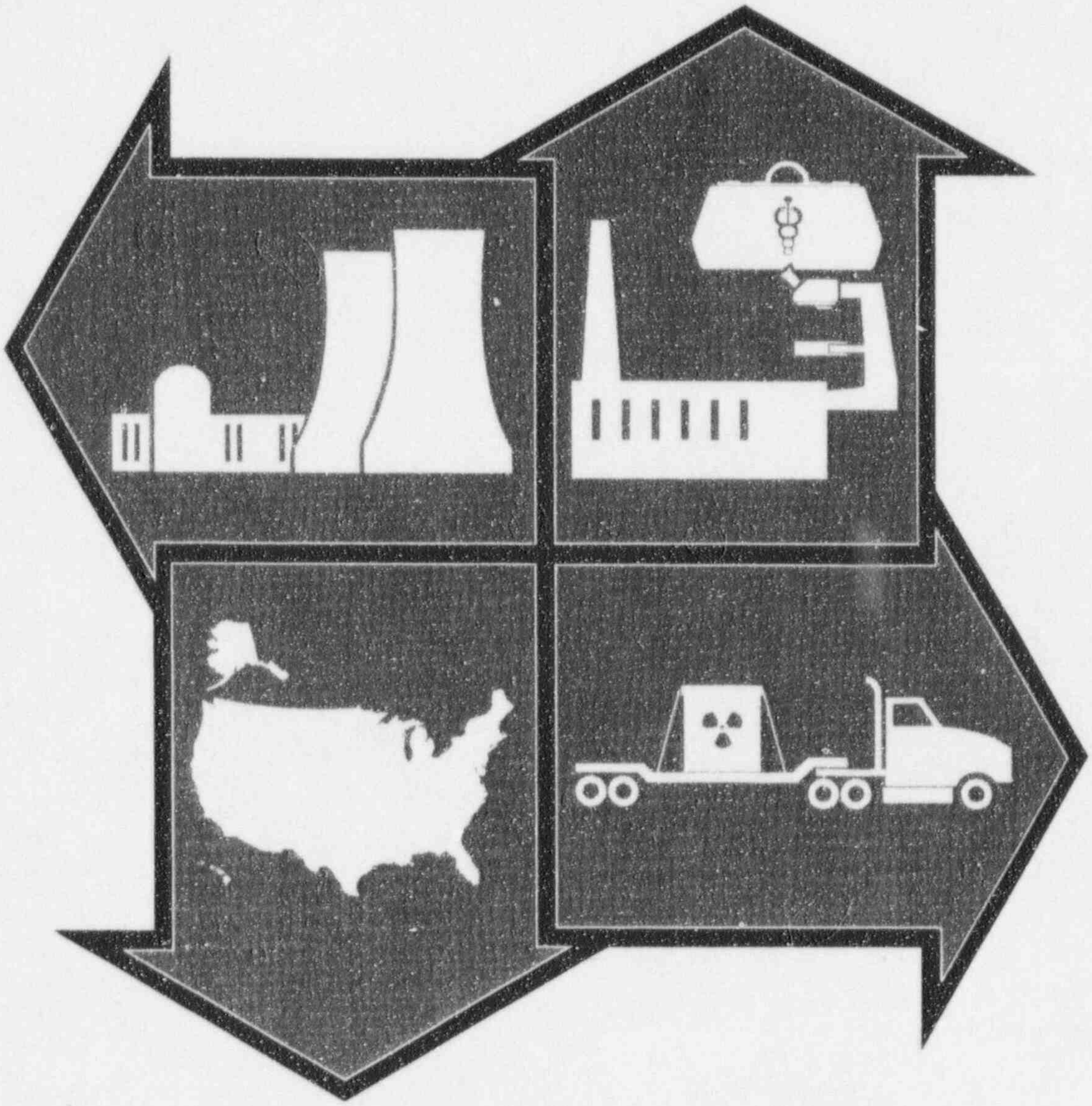
UNITED STATES NUCLEAR REGULATORY COMMISSION

INFORMATION DIGEST



Office of the Chief Financial Officer

1997 Edition

NUREG-1350, Volume 9

DF02 0/1

Availability Notice

Availability of Reference Materials Cited in NRC Publications

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

1. The NRC Public Document Room, 2120 L Street, NW., Lower Level, Washington, DC 20037

2. The Superintendent of Documents, U.S. Government Printing Office, P. O. Box 37082, Washington, DC 20402-9328

3. The National Technical Information Service, Springfield, VA 22161-0002

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

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

The following documents in the NUREG-series are available for purchase from the Government Printing Office: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, international agreement reports, grantee reports, and NRC booklets and brochures. Also available are regulatory guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

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

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

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

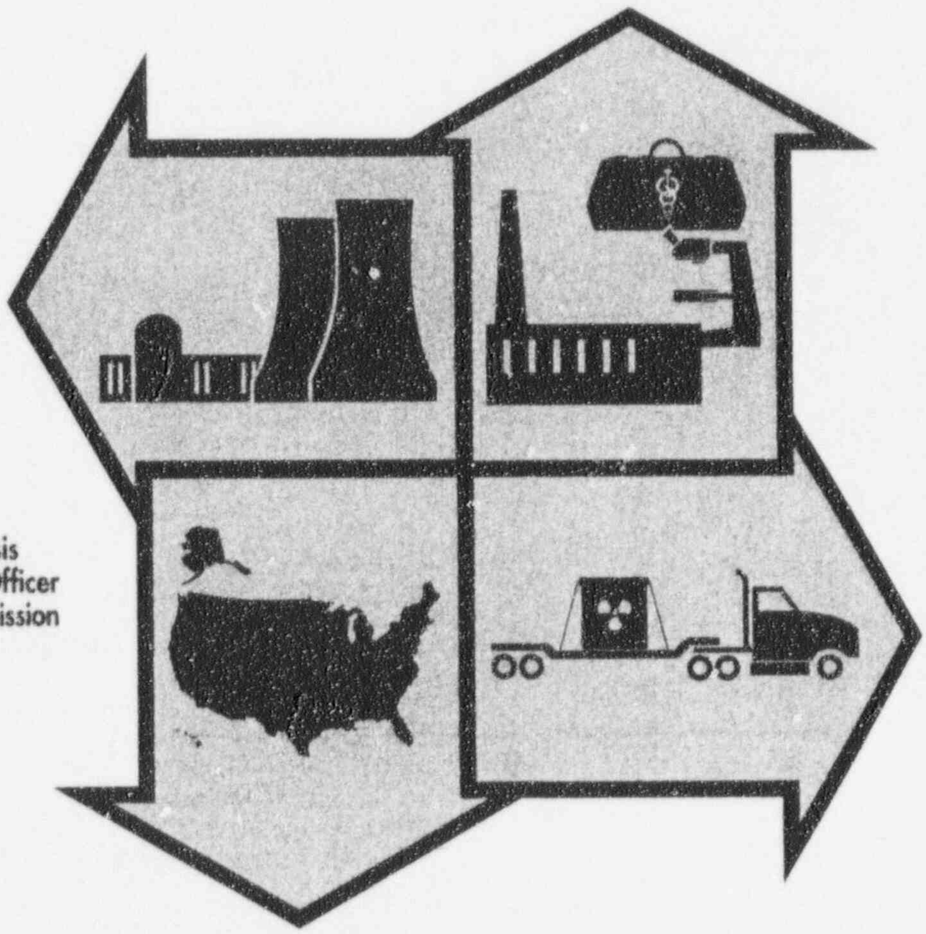
Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Office of Information Resources Management, Printing, Graphics and Distribution Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, Two White Flint North, 11545 Rockville Pike, Rockville, MD 20852-2738, for use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018-3308.

UNITED STATES NUCLEAR REGULATORY COMMISSION

INFORMATION DIGEST

1997 Edition



NUREG-1350
Volume 9

Manuscript Completed:
April 1997

Date Published
May 1997

Division of Budget and Analysis
Office of the Chief Financial Officer
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

For sale by the U.S. Government Printing Office
Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328
ISBN 0-16-049108-8

Abstract

The Nuclear Regulatory Commission Information Digest (digest) provides a summary of information about the U.S. Nuclear Regulatory Commission (NRC), NRC's regulatory responsibilities, NRC licensed activities, and general information on domestic and worldwide nuclear energy. The digest, published annually, is a compilation of nuclear- and NRC-related data and is designed to provide a quick reference to major facts about the agency and the industry it regulates. In general, the data cover 1975 through 1996, with exceptions noted. Information on generating capacity and average capacity factor for operating U.S. commercial nuclear power reactors is obtained from monthly operating reports that are submitted directly to the NRC by the licensee. This information is reviewed by the NRC for consistency only and no independent validation and/or verification is performed.

Comments and/or suggestions on the data presented are welcomed and should be directed to Melanie Garver, United States Nuclear Regulatory Commission, Office of the Chief Financial Officer, Division of Budget and Analysis, Washington, DC 20555-0001. For detailed and complete information about tables and figures, refer to the source publications.

Contents

(Continued)

Figures

(Continued)

Figures *(Continued)*

Figures *(Continued)*

Tables

(Continued)

Tables *(Continued)*

For More Information...

The U.S. Nuclear Regulatory Commission (NRC) offers a variety of programs to make agency, licensee, and nuclear industry information available to the public. The agency maintains a Public Document Room (PDR) in Washington, D.C. that provides for the public a comprehensive collection of over 2 million publicly released documents related to NRC licensing proceedings, rulemaking activities, and the setting of policy for nuclear regulation in the United States. The PDR supports access to these documents by the public anywhere in this country or overseas via various electronic systems, including an online search and retrieval capability and a bulletin board for selected meeting announcements, documents, etc. For further information, telephone (202) 634-3273 or toll free (800) 397-4209; Internet e-mail to pdr@nrc.gov; telefax to (202) 634-3343; or write to the PDR, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

The NRC has also established Local Public Document Rooms (LPDRs) near the site of each commercial nuclear power reactor, the proposed high-level waste repository, and certain fuel cycle facilities. The LPDR collections consist of publicly available documents about the facility, including hearing transcripts, safety evaluation reports, environmental impact statements, and inspection and licensee event reports. The power reactor and high-level waste LPDRs also maintain a microfiche file of most documents made publicly available by the NRC since 1981, in addition to those about the nearby nuclear facility.

The agency makes the majority of its regulatory and technical publications available for sale at both the Government Printing Office and the National Technical Information Service. Copies of agency publications are also routinely sent to U.S. Depository Libraries throughout the United States and the Commonwealth of Puerto Rico.

The NRC announces the schedules of selected meetings open to the public. Recorded information about open meetings of the following organizations is available at the agency headquarter's numbers listed below.

Advisory Committee on Nuclear Waste
(301) 415-5024

Advisory Committee on Reactor Safeguards
(301) 415-5024

The Commission
(301) 415-1292

NRC/Department of Energy Meetings
(800) 841-0286

Information on NRC staff meetings open to public observation, including those of the Offices of Nuclear Material Safety and Safeguards, Nuclear Reactor Regulation, and Nuclear Regulatory Research, and the regional offices, is announced on a toll-free telephone recording at (800) 952-9674 and on a toll-free electronic bulletin board at (800) 952-9676 or (800) 303-9672 (access through GATEWAY).

Open Predecisional Enforcement Conferences are also announced on the toll-free telephone recording and electronic bulletin board as are public Commission and

(Continued)

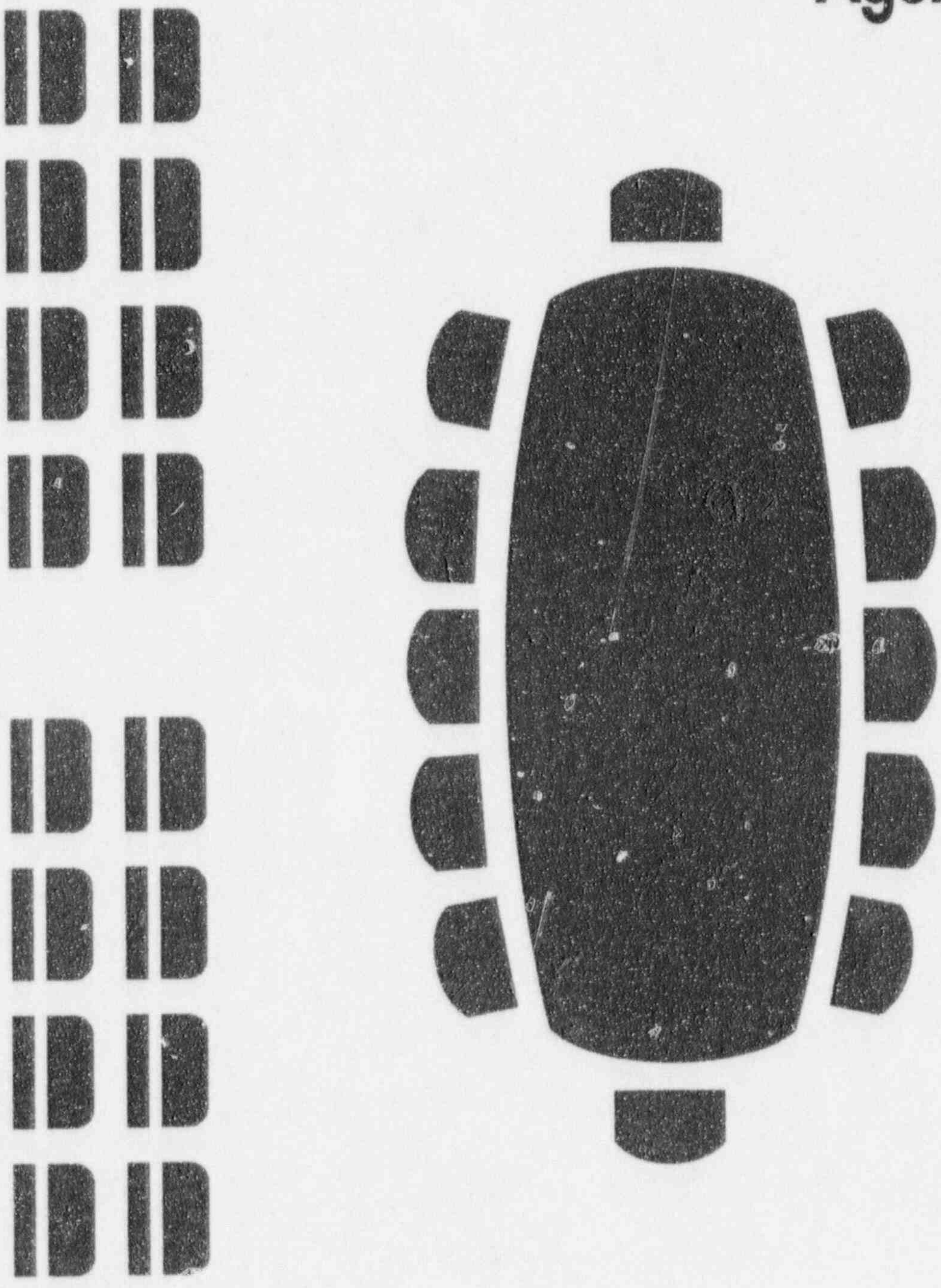
For More Information *(Continued)*

Advisory Committee meetings and Atomic Safety and Licensing Board hearings that are published in the *Federal Register*. A daily posting of upcoming open meetings is also available on the NRC World Wide Web at www.nrc.gov/nrc/public/meet.html.

The NRC is required to answer inquires from small entities concerning information on, advice about, and compliance with the statutes and regulations that affect them. The NRC is expected to interpret and apply the law, or regulations implementing the law, to specific sets of facts that are specified by the small entity. The NRC is required to establish a program to receive and respond to these types of inquiries. To help small entities obtain information quickly, the NRC has established a toll-free telephone number at (800) 368-5642.

To learn more about these and other sources of public information about agency activities, send for a free copy of the booklet, "Citizen's Guide to U.S. Nuclear Regulatory Commission Information" (NUREG/BR-0010, Rev. 2), at the following address: U.S. Nuclear Regulatory Commission, ATTN: Printing, Graphics and Distribution Branch, Washington, DC 20555-0001.

NRC as a Regulatory Agency



Mission and Statutory Authority

The mission of the U.S. Nuclear Regulatory Commission (NRC) is to regulate the Nation's civilian use of byproduct, source, and special nuclear materials to ensure adequate protection of public health and safety, to promote the common defense and security, and to protect the environment. The NRC's scope of responsibility includes regulation of commercial nuclear power plants; research, test, and training reactors; fuel cycle facilities; medical, academic, and industrial uses of nuclear materials; and the transport, storage, and disposal of nuclear materials and wastes.

The NRC was created as an independent agency by the Energy Reorganization Act of 1974, which abolished the Atomic Energy Commission (AEC) and moved the AEC's regulatory function to the NRC. This act, along with the Atomic Energy Act of 1954, as amended, provides the foundation for regulation of the Nation's commercial nuclear power industry.

NRC regulations are issued under the *United States Code of Federal Regulations* (CFR) Title 10, Chapter 1. Principal statutory authorities that govern NRC's work are:

- Atomic Energy Act of 1954, as amended
- Energy Reorganization Act of 1974, as amended
- Uranium Mill Tailings Radiation Control Act of 1978, as amended
- Nuclear Non-Proliferation Act of 1978
- Low-Level Radioactive Waste Policy Act of 1980
- West Valley Demonstration Project Act of 1980
- Nuclear Waste Policy Act of 1982
- Low-Level Radioactive Waste Policy Amendments Act of 1985
- Diplomatic Security and Anti-Terrorism Act of 1986
- Nuclear Waste Policy Amendments Act of 1987
- Solar, Wind, Waste and Geothermal Power Production Incentives Act of 1990
- Energy Policy Act of 1992

The NRC and its licensees share a common responsibility to protect public health and safety. Federal regulations and the NRC regulatory program are important elements in the protection of the public. NRC licensees, however, have the primary responsibility for the safe use of nuclear materials.

Principles of Good Regulation

The NRC adheres to the following Principles of Good Regulation:

- **Independence** - Nothing but the highest possible standards of ethical performance and professionalism should influence regulation. However, independence does not imply isolation. All available facts and opinions must be sought openly from licensees and other interested members of the public. The many and possibly conflicting public interests involved must be considered. Final decisions must be based on objective, unbiased assessments of all information, and must be documented with reasons explicitly stated.

- **Openness** - Nuclear regulation is the public's business, and it must be transacted publicly and candidly. The public must be informed about and have the opportunity to participate in the regulatory processes as required by law. Open channels of communication must be maintained with Congress, other government agencies, licensees, and the public, as well as with the international nuclear community.

- **Efficiency** - The American taxpayer, the rate-paying consumer, and licensees are all entitled to the best possible management and administration of regulatory activities. The highest technical and managerial competence is required, and must be a constant agency goal. NRC must establish means to evaluate and continually upgrade its regulatory capabilities. Regulatory activities should be consistent with the degree of risk reduction they achieve. Where several effective alternatives are available, the option which minimizes the use of resources should be adopted. Regulatory decisions should be made without undue delay.

- **Clarity** - Regulations should be coherent, logical and practical. There should be a clear nexus between regulations and agency goals and objectives whether explicitly or implicitly stated. Agency positions should be readily understood and easily applied.

- **Reliability** - Regulations should be based on the best available knowledge from research and operational experience. Systems interactions, technological uncertainties, and the diversity of licensees and regulatory activities must all be taken into account so that risks are maintained at an acceptably low level. Once established, regulation should be perceived to be reliable and not unjustifiably in a state of transition. Regulatory actions should always be fully consistent with written regulations and should be promptly, fairly, and decisively administered so as to lend stability to the nuclear operational and planning processes.

Major Activities

The NRC fulfills its responsibilities through a system of licensing and regulatory activities that include:

- Licensing the construction and operation of nuclear plants and other nuclear facilities, such as nuclear fuel cycle facilities and test and research reactors, and overseeing their decommissioning
- Licensing the possession, use, processing, handling, and export of nuclear material
- Licensing the siting, design, construction, operation, and closure of low-level radioactive waste disposal sites under NRC jurisdiction and the construction, operation, and closure of the geologic repository for high-level radioactive waste
- Licensing the operators of nuclear power and test and research reactors
- Inspecting licensed facilities and activities
- Conducting the principal U.S. Government research program on light-water reactor safety
- Conducting research to provide independent expertise and information for making timely regulatory judgments and for anticipating problems of potential safety significance
- Developing and implementing rules and regulations that govern licensed nuclear activities
- Investigating nuclear incidents and allegations concerning any matter regulated by the NRC
- Enforcing NRC regulations and the conditions of NRC licenses
- Conducting public hearings on matters of nuclear and radiological safety, environmental concern, common defense and security, and antitrust matters
- Developing effective working relationships with the States regarding reactor operations and the regulation of nuclear material
- Maintaining the NRC Incident Response Program, including the NRC Operations Center
- Collecting, analyzing, and disseminating information about the operational safety of commercial nuclear power reactors and certain nonreactor activities

Organizations and Functions

The NRC is headed by five Commissioners appointed by the President and confirmed by the Senate for 5-year terms. One of them is designated by the President to be the Chairman, serving as the principal executive officer and official spokesperson of the Commission. The Executive Director for Operations carries out the policies and decisions made by the Commission. The NRC's offices associated with Regulatory Programs are:

- **Nuclear Reactor Regulation** - Directs all licensing and inspection activities associated with the design, construction, and operation of nuclear power reactors and nonpower reactors
- **Nuclear Material Safety and Safeguards** - Directs all licensing and inspection activities associated with nuclear fuel cycle facilities, uses of nuclear material, transport of nuclear material, safeguarding of nuclear material, management and disposal of low-level and high-level radioactive nuclear waste, and decontamination and decommissioning of facilities and sites
- **Regional Offices** - Conduct inspection, enforcement, investigation, licensing, and emergency response programs for nuclear reactors, fuel facilities, and material licensees within regional boundaries that the headquarters offices originate
- **State Programs** - Establishes and maintains communication with State and local governments and administers the Agreement States Program.

Offices associated with Regulatory Effectiveness include:

- **Nuclear Regulatory Research** - Provides independent expertise and information for making timely regulatory judgments, anticipating problems of potential safety significance, and resolving safety issues and developing technical regulations and standards
- **Analysis and Evaluation of Operational Data** - Collects, analyzes, and disseminates information about the operational safety of commercial nuclear power reactors and certain nuclear material activities, and manages the NRC's Incident Response Program and the NRC's Technical Training Center
- **Office of Enforcement** - Directs all enforcement activities associated with NRC licensees

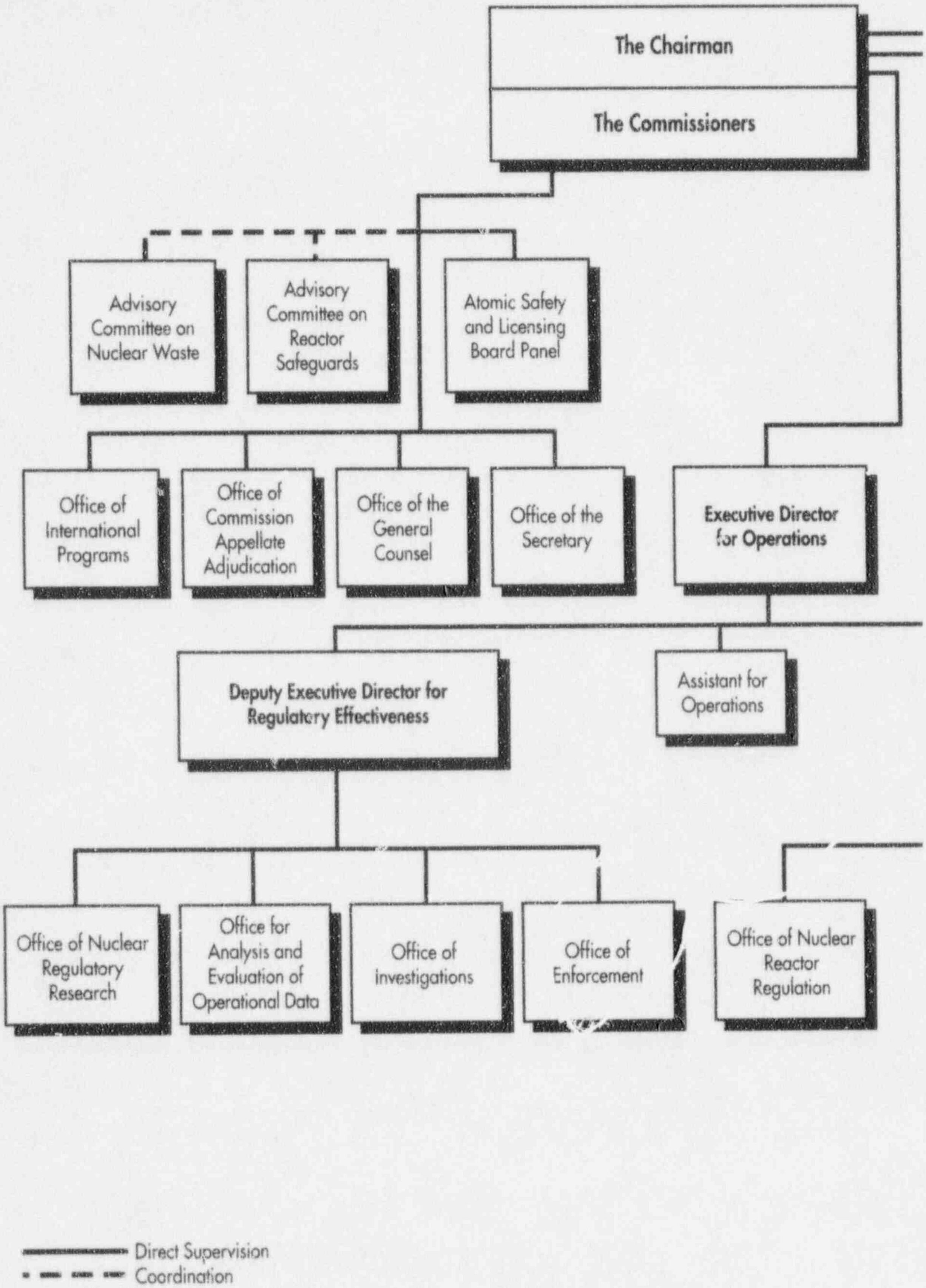
Other major offices are:

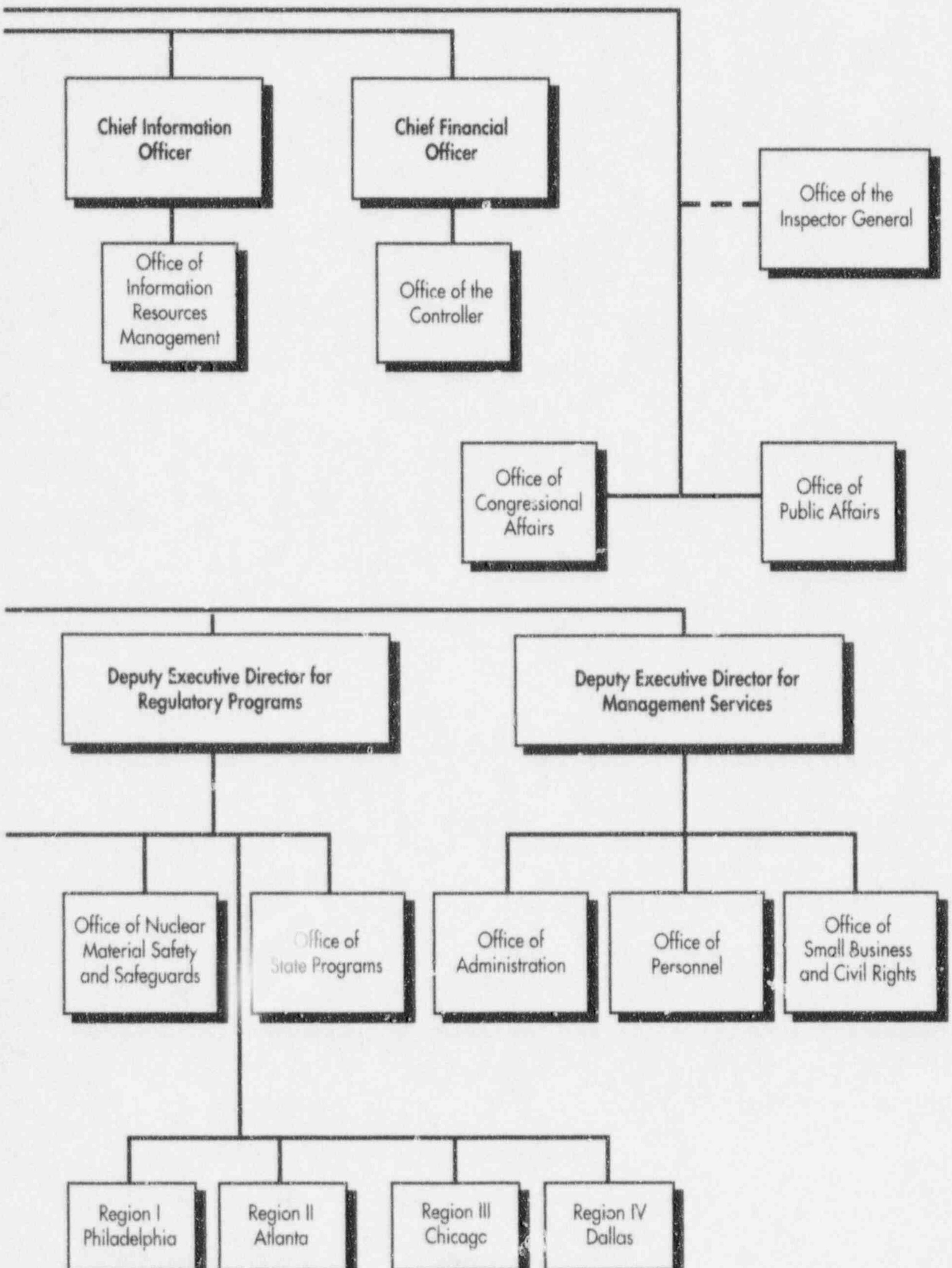
- **Office of Investigations** - Conducts investigations of allegations of wrongdoing by NRC licensees
- **Office of the Chief Financial Officer** - Responsible for agency-wide financial planning, policy, operations and systems
- **Office of the Chief Information Officer** - Responsible for the strategic use of information technology as a management tool across a spectrum of agency activities and for an agency-wide approach to information management, capital planning and performance-based management of information technology, and information management service functions
- **Inspector General** - Provides the Commission with an independent review and appraisal of NRC programs and operations to ensure their effectiveness, efficiency, and integrity

The "Nuclear Regulatory Commission 1995 Annual Report" (NUREG-1145, Volume 12) provides additional information regarding NRC offices and their functions.

Figure 1 is an organization chart of the NRC.

Figure 1. **U.S. Nuclear Regulatory Commission (NRC)**




Chief Information Officer
Office of Information Resources Management
Chief Financial Officer
Office of the Controller
Office of the Inspector General
Office of Congressional Affairs
Office of Public Affairs
Deputy Executive Director for Regulatory Programs
Deputy Executive Director for Management Services
Office of Nuclear Material Safety and Safeguards
Office of State Programs
Office of Administration
Office of Personnel
Office of Small Business and Civil Rights
Region I Philadelphia
Region II Atlanta
Region III Chicago
Region IV Dallas

NRC Locations

Headquarters:

Rockville, Maryland
(301) 415-7000

Operations Center:

Rockville, Maryland
(301) 816-5100

The NRC maintains an Operations Center that provides a focal point for NRC communications with its licensees, State agencies, and other Federal agencies concerning operating events in the commercial nuclear sector. The Operations Center is staffed 24 hours a day by NRC operations officers.

Regional Offices:

The NRC has four regional offices located throughout the United States (see Figure 2):

Region I
King of Prussia, Pennsylvania
(610) 337-5000

Region II
Atlanta, Georgia
(404) 562-4400

Region III
Lisle, Illinois
(630) 829-9500

Region IV
Arlington, Texas
(817) 860-8100

Region IV Field Office:
Walnut Creek, California
(510) 975-0200

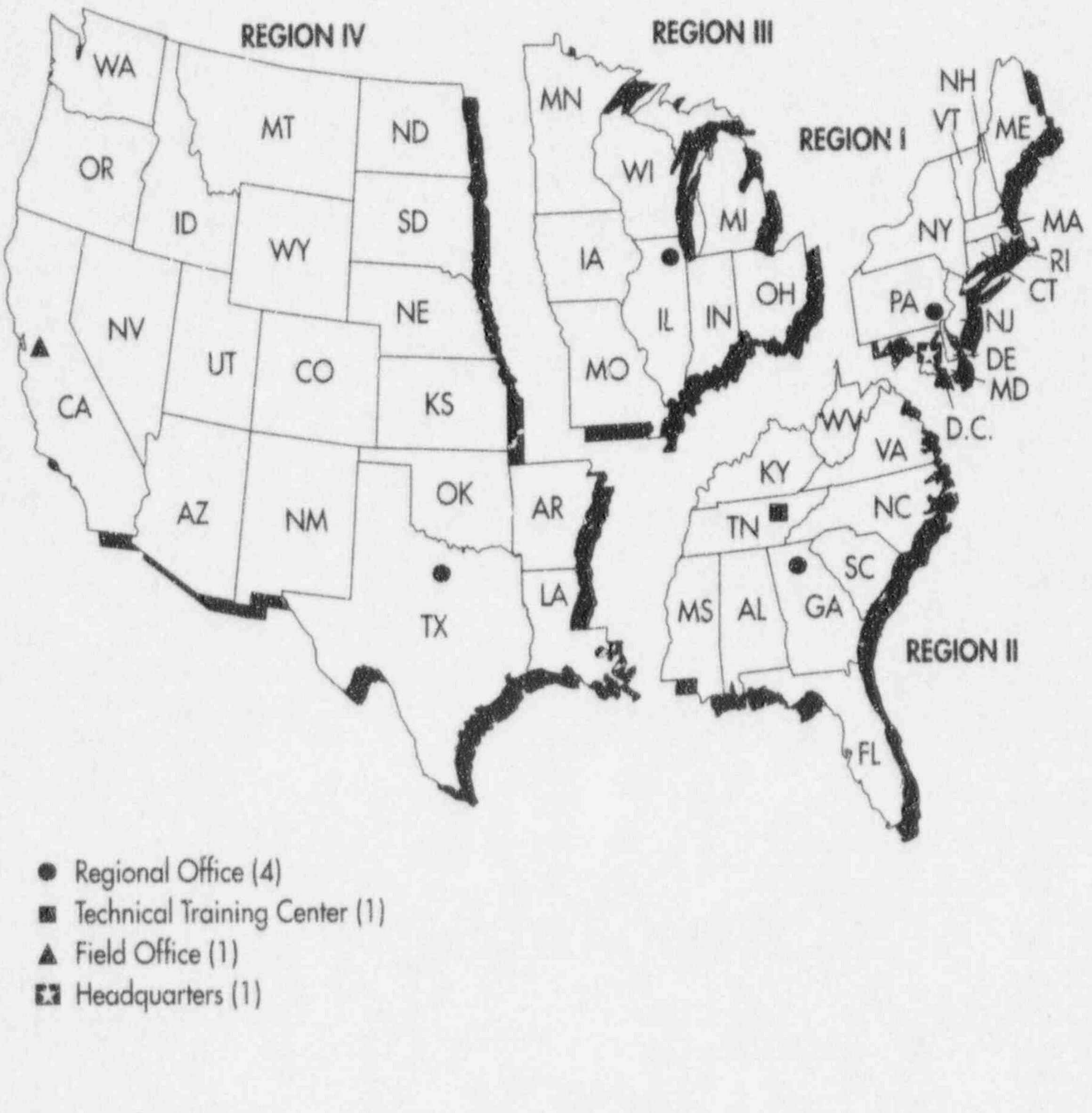
Resident Sites:

At least two NRC resident inspectors who report to the appropriate regional office are located at each nuclear power reactor site. Refer to Figure 15 for a map of the U.S. commercial nuclear power reactor sites.

Technical Training Center:

Chattanooga, Tennessee
(423) 855-6500

Figure 2. **NRC Regions**



- ● Regional Office (4)
- ■ Technical Training Center (1)
- ▲ Field Office (1)
- ✪ Headquarters (1)

Note: Alaska and Hawaii are included in Region IV.

Source: Nuclear Regulatory Commission

NRC Fiscal Year 1997 Resources

Appropriation:

The NRC was appropriated $476.8 million for Fiscal Year (FY) 1997. The NRC's FY 1997 personnel ceiling is 3,061 full-time equivalent (FTE) staff.

The NRC allocates funds and staff to the following programs (see Figure 3):

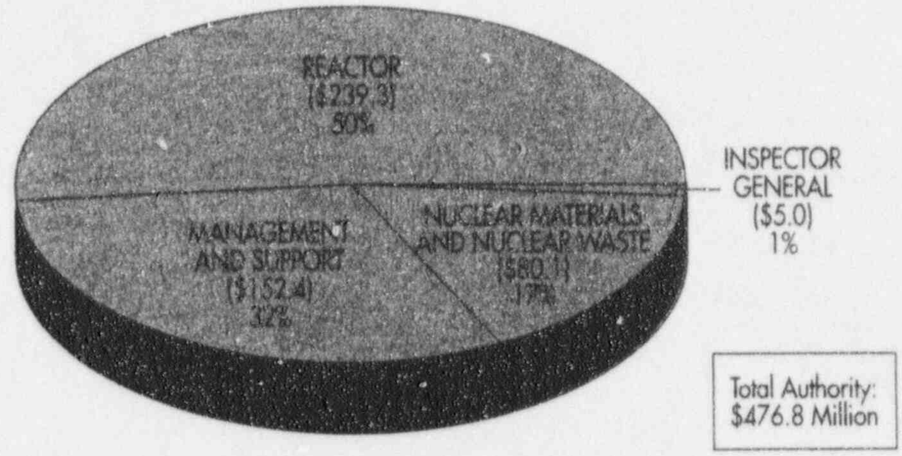
- Reactor
- Nuclear Materials and Nuclear Waste
- Management and Support
- Inspector General (IG)

Civil Penalties:

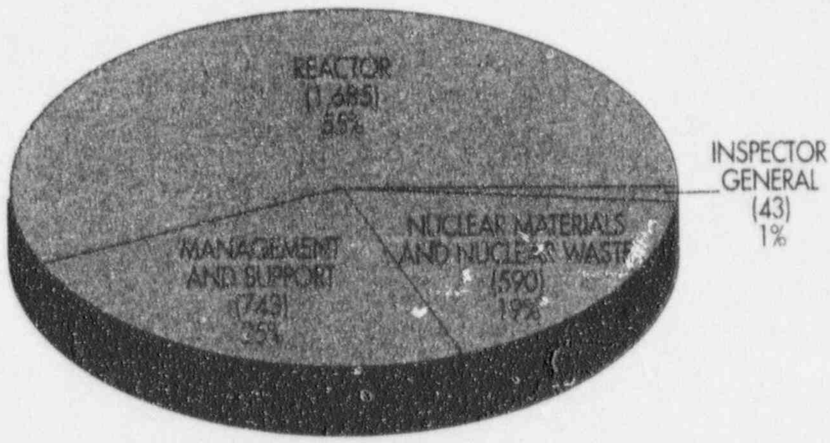
The NRC's enforcement program supports the agency's overall safety mission in protecting the public and the environment. Consistent with that purpose, enforcement action is used as a deterrent to emphasize the importance of compliance with regulatory requirements, and to encourage prompt identification and prompt, comprehensive correction of violations. The NRC enforcement program is governed by the NRC Enforcement Policy, published as NUREG-1600. Three primary enforcement sanctions are available: Notices of Violation; civil penalties; and orders to modify, suspend, or revoke licenses. The NRC ranks violations according to their level of severity. Severity levels range from Severity Level I for the most significant violations to Severity Level IV for those less serious. Civil penalties are considered for Severity Level III violations and are normally assessed for Severity Level I and II violations and knowing and conscious violations of the reporting requirements of Section 206 of the Energy Reorganization Act. The NRC imposes different levels of civil penalties based on a combination of the type of licensed activity, the type of licensee, the severity level of the violation, and other criteria including identification, corrective action, and discretion.

In FY 1996, approximately $3.0 million in civil penalties was paid. These civil penalties are deposited in the U.S. Treasury and are not used by the NRC.

