

---

---

# Occupational Radiation Exposure at Commercial Nuclear Power Reactors And Other Facilities 1985

Eighteenth Annual Report

---

---

**U.S. Nuclear Regulatory  
Commission**

Office of Nuclear Regulatory Research

B.G. Brooks



## NOTICE

### Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 1717 H Street, N.W.  
Washington, DC 20555
2. The Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082,  
Washington, DC 20013-7082
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda; NRC Office of Inspection and Enforcement bulletins, circulars, information notices, inspection and investigation notices; Licensee Event Reports; vendor reports and correspondence; Commission papers; and applicant and licensee documents and correspondence.

The following documents in the NUREG series are available for purchase from the GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, and NRC booklets and brochures. Also available are Regulatory Guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

Documents available from the National Technical Information Service include NUREG series reports and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal and periodical articles, and transactions. *Federal Register* notices, federal and state legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Division of Information Support Services, Distribution Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

---

---

# Occupational Radiation Exposure at Commercial Nuclear Power Reactors And Other Facilities 1985

Eighteenth Annual Report

---

---

Manuscript Completed: March 1988  
Date Published: April 1988

B.G. Brooks

Division of Regulatory Applications  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555



# 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.

Previous reports in the NUREG-0714 series, which will are now combined with NUREG-0713 are as follows:

WASH-1350-R1 First through Sixth Annual Reports of the Operation of the U.S. AEC's Centralized Ionizing  
through  
WASH-1350-R6 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 1985 annual statistical reports submitted by six of the seven categories\* 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 1985 were received from a total of 480 NRC licensees, 93 of whom were licensed nuclear power reactors. Compilations of the 480 reports indicated that some 215,800 individuals were monitored, 113,300 of whom received a measurable dose (Table 3.2). The collective dose incurred by these individuals was calculated to be 47,500 person-rem (person-cSv)\*\* which represents a decrease of 20% from the 1984 value. Since the number of workers receiving a measurable dose remained about the same, the average measurable dose decreased from 0.55 rem (cSv) to 0.43 rem (cSv). About 13% of the monitored individuals were found to have received doses greater than 0.50 rem (cSv), down from the approximately 20% found for the previous four years. The number of individuals receiving doses greater than five rem (cSv) also continued to decrease.

Some 290,000 termination reports (Table 5.1) were submitted to the NRC which contained personal identification and exposure information for about 77,250 individuals who had completed their work assignment or employment with a covered category of NRC licensees during 1984. This number is approximately the same as reported for 1982 and 1983. Due to such a large number of records, the termination data for 1985 is not yet available. It should be noted that the data presented herein are revised from last year's report as additional termination data for 1983 and 1984 have now been entered into REIRS. The total number of monitored individuals for whom personal identification and exposure information has been incorporated into REIRS during the 17 years that it has been operating is now about 390,000, more than 300,000 of whom terminated from nuclear power facilities.

Analyses of these termination data indicate that about 7,400 individuals completed work assignments at two or more nuclear reactor facilities during calendar year 1984 and received an average dose of 1.05 rem (cSv). Approximately 3,000 of these individuals worked at two or more reactor facilities during one calendar quarter and received an average dose of 0.34 rem (cSv).

\* 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.

\*\* 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

In the fall of 1987, Science Applications International Corporation (SAIC) was selected to assist the NRC Staff in the preparation of the NUREG-0713 series. In the months and years ahead, SAIC will be suggesting periodic changes in the presentation of certain data by the NRC 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 B. G. Brooks, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 (301)492-3738.

## TABLE OF CONTENTS

	<u>Page</u>
EDITOR'S NOTE.....	iv
ABSTRACT.....	iii
PREFACE.....	ix
1 INTRODUCTION.....	1-1
2 LIMITATIONS OF THE DATA.....	2-1
3 ANNUAL PERSONNEL MONITORING REPORTS - 10 CFR § 20.407.....	3-1
3.1 Definition of Terms and Sources of Data.....	3-1
3.1.1 Statistical Summary Reports.....	3-1
3.1.2 Number of Monitored Individuals.....	3-1
3.1.3 Number of Workers with Measurable Doses.....	3-1
3.1.4 Collective Dose.....	3-1
3.1.5 Average Individual Dose.....	3-2
3.1.6 Average Measurable Dose.....	3-2
3.1.7 Number of Licensees Reporting.....	3-2
3.1.8 CR.....	3-2
3.2 Annual Whole Body Dose Distributions.....	3-4
3.3 Summary of Occupational Exposure Data By License Category.....	3-4
3.3.1 Industrial Radiography Licenses, Single and Multiple Locations.....	3-4
3.3.2 Manufacturer and Distributor Licenses, Broad and Other.....	3-9
3.3.3 Low-Level Waste Disposal Licenses.....	3-10
3.3.4 Independent Spent Fuel Storage Installation Licenses.....	3-12
3.3.5 Fuel Fabrication and Reprocessing Licenses.....	3-13
3.3.6 Light Water-Cooled Power Reactor (LWRs) Licenses...	3-17
3.3.7 High-Temperature Gas-Cooled Power Reactor (HTGR) Licenses.....	3-19
4 COMMERCIAL LIGHT WATER REACTORS - FURTHER ANALYSIS.....	4-1
4.1 Introduction.....	4-1
4.2 Definitions of Terms and Sources of Data.....	4-1
4.2.1 Number of Reactors.....	4-1
4.2.2 Electric Energy Generated.....	4-1
4.2.3 Collective Dose per Megawatt-Year.....	4-1
4.2.4 Average Rated Capacity.....	4-5
4.3 Annual Whole Body Dose Distributions.....	4-5

## TABLE OF CONTENTS (Continued)

	<u>Page</u>
4.4 Average Annual Whole Body Doses.....	4-5
4.5 Plant Rankings by Collective Dose per Reactor.....	4-11
4.6 Collective Dose by Work Function and Employee Type.....	4-16
4.7 Health Implications of Average Annual Doses.....	4-22
 5 TERMINATION DATA SUBMITTED PURSUANT TO 10 CFR § 20.408.....	 5-1
5.1 Termination Reports, 1969-1984.....	5-1
5.2 Limitations of Termination Data.....	5-1
5.3 Transient Workers per Calendar Quarter.....	5-3
5.4 Transient Workers per Calendar Year at Nuclear Power Facilities.....	5-3
5.5 Temporary Workers per Calendar Year at Nuclear Power Facilities.....	5-9
 6 PERSONNEL OVEREXPOSURES - 10 CFR § 20.403 and 10 CFR § 20.405..	 6-1
6.1 Control Levels.....	6-1
6.2 Summary of Overexposures.....	6-1
 REFERENCES.....	 7-1
 APPENDIX A - ALPHABETICAL LISTING OF ANNUAL EXPOSURE DATA COMPILED FOR CERTAIN NRC LICENSEES, 1985.....	 A-1
 APPENDIX B - ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES, 1985.....	 B-1
 APPENDIX C - PERSONNEL, DOSE, AND POWER GENERATION SUMMARY, 1969-1985.....	 C-1
 APPENDIX D - NUMBER OF PERSONNEL AND COLLECTIVE DOSE BY WORK AND JOB FUNCTION, 1985.....	 D-1
 APPENDIX E - SUMMARY OF ANNUAL WHOLE BODY DOSE DISTRIBUTIONS BY YEAR AND REACTOR TYPE, 1981-1985.....	 E-1

## LIST OF TABLES

### Table

Table 3.1 Annual Exposure Data for Certain Categories of Licensees, 1976-1985.....	3-3
Table 3.2 Distribution of Annual Whole Body Doses by License Category, 1985.....	3-5
Table 3.3 Summary of Annual Dose Distributions for Certain NRC Licensees, 1968-1985.....	3-6



## TABLE OF CONTENTS (Continued)

<u>Table</u>	<u>Page</u>
Table 3.4 Annual Exposure Information for Industrial Radiographers, 1983-1985.....	3-7
Table 3.5 Annual Exposure Information for Manufacturers and Distributors, 1983-1985.....	3-12
Table 3.6 Annual Exposure Information for Fuel Fabricators, 1983-1985.....	3-15
Table 3.7 Annual Exposure Information for Fort St. Vrain, 1974-1985.....	3-19
Table 4.1 Summary of Annual Information Reported by Commercial Boiling Water Reactors, 1973-1985.....	4-2
Table 4.2 Summary of Annual Information Reported by Commercial Pressurized Water Reactors, 1973-1985.....	4-3
Table 4.3 Summary of Annual Information Reported by Commercial Light Water Cooled Reactors, 1973-1985.....	4-4
Table 4.4 Summary Distribution of Annual Whole Body Doses at Commercial Light Water Reactors, 1973-1985.....	4-6
Table 4.5 Boiling Water Reactors Listed in Ascending Order of Collective Dose per Reactor, 1981-1985.....	4-12
Table 4.6 Pressurized Water Reactors Listed in Ascending Order of Collective Dose per Reactor, 1981-1985.....	4-13
Table 4.7a Five-year Totals and Averages Listed in Ascending Order of Collective Dose per BWR, 1981-1985.....	4-14
Table 4.7b Five-year Totals and Averages Listed in Ascending Order of Collective Dose per PWR, 1981-1985.....	4-15
Table 4.8 Annual Collective Dose by Work Function and Personnel Type, 1985.....	4-18
Table 4.9 Percentages of Annual Collective Dose at LWRs by Work Function, 1975-1985.....	4-19
Table 4.10 Annual Collective Dose by Occupation and Personnel Type, 1985.....	4-20
Table 5.1 Termination Reports Submitted to the NRC, 1969-1984....	5-2
Table 5.2 Transient Workers per Calendar Quarter, 1973-1984.....	5-4

## TABLE OF CONTENTS (Continued)

<u>Table</u>	<u>Page</u>
Table 5.3 Transient Workers per Calendar Year at Nuclear Power Facilities, 1977-1984.....	5-5
Table 5.4a Reported and Corrected Dose Distributions of Transient Workers per Calendar Year at Power Reactors.	5-7
Table 5.4b Effects of Transient Workers on Annual Statistical Compilations.....	5-8
Table 5.5 Annual Whole Body Doses Exceeding Five Rems at Nuclear Power Facilities.....	5-9
Table 5.6 Temporary Workers per Calendar Year at Nuclear Power Facilities.....	5-10
Table 6.1 Personnel Overexposures to External Radiation 1978-1985.....	6-2

## LIST OF FIGURES

<u>Figures</u>	
Figure 3.1 Annual Dose Distributions of Workers at Industrial Radiography Facilities, 1982-1985.....	3-8
Figure 3.2 Annual Dose Distributions of Workers at Manufacturing and Distribution Facilities, 1982-1985.....	3-11
Figure 3.3 Annual Dose Distributions of Workers at Low-Level Waste Disposal Facilities and at an Independent Spent Fuel Storage Facility, 1982-1985.....	3-14
Figure 3.4 Annual Dose Distributions of Workers at Fuel Fabricators and Processors, 1982-1985.....	3-16
Figure 3.5 Annual Dose Distributions of Workers at Light Water Reactor Facilities, 1983 and 1985.....	3-18
Figure 4.1 Average Collective Dose and Number of Workers per Reactor, 1973-1985.....	4-7
Figure 4.2 Annual Values at BWRs and PWRs, 1973-1985.....	4-8
Figure 4.3 Average Annual Values at LWRs, 1973-1985.....	4-9
Figure 4.4 Average, Median and Extreme Values of the Collective Dose per Reactor, 1973-1985.....	4-10
Figure 4.5 Collective Dose by Work Function and Personnel Type at BWRs and PWRs, 1979-1985.....	4-21

## PREFACE

A number of NRC Licensees have inquired as to how occupational radiation exposure data (from reports required by the NRC) 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, including individual and collective radiation doses from external sources as well as pertinent information on the inhalation of radioactive material (nuclides involved, bioassay results, exposure magnitude, etc.). 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 governmental monitoring of the potential transient-worker problem.
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 are considered in reviews of inspection frequencies that are programmed for various categories of licensees and may influence licensing actions.
8. 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.
9. The data provide information that may be used in the planning of epidemiological studies.

With regard to routine workplace conditions, 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 provide the only centralized data base available to assist the staff in the performance of its duties as listed above. It is to everyone's advantage if these duties are performed by a well-informed staff in the light of factual information.

A handwritten signature in dark ink, appearing to read "R E Alexander", followed by a long horizontal line that extends to the right.

Robert E. Alexander, Chief  
Radiation Protection and Health Effects Branch

Occupational Radiation Exposure  
at Commercial Nuclear Power Reactors and Other Facilities  
Eighteenth Annual Report, 1985

## 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 categories\* 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 maintained at the Oak Ridge National Laboratory Computer Technology Center in Oak Ridge, Tennessee. The computerization of these data ensured that they would be kept indefinitely and facilitated 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.

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.

---

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

In 1982 and 1983, paragraph 20.408(a) 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 Services, 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.

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. 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 half of the nuclear power reactors reported the actual collective dose so the figure shown for this category is more accurate.

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 in which his actual accumulated dose (the sum of his doses incurred at each facility) would have placed him. 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 he were involved in that activity for the full year.

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 byproduct material, and low-level waste disposal. Companies that conduct these types of activities in Agreement States\* 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.

---

\* 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 categories\* 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. Table 3.2 shows the dose ranges specified by 10 CFR § 20.407(b) among which the doses are distributed. In prior years, the annual report was formatted differently and was not very useful as a basis for estimating the collective dose.

##### 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 an individual's average measurable dose 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).

##### 3.1.4 Collective Dose

The concept of collective dose is used in this report to denote the summation of the whole body external dose received by each monitored individual and has the units person-rem (person-cSv)\*\*. The collective dose is not usually provided in the annual dose distribution reports

---

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

\*\* 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.

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 (shown in Table 1) 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 the NRC staff used these doses when provided, 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 by convenience.

### 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 1.5 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 CR is close to 0.50 for three of the categories and is much less than 0.50 for the remaining three categories for 1985. It should be noted that 1985 is the first year the CR

TABLE 3.1  
ANNUAL EXPOSURE DATA FOR CERTAIN CATEGORIES OF LICENSEES  
1976-1985

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	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
	1979	341	11,969	6,904	3,461	0.29	0.50	0.47
	1978	337	13,093	6,685	2,950	0.23	0.44	0.43
	1977	339	10,569	6,197	3,159	0.30	0.51	0.45
	1976	321	11,245	6,222	3,629	0.32	0.58	0.51
Manufacturing and Distribution	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
	1979	28	3,937	2,219	888	0.23	0.40	0.55
	1978	27	3,973	1,886	851	0.21	0.45	0.61
	1977	30	4,243	2,459	1,329	0.31	0.54	0.63
	1976	24	3,501	1,976	1,226	0.35	0.62	0.67
Low-Level Waste Disposal	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	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	1985	11	7,987	4,701	617	0.08	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
	1979	21	9,946	5,365	1,268	0.13	0.24	0.16
	1978	20	11,305	6,100	1,525	0.13	0.25	0.24
	1977	21	11,496	7,004	1,725	0.15	0.25	0.34
	1976	24	11,227	5,285	1,830	0.16	0.35	0.41
Commercial Light Water Reactors***	1985	93	191,132	97,978	43,624	0.23	0.44	0.44
	1984	88	169,242**	94,996**	55,353	0.32	0.58	0.55
	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
	1979	69	99,463**	62,316**	39,759	0.40	0.64	0.57
	1978	68	72,448**	45,474**	31,910	0.44	0.70	0.61
	1977	65	67,130**	42,867**	32,731	0.49	0.76	0.64
	1976	62	66,800	36,715	26,555	0.40	0.72	0.62
Grand Totals and Averages	1985	480	212,825	110,763	47,474	0.22	0.43	0.44
	1984	506	193,221**	108,520**	59,421	0.31	0.55	0.54
	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
	1979	459	125,316**	76,804**	45,376	0.36	0.59	0.55
	1978	453	100,819**	60,145**	37,236	0.37	0.62	0.59
	1977	455	93,438**	58,527**	38,944	0.42	0.67	0.62
	1976	428	92,773	50,198	33,240	0.36	0.66	0.60

\*These categories consist only of NRC licensees. Agreement States license organizations conducting industrial radiography, manufacturing and distribution, and low-level waste disposal in those states do not report occupational exposure data to the NRC.

\*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)

\*\*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, and excludes the gas-cooled reactor.

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 some 40%-70% of the doses are less than measurable. 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 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 no annual limit, annual exposures that exceed 12 rems (cSv) indicate that an over exposure has occurred. Any quarterly exposure in excess of the applicable quarterly limits must 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) since 1967. The number of individuals receiving an annual exposure in excess of five rems (cSv) has declined to remain at about one-tenth of one percent of the total number of individuals monitored each year for the period 1982 through 1984, and in 1985 this figure dropped to less than 0.01%.

### 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 340 radiography licensees in 1985, which is about the same number as reported since 1982.

Table 3.4 summarizes the reported data for the two types of radiography licenses for 1985 and for the previous two years for comparison purposes. The table shows that the number of workers receiving measurable doses (635) decreased by about 9%, while the collective dose (124) of workers at the

TABLE 3.2  
DISTRIBUTION OF ANNUAL WHOLE BODY DOSES BY LICENSE CATEGORY  
1985

LICENSE CATEGORY	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)*																	TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. DOSE	TOTAL COLLECTIVE DOSE (PERSON- cSv)
	No Meas- urable	<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	>12.00				
INDUSTRIAL RADIOGRAPHY																				
Single Location	1,068	469	74	46	11	11	15	6	1	1				1			1,703	635	124	
Multiple Locations	1,858	2,318	728	619	368	269	383	137	61	21	3	5	1			2	6,773	4,915	2,250	
Total	2,926	2,787	802	665	379	280	398	143	62	22	3	5	1	1	0	2	8,476	5,550	2,374	
MANUFACTURING AND DISTRIBUTION																				
Broad	1,493	1,269	239	127	77	63	102	58	31	1							3,460	1,967	668	
Other	215	158	58	31	8	7	11	6	1	1							498	283	87	
Total	1,708	1,427	297	158	85	70	113	64	32	2	2						3,958	2,250	755	
LOW-LEVEL WASTE DISPOSAL																				
Total	988	151	38	23	9	9	22										1,240	252	70	
INDEPENDENT SPENT FUEL STORAGE																				
Total	0	2	1	5	7	4	9	4									32	32	33	
FUEL FABRICATION																				
Uranium Fuel Process.	3,045	3,140	947	518	101	13	11	2									7,777	4,372	575	
Decommiss. of U and Pu																				
Fuel Facilities	519	242	9	4	7	13	25										819	300	68	
Total	3,564	3,382	956	522	108	26	36	2									8,596	5,032	643	
***COMMERCIAL POWER REACT.																				
Boiling Water Reactors	35,705	16,583	6,227	5,347	3,165	2,310	4,993	1,731	468	42							76,571	40,866	20,855	
Press. Water Reactors	55,718	29,136	8,615	6,898	4,125	2,606	5,587	1,586	248	42							114,561	58,843	22,769	
High Temp. Gas Reactors	1,929	370	40	15	7	4	7										2,372	443	35	
Total	93,352	46,089	14,882	12,260	7,297	4,920	10,587	3,317	716	84							193,504	100,152	43,659	
* GRAND TOTALS	102,538	53,838	16,976	13,633	7,885	5,309	11,165	3,530	810	108	5	5	1	1	0	2	215,806	113,268	47,534	

\*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 for a full year.

+ These values have not been adjusted for the multiple counting of transient reactor workers.

TABLE 3.3  
SUMMARY OF ANNUAL DOSE DISTRIBUTIONS FOR CERTAIN NRC LICENSEES  
1968-1985

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%	0.5%	3
1969	31,176		96.5%	0.5%	7
1970	36,164		96.1%	0.6%	0
1971	36,311		96.3%	0.7%	1
1972	44,690		95.7%	0.5%	8
1973	67,862		95.0%	0.5%	1
1974	85,097		96.4%	0.3%	1
1975	78,713		94.8%	0.5%	1
1976	92,773		95.0%	0.4%	3
1977	98,212	(93,438)	93.8%*	0.4%*	1
1978	105,893	(100,818)	94.6%*	0.2%*	3
1979	131,027	(125,316)	95.2%*	0.2%*	1
1980	159,177	(150,675)	94.6%*	0.3%*	0
1981	157,874	(149,314)	94.6%*	0.2%*	1
1982	162,456	(154,117)	94.9%*	0.1%*	0
1983	172,927	(164,239)	94.6%*	0.1%*	0
1984	204,136	(194,840)	95.9%*	0.1%*	0
1985	215,197		97.9%	<0.01%	2

\* Based on the distribution of individual doses after adjusting for the multiple counting of transient reactor works (see Section 5).

single-location facilities decreased by about 37% from the 1984 values. This resulted in the average measurable dose falling to 0.20 rem (cSv) in 1985. The number of monitored workers at firms having multiple-location licenses increased by about 1% but the collective dose decreased by about 2%. This resulted in the average measurable dose decreasing slightly to 0.46 rem (cSv). Overall, the average measurable dose for radiography workers continues to remain at a little less than one-half rem (cSv), as it has for the last several years, while the average dose for workers performing radiography at a single location is usually about half this amount. This is 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 1985 is presented in alphabetical order in Appendix A.

TABLE 3.4  
ANNUAL EXPOSURE INFORMATION FOR INDUSTRIAL RADIOGRAPHERS  
1983-1985

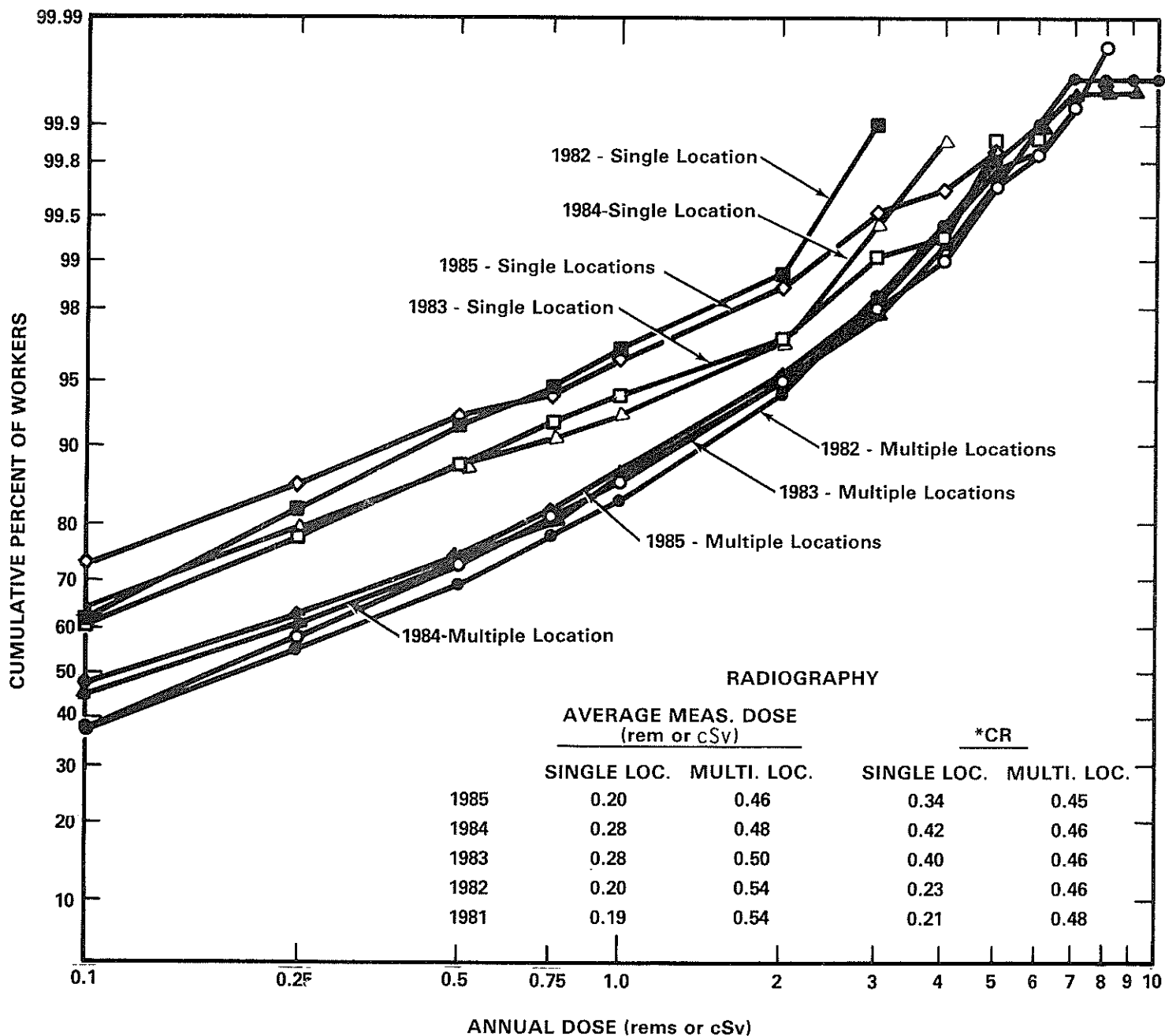
Year	Type of License	Number of Licenses	Number of Monitored Individuals	Workers with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Measurable Dose (rem or cSv)
1985	Single location	111	1,703	635	124	0.20
	Multiple locations	229	6,773	4,915	2,250	0.46
	Total	340	8,476	5,550	2,374	0.43
1984	Single location	129	1,778	701	196	0.28
	Multiple locations	232	6,680	4,745	2,294	0.48
	Total	361	8,458	5,446	2,490	0.46
1983	Single location	128	1,714	773	213	0.28
	Multiple locations	210	6,910	4,358	2,171	0.50
	Total	338	8,624	5,131	2,384	0.46

Since personnel monitoring data has frequently been found to have log-normal distributions [Ref. 11], trends in the data reported by radiography licensees may be observed from log probability plots\* of data (see for example Fig. 3.1). 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 average 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, because it is not possible to plot 100% on these figures, the data for the highest dose group must be inferred from the plotted data.

For example, if the last plotted point on a curve represented 90% at one rem, it must be inferred that the remaining 10% of workers fell in the range one to two rems (ie., none exceeded 2 rems) Figure 3.1 displays such plots of the doses incurred by workers monitored by the two types of radiography licensees for each of the years 1982 through 1985. The plots of the dose distributions of workers at single-location radiography facilities, where the workers receive doses that are lower than those usually received by

\* 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.

Figure 3.1  
ANNUAL DOSE DISTRIBUTION OF WORKERS  
AT INDUSTRIAL RADIOGRAPHY FACILITIES  
1982 - 1985



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



workers at multiple-location facilities, form fairly straight lines and usually lie above those of the multiple-location facilities.

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 1985, about 87% of the workers monitored by firms licensed for radiography at multiple locations received doses that were less than one rem (cSv), while some 96% of the workers monitored at single location radiography facilities received such doses. Also, the relative positions and curvature of the graphs are indicative of certain characteristics of the dose distributions. This is demonstrated by the positions of the 1982 and 1985 plots of the dose distribution of workers at single-location 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 fact that there was a smaller proportion of workers with doses that exceeded three rems (cSv) in 1982 and 1985 as compared to 1983 and 1984. The plots of the multiple-location licensees appear to be inching upwards, and one finds that the average doses and values of CR exhibit a decreasing trend, overall.

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.

### 3.3.2 Manufacturer and Distributor Licenses, Broad and Other

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. 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 Other 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. Other 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 and smoke detectors, and radiochemicals for nonmedical research. However, only those NRC licensees (about 35) 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 1985 and the previous two years. The total number of workers receiving measurable doses as reported by these types of licensees increased by about 14% to 2,250 workers in 1985. The collective dose also increased by about the same percentage so that the average dose remained about 0.34 rem (cSv). Looking at the information shown separately for the Broad and Other 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 Other 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 included as a Broad licensee one year and an Other 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.

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 alphabetical order by licensee name for 1985.

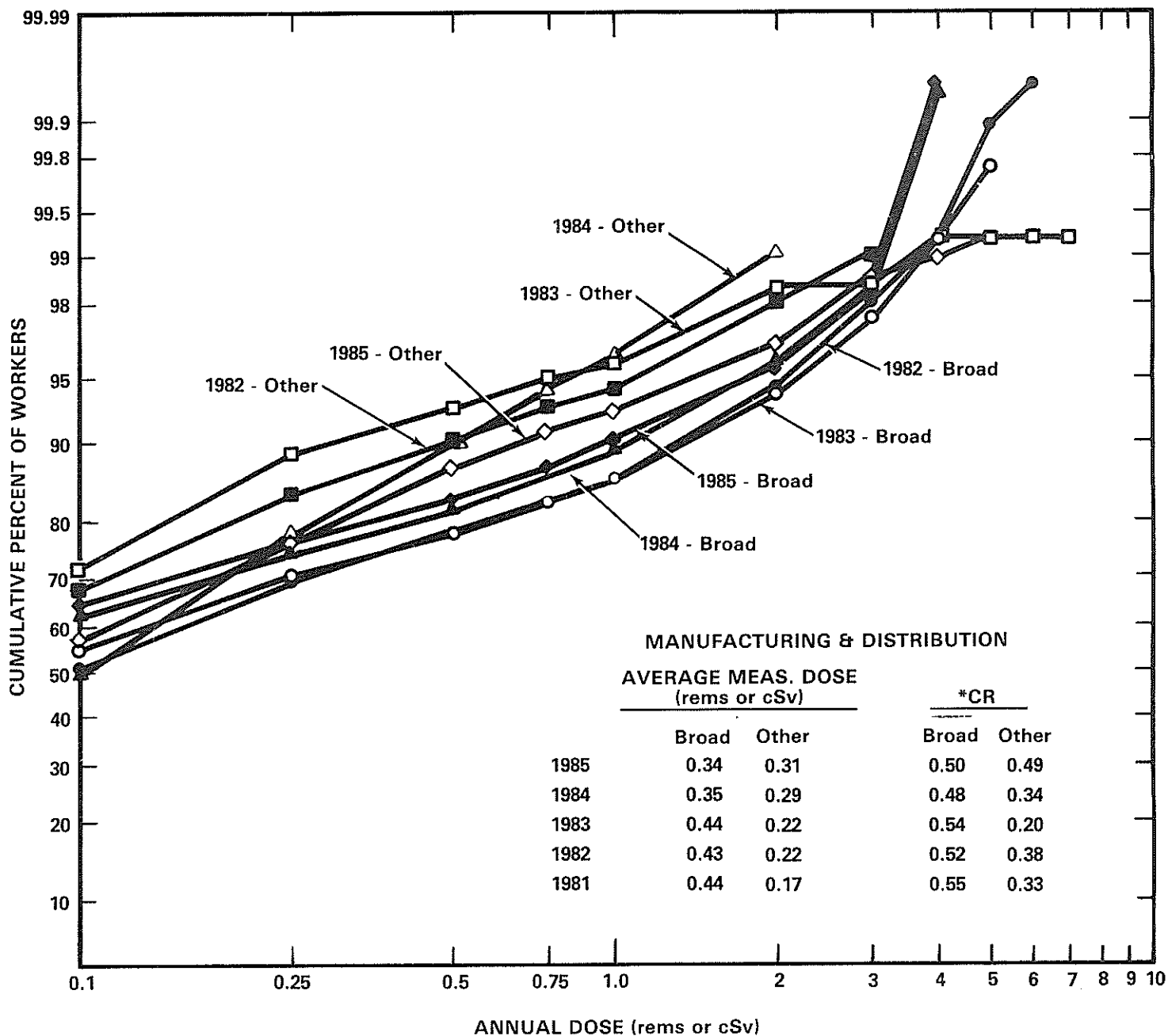
Figure 3.2 displays log probability plots of the doses incurred by workers under the two types of manufacturing and distribution licenses for the years 1982 through 1985. The position of the curves plotted for the Other licenses above those plotted for the Broad licenses indicates that a larger portion of the workers reported by the Other licensees have lower doses than those reported by the Broad licensees. For example, the graphs show that about 90% of workers monitored by the broad licensees received doses that were less than one rem (cSv), while about 93% of the workers monitored by the Other licensees received such doses in 1985.

### 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. Two licensees in this category submitted annual reports in 1984 and 1985, while in 1982 and 1983 there was only one licensee in this category. Table 3.1 summarizes the data reported for 1982 through 1985. In 1985, the total number of monitored individuals increased by about 34% to 1,240 individuals. However, the number of workers receiving measurable doses decreased somewhat so that although the collective dose, 70

Figure 3.2  
ANNUAL DOSE DISTRIBUTION OF WORKERS  
AT MANUFACTURING & DISTRIBUTION FACILITIES  
1982 - 1985



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

TABLE 3.5  
ANNUAL EXPOSURE INFORMATION FOR MANUFACTURERS AND DISTRIBUTORS  
1983-1985

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)
1985	M & D-Broad	12	3,460	1,967	668	0.34
	M & D-Other	21	498	283	87	0.31
	Total	33	3,958	2,250	755	0.34
1984	M & D-Broad	13	4,625	1,716	594	0.35
	M & D-Other*	27	451	261	77	0.29
	Total*	40	5,076	1,977	671	0.34
1983	M & D-Broad	16	4,332	1,744	767	0.44
	M & D-Other	17	719	259	57	0.22
	Total	33	5,051	2,003	824	0.41

\* The figures for 1984 were corrected to include data for two licensees that had been erroneously excluded from this category.

person-rem (person-cSv), remained about the same as that found for the previous two years, the average measurable dose rose slightly to 0.28 rem (cSv).

Figure 3.3 displays log probability plots of the doses incurred by workers at the low-level waste disposal facilities from 1982 through 1985. One can quickly see that the distributions are quite similar, with all of the doses being two rem (cSv) or less, and 96% of the doses being less than one rem (cSv) each year. However, the position of the plot for 1985 below that of the others is indicative of the increases in the average dose and CR. Appendix A summarizes the exposure information reported by these two licensees in 1985.

#### 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. Presently, there is only one license for a facility that is not located at a nuclear power plant. Two other licenses have been issued to nuclear power utilities and any doses due to the storage of spent fuel are included in the annual dose report submitted for the utilities' nuclear power plants.

Table 3.1 summarizes the data submitted for 1982 through 1985 by the only ISFSI that is separate from a nuclear power plant. Only about 35 individuals have been monitored at the facility each year. However, in 1984 the collective dose increased to a value of 13 person-rem (person-cSv), and in 1985 the collective dose increased to 34 person-rem (person-cSv). The number of workers receiving measurable doses, however, remained at 32 so that the average dose increased to 1.06 rem (cSv) in 1985. These increases were primarily due to significant increase in the amount of incoming spent fuel. Also, the licensee reports the doses of only those workers required to be monitored for exposure to radiation instead of the doses of all individuals for whom monitoring was provided. This results in the calculation of a higher average dose.

Figure 3.3 displays log probability plots of the doses incurred by workers at the ISFSI for the years 1982 through 1985. The plots are quite similar for 1982 and 1983 when all doses were less than 0.75 rem so the value of CR was zero each year. The position of the plot of the 1985 data considerably below that of the previous years indicates more doses in the higher ranges and is reflected in the higher value (0.51) of CR. However, the figure shows that all doses remained less than 3 rem (cSv).

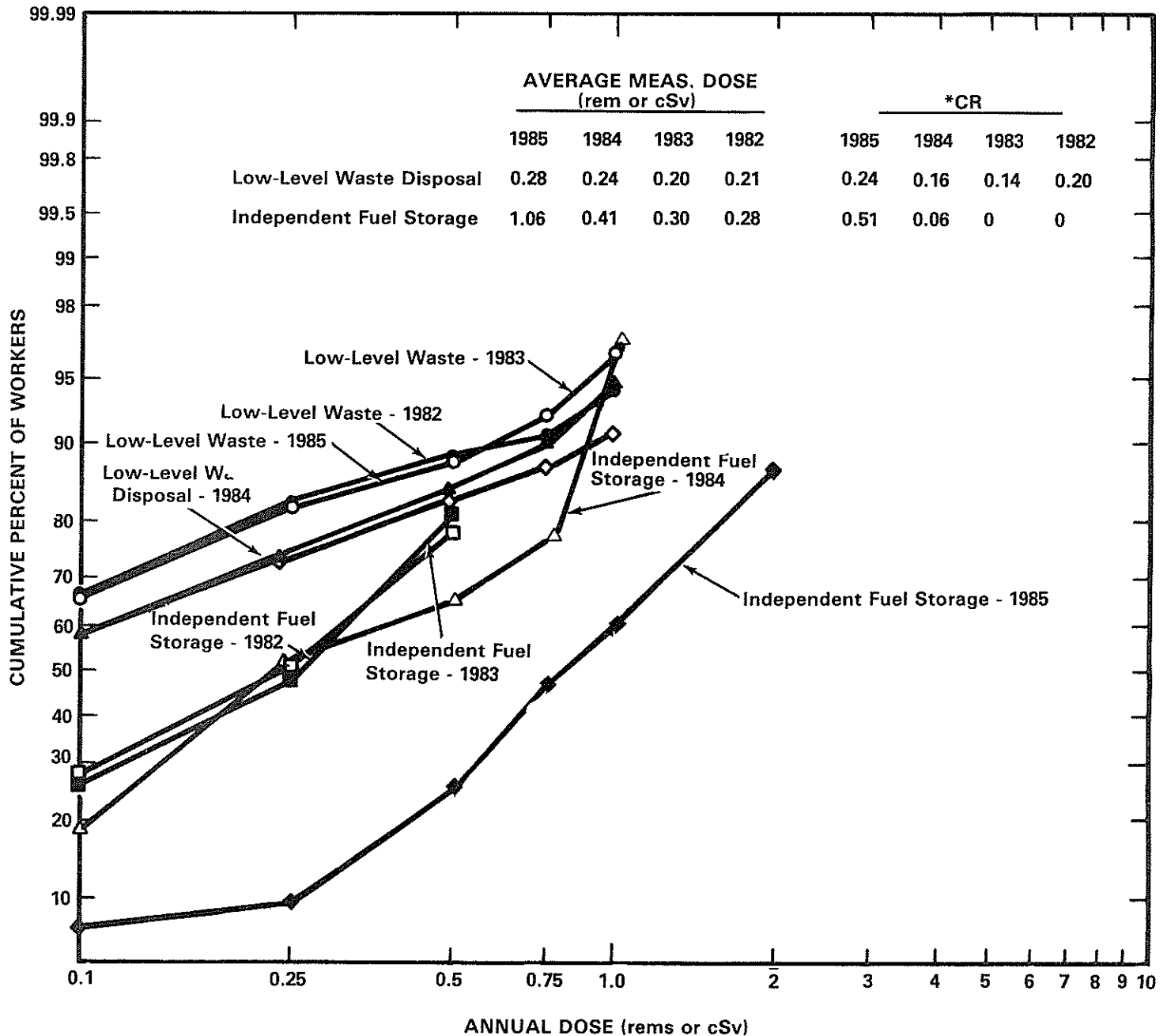
### 3.3.5 Fuel Fabrication and Reprocessing Licenses

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.

The number of facilities licensed by the NRC to fabricate fuel, especially plutonium fuel, has been decreasing for the last several years (Table 3.1). Therefore, a number of licensees ceased fuel fabrication and began decommissioning activities so that the information that was provided for these years is shown as "Decommissioning" in Table 3.6.

Table 3.6 shows that in 1985 the number of licensees involved in fuel fabrication and decommissioning activities continued to decline, as did the collective dose. One of the licensees (SNM-0021, see Appendix A) that was included with the uranium fuel fabricators in previous years had fuel fabrication activities dropped from their license in 1984. Therefore, in 1985, this licensee's data are shown in the "Decommissioning" category. However, most of the dose incurred by workers monitored by this licensee

Figure 3.3  
ANNUAL DOSE DISTRIBUTION OF WORKERS AT LOW-LEVEL WASTE  
DISPOSAL FACILITIES AND AT AN INDEPENDENT SPENT FUEL STORAGE FACILITY  
1982 - 1985



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

TABLE 3.6  
ANNUAL EXPOSURE INFORMATION FOR FUEL FABRICATORS  
1983-1985

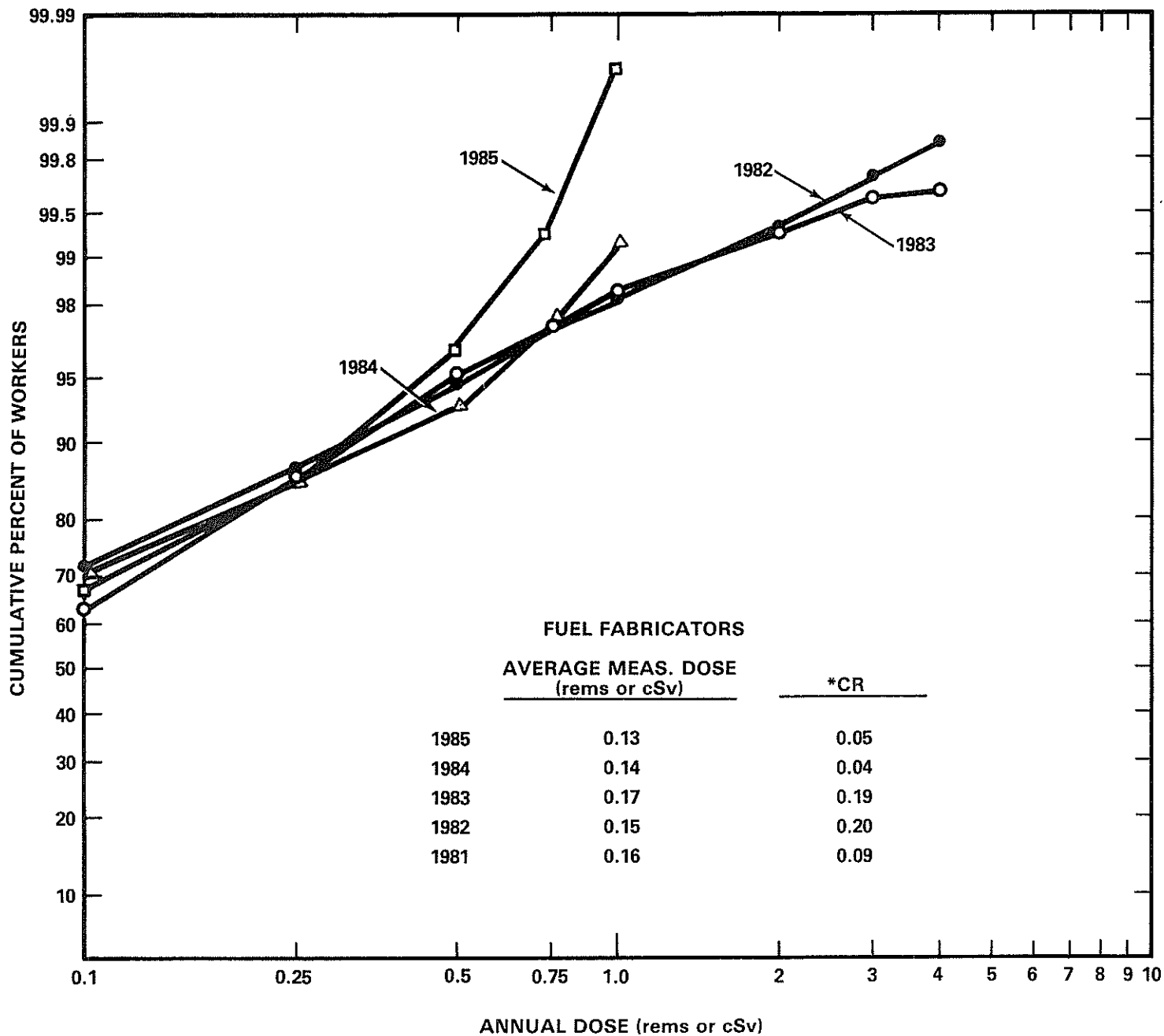
Year	Type of License	Number of Licenses	Number of Monitored Individuals	Workers with Measurable Doses	Collective Dose (person-rem or person-cSv)	Average Measurable Dose (rem or cSv)
1985	Uranium Fuel Fab	9	6,920	4,244	519	0.12
	Pu Decommissioning	2	1,067	457	98	0.21
	Total	11	7,987	4,701	617	0.13
1984	Uranium Fuel Fab	11	9,379	5,947	815	0.14
	Pu Decommissioning	3	109	25	3	0.12
	Total	14	9,488	5,772	818	0.14
1983	Uranium Fuel Fab	11	8,440	4,746	748	0.16
	Pu Decommissioning	4	583	267	87	0.33
	Total	15	9,023	5,013	835	0.17

continues to be due to hot cell operations involving the examination of post-irradiated fuel. As annual exposure reports are not required to be submitted for this type of licensed activity, information for this licensee will not be included in this report. Also, for similar reasons, those licensees that were included in the "Decommissioning" category in previous years are no longer required to file annual reports, and they are no longer included in this document. Appendix A lists alphabetically each of the eleven licensees reporting in 1985, with the number of persons monitored, the number of workers receiving measurable doses, and the collective dose for each licensee.

Figure 3.4 consists of the log-normal plots of the dose distributions of workers at fuel fabrication facilities for the years 1982 through 1985. The plots for 1982 and 1983 are quite similar, with all doses being less than five rems (cSv) and about 99% of the doses being less than two rems (cSv) each year. The average dose and the value of CR were therefore about the same for each year. However, in 1984 and 1985, there were so few doses greater than two rems (cSv) that the value of CR fell to 0.04 and 0.05, respectively.

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

Figure 3.4  
ANNUAL DOSE DISTRIBUTION OF WORKERS  
AT FUEL FABRICATORS AND PROCESSORS  
1982 - 1985



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



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.

### 3.3.6 Light Water-Cooled Power Reactor (LWR) Licenses

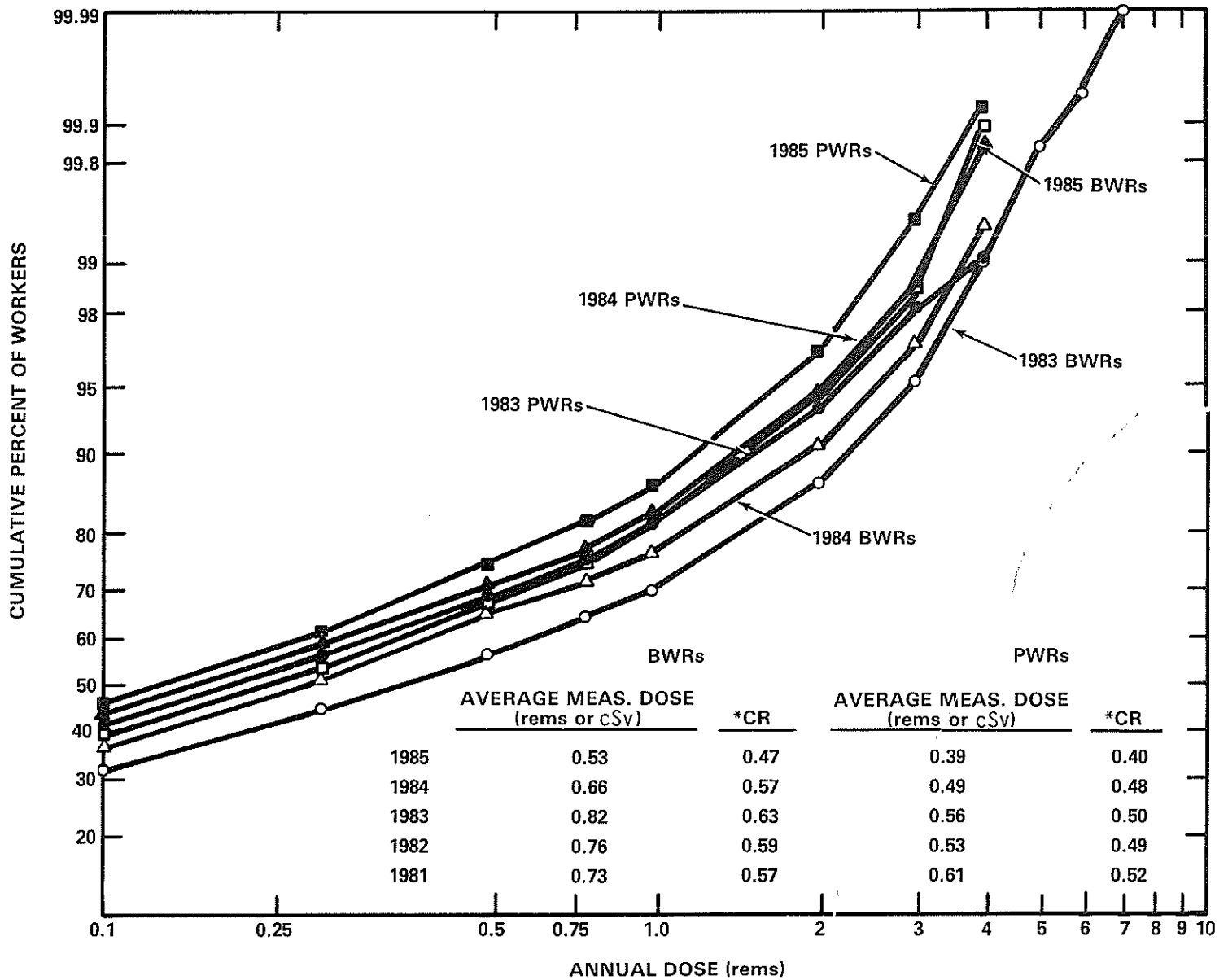
These licenses are issued to utilities to allow them to use special nuclear material in a reactor to produce heat generate electricity to be sold to consumers. There are two major types of commercial LWRs in the United States -pressurized water reactors (PWRs) and boiling water reactors (BWRs) - each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

As shown in Table 3.1, annual reports were received from nuclear power facilities for 93 licensed, LWRs where 191,132 individuals were monitored for exposure to radiation in 1985. Of this number, 97,978 workers received a measurable dose and incurred a collective dose of 43,624 person-rem (person-cSv). This is a significant decrease (21%) in the collective dose from that reported for the previous two years. However, the number of workers has continued to increase somewhat. This has resulted in the average measurable dose continuing to decrease to an all-time low of 0.44 rem (cSv) in 1985. The dose distribution of workers monitored at each plant site is presented in alphabetical order by site name in Appendix B.

