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Protecting People and the Environment

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Vol. 33

Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 2011

Forty-Fourth Annual Report

Office of Nuclear Regulatory Research

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United States Nuclear Regulatory Commission

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Forty-Fourth Annual Report

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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.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1985, Vol. 7, U.S. Nuclear Regulatory Commission, April 1988.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1986, Vol. 8, U.S. Nuclear Regulatory Commission, August 1989.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1987, Vol. 9, U.S. Nuclear Regulatory Commission, November 1990.
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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.
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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.
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NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2008, Vol. 30, U.S. Nuclear Regulatory Commission, December 2009.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2009, Vol. 31, U.S. Nuclear Regulatory Commission, April 2011.
NUREG-0713	Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 2010, Vol. 32, U.S. Nuclear Regulatory Commission, May 2012.

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

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

ABSTRACT

This report summarizes the occupational exposure data that are maintained in the U.S. Nuclear Regulatory Commission's (NRC's) Radiation Exposure Information and Reporting System (REIRS) database. The bulk of the information contained in the report was compiled from the 2011 annual reports submitted by five of the seven categories[1] of NRC licensees subject to the reporting requirements of 10 CFR 20.2206. Because there are no geologic repositories for high-level waste currently licensed and no NRC-licensed low-level waste disposal facilities currently in operation, only five categories will be considered in this report. 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.

Annual reports for 2011 were received from a total of **194** NRC licensees. The summation of reports submitted by the **194** licensees indicated that **204,561** individuals were monitored, **88,606** of whom received a measurable dose (Table 3.1).[2] When adjusted for transient individuals, there were actually **149,927** monitored individuals, **66,408** of whom received a measurable dose (see Section 5).

The collective dose incurred by these individuals was **11,097** person-rem, which represents a **5% increase** from the 2010 value. This increase was primarily due to the increase in collective dose for industrial radiography licensees, as well as an increase in the collective dose for commercial nuclear power reactor licensees. The number of individuals receiving a measurable dose increased by **8%** from the 2010 value. However, the average measurable dose of 0.13 rem for 2011 is the same as the 2010 value. The average measurable dose is defined as the total effective dose equivalent (TEDE) divided by the number of individuals receiving a measurable dose.

In calendar year 2011, the average annual collective dose per reactor for light water reactor (LWR) licensees was **84** person-rem. This represents a **1% increase** from the value reported for 2010 (83 person-rem). The increase in collective dose for commercial nuclear power reactors was due to a 32% increase in total outage hours in 2011. During outages, activities involving increased radiation exposure such as refueling and maintenance are performed while the reactor is not in operation. The average annual collective dose per reactor for boiling water reactors (BWRs) was **142** person-rem for **35** BWRs and **55** person-rem for **69** pressurized water reactors (PWRs).

Analyses of transient individual data indicate that **31,910** 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 individuals by multiple licensees. The adjustment to account for transient individuals has been specifically noted in footnotes in the figures and tables for commercial nuclear power reactors. In 2011, the average measurable dose per individual for all licensees calculated from reported data was **0.13** rem. Although the average measurable dose per individual from data submitted by licensees was 0.13 rem, a corrected dose distribution resulted in an average measurable dose per individual of **0.17** rem.

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[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 individuals 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

Staff in the Offices of Nuclear Reactor Regulation, Nuclear Material Safety and Safeguards, New Reactors, Federal and State Materials and Environmental Management Programs, and Nuclear Regulatory Research assisted in the preparation of this NUREG, serving as technical reviewers. The NRC welcomes responses from readers.

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FOREWORD

Through this annual report, the 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 33, summarizes the 2011 occupational radiation exposure data maintained in the NRC's 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 of the *Code of Federal Regulations*, Section 20.2206 (10 CFR 20.2206, "Reports of Individual Monitoring"). Specifically, these categories include 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. Because NRC has not licensed any geologic repositories for high-level waste and all low-level waste disposal facilities are regulated by Agreement States, 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 2011, 149,927 individuals were monitored and 66,408 received a measurable dose when adjusted for transient individuals who worked at more than one facility during the year. This report analyzes and presents these records in terms of collective dose and the distribution of dose among the monitored individuals. During 2011, these individuals incurred a collective dose of 11,097 person-rem, which represents a 5% increase from the 2010 value of 10,617 person-rem. This increase was primarily due to the increase in collective dose at industrial radiography licensees, as well as an increase in the collective dose for commercial nuclear power reactors. The average measurable dose is the total collective dose divided by the number of individuals receiving a measurable dose. While the collective dose increased from 2010 to 2011, there was a proportional increase in the number of individuals receiving a measurable dose, resulting in the average measurable dose remaining the same at 0.17 rem in 2011 when adjusted for transient workers. This value can be compared with the 0.31 rem [Ref. 1] that the average person in the United States receives annually from natural background radiation. Worldwide annual exposures to natural background radiation are generally expected to be in the range of 0.1 rem to 1.3 rem, with 0.24 rem [Ref. 2] 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 is reasonably achievable (ALARA). For example, the NRC staff uses the data presented in this report as one of the metrics of the NRC's Reactor Oversight Program to evaluate the effectiveness of licensees' ALARA programs.

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PREFACE

A number of NRC licensees have inquired as to how the occupational radiation exposure data that are compiled from the individual exposure reports required by 10 CFR 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. NRC staff use this data for the following purposes:

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 is reasonably achievable (ALARA) efforts by licensees.

2. The 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 permit evaluation of transient individuals who may affect dose distribution statistics through multiple counting.

5. The data are used in the establishment of priorities for the utilization of NRC health physics resources: research, standards development, regulatory program development, and inspections conducted at NRC-licensed facilities.

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

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

8. The data provide information that may be used to conduct epidemiologic studies.

ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
ALARA	as low as is 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
FSME	Office of Federal and State Materials and Environmental Management Programs
FSSR	final status survey report
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ISFSI	independent spent fuel storage installation
ISOE	Information System on Occupational Exposure
ISOEDAT	Information System on Occupational Exposure Database
LDE	lens dose equivalent
LES	Louisiana Energy Services
LTP	license termination plan
LWR	light water reactor
M&D	manufacturing and distribution
mSv	millisievert
MWe	megawatts electric
MW-yr	megawatt-year
ND	not detectable
NEA	Nuclear Energy Agency
NMSS	Office of Nuclear Material Safety and Safeguards
NR	not required to be reported

ABBREVIATIONS (Continued)

NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
OECD	Organisation for Economic Co-operation and Development
PSDAR	Post shut-down decommissioning activities report
PSE	planned special exposure
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
SRE	collective dose distribution ratio
Sv	sieverts
TEDE	total effective dose equivalent
TMI	Three Mile Island
TODE	total organ dose equivalent
UF_6	uranium hexafluoride

Section 1
INTRODUCTION

1.1 Background

One of the basic purposes of the Atomic Energy Act and the implementing regulations in Title 10, Part 20, of the *Code of Federal Regulations* (10 CFR Part 20), is to protect the health and safety of the public, including the employees of the licensees conducting operations under those regulations. The regulations at 10 CFR 20.1502 specifies conditions that require individual monitoring of external and internal occupational dose. Each licensee is also required, under 10 CFR 20.2106(f), to maintain records of the results of such monitoring until the Commission terminates the license. 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 Part 20 requiring the reporting of certain occupational radiation exposure information to a central repository at AEC Headquarters. At that time, there were only four categories[3] of AEC licensees required to report. These facilities were considered to have the greatest potential for significant occupational doses. A procedure was established whereby the appropriate occupational exposure data were extracted from these reports and entered into the AEC's 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 Education, which is managed by Oak Ridge Associated Universities. The computerization of these data 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

[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.

under ERDA, now the U.S. Department of Energy (DOE), is collected and published by the DOE Office of Analysis within the Office of Health, Safety and Security, in Germantown, Maryland.

In 1982 and 1983, 10 CFR 20.408(a) was amended to require three additional categories of NRC licensees to submit annual statistical exposure reports and individual termination exposure reports. The 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 one of these categories—independent spent fuel storage installations; there are no geologic repositories for high-level waste currently licensed, and there are no low-level waste land disposal facilities currently in operation that report to the NRC.

In May 1991, 10 CFR Part 20 was revised. The revision redefined the radiation monitoring and reporting requirements of NRC licensees. Instead of submitting annual reports summarizing the total number of individuals who were monitored (§20.407) and termination reports (§20.408), licensees were required to submit an annual report of the dose received by each monitored individual (§20.2206). Licensees were required to implement the new requirements no later than January 1994.

This report summarizes information reported for the current year and previous 10 years. More licensee-specific data for the previous 10 years, such as the annual reports submitted by each commercial nuclear 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 nuclear power reactor for the years 1973 through 1982 may be found in a series of reports, Nuclear Power Plant Operating Experience [Refs. 3–11]. 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.

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. 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 may submit requests for their dose records contained in REIRS on this Web site. In addition, organizations that have provided documentation to the NRC may also submit requests for dose records contained in REIRS on this website.

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, in one year, a dose in excess of 10 percent of the applicable limits. For occupational individuals, 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, declared pregnant women, and members of the public. 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 individuals may also be provided with monitoring devices, even though the probability of their exposure to measurable levels of radiation is extremely small.

Pursuant to 10 CFR 20.2206(b), certain categories of licensees must submit an annual report of the results of individual monitoring carried out by the licensee for each individual for whom monitoring was required by Section 20.1502. In addition to this requirement, many licensees elect to report the doses for every individual for whom they provided monitoring. This practice increases the number of individuals that are monitored for radiation exposure. In an effort to account for this increase, the number of individuals reported as having "no measurable dose"[4] is subtracted from the total number of monitored individuals. This resulting number can then be used to calculate the average measurable dose per individual as well as the average dose per monitored individual.

This report contains information reported by NRC 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 seven times as many facilities are licensed and regulated by Agreement States than are licensed and regulated 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 NRC.

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

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. NUREG-2118, "*Occupational Radiation Exposure at Agreement State-Licensed Materials Facilities, 1997-2010*", provides information regarding occupational radiation exposures at Agreement State-licensed facilities. This report can be obtained from the website, www.reirs.com. In addition, this report does not include compilations of non-occupational exposure, such as exposure received by medical patients from X-rays, fluoroscopy, or accelerators.

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 dose 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 commercial nuclear power reactors, since they employ many short-term individuals. Section 5 contains an analysis that adjusts the data for transient 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 monitored throughout the entire year. Many licensees, such as radiography firms and commercial 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 would receive for the full year.

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. See Section 1.1 for the categories of licensees that are required to report to REIRS. A number of licensees are not required to report to REIRS but voluntarily report for convenient recordkeeping or because they have reported in the past and have decided to continue to do so. These licensees are listed in Appendix A, Table A2 – Other Facilities Reporting to the NRC.

Likewise, one should distinguish between the doses attributed to 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.

All dose equivalent values in this report are given in units of rem in accordance with the general provisions for records in 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.

Section 3

ANNUAL PERSONNEL MONITORING REPORTS – 10 CFR 20.2206

3.1 Definition of Terms and Methodologies

3.1.1 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 past 11 years. All commercial nuclear power reactors, 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.

Many companies that conduct industrial radiography and manufacturing and distribution activities are located in and regulated by Agreement States and are, therefore, not required to adopt the reporting requirements of 10 CFR 20.2206. However, industrial radiography and manufacturing and distribution licensees that are licensed and regulated by NRC are required to report occupational exposure to NRC. Appendix A, Table A1 lists all non-reactor licensees that reported occupational data to NRC in 2011.

3.1.2 Number of Monitored Individuals

The number of monitored individuals refers to the total number of individuals that NRC licensees reported as being monitored for exposure to external and/or internal radiation during the year. This number includes all individuals for whom monitoring is required under 10 CFR 20.1502. This number also includes visitors, service representatives, contract individuals, clerical individuals, and any other individuals for whom the licensee determines that monitoring devices should be provided, although monitoring was not required.

The total number of individuals 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. 12].

3.1.3 Number of Individuals with Measurable Dose

The number of individuals with measurable dose includes any individual with a total effective dose equivalent (TEDE) greater than zero rem.

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[5] 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 geolog ic repositories for high-level waste.

Table 3.1
Average Annual Exposure Data for Certain Categories of NRC Licensees
2001–2011

NRC License Category * and Program code	Calendar Year	Number of Licensees Reporting	Number of Monitored Individuals	Number of Individuals with Measurable TEDE	Collec-tive TEDE (person-rem)	Average TEDE (rem)	Average Measur-able TEDE per Individual (rem)
Industrial Radiography	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
03310	2004	113	3,568	3,014	1,603.591	0.45	0.53
03320	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
	2009	64	2,651	2,302	1,317.135	0.50	0.57
	2010	56	2,371	2,030	1,296.291	0.55	0.64
	2011	62	2,533	2,199	1,605.340	0.63	0.73
Manufacturing and Distribution	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
02500	2005	23	2,566	1,557	388.547	0.15	0.25
03211	2006	22	1,256	795	273.028	0.22	0.34
03212	2007	23	2,106	1,463	291.326	0.14	0.20
03214	2008	18	1,934	1,341	222.123	0.11	0.17
	2009	16	1,933	1,386	179.222	0.09	0.13
	2010	17	970	670	146.365	0.15	0.22
	2011	15	901	700	111.748	0.12	0.16
Independent Spent Fuel Storage	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
23100	2005	2	59	30	0.769	0.01	0.03
23200	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	0.06
	2009	2	72	34	1.465	0.02	0.04
	2010	2	73	39	1.337	0.02	0.03
	2011	2	54	25	1.449	0.03	0.06
Fuel Cycle Licenses - Fabrication Processing and Uranium Enrichment and UF_6 Production Plants	2001	10	8,498	4,316	1,286.572	0.15	0.30
	2002	9	8,270	4,209	820.442	0.10	0.19
	2003	9	8,103	3,986	676.082	0.08	0.17
	2004	9	8,060	4,283	657.799	0.08	0.15
	2005	10	8,215	3,839	643.631	0.08	0.17
	2006	10	8,097	4,017	677.025	0.08	0.17
	2007	10	8,402	4,007	588.837	0.07	0.15
11400	2008	10	7,807	3,424	538.201	0.07	0.16
21200	2009	11	8,918	3,738	533.721	0.06	0.14
21210	2010	11	9,362	4,212	541.876	0.06	0.13
	2011	11	9,535	4,361	607.202	0.06	0.14
Commercial Light Water Reactors (LWRs) **	2001	104	140,776	67,570	11,108.552	0.08	0.16
	2002	104	149,512	73,242	12,126.190	0.08	0.17
	2003	104	152,702	74,813	11,955.570	0.08	0.16
	2004	104	150,322	69,849	10,367.897	0.07	0.15
41111	2005	104	160,701	78,127	11,455.807	0.07	0.15
	2006	104	164,823	80,265	11,021.186	0.07	0.14
	2007	104	164,081	79,530	10,120.013	0.06	0.13
	2008	104	169,324	79,450	9,195.940	0.05	0.12
	2009	104	176,381	81,754	10,024.804	0.06	0.12
	2010	104	179,648	75,010	8,631.384	0.05	0.12
	2011	104	191,538	81,321	8,771.326	0.05	0.11
Grand Totals and Averages	2001	274	154,693	76,217	14,859.168	0.10	0.19
	2002	244	162,714	81,412	15,009.959	0.09	0.18
	2003	266	166,347	83,292	14,655.352	0.09	0.18
	2004	255	164,526	78,960	12,977.802	0.08	0.16
	2005	229	174,550	86,176	13,993.329	0.08	0.16
	2006	216	176,623	87,084	13,082.694	0.07	0.15
	2007	213	177,253	87,250	12,317.044	0.07	0.14
	2008	195	182,085	86,823	11,418.269	0.06	0.13
	2009	197	189,955	89,214	12,056.347	0.06	0.14
	2010	190	192,424	81,961	10,617.253	0.06	0.13
	2011	194	204,561	88,606	11,097.065	0.05	0.13

* These categories consist only of NRC licensees required to submit an annual report (see Section 2).
** This category includes all LWRs in commercial operation for a full year for each of the years indicated. Reactor data have not been corrected to account for the multiple counting of transient reactor workers (see Section 5).

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 individuals 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 individuals.

The phrase "collective dose" is used throughout this report to mean the collective TEDE, unless otherwise specified.

Prior to the implementation of the revised dose reporting requirements of 10 CFR 20.2206 in 1994, the collective dose, in some cases, was calculated from the dose distributions by multiplying the number of individuals reported in each of the dose ranges by the midpoint of the corresponding dose range and then summing the products. This assumed that the midpoint of the range was equal to the arithmetic mean of the individual doses in the range. Experience has shown that the actual mean dose of individuals 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 2011 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 committed effective dose equivalent (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 monitored individuals. This figure is usually less than the average measurable dose because it includes the number of those individuals who received zero or less than measurable doses.

3.1.6 Average Measurable Dose

The average measurable dose is obtained by dividing the collective TEDE by the number of individuals with a measurable dose. This is the average most commonly used in this and other reports when examining trends and comparing doses received by individuals in various segments of the nuclear industry.

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 several licensee categories, a large number of individuals receive doses that are less than measurable, and nine individuals exceeded 4 rem in 2011. Ninety-two percent of the reported individuals with measurable doses (shown in Table 3.2) were monitored by commercial nuclear power reactors in 2011, where they received 79% of the total collective dose.

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 62 radiography licensees in 2011. Table 3.3 summarizes the reported data for the two types of industrial radiography licensees for 2009, 2010, and 2011 for comparison purposes.

The average measurable dose for individuals performing radiography at a fixed location ranged from 6% to 11% of the average measurable dose of individuals at temporary job sites over the past three years. This is because it is more difficult for individuals to avoid exposure to radiation at temporary job sites in the field, where conditions are not optimal and may change daily.
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 reducing exposure. Although these licensed activities usually result in average measurable doses that are higher than those received by other licensees, they involve a relatively small number of exposed individuals.

Figure 3.1 shows the number of individuals with measurable dose, the total collective dose, and the average measurable dose per individual for both types of industrial radiography licensees from 1994 through 2011. From 2010 to 2011, there was an 8% increase in the number of individuals with measurable TEDE, a 24% increase in the collective TEDE, and a 14% increase in the average measurable TEDE. As shown in Table 3.3, two additional fixed location and four additional temporary job site radiography licensees reported in 2011.

Table 3.2
Distribution of Annual Collective TEDE by License Category
2011

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 (4)	69	13	5	1	-	-	-	-	-	-	-	-	-	88	19	1.435
Temporary Job Sites (58)	265	464	283	358	275	206	432	120	33	9	-	-	-	2,445	2,180	1,603.905
Total (62)	**334**	**477**	**288**	**359**	**275**	**206**	**432**	**120**	**33**	**9**	**-**	**-**	**-**	**2,533**	**2,199**	**1,605.340**
MANUFACTURING AND DISTRIBUTION																
Type "A" Broad (2)	44	173	91	40	21	20	14	-	-	-	-	-	-	403	359	83.563
Type "B" Broad and Other (1)	14	3	-	-	-	-	1	-	-	-	-	-	-	18	4	1.328
Nuclear Pharmacies (12)	143	280	37	9	3	4	3	1	-	-	-	-	-	480	337	26.857
Total (15)	**201**	**456**	**128**	**49**	**24**	**24**	**18**	**1**	**-**	**-**	**-**	**-**	**-**	**901**	**700**	**111.748**
INDEPENDENT SPENT FUEL STORAGE																
Total (2)	**29**	**19**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**54**	**25**	**1.449**
FUEL CYCLE **																
Total (11)	**5,174**	**2,793**	**802**	**456**	**204**	**61**	**41**	**4**	**-**	**-**	**-**	**-**	**-**	**9,535**	**4,361**	**607.202**
COMMERCIAL POWER REACTORS ***																
Boiling Water (35)	31,604	23,979	8,379	4,058	1,136	411	239	-	-	-	-	-	-	69,806	38,202	4,976.503
Pressurized Water (69)	78,613	31,428	8,272	2,695	539	148	37	-	-	-	-	-	-	121,732	43,119	3,794.823
Total (104)	**110,217**	**55,407**	**16,651**	**6,753**	**1,675**	**559**	**276**	**-**	**-**	**-**	**-**	**-**	**-**	**191,538**	**81,321**	**8,771.326**
GRAND TOTALS	**115,955**	**59,152**	**17,875**	**7,617**	**2,178**	**850**	**767**	**125**	**33**	**9**	**-**	**-**	**-**	**204,561**	**88,606**	**11,097.065**

* 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 2011. 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
Annual Exposure Information for Industrial Radiography Licensees
2009-2011

Year	Type of License	Number of Licensees	Number of Monitored Individuals	Individuals with Measurable Dose	Collective Dose (person-rem)	Average Measurable Dose (rem)
2009	Fixed Location	2	80	45	1.805	0.04
	Temporary Job Sites	62	2,571	2,257	1,315.330	0.58
	Total	**64**	**2,651**	**2,302**	**1,317.135**	**0.57**
2010	Fixed Location	2	84	13	0.496	0.04
	Temporary Job Sites	54	2,287	2,017	1,295.795	0.64
	Total	**56**	**2,371**	**2,030**	**1,296.291**	**0.64**
2011	Fixed Location	4	88	19	1.435	0.08
	Temporary Job Sites	58	2,445	2,180	1,603.905	0.74
	Total	**62**	**2,533**	**2,199**	**1,605.340**	**0.73**

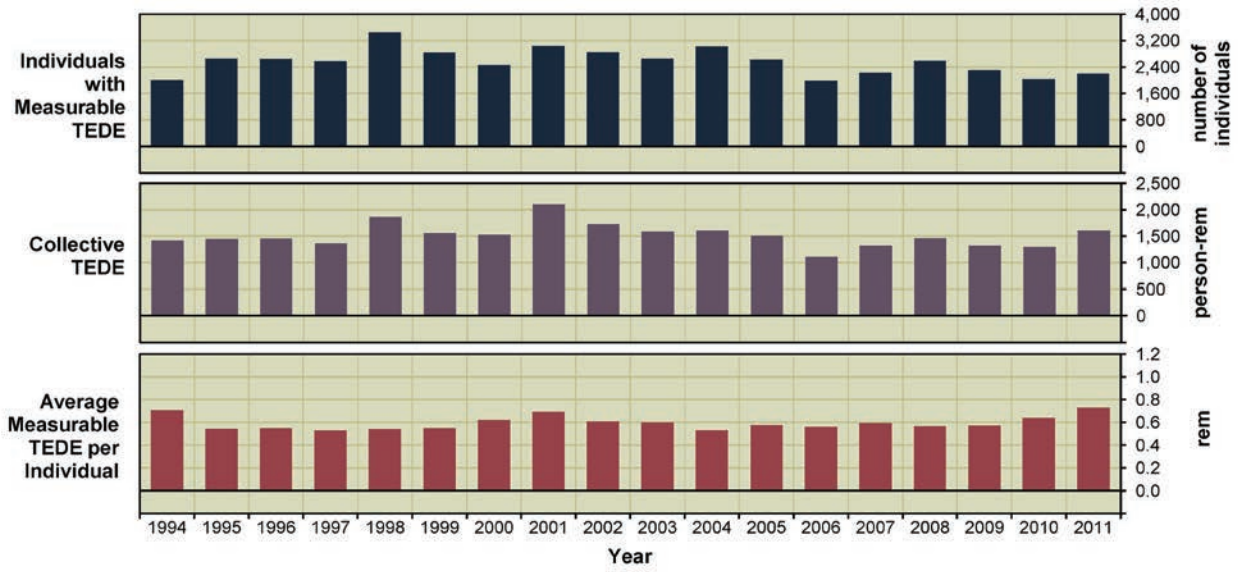


Figure 3.1. Average Annual Values for Industrial Radiography Licensees
1994–2011

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. 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 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 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 3.4 presents the annual data that were reported by the three types of licensees for 2009, 2010, and 2011. It can be seen that the average measurable dose is generally higher for the Type “A” Broad and Type “B” Broad and Other licensees. These licensees can be authorized to handle larger quantities of radioactive materials, which can result in higher average doses during possession and use. Only two Type “A” Broad licensees and one Type “B” Broad and Other licensee reported in 2011.

Table 3.4 and Figure 3.2 show the number of individuals with measurable dose, the total collective dose, and the average measurable dose per individual for Type “A” Broad, Type “B” Broad and Other, and Nuclear Pharmacy licensees. The number of individuals with measurable dose increased by 4% because the Type “A” Broad licensees and the nuclear pharmacies submitted records for more individuals with measurable dose when compared to the 2010 numbers for these two licensee categories. The collective TEDE decreased nearly 24% in 2011. The average measurable dose decreased by 27% from 0.22 rem to 0.16 rem due to the moderate decrease in collective TEDE.

Table 3.4
Annual Exposure Information for Manufacturing and Distribution Licensees
2009–2011

Year	Type of License	Number of Licensees	Number of Monitored Individuals	Individuals with Measurable Dose	Collective Dose (person-rem)	Average Measurable Dose (rem)
2009	M & D - Type "A" Broad	3	738	525	103.094	0.20
	M & D - Type "B" Broad and Other	3	88	44	3.785	0.09
	M & D - Nuclear Pharmacies	10	1,107	817	72.343	0.09
	Total	**16**	**1,933**	**1,386**	**179.222**	**0.13**
2010	M & D - Type "A" Broad	2	386	339	115.733	0.34
	M & D - Type "B" Broad and Other	3	58	17	4.410	0.26
	M & D - Nuclear Pharmacies	12	526	314	26.222	0.08
	Total	**17**	**970**	**670**	**146.365**	**0.22**
2011	M & D - Type "A" Broad	2	403	359	83.563	0.23
	M & D - Type "B" Broad and Other	1	18	4	1.328	0.33
	M & D - Nuclear Pharmacies	12	480	337	26.857	0.08
	Total	**15**	**901**	**700**	**111.748**	**0.16**

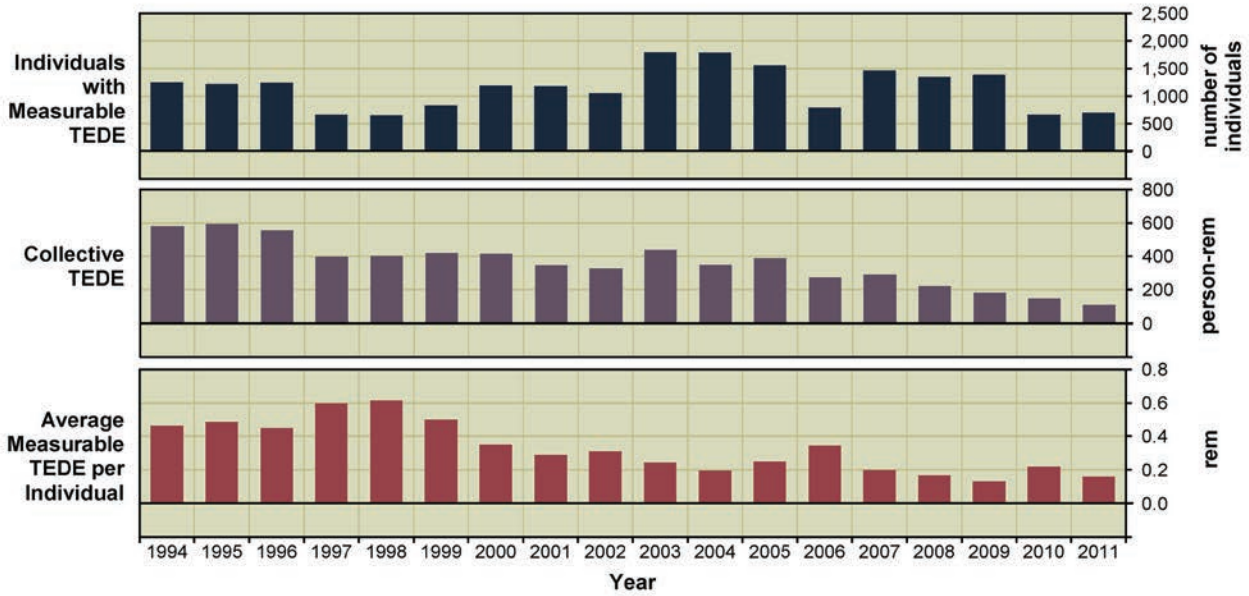


Figure 3.2. Average Annual Values for Manufacturing and Distribution Licensees 1994–2011

The values for Type "A" Broad licensees are attributed to Covidien-Mallinckrodt, Inc. and International Isotopes Idaho, Inc., which accounted for 75% of the collective dose in 2011 for this licensee category.

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

3.3.4 Independent Spent Fuel Storage Installation Licenses

IIndependent spent fuel storage installation (ISFSI) licenses are issued to allow the possession of commercial nuclear power reactor spent fuel and other associated radioactive materials for the purpose of storage. The spent fuel, which has undergone at least 1 year of decay since being used as a source of energy in a commercial nuclear power reactor, is provided interim storage, protection, and safeguarding in ISFSI facilities, pending its final disposal.

The majority of ISFSI facilities are located onsite at commercial nuclear power reactors. The occupational dose information from ISFSI facilities is usually included with the dose information

reported by the commercial nuclear power reactors and is not reported separately to NRC. In 2011, two ISFSI licensees reported dose information to NRC. One is the GE Morris facility located in Illinois and the second is the Trojan ISFSI located in Oregon. The GE Morris facility is the only spent fuel pool that is not located at an existing reactor site. The GE Morris ISFSI license has been renewed by the NRC until 2022. The Trojan commercial nuclear power reactor 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 3.3 shows the number of individuals with measurable dose, the total collective dose, and the average measurable dose per individual for ISFSI facilities. The relatively high values for the collective dose and number of individuals from 1994 to 1996 was mainly because only one licensee reported separately for 1994 through 1998. Table 3.1 shows the number of individuals with measurable dose decreased by 36%, while the collective TEDE increased by 8% from 2010 to 2011. The effect of fewer individuals with measurable dose and a slight increase in collective TEDE caused the average measurable dose to double from 0.03 rem to 0.06 rem.

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 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 commercial nuclear power

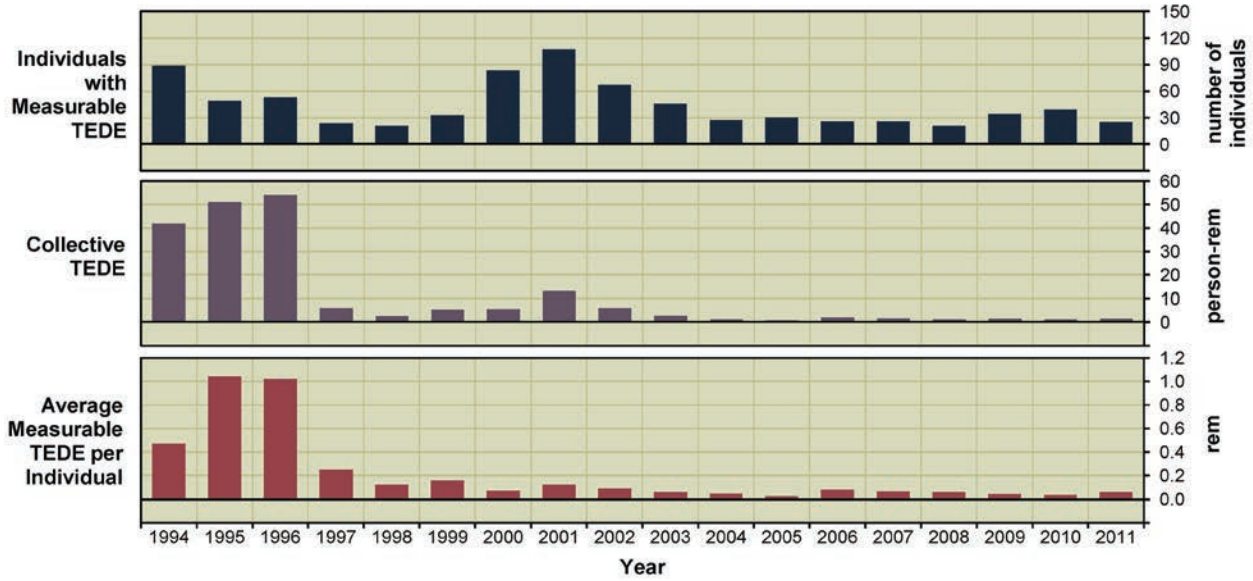


Figure 3.3. Average Annual Values for Independent Spent Fuel Storage Installations 1994–2011

reactors. 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 was added to the NRC's fuel cycle licensee category. In 2005, a third uranium enrichment facility, the Lead Cascade, operated by the United States Enrichment Corporation, Inc., was added to this category. In 2009, Louisiana Energy Services (LES) joined this category as the fourth uranium enrichment facility. It should be noted that LES was performing construction during 2009, 2010, and 2011, and therefore did not significantly contribute to the collective radiation exposure for this licensee category. LES will continue to construct facilities into 2012, and as more operations are brought on-line, it can be expected that exposures at this facility will increase.

For the 2010 report, the decision was made to add Honeywell International, Inc., a uranium hexafluoride (UF_6) production plant, to the analysis of fuel cycle licensees. The data for Honeywell from 2000 through 2011 have been added to the tables and figures in this report. Honeywell has reported under their license for UF_6 production since 1994, but this activity was not included under the fuel cycle category until 2010, so the addition of this licensee does not represent any change other than the inclusion into the fuel cycle category in this report.

Figure 3.4 shows the number of individuals with measurable dose, the total collective dose, and the average measurable dose per individual for fuel cycle licensees. The collective deep dose equivalent (DDE), DDE average measurable dose, collective CEDE, and CEDE average measurable dose are also shown because they are a significant contribution to the TEDE for fuel fabrication facilities.

As shown in Table 3.5, the collective TEDE, DDE, and CEDE each increased by 12%, 22%, and 4%, respectively, from 2010. Table 3.5 shows that there were 11 licensed fuel cycle (fabrication processing, uranium enrichment, and uranium hexafluoride production) facilities reporting in 2011.

3.3.6 Light Water Reactor Licenses

Light water reactor (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, pressurized water reactors (PWRs) and boiling water reactors (BWRs), each of which uses water as the primary coolant.

Table 3.1 shows the number of licensees, number of monitored individuals, number of individuals with measurable dose, total collective dose, and average dose per individual for reactor facilities that were in commercial operation for at least 1 full year for each of the years 2001 through 2011. The values do not include reactors that have been permanently shut down or reactors that have not been in commercial operation for 1 full year. The figures for reactors have not been adjusted for the multiple counting of transient individuals (see Section 5).

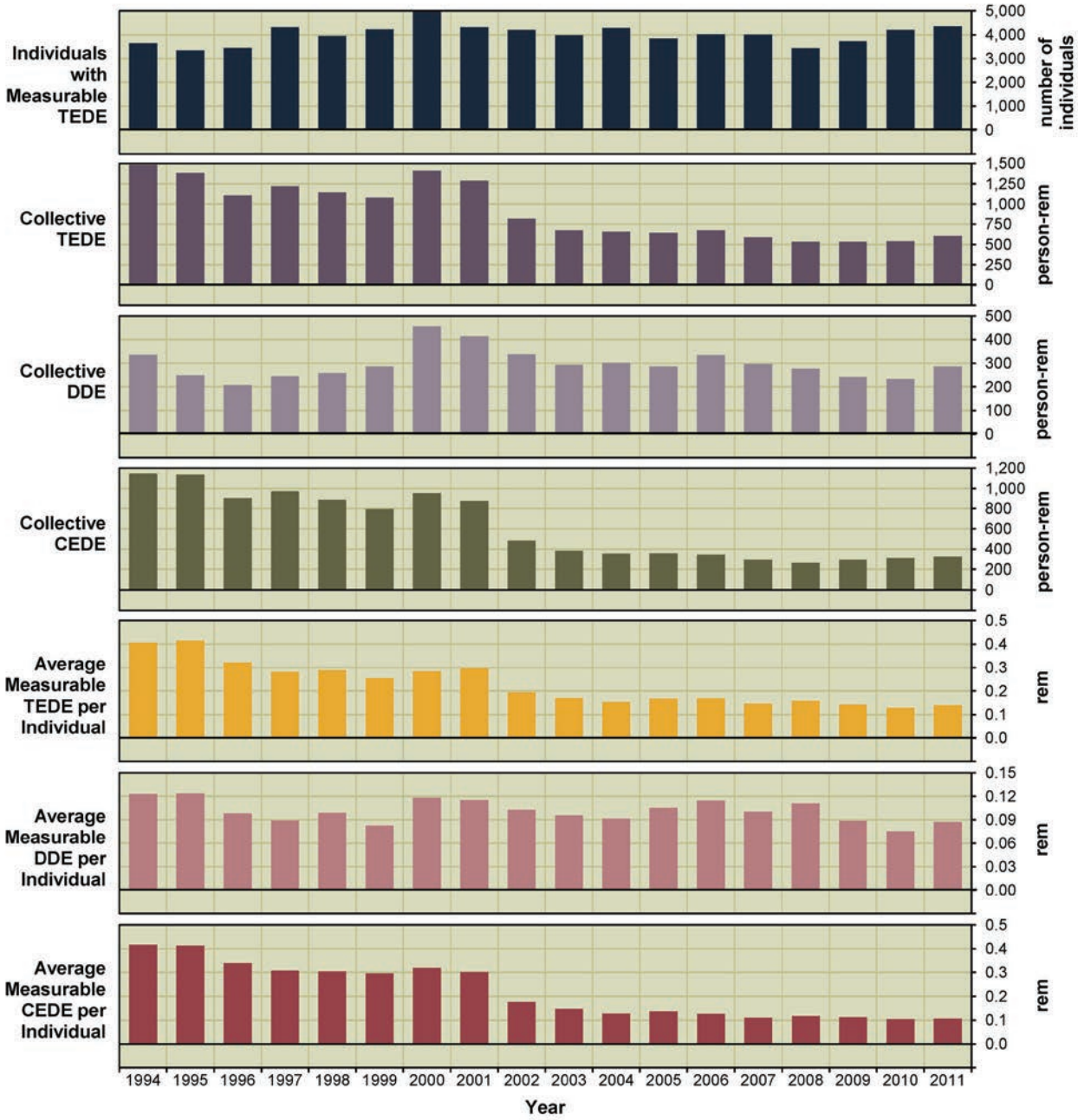


Figure 3.4. Average Annual Values for Fuel Cycle Licensees 1994–2011

Table 3.5
Annual Exposure Information for Fuel Cycle Licensees*
2009–2011

Year	Type of License	Number of Licensees	Number of Monitored Individuals	Individuals with Meas. TEDE	Collective TEDE (person-rem)	Average Meas. TEDE (rem)	Individuals with Meas. DDE	Collective DDE (person-rem)	Average Meas. DDE (rem)	Individuals with Meas. CEDE	Collective CEDE (person-rem)	Average Meas. CEDE (rem)
2009	Fuel Cycle	11	8,918	3,738	533.721	0.14	2,737	242.583	0.09	2,598	291.138	0.11
2010	Fuel Cycle	11	9,362	4,212	541.876	0.13	3,129	234.721	0.08	2,966	307.151	0.10
2011	Fuel Cycle	11	9,535	4,361	607.202	0.14	3,282	286.500	0.09	3,022	320.700	0.11

* All data for this table include program code 11400 for UF_6 Production Plants that have not been included in previous years for this table.

The reported dose distribution of individuals monitored at each plant site for the year 2011 is presented in alphabetical order by plant name in Appendix B. More detailed presentations and analyses of the annual dose information reported by commercial nuclear power reactors can be found in Sections 4 and 5.

3.3.7 Other Facilities Reporting to NRC

Appendix A, Table A2 contains additional facilities that reported occupational radiation dose reports to NRC in 2011. These facilities are not among the seven categories of licensees required to report under 10 CFR 20.2206 and are not included in the analysis presented in this report. However, these facilities may be of interest to researchers and are included in this report for completeness.

3.4 Summary of Intake Data by Licensee Category

For each intake recorded, licensees are required 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, its equivalent paper document or an electronic format containing this information, is required to be completed and submitted to NRC under 10 CFR 20.2206. Tables 3.6 and 3.7 summarize the intake data reported to NRC during 2011. The data are categorized by licensee type and are listed in order of radionuclide and pulmonary clearance class or pulmonary solubility type. Table 3.6 lists the intakes where the mode of intake into the body was recorded as ingestion or other. These other modes of intake can include absorption through the skin and injection through a puncture or wound.

Table 3.7 lists the intakes where the mode of intake was inhalation from ambient airborne radioactive material in the workplace. The pulmonary clearance class or pulmonary solubility type is recorded as D, W, Y (days, weeks, years) or F, M, S (fast, medium, slow), respectively, 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 the nomenclature in International Commission on Radiological Protection (ICRP) Publication 30 (D, W, Y) [Ref. 13], which is described in 10 CFR Part 20 or ICRP Publication 68 (F, M, S) [Ref. 14]. Licensees that use the methodology described in ICRP Publication 30 utilize D, W, and Y pulmonary classes to determine dose. Licensees that use the methodology described in ICRP Publication 68 utilize F, M, and S pulmonary solubility types to determine dose. The amount of material taken into the body is given in microcuries, a unit of measure of the quantity of radioactive material. For each licensee category, the maximum number of intake records and the maximum intake are highlighted in the table in bold and boxed for ease of reference.

Table 3.8 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 and the UF_6 production facility had the majority of internal dose (99%) in 2011 and the highest average CEDE per individual. This is due to the individuals' exposures to uranium during the processing and fabrication of the uranium fuel.

Table 3.9 shows the distribution of internal dose (CEDE) from 1994 to 2011 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. In 2011, both the collective CEDE and the number of individuals with measurable CEDE have increased. The majority of the increase in collective CEDE in the past 3 years is due to increases in collective CEDE at the Honeywell UF_6 production facility.

Table 3.6
Intake by Licensee Category and Radionuclide Mode of Intake—Ingestion and Other
2011

Mode	Licensee Category	Program Code	Radionuclide	Number of Intake Records	Collective Intake in Microcuries (sci. notation)
Ingestion	Manufacturing and Distribution	03211	MO-99	**1**	1.90E-06
		03211	TC-99M	**1**	**2.96E-06**
	Nuclear Power Reactor	41111	AM-241	1	9.96E-05
		41111	CM-244	1	8.19E-05
		41111	CO-60	**2**	**6.06E+00**
		41111	NB-95	1	2.23E-02
		41111	PU-238	1	5.33E-05
		41111	PU-239	1	4.84E-05
		41111	PU-241	1	2.27E-03
		41111	ZR-95	1	2.22E-02

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

Table 3.7
Intake by Licensee Category and Radionuclide Mode of Intake—Inhalation
2011

Licensee Category	Program Code	Radionuclide	Pulmonary Clearance Class or Solubility Type	Number of Intake Records *	Collective Intake in Microcuries (sci. notation)
Nuclear Pharmacies	02500	I-131	D	5	4.21E-01
	02500	I-131	W	**49**	**2.27E+01**
Manufacturing and Distribution	03211	I-131	D	**2**	**1.97E+00**
Uranium Hexafluoride (UF_6) Production Plants	11400	AC-227	D	56	5.80E-05
	11400	AC-227	Y	192	2.24E-04
	11400	PA-231	D	56	5.80E-05
	11400	PA-231	Y	192	2.24E-04
	11400	PB-210	D	32	3.20E-05
	11400	PB-210	Y	131	1.49E-04
	11400	PO-210	D	19	1.90E-05
	11400	PO-210	Y	101	1.11E-04
	11400	RA-226	D	214	2.51E-04
	11400	RA-226	Y	446	6.80E-04
	11400	RA-228	D	18	1.80E-05
	11400	RA-228	Y	92	9.90E-05
	11400	TH-228	D	18	1.80E-05
	11400	TH-228	Y	92	9.90E-05
	11400	TH-230	D	917	3.57E-03
	11400	TH-230	Y	1,011	7.60E-03
	11400	TH-232	D	18	1.80E-05
	11400	TH-232	Y	92	9.90E-05
	11400	U-234	D	1,065	3.30E-01
	11400	U-234	Y	**1,066**	**7.02E-01**
	11400	U-235	D	1,042	1.54E-02
	11400	U-235	Y	1,062	3.28E-02
	11400	U-238	D	1,064	2.75E-01
	11400	U-238	Y	**1,066**	5.85E-01
Uranium Enrichment	21200	U-234	D	**14**	**1.90E-02**
	21200	U-235	D	2	2.30E-03
	21200	U-238	D	2	2.42E-03
Fuel Fabrication	21210	AM-241	M	39	7.49E-05
	21210	CO-60	Y	14	9.06E-02
	21210	PU-239	M	64	6.38E-04
	21210	RA-224	M	11	1.54E-05
	21210	RN-220	D	116	**1.04E+02**
	21210	SR-90	D	143	2.78E-02
	21210	SR-90	S	186	1.36E+00
	21210	TH-228	M	58	9.16E-05
	21210	TH-232	M	12	2.31E-05
	21210	TH-232	S	3	1.68E-05
	21210	U-232	Y	130	2.77E-05
	21210	U-234	D	301	2.07E-01
	21210	U-234	F	523	6.47E-02
	21210	U-234	M	504	7.93E-03
	21210	U-234	S	**1,617**	2.25E+00
	21210	U-234	W	72	5.48E-02
	21210	U-234	Y	970	2.47E+00
	21210	U-235	D	126	5.96E-03
	21210	U-235	M	3	5.60E-07
	21210	U-235	S	379	6.84E-02

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 3.7
Intake by Licensee Category and Radionuclide Mode of Intake—Inhalation (continued)
2011

Licensee Category	Program Code	Radionuclide	Pulmonary Clearance Class or Solubility Type	Number of Intake Records *	Collective Intake in Microcuries (sci. notation)
Fuel Fabrication (continued)	21210	U-235	W	72	2.04E-03
	21210	U-235	Y	290	6.43E-02
	21210	U-236	D	126	2.51E-04
	21210	U-236	F	451	4.65E-03
	21210	U-236	M	3	7.02E-06
	21210	U-236	S	158	3.00E-03
	21210	U-236	W	72	8.46E-05
	21210	U-236	Y	290	2.11E-02
	21210	U-238	D	157	2.39E-02
	21210	U-238	F	21	1.49E-07
	21210	U-238	M	430	5.18E-03
	21210	U-238	S	380	2.41E-01
	21210	U-238	W	72	7.50E-03
	21210	U-238	Y	970	3.50E-01
Commercial Light Water Reactors	41111	AM-241	W	2	6.12E-05
	41111	CM-243	W	2	3.47E-05
	41111	CM-244	W	2	3.47E-05
	41111	CO-58	Y	4	1.82E-01
	41111	CO-60	Y	**22**	4.81E+01
	41111	CR-51	Y	1	9.10E-02
	41111	CS-137	D	4	4.50E-02
	41111	H-3**	W	9	**2.16E+03**
	41111	H-3**	Y	2	4.50E+02
	41111	I-131	D	2	3.68E-01
	41111	MN-54	W	2	2.09E-01
	41111	NB-95	Y	2	3.01E-02
	41111	PU-238	W	2	5.53E-05
	41111	PU-239	W	2	2.37E-05
	41111	PU-240	W	2	2.37E-05
	41111	PU-241	W	2	5.02E-04
	41111	SR-90	Y	2	2.49E-04
	41111	Y-90	Y	2	2.49E-04
	41111	ZR-95	Y	1	2.00E-02

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.
** Additional information on tritium can be found on NRC's public website at http://www.nrc.gov/reactors/operating/ops-experience/tritium/faqs.html

Table 3.8
Collective and Average CEDE by Licensee Category
2011

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	**36**	0.458	0.013
02500	GE HEALTHCARE - KENTWOOD	21-26707-01MD	3	0.003	0.001
02500	MEDI-PHYSICS, INC. DBA GE HEALTHCARE	24-32462-01MD	3	0.009	0.003
02500	SCELA, INC.	11-27664-01MD	2	0.003	0.002
02500	SYNCOR INTERNATIONAL CORP.	04-26507-01MD	3	0.107	0.036
03211	COVIDIEN	24-04206-01	1	**0.675**	**0.675**
03211	INTERNATIONAL ISOTOPES IDAHO, INC.	11-27680-01	2	0.049	0.025
	Totals and Averages		**50**	**1.304**	**0.026**
UF_6 PRODUCTION					
11400	HONEYWELL INTERNATIONAL, INC.	SUB-0526	**1,064**	**173.406**	**0.163**
	Totals and Averages		**1,064**	**173.406**	**0.163**
URANIUM ENRICHMENT					
21200	LOUISIANA ENERGY SERVICES, LLC	SNM-2010	2	**0.406**	**0.203**
21200	U. S. ENRICHMENT CORP. - PADUCAH	GDP-1	**5**	0.019	0.004
	Totals and Averages		**7**	**0.425**	**0.061**
FUEL FABRICATION					
21210	AREVA NP, INC. - LYNCHBURG	SNM-1168	27	0.385	0.014
21210	AREVA NP, INC. - RICHLAND	SNM-1227	251	**53.264**	**0.212**
21210	B & W NUCLEAR OPERATIONS GROUP	SNM-0042	178	7.193	0.040
21210	GLOBAL NUCLEAR FUEL - AMERICAS, LLC	SNM-1097	519	28.940	0.056
21210	NUCLEAR FUEL SERVICES, INC.	SNM-0124	**645**	6.183	0.010
21210	WESTINGHOUSE ELECTRIC COMPANY, LLC	SNM-1107	331	50.935	0.154
	Totals and Averages		**1,951**	**146.900**	**0.075**
COMMERCIAL LIGHT WATER REACTORS					
41111	ARKANSAS	DPR-51	2	0.034	0.017
41111	BRAIDWOOD	NPF-72	9	**0.141**	0.016
41111	BROWNS FERRY	DPR-33	**51**	0.096	0.002
41111	COMANCHE PEAK	NPF-87	2	0.022	0.011
41111	COOPER STATION	DPR-46	1	0.011	0.011
41111	FARLEY	NPF-02	2	0. 029	0.015
41111	FT CALHOUN	DPR-40	2	0.104	**0.052**
41111	MILLSTONE	NPF-49	1	0.003	0.003
41111	MONTICELLO	DPR-22	3	0.026	0.009
41111	PILGRIM	DPR-35	1	0.014	0.014
41111	RIVER BEND	NPF-47	12	0.076	0.006
41111	WOLF CREEK	NPF-42	4	0.015	0.004
41111	ZION	DPR-39	1	0.009	0.009
	Totals and Averages		91	0.580	0.006
Grand Totals and Averages			**3,163**	**322.615**	**0.102**

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

Table 3.9
Internal Dose (CEDE) Distribution
1994–2011

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	683	237	141	293	69	2	-	5,714	1170.453	0.205
1995	2,869	691	338	730	254	147	290	49	2	-	5,370	1167.105	0.217
1996	3,096	598	305	584	324	138	187	22	2	2	5,258	931.799	0.177
1997	3,835	869	381	827	267	148	169	30	-	-	6,526	998.406	0.153
1998	3,310	932	426	746	246	140	153	21	2	-	5,976	922.935	0.154
1999	3,423	752	466	438	206	117	173	29	-	-	5,604	813.605	0.145
2000	3,275	1,001	570	383	216	98	224	58	7	1	5,833	988.640	0.169
2001	1,774	827	716	364	128	53	146	82	15	1	4,106	884.134	0.215
2002	1,760	746	647	531	144	33	23	3	-	-	3,887	494.821	0.127
2003	2,208	778	726	388	116	17	5	-	-	-	4,238	395.573	0.093
2004	1,989	838	657	381	105	17	3	-	-	-	3,990	375.021	0.094
2005	1,205	706	685	341	98	33	2	-	-	-	3,070	365.258	0.119
2006	1,302	726	686	346	96	18	3	-	-	-	3,177	346.918	0.109
2007	1,480	805	646	310	52	5	3	-	-	-	3,301	300.863	0.091
2008	979	758	526	303	41	8	4	-	-	-	2,619	267.510	0.102
2009	1,115	711	597	229	80	21	7	-	-	-	2,760	293.251	0.106
2010	1,216	884	669	210	67	30	6	-	-	-	3,082	308.332	0.100
2011	1,243	916	628	270	72	19	14	1	-	-	3,163	322.615	0.102

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

Section 4
COMMERCIAL LIGHT WATER REACTORS

4.1 Introduction

General trends in occupational radiation exposures at commercial 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 are the number of BWRs, PWRs, and LWRs that were in commercial operation during the year listed. This is the number of reactors on which the average number of individuals with measurable dose and average collective dose per reactor is based. Excluded are reactors that had not yet completed a first full year of commercial operation and those reactors that have been permanently defueled. The date that each reactor was declared to be in commercial operation was taken from Licensed Operating Reactors, Status Summary Report [Ref. 15].

Three Mile Island (TMI) Unit 2 was included in the compilation of data for commercially operating reactors from 1975 through 1988 and has not been included in the data analyses since 1988. Three Mile Island Unit 1 and TMI Unit 2 reported data separately beginning in 1986, but since 2001, the dose breakdowns for TMI Unit 2 have been reported with those for TMI Unit 1, as there is very little dose from activities at TMI Unit 2.

There were no changes to the count of operating reactors in 2011. The number of operating BWRs remains the same as in 2010 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. 15.

Table 4.1
Summary of Information Reported by Commercial Boiling Water Reactors
1994–2011

Year	Number of Reactors Included*	No. of Individuals with Measurable Dose**	Annual Collective Dose (person-rem)	Average Measurable Dose per Individual (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Individuals with Measurable Doses per Reactor**	Electricity Generated*** (MW-yr)	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
1994	37	39,171	12,098	0.31	327	1,059	22,139.0	0.55	598	801	75%
1995	37	35,686	9,471	0.27	256	964	24,737.0	0.38	669	835	80%
1996	37	37,792	9,466	0.25	256	1,021	24,322.2	0.39	657	838	78%
1997	37	34,021	7,603	0.22	205	919	22,866.1	0.33	618	845	73%
1998	36	32,899	6,829.296	0.21	190	914	23,781.2	0.29	661	874	76%
1999	35	31,482	6,434.430	0.20	184	899	26,962.6	0.24	770	885	87%
2000	35	31,186	6,089.676	0.20	174	891	28,476.9	0.21	814	893	91%
2001	35	28,797	4,835.397	0.17	138	823	28,730.4	0.17	821	895	92%
2002	35	30,978	6,107.767	0.20	175	885	29,460.0	0.21	842	907	93%
2003	35	30,759	5,659.434	0.18	162	879	29,094.4	0.19	831	912	91%
2004	35	33,948	5,450.982	0.16	156	970	29,424.8	0.19	841	893	94%
2005	35	33,544	5,995.975	0.18	171	958	29,386.8	0.20	840	946	89%
2006	35	34,159	4,989.761	0.15	143	976	30,238.4	0.17	864	954	91%
2007	35	37,515	5,388.416	0.14	154	1,072	30,189.3	0.18	863	955	90%
2008	35	34,642	4,522.413	0.13	129	990	31,248.3	0.14	893	957	93%
2009	35	36,207	5,282.869	0.15	151	1,034	30,762.7	0.17	879	959	92%
2010	35	37,214	4,807.656	0.13	137	1,063	31,274.6	0.15	894	961	93%
2011	35	38,202	4,976.503	0.13	142	1,091	30,549.7	0.16	873	937	93%

* Includes only those reactors that had been in commercial operation for at least 1 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).
*** Beginning in 1997, the electricity reflects the net electricty generated.

