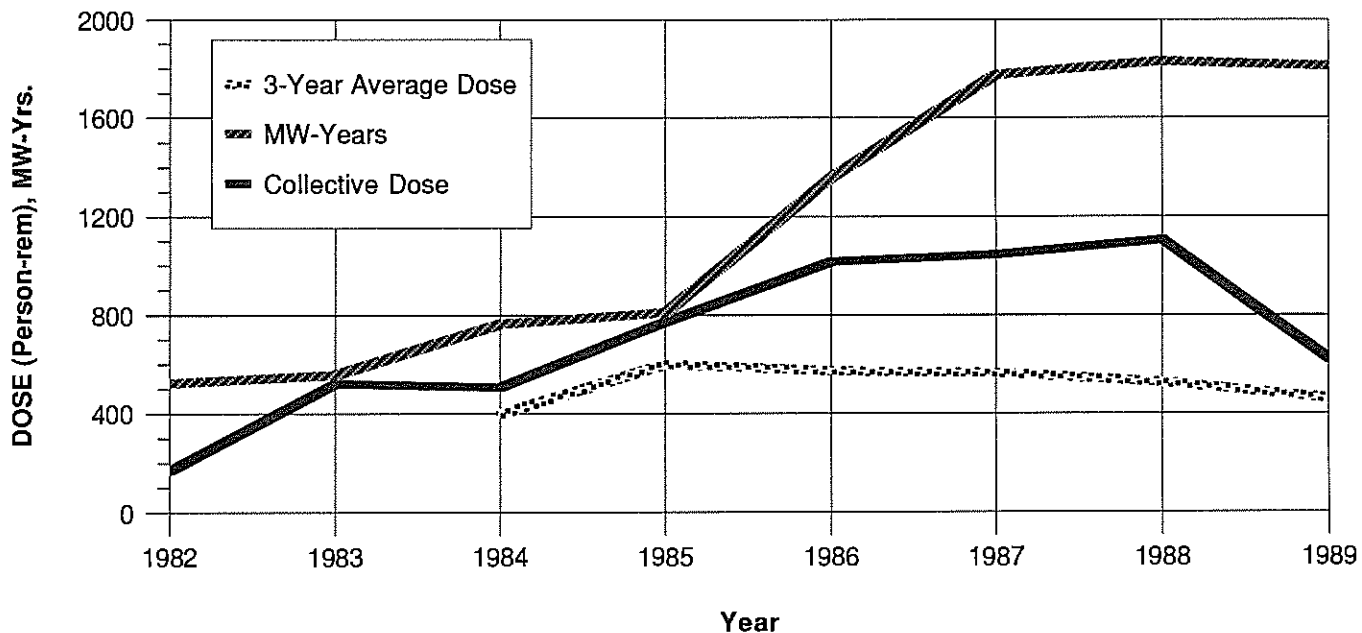
Contract

APPENDIX E (continued)

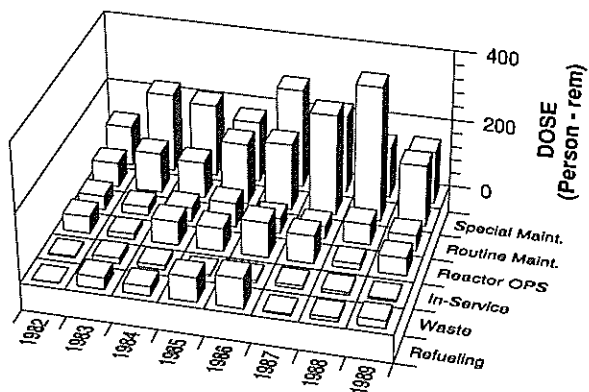
MCGUIRE 1, 2

PWR

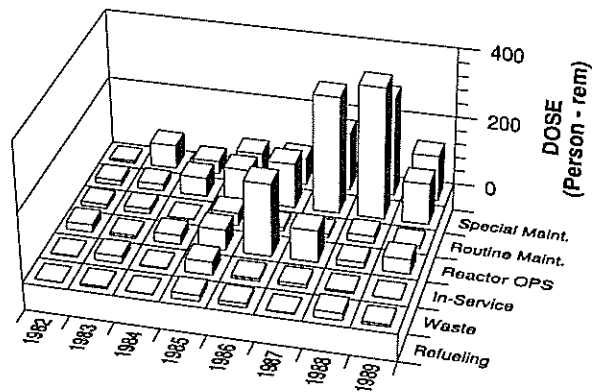
Dose-Performance Indicators



Breakdown By Job Function



Plant



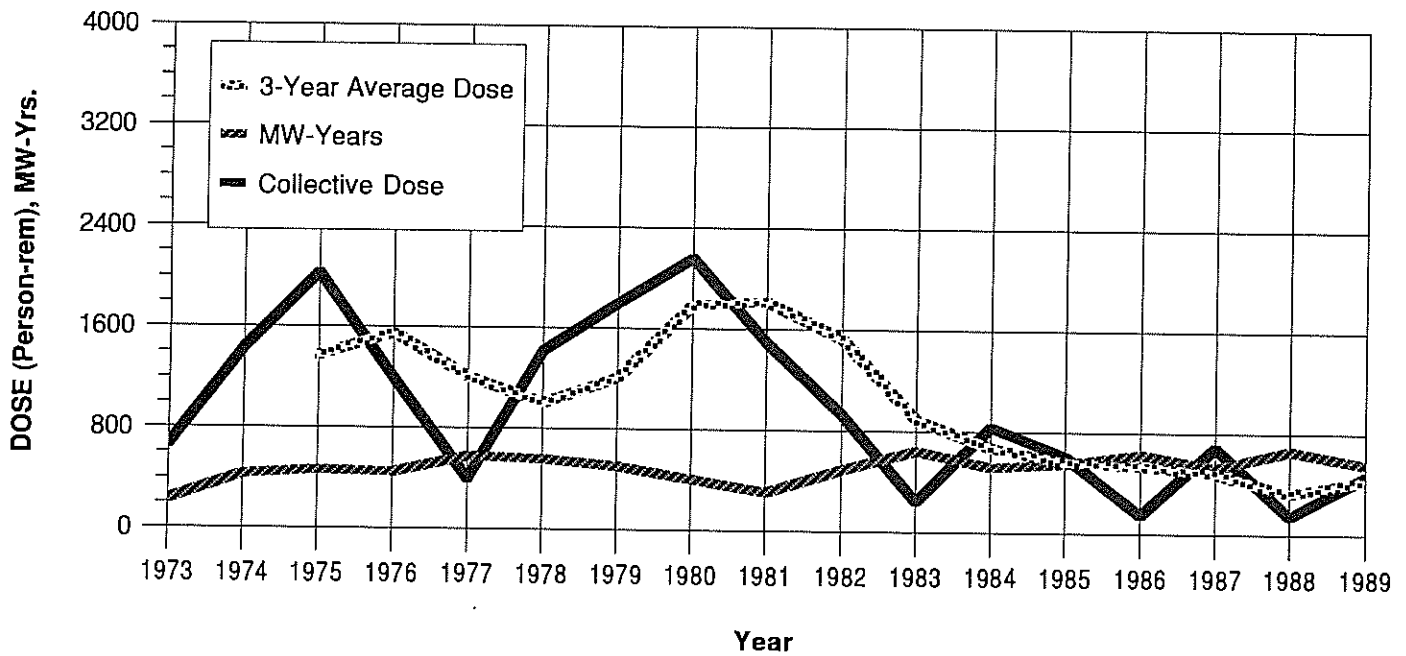
Contract

APPENDIX E (continued)

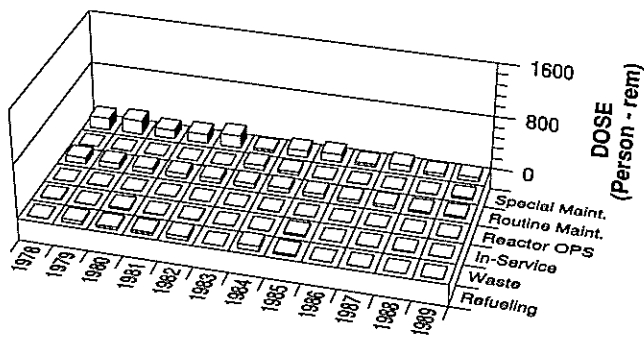
MILLSTONE POINT 1

BWR

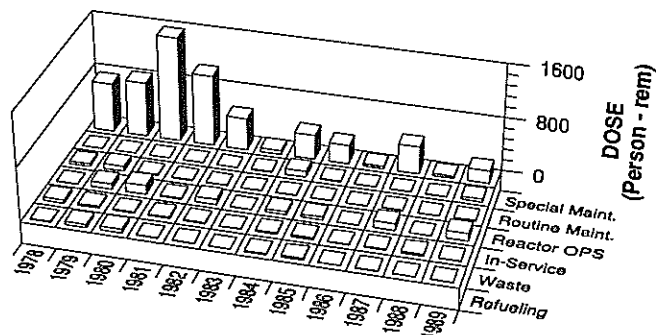
Dose-Performance Indicators



Breakdown By Job Function



Plant



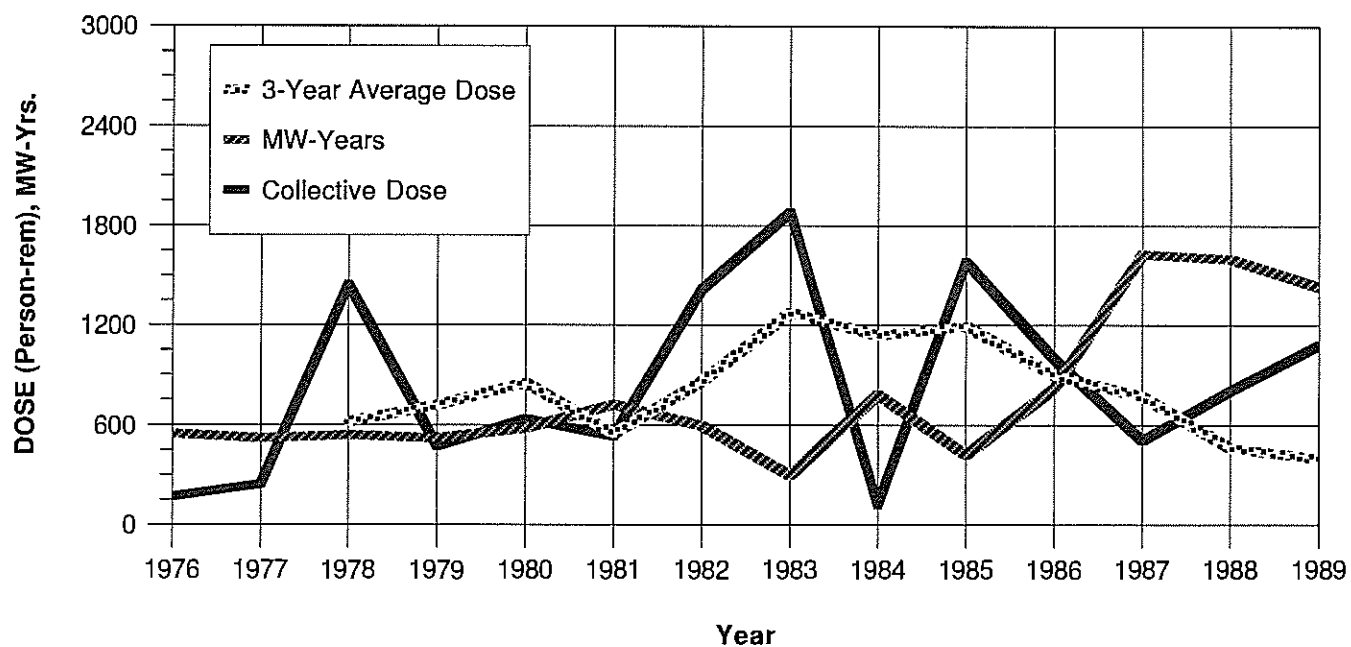
Contract

APPENDIX E (continued)

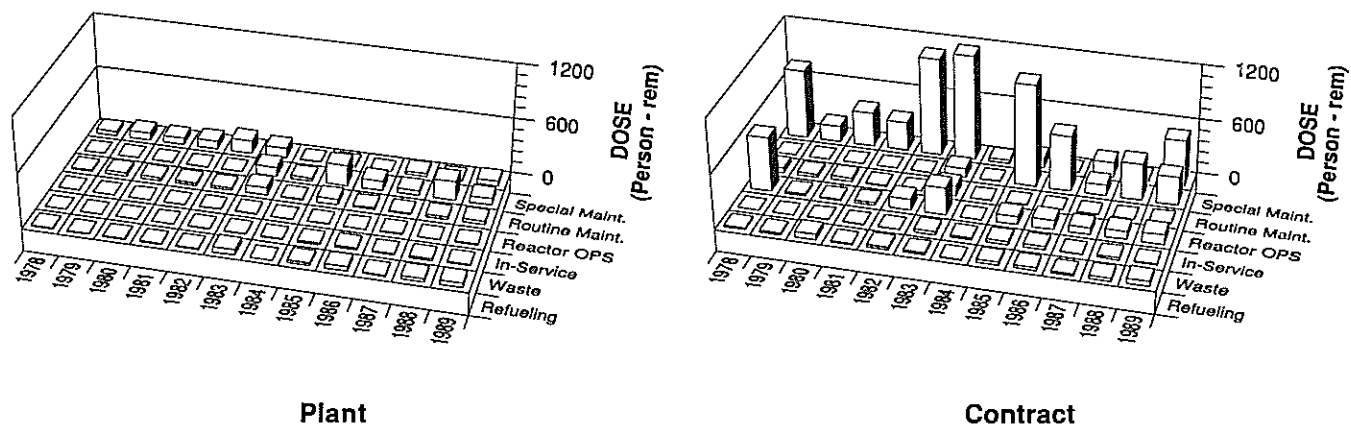
MILLSTONE POINT 2, 3

PWR

Dose-Performance Indicators



Breakdown By Job Function

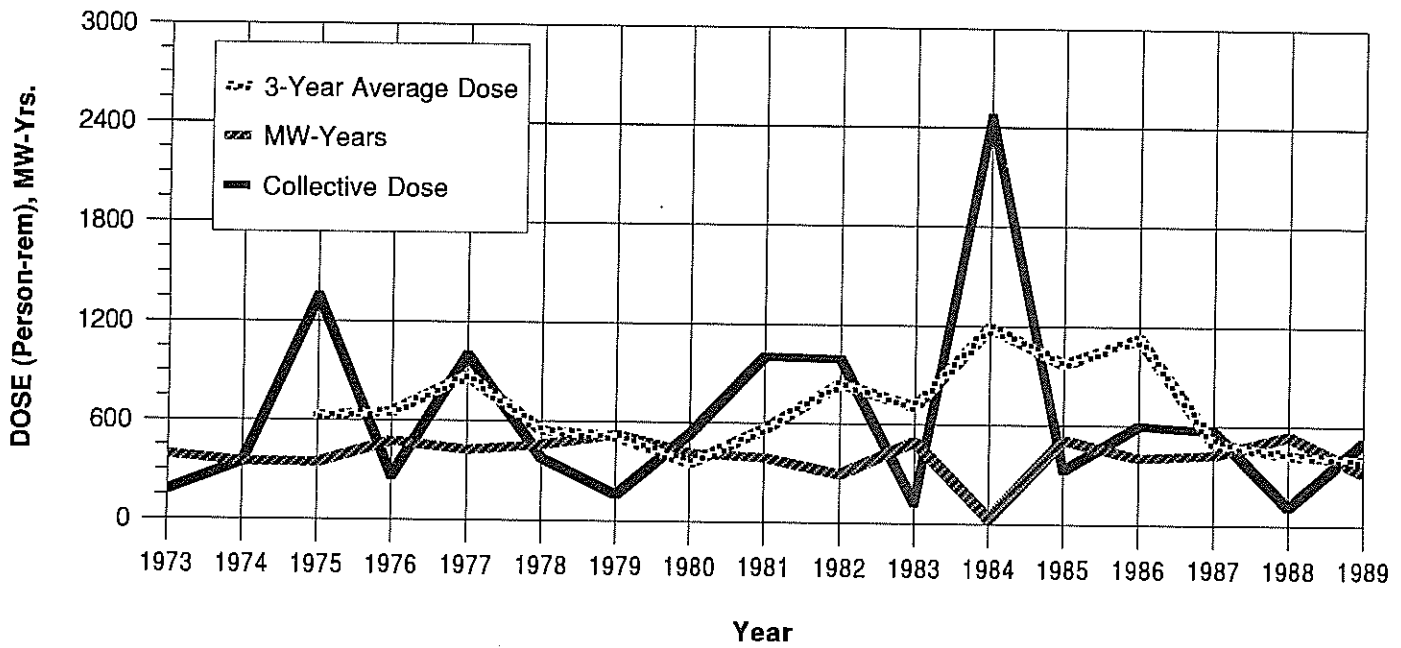


APPENDIX E (continued)

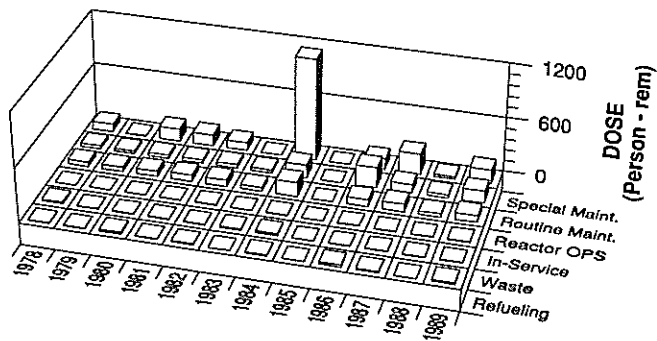
MONTICELLO

BWR

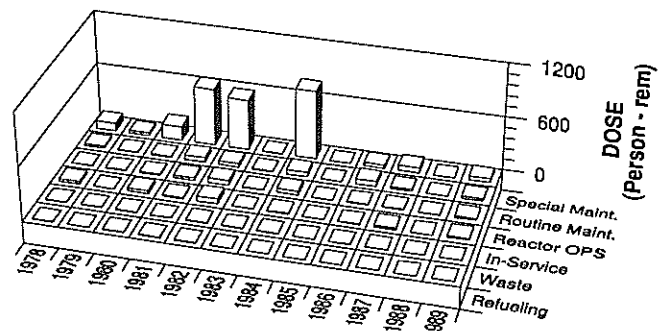
Dose-Performance Indicators



Breakdown By Job Function



Plant



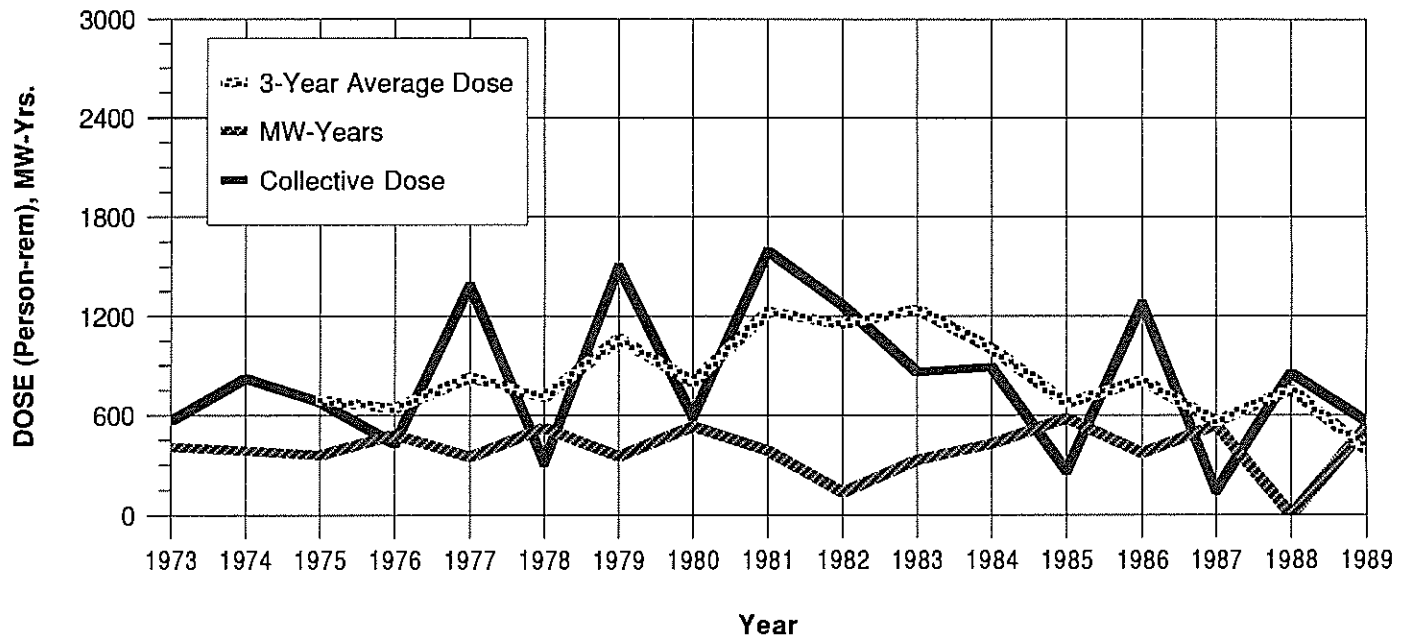
Contract

APPENDIX E (continued)