Figure 3.5 presents the log-normal plot of the distribution of the whole body doses received by radiation workers at nuclear power facilities in 1983, 1984, and 1985. The position of the plots of the 1985 data above the others indicates a smaller portion of doses were distributed in the higher ranges. For example, in 1984 about 78% of the workers receiving measurable doses at BWRs received doses that were less than one rem (cSv), but in 1985 about 82% of such workers at BWRs received doses of less than one rem (cSv). The plots for the PWRs showed a similar shift. However, the position of the BWR plots below those of the PWRs each year indicates that higher average doses were received at BWRs. Also, departures from a straight line for doses that exceed one rem are again seen, and, according to the hybrid log-normal method [Ref. 12] of analyzing these dose distributions, the sharpness of the departure indicates that a strong feedback mechanism operates when workers begin to incur larger doses and may reflect efforts to keep doses as low as reasonably achievable [Ref. 13].

Listed at the bottom of the figure are the values of the average measurable dose and of CR for the last five years. These show that both parameters continue to be larger at BWRs, but that there were significant decreases in the values of both in 1985. The portion of the collective dose due to doses greater than 1.5 rems (cSv) fell to 40% at PWRs and 47% at BWRs (less than 50% for the first time), and the average doses fell to 0.39 rem (cSv) and 0.53 rem (cSv) at PWRs and BWRs, respectively. More detailed presentations and analyses of the annual exposure information reported by nuclear power facilities can be found in Section 4.

Figure 3.5  
ANNUAL DOSE DISTRIBUTION OF WORKERS AT  
LIGHT WATER REACTOR FACILITIES  
1983 - 1985



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

### 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 this type of a reactor, a gas, usually helium, is used as the primary coolant. Fort St. Vrain near Greeley, Colorado, is the only such reactor in operation in the U.S. 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 rems (cSv). Also, in 1985 the average dose per worker increased to 0.08 rem (cSv). The reactor has not operated near full power for significant periods of time since July, 1984, with most of the collective dose in 1985 resulting from maintenance activities. These activities resulted in the largest annual and average collective doses in the history of the plant, though these figures still remain much smaller than for PWRs and BWRs.

TABLE 3.7  
ANNUAL EXPOSURE INFORMATION FOR FORT ST. VRAIN  
1974-1985

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



## 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 type 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 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.

#### 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. 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 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 also 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 by the total gross megawatt-years generated and is a figure that 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.

TABLE 4.1

## SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL BOILING WATER REACTORS†

1973-1985

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 Personnel With Measurable Doses Per Reactor	Average Collective Dose per MW-yr	Average Electricity Generated Per Reactor (MW-yr)	Average Rated Capacity Net (MWe)
1973	12	4,564	5,340	3,394	0.85	380	445	1.3	283	459
1974	14	7,095	8,769	4,059	0.81	507	626	1.7	290	513
1975	18	12,611	14,607	5,786	0.86	701	812	2.2	321	611
1976	23	12,626	17,859	8,586	0.71	549	776	1.5	373	647
1977	23	19,042	21,388	9,098	0.89	828	930	2.1	396	645
1978	25	15,096	20,278	11,774	0.74	604	811	1.3	471	668
1979	25	18,322	25,245	11,671	0.73	733	1,010	1.6	467	669
1980	26	29,530	34,094	10,868	0.87	1,136	1,311	2.7	418	664
1981	26	25,471	34,832	10,899	0.73	980	1,340	2.3	419	674
1982	26	24,437	32,235	10,665	0.76	940	1,240	2.3	410	674
1983	26	27,455	33,473	9,730	0.82	1,056	1,287	2.8	374	675
1984	27*	27,074	41,105	9,963	0.66	1,003	1,522	2.7	369	722
1985	28**	20,572	38,237	11,461	0.54	735	1,366	1.8	409	766

†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 Humboldt Bay, a plant that has been shut down since 7/76, would not be put in commercial operation again, and it is no longer included in this count of reactors.

\*\*In 1985 it was decided that Dresden 1, a plant that has been shut down since 10/78, would not be put in commercial operation again, and it is not included in this count of reactors.

TABLE 4.2

## SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL PRESSURIZED WATER REACTORS †

1973-1985

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 Doses per MW-yr	Average Electricity Generated Per Reactor (MW-yr)	Average Rated Capacity Net (MWe)
1973	12	9,399	9,440	3,770	1.00	783	787	2.5	314	533
1974	20	6,627	9,697	6,824	0.68	331	485	1.0	341	619
1975	26	8,268	10,884	11,983	0.76	318	419	0.7	461	643
1976	30	13,807	17,588	13,325	0.79	460	586	1.0	444	675
1977	34	13,469	20,878	17,346	0.65	396	614	0.8	510	699
1978	39	16,713	25,720	19,840	0.65	429	659	0.8	509	723
1979	42	21,659	38,877	18,249	0.56	516	924	1.2	434	729
1980	42	24,266	46,237	18,287	0.52	578	1,101	1.3	435	721
1981	44	28,671	47,351	20,552	0.61	652	1,076	1.4	467	745
1982	48	27,753	52,147	22,141	0.53	578	1,086	1.3	461	773
1983	49	29,016	52,173	23,196	0.56	592	1,065	1.3	473	778
1984	51	28,140	56,987	26,478	0.49	552	1,117	1.1	519	805
1985	54*	22,470	54,634	30,140	0.41	416	1,012	0.7	558	826

†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 this count of reactors.

TABLE 4.3

SUMMARY OF ANNUAL INFORMATION REPORTED BY COMMERCIAL LIGHT WATER COOLED REACTORS†  
1973-1985

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	Average Electricity Generated Per Reactor (MW-yr)	Average Rated Capacity Net (MWe)
1973	24	13,963	14,780	7,164	0.94	582	616	1.9	299	496
1974	34	13,722	18,466	10,883	0.74	404	543	1.3	320	575
1975	44	20,879	25,489	17,769	0.82	475	579	1.2	404	630
1976	53	26,433	35,447	21,911	0.75	499	669	1.2	413	663
1977	57	32,511	42,266	26,444	0.77	570	742	1.2	462	677
1978	64	31,809	45,998	31,614	0.69	497	719	1.0	494	702
1979	67	39,981	64,122	29,920	0.62	597	956	1.3	447	705
1980	68	53,796	80,331	29,155	0.67	791	1,181	1.8	429	699
1981	70	54,142	82,183	31,451	0.66	773	1,174	1.7	449	719
1982	74	52,190	84,382	32,795	0.62	705	1,139	1.6	443	738
1983	75	56,471	85,646	32,926	0.66	753	1,142	1.7	439	742
1984	78*	55,214	98,092	36,441	0.56	708	1,258	1.5	467	776
1985	82**	43,042	92,871	41,601	0.46	525	1,132	1.0	507	806

†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 Humboldt Bay and Indian Point 1 would not be put in commercial operation again, and they are no longer included in this count of reactors.

\*\*In 1985 it was decided that Dresden 1, a plant that has been shut down since 10/78, would not be put in commercial operation again, and it is not included in this count of reactors.



#### 4.2.4 Average Rated Capacity

Average rated capacity, shown in Tables 4.1, 4.2, and 4.3 was found by dividing the sum of the net maximum dependable capacities (net MWe) of the reactors by the number of reactors included each year. The net maximum dependable capacity is defined to be 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 1973 through 1985. 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 1985 is shown in Appendix B. The table shows that the number of monitored individuals continues to increase somewhat while the collective dose, after leveling off for a couple of years, declined sharply in 1985. The values of CR show that the fraction of the collective dose due to individual doses greater than 1.5 rems (cSv), also decreased significantly, falling to a value (0.44) less than 0.50 for the first time. However, the distribution shown in Table 4.4 for 1985 has not been corrected for the number of individuals that may have been reported by more than one site (see Section 5) and the corrected value of CR would probably be slightly higher. Appendix D provides uncorrected dose distributions for BWRs and PWRs separately for 1985.

#### 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 1982. At that time, the average collective dose per reactor appeared to begin leveling off or decreasing slightly, as did the number of workers. However, in 1985, the collective dose decreased sharply at both types of facilities so that the average measurable doses fell to 0.54 rem (cSv) and 0.41 rem (cSv) at BWRs and PWRs, respectively.

Figures 4.2 and 4.3 are plots of much of the information that is given in Tables 4.1, 4.2, and 4.3. The values of all of the parameters plotted, except for the electricity generated, decreased significantly from last year's values. These figures and 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 recent reversal in dose trends 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 is continually being stressed, and programs to collect and share information

TABLE 4.4  
SUMMARY DISTRIBUTION OF ANNUAL WHOLE BODY DOSES AT COMMERCIAL LIGHT WATER REACTORS\*  
1973 - 1985

Year	No Meas'ble Exposure	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)															Total Number Monitored	Number with Measurable Exposure	**Collective Dose (person-rems or cSv)	CR***
		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			
1973	19,043	5,494	1,698	1,214	740	652	2,468	1,584	422	251	125	71	38	16	7		33,823	14,780	13,963	0.72
1974	20,472	6,735	2,887	2,056	1,182	906	2,503	1,378	471	226	86	30	6				38,938	18,466	13,722	0.63
1975	18,854	8,841	3,674	2,750	1,685	1,339	3,948	1,872	691	423	169	60	24	12	0	1	44,343	25,489	20,879	0.65
1976	25,704	12,821	5,130	4,135	2,520	2,030	4,880	2,354	789	487	188	70	26	11	5	1	61,151	35,447	26,433	0.62
1977	23,502	12,395	6,030	4,518	2,890	2,220	5,649	2,856	1,288	661	186	89	47	23	6		62,360	38,858	32,511	0.64
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	71,046	42,674	31,804	0.61
1979	39,434	22,711	9,020	7,400	4,755	3,206	7,536	3,403	1,404	545	117	42	17	3	0	1	99,594	60,160	39,981	0.57
1980	44,703	26,903	10,676	8,904	5,570	4,134	10,671	4,607	1,816	831	235	119	29	7	1		119,206	74,503	53,796	0.59
1981	39,245	26,836	11,226	9,330	6,042	4,497	11,170	4,811	1,999	585	122	96	11	3	1	0	115,975	76,730	54,142	0.58
1982	41,713	29,226	11,713	9,903	6,229	4,420	10,220	4,716	2,066	596	97	31	5	0	1	1	120,937	79,224	52,190	0.57
1983	48,545	29,774	11,413	9,522	5,998	4,366	11,553	5,390	2,276	716	121	38	8	2			129,722	81,177	57,212	0.60
1984	55,606	37,723	13,936	10,734	6,689	5,061	12,026	5,364	2,153	485	52	19					149,848	94,252	57,487	0.55
1985	64,470	39,991	14,115	11,978	7,214	4,897	10,557	3,317	716	84							157,339	92,869	43,042	0.44

\*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 for the years 1977-1984 have been adjusted for the multiple reporting of transient individuals (see Section 5).

\*\*Not all plants' collective dose and no values of CR were reported by the utilities; they were 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.

Figure 4.1  
**AVERAGE COLLECTIVE DOSE AND NUMBER OF WORKERS PER REACTOR  
 1973 - 1985**

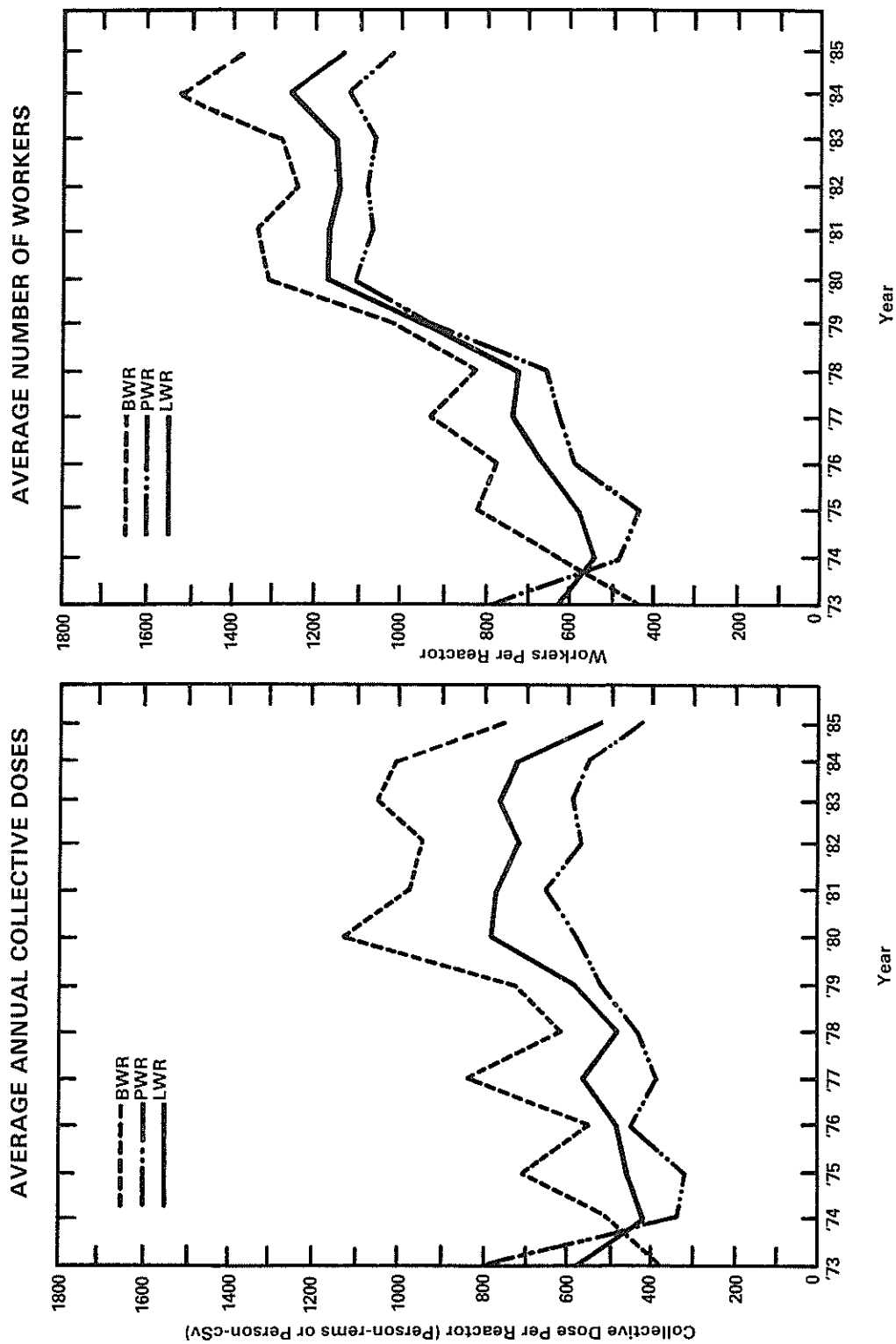


Figure 4.2  
ANNUAL VALUES AT BWRs AND PWRs  
1973 - 1985

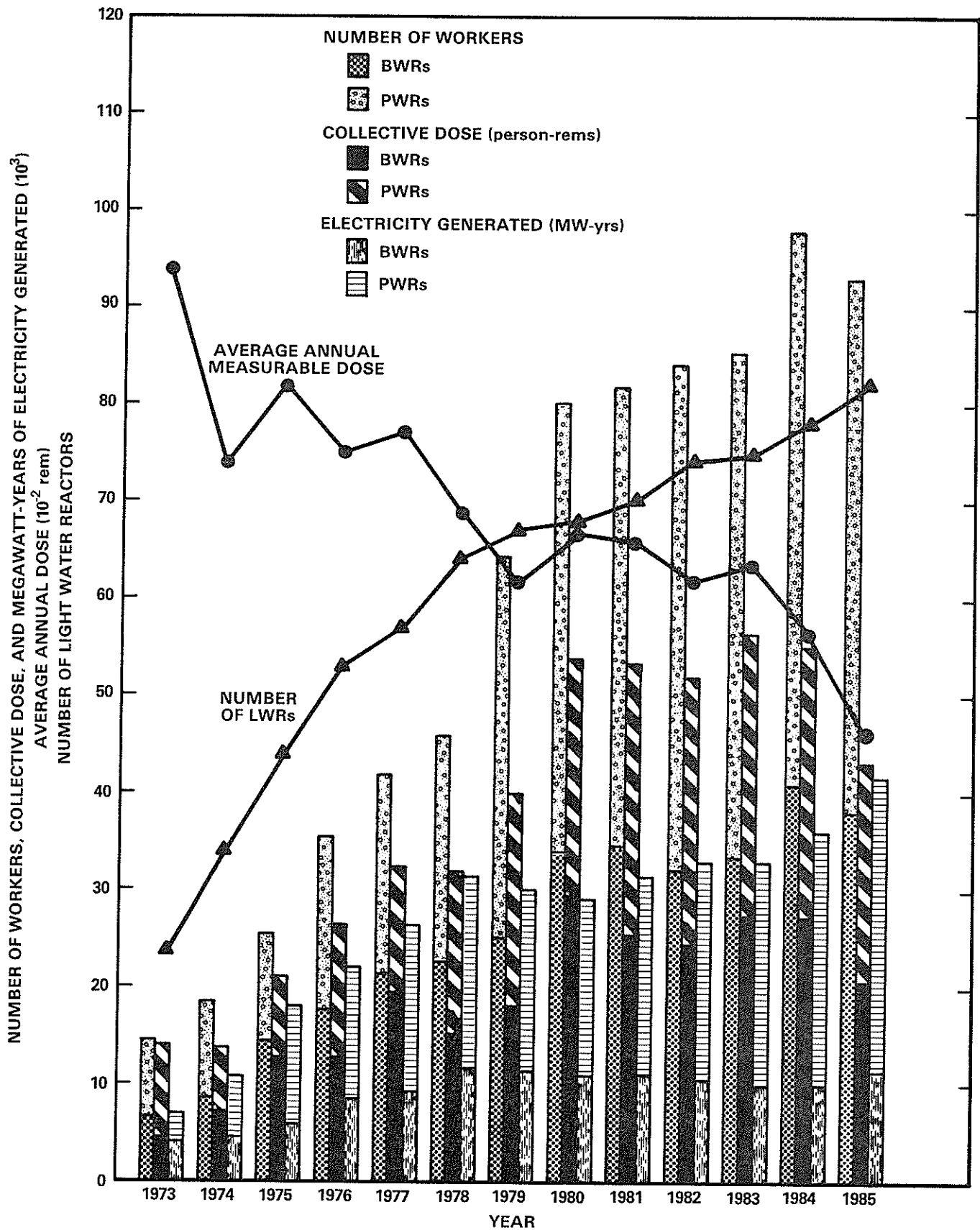


Figure 4.3  
AVERAGE ANNUAL VALUES AT LWRs  
1973 - 1985

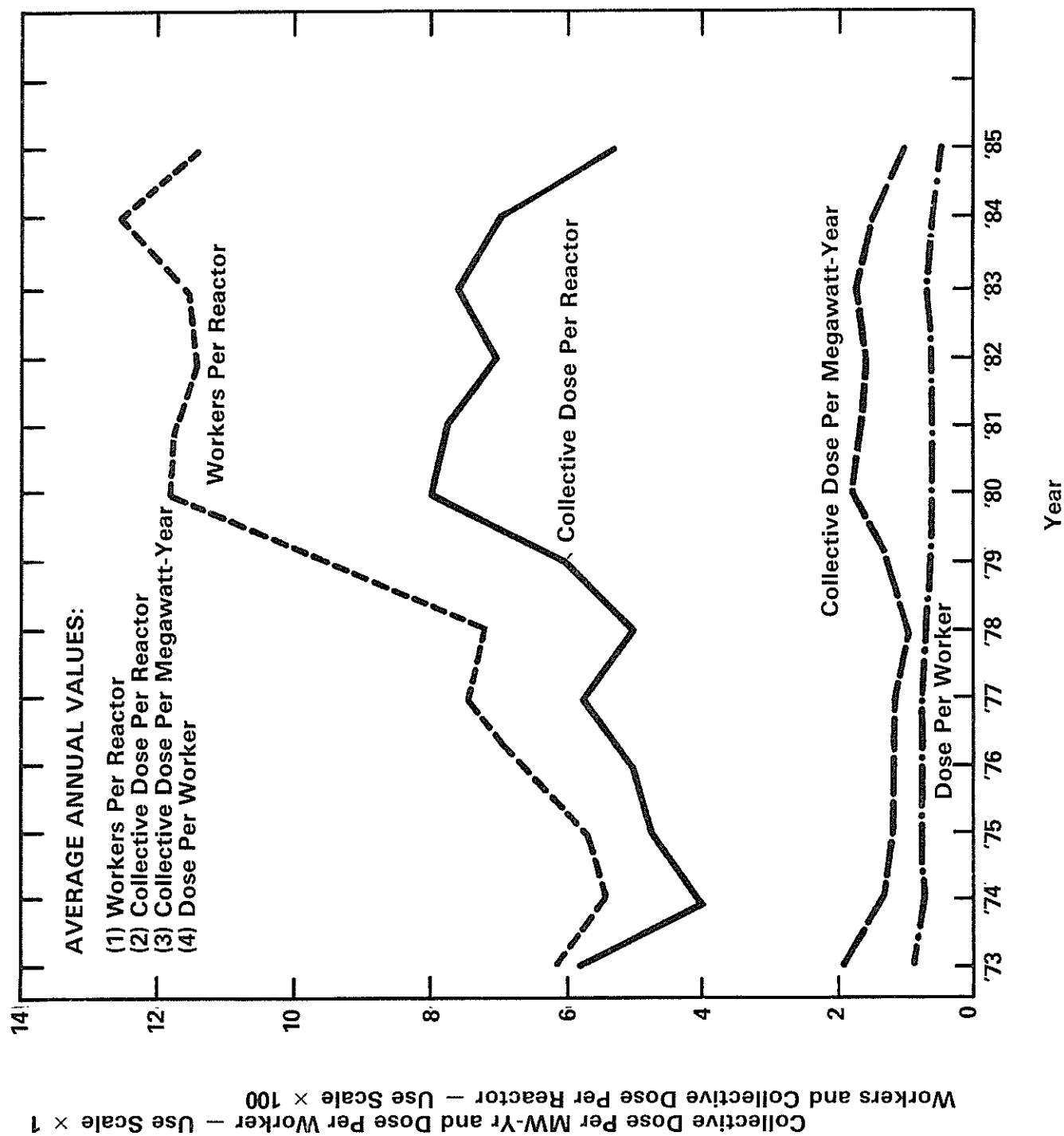
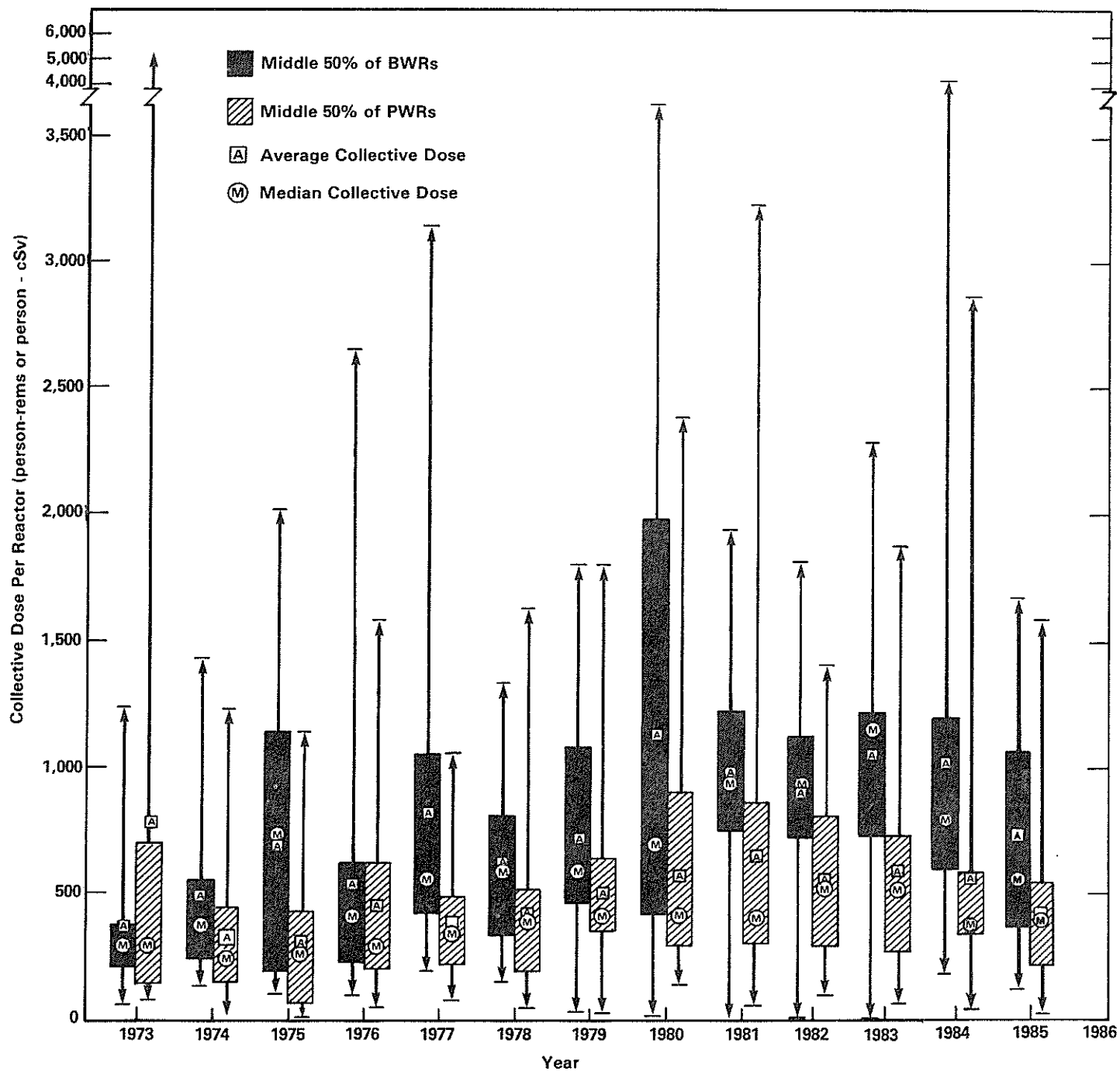


Figure 4.4  
**AVERAGE, MEDIAN AND EXTREME VALUES OF  
 THE COLLECTIVE DOSE PER REACTOR  
 1973 - 1985**



relative to tasks, techniques, and exposures have been established.

To further assist in the identification of any trends that might exist, Figure 4.4 displays the average and median\* values of the collective dose per reactor for BWRs and for PWRs for the years 1973 through 1985. 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 continues to range between 400 and 500 person-rem (person-cSv). At BWRs the median fluctuates more from year to year, but in 1985 the median decreased to 550 person-rem (person-cSv), which is closer to that found for PWRs (400 person-rem (person-cSv)). Figure 4.4 also shows that in 1985 fifty percent of the PWRs reported collective doses between 220 and 540 person-rem (person-cSv) while fifty percent of the BWRs reported collective doses between 375 and 1,070 person-rem (person-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 person-rem (person-cSv) per reactor for each of the five years from 1981 through 1985. Two other parameters, 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 to be the ratio of the annual collective dose delivered at individual doses exceeding 1.5 rem (cSv) to the total annual collective dose. In 1985 the value of CR continued to decline for most plants so that about 80% (up from about 65% in 1984) of the U.S. LWRs fell within the range 0.05 to 0.50 which is recommended by the UNSCEAR [Ref. 10]. Most of the reactors having values of CR greater than 0.50 were BWRs, the highest value being 0.68.

Table 4.7 lists the plants that had been in commercial operation for at least five years as of December 31, 1985, and shows the values of several parameters for each of the sites. It also gives a number of averages for the two types of reactors. Based on the 123 reactor-years of operation accumulated by the BWRs listed, the average annual collective dose per reactor was found to be 996 person-rem (person-cSv), the average measurable dose was 0.72 rem (cSv), and the average collective dose per megawatt-year was 2.5.

---

\* 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

1981 - 1985

1981					1982					1983				
Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR
Humboldt Bay	9	0.12	-	0.00	Humboldt Bay	19	0.27	-	0.08	Humboldt Bay	17	0.20	-	0.09
La Crosse	123	0.66	4.2	0.68	La Crosse	205	1.39	11.9	0.81	Monticello	121	0.29	0.2	0.16
Big Rock Point	160	0.33	2.8	0.47	Vermont Yankee	205	0.43	0.4	0.24	Millstone Point 1	244	0.79	0.4	0.46
Cooper Station	579	0.62	1.3	0.45	Duane Arnold	227	0.44	0.8	0.48	Big Rock Point	263	0.53	6.2	0.66
Hatch 1, 2	1,337	0.46	1.5	0.35	Big Rock Point	328	0.63	7.5	0.58	La Crosse	313	1.96	12.6	0.90
Vermont Yankee	731	0.58	1.7	0.45	Cooper Station	542	0.73	0.9	0.52	Hatch 1, 2	1,299	0.38	1.4	0.29
Duane Arnold	790	0.61	2.8	0.50	Hatch 1, 2	1,460	0.43	1.9	0.33	Nine Mile Point	860	0.61	2.6	0.45
Browns Ferry 1, 2, 3	2,380	0.70	1.1	0.49	Browns Ferry 1, 2, 3	2,220	0.68	1.1	0.51	Fitzpatrick	1,090	1.02	2.0	0.58
Oyster Creek	917	0.54	2.9	0.40	Oyster Creek	865	0.68	3.6	0.51	Browns Ferry 1, 2, 3	3,363	1.02	2.0	0.58
Dresden 1, 2, 3	2,820	1.16	2.7	0.52	Millstone Point 1	929	0.68	1.9	0.48	Duane Arnold	1,135	0.77	4.0	0.53
Monticello	1,004	0.69	2.6	0.56	Dresden 1, 2, 3	2,923	1.14	2.7	0.73	Pilgrim	1,162	0.50	2.1	0.47
Peach Bottom 2, 3	2,506	0.88	2.2	0.56	Peach Bottom 2, 3	1,977	0.72	1.2	0.48	Dresden 1, 2, 3	3,582	1.26	3.9	0.75
Brunswick 1, 2	2,638	0.68	2.9	0.66	Monticello	1,993	0.76	3.4	0.57	Quad Cities 1, 2	2,491	1.38	2.3	0.77
Fitzpatrick	1,425	0.57	2.5	0.44	Fitzpatrick	1,190	0.51	2.0	0.37	Cooper Station	1,293	0.93	3.3	0.68
Millstone 1	1,496	0.60	4.9	0.44	Nine Mile Point	1,264	0.93	9.5	0.66	Peach Bottom 2, 3	2,963	0.95	3.6	0.67
Quad Cities 1, 2	3,146	1.40	2.7	0.81	Pilgrim	1,539	0.54	3.9	0.42	Vermont Yankee	1,527	1.16	4.4	0.61
Nine Mile Point	1,592	0.78	4.1	0.59	Quad Cities 1, 2	3,757	1.62	3.7	0.79	Brunswick 1, 2	3,475	0.62	5.5	0.63
Pilgrim	1,836	0.66	4.5	0.44	Brunswick 1, 2	3,792	0.76	6.5	0.70	Oyster Creek	2,257	0.98	80.9	0.63

1984					1985				
Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR
Big Rock Point	155	0.52	3.1	0.52	WNP 2	119	0.16	0.2	0.11
La Salle 1, 2	252	0.20	0.4	0.07	La Crosse	173	0.46	4.4	0.68
Duane Arnold	189	0.31	0.6	0.19	Nine Mile Point 1	265	0.26	0.5	0.25
La Crosse	252	0.87	6.5	0.87	Big Rock Point 1	291	0.67	6.6	0.61
Susquehanna 1	308	0.11	0.4	0.02	Monticello	327	0.56	0.6	0.42
Dresden 1, 2, 3	1,774	0.78	2.2	0.54	La Salle 1, 2	685	0.42	0.7	0.35
Vermont Yankee	603	0.63	1.5	0.39	Browns Ferry 1, 2, 3	1,159	0.42	3.1	0.30
Browns Ferry 1, 2, 3	1,940	0.66	1.4	0.51	Hatch 1, 2	818	0.29	0.7	0.19
Quad Cities 1, 2	1,579	0.94	1.6	0.63	Quad Cities 1, 2	990	0.84	0.8	0.58
Cooper Station	799	0.50	1.9	0.53	Millstone Point 1	608	0.83	1.1	0.60
Millstone Point 1	836	0.42	1.6	0.31	Oyster Creek 1	748	0.32	1.7	0.33
Nine Mile Point	890	0.58	2.1	0.50	Dresden 2, 3	1,685	0.60	1.9	0.39
Fitzpatrick	971	0.60	1.7	0.57	Pilgrim 1	893	0.40	1.5	0.39
Hatch 1, 2	2,218	0.54	3.4	0.44	Fitzpatrick	1,051	0.57	2.1	0.53
Peach Bottom 2, 3	2,450	0.74	2.1	0.57	Vermont Yankee	1,051	0.76	2.9	0.42
Brunswick 1, 2	3,280	0.66	4.3	0.62	Susquehanna 1	1,106	0.30	1.8	0.20
Oyster Creek	2,054	0.87	55.4	0.60	Duane Arnold	1,112	0.79	4.7	0.30
Monticello	2,462	1.32	73.1	0.79	Cooper Station	1,333	0.67	10.5	0.59
Pilgrim	4,082	0.90	-	0.65	Brunswick 1, 2	2,804	0.69	3.4	0.65
					Peach Bottom 2, 3	3,354	0.80	4.9	0.59

\*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.



TABLE 4.6

## PRESSURIZED WATER REACTORS LISTED IN ASCENDING ORDER OF COLLECTIVE DOSE PER REACTOR

1981 - 1985

1981					1982					1983				
Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR
Davis Besse	58	0.10	0.1	0.04	Kewaunee	101	0.29	0.2	0.11	Yankee Rowe	68	0.17	0.4	0.20
Kawaunee	141	0.37	0.3	0.18	Prairie Island 1, 2	229	0.36	0.2	0.16	Davis Besse	80	0.11	0.1	0.04
Prairie Island 1, 2	329	0.39	0.4	0.30	Haddam Neck	126	0.23	0.2	0.27	Prairie Island 1, 2	233	0.36	0.3	0.24
Three Mile Island 1, 2	376	0.18	-	0.06	Davis Besse	164	0.12	0.4	0.06	San Onofre 1	155	0.09	-	0.13
Beaver Valley	229	0.19	0.4	0.10	McGuire	169	0.11	0.3	0.03	Maine Yankee	164	0.28	0.2	0.14
Salem 1	254	0.15	0.3	0.09	Crystal River	177	0.23	0.3	0.13	Kewaunee	165	0.37	0.4	0.24
Point Beach 1, 2	596	0.77	0.8	0.46	Fort Calhoun	217	0.36	0.5	0.42	Indian Point 1, 2	486	0.46	0.7	0.46
Yankee Rowe	302	0.59	2.8	0.43	Farley 1, 2	484	0.33	0.4	0.18	Sesquoyah 1, 2	491	0.28	0.3	0.14
Calvert Cliffs 1, 2	607	0.39	0.4	0.19	St. Lucie	272	0.26	0.3	0.18	Salem 1, 2	581	0.24	0.8	0.16
Cook 1, 2	655	0.49	0.4	0.29	Point Beach 1, 2	609	0.79	0.8	0.50	Trojan	307	0.32	0.6	0.25
North Anna 1, 2	680	0.28	0.5	0.37	Palisades	330	0.21	0.8	0.20	Cook 1, 2	658	0.46	0.5	0.33
Indian Point 3	364	0.54	1.0	0.65	Rancho Seco	337	0.44	0.8	0.36	North Anna 1, 2	665	0.30	0.5	0.38
Rancho Seco	402	0.52	1.3	0.28	Cook 1, 2	699	0.46	0.5	0.27	Calvert Cliffs 1, 2	668	0.35	0.5	0.32
Oconee 1, 2, 3	1,211	0.50	0.7	0.45	Arkansas 1, 2	803	0.50	0.9	0.40	Oconee 1, 2, 3	1,207	0.63	0.6	0.45
Crystal River 3	408	0.36	0.8	0.23	Trojan	419	0.42	0.7	0.35	Fort Calhoun	433	0.50	1.3	0.39
Maine Yankee	424	0.49	0.7	0.29	Yankee Rowe	474	0.58	4.4	0.54	Farley 1, 2	1,021	0.53	0.8	0.41
Fort Calhoun	458	0.56	1.8	0.50	Three Mile Island 1, 2	1,004	0.47	-	0.44	McGuire 1	521	0.30	0.9	0.32
Farley	511	0.38	1.6	0.28	Calvert Cliffs 1, 2	1,057	0.59	0.8	0.40	Crystal River	552	0.32	1.2	0.18
Millstone Point 2	531	0.60	0.7	0.44	Sesquoyah	570	0.29	1.0	0.18	Three Mile Island 1, 2	1,159	0.73	-	0.57
Arkansas 1, 2	1,102	0.50	1.0	0.39	Oconee 1, 2, 3	1,792	0.73	1.4	0.58	Indian Point 3	607	0.65	77.8	0.46
Trojan	609	0.46	0.8	0.33	Beaver Valley	599	0.34	1.8	0.26	Zion 1, 2	1,311	1.02	1.1	0.62
Ginna	655	0.71	1.6	0.45	Salem 1, 2	1,203	0.37	0.8	0.29	Arkansas 1, 2	1,397	0.65	1.5	0.65
Robinson 2	733	0.50	1.7	0.51	Maine Yankee	619	0.48	1.1	0.32	Point Beach 1, 2	1,403	0.82	2.2	0.53
Zion 1, 2	1,720	0.98	1.3	0.69	Surry 1, 2	1,490	0.79	1.1	0.73	Beaver Valley	772	0.52	1.4	0.42
Palisades	902	0.42	2.2	0.41	Indian Point 1, 2	1,635	0.76	3.1	0.52	Rancho Seco	787	0.59	2.3	0.39
St. Lucie	929	0.63	1.6	0.43	San Onofre	832	0.27	13.5	0.35	Ginna	855	0.88	2.3	0.55
Haddam Neck	1,036	0.67	2.1	0.52	North Anna 1, 2	1,915	0.67	2.5	0.67	Robinson	923	0.41	2.3	0.44
Turkey Point 3, 4	2,251	0.77	3.4	0.51	Zion 1, 2	2,103	1.34	1.8	0.76	Palisades	977	0.45	2.2	0.54
Indian Point 1, 2	2,731	1.05	7.4	0.65	Turkey Point 3, 4	2,119	0.72	2.3	0.48	St. Lucie	1,204	0.54	4.2	0.47
Surry 1, 2	4,244	1.13	4.7	0.77	Ginna	1,140	1.02	3.9	0.65	Turkey Point 1, 2	2,681	0.92	3.1	0.60
San Onofre	3,223	1.11	33.6	0.72	Indian Point 3	1,226	0.83	7.1	0.52	Haddam Neck	1,384	0.84	3.1	0.57
					Millstone Point 2	1,413	0.68	2.4	0.48	Surry 1, 2	3,220	1.17	3.5	0.78
					Robinson 2	1,426	0.71	5.1	0.65	Millstone Point 2	1,881	0.79	6.4	0.67

1984					1985				
Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR	Site Name	*Coll. Dose per Site	Dose per Worker (rems or cSv)	Coll. Dose per MW-Yr	**CR
Crystal River	49	0.09	0.1	0.00	Callaway 1	36	0.04	0.0	0.00
Prairie Island 1, 2	147	0.27	0.2	0.16	Beaver Valley	60	0.10	0.1	0.00
Millstone Point 2	120	0.42	0.2	0.33	Davis-Besse	71	0.10	0.3	0.04
Kewaunee	139	0.29	0.3	0.15	Haddam Neck	101	0.26	0.2	0.28
Davis Besse	177	0.16	0.3	0.07	Salem 1, 2	204	0.18	0.1	0.15
Rancho Seco	222	0.28	0.5	0.22	Arkansas 1, 2	286	0.23	0.2	0.10
Indian Point 3	230	0.35	0.3	0.61	Kewaunee	176	0.34	0.4	0.15
Calvert Cliffs 1, 2	479	0.35	0.3	0.33	San Onofre 1	189	0.07	0.6	0.06
Summer	295	0.26	0.6	0.11	Indian Point 2	192	0.27	0.2	0.20
Salem 1, 2	681	0.49	1.0	0.39	Prairie Island 1, 2	416	0.38	0.5	0.31
Three Mile Island 1, 2	688	0.64	-	0.45	Yankee-Rowe	211	0.32	1.5	0.24
Yankee Rowe	348	0.53	2.8	0.44	Point Beach 1, 2	482	0.72	0.6	0.43
Oconee 1, 2, 3	1,105	0.53	0.5	0.39	San Onofre 2, 3	533	0.17	0.5	0.18
Cook 1, 2	762	0.49	0.5	0.32	Robinson 2	311	0.23	0.5	0.28
Zion 1, 2	786	0.71	0.6	0.47	Calvert Cliffs 1, 2	694	0.43	0.6	0.37
Ginna	394	0.55	1.0	0.39	Trojan	363	0.43	0.4	0.26
Point Beach 1, 2	789	0.58	1.0	0.50	Fort Calhoun 1	373	0.38	1.0	0.37
Arkansas 1, 2	806	0.46	0.6	0.34	Summer 1	379	0.32	0.6	0.34
Trojan	433	0.42	0.8	0.37	McGuire 1, 2	771	0.35	0.5	0.29
Farley 1, 2	902	0.44	0.6	0.41	Farley 1, 2	799	0.31	0.6	0.30
San Onofre 1, 2	946	0.15	0.7	0.14	North Anna 1, 2	839	0.34	0.6	0.31
Beaver Valley	504	0.36	0.9	0.32	Ginna	426	0.50	1.0	0.37
McGuire 1	507	0.30	0.7	0.26	Three Mile Island 1, 2	857	0.45	8.3	0.50
Sesquoyah 1, 2	1,117	0.47	0.8	0.36	Oconee 1, 2, 3	1,304	0.48	0.6	0.42
Fort Calhoun	563	0.62	2.0	0.47	Cook 1, 2	945	0.48	1.0	0.31
Palisades	573	0.43	5.8	0.41	Palisades	507	0.37	0.8	0.27
Turkey Point 3, 4	1,255	0.62	1.3	0.53	Sesquoyah 1, 2	1,071	0.58	0.9	0.47
St. Lucie 1, 2	1,263	0.60	1.1	0.49	Indian Point 3	570	0.52	1.0	0.20
Maine Yankee	884	0.70	1.5	0.47	Zion 1, 2	1,166	0.78	1.0	0.55
North Anna 1, 2	1,945	0.64	1.9	0.59	Turkey Point 3, 4	1,253	0.66	1.2	0.48
Surry 1, 2	2,247	0.70	2.2	0.61	St. Lucie 1, 2	1,344	0.68	0.9	0.50
Haddam Neck	1,216	0.85	3.0	0.66	Crystal River 3	689	0.35	2.0	0.20
Indian Point 2	2,644	0.91	6.3	0.61	Maine Yankee	700	0.69	1.1	0.49
Robinson 2	2,880	0.70	-	0.69	Rancho Seco	756	0.43	3.2	0.27
					Surry 1, 2	1,815	0.57	1.6	0.58
					Millstone 2	1,581	0.83	3.8	0.64

\*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.

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

1981-1985

BWRs  **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
La Crosse	1,066	1,156	0.92	149.3	7.1
Big Rock Point	1,197	2,225	0.54	236.9	5.1
Duane Arnold	3,455	5,303	0.65	1,404.8	2.5
Hatch 1, 2	7,132	16,696	0.43	4,443.2	1.6
Browns Ferry 1, 2, 3	11,062	15,675	0.71	7,599.4	1.5
Millstone 1	4,113	6,909	0.60	2,499.2	1.6
Vermont Yankee	4,117	5,407	0.76	2,035.7	2.0
Cooper Station	4,546	6,639	0.68	2,015.2	2.3
Nine Mile Point	4,871	7,323	0.67	1,856.2	2.6
Monticello	4,907	5,627	0.87	1,718.5	2.9
Dresden 1,2, 3	12,766	12,915	0.99	4,727.4	2.7
Fitzpatrick	5,727	9,982	0.57	2,761.2	2.1
Quad Cities 1, 2	11,963	9,224	1.30	5,526.7	2.2
Peach Bottom 2, 3	13,250	16,220	0.82	5,418.3	2.4
Oyster Creek	6,841	9,973	0.69	1,068.6	6.4
Brunswick 1, 2	15,969	23,516	0.68	3,685.7	4.3
Pilgrim	9,512	14,734	0.65	1,947.0	4.9
(123 reactor-years)					
Grand Totals and Averages	122,494	169,521	0.72	49,093.1	2.5
Averages per Reactor-year	996	1,378		399	

\*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 12/31/85 are not included.

TABLE 4.7b

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

1981-1985

PWRs	*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					
Davis Besse	550	4,452	0.12	2,271.1	0.2
Prairie Island 1, 2	1,354	3,756	0.36	4,565.9	0.3
Kewaunee	722	2,182	0.33	2,252.7	0.3
Yankee Rowe	1,403	3,036	0.46	650.2	2.2
Calvert Cliffs 1, 2	3,505	8,242	0.43	6,594.4	0.5
Cook 1, 2	3,719	7,829	0.48	6,926.9	0.5
Crystal River 3	1,875	6,145	0.31	2,650.7	0.7
Point Beach 1, 2	3,879	5,285	0.73	3,786.0	1.0
Three Mile Island 1, 2	4,084	8,787	0.46	103.6	39.4***
Fort Calhoun	2,044	4,181	0.40	1,655.5	1.2
Trojan	2,131	5,151	0.41	3,245.4	0.7
Beaver Valley	2,164	6,489	0.33	2,755.7	0.8
Arkansas 1, 2	4,394	8,946	0.49	5,406.5	0.8
Oconee 1, 2, 3	6,620	11,606	0.57	9,375.3	0.7
Rancho Seco	2,504	5,442	0.46	1,777.3	1.4
Main Yankee	2,791	5,026	0.56	3,084.9	0.9
Indian Point 3	2,997	4,846	0.62	1,827.7	1.6
North Anna 1, 2	6,044	13,014	0.46	5,896.2	1.0
Palisades	3,289	8,571	0.38	2,014.8	1.6
Ginna	3,470	4,569	0.76	1,867.8	1.9
Zion 1, 2	7,086	7,222	0.98	6,353.4	1.1
Haddam Neck	3,863	5,572	0.69	2,445.2	1.6
Turkey Point 3, 4	9,559	12,733	0.75	4,429.7	2.2
San Onofre 1	4,912	14,725	0.33	491.2	10.0
Millstone 2	5,526	7,546	0.73	2,812.8	2.0
Robinson 2	6,273	11,222	0.56	1,771.4	3.5
Surry 1, 2	13,016	14,789	0.88	5,340.2	2.4
Indian Point 2	7,688	9,423	0.82	2,810.6	2.7
(200 reactor-years)					
Grand Totals and Averages	117,462	210,784	0.53	95,163.3	1.2
Averages per Reactor-year	587	1054		475.8	

\*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 12/31/85 are not included.

\*\*\*These two units were shut down after the 1979 accident at unit 2. Unit 1 was unable to begin normal power generation during this period. Most of the collective dose during 1981-1985 was the result of recovery effort at unit 2 and steam generator repairs at unit 1.

Based on the 200 reactor-years of operation at the PWRs listed, these averages were found to be 587 person-rem (person-cSv), 0.53 rem and 1.2, respectively. All of these values, at both types of facilities, are lower than those found for the previous five years.

In 1985, there were five BWR units where collective doses exceeded 1,300 person-rem (person-cSv) per reactor. Although these five units represented only 18% of the 28 BWRs, they contributed nearly 37% of the total collective dose incurred at BWRs in 1985. Most of the collective dose accumulated at the BWR site with the highest collective dose (3,354 person-rem (person-cSv)) was attributed to routine maintenance activities, such as snubber and control rod drive repair, standing fire watches, and pipe safe-end replacement (weld overlays).

At PWRs, there were three units where the collective dose exceeded 900 person-rem (person-cSv) per reactor. Although representing less than 6% of the 54 PWRs operating in 1985, they contributed over 15% of the total collective dose at PWRs in 1985. The plant with the highest collective dose (1,581 person-rem (person-cSv)) in 1985 accumulated most of the dose during cleaning, decontamination, plugging and sleeving of steam generators.

In general, particularly for BWRs, 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 11 or 12 years, have experienced lower collective doses than many new reactors for years.

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 1985 included replacement of recirculation system piping, inspection for intergranular stress corrosion cracking (IGSCC), IGSCC repair, induction heating stress improvement (IHSI) of welds, reactor vessel component inservice inspection, and plant decontamination activities. At PWR facilities, the major contributors to the collective dose have been extensive tube inspection, sleeving, and plugging related to the repair of steam generators. Even with the use of better techniques and robots, these tasks continue to be a major source of exposure. 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. Table 4.8 and Figure 4.5 are presented to summarize the 1985 data. 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 do not use the official dosimeter results 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 usually incurred the largest portion (35%-45%) of the collective dose and that workers performing routine maintenance activities usually incurred between 30% and 35%. The figures have been fairly stable over the years with these two categories always accounting for the majority of the collective dose. Figure 4.5 graphically shows the trends in the collective dose by work function and type of personnel for the years 1979 through 1985 for BWRs and PWRs separately. Contractor personnel incur most of the collective dose during special maintenance while it is nearly equally divided between contractor and plant and utility personnel during routine maintenance and waste processing.

