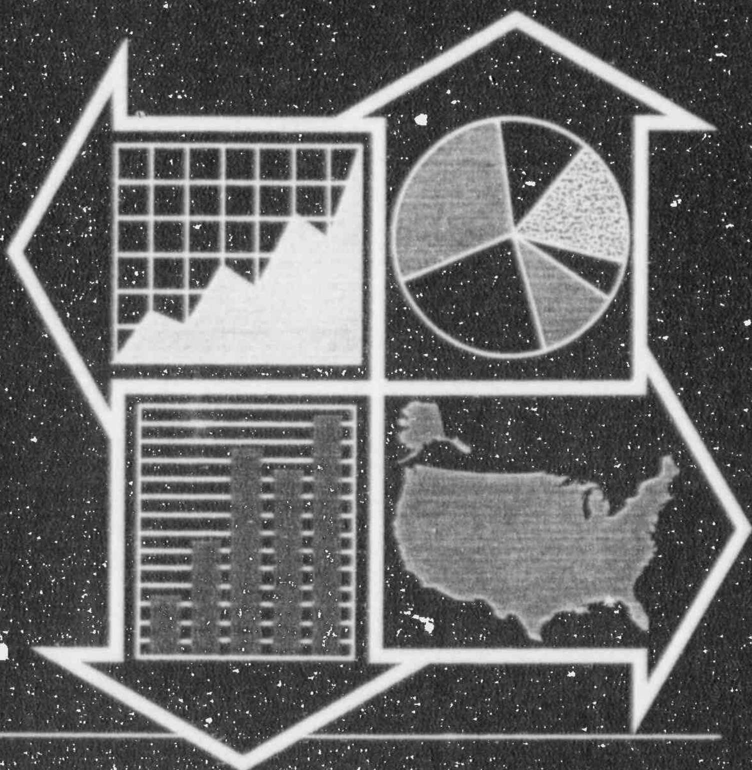
Nuclear Regulatory Commission

Information Digest

1993 Edition



NUREG-1350
Volume 5

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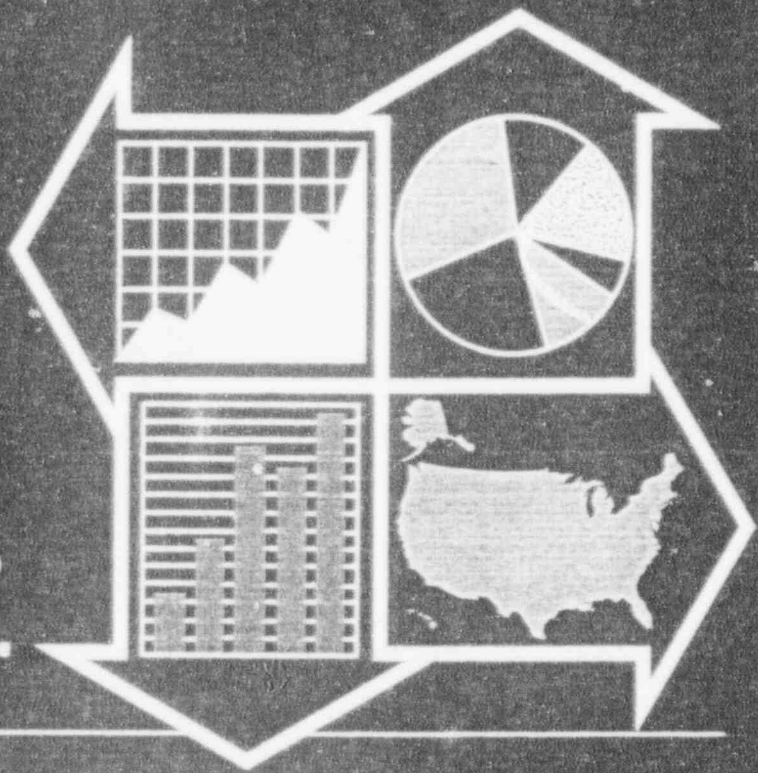

NUREG-1350
Volume 5

Office of the Controller

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 20555

2. The Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082

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

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

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

The following documents in the NUREG series are available for purchase from the GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, grants, international agreement 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 and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

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

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

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

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copy-righted 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.

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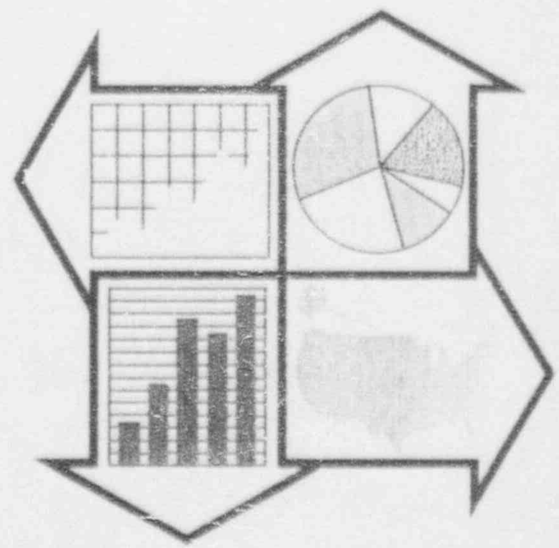

Abstract

The Nuclear Regulatory Commission Information Digest (digest) provides a summary of information about the U.S. Nuclear Regulatory Commission (NRC), NRC's regulatory responsibilities, the activities NRC licenses, 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 1992, 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 Karen Olive, United States Nuclear Regulatory Commission, Office of the Controller, Division of Budget and Analysis, Washington, D.C. 20555. For detailed and complete information about tables and figures, refer to the source publications.

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***Figures** (Continued)*

Tables

***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 in Washington, D.C., that provides public access to documents pertaining to the licensing and regulation of nuclear facilities and materials and related agency information. The NRC has also established Local Public Document Rooms (LPDRs) near the site of each commercial nuclear power reactor, low-level waste repository, the proposed high-level waste repository, and certain fuel cycle facilities. The LPDR collections consist of all publicly available documents about the facility, including hearing transcripts, safety evaluation reports, environmental impact statements, and inspection and licensee event reports. Power reactor LPDRs also maintain a microfiche file of all 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.

Finally, the NRC announces the schedules of all meetings open to the public. Meetings between the NRC staff and outside persons open for public observation are announced on a recorded message at 1-800-952-9674. The public meetings of the 5-member Commission are announced on a recorded message at (301) 504-1292.

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. 1), at the following address:

U.S. Nuclear Regulatory Commission ATTN: Distribution and Mail Services, Washington, D.C. 20555

NRC as a Regulatory Agency

Mission and Statutory Authority

The mission of the U.S. Nuclear Regulatory Commission (NRC) is to ensure adequate protection of the public health and safety, the common defense and security, and the environment in the use of nuclear materials in the United States. The NRC's scope of responsibility includes regulation of commercial nuclear power reactors; nonpower 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 waste.

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 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 the 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 reactors and other nuclear facilities, such as nuclear fuel cycle facilities and nonpower 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 nonpower 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

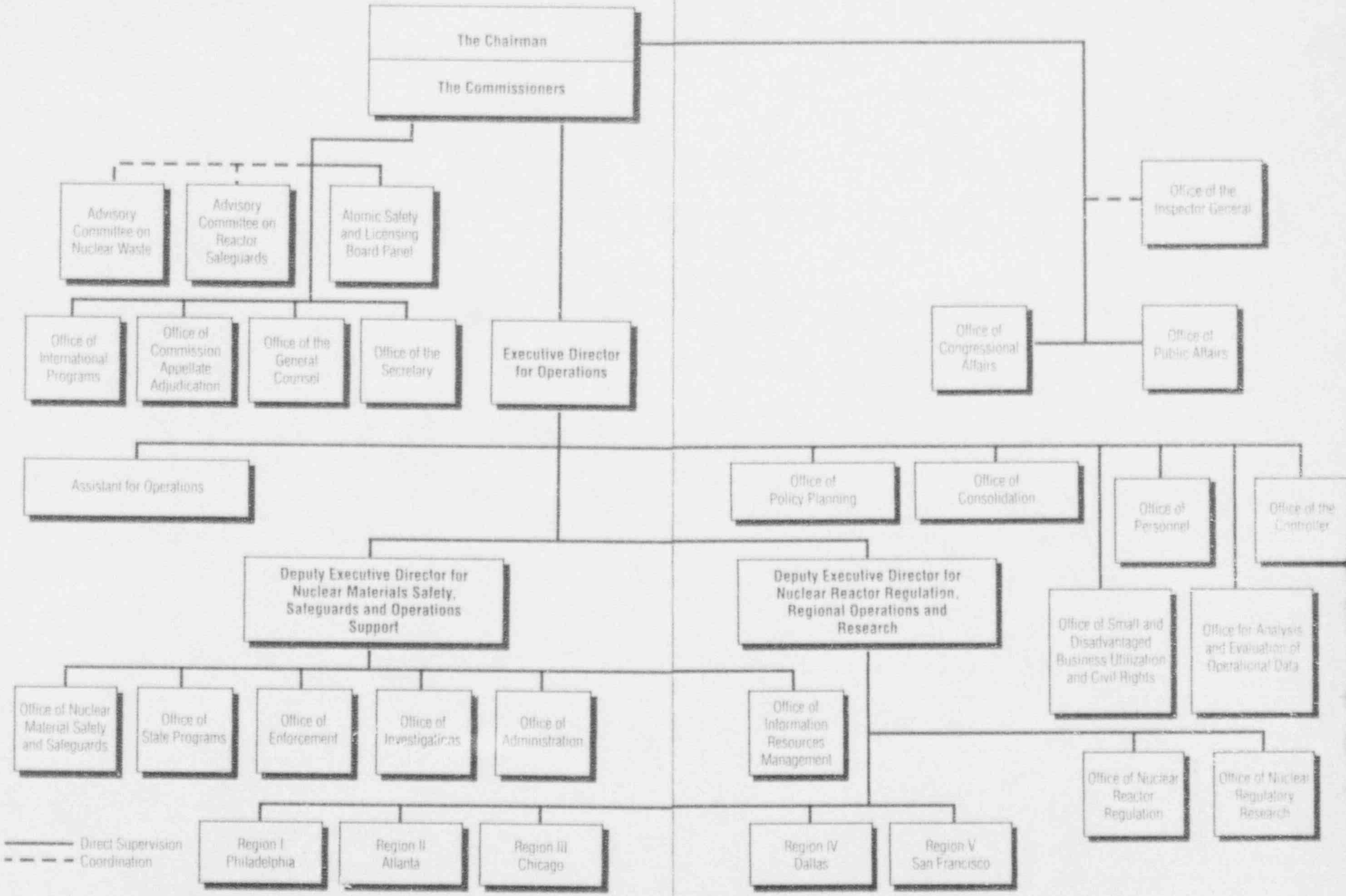
The NRC is headed by five Commissioners appointed by the President and confirmed by the Senate for 5-year terms. One of them is designated by the President to be the Chairman, serving as the principal executive officer and official spokesperson of the Commission. The staff, headed by the Executive Director for Operations, carries out the policies and decisions made by the Commission. The NRC's principal offices 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 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
- **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
- **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
- **Office of Investigations** - Conducts investigations of allegations of wrongdoing by NRC licensees
- **Regional Offices** - Conduct inspection, enforcement, investigation, licensing, and emergency response programs within regional boundaries that the headquarters offices originate
- **Inspector General** - Provides the Commission with an independent review and appraisal of NRC programs and operations to ensure their effectiveness, efficiency, and integrity

Refer to the "Nuclear Regulatory Commission 1991 Annual Report" (NUREG-1145) for 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)**



NRC Locations

Headquarters:

Greater Washington, D.C., Area
(301) 492-7000

The NRC is in the process of consolidating its headquarters staff in Rockville, Maryland. The consolidation is expected to be completed in 1994.

Operations Center:

Bethesda, Maryland
(301) 951-0550

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 five regional offices located throughout the United States (see Figure 2).

Region I
King of Prussia, Pennsylvania
(215) 337-5000

Region II
Atlanta, Georgia
(404) 331-4503

Region III
Glen Ellyn, Illinois
(708) 790-5500

Region IV
Arlington, Texas
(817) 860-8100

Region V
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 16 for a map of the U.S. commercial nuclear power reactor sites.

Technical Training Center:

Chattanooga, Tennessee
(615) 855-6500

Uranium Recovery Field Office:

Golden, Colorado
(303) 231-5800

Figure 2. **NRC Regions**

Note: Alaska and Hawaii are included in Region V.
Source: Nuclear Regulatory Commission.

NRC Fiscal Year 1993 Resources

The Energy and Water Development Appropriations Act (Public Law 102-377) appropriated $540 million to the NRC for Fiscal Year (FY) 1993. The NRC's FY 1993 personnel ceiling is 3,343 full-time equivalent (FTE) staff.

The NRC allocates funds and staff to the following programs (see Figures 3 and 4):

- Reactor Safety and Safeguards Regulation (RSSR)
- Reactor Safety Research (RSR)
- Reactor Special and Independent Reviews, Investigations, and Enforcement (RSIRIE)
- Nuclear Material and Low-Level Waste Safety and Safeguards Regulation (NMLLWSSR)
- High-Level Nuclear Waste Regulation (HLNWR)
- Nuclear Safety Management and Support (NSMS)
- Inspector General (IG)

These programs fall into three categories—reactor-related, nuclear material-related, and management and support.