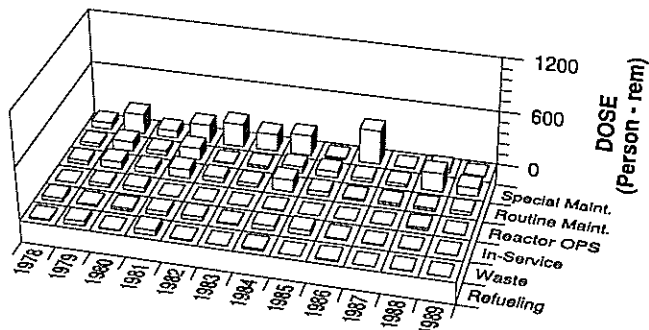
NINE MILE POINT 1, 2

BWR

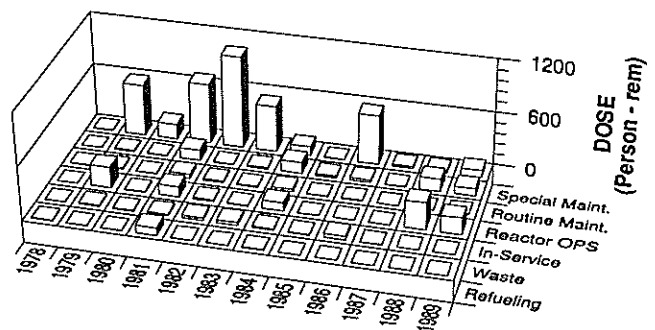
Dose-Performance Indicators



Breakdown By Job Function



Plant



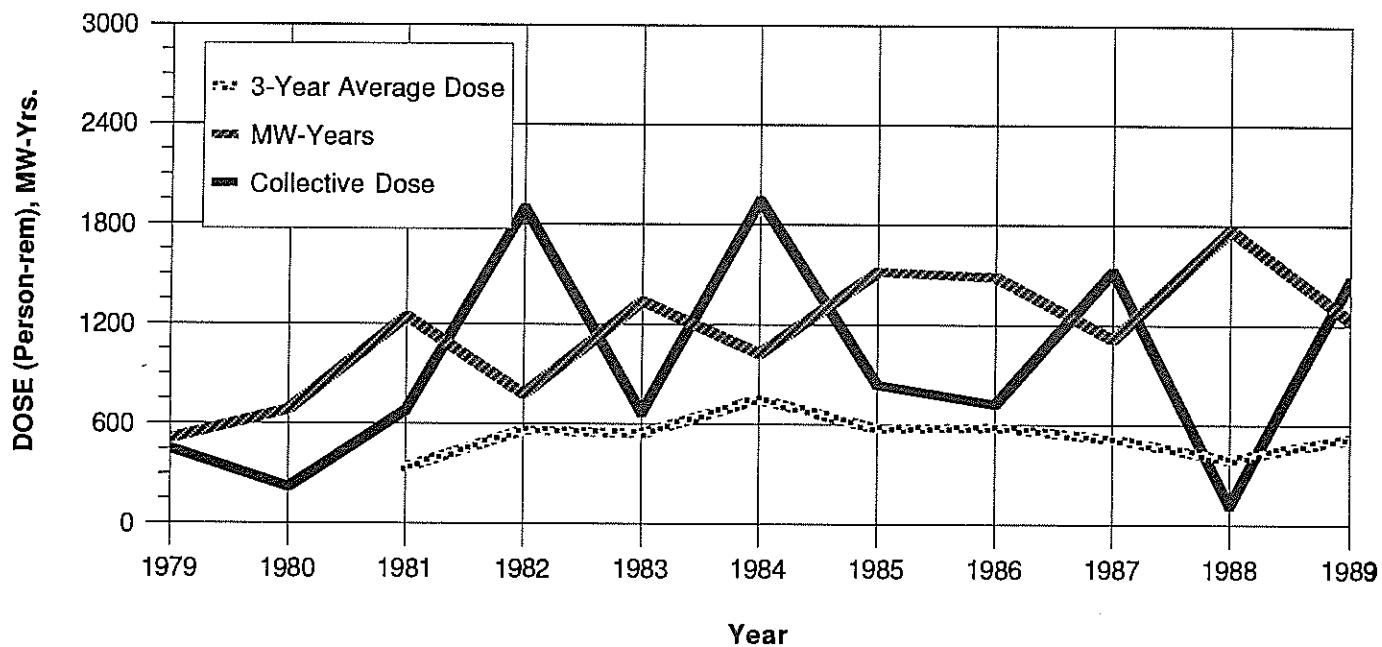
Contract

APPENDIX E (continued)

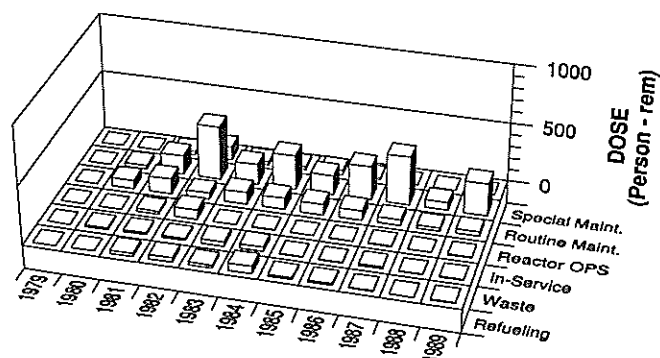
NORTH ANNA 1, 2

PWR

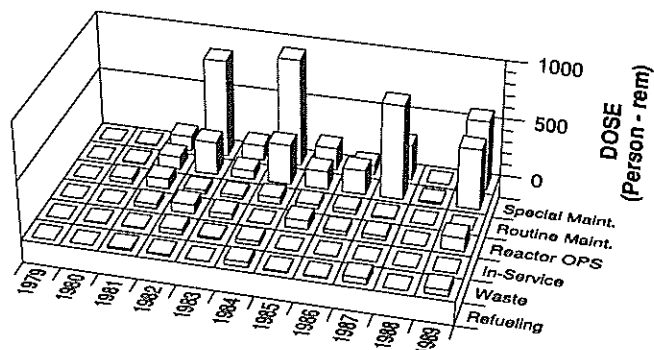
Dose-Performance Indicators



Breakdown By Job Function



Plant



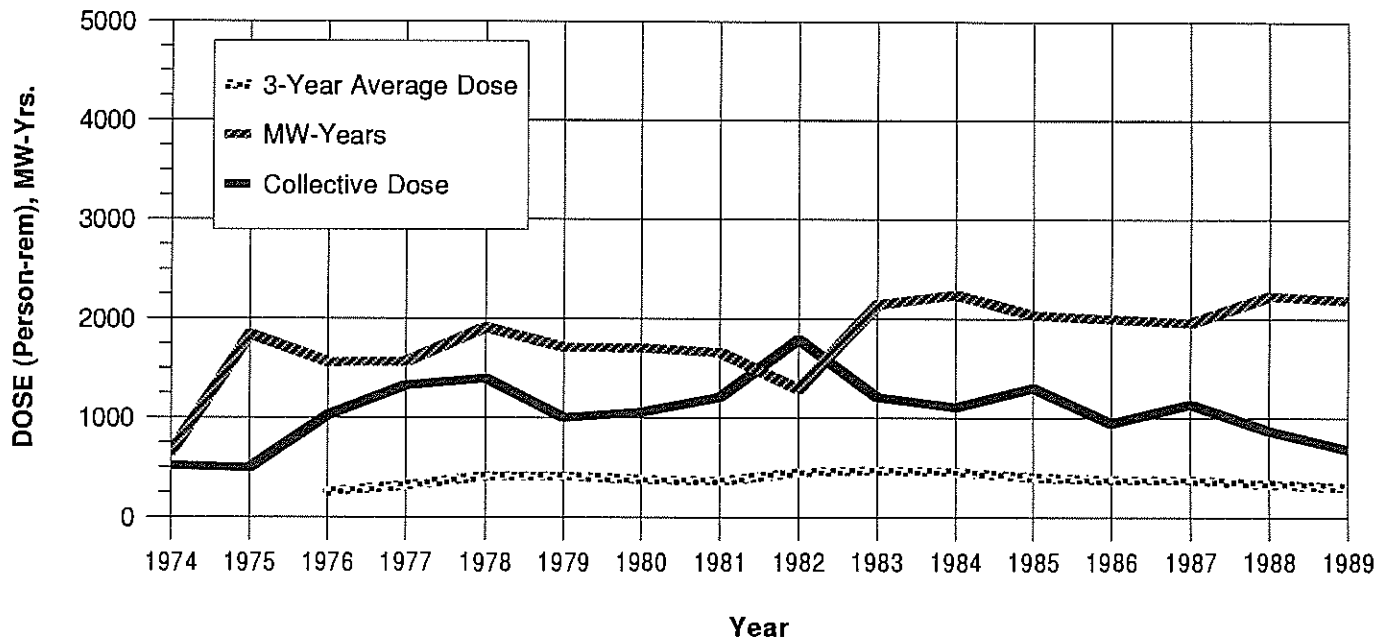
Contract

APPENDIX E (continued)

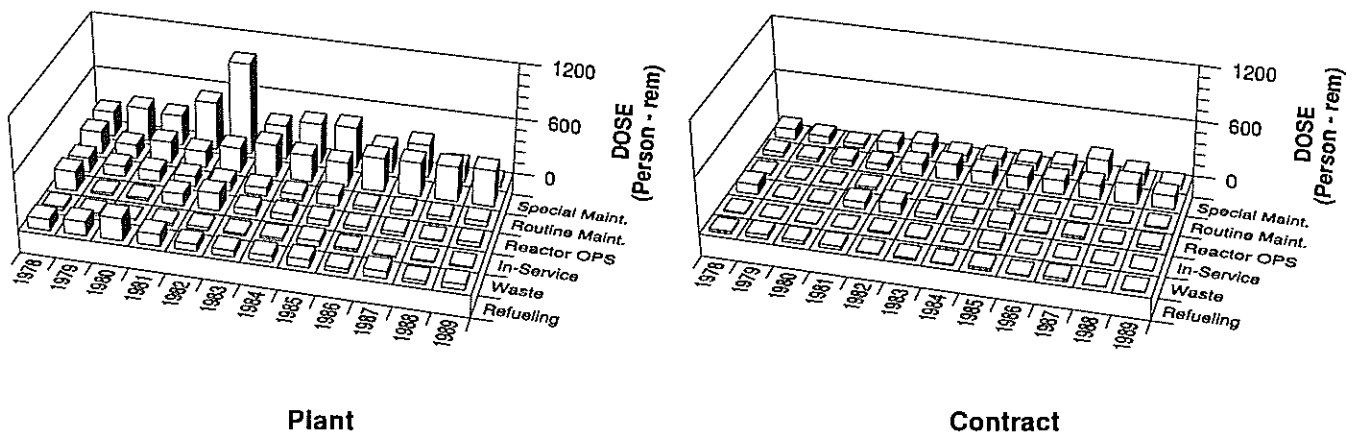
OCONEE 1, 2, 3

PWR

Dose-Performance Indicators



Breakdown By Job Function

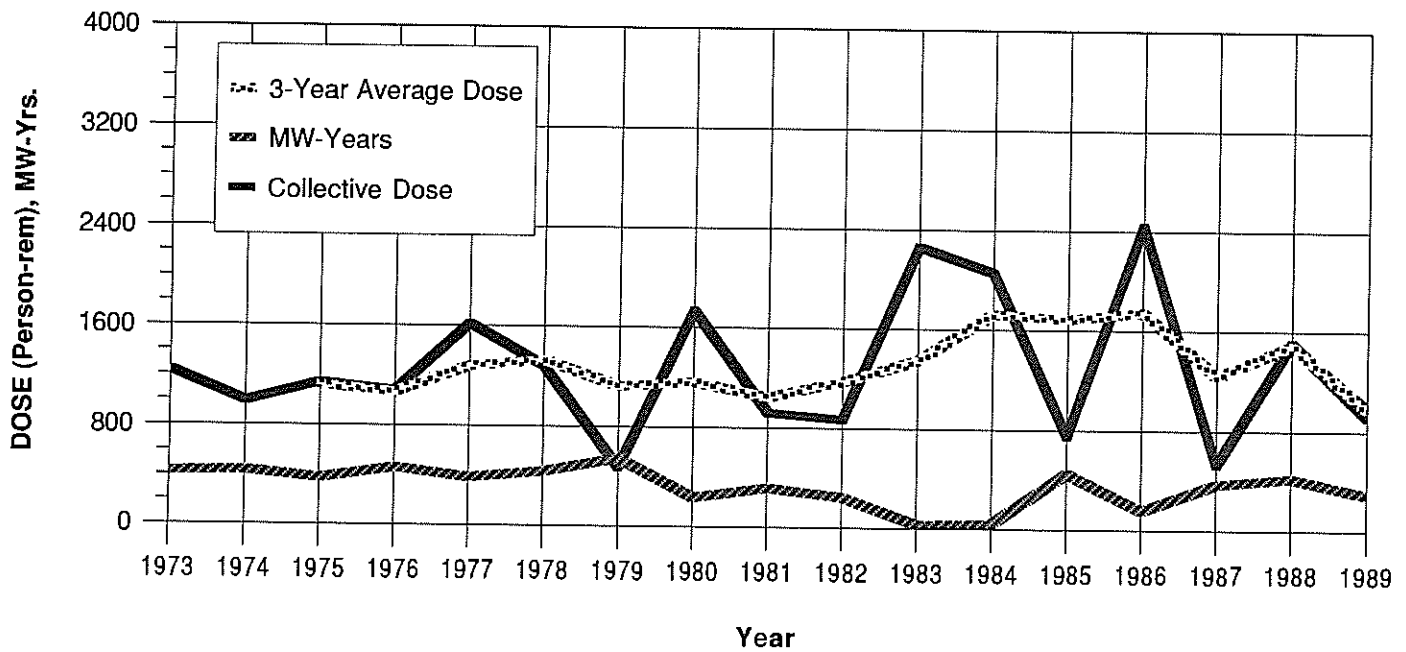


APPENDIX E (continued)

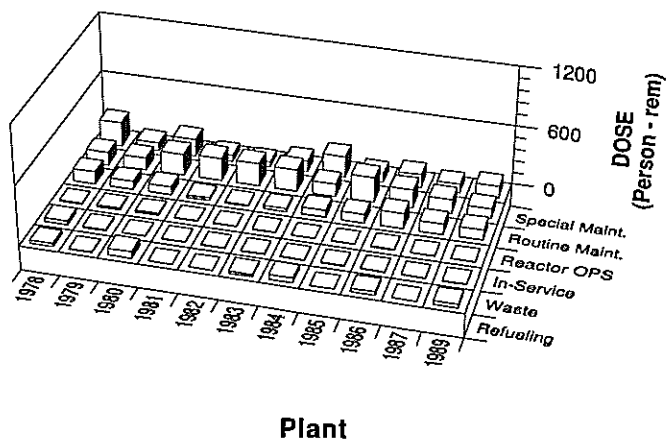
OYSTER CREEK

BWR

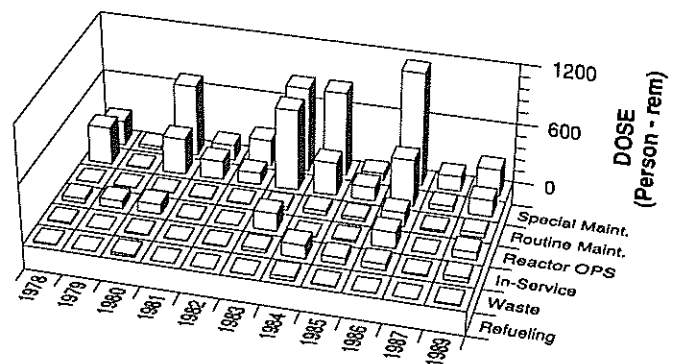
Dose-Performance Indicators



Breakdown By Job Function



Plant



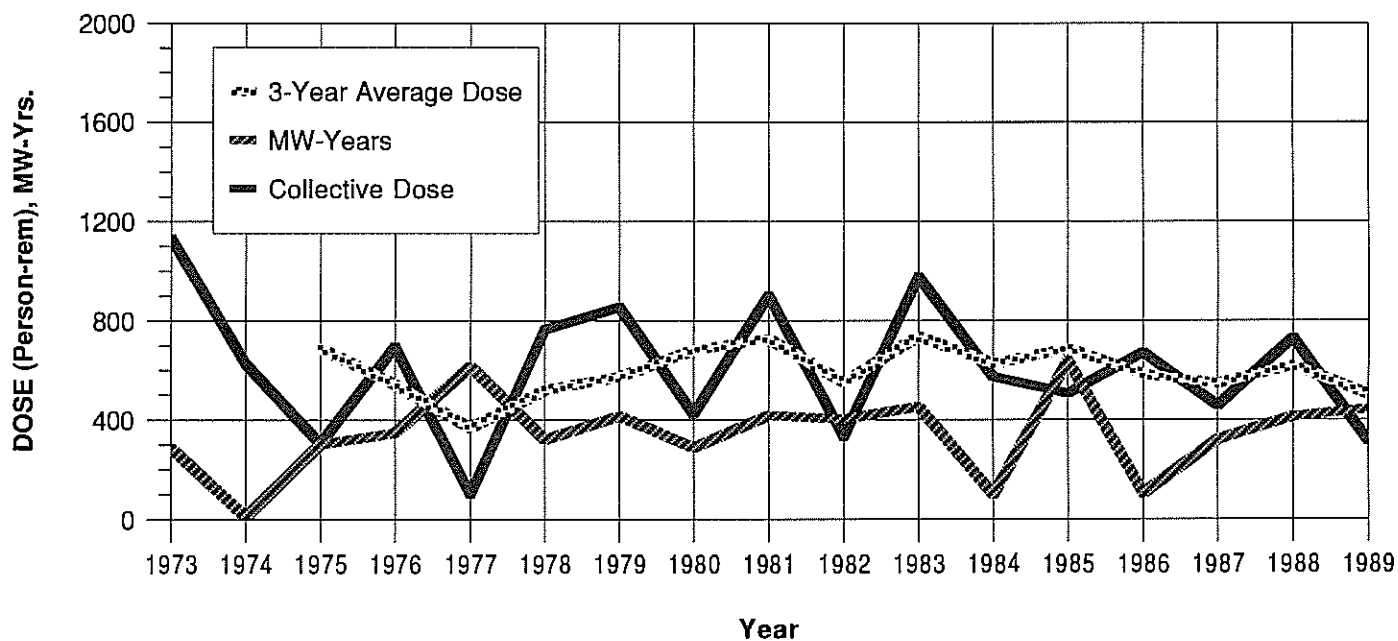
Contract

APPENDIX E (continued)

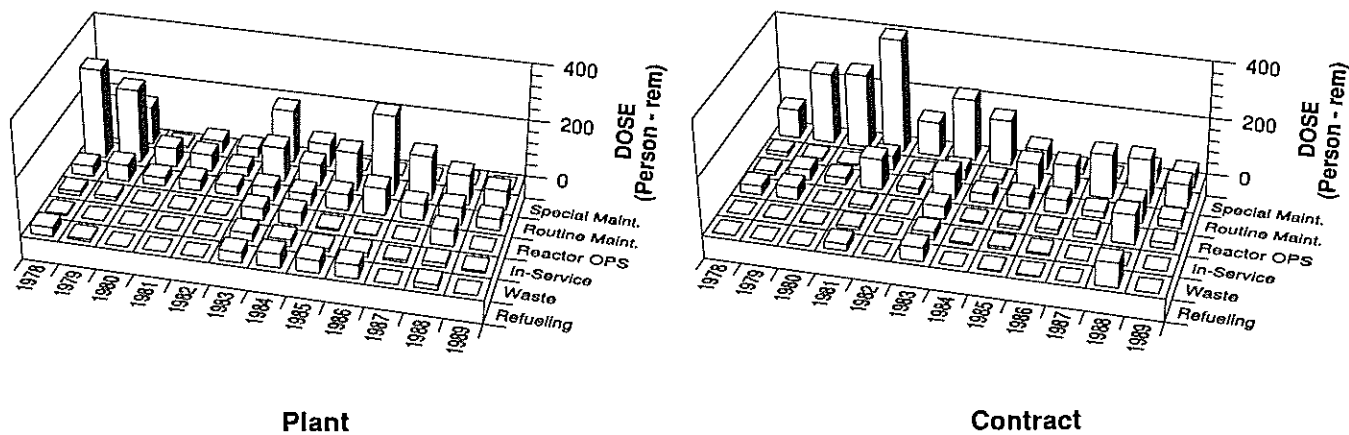
PALISADES

PWR

Dose-Performance Indicators



Breakdown By Job Function

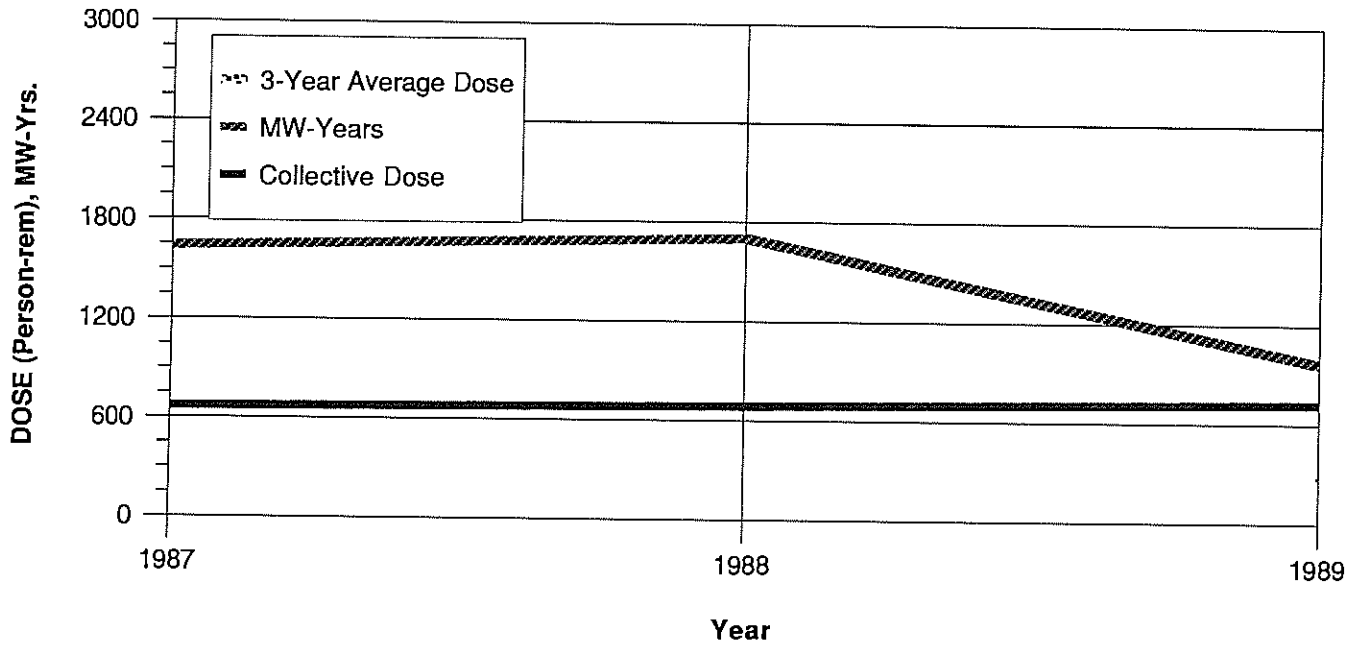


APPENDIX E (continued)