Table 4.10 presents the distribution of the collective dose for 1985 at all LWRs among five occupations. As expected, maintenance personnel incurred the majority (67%) 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 1984. Supervisory personnel received 3.1% of the dose, compared to 4.1% in 1984, while workers in the remaining three occupations--operations, health physics, and engineering--received 9.3%, 13%, and 8.3% respectively, of the collective dose. None of these values changed very much from those found for 1983 and 1984. 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 § 20.407 annual reports.

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 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 estimated or obtained from the § 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

TABLE 4.8

ANNUAL COLLECTIVE DOSE  
BY WORK FUNCTION AND PERSONNEL TYPE  
1985

WORK FUNCTION	STATION EMPLOYEES		UTILITY EMPLOYEES		CONTRACT WORKERS		TOTAL PER FUNCTION	
	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL
<b>*BOILING WATER REACTORS</b>								
REACTOR OPS & SURV	1,399.699	7.02%	354.807	1.78%	735.848	3.69%	2,490.354	12.49%
ROUTINE MAINTENANCE	2,137.180	10.72%	962.727	4.83%	4,221.369	21.17%	7,321.276	36.71%
IN-SERVICE INSPECTION	134.393	0.67%	267.932	1.34%	1,316.130	6.60%	1,718.455	8.62%
SPECIAL MAINTENANCE	869.333	4.36%	456.970	2.29%	5,919.359	29.68%	7,245.662	36.33%
WASTE PROCESSING	347.800	1.74%	17.666	0.09%	375.753	1.88%	741.219	3.72%
REFUELING	180.344	0.90%	35.145	0.18%	212.257	1.06%	427.746	2.14%
TOTALS	5,068.749	25.41%	2,095.247	10.51%	12,780.716	64.08%	19,944.712	100.00%
<b>*PRESSURIZED WATER REACTORS</b>								
REACTOR OPS & SURV	1,815.508	7.55%	161.315	0.67%	1,177.418	4.89%	3,154.241	13.11%
ROUTINE MAINTENANCE	2,618.156	10.88%	678.291	2.82%	4,587.473	19.07%	7,883.920	32.77%
IN-SERVICE INSPECTION	341.003	1.42%	370.901	1.54%	1,332.540	5.54%	2,044.444	8.50%
SPECIAL MAINTENANCE	1,775.804	7.38%	841.856	3.50%	4,441.228	18.46%	7,058.888	29.34%
WASTE PROCESSING	642.477	2.67%	60.398	0.25%	780.442	3.24%	1,483.317	6.17%
REFUELING	781.935	3.25%	359.409	1.49%	1,290.225	5.36%	2,431.569	10.11%
TOTALS	7,974.883	33.15%	2,472.170	10.28%	13,609.326	56.57%	24,056.379	100.00%
<b>*ALL LIGHT WATER REACTORS</b>								
REACTOR OPS & SURV	3,215.207	7.31%	516.122	1.17%	1,913.266	4.35%	5,644.595	12.83%
ROUTINE MAINTENANCE	4,755.336	10.81%	1,641.018	3.73%	8,808.842	20.02%	15,205.196	34.56%
IN-SERVICE INSPECTION	475.396	1.08%	638.833	1.45%	2,648.670	6.02%	3,762.899	8.55%
SPECIAL MAINTENANCE	2,645.137	6.01%	1,298.826	2.95%	10,360.587	23.55%	14,304.550	32.51%
WASTE PROCESSING	990.277	2.25%	78.064	0.18%	1,156.195	2.63%	2,224.536	5.06%
REFUELING	962.279	2.19%	394.554	0.90%	1,502.482	3.41%	2,859.315	6.50%
TOTALS	13,043.632	29.64%	4,567.417	10.38%	26,390.042	59.98%	44,001.091	100.00%

\*Table does not include results from the PWRs at Point Beach 1, 2 (444 person-rem) and the BWR at Shoreham (19.21 person-rem), because the data for these plants were not submitted in the suggested format.

TABLE 4.9

PERCENTAGES OF ANNUAL COLLECTIVE  
DOSE AT LWR'S BY WORK FUNCTION

WORK FUNCTION	PERCENTAGE OF COLLECTIVE DOSE EACH YEAR									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984 1985
REACTOR OPERATIONS AND SURVEILLANCE	10.8%	10.2%	10.5%	13.3%	12.2%	9.5%	8.9%	9.4%	10.1%	11.4% 12.8%
ROUTINE MAINTENANCE	52.6%	31.0%	28.1%	31.5%	29.2%	35.5%	36.1%	27.9%	29.7%	26.9% 34.6%
INSERVICE INSPECTION	3.0%	6.0%	6.4%	7.7%	9.0%	5.5%	5.3%	6.5%	7.6%	6.3% 8.6%
SPECIAL MAINTENANCE	19.0%	40.0%	42.5%	35.9%	39.4%	40.6%	40.5%	46.8%	43.9%	45.4% 32.5%
WASTE PROCESSING	6.9%	5.0%	5.8%	5.0%	3.6%	3.0%	4.2%	5.0%	4.6%	3.6% 5.1%
REFUELING	7.7%	7.9%	6.7%	6.6%	6.6%	6.1%	5.0%	4.4%	4.1%	6.4% 6.5%

TABLE 4.10

ANNUAL COLLECTIVE DOSE  
BY OCCUPATION AND PERSONNEL TYPE  
1985

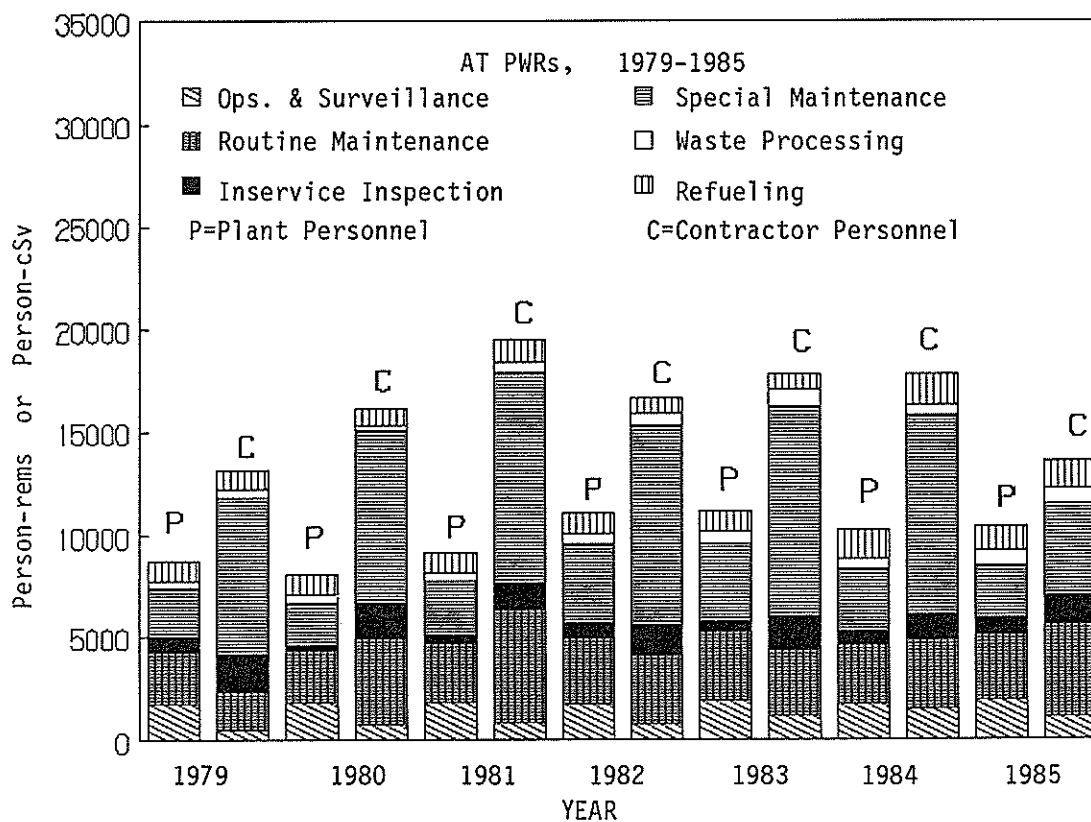
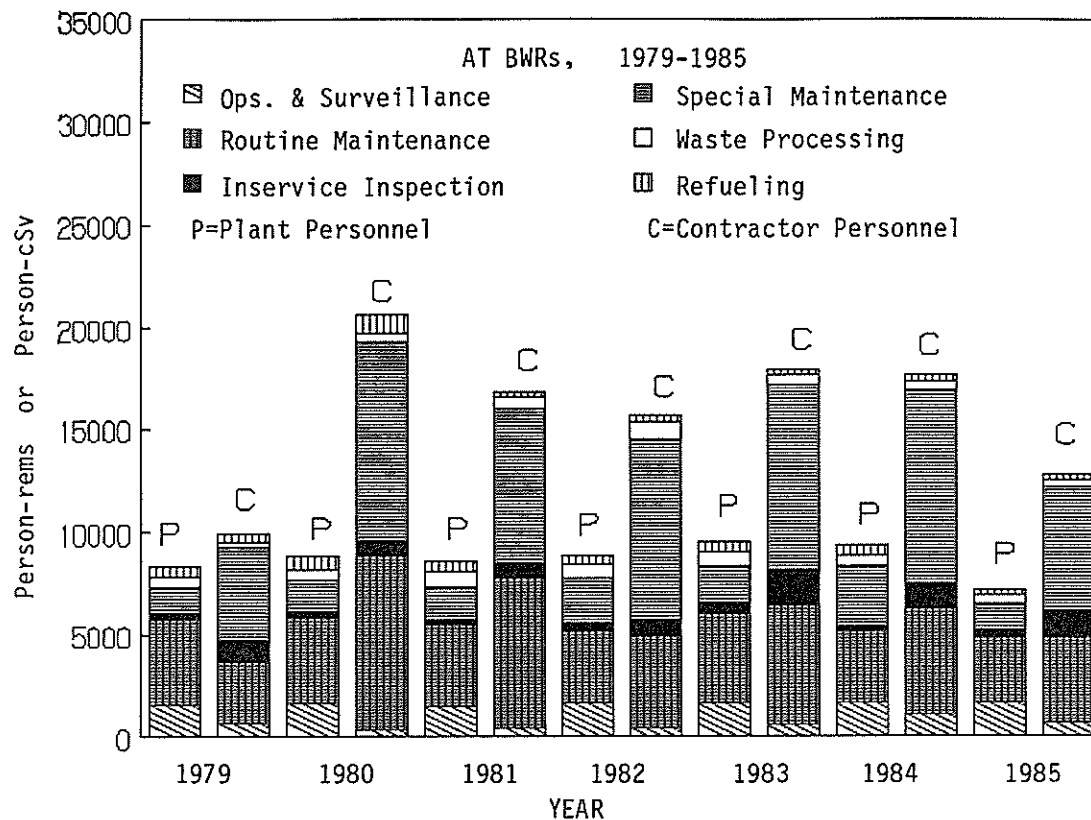
OCCUPATION	STATION EMPLOYEES		UTILITY EMPLOYEES		CONTRACT WORKERS		TOTAL PER FUNCTION	
	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL	PERSON-REM	% OF TOTAL
<b>*BOILING WATER REACTORS</b>								
MAINTENANCE	2,605.499	13.06%	1,603.877	8.04%	10,094.016	50.61%	14,303.392	71.72%
OPERATIONS	1,163.361	5.83%	206.333	1.03%	384.173	1.93%	1,753.867	8.79%
HEALTH PHYSICS	700.327	3.51%	90.095	0.45%	1,045.809	5.24%	1,836.231	9.21%
SUPERVISORY	280.383	1.41%	34.962	0.18%	394.704	1.98%	710.049	3.56%
ENGINEERING	319.179	1.60%	159.980	0.80%	862.014	4.32%	1,341.173	6.72%
TOTALS	5,068.749	25.41%	2,095.247	10.51%	12,780.716	64.08%	19,944.712	100.00%
<b>*PRESSURIZED WATER REACTORS</b>								
MAINTENANCE	4,439.867	18.46%	1,907.124	7.93%	8,768.051	36.45%	15,115.042	62.83%
OPERATIONS	1,410.701	5.86%	229.810	0.90%	680.201	2.83%	2,320.712	9.65%
HEALTH PHYSICS	1,276.539	5.31%	73.333	0.30%	2,348.569	9.76%	3,698.441	15.37%
SUPERVISORY	367.705	1.53%	46.088	0.19%	217.021	0.90%	630.814	2.62%
ENGINEERING	480.071	2.00%	215.815	0.90%	1,595.484	6.63%	2,291.370	9.52%
TOTALS	7,974.883	33.15%	2,472.170	10.28%	13,609.326	56.57%	24,056.379	100.00%
<b>*ALL LIGHT WATER REACTORS</b>								
MAINTENANCE	7,045.366	16.01%	3,511.001	7.98%	18,862.067	42.87%	29,418.434	66.86%
OPERATIONS	2,574.062	5.85%	436.143	0.99%	1,064.374	2.42%	4,074.579	9.26%
HEALTH PHYSICS	1,976.866	4.49%	163.428	0.37%	3,394.378	7.71%	5,534.672	12.58%
SUPERVISORY	648.088	1.47%	81.050	0.18%	611.725	1.39%	1,340.863	3.05%
ENGINEERING	799.250	1.82%	375.795	0.85%	2,457.498	5.59%	3,632.543	8.26%
TOTALS	13,043.632	29.64%	4,567.417	10.38%	26,390.042	59.98%	44,001.091	100.00%

\*Table does not include results from the PWRs at Point Beach 1, 2 (444 person-rems) and the BWR at Shoreham (19.21 person-rems), because the data for these plants were not submitted in the suggested format.



Figure 4.5

COLLECTIVE DOSE BY WORK FUNCTION and PERSONNEL TYPE



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 estimated 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 Health Implications of Average Annual Doses

Of interest to individuals exposed to radiation in the workplace, are the potential health risks associated with occupational exposure. If any damage to health is caused by exposure to radiation in the workplace, it would likely manifest itself as certain types of cancer in the exposed worker or, less likely, as inherited genetic damage in the first few generations of the workers' offspring. However, the likelihood of cancer or genetic damage occurring as a result of radiation exposure experienced by workers in the nuclear industry is small. A vast amount of scientific information is available from which estimates of these risks can be made. Much of this information, however, has been obtained from epidemiologic studies of human populations at levels of exposure considerably higher than those normally experienced in the workplace. Complementary to this, information obtained from many animal and cell biology studies have greatly enhanced our knowledge and understanding of the biological effects of ionizing radiation. Although using this information to estimate risks in the workplace introduces uncertainties, these uncertainties can be dealt with in such a manner that the risk is not likely to be underestimated. Thus, the discussion below is likely to overstate the health implications rather than understate them.

Cancer induction as a result of radiation exposure has been examined by many organizations having scientific and medical expertise in the subject. One of these, the National Academy of Sciences (NAS), published a comprehensive review of the biological effects of ionizing radiation in 1980 [Ref. 16]. Based on this report, a large working population receiving one million person-rem (person-cSv) might suffer an estimated 100 to 200 additional cancer deaths over the remaining years of their lives. This risk estimate can be applied to the 47,474 person-rem (person-cSv) (Table 3.1) and the 110,763 workers who received measurable exposures in 1985. The result is that for these workers the expected number of additional cancer deaths that might result from radiation dose received that year would be about ten. These deaths would occur many years following the exposure and would be in addition to the approximately 20,000 cancer deaths that occur normally in a population of 110,763 workers without exposure to this amount of radiation. Perhaps more meaningful to the individual workers are the health implications to the workers receiving the average dose of 0.43 rem (cSv) or the maximum dose of 27 rem (cSv) during 1985. The estimated increased cancer death risk is about one chance in 10,000 for the average dose and about three chances in 1000 for the maximum dose. Should a worker receive 0.43 rem (cSv) per year continuously during his entire working career (working from age 20 until age 65) his risk of dying from cancer could increase by less than 2% over the normal risk of dying of cancer. These risks can be compared to the American Cancer Society's estimates of one

chance in four of developing cancer and one chance in five of dying of cancer.

The potential genetic effects from a worker population receiving about 47,474 person-rems (person-cSv) is very 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 110,763 exposed\* workers would, according to the 1980 NAS report, be an increase of three or less cases (less than 0.05%) compared to the expected 10,000 cases that occur normally. 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.

---

\* Assuming that, on the average, each exposed person will have one live born child in the future, i.e., 110,763 children born to this worker population.



## 5 TERMINATION DATA SUBMITTED PURSUANT TO 10 CFR § 20.408

### 5.1 Termination Reports, 1969-1984\*

In 1969, the Atomic Energy Commission (predecessor of the NRC) began requiring certain categories of licensees\*\* to submit personal identification and exposure information upon the termination of each monitored person's employment or work assignment at their facility. 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, some 1,600,000 termination records have been received for approximately 390,000 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 numerous individuals have been terminated more than once over the years and because some individuals may have had external doses reported for more than one part of the body, as well as estimates of internal depositions of radioactive material, each of which is counted as one record. Due to the large number of records, it takes a considerable amount of time to process these records so that the termination data for 1985 are not yet available. It should be noted that the data presented in this section are revised from last year's report as all the termination data for 1983 and 1984 have now been entered into REIRS. Table 5.1 provides a breakdown of this information for individuals terminating during each of these 16 years and, since the majority of termination reports are now submitted by nuclear power facilities, the number of records and individuals that they reported are displayed separately. As shown, the number of records continues to increase each year, primarily because of the growing need for workers at power reactors.

### 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 his work assignment at the facility, (2) the period(s) of exposure that are reported for terminating individuals may indicate the monitoring period during which he may have been exposed to radiation rather than the actual dates of exposure,

---

\* Updated for 1983 and 1984 data which have now been entered into REIRS.

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

(3) some licensees report cumulative periods of exposure and doses rather than the actual periods and dose incurred during each period, and (4) licensees having more than one licensed facility sometimes include in the termination report submitted when the individual leaves the second facility the dose that he 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 small additional source of error in any statistics developed from the termination data.

TABLE 5.1  
TERMINATION REPORTS SUBMITTED TO THE NRC  
1969 - 1984\*\*

YEAR	<u>All Covered Categories*</u>		<u>Power Reactor Licensees</u>	
	Number of Termination Records	Number of Terminating Individuals	Number of Termination Records	Number of Terminating Individuals
1969	5,009	3,992	790	727
1970	8,606	6,069	2,126	1,908
1971	12,955	8,874	2,246	2,197
1972	15,685	10,353	4,997	3,888
1973	19,985	15,588	11,525	9,071
1974	30,389	21,499	16,946	11,603
1975	44,676	27,415	38,376	22,627
1976	70,230	40,079	63,593	35,294
1977	88,295	42,183	81,074	36,864
1978	96,010	44,541	85,308	37,359
1979	133,470	58,913	118,218	48,305
1980	175,408	73,662	162,515	65,092
1981**	205,103	73,004	196,104	67,908
1982**	200,191	67,589	192,314	63,848
1983**	243,229	76,202	234,803	72,869
1984**	294,556	77,251	284,144	74,182

\*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.

\*\*Additional termination data for these years have now been entered into the REIR System and the corresponding figures have been updated.

### 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 nearly half 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 most likely to approach the quarterly limits without their employer's knowledge since they move so rapidly among 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 increased about tenfold during the past ten years from 332 in 1974 to 3,284 in 1984, and yet the average individual dose (which is close to being a quarterly dose for these workers) has steadily decreased over these years to a value of .34 rem (cSv) for 1984. As previously noted, there are no data yet available for 1985.

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. The smaller number of workers terminated by three licensees received the same or higher average doses than those terminated by two employers every year until 1983. In 1983, for the first time workers terminating from three nuclear power licensees received a lesser average dose than those workers terminated by two such licensees, and in 1984 the average dose is about the same for these workers. This is believed to be a reflection of the industry's efforts to reduce the exposure of all individuals working at their facilities.

Examination of these records also revealed that some individuals have worked for as many as six different NRC licensees during one calendar quarter. However, on the average, less than two instances per year have been found in which a worker exceeded his quarterly limit of three rems (cSv) as a result of his working at two or more different licensed facilities within one calendar quarter. In a few of these instances, the doses that the workers had received while employed by the first utility were revised upward later in the year. The underestimates resulted in quarterly doses that slightly exceeded three rems (cSv). A very few quarterly exposures exceeding three rems (cSv) may have gone undetected because a worker's dose was received over a period spanning a calendar quarter and was reported for the entire period. When this happens, it is not possible to determine the portion of the dose received during each quarter.

### 5.4 Transient Workers per Calendar Year at Nuclear Power Facilities

Since the number of transient workers per calendar quarter comprise only a

TABLE 5.2

## TRANSIENT WORKERS PER CALENDAR QUARTER

1973 - 1984

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)
1973	157	138	0.88	1973	146	123	0.84
1974	332	170	0.51	1974	285	158	0.55
1975	709	508	0.72	1975	684	493	0.72
1976	1,299	904	0.70	1976	1,257	889	0.71
1977	1,481	870	0.59	1977	1,437	851	0.59
1978	1,570	720	0.46	1978	1,500	680	0.45
1979	1,809	836	0.46	1979	1,754	802	0.46
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*	3,284	1,122	0.34	1984*	3,223	1,090	0.34

## Power Reactor Facilities

Power Reactor Facilities				Power Reactor Facilities			
Year	No. of Workers Terminated by Two Licensees	Collective Dose	Average Dose	No. of Workers Terminated by Three Licensees	Collective Dose	Average Dose	No. of Workers Terminated by >Three Licensees
1973	133	108	0.81	11	13	1.18	2
1974	255	132	0.52	28	24	0.86	1
1975	609	427	0.70	70	63	0.89	4
1976	1,095	720	0.66	145	146	1.01	23
1977	1,271	718	0.56	147	115	0.78	18
1978	1,303	590	0.45	165	75	0.45	15
1979	1,527	647	0.43	178	130	0.73	32
1980	1,896	856	0.45	259	140	0.54	49
1981	1,967	780	0.40	308	145	0.47	63
1982*	2,047	789	0.39	288	113	0.39	60
1983*	2,276	767	0.34	362	101	0.28	61
1984*	2,677	907	0.34	414	146	0.35	90
							132
							37

\*Figures for these years have been updated because additional termination data have now been entered into the REIR System.



TABLE 5.3  
TRANSIENT WORKERS PER CALENDAR YEAR AT NUCLEAR POWER FACILITIES  
1977 - 1984

Year	No. of Commercial Reactors	No. of Workers Terminated by Two or More Licensees	Collective Dose (person-cSv)		Average Dose (rems or cSv)
			person-cSv	person-cSv	
1977	57	3,161	3,776		1.19
1978	64	3,202	3,231		1.01
1979	68	3,938	3,891		0.99
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	7,403	7,763		1.05

Year	No. of Workers Terminated by Two Licensees		Collective Dose (person-cSv)		No. of Workers Terminated by Three Licensees	Collective Dose (person-cSv)		No. of Workers Terminated by >Three Licensees	Collective Dose (person-cSv)		Average Dose (rems or cSv)
	person-cSv	person-cSv	person-cSv	person-cSv		person-cSv	person-cSv		person-cSv	person-cSv	
1977	2,166	1,987	0.92	842	572	1.47	423	947	2.24		
1978	2,119	1,490	0.70	792	621	1.28	462	949	2.05		
1979	2,761	2,097	0.76	805	688	1.17	489	989	2.02		
1980	3,772	3,444	0.91	1,245	959	1.30	732	1,339	1.83		
1981	3,745	3,033	0.81	1,172	924	1.27	756	1,176	1.56		
1982	3,645	3,349	0.92	1,131	913	1.24	745	1,130	1.52		
1983*	4,203	3,624	0.86	1,694	1,256	1.39	881	1,357	1.53		
1984*	4,868	4,034	0.83	1,924	1,420	1.35	1,115	1,805	1.62		

\*Figures for these years have been updated because additional termination data have now been entered into the REIR System.

small percentage of the total number of individuals terminating each year, it was decided to change the criteria so that the records of more workers would be examined. This was done by selecting the records of all individuals who began and terminated two or more periods of employment with at least two different reactor facilities within one calendar year and summing each worker's whole body doses. 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 eight years from 1977 through 1984. The number of these workers increased from about 3,200 workers in 1977 to about 7,400 in 1984. After a sharp peak of about 6,000 person-rem (person-cSv) in 1980, the collective dose incurred by these workers decreased to about 5,400 person-rem (person-cSv) in 1981 and then began increasing again to a value of 7,763 person-rem (person-cSv) in 1984. The average dose, however, has remained constant at about 1.05 rem (cSv) during this period. 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.

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 licensee's annual reports had on the annual summary (Table 4.4) for all nuclear power facilities (one of the problems mentioned in Section 2). Table 5.4a shows the corrected 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. 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 workers had on the staff's summation of the annual statistical reports for the years 1978 through 1984. 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 1983 the summation of annual reports indicated that 85,839 workers received a measurable dose, 85 of whom received doses greater than five rem (cSv). After accounting for those individuals that were reported more than once, the corrected distribution indicated that there were only 81,177 workers that received a measurable dose and that 169 of them received doses greater than five rem (cSv). This resulted in an average measurable dose of 0.76 rem (cSv) rather than the 0.65 rem (cSv) obtained from a summation of the reports.

**TABLE 5.4a**  
**REPORTED AND CORRECTED DOSE DISTRIBUTIONS OF TRANSIENT WORKERS**  
**PER CALENDAR YEAR AT POWER REACTORS**

Type of Distribution and Year	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)																b Collective Dose (Person-rem or -cSv)		Avg. Measurable Dose (rem or cSv)
	Less than Measurable	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	5.0-6.0	6.0-7.0	7.0-8.0	8.0-9.0	9.0-10.0	>10	Total Individuals			
Corrected Distribution of Transients - 1978	308	885	317	282	177	131	463	307	168	107	42	13	1	0	1	3,202	3,231	1.01	1.12
Reported Distribution of Transients - 1978	2,079	2,423	918	788	488	382	873	282	51	11	0	2				8,277	3,231	0.39	0.52
Corrected Distribution of Transients - 1979	373	883	398	358	281	240	678	410	195	71	32	14	4	1		3,938	3,888	0.99	1.09
Reported Distribution of Transients - 1979	2,130	2,676	1,259	1,048	673	460	1,040	313	46	13	1					9,649	3,888	0.40	0.52
Corrected Distribution of Transients - 1980	533	1,175	565	482	388	277	829	595	353	174	47	25	15	4	1	5,463	6,028	1.10	1.22
Reported Distribution of Transients - 1980	3,207	3,910	1,639	1,398	900	661	1,632	503	74	29	4	4	4			13,955	6,028	0.43	0.56
Corrected Distribution of Transients - 1981	562	1,271	482	422	380	310	954	614	275	107	30	17	0	1		5,425	5,381	0.99	1.08
Reported Distribution of Transients - 1981	3,640	3,767	1,473	1,418	963	716	1,550	349	69	8	1	1				13,955	5,381	0.39	0.52
Corrected Distribution of Transients - 1982	623	1,226	452	397	332	286	867	536	339	184	42	18	1	0	1	5,303	5,610	1.06	1.20
Reported Distribution of Transients - 1982	3,803	3,480	1,432	1,308	842	661	1,502	506	87	20	1					13,642	5,610	0.41	0.57
Corrected 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	1.22
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	0.58
Corrected Distribution of Transients - 1984	1,043	1,748	539	510	406	361	1,148	844	536	197	52	19				7,403	7,762	1.05	1.22
Reported Distribution of Transients - 1984	5,757	5,120	1,826	1,692	1,184	930	2,335	611	93	7	0					19,555	7,762	0.40	0.56

<sup>a</sup> Includes data from Fort St. Vrain.

<sup>b</sup> Collective dose found by summing the actual doses reported for those workers on their termination reports.

<sup>c</sup> Distribution found by subtracting the corrected from the reported distribution shown in Table 5.4a and then subtracting this difference from the reported statistical distribution shown in Table 5.4b.

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	bCollective Dose (Person-rems or cSv)	Avg. Dose (rem or cSv)	Avg. Measurable 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				
<sup>a</sup> Reported Statistical Distribution - 1978	31,039	16,673	6,943	5,504	3,399	2,498	6,405	2,989	1,080	418	67	26	8	0	0	2	77,051	31,806	0.41	0.69
<sup>c</sup> Corrected Statistical Distribution - 1978	29,268	15,135	6,342	4,998	3,088	2,247	5,995	3,034	1,197	514	109	37	9	0	1	2	71,976	31,668	0.45	0.74
<sup>a</sup> Reported Statistical Distribution - 1979	42,340	24,632	9,883	8,090	5,147	3,426	7,898	3,306	1,255	477	86	28	13	2	0	1	106,584	39,987	0.38	0.62
<sup>c</sup> Corrected Statistical Distribution - 1979	40,583	22,831	9,022	7,400	4,755	3,206	7,536	3,403	1,404	545	117	42	17	3	0	1	100,865	39,525	0.39	0.66
<sup>a</sup> Reported Statistical Distribution - 1980	47,377	29,695	11,751	9,820	6,082	4,518	11,474	4,515	1,537	686	192	98	18	3			128,668	53,799	0.42	0.67
<sup>c</sup> Corrected Statistical Distribution - 1980	44,703	26,960	10,677	8,904	5,570	4,134	10,671	4,607	1,816	831	235	119	29	7	1		120,166	53,626	0.45	0.72
<sup>a</sup> Reported Statistical Distribution - 1981	42,323	29,332	12,217	10,326	6,625	4,903	11,766	4,546	1,763	486	93	81	11	2	1	1	124,506	54,152	0.43	0.66
<sup>c</sup> Corrected Statistical Distribution - 1981	39,245	25,836	11,226	9,330	6,042	4,497	11,170	4,811	1,969	585	122	91	11	3	1	1	115,946	54,142	0.47	0.71
<sup>a</sup> Reported Statistical Distribution - 1982	45,871	31,502	12,693	10,814	6,739	4,795	10,855	4,686	1,814	432	56	13	4	0	1		130,275	52,191	0.40	0.62
<sup>c</sup> Corrected Statistical Distribution - 1982	42,691	29,248	11,713	9,903	6,229	4,420	10,220	4,716	2,066	596	97	31	5	0	1	1	121,937	52,191	0.43	0.66
<sup>a</sup> Reported Statistical Distribution - 1983	52,568	32,567	12,429	10,474	6,617	4,798	12,379	5,369	1,957	544	65	16	4				139,787	57,212	0.41	0.65
<sup>c</sup> Corrected Statistical Distribution - 1983	48,545	29,774	11,413	9,522	5,998	4,366	11,553	5,390	2,276	716	121	38	8	2			129,722	57,212	0.44	0.76
<sup>a</sup> Reported Statistical Distribution - 1984	60,330	41,095	15,223	11,916	7,467	5,630	13,213	5,140	1,710	295							162,019	57,487	0.39	0.58
<sup>c</sup> Corrected Statistical Distribution - 1984	55,606	37,723	13,936	10,734	6,689	5,061	12,026	5,364	2,153	485	52	19					149,848	57,487	0.51	0.72

<sup>a</sup>Includes data from Fort St. Vrain.

<sup>b</sup>Collective dose found by summing the actual doses reported for those workers on their termination reports.

<sup>c</sup>Distribution found by subtracting the corrected from the reported distribution shown in Table 5.4a and then subtracting this difference from the reported statistical distribution shown in Table 5.4b.

Since the number of transient workers receiving measurable doses is only about 5% of the total number of workers receiving measurable doses during the 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 exceeding five rems, one finds that the corrected statistical distribution (Table 5.4a) indicates that the number of workers who received doses greater than five rems (cSv) was between 50 and 70 more than the number found in the reported statistical distribution for each year. This is more clearly shown in Table 5.5, where it can be seen that in 1984 the corrected number of transient workers receiving doses greater than five rems (cSv) was 71, as opposed to zero reported doses in excess of five rems. This corrected number of workers (71) represents a significant decrease from previous years and reflects the industry's concerted efforts to keep annual doses of all workers under five rems.

TABLE 5.5  
ANNUAL WHOLE BODY DOSES EXCEEDING FIVE REMS (cSv)  
AT NUCLEAR POWER FACILITIES

Year	Reported Number >5 Rems (cSv)	Corrected Number >5 Rems (cSv)	Percent of Workers
1977	270	351	0.9
1978	103	158	0.4
1979	130	180	0.3
1980	311	391	0.5
1981	189	235	0.3
1982	74	135	0.2
1983*	85	168	0.2
1984*	0	71	<0.1

\*Figures for these years have been updated because additional termination data have now been entered into the REIR System.

#### 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 their employment at only one nuclear power facility during the calendar year. Table 5.6 shows that the number of these temporary individuals has increased by 77% between 1977 and 1984 while the number of reactors has increased by about 40% during this time. The number of temporary workers receiving a measurable dose, however, has increased by only 51%. The average dose per monitored individual remains at about 0.30 rem (cSv) and, since about half of them received less than measurable doses, the average measurable dose for 1984 is 0.54 rem (cSv). Comparison of these figures with those in Table 5.4b reveals that

these workers comprised 31% of the total number of workers receiving a measurable dose in 1984 (94,242), while their collective dose was only 27% of the total collective dose. Their average measurable dose of 0.54 rem (cSv) was also considerably less than the overall average of 0.72 rem (cSv).

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)
1977	57	29,090	19,094	11,373	0.39	0.60
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	51,502	28,820	15,549	0.30	0.54

\*Figures for these years have been updated because additional termination data have now been entered into the REIR System.

## 6 PERSONNEL OVEREXPOSURES - 10 CFR § 20.403 and 10 CFR § 20.405

### 6.1 Control Levels

One requirement of the above-referenced sections of Part 20, Title 10, Chapter I, Code of Federal Regulations, is that all persons licensed by the NRC must submit reports of all occurrences involving personnel radiation exposures that exceed certain control levels, thus providing for investigations and corrective actions as necessary. The term "overexposure" is not necessarily intended to indicate that a worker has been subjected to an unacceptable biological risk. 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.

#### (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 or § 20.104(b)] 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 Section 3.2. 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 usually fall into this category as well. These reports must be submitted to the Commission within 30 days of the occurrence.

### 6.2 Summary of Overexposures

Table 6.1 summarizes all the occupational overexposures to external sources of radiation as reported by Commission licensees pursuant to § 20.403 and § 20.405 during the years 1978 through 1985. For 1983, 1984, and 1985, it shows the number of individuals that exceeded various limits while employed by one of several types of licensees. For the years 1978 through 1982, only the overexposures reported by licensed industrial radiography firms are shown separately. Most of the occurrences included in the "Others" category

TABLE 6.1  
PERSONNEL OVEREXPOSURES TO EXTERNAL RADIATION  
1978-1985

YEAR	LICENSE CATEGORY	PERSONS AND DOSES (REM)	TYPES OF OVEREXPOSURES AND DOSES								
			WHOLE BODY (REMS)			SKIN (REMS)			EXTREMITY (REMS)		
			(<5)	(>5<25)	(>25)	(>7.5<30)	(>30<150)	(>150)	(>18.75<75)	(>75<375)	(>375)
1985	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	5	3	1					1	
		SUM OF DOSES	13.3	32.6	27.0					288	
	POWER REACTORS	NO. OF PERSONS	3			1					
		SUM OF DOSES	3.3			10.8					
	MEDICAL FACILITIES	NO. OF PERSONS	3								
		SUM OF DOSES	6.7								
	MARKETING & MANUFACT.	NO. OF PERSONS							2	1	
1984		SUM OF DOSES							38.7	93	
	OTHERS	NO. OF PERSONS	1			1			1		
		SUM OF DOSES	1.8			38.0			21.5		
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	3	1					3		
		SUM OF DOSES	12.5	8.2					127.9		
	POWER REACTORS	NO. OF PERSONS	3								
		SUM OF DOSES	7.6								
1983	MEDICAL FACILITIES	NO. OF PERSONS	2	1					1		
		SUM OF DOSES	5.7	5.2					18.8		
	MARKETING & MANUFACT.	NO. OF PERSONS							1		
		SUM OF DOSES							21.8		
	OTHERS	NO. OF PERSONS	1						3		
		SUM OF DOSES	1.7						70.1		
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	1								1
1982		SUM OF DOSES	4.7								650
	POWER REACTORS	NO. OF PERSONS	8								
		SUM OF DOSES	14.9								
	MEDICAL FACILITIES	NO. OF PERSONS	3								
		SUM OF DOSES	5.2								
	MARKETING & MANUFACT.	NO. OF PERSONS		1 <sup>a</sup>					2		
		SUM OF DOSES		25					49.5		
1981	OTHERS	NO. OF PERSONS							25	2	
		SUM OF DOSES							837	228	
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	6	3							
1980		SUM OF DOSES	16.1 <sup>b</sup>	20.7							
	ALL OTHERS	NO. OF PERSONS	5	1					15	2	
		SUM OF DOSES	12.5	9.4					569	206	
1979	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	7	1							
		SUM OF DOSES	12.2	7.1							
	ALL OTHERS	NO. OF PERSONS	10	2 <sup>c</sup>		1			4		
1978		SUM OF DOSES	24.1	30.9		8.1			102.9		
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	4	1					1		
		SUM OF DOSES	23.6	7.7					56		
1977	ALL OTHERS	NO. OF PERSONS	84						3		3
		SUM OF DOSES	285.4 <sup>d</sup>						73.5		33,000
1976	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	8 <sup>d</sup>	3							
		SUM OF DOSES	25.9	34.6							
	ALL OTHERS	NO. OF PERSONS	30	3 <sup>e</sup>		7	1	2 <sup>f</sup>	15	1 <sup>g</sup>	
1975		SUM OF DOSES	65.0	39.0		125.7	40.0	327	468.1	147	
	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS	4	1						1	
		SUM OF DOSES	15.3	21.6						150	
1974	ALL OTHERS	NO. OF PERSONS	12	4	1	2			2		
		SUM OF DOSES	36.0	51.9	27.3	18.2			49.2		

<sup>a</sup>This person simultaneously received an extremity overexposure of 61 rems (cSv) that is not shown.

<sup>b</sup>One of these persons simultaneously received a skin overexposure of 15.2 rems (cSv) that is not shown.

<sup>c</sup>One of these persons simultaneously received an extremity overexposure of 21 rems (cSv) that is not shown.

<sup>d</sup>One of these persons simultaneously received an extremity overexposure of 46 rems (cSv) that is not shown.

<sup>e</sup>One of these persons simultaneously received an extremity overexposure of 45 rems (cSv) that is not shown.

<sup>f</sup>These two persons simultaneously received extremity overexposures of 82 and 38 rems (cSv) that are not shown.

<sup>g</sup>This person simultaneously received a skin overexposure of 13 rems (cSv) that is not shown.



come from research facilities, universities and measuring and well-logging activities. In 1980 the total number of individuals reported as being overexposed was 96, a considerable increase over the numbers reported for other years. This increase was due to the overexposure of some 67 individuals at one nuclear power facility during steam generator repair work. They received doses between three and five rems. In 1984, the total number of overexposed individuals was 19, which was the lowest number reported during the years shown. In 1985, the number of individuals increased somewhat to 23, and the highest whole body dose was 27 rem (cSv). In each of the years from 1978 through 1984, the highest whole body doses were 27.3, 17.0, 7.7, 21, 9.4, 25, and 8.2 rems (cSv), respectively.

In 1985, there were six incidents in which external exposures of the magnitude described in Category A or B were received by seven individuals. A summary of these incidents is provided below. The first four incidents occurred during industrial radiography operations, and the remaining two incidents occurred at a chemistry laboratory and a university.

On February 7, 1985, two radiographers were conducting radiography of reheater tubes located inside the reheater boiler of a fossil fuel power generating station. One radiographer received a whole body dose of 7.96 rems when he failed to completely retract the 93-curie iridium-192 source to its shielded position, and he entered the radiation area without surveying the exposure device. The second radiographer surveyed the device, alerted the first radiographer to leave the area and properly retracted the source.

On June 14, 1985, two unsupervised radiographer's assistants were performing radiographic exposures of furnace boiler tubes using a 61-curie iridium-192 source. One radiographer's assistant received an extremity dose between 96 and 288 rems to the left hand when he failed to properly perform a survey of the exposure device and as a result, his hand was in close proximity to the unshielded source when he disconnected the guide tube.

During August 1 and August 2, 1985, two radiographers were conducting radiography on a pipeline near Table Rock, Wyoming. They received whole body doses of 27 rems and 9 rems when a 28-curie iridium-192 source failed to retract and remained in the unshielded tube. They failed to conduct proper surveys of their equipment, and the source remained undetected at the end of the source tube for two days.

The fourth radiography overexposure occurred on October 8, 1985, when two radiographers were conducting radiography on small diameter piping at an industrial facility in Olean, New York. When the radiographer noticed that the number on the film being used was incorrect, he started to retract the 100-curie iridium-192 source so that he could change the film number. However, after a conversation with the assistant radiographer about the problem, he neglected to retract the source, failed to survey the exposure device, entered the radiation area and received a whole body dose of 15.59 rems.

On November 18, 1985, a chem-technologist received an extremity dose of 93 rems averaged over a one square centimeter area on the thumb of the left hand. The chem-technologist was manipulating 200 mCi of carbon-14 (acetic anhydride) when she experienced difficulty in removing the syringe from the

rubber septum and attempted to grasp the needle with her PVC gloved hand. Contamination from the syringe and septum passed through the gloves to her hand during the attempt.

On the morning of May 7, 1985, a researcher at a university opened a vial containing 1.8 millicuries of a phosphorus-32 labeled compound. The researcher, who was not working behind a shield nor wearing a lab coat, was sprayed with the material when he opened it. It is believed that the vial somehow became pressurized either in the preparation for shipment or during shipment. The researcher did not survey himself or his lab after opening the vial, and the incident was not discovered until late in the day when another researcher was surveying nearby areas. Calculations determined that the researcher received a dose of approximately 38 rems to the skin of the whole body.

There were no instances in 1985 in which the intake of radioactive material exceeded the quarterly intake limit, nor were there any reports of personnel exposure to airborne concentrations of radioactive material in excess of applicable limits.

## 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.
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. 9, No. 1, January 1985.\*

---

\* 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.

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 Academy of Sciences, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980, "Committee on the Biological Effects of Ionizing Radiations, July 1980. Available from the National Academy Press, 2101 Constitution Avenue NW., Washington, DC 20418.