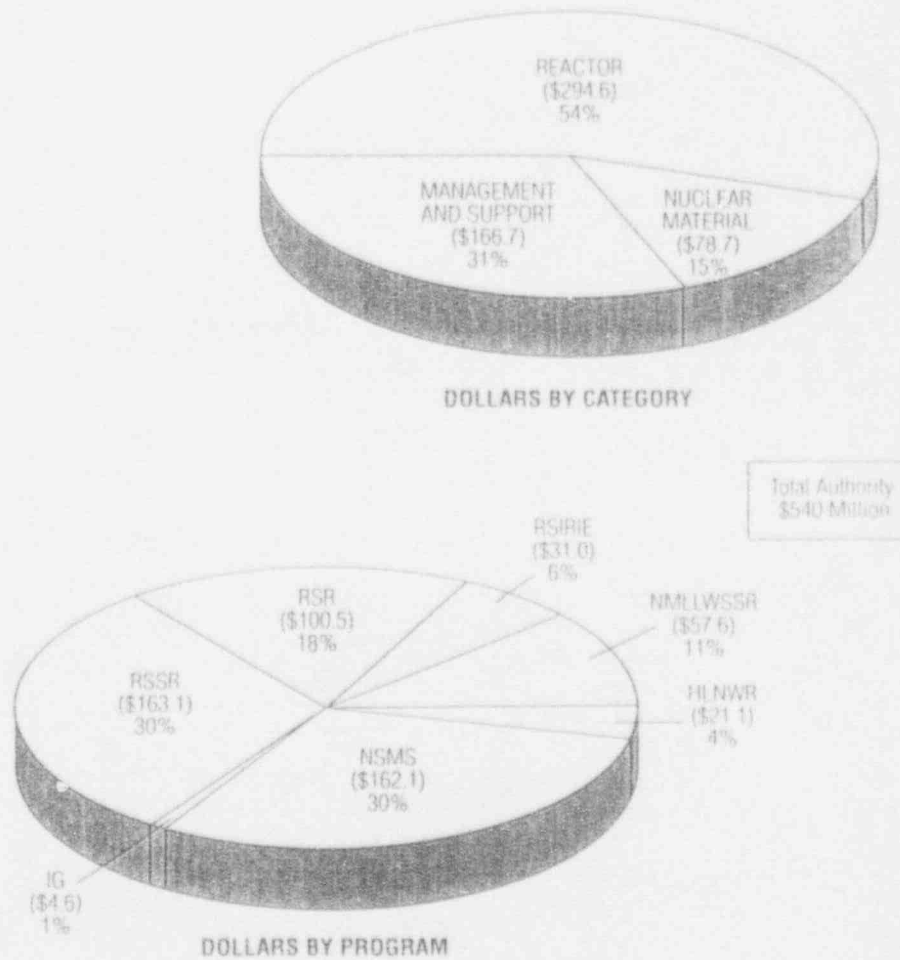
In 1983 constant dollars, the NRC's FY 1993 budget has decreased approximately 18 percent (see Table 1 and Figure 5). Although the NRC personnel ceiling has fluctuated over the past ten years, it essentially remains the same in FY 1993 as it did in FY 1983 (see Table 2 and Figure 6).

Public Law 101-508, the Omnibus Budget Reconciliation Act of 1990, requires the NRC to recover 100 percent of its budget authority, less appropriations from the Nuclear Waste Fund, for FYs 1991-1995 by assessing fees to its licensees. In FY1992, the NRC was required to collect approximately $493 million through these fees (see Figure 7). In FY 1993, the NRC is required to collect approximately $519 million. The fees assessed to the major classes of NRC licensees in FY 1992 were:

Class of Licensee	Range of Annual Fees
Operating Power Reactor	$3,082,000 to $3,138,000
Fuel Facility	$536,250 to $2,325,250
Uranium Recovery Facility	$58,950 to $167,650
Transportation Approval	$1,650 to $62,950
Materials User	$580 to $16,550

The NRC's enforcement program seeks to protect the public health and safety by ensuring compliance with regulations and license conditions, obtaining prompt correction in areas of noncompliance, deterring further noncompliance, and encouraging improvement of licensee performance. The NRC enforcement program is governed by the NRC Enforcement Policy found at 10 CFR Part 2, Appendix C. 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 V for those less serious. Civil penalties are normally issued for Severity Level III or higher violations. The amount of each civil penalty assessed reflects the amount that the NRC ultimately decides is appropriate through its enforcement process (proposed penalty, licensee response, and imposition of penalty) or the hearing process. More significant violations result in civil penalties. In FY 1992, approximately $4 million in civil penalties was paid. These civil penalties are deposited in the U.S. Treasury and are not used by the NRC.

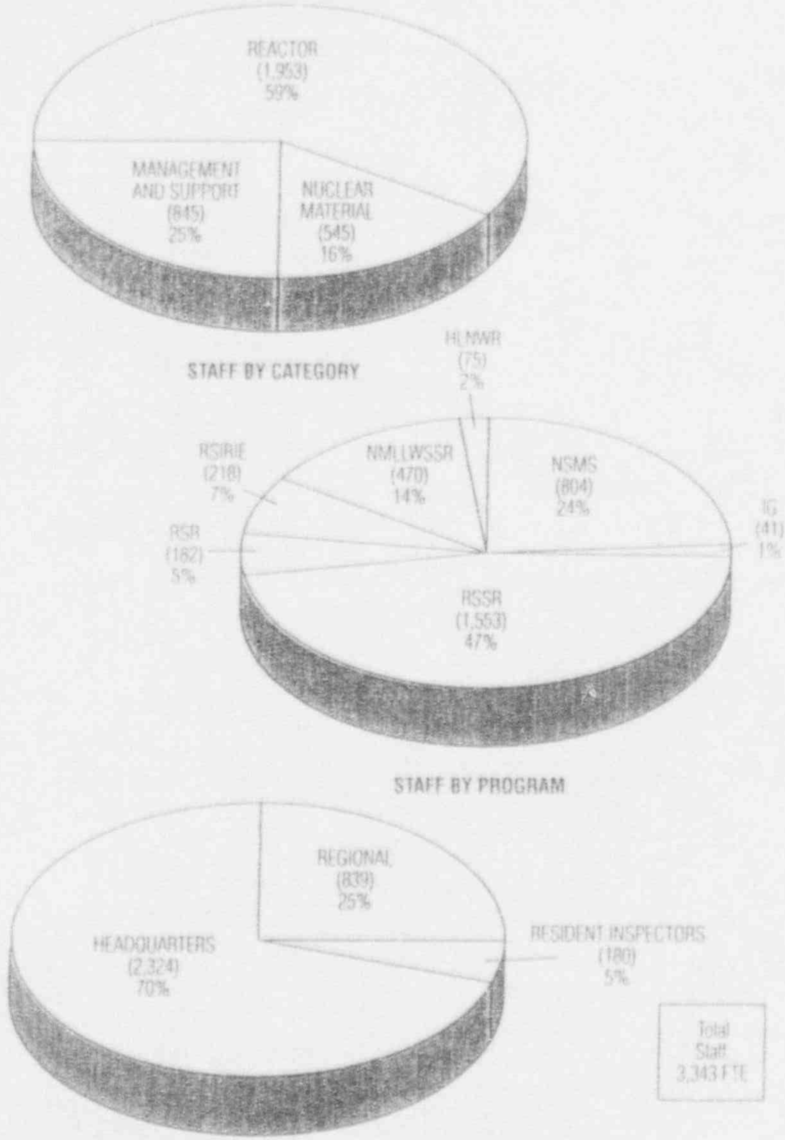
Figure 3. **Distribution of NRC FY 1993 Budget Authority (Dollars in Millions)**



Note: Percentages are rounded to the nearest whole number.

Source: Nuclear Regulatory Commission

Figure 4 **Distribution of NRC FY 1993 Staff**



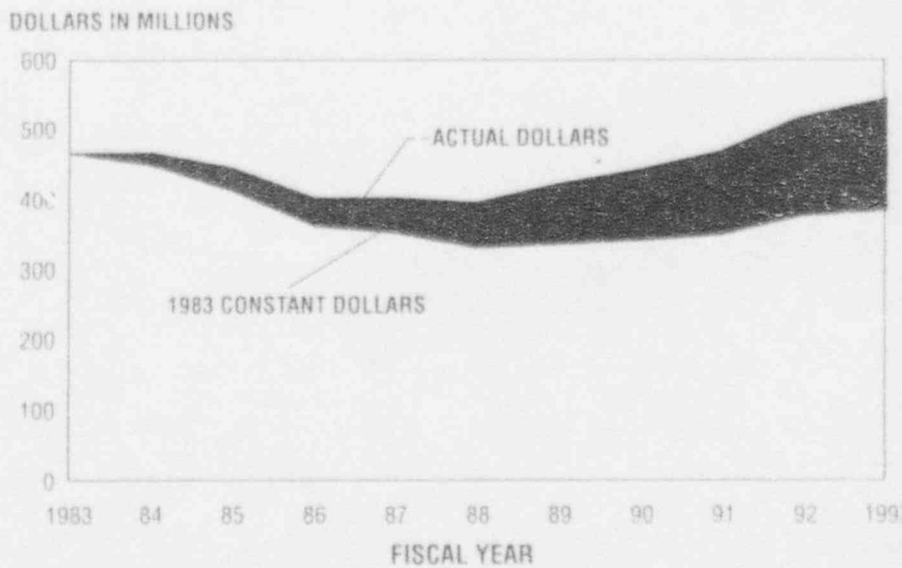
Note: Percentages are rounded to the nearest whole number.

Source: Nuclear Regulatory Commission

Table 1 **NRC Budget Authority, FYs 1983-1993 (Dollars in Millions)**

Fiscal Year	Actual Dollars	1983 Constant Dollars
1983	465	465
1984	466	448
1985	444	412
1986	400	362
1987	401	351
1988	393	330
1989	420	334
1990	439	340
1991	465	347
1992	513	373
1993	540	381

Figure 5 **NRC Budget Authority, FYs 1983-1993**



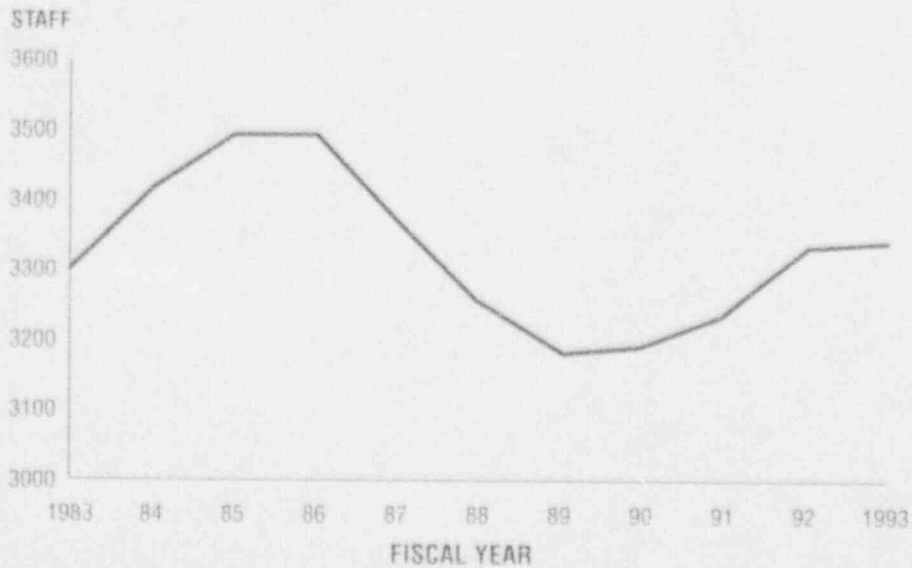
Note: Dollars are rounded to the nearest million.

Source (Table 1 and Figure 5): Nuclear Regulatory Commission

Table 2. **NRC Personnel Ceiling, FYs 1983-1993**

Fiscal Year	Staff
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

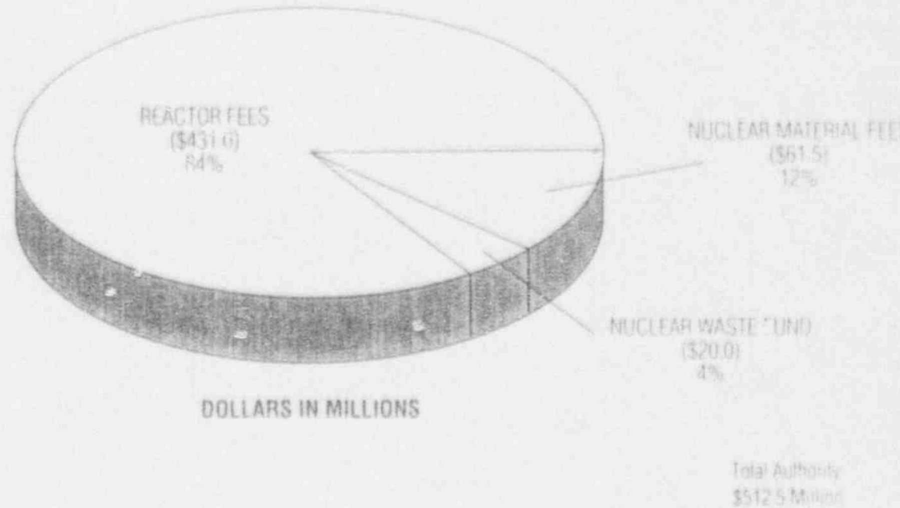
Figure 6. **NRC Personnel Ceiling, FYs 1983-1993**



Note (Table 2 and Figure 6): The data reflect full-time equivalents (FTE). See Glossary for definition.

Source (Table 2 and Figure 6): Nuclear Regulatory Commission

Figure 7. **Sources of NRC FY 1992 Budget Authority**



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 693 gigawatts in 1991. Nuclear energy accounted for approximately 14 percent of this capability (see Figure 8).

U.S. net electric generation totaled approximately 2,823 thousand gigawatthours in 1991. Nuclear energy accounted for approximately 22 percent of this generation (see Figure 8).

In 1991, 111 operating nuclear reactors in 33 States generated approximately one-fifth of the nation's electricity (see Table 3 and Figure 9).

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

Since 1975, nuclear electric generation has 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 10).

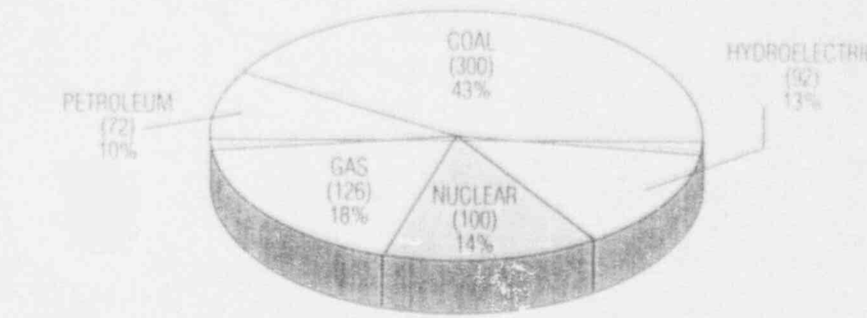
Electricity from coal and nuclear sources, which accounted for 57 percent of the U.S. generating capability, produced 77 percent of the net electricity generated in 1991 (see Table 5 and Figure 11).