Table 4.2
Summary of Information Reported by Commercial Pressurized Water Reactors
1994–2011

Year	Number of Reactors Included*	No. of Individuals with Measurable Dose**	Annual Collective Dose (person-rem)	Average Measurable Dose per Individual (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Individuals with Measurable Doses per Reactor**	Electricity Generated*** (MW-yr)	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
1994	70	44,283	9,574	0.22	137	633	52,397.6	0.18	749	928	81%
1995	70	49,985	11,762	0.24	168	714	54,138.2	0.22	773	929	83%
1996	72	46,852	9,417	0.20	131	651	55,337.8	0.17	769	935	82%
1997	72	50,690	9,546	0.19	133	704	48,985.3	0.19	680	943	72%
1998	69	38,586	6,358.096	0.16	92	559	53,288.7	0.12	772	942	82%
1999	69	43,938	7,231.281	0.16	105	637	56,235.0	0.13	815	942	87%
2000	69	42,922	6,562.006	0.15	95	622	57,529.9	0.11	834	943	88%
2001	69	38,773	6,273.155	0.16	91	562	58,822.4	0.11	852	946	90%
2002	69	42,264	6,018.423	0.14	87	613	59,369.7	0.10	860	947	91%
2003	69	44,054	6,296.136	0.14	91	638	57,920.6	0.11	839	949	88%
2004	69	35,901	4,916.915	0.14	71	520	60,398.7	0.08	875	943	93%
2005	69	44,583	5,459.832	0.12	79	646	59,790.9	0.09	867	955	91%
2006	69	46,106	6,031.425	0.13	87	668	59,751.3	0.10	866	960	90%
2007	69	42,015	4,731.597	0.11	69	609	61,955.6	0.08	898	961	93%
2008	69	44,808	4,673.527	0.10	68	649	60,586.0	0.08	878	964	91%
2009	69	45,547	4,741.935	0.10	69	660	60,467.9	0.08	876	966	91%
2010	69	37,796	3,823.728	0.10	55	548	60,859.4	0.06	882	967	91%
2011	69	43,119	3,794.823	0.09	55	625	59,682.5	0.06	865	937	92%

* Includes only those reactors that had been in commercial operation for at least 1 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).
*** Beginning in 1997, the electricity reflects the net electricty generated.

Table 4.3
Summary of Information Reported by Commercial Light Water Reactors
1994–2011

Year	Number of Reactors Included*	No. of Individuals with Measurable Dose**	Annual Collective Dose (person-rem)	Average Measurable Dose per Individual (rem)**	Average Collective Dose per Reactor (person-rem)	Average No. Individuals with Measurable Doses per Reactor**	Electricity Generated*** (MW-yr)	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
1994	107	83,454	21,672	0.26	203	780	74,536.6	0.29	697	884	79%
1995	107	85,671	21,233	0.25	198	801	78,875.2	0.27	737	896	82%
1996	109	84,644	18,883	0.22	173	777	79,660.0	0.24	731	902	81%
1997	109	84,711	17,149	0.20	157	777	71,851.4	0.24	659	910	72%
1998	105	71,485	13,187.392	0.18	126	681	77,069.9	0.17	734	918	80%
1999	104	75,420	13,665.711	0.18	131	725	83,197.6	0.16	800	923	87%
2000	104	74,108	12,651.682	0.17	122	713	86,006.8	0.15	827	926	89%
2001	104	67,570	11,108.552	0.16	107	650	87,552.8	0.13	842	929	91%
2002	104	73,242	12,126.190	0.17	117	704	88,829.7	0.14	854	934	91%
2003	104	74,813	11,955.570	0.16	115	719	87,015.0	0.14	837	936	89%
2004	104	69,849	10,367.897	0.15	100	672	89,823.5	0.12	864	926	93%
2005	104	78,127	11,455.807	0.15	110	751	89,177.7	0.13	857	952	90%
2006	104	80,265	11,021.186	0.14	106	772	89,989.7	0.12	865	958	90%
2007	104	79,530	10,120.013	0.13	97	765	92,144.9	0.11	886	959	92%
2008	104	79,450	9,195.940	0.12	88	764	91,834.3	0.10	883	961	92%
2009	104	81,754	10,024.804	0.12	96	786	91,230.6	0.11	877	964	91%
2010	104	75,010	8,631.384	0.12	83	721	92,134.0	0.09	886	965	92%
2011	104	81,321	8,771.326	0.11	84	782	90,232.2	0.10	868	967	90%

* Includes only those reactors that had been in commercial operation for at least 1 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).
*** Beginning in 1997, the electricity reflects the net electricty generated.

For the years 1973 to 1996, the electricity generated is the gross electricity output of the reactor. For 1997 to 2011, the number reflects the net electricity produced, which is the gross electricity minus the amount the plant used for operations. This change is the result of a change in NRC power generation reporting requirements. The electricity generated (in megawatt-year [MW-yr]) that is presented in Tables 4.1, 4.2, and 4.3 is the summation of electricity 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, in 2011, there was a 2% decrease in the net electricity generated at LWRs. Thirty-eight reactor sites decreased power production and 27 increased power production from 2010 to 2011. From 2010 to 2011, Columbia Generating Station, a BWR, had the largest decrease in power production because this plant was in a refueling outage for 6 months. Fort Calhoun had the largest decrease in power production at a PWR, also due to a refueling outage. From 2010 to 2011, Robinson and San Onofre, both PWRs, had the largest increases in power production. These plants had long refueling outages in 2010, and San Onofre also underwent a steam generator replacement in 2010. Both sites returned to full power operation in 2011.

4.2.3 Collective Dose per Megawatt-Year

The number of megawatt-years of electricity generated was used in determining the ratio of the average value of the annual collective dose (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 individuals at commercial nuclear power reactors 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 2011, the number reflects the net electricity produced. The ratio of collective dose to the number of MW-yr is calculated by year for BWRs, PWRs, and LWRs, and 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 increased to a value of 0.10 rem/MW-yr in 2011 from a value of 0.09 rem/MW-yr in 2010 due to the combination of a 2% increase in the collective dose and a 2% 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 megawatts electric [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. 15.

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.

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 decreased to 90% in 2011 from 92% in 2010. This decrease in capacity was due to a 32% increase in refueling outage hours and equipment outages in 2011, reducing the number of hours of power generation.

4.3 Annual TEDE Distributions

Table 4.4 summarizes the distribution of the annual TEDE doses received by individuals at all commercial LWRs during each of the years 1994 through 2011. 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 2011 is shown in Appendix B. Table 4.4 includes only those reactors in operation for 1 full year for each year presented in the table. In 2011, the total collective dose increased by 2% to a value of 8,771 person-rem.

Each year, this report identifies the reactors with the largest increases and decreases in collective dose from the previous year and identifies the main reasons for these changes. The changes generally are driven by whether the sites had an increase or decrease in outages from one year to the next. During an outage, more work is performed by individuals in radiation areas, thereby resulting in increased collective dose. This is particularly true during a refueling outage, which entails the opening of the reactor vessel and transferring spent fuel to a storage area. In addition, the sites usually schedule maintenance and inspections during a refueling outage, which also tends to increase collective dose. If a site does not have a refueling outage during a year, the collective dose tends to be lower.

From 2010 to 2011, Davis-Besse was the PWR that had the largest decrease in collective dose. In 2010, Davis-Besse had over 2,900 hours of outage time for an extended refueling outage, resulting in a collective dose of 464.095 person-rem. In 2011, Davis-Besse had very little outage time (outage hours decreased by 40%), resulting in a collective dose of 73.36 person-rem. Byron was the PWR with the largest increase in collective dose from 2010 to 2011. In 2010, Byron had very little outage time, resulting in a collective dose of 56.425 person-rem. In 2011, Bryon had more than 1,500 hours of outage time for refueling at both units, resulting in a collective dose of 244.104 person-rem.

Table 4.4
Summary Distribution of Annual Doses* at Commercial Light Water Reactors**
1994–2011

Year	Number of Individuals with Annual Doses* in the Ranges (rem) ***																	Total Number Monitored	Number with Measurable Exposure	Collective Dose (person-rem)
	No Measurable Exposure	Mesurable <0.1	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.0	1.0-2.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	6.0-7.0	7.0-8.0	8.0-9.0	9.0-10.0	10.0-12.0	>12			
1994	85,145	36,528	18,633	14,246	6,800	3,502	3,323	215	6	-	-	-	-	-	-	-	-	168,398	83,253	21,534.000
1995	81,032	38,575	20,245	15,279	6,884	3,336	3,077	125	5	-	-	-	-	-	-	-	-	168,558	87,526	21,674.000
1996	78,197	39,426	19,955	14,201	5,809	2,648	2,342	68	-	-	-	-	-	-	-	-	-	162,646	84,449	18,874.000
1997	80,163	41,759	19,951	13,396	5,394	2,240	1,671	59	3	-	-	-	-	-	-	-	-	164,636	84,473	17,136.000
1998	77,080	37,039	17,189	10,467	3,930	1,562	1,129	35	-	-	-	-	-	-	-	-	-	148,431	71,351	13,169.366
1999	74,867	39,663	18,063	10,964	3,994	1,569	1,141	24	2	-	-	-	-	-	-	-	-	150,287	75,420	13,665.711
2000	73,793	40,301	17,598	10,310	3,525	1,375	976	23	-	-	-	-	-	-	-	-	-	147,901	74,108	12,651.682
2001	73,206	37,461	16,078	9,231	2,930	1,060	747	63	-	-	-	-	-	-	-	-	-	140,776	67,570	11,108.552
2002	76,270	41,588	16,752	9,426	3,121	1,245	1,003	105	2	-	-	-	-	-	-	-	-	149,512	73,242	12,126.190
2003	77,889	42,720	17,231	9,589	3,139	1,233	864	37	-	-	-	-	-	-	-	-	-	152,702	74,813	11,955.570
2004	80,473	41,583	15,626	8,245	2,733	978	668	16	-	-	-	-	-	-	-	-	-	150,322	69,849	10,367.897
2005	82,574	46,444	17,754	9,191	2,934	1,104	683	17	-	-	-	-	-	-	-	-	-	160,701	78,127	11,455.807
2006	84,558	48,571	18,269	9,312	2,675	904	532	2	-	-	-	-	-	-	-	-	-	164,823	80,265	11,021.186
2007	84,551	49,998	17,672	8,294	2,329	824	402	11	-	-	-	-	-	-	-	-	-	164,081	79,530	10,120.013
2008	89,874	51,831	17,337	7,578	1,847	583	269	5	-	-	-	-	-	-	-	-	-	169,324	79,450	9,195.940
2009	94,627	52,670	17,417	8,352	2,161	741	413	-	-	-	-	-	-	-	-	-	-	176,381	81,754	10,024.804
2010	104,638	49,571	16,042	6,656	1,801	602	333	5	-	-	-	-	-	-	-	-	-	179,648	75,010	8,631.384
2011	110,217	55,407	16,651	6,753	1,675	559	276	-	-	-	-	-	-	-	-	-	-	191,538	81,321	8,771.326

* These doses are annual TEDE doses.
** 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 not 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.

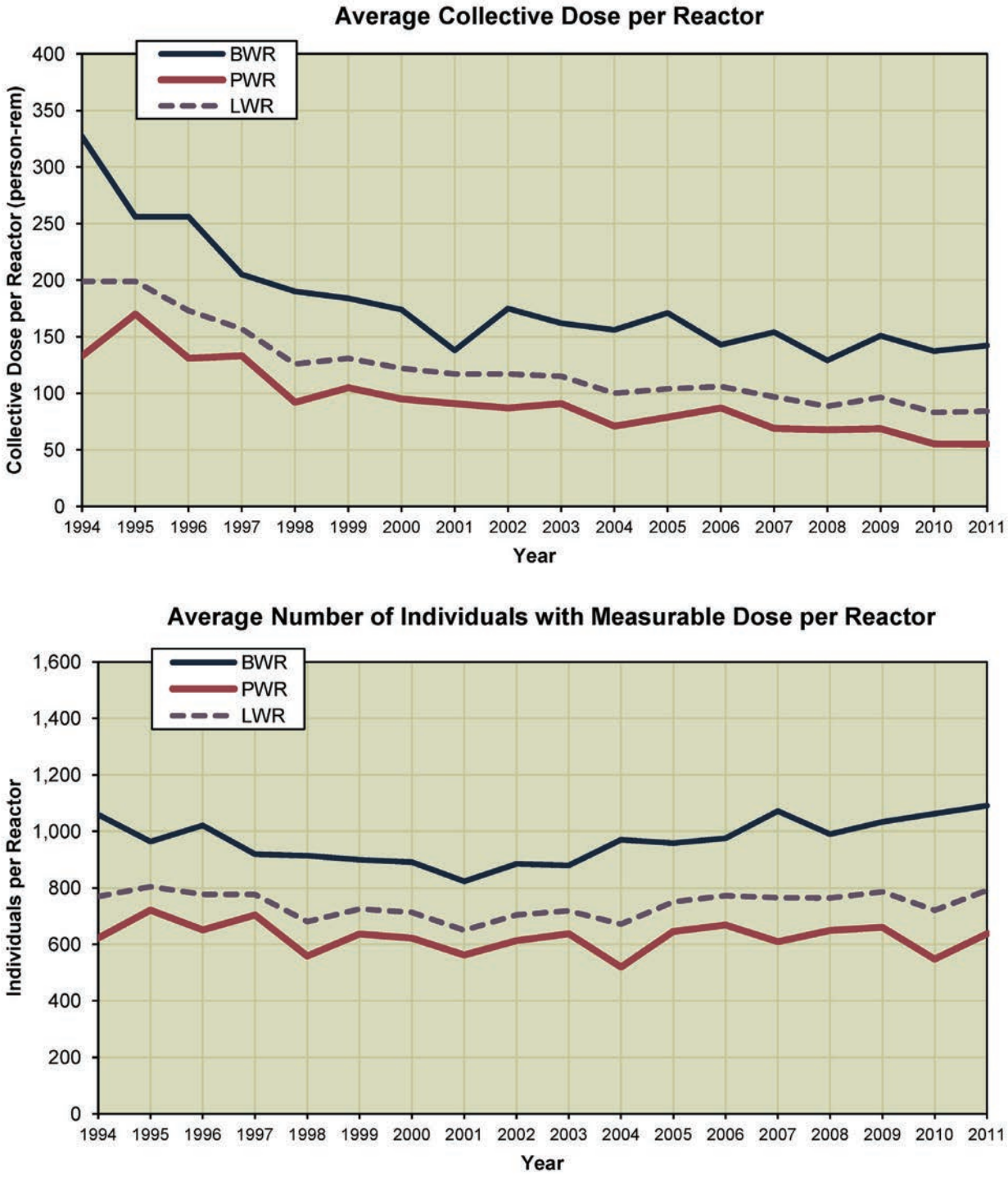


Figure 4.1. Average Collective Dose per Reactor and Average Number of Individuals with Measurable Dose per Reactor 1994–2011

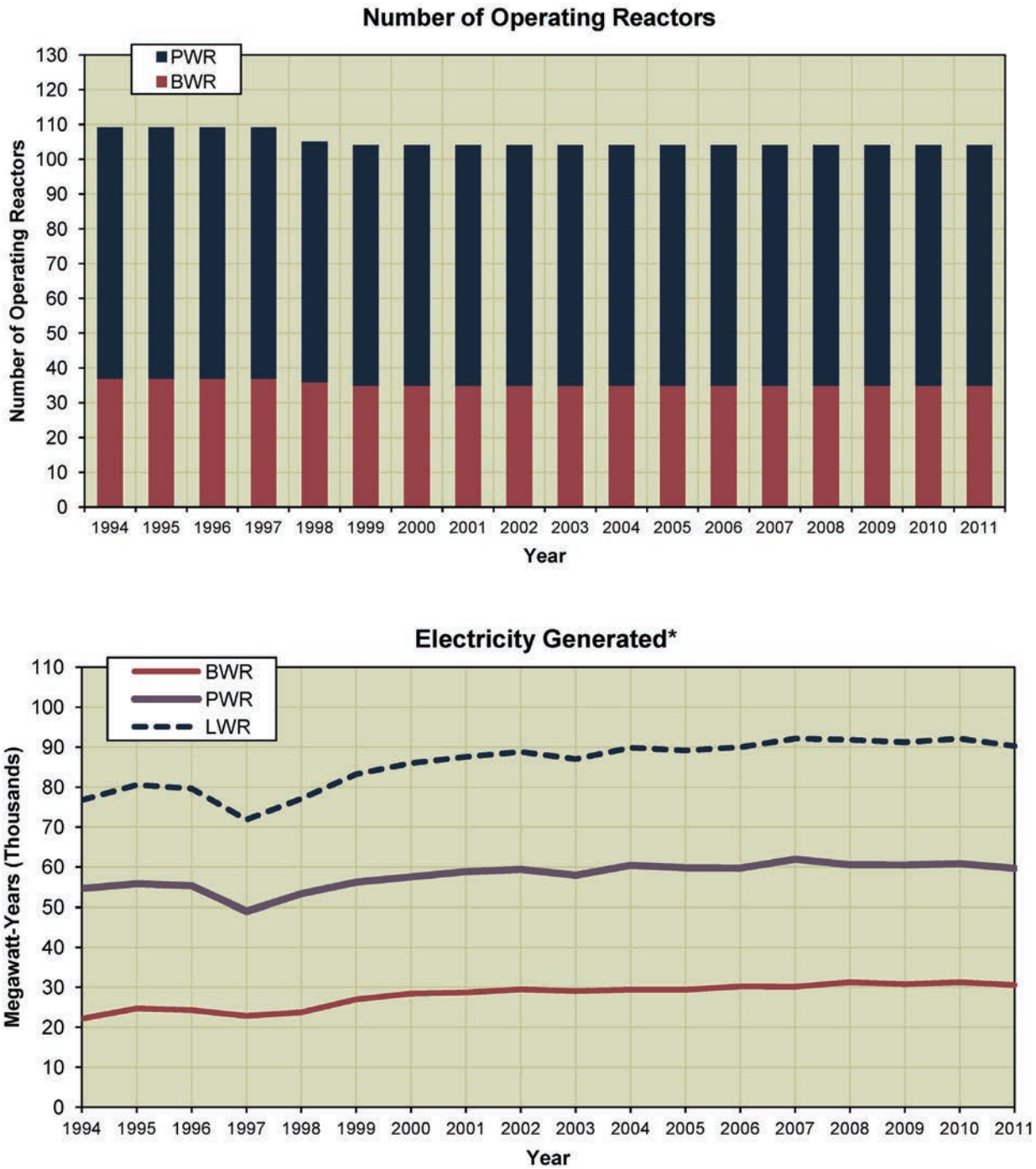
From 2010 to 2011, Browns Ferry was the 3-unit BWR that had the largest decrease in collective dose. In 2010, two of the three Browns Ferry units refueled and there were several maintenance issues, resulting in a 3-unit collective dose of 556.749 person-rem. In 2011, all three Browns Ferry units were shut down for nearly a month due to transmission line damage caused by a tornado. These repairs did not involve activities that resulted in radiation exposure. The collective dose at Browns Ferry was 296.642 person-rem. Cooper Station was the BWR site with the largest increase in collective dose from 2010 to 2011. In 2010, Cooper Station had very little outage time, resulting in a collective dose of 61.303 person-rem. In 2011, Cooper Station had over 1,300 hours of outage time, resulting in a collective dose of 349.247 person-rem.

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 individuals per BWR have been higher than those for PWRs for the 18 years depicted on Figure 4.1. BWRs generally have higher collective doses due to the fact that the steam produced directly from the reactor is used to drive turbines to produce electricity. This results in radioactivity being present in both the reactor and power generation components of the systems, while PWR systems are designed to keep the radioactivity within the reactor vessel and primary system and not in the turbine systems. Between 1994 and 2011, the annual collective dose per LWR dropped by 59%. Since 2002, BWR collective doses have decreased by approximately 19% and PWR collective doses have decreased by approximately 37%.

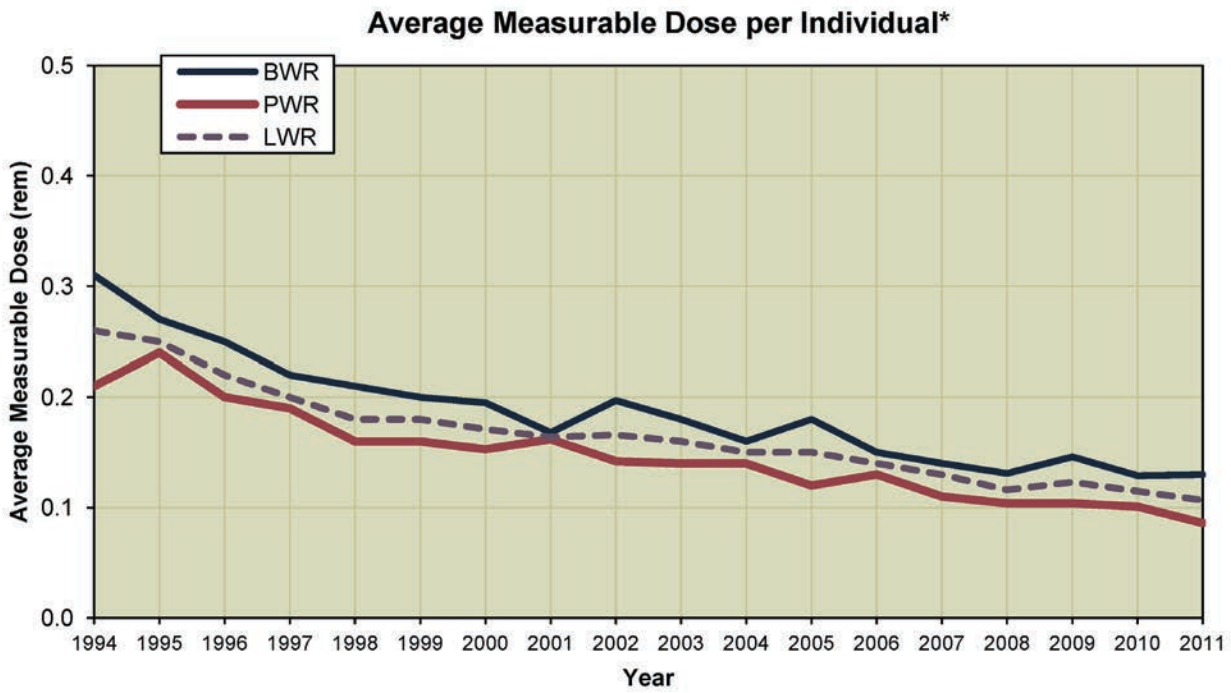
In 2011, the average collective dose per reactor for PWRs was 55 person-rem and the average collective dose per reactor for BWRs was 142 person-rem. In comparison to the 2010 values, the collective dose per reactor for PWRs remained the same and the average collective dose per reactor for BWRs increased by 4%. The average collective dose per reactor for LWRs increased by 1% from 83 person-rem in 2010 to 84 person-rem in 2011. This is the fifth year that the average collective dose per reactor for LWRs has been below 100 person-rem since tracking began in 1973. The overall decreasing trend in average reactor collective doses since 1994 indicates that licensees are continuing to successfully implement as low as is reasonably achievable (ALARA) dose reduction processes at their facilities. In 2011, the number of individuals with measurable dose per reactor increased to 625 for PWRs and increased to 1,091 for BWRs.

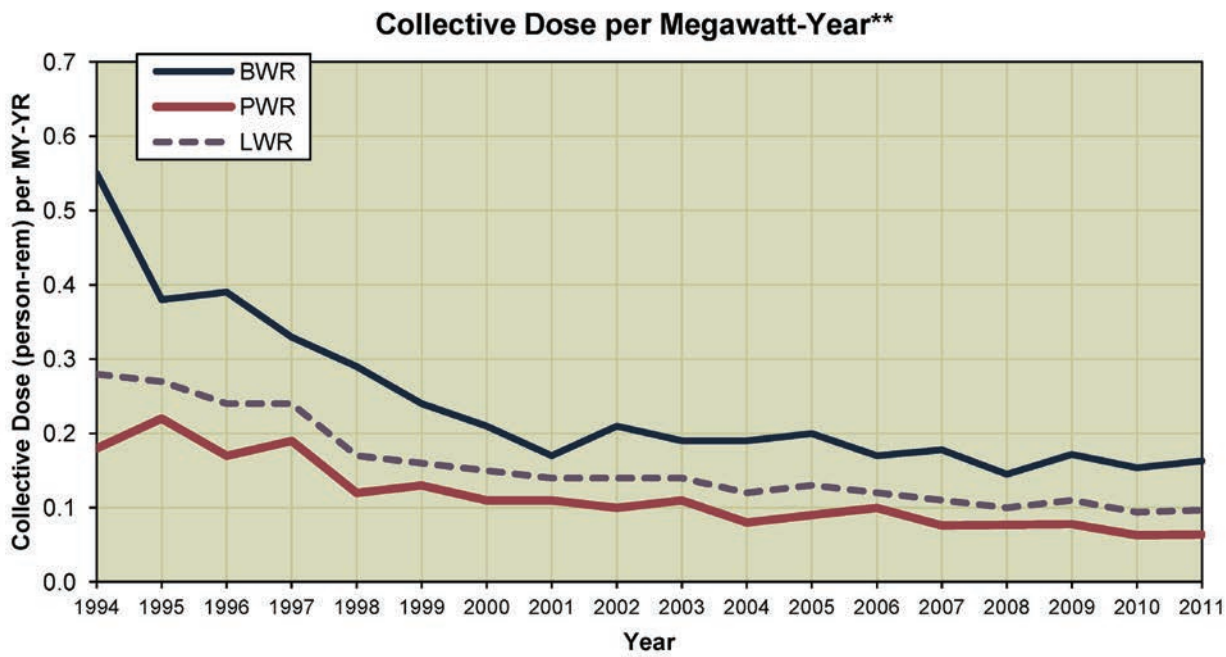
Figures 4.2 and 4.3 are plots of most of the other information that is presented in Tables 4.1, 4.2, and 4.3. Table 4.3 shows that in 2011 the net electricity generated decreased slightly to 90,232 MW-yr, while the number of operating reactors has remained constant for the past 13 years. Table 4.3 also shows that the value for the total collective dose for all LWRs increased by 2% to 8,771 person-rem in 2011 from a value of 8,631 person-rem in 2010. The average measurable dose per individual decreased to 0.11 rem in 2011 (not adjusted for transient individuals).



* Gross electricity is shown for 1994–1996, net electricity is shown for 1997–2011.

Figure 4.2. Number of Operating Reactors and Electricity Generated 1994–2011





* Not adjusted for transient workers. See Section 5.
** Gross electricity is shown for 1994–1996, net electricity is shown for 1997–2011.

Figure 4.3. Average Measurable Dose per Individual and Collective Dose per Megawatt-Year 1994–2011

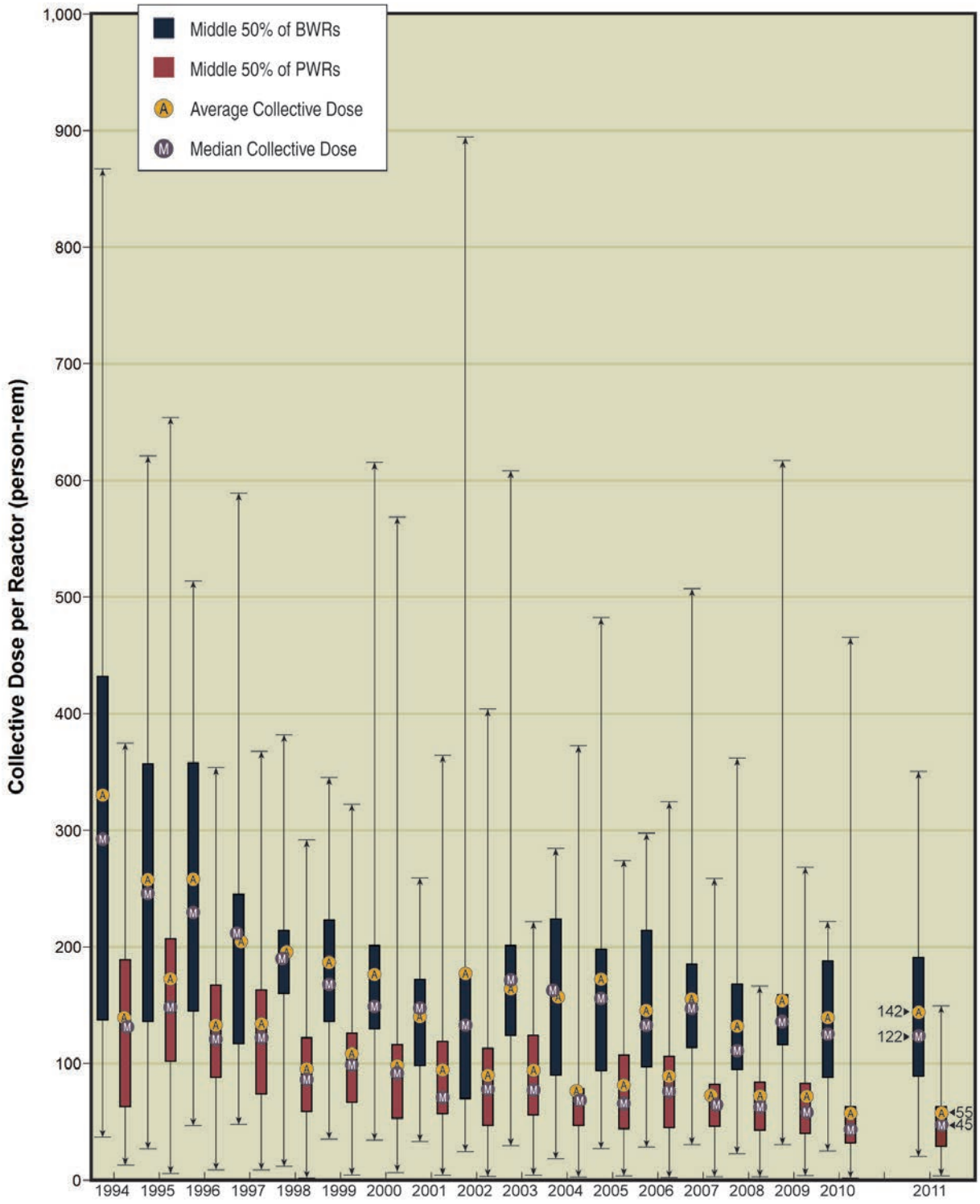


Figure 4.4. Average, Median, and Extreme Values of the Collective Dose per Reactor 1994–2011

The decrease seen in dose trends since 1994 may be attributable to several factors. Utilities have completed the tasks initiated as a result of the lessons learned from the 1979 Three Mile Island (TMI) accident, and they are increasing efforts to avoid and reduce exposure. The concept of keeping exposures to ALARA levels is continually being stressed, and most utilities have established programs to collect and share information relative to exposure control processes, techniques, and procedures.

To further assist in the identification of any trends that might exist, Figure 4.4 displays the average and median[6] values of the collective dose per reactor for BWRs and for PWRs for the years 1994 through 2011. The median values are included here for statistical completeness and are not used in other sections of the report. 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 41 person-rem in 2010 to 45 person-rem in 2011. The median collective dose for BWRs decreased from 123 person-rem in 2010 to 122 person-rem in 2011. Figure 4.4 also shows that, in 2011, 50% of the PWRs reported collective doses between 29 and 63 person-rem, while 50% of the BWRs reported collective doses between 89 and 191 person-rem. The middle 50% of BWRs and PWRs in Figure 4.4 are the reactors between the 25% and 75% dose range. These values are based on annual collective dose values, not the three-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 more of the reactors tend to be at lower collective doses than is reflected by the average. This is a result of the wide difference between the maximum and minimum annual collective doses at power plants and that some plants accrue higher collective dose during refueling outages. The plants that have outages during the year (and thus higher collective doses) increase the value of the average collective dose, while the median (or middle-point of the doses) remains lower.

4.5 Three-Year Average Collective TEDE per Reactor

The three-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 three years as of December 31, 2011, and show the values of several parameters for each of the sites. These tables also give averages for the two types of reactors.

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

Table 4.5
Three-Year Totals and Averages Listed in Ascending Order of Collective TEDE per BWR
2009–2011

Plant Name*	Reactor Years	Three-year Collective TEDE per Reactor Year 2009-2011	Three-year Collective TEDE per Site	Number of Workers with Measurable TEDE	Average TEDE per Worker	Total MW-Yrs	Average TEDE per MW-Yr
GRAND GULF	3	80.058	240.175	2,873	0.084	3,537.5	0.07
FITZPATRICK	3	96.741	290.223	2,429	0.119	2,397.6	0.12
OYSTER CREEK	3	96.847	290.540	2,471	0.118	1,698.8	0.17
LIMERICK 1,2	6	97.826	586.954	5,138	0.114	6,489.3	0.09
HATCH 1,2	6	101.464	608.786	4,725	0.129	4,553.8	0.13
SUSQUEHANNA 1,2	6	101.954	611.726	5,753	0.106	6,344.7	0.10
FERMI 2	3	106.472	319.416	3,509	0.091	2,750.7	0.12
DRESDEN 2,3	6	113.657	681.940	6,466	0.105	4,974.3	0.14
HOPE CREEK 1	3	118.316	354.949	4,501	0.079	3,392.7	0.10
DUANE ARNOLD	3	123.490	370.470	2,453	0.151	1,637.5	0.23
BROWNS FERRY 1,2,3**	9	133.516	1,201.648	7,092	0.169	8,606.9	0.14
QUAD CITIES 1,2	6	141.413	848.480	7,086	0.120	5,086.8	0.17
NINE MILE POINT 1,2	6	142.895	857.371	4,521	0.190	4,950.1	0.17
VERMONT YANKEE	3	147.852	443.555	2,492	0.178	1,722.6	0.26
PEACH BOTTOM 2,3	6	153.284	919.703	6,506	0.141	6,427.7	0.14
MONTICELLO	3	155.579	466.737	3,672	0.127	1,392.5	0.34
RIVER BEND 1	3	157.005	471.014	4,746	0.099	2,729.3	0.17
CLINTON	3	165.470	496.410	3,658	0.136	2,987.6	0.17
LASALLE 1,2	6	170.270	1,021.622	7,177	0.142	6,523.3	0.16
PILGRIM	3	177.119	531.356	2,783	0.191	1,872.0	0.28
BRUNSWICK 1,2	6	189.805	1,138.828	8,688	0.131	5,001.3	0.23
COOPER STATION	3	221.527	664.582	4,148	0.160	2,088.5	0.32
COLUMBIA GENERATING	3	231.844	695.532	5,000	0.139	2,360.8	0.29
PERRY	3	318.337	955.011	3,736	0.256	3,060.7	0.31
Totals and Averages	**105**	**-**	**15,067.028**	**111,623**	**0.135**	**92,587.0**	**0.16**
Average per Reactor-Year	**-**	**143.496**	**-**	**1,063**	**-**	**881.8**	**-**

* Sites where not all reactors had completed 3 full years of commercial operations as of December 31, 2011, 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
2009–2011

Plant Name*	Reactor Years	Three-year Collective TEDE per Reactor Year 2009-2011	Three-year Collective TEDE per Site	Number of Workers with Measurable TEDE	Average TEDE per Worker	Total MW-Yrs	Average TEDE per MW-Yr
PRAIRIE ISLAND 1,2	6	27.759	166.552	1,899	0.088	2,927.2	0.06
SUMMER 1	3	29.920	89.759	1,469	0.061	2,601.0	0.03
COOK 1,2	6	30.075	180.452	2,651	0.068	4,718.1	0.04
PALO VERDE 1,2,3	9	30.210	271.888	4,598	0.059	10,632.3	0.03
ROBINSON 2	3	32.063	96.190	1,259	0.076	1,876.2	0.05
FARLEY 1,2	6	33.446	200.674	2,701	0.074	4,746.0	0.04
WATTS BAR 1	3	40.353	121.060	1,882	0.064	3,102.4	0.04
HARRIS	3	42.901	128.703	1,968	0.065	2,579.4	0.05
BRAIDWOOD 1,2	6	46.015	276.087	3,338	0.083	6,564.4	0.04
COMANCHE PEAK 1,2	6	46.157	276.943	3,555	0.078	6,832.9	0.04
KEWAUNEE	3	46.767	140.301	1,487	0.094	1,609.6	0.09
MCGUIRE 1,2	6	46.789	280.731	4,038	0.070	6,360.8	0.04
CALLAWAY 1	3	47.924	143.771	1,802	0.080	3,271.9	0.04
VOGTLE 1,2	6	47.966	287.794	3,034	0.095	6,578.2	0.04
GINNA	3	48.563	145.688	1,639	0.089	1,586.2	0.09
SOUTH TEXAS 1,2	6	49.687	298.120	3,158	0.094	7,196.5	0.04
SALEM 1,2	6	50.955	305.730	4,393	0.070	6,454.8	0.05
SEABROOK	3	52.484	157.453	2,724	0.058	3,206.3	0.05
TURKEY POINT 3,4	6	52.549	315.292	3,305	0.095	3,756.3	0.08
CATAWBA 1,2	6	53.123	318.740	3,391	0.094	6,353.8	0.05
ARKANSAS 1,2	6	53.165	318.992	4,053	0.079	5,072.2	0.06
CALVERT CLIFFS 1,2	6	53.262	319.570	2,428	0.132	4,894.1	0.07
SEQUOYAH 1,2	6	55.525	333.149	3,597	0.093	6,215.0	0.05
INDIAN POINT 2,3	6	57.123	342.739	5,000	0.069	5,682.2	0.06
BEAVER VALLEY 1,2	6	57.784	346.705	3,085	0.112	5,019.0	0.07
POINT BEACH 1,2	6	58.108	348.649	2,662	0.131	2,651.3	0.13
NORTH ANNA 1,2	6	58.530	351.178	2,569	0.137	4,694.2	0.07
OCONEE 1,2,3	9	61.802	556.217	5,925	0.094	7,098.4	0.08
BYRON 1,2	6	63.995	383.972	3,756	0.102	6,595.4	0.06
FORT CALHOUN	3	66.636	199.907	2,083	0.096	1,043.6	0.19
SAN ONOFRE 2,3	6	67.865	407.188	3,858	0.106	5,420.5	0.08
MILLSTONE 2,3	6	68.368	410.209	2,745	0.149	5,645.6	0.07
SURRY 1,2	6	69.758	418.550	3,320	0.126	4,476.2	0.09
WOLF CREEK 1	3	72.704	218.113	3,233	0.067	2,930.9	0.07
DIABLO CANYON 1,2	6	82.486	494.913	4,648	0.106	6,119.3	0.08
CRYSTAL RIVER 3	3	87.519	262.558	2,622	0.100	615.0	0.43
ST. LUCIE 1,2	6	104.241	625.448	4,546	0.138	4,131.7	0.15
WATERFORD 3	3	120.018	360.054	2,839	0.127	3,217.3	0.11
THREE MILE ISLAND 1	3	136.850	410.549	4,033	0.102	2,174.1	0.19
PALISADES	3	169.607	508.822	2,223	0.229	2,169.1	0.23
DAVIS-BESSE	3	180.359	541.076	2,946	0.184	2,190.4	0.25
Totals and Averages	**207**	**-**	**12,360.486**	**126,462**	**0.098**	**181,009.8**	**0.07**
Average per Reactor-Year	**-**	**59.712**	**-**	**611**	**-**	**874.4**	**-**

* Sites where not all reactors had completed 3 full years of commercial operation as of December 31, 2011, are not included.

Based on the 105 reactor-years of operation accumulated over a three-year period by the 35 BWRs listed, the average three-year collective TEDE per reactor was found to be 143 person-rem, the average measurable TEDE per individual was 0.14 rem, and the average collective TEDE per MW-yr was 0.16 person-rem. For BWRs, all values increased slightly or remained the same from 2010 to 2011.

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 individual, and average collective TEDE per MW-yr were found to be 60 person-rem, 0.10 rem, and 0.07 person-rem, respectively. For PWRs, all values either decreased slightly or remained the same from 2010 to 2011.

In addition to the listings provided in Tables 4.5 and 4.6, the quartile ranking is used by the NRC as a factor in planning the number of inspection hours assigned per site. For this reason, Tables 4.7 and 4.8 have been included in the 2011 annual report for BWRs and PWRs, respectively. These tables show the plant name, three-year collective TEDE per reactor, the percent change in the three-year average from the previous three-year period, and the quartile ranking from the previous period if the ranking has changed.

4.6 International Occupational Radiation Exposure

The NRC must perform certain legislatively mandated international duties. These include licensing the import and export of nuclear materials and equipment and participating in activities supporting U.S. government compliance with international treaties and agreement obligations. In addition, the NRC actively cooperates with multinational organizations, such as the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA), a part of the Organisation for Economic Cooperation and Development (OECD) [Ref. 16]

In 1992, the OECD/NEA, with sponsorship from the IAEA, created the Information System on Occupational Exposure (ISOE) Program as an international forum for representatives from nuclear electric utilities and regulatory agencies to share dose reduction information, operational experience, and information to improve the optimization of radiological protection at commercial nuclear power plants. The ISOE database, ISOEDAT, includes occupational exposure information for 401 operating units and 81 units in cold-shutdown or some stage of decommissioning in 29 countries, covering about 91% of the world's operating commercial nuclear power reactors. One of the purposes of ISOEDAT is to allow for comparison of radiation protection effectiveness and trends among the participating countries and among the various types of commercial nuclear power reactors.

Table 4.7
Three-Year Collective TEDE per Reactor-Year for BWRs
2009-2011

	Plant Name	Three Year Coll. TEDE per Reactor Year 2009-2011	Percent Change From 2008-2010	2008-2010 Quartile (if changed)
1st Quartile	GRAND GULF	80.058	-38% ▼	2
	FITZPATRICK	96.741	-34% ▼	3
	OYSTER CREEK	96.847	-36% ▼	3
	LIMERICK 1,2	97.826	1% ▲	-
	HATCH 1,2	101.464	-2% ▼	-
	SUSQUEHANNA 1,2	101.954	-4% ▼	-
2nd Quartile	FERMI 2	106.472	-3% ▼	-
	DRESDEN 2,3	113.657	6% ▲	1
	HOPE CREEK 1	118.316	-3% ▼	-
	DUANE ARNOLD	123.490	2% ▲	-
	BROWNS FERRY 1,2,3	133.516	-13% ▼	3
	QUAD CITIES 1,2	141.413	2% ▲	3
3rd Quartile	NINE MILE POINT 1,2	142.895	-6% ▼	-
	VERMONT YANKEE	147.852	-8% ▼	4
	PEACH BOTTOM 2,3	153.284	24% ▲	2
	MONTICELLO	155.579	71% ▲	1
	RIVER BEND 1	157.005	-18% ▼	4
	CLINTON	165.470	5% ▲	4
4th Quartile	LASALLE 1,2	170.270	14% ▲	3
	PILGRIM	177.119	70% ▲	1
	BRUNSWICK 1,2	189.805	2% ▲	-
	COOPER STATION	221.527	-2% ▼	-
	COLUMBIA GENERATING	231.844	68% ▲	2
	PERRY	318.337	37% ▲	-
	Average per Reactor-Year	**143.496**	**3% ▲**	

Average 143.496

Table 4.8
Three-Year Collective TEDE per Reactor-Year for PWRs
2009-2011

	Plant Name	Three-Year Coll. TEDE per Reactor Year 2009-2011	Percent Change From 2008-2010	2008-2010 Quartile (if changed)
1st Quartile	PRAIRIE ISLAND 1,2	27.759	-29% ▼	-
	SUMMER 1	29.920	-16% ▼	-
	COOK 1,2	30.075	-10% ▼	-
	PALO VERDE 1,2,3	30.210	-27% ▼	-
	ROBINSON 2	32.063	-40% ▼	2
	FARLEY 1,2	33.446	-2% ▼	-
	WATTS BAR 1	40.353	-14% ▼	-
	HARRIS	42.901	-4% ▼	-
	BRAIDWOOD 1,2	46.015	-11% ▼	2
	COMANCHE PEAK 1,2	46.157	-5% ▼	-
	KEWAUNEE	46.767	-9% ▼	-
2nd Quartile	MCGUIRE 1,2	46.789	-14% ▼	-
	CALLAWAY 1	47.924	32% ▲	1
	VOGTLE 1,2	47.966	-6% ▼	-
	GINNA	48.563	-1% ▼	-
	SOUTH TEXAS 1,2	49.687	-14% ▼	3
	SALEM 1,2	50.955	-40% ▼	4
	SEABROOK	52.484	-6% ▼	3
	TURKEY POINT 3,4	52.549	-10% ▼	3
	CATAWBA 1,2	53.123	-9% ▼	3
	ARKANSAS 1,2	53.165	-20% ▼	-
3rd Quartile	CALVERT CLIFFS 1,2	53.262	7% ▲	2
	SEQUOYAH 1,2	55.525	8% ▲	2
	INDIAN POINT 2,3	57.123	-19% ▼	-
	BEAVER VALLEY 1,2	57.784	-3% ▼	-
	POINT BEACH 1,2	58.108	5% ▲	2
	NORTH ANNA 1,2	58.530	9% ▲	2
	OCONEE 1,2,3	61.802	-1% ▼	-
	BYRON 1,2	63.995	37% ▲	1
4th Quartile	FORT CALHOUN	66.636	-8% ▼	-
	SAN ONOFRE 2,3	67.865	-19% ▼	-
	MILLSTONE 2,3	68.368	-20% ▼	-
	SURRY 1,2	69.758	-8% ▼	-
	WOLF CREEK 1	72.704	22% ▲	3
	DIABLO CANYON 1,2	82.486	-29% ▼	-
	CRYSTAL RIVER 3	87.519	-3% ▼	-
	ST. LUCIE 1,2	104.241	41% ▲	3
	WATERFORD 3	120.018	-9% ▼	-
	THREE MILE ISLAND 1	136.850	45% ▲	-
	PALISADES	169.607	0%	-
	DAVIS-BESSE	180.359	-6% ▼	-
	Average per Reactor-Year	**59.712**	**-7% ▼**	

Average 59.712

As part of the agency's international cooperative research program initiatives, NRC joined the ISOE Program as a regulatory member in December 1994. NRC's REIRS database is the U.S. system comparable with ISOEDAT on the global scale. Since joining the ISOE Program, NRC has leveraged experience in data management and analysis of the REIRS database, as well as provided input to OECD/NEA and IAEA for streamlining certain elements of how ISOEDAT captures, maintains, and displays data.

Figures 4.5 and 4.6 show the average collective dose per reactor for PWRs and BWRs for the U.S. and participating reactors from ISOEDAT. For PWRs, the average collective dose per reactor for the ISOE PWRs has been similar to the U.S. experience since 1994, and for BWRs, the U.S. and international plants have been similar since 1997. In the last 4 years, the U.S. PWR average has remained below the average for other countries. The data were compiled from the ISOEDAT online database. The NEA publishes an annual report entitled "Occupational Exposures at Nuclear Power Plants" that is available on the ISOE Web site at www.isoe-network.net.

4.7 Decontamination and Decommissioning of Commercial Nuclear Power Plants

The NRC regulates the decontamination and decommissioning (D&D) of commercial nuclear power reactors. The purpose of the NRC's Decommissioning Program is to ensure that NRC-licensed sites are decommissioned in a safe, timely, and effective manner so that they can be returned to beneficial use and to ensure that stakeholders are informed and involved in the process, as appropriate.

The NRC's Office of Federal and State Materials and Environmental Management Programs (FSME) has project management responsibilities for decommissioning commercial nuclear power reactors. NRC's commercial nuclear power reactor decommissioning activities include project management, technical review of licensee submittals in support of decommissioning, licensing amendments and exemptions in support of the progressive stages of decommissioning, inspections of decommissioning activities, support for the development of rulemaking guidance, public outreach efforts, international activities, and participation in industry conferences and workshops. FSME staff regularly coordinate with other offices on issues affecting all commercial nuclear power reactors, both operating and decommissioning, and specifically with staff in the Office of Nuclear Material Safety and Safeguards (NMSS) regarding the ISFSIs at reactor sites undergoing decommissioning [Ref. 17].

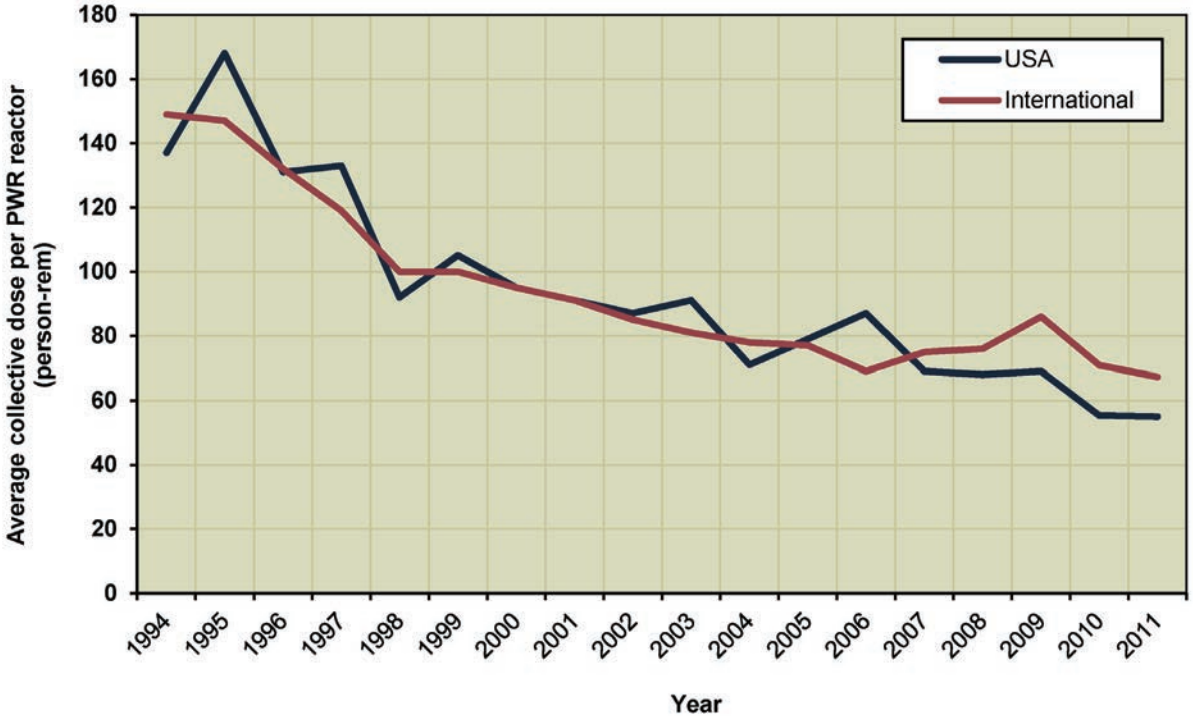


Figure 4.5. Average Collective Dose per PWR Reactor 1994–2011

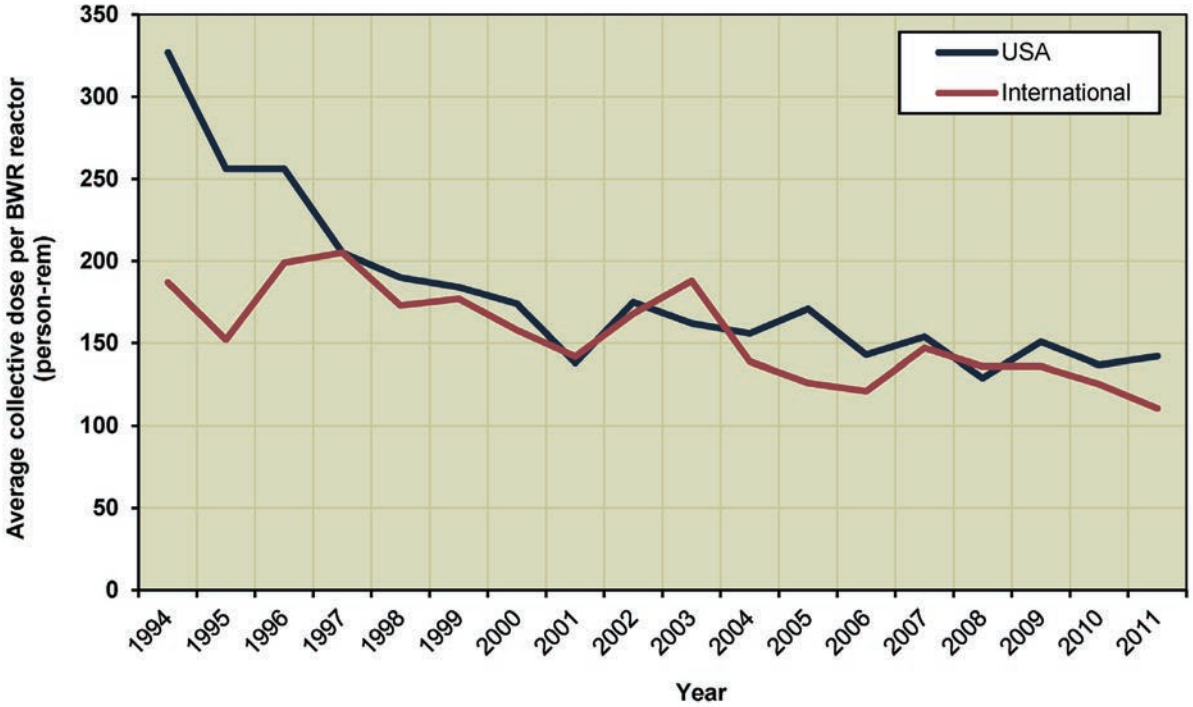


Figure 4.6. Average Collective Dose per BWR Reactor 1994–2011

4.7.1 Decommissioning Process

The decommissioning process begins when a licensee decides to permanently cease operations. The major steps that comprise the commercial nuclear power reactor decommissioning process are notification of cessation of operations; submittal and review of the post-shutdown decommissioning activities report (PSDAR); submittal, review, and approval of the license termination plan (LTP); implementation of the LTP; and completion of decommissioning. The flowchart in Figure 4.7 illustrates the D&D process.

4.7.1.1 Notification

When a licensee has decided to permanently cease operations, the licensee is required to submit a written notification to NRC. In addition, the licensee is required to notify the NRC in writing once fuel has been permanently removed from the reactor vessel.

4.7.1.2 Post-Shutdown Decommissioning Activities Report

Before or within 2 years of cessation of operations, the licensee must submit a PSDAR to the NRC and a copy to the affected State(s). The PSDAR must include a description and schedule for the planned decommissioning activities; an estimate of the expected costs; and a discussion of the means for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements. The NRC will provide notice of receipt of the PSDAR in the *Federal Register* and make the PSDAR available for public comment. In addition, the NRC will hold a public meeting in the vicinity of the licensee's facility to discuss the PSDAR.

4.7.1.3 License Termination Plan

Each commercial nuclear power reactor licensee must submit an application for termination of its license. An LTP must be submitted at least 2 years before the license termination date. The NRC and licensee hold presubmittal meetings to agree on the format and content of the LTP. These meetings are intended to improve the efficiency of the LTP development and review process. The LTP must include the following: a site characterization; identification of remaining dismantlement activities; plans for site remediation; detailed plans for the final radiation survey; description of the end use of the site, if restricted; an updated site-specific estimate of remaining decommissioning costs; and a supplement to the environmental report describing any new information or significant environmental change associated with the licensee's proposed termination activities. In addition, the licensee must demonstrate that it will meet the applicable requirements of the License Termination Rule in 10 CFR Part 20, Subpart E,"Radiological Criteria for License Termination."

