U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-0713
Vol. 30

Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 2008

Forty-First Annual Report

Office of Nuclear Regulatory Research

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Manuscript Completed: January 2010
Date Published: January 2010

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PREVIOUS REPORTS IN THIS 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.
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NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1988, Vol. 10, U.S. Nuclear Regulatory Commission, July 1991.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1989, Vol. 11, U.S. Nuclear Regulatory Commission, April 1992.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1990, Vol. 12, U.S. Nuclear Regulatory Commission, January 1993.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1991, Vol. 13, U.S. Nuclear Regulatory Commission, July 1993.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1992, Vol. 14, U.S. Nuclear Regulatory Commission, December 1993.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1993, Vol. 15, U.S. Nuclear Regulatory Commission, January 1995.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1994, Vol. 16, U.S. Nuclear Regulatory Commission, January 1996.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1995, Vol. 17, U.S. Nuclear Regulatory Commission, January 1997.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1996, Vol. 18, U.S. Nuclear Regulatory Commission, February 1998.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1997, Vol. 19, U.S. Nuclear Regulatory Commission, November 1998.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1998, Vol. 20, U.S. Nuclear Regulatory Commission, November 1999.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1999, Vol. 21, U.S. Nuclear Regulatory Commission, October 2000.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2000, Vol. 22, U.S. Nuclear Regulatory Commission, September 2001.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2001, Vol. 23, U.S. Nuclear Regulatory Commission, September 2002.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2002, Vol. 24, U.S. Nuclear Regulatory Commission, October 2003.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2003, Vol. 25, U.S. Nuclear Regulatory Commission, October 2004.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2004, Vol. 26, U.S. Nuclear Regulatory Commission, December 2005.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2005, Vol. 27, U.S. Nuclear Regulatory Commission, December 2006.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2006, Vol. 28, U.S. Nuclear Regulatory Commission, November 2007.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2007, Vol. 29, U.S. Nuclear Regulatory Commission, December 2008.

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

WASH-1350-R1 through WASH-1350 R6	First through Sixth Annual Reports of the Operation of the U.S. AEC's Centralized Ionizing Radiation Exposure Records and Reporting System, U.S. Atomic Energy Commission.
NUREG-75/108	Seventh Annual Occupational Radiation Exposure Report for Certain NRC Licensees, 1974, U.S. Nuclear Regulatory Commission, October 1975.
NUREG-0119	Eighth Annual Occupational Radiation Exposure Report for 1975, U.S. Nuclear Regulatory Commission, October 1976.
NUREG-0322	Ninth Annual Occupational Radiation Exposure Report for 1976, U.S. Nuclear Regulatory Commission, October 1977.
NUREG-0463	Tenth Annual Occupational Radiation Exposure Report for 1977, U.S. Nuclear Regulatory Commission, October 1978.
NUREG-0593	Eleventh Annual Occupational Radiation Exposure Report for 1978, U.S. Nuclear Regulatory Commission, January 1981.
NUREG-0714	Twelfth Annual Occupational Radiation Exposure Report for 1979, Vol. 1, U.S. Nuclear Regulatory Commission, August 1982.
NUREG-0714	Occupational Radiation Exposure, Thirteenth and Fourteenth Annual Reports, 1980 and 1981, Vols. 2 and 3, U.S. Nuclear Regulatory Commission, October 1983.
NUREG-0714	Occupational Radiation Exposure, Fifteenth and Sixteenth Annual Reports, 1982 and 1983, Vols. 4 and 5, U.S. Nuclear Regulatory Commission, October 1985.

ABSTRACT

This report summarizes the occupational exposure data that are maintained in the U.S. Nuclear Regulatory Commission (NRC) Radiation Exposure Information and Reporting System (REIRS). The bulk of the information contained in the report was compiled from the 2008 annual reports submitted by five of the seven categories[1] of NRC licensees subject to the reporting requirements of 10 CFR 20.2206. The annual reports submitted by these licensees consist of radiation exposure records for each monitored individual. These records are analyzed for trends and presented in this report in terms of collective dose and the distribution of dose among the monitored individuals. Because there are no geologic repositories for high-level waste currently licensed and no low-level waste disposal facilities in operation, only five categories will be considered in this report.

Annual reports for 2008 were received from a total of **194** NRC licensees. Compilations of the reports submitted by the **194** licensees indicated that **181,462** individuals were monitored, **86,169** of whom received a measurable dose (Table 3.2). The collective dose incurred by these individuals was **11,301** person-rem, which represents a **7% decrease** from the 2007 value. The number of workers receiving a measurable dose also decreased, resulting in an average measurable dose of **0.13** rem for 2008. The average measurable dose is defined as the total effective dose equivalent (TEDE) divided by the number of workers receiving a measurable dose.[2] The figures and tables for commercial reactors in this report have been adjusted to account for transient reactor workers where specifically noted in footnotes.

In calendar year 2008, the average annual collective dose per reactor for light water reactor (LWR) licensees was **88** person-rem. This represents a **9% decrease** from the value reported for 2007 (97 person-rem). The annual collective dose per reactor for boiling water reactors (BWRs) was **129** person-rem for **35** BWRs, and for pressurized water reactors (PWRs), it was **68** person-rem for **69** PWRs. Analyses of transient worker data indicate that **28,780** individuals completed work assignments at two or more licensees during the monitoring year. The dose distributions are adjusted each year to account for the duplicate reporting of transient workers by multiple licensees. In 2008, the average measurable dose per worker for all licensees calculated from reported data was **0.13** rem. The corrected dose distribution resulted in an average measurable dose per worker for all licensees of **0.18** rem.

[1]Commercial nuclear power reactors and test reactor facilities, industrial radiographers; fuel processors (including uranium enrichment facilities), fabricators, and reprocessors; manufacturing and distribution of byproduct material; independent spent fuel storage installations; facilities for land disposal of low-level waste; and geologic repositories for high-level waste. There are currently no NRC licensees involved in low-level waste disposal or geologic repositories for high-level waste.

[2]The number of workers with measurable dose includes any individual with a dose greater than zero rem and does not include doses reported as “not detectable.”

EDITOR'S NOTE

Charles Hinson, Ronald LaVera, Steven Garry, Gregory Chapman, Richard Struckmeyer, Sami Sherbini, Janine Katanic, and Vincent Holahan assisted in the preparation of this NUREG, serving as technical reviewers. The U.S. Nuclear Regulatory Commission welcomes responses from readers.

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PREFACE

A number of U.S. Nuclear Regulatory Commission (NRC) licensees have inquired as to how the occupational radiation exposure data that are compiled from the individual exposure reports required by §20.2206 are used by the NRC staff. In combination with other sources of information, the principal uses of the data are to provide facts regarding routine occupational exposures to radiation and radioactive material that occur in connection with certain NRC-licensed activities. These facts, as indicated below, are used by the NRC staff:

1. The data permit evaluation of trends, both favorable and unfavorable, from the viewpoint of the effectiveness of overall NRC/licensee radiation protection and as low as reasonably achievable (ALARA) efforts by licensees.

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: U.S./foreign, boiling water reactors/pressurized water reactors (BWRs/PWRs), civilian/military, facility/facility, nuclear industry/other industries, etc.

3. The data are used as one of the metrics of the NRC Reactor Oversight Program to evaluate the effectiveness of the licensees' ALARA programs and also for inspection planning purposes.

4. The data provide for the monitoring of transient workers who may affect dose distribution statistics through multiple counting.

5. 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).

6. The data permit comparisons of occupational radiation risks with potential public risks when action for additional protection of the public involves worker exposures.

7. The data are used in the establishment of priorities for the utilization of NRC health physics resources: research, standards development, and regulatory program development.

8. The data provide facts for answering Congressional and administration inquiries and for responding to questions raised by the public.

9. The data are used to provide radiation exposure histories to individuals who were exposed to radiation at NRC-licensed facilities.

10. The data provide information that may be used in the planning of epidemiological studies.

FOREWORD

Through this annual report, the U.S. Nuclear Regulatory Commission (NRC) supports openness in its regulatory process by providing the public with accurate and timely information about the radiation protection program of NRC's licensees. Toward that end, NUREG-0713, Volume 30, summarizes the 2008 occupational radiation exposure data maintained in the NRC Radiation Exposure Information and Reporting System (REIRS) database.

Seven categories of NRC licensees are required to report annually on individual exposure in accordance with Title 10, Section 20.2206, of the Code of Federal Regulations (10 CFR 20.2206, "Reports of Individual Monitoring"). Specifically, these categories include commercial nuclear power plants; industrial radiographers; fuel processors (including uranium enrichment facilities), fabricators, and reprocessors; manufacturing and distribution of byproduct material; independent spent fuel storage installations; facilities for land disposal of low-level waste; and geologic repositories for high-level waste. Because NRC has not licensed any geologic repositories for high-level waste and no NRC-licensed low-level waste disposal facilities are currently in operation, this report considers only the first five categories of NRC licensees. As such, this report reflects the occupational radiation exposure data that NRC received from 194 licensees.

The data submitted by licensees consist of radiation exposure records for each monitored individual. In 2008, 130,830 individuals were monitored and 64,075 received a measurable dose (when adjusted for transient workers). This report analyzes and presents these records in terms of collective dose and the distribution of dose among the monitored individuals. During 2008, these individuals incurred a collective dose of 11,301 person-rem, which represents a 7% decrease from the 2007 value of 12,157 person-rem. The average measurable dose is the total collective dose divided by the number of workers receiving a measurable dose. The average measurable dose decreased from 0.19 rem in 2007 to 0.18 rem in 2008. This value can be compared with the 0.30 rem that the average person in the United States receives annually from natural background radiation. Worldwide annual exposures to natural radiation are generally expected to be in the range of 0.1 rem to 1.0 rem, with 0.24 rem [Ref. 12] being the current average worldwide value.

This annual report is useful in evaluating trends in occupational radiation exposure to assess the effectiveness of licensees' radiation protection programs to maintain exposures as low as reasonably achievable (ALARA). For example, the NRC staff uses the data presented in this report as one of the metrics of the NRC Reactor Oversight Program to evaluate the effectiveness of licensees' ALARA programs.

ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
BWR	boiling water reactor
CDE	committed dose equivalent
CEDE	committed effective dose equivalent
CFR	Code of Federal Regulations
D&D	decontamination and decommissioning
DDE	deep dose equivalent
DOE	U. S. Department of Energy
ERDA	Energy Research and Development Administration
ISFSI	independent spent fuel storage installation
LDE	lens dose equivalent
LWR	light water reactor
M&D	manufacturing and distribution
mSv	millisievert
MWe	megawatts electric
MW-yr	megawatt-year
ND	not detectable
NR	not required to be reported
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
PSE	planned special exposures
PWR	pressurized water reactor
REIRS	Radiation Exposure Information and Reporting System
RES	Office of Nuclear Regulatory Research
SDE-ME	shallow dose equivalent maximum extremity
SDE-WB	shallow dose equivalent whole body
SI	international system of units
SR	collective dose ratio
Sv	sieverts
TEDE	total effective dose equivalent
TMI	Three Mile Island
TODE	total organ dose equivalent
UF_6	uranium hexafluoride
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
USEC	United States Enrichment Corporation

Section 1
INTRODUCTION

1.1 BACKGROUND

One of the basic purposes of the Atomic Energy Act and the implementing regulations in Title 10, Code of Federal Regulations (CFR), 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 20 are met is a requirement that licensees provide individuals likely to be exposed to radiation with devices to monitor their exposures. 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 10 CFR 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[3] 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 AEC Radiation Exposure Information and Reporting System (REIRS), a computer system that was maintained at the Oak Ridge National Laboratory Computer Technology Center in Oak Ridge, Tennessee, until May 1990. At that time, the data were transferred to a database management system and are now maintained at the Oak Ridge Institute for Science and Energy, which is managed by Oak Ridge Associated Universities. The computerization of these data ensures that they are kept indefinitely and facilitates 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 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 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 U.S. Department of Energy (DOE), is collected and published by the DOE Office of Corporate Safety Analysis, a division of Health, Safety and Security, in Germantown, Maryland.

[3]Commercial nuclear power reactors; industrial radiographers; fuel processors (including uranium enrichment facilities as of 1997), fabricators, and reprocessors; and manufacturing and distribution of specified quantities of byproduct material.

In 1982 and 1983, Paragraph 20.408(a) of 10 CFR 20 was amended to require three additional categories of NRC licensees to submit annual statistical exposure reports and individual termination exposure reports. The three additional NRC licensee categories were: (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. This document presents the exposure information that was reported by NRC licensees representing two of these categories; there are no geologic repositories for high-level waste currently licensed.

This report and each of the predecessors summarize information reported for both the current year and previous years. More licensee-specific data for previous years, such as the annual reports submitted by each commercial power reactor pursuant to 10 CFR 20.407 and 20.2206 (after 1993) and their technical specifications (prior to Volume 20 of this report), may be found in the documents listed on the inside of the front cover of this report for the specific year desired. Additional operating data and statistics for each commercial 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, as well as on the NRC public Web site (www.nrc.gov), or they may be purchased from the National Technical Information Service, as shown in the References section.

In May 1991, 10 CFR 20 Standards for Protection Against Radiation; Final Rule was revised. The revision redefined the radiation monitoring and reporting requirements of NRC licensees. Instead of submitting summary annual reports (§20.407) and termination reports (§20.408), licensees are now required to submit an annual report of the dose received by each monitored worker (§20.2206). Licensees were required to implement the new requirements no later than January 1994.

1.2 RADIATION EXPOSURE INFORMATION ON THE INTERNET

In May 1995, NRC began pursuing the dissemination of radiation exposure information via a Web site on the Internet. This site allows interested parties with the appropriate equipment to access the data electronically rather than through the published NUREG-0713 document. A Web site was created for radiation exposure and linked into the main NRC Web page. The Web site contains up-to-date information on radiation exposure, as well as information and guidance on reporting radiation exposure information to NRC. Interested parties may read the documents online or download information to their systems for further analysis. Software, such as the Radiation Exposure Monitoring and Information Transmittal System, a software application designed to maintain licensee dose records, and REIRView, a software package designed to validate a licensee's annual data submittal, are also available for downloading via the Web site. There are also links to other Web sites dealing with the topics of radiation and health physics. Individuals and organizations may also submit requests for dose records contained in REIRS on this Web site.

NRC intends to continue pursuing the dissemination of radiation exposure information via the Web and will focus more resources on the electronic distribution of information rather than the publication of hard-copy reports.

The main Web address for NRC is

http://www.nrc.gov

The NRC radiation exposure information Web URL is

http://www.reirs.com

Comments on this report or the NRC's radiation exposure Web page should be directed to

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Section 2
LIMITATIONS OF THE DATA

All of the figures compiled in this report relating to exposures and occupational 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 exposure incident to individuals' work and is used in evaluating the radiation protection program.

Monitoring requirements are specified in 10 CFR 20.1502, which requires licensees to monitor individuals who receive or are likely to receive a dose in a year in excess of 10% of the applicable limits. For most adults, the annual limit for the whole body is 5 rem, so 0.5 rem per year is the level above which monitoring is required. Separate dose limits have been established for minors and declared pregnant workers. Monitoring is also required for any individual entering a high or very high radiation area. Depending on the administrative policy of each licensee, persons such as visitors and clerical workers may also be provided with monitoring devices, even though the probability of their exposure to measurable levels of radiation is extremely small. Licensees must report the dose records of those individuals for whom monitoring is required. Many licensees elect to report the doses for every individual for whom they provided monitoring. This practice increases the number of individuals that are considered to be radiation workers.

In an effort to account for this increase, the number of individuals reported as having "no measurable dose"[4] 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.

The average dose per individual, as well as the dose distributions shown for groups of licensees, also can be affected by the multiple reporting of individuals who were monitored by two or more licensees during the year. Licensees are only required to report the doses received by individuals at their licensed facilities. A dose distribution for a single licensee does not consider that some of the individuals may have received doses at other facilities. When the data are summed to determine the total number of individuals monitored by a group of licensees, individuals may be counted more than once if they have worked at more than one facility during the calendar year. These occurrences can also affect the distribution of doses because individuals may be counted multiple times in the lower dose ranges rather than one time in the higher range corresponding to the actual accumulated dose for the year (the sum of an individual's dose accrued at all facilities). This source of error has the greatest potential impact on the data reported by nuclear power reactors since they employ many short-term workers. Section 5 contains an analysis that corrects for individuals being counted more than once.

When examining the annual statistical data it is important to note that all of the personnel included in the report may not have been

[4] The number of workers with measurable dose includes any individual with a total effective dose equivalent greater than zero rem. Workers reported with zero dose, or no detectable dose, are included in the number of workers with no measurable exposure.

monitored throughout the entire year. Many licensees, such as radiography firms and nuclear power reactors, 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 involved in that activity for the full year would receive.

Considerable attention should be given when referencing the collective totals presented in this report. The differences between the totals presented for all licensees that reported versus only those licensees that are required to report should be noted. Likewise, one should distinguish between the doses attributed to the pressurized water reactors (PWRs) and the doses attributed to boiling water reactors (BWRs). The totals may be inclusive or exclusive of those licensees that were in commercial operation for less than one full year. These parameters vary throughout the tables and appendices of this report. The apparent discrepancies among the various tables are a necessary side effect of this endeavor.

The data contained in this report are subject to change because licensees may submit corrections or additions to data for previous years. For the 2008 report, data for prior years may have been updated to account for these corrections and additions. Users should be aware of these changes, which are italicized for easy identification.

This report contains information reported by NRC licensees and some Agreement State[5] licensees. Since NRC licenses all commercial nuclear power reactors, fuel processors and fabricators, and independent spent fuel storage installations, information shown for these categories reflect all relevant activity in the United States. 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. Many companies that conduct these types of activities are located in Agreement States. More than three times as many facilities are regulated by Agreement States than are licensed by NRC. Agreement States are not required to adopt the reporting requirements in 10 CFR 20.2206. As a result, Agreement State licensees are not required to submit occupational dose reports to the NRC. Although some Agreement State licensees voluntarily submit occupational dose reports to NRC, these results are not included in the analyses presented in Sections 3, 5, and 6 of this report. The data are, however, included in Appendix A for completeness. In addition, this report does not include compilations of nonoccupational exposure, such as exposure received by medical patients from X-rays, fluoroscopy, or accelerators.

All dose equivalent values in this report are given in units of rem in accordance with the general provisions for records, 10 CFR 20.2101(a). In order to convert rem into the International System of Units (SI) unit of sieverts (Sv), readers should divide the value in rem by 100. Therefore, 1 rem = 0.01 Sv. In order to convert rem into millisieverts (mSv), readers should multiply the value in rem by 10.

[5]Agreement States are States that have entered into formal agreement with NRC under which the State regulates the use of certain byproduct, source, and small quantities of special nuclear material in that State. In 2008, there were 35 Agreement States.

Section 3

ANNUAL PERSONNEL MONITORING REPORTS – 10 CFR 20.2206

3.1 DEFINITION OF TERMS AND SOURCES OF DATA

3.1.1 Statistical Summary Reports

The total effective dose equivalent (TEDE) is summed per individual and tabulated into the appropriate dose range to generate the dose distribution for each licensee. The total collective dose is more accurate using this method, because the licensee reported the dose to each individual and the total collective dose was calculated from the sum of these doses and not statistically derived from the dose distribution (see Section 3.1.4). The TEDE includes the dose contribution from the committed effective dose equivalent (CEDE) for those workers who had intakes that required monitoring and reporting of internal dose.

3.1.2 Number of Monitored Workers

The number of monitored workers refers to the total number of workers that the NRC licensees (who are covered by 10 CFR 20.1502) reported as being monitored for exposure to external and internal radiation during the year. This number includes all workers for whom monitoring is required and may include visitors, service representatives, contract workers, clerical workers, and any other workers for whom the licensee determines that monitoring devices should be provided.

For licensees submitting under 10 CFR 20.2206, the total number of workers was determined from the number of unique personal identification numbers submitted per licensee. Uniqueness is defined by the combination of identification number and identification type [Ref. 10].

3.1.3 Number of Workers with Measurable Dose

The number of workers with measurable dose includes any individual with a TEDE greater than zero rem. This does not include workers with a TEDE reported as zero, not detectable (ND), or not required to be reported (NR) [Ref. 10].

3.1.4 Collective Dose

The concept of collective dose is used in this report to denote the summation of the TEDE received by all monitored workers and is reported in units of person-rem. Since 10 CFR 20.2206 requires that the TEDE be reported, the collective dose is calculated by summing the TEDE for all monitored workers. The phrase “collective dose” is used throughout this report to mean the collective TEDE, unless otherwise specified.

It should be noted that, prior to the implementation of the revised dose reporting requirements of 10 CFR 20.2206 in 1994, the collective dose was, in some cases, calculated from the dose distributions by summing the products obtained from multiplying the number of workers reported in each of the dose ranges by the midpoint of the corresponding dose range. This assumes that the midpoint of the range is equal to the arithmetic mean of the individual doses in the range. Experience has shown that the actual mean dose of workers reported in each dose range is less than the midpoint of the range. For this reason, the resultant calculated collective doses shown in this report for these licensees may be approximately 10% higher than the sum of the

actual individual doses. Care should be taken when comparing the actual collective dose calculated for 1994 to 2008 with the collective dose for years prior to 1994 because of this change in methodology. In addition, prior to 1994, doses only included the external whole-body dose with no internal dose contribution. Although the contribution of internal dose to the TEDE is minimal for most licensees, it should be considered when comparing collective doses for 1994 and later with the collective dose for years prior to 1994. One noted exception is for fuel fabrication licensees where the CEDE, in some cases, contributes the majority of the TEDE (see Section 3.3.5).

3.1.5 Average Individual Dose

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

3.1.6 Average Measurable Dose

The average measurable dose is obtained by dividing the collective TEDE by the number of workers who 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 deletes those workers receiving zero or no detectable dose, many of whom were monitored for convenience or identification purposes.

3.1.7 Number of Licensees Reporting

The number of licensees refers to the NRC licenses issued to use radioactive material for certain activities that would place the licensees in one of the seven[5] categories that are required to report pursuant to 10 CFR 20.2206. The third column in Table 3.1 shows the number of licensees that have filed such reports during the last 11 years. All nuclear power plants, fuel processors and fabricators, and independent spent fuel storage installations are required to report occupational exposure to NRC, whether or not they are in an Agreement State. The other types of Agreement State licensees are not required to submit exposure reports to NRC.

3.1.8 Collective TEDE Distribution by Dose Range

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000 report, entitled Sources and Effects of Ionizing Radiation, United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly, Volume I [Ref. 11], recommends the calculation of a parameter, SR (collective distribution ratio), to aid in the examination of the distribution of radiation exposure among workers. SR is defined as the ratio of the annual collective dose incurred by workers whose annual doses exceed a certain dose level to the total annual collective dose. UNSCEAR uses a subscript to denote the specific dose level in millisieverts. Therefore, SR_{15} is the notation for the collective dose for individuals who received 15 mSv (1.5 rem) or more in the year, divided by the total annual collective dose. The UNSCEAR 2000

[6]These categories are commercial nuclear power reactors; industrial radiographers; fuel processors (including uranium enrichment facilities), fabricators, and reprocessors; manufacturing and distribution of byproduct material; independent spent fuel storage installations; facilities for land disposal of low-level waste; and geologic repositories for high-level waste. There are currently no NRC licensees involved in low-level waste disposal or geologic repositories for high-level waste.

TABLE 3.1
Average Annual Exposure Data for Certain Categories of NRC Licensees 1998–2008

NRC License Category* and Program Code	Calendar Year	Number of Licensees Reporting	Number of Monitored Individuals	Number of Workers with Measurable TEDE	Collective TEDE (person-rem)	Average TEDE (rem)	Average Measurable TEDE per Worker (rem)
Industrial Radiography **03310** **03320**	1998	141	4,940	3,439	1,858.775	0.38	0.54
	1999	131	3,557	2,689	1,548.110	0.44	0.58
	2000	128	3,157	2,454	1,525.143	0.48	0.62
	2001	123	3,560	3,040	2,106.213	0.59	0.69
	2002	100	3,420	2,842	1,729.222	0.51	0.61
	2003	118	3,115	2,651	1,584.249	0.51	0.60
	2004	113	3,568	3,014	1,603.591	0.45	0.53
	2005	90	3,009	2,623	1,504.575	0.50	0.57
	2006	78	2,388	1,981	1,109.347	0.46	0.56
	2007	74	2,607	2,224	1,315.171	0.50	0.59
	2008	61	2,967	2,587	1,460.757	0.49	0.56
Manufacturing and Distribution **02500** **03211** **03212** **03214**	1998	28	1,922	644	401.356	0.21	0.62
	1999	40	2,205	836	418.993	0.19	0.50
	2000	39	2,460	1,187	415.402	0.17	0.35
	2001	35	1,705	1,184	344.743	0.20	0.29
	2002	29	1,437	1,052	328.092	0.23	0.31
	2003	33	2,372	1,796	436.660	0.18	0.24
	2004	28	2,539	1,787	347.258	0.14	0.19
	2005	23	2,566	1,557	388.547	0.15	0.25
	2006	23	1,391	903	284.556	0.20	0.32
	2007	23	2,106	1,463	291.326	0.14	0.20
	2008	18	1,934	1,341	222.123	0.11	0.17
Independent Spent Fuel Storage **23100** **23200**	1998	1	53	21	2.561	0.05	0.12
	1999	2	86	33	5.172	0.06	0.16
	2000	2	146	83	5.571	0.04	0.07
	2001	2	154	107	13.088	0.08	0.12
	2002	2	75	67	6.013	0.08	0.09
	2003	2	55	46	2.791	0.05	0.06
	2004	1	37	27	1.257	0.03	0.05
	2005	2	59	30	0.769	0.01	0.03
	2006	2	59	26	2.108	0.04	0.08
	2007	2	57	26	1.697	0.03	0.07
	2008	2	53	21	1.248	0.02	0.05
Fuel Cycle Licenses – Fabrication Processing and Uranium Enrich. **21200** **21210**	1998	10	10,684	3,613	949.865	0.09	0.26
	1999	10	9,773	3,935	1,020.333	0.10	0.26
	2000	9	9,336	4,649	1,339.398	0.14	0.29
	2001	9	8,145	3,980	1,162.262	0.14	0.29
	2002	8	7,937	3,886	660.899	0.08	0.17
	2003	8	7,738	3,633	556.297	0.07	0.15
	2004	8	7,562	3,813	513.929	0.07	0.13
	2005	9	7,695	3,370	496.502	0.06	0.15
	2006	9	7,417	3,415	521.525	0.07	0.15
	2007	9	7,536	3,225	428.717	0.06	0.13
	2008	9	7,184	2,770	420.898	0.06	0.15
Commercial Light Water Reactors (LWRs)** **41111**	1998	104	114,367	57,466	13,187.392	0.12	0.23
	1999	104	113,916	59,031	13,665.711	0.12	0.23
	2000	104	110,557	57,233	12,651.682	0.11	0.22
	2001	104	104,928	52,292	11,108.552	0.11	0.21
	2002	104	107,900	54,460	12,126.190	0.11	0.22
	2003	104	109,990	55,967	11,955.570	0.11	0.21
	2004	104	110,290	52,873	10,367.897	0.09	0.20
	2005	104	114,344	57,566	11,455.807	0.10	0.20
	2006	104	116,354	58,788	11,021.186	0.09	0.19
	2007	104	114,583	57,267	10,120.013	0.09	0.18
	2008	104	118,692	57,356	9,195.940	0.08	0.16
Grand Totals and Averages	1998	284	131,966	65,183	16,399.949	0.12	0.25
	1999	287	129,537	66,524	16,658.319	0.13	0.25
	2000	282	125,656	65,606	15,937.196	0.13	0.24
	2001	273	118,492	60,603	14,734.858	0.12	0.24
	2002	243	120,769	62,307	14,850.416	0.12	0.24
	2003	265	123,270	64,093	14,535.567	0.12	0.23
	2004	254	123,996	61,514	12,833.932	0.10	0.21
	2005	228	127,673	65,146	13,846.200	0.11	0.21
	2006	216	127,609	65,113	12,938.722	0.10	0.20
	2007	212	126,889	64,205	12,156.924	0.10	0.19
	2008	194	130,830	64,075	11,300.966	0.09	0.18

* These categories consist only of NRC licensees. Agreement State licensed organizations are not required to report occupational exposure data to NRC.

** This category includes all LWRs in commercial operation for a full year for each of the years indicated. Reactor data have been corrected to account for the multiple counting of transient reactor workers (see Section 5).

report notes that the 1.5 rem dose level may not be useful where doses are consistently lower than this level, and UNSCEAR recommends that research organizations report SR values lower than 1.5 rem where appropriate. For this reason, NRC has adopted the policy of calculating and tracking the collective TEDE distribution by dose range at dose levels of 0.10, 0.25, 0.50, 1.0, and 2.0 rem. The collective TEDE distribution by dose range values in this report was calculated by summing the TEDE to each individual who received a TEDE greater than or equal to the specified dose range divided by the total collective TEDE. In addition, the distribution is presented as a percentage rather than as a decimal fraction.

Figures 3.2, 3.3, 3.5, 3.6, 3.8, 3.10, and 3.11 show the collective TEDE distribution by dose range calculated in terms of percentage of the collective dose delivered above the specified dose levels for each of the categories of NRC licensees. Two properties of these graphs help to further reveal the nature of the distribution of dose and dose trends at NRC licensees. The first is that the percentage of dose in the higher dose ranges (i.e., above 0.50 rem) should be relatively small. This would indicate that fewer workers are exposed at these higher levels of individual risk. The second property is the ability to track the shift in dose over time. For a given dose value, a reduction in the percentage from one year to the next indicates that less dose is being received by workers above this value. Therefore, these graphs can be useful in qualifying the dose received in a given year and the trends in doses from year to year.

3.2 ANNUAL TEDE DOSE DISTRIBUTIONS

Table 3.2 provides a statistical compilation of the occupational dose reports by categories of licensees (see Section 3.3 for a description of each licensee category). The dose distributions are generated by summing the TEDE for each individual and counting the number of individuals in each dose range. In nearly every licensee category, a large number of workers receive doses that are less than measurable, and very few doses exceed 4 rem. Ninety-two percent of the reported workers with measurable doses (shown in Table 3.2) were monitored by nuclear power facilities in 2008, where they received 82% of the total collective dose.

Under the regulatory limits in 10 CFR 20.1201, an annual TEDE greater than 5 rem, for an adult occupational worker, is a dose that exceeds the regulatory limits (see Section 6).

Table 3.3 gives a summary of the annual occupational dose records reported to NRC, as required by 10 CFR 20.2206, by certain categories of NRC licensees. Table 3.3 shows that for the past 11 years, the percentage of workers with <2 rem has been greater than 99%. The number of workers receiving an annual dose greater than 5 rem has been <0.01% since 1998. No individual monitored at any of the five NRC licensee categories included in this report received a dose above the 5 rem annual TEDE limit during the past 5 years (see Section 6).

TABLE 3.2
Distribution of Annual Collective TEDE by License Category
2008

License Category (Number of sites reporting)	Number of Individuals with TEDE in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective Dose (TEDE) (person-rem)
	No Meas.	Meas. <0.1	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	6.00-12.00	>12			
INDUSTRIAL RADIOGRAPHY																
Fixed Locations (3)	35	26												61	26	0.509
Temporary Job Sites (58)	345	667	429	452	298	229	371	93	20	2				2,906	2,561	1,460.248
Total (61)	**380**	**693**	**429**	**452**	**298**	**229**	**371**	**93**	**20**	**2**	**0**	**0**	**0**	**2,967**	**2,587**	**1,460.757**
MANUFACTURING AND DISTRIBUTION																
Type "A" Broad (2)	153	122	60	50	43	22	14	1						465	312	95.790
Type "B" Broad and Other (4)	91	91	15	7	1	0	0	0	0					205	114	8.421
Nuclear Pharmacies (12)	349	680	149	43	17	4	10	5	6	1				1,264	915	117.912
Total (18)	**593**	**893**	**224**	**100**	**61**	**26**	**24**	**6**	**6**	**1**	**0**	**0**	**0**	**1,934**	**1,341**	**222.123**
INDEPENDENT SPENT FUEL STORAGE																
Total (2)	**32**	**17**	**3**	**1**										**53**	**21**	**1.248**
FUEL CYCLE**																
Total (9)	**4,414**	**1,515**	**648**	**416**	**164**	**24**	**3**							**7,184**	**2,770**	**420.898**
COMMERCIAL POWER REACTORS***																
Boiling Water (35)	27,150	21,809	7,276	3,841	1,098	392	221	5						61,792	34,642	4,522.413
Pressurized Water (69)	62,724	30,022	10,061	3,737	749	191	48							107,532	44,808	4,673.527
Total (104)	**89,874**	**51,831**	**17,337**	**7,578**	**1,847**	**583**	**269**	**5**	**0**	**0**	**0**	**0**	**0**	**169,324**	**79,450**	**9,195.940**
GRAND TOTALS	**95,293**	**54,949**	**18,641**	**8,547**	**2,370**	**862**	**667**	**104**	**26**	**3**	**0**	**0**	**0**	**181,462**	**86,169**	**11,300.966**

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

** This category includes fabrication, processing, and uranium enrichment plants (see Section 3.3.5).

*** This category includes all reactors in commercial operation for a full year during 2008. Although Brown's Ferry 1 was placed on administrative hold in 1985, it remains in the count of operating reactors and has resumed operation as of June, 2007. These values have not been adjusted for the multiple counting of transient reactor workers (see Section 5).

TABLE 3.3
Summary of Annual Dose Distributions for Certain* NRC Licensees
1998–2008

Year	Total Number of Monitored Persons		Percent of Individuals with Doses <2 rem ***		Percent of Individuals with Doses <5 rem ***		Number of Individuals with Doses >12 rem ***
	Reported Number	Corrected Number **					
1998	166,127	132,069	99.6%	(489)	>99.99%	(6)	1
1999	166,084	129,117	99.6%	(534)	>99.99%	(1)	0
2000	163,073	125,026	99.5%	(573)	>99.99%	(3)	0
2001	154,717	118,150	99.4%	(734)	>99.99%	(1)	0
2002	162,381	119,694	99.5%	(582)	>99.99%	(1)	0
2003	165,941	122,213	99.7%	(419)	>99.99%	(1)	1
2004	164,017	122,975	99.7%	(368)	100%	(0)	0
2005	174,021	126,627	99.7%	(370)	100%	(0)	0
2006	176,071	126,726	99.8%	(258)	100%	(0)	0
2007	176,367	125,869	99.8%	(243)	100%	(0)	0
2008	181,368	129,796	99.9%	(167)	100%	(0)	0

* Licensees required to submit radiation exposure reports to the NRC under 10 CFR 20.2206.

** This column lists the actual number of persons who may have been counted more than once because they worked at more than one facility during the calendar year (see Section 5).

*** Data for 1998–2008 are based on the distribution of individual doses after adjusting for the multiple counting of transient workers (see Section 5). The number of people exceeding both 2 and 5 rem are shown in parentheses from 1998–2008.

3.3 SUMMARY OF OCCUPATIONAL DOSE DATA BY LICENSE CATEGORY

3.3.1 Industrial Radiography Licenses, Fixed Locations and Temporary Job Sites

Industrial radiography 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, aircraft 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 designed and shielded for radiography; others perform radiography at temporary job 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 61 radiography licensees in 2008. Table 3.4 summarizes the reported data for the two types of industrial radiography licenses for 2008 and for the previous 2 years for comparison purposes.

The average measurable dose for workers performing radiography at a fixed location ranged from 5% to 10% of the average measurable dose of workers at temporary job sites over the past 3 years. This is because it is more difficult for workers to avoid exposure to radiation at temporary job sites in the field, where conditions are not optimal and may change daily. To view the contribution that each radiography licensee made to the total collective dose, see Appendix A which presents a summary of the information reported by each of these licensees in 2008.

High exposures in radiography can be directly attributable to the type and location of the radiography field work. For example, locations such as oil drilling platforms and aerial tanks offer the radiographer little available shielding. In these situations, there may not be an opportunity to use distance as a means of minimizing exposure and achieving doses that are as low as is reasonably achievable (ALARA). Although these licensed activities

TABLE 3.4
Annual Exposure Information for Industrial Radiographers
2006–2008

Year	Type of License	Number of Licensees	Number of Monitored Individuals	Workers with Measurable Dose	Collective Dose (person-rem)	Average Measurable Dose (rem)
2006	Fixed Location	8	122	22	0.784	0.04
	Temporary Job Sites	70	2,266	1,959	1,108.563	0.57
	Total	**78**	**2,388**	**1,981**	**1,109.347**	**0.56**
2007	Fixed Location	5	59	20	0.623	0.03
	Temporary Job Sites	69	2,548	2,204	1,314.548	0.60
	Total	**74**	**2,607**	**2,224**	**1,315.171**	**0.59**
2008	Fixed Location	3	61	26	0.509	0.02
	Temporary Job Sites	58	2,906	2,561	1,460.248	0.57
	Total	**61**	**2,967**	**2,587**	**1,460.757**	**0.56**

usually result in average measurable doses that are higher than those received by other licensees, they involve a relatively small number of exposed workers.

Figure 3.1 shows the number of workers with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose per worker for both types of industrial radiography licensees from 1973 through 2008. While the number of workers with measurable TEDE per licensee increased from 2007 to 2008, the collective TEDE also increased, resulting in the average measurable TEDE remaining nearly the same for the past 3 years.

Figures 3.2 and 3.3 show the collective dose distribution by dose range (see Section 3.1.8) for fixed location and temporary job site radiography licensees. These graphs demonstrate that temporary job site licensees consistently have individuals receiving doses in the higher dose ranges and routinely have 20% to 30% of the collective dose delivered to individuals above 2 rem. It should be noted that the 2006 distribution for fixed location radiographers in Figure 3.2 has been adjusted due to a change in status for a radiographer who was initially identified as a fixed location radiographer and who was later determined to be a temporary job site radiographer.

3.3.2 Manufacturing and Distribution Licenses, Type "A" Broad, Type "B" Broad, Other, and Nuclear Pharmacies

Manufacturing and distribution (M&D) 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 organizations/companies specifically licensed by NRC or an Agreement State. Type "A" Broad licenses are issued to larger organizations that may use many different radionuclides in many different ways and that have a comprehensive radiation protection program. Some Type "A" Broad license 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. Type "B" Broad and Other licenses are usually issued to smaller firms requiring a more restrictive license. These 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. Nuclear pharmacies are involved in the compounding and dispensing of radioactive materials for use in nuclear medicine procedures.

Table 3.5 presents the annual data that were reported by the three types of licensees for 2008 and the previous 2 years. Looking at the information shown separately for the Type

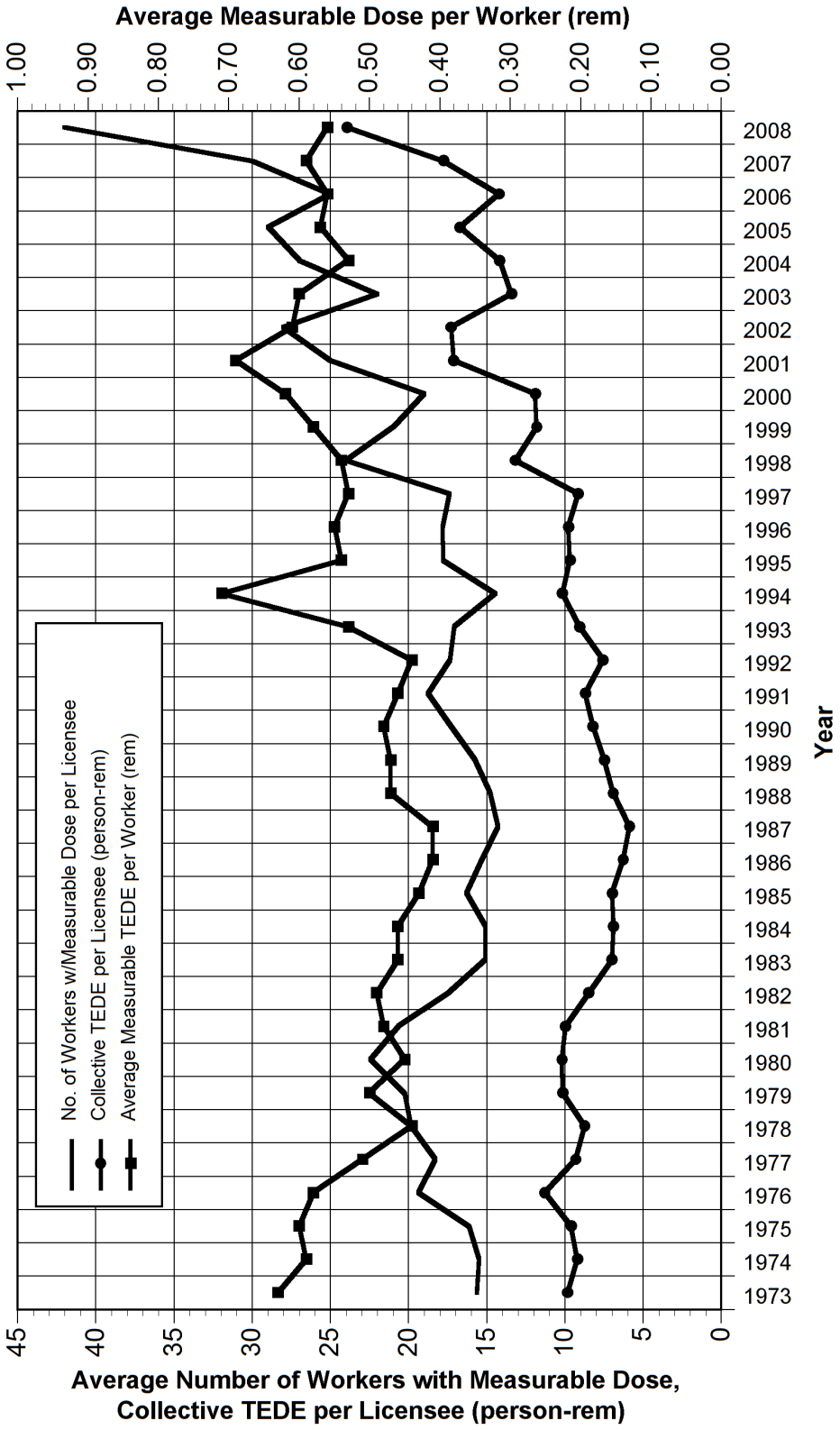

FIGURE 3.1. Average Annual Values for Industrial Radiography Licensees 1973–2008

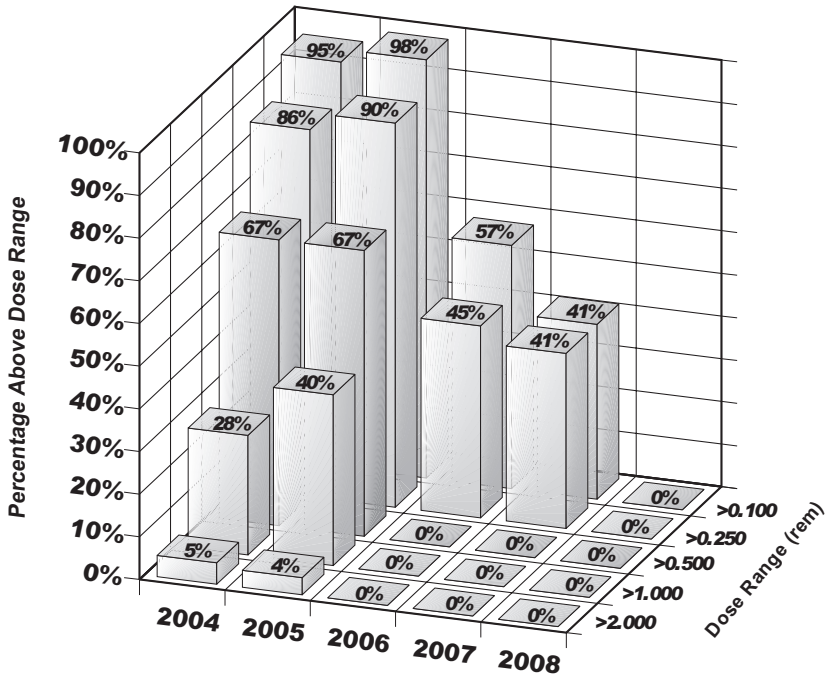

FIGURE 3.2. Collective TEDE Distribution by Dose Range
Industrial Radiographer—Fixed Location Licensees
2004–2008

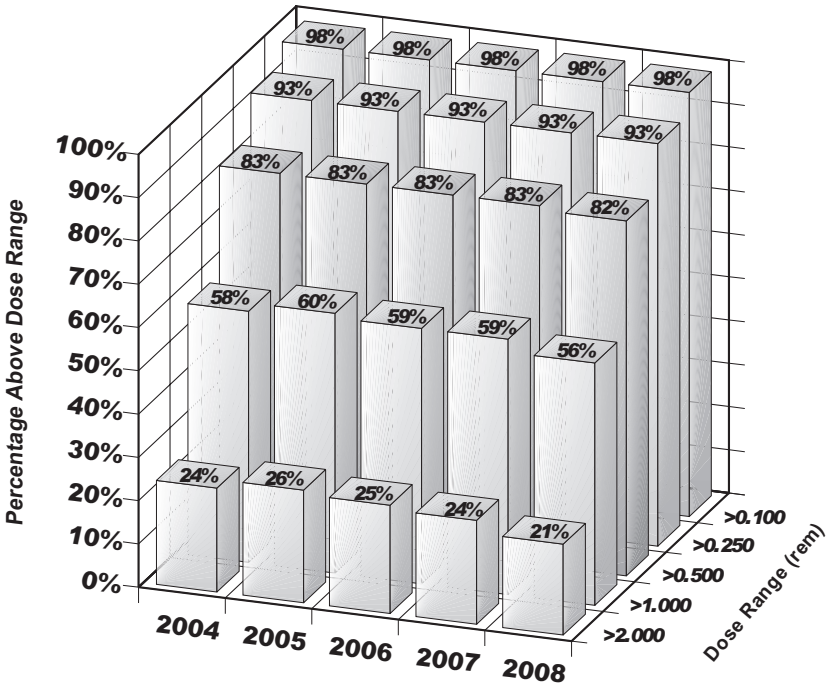

FIGURE 3.3. Collective TEDE Distribution by Dose Range
Industrial Radiographer—Temporary Job Site Licensees
2004–2008

"A" Broad licensees, it can be seen that the average measurable dose generally remains higher for the Type "A" Broad licensees. Only two Type "A" Broad licensees reported in 2008.

Figure 3.4 shows the number of workers with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose per worker for Type "A" Broad, Type "B" Broad, Other, and Nuclear Pharmacy licensees. The number of workers with measurable dose per licensee increased and the collective TEDE per licensee decreased slightly in 2008. The average measurable dose decreased by 15% to 0.17 rem. The figures for Type "A" Broad licensees are primarily attributed to Mallinckrodt, Inc., which accounted for 86% of the collective dose, in 2008, for this licensee category.

Figure 3.5 shows the collective dose distribution by dose range (see Section 3.1.8) for Type "A" Broad licensees and Figure 3.6 shows the collective dose distribution by dose range for Type "B" Broad, Other, and Nuclear Pharmacy licensees. These graphs show that, for 2005 through 2008, the Type "B" Broad, Other, and Nuclear Pharmacy manufacturing and distribution licensees have more individuals receiving dose in the higher dose ranges.

For Type "A" Broad licensees, the decrease in values for 2005 through 2008 has been due to one licensee decreasing its collective TEDE by 45% from the 2007 value and accounted for 49% of the collective dose in this licensee category in 2008. Appendix A lists the contribution that each of these licensees made toward the total values of the number of workers monitored, number of workers, and collective dose for 2008.

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TABLE 3.5
Annual Exposure Information for Manufacturing and Distribution
2006–2008

Year	Type of Manufacturing and Distribution	Number of Licensees	Number of Monitored Individuals	Workers with Measurable Dose	Collective Dose (person-rem)	Average Measurable Dose (rem)
2006	Type "A" Broad	2	501	363	153.846	0.42
	Type "B" Broad and Other	4	245	161	15.291	0.09
	Nuclear Pharmacies	17	645	379	115.419	0.30
	Total	**23**	**1,391**	**903**	**284.556**	**0.32**
2007	Type "A" Broad	2	504	352	113.354	0.32
	Type "B" Broad and Other	3	83	58	5.447	0.09
	Nuclear Pharmacies	18	1,519	1,053	172.525	0.16
	Total	**23**	**2,106**	**1,463**	**291.326**	**0.20**
2008	Type "A" Broad	2	465	312	95.790	0.31
	Type "B" Broad and Other	4	205	114	8.421	0.07
	Nuclear Pharmacies	12	1,264	915	117.912	0.13
	Total	**18**	**1,934**	**1,341**	**222.123**	**0.17**

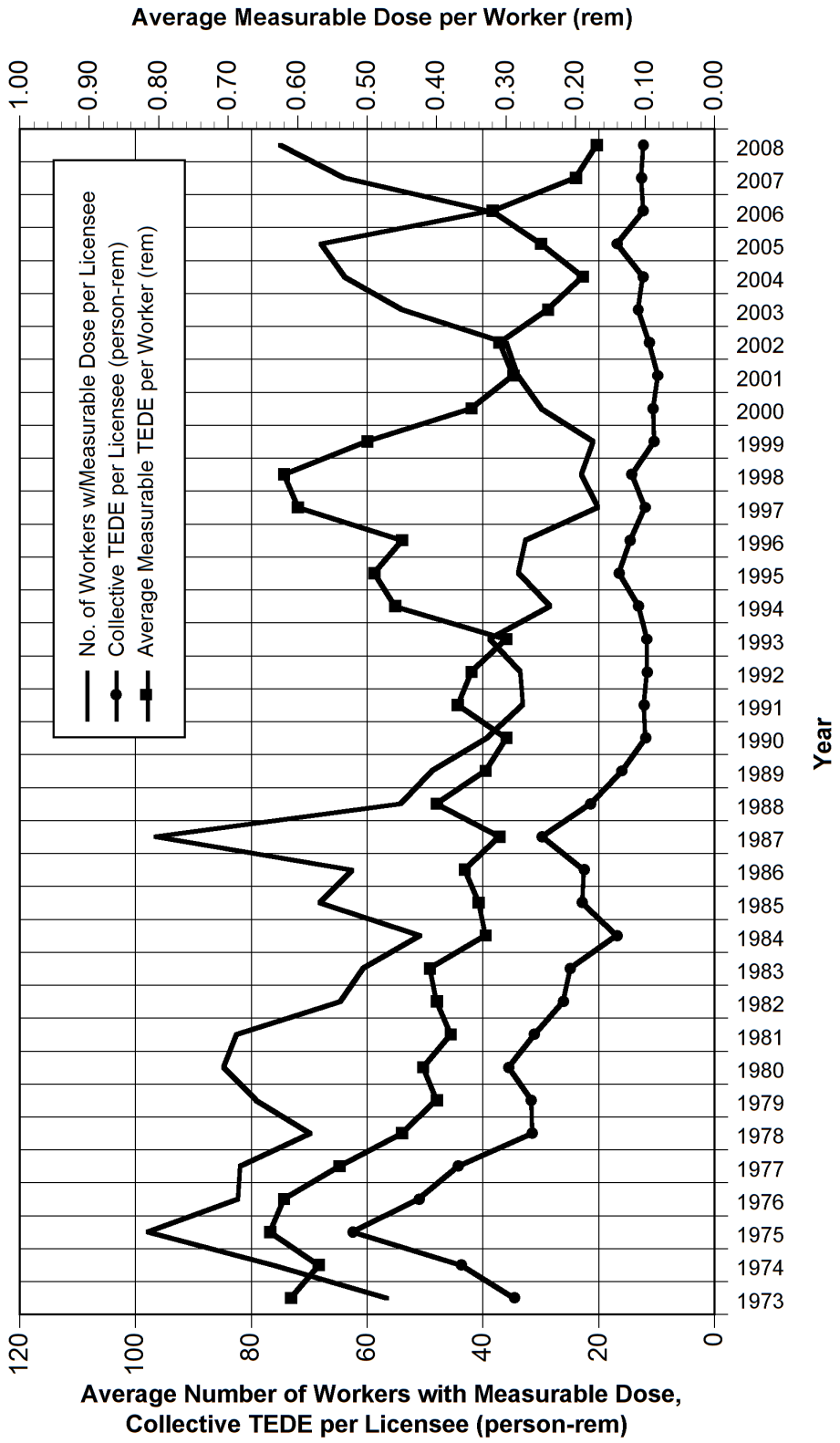


FIGURE 3.4. Average Annual Values for Manufacturing and Distribution Licensees 1973–2008

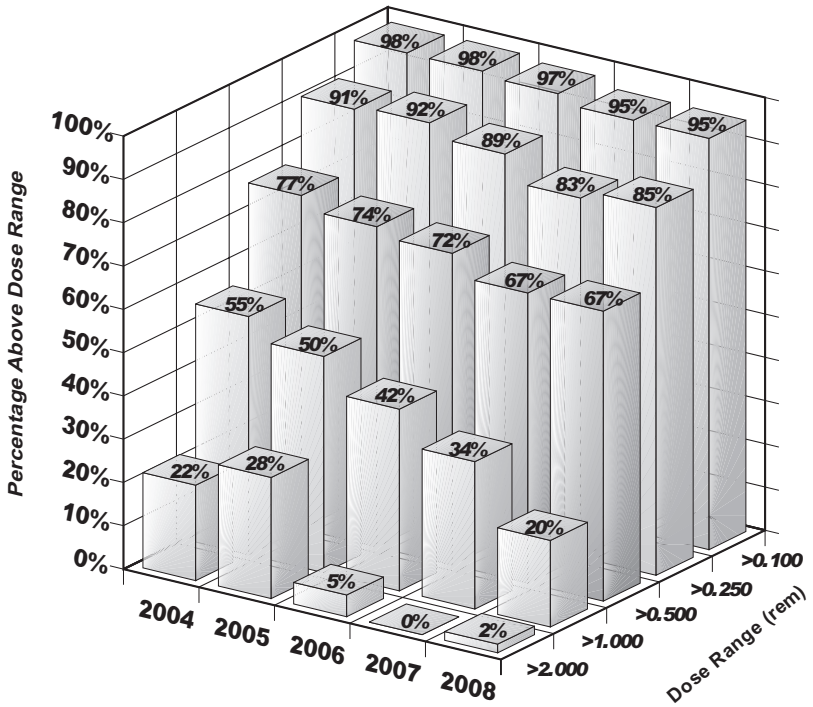


FIGURE 3.5. Collective TEDE Distribution by Dose Range
Type “A” Broad Manufacturing and Distribution Licensees
2004–2008

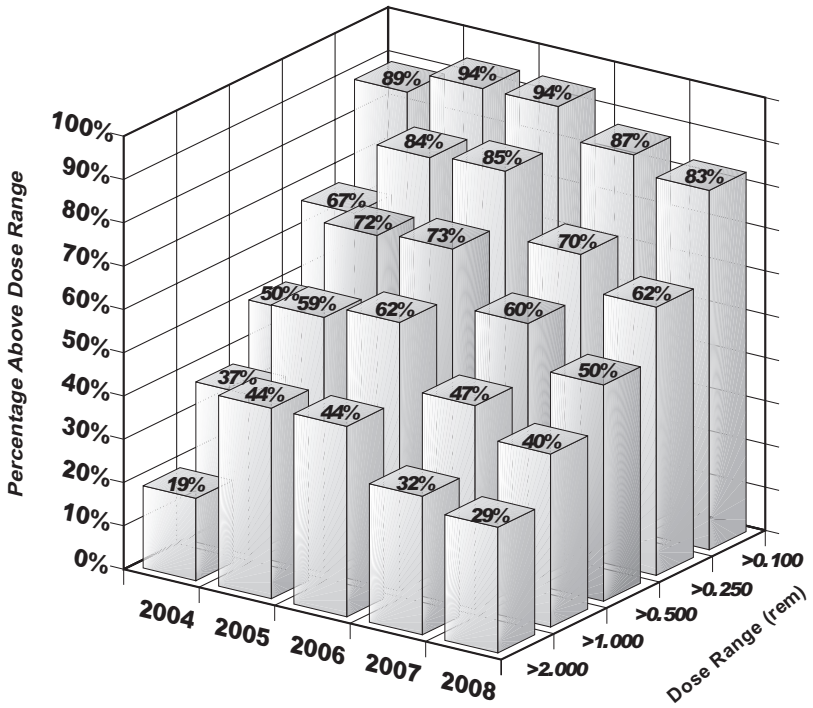


FIGURE 3.6. Collective TEDE Distribution by Dose Range
Type "B" Broad, Other, and Nuclear Pharmacy Licensees
2004–2008

3.3.3 Low-Level Waste Disposal Licenses

Low-level waste disposal 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, which have primary regulatory authority over the licensees' activities. Since 1999, all licensees that have conducted these activities have been located in Agreement States; therefore, there are no NRC low-level waste licensees reporting radiation exposure data to REIRS.

3.3.4 Independent Spent Fuel Storage Installation Licenses

Independent spent fuel storage installation (ISFSI) 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 ISFSI. Here, the spent fuel, which has undergone at least 1 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.

The majority of ISFSI facilities are located onsite at commercial power reactors. Since the doses from these ISFSI facilities are usually included with the doses reported by the power reactors, the doses from these ISFSI facilities are not reported separately to NRC. The doses from the two ISFSI licensees that are not associated with power reactors are reported here for 2008. One is the GE Morris facility located in Illinois, and the second is the Trojan ISFSI. The Trojan nuclear power plant is no longer in commercial operation and has been decommissioned. However, the ISFSI facility at Trojan remains in operation and the occupational dose information is reported to NRC under the ISFSI license. Appendix A summarizes the occupational dose information reported by these licensees.

Figure 3.7 shows the number of workers with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose per worker for ISFSI facilities. The large increase in the collective dose per licensee and number of workers per licensee in 1994 was mainly because only one licensee reported separately for 1994 through 1998, rather than the two licensees that reported in prior years. The number of workers with measurable dose and collective TEDE per licensee have decreased between 2001 and 2008. Figure 3.8 shows the collective dose distribution by dose range (see Section 3.1.8) for ISFSI licensees from 2004 to 2008. In 2008, the percentages were similar to those of 2004 and 2007.

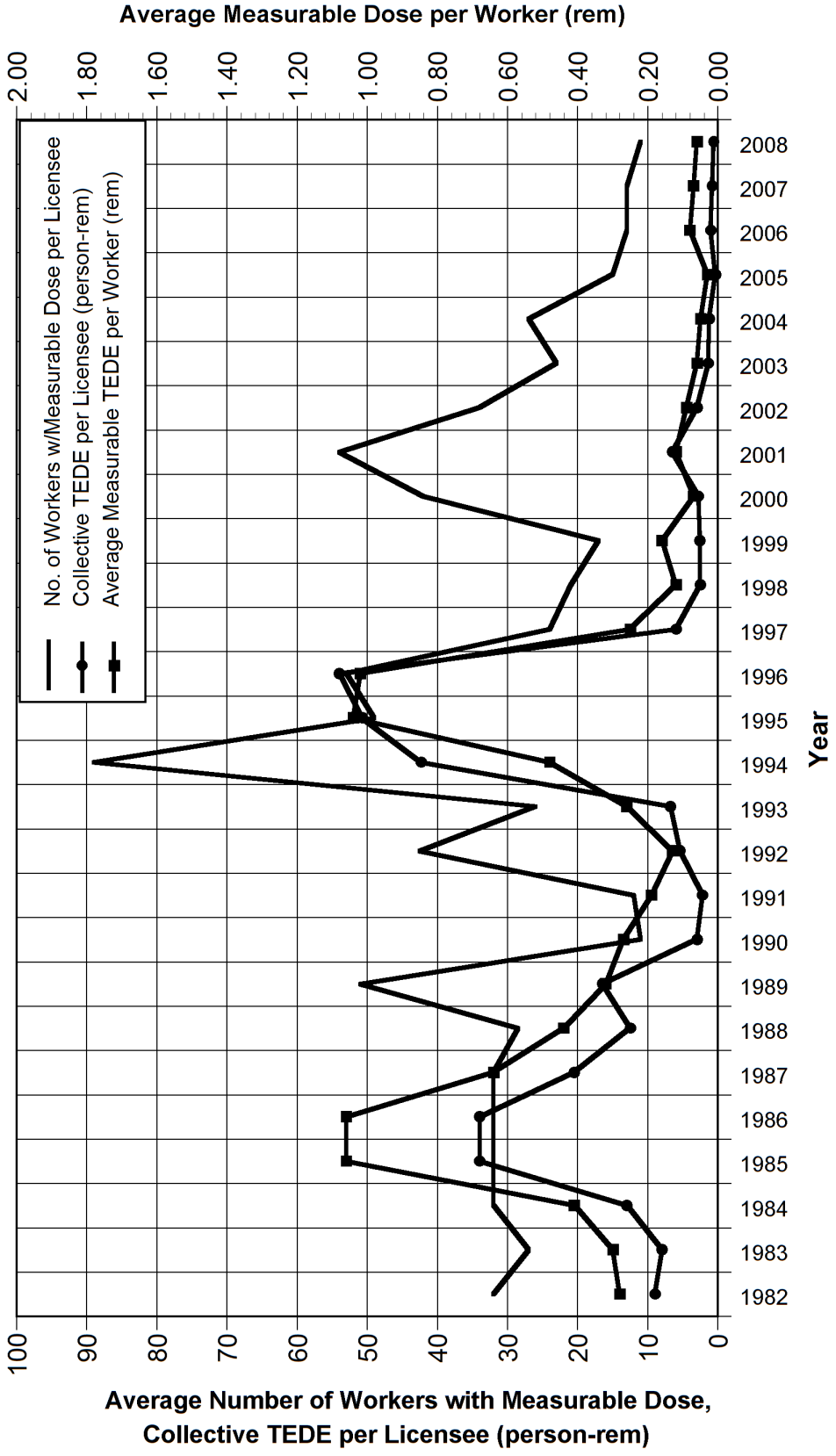


FIGURE 3.7. Average Annual Values for Independent Spent Fuel Storage Installations 1982–2008

3.3.5 Fuel Cycle Licenses

Fuel cycle licenses are issued to allow the processing, enrichment, and fabrication of reactor fuels. In most uranium facilities where light water reactor (LWR) fuels are fabricated, enriched uranium hexafluoride is converted to solid uranium dioxide pellets and inserted into zirconium alloy tubes. The tubes are fabricated into fuel assemblies that are shipped to nuclear power plants. Some facilities also perform chemical operations to recover the uranium from scrap and other off-specification materials prior to disposal of these materials. In 1997, the regulatory oversight for the uranium enrichment facilities at Portsmouth, Ohio and Paducah, Kentucky was transferred from DOE to NRC and were added to the NRC's fuel cycle license category. In 2005, a third uranium enrichment facility, the United States Enrichment Corporation (USEC), Inc., was also added to this category.

Figure 3.9 shows the number of workers with measurable dose per licensee, the total collective dose per licensee, and the average measurable dose per worker for fuel cycle licensees. In addition to the collective TEDE and average measurable dose, the deep dose equivalent (DDE) collective dose and DDE

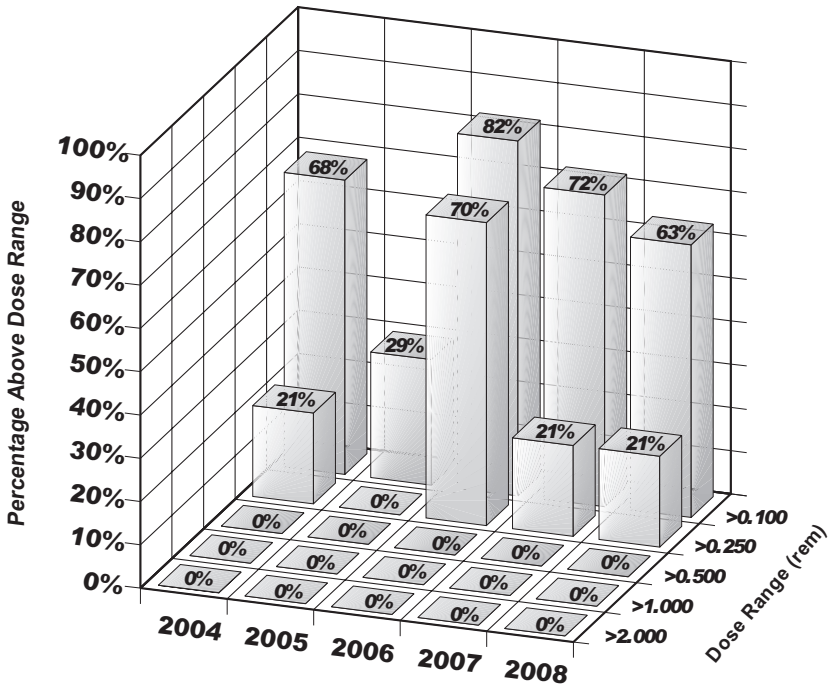


FIGURE 3.8. Collective TEDE Distribution by Dose Range Independent Spent Fuel Storage Installation Licensees 2004–2008

average measurable dose are also shown since the CEDE is a significant contribution to the TEDE for fuel fabrication facilities.

Figure 3.10 shows the collective dose distribution by dose range (see Section 3.1.8) for fuel cycle licensees from 2004 to 2008. From 2004 to 2005, the percentages remained fairly constant, and in 2006, there was an increase in the dose range above 1.00 rem. Although in 2007 there was a decrease in all dose ranges, in 2008 the dose increased in the dose ranges 0.100 rem to 0.250 rem and was attributable to Westinghouse Electric Co. at the Commercial Nuclear Fuel Division in South Carolina.

As shown in Table 3.6, the collective DDE decreased by 4%, while the collective CEDE increased by less than 1% in 2008.

Table 3.6 shows that there were nine licensed fuel cycle (fabrication and enrichment) facilities reporting in 2008. Appendix A lists each of the nine licensees with the number of workers monitored, the number of workers receiving measurable external doses, and the collective dose for each licensee.

3.3.6 Light Water Reactor Licenses

LWR licenses are issued to utilities to allow them to use special nuclear material in a reactor that produces heat to generate electricity to be sold to consumers. There are two major types of commercial LWRs in the United States, PWRs and BWRs, each of which uses water as the primary coolant.

Table 3.1 shows the number of licensees, number of monitored individuals, number of workers with measurable dose, total collective dose, and average dose per worker for reactor facilities that were in commercial operation for at least a full year for each of the years

TABLE 3.6
Annual Exposure Information for Fuel Cycle Licensees
2006–2008

Year	Type of License	Number of Licensees	Number of Monitored Individuals	Workers with Meas. TEDE	Collective TEDE (person-rem)	Average Meas. TEDE (rem)	Workers with Meas. DDE	Collective DDE (person-rem)	Average Meas. DDE (rem)	Workers with Meas. CEDE	Collective CEDE (person-rem)	Average Meas. CEDE (rem)
2006	Fuel Cycle	9	7,417	3,413	521.525	0.15	2,475	283	0.11	2,131	238.139	0.112
2007	Fuel Cycle	9	7,536	3,225	428.717	0.13	2,254	230	0.10	1,983	198.914	0.100
2008	Fuel Cycle	9	7,184	2,770	420.899	0.15	1,849	221	0.12	1,786	199.949	0.112

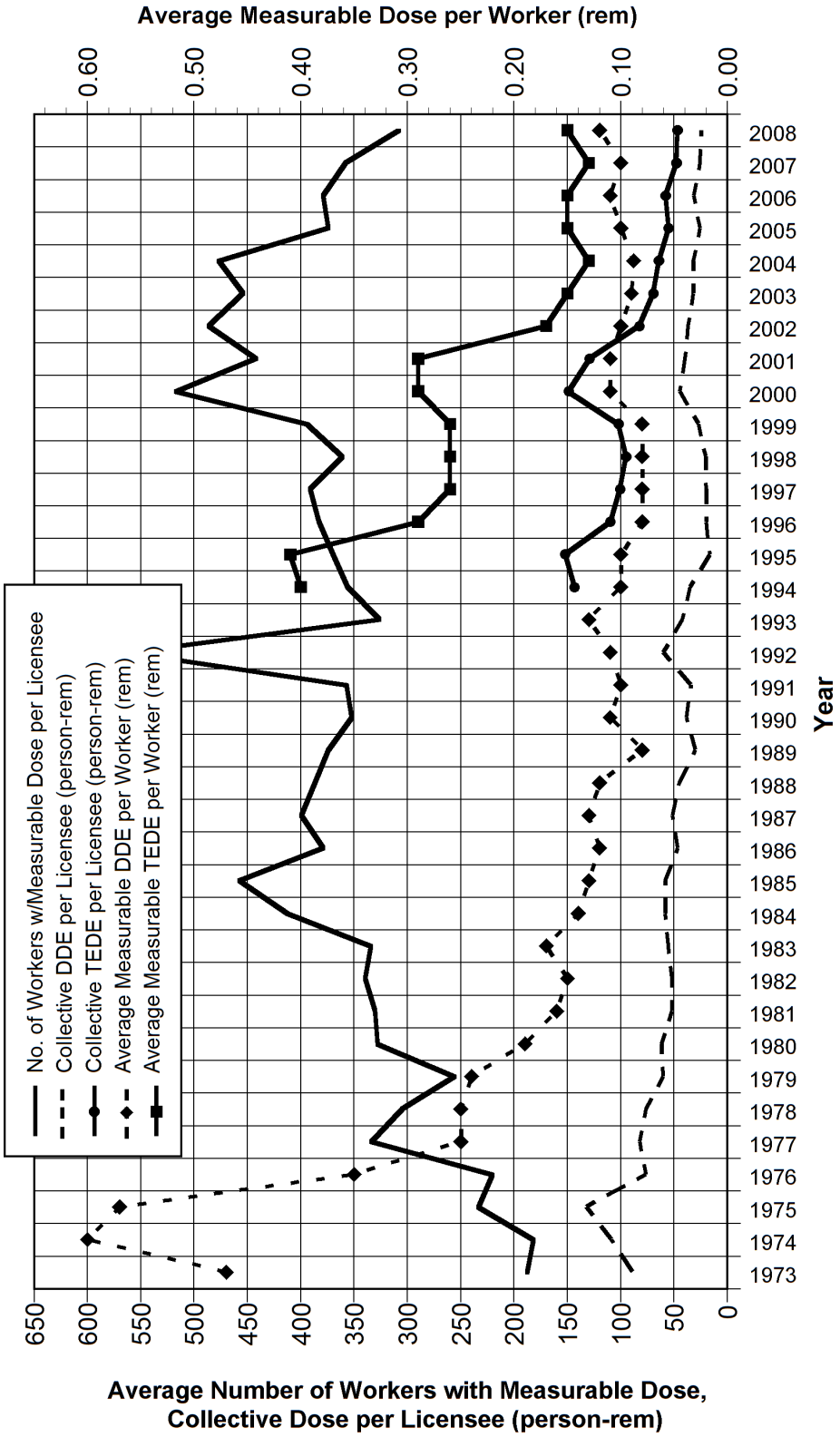


FIGURE 3.9. Average Annual Values for Fuel Cycle Licensees 1973–2008

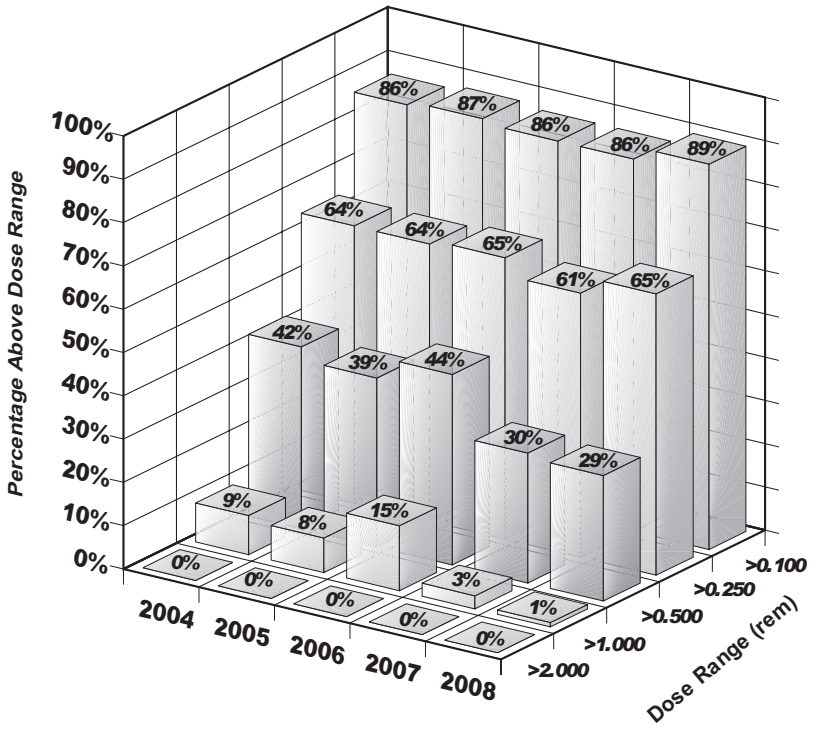


FIGURE 3.10. Collective TEDE Distribution by Dose Range
Fuel Cycle Licensees
2004–2008

1998 through 2008. The values do not include reactors that have been permanently shut down or reactors that have not been in commercial operation for a full year. The figures for reactors have been adjusted for the multiple counting of transient workers (see Section 5).