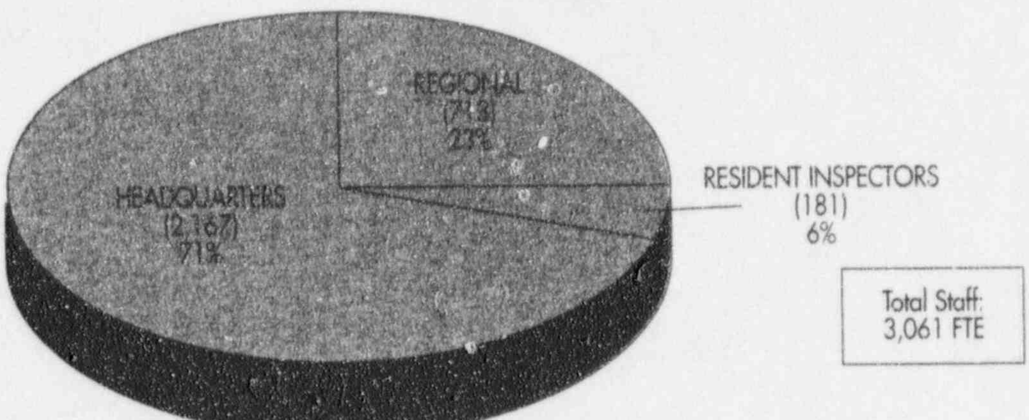
Figure 3. **Distribution of NRC FY 1997 Budget Authority and Staff (Dollars in Millions)**



DOLLARS BY PROGRAM



STAFF BY PROGRAM



STAFF BY LOCATION

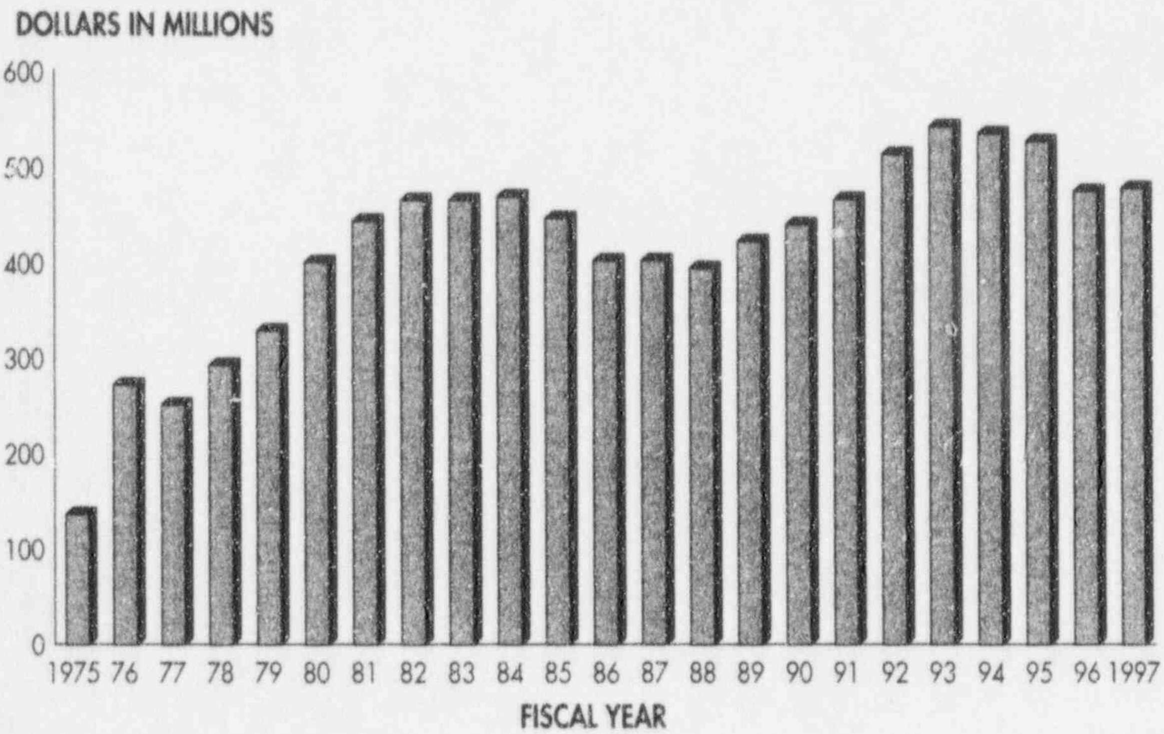
Note: Percentages are rounded to the nearest whole number.

Source: Nuclear Regulatory Commission

Table 1. **NRC Budget Authority, FYs 1975-1997 (Dollars in Millions)**

Fiscal Year	Actual Dollars
1975	135
1976	270
1977	249
1978	290
1979	327
1980	399
1981	441
1982	466
1983	465
1984	466
1985	444
1986	400
1987	401
1988	393
1989	420
1990	439
1991	465
1992	513
1993	540
1994	535
1995	524
1996	473
1997	477

Figure 4. **NRC Budget Authority, FYs 1975-1997**



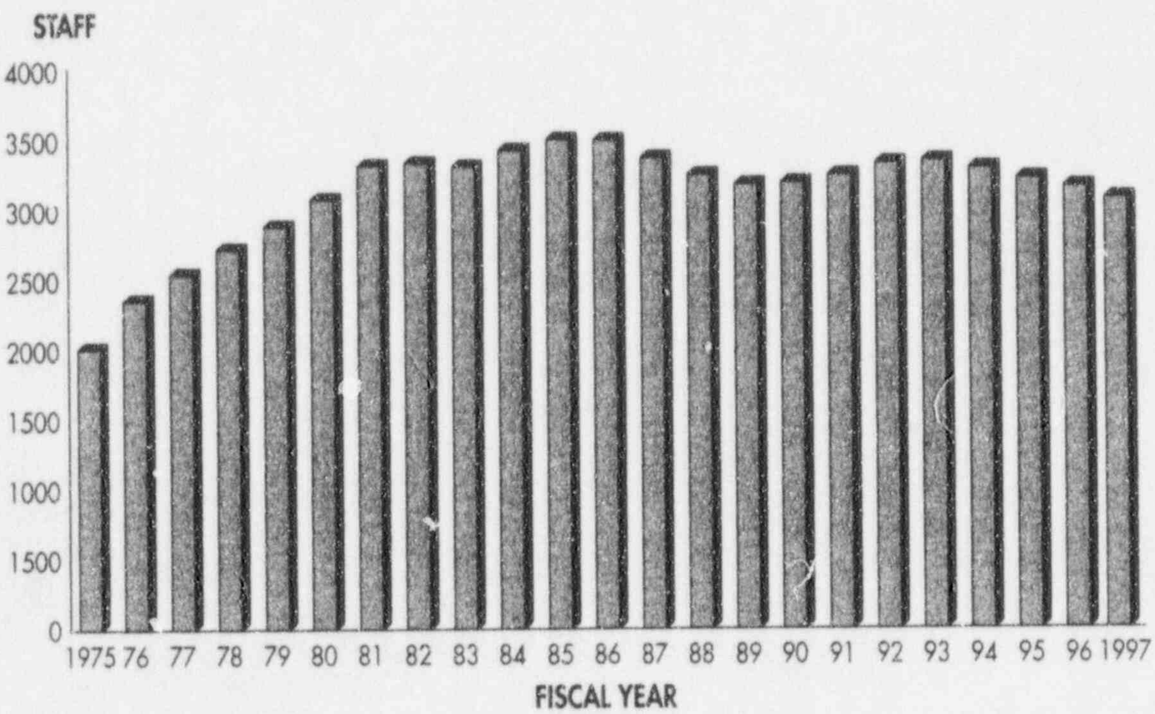
Note: Dollars are rounded to the nearest million.

Source (Table 1 and Figure 4): Nuclear Regulatory Commission

Table 2. **NRC Personnel Ceiling, FYs 1975-1997**

Fiscal Year	Staff
1975	2,006
1976	2,339
1977	2,529
1978	2,723
1979	2,888
1980	3,066
1981	3,300
1982	3,325
1983	3,303
1984	3,416
1985	3,491
1986	3,491
1987	3,369
1988	3,250
1989	3,180
1990	3,195
1991	3,240
1992	3,335
1993	3,343
1994	3,293
1995	3,218
1996	3,160
1997	3,061

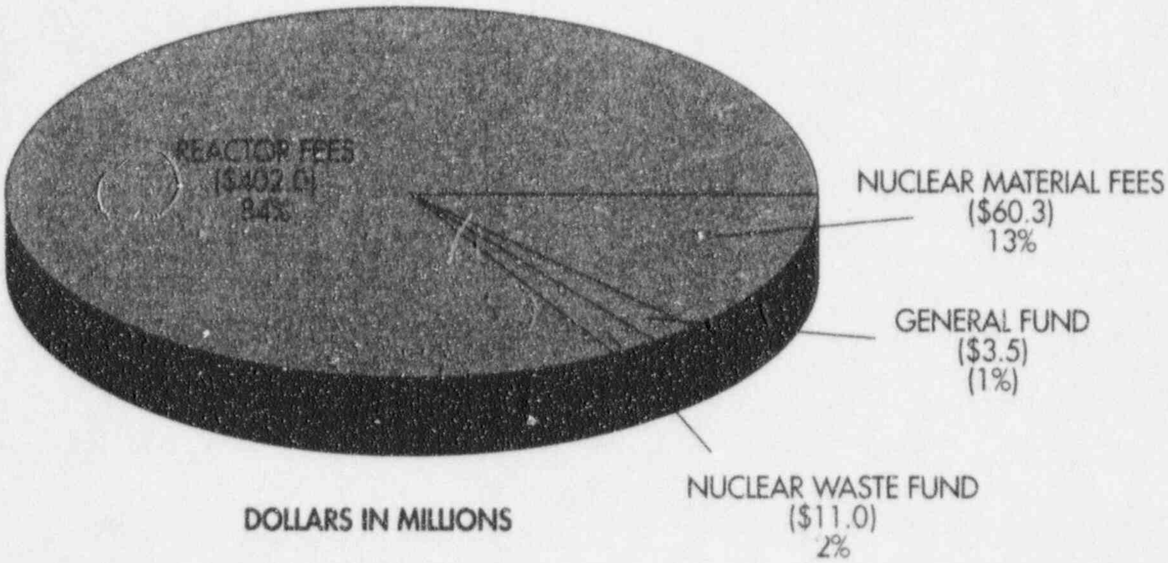
Figure 5. **NRC Personnel Ceiling, FYs 1975-1997**



Note (Table 2 and Figure 5): FY 1975-1982 data reflect permanent full-time positions, at end-of-year strength. FY 1983-1997 reflect full-time equivalents (FTE).

Source (Table 2 and Figure 5): Nuclear Regulatory Commission

Figure 6. **Sources of NRC FY 1997 Budget Authority**



The Omnibus Budget Reconciliation Act of 1990, as amended, requires the NRC to recover 100 percent of its budget authority, less appropriations from the Nuclear Waste Fund, for FYs 1991-1998 by assessing fees to its licensees. In FY 1997, the NRC budget authority to be recovered from fees is $462.3 million. The fees assessed to the major classes of NRC licensees in FY 1997 are:

Class of Licensee	Range of Annual Fees
Operating Power Reactor	$2,972,000
Fuel Facility	$647,000 to [illegible],000
Uranium Recovery Facility	$22,300 to [illegible]
Transportation Approval	$1,000 to $76,700
Materials User	$490 to $23,500

Note: Percentages are rounded to the nearest whole number.

Source: Nuclear Regulatory Commission

U.S. and Worldwide Energy

U.S. Electricity

Capability and Net Generation:

U.S. electric generating capability totaled approximately 706 gigawatts in 1995. Nuclear energy accounted for approximately 14 percent of this capability (see Figure 7).

U.S. net electric generation totaled approximately 2,994 thousand gigawatthours in 1995. Nuclear energy accounted for approximately 22 percent of this generation (see Figure 7).

In 1995, 109 operating nuclear reactors in 32 States generated approximately one-fifth of the Nation's electricity (see Table 3 and Figure 8).

- 6 States relied on nuclear power for more than 50 percent of their electricity.
- 13 additional States relied on nuclear power for 25 to 50 percent of their electricity.

Since 1975, nuclear electric generation has more than tripled and coal-fired generation has almost doubled, while electricity generated by all other sources has decreased by 26 percent (see Table 4 and Figure 9).

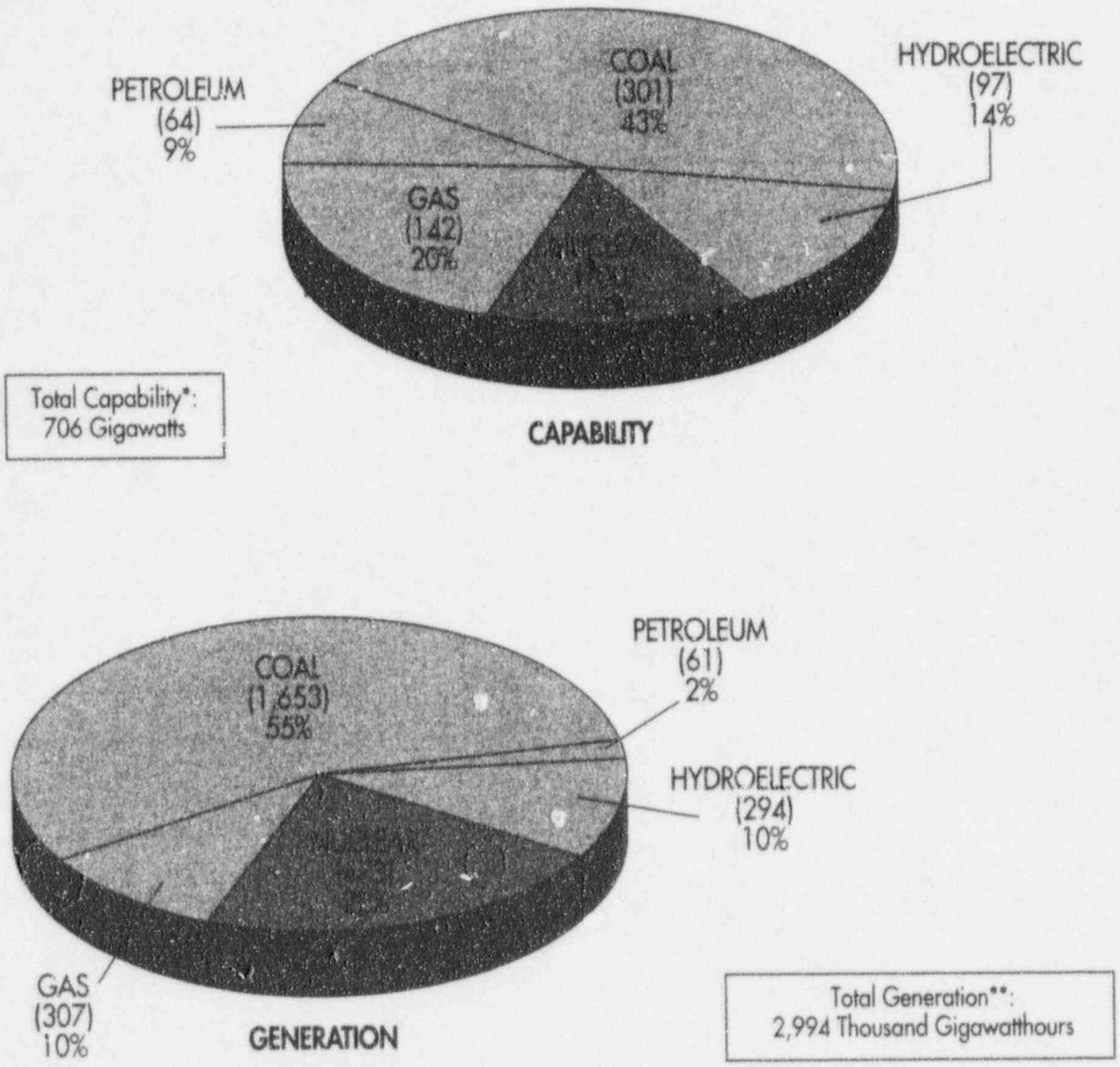
Electricity from coal and nuclear sources, which accounted for 57 percent of the U.S. generating capability, produced 77 percent of the net electricity generated in 1995 (see Table 5 and Figure 10).

Average Production Expenses:

The production expense data presented here include all nuclear and coal-fired utility-owned steam electric plants (see Table 6 and Figure 11).

- In 1995, production expenses averaged $19.23 per megawatthour for nuclear reactors and $18.75 per megawatthour for coal-fired plants.

Figure 7. **1995 U.S. Electric Capability and Net Generation by Energy Source**



* Total value includes approximately 2 gigawatts of other generating capability (geothermal, refuse, solar, wind, and wood), which represents less than 1 percent of total capability.

** Total value includes approximately 6 thousand gigawatthours of generation by other energy sources (biomass fuels, wood, wind, photovoltaic, and solar), which represents less than 1 percent of total generation.

Note: Net summer capability. Percentages are rounded to the nearest whole number.

Source: DOE/EIA Inventory of Power Plants in the United States 1995 (DOE/EIA-0095 (95)),Table 1 (page 19) and DOE/EIA Monthly Energy Review (DOE/EIA–0035 (96/11)), Table 7.1 (page 95)

Table 3. **1995 Electric Generating Capability and Electricity Generated in Each State by Nuclear Power**

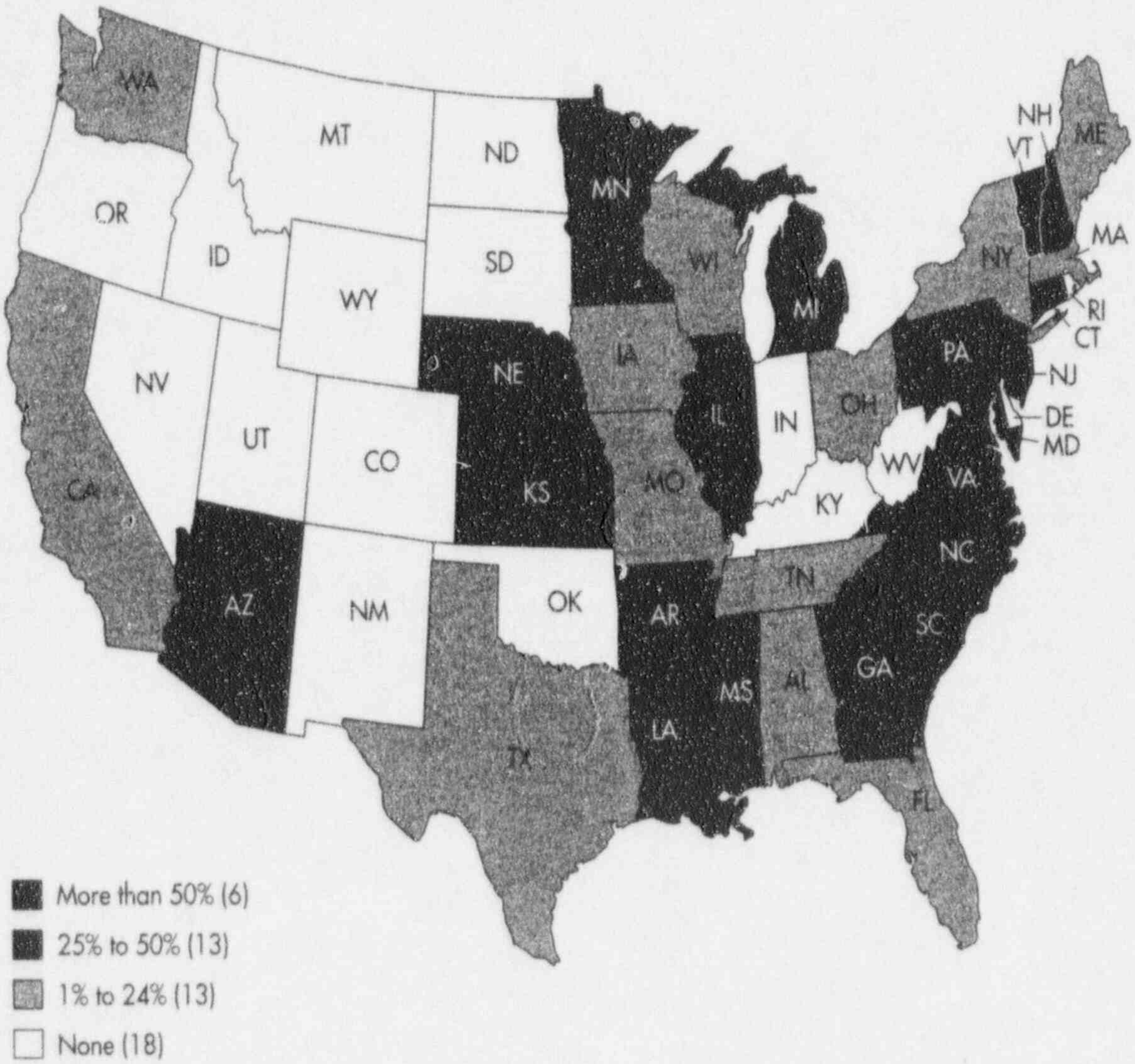
State	Percent Net Nuclear Capability	Generation	State	Percent Net Nuclear Capability	Generation
Alabama	24	21	Missouri	7	12
Arizona	25	39	Nebraska	23	31
Arkansas	18	31	New Hampshire	46	62
California	10	24	New Jersey	28	65
Connecticut	48	64	New York	15	23
Florida	11	21	North Carolina	23	38
Georgia	17	30	Ohio	7	12
Illinois	38	54	Pennsylvania	27	39
Iowa	6	10	South Carolina	38	62
Kansas	12	26	Tennessee	14	21
Louisiana	12	25	Texas	7	13
Maine	36	10	Vermont	46	79
Maryland	15	28	Virginia	24	46
Massachusetts	7	15	Washington	5	6
Michigan	18	26	Wisconsin	13	22
Minnesota	18	30	Others*	0	0
Mississippi	16	25			

* There are 18 States with no nuclear generating capability.

Note: Net summer capability. Capability is the percent of electricity the State is capable of producing with nuclear energy. Generation is the percent of all sources of electricity actually produced with nuclear energy. Percentages are rounded to the nearest whole number.

Source: DOE/EIA Inventory of Power Plants in the United States 1995 (DOE/EIA-0095 (95)), Table 17 (page 33) and DOE/EIA Electric Power Monthly (DOE/EIA-0226 (96/11)), Table 12 (page 24)

Figure 8. **1995 Net Electricity Generated in Each State by Nuclear Power**



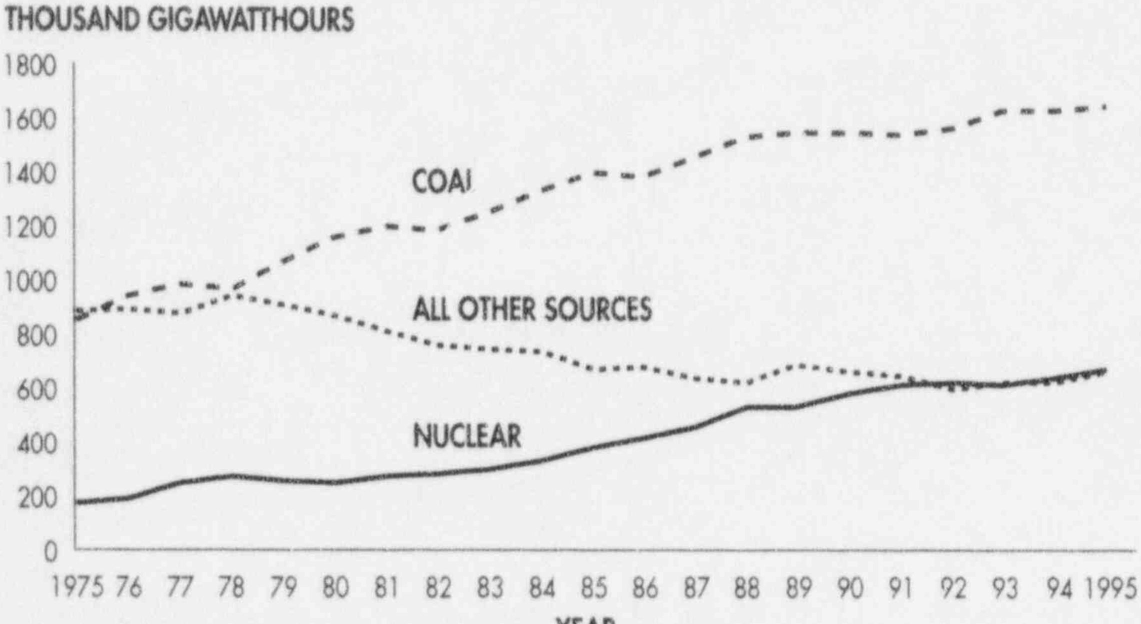
Note: There are no commercial reactors in Alaska or Hawaii. Percentages are rounded to the nearest whole number.

Source: DOE/EIA Electric Power Monthly (DOE/EIA-0226 (96/11)), Table 12 (page 24)

Table 4. **U.S. Net Electric Generation by Source, 1975-1995 (Thousand Gigawatthours)**

Year	Coal	Petroleum	Gas	Hydroelectric	Nuclear
1975	853	289	300	300	173
1976	944	320	295	284	191
1977	985	358	306	220	251
1978	976	365	305	280	276
1979	1,075	304	329	280	255
1980	1,162	246	346	276	251
1981	1,203	206	346	261	273
1982	1,192	147	305	309	283
1983	1,259	144	274	332	294
1984	1,342	120	297	321	328
1985	1,402	100	292	281	384
1986	1,386	137	249	291	414
1987	1,464	118	273	250	455
1988	1,541	149	253	223	527
1989	1,554	158	267	265	529
1990	1,558	117	264	280	577
1991	1,549	111	264	276	613
1992	1.576	89	264	240	619
1993	1,639	100	259	265	610
1994	1,635	91	291	244	640
1995	1,653	61	307	294	673

Figure 9. **U.S. Net Electric Generation by Source, 1975-1995**

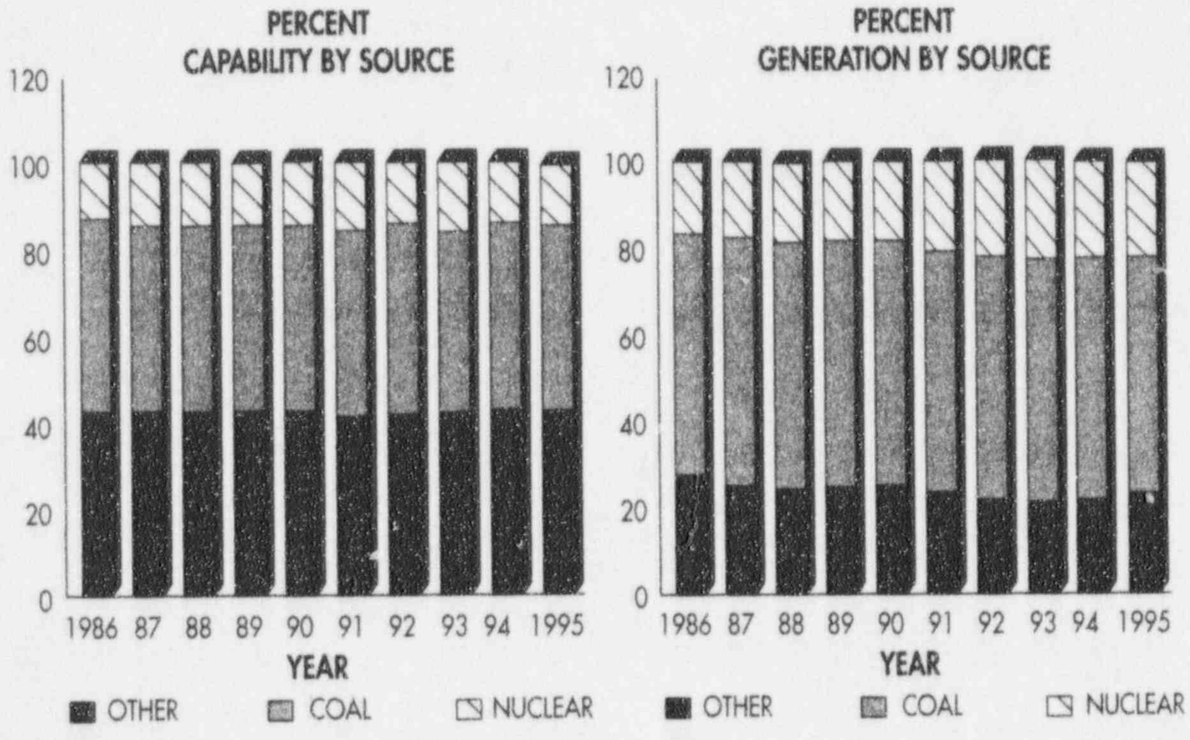


Source (Table 4 and Figure 9): DOE/EIA Monthly Energy Review (DOE/EIA–0035 (96/11)), Table 7.1 (page 95)

Table 5. **U.S. Electric Generating Capability by Source, 1986-1995 (Gigawatts)**

Year	Coal	Petroleum	Gas	Hydroelectric	Nuclear
1986	290	78	117	89	85
1987	293	76	118	90	94
1988	295	77	116	90	95
1989	297	78	117	90	98
1990	300	77	120	91	100
1991	300	72	126	92	100
1992	301	72	127	93	99
1993	301	70	132	96	99
1994	301	70	134	96	99
1995	301	64	142	97	100

Figure 10. **U.S. Electric Generating Capability and Electricity Generated by Source, 1986-1995**



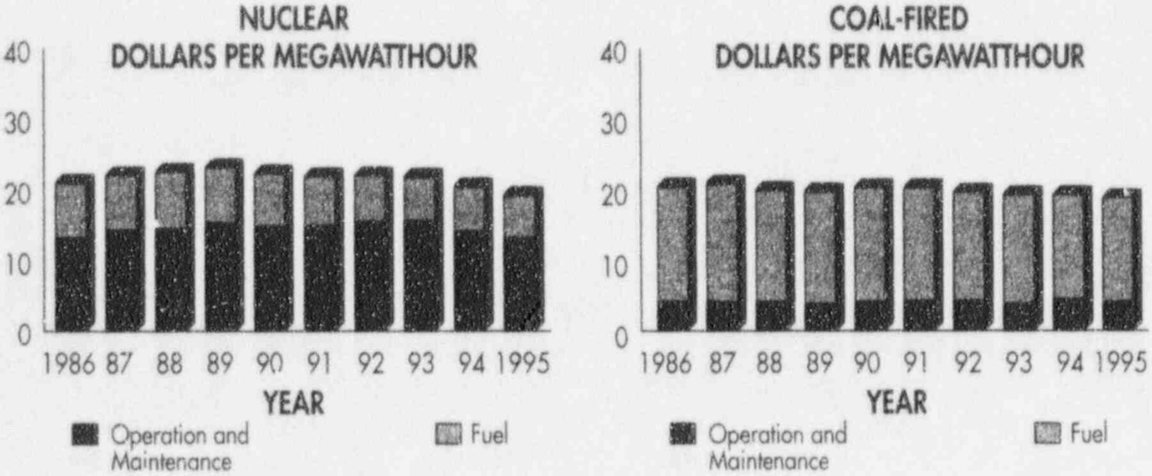
Note (Table 5 and Figure 10): Net summer capability. Percentages are rounded to the nearest whole number.

Source (Table 5 and Figure 10): DOE/EIA Inventory of Power Plants in the United States 1995 (DOE/EIA-0095 (95)), Table 1 (page 18) and DOE/EIA Monthly Energy Review (DOE/EIA-0035 (96/11)), Table 7.1 (page 95)

Table 6. **U.S. Average Nuclear Reactor and Coal-Fired Plant Production Expenses, 1986-1995 (Dollars per Megawatthour)**

Year	Operation and Maintenance	Fuel	Total Production Expenses
Nuclear:			
1986	12.84	7.56	20.40
1987	14.04	7.73	21.77
1988	14.19	7.89	22.08
1989	15.05	7.40	22.45
1990	14.65	7.24	21.89
1991	14.72	6.75	21.47
1992	15.35	6.24	21.59
1993	15.26	6.02	21.28
1994	14.01	6.02	20.03
1995	13.49	5.74	19.23
Coal-Fired:			
1986	4.25	17.31	21.56
1987	4.14	16.45	20.59
1988	4.12	15.84	19.96
1989	4.07	15.70	19.77
1990	4.30	15.84	20.14
1991	4.39	15.85	20.24
1992	4.33	15.37	19.70
1993	4.32	15.31	19.63
1994	4.32	14.88	19.20
1995	4.24	14.51	18.75

Figure 11. **U.S. Average Nuclear Reactor and Coal-Fired Plant Production Expenses, 1986-1995**



Note (Table 6 and Figure 11): Costs have not been adjusted to reflect inflation.

Source (Table 6 and Figure 11): Utility Data Institute, Inc., 1995 Production Costs Operating Steam Electric Plants (UDI-2011-96)

U.S. Electricity Generated by Commercial Nuclear Power

In 1996, net nuclear-based electric generation in the United States produced a total of 670 thousand gigawatthours (see Table 7 and Figure 12).

In 1995, the average U.S. net capacity factor was 79 percent. It decreased to 77 percent in 1996. Since 1985, the average capacity factor has increased 14 percentage points (see Table 7).

- Capacity factor is the ratio of electricity generated to the amount of energy that could have been generated (see Glossary).

- More than three quarters of the U.S. commercial nuclear reactors operated above a capacity factor of 70 percent in 1996 (see Table 8).

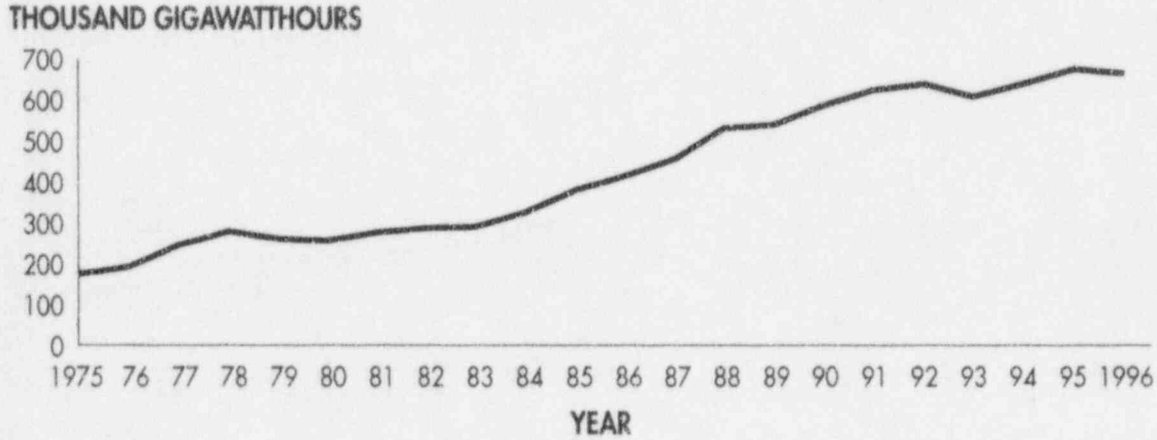
- In 1996, Combustion Engineering (CE) reactors had the highest average capacity factors compared to those of the other three vendors. The 15 CE reactors had an average capacity factor of 81 percent. The average capacity factors for the other three vendors were the following: 37 General Electric reactors -- 73 percent, 51 Westinghouse reactors -- 79 percent, and 7 Babcock and Wilcox (B&W) reactors -- 73 percent (see Table 8).

Table 7. **U.S. Commercial Nuclear Power Reactor Average Capacity Factor and Net Generation, 1975-1996**

Year	Number of Operating Reactors	Average Annual Capacity Factor (Percent)	Net Generation of Electricity: Thousands of Gigawatthours	Net Generation of Electricity: Percent of Total U.S.
1975	51	67	167	8.7
1976	55	64	185	9.1
1977	63	64	240	11.3
1978	66	67	271	12.3
1979	66	61	252	11.2
1980	67	58	248	10.9
1981	70	61	268	11.7
1982	72	58	278	12.4
1983	74	58	280	12.1
1984	82	58	317	13.1
1985	89	63	371	15.0
1986	95	60	404	16.2
1987	102	62	446	17.3
1988	108	65	522	19.3
1989	109	63	528	19.0
1990	111	68	576	20.5
1991	111	71	613	21.7
1992	110	71	620	22.2
1993	109	73	611	21.2
1994	109	75	640	22.1
1995	109	79	674	22.5
1996	110	77	670	*

*Data are not available.

Figure 12. **Net Generation of U.S. Nuclear Electricity, 1975-1996**



Note (Table 7 and Figure 12): Average annual capacity factor is based on net maximum dependable capacity. See Glossary for definition.

Source (Table 7 and Figure 12): Licensee data as compiled by the Nuclear Regulatory Commission

Table 8. U.S. Commercial Nuclear Power Reactor Average Capacity Factor by Vendor and Reactor Type, 1994–1996

Capacity Factor	Number of Operating Reactors 1994	1995	1996	Percent of Net Nuclear Generated 1994	1995	1996
Above 70 Percent	75	92	84	79	91	87
50 to 70 Percent	23	9	15	18	7	10
Below 50 Percent	11	8	11	3	2	3
Total	109	109	110	100	100	100

	Number of Operating Reactors 1994	1995	1996	Average Capacity Factor (Percent) 1994	1995	1996	Percent of Net Nuclear Generated 1994	1995	1996
Vendor:									
Babcock & Wilcox	7	7	7	86	92	73	7	7	6
Combustion Engineering	15	15	15	80	72	81	15	13	15
General Electric	37	37	37	68	77	73	29	31	31
Westinghouse Electric	50	50	51	77	80	79	49	49	48
Total	109	109	110				100	100	100
Reactor Type:									
Boiling-Water Reactor	37	37	37	68	77	73	29	31	31
Pressurized-Water Reactor	72	72	73	79	80	79	71	69	69
Total	109	109	110				100	100	100

Note: Average capacity factor is based on net maximum dependable capacity. See Glossary for definition. Refer to Appendix A for the 1991, 1992, 1993, 1994 ,1995, and 1996 average capacity factors for each reactor. Percentages are rounded to the nearest whole number.

Source: Licensee data as compiled by the Nuclear Regulatory Commission

Worldwide Electricity Generated by Commercial Nuclear Power

In 1996, 434 operating reactors in 33 countries had a maximum dependable capacity of 344,492 megawatts electric (net MWe).

- Refer to Appendix I for a world list of nuclear power reactors and Appendix J for nuclear power units by reactor type, worldwide.

Major producers of nuclear electricity during 1995 were the United States and France.

- Approximately 31 percent of the world's net nuclear-generated electricity was produced in the United States (see Figure 13).

- France produced approximately 16 percent of the world's net nuclear-generated electricity. The nuclear portion of its total domestic electricity generation was approximately 77 percent (see Figure 13).

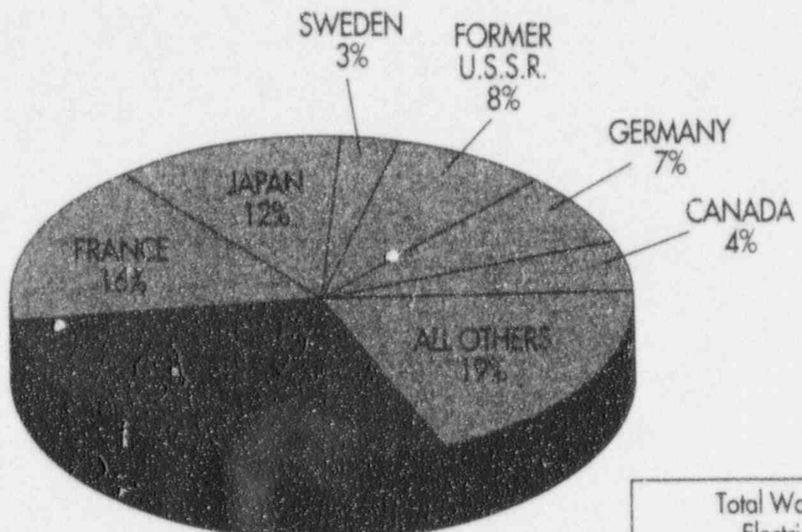
Of the countries cited here, reactors in Japan (80 percent), Germany (79 percent), and Sweden (79 percent) had the highest gross capacity factors in 1996. Reactors in the United States had the greatest gross generation by over double the next highest producer, Japan (see Table 9).