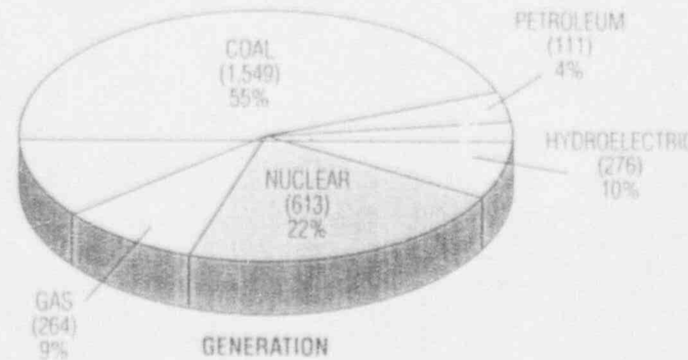
Average Generation Expenses

The generation expense data presented here include all nuclear and coal-fired power plants owned and operated by the major investor-owned electric utilities in the United States (see Glossary). For jointly owned plants, only the portion owned by the major investor-owned electric utilities is included (see Table 6 and Figure 12).

- In 1991, generation expenses averaged 5.54 cents per kilowatthour for nuclear reactors and 3.01 cents per kilowatthour for coal-fired plants. Production expenses averaged 2.24 cents per kilowatthour for nuclear reactors and 2.13 cents per kilowatthour for coal-fired plants.
- Recently built nuclear reactors generally incur higher interest costs, which are a major component of the capital expenses.

Figure 8 **1991 U.S. Electric Capability and Net Generation by Energy Source**





* Total does not equal sum of components due to independent rounding. Total value includes approximately 4 gigawatts of other generating capability (geothermal, refuse, waste heat, waste steam, solar, wind, and wood), which represents less than 1 percent of total capability.

** Total value includes approximately 10 thousand gigawatthours of generation by other energy sources (geothermal, wood, wind, waste, 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 1991 (DOE/EIA-0095 (91)) Table 17 (page 23) and DOE/EIA Monthly Energy Review (DOE/EIA-0035 (92/10)), Table 7.1 (page 93).

Table 3. **1991 Electric Generating Capability and Electricity Generated in Each State by Nuclear Power**

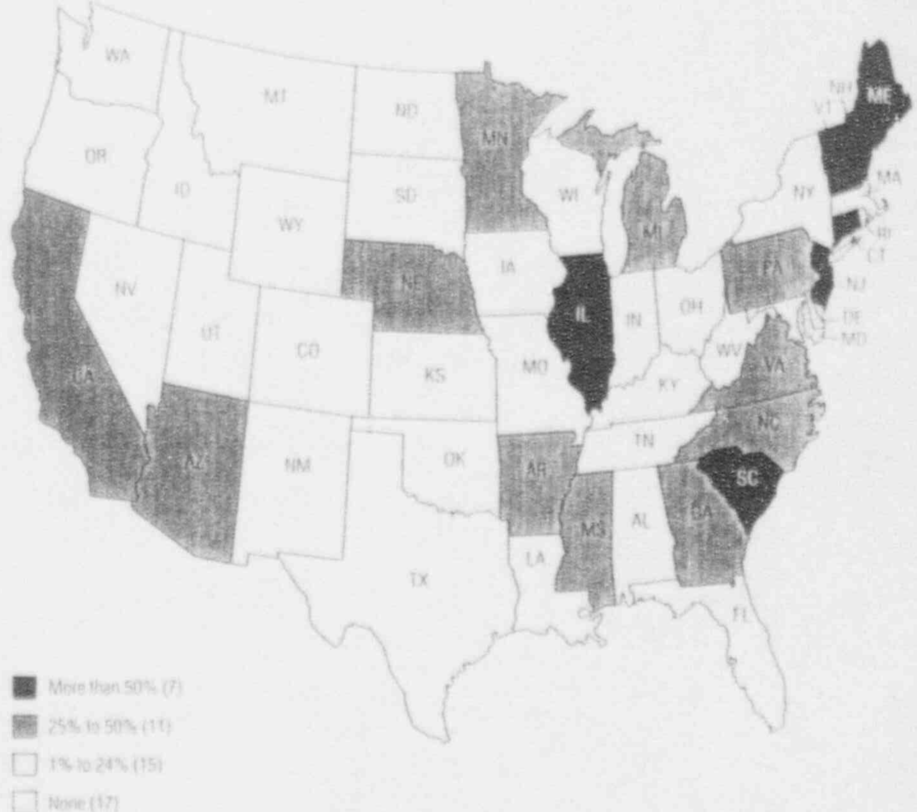
	Percent Net Nuclear			Percent Net Nuclear	
State	Capability	Generation	State	Capability	Generation
Alabama	24	19	Missouri	7	16
Arizona	26	38	Nebraska	23	35
Arkansas	18	33	New Hampshire	44	53
California	11	30	New Jersey	28	67
Connecticut	46	52	New York	16	23
Florida	12	16	North Carolina	23	36
Georgia	18	28	Ohio	7	11
Illinois	39	56	Oregon	10	3
Iowa	6	13	Pennsylvania	26	35
Kansas	12	18	South Carolina	40	63
Louisiana	12	24	Tennessee	14	23
Maine	36	66	Texas	6	8
Maryland	15	24	Vermont	46	78
Massachusetts	9	12	Virginia	25	49
Michigan	18	29	Washington	5	4
Minnesota	17	30	Wisconsin	14	23
Mississippi	16	39	Others*	0	0

* There are 17 States with no nuclear generating capability.

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

Source: DOE/EIA Inventory of Power Plants in the United States (DOE/EIA-0095 (91)), Table 17 (page 23) and DOE/EIA Report on Electric Power Generation

Figure 9. **1991 Net Electricity Generated in Each State by Nuclear Power**



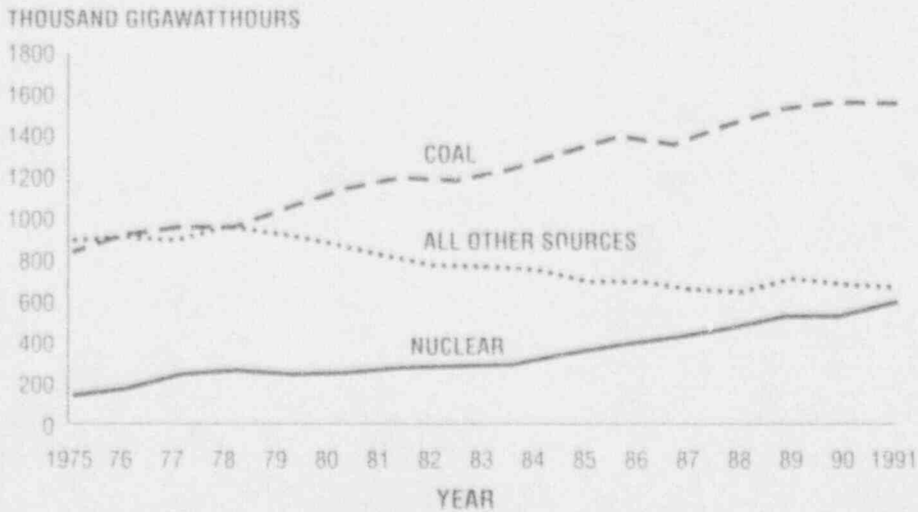
Note: There are no commercial reactors in Alaska or Hawaii. Percentages are rounded to the nearest whole number.

Source: DOE/EIA Report on Electric Power Generation

Table 4 **U.S. Net Electric Generation by Source, 1975-1991 (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

Figure 10 **U.S. Net Electric Generation by Source, 1975-1991**

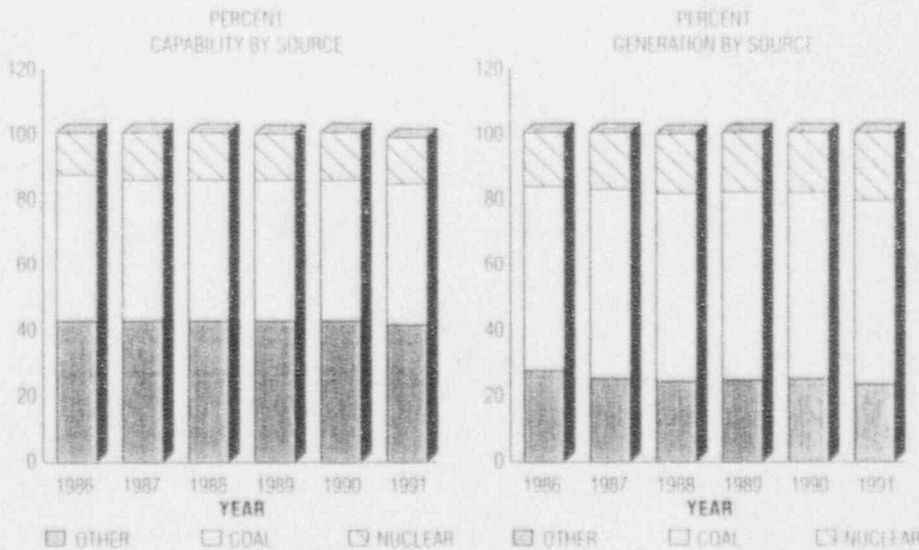


Source (Table 4 and Figure 10): DOE/EIA Monthly Energy Review (DOE/EIA-0035 (92/10)), Table 7.1 (page 93)

Table 5 **U.S. Electric Generating Capability by Source, 1986-1991 (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

Figure 11 **U.S. Electric Generating Capability and Electricity Generated by Source, 1986-1991**



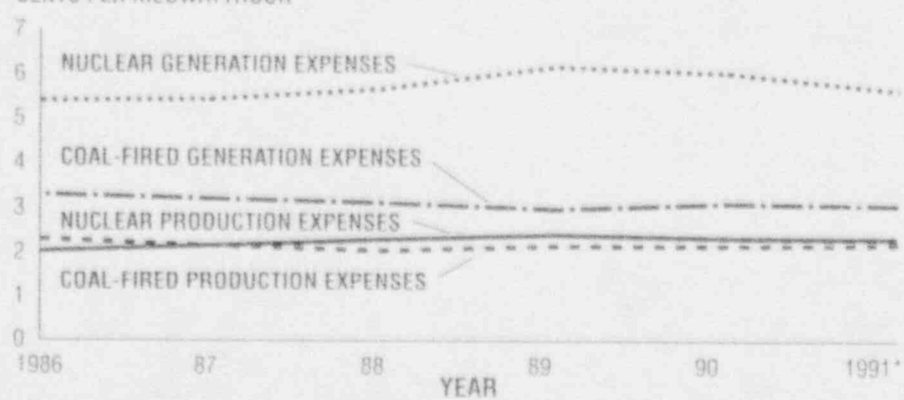
Note (Table 5 and Figure 11): Net summer capability. Percentages are rounded to the nearest whole number

Source (Table 5 and Figure 11): DOE/EIA Inventory of Power Plants in the United States (DOE/EIA-0095 (91)), Table 17 (page 23) and DOE/EIA Monthly Energy Review (DOE/EIA-0035 (92/10)), Table 7.1 (page 93)

Table 6. **U.S. Average Nuclear Reactor and Coal-Fired Plant Generation Expenses, 1986-1991 (Cents per Kilowatthour)**

Year	Production Expenses: Operation and Maintenance	Production Expenses: Fuel	Capital Expenses	Total Generation Expenses
Nuclear:				
1986	1.25	0.75	3.34	5.34
1987	1.37	0.76	3.25	5.38
1988	1.46	0.79	3.35	5.60
1989	1.62	0.75	3.73	6.10
1990	1.55	0.72	3.70	5.97
1991*	1.57	0.67	3.29	5.54
Coal-Fired:				
1986	0.44	1.85	0.99	3.27
1987	0.45	1.69	1.03	3.17
1988	0.36	1.65	1.06	3.07
1989	0.39	1.75	0.79	2.93
1990	0.35	1.77	0.91	3.04
1991*	0.37	1.76	0.89	3.01

Figure 12. **U.S. Average Nuclear Reactor and Coal-Fired Plant Generation and Production Expenses, 1986-1991**



Note (Table 6 and Figure 12): Generation expenses include costs associated both with production expenses (operation, maintenance, and fuel costs) and with capital expenses (taxes, depreciation, etc.). Costs have not been adjusted to reflect inflation. Totals do not equal sum of components due to independent rounding.

Source (Table 6 and Figure 12): DOE/EIA Electric Plant Cost and Power Production Expenses 1990 (DOE/EIA-0455 (90)), Table 7 (page 14).

U.S. Electricity Generated by Commercial Nuclear Power

Net nuclear-based electric generation in the United States surpassed its previous-year level for the twelfth consecutive year, reaching an all time high in 1992 of 620 thousand gigawatthours (see Table 7 and Figure 13).

In 1991, the average U.S. net capacity factor was 71 percent. It remained at 71 percent in 1992. Since 1982, the average capacity factor has increased 13 percentage points (see Table 7).

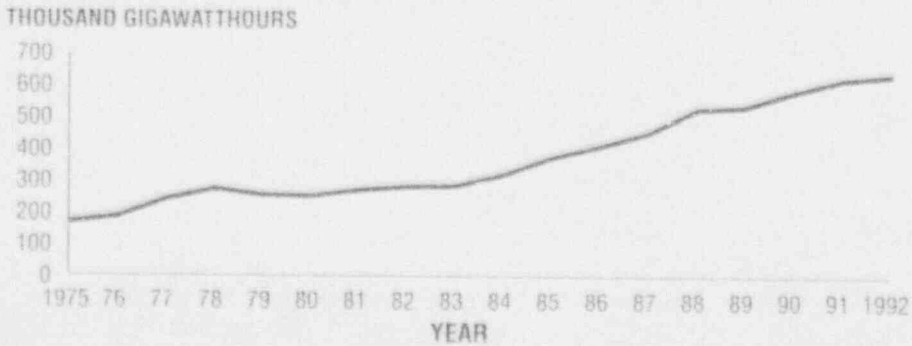
- Capacity factor is the ratio of electricity generated to the amount of energy that could have been generated (see Glossary).
- More than half of the U.S. commercial nuclear reactors operated above a capacity factor of 70 percent in 1992 (see Table 8).
- Babcock and Wilcox (B&W) reactors had the highest average capacity factors compared to those of the other three vendors. The seven B&W reactors had an average capacity factor of 84 percent. The average capacity factors for the other three vendors were the following: 51 Westinghouse reactors—75 percent, 15 Combustion Engineering reactors—also 75 percent, and 37 General Electric reactors—61 percent (see Table 8).