## **APPENDIX A**

**Alphabetical Listing of Annual Exposure Data  
Compiled for Certain NRC Licensees**

**1985**



# APPENDIX A

## INDUSTRIAL RADIOGRAPHERS Single Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
ABEX CORP	48-13776-01	9	3	0	0.05
ABEX CORP.	34-24346-01	11	11	1	0.07
ABEX CORPORATION	29-01208-02	5	0	0	0.00
AIR PRODUCTS AND CHEMICALS, IN	37-05105-05	17	4	0	0.05
ALLOY CRAFTS COMPANY	13-17511-01	5	4	0	0.08
ALONSO & CARUS IRON WORKS	52-21350-01	7	3	0	0.13
ANCHOR/DARLING VALVE COMPANY	37-15476-01	6	4	0	0.05
ARMY, DEPARTMENT OF THE	13-18235-01	159	22	1	0.05
ARMY, DEPARTMENT OF THE	29-00047-06	166	39	2	0.05
ARROW TANK & ENGINEERING COMPA	22-13253-01	4	4	0	0.05
ATLANTIC RESEARCH CORPORATION	45-02808-04	16	16	5	0.34
BABCOCK & WILCOX COMPANY	34-02160-03	37	37	2	0.05
BELOIT CORPORATION	48-02412-02	2	0	0	0.00
BORG-WARNER CORPORATION	37-16828-01	11	2	0	0.05
BRAND EXAMINATION SERVICES	06-17156-01	20	15	16	1.04
BRIGHTON CORP.	34-21480-01	3	3	3	0.83
BUCKEYE INTERNATIONAL	34-06627-01	3	2	0	0.05
CALUMET TESTING SERVICES INC.	13-16347-01	38	25	21	0.82
CATERPILLAR TRACTOR COMPANY	12-18023-01	6	0	0	0.00
CHICAGO BRIDGE AND IRON COMPAN	12-05639-01	7	6	0	0.05
COLT INDUSTRIES OPERATING CORP	48-02387-03	5	0	0	0.00
COLT INDUSTRIES OPERATING CORP	48-02387-03	5	0	0	0.00
CONNECTICUT, STATE OF	06-06472-03	36	2	0	0.05
CONSOLIDATED FOUNDRIES & MFG.	34-04657-02	0	0	0	0.00
CONSTRUCTION ENGINEERING CONSU	37-18456-01	22	8	1	0.08
COPEES-VULCAN	37-19530-01	1	1	0	0.38
CRANE COMPANY - INDIAN ORCHARD	20-00518-02	2	0	0	0.00
DAY AND ZIMMERMANN INC.	42-15051-02	3	3	0	0.05
DELTAK CORP.	22-21447-01	0	0	0	0.00
DEPT. OF ARMY, MCALESTER ARMY	35-19189-02	29	1	0	0.05
DEPT. OF THE NAVY, NONDESTRUCT	04-06145-03	11	0	0	0.00
DODGE FOUNDRY AND MACHINE COMP	37-15324-01	5	3	0	0.05
DRAVO CORPORATION	34-00850-02	10	2	0	0.05
DUNCAN FOYNDRY & MACHINE WORKS	12-09687-01	0	0	0	0.00
DURALOY COMPANY (THE)	37-02279-02	6	5	1	0.24
DURIRON COMPANY INCORPORATED	34-06398-01	5	5	1	0.27
EMPIRE STEEL CASTINGS, INC.	37-02448-01	3	1	0	0.38
EXXON COMPANY U. S. A.	25-03375-02	7	0	0	0.00

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS      Single Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
GENERAL ELECTRIC COMPANY	20-00815-05	12	1	0	0.05
GENERAL ELECTRIC COMPANY	34-00499-10	3	1	0	0.05
GENERAL MOTORS CORP.	21-08678-04	4	0	0	0.00
GENERAL MOTORS CORPORATION	12-02251-01	4	0	0	0.00
GENERAL MOTORS CORPORATION	21-02392-01	3	0	0	0.00
GENERAL MOTORS CORPORATION	34-15315-02	8	0	0	0.00
GLOBE X-RAY SERVICES INC	35-15194-01	22	22	25	1.14
GREDE FOUNDRIES INCORPORATED	48-02844-01	3	1	0	0.05
HARRISON STEEL CASTINGS COMPAN	13-02141-01	6	4	1	0.31
HESS OIL VIRGIN ISLAND CORPORA	55-15533-02	11	4	0	0.08
HIGH STEEL STRUCTURES INC.	37-17534-01	9	5	0	0.05
INDUSTRIAL RADIOGRAPHIC SERVIC	55-16734-01	0	0	0	0.00
INGERSOLL-RAND COMPANY	29-02015-02	2	2	1	0.40
INTERIOR, DEPARTMENT OF THE	24-02619-02	6	3	0	0.05
INTERIOR, DEPARTMENT OF THE	36-01142-03	6	3	0	0.05
JOHN DEERE FOUNDRY	12-09111-01	3	3	0	0.05
KELSEY-HAYES COMPANY INCORPORA	12-02360-02	4	0	0	0.00
LABARGE INC.	35-15514-01	4	4	1	0.19
LUKENS STEEL COMPANY	37-02827-01	9	0	0	0.00
LYNCHBURG FOUNDRY COMPANY	45-17464-01	9	2	0	0.05
MASON & HANGER-SILAS MASON COM	16-17692-01	106	11	1	0.05
MAYNARD ELECTRIC STEEL CASTING	48-07080-01	4	4	2	0.46
MINNEAPOLIS ELECTRIC STEEL CAS	22-05572-02	2	2	0	0.05
MINNESOTA VALLEY ENGINEERING	22-24393-01	6	4	1	0.28
MISSOURI STEEL CASTINGS COMPAN	24-15152-01	5	0	0	0.00
NATIONAL AERONAUTICS AND SPACE	34-00507-04	34	15	1	0.06
NATIONAL AERONAUTICS AND SPACE	45-08886-02	4	0	0	0.00
NAVY, DEPARTMENT OF THE	04-06145-01	37	7	1	0.07
NAVY, DEPARTMENT OF THE	04-09369-01	99	1	0	0.05
NAVY, DEPARTMENT OF THE	28-01012-02	53	49	5	0.10
NAVY, DEPARTMENT OF THE	37-00314-06	44	11	1	0.07
NAVY, DEPARTMENT OF THE	39-06126-01	57	50	5	0.10
NAVY, DEPARTMENT OF THE	39-19047-01	10	0	0	0.00
NAVY, DEPARTMENT OF THE	39-19047-01	10	0	0	0.00
NAVY, DEPARTMENT OF THE	45-02757-01	26	2	0	0.05
NAVY, DEPARTMENT OF THE	45-17845-01	7	1	0	0.05
NAVY, DEPARTMENT OF THE	46-09611-01	3	0	0	0.00
NAVY, DEPARTMENT OF THE	46-19259-01	26	25	1	0.05



## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS    Single Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rem)	Average Meas'ble Dose (rem or cSv)
NAVY, DEPARTMENT OF THE	53-06007-01	32	28	1	0.05
NAVY, DEPT OF THE    NAVAL AIR	29-14031-02	4	0	0	0.00
NAVY, DEPT. OF, USS FRANK CABL	31-19283-01	14	13	3	0.25
NILES STEEL TANK COMPANY	21-04741-01	4	1	0	0.05
NORTHWEST AIRLINES INC.	22-12080-01	30	8	0	0.05
OKLAHOMA STEEL CASTINGS CO.	35-21159-01	7	2	0	0.05
OZARK AIR LINES, INC.	24-13591-01	24	2	0	0.11
P. X. ENGINEERING COMPANY INC.	20-15102-01	2	1	0	0.05
PELTON CASTEEL INC	48-02669-02	3	3	0	0.05
PENNSYLVANIA SHIPBUILDING CO.	37-21067-01	7	6	0	0.05
PROFESSIONAL SERVICES INDUSTRI	12-21501-01	15	15	1	0.05
PROFESSIONAL SERVICES INDUSTRI	24-20039-01	11	1	0	0.05
PROGRESSIVE FABRICATORS	24-21200-01	0	0	0	0.00
QUAKER ALLOY CASTING COMPANY	37-03671-01	19	16	4	0.24
REFINERY PRODUCTS CORPORATION	48-03665-02	3	3	1	0.33
RICHMOND ENGINEERING COMPANY I	45-02884-01	15	1	2	1.50
SAWYER RESEARCH PRODUCT INC	34-02044-01	6	3	0	0.09
SHAHER VALVE CO.	34-21198-01	5	1	0	0.05
SOUTHWESTERN ENGINEERING CO.	24-19500-01	4	2	0	0.11
ST. LOUIS STEEL CASTING, INC.	24-01587-01	3	3	0	0.05
STRUTHERS WELLS CORPORATION	37-11152-01	15	8	0	0.05
TAYLOR AND FENN COMPANY	06-02024-01	2	0	0	0.00
THIOKOL CHEMICAL CORPORATION	01-00856-02	16	0	0	0.00
THIOKOL CORPORATION	17-16380-01	58	32	2	0.05
TRANS WORLD AIRLINES INC	24-05151-05	28	7	0	0.05
U.S.A. WORTHINGTON PUMP CORPOR	29-02210-02	4	0	0	0.00
UNITED STATES PIPE AND FOUNDRY	29-07262-01	3	0	0	0.00
VOLLRATH COMPANY (THE)	48-05395-01	6	0	0	0.00
WEATHERLY FOUNDRY AND MANUFACT	37-09859-01	2	0	0	0.00
WEHR STEEL COMPANY	48-02005-02	4	3	1	0.24
WESTINGHOUSE ELECTRIC CORPORAT	37-05809-02	5	1	0	0.05
WHITING CORPORATION	12-04921-01	4	0	0	0.00
WILLIAM POWELL COMPANY (THE)	34-02963-01	6	1	0	0.05
WISCONSIN CENTRIFUGAL INCORPOR	48-11641-01	4	4	3	0.70
YUBA HEAT TRANSFER CORPORATION	35-13735-01	3	3	2	0.60

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rem)	Average Meas'ble Dose (rem or cSv)
A-1 INSPECTION, INC.	49-21496-01	3	2	2	1.06
ABC TESTING	20-19778-01	18	10	2	0.20
ADVANCED RADIATION SERVICE INC	29-14171-01	8	3	2	0.71
ADVEX CORPORATION	45-16452-01	15	10	9	0.94
AIR FORCE, DEPARTMENT OF THE	09-15149-01	7	7	1	0.07
ALASKA INDUSTRIAL X-RAY	50-16084-01	7	6	1	0.23
ALASKA WELDING CENTER	50-19202-01	65	58	54	0.94
ALLEGHENY LABS.	37-20734-01	2	2	3	1.44
ALLIED INSPECTION SERVICES INC	21-18428-01	9	6	6	0.93
ALLIS-CHALMERS HYDRO	37-16280-03	14	5	0	0.05
AMERICAN AIRLINES INC	35-13964-01	92	32	2	0.08
AMERICAN OIL COMPANY (THE)	13-00155-10	21	17	1	0.07
AMOCO OIL COMPANY	45-01378-02	14	4	1	0.14
ANP PIPELINE CO., LABORATORY SE	21-24502-01	6	3	0	0.09
ARMY, DEPARTMENT OF THE	30-02405-05	4	4	1	0.11
ARNOLD GREENE TESTING LABORATO	20-01074-02	42	29	7	0.24
ASTROTECH INC	37-09928-01	13	12	4	0.35
BABCOCK & WILCOX CO. (THE)	34-02160-04	101	38	6	0.16
BAKER TESTING SERVICES INC.	20-19067-01	4	3	0	0.09
BASIN INDUSTRIAL X-RAY, INC.	42-19906-01	0	0	0	0.00
BATH IRON WORKS CORPORATION	18-00828-04	15	3	0	0.05
BENJAMIN F. SHAW COMPANY	39-13318-01	1	1	0	0.38
BILL MILLER INC.	35-19048-01	31	27	22	0.82
BRANCH RADIOGRAPHIC LABORATORI	29-03405-02	66	66	8	0.12
BRAUN ENGINEERING TESTING, INC	22-16537-02	0	0	0	0.00
BRIGGS ENGINEERING & TESTING C	20-16401-01	8	8	1	0.15
BRISTOL STEEL AND IRON WORKS I	45-16947-01	8	6	2	0.37
BOOTHE-TWINING, INC	04-19522-01	68	59	58	0.98
C & R LABORATORIES	53-19179-01	4	4	0	0.05
CAPITAL X-RAY SERVICE	35-11114-01	25	25	59	2.35
CARIBE SHELL & TUBE, INC.	52-19438-01	5	5	3	0.58
CATERPILLAR TRACTOR COMPANY	12-00013-02	3	0	0	0.00
CERTIFIED TESTING LABORATORIES	29-14150-01	47	47	9	0.20
CHERNE CONTRACTING CORPORATION	22-18342-01	6	4	1	0.23
CHICAGO BRIDGE AND IRON COMPAN	42-13553-02	97	83	82	0.99
CLEVELAND X-RAY INSPECTION INC	35-15205-01	45	44	44	1.01
COLBY AND THIELMEIER TESTING C	24-13737-01	4	4	4	0.95
COLONIAL GAS CO	20-15003-01	5	0	0	0.00

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
COLUMBIA GAS TRANSMISSION CORP	47-16060-01	7	4	1	0.24
COMBUSTION ENGINEERING INC	06-04154-01	24	22	4	0.18
CONSOLIDATED X-RAY SERVICE	29-21452-01	108	98	49	0.50
CONSOLIDATED X-RAY SERVICE COR	42-08456-02	113	113	122	1.08
CONSUMERS POWER COMPANY	21-08606-03	20	12	2	0.17
CORPORACION GEOTEC	52-21486-01	3	3	0	0.05
CRAMER & LINDELL ENGINEERS	06-20794-01	4	2	0	0.05
CRANE COMPANY	24-00563-02	9	9	3	0.32
CTL ENGINEERING INC.	34-08331-01	2	2	2	1.06
CYCLOPS TESTING LABS.	07-23400-01	0	0	0	0.00
D & S TESTING, INC.	34-21458-01	11	11	13	1.15
DANIEL INTERNATIONAL CORPORATI	39-01261-02	0	0	0	0.00
DAYTON X-RAY COMPANY	34-06943-01	20	20	9	0.47
DEPT. OF NAVY, USS AJAX (AR-6)	04-17872-01	17	2	0	0.05
DEPT. OF NAVY, USS DIXON (AS-3	04-17976-01	13	13	1	0.05
DEPT. OF NAVY, USS HECTOR (AR-	04-18130-01	32	2	0	0.11
DEPT. OF NAVY, USS JASON (AR-8	04-17765-01	34	0	0	0.00
DEPT. OF NAVY, USS PRAIRIE (AD	04-18013-01	12	0	0	0.00
DEPT. OF NAVY, USS PROTEUS (AS	04-18041-01	19	19	1	0.05
DEPT. OF NAVY, USS SAMUEL GOMP	04-18082-01	18	3	0	0.05
DEPT. OF THE NAVY	09-21465-01	13	10	1	0.11
DEPT. OF THE NAVY	31-17825-02	71	60	4	0.06
DEPT. OF THE NAVY, COMMANDING	38-05314-05	8	0	0	0.00
DEPT. OF THE NAVY, USS SIERRA	09-19770-01	15	1	0	0.05
DUQUESNE LIGHT COMPANY	37-17507-01	14	10	3	0.25
E. L. CONWELL & COMPANY	37-17637-01	0	0	0	0.00
EASTERN TESTING AND INSPECTION	29-09814-01	32	32	15	0.46
EBASCO SERVICES INC.	29-07056-03	63	42	10	0.24
EG & G FLORIDA, INC.	09-21233-01	52	13	2	0.15
ELPASO NATURAL GAS COMPANY	42-03201-02	5	5	2	0.31
EQUITABLE GAS COMPANY	37-17491-01	7	1	0	0.18
EXAM COMPANY	35-16191-01	474	474	81	0.17
FACTORY MUTUAL RESEARCH CORPOR	20-04007-02	7	5	0	0.05
FINLAY TESTING LABORATORIES	53-17854-01	7	7	8	1.17
FOSTER WHEELER ENERGY CORP.	31-01776-05	28	16	6	0.40
FRANKLIN RESEARCH CENTER	37-00637-11	17	0	0	0.00
FROEHLING & ROBERTSON INC.	45-08890-01	11	8	4	0.45
GAMMA FIELD RADIOGRAPHIC FACIL	12-13858-01	28	18	8	0.42

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
GENERAL DYNAMICS CORPORATION	06-01781-08	92	91	18	0.20
GENERAL DYNAMICS CORPORATION	20-11915-01	12	6	0	0.07
GEO CONSTRUCTION TESTING	04-00616-04	175	118	42	0.36
GLITCH FIELD SERVICE	34-14071-01	41	37	20	0.54
GREAT LAKES TESTING CORP.	13-21306-01	0	0	0	0.00
GRINNELL COMPANY, INC.	38-02839-01	50	29	2	0.07
H. C. NUTTING CO.	34-14924-01	4	4	0	0.08
H. R. INSPECTION SERVICE INC.	15-06209-01	8	6	5	0.83
H&H X-RAY SERVICES INC.	17-19236-01	0	0	0	0.00
H&H X-RAY SERVICES INC.	17-19236-01	9	8	10	1.21
HERRON TESTING LABORATORY INC.	34-00681-03	9	9	1	0.14
HOUSTON INSPECTION SERVICE, IN	42-23150-01	5	5	11	2.15
HUNTINGTON TESTING LAB	47-23076-01	17	16	8	0.50
HUTCHINSON AREA VO-TECH INSTIT	22-15554-01	219	45	3	0.08
INDEPENDENT INSPECTION, C/O P	42-19441-01	3	2	2	0.88
INDEPENDENT TESTING LABORATORI	03-15981-02	46	46	17	0.36
INDUSTRIAL GAMMA INSPECTION	24-19850-01	1	1	0	0.18
INDUSTRIAL LABORATORIES INC	41-04226-02	5	5	8	1.64
INDUSTRIAL NDT COMPANY	45-19494-01	16	15	6	0.43
INDUSTRIAL NDT SERVICES DIVISI	13-06147-04	12	11	2	0.17
INDUSTRIAL TESTING LABORATORY	37-16406-01	14	3	1	0.20
INSPECTION SERVICE CORP OF PEN	37-11636-01	4	3	5	1.54
INSPECTION SERVICE, INC.	41-21154-01	34	16	15	0.93
INTERMOUNTAIN TESTING COMPANY	05-07872-01	22	22	20	0.89
INTERNATIONAL TESTING LABS. IN	29-14027-01	8	2	0	0.05
J.T. CULLEN COMPANY INC.	12-15025-01	8	5	8	1.50
JACKSONVILLE SHIPYARDS INC.	09-15611-01	10	5	1	0.12
JAN X-RAY SERVICES INC.	21-16560-01	20	19	15	0.78
KELLOG RUST CONSTRUCTORS	42-16573-01	0	0	0	0.00
LAKEHEAD TESTING LABORATORY IN	22-14897-01	8	2	0	0.11
LATY INSPECTION SERVICE	37-21473-01	0	0	0	0.00
LAW ENGINEERING TESTING COMPAN	10-00346-03	289	135	18	0.13
LEHIGH TESTING LABORATORIES IN	07-01173-03	14	11	5	0.41
LOCKHEED SHIPBUILDING & CONSTR	46-06926-02	8	3	0	0.13
MAGNA CHEK, INC.	21-19111-02	9	8	1	0.15
MASSACHUSETTS MATERIALS RESEAR	20-19130-01	5	3	0	0.05
MATERIALS TESTING LABORATORY O	45-17151-01	21	19	9	0.49
MATTINGLY & OIREILLY SERVICE	25-21479-01	5	4	3	0.67

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
MET LAB INC	45-09963-01	7	5	4	0.70
MET-CHEM ENGINEERING LAB	43-19662-01	43	40	35	0.88
MET-CHEM ENGINEERING LAB	43-19662-01	42	39	32	0.83
MET-CHEM ENGINEERING LAB	43-19662-01	43	40	33	0.83
METALOGIC, INC.	02-19728-01	63	58	12	0.20
METILS INC.	42-16534-01	0	0	0	0.00
MID-CON INSPECTION	49-16670-01	102	102	29	0.28
MIDWEST INSPECTION SERVICE LTD	48-16296-01	14	10	4	0.37
MINNOTTE MANUFACTURING CORPORA	37-11460-01	1	0	0	0.00
MONROE X-RAY CO.	17-12201-02	0	0	0	0.00
MONTANA X-RAY INC.	25-21134-01	1	1	2	1.50
MORRISON-KNUDSEN COMPANY INC	11-15946-01	12	11	9	0.78
MQS INSPECTION	12-00622-07	537	408	236	0.58
NATIONAL INSPECTION & CONSUL	09-21289-01	0	0	0	0.00
NAVY DEPT, NAVAL SUB BASE, DEP	53-10226-01	25	4	0	0.05
NAVY DEPT, USS ACADIA (AD-42)	04-19846-01	10	10	1	0.05
NAVY, DEPARTMENT OF USS FULT	31-18014-01	12	12	1	0.05
NAVY, DEPARTMENT OF USS L. Y	31-17970-01	13	13	1	0.06
NAVY, DEPARTMENT OF USS ORIO	31-18096-01	11	11	1	0.05
NAVY, DEPARTMENT OF USS PUGE	31-17928-01	23	7	0	0.05
NAVY, DEPARTMENT OF THE	04-03141-01	25	1	0	0.05
NAVY, DEPARTMENT OF THE	04-13252-01	18	0	0	0.00
NAVY, DEPARTMENT OF THE	06-07150-01	20	19	2	0.10
NAVY, DEPARTMENT OF THE	45-04052-03	66	59	7	0.11
NAVY, DEPARTMENT OF THE	45-15650-02	15	0	0	0.00
NAVY, DEPARTMENT OF THE	46-03078-01	86	85	12	0.15
NAVY, DEPT. OF THE, (USS CANO	09-19932-01	14	13	1	0.05
NAVY, DEPT. OF THE, USS MCKEE	04-19966-01	16	15	1	0.05
NAVY, DEPT. OF THE, USS CAPE C	04-21246-01	14	1	0	0.05
NAVY, DEPT. OF THE, USS EMORY	31-19040-01	12	12	1	0.05
NAVY, DEPT. OF THE, USS HOLLAN	31-18061-01	13	13	2	0.16
NDE SERVICES, INC.	05-19821-01	48	44	52	1.18
NEW YORK TESTING LABORATORIES	31-02933-01	4	2	0	0.21
NEWPORT NEWS INDUSTRIAL CORP.	34-16805-01	0	0	0	0.00
NEWPORT NEWS SHIPBUILDING AND	45-09428-02	87	86	26	0.30
NIC TESTING SERVICE	37-18348-02	19	10	3	0.29
NONDESTRUCTIVE INSPECTION SERV	47-11883-01	10	10	4	0.41
NONDESTRUCTIVE TESTING CORP	29-19742-01	23	16	5	0.28
NOOTER CORPORATION	24-03783-01	21	14	1	0.07

## APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
NORFOLK SHIPBUILDING AND DRYDO	45-12042-01	14	11	1	0.08
NORTH AMERICAN INSPECTION, INC	37-23370-01	26	23	9	0.39
NORTHEASTERN RESEARCH & TESTIN	29-18006-01	0	0	0	0.00
NUCLEAR ENERGY SERVICE INC	42-16559-01	78	56	19	0.34
NUCLEAR INSTALLATION SERV. CO.	09-23042-01	8	4	0	0.08
OKLAHOMA TRSTING LABORATORIES	35-10577-01	15	5	1	0.14
OLD DOMINION IRON & STEEL CORP	45-15581-01	5	4	1	0.11
PANHANDLE EASTERN PIPE LINE CO	15-17729-01	9	7	1	0.20
PARKER INDUSTRIAL X-RAY LABORA	06-01337-03	18	13	3	0.21
PATZIG TESTING LABS INC	14-18897-02	15	9	1	0.11
PDM LATIN AMERICA, LTD.	10-19980-01	0	0	0	0.00
PENN INSPECTION CO.	35-21144-01	18	18	7	0.38
PERINI CORP.	20-21490-01	0	0	0	0.00
PHOTON FIELD INSPECTION, INC.	21-21010-01	4	2	0	0.05
PITTSBURGH DES MOINES STEEL CO	14-01837-04	12	8	2	0.19
PITTSBURGH DES MOINES STEEL CO	37-02607-02	21	14	4	0.26
PITTSBURGH TESTING LABORATORY	37-00276-25	312	232	172	0.74
PLANT INSPECTION CO	04-21032-01	0	0	0	0.00
POGUE INDUSTRIES	24-24541-01	9	8	2	0.20
PORTABLE ATOMIC X-RAY COMPANY	35-07488-03	2	1	0	0.38
POWER INSPECTION, INC.	37-21428-01	0	0	0	0.00
POWER PIPING COMPANY	37-09945-01	9	7	2	0.27
PRECISION COMPONENTS	37-16280-01	72	53	4	0.08
PROGRESS SERVICES, INC.	34-19592-01	15	12	3	0.23
PULLMAN POWER PRODUCTS, DIV. O	37-08042-01	77	41	10	0.23
Q.C. LABORATORIES INC.	09-11579-03	27	25	9	0.34
QUAD CITY TESTING LABORATORY,	14-17989-01	9	8	5	0.64
QUALITY ASSURANCE INDUSTRIES	48-14158-01	0	0	0	0.00
QUALITY ASSURANCE LABORATORIES	18-19078-01	7	5	1	0.26
QUALITY SYSTEMS OF ALASKA, INC	50-23426-01	0	0	0	0.00
QUALITY TESTING INC.	34-17799-01	2	2	0	0.11
RADIOGRAPHY INSPECTION	35-26812-01	16	16	7	0.42
RADIOGRAPHY INSPECTION, INC.	15-21451-01	16	16	7	0.42
REACTOR CONTROLS INC.	04-15365-01	10	7	1	0.10
RELIANCE TESTING LABORATORIES	19-17176-01	21	16	5	0.31
RICHARD KRUEGEL, DBA GENERAL T	34-09037-01	0	0	0	0.00
ROCKWELL INTERNATIONAL, SPACE	04-17624-03	0	0	0	0.00
S & S INSPECTION COMPANY	12-19780-01	20	17	6	0.38

# APPENDIX A (cont.)

## INDUSTRIAL RADIOGRAPHERS Multiple Location - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers With Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
SMITH-EMERY COMPANY	04-19467-01	12	3	0	0.05
SOUTHWEST X-RAY CORP.	03-21354-01	25	25	37	1.46
SPACE SCIENCE SERVICES INC	09-07550-01	36	31	30	0.95
SPECTRUM LABORATORIES INC.	29-07266-01	7	3	0	0.05
SSW INSPECTION SERVICES	14-19899-01	0	0	0	0.00
ST. LOUIS TESTING LABORATORIES	24-00188-02	14	12	17	1.38
STONE & WEBSTER ENGINEERING CO	20-05600-02	84	23	1	0.05
SUN RAY TESTING INTERNATIONAL	04-19810-01	0	0	0	0.00
SUPERIOR INDUSTRIAL X-RAY COMP	12-02370-01	11	2	0	0.05
TENNECO INC	42-09073-02	22	22	5	0.21
TENNESSEE VALLEY AUTHORITY, D	41-06832-06	44	25	3	0.12
TEREX CORPORATION	34-19607-01	4	0	0	0.00
TESTING INSTITUTE OF ALASKA	50-17446-01	7	6	3	0.51
TOWNSEND AND BOTTUM INC.	21-17095-01	0	0	0	0.00
TRANS-EASTERN INSPECTION SERVI	37-14855-01	107	91	16	0.17
TRANS-WORLD TESTING LABS., INC	04-23360-01	13	13	2	0.16
TRI-STATE INSPECTION & CONSULT	37-19640-01	3	3	1	0.24
TRUTOM LTD.	06-20755-01	21	16	6	0.37
TULSA GAMMA RAY INC.	35-17178-01	26	25	24	0.97
TULSA INSPECTION SERVICE, INC.	35-23362-01	40	40	22	0.54
TUMBLEWEED X-RAY	03-23185-01	54	54	43	0.79
TWIN PORTS TESTING, INC.	48-23476-01	19	15	11	0.70
TWIN PORTS TESTING, INC.	48-23476-01	0	0	0	0.00
U.S. TESTING CO., INC.	29-02477-09	176	80	9	0.11
ULTRA TECHNOLOGY, INC.	50-23363-01	15	11	6	0.50
UNITED INSPECTION, INC.	35-23436-01	18	18	25	1.39
UNIVERSAL TECHNICAL TESTING LA	37-00453-03	27	18	16	0.87
UNIVERSAL TESTING	43-11213-02	20	17	18	1.08
UNIVERSAL TESTING LABORATORIES	29-16397-01	6	3	0	0.05
VECTOR CORP.	37-20827-01	5	3	1	0.28
VENEGAS INDUSTRIAL TESTING LAB	28-14847-02	5	3	1	0.18
WALASHEK ENTERPRISES	53-23225-01	4	4	0	0.05
WESTERN STRESS, INC.	49-23490-01	30	26	29	1.10
WESTERN X-RAY COMPANY	35-19993-01	13	13	9	0.69
WISCONSIN INDUSTRIAL TESTING I	48-17480-01	73	68	46	0.68
X-R-I TESTING OF MICHIGAN	21-05472-01	60	28	5	0.19
X-RAY, INC.	46-03414-03	38	36	33	0.91
X-SCAN INSPECTION COMPANY	35-19507-01	11	8	16	2.01

APPENDIX A (cont.)  
MANUFACTURERS AND DISTRIBUTORS - 1985

Licensee Name	License Number	Program Type	Total Individuals Monitored	Workers with Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
ACCURAY CORPORATION	34-00255-03	BROAD	401	184	17	0.09
AMERSHAM CORPORATION	12-12836-01	BROAD	206	52	20	0.39
E. I. DUPONT (NEN)	20-00320-21	BROAD	873	657	302	0.46
E. R. SQUIBB AND SONS INC.	29-00139-02	BROAD	364	241	48	0.20
HALLIBURTON COMPANY	35-00502-03	BROAD	406	350	42	0.12
MALLINCKRODT/NUCLEAR	24-04206-01	BROAD	352	320	204	0.64
NEW ENGLAND NUCLEAR CORPORATIO	20-00320-19	BROAD	4	4	1	0.11
NUCLEAR RESEARCH CORPORATION	29-04236-01	BROAD	46	11	1	0.07
PITTSWAY CORPORATION	12-15023-01	BROAD	101	7	0	0.05
RAMSEY ENGINEERING CO., TEXAS	42-01485-04	BROAD	91	82	22	0.26
TECHNICAL OPERATIONS INC.	20-00277-03	BROAD	68	43	11	0.25
UPJOHN COMPANY	21-00182-03	BROAD	548	16	1	0.06
ADVANCED MEDICAL SYSTEMS INC.	34-19089-01	OTHER	34	20	35	1.74
AIRCO INCORPORATED	29-02085-01	OTHER	18	3	0	0.05
ATOMIC ENERGY OF CANADA LIMITE	54-00300-09	OTHER	69	40	6	0.14
CAMBRIDGE NUCLEAR CORPORATION-	20-06799-02	OTHER	24	17	3	0.19
GAMMA DIAGNOSTIC LABORATORIES	20-15215-02	OTHER	18	18	12	0.65
KAY-RAY INCORPORATED	12-11184-01	OTHER	43	26	3	0.11
NUCLEAR RESEARCH CORPORATION	37-02401-01	OTHER	43	9	1	0.05
SEAMAN NUCLEAR CORPORATION	48-12016-01	OTHER	16	16	11	0.69
ELFRETH ALLEY APOTHECARY	37-18461-01	*OTHER	21	10	3	0.31
NUCLEAR PHARMACY, INC.	20-21227-01	*OTHER	29	12	1	0.10
PHARMACO NUCLEAR INC.	37-18467-01	*OTHER	14	4	1	0.11
PHARMATOPES INC.	21-19219-01	*OTHER	17	3	0	0.05
PHARMATOPES INC.	34-16654-01	*OTHER	20	20	8	0.38
PHARMATOPES INC.	34-19007-01	*OTHER	12	9	1	0.05
PHARMATOPES INC.	34-19008-01	*OTHER	7	1	0	0.05
PHARNATOPES & COMPANY	13-19451-01	*OTHER	0	0	0	0.00
SYNCOR CORP.	12-19333-01	*OTHER	59	38	3	0.08
SYNCOR CORP.	24-19360-01	*OTHER	17	15	2	0.16
SYNCOR CORP.	34-18484-01	*OTHER	14	14	3	0.18
SYNCOR CORP.	35-19583-01	*OTHER	9	2	0	0.11
SYNCOR CORP.	37-21092-01	*OTHER	14	6	1	0.11

\*Activity includes distribution of radiopharmaceuticals.



# APPENDIX A (cont.)

## FUEL FABRICATORS AND PROCESSORS - 1985

Licensee Name	License Number	Total Individuals Monitored	Workers With Measurable Dose	Collective Dose (person-rems)	Average Meas'ble Dose (rems or cSv)
BABCOCK AND WILCOX	SNM-1168	160	160	43	0.27
BABCOCK AND WILCOX INC NAVAL N	SNM-0042	2579	1663	142	0.09
COMBUSTION ENGINEERING INC.	SNM-1067	264	106	24	0.23
COMBUSTION ENGINEERING, INC. C	SNM-0033	70	46	5	0.10
EXXON NUCLEAR COMPANY INC	SNM-1227	857	488	57	0.12
GENERAL ATOMIC COMPANY	SNM-0696	825	224	32	0.14
GENERAL ELECTRIC CO.	SNM-1097	1151	617	75	0.12
NUCLEAR FUEL SERVICES INC.	SNM-0124	871	562	28	0.05
UNITED NUCLEAR CORPORATION NAV	SNM-0368	134	71	4	0.05
WESTINGHOUSE ELECTRIC CORP	SNM-1107	866	795	219	0.28
ATOMICS INTERNATIONAL DIVISION *	SNM-0021	819	300	68	0.23

## LOW LEVEL WASTE DISPOSAL FACILITIES

CHEM-NUCLEAR SYSTEMS	12-13536-01	636	183	32	0.17
U. S. ECOLOGY	16-19204-01	604	69	38	0.55

## INDEPENDENT SPENT FUEL STORAGE INSTALLATION

GENERAL ELECTRIC COMPANY	SNM-2500	32	32	34	1.05
--------------------------	----------	----	----	----	------

\*No longer engaged in fuel fabrication.



## **APPENDIX B**

### **Annual Whole Body Doses at Licensed Nuclear Power Facilities**

**1985**

APPENDIX B  
ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES  
CY 1985

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)														TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	COLLEC- TIVE DOSE
		No Meas- urable	<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	1,341	600	273	219	93	40	37								2,603	1,262	286**
BEAVER VALLEY	PWR	1,157	448	114	36	18	3									1,776	619	60**
BIG ROCK	BWR	143	165	73	53	26	20	50	28	19	1					578	435	291
BROWNS FERRY 1,2,3	BWR	4,158	903	558	515	288	156	281	53	1						6,913	2,755	1,159**
BRUNSWICK 1,2	BWR	1,707	1,682	429	340	260	220	630	395	101						5,764	4,057	2,804**
CALLAWAY	PWR	886	861	71	23	8	1									1,850	964	36**
CALVERT CLIFFS 1,2	PWR	489	710	239	209	141	80	167	52							2,087	1,598	694
COOK 1,2	PWR	776	637	377	328	254	100	245	40	3						2,760	1,984	945
COOPER STATION	BWR	1,503	816	210	198	151	99	302	151	50	3					3,483	1,980	1,333**
CRYSTAL RIVER 3	PWR	1,048	796	411	330	164	119	143	13							3,024	1,976	689
DAVIS BESSE	PWR	1,748	497	154	51	10	2	4								2,466	718	71**
DRESDEN 2,3	BWR	1,059	945	388	357	233	229	578	81	6						3,876	2,817	1,685
DUANE ARNOLD	BWR	1,029	342	203	207	149	124	217	148	23	1					2,443	1,414	1,112
FARLEY 1,2	PWR	246	1,276	393	320	218	129	170	43	2						2,797	2,551	799**
FITZPATRICK	BWR	825	758	247	205	139	99	272	89	29	7					2,670	1,845	1,051**
FORT CALHOUN	PWR	195	419	84	112	93	70	122	48	21	13					1,177	982	373**
GINNA	PWR	436	322	114	130	80	66	102	29	1						1,281	845	426
HADDAM NECK	PWR	804	224	59	37	24	9	28	3							1,188	384	101**
HATCH 1,2	BWR	1,500	1,275	558	434	246	150	167	9	2						4,341	2,841	818**
INDIAN POINT 2	PWR	1,456	407	98	89	39	30	42	3							2,164	708	192
INDIAN POINT 3	PWR	694	338	204	170	101	91	164	23	2						1,787	1,093	570
KEWAUNEE	PWR	331	162	113	99	75	39	30	0	1						850	519	176**
LACROSSE	BWR	291	267	13	6	13	10	27	32	5						664	373	173
LASALLE 1,2	BWR	723	717	247	243	140	112	115	57	4						2,358	1,635	685
MAINE YANKEE	PWR	240	375	86	99	84	72	224	64	5						1,249	1,009	700
MCGUIRE 1	PWR	1,197	932	389	395	158	112	203	28							3,414	2,217	771**
MILLSTONE 1	BWR	485	196	96	91	70	46	130	76	22	5					1,217	732	608**
MILLSTONE 2	PWR	1,259	510	250	235	182	119	339	198	57	15					3,164	1,905	1,581**
MONTICELLO	BWR	1,004	190	87	103	67	44	63	24	7	1					1,590	586	327
NINE MILE POINT 1	BWR	788	624	119	108	59	36	51	8	1						1,795	1,007	265
NORTH ANNA 1,2	PWR	1,069	1,423	246	202	186	128	209	41	1						3,505	2,436	839

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

APPENDIX B(cont.)  
ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES  
CY 1985

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)														TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	COLLEC- TIVE DOSE
		No Meas- urable	<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	>12.0			
OCONEE 1,2,3	PWR	863	991	465	404	248	175	327	113	6						3,592	2,729	1,304**
OYSTER CREEK	BWR	439	1,361	285	252	153	93	147	40	11						2,781	2,342	748
PALISADES	PWR	470	678	178	157	107	75	150	9	1						1,825	1,355	507
PEACH BOTTOM 2,3	BWR	2,080	1,004	607	621	384	329	794	295	156	19					6,289	4,209	3,354**
PILGRIM 1	BWR	0	702	551	483	124	79	199	54	14	3					2,209	2,209	893**
POINT BEACH 1,2	PWR	851	165	89	96	67	61	157	35	1						1,522	671	482
PRAIRIE ISLAND 1,2	PWR	511	399	280	161	86	45	87	21	3						1,593	1,082	416
QUAD CITIES 1,2	BWR	1,167	286	136	141	97	75	322	109	17	1					2,351	1,184	990**
RANCHO SECO	PWR	793	642	335	275	180	116	192	24							2,557	1,764	756
ROBINSON 2	PWR	1,679	818	205	187	64	30	59	10	5						3,057	1,378	311**
SALEM 1,2	PWR	1,214	752	162	96	44	24	31	3							2,326	1,112	204
SAN ONOFRE 1	PWR	8,188	2,264	233	120	44	17	15								10,881	2,693	189**
SAN ONOFRE 2,3	PWR	2,858	1,872	588	302	121	56	103	7							5,907	3,049	533**
SEQUOYAH 1,2	PWR	1,804	581	280	284	193	134	264	111	7						3,658	1,854	1,071**
ST. LUCIE 1,2	PWR	1,265	611	288	261	166	87	419	131	7	1					3,236	1,971	1,344
SUMNER 1	PWR	597	558	194	143	91	52	160	3							1,798	1,201	379**
SURRY 1,2	PWR	365	1,670	288	267	181	109	421	211	52	7					3,571	3,206	1,815
SUSQUEHANNA 1,2	BWR	920	1,501	846	551	299	191	272	9							4,589	3,669	1,106**
THREE MILE ISLAND 1,2	PWR	1,005	1,068	176	157	109	90	188	72	30						2,895	1,890	857
TROJAN	PWR	592	264	159	155	100	68	98	8							1,444	852	363**
TURKEY POINT 3,4	PWR	1,505	535	299	312	185	116	324	115	19						3,410	1,905	1,253
VERMONT YANKEE 1	BWR	930	223	189	223	176	169	339	73							2,322	1,392	1,051**
WPPSS-2	BWR	1,310	489	115	87	33	14	17								2,065	755	119**
YANKEE-ROWE 1	PWR	1,402	309	78	101	65	35	64	1							2,055	653	211**
ZION 1,2	PWR	1,075	431	186	199	128	102	296	127	24	5					2,573	1,498	1,166
TOTALS - BWR's		22,061	14,446	5,957	5,218	3,107	2,295	4,973	1,731	468	42					60,298	38,237	20,572
TOTALS - PWR's		42,409	25,545	8,158	6,761	4,107	2,602	5,584	1,586	248	42					97,042	54,633	22,470
TOTALS - LWR's		64,470	39,991	14,115	11,979	7,214	4,897	10,557	3,317	716	84					157,340	92,870	43,042
FT. ST. VRAIN	HTGR	1,929	370	40	15	7	4	7								2,372	443	35**

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

APPENDIX B(cont.)  
ANNUAL WHOLE BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES  
PLANTS NOT IN COMMERCIAL OPERATION OR IN OPERATION LESS THAN ONE YEAR  
CY 1985

PLANT NAME	TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)													TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	COLLEC- TIVE DOSE
		No Meas- urable	<0.10	Meas. 0.10-	0.25-	0.50-	0.75-	1.00-	2.00-	3.00-	4.00-	5.00-	6.00-	7.00-	12.00	>12.0	
BYRON 1,2	PMR	4,061	1,233	213	76	5	2	2							5,592	1,531	135
CATAMBA	PMR	2,601	947	130	36	12	2	1							3,729	1,128	63**
DIABLO CANYON 1,2	PMR	2,709	964	80	17	1									3,771	1,062	68
FERMI-2	PMR	3,245	323	2	1										3,571	326	17
GRAND GULF	PMR	1,933	510	165	95	40	10	9							2,762	829	137
HUMBOLDT BAY	PMR	233	94	27	26	15	4	11	1						411	178	51
LIMERICK 1	PMR	5,109	491	30	3										5,633	524	31
PALO VERDE 1,2	PMR	2,534	292	23	4										2,853	319	20
RIVER BEND 1	PMR	1,518	142	15	1										1,676	158	10
SHOREHAM	PMR	1,606	577	31	4	3	1								2,222	616	38
WOLF CREEK 1	PMR	1,404	155	11	4										1,574	170	13
TOTALS		26,953	5,728	727	267	76	19	23	1						33,794	6,841	583

## **APPENDIX C\***

### **Personnel, Dose and Power Generation Summary**

**1969-1985**

---

\* 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 Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rems or cSv)	Person-rems (-cSv) per Work Function		Person-rems (-cSv) per Contract		Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
						Operations	Maintenance & Others	Personnel	Type Station & Utility		
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	262	100	189	0.61	0.6
	1977	610.3	76.8	601	256	28	228	111	345	0.43	0.4
	1978	627.2	77.5	722	189	32	157	109	80	0.26	0.3
	1979	397.0	55.3	1321	369	54	315	252	117	0.28	0.9
	1980	452.8	63.7	1233	342	81	261	213	129	0.28	0.8
	1981	1104.7	68.3	2225	1102	130	972	843	259	0.50	1.0
	1982	905.4	58.6	1608	803	97	706	505	298	0.50	0.9
	1983	915.0	54.6	2109	1397	97	1300	1145	252	0.66	1.5
	1984	1289.1	77.4	1742	806	89	717	533	273	0.46	0.6
	1985	1192.3	73.6	1262	286	61	225	148	138	0.23	0.2
BEAVER VALLEY 1 Docket 50-334; DPR-66 1st commercial operation 10/76 Type - PWR Capacity - 810 MWe	1977	355.6	57.0	331	87	8	79	58	29	0.26	0.2
	1978	304.2	40.8	646	190	11	179	152	38	0.29	0.6
	1979	221.0	40.0	704	132	22	110	67	65	0.19	0.6
	1980	39.8	6.8	1817	553	76	477	477	76	0.30	13.9
	1981	573.4	73.6	1237	229	38	191	142	87	0.19	0.4
	1982	326.7	41.6	1755	599	126	473	481	118	0.34	1.8
	1983	561.2	68.2	1485	772	158	614	615	157	0.52	1.4
	1984	576.7	71.8	1393	504	125	379	302	202	0.36	0.9
	1985	717.7	91.9	619	60	17	43	12	48	0.10	0.1
	1969	48.1		165	136					0.82	2.8
	1970	43.5		290	194					0.67	4.5
BIG ROCK POINT Docket 50-155, DPR-6 1st commercial operation 3/63 Type - BWR Capacity 69 MWe	1971	44.4		260	184					0.71	4.1
	1972	43.5		195	181					0.93	4.2
	1973	50.9		241	245			119	166	1.18	5.6
	1974	40.7	70.3	281	243	54	222	42	234	0.98	6.8
	1975	35.1	59.8	300	180	58	122	20	160	0.60	5.1
	1976	29.5	50.1	488	289	82	207	105	184	0.59	9.8
	1977	43.6	73.4	465	334	94	240	60	274	0.72	7.7
	1978	48.5	77.9	285	175	93	82	9	166	0.61	3.6
	1979	13.0	23.5	623	455	89	366	102	353	0.73	35.0
	1980	48.9	79.0	599	354	16	338	91	263	0.59	7.2
	1981	56.9	90.6	479	160	58	102	38	122	0.33	2.8
	1982	43.6	70.8	521	328	129	199	68	260	0.63	7.5



Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 & Others	Person-rems (-cSv) per Contract Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
BIG ROCK POINT (Continued)	1983	42.3	71.0	493	263	32	55	0.53	6.9
	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
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	2380	325			0.14	2.0
	1976	337.6	26.9	2207	234			0.11	0.7
	1977	1327.5	73.0	1858	863	60	249	0.46	0.6
	1978	1992.1	73.5	2376	1792	4	259	0.75	0.9
	1979	2393.0	79.1	2689	1667	0	289	0.62	0.7
	1980	2182.1	73.6	2712	1825	4	49	0.67	0.8
	1981	2132.9	69.5	3379	2380	100	404	0.70	1.1
	1982	2025.4	67.6	3277	2220	181	317	0.68	1.1
	1983	1641.0	54.3	3302	3363	276	908	1.02	2.0
	1984	1431.9	54.2	2962	1940	229	541	0.66	1.4
	1985	368.2	11.9	2755	1159	201	306	0.42	3.1
BRUNSWICK 2, 1 Docket 50-324, 50-325; DPR-62, -71 1st commercial operation 11/75, 3/77 Type - BWR Capacity - 790, 790 MWe	1976	297.2	56.0	1265	326	15	222	0.26	1.1
	1977	291.1	55.7	1512	1119	48	782	0.74	3.8
	1978	1173.1	83.7	1458	1004	99	695	0.69	0.8
	1979	810.0	60.1	2891	2602	97	2074	0.90	3.2
	1980	687.2	52.2	3788	3870	111	3098	1.02	5.6
	1981	925.2	56.9	3854	2638	159	1890	0.68	2.9
	1982	540.3	50.3	4957	3792	162	2841	0.76	6.5
	1983	636.7	40.6	5602	3475	152	2428	0.62	5.5
	1984	761.3	51.5	5046	3260	143	2363	0.66	4.3
	1985	822.2	58.4	4057	2804	121	2078	0.69	3.4
CALLAWAY Docket 50-483, NPF-30 1st commercial operation 12/84 Type - PWR Capacity - 1120 MWe	1985	967.4	90.0	964	36	16	7	0.04	0.0

Appendix C (Continued)  
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		Person-rems (-cSv) per Contractor	Average Meas'ble Dose (rems or cSv)	Person- rems (-cSv)/ MW-Yr
						Work Opera- tions	Function Maint. & Others			
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	46	8	0.15	0.1
	1977	583.0	72.1	2265	547	36	511	224	0.24	0.9
	1978	1188.5	75.8	1391	500	13	487	143	0.36	0.4
	1979	1161.0	74.0	1428	805	33	772	423	0.56	0.7
	1980	1309.9	84.1	1496	677	15	662	402	0.45	0.5
	1981	1379.7	83.1	1555	607	29	578	378	0.39	0.4
	1982	1238.3	73.7	1805	1057	84	973	402	0.59	0.8
	1983	1397.2	81.6	1915	668	5	663	143	0.35	0.5
	1984	1389.4	79.2	1369	479	61	418	78	0.35	0.3
	1985	1189.8	68.4	1598	694	69	625	144	0.43	0.6
COOK 1, 2 Docket 50-315; DPR-58, -74 1st commercial operation 8/75, 7/78 Type - PWRs Capacity - 1020 MWe, 1060 MWe	1976	807.4	83.1	395	116	13	103	71	0.29	0.1
	1977	573.0	76.1	802	299	21	278	138	0.37	0.5
	1978	744.8	73.6	778	336	49	287	139	0.43	0.4
	1979	1373.0	65.3	1445	718	45	673	454	0.50	0.5
	1980	1552.4	74.1	1345	493	46	447	323	0.37	0.3
	1981	1557.3	73.4	1341	655	48	607	442	0.49	0.4
	1982	1461.6	69.8	1527	699	67	632	472	0.46	0.5
	1983	1456.5	71.2	1418	658	50	608	467	0.46	0.5
	1984	1526.0	75.3	1559	762	42	720	597	0.49	0.5
	1985	925.4	47.6	1984	945	93	852	758	0.48	1.0
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	0.20	0.2
	1976	433.3	75.5	763	350	39	311	210	0.46	0.8
	1977	538.2	86.2	315	197	50	147	66	0.63	0.4
	1978	576.0	91.0	297	158	40	118	58	0.53	0.3
	1979	591.0	87.6	426	221	50	171	89	0.52	0.4
	1980	448.3	71.2	785	859	70	789	644	1.09	1.9
	1981	457.1	71.2	935	579	63	516	382	0.62	1.3
	1982	622.3	84.6	743	542	66	476	361	0.73	0.9
	1983	396.6	63.3	1383	1293	57	1236	1081	0.93	3.3
	1984	411.9	67.2	1598	799	46	753	635	0.50	1.9
	1985	127.3	21.5	1980	1333	49	1284	1104	0.67	10.5

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 Operations & Others	Person-rems (-cSv) per Maintenance & Others	Person-rems (-cSv) per Contractor	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
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	0.50	1.0
	1979	453.0	58.9	1150	495	29	466	346	0.43	1.1
	1980	402.1	53.2	1053	625	24	601	243	0.59	1.6
	1981	490.4	62.2	1120	408	18	340	236	0.36	0.8
	1982	589.8	76.0	780	177	9	168	116	0.23	0.3
	1983	452.1	58.8	1720	552	71	481	353	0.32	1.2
	1984	774.2	94.5	549	49	10	27	22	0.09	0.1
	1985	344.2	47.6	1976	689	43	646	424	0.35	2.0
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	0.11	0.1
	1979	381.0	67.0	304	30	8	22	5	0.10	0.1
	1980	256.4	36.2	1283	154	4	150	121	0.12	0.6
	1981	531.4	67.4	578	58	1	57	32	0.10	0.1
	1982	390.8	51.5	1350	164	12	152	139	0.12	0.4
	1983	592.1	73.0	718	80	6	74	46	0.11	0.1
	1984	518.5	62.5	1088	177	10	167	122	0.16	0.3
	1985	238.3	31.2	718	71	3	68	46	0.10	0.3
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 - 0, 772, 773 MWe	1969	99.7			286					2.9
	1970	163.1			143					0.9
	1971	394.5			715					1.8
	1972	1243.7			728					0.6
	1973	1112.2		1341	939	143	796	344	0.70	0.8
	1974	842.5	54.9	1594	1662			57	1.04	2.0
	1975	708.1	54.6	2310	3423	271	3152	2252	1.48	4.8
	1976	1127.2	80.8	1746	1680	228	1452	749	0.96	1.5
	1977	1132.9	77.0	1862	1693	316	1377	693	0.91	1.5
	1978	1242.2	79.5	1946	1529	204	1325	619	0.79	1.2
	1979	1013.0	74.7	2407	1800	191	1609	641	0.75	1.8
	1980	1074.4	55.0	2717	2105	236	1869	1093	0.77	2.0
	1981	1035.7	51.5	2408	2802	120	2682	1850	1.16	2.7
	1982	1085.3	77.9	2572	2923	136	2787	1731	1.14	3.9
	1983	913.6	65.6	2854	3582	176	3406	2127	1.26	2.2
	1984	789.8	55.3	2261	1774	153	1621	814	0.78	2.2
	1985	903.0	64.5	2817	1685	473	1212	878	0.60	1.9

\*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 (Continued)  
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 Contrac- tor 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 - 515 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	1112	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	1108	671	32	570	0.61	2.0
	1981	277.7	69.8	1286	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	1468	1135	42	1016	0.77	4.0
	1984	329.4	72.9	611	189	27	117	0.31	0.6
	1985	236.2	53.8	1414	1112	49	954	0.79	4.7
FARLEY 1, 2 Docket 50-348, 50-364; NPF-2, -8 1st commercial operation 12/77, 7/81 Type - PWR Capacity - 816, 807 MWe	1978	713.8	86.5	527	108	39	34	0.20	0.1
	1979	211.0	28.6	1227	643	108	460	0.52	3.0
	1980	557.3	69.3	1330	435	106	185	0.33	0.8
	1981	310.2	41.4	1331	511	96	270	0.38	1.6
	1982	1271.5	79.2	1453	484	155	196	0.33	0.4
	1983	1356.5	82.9	1938	1021	241	479	0.53	0.8
	1984	1447.0	86.6	2046	902	177	504	0.44	0.6
	1985	1368.2	81.1	2551	799	157	443	0.31	0.6
	1976	489.0	71.6	600	202	14	937	0.34	0.4
	1977	460.5	68.4	1380	1080	14	1066	0.78	2.3
FITZPATRICK Docket 50-333; DPR-59 1st commercial operation 7/75 Type - BWR Capacity - 810 MWe	1978	497.0	72.1	904	909	166	597	1.00	1.8
	1979	349.0	50.8	850	859	169	538	1.01	2.5
	1980	509.5	70.3	2056	2040	118	1808	0.99	4.0
	1981	562.9	74.7	2490	1425	187	1072	0.57	2.5
	1982	583.6	75.0	2322	1190	136	862	0.51	2.0
	1983	546.2	70.6	1715	1090	158	667	0.64	2.0
	1984	576.2	76.8	1610	971	82	467	0.60	1.7
	1985	492.3	63.7	1845	1051	110	718	0.57	2.1
	1974	294.0	83.5	327	71		24	0.22	0.2
	1975	252.3	67.4	469	294		92	0.63	1.2
FORT CALHOUN Docket 50-285; DPR-40 1st commercial operation 9/73 Type - PWR Capacity - 478 MWe	1976	265.9	69.5	516	313	28	38	0.61	1.2
	1977	351.8	79.4	535	297	33	72	0.56	0.8
	1978	342.3	75.1	596	410	59	151	0.69	1.2
	1978	342.3	75.1	596	410	59	151	0.69	1.2

Appendix C (Continued)  
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		Person-rems (-cSv) per Personnel Type	Average Meas'ble Dose (rems or cSv)	Person- rems (-cSv)/ MW-Yr
						Work Function Opera- tions	Maint. & Others	Contrac- tor		
FORT CALHOUN (Continued)	1979	440.0	95.7	451	126	19	107	47	79	0.3
	1980	242.3	60.4	891	668	38	630	426	242	2.8
	1981	260.9	72.3	822	458	61	397	254	204	1.8
	1982	418.0	89.7	604	217	44	173	99	118	0.5
	1983	330.4	73.1	860	433	66	367	205	228	1.3
	1984	279.2	59.9	913	563	91	472	313	250	2.0
	1985	367.0	73.7	982	373	54	319	231	142	1.0
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	1.3
	1972	293.6		677	1032	71	961	278	754	3.5
	1973	409.5		319	224	55	169	84	140	0.5
	1974	253.7	62.4	884	1225					4.8
	1975	365.2	76.7	685	538					1.5
	1976	248.8	58.2	758	636	29	607	210	426	2.5
	1977	365.6	85.5	530	401	15	386	120	281	1.1
	1978	386.5	80.6	657	450	20	430	98	352	1.2
	1979	355.0	72.8	878	592	68	524	207	385	1.7
	1980	370.5	76.0	1073	708	64	644	302	406	1.9
	1981	399.0	82.1	925	655	49	606	251	404	1.6
	1982	289.0	58.8	1117	1140	80	1060	546	594	3.9
	1983	365.0	74.6	969	855	42	813	378	477	2.3
	1984	378.1	77.2	713	394	57	337	195	199	1.0
	1985	436.7	87.9	845	426	91	335	178	248	1.0
HADDAM NECK (CONN. YANKEE) Docket 50-213; DPR-61 1st commercial operation 1/68 Type - PWR Capacity - 569 MWe	1969	438.5		138	106			27	79	0.2
	1970	424.7		734	689			463	226	1.6
	1971	502.2		289	342			166	176	0.7
	1972	515.6		355	325			181	144	0.6
	1973	293.1		951	697			544	153	2.4
	1974	521.4	91.2	550	201					0.4
	1975	494.3	89.9	795	703	20	683			1.4
	1976	482.9	82.5	644	449	5	444	253	196	0.9
	1977	480.7	83.9	894	641	59	582	440	201	1.3
	1978	563.4	98.6	216	117	25	92	18	99	0.2
	1979	493.0	87.5	1226	1161	73	1088	783	378	2.4
	1980	426.8	75.0	1860	1353	175	1178	1076	277	3.2
	1981	487.5	84.3	1554	1036	174	862	809	227	2.1

Appendix C (Continued)  
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 Personnel Type Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person- rems (-cSv)/ MW-Yr
HADDAM NECK (CONN. YANKEE) (Continued)	1982	543.9	93.4	559	126	46	22	0.23	0.2
	1983	453.7	77.8	1645	1384	106	1017	0.84	3.1
	1984	404.0	71.7	1430	1216	154	803	0.85	3.0
	1985	556.1	98.4	384	101	21	22	0.26	0.2
HATCH 1, 2 Docket 50-321, 50-366; DPR-57; NPF-05 1st commercial operation 12/75, 9/79 Type - BWR Capacity - 752, 748 MWe	1976	496.3	83.8	630	134	79	4	0.21	0.3
	1977	446.8	66.3	1303	465	96	220	0.36	1.0
	1978	513.0	72.8	1304	248	88	52	0.19	0.5
	1979	401.0	54.6	2131	582	85	382	0.27	1.5
	1980	1008.7	70.9	1930	449	143	163	0.23	0.4
	1981	870.9	64.3	2899	1337	200	792	0.46	1.5
	1982	768.0	56.6	3418	1460	218	1064	0.43	1.9
	1983	934.7	68.6	3428	1299	253	1046	0.38	1.4
	1984	658.6	117.3	4110	2218	311	1861	0.54	3.4
	1985	124.0	79.1	2841	818	182	507	0.29	0.7
	1969	44.6		125	164	69	12	1.31	3.7
HUMBOLDT BAY <sup>a</sup> Docket 50-133; DPR-7 1st commercial operation 8/63 Type - BWR Capacity - 0 MWe	1970	49.3		115	209	130	37	1.82	4.2
	1971	39.6		140	292	114	65	2.09	7.4
	1972	43.1		127	253	81	57	1.99	5.9
	1973	50.1		210	266	60		1.27	5.3
	1974	43.4	83.8	296	318	103		1.07	7.3
	1975	45.3	83.9	265	339	131		1.28	7.5
	1976	23.5	46.4	523	683	37		1.31	29.1
	1977	0		1063	1904	24	112	1.79	-
	1978	0	0	320	335	13	50	1.05	-
	1979	0	0	135	31	11	973	0.23	-
	1980	0	0	142	22	10	145	0.15	-
	1981	0	0	75	9		2	0.12	-
	1982	0	0	71	19	5	3	0.27	-
	1983	0	0	84	17	4	0	0.20	-

<sup>a</sup>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.