- Refer to Appendix K for a list of the top 50 units by gross capacity factor, worldwide, and Appendix L for a list of the top 50 units by gross generation, worldwide.

Over the past ten years, the average annual gross capacity factor has increased 18 percentage points in the United States, 4 percentage points in Japan, and decreased 2 percentage points in Sweden (see Table 10).

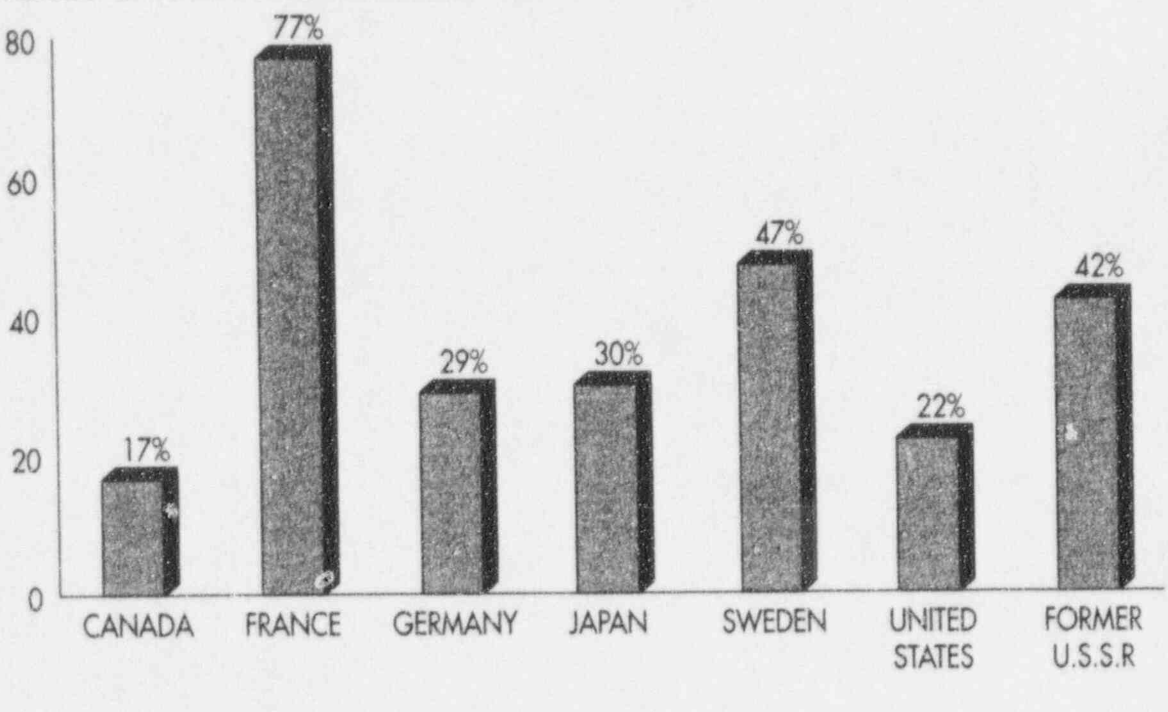
Figure 13. **1995 Net Nuclear Electric Power as Percent of World Nuclear and Total Domestic Electricity Generation**

PERCENT OF WORLD NUCLEAR GENERATION



Total World Net Nuclear Electric Generation: 2,202 Thousand Gigawatthours

PERCENT OF TOTAL DOMESTIC NET ELECTRICITY GENERATION



Note: Data is preliminary. Percentages are rounded to the nearest whole number.

Source: DOE/EIA International Energy Annual 1995 (DOE/EIA–0219(95)), Various tables and DOE/EIA Monthly Energy Review (DOE/EIA 0035 (96/11)) Table 7.1 (page 95).

Table 9. 1996 Commercial Nuclear Power Reactor Average Gross Capacity Factor and Gross Generation by Selected Country

Country	Number of Operating Reactors	Average Gross Capacity Factor (Percent)	Total Gross Nuclear Generation (Thousand Gigawatthours)	Number of Operating Reactors in Top 50 by Capacity Factor	Number of Operating Reactors in Top 50 by Generation
Canada	21	65	95	3	0
France	56	74	397	0	12
Germany	20	79	162	4	10
Japan	51	80	293	6	4
Sweden	12	79	72	0	2
United States	110	75*	705	24	21
Former U.S.S.R.	**	**	**	**	**

Source: Excerpted from *Nucleonics Week* © 1997 by McGraw-Hill, Inc. Reproduced by permission. Further reproduction prohibited.

Table 10. Commercial Nuclear Power Reactor Average Gross Capacity Factor by Selected Country, 1986-1996

	Average Gross Annual Capacity Factor (Percent)										
Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Canada	73	72	77	74	61	72	68	70	76	68	65
France	67	60	58	62	63	63	63	69	67	71	74
Germany	78	75	74	69	66	66	72	69	72	71	79
Japan	76	77	71	71	72	72	72	73	74	79	80
Sweden	81	77	77	74	75	85	67	62	76	73	79
United States	57 {60	57 62	64 65	62 63	66 68	69 71	69 71	71 73	73 75	77 79	75 77}*
Former U.S.S.R.	**	**	**	**	**	**	**	**	**	**	**

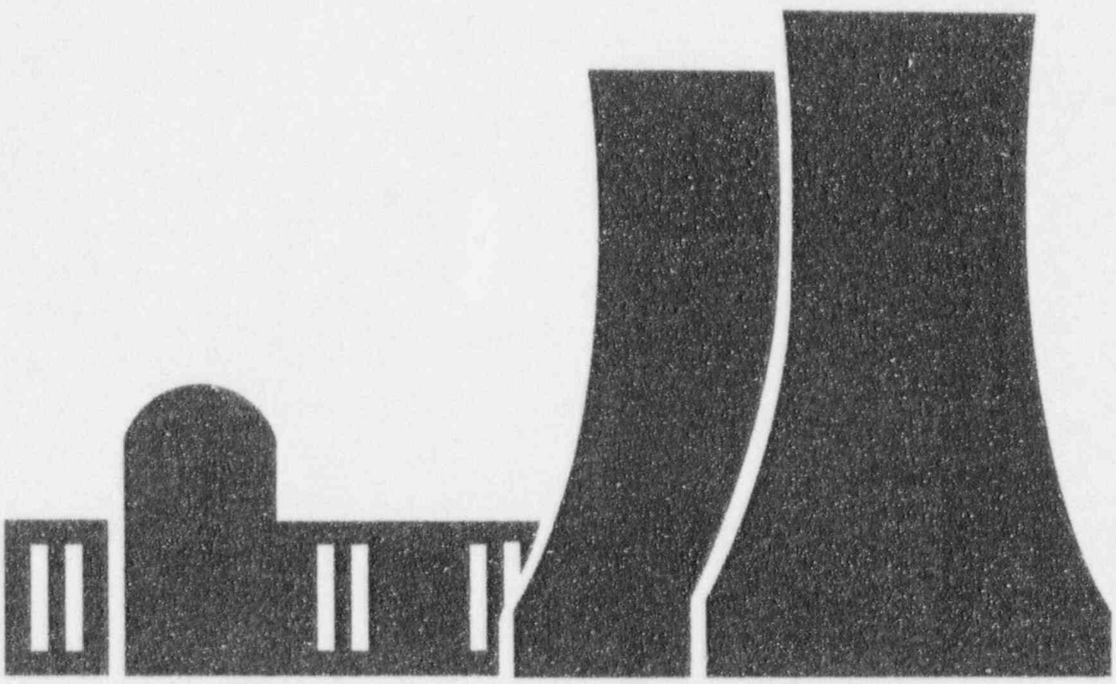
* For comparison, U.S. average gross capacity factor is used. The 1996 U.S. average net capacity factor is 77 percent. Brackets {} in Table 10 denote average net capacity factor. See Glossary for definition.

**Data are not available.

Note (Table 9 and 10): Percentages are rounded to the nearest whole number.

Source: DOE/EIA Commercial Nuclear Power 1991 (DOE/EIA-0438), Table 18 (page 40), *Nucleonics Week* © 1997 by McGraw-Hill, Inc., and licensee data as compiled by the Nuclear Regulatory Commission

Operating Nuclear Reactors



U.S. Commercial Nuclear Power Reactors

There are currently 110 commercial nuclear power reactors licensed to operate in 32 States (see Figures 15-19):

- Joint owners of the Haddam Neck plant voted on December 4, 1996, to permanently close the unit and begin the decommissioning process.
- Refer to Appendices A-D for a listing of currently operating, formerly operating, and canceled U.S. commercial nuclear power reactors.

Diversity - Although there are many similarities, each reactor design can be considered unique. A typical light-water reactor is shown in Figure 14:

- 4 reactor vendors
- 48 licensees
- 80 different designs
- 72 sites

Experience - The 110 reactors licensed to operate during 1996 have accumulated 1838 reactor-years of experience (see Table 11 and Figure 21). An additional 193 reactor-years of experience have been accumulated by permanently shutdown reactors.

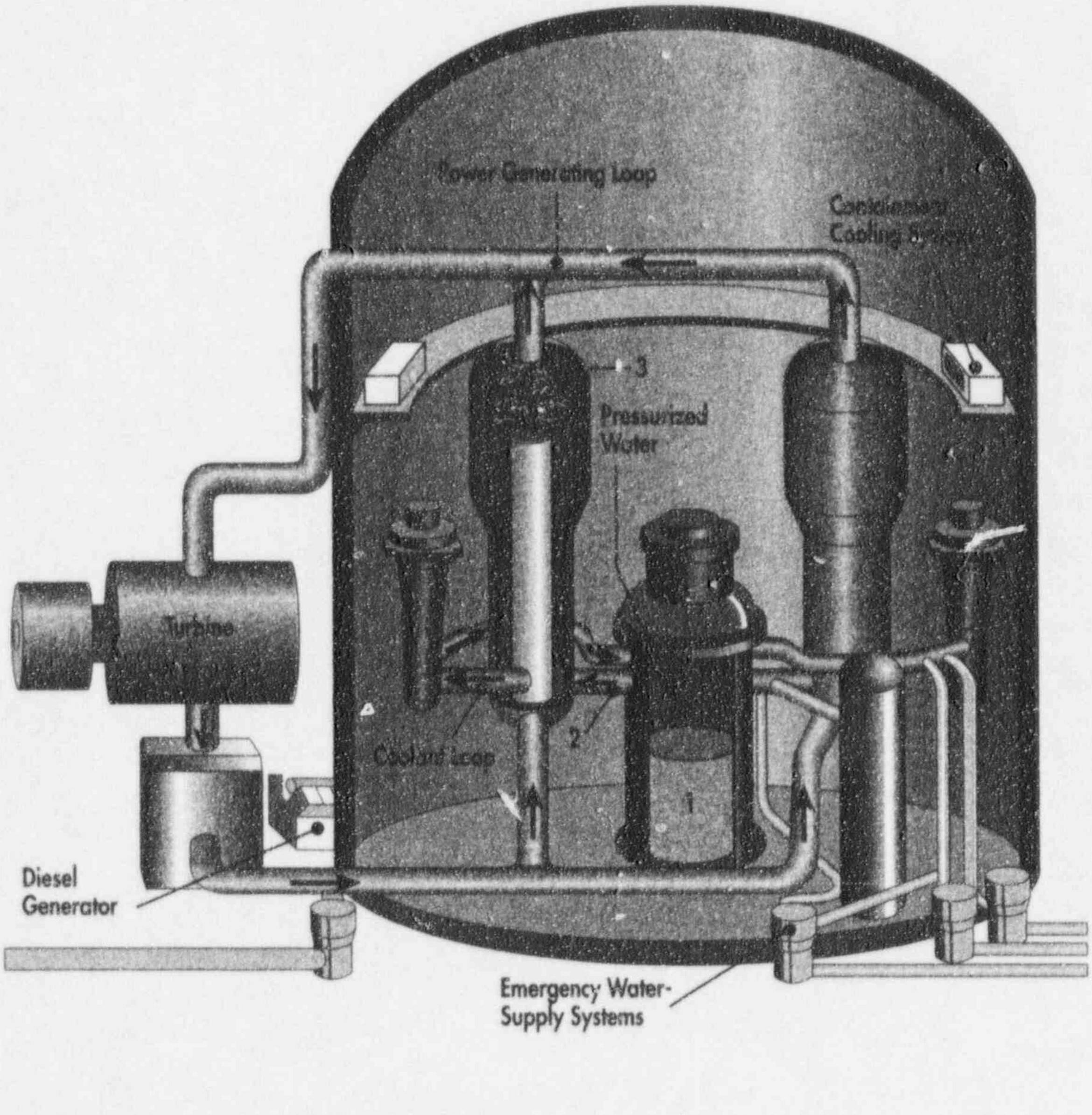
Principal Licensing and Inspection Activities:

- The NRC depends primarily on reactor and facility inspections as the basis for its independent determination of licensee compliance with NRC regulations:
  - On average, approximately 4,100 inspection hours were expended at each operating reactor during FY 1996 (see Figure 20).
- Approximately 14 separate license changes are requested per power reactor each year:
  - More than 1,400 separate reviews were completed by the NRC in FY 1996.
- Approximately 5,200 reactor operators are licensed by the NRC:
  - Each operator is requalified before renewal of a 6-year license.
- Approximately 1,700 reactor event reports are assessed by the NRC annually.
- The NRC is overseeing the decommissioning of 15 nuclear power reactors. Refer to Appendix B for their decommissioning status.

Figure 14. **Typical Nuclear Reactor**

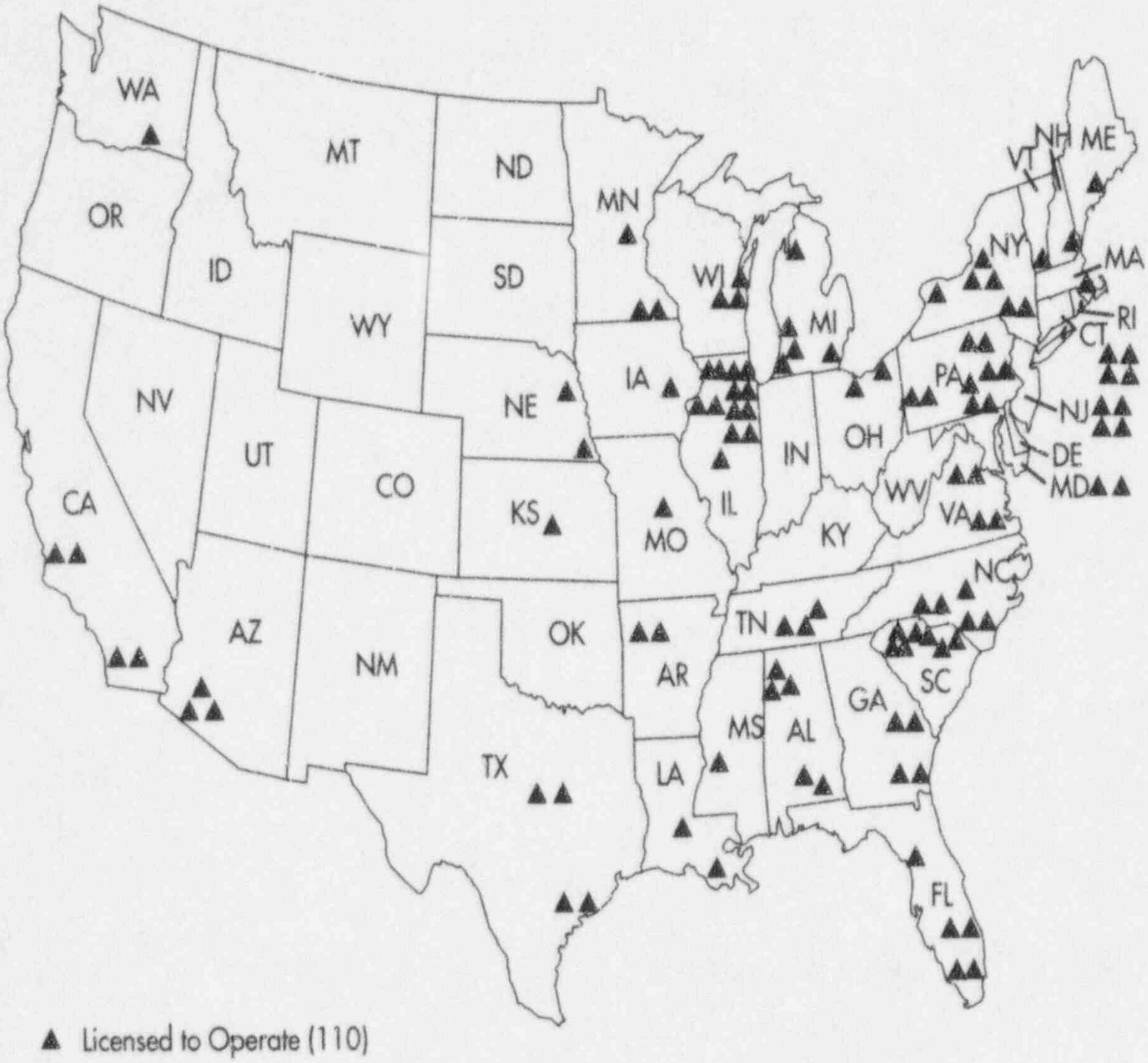
How Nuclear Reactors Work

In a typical commercial pressurized light-water reactor (1) the reactor core creates heat, (2) pressurized-water in the primary coolant loop carries the heat to the steam generator, and (3) the steam generator vaporizes the water in a secondary loop to drive the turbine which produces electricity. Boiling-water reactors are similar to pressurized-water reactors, but use the same loop to cool the reactor and to deliver steam to the turbine. The reactor's core is cooled by water which is force-circulated by electrically powered pumps. Emergency cooling water is supplied by other pumps which can be powered by on-site diesel generators. Other safety systems, such as the containment building air coolers, also need electric power.



Source: Nuclear Regulatory Commission

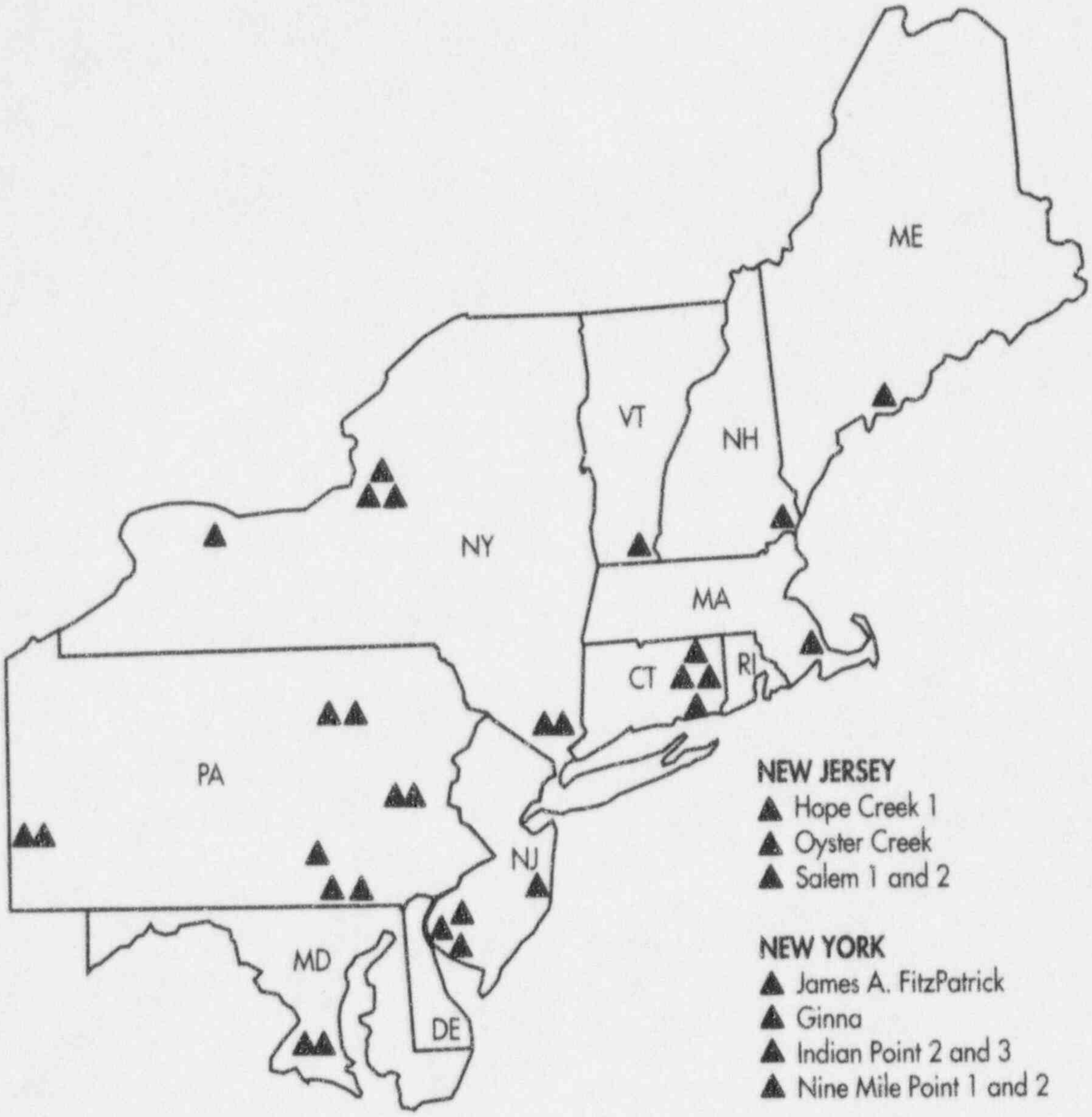
Figure 15. **U.S. Commercial Nuclear Power Reactors**



Note: There are no commercial reactors in Alaska or Hawaii.

Source: Nuclear Regulatory Commission

Figure 16. **NRC Region I Commercial Nuclear Power Reactors**



NEW JERSEY
- ▲ Hope Creek 1
- ▲ Oyster Creek
- ▲ Salem 1 and 2

NEW YORK
- ▲ James A. FitzPatrick
- ▲ Ginna
- ▲ Indian Point 2 and 3
- ▲ Nine Mile Point 1 and 2

CONNECTICUT
- ▲ Haddam Neck
- ▲ Millstone 1,2, and 3

MAINE
- ▲ Maine Yankee

MARYLAND
- ▲ Calvert Cliffs 1 and 2

MASSACHUSETTS
- ▲ Pilgrim 1

NEW HAMPSHIRE
- ▲ Seabrook 1

PENNSYLVANIA
- ▲ Beaver Valley 1 and 2
- ▲ Limerick 1 and 2
- ▲ Peach Bottom 2 and 3
- ▲ Susquehanna 1 and 2
- ▲ Three Mile Island 1

VERMONT
- ▲ Vermont Yankee

▲ Licensed to Operate (29)

Source: Nuclear Regulatory Commission

Figure 17. **NRC Region II Commercial Nuclear Power Reactors**

ALABAMA
- ▲ Browns Ferry 1, 2, and 3
- ▲ Joseph M. Farley 1 and 2

FLORIDA
- ▲ Crystal River 3
- ▲ St. Lucie 1 and 2
- ▲ Turkey Point 3 and 4

GEORGIA
- ▲ Edwin I. Hatch 1 and 2
- ▲ Vogtle 1 and 2

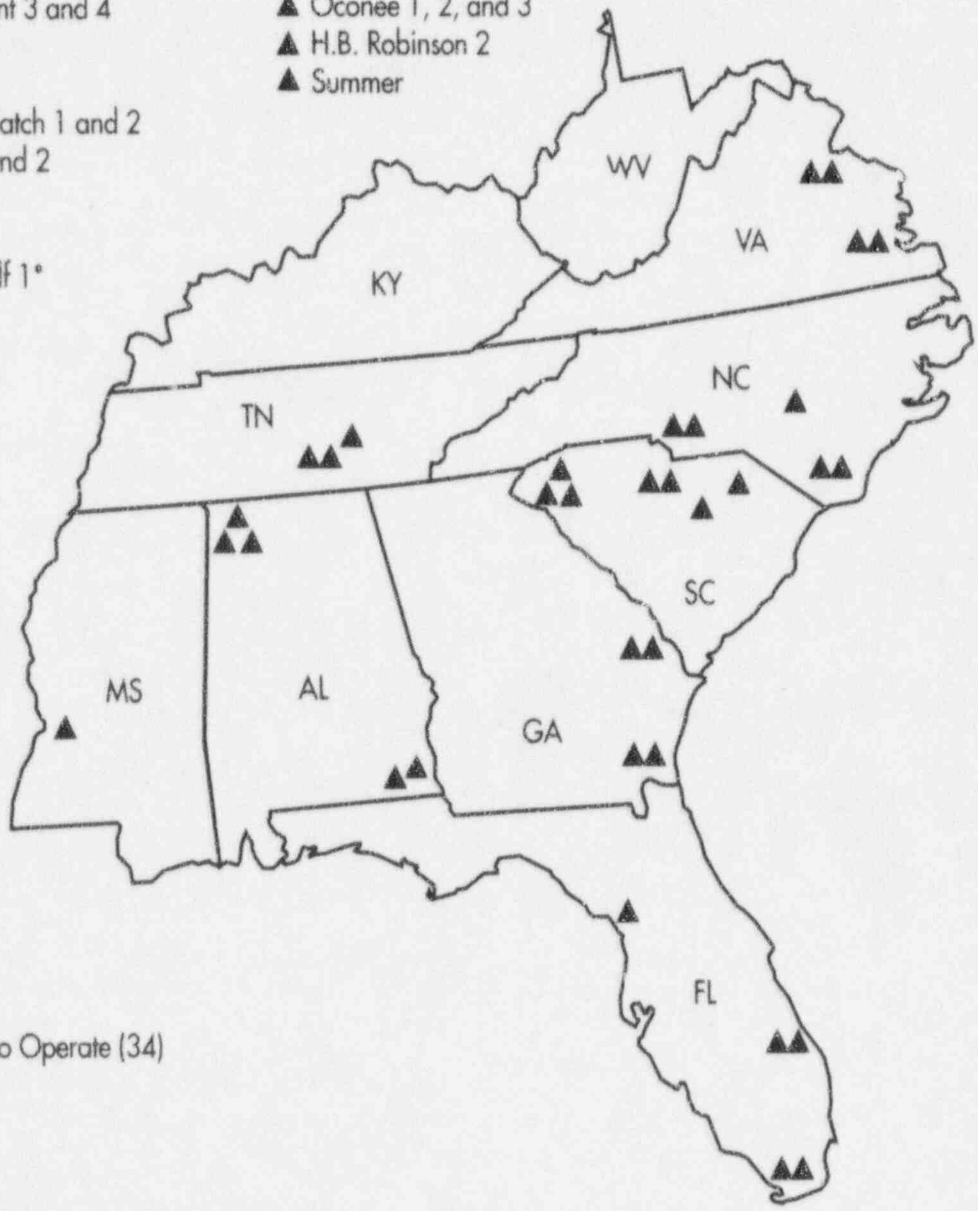
MISSISSIPPI
- ▲ Grand Gulf 1*

NORTH CAROLINA
- ▲ Brunswick 1 and 2
- ▲ McGuire 1 and 2
- ▲ Shearon Harris 1

SOUTH CAROLINA
- ▲ Catawba 1 and 2
- ▲ Oconee 1, 2, and 3
- ▲ H.B. Robinson 2
- ▲ Summer

TENNESSEE
- ▲ Sequoyah 1 and 2
- ▲ Watts Bar 1

VIRGINIA
- ▲ North Anna 1 and 2
- ▲ Surry 1 and 2



▲ Licensed to Operate (34)

**Note:* The NRC transferred regional oversight responsibility for the Grand Gulf 1 nuclear reactor to its Region IV office effective October 1, 1995.

Source: Nuclear Regulatory Commission

Figure 18. **NRC Region III Commercial Nuclear Power Reactors**

ILLINOIS
- ▲ Braidwood 1 and 2
- ▲ Byron 1 and 2
- ▲ Clinton
- ▲ Dresden 2 and 3
- ▲ La Salle County 1 and 2
- ▲ Quad Cities 1 and 2
- ▲ Zion 1 and 2

IOWA
- ▲ Duane Arnold

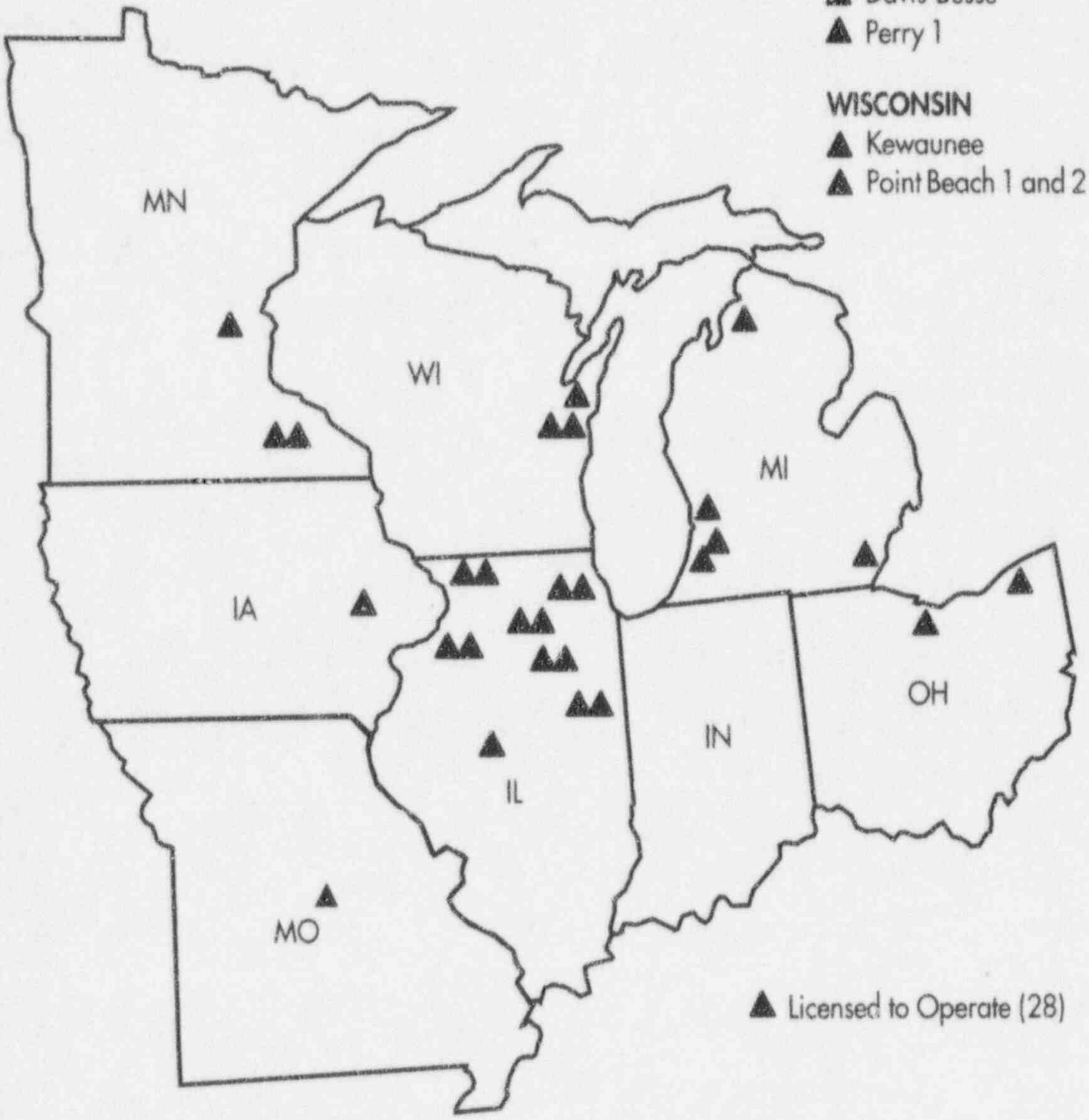
MICHIGAN
- ▲ Big Rock Point
- ▲ D.C. Cook 1 and 2
- ▲ Fermi 2
- ▲ Palisades

MINNESOTA
- ▲ Monticello
- ▲ Prarie Island 1 and 2

MISSOURI
- ▲ Callaway*

OHIO
- ▲ Davis-Besse
- ▲ Perry 1

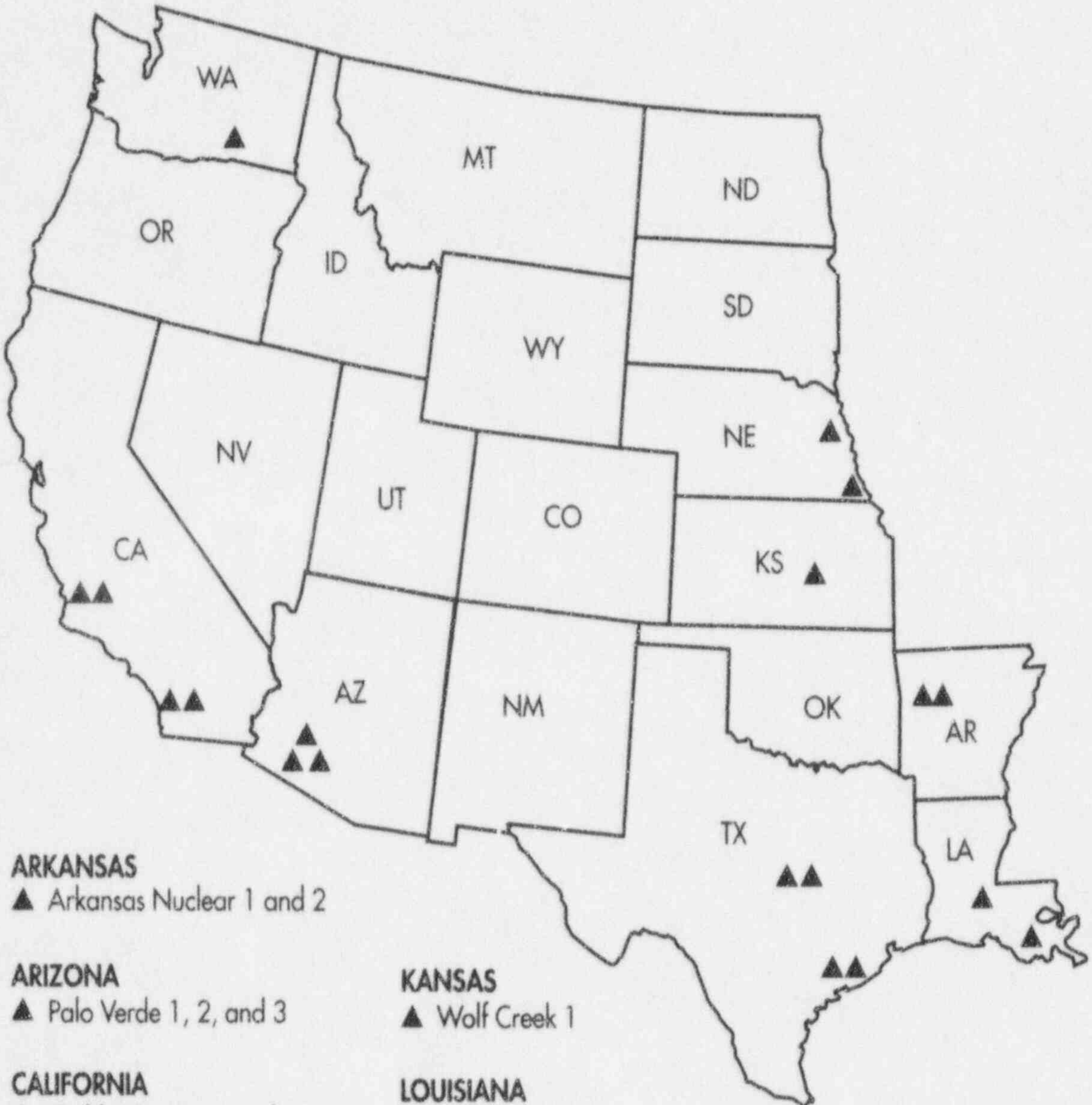
WISCONSIN
- ▲ Kewaunee
- ▲ Point Beach 1 and 2



**Note:* The NRC transferred regional oversight responsibility for the Callaway nuclear reactor to its Region IV office effective October 1, 1995.

Source: Nuclear Regulatory Commission

Figure 19. **NRC Region IV Commercial Nuclear Power Reactors**



ARKANSAS
▲ Arkansas Nuclear 1 and 2

ARIZONA
▲ Palo Verde 1, 2, and 3

CALIFORNIA
▲ Diablo Canyon 1 and 2
▲ San Onofre 2 and 3

▲ Licensed to Operate (19)

KANSAS
▲ Wolf Creek 1

LOUISIANA
▲ River Bend 1
▲ Waterford 3

NEBRASKA
▲ Cooper
▲ Fort Calhoun

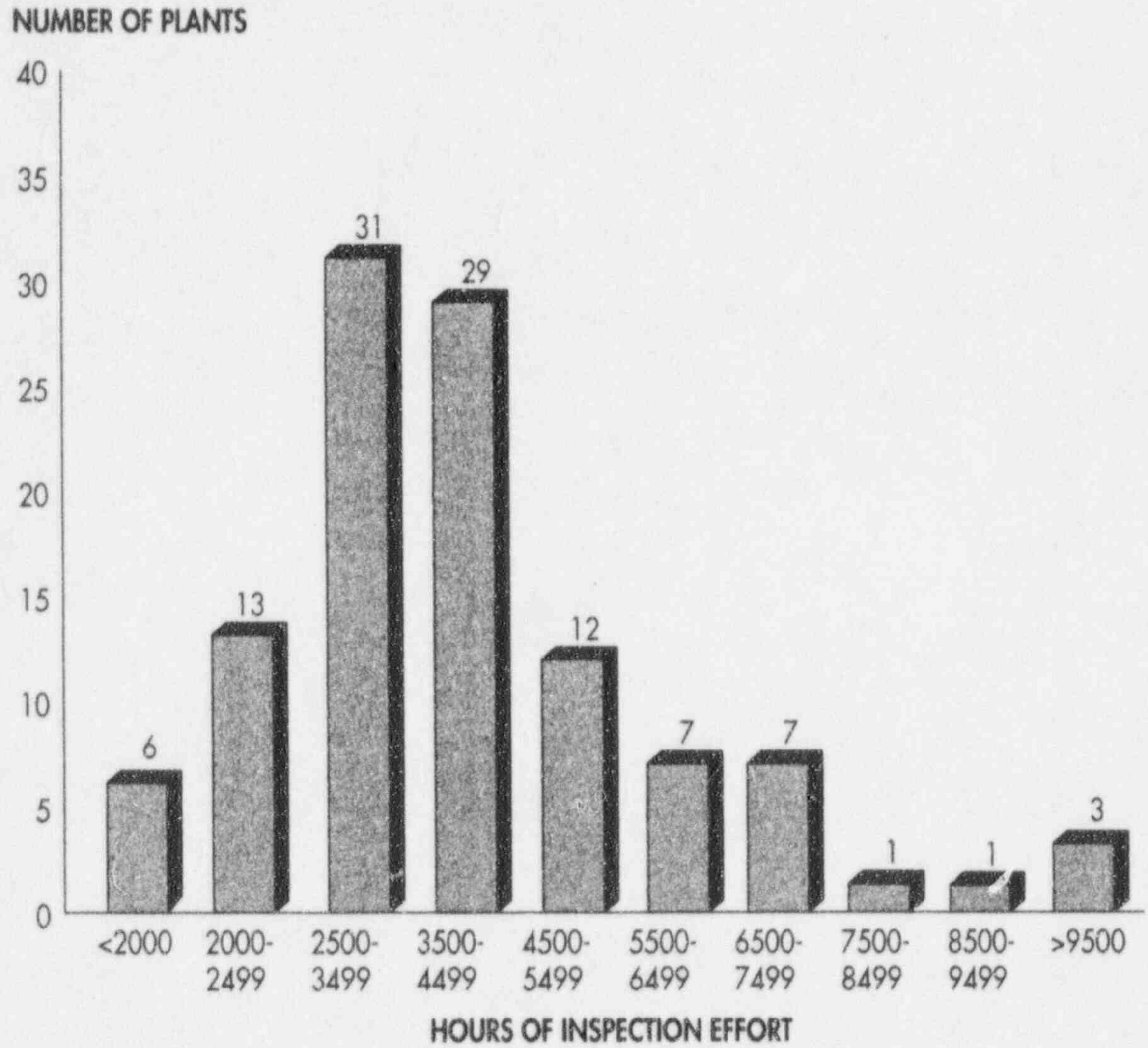
TEXAS
▲ Comanche Peak 1 and 2
▲ South Texas Project 1 and 2

WASHINGTON
▲ Washington Nuclear 2

Note: The NRC transfered regional oversight responsibility for the Grand Gulf 1 (formerly Region II) and Callaway (formerly Region III) nuclear reactors to its Region IV office effective October 1, 1995. There are no commercial reactors in Alaska or Hawaii.