Table 7 **U.S. Commercial Nuclear Power Reactor Average Capacity Factor and Net Generation, 1975-1992**

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	*

*Data are not available

Figure 13 **Net Generation of U.S. Nuclear Electricity, 1975-1992**



Note (Table 7 and Figure 13) Average annual capacity factor is based on net maximum dependable capacity. See Glossary for definition.

Source (Table 7 and Figure 13) 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, 1991–1992**

Capacity Factor	Numbr of Operating Reactors 1991	1992	Percent of Net Nuclear Generated 1991	1992
Above 70 Percent	69	70	72	73
50 to 70 Percent	28	27	23	23
Below 50 Percent	14*	13*	5	4
Total	111	110	100	100

	Number of Operating Reactors 1991	1992	Average Capacity Factor (Percent) 1991	1992	Percent of Net Nuclear Generated 1991	1992
Vendor:						
Babcock & Wilcox	7	7	83	84	7	7
Combustion Engineering	15	15	76	75	15	15
General Electric	37*	37*	65	61	30	28
Westinghouse Electric	52	51	72 *	75	48	50
Total	111	110				
Reactor Type:						
Boiling-Water Reactor	37*	37*	65	61	30	27
Pressurized-Water Reactor	74	73	73	76	70	73
Total	111	110				

*Includes two reactors (Browns Ferry 1 and Browns Ferry 3) that were shutdown for the entire year.

Note Average capacity factor is based on net maximum dependable capacity. See Glossary for definition. Refer to Appendix A for the 1991 and 1992 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 1992, 412 operating reactors in 33 countries had a maximum dependable capacity of 324,410 megawatts electric (net MWe).

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

Major producers of nuclear electricity during 1991 were the United States and France.

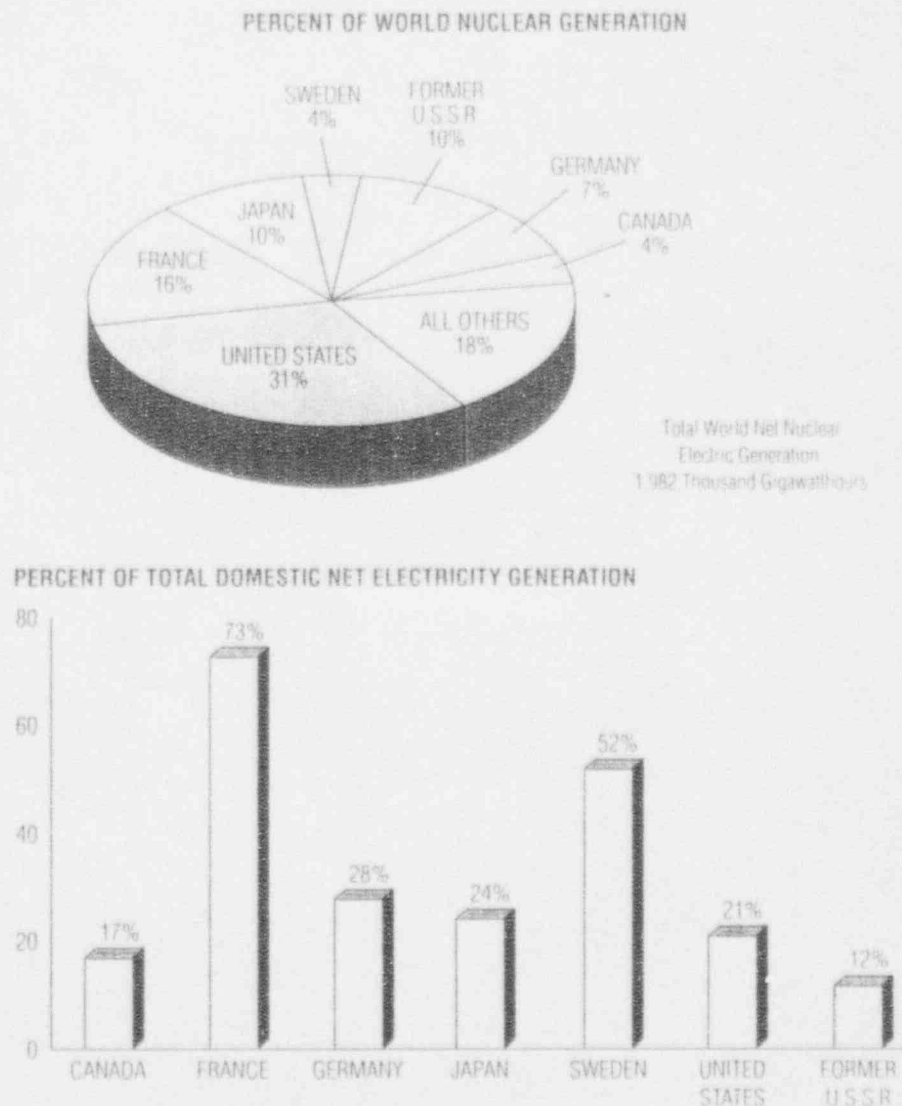
- Approximately 31 percent of the world's net nuclear-generated electricity was produced in the United States (see Figure 14).
- Although France produced approximately 16 percent of the world's net nuclear-generated electricity, the nuclear portion of its total domestic electricity generation was approximately 73 percent (see Figure 14).

Of the countries cited here, reactors in Germany and Japan (72 percent), the United States (69 percent), and Canada (68 percent) had the highest gross capacity factors in 1992. Reactors in the United States had the greatest gross generation by almost double the next highest producer, France (see Table 9).

- Refer to Appendix H for a list of the top 50 units by gross capacity factor, worldwide, and Appendix I 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 12 percentage points in the United States and 10 percentage points in France. Since 1991, the capacity factor in Germany has increased 6 percentage points (see Table 10).

Figure 14 **1991 Net Nuclear Electric Power as Percent of World Nuclear and Total Domestic Electricity Generation**



Note. Percentages are rounded to the nearest whole number.

Source: DOE/EIA International Energy Annual 1991 (DOE/EIA-0219(91)), Various Tables.

Table 9. **1992 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	20	68	81	4	0
France	57	63	338	0	10
Germany	22	72	159	5	11
Japan	42	72	216	6	4
Sweden	12	67	64	0	2
United States	110	69*	651	20	20
Former U.S.S.R.	**	*	**	**	**

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Table 10. **Commercial Nuclear Power Reactor Average Gross Capacity Factor by Selected Country, 1982-1992**

	Average Gross Annual Capacity Factor (Percent)										
Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	82	79	72	72	73	72	77	74	61	72	58
France	53	62	70	71	67	60	58	62	63	63	63
Germany	70	70	76	87	78	75	74	69	66	66	72
Japan	69	68	70	71	76	77	71	71	72	72	72
Sweden	61	60	76	71	81	77	77	74	75	85	67
United States	57 [58	54 58	56 58	58 63	57 60	57 62	64 65	62 63	66 68	69 71	69 71]*
Former U.S.S.R.	**	**	**	**	**	**	**	**	**	**	**

* For comparison, U.S. average gross capacity factor is used. The 1992 U.S. average net capacity factor is 71 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) and licensee data as compiled by the Nuclear Regulatory Commission.

Operating Nuclear Reactors

U.S. Commercial Nuclear Power Reactors

In 1992, there were 110 commercial nuclear power reactors licensed to operate in the United States. Since then, San Onofre 1 and Trojan have ceased operations and Comanche Peak 2 has received its operating license. There are currently 109 commercial nuclear power reactors licensed to operate in 33 States (see Figures 16-21).

- 2 are under construction (Watts Bar 1 and 2).
- 5 are partially completed, but construction has been deferred (Bellefonte 1 and 2, Perry 2, and Washington Nuclear 1 and 3).
- 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 15.

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

Experience - The 109 reactors licensed to operate have accumulated 1,523 reactor-years of experience (see Table 11 and Figure 22). An additional 193 reactor-years of experience have been accumulated by permanently shutdown reactors.

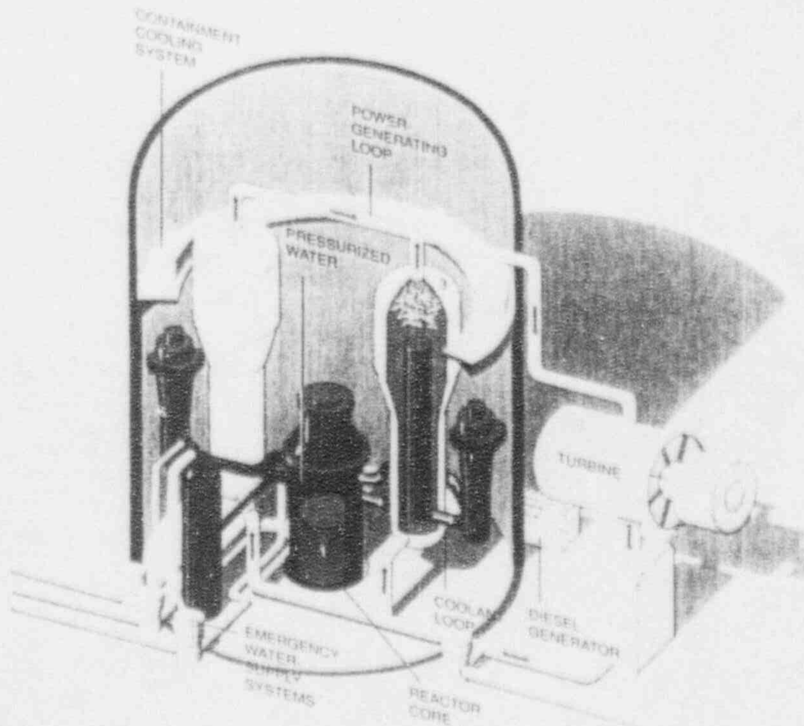
Principal Licensing and Inspection Activities

- The NRC depends primarily on reactor and facility inspections as the basis for its independent determination of licensee compliance with NRC regulations.
  - Approximately 3,000 power reactor inspections are conducted by the NRC annually.
  - On average, 4,210 inspection hours were expended at each operating reactor during FY 1992 (see Figure 23).
- Approximately 20 separate license changes are requested per power reactor each year—resulting in more than 2,000 separate NRC reviews per year.
- Approximately 5,300 reactor operators are licensed.
  - Each operator is licensed for a specific reactor.
  - Each operator is requalified before renewal of a 6-year license.
- Approximately 5,000 reactor event reports are assessed by the NRC annually.
- The NRC is overseeing the decommissioning of 13 nuclear power reactors.

Figure 15. **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: Peter Miller and Pierre Mion, National Geographic Society ©. Reproduced by permission. Further reproduction prohibited.

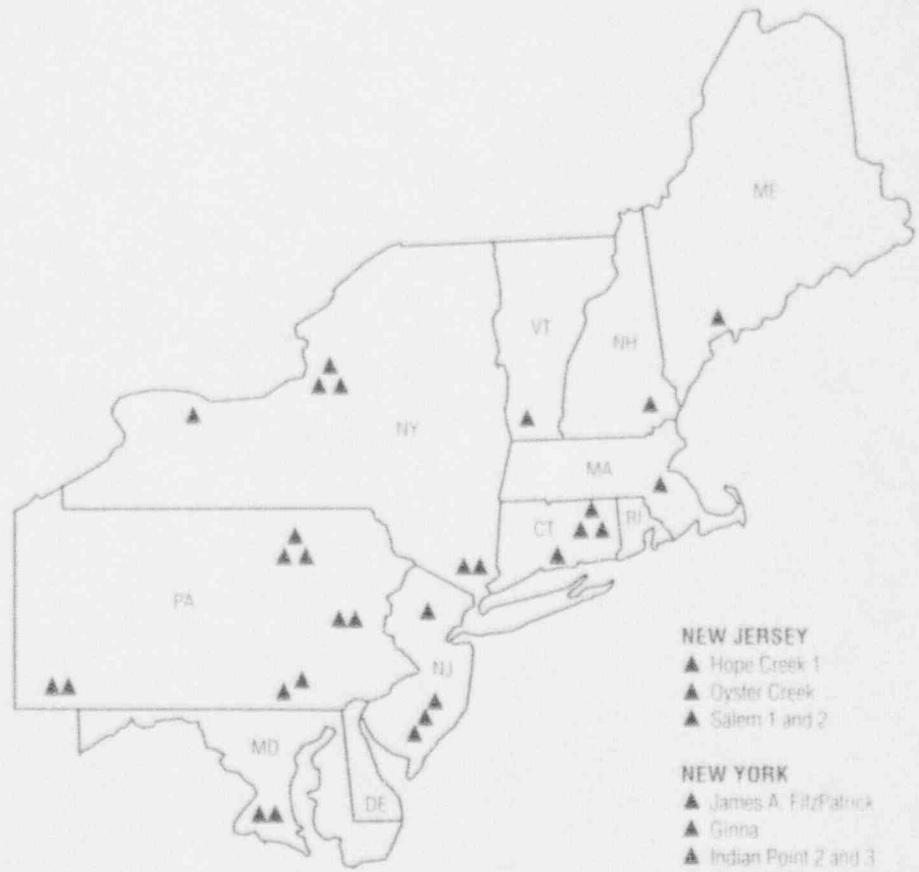
Figure 16. **U.S. Commercial Nuclear Power Reactor Sites**

▲ Licensed to Operate (109)
■ Under Construction (2)
● Deferred Construction (5)

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

Source: Nuclear Regulatory Commission

Figure 17. **NRC Region I Commercial Nuclear Power Reactor Sites**



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

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

MAINE
- ▲ Maine Yankee

MASSACHUSETTS
- ▲ Pilgrim 1

MARYLAND
- ▲ Calvert Cliffs 1 and 2

NEW HAMPSHIRE
- ▲ Seabrook 1

VERMONT
- ▲ Vermont Yankee

Source: Nuclear Regulatory Commission

▲ Licensed to Operate (29)