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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
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	1969	206.2			298				1.4
	1970	43.3			1639				37.8
	1971	154.0			768				5.0
	1972	142.3			967				6.8
	1973	0		2998	5262	709	2847	1.75	-
	1974	556.1	59.4	1019	910			0.89	1.6
	1975	584.4	74.8	891	705	166	47	0.79	1.2
	1976	273.9	34.8	1590	1950	154	172	1.23	7.1
	1977	1278.3	75.3	1391	1070	189	383	0.77	0.8
	1978	1172.3	67.8	1909	2006	260	759	1.05	1.7
INDIAN POINT 1, * 2 Docket 50-3, 50-247, DPR-5, -26 1st commercial operation 10/62, 8/73 Type - PWR Capacity, 0, 864 MWe	1979	574.0	71.4	1349	1279	209	612	0.95	2.2
	1980	510.8	64.8	1577	971	181	398	0.62	1.9
	1981	367.5	46.0	2595	2731	237	1595	1.05	7.4
	1982	532.4	65.4	2144	1635	343	883	0.76	3.1
	1983	702.6	84.0	1057	486	200	217	0.46	0.7
	1984	416.7	51.9	2919	2644	650	1863	0.91	6.3
	1985	791.4	95.7	708	192	123	95	0.27	0.2
	1979	568.0	66.5	808	636	63	482	0.79	1.1
	1980	367.3	53.2	977	308	47	210	0.32	0.8
	1981	365.8	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	1477	1226	42	1094	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	1093	570	35	455	0.52	1.0
	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	139	8	76	0.44	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
KEWAUNEE Docket 50-305; DPR-43 1st commercial operation 6/74 Type - PWR Capacity - 503 MWe	1981	451.8	86.7	383	141	7	94	0.37	0.3
	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	139	8	76	0.44	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
	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

\*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 (Continued)  
Personnel, Dose and Power Generation Summary

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 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
KEWAUNEE (Continued)	1982	458.4	87.6	353	101	5	96	51	50	0.29	0.2
	1983	444.1	83.7	445	165	10	155	119	46	0.37	0.4
	1984	455.3	85.7	482	139	7	132	90	49	0.29	0.3
	1985	443.1	82.4	519	176	4	172	118	58	0.34	0.4
LACROSSE Docket 50-409; DPR-45 1st commercial operation 11/69 Type - BWR Capacity - 48 MWe	1970	15.3			111			40	71		7.2
	1971	33.1		218	158					0.72	4.8
	1972	29.2		151	172					1.14	5.9
	1973	24.4		157	221					1.41	9.1
	1974	37.9	81.0	115	139	89	50	6	133	1.21	3.7
	1975	32.0	69.6	165	234					1.42	7.3
	1976	21.2	47.6	118	111					0.94	5.2
	1977	11.3	33.7	141	224	40	71	6	105	1.59	19.8
	1978	21.6	62.0	182	164	60	164	8	216	0.90	7.6
	1979	24.0	71.8	153	186	69	95	6	158	1.22	7.7
	1980	26.4	68.5	124	218	65	121	21	165	1.76	8.3
	1981	29.6	76.0	187	123	62	61	3	120	0.66	4.2
	1982	17.2	44.6	148	205	65	140	16	189	1.39	11.9
	1983	24.8	59.7	160	313	103	210	31	282	1.96	12.6
	1984	38.5	80.5	288	252	141	111	5	247	0.87	6.5
	1985	39.2	86.7	373	173	76	97	22	151	0.46	4.4
	1984	677.8	68.9	1245	252	30	222	85	166	0.20	0.4
	1985	987.9	52.5	1635	685	88	597	420	265	0.42	0.7
MAINE YANKEE Docket 50-309; DPR-36 1st commercial operation 12/72 Type - PWR Capacity - 810 MWe	1973	408.7		782	117			59	58	0.15	0.3
	1974	432.6	68.7	619	420	64	356	188	232	0.68	1.0
	1975	542.9	79.9	440	319	15	304	181	138	0.72	0.6
	1976	712.2	95.0	244	85	27	58	26	59	0.35	0.1
	1977	617.6	82.2	508	245	46	199	112	133	0.48	0.4
	1978	642.7	84.1	638	420	54	366	262	158	0.66	0.6
	1979	537.0	68.4	393	154	70	84	26	128	0.39	0.3

\*LaSalle 2 was counted for the first time in 1985.



Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 & Others	Person-rems (-cSv) per Contractor Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
MAINE YANKEE (Continued)	1980	527.0	72.2	735	462	117	277	0.63	0.9
	1981	624.2	78.2	868	424	11	308	0.49	0.7
	1982	542.5	69.1	1295	619	33	462	0.48	1.1
	1983	677.1	83.6	592	164	40	72	0.28	0.2
	1984	605.7	74.4	1262	884	9	702	0.70	1.5
	1985	635.4	79.2	1009	700	54	529	0.69	1.1
MCGUIRE 1, 2*	1982	524.9	80.4	1560	169	26	29	0.11	0.3
	1983	558.3	55.4	1751	521	35	123	0.30	0.9
	1984	764.1	68.5	1663	507	40	110	0.30	0.7
	1985	1477.6	68.1	2217	771	92	277	0.35	0.5
MILLSTONE POINT 1 Docket 50-245; DPR-21 1st commercial operation 3/71 Type - BWR Capacity - 654 MWe	1972	377.6		612	596	50	340	0.97	1.6
	1973	225.1		1184	663	125	422	0.56	2.9
	1974	430.3	79.1	2477	1430			0.58	3.3
	1975	465.4	75.6	2587	2022			0.78	4.3
	1976	449.8	76.1	1377	1194	54	955	0.87	2.6
	1977	575.7	89.6	1075	392	118	159	0.36	0.7
	1978	556.6	87.6	1391	1239	140	332	0.89	2.2
	1979	505.0	77.3	1769	1793	198	907	1.01	3.6
	1980	405.8	69.0	3024	2158	100	1326	0.71	5.3
	1981	304.3	51.6	2506	1496	96	1864	0.60	4.9
	1982	490.2	79.9	1370	929	78	587	0.68	1.9
	1983	640.1	95.6	309	244	63	74	0.79	0.4
	1984	516.1	78.8	1992	836	80	532	0.42	1.6
	1985	548.5	83.6	732	608	65	369	0.83	1.1
MILLSTONE POINT 2 Docket 50-336; DPR-65 1st commercial operation 12/75 Type-PWR Capacity - 857 MWe	1976	545.7	78.7	620	168	26	73	0.27	0.3
	1977	518.7	65.7	667	242	38	153	0.36	0.5
	1978	536.6	67.3	1420	1621	72	1549	1.14	3.0
	1979	520.0	62.8	757	472	81	305	0.62	0.9
	1980	579.3	69.2	892	636	76	514	0.71	1.1
	1981	722.4	82.6	890	531	44	393	0.60	0.7
	1982	595.9	70.6	2083	1413	27	1219	0.68	2.4
	1983	294.0	34.2	2383	1881	170	1548	0.79	6.4

\*McGuire 2 was counted for the first time in 1985.

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 & Others	Person-rems (-cSv) per Contract Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
MILLSTONE POINT 2 (Continued)	1984	782.7	93.5	285	120	11	109	0.42	0.2
	1985	417.8	49.4	1905	1581	60	1521	0.83	3.8
	1972	424.4		99	61	40	21	0.62	0.1
	1973	389.5		401	176	48	128	0.44	0.4
	1974	349.3	74.9	842	349		67	0.41	1.0
	1975	344.8	72.2	1353	1353		91	1.00	3.9
	1976	476.4	91.5	325	263	59	204	0.81	0.5
	1977	425.6	79.9	860	1000	135	865	1.16	2.3
	1978	459.4	87.2	679	375	62	313	0.55	0.8
	1979	522.0	97.6	372	157	62	95	0.42	0.3
MONTICELLO Docket 50-263; DPR-22 1st commercial operation 6/71 Type - BWR Capacity - 536 MWe	1980	411.8	78.2	1114	531	82	449	0.48	1.3
	1981	389.3	72.6	1446	1004	101	903	0.69	2.6
	1982	291.1	63.3	1307	993	130	756	0.76	3.4
	1983	494.6	96.3	416	121	57	863	0.29	0.2
	1984	33.7	9.2	1872	2462	208	2254	1.32	73.1
	1985	509.8	91.7	586	327	87	240	0.56	0.6
	1970	227.0		821	44	12	32	0.05	0.2
	1971	346.5		1006	195	43	152	0.19	0.6
	1972	381.8		735	285	59	226	0.39	0.7
	1973	411.0		550	567	139	428	1.03	1.4
NINE MILE POINT 1 Docket 50-220; DPR-63 1st commercial operation 12/69 Type - BWR Capacity - 610 MWe	1974	385.9	70.5	740	824	42	782	1.11	2.1
	1975	359.0	72.1	649	681	68	613	1.05	1.9
	1976	484.6	88.2	392	428	52	376	1.09	0.9
	1977	347.4	59.2	1093	1383	41	1342	1.26	4.0
	1978	527.7	95.1	561	314	59	255	0.56	0.6
	1979	354.0	66.1	1326	1497	106	1391	1.13	4.2
	1980	533.9	92.3	1174	591	75	516	0.50	1.1
	1981	385.2	66.0	2029	1592	144	1448	0.78	4.1
	1982	133.5	21.4	1352	1264	63	1201	0.93	9.5
	1983	329.8	56.2	1405	860	50	810	0.61	2.6
	1984	426.8	71.9	1530	890	163	727	0.58	2.1
	1985	580.9	96.4	1007	265	60	205	0.26	0.5
	1970	227.0		821	44	12	32	0.05	0.2
	1971	346.5		1006	195	43	152	0.19	0.6
	1972	381.8		735	285	59	226	0.39	0.7
	1973	411.0		550	567	139	428	1.03	1.4
	1974	385.9	70.5	740	824	42	782	1.11	2.1

Appendix C (Continued)  
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
NORTH ANNA 1, 2 Docket 50-338; NPF-04, - 09 1st commercial operation 6/78, 12/80 Type - PWRs Capacity - 893, 893 MWe	1979	507.0	61.7	2025	449	78	190	0.22	0.9
	1980	681.8	86.5	2086	218	128	85	0.10	0.3
	1981	1241.9	71.5	2416	680	188	343	0.28	0.5
	1982	777.7	45.8	2872	1915	78	1207	0.67	2.5
	1983	1338.4	76.1	2228	665	129	296	0.30	0.5
	1984	1021.3	58.8	3062	1945	154	1416	0.54	1.9
	1985	1516.9	86.1	2436	839	141	502	0.34	0.6
OCONEE 1, 2, 3 Docket 50-269, 50-270, 50-287; DPR-38, -47, -55 1st commercial operation 7/73 9/74, 12/74 Type - PWRs Capacity - 860, 860, 860 MWe	1974	650.6	60.1	844	517	18	144	0.61	0.8
	1975	1838.3	75.5	829	497	72	90	0.60	0.3
	1976	1561.4	63.0	1215	1026	65	219	0.84	0.6
	1977	1566.4	65.9	1595	1328	244	294	0.83	0.8
	1978	1909.0	75.8	1636	1393	179	340	0.85	0.7
	1979	1708.0	67.7	2100	1001	123	181	0.48	0.6
	1980	1703.7	70.1	2124	1055	117	162	0.50	0.6
	1981	1661.5	66.8	2445	1211	113	275	0.50	0.7
	1982	1293.1	52.5	2445	1792	97	364	0.73	1.4
	1983	2141.5	82.2	1902	1207	88	316	0.63	0.6
	1984	2242.9	85.7	2085	1106	63	260	0.53	0.5
	1985	2036.3	80.5	2729	1304	143	378	0.48	0.6
OYSTER CREEK Docket 50-219; DPR-16 1st commercial operation 12/69 Type - BWR Capacity - 620 MWe	1970	413.6		95	63	21	11	0.66	0.1
	1971	448.9		249	240	50	92	0.96	0.5
	1972	515.0		339	582	150	167	1.72	1.1
	1973	424.6		782	1236	195	683	1.58	2.9
	1974	434.5	70.4	935	984	166	162	1.05	2.3
	1975	373.6	73.3	1210	1140	169	271	0.94	3.0
	1976	456.5	79.3	1582	1078	70	587	0.68	2.4
	1977	385.7	70.1	1673	1614	76	1048	0.96	4.2
	1978	431.8	74.3	1411	1279	134	696	0.91	3.0
	1979	541.0	85.9	842	467	95	372	0.55	0.9
	1980	232.9	41.4	1966	1733	97	1182	0.88	7.4
	1981	314.8	59.8	1689	917	48	479	0.54	2.9
	1982	242.7	62.5	1270	865	33	491	0.68	3.6
	1983	27.9	11.5	2303	2257	65	1863	0.98	80.9
	1984	37.1	9.6	2369	2054	134	1538	0.87	55.4
	1985	446.1	89.4	2342	748	116	318	0.32	1.7

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 Maintenance & Others	Person-rems (-cSv) per Contractor	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
PALISADES Docket 50-255; DPR-20 1st commercial operation 12/71 Type - PWR Capacity - 730 MWe	1972	216.8		975	78	16	1117	661		0.4
	1973	286.8		774	1133			472	1.16	3.9
	1974	10.7	5.5	495	627				0.81	58.6
	1975	302.0	64.5	742	306	23	673	109	0.62	1.0
	1976	346.9	55.2	849	696	13	87	23	0.94	2.0
	1977	616.6	91.4	1599	100	52	712	173	0.30	0.2
	1978	320.2	49.7	849	764	99	755	360	0.90	2.4
	1979	415.0	59.9	1307	854	191	735	312	0.53	2.1
	1980	288.3	42.9	2151	424	167	735	737	0.32	1.5
	1981	418.2	57.2	1554	330	73	257	203	0.42	2.2
	1982	404.3	54.7	2167	977	145	832	483	0.21	0.8
	1983	454.4	60.3	1344	573	79	494	339	0.45	2.2
	1984	98.7	15.2	1355	507	105	402	239	0.43	5.8
	1985	639.2	83.8						0.37	0.8
PEACH BOTTOM 2, 3 Docket 50-277, 50-278; DPR-44, -56 1st commercial operation 7/74, 12/74 Type - BWR Capacity - 1051, 1035 MWe	1975	1234.3	80.9	971	228	180	660	434	0.23	0.2
	1976	1379.2	73.0	2136	840	223	1813	1374	0.39	0.6
	1977	1052.4	58.7	2827	2036	162	1155	709	0.72	1.9
	1978	1636.3	84.0	2244	1317	245	1143	717	0.59	0.8
	1979	1740.0	84.5	2276	1388	311	1991	1596	0.61	0.8
	1980	1374.2	66.3	2774	2302	273	2233	1880	0.83	1.7
	1981	1161.8	58.0	2857	2506	313	1664	1347	0.88	2.2
	1982	1583.3	76.9	2734	1977	331	2632	2422	0.72	1.2
	1983	824.7	40.5	3107	2963	225	2225	2045	0.95	3.6
	1984	1165.8	57.4	3313	2450	396	2958	2727	0.74	2.1
	1985	682.7	42.5	4209	3354				0.80	4.9
PILGRIM 1 Docket 50-293; DPR-35 1st commercial operation 12/72 Type - BWR Capacity - 670 MWe	1973	484.0		230	126	49	77		0.55	0.3
	1974	234.1	39.2	454	415				0.91	1.8
	1975	308.1	71.3	473	798	142	656	412	1.69	2.6
	1976	287.8	60.7	1317	2648	66	2582	2270	2.01	9.2
	1977	316.6	61.4	1875	3142	146	2996	2176	1.68	9.9
	1978	519.5	83.1	1667	1327	157	1170	895	0.80	2.5
	1979	574.0	89.4	2458	1015	131	884	516	0.41	1.8
	1980	360.3	56.2	3549	3626	207	3419	3076	1.02	10.1
	1981	408.9	65.9	2803	1836	70	1766	1418	0.66	4.5
	1982	389.9	63.9	2854	1539	314	1225	1094	0.54	3.9

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 Maintenance & Others	Contractor	Person-rems (-cSv) per Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
PILGRIM 1 (Continued)	1983	559.5	87.2	2326	1162	296	886	776	386	0.50	2.1
	1984	1.4	0.4	4542	4082	647	3435	3767	315	0.90	-
	1985	587.3	91.5	2209	893	13	880	718	175	0.40	1.5
POINT BEACH 1, 2	1971	393.4			164						0.4
Docket 50-266, 50-301; DPR-24, -27	1972	378.3			580						1.5
1st commercial operation 12/70, 10/72	1973	693.7		501	588	72	516	81	214	1.17	0.8
	1974	760.2	81.3	400	295	70	225			0.74	0.4
Type - PWRs	1975	801.2	82.9	339	459					1.35	0.6
Capacity - 485, 485 MWe	1976	857.3	86.7	313	370	58	312	107	263	1.18	0.4
	1977	873.9	87.3	417	429	63	366	212	217	1.03	0.5
	1978	914.4	90.9	336	320	71	249	111	209	0.95	0.3
	1979	808.0	80.8	610	644	65	579	449	195	1.06	0.8
	1980	727.2	82.5	561	598	60	538	420	178	1.07	0.8
	1981	760.4	83.6	773	596	83	513	364	232	0.77	0.8
	1982	757.2	84.3	767	609	72	537	375	234	0.79	0.8
	1983	648.2	72.7	1702	1403	81	1322	1179	224	0.82	2.2
	1984	788.9	78.6	1372	789	121	668	457	332	0.56	1.0
	1985	831.3	82.5	671	482	71	411	242	240	0.72	0.6
PRAIRIE ISLAND 1, 2	1974	181.9	43.9	150	18			5	13	0.12	0.1
Docket 50-282, 50-306; DPR-42, -60	1975	836.0	83.3	477	123					0.26	0.1
1st commercial operation 12/73, 12/74	1976	725.2	76.6	818	447	68	379	235	212	0.55	0.6
Type - PWRs	1977	922.9	87.2	718	300	73	227	60	240	0.42	0.3
Capacity - 503, 500 MWe	1978	941.1	92.2	546	221	43	178	48	173	0.40	0.2
	1979	865.0	86.0	594	180	29	151	49	131	0.30	0.2
	1980	800.7	79.9	983	353	40	313	141	212	0.36	0.4
	1981	844.9	80.5	836	329	153	176	128	201	0.39	0.4
	1982	944.9	90.4	645	229	30	199	68	161	0.36	0.2
	1983	921.1	86.8	654	233	14	219	73	160	0.36	0.3
	1984	972.4	91.7	539	147	18	129	52	95	0.27	0.2
	1985	882.6	84.0	1082	416	31	385	136	280	0.38	0.5

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rem or cSv)	Person-rem Work Functions	Person-rem per Station & Utility	Average Measurable Dose (rem or cSv)	Person-rem (-cSv)/MW-Yr
QUAD CITIES 1, 2 Docket 50-254; 50-265; DPR-29, -30 1st commercial operation 2/73, 3/73 Type - BWRs Capacity - 769, 769 MWe	1974	958.1	72.3	678	482		36	0.71	0.5
	1975	833.6	68.4	1083	1618	1504	692	1.49	1.9
	1976	951.2	73.1	1225	1651	1382	648	1.35	1.7
	1977	970.1	84.0	907	1031	923	373	1.14	1.1
	1978	1124.5	88.6	1207	1618	1462	722	1.34	1.4
	1979	1075.0	84.6	1688	2158	1943	1250	1.28	2.0
	1980	866.9	64.4	3089	4838	4547	3657	1.57	5.6
	1981	1156.9	81.1	2246	3146	3580	2623	1.40	2.7
	1982	1018.7	76.0	2314	3757	3580	2653	1.62	3.7
	1983	1088.5	79.2	1802	2491	2325	1937	1.38	2.3
	1984	994.6	65.7	1678	1579	1457	1078	0.94	1.6
	1985	1268.0	82.7	1184	990	818	27	0.84	0.8
RANCHO SECO Docket 50-312; DPR-54 1st commercial operation 4/75 Type - PWR Capacity - 873 MWe	1976	268.1	30.4	297	58	52	17	0.19	0.2
	1977	706.4	77.1	515	390	329	248	0.76	0.5
	1978	607.7	80.5	508	323	247	176	0.64	0.5
	1979	687.0	91.1	287	126	99	64	0.44	0.2
	1980	530.9	60.4	890	412	302	281	0.46	0.8
	1981	321.2	40.2	772	402	319	266	0.52	1.3
	1982	409.5	53.3	766	337	288	217	0.44	0.8
	1983	347.9	46.8	1338	787	629	604	0.59	2.3
	1984	460.0	58.3	802	222	149	115	0.28	0.5
	1985	238.7	30.8	1764	756	573	583	0.43	3.2
ROBINSON 2 Docket 50-261; DPR-23 1st commercial operation 3/71 Type - PWR Capacity - 665 MWe	1972	580.0		245	215	173	137	0.88	0.4
	1973	455.1		831	695		78	0.84	1.5
	1974	578.1	83.3	853	672	487		0.79	1.2
	1975	501.8	72.7	849	1142			1.34	2.3
	1976	585.5	84.7	597	715	685	457	1.20	1.2
	1977	511.5	85.2	634	455	403	223	0.72	0.9
	1978	480.5	72.0	943	963	900	529	1.02	2.0
	1979	482.0	70.8	1454	1188	794	394	0.82	2.5
	1980	387.3	62.2	2009	1852	1773	1379	0.92	4.8
	1981	426.6	73.0	1462	733	688	513	0.50	1.7
	1982	277.5	48.9	2011	1426	1298	945	0.71	5.1
	1983	409.8	75.5	2244	923	827	628	0.41	2.3

Appendix C (Continued)  
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 & Maint.	Person-rems (-cSv) per Contractor Station & Utility	Average Meas'ble Dose (rems or cSv)	Person- rems (-cSv)/ MW-Yr
ROBINSON 2 (Continued)	1984	28.0	7.0	4127	2880	196	2549	0.70	-
	1985	629.5	87.9	1378	311	52	165	0.23	0.5
SALEM 1, 2	1978	546.4	55.6	574	122	28	32	0.21	0.2
Docket 50-272,-311; DPR-70,-75	1979	250.0	25.5	1488	584	100	359	0.39	2.3
1st commercial operation 6/77,	1980	680.6	69.2	1704	449	55	281	0.26	0.7
10/81	1981	743.0	78.1	1652	254	4	152	0.15	0.3
Type - PWRs	1982	1440.4	72.6	3228	1203	66	846	0.37	0.8
Capacity - 1079, 1106 MWe	1983	742.0	35.4	2383	581	10	463	0.24	0.8
	1984	650.1	31.8	1395	681	10	469	0.70	1.0
	1985	1657.7	75.8	1112	204	26	91	0.18	0.1
SAN ONOFRE 1	1969	314.1		123	42	10	5	0.34	0.1
Docket 50-206; DPR-13	1970	365.9		251	155	13	59	0.62	0.4
1st commercial operation 1/68	1971	362.1		121	50	12	3	0.41	0.1
Type - PWR	1972	338.5		326	256	29	117	0.78	0.8
Capacity - 436 MWe	1973	273.7		570	353	40	168	0.62	1.3
	1974	377.8	86.1	219	71			0.32	0.2
	1975	389.0	87.4	424	292			0.69	0.7
	1976	297.9	70.2	1330	880	147	629	0.66	2.9
	1977	281.2	63.7	985	847	77	451	0.86	3.0
	1978	323.2	80.2	764	401	25	234	0.52	1.2
	1979	401.0	90.2	521	139	23	65	0.27	0.3
	1980	97.3	22.3	3063	2387	219	2018	0.78	24.5
	1981	95.9	26.7	2902	3223	100	3104	1.11	33.6
	1982	61.6	15.7	3055	832	81	729	0.27	13.5
	1983	0.0	0.0	1701	155	31	113	0.09	-
	1984	34.7	9.4	4374	513	67	432	0.12	14.7
	1985	299.0	76.8	2693	189	46	126	0.07	0.6
SAN ONOFRE 2, 3*	1984	635.7	58.9	3140	473	38	398	0.15	0.7
Docket 50-361, -362; NPF-10, -15	1985	1082.8	56.1	3049	533	12	455	0.17	0.5
1st commercial operation 3/83									
Type - PWR									
Capacity - 1070, 1080 MWe									

\*San Onofre 3 was counted for the first time in 1985.

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 Contract Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
						Work Functions Operations & Others	Personnel Type			
SEQUOIAH 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	1965	570	67	503	57	513	0.29
	1983	1663.7	75.0	1772	491	74	417	46	445	0.28
	1984	1481.9	69.0	2373	1117	153	964	111	1006	0.47
	1985	1151.3	51.3	1854	1071	118	953	243	828	0.58
ST. LUCIE 1, 2 Docket 50-335, -387; DPR-67; NPF-16 1st commercial oper. 12/76, 3/83 Type - PWRs Capacity - 827, 837 MWe	1977	649.1	84.7	445	152	26	126	92	60	0.34
	1978	606.4	76.5	797	337	15	322	140	197	0.42
	1979	592.0	74.0	907	438	25	413	209	229	0.48
	1980	627.9	77.5	1074	532	82	450	195	337	0.50
	1981	599.1	72.7	1473	929	20	909	556	373	0.63
	1982	816.8	94.0	1045	272	17	255	105	167	0.3
	1983	290.3	15.4	2211	1204	5	1199	924	280	4.2
	1984	1183.0	69.6	2090	1263	41	1222	808	455	1.1
	1985	1445.8	82.5	1971	1344	293	1046	809	535	0.9
SUMMER 1 Docket 50-395; NPF-12 1st commercial operation 1/84 Type - PWR Capacity - 885 MWe	1984	504.6	61.1	1120	295	29	266	202	93	0.26
	1985	627.7	71.6	1201	379	74	305	241	138	0.32
SURRY 1, 2 Docket 50-280, 50-281; DPR-32, -37 1st commercial operation 12/72, 5/73 Type - PWRs Capacity - 781, 775 MWe	1973	420.6		936	152					0.16
	1974	717.4	49.8	1715	884	72	812			0.51
	1975	1079.0	70.8	1948	1649	27	1622	1065	584	1.2
	1976	930.7	60.4	2753	3165	444	2721	1873	1292	1.5
	1977	1139.0	72.2	1860	2307	348	1959	1380	927	3.4
	1978	1210.6	77.2	2203	1837	726	1111	1029	808	2.0
	1979	343.0	42.3	5065	3584	173	3411	2975	609	1.5
	1980	568.2	40.3	5317	3836	353	3483	3117	719	10.4
	1981	907.6	59.3	3753	4244	428	3816	3040	1204	6.6
	1982	1323.3	88.5	1878	1490	399	1091	506	984	4.7
	1983	916.2	61.3	2754	3220	571	2649	1786	984	1.1
	1984	1026.7	71.0	3198	2247	536	1711	1575	672	3.5
	1985	1166.4	78.2	3206	1815	508	1307	1232	583	2.2



Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

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 Operations	Person-rems (-cSv) per Maintenance & Others	Person-rems (-cSv) per Contract Station & Utility	Average Measurable Dose (rems or cSv)	Person-rems (-cSv)/MW-Yr
SUSQUEHANNA 1 Docket 50-387; NPF-14 1st commercial operation 6/83 Type - BWR Capacity - 1032 MWe	1984	719.9	72.6	2827	308	71	237	128	0.11	0.4
	1985	628.3	62.5	3669	1106	77	1029	790	0.30	1.8
THREE MILE ISLAND 1, 2* Docket 50-289; DPR-50, -73 1st commercial operation 9/74, 12/78 Type - PWRs Capacity - 776, 880 MWe	1975	675.9	82.2	131	73	23	263	18	0.56	0.1
	1976	530.0	65.4	819	286	15	344	69	0.35	0.5
	1977	664.5	80.9	1122	359	23	481	128	0.32	0.5
	1978	690.0	85.1	1929	504	197	1195	235	0.26	0.7
	1979	266.0	21.9	4024	1392	29	365	907	0.35	5.2
	1980	0.0	0.0	2328	394	50	326	234	0.17	-
	1981	0.0	0.0	2103	376	62	942	190	0.18	-
	1982	0.0	0.0	2123	1004	79	1080	433	0.47	-
	1983	0.0	0.0	1592	1159	49	639	637	0.73	-
	1984	0.0	0.0	1079	688	85	772	330	0.64	-
	1985	103.6	10.1	1890	857			591	0.45	8.3
TROJAN Docket 50-344; NPF-1 1st commercial operation 5/76 Type - PWR Capacity - 1080 MWe	1977	792.0	92.6	591	174	30	144	105	0.29	0.2
	1978	205.5	20.6	711	319	81	238	124	0.45	1.5
	1979	631.0	58.1	736	257	74	183	113	0.35	0.4
	1980	727.5	72.5	1159	421	77	344	305	0.36	0.6
	1981	775.6	74.1	1311	609	113	496	363	0.46	0.8
	1982	579.5	60.8	977	419	76	343	168	0.42	0.7
	1983	494.2	62.4	969	307	35	272	129	0.32	0.6
	1984	567.0	54.4	1042	433	40	393	230	0.42	0.8
	1985	829.1	76.7	852	363	31	332	210	0.43	0.4
	1973	401.9		444	78	88	366	202	0.18	0.2
	1974	953.6		794	454	270	606	559	0.57	0.5
	1975	1003.7	74.9	1176	876	89	1095	868	0.74	0.9
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	1976	974.2	71.2	1647	1184	94	942	522	0.72	1.2
	1977	979.5	72.1	1319	1036	90	942	514	0.78	1.1
	1978	1000.2	78.8	1336	1032	299	1381	546	0.77	1.0
	1979	811.0	62.4	2002	1680			997	0.84	2.1

\*Three Mile Island 2 is shut down, but it is still included in the count of commercial reactors.

Appendix C (Continued)  
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		Person-rems (-cSv) per Contractor	Person-rems (-cSv) per Station & Utility	Average Meas'ble Dose (rems or cSv)	Person- rems (-cSv)/ MW-Yr
						Work Function	Maint. & Others				
TURKEY POINT 3, 4 (Continued)	1980	990.6	73.6	1803	1651	232	1419	1218	433	0.92	1.7
	1981	654.0	46.8	2932	2251	274	1977	1854	397	0.77	3.4
	1982	915.7	65.2	2956	2119	197	1922	1656	463	0.72	2.3
	1983	878.4	62.8	2930	2681	272	2409	2119	562	0.92	3.1
	1984	946.7	68.5	2010	1255	217	1038	876	379	0.62	1.3
	1985	1034.9	74.7	1905	1253	91	1162	817	436	0.66	1.2
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	113	0.60	0.7
	1975	429.0	87.8	282	153	70	83	63	90	0.54	0.4
	1976	389.6	77.1	815	411	36	375	246	165	0.50	1.0
	1977	423.5	85.1	641	258	83	175	90	168	0.40	0.6
	1978	387.5	75.9	934	339	78	261	158	181	0.36	0.9
	1979	414.0	82.1	1220	1170	546	624	642	528	0.96	2.8
	1980	357.8	71.5	1443	1338	141	1197	926	412	0.93	3.7
	1981	429.1	84.6	1264	731	121	610	408	323	0.58	1.7
	1982	501.0	96.0	481	205	60	145	80	125	0.43	0.4
	1983	346.1	69.3	1316	1527	215	1312	787	740	1.16	4.4
	1984	398.1	79.0	954	603	80	523	307	296	0.63	1.5
	1985	361.4	71.8	1392	1051	164	887	898	153	0.76	2.9
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	133	1.11	1.5
	1970	146.1		355	255	90	165	158	97	0.72	1.7
	1971	173.5		155	90	46	44	19	71	0.58	0.5
	1972	78.7		282	255	63	192	146	109	0.90	3.2
	1973	127.1		133	99			47	52	0.74	0.8
	1974	111.3		243	205			99	106	0.84	1.8
	1975	145.1	82.4	152	116	52	64	66	50	0.47	0.8
	1976	152.2	89.8	152	59	17	42	4	55	0.39	0.4
	1977	124.6	73.9	725	356	28	328	174	182	0.49	2.9
	1978	145.0	81.0	565	282	26	256	95	187	0.50	1.9
	1979	149.0	81.6	441	127	16	111	52	75	0.29	0.9
	1980	35.6	22.0	502	213	6	123	90	123	0.42	6.0
	1981	109.0	74.4	515	302	8	294	136	166	0.59	2.8
	1982	108.6	73.4	814	474	6	468	215	259	0.54	4.4
	1983	163.5	91.4	395	68	19	49	4	64	0.17	0.4

Appendix C (Continued)  
Personnel, Dose and Power Generation Summary

Reporting Organization	Year	Mega-watt-Years (MW-Yr)	Unit Availability Factor	Total Personnel With Measurable Doses	Collective Dose (person-rem or cSv)	Person-rem (-cSv) per Work Function Operations & Others	Person-rem (-cSv) per Contractor	Person-rem (-cSv) per Station & Utility	Average Measurable Dose (rem or cSv)	Person-rem (-cSv)/MW-Yr
YANKEE ROWE (Continued)	1984	124.8	71.4	654	348	15	333	141	0.53	2.8
	1985	144.3	85.3	653	211	17	194	81	0.32	1.5
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
ZION 1, 2 Docket 50-295; 50-304; DPR-39, -48 1st commercial operation 12/73, 9/74 Type - PWRs Capacity - 1040, 1040 MWe	1974	425.3	71.1	306	56	17	110	13	0.18	0.1
	1975	1181.5	74.9	436	127	64	507	49	0.29	0.1
	1976	1134.9	61.9	774	571	43	960	257	0.74	0.5
	1977	1358.6	75.0	784	1003	150	867	561	1.28	0.7
	1978	1613.5	80.2	1104	1017	168	1106	418	0.92	0.6
	1979	1238.0	67.6	1472	1274	97	823	747	0.87	1.0
	1980	1411.2	74.1	1363	920	50	1670	560	0.67	0.7
	1981	1366.9	72.3	1754	1720	42	2061	1155	0.98	1.3
	1982	1186.4	64.3	1575	2103	118	1193	1688	1.34	1.8
	1983	1222.3	66.8	1285	1311	23	763	905	1.02	1.1
	1984	1389.9	69.5	1110	786	41	1125	556	0.71	0.6
	1985	1187.9	62.9	1498	1166			784	0.78	1.0

\*Washington Nuclear 2 was counted for the first time in 1985.



## **APPENDIX D**

**Number of Personnel and Collective Dose by Work and Job Function**

**1985**

# APPENDIX D

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *ARKANSAS 1,2					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	22	0	41		3.944	0	6.939	
OPERATING PERSONNEL	50	0	0		15.557	0	0	
HEALTH PHYSICS PERSONNEL	37	0	50		11.065	0	11.109	
SUPERVISORY PERSONNEL	1	0	0		0.124	0	0	
ENGINEERING PERSONNEL	0	1	5		0	0.119	0.938	
TOTAL	110	1	96	207	30.69	0.119	18.986	49.795
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	50	1	4		10.539	0.147	0.538	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	9	0	0		1.554	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	59	1	4	64	12.093	0.147	0.538	12.778
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	31		0	0	11.207	
OPERATING PERSONNEL	2	0	0		0.697	0	0	
HEALTH PHYSICS PERSONNEL	4	0	4		0.802	0	0.853	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	3		0	0	0.96	
TOTAL	6	0	38	44	1.499	0	13.02	14.519
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	99	5	213		42.552	0.784	54.265	
OPERATING PERSONNEL	2	0	0		0.597	0	0	
HEALTH PHYSICS PERSONNEL	31	0	44		7.409	0	13.443	
SUPERVISORY PERSONNEL	1	0	0		0.15	0	0	
ENGINEERING PERSONNEL	3	3	19		0.356	0.591	9.305	
TOTAL	136	8	276	420	51.064	1.375	77.013	129.452
WASTE PROCESSING								
MAINTENANCE PERSONNEL	7	0	11		2.215	0	3.412	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	21	0	0		6.462	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	28	0	11	39	8.677	0	3.412	12.089
REFUELING								
MAINTENANCE PERSONNEL	24	2	20		5.371	0.655	6.152	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	3		0	0	0.412	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	24	2	23	49	5.371	0.655	6.564	12.59
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	202	8	320	530	64.621	1.586	82.513	148.72
OPERATING PERSONNEL	54	0	0	54	16.851	0	0	16.851
HEALTH PHYSICS PERSONNEL	102	0	101	203	27.292	0	25.817	53.109
SUPERVISORY PERSONNEL	2	0	0	2	0.274	0	0	0.274
ENGINEERING PERSONNEL	3	4	27	34	0.356	0.71	11.203	12.269
GRAND TOTALS	363	12	448	823	109.394	2.296	119.533	231.223

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: BEAVER VALLEY				TYPE: PWR				
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	4.63	0	4.61	1.179	0	0.758		
OPERATING PERSONNEL	5.1	0	0	0.85	0	0		
HEALTH PHYSICS PERSONNEL	15.9	0	0	4.912	0	0		
SUPERVISORY PERSONNEL	3.79	0	0	1.154	0	0		
ENGINEERING PERSONNEL	0	0	0.28	0	0	0.03		
TOTAL	29.42	0	4.89	8.095	0	0.788	8.883	
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	40.48	0	4.86	9.149	0	1.405		
OPERATING PERSONNEL	0.37	0	0	0.095	0	0		
HEALTH PHYSICS PERSONNEL	9.85	0	0	3.232	0	0		
SUPERVISORY PERSONNEL	1.08	0	0	0.362	0	0		
ENGINEERING PERSONNEL	3	0	0.8	0.042	0	0.08		
TOTAL	54.78	0	5.66	12.88	0	1.485	14.365	
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	1.02	0	0	0.241	0	0		
OPERATING PERSONNEL	0	0	0	0	0	0		
HEALTH PHYSICS PERSONNEL	1.53	0	0	0.532	0	0		
SUPERVISORY PERSONNEL	0	0	0	0	0	0		
ENGINEERING PERSONNEL	0.86	0	0	0.265	0	0		
TOTAL	3.41	0	0	1.038	0	0	1.038	
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	3.12	0	14.53	0.66	0	3.516		
OPERATING PERSONNEL	0	0	0	0.272	0	0		
HEALTH PHYSICS PERSONNEL	0.63	0	0	0.05	0	0		
SUPERVISORY PERSONNEL	0.18	0	0	0.015	0	0.095		
ENGINEERING PERSONNEL	0.14	0	0.92	0.99	0	0.29		
TOTAL	4.07	0	15.45	1.987	0	3.901	5.888	
WASTE PROCESSING								
MAINTENANCE PERSONNEL	6.75	0	2	1.395	0	0		
OPERATING PERSONNEL	2.53	0	0	0.05	0	0		
HEALTH PHYSICS PERSONNEL	0.09	0	0	0.425	0	0		
SUPERVISORY PERSONNEL	0.95	0	0	0	0	0		
ENGINEERING PERSONNEL	0	0	0	0	0	0		
TOTAL	10.32	0	2	1.87	0	0	1.87	
REFUELING								
MAINTENANCE PERSONNEL	0	0	0	0	0	0		
OPERATING PERSONNEL	0	0	0	0	0	0		
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0		
SUPERVISORY PERSONNEL	0	0	0	0	0	0		
ENGINEERING PERSONNEL	0	0	0	0	0	0		
TOTAL	0	0	0	0	0	0	0	
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	56	0	26	82	12.624	0	5.679	18.303
OPERATING PERSONNEL	8	0	0	8	1.267	0	0	1.267
HEALTH PHYSICS PERSONNEL	28	0	0	28	9.151	0	0	9.151
SUPERVISORY PERSONNEL	6	0	0	6	1.531	0	0.095	1.626
ENGINEERING PERSONNEL	4	0	2	6	1.297	0	0.4	1.697
GRAND TOTALS	102	0	28	130	25.87	0	6.174	32.044

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*BIG ROCK

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	4	1	0		1.097	0.187	0.013	
OPERATING PERSONNEL	34	0	0		35.758	0.1	0.019	
HEALTH PHYSICS PERSONNEL	12	0	0		8.88	0.005	0.107	
SUPERVISORY PERSONNEL	10	0	0		2.937	0.04	0.057	
ENGINEERING PERSONNEL	1	1	0		0.438	0.129	0.002	
TOTAL	61	2	0	63	49.11	0.461	0.198	49.769
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	24	42	8		12.938	17.16	1.85	
OPERATING PERSONNEL	6	0	0		4.828	0.01	0	
HEALTH PHYSICS PERSONNEL	10	0	7		3.387	0.259	3.356	
SUPERVISORY PERSONNEL	3	3	0		0.535	1.463	0.021	
ENGINEERING PERSONNEL	1	0	0		0.474	0.062	0.044	
TOTAL	44	45	15	104	22.162	18.954	5.271	46.387
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	1	32	22		0.793	28.654	16.379	
OPERATING PERSONNEL	0	0	0		0.094	0	0	
HEALTH PHYSICS PERSONNEL	6	1	8		1.341	0.257	5.634	
SUPERVISORY PERSONNEL	0	1	0		0.083	0.772	0	
ENGINEERING PERSONNEL	1	4	5		0.393	0.987	3.76	
TOTAL	8	38	35	81	2.704	30.67	25.773	59.147
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	25	58	30		24.45	25.299	7.985	
OPERATING PERSONNEL	10	0	1		2.252	0.019	0.112	
HEALTH PHYSICS PERSONNEL	13	0	8		9.103	0.145	3.405	
SUPERVISORY PERSONNEL	6	8	0		1.875	1.716	0.091	
ENGINEERING PERSONNEL	4	0	3		1.016	0.147	0.392	
TOTAL	58	66	42	166	38.696	27.326	11.985	78.007
WASTE PROCESSING								
MAINTENANCE PERSONNEL	14	1	13		4.017	0.515	4.501	
OPERATING PERSONNEL	3	0	0		0.785	0	0	
HEALTH PHYSICS PERSONNEL	6	0	6		2.48	0.019	1.756	
SUPERVISORY PERSONNEL	2	0	0		0.36	0.009	0	
ENGINEERING PERSONNEL	0	0	0		0.117	0	0	
TOTAL	25	1	19	45	7.759	0.543	6.257	14.559
REFUELING								
MAINTENANCE PERSONNEL	13	4	3		4.734	1.332	1.812	
OPERATING PERSONNEL	21	0	0		6.415	0.087	0	
HEALTH PHYSICS PERSONNEL	5	0	0		1.098	0	0.048	
SUPERVISORY PERSONNEL	0	0	0		0.112	0.007	0	
ENGINEERING PERSONNEL	4	2	6		1.252	0.408	3.841	
TOTAL	43	6	9	58	13.611	1.834	5.701	21.146
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	81	138	76	295	48.029	73.147	32.54	153.716
OPERATING PERSONNEL	74	0	1	75	50.132	0.216	0.131	50.479
HEALTH PHYSICS PERSONNEL	52	1	29	82	26.289	0.685	14.306	41.28
SUPERVISORY PERSONNEL	21	12	0	33	5.902	4.007	0.169	10.078
ENGINEERING PERSONNEL	11	7	14	32	3.69	1.733	8.039	13.462
GRAND TOTALS	239	158	120	517	134.042	79.788	55.185	269.015

\*Workers may be counted in more than one category.



# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*BROWNS FERRY 1,2,3

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			TOTAL				
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT					
REACTOR OPS & SURV												
MAINTENANCE PERSONNEL	738	48	30		35.749	3.931	2.306					
OPERATING PERSONNEL	77	2	0		15.936	0.28	0					
HEALTH PHYSICS PERSONNEL	96	4	111		26.681	0.859	42.411					
SUPERVISORY PERSONNEL	15	0	1		2.131	0	0.015					
ENGINEERING PERSONNEL	133	12	44		17.519	1.792	6.103					
TOTAL	1059	66	186	1311	98.016	6.862	50.835	155.713				
ROUTINE MAINTENANCE												
MAINTENANCE PERSONNEL	854	44	94		249.317	4.844	28.191					
OPERATING PERSONNEL	75	2	0		5.654	0.007	0					
HEALTH PHYSICS PERSONNEL	92	3	109		11.692	0.522	19.894					
SUPERVISORY PERSONNEL	13	1	2		1.217	0	0.247					
ENGINEERING PERSONNEL	137	12	43		25.903	0.865	2.604					
TOTAL	1171	62	248	1481	293.783	6.238	50.936	350.957				
IN-SERVICE INSPECTION												
MAINTENANCE PERSONNEL	0	0	0		0	0	0					
OPERATING PERSONNEL	0	0	0		0	0	0					
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0					
SUPERVISORY PERSONNEL	0	0	0		0	0	0					
ENGINEERING PERSONNEL	0	0	0		0	0	0					
TOTAL	0	0	0	0	0	0	0	0				
SPECIAL MAINTENANCE												
MAINTENANCE PERSONNEL	664	73	126		175.136	41.738	98.323					
OPERATING PERSONNEL	31	0	0		1.147	0	0					
HEALTH PHYSICS PERSONNEL	56	0	100		4.44	0	29.805					
SUPERVISORY PERSONNEL	11	1	2		2.559	0.314	0.14					
ENGINEERING PERSONNEL	96	5	22		16.327	0.273	4.732					
TOTAL	858	79	250	1187	199.609	42.325	133	374.934				
WASTE PROCESSING												
MAINTENANCE PERSONNEL	129	0	6		4.613	0	0.56					
OPERATING PERSONNEL	13	0	0		2.089	0	0					
HEALTH PHYSICS PERSONNEL	62	1	42		1.859	0	0.813					
SUPERVISORY PERSONNEL	0	0	1		0	0	0					
ENGINEERING PERSONNEL	3	0	4		0.006	0	0.56					
TOTAL	207	1	53	261	8.567	0	1.933	10.5				
REFUELING												
MAINTENANCE PERSONNEL	88	0	0		4.282	0	0					
OPERATING PERSONNEL	22	1	0		0.891	0.004	0					
HEALTH PHYSICS PERSONNEL	15	0	21		0.047	0	0.735					
SUPERVISORY PERSONNEL	1	0	0		0	0	0					
ENGINEERING PERSONNEL	30	0	0		0.464	0	0					
TOTAL	156	1	21	178	5.684	0.004	0.735	6.423				
TOTAL BY JOB FUNCTION												
MAINTENANCE PERSONNEL	2473	(870)	165	(73)	256	(151)	2894	(1094)	469.097	50.513	129.38	648.99
OPERATING PERSONNEL	218	(76)	5	(2)	0	(0)	223	(78)	25.717	0.291	0	26.008
HEALTH PHYSICS PERSONNEL	321	(96)	8	(4)	383	(110)	712	(210)	44.719	1.381	93.658	139.758
SUPERVISORY PERSONNEL	40	(16)	2	(1)	6	(2)	48	(19)	5.907	0.314	0.402	6.623
ENGINEERING PERSONNEL	399	(131)	29	(8)	113	(46)	541	(185)	60.219	2.93	13.999	77.148
GRAND TOTALS	3451	(1189)	209	(88)	758	(309)	4418	(1586)	605.659	55.429	237.439	898.527

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *BRUNSWICK 1,2				TYPE: BWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT
TOTAL							
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	1	0	1	1.096	0.01	4.387	
OPERATING PERSONNEL	92	0	0	74.176	0	0	
HEALTH PHYSICS PERSONNEL	26	0	11	23.284	0	9.475	
SUPERVISORY PERSONNEL	1	0	0	0.835	0.06	0.035	
ENGINEERING PERSONNEL	12	0	1	3.718	0.04	0.568	
TOTAL	132	0	13	103.109	0.11	14.465	117.684
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	262	75	387	235.527	72.429	384.043	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	15	0	22	13.97	0	18.946	
SUPERVISORY PERSONNEL	4	0	11	0.967	0.01	7.22	
ENGINEERING PERSONNEL	23	4	131	8.234	1.361	106.593	
TOTAL	304	79	551	258.698	73.8	516.802	849.3
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	39	15	67	17.646	4.042	55.138	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	10	0	22	9.323	0	18.716	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	11	0	74	5.447	0.368	45.923	
TOTAL	60	15	163	32.416	4.41	119.777	156.603
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	129	3	745	99.715	1.655	989.035	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	36	0	134	32.597	0	113.684	
SUPERVISORY PERSONNEL	0	0	11	0.084	0	8.272	
ENGINEERING PERSONNEL	23	11	204	8.58	6.28	149.894	
TOTAL	188	14	1094	140.976	7.935	1260.885	1409.796
WASTE PROCESSING							
MAINTENANCE PERSONNEL	39	13	63	27.793	8.195	42.951	
OPERATING PERSONNEL	11	0	9	8.727	0	8.18	
HEALTH PHYSICS PERSONNEL	11	0	21	9.32	0	18.947	
SUPERVISORY PERSONNEL	0	0	0	0	0	0.035	
ENGINEERING PERSONNEL	1	0	1	0.54	0.07	0.415	
TOTAL	62	13	94	46.38	8.265	70.528	125.173
REFUELING							
MAINTENANCE PERSONNEL	31	24	67	20.935	6.656	30.336	
OPERATING PERSONNEL	5	0	8	4.363	0	6.692	
HEALTH PHYSICS PERSONNEL	5	0	11	4.65	0	9.705	
SUPERVISORY PERSONNEL	1	0	0	0.18	0	0.03	
ENGINEERING PERSONNEL	2	0	17	0.765	0.125	9.58	
TOTAL	44	24	103	30.893	6.781	56.343	94.017
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	501	130	1330	402.712	92.987	1505.89	2001.589
OPERATING PERSONNEL	108	0	17	87.266	0	14.872	102.138
HEALTH PHYSICS PERSONNEL	103	0	221	93.144	0	189.473	282.617
SUPERVISORY PERSONNEL	6	0	22	2.066	0.07	15.592	17.728
ENGINEERING PERSONNEL	72	15	428	27.284	8.244	312.973	348.501
GRAND TOTALS	790	145	2018	612.472	101.301	2038.8	2752.573

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: CALLAWAY

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		0.003	0.719	0.468	
OPERATING PERSONNEL	0	15	1		0.029	5.777	1.285	
HEALTH PHYSICS PERSONNEL	0	20	1		0	6.304	0.003	
SUPERVISORY PERSONNEL	0	1	0		0.028	1.082	0.029	
ENGINEERING PERSONNEL	0	0	0		0.002	0.11	0.109	
TOTAL	0	36	2	38	0.062	13.992	1.894	15.948
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	36	15		0.041	9.98	4.668	
OPERATING PERSONNEL	0	2	1		0.012	1.405	0.215	
HEALTH PHYSICS PERSONNEL	0	10	0		0	1.948	0	
SUPERVISORY PERSONNEL	0	1	0		0.002	0.246	0.017	
ENGINEERING PERSONNEL	0	0	0		0	0.204	0.073	
TOTAL	0	49	16	65	0.055	13.783	4.973	18.811
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0.137	0.135	
OPERATING PERSONNEL	0	0	0		0.037	0.069	0.003	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.002	0.008	
SUPERVISORY PERSONNEL	0	0	0		0.004	0.023	0	
ENGINEERING PERSONNEL	0	0	1		0.001	0.217	0.15	
TOTAL	0	0	1	1	0.042	0.448	0.296	0.786
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0	0.012	0	
OPERATING PERSONNEL	0	0	0		0	0.272	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.055	0.002	
SUPERVISORY PERSONNEL	0	0	0		0	0.078	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0.417	0.002	0.419
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	0	36	15	51	0.044	10.848	5.271	16.163
OPERATING PERSONNEL	0	17	2	19	0.078	7.523	1.503	9.104
HEALTH PHYSICS PERSONNEL	0	30	1	31	0	8.309	0.013	8.322
SUPERVISORY PERSONNEL	0	2	0	2	0.034	1.429	0.046	1.509
ENGINEERING PERSONNEL	0	0	1	1	0.003	0.531	0.332	0.866
GRAND TOTALS	0	85	19	104	0.159	28.64	7.165	35.964

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*CALVERT CLIFFS 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	STATION		UTILITY	CONTRACT	TOTAL	
REACTOR OPS & SURV									
MAINTENANCE PERSONNEL	52	8	5		10.849	1.019	1.25		
OPERATING PERSONNEL	68	0	1		26.664	0	0.118		
HEALTH PHYSICS PERSONNEL	22	0	16		10.895	0	6.664		
SUPERVISORY PERSONNEL	3	0	0		0.703	0	0		
ENGINEERING PERSONNEL	3	0	0		0.328	0	0		
TOTAL	148	8	22	178	49.439	1.019	8.032	58.49	
ROUTINE MAINTENANCE									
MAINTENANCE PERSONNEL	42	8	7		10.954	1.496	1.553		
OPERATING PERSONNEL	4	0	0		0.602	0	0		
HEALTH PHYSICS PERSONNEL	6	0	5		1.366	0	1.21		
SUPERVISORY PERSONNEL	1	0	0		0.139	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	53	8	12	73	13.061	1.496	2.763	17.32	
IN-SERVICE INSPECTION									
MAINTENANCE PERSONNEL	7	102	27		6.813	97.199	8.363		
OPERATING PERSONNEL	4	0	0		0.692	0	0		
HEALTH PHYSICS PERSONNEL	11	0	11		3.754	0	2.225		
SUPERVISORY PERSONNEL	1	0	2		0.55	0	1.769		
ENGINEERING PERSONNEL	7	0	2		4.51	0	0.347		
TOTAL	30	102	42	174	16.319	97.199	12.704	126.222	
SPECIAL MAINTENANCE									
MAINTENANCE PERSONNEL	150	119	97		96.99	51.92	30.487		
OPERATING PERSONNEL	15	4	0		6.264	1.443	0		
HEALTH PHYSICS PERSONNEL	28	0	84		14.851	0	36.102		
SUPERVISORY PERSONNEL	3	3	7		0.784	0.502	2.303		
ENGINEERING PERSONNEL	13	3	9		4.173	1.175	2.071		
TOTAL	209	129	197	535	123.062	55.04	70.963	249.065	
WASTE PROCESSING									
MAINTENANCE PERSONNEL	2	11	3		0.472	7.357	1.621		
OPERATING PERSONNEL	0	0	0		0	0	0		
HEALTH PHYSICS PERSONNEL	23	2	31		19.704	0.378	20.397		
SUPERVISORY PERSONNEL	1	0	0		0.25	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	26	13	34	73	20.426	7.735	22.018	50.179	
REFUELING									
MAINTENANCE PERSONNEL	59	46	3		50.863	19.121	0.584		
OPERATING PERSONNEL	6	4	0		2.622	1.102	0		
HEALTH PHYSICS PERSONNEL	16	0	20		4.764	0	4.772		
SUPERVISORY PERSONNEL	2	0	0		0.787	0	0		
ENGINEERING PERSONNEL	1	1	0		0.311	0.769	0		
TOTAL	84	51	23	158	59.347	20.992	5.356	85.695	
TOTAL BY JOB FUNCTION									
MAINTENANCE PERSONNEL	312 (181)	294 (232)	142 (125)	748	176.941	178.112	43.858	398.911	
OPERATING PERSONNEL	97 (92)	8 (6)	1 (1)	106	36.844	2.545	0.118	39.507	
HEALTH PHYSICS PERSONNEL	106 (49)	2 (2)	167 (123)	275	55.334	0.378	71.37	127.082	
SUPERVISORY PERSONNEL	11 (8)	3 (3)	9 (9)	23	3.213	0.502	4.072	7.787	
ENGINEERING PERSONNEL	24 (26)	4 (3)	11 (11)	39	9.322	1.944	2.418	13.684	
GRAND TOTALS	550 (356)	311 (246)	330 (269)	1191	281.654	183.481	121.836	586.971	

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: CATAWBA					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	51	75	13		2.005	1.795	0.24	
OPERATING PERSONNEL	50	4	17		6.604	0.305	0.115	
HEALTH PHYSICS PERSONNEL	29	0	18		5.755	0	1.84	
SUPERVISORY PERSONNEL	1	0	0		0.1	0	0	
ENGINEERING PERSONNEL	12	11	2		1.495	0.15	0.045	
TOTAL	143	90	50	283	15.959	2.25	2.24	20.449
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	51	93	14		5.735	15.17	1.58	
OPERATING PERSONNEL	38	2	22		3	0.285	4.505	
HEALTH PHYSICS PERSONNEL	29	0	18		4.795	0	3.925	
SUPERVISORY PERSONNEL	1	0	0		0.01	0	0	
ENGINEERING PERSONNEL	11	12	2		1.45	1.385	0.27	
TOTAL	130	107	56	293	14.99	16.84	10.28	42.11
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	7	10	2		0	0.21	0.02	
OPERATING PERSONNEL	15	1	7		0.005	0	0.01	
HEALTH PHYSICS PERSONNEL	18	0	6		0.175	0	0.095	
SUPERVISORY PERSONNEL	1	0	0		0.07	0	0	
ENGINEERING PERSONNEL	1	0	1		0	0	0.015	
TOTAL	42	11	16	69	0.25	0.21	0.14	0.6
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	25	21	6		1.41	0.92	0.28	
OPERATING PERSONNEL	7	0	0		0.11	0	0	
HEALTH PHYSICS PERSONNEL	18	0	11		0.55	0	0.385	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	6	0	0		0.075	0	0	
TOTAL	56	21	17	94	2.145	0.92	0.665	3.73
WASTE PROCESSING								
MAINTENANCE PERSONNEL	27	35	1		0.375	0.125	0	
OPERATING PERSONNEL	9	2	22		0.665	0.325	3.88	
HEALTH PHYSICS PERSONNEL	24	0	15		0.43	0	0.49	
SUPERVISORY PERSONNEL	1	0	0		0	0	0	
ENGINEERING PERSONNEL	3	5	0		0.015	0.015	0	
TOTAL	64	42	38	144	1.485	0.465	4.37	6.32
REFUELING								
MAINTENANCE PERSONNEL	1	1	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	2	0	0		0	0	0	
TOTAL	3	1	0	4	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	162 (52)	235 (93)	36 (15)	433 (160)	9.525	18.22	2.12	29.865
OPERATING PERSONNEL	119 (52)	9 (4)	68 (22)	196 (78)	10.384	0.915	8.51	19.809
HEALTH PHYSICS PERSONNEL	118 (29)	0 (0)	68 (18)	186 (65)	11.705	0	6.735	18.44
SUPERVISORY PERSONNEL	4 (1)	0 (0)	0 (0)	4 (1)	0.18	0	0	0.18
ENGINEERING PERSONNEL	35 (16)	28 (8)	5 (2)	68 (26)	3.035	1.55	0.33	4.915
GRAND TOTALS	438 (150)	272 (105)	177 (57)	887 (330)	34.829	20.685	17.695	73.209

Numbers in parentheses are total numbers of individuals.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*COOK 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	18	0	52		3.12	0	19.266	
OPERATING PERSONNEL	85	0	13		28.703	0	5.801	
HEALTH PHYSICS PERSONNEL	19	0	73		4.36	0	17.638	
SUPERVISORY PERSONNEL	3	0	0		0.481	0	0	
ENGINEERING PERSONNEL	1	1	2		0.229	0.328	0.231	
TOTAL	126	1	140	267	36.893	0.328	42.936	80.157
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	114	0	488		74.368	0	265.319	
OPERATING PERSONNEL	23	0	39		5.487	0	24.879	
HEALTH PHYSICS PERSONNEL	17	0	101		3.994	0	49.511	
SUPERVISORY PERSONNEL	10	0	1		3.762	0	0.398	
ENGINEERING PERSONNEL	4	5	9		0.83	0.877	3.086	
TOTAL	168	5	638	811	88.441	0.877	343.193	432.511
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	13	0	211		4.55	0	88.436	
OPERATING PERSONNEL	14	0	17		2.701	0	8.583	
HEALTH PHYSICS PERSONNEL	5	0	47		0.653	0	13.026	
SUPERVISORY PERSONNEL	4	0	0		0.721	0	0	
ENGINEERING PERSONNEL	2	4	4		0.304	0.706	0.801	
TOTAL	38	4	279	321	8.929	0.706	110.846	120.481
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	22	0	174		5.87	0	63.665	
OPERATING PERSONNEL	1	0	7		0.192	0	1.431	
HEALTH PHYSICS PERSONNEL	0	0	14		0	0	3.352	
SUPERVISORY PERSONNEL	1	0	0		0.132	0	0	
ENGINEERING PERSONNEL	3	3	8		0.886	0.391	1.531	
TOTAL	27	3	203	233	7.08	0.391	69.979	77.45
WASTE PROCESSING								
MAINTENANCE PERSONNEL	37	0	120		10.343	0	68.615	
OPERATING PERSONNEL	1	0	1		0.23	0	0.4	
HEALTH PHYSICS PERSONNEL	10	0	6		2.699	0	1.074	
SUPERVISORY PERSONNEL	1	0	0		2.501	0	0	
ENGINEERING PERSONNEL	1	0	0		1.525	0	0	
TOTAL	50	0	127	177	17.298	0	70.089	87.387
REFUELING								
MAINTENANCE PERSONNEL	5	0	43		0.672	0	17.9	
OPERATING PERSONNEL	4	0	11		0.802	0	2.578	
HEALTH PHYSICS PERSONNEL	0	0	2		0	0	0.285	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	1		0	0	0.14	
TOTAL	9	0	57	66	1.474	0	20.903	22.377
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	209 (121)	0 (0)	1088 (786)	1297 (907)	98.923	0	523.201	622.124
OPERATING PERSONNEL	128 (105)	0 (0)	88 (64)	216 (169)	38.115	0	43.672	81.787
HEALTH PHYSICS PERSONNEL	51 (31)	0 (0)	243 (106)	294 (137)	11.706	0	84.886	96.592
SUPERVISORY PERSONNEL	19 (17)	0 (0)	1 (1)	20 (18)	7.597	0	0.398	7.995
ENGINEERING PERSONNEL	11 (7)	13 (10)	24 (22)	48 (39)	3.774	2.302	5.789	11.865
GRAND TOTALS	418 (281)	13 (10)	1444 (979)	1875 (1270)	160.115	2.302	657.946	820.363

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *COOPER					TYPE: BWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	2	0	20		0.315	0	2.284	
OPERATING PERSONNEL	57	0	0		25.138	0	0	
HEALTH PHYSICS PERSONNEL	19	0	1		7.786	0	0.056	
SUPERVISORY PERSONNEL	8	3	8		1.559	0.95	1.083	
ENGINEERING PERSONNEL	15	5	10		6.438	0.359	1.074	
TOTAL	101	8	39	148	41.236	1.309	4.497	47.042
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	120	0	102		120.596	0	49.477	
OPERATING PERSONNEL	4	0	0		0.113	0	0	
HEALTH PHYSICS PERSONNEL	11	0	0		3.636	0	0	
SUPERVISORY PERSONNEL	5	3	1		1.283	0.211	0.952	
ENGINEERING PERSONNEL	1	9	31		0.071	0.48	5.134	
TOTAL	141	12	134	287	125.699	0.691	55.563	181.953
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	10		0	0	6.217	
OPERATING PERSONNEL	1	0	0		0.002	0	0	
HEALTH PHYSICS PERSONNEL	1	0	0		0.059	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	2	0	10	12	0.061	0	6.217	6.278
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	2	1	651		3.485	0.191	823.412	
OPERATING PERSONNEL	6	0	0		1.046	0	0	
HEALTH PHYSICS PERSONNEL	15	0	29		11.496	0	24.509	
SUPERVISORY PERSONNEL	7	6	96		0.568	5.288	133.685	
ENGINEERING PERSONNEL	3	15	11		0.28	6.713	3.312	
TOTAL	33	22	787	842	16.875	12.192	984.918	1013.985
WASTE PROCESSING								
MAINTENANCE PERSONNEL	4	0	4		0.034	0	0.422	
OPERATING PERSONNEL	30	0	0		5.825	0	0	
HEALTH PHYSICS PERSONNEL	14	0	1		5.203	0	0.405	
SUPERVISORY PERSONNEL	3	0	0		0.119	0	0	
ENGINEERING PERSONNEL	4	0	0		0.985	0	0	
TOTAL	55	0	5	60	12.166	0	0.827	12.993
REFUELING								
MAINTENANCE PERSONNEL	0	0	13		0	0	2.253	
OPERATING PERSONNEL	41	0	0		8.407	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	1	0	0		0.001	0	0	
ENGINEERING PERSONNEL	4	0	0		0.358	0	0	
TOTAL	46	0	13	59	8.766	0	2.253	11.019
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	128 (122)	1 (1)	800 (749)	929	124.43	0.191	884.065	1008.686
OPERATING PERSONNEL	139 (59)	0 (0)	0 (0)	139	40.531	0	0	40.531
HEALTH PHYSICS PERSONNEL	60 (19)	0 (0)	31 (29)	91	28.18	0	24.97	53.15
SUPERVISORY PERSONNEL	24 (12)	12 (6)	105 (101)	141	3.53	6.449	135.72	145.699
ENGINEERING PERSONNEL	27 (15)	29 (16)	52 (41)	108	8.132	7.552	9.52	25.204
GRAND TOTALS	378 (227)	42 (23)	988 (913)	1408	204.803	14.192	1054.275	1273.27

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	2	2		0.159	0.857	0.723	
OPERATING PERSONNEL	0	36	8		0	14.943	2.912	
HEALTH PHYSICS PERSONNEL	0	6	1		0	1.167	1.242	
SUPERVISORY PERSONNEL	2	6	26		0.736	2.459	12.169	
ENGINEERING PERSONNEL	2	1	6		0.794	0.757	1.935	
TOTAL	4	51	43	98	1.689	20.183	18.981	40.853
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	129	217	479		87.927	95.801	257.83	
OPERATING PERSONNEL	0	8	0		0	4.396	0.025	
HEALTH PHYSICS PERSONNEL	0	18	83		0	9.593	56.7	
SUPERVISORY PERSONNEL	2	1	9		0.929	0.877	3.473	
ENGINEERING PERSONNEL	3	7	61		1.124	2.718	36.908	
TOTAL	134	251	632	1017	89.98	113.385	354.936	558.301
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	3		0.006	0.004	1.764	
OPERATING PERSONNEL	1	0	0		0.869	0	0.002	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	2		0.002	0	1.226	
ENGINEERING PERSONNEL	2	3	15		1.644	2.109	9.582	
TOTAL	3	3	20	26	2.521	2.113	12.574	17.208
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	1	9		0	1.502	5.962	
OPERATING PERSONNEL	0	4	1		0	5.605	1.819	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	3	2		0	4.164	2.533	
ENGINEERING PERSONNEL	0	0	0		0	0.051	0	
TOTAL	0	8	12	20	0	11.322	10.314	21.636
REFUELING								
MAINTENANCE PERSONNEL	4	12	0		1.932	4.508	0.068	
OPERATING PERSONNEL	0	2	0		0	0.79	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	1		0	0.086	0.129	
TOTAL	4	14	1	19	1.932	5.384	0.197	7.513
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	133	232	493	858	90.024	102.672	266.347	459.043
OPERATING PERSONNEL	1	50	9	60	0.869	25.734	4.758	31.361
HEALTH PHYSICS PERSONNEL	0	24	84	108	0	10.76	57.942	68.702
SUPERVISORY PERSONNEL	4	10	39	53	1.667	7.5	19.401	28.568
ENGINEERING PERSONNEL	7	11	83	101	3.562	5.721	48.554	57.837
GRAND TOTALS	145	327	708	1180	96.122	152.387	397.002	645.511



# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	17	1	68		0.19	0.005	1.516	
OPERATING PERSONNEL	85	0	11		4.483	0	0.282	
HEALTH PHYSICS PERSONNEL	12	0	3		0.315	0	0.055	
SUPERVISORY PERSONNEL	28	1	4		0.664	0.005	0.055	
ENGINEERING PERSONNEL	11	0	5		0.21	0	0.149	
TOTAL	153	2	91	246	5.862	0.01	2.057	7.929
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	130	11	346		7.074	0.322	18.122	
OPERATING PERSONNEL	20	0	0		0.836	0	0	
HEALTH PHYSICS PERSONNEL	31	0	49		4.366	0	9.465	
SUPERVISORY PERSONNEL	25	0	6		0.593	0	0.26	
ENGINEERING PERSONNEL	28	1	21		0.67	0.005	0.671	
TOTAL	234	12	422	668	13.539	0.327	28.518	42.384
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	48	4	198		3.982	0.162	26.052	
OPERATING PERSONNEL	2	0	0		0.035	0	0	
HEALTH PHYSICS PERSONNEL	0	0	9		0	0	0.106	
SUPERVISORY PERSONNEL	2	0	1		0.035	0	0.01	
ENGINEERING PERSONNEL	3	0	8		0.385	0	0.682	
TOTAL	55	4	216	275	4.437	0.162	26.85	31.449
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	98	3	123		7.05	0.23	7.798	
OPERATING PERSONNEL	8	0	0		0.48	0	0	
HEALTH PHYSICS PERSONNEL	4	0	6		0.04	0	0.055	
SUPERVISORY PERSONNEL	17	1	5		0.56	0.02	0.055	
ENGINEERING PERSONNEL	11	1	17		0.224	0.01	0.79	
TOTAL	138	5	151	294	8.354	0.26	8.698	17.312
WASTE PROCESSING								
MAINTENANCE PERSONNEL	4	0	13		0.07	0	0.886	
OPERATING PERSONNEL	3	0	0		0.035	0	0	
HEALTH PHYSICS PERSONNEL	14	0	13		6.279	0	0.455	
SUPERVISORY PERSONNEL	3	0	1		1.19	0	0.055	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	24	0	27	51	7.574	0	1.396	8.97
REFUELING								
MAINTENANCE PERSONNEL	5	0	5		0.195	0	0.095	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	2	0	0		0.065	0	0	
SUPERVISORY PERSONNEL	1	0	0		0.005	0	0	
ENGINEERING PERSONNEL	1	0	0		0.015	0	0	
TOTAL	9	0	5	14	0.28	0	0.095	0.375
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	302	19	753	1074	18.561	0.719	54.469	73.749
OPERATING PERSONNEL	118	0	11	129	5.869	0	0.282	6.151
HEALTH PHYSICS PERSONNEL	63	0	80	143	11.065	0	10.136	21.201
SUPERVISORY PERSONNEL	76	2	17	95	3.047	0.025	0.435	3.507
ENGINEERING PERSONNEL	54	2	51	107	1.504	0.015	2.292	3.811
GRAND TOTALS	613	23	912	1548	40.046	0.759	67.614	108.419

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	0		0.039	0.252	0.311	
OPERATING PERSONNEL	0	1	1		0.068	2.134	0.522	
HEALTH PHYSICS PERSONNEL	0	5	24		0.011	2.669	6.039	
SUPERVISORY PERSONNEL	0	0	0		0.015	0.211	0.019	
ENGINEERING PERSONNEL	0	0	0		0.038	0.267	0.002	
TOTAL	0	6	25	31	0.171	5.533	6.893	12.597
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	1	19	24		0.491	6.645	12.325	
OPERATING PERSONNEL	0	0	1		0.054	1.184	0.682	
HEALTH PHYSICS PERSONNEL	0	3	8		0.002	1.091	2.818	
SUPERVISORY PERSONNEL	0	0	0		0	0.018	0.008	
ENGINEERING PERSONNEL	0	1	0		0.035	0.366	0.004	
TOTAL	1	23	33	57	0.582	9.304	15.837	25.723
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0	0.025	
OPERATING PERSONNEL	0	0	0		0.002	0.044	0.008	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.026	0.038	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0.001	0.047	
TOTAL	0	0	0	0	0.002	0.071	0.118	0.191
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0.036	0.012	
OPERATING PERSONNEL	0	0	0		0.002	0.003	0.013	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0.019	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0.001	0	
TOTAL	0	0	0	0	0.002	0.04	0.044	0.086
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0	0.007	0.012	
OPERATING PERSONNEL	0	0	0		0.009	0.04	0.001	
HEALTH PHYSICS PERSONNEL	0	0	2		0	0.281	0.29	
SUPERVISORY PERSONNEL	0	0	0		0	0	0.001	
ENGINEERING PERSONNEL	0	0	0		0	0.004	0	
TOTAL	0	0	2	2	0.009	0.332	0.304	0.645
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0.013	
OPERATING PERSONNEL	0	0	0		0.002	0.001	0.008	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0.009	0	
TOTAL	0	0	0	0	0.002	0.01	0.021	0.033
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	1	19	24	44	0.53	6.94	12.698	20.168
OPERATING PERSONNEL	0	1	2	3	0.137	3.406	1.234	4.777
HEALTH PHYSICS PERSONNEL	0	8	34	42	0.013	4.067	9.204	13.284
SUPERVISORY PERSONNEL	0	0	0	0	0.015	0.229	0.028	0.272
ENGINEERING PERSONNEL	0	1	0	1	0.073	0.648	0.053	0.774
GRAND TOTALS	1	29	60	90	0.768	15.29	23.217	39.275

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*DUANE ARNOLD

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL STATION	UTILITY	(>100 mREM) CONTRACT	TOTAL	STATION	TOTAL PERSON-REM UTILITY CONTRACT	TOTAL
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	49	1	136		2.99	0.02	5.576
OPERATING PERSONNEL	69	1	21		42.42	0.03	0.1698
HEALTH PHYSICS PERSONNEL	23	0	73		2.656	0	5.09
SUPERVISORY PERSONNEL	24	5	72		1.223	0.029	5.354
ENGINEERING PERSONNEL	9	30	51		0.347	0.905	1.109
TOTAL	174	37	353	564	49.636	0.984	17.2988 67.9188
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	134	3	545		57.748	0.403	119.772
OPERATING PERSONNEL	38	0	40		1.638	0	4.604
HEALTH PHYSICS PERSONNEL	29	0	111		8.199	0	11.592
SUPERVISORY PERSONNEL	17	4	74		0.814	0.016	4.411
ENGINEERING PERSONNEL	23	15	105		1.156	0.67	8.09
TOTAL	241	22	875	1138	69.555	1.089	148.469 219.113
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	68	0	540		7.608	0	366.816
OPERATING PERSONNEL	6	0	13		0.272	0	0.464
HEALTH PHYSICS PERSONNEL	28	2	118		3.289	0.08	24.547
SUPERVISORY PERSONNEL	16	3	71		0.929	0.137	9.397
ENGINEERING PERSONNEL	21	29	168		4.647	4.488	100.551
TOTAL	139	34	910	1083	16.745	4.705	501.775 523.225
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	116	9	711		23.507	0.32	442.987
OPERATING PERSONNEL	24	1	22		0.59	0.005	1.067
HEALTH PHYSICS PERSONNEL	33	3	146		8.101	0.035	40.448
SUPERVISORY PERSONNEL	31	6	124		1.634	0.044	33.919
ENGINEERING PERSONNEL	31	43	207		6.881	5.158	53.665
TOTAL	235	62	1210	1507	40.713	5.562	572.086 618.361
WASTE PROCESSING							
MAINTENANCE PERSONNEL	62	1	102		7.828	0.005	8.288
OPERATING PERSONNEL	19	0	33		6.941	0	7.516
HEALTH PHYSICS PERSONNEL	6	0	36		1.955	0	3.245
SUPERVISORY PERSONNEL	2	0	18		0.157	0	2.747
ENGINEERING PERSONNEL	5	1	8		0.2	0.015	0.095
TOTAL	94	2	197	293	17.081	0.02	21.891 38.992
REFUELING							
MAINTENANCE PERSONNEL	67	3	192		5.686	0.06	31.888
OPERATING PERSONNEL	51	2	6		2.344	0.06	0.085
HEALTH PHYSICS PERSONNEL	23	0	58		2.343	0	7.756
SUPERVISORY PERSONNEL	24	1	26		0.415	0.02	2.424
ENGINEERING PERSONNEL	17	13	72		0.748	0.252	11.091
TOTAL	182	19	354	555	11.536	0.392	53.244 65.172
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	496 (199)	17 (14)	2226 (863)	2739	105.367	0.808	975.327 1081.502
OPERATING PERSONNEL	207 (93)	4 (4)	135 (103)	346	54.205	0.095	13.9058 68.2058
HEALTH PHYSICS PERSONNEL	142 (53)	5 (5)	542 (213)	689	26.543	0.115	92.678 119.336
SUPERVISORY PERSONNEL	114 (67)	19 (15)	385 (255)	518	5.172	0.246	58.252 63.67
ENGINEERING PERSONNEL	106 (61)	131 (76)	611 (358)	848	13.979	11.488	174.601 200.068
GRAND TOTALS	1065 (473)	176 (114)	3899 (1792)	5140	205.266	12.752	1314.763 1532.781

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	64	0	50		1.467	0	4.343	
OPERATING PERSONNEL	160	8	17		44.967	0.178	0.78	
HEALTH PHYSICS PERSONNEL	64	7	130		28.979	1.093	49.46	
SUPERVISORY PERSONNEL	174	9	22		12.269	0.43	1.327	
ENGINEERING PERSONNEL	42	10	161		2.351	0.529	9.34	
TOTAL	504	34	380	918	90.033	2.23	65.25	157.513
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	176	1	56		38.109	0.02	2.632	
OPERATING PERSONNEL	86	7	2		35.226	0.366	0.12	
HEALTH PHYSICS PERSONNEL	9	0	12		0.921	0	0.383	
SUPERVISORY PERSONNEL	46	1	2		4.17	0.02	0.054	
ENGINEERING PERSONNEL	16	10	278		0.287	0.231	14.438	
TOTAL	333	19	350	702	78.713	0.637	17.627	96.977
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	6	0	77		0.159	0	22.443	
OPERATING PERSONNEL	4	0	0		0.088	0	0	
HEALTH PHYSICS PERSONNEL	5	0	2		0.176	0	0.239	
SUPERVISORY PERSONNEL	0	0	1		0	0	0.13	
ENGINEERING PERSONNEL	11	2	125		0.697	0.612	32.485	
TOTAL	26	2	205	233	1.12	0.612	55.297	57.029
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	167	1	482		132.626	0.03	183.332	
OPERATING PERSONNEL	89	5	2		19.249	0.376	0.05	
HEALTH PHYSICS PERSONNEL	29	2	50		5.205	0.037	4.437	
SUPERVISORY PERSONNEL	53	2	6		10.168	0.84	0.241	
ENGINEERING PERSONNEL	22	12	718		4.112	0.865	107.117	
TOTAL	360	22	1258	1640	171.36	2.148	295.177	468.685
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	0	2		0.007	0	1.098	
OPERATING PERSONNEL	24	0	0		4.8	0	0	
HEALTH PHYSICS PERSONNEL	9	0	4		0.453	0	2.025	
SUPERVISORY PERSONNEL	7	0	0		3.196	0	0	
ENGINEERING PERSONNEL	0	1	4		0	0.004	0.074	
TOTAL	41	1	10	52	8.456	0.004	3.197	11.657
REFUELING								
MAINTENANCE PERSONNEL	10	0	36		0.132	0	4.666	
OPERATING PERSONNEL	6	0	0		0.14	0	0	
HEALTH PHYSICS PERSONNEL	2	0	8		1.007	0	0.211	
SUPERVISORY PERSONNEL	7	0	1		0.477	0	0.088	
ENGINEERING PERSONNEL	3	2	3		0.052	0.119	0.114	
TOTAL	28	2	48	78	1.808	0.119	5.079	7.006
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	424	2	703	1129	172.5	0.05	218.514	391.064
OPERATING PERSONNEL	369	20	21	410	104.47	0.92	0.95	106.34
HEALTH PHYSICS PERSONNEL	118	9	206	333	36.741	1.13	56.755	94.626
SUPERVISORY PERSONNEL	287	12	32	331	30.28	1.29	1.84	33.41
ENGINEERING PERSONNEL	94	37	1289	1420	7.499	2.36	163.568	173.427
GRAND TOTALS	1292	80	2251	3623	351.49	5.75	441.627	798.867

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: FERM1-2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	0		0.474	0	0.51	
OPERATING PERSONNEL	0	0	1		1.407	0.043	0.98	
HEALTH PHYSICS PERSONNEL	0	0	0		0.171	0	0.307	
SUPERVISORY PERSONNEL	0	0	0		0.117	0	0.091	
ENGINEERING PERSONNEL	0	0	0		0.445	0.03	1.22	
TOTAL	0	0	1	1	2.614	0.073	3.108	5.795
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0.456	0.002	1.878	
OPERATING PERSONNEL	0	0	0		0.004	0	0.1	
HEALTH PHYSICS PERSONNEL	0	0	0		0.008	0	0	
SUPERVISORY PERSONNEL	0	0	0		0.003	0	0.093	
ENGINEERING PERSONNEL	0	0	0		0.101	0	0.2	
TOTAL	0	0	0	0	0.572	0.002	2.271	2.845
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0.005	0	0.004	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0.015	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0.015	
TOTAL	0	0	0	0	0.005	0	0.034	0.039
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0.134	0	0.221	
OPERATING PERSONNEL	0	0	0		0.015	0	0.124	
HEALTH PHYSICS PERSONNEL	0	0	0		0.045	0	0.058	
SUPERVISORY PERSONNEL	0	0	0		0.017	0	0.008	
ENGINEERING PERSONNEL	0	0	2		0.022	0	0.485	
TOTAL	0	0	2	2	0.233	0	0.896	1.129
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0.084	0	0.022	
OPERATING PERSONNEL	0	0	0		0.023	0	0.493	
HEALTH PHYSICS PERSONNEL	0	0	0		0.007	0	0.058	
SUPERVISORY PERSONNEL	0	0	0		0.015	0	0.012	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0.129	0	0.585	0.714
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0.002	0	0	
OPERATING PERSONNEL	0	0	0		0.005	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0.001	0	0.001	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0.008	0	0.009	
TOTAL	0	0	0	0	0.016	0	0.01	0.026
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	0	0	0	0	1.155	0.002	2.635	3.792
OPERATING PERSONNEL	0	0	1	1	1.454	0.043	1.697	3.194
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.232	0	0.439	0.671
SUPERVISORY PERSONNEL	0	0	0	0	0.152	0	0.204	0.356
ENGINEERING PERSONNEL	0	0	2	2	0.576	0.03	1.929	2.535
GRAND TOTALS	0	0	3	3	3.569	0.075	6.904	10.548

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*FORT CALHOUN

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV									
MAINTENANCE PERSONNEL	3	1	5		1.614	0.978	3.771		
OPERATING PERSONNEL	6	3	7		2.064	1.435	2.254		
HEALTH PHYSICS PERSONNEL	3	0	0		0.59	0.016	0		
SUPERVISORY PERSONNEL	30	1	0		12.886	0.289	0		
ENGINEERING PERSONNEL	18	0	27		15.114	0.007	23.31		
TOTAL	60	5	39	104	32.268	2.725	29.335	64.328	
ROUTINE MAINTENANCE									
MAINTENANCE PERSONNEL	43	42	108		20.801	13.487	53.768		
OPERATING PERSONNEL	5	0	16		1.828	0.694	5.472		
HEALTH PHYSICS PERSONNEL	1	0	0		0.35	0	0		
SUPERVISORY PERSONNEL	0	0	0		0.592	0	0		
ENGINEERING PERSONNEL	1	0	20		0.433	0	20.83		
TOTAL	50	42	144	236	24.004	14.181	80.07	118.255	
IN-SERVICE INSPECTION									
MAINTENANCE PERSONNEL	1	1	45		0.33	0.265	28.623		
OPERATING PERSONNEL	0	1	1		0.061	0.707	0.207		
HEALTH PHYSICS PERSONNEL	0	0	0		0.005	0	0		
SUPERVISORY PERSONNEL	1	0	0		0.153	0	0		
ENGINEERING PERSONNEL	0	0	1		0	0	0.12		
TOTAL	2	2	47	51	0.549	0.972	28.95	30.471	
SPECIAL MAINTENANCE									
MAINTENANCE PERSONNEL	33	45	144		12.338	19.061	96.367		
OPERATING PERSONNEL	8	12	16		2.815	4.59	8.383		
HEALTH PHYSICS PERSONNEL	1	0	0		0.211	0.03	0.078		
SUPERVISORY PERSONNEL	6	0	0		1.823	0.008	0		
ENGINEERING PERSONNEL	6	0	7		2.376	0	2.073		
TOTAL	54	57	167	278	19.563	23.689	106.901	150.153	
WASTE PROCESSING									
MAINTENANCE PERSONNEL	10	2	22		3.67	0.881	11.695		
OPERATING PERSONNEL	0	0	0		0.265	0.062	0.008		
HEALTH PHYSICS PERSONNEL	3	0	0		2.57	0	0		
SUPERVISORY PERSONNEL	1	0	0		0.962	0.002	0		
ENGINEERING PERSONNEL	5	0	7		7.955	0	3.69		
TOTAL	19	2	29	50	15.422	0.945	15.393	31.76	
REFUELING									
MAINTENANCE PERSONNEL	16	38	31		6.572	17.57	14.179		
OPERATING PERSONNEL	3	1	10		1.665	0.24	2.47		
HEALTH PHYSICS PERSONNEL	5	0	0		1.088	0	0.025		
SUPERVISORY PERSONNEL	32	2	0		8.423	0.469	0		
ENGINEERING PERSONNEL	0	0	1		0.125	0	0.31		
TOTAL	56	41	42	139	17.873	18.279	16.984	53.136	
TOTAL BY JOB FUNCTION									
MAINTENANCE PERSONNEL	106	129	355	590	45.325	52.242	208.403	305.97	
OPERATING PERSONNEL	22	17	50	89	8.698	7.728	18.794	35.22	
HEALTH PHYSICS PERSONNEL	13	0	0	13	4.814	0.046	0.103	4.963	
SUPERVISORY PERSONNEL	70	3	0	73	24.839	0.768	0	25.607	
ENGINEERING PERSONNEL	30	0	63	93	26.003	0.007	50.333	76.343	
GRAND TOTALS	241	149	468	858	109.679	60.791	277.633	448.103	

\*Workers may be counted in more than one category.

## APPENDIX D (cont)

NUMBER OF PERSONNEL AND PERSON-REM  
BY WORK AND JOB FUNCTION  
1985

PLANT: FT. ST. VRAIN				TYPE: HTGR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT	STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	0	0	0	0	0	0.03	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	6	0	2	0.82	0	0.4	
SUPERVISORY PERSONNEL	0	0	56	0	0	24.51	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	6	0	58	0.82	0	24.94	25.76
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	2	0	2	0.34	0	0.37	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	2	0	2	0.34	0	0.37	0.71
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	0	0	0	0	0	0	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	0	0	0	0	0	0	0
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	0	0	0	0	0	0	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	0	0	0	0	0	0	0
WASTE PROCESSING							
MAINTENANCE PERSONNEL	0	0	0	0	0	0	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	0	0	0	0	0	0	0
REFUELING							
MAINTENANCE PERSONNEL	0	0	0	0	0	0	
OPERATING PERSONNEL	0	0	0	0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	0	0	0	0	0	0	
ENGINEERING PERSONNEL	0	0	0	0	0	0	
TOTAL	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	2	0	2	0.34	0	0.4	0.74
OPERATING PERSONNEL	0	0	0	0	0	0	0
HEALTH PHYSICS PERSONNEL	6	0	2	0.82	0	0.4	1.22
SUPERVISORY PERSONNEL	0	0	56	0	0	24.51	24.51
ENGINEERING PERSONNEL	0	0	0	0	0	0	0
GRAND TOTALS	8	0	60	1.16	0	25.31	26.47

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *GINNA					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	131	42	143		18.184	6.889	21.978	
OPERATING PERSONNEL	1	26	0		0.248	11.763	0	
HEALTH PHYSICS PERSONNEL	38	17	2		8.91	5.782	0	
SUPERVISORY PERSONNEL	39	21	11		6.297	5.179	0.876	
ENGINEERING PERSONNEL	11	1	6		0.321	0.01	0.246	
TOTAL	220	107	162	489	33.96	29.623	23.1	86.683
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	150	40	132		15.778	8.556	11.724	
OPERATING PERSONNEL	1	20	0		0.003	0.215	0	
HEALTH PHYSICS PERSONNEL	40	17	2		8.777	2.238	0.425	
SUPERVISORY PERSONNEL	40	19	9		2.847	1.547	0.488	
ENGINEERING PERSONNEL	14	1	6		2.665	0	0.047	
TOTAL	245	97	149	491	30.07	12.556	12.684	55.31
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	79	37	83		7.281	4.544	8.183	
OPERATING PERSONNEL	0	5	0		0	0.062	0	
HEALTH PHYSICS PERSONNEL	31	3	0		1.59	0.2	0	
SUPERVISORY PERSONNEL	25	11	10		1.56	0.664	2.916	
ENGINEERING PERSONNEL	0	1	5		0	0.01	0.177	
TOTAL	135	57	98	290	10.431	5.48	11.276	27.187
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	164	41	146		39.347	10.631	117.59	
OPERATING PERSONNEL	0	7	0		0	0.144	0	
HEALTH PHYSICS PERSONNEL	39	17	2		4.624	1.746	0.01	
SUPERVISORY PERSONNEL	42	18	8		11.209	1.761	2.827	
ENGINEERING PERSONNEL	0	1	6		0	0.12	0.231	
TOTAL	245	84	162	491	55.18	14.402	120.658	190.24
WASTE PROCESSING								
MAINTENANCE PERSONNEL	36	25	18		2.4	2.132	1.352	
OPERATING PERSONNEL	0	6	0		0	0.576	0	
HEALTH PHYSICS PERSONNEL	36	13	2		6.295	1.895	0.485	
SUPERVISORY PERSONNEL	9	14	0		2.301	1.488	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	81	58	20	159	10.996	6.091	1.837	18.924
REFUELING								
MAINTENANCE PERSONNEL	41	18	18		9.941	2.816	2.285	
OPERATING PERSONNEL	0	2	0		0	0.41	0	
HEALTH PHYSICS PERSONNEL	16	1	0		1.058	0	0	
SUPERVISORY PERSONNEL	15	5	1		1.441	1.249	0.002	
ENGINEERING PERSONNEL	15	0	4		10.768	0	5.688	
TOTAL	87	26	23	136	23.208	4.475	7.975	35.658
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	601 (180)	203 (43)	540 (146)	1344 (369)	92.931	35.568	163.112	291.611
OPERATING PERSONNEL	2 (1)	66 (26)	0 (0)	68 (27)	0.251	13.17	0	13.421
HEALTH PHYSICS PERSONNEL	200 (42)	68 (17)	8 (2)	276 (61)	31.254	11.861	0.92	44.035
SUPERVISORY PERSONNEL	170 (43)	88 (22)	39 (11)	297 (76)	25.655	11.888	7.109	44.652
ENGINEERING PERSONNEL	40 (15)	4 (1)	27 (6)	71 (22)	13.754	0.14	6.389	20.283
GRAND TOTALS	1013 (281)	429 (109)	614 (165)	2056 (555)	163.845	72.627	177.53	414.002

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



## APPENDIX D (cont)

NUMBER OF PERSONNEL AND PERSON-REM  
BY WORK AND JOB FUNCTION  
1985

PLANT: HADDAM NECK				TYPE: PWR				
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	0		0.19	0.01	0.27	
OPERATING PERSONNEL	24	0	2		14.72	0.01	1.1	
HEALTH PHYSICS PERSONNEL	16	0	0		5.97	0.05	0.8	
SUPERVISORY PERSONNEL	1	0	0		0.22	0	0	
ENGINEERING PERSONNEL	0	0	0		0.51	0.18	0.04	
TOTAL	41	0	2	43	21.61	0.25	2.21	24.07
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	46	0	15		21.88	0.59	9.93	
OPERATING PERSONNEL	9	0	0		2.5	0	0.15	
HEALTH PHYSICS PERSONNEL	23	0	1		11.49	0.01	2.53	
SUPERVISORY PERSONNEL	0	0	0		0.04	0	0	
ENGINEERING PERSONNEL	2	0	0		0.87	0.53	0.21	
TOTAL	80	0	16	96	36.78	1.13	12.82	50.73
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	1		0.02	0	0.53	
OPERATING PERSONNEL	0	0	0		0.23	0	0.01	
HEALTH PHYSICS PERSONNEL	0	0	0		0.14	0	0.03	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	3	0	0		0.71	0.08	0	
TOTAL	3	0	1	4	1.1	0.08	0.57	1.75
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	7	0	3		2.97	0.1	1.57	
OPERATING PERSONNEL	0	0	0		0.17	0.05	0.01	
HEALTH PHYSICS PERSONNEL	6	0	0		1.57	0	0.1	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	1	7		0.12	0.39	4.7	
TOTAL	13	1	10	24	4.83	0.54	6.38	11.75
WASTE PROCESSING								
MAINTENANCE PERSONNEL	2	0	1		0.42	0	0.36	
OPERATING PERSONNEL	0	0	0		0.23	0	0	
HEALTH PHYSICS PERSONNEL	21	0	6		24.11	0	2.71	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0.17	0.01	0.09	
TOTAL	23	0	7	30	24.93	0.01	3.16	28.1
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0.05	0	0.01	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0.03	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0.08	0	0.01	0.09
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	55	0	20	75	25.53	0.7	12.67	38.9
OPERATING PERSONNEL	33	0	2	35	17.85	0.06	1.27	19.18
HEALTH PHYSICS PERSONNEL	66	0	7	73	43.31	0.06	6.17	49.54
SUPERVISORY PERSONNEL	1	0	0	1	0.26	0	0	0.26
ENGINEERING PERSONNEL	5	1	7	13	2.38	1.19	5.04	8.61
GRAND TOTALS	160	1	36	197	89.33	2.01	25.15	116.49

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: HATCH 1,2

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT
TOTAL							
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	0	8	5	0.013	2.323	1.541	
OPERATING PERSONNEL	0	87	0	0.03	43.476	0.136	
HEALTH PHYSICS PERSONNEL	1	95	84	0.13	64.117	41.49	
SUPERVISORY PERSONNEL	0	32	0	0.603	13.958	0.255	
ENGINEERING PERSONNEL	0	40	6	0.395	13.29	1.973	
TOTAL	1	262	95	1.171	137.164	45.395	183.73
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	0	170	166	0.143	94.081	53.156	
OPERATING PERSONNEL	0	23	0	0	13.015	0.089	
HEALTH PHYSICS PERSONNEL	0	25	12	0.01	11.608	3.696	
SUPERVISORY PERSONNEL	0	16	3	0.108	5.915	1.011	
ENGINEERING PERSONNEL	1	6	7	0.203	2.893	2.898	
TOTAL	1	240	188	0.464	127.512	60.85	188.826
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	0	0	70	0	0.376	30.697	
OPERATING PERSONNEL	0	0	0	0	0.054	0.057	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.074	0.012	
SUPERVISORY PERSONNEL	0	1	8	0.019	0.181	3.218	
ENGINEERING PERSONNEL	0	1	18	0	0.161	10.408	
TOTAL	0	2	96	0.019	0.846	44.392	45.257
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	0	71	688	0.045	27.482	306.723	
OPERATING PERSONNEL	0	5	1	0	2.2	0.625	
HEALTH PHYSICS PERSONNEL	0	10	17	0.014	3.246	10.415	
SUPERVISORY PERSONNEL	0	2	17	0.074	0.834	7.704	
ENGINEERING PERSONNEL	0	11	83	0.141	5.789	29.977	
TOTAL	0	99	806	0.274	39.551	355.444	395.269
WASTE PROCESSING							
MAINTENANCE PERSONNEL	0	0	9	0	0	3.2	
OPERATING PERSONNEL	0	0	0	0	0.035	0.057	
HEALTH PHYSICS PERSONNEL	0	0	2	0	0.074	2.493	
SUPERVISORY PERSONNEL	0	0	0	0.019	0.005	0.015	
ENGINEERING PERSONNEL	0	0	1	0	0.003	0.319	
TOTAL	0	0	12	0.019	0.117	6.084	6.22
REFUELING							
MAINTENANCE PERSONNEL	0	19	4	0	5.342	1.142	
OPERATING PERSONNEL	0	1	0	0	1.044	0.057	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0.115	0.078	
SUPERVISORY PERSONNEL	0	0	0	0.019	0.053	0.015	
ENGINEERING PERSONNEL	0	0	0	0.021	0.267	0.086	
TOTAL	0	20	4	0.04	6.821	1.378	8.239
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	0	268	942	1210	0.201	129.604	396.459
OPERATING PERSONNEL	0	116	1	117	0.03	59.824	1.021
HEALTH PHYSICS PERSONNEL	1	130	115	246	0.154	79.234	58.184
SUPERVISORY PERSONNEL	0	51	28	79	0.842	20.946	12.218
ENGINEERING PERSONNEL	1	58	115	174	0.76	22.403	45.661
GRAND TOTALS	2	623	1201	1826	1.987	312.011	513.543
							827.541