Source: Nuclear Regulatory Commission

Figure 20. **FY 1996 NRC Inspection Effort at Operating Reactors**



Source: Nuclear Regulatory Commission

Table 11. **U.S. Commercial Nuclear Power Reactor Operating Licenses Issued by Year**

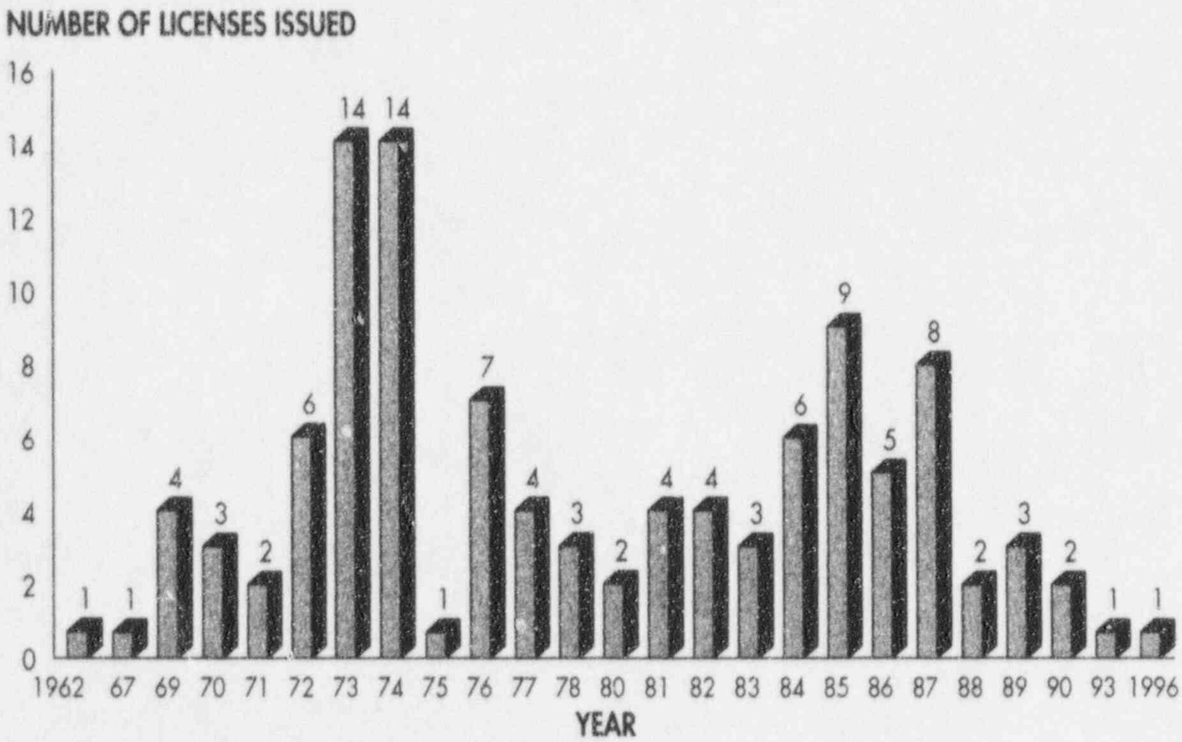
Year	Reactor Name	Number of Licenses Issued	Total Number of Operating Licenses
1962	Big Rock Point	1	1
1967	Haddam Neck	1	2
1969	Dresden 2	4	6
	Ginna		
	Nine Mile Point 1		
	Oyster Creek		
1970	H. B. Robinson 2	3	9
	Millstone 1		
	Point Beach 1		
1971	Dresden 3	2	11
	Monticello		
1972	Palisades	6	17
	Pilgrim 1		
	Quad Cities 1		
	Quad Cities 2		
	Surry 1		
	Turkey Point 3		
1973	Browns Ferry 1	14	31
	Fort Calhoun		
	Indian Point 2		
	Kewaunee		
	Maine Yankee		
	Oconee 1		
	Oconee 2		
	Peach Bottom 2		
	Point Beach 2		
	Surry 2		
	Turkey Point 4		
	Vermont Yankee		
	Zion 1		
	Zion 2		
1974	Arkansas Nuclear 1	14	45
	Browns Ferry 2		
	Brunswick 2		
	Calvert Cliffs 1		
	Cooper		
	D. C. Cook 1		
	Duane Arnold		
	Edwin I. Hatch 1		
	James A. FitzPatrick		
1974 *(Continued)*			
	Oconee 3		
	Peach Bottom 3		
	Prairie Island 1		
	Prairie Island 2		
	Three Mile Island 1		
1975	Millstone 2	1	46
1976	Beaver Valley 1	7	53
	Browns Ferry 3		
	Brunswick 1		
	Calvert Cliffs 2		
	Indian Point 3		
	Salem 1		
	St. Lucie 1		
1977	Crystal River 3	4	57
	Davis-Besse		
	D. C. Cook 2		
	Joseph M. Farley 1		
1978	Arkansas Nuclear 2	3	60
	Edwin I. Hatch 2		
	North Anna 1		
1980	North Anna 2	2	62
	Sequoyah 1		
1981	Joseph M. Farley 2	4	66
	McGuire 1		
	Salem 2		
	Sequoyah 2		
1982	La Salle County 1	4	70
	San Onofre 2		
	Summer		
	Susquehanna 1		
1983	McGuire 2	3	73
	San Onofre 3		
	St. Lucie 2		
1984	Callaway	6	79
	Diablo Canyon 1		
	Grand Gulf 1		
	La Salle County 2		
	Susquehanna 2		
	Washington Nuclear 2		

Year	Reactor Name	Number of Licenses Issued	Total Number of Operating Licenses
1985	Byron 1	9	88
	Catawba 1		
	Diablo Canyon 2		
	Fermi 2		
	Limerick 1		
	Palo Verde 1		
	River Bend 1		
	Waterford 3		
	Wolf Creek 1		
1986	Catawba 2	5	93
	Hope Creek 1		
	Millstone 3		
	Palo Verde 2		
	Perry 1		
1987	Beaver Valley 2	8	101
	Braidwood 1		
	Byron 2		
	Clinton		
	Nine Mile Point 2		
	Palo Verde 3		
1987 *(Continued)*			
	Shearon Harris 1		
	Vogtle 1		
1988	Braidwood 2	2	103
	South Texas Project 1		
1989	Limerick 2	3	106
	South Texas Project 2		
	Vogtle 2		
1990	Comanche Peak 1	2	108
	Seabrook 1		
1993	Comanche Peak 2	1	109
1996	Watts Bar 1	1	110

Note (Table 11 and Figure 22):
Limited to reactors licensed to operate.
Year is based on the date the initial full power operating license was issued.

Source (Table 11 and Figure 22): Nuclear Regulatory Commission

Figure 21. **U.S. Commercial Nuclear Power Reactor Operating Licenses Issued by Year**



Performance at U.S. Commercial Nuclear Power Reactors

Performance Indicator Program:

The Performance Indicator Program is a single, coordinated, overall NRC program that provides an additional view of operational performance and enhances the NRC's ability to recognize areas of changing safety performance of operating plants. When viewed as a set, the performance indicators (PIs) for a given plant provide additional data for determining performance trends. PIs focus attention on the need to assess and understand underlying causes of identified changes by evaluating other available information (see Figure 22 and Appendix F).

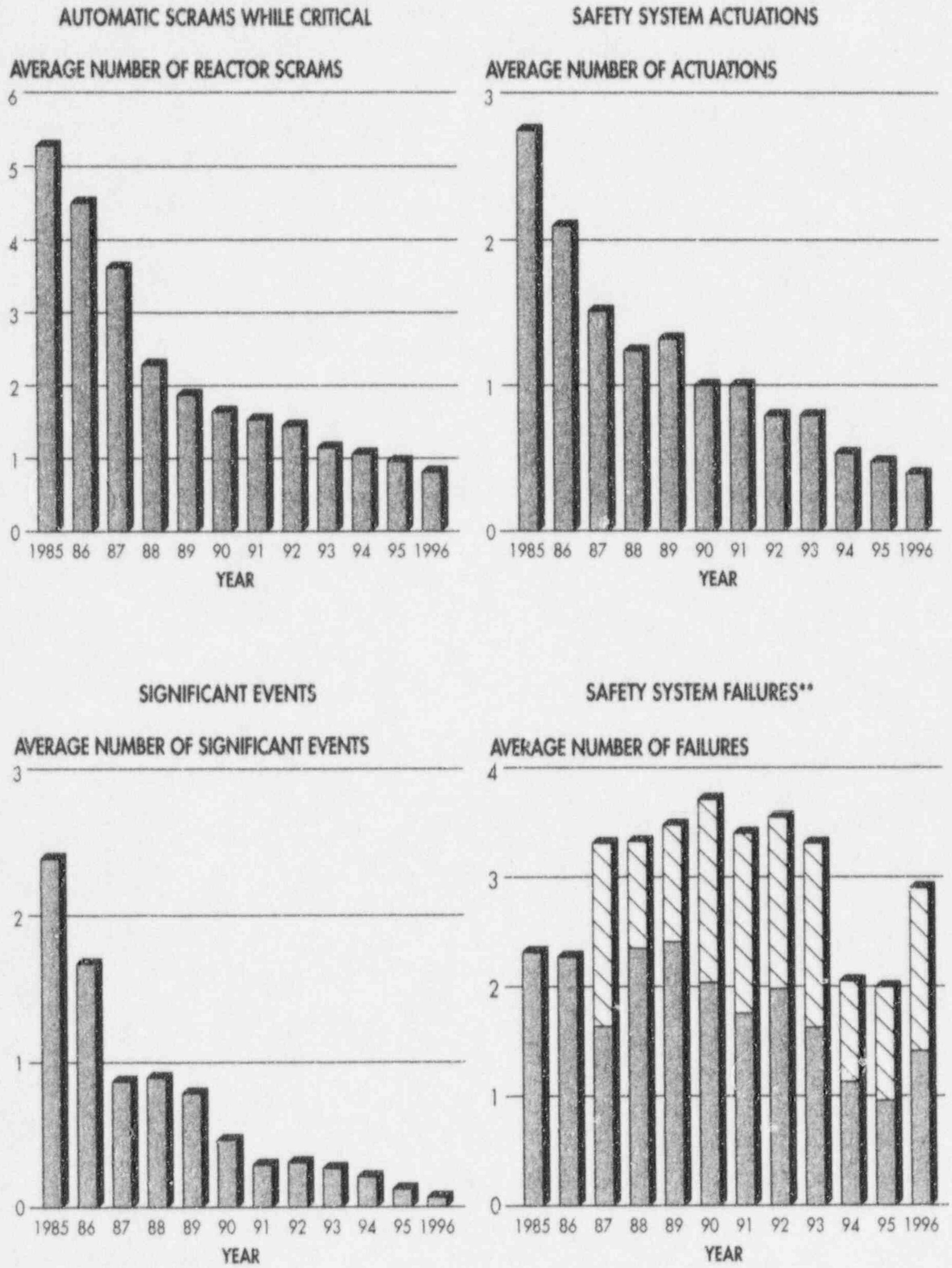
The PI Program is used in conjunction with other tools, such as the results of routine and special inspections and the Systematic Assessment of Licensee Performance (SALP), to provide data to NRC managers who decide whether any plant-specific regulatory programs need adjustment. The staff is evaluating the use of performance indicators to provide more objective bases for judging whether a plant should be placed on or deleted from the NRC Watch List. The main objective of this effort is to supplement the material that is currently being presented at the Senior Management Meetings (SMM) to provide a more systematic process for evaluating plant-specific performance indicators. PIs have limitations and are subject to misinterpretation. Therefore, caution is warranted in the interpretation and use of the data. The application of PIs for purposes and in manners other than those stated above will be counter to the NRC objective of operational safety.

Systematic Assessment of Licensee Performance:

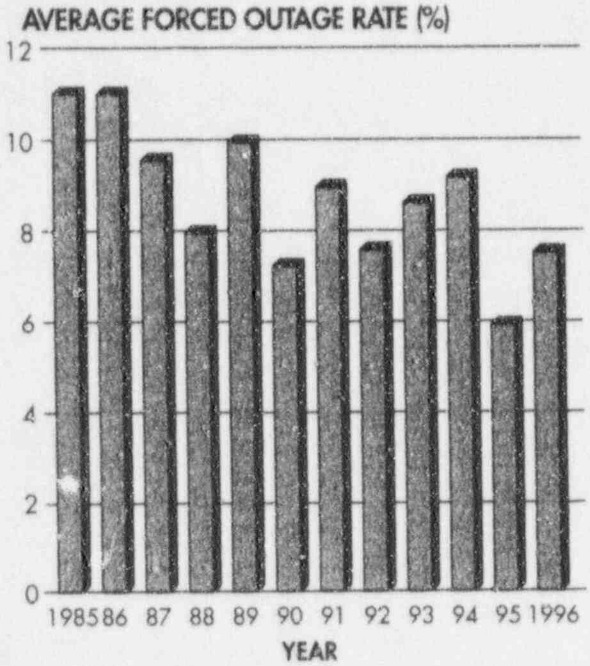
The Systematic Assessment of Licensee Performance, or SALP, Program is an integrated NRC effort to collect and evaluate observations and data to assess and better understand the reasons for a licensee's performance. The purpose of the program is to direct NRC attention and resources toward those areas that reflect weaknesses and that involve nuclear safety. This involves a review of licensee performance over an extended period of time (normally about 18 months) in areas such as operations, engineering, maintenance, and plant support.

On the basis of the review, a rating is assigned to reflect the quality of licensee performance within each area evaluated. The SALP evaluations are discussed with the licensee to communicate the results of the evaluation. Those discussions are usually conducted in a public meeting. The NRC continually reviews the SALP process to identify procedural changes or refinements that can be made to improve on its intended purpose of clear and concise communication to licensee management regarding the strengths and weaknesses of plant performance. For the latest SALP rating by reactor, refer to NUREG-1214, "Historical Data Summary of the Systematic Assessment of Licensee Performance."

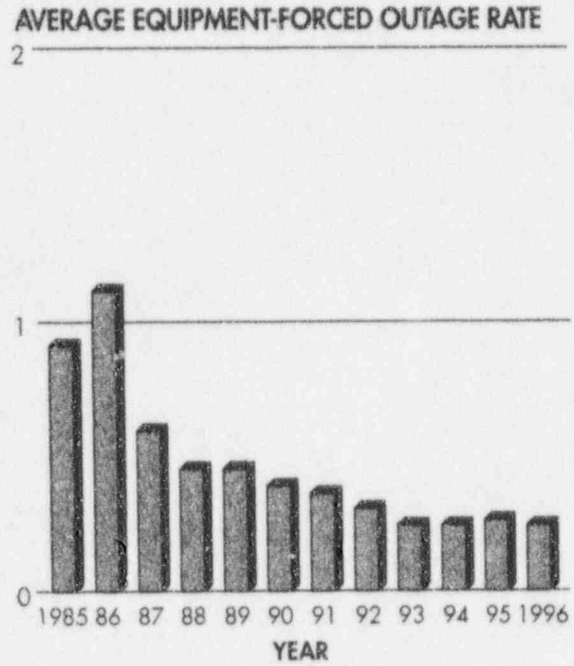
Figure 22. **NRC Performance Indicators; Annual Industry Averages, 1985-1996***



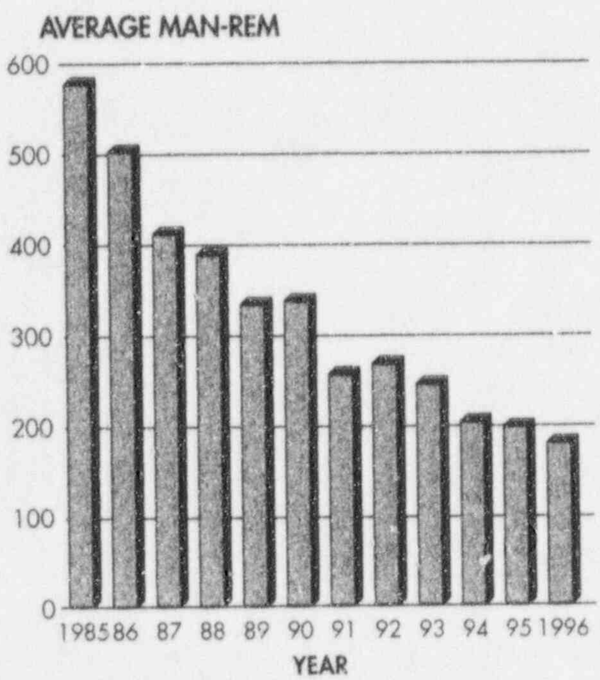
FORCED OUTAGE RATE



EQUIPMENT-FORCED OUTAGES
PER 1000 CRITICAL HOURS



COLLECTIVE RADIATION EXPOSURE



* Calendar year values are used for 1985 through 1995. Fiscal year values are used beginning in 1996. Data for October 1, 1995 through December 31,1995, are included in both calendar year 1995 and fiscal year 1996 values. Refer to Appendix F for values.

** The hatched areas represent additional data that resulted from reclassification of safety system failures.

Note: Data represent annual industry averages with plants in extended shutdown excluded. Data are rounded for display purposes. These data may differ slightly from previously published data as a result of refinements in data quality.

Source: Licensee data as compiled by the Nuclear Regulatory Commission

Future U.S. Commercial Nuclear Power Reactor Licensing

Reactor Aging and License Renewal:

In 1996, 53 reactors were 20 years or older. This represented approximately 48 percent of the licensed reactors producing approximately 38 percent of net nuclear-generated electricity (see Figure 23).

In contrast, by the year 2000, 61 reactors will be 20 years or older. This represents approximately 56 percent of the licensed reactors producing approximately 47 percent of net nuclear-generated electricity.

In 2000, the licensed nuclear generating capacity could begin to decrease as reactors begin to reach their 40-year terms, a limit imposed by the Atomic Energy Act of 1954, as amended or are shut down for other reasons (see Table 12 and Figures 24 and 25).

Extending reactor operating licenses beyond their current 40-year terms will provide a viable approach for electric utilities to ensure the adequacy of future electricity-generating capacity that offers significant economic benefits when compared to the construction of new reactors.

In December 1991, the NRC issued the rule and associated documentation that describe what a licensee must be able to demonstrate for the NRC to make a determination that the plant can continue to be operated for up to 20 additional years beyond the expiration of its 40-year license. The NRC issued an amendment to the license renewal rule that became effective on June 7, 1995. The amendment to the rule is expected to provide a more stable and predictable regulatory process for license renewal by focusing the license renewal process on the management of the adverse effects of aging on certain systems, structures, and components during the period of extended operation.

In a separate rulemaking, the NRC revised the scope of environmental effects for license renewal to enhance the agency's environmental review process for reactor license renewal. The final, revised rule became effective on September 5, 1996. The NRC has begun efforts to develop regulatory guidance and standard review plans for license renewal.

The current industry approach is focused on submitting, in lieu of a formal license renewal application, plant-specific or owners group generic reports for NRC review and approval. The NRC received five technical reports from Baltimore Gas and Electric (BG&E) Company for review in FY 1996. BG&E intends to submit 29 additional technical reports through FY 1997 and the BG&E program could result in a license renewal application in FY 1997. The Nuclear Energy Institute is the lead industry group interacting with the NRC on the license renewal rule implementation guidance. The Babcock & Wilcox Owners Group has formulated a generic license renewal program that will lead to the submittal of a renewal application. The Westinghouse, Babcock & Wilcox, and Boiling Water Reactor Owners groups have submitted topical reports on aging management activities to the NRC to review. Duke Power Company also has begun submitting topical reports for its Oconee plants.

The NRC is conducting research providing the technical bases to ensure that critical reactor components, safety systems, and structures will provide adequate reliability as reactors age. Research results will be useful in assessing safety implications of age-related degradation during the 40-year license and in supporting safety decisions associated with license renewal.

Figure 23. **U.S. Commercial Nuclear Power Reactors—Years of Operation**

YEARS OF COMMERCIAL OPERATION	NUMBER OF REACTORS	AVERAGE CAPACITY (MDC)
△ 0-9	17	1106
▲ 10-19	40	1038
▲ 20-29	52	751
▲ Over 30	1	67

Note: There are no commercial reactors in Alaska or Hawaii. Calculated data as of 1996.

Source: Nuclear Regulatory Commission

Table 12. U.S. Commercial Nuclear Power Reactor Operating Licenses—Expiration Date by Year

Year	Reactor Name	Number of Licenses Expired	Year Assuming Construction Recapture*
2000	Big Rock Point	1	
2006	Dresden 2	1	
2007	Haddam Neck**	2	
	Palisades		2011
2008	Maine Yankee	1	2012
2009	Ginna	3	
	Nine Mile Point 1		
	Oyster Creek		
2010	H. B. Robinson 2	4	
	Millstone 1		
	Monticello		
	Point Beach 1		
2011	Dresden 3	1	
2012	Pilgrim 1	6	
	Quad Cities 1		
	Quad Cities 2		
	Surry 1		
	Turkey Point 3		
	Vermont Yankee		
2013	Browns Ferry 1	15	
	Fort Calhoun		
	Indian Point 2		
	Kewaunee		
	Oconee 1		
	Oconee 2		
	Peach Bottom 2		
	Point Beach 2		
	Prairie Island 1		
	San Onofre 2		2022
	San Onofre 3		2022
	Surry 2		
	Turkey Point 4		
	Zion 1		
	Zion 2		
2014	Arkansas Nuclear 1	13	
	Browns Ferry 2		
	Brunswick 2		
	Calvert Cliffs 1		
	Cooper		
2014 *(Continued)*			
	D. C. Cook 1		
	Duane Arnold		
	Edwin I. Hatch 1		
	James A. FitzPatrick		
	Oconee 3		
	Peach Bottom 3		
	Prairie Island 2		
	Three Mile Island 1		
2015	Indian Point 3	2	
	Millstone 2		
2016	Beaver Valley 1	7	
	Browns Ferry 3		
	Brunswick 1		
	Calvert Cliffs 2		
	Crystal River 3		
	Salem 1		
	St. Lucie 1		
2017	Davis-Besse	3	
	D. C. Cook 2		
	Joseph M. Farley 1		
2018	Arkansas Nuclear 2	3	
	Edwin I. Hatch 2		
	North Anna 1		
2020	North Anna 2	3	
	Salem 2		
	Sequoyah 1		
2021	Diablo Canyon 1	4	
	Joseph M. Farley 2		
	McGuire 2		
	Sequoyah 2		
2022	Grand Gulf 1	4	
	La Salle County 1		
	Summer		
	Susquehanna 1		
2023	La Salle County 2	4	
	McGuire 2		
	St. Lucie 2		
	Washington Nuclear 2		
2024	Byron 1	7	
	Callaway		

Year	Reactor Name	Number of Licenses Expired	Year Assuming Construction Recapture*
2024 *(Continued)*			
	Catawba 1		
	Limerick 1		
	Palo Verde 1		
	Susquehanna 2		
	Waterford 3		
2025	Diablo Canyon 2	6	
	Fermi 2		
	Millstone 3		
	Palo Verde 2		
	River Bend 1		
	Wolf Creek 1		
2026	Braidwood 1	9	
	Byron 2		
	Catawba 2		
	Clinton		
	Hope Creek 1		
	Nine Mile Point 2		
	Perry 1		
	Seabrook 1		
	Shearon Harris 1		
2027	Beaver Valley 2	5	
	Braidwood 2		
2027 *(Continued)*			
	Palo Verde 3		
	South Texas Project 1		
	Vogtle 1		
2028	South Texas Project 2	1	
2029	Limerick 2	2	
	Vogtle 2		
2030	Comanche Peak 1	1	
2033	Comanche Peak 2	1	
2035	Watts Bar	1	

*Year assumes that the maximum number of years for construction recapture has been added to the current expiration date. This column is limited to reactors eligible for construction recapture. See Glossary for definition.

**Haddam Neck prematurely shutdown in December, 1996

Note (Table 12 and Figure 24):

Limited to reactors licensed to operate.

Source (Table 12 and Figure 24): Nuclear Regulatory Commission

Figure 24. **U.S. Commercial Nuclear Power Reactor Operating Licenses — Expiration Date by Year Assuming Construction Recapture**

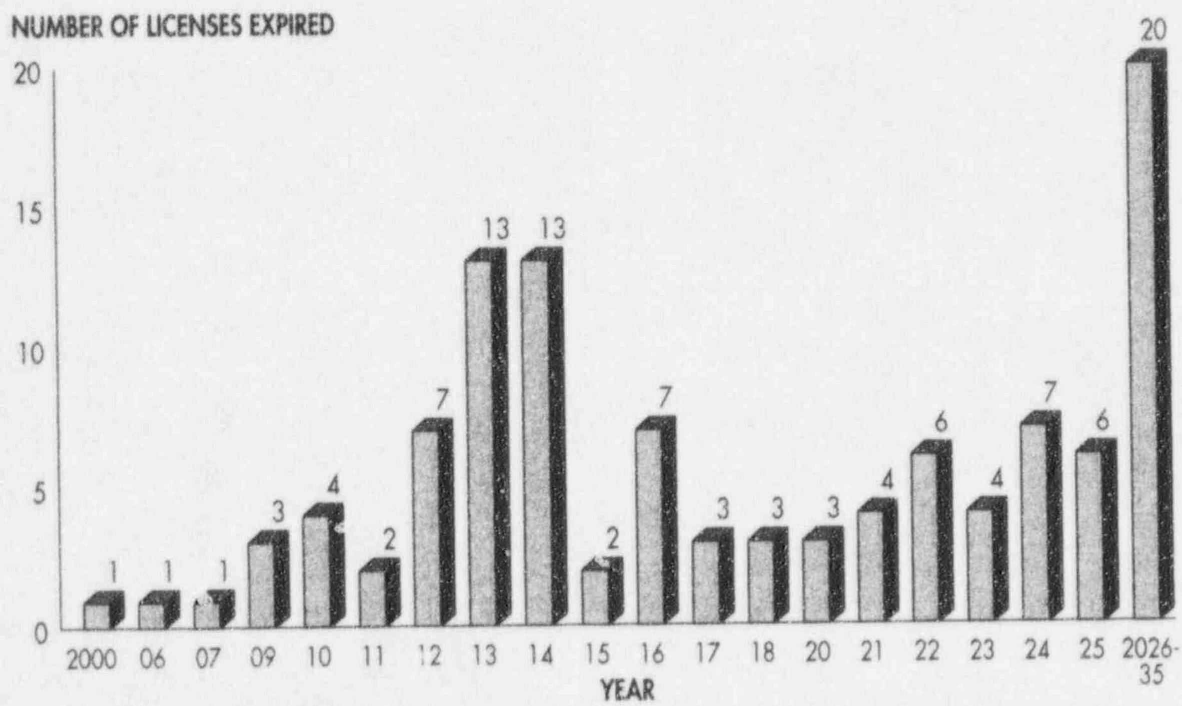
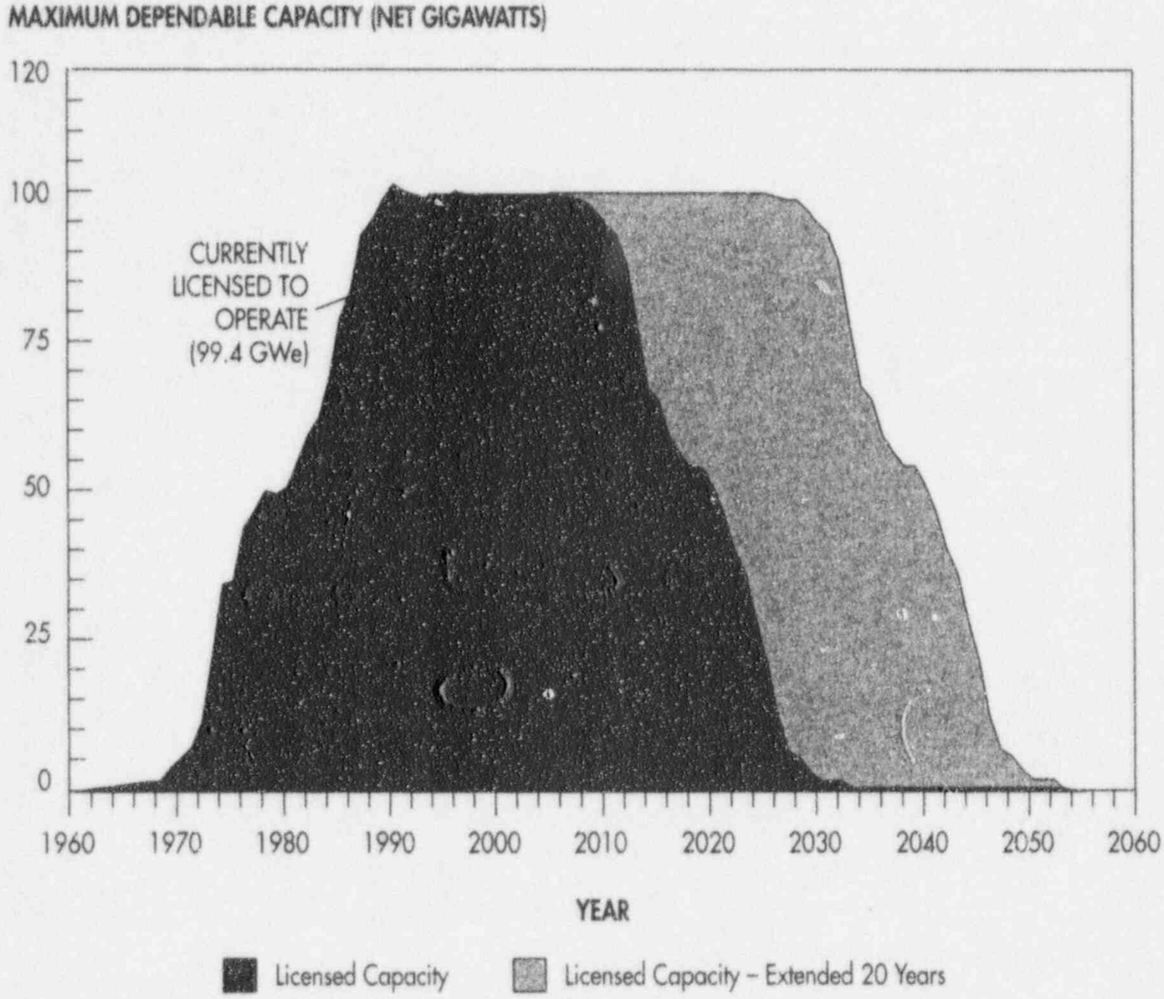


Figure 25. **U.S. Commercial Nuclear Power Reactor Generating Capacity, 1960-2060**



Note: Data assume current expiration dates have been adjusted for construction recapture and licenses extended 20 years. Reflects Haddam Neck prematurely shutting down in December, 1996. See Glossary for definition.

Source: Licensee data as compiled by the Nuclear Regulatory Commission

Future U.S. Commercial Nuclear Power Reactor Licensing *(Continued)*

Standardization of Future Reactor Designs:

The NRC has revised its regulations to make the licensing process for future nuclear power reactors more stable and predictable. This new licensing process provides for Early Site Permits, Certification of Standard Designs, and Combined Licenses. The changes should substantially improve the entire licensing process, with the goal that future nuclear power plants will use standard reactor designs that are certified by the NRC and will be located at preapproved sites. Standardization can minimize excessive diversity in reactor designs and can increase confidence in the safety, reliability, and availability of future nuclear power reactors.

The NRC issued final design approvals and expects to complete rulemaking certifying the two evolutionary designs, the General Electric Advanced Boiling-Water Reactor (ABWR) and the ASEA Brown Boveri/Combustion Engineering System 80+, in Spring of 1997. There is also one advanced light-water reactor design under NRC review for design certification, the Westinghouse Electric Corporation's advanced passive reactor (AP600). Activities associated with resolving the remaining technical and policy items, issuing the final design approval, and completing rulemaking for the design will continue through 1998. The AP600 employs passive safety features.

U.S. Nuclear Nonpower Reactors

Nuclear nonpower reactors are designed and utilized for research, testing, and educational purposes, for example:

- In the performance of research and testing in the areas of physics, chemistry, biology, medicine, materials sciences, and related fields
- In educating people for nuclear-related careers in the power industry, national defense, research, and education

There are 43 nonpower reactors licensed to operate in 27 States (see Figure 26):

- 4 nonpower reactors are being decommissioned
- 7 nonpower reactors have possession only licenses
- Since 1958, 72 licensed nonpower reactors have been decommissioned
- McClellan Air Force Base in California applied for a nonpower reactor license in October 1996.
- Refer to Appendix E for a listing of U.S. nuclear nonpower reactors with operating licenses

Principal Licensing and Inspection Activities:

- Approximately 300 nonpower reactor operators are licensed by the NRC:
  - Each operator is requalified before renewal of a 6-year license
- Approximately 40 nonpower reactor inspections are conducted annually

Figure 26. **U.S. Nuclear Nonpower Reactor Sites**

Note: There are no nonpower reactors in Alaska or Hawaii.

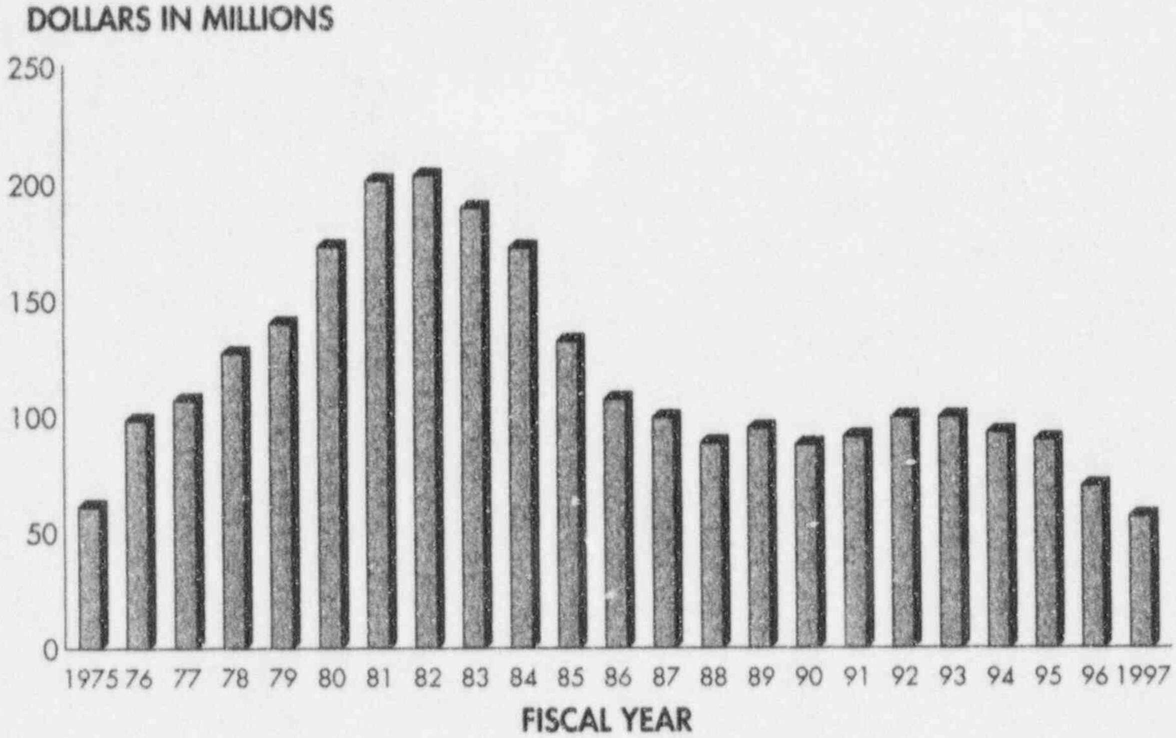
Source: Nuclear Regulatory Commission

Nuclear Regulatory Research

NRC's regulatory research program seeks to provide information necessary to resolve technical issues associated with nuclear safety and regulation of NRC licensed facilities. As such, the research program is both confirmatory of existing safety margins and anticipatory of future concerns. The challenges and influences that govern NRC's regulatory research program include: changes in the practices and performance of the regulated industry, increased economic pressures on licensees, emergence of new safety issues as the industry continues to mature, availability of new technologies, and public awareness and involvement in the regulatory process. The NRC's research program is key to providing the capability to face these challenges. Accordingly, the NRC must have highly skilled independent expertise and accurate information necessary to formulate sound technical solutions and make timely regulatory judgments.

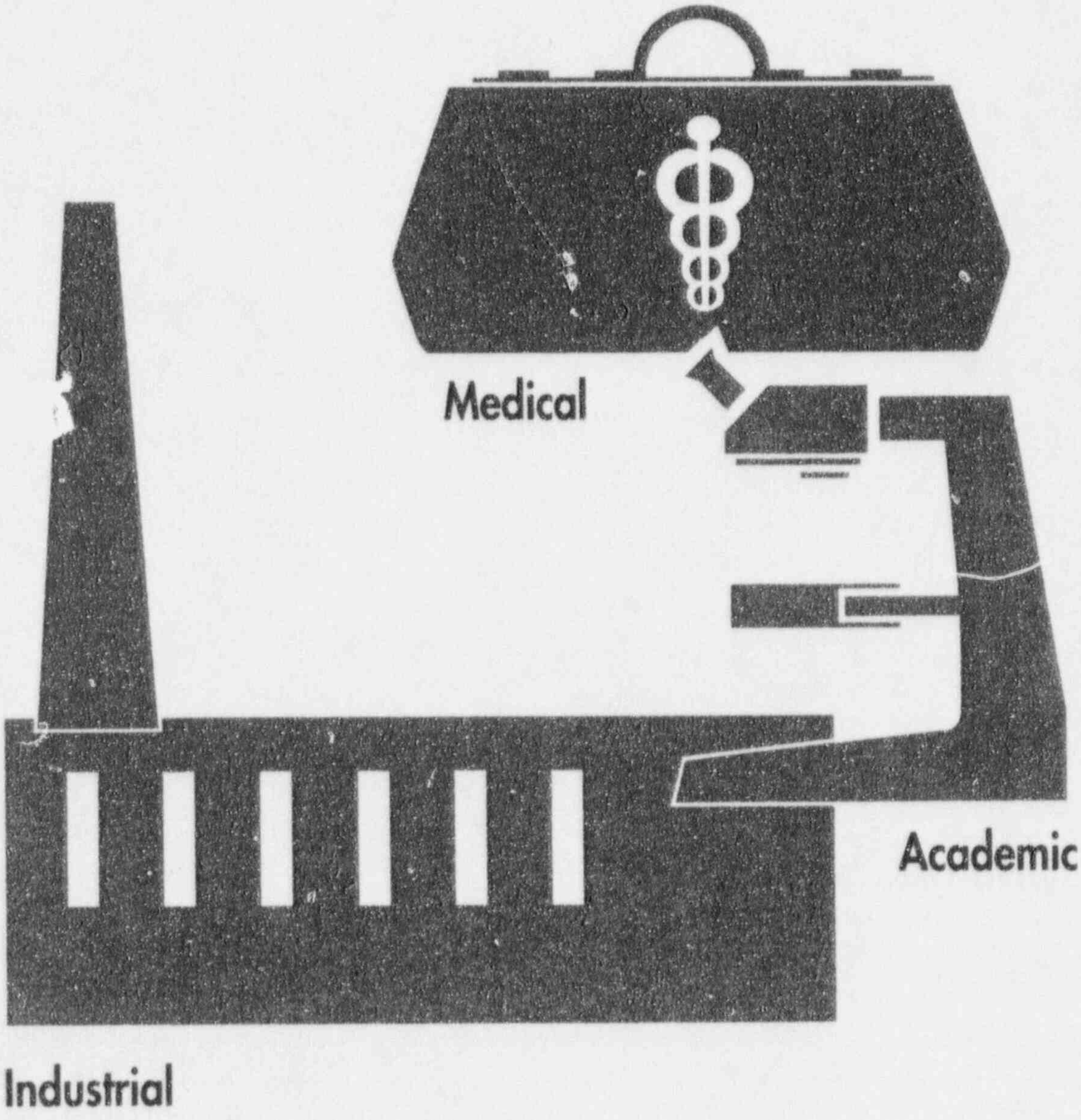
Over time, the NRC's research program has evolved as the regulated industry has matured, and that is reflected in the program's reduction in size as earlier technical issues have been resolved and corresponding regulations have been promulgated (see Figure 27). The current NRC research program focuses on supporting the NRC's review of emerging technologies (e.g., digital instrumentation and control systems), understanding and resolving nuclear plant aging issues arising as a result of operating experience, decommissioning licensed facilities, understanding the risks associated with nuclear facilities, preparing for license renewal applications, and understanding recent safety issues regarding design-basis accidents and postulated severe accidents that have been identified from the NRC's review of advanced reactor designs.