Figure 18. **NRC Region II Commercial Nuclear Power Reactor Sites**

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

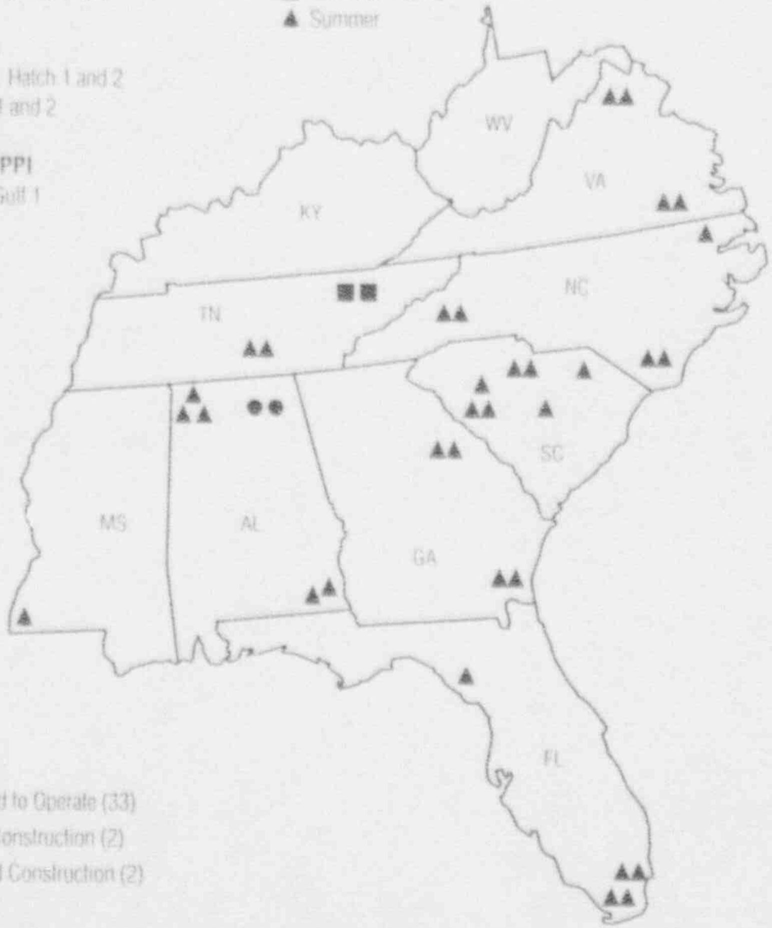
MISSISSIPPI
- ▲ Grand Gulf 1

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 and 2

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



- ▲ Licensed to Operate (33)
- ■ Under Construction (2)
- ● Deferred Construction (2)

Source: Nuclear Regulatory Commission

Figure 19. **NRC Region III Commercial Nuclear Power Reactor Sites**

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
- ▲ Prairie Island 1 and 2

MISSOURI
- ▲ Callaway

OHIO
- ▲ Davis-Besse
- ▲ Perry 1
- ● Perry 2

WISCONSIN
- ▲ Kewaunee
- ▲ Point Beach 1 and 2

- ▲ Licensed to Operate (28)
- ● Deferred Construction (1)

Source: Nuclear Regulatory Commission

Figure 20. **NRC Region IV Commercial Nuclear Power Reactor Sites**

ARKANSAS
▲ Arkansas Nuclear 1 and 2

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

▲ Licensed to Operate (11)

Source: Nuclear Regulatory Commission

Figure 21. **NRC Region V Commercial Nuclear Power Reactor Sites**

ARIZONA
▲ Palo Verde 1, 2, and 3

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

WASHINGTON
▲ Washington Nuclear 2
● Washington Nuclear 1 and 3

▲ Licensed to Operate (8)
● Deferred Construction (2)

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

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		
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

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 22. U.S. Commercial Nuclear Power Reactor Operating Licenses Issued by Year

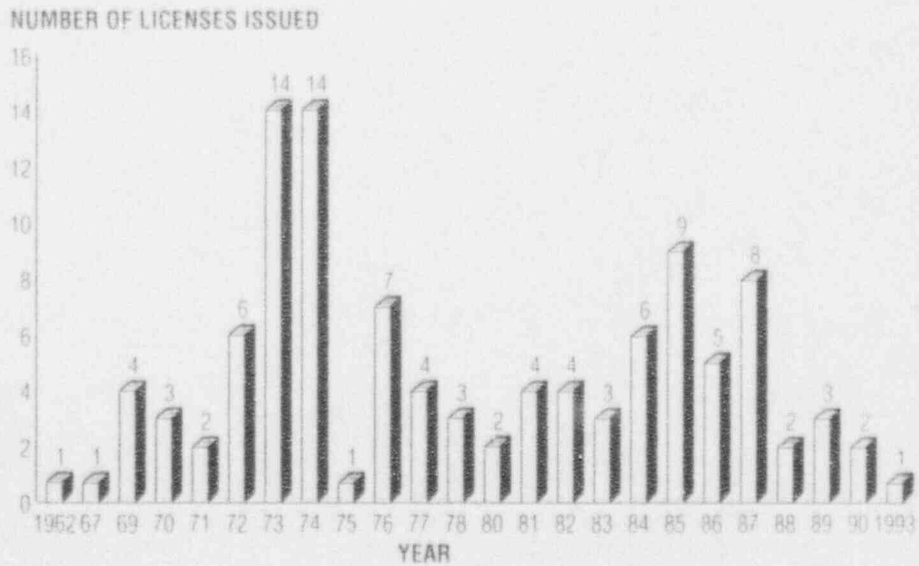
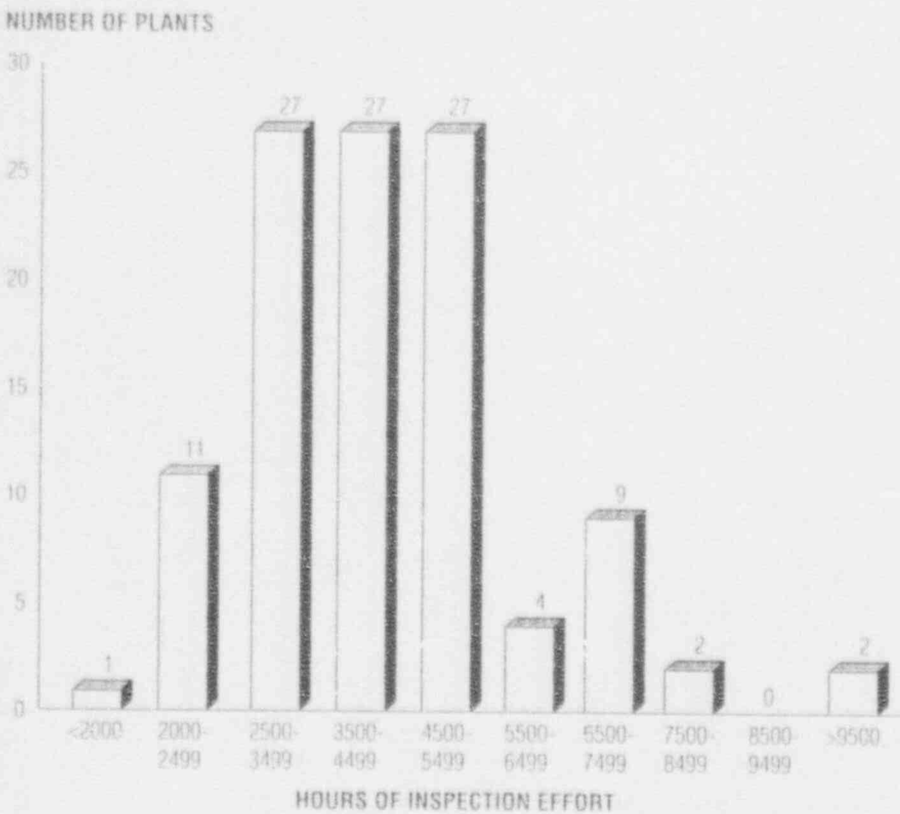


Figure 23 **FY 1992 NRC Inspection Effort at Operating Reactors**



Source: Nuclear Regulatory Commission

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 24).

The PI Program is a tool that must be used only in conjunction with other tools, such as the results of routine and special inspections and the Systematic Assessment of Licensee Performance Program, for providing input to NRC management decisions regarding the need to adjust plant-specific regulatory programs. 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 ensuring operational safety.

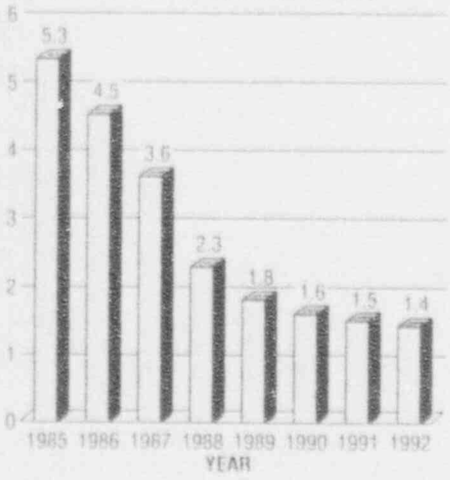
Systematic Assessment of Licensee Performance

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 (12-18 months) in areas such as operations and maintenance.

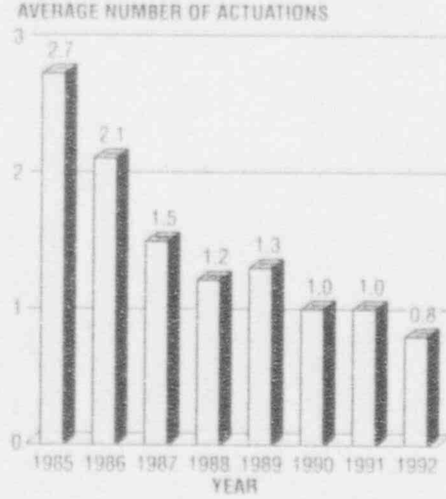
On the basis of the review, a rating is assigned to reflect the quality of licensee performance within each area evaluated. The SALP evaluations are discussed with the licensee to communicate the results of the evaluation. Those discussions are usually conducted in a public meeting. The NRC continually 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 24 **NRC Performance Indicators; Annual Industry Averages, 1985-1992**

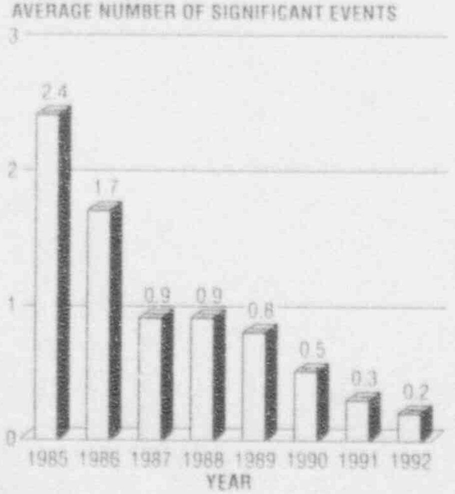
AUTOMATIC SCRAMS WHILE CRITICAL



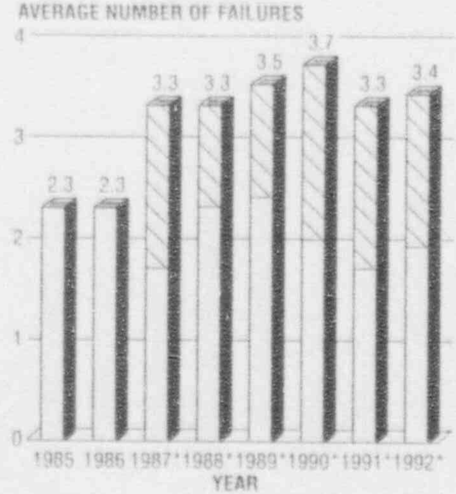
SAFETY SYSTEM ACTUATIONS



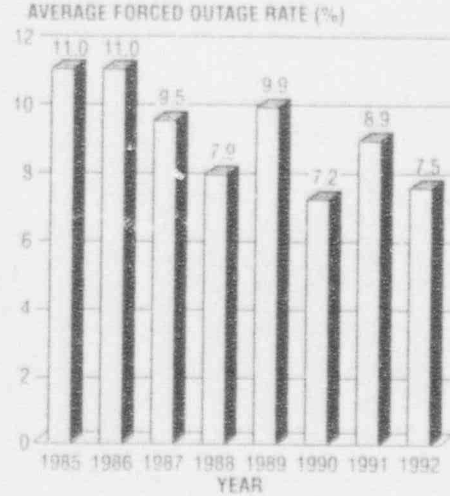
SIGNIFICANT EVENTS



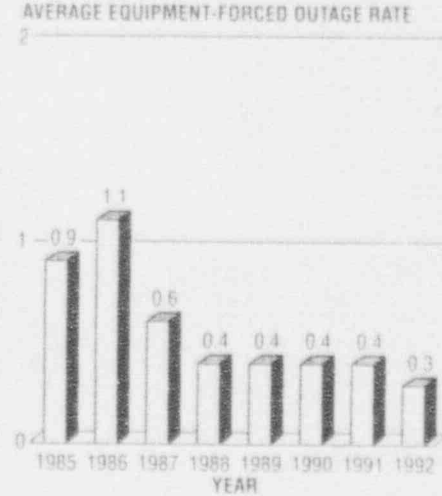
SAFETY SYSTEM FAILURES



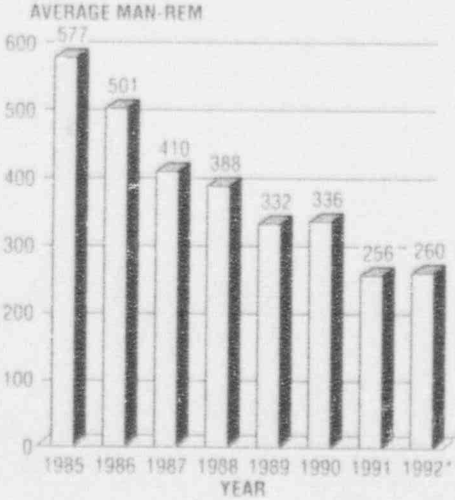
FORCED OUTAGE RATE



EQUIPMENT-FORCED OUTAGES PER 1000 CRITICAL HOURS



COLLECTIVE RADIATION EXPOSURE



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

** Estimated value.

Note: Data represent annual industry averages with plants in extended shutdown excluded. 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 1992, 12 reactors were more than 20 years old. This represented approximately 11 percent of the licensed reactors producing approximately 7 percent of net nuclear-generated electricity.