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: HUMBOLDT BAY

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	0	
OPERATING PERSONNEL	7	0	0		2.6	0	0	
HEALTH PHYSICS PERSONNEL	2	0	0		1.4	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	9	0	0	9	4	0	0	4
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	12.5	1	0		6.1	0.1	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	12.5	1	0	13.5	6.1	0.1	0	6.2
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	6.5	0	6		4.3	0	1	
OPERATING PERSONNEL	9	0	0		5.1	0	0	
HEALTH PHYSICS PERSONNEL	0	0	11		0	0	7.8	
SUPERVISORY PERSONNEL	2	0	1		0.6	0	0.4	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	17.5	0	18	35.5	10	0	9.2	19.2
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	7	0	11		2.6	0	4.4	
HEALTH PHYSICS PERSONNEL	0	0	4		0	0	6	
SUPERVISORY PERSONNEL	1	0	0		0.2	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	8	0	15	23	2.8	0	10.4	13.2
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	19	1	6	26	10.4	0.1	1	11.5
OPERATING PERSONNEL	23	0	11	34	10.3	0	4.4	14.7
HEALTH PHYSICS PERSONNEL	2	0	15	17	1.4	0	13.8	15.2
SUPERVISORY PERSONNEL	3	0	1	4	0.8	0	0.4	1.2
ENGINEERING PERSONNEL	0	0	0	0	0	0	0	0
GRAND TOTALS	47	1	33	81	22.9	0.1	19.6	42.6

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	2	0	4		0.39	0	1.13	
OPERATING PERSONNEL	41	1	1		16.94	0.26	0.11	
HEALTH PHYSICS PERSONNEL	12	0	9		7.23	0	1.52	
SUPERVISORY PERSONNEL	8	0	0		4.46	0	0	
ENGINEERING PERSONNEL	1	0	3		0.12	0	0.46	
TOTAL	64	1	17	82	29.14	0.26	3.22	32.62
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	19	0	95		4.77	0	67.99	
OPERATING PERSONNEL	2	4	6		1.18	1.87	1.36	
HEALTH PHYSICS PERSONNEL	12	0	39		10.61	0	29.15	
SUPERVISORY PERSONNEL	4	0	0		2.19	0	0	
ENGINEERING PERSONNEL	1	0	2		0.44	0	0.15	
TOTAL	38	4	142	184	19.19	1.87	98.65	119.71
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	3	0	41		0.78	0	19.04	
OPERATING PERSONNEL	4	4	8		1.06	1.63	2	
HEALTH PHYSICS PERSONNEL	0	0	1		0	0	0.16	
SUPERVISORY PERSONNEL	1	0	0		0.18	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	8	4	50	62	2.02	1.63	21.2	24.85
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	32	0	298		22.74	0	254.05	
OPERATING PERSONNEL	18	4	15		7.37	2.48	5.93	
HEALTH PHYSICS PERSONNEL	3	0	12		0.86	0	3.28	
SUPERVISORY PERSONNEL	10	0	1		5.07	0	0.13	
ENGINEERING PERSONNEL	2	0	1		0.55	0	0.11	
TOTAL	65	4	327	396	36.59	2.48	263.5	302.57
WASTE PROCESSING								
MAINTENANCE PERSONNEL	6	0	30		5.82	0	12.29	
OPERATING PERSONNEL	1	0	2		0.58	0	0.52	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	3	0	0		2.01	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	10	0	32	42	8.41	0	12.81	21.22
REFUELING								
MAINTENANCE PERSONNEL	6	0	26		0.97	0	18.89	
OPERATING PERSONNEL	4	1	0		0.56	0.11	0	
HEALTH PHYSICS PERSONNEL	1	0	2		0.26	0	0.17	
SUPERVISORY PERSONNEL	5	0	0		1.84	0	0	
ENGINEERING PERSONNEL	2	1	1		0.27	0.16	0.11	
TOTAL	18	2	29	49	3.9	0.27	19.17	23.34
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	68	0	494	562	35.47	0	373.39	408.86
OPERATING PERSONNEL	70	14	32	116	27.69	6.35	9.92	43.96
HEALTH PHYSICS PERSONNEL	28	0	63	91	18.96	0	34.28	53.24
SUPERVISORY PERSONNEL	31	0	1	32	15.75	0	0.13	15.88
ENGINEERING PERSONNEL	6	1	7	14	1.38	0.16	0.83	2.37
GRAND TOTALS	203	15	597	815	99.25	6.51	418.55	524.31

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: KEWAUNEE				TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT TOTAL		STATION	UTILITY	CONTRACT TOTAL
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	2	0	11	0.494	0	0.94	
OPERATING PERSONNEL	20	0	0	5.314	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	8	2	0	0.798	0.384	0	
ENGINEERING PERSONNEL	9	1	4	0.598	0.338	0.393	
TOTAL	39	3	15	7.204	0.722	1.333	9.259
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	48	17	127	13.862	3.736	44.912	
OPERATING PERSONNEL	16	0	2	1.92	0	0.44	
HEALTH PHYSICS PERSONNEL	17	0	18	10.345	0	9.068	
SUPERVISORY PERSONNEL	8	0	7	0.592	0	3.517	
ENGINEERING PERSONNEL	8	0	5	0.912	0	0.959	
TOTAL	97	17	159	27.631	3.736	58.896	90.263
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	12	1	35	0.303	0.01	8.673	
OPERATING PERSONNEL	3	0	8	0.593	0	3.857	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	2	0	2	0.018	0	0	
ENGINEERING PERSONNEL	6	0	1	0.68	0	0.902	
TOTAL	23	1	46	1.594	0.01	13.432	15.036
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	42	15	124	7.253	1.65	33.198	
OPERATING PERSONNEL	7	0	1	0.368	0	0.011	
HEALTH PHYSICS PERSONNEL	10	0	0	0.377	0	0	
SUPERVISORY PERSONNEL	4	0	0	0.113	0	0	
ENGINEERING PERSONNEL	4	2	5	0.075	0.371	0.87	
TOTAL	67	17	130	8.186	2.021	34.079	44.286
WASTE PROCESSING							
MAINTENANCE PERSONNEL	18	12	6	0.4	1	0.547	
OPERATING PERSONNEL	3	0	0	3.811	0	0	
HEALTH PHYSICS PERSONNEL	7	0	2	3.314	0	0.91	
SUPERVISORY PERSONNEL	2	0	0	1.069	0	0	
ENGINEERING PERSONNEL	0	0	1	0	0	0.401	
TOTAL	30	12	9	8.594	1	1.858	11.452
REFUELING							
MAINTENANCE PERSONNEL	8	4	12	0.407	0.288	4.878	
OPERATING PERSONNEL	2	0	0	0.001	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0	0	0	0	
SUPERVISORY PERSONNEL	3	0	2	0.097	0	0	
ENGINEERING PERSONNEL	2	0	0	0.028	0	0	
TOTAL	15	4	14	0.533	0.288	4.878	5.699
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	130	49	315	494	22.719	6.684	93.148
OPERATING PERSONNEL	51	0	11	62	12.007	0	4.308
HEALTH PHYSICS PERSONNEL	34	0	20	54	14.036	0	9.978
SUPERVISORY PERSONNEL	27	2	11	40	2.687	0.384	3.517
ENGINEERING PERSONNEL	29	3	16	48	2.293	0.709	3.525
GRAND TOTALS	271	54	373	698	53.742	7.777	114.476
							175.995

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *LACROSSE					TYPE: BWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL STATION	UTILITY	(>100 mREM) CONTRACT	TOTAL	STATION	UTILITY	PERSON-REM CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	18	0	0		7.437	0.137	0.259	
OPERATING PERSONNEL	21	0	1		38.293	0	0.61	
HEALTH PHYSICS PERSONNEL	8	0	0		11.305	0	0	
SUPERVISORY PERSONNEL	12	0	0		6.688	0.01	0.582	
ENGINEERING PERSONNEL	11	0	0		4.479	0	0.159	
TOTAL	70	0	1	71	68.202	0.147	1.61	69.959
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	18	7	0		15.638	4.655	0.004	
OPERATING PERSONNEL	3	0	0		0.634	0	0	
HEALTH PHYSICS PERSONNEL	1	0	0		0.284	0	0	
SUPERVISORY PERSONNEL	0	0	0		0.08	0	0	
ENGINEERING PERSONNEL	2	0	0		0.32	0	0	
TOTAL	24	7	0	31	16.956	4.655	0.004	21.615
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	3		0.075	0.004	5.297	
OPERATING PERSONNEL	0	0	0		0.245	0	0	
HEALTH PHYSICS PERSONNEL	2	0	0		0.667	0	0	
SUPERVISORY PERSONNEL	2	0	1		0.895	0	0.14	
ENGINEERING PERSONNEL	2	0	13		2.092	0	11.281	
TOTAL	6	0	17	23	3.974	0.004	16.718	20.696
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	17	6	0		9.918	3.431	0	
OPERATING PERSONNEL	10	0	0		2.34	0	0	
HEALTH PHYSICS PERSONNEL	1	0	0		0.526	0	0	
SUPERVISORY PERSONNEL	4	0	0		1.123	0	0.087	
ENGINEERING PERSONNEL	3	0	1		0.903	0	0.24	
TOTAL	35	6	1	42	14.81	3.431	0.327	18.568
WASTE PROCESSING								
MAINTENANCE PERSONNEL	5	1	0		1.328	0.164	0.008	
OPERATING PERSONNEL	6	0	0		1.622	0	0	
HEALTH PHYSICS PERSONNEL	5	0	0		3.835	0	0	
SUPERVISORY PERSONNEL	2	0	0		0.435	0	0	
ENGINEERING PERSONNEL	1	0	0		0.985	0	0	
TOTAL	19	1	0	20	8.205	0.164	0.008	8.377
REFUELING								
MAINTENANCE PERSONNEL	9	3	2		4.254	2.449	1.42	
OPERATING PERSONNEL	20	0	0		6.595	0	0	
HEALTH PHYSICS PERSONNEL	5	0	0		0.943	0	0	
SUPERVISORY PERSONNEL	4	0	1		2.39	0.01	0.152	
ENGINEERING PERSONNEL	8	0	0		2.393	0	0	
TOTAL	46	3	3	52	16.575	2.459	1.572	20.606
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	67 (20)	17 (8)	5	89	38.65	10.84	6.988	56.478
OPERATING PERSONNEL	60 (21)	0 (0)	1	61	49.729	0	0.61	50.339
HEALTH PHYSICS PERSONNEL	22 (8)	0 (0)	0	22	17.56	0	0	17.56
SUPERVISORY PERSONNEL	24 (15)	0 (0)	2	26	11.611	0.02	0.961	12.592
ENGINEERING PERSONNEL	27 (12)	0 (0)	14	41	11.172	0	11.68	22.852
GRAND TOTALS	200 (76)	17 (8)	22	239	128.722	10.86	20.239	159.821

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: LIMERICK				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	12	1		0	0.398	0.019	
OPERATING PERSONNEL	10	1	22		0.568	0.02	1.153	
HEALTH PHYSICS PERSONNEL	24	0	17		2.209	0	2.033	
SUPERVISORY PERSONNEL	0	0	4		0	0	0.086	
ENGINEERING PERSONNEL	6	2	3		0.117	0.037	0.303	
TOTAL	40	15	47	102	2.894	0.455	3.594	6.943
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	104	41		0	3.112	0.938	
OPERATING PERSONNEL	21	24	120		0.543	0.648	3.125	
HEALTH PHYSICS PERSONNEL	16	1	10		0.489	0.022	0.286	
SUPERVISORY PERSONNEL	2	7	8		0.182	0.214	0.166	
ENGINEERING PERSONNEL	6	32	34		0.166	0.876	0.921	
TOTAL	45	168	213	426	1.38	4.872	5.436	11.688
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	1		0	0	0.004	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	1	1	0	0	0.004	0.004
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	1		0	0	0.095	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	1	1	0	0	0.095	0.095
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	1	1		0	0.006	0.02	
OPERATING PERSONNEL	0	2	14		0	0.091	0.563	
HEALTH PHYSICS PERSONNEL	4	0	1		0.089	0	0.04	
SUPERVISORY PERSONNEL	1	0	0		0.044	0	0	
ENGINEERING PERSONNEL	0	1	0		0	0.026	0	
TOTAL	5	4	16	25	0.133	0.123	0.623	0.879
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	0	117	44	161	0	3.516	0.981	4.497
OPERATING PERSONNEL	31	27	157	215	1.111	0.759	4.936	6.806
HEALTH PHYSICS PERSONNEL	44	1	28	73	2.787	0.022	2.359	5.168
SUPERVISORY PERSONNEL	3	7	12	22	0.226	0.214	0.252	0.692
ENGINEERING PERSONNEL	12	35	37	84	0.283	0.939	1.224	2.446
GRAND TOTALS	90	187	278	555	4.407	5.45	9.752	19.609

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*MAIN EYANKEE

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	3	0	0		1.275	0	0.27	
OPERATING PERSONNEL	29	0	0		12.706	0	0	
HEALTH PHYSICS PERSONNEL	15	0	36		7.315	0	27.51	
SUPERVISORY PERSONNEL	11	0	0		3.008	0	0.582	
ENGINEERING PERSONNEL	13	0	3		3.53	0	1.07	
TOTAL	71	0	39	110	27.834	0	29.432	57.266
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	28	0	29		13.035	0.065	9.262	
OPERATING PERSONNEL	6	0	0		1.895	0	0	
HEALTH PHYSICS PERSONNEL	6	0	2		2.315	0	0.43	
SUPERVISORY PERSONNEL	8	0	7		2.72	0	3.632	
ENGINEERING PERSONNEL	10	0	0		3.355	0	0.42	
TOTAL	58	0	38	96	23.32	0.065	13.744	37.129
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	7	1	113		3.28	0.5	101.038	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0.1	0	0	
SUPERVISORY PERSONNEL	4	0	7		1.01	0	8.19	
ENGINEERING PERSONNEL	4	0	36		1.545	0	41.06	
TOTAL	15	1	156	172	5.935	0.5	150.288	156.723
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	3	0	72		1.52	0	37.59	
OPERATING PERSONNEL	2	0	0		0.61	0	0	
HEALTH PHYSICS PERSONNEL	4	0	0		1.105	0	0.01	
SUPERVISORY PERSONNEL	1	0	9		0.825	0	3.16	
ENGINEERING PERSONNEL	4	0	3		1.14	0	2.375	
TOTAL	14	0	84	98	5.2	0	43.135	48.335
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	0	6		0.56	0	3.654	
OPERATING PERSONNEL	5	0	0		1.635	0	0	
HEALTH PHYSICS PERSONNEL	6	0	0		3.51	0	0	
SUPERVISORY PERSONNEL	5	0	0		3.64	0	0.065	
ENGINEERING PERSONNEL	1	0	0		0.255	0	0.005	
TOTAL	18	0	6	24	9.6	0	3.724	13.324
REFUELING								
MAINTENANCE PERSONNEL	36	7	244		42.16	7.835	273.659	
OPERATING PERSONNEL	36	0	0		32.072	0	0	
HEALTH PHYSICS PERSONNEL	3	0	14		0.885	0	6.385	
SUPERVISORY PERSONNEL	19	0	34		12.359	0	27.695	
ENGINEERING PERSONNEL	23	0	17		12.92	0.01	10.379	
TOTAL	117	7	309	433	100.396	7.845	318.118	426.359
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	78	8	464	550	61.83	8.4	425.473	495.703
OPERATING PERSONNEL	78	0	0	78	48.918	0	0	48.918
HEALTH PHYSICS PERSONNEL	34	0	52	86	15.23	0	34.335	49.565
SUPERVISORY PERSONNEL	48	0	57	105	23.562	0	43.324	66.886
ENGINEERING PERSONNEL	55	0	59	114	22.745	0.01	55.309	78.064
GRAND TOTALS	293	8	632	933	172.285	8.41	558.441	739.136

\*Workers may be counted in more than one category.



# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*MCGUIRE 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	169	450	177		7.294	5.7	3.325	
OPERATING PERSONNEL	119	6	14		34.91	0.885	0.32	
HEALTH PHYSICS PERSONNEL	43	9	131		9.93	1.43	32.03	
SUPERVISORY PERSONNEL	13	0	0		1.7	0	0	
ENGINEERING PERSONNEL	84	22	19		6.635	1.005	0.075	
TOTAL	428	487	341	1256	60.469	9.02	35.75	105.239
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	174	462	165		59.665	82.39	55.95	
OPERATING PERSONNEL	113	5	43		5.405	0.05	4.45	
HEALTH PHYSICS PERSONNEL	43	7	123		4.8	0.61	23.445	
SUPERVISORY PERSONNEL	9	0	0		0.68	0	0	
ENGINEERING PERSONNEL	85	20	24		17.76	4.035	8.71	
TOTAL	424	494	355	1273	88.31	87.085	92.555	267.95
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	21	159	103		1.375	45.765	36.895	
OPERATING PERSONNEL	5	0	18		0.015	0	0.42	
HEALTH PHYSICS PERSONNEL	18	1	65		2.385	0.005	12.625	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	33	8	7		14.54	2.255	6.7	
TOTAL	77	168	193	438	18.315	48.025	56.64	122.98
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	140	396	157		9.99	140.455	54.405	
OPERATING PERSONNEL	70	3	17		3.725	0.18	0.67	
HEALTH PHYSICS PERSONNEL	35	4	100		5.045	0.2	9.62	
SUPERVISORY PERSONNEL	8	0	0		1.133	0	0	
ENGINEERING PERSONNEL	72	17	28		11.615	2.525	10.86	
TOTAL	325	420	302	1047	31.508	143.36	75.555	250.423
WASTE PROCESSING								
MAINTENANCE PERSONNEL	76	98	52		2.965	1.2	0.925	
OPERATING PERSONNEL	25	2	43		0.57	0.15	22.855	
HEALTH PHYSICS PERSONNEL	42	8	100		0.4	0.16	14.23	
SUPERVISORY PERSONNEL	4	0	0		0.12	0	0	
ENGINEERING PERSONNEL	18	4	1		0.43	0.06	0.01	
TOTAL	165	112	196	473	4.485	1.57	38.02	44.075
REFUELING								
MAINTENANCE PERSONNEL	72	100	34		9.925	49.205	2.365	
OPERATING PERSONNEL	76	3	23		6.24	0.58	1.26	
HEALTH PHYSICS PERSONNEL	10	1	68		0.27	0.02	9.88	
SUPERVISORY PERSONNEL	4	0	0		0.235	0	0	
ENGINEERING PERSONNEL	34	5	14		3.42	1.005	3.275	
TOTAL	196	109	139	444	20.09	50.81	16.78	87.68
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	652 (174)	1665 (489)	688 (211)	3005	91.214	324.715	153.865	569.794
OPERATING PERSONNEL	408 (121)	19 (6)	158 (45)	585	50.865	1.845	29.975	82.685
HEALTH PHYSICS PERSONNEL	191 (45)	30 (10)	587 (131)	808	22.83	2.425	101.83	127.085
SUPERVISORY PERSONNEL	38 (12)	0 (0)	0 (0)	38	3.868	0	0	3.868
ENGINEERING PERSONNEL	326 (86)	76 (21)	93 (47)	495	54.4	10.885	29.63	94.915
GRAND TOTALS	1615 (438)	1790 (526)	1526 (434)	4931	223.177	339.87	315.3	878.347

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*NINE MILE POINT 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM		TOTAL
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	223	1	18		12.96	0.005	0.866	
OPERATING PERSONNEL	200	17	23		9.908	0.169	2.359	
HEALTH PHYSICS PERSONNEL	122	1	4		22.605	0.001	0.755	
SUPERVISORY PERSONNEL	34	2	2		3.475	0.037	0.022	
ENGINEERING PERSONNEL	19	7	19		0.526	0.06	0.504	
TOTAL	598	28	66	692	49.474	0.272	4.506	54.252
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	279	2	68		48.933	0.281	6.045	
OPERATING PERSONNEL	116	17	57		9.297	0.173	12.679	
HEALTH PHYSICS PERSONNEL	59	2	3		6.161	0.025	0.512	
SUPERVISORY PERSONNEL	43	1	2		3.176	0.001	0.03	
ENGINEERING PERSONNEL	33	10	48		1.295	0.153	2.559	
TOTAL	530	32	178	740	68.862	0.633	21.825	91.32
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	3	0	0		0.019	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	1	0	0		0.008	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	4	0	0	4	0.027	0	0	0.027
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	328	1	12		10.551	0.011	0.242	
OPERATING PERSONNEL	103	3	11		4.12	0.073	3.404	
HEALTH PHYSICS PERSONNEL	74	0	3		3.119	0	0.175	
SUPERVISORY PERSONNEL	26	1	0		0.673	0.005	0	
ENGINEERING PERSONNEL	20	3	17		0.567	0.06	1.287	
TOTAL	551	8	43	602	19.03	0.149	5.108	24.287
WASTE PROCESSING								
MAINTENANCE PERSONNEL	172	1	21		33.577	0.06	0.811	
OPERATING PERSONNEL	58	4	12		15.998	0.004	1.638	
HEALTH PHYSICS PERSONNEL	51	0	2		8.609	0	0.861	
SUPERVISORY PERSONNEL	16	0	0		0.714	0	0	
ENGINEERING PERSONNEL	7	2	5		0.26	0.007	3.323	
TOTAL	304	7	40	351	59.158	0.071	6.633	65.862
REFUELING								
MAINTENANCE PERSONNEL	37	0	4		0.914	0	0.004	
OPERATING PERSONNEL	61	0	48		0.54	0	0.255	
HEALTH PHYSICS PERSONNEL	11	0	0		0.063	0	0	
SUPERVISORY PERSONNEL	4	0	1		0.02	0	0.002	
ENGINEERING PERSONNEL	4	0	3		0.06	0	0.006	
TOTAL	117	0	56	173	1.597	0	0.267	1.864
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	1042	5	123	1170	106.954	0.357	7.968	115.279
OPERATING PERSONNEL	538	41	151	730	39.863	0.419	20.335	60.617
HEALTH PHYSICS PERSONNEL	317	3	12	332	40.557	0.026	2.303	42.886
SUPERVISORY PERSONNEL	124	4	5	133	8.066	0.043	0.054	8.163
ENGINEERING PERSONNEL	83	22	92	197	2.708	0.28	7.679	10.667
GRAND TOTALS	2104	75	383	2562	198.148	1.125	38.339	237.612

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	172	23	364		22.462	0.8	24.532	
OPERATING PERSONNEL	230	0	19		33.361	0	1.099	
HEALTH PHYSICS PERSONNEL	62	2	152		31.361	0.066	14.613	
SUPERVISORY PERSONNEL	38	4	6		2.301	0.03	0.048	
ENGINEERING PERSONNEL	51	19	70		0.839	0.2	2.103	
TOTAL	553	48	611	1212	90.324	1.096	42.395	133.815
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	161	40	437		94.033	9.391	97.43	
OPERATING PERSONNEL	111	3	10		32.171	0.079	2.4	
HEALTH PHYSICS PERSONNEL	51	6	142		14.686	0.39	50.332	
SUPERVISORY PERSONNEL	21	2	4		2.588	0.05	0.02	
ENGINEERING PERSONNEL	33	7	56		11.769	0.234	4.426	
TOTAL	377	58	649	1084	155.247	10.144	154.608	319.999
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	3	80		0	0.171	67.535	
OPERATING PERSONNEL	6	0	1		1.883	0	0.005	
HEALTH PHYSICS PERSONNEL	5	0	51		0.2	0	6.614	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	3	4	11		0.03	0.194	5.548	
TOTAL	14	7	143	164	2.113	0.365	79.702	82.18
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	49	35	497		7.982	22.593	83.33	
OPERATING PERSONNEL	85	1	13		2.929	0.005	0.41	
HEALTH PHYSICS PERSONNEL	25	0	115		1.771	0	24.819	
SUPERVISORY PERSONNEL	17	1	1		0.741	0.482	0.001	
ENGINEERING PERSONNEL	27	10	156		2.499	0.261	79.751	
TOTAL	203	47	782	1032	15.922	23.341	188.311	227.574
WASTE PROCESSING								
MAINTENANCE PERSONNEL	41	0	11		0.939	0	0.501	
OPERATING PERSONNEL	16	0	2		3.007	0	0.135	
HEALTH PHYSICS PERSONNEL	27	0	10		2.764	0	0.224	
SUPERVISORY PERSONNEL	2	0	1		0.16	0	0.03	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	86	0	24	110	6.87	0	0.89	7.76
REFUELING								
MAINTENANCE PERSONNEL	46	4	21		11.07	0.235	1.718	
OPERATING PERSONNEL	31	0	0		1.583	0	0	
HEALTH PHYSICS PERSONNEL	8	1	77		0.598	0.125	5.951	
SUPERVISORY PERSONNEL	8	2	0		0.265	0.635	0	
ENGINEERING PERSONNEL	2	5	19		0.56	0.387	3.186	
TOTAL	95	12	117	224	14.076	1.382	10.855	26.313
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	469	105	1410	1984	136.486	33.19	275.046	444.722
OPERATING PERSONNEL	479	4	45	528	74.934	0.084	4.049	79.067
HEALTH PHYSICS PERSONNEL	178	9	547	734	51.38	0.581	102.553	154.514
SUPERVISORY PERSONNEL	86	9	12	107	6.055	1.197	0.099	7.351
ENGINEERING PERSONNEL	116	45	312	473	15.697	1.276	95.014	111.987
GRAND TOTALS	1328	172	2326	3826	284.552	36.328	476.761	797.641

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *OCONEE					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	197	434	166		6.075	3.61	2.045	
OPERATING PERSONNEL	146	1	16		70.522	1.335	0.605	
HEALTH PHYSICS PERSONNEL	62	0	119		15.695	0	42.57	
SUPERVISORY PERSONNEL	31	0	0		2.105	0	0	
ENGINEERING PERSONNEL	100	29	8		11.525	1.065	1.02	
TOTAL	536	464	309	1309	105.922	6.01	46.24	158.172
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	208	586	245		103.496	126.394	100.327	
OPERATING PERSONNEL	30	0	46		0.44	0	14.425	
HEALTH PHYSICS PERSONNEL	57	0	118		7.033	0	21.07	
SUPERVISORY PERSONNEL	20	0	0		0.905	0	0	
ENGINEERING PERSONNEL	91	22	15		17.63	2.915	3.825	
TOTAL	406	608	424	1438	129.504	129.309	139.647	398.46
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	38	215	119		1.74	41.67	46.735	
OPERATING PERSONNEL	4	0	19		0.055	0	0.56	
HEALTH PHYSICS PERSONNEL	16	0	83		0.975	0	8.965	
SUPERVISORY PERSONNEL	2	0	0		0.25	0	0	
ENGINEERING PERSONNEL	59	13	6		13.84	2.82	4.195	
TOTAL	119	228	227	574	16.86	44.49	60.455	121.805
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	144	630	140		48.215	360.025	52.81	
OPERATING PERSONNEL	57	2	31		4.25	0.04	3.63	
HEALTH PHYSICS PERSONNEL	10	0	109		6.37	0	28.135	
SUPERVISORY PERSONNEL	14	0	0		0.755	0	0	
ENGINEERING PERSONNEL	79	34	5		16.68	5.28	4.52	
TOTAL	304	666	285	1255	76.27	365.345	89.095	530.71
WASTE PROCESSING								
MAINTENANCE PERSONNEL	113	166	27		13.095	13.405	0.21	
OPERATING PERSONNEL	78	1	47		14.115	0.105	42.749	
HEALTH PHYSICS PERSONNEL	59	0	75		11.95	0	11.235	
SUPERVISORY PERSONNEL	19	0	0		2.88	0	0	
ENGINEERING PERSONNEL	42	4	0		5.48	0	0	
TOTAL	311	171	149	631	47.52	13.51	54.194	115.224
REFUELING								
MAINTENANCE PERSONNEL	77	188	55		17.13	49.24	12.69	
OPERATING PERSONNEL	96	1	30		11.52	0.165	5.765	
HEALTH PHYSICS PERSONNEL	21	0	78		0.925	0	6.59	
SUPERVISORY PERSONNEL	10	0	0		2.185	0	0	
ENGINEERING PERSONNEL	21	6	3		3.205	0.555	0.865	
TOTAL	225	195	166	586	34.965	49.96	25.91	110.835
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	777 (215)	2219 (714)	752 (283)	3748 (1212)	189.751	594.344	214.817	998.912
OPERATING PERSONNEL	411 (153)	5 (1)	189 (51)	605 (205)	100.902	1.645	67.734	170.281
HEALTH PHYSICS PERSONNEL	225 (63)	0 (0)	582 (119)	807 (182)	42.948	0	118.565	161.513
SUPERVISORY PERSONNEL	96 (30)	0 (0)	0 (0)	96 (30)	9.08	0	0	9.08
ENGINEERING PERSONNEL	392 (113)	108 (38)	37 (16)	537 (167)	68.36	12.635	14.425	95.42
GRAND TOTALS	1901 (574)	2332 (753)	1560 (469)	5793 (1796)	411.041	608.624	415.541	1435.206

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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	164	1	240		11.42	0.005	23.298	
OPERATING PERSONNEL	215	0	64		61.775	0	0.932	
HEALTH PHYSICS PERSONNEL	48	0	31		6.639	0	4.746	
SUPERVISORY PERSONNEL	64	1	11		4.477	0.005	0.418	
ENGINEERING PERSONNEL	45	0	32		3.393	0	3.245	
TOTAL	536	2	378	916	87.704	0.01	32.639	120.353
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	307	22	877		145.989	0.687	108.351	
OPERATING PERSONNEL	402	1	165		36.43	0.01	4.327	
HEALTH PHYSICS PERSONNEL	104	0	67		33.139	0	10.901	
SUPERVISORY PERSONNEL	149	2	29		27.286	0.109	1.64	
ENGINEERING PERSONNEL	170	0	142		8.956	0	5.787	
TOTAL	1132	25	1280	2437	251.8	0.806	131.006	383.612
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	49	2	119		1.5	0.012	13.837	
OPERATING PERSONNEL	21	1	9		0.781	0	3.373	
HEALTH PHYSICS PERSONNEL	6	0	1		0.113	0	0.015	
SUPERVISORY PERSONNEL	7	0	3		0.358	0	0.301	
ENGINEERING PERSONNEL	6	0	10		0.235	0	2.52	
TOTAL	89	3	142	234	2.987	0.012	20.046	23.045
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	155	19	429		61.72	5.411	68.334	
OPERATING PERSONNEL	52	1	10		7.754	0.005	1.344	
HEALTH PHYSICS PERSONNEL	46	0	16		9.864	0	0.774	
SUPERVISORY PERSONNEL	31	2	9		7.158	0.227	0.379	
ENGINEERING PERSONNEL	22	0	17		1.769	0	0.848	
TOTAL	306	22	481	809	88.265	5.643	71.679	165.587
WASTE PROCESSING								
MAINTENANCE PERSONNEL	138	0	166		3.711	0	59.523	
OPERATING PERSONNEL	62	0	13		0.919	0	0.771	
HEALTH PHYSICS PERSONNEL	42	0	22		2.742	0	2.396	
SUPERVISORY PERSONNEL	11	0	5		0.546	0	0.136	
ENGINEERING PERSONNEL	4	0	10		0.034	0	0.591	
TOTAL	257	0	216	473	7.952	0	63.417	71.369
REFUELING								
MAINTENANCE PERSONNEL	55	0	62		0.431	0	9.636	
OPERATING PERSONNEL	17	0	5		0.189	0	0.024	
HEALTH PHYSICS PERSONNEL	15	0	9		0.122	0	0.525	
SUPERVISORY PERSONNEL	4	0	0		0.019	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	91	0	76	167	0.761	0	10.185	10.946
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	868 (317)	44 (25)	1893 (969)	2805 (1311)	224.771	6.115	282.979	513.865
OPERATING PERSONNEL	769 (420)	3 (1)	266 (187)	1038 (608)	107.848	0.015	10.771	118.634
HEALTH PHYSICS PERSONNEL	261 (104)	0 (0)	146 (71)	407 (175)	52.619	0	19.357	71.976
SUPERVISORY PERSONNEL	266 (153)	5 (2)	57 (34)	328 (189)	39.844	0.341	2.874	43.059
ENGINEERING PERSONNEL	247 (174)	0 (0)	211 (151)	458 (325)	14.387	0	12.991	27.378
GRAND TOTALS	2411 (1168)	52 (28)	2573 (1912)	5036 (2608)	439.469	6.471	328.972	774.912

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*PALISADES

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	13	1	3		3.433	0.491	1.707	
OPERATING PERSONNEL	60	0	30		27.449	0.081	7.939	
HEALTH PHYSICS PERSONNEL	24	1	73		12.246	0.263	31.665	
SUPERVISORY PERSONNEL	19	7	3		5.768	1.741	0.351	
ENGINEERING PERSONNEL	9	7	3		2.764	1.412	1.373	
TOTAL	125	16	112	253	51.66	3.988	43.035	98.683
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	81	80	82		48.378	55.977	28.474	
OPERATING PERSONNEL	28	1	1		6.228	0.848	0.347	
HEALTH PHYSICS PERSONNEL	18	0	42		5.173	0	16.65	
SUPERVISORY PERSONNEL	12	9	2		2.885	3.132	1.184	
ENGINEERING PERSONNEL	5	14	41		2.296	7.946	42.121	
TOTAL	144	104	168	416	64.96	67.903	88.776	221.639
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	7	2	23		1.539	0.373	9.097	
OPERATING PERSONNEL	6	0	0		1.323	0	0.006	
HEALTH PHYSICS PERSONNEL	1	0	2		0.29	0	0.657	
SUPERVISORY PERSONNEL	0	0	1		0.151	0.137	0.156	
ENGINEERING PERSONNEL	3	5	0		0.667	1.106	0.007	
TOTAL	17	7	26	50	3.97	1.616	9.923	15.509
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	2	1	153		0.567	0.221	62.944	
OPERATING PERSONNEL	0	0	7		0.081	0	1.634	
HEALTH PHYSICS PERSONNEL	0	0	1		0.133	0	0.317	
SUPERVISORY PERSONNEL	0	0	4		0.193	0.076	1.391	
ENGINEERING PERSONNEL	2	2	10		0.836	0.603	3.59	
TOTAL	4	3	175	182	1.81	0.9	69.876	72.586
WASTE PROCESSING								
MAINTENANCE PERSONNEL	17	0	15		5.039	0.305	8.237	
OPERATING PERSONNEL	0	1	0		0.225	0.1	0.003	
HEALTH PHYSICS PERSONNEL	6	0	1		4.079	0	0.321	
SUPERVISORY PERSONNEL	2	0	0		0.674	0.007	0	
ENGINEERING PERSONNEL	0	0	0		0.073	0.067	0.001	
TOTAL	25	1	16	42	10.09	0.479	8.562	19.131
REFUELING								
MAINTENANCE PERSONNEL	10	34	6		5.136	29.73	0.898	
OPERATING PERSONNEL	10	0	0		3.893	0.015	0.03	
HEALTH PHYSICS PERSONNEL	1	0	5		0.325	0	0.68	
SUPERVISORY PERSONNEL	9	2	0		2.406	1.669	0.076	
ENGINEERING PERSONNEL	6	0	6		2.219	0.065	3.05	
TOTAL	36	36	17	89	13.979	31.479	4.734	50.192
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	130	118	282	530	64.092	87.097	111.357	262.546
OPERATING PERSONNEL	104	2	38	144	39.199	1.044	9.959	50.202
HEALTH PHYSICS PERSONNEL	50	1	124	175	22.246	0.263	50.29	72.799
SUPERVISORY PERSONNEL	42	18	10	70	12.077	6.762	3.158	21.997
ENGINEERING PERSONNEL	25	28	60	113	8.855	11.199	50.142	70.196
GRAND TOTALS	351	167	514	1032	146.469	106.365	224.906	477.74

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *PEACH BOTTOM 2,3					TYPE: BWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	8	290	1014		1.466	43.044	83.628	
OPERATING PERSONNEL	91	40	261		54.477	9.229	45.56	
HEALTH PHYSICS PERSONNEL	95	2	131		69.046	0.036	31.61	
SUPERVISORY PERSONNEL	3	2	9		0.376	0.563	1.244	
ENGINEERING PERSONNEL	74	30	18		43.806	6.089	5.677	
TOTAL	271	364	1433	2068	169.171	58.961	167.719	395.851
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	10	728	2133		0.615	351.898	1764.162	
OPERATING PERSONNEL	68	29	365		3.184	1.303	142.597	
HEALTH PHYSICS PERSONNEL	76	2	166		14.103	0.067	116.938	
SUPERVISORY PERSONNEL	1	9	12		0.006	0.536	0.202	
ENGINEERING PERSONNEL	50	40	21		3.658	4.199	4.582	
TOTAL	205	808	2697	3710	21.566	358.003	2028.481	2408.05
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	11	123		0	5.573	40.745	
OPERATING PERSONNEL	1	0	15		0.018	0	4.804	
HEALTH PHYSICS PERSONNEL	0	0	6		0	0	0.205	
SUPERVISORY PERSONNEL	0	0	3		0	0	0.163	
ENGINEERING PERSONNEL	0	3	2		0	0.533	0.75	
TOTAL	1	14	149	164	0.018	6.106	46.667	52.791
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	28	644		0	1.163	357.073	
OPERATING PERSONNEL	1	0	58		0.009	0	44.867	
HEALTH PHYSICS PERSONNEL	6	0	27		0.372	0	1.358	
SUPERVISORY PERSONNEL	0	0	1		0	0	0.023	
ENGINEERING PERSONNEL	4	2	3		0.079	0.024	0.864	
TOTAL	11	30	733	774	0.46	1.187	404.185	405.832
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1	47	192		0.009	1.82	18.447	
OPERATING PERSONNEL	5	1	30		1.345	0.015	2.419	
HEALTH PHYSICS PERSONNEL	7	0	36		0.429	0	2.961	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	8	4	1		0.371	0.107	0.013	
TOTAL	21	52	259	332	2.154	1.942	23.84	27.936
REFUELING								
MAINTENANCE PERSONNEL	0	55	250		0	5.324	46.926	
OPERATING PERSONNEL	12	0	38		1.097	0	1.739	
HEALTH PHYSICS PERSONNEL	20	1	36		1.809	0.005	6.17	
SUPERVISORY PERSONNEL	0	0	3		0	0	0.225	
ENGINEERING PERSONNEL	7	3	5		0.156	0.05	0.537	
TOTAL	39	59	332	430	3.062	5.379	55.597	64.038
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	19 (10)	1159 (750)	4356 (2363)	5534 (3123)	2.09	408.822	2310.981	2721.893
OPERATING PERSONNEL	178 (97)	70 (45)	767 (476)	1015 (618)	60.13	10.547	241.986	312.663
HEALTH PHYSICS PERSONNEL	204 (96)	5 (4)	402 (181)	611 (281)	85.759	0.108	159.242	245.109
SUPERVISORY PERSONNEL	4 (3)	11 (10)	28 (16)	43 (29)	0.382	1.099	1.857	3.338
ENGINEERING PERSONNEL	143 (75)	82 (54)	50 (29)	275 (158)	48.07	11.002	12.423	71.495
GRAND TOTALS	548 (281)	1327 (863)	5603 (3065)	7478 (4209)	196.431	431.578	2726.489	3354.498

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*PILGRIM

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	26	0	47		0.4	0	1.62	
OPERATING PERSONNEL	30	0	0		0.83	0	0	
HEALTH PHYSICS PERSONNEL	24	0	52		2.87	0	0.875	
SUPERVISORY PERSONNEL	9	0	0		0.325	0	0	
ENGINEERING PERSONNEL	4	5	12		0.155	0.17	0.295	
TOTAL	93	5	111	209	4.58	0.17	2.79	7.54
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	96	3	525		36.945	0.22	296.575	
OPERATING PERSONNEL	55	0	0		12.315	0	0	
HEALTH PHYSICS PERSONNEL	40	0	103		12.43	0	34.13	
SUPERVISORY PERSONNEL	39	18	17		4.415	0.28	1.655	
ENGINEERING PERSONNEL	24	13	87		1.65	1.175	14.62	
TOTAL	254	34	732	1020	67.755	1.675	346.98	416.41
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	34	0	95		0.235	0	1.275	
OPERATING PERSONNEL	18	0	0		0.19	0	0	
HEALTH PHYSICS PERSONNEL	17	0	51		0.465	0	0.81	
SUPERVISORY PERSONNEL	14	0	5		0.085	0	0.145	
ENGINEERING PERSONNEL	13	0	28		0.19	0	0.43	
TOTAL	96	0	179	275	1.165	0	2.66	3.825
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	31	0	208		1.345	0	18.14	
OPERATING PERSONNEL	16	0	0		0.145	0	0	
HEALTH PHYSICS PERSONNEL	12	0	47		0.695	0	1.535	
SUPERVISORY PERSONNEL	7	0	3		0.155	0	0.36	
ENGINEERING PERSONNEL	0	0	20		0	0	1.89	
TOTAL	66	0	278	344	2.34	0	21.925	24.265
WASTE PROCESSING								
MAINTENANCE PERSONNEL	60	0	208		4.195	0	45.495	
OPERATING PERSONNEL	39	0	0		5.075	0	0	
HEALTH PHYSICS PERSONNEL	30	0	83		3.255	0	10.54	
SUPERVISORY PERSONNEL	6	0	8		0.175	0	0.5	
ENGINEERING PERSONNEL	6	0	14		0.175	0	2.645	
TOTAL	141	0	313	454	12.875	0	59.18	72.055
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	247	3	1083	1333	43.12	0.22	363.105	406.445
OPERATING PERSONNEL	158	0	0	158	18.555	0	0	18.555
HEALTH PHYSICS PERSONNEL	123	0	336	459	19.715	0	47.89	67.605
SUPERVISORY PERSONNEL	75	18	33	126	5.155	0.28	2.66	8.095
ENGINEERING PERSONNEL	47	18	161	226	2.17	1.345	19.88	23.395
GRAND TOTALS	650	39	1613	2302	88.715	1.845	433.535	524.095

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



APPENDIX D (cont.)  
NUMBER OF PERSONNEL AND PERSON-REM  
BY WORK AND JOB FUNCTION  
1985

PLANT: POINT BEACH 1,2

TYPE: PWR

	GREATER THAN 100 REM	TOTAL REM FOR WORK GROUP	JOB FUNCTION					
			REACTOR OPERATIONS & SURVEILLANCE	ROUTINE MAINTENANCE	INSPECTIONS	SPECIAL MAINTENANCE	WASTE PROCESSING	REFUELING
<u>1. Company Employees</u>								
Operations	66	68.340	43.720	-----	12.930	-----	3.800	7.890
Maintenance & Peak Maintenance	94	111.810	-----	16.850	8.960	44.110	-----	41.890
Chemistry & Health Physics	27	27.170	21.540	-----	-----	-----	2.310	3.320
Instrumentation & Control	15	8.640	-----	0.990	0.710	6.040	-----	0.900
Reactor Engineering	4	1.590	-----	-----	0.170	-----	-----	1.420
Administration, Engineering Quality & Regulatory Services	15	3.820	0.240	-----	3.470	-----	-----	0.110
<u>2. Contract Workers &amp; Others</u>	285	222.680	0.140	-----	14.320	193.760	14.460	-----
TOTALS	506	444.050 <sup>1</sup>	65.640	17.840	40.560	243.910	20.570	55.530

<sup>1</sup> 75.385 man-rem of the above total is related to an EPRI steam generator tubesheet research project on steam generators removed from Unit 1.