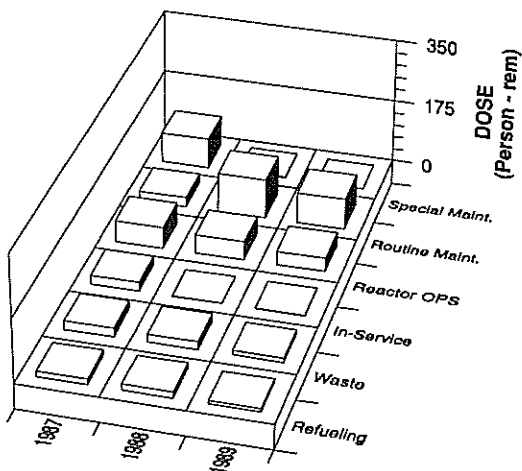
PALO VERDE 1, 2, 3

PWR

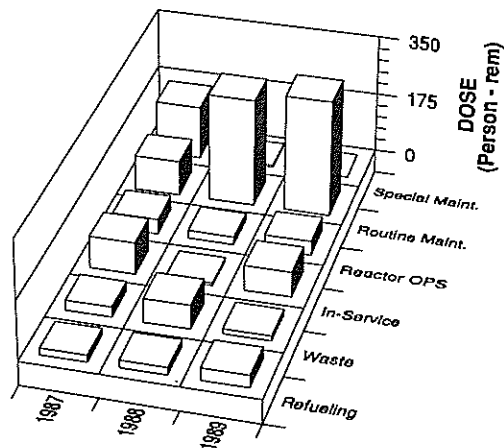
Dose-Performance Indicators



Breakdown By Job Function



Plant



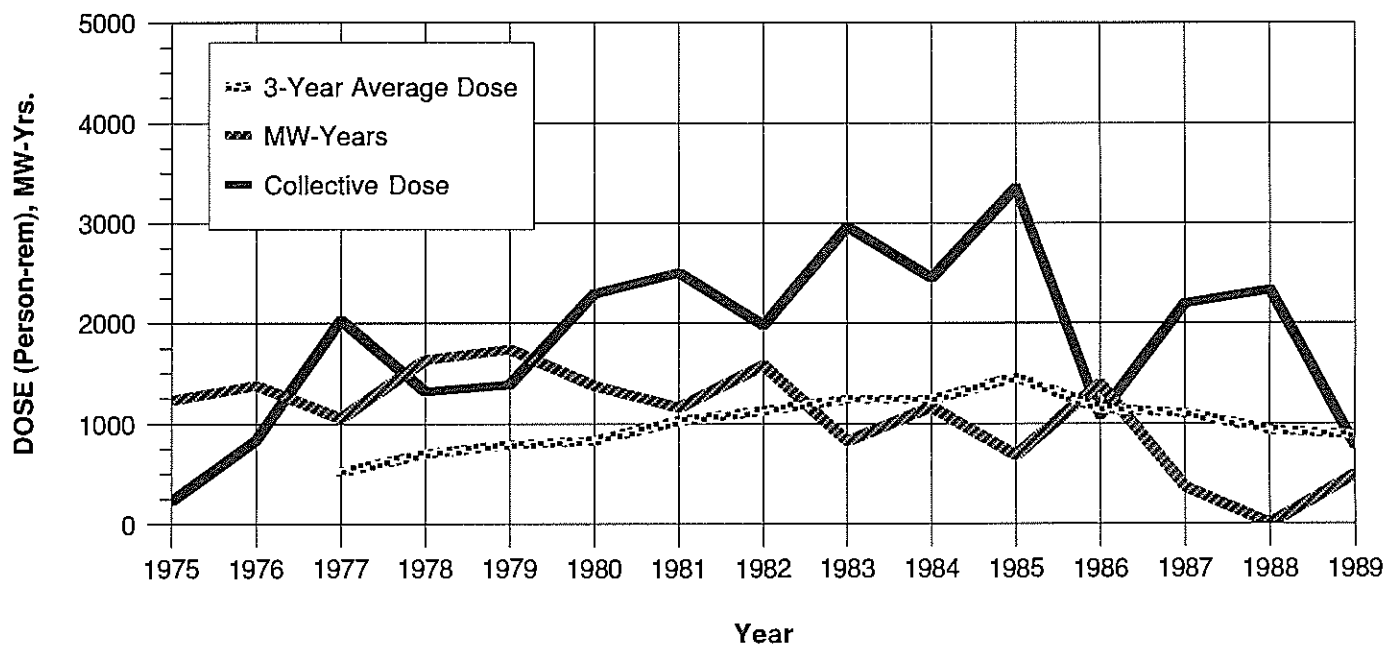
Contract

APPENDIX E (continued)

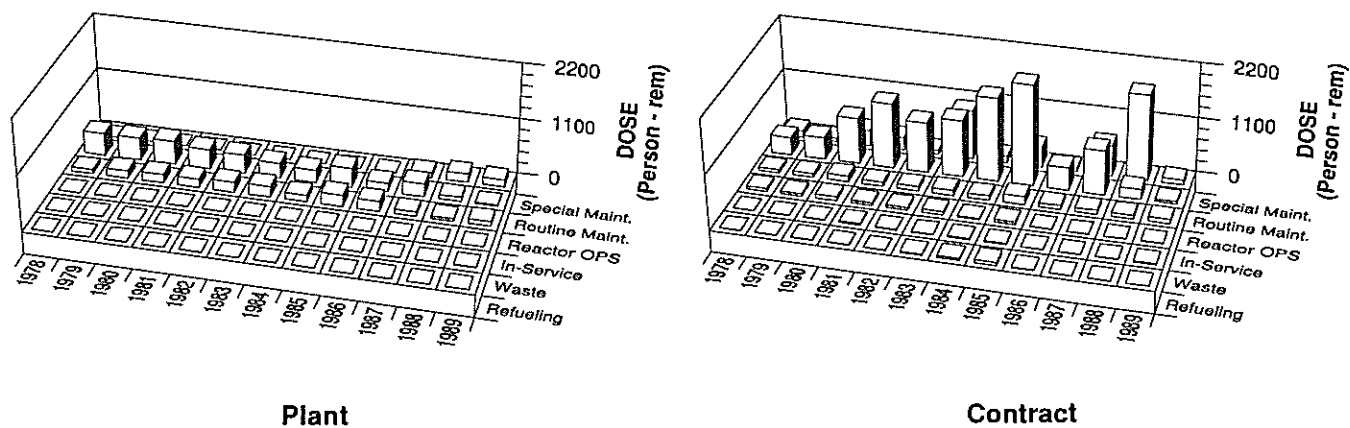
PEACH BOTTOM 2, 3

BWR

Dose-Performance Indicators



Breakdown By Job Function

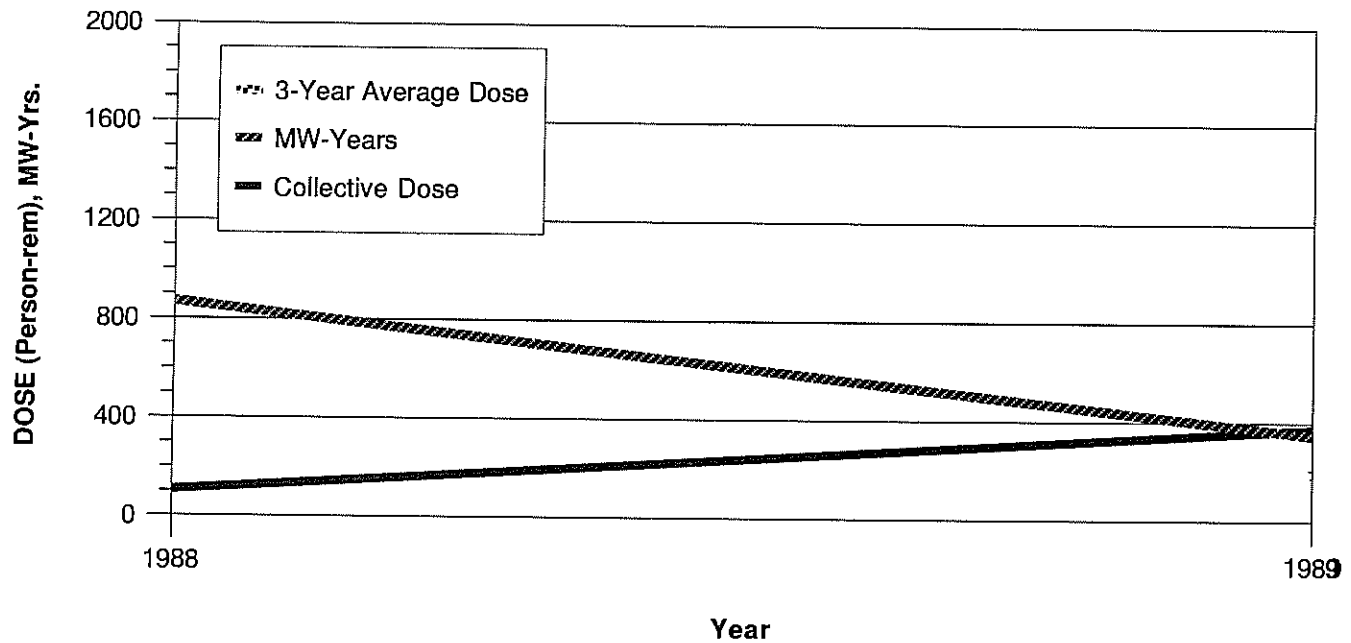


APPENDIX E (continued)

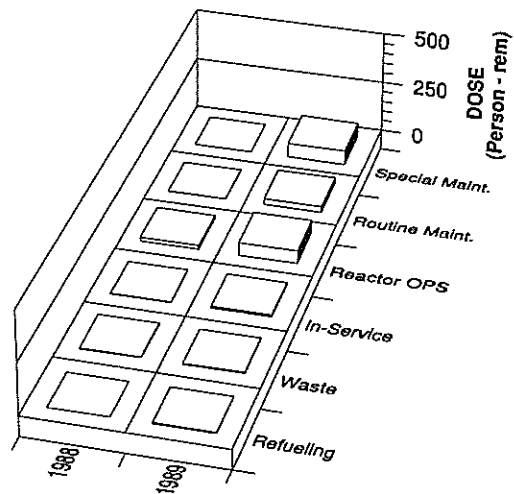
PERRY

Dose-Performance Indicators

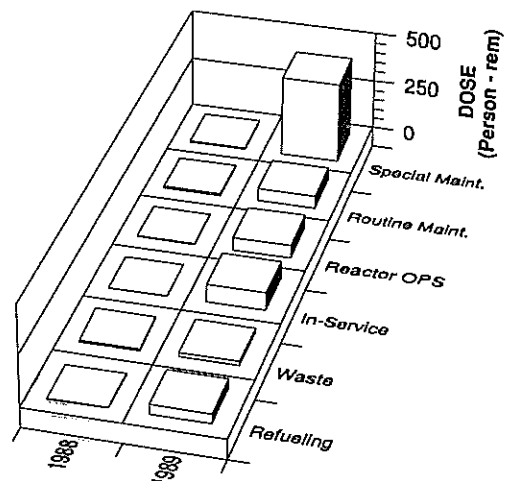
BWR



Breakdown By Job Function



Plant



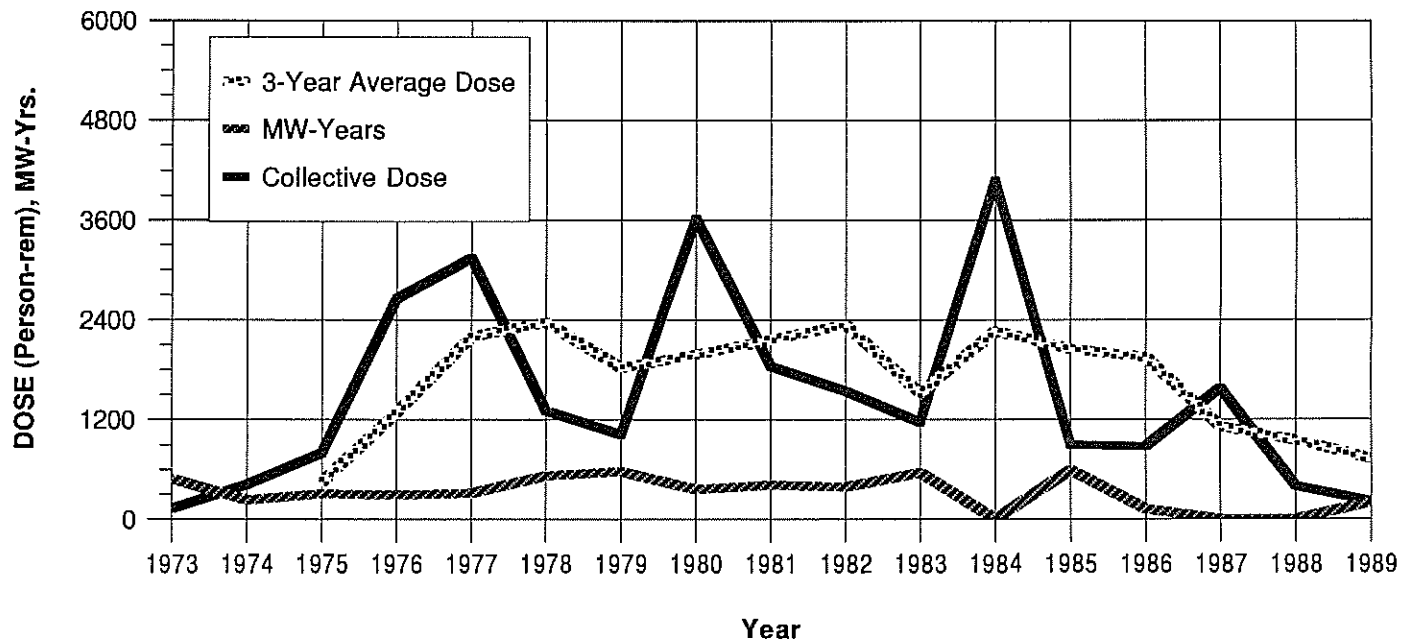
Contract

APPENDIX E (continued)

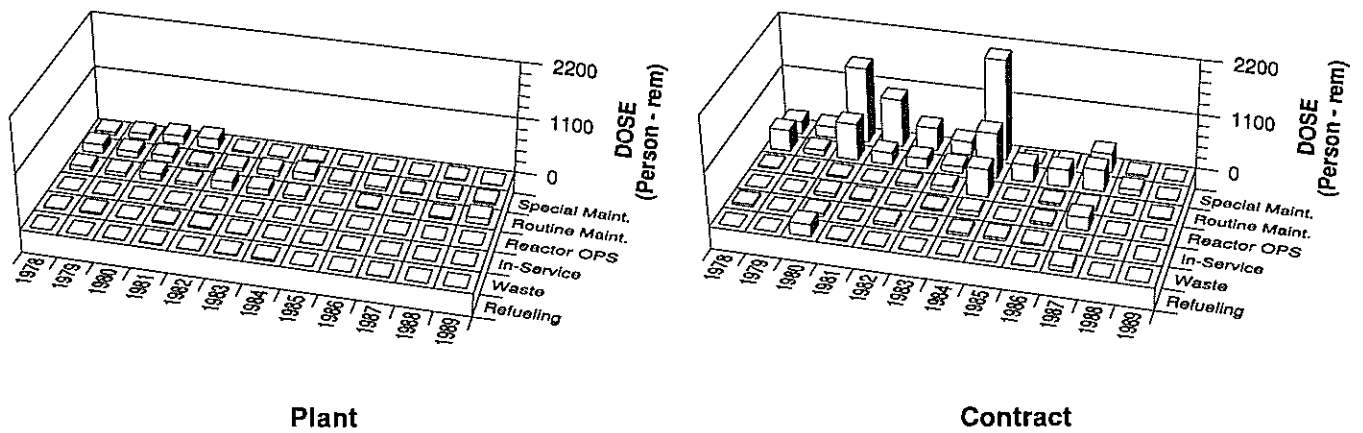
PILGRIM

BWR

Dose-Performance Indicators



Breakdown By Job Function

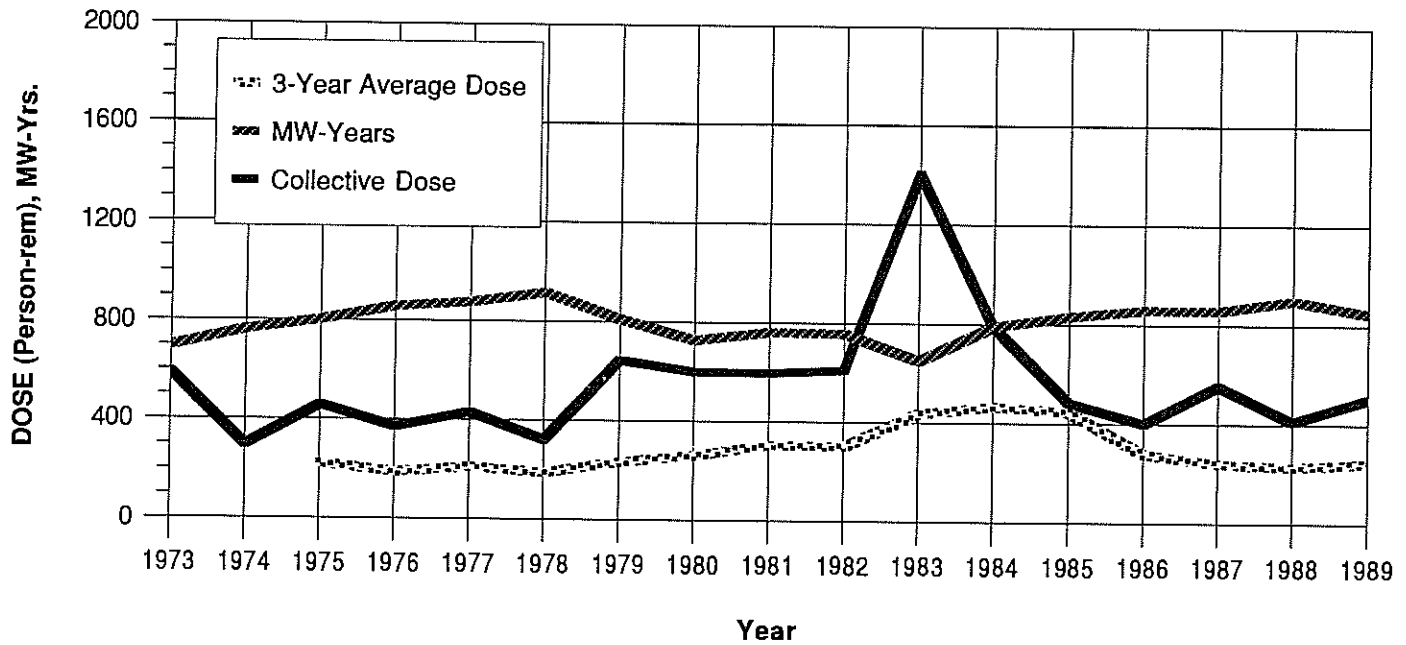


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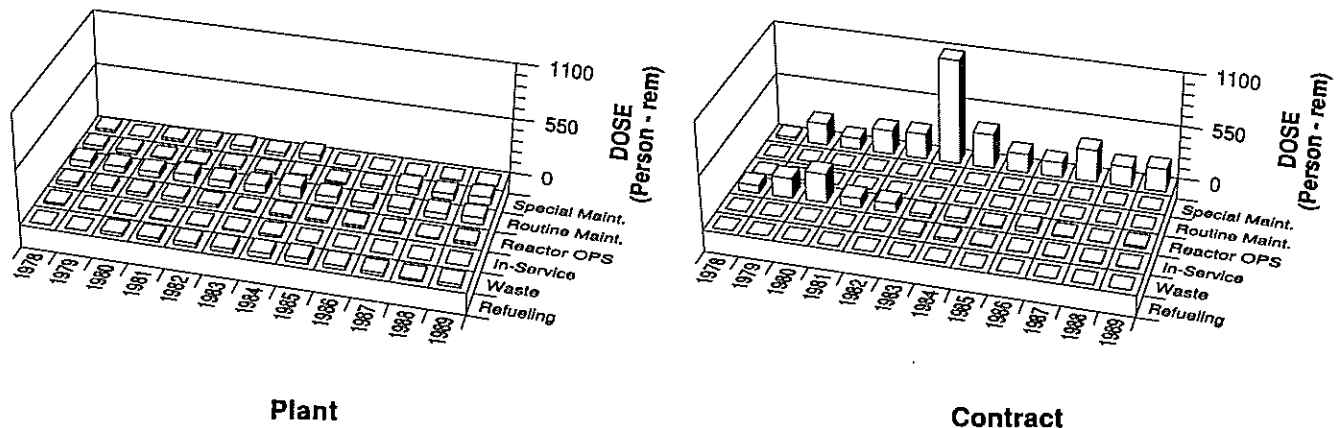
POINT BEACH 1, 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