Figure 27. **Research Budget Trends FY 1975-1997**



The NRC research program provides the independent expertise and information necessary for making timely regulatory judgements, anticipating problems of potential safety significance for which new or expanded knowledge can assist NRC in pursuing its mission, and developing regulations and regulatory guides pertaining to Commission policy or technical requirements. Over the years, the research program has been significantly reduced to reflect the changing environment and the maturing industry.

Nuclear Material Safety



U.S. Fuel Cycle Facilities

The NRC licenses and inspects all commercial nuclear fuel facilities involved in the processing and fabrication of uranium ore into reactor fuel.

There are eight major facilities licensed to operate in seven States (see Figure 28):

- **Uranium Fuel Fabrication Facilities:**
  - ABB Combustion Engineering (Hematite, Missouri)
  - General Electric (Wilmington, North Carolina)
  - Westinghouse Electric Columbia, South Carolina)
  - Nuclear Fuel Services (Erwin, Tennessee)
  - Babcock & Wilcox Fuel Company (Lynchburg, Virginia)
  - Babcock & Wilcox Naval Nuclear Fuel Division (Lynchburg, Virginia)
  - Siemens Nuclear Power Corporation (Richland, Washington)
- **Uranium Hexafluoride Production Facilities:**
  - Allied-Signal Incorporated (Metropolis, Illinois)

In addition, NRC regulates the two gaseous diffusion uranium enrichment facilities, which are leased by the United States Enrichment Corporation from the Department of Energy. NRC promulgated regulations for the gaseous diffusion plants in 10 CFR Part 76 in September 1994. The two plants came under NRC regulation on March 3, 1997.

- **Gaseous Diffusion Enrichment Facilities:**
  - U. S. Enrichment Corporation (Paducah, Kentucky)
  - U. S. Enrichment Corporation (Piketon, Ohio)

In January 1991, the NRC received an application to construct and operate the Nation's first privately owned uranium enrichment facility in Homer, Louisiana. NRC's Safety Evaluation Report for the facility was published in January 1994, and NRC's Final Environmental Impact Statement was published in August 1994. Hearings were completed in 1995, and a final decision from the Atomic Safety and Licensing Board is expected in 1997.

In addition, NRC regulates 17 other facilities that possess significant quantities of special nuclear material (other than reactors) or process source material (other than uranium recovery facilities).

NRC is also engaged in a cooperative effort with the Department of Energy on processing and solidification of high-level radioactive waste for long-term isolation. Since 1980, the West Valley Demonstration Project Act has required NRC to oversee the protection of the public safety for the high-level waste vitrification demonstration project at the Western New York Nuclear Center, West Valley, New York. Under a joint project between the Department of Energy and New York State Energy Research and Development Authority, the West Valley Demonstration Project began converting liquid high-level waste into glass logs in July 1996.
In 1996, NRC also initiated a cooperative

project with the Department of Energy's Tank Waste Remediation System Privatization Project in Hanford, Washington. Under a Memorandum of Understanding signed in early 1997, NRC agreed to provide technical assistance to DOE's efforts for regulating the construction and operation of the high-level waste solidification facility, with the possibility that NRC may be called on to license that facility during the second phase of the project.

Principal Licensing and Inspection Activities:

- NRC issues approximately 120 new, renewal, license amendments, and safety and safeguards reviews for fuel cycle facilities annually.
- NRC routinely conducts safety inspections of approximately 15 fuel cycle facilities or sites.

Figure 28. **Major U.S. Fuel Cycle Facility Sites**

- ● Uranium Fuel Fabrication Facility (7)
- ■ Uranium Hexafluoride Production Facility (1)
- ★ Uranium Enrichment Facility Site (1)
- ▲ Gaseous Diffusion Enrichment Facility (2)

Note: There are no fuel cycle facilities in Alaska and Hawaii.
Source: Nuclear Regulatory Commission

U.S. Material Licenses

Approximately 21,600 licenses are issued for medical, academic, and industrial uses of nuclear material (see Table 13):

- Approximately 5,900 licenses are administered by the NRC.
- Approximately 15,700 licenses are administered by the 30 States that participate in the NRC Agreement States Program. The State of Massachusetts became an Agreement State in March 1997. An Agreement State is one that has signed an agreement with the NRC allowing the State to regulate the use of radioactive material within that State (see Figure 29). Other States that have applied for the Agreement States Program are Ohio, Pennsylvania and Oklahoma.

Medical - An estimated 8-9 million diagnostic and therapeutic clinical procedures using radioactive material, of which approximately 250,000 are therapeutic, are performed annually.

Academic - Used in universities, colleges, and other academic institutions in course work and research

Industrial - Used in such areas as radiography, gauging devices, gas chromatography, well logging, and smoke detectors

Principal Licensing and Inspection Activities:

- NRC issues approximately 3,200 new, renewal, or license amendments for material licenses annually.
- NRC conducts approximately 1,700 health and safety inspections of its nuclear material licensees annually.
- NRC implemented in 1996 the Materials Licensing Business Process Redesign initiative to streamline the workflow for processing materials licensing actions (see Figure 30).

Table 13. **U.S. Material Licenses by State**

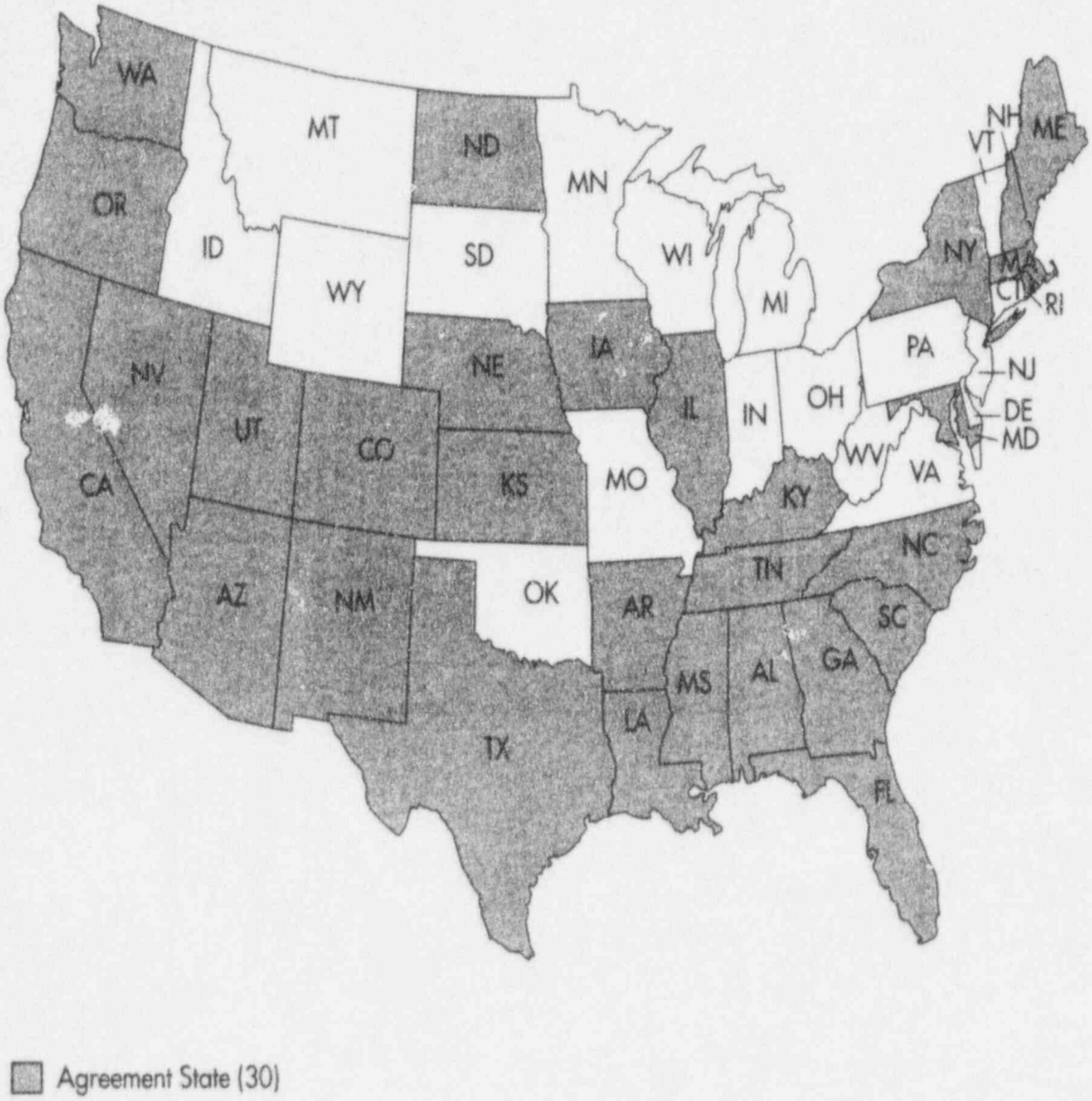
State	NRC	Agreement States
	Number of Licenses	
Alabama	19	401
Alaska	52	0
Arizona	20	285
Arkansas	9	267
California	61	2,100
Colorado	28	388
Connecticut	212	0
Delaware	63	0
District of Columbia	52	0
Florida	24	1,144
Georgia	17	500
Hawaii	64	0
Idaho	75	0
Illinois	57	789
Indiana	299	0
Iowa	6	215
Kansas	18	322
Kentucky	15	403
Louisiana	12	511
Maine	5	128
Maryland	65	561
Massachusetts	48	612
Michigan	522	0
Minnesota	172	0
Mississippi	10	320
Missouri	301	0
Montana	84	0
Nebraska	4	171
Nevada	5	181
New Hampshire	11	99
New Jersey	538	0
New Mexico	22	240
New York	51	1,558
North Carolina	16	538
North Dakota	8	69
Ohio	620	0
Oklahoma	234	0
Oregon	10	268
Pennsylvania	808	0
Rhode Island	2	83
South Carolina	12	330
South Dakota	45	0
Tennessee	25	563
Texas	60	2,043
Utah	15	223
Vermont	37	0
Virginia	388	0
Washington	19	412
West Virginia	199	0
Wisconsin	272	0
Wyoming	89	0
Others*	161	0
Total	**5,961**	**15,724**

*"Others" includes territories such as Puerto Rico, Virgin Islands, Guam, and American Samoa.

Note: NRC data as of 04/14/97. Agreement States data are latest available as of 12/96.

Source: Nuclear Regulatory Commission and a 01/96 report by the Texas Department of Health, Bureau of Radiation Control.

Figure 29. **NRC Agreement States**

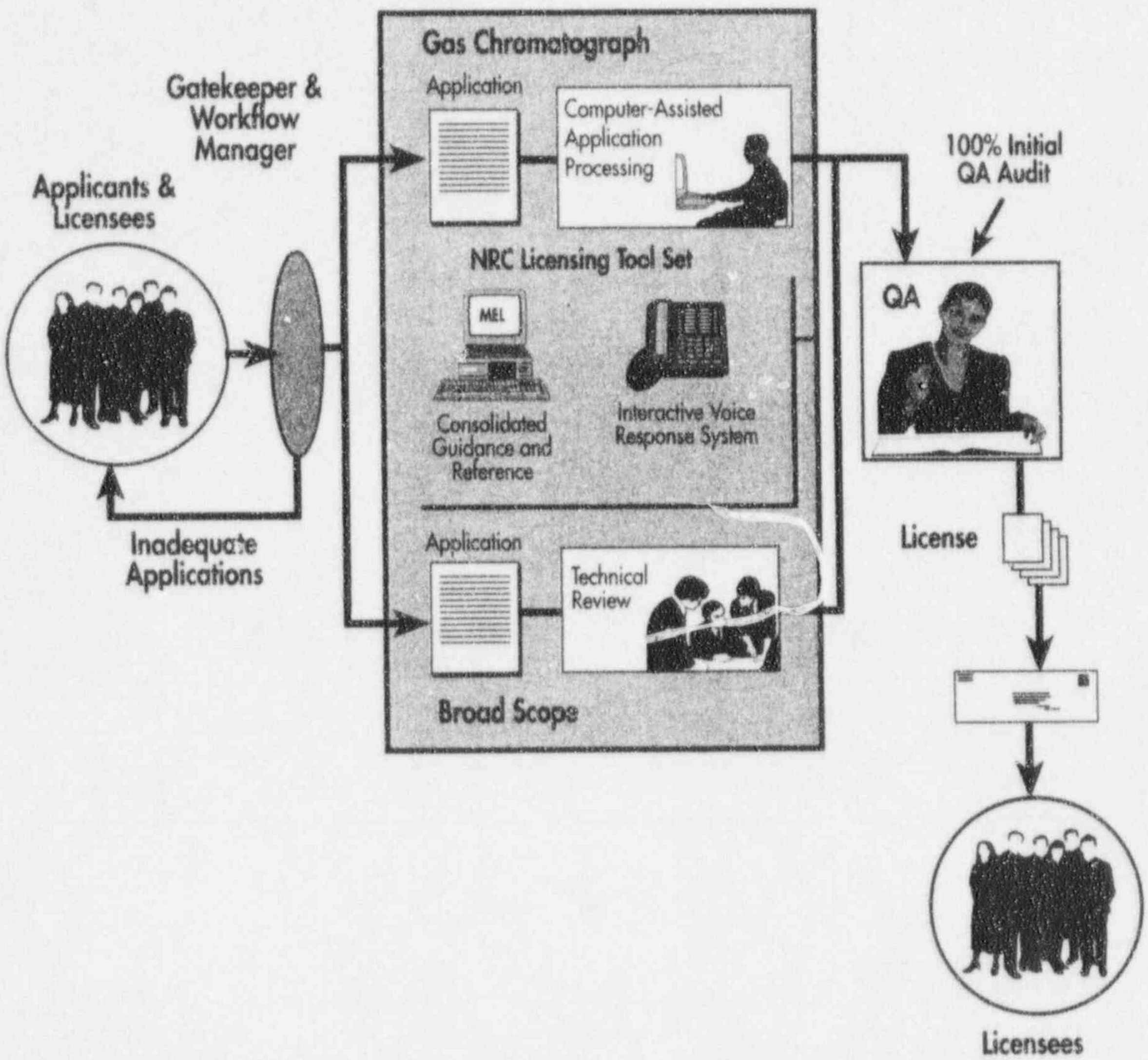


* The State of Massachusetts became an Agreement State in March 1997.

Note: Data as of 3/97. Alaska and Hawaii are not Agreement States.

Source: Nuclear Regulatory Commission

Figure 30. **Business Process Redesign**



Applications for relatively simple actions go through a computer-assisted process. This process uses artificial intelligence-assisted scripts to help reviewers rapidly determine if the applications conform with established NRC regulations and licensing policies. Applications for more complex uses would be processed by trained technical reviewers, working either individually or in teams.

U.S. Nuclear Material Transportation and Safeguards

The NRC reviews and licenses the design of containers used to transport radioactive materials; conducts transport-related safety inspections; quality assurance inspections of designers, fabricators, and suppliers of approved transportation containers; and safeguards inspections of nuclear material licensees.

Both the NRC and the Department of Energy continue joint operation of a national database and information support system to track movement of domestic and foreign nuclear material under safeguards control.

Principal Licensing and Inspection Activities:

- NRC examines transport-related safety during approximately 1,000 safety inspections of fuel, reactor, and material licensees annually.
- NRC reviews, evaluates, and certifies approximately 100 new, renewal, or amended container-design applications for the transport of nuclear material annually.
- NRC reviews and evaluates approximately 100 license applications for the export of nuclear material from the United States annually.
- NRC conducts comprehensive physical security and material control and accounting license reviews and conducts inspections at the major fuel fabrication facilities annually.
- NRC inspects 10 to 12 dry storage and transport package vendors annually.

International Nuclear Safety and Safeguards

The NRC participates in a broad program of international cooperation related to nuclear safety and safeguards.

- NRC has 33 arrangements/letters of agreement signed with regulatory organizations. These arrangements/ letters of agreement:
  - Ensure prompt notification of safety problems that warrant action or investigation
  - Provide for bilateral cooperation on nuclear safety, safeguards, waste management, and radiological protection with:

    — Argentina, Belgium, Brazil, Canada, China, Czech Republic, Egypt, Finland, France, Germany, Greece, Hungary, Indonesia, Israel, Italy, Japan, Kazakstan, Korea, Lithuania, Mexico, Netherlands, Peru, Philippines, Russia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Ukraine, and the United Kingdom

- NRC is assisting Russia, Ukraine, Armenia, Kazakstan and Central and Eastern European countries (Bulgaria, Hungary, the Czech and Slovak Republics, and Lithuania) that use Soviet-designed reactors to improve nuclear safety regulation. These assistance efforts are carried out primarily through training, working group meetings, exchange of specialists, and technical information exchanges.

- Under the Cooperative Threat Reduction (CTR) Program, NRC provides support to the regulatory agencies in Russia, Ukraine, and Kazakstan in the development of material protection, control, and accounting (MPC&A) regulations and MPC&A licensing and inspection programs. NRC also provides this support to Russia under the Lisbon Initiative Program.

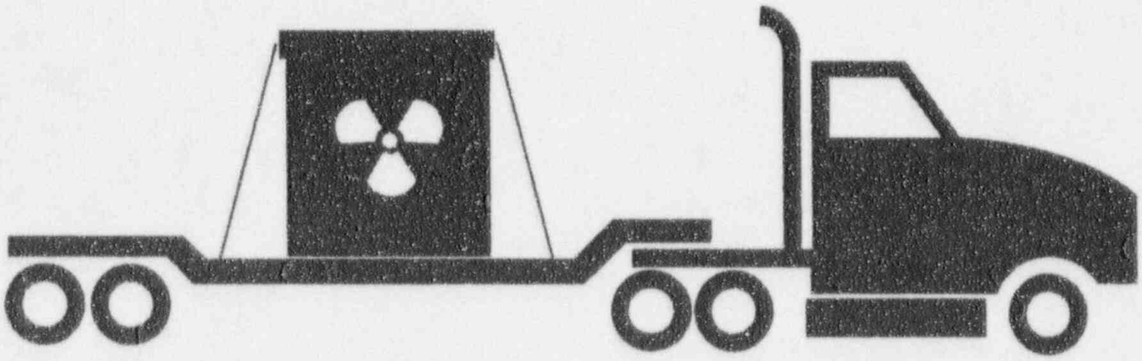
- NRC participates in the programs of the International Atomic Energy Agency (IAEA), and the Organization for Economic Cooperation and Development's Nuclear Energy Agency concerned with physical protection of nuclear materials, reactor safety research and regulatory matters, radiation protection, risk assessment, waste management, transportation, safeguards, standards, training, and technical assistance.

- NRC implements IAEA safeguards at NRC-licensed nuclear facilities in the U.S. and helps strengthen and maintain IAEA effectiveness worldwide.

- NRC licenses imports and exports of nuclear facilities, equipment, material, and related commodities.

- NRC is involved in approximately 55 joint international safety research agreements. Participants share the exchange of technical information, funding, technical support, and results of specific joint projects and programs.

Radioactive Waste



U.S. Low-Level Radioactive Waste Disposal

Low-level waste disposal facilities must be licensed by either NRC or Agreement States in accordance with health and safety requirements. The facilities are to be designed, constructed, and operated to meet safety standards. The operator of the facility must also extensively characterize the site on which the facility is located and analyze how the facility will perform for thousands of years into the future. NRC's requirements place restrictions on the types of waste that can be disposed of. A new low-level waste disposal facility, typical of those proposed in the east or midwest United States is shown in Figure 31. Current low-level disposal uses shallow land burial sites without concrete vaults.

Approximately 690 thousand cubic feet of low-level radioactive waste was disposed of in 1995, a 20 percent decrease from the preceding year (see Figures 32 and 33).

- The NRC has developed a classification system for low-level waste based on its potential hazards, and has specified disposal and waste form requirements for each of the three general classes of waste — A, B, and C. Class A waste contains lower concentrations of radioactive material than Class C waste.

The volume and radioactivity of waste vary from year to year based on the types and quantities of waste shipped each year (see Figures 33 and 34).

The Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA) of 1985 authorized:

- Formation of regional compacts; nine compacts now active. The Texas, Maine, and Vermont compact has been introduced into Congress for congressional consent (see Table 14 and Figure 35)
- Exclusion of waste generated outside a compact
- System of milestones, incentives, and penalties to ensure that States and compacts will be responsible for their own waste

Active, Licensed Disposal Facilities:

- Barnwell, South Carolina (access authorized for all low-level waste generators except North Carolina)
- Hanford, Washington (restricted access to only the Northwest and Rocky Mountain compacts)
- Clive, Utah (restricted to only Class A low-activity, high-volume waste, e.g., slightly contaminated soil)

Other Disposal Facilities:

Closed Sites:

- Beatty, Nevada-closed 1993
- Sheffield, Illinois-closed 1978
- Maxey Flats, Kentucky-closed 1977
- West Valley, New York-closed 1975

Disposal Facilities Licensed, But not Operating:

- Ward Valley, California (never operated, licensed in 1993, conditioned upon future ownership of the site by the State; U.S. Department of Interior and California are negotiating land transfer)

Disposal Facilities Under License Review by the Agreement State Regulatory Authorities:

- Boyd County, Nebraska
- Hudspeth County, Texas
- Wake County, North Carolina

Figure 31. **Low-Level Waste Disposal Site**

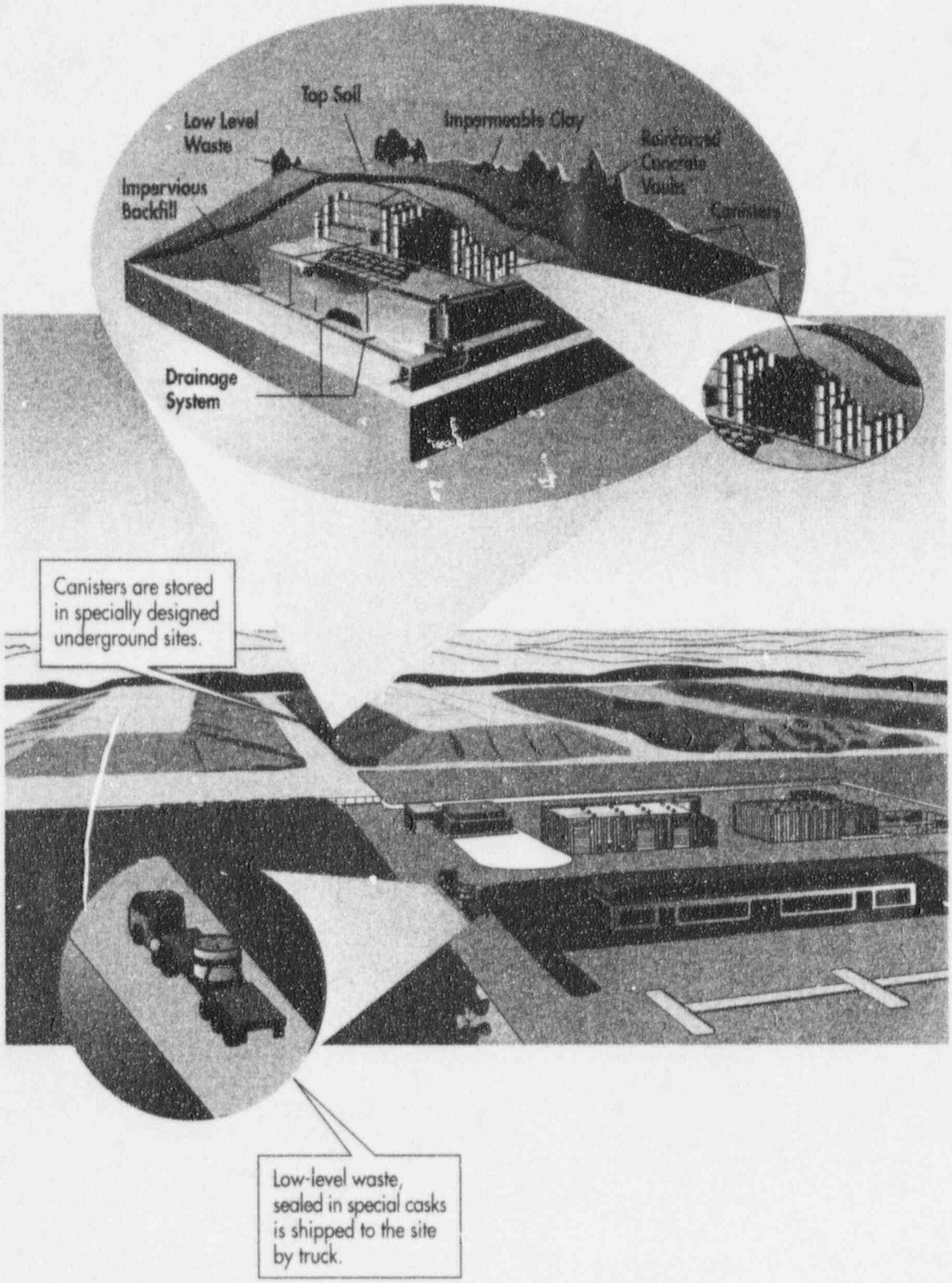
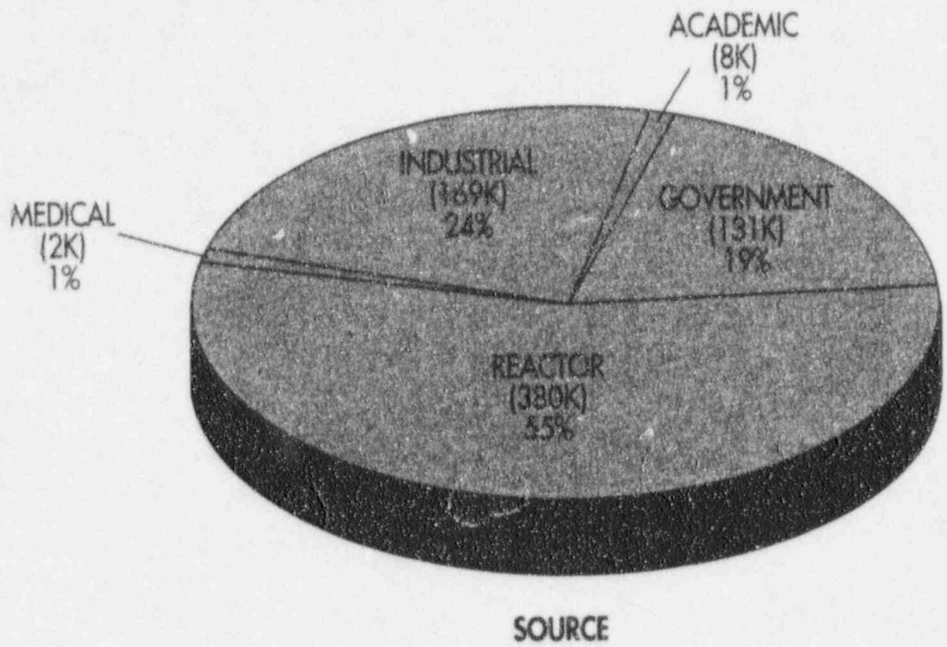
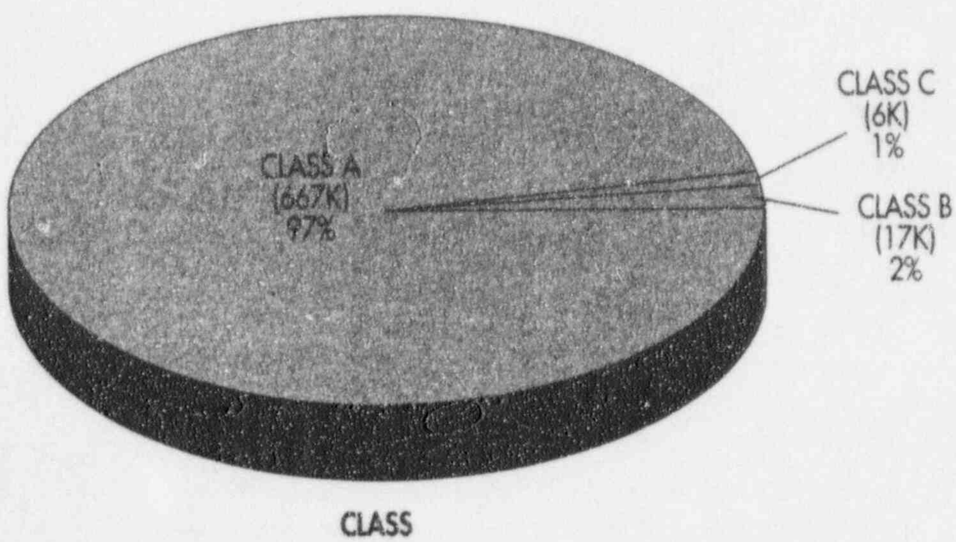


Figure 32. **1995 Volume of Low-Level Radioactive Waste Received at U.S. Disposal Facilities (Cubic Feet)**



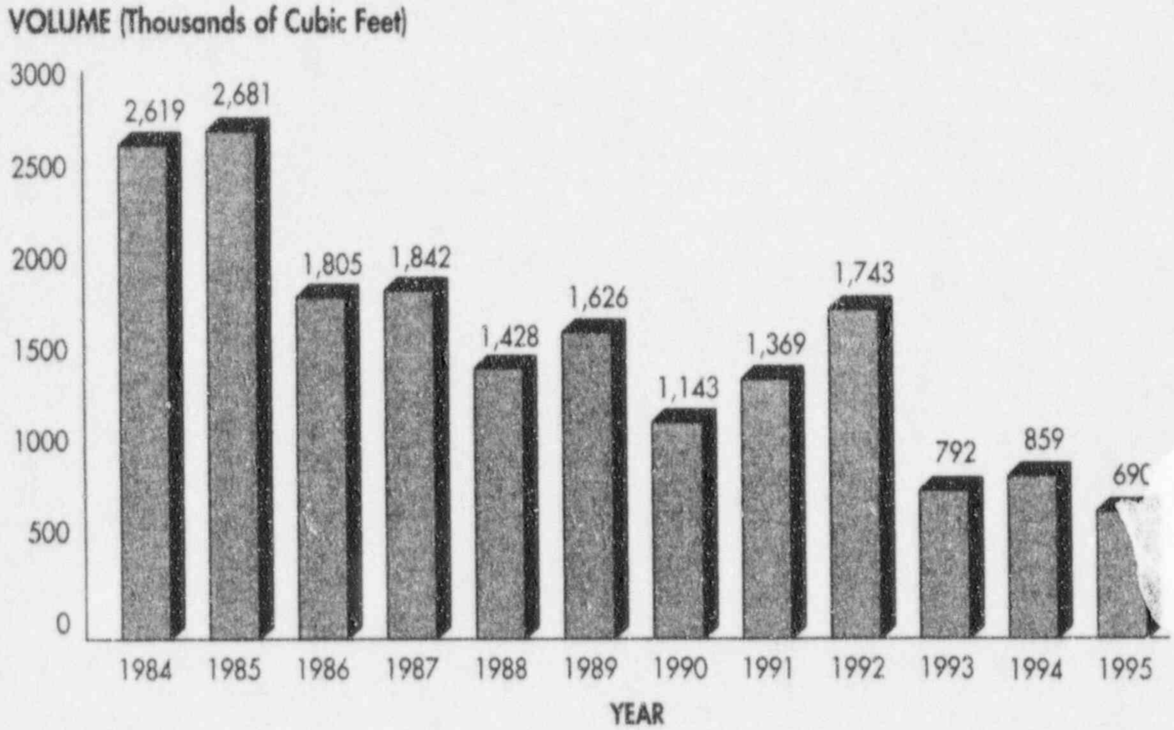
Total Amount Received:
690 Thousand Cubic Feet

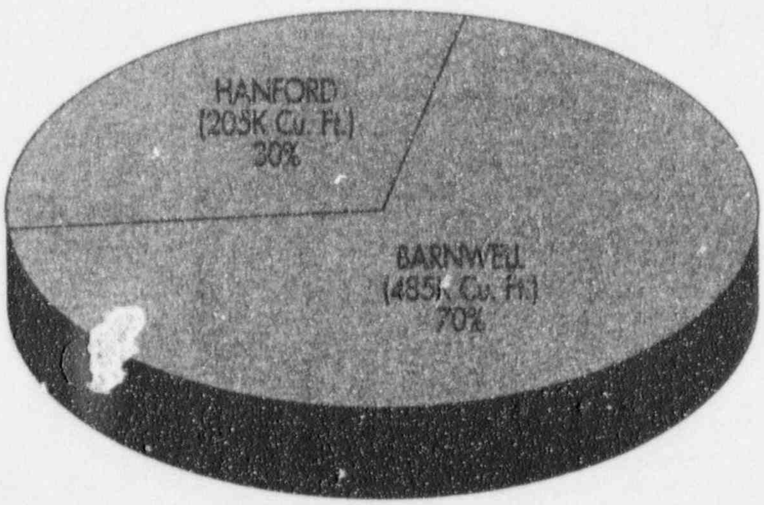


Note: Class A waste contains lower concentrations of radioactive material than Class C waste. Determination of the classification of waste, however, is a complex process. For more information, see 10 CFR Part 61. Volumes are rounded to the nearest thousand cubic feet and percentages are rounded to the nearest whole number.

Source: DOE 1995 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW– 237), (page A-1 and page A-2)

Figure 33. **Volume of Low-Level Waste Received at U.S. Disposal Facilities, 1984-1995**



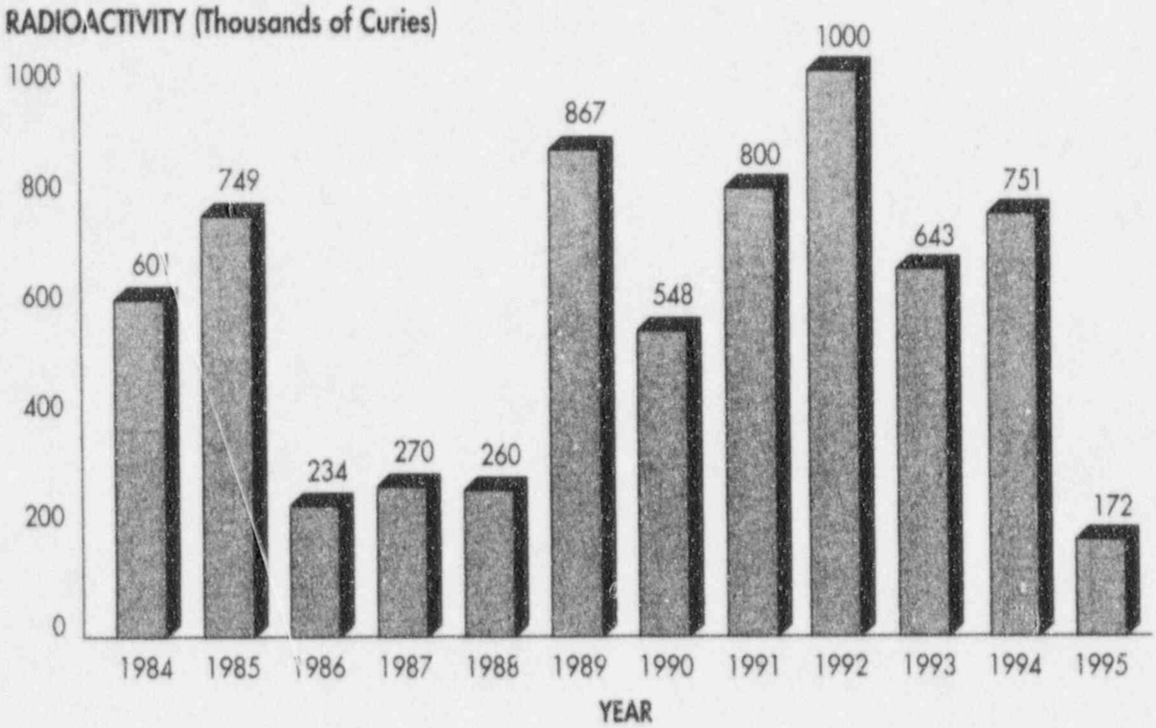


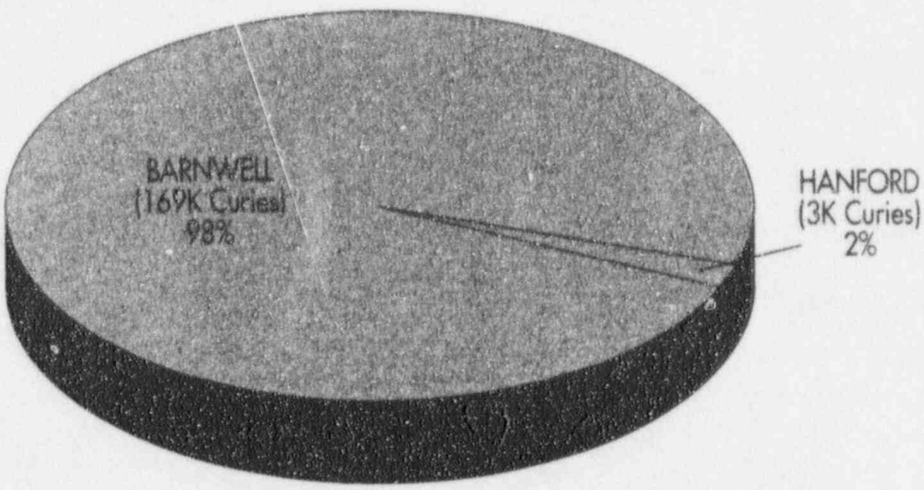
1995 VOLUME BY DISPOSAL FACILITY

Note: Volumes are rounded to the nearest thousand cubic feet and percentages are rounded to the nearest whole number.

Source: DOE 1995 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW–237), Table 2 (page 6)

Figure 34. **Radioactivity of Low-Level Waste Received at U.S. Disposal Facilities, 1984-1995**





1995 RADIOACTIVITY BY DISPOSAL FACILITY

Note: Radioactivity is rounded to the nearest thousand curies and percentages are rounded to the nearest whole number.