The NRC will provide notice of receipt of the LTP and make the LTP available for public comment. In addition, the NRC will hold a public meeting in the vicinity of the licensee's facility to discuss the LTP and the LTP review process. The NRC staff use three technical reports to guide them in the review of the LTP and approve the LTP through a license amendment.

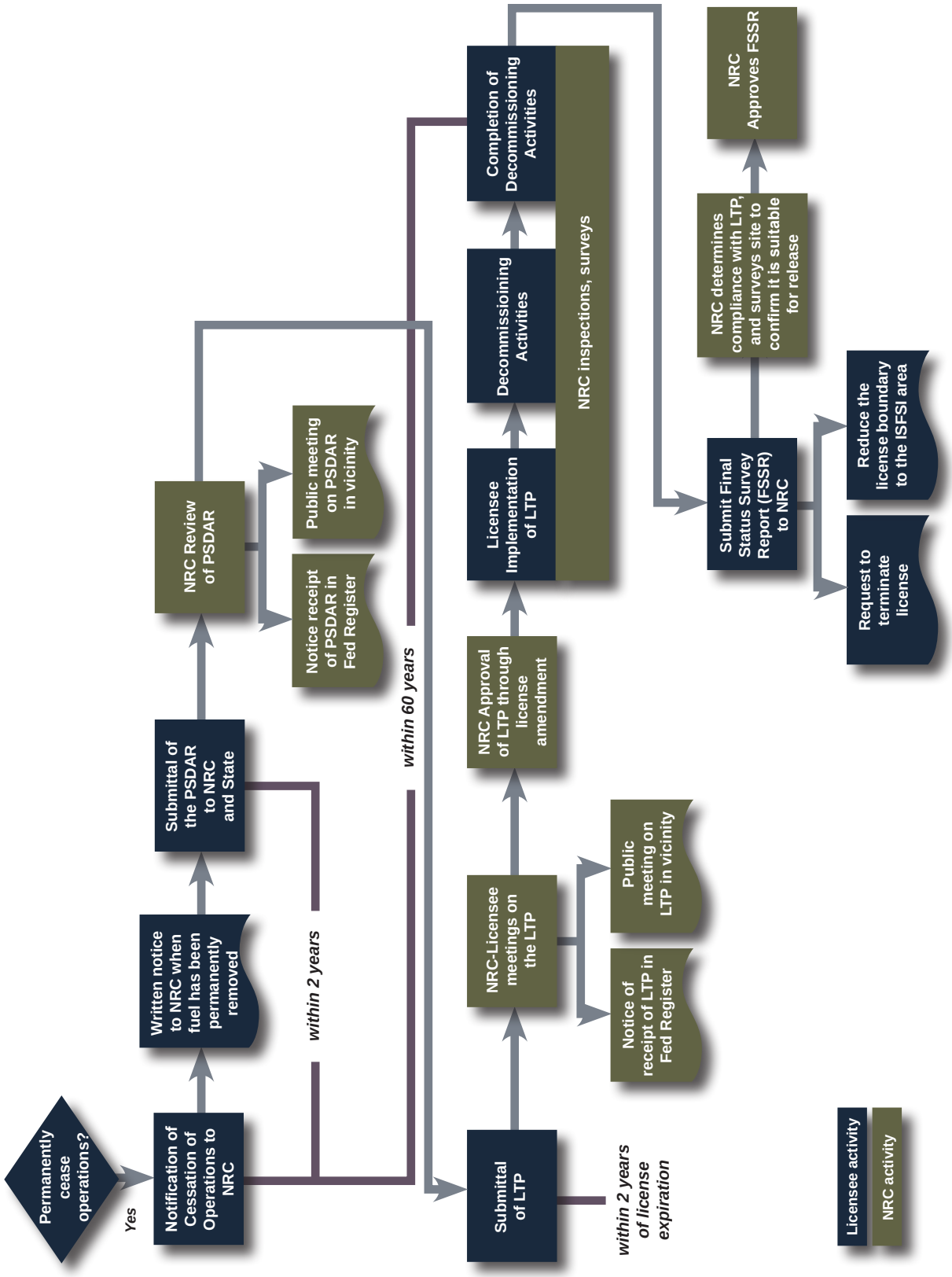


Figure 4.7. D&D Process Flowchart

4.7.1.4 Implementation of the License Termination Plan

After approval of the LTP, the licensee or responsible party must complete decommissioning in accordance with the approved LTP. The NRC staff will periodically inspect the decommissioning operations at the site to ensure compliance with the LTP. These inspections will normally include in-process and confirmatory radiological surveys.

Decommissioning must be completed within 60 years of permanent cessation of operations, unless otherwise approved by the Commission.

4.7.1.5 Completion of Decommissioning

At the conclusion of decommissioning activities, the licensee will submit a Final Status Survey Report (FSSR), which identifies the final radiological conditions of the site and requests that the NRC either: (1) terminate the 10 CFR Part 50 license; or (2) reduce the 10 CFR Part 50 license boundary to the footprint of the ISFSI. For decommissioning commercial nuclear power reactors with no ISFSI or an ISFSI holding a specific license under 10 CFR Part 72, completion of reactor decommissioning will result in the termination of the 10 CFR Part 50 license. The NRC will approve the FSSR and the licensee's request if it determines that the licensee has met both of the following conditions: the remaining dismantlement has been performed in accordance with the approved LTP, and the final radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the License Termination Rule.

4.7.2 Status of Decommissioning Activities at Commercial Nuclear Power Reactors

While 104 commercial nuclear power reactors are currently in operation, several shutdown power reactors have undergone the process of D&D. As more commercial nuclear power reactors 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 operational status as of the date shown [Ref. 16]. In addition, Appendix E provides descriptions of the decommissioning activities currently underway at these commercial nuclear power reactors, as well as the total collective TEDE for each plant, from the year megawatt production stopped through 2011.

Table 4.9*
Plants No Longer in Operation
2011

Plant Name	Date of First Commercial Operation	Plant Shutdown/ Notification to NRC	License Termination Plan Approved by NRC	PSDAR Submitted	Plant Status	Completion of Decommissioning
BIG ROCK POINT	3/29/1963	8/1997	TBD	9/1997	ISFSI only	2007
DRESDEN 1	8/1/1960	10/1978	TBD	6/1998	SAFSTOR**	2036
FERMI 1	5/10/1963	9/1972	2030	4/1998	DECON***	2032
HADDAM NECK	12/27/1974	12/1996	TBD	8/1997	ISFSI only	2007
HUMBOLDT BAY 3	8/1/1963	7/1976	2012	2/1998	SAFSTOR	2015
INDIAN POINT 1	3/26/1962	10/1974	2022	1/1996	SAFSTOR	2026
LACROSSE	11/1/1969	4/1987	TBD	5/1991	SAFSTOR	2026
MAINE YANKEE	6/29/1973	8/1997	TBD	8/1997	ISFSI only	2005
MILLSTONE 1	12/28/1970	7/1998	TBD	6/1999	SAFSTOR	TBD
PEACH BOTTOM 1	1/24/1966	10/1974	TBD	6/1998	SAFSTOR	2034
RANCHO SECO	4/17/1975	6/1989	TBD	3/1997	ISFSI only	2009
SAN ONOFRE 1	1/1/1968	11/1992	TBD	12/1998	DECON	2030
THREE MILE ISLAND 2	12/30/1978	3/1979	TBD	TBD	"Post-Defueling Monitored Storage"	TBD
TROJAN	5/20/1976	11/1992	2/2001	8/1995	ISFSI only	2004
YANKEE ROWE	12/24/1963	10/1991	TBD	-	ISFSI only	2007
ZION 1	12/31/1973	2/1997	TBD	2/2000	SAFSTOR	2020
ZION 2	9/17/1974	9/1996	TBD	2/2000	SAFSTOR	2020

* Information regarding the latest decommissioning status of plants listed in this table can be found in Status of the Decommissioning Program: 2011 Annual Report from the NRC's public library under ADAMS Accession No. ML112700498.

** SAFSTOR - (often considered 'delayed DECON'): a nuclear facility that is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, it is dismantled.

*** DECON - (immediate dismantlement): soon after the nuclear facility closes, equipment, structures, and portions of the facility containing radioactive contaminants are removed or decontaminated to a level that permits release of the property and termination of the NRC license.

Section 5
TRANSIENT INDIVIDUALS AT NRC-LICENSED FACILITIES

The following analysis examines the individuals who had more than one Form 5 dose record at more than one NRC-licensed facility during the monitoring year. These individuals 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 10 CFR 20.1003, which defines a year as "the period of time beginning in January used to determine compliance with the provisions of 10 CFR 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."

Examination of the data reported for individuals 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 individuals 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 commercial nuclear power reactors and all NRC licensees combined (one of the issues mentioned in Section 2). Table 5.1 shows the actual distribution of transient individual doses as determined from the NRC Form 5 termination reports and compares it with the reported distribution of the doses of these individuals as they would have appeared in a summation of the annual reports submitted by each of the licensees.

In 2011, over 99% of the transient individuals were reported by commercial nuclear power reactors. For this reason, these data are shown separately in Table 5.1.

Table 5.1 illustrates the impact that the multiple reporting of these transient individuals had on the summation of the dose reports for 2011. Each licensee reports the radiation dose received by individuals monitored at their facility. Many of these individuals are monitored at more than one facility during the year. When these dose records are summed for all licensees, they appear to be separate individuals reported by each facility. If an individual visited five facilities during a year, this individual would appear in the summation to be five different people, with one dose record for each of the five facilities. When these dose records are summed per individual, these records appear as one person, with a total annual dose that accurately represents the dose received for the entire monitoring year. Thus, while the total collective dose would remain the same, the number of individuals, their dose distributions, and average doses would be affected by this multiple reporting.

Table 5.1
Effects of Transient Individuals on Annual Statistical Compilations
2011

License Category	Number of Individuals with TEDE in the Ranges (rem) *												Total Number Monitored	Number with Measurable TEDE	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				
COMMERCIAL LIGHT WATER REACTORS																
(1) Form 5 Summation	110,217	55,407	16,651	6,753	1,675	559	276	-	-	-	-	-	191,538	81,321	8,771.326	0.11
(2) Transients, As Reported	41,725	28,625	10,026	4,101	997	332	147	-	-	-	-	-	85,953	44,228	5,170.812	0.12
(3) Transients, Actual	9,600	9,965	5,496	3,656	1,547	780	708	23	-	-	-	-	31,775	22,175	5,170.812	0.23
Corrected Distribution (1-[2-3]) **	**78,092**	**36,747**	**12,121**	**6,308**	**2,225**	**1,007**	**837**	**23**	**-**	**-**	**-**	**-**	**137,360**	**59,268**	**8,771.326**	**0.15**
ALL LICENSEES																
(1) Form 5 Summation	115,955	59,152	17,875	7,617	2,178	850	767	125	33	9	-	-	204,561	88,606	11,097.065	0.13
(2) Transients, As Reported	42,031	28,753	10,080	4,137	1,030	342	166	5	-	-	-	-	86,544	44,513	5,264.298	0.12
(3) Transients, Actual	9,595	10,002	5,511	3,679	1,568	793	726	35	1	-	-	-	31,910	22,315	5,264.298	0.24
Corrected Distribution (1-[2-3]) **	**83,519**	**40,401**	**13,306**	**7,159**	**2,716**	**1,301**	**1,327**	**155**	**34**	**9**	**-**	**-**	**149,927**	**66,408**	**11,097.065**	**0.17**

* Dose values exactly equal to the values separating ranges are reported in the next higher range.
** The corrected distribution only applies to the number of individuals.

For example, in 2011, Table 5.1 shows that the initial summation (see line (2) Transients, As Reported) of the Form 5 reports for reactor licensees indicated that no individual received a dose greater than 2 rem. After accounting for those individuals who were reported more than once, the corrected distribution indicated that there were 23 transient individuals who received doses between 2.0 rem and 3.0 rem. Correcting for the multiple counting of individuals also has a significant effect (see line (3) Transients, Actual) on the average measurable dose for these individuals. The corrected average measurable dose for transient individuals is twice as high as the value calculated by the summation of the Form 5 records. The transient individuals represent 34% of the workforce that receives measurable dose. The correction for the transient individuals increases the average measurable dose by a factor of two from 0.12 rem to 0.24 rem for the transient workforce for all licensees. It should be noted that the analysis of transient individuals does not include individuals who may have been exposed at facilities that are not required to report to the NRC (see Section 1), such as Agreement State licensees and 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. 12, Section 1.5] and sums the dose for all facilities during the monitoring year. An individual exceeding the 5 rem per year regulatory limit (TEDE) would be identified in Table 5.1 in one of the dose ranges >5 rem. In 2011, there were no individuals reported by NRC licensees that exceeded this 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 an individual has been subjected to an unacceptable biological risk, which may or may not be the case.

10 CFR 20.2202 and 10 CFR 20.2203 require that all licensees submit reports of all incidents involving personnel radiation doses that exceed certain 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 rads 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 woman, and the public, respectively) or any applicable limit in the license
   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 Part 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

Exposure events reported as either Category A, B, or C typically undergo a review and evaluation process by the licensee, NRC inspectors, and NRC Headquarters staff. Preliminary dose estimates submitted by licensees are often conservatively high and do not represent the final (legal) dose of record assigned for the event. It is, therefore, not uncommon for a dose in excess of a regulatory limit event to be reassessed and the final assigned dose to be categorized as not having been in excess of a regulatory limit. 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 event records.

6.2 Summary of Occupational Radiation Doses in Excess of NRC Regulatory Limits

The exposure events summary presented here are for events that occurred between 2001 through 2011. An event that has been reassessed and determined not to be a dose in excess of a regulatory limit 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.

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

- Occupational radiation doses in excess of the annual 5 rem regulatory limit
- Events at NRC-licensed facilities
- Final dose of record assigned to an individual

It **does not** include

- Medical events as defined in 10 CFR Part 35
- Doses in excess of the regulatory limits to the general public
- Agreement State-licensed activities or DOE facilities
- 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

In 2011, there were no category A, B, or C occurrences reported under the licensed activities included in this report.

6.3 Summary of Annual Dose Distributions for Certain NRC Licensees

Table 6.1 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 6.1 shows that for the past 11 years, the percentage of individuals with <2 rem has been greater than 99%. No individual monitored at any of the five NRC licensee categories included in this report received a dose above the 5 rem annual regulatory limit (TEDE) during the past 8 years.

Table 6.1
Summary of Annual Dose Distributions for Certain* NRC Licensees
2001–2011

Year	Total Number of Monitored Individuals		Individuals with Dose (TEDE) ***				Individuals with Dose >12 rem TEDE ***
			< 2 rem	> 2 rem	< 5 rem	> 5 rem	
	Reported Number	Corrected Number **	%	Number	%	Number	
2001	154,693	118,502	99.4%	734	>99.99%	1	-
2002	162,714	120,026	99.5%	582	>99.99%	1	-
2003	166,347	122,575	99.7%	419	>99.99%	1	1
2004	164,526	123,470	99.7%	368	100%	-	-
2005	174,550	127,138	99.7%	370	100%	-	-
2006	176,623	127,391	99.8%	258	100%	-	-
2007	177,253	126,709	99.8%	243	100%	-	-
2008	182,085	130,462	99.9%	167	100%	-	-
2009	189,955	139,448	99.9%	173	100%	-	-
2010	192,424	142,471	99.9%	185	100%	-	-
2011	204,561	149,927	99.9%	198	100%	-	-

* 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 2001–2011 are based on the distribution of individual doses after adjusting for the multiple counting of transient individuals (see Section 5).

6.4 Maximum Occupational Radiation Doses Below NRC Regulatory Limits

Certain researchers have expressed an interest in a listing of the maximum doses received at NRC licensees that do not exceed the regulatory limits. This information allows for an examination of these doses and could possibly provide insights for where certain improvements could be made in the licensee's radiation protection program. Table 6.2 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 6.2, few doses exceed half of the NRC occupational annual limits. In 2011, 15 individuals exceeded 75% of the TEDE dose limit and 4 individuals exceeded 95% of the TEDE dose limit. In addition, one individual exceeded 75% of the maximum extremity dose limit; however, no individual exceeded any of the annual occupational dose limits.

NRC occupational annual limits. In 2010, four individuals exceeded 75% of the TEDE dose limit, but no individual exceeded any of the annual occupational dose limits.

Table 6.2
Maximum Occupational Doses for Each Exposure Category*
2011

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	42.560	85%	61,121	47	7	1	-	-
SDE-WB	50 rem	12.094	24%	67,000	-	-	-	-	-
LDE	15 rem	4.912	33%	65,162	18	-	-	-	-
CEDE		2.053		3,163					
CDE		16.527		2,283					
DDE		4.870		65,819					
TEDE	5 rem	4.870	97%	66,408	570	84	15	4	-
TODE	50 rem	16.933	34%	65,867	3	-	-	-	-

* 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 = lens 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 Part 20.

Section 7
REFERENCES

1. National Council on Radiation Protection and Measurements, *Ionizing Radiation Exposure of the Population of the United States*, Report No. 160, 2009.

2. United Nations, *Sources and Effects of Ionizing Radiation, United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2008 Report to the General Assembly, Volume I*, General Assembly of Official Records, United Nations, New York, 2010.

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

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

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

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

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

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

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

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

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

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

*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.

13. International Commission on Radiological Protection Publication 30, *Limits for Intakes of Radionuclides by Workers*, Annals of the ICRP Volume 2 No 3/4, 1972.

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

15. *Monthly Operating Report Data*, provided by the Institute of Nuclear Power Operations (INPO) and compiled by Idaho National Laboratory's Risk Assessment and Management Services department under contract to the NRC. These reports are publically available under ADAMS Accession Nos. ML11116A039, ML11207A335, ML11312A048, and ML12048A229.

16. U. S. Nuclear Regulatory Commission, *2011-2012 Information Digest*, USNRC Report NUREG-1350, Volume 23, August 2011.

17. U. S. Nuclear Regulatory Commission, Division of Waste Management and Environmental Protection, Office of Federal and State Materials and Environmental Management Programs, *Status of the Decommissioning Program, 2011 Annual Report*.

18. http://www.nrc.gov/info-finder/decommissioning/power-reactor/

19. http://www.nrc.gov/reading-rm/basic-ref/glossary.html

20. Shleien, Slaback, et al. *Handbook of Health Physics and Radiological Health*. 3rd ed. Lippincott Williams & Wilkins, 1998.

Appendix A

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

2011

APPENDIX A

Table A1 - Annual TEDE for Nonreactor NRC Licensees 2011

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																		
AMERICAN CASTINGS	35-18099-01	1	2	-	-	-	-	-	-	-	-	-	-	-	3	2	0.056	0.028
ARMY - DEPARTMENT OF THE (CRANE)	13-18235-01	63	8	-	-	-	-	-	-	-	-	-	-	-	**71**	**8**	0.264	0.033
HARRISON STEEL CASTINGS CO.	13-02141-01	4	1	1	1	-	-	-	-	-	-	-	-	-	7	3	0.376	**0.125**
METALTEK INTERNATIONAL	24-26136-01	1	2	4	-	-	-	-	-	-	-	-	-	-	7	6	**0.739**	0.123
Total	**4**	**69**	**13**	**5**	1	-	-	-	-	-	-	-	-	-	**88**	**19**	**1.435**	**0.076**
INDUSTRIAL RADIOGRAPHY – TEMPORARY JOB SITE – 03320																		
ACUREN INSPECTION, INC.	42-27593-01	-	5	3	2	3	-	-	-	-	-	-	-	-	13	13	3.068	0.236
ACUREN USA, INC.	42-32443-01	13	62	37	29	17	16	23	-	-	-	-	-	-	197	184	74.127	0.403
ALASKA INDUSTRIAL X-RAY	50-16084-01	1	3	3	2	3	-	-	-	-	-	-	-	-	12	11	3.033	0.276
ALLIED INSPECTION SERVICES, INC.	21-18428-01	-	1	-	1	2	-	1	-	-	-	-	-	-	5	5	2.840	0.568
ALONSO & CARUS IRON WORKS, INC.	52-21350-01	-	3	-	-	-	-	-	-	-	-	-	-	-	3	3	0.089	0.030
AMERICAN ENGINEERING TESTING, INC.	22-20271-02	-	1	1	1	-	-	5	-	-	-	-	-	-	8	8	8.937	1.117
C & J'S NDT, INC.	33-29238-01	-	-	3	1	5	1	4	1	1	-	-	-	-	16	16	14.352	0.897
CALUMET TESTING SERVICES, INC.	13-16347-01	5	3	3	2	-	1	4	3	-	-	-	-	-	21	16	16.041	1.003
CANYON STATE INSPECTION	02-29359-01	4	8	2	3	-	-	-	-	-	-	-	-	-	17	13	1.522	0.117
CAPITAL X-RAY SERVICES, INC.	35-11114-01	6	6	1	-	-	1	4	2	-	-	-	-	-	20	14	12.593	0.900
CENTURY INSPECTION, INC.	42-08456-02	11	9	9	8	3	-	-	-	-	-	-	-	-	40	29	7.009	0.242
COMO TECH INSPECTION	15-26978-01	-	-	1	1	-	-	-	-	-	-	-	-	-	2	2	0.447	0.224
CONCRETE IMAGING, INC.	47-31316-01	1	2	1	-	1	-	2	-	-	-	-	-	-	7	6	3.919	0.653
DBI, INC.	49-29301-01	-	10	7	3	4	7	10	2	-	-	-	-	-	43	43	31.843	0.741
ENERFLEX ENERGY SYSTEMS	49-29253-01	-	1	1	1	-	-	4	-	1	-	-	-	-	8	8	9.849	1.231
ENGINEERING & INSPECTIONS - HAWAII	53-27731-01	2	3	3	3	1	1	5	1	-	-	-	-	-	19	17	13.788	0.811
GE INSPECTION SERVICES	04-24888-01	1	3	-	-	-	-	-	-	-	-	-	-	-	4	3	0.098	0.033
GENERAL DYNAMICS CORP - ELEC BOAT	06-01781-08	5	13	-	-	-	-	-	-	-	-	-	-	-	18	13	0.330	0.025

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 2011 (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)																		
GENERAL TESTING & INSPECTION CO.	47-32191-01	-	1	1	-	-	-	-	-	-	-	-	-	-	2	2	0.179	0.090
GLOBAL X-RAY & TESTING CORP.	17-29308-01	5	37	19	11	10	7	11	5	1	-	-	-	-	106	101	51.639	0.511
H & H X-RAY SERVICES, INC.	17-19236-01	-	16	20	39	28	33	54	6	-	-	-	-	-	196	196	154.311	0.787
HIGH COUNTRY FABRICATION	49-29300-01	-	5	1	-	-	-	-	-	-	-	-	-	-	6	6	0.355	0.059
HIGH MOUNTAIN INSPECTION SERVICES	49-26808-02	-	5	8	11	12	7	23	7	3	1	-	-	-	77	77	84.201	1.094
HUNTINGTON TESTING & TECHNOLOGY	47-23076-01	4	9	6	7	6	1	5	4	-	-	-	-	-	42	38	25.696	0.676
INTEGRITY TESTLAB	07-30791-01	2	10	3	3	5	3	5	2	-	-	-	-	-	33	31	19.279	0.622
IRISNDT MATRIX CORPORATION	42-32791-01	-	4	-	-	1	-	1	-	-	-	-	-	-	6	6	1.874	0.312
J CORE DRILLING, INC.	45-30846-01	-	4	-	1	-	-	-	-	-	-	-	-	-	5	5	0.375	0.075
JANX INTEGRITY GROUP	21-16560-01	84	34	50	82	71	45	125	33	6	-	-	-	-	**530**	**446**	**396.989**	0.890
KAKIVIK ASSET MANAGEMENT	50-27667-01	16	25	10	26	21	18	14	1	-	-	-	-	-	131	115	62.319	0.542
LEHIGH TESTING LABORATORIES, INC.	07-01173-03	1	2	-	-	-	-	-	-	-	-	-	-	-	3	2	0.094	0.047
LKS INSPECTION SERVICES, LLC	53-27795-01	2	-	-	-	2	-	1	-	-	-	-	-	-	5	3	2.890	0.963
MARTIN INDUSTRIAL TESTING, INC.	45-25452-01	-	-	-	-	1	-	1	-	-	-	-	-	-	2	2	2.254	1.127
MARYLAND Q.C. LABORATORIES, INC.	19-28683-01	4	10	2	1	-	-	1	-	-	-	-	-	-	18	14	2.294	0.164
MECHNICAL INTEGRITY SOLUTIONS	52-25615-01	1	2	2	1	2	1	3	-	-	-	-	-	-	12	11	7.089	0.644
METALS TESTING SERVICES, INC.	25-29406-01	-	-	-	2	3	-	1	2	3	3	-	-	-	14	14	33.234	**2.374**
MID AMERICAN INSPECTION SERVICES, INC.	21-26060-01	-	2	-	7	4	3	3	-	-	-	-	-	-	19	19	11.146	0.587
MISTRAS GROUP, INC.	12-16559-02	9	23	6	15	6	9	3	3	-	-	-	-	-	74	65	29.261	0.450
NONDESTRUCTIVE & VISUAL INSPECTION, LLC.	17-29410-01	-	5	2	6	6	3	10	2	1	-	-	-	-	35	35	32.365	0.925
PACIFIC TESTING SERVICES, INC.	53-29118-01	3	4	-	-	-	-	-	-	-	-	-	-	-	7	4	0.033	0.008
POLE BROTHERS IMAGING COMPANY	45-25383-01	-	-	1	1	1	-	-	-	-	-	-	-	-	3	3	0.980	0.327
PRIME NDT SERVICES, INC.	37-23370-01	-	3	3	5	13	11	17	5	5	-	-	-	-	62	62	75.614	1.220
QUALITY CONTROL INSPECTION & TESTING LABORATORIES	11-29245-01	1	-	-	2	1	-	-	-	-	-	-	-	-	4	3	1.292	0.431

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 2011 (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)																		
QUALITY INSPECTION & TESTING , INC.	50-29038-01	1	1	-	1	1	-	1	-	-	-	-	-	-	5	4	1.873	0.468
QUALITY TESTING SERVICES, INC.	24-32292-01	3	11	3	2	1	-	1	-	-	-	-	-	-	21	18	4.242	0.236
SCIENTIFIC TECHNICAL, INC.	45-24882-01	6	1	-	1	-	-	1	-	-	-	-	-	-	9	3	1.679	0.560
SOUTHWEST X-RAY CORP	49-29277-01	-	-	-	1	-	-	2	1	-	-	-	-	-	4	4	5.100	1.275
STEELE TESTING, INC.	33-49619-01	-	-	2	-	-	-	-	-	-	-	-	-	-	2	2	0.426	0.213
SYSTEM ONE SERVICES, INC.	37-27891-02	-	4	3	3	4	1	3	-	-	-	-	-	-	18	18	9.218	0.512
T & K INSPECTION, INC.	33-27678-01	-	2	1	1	1	1	5	6	1	5	-	-	-	23	23	49.612	2.157
TEAM INDUSTRIAL SERVICES, INC.	42-32219-01	49	54	22	23	11	14	24	9	-	-	-	-	-	206	157	89.946	0.573
TECH CORR USA, LLC	42-29261-01	1	8	7	5	2	2	5	3	-	-	-	-	-	33	32	20.670	0.646
TEI ANALYTICAL SERVICES, INC.	37-28004-01	4	8	8	3	6	4	18	9	6	-	-	-	-	66	62	80.598	1.300
TESTING TECHNOLOGIES, INC.	45-25007-01	1	6	4	11	3	1	-	-	-	-	-	-	-	26	25	7.321	0.293
THERMAL ENGINEERING INTERNATIONAL	24-19500-01	-	3	-	-	-	-	-	-	-	-	-	-	-	3	3	0.036	0.012
TULSA GAMMA RAY, INC.	35-17178-01	5	13	8	20	10	13	26	13	5	-	-	-	-	113	108	113.731	1.053
TVA - INSPECTION SERVICES ORG	41-06832-06	11	6	-	-	-	-	-	-	-	-	-	-	-	17	6	0.277	0.046
URS ENERGY AND CONSTRUCTION	29-27761-01	1	4	1	-	-	-	-	-	-	-	-	-	-	6	5	0.200	0.040
WELDSONIX, INC.	42-29354-01	2	9	15	10	4	2	6	-	-	-	-	-	-	48	46	19.328	0.420
Total	**58**	**265**	**464**	**283**	**358**	**275**	**206**	**432**	**120**	**33**	**9**	**-**	**-**	**-**	**2,445**	**2,180**	**1,603.905**	**0.736**

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 2011 (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																		
CARDINAL HEALTH	04-26507-01MD	7	17	1	-	-	-	-	-	-	-	-	-	-	25	18	0.473	0.026
CARDINAL HEALTH	11-27664-01MD	1	7	1	1	-	-	-	-	-	-	-	-	-	10	9	0.598	0.066
CARDINAL HEALTH	34-29200-01MD	83	184	22	4	2	2	1	-	-	-	-	-	-	**298**	**215**	**13.212**	0.061
CARDINAL HEALTH	47-25322-01MD	13	3	-	1	-	-	-	-	-	-	-	-	-	17	4	0.322	0.081
GE HEALTHCARE - KENTWOOD	21-26707-01MD	-	5	2	-	-	-	-	-	-	-	-	-	-	7	7	0.435	0.062
GE HEALTHCARE - LIVONIA	21-24828-01MD	5	9	1	-	-	-	-	-	-	-	-	-	-	15	10	0.519	0.052
GE HEALTHCARE - ST. LOUIS/OVERLAND	24-32462-01MD	7	7	2	-	-	-	-	-	-	-	-	-	-	16	9	0.423	0.047
MID-AMERICA ISOTOPES, INC.	24-26241-01MD	15	6	3	2	-	1	-	-	-	-	-	-	-	27	12	2.226	0.186
PHARMALOGIC MICHIGAN, LLC	21-32190-01MD	-	7	2	-	-	-	-	-	-	-	-	-	-	9	9	0.540	0.060
SPECTRON MRC, LLC	13-32726-01MD	-	12	1	-	2	1	1	1	-	-	-	-	-	18	18	6.867	**0.382**
TRIAD ISOTOPES - MO	09-32781-01MD	6	10	-	-	-	-	-	-	-	-	-	-	-	16	10	0.350	0.035
TRIAD ISOTOPES - MO	09-32781-04MD	6	13	2	1	-	-	-	-	-	-	-	-	-	22	16	0.892	0.056
Total	**12**	**143**	**280**	**37**	**9**	**4**	**4**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**480**	**337**	**26.857**	**0.080**
MANUFACTURING AND DISTRIBUTION – TYPE "A" BROAD – 03211																		
COVIDIEN - MALLINCKRODT, INC.	24-04206-01	44	173	89	36	21	18	9	-	-	-	-	-	-	**390**	**346**	**71.865**	0.208
INTERNATIONAL ISOTOPES IDAHO, INC.	11-27680-01	-	-	2	4	-	2	5	-	-	-	-	-	-	13	13	11.698	**0.900**
Total	**2**	**44**	**173**	**91**	**40**	**21**	**20**	**14**	**-**	**-**	**-**	**-**	**-**	**-**	**403**	**359**	**83.563**	**0.233**

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 2011 (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																		
I2S, LLC	06-21253-01	14	3	-	-	-	-	1	-	-	-	-	-	-	**18**	**4**	**1.328**	**0.332**
Total	**1**	**14**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**18**	**4**	**1.328**	**0.332**
INDEPENDENT SPENT FUEL STORAGE INSTALLATION – 23200																		
GENERAL ELECTRIC - MORRIS ISFSI	SNM-2500	1	19	6	-	-	-	-	-	-	-	-	-	-	26	**25**	**1.449**	**0.058**
TROJAN - ISFSI	SNM-2509	28	-	-	-	-	-	-	-	-	-	-	-	-	**28**	-	-	-
Total	**2**	**29**	**19**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**54**	**25**	**1.449**	**0.058**
URANIUM HEXAFLUORIDE (UF_6) PRODUCTION PLANTS – 11400																		
HONEYWELL INTERNATIONAL, INC.	SUB-0526	57	478	352	174	82	37	37	4	-	-	-	-	-	**1,221**	**1,164**	**278.730**	**0.239**
Total	**1**	**57**	**478**	**352**	**174**	**82**	**37**	**37**	**4**	**-**	**-**	**-**	**-**	**-**	**1,221**	**1,164**	**278.730**	**0.239**
FUEL CYCLE URANIUM ENRICHMENT PLANTS – 21200																		
LOUISIANA ENERGY SERVICES, LLC	SNM-2010	324	145	1	1	-	-	-	-	-	-	-	-	-	471	147	1.695	0.012
USEC, INC.	SNM-7003	335	5	-	-	-	-	-	-	-	-	-	-	-	340	5	0.093	0.019
USEC - PADUCAH GDP	GDP-1	1,542	186	16	-	-	-	-	-	-	-	-	-	-	**1,744**	**202**	**6.956**	**0.034**
USEC - PORTSMOUTH GDP	GDP-2	1,308	92	-	-	-	-	-	-	-	-	-	-	-	1,400	92	1.610	0.018
Total	**4**	**3,509**	**428**	**17**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3,955**	**446**	**10.354**	**0.023**
FUEL CYCLE FUEL FABRICATION FACILITIES – 21210																		
AREVA NP, INC. - LYNCHBURG	SNM-1168	92	52	23	1	-	-	-	-	-	-	-	-	-	168	76	6.243	0.082
AREVA NP, INC. - RICHLAND	SNM-1227	395	398	49	79	43	16	3	-	-	-	-	-	-	983	588	91.575	0.156
B & W NUCLEAR OPERATIONS GROUP	SNM-0042	40	175	20	2	-	1	1	-	-	-	-	-	-	239	199	11.480	0.058
GLOBAL NUCLEAR FUEL - AMERICAS, LLC	SNM-1097	418	430	152	27	4	-	-	-	-	-	-	-	-	1,031	613	46.304	0.076
NUCLEAR FUEL SERVICES, INC.	SNM-0124	526	636	55	4	-	-	-	-	-	-	-	-	-	**1,221**	**695**	21.599	0.031
WESTINGHOUSE ELECTRIC COMPANY	SNM-1107	137	196	134	168	75	7	-	-	-	-	-	-	-	717	580	**140.917**	**0.243**
Total	**6**	**1,608**	**1,887**	**433**	**281**	**122**	**24**	**4**	**-**	**-**	**-**	**-**	**-**	**-**	**4,359**	**2,751**	**318.118**	**0.116**

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

APPENDIX A

Table A2 - Other Facilities Reporting to the NRC
2011

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**	**1**	**0.010**	**0.010**
Total	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**0.010**	**0.010**
MEASURING SYSTEMS PORTABLE GAUGES – 03121																		
MK WEEDEN CONSTRUCTION, INC.	25-29366-01	1	1	-	-	-	-	-	-	-	-	-	-	-	**2**	**1**	**0.015**	**0.015**
Total	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**0.015**	**0.015**
INSTRUMENT CALIBRATION SERVICE ONLY – SOURCE > 100 CURIES – 03222																		
GENERAL DYNAMICS CORP - ELEC BOAT	06-01781-03	2	2	-	-	-	-	-	-	-	-	-	-	-	**4**	**2**	**0.015**	**0.008**
Total	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4**	**2**	**0.015**	**0.008**
OTHER SERVICES - 03225																		
VEGA AMERICAS, INC.	34-00639-04	9	52	4	2	-	-	1	-	-	-	-	-	-	**68**	**59**	**3.665**	**0.062**
Total	**1**	**9**	**52**	**4**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**68**	**59**	**3.665**	**0.062**
CRITICAL MASS MATERIAL - OTHER THAN UNIVERSITIES – 21320																		
G.E. - HITACHI (VALLECITOS NUCLEAR CENTER)	SNM-0960	101	81	15	8	8	3	6	-	-	-	-	-	-	**222**	**121**	**23.601**	**0.195**
Total	**1**	**101**	**81**	**15**	**8**	**8**	**3**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**222**	**121**	**23.601**	**0.195**

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 t he values separating ranges are reported in the next higher range.

APPENDIX A

Table A2 - Other Facilities Reporting to the NRC 2011 (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)																		
FORSMARK NUCLEAR POWER PLANT	556174-8525	-	1	-	-	-	-	-	-	-	-	-	-	-	**1**	**1**	**0.010**	**0.010**
IRRS - REPUBLIC OF KOREA	IRRS-ROK	1	-	-	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
Total	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**0.010**	**0.010**
TEST REACTOR FACILITIES – 42140																		
NAT'L INSTITUTE OF STANDARDS & TECH	TR-5	18	121	23	17	5	1	-	-	-	-	-	-	-	**185**	**167**	**17.338**	**0.104**
Total	**1**	**18**	**121**	**23**	**17**	**5**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**185**	**167**	**17.338**	**0.104**
PROGRAM CODE – 42150																		
AEROTEST OPERATIONS, INC.	R-98	-	7	2	2	-	-	-	-	-	-	-	-	-	**11**	**11**	**1.202**	**0.109**
Total	**1**	**-**	**7**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**11**	**11**	**1.202**	**0.109**

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

Appendix B

ANNUAL DOSES AT LICENSED NUCLEAR POWER FACILITIES

2011

APPENDIX B

Annual Doses* at Licensed Nuclear Power Facilities
2011

PLANT NAME	TYPE	Number of Individuals with Annual Doses* in the Ranges (rem)**														Total Number Monitored	Number with Meas. Dose	Total Collective TEDE per Site (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	1,492	1,124	323	71	8	-	-	-	-	-	-	-	-	-	3,018	1,526	116.884
BEAVER VALLEY 1, 2	PWR	1,691	575	211	43	2	-	-	-	-	-	-	-	-	-	2,522	831	72.206
BRAIDWOOD 1, 2	PWR	2,094	859	192	20	-	-	-	-	-	-	-	-	-	-	3,165	1,071	70.165
BROWNS FERRY 1, 2, 3	BWR	2,013	1,126	567	290	79	14	3	-	-	-	-	-	-	-	4,092	2,079	296.642
BRUNSWICK 1, 2	BWR	1,670	1,770	545	297	113	37	16	-	-	-	-	-	-	-	4,448	2,778	381.057
BYRON 1, 2	PWR	1,992	1,138	425	193	63	26	4	-	-	-	-	-	-	-	3,841	1,849	244.104
CALLAWAY 1	PWR	1,137	609	156	51	13	7	2	-	-	-	-	-	-	-	1,975	838	80.215
CALVERT CLIFFS 1, 2	PWR	1,396	383	210	89	14	7	-	-	-	-	-	-	-	-	2,099	703	95.233
CATAWBA 1, 2	PWR	2,187	829	122	9	1	-	-	-	-	-	-	-	-	-	3,148	961	52.321
CLINTON	BWR	1,583	1,067	341	188	44	28	15	-	-	-	-	-	-	-	3,266	1,683	228.447
COLUMBIA GENERATING	BWR	1,185	1,451	429	254	103	53	19	-	-	-	-	-	-	-	3,494	2,309	335.657
COMANCHE PEAK 1, 2	PWR	907	1,129	264	142	34	6	5	-	-	-	-	-	-	-	2,487	1,580	154.716
COOK 1, 2	PWR	1,935	668	138	35	1	-	-	-	-	-	-	-	-	-	2,777	842	57.169
COOPER STATION	BWR	373	1,049	283	170	95	75	65	-	-	-	-	-	-	-	2,110	1,737	349.247
CRYSTAL RIVER 3	PWR	1,715	238	13	-	-	-	-	-	-	-	-	-	-	-	1,966	251	8.292
DAVIS-BESSE	PWR	1,661	969	183	29	1	-	-	-	-	-	-	-	-	-	2,843	1,182	73.360
DIABLO CANYON 1, 2	PWR	1,920	671	73	3	-	-	-	-	-	-	-	-	-	-	2,667	747	31.625
DRESDEN 2, 3	BWR	1,359	1,623	530	196	29	3	1	-	-	-	-	-	-	-	3,741	2,382	236.427
DUANE ARNOLD	BWR	867	296	84	20	-	-	-	-	-	-	-	-	-	-	1,267	400	29.663
FARLEY 1, 2	PWR	1,690	626	94	3	-	-	-	-	-	-	-	-	-	-	2,413	723	37.510
FERMI 2	BWR	1,418	302	80	5	-	-	-	-	-	-	-	-	-	-	1,805	387	24.080
FITZPATRICK	BWR	425	396	88	21	7	1	-	-	-	-	-	-	-	-	938	513	35.217
FT CALHOUN	PWR	1,015	766	221	52	3	-	-	-	-	-	-	-	-	-	2,057	1,042	79.226
GINNA	PWR	1,366	584	254	83	6	4	-	-	-	-	-	-	-	-	2,297	931	100.711
GRAND GULF	BWR	1,799	467	57	5	1	-	-	-	-	-	-	-	-	-	2,329	530	21.084
HARRIS	PWR	1,127	150	5	2	-	-	-	-	-	-	-	-	-	-	1,284	157	4.724
HATCH 1, 2	BWR	1,371	1,084	422	150	24	1	-	-	-	-	-	-	-	-	3,052	1,681	176.976
HOPE CREEK 1	BWR	268	351	48	21	5	1	-	-	-	-	-	-	-	-	694	426	24.677
INDIAN POINT 2, 3	PWR	1,662	1,004	142	39	-	-	-	-	-	-	-	-	-	-	2,847	1,185	63.267
KEWAUNEE	PWR	996	490	184	70	13	-	-	-	-	-	-	-	-	-	1,753	757	79.396
LASALLE 1, 2	BWR	1,635	1,841	547	304	81	21	11	-	-	-	-	-	-	-	4,440	2,805	340.529
LIMERICK 1, 2	BWR	1,988	1,398	438	149	21	1	-	-	-	-	-	-	-	-	3,995	2,007	184.415
MCGUIRE 1, 2	PWR	2,465	1,280	301	59	8	-	-	-	-	-	-	-	-	-	4,113	1,648	119.637
MILLSTONE 2, 3	PWR	1,867	533	290	156	45	13	7	-	-	-	-	-	-	-	2,911	1,044	169.417
MONTICELLO	BWR	2,115	1,275	365	169	53	23	18	-	-	-	-	-	-	-	4,018	1,903	236.997
NINE MILE POINT 1, 2	BWR	1,551	740	305	202	61	28	26	-	-	-	-	-	-	-	2,913	1,362	244.395
NORTH ANNA 1, 2	PWR	3,073	501	202	70	8	10	1	-	-	-	-	-	-	-	3,865	792	90.763

NOTE: Totals corrected for transients on page B-3.
* These doses are annual TEDE doses.
** Dose values exactly equal to the values separating ranges are reported in the next higher range.

APPENDIX B

Annual Doses* at Licensed Nuclear Power Facilities
2011 (continued)

PLANT NAME	TYPE	Number of Individuals with Annual Doses* in the Ranges (rem)**														Total Number Monitored	Number with Meas. Dose	Total Collective TEDE per Site (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	2,851	1,549	458	121	14	-	-	-	-	-	-	-	-	-	4,993	2,142	182.261
OYSTER CREEK	BWR	1,078	256	133	38	7	-	-	-	-	-	-	-	-	-	1,512	434	46.984
PALISADES	PWR	667	276	41	21	1	1	-	-	-	-	-	-	-	-	1,007	340	21.654
PALO VERDE 1, 2, 3	PWR	2,748	1,087	135	24	1	1	-	-	-	-	-	-	-	-	3,996	1,248	61.374
PEACH BOTTOM 2, 3	BWR	1,537	1,614	702	290	102	35	15	-	-	-	-	-	-	-	4,295	2,758	389.814
PERRY	BWR	959	814	397	287	84	35	23	-	-	-	-	-	-	-	2,599	1,640	307.866
PILGRIM 1	BWR	1,099	506	339	215	85	19	15	-	-	-	-	-	-	-	2,278	1,179	241.402
POINT BEACH 1, 2	PWR	2,399	562	239	160	48	15	3	-	-	-	-	-	-	-	3,426	1,027	159.684
PRAIRIE ISLAND 1, 2	PWR	1,312	473	163	41	1	-	-	-	-	-	-	-	-	-	1,990	678	58.029
QUAD CITIES 1, 2	BWR	1,534	1,509	618	280	28	17	1	-	-	-	-	-	-	-	3,987	2,453	288.618
RIVER BEND 1	BWR	721	1,206	407	215	46	5	1	-	-	-	-	-	-	-	2,601	1,880	211.212
ROBINSON 2	PWR	1,470	133	4	-	-	-	-	-	-	-	-	-	-	-	1,607	137	3.630
SALEM 1, 2	PWR	1,376	1,800	248	105	23	4	-	-	-	-	-	-	-	-	3,556	2,180	126.716
SAN ONOFRE 2, 3	PWR	3,073	557	71	13	-	-	-	-	-	-	-	-	-	-	3,714	641	29.658
SEABROOK	PWR	1,019	961	143	41	10	1	-	-	-	-	-	-	-	-	2,175	1,156	65.593
SEQUOYAH 1, 2	PWR	2,268	977	301	76	-	-	-	-	-	-	-	-	-	-	3,622	1,354	109.417
SOUTH TEXAS 1, 2	PWR	1,713	696	301	115	35	6	-	-	-	-	-	-	-	-	2,866	1,153	139.274
ST. LUCIE 1, 2	PWR	2,644	1,139	548	269	72	15	7	-	-	-	-	-	-	-	4,694	2,050	295.228
SUMMER 1	PWR	1,841	516	68	14	-	-	-	-	-	-	-	-	-	-	2,439	598	31.580
SURRY 1, 2	PWR	3,678	777	231	90	15	5	3	-	-	-	-	-	-	-	4,799	1,121	113.718
SUSQUEHANNA 1, 2	BWR	2,175	1,283	429	118	16	-	1	-	-	-	-	-	-	-	4,022	1,847	168.968
THREE MILE ISLAND 1	PWR	1,763	800	309	84	21	8	2	-	-	-	-	-	-	-	2,987	1,224	129.775
TURKEY POINT 3, 4	PWR	2,920	730	158	33	-	-	-	-	-	-	-	-	-	-	3,841	921	62.326
VERMONT YANKEE	BWR	881	555	225	174	52	14	9	-	-	-	-	-	-	-	1,910	1,029	176.129
VOGTLE 1, 2	PWR	1,804	771	307	85	13	3	-	-	-	-	-	-	-	-	2,983	1,179	118.931
WATERFORD 3	PWR	1,110	840	208	63	27	6	-	-	-	-	-	-	-	-	2,254	1,144	100.053
WATTS BAR 1	PWR	5,633	762	117	21	-	-	-	-	-	-	-	-	-	-	6,533	900	51.021
WOLF CREEK 1	PWR	936	896	219	100	38	10	3	-	-	-	-	-	-	-	2,202	1,266	133.960
Totals BWRs	**BWRs**	**31,604**	**23,979**	**8,379**	**4,058**	**1,136**	**411**	**239**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**69,806**	**38,202**	**4,976.503**
Totals PWRs	**PWRs**	**78,613**	**31,428**	**8,272**	**2,695**	**539**	**148**	**37**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**121,732**	**43,119**	**3,794.823**
Total LWRs	**LWRs**	**110,217**	**55,407**	**16,651**	**6,753**	**1,675**	**559**	**276**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**191,538**	**81,321**	**8,771.326**
Corrected for Transients	**LWRs**	**78,092**	**36,747**	**12,121**	**6,308**	**2,225**	**1,007**	**837**	**23**	**-**	**-**	**-**	**-**	**-**	**-**	**137,360**	**59,268**	**8,771.326**

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

APPENDIX B

Annual Doses* at Licensed Nuclear Power Facilities 2011 (continued)

PLANT NAME	TYPE	Number of Individuals with Annual Doses* in the Ranges (rem)**														Total Number Monitored	Number with Meas. Dose	Total Collective TEDE per Site (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	23	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-
FERMI	FBR	49	37	7	8	11	8	7	-	-	-	-	-	-	-	127	78	29.485
HADDAM NECK	PWR	26	4	2	-	-	-	-	-	-	-	-	-	-	-	32	6	0.364
HUMBOLDT BAY	BWR	263	143	15	-	-	-	-	-	-	-	-	-	-	-	421	158	6.709
LA CROSSE	BWR	72	99	7	1	-	3	-	-	-	-	-	-	-	-	182	110	5.296
MAINE YANKEE	PWR	31	2	-	-	-	-	-	-	-	-	-	-	-	-	33	2	0.060
YANKEE-ROWE	PWR	20	8	-	-	-	-	-	-	-	-	-	-	-	-	28	8	0.113
ZION 1, 2	PWR	550	74	25	7	5	13	4	-	-	-	-	-	-	-	678	128	28.794
Total Reporting* **	**8**	**1,034**	**367**	**56**	**16**	**16**	**24**	**11**	**-**	**-**	-	-	-	-	-	**1,524**	**490**	**70.821**
REACTORS NO LONGER IN COMMERCIAL OPERATION, REPORTED WITH OTHER UNITS																		
DRESDEN 1	BWR	Reported with Dresden 2, 3.																
INDIAN POINT 1	PWR	Reported with Indian Point Units 2 and 3.																
MILLSTONE 1	BWR	Reported with Millstone Units 2 & 3; estimated dose from Unit 1 is 0.265 person-rem.																
SAN ONOFRE 1	PWR	Reported with San Onofre 2, 3.																
THREE MILE ISLAND 2	PWR	Reported with Three Mile Island 1; estimated dose from Unit 2 is 0.291 person-rem.																
REACTORS NO LONGER IN COMMERCIAL OPERATION, DECOMMISSIONED																		
PEACH BOTTOM 1	HTGR																	
RANCHO SECO	PWR																	
TROJAN	PWR	Reported as ISFSI (See Appendix A)																

Note: Totals corrected for transients on page B-3.
* These doses are annual TEDE doses.
** 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

1969–2011

*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 per Site (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	0.30
	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
	2009	1,733.7	95.5	1,139	102.732	0.09	0.06
	2010	1,716.6	93.7	1,388	99.376	0.07	0.06
	2011	1,621.9	90.5	1,526	116.884	0.08	0.07
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, 885 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	0.25
	2001	1,500.8	92.3	1,202	184.361	0.15	0.12

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BEAVER VALLEY 1, 2	2002	1,548.0	95.4	1,048	90.479	0.09	0.06
(continued)	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
	2005	1,590.4	96.7	978	79.055	0.08	0.05
	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
	2009	1,599.3	89.6	1,504	224.516	0.15	0.14
	2010	1,714.2	95.6	750	49.983	0.07	0.03
	2011	1,705.5	95.1	831	72.206	0.09	0.04
BIG ROCK POINT[1]	1969	48.1	---	165	136	0.82	2.83
Docket 50-155;	1970	43.5	---	290	194	0.67	4.46
DPR-6	1971	44.4	---	260	184	0.71	4.14
1st commercial operation 3/63	1972	43.5	---	195	181	0.93	4.16
Type - BWR	1973	50.9	---	241	285	1.18	5.60
Capacity - (67) MWe	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	0.35
	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	0.30	---
	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	---	---
	2009	0.0	0.0	0	0.000	---	---
	2010	0.0	0.0	0	0.000	---	---
	2011	0.0	0.0	---	---	---	---
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, NPF-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 - 1,151, 1,125 MWe	1995	1,914.7	85.4	1,134	236	0.21	0.12

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BRAIDWOOD 1, 2	1996	1,854.9	82.1	1,356	334	0.25	0.18
(continued)	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
	2003	2,279.9	95.6	1,572	244.860	0.16	0.11
	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
	2009	2,195.0	93.8	1,397	142.066	0.10	0.06
	2010	2,111.9	94.0	870	63.856	0.07	0.03
	2011	2,257.5	96.8	1,071	70.165	0.07	0.03
BROWNS FERRY 1[2], 2, 3	1975	161.7	17.8	2,743	347	0.13	2.15
Docket 50-259, 50-260, 50-296	1976	337.6	26.9	2,530	232	0.09	0.69
DPR-33, DPR-52, DPR-68	1977	1,327.5	73.7	1,985	876	0.44	0.66
1st commercial operation	1978	1,992.1	73.5	2,479	1,776	0.72	0.89
8/74, 3/75, 3/77	1979	2,393.0	79.1	2,869	1,593	0.56	0.67
Type - BWRs	1980	2,182.1	73.6	2,838	1,768	0.62	0.81
Capacity - 1,101, 1,104,	1981	2,132.9	69.5	3,497	2,398	0.69	1.12
1,105 MWe	1982	2,025.4	67.6	3,360	2,230	0.66	1.10
	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
	2009	2,933.1	91.2	2,188	348.257	0.16	0.12
	2010	2,828.0	92.3	2,825	556.749	0.20	0.20
	2011	2,845.8	87.9	2,079	296.642	0.14	0.10
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, DPR-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, 920 MWe	1982	540.3	50.3	4,957	3,792	0.76	7.02

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
BRUNSWICK 1, 2	1983	636.7	44.3	5,602	3,475	0.62	5.46
(continued)	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
	1994	1,268.4	83.0	3,049	999	0.33	0.79
	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	0.18
	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
	2009	1,647.9	89.6	2,683	350.347	0.13	0.21
	2010	1,690.7	91.3	3,227	407.424	0.13	0.24
	2011	1,662.7	90.5	2,778	381.057	0.14	0.23
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 - 1,138, 1,120 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
	2009	2,250.9	96.7	985	83.443	0.08	0.04
	2010	2,266.6	97.4	922	56.425	0.06	0.02
	2011	2,077.9	91.0	1,849	244.104	0.13	0.12
CALLAWAY 1	1985	967.4	90.0	964	36	0.04	0.04
Docket 50-483;	1986	865.2	81.3	1,052	225	0.21	0.26
NPF-30	1987	759.0	71.1	1,082	393	0.36	0.52
1st commercial operation 12/84	1988	1,069.2	93.4	353	27	0.08	0.03
Type - PWR	1989	1,000.3	85.4	1,055	283	0.27	0.28
Capacity - 1,190 MWe	1990	960.7	84.1	1,134	442	0.39	0.46

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
CALLAWAY 1	1991	1,193.1	99.7	280	21	0.08	0.02
(continued)	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
	2009	1,170.3	97.6	164	4.821	0.03	0.00
	2010	1,029.9	84.8	800	58.735	0.07	0.06
	2011	1,071.7	88.9	838	80.215	0.10	0.07
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, DPR-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 - 855, 850 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
	2009	1,660.9	96.6	891	95.756	0.11	0.06
	2010	1,597.3	93.5	834	128.581	0.15	0.08
	2011	1,635.9	95.7	703	95.233	0.14	0.06