The reported dose distribution of workers monitored at each plant site for the year 2008 is presented in alphabetical order by plant name in Appendix B.

Figure 3.11 shows the collective dose distribution by dose range (see Section 3.1.8) for reactor licensees from 2004 to 2008. The distribution of collective dose has been fairly constant over the past 5 years, with a slight decrease noted from 2004 to 2008 in each dose range.

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

3.3.7 Other Facilities Reporting to NRC

The end of Appendix A contains additional facilities that reported occupational radiation dose reports to NRC in 2008. These facilities are not among the seven categories of licensees required to report under 10 CFR 20.2206 (see Section 3.1.7) and are not included in the analysis presented in this report. However, these facilities may be of interest to researchers, and since they are not included in any other published reports, they are included here in the interest of completeness. The facility with the largest collective dose for these additional facilities reported under the category of uranium hexafluoride (UF_6) production plants.

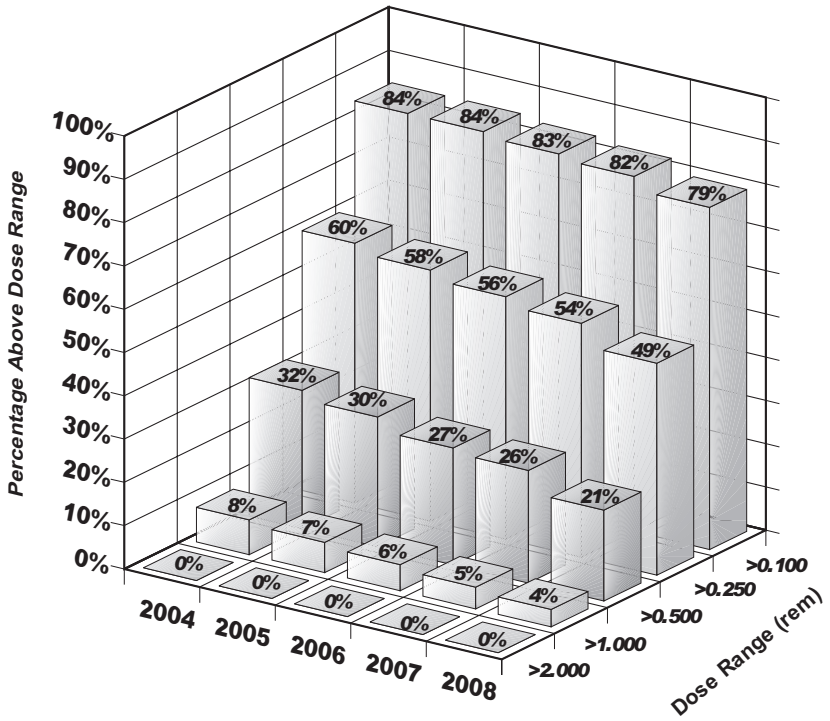


FIGURE 3.11. Collective TEDE Distribution by Dose Range
Reactor Licensees
2004–2008

3.4 SUMMARY OF INTAKE DATA BY LICENSEE CATEGORY

Licensees are required for each intake to list the radionuclide that was taken into the body, pulmonary clearance class, intake mode, and amount of the intake in microcuries. An NRC Form 5 report containing this information is required to be completed and submitted to NRC under 10 CFR 20.2206. Tables 3.7 and 3.8 summarize the intake data reported to NRC during 2008. The data are categorized by licensee type and are listed in order of radionuclide and pulmonary clearance class. Table 3.7 lists the intakes where the mode of intake into the body was recorded as ingestion. Table 3.8 lists the intakes where the mode of intake was inhalation from ambient airborne radioactive material in the workplace. The pulmonary clearance class is recorded as F, M, S, D, W, or Y (fast, medium, slow, days, weeks, or years), corresponding to the clearance half-time from the pulmonary region of the lung into the blood and gastrointestinal tract. The pulmonary clearance class designation depends on whether the licensee is using 10 CFR 20 (D, W, Y) or ICRP 68 (F, M, S) nomenclature. [Ref. 12] The amount of material taken into the body is given in microcuries, a unit of measure of the quantity of radioactive material. For each category of licensee, the maximum number of intake records and the maximum intake are highlighted in the table in bold for ease of reference.

Table 3.9 lists the number of individuals with measurable CEDE, the collective CEDE, and the average measurable CEDE per individual for each licensee category. Fuel fabrication facilities have the majority of internal dose (97%) in 2008 and the highest average CEDE per individual. This is due to the workers' exposure to uranium during the processing and fabrication of the uranium fuel.

Table 3.10 shows the distribution of internal dose (CEDE) from 1994 to 2008 for licensees required to report under 10 CFR 20.2206. For the purposes of this table, the definition of a "measurable CEDE" is any reported value greater than zero. As noted above, the vast majority of the internal doses are received by individuals working at fuel fabrication facilities.

TABLE 3.7
Intake by Licensee Category and Radionuclide Mode of Intake—*Ingestion*
2008

Mode	Licensee Category	Program Code	Radionuclide	Number of Intake Records*	Collective Intake in Microcuries (sci. notation)
Ingestion	Fuel Fabrication	21210	U-234	**1**	**4.32E-04**
	Power Reactors	41111	C-14	1	3.61E-02
		41111	CO-58	**5**	2.14E-01
		41111	CO-60	4	7.02E-01
		41111	FE-55	1	2.21E-01
		41111	H-3	1	3.36E-03
		41111	MN-54	2	2.06E-01
		41111	NB-95	2	8.01E-01
		41111	NI-63	1	4.46E-02
		41111	RU-103	1	1.58E-01
		41111	ZR-95	1	**2.79E+00**

NOTE: The data values shown bolded and in boxes represent the highest value in each category.

* An intake event may involve multiple nuclides, and individuals may incur multiple intakes during the year. The number of intake records given here indicates the number of separate intake reports that were submitted on NRC Form 5 reports under 10 CFR 20.2206.

TABLE 3.8
Intake by Licensee Category and Radionuclide Mode of Intake—*Inhalation*
2008

Licensee Category	Program Code	Radionuclide	Pulmonary Clearance Class	Number of Intake Records*	Collective Intake in Microcuries (sci. notation)
Manufacturing and Distribution	02500	I-123	W	23	2.10E+01
	02500	I-131	D	10	1.24E+00
	02500	I-131	W	**100**	**3.35E+01**
	03211	I-131	D	4	1.77E+00
Uranium Enrichment	21200	NP-237	W	3	2.74E-05
	21200	U-234	D	**43**	**4.43E-02**
Fuel Fabrication	21210	AM-241	M	14	1.68E-04
	21210	CO-60	Y	31	3.91E-01
	21210	MN-54	W	1	4.10E-02
	21210	PU-239	M	14	4.70E-04
	21210	RA-224	M	14	1.99E-04
	21210	SR-90	S	196	5.71E-01
	21210	TH-228	M	103	6.83E-04
	21210	TH-228	S	77	6.49E-04
	21210	TH-232	M	14	3.00E-04
	21210	U-232	F	89	4.36E-04
	21210	U-232	S	105	7.53E-04
	21210	U-232	Y	141	2.06E-04
	21210	U-234	D	358	1.47E-01
	21210	U-234	F	158	3.78E-01
	21210	U-234	M	207	4.04E-02
	21210	U-234	S	885	3.37E+00
	21210	U-234	W	79	1.66E-02
	21210	U-234	Y	**1,016**	**3.40E+00**
	21210	U-235	D	133	3.64E-03
	21210	U-235	F	89	1.25E-03
	21210	U-235	M	5	1.49E-05
	21210	U-235	S	478	8.56E-02
	21210	U-235	W	79	6.15E-04
	21210	U-235	Y	263	5.56E-02
	21210	U-236	D	296	2.51E-04
	21210	U-236	F	89	1.89E-02
	21210	U-236	M	5	1.86E-04
	21210	U-236	S	115	3.29E-02
	21210	U-236	W	79	2.53E-05
	21210	U-236	Y	263	2.84E-02
	21210	U-238	D	191	2.16E-02
	21210	U-238	F	6	3.94E-07
	21210	U-238	M	181	1.45E-02
	21210	U-238	S	375	2.94E-01
	21210	U-238	W	79	2.30E-03
	21210	U-238	Y	**1,016**	5.12E-01
Power Reactors	41111	AM-241	Y	2	1.68E-04
	41111	CO-58	Y	11	1.03E+00
	41111	CO-60	Y	10	1.50E+00
	41111	CS-137	D	4	5.95E-01
	41111	H-3	W	1	**2.40E+05**
	41111	I-131	D	**202**	9.22E+01
	41111	MN-54	W	11	5.77E-01

NOTE: The data values shown bolded and in boxes represent the highest value in each category.

* An intake event may involve multiple nuclides, and individuals may incur multiple intakes during the year. The number of intake records given here indicates the number of separate intake reports that were submitted on NRC Form 5 reports under 10 CFR 20.2206.

TABLE 3.9
Collective and Average CEDE by Licensee Category
2008

Licensee Category	Licensee Name	License Number	Number with Meas. CEDE	Collective CEDE (person-rem)	Average Meas. CEDE (rem)
Manufacturing and Distribution					
02500	CARDINAL HEALTH	34-29200-01MD	**72**	**0.831**	**0.012**
02500	GE HEALTHCARE - ST. LOUIS/OVERLAND	24-32462-01MD	1	0.003	0.003
02500	GE HEALTHCARE - KENTWOOD	21-26707-01MD	5	0.015	0.003
02500	IBA MOLECULAR NORTH AMERICA, INC.	45-25221-01MD	7	0.019	0.003
03211	INTERNATIONAL ISOTOPES IDAHO, INC.	11-27680-01	4	0.044	0.011
		Total	**89**	**0.912**	**0.010**
Uranium Enrichment					
21200	U. S. ENRICHMENT CORP. - PADUCAH	GDP-1	**30**	**0.135**	**0.005**
		Total	**30**	**0.135**	**0.005**
Fuel Fabrication					
21210	B&W NUCLEAR OPERATIONS GROUP	SNM-0042	196	20.245	0.103
	AREVA NP, INC.	SNM-1168	36	1.334	0.037
	AREVA NP, INC.	SNM-1227	225	45.374	**0.202**
	NUCLEAR FUEL SERVICES, INC.	SNM-0124	336	13.039	0.039
	GLOBAL NUCLEAR FUEL - AMERICAS, LLC	SNM-1097	**614**	57.757	0.094
	WESTINGHOUSE ELECTRIC COMPANY	SNM-1107	349	**62.065**	0.178
		Total	**1,756**	**199.814**	**0.114**
Power Reactors					
41111	ARKANSAS	DPR-51	4	0.033	0.008
	MILLSTONE	NPF-49	1	0.008	0.008
	SEQUOYAH	DPR-77	2	0.002	0.001
	NINE MILE POINT	DPR-63	3	0.037	0.012
	VERMONT YANKEE	DPR-28	1	0.025	0.025
	HUMBOLDT BAY	DPR-07	2	0.054	0.027
	MONTICELLO	DPR-22	1	0.002	0.002
	PALO VERDE	NPF-41	**201**	**3.069**	0.015
	WOLF CREEK	NPF-42	8	0.010	0.001
	RIVER BEND	NPF-47	8	0.304	**0.038**
	DIABLO CANYON	DPR-80	2	0.049	0.025
	BROWNS FERRY	DPR-33	25	0.858	0.034
	SAN ONOFRE	DPR-13	2	0.043	0.022
	BRAIDWOOD	NPF-72	1	0.015	0.015
	COMANCHE PEAK	NPF-87	3	0.059	0.020
	LIMERICK	NPF-39	1	0.014	0.014
	SOUTH TEXAS	NPF-76	2	0.018	0.009
	CALLAWAY	NPF-30	3	0.014	0.005
		Total	**270**	**4.614**	**0.017**
Grand Totals			**2,145**	**205.475**	**0.096**

NOTE: The data values shown bolded and in boxes represent the highest value in each category.

TABLE 3.10
Internal Dose (CEDE) Distribution
1994–2008

Year	Number of Individuals with CEDE in the Ranges (rem)*										Total with Meas. CEDE	Collective CEDE (person-rem)	Average Meas. CEDE (rem)
	Meas. 0.020	0.020–0.100	0.100–0.250	0.250 – 0.500	0.500–0.750	0.750–1.000	1– 2	2–3	3–4	4 – 5			
1994	3,425	577	287	351	196	138	293	69	2	-	5,338	1,033.688	0.194
1995	2,868	691	338	362	216	145	288	49	2	-	4,959	1,019.045	0.205
1996	3,096	598	305	317	190	121	185	22	2	2	4,838	741.373	0.153
1997	3,835	869	381	366	242	148	169	30	-	-	6,040	826.280	0.137
1998	3,310	932	426	355	230	140	153	21	2	-	5,569	779.148	0.140
1999	3,399	630	402	425	206	117	173	29	-	-	5,381	792.586	0.147
2000	3,248	891	514	373	214	98	224	58	7	1	5,628	969.792	0.172
2001	1,767	766	572	277	109	51	146	82	15	1	3,786	810.128	0.214
2002	1,759	739	555	370	95	20	23	3	-	-	3,564	377.016	0.106
2003	2,208	727	572	271	98	13	4	-	-	-	3,893	311.641	0.080
2004	1,987	738	440	252	90	14	3	-	-	-	3,524	274.606	0.078
2005	1,204	633	432	223	89	25	2	-	-	-	2,608	263.857	0.101
2006	1,294	583	383	245	80	13	3	-	-	-	2,601	245.743	0.094
2007	1,418	524	415	228	38	1	3	-	-	-	2,627	207.121	0.079
2008	900	547	411	254	29	3	1	-	-	-	2,145	205.475	0.096

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

Section 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 Section, some of the tables and appendices that summarize dose data also show the type, capacity, amount of electricity generated, and age of the reactor. Dose data are then presented as a function of these data.

4.2 DEFINITION 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 1 full year as of December 31 of each of the indicated years. This is the number of reactors in which the average number of workers with measurable dose and average collective dose per reactor is based. Excluded are reactors that have been in commercial operation for less than 12 months during the first year and reactors that have been permanently defueled. This technique 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 taken from Ref. 13.

Three Mile Island (TMI) 2 was included in the compilation of data for commercially operating reactors from 1975 through 1988 and has not been included in the data analysis since 1988. TMI 1 and 2 reported data separately beginning in 1986.

Browns Ferry Unit 1 (BWR) was restarted in 2007 and was in commercial power production operation during 2008. From 1985 to 2007, Browns Ferry Unit 1 was on administrative hold, and although not producing electric power, it remained in the count of operating reactors. Therefore, its return to commercial power production does not officially change the number of operating BWRs in 2008.

There were no changes to the count of operating reactors in 2008. The number of operating BWRs remains the same as in 2007 at 35, and the number of operating PWRs remains the same at 69. The dose information for these reactors and for others that are no longer in commercial operation is listed at the end of Appendix B.

4.2.2 Electric Energy Generated

The electric energy generated in megawatt years (MW-yr) each year by each reactor is graphically represented in Appendix D. This number was obtained by dividing the 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 number of megawatt hours of electricity produced each year was obtained from Ref. 13. For the years 1973 to 1996, the electricity generated is the gross electricity output of the reactor. For 1997 to 2008, the number reflects the net electricity produced, which is the gross electricity minus the amount the plant uses for operations. This change is the result of a change in NRC power generation reporting requirements. The electricity generated (in MW-yr) that is presented in Tables 4.1, 4.2, and 4.3 is the summation of electricity

TABLE 4.1
Summary of Information Reported by Commercial Boiling Water Reactors
1973–2008

Year	Number of Reactors Included*	Annual Collective Dose (person-rem)	No. of Workers with Measurable Dose**	Electricity Generated*** (MW-yr)	Average Measurable Dose per Worker (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Personnel with Measurable Doses per Reactor**	Average Collective Dose per MW-yr (person-rem/ MW-yr)	Average Electricity Generated per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)	Maximum Dependable Capacity Achieved
1973	12	4,564	5,340	3,393.9	0.86	380	445	1.35	283	438	65%
1974	14	7,095	8,769	4,060.2	0.81	507	626	1.75	290	485	60%
1975	18	12,633	17,350	5,786.4	0.73	702	964	2.18	321	595	54%
1976	22	12,298	16,927	8,137.9	0.73	559	769	1.51	370	630	59%
1977	23	19,054	21,515	9,102.5	0.89	828	935	2.09	396	637	62%
1978	25	15,257	20,381	11,856.0	0.75	610	815	1.29	474	660	72%
1979	25	18,251	25,425	11,671.0	0.72	730	1,017	1.56	467	660	71%
1980	26	29,472	34,220	10,868.2	0.86	1,134	1,316	2.71	418	663	63%
1981	26	25,490	34,873	10,899.2	0.73	980	1,341	2.34	419	663	63%
1982	26	24,447	32,318	10,614.6	0.76	940	1,243	2.30	408	663	62%
1983	26	27,467	33,581	9,730.1	0.82	1,056	1,292	2.82	374	663	56%
1984	27	27,111	41,315	10,019.2	0.66	1,004	1,530	2.71	371	754	49%
1985	29	20,578	38,336	12,284.0	0.54	710	1,322	1.68	424	775	55%
1986	30	19,353	37,999	12,102.1	0.51	645	1,267	1.60	403	786	51%
1987	32	16,722	41,806	15,109.0	0.40	523	1,306	1.11	472	832	57%
1988	34	17,986	40,371	16,665.4	0.45	529	1,187	1.08	490	845	58%
1989	36	15,550	44,384	17,543.5	0.35	432	1,233	0.89	487	857	57%
1990	37	15,781	41,585	21,336.1	0.38	427	1,124	0.74	577	862	67%
1991	37	12,007	38,508	21,505.8	0.31	325	1,041	0.56	581	860	68%
1992	37	13,312	42,107	20,592.2	0.32	360	1,138	0.65	557	859	65%
1993	37	12,221	39,352	21,995.6	0.31	330	1,064	0.56	594	798	74%
1994	37	12,098	39,171	22,139.0	0.31	327	1,059	0.55	598	801	75%
1995	37	9,471	35,686	24,737.0	0.27	256	964	0.38	669	835	80%
1996	37	9,466	37,792	24,322.2	0.25	256	1,021	0.39	657	838	78%
1997	37	7,603	34,021	22,866.1	0.22	205	919	0.33	618	845	73%
1998	36	6,829.296	32,899	23,781.2	0.21	190	914	0.29	661	874	76%
1999	35	6,434.430	31,482	26,962.6	0.20	184	899	0.24	770	885	87%
2000	35	6,089.676	31,186	28,476.9	0.20	174	891	0.21	814	893	91%
2001	35	4,835.397	28,797	28,730.4	0.17	138	823	0.17	821	895	92%
2002	35	6,107.767	30,978	29,460.0	0.20	175	885	0.21	842	907	93%
2003	35	5,659.434	30,759	29,094.4	0.18	162	879	0.19	831	912	91%
2004	35	5,450.982	33,948	29,424.8	0.16	156	970	0.19	841	893	94%
2005	35	5,995.975	33,544	29,386.8	0.18	171	958	0.20	840	946	89%
2006	35	4,989.761	34,159	30,238.4	0.15	143	976	0.17	864	954	91%
2007	35	5,388.416	37,515	30,189.3	0.14	154	1,072	0.18	863	955	90%
2008	35	4,522.413	34,642	31,248.3	0.13	129	990	0.14	893	957	93%

* 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.
** Figures are not adjusted for the multiple reporting of transient individuals (see section 5).
*** Electricity generated reflects the gross electricity generated for the years 1973–1996. Beginning in 1997, it reflects the net electricity generated.

TABLE 4.2
Summary of Information Reported by Commercial Pressurized Water Reactors
1973–2008

Year	Number of Reactors Included*	Annual Collective Dose (person-rem)	No. of Workers with Measurable Dose**	Electricity Generated*** (MW-yr)	Average Measurable Dose per Worker (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Personnel with Measurable Doses Per Reactor**	Average Collective Dose per MW-yr (person-rem/ MW-yr)	Average Electricity Generated per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)	Maximum Dependable Capacity Achieved
1973	12	9,398	9,440	3,770.2	1.00	783	787	2.49	314	544	58%
1974	19	6,555	9,370	6,530.7	0.70	345	493	1.00	344	591	58%
1975	26	8,268	10,884	11,982.5	0.76	318	419	0.69	461	647	71%
1976	30	13,807	17,588	13,325.0	0.79	460	586	1.04	444	701	63%
1977	34	13,467	20,878	17,345.8	0.65	396	614	0.78	510	688	74%
1978	39	16,528	25,700	19,840.5	0.64	424	659	0.83	509	706	72%
1979	42	21,657	38,828	18,255.0	0.56	516	924	1.19	435	746	58%
1980	42	24,267	46,237	18,289.3	0.53	578	1,101	1.33	435	746	58%
1981	44	28,673	47,351	20,553.7	0.61	652	1,076	1.40	467	752	62%
1982	48	27,754	52,149	22,140.6	0.53	578	1,086	1.25	461	777	59%
1983	49	29,017	52,170	23,195.5	0.56	592	1,065	1.25	473	785	60%
1984	51	28,140	56,994	26,478.4	0.49	552	1,118	1.06	519	809	64%
1985	53	22,470	54,632	29,470.7	0.41	424	1,031	0.76	556	820	68%
1986	60	23,033	62,998	33,593.0	0.37	384	1,050	0.69	560	878	64%
1987	64	23,684	62,597	37,007.3	0.38	370	978	0.64	578	900	64%
1988	68	22,786	62,923	42,929.7	0.36	335	925	0.53	631	885	71%
1989	71	20,381	63,894	44,679.5	0.32	287	900	0.46	629	897	70%
1990	73	20,821	67,082	46,955.6	0.31	285	919	0.44	643	907	71%
1991	74	16,512	60,274	51,942.6	0.27	223	815	0.32	702	913	77%
1992	73	15,985	61,048	53,419.8	0.26	219	836	0.30	732	923	79%
1993	69	13,376	54,397	48,709.3	0.25	194	788	0.28	706	941	75%
1994	70	9,574	44,283	52,397.6	0.22	137	633	0.18	749	928	81%
1995	70	11,762	49,985	54,138.2	0.24	168	714	0.22	773	929	83%
1996	72	9,417	46,852	55,337.8	0.20	131	651	0.17	769	935	82%
1997	72	9,546	50,690	48,985.3	0.19	133	704	0.20	680	943	72%
1998	69	6,358.096	38,586	53,288.7	0.17	92	559	0.12	772	942	82%
1999	69	7,231.281	43,938	56,235.0	0.17	105	637	0.13	815	942	86%
2000	69	6,562.006	42,922	57,529.9	0.15	95	622	0.11	834	943	88%
2001	69	6,273.155	38,773	58,822.4	0.16	91	562	0.11	852	946	90%
2002	69	6,018.423	42,264	59,369.7	0.14	87	613	0.10	860	947	91%
2003	69	6,296.136	44,054	57,920.6	0.14	91	638	0.11	839	949	88%
2004	69	4,916.915	35,901	60,398.7	0.14	71	520	0.08	875	943	93%
2005	69	5,459.832	44,583	59,790.9	0.12	79	646	0.09	867	955	91%
2006	69	6,031.425	46,106	59,751.3	0.13	87	668	0.10	866	960	90%
2007	69	4,731.597	42,015	61,955.6	0.11	69	609	0.08	898	961	93%
2008	69	4,673.527	44,808	60,586.0	0.10	68	649	0.08	878	964	91%

* 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.
** Figures are not adjusted for the multiple reporting of transient individuals (see section 5).
*** Electricity generated reflects the gross electricity generated for the years 1973–1996. Beginning in 1997, it reflects the net electricity generated.

TABLE 4.3
Summary of Information Reported by Commercial Light Water Reactors 1973–2008

Year	Number of Reactors Included*	Annual Collective Dose (person-rem)	No. of Workers with Measurable Dose**	Electricity Generated*** (MW-yr)	Average Measurable Dose per Worker (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Personnel with Measurable Doses Per Reactor**	Average Collective Dose per MW-yr (person-rem/ MW-yr)	Average Electricity Generated per Reactor (MW-yr)	Average Maximum Dependable Capacity Net (MWe)	Maximum Dependable Capacity Achieved
1973	24	13,962	14,780	7,164.1	0.95	582	616	1.95	299	491	61%
1974	33	13,650	18,139	10,590.9	0.75	414	550	1.29	321	546	59%
1975	44	20,901	28,234	17,768.9	0.74	475	642	1.18	404	626	65%
1976	52	26,105	34,515	21,462.9	0.76	502	664	1.22	413	671	62%
1977	57	32,521	42,393	26,448.3	0.77	571	744	1.23	464	667	70%
1978	64	31,785	46,081	31,696.5	0.69	497	720	1.00	495	688	72%
1979	67	39,908	64,253	29,926.0	0.62	596	959	1.33	447	714	63%
1980	68	53,739	80,457	29,157.5	0.67	790	1,183	1.84	429	714	60%
1981	70	54,163	82,224	31,452.9	0.66	774	1,175	1.72	449	719	63%
1982	74	52,201	84,467	32,755.2	0.62	705	1,141	1.59	443	737	60%
1983	75	56,484	85,751	32,925.6	0.66	753	1,143	1.72	439	743	59%
1984	78	55,251	98,309	36,497.6	0.56	708	1,260	1.51	468	790	59%
1985	82	43,048	92,968	41,754.7	0.46	525	1,134	1.03	509	804	63%
1986	90	42,386	100,997	45,695.1	0.42	471	1,122	0.93	508	847	60%
1987	96	40,406	104,403	52,116.3	0.39	421	1,088	0.78	543	877	62%
1988	102	40,772	103,294	59,595.1	0.40	400	1,013	0.68	584	871	67%
1989	107	35,931	108,278	62,223.0	0.33	336	1,012	0.58	582	883	66%
1990	110	36,602	108,667	68,291.7	0.34	333	988	0.54	621	892	70%
1991	111	28,519	98,782	73,448.4	0.29	257	890	0.39	662	895	74%
1992	110	29,297	103,155	74,012.0	0.28	266	938	0.40	673	901	75%
1993	106	25,597	93,749	70,704.9	0.27	241	884	0.36	667	891	75%
1994	107	21,672	83,454	74,536.6	0.26	203	780	0.29	697	884	79%
1995	107	21,233	85,671	78,875.2	0.25	198	801	0.27	737	896	82%
1996	109	18,883	84,644	79,660.0	0.22	173	777	0.24	731	902	81%
1997	109	17,149	84,711	71,851.4	0.20	157	777	0.24	659	910	72%
1998	105	13,187.392	71,485	77,069.9	0.18	126	681	0.17	734	918	80%
1999	104	13,665.711	75,420	83,197.6	0.18	131	725	0.16	800	923	87%
2000	104	12,651.682	74,108	86,006.8	0.17	122	713	0.15	827	926	89%
2001	104	11,108.552	67,570	87,552.8	0.16	107	650	0.13	842	929	91%
2002	104	12,126.190	73,242	88,829.7	0.17	117	704	0.14	854	934	91%
2003	104	11,955.570	74,813	87,015.0	0.16	115	719	0.14	837	936	89%
2004	104	10,367.897	69,849	89,823.5	0.15	100	672	0.12	864	926	93%
2005	104	11,455.807	78,127	89,177.7	0.15	110	751	0.13	857	952	90%
2006	104	11,021.186	80,265	89,989.7	0.14	106	772	0.12	865	958	90%
2007	104	10,120.013	79,530	92,144.9	0.13	97	765	0.11	886	959	92%
2008	104	9,195.940	79,450	91,834.3	0.12	88	764	0.10	883	961	92%

* 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.
** Figures are not adjusted for the multiple reporting of transient individuals (see section 5).
*** Electricity generated reflects the gross electricity generated for the years 1973–1996. Beginning in 1997, it reflects the net electricity generated.

generated by the number of reactors included in each year. These sums are divided by the number of operating reactors included in each year to yield the average amount of electric energy generated per reactor, which is also shown in Tables 4.1, 4.2, and 4.3.

As shown in Table 4.3, there was a less than 0.3% decrease in the net electricity generated at LWRs in 2008. Contributors to this decrease included North Anna and Cook for PWRs and Fermi 2 for BWRs. These plants experienced the largest decreases in power production (in MW-yr) from 2007 to 2008. The return of Browns Ferry Unit 1 to power production in 2007 contributed significantly to the 4% increase in the electricity generated from BWRs in 2008.

4.2.3 Collective Dose per Megawatt-Year

The number of MW-yr of electricity generated was used in determining the ratio of the average value of the annual collective dose (TEDE) to the number of MW-yr of electricity generated. The ratio was calculated by dividing the total collective dose in person-rem by the electric energy generated in MW-yr and is a measure of the dose incurred by workers at power plants in relation to the electric energy produced. For the years 1973 to 1996, the electricity generated is the gross electricity output of the reactor. For 1997 to 2008, the number reflects the net electricity produced. This ratio, calculated by year for BWRs, PWRs, and LWRs is presented in Tables 4.1, 4.2, and 4.3. This ratio was also calculated for each reactor site (see Appendix C). The average collective dose per MW-yr for LWRs decreased to a value of 0.10 rem/MW-yr in 2008 from a value of 0.11 rem/MW-yr in 2007 due to a combination of a 9% decrease in the collective dose and a 0.3% decrease in power production.

4.2.4 Average Maximum Dependable Capacity

Average maximum dependable capacity as shown in Tables 4.1, 4.2, and 4.3 was calculated by dividing the sum of the net maximum dependable capacities of the reactors in megawatts (net MWe) by the number of reactors included each year. The net maximum dependable capacity is defined as the gross electrical output as measured at the output terminals of the turbine generator during the most restrictive seasonal conditions less the normal station service loads. This “capacity” of each plant was found in Ref. 13.

4.2.5 Percent of Maximum Dependable Capacity Achieved

The percent of maximum dependable capacity achieved is shown for all LWRs in Table 4.3. This parameter gives an indication of the overall power generation performance of LWRs as compared with the maximum dependable capacity that could be obtained in a given year. It is calculated by dividing the average electricity generated per reactor by the average maximum dependable capacity for each year.

From 1973 to 1978, this indicator exhibited an increasing trend as a number of new reactors began producing power at higher efficiencies. Following the accident at TMI, reactor operations personnel concentrated on improving safety systems and complying with

the new regulations for these systems. During this time period, from 1979 to 1987, the percent of maximum dependable capacity remained around 61%. Following the completion of most of these mandated repairs, reactors increased the percent of maximum dependable capacity from 62% in 1987 to 81% in 1996, a gain of nearly 20% in 10 years. The decrease in maximum dependable capacity from 1996 to 1997 was due to the change from measuring the gross electricity generated to the net electricity generated. The percent of maximum dependable capacity for LWRs remained the same at 92% in 2008.

4.3 ANNUAL TEDE DISTRIBUTIONS

Table 4.4 summarizes the distribution of the annual TEDE doses received by workers at all commercial LWRs during each of the years 1977 through 2008. This distribution is the sum of the annual dose distributions reported by each licensed LWR each year. As previously noted, the distribution reported by each LWR site for 2008 is shown in Appendix B. Table 4.4 shows the reported dose distributions corrected for the number of transient workers that were reported by more than one site (see Section 5).

Table 4.4 includes only those reactors in operation for a full year for each year presented in the table. In 2008, the total collective dose decreased by 9% to a value of 9,196 person-rem. The PWR with the largest decrease in the collective dose was Ft. Calhoun. TMI1 experienced the highest increase in collective dose among PWRs. The BWR with the largest decrease in the collective dose was Cooper Station. Pilgrim experienced the highest increase in collective dose among BWRs.

4.4 AVERAGE ANNUAL TEDE DOSES

Some of the data presented in Tables 4.1, 4.2, and 4.3 are graphically displayed in Figure 4.1, where it can be seen that the average collective dose and average number of workers per BWR have been higher than those for PWRs since 1974 and that the values of both parameters, in general, continued to rise at both types of facilities until 1983. Between 1983 and 2008, the annual collective dose per LWR dropped by 84%. Between 2007 and 2008, the collective dose per reactor for PWRs decreased by 1% to 68 person-rem. The collective dose per reactor for BWRs decreased by 16% to 129 person-rem from 2007 to 2008. The overall collective dose per reactor for LWRs decreased by 9% from 97 person-rem in 2007 to 88 person-rem in 2008. This is the second year that this value has been below 100 person-rem since tracking began in 1973. The overall decreasing trend in average reactor collective doses since 1983 indicates that licensees are continuing to successfully implement ALARA dose reduction processes at their facilities. In 2008 the number of workers with measurable dose per reactor increased to 649 for PWRs and decreased to 990 for BWRs.

Figures 4.2 and 4.3 are plots of most of the other information that is given in Tables 4.1, 4.2, and 4.3. Figure 4.2 shows that in 2008 the net electricity generated decreased slightly to 91,834 MW-yr while the number of operating

TABLE 4.4
Summary Distribution of Annual Whole-Body Doses at Commercial Light Water Reactors*
1977–2008

Year	No Measurable Exposure	Measurable <0.10	Number of Individuals with Whole-Body Doses in the Ranges (rem)** 0.10–0.25	0.25–0.5	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	Total Number Monitored	Number with Measurable Exposure	Collective Dose*** (person-rem)
1977	22,688	12,436	6,056	4,538	2,905	2,230	5,660	2,858	1,290	661	186	89	47	23	6	-	-	61,673	38,985	32,521
1978	26,360	15,165	6,349	5,010	3,094	2,255	5,984	3,050	1,194	517	110	37	9	-	1	-	2	69,137	42,777	31,785
1979	40,535	22,642	9,012	7,485	4,795	3,262	7,574	3,401	1,403	545	117	42	17	3	1	-	-	100,834	60,299	39,908
1980	44,716	26,990	10,697	8,913	5,573	4,139	10,672	4,607	1,816	831	235	119	29	7	1	-	-	119,345	74,629	53,739
1981	39,258	26,916	11,241	9,338	6,051	4,501	11,174	4,809	1,999	533	103	93	9	3	1	-	1	116,030	76,772	54,163
1982	41,704	29,278	11,734	9,907	6,235	4,422	10,220	4,716	2,066	596	97	31	5	-	1	1	-	121,013	79,309	52,201
1983	47,027	29,200	11,200	9,345	5,854	4,279	11,342	5,334	2,270	716	121	38	8	2	-	-	-	126,736	79,709	56,484
1984	54,637	36,488	13,438	10,277	6,338	4,804	11,284	5,208	2,122	487	52	22	-	-	-	-	-	145,157	90,520	55,251
1985	59,625	36,920	13,015	11,044	6,626	4,545	10,042	3,574	1,002	157	1	-	-	-	-	-	-	146,551	86,926	43,048
1986	67,677	41,536	14,574	11,842	7,017	4,693	10,241	3,062	868	146	-	-	-	-	-	-	-	161,656	93,979	42,386
1987	85,170	41,283	15,842	12,838	7,586	5,333	10,611	2,192	477	69	-	-	-	-	-	-	-	181,401	96,231	40,406
1988	87,281	40,290	15,915	13,152	7,905	5,461	10,310	2,442	511	26	-	1	-	-	-	-	-	183,294	96,013	40,772
1989	83,954	45,302	17,270	13,778	7,944	5,138	8,633	1,615	370	34	-	-	-	-	-	-	-	184,038	100,084	35,931
1990	83,875	42,612	17,526	14,199	8,226	5,261	8,594	1,791	337	21	-	-	-	-	-	-	-	182,442	98,567	36,602
1991	87,247	42,603	16,770	13,182	7,188	4,192	5,977	938	219	17	-	-	-	-	-	-	-	178,333	91,086	28,519
1992	87,717	41,943	17,821	14,779	8,135	4,521	6,076	808	85	4	-	-	-	-	-	-	-	181,889	94,172	29,297
1993	83,066	37,332	17,235	13,734	7,562	4,289	5,322	638	76	5	-	-	-	-	-	-	-	169,259	86,193	26,364
1994	67,777	30,185	15,010	11,823	6,185	3,620	4,242	508	40	-	-	-	-	-	-	-	-	139,390	71,613	21,704
1995	61,445	29,631	15,096	12,023	6,125	3,304	3,912	595	133	2	-	-	-	-	-	-	-	132,266	70,821	21,688
1996	58,097	30,204	14,831	11,343	5,423	2,833	3,196	408	67	-	-	-	-	-	-	-	-	126,402	68,305	18,883
1997	58,409	31,955	14,890	10,913	5,233	2,455	2,599	286	41	-	-	-	-	-	-	-	-	126,781	68,372	17,149
1998	56,901	27,998	12,849	8,816	3,940	1,841	1,827	179	15	1	-	-	-	-	-	-	-	114,367	57,466	13,187.392
1999	54,885	29,048	13,184	8,949	3,793	1,900	1,894	245	18	-	-	-	-	-	-	-	-	113,916	59,031	13,665.711
2000	53,324	28,480	12,921	8,679	3,571	1,644	1,734	186	18	-	-	-	-	-	-	-	-	110,557	57,233	12,651.682
2001	52,636	27,246	11,491	7,659	2,907	1,323	1,392	221	53	-	-	-	-	-	-	-	-	104,928	52,292	11,108.552
2002	53,440	28,523	11,610	7,668	3,004	1,479	1,820	320	35	1	-	-	-	-	-	-	-	107,900	54,460	12,126.190
2003	54,023	29,164	11,978	8,199	3,249	1,524	1,651	184	18	-	-	-	-	-	-	-	-	109,990	55,967	11,955.570
2004	57,417	28,863	11,179	7,334	2,873	1,233	1,190	188	13	-	-	-	-	-	-	-	-	110,290	52,873	10,367.897
2005	56,778	31,043	12,427	7,815	3,104	1,537	1,490	147	3	-	-	-	-	-	-	-	-	114,344	57,566	11,455.807
2006	57,566	32,426	12,685	7,796	2,975	1,416	1,406	82	2	-	-	-	-	-	-	-	-	116,354	58,788	11,021.186
2007	57,316	32,706	11,961	7,396	2,714	1,283	1,101	97	9	-	-	-	-	-	-	-	-	114,583	57,267	10,120.013
2008	61,336	33,832	12,324	6,786	2,429	1,026	921	38	-	-	-	-	-	-	-	-	-	118,692	57,356	9,195.940

* Summary of reports submitted in accordance with 10 CFR 20.407 or 20.2206 by BWRs and PWRs that had been in commercial operation for at least 1 full year as of December 31 of each of the indicated years. Figures shown have been adjusted for the multiple reporting of transient individuals (see section 5).

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

*** The collective dose, when not reported by the licensee, was calculated by the NRC staff using methods described in section 3.1.4.

reactors has remained constant for the past 10 years. Figure 4.3 shows that the value for the total collective dose for all LWRs decreased by 9% from a value of 10,120 person-rem in 2007 to 9,196 person-rem in 2008. The average measurable dose per worker also decreased to 0.12 rem in 2008 (not adjusted for transient workers).

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

To further assist in the identification of any trends that might exist, Figures 4.4 and 4.5 together display the average and median[7] values of the collective dose per reactor for BWRs and for PWRs for the years 1973 through 2008. 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 25th through the 75th percentiles. The median collective dose for PWRs increased from 60 person-rem in 2007 to 63 person-rem in 2008. The median collective dose for BWRs decreased from 145 person-rem in 2007 to 109 person-rem in 2008. Figure 4.5 also shows that, in 2008, 50% of the PWRs reported collective doses between 43 and 84 person-rem, while 50% of the BWRs reported collective doses between 95 and 168 person-rem. (Note that these values are based on an annual average, not the 3-year rolling average that is presented in Section 4.5.) 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).

[7]The median is the value at which 50% of the reactors reported greater collective doses and the other 50% reported smaller collective doses.

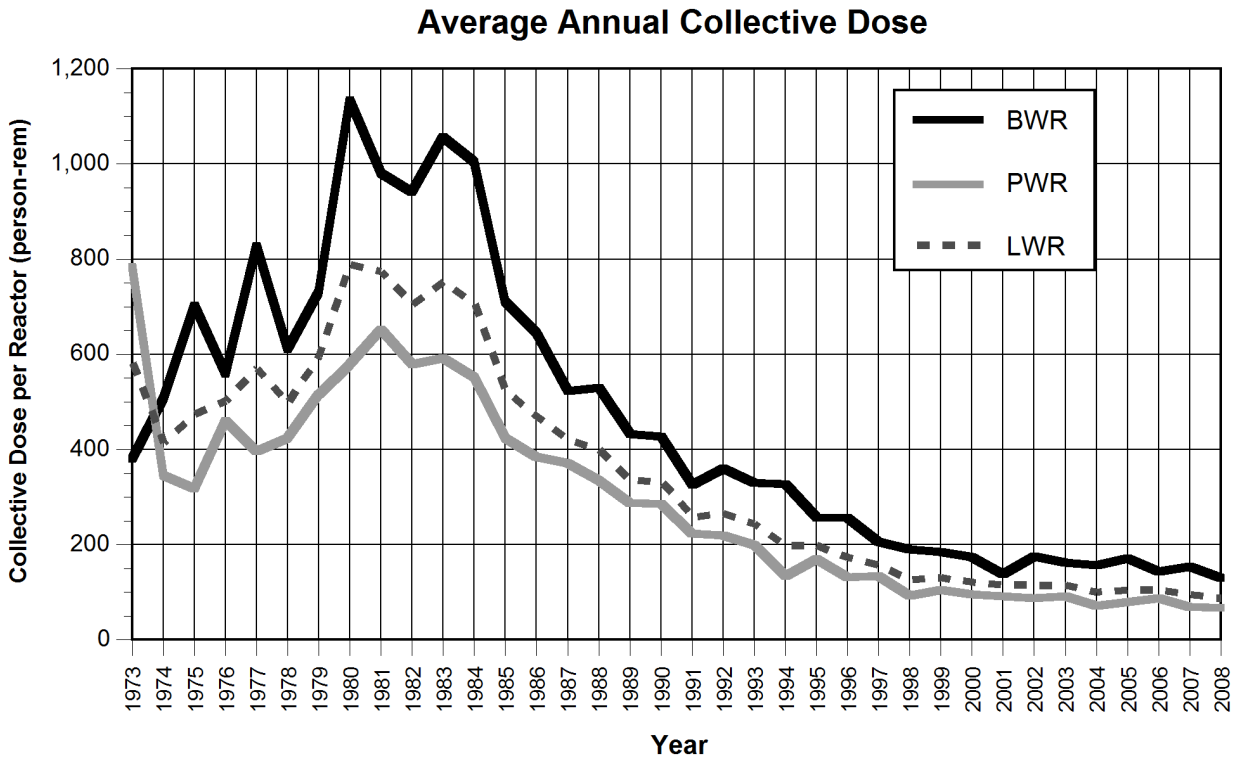
4.5 THREE-YEAR AVERAGE COLLECTIVE TEDE PER REACTOR

The 3-year average collective dose per reactor is one of the metrics that the NRC uses in the Reactor Oversight Program to evaluate the effectiveness of the licensee's ALARA program. Tables 4.5 and 4.6 list the sites that had been in commercial operation for at least 3 years as of December 31, 2008, and show the values of several parameters for each of the sites. These tables also give averages for the two types of reactors.

Based on the 105 reactor-years of operation accumulated over a three-year period by the 35 BWRs listed, the average 3-year collective TEDE per reactor was found to be 142 person-rem, the average measurable TEDE per worker was 0.14 rem, and the average collective TEDE per MW-yr was 0.16 person-rem per MW-yr. All values decreased slightly from 2007 to 2008.

Based on the 207 reactor-years of operation accumulated over a three-year period at the 69 PWRs listed, the average annual collective TEDE per reactor, average measurable TEDE per worker, and average collective TEDE per MW-yr were found to be 75 person-rem, 0.12 rem, and 0.08 person-rem per MW-yr, respectively. For PWRs from 2007 to 2008, all values either decreased slightly or remained the same.

In addition to the listings provided in Tables 4.5 and 4.6, considerable attention is paid to the quartile ranking of reactors for the 3-year average dose per reactor. The quartile ranking is used by the NRC as a factor in planning the number of inspection hours assigned per reactor. For this reason, Tables 4.7 and 4.8 have been included in the 2008 annual report. These tables show the plant name, 3-year collective TEDE per reactor, the percent change in the 3-year average from the previous 3-year period, and the quartile ranking from the previous period if the ranking has changed.



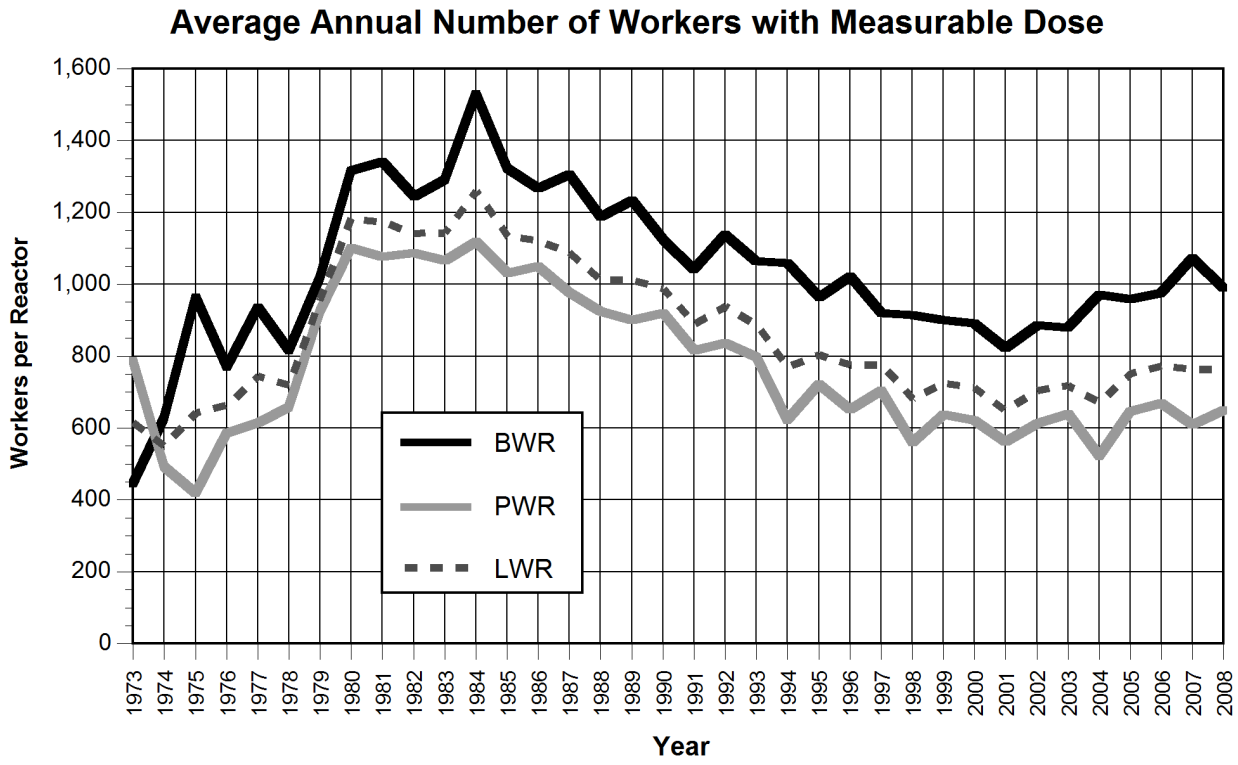


FIGURE 4.1. Average Collective Dose and Number of Workers with Measurable Dose per Reactor 1973–2008

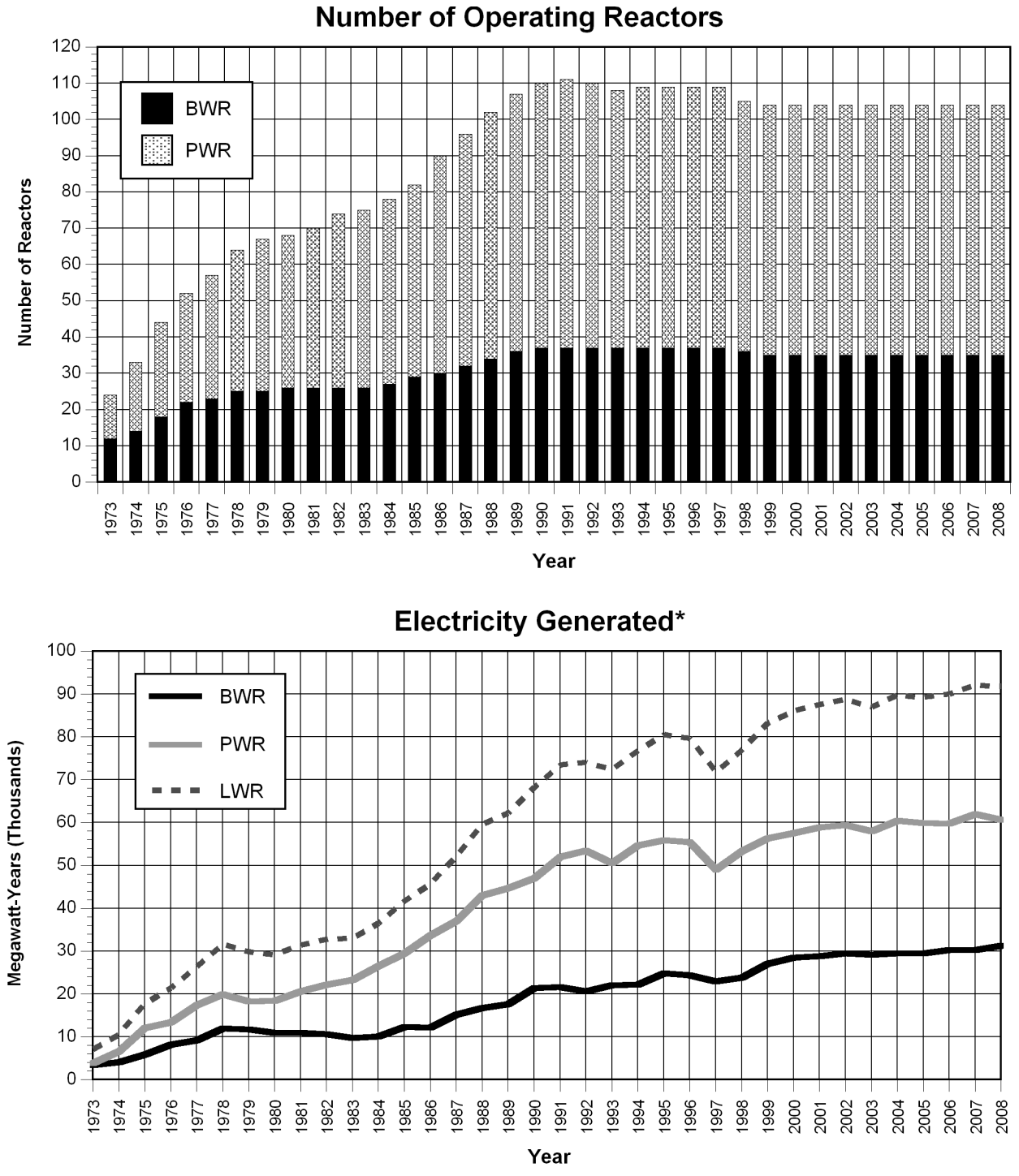
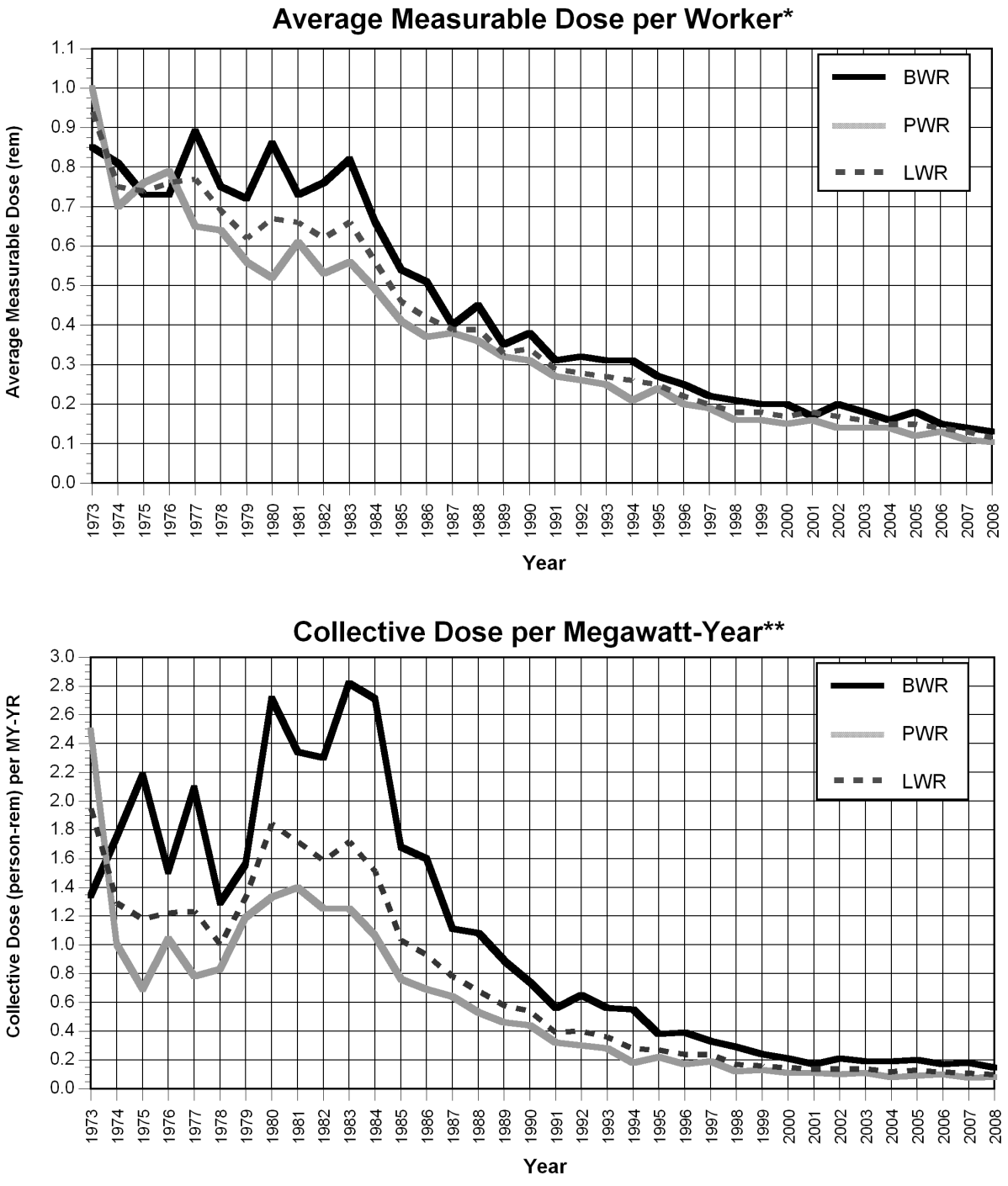


FIGURE 4.2. Number of Operating Reactors and Electricity Generated 1973–2008



* Not adjusted for transient workers. See Section 5.

** Gross electricity is shown for 1973–1996, net electricity is shown for 1997–2008.

FIGURE 4.3. Average Measurable Dose per Worker and Collective Dose per Megawatt-Year 1973–2008

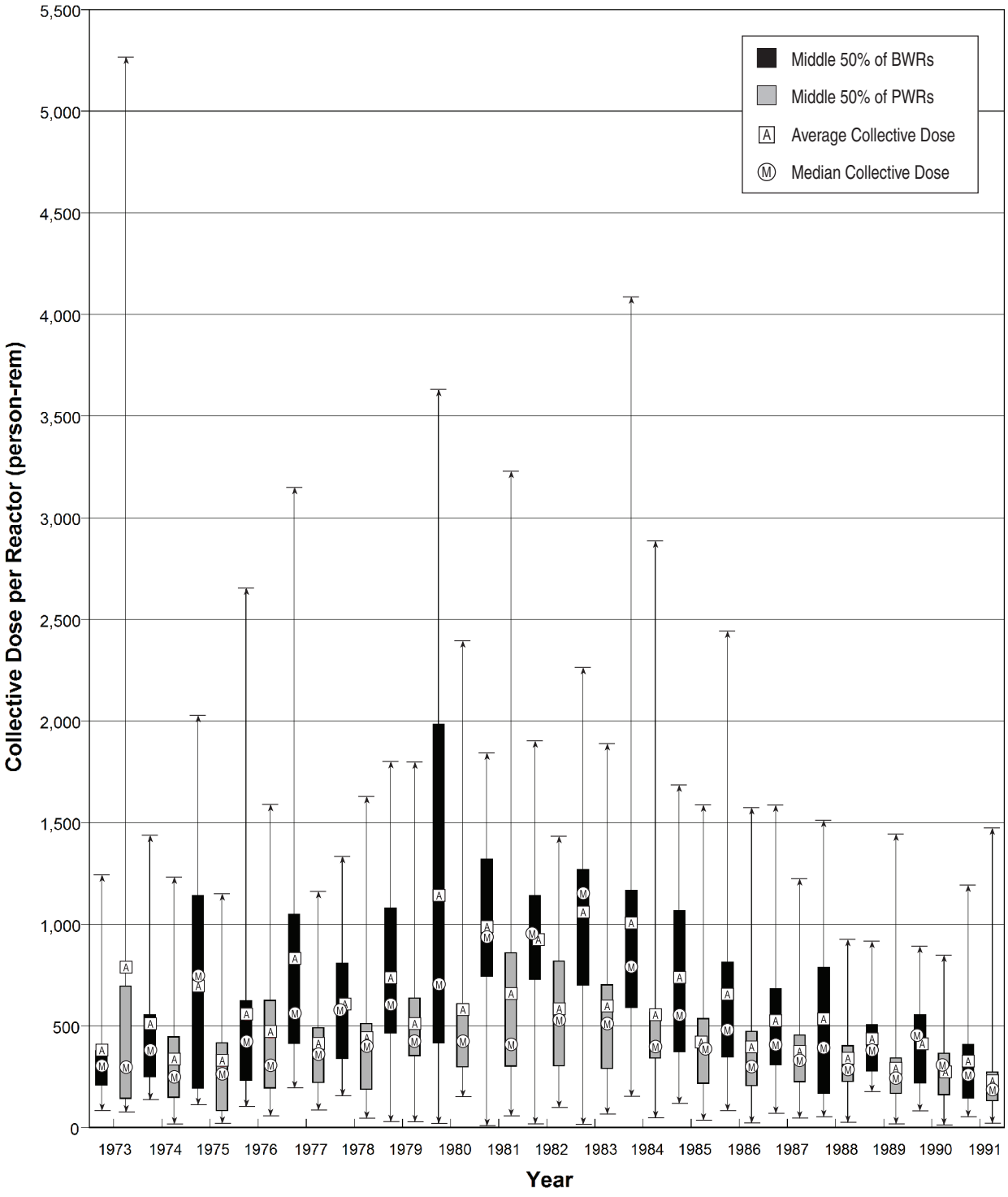


FIGURE 4.4. Average, Median, and Extreme Values of the Collective Dose per Reactor 1973–1991

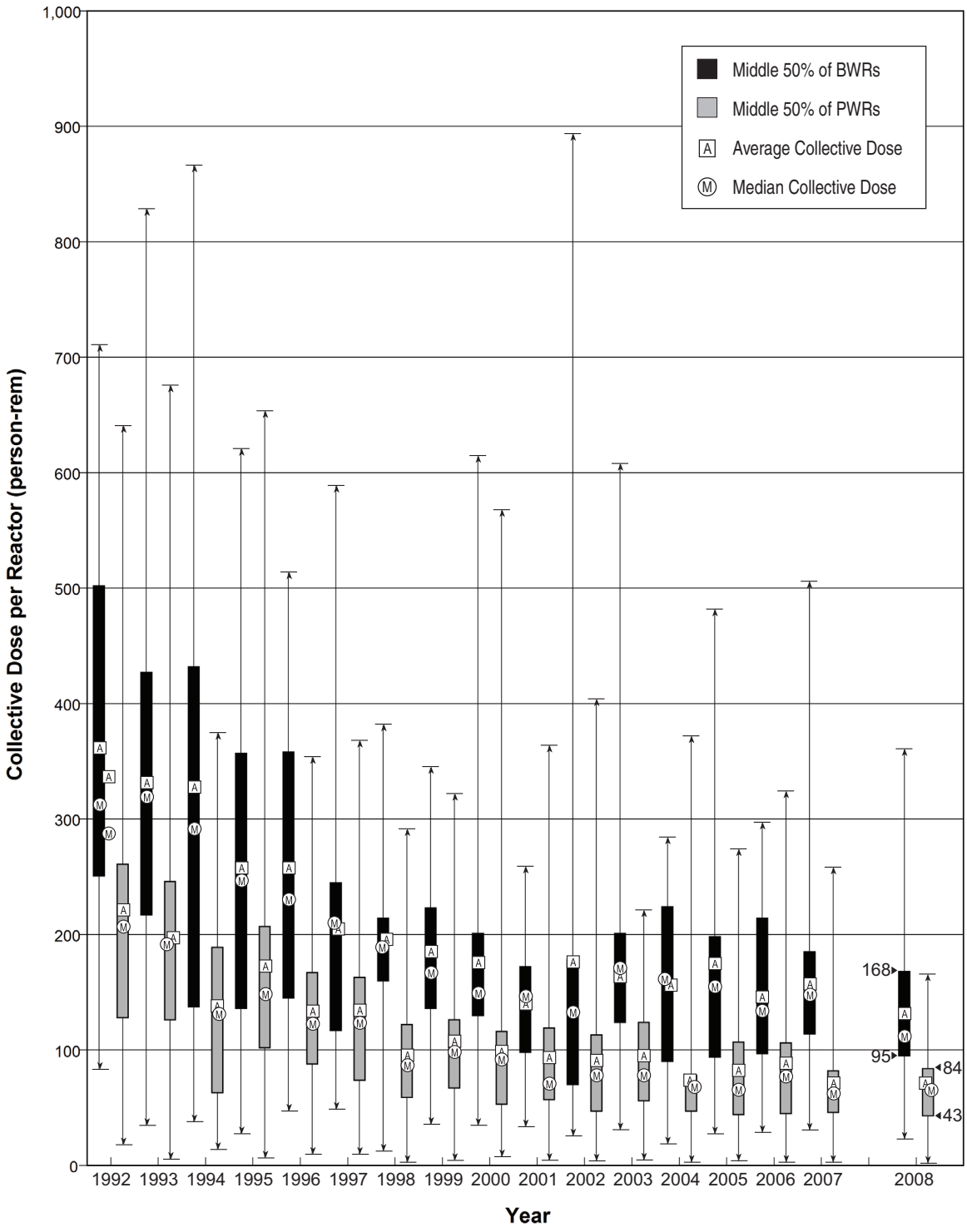


FIGURE 4.5. Average, Median, and Extreme Values of the Collective Dose per Reactor 1992–2008

TABLE 4.5
Three-Year Totals and Averages Listed in Ascending Order of Collective TEDE per BWR 2006–2008

Plant Name *	Reactor Years	Collective TEDE per Reactor Year	Collective TEDE per Site	Number of Workers with Measurable TEDE	Average TEDE per Worker	Total MW-Yr	Average TEDE per MW-Yr
DUANE ARNOLD	3	79.063	237.188	1,592	0.15	1,698.9	0.14
MONTICELLO	3	89.530	269.591	1,699	0.16	1,613.0	0.17
LIMERICK 1,2	6	94.560	567.358	4,472	0.13	6,562.2	0.09
HATCH 1,2	6	97.670	586.019	4,143	0.14	4,815.4	0.12
PILGRIM	3	102.208	306.625	2,438	0.13	1,918.0	0.16
SUSQUEHANNA 1,2	6	106.802	640.814	6,071	0.11	6,303.7	0.10
LASALLE 1,2	6	115.732	694.394	6,361	0.11	6,493.8	0.11
HOPE CREEK 1	3	119.716	359.148	5,355	0.07	3,052.2	0.12
DRESDEN 2,3	6	127.170	763.017	6,659	0.11	4,945.8	0.15
GRAND GULF	3	135.226	405.678	4,609	0.09	3,376.3	0.12
FERMI 2	3	136.842	410.525	3,374	0.12	2,900.6	0.14
COLUMBIA GENERATING	3	139.072	417.217	3,485	0.12	3,045.8	0.14
PEACH BOTTOM 2,3	6	140.869	845.212	5,235	0.16	6,448.2	0.13
NINE MILE POINT 1,2	6	143.447	860.682	4,347	0.20	4,887.5	0.18
VERMONT YANKEE	3	144.806	434.417	2,973	0.15	1,677.2	0.26
OYSTER CREEK	3	149.491	448.472	3,418	0.13	1,640.9	0.27
BRUNSWICK 1,2	6	154.128	924.770	6,835	0.14	5,070.6	0.18
FITZPATRICK	3	159.313	477.938	3,483	0.14	2,323.3	0.21
CLINTON	3	177.141	531.424	3,340	0.16	2,962.1	0.18
QUAD CITIES 1,2	6	180.622	1,084.733	6,339	0.17	4,794.6	0.23
BROWNS FERRY 1,2,3**	9	186.399	1,678.595	9,278	0.18	7,297.7	0.23
PERRY	3	207.444	622.331	2,666	0.23	3,331.4	0.19
RIVER BEND 1	3	219.160	657.479	4,434	0.15	2,401.5	0.27
COOPER STATION	3	226.654	679.963	3,710	0.18	2,115.3	0.32
Totals and Averages	**105**		**14,901.590**	**106,316**	**0.14**	**91,676.0**	**0.16**
Average per Reactor-Year		**141.910**		**1,013**		**873.1**	

* Sites where not all reactors had completed three full years of commercial operation as of December 31, 2008, are not included.

** Although Brown's Ferry 1 was placed on administrative hold in 1985, it remains in the count of operating reactors and has resumed operation as of June, 2007.

TABLE 4.6
Three-Year Totals and Averages Listed in Ascending Order of Collective TEDE per PWR 2006–2008

Plant Name *	Reactor Years	Collective TEDE per Reactor Year	Collective TEDE per Site	Number of Workers with Measurable TEDE	Average TEDE per Worker	Total MW-Yr	Average TEDE per MW-Yr
INDIAN POINT 3	3	36.266	108.798	2,072	0.05	2,957.7	0.04
SUMMER 1	3	37.705	113.115	1,374	0.08	2,643.7	0.04
POINT BEACH 1,2	6	39.274	235.641	1,946	0.12	2,825.1	0.08
THREE MILE ISLAND 1	3	40.526	121.577	1,455	0.08	2,422.1	0.05
FARLEY 1,2	6	41.123	246.738	2,642	0.09	4,701.1	0.05
CALLAWAY 1	3	41.761	125.282	2,033	0.06	3,290.1	0.04
PRAIRIE ISLAND 1,2	6	45.059	270.351	2,293	0.12	2,865.5	0.09
GINNA	3	50.329	150.988	1,601	0.09	1,574.7	0.10
ROBINSON 2	3	50.818	152.453	1,764	0.09	2,008.6	0.08
PALO VERDE 1,2,3	9	51.121	460.089	5,663	0.08	9,129.6	0.05
SEABROOK	3	51.969	155.907	2,892	0.05	3,365.9	0.05
HARRIS	3	54.130	162.389	1,979	0.08	2,537.9	0.06
TURKEY POINT 3,4	6	59.028	354.166	3,473	0.10	3,828.2	0.09
KEWAUNEE	3	59.604	178.811	1,282	0.14	1,446.9	0.12
VOGTLE 1,2	6	62.274	373.644	3,028	0.12	6,162.6	0.06
WOLF CREEK 1	3	65.364	196.092	1,791	0.11	3,219.4	0.06
BRAIDWOOD 1,2	6	66.731	400.388	4,117	0.10	6,730.6	0.06
BYRON 1,2	6	67.351	404.103	3,957	0.10	6,579.1	0.06
CRYSTAL RIVER 3	3	68.379	205.138	1,555	0.13	2,352.4	0.09
DIABLO CANYON 1,2	6	71.525	429.148	4,476	0.10	6,192.5	0.07
SOUTH TEXAS 1,2	6	71.539	429.231	3,140	0.14	7,419.0	0.06
MCGUIRE 1,2	6	71.681	430.087	4,206	0.10	6,054.9	0.07
CALVERT CLIFFS 1,2	6	71.879	431.274	3,151	0.14	4,894.1	0.09
OCONEE 1,2,3	9	73.388	660.493	5,698	0.12	6,921.1	0.10
CATAWBA 1,2	6	73.645	441.868	4,301	0.10	6,191.4	0.07
ARKANSAS 1,2	6	74.109	444.653	4,362	0.10	5,123.9	0.09
COMANCHE PEAK 1,2	6	74.766	448.594	3,339	0.13	6,612.3	0.07
SEQUOYAH 1,2	6	74.881	449.286	3,909	0.11	6,337.6	0.07
NORTH ANNA 1,2	6	75.385	452.309	3,125	0.14	4,962.8	0.09
WATERFORD 3	3	88.009	264.028	2,928	0.09	3,220.2	0.08
SAN ONOFRE 2,3	6	88.659	531.952	3,711	0.14	5,269.8	0.10
SALEM 1,2	6	89.484	536.906	6,173	0.09	6,368.6	0.08
BEAVER VALLEY 1,2	6	90.023	540.135	4,120	0.13	4,719.9	0.11
SURRY 1,2	6	98.730	592.377	3,407	0.17	4,479.8	0.13
MILLSTONE 2,3	6	101.802	610.811	3,787	0.16	5,534.7	0.11
COOK 1,2	6	104.584	627.503	4,061	0.15	5,486.0	0.11
DAVIS-BESSE	3	105.964	317.892	2,505	0.13	2,385.0	0.13
ST. LUCIE 1,2	6	107.026	642.155	4,800	0.13	4,411.0	0.15
FORT CALHOUN	3	129.748	389.245	2,530	0.15	1,254.2	0.31
WATTS BAR 1	3	132.581	397.744	3,085	0.13	2,838.6	0.14
INDIAN POINT 2	3	144.533	433.600	2,989	0.15	2,854.8	0.15
PALISADES	3	173.254	519.762	2,219	0.23	2,119.5	0.25
Totals and Averages	**207**		**15,436.723**	**132,939**	**0.12**	**182,292.9**	**0.08**
Average per Reactor-Year		**74.574**		**642**		**880.6**	

* Sites where not all reactors had completed three full years of commercial operation as of December 31, 2008, are not included.