Source: DOE 1995 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW-237), Table 2 (page 6)

Table 14. **U.S. Low-Level Waste Compacts**

Compact	Percent of Total Volume of Low-Level Waste Disposed in 1995
Northwest	20%
Alaska	
Hawaii	
Idaho	
Montana	
Oregon	
Utah	
Washington*	
Wyoming	
Southwestern	2%
Arizona	
California**	
North Dakota	
South Dakota	
Rocky Mountain	10%
Colorado	
Nevada	
New Mexico	
Midwest	2%
Indiana	
Iowa	
Minnesota	
Missouri	
Ohio**	
Wisconsin	
Central Interstate	2%
Arkansas	
Kansas	
Louisiana	
Nebraska**	
Oklahoma	
Central Midwest	8%
Illinois**	
Kentucky	
Appalachian	6%
Delaware	
Maryland	
Pennsylvania**	
West Virginia	
Northeast	3%
Connecticut**	
New Jersey**	
Southeast	28%
Alabama	
Florida	
Georgia	
Mississippi	
North Carolina**	
Tennessee	
Virginia	
Unaffiliated States	19%
District of Columbia	<0.1%
Maine+	0.4%
Massachusetts**	1.6%
Michigan**	3.0%
New Hampshire	<0.1%
New York**	1.5%
Puerto Rico	0%
Rhode Island	<0.1%
South Carolina*	12.6%
Texas**+	0.4%
Vermont+	<0.1%

* Current Host State (2)

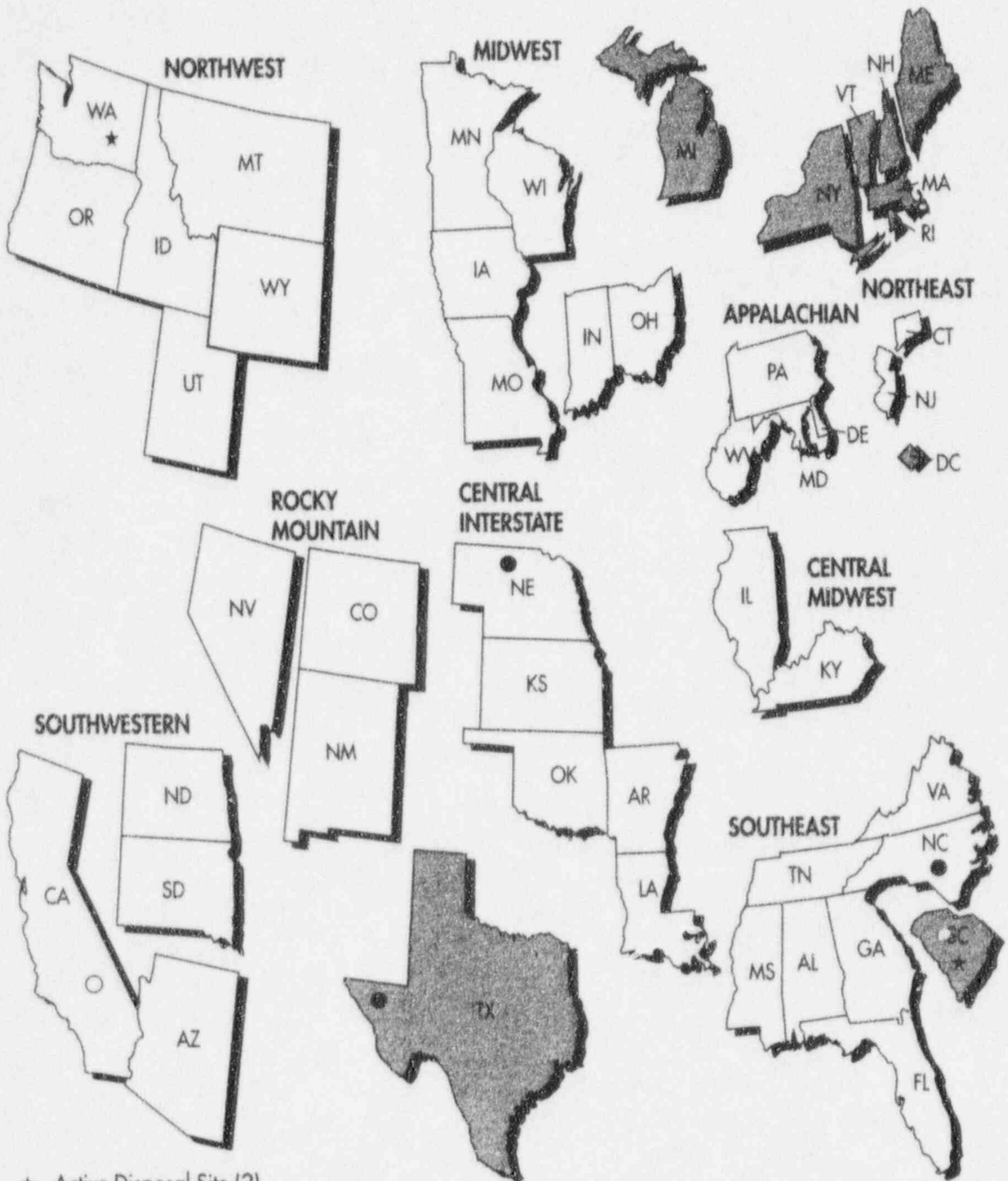
** Selected Host State (12)

\+ Proposed compact with Maine, Vermont, and Texas (3)

Note: Percentages have been adjusted to reflect the withdrawal of South Carolina from the Southeast Compact in June 1995. Totals do not equal sum of components due to independent rounding.

Source: DOE 1995 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW-237), Table 1 (pages 3 and 4), and the Nuclear Regulatory Commisssion

Figure 35. **U.S. Low-Level Waste Compacts**



★ Active Disposal Site (2)
● Disposal Site Under License Review (3)
○ Licensed Disposal Site – Operations Conditioned on Site Ownership (Under Litigation) (1)
□ Approved Compact (9)
▩ Unaffiliated State (11)

Note: Data as of September 1996.
Alaska and Hawaii belong to the Northwest Compact. Puerto Rico is an unaffiliated State. Texas, Maine, and Vermont Compact awaiting Congressional consent.

Source: Nuclear Regulatory Commission

U.S. High-Level Radioactive Waste Disposal

The Nuclear Waste Policy Act of 1982 and the Nuclear Waste Policy Amendments Act of 1987 specify a detailed approach for the disposal of high-level radioactive waste with the Department of Energy (DOE) having operational responsibility and the NRC having regulatory responsibility for the transportation, storage, and geologic disposal of the waste.

- The disposal of high-level radioactive waste requires a determination of acceptable health and environmental impacts over thousands of years.

- Current plans call for the ultimate disposal of the waste in solid form in a licensed deep, geologic structure.

- The Amendments Act redirected DOE to investigate only one potential high-level waste repository at Yucca Mountain, Nevada. DOE is currently working on a viability assessment for 1998. (See Figure 36 for a conceptual design of the Yucca Mountain storage plan.)

- Ultimately, any high-level waste repository will require an NRC license.

Approximately 30,000 metric tons of spent nuclear fuel is stored at commercial nuclear power reactors as of 1995. By the year 2005, this amount is expected to increase to 52,000 metric tons (see Table 15):

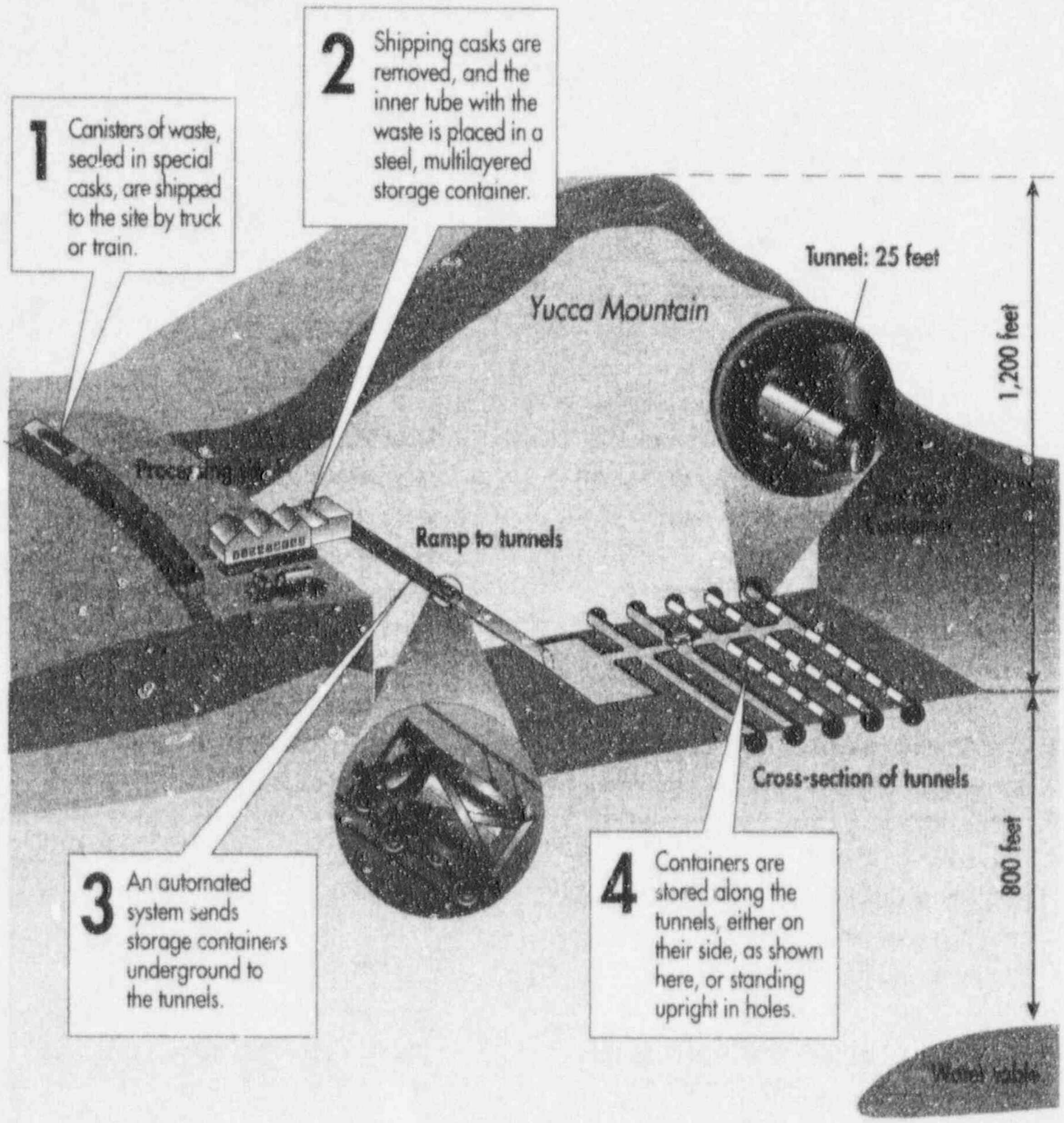
- All of the operating nuclear power reactors are storing used fuel under NRC license in spent fuel pools (see Figure 37).

- In 1990, the NRC amended its regulations to authorize licensees to store spent fuel at reactor sites in storage casks approved by the NRC. Seven cask designs have received certificates of compliance as a result of this rule change (see Appendix G). Current operating independent spent fuel storage installation sites are shown on Figure 39.

- Refer to Appendix H for a list of NRC Dry Spent Fuel Storage Licensees.

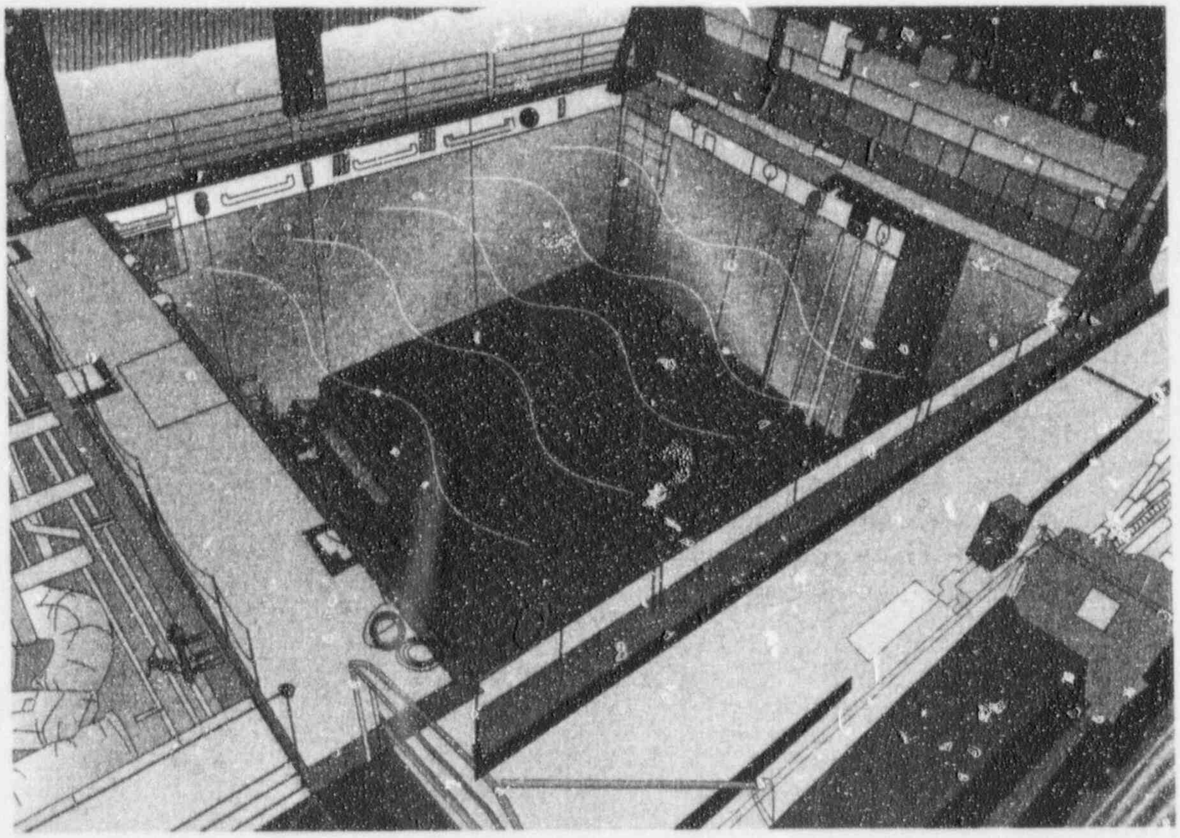
- The NRC is also responsible for approving dual-purpose (transportation and interim storage) casks (see Figure 38).

Figure 36. **The Yucca Mountain Storage Plan**



Source: Department of Energy and the Nuclear Energy Institute

Figure 37. **Nuclear Fuel Storage Pool**

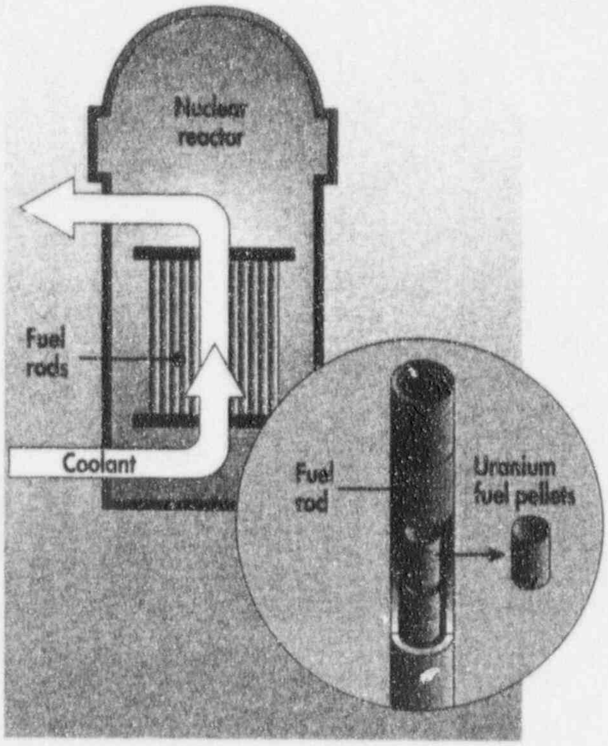


Commercial light-water nuclear reactors store spent fuel outside the primary containment in a steel-lined, seismically designed concrete pool. The spent fuel is cooled while in the spent fuel storage pool by water that is force-circulated using electrically powered pumps. Makeup water to the pool is provided by other pumps that can be powered from an on-site emergency diesel generator. Support features, such as water and radiation level detectors, are also provided. Spent fuel is stored in the spent fuel storage pool until it can be transferred on-site to a dry cask storage location or transported off-site to a high-level radioactive waste disposal site.

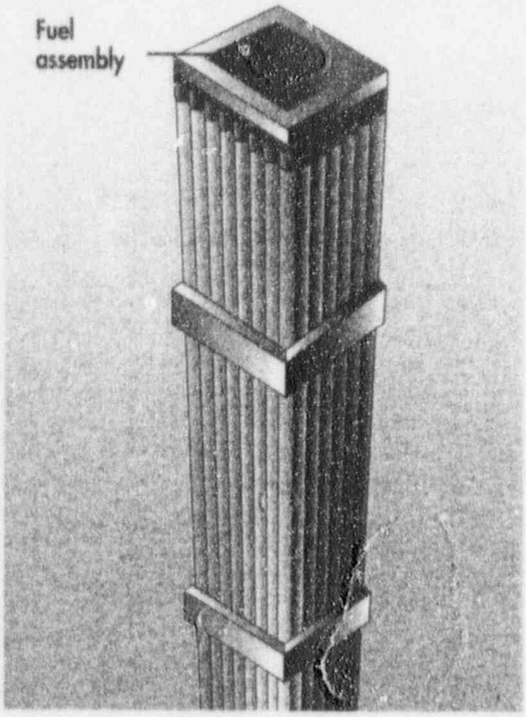
Source. Department of Energy and the Nuclear Energy Institute

Figure 38. **Storage of High-Level Radioactive Waste**

At nuclear reactors across the country, high-level radioactive waste is kept on site, above ground, in systems basically similar to the one shown here. On-site storage is supposed to be temporary, however, and many plants have already reached capacity.

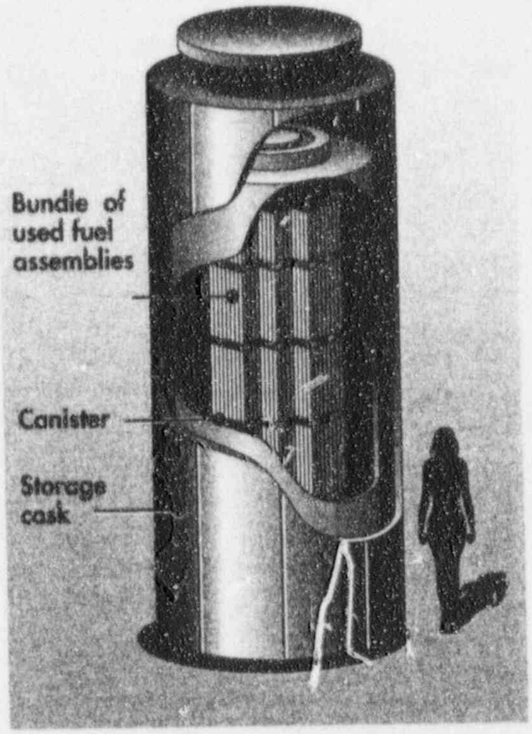


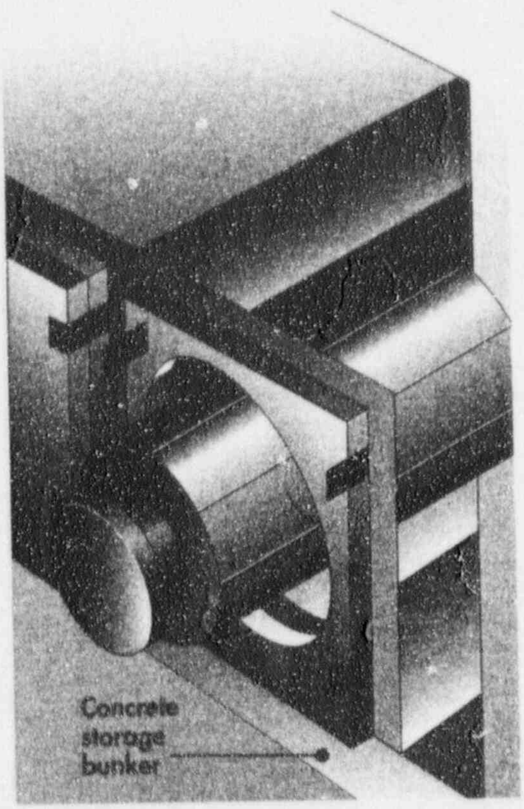
1 Nuclear reactors are powered by enriched uranium-235 fuel. Fission generates heat, which produces steam, which turns turbines to produce electricity. A reactor rated at several hundred megawatts may contain 100 or more tons of fuel in the form of bullet-sized pellets loaded into long rods.



2 After about six years, spent fuel assemblies—typically 14 feet long and containing nearly 200 fuel rods—are removed from the reactor and allowed to cool in storage pools for a few years. At this point, the 900-pound assemblies contain only about one-fifth the original amount of U-235.

3 Once the spent fuel has cooled somewhat, it is loaded into special canisters, each of which is designed to hold about two dozen assemblies. Water and air are removed. The canister is filled with inert gas, welded shut and rigorously tested for leaks. It may then be placed in a "cask" for storage or transportation.





4 The canisters can also be stored in above-ground concrete bunkers, each of which is about the size of a one-car garage. Eventually they may be transported elsewhere for storage.

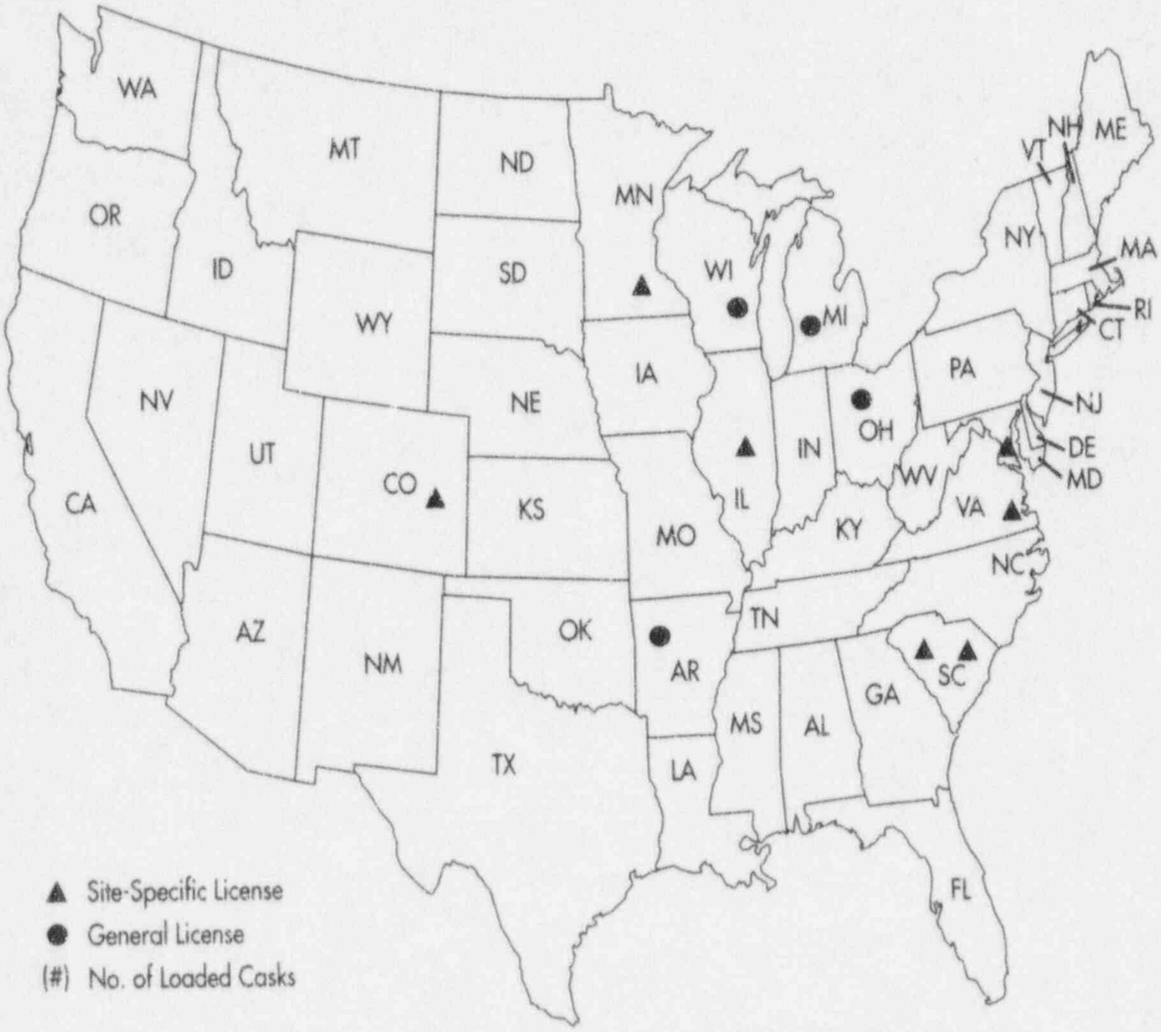
Table 15. **Spent Nuclear Fuel Stored at U.S. Commercial Nuclear Power Reactors–Total Metric Tons by State**

State	1995	State	1995
Alabama	1,439	Mississippi	299
Arizona	465	Missouri	240
Arkansas	581	Nebraska	353
California	1,319	New Hampshire	96
Colorado	15	New Jersey	1,187
Connecticut	1,254	New York	1,714
Florida	1,440	North Carolina	1,575
Georgia	1,019	Ohio	422
Illinois	4,292	Oregon	359
Iowa	235	Pennsylvania	2,536
Kansas	226	South Carolina	1,789
Louisiana	390	Tennessee	415
Maine	433	Texas	361
Maryland	608	Vermont	366
Massachusetts	429	Virginia	1,155
Michigan	1,260	Washington	219
Minnesota	648	Wisconsin	809
		Total	**29,948**

Note: Values include spent nuclear fuel stored at formerly operating reactors and exclude spent fuel stored at DOE facilities.

Source: Spent Fuel Discharges From U.S. Reactors (SR/CNEAF/96-01), February 1996

Figure 39. **Operating Independent Spent Fuel Storage Installations**



ARKANSAS
● Arkansas Nuclear 1, 2 (2)

COLORADO
▲ Fort St. Vrain (247)

ILLINOIS
▲ GE Morris (Wet Storage)

MARYLAND
▲ Calvert Cliffs 1, 2 (14)

MICHIGAN
● Palisades (13)

MINNESOTA
▲ Prairie Island 1, 2 (7)

OHIO
● Davis-Besse (3)

SOUTH CAROLINA
▲ Oconee (34)
▲ H.B. Robinson (8)

VIRGINIA
▲ Surry 1, 2 (31)

WISCONSIN
● Point Beach (2)

* Data as of February 12, 1997
Source: Nuclear Regulatory Commission

Decommissioning

Decommissioning is the safe removal of a facility from service and reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license (see Glossary).

Nuclear Power Reactors:

In July 1996, the NRC issued a revised rule for power reactor decommissioning. The rule is intended to clarify the applicability of certain regulations to permanently shut down nuclear power reactors and to provide for public participation in the decommissioning process. The NRC is currently overseeing the decommissioning of 15 nuclear power reactors. Refer to Appendix B for their decommissioning status.

Other Sites and Facilities:

Over the last 40 years, operations at licensed nuclear facilities have caused radiological contamination at a number of sites. This contamination must be reduced or stabilized in a timely and efficient manner to ensure protection of the public and the environment before the sites can be released and the license terminated. The NRC's Site Decommissioning Management Plan lists 28 sites that require special attention to resolve decommissioning policy and regulatory issues, and to prompt timely decommissioning at these sites (see Table 16). The list is updated annually and published as NUREG-1444 and Supplement No. 1.

Table 16. **Site Decommissioning Management Plan Site List**

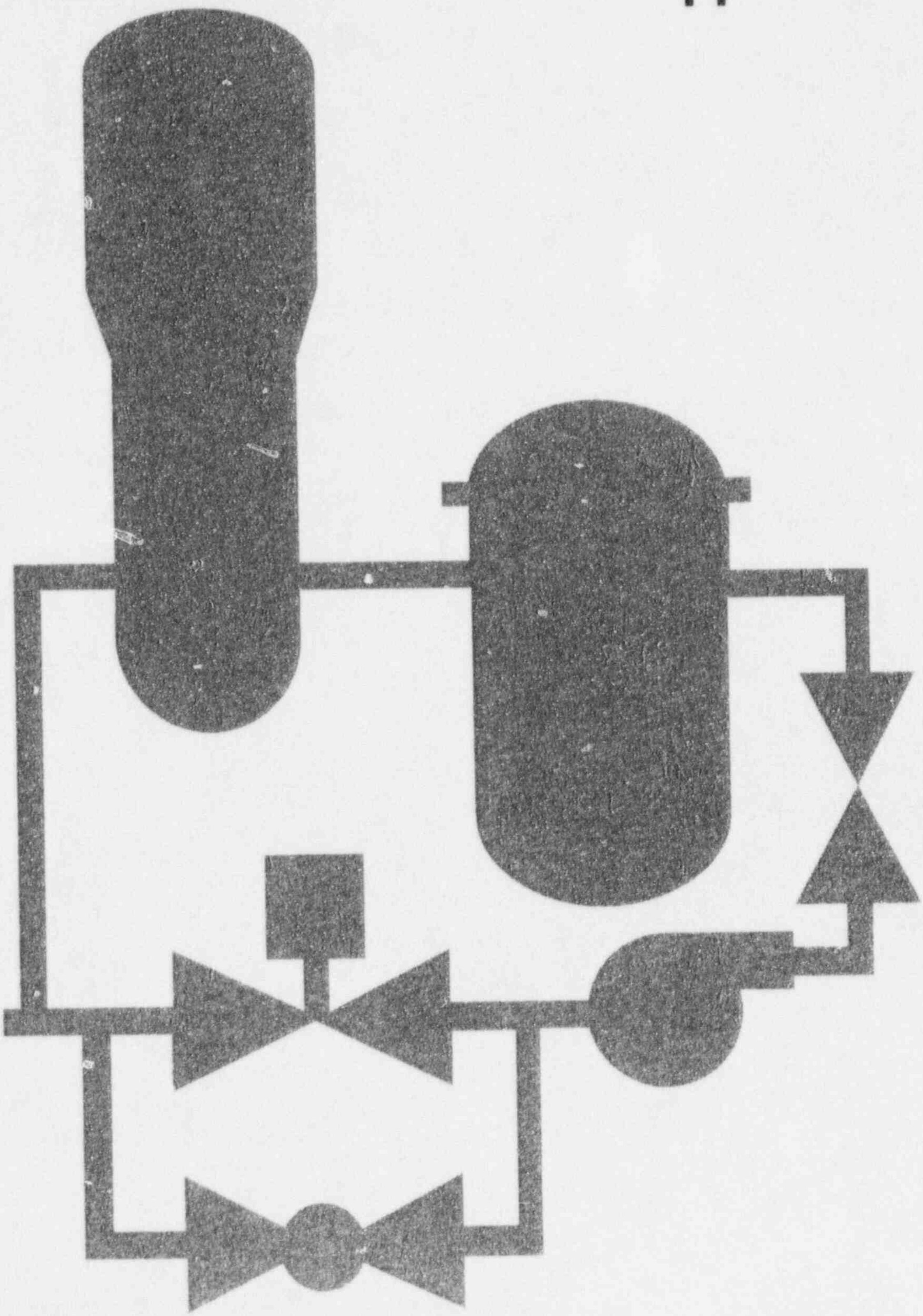
Company	Location
Advanced Medical Systems, Inc.	Cleveland, OH
Anne Arundel County/Curtis Bay	Anne Arundel County, MD
Army, Department of, Jefferson Proving Ground	Jefferson, IN
Babcock & Wilcox	Parks Township, PA
BP Chemicals America, Inc,	Lima, OH
Brooks & Perkins	Detroit, MI
Brooks & Perkins	Livonia, MI
Cabot Corporation	Boyertown, PA
Cabot Corporation	Reading, PA
Cabot Corporation	Revere, PA
Chemetron Corporation, Bert Avenue	Cleveland, OH
Chemetron Corporation, Harvard Avenue	Cleveland, OH
Clevite	Cleveland, OH
Dow Chemical Company	Bay City and Midland, MI
Elkem Metals, Inc.	Marietta, OH
Englehard Corporation	Plainville, MA
Fansteel, Inc.	Muskogee, OK
Hartley and Hartley (Kawkawlin) Landfill	Bay County, MI
Heritage Minerals	Lakehurst, NJ
Horizons, Inc.	Cleveland, OH
Kaiser Aluminum	Tulsa, OK
Kerr-McGee	Cimarron, OK
Kerr-McGee	Cushing, OK
Lake City Army Ammunition Plant (formerly Remington Arms Company)	Independence, MO
Minnesota Mining and Manufacturing Co. (3M)	Pine County, MN
Molycorp, Inc.	Washington, PA
Molycorp, Inc.	York, PA
Northeast Ohio Regional Sewer District/Southerly Plant	Cleveland, OH
Nuclear Metals, Inc.	Concord, MA
Permagrain Products	Media, PA
Pesses Comany, METCOA Site	Pulaski, PA
RMI Titanium Company	Ashtabula, OH

(Continued

Company	Location
Safety Light Corporation	Bloomsburg, PA
Schott Glass Technologies	Duryea, PA
Sequoyah Fuels Corporation	Gore, OK
Shieldalloy Metallurgical Corporation	Cambridge, OH
Shieldalloy Metallurgical Corporation	Newfield, NJ
Watertown Arsenal/Mall	Watertown, MA
Watertown GSA	Watertown, MA
Westinghouse Electric Corporation	Waltz Mill, PA
Whittaker Corporation	Greenville, PA
Wyman-Gordon Company	North Grafton, MA

Source: Nuclear Regulatory Commission

Appendices



Abbreviations Used In Appendices

ACECOWEN: Belgian Consortium with Westinghouse
AE: Architect-Engineer
AECL: Atomic Energy of Canada, Ltd.
AEE: Atomenergoexport
AEP: American Electric Power
AGN: Aerojet-General Nucleonics
B&R: Burns & Roe
B&W: Babcock & Wilcox
BALD: Baldwin Associates
BECH: Bechtel
BRRT: Brown & Root
BWR: Boiling-Water Reactor
COMB: Combustion Engineering
COMM. OP.: Date of Commercial Operation
CON TYPE: Containment Type
- DRYAMB: Dry, Ambient Pressure
- DRYSUB: Dry, Subatmospheric
- HTG: High-Temperature Gas-Cooled
- ICECND: Wet, Ice Condenser
- LMFB Liquid Metal Fast Breeder
- MARK 1: Wet, Mark I
- MARK 2: Wet, Mark II
- MARK 3: Wet, Mark III
- OCM: Organic Cooled & Moderated
- PTHW: Pressure Tube, Heavy Water
- SCF: Sodium Cooled, Fast
- SCGM: Sodium Cooled, Graphite Moderated

CP ISSUED: Date of Construction Permit Issuance
CPPR: Construction Permit Power Reactor
CWE: Commonwealth Edison Company
CX: Critical Assembly
DANI: Daniel International
DBDB: Duke & Bechtel
DER: Design Electric Rating
DPR: Demonstration Power Reactor
DUKE: Duke Power Company
EBSO: Ebasco
EXP. DATE: Expiration Date of Operating License
FRAM: Framatome
FLUR: Fluor Pioneer
G&H: Gibbs & Hill
GCR: Gas-Cooled Reactor
GE: General Electric
GHDR: Gibbs & Hill & Durham & Richardson
GIL: Gilbert Associates
GPC: Georgia Power Company
HIT: Hitachi
HWR: Pressurized Heavy-Water Reactor
JONES: J. A. Jones
KAIS: Kaiser Engineers
KWU: Kraftwerk Union, Siemens AG
LIC. TYPE: License Type
- CP: Construction Permit
- OL-FP: Operating License-Full Power
- OL-LP: Operating License-Low Power

MDC: Maximum Dependable Capacity - Net
MHI: Mitsubishi Heavy Industries, Ltd.
MWe: Megawatts Electrical
MWt: Megawatts Thermal
NIAG: Niagara Mohawk Power Corporation
NPF: Nuclear Power Facility
NSP: Northern States Power Company
NSSS: Nuclear Steam System Supplier & Design Type
- 1: GE Type 1
- 2: GE Type 2
- 3: GE Type 3
- 4: GE Type 4
- 5: GE Type 5
- 6: GE Type 6
- 2LP: Westinghouse Two-Loop
- 3LP: Westinghouse Three-Loop
- 4LP: Westinghouse Four-Loop
- CE: Combustion Engineering
- CE80: CE Standard Design
- LLP: B&W Lowered Loop
- RLP: B&W Raised Loop

OL ISSUED: Date of Latest Full Power Operating License
PG&E: Pacific Gas & Electric Company
PSE: Pioneer Services & Engineering
PUBS: Public Service Electric & Gas Company
PWR: Pressurized-Water Reactor
R: Research
S&L: Sargent & Lundy
S&W: Stone & Webster
SBEC: Southern Services & Bechtel
SSI: Southern Services Incorporated
TNPG: The Nuclear Power Group
TOSH: Toshiba
TR: Test Reactor
TVA: Tennessee Valley Authority
UE&C: United Engineers & Constructors
UTR: Universal Training Reactor
WDCO: Westinghouse Development Corporation
WEST: Westinghouse Electric

U.S. Commercial Nuclear Power Reactors

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Arkansas Nuclear 1 Entergy Operations, Inc. 6 MI WNW of Russellville, AR 050-00313	IV	PWR-DRYAMB B&W LLP BECH BECH	2568	0836	12/06/1968 05/21/1974 12/19/1974 05/20/2014	OL-FP DPR-51	89.3 79.3 83.7 98.3 81.6 85.6
Arkansas Nuclear 2 Entergy Operations, Inc. 6 MI WNW of Russellville, AR 050-00368	IV	PWR-DRYAMB COMB CE BECH BECH	2815	0858	12/06/1972 09/01/1978 03/26/1980 07/17/2018	OL-FP NPF-6	81.4 73.0 97.7 89.5 75.6 93.7
Beaver Valley 1 Duquesne Light Co. 17 MI W of McCandless, PA 050-00334	I	PWR-DRYSUB WEST 3LP S&W S&W	2652	0810	06/26/1970 07/02/1976 10/01/1976 01/29/2016	OL-FP DPR-66	52.2 88.5 61.4 77.6 76.7 80.0
Beaver Valley 2 Duquesne Light Co. 17 MI W of McCandless, PA 050-00412	I	PWR-DRYSUB WEST 3LP S&W S&W	2652	0820	05/03/1974 08/14/1987 11/17/1987 05/27/2027	OL-FP NPF-73	94.1 78.4 72.4 97.8 84.1 66.2
Big Rock Point Consumers Power Co. 4 MI NE of Charlevoix, MI 050-00155	III	BWR-DRYAMB GE 1 BECH BECH	0240	0067	05/31/1960 05/01/1964 03/29/1963 05/31/2000	OL-FP DPR-6	83.8 46.1 72.6 69.9 88.0 62.1
Braidwood 1 Commonwealtt Edison Co. 24 MI SSW o' Joilet, IL 050-00456	III	PWR-DRYAMB WEST 4LP S&L CWE	3411	1120	12/31/1975 07/02/1987 07/29/1988 10/17/2026	OL-FP NPF-72	50.8 72.7 88.6 75.3 67.2 70.5
Braidwood 2 Commonwealth Edison Co. 24 MI SSW of Joilet, IL 050-00457	III	PWR-DRYAMB WEST 4LP S&L CWE	3411	1120	12/31/1975 05/20/1988 10/17/1988 12/18/2027	OL-FP NPF-77	66.6 89.0 74.9 67.6 97.2 81.3
Browns Ferry 1 Tennessee Valley Authority 10 MI NW of Decatur, AL 050-00259	II	BWR-MARK1 GE 4 TVA TVA	3293	0	05/10/1967 12/20/1973 08/01/1974 12/20/2013	OL-FP DPR-33	0.0 0.0 0.0 0.0 0.0 0.0

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Browns Ferry 2 Tennessee Valley Authority 10 MI NW of Decatur, AL 050-00260	II	BWR-MARK1 GE 4 TVA TVA	3293	1065	05/10/1967 08/02/1974 03/01/1975 06/28/2014	OL-FP DPR-52	40.3 89.7 61.9 78.7 98.6 86.0
Browns Ferry 3 Tennessee Valley Authority 10 MI NW of Decatur, AL 050-00296	II	BWR-MARK1 GE 4 TVA TVA	3293	1065	07/31/1968 08/18/1976 03/01/1977 07/02/2016	OL-FP DPR-68	0.0 0.0 0.0 0.0 70.4 94.1
Brunswick 1 Carolina Power & Light Co. 2 MI N of Southport, NC 050-00325	II	BWR-MARK1 GE 4 UE&C BRRT	2558	0767	02/07/1970 11/12/1976 03/18/1977 09/08/2016	OL-FP DPR-71	65.4 27.1 -1.0 88.6 85.9 84.7
Brunswick 2 Carolina Power & Light Co. 2 MI N of Southport, NC 050-00324	II	BWR-MARK1 GE 4 UE&C BRRT	2436	0754	02/07/1970 12/27/1974 11/03/1975 12/27/2014	OL-FP DPR-62	55.1 19.0 60.2 72.8 94.1 78.3
Byron 1 Commonwealth Edison Co. 17 MI SW of Rockford, IL 050-00454	III	PWR-DRYAMB WEST 4LP S&L CWE	3411	1105	12/31/1975 02/14/1985 09/16/1985 10/31/2024	OL-FP NPF-37	65.2 92.6 76.0 76.7 79.5 70.6
Byron 2 Commonwealth Edison Co. 17 MI SW of Rockford, IL 050-00455	III	PWR-DRYAMB WEST 4LP S&L CWE	3411	1105	12/31/1975 01/30/1987 08/21/1987 11/06/2026	OL-FP NPF-66	90.6 72.0 78.8 98.2 84.5 80.6
Callaway Union Electric Co. 10 MI SE of Fulton, MO 050-00483	IV	PWR-DRYAMB WEST 4LP BECH DANI	3565	1125	04/16/1976 10/18/1984 12/19/1984 10/18/2024	OL-FP NPF-30	101.3 81.9 85.5 102.4 83.7 90.0
Calvert Cliffs 1 Baltimore Gas & Electric Co. 40 MI S of Annapolis, MD 050-00317	I	PWR-DRYAMB COMB CE BECH BECH	2700	0835	07/07/1969 07/31/1974 05/08/1975 07/31/2014	OL-FP DPR-53	75.6 56.8 101.1 64.3 96.1 65.8