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
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, NPF-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	0.05
	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
	2009	2,044.8	89.1	1,385	169.409	0.12	0.08
	2010	2,164.8	94.8	1,045	97.010	0.09	0.04
	2011	2,144.2	93.9	961	52.321	0.05	0.02
CLINTON	1988	701.3	84.2	769	130	0.17	0.19
Docket 50-461;	1989	348.3	48.5	1,196	372	0.31	1.07
NPF-62	1990	435.8	55.1	1,390	553	0.40	1.27
1st commercial operation 11/87	1991	722.7	80.8	1,010	233	0.23	0.32
Type - BWR	1992	589.7	68.6	1,195	431	0.36	0.73
Capacity - 1,022 MWe	1993	701.5	79.6	1,253	498	0.40	0.71
	1994	883.3	94.8	409	63	0.15	0.07
	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
	2009	1,014.6	96.6	435	48.009	0.11	0.05
	2010	983.1	93.5	1,540	219.954	0.14	0.22
	2011	989.9	94.4	1,683	228.447	0.14	0.23
COLUMBIA GENERATING[3]	1985	616.0	87.6	755	119	0.16	0.19
Docket 50-397;	1986	616.0	74.4	1,013	222	0.22	0.36
NPF-21	1987	639.0	70.8	1,201	406	0.34	0.64
1st commercial operation 12/84	1988	707.7	71.8	1,050	353	0.34	0.50
Type - BWR	1989	727.2	78.3	1,299	492	0.38	0.68
Capacity - 1,107 MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
COLUMBIA GENERATING[3]	1995	824.7	83.8	1,694	456	0.27	0.55
(continued)	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
	2009	757.2	76.3	1,958	305.163	0.16	0.40
	2010	1,054.9	100.0	733	54.712	0.07	0.05
	2011	548.7	54.4	2,309	335.657	0.15	0.61
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, NPF-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 - 1,205, 1,195 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
	2009	2,299.3	96.7	938	51.420	0.05	0.02
	2010	2,316.8	96.3	1,037	70.807	0.07	0.03
	2011	2,216.8	92.6	1,580	154.716	0.10	0.07
COOK 1, 2	1976	807.4	83.1	395	116	0.29	0.14
Docket 50-315, 50-316;	1977	573.0	76.1	802	300	0.37	0.52
DPR-58, DPR-74	1978	744.8	73.6	778	336	0.43	0.45
1st commercial operation	1979	1,373.0	65.3	1,445	718	0.50	0.52
8/75, 7/78	1980	1,552.4	74.1	1,345	493	0.37	0.32
Type - PWRs	1981	1,557.3	73.4	1,341	656	0.49	0.42
Capacity - 1,030, 1,077 MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
COOK 1, 2	1998	0.0	0.0	1,155	104.638	0.09	---
(continued)	1999	0.0	0.0	1,662	171.479	0.10	---
	2000	560.1	28.1	2,506	337.584	0.13	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	0.04
	2009	950.5	45.3	693	40.007	0.06	0.04
	2010	1,786.1	86.7	1,116	83.276	0.07	0.05
	2011	1,981.5	94.2	842	57.169	0.07	0.03
COOPER STATION	1975	456.4	83.6	579	117	0.20	0.26
Docket 50-298;	1976	433.3	75.5	763	350	0.46	0.81
DPR-46	1977	538.2	86.2	315	198	0.63	0.37
1st commercial operation 7/74	1978	576.0	91.0	297	158	0.53	0.27
Type - BWR	1979	591.0	87.6	426	221	0.52	0.37
Capacity - 769 MWe	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	0.15	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
	2003	511.4	74.1	882	135.249	0.15	0.26
	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
	2009	654.6	86.6	1,638	254.032	0.16	0.39
	2010	775.4	100.0	773	61.303	0.08	0.08
	2011	658.5	84.8	1,737	349.247	0.20	0.53
CRYSTAL RIVER 3	1978	311.5	41.4	643	321	0.50	1.03
Docket 50-302;	1979	453.0	58.9	1,150	495	0.43	1.09
DPR-72	1980	404.1	53.2	1,053	625	0.59	1.55
1st commercial operation 3/77	1981	490.4	62.2	1,120	408	0.36	0.83
Type - PWR	1982	589.8	76.0	780	177	0.23	0.30
Capacity - 860 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
CRYSTAL RIVER 3 (continued)	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	0.00
	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
	2009	615.0	72.5	1,705	222.344	0.13	0.36
	2010	---	0.0	666	31.922	0.05	---
	2011	---	---	251	8.292	0.03	---
DAVIS-BESSE 1 Docket 50-346; NPF-3 1st commercial operation 7/78 Type - PWR Capacity - 894 MWe	1978	326.4	48.7	421	48	0.11	0.15
	1979	381.0	67.0	304	30	0.10	0.08
	1980	256.4	36.2	1,283	154	0.12	0.60
	1981	531.4	67.4	578	58	0.10	0.11
	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	3.80
	2003	0.0	0.0	1,047	219.696	0.21	---
	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
	2009	868.7	95.7	115	3.621	0.03	0.00
	2010	598.0	67.1	1,649	464.095	0.28	0.78
	2011	723.7	80.7	1,182	73.360	0.06	0.10

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
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	0.16	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
	2009	1,873.0	85.3	2,534	337.831	0.13	0.18
	2010	2,115.2	94.7	1,367	125.457	0.09	0.06
	2011	2,131.1	94.6	747	31.625	0.04	0.01
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, DPR-19, DPR-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
	1998	1,354.7	90.6	2,311	426.918	0.18	0.32
	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
DRESDEN 1[4], 2, 3	2001	1,427.4	94.5	2,769	400.702	0.14	0.28
(continued)	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
	2009	1,628.7	95.4	1,932	231.688	0.12	0.14
	2010	1,665.9	96.3	2,152	213.825	0.10	0.13
	2011	1,679.7	96.7	2,382	236.427	0.10	0.14
DUANE ARNOLD	1976	305.2	78.0	350	105	0.30	0.34
Docket 50-331;	1977	353.6	78.9	538	299	0.56	0.85
DPR-49	1978	149.2	33.2	1,112	974	0.88	6.53
1st commercial operation 2/75	1979	352.0	78.0	757	275	0.36	0.78
Type - BWR	1980	339.1	73.3	1,108	671	0.61	1.98
Capacity - 602 MWe	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
	2009	534.1	91.3	960	140.206	0.15	0.26
	2010	508.1	86.9	1,093	200.601	0.18	0.39
	2011	595.3	98.6	400	29.663	0.07	0.05
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, NPF-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 - 874, 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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
FARLEY 1, 2	1989	1,402.9	84.6	2,206	749	0.34	0.53
(continued)	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
	1992	1,331.7	81.8	2,018	805	0.40	0.60
	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	0.12	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
	2009	1,595.2	94.1	657	41.851	0.06	0.03
	2010	1,503.4	89.0	1,321	121.313	0.09	0.08
	2011	1,647.4	95.1	723	37.510	0.05	0.02
FERMI 2	1989	624.0	68.5	1,270	255	0.20	0.41
Docket 50-341;	1990	848.2	84.7	462	83	0.18	0.10
NPF-43	1991	739.0	77.0	1,223	228	0.19	0.31
1st commercial operation 1/88	1992	874.3	81.3	1,213	245	0.20	0.28
Type - BWR	1993	984.3	92.9	360	35	0.10	0.04
Capacity - 1,037 MWe	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	0.16
	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
	2009	847.8	79.3	1,497	148.846	0.10	0.18
	2010	885.0	86.4	1,625	146.490	0.09	0.17
	2011	1,017.9	95.7	387	24.080	0.06	0.02
FITZPATRICK	1976	489.0	71.6	600	202	0.34	0.41
Docket 50-333;	1977	460.5	68.4	1,380	1,080	0.78	2.35
DPR-59	1978	497.0	72.1	904	909	1.01	1.83
1st commercial operation 7/75	1979	349.0	50.8	850	859	1.01	2.46
Type - BWR	1980	509.5	70.3	2,056	2,040	0.99	4.00
Capacity - 813 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
FITZPATRICK	1991	399.7	53.4	1,269	333	0.26	0.83
(continued)	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
	2001	807.2	98.9	665	63.229	0.10	0.08
	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
	2009	844.5	100.0	487	35.119	0.07	0.04
	2010	726.2	91.3	1,429	219.887	0.15	0.30
	2011	826.9	100.0	513	35.217	0.07	0.04
FORT CALHOUN	1975	252.3	67.4	469	294	0.63	1.17
Docket 50-285;	1976	265.9	69.5	516	313	0.61	1.18
DPR-40	1977	351.8	79.4	535	297	0.56	0.84
1st commercial operation 6/74	1978	342.3	75.1	596	410	0.69	1.20
Type - PWR	1979	440.0	95.7	451	126	0.28	0.29
Capacity - 482 MWe	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	0.23	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
	2009	422.7	87.0	870	110.918	0.13	0.26
	2010	486.5	98.5	171	9.763	0.06	0.02
	2011	134.4	26.8	1,042	79.226	0.08	0.59

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
GINNA	1971	327.8	---	340	430	1.26	1.31
Docket 50-244;	1972	293.6	---	677	1,032	1.52	3.51
DPR-18	1973	409.5	---	319	224	0.70	0.55
1st commercial operation 7/70	1974	253.7	62.4	884	1,225	1.39	4.83
Type - PWR	1975	365.2	76.7	685	538	0.79	1.47
Capacity - 560 MWe	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
	1991	418.6	86.7	947	328	0.35	0.78
	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	0.09
	2007	564.4	99.0	111	4.412	0.04	0.01
	2008	540.1	94.5	976	101.996	0.10	0.19
	2009	529.2	94.3	633	41.809	0.07	0.08
	2010	564.9	98.9	75	3.168	0.04	0.01
	2011	492.1	86.4	931	100.711	0.11	0.20
GRAND GULF	1986	494.7	60.9	1,486	436	0.29	0.88
Docket 50-416;	1987	920.7	82.2	1,358	420	0.31	0.46
NPF-29	1988	1,136.6	96.7	692	147	0.21	0.13
1st commercial operation 7/85	1989	932.6	80.0	1,972	498	0.25	0.53
Type - BWR	1990	883.5	78.9	1,765	482	0.27	0.55
Capacity - 1,266 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
GRAND GULF	2006	1,233.7	98.0	1,016	59.935	0.06	0.05
(continued)	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
	2009	1,255.5	100.0	521	30.721	0.06	0.02
	2010	1,102.0	91.5	1,822	188.370	0.10	0.17
	2011	1,180.0	100.0	530	21.084	0.04	0.02
HADDAM NECK[5]	1969	438.5	---	138	106	0.77	0.24
Docket 50-213;	1970	424.7	---	734	689	0.94	1.62
DPR-61	1971	502.2	---	289	342	1.18	0.68
1st commercial operation 1/68	1972	515.6	---	355	325	0.92	0.63
Type - PWR	1973	293.1	---	951	697	0.73	2.38
Capacity - (560) MWe	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
	1986	294.8	53.6	1,945	1,567	0.81	5.32
	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	---
	2009	0.0	0.0	1	0.010	0.01	---
	2010	0.0	0.0	2	0.024	0.01	---
	2011	0.0	0.0	6	0.364	0.06	---
HARRIS 1	1988	652.9	75.0	721	169	0.23	0.26
Docket 50-400;	1989	690.6	79.5	929	156	0.17	0.23
NPF-63	1990	776.4	89.6	453	85	0.19	0.11
1st commercial operation 5/87	1991	724.8	81.5	872	226	0.26	0.31
Type - PWR	1992	661.8	74.9	930	213	0.23	0.32
Capacity - 900 MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
HARRIS 1	1998	766.2	90.4	931	133.497	0.14	0.17
(continued)	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
	2009	845.1	92.7	742	41.401	0.06	0.05
	2010	808.3	89.0	1,069	82.578	0.08	0.10
	2011	926.0	100.0	157	4.724	0.03	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-5	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
	1990	1,268.0	83.5	2,902	1,455	0.50	1.15
	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	0.27
	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
	2009	1,416.5	83.2	1,310	186.013	0.14	0.13
	2010	1,586.9	93.0	1,734	245.797	0.14	0.15
	2011	1,550.4	93.1	1,681	176.976	0.11	0.11
HOPE CREEK 1	1987	869.2	86.4	589	117	0.20	0.13
Docket 50-354;	1988	832.7	80.7	1,734	287	0.17	0.34
NPF-57	1989	791.1	77.8	1,873	465	0.25	0.59
1st commercial operation 12/86	1990	966.4	91.6	1,394	196	0.14	0.20
Type - BWR	1991	882.5	84.2	1,700	373	0.22	0.42
Capacity - 1,172 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
HOPE CREEK 1	1997	731.8	77.8	1,747	350	0.20	0.48
(continued)	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
	2009	1,111.4	93.3	2,090	169.362	0.08	0.15
	2010	1,082.0	92.1	1,985	160.910	0.08	0.15
	2011	1,199.3	99.4	426	24.677	0.06	0.02
HUMBOLDT BAY[6]	1969	44.6	---	125	164	1.31	3.68
Docket 50-133;	1970	49.3	---	115	209	1.82	4.24
DPR-7	1971	39.6	---	140	292	2.09	7.37
1st commercial operation 8/63	1972	43.1	---	127	253	1.99	5.87
Type - BWR	1973	50.1	---	210	266	1.27	5.31
Capacity - (63) MWe	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	---
	1986	0.0	0.0	115	50	0.43	---
	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	0.929	0.02	---
	1999	0.0	0.0	28	0.720	0.03	---
	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	---
	2009	0.0	0.0	30	0.631	0.02	---
	2010	0.0	0.0	136	7.691	0.06	---
	2011	0.0	0.0	158	6.709	0.04	---

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
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, DPR-26, DPR-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;	1980	510.8	64.8	1,577	971	0.62	1.90
DPR-5, DPR-26	1981	367.5	46.0	2,595	2,731	1.05	7.43
1st commercial operation	1982	532.4	65.4	2,144	1,635	0.76	3.07
10/62, 8/74	1983	702.6	84.0	1,057	486	0.46	0.69
Type - PWRs	1984	416.7	51.9	2,919	2,644	0.91	6.35
Capacity - (265), 998 MWe	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
	1997	360.6	45.1	1,340	367	0.27	1.02
	1998	282.8	31.5	1,154	289.600	0.25	1.02
	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;	2005	0.0	0.0	151	6.692	0.04	---
DPR-05	2006	0.0	0.0	193	7.670	0.04	---
1st commercial operation 10/62	2007	0.0	0.0	210	2.554	0.01	---
Type - PWR	2008	0.0	0.0	234	4.322	0.02	---
Capacity - (265) MWe	2009	0.0	0.0	140	0.404	0.00	---
	2010	0.0	0.0	157	0.833	0.01	---
	2011	0.0	0.0	103	0.262	0.00	---
INDIAN POINT 3[8]	1979	574.0	66.5	808	636	0.79	1.11
Docket 50-286;	1980	367.3	53.2	977	308	0.32	0.84
DPR-64	1981	367.5	59.8	677	364	0.54	0.99
1st commercial operation 8/76	1982	171.5	22.5	1,477	1,226	0.83	7.15
Type - PWR	1983	7.8	2.6	941	607	0.65	77.82
Capacity - 1,030 MWe	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

[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. Indian Point 1, 2, and 3 have been owned by the same utility since 2001 and report together.

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
INDIAN POINT 3[8]	1991	862.8	87.5	299	40	0.13	0.05
(continued)	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	0.01
	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
INDIAN POINT 2, 3[8]	2004	1,851.1	191.0	1,370	199.862	0.15	0.11
Docket 50-247, 50-286;	2005	1,922.2	191.7	1,363	85.280	0.06	0.04
DPR-26, DPR-64	2006	1,936.0	191.0	1,634	289.701	0.18	0.15
1st commercial operation	2007	1,899.3	188.0	1,971	109.969	0.06	0.06
8/74, 8/76	2008	1,977.2	192.6	1,456	142.728	0.10	0.07
Type - PWRs	2009	1,884.2	187.5	1,853	79.090	0.04	0.04
Capacity - 998, 1,030 MWe	2010	1,859.2	183.6	1,962	200.382	0.10	0.11
	2011	1,938.8	95.1	1,185	63.267	0.05	0.03
KEWAUNEE	1975	401.9	88.2	104	28	0.27	0.07
Docket 50-305;	1976	405.9	78.9	381	270	0.71	0.67
DPR-43	1977	425.0	79.9	312	140	0.45	0.33
1st commercial operation 6/74	1978	466.6	89.5	335	154	0.46	0.33
Type - PWR	1979	412.0	79.0	343	127	0.37	0.31
Capacity - 556 MWe	1980	433.8	82.1	401	165	0.41	0.38
	1981	451.8	86.7	383	141	0.37	0.31
	1982	458.4	87.6	353	101	0.29	0.22
	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
	2009	515.4	92.0	595	56.215	0.09	0.11
	2010	569.7	100.0	135	4.690	0.03	0.01
	2011	524.5	92.3	757	79.396	0.10	0.15

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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
LACROSSE[9]	1970	15.3	---	---	111	---	7.25
Docket 50-409;	1971	33.1	---	218	158	0.72	4.77
DPR-45	1972	29.2	---	151	172	1.14	5.89
1st commercial operation 11/69	1973	24.4	---	157	221	1.41	9.06
Type - BWR	1974	37.9	81.0	115	139	1.21	3.67
Capacity - (48) MWe	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	0.16	---
	1997	0.0	0.0	23	2	0.09	---
	1998	0.0	0.0	27	1.530	0.06	---
	1999	0.0	0.0	66	3.725	0.06	---
	2000	0.0	0.0	37	3.548	0.10	---
	2001	0.0	0.0	45	2.782	0.06	---
	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	---
	2009	0.0	0.0	48	1.307	0.03	---
	2010	0.0	0.0	78	2.971	0.04	---
	2011	0.0	0.0	110	5.296	0.05	---
LASALLE 1, 2	1984	677.8	77.8	1,245	252	0.20	0.37
Docket 50-373, 50-374;	1985	987.9	53.0	1,635	685	0.42	0.69
NPF-11, NPF-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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
LASALLE 1, 2	2000	2,138.6	97.1	1,831	260.320	0.14	0.12
(continued)	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
	2009	2,141.0	95.7	1,986	296.659	0.15	0.14
	2010	2,184.1	96.5	2,386	384.434	0.16	0.18
	2011	2,198.2	96.1	2,805	340.529	0.12	0.15
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, NPF-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 - 1,092, 1,096 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
	2009	2,211.4	97.2	1,606	234.742	0.15	0.11
	2010	2,165.2	96.7	1,525	167.797	0.11	0.08
	2011	2,112.7	94.5	2,007	184.415	0.09	0.09
MAINE YANKEE[10]	1973	408.7	---	782	117	0.15	0.29
Docket 50-309;	1974	432.6	68.7	619	420	0.68	0.97
DPR-36	1975	542.9	79.9	440	319	0.73	0.59
1st commercial operation 12/72	1976	712.2	95.0	244	85	0.35	0.12
Type - PWR	1977	617.6	82.2	508	245	0.48	0.40
Capacity - (860) MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MAINE YANKEE[10]	1993	674.8	79.8	1,016	377	0.37	0.56
(continued)	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	---
	2009	0.0	0.0	3	0.137	0.05	---
	2010	0.0	0.0	1	0.084	0.08	---
	2011	0.0	0.0	2	0.060	0.03	---
MCGUIRE 1, 2	1982	524.9	80.4	1,560	169	0.11	0.32
Docket 50-369, 50-370;	1983	558.3	55.4	1,751	521	0.30	0.93
NPF-9, NPF-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	0.15	0.09
	2003	2,156.2	96.0	841	71.323	0.08	0.03
	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
	2009	2,170.6	95.3	1,165	79.773	0.07	0.04
	2010	2,151.9	94.8	1,225	81.321	0.07	0.04
	2011	2,038.3	89.9	1,648	119.637	0.07	0.06
MILLSTONE 1[11]	1972	377.6	---	612	596	0.97	1.58
Docket 50-245;	1973	225.1	---	1,184	663	0.56	2.95
DPR-21	1974	430.3	79.1	2,477	1,430	0.58	3.32
1st commercial operation 3/71	1975	465.4	75.6	2,587	2,022	0.78	4.34
Type - BWR	1976	449.8	76.1	1,387	1,194	0.86	2.65
Capacity - (641) MWe	1977	575.7	89.6	1,075	394	0.37	0.68

[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.

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MILLSTONE 1[11] (continued)	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	0.222	---	---
	2009	0.0	0.0	0	0.114	---	---
	2010	0.0	0.0	0	0.142	---	---
	2011	0.0	0.0	0	0.265	---	---
MILLSTONE 2, 3 Docket 50-336, 50-423; DPR-65; NPF-49 1st commercial operation 12/75, 4/86 Type - PWRs Capacity - 878, 1,218 MWe	1976	545.7	78.7	620	168	0.27	0.31
	1977	518.7	65.7	667	242	0.36	0.47
	1978	536.6	67.3	1,420	1,444	1.02	2.69
	1979	520.0	62.8	525	471	0.90	0.91
	1980	579.3	69.2	893	637	0.71	1.10
	1981	722.4	82.6	890	531	0.60	0.74
	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
	1991	819.5	69.7	1,084	381	0.35	0.46
	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
MILLSTONE 2, 3	2000	1,865.8	92.4	1,385	142.664	0.10	0.08
(continued)	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	0.19	0.15
	2009	1,906.1	89.6	983	159.203	0.16	0.08
	2010	1,916.8	93.1	718	81.589	0.11	0.04
	2011	1,822.7	87.7	1,044	169.417	0.16	0.09
MONTICELLO	1972	424.4	---	99	61	0.62	0.14
Docket 50-263;	1973	389.5	---	401	176	0.44	0.45
DPR-22	1974	349.3	74.9	842	349	0.41	1.00
1st commercial operation 6/71	1975	344.8	72.2	1,353	1,353	1.00	3.92
Type - BWR	1976	476.4	91.5	325	263	0.81	0.55
Capacity - 578 MWe	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
	2009	473.1	85.2	1,235	173.624	0.14	0.37
	2010	536.0	98.5	534	56.116	0.11	0.10
	2011	383.4	71.3	1,903	236.997	0.12	0.62
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
	1977	347.4	59.2	1,093	1,383	1.27	3.98

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
NINE MILE POINT 1, 2 (continued)	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
	2009	1,706.2	97.1	1,456	237.552	0.16	0.14
	2010	1,627.1	95.2	1,703	375.424	0.22	0.23
	2011	1,616.8	92.5	1,362	244.395	0.18	0.15
NORTH ANNA 1, 2 Docket 50-338, 50-339; NPF-4, NPF-7 1st commercial operation 6/78, 12/80 Type - PWRs Capacity - 903, 903 MWe	1979	507.0	61.7	2,025	449	0.22	0.89
	1980	681.8	86.5	2,086	218	0.10	0.32
	1981	1,241.9	71.5	2,416	680	0.28	0.55
	1982	777.7	45.8	2,872	1,915	0.67	2.46
	1983	1,338.4	76.1	2,228	665	0.30	0.50
	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
NORTH ANNA 1, 2	2005	1,751.5	96.0	686	58.844	0.09	0.03
(continued)	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
	2009	1,735.5	95.6	745	78.126	0.10	0.05
	2010	1,529.6	84.9	1,032	182.289	0.18	0.12
	2011	1,429.1	76.5	792	90.763	0.11	0.06
OCONEE 1, 2, 3	1974	650.6	60.1	844	517	0.61	0.79
Docket 50-269, 50-270, 50-287;	1975	1,838.3	75.5	829	497	0.60	0.27
DPR-38, DPR-47, DPR-55	1976	1,561.4	63.0	1,215	1,026	0.84	0.66
1st commercial operation	1977	1,566.4	65.9	1,595	1,329	0.83	0.85
7/73, 9/74, 12/74	1978	1,909.0	75.8	1,636	1,393	0.85	0.73
Type - PWRs	1979	1,708.0	67.7	2,100	1,001	0.48	0.59
Capacity - 846, 846, 846 MWe	1980	1,703.7	70.1	2,124	1,055	0.50	0.62
	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
	2009	2,385.7	92.6	1,830	180.868	0.10	0.08
	2010	2,391.1	93.3	1,953	193.088	0.10	0.08
	2011	2,321.6	90.7	2,142	182.261	0.09	0.08
OYSTER CREEK	1970	413.6	---	95	63	0.66	0.15
Docket 50-219;	1971	448.9	---	249	240	0.96	0.53
DPR-16	1972	515.0	---	339	582	1.72	1.13
1st commercial operation 12/69	1973	424.6	---	782	1,236	1.58	2.91
Type - BWR	1974	434.5	70.4	935	984	1.05	2.26
Capacity - 619 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
OYSTER CREEK	1985	446.1	89.4	2,342	748	0.32	1.68
(continued)	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
	1997	579.1	94.3	509	50	0.10	0.09
	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
	2009	568.3	96.4	382	37.272	0.10	0.07
	2010	525.7	89.9	1,655	206.284	0.12	0.39
	2011	604.8	98.0	434	46.984	0.11	0.08
PALISADES	1972	216.8	---	---	78	---	0.36
Docket 50-255;	1973	286.8	---	975	1,133	1.16	3.95
DPR-20	1974	10.7	5.5	774	627	0.81	58.60
1st commercial operation 12/71	1975	302.0	64.5	495	306	0.62	1.01
Type - PWR	1976	346.9	55.2	742	696	0.94	2.01
Capacity - 744 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PALISADES (continued)	2005	756.6	98.0	156	10.459	0.07	0.01
	2006	675.5	86.0	882	239.652	0.27	0.35
	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
	2009	698.5	89.0	975	267.295	0.27	0.38
	2010	712.5	90.8	908	219.873	0.24	0.31
	2011	758.1	96.5	340	21.654	0.06	0.03
PALO VERDE 1, 2, 3 Docket 50-528, 50-529, 50-530; NPF-41, NPF-51, NPF-74 1st commercial operation 1/86, 9/86, 1/88 Type - PWRs Capacity - 1,311, 1,314, 1,312 MWe	1987	1,638.1	66.1	1,792	669	0.37	0.41
	1988	1,700.9	65.5	2,173	688	0.32	0.40
	1989	965.3	26.5	2,615	720	0.28	0.75
	1990	2,500.9	67.5	2,236	499	0.22	0.20
	1991	3,043.9	78.9	2,242	605	0.27	0.20
	1992	3,102.3	82.0	1,981	541	0.27	0.17
	1993	2,677.1	74.3	2,124	592	0.28	0.22
	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
	2000	3,458.6	93.0	1,279	158.105	0.12	0.05
	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
	2009	3,500.2	89.6	1,695	97.902	0.06	0.03
	2010	3,561.6	90.9	1,655	112.612	0.07	0.03
	2011	3,570.5	91.9	1,248	61.374	0.05	0.02
PEACH BOTTOM 2, 3 Docket 50-277, 50-278; DPR-44, DPR-56 1st commercial operation 7/74, 12/74 Type - BWRs Capacity - 1,112, 1,112 MWe	1975	1,234.3	80.9	971	228	0.23	0.18
	1976	1,379.2	73.0	2,136	840	0.39	0.61
	1977	1,052.4	58.7	2,827	2,036	0.72	1.93
	1978	1,636.3	84.0	2,244	1,317	0.59	0.80
	1979	1,740.0	84.5	2,276	1,388	0.61	0.80
	1980	1,374.2	66.3	2,774	2,302	0.83	1.68
	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PEACH BOTTOM 2, 3	2004	2,148.8	96.4	1,422	264.727	0.19	0.12
(continued)	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
	2009	2,130.4	95.5	2,032	310.517	0.15	0.15
	2010	2,145.3	96.2	1,716	219.372	0.13	0.10
	2011	2,152.0	95.7	2,758	389.814	0.14	0.18
PERRY	1988	869.3	79.0	782	105	0.13	0.12
Docket 50-440;	1989	642.2	57.0	1,883	767	0.41	1.19
NPF-58	1990	792.7	67.1	1,537	638	0.42	0.80
1st commercial operation 11/87	1991	1,074.2	91.9	600	146	0.24	0.14
Type - BWR	1992	856.2	75.5	1,487	571	0.38	0.67
Capacity - 1,240 MWe	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
	2007	919.7	79.0	1,650	505.121	0.31	0.55
	2008	1,215.9	97.9	528	52.058	0.10	0.04
	2009	869.2	73.3	1,818	614.959	0.34	0.71
	2010	1,213.3	98.5	278	32.186	0.12	0.03
	2011	978.2	82.4	1,640	307.866	0.19	0.31
PILGRIM 1	1973	484.0	---	230	126	0.55	0.26
Docket 50-293;	1974	234.1	39.2	454	415	0.91	1.77
DPR-35	1975	308.1	71.3	473	798	1.69	2.59
1st commercial operation 12/72	1976	287.8	60.7	1,317	2,648	2.01	9.20
Type - BWR	1977	316.6	61.4	1,875	3,142	1.68	9.92
Capacity - 685 MWe	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PILGRIM 1	2002	657.0	100.0	463	38.280	0.08	0.06
(continued)	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
	2009	616.0	91.7	1,301	264.215	0.20	0.43
	2010	675.5	100.0	303	25.739	0.08	0.04
	2011	580.5	89.0	1,179	241.402	0.20	0.42
POINT BEACH 1, 2	1971	393.4	---	---	164	---	0.42
Docket 50-266, 50-301;	1972	378.3	---	---	580	---	1.53
DPR-24, DPR-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, 582 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
	1995	858.4	86.1	548	190	0.35	0.22
	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
	2009	902.3	92.9	766	93.270	0.12	0.10
	2010	952.8	93.8	869	95.695	0.11	0.10
	2011	796.2	75.8	1,027	159.684	0.16	0.20
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, DPR-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, 519 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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
PRAIRIE ISLAND 1, 2 (continued)	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	0.23	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
	2009	942.2	89.9	560	53.590	0.10	0.06
	2010	1,002.6	94.9	661	54.933	0.08	0.05
	2011	982.4	92.0	678	58.029	0.09	0.06
QUAD CITIES 1, 2 Docket 50-254, 50-265; DPR-29, DPR-30 1st commercial operation 2/73, 3/73 Type - BWRs Capacity - 866, 888 MWe	1974	958.1	72.3	678	482	0.71	0.50
	1975	833.6	68.4	1,083	1,618	1.49	1.94
	1976	951.2	73.1	1,225	1,651	1.35	1.74
	1977	970.1	84.0	907	1,031	1.14	1.06
	1978	1,124.5	88.6	1,207	1,618	1.34	1.44
	1979	1,075.0	84.6	1,688	2,158	1.28	2.01
	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
	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	0.31	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
QUAD CITIES 1, 2	2007	1,650.3	97.0	1,945	249.927	0.13	0.15
(continued)	2008	1,619.4	95.2	2,065	274.444	0.13	0.17
	2009	1,662.6	95.4	2,366	318.418	0.13	0.19
	2010	1,688.9	95.0	2,267	241.444	0.11	0.14
	2011	1,735.3	95.9	2,453	288.618	0.12	0.17
RANCHO SECO[12]	1976	268.1	30.4	297	58	0.20	0.22
Docket 50-312;	1977	706.4	77.1	515	391	0.76	0.55
DPR-54	1978	607.7	80.5	508	323	0.64	0.53
1st commercial operation 4/75	1979	687.0	91.1	287	126	0.44	0.18
Type - PWR	1980	530.9	60.4	890	412	0.46	0.78
Capacity - (873) MWe	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	0.06	---
	1995	0.0	0.0	16	1	0.06	---
	1996	0.0	0.0	16	1	0.06	---
	1997	0.0	0.0	16	0	0.00	---
	1998	0.0	0.0	61	2.661	0.04	---
	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	---
RIVER BEND 1	1987	605.2	68.4	1,268	378	0.30	0.62
Docket 50-458;	1988	880.7	94.3	513	107	0.21	0.12
NPF-47	1989	584.5	69.1	1,566	558	0.36	0.95
1st commercial operation 6/86	1990	682.2	78.0	1,616	489	0.30	0.72
Type - BWR	1991	814.7	87.2	780	144	0.18	0.18
Capacity - 967 MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
RIVER BEND 1	2007	823.0	92.0	1,131	131.373	0.12	0.16
(continued)	2008	724.8	78.7	1,809	311.697	0.17	0.43
	2009	895.6	92.6	1,978	219.446	0.11	0.25
	2010	955.1	98.9	888	40.356	0.05	0.04
	2011	878.6	91.9	1,880	211.212	0.11	0.24
ROBINSON 2	1972	580.0	---	245	215	0.88	0.37
Docket 50-261;	1973	455.1	---	831	695	0.84	1.53
DPR-23	1974	578.1	83.3	853	672	0.79	1.16
1st commercial operation 3/71	1975	501.8	72.7	849	1,142	1.35	2.28
Type - PWR	1976	585.5	84.7	597	715	1.20	1.22
Capacity - 724 MWe	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	0.00
	2007	655.0	90.0	890	80.752	0.09	0.12
	2008	618.1	84.6	788	68.381	0.09	0.11
	2009	738.9	99.3	126	6.643	0.05	0.01
	2010	410.8	57.0	996	85.917	0.09	0.21
	2011	726.5	99.3	137	3.630	0.03	0.00
SALEM 1, 2	1978	546.4	55.6	574	122	0.21	0.22
Docket 50-272, 50-311;	1979	250.0	25.5	1,488	584	0.39	2.34
DPR-70, DPR-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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SALEM 1, 2	1993	1,366.3	65.4	3,559	408	0.11	0.30
(continued)	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
	2009	2,252.9	96.2	1,249	101.186	0.08	0.04
	2010	2,147.3	93.9	964	77.828	0.08	0.04
	2011	2,054.6	91.4	2,180	126.716	0.06	0.06
SAN ONOFRE 1[13], 2, 3	1969	314.1	---	123	42	0.34	0.13
Docket 50-206, 50-361, 50-362;	1970	365.9	---	251	155	0.62	0.42
DPR-13; NPF-10, NPF-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
	1996	2,089.3	93.2	1,272	129	0.10	0.06
	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	---

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SAN ONOFRE 2, 3	1999	1,901.4	86.9	1,477	353.765	0.24	0.19
Docket 50-361, 50-362;	2000	2,067.2	94.7	1,073	115.499	0.11	0.06
NPF-10, NPF-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
	2009	1,774.5	79.9	1,575	178.131	0.11	0.10
	2010	1,578.9	75.3	1,642	199.399	0.12	0.13
	2011	2,067.1	93.0	641	29.658	0.05	0.01
SEABROOK	1991	810.4	75.9	699	92	0.13	0.11
Docket 50-443;	1992	932.4	81.3	806	147	0.18	0.16
NPF-86	1993	1,071.5	93.6	110	6	0.05	0.01
1st commercial operation 8/90	1994	736.4	63.5	852	113	0.13	0.15
Type - PWR	1995	995.5	87.5	800	102	0.13	0.10
Capacity - 1,246 MWe	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
	2009	1,006.4	86.5	1,233	87.372	0.07	0.09
	2010	1,245.4	100.0	335	4.488	0.01	0.00
	2011	954.5	80.5	1,156	65.593	0.06	0.07
SEQUOYAH 1, 2	1982	583.5	52.8	1,968	570	0.29	0.98
Docket 50-327, 50-328;	1983	1,663.7	75.1	1,769	491	0.28	0.30
DPR-77, DPR-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 - 1,152, 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
	1999	2,165.1	97.0	1,346	164.569	0.12	0.08
	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SEQUOYAH 1, 2	2008	2,153.6	94.3	960	83.730	0.09	0.04
(continued)	2009	2,026.8	90.1	1,415	166.776	0.12	0.08
	2010	2,054.9	92.2	828	56.956	0.07	0.03
	2011	2,133.3	95.3	1,354	109.417	0.08	0.05
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, NPF-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
	2009	2,444.5	91.9	1,138	79.687	0.07	0.03
	2010	2,418.7	91.5	867	79.159	0.09	0.03
	2011	2,333.3	87.7	1,153	139.274	0.12	0.06
ST. LUCIE 1, 2	1977	649.1	84.7	445	152	0.34	0.23
Docket 50-335, 50-389;	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	0.31
	2008	1,566.5	92.7	1,127	112.234	0.10	0.07
	2009	1,490.6	88.8	1,139	132.861	0.12	0.09
	2010	1,440.2	88.4	1,357	197.359	0.15	0.14
	2011	1,200.9	77.3	2,050	295.228	0.14	0.25

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (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;	1985	627.7	71.6	1,201	379	0.32	0.60
NPF-12	1986	853.7	95.3	392	23	0.06	0.03
1st commercial operation 1/84	1987	618.7	71.0	1,075	560	0.52	0.91
Type - PWR	1988	605.3	69.1	1,127	511	0.45	0.84
Capacity - 966 MWe	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
	2009	784.5	82.6	767	56.050	0.07	0.07
	2010	968.8	99.4	104	2.129	0.02	0.00
	2011	847.7	87.6	598	31.580	0.05	0.04
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, DPR-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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
SURRY 1, 2	2006	1,427.0	90.0	1,227	234.978	0.19	0.16
(continued)	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
	2009	1,485.1	93.1	1,241	193.703	0.16	0.13
	2010	1,503.7	93.7	958	111.129	0.12	0.07
	2011	1,487.4	88.1	1,121	113.718	0.10	0.08
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; NPF-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 - 1,257, 1,257 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
	2009	2,231.1	94.7	1,956	266.597	0.14	0.12
	2010	2,121.6	90.4	1,950	176.161	0.09	0.08
	2011	1,992.0	82.2	1,847	168.968	0.09	0.08
THREE MILE ISLAND 1[14], 2[15]	1975	675.9	82.2	131	73	0.56	0.11
Docket 50-289, 50-320;	1976	530.0	65.4	819	286	0.35	0.54
DPR-50, DPR-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;	1987	610.7	73.6	1,259	149	0.12	0.24
DPR-50	1988	661.0	77.8	1,012	210	0.21	0.32
1st commercial operation 9/74	1989	871.3	100.0	670	54	0.08	0.06
Type - PWR	1990	645.5	84.6	1,319	264	0.20	0.41
Capacity - 802 MWe	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

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
THREE MILE ISLAND 1[14]	1995	772.9	90.8	1,220	213	0.17	0.28
(continued)	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
	2004	828.0	100.0	105	3.573	0.03	0.00
	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
	2009	672.6	81.7	2,019	241.780	0.12	0.36
	2010	757.3	93.1	790	38.994	0.05	0.05
	2011	744.2	91.4	1,224	129.775	0.11	0.17
THREE MILE ISLAND 2[15]	1986	0.0	0.0	1,497	915	0.61	---
Docket 50-320;	1987	0.0	0.0	1,378	977	0.71	---
DPR-73	1988	0.0	0.0	1,247	917	0.74	---
1st commercial operation 12/78	1989	0.0	0.0	1,014	639	0.63	---
Type - PWR	1990	0.0	0.0	484	136	0.28	---
Capacity - (880) MWe	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	---	---
	2009	0.0	0.0	0	0.113	---	---
	2010	0.0	0.0	0	0.359	---	---
	2011	0.0	0.0	0	0.291	---	---
TROJAN[16]	1977	792.0	92.6	591	174	0.29	0.22
Docket 50-344;	1978	205.5	20.6	711	319	0.45	1.55
NPF-1	1979	631.0	58.1	736	258	0.35	0.41
1st commercial operation 5/76	1980	727.5	72.5	1,159	421	0.36	0.58
Type - PWR	1981	775.6	74.1	1,311	609	0.46	0.79
Capacity - (1,080) MWe	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

[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.

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
TROJAN[16] (continued)	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	---
	2000	0.0	0.0	127	17.631	0.14	---
	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	---
TURKEY POINT 3, 4 Docket 50-250, 50-251; DPR-31, DPR-41 1st commercial operation 12/72, 9/73 Type - PWRs Capacity - 693, 693 MWe	1973	401.9	---	444	78	0.18	0.19
	1974	953.6	---	794	454	0.57	0.48
	1975	1,003.7	74.9	1,176	876	0.74	0.87
	1976	974.2	71.2	1,647	1,184	0.72	1.22
	1977	979.5	72.1	1,319	1,036	0.79	1.06
	1978	1,000.2	78.8	1,336	1,032	0.77	1.03
	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
	2009	1,219.7	87.6	1,359	166.217	0.12	0.14
	2010	1,290.9	91.9	1,025	86.749	0.08	0.07
	2011	1,245.7	89.6	921	62.326	0.07	0.05

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
VERMONT YANKEE	1973	222.1	---	244	85	0.35	0.38
Docket 50-271;	1974	303.5	---	357	216	0.61	0.71
DPR-28	1975	429.0	87.8	282	153	0.54	0.36
1st commercial operation 11/72	1976	389.6	77.1	815	411	0.50	1.05
Type - BWR	1977	423.5	85.1	641	258	0.40	0.61
Capacity - 605 MWe	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
	1986	248.1	48.9	1,389	1,188	0.86	4.79
	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	0.08
	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
	2009	611.9	100.0	392	61.105	0.16	0.10
	2010	548.6	91.2	1,071	206.321	0.19	0.38
	2011	562.1	93.3	1,029	176.129	0.17	0.31
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, NPF-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 - 1,150, 1,152 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	0.07
	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
VOGTLE 1, 2	2008	2,023.9	89.3	1,185	137.620	0.12	0.07
(continued)	2009	2,201.6	95.7	931	79.681	0.09	0.04
	2010	2,238.6	95.8	924	89.182	0.10	0.04
	2011	2,138.0	92.6	1,179	118.931	0.10	0.06
WATERFORD 3	1986	875.7	79.1	1,244	223	0.18	0.25
Docket 50-382;	1987	891.8	82.5	959	156	0.16	0.17
NPF-38	1988	784.3	75.4	1,246	259	0.21	0.33
1st commercial operation 9/85	1989	909.8	82.6	1,306	265	0.20	0.29
Type - PWR	1990	1,027.9	92.8	432	47	0.11	0.05
Capacity - 1,152 MWe	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	0.15
	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
	2003	968.0	90.9	710	95.332	0.13	0.10
	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
	2009	1,023.4	88.0	1,479	255.088	0.17	0.25
	2010	1,173.1	100.0	216	4.913	0.02	0.00
	2011	1,020.8	90.4	1,144	100.053	0.09	0.10
WATTS BAR 1	1997	867.6	83.8	1,103	113	0.10	0.13
Docket 50-390;	1998	1,105.1	99.1	96	3.106	0.03	0.00
NPF-90	1999	943.1	87.2	975	98.946	0.10	0.10
1st commercial operation 5/96	2000	1,033.3	92.8	1,053	122.453	0.12	0.12
Type - PWR	2001	1,095.9	96.5	197	5.912	0.03	0.01
Capacity - 1,123 MWe	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
	2009	1,051.1	92.1	853	63.846	0.07	0.06
	2010	1,111.7	98.3	129	6.193	0.05	0.01
	2011	939.6	85.4	900	51.021	0.06	0.05
WOLF CREEK 1	1986	832.8	73.3	682	143	0.21	0.17
Docket 50-482;	1987	778.8	71.1	675	138	0.20	0.18
NPF-42	1988	794.7	70.7	1,010	297	0.29	0.37
1st commercial operation 9/85	1989	1,108.4	99.5	186	18	0.10	0.02
Type - PWR	1990	940.2	81.0	798	195	0.24	0.21
Capacity - 1,195 MWe	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	0.06	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

Reporting Organization	Year	Megawatt Years (MW-yr)	Unit Availability Factor	Total Personnel with Measurable Doses	Collective Dose per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
WOLF CREEK 1	2001	1,177.9	100.0	105	5.176	0.05	0.00
(continued)	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
	2009	1,001.0	86.9	1,504	73.637	0.05	0.07
	2010	1,090.8	94.2	463	10.516	0.02	0.01
	2011	839.1	73.0	1,266	133.960	0.11	0.16
YANKEE ROWE[17]	1969	138.3	---	193	215	1.11	1.55
Docket 50-29;	1970	146.1	---	355	255	0.72	1.75
DPR-3	1971	173.5	---	155	90	0.58	0.52
1st commercial operation 7/61	1972	78.7	---	282	255	0.90	3.24
Type - PWR	1973	127.1	---	133	99	0.74	0.78
Capacity - (175) MWe	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
	1986	169.7	95.0	384	45	0.12	0.27
	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	---
	2009	0.0	0.0	5	0.114	0.02	---
	2010	0.0	0.0	3	0.083	0.03	---
	2011	0.0	0.0	8	0.113	0.01	---

[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 per Site (person-rem)	Average Measurable Dose (rem)	Collective Dose/ MW-yr
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, DPR-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	---
	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	---
	2009	0.0	0.0	0	0.000	---	---
	2010	0.0	0.0	17	0.562	0.03	---
	2011	0.0	0.0	128	28.794	0.22	---

[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 TRENDS BY REACTOR SITE

1973–2011

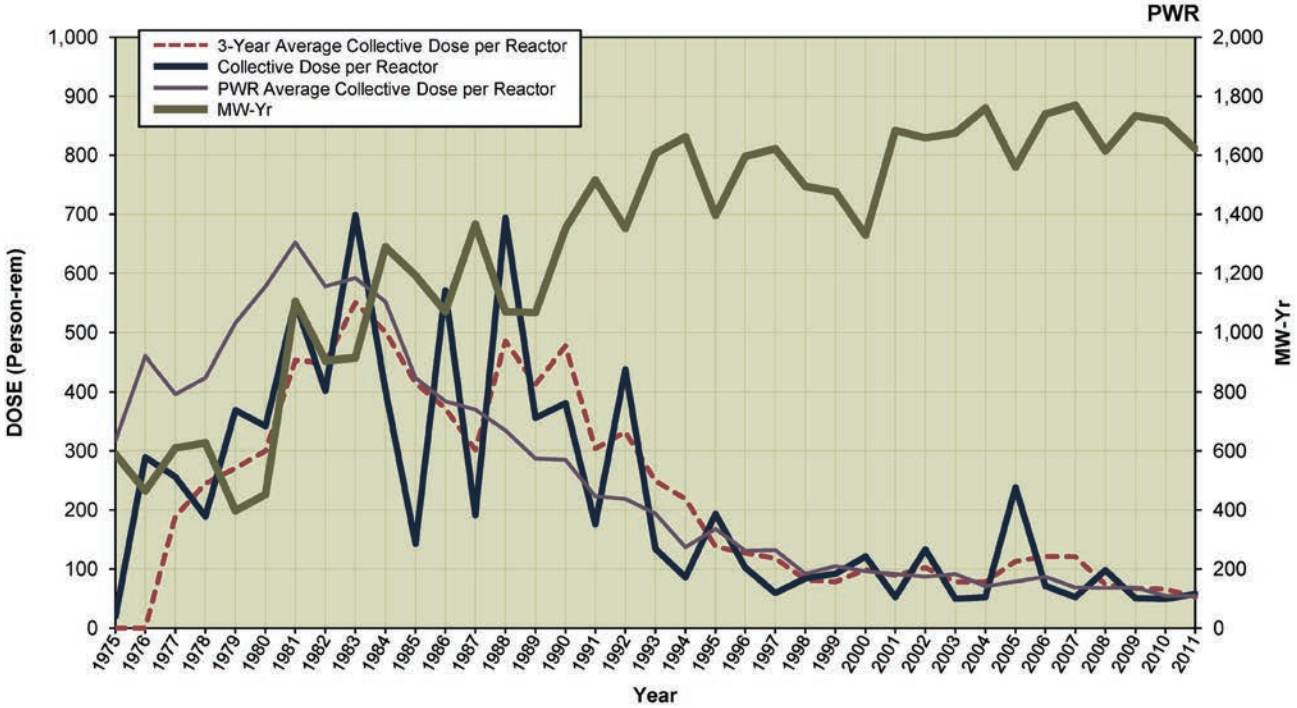
* Appendix D only contains data on plants still operating in 2011.

GRAPHICAL REPRESENTATION OF DOSE TRENDS IN APPENDIX D

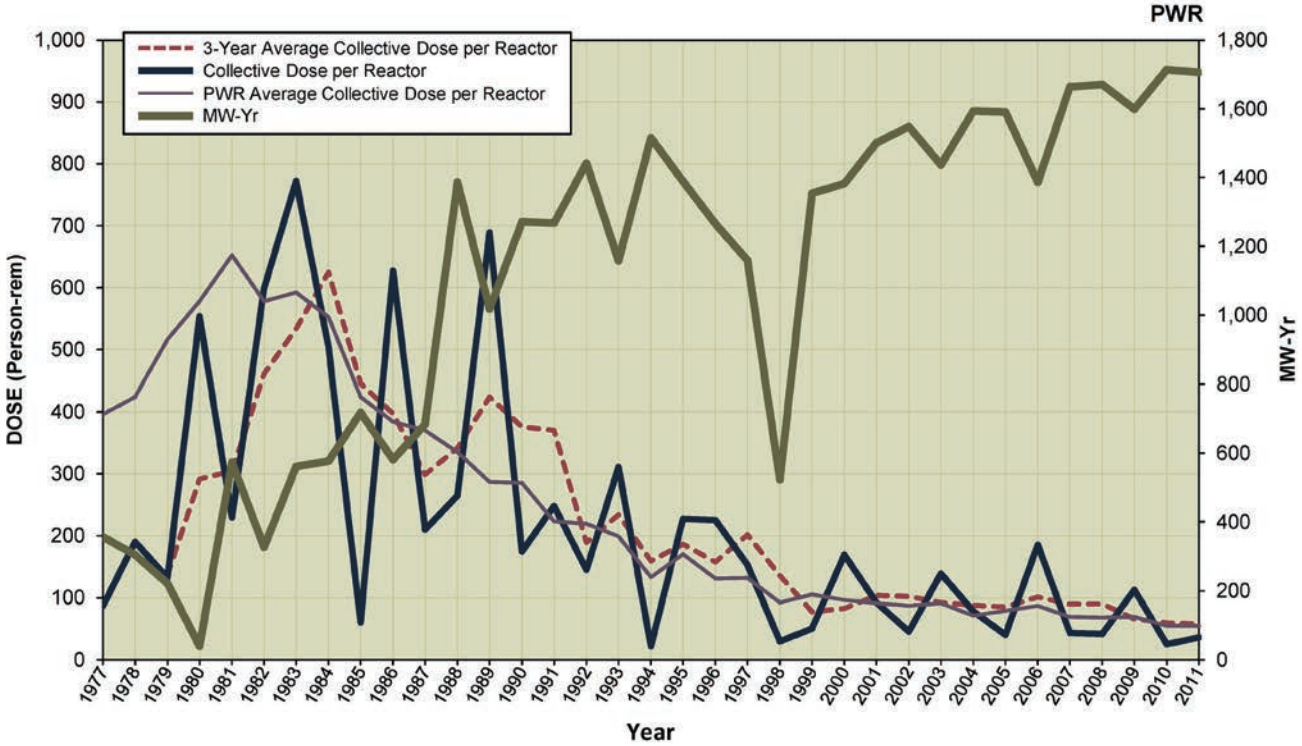
Each page of Appendix D presents a graph of selected dose performance trends from 1973 through 2011. The graphs illustrate the history of the collective dose per reactor for the site, the rolling three-year average collective dose per reactor, and the electricity generated at the site. These data are plotted, beginning with each plant's first full year of commercial operation and continuing through 2011. 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 three-year average collective dose per reactor data is included because the data provide an overall indication of each plant's general trend in collective dose.

The three-year average collective dose per reactor is also one of the metrics used by NRC in the Reactor Oversight Program to evaluate a licensee's ALARA program. This average is determined by summing the collective dose for the current year and the previous two years and then dividing this sum by the number of reactors reporting during those years. Depicting dose trends by using a three-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.