In contrast, by the year 2000, 60 reactors will be more than 20 years old. This represents approximately 55 percent of the licensed reactors producing approximately 44 percent of net nuclear-generated electricity.

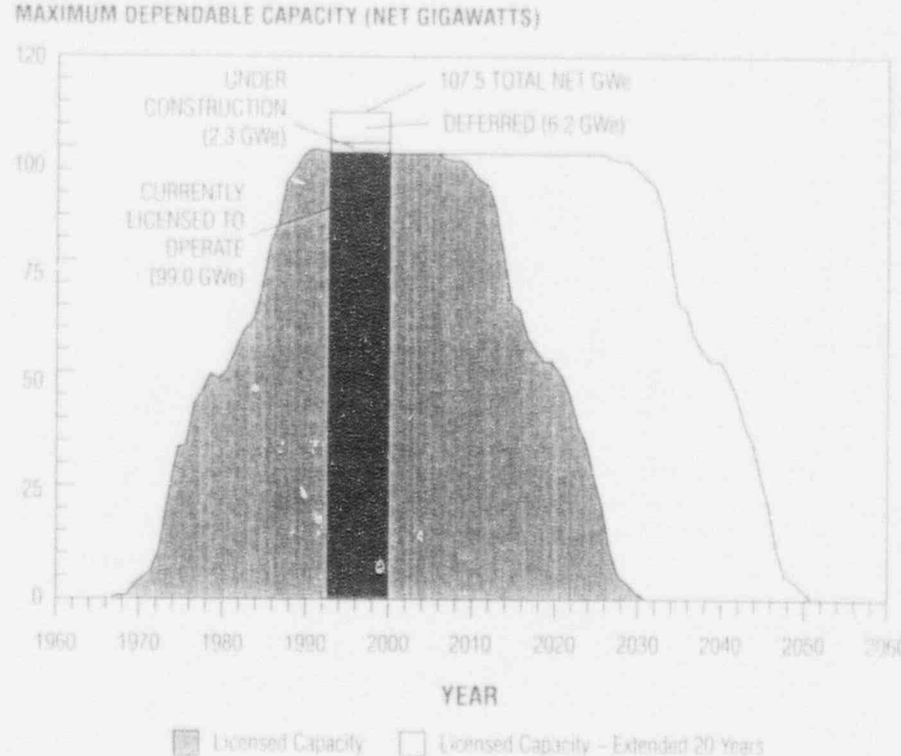
In 2000, the licensed nuclear generating capacity could begin to decrease as reactors begin to reach their 40-year terms, a limit imposed by the Atomic Energy Act of 1954, as amended (see Table 12 and Figures 25 and 26).

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 final regulation governing the renewal of nuclear power reactor operating licenses was issued by the NRC. The rule and associated documentation describe what a licensee must be able to demonstrate in order for the NRC to make a determination that the plant can continue to be operated safely beyond the expiration of its current 40-year license. Under the rule, reactor operation for up to 20 additional years may be permitted. Applications for license renewal can be submitted 5 to 20 years before the expiration of the current license.

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 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. See Glossary for definition.

Source: Licensee data as compiled by the 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	
2004	Oyster Creek 1	1	2009
2006	Dresden 2	1	
2007	Haddam Neck	4	
	Palisades		2011
	Turkey Point 3		2012
	Turkey Point 4		2013
2008	Diablo Canyon 1	5	2021
	Fort Calhoun		2013
	Maine Yankee		2012
	Peach Bottom 2		2013
	Peach Bottom 3		2014
2009	Ginna	2	
	Nine Mile Point 1		
2010	Diablo Canyon 2	5	2025
	H. B. Robinson 2		
	Millstone 1		
	Monticello		
	Point Beach 1		
2011	Dresden 3	1	
2012	Pilgrim 1	5	
	Quad Cities 1		
	Quad Cities 2		
	Surry 1		
	Vermont Yankee		
2013	Browns Ferry 1	12	
	Indian Point 2		
	Kewaunee		
	Oconee 1		
	Oconee 2		
	Point Beach 2		
	Prairie Island 1		
	San Onofre 2		2022
	San Onofre 3		2022
	Surry 2		
	Zion 1		
	Zion 2		
2014	Arkansas Nuclear 1	12	
	Browns Ferry 2		
	Brunswick 2		
2014 *(Continued)*			
	Calvert Cliffs 1		
	Cooper		
	D. C. Cook 1		
	Duane Arnold		
	Edwin I. Hatch 1		
	James A. FitzPatrick		
	Oconee 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	Joseph M. Farley 2	3	
	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		
2024 *(Continued)*			
	Catawba 1		
	Limerick 1		
	Palo Verde 1		
	Susquehanna 2		
	Waterford 3		
2025	Fermi 2	5	
	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		
	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	

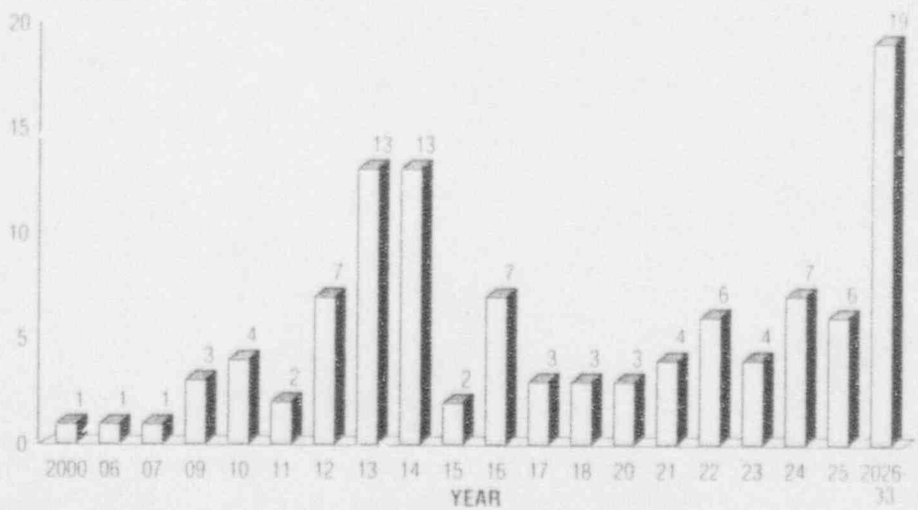
*Year assumes that the maximum number of years for construction recapture has been added to the current expiration date. This column is limited to reactors eligible for construction recapture. See Glossary for definition.

Note (Table 12 and Figure 26)

Limited to reactors licensed to operate.

Souce (Table 12 and Figure 26): Nuclear Regulatory Commission

Figure 26 U.S. Commercial Nuclear Power Reactor Operating Licenses—Expiration Date by Year Assuming Construction Recapture



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

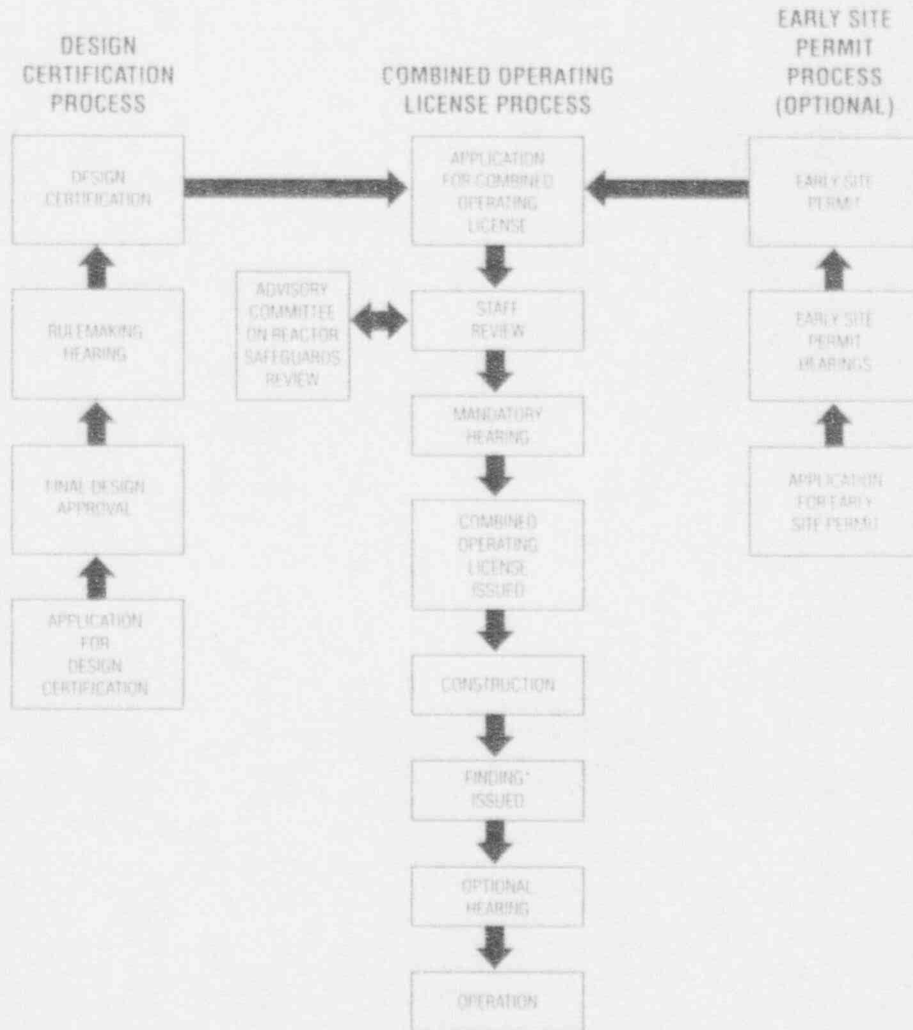
Standardization of Future Reactor Designs

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 has revised its regulations to streamline the licensing process for future nuclear power reactors. The changes should substantially improve the entire licensing process, with the goal that future nuclear power reactors will use standard designs already certified by the NRC and will be located at preapproved sites (see Figure 27).

The NRC is reviewing the Electric Power Research Institute Evolutionary and Passive Requirements Documents. Each will be a comprehensive statement of utility requirements for the design, construction, and performance of advanced light-water reactors. The development of these common utility requirements and their review and approval by the NRC are important steps toward achieving standardization.

Currently under NRC review are four advanced light-water reactor designs. Two of the designs evolved from the currently licensed generation of reactors, the General Electric advanced boiling-water reactor (ABWR) and the ASEA Brown Boveri/Combustion Engineering advanced pressurized-water reactor System 80+. Additionally, the NRC has received two applications for design certification of advanced light-water reactors that employ some passive safety features and modular construction, the Westinghouse Electric advanced passive reactor (AP600) and the General Electric simplified boiling-water reactor (SBWR).

Figure 27 **Basic Design Certification and Reactor Licensing Process**



*Finding issued after construction to determine whether the conditions of the combined operating license were met.

Note: Process as specified under 10 CFR Part 52.

Source: Nuclear Regulatory Commission

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 46 nonpower reactors licensed to operate in 27 States (see Figure 28).

- 1 construction permit application submitted by Arkansas Tech University is under NRC review
- 9 nonpower reactors are being decommissioned
- 7 nonpower reactors have possession only licenses
- Since 1958, 63 licensed nonpower reactors have been decommissioned
- Refer to Appendix E for a listing of operating U.S. nuclear nonpower reactors.

Principal Licensing and Inspection Activities

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

Figure 28. **U.S. Nuclear Nonpower Reactor Sites**

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

Source: Nuclear Regulatory Commission

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 11 major facilities licensed to operate in 10 States (see Figure 29).

- **Uranium Fuel Fabrication Facilities**
  - General Atomics (San Diego, California)
  - Combustion Engineering (Windsor, Connecticut)
  - 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) (Lynchburg, Virginia)
  - Siemens Nuclear Power Corporation (Richland, Washington)
- **Uranium Hexafluoride Production Facilities**
  - Allied-Signal Incorporated (Metropolis, Illinois)
  - Sequoyah Fuels Corporation (Sequoyah, Oklahoma)

In January 1991, the NRC received an application to construct and operate the nation's first privately owned uranium enrichment facility in Homer, Louisiana. The NRC is currently reviewing the application and expects to reach a decision by July 1994.

The Energy Policy Act of 1992 places significant new responsibilities on the NRC. The Act establishes the United States Enrichment Corporation and requires the NRC to regulate, from a health, safety, and safeguards perspective, the two gaseous diffusion uranium enrichment facilities which the Corporation will lease from the Department of Energy. The NRC will have regulatory oversight of the existing gaseous diffusion enrichment facilities at Paducah, Kentucky and Portsmouth, Ohio.

Principal Licensing and Inspection Activities

- NRC issues approximately 80 new, renewal, or license amendments for fuel cycle facilities annually.

Figure 29. **Major U.S. Fuel Cycle Facility Sites**

Note: There are no fuel cycle facilities in Alaska and Hawaii.

Source: Nuclear Regulatory Commission

U.S. Material Licenses

Approximately 22,000 licenses are issued for medical, academic, and industrial uses of nuclear material (see Table 13):

- 7,100 licenses are administered by the NRC.
- 15,000 licenses are administered by the 29 States that participate in the NRC Agreement States Program. 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 30).

Medical - More than 7 million clinical procedures using radioactive material are performed annually:

- Approximately 7 million for medical diagnosis and therapy
- Approximately 200 thousand for treatment of patients

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 5,300 new, renewal, or license amendments for material licenses annually. The Agreement States issue more than 13,000 such actions annually.
- NRC conducts approximately 2,700 health and safety inspections of nuclear material licensees annually. The Agreement States conduct approximately 4,800 such inspections annually.

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

State	Number of Licenses NRC	Number of Licenses Agreement States	State	Number of Licenses NRC	Number of Licenses Agreement States
Alabama	21	403	Montana	94	0
Alaska	62	0	Nebraska	5	138
Arizona	21	297	Nevada	5	153
Arkansas	10	254	New Hampshire	7	108
California	77	2,230	New Jersey	580	0
Colorado	36	409	New Mexico	24	255
Connecticut	232	0	New York	60	1,589
Delaware	71	0	North Carolina	20	554
District of Columbia	67	0	North Dakota	7	75
Florida	28	1,104	Ohio	686	0
Georgia	20	503	Oklahoma	258	0
Hawaii	69	0	Oregon	14	296
Idaho	88	0	Pennsylvania	905	0
Illinois	75	957	Rhode Island	5	68
Indiana	331	0	South Carolina	10	320
Iowa	8	220	South Dakota	46	0
Kansas	23	330	Tennessee	34	560
Kentucky	18	388	Texas	70	1,731
Louisiana	12	520	Utah	17	215
Maine	5	125	Vermont	40	0
Maryland	71	520	Virginia	420	0
Massachusetts	476	0	Washington	24	379
Michigan	578	0	West Virginia	209	0
Minnesota	207	0	Wisconsin	292	0
Mississippi	11	317	Wyoming	92	0
Missouri	354	0	Others*	165	0
			Total	**7,060**	**15,118**

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

Note: NRC data as of 01/04/93. Agreement States data are latest available as of 02/11/93.