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Calvert Cliffs 2 Baltimore Gas & Electric Co. 40 MI S of Annapolis, MD 050-00318	I	PWR-DRYAMB COMB CE BECH BECH	2700	0840	07/07/1969 11/30/1976 04/01/1977 08/31/2016	OL-FP DPR-69	50.3 90.9 68.6 89.8 80.3 98.2
Catawba 1 Duke Power Co. 6 MI NNW of Rock Hill, SC 050-00413	II	PWR-ICECND WEST 4LP DUKE DUKE	3411	1129	08/07/1975 01/17/1985 06/29/1985 12/06/2024	OL-FP NPF-35	67.4 70.9 76.6 98.9 88.2 63.6
Catawba 2 Duke Power Co. 6 MI NNW of Rock Hill, SC 050-00414	II	PWR-ICECND WEST 4LP DUKE DUKE	3411	1129	08/07/1975 05/15/1986 08/19/1986 02/24/2026	OL-FP NPF-52	73.5 93.5 82.5 77.6 80.3 93.1
Clinton Illinois Power Co. 6 MI E of Clinton, IL 050-00461	III	BWR-MARK3 GE 6 S&L BALD	2894	0930	02/24/1976 04/17/1987 11/24/1987 09/29/2026	OL-FP NPF-62	74.2 60.4 72.2 91.0 75.0 65.0
Comanche Peak 1 Texas Utilities Electric Co. 4 MI N of Glen Rose, TX 050-00445	IV	PWR-DRYAMB WEST 4LP G&H BRRT	3411	1150	12/19/1974 04/17/1990 08/13/1990 02/08/2030	OL-FP NPF-87	53.2 68.8 71.0 93.0 77.5 76.8
Comanche Peak 2 Texas Utilities Electric Co. 4 MI N of Glen Rose, TX 050-00446	IV	PWR-DRYAMB WEST 4LP BECH BRRT	3411	1150	12/19/1974 04/06/1993 08/03/1993 02/02/2033	OL-FP NPF-89	– – 82.8 52.2 91.0 73.0
Cooper Nebraska Public Power District 23 MI S of Nebraska City, NE 050-00298	IV	BWR-MARK1 GE 4 B&R B&R	2381	0764	06/04/1968 01/18/1974 07/01/1974 01/18/2014	OL-FP DPR-46	71.8 92.8 55.5 33.3 61.7 94.5
Crystal River 3 Florida Power Corp. 7 MI NW of Crystal River, FL 050-00302	II	PWR-DRYAMB B&W LLP GIL JONES	2544	0818	09/25/1968 01/28/1977 03/13/1977 12/03/2016	OL-FP DPR-72	75.9 73.5 84.5 82.9 101.0 33.6

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Davis-Besse Toledo Edison Co. 21 MI ESE of Toledo, OH 050-00346	III	PWR-DRYAMB B&W LLP BECH BECH	2772	0873	03/24/1971 04/22/1977 07/31/1978 04/22/2017	OL-FP NPF-3	76.3 99.3 79.2 84.0 100.5 84.3
D. C. Cook 1 Indiana/Michigan Power Co. 11 MI S of Benton Harbor, MI 050-00315	III	PWR-ICECND WEST 4LP AEP AEP	3250	1000	03/25/1969 10/25/1974 08/28/1975 10/25/2014	OL-FP DPR-58	83.2 55.7 100.0 65.7 61.6 95.3
D. C. Cook 2 Indiana/Michigan Power Co. 11 MI S of Benton Harbor, MI 050-00316	III	PWR-ICECND WEST 4LP AEP AEP	3411	1060	03/25/1969 12/23/1977 07/01/1978 12/23/2017	OL-FP DPR-74	85.7 14.9 81.3 38.0 92.6 86.2
Diablo Canyon 1 Pacific Gas & Electric Co. 12 MI WSW of San Luis Obispo, CA 050-00275	IV	PWR-DRYAMB WEST 4LP PG&E PG&E	3338	1073	04/23/1968 11/02/1984 05/07/1985 09/22/2021	OL-FP DPR-80	78.3 79.0 96.0 78.4 79.2 93.2
Diablo Canyon 2 Pacific Gas & Electric Co. 12 MI WSW of San Luis Obispo, CA 050-00323	IV	PWR-DRYAMB WEST 4LP PG&E PG&E	3411	1087	12/09/1970 08/26/1985 03/13/1986 04/26/2025	OL-FP DPR-82	81.0 96.9 81.8 82.9 92.6 83.1
Dresden 2 Commonwealth Edison Co. 9 MI E of Morris, IL 050-00237	III	BWR-MARK1 GE 3 S&L UE&C	2527	0772	01/10/1966 02/20/1991 06/09/1970 01/10/2006	OL-FP DPR-19	43.9 55.4 45.0 60.2 27.5 31.4
Dresden 3 Commonwealth Edison Co. 9 MI E of Morris, IL 050-00249	III	BWR-MARK1 GE 3 S&L UE&C	2527	0773	10/14/1966 03/02/1971 11/16/1971 01/12/2011	OL-FP DPR-25	37.9 23.5 73.3 24.0 51.2 43.4
Duane Arnold IES Utilities, Inc. 8 MI NW of Cedar Rapids, IA 050-00331	III	BWR-MARK1 GE 4 BECH BECH	1658	0520	06/22/1970 02/22/1974 02/01/1975 02/21/2014	OL-FP DPR-49	91.9 73.7 71.7 91.1 82.8 86.2

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Edwin I. Hatch 1 Southern Nuclear Operating Co. 11 MI N of Baxley, GA 050-00321	II	BWR-MARK1 GE 4 BECH GPC	2558	0805	09/30/1969 10/13/1974 12/31/1975 08/06/2014	OL-FP DPR-57	72.4 94.6 76.7 84.8 99.6 80.7
Edwin I. Hatch 2 Southern Nuclear Operating Co. 11 MI N of Baxley, GA 050-00366	II	BWR-MARK1 GE 4 BECH GPC	2558	0809	12/27/1972 06/13/1978 09/05/1979 06/13/2018	OL-FP NPF-5	73.8 69.8 75.4 78.7 75.0 98.8
Fermi 2 Detroit Edison Co. 25 MI NE of Toledo, OH 050-00341	III	BWR-MARK1 GE 4 S&L DANI	3430	0876	09/26/1972 07/15/1985 01/23/1988 03/20/2025	OL-FP NPF-43	66.7 79.0 87.2 0.0 66.9 62.3
Fort Calhoun Omaha Public Power District 19 MI N of Omaha, NE 050-00285	IV	PWR-DRYAMB COMB CE GHDR GHDR	1500	0478	06/07/1968 08/09/1973 09/26/1973 08/09/2013	OL-FP DPR-40	77.6 60.4 74.1 98.4 80.4 74.5
Ginna Rochester Gas & Electric Corp. 20 MI NE of Rochester, NY 050-00244	I	PWR-DRYAMB WEST 2LP GIL BECH	1520	0470	04/25/1966 12/10/1984 07/01/1970 09/18/2009	OL-FP DPR-18	84.6 84.4 85.0 81.9 88.4 70.2
Grand Gulf 1 Entergy Operations, Inc. 25 MI S of Vicksburg, MS 050-00416	IV	BWR-MARK3 GE 6 BECH BECH	3833	1179	09/04/1974 11/01/1984 07/01/1985 06/16/2022	OL-FP NPF-29	91.1 81.4 78.9 96.0 79.2 89.3
Haddam Neck** CT Yankee Atomic Power Co. 13 MI E of Meriden, CT 050-00213	I	PWR-DRYAMB WEST 4LP S&W S&W	1825	0560	05/26/1964 12/27/1974 01/01/1968 06/29/2007	OL-FP DPR-61	74.9 78.9 76.2 77.4 74.5 56.2
H. B. Robinson 2 Carolina Power & Light Co. 26 MI from Florence, SC 050-00261	II	PWR-DRYAMB WEST 3LP EBSO EBSO	2300	0683	04/13/1967 09/23/1970 03/07/1971 07/31/2010	OL-FP DPR-23	80.0 67.7 70.0 77.7 86.1 91.0

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Hope Creek 1 Public Service Electric & Gas Co. 18 MI SE of Wilmington, DE 050-00354	I	BWR-MARK1 GE 4 BECH BECH	3293	1031	11/04/1974 07/25/1986 12/20/1986 04/11/2026	OL-FP NPF-57	81.9 77.9 97.7 78.9 78.2 74.6
Indian Point 2 Consolidated Edison Co. 24 MI N of New York City, NY 050-00247	I	PWR-DRYAMB WEST 4LP UE&C WDCO	3071	0951	10/14/1966 09/28/1973 08/01/1974 09/28/2013	OL-FP DPR-26	47.5 95.7 72.0 92.8 59.3 94.9
Indian Point 3 Power Authority of the State of New York 24 MI N of New York City, NY 050-00286	I	PWR-DRYAMB WEST 4LP UE&C WDCO	3025	0965	08/13/1969 04/05/1976 08/30/1976 12/15/2015	OL-FP DPR-64	86.4 56.2 14.1 0.0 17.4 69.3
James A. FitzPatrick Power Authority of the State of New York 8 MI NE of Oswego, NY 050-00333	I	BWR-MARK1 GE 4 S&W S&W	2536	0762	05/20/1970 10/17/1974 07/28/1975 10/17/2014	OL-FP DPR-59	49.4 0.0 69.5 73.4 70.7 78.6
Joseph M. Farley 1 Southern Nuclear Operating Co. 18 MI SE of Dothan, AL 050-00348	II	PWR-DRYAMB WEST 3LP SSI DANI	2652	0812	08/16/1972 06/25/1977 12/01/1977 06/25/2017	OL-FP NPF-2	75.9 79.2 96.6 85.2 80.7 100.1
Joseph M. Farley 2 Southern Nuclear Operating Co. 18 MI SE of Dothan, AL 050-00364	II	PWR-DRYAMB WEST 3LP SSI BECH	2652	0822	08/16/1972 03/31/1981 07/30/1981 03/31/2021	OL-FP NPF-8	93.4 74.7 72.7 99.3 70.7 79.5
Kewaunee Wisconsin Public Service Corp. 27 MI E of Green Bay, WI 050-00305	III	PWR-DRYAMB WEST 2LP PSE PSE	1650	0511	08/06/1968 12/21/1973 06/16/1974 12/21/2013	OL-FP DPR-43	82.7 87.7 85.3 88.5 84.7 70.6
La Salle County 1 Commonwealth Edison Co. 11 MI SE of Ottawa, IL 050-00373	III	BWR-MARK2 GE 5 S&L CWE	3323	1036	09/10/1973 08/13/1982 01/01/1984 05/17/2022	OL-FP NPF-11	75.2 70.9 79.3 54.2 92.2 36.3

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
La Salle County 2 Commonwealth Edison Co. 11 MI SE of Ottawa, IL 050-00374	III	BWR-MARK2 GE 5 S&L CWE	3323	1036	09/10/1973 03/23/1984 10/19/1984 12/16/2023	OL-FP NPF-18	96.0 63.5 64.4 92.9 65.8 62.0
Limerick 1 Philadelphia Electric Co. 21 MI NW of Philadelphia, PA 050-00352	I	BWR-MARK2 GE 4 BECH BECH	3458	1105	06/19/1974 08/08/1985 02/01/1986 10/26/2024	OL-FP NPF-39	88.0 67.2 94.6 85.0 88.2 84.2
Limerick 2 Philadelphia Electric Co. 21 MI NW of Philadelphia, PA 050-00353	I	BWR-MARK2 GE 4 BECH BECH	3458	1115	06/19/1974 08/25/1989 01/08/1990 06/22/2029	OL-FP NPF-85	77.3 91.6 80.8 92.7 86.2 91.9
Maine Yankee Maine Yankee Atomic Power Co. 10 MI N of Bath, ME 050-00309	I	PWR-DRYAMB COMB CE S&W S&W	2700	0860	10/21/1968 06/29/1973 12/28/1972 10/21/2008	OL-FP DPR-36	85.1 70.9 76.2 88.0 2.6 67.0
McGuire 1 Duke Power Co. 17 MI S of Charlotte, NC 050-00369	II	PWR-ICECND WEST 4LP DUKE DUKE	3411	1129	02/23/1973 07/08/1981 12/01/1981 06/12/2021	OL-FP NPF-9	69.2 75.5 55.8 69.5 89.6 86.3
McGuire 2 Duke Power Co. 7 MI S of Charlotte, NC 50-00370	II	PWR-ICECND WEST 4LP DUKE DUKE	3411	1129	02/23/1973 05/27/1983 03/01/1984 03/03/2023	OL-FP NPF-17	96.2 68.4 [illegible] [illegible] [illegible] 73.2
Millstone 1 Northeast Nuclear Energy Co. 3.2 MI WSW of New London, CT 050-00245	I	BWR-MARK1 GE 3 EBSO EBSO	2011	0641	05/19/1966 10/31/1986 03/01/1971 10/06/2010	OL-FP DPR-21	30.6 62.9 93.9 58.5 77.6 -0.5
Millstone 2 Northeast Nuclear Energy Co. 3.2 MI WSW of New London, CT 050-00336	I	PWR-DRYAMB COMB CE BECH BECH	2700	0871	12/11/1970 09/26/1975 12/26/1975 07/31/2015	OL-FP DPR-65	52.2 35.3 82.3 47.8 35.5 13.4

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Millstone 3 Northeast Nuclear Energy Co. 3.2 MI WSW of New London, CT 050-00423	I	PWR-DRYSUB WEST 4LP S&W S&W	3411	1137	08/09/1974 01/31/1986 04/23/1986 11/25/2025	OL-FP NPF-49	28.5 65.8 65.1 94.5 80.2 24.3
Monticello Northern States Power Co. 30 MI NW of Minneapolis, MN 050-00263	III	BWR-MARK1 GE 3 BECH BECH	1670	0544	06/19/1967 01/09/1981 06/30/1971 09/08/2010	OL-FP DPR-22	76.6 94.6 82.3 84.3 101.3 81.6
Nine Mile Point 1 Niagara Mohawk Power Corp. 6 MI NE of Oswego, NY 050-00220	I	BWR-MARK1 GE 2 NIAG S&W	1850	0565	04/12/1965 12/26/1974 12/01/1969 08/22/2009	OL-FP DPR-63	71.9 54.2 88.0 99.4 87.0 94.2
Nine Mile Point 2 Niagara Mohawk Power Corp. 6 MI NE of Oswego, NY 050-00410	I	BWR-MARK2 GE 5 S&W S&W	3467	1105	06/24/1974 07/02/1987 03/11/1988 10/31/2026	OL-FP NPF-69	68.6 54.5 82.6 96.0 78.1 89.6
North Anna 1 Virginia Electric & Power Co. 40 MI NW of Richmond, VA 050-00338	II	PWR-DRYSUB WEST 3LP S&W S&W	2893	0893	02/19/1971 04/01/1978 06/06/1978 04/01/2018	OL-FP NPF-4	70.5 70.6 73.1 86.2 99.8 88.5
North Anna 2 Virginia Electric & Power Co. 40 MI NW of Richmond, VA 050-00339	II	PWR-DRYSUB WEST 3LP S&W S&W	2893	0897	02/19/1971 08/21/1980 12/14/1980 08/21/2020	OL-FP NPF-7	96.5 79.2 78.3 96.4 77.2 77.7
Oconee 1 Duke Power Co. 30 MI W of Greenville, SC 050-00269	II	PWR-DRYAMB B&W LLP DBDB DUKE	2568	0846	11/06/1967 02/06/1973 07/15/1973 02/06/2013	OL-FP DPR-38	81.2 84.5 88.0 82.1 85.8 74.8
Oconee 2 Duke Power Co. 30 MI W of Greenville, SC 050-00270	II	PWR-DRYAMB B&W LLP DBDB DUKE	2568	0846	11/06/1967 10/06/1973 09/09/1974 10/06/2013	OL-FP DPR-47	100.2 80.0 84.1 83.0 94.1 59.4

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Oconee 3 Duke Power Co. 30 MI W of Greenville, SC 050-00287	II	PWR-DRYAMB B&W LLP DBDB DUKE	2568	0846	11/06/1967 07/19/1974 12/16/1974 07/19/2014	OL-FP DPR-55	75.4 73.3 99.8 76.5 87.3 73.3
Oyster Creek GPU Nuclear Corp 9 MI S of Toms River, NJ 050-00219	I	BWR-MARK1 GE 2 B&R B&R	1930	0619	12/15/1964 07/02/1991 12/01/1969 12/15/2009	OL-FP DPR-16	54.7 84.5 87.3 67.8 95.8 79.8
Palisades Consumers Power Co. 5 MI S of South Haven, MI 050-00255	III	PWR-DRYAMB COMB CE BECH BECH	2530	0730	03/14/1967 02/21/1991 12/31/1971 03/14/2007	OL-FP DPR-20	76.2 75.9 55.4 70.6 76.0 82.9
Palo Verde 1 Arizona Public Service Co. 36 MI W of Phoenix, AZ 050-00528	IV	PWR-DRYAMB COMB CE80 BECH BECH	3800	1227	05/25/1976 06/01/1985 01/28/1986 12/31/2024	OL-FP NPF-41	87.1 66.4 70.3 91.4 79.3 80.8
Palo Verde 2 Arizona Public Service Co. 36 MI W of Phoenix, AZ 050-00529	IV	PWR-DRYAMB COMB CE80 BECH BECH	3876	1227	05/25/1976 04/24/1986 09/19/1986 12/09/2025	OL-FP NPF-51	77.3 94.4 47.9 61.5 84.4 86.7
Palo Verde 3 Arizona Public Service Co. 36 MI W of Phoenix, AZ 050-00530	IV	PWR-DRYAMB COMB CE80 BECH BECH	3876	1230	05/25/1976 11/25/1987 01/08/1988 03/25/2027	OL-FP NPF-74	70.3 78.2 87.8 63.8 87.1 99.9
Peach Bottom 2 PECO Energy Co. 17.9 MI S of Lancaster, PA 050-00277	I	BWR-MARK1 GE 4 BECH BECH	3458	1093	01/31/1968 12/14/1973 07/05/1974 08/08/2013	OL-FP DPR-44	54.8 61.2 83.4 77.8 97.8 79.8
Peach Bottom 3 PECO Energy Co. 17.9 MI S of Lancaster, PA 050-00278	I	BWR-MARK1 GE 4 BECH BECH	3458	1093	01/31/1968 07/02/1974 12/23/1974 07/02/2014	OL-FP DPR-56	56.1 79.0 69.6 97.8 78.0 98.2

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Perry 1 Cleveland Electric Illuminating Co. 7 MI NE of Painesville, OH 050-00440	III	BWR-MARK3 GE 6 GIL KAIS	3579	1160	05/03/1977 11/13/1986 11/18/1987 03/18/2026	OL-FP NPF-58	87.9 70.0 38.9 45.0 89.2 73.1
Pilgrim 1 Boston Edison Co. 4 MI SE of Plymouth, MA 050-00293	I	BWR-MARK1 GE 3 BECH BECH	1998	0670	08/26/1968 09/15/1972 12/01/1972 06/08/2012	OL-FP DPR-35	58.4 80.6 74.0 65.2 76.4 90.5
Point Beach 1 Wisconsin Electric Power Co. 13 MI NNW of Manitowoc, WI 050-00266	III	PWR-DRYAMB WEST 2LP BECH BECH	1519	0485	07/19/1967 10/05/1970 12/21/1970 10/05/2010	OL-FP DPR-24	85.4 84.6 89.5 91.9 89.3 97.7
Point Beach 2 Wisconsin Electric Power Co. 13 MI NNW of Manitowoc, WI 050-00301	III	PWR-DRYAMB WEST 2LP BECH BECH	1519	0485	07/25/1968 03/08/1973 10/01/1972 03/08/2013	OL-FP DPR-27	86.8 86.1 90.5 88.3 79.7 69.2
Prairie Island 1 Northern States Power Co. 28 MI SE of Minneapolis, MN 050-00282	III	PWR-DRYAMB WEST 2LP FLUR NSP	1650	0513	06/25/1968 04/05/1974 12/16/1973 08/09/2013	OL-FP DPR-42	90.4 79.1 98.9 82.7 100.6 83.0
Prairie Island 2 Northern States Power Co. 28 MI SE of Minneapolis, MN 050-00306	III	PWR-DRYAMB WEST 2LP FLUR NSP	1650	0512	06/25/1968 10/29/1974 12/21/1974 10/29/2014	OL-FP DPR-60	102.3 73.3 85.0 101.5 88.5 99.7
Quad Cities 1 Commonwealth Edison Co. 20 MI NE of Moline, IL 050-00254	III	BWR-MARK1 GE 3 S&L UE&C	2511	0769	02/15/1967 12/14/1972 02/18/1973 12/14/2012	OL-FP DPR-29	52.5 61.7 74.9 24.8 87.4 39.7
Quad Cities 2 Commonwealth Edison Co. 20 MI NE of Moline, IL 050-00265	III	BWR-MARK1 GE 3 S&L UE&C	2511	0769	02/15/1967 12/14/1972 03/10/1973 12/14/2012	OL-FP DPR-30	78.5 57.7 46.2 59.6 37.1 69.1

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
River Bend 1 Entergy Operations, Inc 24 MI NNW of Baton Rouge, 050-00458	IV LA	BWR-MARK3 GE 6 S&W S&W	2894	0936	03/25/1977 11/20/1985 06/16/1986 08/29/2025	OL-FP NPF-47	81.6 33.6 64.1 59.6 96.7 83.4
Salem 1 Public Service Electric & Gas Co. 18 MI S of Wilmington, DE 050-00272	I	PWR-DRYAMB WEST 4LP PUBS UE&C	3411	1106	09/25/1968 12/01/1976 06/30/1977 08/13/2016	OL-FP DPR-70	70.3 54.5 60.5 59.3 26.0 0.0
Salem 2 Public Service Electric & Gas Co. 18 MI S of Wilmington, DE 050-00311	I	PWR-DRYAMB WEST 4LP PUBS UE&C	3411	1106	09/25/1968 05/20/1981 10/13/1981 04/18/2020	OL-FP DPR-75	79.1 48.6 57.2 57.8 20.8 0.0
San Onofre 2 Southern California Edison Co. & San Diego Gas & Electric Co. 4 MI SE of San Clemente, CA 050-00361	IV	PWR-DRYAMB COMB CE BECH BECH	3390	1070	10/18/1973 09/07/1982 08/08/1983 10/18/2013	OL-FP NPF-10	61.5 93.6 81.6 99.3 69.1 91.0
San Onofre 3 Southern California Edison Co. & San Diego Gas & Electric Co. 4 MI SE of San Clemente, CA 050-00362	IV	PWR-DRYAMB COMB CE BECH BECH	3390	1080	10/18/1973 09/16/1983 04/01/1984 10/18/2013	OL-FP NPF-15	91.9 72.0 75.2 97.0 79.3 93.2
Seabrook 1 North Atlantic Energy Service Corp. 13 MI S of Porthsmouth, NH 050-00443	I	PWR-DRYAMB WEST 4LP UE&C UE&C	3411	1158	07/07/1976 03/15/1990 08/19/1990 10/17/2026	OL-FP NPF-86	67.6 77.9 89.8 61.6 83.1 96.8
Sequoyah 1 Tennessee Valley Authority 9.5 MI NE of Chattanooga, TN 050-00327	II	PWR-ICECND WEST 4LP TVA TVA	3411	1117	05/27/1970 09/17/1980 07/01/1981 09/17/2020	OL-FP DPR-77	73.9 84.8 12.6 62.7 70.1 94.7
Sequoyah 2 Tennessee Valley Authority 9.5 MI NE of Chattanooga, TN 050-00328	II	PWR-ICECND WEST 4LP TVA TVA	3411	1117	05/27/1970 09/15/1981 06/01/1982 09/15/2021	OL-FP DPR-79	94.8 73.8 21.0 60.2 91.7 78.3

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Shearon Harris 1 Carolina Power & Light Co. 20 MI SW of Raleigh, NC 050-00400	II	PWR-DRYAMB WEST 3LP EBSO DANI	2775	0860	01/27/1978 01/12/1987 05/02/1987 10/24/2026	OL-FP NPF-63	78.6 71.6 99.9 80.4 79.2 93.6
South Texas Project 1 Houston Lighting & Power Co. 12 MI SSW of Bay City, TX 050-00498	IV	PWR-DRYAMB WEST 4LP BECH EBSO	3800	1251	12/22/1975 03/22/1988 08/25/1988 08/20/2027	OL-FP NPF-76	65.8 66.1 6.1 75.3 84.9 93.1
South Texas Project 2 Houston Lighting & Power Co. 12 MI SSW of Bay City, TX 050-00499	IV	PWR-DRYAMB WEST 4LP BECH EBSO	3800	1251	12/22/1975 03/28/1989 06/19/1989 12/15/2028	OL-FP NPF-80	66.2 94.1 6.3 54.7 90.6 95.2
St. Lucie 1 Florida Power & Light Co. 12 MI SE of Ft. Pierce, FL 050-00335	II	PWR-DRYAMB COMB CE EBSO EBSO	2700	0839	07/01/1970 03/01/1976 12/21/1976 03/01/2016	OL-FP DPR-67	78.8 96.9 73.9 84.1 74.9 70.9
St. Lucie 2 Florida Power & Light Co. 12 MI SE of Ft. Pierce, FL 050-00389	II	PWR-DRYAMB COMB CE EBSO EBSO	2700	0839	05/02/1977 06/10/1983 08/08/1983 04/06/2023	OL-FP NPF-16	101.1 73.7 64.1 76.3 71.9 94.8
Summer South Carolina Electric & Gas Co. 26 MI NW of Columbia, SC 050-00395	II	PWR-DRYAMB WEST 3LP GIL DANI	2900	0945	03/21/1973 11/12/1982 01/01/1984 08/06/2022	OL-FP NPF-12	68.9 96.7 78.7 57.3 97.5 88.0
Surry 1 Virginia Electric & Power Co. 17 MI NW of Newport News, VA 050-00280	II	PWR-DRYSUB WEST 3LP S&W S&W	2546	0801	06/25/1968 05/25/1972 12/22/1972 05/25/2012	OL-FP DPR-32	96.3 76.1 91.1 71.4 83.6 101.4
Surry 2 Virginia Electric & Power Co. 17 MI NW of Newport News, VA 050-00281	II	PWR-DRYSUB WEST 3LP S&W S&W	2546	0801	06/25/1968 01/29/1973 05/01/1973 01/29/2013	OL-FP DPR-37	58.3 93.7 66.4 91.5 80.1 86.4

(Continued)

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Susquehanna 1 Pennsylvania Power & Light Co. 7 MI NE of Berwick, PA 050-00387	I	BWR-MARK2 GE 4 BECH BECH	3441	1090	11/02/1973 11/12/1982 06/08/1983 07/17/2022	OL-FP NPF-14	96.8 70.0 57.0 92.4 78.8 81.0
Susquehanna 2 Pennsylvania Power & Light Co. 7 MI NE of Berwick, PA 050-00388	I	BWR-MARK2 GE 4 BECH BECH	3441	1094	11/02/1973 06/27/1984 02/12/1985 03/23/2024	OL-FP NPF-22	76.9 78.3 91.2 72.8 85.5 95.0
Three Mile Island 1 GPU Nuclear Corp. 10 MI SE of Harrisburg, PA 050-00289	I	PWR-DRYAMB B&W LLP GIL UE&C	2568	0786	05/18/1968 04/19/1974 09/02/1974 04/19/2014	OL-FP DPR-50	80.1 100.5 86.6 95.7 92.8 102.8
Turkey Point 3 Florida Power & Light Co. 25 MI S of Miami, FL 050-00250	II	PWR-DRYAMB WEST 3LP BECH BECH	2300	0693	04/27/1967 07/19/1972 12/14/1972 07/19/2012	OL-FP DPR-31	22.5 58.4 97.0 84.4 89.5 97.3
Turkey Point 4 Florida Power & Light Co. 25 MI S of Miami, FL 050-00251	II	PWR-DRYAMB WEST 3LP BECH BECH	2300	0693	04/27/1967 04/10/1973 09/07/1973 04/10/2013	OL-FP DPR-41	13.7 79.3 81.4 83.0 99.5 87.7
Vermont Yankee VT Yankee Nuclear Power Corp. 5 MI S of Brattleboro, VT 050-00271	I	BWR-MARK1 GE 4 EBSO EBSO	1593	0510	12/11/1967 02/28/1973 11/30/1972 03/21/2012	OL-FP DPR-28	93.1 84.4 76.4 97.8 86.7 84.8
Vogtle 1 Southern Nuclear Operating Co. 26 MI SE of Augusta, GA 050-00424	II	PWR-DRYAMB WEST 4LP SBEC GPC	3565	1162	06/28/1974 03/16/1987 06/01/1987 01/16/2027	OL-FP NPF-68	77.8 96.7 85.7 86.1 98.1 79.8
Vogtle 2 Southern Nuclear Operating Co. 26 MI SE of Augusta, GA 050-00425	II	PWR-DRYAMB WEST 4LP SBEC GPC	3565	1162	06/28/1974 03/31/1989 05/20/1989 02/09/2029	OL-FP NPF-81	92.6 79.7 87.1 91.2 90.0 88.5

Unit Operating Utility Location Docket Number	NRC Region	Con Type NSSS AE Constructor	Licensed MWt	Net MDC	CP Issued OL Issued Comm. Op Exp. Date	License Type & Number	1991-1996* Average Capacity Factors (Percent)
Washington Nuclear 2 Washington Public Power Supply System 12 MI NW of Richland, WA 050-00397	IV	BWR-MARK2 GE 5 B&R BECH	3486	1107	03/19/1973 04/13/1984 12/13/1984 12/20/2023	OL-FP NPF-21	44.3 59.7 75.0 70.8 72.5 57.1
Waterford 3 Entergy Operations, Inc. 20 MI W of New Orleans, LA 050-00382	IV	PWR-DRYAMB COMB CE EBSO EBSO	3390	1104	11/14/1974 03/16/1985 09/24/1985 12/18/2024	OL-FP NPF-38	77.3 80.7 97.0 84.2 82.4 94.5
Watts Bar 1 Tennessee Valley Authority 10 MI S of Spring City, TN 050-00390	II	PWR-ICECND WEST 4LP TVA TVA	3411	1117	01/23/1973 02/07/1996 05/27/1996 11/09/2035	OL NPF-90	- - - - - 89.1
Wolf Creek 1 Wolf Creek Nuclear Operating Corp. 3.5 MI NE of Burlington, KS 050-00482	IV	PWR-DRYAMB WEST 4LP BECH DANI	3565	1163	05/31/1977 06/04/1985 09/03/1985 03/11/2025	OL-FP NPF-42	58.9 85.5 79.6 84.7 98.7 80.2
Zion 1 Commonwealth Edison Co. 40 MI N of Chicago, IL 050-00295	III	PWR-DRYAMB WEST 4LP S&L CWE	3250	1040	12/26/1968 10/19/1973 12/31/1973 04/06/2013	OL-FP DPR-39	46.8 45.0 77.1 45.5 71.0 80.2
Zion 2 Commonwealth Edison Co. 40 MI N of Chicago, IL 050-00304	III	PWR-DRYAMB WEST 4LP S&L CWE	3250	1040	12/26/1968 11/14/1973 09/17/1974 11/14/2013	OL-FP DPR-48	56.3 58.7 58.1 67.5 65.0 61.5

* *Note:* Average capacity factors are listed in year order starting with 1991. The *1998 Information Digest* will drop 1991 average capacity factor and only show 6 years of data.

**Haddam Neck prematurely shut down in December 1996.

Source: Nuclear Regulatory Commission and licensee data as compiled by the Nuclear Regulatory Commission.

U.S. Commercial Nuclear Power Reactors Formerly Licensed To Operate

Unit Location	Con Type MWt	OL Issued Shut Down	Decommissioning Alternative Selected Current Status
Bonus * Punta Higuera, PR	BWR 50	04/02/1964 06/01/1968	ENTOMB ENTOMB
CVTR ** Parr, SC	PTHW 65	11/27/1962 01/01/1967	SAFSTOR SAFSTOR
Dresden 1 Morris, IL	BWR 700	09/28/1959 10/31/1978	SAFSTOR SAFSTOR
Elk River * Elk River, MN	BWR 58	11/06/1962 02/01/1968	DECON DECON Completed
Fermi 1 Lagnona Beach, MI	SCF 200	05/10/1963 09/22/1972	SAFSTOR SAFSTOR
Fort St. Vrain Platteville, CO	HTG 842	12/21/1973 08/18/1989	DECON DECON in Progress
GE VBWR Pleasanton,CA	BWR 50	08/31/1957 12/09/1963	SAFSTOR SAFSTOR
Hallam * Hallam, NE	SCGM 256	01/02/1962 09/01/1964	ENTOMB ENTOMB
Humboldt Bay 3 Eureka, CA	BWR 200	08/28/1962 07/02/1976	SAFSTOR SAFSTOR
Indian Point 1 Buchanan, NY	PWR 615	03/26/1962 10/31/1974	SAFSTOR SAFSTOR
La Crosse Genoa, WI	BWR 165	07/03/1967 04/30/1987	SAFSTOR SAFSTOR
Pathfinder Sioux Falls, SD	BWR 190	03/12/1964 09/16/1967	SAFSTOR DECON Completed
Peach Bottom 1 Peach Bottom, PA	HTG 115	01/24/1966 10/31/1974	SAFSTOR SAFSTOR
Piqua * Piqua, OH	OCM 46	08/23/1962 01/01/1966	ENTOMB ENTOMB

Appendix B. U.S. Commercial Nuclear Power Reactors Formerly Licensed to Operate *(Continued)*

Unit Location	Con Type MWt	OL Issued Shut Down	Decommissioning Alternative Selected Current Status
Rancho Seco Herald, CA	PWR 2772	08/16/1974 06/07/1989	SAFSTOR SAFSTOR (1)
San Onofre 1 San Clemente, CA	PWR 1347	03/27/1967 11/30/1992	SAFSTOR (2)
Shippingport * Shippingport, PA	PWR 236	N/A 1982	DECON DECON Completed
Shoreham Wading River, NY	BWR 2436	04/21/1989 06/28/1989	DECON DECON Completed
Three Mile Island 2 Londonderry Township, PA	PWR 2770	02/08/1978 03/28/1979	(3)
Trojan Portland, OR	PWR 3411	11/21/1975 11/09/1992	DECON DECON in Progress
Yankee-Rowe Franklin County, MA	PWR 0600	12/24/1963 10/01/1991	DECON DECON in Progress

* AEC/DOE owned; not regulated by NRC.

** Holds byproduct license from State of South Carolina.

Notes: See Glossary for definitions of decommissioning alternatives.

(1) Dismantlement of radioactive contaminated secondary system piping and components is ongoing.

(2) The licensee plans to maintain the facility in SAFSTOR until Units 2 and 3 permanently cease operation, at which time all units are planned to be decommissioned.

(3) Three Mile Island 2 has been placed in a monitored storage mode until Unit 1 permanently ceases operation, at which time both units are planned to be decommissioned.

Source: DOE Integrated Data Base for 1990; U.S. Spent Fuel and Radioactive Waste, Inventories, Projections, and Characteristics (DOE/RW-0006, Rev. 6), and Nuclear Regulatory Commission

Canceled U.S. Commercial Nuclear Power Reactors

Unit Utility	Con Type MWe per Unit	Canceled Date Status
Allens Creek 1 Houston Lighting & Power Company	BWR 1150	1982 Under CP Review
Allens Creek 2 Houston Lighting & Power Company	BWR 1150	1976 Under CP Review
Atlanta 1 & 2 Public Service Electric & Gas Company	PWR 1150	1978 Under CP Review
Bailly Northern Indiana Public Service Company	BWR 645	1981 With CP
Barton 1 & 2 Alabama Power & Light	BWR 1159	1977 Under CP Review
Barton 3 & 4 Alabama Power & Light	BWR 1159	1975 Under CP Review
Bellefonte 1&2 Tennessee Valley Authority	PWR 1235	(1) With CP
Black Fox 1 & 2 Public Service Company of Oklahoma	BWR 1150	1982 Under CP Review
Blue Hills 1 & 2 Gulf States Utilities Company	PWR 918	1978 Under CP Review
Callaway 2 Union Electric Company	PWR 1150	1981 With CP
Cherokee 1 Duke Power Company	PWR 1280	1983 With CP
Cherokee 2 & 3 Duke Power Company	PWR 1280	1982 With CP
Clinch River Project Management Corp.; DOE; TVA	LMFB 350	1983 Under CP Review
Clinton 2 Illinois Power Company	BWR 933	1983 With CP
Davis-Besse 2 & 3 Toledo Edison Company	PWR 906	1981 Under CP Review
Douglas Point 1 & 2 Potomac Electric Power Company	BWR 1146	1977 Under CP Review

Appendix C. Canceled U.S. Commercial Nuclear Power Reactors *(Continued)*

Unit Utility	Con Type MWe per Unit	Canceled Date Status
Erie 1 & 2 Ohio Edison Company	PWR 1260	1980 Under CP Review
Forked River 1 Jersey Central Power & Light Company	PWR 1070	1980 With CP
Fort Calhoun 2 Omaha Public Power District	PWR 1136	1977 Under CP Review
Fulton 1 & 2 Philadelphia Electric Company	HTG 1160	1975 Under CP Review
Grand Gulf 2 Entergy Operations, Incorporated	BWR 1250	1990 With CP
Greene County Power Authority of the State of NY	PWR 1191	1980 Under CP Review
Greenwood 2 & 3 Detroit Edison Company	PWR 1200	1980 Under CP Review
Hartsville A1 & A2 Tennessee Valley Authority	BWR 1233	1984 With CP
Hartsville B1 & B2 Tennessee Valley Authority	BWR 1233	1982 With CP
Haven 1 Wisconsin Electric Power Company	PWR 900	1980 Under CP Review
Haven 2 (formerly Koshkonong 2) Wisconsin Electric Power Company	PWR 900	1978 Under CP Review
Hope Creek 2 Public Service Electric & Gas Company	BWR 1067	1981 With CP
Jamesport 1 & 2 Long Island Lighting Company	PWR 1150	1980 With CP
Marble Hill 1 & 2 Public Service of Indiana	PWR 1130	1985 With CP
Midland 1 Consumers Power Company	PWR 492	1986 With CP
Midland 2 Consumers Power Company	PWR 818	1986 With CP
Montague 1 & 2 Northeast Nuclear Energy Company	BWR 1150	1980 Under CP Review

(Continued)

Unit Utility	Con Type MWe per Unit	Canceled Date Status
New England 1 & 2 New England Power Company	PWR 1194	1979 Under CP Review
New Haven 1 & 2 New York State Electric & Gas Corporation	PWR 1250	1980 Under CP Review
North Anna 3 Virginia Electric & Power Company	PWR 907	1982 With CP
North Anna 4 Virginia Electric & Power Company	PWR 907	1980 With CP
North Coast 1 Puerto Rico Water Resources Authority	PWR 583	1978 Under CP Review
Palo Verde 4 & 5 Arizona Public Service Company	PWR 1270	1979 Under CP Review
Pebble Springs 1 & 2 Portland General Electric Company	PWR 1260	1982 Under CP Review
Perkins 1, 2, & 3 Duke Power Company	PWR 1280	1982 Under CP Review
Perry 2 Cleveland Electric Illuminating Co.	BWR 1205	1994 Under CP Review
Phipps Bend 1 & 2 Tennessee Valley Authority	BWR 1220	1982 With CP
Pilgrim 2 Boston Edison Company	PWR 1180	1981 Under CP Review
Pilgrim 3 Boston Edison Company	PWR 1180	1974 Under CP Review
Quanicassee 1 & 2 Consumers Power Company	PWR 1150	1974 Under CP Review
River Bend 2 Gulf States Utilities Company	BWR 934	1984 With CP
Seabrook 2 Public Service Co. of New Hampshire	PWR 1198	1988 With CP
Shearon Harris 2 Carolina Power & Light Company	PWR 900	1983 With CP
Shearon Harris 3 & 4 Carolina Power & Light Company	PWR 900	1981 With CP

Appendix C. Canceled U.S. Commercial Nuclear Power Reactors *(Continued)*

Unit Utility	Con Type MWe per Unit	Canceled Date Status
Skagit/Hanford 1 & 2 Puget Sound Power & Light Company	PWR 1277	1983 Under CP Review
Sterling Rochester Gas & Electric Corporation	PWR 1150	1980 With CP
Summit 1 & 2 Delmarva Power & Light Company	HTG 1200	1975 Under CP Review
Sundesert 1 & 2 San Diego Gas & Electric Company	PWR 974	1978 Under CP Review
Surry 3 & 4 Virginia Electric & Power Company	PWR 882	1977 With CP
Tyrone 1 Northern States Power Company	PWR 1150	1981 Under CP Review
Tyrone 2 Northern States Power Company	PWR 1150	1974 With CP
Vogtle 3 & 4 Georgia Power Company	PWR 1113	1974 With CP
Washington Nuclear 1 Washington Public Power Supply System	PWR 1266	1995 With CP
Washington Nuclear 3 Washington Public Power Supply System	PWR 1242	1995 With CP
Washington Nuclear 4 Washington Public Power Supply System	PWR 1218	1982 With CP
Washington Nuclear 5 Washington Public Power Supply System	PWR 1242	1982 With CP
Watts Bar 2 Tennessee Valley Authority	PWR 1165	(1) With CP
Yellow Creek 1 & 2 Tennessee Valley Authority	BWR 1285	1984 With CP
Zimmer 1 Cincinnati Gas & Electric Company	BWR 810	1984 With CP

Note: Cancelation is defined as public announcement of cancellation or written notification to NRC. Only docketed applications are indicated.