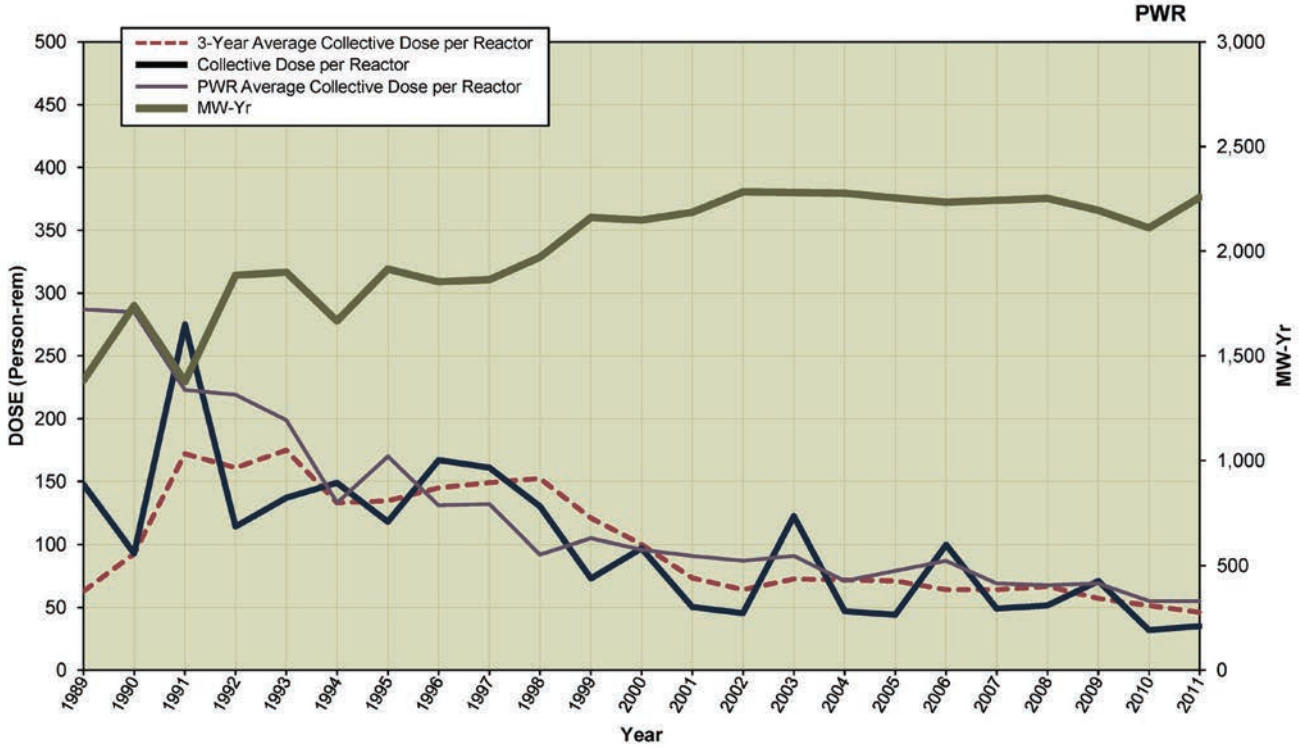
ARKANSAS 1, 2
Dose Performance Trends



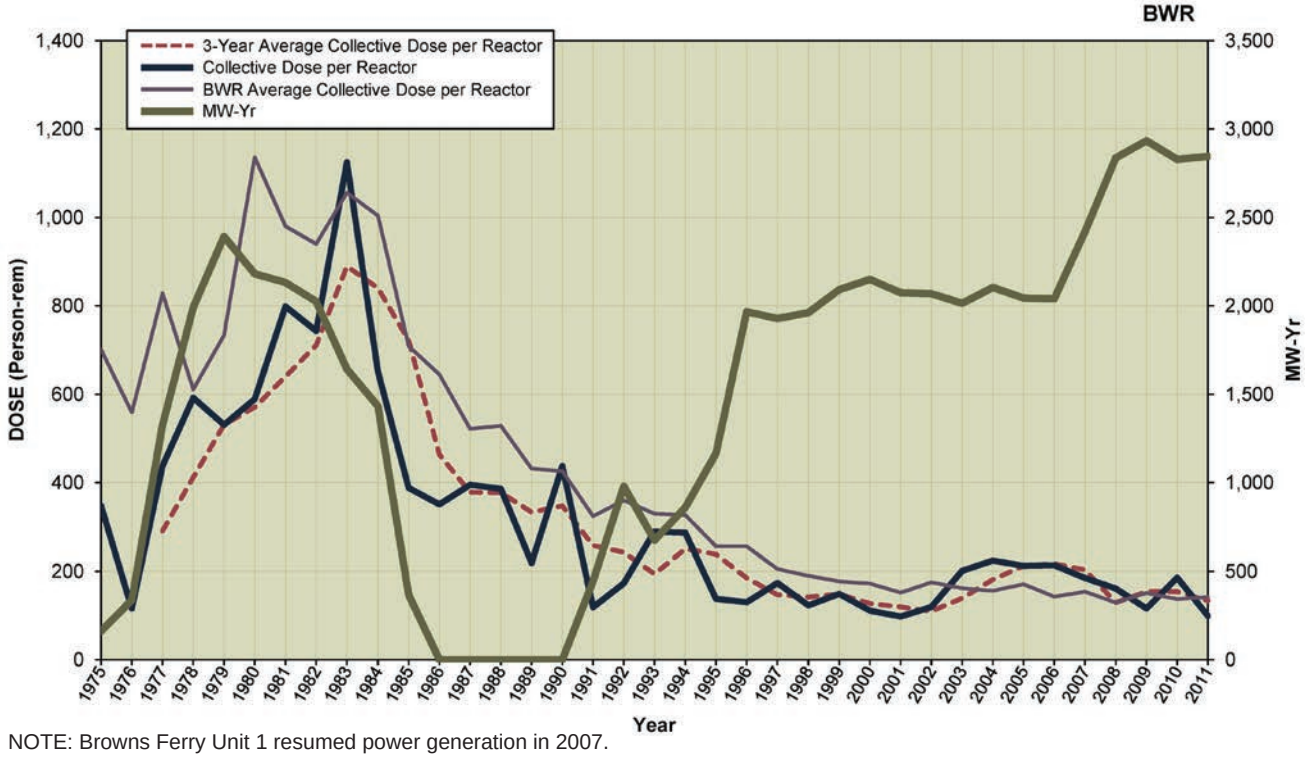
BEAVER VALLEY 1, 2
Dose Performance Trends



BRAIDWOOD 1, 2
Dose Performance Trends

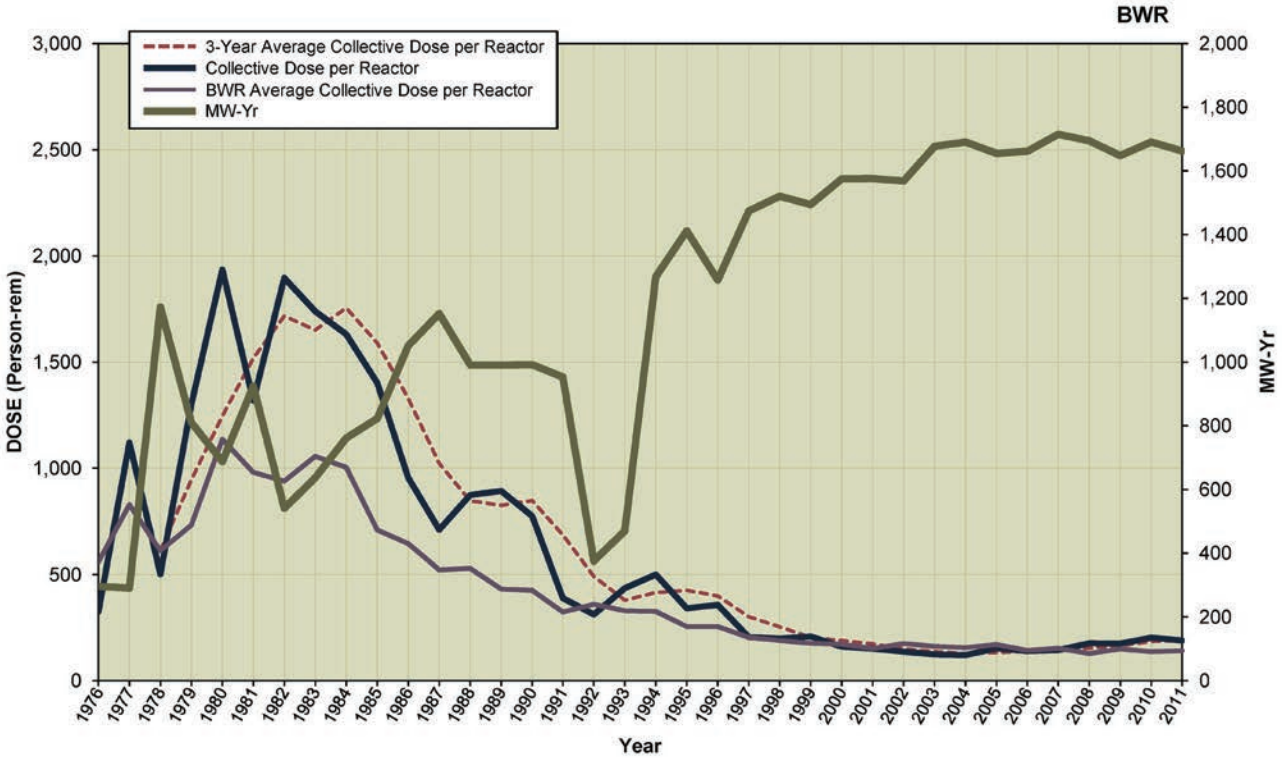


BROWNS FERRY 1, 2, 3
Dose Performance Trends

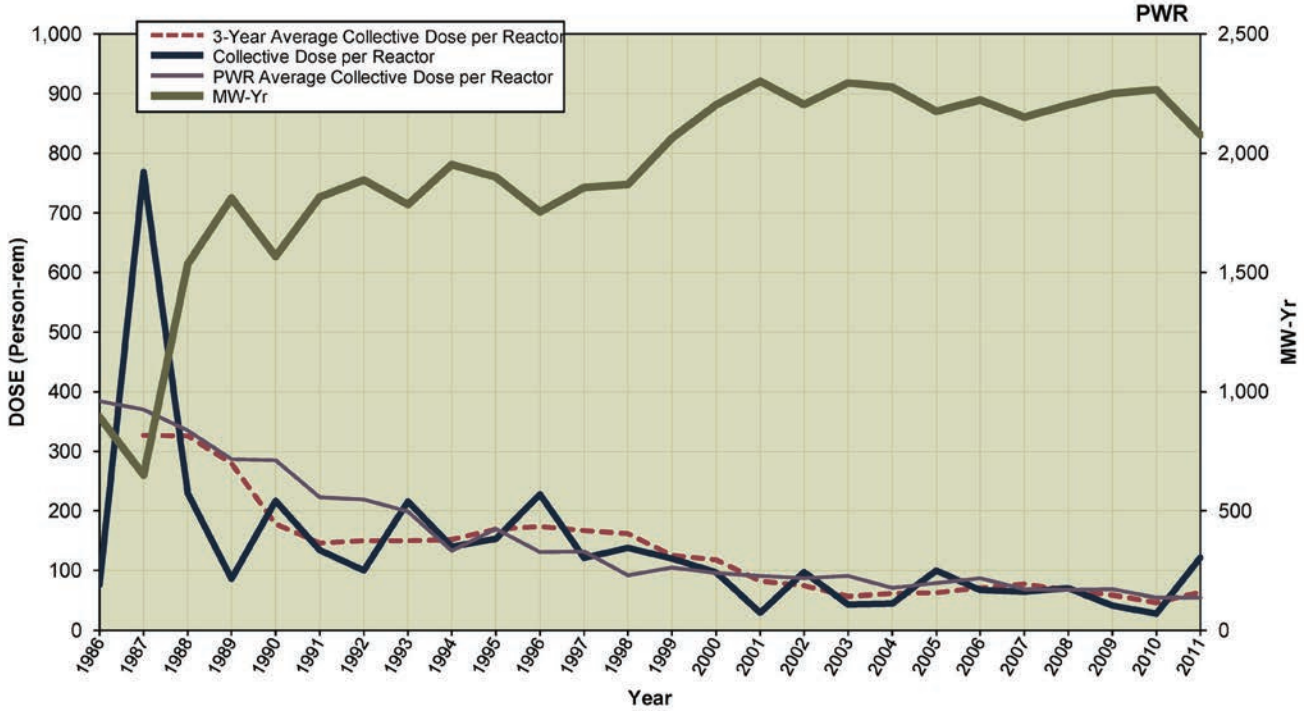


NOTE: Browns Ferry Unit 1 resumed power generation in 2007.

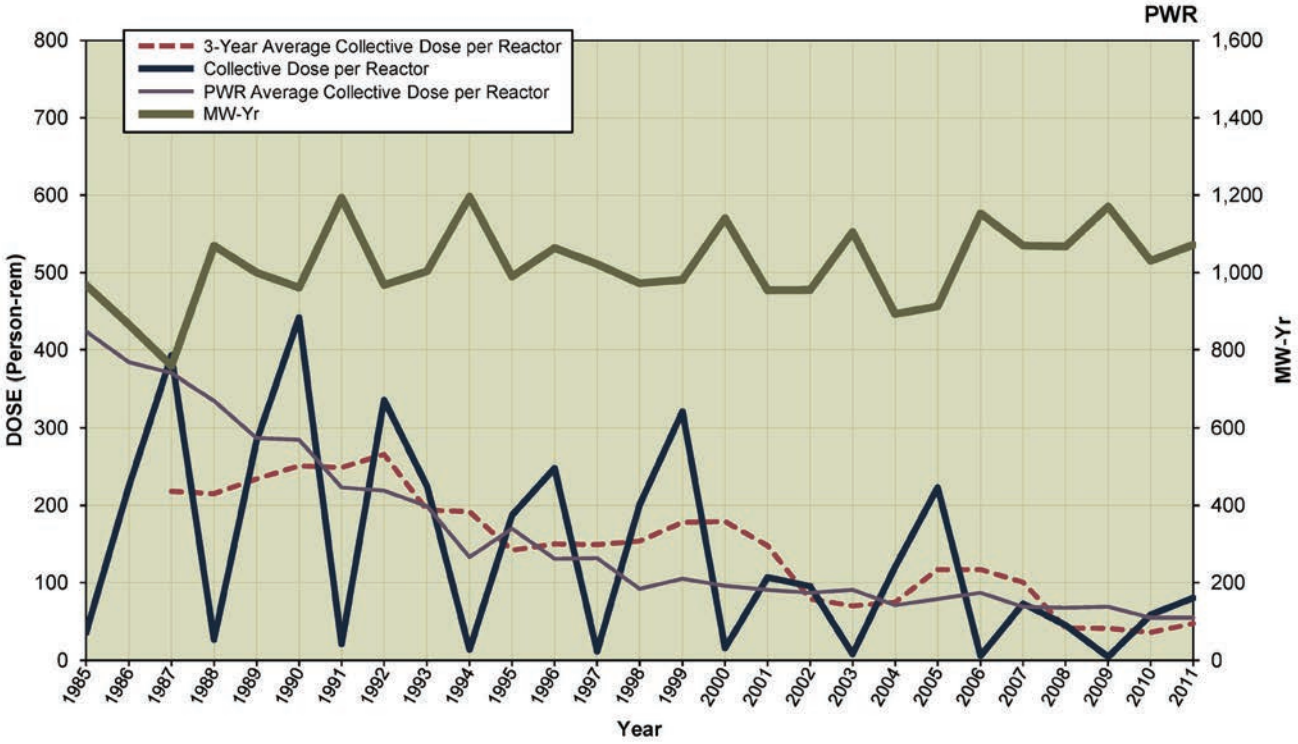
BRUNSWICK 1, 2
Dose Performance Trends



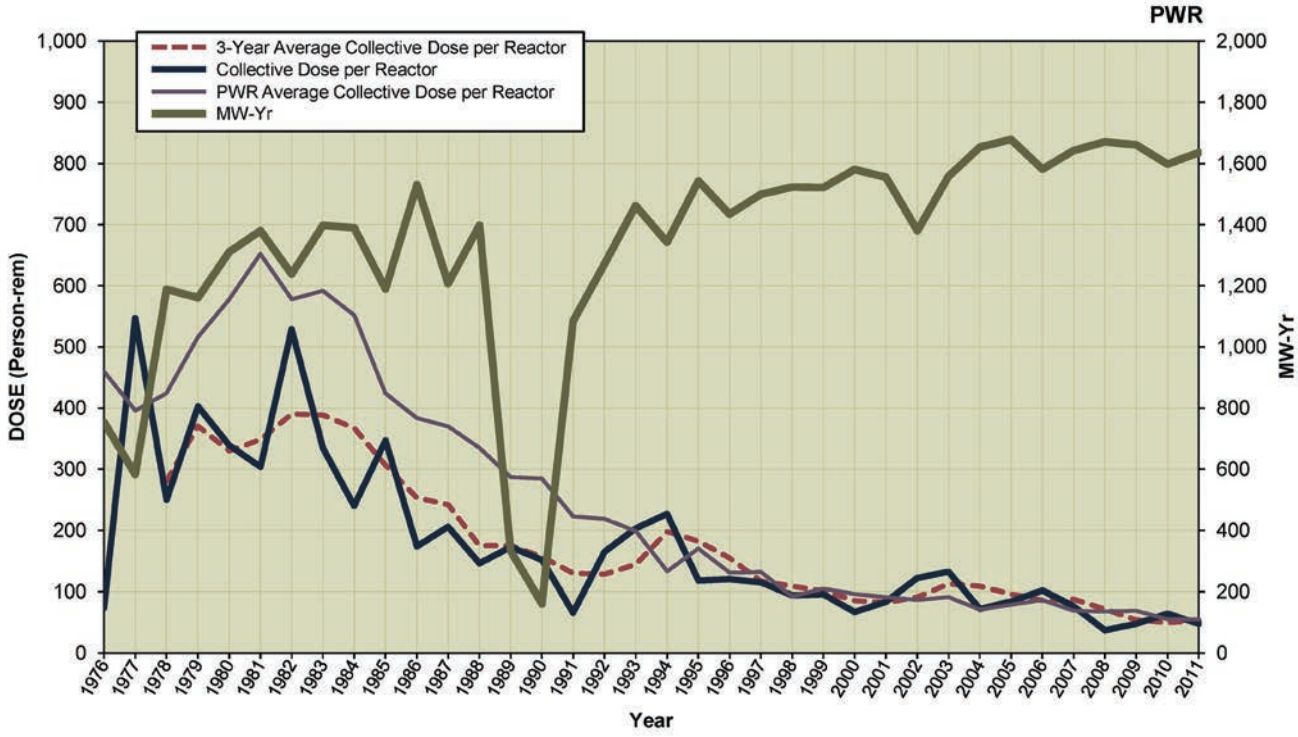
BYRON 1, 2
Dose Performance Trends



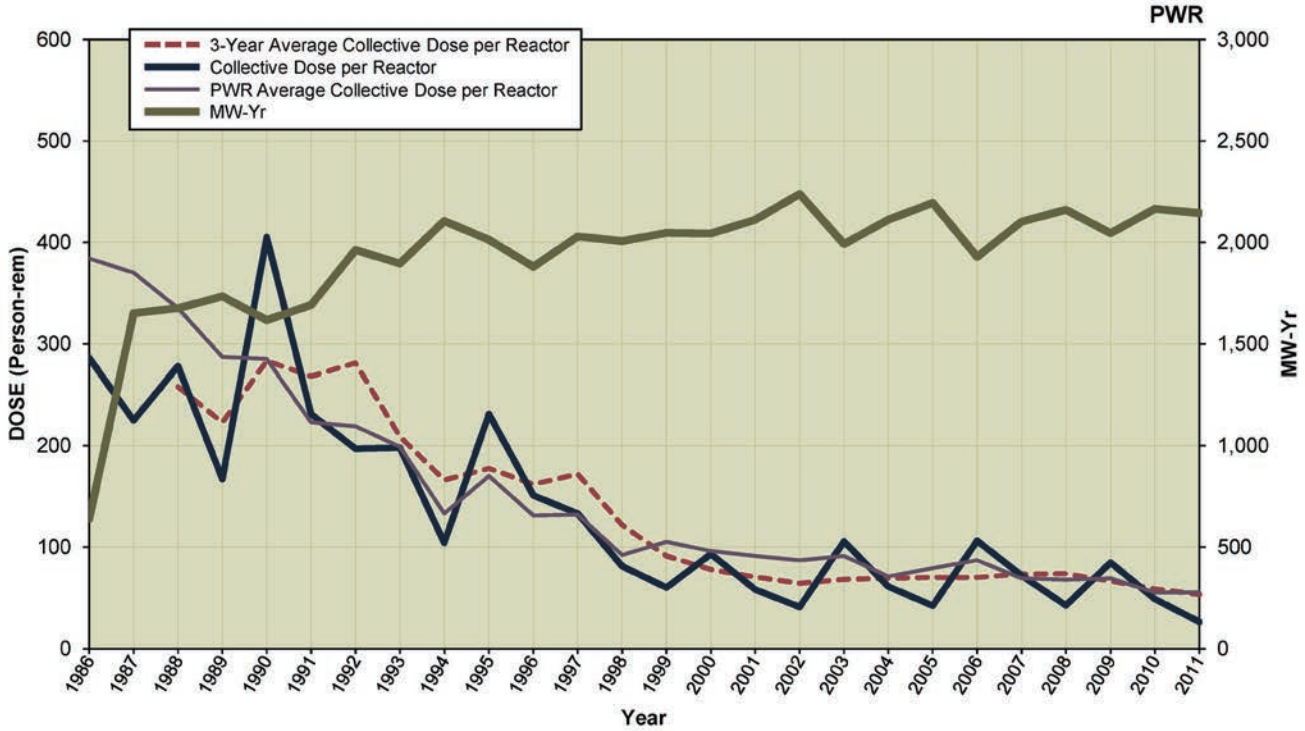
CALLAWAY 1
Dose Performance Trends



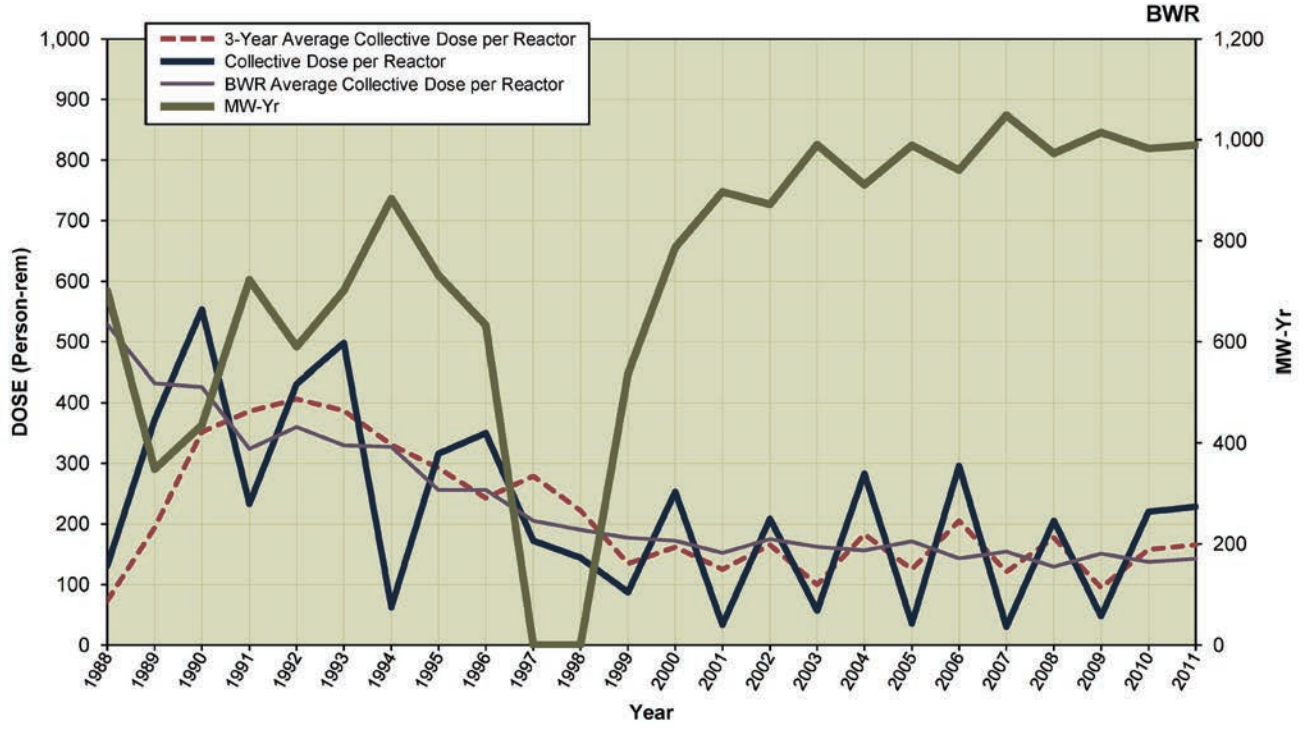
CALVERT CLIFFS 1, 2
Dose Performance Trends



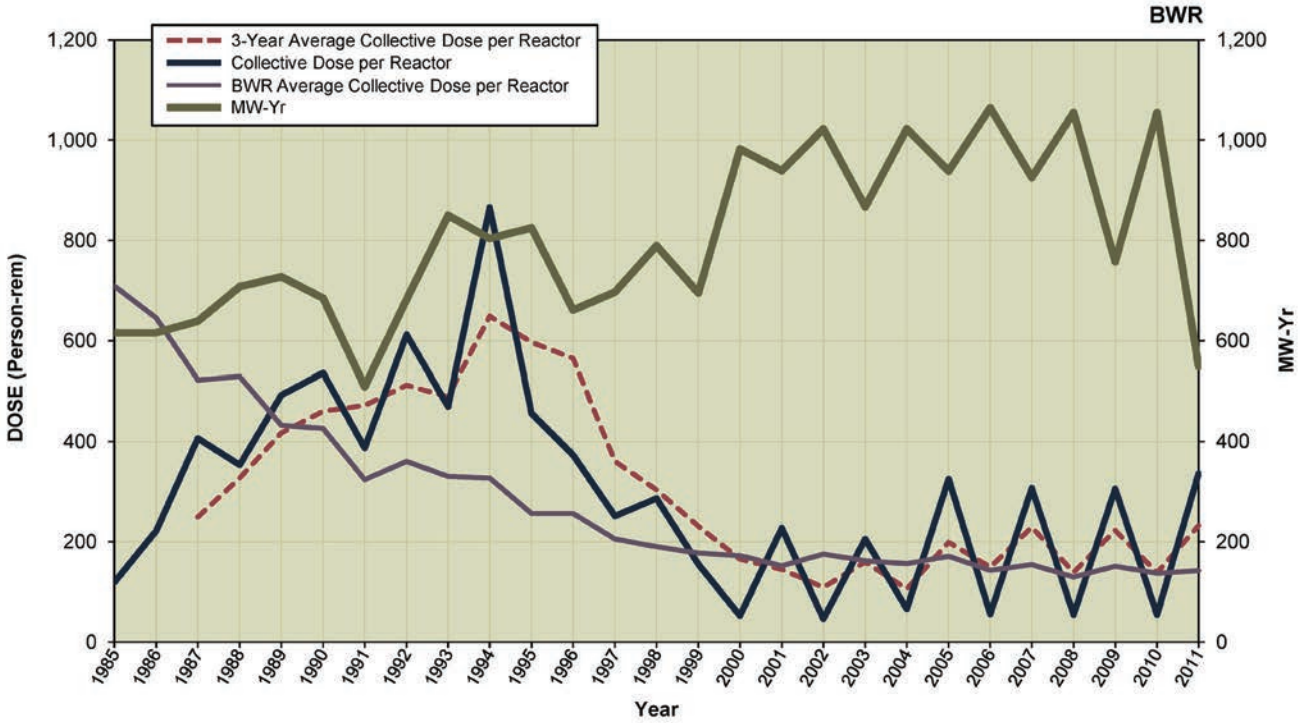
CATAWBA 1, 2
Dose Performance Trends



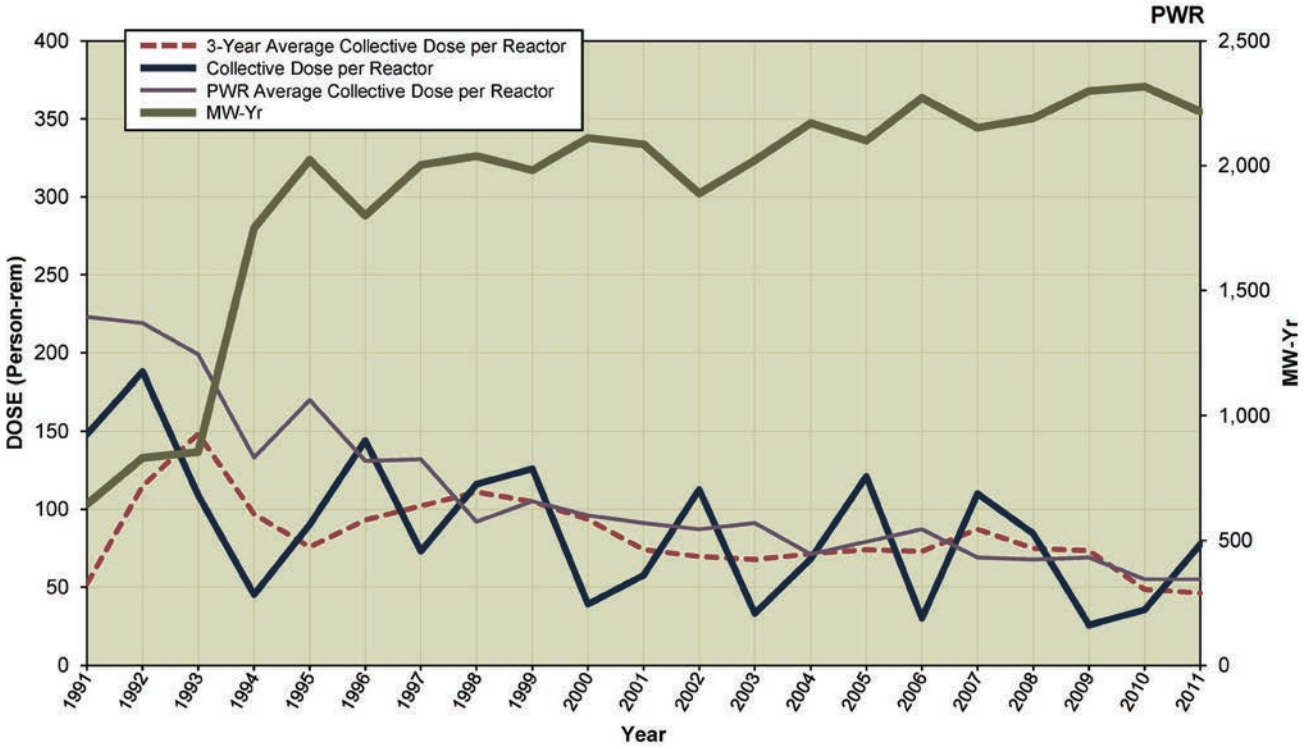
CLINTON
Dose Performance Trends



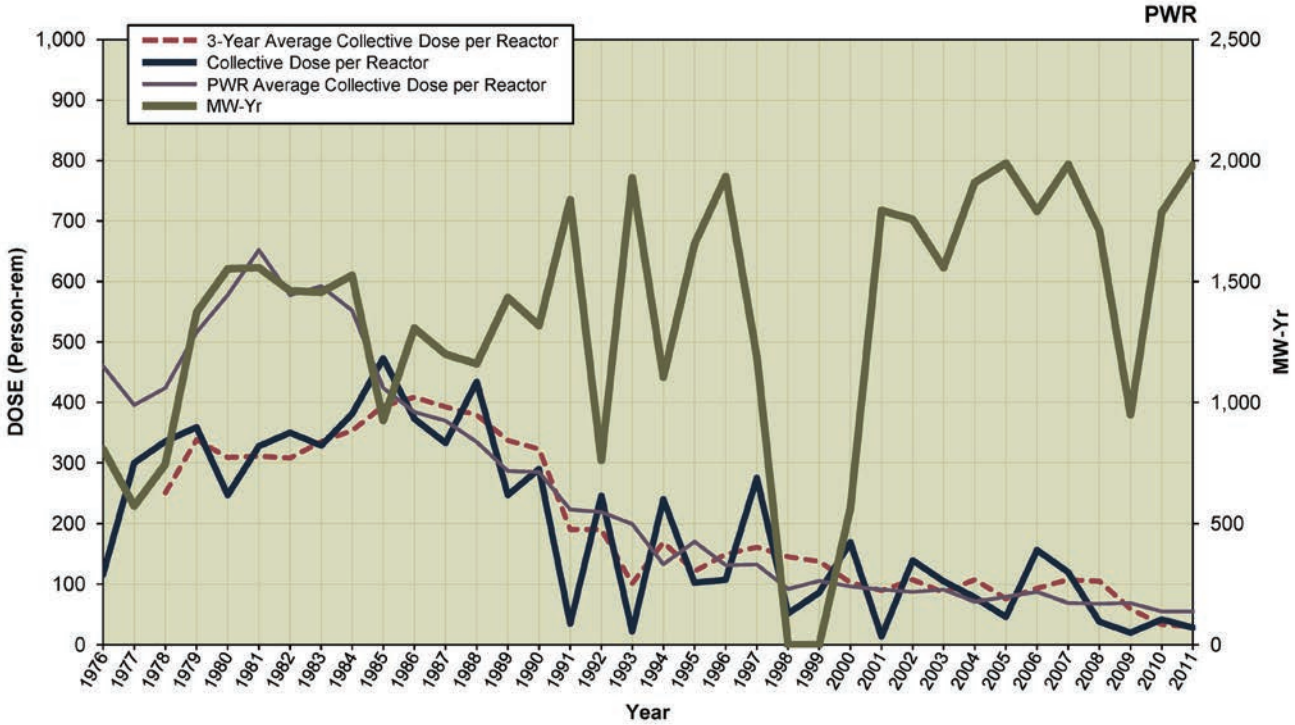
COLUMBIA GENERATING
Dose Performance Trends



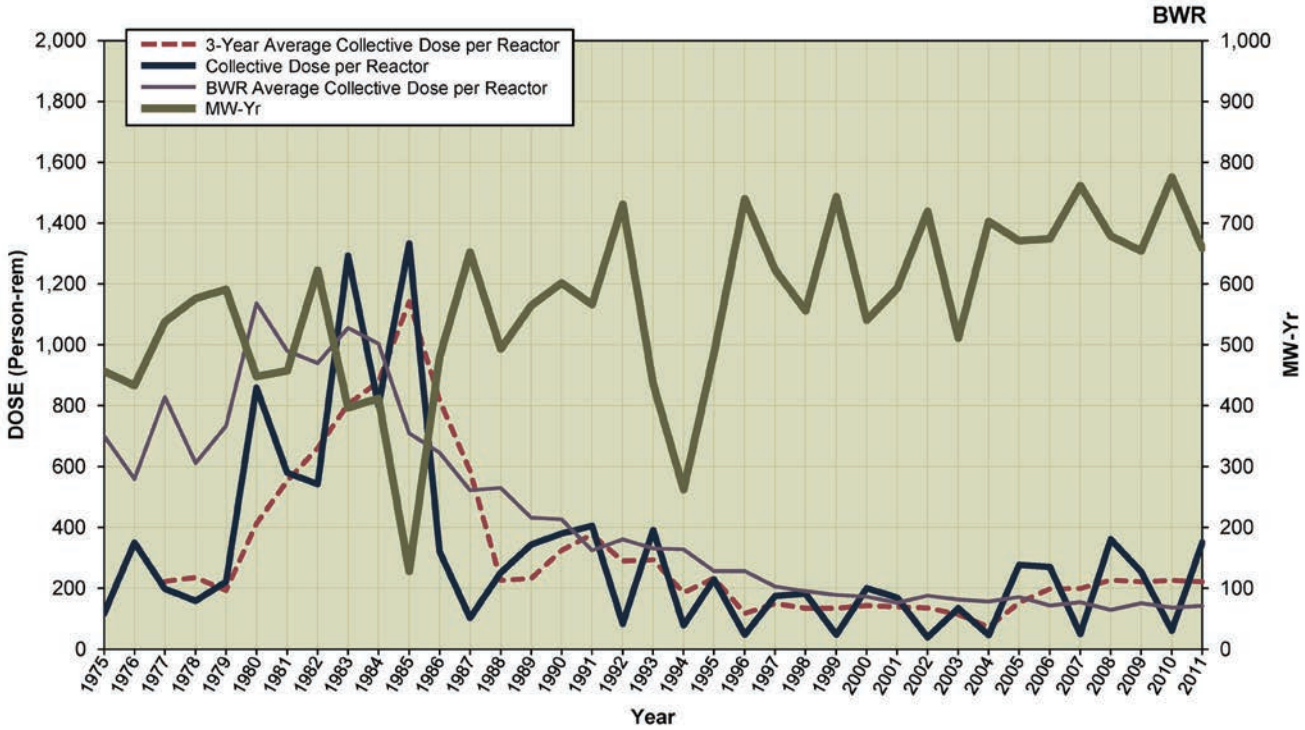
COMANCHE PEAK 1, 2
Dose Performance Trends



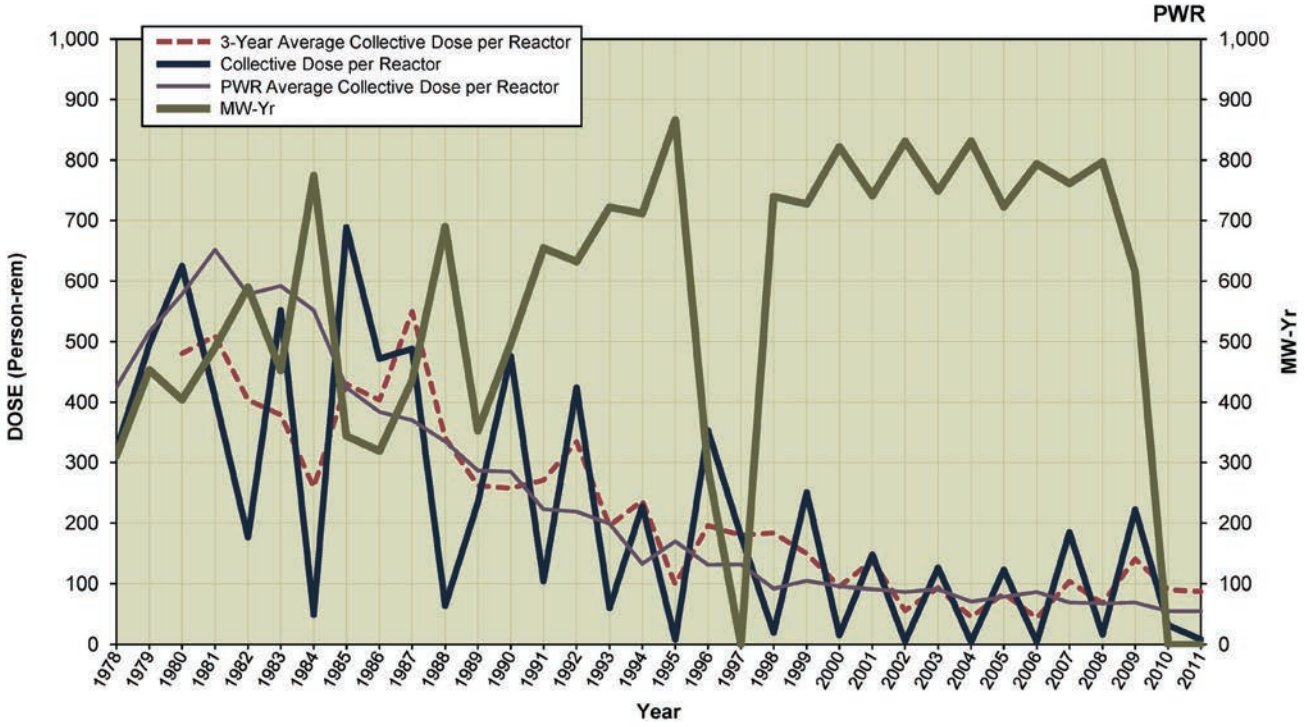
COOK 1, 2
Dose Performance Trends



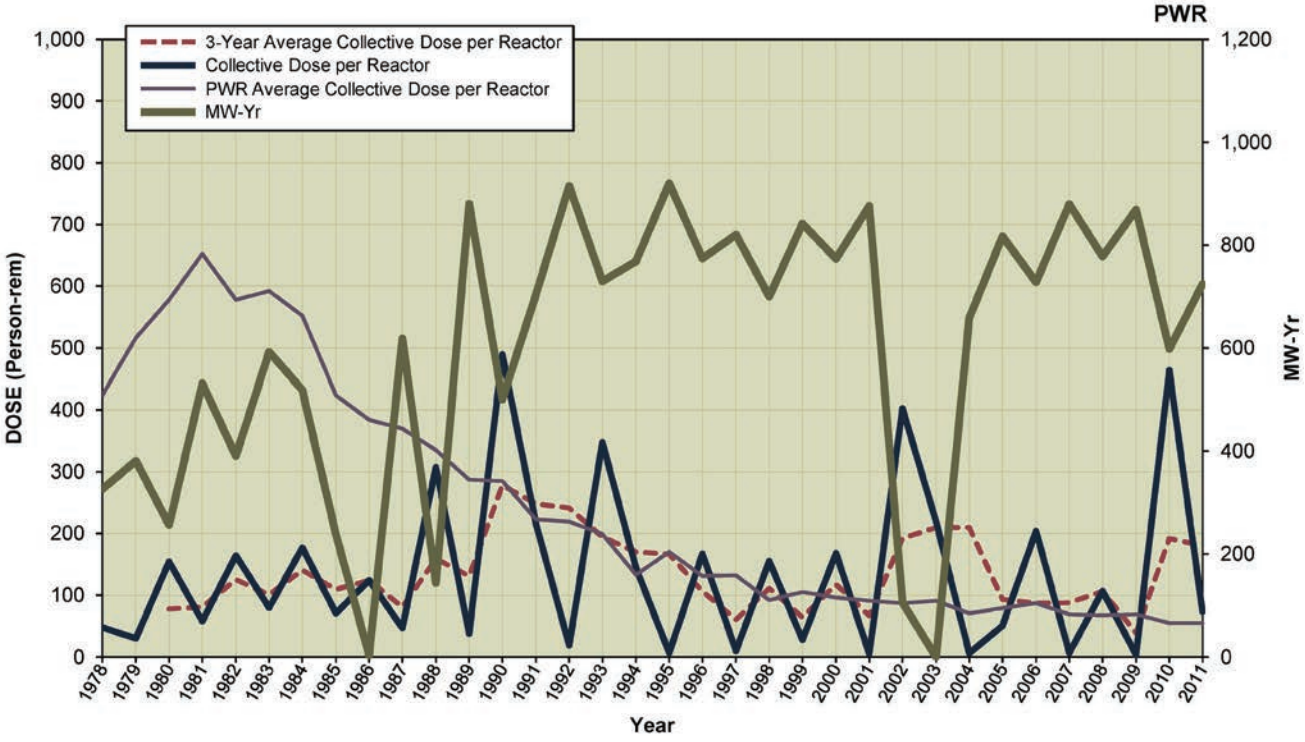
COOPER STATION
Dose Performance Trends



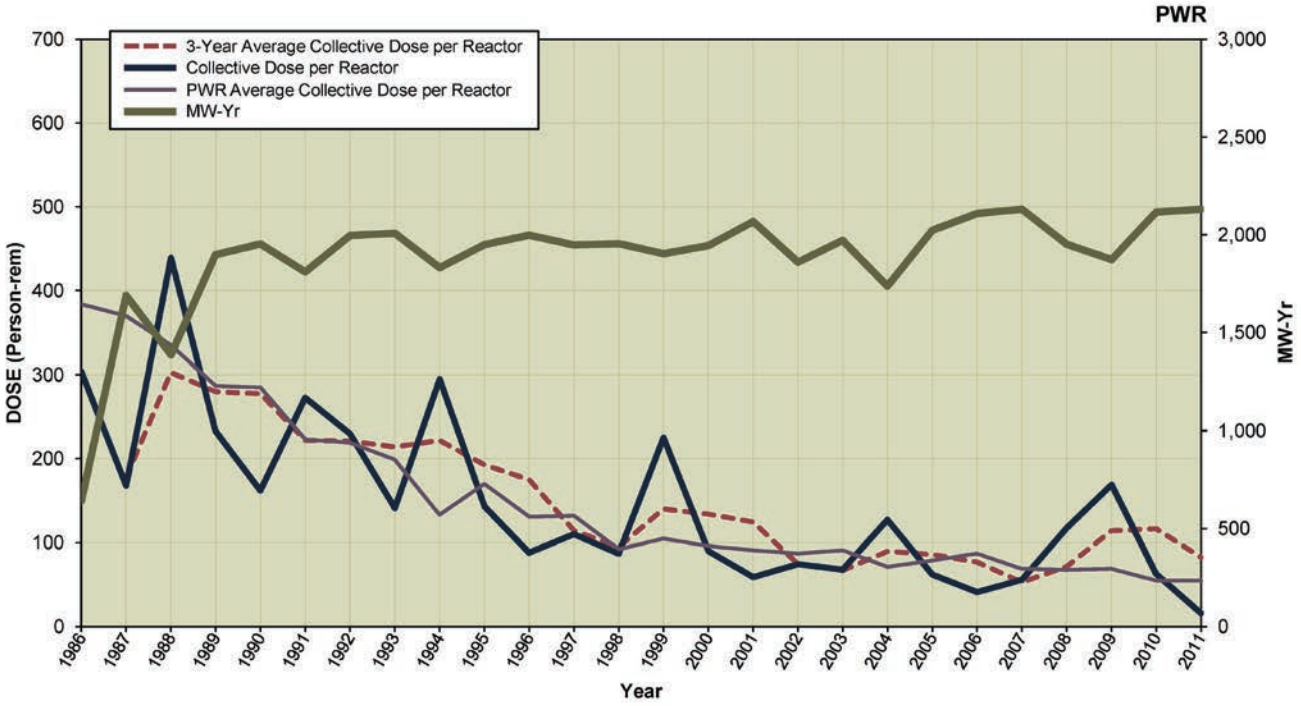
CRYSTAL RIVER 3
Dose Performance Trends



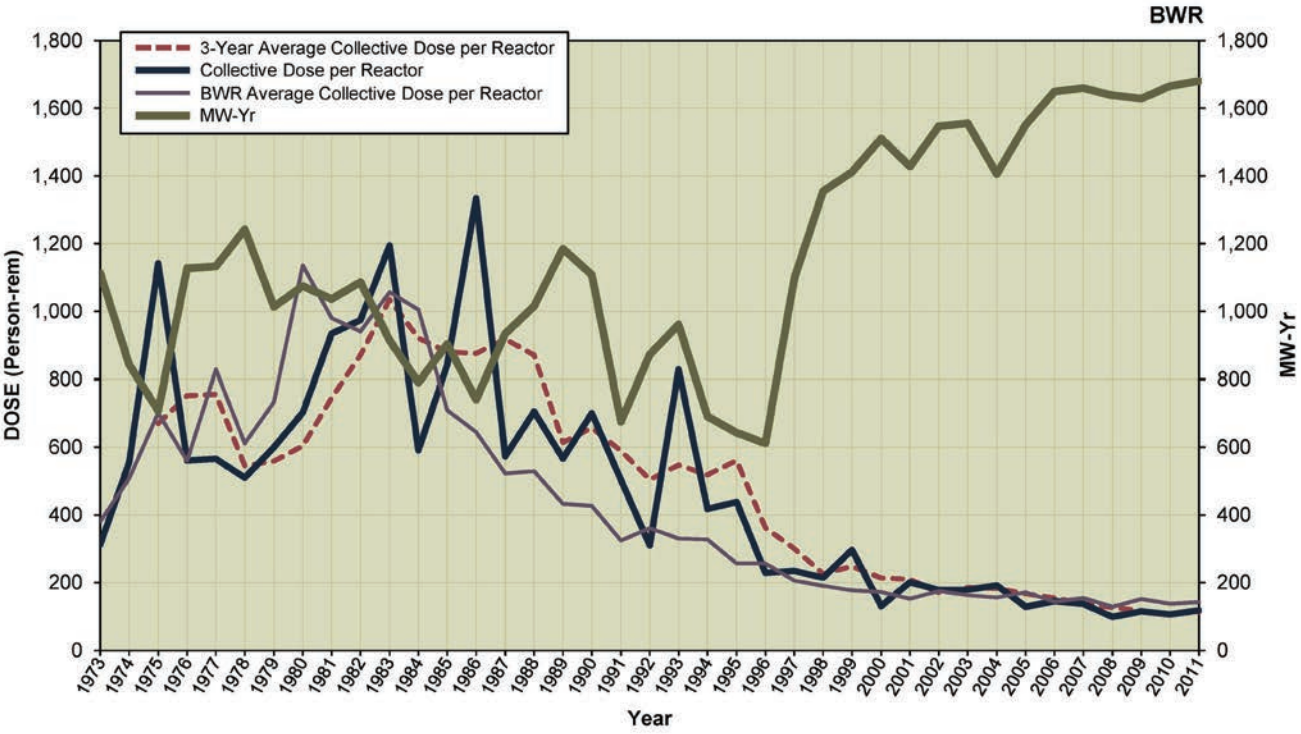
DAVIS-BESSE 1
Dose Performance Trends



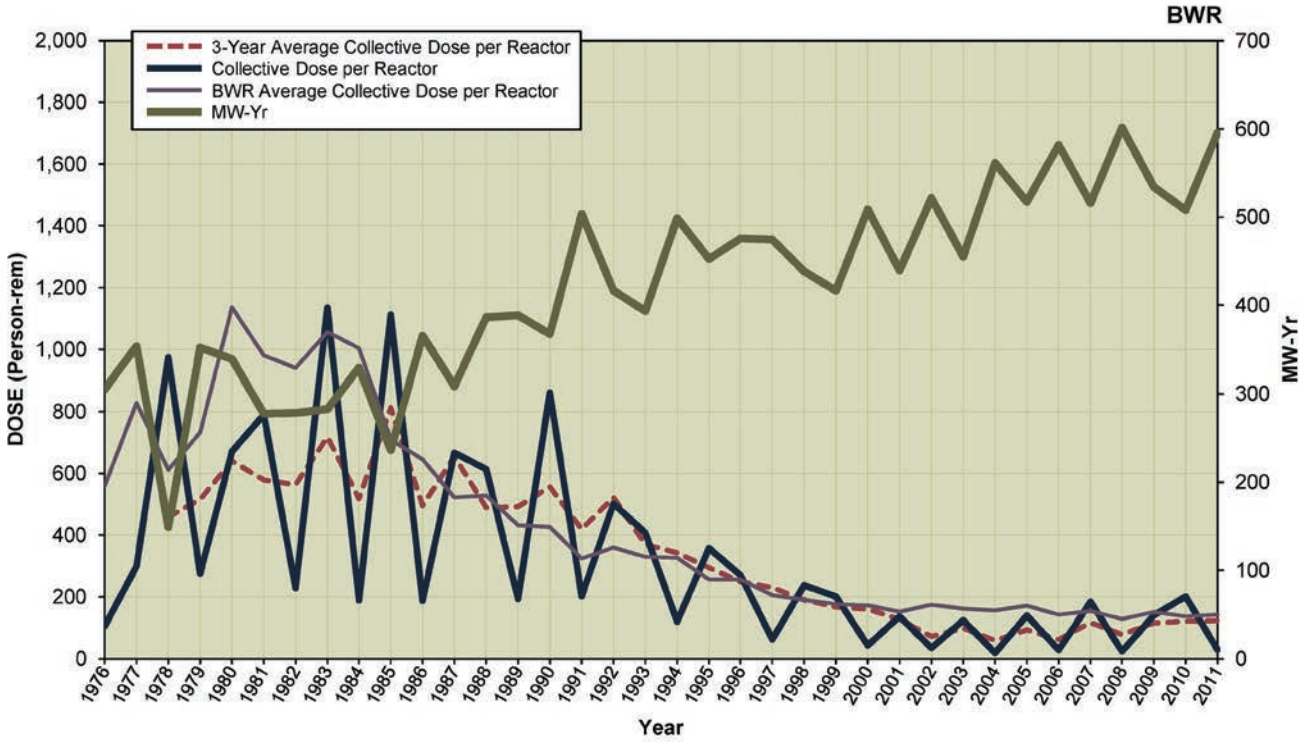
DIABLO CANYON 1, 2
Dose Performance Trends