TABLE 4.7
Three-Year Collective TEDE per Reactor-Year for BWRs
2006-2008

	Plant Name	Three-Year Coll. TEDE per Reactor Year 2006-2008	Percent Change From 2005-2007	2005 - 2007 Quartile (if changed)	
1st Quartile	DUANE ARNOLD	79.063	-33%▼		
	MONTICELLO	89.530	-33%▼	2	
	LIMERICK 1, 2	94.670	-2%▼		
	HATCH 1, 2	97.670	-3%▼		
	PILGRIM	102.208	-37%▼	4	
	SUSQUEHANNA 1, 2	106.802	2%▲		
2nd Quartile	LASALLE 1, 2	115.732	-14%▼		
	HOPE CREEK 1	119.716	-8%▼		
	DRESDEN 2, 3	127.170	-7%▼	3	
	GRAND GULF	135.226	0%▲		
	FERMI 2	136.842	-6%▼	3	
	COLUMBIA GENERATING	139.072	-39%▼	4	
	PEACH BOTTOM 2, 3	140.869	-10%▼	3	
3rd Quartile	NINE MILE POINT 1, 2	143.447	-10%▼		< *Average 141.9*
	VERMONT YANKEE	144.806	4%▲		
	OYSTER CREEK	149.491	70%▲	1	
	BRUNSWICK 1, 2	154.128	6%▲		
	FITZPATRICK	159.313	34%▲	1	
4th Quartile	CLINTON	177.141	47%▲	2	
	QUAD CITIES 1, 2	180.622	-39%▼		
	BROWNS FERRY 1, 2, 3	186.399	-8%▼		
	PERRY	207.444	-37%▼		
	RIVER BEND 1	219.160	64%▲	2	
	COOPER STATION	226.654	14%▲		
	Average per Reactor-Year	**141.910**	**-9%▼**		

TABLE 4.8
Three-Year Collective TEDE per Reactor-Year for PWRs 2006-2008

	Plant Name	Three-Year Coll. TEDE per Reactor Year 2006-2008	Percent Change From 2005-2007	2005 - 2007 Quartile (if changed)	
1st Quartile	INDIAN POINT 3	36.266	-39%▼	2	
	SUMMER 1	37.705	-17%▼		
	POINT BEACH 1, 2	39.274	7%▲		
	THREE MILE ISLAND 1	40.526	-34%▼	2	
	FARLEY 1, 2	41.123	-10%▼		
	CALLAWAY 1	41.761	-59%▼	4	
	PRAIRIE ISLAND 1, 2	45.059	19%▲		
	GINNA	50.329	24%▲		
	ROBINSON 2	50.818	3%▲		
	PALO VERDE 1,2,3	51.121	-8%▼		
	SEABROOK	51.969	17%▲		
2nd Quartile	HARRIS	54.130	1%▲	1	
	TURKEY POINT 3, 4	59.028	-3%▼		
	KEWAUNEE	59.604	99%▲	1	
	VOGTLE 1, 2	62.274	-3%▼		
	WOLF CREEK 1	65.364	-6%▼		
	BRAIDWOOD 1, 2	66.731	4%▲		
	BYRON 1, 2	67.351	-13%▼	3	
	CRYSTAL RIVER 3	68.379	-34%▼	4	
	DIABLO CANYON 1, 2	71.525	35%▲	1	
	SOUTH TEXAS 1, 2	71.539	-12%▼	3	
3rd Quartile	MCGUIRE 1, 2	71.681	-2%▼	2	
	CALVERT CLIFFS 1, 2	71.879	-18%▼		
	OCONEE 1, 2, 3	73.388	6%▲	2	
	CATAWBA 1, 2	73.645	0%▲	2	
	ARKANSAS 1, 2	74.109	-39%▼	4	< *Average 74.6*
	COMANCHE PEAK 1, 2	74.766	-14%▼		
	SEQUOYAH 1, 2	74.881	-2%▼		
	NORTH ANNA 1, 2	75.385	0%▲		
	WATERFORD 3	88.009	-1%▼		
	SAN ONOFRE 2, 3	88.659	27%▲	2	
4th Quartile	SALEM 1, 2	89.484	20%▲	3	
	BEAVER VALLEY 1, 2	90.023	1%▲		
	SURRY 1, 2	98.730	12%▲	3	
	MILLSTONE 2, 3	101.802	13%▲		
	COOK 1, 2	104.584	-2%▼		
	DAVIS-BESSE	105.964	21%▲	3	
	ST. LUCIE 1, 2	107.026	-31%▼		
	FORT CALHOUN	129.748	-31%▼		
	WATTS BAR 1	132.581	-15%▼		
	INDIAN POINT 2	144.533	42%▲		
	PALISADES	173.254	3%▲		
	Average per Reactor-Year	**74.574**	**-4%▼**		

4.6 GRAPHICAL REPRESENTATION OF DOSE TRENDS IN APPENDIX D

Each page of Appendix D presents a graph of selected dose performance indicators from 1973 through 2008. The dose and performance indicators illustrate the history of the collective dose per reactor for the site, the rolling 3-year average collective dose per reactor, and the electricity generated at the site. These data are plotted, beginning with each plant's first full year of commercial operation and continuing through 2008. Data for years when a plant was not in commercial operation have been included when available. However, any data reported prior to 1973 are not included. The 3-year average collective dose per reactor data are included because they provide an overall indication of each plant's general trend in collective dose. The 3-year average collective dose per reactor is also one of the metrics used by NRC in the Reactor Oversight Program to evaluate a plant's ALARA program. This average is determined by summing the collective dose for the current year and the previous 2 years and then dividing this sum by the number of reactors reporting during those years. Depicting dose trends by using a 3-year average reduces the sporadic effects on annual doses of refueling operations (usually an 18- to 24-month cycle) and occasional high-dose maintenance activities and provides a more representative depiction of collective dose trends over the life of a plant. The annual average collective dose per reactor for all reactors of the same type is also shown on the graph.

4.7 DECONTAMINATION AND DECOMMISSIONG OF NUCLEAR POWER PLANTS

While 104 nuclear power plants are currently in commercial operation, several have undergone the process of decontamination and decommissioning (D&D), which involves the cleanup, dismantlement, and closure of the site. As more nuclear power plants reach the end of their operating license, there will be a commensurate increase in activities involving radiation exposure related to D&D. For this reason, there is an increased need to provide further information on plants undergoing D&D.

Appendix B contains a list of the plants that are no longer in commercial operation along with the dose distribution and collective dose for these plants. It should be noted that these plants may be in different stages of D&D, so that a comparison of dose at one plant versus another would not be meaningful. In addition, Appendix B lists the plant units that are no longer in commercial operation but report along with other units at the site. Under the licensing conditions and reporting requirements, it is permitted to report this information together in one report. Table 4.9 lists the plants that have ceased operation and have changed the status to "Decommissioned" as of the date shown.

TABLE 4.9
Plants No Longer in Operation
2008

Plant Name	Date of First Commercial Operation	Decommissioning Date
BIG ROCK POINT	3/29/1963	9/20/1997
DRESDEN 1	8/1/1960	8/31/1978
FORT ST. VRAIN	7/1/1979	8/29/1989
HADDAM NECK	1/1/1968	12/4/1996
HUMBOLDT BAY 3	8/1/1963	7/1/1983
LACROSSE	11/1/1969	4/30/1987
MAINE YANKEE	12/28/1972	8/6/1997
MILLSTONE 1	3/1/1971	6/30/1998
RANCHO SECO	4/17/1975	6/7/1989
SAN ONOFRE 1	1/1/1968	11/30/1992
SHOREHAM		6/6/1987
THREE MILE ISLAND 2	12/30/1978	3/28/1979
TROJAN	5/20/1976	12/31/1992
YANKEE-ROWE	7/1/1961	2/26/1992
ZION 1	12/31/1973	12/31/1997
ZION 2	9/17/1974	12/31/1997

Section 5

TRANSIENT WORKERS AND CAREER DOSES AT NRC-LICENSED FACILITIES

5.1 TERMINATION REPORTS

Under 10 CFR 20, licensees are required to submit an NRC Form 5 to NRC for each individual who is required to be monitored at the end of the monitoring year or upon the individual's termination of employment at the facility. The termination report submitted in accordance with the old §20.408, listing the individual's complete dose history during employment at the facility, is no longer required.

However, the Form 5 submitted to NRC upon an individual's termination of employment serves the same function as the previous requirements with regard to the analysis of transient workers at NRC-licensed facilities. The following analysis examines the workers who had more than one Form 5 dose record at more than one NRC-licensed facility during the monitoring year. These workers are defined as "transient" because they worked at more than one facility during the monitoring year.

The term "monitoring year" is used here in accordance with the definition of a year given in §20.1003, which defines a year as "the period of time beginning in January used to determine compliance with the provisions of Part 20. The licensee may change the start date of the monitoring year used to determine compliance provided that the change is made at the beginning of the monitoring/calendar year and that no day is omitted or duplicated in consecutive years."

5.2 TRANSIENT WORKERS AT NRC FACILITIES

Examination of the data reported for workers who began and terminated two or more periods of employment with two or more different facilities within one monitoring year is useful in many ways. For example, the number of transients and the individual doses received by them can be determined from examining these data.

Additionally, the distribution of the doses received by transient workers can be useful in determining the impact that the inclusion of these individuals in each of two or more licensees' annual reports has on the annual summary (as reported in Appendix B) for all nuclear power facilities and all NRC licensees combined (one of the issues mentioned in Section 2). Table 5.1 shows the actual distribution of transient worker doses as determined from the NRC Form 5 termination reports and compares it with the reported distribution of the doses of these workers as they would have appeared in a summation of the annual reports submitted by each of the licensees.

In 2008, over 99% of the transient individuals were reported by nuclear power facilities. For this reason, these data are shown separately in Table 5.1.

TABLE 5.1
Effects of Transient Workers on Annual Statistical Compilations
2008

License Category	Number of Individuals with TEDE in the Ranges (rem)*												Total Number Monitored	Number with Measurable Exposure	Collective TEDE (person-rem)	Average Meas. TEDE (rem)
	No Measurable Exposure	Measurable <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				
POWER REACTORS																
(1) Form 5 Summation	89,874	51,831	17,337	7,578	1,847	583	269	5					169,324	79,450	9,195.940	0.12
(2) Transients, As Reported	36,342	26,509	10,214	4,564	1,076	360	148	1					79,214	42,872	5,362.857	0.13
(3) Transients, Actual	7,804	8,510	5,201	3,772	1,658	803	800	34					28,582	20,778	5,362.857	0.26
Corrected Distribution (1-[2-3])	**61,336**	**33,832**	**12,324**	**6,786**	**2,429**	**1,026**	**921**	**38**					**118,692**	**57,356**	**9,195.940**	**0.16**
ALL LICENSEES																
(1) Form 5 Summation	95,293	54,949	18,641	8,547	2,370	862	667	104	26	3			181,462	86,169	11,300.966	0.13
(2) Transients, As Reported	36,932	26,741	10,338	4,666	1,121	378	169	7					80,352	43,420	5,650.483	0.13
(3) Transients, Actual	7,767	8,528	5,246	3,823	1,704	833	838	40	1				28,780	21,013	5,650.483	0.27
Corrected Distribution (1-[2-3])	**66,128**	**36,736**	**13,549**	**7,704**	**2,953**	**1,317**	**1,336**	**137**	**27**	**3**			**129,890**	**63,762**	**11,300.966**	**0.18**

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

Table 5.1 illustrates the impact that the multiple reporting of these transient individuals had on the summation of the dose reports for 2008. Because each licensee reports the doses received by workers while they are monitored by the particular licensee during the year, it is expected 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 doses (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 distributions, and average doses 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 2008, Table 5.1 shows that the summation of annual reports for reactor licensees indicated that 5 individuals received doses greater than 2 rem. After accounting for those individuals who were reported more than once, the corrected distribution indicated that there were really 38 transient workers who received doses greater than 2 rem. Correcting for the multiple counting of individuals also has a significant effect on the average measurable dose for these workers. The corrected average measurable dose for transient workers is twice as high as the value calculated by the summation of licensee records. The transient workers represent 33% of the workforce that receives measurable dose. The correction for the transient workers increases the average measurable dose by a factor of 2 from 0.13 rem to 0.26 rem for the transient workforce for all licensees. It should be noted that this analysis of transient workers does not include workers who may have been exposed at facilities that are not required to report to the NRC REIRS database (see Section 1), such as Agreement State licensees or DOE facilities.

One purpose of the REIRS database, which tracks occupational radiation exposures at NRC-licensed facilities, is to identify individuals who may have exceeded the occupational radiation dose limits because of multiple exposures at different facilities throughout the year. The REIRS database stores the radiation dose information for an individual by his/her unique identification number and identification type [Ref. 10, Section 1.5] and sums the dose for all facilities during the monitoring year. An individual exceeding the TEDE 5 rem per year regulatory limit would be identified in Table 5.1 in one of the dose ranges >5 rem. In 2008, there were no individuals reported by NRC licensees that exceeded the 5 rem annual TEDE limit.

Section 6

EXPOSURES TO PERSONNEL IN EXCESS OF REGULATORY LIMITS

6.1 REPORTING CATEGORIES

Doses in excess of regulatory limits are sometimes referred to as "overexposures." The phrase "doses in excess of regulatory limits" is preferred to "overexposures" because the latter suggests that a worker has been subjected to an unacceptable biological risk, which may or may not be the case.

The implementation date for the revised 10 CFR 20 was January 1, 1994. Section 10 CFR 20 includes requirements for summing internal and external dose equivalents to yield TEDEs and to implement a similar limitation system for organs and tissues (such as the gonads, red bone marrow, bone surfaces, lung, thyroid, and breast). Section 10 CFR 20.1201 limits the TEDE of workers to ionizing radiation from licensed material and other sources of radiation within the licensee's control. Section 10 CFR 20 no longer contains quarterly dose limits but has reporting requirements for planned special exposures (PSEs).[8] The annual TEDE limit for adult occupational radiation workers is 5 rem.

Sections 10 CFR 20.2202 and 10 CFR 20.2203 require that all licensees submit reports of all occurrences involving personnel radiation doses that exceed certain control levels, thus providing for investigations and corrective actions as necessary. Based on the magnitude of the dose, the occurrence may be placed into one of three categories as follows:

1. Category A
   10 CFR 20.2202(a)(1)—a TEDE to any individual of 25 rem or more, a lens dose equivalent of 75 rem or more, or a shallow-dose equivalent to the skin or extremities of 250 rad or more. The Commission must be notified immediately of these events.

2. Category B
   10 CFR 20.2202(b)(1)— In a 24-hour period, the Commission must be notified of the following events: a TEDE to any individual exceeding 5 rem, a lens dose equivalent exceeding 15 rem, or a shallow-dose equivalent to the skin or extremities exceeding 50 rem.

3. Category C
   10 CFR 20.2203—In addition to the notification required by 10 CFR 20.2202 (Category A or B events), each licensee must submit a written report within 30 days after learning of any of the following occurrences:

   a. Any incident for which notification is required by 10 CFR 20.2202

   b. Doses that exceed the limits in §20.1201, §20.1207, §20.1208, or §20.1301 (for adults, minors, the embryo/fetus of a declared pregnant worker, and the public, respectively), or any applicable limit in the license

[8]See 10 CFR 20.1206, 20.2204, and Regulatory Guide 8.35 for more information on PSEs and their reporting requirements.

c. Levels of radiation or concentrations of radioactive material that exceed any applicable license limit for restricted areas or that, for unrestricted areas, are in excess of 10 times any applicable limit set forth in 10 CFR 20 or in the license (whether or not involving dose of any individual in excess of the limits in §20.1301)

d. For licensees subject to the provisions of the Environmental Protection Agency's generally applicable environmental radiation standards in 40 CFR 190, levels of radiation or releases of radioactive material in excess of those standards or license conditions related to those standards

6.2 LIMITATIONS OF THE DATA

It is important to note that this summary of events includes only

- Occupational radiation doses in excess of the regulatory limits
- Events at NRC-licensed facilities
- Final dose of record assigned to an individual

It **does not** include

- Medical events as defined in 10 CFR 35
- Doses in excess of the regulatory limits to the general public
- Agreement State-licensed activities or DOE facilities
- Other radiation-related violations, such as high dose-rate areas or effluent limits
- Exposures to dosimeters that, upon evaluation, have been determined to be high dosimeter readings only and are not assigned to an individual as the dose of record by the licensee

Care should be taken when comparing the summary information presented here with other reports and analyses published by NRC or other agencies. Various reports may include other types of "overexposure" events; therefore, the distinctions should be noted.

The analysis and summary of incidents presented here involving doses in excess of regulatory limits represent the status of events as of the publication of this report.

Exposure events of this type typically undergo a long review and evaluation process by the licensee, the NRC inspector for the regional office, and NRC Headquarters. Preliminary dose estimates submitted by licensees are often conservatively high and do not represent the final (record) dose assigned for the event. It is, therefore, not uncommon for a dose in excess of a regulatory limits event to be reassessed and the final assigned dose to be categorized as not having been in excess of the regulatory limits. In other cases, the exposure event may not be identified until a later date, such as during the next scheduled audit or inspection of the licensee's exposure event records.

For these reasons, an attempt is made to keep the exposure events summary presented here current. An event that has been reassessed and determined not to be a dose in excess of the regulatory limits is not included in this report. In addition, events that occurred in prior years are added to the summary in the appropriate year of occurrence. The reader should note that the summary presented here represents a snapshot of the status of events as of the publication date of this report. Previous or future reports may not correlate in the exact number of events because of the review cycle and reassessment of the events.

6.3 SUMMARY OF OCCUPATIONAL RADIATION DOSES IN EXCESS OF NRC REGULATORY LIMITS

Table 6.1 summarizes the occupational radiation doses in excess of regulatory limits as reported by NRC licensees pursuant to 10 CFR 20.2202 and 10 CFR 20.2203 from 1994 to 2008. Table 6.2 shows the data reported under 10 CFR 20.403 and 10 CFR 20.405 for the period 1985 to 1993. Note that the categorization criteria changed with the revision of 10 CFR 20 in 1994.

For the period 1990 to 1993, Table 6.2 shows the number of individuals who exceeded various regulatory limits while employed by one of several types of licensees. For the period 1985 to 1989, only the doses in excess of regulatory limits reported by licensed industrial radiography firms are shown separately. Most of the occurrences included in the “All Other” category come from research facilities, universities, and measuring and well-logging activities.

In 2008, there were no category A, B, or C occurrences reported under the licensed activities included in this report.

TABLE 6.1
Occupational Doses in Excess of Regulatory Limits
1994–2008

Year	License Category	Persons and Doses (rem)	Types of Exposures and Doses					
			TEDE (rem)		Lens of the Eye (rem)		Skin/Extremity (rem)	
			5–25	>25	15–75	>75	50–250	>250 rad
2008	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES						
	POWER REACTORS	NO. OF PERSONS SUM OF DOSES			NONE REPORTED			
	NUCLEAR PHARMACIES	NO. OF PERSONS SUM OF DOSES						
	MANUFACTURING AND DISTRIBUTION	NO. OF PERSONS SUM OF DOSES						
	OTHER	NO. OF PERSONS SUM OF DOSES						
2007	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES						
	OTHER	NO. OF PERSONS SUM OF DOSES			NONE REPORTED			
2006	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES						
	OTHER	NO. OF PERSONS SUM OF DOSES			NONE REPORTED			
2005	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES					2 154	
	OTHER	NO. OF PERSONS SUM OF DOSES						
2004	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES						
	OTHER	NO. OF PERSONS SUM OF DOSES			NONE REPORTED			
2003	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1[g] 15.678		1[g] 15.667			
	OTHER	NO. OF PERSONS SUM OF DOSES						
2002	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 5.860					
	OTHER	NO. OF PERSONS SUM OF DOSES						
2001	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 5.606				1 80	
	OTHER	NO. OF PERSONS SUM OF DOSES					1 127	3 1,260
2000	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	2 11.373					
	OTHER	NO. OF PERSONS SUM OF DOSES	2 10.636					3 2,677
1999	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 5.67					
	OTHER	NO. OF PERSONS SUM OF DOSES					5[f] 566	2[f] 1,080
1998	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	4[a] 34.8				1 50-200	
	OTHER	NO. OF PERSONS SUM OF DOSES					5[f] 675	3[f] 1,115
1997	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES					1[b] 51.1	
	OTHER	NO. OF PERSONS SUM OF DOSES					5[f] 431	3[f] 1,199
1996	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 8.3					
	OTHER	NO. OF PERSONS SUM OF DOSES					7[c,f] 810.6	
1995	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 5.1					
	OTHER	NO. OF PERSONS SUM OF DOSES					4[d,f] 782	1[f] 255
1994	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	2 12.2					
	OTHER	NO. OF PERSONS SUM OF DOSES					1[e] 180	

[a]One of these individuals also received the extremity exposure as shown.

[b]This exposure was from a hot particle to a localized area of the skin.

[c]This exposure was from a hot particle to a localized area of the skin.

[d]Two of these exposures (230 rem and 342 rem) were the result of hot particles.

[e]This exposure was from a hot particle to a localized area of the skin.

[f]These exposures have been added due to a reassessment of extremity dose from the direct handling of vials containing indium at a radiopharmaceutical manufacturing licensee.

[g]These exposures were received by the same individual.

TABLE 6.2
Occupational Doses in Excess of Regulatory Limits
1985–1993

Year	License Category	Persons and Doses (rem)	Types of Exposures and Doses								
			Whole-Body (rem)			Skin (rem)			Extremity (rem)		
			<5	5– 25	>25	<7.5<30	30–50	>150	>18.75>75	75–375	>375
1993	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES		1 6							
	OTHER	NO. OF PERSONS SUM OF DOSES	8[a] 15.9	1[a] 5.4						4[f] 462.3	
1992	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES									1 300-1,000
	OTHER	NO. OF PERSONS SUM OF DOSES	2[b] 3.8			5 81.8			5 184.1	1 272	
1991	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	2 5.6								
	OTHER	NO. OF PERSONS SUM OF DOSES	3 6.2							1 22.3	
1990	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	3 7.2	3[c, d] 49.9				1[c] 6,000			
	OTHER	NO. OF PERSONS SUM OF DOSES	4[e] 11.2						1 48.8		
1989	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	3 8.1		1 93				1 72		
	ALL OTHER	NO. OF PERSONS SUM OF DOSES	4 6.6			1 9.2			2 105	1 178	
1988	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	3 8.1	1 6.1						1 118	
	ALL OTHER	NO. OF PERSONS SUM OF DOSES	7 19.34			4 66.8	1 61	1 278	1 58	1 127	
1987	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	1 3.1							1 180	
	ALL OTHER	NO. OF PERSONS SUM OF DOSES	2 2.8	1 7.5		5 128.4			3 72.0		1 650
1986	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	2 4.4								
	ALL OTHER	NO. OF PERSONS SUM OF DOSES	3 9.6						1 41.2	1 115	2 930
1985	INDUSTRIAL RADIOGRAPHY	NO. OF PERSONS SUM OF DOSES	6 16.7	3 32.6	1 27.0					1 288	
	ALL OTHER	NO. OF PERSONS SUM OF DOSES	7 11.8						3 60.2	1 93	

[a]Same individual exceeded 1.25 rem/qtr limit twice during 1993.

[b]This 1992 exposure was reported in 1994.

[c]This individual received a whole-body dose of 24 rem in addition to a 6,000 rem skin dose.

[d]One of these individuals received a 9 rem whole-body dose in addition to a 1,070 rem extremity dose.

[e]One of these individuals exceeded the quarterly whole-body dose limits three times in one calendar year.

[f]An additional 1993 exposure was reported in 1994.

6.4 MAXIMUM OCCUPATIONAL RADIATION DOSES BELOW NRC REGULATORY LIMITS

Because few radiation doses exceed the NRC occupational radiation dose limits, certain researchers have expressed an interest in a listing of the maximum radiation doses received at NRC licensees that do not exceed the regulatory limits. This would allow an examination of doses that approach, but do not exceed, the regulatory limits. Table 6.3 shows the maximum doses for each dose category required to be reported to the NRC. In addition, the number of doses in certain dose ranges is shown to reflect the number of doses that approach NRC regulatory limits. As shown in Table 6.3, few doses exceed half of the NRC occupational annual limits. In 2008, seven individuals exceeded 75% of the TEDE dose limit, but no individual exceeded the 5 rem TEDE annual limit or any other annual limit.

TABLE 6.3
Maximum Occupational Doses for Each Exposure Category*
2008

Dose Category**	Annual Dose Limit 10CFR20***	Maximum Dose Reported (rem)	Max Dose Percent of the Limit	Number of Individuals with Measurable Dose	Number of Individuals >25% of the Limit	Number of Individuals >50% of the Limit	Number of Individuals >75% of the Limit	Number of Individuals >95% of the Limit	Number of Individuals > Limit
SDE-ME	50 rem	49.270	99%	59,187	141	30	7	1	0
SDE-WB	50 rem	5.470	10%	63,933	0	0	0	0	0
LDE	15 rem	4.270	28%	62,064	7	0	0	0	0
CEDE		1.028		2,145					
CDE		8.564		1,877					
DDE		4.198		62,709					
TEDE	5 rem	4.198	84%	63,621	836	58	7	0	0
TODE	50 rem	8.716	17%	62,963	0	0	0	0	0

* Only records reported by licensees required to report under 10 CFR 20.2206 are included. Numbers have been adjusted for the multiple reporting of transient individuals.

**SDE-ME = shallow dose equivalent to the maximally exposed extremity
SDE-WB = shallow dose equivalent to the whole body
LDE = eye dose equivalent to the lens of the eye
CEDE = committed effective dose equivalent
CDE = committed dose equivalent
DDE = deep dose equivalent
TEDE = total effective dose equivalent
TODE = total organ dose equivalent

*** Shaded boxes represent dose categories that do not have specific dose limits defined in 10 CFR 20.

Section 7
REFERENCES

1. U.S. Atomic Energy Commission, *Nuclear Power Plant Operating Experience During 1973,* USAEC Report 00E-ES-004, December 1974.*

2. U.S. Nuclear Regulatory Commission, *Nuclear Power Plant Operating Experience 1974–1975,* USNRC Report NUREG-0227, April 1977.*

3. U.S. Nuclear Regulatory Commission, *Nuclear Power Plant Operating Experience 1976,* USNRC Report NUREG-0366, December 1977.*

4. M. R. Beebe, *Nuclear Power Plant Operating Experience – 1977,* USNRC Report NUREG-0483, February 1979.*

5. *Nuclear Power Plant Operating Experience – 1978,* USNRC Report NUREG-0618, December 1979.*

6. *Nuclear Power Plant Operating Experience – 1979,* USNRC Report NUREG/CR-1496, May 1981.*

7. *Nuclear Power Plant Operating Experience – 1980,* USNRC Report NUREG/CR-2378, ORNL/NSIC-191, October 1982.*

8. *Nuclear Power Plant Operating Experience – 1981,* USNRC Report NUREG/CR-3430, ORNL/NSIC-215, Vol. 1, December 1983.*

9. *Nuclear Power Plant Operating Experience – 1982,* USNRC Report NUREG/CR-3430, ORNL/NSIC-215, Vol. 2, January 1985.*

10. *Instructions for Recording and Reporting Occupational Radiation Exposure Data,* USNRC Regulatory Guide 8.7, Rev. 2, November 2005.

11. United Nations, *Sources and Effects of Ionizing Radiation, United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly, Volume I,* General Assembly of Official Records, United Nations, New York, 2000.

12. International Commission on Radiological Protection Publication 68, *Dose Coefficients for Intakes of Radionuclides by Workers*, Annals of the ICRP Volume 24/4, December 1994.

13. *Licensed Operating Reactors, Status Summary Report,* compiled from reactor monthly operating reports submitted to the NRC. Data provided electronically from the Idaho National Engineering and Environmental Laboratory Risk, Reliability and Regulatory Support Department under contract to the NRC in support of NRC's Performance Indicator Project.

*Report is available for purchase from the National Technical Information Service, Springfield, VA, 22161, and/or the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328.

Appendix A

ANNUAL TEDE FOR NONREACTOR NRC LICENSEES AND OTHER FACILITIES REPORTING TO THE NRC

2008

APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2008

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00–2.00	2.00–3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–12.00	>12.0				
INDUSTRIAL RADIOGRAPHY – FIXED LOCATION – 03310																		
DEPARTMENT OF THE ARMY	13-18235-01	26	25	-	-	-	-	-	-	-	-	-	-	-	**51**	**25**	**0.484**	0.019
HARRISON STEEL CASTINGS CO.	13-02141-01	6	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
INTERMET - ARCHER CREEK	45-17464-01	3	1	-	-	-	-	-	-	-	-	-	-	-	4	1	0.025	**0.025**
Total	**3**	**35**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**61**	**26**	**0.509**	**0.020**
INDUSTRIAL RADIOGRAPHY – TEMPORARY JOB SITE – 03320																		
ACUREN INSPECTION, INC.	42-27593-01	1	12	6	4	5	3	4	2	-	-	-	-	-	37	36	18.815	0.523
ACUREN USA, INC.	42-32443-01	22	80	42	30	13	5	5	-	-	-	-	-	-	197	175	38.220	0.218
ALASKA INDUSTRIAL X-RAY	50-16084-01	-	1	1	4	2	1	1	1	1	-	-	-	-	12	12	11.405	0.950
ALLIED INSPECTION SERVICES, INC.	21-18428-01	-	-	-	1	1	1	1	-	-	-	-	-	-	4	4	2.958	0.740
ALONSO & CARUS IRON WORKS, INC.	52-21350-01	1	1	1	1	-	-	1	-	-	-	-	-	-	5	4	2.091	0.523
AMERICAN ENGINEERING TESTING, INC.	22-20271-02	-	3	-	1	1	2	1	1	1	-	-	-	-	10	10	9.829	0.983
APPLIED TECHNICAL SERVICES, INC.	45-25477-01	6	26	6	7	2	2	6	1	-	-	-	-	-	56	50	17.005	0.340
BRANCH RADIOGRAPHIC LABS.	29-03405-02	4	7	3	2	6	3	1	-	-	-	-	-	-	26	22	9.532	0.433
CALUMET TESTING SERVICES	13-16347-01	3	5	4	3	-	-	5	2	-	-	-	-	-	22	19	14.858	0.782
CAPITAL X-RAY SERVICES, INC.	35-11114-01	7	8	1	1	3	2	6	4	1	-	-	-	-	33	26	26.071	1.003
CENTURY INSPECTION, INC.	42-08456-02	34	28	14	9	6	4	3	-	1	-	-	-	-	99	65	20.341	0.313
CERTIFIED TESTING LABS., INC	29-14150-01	4	10	4	1	-	-	1	-	-	-	-	-	-	20	16	2.938	0.184
COLBY-THIELMEIER TESTING CO.	24-13737-01	-	2	-	4	1	-	4	-	-	-	-	-	-	11	11	8.762	0.797
COMO TECH INSPECTION	15-26978-01	-	-	-	3	1	-	1	-	-	-	-	-	-	5	5	3.427	0.685
CONAM INSPECTION	12-16559-02	2	20	18	13	9	6	9	2	-	-	-	-	-	79	77	35.736	0.464
CONCRETE IMAGING, INC.	47-31316-01	2	-	-	2	-	1	-	-	-	-	-	-	-	5	3	1.492	0.497
CONSUMERS ENERGY LAB SERVICES	21-08606-03	13	2	2	9	3	-	1	-	-	-	-	-	-	30	17	6.566	0.386
DBI, INC. QUALITY INSPECTION	49-29301-01	1	3	5	3	2	4	18	2	-	-	-	-	-	38	37	39.396	1.065
EASTERN TESTING & INSPECTION, INC.	29-09814-01	3	1	3	4	2	-	-	-	-	-	-	-	-	13	10	3.368	0.337

NOTE: The data values shown bolded and in boxes represent the highest value in each category. These values have not been adjusted for the multiple counting of transient workers (see section 5).
*Dose values exactly equal to the values separating ranges are reported in the next higher range.

APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00–2.00	2.00–3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–12.00	>12.0				
INDUSTRIAL RADIOGRAPHY – TEMPORARY JOB SITE – 03320 (Continued)																		
FROEHLING & ROBERTSON, INC.	45-08890-01	3	1	2	-	-	-	-	-	-	-	-	-	-	6	3	0.339	0.113
G. E. INSPECTION SERVICES, INC.	39-24888-01	9	28	8	10	2	-	1	-	-	-	-	-	-	58	49	8.662	0.177
GENERAL DYNAMICS CORP - ELEC BOAT	06-01781-08	5	23	7	-	-	-	-	-	-	-	-	-	-	35	30	1.867	0.062
GENERAL TESTING & INSPECTION CO.	47-32191-01	-	2	-	-	-	-	-	-	-	-	-	-	-	2	2	0.024	0.012
H & H X-RAY SERVICES, INC.	17-19236-01	5	15	37	61	60	34	50	10	3	-	-	-	-	275	270	200.159	0.741
HIGH MOUNTAIN INSPECTION SERVICES	49-26808-02	-	5	4	4	6	6	23	10	2	-	-	-	-	60	60	75.395	1.257
HUDSON GLOBAL RESOURCES	37-27891-02	4	6	5	5	-	1	3	-	-	-	-	-	-	24	20	7.468	0.373
HUNTINGTON TESTING & TECHNOLOGY	47-23076-01	5	7	9	3	1	6	5	2	-	-	-	-	-	38	33	20.309	0.615
INTEGRITY TESTING AND INSPECTION	16-31189-01	-	2	2	5	6	2	5	1	-	-	-	-	-	23	23	16.823	0.731
INTEGRITY TESTLAB	07-30791-01	1	4	3	3	3	7	7	2	1	-	-	-	-	31	30	27.949	0.932
JANX INTEGRITY GROUP	21-16560-01	82	63	54	68	52	43	85	8	1	-	-	-	-	**456**	**374**	**245.700**	0.657
J CORE DRILLING, INC.	45-30846-01	1	2	1	-	-	1	-	-	-	-	-	-	-	5	4	1.029	0.257
KAKIVIK ASSET MANAGEMENT	50-27667-01	37	38	29	32	10	13	6	2	-	-	-	-	-	167	130	49.210	0.379
LKS INSPECTION SERVICES, LLC	53-27795-01	-	2	2	-	-	-	-	1	-	-	-	-	-	5	5	2.490	0.498
MARTIN INDUSTRIAL TESTING, INC.	45-25452-01	-	1	-	-	1	-	1	-	-	-	-	-	-	3	3	1.594	0.531
MARYLAND Q.C. LABORATORIES, INC.	19-28683-01	5	7	3	2	1	-	-	-	-	-	-	-	-	18	13	1.760	0.135
MASSACHUSETTS MATERIALS RESEARCH	07-01173-03	1	3	-	-	-	-	-	-	-	-	-	-	-	4	3	0.012	0.004
MECHANICAL INTEGRITY SOLUTIONS	52-25615-01	-	5	8	1	-	-	-	-	-	-	-	-	-	14	14	1.792	0.128
MID AMERICAN INSPECTION SERVICES, INC.	21-26060-01	-	2	3	2	1	-	6	4	-	-	-	-	-	18	18	20.433	1.135
NEWPORT NEWS SHIPBUILDING & DRY DOCK CO.	45-09428-02	3	22	4	-	-	-	-	-	-	-	-	-	-	29	26	1.155	0.044
PACIFIC TESTING SERVICES, INC.	53-29118-01	-	8	-	-	-	-	-	-	-	-	-	-	-	8	8	0.018	0.002
POLE BROTHERS IMAGING COMPANY	45-25383-01	-	-	-	-	2	-	2	-	-	-	-	-	-	4	4	3.841	0.960
PRECISION CUSTOM COMPONENTS, LLC.	37-16280-01	12	7	-	-	-	-	-	-	-	-	-	-	-	19	7	0.024	0.003
PRIME NDT SERVICES, INC.	37-23370-01	1	9	8	9	12	6	8	5	-	-	-	-	-	58	57	40.988	0.719

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APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00–2.00	2.00–3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–12.00	>12.0				
INDUSTRIAL RADIOGRAPHY – TEMPORARY JOB SITE – 03320 (Continued)																		
PROFESSIONAL SERVICE INDUSTRIES	12-16941-03	2	1	1	1	1	-	4	-	-	-	-	-	-	10	8	8.060	1.008
QUALITY INSPECTION SERVICES, INC.	31-30187-01	7	26	13	15	8	3	9	-	-	-	-	-	-	81	74	27.117	0.366
QUALITY TESTING SERVICE, INC.	24-32292-01	-	12	3	-	-	-	1	-	-	-	-	-	-	16	16	2.145	0.134
SCIENTIFIC TECHNICAL, INC.	45-24882-01	6	2	-	-	-	-	-	-	-	-	-	-	-	8	2	0.087	0.044
SHAW PIPELINE SERVICES	35-23193-01	12	46	55	73	35	35	32	4	1	-	-	-	-	293	281	144.569	0.514
SOUTHWEST X-RAY CORP	49-29277-01	-	2	2	2	-	1	-	-	-	-	-	-	-	7	7	1.771	0.253
T & K INSPECTION, INC.	33-27678-01	-	-	1	3	2	-	9	3	-	-	-	-	-	18	18	22.582	1.255
TEAM INDUSTRIAL SERVICES, INC.	42-32219-01	20	47	19	27	10	7	10	7	-	-	-	-	-	147	127	57.858	0.456
TEI ANALYTICAL SERVICES, INC.	37-28004-01	-	9	9	5	5	13	13	4	-	-	-	-	-	58	58	44.688	0.770
TESTING TECHNOLOGIES, INC.	45-25007-01	-	4	8	4	3	4	2	-	-	-	-	-	-	25	25	10.774	0.431
TESTMASTER INSPECTION COMPANY	34-24872-02	-	-	1	1	3	1	1	-	-	-	-	-	-	7	7	4.651	0.664
TULSA GAMMA RAY, INC.	35-17178-01	6	14	16	14	17	12	17	13	8	2	-	-	-	119	113	122.565	1.085
TVA - INSPECTION SERVICES ORG	41-06832-06	10	5	-	-	-	-	-	-	-	-	-	-	-	15	5	0.117	0.023
VALLEY INSPECTION SERVICE, INC.	37-28385-01	-	-	1	-	-	-	3	2	-	-	-	-	-	6	6	10.486	**1.748**
WASHINGTON GROUP INTERNATIONAL	29-27761-01	5	28	1	-	-	-	-	-	-	-	-	-	-	34	29	0.927	0.032
Total	**58**	**345**	**667**	**429**	**452**	**298**	**229**	**371**	**93**	**20**	**2**	**0**	**0**	**0**	**2,906**	**2,561**	**1,460.248**	**0.570**

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APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-12.00	>12.0				
MANUFACTURING AND DISTRIBUTION - NUCLEAR PHARMACIES - 02500																		
CAPITAL PHARMACY INCORPORATED	21-26597-01MD	8	7	2	-	-	-	-	-	-	-	-	-	-	17	9	0.521	0.058
CARDINAL HEALTH	34-29200-01MD	185	564	108	26	11	1	3	-	-	-	-	-	-	**898**	**713**	50.665	0.071
GE HEALTHCARE - KENTWOOD	21-26707-01MD	18	7	-	-	-	-	-	-	-	-	-	-	-	25	7	0.266	0.038
GE HEALTHCARE - LIVINGSTON, NJ	29-28341-02MD	21	8	10	5	-	-	-	-	-	-	-	-	-	44	23	3.564	0.155
GE HEALTHCARE - LIVONIA	21-24828-01MD	14	15	2	1	-	-	-	-	-	-	-	-	-	32	18	1.114	0.062
GE HEALTHCARE - ST. LOUIS/OVERLAND	24-32462-01MD	6	12	-	-	-	-	-	-	-	-	-	-	-	18	12	0.361	0.030
IBA MOLECULAR NORTH AMERICA, INC.	45-25221-01MD	13	42	23	10	5	2	7	5	6	1	-	-	-	114	101	**58.082**	**0.575**
MALLINCKRODT, INC.	24-04206-08MD	10	7	-	-	-	-	-	-	-	-	-	-	-	17	7	0.312	0.045
MALLINCKRODT MEDICAL, INC.	24-04206-01MD	15	2	1	-	-	-	-	-	-	-	-	-	-	18	3	0.217	0.072
MALLINCKRODT MEDICAL, INC.	24-04206-10MD	15	5	-	-	-	-	-	-	-	-	-	-	-	20	5	0.101	0.020
MALLINCKRODT MEDICAL, INC.	24-04206-13MD	9	5	-	-	-	-	-	-	-	-	-	-	-	14	5	0.145	0.029
MID-AMERICA ISOTOPES, INC.	24-26241-01MD	35	6	3	1	1	1	-	-	-	-	-	-	-	47	12	2.564	0.214
Total	**12**	**349**	**680**	**149**	**43**	**17**	**4**	**10**	**5**	**6**	**1**	**0**	**0**	**0**	**1,264**	**915**	**117.912**	**0.129**
MANUFACTURING AND DISTRIBUTION - TYPE "A" BROAD - 03211																		
INTERNATIONAL ISOTOPES IDAHO, INC.	11-27680-01	6	12	6	3	7	2	2	1	-	-	-	-	-	39	33	13.456	**0.408**
MALLINCKRODT MEDICAL, INC.	24-04206-01	147	110	54	47	36	20	12	-	-	-	-	-	-	**426**	**279**	**82.334**	0.295
Total	**2**	**153**	**122**	**60**	**50**	**43**	**22**	**14**	**1**	**0**	**0**	**0**	**0**	**0**	**465**	**312**	**95.790**	**0.307**
MANUFACTURING AND DISTRIBUTION - TYPE "B" BROAD - 03212																		
BEST MEDICAL INTERNATIONAL, INC.	45-19757-01	65	85	13	6	1	-	-	-	-	-	-	-	-	**170**	**105**	**7.610**	**0.072**
Total	**1**	**65**	**85**	**13**	**6**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**170**	**105**	**7.610**	**0.072**

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APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-12.00	>12.0				
MANUFACTURING AND DISTRIBUTION - OTHER - 03214																		
BEST THERATRONICS	45-31299-01	-	1	-	1	-	-	-	-	-	-	-	-	-	2	2	**0.427**	**0.214**
INTERGRATED INDUSTRIAL SYSTEMS, INC.	06-21253-01	17	2	2	-	-	-	-	-	-	-	-	-	-	**21**	**4**	0.358	0.090
PRINCETON GAMMA-TECH, INC.	29-12783-01	9	3	-	-	-	-	-	-	-	-	-	-	-	12	3	0.026	0.009
Total	**3**	**26**	**6**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**9**	**0.811**	**0.090**
INDEPENDENT SPENT FUEL STORAGE INSTALLATION - 23200																		
GENERAL ELECTRIC - MORRIS OPERATION	SNM-2500	2	17	3	1	-	-	-	-	-	-	-	-	-	23	**21**	**1.248**	**0.059**
TROJAN ISFSI	SNM-2509	30	-	-	-	-	-	-	-	-	-	-	-	-	**30**	-	-	-
Total	**2**	**32**	**17**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**53**	**21**	**1.248**	**0.059**
FUEL CYCLE URANIUM ENRICHMENT PLANTS - 21200																		
USEC, INC.	SNM-7003	467	30	-	-	-	-	-	-	-	-	-	-	-	497	30	0.472	0.016
USEC - PADUCAH GDP	GDP-1	1,614	98	17	3	-	-	-	-	-	-	-	-	-	**1,732**	118	6.600	**0.056**
USEC - PORTSMOUTH GDP	GDP-2	1,188	211	20	1	-	-	-	-	-	-	-	-	-	1,420	**232**	**8.555**	0.037
Total	**3**	**3,269**	**339**	**37**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,649**	**380**	**15.627**	**0.041**
FUEL CYCLE FUEL FABRICATION FACILITIES - 21210																		
AREVA NP, INC.	SNM-1168	575	129	54	30	7	-	-	-	-	-	-	-	-	795	220	27.504	0.125
AREVA NP, INC.	SNM-1227	84	136	59	41	44	12	2	-	-	-	-	-	-	378	294	66.884	0.227
B&W NUCLEAR OPERATIONS GROUP	SNM-0042	23	142	55	17	2	2	1	-	-	-	-	-	-	242	219	24.347	0.111
GLOBAL NUCLEAR FUEL AMERICAS	SNM-1097	384	417	169	101	4	-	-	-	-	-	-	-	-	**1,075**	**691**	73.459	0.106
NUCLEAR FUEL SERVICES, INC.	SNM-0124	-	163	110	42	16	6	-	-	-	-	-	-	-	337	337	54.363	0.161
WESTINGHOUSE ELECTRIC COMPANY	SNM-1107	79	189	164	181	91	4	-	-	-	-	-	-	-	708	629	**158.714**	**0.252**
Total	**6**	**1,145**	**1,176**	**611**	**412**	**164**	**24**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**3,535**	**2,390**	**405.271**	**0.170**

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APPENDIX A

Table A2 - Other Facilities Reporting to the NRC
2008

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-12.00	>12.0				
MEASURING SYSTEMS FIXED GAUGES - 03120																		
TRANSCANADA	21-29258-01	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
TVA - CUMBERLAND FOSSIL PLANT	41-25219-01	12	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-
TVA - PARADISE FOSSIL PLANT	16-25243-01	15	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-
TVA - WIDOWS CREEK FOSSIL PLANT	01-25207-01	28	-	-	-	-	-	-	-	-	-	-	-	-	**28**	-	-	-
Total	**4**	**56**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**0**	**0.000**	**0**
INSTRUMENT CALIBRATION SERVICE ONLY - SOURCE > 100 CURIES - 03222																		
GENERAL DYNAMICS CORP - ELEC BOAT	06-01781-03	1	6	-	-	-	-	-	-	-	-	-	-	-	**7**	**6**	**0.036**	**0.006**
Total	**1**	**1**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**6**	**0.036**	**0.006**
OTHER SERVICES - 03225																		
TVA - POWER SERVICE CENTER	41-08165-08	69	2	-	-	-	-	-	-	-	-	-	-	-	**71**	**2**	**0.040**	**0.020**
TVA - WESTERN AREA RADIOLOGICAL LAB	01-06113-04	15	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-
Total	**2**	**84**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**86**	**2**	**0.040**	**0.020**
INDUSTRIAL RADIOGRAPHY - TEMPORARY JOB SITES - 03320																		
BRAUN INTERTEC CORP.	MN-1082-100-27	4	7	3	6	3	5	3	2	-	-	-	-	-	33	29	18.129	0.625
VALLEY INDUSTRIAL X-RAY & INSPECTION	CA-4182-15	9	40	14	15	15	16	29	7	1	-	-	-	-	**146**	**137**	**91.811**	**0.670**
WYLE LABORATORIES	FL-2953-1	20	9	-	-	-	-	-	-	-	-	-	-	-	29	9	0.203	0.023
YUBA HEAT TRANSFER	OK-13735-01	-	1	3	-	-	-	-	-	-	-	-	-	-	4	4	0.347	0.087
Total	**4**	**33**	**57**	**20**	**21**	**18**	**21**	**32**	**9**	**1**	**0**	**0**	**0**	**0**	**212**	**179**	**110.490**	**0.617**

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APPENDIX A

Table A2 - Other Facilities Reporting to the NRC 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-12.00	>12.0				
IRRADIATORS OTHER GREATER THAN 10000 CURIES - 03521																		
ARMED FORCES RADIOBIO. RES. INST.	19-08330-03	58	13	-	-	-	-	-	-	-	-	-	-	-	**71**	**13**	**0.161**	**0.012**
Total	**1**	**58**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**71**	**13**	**0.161**	**0.012**
MULTI-SITE, MULTI-REGIONAL MATERIALS LICENSE - 03613																		
DEPARTMENT OF THE NAVY	45-23645-01NA	97	98	3	2	-	-	-	-	-	-	-	-	-	**200**	**103**	**2.964**	**0.029**
Total	**1**	**97**	**98**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**200**	**103**	**2.964**	**0.029**
BYPRODUCT MATERIAL STANDBY - NO OPERATIONS - 03810																		
TVA - ERC MIXED WASTE STORAGE	01-25284-01	5	-	-	-	-	-	-	-	-	-	-	-	-	**5**	**-**	**-**	**-**
Total	**1**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0.000**	**0**
URANIUM HEXAFLUORIDE (UF_6) PRODUCTION PLANTS - 11400																		
HONEYWELL INTERNATIONAL, INC.	SUB-0526	29	370	137	79	40	13	15	-	-	-	-	-	-	**683**	**654**	**117.303**	**0.179**
Total	**1**	**29**	**370**	**137**	**79**	**40**	**13**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**683**	**654**	**117.303**	**0.179**

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APPENDIX A

Table A2 - Other Facilities Reporting to the NRC 2008 (continued)

PROGRAM CODE – LICENSEE NAME	LICENSE#	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)	Average Meas. TEDE (rem)
		No Meas. Exposure	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-2.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-12.00	>12.0				
NUCLEAR REACTOR - 41111 (INTERNATIONAL)																		
TOMARI NPP	TOMARI-1	-	27	36	58	10	-	-	-	-	-	-	-	-	**131**	**131**	**32.541**	**0.248**
Total	**1**	**0**	**27**	**36**	**58**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**131**	**131**	**32.541**	**0.248**
TEST REACTOR FACILITIES - 42140**																		
NAT'L AERONAUTICS AND SPACE ADMIN	TR-3	142	21	-	-	-	-	-	-	-	-	-	-	-	163	21	0.225	0.011
NAT'L INSTITUTE OF STANDARDS & TECH	TR-5	8	131	18	11	-	-	-	-	-	-	-	-	-	**168**	**160**	**9.831**	**0.061**
Total	**2**	**150**	**152**	**18**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**331**	**181**	**10.056**	**0.056**
PROGRAM CODE - 42150																		
UNIVERSITY OF ARIZONA	R-52	6	-	-	-	-	-	-	-	-	-	-	-	-	**6**	**-**	**-**	**-**
Total	**1**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0.000**	**0**
PROGRAM CODE - NONE																		
AEROTEST OPERATIONS, INC.	R-98	-	-	-	1	1	5	5	7	2	-	-	-	-	21	21	36.238	**1.726**
ENVIRONMENTAL MANAGEMENT & CONTROL	3546-50	-	-	2	2	1	-	-	-	-	-	-	-	-	5	5	1.717	0.343
WELDSONIX, INC.	L05718	7	15	23	21	17	7	5	1	1	-	-	-	-	**97**	**90**	**41.157**	0.457
Total	**3**	**7**	**15**	**25**	**24**	**19**	**12**	**10**	**8**	**3**	**0**	**0**	**0**	**0**	**123**	**116**	**79.112**	**0.682**

NOTE: The data values shown bolded and in boxes represent the highest value in each category. These values have not been adjusted for the multiple counting of transient workers (see section 5).

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

**Test reactor facilities are required to report to NRC, but only two facilities report under this category and one of the facilities is in decommissioning.

Appendix B

ANNUAL WHOLE-BODY DOSES AT LICENSED NUCLEAR POWER FACILITIES

2008

APPENDIX B

Annual Whole-Body Doses at Licensed Nuclear Power Facilities 2008

PLANT NAME	TYPE	Number of Individuals with Whole-Body Doses in the Ranges (rem)*														Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00–2.00	2.00-3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–7.00	7.00–12.00	>12.0			
ARKANSAS 1, 2	PWR	1,386	1,201	374	158	37	18	3	-	-	-	-	-	-	-	3,177	1,791	196.047
BEAVER VALLEY 1, 2	PWR	1,669	713	210	64	4	-	-	-	-	-	-	-	-	-	2,660	991	83.394
BRAIDWOOD 1, 2	PWR	1,844	852	333	50	-	-	-	-	-	-	-	-	-	-	3,079	1,235	103.180
BROWNS FERRY 1, 2, 3	BWR	1,947	1,384	566	422	171	67	23	-	-	-	-	-	-	-	4,580	2,633	482.127
BRUNSWICK 1, 2	BWR	1,394	1,586	508	308	94	34	16	-	-	-	-	-	-	-	3,940	2,546	354.212
BYRON 1, 2	PWR	1,990	996	355	118	13	1	-	-	-	-	-	-	-	-	3,473	1,483	140.809
CALLAWAY 1	PWR	1,216	602	105	19	3	-	-	-	-	-	-	-	-	-	1,945	729	45.738
CALVERT CLIFFS 1,2	PWR	1,404	503	171	61	9	1	-	-	-	-	-	-	-	-	2,149	745	74.149
CATAWBA 1, 2	PWR	2,431	837	221	46	5	1	-	-	-	-	-	-	-	-	3,541	1,110	85.080
CLINTON	BWR	1,610	706	399	216	51	8	1	-	-	-	-	-	-	-	2,991	1,381	205.086
COLUMBIA GENERATING	BWR	938	519	159	35	2	-	-	-	-	-	-	-	-	-	1,653	715	54.957
COMANCHE PEAK 1, 2	PWR	1,465	566	227	184	34	21	5	-	-	-	-	-	-	-	2,502	1,037	168.836
COOK 1, 2	PWR	2,299	695	238	35	3	-	-	-	-	-	-	-	-	-	3,270	971	76.460
COOPER STATION	BWR	620	990	291	178	127	73	51	5	-	-	-	-	-	-	2,335	1,715	359.926
CRYSTAL RIVER 3	PWR	953	229	47	6	-	-	-	-	-	-	-	-	-	-	1,235	282	16.110
DAVIS-BESSE 1	PWR	1,201	616	248	115	6	-	-	-	-	-	-	-	-	-	2,186	985	106.603
DIABLO CANYON 1, 2	PWR	1,910	1,314	558	212	32	5	-	-	-	-	-	-	-	-	4,031	2,121	235.034
DRESDEN 2, 3	BWR	1,402	1,688	457	144	18	-	-	-	-	-	-	-	-	-	3,709	2,307	198.153
DUANE ARNOLD	BWR	912	187	74	14	1	-	-	-	-	-	-	-	-	-	1,188	276	24.187
FARLEY 1, 2	PWR	1,173	537	127	5	-	-	-	-	-	-	-	-	-	-	1,842	669	40.833
FERMI 2	BWR	1,075	328	115	17	-	-	-	-	-	-	-	-	-	-	1,535	460	35.186
FITZPATRICK	BWR	607	899	275	194	45	10	7	-	-	-	-	-	-	-	2,037	1,430	184.772
FT CALHOUN	PWR	808	531	215	62	26	5	-	-	-	-	-	-	-	-	1,647	839	96.155
GINNA	PWR	1,134	633	220	106	16	-	1	-	-	-	-	-	-	-	2,110	976	101.996
GRAND GULF	BWR	892	1,316	333	163	25	6	-	-	-	-	-	-	-	-	2,735	1,843	167.859
HARRIS 1	PWR	972	159	27	6	-	-	-	-	-	-	-	-	-	-	1,164	192	10.356
HATCH 1, 2	BWR	985	765	386	208	29	7	2	-	-	-	-	-	-	-	2,382	1,397	189.433
HOPE CREEK 1	BWR	127	734	167	78	17	3	-	-	-	-	-	-	-	-	1,126	999	34.510
INDIAN POINT 2	PWR	12	604	232	116	47	12	2	-	-	-	-	-	-	-	1,025	1,013	139.683
INDIAN POINT 3	PWR	151	443	-	-	-	-	-	-	-	-	-	-	-	-	594	443	3.045
KEWAUNEE	PWR	1,001	346	115	98	29	7	3	-	-	-	-	-	-	-	1,599	598	92.951
LASALLE 1, 2	BWR	1,481	1,777	403	179	33	4	6	-	-	-	-	-	-	-	3,883	2,402	217.567
LIMERICK 1, 2	BWR	1,758	833	323	198	35	4	-	-	-	-	-	-	-	-	3,151	1,393	176.825
MCGUIRE 1, 2	PWR	1,940	1,007	464	128	12	2	-	-	-	-	-	-	-	-	3,553	1,613	165.767
MILLSTONE 2, 3	PWR	1,949	737	371	217	92	38	12	-	-	-	-	-	-	-	3,416	1,467	272.693
MONTICELLO	BWR	1,115	188	110	49	3	1	-	-	-	-	-	-	-	-	1,466	351	43.777
NINE MILE POINT 1, 2	BWR	1,269	636	353	219	105	42	36	-	-	-	-	-	-	-	2,660	1,391	301.824
NORTH ANNA 1, 2	PWR	2,960	603	163	24	4	1	-	-	-	-	-	-	-	-	3,755	795	61.003

Note: Totals corrected for transients on page B-3.

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

APPENDIX B

Annual Whole-Body Doses at Licensed Nuclear Power Facilities 2008 (continued)

PLANT NAME	TYPE	Number of Individuals with Whole-Body Doses in the Ranges (rem)*														Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00-2.00	2.00–3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–7.00	7.00–12.00	>12.0			
OCONEE 1, 2, 3	PWR	2,589	1,269	516	124	15	-	-	-	-	-	-	-	-	-	4,513	1,924	186.335
OYSTER CREEK	BWR	1,600	899	351	185	47	19	10	-	-	-	-	-	-	-	3,111	1,511	211.932
PALISADES	PWR	849	178	80	13	1	-	-	-	-	-	-	-	-	-	1,121	272	23.478
PALO VERDE 1, 2, 3	PWR	2,492	1,171	377	144	12	1	1	-	-	-	-	-	-	-	4,198	1,706	159.913
PEACH BOTTOM 2, 3	BWR	1,593	1,222	364	167	40	17	6	-	-	-	-	-	-	-	3,409	1,816	212.741
PERRY	BWR	1,003	338	142	45	3	-	-	-	-	-	-	-	-	-	1,531	528	52.058
PILGRIM 1	BWR	238	294	68	14	1	-	-	-	-	-	-	-	-	-	615	377	22.568
POINT BEACH 1, 2	PWR	1,378	527	239	141	42	6	3	-	-	-	-	-	-	-	2,336	958	144.021
PRAIRIE ISLAND 1, 2	PWR	911	650	274	106	24	3	3	-	-	-	-	-	-	-	1,971	1,060	126.723
QUAD CITIES 1, 2	BWR	1,582	1,203	503	299	53	4	3	-	-	-	-	-	-	-	3,647	2,065	274.444
RIVER BEND 1	BWR	794	1,116	276	225	103	49	40	-	-	-	-	-	-	-	2,603	1,809	311.697
ROBINSON 2	PWR	1,105	534	218	35	1	-	-	-	-	-	-	-	-	-	1,893	788	68.381
SALEM 1, 2	PWR	425	2,469	562	262	57	10	2	-	-	-	-	-	-	-	3,787	3,362	328.761
SAN ONOFRE 2, 3	PWR	2,547	671	177	115	42	7	2	-	-	-	-	-	-	-	3,561	1,014	125.320
SEABROOK	PWR	889	1,101	138	45	8	5	-	-	-	-	-	-	-	-	2,186	1,297	74.992
SEQUOYAH 1, 2	PWR	1,553	670	227	55	5	3	-	-	-	-	-	-	-	-	2,513	960	83.730
SOUTH TEXAS 1, 2	PWR	1,507	642	279	177	65	12	6	-	-	-	-	-	-	-	2,688	1,181	187.295
ST. LUCIE 1, 2	PWR	1,750	747	264	106	8	2	-	-	-	-	-	-	-	-	2,877	1,127	112.234
SUMMER 1	PWR	1,257	467	120	35	1	-	-	-	-	-	-	-	-	-	1,880	623	49.091
SURRY 1, 2	PWR	3,101	560	354	118	25	8	4	-	-	-	-	-	-	-	4,170	1,069	150.269
SUSQUEHANNA 1, 2	BWR	1,811	1,306	396	148	35	8	2	-	-	-	-	-	-	-	3,706	1,895	192.892
THREE MILE ISLAND 1	PWR	1,128	62	2	-	-	-	-	-	-	-	-	-	-	-	1,192	64	2.219
TURKEY POINT 3, 4	PWR	1,783	753	237	66	11	-	-	-	-	-	-	-	-	-	2,850	1,067	97.357
VERMONT YANKEE	BWR	397	895	257	136	60	36	18	-	-	-	-	-	-	-	1,799	1,402	213.680
VOGTLE 1, 2	PWR	1,251	720	312	137	12	3	1	-	-	-	-	-	-	-	2,436	1,185	137.620
WATERFORD 3	PWR	902	856	257	113	29	13	-	-	-	-	-	-	-	-	2,170	1,268	134.221
WATTS BAR 1	PWR	2,550	649	198	35	5	-	-	-	-	-	-	-	-	-	3,437	887	70.648
WOLF CREEK 1	PWR	889	602	209	80	14	6	-	-	-	-	-	-	-	-	1,800	911	94.997
Totals BWRs	**BWRs**	**27,150**	**21,809**	**7,276**	**3,841**	**1,098**	**392**	**221**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**61,792**	**34,642**	**4,522.413**
Totals PWRs	**PWRs**	**62,724**	**30,022**	**10,061**	**3,737**	**749**	**191**	**48**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**107,532**	**44,808**	**4,673.527**
Total LWR	**LWRs**	**89,874**	**51,831**	**17,337**	**7,578**	**1,847**	**583**	**269**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**169,324**	**79,450**	**9,195.940**
Corrected for Transients	**LWRs**	**61,336**	**33,832**	**12,324**	**6,786**	**2,429**	**1,026**	**921**	**38**	**-**	**-**	**-**	**-**	**-**	**-**	**118,692**	**57,356**	**9,195.940**

Note: Totals corrected for transients on page B-3.

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

APPENDIX B

Annual Whole-Body Doses at Licensed Nuclear Power Facilities 2008 (continued)

PLANT NAME	TYPE	Number of Individuals with Whole-Body Doses in the Ranges (rem)*													Total Number Monitored	Number with Meas. Dose	Total Collective TEDE (person-rem)
		No Meas. Exposure	Meas. <0.10	0.10–0.25	0.25–0.50	0.50–0.75	0.75–1.00	1.00–2.00	2.00–3.00	3.00–4.00	4.00–5.00	5.00–6.00	6.00–7.00	7.00–12.00	>12.0			
REACTORS NOT YET IN COMMERCIAL OPERATION																		
WATTS BAR 2	PWR	Reported with Watts Bar 1																
REACTORS NO LONGER IN COMMERCIAL OPERATION																		
BIG ROCK POINT	BWR	26	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-
HADDAM NECK	PWR	35	1	-	-	-	-	-	-	-	-	-	-	-	36	1	0.011
HUMBOLDT BAY	BWR	211	52	4	-	-	-	-	-	-	-	-	-	-	267	56	2.051
INDIAN POINT 1	PWR	72	227	2	5	-	-	-	-	-	-	-	-	-	306	234	4.322
LACROSSE	BWR	30	34	6	-	-	-	-	-	-	-	-	-	-	70	40	1.759
MAINE YANKEE	PWR	31	1	-	-	-	-	-	-	-	-	-	-	-	32	1	0.013
RANCHO SECO	PWR	88	74	10	-	-	-	-	-	-	-	-	-	-	172	84	2.434
SAN ONOFRE 1	PWR	490	2	-	-	-	-	-	-	-	-	-	-	-	492	2	0.043
YANKEE-ROWE	PWR	48	1	-	-	-	-	-	-	-	-	-	-	-	49	1	0.019
ZION 1, 2	PWR	181	7	-	-	-	-	-	-	-	-	-	-	-	188	7	0.147
REACTORS NO LONGER IN COMMERCIAL OPERATION, REPORTED WITH OTHER UNITS																		
DRESDEN 1	BWR	Reported with Dresden 2,3																
MILLSTONE 1	BWR	Reported with Millstone Units 2 & 3; estimated dose from Unit 1 is 0.222 person-rem.																
THREE MILE ISLAND 2	PWR	Reported with Three Mile Island 1; estimated dose from Unit 2 is 0.138 person-rem.																
TROJAN	PWR	Reported with ISFSI																
Total Reporting**	**11**	**1,212**	**399**	**22**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,638**	**426**	**10.799**

Note: Totals corrected for transients on page B-3.

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

** These numbers are for the reactors no longer in commercial operation that report their doses separately (i.e., do not report their doses with other units).