(1) Bellefonte 1 and 2 and Watts Bar 2 have not been formally cancelled; however TVA has stopped construction and is presently evaluating options (e.g. cancellation or conversion).

Source: DOE/EIA Commercial Nuclear Power 1991 (DOE/EIA-0438 (91)), Appendix E (page 105) and Nuclear Regulatory Commission

Appendix D

U.S. Commercial Nuclear Power Reactors by Licensee

Utility	Unit
Arizona Public Service Company	Palo Verde 1, 2, & 3
Baltimore Gas & Electric Company	Calvert Cliffs 1 & 2
Boston Edison Company	Pilgrim 1
Carolina Power & Light Company	Brunswick 1 & 2
Carolina Power & Light Company	H. B. Robinson 2
Carolina Power & Light Company	Shearon Harris 1
Cleveland Electric Illuminating Company	Perry 1
Commonwealth Edison Company	Braidwood 1 & 2
Commonwealth Edison Company	Byron 1 & 2
Commonwealth Edison Company	Dresden 2 & 3
Commonwealth Edison Company	La Salle County 1 & 2
Commonwealth Edison Company	Quad Cities 1 & 2
Commonwealth Edison Company	Zion 1 & 2
CT Yankee Atomic Power Company	Haddam Neck
Consolidated Edison Company	Indian Point 2
Consumers Power Company	Big Rock Point
Consumers Power Company	Palisades
Detroit Edison Company	Fermi 2
Duke Power Company	Catawba 1 & 2
Duke Power Company	McGuire 1 & 2
Duke Power Company	Oconee 1, 2, & 3
Duquesne Light Company	Beaver Valley 1 & 2
Entergy Operations, Incorporated	Arkansas Nuclear 1 & 2
Entergy Operations, Incorporated	Grand Gulf 1
Entergy Operations, Incorporated	River Bend 1
Entergy Operations, Incorporated	Waterford 3
Florida Power & Light Company	St. Lucie 1 & 2
Florida Power & Light Company	Turkey Point 3 & 4
Florida Power Corporation	Crystal River 3
GPU Nuclear Corporation	Oyster Creek
GPU Nuclear Corporation	Three Mile Island 1
Houston Lighting & Power Company	South Texas Project 1 & 2
IES Utilities, Incorporated	Duane Arnold
Illinois Power Company	Clinton
Indiana/Michigan Power Company	D. C. Cook 1 & 2
Maine Yankee Atomic Power Company	Maine Yankee

Appendix D. U.S. Commercial Nuclear Power Reactors by Licensee *(Continued)*

Utility	Unit
Nebraska Public Power District	Cooper
Niagara Mohawk Power Corporation	Nine Mile Point 1 & 2
North Atlantic Energy Service Corporation	Seabrook 1
Northeast Nuclear Energy Company	Millstone 1, 2, & 3
Northern States Power Company	Monticello
Northern States Power Company	Prairie Island 1 & 2
Omaha Public Power District	Fort Calhoun
Pacific Gas & Electric Company	Diablo Canyon 1 & 2
PECO Energy Company	Peach Bottom 2 & 3
Pennslyvania Power & Light Company	Susquehanna 1 & 2
Philadelphia Electric Company	Limerick 1 & 2
Power Authority of the State of New York	Indian Point 3
Power Authority of the State of New York	James A. FitzPatrick
Public Service Electric & Gas Company	Hope Creek 1
Public Service Electric & Gas Company	Salem 1 & 2
Rochester Gas & Electric Corporation	Ginna
South Carolina Electric & Gas Company	Summer
Southern California Edison Co. & San Diego Gas & Electric Company	San Onofre 2 & 3
Southern Nuclear Operating Company	Joseph M. Farley 1 & 2
Southern Nuclear Operating Company	Edwin I. Hatch 1 & 2
Southern Nuclear Operating Company	Vogtle 1 & 2
Tennessee Valley Authority	Browns Ferry 1, 2, & 3
Tennessee Valley Authority	Sequoyah 1 & 2
Tennessee Valley Authority	Watts Bar 1
Texas Utilities Electric Company	Comanche Peak 1 & 2
Toledo Edison Company	Davis-Besse
Union Electric Company	Callaway
VT Yankee Nuclear Power Corporation	Vermont Yankee
Virginia Electric & Power Company	North Anna 1 & 2
Virginia Electric & Power Company	Surry 1 & 2
Washington Public Power Supply System	Washington Nuclear 2
Wisconsin Electric Power Company	Point Beach 1 & 2
Wisconsin Public Service Company	Kewaunee
Wolf Creek Nuclear Operating Corporation	Wolf Creek 1

Source: Nuclear Regulatory Commission

Appendix E

U.S. Nuclear Nonpower Reactors

Licensee Location	Reactor Type OL Issued	License Type Docket Number	License Number
Aerotest San Ramon, CA	Triga (Indus) 07/02/1965	OL 50-228	R-98
Armed Forces Radiobiology Research Institute Bethesda, MD	Triga 06/26/1962	OL 50-170	R-84
Cornell University Ithaca, NY	Zero Power 12/11/1962	OL 50-97	R-89
Cornell University Ithaca, NY	Triga Mark II 01/11/1962	OL 50-157	R-80
Dow Chemical Company Midland, MI	Triga 07/03/1967	OL 50-264	R-108
General Atomics Mark I San Diego, CA	Triga Mark I 05/03/1958	OL 50-89	R-38
General Electric Company Pleasanton, CA	Nuclear Test 10/31/1957	OL 50-73	R-33
Georgia Institute of Technology Atlanta, GA	Heavy Water 12/29/1964	OL 50-160	R-97
Idaho State University Pocatello, ID	AGN-201 #103 10/11/1967	OL 50-284	R-110
Iowa State University Ames, IA	Argonaut 10/16/1959	OL 50-116	R-59
Kansas State University Manhattan, KS	Triga 10/16/1962	OL 50-188	R-88
Manhattan College Bronx, NY	Tank 03/24/1964	OL 50-199	R-94
Massachusetts Institute of Technology Cambridge, MA	HWR Reflected 06/09/1958	OL 50-20	R-37
National Institute of Standards & Technology Gaithersburg, MD	Nuclear Test 06/30/1970	OL 50-184	TR-5

Licensee Location	Reactor Type OL Issued	License Type Docket Number	License Number
North Carolina State University Raleigh, NC	Pulstar 08/25/1972	OL 50-297	R-120
Ohio State University Columbus, OH	Pool 02/24/1961	OL 50-150	R-75
Oregon State University Corvallis, OR	Triga Mark II 03/07/1967	OL 50-243	R-106
Pennsylvania State University University Park, PA	Triga 07/08/1955	OL 50-5	R-2
Purdue University West Lafayette, IN	Lockheed 08/16/1962	OL 50-182	R-87
Reed College Portland, OR	Triga Mark I 07/02/1968	OL 50-288	R-112
Rensselaer Polytechnic Institute Troy, NY	Critical Assembly 07/03/1964	OL 50-225	CX-22
Rhode Island Atomic Energy Commission Narragansett, RI	GE Pool 07/21/1964	OL 50-193	R-95
State University of New York (Buffalo) Buffalo, NY	Pulstar 03/24/1961	OL 50-57	R-77
Texas A&M University College Station, TX	AGN-201M #106 08/26/1957	OL 50-59	R-23
Texas A&M University College Station, TX	Triga 12/07/1961	OL 50-128	R-128
U.S. Geological Survey Denver, CO	Triga Mark I 02/24/1969	OL 50-274	R-113
University of Arizona Tucson, AZ	Triga Mark I 12/05/1958	OL 50-113	R-52
University of California/Irvine Irvine, CA	Triga Mark I 11/24/1969	OL 50-326	R-116
University of Florida Gainesville, FL	Argonaut 05/21/1959	OL 50-83	R-56

(Continued)

Licensee Location	Reactor Type OL Issued	License Type Docket Number	License Number
University of Illinois Urbana, IL	Triga 07/22/1969	OL 50-151	R-115
University of Lowell Lowell, MA	GE Pool 12/24/1974	OL 50-223	R-125
University of Maryland College Park, MD	Triga 10/14/1960	OL 50-166	R-70
University of Michigan Ann Arbor, MI	Pool 09/13/1957	OL 50-2	R-28
University of Missouri/Rolla Rolla, MO	Pool 11/21/1961	OL 50-123	R-79
University of Missouri/ Columbia Columbia, MO	Tank 10/11/1966	OL 50-186	R-103
University of New Mexico Albuquerque, NM	AGN-201M #112 09/17/1966	OL 50-252	R-102
University of Texas Austin, TX	Triga Mark II 01/17/1992	OL 50-602	R-92
University of Utah/Triga Salt Lake City, UT	Triga Mark I 09/30/1975	OL 50-407	R-126
University of Virginia Charlottesville, VA	Pool 06/27/1960	OL 50-62	R-66
University of Wisconsin Madison, WI	Triga 11/23/1960	OL 50-156	R-74
Veterans Administration Omaha, NE	Triga 06/26/1959	OL 50-131	R-57
Washington State University Pullman, WA	Triga 03/06/1961	OL 50-27	R-76
Worcester Polytechnic Institute Worcester, MA	GE 12/16/1959	OL 50-134	R-61

Note: Limited to nonpower reactors licensed to operate.
Source: Nuclear Regulatory Commission

Appendix F

NRC Performance Indicators: Annual Industry Averages*

Indicator	1985	1986	1987	1988	1989	1990
Automatic Scrams	5.28	4.50	3.60	2.26	1.85	1.63
Safety System Actuations	2.74	2.09	1.51	1.23	1.31	1.00
Significant Events	2.38	1.66	0.85	0.88	0.77	0.46
Safety System Failures	2.30	2.27	1.65/ 1.66**	2.35/ 0.98**	2.41/ 1.07**	2.03/ 1.68**
Forced Outage Rate	11.00	11.00	95.4	7.95	9.92	7.20
Equipment Forced Outage Rate	0.90	1.11	0.59	0.45	0.45	0.39
Collective Radiation Exposure	577.00	501.00	410.00	388.00	332.00	336.00

Indicator	1991	1992	1993	1994	1995	1996
Automatic Scrams	1.52	1.43	1.13	1.04	0.95	0.80
Safety System Actuations	1.00	0.78	0.79	0.52	0.47	0.39
Significant Events	0.28	0.30	0.26	0.21	0.12	0.07
Safety System Failures	1.76/ 1.64**	1.98/ 1.56**	1.63/ 1.67**	1.13/ 0.92**	0.95/ 1.05**	1.40/ 1.50**
Forced Outage Rate	8.95	7.55	8.58	9.17	5.88	7.50
Equipment Forced Outage Rate	0.36	0.30	0.24	0.24	0.26	0.24
Collective Radiation Exposure	255.00	267.00	243.00	203.00	199.00	178.00

* Calendar year values are being shown for 1985 through 1995. Fiscal year values are used beginning in 1996. Data for October 1, 1995 through December 31, 1995, are included in both calendar year 1995 and fiscal year 1996 values.

** These numbers represent additional data that resulted from reclassification of safety system failures.

Source: Licensee data as compiled by the Nuclear Regulatory Commission.

NRC-Approved Dry Spent Fuel Storage Designs

Vendor	Storage Design Model	Capacity (Assemblies)	Storage Design Approval Date	Certificate of Compliance Approval Date
General Nuclear Systems, Incorporated	Metal Cask CASTOR V/21	21 PWR	09/30/1985	08/17/1990
Vectra Technologies, Incorporated	Concrete Module NUHOMS-7	7 PWR	03/28/1986	
Westinghouse Electric	Metal Cask MC-10	24 PWR	09/30/1987	08/17/1990
Foster Wheeler Energy Applications, Incorporated	Concrete Vault Modular Vault Dry Store	83 PWR or 150 BWR	03/22/1988	
NAC International	Metal Cask NAC S/T	26 PWR	03/29/1988	08/17/1990
NAC International	Metal Cask NAC-C28 S/T	28 Canisters (fuel rods from 56 PWR assemblies)	09/29/1988	08/17/1990
Vectra Technologies, Incorporated	Concrete Module NUHOMS-24P	24 PWR	04/21/1989	
Transnuclear, Incorporated	Metal Cask TN-24	24 PWR	07/05/1989	11/04/1993
NAC International	Metal Cask NAC-I28/ST	28 PWR	02/01/1990	
Pacific Sierra Nuclear Associates	VentilatedCask VSC-24	24 PWR	03/29/1991	05/07/1993
Vectra Technologies, Incorporated	Concrete Module Standardized NUHOMS-24P NUHOMS-52B	24 PWR 52 BWR	N/A	01/23/1995
NAC International	NAC-STC	26 PWR	07/18/95	

Note: PWR – Pressurized-Water Reactor; BWR – Boiling-Water Reactor

Source: Nuclear Regulatory Commission

Appendix H

NRC Dry Spent Fuel Storage Licensees

Reactor Name Utility	Date Issued	Vendor	Storage Model
Surry 1, 2 Virginia Electric & Power Company	07/02/1986	General Nuclear Systems, Incorporated	Metal Cask CASTOR V/21
H. B. Robinson 2 Carolina Power & Light Company	08/13/1986	Vectra Technologies, Incorporated	Concrete Module NUHOMS-7
Oconee 1, 2, 3 Duke Power Company	01/29/1990	Vectra Technologies, Incorporated	Concrete Module NUHOMS-24P
Fort St. Vrain Public Service Company of Colorado	11/04/1991	Foster Wheeler Energy Applications, Incorprated	Modular Vault Dry Store
Calvert Cliffs 1, 2 Baltimore Gas & Electric Company	11/25/1992	Vectra Technologies, Incorporated	Concrete Module NUHOMS-24P
Palisades Consumer Power Company	Under General License	Pacific Sierra Nuclear Associates	Ventilated Cask VSC-24
Prairie Island 1, 2 Northern States Power Company	10/19/1993 *	Transnuclear, Incorporated	Metal Cask TN-40
Point Beach Wisconsin Electric and Power Company	Under General License	Pacific Sierra Nuclear Associates	Ventilated Concrete VSC-24
Davis-Besse Toledo Edison Company	Under General License	VECTRA Techologies Incorporated	Concrete Module NUHOMS-24P

* Application Received

Source: Nuclear Regulatory Commission

Appendix I

World List of Nuclear Power Reactors

Country	In Operation		Under Construction or on Order		Total	
	Number of Units	Net MWe	Number of Units	Net MWe	Number of Units	Net MWe
Argentina	2	935	1	692	3	1,627
Armenia	1	400	0	0	1	400
Belgium	7	5,527	0	0	7	5,527
Brazil	1	626	2	2,458	3	3,084
Bulgaria	6	3,420	0	0	6	3,420
Canada	22	15,439	0	0	22	15,439
China	3	2,100	6	4,570	9	6,670
Cuba	0	0	2	834	2	834
Czech Republic	4	1,632	2	1,780	6	3,412
Finland	4	2,310	0	0	4	2,310
France	55	57,373	5	6,410	60	63,783
Germany	20	22,237	0	0	20	22,237
Hungary	4	1,729	0	0	4	1,729
India	10	1,695	6	1,748	16	3,443
Japan	51	40,970	6	6,027	57	46,997
Kazakstan	1	135	0	0	1	135
Korea	11	9,120	9	7,650	20	16,770
Lithuania	2	2,760	0	0	2	2,760
Mexico	2	1,308	0	0	2	1,308
Netherlands	2	507	0	0	2	507
Pakistan	1	125	1	300	2	425
Romania	1	706	4	2,480	5	3,186
Russia	26	19,849	4	3,375	30	23,224
Slovakia	4	1,632	4	1,664	8	3,296
Slovenia	1	620	0	0	1	620
South Africa	2	1,840	0	0	2	1,840
Spain	9	7,188	0	0	9	7,188
Sweden	12	10,075	0	0	12	10,075
Switzerland	5	3,072	0	0	5	3,072
Taiwan, China	6	4,884	2	2,700	8	7,584
Ukraine	14	12,095	6	5,700	20	17,795
United Kingdom	35	12,728	0	0	35	12,728
United States	110	99,455	0	0	110	99,455
Total	**434**	**344,492**	**60**	**48,388**	**494**	**392,880**

Note: Operable, under construction, or on order (30 MWe and over) as of 12/31/96.
Source: Excerpted from *Nuclear News* © March 1997. Reproduced by permission. Further reproduction prohibited. U.S. data compiled by the Nuclear Regulatory Commission from licensee data.

Nuclear Power Units by Reactor Type, Worldwide

Reactor Type	In Operation		Total	
	Number of Units	Net MWe	Number of Units	Net MWe
Pressurized light-water reactors	250	220,077	283	249,915
Boiling light-water reactors	95	77,626	101	84,601
Gas-cooled reactors, all varieties	35	11,699	35	11,699
Heavy-water reactors, all varieties	36	19,377	52	27,647
Graphite-moderated light-water reactors	15	14,785	16	15,710
Liquid metal fast-breeder reactors	3	928	7	3,308
Total	**434**	**344,492**	**494**	**392,880**

Note: Operable, under construction, or on order (30 MWe and over) as of 12/31/96.

Source: Excerpted from *Nuclear News* © March 1997. Reproduced by permission. Further reproduction prohibited. U.S. data compiled by the Nuclear Regulatory Commission from licensee data.

Top 50 Reactors by Capacity Factor, Worldwide

Country	Unit	Reactor Type	Vendor	1996 Gross Capacity Factor (Percent)	1996 Gross Generation (MWh)
Japan	Fukushima II-2	BWR	Hitachi	100.00	9,662,253
Japan	Ohi-3	PWR	MHI	99.99	10,363,680
U.S.	Surry-1	PWR	West.	99.40	7,395,635
South Korea	Kori-3	PWR	West.	99.10	8,269,639
Spain	Asco-1	PWR	West.	99.04	8,238,860
U.S.	Hatch-2	BWR	GE	98.75	7,321,204
U.S.	Palo Verde-3	PWR	CE	98.61	11,320,800
U.S.	Three Mile Island-1	PWR	B&W	98.17	7,511,072
U.S.	Farley-1	PWR	West.	98.12	7,524,424
Japan	Ohi-2	PWR	West.	98.07	10,121,935
Japan	Sendai-2	PWR	MHI	98.05	7,665,260
U.S.	Seabrook	PWR	West.	97.68	10,244,636
U.S.	Calvert Cliffs-2	PWR	CE	97.65	7,547,886
Japan	Takahama-2	PWR	MHI	97.39	7,066,047
South Korea	Ulchin-2	PWR	Fram.	96.65	8,065,354
U.S.	Prarie Island-2	PWR	West.	96.24	4,733,980
Canada	Darlington-3	PHWR	AECL	96.16	7,897,856
South Korea	Yonggwang-2	PWR	West.	95.67	7,983,882
Finland	Olkiluoto-1	BWR	ABB	95.46	6,163,389
U.S.	Peach Bottom-3	BWR	GE	95.27	9,699,000
Japan	Kashiwazaki-2	BWR	Toshiba	95.25	9,203,910
U.S.	St. Lucie-2	PWR	CE	95.23	7,377,830
U.S.	Susquehanna-2	BWR	GE	95.13	9,459,366
Finland	Olkiluoto-2	BWR	ABB	95.07	6,137,716
Germany	Neckar-2	PWR	Siemens	94.69	11,353,400
Argentina	Embalse	PHWR	AECL	94.58	5,383,704
U.S.	South Texas-2	PWR	West.	94.55	10,920,900
U.S.	Turkey Point-3	PWR	West.	94.31	6,031,012
U.S.	San Onofre-3	PWR	CE	94.16	9,321,741
Canada	Gentilly-2	PHWR	AECL	94.13	5,581,186
Taiwan	Maanshan-1	PWR	West.	94.12	7,869,004
U.S.	Browns Ferry-3	BWR	GE	93.58	9,025,810
Switzerland	Goesgen	PWR	KWU	93.58	8,384,538
U.S.	Cooper	BWR	GE	93.24	6,560,518
Finland	Loviisa-2	PWR	AEE	93.20	3,806,724
Germany	Obrigheim	PWR	KWU	93.10	2,919,590
Germany	Emsland	PWR	Siemens	93.02	11,136,652
U.S.	Sequoyah-1	PWR	West.	92.64	9,626,795
U.S.	South Texas-1	PWR	West.	92.46	10,680,540

Appendix K. Top 50 Reactors by Capacity Factor, Worldwide *(Continued)*

Country	Unit	Reactor Type	Vendor	1996 Gross Capacity Factor (Percent)	1996 Gross Generation (MWh)
U.S.	Diablo Canyon-1	PWR	West.	92.46	9,226,200
Canada	Bruce-8	PHWR	AECL	92.14	7,405,610
U.S.	Waterford-3	PWR	CE	92.10	9,327,910
U.S.	Catawba-2	PWR	West.	92.06	9,744,266
Belgium	Doel-1	PWR	ACEC.	91.91	3,326,100
Spain	Almaraz-2	PWR	West.	91.84	7,502,180
U.S.	Indian Point-2	PWR	West.	91.79	8,127,281
Germany	Philippsburg-2	PWR	Siemens	91.72	11,472,475
Spain	Cofrentes	BWR	GE	91.66	7,970,685
U.S.	Pilgrim	BWR	GE	91.54	5,530,209
Hungary	Paks-1	PWR	AEE	91.38	3,692,256

Source: Excerpted from *Nucleonics Week*© 1997 by McGraw Hill, Inc. Reproduced by permission. Further reproduction prohibited.

Top 50 Reactors by Generation, Worldwide

Country	Unit	Reactor Type	Vendor	1996 Gross Generation (MWh)	1996 Gross Capacity Factor (Percent)
Germany	Philippsburg-2	PWR	Siemens	11,472,475	91.72
Germany	Neckar-2	PWR	Siemens	11,353,400	94.69
U.S.	Palo Verde-3	PWR	CE	11,320,800	98.61
Germany	Emsland	PWR	Siemens	11,136,652	93.02
Germany	Grohnde	PWR	Siemens	11,134,588	88.64
Germany	Brokdorf	PWR	Siemens	11,124,556	90.79
U.S.	South Texas-2	PWR	West.	10,920,900	94.55
Germany	Isar-2	PWR	Siemens	10,879,849	87.23
U.S.	South Texas-1	PWR	West.	10,680,540	92.46
Germany	Unterweser	PWR	Siemens	10,432,002	87.97
Japan	Ohi-3	PWR	MHI	10,363,680	99.99
U.S.	Seabrook	PWR	West.	10,244,636	97.68
France	Penly-2	PWR	Fram.	10,175,597	83.82
Japan	Ohi-2	PWR	West.	10,121,935	98.07
Germany	Grafenrheinfeld	PWR	Siemens	10,058,372	85.14
France	Cattenom-1	PWR	Fram.	10,013,668	84.76
Germany	Gundremmingen-C	BWR	Siemens	9,988,213	84.61
France	Penly-1	PWR	Fram.	9,917,797	81.70
Germany	Gundremmingen-B	BWR	Siemens	9,864,867	83.56
U.S.	Palo Verde-2	PWR	CE	9,853,400	85.83
France	Flamanville-2	PWR	Fram.	9,798,691	82.94
U.S.	Catawba-2	PWR	West.	9,744,266	92.06
U.S.	Peach Bottom-3	BWR	GE	9,699,000	95.27
Japan	Fukushima II-2	BWR	Hitachi	9,662,253	100.00
U.S.	Sequoyah-1	PWR	West.	9,626,795	92.64
U.S.	Grand Gulf-1	BWR	GE	9,602,740	83.71
France	Cattenom-2	PWR	Fram.	9,539,041	81.71
U.S.	Vogtle-2	PWR	West.	9,465,396	88.11
U.S.	Susquehanna-2	BWR	GE	9,459,366	95.13
France	Golfech-2	PWR	Fram.	9,431,304	78.77
France	Cattenom-4	PWR	Fram.	9,364,868	78.28
U.S.	Callaway	PWR	West.	9,338,062	89.18
U.S.	Waterford-3	PWR	CE	9,327,910	92.10
U.S.	San Onofre-3	PWR	CE	9,321,741	94.16
U.S.	Limerick-2	BWR	GE	9,312,400	91.16

Appendix L. Top 50 Reactors by Generation, Worldwide *(Continued)*

Country	Unit	Reactor Type	Vendor	1996 Gross Generation (MWh)	1996 Gross Capacity Factor (Percent)
France	Golfech-1	PWR	Fram.	9,273,650	77.46
U.S.	Palo Verde-1	PWR	CE	9,243,200	80.51
U.S.	Diablo Canyon-1	PWR	West.	9,226,200	92.46
Japan	Kashiwazaki-2	BWR	Toshiba	9,203,910	95.25
U.S.	Nine Mile Point-2	BWR	GE	9,196,239	86.88
Sweden	Forsmark-3	BWR	ABB	9,139,667	86.71
U.S.	Browns Ferry-3	BWR	GE	9,025,810	93.58
France	Flamanville-1	PWR	Fram.	8,992,200	76.11
U.S.	San Onofre-2	PWR	CE	8,980,893	90.72
U.S.	McGuire-1	PWR	West.	8,914,839	82.85
Britain	Sizewell B-1	PWR	West.	8,885,406	81.37
Sweden	Oskarshamn-3	BWR	ABB	8,880,508	83.90
France	Nogent-2	PWR	Fram.	8,874,623	75.96
France	Paluel-2	PWR	Fram.	8,797,302	74.46
France	St. Alban-2	PWR	Fram.	8,717,252	73.62

Source: Excerpted from *Nucleonics Week*© 1997 by McGraw Hill, Inc. Reproduced by permission. Further reproduction prohibited.

Appendix M

Quick Reference Metric Conversion Tables

SPACE AND TIME

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Length	mi (statute)	km	1.609 347
	yd	m	*0.914 4
	ft (int)	m	*0.304 8
	in	cm	*2.54
Area	mi^2	km^2	2.589 998
	acre	m^2	4 046.873
	yd^2	m^2	0.836 127 4
	ft^2	m^2	*0.092 903 04
	in^2	cm^2	*6.451 6
Volume	acre foot	m^3	1 233.489
	yd^3	m^3	0.764 554 9
	ft^3	m^3	0.028 316 85
	ft^3	L	28.316 85
	gallon	L	3.785 412
	fl oz	mL	29.573 53
	in^3	cm^3	16.387 06
Velocity	mi/h	km/h	1.609 347
	ft/s	m/s	*0.304 8
Acceleration	ft/s^2	m/s^2	*0.304 8

NUCLEAR REACTION and IONIZING RADIATION

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Activity (of a radionuclide)	curie (Ci)	MBq	*37,000.0
	dpm	Bq (becquerel)	0.016 667
Absorbed dose	rad	Gy (gray)	*0.01
	rad	cGy	*1.0
Dose equivalent	rem	Sv (sievert)	*0.01
	rem	mSv	*10.0
	mrem	mSv	*0.01
	mrem	μSv	*10.0
Exposure (X- and gamma rays)	roentgen (R)	C/kg (coulomb)	0.000 258

*Exact conversion factors

HEAT

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Thermodynamic temperature	°F	°K	*°K = (°F + 459.67)/1.8
Celsius temperature	°F	°C	*°C = (°F−32)/1.8
Linear expansion coefficient	$°F^{-1}$	$°K^{-1}$ or $°C^{-1}$	*1.8
Thermal conductivity	(Btu • in)/(ft^2 • h • °F)	W/(m • °C)	0.144 227 9
Coefficient of heat transfer	Btu / (ft^2 • h • °F)	W/(m^2 • °C)	5.678 263
Heat capacity	Btu/°F	kJ/°C	1.899 108
Specific heat capacity	Btu/(lb • °F)	kJ/(kg •°C)	*4.186 8
Entropy	Btu/°F	kJ/°C	1.899 108
Specific entropy	Btu/(lb • °F)	kJ/(kg •°C)	*4.186 8
Specific internal energy	Btu/lb	kJ/kg	*2.326

MECHANICS

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Mass (weight)	ton (short) lb (avdp)	t (metric ton) kg	*0.907 184 74 *0.453 592 37
Moment of mass	lb • ft	kg • m	0.138 255
Density	ton (short)/yd^3 lb/ft^3	t/m3 kg/m3	1.186 553 16.018 46
Concentration (mass)	lb/gal	g/L	119.826 4
Momentum	lb • ft/s	kg •m/s	0.138 255
Angular momentum	lb • ft^2/s	kg •m^2/s	0.042 140 11
Moment of Inertia	lb • ft^2	kg •m^2	0.042 140 11
Force	kip (kilopound) lbf	kN (kilonewton) N (newton)	4.448 222 4.448 222

(Continued)

*Exact conversion factors

MECHANICS ***(Continued)***

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Moment of Force, torque	lbf • ft	N • m	1.355 818
	lbf • in	N • m	0.122 984 8
Pressure	atm (std)	kPa (kilopascal)	*101.325
	bar	kPa	*100.0
	lbf/in^2 (formerly psi)	kPa	6.894 757
	inHg (32°F)	kPa	3.386 38
	ftH_2O (39.2°F)	kPa	2.988 98
	inH_2O (60°F)	kPa	0.248 84
	mmHg (0°C)	kPa	0.133 322
Stress	kip/in^2 (formerly ksi)	MPa	6.894 757
	lbf/in^2 (formerly psi)	MPa	0.006 894 757
	lbf/in^2 (formerly psi)	kPa	6.894 757
	lbf/ft^2	kPa	0.047 880 26
Energy, work	kwh	MJ	*3.6
	cal_{th}	J (joule)	*4.184
	Btu	kJ	1.055 056
	ft • lbf	J	1.355 818
	therm (US)	MJ	105.480 4
Power	Btu/s	kW	1.055 056
	hp (electric)	kW	*0.746
	Btu/h	W	0.293 071 1

To convert from metric units to inch-pound units, divide the metric unit by the conversion factor.

*Exact conversion factors

Note: The information contained in this table is intended to familiarize NRC personnel with commonly used SI units and provide a quick reference to aid in the understanding of documents containing SI units. The conversion factors provided have not been approved as NRC guidelines for development of licensing actions, regulations or policy.

Source: Federal Standard 376A (May 5, 1983), Preferred Metric Units for General Use by the Federal Government; and International Commission of Radiation Units and Measurements, ICRU Report 33 (1980), Radiation Quantities and Unit

Glossary

AGREEMENT STATE: A State that has signed an agreement with the NRC allowing the State to regulate the use of radioactive material within that State.

BOILING-WATER REACTOR (BWR): A nuclear reactor in which water, used as both coolant and moderator, is allowed to boil in the core.

CAPABILITY: The maximum load that a generating station can carry under specified conditions for a given period of time without exceeding approved limits of temperature and stress. Net summer capability is used in the digest. Measured in watts except as noted otherwise.

CAPACITY FACTOR (Gross): The ratio of the gross electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

CAPACITY FACTOR (Net): The ratio of the net electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

CASK: A heavily shielded container used to store and/or ship radioactive materials. Lead and steel are common materials used in the manufacture of casks.

COMPACT: A group of two or more States formed to dispose of low-level radioactive waste on a regional basis. Forty-two States have formed nine compacts.

CONSTRUCTION RECAPTURE: The maximum number of years that could be added to the license expiration date to recover the period from the construction permit to the date when the operating license was granted. A licensee is required to submit an application for such a change.

CONTAMINATION: The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel.

DECOMMISSION: The process of safely removing a facility from service followed by reducing residual radioactivity to a level that permits the release of the property for unrestricted use.

DECON: A method of decommissioning in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations.

(Continued)

DECONTAMINATION: The reduction or removal of contaminated radioactive material from a structure, area, object, or person.

ENTOMB: A method of decommissioning in which radioactive contaminants are encased in a structurally long-lived material, such as concrete. The entombment structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level permitting unrestricted release of the property.

FISCAL YEAR: The 12 month period, from October 1 through September 30, used by the Federal Government in budget formulation and execution. The fiscal year is designated by the calendar year in which it ends.

FUEL CYCLE: The series of steps involved in supplying fuel for nuclear power reactors.

FULL-TIME EQUIVALENT: A measurement equal to one staff person working a full-time work schedule for 1 year.

GENERATION (Gross): The total amount of electric energy produced by a generating station as measured at the generator terminals. Measured in watthours except as noted otherwise.

GENERATION (Net): The gross amount of electric energy produced less the electric energy consumed at a generating station for station use. Measured in watthours except as noted otherwise.

GIGAWATT: One billion watts.

GIGAWATTHOUR: One billion watthours.

HIGH-LEVEL WASTE: High-level radioactive waste (HLW) means (1) irradiated (spent) reactor fuel; (2) liquid waste resulting from the operation of the first cycle solvent extraction system, and the concentrated wastes from subsequent extraction cycles, in a facility for reprocessing irradiated reactor fuel; and (3) solids into which such liquid wastes have been converted. HLW is primarily in the form of spent fuel discharged from commercial nuclear power reactors. It also includes some reprocessed HLW from defense activities, and a small quantity of reprocessed commercial HLW.

LOW-LEVEL WASTE: Low-level radioactive waste (LLW) is a general term for a wide range of wastes. Industries; hospitals and medical, educational, or research institutions; private or government laboratories; and nuclear fuel cycle facilities (e.g., nuclear power reactors and fuel fabrication plants) using radioactive materials generate low-level wastes as part of their normal operations. These wastes are generated in many physical and chemical forms and levels of contamination.

MAXIMUM DEPENDABLE CAPACITY (Gross): Dependable main-unit gross capacity, winter or summer, whichever is smaller. The dependable capacity varies because the unit efficiency varies during the year due to temperature variations in cooling water. It is the gross electrical output as measured at the output terminals of the turbine generator during the most restrictive seasonal conditions (usually summer). Measured in watts except as noted otherwise.

MAXIMUM DEPENDABLE CAPACITY (Net): Gross maximum dependable capacity less the normal station service loads. Measured in watts except as noted otherwise.

MEGAWATT (MW): One million watts.

MEGAWATTHOUR (MWh): One million watthours.

METRIC TON: Approximately 2,200 pounds.

NET SUMMER CAPABILITY: The steady hourly output that generating equipment is expected to supply to system load exclusive of auxiliary power, as demonstrated by tests at the time of summer peak demand. Measured in watts except as noted otherwise.

NONPOWER REACTOR: Reactors used for research, training, and test purposes, and for the production of radioisotopes for medical and industrial uses.

POSSESSION ONLY LICENSE: A form of license that allows possession but not operation.

PRESSURIZED-WATER REACTOR (PWR): A nuclear reactor in which heat is transferred from the core to a heat exchanger via water kept under high pressure without boiling the water.

PRODUCTION EXPENSE: Production expenses are a component of generation expenses that includes costs associated with operation, maintenance, and fuel.

RADIOACTIVITY: The rate at which radioactive material emits radiation. Measured in units of becquerels or disintegrations per second.

SAFSTOR: A method of decommissioning in which the nuclear facility is placed and maintained in such condition that the nuclear facility can be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use.

SPENT NUCLEAR FUEL: Fuel that has been removed from a nuclear reactor because it can no longer sustain power production for economic or other reasons.

(Continued)

URANIUM FUEL FABRICATION FACILITY: A facility that (1) manufactures reactor fuel containing uranium for any of the following (i) preparation of fuel materials; (ii) formation of fuel materials into desired shapes; (iii) application of protective cladding; (iv) recovery of scrap material; and (v) storage associated with such operations; or (2) conducts research and development activities.

URANIUM HEXAFLUORIDE PRODUCTION FACILITY: A facility that receives natural uranium in the form of ore concentrate; enriches it, either by gaseous diffusion or gas centrifuge methods; and converts it into uranium hexafluoride.

VIABILITY ASSESSMENT: A DOE decisionmaking process to judge the prospects for geologic disposal of high-level radioactive wastes at Yucca Mountain based on (1) specific design work on the critical elements of the repository and waste package, (2) a total system performance assessment that will describe the probable behavior of the repository, (3) a plan and cost estimate for the work required to complete a license application, and (4) an estimate of the costs to construct and operate the repository.

WATT: The electrical unit of power. The rate of energy transfer equivalent to 1 ampere flowing under a pressure of 1 volt at unity power factor.

WATTHOUR: An electrical energy unit of measure equal to 1 watt of power supplied to, or taken from, an electrical circuit steadily for 1 hour.

WHEELING SERVICE: The movement of electricity from one system to another over transmission facilities of intervening systems. Wheeling service contracts can be established between two or more systems.

NRC FORM 335 (2-89) NRCM 1102, 3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER (Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)
NUREG-1350
Vol. 9

2. TITLE AND SUBTITLE

Nuclear Regulatory Commission
Information Digest
1997 Edition

3. DATE REPORT PUBLISHED

MONTH	YEAR
May	1997

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

M. Garver, et al.

6. TYPE OF REPORT

Annual

7. PERIOD COVERED (Inclusive Dates)

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

Division of Budget and Analysis
Office of the Chief Financial Officer
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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

Same as 8, above.

10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

The Nuclear Regulatory Commission Information Digest (digest) provides a summary of information about the U.S. Nuclear Regulatory Commission (NRC), NRC's regulatory responsibilities, NRC licensed activities, and general information on domestic and worldwide nuclear energy. The digest, published annually, is a compilation of nuclear- and NRC-related data and is designed to provide a quick reference to major facts about the agency and the industry it regulates. In general, the data cover 1975 through 1996, with exceptions noted. Information on generating capacity and average capacity factor for operating U.S. commercial nuclear power reactors is obtained from monthly operating reports that are submitted directly to the NRC by the licensee. This information is reviewed by the NRC for consistency only and no independent validation and/or verification is performed.

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

Information Digest
NRC Facts

13. AVAILABILITY STATEMENT

Unlimited

14. SECURITY CLASSIFICATION

(This Page)
Unclassified

(This Report)
Unclassified

15. NUMBER OF PAGES

16. PRICE

NRC FORM 335 (2-89)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS MAIL
POSTAGE AND FEES PAID
USNRC
PERMIT NO. G-67