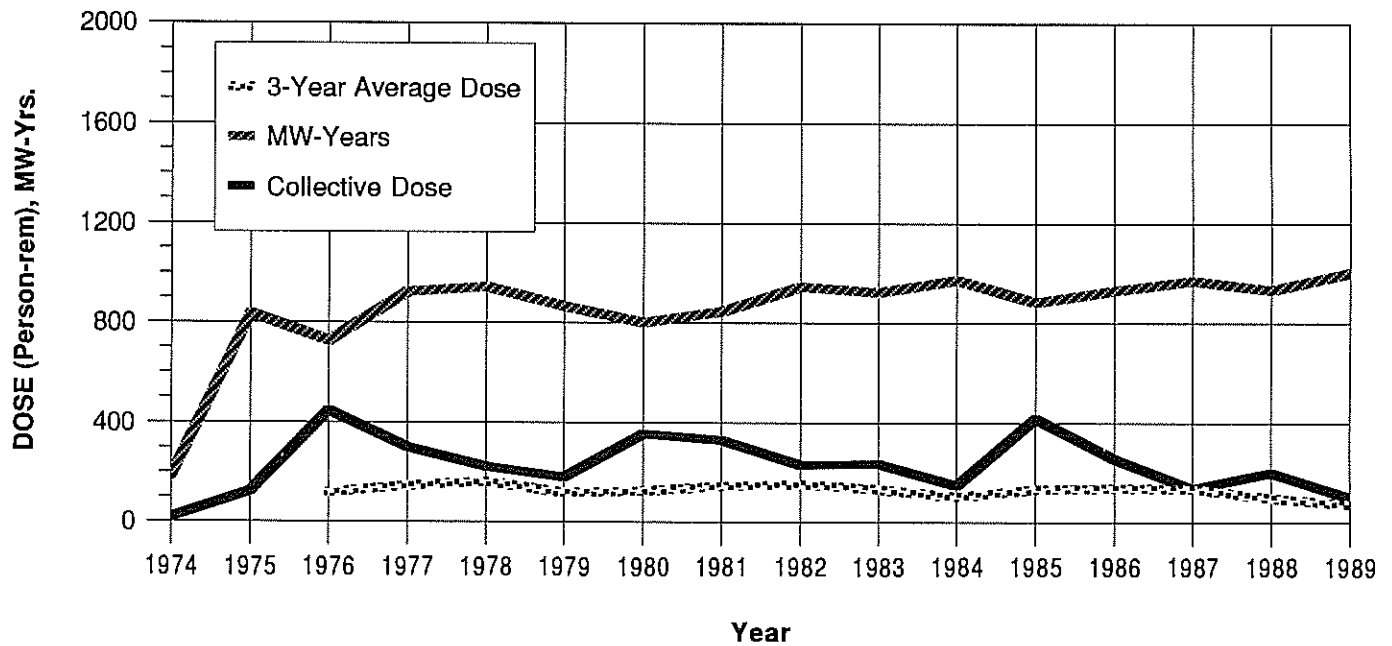


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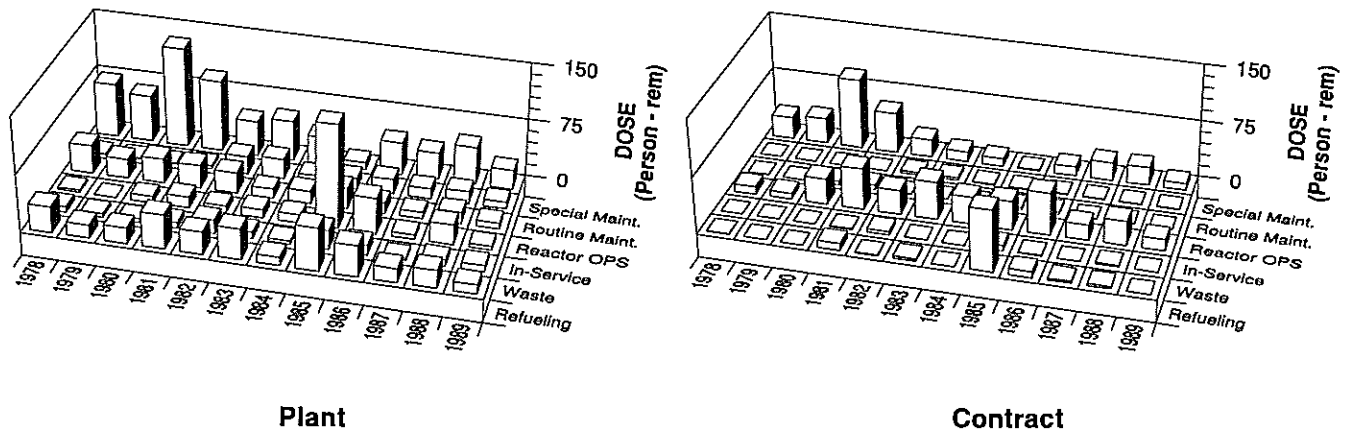
PRAIRIE ISLAND 1, 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

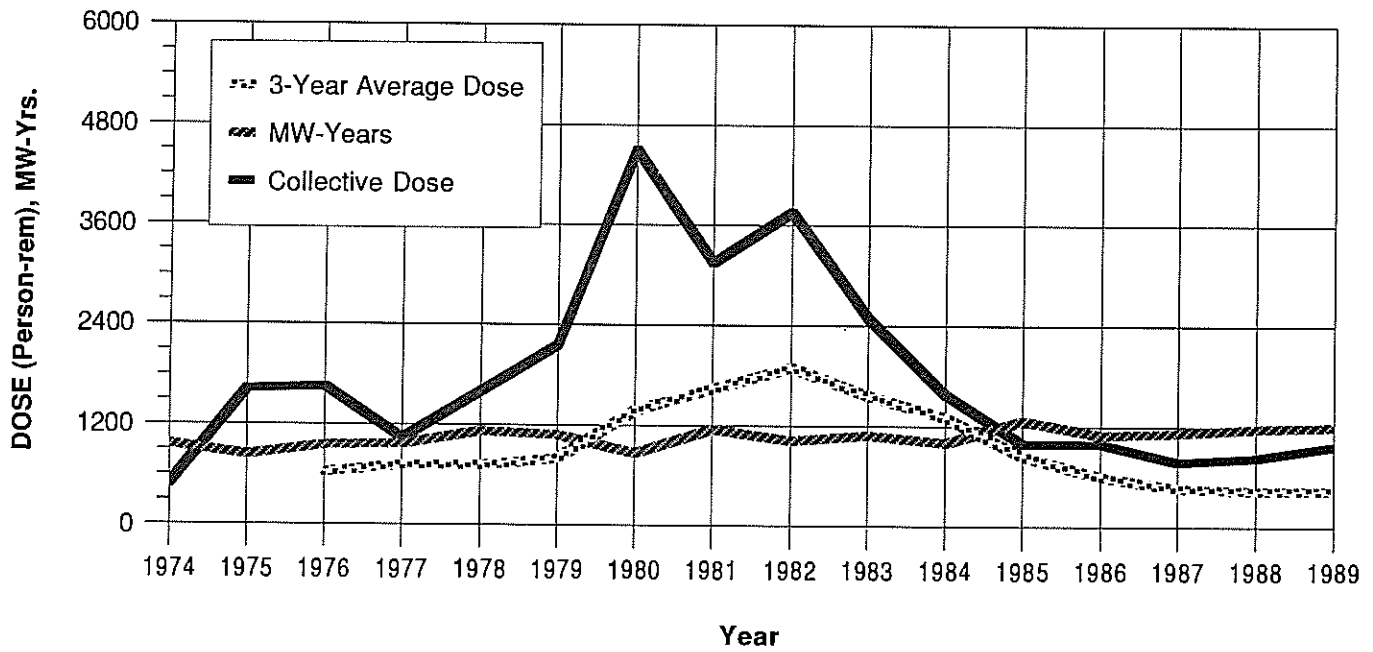


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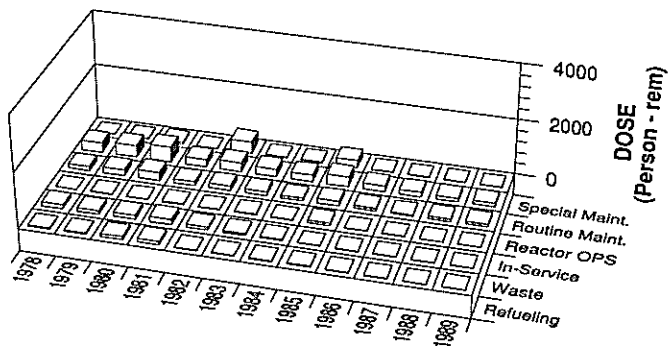
QUAD CITIES 1, 2

BWR

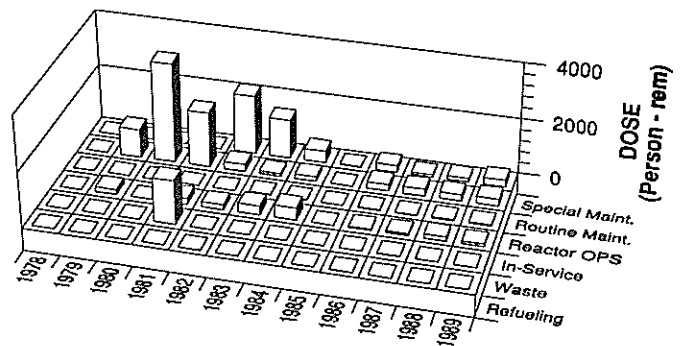
Dose-Performance Indicators



Breakdown By Job Function



Plant



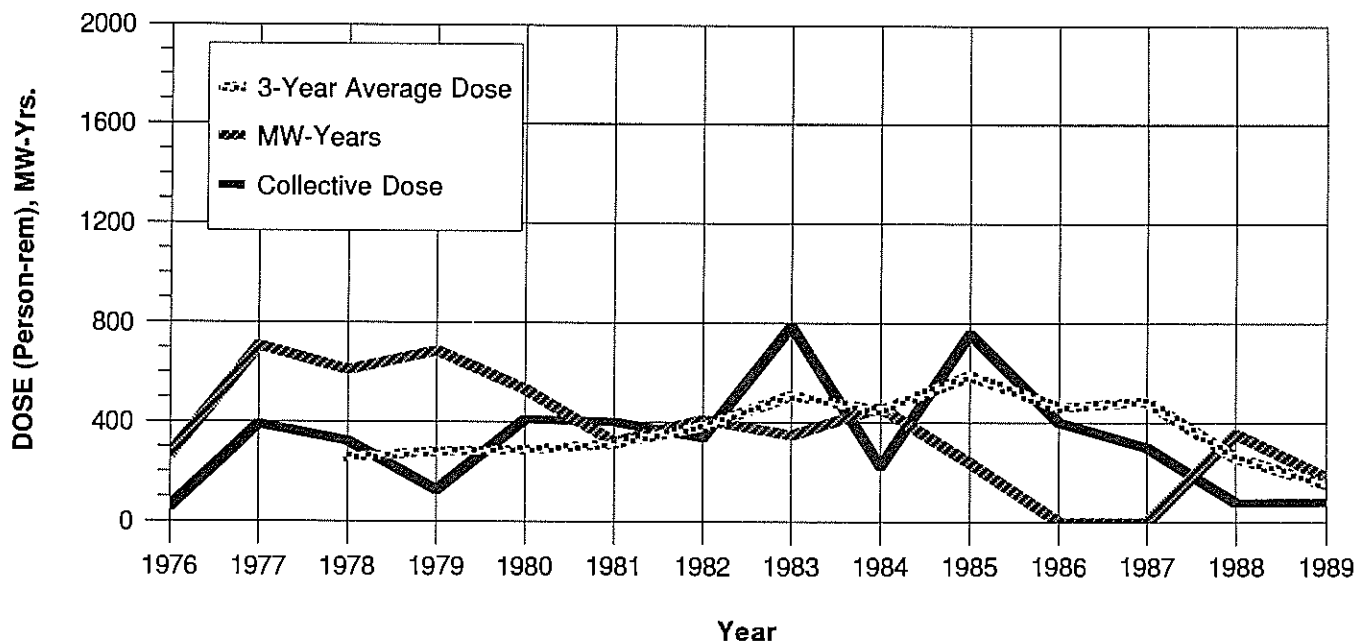
Contract

APPENDIX E (continued)

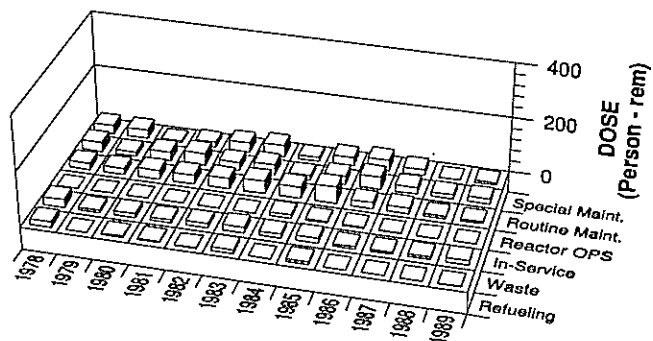
RANCHO SECO

PWR

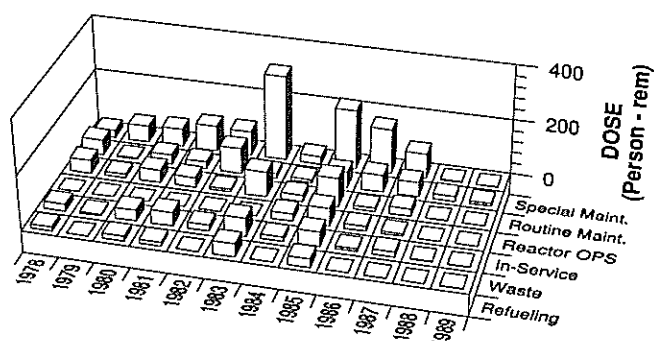
Dose-Performance Indicators



Breakdown By Job Function



Plant



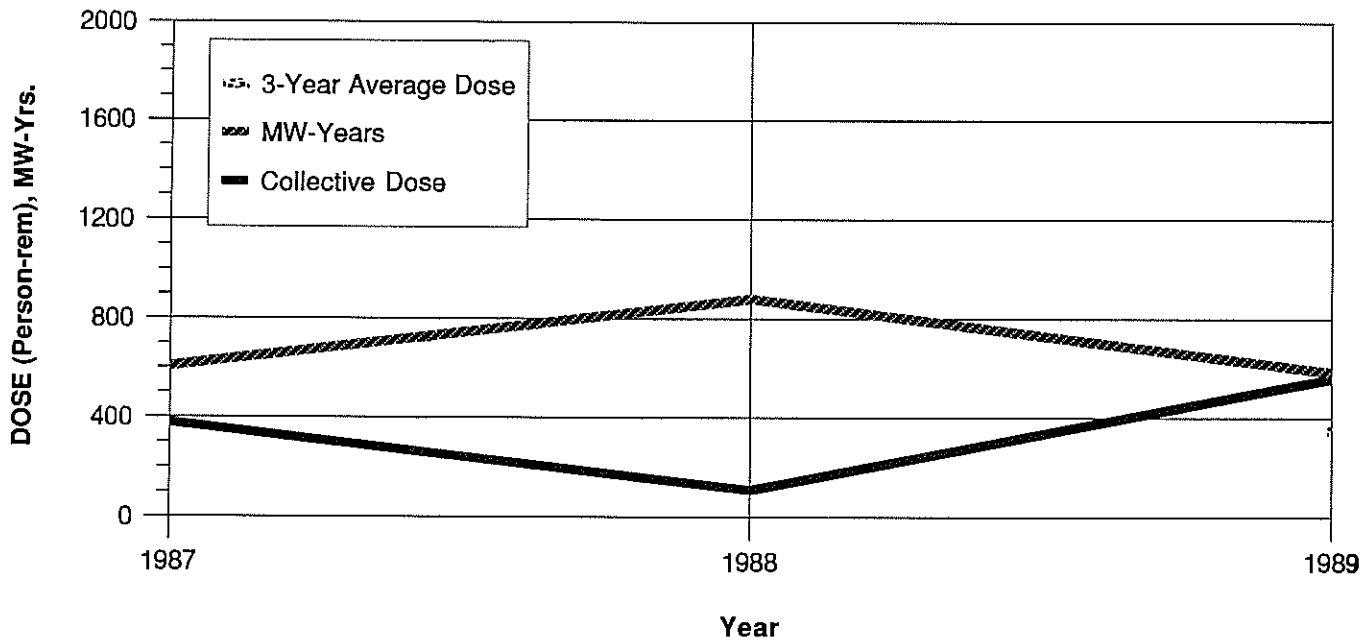
Contract

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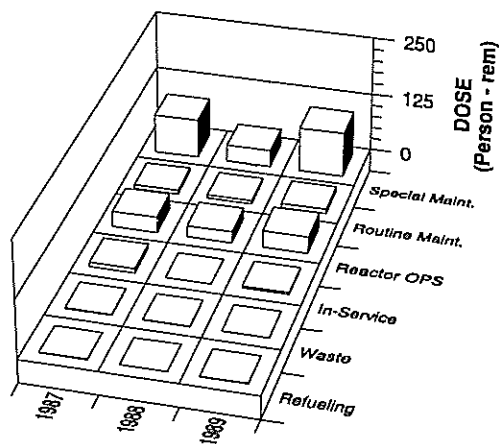
RIVER BEND 1

BWR

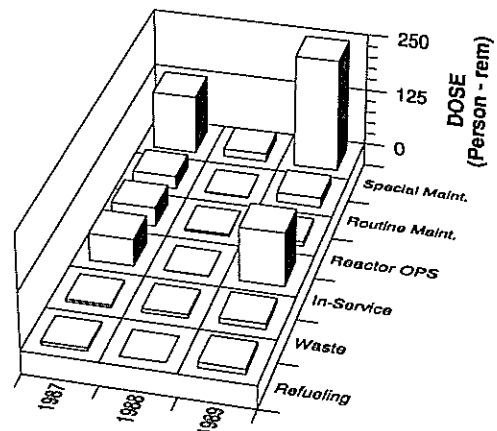
Dose-Performance Indicators



Breakdown By Job Function



Plant



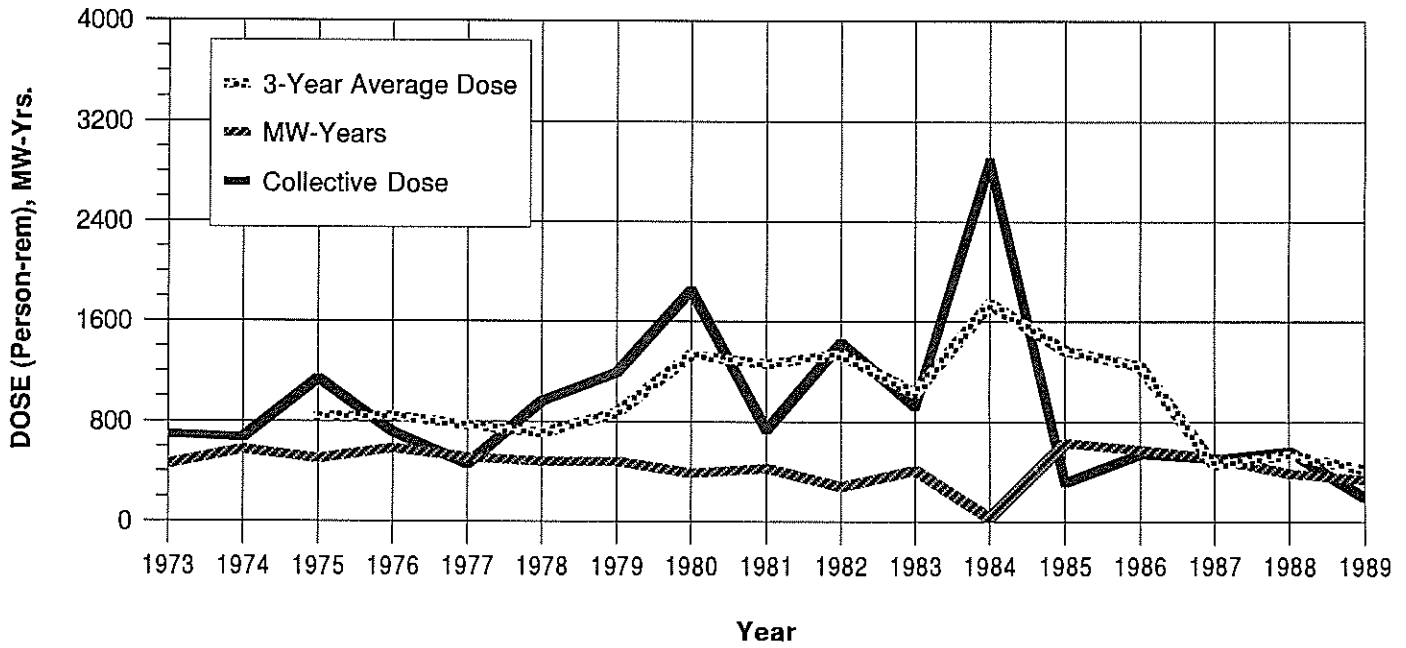
Contract

APPENDIX E (continued)

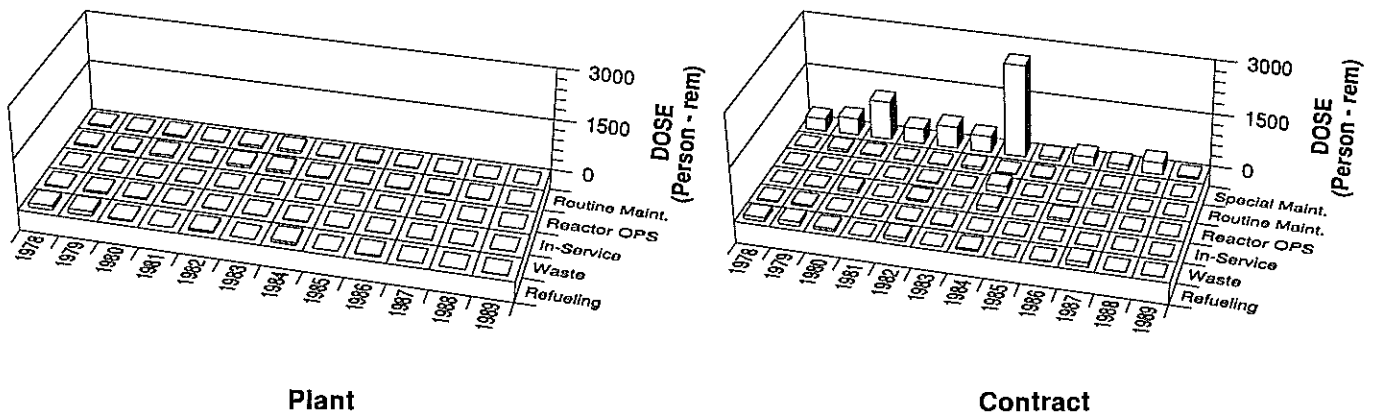
ROBINSON 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