Appendix C*

PERSONNEL, DOSE, AND POWER GENERATION SUMMARY

1969–2008

*A discussion of the methods used to collect and calculate the information contained in this appendix is given in sections 3.1 and 4.2.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
ARKANSAS 1, 2	1975	588.0	76.5	147	21	0.14	0.04
Docket 50-313, 50-368;	1976	464.6	56.6	476	289	0.61	0.62
DPR-51; NPF-6	1977	610.3	76.8	601	256	0.43	0.42
1st commercial operation	1978	627.2	77.5	722	189	0.26	0.30
12/74, 3/80	1979	397.0	55.3	1,321	369	0.28	0.93
Type - PWRs	1980	452.8	63.7	1,233	342	0.28	0.76
Capacity - 836, 988 MWe	1981	1,104.7	68.3	2,225	1,102	0.50	1.00
	1982	905.4	58.6	1,608	803	0.50	0.89
	1983	915.0	54.7	2,109	1,397	0.66	1.53
	1984	1,289.1	77.4	1,742	806	0.46	0.63
	1985	1,192.3	73.6	1,262	286	0.23	0.24
	1986	1,070.3	66.9	2,135	1,141	0.53	1.07
	1987	1,366.1	88.9	1,123	382	0.34	0.28
	1988	1,070.3	69.4	2,421	1,387	0.57	1.30
	1989	1,066.3	72.0	2,063	711	0.34	0.67
	1990	1,351.9	84.2	2,493	762	0.31	0.56
	1991	1,515.8	88.4	2,064	351	0.17	0.23
	1992	1,352.1	77.4	3,114	876	0.28	0.65
	1993	1,606.0	91.3	1,981	268	0.14	0.17
	1994	1,662.8	93.6	1,361	172	0.13	0.10
	1995	1,397.0	82.7	2,259	386	0.17	0.28
	1996	1,596.0	89.5	1,441	203	0.14	0.13
	1997	1,621.9	95.9	1,195	119	0.10	0.07
	1998	1,494.6	88.1	1,249	166.599	0.13	0.11
	1999	1,477.3	86.9	1,463	183.997	0.13	0.12
	2000	1,329.2	79.5	1,977	242.326	0.12	0.18
	2001	1,684.0	95.8	1,082	106.040	0.10	0.06
	2002	1,659.0	91.8	1,581	265.337	0.17	0.16
	2003	1,675.8	93.1	973	99.003	0.10	0.06
	2004	1,759.5	95.0	1,227	106.172	0.09	0.06
	2005	1,560.0	84.5	2,335	475.784	0.20	0.31
	2006	1,739.8	95.0	1,184	143.296	0.12	0.08
	2007	1,769.3	96.0	1,387	105.310	0.08	0.06
	2008	1,614.8	89.7	1,791	196.047	0.11	0.12
BEAVER VALLEY 1, 2	1977	355.6	57.0	331	87	0.26	0.24
Docket 50-334, 50-412;	1978	304.2	40.8	646	190	0.29	0.62
DPR-66; NPF-73	1979	221.0	40.0	704	132	0.19	0.60
1st commercial operation	1980	39.8	6.8	1,817	553	0.30	13.89
10/76, 11/87	1981	573.4	73.6	1,237	229	0.19	0.40
Type - PWRs	1982	326.7	41.6	1,755	599	0.34	1.83
Capacity - 892, 846 MWe	1983	561.2	68.2	1,485	772	0.52	1.38
	1984	576.7	71.8	1,393	504	0.36	0.87
	1985	717.7	91.9	619	60	0.10	0.08
	1986	581.3	70.7	1,575	627	0.40	1.08
	1987	684.1	83.8	1,282	210	0.16	0.31
	1988	1,386.1	87.4	1,764	530	0.30	0.38
	1989	1,017.4	69.6	2,349	1,378	0.59	1.35
	1990	1,271.0	85.3	1,675	348	0.21	0.27
	1991	1,267.5	78.6	1,689	495	0.29	0.39
	1992	1,441.9	89.1	1,414	289	0.20	0.20
	1993	1,157.9	73.1	2,087	621	0.30	0.54
	1994	1,514.6	88.6	487	44	0.09	0.03
	1995	1,389.2	83.1	1,536	453	0.29	0.33
	1996	1,269.0	76.5	1,688	449	0.27	0.35
	1997	1,159.3	72.1	1,391	306	0.22	0.26
	1998	523.1	33.5	700	59.311	0.08	0.11
	1999	1,353.7	85.9	841	99.461	0.12	0.07
	2000	1,378.7	87.3	1,730	337.867	0.20	0.24
	2001	1,500.8	92.3	1,202	184.361	0.15	0.12
	2002	1,548.0	95.4	1,048	90.479	0.09	0.06
	2003	1,437.0	88.4	1,623	277.168	0.17	0.19
	2004	1,593.1	96.3	1,270	156.509	0.12	0.10

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BEAVER VALLEY 1, 2	2005	1,590.4	96.7	978	79.055	0.08	0.05
(continued)	2006	1,385.6	84.0	2,174	370.146	0.17	0.27
	2007	1,664.1	96.0	955	86.595	0.09	0.05
	2008	1,670.2	94.4	991	83.394	0.08	0.05
BIG ROCK POINT[1]	1969	48.1		165	136	0.82	2.83
Docket 50-155; DPR-6	1970	43.5		290	194	0.67	4.46
1st commercial operation 3/63	1971	44.4		260	184	0.71	4.14
Type - BWR	1972	43.5		195	181	0.93	4.16
Capacity - (67) MWe	1973	50.9		241	285	1.18	5.60
	1974	40.7	70.3	281	276	0.98	6.78
	1975	35.1	59.8	300	180	0.60	5.13
	1976	29.5	50.1	488	289	0.59	9.80
	1977	43.6	73.4	465	334	0.72	7.66
	1978	48.5	77.9	285	175	0.61	3.61
	1979	13.0	23.5	623	455	0.73	35.00
	1980	48.9	79.0	599	354	0.59	7.24
	1981	56.9	90.6	479	160	0.33	2.81
	1982	43.6	70.8	521	328	0.63	7.52
	1983	42.3	71.0	493	263	0.53	6.22
	1984	50.3	78.6	297	155	0.52	3.08
	1985	43.8	73.5	435	291	0.67	6.64
	1986	61.0	95.5	202	84	0.42	1.38
	1987	45.3	71.0	251	222	0.88	4.90
	1988	46.1	72.8	303	170	0.56	3.69
	1989	50.2	79.0	418	177	0.42	3.53
	1990	51.3	77.2	351	232	0.66	4.52
	1991	59.1	85.2	435	226	0.52	3.82
	1992	32.7	54.5	496	277	0.56	8.47
	1993	51.2	79.4	419	152	0.36	2.97
	1994	49.5	75.3	310	119	0.38	2.40
	1995	62.2	95.0	205	54	0.26	0.87
	1996	1,265.6	76.5	1,688	449	0.27	0.36
	1997	22.4	54.1	258	55	0.21	2.46
	1998	0.0	0.0	432	104.130	0.24	---
	1999	0.0	0.0	285	86.577	0.31	---
	2000	0.0	0.0	226	89.271	0.40	---
	2001	0.0	0.0	167	47.556	0.28	---
	2002	0.0	0.0	170	43.538	0.26	---
	2003	0.0	0.0	336	121.045	0.36	---
	2004	0.0	0.0	227	57.599	0.25	---
	2005	0.0	0.0	223	20.227	0.09	---
	2006	0.0	0.0	27	0.382	0.01	---
	2007	0.0	0.0	0	0.000	---	---
	2008	0.0	0.0	0	0.000	---	---
BRAIDWOOD 1, 2	1989	1,381.8	75.4	1,460	296	0.20	0.21
Docket 50-456, 50-457;	1990	1,740.2	84.1	1,081	186	0.17	0.11
NPF-72, -77	1991	1,377.2	68.9	1,641	550	0.34	0.40
1st commercial operation	1992	1,885.9	89.0	1,059	228	0.22	0.12
7/88, 10/88	1993	1,899.3	86.9	1,043	273	0.26	0.14
Type - PWRs	1994	1,666.1	77.2	1,237	298	0.24	0.18
Capacity - 1,156, 1,131 MWe	1995	1,914.7	85.4	1,134	236	0.21	0.12
	1996	1,854.9	82.1	1,356	334	0.25	0.18
	1997	1,863.3	85.4	1,693	321	0.19	0.17
	1998	1,979.1	88.9	1,869	259.236	0.14	0.13
	1999	2,161.6	95.8	1,153	145.976	0.13	0.07
	2000	2,142.8	94.9	1,562	194.126	0.12	0.09
	2001	2,186.4	95.8	881	100.570	0.11	0.05
	2002	2,284.0	96.8	975	90.716	0.09	0.04

[1] Big Rock Point was shut down in September 1997 and is no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BRAIDWOOD 1, 2	2003	2,279.9	95.6	1,572	244.860	0.16	0.11
(continued)	2004	2,277.8	97.3	986	94.942	0.10	0.04
	2005	2,253.7	96.6	926	88.084	0.10	0.04
	2006	2,234.1	95.0	1,624	199.168	0.12	0.09
	2007	2,244.0	96.0	1,258	98.040	0.08	0.04
	2008	2,252.5	96.3	1,235	103.180	0.08	0.05
BROWNS FERRY 1[2], 2, 3	1975	161.7	17.8	2,743	347	0.13	2.15
Docket 50-259, 50-260,	1976	337.6	26.9	2,530	232	0.09	0.69
50-296	1977	1,327.5	73.7	1,985	876	0.44	0.66
DPR -33, -52, -68	1978	1,992.1	73.5	2,479	1,776	0.72	0.89
1st commercial operation	1979	2,393.0	79.1	2,869	1,593	0.56	0.67
8/74, 3/75, 3/77	1980	2,182.1	73.6	2,838	1,768	0.62	0.81
Type - BWRs	1981	2,132.9	69.5	3,497	2,398	0.69	1.12
Capacity - 1,079, 1,104,	1982	2,025.4	67.6	3,360	2,230	0.66	1.10
1,105 MWe	1983	1,641.0	54.3	3,410	3,375	0.99	2.06
	1984	1,431.9	54.2	3,172	1,954	0.62	1.36
	1985	368.2	11.9	2,854	1,164	0.41	3.16
	1986	0.0	0.0	3,074	1,054	0.34	---
	1987	0.0	0.0	3,184	1,186	0.37	---
	1988	0.0	0.0	3,390	1,158	0.34	---
	1989	0.0	0.0	2,707	657	0.24	---
	1990	0.0	0.0	2,725	1,311	0.48	---
	1991	445.0	17.7	1,831	356	0.19	0.80
	1992	979.9	32.2	2,670	519	0.19	0.53
	1993	675.1	66.8	3,594	870	0.24	1.29
	1994	860.2	83.4	3,362	861	0.26	1.00
	1995	1,165.8	98.6	2,567	413	0.16	0.35
	1996	1,972.8	93.0	1,904	389	0.20	0.20
	1997	1,928.8	90.2	2,268	522	0.23	0.27
	1998	1,961.9	87.7	1,612	367.716	0.23	0.19
	1999	2,091.0	85.1	1,741	446.941	0.26	0.21
	2000	2,143.8	97.1	1,657	333.215	0.20	0.16
	2001	2,074.0	90.7	1,525	293.879	0.19	0.14
	2002	2,069.0	95.4	1,977	357.573	0.18	0.17
	2003	2,014.5	93.6	2,608	602.535	0.23	0.30
	2004	2,104.7	95.5	3,242	672.714	0.21	0.32
	2005	2,044.2	94.3	3,743	636.282	0.17	0.31
	2006	2,040.1	94.0	3,618	641.154	0.18	0.31
	2007	2,420.2	90.0	3,027	554.314	0.18	0.23
	2008	2,837.4	88.5	2,633	482.127	0.18	0.17
BRUNSWICK 1, 2	1976	297.2	56.0	1,265	326	0.26	1.10
Docket 50-324, 50-325;	1977	291.1	55.7	1,512	1,120	0.74	3.85
DPR-62, -71	1978	1,173.1	83.7	1,458	1,004	0.69	0.86
1st commercial operation	1979	810.0	60.1	2,891	2,602	0.90	3.21
3/77, 11/75	1980	687.2	52.2	3,788	3,870	1.02	5.63
Type - BWRs	1981	925.2	56.9	3,854	2,638	0.68	2.85
Capacity - 938, 937 MWe	1982	540.3	50.3	4,957	3,792	0.76	7.02
	1983	636.7	44.3	5,602	3,475	0.62	5.46
	1984	761.3	51.5	5,046	3,260	0.65	4.28
	1985	822.2	58.4	4,057	2,804	0.69	3.41
	1986	1,051.3	69.1	3,370	1,909	0.57	1.82
	1987	1,152.4	80.6	3,052	1,419	0.46	1.23
	1988	990.8	70.1	2,648	1,747	0.66	1.76
	1989	990.9	65.8	3,844	1,786	0.46	1.80
	1990	991.6	67.8	3,182	1,548	0.49	1.56
	1991	952.8	64.5	2,586	778	0.30	0.82
	1992	375.9	27.9	2,690	623	0.23	1.66
	1993	470.0	33.8	2,921	872	0.30	1.86

[2] All three Brown's Ferry units were placed on administrative hold in 1985. Units 2 & 3 were restarted in 1991 and 1995, respectively. Brown's Ferry Unit 1 was restarted during 2007.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BRUNSWICK 1, 2	1994	1,268.4	83.0	3,049	999	0.33	0.79
(continued)	1995	1,411.7	92.9	2,657	683	0.26	0.48
	1996	1,261.1	85.9	2,784	716	0.26	0.57
	1997	1,474.0	94.1	2,212	411	0.19	0.28
	1998	1,521.0	94.3	2,005	395.526	0.20	0.26
	1999	1,494.7	92.8	1,818	418.417	0.23	0.28
	2000	1,571.2	95.6	1,648	321.785	0.20	0.20
	2001	1,576.0	95.8	1,623	302.812	0.19	0.19
	2002	1,568.0	94.5	1,743	275.534	0.16	0.18
	2003	1,676.9	95.6	1,794	248.622	0.14	0.15
	2004	1,690.6	94.5	2,140	244.577	0.11	0.14
	2005	1,654.9	92.2	1,944	305.978	0.16	0.19
	2006	1,661.2	90.0	2,103	280.465	0.13	0.17
	2007	1,714.9	92.0	2,186	290.093	0.13	0.17
	2008	1,694.5	91.7	2,546	354.212	0.14	0.21
BYRON 1, 2	1986	894.5	88.6	1,081	76	0.07	0.08
Docket 50-454, 50-455;	1987	650.9	70.9	1,826	769	0.42	1.18
NPF-37, NPF-66	1988	1,534.7	86.3	1,222	459	0.38	0.30
1st commercial operation	1989	1,812.6	90.2	1,109	172	0.16	0.09
9/85, 8/87	1990	1,567.3	78.8	1,396	434	0.31	0.28
Type - PWRs	1991	1,816.3	89.9	1,077	268	0.25	0.15
Capacity - 1,152, 1,125 MWe	1992	1,888.4	90.1	1,021	199	0.19	0.11
	1993	1,785.6	83.5	1,370	432	0.32	0.24
	1994	1,953.3	90.7	962	280	0.29	0.14
	1995	1,900.6	85.5	1,107	306	0.28	0.16
	1996	1,758.4	79.3	1,610	455	0.28	0.26
	1997	1,856.7	86.6	1,546	241	0.16	0.13
	1998	1,869.8	85.9	1,809	275.221	0.15	0.15
	1999	2,064.2	92.3	1,478	239.102	0.16	0.12
	2000	2,196.9	97.4	959	193.871	0.20	0.09
	2001	2,301.5	97.8	719	59.451	0.08	0.03
	2002	2,205.0	93.8	1,287	195.013	0.15	0.09
	2003	2,294.8	97.2	824	87.129	0.11	0.04
	2004	2,277.4	97.7	906	89.147	0.10	0.04
	2005	2,175.6	94.2	1,542	199.812	0.13	0.09
	2006	2,223.3	95.0	1,163	134.497	0.12	0.06
	2007	2,152.1	93.0	1,311	128.797	0.10	0.06
	2008	2,203.7	94.6	1,483	140.809	0.09	0.06
CALLAWAY 1	1985	967.4	90.0	964	36	0.04	0.04
Docket 50-483; NPF-30	1986	865.2	81.3	1,052	225	0.21	0.26
1st commercial operation 12/84	1987	759.0	71.1	1,082	393	0.36	0.52
Type - PWR	1988	1,069.2	93.4	353	27	0.08	0.03
Capacity - 1,190 MWe	1989	1,000.3	85.4	1,055	283	0.27	0.28
	1990	960.7	84.1	1,134	442	0.39	0.46
	1991	1,193.1	99.7	280	21	0.07	0.02
	1992	967.5	83.0	1,133	336	0.30	0.35
	1993	1,002.9	86.4	1,126	225	0.20	0.22
	1994	1,196.4	100.0	191	14	0.07	0.01
	1995	989.6	84.7	1,062	187	0.18	0.19
	1996	1,066.0	90.5	980	248	0.25	0.23
	1997	1,022.2	100.0	248	12	0.05	0.01
	1998	972.2	91.3	929	200.729	0.22	0.21
	1999	981.3	88.7	1,098	320.554	0.29	0.33
	2000	1,137.5	99.8	244	16.058	0.07	0.01
	2001	954.5	86.7	873	106.782	0.12	0.11
	2002	955.0	86.2	983	95.648	0.10	0.10
	2003	1,104.3	96.2	252	8.297	0.03	0.01
	2004	892.8	78.9	1,124	120.621	0.11	0.14
	2005	913.2	80.7	1,600	222.629	0.14	0.24
	2006	1,152.8	95.0	225	6.308	0.03	0.01
	2007	1,069.7	89.0	1,079	73.236	0.07	0.07
	2008	1,067.6	89.8	729	45.738	0.06	0.04

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
CALVERT CLIFFS 1, 2	1976	753.4	95.2	507	74	0.15	0.10
Docket 50-317, 50-318;	1977	583.0	72.1	2,265	547	0.24	0.94
DPR-53, -69	1978	1,188.5	75.8	1,391	500	0.36	0.42
1st commercial operation	1979	1,161.0	74.0	1,428	805	0.56	0.69
5/75, 4/77	1980	1,309.9	84.1	1,496	677	0.45	0.52
Type - PWRs	1981	1,379.7	83.1	1,555	607	0.39	0.44
Capacity - 870, 858 MWe	1982	1,238.3	73.7	1,805	1,057	0.59	0.85
	1983	1,397.2	81.6	1,915	668	0.35	0.48
	1984	1,389.4	79.3	1,369	479	0.35	0.34
	1985	1,189.8	68.4	1,598	694	0.43	0.58
	1986	1,530.0	87.2	1,296	347	0.27	0.23
	1987	1,207.3	71.8	1,384	412	0.30	0.34
	1988	1,397.7	81.0	1,296	291	0.22	0.21
	1989	333.6	20.1	1,786	346	0.19	1.04
	1990	161.1	11.0	2,019	304	0.15	1.89
	1991	1,085.0	64.7	1,974	132	0.07	0.12
	1992	1,271.2	73.9	1,979	330	0.17	0.26
	1993	1,462.1	83.9	1,462	405	0.28	0.28
	1994	1,342.1	79.4	1,482	454	0.31	0.34
	1995	1,542.8	89.9	1,203	235	0.20	0.15
	1996	1,438.5	82.4	1,167	239	0.20	0.17
	1997	1,499.6	89.1	1,091	229	0.21	0.15
	1998	1,523.1	89.3	1,042	186.887	0.18	0.12
	1999	1,521.4	90.1	1,134	191.778	0.17	0.13
	2000	1,575.7	92.7	912	134.689	0.15	0.09
	2001	1,554.7	91.7	895	166.864	0.19	0.11
	2002	1,380.0	81.7	1,582	245.075	0.16	0.18
	2003	1,558.4	90.9	1,671	265.164	0.16	0.17
	2004	1,653.7	95.7	1,205	143.944	0.12	0.09
	2005	1,678.1	97.2	942	168.390	0.18	0.10
	2006	1,581.8	92.0	1,215	203.790	0.17	0.13
	2007	1,641.6	95.0	1,191	153.335	0.13	0.09
	2008	1,670.7	97.4	745	74.149	0.10	0.04
CATAWBA 1, 2	1986	638.9	49.9	1,724	286	0.17	0.45
Docket 50-413, 50-414;	1987	1,651.2	75.9	1,865	449	0.24	0.27
NPF-35, -52	1988	1,675.2	77.2	2,009	556	0.28	0.33
1st commercial operation	1989	1,733.6	79.5	1,660	334	0.20	0.19
6/85, 8/86	1990	1,616.3	70.8	2,174	809	0.37	0.50
Type - PWRs	1991	1,691.5	74.6	1,871	462	0.25	0.27
Capacity - 1,129, 1,129 MWe	1992	1,962.8	83.9	1,515	414	0.27	0.21
	1993	1,896.1	81.5	1,564	396	0.25	0.21
	1994	2,105.2	90.2	1,268	207	0.16	0.10
	1995	2,011.9	85.3	1,892	462	0.24	0.23
	1996	1,879.1	80.5	1,588	302	0.19	0.16
	1997	2,028.2	89.3	1,561	266	0.17	0.13
	1998	2,006.4	89.6	1,123	162.068	0.14	0.08
	1999	2,046.7	90.2	1,024	118.662	0.12	0.06
	2000	2,038.3	90.3	1,185	186.532	0.16	0.09
	2001	2,119.9	92.9	960	116.241	0.12	0.06
	2002	2,238.0	97.2	884	81.325	0.09	0.04
	2003	1,991.8	89.2	1,409	210.617	0.15	0.11
	2004	2,111.4	93.0	1,123	122.831	0.11	0.06
	2005	2,194.5	96.0	1,019	83.679	0.08	0.04
	2006	1,928.6	85.0	1,792	212.570	0.12	0.11
	2007	2,102.5	92.0	1,399	144.218	0.10	0.07
	2008	2,160.3	93.5	1,110	85.080	0.08	0.04
CLINTON	1988	701.3	84.2	769	130	0.17	0.19
Docket 50-461; NPF-62	1989	348.3	48.5	1,196	372	0.31	1.07
1st commercial operation 11/87	1990	435.8	55.1	1,390	553	0.40	1.27
Type - BWR	1991	722.7	80.8	1,010	233	0.23	0.32
Capacity - 1,022 MWe	1992	589.7	68.6	1,195	431	0.36	0.73
	1993	701.5	79.6	1,253	498	0.40	0.71

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
CLINTON	1994	883.3	94.8	409	63	0.15	0.07
(continued)	1995	731.1	83.0	1,182	316	0.27	0.43
	1996	634.7	66.7	1,154	350	0.30	0.55
	1997	0.0	0.0	738	172	0.23	---
	1998	0.0	0.0	866	144.140	0.17	---
	1999	537.0	63.5	637	87.489	0.14	0.16
	2000	784.2	87.8	1,248	253.382	0.20	0.32
	2001	896.8	98.5	329	33.770	0.10	0.04
	2002	872.0	90.5	1,418	208.094	0.15	0.24
	2003	990.5	99.1	372	57.118	0.15	0.06
	2004	910.8	92.6	1,622	282.833	0.17	0.31
	2005	989.1	97.4	298	36.019	0.12	0.04
	2006	939.9	92.0	1,649	295.720	0.18	0.32
	2007	1,049.2	100.0	310	30.618	0.10	0.03
	2008	973.0	93.3	1,381	205.086	0.15	0.21
COLUMBIA GENERATING[3]	1985	616.0	87.6	755	119	0.16	0.19
Docket 50-397; NPF-21	1986	616.0	74.4	1,013	222	0.22	0.36
1st commercial operation 12/84	1987	639.0	70.8	1,201	406	0.34	0.64
Type - BWR	1988	707.7	71.8	1,050	353	0.34	0.50
Capacity - 1,107 MWe	1989	727.2	78.3	1,299	492	0.38	0.68
	1990	684.7	67.5	1,348	536	0.40	0.78
	1991	508.5	50.3	1,088	387	0.36	0.76
	1992	682.3	65.6	1,489	612	0.41	0.90
	1993	849.6	79.5	1,385	469	0.34	0.55
	1994	803.8	75.2	1,870	866	0.46	1.08
	1995	824.7	83.8	1,694	456	0.27	0.55
	1996	662.9	82.2	1,453	373	0.26	0.56
	1997	697.0	72.7	1,218	251	0.21	0.36
	1998	789.5	75.3	1,220	286.020	0.23	0.36
	1999	694.7	70.0	1,022	155.109	0.15	0.22
	2000	979.6	96.3	706	53.152	0.08	0.05
	2001	939.3	88.1	1,515	226.675	0.15	0.24
	2002	1,023.0	97.5	647	46.650	0.07	0.05
	2003	866.9	81.8	1,618	205.225	0.13	0.24
	2004	1,022.5	94.6	716	66.130	0.09	0.06
	2005	938.3	87.3	1,718	325.025	0.19	0.35
	2006	1,064.9	98.0	623	55.817	0.09	0.05
	2007	925.6	87.0	2,147	306.443	0.14	0.33
	2008	1,055.3	98.3	715	54.957	0.08	0.05
COMANCHE PEAK 1, 2	1991	644.4	82.2	985	148	0.15	0.23
Docket 50-445, 50-446;	1992	830.8	84.0	1,128	188	0.17	0.23
NPF-87, 89	1993	853.8	81.2	945	109	0.12	0.13
1st commercial operation	1994	1,750.0	93.7	970	90	0.09	0.05
8/90, 8/93	1995	2,022.6	92.5	951	179	0.19	0.09
Type - PWR	1996	1,804.8	81.4	1,462	288	0.20	0.16
Capacity - 1,150, 1,150 MWe	1997	2,002.4	93.4	870	146	0.17	0.07
	1998	2,037.8	94.9	967	232.026	0.24	0.11
	1999	1,981.5	90.9	1,316	251.276	0.19	0.13
	2000	2,104.7	95.3	759	77.679	0.10	0.04
	2001	2,085.9	94.7	853	114.968	0.13	0.06
	2002	1,887.0	86.9	1,106	225.317	0.20	0.12
	2003	2,020.6	91.6	639	66.313	0.10	0.03
	2004	2,169.5	95.1	864	135.388	0.16	0.06
	2005	2,099.6	91.5	1,365	242.481	0.18	0.12
	2006	2,271.3	97.0	686	59.959	0.09	0.03
	2007	2,151.3	93.0	1,616	219.799	0.14	0.10
	2008	2,189.7	94.3	1,037	168.836	0.16	0.08

[3] Energy Northwest has changed the name of Washington Nuclear 2 to Columbia Generating Station.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
COOK 1, 2	1976	807.4	83.1	395	116	0.29	0.14
Docket 50-315; DPR-58, -74	1977	573.0	76.1	802	300	0.37	0.52
1st commercial operation	1978	744.8	73.6	778	336	0.43	0.45
8/75, 7/78	1979	1,373.0	65.3	1,445	718	0.50	0.52
Type - PWRs	1980	1,552.4	74.1	1,345	493	0.37	0.32
Capacity - 1,030, 1,077 MWe	1981	1,557.3	73.4	1,341	656	0.49	0.42
	1982	1,461.6	69.8	1,527	699	0.46	0.48
	1983	1,456.5	71.2	1,418	658	0.46	0.45
	1984	1,526.0	75.3	1,559	762	0.49	0.50
	1985	925.4	47.6	1,984	945	0.48	1.02
	1986	1,307.1	73.4	1,774	745	0.42	0.57
	1987	1,199.5	70.2	1,696	666	0.39	0.56
	1988	1,160.4	63.5	2,266	867	0.38	0.75
	1989	1,433.1	72.8	1,575	493	0.31	0.34
	1990	1,318.5	67.9	1,851	580	0.31	0.44
	1991	1,837.4	90.2	815	69	0.08	0.04
	1992	760.9	50.8	1,954	492	0.25	0.65
	1993	1,927.7	98.5	587	44	0.07	0.02
	1994	1,105.2	65.2	1,748	479	0.27	0.43
	1995	1,656.0	82.1	1,310	203	0.15	0.12
	1996	1,938.9	92.7	1,114	214	0.19	0.11
	1997	1,189.7	59.7	1,864	550	0.30	0.46
	1998	0.0	0.0	1,155	104.638	0.09	---
	1999	0.0	0.0	1,662	171.479	0.10	---
	2000	560.1	28.1	2,506	337.584	0.14	0.60
	2001	1,794.3	89.2	423	27.290	0.06	0.02
	2002	1,756.0	87.3	1,624	278.001	0.17	0.16
	2003	1,557.6	75.7	1,408	209.526	0.15	0.13
	2004	1,909.2	91.4	1,015	156.213	0.15	0.08
	2005	1,989.0	95.0	852	91.192	0.11	0.05
	2006	1,790.5	86.0	1,780	312.214	0.18	0.17
	2007	1,983.7	93.0	1,310	238.829	0.18	0.12
	2008	1,711.8	80.8	971	76.460	0.08	0.05
COOPER STATION	1975	456.4	83.6	579	117	0.20	0.26
Docket 50-298; DPR-46	1976	433.3	75.5	763	350	0.46	0.81
1st commercial operation 7/74	1977	538.2	86.2	315	198	0.63	0.37
Type - BWR	1978	576.0	91.0	297	158	0.53	0.27
Capacity - 769 MWe	1979	591.0	87.6	426	221	0.52	0.37
	1980	448.3	71.2	785	859	1.09	1.92
	1981	457.1	71.2	935	579	0.62	1.27
	1982	622.3	84.6	743	542	0.73	0.87
	1983	396.6	63.3	1,383	1,293	0.93	3.26
	1984	411.9	67.2	1,598	799	0.50	1.94
	1985	127.3	21.5	1,980	1,333	0.67	10.47
	1986	480.0	74.7	895	320	0.36	0.67
	1987	652.3	96.2	549	103	0.19	0.16
	1988	493.4	67.9	942	251	0.27	0.51
	1989	564.3	76.2	1,202	343	0.29	0.61
	1990	602.0	79.4	1,174	379	0.32	0.63
	1991	566.3	78.8	1,099	405	0.37	0.72
	1992	731.0	96.4	463	84	0.18	0.11
	1993	436.1	58.8	1,130	391	0.35	0.90
	1994	262.2	35.1	333	79	0.24	0.30
	1995	486.5	66.8	1,095	228	0.21	0.47
	1996	742.1	97.9	468	48	0.10	0.06
	1997	622.8	84.4	1,125	174	0.16	0.28
	1998	555.9	75.9	977	181.858	0.19	0.33
	1999	743.2	98.1	318	47.815	0.15	0.06
	2000	539.2	74.2	963	199.589	0.21	0.37
	2001	592.7	80.9	1,309	168.665	0.13	0.28
	2002	719.0	98.6	362	38.739	0.11	0.05

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
COOPER STATION	2003	511.4	74.1	882	135.249	0.15	0.26
(continued)	2004	702.6	94.7	481	47.064	0.10	0.07
	2005	670.8	89.4	1,266	275.652	0.22	0.41
	2006	674.7	90.0	1,265	270.135	0.21	0.40
	2007	761.6	99.0	730	49.902	0.07	0.07
	2008	679.0	89.9	1,715	359.926	0.21	0.53
CRYSTAL RIVER 3	1978	311.5	41.4	643	321	0.50	1.03
Docket 50-302; DPR-72	1979	453.0	58.9	1,150	495	0.43	1.09
1st commercial operation 3/77	1980	404.1	53.2	1,053	625	0.59	1.55
Type - PWR	1981	490.4	62.2	1,120	408	0.36	0.83
Capacity - 838 MWe	1982	589.8	76.0	780	177	0.23	0.30
	1983	452.1	58.8	1,720	552	0.32	1.22
	1984	774.2	94.5	549	49	0.09	0.06
	1985	344.2	47.6	1,976	689	0.35	2.00
	1986	319.5	41.8	1,057	472	0.45	1.48
	1987	436.0	60.9	1,384	488	0.35	1.12
	1988	690.2	84.0	569	64	0.11	0.09
	1989	352.8	48.8	880	234	0.27	0.66
	1990	497.8	63.8	1,441	476	0.33	0.96
	1991	654.6	82.0	821	116	0.14	0.18
	1992	632.1	76.1	1,403	424	0.30	0.67
	1993	722.4	85.0	683	60	0.09	0.08
	1994	711.9	84.3	1,079	228	0.21	0.32
	1995	866.3	100.0	209	8	0.04	0.01
	1996	290.8	37.7	1,192	353	0.30	1.21
	1997	0.0	0.0	973	179	0.18	---
	1998	739.9	90.3	313	19.298	0.06	0.03
	1999	727.5	87.8	1,324	251.077	0.19	0.35
	2000	819.4	97.6	257	14.649	0.06	0.02
	2001	741.6	89.2	902	147.946	0.16	0.20
	2002	831.0	99.4	128	5.039	0.04	0.01
	2003	749.0	90.8	961	126.554	0.13	0.17
	2004	831.4	98.1	131	4.044	0.03	0.0
	2005	723.0	88.5	939	122.608	0.13	0.17
	2006	793.8	95.0	138	4.474	0.03	0.01
	2007	761.7	91.0	1,135	184.554	0.16	0.24
	2008	796.9	93.7	282	16.110	0.06	0.02
DAVIS-BESSE 1	1978	326.4	48.7	421	48	0.11	0.15
Docket 50-346; NPF-3	1979	381.0	67.0	304	30	0.10	0.08
1st commercial operation 7/78	1980	256.4	36.2	1,283	154	0.12	0.60
Type - PWR	1981	531.4	67.4	578	58	0.10	0.11
Capacity - 879 MWe	1982	390.8	51.5	1,350	164	0.12	0.42
	1983	592.1	73.0	718	80	0.11	0.14
	1984	518.5	62.5	1,088	177	0.16	0.34
	1985	238.3	31.2	718	71	0.10	0.30
	1986	3.3	1.3	981	124	0.13	37.58
	1987	618.0	89.6	625	47	0.08	0.08
	1988	144.1	27.1	1,183	307	0.26	2.13
	1989	880.0	98.6	404	38	0.09	0.04
	1990	500.0	56.7	1,377	489	0.36	0.98
	1991	703.6	81.8	1,000	216	0.22	0.31
	1992	915.2	100.0	287	19	0.07	0.02
	1993	729.5	83.4	1,244	348	0.28	0.48
	1994	768.4	88.0	861	144	0.17	0.19
	1995	920.4	100.0	256	7	0.03	0.01
	1996	775.8	85.3	949	167	0.18	0.22
	1997	820.0	94.0	213	10	0.05	0.01
	1998	699.8	83.2	980	155.269	0.16	0.22
	1999	841.3	95.6	397	27.951	0.07	0.03
	2000	770.8	87.3	1,109	168.044	0.15	0.22
	2001	875.6	100.0	119	5.505	0.05	0.01
	2002	106.0	12.6	1,983	402.766	0.20	3.81

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
DAVIS-BESSE 1	2003	0.0	0.0	1,047	219.696	0.21	---
(continued)	2004	657.8	77.6	161	6.594	0.04	0.01
	2005	817.1	93.3	577	51.332	0.09	0.06
	2006	727.8	84.0	1,331	204.201	0.15	0.28
	2007	879.7	100.0	189	7.088	0.04	0.01
	2008	777.5	89.4	985	106.603	0.11	0.14
DIABLO CANYON 1, 2	1986	641.5	80.6	1,260	304	0.24	0.47
Docket 50-275, 50-323;	1987	1,688.6	83.0	1,170	336	0.29	0.20
DPR-80, DPR-82	1988	1,386.1	67.6	1,826	877	0.48	0.63
1st commercial operation	1989	1,899.0	87.5	1,646	465	0.28	0.24
5/85, 3/86	1990	1,952.6	91.0	1,441	323	0.22	0.17
Type - PWRs	1991	1,809.6	83.8	2,040	546	0.27	0.30
Capacity - 1,122, 1,118 MWe	1992	1,995.7	90.9	1,850	459	0.25	0.23
	1993	2,008.6	91.4	1,508	281	0.19	0.14
	1994	1,832.6	83.3	2,317	590	0.25	0.32
	1995	1,950.3	90.0	1,615	286	0.18	0.15
	1996	2,003.6	90.7	1,462	176	0.12	0.09
	1997	1,948.7	92.7	1,331	219	0.17	0.11
	1998	1,955.1	92.8	1,313	173.238	0.13	0.09
	1999	1,902.8	90.1	1,566	448.634	0.29	0.24
	2000	1,940.1	92.0	1,057	180.792	0.17	0.09
	2001	2,067.7	96.4	1,074	117.804	0.11	0.06
	2002	1,860.0	88.4	1,016	148.690	0.15	0.08
	2003	1,970.7	91.6	1,004	135.482	0.13	0.07
	2004	1,736.3	83.5	1,230	254.367	0.21	0.15
	2005	2,022.4	94.8	955	124.469	0.13	0.06
	2006	2,109.0	94.0	1,086	82.248	0.08	0.04
	2007	2,131.4	95.0	1,269	111.866	0.09	0.05
	2008	1,952.1	87.7	2,121	235.034	0.11	0.12
DRESDEN 1[4], 2, 3	1969	99.7			286		2.87
Docket 50-010, 50-237, 50-249;	1970	163.1			143		0.88
DPR-2, -19, -25	1971	394.5			715		1.81
1st commercial operation 7/60,	1972	1,243.7			728		0.59
6/70, 11/71	1973	1,112.2		1,341	939	0.70	0.84
Type - BWRs	1974	842.5	54.9	1,594	1,662	1.04	1.97
Capacity - (197), 850, 850 MWe	1975	708.1	54.6	2,310	3,423	1.48	4.83
	1976	1,127.2	80.8	1,746	1,680	0.96	1.49
	1977	1,132.9	77.0	1,862	1,694	0.91	1.50
	1978	1,242.2	79.5	1,946	1,529	0.79	1.23
	1979	1,013.0	74.7	2,407	1,800	0.75	1.78
	1980	1,074.4	55.0	2,717	2,105	0.77	1.96
	1981	1,035.7	51.5	2,331	2,802	1.20	2.71
	1982	1,085.3	77.9	2,572	2,923	1.14	2.69
	1983	913.6	65.6	2,854	3,582	1.26	3.92
	1984	789.8	55.3	2,261	1,774	0.78	2.25
	1985	903.0	64.5	2,817	1,686	0.60	1.87
	1986	740.5	52.6	3,111	2,668	0.86	3.60
	1987	933.9	74.0	2,052	1,145	0.56	1.23
	1988	1,014.7	75.8	2,414	1,409	0.58	1.39
	1989	1,184.2	83.1	2,259	1,131	0.50	0.96
	1990	1,107.8	76.6	2,235	1,400	0.63	1.26
	1991	675.2	60.7	2,044	1,005	0.49	1.49
	1992	872.4	75.4	1,812	619	0.34	0.71
	1993	960.1	68.5	2,751	1,655	0.60	1.72
	1994	690.2	51.7	2,336	833	0.36	1.21
	1995	643.1	49.8	2,482	875	0.35	1.36
	1996	612.6	47.7	1,788	456	0.26	0.74
	1997	1,096.2	79.5	2,747	467	0.17	0.43

[4] 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 operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
DRESDEN 1[4], 2, 3	1998	1,354.7	90.6	2,311	426.918	0.18	0.32
(continued)	1999	1,410.9	92.5	3,243	591.443	0.18	0.42
	2000	1,506.4	97.3	2,341	261.684	0.11	0.17
	2001	1,427.4	94.5	2,769	400.702	0.14	0.28
	2002	1,547.0	95.7	2,819	355.011	0.13	0.23
	2003	1,555.9	93.5	2,098	356.572	0.17	0.23
	2004	1,405.5	84.8	2,044	381.054	0.19	0.27
	2005	1,550.8	92.0	2,006	258.799	0.13	0.17
	2006	1,649.0	96.0	2,042	289.167	0.14	0.18
	2007	1,658.8	97.0	2,310	275.697	0.12	0.17
	2008	1,638.0	95.9	2,307	198.153	0.09	0.12
DUANE ARNOLD	1976	305.2	78.0	350	105	0.30	0.34
Docket 50-331; DPR-49	1977	353.6	78.9	538	299	0.56	0.85
1st commercial operation 2/75	1978	149.2	33.2	1,112	974	0.88	6.53
Type - BWR	1979	352.0	78.0	757	275	0.36	0.78
Capacity - 593 MWe	1980	339.1	73.3	1,108	671	0.61	1.98
	1981	277.7	69.8	1,286	790	0.61	2.84
	1982	278.5	74.7	524	229	0.44	0.82
	1983	283.0	62.9	1,468	1,135	0.77	4.01
	1984	329.4	72.9	611	189	0.31	0.57
	1985	236.2	53.8	1,414	1,112	0.79	4.71
	1986	365.5	82.0	476	187	0.39	0.51
	1987	308.4	64.7	1,094	667	0.61	2.16
	1988	386.5	75.2	1,136	614	0.54	1.59
	1989	388.5	79.0	425	194	0.46	0.50
	1990	367.4	75.8	1,460	861	0.59	2.34
	1991	503.7	94.5	336	202	0.60	0.40
	1992	416.5	81.9	1,043	502	0.48	1.21
	1993	393.4	79.5	1,043	407	0.39	1.03
	1994	498.6	94.0	493	120	0.24	0.24
	1995	452.5	83.8	1,129	357	0.32	0.79
	1996	476.8	90.7	1,093	270	0.25	0.57
	1997	474.4	94.4	352	63	0.18	0.13
	1998	438.3	86.6	1,019	236.693	0.23	0.54
	1999	416.6	84.3	834	201.196	0.24	0.48
	2000	507.3	98.4	317	44.181	0.14	0.09
	2001	439.5	86.8	898	137.564	0.15	0.31
	2002	522.0	94.4	319	35.061	0.11	0.07
	2003	455.2	84.8	829	124.402	0.15	0.27
	2004	561.2	98.3	220	18.993	0.09	0.03
	2005	517.4	90.5	879	139.622	0.16	0.27
	2006	581.7	99.0	254	29.392	0.12	0.05
	2007	515.8	88.0	1,062	183.609	0.17	0.36
	2008	601.4	100.0	276	24.187	0.09	0.04
FARLEY 1, 2	1978	713.8	86.5	527	108	0.20	0.15
Docket 50-348, 50-364;	1979	211.0	28.6	1,227	643	0.52	3.05
NPF-2, -8	1980	557.3	69.3	1,330	435	0.33	0.78
1st commercial operation	1981	310.2	41.4	1,331	512	0.38	1.65
12/77, 7/81	1982	1,271.5	79.2	1,453	484	0.33	0.38
Type - PWRs	1983	1,356.5	83.0	1,938	1,021	0.53	0.75
Capacity - 851, 860 MWe	1984	1,447.0	86.6	2,046	902	0.44	0.62
	1985	1,368.2	81.1	2,551	799	0.31	0.58
	1986	1,409.4	83.8	2,314	858	0.37	0.61
	1987	1,369.7	84.7	1,871	598	0.32	0.44
	1988	1,567.7	92.3	1,840	552	0.30	0.35
	1989	1,402.9	84.6	2,206	749	0.34	0.53
	1990	1,464.0	86.7	1,700	457	0.27	0.31
	1991	1,464.0	88.1	1,645	648	0.39	0.44

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Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
FARLEY 1, 2	1992	1,331.7	81.8	2,018	805	0.40	0.60
(continued)	1993	1,455.5	88.3	1,284	333	0.26	0.23
	1994	1,587.2	93.0	1,035	250	0.24	0.16
	1995	1,311.2	83.8	1,574	460	0.29	0.35
	1996	1,549.2	90.9	1,150	232	0.20	0.15
	1997	1,449.7	89.0	1,105	278	0.25	0.19
	1998	1,313.9	80.9	1,380	431.821	0.31	0.33
	1999	1,436.0	91.4	1,102	190.463	0.17	0.13
	2000	1,430.1	88.6	1,683	359.855	0.21	0.25
	2001	1,384.3	84.4	1,810	320.509	0.18	0.23
	2002	1,558.0	93.5	772	96.431	0.13	0.06
	2003	1,592.6	95.3	788	111.016	0.14	0.07
	2004	1,496.8	89.4	1,141	107.227	0.09	0.07
	2005	1,564.2	93.3	810	67.826	0.08	0.04
	2006	1,602.7	94.0	747	66.189	0.09	0.04
	2007	1,495.8	88.0	1,226	139.716	0.11	0.09
	2008	1,602.6	94.4	669	40.833	0.06	0.03
FERMI 2	1989	624.0	68.5	1,270	255	0.20	0.41
Docket 50-341; NPF-43	1990	848.2	84.7	462	83	0.18	0.10
1st commercial operation 1/88	1991	739.0	77.0	1,223	228	0.19	0.31
Type - BWR	1992	874.3	81.3	1,213	245	0.20	0.28
Capacity - 1,087 MWe	1993	984.3	92.9	360	35	0.10	0.04
	1994	0.0	2.2	1,130	213	0.19	---
	1995	618.3	86.9	390	28	0.07	0.05
	1996	577.5	69.1	1,402	157	0.11	0.27
	1997	637.0	66.6	623	49	0.08	0.08
	1998	815.8	79.9	1,362	207.593	0.15	0.25
	1999	1,082.7	99.5	461	36.152	0.08	0.03
	2000	939.6	87.6	1,266	145.964	0.12	0.15
	2001	975.0	90.9	1,202	168.689	0.14	0.17
	2002	1,059.0	98.7	463	38.235	0.08	0.04
	2003	925.3	86.9	1,207	168.138	0.14	0.18
	2004	962.3	90.0	1,302	145.090	0.11	0.15
	2005	998.1	91.7	538	61.626	0.11	0.06
	2006	855.9	83.0	1,430	181.300	0.13	0.21
	2007	950.2	87.0	1,484	194.039	0.13	0.20
	2008	1,094.5	99.5	460	35.186	0.08	0.03
FITZPATRICK	1976	489.0	71.6	600	202	0.34	0.41
Docket 50-333; DPR-59	1977	460.5	68.4	1,380	1,080	0.78	2.35
1st commercial operation 7/75	1978	497.0	72.1	904	909	1.01	1.83
Type - BWR	1979	349.0	50.8	850	859	1.01	2.46
Capacity - 813 MWe	1980	509.5	70.3	2,056	2,040	0.99	4.00
	1981	562.9	74.7	2,490	1,425	0.57	2.53
	1982	583.6	75.0	2,322	1,190	0.51	2.04
	1983	546.2	70.6	1,715	1,090	0.64	2.00
	1984	576.2	76.8	1,610	971	0.60	1.69
	1985	492.3	63.7	1,845	1,051	0.57	2.13
	1986	711.2	90.6	1,185	411	0.35	0.58
	1987	496.2	70.3	1,578	940	0.60	1.89
	1988	514.0	69.0	1,553	786	0.51	1.53
	1989	727.5	92.3	1,027	377	0.37	0.52
	1990	543.8	72.6	1,536	884	0.58	1.63
	1991	399.7	53.4	1,269	333	0.26	0.83
	1992	0.0	0.0	2,374	674	0.28	---
	1993	559.6	81.7	1,427	232	0.16	0.41
	1994	588.4	83.2	1,595	322	0.20	0.55
	1995	569.8	74.5	1,249	327	0.26	0.57
	1996	623.3	83.1	1,384	357	0.26	0.57
	1997	756.2	95.9	662	91	0.14	0.12
	1998	562.8	78.0	1,781	357.826	0.20	0.64
	1999	749.7	95.5	558	68.409	0.12	0.09
	2000	685.9	88.4	1,267	300.997	0.24	0.44

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
FITZPATRICK	2001	807.2	98.9	665	63.229	0.10	0.08
(continued)	2002	751.0	93.3	1,234	230.523	0.19	0.31
	2003	793.0	97.9	298	51.156	0.17	0.06
	2004	735.0	92.1	1,091	186.055	0.17	0.25
	2005	802.9	96.3	382	62.697	0.16	0.08
	2006	771.5	93.0	1,527	234.425	0.15	0.30
	2007	790.1	96.0	526	58.741	0.11	0.07
	2008	761.7	92.9	1,430	184.772	0.13	0.24
FORT CALHOUN	1975	252.3	67.4	469	294	0.63	1.17
Docket 50-285; DPR-40	1976	265.9	69.5	516	313	0.61	1.18
1st commercial operation 6/74	1977	351.8	79.4	535	297	0.56	0.84
Type - PWR	1978	342.3	75.1	596	410	0.69	1.20
Capacity - 482 MWe	1979	440.0	95.7	451	126	0.28	0.29
	1980	242.3	60.4	891	668	0.75	2.76
	1981	260.9	72.3	822	458	0.56	1.76
	1982	418.0	89.7	604	217	0.36	0.52
	1983	330.4	73.1	860	433	0.50	1.31
	1984	279.2	59.9	913	563	0.62	2.02
	1985	367.0	73.7	982	373	0.38	1.02
	1986	431.8	94.3	756	75	0.10	0.17
	1987	366.0	75.4	1,247	388	0.31	1.06
	1988	315.5	74.1	1,594	272	0.17	0.86
	1989	395.7	89.2	1,210	93	0.08	0.24
	1990	290.0	64.2	760	290	0.38	1.00
	1991	391.1	91.7	284	57	0.20	0.15
	1992	303.4	65.9	802	272	0.34	0.90
	1993	369.7	80.8	713	157	0.22	0.42
	1994	492.8	99.6	211	23	0.11	0.05
	1995	402.8	83.2	627	139	0.22	0.35
	1996	374.9	79.5	740	226	0.31	0.60
	1997	435.9	93.6	258	41	0.16	0.09
	1998	387.7	82.5	788	223.847	0.28	0.58
	1999	409.2	89.2	676	158.843	0.24	0.39
	2000	443.8	93.5	249	35.215	0.14	0.08
	2001	401.2	88.3	770	225.891	0.29	0.56
	2002	434.0	92.3	742	163.806	0.22	0.38
	2003	399.6	87.0	914	212.422	0.23	0.53
	2004	463.5	97.0	215	21.574	0.10	0.05
	2005	332.4	72.2	1,069	272.876	0.26	0.82
	2006	353.9	75.0	1,591	289.100	0.18	0.82
	2007	499.9	100.0	100	3.990	0.04	0.01
	2008	400.4	82.2	839	96.155	0.11	0.24
GINNA	1971	327.8		340	430	1.26	1.31
Docket 50-244; DPR-18	1972	293.6		677	1,032	1.52	3.51
1st commercial operation 7/70	1973	409.5		319	224	0.70	0.55
Type - PWR	1974	253.7	62.4	884	1,225	1.39	4.83
Capacity - 560 MWe	1975	365.2	76.7	685	538	0.79	1.47
	1976	248.8	58.2	758	636	0.84	2.56
	1977	365.6	85.5	530	401	0.76	1.10
	1978	386.5	80.6	657	450	0.68	1.16
	1979	355.0	72.8	878	592	0.67	1.67
	1980	370.5	76.0	1,073	708	0.66	1.91
	1981	399.0	82.1	925	655	0.71	1.64
	1982	289.0	58.8	1,117	1,140	1.02	3.94
	1983	365.0	74.6	969	855	0.88	2.34
	1984	378.1	77.2	713	395	0.55	1.04
	1985	436.7	87.9	845	426	0.50	0.98
	1986	433.3	87.4	901	357	0.40	0.82
	1987	459.0	91.5	773	344	0.45	0.75
	1988	423.1	87.4	897	295	0.33	0.70
	1989	369.2	75.9	1,254	605	0.48	1.64
	1990	414.3	84.4	991	347	0.35	0.84

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
GINNA	1991	418.6	86.7	947	328	0.35	0.78
(continued)	1992	417.6	86.9	832	261	0.31	0.63
	1993	419.6	86.3	856	193	0.23	0.46
	1994	405.3	83.2	679	138	0.20	0.34
	1995	437.0	89.6	738	136	0.18	0.31
	1996	347.9	71.1	976	168	0.17	0.48
	1997	444.6	91.8	533	81	0.15	0.18
	1998	491.8	100.0	161	14.892	0.09	0.03
	1999	403.4	85.6	641	175.173	0.27	0.43
	2000	434.2	91.6	429	76.435	0.18	0.18
	2001	488.0	100.0	140	10.156	0.07	0.02
	2002	438.0	91.3	535	80.432	0.15	0.18
	2003	440.4	91.1	510	74.533	0.15	0.17
	2004	490.5	99.5	111	7.486	0.07	0.02
	2005	455.0	93.9	564	72.841	0.13	0.16
	2006	470.2	94.0	514	44.580	0.09	0.10
	2007	564.4	99.0	111	4.412	0.04	0.01
	2008	540.1	94.5	976	101.996	0.10	0.19
GRAND GULF	1986	494.7	60.9	1,486	436	0.29	0.88
Docket 50-416; NPF-29	1987	920.7	82.2	1,358	420	0.31	0.46
1st commercial operation 7/85	1988	1,136.6	96.7	692	147	0.21	0.13
Type - BWR	1989	932.6	80.0	1,972	498	0.25	0.53
Capacity - 1,266 MWe	1990	883.5	78.9	1,765	482	0.27	0.55
	1991	1,085.2	94.0	699	94	0.13	0.09
	1992	969.0	83.7	2,032	484	0.24	0.50
	1993	936.4	81.5	1,807	332	0.18	0.35
	1994	1,143.2	96.6	455	56	0.12	0.05
	1995	952.9	80.4	1,589	342	0.22	0.36
	1996	1,096.2	88.7	1,564	357	0.23	0.33
	1997	1,234.9	100.0	514	105	0.20	0.09
	1998	1,049.2	88.9	1,410	303.695	0.22	0.29
	1999	962.1	81.3	1,180	226.277	0.19	0.23
	2000	1,217.5	99.4	289	34.877	0.12	0.03
	2001	1,129.8	93.0	1,109	185.214	0.17	0.16
	2002	1,145.0	93.6	1,060	176.396	0.17	0.15
	2003	1,241.2	98.6	290	31.250	0.11	0.03
	2004	1,165.2	92.2	1,243	158.112	0.13	0.14
	2005	1,147.3	91.9	1,326	167.914	0.13	0.15
	2006	1,233.7	98.0	1,016	59.935	0.06	0.05
	2007	1,070.5	88.0	1,750	177.884	0.10	0.17
	2008	1,072.1	89.5	1,843	167.859	0.09	0.16
HADDAM NECK[5]	1969	438.5		138	106	0.77	0.24
Docket 50-213; DPR-61	1970	424.7		734	689	0.94	1.62
1st commercial operation 1/68	1971	502.2		289	342	1.18	0.68
Type - PWR	1972	515.6		355	325	0.91	0.63
Capacity - (560) MWe	1973	293.1		951	697	0.73	2.38
	1974	521.4	91.2	550	201	0.37	0.39
	1975	494.3	89.9	795	703	0.88	1.42
	1976	482.9	82.5	644	449	0.70	0.93
	1977	480.7	83.9	894	641	0.72	1.33
	1978	563.4	98.6	216	117	0.54	0.21
	1979	493.0	87.5	1,226	1,162	0.95	2.36
	1980	426.8	75.0	1,860	1,353	0.73	3.17
	1981	487.5	84.3	1,554	1,036	0.67	2.13
	1982	543.9	93.4	559	126	0.23	0.23
	1983	453.7	77.8	1,645	1,384	0.84	3.05
	1984	404.0	71.7	1,430	1,216	0.85	3.01
	1985	556.1	98.4	384	101	0.26	0.18

[5] Haddam Neck (also known as Connecticut Yankee) was shut down on December 4, 1996, and is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
HADDAM NECK[5]	1986	294.8	53.6	1,945	1,567	0.81	5.32
(continued)	1987	304.6	54.0	1,763	750	0.43	2.46
	1988	397.4	70.3	735	237	0.32	0.60
	1989	356.4	67.2	1,455	596	0.41	1.67
	1990	142.7	32.2	979	421	0.43	2.95
	1991	444.4	76.4	1,168	590	0.51	1.33
	1992	465.2	80.1	797	202	0.25	0.43
	1993	448.6	81.6	1,004	408	0.41	0.91
	1994	455.6	77.7	463	135	0.29	0.30
	1995	439.4	77.7	1,006	442	0.44	1.01
	1996	331.8	55.7	673	175	0.26	0.53
	1997	-1.3	0.0	219	11	0.05	---
	1998	0.0	0.0	423	93.743	0.22	---
	1999	0.0	0.0	545	108.602	0.20	---
	2000	0.0	0.0	555	262.192	0.47	---
	2001	0.0	0.0	361	95.348	0.26	---
	2002	0.0	0.0	258	51.668	0.20	---
	2003	0.0	0.0	400	82.022	0.21	---
	2004	0.0	0.0	564	91.981	0.16	---
	2005	0.0	0.0	350	36.479	0.10	---
	2006	0.0	0.0	124	11.883	0.10	---
	2007	0.0	0.0	0	0.000	---	---
	2008	0.0	0.0	1	0.011	0.01	---
HARRIS 1	1988	652.9	75.0	721	169	0.23	0.26
Docket 50-400; NPF-63	1989	690.6	79.5	929	156	0.17	0.23
1st commercial operation 5/87	1990	776.4	89.6	453	85	0.19	0.11
Type - PWR	1991	724.8	81.5	872	226	0.26	0.31
Capacity - 900 MWe	1992	661.8	74.9	930	213	0.23	0.32
	1993	913.0	99.7	327	31	0.09	0.03
	1994	740.8	82.7	1,089	222	0.20	0.30
	1995	731.1	83.8	1,068	174	0.16	0.24
	1996	860.6	95.4	444	17	0.04	0.02
	1997	673.6	80.4	1,131	149	0.13	0.22
	1998	766.2	90.4	931	133.497	0.14	0.17
	1999	827.0	97.9	247	15.538	0.06	0.02
	2000	783.0	92.5	888	100.981	0.11	0.13
	2001	611.2	72.4	1,586	252.241	0.16	0.41
	2002	892.0	99.4	145	6.674	0.05	0.01
	2003	823.9	93.2	786	68.463	0.09	0.08
	2004	797.9	88.2	747	57.103	0.08	0.07
	2005	902.9	99.5	164	8.483	0.05	0.01
	2006	802.4	89.0	917	87.225	0.10	0.11
	2007	845.1	94.0	870	64.808	0.07	0.08
	2008	890.4	97.4	192	10.356	0.05	0.01
HATCH 1, 2	1976	496.3	83.8	630	134	0.21	0.27
Docket 50-321, 50-366;	1977	446.8	66.3	1,303	465	0.36	1.04
DPR-57; NPF-05	1978	513.0	72.8	1,304	248	0.19	0.48
1st commercial operation	1979	401.0	54.6	2,131	582	0.27	1.45
12/75, 9/79	1980	1,008.7	70.9	1,930	449	0.23	0.45
Type - BWRs	1981	870.9	64.3	2,899	1,337	0.46	1.54
Capacity - 876, 883 MWe	1982	768.0	56.6	3,418	1,460	0.43	1.90
	1983	934.7	68.6	3,428	1,299	0.38	1.39
	1984	658.6	47.3	4,110	2,218	0.54	3.37
	1985	1,211.0	79.6	2,841	818	0.29	0.68
	1986	872.0	64.8	3,486	1,497	0.43	1.72
	1987	1,295.4	89.7	2,202	816	0.37	0.63
	1988	1,001.4	70.4	2,509	1,401	0.56	1.40
	1989	1,271.1	87.1	1,350	556	0.41	0.44

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Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
HATCH 1, 2	1990	1,268.0	83.5	2,902	1,455	0.50	1.15
(continued)	1991	1,152.4	77.4	2,508	1,161	0.46	1.01
	1992	1,293.8	88.6	1,615	550	0.34	0.43
	1993	1,189.6	85.5	1,733	669	0.39	0.56
	1994	1,289.0	87.1	2,243	864	0.39	0.67
	1995	1,376.3	90.6	1,458	488	0.33	0.35
	1996	1,519.6	94.0	1,495	441	0.29	0.29
	1997	1,374.7	88.1	1,945	722	0.37	0.53
	1998	1,458.4	91.7	1,610	320.469	0.20	0.22
	1999	1,487.4	90.0	1,866	328.583	0.18	0.22
	2000	1,515.0	88.7	1,913	401.891	0.21	0.26
	2001	1,603.0	93.5	1,407	230.242	0.16	0.14
	2002	1,600.0	94.0	1,299	214.441	0.17	0.13
	2003	1,606.3	94.5	1,295	168.281	0.13	0.10
	2004	1,641.3	95.3	1,209	180.129	0.15	0.11
	2005	1,562.1	91.3	1,288	207.295	0.16	0.13
	2006	1,604.9	94.0	1,405	259.313	0.18	0.16
	2007	1,626.5	94.0	1,341	137.273	0.10	0.08
	2008	1,584.0	92.7	1,397	189.433	0.14	0.12
HOPE CREEK 1	1987	869.2	86.4	589	117	0.20	0.13
Docket 50-354; NPF-57	1988	832.7	80.7	1,734	287	0.17	0.34
1st commercial operation 12/86	1989	791.1	77.8	1,873	465	0.25	0.59
Type - BWR	1990	966.4	91.6	1,394	196	0.14	0.20
Capacity - 1,049 MWe	1991	882.5	84.2	1,700	373	0.22	0.42
	1992	841.9	80.8	1,694	436	0.26	0.52
	1993	1,049.2	97.8	688	98	0.14	0.09
	1994	852.0	81.2	1,779	326	0.18	0.38
	1995	844.5	79.8	1,571	196	0.12	0.23
	1996	806.9	77.4	1,069	158	0.15	0.20
	1997	731.8	77.8	1,747	350	0.20	0.48
	1998	993.2	98.0	620	54.816	0.09	0.06
	1999	879.1	86.7	1,111	279.063	0.25	0.32
	2000	827.8	87.9	1,236	188.295	0.15	0.23
	2001	918.2	91.1	1,532	156.180	0.10	0.17
	2002	1,007.0	99.2	220	25.922	0.12	0.03
	2003	826.6	84.6	1,597	139.295	0.09	0.17
	2004	688.6	71.3	2,440	239.540	0.10	0.35
	2005	874.9	88.6	881	67.063	0.08	0.08
	2006	983.8	93.0	2,135	133.570	0.06	0.14
	2007	929.3	91.0	2,221	191.068	0.09	0.21
	2008	1,139.1	100.0	999	34.510	0.03	0.03
HUMBOLDT BAY[6]	1969	44.6		125	164	1.31	3.68
Docket 50-133; DPR-7	1970	49.3		115	209	1.82	4.24
1st commercial operation 8/63	1971	39.6		140	292	2.09	7.37
Type - BWR	1972	43.1		127	253	1.99	5.87
Capacity - (63) MWe	1973	50.1		210	266	1.27	5.31
	1974	43.4	83.8	296	318	1.07	7.33
	1975	45.3	83.9	265	339	1.28	7.48
	1976	23.5	46.4	523	683	1.31	29.06
	1977	0.0	0.0	1,063	1,905	1.79	---
	1978	0.0	0.0	320	335	1.05	---
	1979	0.0	0.0	135	31	0.23	---
	1980	0.0	0.0	142	22	0.15	---
	1981	0.0	0.0	75	9	0.12	---
	1982	0.0	0.0	71	19	0.27	---
	1983	0.0	0.0	84	17	0.20	---
	1984	"Data not available"					
	1985	0.0	0.0	178	51	0.29	---

[6] Humboldt Bay had been shut down 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 operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
HUMBOLDT BAY[6]	1986	0.0	0.0	115	50	0.43	---
(continued)	1987	"Data not available"					
	1988	0.0	0.0	10	1	0.10	---
	1989	0.0	0.0	0	0	0.00	---
	1990	0.0	0.0	0	0	0.00	---
	1991	0.0	0.0	0	0	0.00	---
	1992	0.0	0.0	8	0	0.00	---
	1993	0.0	0.0	24	1	0.04	---
	1994	0.0	0.0	21	1	0.05	---
	1995	0.0	0.0	42	2	0.05	---
	1996	0.0	0.0	66	5	0.08	---
	1997	0.0	0.0	105	16	0.15	---
	1998	0.0	0.0	38	201.000	0.03	---
	1999	0.0	0.0	28	0.720	0.04	---
	2000	0.0	0.0	20	0.911	0.05	---
	2001	0.0	0.0	10	0.360	0.04	---
	2002	0.0	0.0	18	1.504	0.08	---
	2003	0.0	0.0	14	0.351	0.03	---
	2004	0.0	0.0	11	0.454	0.04	---
	2005	0.0	0.0	11	0.547	0.05	---
	2006	0.0	0.0	40	4.086	0.10	---
	2007	0.0	0.0	45	3.271	0.07	---
	2008	0.0	0.0	56	2.051	0.04	---
INDIAN POINT 1[7]**, 2, 3**[8]	1969	206.2			298		1.45
Docket 50-3, 50-247, 50-286;	1970	43.3			1,639		37.85
DPR-5, -26, -64	1971	154.0			768		4.99
1st commercial operation	1972	142.3			967		6.80
10/62, 8/74, 8/76	1973	0.0		2,998	5,262	1.76	---
Type - PWRs	1974	556.1	59.4	1,019	910	0.89	1.64
Capacity - (265), 998, 1,030 MWe	1975	584.4	74.8	891	705	0.79	1.21
	1976	273.9	34.8	1,590	1,950	1.23	7.12
	1977	1,278.3	75.3	1,391	1,070	0.77	0.84
	1978	1,172.3	67.8	1,909	2,006	1.05	1.71
INDIAN POINT 1[7]**, 2**	1979	574.0	71.4	1,349	1,279	0.95	2.23
Docket 50-3, 50-247; DPR-05, -26	1980	510.8	64.8	1,577	971	0.62	1.90
1st commercial operation	1981	367.5	46.0	2,595	2,731	1.05	7.43
10/62, 8/74	1982	532.4	65.4	2,144	1,635	0.76	3.07
Type - PWRs	1983	702.6	84.0	1,057	486	0.46	0.69
Capacity - (265), 998 MWe	1984	416.7	51.9	2,919	2,644	0.91	6.35
	1985	791.4	95.7	708	192	0.27	0.24
	1986	457.5	56.2	1,926	1,250	0.65	2.73
	1987	611.4	73.4	1,980	1,217	0.61	1.99
	1988	719.3	86.9	890	235	0.26	0.33
	1989	532.5	64.6	2,093	1,436	0.69	2.70
	1990	618.0	66.6	1,061	608	0.57	0.98
	1991	461.2	55.7	1,810	1,468	0.81	3.18
	1992	930.9	99.1	489	97	0.20	0.10
	1993	702.1	75.7	1,514	675	0.45	0.96
	1994	903.8	100.0	381	48	0.13	0.05
	1995	582.4	70.8	1,690	548	0.32	0.94
	1996	927.8	94.8	388	54	0.14	0.06

[6] Humboldt Bay had been shut down 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 operating reactors. Parentheses indicate plant capacity when plant was operational.

[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 operating reactors. Parentheses indicate plant capacity when plant was operational.

[8] Indian Point 3 was purchased by a different utility in 1979 and, subsequently, reported its dose separately. Although Indian Point 1, 2, and 3 have been owned by the same utility since 2001, Indian Point 3 still reports separately.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
INDIAN POINT 1[7], 2	1997	360.6	45.1	1,340	367	0.27	1.02
(continued)	1998	282.8	31.5	1,154	289.600	0.25	1.03
	1999	831.8	88.2	350	40.931	0.12	0.05
	2000	115.4	13.0	2,003	567.224	0.28	4.92
	2001	887.2	97.2	399	22.067	0.06	0.02
	2002	860.0	91.3	1,361	248.487	0.18	0.29
	2003	953.0	98.9	241	11.778	0.05	0.01
INDIAN POINT 1[7]	2004	0.0	0.0	156	3	0.02	---
Docket 50-3; DPR-05	2005	0.0	0.0	151	6.692	0.04	---
1st commercial operation 10/62	2006	0.0	0.0	193	7.670	0.04	---
Type - PWR	2007	0.0	0.0	210	2.554	0.01	---
Capacity - (265) MWe	2008	0.0	0.0	234	4.322	0.02	---
INDIAN POINT 2	2004	855.3	91.0	1,136	195.630	0.17	0.23
Docket 50-247; DPR-26	2005	1,007.2	100.0	470	11.418	0.02	0.01
1st commercial operation 8/74	2006	911.5	91.0	1,327	286.908	0.22	0.32
Type - PWR	2007	1,009.2	100.0	649	7.009	0.01	0.01
Capacity - 998 MWe	2008	934.1	92.6	1,013	139.683	0.14	0.15
INDIAN POINT 3[8]	1979	574.0	66.5	808	636	0.79	1.11
Docket 50-286; DPR-64	1980	367.3	53.2	977	308	0.32	0.84
1st commercial operation 8/76	1981	367.5	59.8	677	364	0.54	0.99
Type - PWR	1982	171.5	22.5	1,477	1,226	0.83	7.15
Capacity - 1,030 MWe	1983	7.8	2.6	941	607	0.65	77.82
	1984	714.4	76.3	658	230	0.35	0.32
	1985	566.5	66.0	1,093	570	0.52	1.01
	1986	655.3	73.4	588	202	0.34	0.31
	1987	574.6	62.7	1,308	500	0.38	0.87
	1988	792.5	83.3	451	93	0.21	0.12
	1989	587.8	61.1	1,800	876	0.49	1.49
	1990	595.3	62.9	1,066	358	0.34	0.60
	1991	862.8	87.5	299	40	0.13	0.05
	1992	561.7	61.4	1,003	212	0.21	0.38
	1993	140.5	14.9	478	60	0.13	0.43
	1994	0.0	0.0	529	58	0.11	---
	1995	174.8	21.4	638	67	0.11	0.38
	1996	695.3	74.8	289	22	0.08	0.03
	1997	495.1	54.9	1,608	234	0.15	0.47
	1998	874.0	95.3	213	14.774	0.07	0.02
	1999	829.8	88.3	893	116.920	0.13	0.14
	2000	960.0	99.3	143	8.693	0.06	0.00
	2001	903.9	93.1	1,014	118.115	0.12	0.13
	2002	960.0	98.5	156	6.797	0.04	0.01
	2003	866.2	89.8	902	96.059	0.11	0.11
	2004	995.8	100.0	234	4.232	0.02	0.00
	2005	915.0	91.7	893	73.862	0.08	0.08
	2006	1,024.5	100.0	307	2.793	0.01	0.00
	2007	890.1	88.0	1,322	102.960	0.08	0.12
	2008	1,043.1	100.0	443	3.045	0.01	0.00
KEWAUNEE	1975	401.9	88.2	104	28	0.27	0.07
Docket 50-305; DPR-43	1976	405.9	78.9	381	270	0.71	0.67
1st commercial operation 6/74	1977	425.0	79.9	312	140	0.45	0.33
Type - PWR	1978	466.6	89.5	335	154	0.46	0.33
Capacity - 556 MWe	1979	412.0	79.0	343	127	0.37	0.31
	1980	433.8	82.1	401	165	0.41	0.38
	1981	451.8	86.7	383	141	0.37	0.31

[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 operating reactors. Parentheses indicate plant capacity when plant was operational.