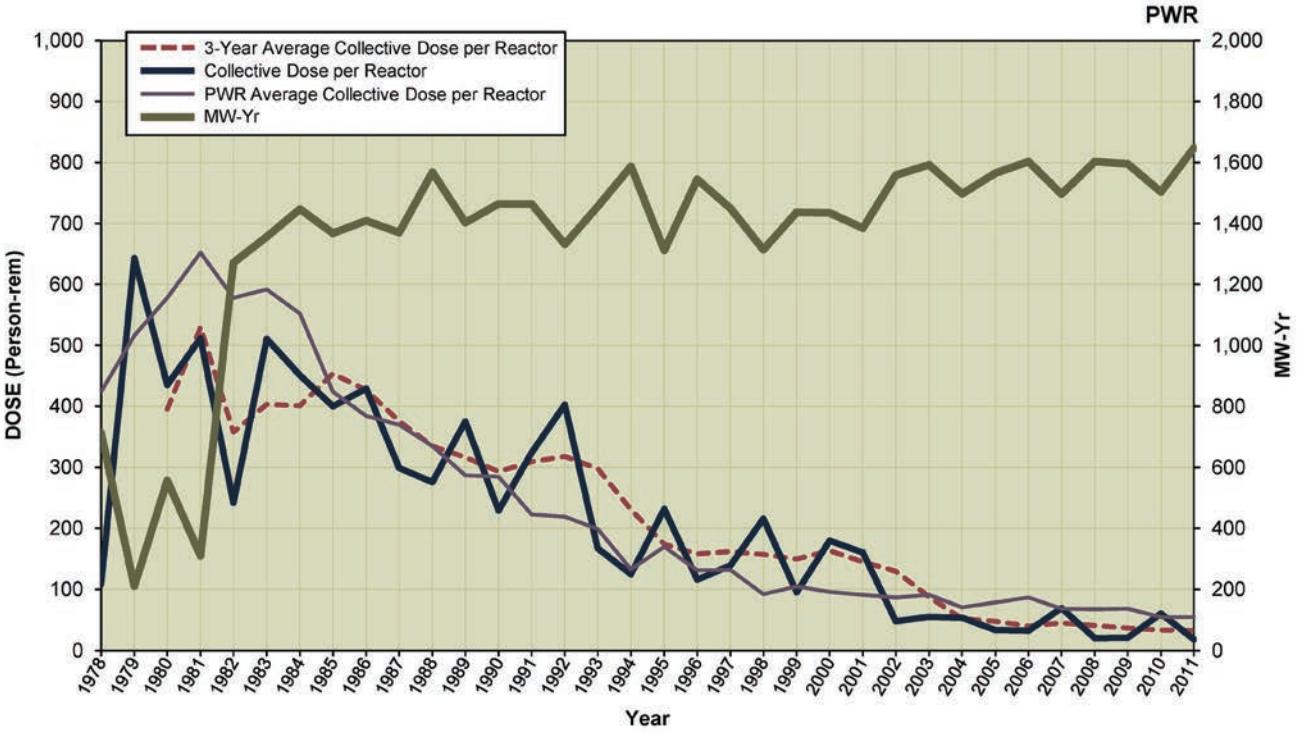
DRESDEN 2, 3
Dose Performance Trends



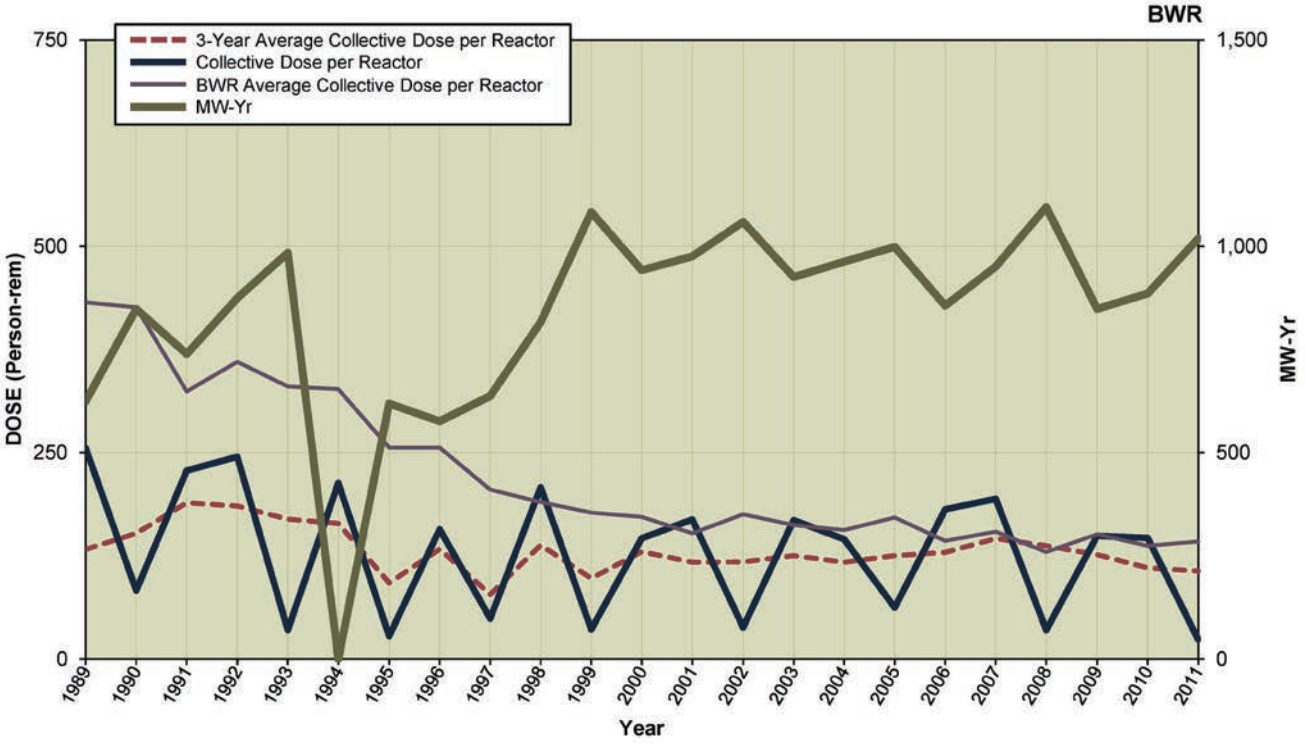
DUANE ARNOLD
Dose Performance Trends



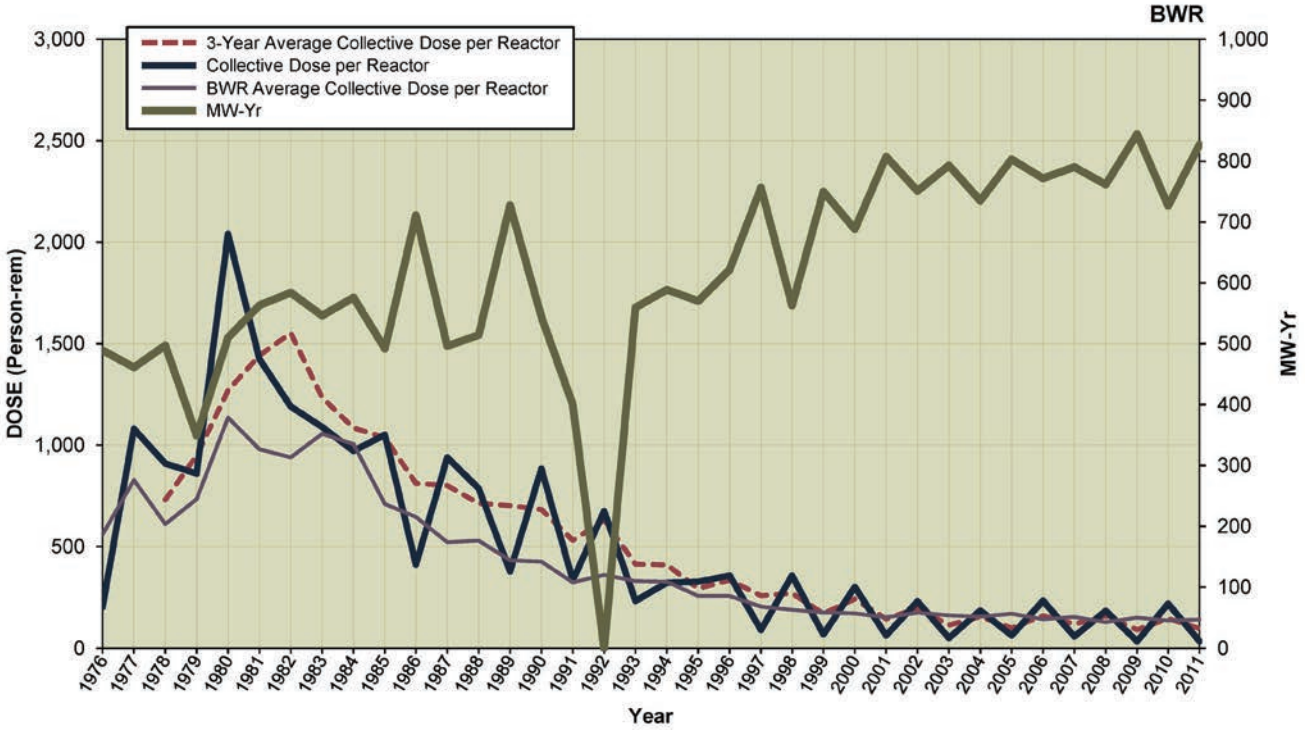
FARLEY 1, 2
Dose Performance Trends



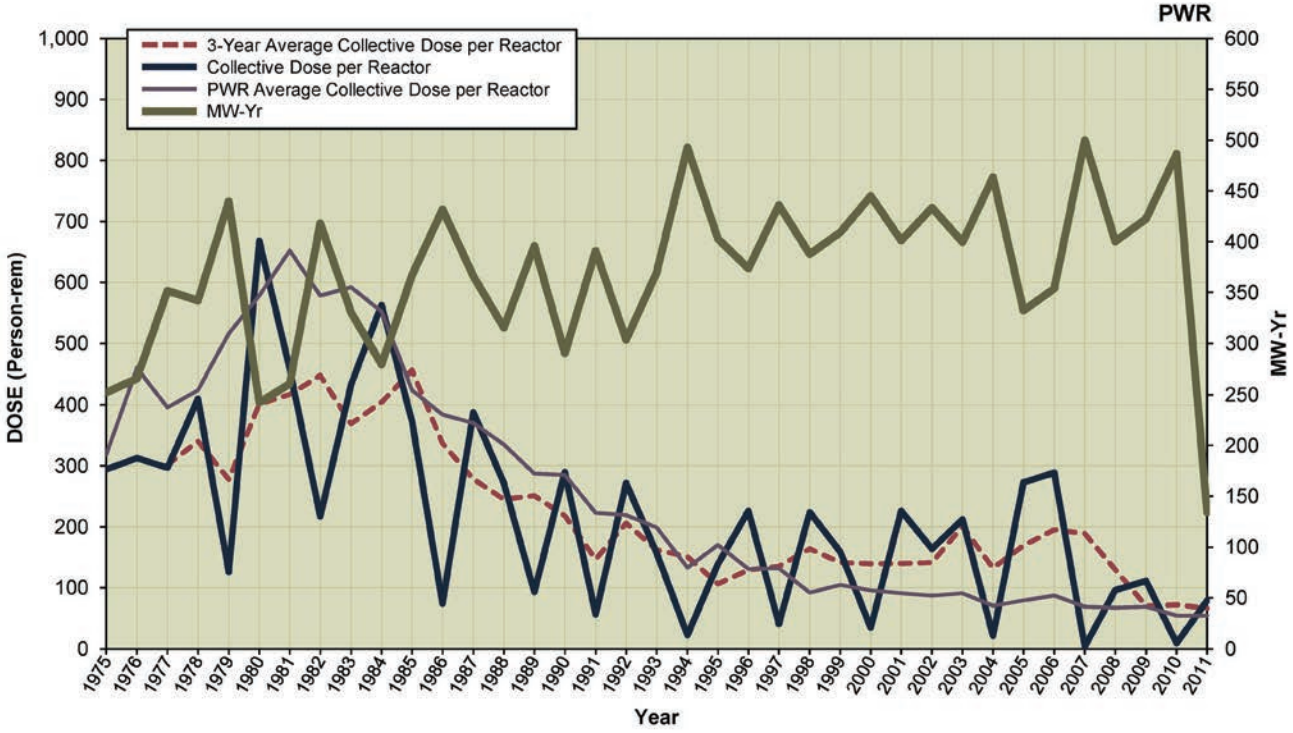
FERMI 2
Dose Performance Trends



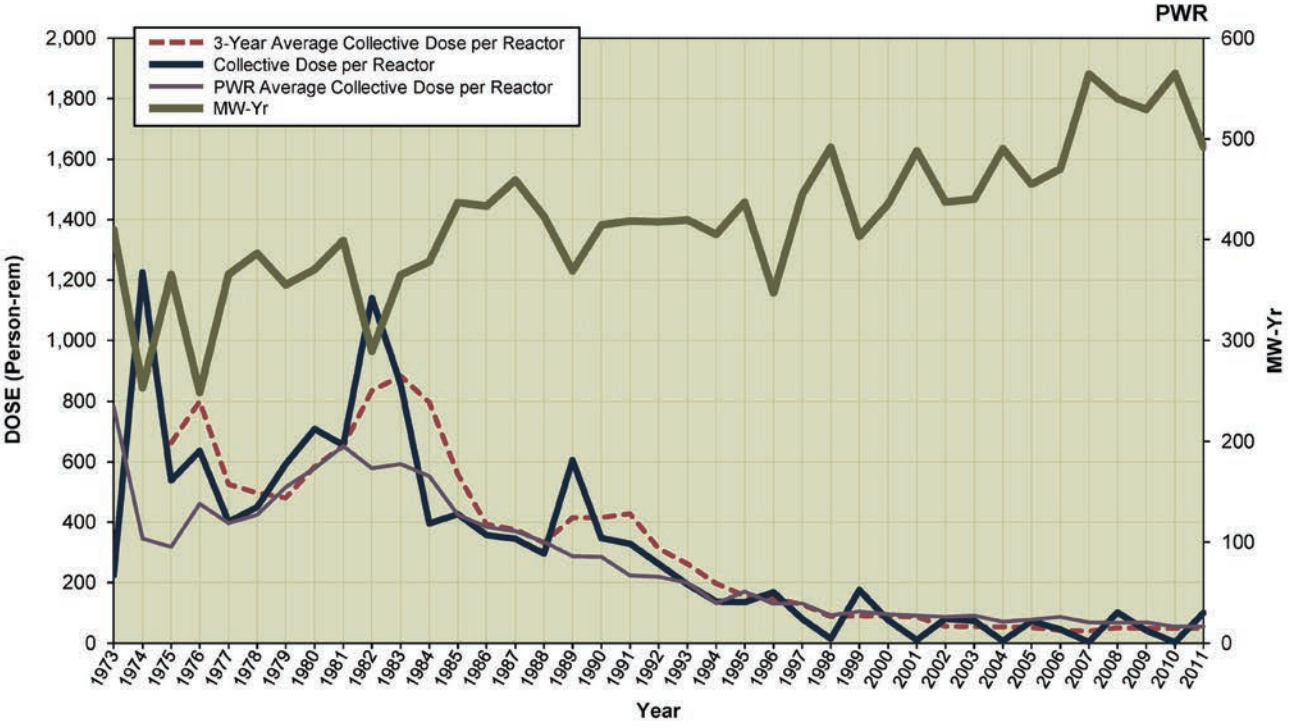
FITZPATRICK
Dose Performance Trends



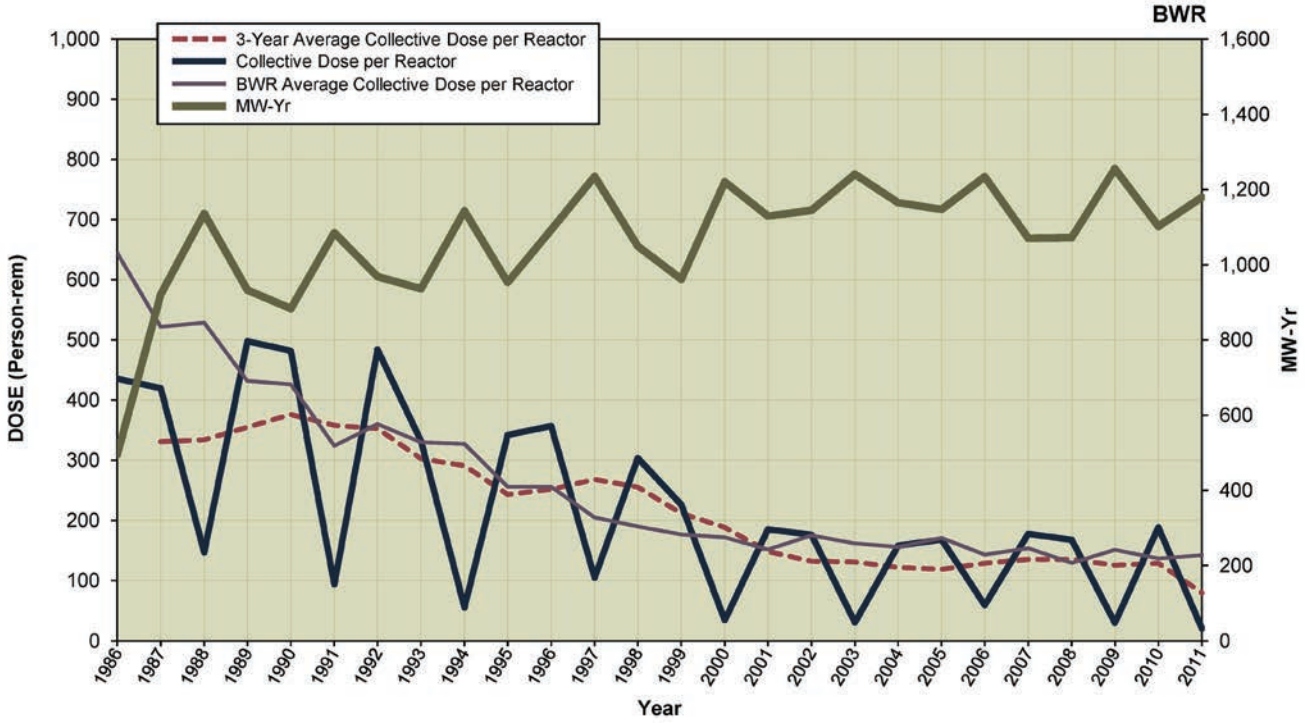
FORT CALHOUN
Dose Performance Trends



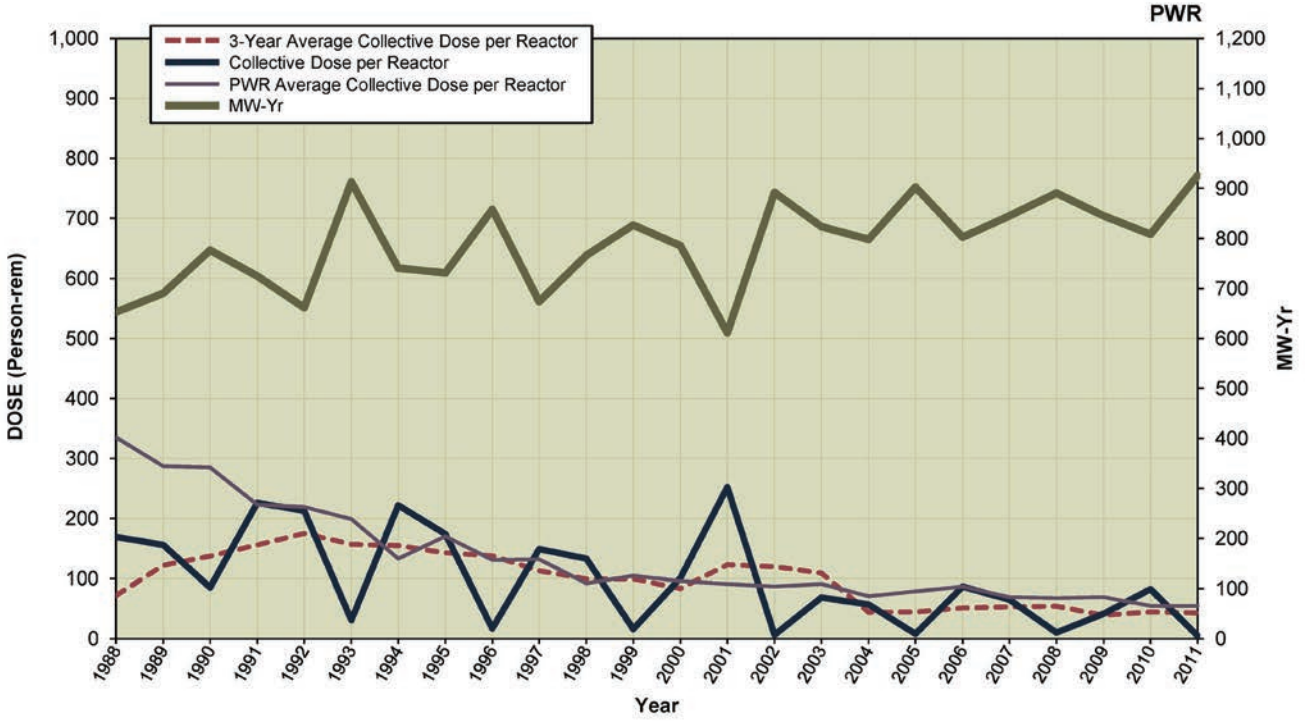
GINNA
Dose Performance Trends



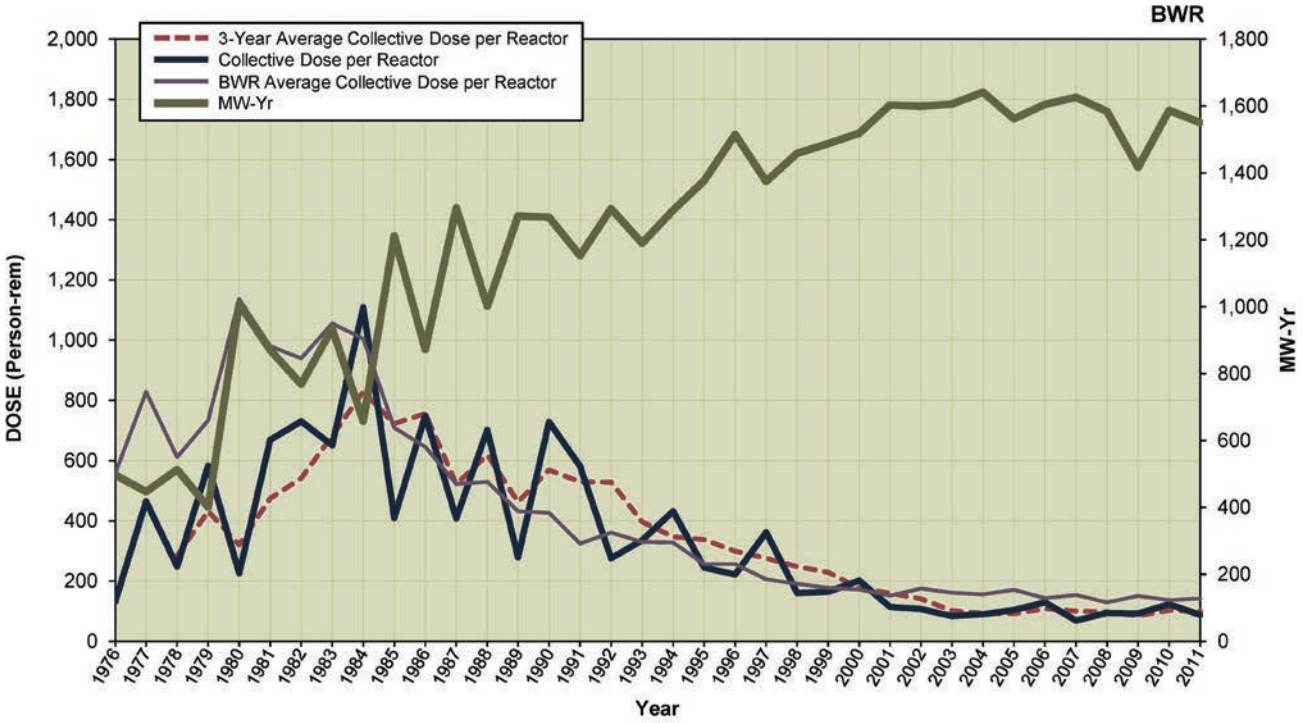
GRAND GULF
Dose Performance Trends



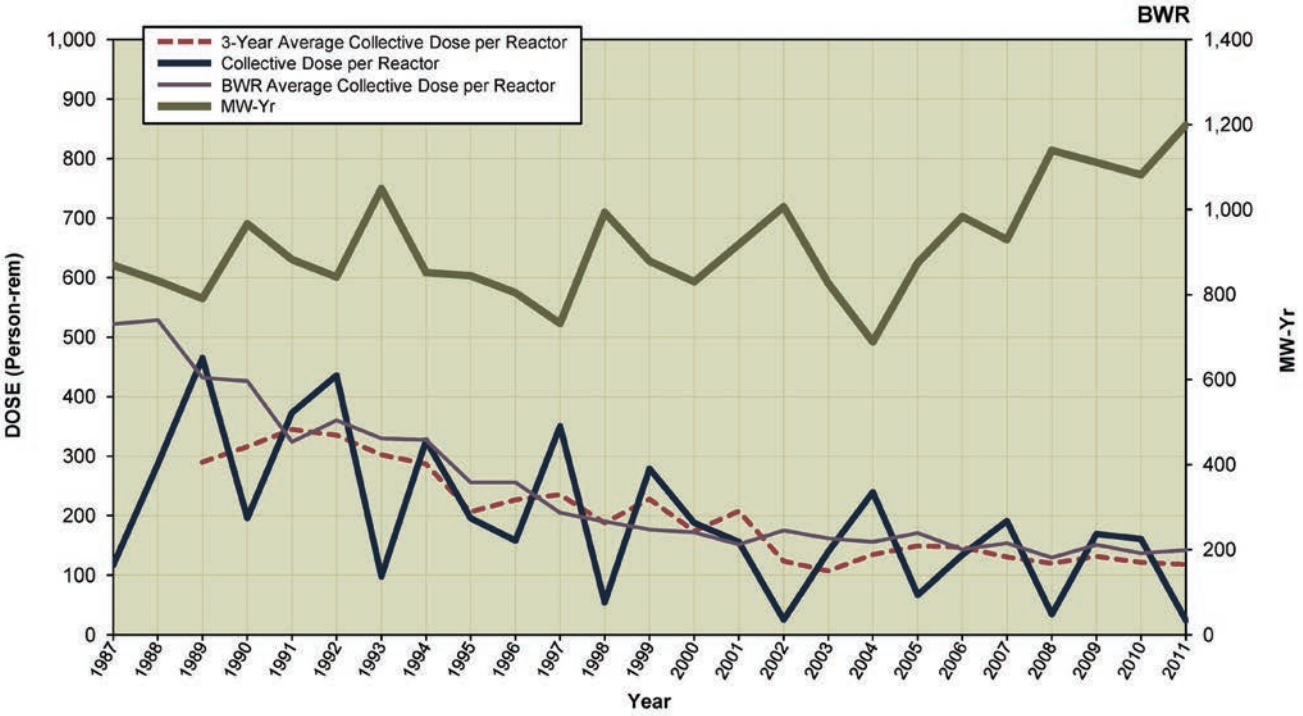
HARRIS 1
Dose Performance Trends



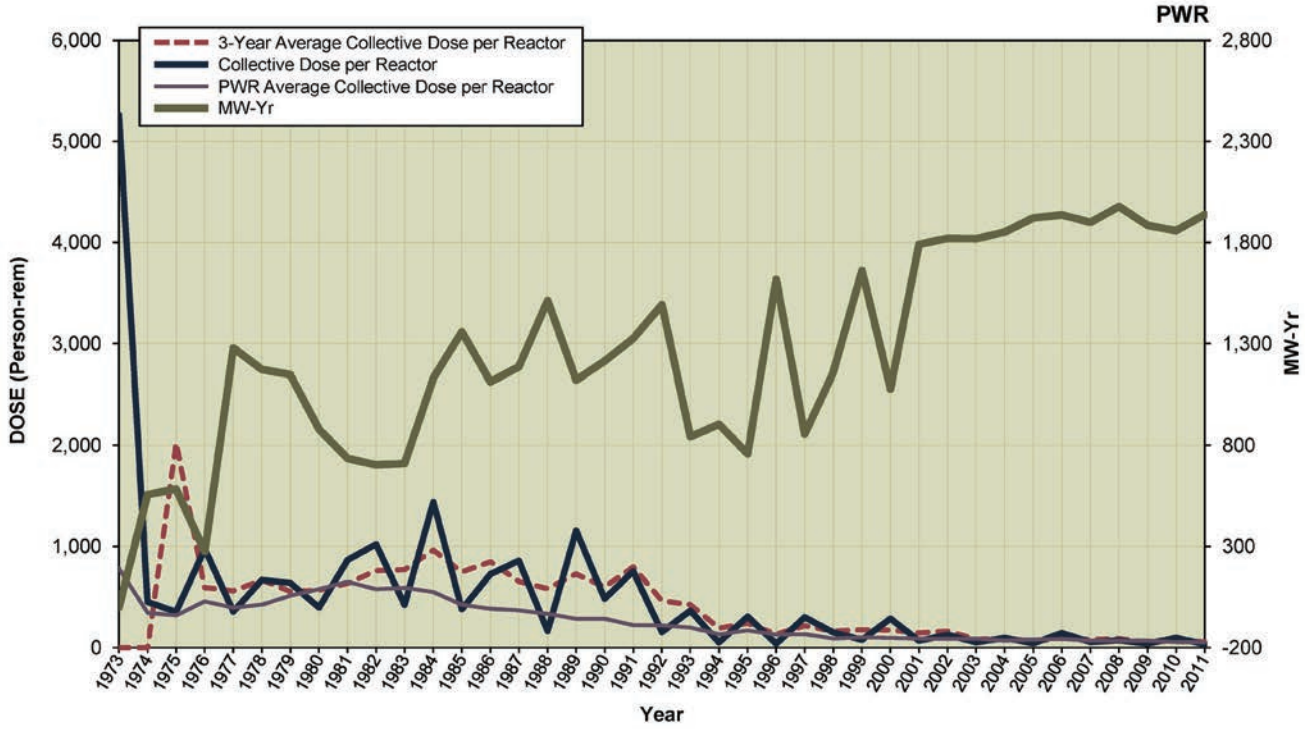
HATCH 1, 2
Dose Performance Trends



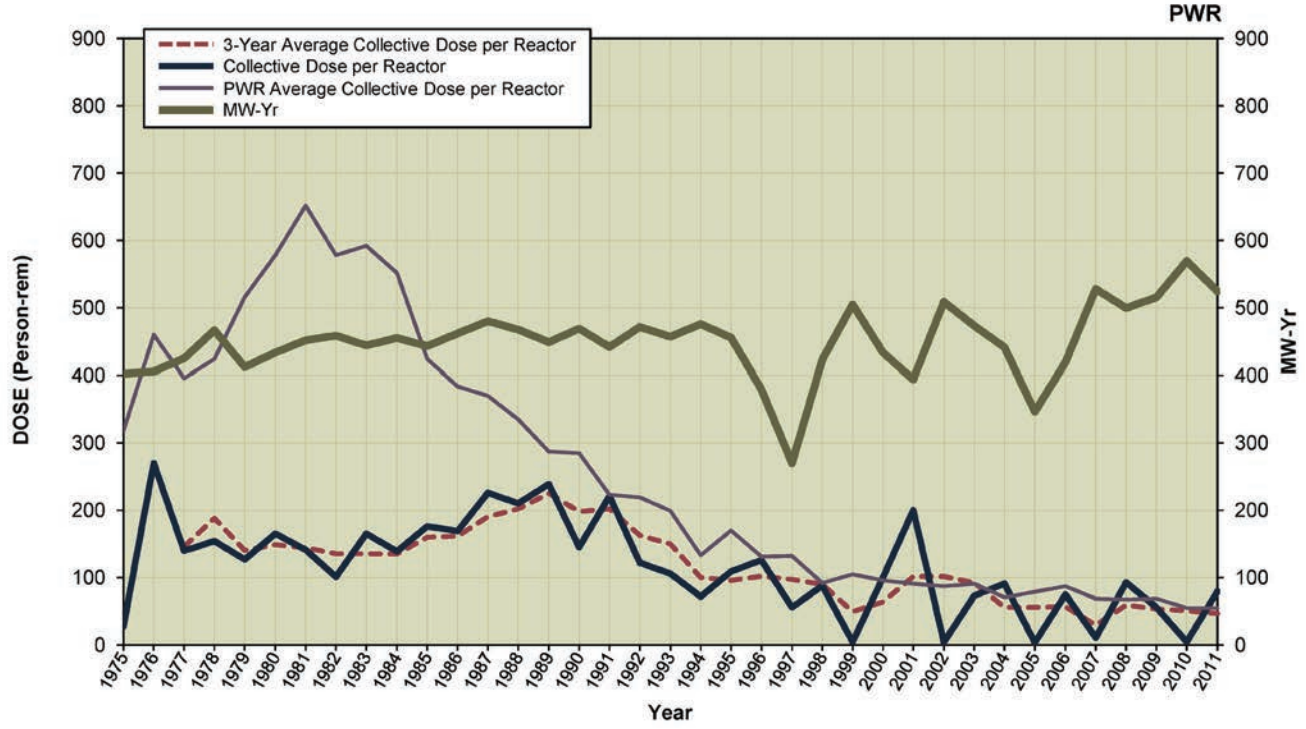
HOPE CREEK 1
Dose Performance Trends



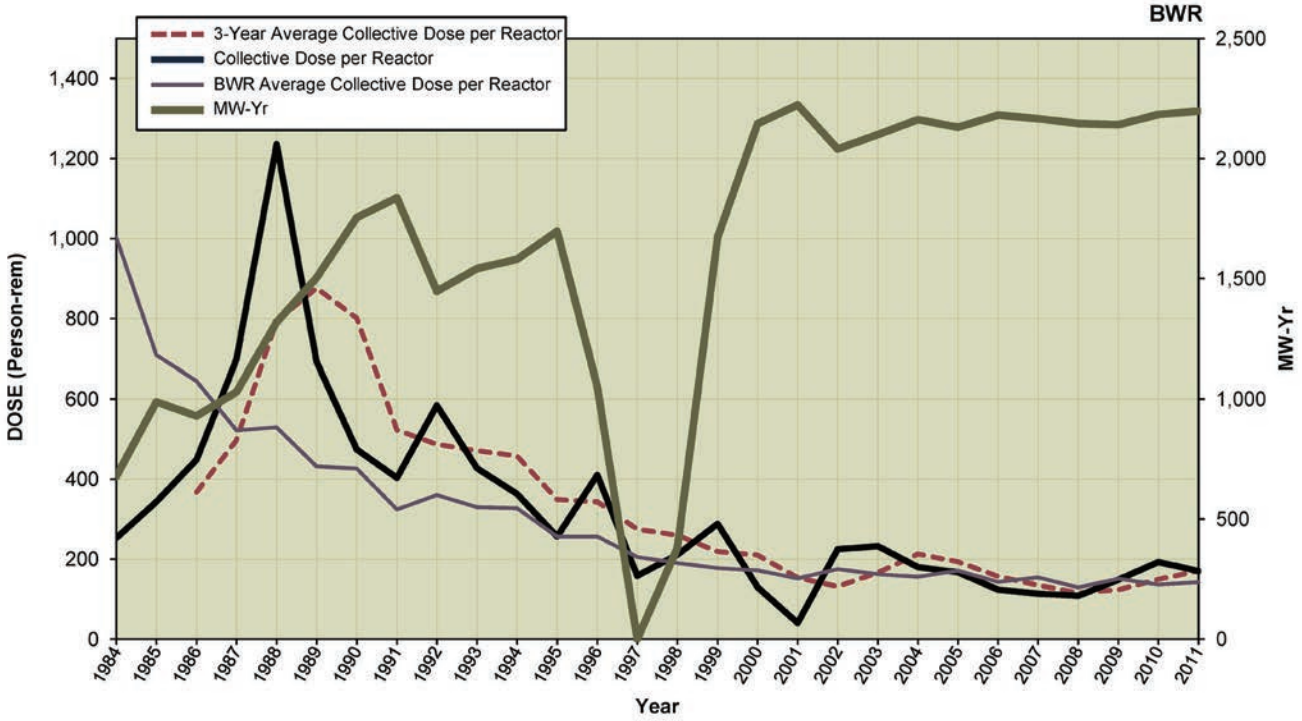
INDIAN POINT 2,3
Dose Performance Trends



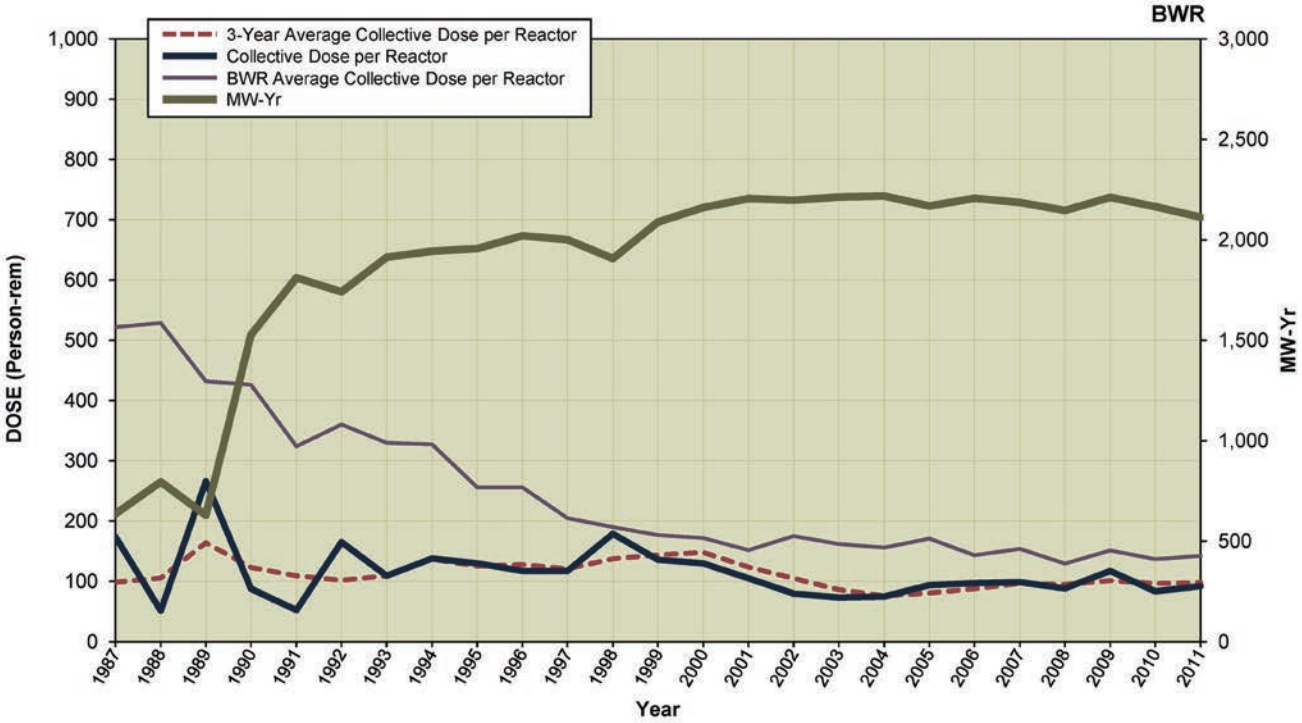
KEWAUNEE
Dose Performance Trends



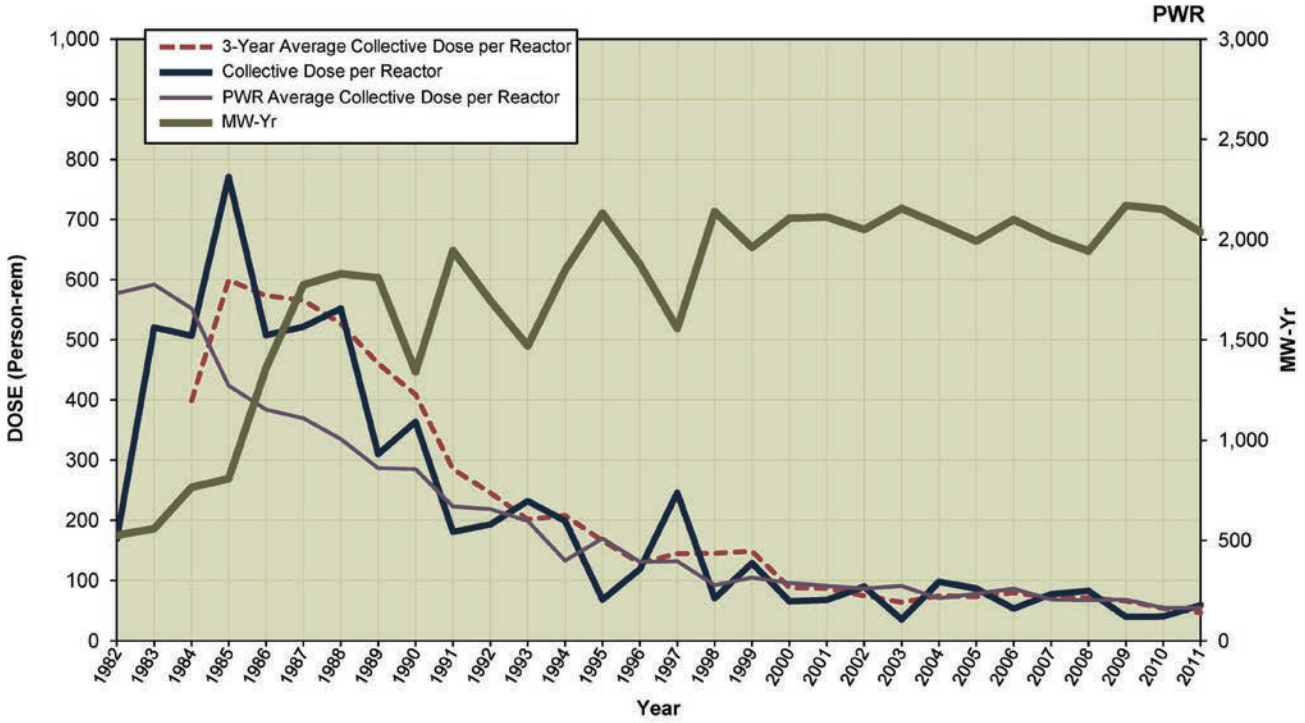
LASALLE 1, 2
Dose Performance Trends



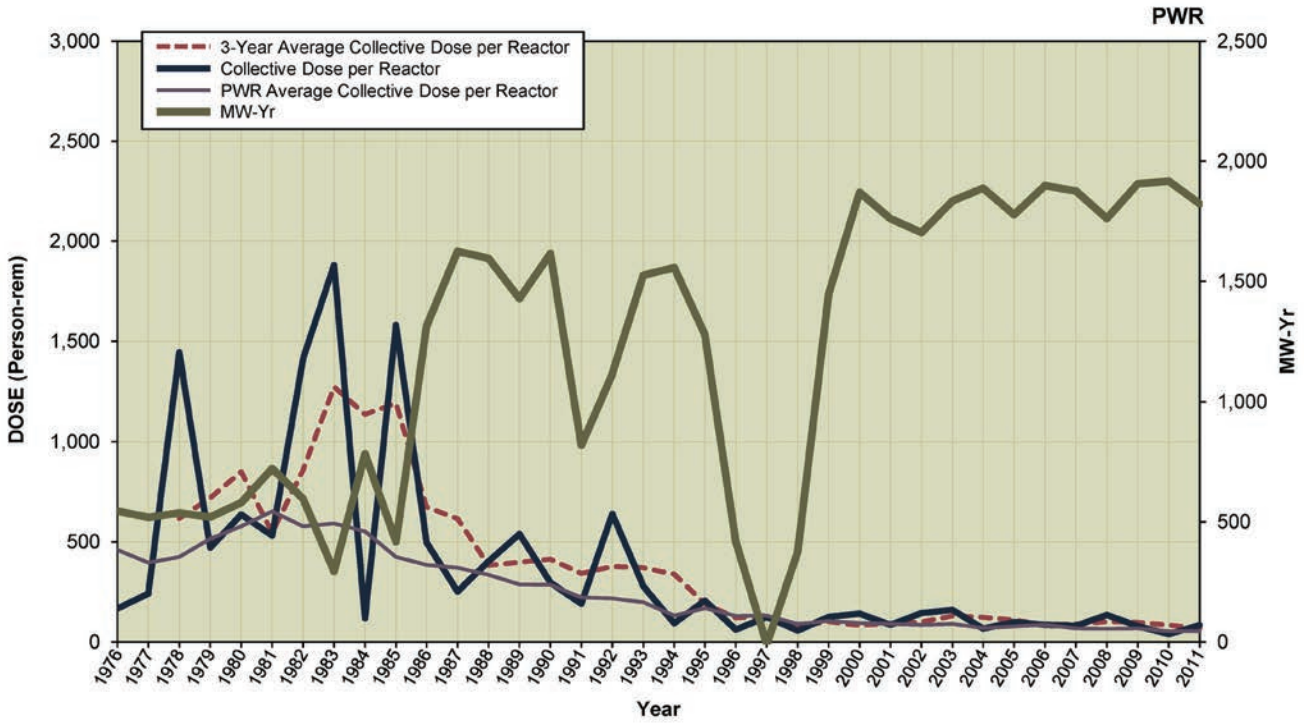
LIMERICK 1, 2
Dose Performance Trends



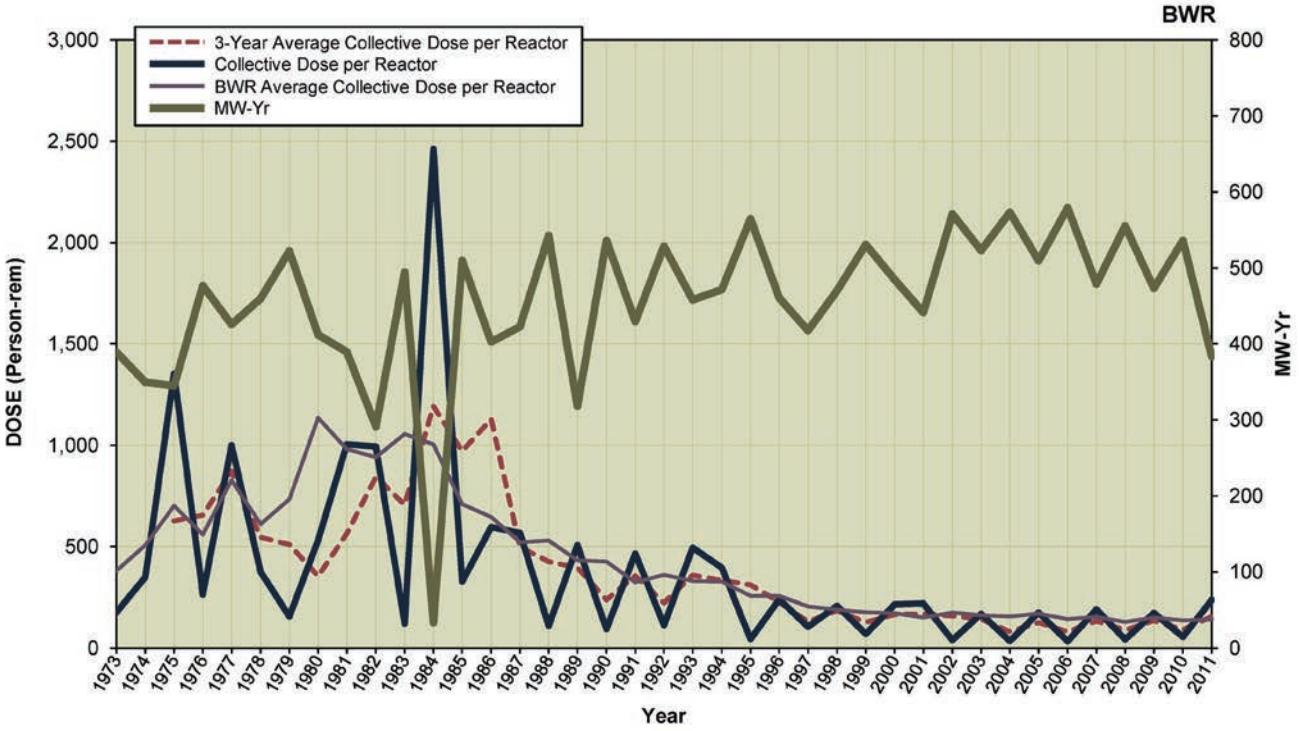
MCGUIRE 1, 2
Dose Performance Trends



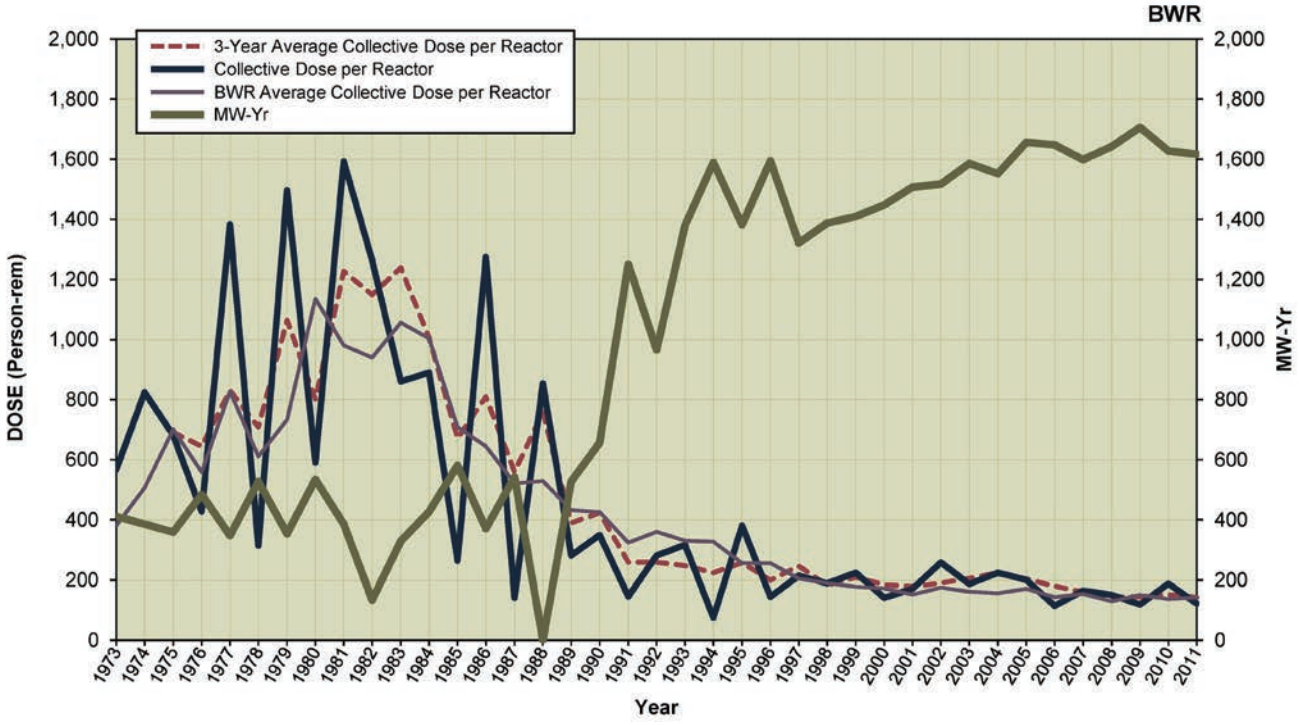
MILLSTONE 2, 3
Dose Performance Trends



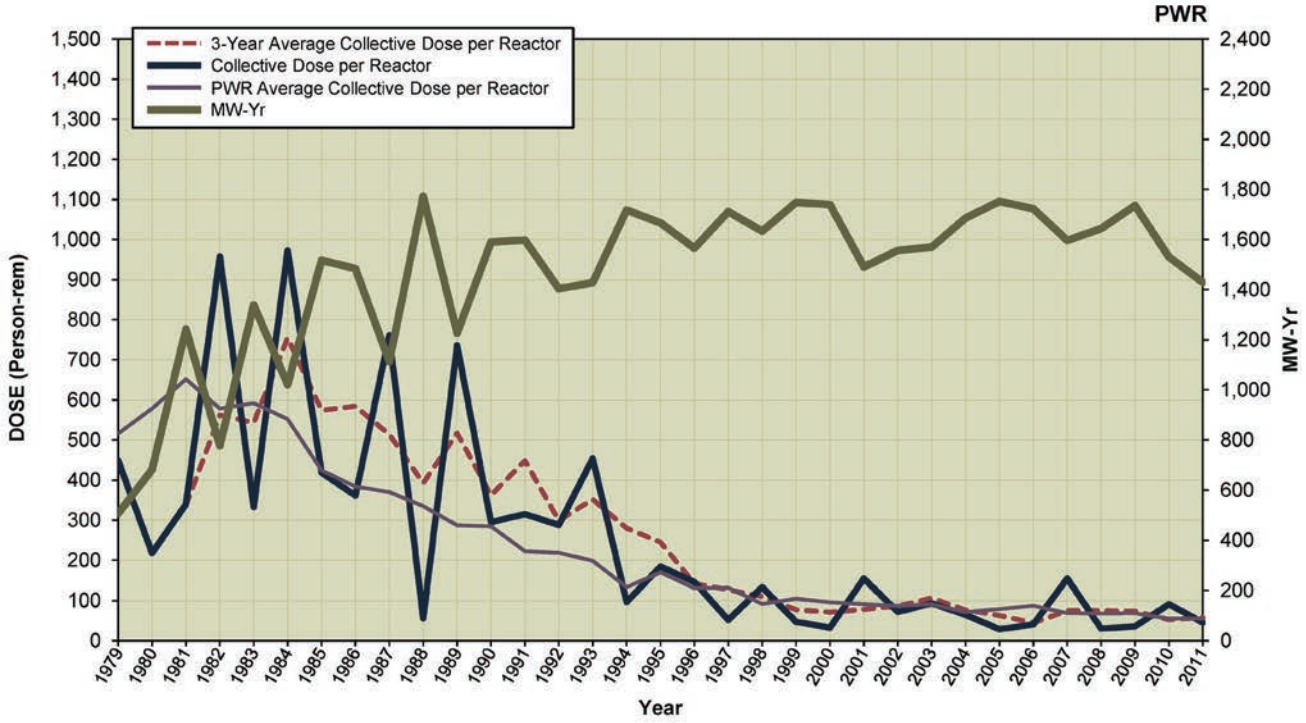
MONTICELLO
Dose Performance Trends



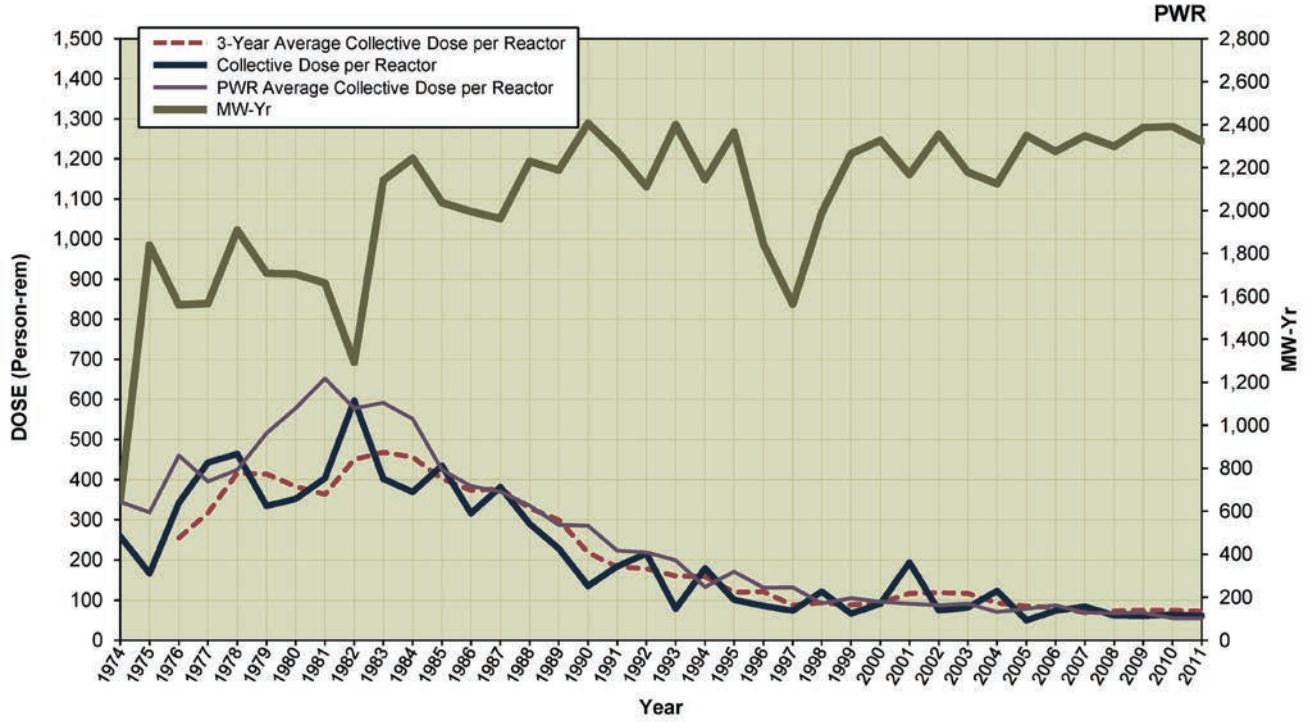
NINE MILE POINT 1, 2
Dose Performance Trends