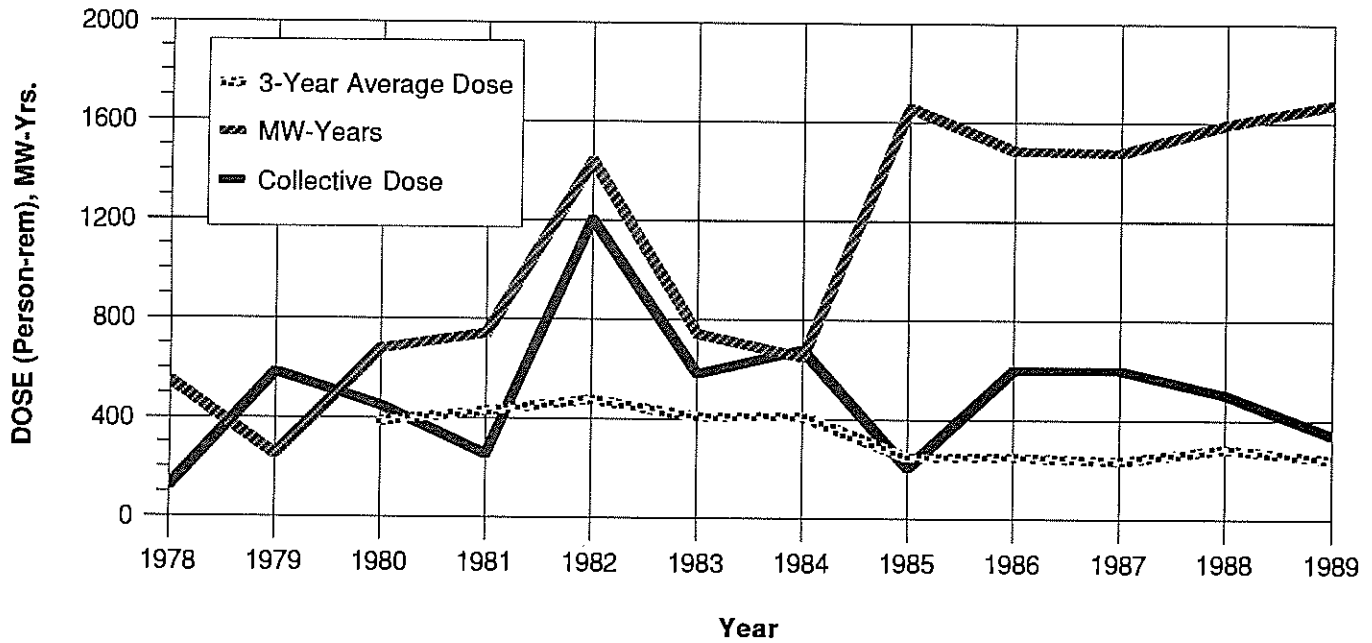


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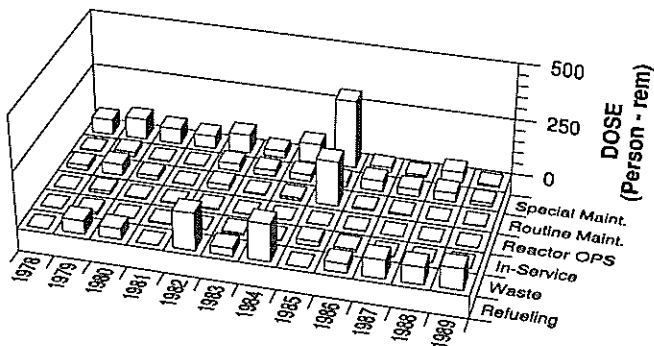
SALEM 1, 2

PWR

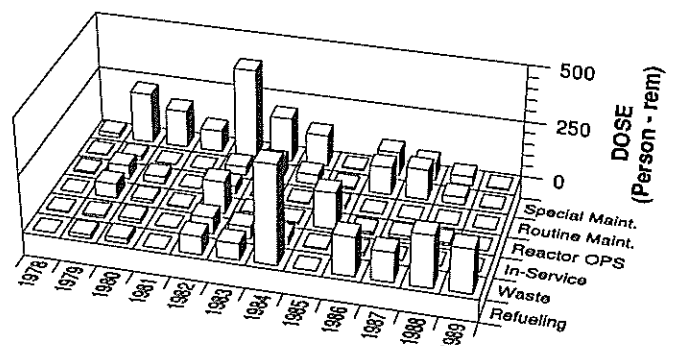
Dose-Performance Indicators



Breakdown By Job Function



Plant



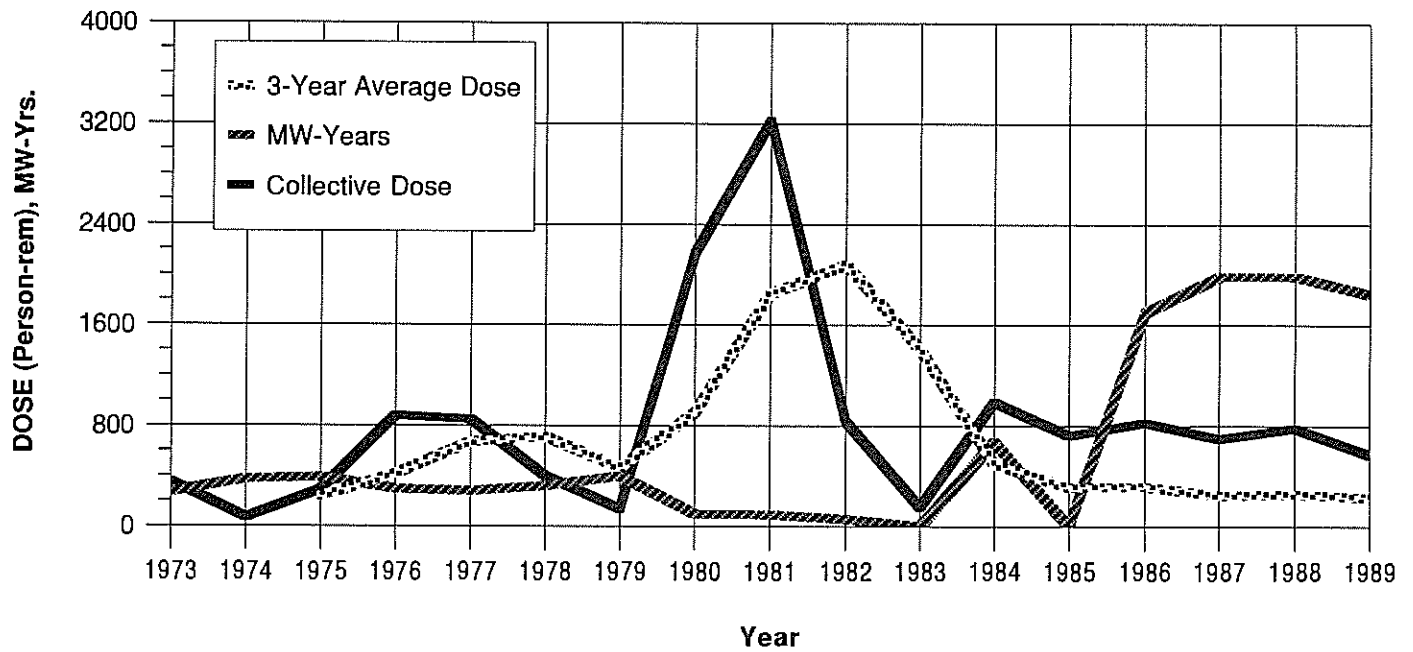
Contract

APPENDIX E (continued)

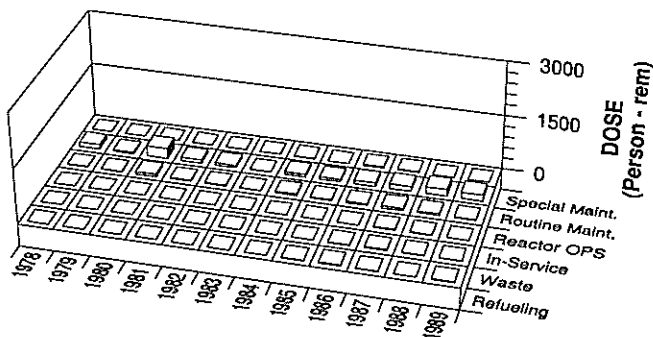
SAN ONOFRE 1, 2, 3

PWR

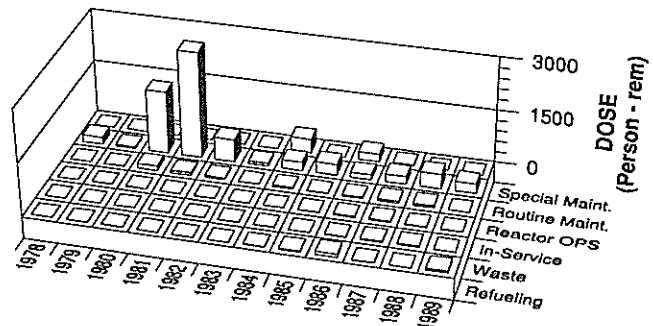
Dose-Performance Indicators



Breakdown By Job Function



Plant



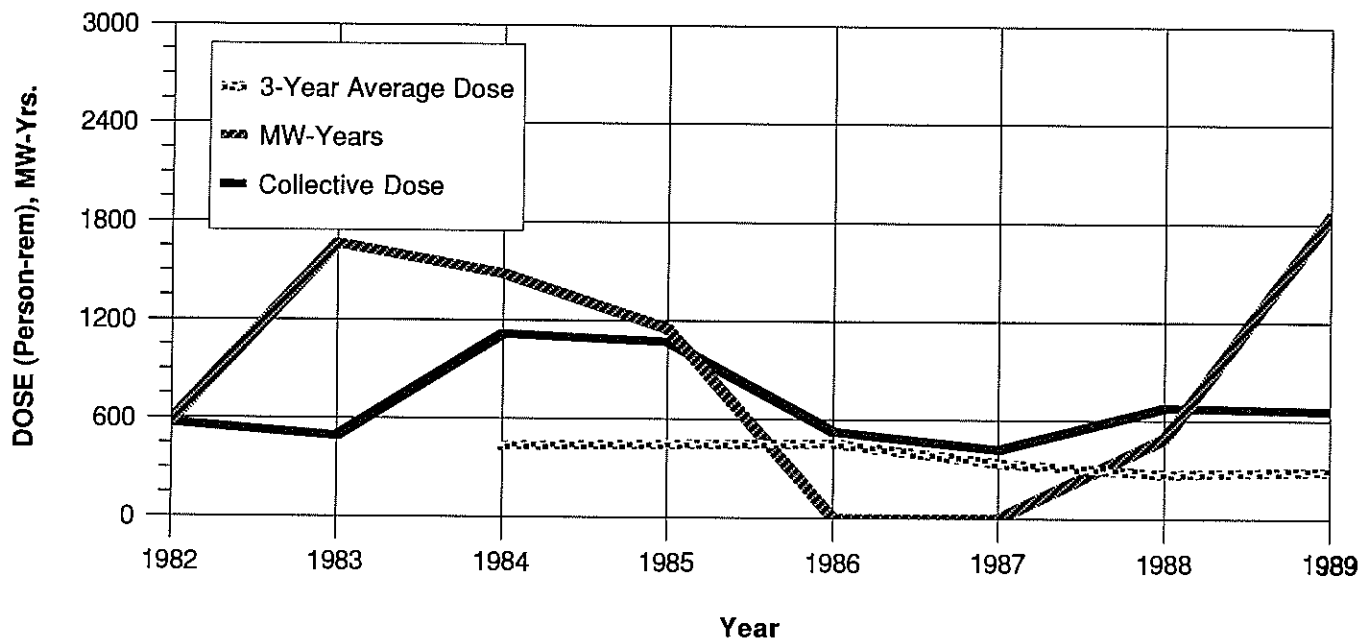
Contract

APPENDIX E (continued)

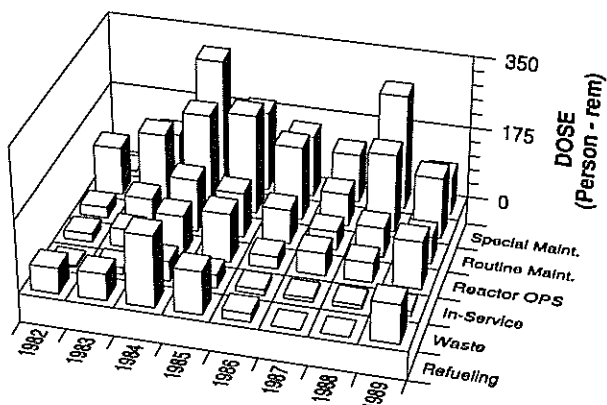
SEQUOYAH 1, 2

PWR

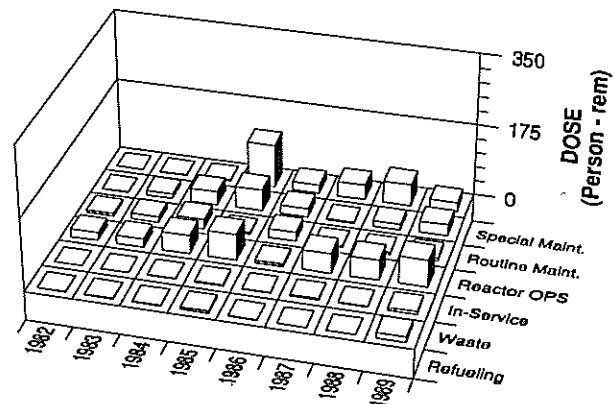
Dose-Performance Indicators



Breakdown By Job Function



Plant



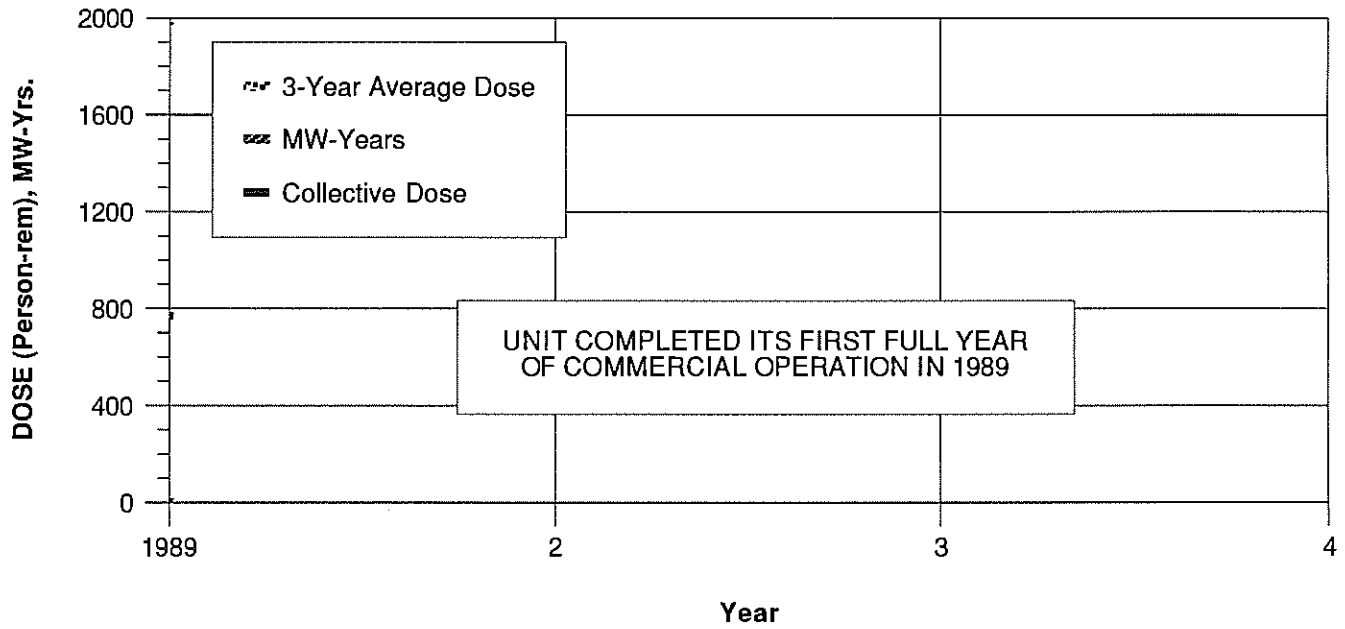
Contract

APPENDIX E (continued)

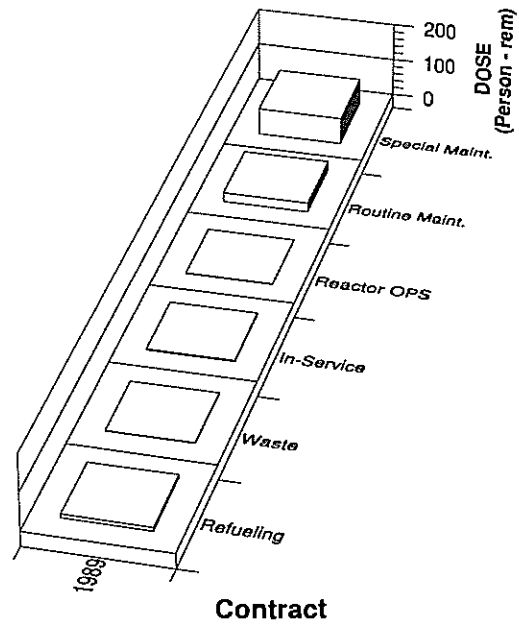
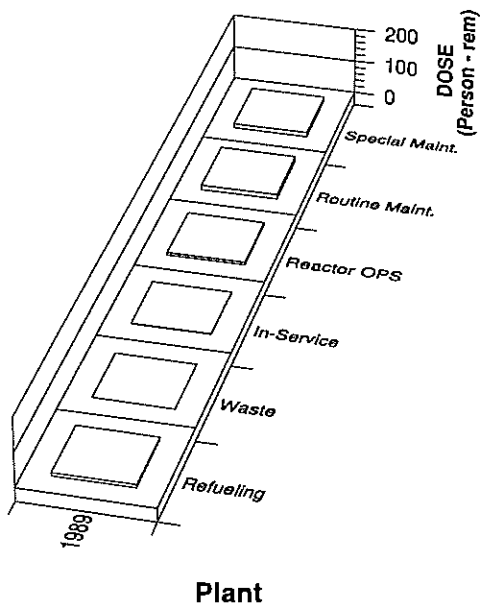
SOUTH TEXAS 1

PWR

Dose-Performance Indicators



Breakdown By Job Function

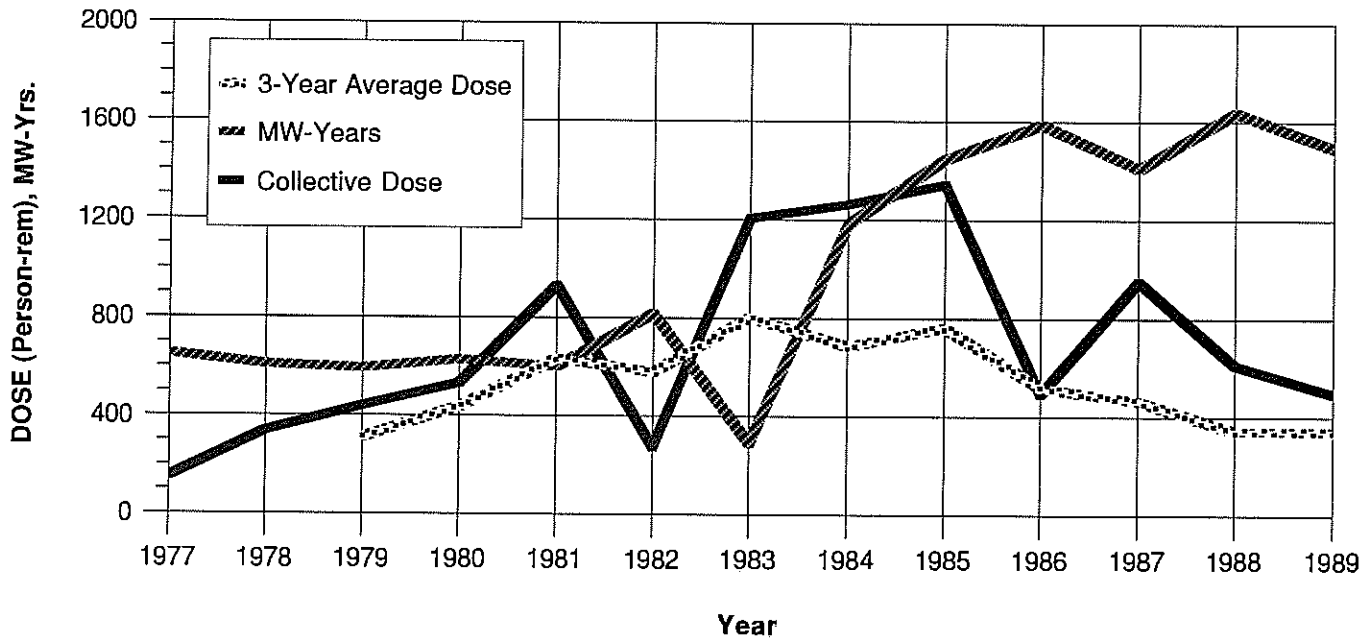


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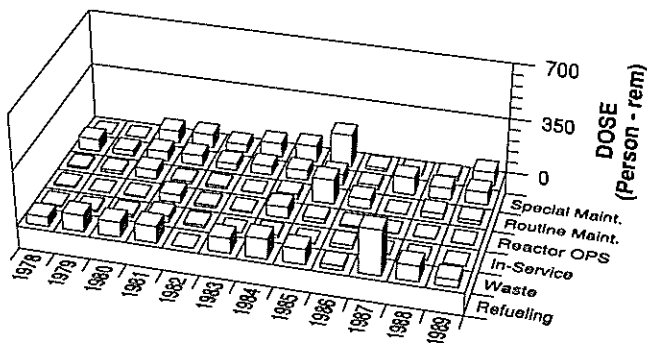
ST. LUCIE 1, 2

PWR

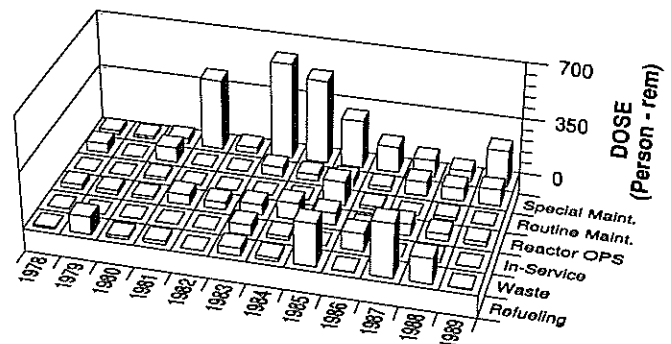
Dose-Performance Indicators



Breakdown By Job Function



Plant



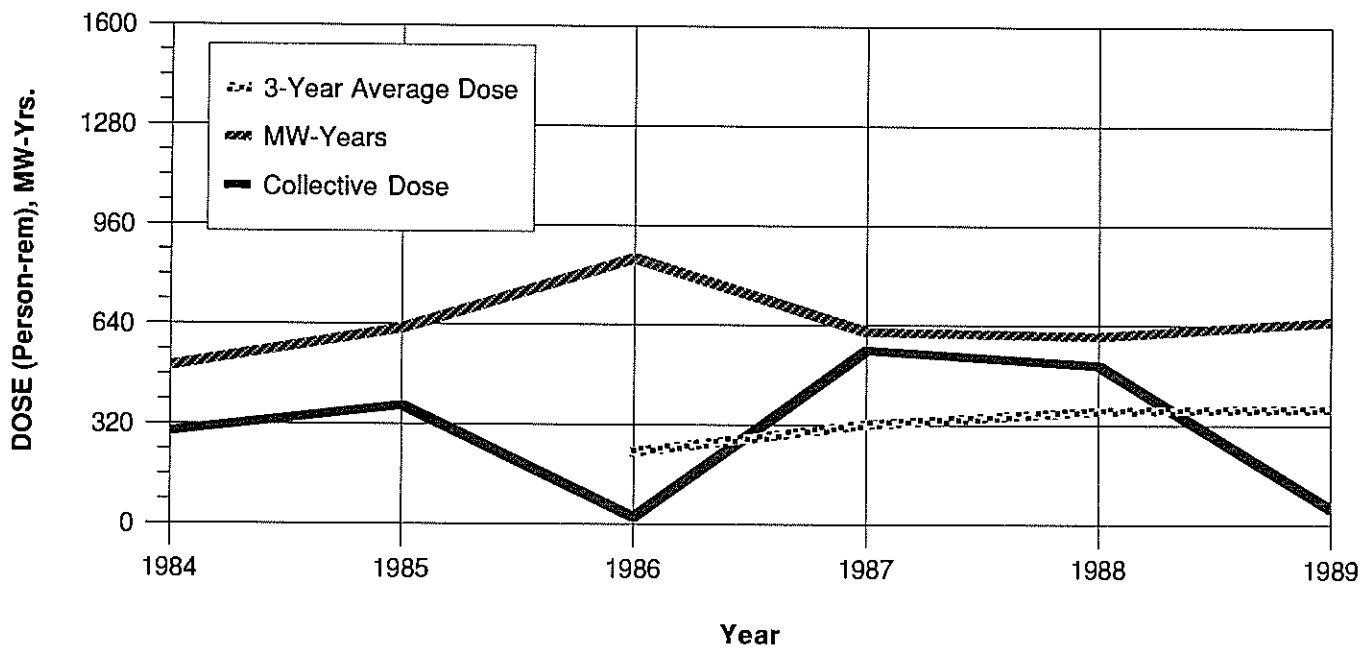
Contract

APPENDIX E (continued)