[8] Indian Point 3 was purchased by a different utility in 1979 and, subsequently, reported its dose separately. Although Indian Point 1, 2, and 3 have been owned by the same utility since 2001, Indian Point 3 still reports separately.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
KEWAUNEE	1982	458.4	87.6	353	101	0.29	0.22
(continued)	1983	444.1	83.7	445	165	0.37	0.37
	1984	455.3	85.7	482	139	0.29	0.31
	1985	443.1	82.4	519	176	0.34	0.40
	1986	461.7	85.8	502	169	0.34	0.37
	1987	480.0	89.7	755	226	0.30	0.47
	1988	467.5	88.3	705	210	0.30	0.45
	1989	449.1	84.9	570	239	0.42	0.53
	1990	468.8	87.9	490	145	0.30	0.31
	1991	441.8	83.4	495	221	0.45	0.50
	1992	471.4	88.0	450	122	0.27	0.26
	1993	457.1	86.8	436	106	0.24	0.23
	1994	475.6	88.8	364	72	0.20	0.15
	1995	455.6	87.8	415	109	0.26	0.24
	1996	380.4	71.8	474	126	0.27	0.33
	1997	269.8	56.0	278	56	0.20	0.21
	1998	423.0	87.2	384	88.205	0.23	0.21
	1999	505.1	100.0	103	5.055	0.05	0.01
	2000	432.6	88.8	394	99.864	0.25	0.23
	2001	394.1	80.8	1,110	200.245	0.18	0.51
	2002	509.0	97.4	102	4.449	0.04	0.01
	2003	473.5	90.5	439	73.108	0.17	0.15
	2004	441.0	81.0	565	91.168	0.16	0.21
	2005	346.4	62.7	97	4.000	0.04	0.01
	2006	419.4	77.0	539	74.734	0.14	0.18
	2007	528.0	95.0	145	11.126	0.08	0.02
	2008	499.5	88.9	598	92.951	0.16	0.19
LACROSSE[9]	1970	15.3			111		7.25
Docket 50-409; DPR-45	1971	33.1		218	158	0.72	0.49
1st commercial operation 11/69	1972	29.2		151	172	1.14	5.17
Type - BWR	1973	24.4		157	221	1.41	6.43
Capacity - (48) MWe	1974	37.9	81.0	115	139	1.21	3.67
	1975	32.0	69.6	165	234	1.42	7.31
	1976	21.2	47.6	118	110	0.93	5.19
	1977	11.3	33.7	141	225	1.60	19.91
	1978	21.6	62.0	182	164	0.90	7.59
	1979	24.0	71.8	153	186	1.22	7.75
	1980	26.4	68.5	124	218	1.76	8.26
	1981	29.6	76.0	187	123	0.66	4.16
	1982	17.2	44.6	148	205	1.39	11.92
	1983	24.8	59.7	160	313	1.96	12.62
	1984	38.5	80.5	288	252	0.88	6.55
	1985	39.2	86.7	373	173	0.46	4.41
	1986	19.6	46.1	260	290	1.12	14.80
	1987	0.0	0.0	127	68	0.54	---
	1988	0.0	0.0	49	31	0.63	---
	1989	0.0	0.0	60	15	0.25	---
	1990	0.0	0.0	51	9	0.18	---
	1991	0.0	0.0	42	8	0.19	---
	1992	0.0	0.0	28	6	0.21	---
	1993	0.0	0.0	48	8	0.17	---
	1994	0.0	0.0	65	8	0.12	---
	1995	0.0	0.0	31	3	0.10	---
	1996	0.0	0.0	25	4	0.15	---
	1997	0.0	0.0	23	2	0.09	---
	1998	0.0	0.0	27	1.530	0.07	---
	1999	0.0	0.0	66	3.725	0.06	---
	2000	0.0	0.0	37	3.548	0.10	---

[9] LaCrosse ended commercial operation in 1987 and will not be put in commercial operation again. Therefore, it is no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
LACROSSE[9]	2001	0.0	0.0	45	2.782	0.06	---
(continued)	2002	0.0	0.0	47	2.314	0.05	---
	2003	0.0	0.0	65	1.836	0.03	---
	2004	0.0	0.0	56	0.918	0.02	---
	2005	0.0	0.0	51	8.139	0.16	---
	2006	0.0	0.0	0	0.000	---	---
	2007	0.0	0.0	86	37.092	0.43	---
	2008	0.0	0.0	40	1.759	0.04	---
LASALLE 1, 2	1984	677.8	77.8	1,245	252	0.20	0.37
Docket 50-373, -374;	1985	987.9	53.0	1,635	685	0.42	0.69
NPF-11, -18	1986	929.5	50.6	1,614	898	0.56	0.97
1st commercial operation	1987	1,030.0	59.3	1,744	1,396	0.80	1.36
1/84, 6/84	1988	1,317.6	71.6	2,737	2,471	0.90	1.88
Type - BWRs	1989	1,503.5	73.1	2,475	1,386	0.56	0.92
Capacity - 1,111, 1,111 MWe	1990	1,754.3	84.6	1,830	948	0.52	0.54
	1991	1,837.0	86.7	1,985	806	0.41	0.44
	1992	1,447.4	72.0	2,418	1,167	0.48	0.81
	1993	1,542.0	76.0	1,701	854	0.50	0.55
	1994	1,580.0	77.6	1,812	726	0.40	0.46
	1995	1,696.6	82.1	1,623	512	0.32	0.30
	1996	1,053.8	54.3	2,782	819	0.29	0.78
	1997	0.0	0.0	1,661	316	0.19	---
	1998	380.9	19.3	2,099	422.249	0.20	1.11
	1999	1,671.9	81.8	2,689	576.354	0.21	0.34
	2000	2,138.6	97.1	1,831	260.320	0.14	0.12
	2001	2,223.8	98.9	535	82.721	0.15	0.04
	2002	2,040.0	92.1	2,012	449.587	0.22	0.22
	2003	2,100.2	94.8	2,253	464.427	0.21	0.22
	2004	2,162.1	96.0	2,366	359.470	0.15	0.17
	2005	2,130.4	95.0	2,097	334.558	0.16	0.16
	2006	2,181.3	97.0	2,006	248.454	0.12	0.11
	2007	2,166.7	98.0	1,953	228.373	0.12	0.11
	2008	2,145.8	96.4	2,402	217.567	0.09	0.10
LIMERICK 1, 2	1987	636.1	70.2	2,156	174	0.08	0.27
Docket 50-352, 50-353;	1988	794.9	96.5	950	52	0.05	0.07
NPF-39, -85	1989	628.4	66.0	1,818	266	0.15	0.42
1st commercial operation	1990	1,527.7	78.2	1,422	175	0.12	0.11
2/86, 1/90	1991	1,810.9	86.8	1,151	106	0.09	0.06
Type - BWRs	1992	1,741.4	84.8	1,559	330	0.21	0.19
Capacity - 1,134, 1,134 MWe	1993	1,913.2	91.6	1,287	217	0.17	0.11
	1994	1,944.4	94.9	1,543	275	0.18	0.14
	1995	1,957.1	93.0	1,581	260	0.16	0.13
	1996	2,026.2	93.3	1,654	234	0.14	0.12
	1997	2,001.7	95.8	1,463	234	0.16	0.12
	1998	1,907.2	89.5	1,854	357.139	0.19	0.19
	1999	2,089.6	94.2	1,800	271.547	0.15	0.13
	2000	2,154.9	95.8	1,279	260.611	0.20	0.12
	2001	2,205.9	97.3	1,127	210.336	0.19	0.10
	2002	2,197.0	97.1	1,248	160.324	0.13	0.07
	2003	2,213.6	97.2	1,298	147.047	0.11	0.07
	2004	2,218.9	97.6	1,265	149.433	0.12	0.07
	2005	2,168.9	96.3	1,460	187.609	0.13	0.09
	2006	2,207.2	97.0	1,509	193.429	0.13	0.09
	2007	2,185.8	96.0	1,570	197.104	0.13	0.09
	2008	2,169.2	96.0	1,393	176.825	0.13	0.08

[9] LaCrosse ended commercial operation in 1987 and will not be put in commercial operation again. Therefore, it is no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MAINE YANKEE[10]	1973	408.7		782	117	0.15	0.29
Docket 50-309; DPR-36	1974	432.6	68.7	619	420	0.68	0.97
1st commercial operation 12/72	1975	542.9	79.9	440	319	0.72	0.59
Type - PWR	1976	712.2	95.0	244	85	0.35	0.12
Capacity - (860) MWe	1977	617.6	82.2	508	245	0.48	0.40
	1978	642.7	84.1	638	420	0.66	0.65
	1979	537.0	68.4	393	154	0.39	0.29
	1980	527.0	72.2	735	462	0.63	0.88
	1981	624.2	78.2	868	424	0.49	0.68
	1982	542.5	69.1	1,295	619	0.48	1.14
	1983	677.1	83.6	592	165	0.28	0.24
	1984	605.7	74.4	1,262	884	0.70	1.46
	1985	635.4	79.2	1,009	700	0.69	1.10
	1986	737.6	87.8	495	100	0.20	0.14
	1987	478.1	65.3	1,100	722	0.66	1.51
	1988	591.9	79.1	1,058	725	0.69	1.22
	1989	819.2	93.7	375	99	0.26	0.12
	1990	573.0	71.0	1,359	682	0.50	1.19
	1991	738.1	86.6	426	105	0.25	0.14
	1992	631.7	79.1	1,189	461	0.39	0.73
	1993	674.8	79.8	1,016	377	0.37	0.56
	1994	782.8	90.9	297	84	0.28	0.11
	1995	23.6	3.7	1,167	653	0.56	27.67
	1996	602.9	78.1	408	56	0.14	0.09
	1997	0.0	0.0	991	153	0.15	---
	1998	0.0	0.0	438	163.008	0.37	---
	1999	0.0	0.0	365	135.057	0.37	---
	2000	0.0	0.0	490	121.133	0.25	---
	2001	0.0	0.0	412	68.121	0.17	---
	2002	0.0	0.0	452	66.226	0.15	---
	2003	0.0	0.0	342	43.775	0.13	---
	2004	0.0	0.0	190	21.313	0.11	---
	2005	0.0	0.0	2	0.048	0.02	---
	2006	0.0	0.0	0	0.000	---	---
	2007	0.0	0.0	0	0.000	---	---
	2008	0.0	0.0	1	0.013	0.01	---
MCGUIRE 1, 2	1982	524.9	80.4	1,560	169	0.11	0.32
Docket 50-369, -370;	1983	558.3	55.4	1,751	521	0.30	0.93
NPF-9, -17	1984	764.1	68.5	1,663	507	0.30	0.66
1st commercial operation	1985	808.4	77.0	2,217	771	0.35	0.95
12/81, 3/84	1986	1,360.0	60.1	2,326	1,015	0.44	0.75
Type - PWRs	1987	1,774.7	79.2	2,865	1,043	0.36	0.59
Capacity - 1,100, 1,100 MWe	1988	1,830.7	80.2	2,808	1,104	0.39	0.60
	1989	1,810.2	80.8	1,994	620	0.31	0.34
	1990	1,340.3	61.3	2,289	727	0.32	0.54
	1991	1,945.1	85.0	1,723	361	0.21	0.19
	1992	1,696.8	74.4	1,619	418	0.26	0.25
	1993	1,470.4	66.2	1,685	463	0.27	0.31
	1994	1,848.0	80.2	1,637	397	0.24	0.21
	1995	2,132.3	92.9	1,259	138	0.11	0.06
	1996	1,881.8	82.8	1,622	238	0.15	0.13
	1997	1,558.2	73.0	2,193	492	0.22	0.32
	1998	2,139.8	95.1	1,045	142.245	0.14	0.07
	1999	1,961.7	88.9	1,274	256.524	0.20	0.13
	2000	2,100.1	94.2	940	132.513	0.14	0.06
	2001	2,113.3	93.9	963	136.581	0.14	0.06
	2002	2,051.0	91.7	1,167	180.618	0.16	0.09

[10] Maine Yankee was shut down in August 1997 and is no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MCGUIRE 1, 2	2003	2,156.2	96.0	841	71.323	0.08	0.03
(continued)	2004	2,075.7	91.8	1,116	196.193	0.18	0.09
	2005	1,993.9	89.2	1,401	173.972	0.12	0.09
	2006	2,100.2	93.0	1,218	108.285	0.09	0.05
	2007	2,011.4	89.0	1,375	156.035	0.11	0.08
	2008	1,943.3	86.2	1,613	165.767	0.10	0.09
MILLSTONE 1[11]	1972	377.6		612	596	0.97	1.58
Docket 50-245; DPR-21	1973	225.1		1,184	663	0.56	2.95
1st commercial operation 3/71	1974	430.3	79.1	2,477	1,430	0.58	3.32
Type - BWR	1975	465.4	75.6	2,587	2,022	0.78	4.34
Capacity - (641) MWe	1976	449.8	76.1	1,387	1,194	0.86	2.65
	1977	575.7	89.6	1,075	394	0.37	0.68
	1978	556.6	87.6	1,391	1,416	1.02	2.54
	1979	505.0	77.3	2,001	1,795	0.90	3.55
	1980	405.8	69.0	3,024	2,157	0.71	5.32
	1981	304.3	51.6	2,506	1,496	0.60	4.92
	1982	490.2	79.9	1,370	929	0.68	1.90
	1983	640.1	95.6	309	244	0.79	0.38
	1984	516.1	78.8	1,992	836	0.42	1.62
	1985	548.5	83.6	732	608	0.83	1.11
	1986	626.8	95.4	389	150	0.39	0.24
	1987	523.4	79.6	1,588	684	0.43	1.31
	1988	658.8	98.6	327	144	0.44	0.22
	1989	554.6	84.2	852	462	0.54	0.83
	1990	608.3	91.6	365	131	0.36	0.22
	1991	213.1	35.4	1,154	409	0.35	1.92
	1992	431.8	68.1	348	99	0.28	0.23
	1993	627.9	96.8	305	81	0.27	0.13
	1994	394.0	63.6	1,321	391	0.30	0.99
	1995	520.6	80.0	910	620	0.68	1.19
	1996	0.0	0.0	747	431	0.58	---
	1997	-2.9	0.0	1,053	195	0.19	---
	1998	-2.7	0.0	347	12.741	0.04	---
	1999	0.0	0.0	397	9.790	0.02	---
	2000	0.0	0.0	478	59.955	0.13	---
	2001	0.0	0.0	414	14.946	0.04	---
	2002	0.0	0.0	185	4.151	0.02	---
	2003	0.0	0.0	195	10.675	0.05	---
	2004	0.0	0.0	147	11.152	0.08	---
	2005	0.0	0.0	145	0.897	0.01	---
	2006	0.0	0.0	4	0.607	0.15	---
	2007	0.0	0.0	33	0.901	0.03	---
	2008	0.0	0.0	0	0.000	---	---
MILLSTONE 2, 3	1976	545.7	78.7	620	168	0.27	0.31
Docket 50-336, 50-423;	1977	518.7	65.7	667	242	0.36	0.47
DPR-65; NPF-49	1978	536.6	67.3	1,420	1,444	1.02	2.69
1st commercial operation	1979	520.0	62.8	525	471	0.90	0.91
12/75, 4/86	1980	579.3	69.2	893	637	0.71	1.10
Type - PWRs	1981	722.4	82.6	890	531	0.60	0.74
Capacity - 878, 1,148 MWe	1982	595.9	70.6	2,083	1,413	0.68	2.37
	1983	294.0	34.2	2,383	1,881	0.79	6.40
	1984	782.7	93.5	285	120	0.42	0.15
	1985	417.8	49.4	1,905	1,581	0.83	3.78
	1986	1,313.8	80.4	2,393	993	0.41	0.76
	1987	1,624.5	84.1	1,441	505	0.35	0.31
	1988	1,594.8	83.2	1,827	804	0.44	0.50
	1989	1,428.3	72.9	1,984	1,079	0.54	0.76
	1990	1,614.9	87.1	1,652	593	0.36	0.37

[11]Millstone 1 was shut down on June 30, 1998, and is no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MILLSTONE 2, 3	1991	819.5	69.7	1,084	381	0.35	0.46
(continued)	1992	1,115.1	59.9	3,190	1,280	0.40	1.15
	1993	1,525.2	79.7	2,064	557	0.27	0.37
	1994	1,556.6	73.1	1,249	188	0.15	0.12
	1995	1,278.1	60.5	1,691	416	0.25	0.33
	1996	418.1	19.3	983	126	0.13	0.30
	1997	0.0	0.0	1,435	253	0.18	---
	1998	374.9	20.9	1,179	112.543	0.10	0.30
	1999	1,446.3	73.3	1,688	252.138	0.15	0.17
	2000	1,865.8	92.4	1,385	142.664	0.10	0.08
	2001	1,759.3	92.0	1,327	174.238	0.13	0.10
	2002	1,703.0	87.5	1,548	292.197	0.19	0.17
	2003	1,834.6	91.0	1,274	322.923	0.25	0.18
	2004	1,887.5	95.0	803	136.459	0.17	0.07
	2005	1,777.1	88.8	1,329	202.490	0.15	0.11
	2006	1,898.5	93.0	1,160	174.164	0.15	0.09
	2007	1,875.1	94.0	1,150	163.780	0.14	0.09
	2008	1,761.1	87.7	1,467	272.693	0.18	0.16
MONTICELLO	1972	424.4		99	61	0.62	0.14
Docket 50-263; DPR-22	1973	389.5		401	176	0.44	0.45
1st commercial operation 6/71	1974	349.3	74.9	842	349	0.41	1.00
Type - BWR	1975	344.8	72.2	1,353	1,353	1.00	3.92
Capacity - 578 MWe	1976	476.4	91.5	325	263	0.81	0.55
	1977	425.6	79.9	860	1,000	1.16	2.35
	1978	459.4	87.2	679	375	0.55	0.82
	1979	522.0	97.6	372	157	0.42	0.30
	1980	411.8	78.2	1,114	531	0.48	1.29
	1981	389.3	72.6	1,446	1,004	0.69	2.58
	1982	291.1	63.3	1,307	993	0.76	3.41
	1983	494.6	96.3	416	121	0.29	0.24
	1984	33.7	9.2	1,872	2,462	1.32	73.06
	1985	509.8	91.7	586	327	0.56	0.64
	1986	402.7	79.1	895	596	0.67	1.48
	1987	422.5	81.9	941	568	0.60	1.34
	1988	542.5	99.8	375	110	0.29	0.20
	1989	318.2	76.2	1,102	507	0.46	1.59
	1990	536.0	96.9	336	94	0.28	0.18
	1991	429.4	80.8	964	465	0.48	1.08
	1992	528.3	97.5	454	114	0.25	0.22
	1993	458.1	84.4	954	494	0.52	1.08
	1994	471.3	87.0	788	395	0.50	0.84
	1995	564.7	100.0	200	44	0.22	0.08
	1996	461.6	86.9	757	240	0.32	0.52
	1997	417.4	75.9	399	106	0.27	0.25
	1998	470.2	88.1	674	209.137	0.31	0.44
	1999	530.7	92.9	451	70.075	0.16	0.13
	2000	483.2	84.2	792	216.136	0.27	0.45
	2001	441.3	78.5	834	220.683	0.26	0.50
	2002	571.0	99.0	399	40.030	0.10	0.07
	2003	522.8	91.7	858	168.896	0.20	0.32
	2004	573.2	99.2	279	35.081	0.13	0.06
	2005	509.4	90.0	919	175.201	0.19	0.34
	2006	579.1	100.0	273	33.416	0.12	0.06
	2007	478.6	85.0	1,075	191.398	0.18	0.40
	2008	555.3	95.8	351	43.777	0.12	0.08
NINE MILE POINT 1, 2	1970	227.0		821	44	0.05	0.19
Docket 50-220, 50-410;	1971	346.5		1,006	195	0.19	0.56
DPR-63; NPF-69	1972	381.8		735	285	0.39	0.75
1st commercial operation	1973	411.0		550	567	1.03	1.38
12/69, 4/88	1974	385.9	70.5	740	824	1.11	2.14
Type - BWRs	1975	359.0	72.1	649	681	1.05	1.90
Capacity - 565, 1,120 MWe	1976	484.6	88.2	392	428	1.09	0.88

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
NINE MILE POINT 1, 2 (continued)	1977	347.4	59.2	1,093	1,383	1.27	3.98
	1978	527.7	95.1	561	314	0.56	0.60
	1979	354.0	66.1	1,326	1,497	1.13	4.23
	1980	533.9	92.3	1,174	591	0.50	1.11
	1981	385.2	66.0	2,029	1,592	0.78	4.13
	1982	133.5	21.4	1,352	1,264	0.93	9.47
	1983	329.8	56.2	1,405	860	0.61	2.61
	1984	426.8	71.9	1,530	890	0.58	2.09
	1985	580.9	96.4	1,007	265	0.26	0.46
	1986	371.0	65.3	1,878	1,275	0.68	3.44
	1987	542.6	93.3	1,190	141	0.12	0.26
	1988	0.0	0.0	2,626	854	0.33	---
	1989	527.5	29.7	2,737	564	0.21	1.07
	1990	656.2	46.6	2,405	699	0.29	1.07
	1991	1,250.8	79.7	1,543	292	0.19	0.23
	1992	965.9	61.8	1,800	563	0.31	0.58
	1993	1,380.2	84.6	2,352	633	0.27	0.46
	1994	1,589.6	95.9	800	149	0.19	0.09
	1995	1,382.2	82.5	2,304	759	0.33	0.55
	1996	1,598.6	91.6	1,596	290	0.18	0.18
	1997	1,321.5	74.8	1,425	429	0.30	0.32
	1998	1,387.3	87.0	1,744	378.484	0.22	0.27
	1999	1,409.5	81.3	1,709	446.699	0.26	0.32
	2000	1,443.9	88.1	1,783	282.838	0.16	0.20
	2001	1,506.9	88.9	1,371	343.197	0.25	0.23
	2002	1,517.0	90.4	2,449	516.663	0.21	0.34
	2003	1,585.6	91.4	1,501	374.775	0.25	0.24
	2004	1,551.9	92.0	1,362	448.509	0.33	0.29
	2005	1,656.5	94.5	1,366	401.719	0.29	0.24
	2006	1,647.1	96.0	1,130	229.551	0.20	0.14
	2007	1,598.3	93.0	1,826	329.307	0.18	0.21
	2008	1,642.1	95.8	1,391	301.824	0.22	0.18
NORTH ANNA 1, 2	1979	507.0	61.7	2,025	449	0.22	0.89
Docket 50-338; NPF-04, -07	1980	681.8	86.5	2,086	218	0.10	0.32
1st commercial operation	1981	1,241.9	71.5	2,416	680	0.28	0.55
6/78, 12/80	1982	777.7	45.8	2,872	1,915	0.67	2.46
Type - PWRs	1983	1,338.4	76.1	2,228	665	0.30	0.50
Capacity - 903, 903 MWe	1984	1,021.3	58.8	3,062	1,945	0.64	1.90
	1985	1,516.9	86.1	2,436	838	0.34	0.55
	1986	1,484.5	83.0	2,831	722	0.26	0.49
	1987	1,112.6	67.8	2,624	1,521	0.58	1.37
	1988	1,772.7	96.7	992	112	0.11	0.06
	1989	1,226.8	72.5	2,861	1,471	0.51	1.20
	1990	1,590.4	90.5	2,161	590	0.27	0.37
	1991	1,597.5	88.6	2,085	629	0.30	0.39
	1992	1,403.2	84.1	2,159	576	0.27	0.41
	1993	1,428.4	80.1	2,768	908	0.33	0.64
	1994	1,717.1	95.9	1,036	193	0.19	0.11
	1995	1,666.4	90.8	1,551	367	0.24	0.22
	1996	1,569.6	89.1	1,203	291	0.24	0.19
	1997	1,711.5	96.2	856	103	0.12	0.06
	1998	1,632.8	92.7	1,201	265.922	0.22	0.16
	1999	1,747.7	96.1	727	94.402	0.13	0.05
	2000	1,734.1	95.8	730	65.405	0.09	0.04
	2001	1,491.0	84.8	1,231	308.907	0.25	0.21
	2002	1,557.0	84.3	914	143.312	0.16	0.09
	2003	1,569.1	87.2	1,041	187.014	0.18	0.12
	2004	1,685.6	92.0	965	129.686	0.13	0.08
	2005	1,751.5	96.0	686	58.844	0.09	0.03
	2006	1,723.0	95.0	749	82.069	0.11	0.05
	2007	1,596.7	88.0	1,581	309.237	0.20	0.19
	2008	1,643.1	91.2	795	61.003	0.08	0.04

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
OCONEE 1, 2, 3	1974	650.6	60.1	844	517	0.61	0.79
Docket 50-269, 50-270,	1975	1,838.3	75.5	829	497	0.60	0.27
50-287;	1976	1,561.4	63.0	1,215	1,026	0.84	0.66
DPR-38, -47, -55	1977	1,566.4	65.9	1,595	1,329	0.83	0.85
1st commercial operation	1978	1,909.0	75.8	1,636	1,393	0.85	0.73
7/73, 9/74, 12/74	1979	1,708.0	67.7	2,100	1,001	0.48	0.59
Type - PWRs	1980	1,703.7	70.1	2,124	1,055	0.50	0.62
Capacity - 846, 846, 846 MWe	1981	1,661.5	66.8	2,445	1,211	0.50	0.73
	1982	1,293.1	52.5	2,445	1,792	0.73	1.39
	1983	2,141.5	82.2	1,902	1,207	0.63	0.56
	1984	2,242.9	85.7	2,085	1,106	0.53	0.49
	1985	2,036.3	80.5	2,729	1,304	0.48	0.64
	1986	1,995.6	79.0	2,499	949	0.38	0.48
	1987	1,962.6	82.4	2,672	1,142	0.43	0.58
	1988	2,228.9	87.2	2,672	871	0.33	0.39
	1989	2,188.6	85.4	2,205	684	0.31	0.31
	1990	2,405.2	91.4	1,948	404	0.21	0.17
	1991	2,275.0	86.7	1,966	551	0.28	0.24
	1992	2,110.7	82.0	1,954	612	0.31	0.29
	1993	2,399.2	91.3	1,499	237	0.16	0.10
	1994	2,144.3	82.2	1,923	537	0.28	0.25
	1995	2,366.1	89.5	1,586	304	0.19	0.13
	1996	1,847.9	70.3	1,479	257	0.17	0.14
	1997	1,563.7	67.7	1,379	223	0.16	0.14
	1998	1,989.1	81.3	1,695	366.028	0.22	0.18
	1999	2,264.5	90.3	1,568	202.025	0.13	0.09
	2000	2,321.0	91.6	1,686	272.697	0.16	0.12
	2001	2,167.6	86.8	2,002	579.209	0.29	0.27
	2002	2,355.0	92.5	1,723	224.672	0.13	0.10
	2003	2,177.7	86.3	2,180	245.349	0.11	0.11
	2004	2,125.2	84.1	2,295	367.891	0.16	0.17
	2005	2,349.5	92.3	1,516	148.694	0.10	0.06
	2006	2,274.8	90.0	1,859	221.222	0.12	0.10
	2007	2,347.8	92.0	1,915	252.936	0.13	0.11
	2008	2298.5	90.9	1,924	186.335	0.10	0.08
OYSTER CREEK	1970	413.6		95	63	0.66	0.15
Docket 50-219; DPR-16	1971	448.9		249	240	0.96	0.53
1st commercial operation 12/69	1972	515.0		339	582	1.72	1.13
Type - BWR	1973	424.6		782	1,236	1.58	2.91
Capacity - 619 MWe	1974	434.5	70.4	935	984	1.05	2.26
	1975	373.6	73.3	1,210	1,140	0.94	3.05
	1976	456.5	79.3	1,582	1,078	0.68	2.36
	1977	385.7	70.1	1,673	1,614	0.96	4.18
	1978	431.8	74.3	1,411	1,279	0.91	2.96
	1979	541.0	85.9	842	467	0.55	0.86
	1980	232.9	41.4	1,966	1,733	0.88	7.44
	1981	314.8	59.8	1,689	917	0.54	2.91
	1982	242.7	62.5	1,270	865	0.68	3.56
	1983	27.9	11.5	2,303	2,257	0.98	80.90
	1984	37.1	9.6	2,369	2,054	0.87	55.36
	1985	446.1	89.4	2,342	748	0.32	1.68
	1986	157.3	31.5	3,740	2,436	0.65	15.49
	1987	371.0	64.2	1,932	522	0.27	1.41
	1988	419.6	65.9	2,875	1,504	0.52	3.58
	1989	287.5	57.3	2,395	910	0.38	3.17
	1990	511.8	89.1	1,941	310	0.16	0.61
	1991	351.6	60.5	3,089	1,185	0.38	3.37
	1992	536.3	85.9	2,771	657	0.24	1.23
	1993	551.9	87.8	2,560	416	0.16	0.75
	1994	431.7	70.8	2,382	844	0.35	1.96
	1995	615.4	97.4	761	90	0.12	0.15
	1996	515.0	82.6	1,833	449	0.24	0.87

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
OYSTER CREEK	1997	579.1	94.3	509	50	0.10	0.09
(continued)	1998	490.8	82.4	1,408	308.323	0.22	0.63
	1999	615.1	100.0	466	41.664	0.09	0.07
	2000	444.9	83.3	2,044	614.379	0.30	1.38
	2001	595.0	97.6	442	45.817	0.10	0.08
	2002	573.0	94.0	1,468	265.810	0.18	0.46
	2003	598.4	97.2	416	43.363	0.10	0.07
	2004	551.8	91.6	1,346	226.880	0.17	0.41
	2005	611.9	99.5	316	27.813	0.09	0.05
	2006	530.2	90.0	1,443	189.950	0.13	0.36
	2007	579.7	97.0	464	46.590	0.10	0.08
	2008	531.0	91.0	1,511	211.932	0.14	0.40
PALISADES	1972	216.8			78		0.36
Docket 50-255; DPR-20	1973	286.8		975	1,133	1.16	3.95
1st commercial operation 12/71	1974	10.7	5.5	774	627	0.81	58.60
Type - PWR	1975	302.0	64.5	495	306	0.62	1.01
Capacity - 730 MWe	1976	346.9	55.2	742	696	0.94	2.01
	1977	616.6	91.4	332	100	0.30	0.16
	1978	320.2	49.7	849	764	0.90	2.39
	1979	415.0	59.9	1,599	854	0.53	2.06
	1980	288.3	42.9	1,307	424	0.32	1.47
	1981	418.2	57.2	2,151	902	0.42	2.16
	1982	404.3	54.7	1,554	330	0.21	0.82
	1983	454.4	60.3	2,167	977	0.45	2.15
	1984	98.7	15.2	1,344	573	0.43	5.81
	1985	639.2	83.8	1,355	507	0.37	0.79
	1986	102.3	15.1	1,438	672	0.47	6.57
	1987	319.2	48.2	1,122	456	0.41	1.43
	1988	413.4	56.8	1,472	730	0.50	1.77
	1989	442.8	69.1	1,026	314	0.31	0.71
	1990	366.7	58.7	2,414	766	0.32	2.09
	1991	587.0	78.1	1,315	211	0.16	0.36
	1992	581.9	76.1	1,267	295	0.23	0.51
	1993	424.4	53.7	908	289	0.32	0.68
	1994	541.8	67.0	397	60	0.15	0.11
	1995	583.5	75.8	1,230	462	0.38	0.79
	1996	638.2	81.4	1,109	318	0.29	0.50
	1997	662.5	89.9	338	48	0.14	0.07
	1998	615.4	83.5	895	216.563	0.24	0.35
	1999	585.4	80.2	939	218.451	0.23	0.37
	2000	654.4	88.0	255	26.305	0.10	0.04
	2001	268.2	36.3	1,032	362.723	0.35	1.35
	2002	725.0	94.8	224	24.380	0.11	0.03
	2003	701.1	90.7	822	202.571	0.25	0.29
	2004	608.6	82.3	974	370.895	0.38	0.61
	2005	756.6	98.0	156	10.459	0.07	0.01
	2006	675.5	86.0	882	239.652	0.27	0.36
	2007	665.6	85.0	1,065	256.632	0.24	0.39
	2008	778.4	98.2	272	23.478	0.09	0.03
PALO VERDE 1, 2, 3	1987	1,638.1	66.1	1,792	669	0.37	0.41
Docket 50-528, 50-529, 50-530;	1988	1,700.9	65.5	2,173	688	0.32	0.40
NPF-41, -51, -74	1989	965.3	26.5	2,615	720	0.28	0.75
1st commercial operation	1990	2,500.9	67.5	2,236	499	0.22	0.20
1/86, 9/86, 1/88	1991	3,043.9	78.9	2,242	605	0.27	0.20
Type - PWRs	1992	3,102.3	82.0	1,981	541	0.27	0.17
Capacity - 1,311, 1,314,	1993	2,677.1	74.3	2,124	592	0.28	0.22
1,317 MWe	1994	2,827.6	79.1	2,048	462	0.23	0.16
	1995	3,265.2	85.6	1,875	482	0.26	0.15
	1996	3,482.7	90.0	1,717	302	0.18	0.09
	1997	3,369.2	92.2	1,585	246	0.16	0.07
	1998	3,454.4	93.2	1,410	192.425	0.14	0.06
	1999	3,471.2	93.2	1,275	146.328	0.11	0.04

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PALO VERDE 1, 2, 3	2000	3,458.6	93.0	1,279	158.105	0.12	0.05
(continued)	2001	3,280.2	88.6	1,361	182.043	0.13	0.06
	2002	3,513.0	94.0	1,343	140.057	0.10	0.04
	2003	3,254.4	88.6	1,943	210.842	0.11	0.06
	2004	3,201.4	86.3	1,324	199.016	0.15	0.06
	2005	2,937.6	80.4	2,014	200.300	0.10	0.07
	2006	2,741.1	79.0	1,585	151.516	0.10	0.06
	2007	3,058.5	81.0	2,372	148.660	0.06	0.05
	2008	3,330.0	86.1	1,706	159.913	0.09	0.05
PEACH BOTTOM 2, 3	1975	1,234.3	80.9	971	228	0.23	0.18
Docket 50-277, 50-278;	1976	1,379.2	73.0	2,136	840	0.39	0.61
DPR-44, -56	1977	1,052.4	58.7	2,827	2,036	0.72	1.93
1st commercial operation	1978	1,636.3	84.0	2,244	1,317	0.59	0.80
7/74, 12/74	1979	1,740.0	84.5	2,276	1,388	0.61	0.80
Type - BWRs	1980	1,374.2	66.3	2,774	2,302	0.83	1.68
Capacity - 1,112, 1,112 MWe	1981	1,161.8	58.0	2,857	2,506	0.88	2.16
	1982	1,583.3	76.9	2,734	1,977	0.72	1.25
	1983	824.7	41.0	3,107	2,963	0.95	3.59
	1984	1,165.8	57.5	3,313	2,450	0.74	2.10
	1985	682.7	37.5	4,209	3,354	0.80	4.91
	1986	1,395.0	71.7	2,454	1,080	0.44	0.77
	1987	365.7	20.3	4,363	2,195	0.50	6.00
	1988	0.0	0.0	4,204	2,327	0.55	---
	1989	491.0	35.0	2,301	728	0.32	1.48
	1990	1,684.0	85.7	1,585	377	0.24	0.22
	1991	1,210.9	62.3	2,702	934	0.35	0.77
	1992	1,516.6	78.7	1,911	502	0.26	0.33
	1993	1,654.0	81.9	1,757	552	0.31	0.33
	1994	1,927.4	93.8	2,133	579	0.27	0.30
	1995	1,955.9	95.1	1,940	398	0.21	0.20
	1996	2,012.4	96.9	1,657	282	0.17	0.14
	1997	1,956.3	95.0	1,872	490	0.26	0.25
	1998	1,881.2	93.2	1,903	366.040	0.19	0.19
	1999	2,057.2	96.0	1,630	319.307	0.20	0.16
	2000	2,058.3	96.7	1,729	330.928	0.19	0.16
	2001	2,037.1	95.8	1,445	344.283	0.24	0.17
	2002	2,105.0	96.7	1,915	333.056	0.17	0.16
	2003	2,072.4	94.9	1,641	355.969	0.22	0.17
	2004	2,148.8	96.4	1,422	264.727	0.19	0.12
	2005	2,102.0	95.6	1,801	306.201	0.17	0.15
	2006	2,169.1	97.0	1,513	247.676	0.16	0.11
	2007	2,163.8	97.0	1,906	384.795	0.20	0.18
	2008	2,115.3	95.1	1,816	212.741	0.12	0.10
PERRY	1988	869.3	79.0	782	105	0.13	0.12
Docket 50-440; NPF-58	1989	642.2	57.0	1,883	767	0.41	1.19
1st commercial operation 11/87	1990	792.7	67.1	1,537	638	0.42	0.80
Type - BWR	1991	1,074.2	91.9	600	146	0.24	0.14
Capacity - 1,245 MWe	1992	856.2	75.5	1,487	571	0.38	0.67
	1993	479.2	48.2	1,235	278	0.23	0.58
	1994	550.8	50.2	2,098	691	0.33	1.25
	1995	1,090.9	95.6	587	64	0.11	0.06
	1996	895.6	77.2	1,622	307	0.19	0.34
	1997	930.6	84.7	1,524	272	0.18	0.29
	1998	1,163.1	99.3	385	41.945	0.11	0.04
	1999	1,041.7	89.9	1,758	326.014	0.19	0.31
	2000	1,148.2	97.1	501	55.827	0.11	0.05
	2001	885.9	79.6	1,392	258.268	0.19	0.29
	2002	1,136.0	95.0	436	70.258	0.16	0.06
	2003	973.7	83.8	1,880	607.384	0.32	0.62
	2004	1,164.3	95.9	496	73.481	0.15	0.06
	2005	872.9	73.8	1,734	416.608	0.24	0.48
	2006	1,195.8	99.0	488	65.152	0.13	0.05

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PERRY	2007	919.7	79.0	1,650	505.121	0.31	0.55
(continued)	2008	1,215.9	97.9	528	52.058	0.10	0.04
PILGRIM 1	1973	484.0		230	126	0.55	0.26
Docket 50-293; DPR-35	1974	234.1	39.2	454	415	0.91	1.77
1st commercial operation 12/72	1975	308.1	71.3	473	798	1.69	2.59
Type - BWR	1976	287.8	60.7	1,317	2,648	2.01	9.20
Capacity - 685 MWe	1977	316.6	61.4	1,875	3,142	1.68	9.92
	1978	519.5	83.1	1,667	1,327	0.80	2.55
	1979	574.0	89.4	2,458	1,015	0.41	1.77
	1980	360.3	56.2	3,549	3,626	1.02	10.06
	1981	408.9	65.9	2,803	1,836	0.66	4.49
	1982	389.9	63.9	2,854	1,539	0.54	3.95
	1983	559.5	87.2	2,326	1,162	0.50	2.08
	1984	1.4	0.4	4,542	4,082	0.90	2,915.71
	1985	587.3	91.5	2,209	893	0.40	1.52
	1986	121.9	18.8	2,635	874	0.33	7.17
	1987	0.0	0.0	4,710	1,579	0.34	---
	1988	0.0	0.0	2,073	392	0.19	---
	1989	204.6	64.1	1,797	207	0.12	1.01
	1990	503.5	82.1	1,898	225	0.12	0.45
	1991	406.3	65.8	2,836	605	0.21	1.49
	1992	561.0	85.4	1,332	281	0.21	0.50
	1993	513.7	80.9	1,328	435	0.33	0.85
	1994	453.6	71.4	758	200	0.26	0.44
	1995	531.7	80.7	1,294	482	0.37	0.91
	1996	631.3	95.4	517	116	0.22	0.18
	1997	492.1	80.7	1,655	588	0.36	1.19
	1998	650.5	100.0	530	71.446	0.13	0.11
	1999	510.7	84.4	1,222	344.270	0.28	0.67
	2000	627.5	98.3	422	50.797	0.12	0.08
	2001	585.6	91.0	1,113	179.585	0.16	0.31
	2002	657.0	100.0	463	38.280	0.08	0.06
	2003	566.6	87.5	1,437	250.192	0.17	0.44
	2004	676.1	99.5	427	41.109	0.10	0.06
	2005	623.2	93.7	1,212	206.089	0.17	0.33
	2006	665.4	100.0	654	43.531	0.07	0.07
	2007	584.5	90.0	1,407	240.526	0.17	0.41
	2008	668.1	99.0	377	22.568	0.06	0.03
POINT BEACH 1, 2	1971	393.4			164		0.42
Docket 50-266, 50-301;	1972	378.3			580		1.53
DPR-24, -27	1973	693.7		501	588	1.17	0.85
1st commercial operation	1974	760.2	81.3	400	295	0.74	0.39
12/70, 10/72	1975	801.2	82.9	339	459	1.35	0.57
Type - PWRs	1976	857.3	86.7	313	370	1.18	0.43
Capacity - 516, 518 MWe	1977	873.9	87.3	417	430	1.03	0.49
	1978	914.4	90.9	336	320	0.95	0.35
	1979	808.0	80.8	610	644	1.06	0.80
	1980	727.2	82.5	561	598	1.07	0.82
	1981	760.4	83.6	773	596	0.77	0.78
	1982	757.2	84.3	767	609	0.79	0.80
	1983	648.2	72.7	1,702	1,403	0.82	2.16
	1984	788.9	78.6	1,372	789	0.58	1.00
	1985	831.3	82.5	671	482	0.72	0.58
	1986	858.9	85.7	664	402	0.61	0.47
	1987	857.5	85.5	720	554	0.77	0.65
	1988	899.3	88.6	734	410	0.56	0.46
	1989	847.8	85.5	736	504	0.68	0.59
	1990	875.5	86.5	617	378	0.61	0.43
	1991	874.8	87.1	724	265	0.37	0.30
	1992	866.7	85.8	617	256	0.41	0.30
	1993	911.0	90.0	559	186	0.33	0.20
	1994	914.5	91.2	548	170	0.31	0.19

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
POINT BEACH 1, 2	1995	858.4	86.1	548	190	0.35	0.22
(continued)	1996	831.6	84.7	1,029	276	0.27	0.33
	1997	186.8	21.8	670	92	0.14	0.49
	1998	649.7	69.7	881	169.253	0.19	0.26
	1999	806.0	83.1	962	194.489	0.20	0.24
	2000	872.0	88.7	765	138.989	0.18	0.16
	2001	915.9	93.4	740	131.667	0.18	0.14
	2002	909.0	91.1	945	180.654	0.19	0.20
	2003	917.2	92.1	627	84.965	0.14	0.09
	2004	912.3	90.1	627	109.515	0.17	0.12
	2005	782.5	78.1	851	128.646	0.15	0.16
	2006	977.2	96.0	453	39.597	0.09	0.04
	2007	958.5	94.0	535	52.023	0.10	0.05
	2008	889.4	87.8	958	144.021	0.15	0.16
PRAIRIE ISLAND 1, 2	1974	181.9	43.9	150	18	0.12	0.10
Docket 50-282, 50-306;	1975	836.0	83.3	477	123	0.26	0.15
DPR-42, -60	1976	725.2	76.6	818	447	0.55	0.62
1st commercial operation	1977	922.9	87.2	718	300	0.42	0.33
12/73, 12/74	1978	941.1	92.2	546	221	0.40	0.23
Type - PWRs	1979	865.0	86.0	594	180	0.30	0.21
Capacity - 522, 522 MWe	1980	800.7	79.9	983	353	0.36	0.44
	1981	844.9	80.5	836	329	0.39	0.39
	1982	944.9	90.4	645	229	0.36	0.24
	1983	921.1	86.8	654	233	0.36	0.25
	1984	972.4	91.7	546	147	0.27	0.15
	1985	882.6	84.0	1,082	416	0.38	0.47
	1986	930.6	90.3	818	255	0.31	0.27
	1987	969.6	91.6	593	135	0.23	0.14
	1988	932.0	89.1	732	199	0.27	0.21
	1989	1,001.8	94.7	476	99	0.21	0.10
	1990	925.4	89.2	737	188	0.26	0.20
	1991	1,023.3	95.6	586	98	0.17	0.10
	1992	811.6	76.2	845	211	0.25	0.26
	1993	978.3	90.7	532	106	0.20	0.11
	1994	996.9	91.5	478	109	0.10	0.11
	1995	1,023.2	93.9	499	107	0.21	0.10
	1996	992.1	91.4	558	112	0.20	0.11
	1997	817.6	81.4	753	174	0.23	0.21
	1998	860.3	83.4	582	116.649	0.20	0.14
	1999	989.3	93.8	542	72.496	0.13	0.07
	2000	992.2	93.1	632	106.091	0.17	0.11
	2001	900.8	85.8	691	124.708	0.18	0.14
	2002	987.0	93.6	969	127.713	0.13	0.13
	2003	1,006.1	96.4	594	61.137	0.10	0.06
	2004	940.4	89.9	1,186	143.806	0.12	0.15
	2005	952.5	90.8	782	84.337	0.11	0.09
	2006	926.4	89.0	1,103	137.352	0.12	0.15
	2007	1,014.8	98.0	130	6.276	0.05	0.01
	2008	924.3	88.9	1,060	126.723	0.12	0.14
QUAD CITIES 1, 2	1974	958.1	72.3	678	482	0.71	0.50
Docket 50-254, 50-265;	1975	833.6	68.4	1,083	1,618	1.49	1.94
DPR-29, -30	1976	951.2	73.1	1,225	1,651	1.35	1.74
1st commercial operation	1977	970.1	84.0	907	1,031	1.14	1.06
2/73, 3/73	1978	1,124.5	88.6	1,207	1,618	1.34	1.44
Type - BWRs	1979	1,075.0	84.6	1,688	2,158	1.28	2.01
Capacity - 866, 871 MWe	1980	866.9	64.4	3,089	4,838	1.57	5.58
	1981	1,156.9	81.1	2,246	3,146	1.40	2.72
	1982	1,018.7	76.0	2,314	3,757	1.62	3.69
	1983	1,088.5	79.2	1,802	2,491	1.38	2.29
	1984	994.6	65.7	1,678	1,579	0.94	1.59
	1985	1,268.0	82.7	1,184	990	0.84	0.78
	1986	1,093.2	71.0	1,451	950	0.65	0.87

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
QUAD CITIES 1, 2 (continued)	1987	1,126.6	75.3	1,429	720	0.50	0.64
	1988	1,173.7	84.1	1,486	827	0.56	0.70
	1989	1,196.3	85.9	1,721	900	0.52	0.75
	1990	1,148.9	77.8	2,186	1,028	0.47	0.89
	1991	1,044.5	73.2	1,722	509	0.30	0.49
	1992	960.8	68.0	2,413	1,157	0.48	1.20
	1993	974.9	67.0	2,150	849	0.39	0.87
	1994	681.5	48.7	2,163	1,128	0.52	1.66
	1995	1,002.5	70.4	2,041	736	0.36	0.73
	1996	876.6	60.1	2,248	1,025	0.46	1.17
	1997	935.3	66.5	2,474	654	0.26	0.70
	1998	794.8	55.1	2,177	760.596	0.35	0.96
	1999	1,476.5	95.9	1,000	200.556	0.20	0.14
	2000	1,410.4	93.9	2,840	893.766	0.32	0.63
	2001	1,478.2	95.9	736	143.849	0.20	0.10
	2002	1,396.0	89.0	3,818	1,786.021	0.47	1.28
	2003	1,569.4	93.1	998	438.144	0.44	0.28
	2004	1,443.8	95.5	2,334	510.521	0.22	0.35
	2005	1,516.2	94.2	2,869	961.026	0.33	0.63
	2006	1,524.9	93.0	2,329	559.362	0.24	0.37
	2007	1,650.3	97.0	1,945	249.927	0.13	0.15
	2008	1,619.4	95.2	2,065	274.444	0.13	0.17
RANCHO SECO[12] Docket 50-312; DPR-54 1st commercial operation 4/75 Type - PWR Capacity - (873) MWe	1976	268.1	30.4	297	58	0.20	0.22
	1977	706.4	77.1	515	391	0.76	0.55
	1978	607.7	80.5	508	323	0.64	0.53
	1979	687.0	91.1	287	126	0.44	0.18
	1980	530.9	60.4	890	412	0.46	0.78
	1981	321.2	40.2	772	402	0.52	1.25
	1982	409.5	53.3	766	337	0.44	0.82
	1983	347.9	46.8	1,338	787	0.59	2.26
	1984	460.0	58.3	802	222	0.28	0.48
	1985	238.7	30.8	1,764	756	0.43	3.17
	1986	0.0	0.0	1,513	402	0.27	---
	1987	0.0	0.0	1,533	300	0.20	---
	1988	355.8	63.1	693	78	0.11	0.22
	1989	179.9	54.7	603	81	0.13	0.45
	1990	0.0	0.0	111	13	0.12	---
	1991	0.0	0.0	101	9	0.09	---
	1992	0.0	0.0	70	7	0.10	---
	1993	0.0	0.0	35	4	0.11	---
	1994	0.0	0.0	18	1	0.23	---
	1995	0.0	0.0	16	1	0.06	---
	1996	0.0	0.0	16	1	0.04	---
	1997	0.0	0.0	16	0	0.00	---
	1998	0.0	0.0	61	2.661	0.05	---
	1999	0.0	0.0	302	11.191	0.04	---
	2000	0.0	0.0	219	25.795	0.12	---
	2001	0.0	0.0	210	18.432	0.09	---
	2002	0.0	0.0	193	27.346	0.14	---
	2003	0.0	0.0	121	18.300	0.15	---
	2004	0.0	0.0	122	14.890	0.12	---
	2005	0.0	0.0	157	33.444	0.21	---
	2006	0.0	0.0	143	31.793	0.22	---
	2007	0.0	0.0	129	12.524	0.10	---
	2008	0.0	0.0	84	2.434	0.03	---

[12] Rancho Seco was shut down in June 1989 and is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
RIVER BEND 1	1987	605.2	68.4	1,268	378	0.30	0.62
Docket 50-458; NPF-47	1988	880.7	94.3	513	107	0.21	0.12
1st commercial operation 6/86	1989	584.5	69.1	1,566	558	0.36	0.95
Type - BWR	1990	682.2	78.0	1,616	489	0.30	0.72
Capacity - 967 MWe	1991	814.7	87.2	780	144	0.18	0.18
	1992	336.1	39.7	2,022	710	0.35	2.11
	1993	640.0	71.6	847	180	0.21	0.28
	1994	595.7	64.9	2,209	519	0.23	0.87
	1995	967.1	99.6	667	85	0.13	0.09
	1996	836.1	85.3	2,093	473	0.23	0.57
	1997	778.8	86.3	1,671	347	0.21	0.45
	1998	894.2	96.2	466	57.749	0.12	0.06
	1999	651.2	75.2	1,327	343.858	0.26	0.53
	2000	837.1	89.7	1,104	216.053	0.20	0.26
	2001	889.3	93.6	1,249	207.614	0.17	0.23
	2002	965.0	98.5	373	35.145	0.09	0.04
	2003	871.3	92.7	1,296	216.950	0.17	0.25
	2004	845.6	90.1	1,378	235.749	0.17	0.28
	2005	890.5	94.4	498	55.816	0.11	0.06
	2006	853.7	92.0	1,494	214.409	0.14	0.25
	2007	823.0	92.0	1,131	131.373	0.12	0.16
	2008	724.8	78.7	1,809	311.697	0.17	0.43
ROBINSON 2	1972	580.0		245	215	0.88	0.37
Docket 50-261; DPR-23	1973	455.1		831	695	0.84	1.53
1st commercial operation 3/71	1974	578.1	83.3	853	672	0.79	1.16
Type - PWR	1975	501.8	72.7	849	1,142	1.35	2.28
Capacity - 710 MWe	1976	585.5	84.7	597	715	1.20	1.22
	1977	511.5	85.2	634	455	0.72	0.89
	1978	480.5	72.0	943	963	1.02	2.00
	1979	482.0	70.8	1,454	1,188	0.82	2.46
	1980	387.3	62.2	2,009	1,852	0.92	4.78
	1981	426.6	73.0	1,462	733	0.50	1.72
	1982	277.5	48.9	2,011	1,426	0.71	5.14
	1983	409.8	75.5	2,244	923	0.41	2.25
	1984	28.0	7.0	4,127	2,880	0.70	102.86
	1985	629.5	87.9	1,378	311	0.23	0.49
	1986	577.1	80.3	1,571	539	0.34	0.93
	1987	510.1	72.5	1,379	499	0.36	0.98
	1988	385.0	65.9	1,351	564	0.42	1.46
	1989	336.6	48.7	1,098	195	0.18	0.58
	1990	400.3	64.8	1,626	437	0.27	1.09
	1991	575.1	81.4	885	193	0.22	0.34
	1992	487.2	66.8	1,267	352	0.28	0.72
	1993	502.7	70.7	1,221	337	0.28	0.67
	1994	560.3	79.5	420	63	0.15	0.11
	1995	618.7	84.7	1,058	215	0.20	0.35
	1996	654.8	88.6	1,031	167	0.16	0.26
	1997	707.5	99.0	304	13	0.04	0.02
	1998	628.5	88.9	978	170.476	0.17	0.27
	1999	648.9	91.8	807	123.952	0.15	0.19
	2000	710.0	99.7	138	8.396	0.06	0.01
	2001	627.9	90.6	827	124.750	0.15	0.20
	2002	638.0	91.2	830	110.631	0.13	0.17
	2003	733.1	100.0	109	4.838	0.04	0.01
	2004	653.7	89.3	952	118.159	0.12	0.18
	2005	656.9	89.7	791	64.662	0.08	0.10
	2006	735.5	100.0	86	3.320	0.04	0.01
	2007	655.0	90.0	890	80.752	0.09	0.12
	2008	618.1	84.6	788	68.381	0.09	0.11

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SALEM 1, 2	1978	546.4	55.6	574	122	0.21	0.22
Docket 50-272, -311;	1979	250.0	25.5	1,488	584	0.39	2.34
DPR-70, -75	1980	680.6	69.2	1,704	449	0.26	0.66
1st commercial operation	1981	743.0	78.1	1,652	254	0.15	0.34
6/77, 10/81	1982	1,440.4	72.6	3,228	1,203	0.37	0.84
Type - PWRs	1983	742.0	30.5	2,383	581	0.24	0.78
Capacity - 1,116, 1,134 MWe	1984	650.1	31.8	1,395	681	0.49	1.05
	1985	1,657.7	75.8	1,112	204	0.18	0.12
	1986	1,484.3	70.4	3,554	599	0.17	0.40
	1987	1,478.2	73.3	2,543	600	0.24	0.41
	1988	1,591.6	73.6	1,609	503	0.31	0.32
	1989	1,675.4	79.5	2,944	338	0.11	0.20
	1990	1,362.6	65.1	3,636	272	0.07	0.20
	1991	1,726.4	79.3	4,201	458	0.11	0.27
	1992	1,200.9	61.1	4,376	431	0.10	0.36
	1993	1,366.3	65.4	3,559	408	0.11	0.30
	1994	1,367.4	73.8	950	188	0.20	0.14
	1995	558.1	29.3	1,195	218	0.18	0.39
	1996	0.0	0.0	1,671	300	0.18	---
	1997	279.3	17.8	894	175	0.20	0.63
	1998	1,629.3	79.1	408	41.100	0.10	0.03
	1999	1,821.8	86.8	1,200	317.545	0.27	0.17
	2000	1,973.4	93.0	1,191	198.068	0.17	0.10
	2001	1,961.2	91.1	1,274	153.088	0.12	0.08
	2002	1,934.0	89.4	2,460	292.692	0.12	0.15
	2003	1,957.2	90.7	1,301	124.042	0.10	0.06
	2004	1,850.2	85.8	1,496	148.694	0.10	0.08
	2005	2,086.4	91.7	3,162	240.567	0.08	0.12
	2006	2,211.8	97.0	1,446	90.541	0.06	0.04
	2007	2,158.2	96.0	1,365	117.604	0.09	0.05
	2008	1,998.6	87.8	3,362	328.761	0.10	0.16
SAN ONOFRE 1[13], 2, 3	1969	314.1		123	42	0.34	0.13
Docket 50-206, -361, -362;	1970	365.9		251	155	0.62	0.42
DPR-13; NPF-10, -15	1971	362.1		121	50	0.41	0.14
1st commercial operation	1972	338.5		326	256	0.79	0.76
1/68, 8/83, 4/84	1973	273.7		570	353	0.62	1.29
Type - PWRs	1974	377.8	86.1	219	71	0.32	0.19
Capacity - (436), 1,070,	1975	389.0	87.4	424	292	0.69	0.75
1,080 MWe	1976	297.9	70.2	1,330	880	0.66	2.95
	1977	281.2	63.7	985	847	0.86	3.01
	1978	323.2	80.2	764	401	0.52	1.24
	1979	401.0	90.2	521	139	0.27	0.35
	1980	97.3	22.3	3,063	2,386	0.78	24.52
	1981	95.9	26.7	2,902	3,223	1.11	33.61
	1982	61.6	15.7	3,055	832	0.27	13.51
	1983	0.0	0.0	1,701	155	0.09	---
	1984	670.4	68.3	7,514	986	0.13	1.47
	1985	1,381.8	132.9	5,742	722	0.13	0.52
	1986	1,698.2	61.1	3,594	824	0.23	0.49
	1987	1,983.0	78.8	2,138	696	0.33	0.35
	1988	1,982.3	68.4	2,324	781	0.34	0.39
	1989	1,840.8	64.9	2,237	567	0.25	0.31
	1990	1,980.5	69.1	2,224	885	0.40	0.45
	1991	1,987.6	75.3	1,814	412	0.23	0.21
	1992	2,228.6	87.1	1,651	324	0.20	0.15
	1993	1,771.3	79.9	2,193	767	0.35	0.43
	1994	2,220.7	100.0	528	32	0.06	0.01
	1995	1,686.9	79.1	1,914	455	0.24	0.27

[13] San Onofre 1 was shut down in November 1992 and is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SAN ONOFRE 1[13], 2, 3	1996	2,089.3	93.2	1,272	129	0.10	0.06
(continued)	1997	1,533.9	72.9	1,652	341	0.21	0.22
	1998	1,996.4	92.0	1,091	195.600	0.18	0.10
SAN ONOFRE 1[13]	1999	0.0	0.0	241	15.863	0.07	---
Docket 50-206;	2000	0.0	0.0	416	71.214	0.17	---
DPR-13	2001	0.0	0.0	338	57.785	0.17	---
1st commercial operation 1/68	2002	0.0	0.0	308	61.214	0.20	---
Type - PWR	2003	0.0	0.0	226	35.596	0.16	---
Capacity - (436) MWe	2004	0.0	0.0	169	14.899	0.09	---
	2005	0.0	0.0	198	20.624	0.10	---
	2006	0.0	0.0	183	22.490	0.12	---
	2007	0.0	0.0	20	0.417	0.02	---
	2008	0.0	0.0	2	0.043	0.02	---
SAN ONOFRE 2, 3	1999	1,901.4	86.9	1,477	353.765	0.24	0.19
Docket 50-361, -362;	2000	2,067.2	94.7	1,073	115.499	0.11	0.06
NPF-10, -15	2001	1,727.2	78.9	1,083	131.384	0.12	0.08
1st commercial operation	2002	2,056.0	93.4	1,140	136.443	0.12	0.07
8/83, 4/84	2003	2,084.3	94.0	1,275	163.804	0.13	0.08
Type - PWRs	2004	1,713.8	79.1	1,761	407.063	0.23	0.24
Capacity - 1,070, 1,080 MWe	2005	2,094.7	96.0	305	11.332	0.04	0.01
	2006	1,552.2	73.0	1,632	315.087	0.19	0.20
	2007	1,964.6	89.0	1,065	91.545	0.09	0.05
	2008	1,753.0	82.7	1,014	125.320	0.12	0.07
SEABROOK	1991	810.4	75.9	699	92	0.13	0.11
Docket 50-443; NPF-86	1992	932.4	81.3	806	147	0.18	0.16
1st commercial operation 8/90	1993	1,071.5	93.6	110	6	0.05	0.01
Type - PWR	1994	736.4	63.5	852	113	0.13	0.15
Capacity - 1,243 MWe	1995	995.5	87.5	800	102	0.13	0.10
	1996	1,168.6	99.6	206	10	0.05	0.01
	1997	907.0	79.8	1,571	186	0.12	0.21
	1998	957.6	84.5	559	18.509	0.03	0.02
	1999	991.5	87.5	1,339	105.723	0.08	0.11
	2000	901.8	79.3	1,158	70.091	0.06	0.08
	2001	989.6	89.1	423	8.672	0.02	0.01
	2002	1,058.0	92.8	1,095	66.583	0.06	0.06
	2003	1,055.9	93.6	981	70.953	0.07	0.07
	2004	1,158.6	100.0	291	5.858	0.02	0.01
	2005	1,076.4	91.5	1,034	52.216	0.05	0.05
	2006	1,072.8	89.0	1,246	76.583	0.06	0.07
	2007	1,228.7	100.0	349	4.332	0.01	0.00
	2008	1,064.4	86.9	1,297	74.992	0.06	0.07
SEQUOYAH 1, 2	1982	583.5	52.8	1,968	570	0.29	0.98
Docket 50-327, -328;	1983	1,663.7	75.1	1,769	491	0.28	0.30
DPR-77, -79	1984	1,481.9	69.0	2,373	1,119	0.47	0.76
1st commercial operation	1985	1,151.3	51.3	1,853	1,072	0.58	0.93
7/81, 6/82	1986	0.0	0.0	1,738	527	0.30	---
Type - PWR	1987	0.0	0.0	2,080	420	0.20	---
Capacity - 1,148, 1,126 MWe	1988	490.8	31.8	2,441	678	0.28	1.38
	1989	1,851.7	85.7	2,007	657	0.33	0.35
	1990	1,662.6	77.2	2,935	1,687	0.57	1.01
	1991	1,965.4	88.0	1,933	700	0.36	0.36
	1992	1,849.0	85.4	1,714	465	0.27	0.25
	1993	405.7	21.8	1,631	373	0.23	0.92
	1994	1,418.7	66.3	1,702	295	0.17	0.21
	1995	1,864.2	86.1	1,650	368	0.22	0.20
	1996	2,003.9	87.9	1,444	269	0.19	0.13
	1997	1,946.1	89.0	1,962	420	0.21	0.22
	1998	2,135.3	95.3	1,530	265.980	0.17	0.12

[13] San Onofre 1 was shut down in November 1992 and is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SEQUOYAH 1, 2	1999	2,165.1	97.0	1,346	164.569	0.12	0.08
(continued)	2000	1,910.0	86.8	2,039	357.220	0.18	0.19
	2001	2,158.3	95.7	1,292	145.066	0.11	0.07
	2002	2,106.0	94.1	1,257	108.252	0.09	0.05
	2003	1,776.4	80.0	2,484	430.889	0.17	0.24
	2004	2,135.2	93.9	1,161	85.941	0.07	0.04
	2005	2,162.9	94.9	1,125	95.133	0.08	0.04
	2006	2,054.9	91.0	1,752	242.016	0.14	0.12
	2007	2,129.1	94.0	1,197	123.540	0.10	0.06
	2008	2,153.6	94.3	960	83.730	0.09	0.04
SOUTH TEXAS 1, 2	1989	769.3	65.6	989	161	0.16	0.21
Docket 50-498, 50-499;	1990	1,504.1	65.9	1,136	206	0.18	0.14
NPF -76, -80	1991	1,741.5	72.4	1,144	257	0.22	0.15
1st commercial operation	1992	2,096.0	83.8	923	147	0.16	0.07
8/88, 6/89	1993	163.1	8.3	1,138	251	0.22	1.54
Type - PWRs	1994	1,700.2	70.6	661	47	0.07	0.03
Capacity - 1,251, 1,251 MWe	1995	2,294.2	89.9	1,485	291	0.20	0.13
	1996	2,465.9	95.0	1,145	137	0.12	0.06
	1997	2,265.5	93.6	1,583	273	0.17	0.12
	1998	2,379.4	96.9	1,171	183.977	0.16	0.08
	1999	2,219.7	91.6	1,328	259.770	0.20	0.12
	2000	2,180.0	89.7	1,372	231.634	0.17	0.11
	2001	2,262.7	92.2	1,325	237.645	0.18	0.11
	2002	2,173.0	87.5	1,510	329.091	0.22	0.15
	2003	1,796.3	72.1	909	143.495	0.16	0.08
	2004	2,437.1	96.0	842	119.834	0.14	0.05
	2005	2,258.5	90.0	1,268	247.655	0.20	0.11
	2006	2,439.6	95.0	1,078	150.323	0.14	0.06
	2007	2,527.3	96.0	881	91.613	0.10	0.04
	2008	2,452.1	92.3	1,181	187.295	0.16	0.08
ST. LUCIE 1, 2	1977	649.1	84.7	445	152	0.34	0.23
Docket 50-335, -389;	1978	606.4	76.5	797	337	0.42	0.56
DPR-67; NPF-16	1979	592.0	74.0	907	438	0.48	0.74
1st commercial operation	1980	627.9	77.5	1,074	532	0.50	0.85
12/76, 8/83	1981	599.1	72.7	1,473	929	0.63	1.55
Type - PWRs	1982	816.8	94.0	1,045	272	0.26	0.33
Capacity - 839, 839 MWe	1983	290.3	15.4	2,211	1,204	0.54	4.15
	1984	1,183.0	69.6	2,090	1,263	0.60	1.07
	1985	1,445.8	82.5	1,971	1,344	0.68	0.93
	1986	1,588.6	89.1	1,279	491	0.38	0.31
	1987	1,407.9	81.9	2,012	951	0.47	0.68
	1988	1,639.7	93.0	1,448	611	0.42	0.37
	1989	1,493.1	85.1	1,414	495	0.35	0.33
	1990	1,188.4	70.0	1,876	777	0.41	0.65
	1991	1,592.8	90.8	1,282	479	0.37	0.30
	1992	1,511.9	87.3	1,251	264	0.21	0.17
	1993	1,227.6	77.7	1,462	492	0.34	0.40
	1994	1,424.8	85.0	1,896	505	0.27	0.35
	1995	1,306.6	76.0	1,498	413	0.28	0.32
	1996	1,473.4	86.5	1,433	385	0.27	0.26
	1997	1,394.6	83.6	2,314	646	0.28	0.46
	1998	1,572.5	94.2	1,170	134.459	0.11	0.09
	1999	1,569.1	93.8	1,107	176.878	0.16	0.11
	2000	1,630.0	96.0	990	98.691	0.10	0.06
	2001	1,527.5	91.6	1,375	228.071	0.17	0.15
	2002	1,633.0	96.6	992	155.946	0.16	0.10
	2003	1,524.7	91.5	937	141.734	0.15	0.09
	2004	1,492.0	89.3	1,157	159.436	0.14	0.11
	2005	1,408.4	85.1	2,262	406.171	0.18	0.29
	2006	1,542.4	93.0	1,226	119.963	0.10	0.08
	2007	1,302.1	78.0	2,447	409.958	0.17	0.32
	2008	1,566.5	92.7	1,127	112.234	0.10	0.07

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SUMMER 1	1984	504.6	61.1	1,120	295	0.26	0.58
Docket 50-395; NPF-12	1985	627.7	71.6	1,201	379	0.32	0.60
1st commercial operation 1/84	1986	853.7	95.3	392	23	0.06	0.03
Type - PWR	1987	618.7	71.0	1,075	560	0.52	0.91
Capacity - 966 MWe	1988	605.3	69.1	1,127	511	0.45	0.84
	1989	652.4	83.1	374	52	0.14	0.08
	1990	730.0	83.9	1,090	376	0.34	0.52
	1991	642.5	82.9	984	291	0.30	0.45
	1992	892.6	97.4	249	27	0.11	0.03
	1993	728.3	84.0	1,121	297	0.26	0.41
	1994	536.7	69.5	1,549	374	0.24	0.70
	1995	899.8	97.2	257	13	0.05	0.01
	1996	850.4	90.3	701	97	0.14	0.11
	1997	829.7	89.8	820	163	0.20	0.20
	1998	934.8	98.8	285	13.513	0.05	0.01
	1999	842.0	89.4	827	120.172	0.15	0.14
	2000	723.9	76.6	933	166.561	0.18	0.23
	2001	769.3	83.3	486	69.398	0.14	0.09
	2002	840.0	87.9	685	59.644	0.09	0.07
	2003	837.0	87.4	745	70.828	0.10	0.08
	2004	938.4	96.8	200	10.085	0.05	0.01
	2005	850.3	88.9	734	72.454	0.10	0.09
	2006	858.6	90.0	676	61.333	0.09	0.07
	2007	967.9	100.0	75	2.691	0.04	0.00
	2008	817.2	84.8	623	49.091	0.08	0.06
SURRY 1, 2	1973	420.6		936	152	0.16	0.36
Docket 50-280, 50-281;	1974	717.4	49.8	1,715	884	0.52	1.23
DPR-32, -37	1975	1,079.0	70.8	1,948	1,649	0.85	1.53
1st commercial operation	1976	930.7	60.4	2,753	3,165	1.15	3.40
12/72, 5/73	1977	1,139.0	72.2	1,860	2,307	1.24	2.03
Type - PWRs	1978	1,210.6	77.2	2,203	1,837	0.83	1.52
Capacity - 799, 799 MWe	1979	343.0	42.3	5,065	3,584	0.71	10.45
	1980	568.2	40.3	5,317	3,836	0.72	6.75
	1981	907.6	59.3	3,753	4,244	1.13	4.68
	1982	1,323.3	88.5	1,878	1,490	0.79	1.13
	1983	916.2	61.3	2,754	3,220	1.17	3.51
	1984	1,026.7	71.0	3,198	2,247	0.70	2.19
	1985	1,166.4	78.2	3,206	1,815	0.57	1.56
	1986	1,080.5	69.0	3,763	2,356	0.63	2.18
	1987	1,132.7	72.7	2,675	712	0.27	0.63
	1988	750.4	50.0	3,184	1,542	0.48	2.05
	1989	489.3	33.0	3,100	836	0.27	1.71
	1990	1,276.4	83.9	1,947	575	0.30	0.45
	1991	1,271.9	84.5	1,547	510	0.33	0.40
	1992	1,396.3	88.9	1,660	539	0.32	0.39
	1993	1,283.1	84.6	1,402	383	0.27	0.30
	1994	1,320.9	85.2	1,530	378	0.25	0.29
	1995	1,333.0	84.2	1,883	406	0.22	0.30
	1996	1,562.9	93.1	983	209	0.21	0.13
	1997	1,380.3	87.1	1,335	320	0.24	0.23
	1998	1,476.2	91.6	1,165	188.831	0.16	0.13
	1999	1,483.0	93.5	995	137.891	0.14	0.09
	2000	1,490.0	92.7	1,197	193.169	0.16	0.13
	2001	1,441.5	89.5	1,243	328.650	0.26	0.23
	2002	1,557.0	96.0	799	87.778	0.11	0.06
	2003	1,255.9	79.7	1,628	325.729	0.20	0.26
	2004	1,537.9	94.6	1,028	119.654	0.12	0.08
	2005	1,506.7	94.2	877	87.717	0.10	0.06
	2006	1,427.0	90.0	1,227	234.978	0.19	0.17
	2007	1,516.2	94.0	1,111	207.130	0.19	0.14
	2008	1,536.6	95.7	1,069	150.269	0.14	0.10

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SUSQUEHANNA 1, 2	1984	719.9	72.6	2,827	308	0.11	0.43
Docket 50-387, 50-388;	1985	1,452.2	76.4	3,669	1,106	0.30	0.76
NPF-14; -22	1986	1,344.8	67.0	2,996	828	0.28	0.62
1st commercial operation	1987	1,749.5	85.3	2,548	621	0.24	0.35
6/83, 2/85	1988	1,691.0	83.5	1,904	516	0.27	0.31
Type - BWRs	1989	1,572.5	77.1	2,063	704	0.34	0.45
Capacity - 1,185, 1,140 MWe	1990	1,746.9	85.4	1,691	440	0.26	0.25
	1991	1,878.0	89.8	1,844	507	0.27	0.27
	1992	1,604.2	79.7	1,885	724	0.38	0.45
	1993	1,602.1	77.3	1,488	335	0.23	0.21
	1994	1,814.4	85.4	1,580	442	0.28	0.24
	1995	1,850.8	85.3	1,773	476	0.27	0.26
	1996	1,998.7	90.7	1,430	289	0.20	0.14
	1997	1,918.9	89.6	1,646	433	0.26	0.23
	1998	1,879.6	88.3	1,575	360.778	0.23	0.19
	1999	1,896.0	89.6	1,787	431.397	0.24	0.23
	2000	1,994.6	92.6	1,812	331.163	0.18	0.17
	2001	2,027.6	94.2	1,807	288.413	0.16	0.14
	2002	1,973.0	91.6	1,890	259.968	0.14	0.13
	2003	2,050.8	93.4	1,934	250.096	0.13	0.12
	2004	2,058.8	92.7	2,144	272.202	0.13	0.13
	2005	2,086.6	93.5	1,898	181.360	0.10	0.09
	2006	2,040.4	91.0	1,873	184.901	0.10	0.09
	2007	2,089.2	93.0	2,303	263.021	0.11	0.13
	2008	2,174.1	94.2	1,895	192.892	0.10	0.09
THREE MILE ISLAND 1[14], 2[15]	1975	675.9	82.2	131	73	0.56	0.11
Docket 50-289, -320;	1976	530.0	65.4	819	286	0.35	0.54
DPR-50, -73	1977	664.5	80.9	1,122	360	0.32	0.54
1st commercial operation	1978	690.0	85.1	1,929	504	0.26	0.73
9/74, 12/78	1979	266.0	21.9	3,975	1,392	0.35	5.23
Type - PWRs	1980	0.0	0.0	2,328	394	0.17	---
Capacity - 802, (880) MWe	1981	0.0	0.0	2,103	376	0.18	---
	1982	0.0	0.0	2,123	1,004	0.47	---
	1983	0.0	0.0	1,592	1,159	0.73	---
	1984	0.0	0.0	1,079	688	0.64	---
	1985	103.6	10.6	1,890	857	0.45	8.27
THREE MILE ISLAND 1[14]	1986	585.2	70.9	1,360	213	0.16	0.36
Docket 50-289; DPR-50	1987	610.7	73.6	1,259	149	0.12	0.24
1st commercial operation 9/74	1988	661.0	77.8	1,012	210	0.21	0.32
Type - PWR	1989	871.3	100.0	670	54	0.08	0.06
Capacity - 802 MWe	1990	645.5	84.6	1,319	264	0.20	0.41
	1991	688.7	86.4	1,542	198	0.13	0.29
	1992	836.8	100.0	558	34	0.06	0.04
	1993	722.0	88.5	1,835	206	0.11	0.29
	1994	798.7	95.5	434	40	0.09	0.05
	1995	772.9	90.8	1,220	213	0.17	0.28
	1996	857.4	100.0	267	16	0.06	0.02
	1997	675.7	84.3	1,049	204	0.19	0.30
	1998	805.8	100.0	280	16.722	0.06	0.02
	1999	722.4	89.7	1,171	154.936	0.13	0.21
	2000	813.4	100.0	183	8.689	0.05	0.01
	2001	616.7	84.2	1,196	196.699	0.16	0.32
	2002	833.0	100.0	172	6.533	0.04	0.01
	2003	706.4	87.1	1,230	155.101	0.13	0.22

[14] Three Mile Island 1 resumed commercial power generation in October 1985 after being under regulatory restraint since 1979.

[15] Three Mile Island 2 has been shut down since the 1979 accident but was still included in the count of reactors through 1988 since dose was still being accumulated to defuel and decontaminate the unit during this time period. Parentheses indicate plant capacity when plant was operational. Since 2001, the dose breakdowns for Three Mile Island 2 have been reported with those for Unit 1.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
THREE MILE ISLAND 1[14]	2004	828.0	100.0	105	3.573	0.03	0.00
(continued)	2005	769.1	93.2	955	65.576	0.07	0.09
	2006	825.0	99.0	125	5.155	0.04	0.01
	2007	758.6	92.0	1,266	114.203	0.09	0.15
	2008	838.5	100.0	64	2.219	0.03	0.00
THREE MILE ISLAND 2[15]	1986	0.0	0.0	1,497	915	0.61	---
Docket 50-320; DPR-73	1987	0.0	0.0	1,378	977	0.71	---
1st commercial operation 12/78	1988	0.0	0.0	1,247	917	0.74	---
Type - PWR	1989	0.0	0.0	1,014	639	0.63	---
Capacity - (880) MWe	1990	0.0	0.0	484	136	0.28	---
	1991	0.0	0.0	153	37	0.24	---
	1992	0.0	0.0	315	157	0.50	---
	1993	0.0	0.0	167	33	0.20	---
	1994	0.0	0.0	259	7	0.03	---
	1995	0.0	0.0	191	2	0.01	---
	1996	0.0	0.0	122	2	0.02	---
	1997	0.0	0.0	232	1	0.00	---
	1998	0.0	0.0	105	0.697	0.01	---
	1999	0.0	0.0	203	0.512	0.00	---
	2000	0.0	0.0	70	0.401	0.01	---
	2001	0.0	0.0	0	0.228	---	---
	2002	0.0	0.0	0		---	---
	2003	0.0	0.0	0	0.260	---	---
	2004	0.0	0.0	0	0.216	---	---
	2005	0.0	0.0	0		---	---
	2006	0.0	0.0	0	0.372	---	---
	2007	0.0	0.0	0	0.082	---	---
	2008	0.0	0.0	0	0.138	---	---
TROJAN[16]	1977	792.0	92.6	591	174	0.29	0.22
Docket 50-344; NPF-1	1978	205.5	20.6	711	319	0.45	1.55
1st commercial operation 5/76	1979	631.0	58.1	736	258	0.35	0.41
Type - PWR	1980	727.5	72.5	1,159	421	0.36	0.58
Capacity - (1,080) MWe	1981	775.6	74.1	1,311	609	0.46	0.79
	1982	579.5	60.8	977	419	0.43	0.72
	1983	494.2	62.4	969	307	0.32	0.62
	1984	567.0	54.4	1,042	433	0.42	0.76
	1985	829.1	76.7	852	363	0.43	0.44
	1986	852.4	79.7	1,321	381	0.29	0.45
	1987	525.5	54.0	1,209	363	0.30	0.69
	1988	758.6	67.5	1,408	401	0.28	0.53
	1989	666.8	61.9	1,360	421	0.31	0.63
	1990	732.4	66.3	1,169	258	0.22	0.35
	1991	181.6	16.1	1,496	567	0.38	3.12
	1992	553.9	68.4	567	84	0.15	0.15
	1993	0.0	68.4	54	21	0.39	---
	1994	0.0	0.0	51	9	0.18	---
	1995	0.0	0.0	141	44	0.31	---
	1996	0.0	0.0	112	41	0.37	---
	1997	0.0	0.0	227	41	0.18	---
	1998	0.0	0.0	283	46.417	0.16	---
	1999	0.0	0.0	274	51.504	0.19	---

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[16] Trojan ended commercial operation as of January 1993 and will not be put in commercial operation again. It is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational. As of 2005, Trojan no longer reports under its reactor license but does report under its ISFSI license (see Appendix A).