## APPENDIX D (cont)

NUMBER OF PERSONNEL AND PERSON-REM  
BY WORK AND JOB FUNCTION  
1985

PLANT: *RANCHO SECO					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	22	0	21		17.926	0	17.131	
OPERATING PERSONNEL	52	0	1		30.327	0	1.005	
HEALTH PHYSICS PERSONNEL	13	0	76		8.374	0	67.398	
SUPERVISORY PERSONNEL	2	0	13		0.333	0	4.815	
ENGINEERING PERSONNEL	15	0	50		4.459	0	12.65	
TOTAL	104	0	161	265	61.419	0	102.999	164.418
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	53	0	115		28.134	0	49.852	
OPERATING PERSONNEL	0	0	0		0.746	0	0.107	
HEALTH PHYSICS PERSONNEL	1	0	0		1.389	0	1.475	
SUPERVISORY PERSONNEL	1	0	0		0.097	0	0.349	
ENGINEERING PERSONNEL	1	0	7		0.778	0	3.495	
TOTAL	56	0	122	178	31.144	0	55.278	86.422
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	2	0	69		2.731	0	51.723	
OPERATING PERSONNEL	0	0	0		0	0	0.01	
HEALTH PHYSICS PERSONNEL	0	0	4		0.746	0	3.264	
SUPERVISORY PERSONNEL	0	0	6		0	0	2.539	
ENGINEERING PERSONNEL	8	0	12		2.244	0	7.601	
TOTAL	10	0	91	101	5.721	0	65.137	70.858
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	36	0	295		24.92	0	184.334	
OPERATING PERSONNEL	0	0	1		0.258	0	1.068	
HEALTH PHYSICS PERSONNEL	4	0	3		3.835	0	8.265	
SUPERVISORY PERSONNEL	1	0	8		0.11	0	2.503	
ENGINEERING PERSONNEL	4	0	45		1.783	0	19.257	
TOTAL	45	0	352	397	30.906	0	215.427	246.333
WASTE PROCESSING								
MAINTENANCE PERSONNEL	2	0	74		4.869	0	41.411	
OPERATING PERSONNEL	0	0	0		0.302	0	0	
HEALTH PHYSICS PERSONNEL	13	0	13		12.34	0	11.293	
SUPERVISORY PERSONNEL	0	0	0		0	0	0.058	
ENGINEERING PERSONNEL	0	0	0		0.019	0	0.165	
TOTAL	15	0	87	102	17.53	0	52.927	70.457
REFUELING								
MAINTENANCE PERSONNEL	5	0	23		3.45	0	24.233	
OPERATING PERSONNEL	14	0	0		4.177	0	0.311	
HEALTH PHYSICS PERSONNEL	0	0	0		0.381	0	0.553	
SUPERVISORY PERSONNEL	1	0	1		0.15	0	0.93	
ENGINEERING PERSONNEL	1	0	6		0.487	0	5.297	
TOTAL	21	0	30	51	8.645	0	31.324	39.969
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	120	0	597	717	82.03	0	368.684	450.714
OPERATING PERSONNEL	66	0	2	68	35.81	0	2.501	38.311
HEALTH PHYSICS PERSONNEL	31	0	96	127	27.065	0	92.248	119.313
SUPERVISORY PERSONNEL	5	0	28	33	0.69	0	11.194	11.884
ENGINEERING PERSONNEL	29	0	120	149	9.77	0	48.465	58.235
GRAND TOTALS	251	0	843	1094	155.365	0	523.092	678.457

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: RIVER BEND					TYPE: BWR			
WORK AND JOB FUNCTION	NUMBER OF STATION	PERSONNEL (>100 mREM) UTILITY CONTRACT	TOTAL		TOTAL PERSON-REM STATION UTILITY CONTRACT	TOTAL		
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	0	0	1		0	0	0.149	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	10	0	0		0.582	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	10	0	1	11	0.582	0	0.149	0.731
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	1		0	0	0.015	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	9	0	1		0.276	0	0.03	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	9	0	2	11	0.276	0	0.045	0.321
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	8	0	0		0.609	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	2		0	0	0.347	
TOTAL	8	0	2	10	0.609	0	0.347	0.956
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	2		0	0	0.468	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	6	0	1		0.211	0	0.092	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	6	0	3	9	0.211	0	0.56	0.771
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
REFUELING								
MAINTENANCE PERSONNEL	0	0	3		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	10	0	1		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	2		0	0	0	
TOTAL	10	0	6	16	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	0 (0)	0 (0)	7 (3)	7 (3)	0	0	0.632	0.632
OPERATING PERSONNEL	0 (0)	0 (0)	0 (0)	0 (0)	0	0	0	0
HEALTH PHYSICS PERSONNEL	43 (10)	0 (0)	3 (1)	46 (11)	1.678	0	0.122	1.8
SUPERVISORY PERSONNEL	0 (0)	0 (0)	0 (0)	0 (0)	0	0	0	0
ENGINEERING PERSONNEL	0 (0)	0 (0)	4 (2)	4 (2)	0	0	0.347	0.347
GRAND TOTALS	43 (10)	0 (0)	14 (6)	57 (16)	1.678	0	1.101	2.779

Numbers in parentheses are total numbers of individuals.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*ROBINSON 2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV									
MAINTENANCE PERSONNEL	12	0	24		4.585	0.42	16.645		
OPERATING PERSONNEL	27	0	0		8.53	0	0		
HEALTH PHYSICS PERSONNEL	34	0	8		15.21	0.3	2.84		
SUPERVISORY PERSONNEL	0	0	0		0.275	0.02	0.055		
ENGINEERING PERSONNEL	6	5	7		2.62	1.7	1.95		
TOTAL	79	5	39	123	31.22	2.44	21.49	55.15	
ROUTINE MAINTENANCE									
MAINTENANCE PERSONNEL	42	11	69		34.375	4.68	37.5		
OPERATING PERSONNEL	9	0	0		1.995	0	0		
HEALTH PHYSICS PERSONNEL	18	0	5		13.04	0	2.505		
SUPERVISORY PERSONNEL	0	0	1		0.05	0.02	0.94		
ENGINEERING PERSONNEL	3	0	11		0.755	0.135	3.45		
TOTAL	72	11	86	169	50.215	4.835	44.395	99.445	
IN-SERVICE INSPECTION									
MAINTENANCE PERSONNEL	0	0	0		0.07	0	0		
OPERATING PERSONNEL	0	0	0		0	0	0		
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	0	0	0		0.125	0	0		
TOTAL	0	0	0	0	0.195	0	0	0.195	
SPECIAL MAINTENANCE									
MAINTENANCE PERSONNEL	54	40	185		23.95	14.805	78.425		
OPERATING PERSONNEL	1	0	0		0.275	0	0		
HEALTH PHYSICS PERSONNEL	20	7	27		8.69	1.4	8.86		
SUPERVISORY PERSONNEL	0	0	1		0.025	0	0.755		
ENGINEERING PERSONNEL	3	9	15		0.89	2.715	5.8		
TOTAL	78	56	228	362	33.83	18.92	93.84	146.59	
WASTE PROCESSING									
MAINTENANCE PERSONNEL	1	0	18		0.48	0	10.805		
OPERATING PERSONNEL	13	0	0		6.98	0	0		
HEALTH PHYSICS PERSONNEL	8	0	5		6.52	0	2.565		
SUPERVISORY PERSONNEL	0	0	0		0.005	0	0.005		
ENGINEERING PERSONNEL	2	0	4		0.295	0	1.88		
TOTAL	24	0	27	51	14.28	0	15.255	29.535	
REFUELING									
MAINTENANCE PERSONNEL	0	0	0		0	0	0		
OPERATING PERSONNEL	0	0	0		0	0	0		
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	0	0	0	0	0	0	0	0	
TOTAL BY JOB FUNCTION									
MAINTENANCE PERSONNEL	109	51	296	456	63.46	19.905	143.375	226.74	
OPERATING PERSONNEL	50	0	0	50	17.78	0	0	17.78	
HEALTH PHYSICS PERSONNEL	80	7	45	132	43.46	1.7	16.77	61.93	
SUPERVISORY PERSONNEL	0	0	2	2	0.355	0.04	1.755	2.15	
ENGINEERING PERSONNEL	14	14	37	65	4.685	4.55	13.08	22.315	
GRAND TOTALS	253	72	380	705	129.74	26.195	174.98	330.915	

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: ST. LUCIE 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	137	39	139		50.528	11.838	44.519	
OPERATING PERSONNEL	73	2	65		38.275	1.133	28.226	
HEALTH PHYSICS PERSONNEL	34	0	76		39.782	0	72.758	
SUPERVISORY PERSONNEL	7	0	2		5.95	0.285	0.915	
ENGINEERING PERSONNEL	8	5	4		3.611	2.078	2.187	
TOTAL	259	46	286	591	138.146	15.334	148.605	302.085
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	124	47	103		46.253	13.975	38.246	
OPERATING PERSONNEL	11	2	7		4.78	0.555	4.435	
HEALTH PHYSICS PERSONNEL	2	0	1		0.735	0	0.17	
SUPERVISORY PERSONNEL	0	0	0		0.085	0.05	0.065	
ENGINEERING PERSONNEL	1	0	0		0.617	0.045	0.115	
TOTAL	138	49	111	298	52.47	14.625	43.031	110.126
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	30	9	30		18.313	5.29	16.65	
OPERATING PERSONNEL	4	1	50		1.48	1.445	42.705	
HEALTH PHYSICS PERSONNEL	1	0	7		2.01	0	9.165	
SUPERVISORY PERSONNEL	0	0	0		0.115	0.055	0.13	
ENGINEERING PERSONNEL	3	0	16		1.055	0.13	6.72	
TOTAL	38	10	103	151	22.973	6.92	75.37	105.263
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	158	101	211		84.446	99.45	166.45	
OPERATING PERSONNEL	8	1	122		3.845	1.035	110.761	
HEALTH PHYSICS PERSONNEL	17	0	6		6.785	0	2.93	
SUPERVISORY PERSONNEL	11	2	3		3.81	1.07	1.225	
ENGINEERING PERSONNEL	2	2	20		0.86	1.05	16.515	
TOTAL	196	106	362	664	99.746	102.605	297.881	500.232
WASTE PROCESSING								
MAINTENANCE PERSONNEL	7	0	0		2.02	0.045	0.355	
OPERATING PERSONNEL	0	0	2		0.27	0	0.845	
HEALTH PHYSICS PERSONNEL	2	0	1		1.03	0	0.195	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	9	0	3	12	3.32	0.045	1.395	4.76
REFUELING								
MAINTENANCE PERSONNEL	83	46	157		49.05	31.88	176.278	
OPERATING PERSONNEL	25	2	107		8.107	1.195	75.681	
HEALTH PHYSICS PERSONNEL	1	0	1		0.27	0	1.535	
SUPERVISORY PERSONNEL	8	2	0		2.38	0.485	0.13	
ENGINEERING PERSONNEL	1	0	16		0.24	0.17	13.125	
TOTAL	118	50	281	449	60.047	33.73	266.749	360.526
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	539 (221)	242 (108)	640 (517)	1421 (846)	250.61	162.478	442.498	855.586
OPERATING PERSONNEL	121 (81)	8 (4)	353 (244)	482 (329)	56.757	5.363	262.653	324.773
HEALTH PHYSICS PERSONNEL	57 (32)	0 (0)	92 (81)	149 (113)	50.612	0	86.753	137.365
SUPERVISORY PERSONNEL	26 (16)	4 (3)	5 (5)	35 (24)	12.34	1.945	2.465	16.75
ENGINEERING PERSONNEL	15 (7)	7 (5)	56 (34)	78 (46)	6.383	3.473	38.662	48.518
GRAND TOTALS	758 (357)	261 (120)	1146 (881)	2165 (1358)	376.702	173.259	833.031	1382.992

Numbers in parentheses are total numbers of individuals.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*SEQUOYAH 1,2

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	613	4	2		35.468	1.042	0.06	
OPERATING PERSONNEL	74	1	9		14.256	0.005	0.585	
HEALTH PHYSICS PERSONNEL	65	25	14		24.649	7.4	3.266	
SUPERVISORY PERSONNEL	33	21	2		3.305	0.916	0.19	
ENGINEERING PERSONNEL	119	49	50		17.799	3.104	0.792	
TOTAL	904	100	77	1081	95.477	12.467	4.893	112.837
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	642	2	2		200.89	0.014	0.109	
OPERATING PERSONNEL	66	0	5		1.224	0	2.922	
HEALTH PHYSICS PERSONNEL	64	23	11		8.549	0.735	1.743	
SUPERVISORY PERSONNEL	31	15	2		5.019	0.137	0.091	
ENGINEERING PERSONNEL	111	38	63		18.693	5.536	46.645	
TOTAL	914	78	83	1075	234.375	6.422	51.51	292.307
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	303	5	18		56.969	0.201	18.004	
OPERATING PERSONNEL	33	2	4		0.599	0.057	0.055	
HEALTH PHYSICS PERSONNEL	48	19	9		11.978	3.982	3.019	
SUPERVISORY PERSONNEL	17	17	3		0.398	1.753	0.163	
ENGINEERING PERSONNEL	77	42	63		7.84	34.478	42.012	
TOTAL	478	85	97	660	77.784	40.471	63.253	181.508
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	560	2	2		164.383	0.037	0.333	
OPERATING PERSONNEL	52	0	3		0.385	0	0.342	
HEALTH PHYSICS PERSONNEL	62	18	10		5.784	2.742	2.037	
SUPERVISORY PERSONNEL	25	1	2		1.52	0.005	0.008	
ENGINEERING PERSONNEL	108	31	109		14.717	2.157	102.805	
TOTAL	807	52	126	985	186.789	4.941	105.525	297.255
WASTE PROCESSING								
MAINTENANCE PERSONNEL	306	0	0		14.453	0	0	
OPERATING PERSONNEL	73	0	5		11.417	0	2.548	
HEALTH PHYSICS PERSONNEL	63	9	5		4.451	0.054	0.265	
SUPERVISORY PERSONNEL	17	0	0		1.179	0	0	
ENGINEERING PERSONNEL	43	2	1		0.182	0.022	0.306	
TOTAL	502	11	11	524	31.682	0.076	3.119	34.877
REFUELING								
MAINTENANCE PERSONNEL	315	2	2		70.886	1.85	1.5	
OPERATING PERSONNEL	46	3	2		6.563	0.328	2.335	
HEALTH PHYSICS PERSONNEL	39	15	5		1.469	2.965	1.423	
SUPERVISORY PERSONNEL	16	0	2		7.39	0	0.023	
ENGINEERING PERSONNEL	70	21	4		11.379	1.153	0.056	
TOTAL	486	41	15	542	97.687	6.296	5.337	109.32
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	2739	15	26	2780	543.049	3.144	20.006	566.199
OPERATING PERSONNEL	344	6	28	378	34.444	0.39	8.787	43.621
HEALTH PHYSICS PERSONNEL	341	109	54	504	56.88	17.878	11.753	86.511
SUPERVISORY PERSONNEL	139	54	11	204	18.811	2.811	0.475	22.097
ENGINEERING PERSONNEL	528	183	290	1001	70.61	46.45	192.616	309.676
GRAND TOTALS	4091	367	409	4867	723.794	70.673	233.637	1028.104

\*Workers may be counted in more than one category.

# APPENDIX D (cont.)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: SHOREHAM

TYPE: BWR

Work and Job Function	Number of Personnel (>100 mrem)			Total Man-Rem (2)		
	Station Employee	Utility Employees	Contract Worker and Others	Station Employees	Utility Employees	Contract Worker and Others
<b>Reactor Operations and Surveillance</b>						
<u>Maintenance Personnel</u>						
a) Maintenance	3	None	3	1.568	Insignificant	3.214
b) Instrument & Control	-	None	1	0.525	Insignificant	0.448
c) Computer Engineering	-	None	-	0.030	Insignificant	-
<u>Operations Personnel</u>						
a) Operations	1	None	-	1.109	Insignificant	0.076
b) Reactor Engineering	-	None	10	0.212	Insignificant	3.545
c) Systems Engineering	-	None	-	0.144	Insignificant	0.068
<u>Radiological Controls</u>						
a) Health Physics	11	None	8	3.73	Insignificant	2.04
b) Radiochemistry	-	None	-	0.06	Insignificant	0.13
c) Radwaste	1	None	-	0.17	Insignificant	-
Supervisory/Management	-	None	1	0.16	Insignificant	0.410
<u>Engineering (Not Operations)</u>						
a) Rad. Protection	-	None	-	0.070	Insignificant	-
b) Nuclear Systems	-	None	-	0.140	Insignificant	0.010
c) Project Engineering	-	None	-	0.140	Insignificant	0.290
<u>Outage/Modifications</u>						
a) Outage Planning	-	None	-	-	Insignificant	-
b) Planning & Scheduling	-	None	-	0.010	Insignificant	-
c) Modifications	-	None	-	0.050	Insignificant	0.10
<u>Nuclear Operations Support Department</u>						
a) QA/QC	-	None	-	0.116	Insignificant	0.012
b) Security	-	None	-	0.010	Insignificant	0.430
c) Training	-	None	-	0.07	Insignificant	0.110
<u>Function Total</u>						
Maintenance	3	None	4	2.12	Insignificant	3.66
Operations	1	None	10	1.47	Insignificant	3.69
Radiological Controls (includes H.P.)	12	None	8	3.96	Insignificant	2.17
Supervisory/Management	-	None	1	0.16	Insignificant	0.41
Engineering (not Operations)	-	None	-	0.35	Insignificant	0.30
Outage/Modifications	-	None	-	0.06	Insignificant	0.10
Nuclear Operations Support	-	None	-	0.19	Insignificant	0.56
<b>GRAND TOTAL</b>	<b>16</b>		<b>23</b>	<b>8.32</b>		<b>10.89</b>

(1) Doses associated with low power testing

(2) Represents 100% of cumulative man-rem exposures

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*SUMMER 1

TYPE: PWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT
REACTOR OPS & SURV							
MAINTENANCE PERSONNEL	41	0	19		0.582	0	0.229
OPERATING PERSONNEL	72	0	43		2.707	0	0.674
HEALTH PHYSICS PERSONNEL	13	2	113		0.514	0.04	4.571
SUPERVISORY PERSONNEL	5	6	6		0.077	0.039	0.055
ENGINEERING PERSONNEL	5	16	12		0.07	0.274	0.11
TOTAL	136	24	193	353	3.95	0.353	5.639
ROUTINE MAINTENANCE							
MAINTENANCE PERSONNEL	137	2	267		4.753	0.04	7.891
OPERATING PERSONNEL	26	0	5		0.445	0	0.046
HEALTH PHYSICS PERSONNEL	5	0	59		0.119	0	1.643
SUPERVISORY PERSONNEL	4	3	0		0.03	0.036	0
ENGINEERING PERSONNEL	2	25	56		0.03	1.04	0.993
TOTAL	174	30	387	591	5.377	1.116	10.573
IN-SERVICE INSPECTION							
MAINTENANCE PERSONNEL	25	0	54		0.805	0	1.661
OPERATING PERSONNEL	1	0	1		0.005	0	0.01
HEALTH PHYSICS PERSONNEL	3	0	30		0.09	0	0.833
SUPERVISORY PERSONNEL	0	0	0		0	0	0
ENGINEERING PERSONNEL	2	4	12		0.01	0.11	0.386
TOTAL	31	4	97	132	0.91	0.11	2.89
SPECIAL MAINTENANCE							
MAINTENANCE PERSONNEL	79	1	130		3.05	0.02	5.41
OPERATING PERSONNEL	14	0	0		0.471	0	0
HEALTH PHYSICS PERSONNEL	7	0	42		0.3	0	1.702
SUPERVISORY PERSONNEL	1	0	2		0.01	0	0.035
ENGINEERING PERSONNEL	8	17	33		0.345	0.668	1.099
TOTAL	109	18	207	334	4.176	0.688	8.246
WASTE PROCESSING							
MAINTENANCE PERSONNEL	11	0	31		0.141	0	0.764
OPERATING PERSONNEL	1	0	0		0.005	0	0
HEALTH PHYSICS PERSONNEL	7	0	20		0.07	0	0.506
SUPERVISORY PERSONNEL	0	0	0		0	0	0
ENGINEERING PERSONNEL	0	0	0		0	0	0
TOTAL	19	0	51	70	0.216	0	1.27
REFUELING							
MAINTENANCE PERSONNEL	17	0	60		0.765	0	2.338
OPERATING PERSONNEL	17	0	0		0.635	0	0
HEALTH PHYSICS PERSONNEL	3	0	37		0.042	0	1.44
SUPERVISORY PERSONNEL	3	0	0		0.04	0	0
ENGINEERING PERSONNEL	3	9	9		0.095	0.186	0.201
TOTAL	43	9	106	158	1.577	0.186	3.979
TOTAL BY JOB FUNCTION							
MAINTENANCE PERSONNEL	310	3	561	874	10.096	0.06	18.293
OPERATING PERSONNEL	131	0	49	180	4.268	0	0.73
HEALTH PHYSICS PERSONNEL	38	2	301	341	1.135	0.04	10.695
SUPERVISORY PERSONNEL	13	9	8	30	0.157	0.075	0.09
ENGINEERING PERSONNEL	20	71	122	213	0.55	2.278	2.789
GRAND TOTALS	512	85	1041	1638	16.206	2.453	32.597

\*Workers may be counted in more than one category.



# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *SURREY 1,2					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	35	15	142		1.143	0.063	13.623	
OPERATING PERSONNEL	247	15	57		141.84	1.355	3.89	
HEALTH PHYSICS PERSONNEL	66	7	240		48.522	2.392	229.66	
SUPERVISORY PERSONNEL	36	2	0		6.911	0.082	0	
ENGINEERING PERSONNEL	39	17	60		4.579	0.243	6.068	
TOTAL	423	56	499	978	202.995	4.135	253.241	460.371
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	194	130	769		194.431	35.942	278.052	
OPERATING PERSONNEL	81	8	45		10.002	0.208	6.223	
HEALTH PHYSICS PERSONNEL	25	5	97		4.617	1.975	25.981	
SUPERVISORY PERSONNEL	29	1	0		11.575	0.02	0	
ENGINEERING PERSONNEL	22	3	54		2.683	0.079	6.469	
TOTAL	351	147	965	1463	223.308	38.224	316.725	578.257
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	52	11	280		4.788	0.465	74.671	
OPERATING PERSONNEL	20	4	9		1.799	0.207	0.896	
HEALTH PHYSICS PERSONNEL	4	0	8		0.484	0	1.107	
SUPERVISORY PERSONNEL	10	0	0		1.602	0	0	
ENGINEERING PERSONNEL	12	1	16		1.316	0.083	3.901	
TOTAL	98	16	313	427	9.989	0.755	80.575	91.319
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	58	14	551		8.561	0.305	416.411	
OPERATING PERSONNEL	40	13	40		8.981	1.77	16.55	
HEALTH PHYSICS PERSONNEL	17	3	16		3.222	0.055	1.592	
SUPERVISORY PERSONNEL	6	0	0		0.519	0	0	
ENGINEERING PERSONNEL	5	3	38		0.23	0.024	5.926	
TOTAL	126	33	645	804	21.513	2.154	440.479	464.146
WASTE PROCESSING								
MAINTENANCE PERSONNEL	11	1	147		0.038	0.001	6.784	
OPERATING PERSONNEL	26	1	3		11.097	0.002	0.027	
HEALTH PHYSICS PERSONNEL	6	0	39		2.349	0	9.828	
SUPERVISORY PERSONNEL	6	0	0		0.547	0	0	
ENGINEERING PERSONNEL	0	0	2		0	0	0.026	
TOTAL	49	2	191	242	14.031	0.003	16.665	30.699
REFUELING								
MAINTENANCE PERSONNEL	34	1	40		3.427	0.042	5.952	
OPERATING PERSONNEL	26	9	5		4.821	0.452	0.655	
HEALTH PHYSICS PERSONNEL	2	0	5		0.192	0	0.537	
SUPERVISORY PERSONNEL	5	0	0		0.941	0	0	
ENGINEERING PERSONNEL	0	0	1		0	0	0.026	
TOTAL	67	10	51	128	9.381	0.494	7.17	17.045
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	384	172	1929	2485	212.388	36.818	795.493	1044.699
OPERATING PERSONNEL	440	50	159	649	178.54	3.994	28.241	210.775
HEALTH PHYSICS PERSONNEL	120	15	405	540	59.386	4.422	268.705	332.513
SUPERVISORY PERSONNEL	92	3	0	95	22.095	0.102	0	22.197
ENGINEERING PERSONNEL	78	24	171	273	8.808	0.429	22.416	31.653
GRAND TOTALS	1114	264	2664	4042	481.217	45.765	1114.855	1641.837

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: SUSQUEHANNA					TYPE: BWR				
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV									
MAINTENANCE PERSONNEL	14	1	7		4.339	0.122	1.08		
OPERATING PERSONNEL	60	2	6		29.558	0.967	1.182		
HEALTH PHYSICS PERSONNEL	8	0	36		5.035	0	25.938		
SUPERVISORY PERSONNEL	2	0	0		1.007	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	84	3	49	136	39.939	1.089	28.2	69.228	
ROUTINE MAINTENANCE									
MAINTENANCE PERSONNEL	73	169	125		49.306	101.722	52.906		
OPERATING PERSONNEL	29	1	13		14.98	0.73	5.735		
HEALTH PHYSICS PERSONNEL	12	0	44		8.907	0	29.88		
SUPERVISORY PERSONNEL	10	0	2		2.888	0	0.575		
ENGINEERING PERSONNEL	12	1	23		3.667	0.232	15.381		
TOTAL	136	171	207	514	79.748	102.684	104.477	286.909	
IN-SERVICE INSPECTION									
MAINTENANCE PERSONNEL	6	63	260		2.114	38.247	240.982		
OPERATING PERSONNEL	1	1	18		0.138	1.176	11.693		
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0		
SUPERVISORY PERSONNEL	2	0	4		0.958	0	1.657		
ENGINEERING PERSONNEL	4	2	23		1.975	0.452	16.766		
TOTAL	13	66	305	384	5.185	39.875	271.098	316.158	
SPECIAL MAINTENANCE									
MAINTENANCE PERSONNEL	2	18	439		0.46	4.839	244.978		
OPERATING PERSONNEL	0	3	27		0	0.587	11.022		
HEALTH PHYSICS PERSONNEL	2	0	15		2.13	0	6.675		
SUPERVISORY PERSONNEL	2	1	11		0.419	0.235	6.51		
ENGINEERING PERSONNEL	3	4	19		0.524	0.793	14.996		
TOTAL	9	26	511	546	3.533	6.454	284.181	294.168	
WASTE PROCESSING									
MAINTENANCE PERSONNEL	0	3	21		0	1.266	5.087		
OPERATING PERSONNEL	2	0	13		0.478	0	7.401		
HEALTH PHYSICS PERSONNEL	0	0	5		0	0	2.417		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	2	3	39	44	0.478	1.266	14.905	16.649	
REFUELING									
MAINTENANCE PERSONNEL	1	0	0		0.175	0	0		
OPERATING PERSONNEL	1	0	0		0.23	0	0		
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0		
SUPERVISORY PERSONNEL	1	0	0		0.12	0	0		
ENGINEERING PERSONNEL	0	0	0		0	0	0		
TOTAL	3	0	0	3	0.525	0	0	0.525	
TOTAL BY JOB FUNCTION									
MAINTENANCE PERSONNEL	96	254	852	1202	56.394	146.196	545.033	747.623	
OPERATING PERSONNEL	93	7	77	177	45.384	3.46	37.033	85.877	
HEALTH PHYSICS PERSONNEL	22	0	100	122	16.072	0	64.91	80.982	
SUPERVISORY PERSONNEL	17	1	17	35	5.392	0.235	8.742	14.369	
ENGINEERING PERSONNEL	19	7	65	91	6.166	1.477	47.143	54.786	
GRAND TOTALS	247	269	1111	1627	129.408	151.368	702.861	983.637	

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: \*TROJAN

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	3		1.82	0.07	1.14	
OPERATING PERSONNEL	22	0	0		6.35	0	0	
HEALTH PHYSICS PERSONNEL	23	0	34		8.15	0.05	13.79	
SUPERVISORY PERSONNEL	2	1	4		0.6	0.33	2.41	
ENGINEERING PERSONNEL	2	0	0		0.75	0.91	0.24	
TOTAL	56	1	41	98	17.67	1.36	17.58	36.61
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	70	66	152		35.74	32.48	103.8	
OPERATING PERSONNEL	17	0	0		4.38	0	0	
HEALTH PHYSICS PERSONNEL	30	2	70		11.64	0.22	36.99	
SUPERVISORY PERSONNEL	7	9	4		2.57	3.82	2.07	
ENGINEERING PERSONNEL	6	4	45		2.34	1.79	53.94	
TOTAL	130	81	271	482	56.67	38.31	196.8	291.78
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	2	8	16		0.93	1.86	6.31	
OPERATING PERSONNEL	0	0	0		0.02	0	0	
HEALTH PHYSICS PERSONNEL	4	0	0		1.5	0	0.37	
SUPERVISORY PERSONNEL	0	0	0		0.08	0.13	0.06	
ENGINEERING PERSONNEL	0	2	0		0	0.34	0	
TOTAL	6	10	16	32	2.53	2.33	6.74	11.6
WASTE PROCESSING								
MAINTENANCE PERSONNEL	2	1	11		0.61	0.39	4.79	
OPERATING PERSONNEL	0	0	0		0.21	0	0	
HEALTH PHYSICS PERSONNEL	31	2	19		18.6	0.69	8.71	
SUPERVISORY PERSONNEL	0	0	0		0.05	0	0.01	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	33	3	30	66	19.47	1.08	13.51	34.06
REFUELING								
MAINTENANCE PERSONNEL	16	12	11		14.27	14.2	2.65	
OPERATING PERSONNEL	12	0	0		6.02	0	0	
HEALTH PHYSICS PERSONNEL	12	2	28		3.34	0.73	9.85	
SUPERVISORY PERSONNEL	1	7	0		1.14	1.27	0.06	
ENGINEERING PERSONNEL	0	0	0		0.18	0.08	0.06	
TOTAL	41	21	39	101	24.95	16.28	12.62	53.85
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	97	87	193	377	53.37	49	118.69	221.06
OPERATING PERSONNEL	51	0	0	51	16.98	0	0	16.98
HEALTH PHYSICS PERSONNEL	100	6	151	257	43.23	1.69	69.71	114.63
SUPERVISORY PERSONNEL	10	17	8	35	4.44	5.55	4.61	14.6
ENGINEERING PERSONNEL	8	6	45	59	3.27	3.12	54.24	60.63
GRAND TOTALS	266	116	397	779	121.29	59.36	247.25	427.9

\*Workers may be counted in more than one category.

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *TURKEY POINT					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	TOTAL PERSON-REM			
	STATION	UTILITY	CONTRACT		STATION	UTILITY	CONTRACT	TOTAL
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	43	3	37		16.59	2.465	13.875	
OPERATING PERSONNEL	33	0	1		18.205	0	0.29	
HEALTH PHYSICS PERSONNEL	18	0	71		8.445	0	20.49	
SUPERVISORY PERSONNEL	8	0	8		3.43	0.295	2.61	
ENGINEERING PERSONNEL	24	2	36		7.15	0.735	14.435	
TOTAL	126	5	153	284	53.82	3.495	51.7	109.015
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	209	36	134		146.03	21.575	46.5	
OPERATING PERSONNEL	41	0	0		14.8	0	0.1	
HEALTH PHYSICS PERSONNEL	23	0	99		17.275	0.02	93.485	
SUPERVISORY PERSONNEL	15	2	8		5.46	0.745	2.765	
ENGINEERING PERSONNEL	18	4	16		8.325	2.22	3.82	
TOTAL	306	42	257	605	191.89	24.56	146.67	363.12
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	36	17	100		14.595	3.75	66.515	
OPERATING PERSONNEL	1	0	1		0.555	0	0.205	
HEALTH PHYSICS PERSONNEL	8	0	21		2.14	0	7.6	
SUPERVISORY PERSONNEL	6	1	7		2.535	1.125	1.905	
ENGINEERING PERSONNEL	2	13	6		0.655	12.88	3.525	
TOTAL	53	31	135	219	20.48	17.755	79.75	117.985
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	49	1	662		24.155	0.88	629.324	
OPERATING PERSONNEL	3	0	2		1.915	0	0.56	
HEALTH PHYSICS PERSONNEL	11	0	26		2.785	0.035	12.785	
SUPERVISORY PERSONNEL	3	2	43		0.925	0.395	22.505	
ENGINEERING PERSONNEL	14	8	33		5.995	3.35	18.93	
TOTAL	80	11	766	857	35.775	4.66	684.104	724.539
WASTE PROCESSING								
MAINTENANCE PERSONNEL	8	1	4		2.385	0.275	2.075	
OPERATING PERSONNEL	0	0	0		0.01	0	0	
HEALTH PHYSICS PERSONNEL	13	0	1		17.225	0	0.53	
SUPERVISORY PERSONNEL	0	0	0		0.135	0	0.01	
ENGINEERING PERSONNEL	1	0	0		0.165	0	0.09	
TOTAL	22	1	5	28	19.92	0.275	2.705	22.9
REFUELING								
MAINTENANCE PERSONNEL	137	41	16		84.655	40.35	7.165	
OPERATING PERSONNEL	49	0	2		11.61	0.005	0.26	
HEALTH PHYSICS PERSONNEL	4	0	9		1.93	0	3.595	
SUPERVISORY PERSONNEL	8	0	9		3.955	0	2.61	
ENGINEERING PERSONNEL	10	1	2		7.75	0.31	0.6	
TOTAL	208	42	38	288	109.9	40.665	14.23	164.795
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	482 (225)	99 (45)	953 (746)	1534 (1016)	288.41	69.295	765.454	1123.159
OPERATING PERSONNEL	127 (79)	0 (0)	6 (5)	133 (84)	47.095	0.005	1.415	48.515
HEALTH PHYSICS PERSONNEL	77 (29)	0 (0)	227 (119)	304 (148)	49.8	0.055	138.485	188.34
SUPERVISORY PERSONNEL	40 (22)	5 (3)	75 (52)	120 (77)	16.44	2.56	32.405	51.405
ENGINEERING PERSONNEL	69 (46)	28 (23)	93 (81)	190 (150)	30.04	19.495	41.4	90.935
GRAND TOTALS	795 (401)	132 (71)	1354 (1003)	2281 (1475)	431.785	91.41	979.159	1502.354

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

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: VERMONT YANKEE 1

TYPE: BWR

WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)				STATION	TOTAL PERSON-REM			TOTAL
	STATION	UTILITY	CONTRACT	TOTAL		STATION	UTILITY	CONTRACT	
REACTOR OPS & SURV									
MAINTENANCE PERSONNEL	4	6	59		4.438	1.085	13.83		
OPERATING PERSONNEL	40	0	1		23.6	0	0.087		
HEALTH PHYSICS PERSONNEL	21	0	148		17.17	0	89.518		
SUPERVISORY PERSONNEL	9	0	0		1.949	0	4.489		
ENGINEERING PERSONNEL	3	1	9		5.214	0.209	1.86		
TOTAL	77	7	217	301	52.371	1.294	109.784	163.449	
ROUTINE MAINTENANCE									
MAINTENANCE PERSONNEL	35	106	939		39.993	27.09	339.68		
OPERATING PERSONNEL	11	0	0		4.061	0	0		
HEALTH PHYSICS PERSONNEL	5	0	99		4.176	0	47.367		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	1	0	1		0.912	0	0.27		
TOTAL	52	106	1039	1197	49.142	27.09	387.317	463.549	
IN-SERVICE INSPECTION									
MAINTENANCE PERSONNEL	0	0	14		0.02	0	2.271		
OPERATING PERSONNEL	0	0	0		0.038	0	0		
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0.02		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	0	0	0		0.023	0	0.009		
TOTAL	0	0	14	14	0.081	0	2.3	2.381	
SPECIAL MAINTENANCE									
MAINTENANCE PERSONNEL	6	24	705		6.336	5.008	383.599		
OPERATING PERSONNEL	2	0	0		2.258	0	0		
HEALTH PHYSICS PERSONNEL	0	0	8		0.186	0	3.388		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	4	0	2		2.34	0	0.4		
TOTAL	12	24	715	751	11.12	5.008	387.387	403.515	
WASTE PROCESSING									
MAINTENANCE PERSONNEL	0	0	21		0.186	0.012	6.719		
OPERATING PERSONNEL	3	0	0		5.473	0	0		
HEALTH PHYSICS PERSONNEL	1	0	12		0.629	0	3.582		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	0	0	0		0.02	0	0		
TOTAL	4	0	33	37	6.308	0.012	10.301	16.621	
REFUELING									
MAINTENANCE PERSONNEL	0	0	3		0.084	0.02	0.563		
OPERATING PERSONNEL	0	0	0		0.374	0	0		
HEALTH PHYSICS PERSONNEL	0	0	1		0	0	0.255		
SUPERVISORY PERSONNEL	0	0	0		0	0	0		
ENGINEERING PERSONNEL	1	0	0		0.131	0	0.103		
TOTAL	1	0	4	5	0.589	0.02	0.921	1.53	
TOTAL BY JOB FUNCTION									
MAINTENANCE PERSONNEL	45	136	1741	1922	51.057	33.215	746.662	830.934	
OPERATING PERSONNEL	56	0	1	57	35.804	0	0.087	35.891	
HEALTH PHYSICS PERSONNEL	27	0	268	295	22.161	0	144.13	166.291	
SUPERVISORY PERSONNEL	9	0	0	9	1.949	0	4.489	6.438	
ENGINEERING PERSONNEL	9	1	12	22	8.64	0.209	2.642	11.491	
GRAND TOTALS	146	137	2022	2305	119.611	33.424	898.01	1051.045	

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: WOLF CREEK					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	0.178	0.055	
OPERATING PERSONNEL	0	0	0		0	0.164	0.025	
HEALTH PHYSICS PERSONNEL	0	4	8		0	1.015	2.622	
SUPERVISORY PERSONNEL	0	0	0		0.005	0.066	0.019	
ENGINEERING PERSONNEL	0	0	0		0.003	0.046	0.079	
TOTAL	0	4	8	12	0.008	1.469	2.8	4.277
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0.472	0.567	
OPERATING PERSONNEL	0	0	0		0	0.056	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.217	0.398	
SUPERVISORY PERSONNEL	0	0	0		0	0.07	0.077	
ENGINEERING PERSONNEL	0	0	0		0	0.091	0.058	
TOTAL	0	0	0	0	0	0.906	1.1	2.006
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	0	0	0		0	0.118	0.19	
OPERATING PERSONNEL	0	0	0		0	0.011	0.005	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0.011	
SUPERVISORY PERSONNEL	0	0	0		0.005	0.079	0.05	
ENGINEERING PERSONNEL	0	0	0		0.003	0.038	0.005	
TOTAL	0	0	0	0	0.008	0.246	0.261	0.515
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	0	0	0		0	0.084	0.059	
OPERATING PERSONNEL	0	0	0		0	0.007	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.048	0.093	
SUPERVISORY PERSONNEL	0	0	0		0	0.007	0.006	
ENGINEERING PERSONNEL	0	0	0		0	0.005	0	
TOTAL	0	0	0	0	0	0.151	0.158	0.309
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	0	0		0	0.017	0.022	
OPERATING PERSONNEL	0	0	0		0	0.004	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0.025	0.019	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0.046	0.041	0.087
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	0	0	0	0	0	0.869	0.893	1.762
OPERATING PERSONNEL	0	0	0	0	0	0.242	0.03	0.272
HEALTH PHYSICS PERSONNEL	0	4	8	12	0	1.305	3.143	4.448
SUPERVISORY PERSONNEL	0	0	0	0	0.01	0.222	0.152	0.384
ENGINEERING PERSONNEL	0	0	0	0	0.006	0.18	0.142	0.328
GRAND TOTALS	0	4	8	12	0.016	2.818	4.36	7.194

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: WNP-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	26.298	0	3.418		5.526	0	0.939	
OPERATING PERSONNEL	24.476	1.14	0.443		8.645	0.407	0.439	
HEALTH PHYSICS PERSONNEL	8.863	0	16.581		6.545	0	6.946	
SUPERVISORY PERSONNEL	6.186	0.101	0		1.611	0.081	0	
ENGINEERING PERSONNEL	2.621	1.347	2.624		0.754	0.838	1.268	
TOTAL	68.444	2.588	23.066	94.098	23.081	1.326	9.592	33.999
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	26.454	0	34.406		8.002	0	10.389	
OPERATING PERSONNEL	7.929	0	0		2.788	0	0	
HEALTH PHYSICS PERSONNEL	3.703	0	3.164		3.294	0	1.777	
SUPERVISORY PERSONNEL	2.211	0.043	0		1.227	0.034	0	
ENGINEERING PERSONNEL	1.922	1.407	3.113		0.46	0.526	0.448	
TOTAL	42.219	1.45	40.683	84.352	15.771	0.56	12.614	28.945
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	1.881	0	1.931		0.401	0	0.48	
OPERATING PERSONNEL	0.422	0	0.02		0.135	0	0.02	
HEALTH PHYSICS PERSONNEL	1.035	0	1.194		0.816	0	0.625	
SUPERVISORY PERSONNEL	0.302	0.4	0		0.097	0.321	0	
ENGINEERING PERSONNEL	1.411	1.208	3.708		0.639	1.159	0.905	
TOTAL	5.051	1.608	6.853	13.512	2.088	1.48	2.03	5.598
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	38.287	0	20.471		11.148	0	6.387	
OPERATING PERSONNEL	2.143	0	0		0.715	0	0	
HEALTH PHYSICS PERSONNEL	2.737	0	3.78		2.266	0	2.036	
SUPERVISORY PERSONNEL	1.04	0.456	0		0.458	0.366	0	
ENGINEERING PERSONNEL	2.4	2.829	3.131		0.911	1.451	0.443	
TOTAL	46.607	3.285	27.382	77.274	15.498	1.817	8.866	26.181
WASTE PROCESSING								
MAINTENANCE PERSONNEL	1.994	0	0		0.48	0		
OPERATING PERSONNEL	0	0	0.16		0	0	0.159	
HEALTH PHYSICS PERSONNEL	0.143	0	0.178		0.114	0	0.15	
SUPERVISORY PERSONNEL	0	0	0		0	0		
ENGINEERING PERSONNEL	0	0.209	0.081		0	0.073	0.089	
TOTAL	2.137	0.209	0.419	2.765	0.594	0.073	0.398	1.065
REFUELING								
MAINTENANCE PERSONNEL	0	0	0		0	0	0	
OPERATING PERSONNEL	0	0	0		0	0	0	
HEALTH PHYSICS PERSONNEL	0	0	0		0	0	0	
SUPERVISORY PERSONNEL	0	0	0		0	0	0	
ENGINEERING PERSONNEL	0	0	0		0	0	0	
TOTAL	0	0	0	0	0	0	0	0
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	94.914	0	60.226	155.14	25.557	0	18.195	43.752
OPERATING PERSONNEL	34.97	1.14	0.623	36.733	12.283	0.407	0.618	13.308
HEALTH PHYSICS PERSONNEL	16.481	0	24.897	41.378	13.035	0	11.534	24.569
SUPERVISORY PERSONNEL	9.739	1	0	10.739	3.393	0.802	0	4.195
ENGINEERING PERSONNEL	8.354	7	12.657	28.011	2.764	4.047	3.153	9.964
GRAND TOTALS	164.458	9.14	98.403	272.001	57.032	5.256	33.5	95.788

# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

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
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	1	1	0		1.067	0.495	0.035	
OPERATING PERSONNEL	27	0	0		10.507	0	0	
HEALTH PHYSICS PERSONNEL	12	0	1		7.03	0	0.195	
SUPERVISORY PERSONNEL	0	0	0		0.04	0	0.06	
ENGINEERING PERSONNEL	0	2	0		0.185	0.485	0.15	
TOTAL	40	3	1	44	18.829	0.98	0.44	20.249
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	21	33	10		6.402	9.25	2.765	
OPERATING PERSONNEL	2	0	0		0.705	0	0	
HEALTH PHYSICS PERSONNEL	7	0	36		5.345	0	17.353	
SUPERVISORY PERSONNEL	0	0	0		0.055	0	0.025	
ENGINEERING PERSONNEL	0	2	0		0.035	0.575	0.11	
TOTAL	30	35	46	111	12.542	9.825	20.253	42.62
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	9	29	16		3.423	9.345	12.708	
OPERATING PERSONNEL	0	0	0		0.29	0	0	
HEALTH PHYSICS PERSONNEL	2	0	2		2.51	0	1.025	
SUPERVISORY PERSONNEL	4	0	0		4.215	0	0.005	
ENGINEERING PERSONNEL	7	1	0		8.185	0.34	0.045	
TOTAL	22	30	18	70	18.623	9.685	13.783	42.091
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	16	54	58		7.63	21.91	42.703	
OPERATING PERSONNEL	0	0	0		0.23	0	0	
HEALTH PHYSICS PERSONNEL	3	0	5		1.205	0	1.945	
SUPERVISORY PERSONNEL	1	0	0		0.63	0	0.015	
ENGINEERING PERSONNEL	0	6	0		0.265	2.384	0.085	
TOTAL	20	60	63	143	9.96	24.294	44.748	79.002
WASTE PROCESSING								
MAINTENANCE PERSONNEL	0	2	0		0.485	1.36	0.045	
OPERATING PERSONNEL	8	0	0		4.525	0	0	
HEALTH PHYSICS PERSONNEL	5	0	25		7.09	0	9.65	
SUPERVISORY PERSONNEL	0	0	0		0.01	0	0.01	
ENGINEERING PERSONNEL	0	0	0		0.06	0.045	0.04	
TOTAL	13	2	25	40	12.17	1.405	9.745	23.32
REFUELING								
MAINTENANCE PERSONNEL	19	56	6		5.433	19.843	1.88	
OPERATING PERSONNEL	27	0	0		9.265	0	0	
HEALTH PHYSICS PERSONNEL	2	0	13		0.515	0.015	4.47	
SUPERVISORY PERSONNEL	3	0	0		0.725	0	0.105	
ENGINEERING PERSONNEL	4	4	4		0.89	1.197	1.846	
TOTAL	55	60	23	138	16.828	21.055	8.301	46.184
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	66	175	90	331	24.44	62.203	60.136	146.779
OPERATING PERSONNEL	64	0	0	64	25.522	0	0	25.522
HEALTH PHYSICS PERSONNEL	31	0	82	113	23.695	0.015	34.638	58.348
SUPERVISORY PERSONNEL	8	0	0	8	5.675	0	0.22	5.895
ENGINEERING PERSONNEL	11	15	4	30	9.62	5.026	2.276	16.922
GRAND TOTALS	180	190	176	546	88.952	67.244	97.27	253.466

\*Workers may be counted in more than one category.



# APPENDIX D (cont)

## NUMBER OF PERSONNEL AND PERSON-REM BY WORK AND JOB FUNCTION 1985

PLANT: *ZION					TYPE: PWR			
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL (>100 mREM)			TOTAL	STATION	TOTAL PERSON-REM		
	STATION	UTILITY	CONTRACT			STATION	UTILITY	CONTRACT
REACTOR OPS & SURV								
MAINTENANCE PERSONNEL	10	0	14		1.615	0	6.718	
OPERATING PERSONNEL	62	0	7		16.992	0	2.821	
HEALTH PHYSICS PERSONNEL	9	0	2		6.551	0	1.436	
SUPERVISORY PERSONNEL	10	0	0		0.753	0	0	
ENGINEERING PERSONNEL	4	0	4		0.307	0	0.227	
TOTAL	95	0	27	122	26.218	0	11.202	37.42
ROUTINE MAINTENANCE								
MAINTENANCE PERSONNEL	81	0	616		113.914	0	301.228	
OPERATING PERSONNEL	41	0	0		11.991	0	0	
HEALTH PHYSICS PERSONNEL	27	0	140		27.332	0	106.596	
SUPERVISORY PERSONNEL	58	0	0		29.66	0	0	
ENGINEERING PERSONNEL	53	0	280		20.991	0	36.908	
TOTAL	260	0	1036	1296	203.888	0	444.732	648.62
IN-SERVICE INSPECTION								
MAINTENANCE PERSONNEL	7	0	211		0.961	0	103.792	
OPERATING PERSONNEL	2	0	0		0.488	0	0	
HEALTH PHYSICS PERSONNEL	1	0	9		0.032	0	9.672	
SUPERVISORY PERSONNEL	7	0	0		0.563	0	0	
ENGINEERING PERSONNEL	16	0	19		6.566	0	4.642	
TOTAL	33	0	239	272	8.61	0	118.106	126.716
SPECIAL MAINTENANCE								
MAINTENANCE PERSONNEL	1	145	23		0.01	10.737	10.094	
OPERATING PERSONNEL	25	0	0		6.418	0	0	
HEALTH PHYSICS PERSONNEL	3	0	1		1.46	0	0.034	
SUPERVISORY PERSONNEL	1	0	0		0.004	0	0	
ENGINEERING PERSONNEL	4	231	7		0.67	2.868	0.634	
TOTAL	34	376	31	441	8.562	13.605	10.762	32.929
WASTE PROCESSING								
MAINTENANCE PERSONNEL	18	0	301		25.817	0	146.644	
OPERATING PERSONNEL	3	0	0		0.615	0	0	
HEALTH PHYSICS PERSONNEL	1	0	8		0.266	0	9.838	
SUPERVISORY PERSONNEL	15	0	0		5.141	0	0	
ENGINEERING PERSONNEL	13	0	0		5.24	0	0	
TOTAL	50	0	309	359	37.079	0	156.482	193.561
REFUELING								
MAINTENANCE PERSONNEL	39	0	7		47.507	0	2.939	
OPERATING PERSONNEL	7	0	0		3.323	0	0	
HEALTH PHYSICS PERSONNEL	2	0	5		1.189	0	2.09	
SUPERVISORY PERSONNEL	14	0	0		7.234	0	0	
ENGINEERING PERSONNEL	8	0	1		2.815	0	0.061	
TOTAL	70	0	13	83	62.068	0	5.09	67.158
TOTAL BY JOB FUNCTION								
MAINTENANCE PERSONNEL	156	145	1172	1473	189.824	10.737	571.415	771.976
OPERATING PERSONNEL	140	0	7	147	39.827	0	2.821	42.648
HEALTH PHYSICS PERSONNEL	43	0	165	208	36.83	0	129.666	166.496
SUPERVISORY PERSONNEL	105	0	0	105	43.355	0	0	43.355
ENGINEERING PERSONNEL	98	231	311	640	36.589	2.868	42.472	81.929
GRAND TOTALS	542	376	1655	2573	346.425	13.605	746.374	1106.404

\*Workers may be counted in more than one category.



## **APPENDIX E**

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

**1981-1985**

APPENDIX E\*  
SUMMARY OF ANNUAL WHOLE BODY DOSE DISTRIBUTIONS BY YEAR AND REACTOR TYPE  
1981-1985

YEAR AND REACTOR TYPE	Number of Individuals with Whole Body Doses in the Ranges (rems or cSv)																	TOTAL NUMBER MONI- TORED	NUMBER WITH MEAS. EXPOSURE	COLLEC- TIVE DOSE
	No Meas- urable	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			
1985 - BWR's	22,061	14,446	5,957	5,218	3,107	2,295	4,973	1,731	468	42								60,298	38,237	20,572
1985 - PWR's	42,409	25,545	8,158	6,761	4,107	2,602	5,584	1,586	248	42								97,042	54,633	22,470
1985 - LWR's	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 - BWR's	21,741	14,997	6,165	4,907	3,033	2,398	5,679	2,714	994	218								62,846	41,105	27,074
1984 - PWR's	37,875	24,887	8,599	6,585	4,133	2,998	6,774	2,253	681	77								94,862	56,987	28,140
1984 - LWR's	59,616	39,884	14,764	11,492	7,166	5,396	12,453	4,967	1,675	295								157,708	98,092	55,214
1983 - BWR's	17,721	10,475	4,317	4,036	2,607	1,925	5,659	2,890	1,252	299	63	16	4					51,264	33,543	27,455
1983 - PWR's	33,350	21,425	7,894	6,260	3,863	2,783	6,512	2,421	698	315	2							85,523	52,173	29,016
1983 - LWR's	51,071	31,900	12,211	10,296	6,470	4,708	12,171	5,311	1,950	544	65	16	4					136,717	85,646	56,471
1982 - BWR's	15,661	9,944	4,431	4,403	2,839	2,046	4,794	2,358	1,183	230	7							47,896	32,235	24,437
1982 - PWR's	29,232	21,536	8,262	6,411	3,900	2,749	6,061	2,328	631	202	49	13	4	0	1			81,379	52,147	27,753
1982 - LWR's	44,893	31,480	12,693	10,814	6,739	4,795	10,855	4,686	1,814	432	56	13	4	0	1			129,275	84,382	52,190
1981 - BWR's	15,345	11,130	4,869	4,536	2,939	2,326	5,373	2,485	911	224	32	4	2	0	0	1		50,177	34,832	25,471
1981 - PWR's	26,978	18,202	7,348	5,790	3,686	2,577	6,393	2,061	882	262	61	77	9	2	1			74,329	47,351	28,671
1981 - LWR's	42,323	29,332	12,217	10,326	6,625	4,903	11,766	4,546	1,793	486	93	81	11	2	1	0	1	124,506	82,183	54,142

\* Figures contained herein are uncorrected for multiple reporting of transient individuals.

NRC FORM 335 (2-84) NRCM 1102, 3201, 3202 <b>BIBLIOGRAPHIC DATA SHEET</b> SEE INSTRUCTIONS ON THE REVERSE		U.S. NUCLEAR REGULATORY COMMISSION		1. REPORT NUMBER (Assigned by TIDC, add Vol. No., if any)  NUREG-0713, Vol. 7					
2. TITLE AND SUBTITLE Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 1985 Eighteenth Annual Report				3. LEAVE BLANK					
5. AUTHOR(S)  Barbara Brooks				4. DATE REPORT COMPLETED <table border="1"> <tr> <td>MONTH</td> <td>YEAR</td> </tr> <tr> <td>January</td> <td>1988</td> </tr> </table>		MONTH	YEAR	January	1988
MONTH	YEAR								
January	1988								
7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Division of Regulatory Applications Office of Nuclear Regulatory Research U.S. Nuclear Regulatory Commission Washington, DC 20555				6. DATE REPORT ISSUED <table border="1"> <tr> <td>MONTH</td> <td>YEAR</td> </tr> <tr> <td>April</td> <td>1988</td> </tr> </table>		MONTH	YEAR	April	1988
MONTH	YEAR								
April	1988								
10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Division of Regulatory Applications Office of Nuclear Regulatory Research U.S. Nuclear Regulatory Commission Washington, DC 20555				8. PROJECT/TASK/WORK UNIT NUMBER  9. FUNDING OR GRANT NUMBER					
11a. TYPE OF REPORT  Annual				b. PERIOD COVERED (Inclusive dates)  1985					
12. SUPPLEMENTARY NOTES									
13. 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 1985. 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. Data on workers terminating their employment at certain NRC licensed facilities were obtained from reports submitted pursuant to 10 CFR 20.408. The 1985 annual reports submitted by about 500 licensees indicated that approximately 216,000 individuals were monitored, 94,000 of whom were monitored by nuclear power facilities. They incurred an average individual dose of 0.22 rem (cSv) and an average measurable dose of 0.43 rem (cSv). Termination radiation exposure reports were analyzed to reveal that about 77,300 individuals completed their employment with one or more of the 500 covered licensees during 1984. Some 73,200 of these individuals terminated from power reactor facilities, and about 7,400 of them were considered to be transient workers who received an average dose of 1.05 rem (cSv).									
14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS occupational radiation exposure industrial radiography power reactors collective dose average dose b. IDENTIFIERS/OPEN-ENDED TERMS transient workers fuel fabricators				15. AVAILABILITY STATEMENT  Unlimited					
				16. SECURITY CLASSIFICATION (This page) Unclassified (This report) Unclassified					
				17. NUMBER OF PAGES					
				18. PRICE					





**UNITED STATES**  
**NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300

SPECIAL FOURTH-CLASS RATE  
POSTAGE & FEES PAID  
USNRC  
PERMIT No. G-67