Source: Nuclear Regulatory Commission

Figure 30 **NRC Agreement States**

☐ Agreement State (29)

Note: Data as of 12/31/92. Alaska and Hawaii are not Agreement States.

Source: Nuclear Regulatory Commission

U.S. Nuclear Material Transportation and Safeguards

The NRC 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 conducts approximately 1,300 transport-related safety inspections of fuel and reactor facility 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 165 license applications for the export of nuclear material from the United States annually.
- NRC conducts comprehensive physical security and material control and accounting inspections at the major fuel fabrication facilities annually.

International Nuclear Safety

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

- NRC has formal agreements to exchange technical information with 26 countries and Taiwan. These agreements:
  - Ensure prompt notification of safety problems that warrant action or investigation.
  - Provide for bilateral cooperation on nuclear safety, safeguards, waste management, and environmental protection with:
    - Argentina, Belgium, Brazil, Canada, China, Czechoslovakia (Czech and Slovak Republics as of January 1, 1993), Egypt, Finland, France, Germany, Greece, Hungary, Indonesia, Israel, Italy, Japan, Korea, Mexico, Netherlands, Philippines, Republics of the former Soviet Union (Russia and Ukraine), Spain, Sweden, Switzerland, Taiwan, United Kingdom, and Yugoslavia (Slovenia).
- NRC is working with the Republics of the former Soviet Union to encourage improvements in reactor safety, to understand the important technical lessons from the Chernobyl accident, and to obtain information of value for U.S. plant safety. This cooperative effort is carried out primarily through working group meetings, field visits, and document exchanges.
- NRC and the Department of Energy, under the U.S. Safe and Secure Dismantlement Program, are working with the Republics of the former Soviet Union to provide assistance in the areas of material control and accounting and physical protection.
- NRC participates in programs of the International Atomic Energy Agency (113 member countries) and of the Organization for Economic Cooperation and of the Organization for Economic Cooperation and Development's Nuclear Energy Agency (24 member countries) concerned with reactor safety research and regulatory matters, radiation protection, waste management, transportation, standards, training, and technical assistance.
- NRC is involved in approximately 50 joint international safety research arrangements and agreements. Participants share the funding, technical support, and results of specific projects and programs.

Radioactive Waste

U.S. Low-Level Radioactive Waste Disposal

Approximately 1.37 million cubic feet of low-level radioactive waste was disposed in 1991, almost 20 percent more than the preceding year (see Figures 31 and 32).

- 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 32 and 33).

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

- Formation of regional compacts; nine compacts now active (see Table 14 and Figure 34)
- 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

There are two primary active, licensed disposal facilities*:

- Barnwell (South Carolina)
- Hanford (Washington)

The facility located at Beatty, Nevada ceased disposal operations on January 1, 1993. The Hanford, Washington facility restricted access to only the Northwest and Rocky Mountain compacts.

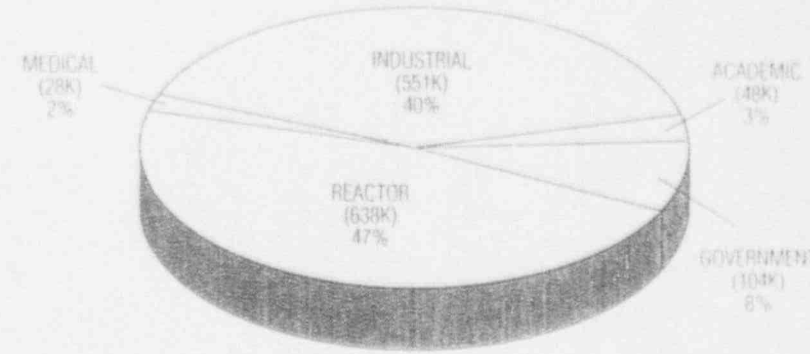
There are three sites under license review by the Agreement State regulatory authorities:

- Boyd County (Nebraska)
- Hudspeth County (Texas)
- San Bernardino County (California)

Storage of low-level waste will be necessary if new regional disposal facilities are not complete when currently operating disposal sites limit access to their facilities.

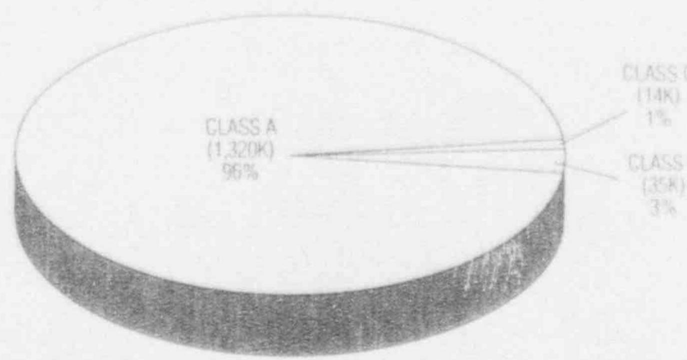
*The Envirocare facility located at Clive, Utah is licensed to dispose of Class A low activity, high volume waste, primarily bulk material, such as slightly contaminated soil and building rubble.

Figure 31 **Volume of Low-Level Radioactive Waste Dispsed in the United States in 1991 (Cubic Feet)**



SOURCE

Total Amount Disposed
1,369 Thousand Cubic Feet

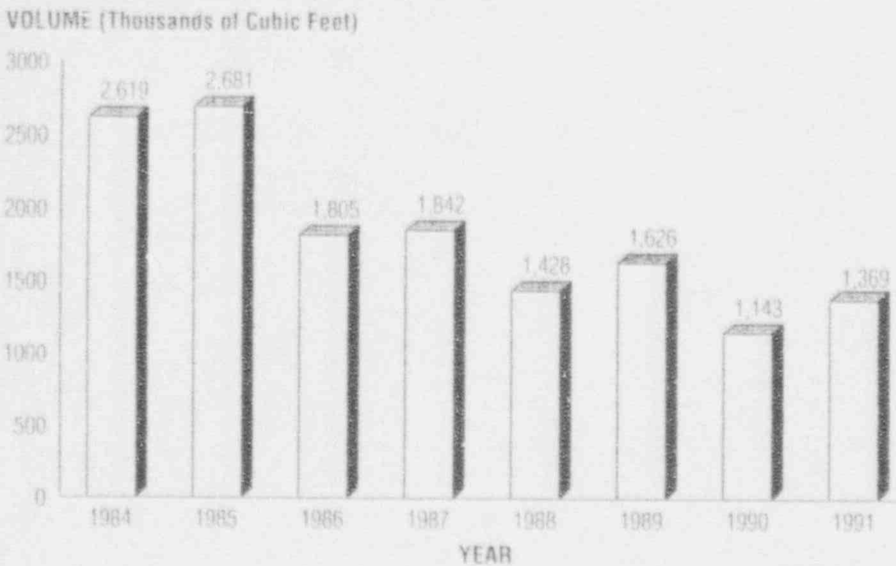


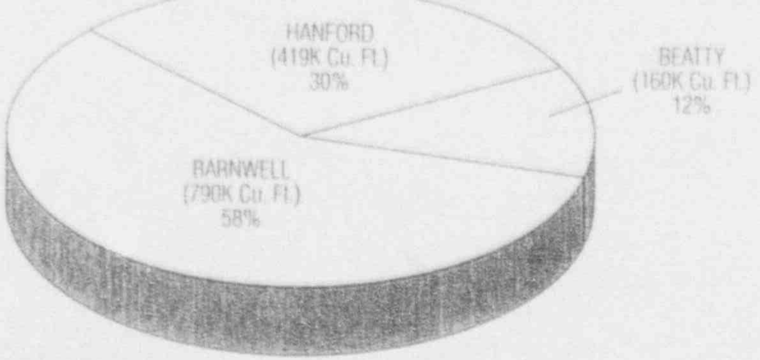
CLASS

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. Percentages are rounded to the nearest whole number.

Source: DOE 1991 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW–152), (page A-1 and page A-2)

Figure 32 **Volume of Low-Level Waste Received at U.S. Disposal Facilities, 1984-1991**



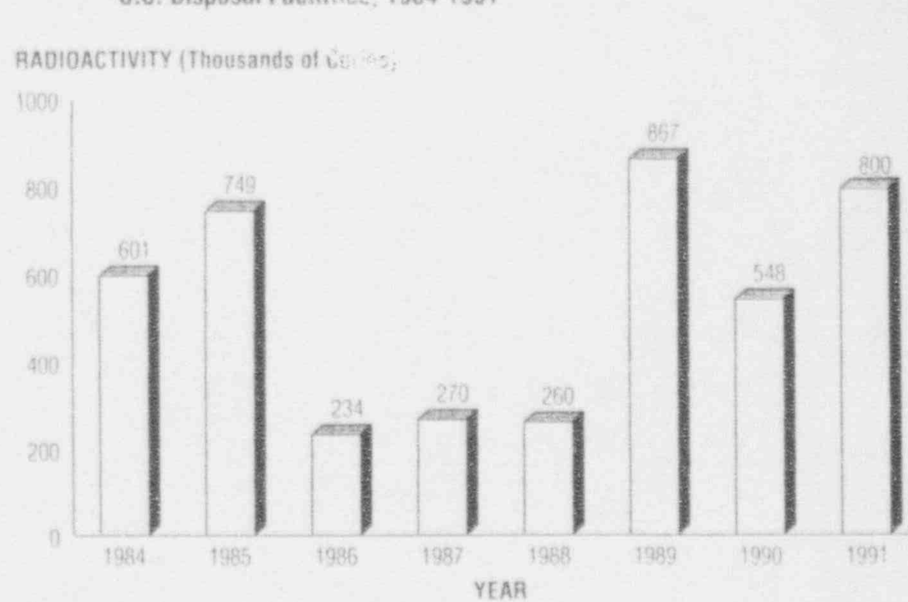


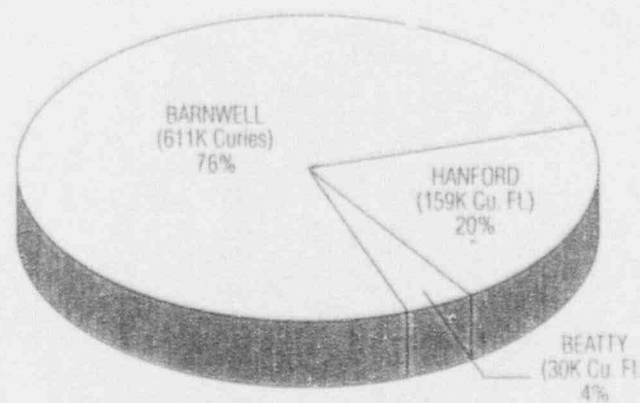
1991 VOLUME BY DISPOSAL FACILITY

Note: The Beatty facility ceased disposal operations on 01/01/93. Percentages are rounded to the nearest whole number.

Source: DOE 1991 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW-152), Table 2 (page 7).

Figure 33 **Radioactivity of Low-Level Waste Received at U.S. Disposal Facilities, 1984-1991**





1991 RADIOACTIVITY BY DISPOSAL FACILITY

Note: The Beatty facility ceased disposal operations on 01/01/93. Percentages are rounded to the nearest whole number.

Source: DOE 1991 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW-152), Table 2 (page 7).

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

Compact	Percent of Total 1991 Low-Level Waste Disposed	Disposal Technology
Northwest	10.1%	
Alaska		
Hawaii		
Idaho		
Montana		
Oregon		
Utah		
Washington*		Shallow land burial
Southwestern	7.3%	
Arizona		
California**		Shallow land burial
North Dakota		
South Dakota		
Rocky Mountain	0.4%	
Colorado**		
Nevada		Shallow land burial
New Mexico		
Wyoming		
Midwest	8.2%	
Indiana		
Iowa		
Minnesota		
Missouri		
Ohio**		Shallow land burial banned
Wisconsin		
Central Interstate	4.1%	
Arkansas		
Kansas		
Louisiana		
Nebraska**		Shallow land burial banned
Oklahoma		
Central Midwest	7.6%	
Illinois**		Shallow land burial banned
Kentucky		
Appalachian	17.9%	
Delaware		
Maryland		
Pennsylvania**		Shallow land burial banned
West Virginia		
Northeast	7.8%	
Connecticut**		
New Jersey**		Shallow land burial banned
Southeast	20.9%	
Alabama		
Florida		
Georgia		
Mississippi		
North Carolina**		Shallow land burial banned
South Carolina*		Shallow land burial
Tennessee		
Virginia		
Unaffiliated States	15.7%	
District of Columbia	<0.1%	
Maine**	0.7%	Shallow land burial banned
Massachusetts**	2.5%	Shallow land burial banned
Michigan	0%	
New Hampshire	<0.1%	
New York**	7.3%	Shallow land burial banned
Puerto Rico	0%	
Rhode Island	<0.1%	
Texas**	3.9%	Shallow land burial banned
Vermont**	1.3%	Shallow land burial banned