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
TROJAN[16]	2000	0.0	0.0	127	17.631	0.14	---
(continued)	2001	0.0	0.0	14	1.091	0.08	---
	2002	0.0	0.0	13	0.536	0.04	---
	2003	0.0	0.0	105	23.996	0.23	---
	2004	0.0	0.0	5	0.079	0.02	---
	2005	0.0	0.0	0	0.000	---	---
	2006	0.0	0.0	0	0.000	---	---
	2007	0.0	0.0	0	0.000	---	---
	2008	0.0	0.0	0	0.000	---	---
TURKEY POINT 3, 4	1973	401.9		444	78	0.18	0.19
Docket 50-250, 50-251;	1974	953.6		794	454	0.57	0.48
DPR-31, -41	1975	1,003.7	74.9	1,176	876	0.74	0.87
1st commercial operation	1976	974.2	71.2	1,647	1,184	0.72	1.22
12/72, 9/73	1977	979.5	72.1	1,319	1,036	0.79	1.06
Type - PWRs	1978	1,000.2	78.8	1,336	1,032	0.77	1.03
Capacity - 693, 693 MWe	1979	811.0	62.4	2,002	1,680	0.84	2.07
	1980	990.6	73.6	1,803	1,651	0.92	1.67
	1981	654.0	46.8	2,932	2,251	0.77	3.44
	1982	915.7	65.2	2,956	2,119	0.72	2.31
	1983	878.4	62.8	2,930	2,681	0.92	3.05
	1984	946.7	68.5	2,010	1,255	0.62	1.33
	1985	1,034.9	74.7	1,905	1,253	0.66	1.21
	1986	754.1	54.9	1,808	946	0.52	1.25
	1987	431.3	36.6	1,980	1,371	0.69	3.18
	1988	809.8	59.5	1,841	738	0.40	0.91
	1989	689.9	56.8	1,625	433	0.27	0.63
	1990	933.1	69.0	2,099	730	0.35	0.78
	1991	258.2	21.0	2,087	939	0.45	3.64
	1992	968.9	75.5	1,374	325	0.24	0.34
	1993	1,244.8	91.0	1,271	275	0.22	0.22
	1994	1,172.9	87.2	1,489	476	0.32	0.41
	1995	1,320.3	94.6	1,142	215	0.19	0.16
	1996	1,307.8	94.0	1,157	187	0.16	0.14
	1997	1,220.9	88.6	1,581	414	0.26	0.34
	1998	1,323.0	94.5	1,045	156.415	0.15	0.12
	1999	1,352.5	96.5	919	127.567	0.14	0.09
	2000	1,283.7	92.2	1,292	219.852	0.17	0.17
	2001	1,324.1	95.0	827	101.575	0.12	0.08
	2002	1,374.0	97.9	793	73.764	0.09	0.05
	2003	1,253.2	91.6	1,442	247.053	0.17	0.20
	2004	1,231.0	89.9	1,089	117.404	0.11	0.10
	2005	1,143.0	84.9	1,136	109.996	0.10	0.10
	2006	1,251.8	90.0	1,321	149.208	0.11	0.12
	2007	1,281.5	91.0	1,085	107.601	0.10	0.08
	2008	1,294.9	92.0	1,067	97.357	0.09	0.08
VERMONT YANKEE	1973	222.1		244	85	0.35	0.38
Docket 50-271; DPR-28	1974	303.5		357	216	0.61	0.71
1st commercial operation 11/72	1975	429.0	87.8	282	153	0.54	0.36
Type - BWR	1976	389.6	77.1	815	411	0.50	1.05
Capacity - 605 MWe	1977	423.5	85.1	641	258	0.40	0.61
	1978	387.5	75.9	934	339	0.36	0.87
	1979	414.0	82.1	1,220	1,170	0.96	2.83
	1980	357.8	71.5	1,443	1,338	0.93	3.74
	1981	429.1	84.6	1,264	731	0.58	1.70
	1982	501.0	96.0	481	205	0.43	0.41
	1983	346.1	69.3	1,316	1,527	1.16	4.41
	1984	398.1	79.0	954	626	0.66	1.57
	1985	361.4	71.8	1,392	1,051	0.76	2.91

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Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
VERMONT YANKEE	1986	248.1	48.9	1,389	1,188	0.86	4.79
(continued)	1987	423.6	84.2	827	303	0.37	0.72
	1988	492.1	95.7	379	124	0.33	0.25
	1989	432.8	84.7	832	288	0.35	0.67
	1990	433.1	85.9	849	307	0.36	0.71
	1991	492.3	94.3	310	118	0.38	0.24
	1992	446.8	88.1	921	381	0.41	0.85
	1993	402.3	80.1	833	217	0.26	0.54
	1994	515.8	98.7	220	38	0.17	0.07
	1995	462.1	87.0	737	182	0.25	0.39
	1996	452.7	85.2	951	231	0.24	0.51
	1997	487.1	96.0	260	57	0.22	0.12
	1998	383.4	77.9	944	199.399	0.21	0.52
	1999	463.4	91.0	854	175.795	0.21	0.38
	2000	517.8	99.6	198	37.846	0.19	0.07
	2001	474.9	93.5	863	143.010	0.17	0.30
	2002	451.0	91.7	946	150.446	0.16	0.33
	2003	505.9	98.8	359	54.348	0.15	0.11
	2004	439.2	87.2	1,379	211.529	0.15	0.48
	2005	467.5	94.2	1,105	198.003	0.18	0.42
	2006	582.9	100.0	380	49.537	0.13	0.09
	2007	537.0	93.0	1,191	171.200	0.14	0.32
	2008	557.3	94.1	1,402	213.680	0.15	0.38
VOGTLE 1, 2	1988	820.4	77.7	1,108	138	0.12	0.17
Docket 50-424; 50-425;	1989	1,045.8	96.0	427	32	0.07	0.03
NPF-68, -81	1990	1,710.9	82.7	1,602	466	0.29	0.27
1st commercial operation	1991	1,966.5	89.2	1,357	362	0.27	0.18
6/87, 5/89	1992	2,047.9	90.0	1,262	426	0.34	0.21
Type - PWRs	1993	2,060.4	88.3	1,338	367	0.27	0.18
Capacity - 1,143, 1,140 MWe	1994	2,170.1	91.3	1,048	217	0.21	0.10
	1995	2,285.4	95.2	953	199	0.21	0.09
	1996	2,056.8	86.5	1,395	452	0.32	0.22
	1997	2,121.1	91.4	994	158	0.16	0.07
	1998	2,123.9	92.3	994	162.210	0.16	0.08
	1999	2,106.0	91.5	1,359	228.942	0.17	0.11
	2000	2,223.9	95.6	899	121.312	0.14	0.05
	2001	2,231.5	96.2	870	129.270	0.15	0.06
	2002	1,942.0	85.3	1,152	243.957	0.21	0.13
	2003	2,179.9	94.8	806	84.344	0.10	0.04
	2004	2,200.7	95.7	765	80.763	0.11	0.04
	2005	2,027.9	88.6	1,099	151.096	0.14	0.08
	2006	2,048.8	89.0	892	115.509	0.13	0.06
	2007	2,089.9	92.0	951	120.515	0.13	0.06
	2008	2,023.9	89.3	1,185	137.620	0.12	0.07
WATERFORD 3	1986	875.7	79.1	1,244	223	0.18	0.25
Docket 50-382; NPF-38	1987	891.8	82.5	959	156	0.16	0.17
1st commercial operation 9/85	1988	784.3	75.4	1,246	259	0.21	0.33
Type - PWR	1989	909.8	82.6	1,306	265	0.20	0.29
Capacity - 1,152 MWe	1990	1,027.9	92.8	432	47	0.11	0.05
	1991	870.6	79.8	1,301	364	0.28	0.42
	1992	909.6	83.2	1,213	226	0.19	0.25
	1993	1,088.3	99.4	195	15	0.08	0.01
	1994	949.1	87.0	1,167	191	0.16	0.20
	1995	927.4	83.4	1,092	153	0.14	0.16
	1996	1,064.8	94.2	342	27	0.08	0.03
	1997	767.2	71.2	1,186	148	0.13	0.19
	1998	984.1	91.9	282	24.032	0.09	0.02
	1999	849.5	79.6	833	123.198	0.15	0.14
	2000	965.1	88.8	825	131.701	0.16	0.14
	2001	1,086.0	99.6	91	4.677	0.05	0.00
	2002	1,007.0	93.2	811	109.439	0.13	0.11

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
WATERFORD 3	2003	968.0	90.9	710	95.332	0.13	0.10
(continued)	2004	1,099.1	100.0	60	2.517	0.04	0.00
	2005	900.9	80.2	902	136.318	0.15	0.15
	2006	1,059.3	92.0	1,190	109.682	0.09	0.10
	2007	1,130.2	96.0	469	20.125	0.04	0.02
	2008	1,030.7	88.0	1,268	134.221	0.11	0.13
WATTS BAR 1	1997	867.6	83.8	1,103	113	0.10	0.13
Docket 50-390; NPF-90	1998	1,105.1	99.1	96	3.106	0.03	0.00
1st commercial operation 5/96	1999	943.1	87.2	975	98.946	0.10	0.10
Type - PWR	2000	1,033.3	92.8	1,053	122.453	0.12	0.12
Capacity - 1,121 MWe	2001	1,095.9	96.5	197	5.912	0.03	0.01
	2002	1,034.0	92.1	909	93.598	0.10	0.09
	2003	973.3	86.7	1,392	165.741	0.12	0.17
	2004	1,122.1	99.1	220	5.893	0.03	0.01
	2005	1,003.7	90.0	1,244	143.506	0.12	0.14
	2006	764.5	70.0	2,070	322.682	0.16	0.42
	2007	1,150.6	100.0	128	4.414	0.03	0.00
	2008	923.5	83.2	887	70.648	0.08	0.08
WOLF CREEK 1	1986	832.8	73.3	682	143	0.21	0.17
Docket 50-482; NPF-42	1987	778.8	71.1	675	138	0.20	0.18
1st commercial operation 9/85	1988	794.7	70.7	1,010	297	0.29	0.37
Type - PWR	1989	1,108.4	99.5	186	18	0.10	0.02
Capacity - 1,160 MWe	1990	940.2	81.0	798	195	0.24	0.21
	1991	707.6	71.9	1,010	331	0.33	0.47
	1992	1,010.8	86.7	446	78	0.17	0.08
	1993	940.5	80.6	975	183	0.19	0.19
	1994	1,017.2	86.8	1,082	235	0.22	0.23
	1995	1,198.0	98.7	242	14	0.06	0.01
	1996	980.6	81.2	986	171	0.17	0.17
	1997	964.3	83.8	989	265	0.27	0.27
	1998	1,187.3	100.0	184	10.382	0.05	0.01
	1999	1,045.3	90.1	812	147.704	0.18	0.14
	2000	1,032.7	89.5	861	143.417	0.17	0.14
	2001	1,177.9	100.0	105	5.176	0.05	0.00
	2002	1,029.0	88.7	816	99.987	0.12	0.10
	2003	1,013.5	87.2	820	88.941	0.11	0.09
	2004	1,153.5	98.8	93	3.388	0.04	0.00
	2005	1,004.2	86.7	856	106.870	0.12	0.11
	2006	1,067.4	91.0	789	96.788	0.12	0.09
	2007	1,183.7	100.0	91	4.307	0.05	0.00
	2008	968.3	83.1	911	94.997	0.10	0.10
YANKEE ROWE[17]	1969	138.3		193	215	1.11	1.55
Docket 50-29; DPR-3	1970	146.1		355	255	0.72	1.75
1st commercial operation 7/61	1971	173.5		155	90	0.58	0.52
Type - PWR	1972	78.7		282	255	0.90	3.24
Capacity - (175) MWe	1973	127.1		133	99	0.74	0.78
	1974	111.3		243	205	0.84	1.84
	1975	145.1	82.4	249	116	0.47	0.80
	1976	152.2	89.8	152	59	0.39	0.39
	1977	124.6	73.9	725	356	0.49	2.86
	1978	145.0	81.0	565	282	0.50	1.94
	1979	149.0	81.6	441	127	0.29	0.85
	1980	35.6	22.0	502	213	0.42	5.98
	1981	109.0	74.4	515	302	0.59	2.77
	1982	108.6	73.4	814	474	0.58	4.36
	1983	163.5	91.4	395	68	0.17	0.42
	1984	124.8	71.4	654	348	0.53	2.79
	1985	144.3	85.3	653	211	0.32	1.46

[17] Yankee Rowe ended commercial operation as of October 1991 and will not be put in commercial operation again. It is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
YANKEE ROWE[17]	1986	169.7	95.0	384	45	0.12	0.27
(continued)	1987	138.7	82.7	593	217	0.37	1.56
	1988	136.4	85.2	738	227	0.31	1.66
	1989	159.4	92.9	496	62	0.13	0.39
	1990	101.1	61.5	702	246	0.35	2.43
	1991	121.2	72.3	162	40	0.25	0.33
	1992	0.0	0.0	324	94	0.29	---
	1993	0.0	0.0	313	163	0.52	---
	1994	0.0	0.0	222	156	0.70	---
	1995	0.0	0.0	191	78	0.41	---
	1996	0.0	0.0	239	95	0.40	---
	1997	0.0	0.0	323	65	0.20	---
	1998	0.0	0.0	125	4.603	0.04	---
	1999	0.0	0.0	83	2.291	0.02	---
	2000	0.0	0.0	38	2.406	0.06	---
	2001	0.0	0.0	48	3.969	0.08	---
	2002	0.0	0.0	128	20.024	0.16	---
	2003	0.0	0.0	136	30.934	0.23	---
	2004	0.0	0.0	70	6.502	0.09	---
	2005	0.0	0.0	63	1.456	0.02	---
	2006	0.0	0.0	45	0.975	0.02	---
	2007	0.0	0.0	0	0.000	---	---
	2008	0.0	0.0	1	0.019	0.02	---
ZION 1[18]**, 2**	1974	425.3	71.1	306	56	0.18	0.13
Docket 50-295; 50-304;	1975	1,181.5	74.9	436	127	0.29	0.11
DPR-39, -48	1976	1,134.9	61.9	774	571	0.74	0.50
1st commercial operation	1977	1,358.6	75.0	784	1,003	1.28	0.74
12/73, 9/74	1978	1,613.5	80.2	1,104	1,017	0.92	0.63
Type - PWRs	1979	1,238.0	67.6	1,472	1,274	0.87	1.03
Capacity - (1,040), (1,040) MWe	1980	1,411.2	74.1	1,363	920	0.67	0.65
	1981	1,366.9	72.3	1,754	1,720	0.98	1.26
	1982	1,186.4	64.3	1,575	2,103	1.34	1.77
	1983	1,222.3	69.4	1,285	1,311	1.02	1.07
	1984	1,389.9	69.6	1,110	786	0.71	0.57
	1985	1,187.9	62.9	1,498	1,166	0.78	0.98
	1986	1,462.0	73.2	967	474	0.49	0.32
	1987	1,337.0	71.0	1,046	653	0.62	0.49
	1988	1,549.1	78.3	1,926	1,260	0.65	0.81
	1989	1,514.1	77.6	1,282	624	0.49	0.41
	1990	860.4	46.9	1,385	696	0.50	0.81
	1991	1,125.7	58.2	902	173	0.19	0.15
	1992	1,128.8	59.0	1,732	1,043	0.60	0.92
	1993	1,458.2	70.9	1,772	643	0.36	0.44
	1994	1,224.9	59.9	1,176	306	0.26	0.25
	1995	1,471.6	72.4	1,807	797	0.44	0.54
	1996	1,538.4	75.8	1,567	437	0.28	0.28
	1997	123.2	7.1	924	119	0.13	0.97
	1998	0.0	0.0	246	12.417	0.05	---
	1999	0.0	0.0	67	4.194	0.06	---
	2000	0.0	0.0	26	3.015	0.12	---
	2001	0.0	0.0	6	0.274	0.05	---
	2002	0.0	0.0	12	0.276	0.02	---
	2003	0.0	0.0	2	0.049	0.02	---
	2004	0.0	0.0	6	0.167	0.03	---

[17] Yankee Rowe ended commercial operation as of October 1991 and will not be put in commercial operation again. It is no longer in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

[18] Zion 1, 2 were shut down in December 1997 and are no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
ZION 1[18], 2 (continued)	2005	0.0	0.0	5	0.109	0.02	---
	2006	0.0	0.0	7	0.109	0.02	---
	2007	0.0	0.0	8	0.224	0.03	---
	2008	0.0	0.0	7	0.147	0.02	---

[18] Zion 1, 2 were shut down in December 1997 and are no longer included in the count of operating reactors. Parentheses indicate plant capacity when plant was operational.

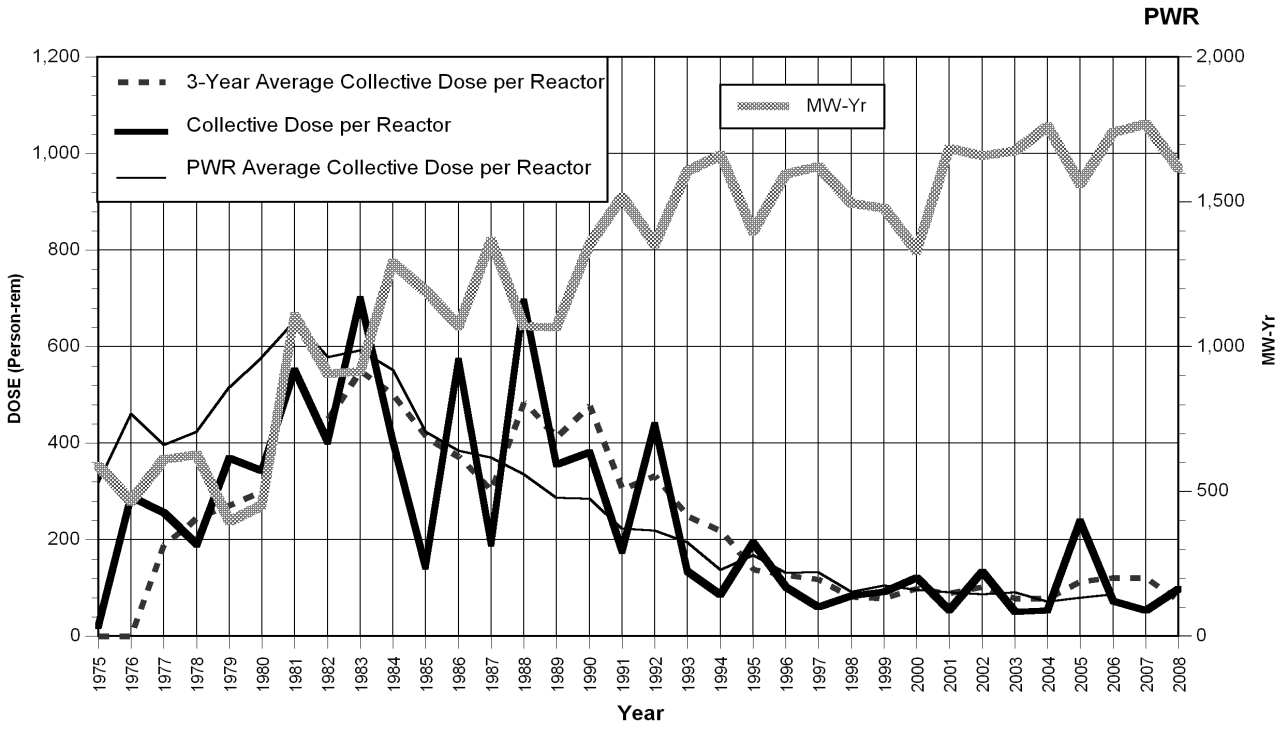
Appendix D*

DOSE PERFORMANCE INDICATORS BY REACTOR SITE

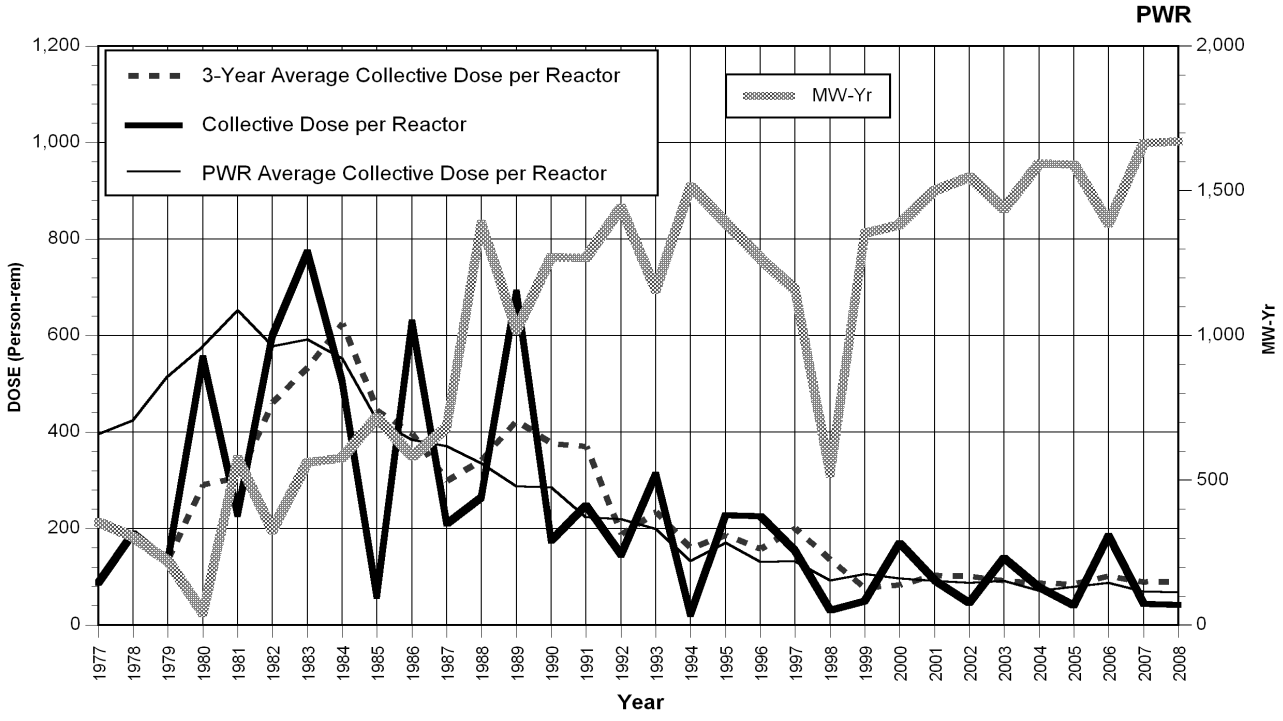
1973–2008

* Appendix D only contains data on plants in operation during 2008.

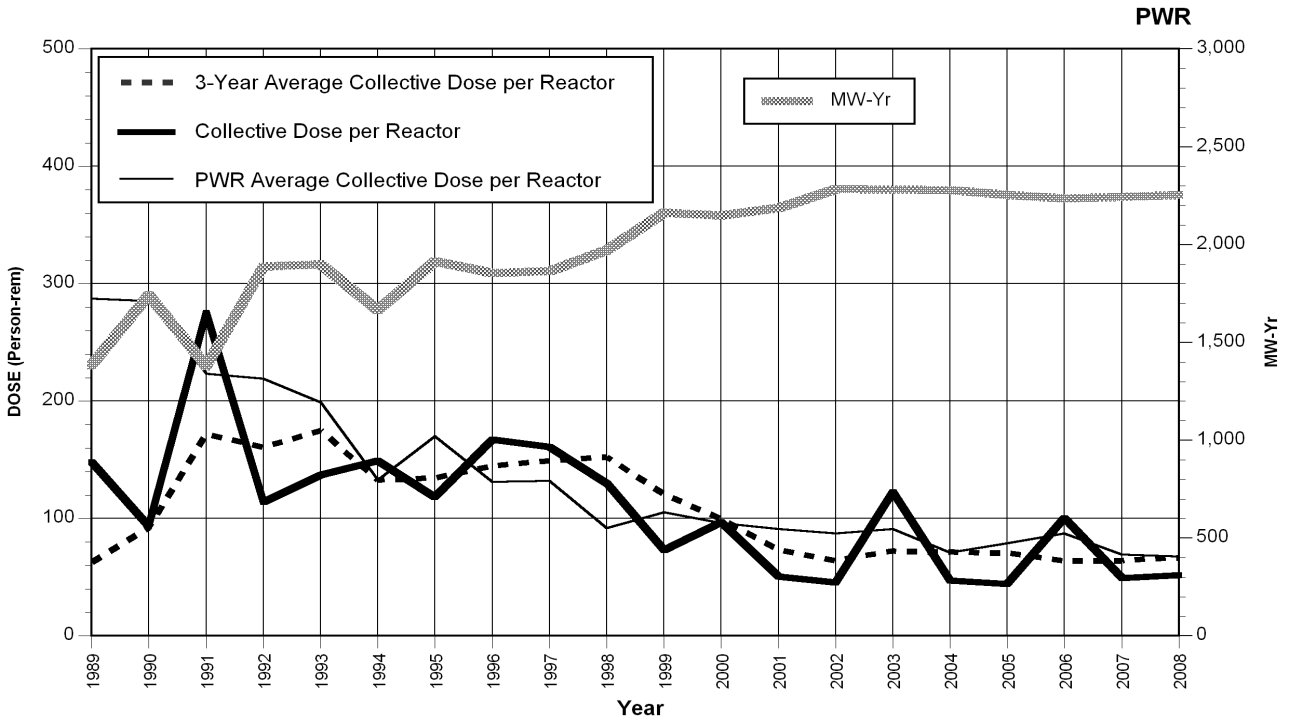
ARKANSAS 1, 2
Dose Performance Indicators



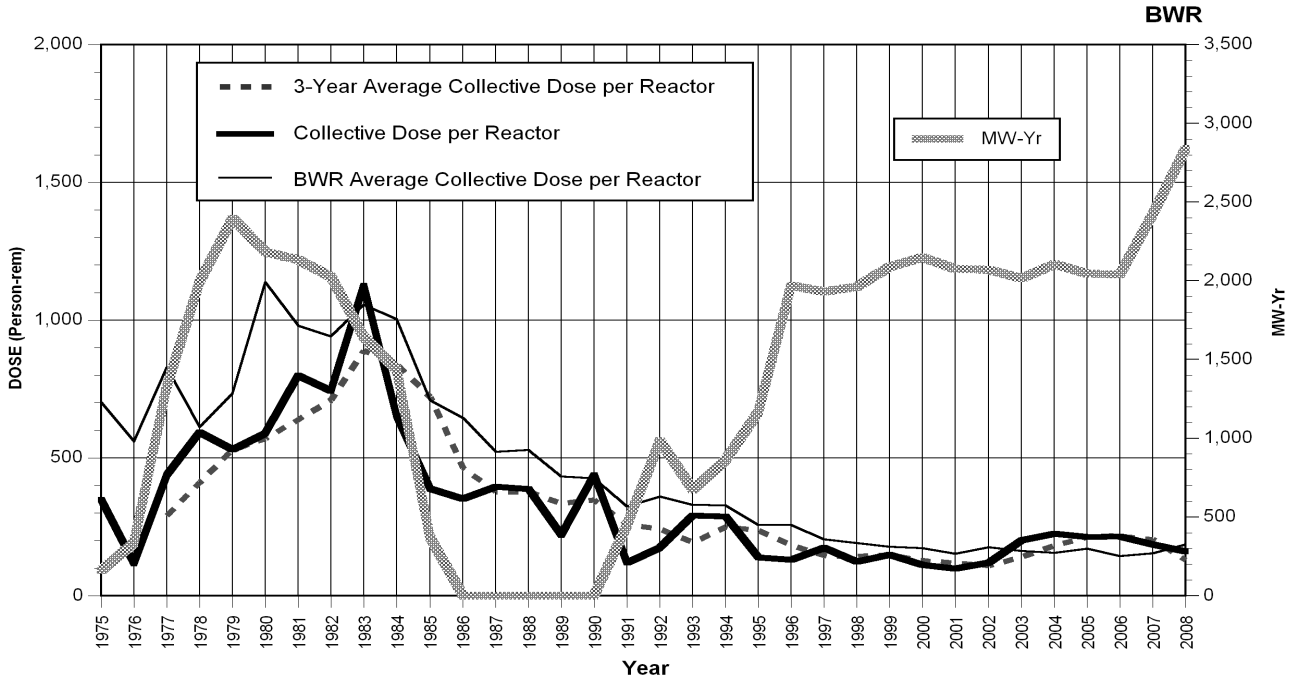
BEAVER VALLEY 1, 2
Dose Performance Indicators



BRAIDWOOD 1, 2
Dose Performance Indicators

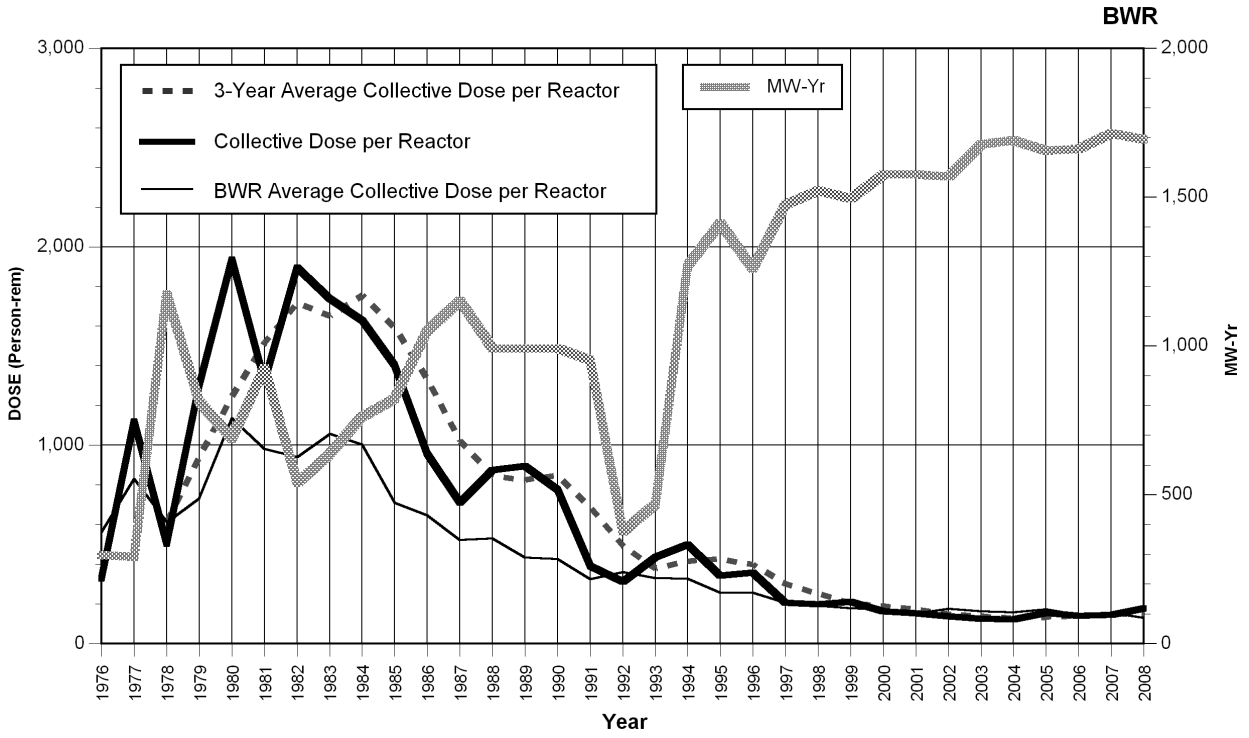


BROWNS FERRY 1, 2, 3
Dose Performance Indicators

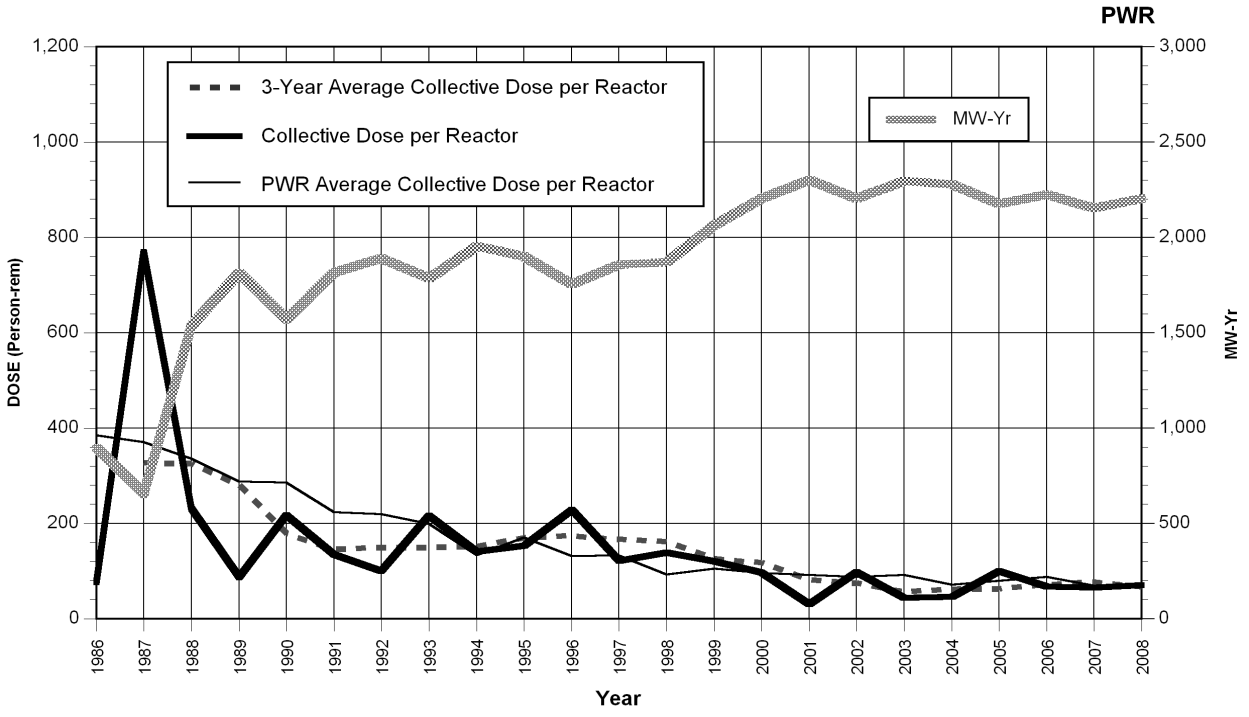


NOTE: Browns Ferry resumed power generation in 2007.

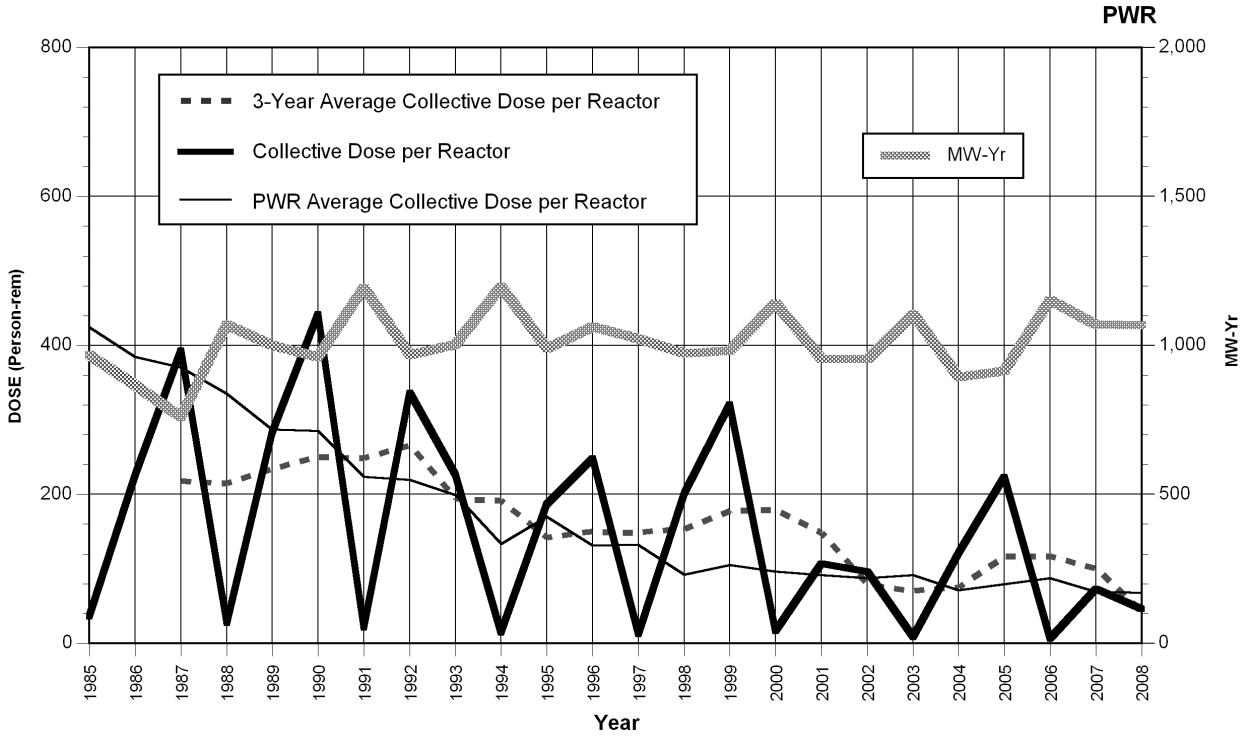
BRUNSWICK 1, 2
Dose Performance Indicators



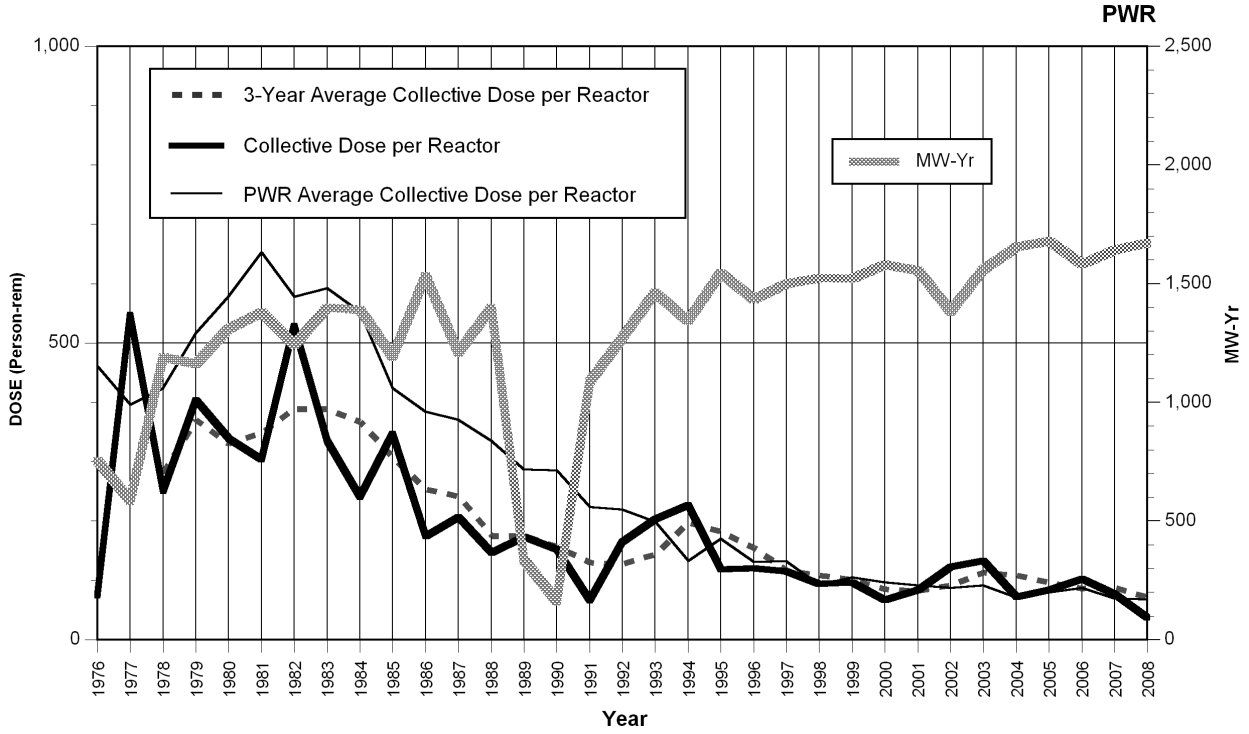
BYRON 1, 2
Dose Performance Indicators



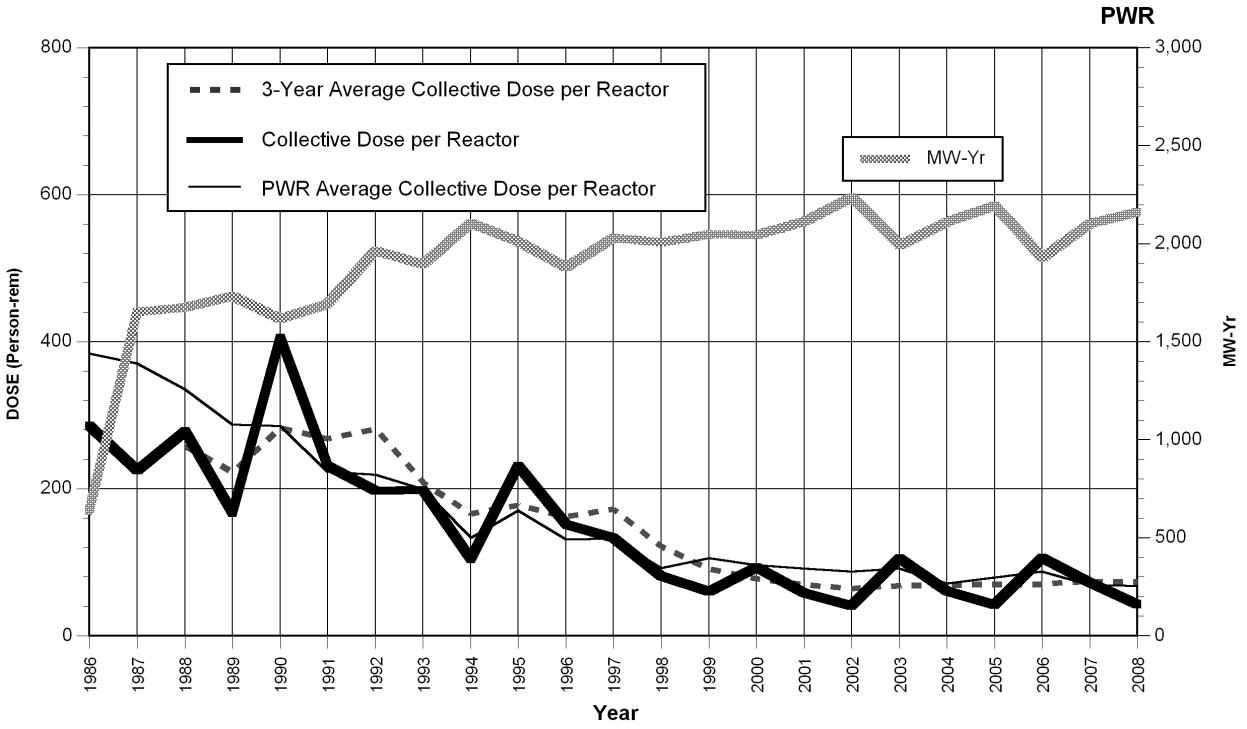
CALLAWAY 1
Dose Performance Indicators



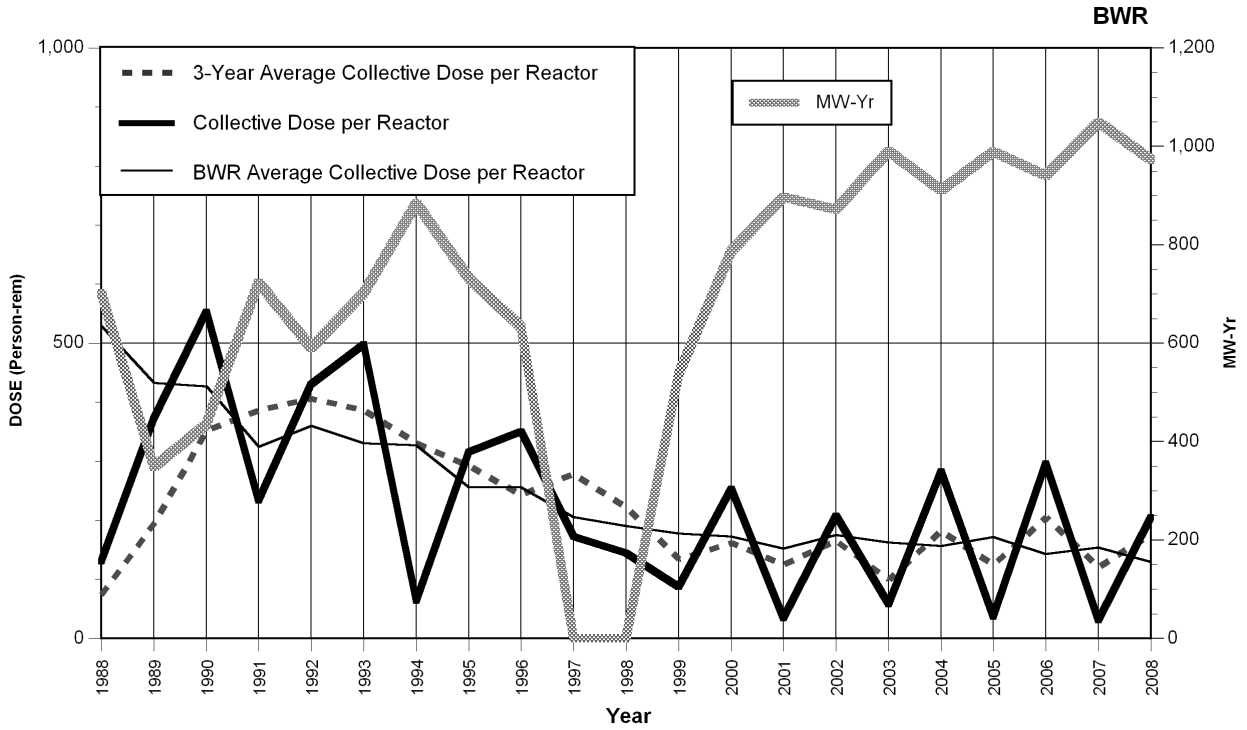
CALVERT CLIFFS 1, 2
Dose Performance Indicators



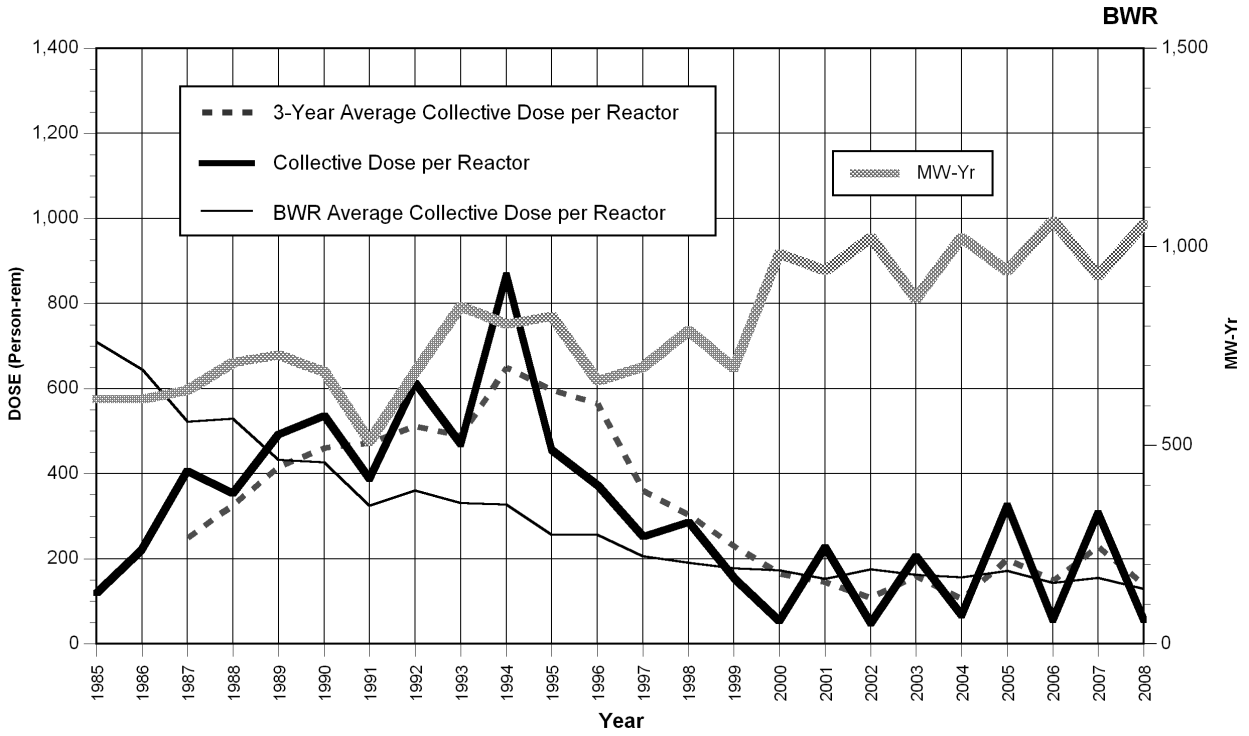
CATAWBA 1, 2
Dose Performance Indicators



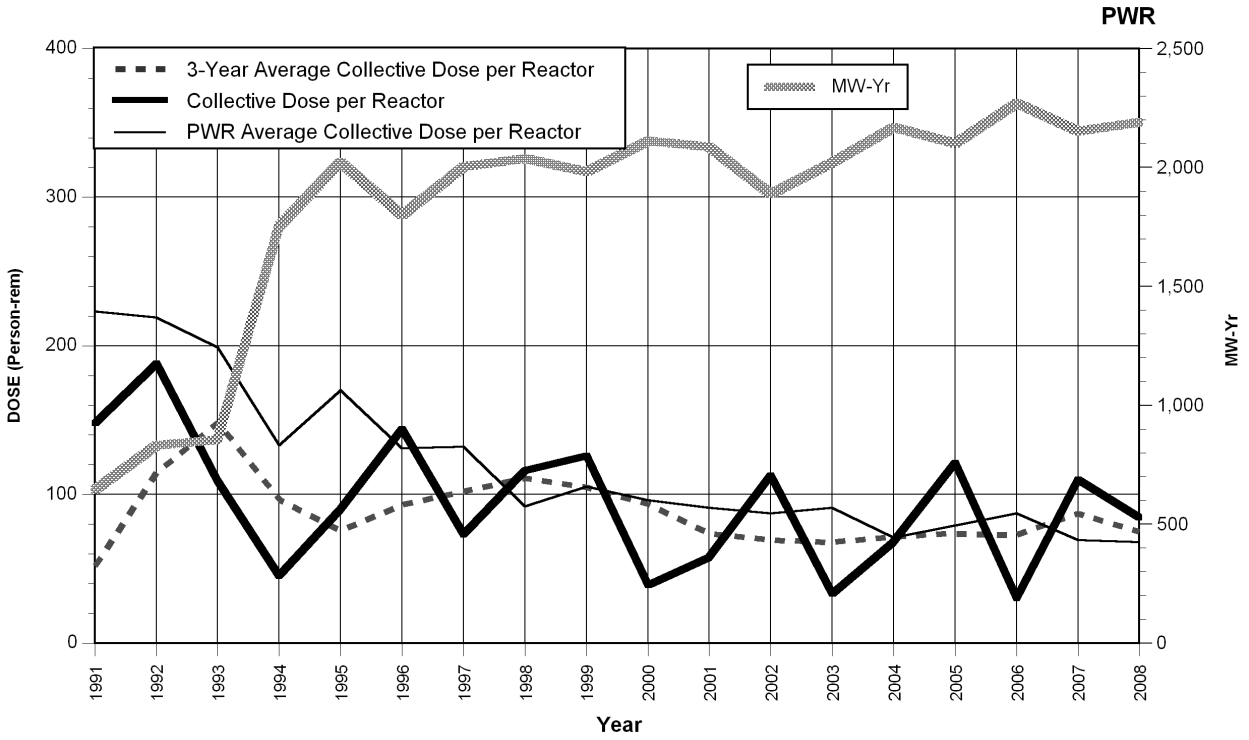
CLINTON
Dose Performance Indicators



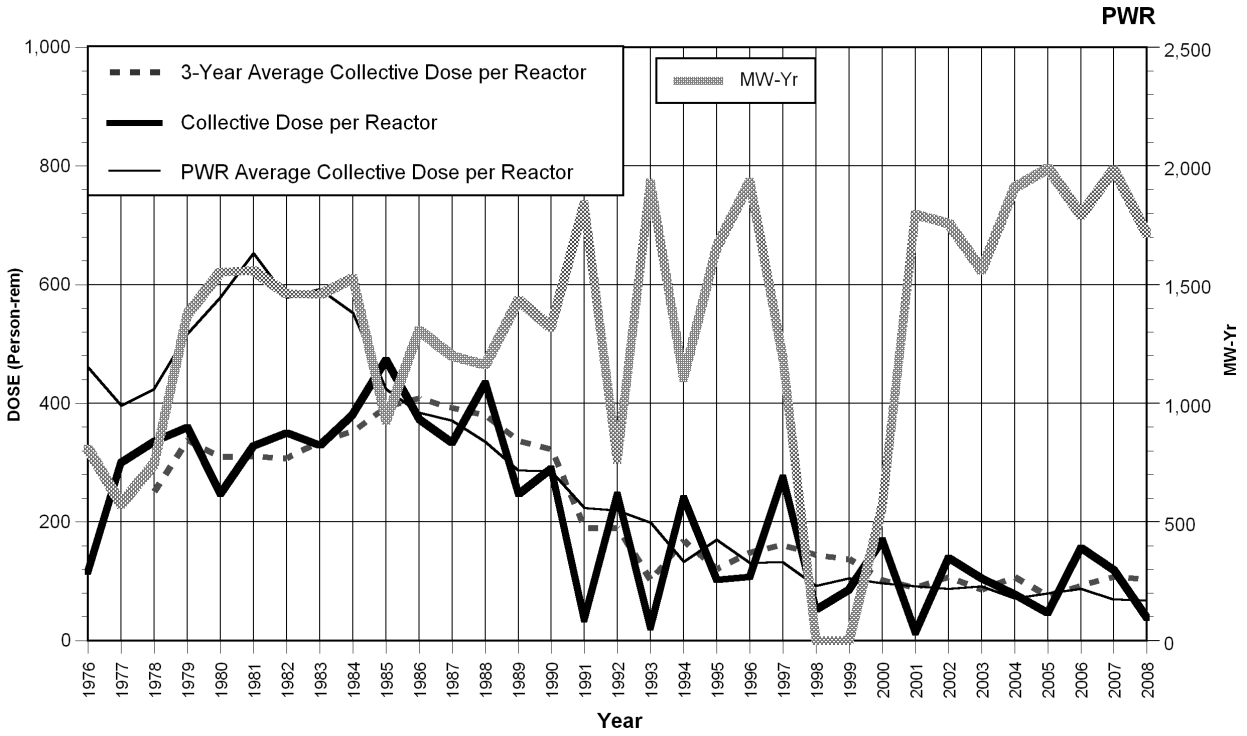
COLUMBIA GENERATING
Dose Performance Indicators



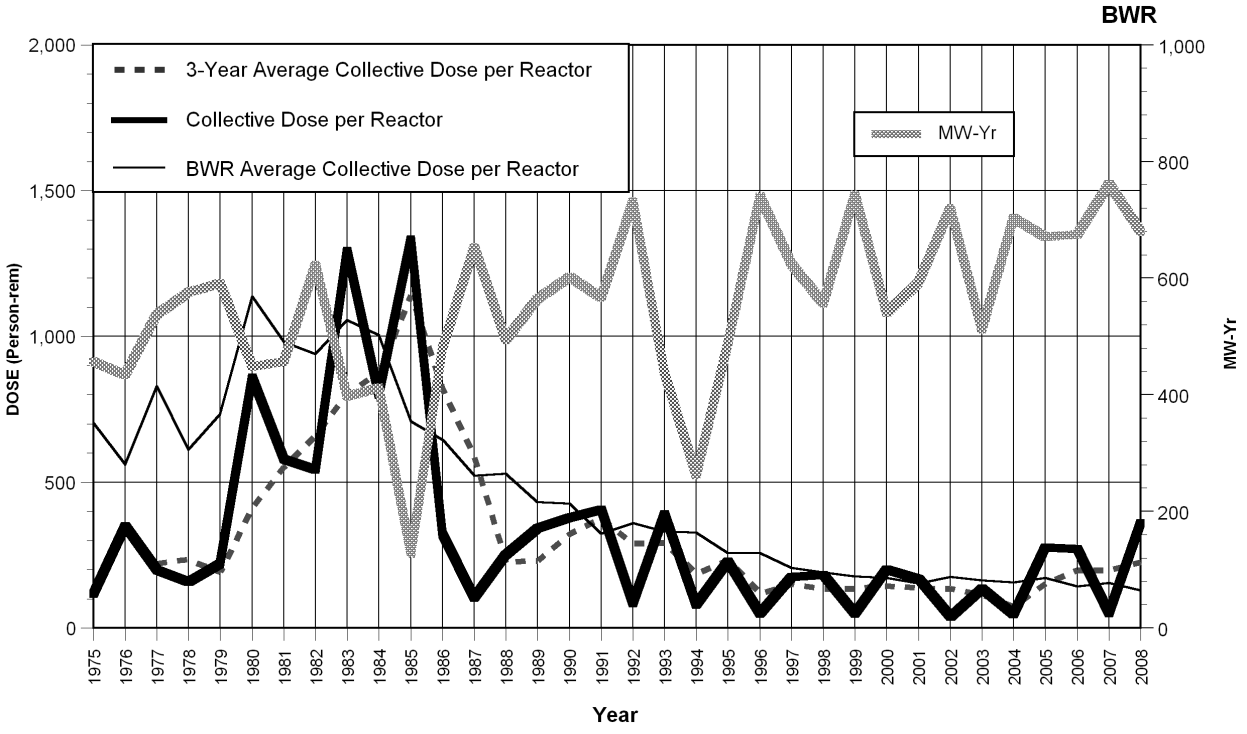
COMANCHE PEAK 1, 2
Dose Performance Indicators



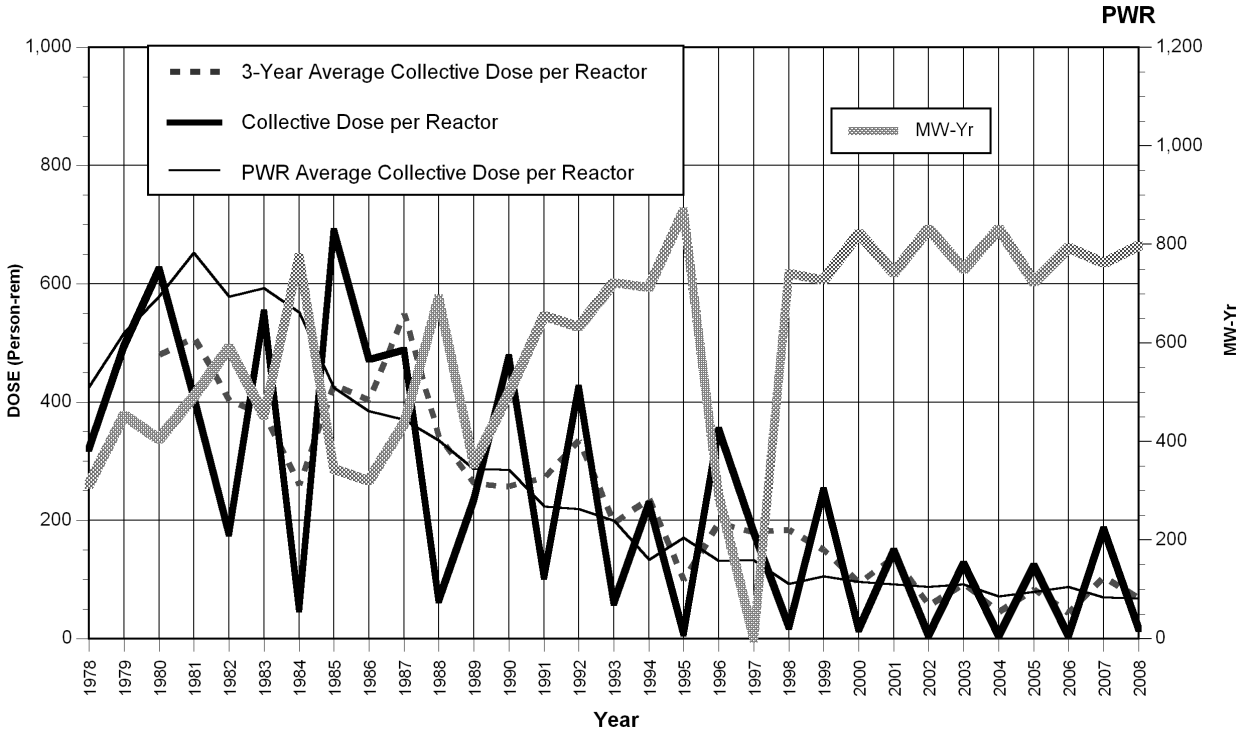
COOK 1, 2
Dose Performance Indicators



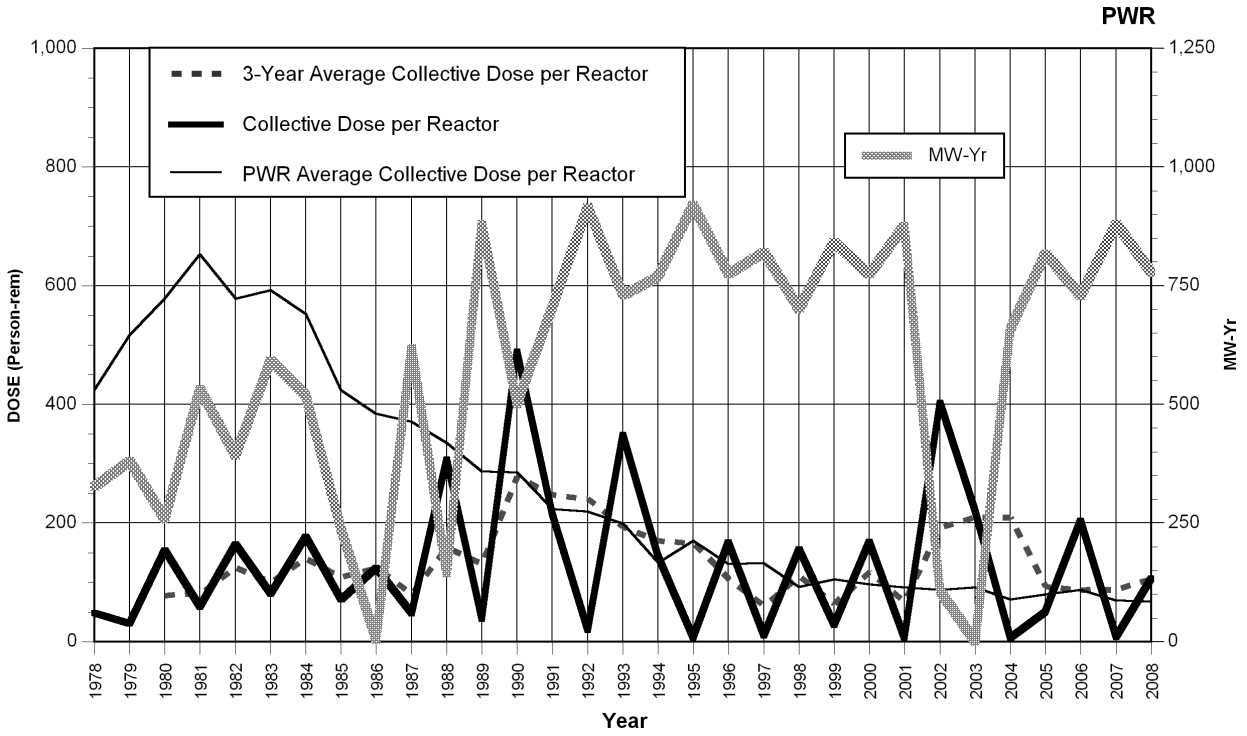
COOPER STATION
Dose Performance Indicators



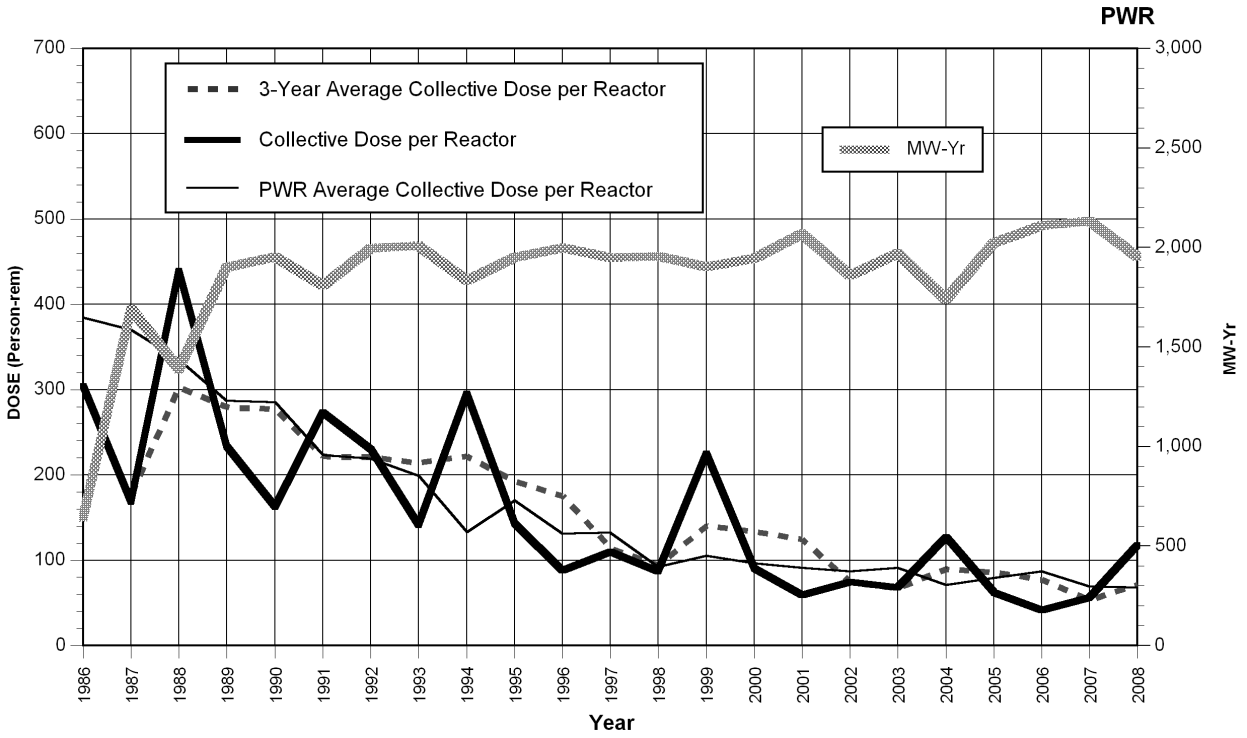
CRYSTAL RIVER 3
Dose Performance Indicators



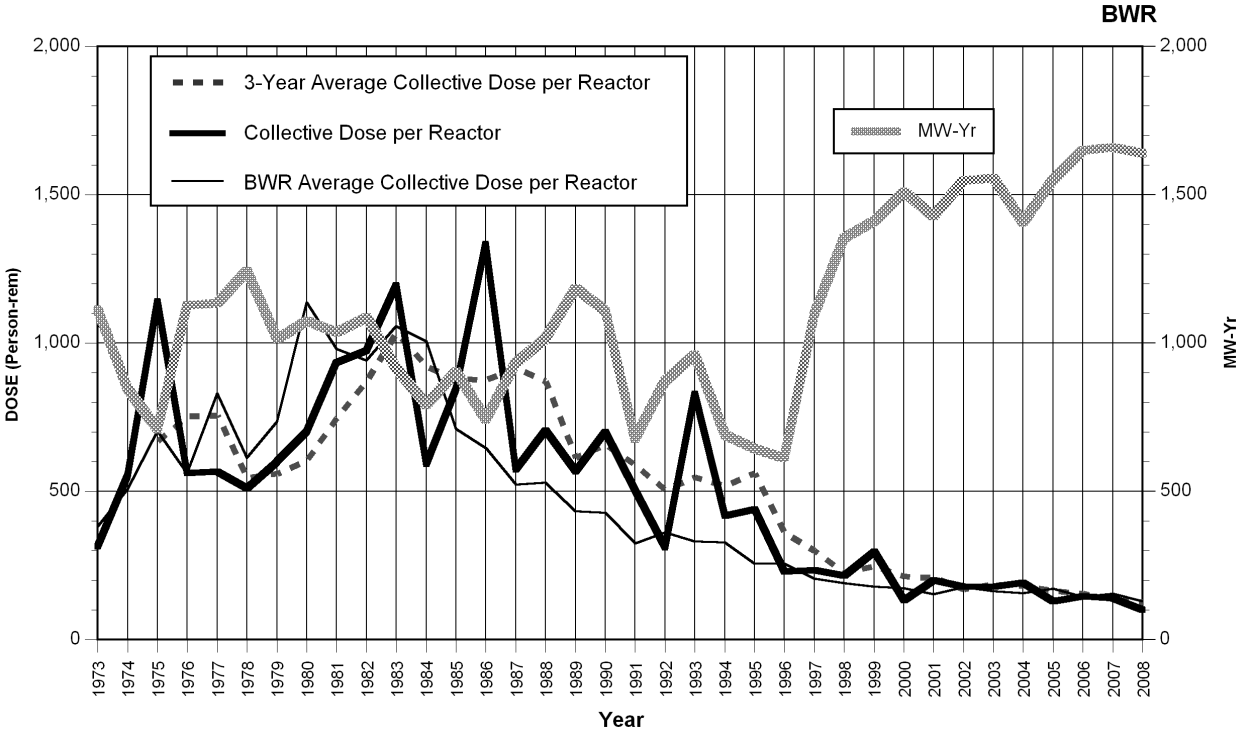
DAVIS-BESSE 1
Dose Performance Indicators



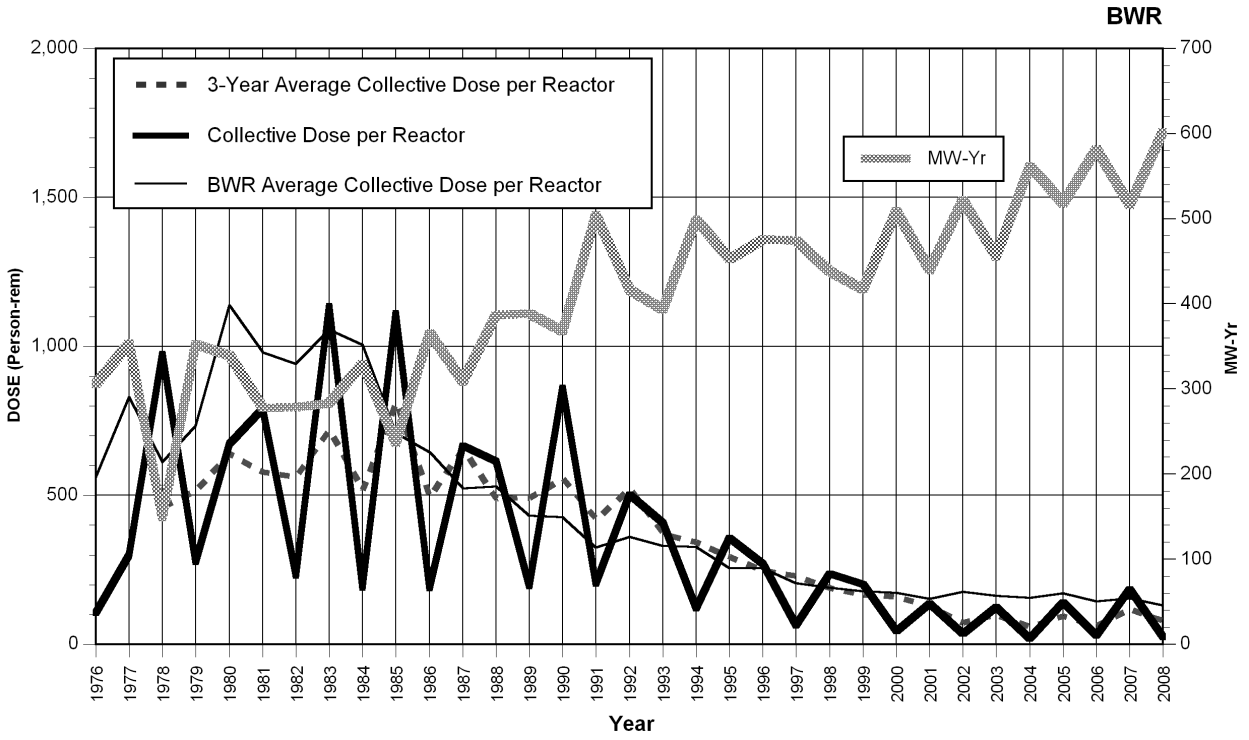
DIABLO CANYON 1, 2
Dose Performance Indicators



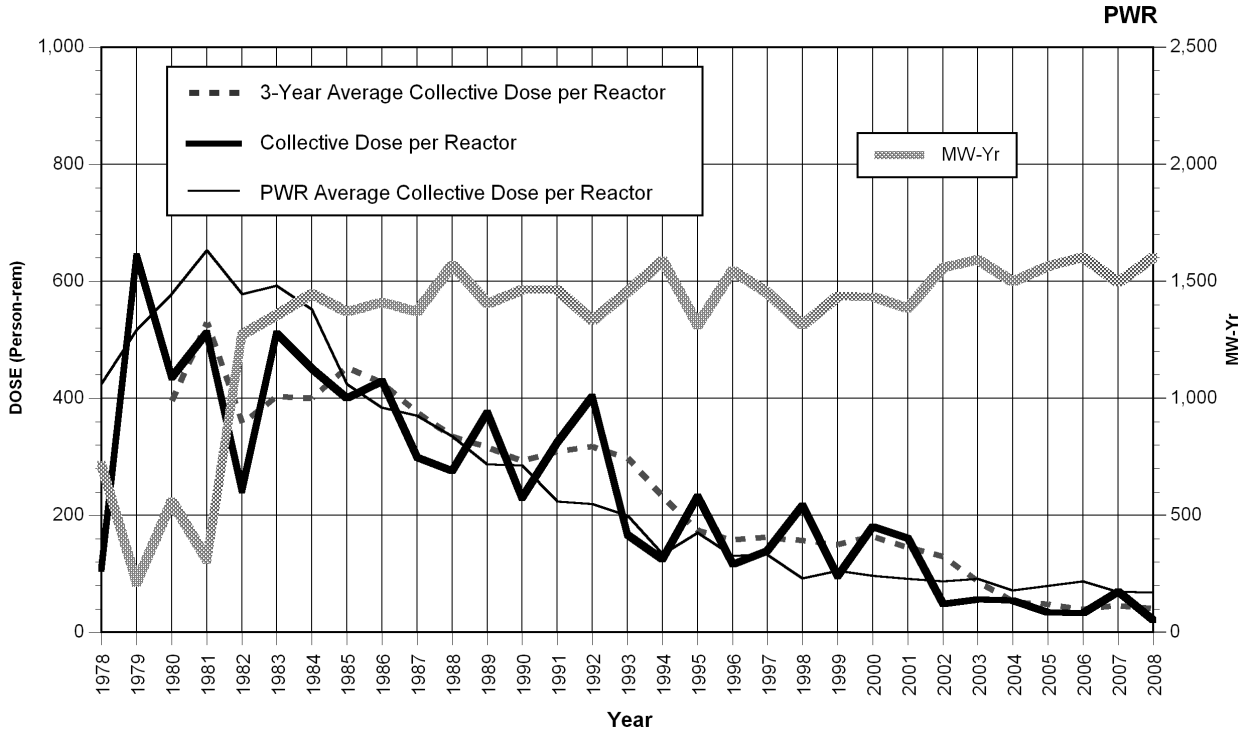
DRESDEN 2, 3
Dose Performance Indicators