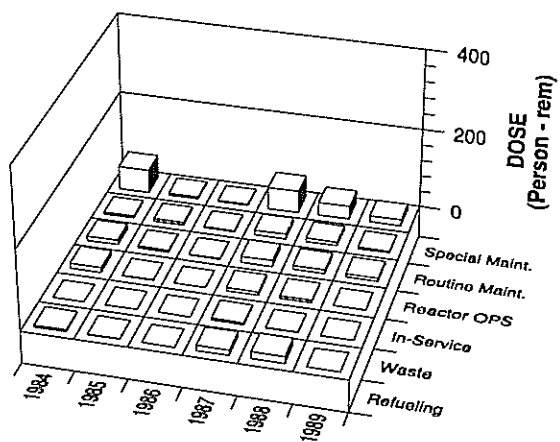
SUMMER 1

PWR

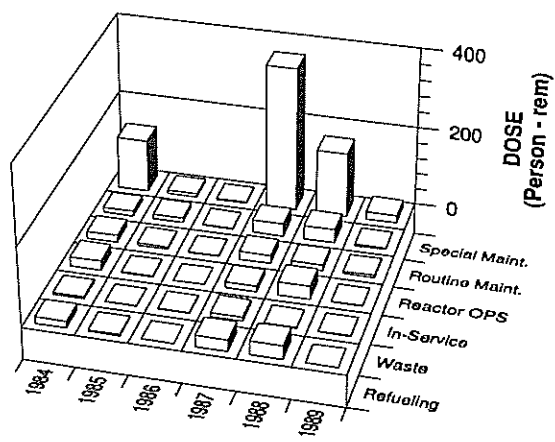
Dose-Performance Indicators



Breakdown By Job Function



Plant



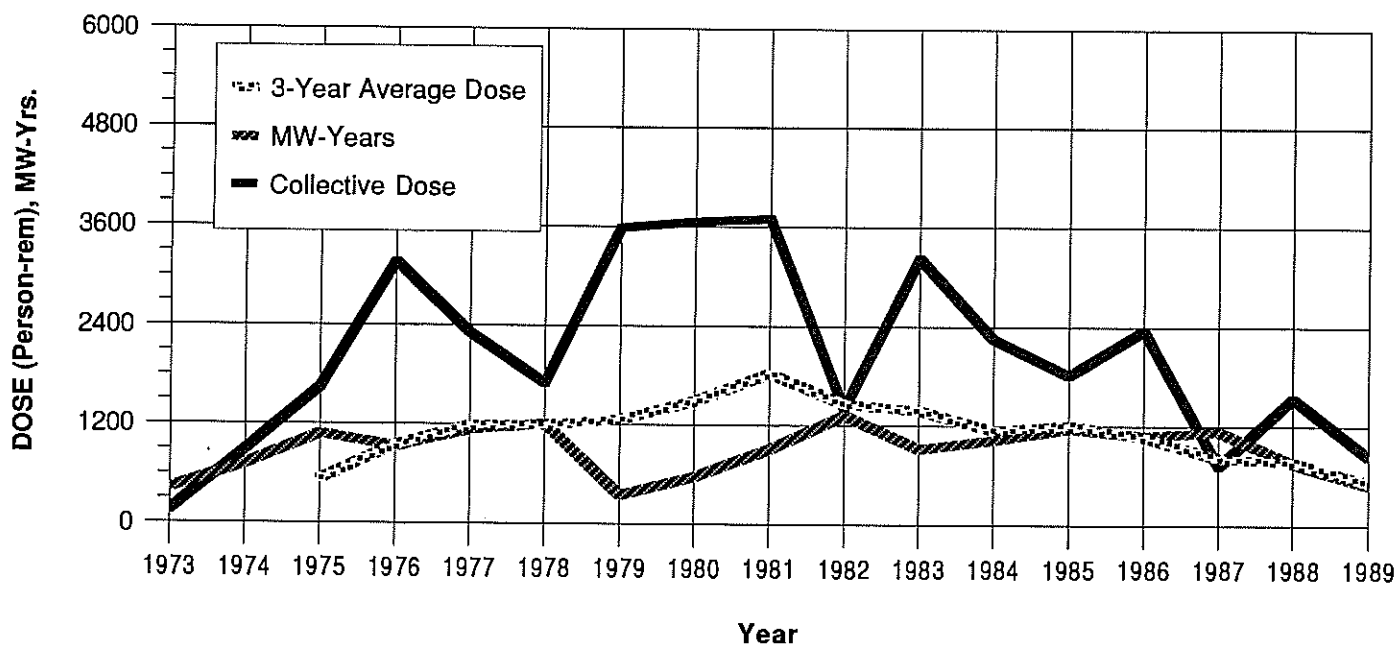
Contract

APPENDIX E (continued)

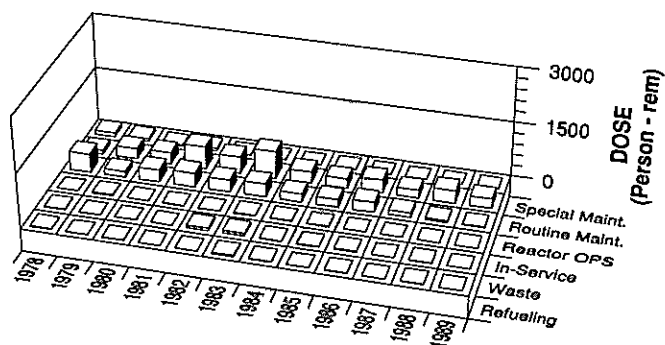
SURRY 1, 2

PWR

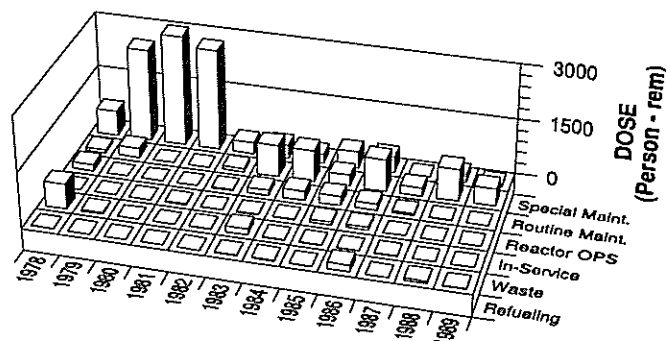
Dose-Performance Indicators



Breakdown By Job Function



Plant



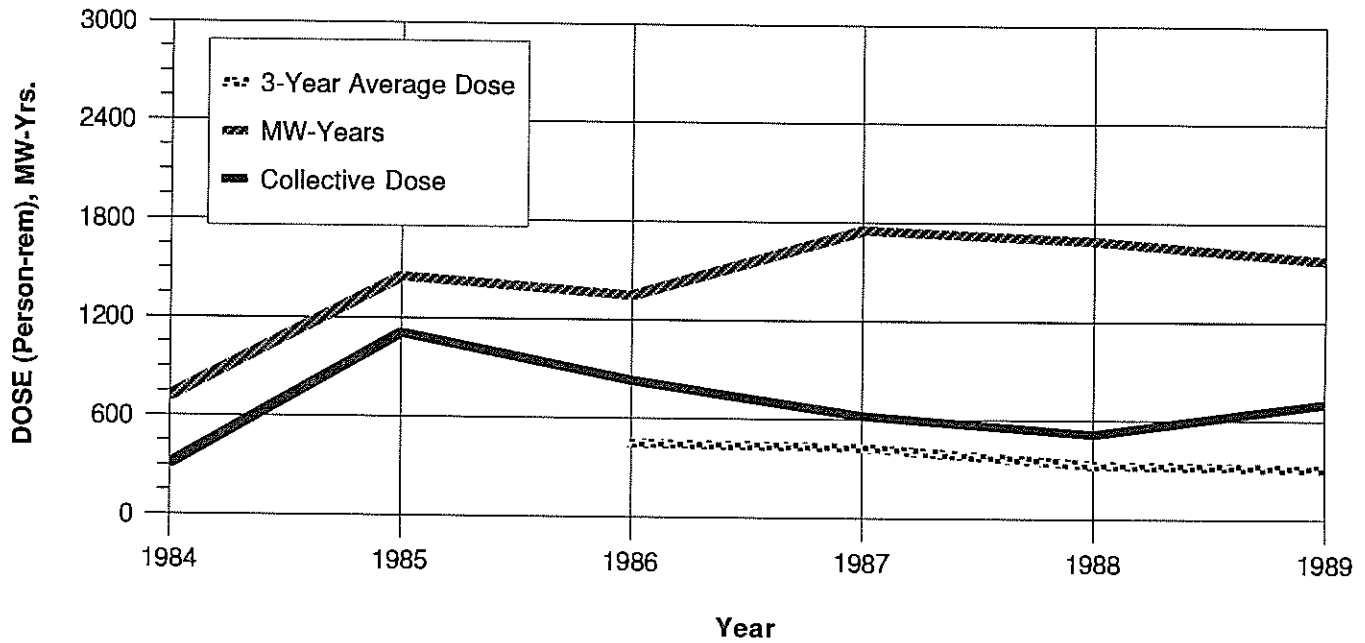
Contract

APPENDIX E (continued)

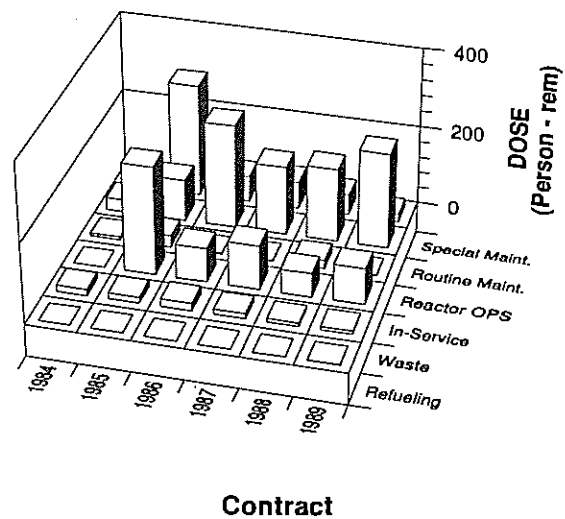
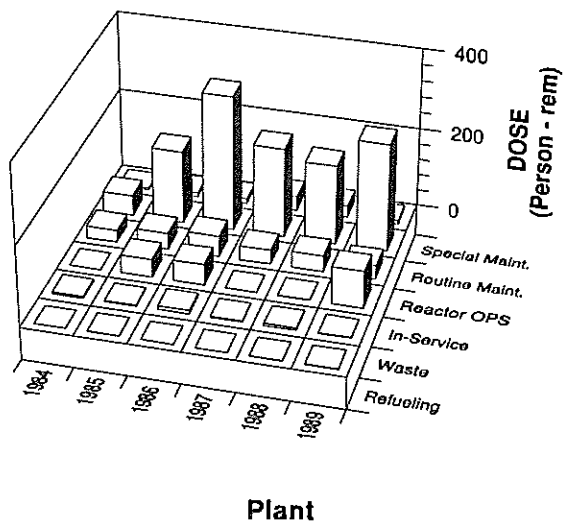
SUSQUEHANNA 1, 2

BWR

Dose-Performance Indicators



Breakdown By Job Function

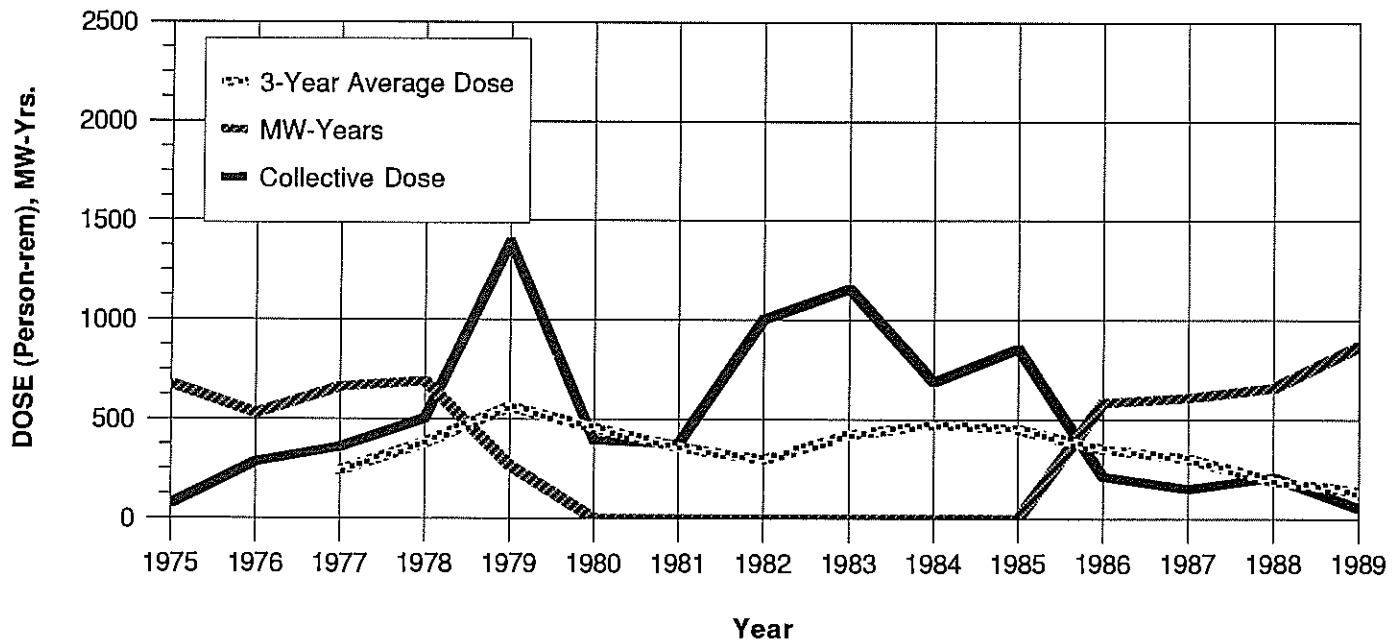


APPENDIX E (continued)

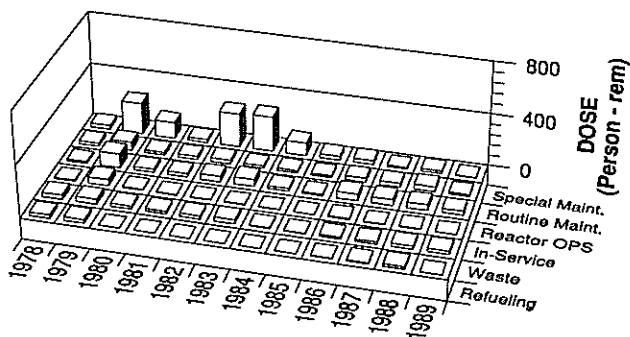
THREE MILE ISLAND 1

PWR

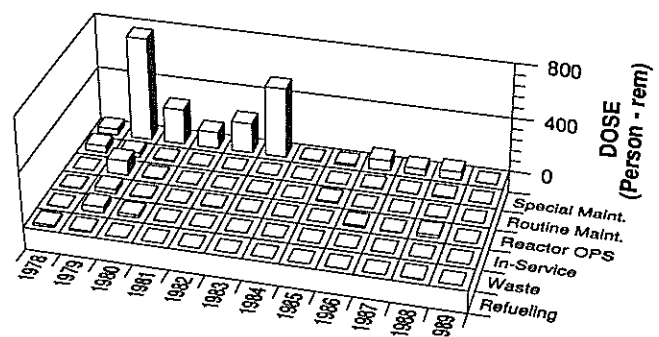
Dose-Performance Indicators



Breakdown By Job Function



Plant



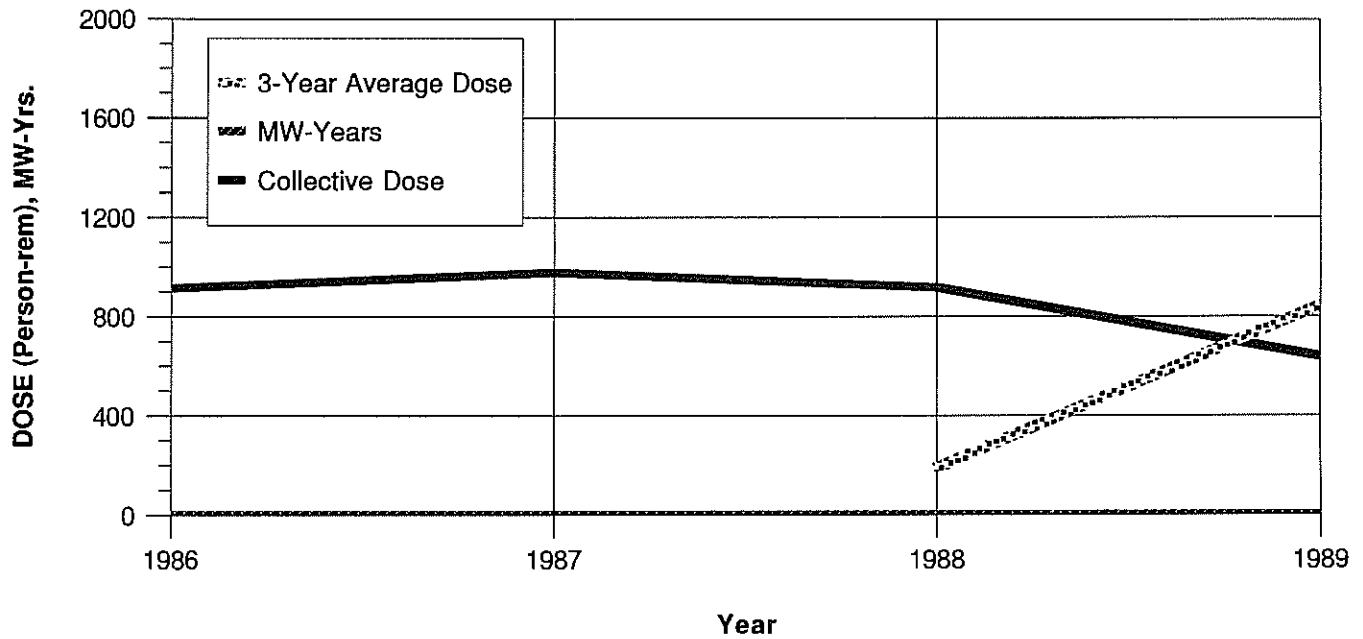
Contract

APPENDIX E (continued)

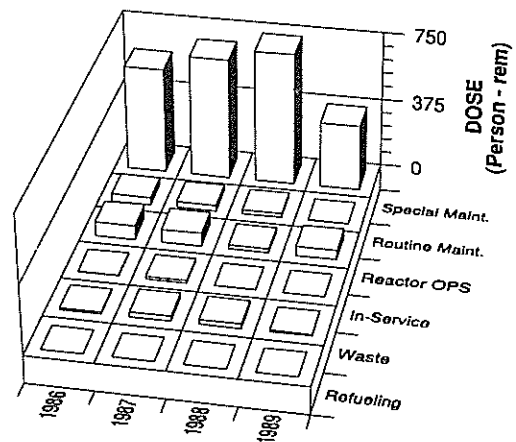
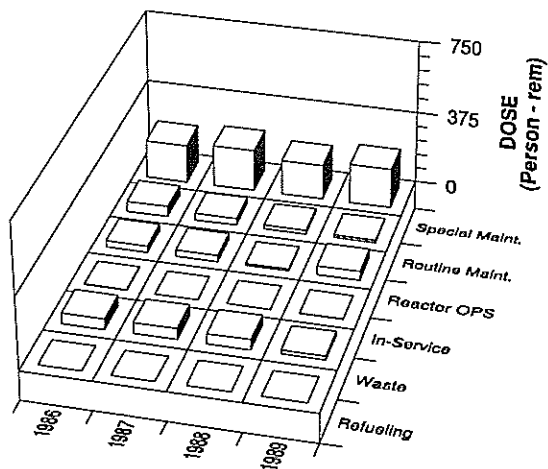
THREE MILE ISLAND 2