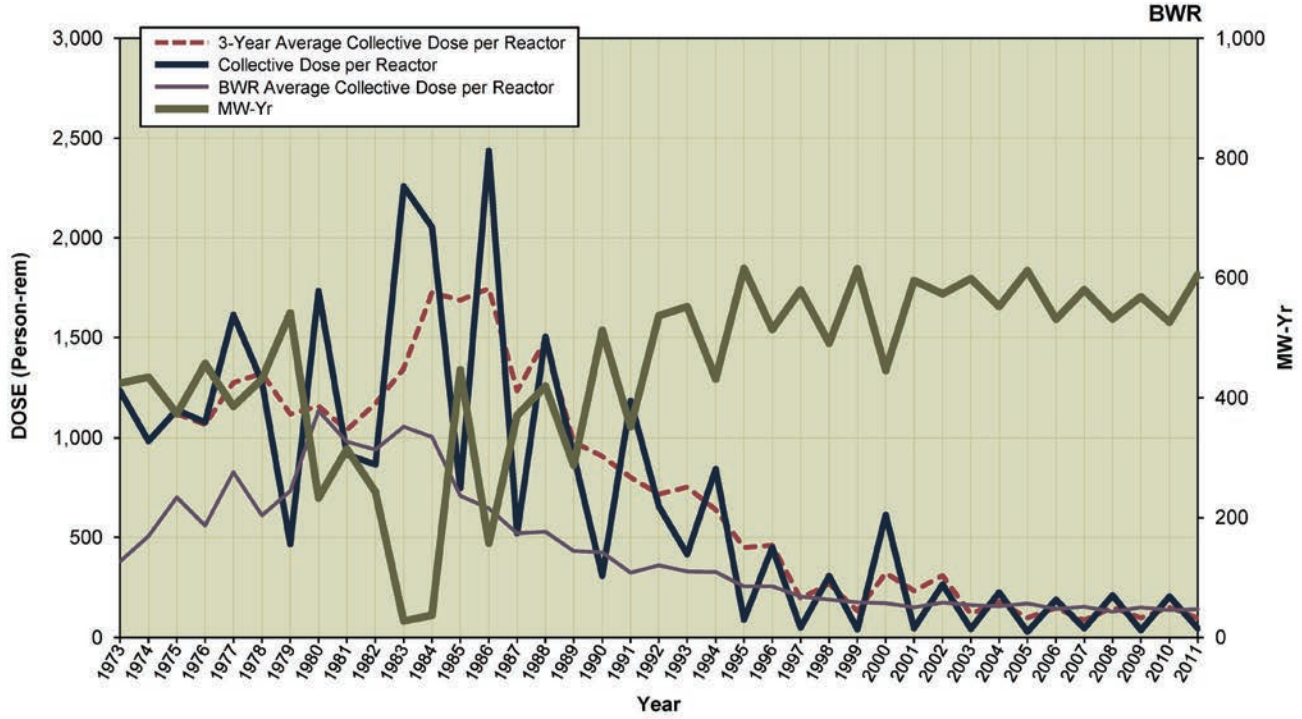
NORTH ANNA 1, 2
Dose Performance Trends



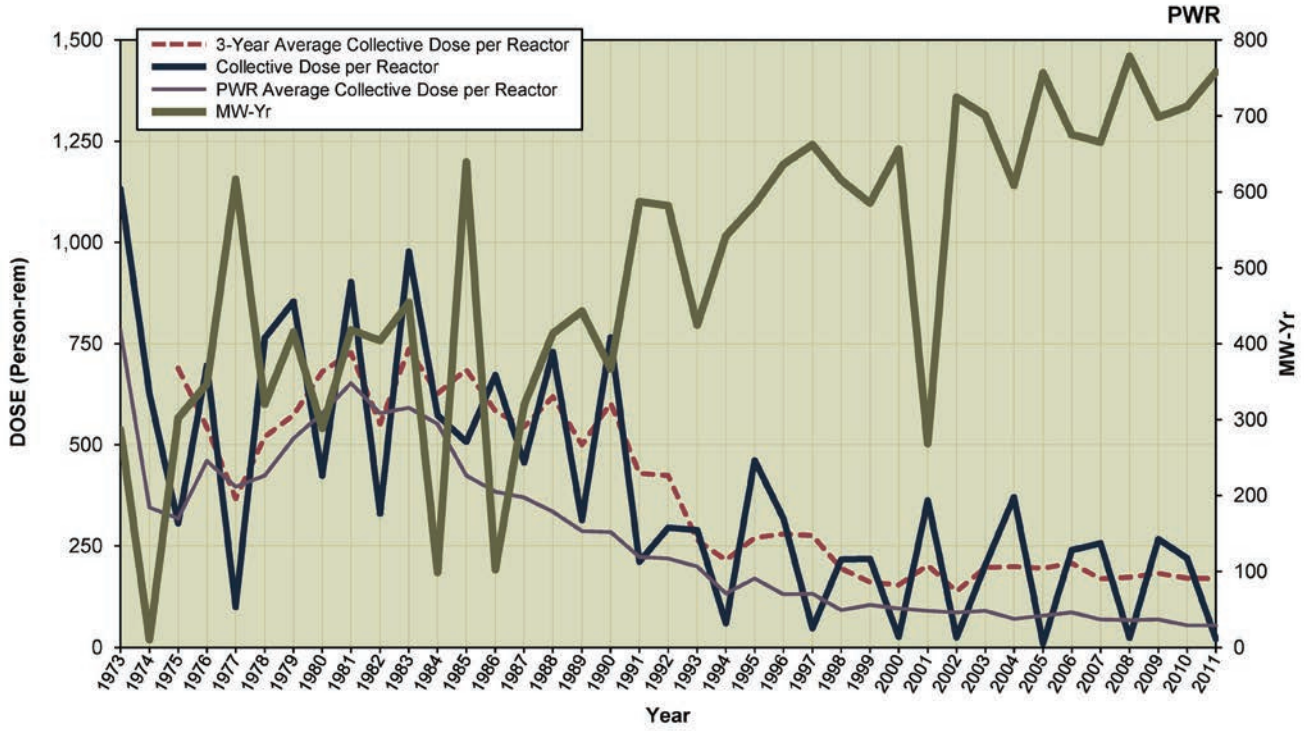
OCONEE 1, 2, 3
Dose Performance Trends



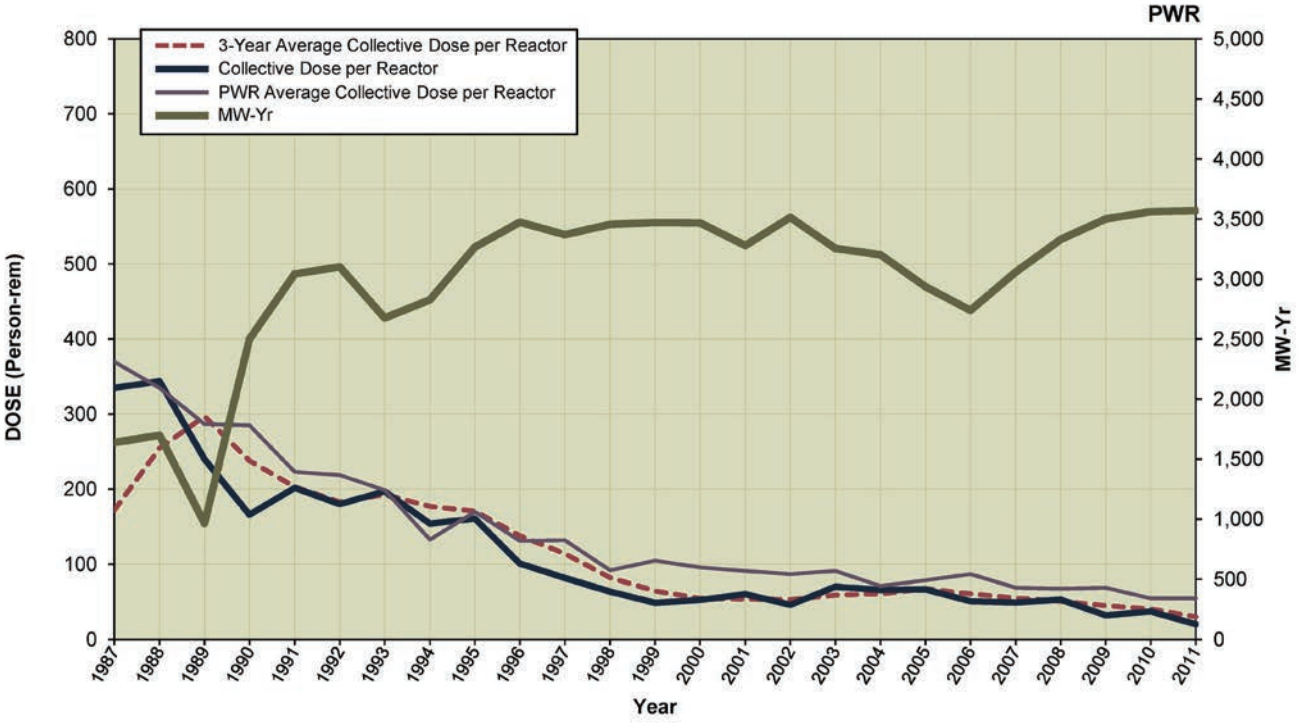
OYSTER CREEK
Dose Performance Trends



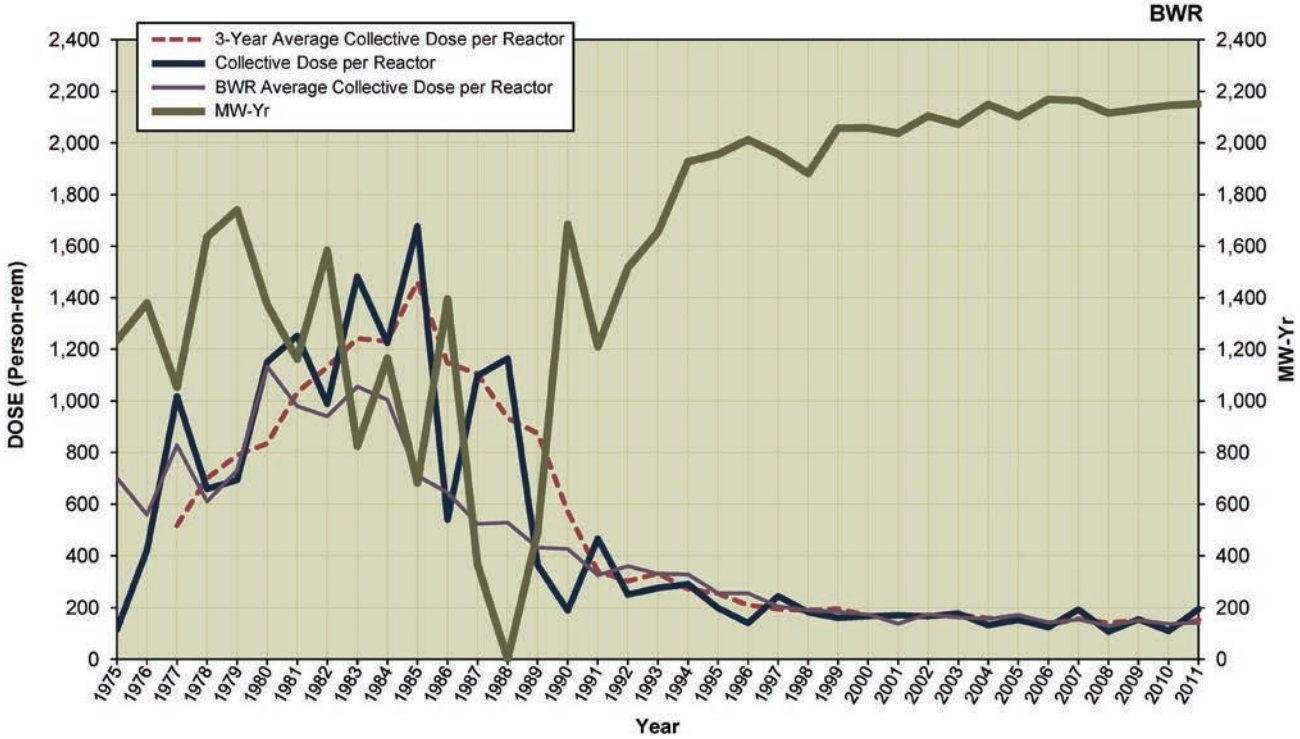
PALISADES
Dose Performance Trends



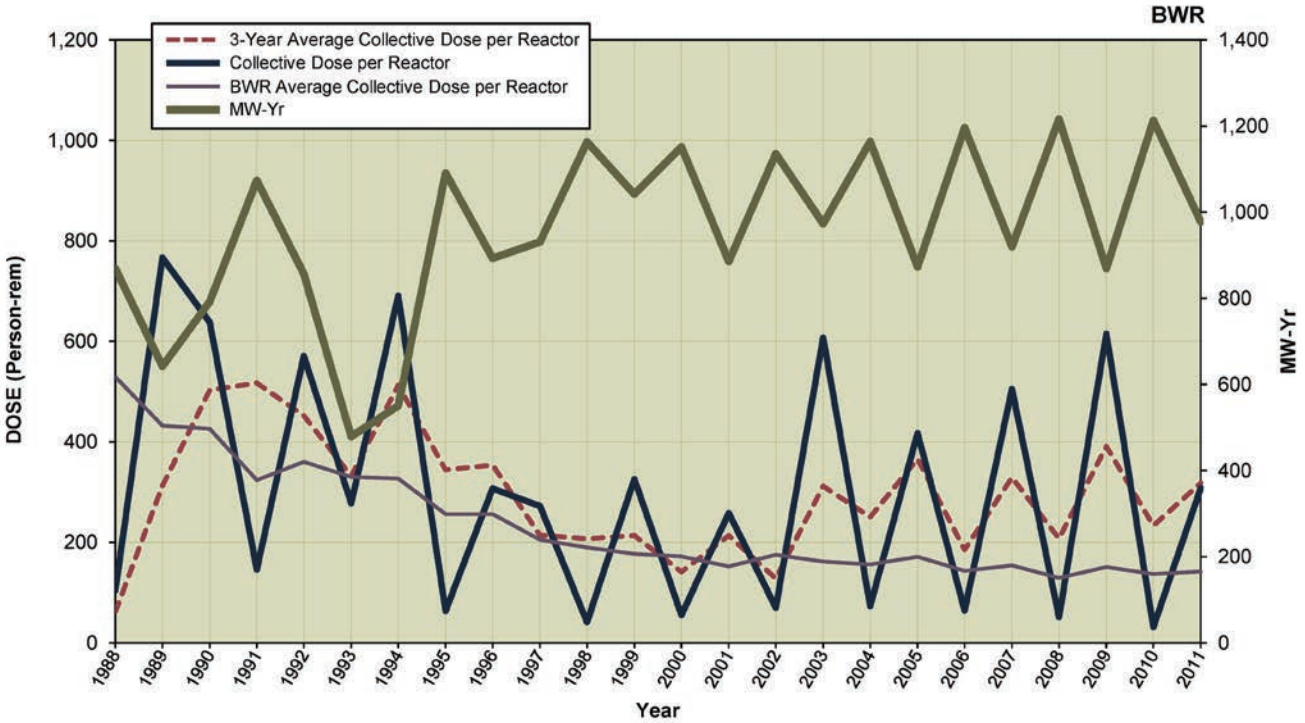
PALO VERDE 1, 2, 3
Dose Performance Trends



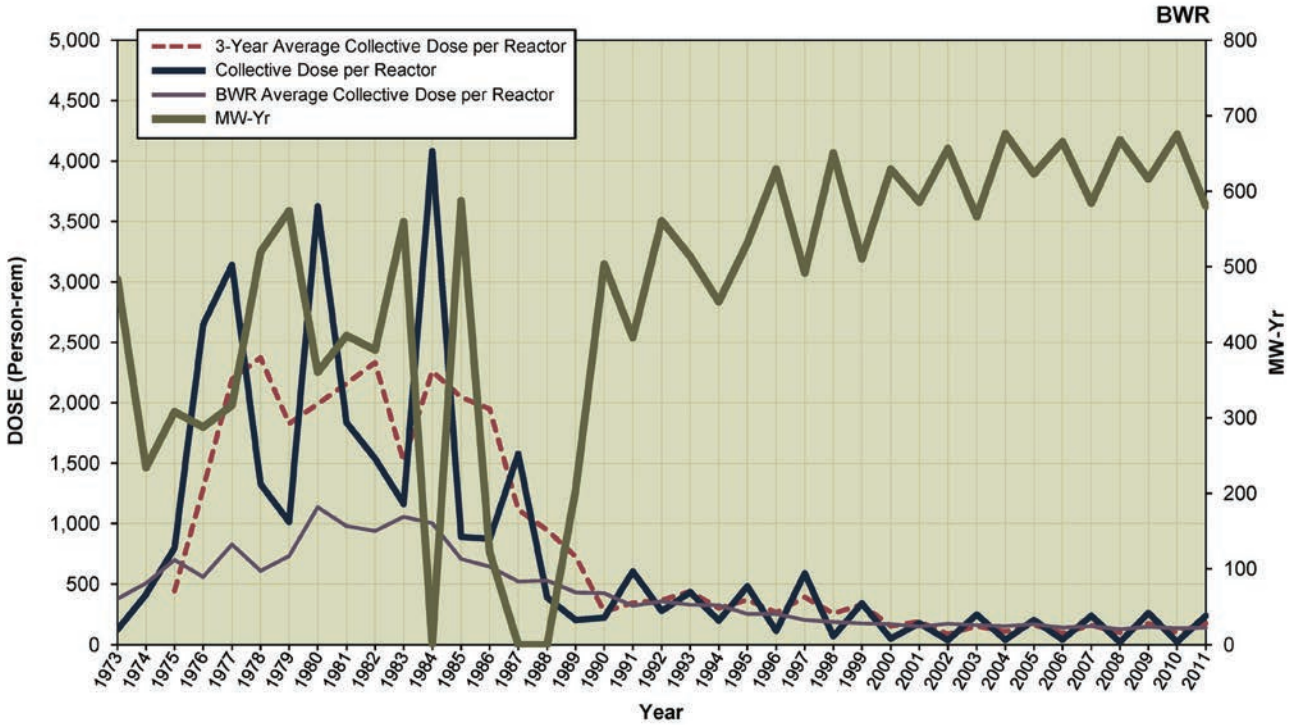
PEACH BOTTOM 2, 3
Dose Performance Trends



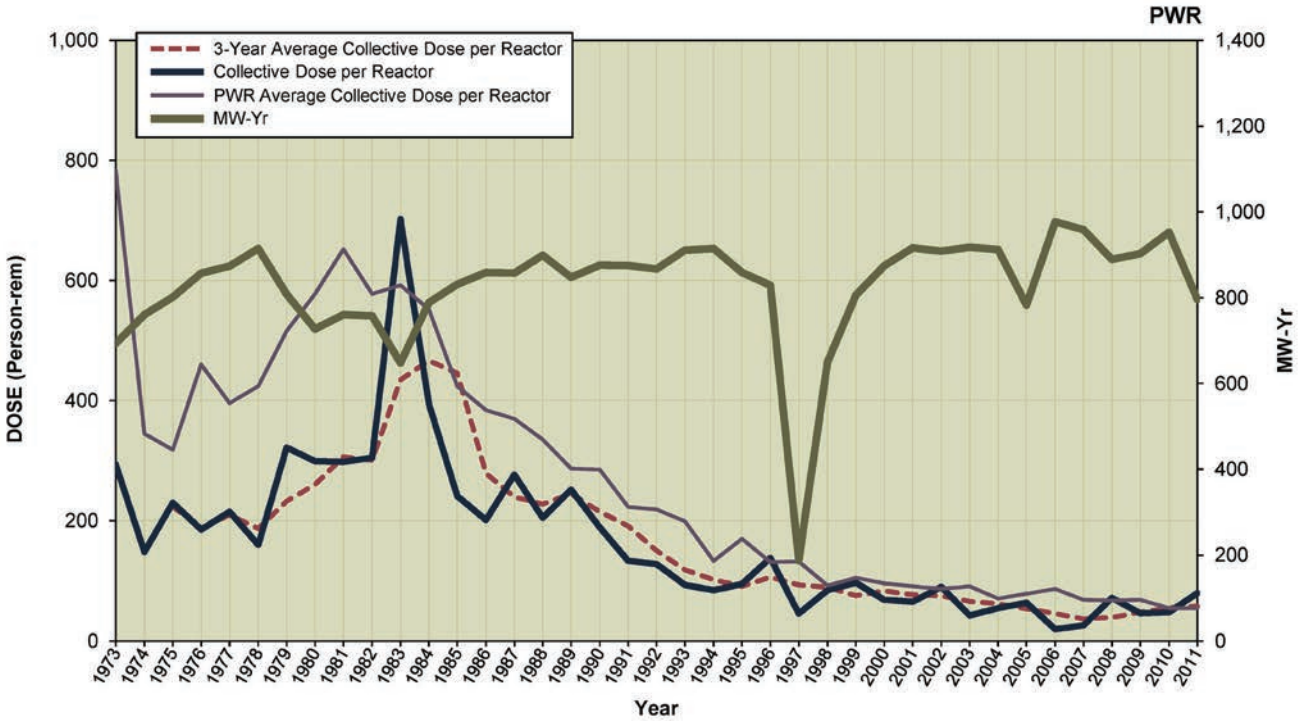
PERRY 1
Dose Performance Trends



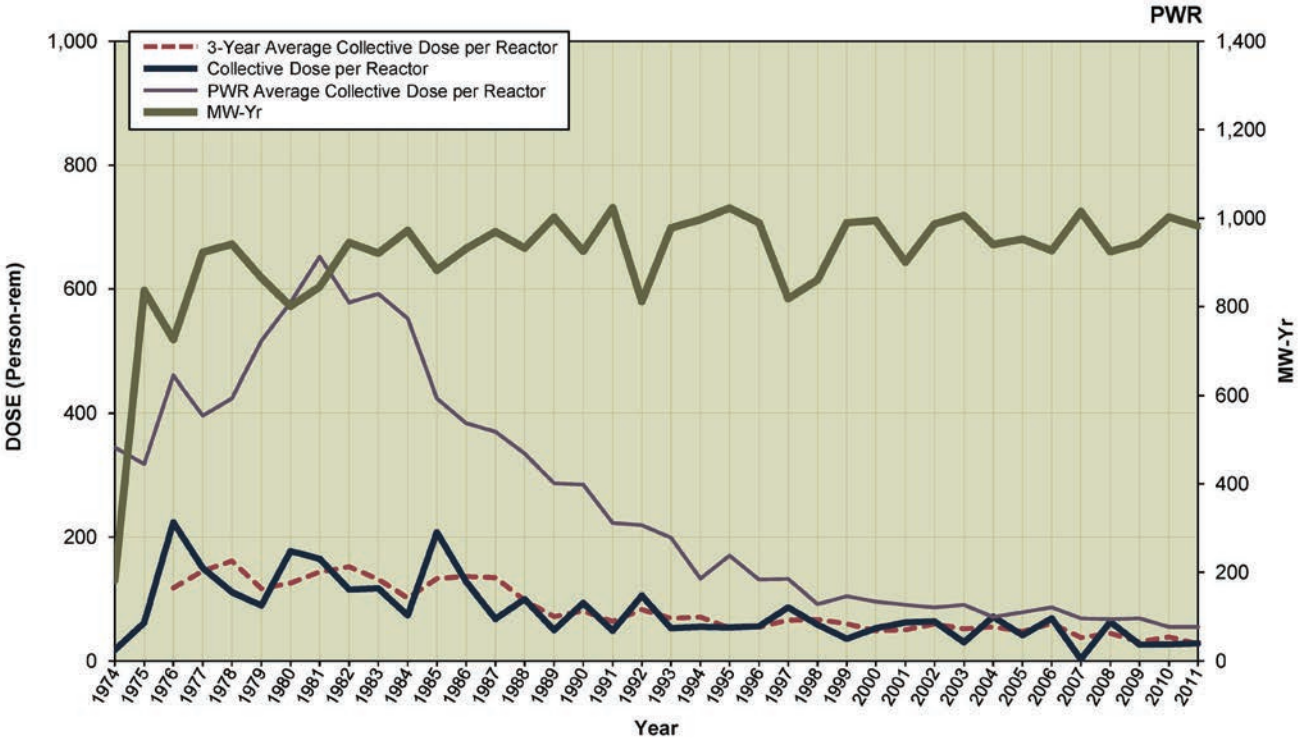
PILGRIM 1
Dose Performance Trends



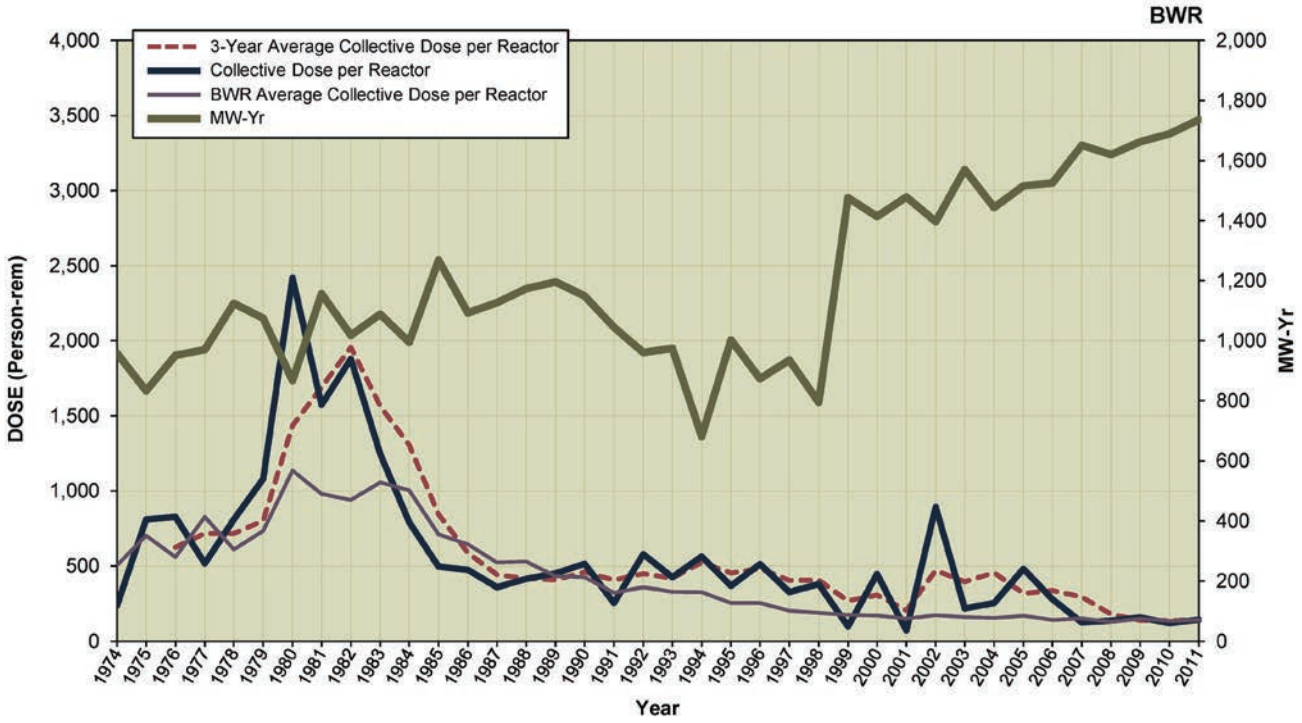
POINT BEACH 1, 2
Dose Performance Trends



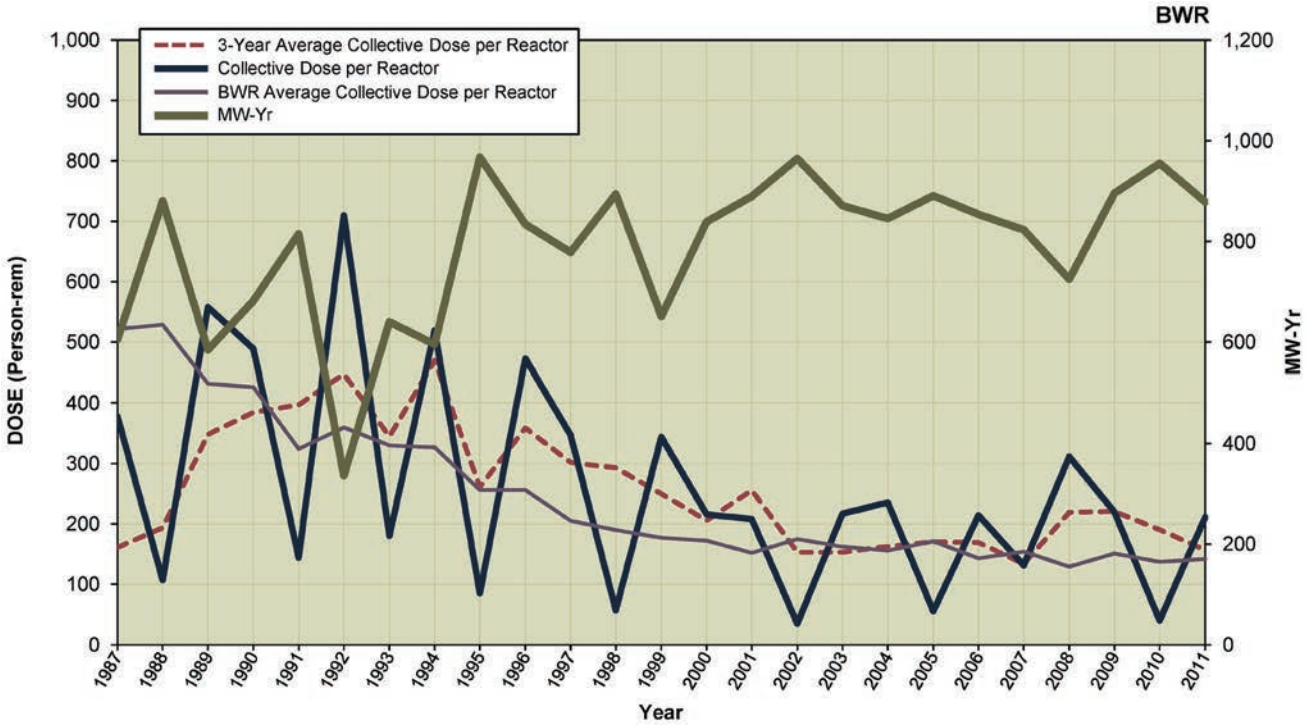
PRAIRIE ISLAND 1, 2
Dose Performance Trends



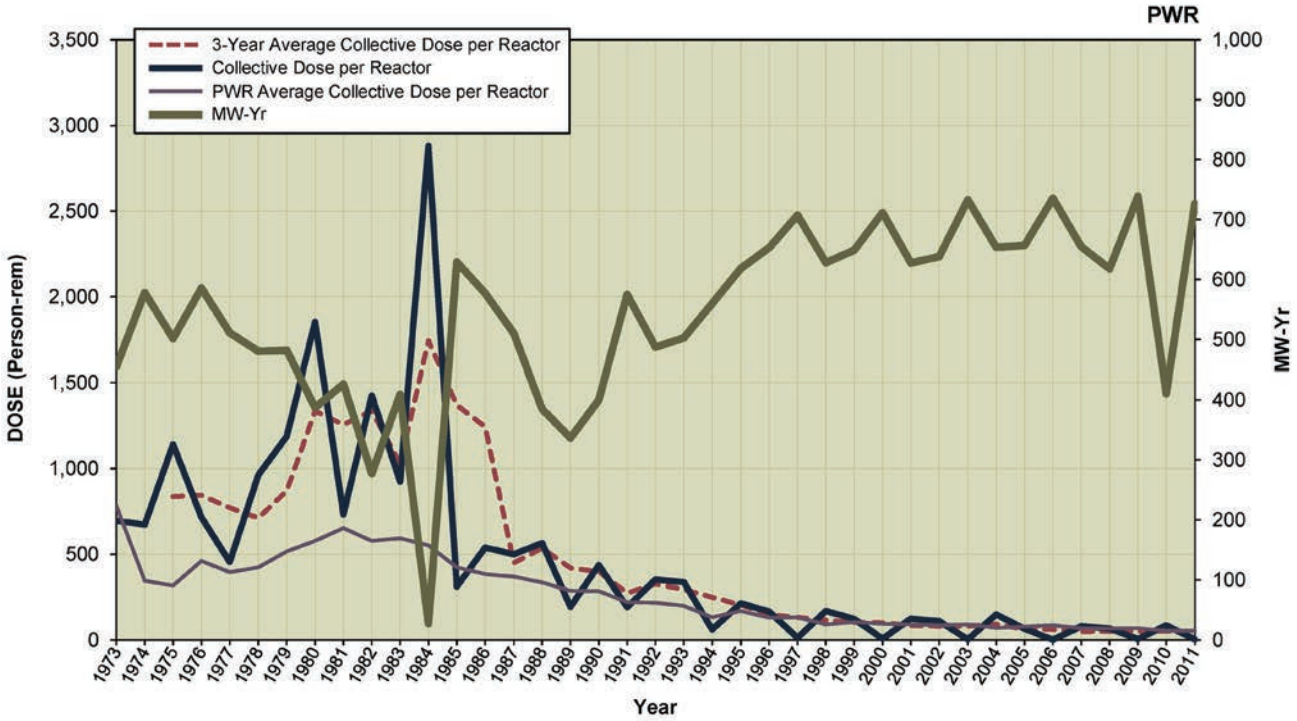
QUAD CITIES 1, 2
Dose Performance Trends



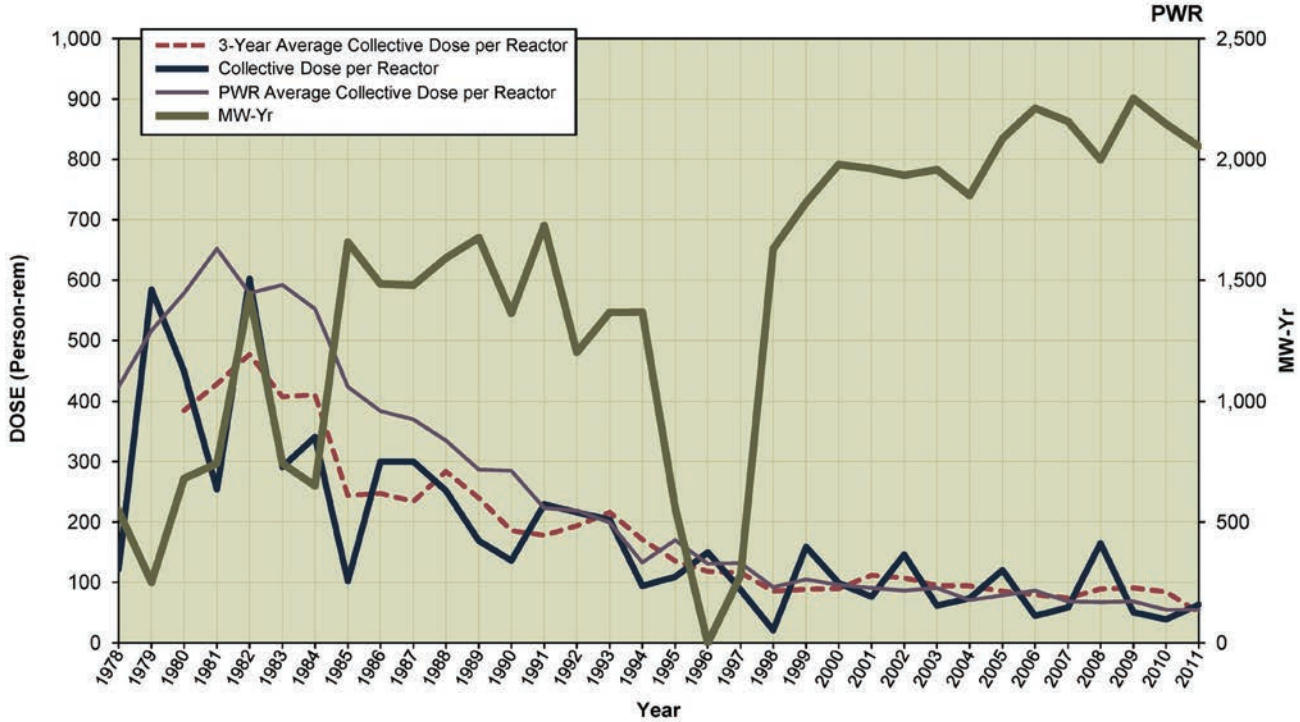
RIVER BEND 1
Dose Performance Trends



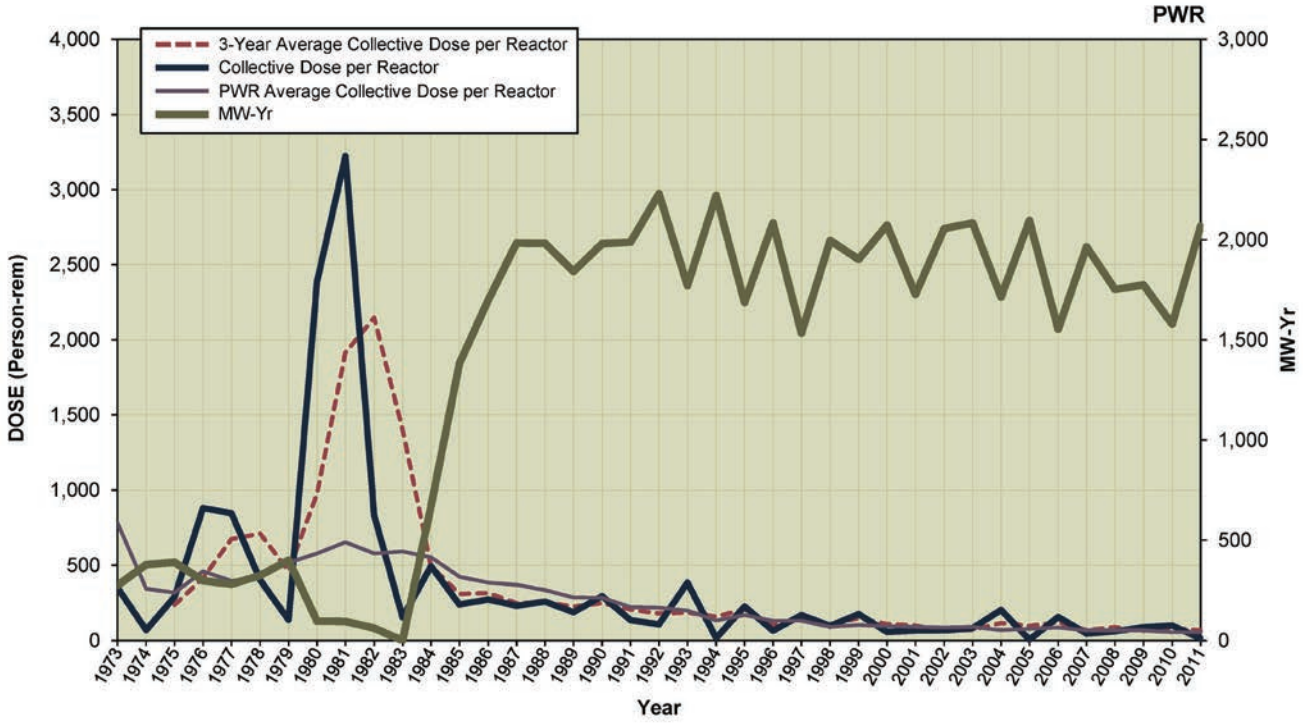
ROBINSON 2
Dose Performance Trends



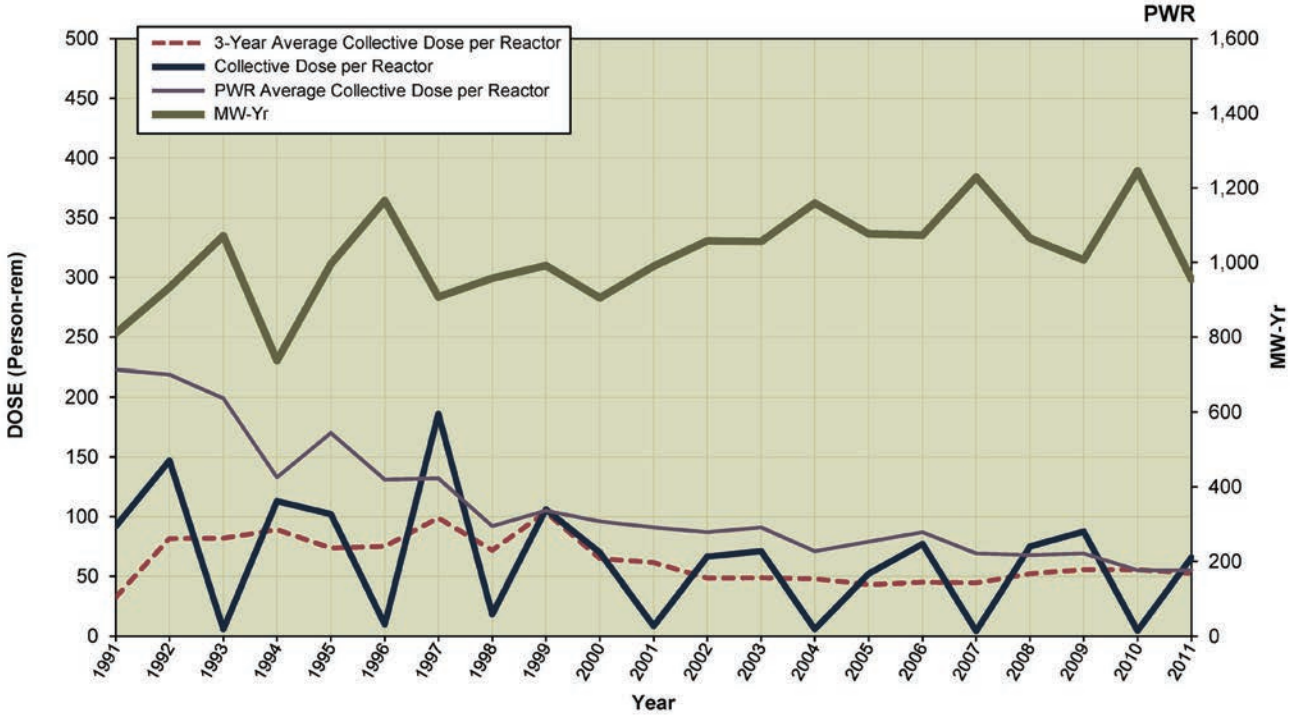
SALEM 1, 2
Dose Performance Trends



SAN ONOFRE 1, 2, 3
Dose Performance Trends

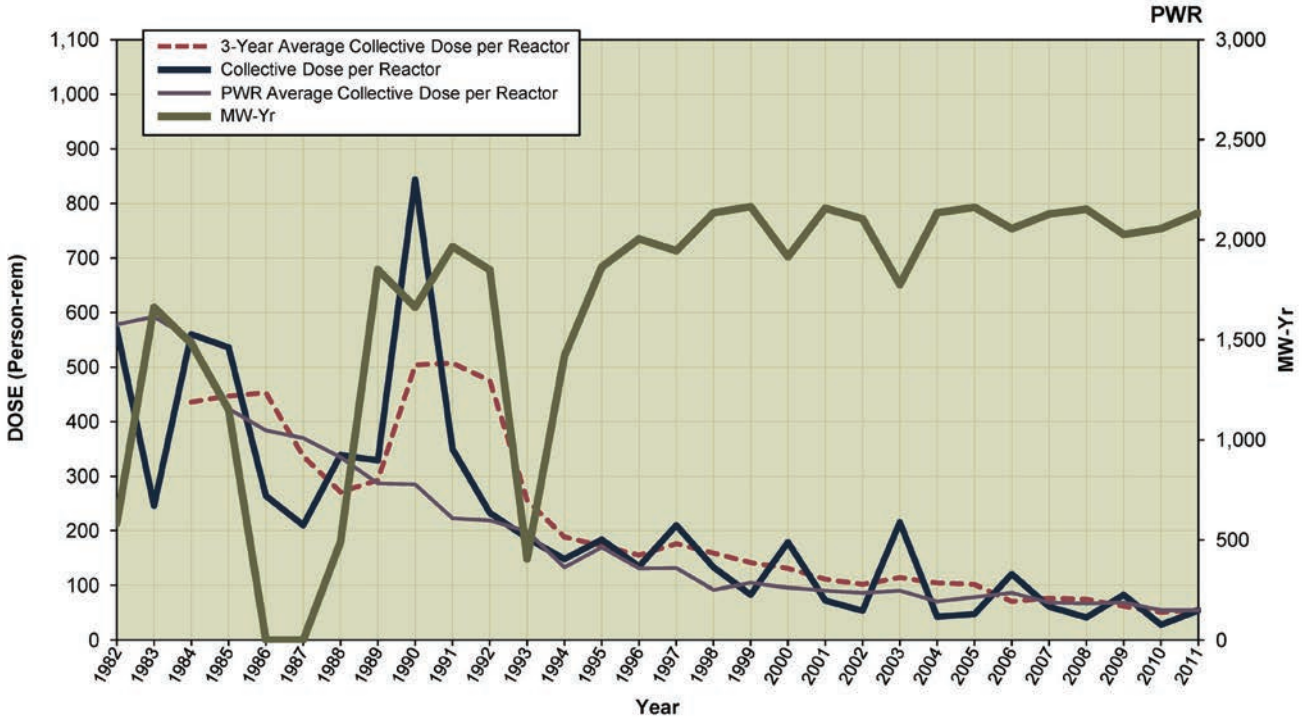


SEABROOK
Dose Performance Trends

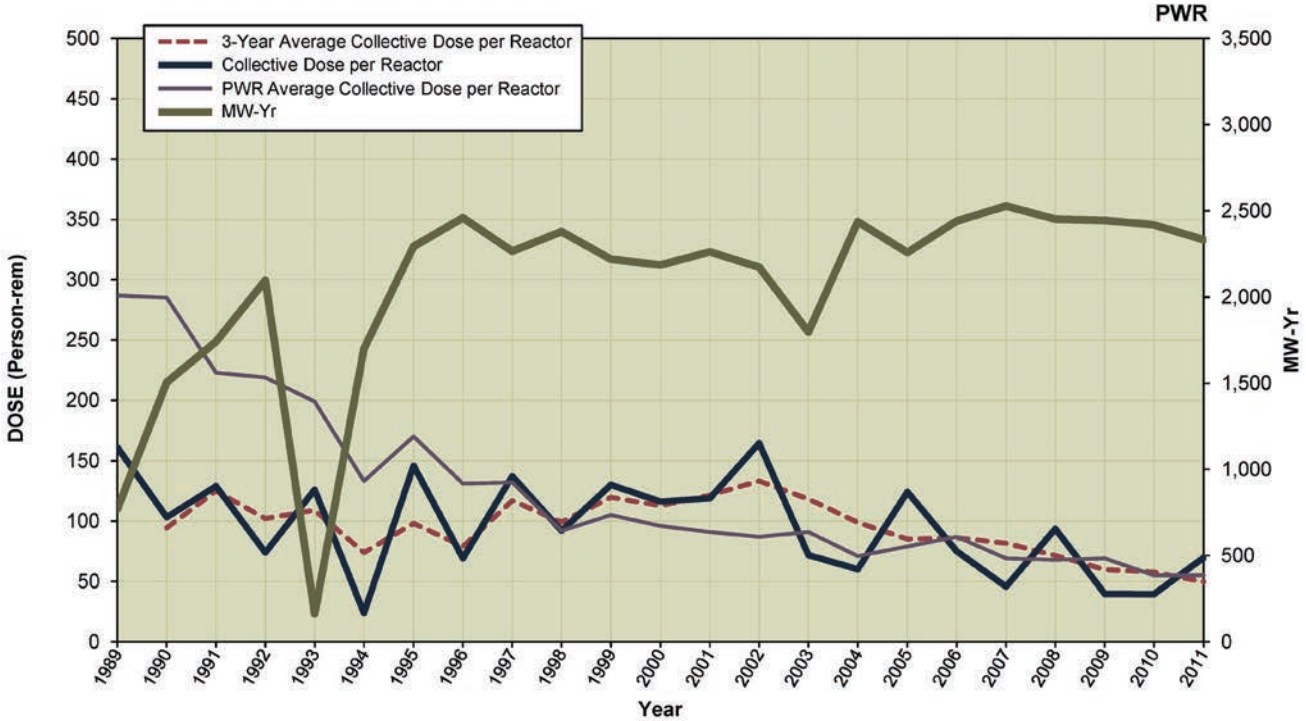


NOTE: Since 2001, data only includes San Onofre Units 2 and 3.

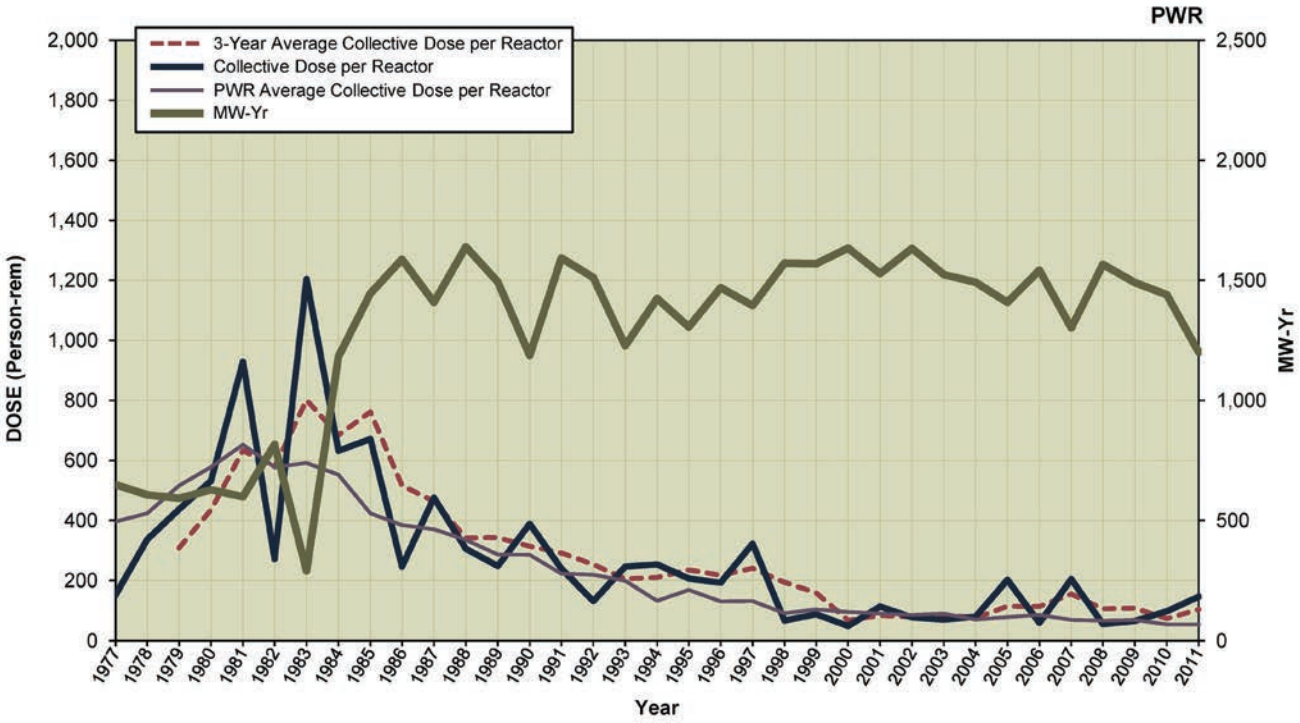
SEQUOYAH 1, 2
Dose Performance Trends



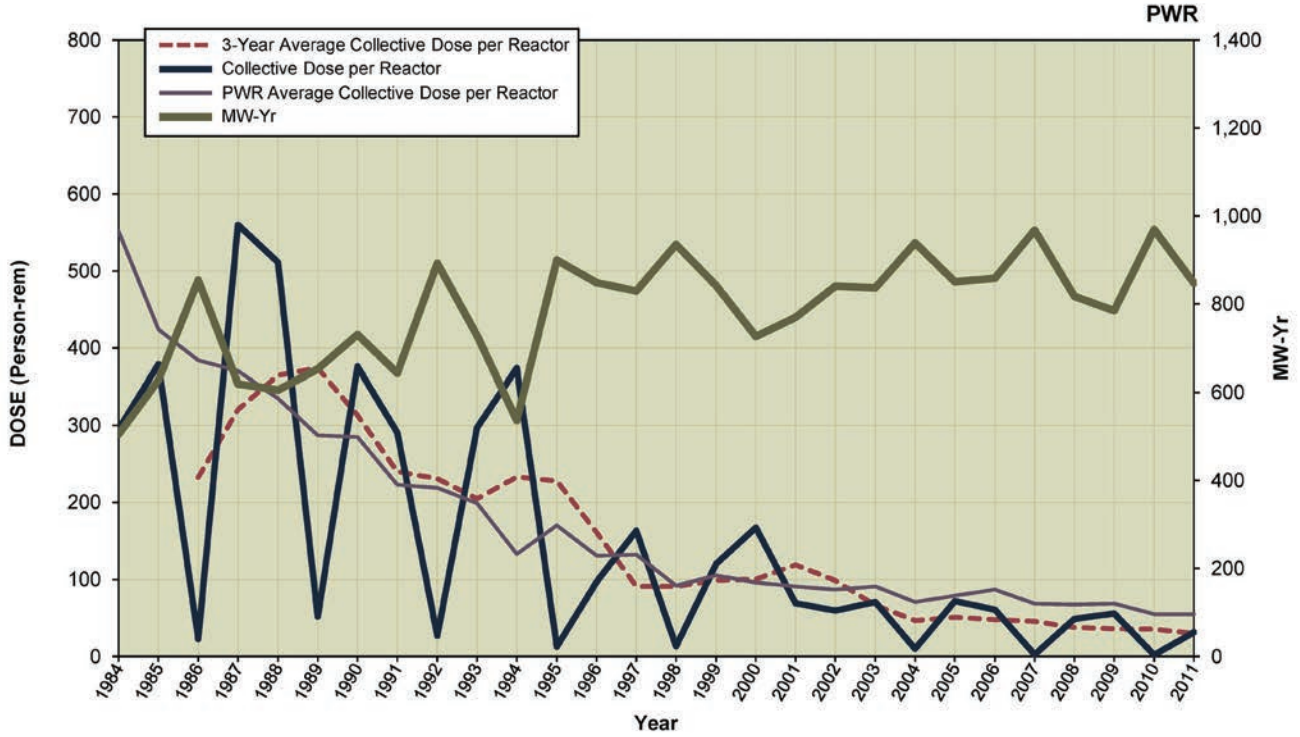
SOUTH TEXAS 1, 2
Dose Performance Trends