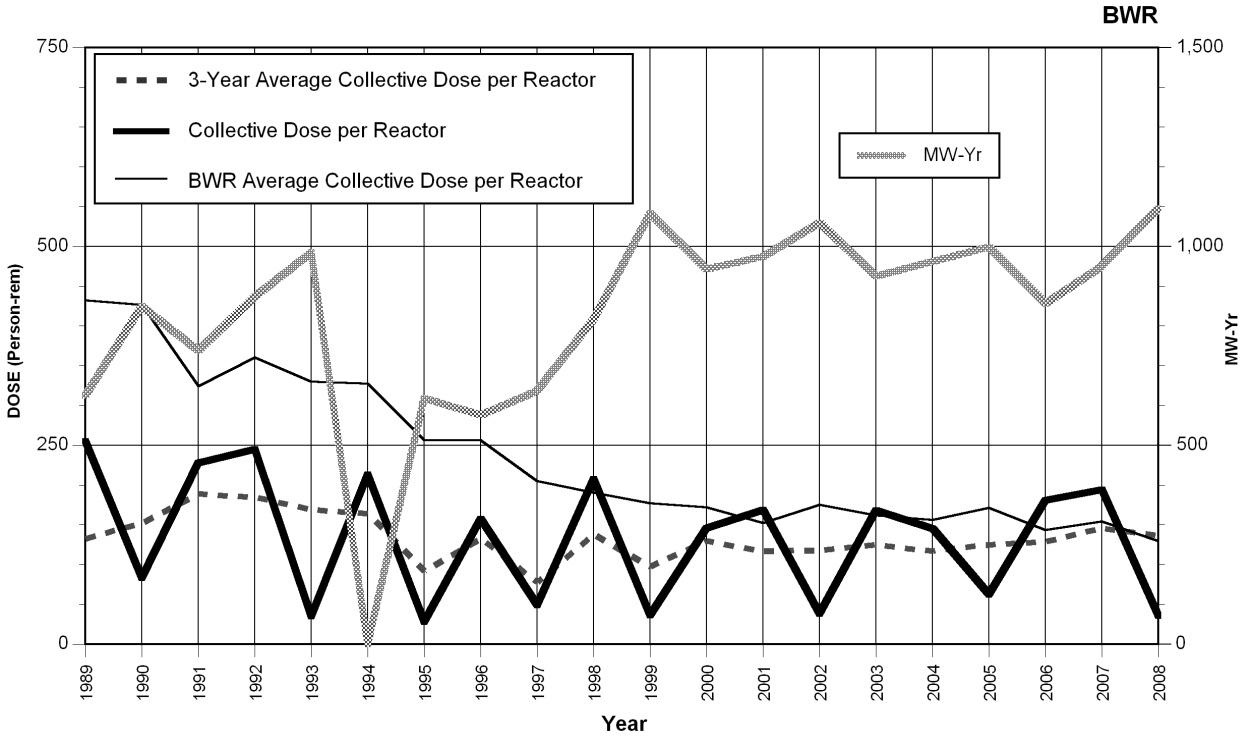
DUANE ARNOLD
Dose Performance Indicators



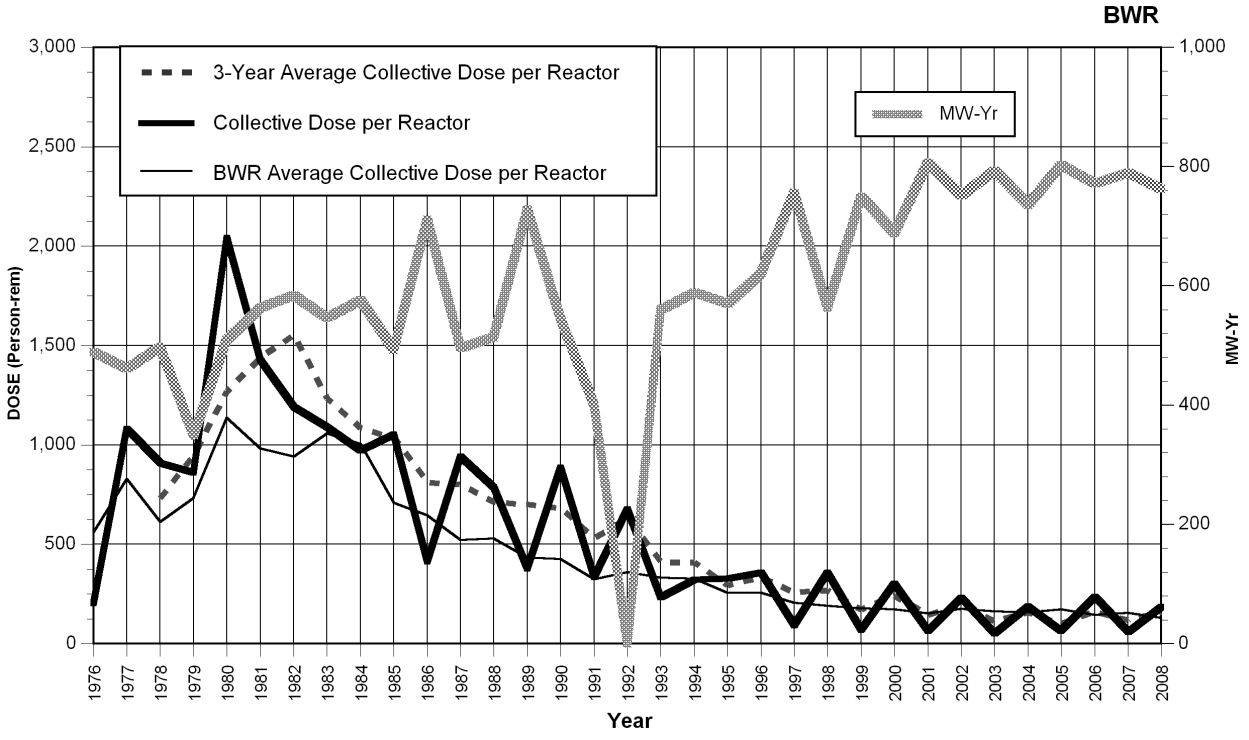
FARLEY 1, 2
Dose Performance Indicators



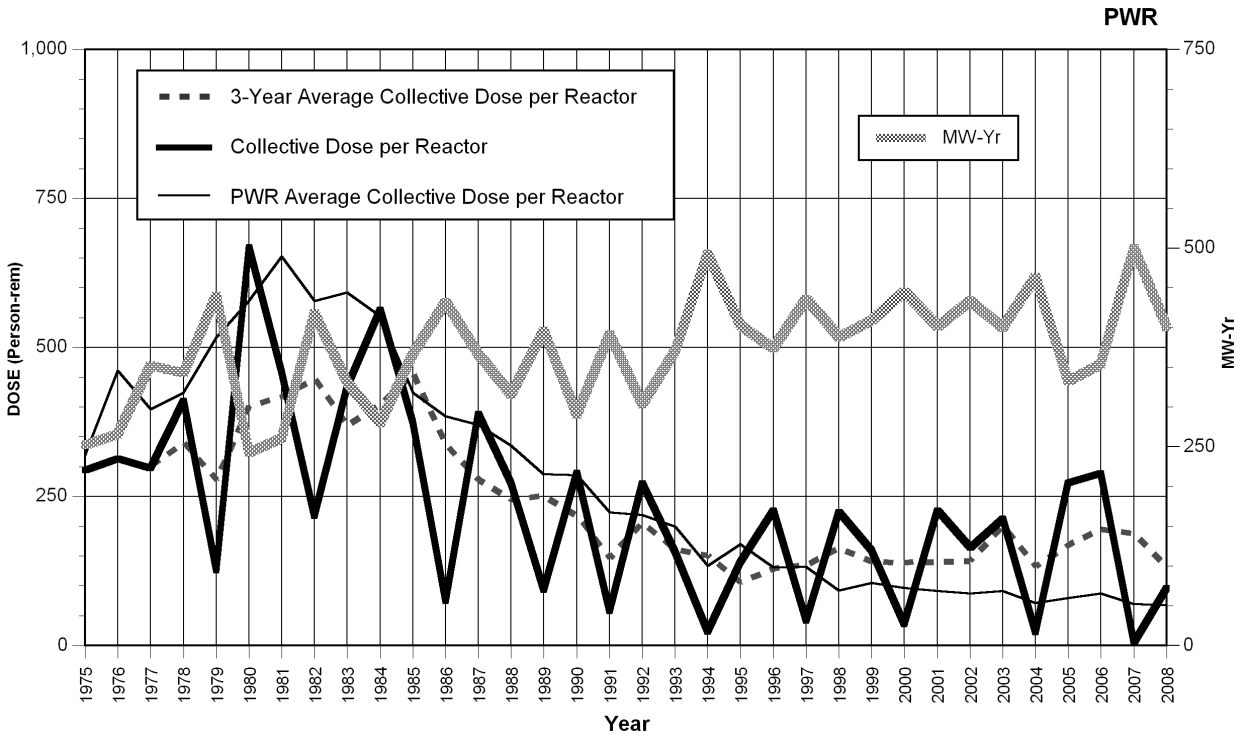
FERMI 2
Dose Performance Indicators



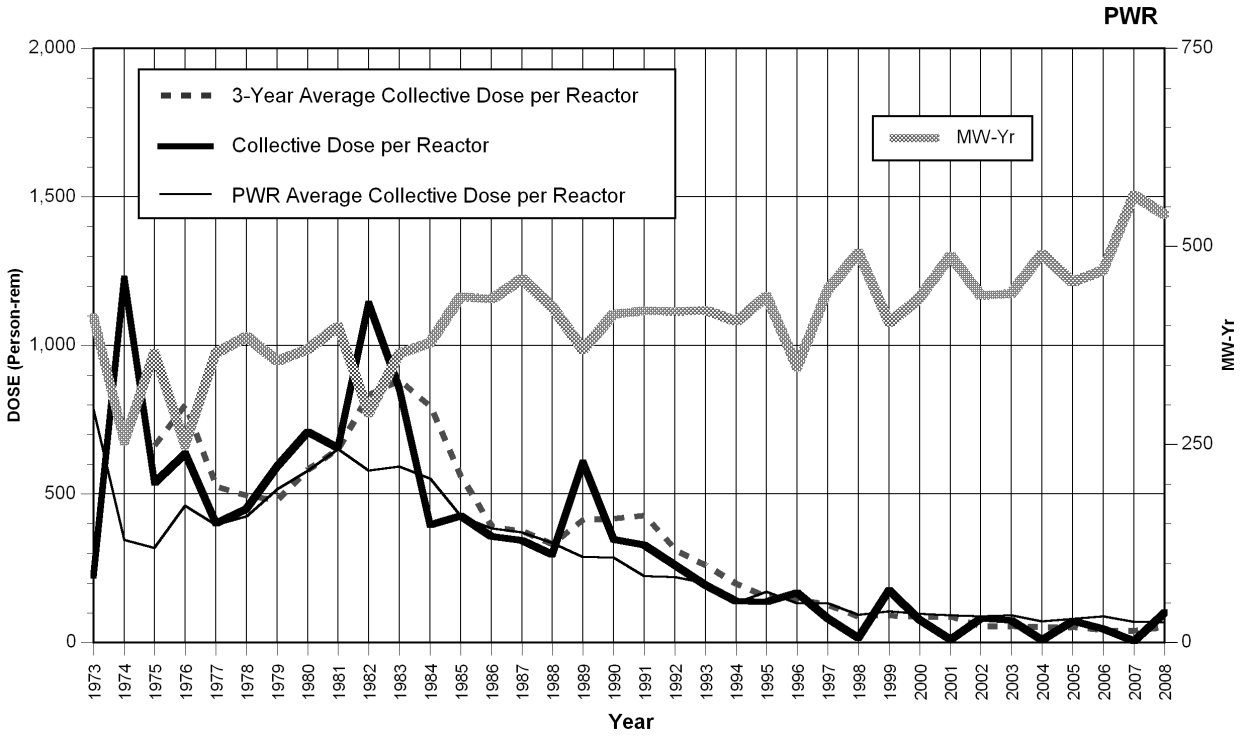
FITZPATRICK
Dose Performance Indicators



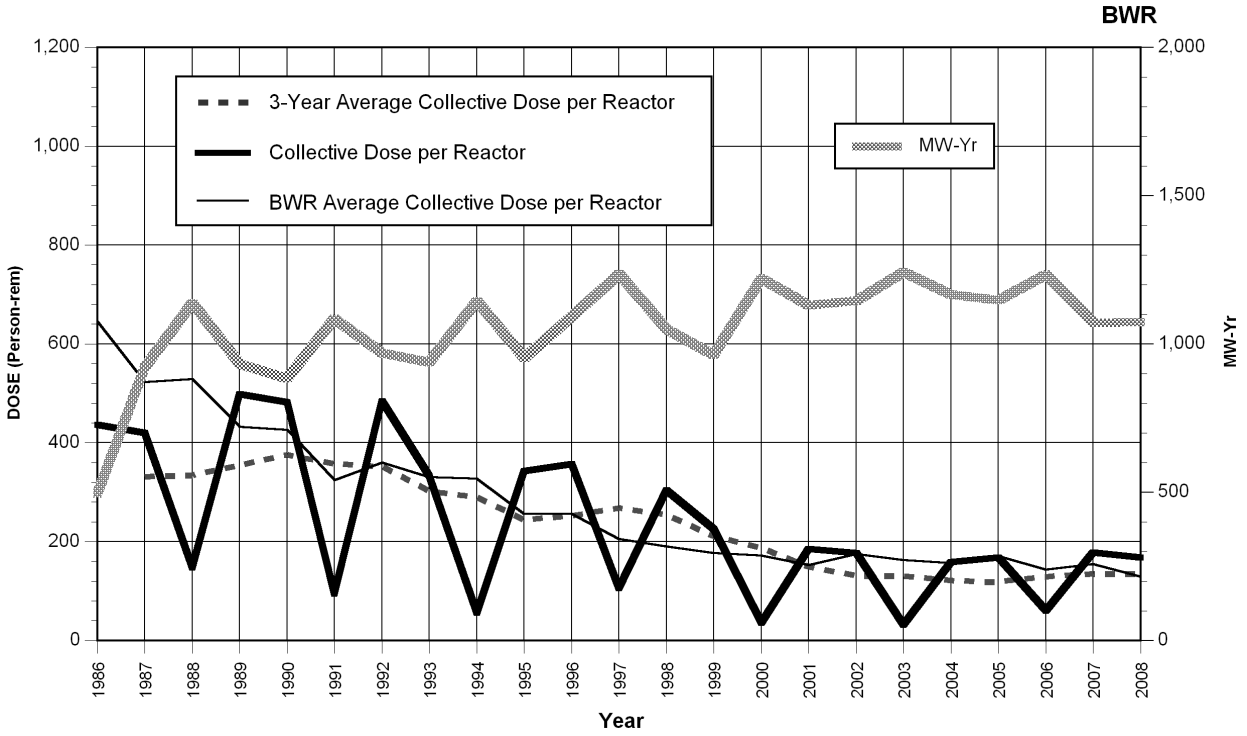
FORT CALHOUN
Dose Performance Indicators



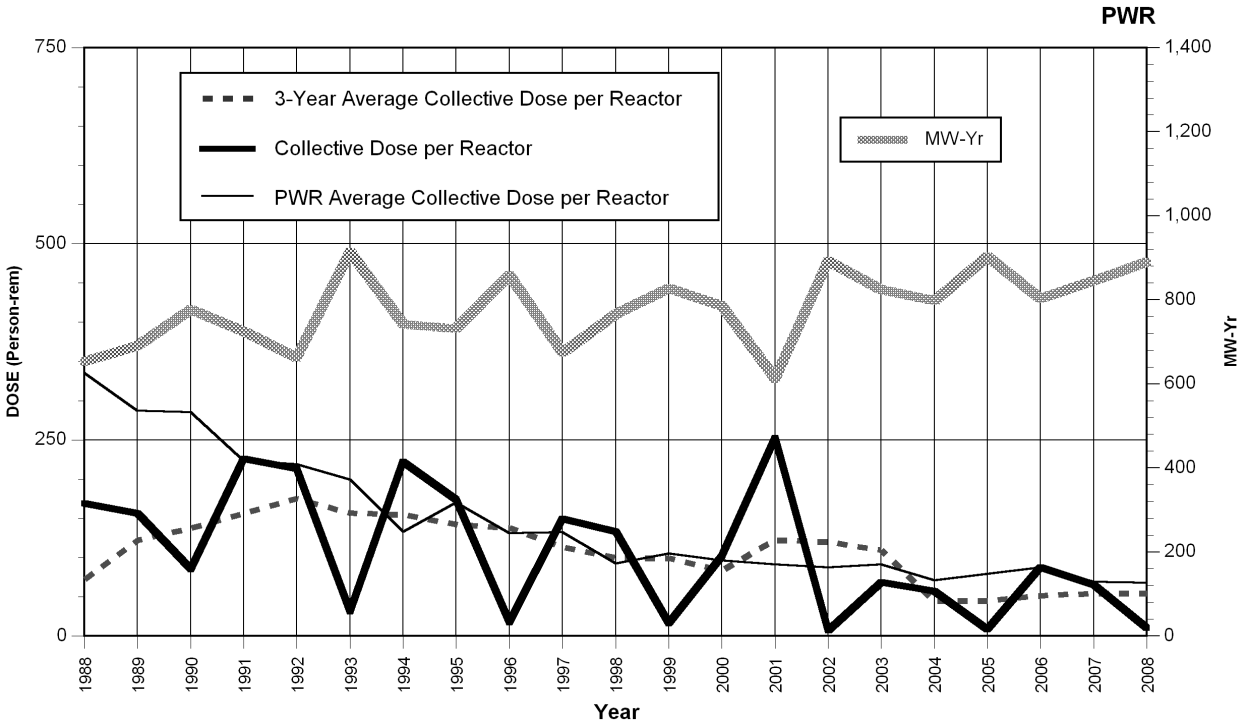
GINNA
Dose Performance Indicators



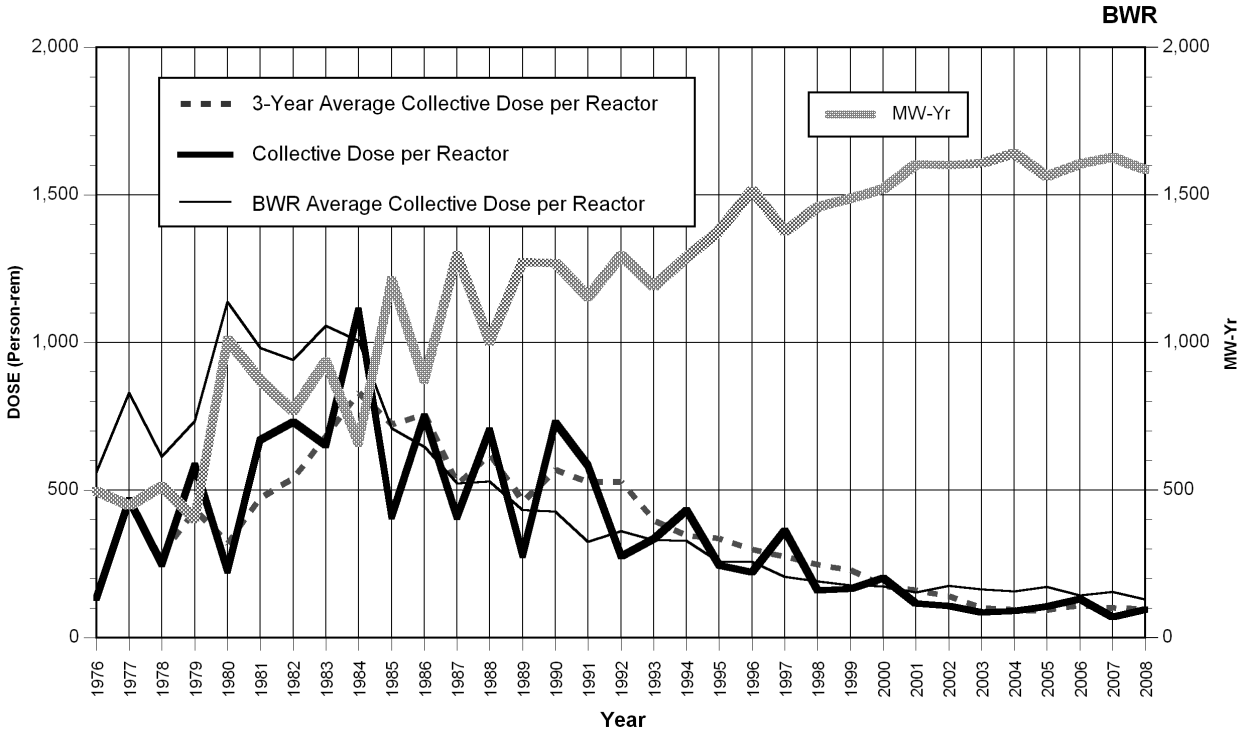
GRAND GULF
Dose Performance Indicators



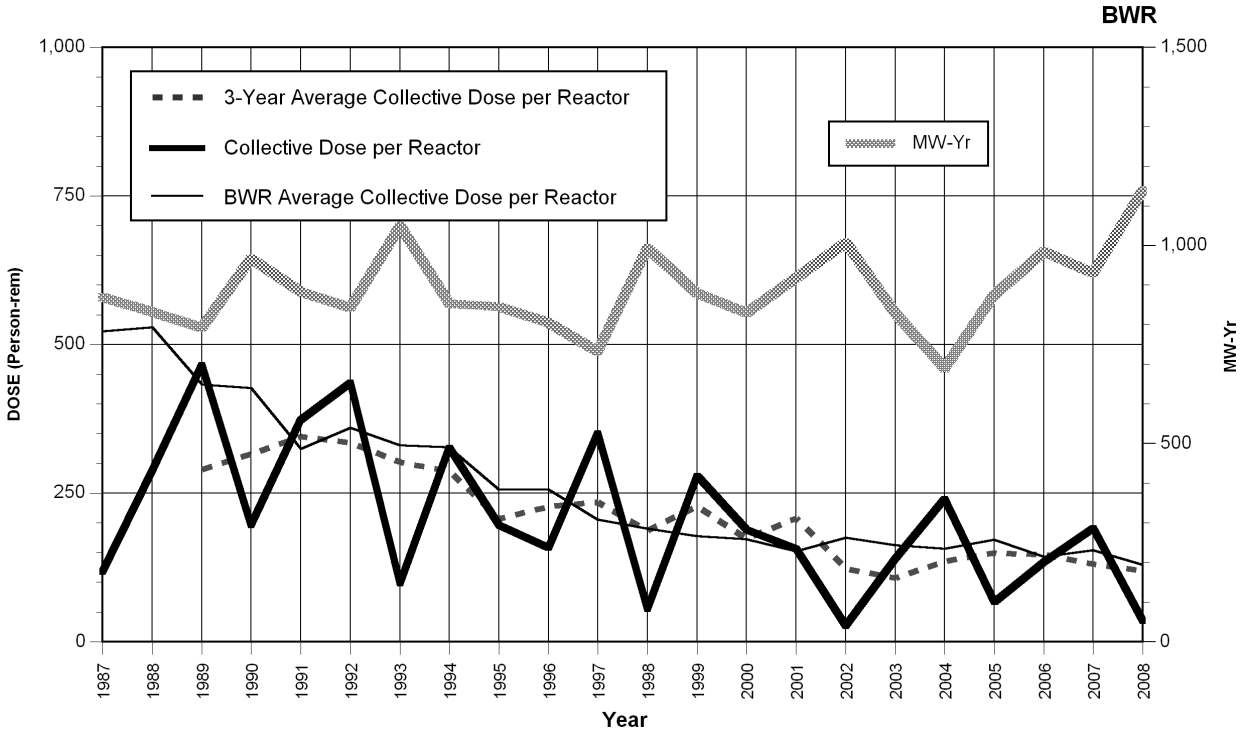
HARRIS 1
Dose Performance Indicators



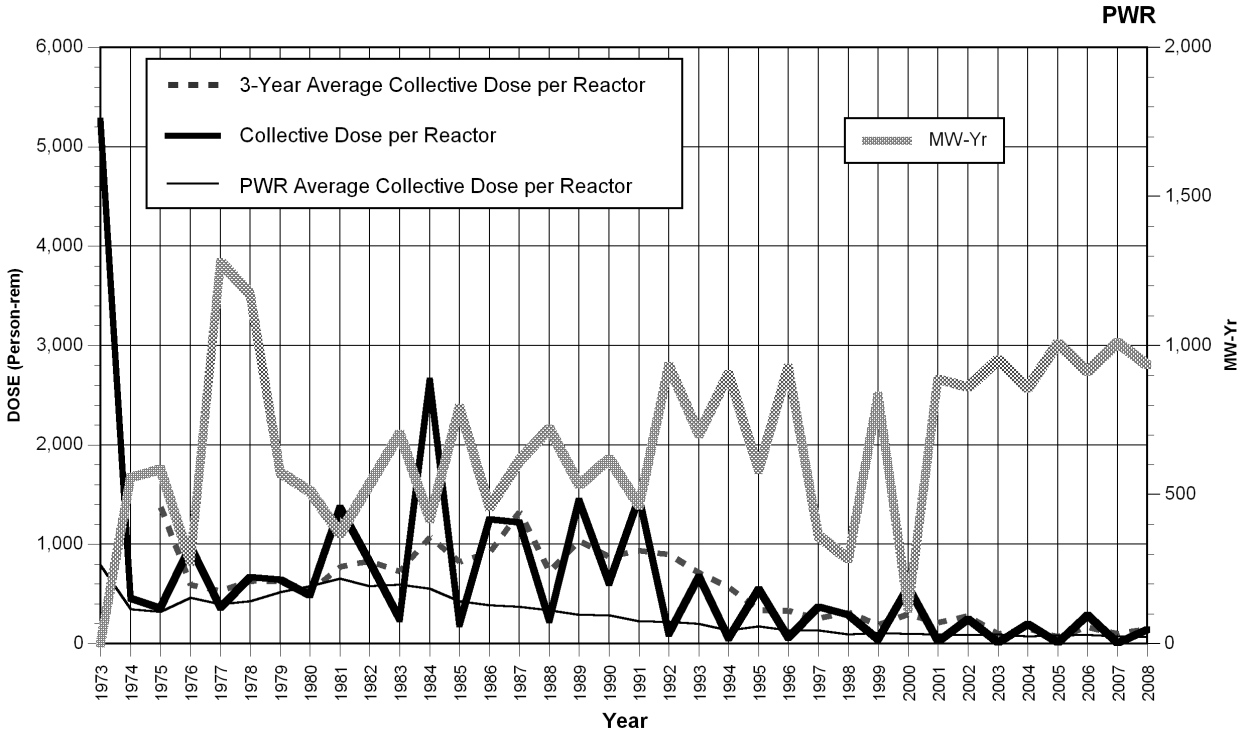
HATCH 1, 2
Dose Performance Indicators



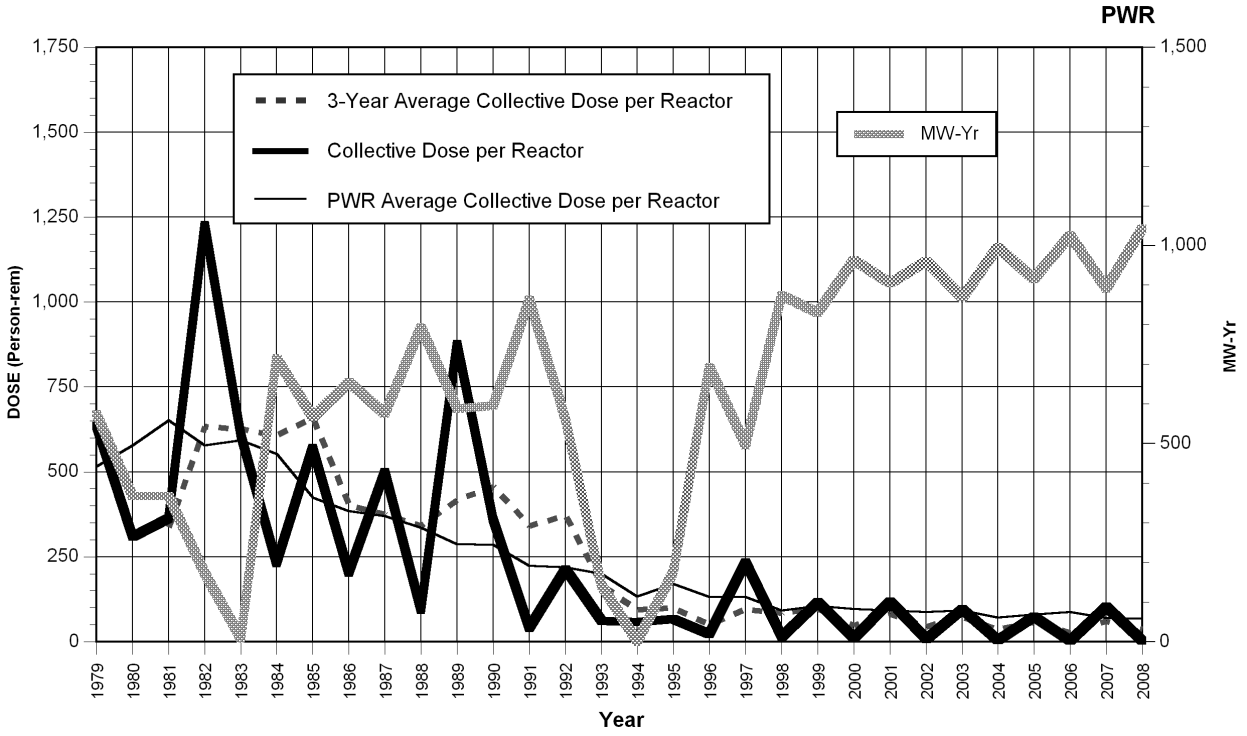
HOPE CREEK 1
Dose Performance Indicators



INDIAN POINT 2
Dose Performance Indicators



INDIAN POINT 3
Dose Performance Indicators



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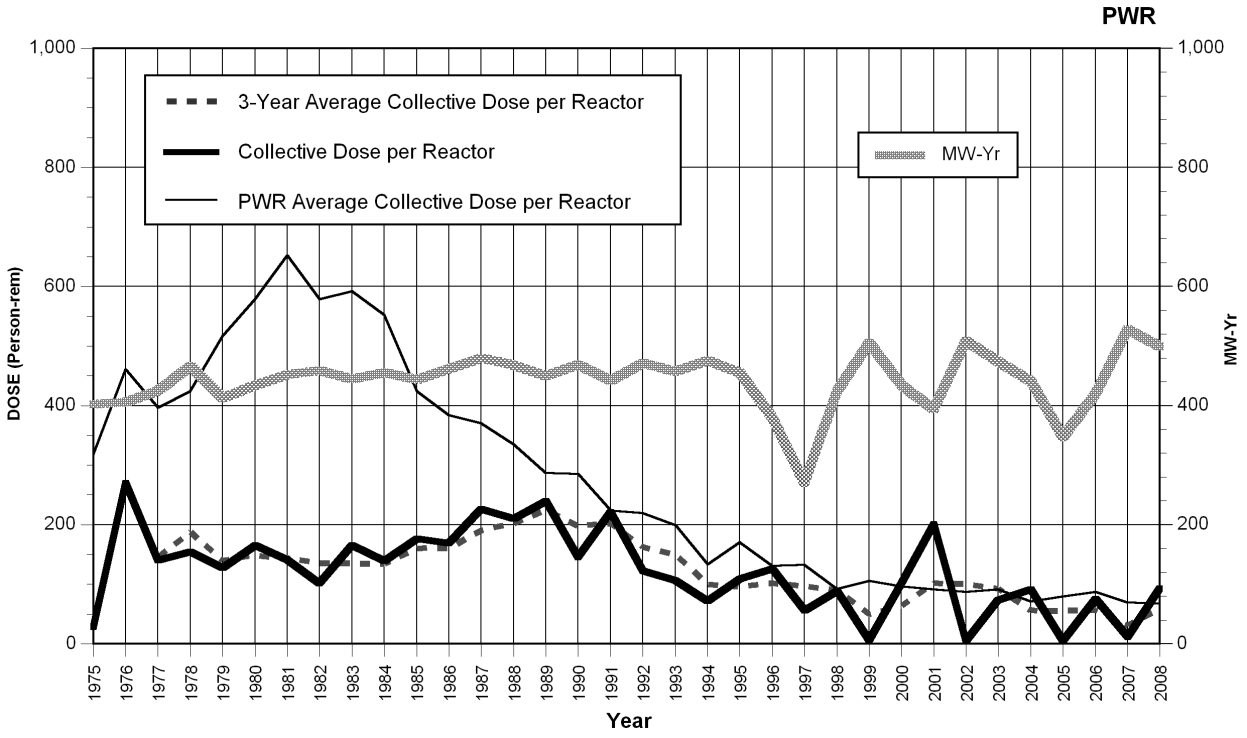

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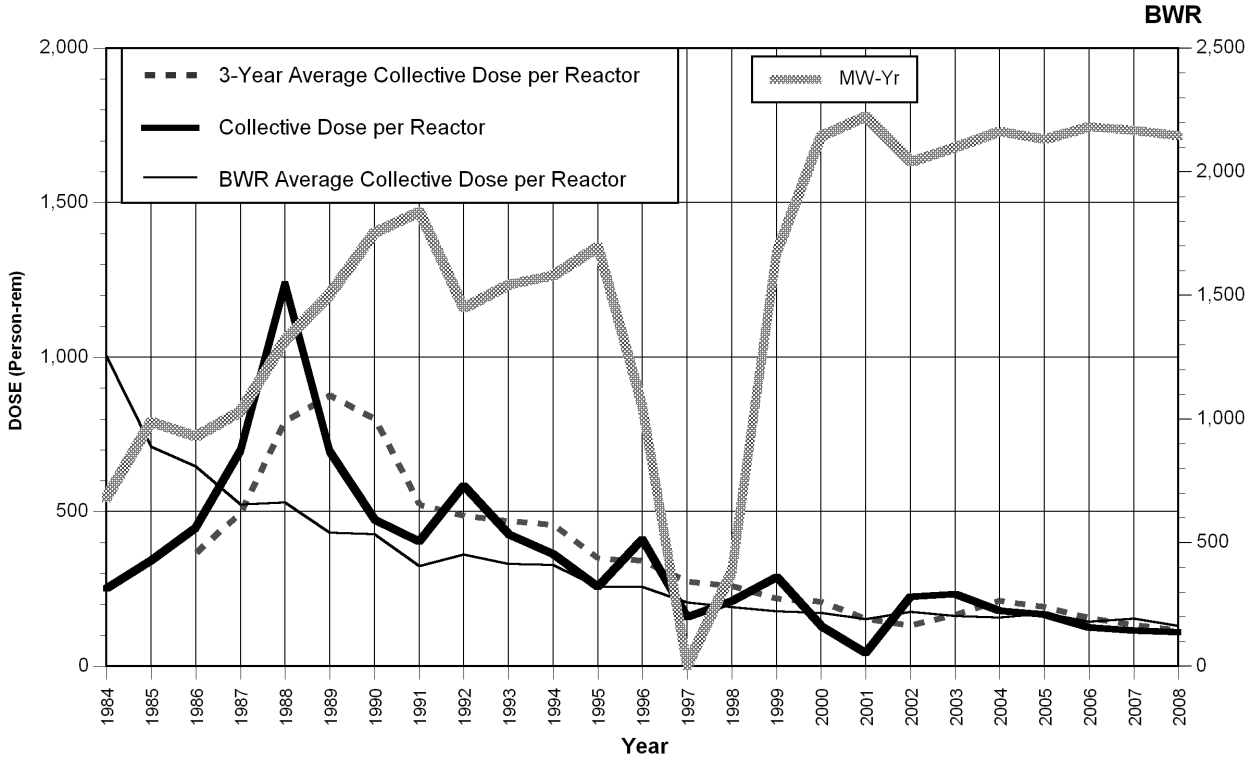

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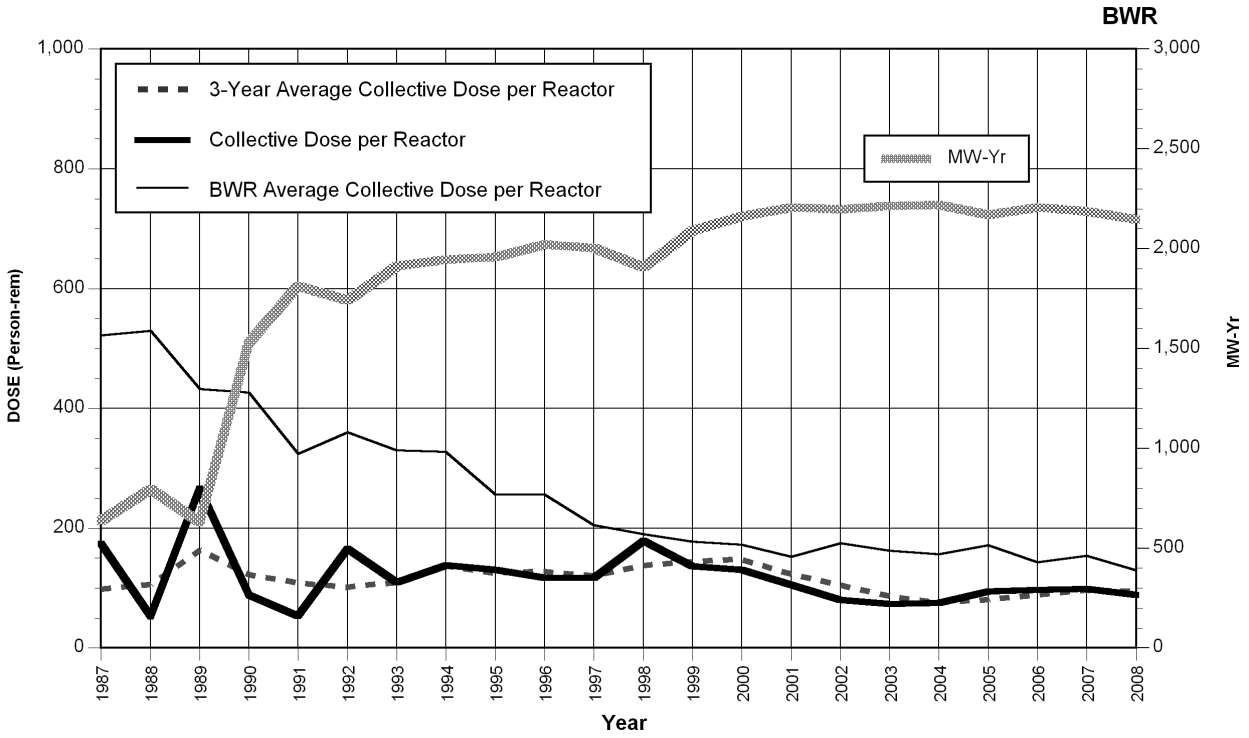

MCGUIRE 1, 2
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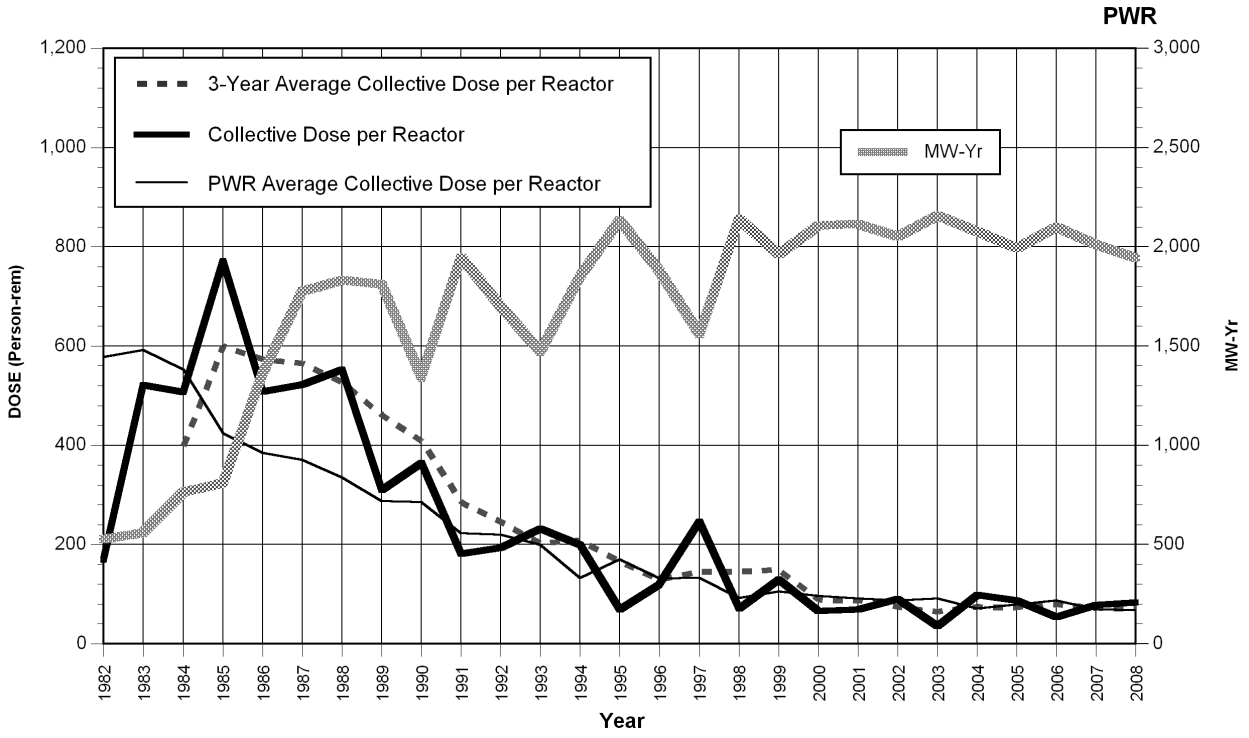

MILLSTONE 2, 3
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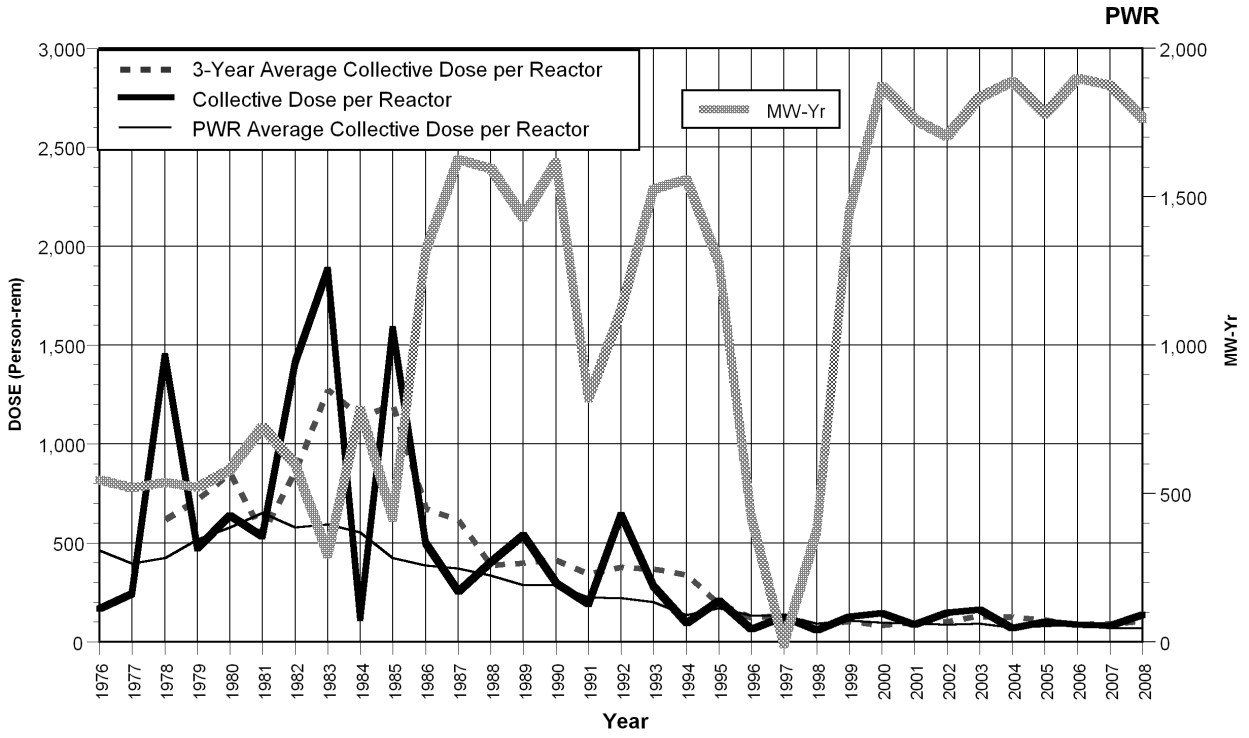

MONTICELLO
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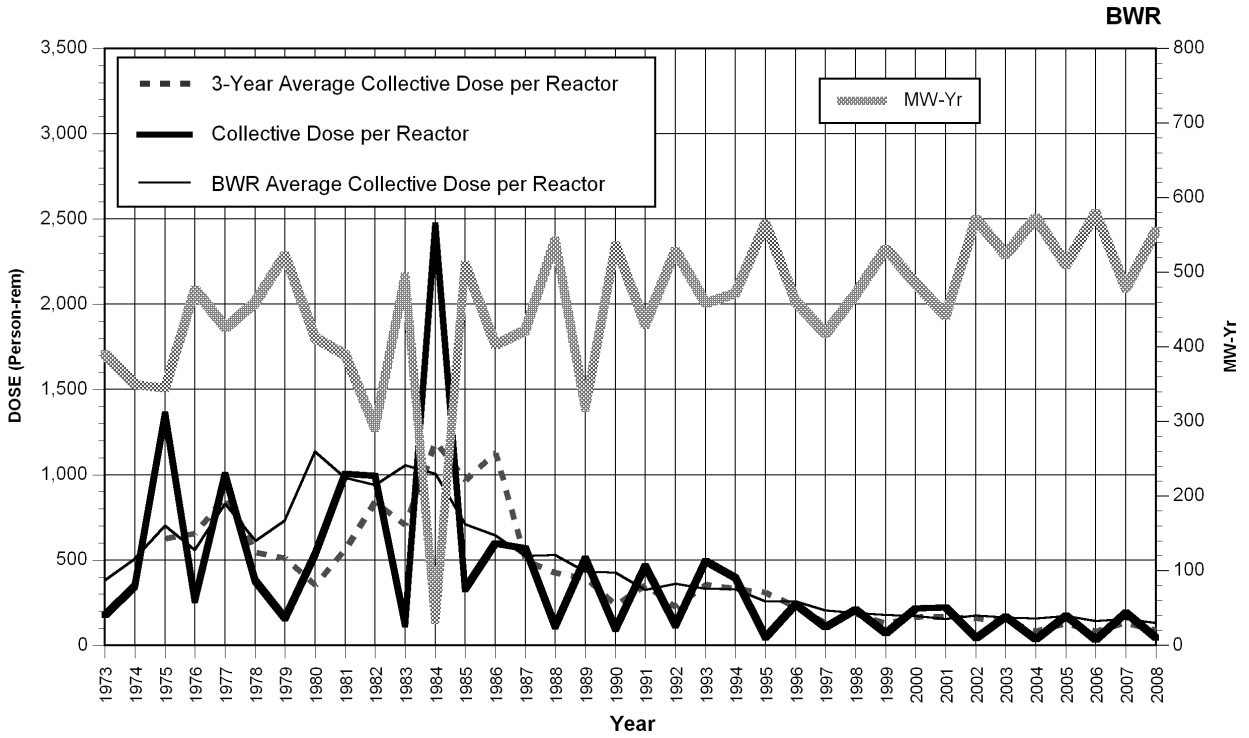

NINE MILE POINT 1, 2
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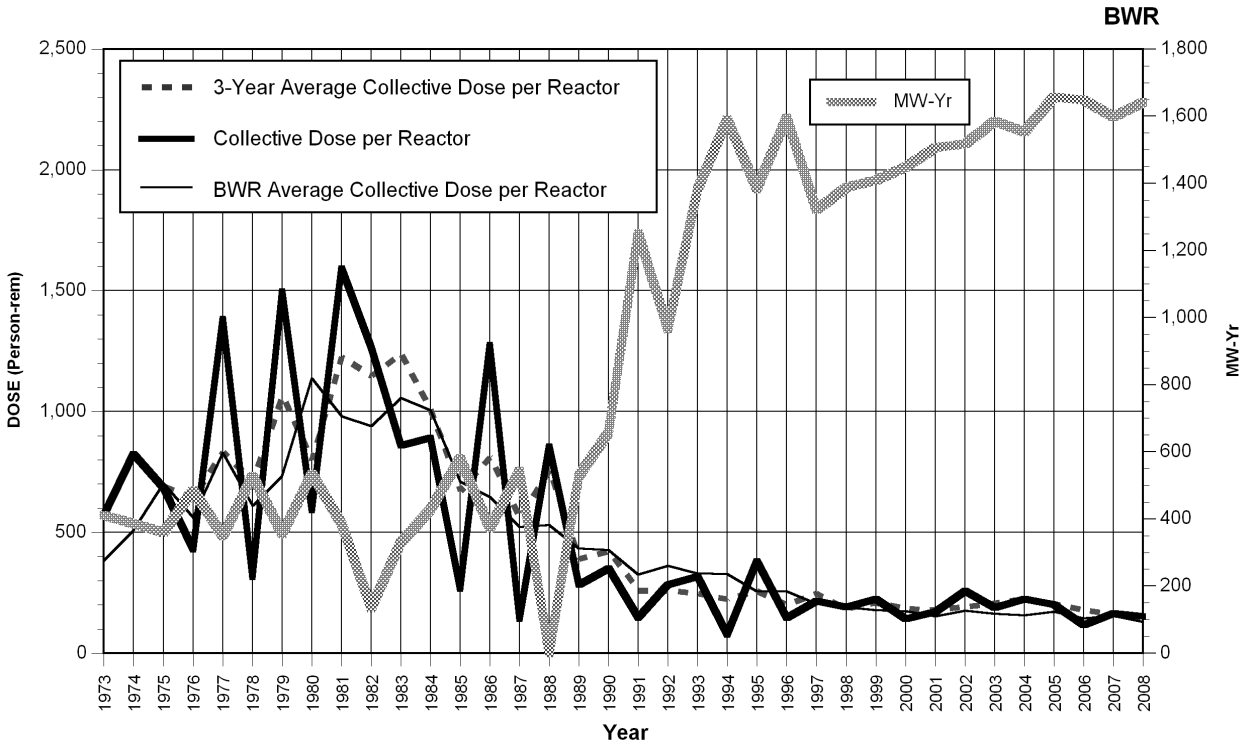

NORTH ANNA 1, 2
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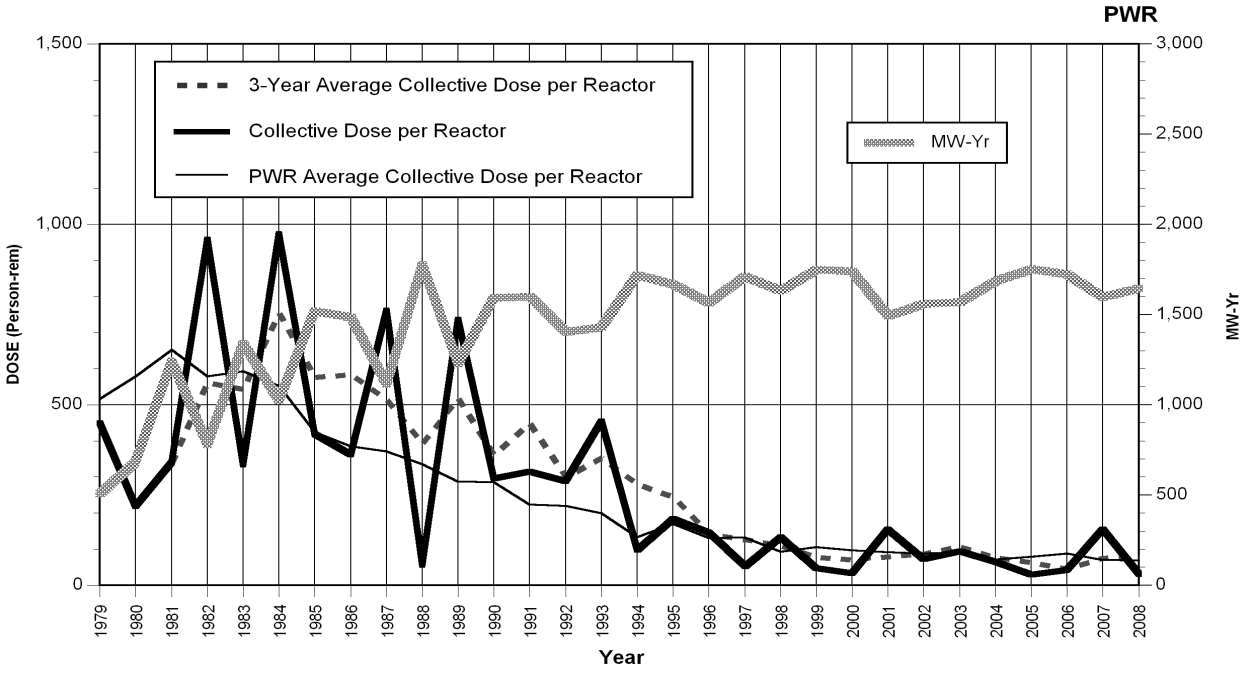
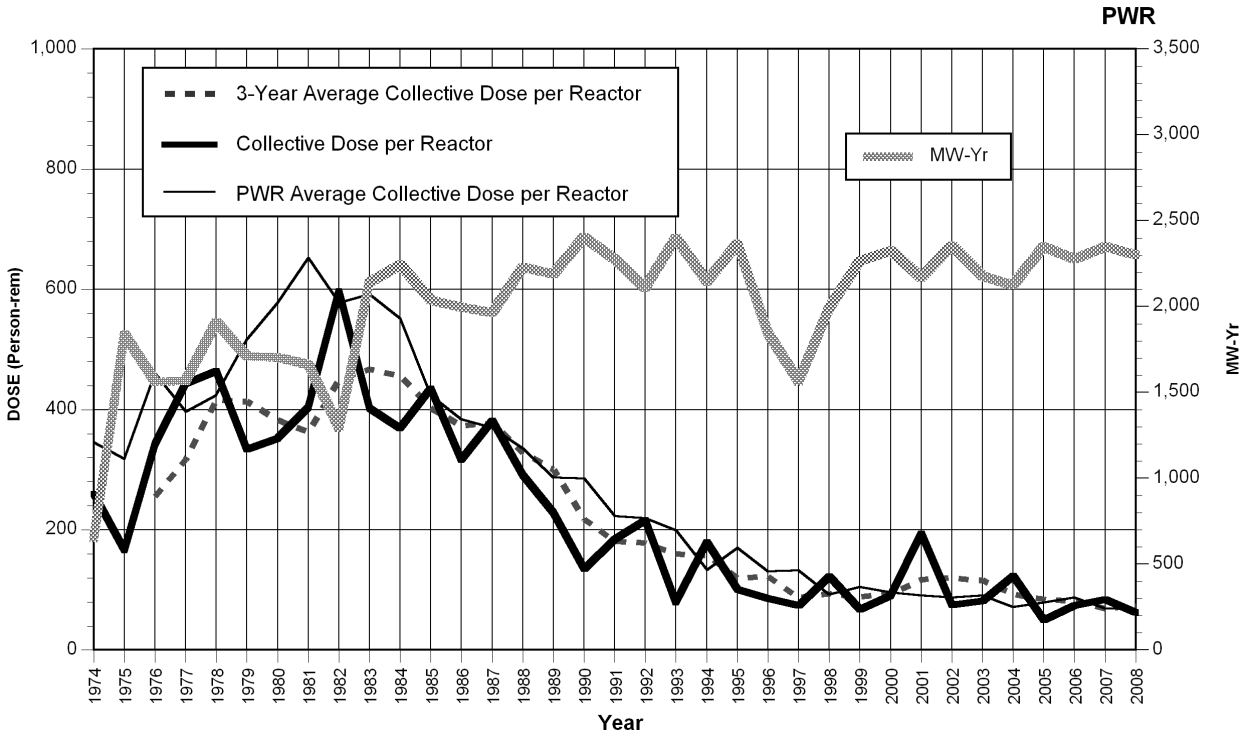


OCONEE 1, 2, 3
Dose Performance Indicators



OYSTER CREEK
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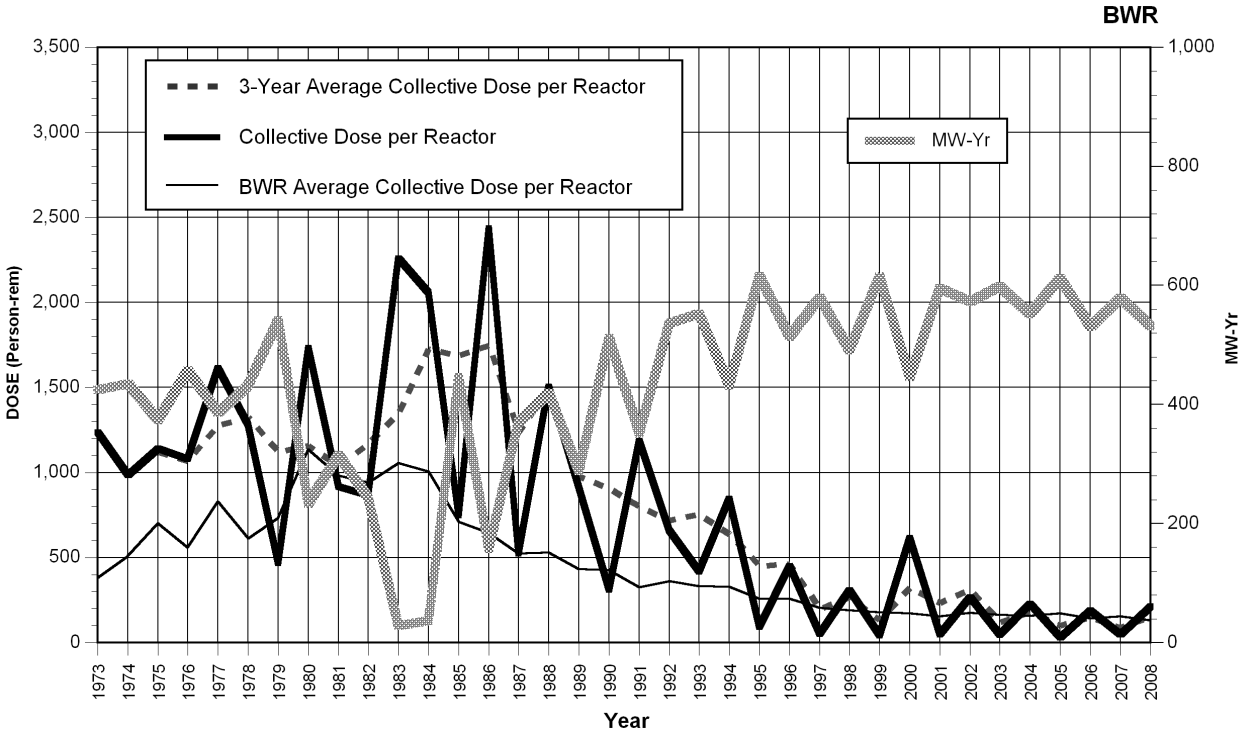

PALISADES
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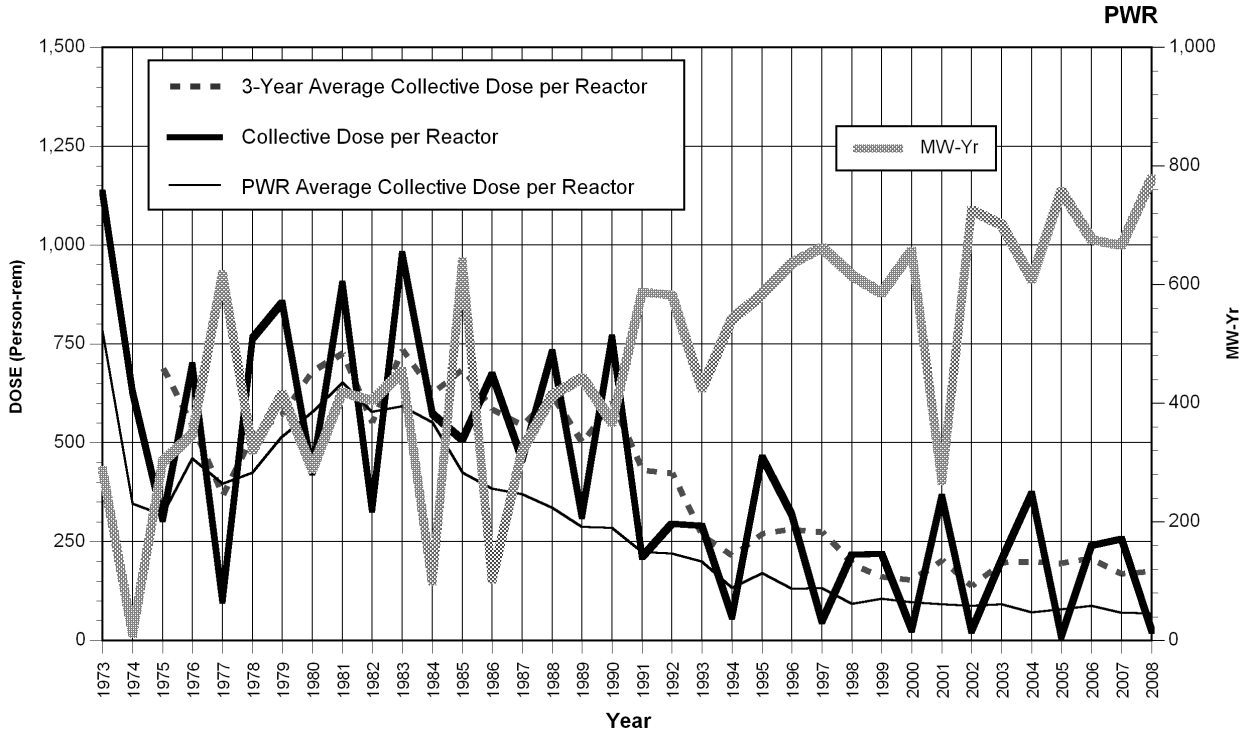

PALO VERDE 1, 2, 3
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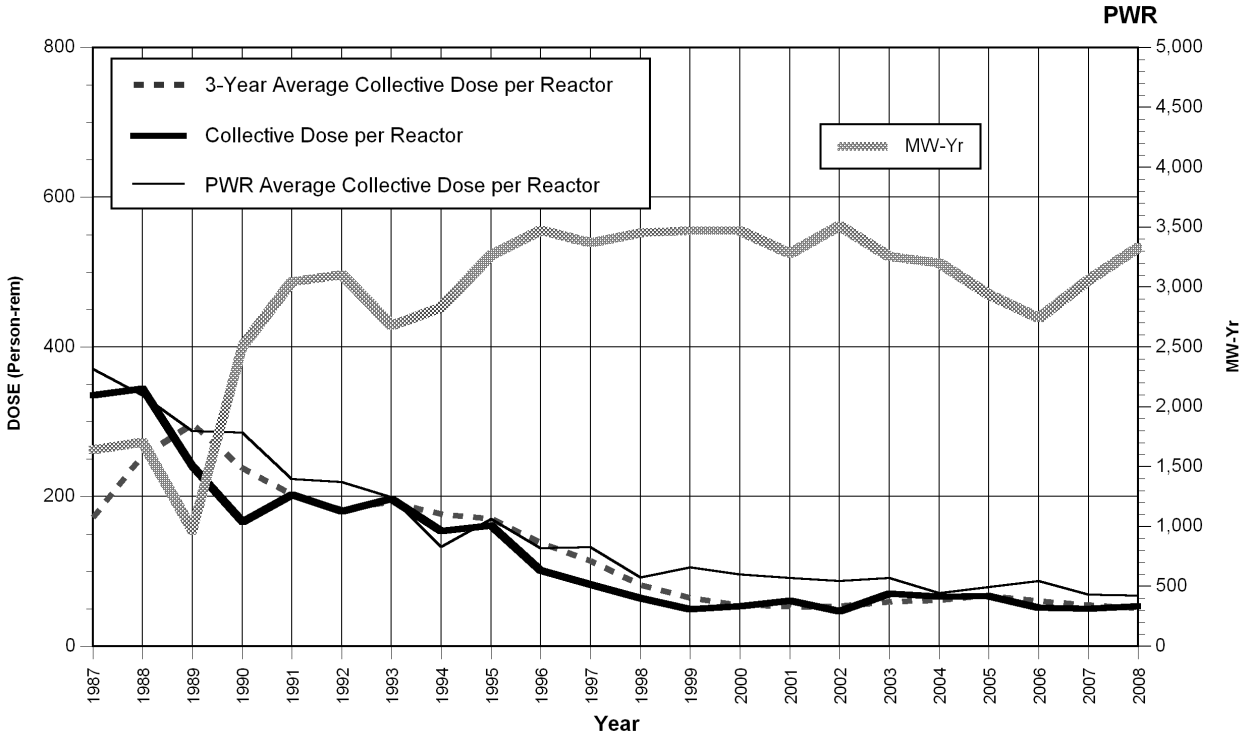
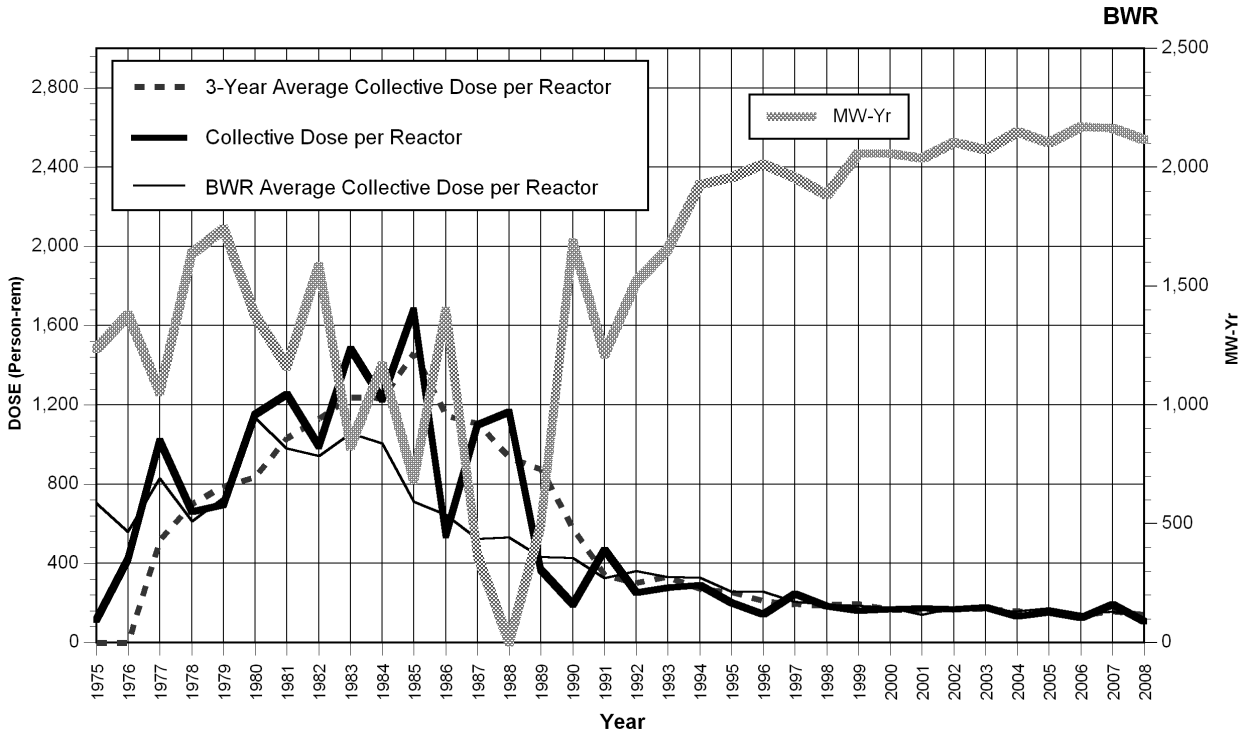
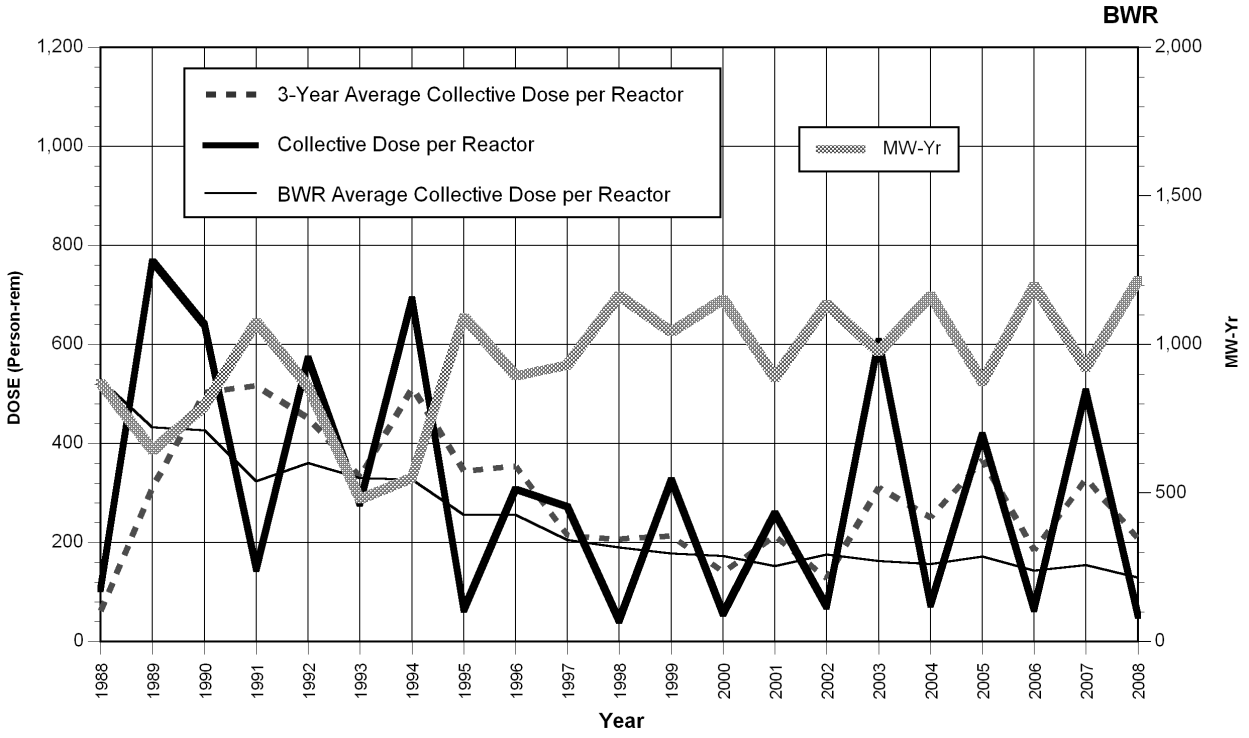