PWR

Dose-Performance Indicators



Breakdown By Job Function

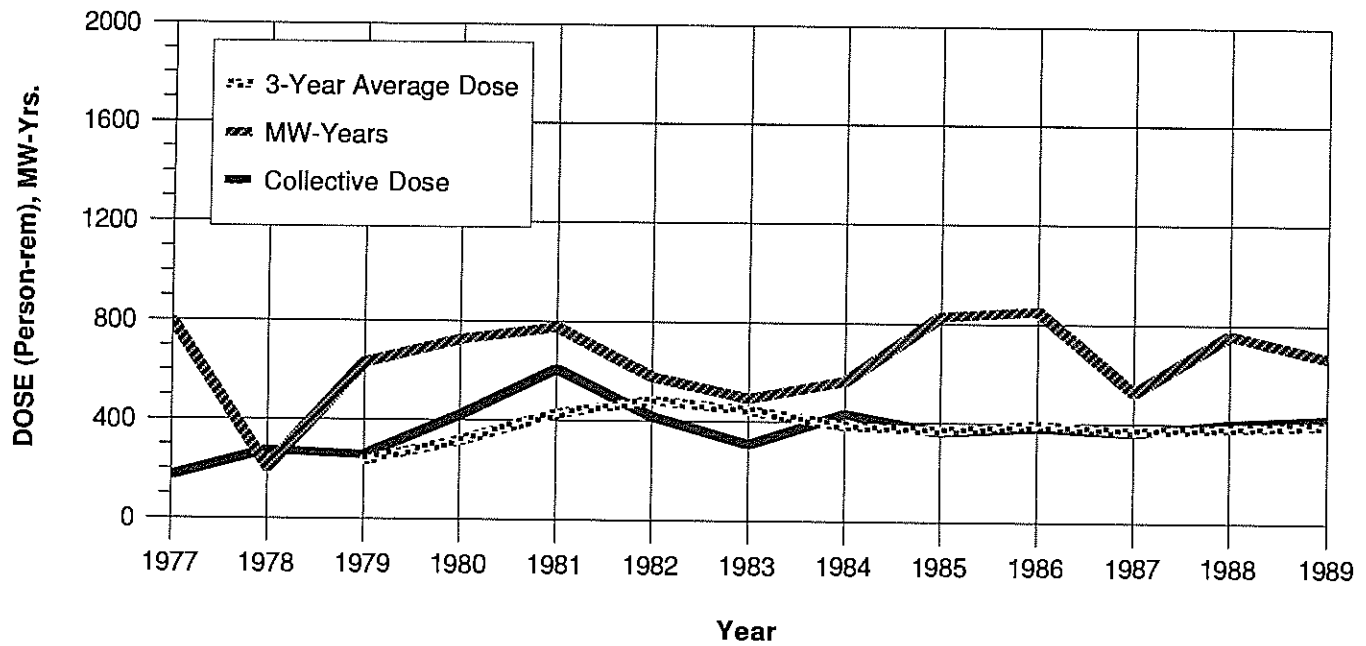


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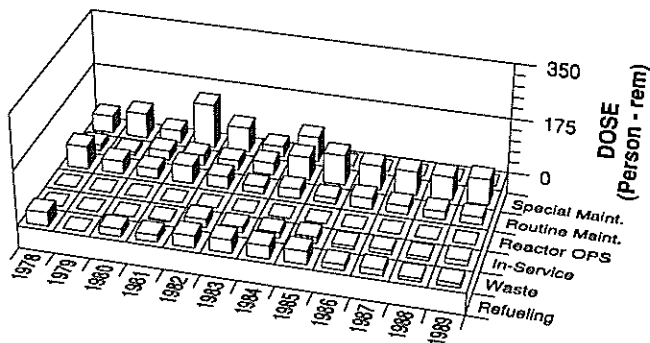
TROJAN

PWR

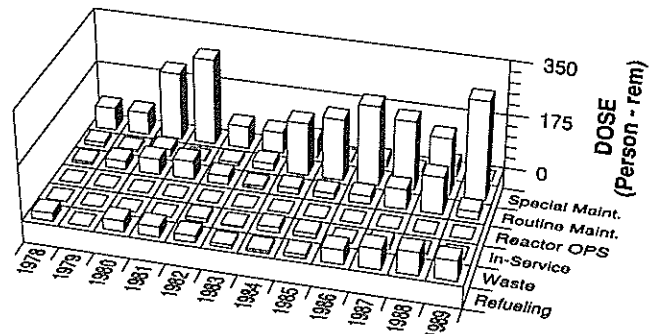
Dose-Performance Indicators



Breakdown By Job Function



Plant



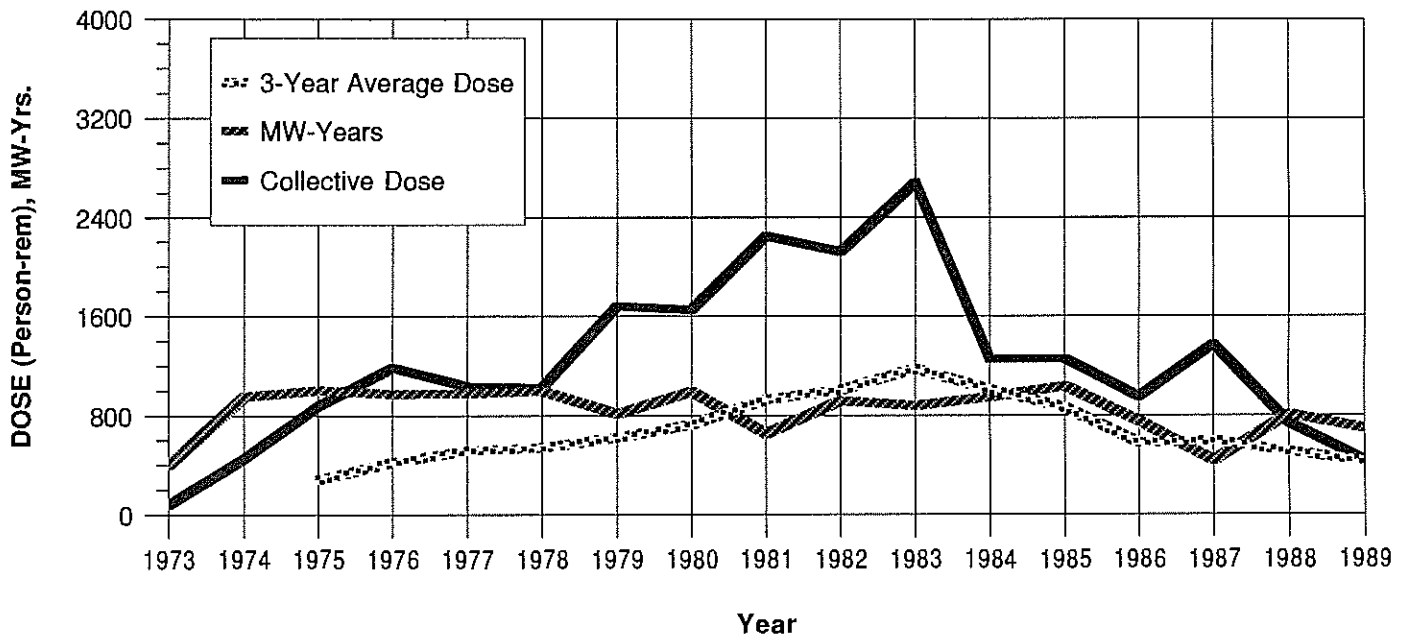
Contract

APPENDIX E (continued)

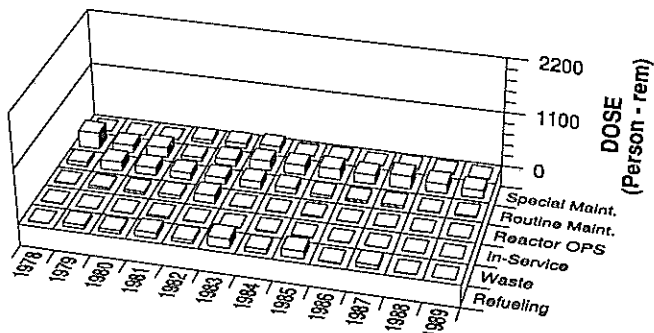
TURKEY POINT 3, 4

PWR

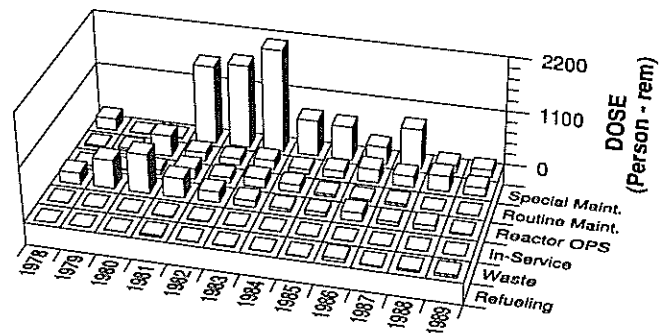
Dose-Performance Indicators



Breakdown By Job Function



Plant



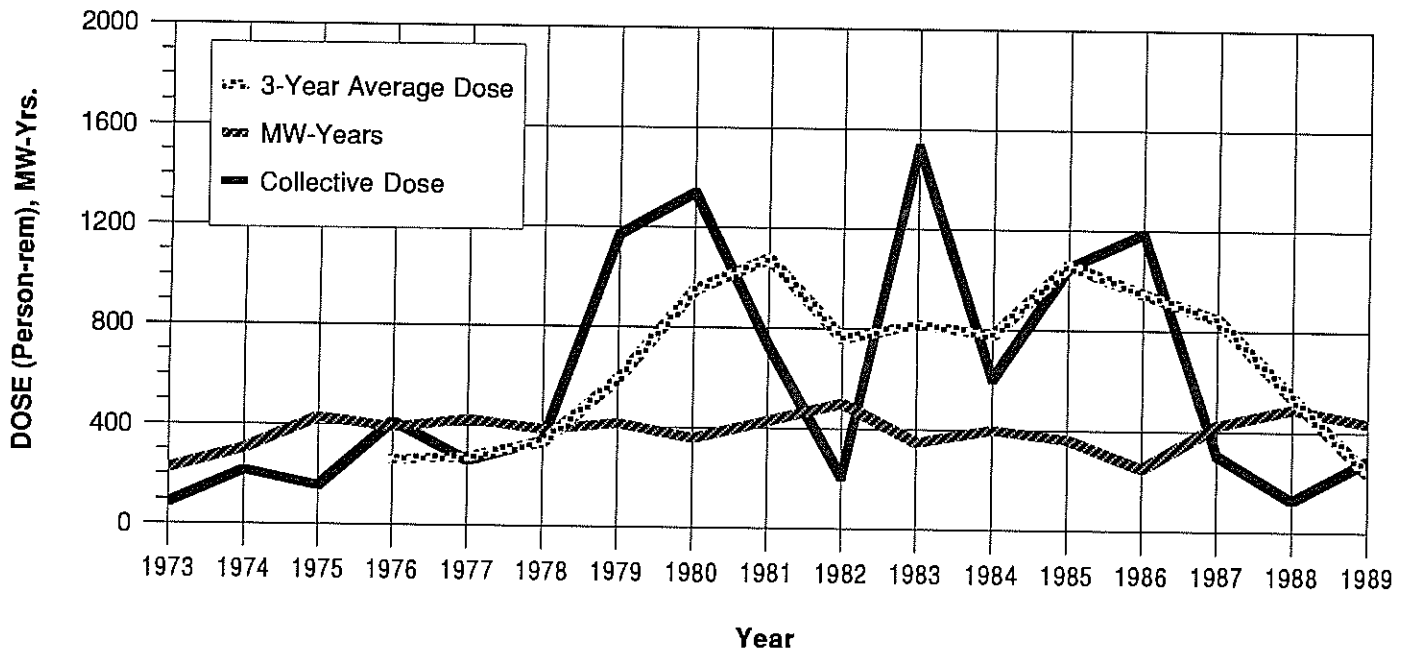
Contract

APPENDIX E (continued)

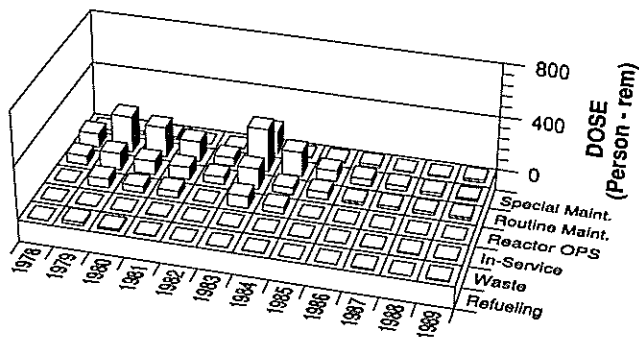
VERMONT YANKEE

BWR

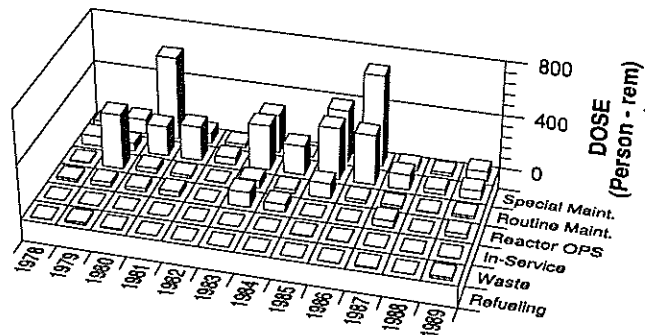
Dose-Performance Indicators



Breakdown By Job Function



Plant



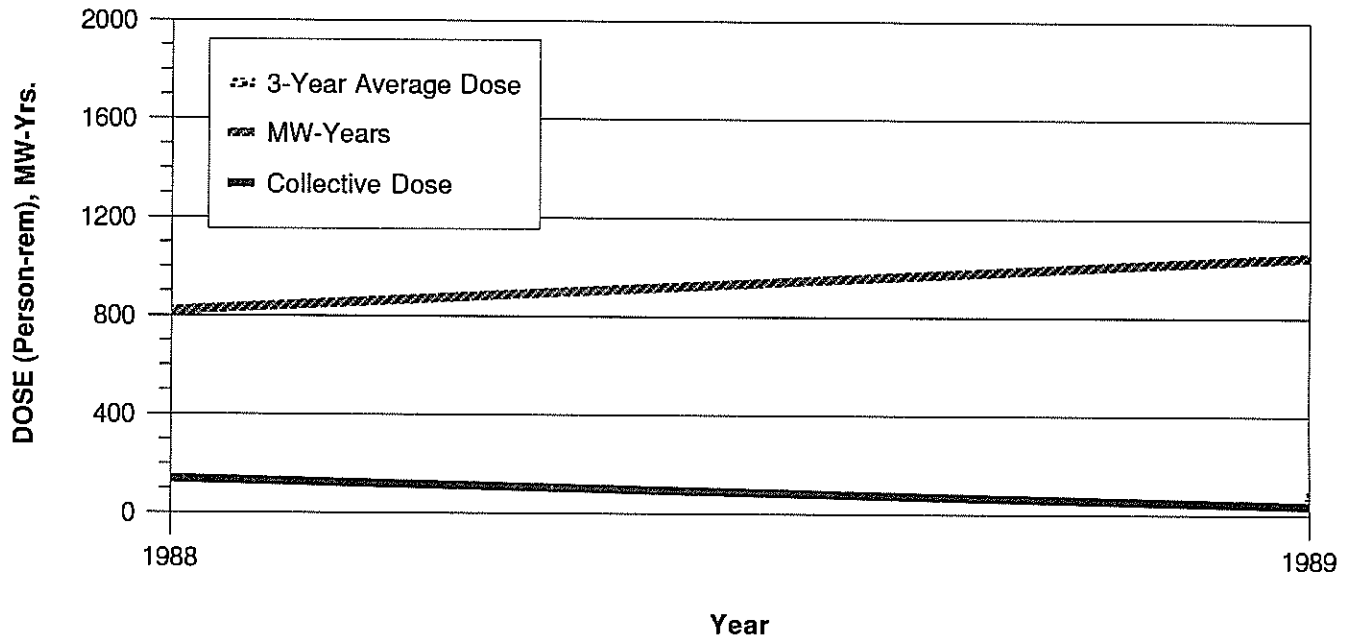
Contract

APPENDIX E (continued)

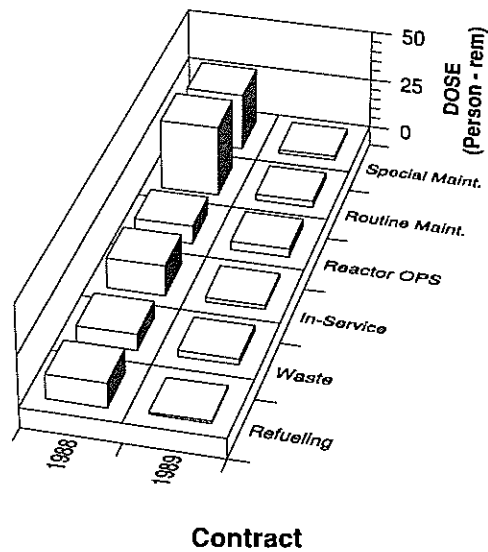
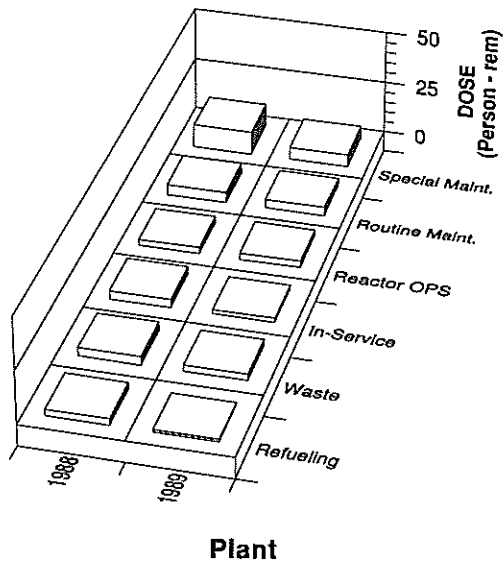
VOGTLE 1

PWR

Dose-Performance Indicators



Breakdown By Job Function

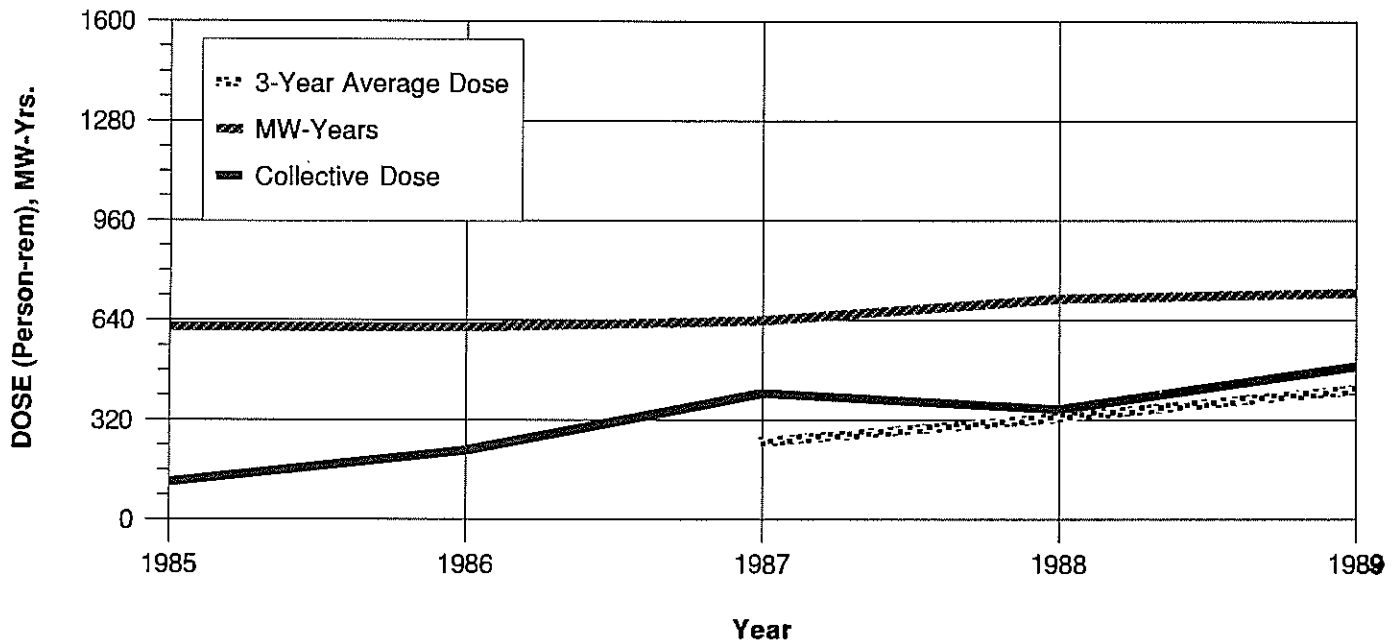


APPENDIX E (continued)

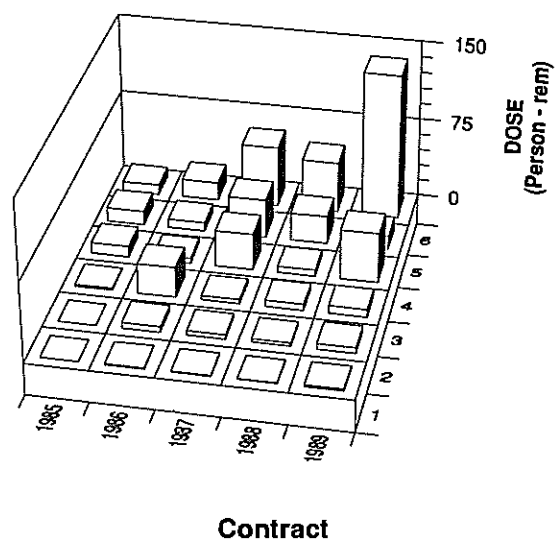
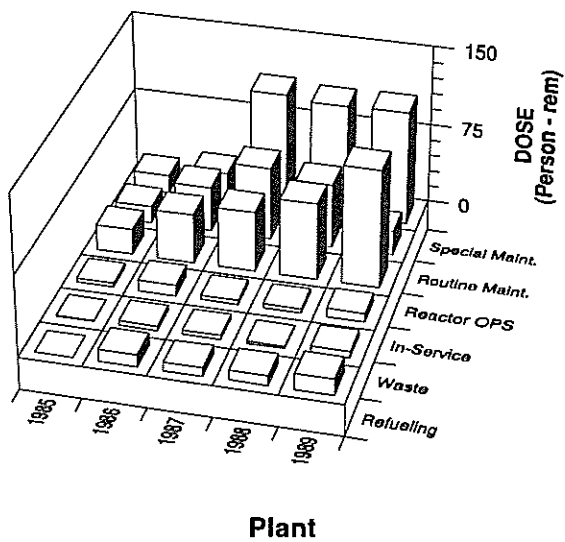
WASHINGTON NUCLEAR 2