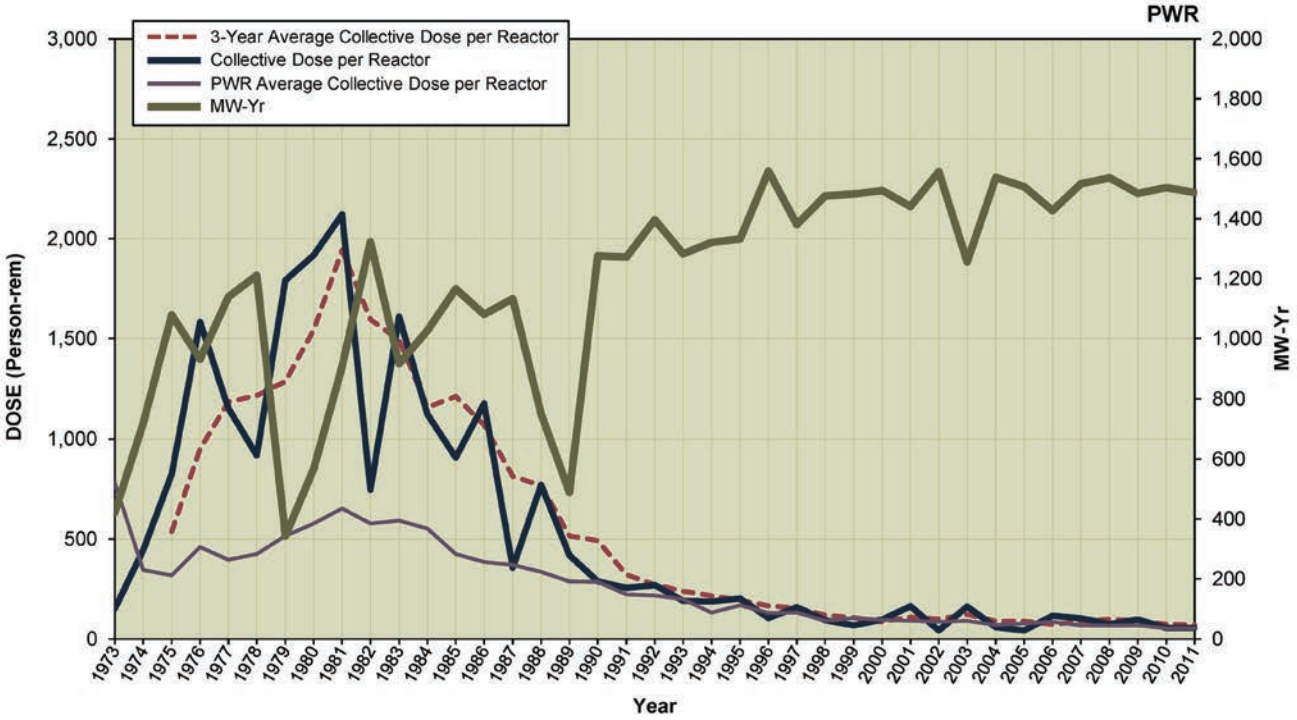
ST. LUCIE 1, 2
Dose Performance Trends



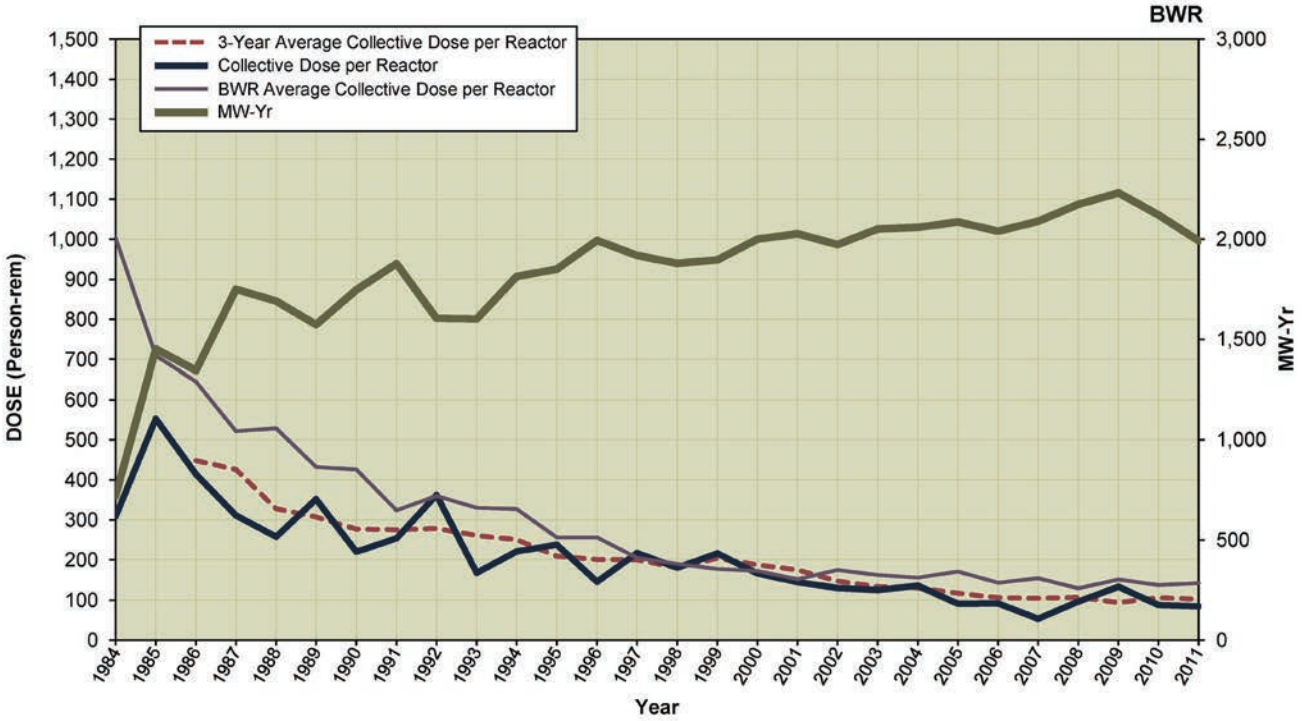
SUMMER
Dose Performance Trends



SURRY 1, 2
Dose Performance Trends

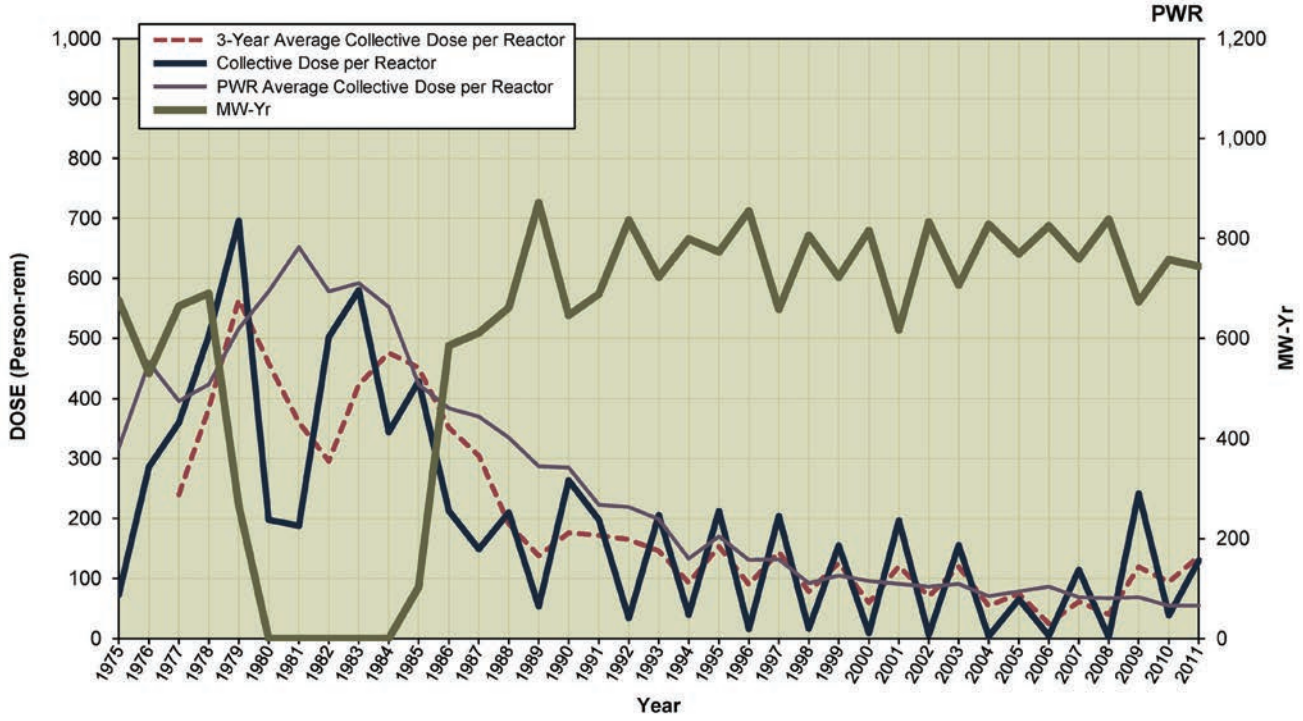


SUSQUEHANNA 1, 2
Dose Performance Trends



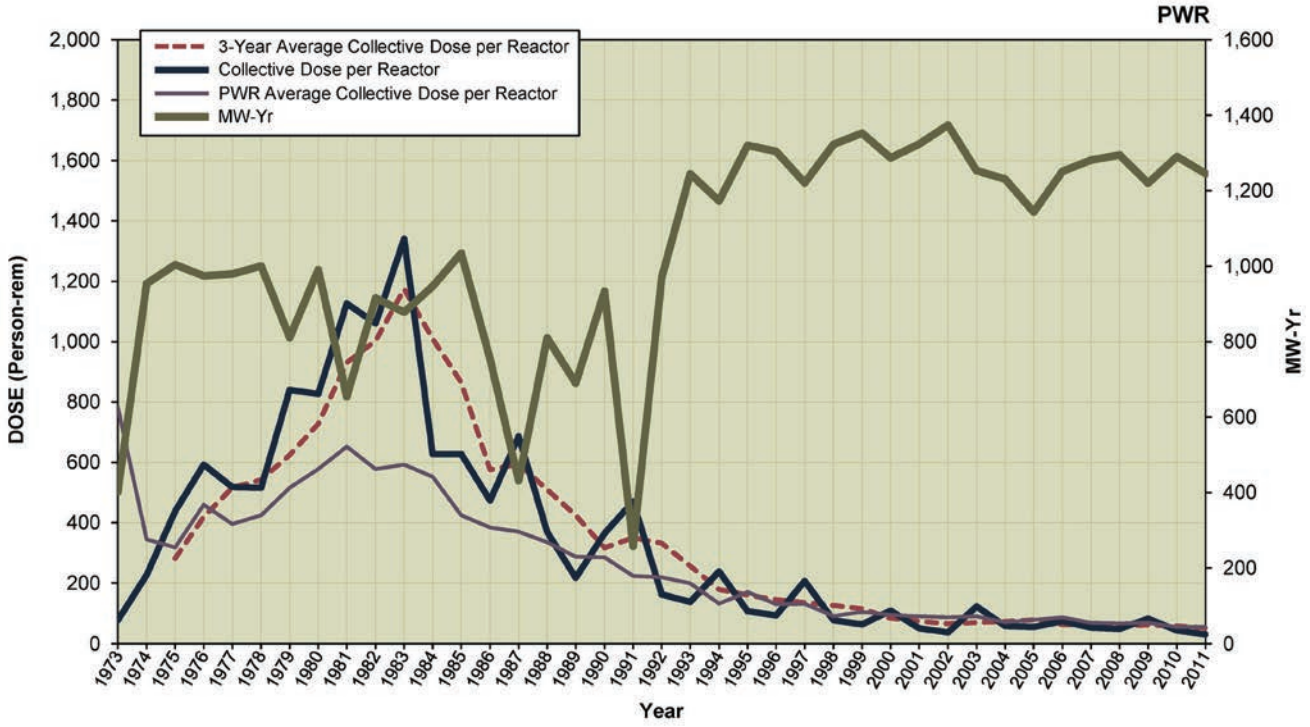
THREE MILE ISLAND 1*

Dose Performance Trends



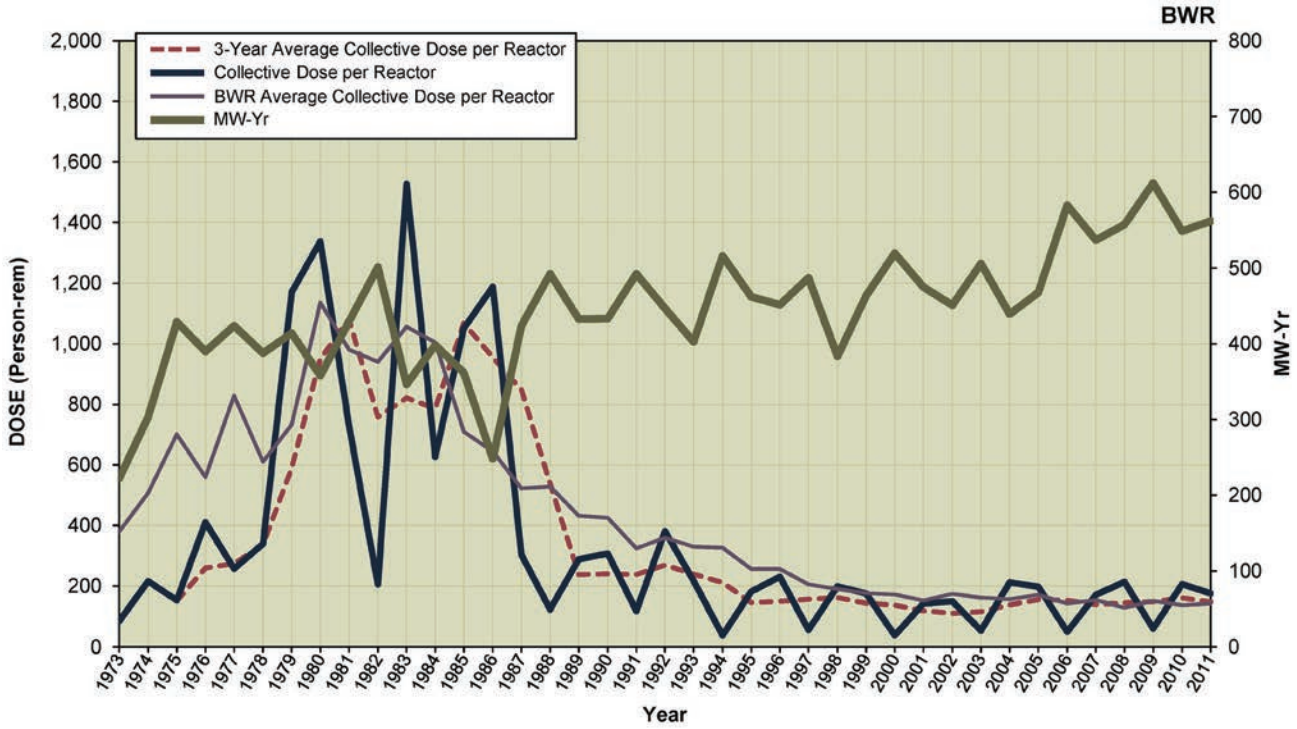
TURKEY POINT 3, 4

Dose Performance Trends

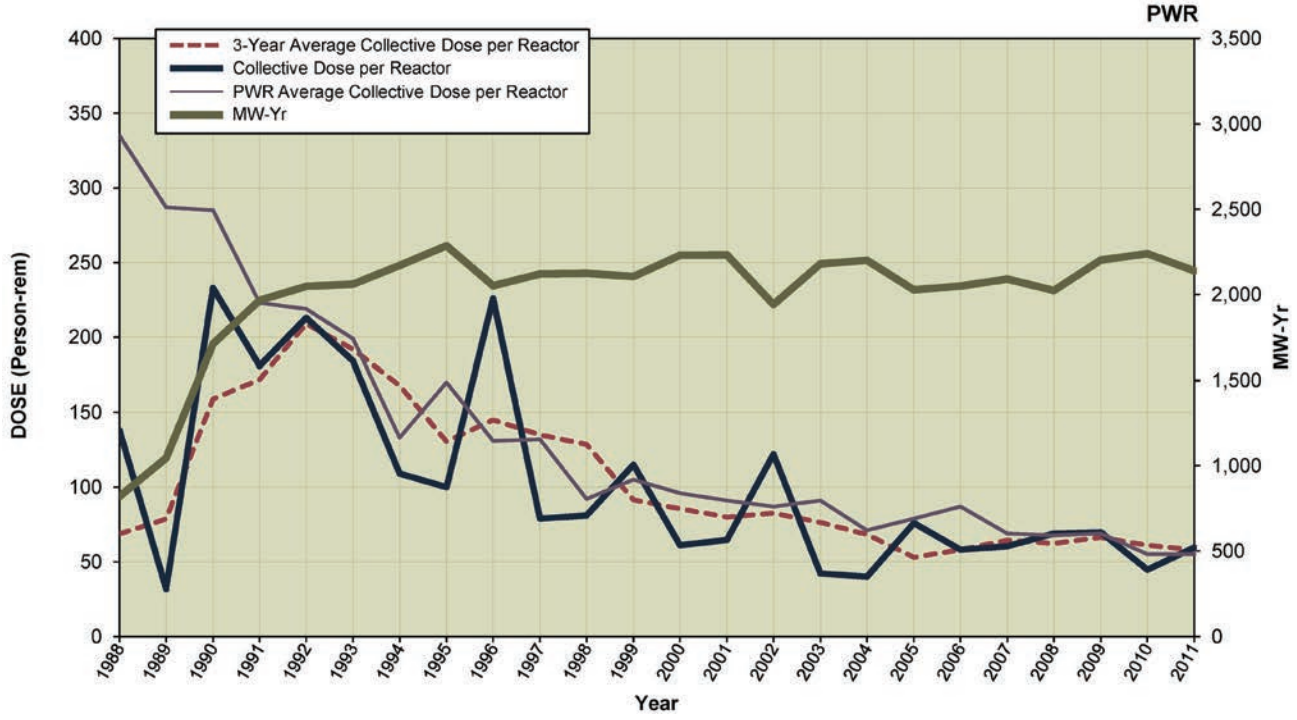


*Graph includes data for Three Mile Island 2 for the years 1975 – 1985.

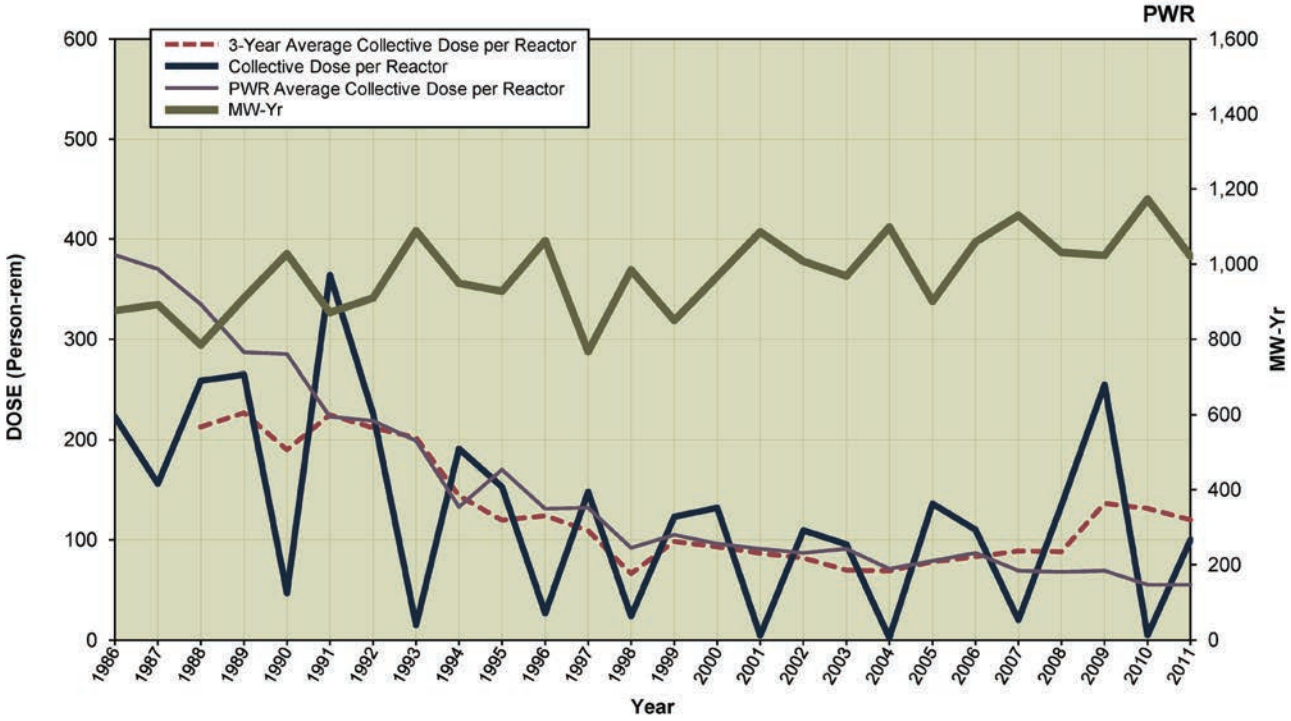
VERMONT YANKEE
Dose Performance Trends



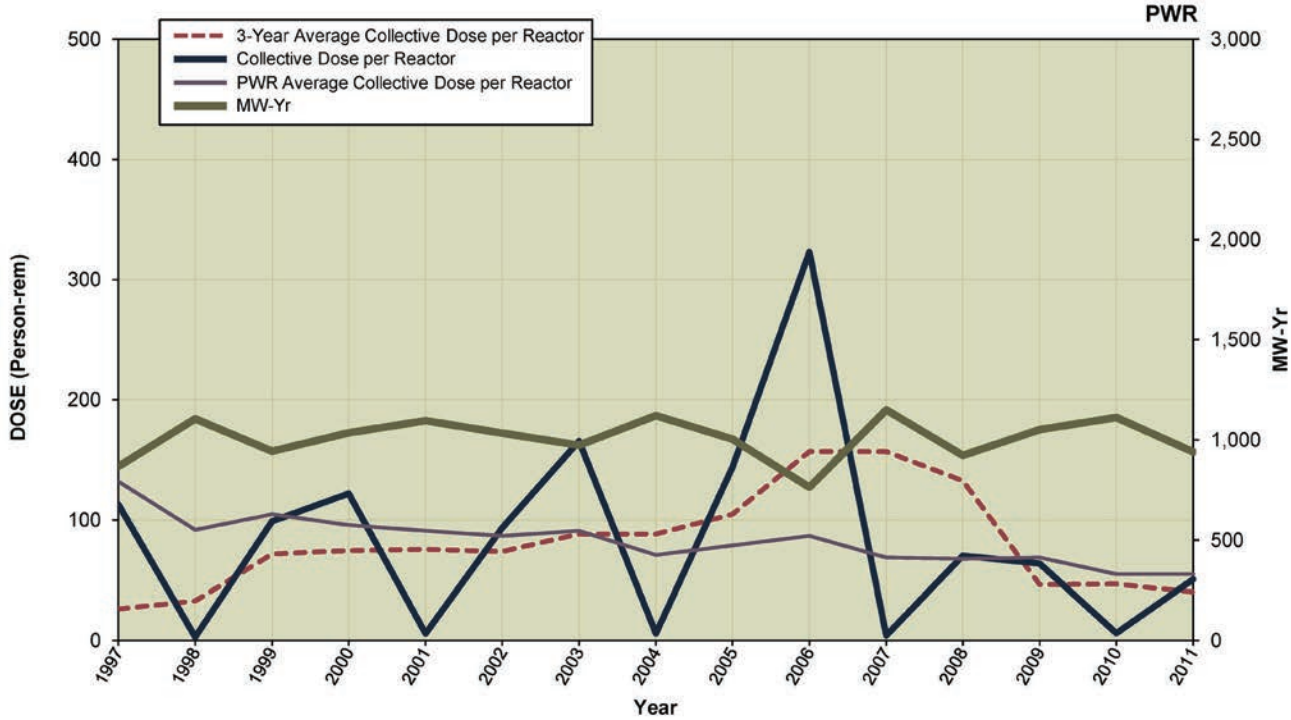
VOGTLE 1, 2
Dose Performance Trends



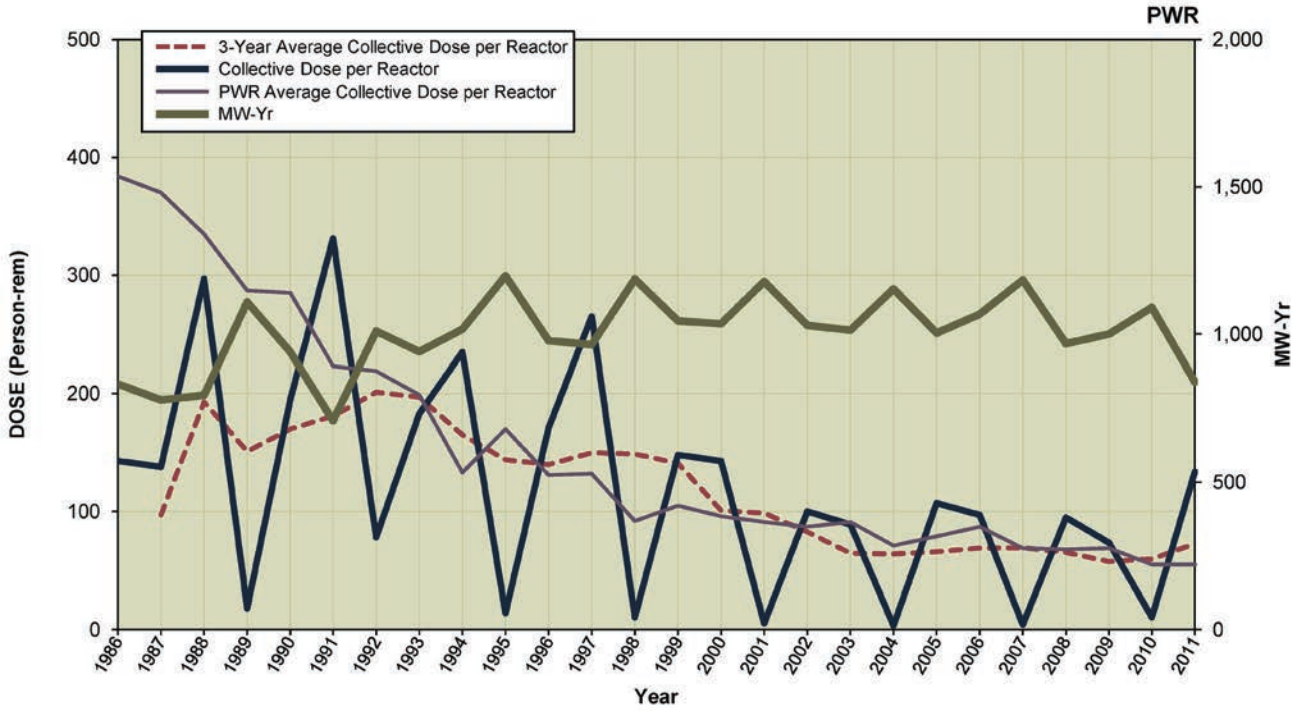
WATERFORD 3
Dose Performance Trends



WATTS BAR 1
Dose Performance Trends



WOLF CREEK 1
Dose Performance Trends



Appendix E*

PLANTS NO LONGER IN OPERATION

2011

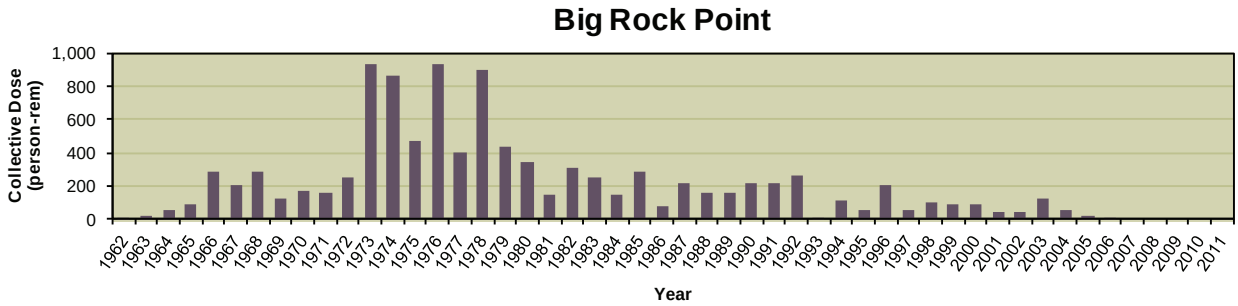
* Information in this Appendix was obtained from Reference 18

Big Rock Point

Big Rock Point (BRP) was a boiling water reactor rated at 75Mw electric, designed by General Electric Company and owned by Consumers Energy Company (CE). BRP permanently shut down on August 29, 1997 and fuel was transferred to the spent fuel pool by September 20, 1997. On March 26, 1998, CE submitted a revised PSDAR that showed conclusion of decommissioning about August 2005. Dry fuel storage will continue until the U.S. Department of Energy (DOE) will accept spent fuel.

All systems and structures not needed for the independent spent fuel storage installation (ISFSI), except the intake piping and sanitary drainfield, have been removed. All remedial work has been completed and final status surveys were completed in 2006.

All fuel was transferred to the ISFSI by March, 2003. After fuel is removed from the site to a DOE facility, the ISFSI will be decommissioned and the license terminated. The NRC license termination plan approval date is to be determined.



Dresden Unit 1

Dresden Unit 1 produced power commercially from August 1, 1960 to October 31, 1978. Unit 1 was taken off-line on October 31, 1978 to backfit it with equipment to meet new federal regulations and to perform a chemical decontamination of major piping systems. While the unit was out of service for retrofitting, additional regulations were issued as a result of the March 1979 incident at Three Mile Island. The estimated cost to bring Unit 1 into compliance with these regulations was more than $300 million. Commonwealth Edison, the owner of the facility, concluded that the age of the unit and its relatively small size did not warrant the added investment and submitted a Decommissioning Plan to the NRC. NRC approved the Decommissioning Plan in September 1993. Dresden Unit 1 is currently in SAFSTOR.

During the SAFSTOR period, through 2027, the Unit 1 facility will be subjected to periodic inspection and monitoring. These activities will include condition monitoring of the ISFSI, ongoing environmental surveys, and maintenance of equipment required to support the SAFSTOR condition of the facility. The licensee plans that decontamination and dismantlement of Unit 1, including removal of any remaining spent fuel that is stored in the Unit 3 spent fuel pool, will take place from 2029 through 2031. In 2031, a comprehensive radiological survey will be initiated to demonstrate readiness for demolition of the Unit 1 portions of the facility. A four-year site restoration delay will

follow the major decontamination and dismantlement of Unit 1 to allow for the decontamination and dismantlement of Units 2 and 3, with completion of these activities tentatively planned for 2035. Site restoration will be conducted in 2035 and 2036, concluding with a final site survey in late 2036. The licensee will monitor the ISFSI complex with site security and periodic inspections until final transfer of the spent fuel to DOE. The NRC license termination plan approval date is to be determined.

Fermi Unit 1

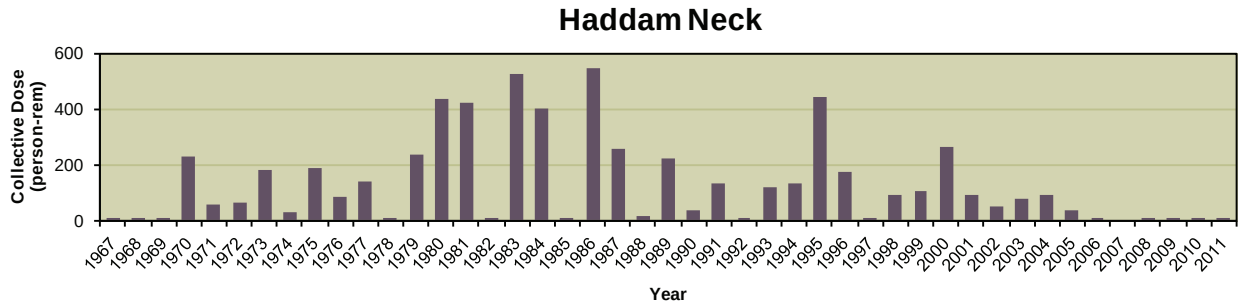
The Enrico Fermi Atomic Power Plant, Unit 1 (Fermi 1) was a fast breeder reactor power plant cooled by sodium and operated at essentially atmospheric pressure. The reactor plant was designed for a maximum capacity of 430 Megawatt (MWt); however, the maximum reactor power was 200 MWt. The primary system was filled with sodium in December of 1960 and criticality was achieved in August 1963. The reactor was tested at low power in its first couple years of operation. Power ascension testing above 1 MWt commenced in December 1965, immediately following receipt of the high power operating license. In October 1966, during a power ascension, a zirconium plate at the bottom of the reactor vessel became loose and blocked sodium coolant flow to some fuel subassemblies. Two subassemblies started to melt. Radiation monitors alarmed and the operators manually shut down the reactor. No abnormal releases to the environment occurred. Three years and nine months later, the cause had been determined, cleanup completed, fuel replaced, and Fermi 1 was restarted. In 1972, the core was approaching the burnup limit. In November 1972, the Power Reactor Development Company made the decision to decommission Fermi 1.

The fuel and blanket subassemblies were shipped offsite in 1973. The non-radioactive secondary sodium system was drained and the sodium sent to Fike Chemical Company. The radioactive primary sodium was stored in storage tanks and in 55 gallon drums until the sodium was shipped offsite in 1984. Decommissioning of the Fermi 1 plant was originally completed in December 1975. The license for Fermi 1 expires in 2025. The licensee submitted a revised LTP in March 2010, and NRC staff completed an expanded acceptance review of the revised LTP for Fermi Unit 1. The NRC license termination plan approval date is to be determined.

Haddam Neck – Connecticut Yankee

In 1996, Haddam Neck (a pressurized water reactor) ceased power operations. Steam generators, reactor coolant pumps, the pressurizer, the reactor vessel, and shield wall blocks from the Reactor Building have been disposed offsite and demolition of the administration and turbine building began in spring 2004. As of March 30, 2005, all spent fuel and greater than Class C waste have been transferred to the ISFSI which is currently operational.

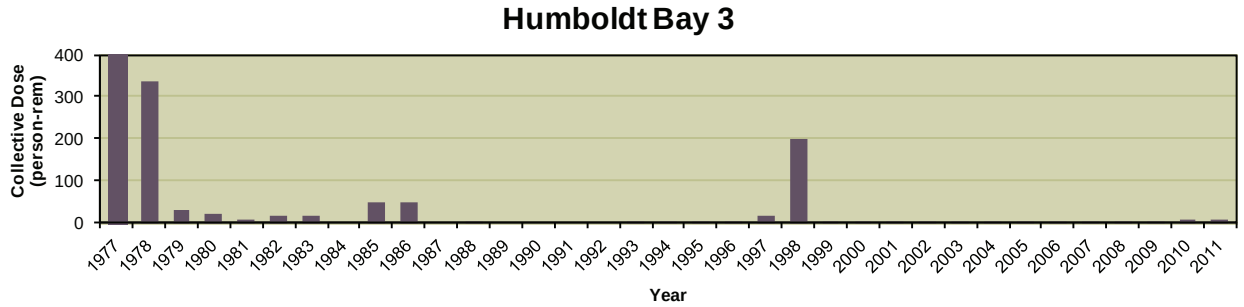
Decommissioning at Haddam Neck was completed in 2007 and the Part 50 license requirements are in effect at the Haddam Neck ISFSI. The NRC license termination plan approval date is to be determined.



Humboldt Bay Unit 3

Humboldt Bay Unit 3 produced power commercially from August 1, 1963 to July 1976. In July 1976, Unit 3 was shut down for seismic modifications. In 1983, with the plant still shutdown, Pacific Gas & Electric, the owner of the facility, determined that required seismic modifications and the requirements imposed as a result of the incident at Three Mile Island, made continued operations no longer economically feasible and decided to decommission the plant. The NRC approved the licensee's Decommissioning Plan in July 1988. Humboldt Bay Unit 3 has been in SAFSTOR since July 1976.

The licensee submitted a PSDAR in February 1998, and has begun incremental decommissioning activities. In December 2003, the licensee submitted an ISFSI application to the NRC. Humboldt Bay will have a unique ISFSI dry cask storage because of the short length of its fuel assemblies. Moreover, the casks will be stored below-grade to accommodate regional seismicity issues, security concerns, and site boundary dose limits. The NRC issued the ISFSI license on November 18, 2005, and the licensee began constructing the ISFSI in 2007. Following fuel loading into the ISFSI in 2008, the licensee began constructing two new units in 2008 and 2009 to replace Humboldt Bay Units 1 and 2. Decommissioning activities of the old Units 1 and 2 began in 2009 and 2010, respectively. During this period, only incremental decommissioning of Unit 3 has occurred. As decommissioning of Units 1 and 2 is completed, full decommissioning of Unit 3 will begin. It is estimated that all decommissioning activities will be completed in 2015. The NRC license termination plan approval date is to be determined.

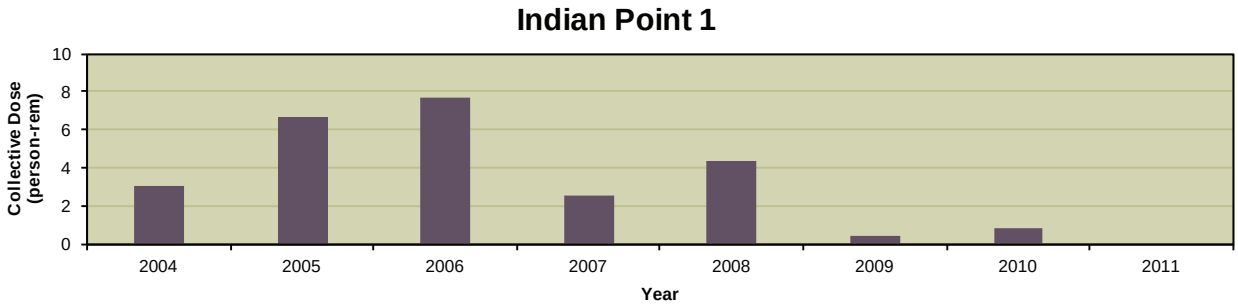


Indian Point Unit 1

Indian Point Unit 1 (IP-1) produced power commercially from August 1962 to October 31, 1974. IP-1 was shutdown on October 31, 1974 because the emergency core cooling system did not meet

regulatory requirements. Some decommissioning work associated with spent fuel storage was performed from 1974 through 1978. By January 1976, all spent fuel was removed from the reactor vessel. The NRC order approving SAFSTOR was issued in January 1996.

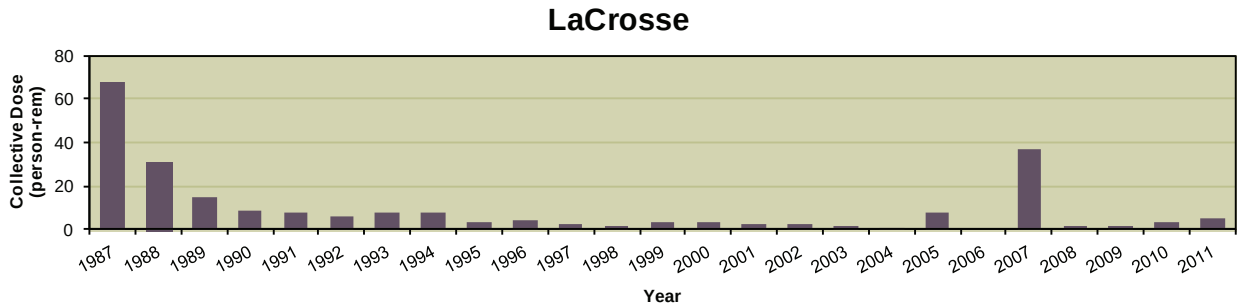
A PSDAR public meeting was held on January 20, 1999. The licensee plans to decommission IP-1 with Indian Point Unit 2 (IP-2), which is currently in operation. The licensee does not plan to begin active decontamination and decommissioning of IP-1 until the IP-2 license expires in September 2013. It is estimated that all decommissioning activities will be completed in 2026. The NRC license termination plan approval date is to be determined.



La Crosse

The La Crosse Boiling Water Reactor (LACBWR) produced power commercially from November 1, 1969 to April 30, 1987. The plant was one of a series of demonstration plants funded, in part, by the U.S Atomic Energy Commission (AEC). The nuclear steam supply system and its auxiliaries were funded by the AEC, and the balance of the plant was funded by the Dairyland Power Cooperative (DPC). The AEC later sold the plant to DPC and provided them with a provisional operating license. LACBWR was shut down on April 30, 1987 and the NRC approved its Decommissioning Plan on August 7, 1991. LACBWR's Decommissioning Plan is also its PSDAR. LACBWR is currently in SAFSTOR.

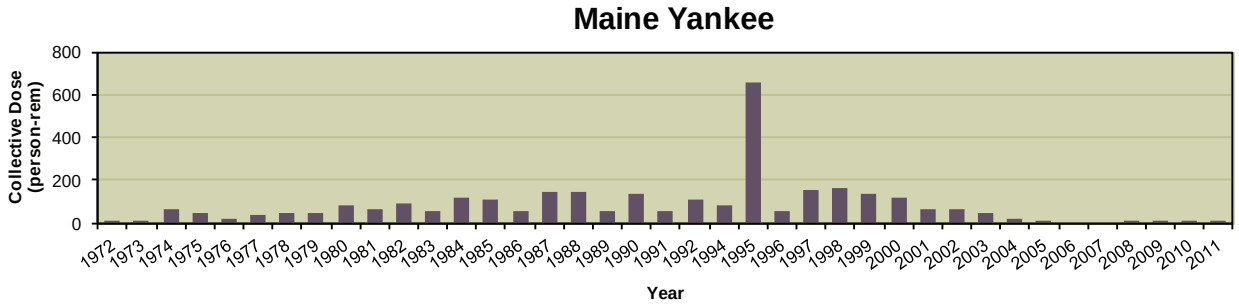
NRC held a public meeting on LACBWR's PSDAR on May 13, 1998. DPC has been conducting dismantlement and decommissioning activities, and in 2011 testing began on spent fuel transfer equipment. Dry-runs were conducted for the transfer of spent fuel from the spent fuel pool to the Interim Spent Fuel Storage Installation. It is estimated that all decommissioning activities will be completed in 2026. The NRC license termination plan approval date is to be determined.



Maine Yankee

Maine Yankee was a 900 Mw pressurized water reactor located on Bailey Point in Wiscasset that started commercial power operations in 1972. The Maine Yankee plant was shut down on December 6, 1996. Certification of permanent cessation of operations was submitted on August 7, 1997. The PSDAR was submitted on August 27, 1997 and the License Termination Plan (LTP) was approved on February 28, 2003.

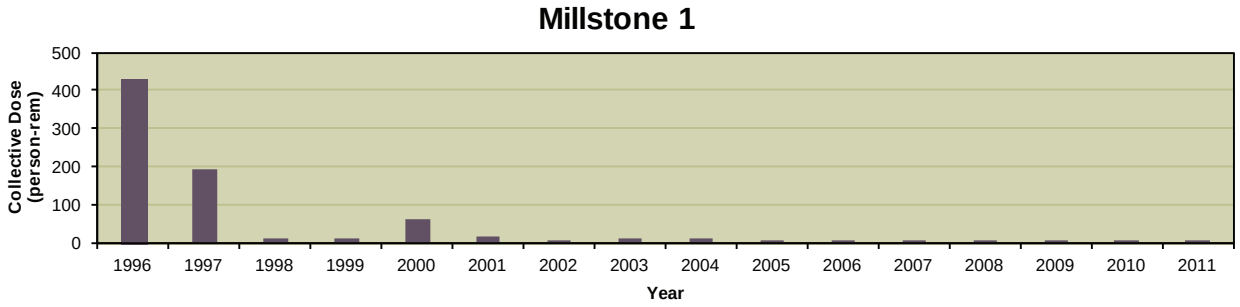
In 2003, the reactor pressure vessel was shipped to Barnwell, South Carolina via barge. Spent nuclear fuel and greater than Class C Waste was transferred to the onsite ISFSI between August 2002 and February 2004. Decommissioning was completed in June 2005 and Maine Yankee will retain its Part 50 license until the fuel is removed from the ISFSI. The NRC license termination plan approval date is to be determined.



Millstone Unit 1

Millstone Unit 1 produced power commercially from December 28, 1970 to November 4, 1995. Millstone Unit 1 was a single-cycle, boiling water reactor with a reactor thermal output of 2011 megawatts and a net electrical output of 652.1 megawatts. The unit was shut down on November 4, 1995. On July 21, 1998, pursuant to 10 CFR 50.82(a)(1)(i) and 10 CFR 50.82(a)(1)(ii), the licensee certified to the NRC that, as of July 17, 1998, Millstone Unit 1 had permanently ceased operations and that fuel had been permanently removed from the reactor vessel. Dominion Nuclear Connecticut, the owner of the facility, submitted its PSDAR to the NRC on June 14, 1999. Millstone Unit 1 is currently in SAFSTOR. The NRC license termination plan approval date is to be determined.

Safety related structures, systems, and components (SSCs) and SSCs important to safety remaining at Millstone Unit 1 are associated with the spent fuel pool island where the spent fuel is stored. Other than non-essential systems supporting the balance of plant facilities, the remaining plant equipment has been de-energized, disabled or removed from the unit and can no longer be used for power generation. Irradiated reactor vessel components have been removed. The reactor cavity and vessel has been drained and a radiation shield has been installed to limit occupational radiation doses to workers. Currently, the licensee has not provided an estimated date for completion of all decommissioning activities and the estimated closure date of this site has not been determined.



Peach Bottom Unit 1

Peach Bottom Atomic Power Station, Unit 1 was a 200 MWt, high temperature, gas cooled reactor that was operated from June of 1967 to its final shutdown on October 31, 1974. All spent fuel has been removed from the site, and the spent fuel pool is drained and decontaminated. The reactor vessel, primary system piping, and steam generators remain in place.

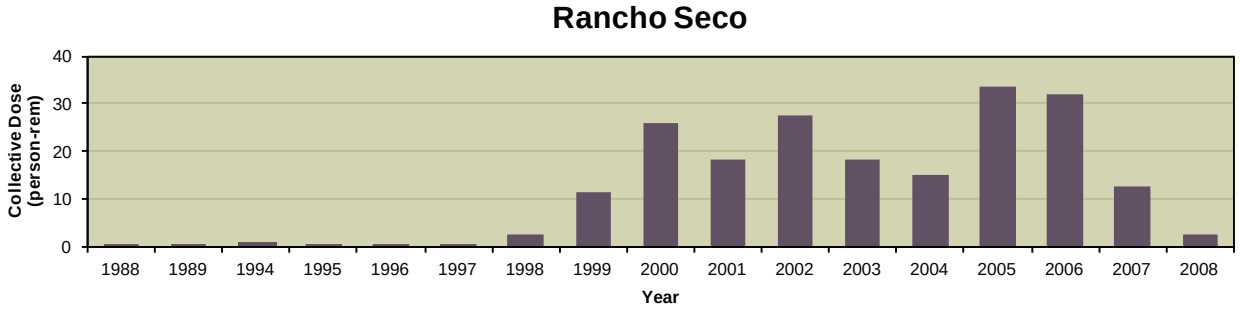
The facility is currently in a SAFSTOR condition. The post-shutdown decommissioning activities report meeting was held on June 29, 1998. Final decommissioning is not expected until 2034 when Units 2 and 3 are scheduled to shut down. The NRC license termination plan approval date is to be determined.

Rancho Seco

Rancho Seco Nuclear Generating Station was a 913 Mw pressurized water reactor owned by the Sacramento Municipal Utility District (SMUD). Rancho Seco permanently shut down in June 1989, after approximately 15 years of operation.

SMUD completed transfer of all the spent nuclear fuel to the Rancho Seco ISFSI in August 2002.

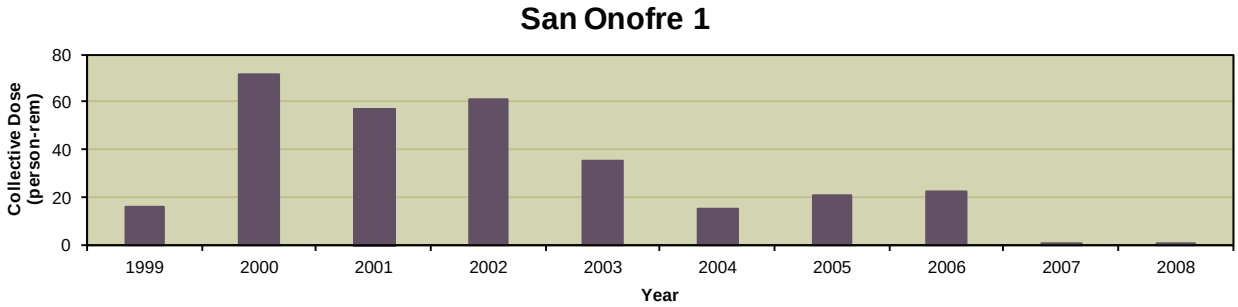
Rancho Seco completed decommissioning in 2009 and the site was released as greenfields, with the exception of a 6-acre ISFSI site. The NRC license termination plan approval date is to be determined.



San Onofre Unit 1

The San Onofre Nuclear Generating Station Unit 1 (SONGS-1), operated by Southern California Edison (SCE), produced power commercially from January 1, 1968 to November 30, 1992. Unit 1 was a Westinghouse 3-loop PWR with a reactor thermal output of 1347 megawatts. SONGS-1 subsequently ceased operation and was shutdown on November 30, 1992.

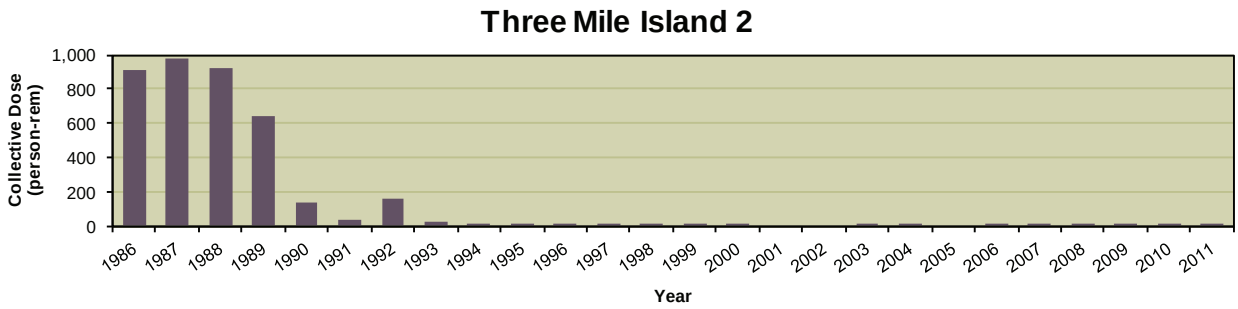
Defueling of SONGS-1 completed on March 6, 1993, and the NRC approved the Permanently Defueled Technical Specifications report on December 28, 1993. Then, on November 3, 1994, SCE submitted a Proposed Decommissioning Plan to place SONGS-1 in SAFSTOR until the shutdown of SONGS- 2 and SONGS- 3. However, on December 15, 1998, SCE submitted the PSDAR for SONGS-1, to commence decontamination in 2000. Since that time, SCE has been actively decommissioning the facility, which has since been almost entirely dismantled. Most of the structures and equipment have been removed and disposed. The SONGS-1 turbine building was removed and the licensee completed internal segmentation and cutup of the reactor pressure vessel. The licensee plans to store the vessel onsite for the foreseeable future, as long as licensed activities are ongoing. In addition, the licensee transferred SONGS-1 spent fuel to an onsite generally licensed ISFSI. The ISFSI will be expanded into the area previously occupied by SONGS- 1, as needed, in order to store all spent fuel from SONGS-2 and SONGS-3. SONGS-2 and SONGS-3 are expected to continue operating until 2022. In February 2010, NRC staff issued a license amendment to release off-shore portions of the San Onofre Unit 1 cooling intake and outlet pipes for unrestricted use. It is estimated that all decommissioning activities for SONGS-1 will be completed in 2030. The NRC license termination plan approval date is to be determined.



Three Mile Island Unit 2

Three Mile Island Unit 2 (TMI-2) produced power commercially from December 30, 1978 to March 28, 1979. On March 28, 1979, the unit experienced an accident which resulted in severe damage to the reactor core. TMI-2 has been in a non-operating status since that time. The licensee conducted a substantial program to defuel the reactor vessel and decontaminate the facility. The plant defueling was completed in April 1990. All spent fuel has been removed except for some debris in the reactor coolant system. The removed fuel is currently in storage at Idaho National Laboratory, and the U.S. Department of Energy has taken title and possession of the fuel.

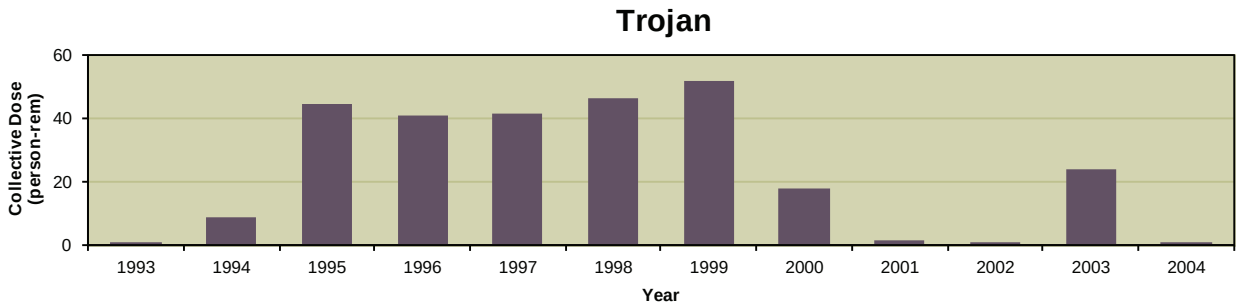
TMI-2 has been defueled and decontaminated to the extent the plant is in a safe, inherently stable condition suitable for long-term management. This long-term management condition is termed post-defueling monitored storage, which was approved in 1993. TMI-2 shares equipment with the operating TMI – Unit 1 (TMI-1). The licensee plans to actively decommission TMI-2 in parallel with the decommissioning of TMI-1. It is estimated that decommissioning activities for TMI-2 will be completed in 2036. The NRC license termination plan approval date is to be determined.



Trojan

The Trojan plant was shut down in November 1992 and the steam generators and reactor vessel were shipped to the Hanford site. The licensee was granted a site-specific Part 72 license for an onsite ISFSI in March 1999 that is still in operation. The licensee began spent fuel transfer to the ISFSI in December 2002 and finished fuel transfer in August 2003.

In December 2004, the Trojan Nuclear Plant completed decommissioning activities. The NRC terminated Trojan's 10 CFR Part 50 operating license on May 23, 2005.

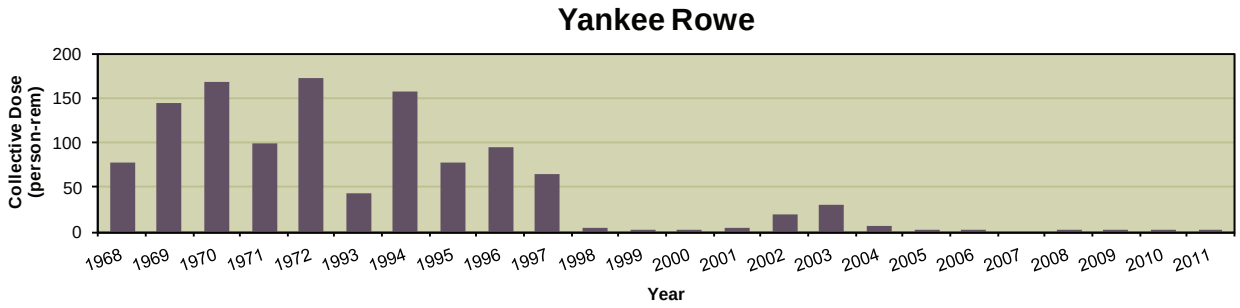


Yankee Rowe

The plant was permanently shut down on October 1, 1991 and the steam generators were shipped to the Barnwell Low-Level Waste facility, in North Carolina, in November 1993. The reactor vessel was shipped to Barnwell in April 1997.

The owner completed construction of an onsite ISFSI and all the fuel from the spent fuel pool was transferred to the onsite ISFSI.

Yankee Rowe completed decommissioning in 2007. The license for the site was reduced to the two acres surrounding the ISFSI which is still in operation. The NRC license termination plan approval date is to be determined.

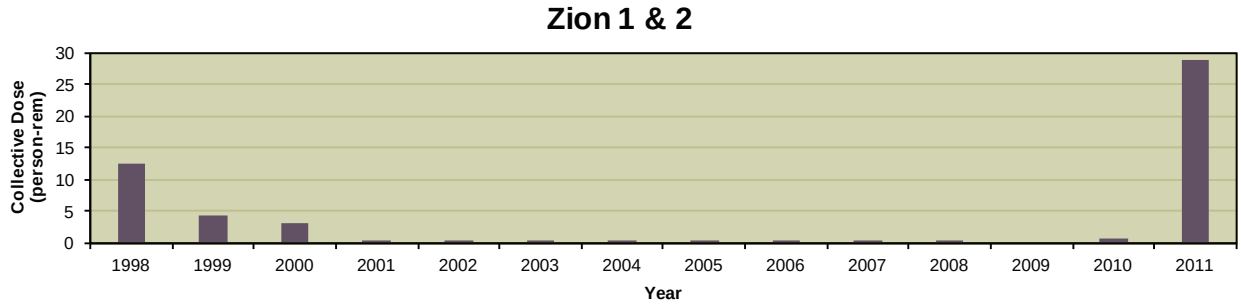


Zion Units 1 and 2

Zion Nuclear Power Station (ZNPS) received a construction permit in December 1968 to begin building two nuclear power reactors. Unit 1 produced power commercially from December 31, 1973 to February 21, 1997 and Unit 2 produced power commercially from September 17, 1974 to September 19, 1996. On April 27, 1997, all fuel from Unit 1 was removed and on February 25, 1998, all fuel from Unit 2 was removed and placed in the spent fuel pool. On January 14, 1998, the Unicom Corporation and ComEd Boards of Directors, the joint owners of the facility, authorized the permanent cessation of operations at ZNPS for economic reasons. ComEd certified, in a letter dated February 13, 1998, to the NRC that operations had ceased at ZNPS. On March 9, 1998, ComEd informed the NRC that all fuel had been removed from the ZNPS reactor vessels and committed to maintain them permanently defueled.

The NRC acknowledged the certification of permanent cessation of power operation and permanent removal of fuel from the reactor vessels in a letter dated May 4, 1998. ZNPS has been placed in SAFSTOR, where it will remain until about 2013. The owner submitted the PSDAR, site-specific cost estimate, and fuel management plan on February 14, 2000. The SAFSTOR approach is the intended decommissioning method to be utilized for ZNPS which involves removal of all radioactive material from the site following a period of dormancy. In 2010, NRC staff finalized the transfer of the possession license for Zion Units 1 and 2 from Exelon Generating Company, LLC to Zion Solutions, LLC to facilitate decommissioning. At Zion Units 1 and 2, decommissioning planning activities for the removal of large components were performed during 2011. In addition, containment accesses were constructed to allow for equipment removal.

Preparations for decontamination and dismantlement are scheduled to commence at the original license expiration date for ZNPS Unit 2 on November 14, 2013. It is estimated that all decommissioning activities will be completed at ZNPS in 2020. The NRC license termination plan approval date is to be determined.



Appendix F

GLOSSARY

2011

Agreement State: as defined in 10 CFR 30.4, 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 certain byproduct, source, and small quantities of special nuclear material in that state.

As low as is 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.

Breeder: a reactor that produces more nuclear fuel than it consumes. A fertile material, such as uranium-238, when bombarded by neutrons, is transformed into a fissile material, such as plutonium-239, which can be used as fuel. [Ref. 19]

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.

Criticality: the normal operating condition of a reactor, in which nuclear fuel sustains a fission chain reaction. A reactor achieves criticality (and is said to be critical) when each fission event releases a sufficient number of neutrons to sustain an ongoing series of reactions. [Ref. 19]

DECON (immediate dismantlement): soon after the nuclear facility closes, equipment, structures, and portions of the facility containing radioactive contaminants are removed or decontaminated to a level that permits release of the property and termination of the NRC license.

ENTOMB: radioactive contaminants that are permanently encased onsite in a structurally sound material such as concrete and appropriately maintained and monitored until the radioactivity decays to a level permitting restricted release of the property.

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. A radioisotope is an unstable isotope that undergoes spontaneous transformation, emitting radiation. [Ref. 20]

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).

SAFSTOR (often considered 'delayed DECON'): a nuclear facility that is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, it is dismantled.

Shallow-dose equivalent for both maximum extremity (SDE-ME) and whole body (SDE-WB): the external exposure of an extremity, 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.