PEACH BOTTOM 2, 3
Dose Performance Indicators



PERRY 1
Dose Performance Indicators



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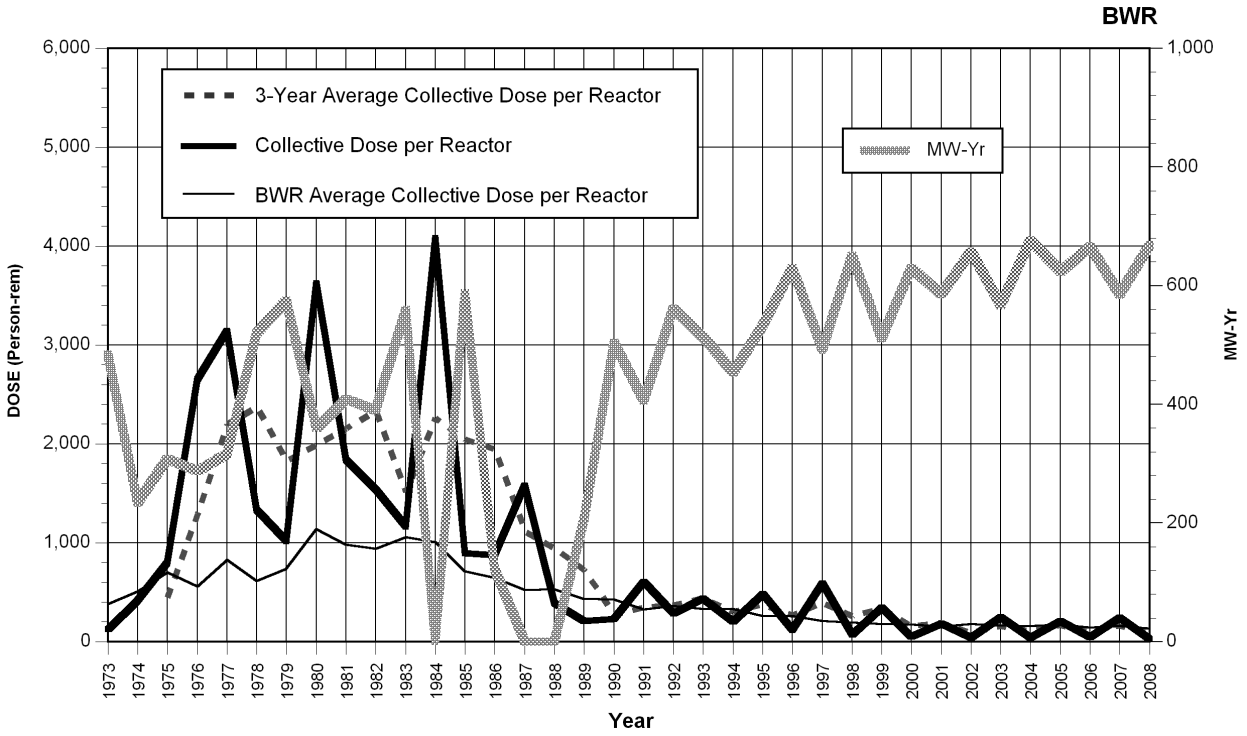

POINT BEACH 1, 2
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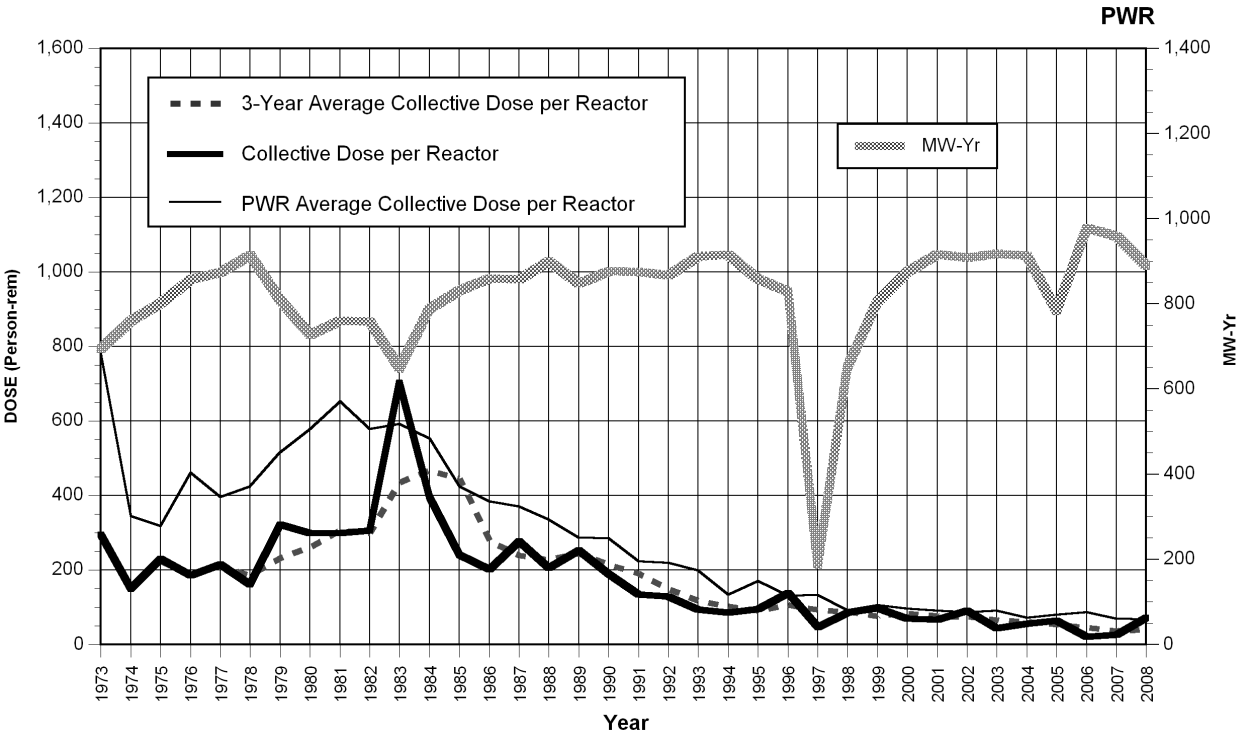
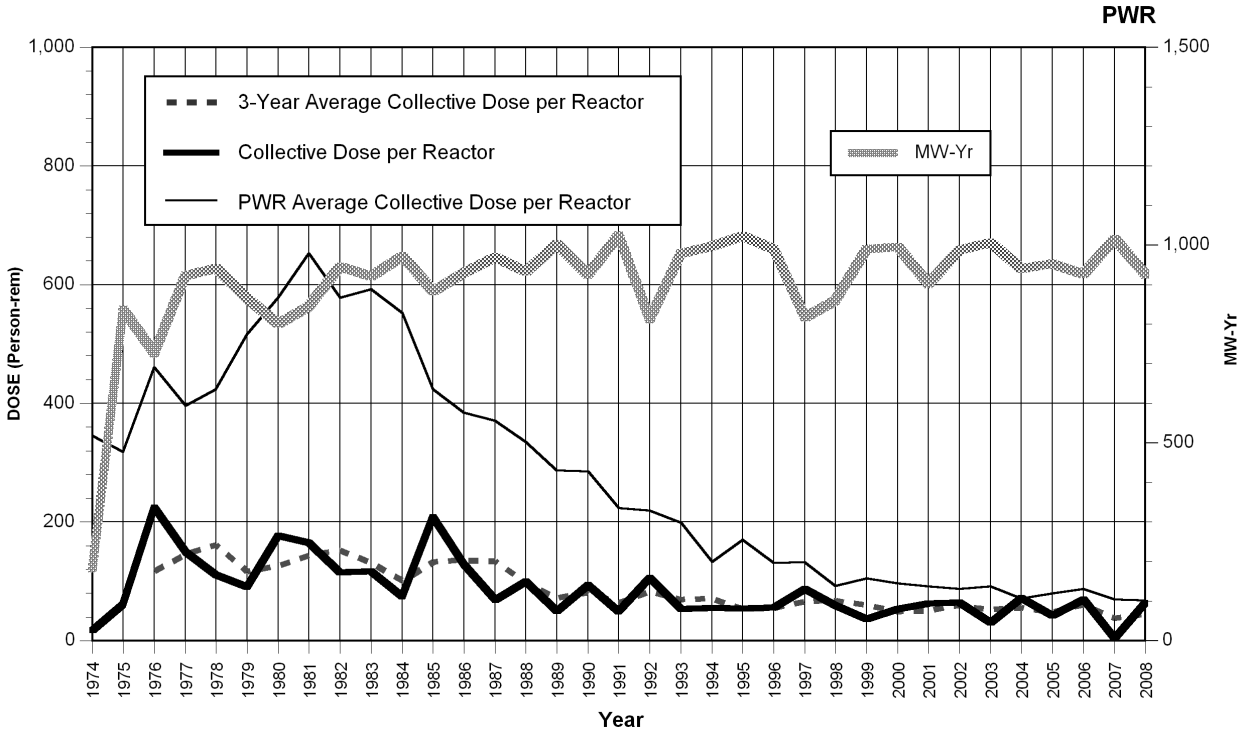


PRAIRIE ISLAND 1, 2
Dose Performance Indicators



QUAD CITIES 1, 2
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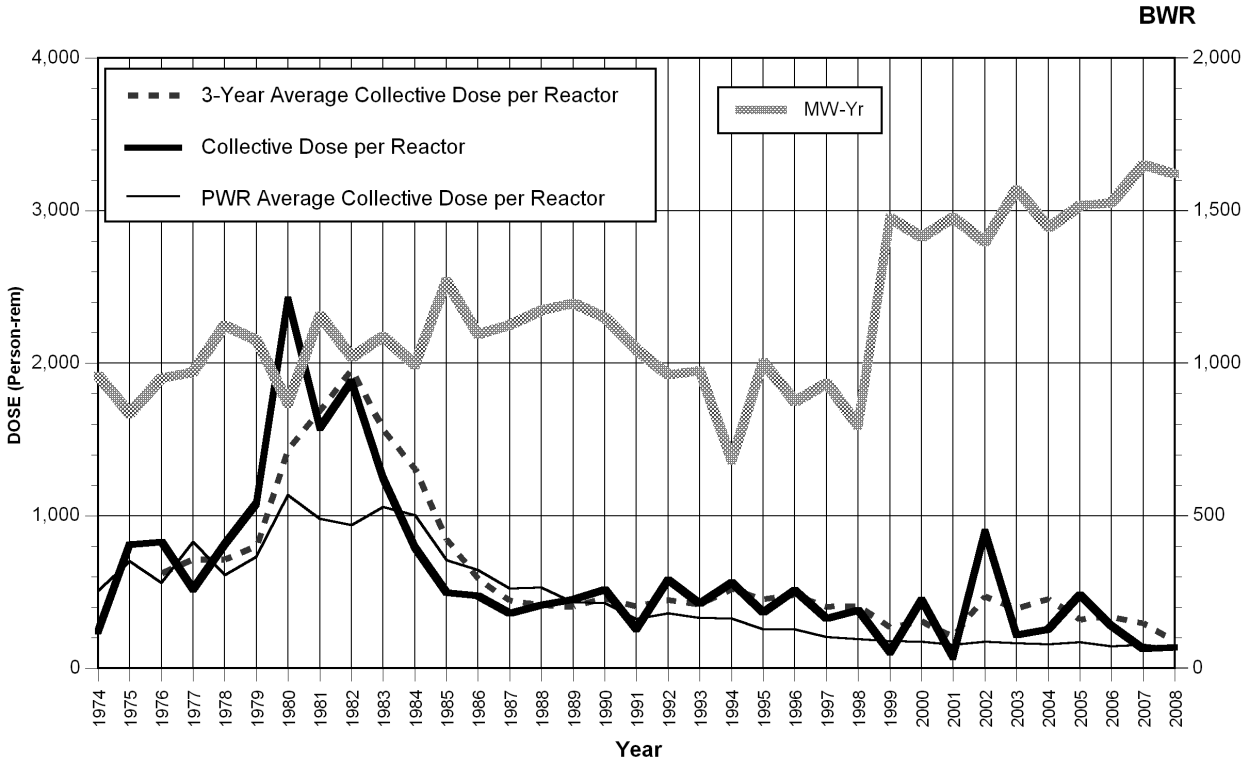

RIVER BEND 1
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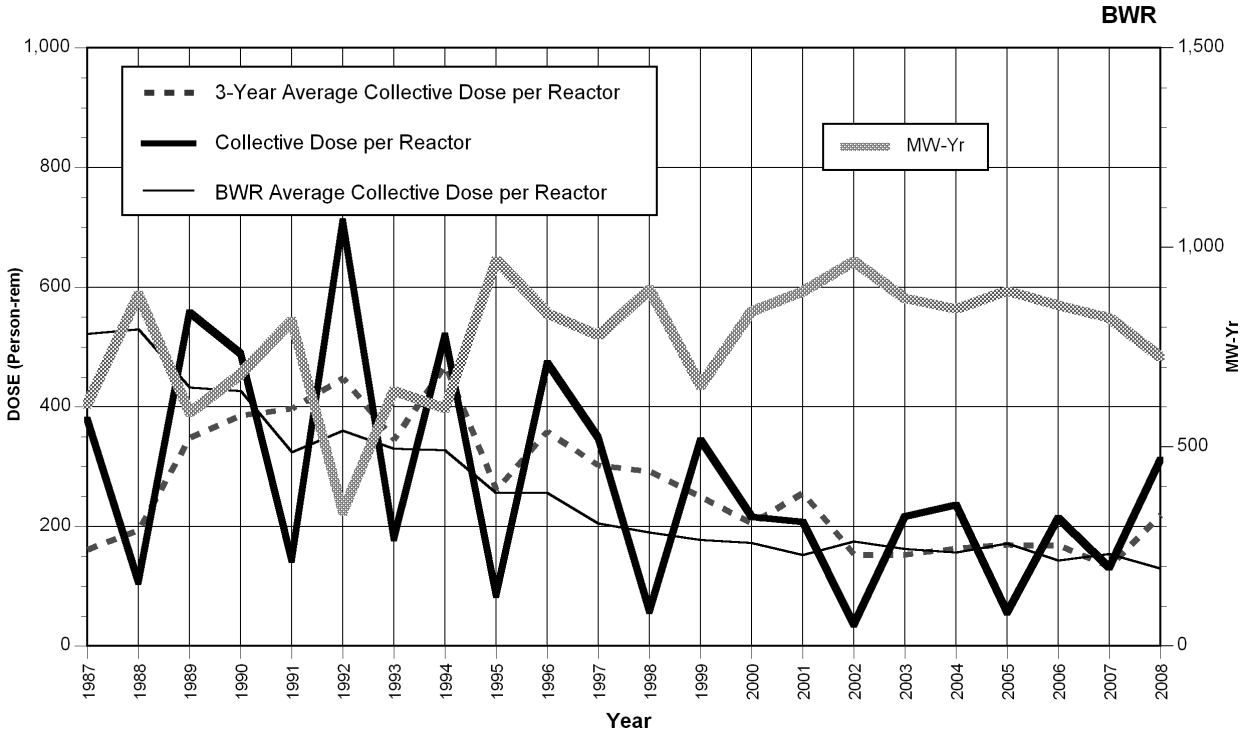

ROBINSON 2
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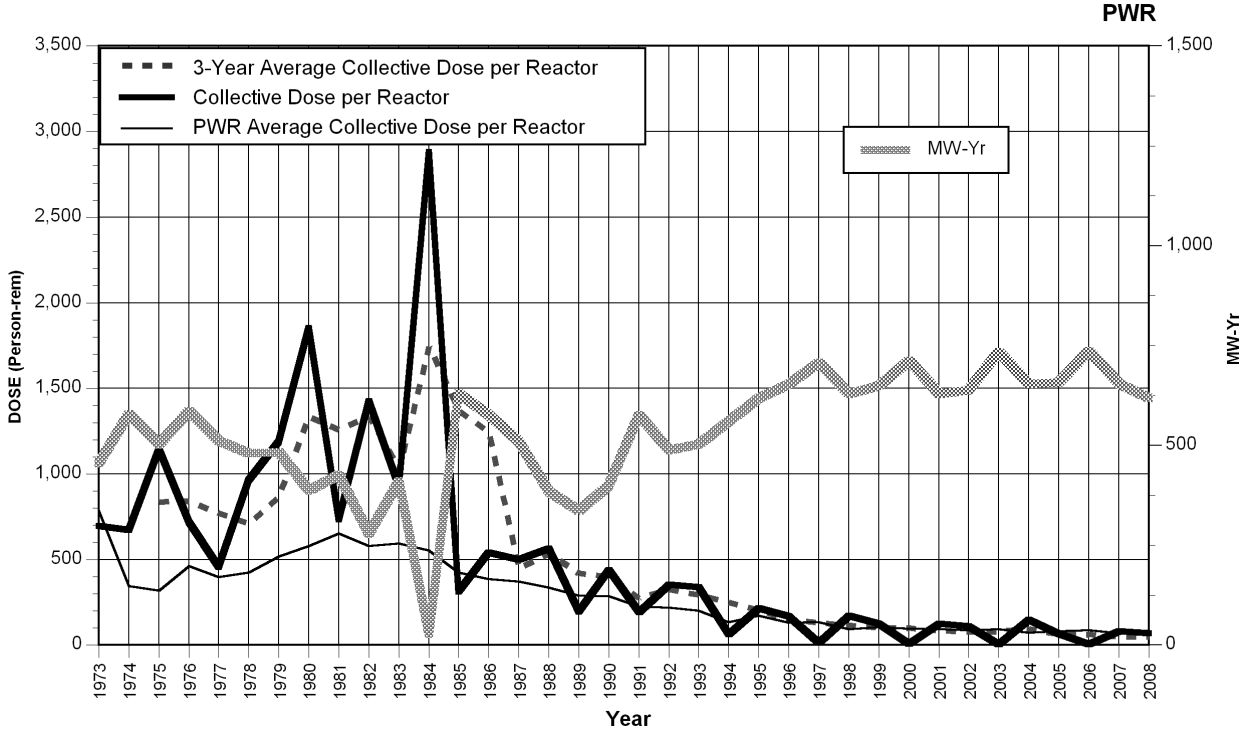

SALEM 1, 2
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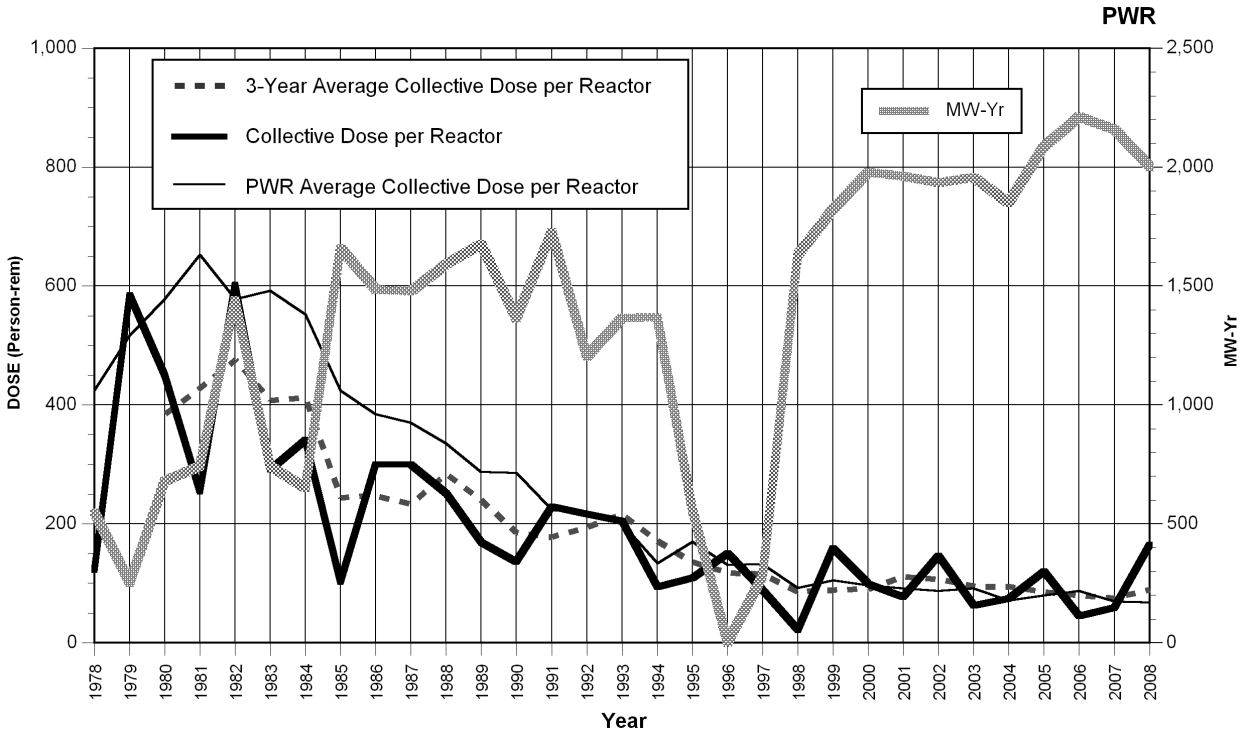
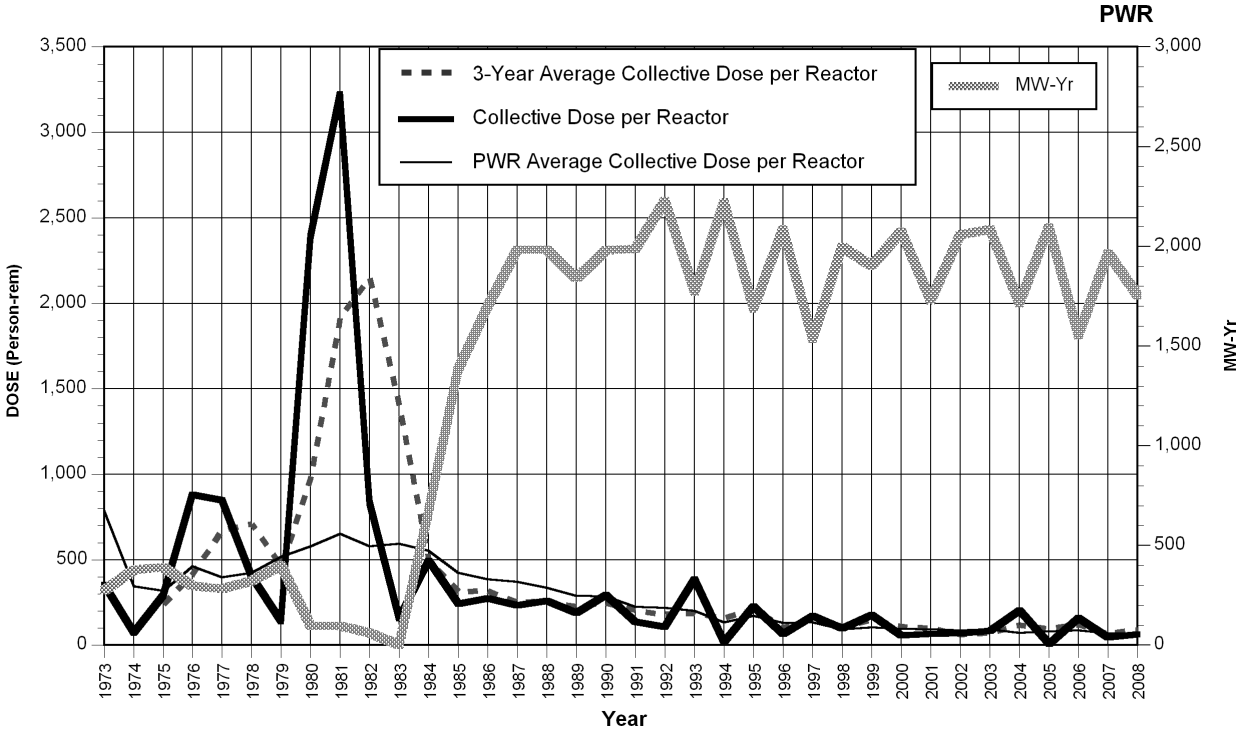
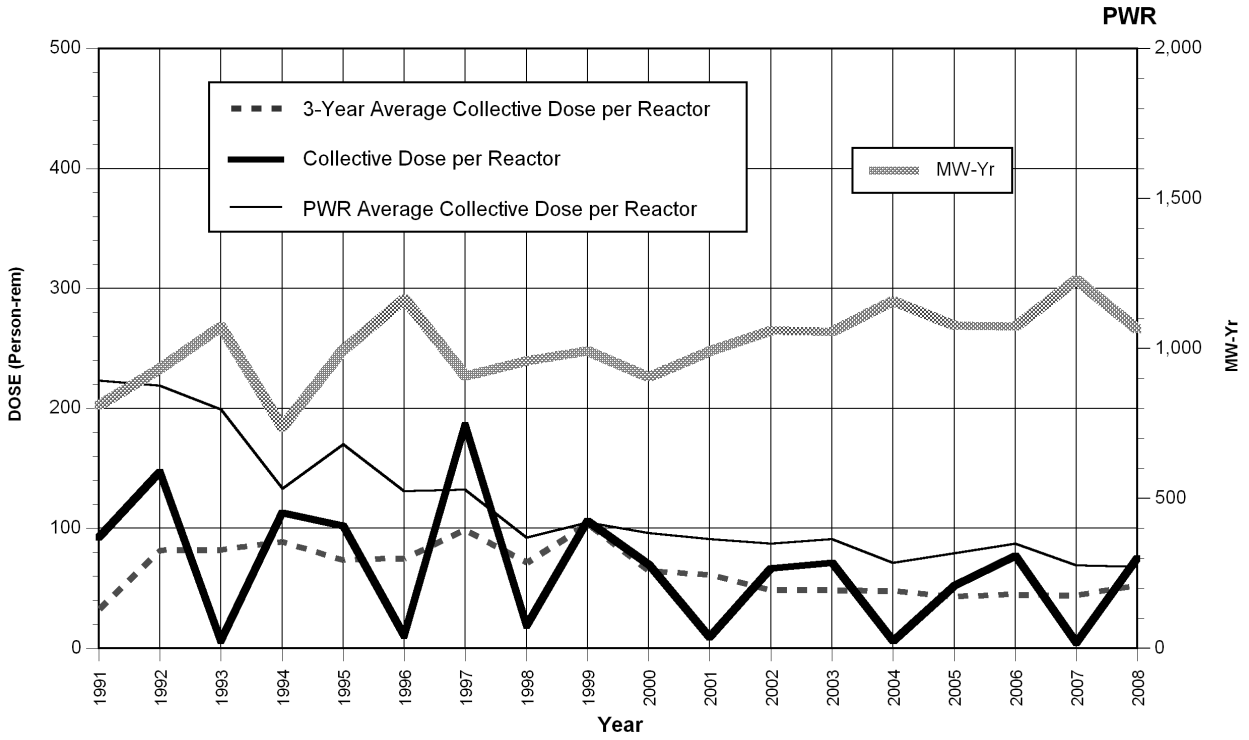


SAN ONOFRE 1, 2, 3
Dose Performance Indicators



NOTE: Since 2001, data only includes San Onofre units 2 and 3.

SEABROOK
Dose Performance Indicators



SEQUOYAH 1, 2
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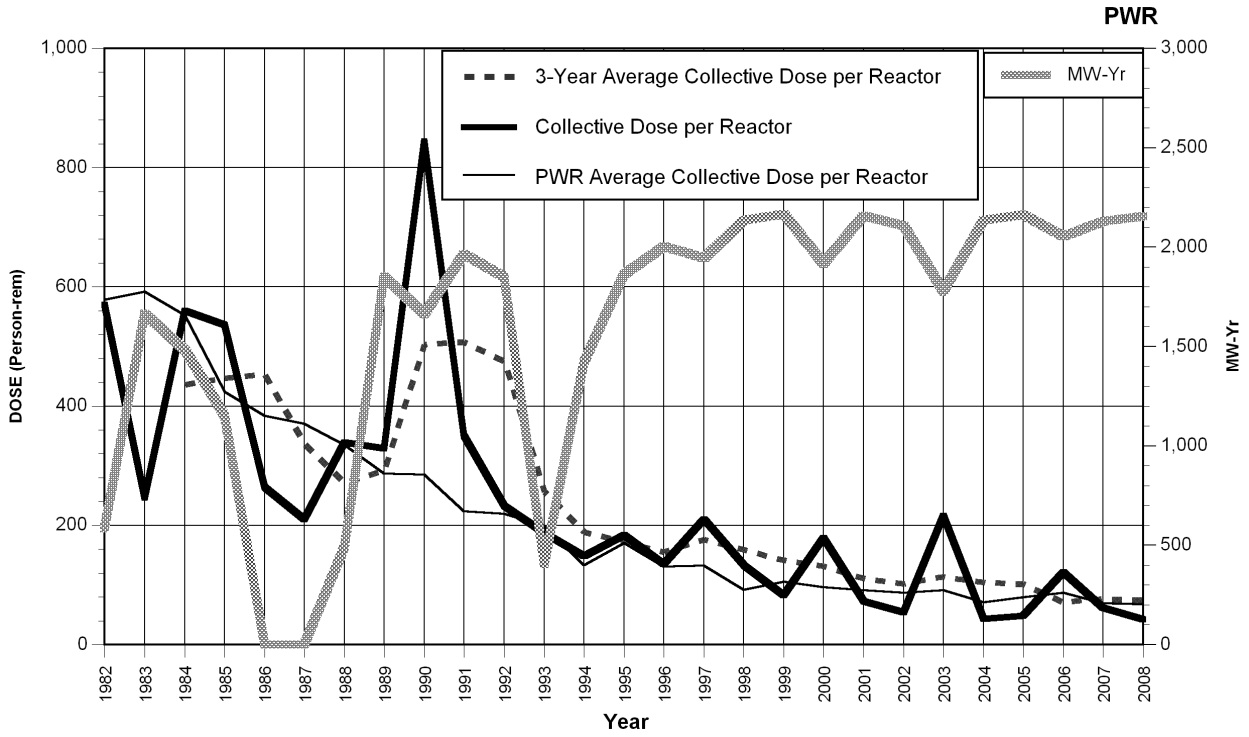

SOUTH TEXAS 1, 2
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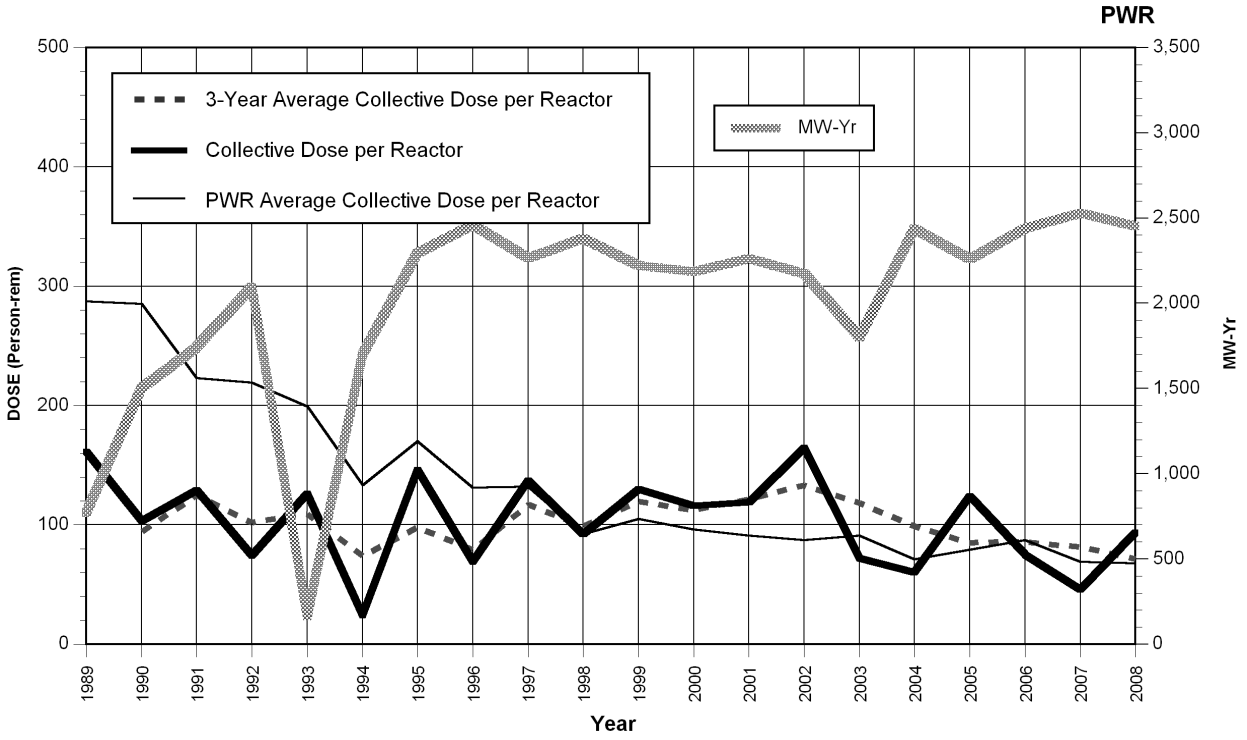
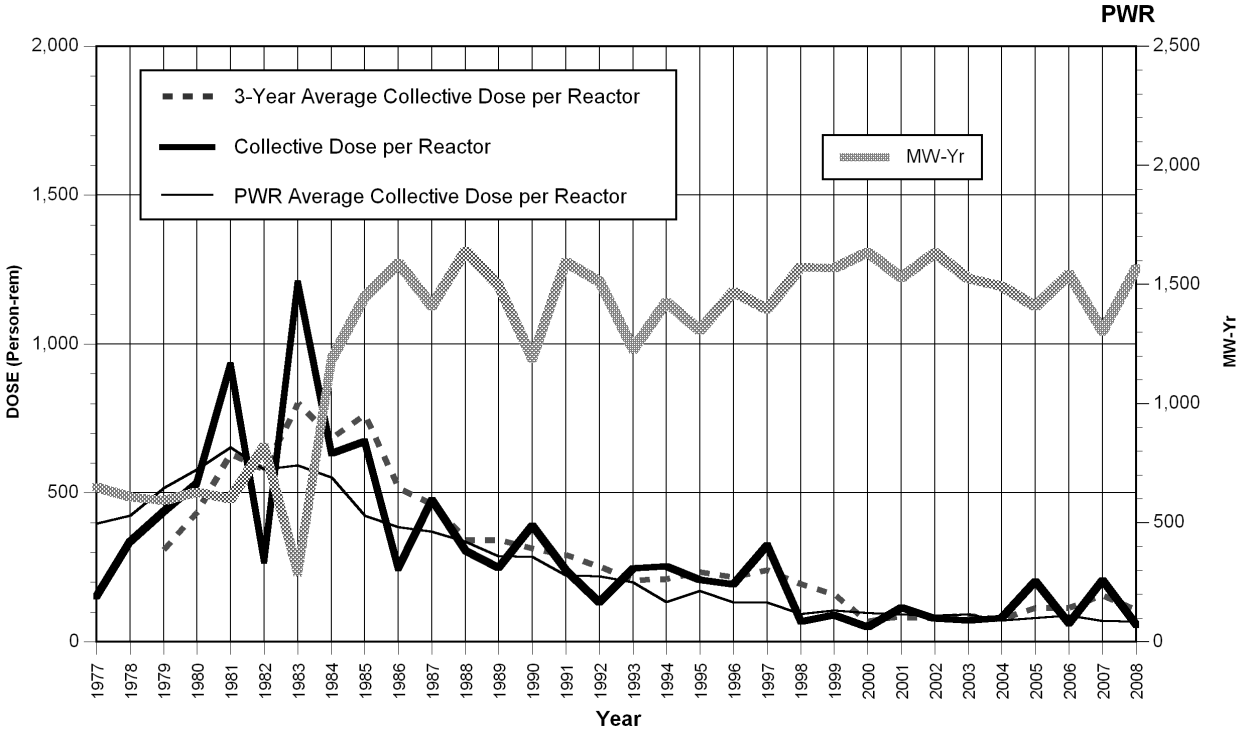
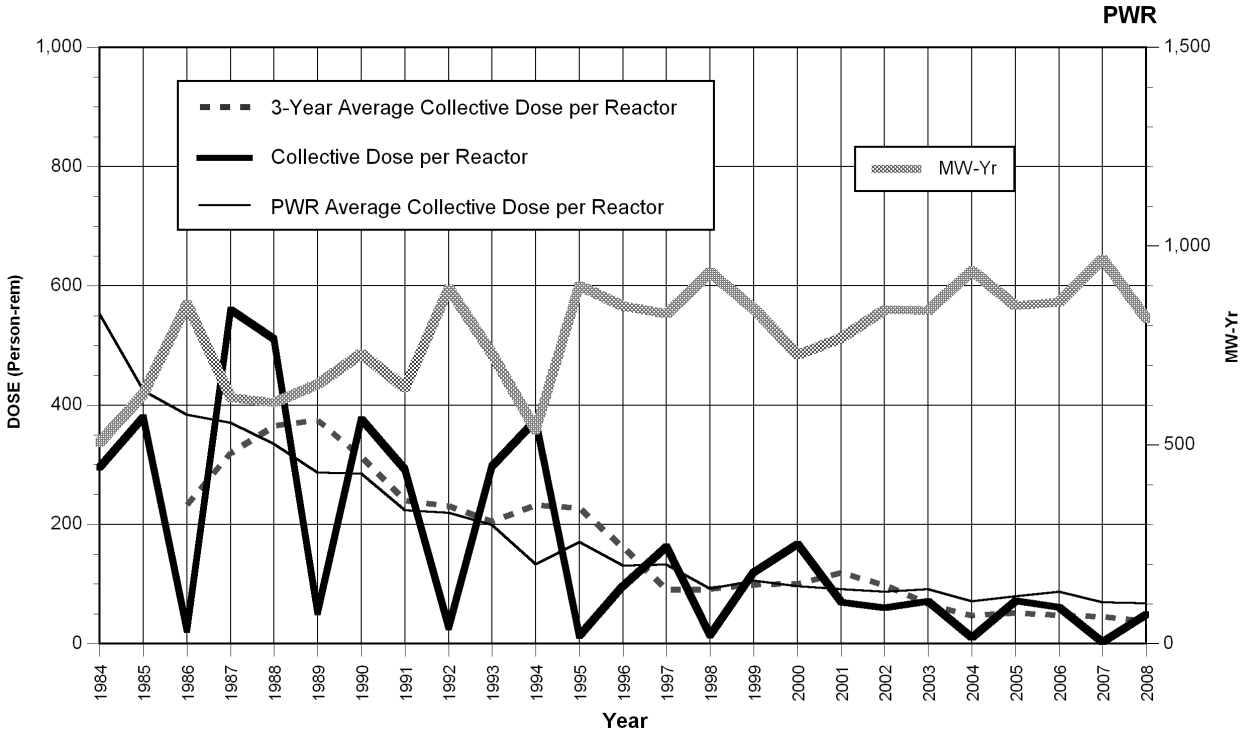


ST. LUCIE 1, 2
Dose Performance Indicators



SUMMER
Dose Performance Indicators



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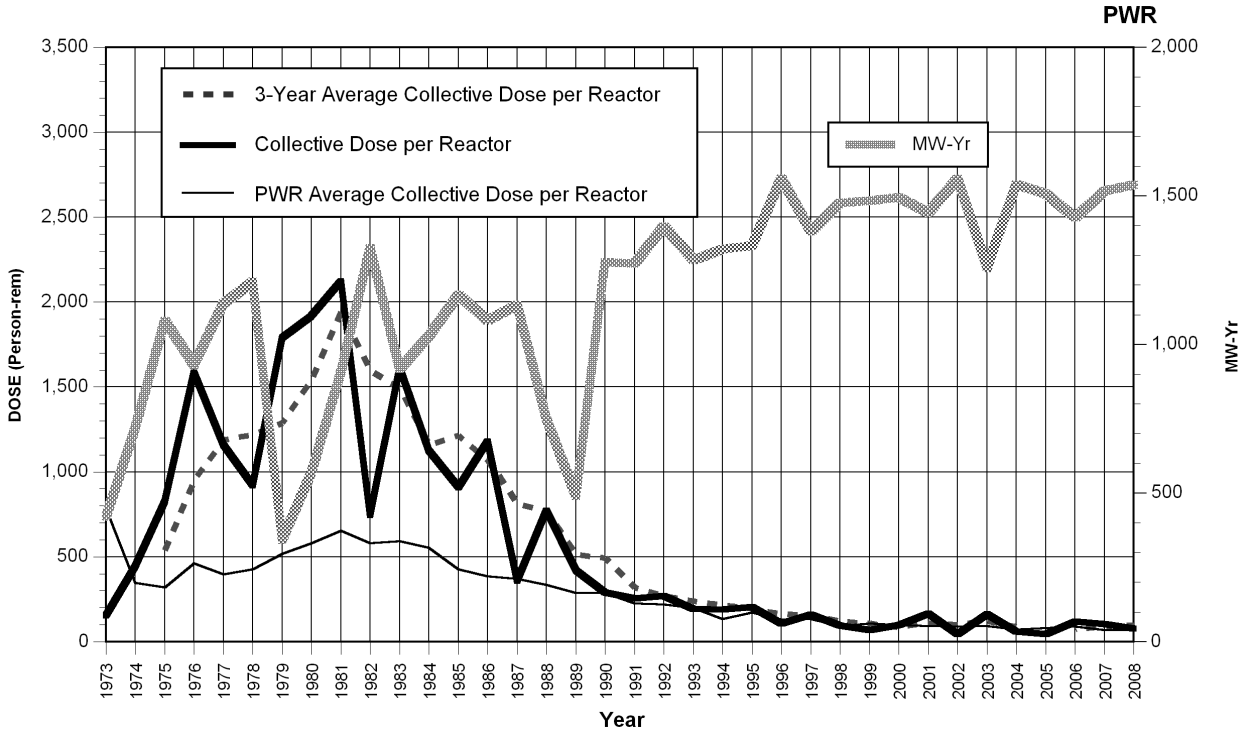
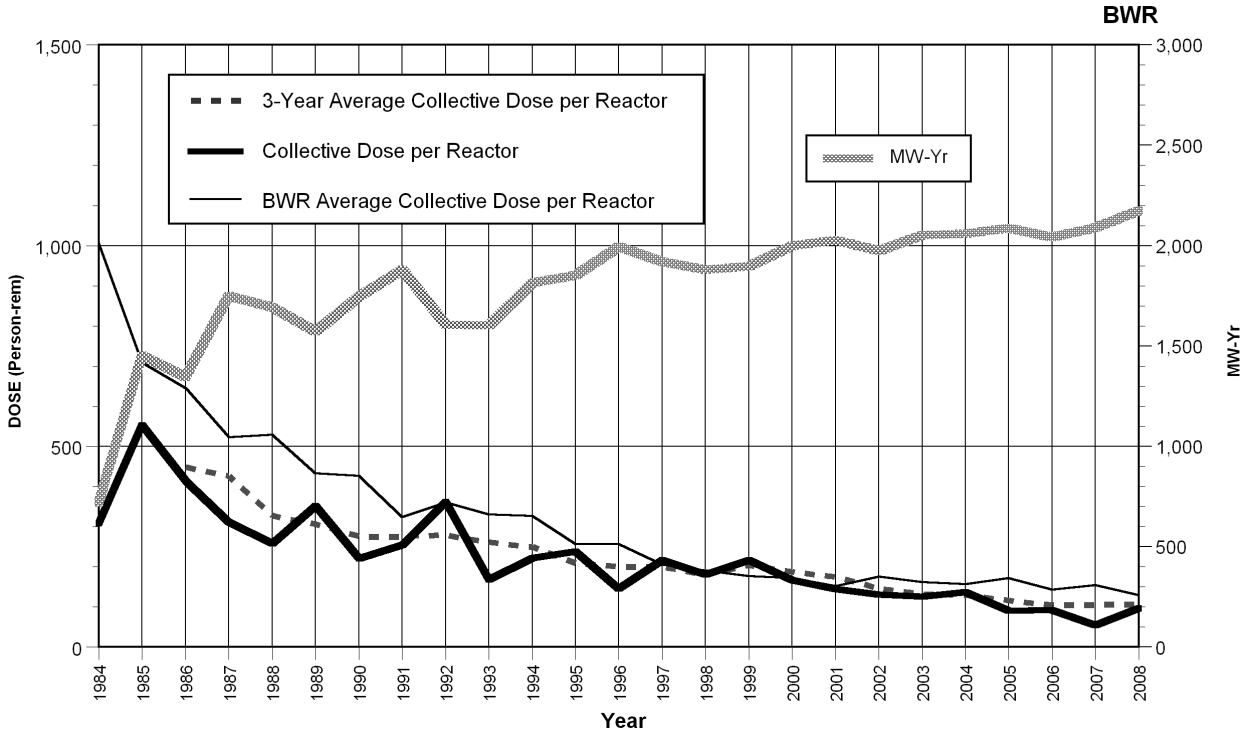
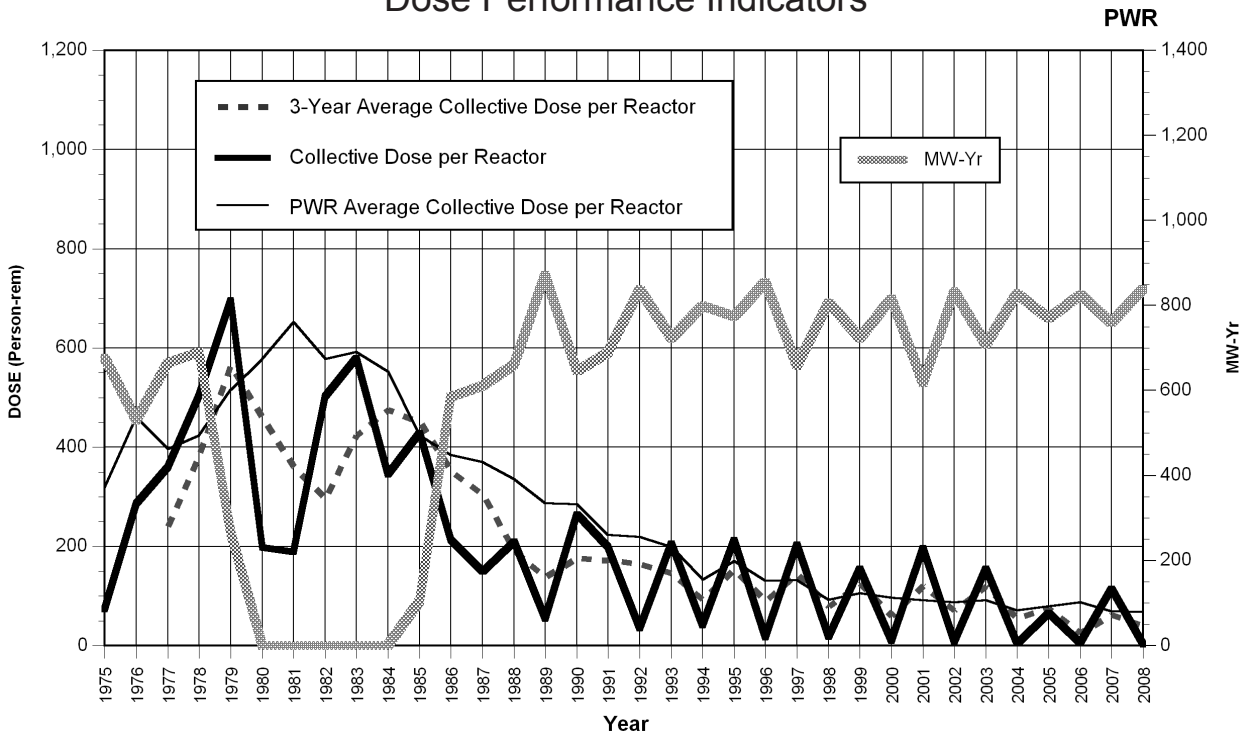
Dose Performance Indicators



SUSQUEHANNA 1, 2
Dose Performance Indicators

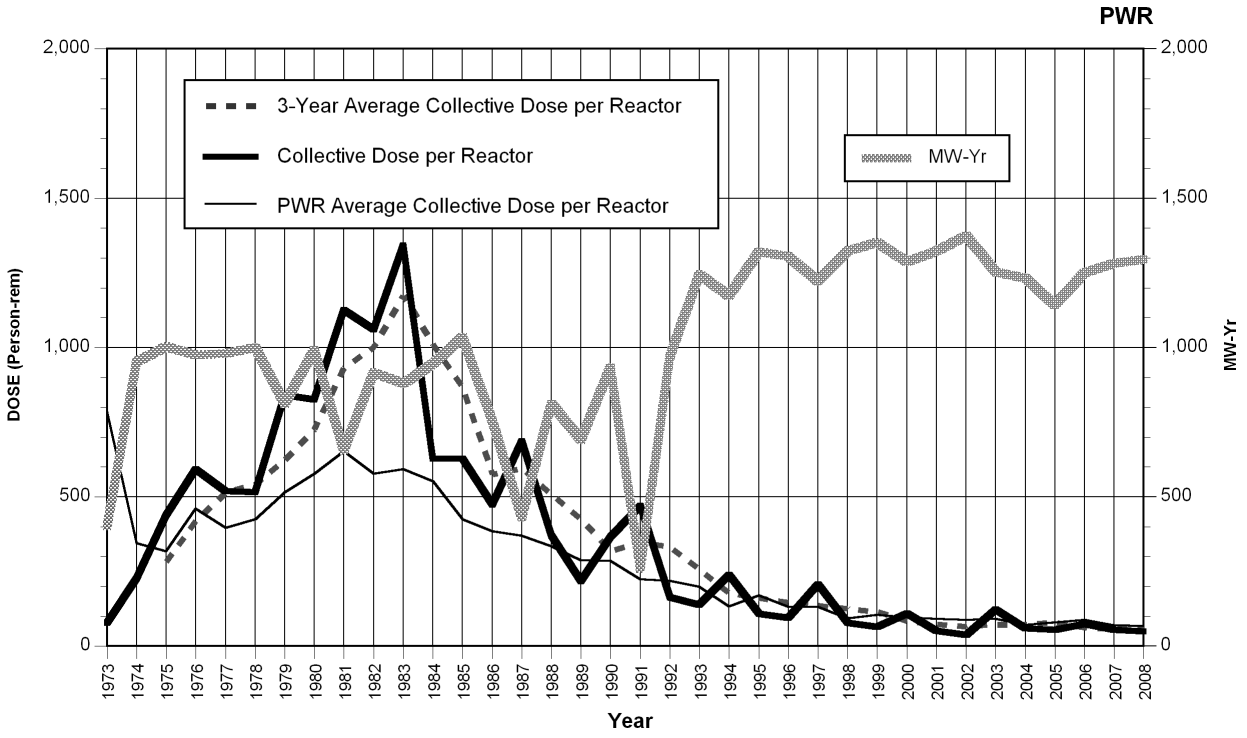


THREE MILE ISLAND 1*
Dose Performance Indicators

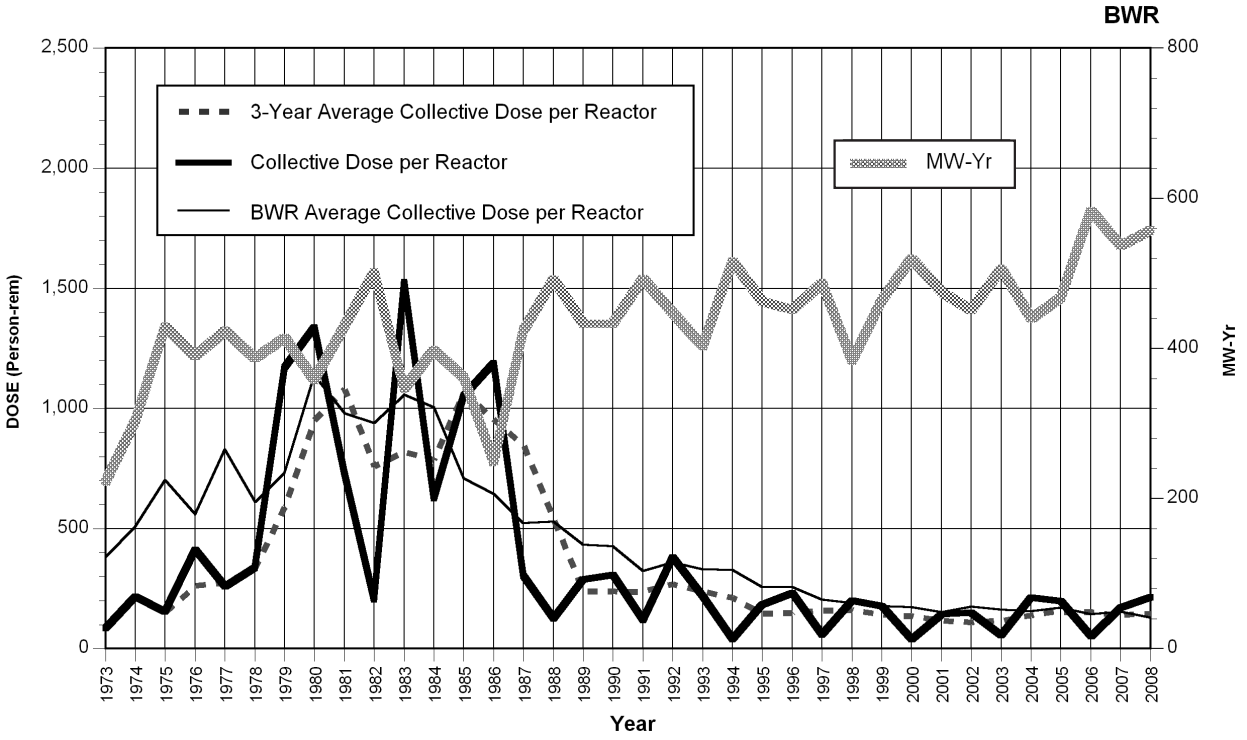


*Graph includes data for Three Mile Island 2 for the years 1975 – 1985.

TURKEY POINT 3, 4
Dose Performance Indicators



VERMONT YANKEE
Dose Performance Indicators



VOGTLE 1, 2
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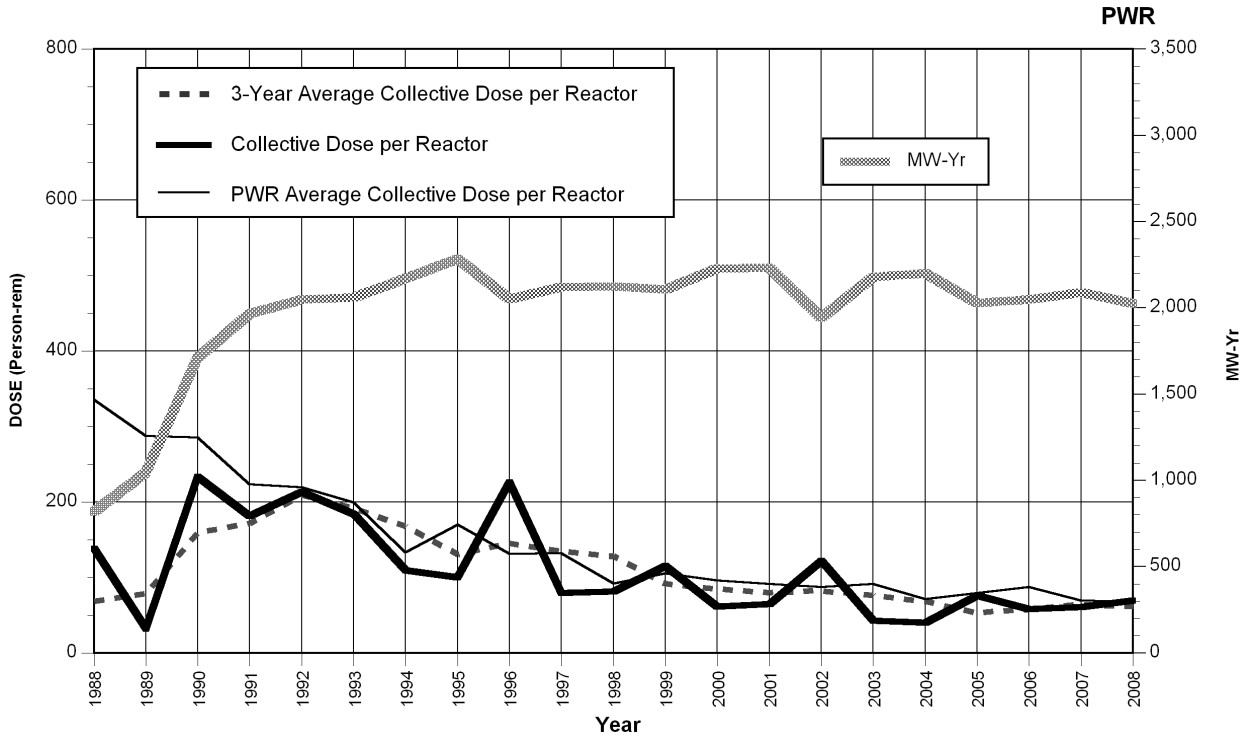
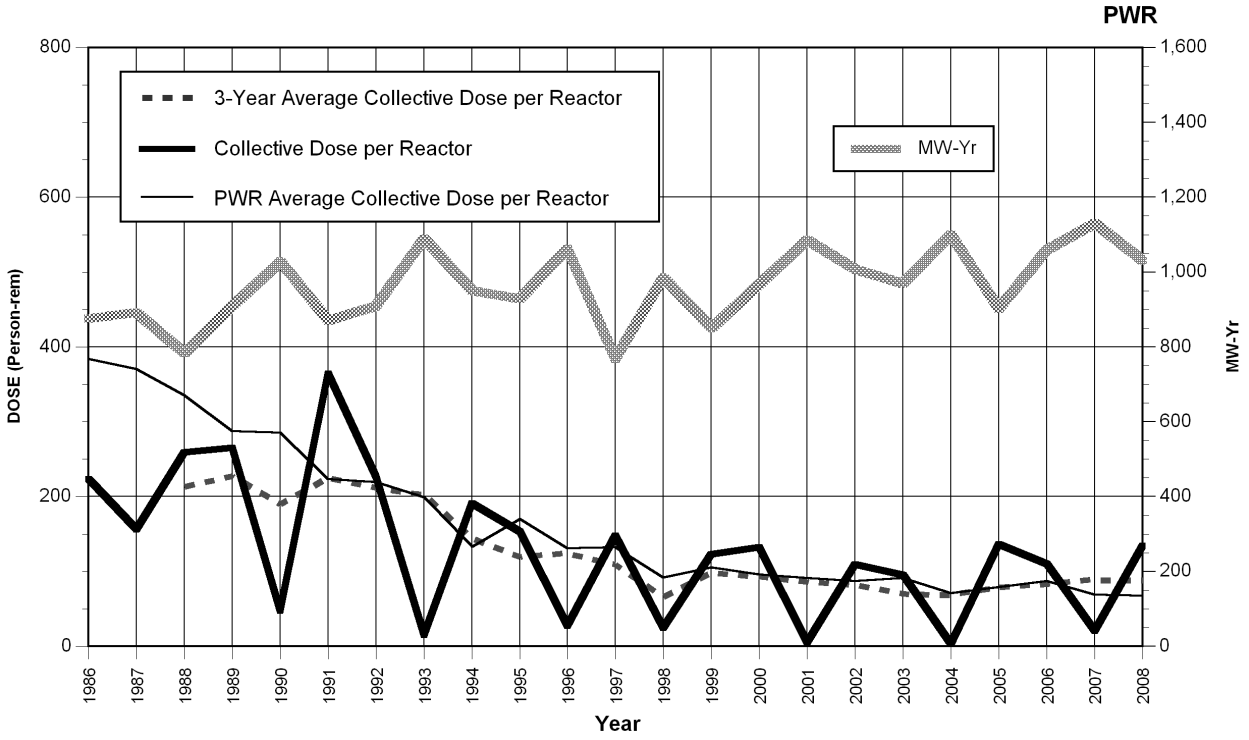
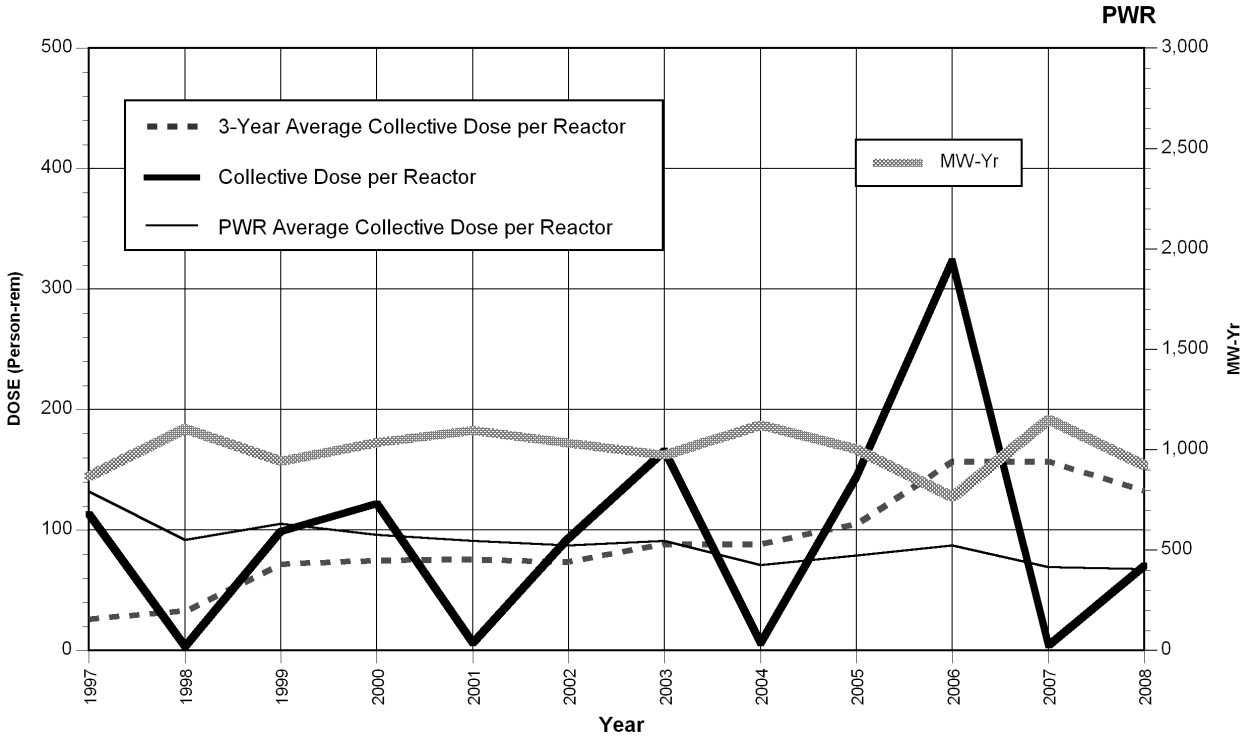


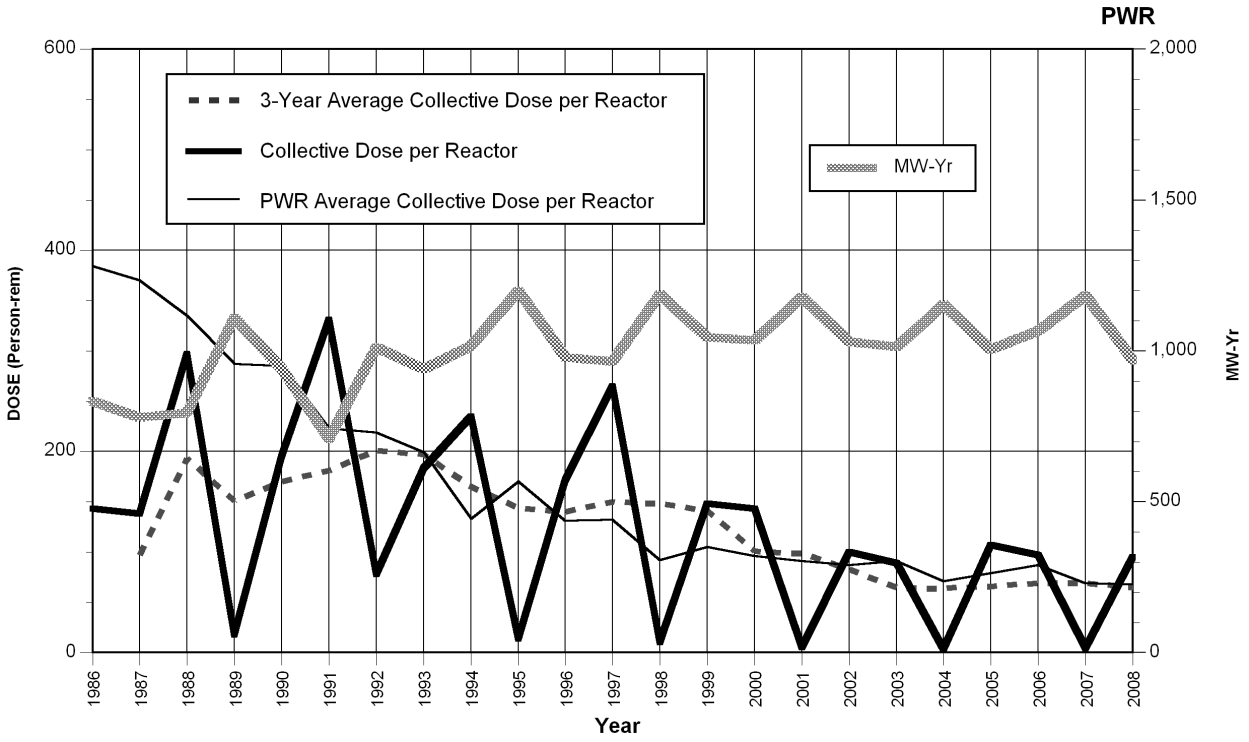
WATERFORD 3
Dose Performance Indicators



WATTS BAR 1
Dose Performance Indicators



WOLF CREEK 1
Dose Performance Indicators



Appendix E

GLOSSARY

2008

Appendix E
GLOSSARY

Agreement State: as defined in 10 CFR 20.1003, means any state with which the Atomic Energy Commission or the Nuclear Regulatory Commission has entered into an effective agreement under subsection 274b. of the [Atomic Energy] Act [of 1954, including any amendments thereto]. To simplify subsection 274b., an Agreement State is a state that has signed an agreement with the NRC under which the state regulates the use of byproduct, source, and small quantities of special nuclear material in that state.

As low as reasonably achievable (ALARA): as defined in 10 CFR 20.1003, means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10 CFR 20 as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

A*verage measurable dose:* the dose obtained by dividing the collective dose by the number of individuals who 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, because it excludes those individuals receiving a less than measurable dose.

Boiling water reactor (BWR): reactor in which the water, used as both coolant and moderator, is allowed to boil in the core. The resulting steam can be used directly to drive a turbine and electrical generator, thereby producing electricity.

Byproduct material: as partially defined in 10 CFR 20.1003, means any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material; and the tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content.

Class (or lung class or inhalation class): as defined in 10 CFR 20.1003, means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: for Class D (Days) of less than 10 days, for Class W (Weeks) from 10 to 100 days, and for Y (Years) of greater than 100 days.

Collective dose: as defined in 10 CFR 20.1003, is the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Committed dose equivalent: as defined in 10 CFR 20.1003, means the dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake. The acronym CDE is an NRC acronym used for this term.

Committed effective dose equivalent: as defined in 10 CFR 20.1003, is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues. The acronym CEDE is an NRC acronym used for this term.

Exposure: as defined in 10 CFR 20.1003, means being exposed to ionizing radiation or to radioactive material.

Independent Spent Fuel Storage Installation (ISFSI): as defined in 10 CFR 72.3 means a complex designed and constructed for the interim storage of spent nuclear fuel, solid reactor-related GTCC waste, and other radioactive materials associated with spent fuel and reactor-related GTCC waste storage. An ISFSI which is located on the site of another facility licensed under 10 CFR 72 or a facility licensed under 10 CFR 50 of [Title 10 of the Code of Federal Regulations] and which shares common utilities and services with that facility or is physically connected with that other facility may still be considered independent.

Lens dose equivalent (LDE): as defined in 10 CFR 20.1003, applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm2).

License: as defined in 10 CFR 20.1003, means a license issued under the regulations in 10 CFR parts 30 through 36, 39, 40, 50, 60, 61, 63, 70, or 72 of [Title 10 of the Code of Federal Regulations].

Licensee: as defined in 10 CFR 20.1003, means the holder of the NRC license.

Licensed material: as defined in 10 CFR 20.1003, means source material, special nuclear material, or byproduct material received, possessed, used, transferred, or disposed of under a general or specific license issued by the [Nuclear Regulatory] Commission.

Light water reactor (LWR): the term used in this report to describe commercial nuclear reactors that use ordinary water as a coolant and are operated for the purposes of generating electricity. Light water reactors include boiling water reactors (BWRs) and pressurized water reactors (PWRs).

Measurable dose: a dose greater than zero rem (not including doses reported as ‘‘not detectable’’).

Megawatt-year: unit of electric energy, equal to the energy from a power of 1,000,000 watts over a period of one year.

Mode of Intake: the manner of intake into the body: inhalation (H), absorption through the skin (B), oral ingestion (G), and injection (J).

Monitoring year: interval during which the radiation exposure monitoring was performed.

Non-reactor licensees: NRC licensees that are not commercial nuclear power reactors. These licensees are 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.

Number of individuals with measurable dose: the count of unique individuals who received measurable dose during the monitoring year. In some instances in this report, the number of individuals with measurable dose may include individuals who are counted more than once since they may be monitored at more than one licensee during the year. (See Section 5 on the effect of transient individuals.) Tables that have been adjusted for transient workers are noted in the appropriate footnotes to the tables.

Occupational dose: as defined in 10 CFR 20.1003, means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under [10 CFR] 35.75, from voluntary participation in medical research programs, or as a member of the public.

Pressurized water reactor (PWR): power reactor in which heat is transferred from the core to an exchanger by high temperature water kept under high pressure in the primary system. Steam used to turn a turbine and electrical generator is generated in a secondary circuit. The majority of reactors producing electric power in the United States are pressurized water reactors.

Radionuclide: a radioisotope.

REM: as defined in 10 CFR 20.1004, is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

Shallow dose equivalent, maximum extremity (SDE-ME): the external exposure of an extremity, taken as the dose equivalent at a tissue depth of 0.007 centimeter.

Shallow dose equivalent, whole body (SDE-WB): the external exposure of the skin, taken as the dose equivalent at a tissue depth of 0.007 centimeter.

Sievert: as defined in 10 CFR 20.1004, is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rems).

Special nuclear material (SNM): as defined in 10 CFR 20.1003, means plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the [Nuclear Regulatory] Commission, pursuant to the provisions of section 51 of the [Atomic Energy] Act [of 1954, as amended], determines to be special nuclear material, but does not include source material. Any material artificially enriched by any of the foregoing but does not include source material.

Total effective dose equivalent (TEDE): as defined in 10 CFR 20.1003, means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Transient individual: one who is monitored at more than one licensed site during the calendar year.

Unit availability factor: the unit available hours (the total clock hours in the report period during which the unit operated online or was capable of such operation) times 100 divided by the period hours.

NRC FORM 335
(9-2004)
NRCMD 3.7

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)

NUREG-0713
Volume 30

2. TITLE AND SUBTITLE

Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2008

3. DATE REPORT PUBLISHED

MONTH	YEAR
January	2010

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

D.E.Lewis
*D.A.Hagemeyer

6. TYPE OF REPORT

Annual

7. PERIOD COVERED *(Inclusive Dates)*

Calendar Year 2008

8. PERFORMING ORGANIZATION - NAME AND ADDRESS *(If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)*

Division of Systems Analysis
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Oak Ridge, TN 37830

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Same as 8. above

10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

This report summarizes the occupational radiation exposure data maintained in the U.S. Nuclear Regulatory Commission's Radiation Exposure Information and Reporting System (REIRS). The bulk of the information contained in this report was compiled from the 2008 annual reports submitted by five of the seven categories of NRC licensees subject to the reporting requirements in 10 CFR 20.2206. The annual reports submitted by these licensees consist of radiation exposure records for each monitored individual.

Annual reports were received from a total of 194 NRC licensees. Complilations of the reports submitted by the 194 licensees indicated that 181,462 individuals were monitored, 86,169 of whom received a measurable dose. The collective dose incurred by these individuals was 11,301 person-rem. In 2008, the average measurable dose per worker for all licensees calculated from reported data was 0.13 rem. Analyses of transient worker data indicate that 28,780 individuals completed work assignments at two or more licensees during the monitoring year. The corrected dose distribution resulted in an average measurable dose per worker for all licensees of 0.18 rem.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

occupational exposure
fuel facility
nuclear power reactor

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

(This Page)
unclassified

(This Report)
unclassified

15. NUMBER OF PAGES

16. PRICE

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