BWR

Dose-Performance Indicators



Breakdown By Job Function

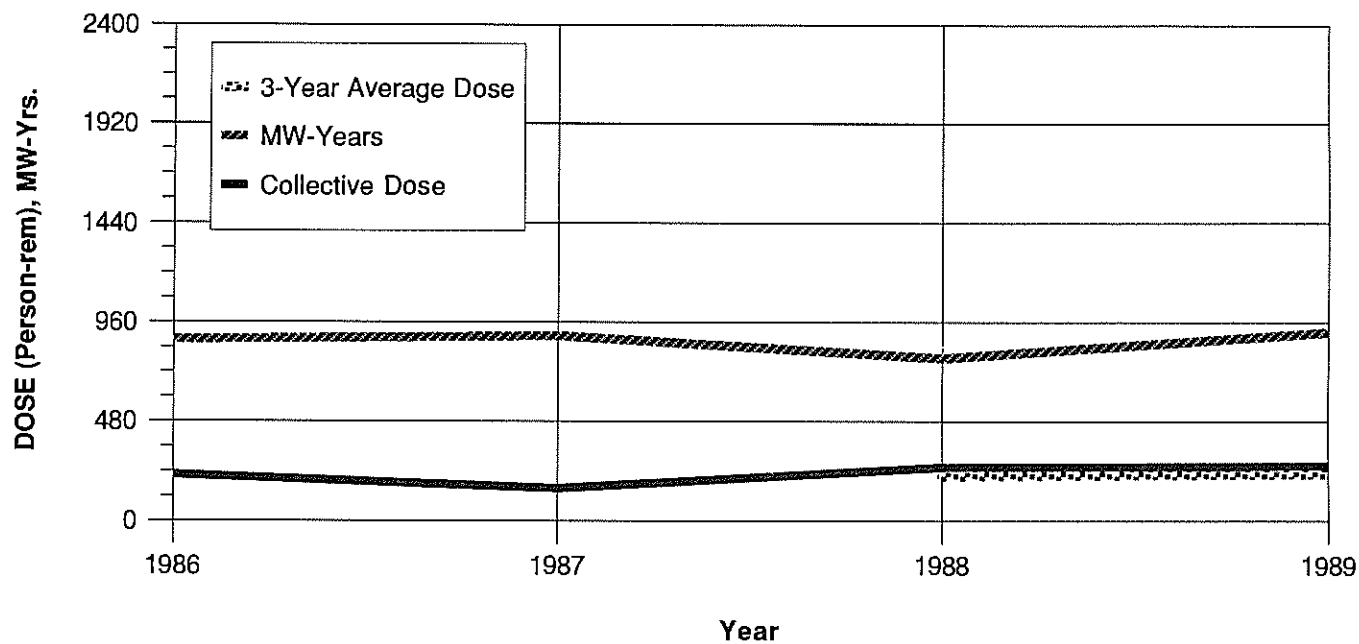


APPENDIX E (continued)

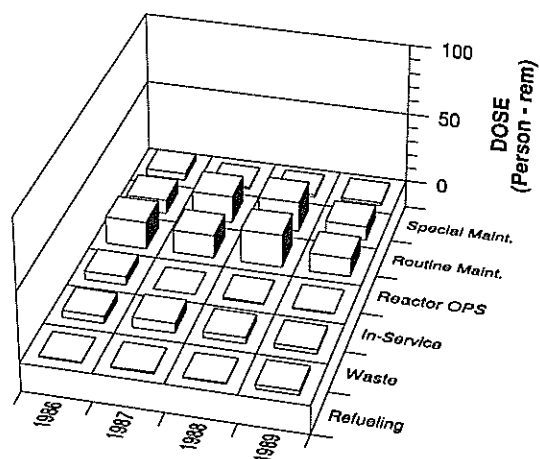
WATERFORD 3

PWR

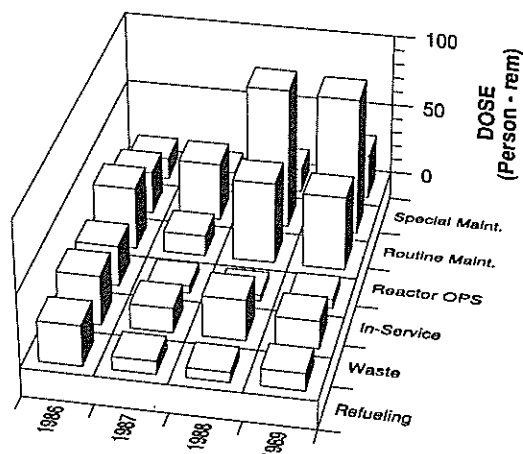
Dose-Performance Indicators



Breakdown By Job Function



Plant



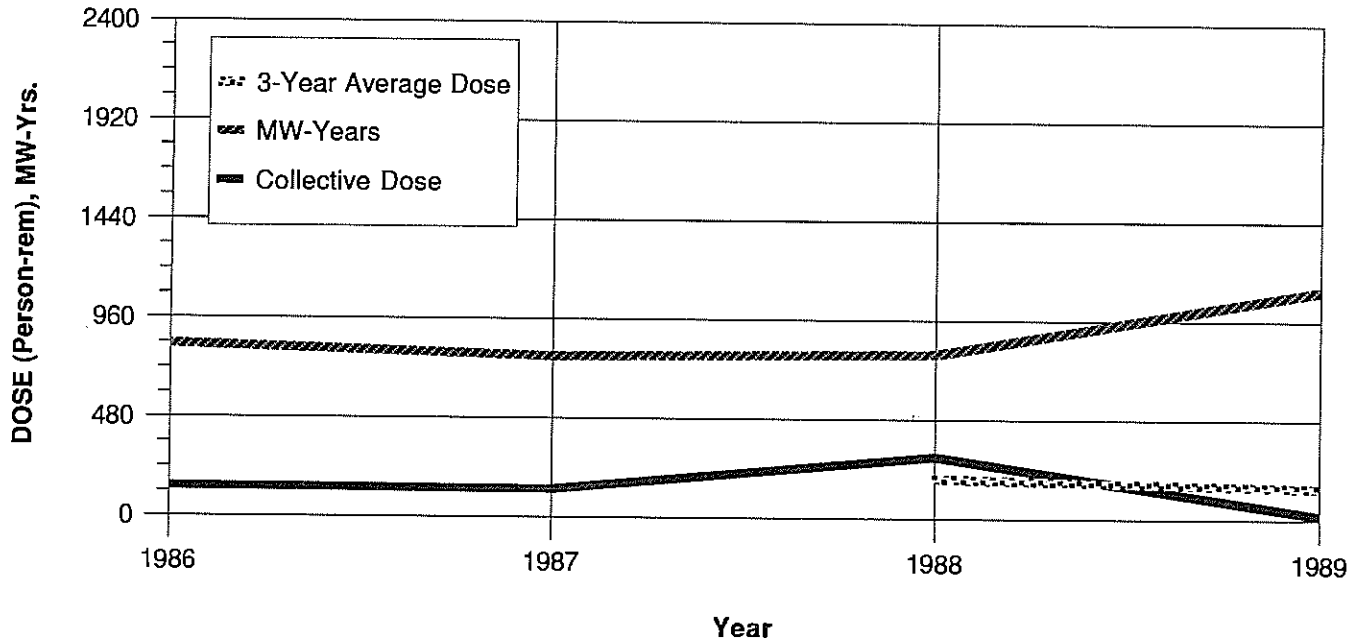
Contract

APPENDIX E (continued)

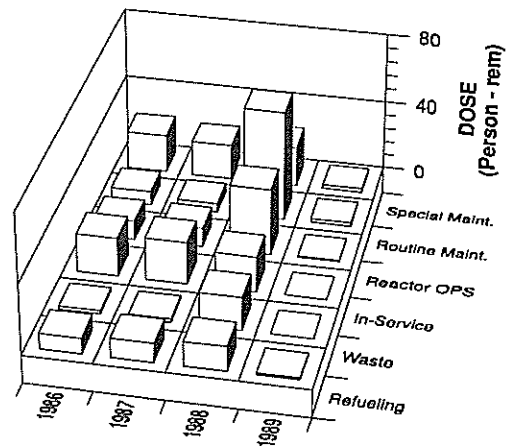
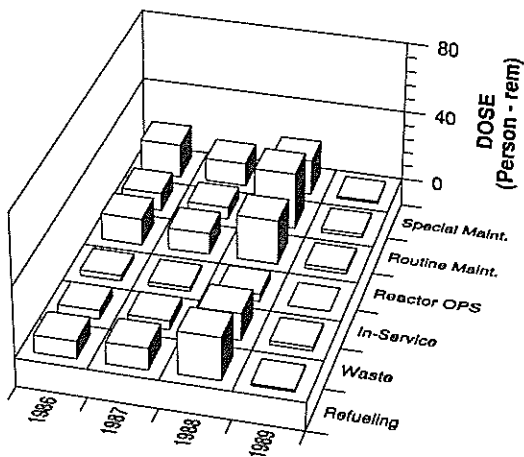
WOLF CREEK 1

PWR

Dose-Performance Indicators



Breakdown By Job Function

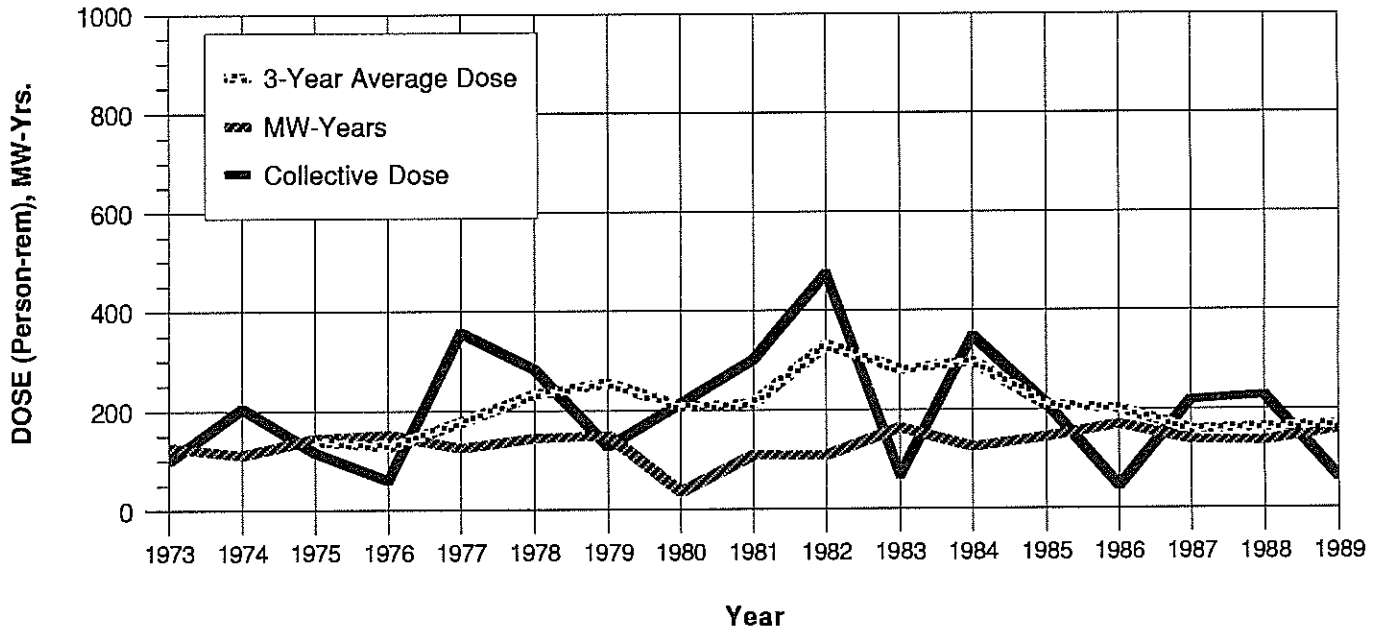


APPENDIX E (continued)

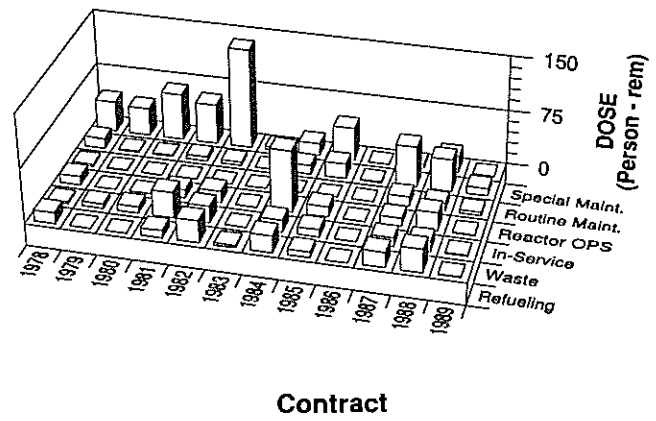
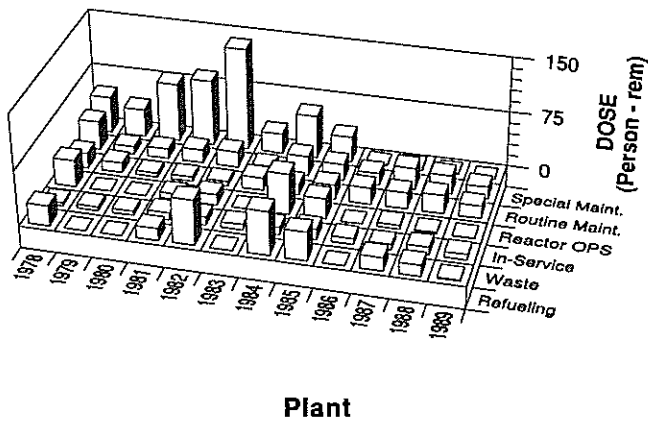
YANKEE-ROWE

PWR

Dose-Performance Indicators



Breakdown By Job Function

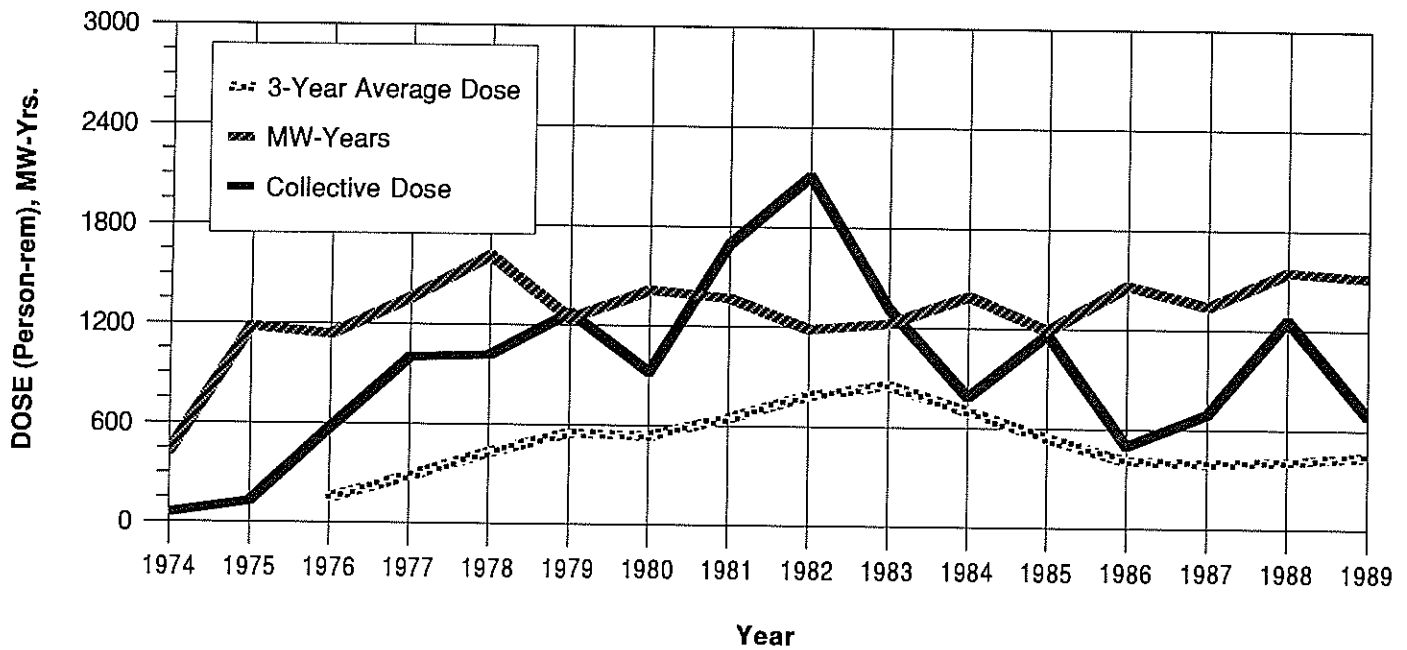


APPENDIX E (continued)

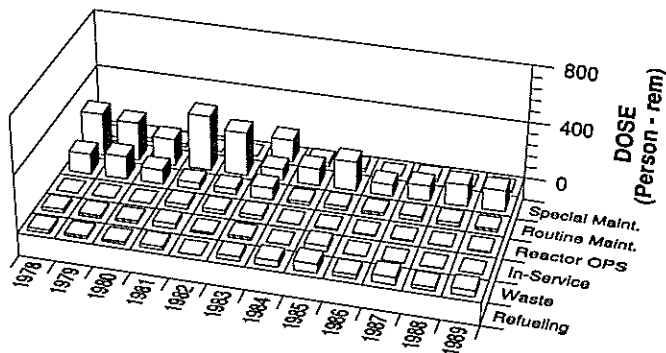
ZION 1, 2

PWR

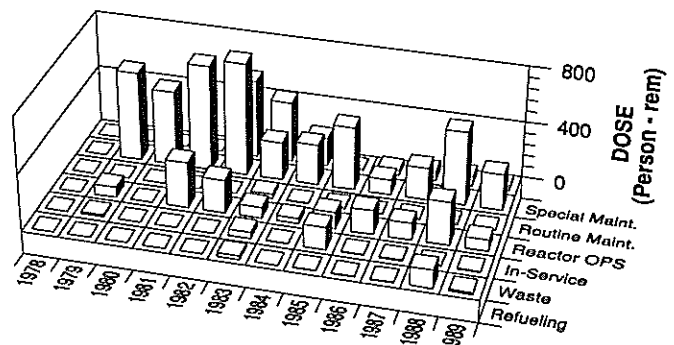
Dose-Performance Indicators



Breakdown By Job Function



Plant



Contract

APPENDIX F

Summary of Annual Whole Body Dose Distributions by Year and Reactor Type

1983-1989

APPENDIX F*
SUMMARY OF ANNUAL WHOLE BODY DOSE DISTRIBUTIONS BY YEAR AND REACTOR TYPE
1983-1989

YEAR AND REACTOR TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)																	TOTAL NUMBER MONITORED	NUMBER WITH MEAS. EXPOSURE	TOTAL COLLECTIVE DOSE	
	No Measurable	Meas. <0.10		0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.0-5.0	5-6.0	6-7.0	7-8.0	8-9.0	9-10	10-12				>12
1989 - BWRs	40,951	19,343	7,887	6,323	3,753	2,544	3,962	515	33									85,311	44,360	15,674	
1989 - PWRs	53,493	29,418	11,591	9,336	5,061	2,997	4,739	674	66	11								117,386	63,893	20,478	
1989 - LWRs	94,444	48,761	19,478	15,659	8,814	5,541	8,701	1,189	99	11								202,697	108,253	36,152	
1988 - BWRs	47,679	16,044	6,736	5,609	3,311	2,397	4,859	1,129	215	5								87,984	40,305	17,986	
1988 - PWRs	49,079	27,178	11,014	9,260	5,563	3,541	5,405	829	127	4			1					112,001	62,922	22,854	
1988 - LWRs	96,758	43,222	17,750	14,869	8,874	5,938	10,264	1,958	342	9			1					199,985	103,227	40,840	
1987 - BWRs	43,688	17,711	7,027	5,739	3,447	2,383	4,578	723	117	12								85,425	41,737	16,870	
1987 - PWRs	49,648	27,070	10,795	8,827	5,152	3,441	6,187	987	124	10								112,241	62,593	23,720	
1987 - LWRs	93,336	44,781	17,822	14,566	8,599	5,824	10,765	1,710	241	22								197,666	104,330	40,590	
1986 - BWRs	29,232	15,075	5,865	4,962	2,996	2,121	5,084	1,426	354	45								67,160	37,928	19,570	
1986 - PWRs	44,365	29,754	10,131	8,160	4,784	3,058	5,594	1,244	239	30								107,359	62,994	23,083	
1986 - LWRs	73,597	44,829	15,996	13,122	7,780	5,179	10,678	2,670	593	75								174,519	100,922	42,653	
1985 - BWRs	22,061	14,446	5,957	5,218	3,107	2,295	4,973	1,731	468	42								60,298	38,237	20,573	
1985 - PWRs	42,409	25,545	8,158	6,761	4,107	2,602	5,584	1,586	248	42								97,042	54,633	22,469	
1985 - LWRs	64,470	39,991	14,115	11,979	7,214	4,897	10,557	3,317	716	84								157,340	92,870	43,042	
1984 - BWRs	21,741	14,997	6,165	4,907	3,033	2,398	5,679	2,714	994	218								62,846	41,105	27,097	
1984 - PWRs	37,875	24,887	8,599	6,585	4,133	2,998	6,774	2,253	681	77								94,862	56,987	28,138	
1984 - LWRs	59,616	39,884	14,764	11,492	7,166	5,396	12,453	4,967	1,675	295								157,708	98,092	55,235	
1983 - BWRs	17,721	10,475	4,317	4,036	2,607	1,925	5,659	2,890	1,252	299								51,194	33,473	27,455	
1983 - PWRs	33,350	21,425	7,894	6,260	3,863	2,783	6,512	2,421	698	315								85,523	52,173	29,017	
1983 - LWRs	51,071	31,900	12,211	10,296	6,470	4,708	12,171	5,311	1,950	544								136,717	85,646	56,472	

* Figures contained herein are uncorrected for multiple reporting of transient individuals, and include only those reactors that have completed a full year of commercial operation in each of the years indicated.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

This report summarizes the occupational radiation exposure information that has been reported to the NRC's Radiation Exposure Information Reporting System (REIRS) by nuclear power facilities and certain other categories of NRC licensees during the years 1969 through 1989. The bulk of the data presented in the report was obtained from annual radiation exposure reports submitted in accordance with the requirements of 10 CFR 20.407 and the technical specifications of nuclear power plants. Data on workers terminating their employment at certain NRC licensed facilities were obtained from reports submitted pursuant to 10 CFR 20.408. The 1989 annual reports submitted by about 448 licensees indicated that approximately 216,294 individuals were monitored, 111,000 of whom were monitored by nuclear power facilities. They incurred an average individual dose of 0.18 rem (cSv) and an average measurable dose of 0.36 (cSv). Termination radiation exposure reports were analyzed to reveal that about 113,535 individuals completed their employment with one or more of the 448 covered licensees during 1989. Some 76,561 of these individuals terminated from power reactor facilities, and about 10,344 of them were considered to be transient workers who received an average dose of 0.64 rem (cSv).

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