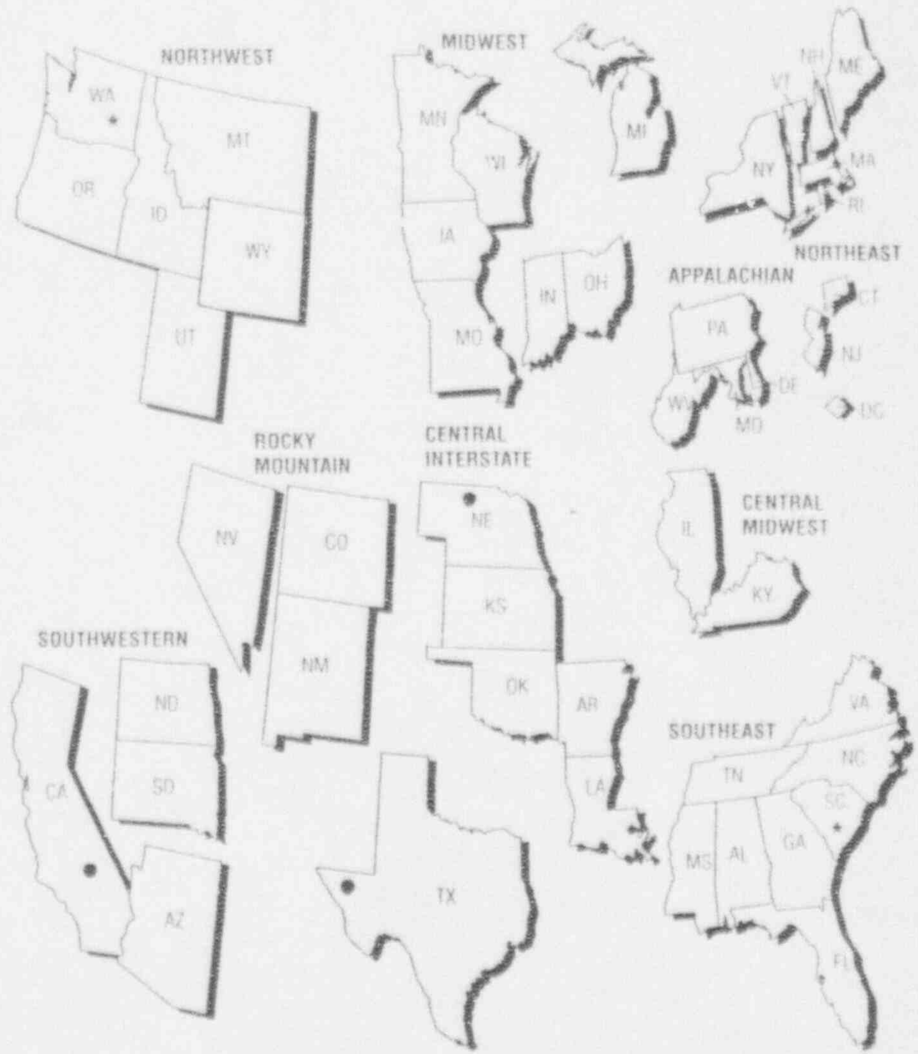
* Current Host State (2)

** Selected Host State (14)

Note: The Beatty, Nevada facility ceased disposal operations on 01/01/93. The State of Wyoming switched to the Northwest Compact on 06/15/92.

Source: DOE 1991 State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites (DOE/LLW-152), Table 1 (pages 3 and 4), and the Nuclear Regulatory Commisssion.

Figure 34 **U.S. Low-Level Waste Compacts**



★ Active Disposal Site (2)

● Disposal Site Under License Review (3)

☐ Approved Compact (9)

☐ Unaffiliated State (10)

Note: Data as of 01/31/93. The Beatty, Nevada facility ceased disposal operations on 01/01/93. Alaska and Hawaii belong to the Northwest Compact. Puerto Rico is an unaffiliated State.

Source: Nuclear Regulatory Commission.

U.S. High-Level Radioactive Waste Disposal

Approximately 23,000 metric tons of spent nuclear fuel is stored at commercial nuclear power reactors as of 1991. By the year 2001, this amount is expected to almost double (see Table 15).

- In 1990, the NRC amended its regulations to authorize licensees to store spent fuel at reactor sites in storage casks approved by the NRC. Four cask designs received certificates of compliance as a result of this rule change (see Tables 16 and 17).

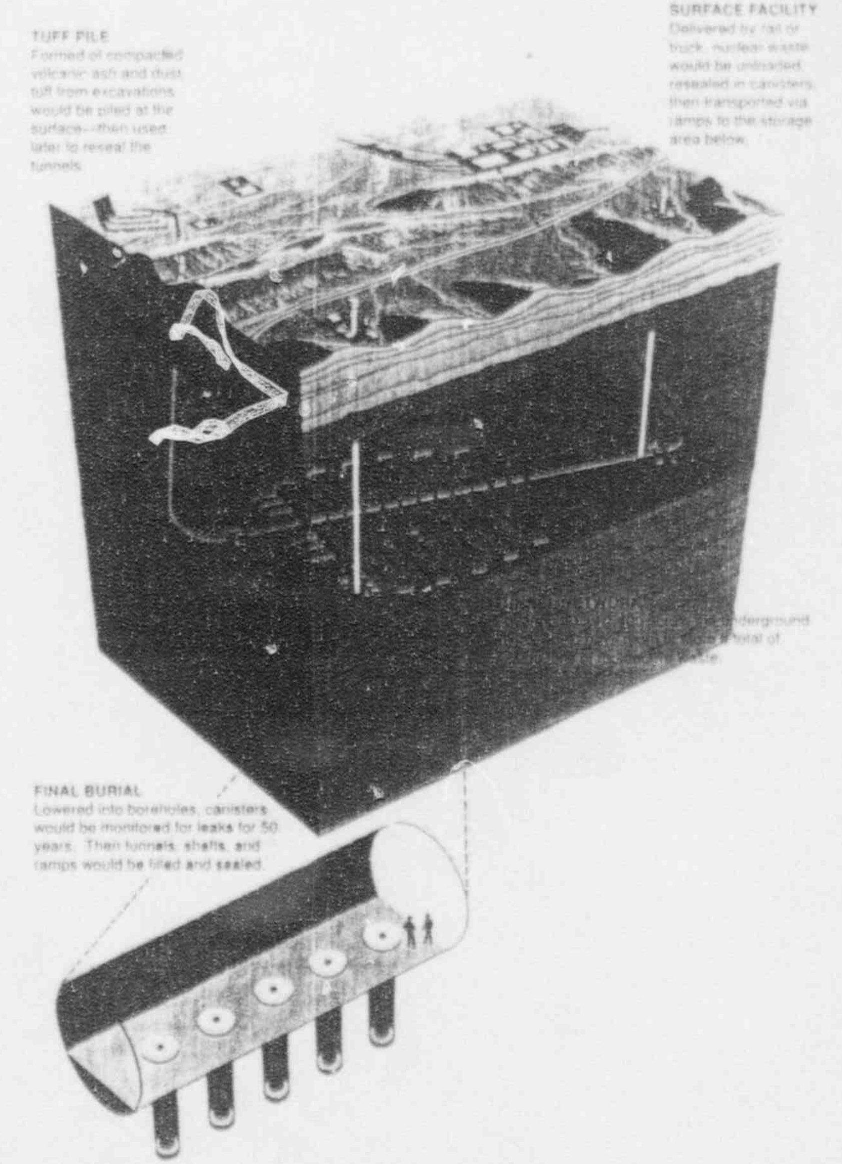
Two offsite (i.e., not at the reactor site) spent fuel storage facilities no longer accept spent fuel for storage:

- West Valley (New York)
- Morris (Illinois)

The Nuclear Waste Policy Act of 1982 and the Nuclear Waste Policy Amendments Act of 1987 specify a detailed approach for high-level radioactive waste disposal, 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, stable geologic structure (see Figure 35 for a conceptual design of the candidate high-level waste repository).
- The Amendments Act designated a candidate site for a high-level waste repository at Yucca Mountain, Nevada. DOE is determining site suitability.
- Ultimately, any high-level waste repository will require an NRC license.

Figure 35. **Conceptual Design of the U.S. High-Level Waste Repository**



Source: Peter Miller and Pierre Mion, National Geographic Society ©. Reproduced by permission. Further reproduction prohibited.

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

State	1991	2001
Alabama	1,218	2,126
Arizona	260	917
Arkansas	465	779
California	1,075	2,055
Colorado	24	24
Connecticut	1,134	1,758
Florida	1,160	1,873
Georgia	740	1,405
Illinois	2,963	5,392
Iowa	193	296
Kansas	157	343
Louisiana	247	749
Maine	375	534
Maryland	510	849
Massachusetts	403	573
Michigan	996	1,806
Minnesota	732	1,075
Mississippi	202	502
Missouri	161	387
Nebraska	484	701
New Hampshire	27	242
New Jersey	916	1,598
New York	1,568	2,456
North Carolina	949	1,797
Ohio	282	664
Oregon	270	509
Pennsylvania	1,639	3,445
South Carolina	1,742	2,961
Tennessee	304	844
Texas	174	910
Vermont	320	591
Virginia	955	1,581
Washington	152	356
Wisconsin	707	1,060
Total	**23,704**	**43,158**

Note: Values contain spent nuclear fuel stored at formerly operating reactors.

Source: DOE Spent Fuel Storage Requirements 1991-2040 (DOE/RL–91–54(92/02)), Table B.2b (page B.38)

Table 16 **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
Pacific Nuclear Fuel Services, 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	
Nuclear Assurance Corporation	Metal Cask NAC-STC	26 PWR	03/29/1988	08/17/1990
Nuclear Assurance Corporation	Metal Cask NAC-C28 S/T	28 Canisters (fuel rods from 56 PWR assemblies)	09/29/1988	08/17/1990
Pacific Nuclear Fuel Services, Incorporated	Concrete Module NUHOMS-24P	24 PWR	04/21/1989	
Transnuclear, Incorporated	Metal Cask TN-24	24 PWR	07/05/1989	
Nuclear Assurance Corporation	Metal Cask NAC-I28/ST	28 PWR	02/01/1990	
Pacific Sierra Nuclear Associates	Concrete Cask VSC-24	24 PWR	03/29/1991	

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

Source: Nuclear Regulatory Commission

Table 17. **NRC Dry Spent Fuel Storage Licensees**

Reactor Name Utility	Date Issued	Vendor	Storage Model
Surry 1, 2 Virginia Electric & Power Company	07/02/1985	General Nuclear Systems, Inccrporated	Metal Cask CASTOR V/21
H. B. Robinson 2 Carolina Power & Light Company	08/13/1986	Pacific Nuclear Fuel Services, Incorporated	Concrete Module NUHOMS-7
Oconee 1, 2, 3 Duke Power Company	01/29/1990	Pacific Nuclear Fuel Services, 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	Pacific Nuclear Fuel Services, Incorporated	Concrete Module NUHOMS-24P
Brunswick 1, 2 Carolina Power & Light Company	*	Pacific Nuclear Fuel Services, Incorporated	Concrete Module NUHOMS-7
Prairie Island 1, 2 Northern States Power Company	*	Transnuclear, Incorporated	Metal Cask TN-40
Rancho Seco Sacramento Municipal Utility District	*	**	**

* Application Received

** To Be Determined

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. Commerical 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 & 1992 Average Capacity Factors (Percent)	Note
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	
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	
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	52.7 58.5	
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	
Bellefonte 1 Tennessee Valley Authority 6 MI NE of Scottsboro, AL 050-00438	II	PWR-DRYAMB B&W RLP TVA TVA	0000	1235 (DER)	12/24/1974	CP CPPR-122	- -	(1)
Bellefonte 2 Tennessee Valley Authority 6 MI NE of Scottsboro, AL 050-00439	II	PWR-DRYAMB B&W RLP TVA TVA	0000	1235 (DER)	12/24/1974	CP CPPR-123	- -	(1)
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	
Braidwood 1 Commonwealth Edison Co. 24 MI SSW of 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	
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	

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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 & 1992 Average Capacity Factors (Percent)	Note
Browns Ferry 1 Tennessee Valley Authority 10 MI NW of Decatur, AL 050-00259	II	BWR-MARK1 GE 4 TVA TVA	3293	1065	05/10/1967 12/20/1973 08/01/1974 12/20/2013	OL-FP DPR-33	0 0	
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	
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	
Brunswick 1 Carolina Power & Light Co. 2 MI N of Southport, NC 050-00325	II	BWR-MARK1 GE 4 UE&C BRRT	2436	0767	02/07/1970 11/12/1976 03/18/1977 09/08/2016	OL-FP DPR-71	65.4 27.1	
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	
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	
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	
Callaway Union Electric Co. 10 MI SE of Fulton, MO 050-00483	III	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	
Calvert Cliffs 1 Baltimore Gas & Electric Co. 40 MI S of Annapolis, MD 050-00317	I	PWR-DRYAMB COMB CE BECH BECH	2700	0825	07/07/1969 07/31/1974 05/08/1975 07/31/2014	OL-FP DPR-53	75.6 56.8	

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 & 1992 Average Capacity Factors (Percent)	Note
Calvert Cliffs 2 Baltimore Gas & Electric Co. 40 MI S of Annapolis, MD 050-00318	I	PWR-DRYAMB COMB CE BECH BECH	2700	0825	07/07/1969 11/30/1976 04/01/1977 08/31/2016	OL-FP DPR-69	50.3 90.9	
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	
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	
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	
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	
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 02/02/2033	OL-FP NPF-89		
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 12/18/2014	OL-FP DPR-46	71.8 92.8	
Crystal River 3 Florida Power Corp. 7 MI NW of Crystal River, FL 050-00302	II	PWR-DRYAMB B&W LLP GIL JONES	2544	0821	09/25/1968 01/28/1977 03/13/1977 12/03/2016	OL-FP DPR-72	75.9 73.5	
Davis-Besse Toledo Edison Co. 21 MI ESE of Toledo, OH 050-00346	III	PWR-DRYAMB B&W LLP BECH BECH	2772	0874	03/24/1971 04/22/1977 07/31/1978 04/22/2017	OL-FP NPF-3	76.3 99.3	

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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 & 1992 Average Capacity Factors (Percent)	Note
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	1020	03/25/1969 10/25/1974 08/28/1975 10/25/2014	OL-FP DPR-58	83.2 55.7	
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	1090	03/25/1969 12/23/1977 07/01/1978 12/23/2017	OL-FP DPR-74	85.7 14.9	
Diablo Canyon 1 Pacific Gas & Electric Co. 12 MI WSW of San Luis Obispo, CA 050-00275	V	PWR-DRYAMB WEST 4LP PG&E PG&E	3338	1073	04/23/1968 11/02/1984 05/07/1985 04/23/2008	OL-FP DPR-80	78.3 79.0	
Diablo Canyon 2 Pacific Gas & Electric Co. 12 MI WSW of San Luis Obispo, CA 050-00323	V	PWR-DRYAMB WEST 4LP PG&E PG&E	3411	1087	12/09/1970 08/26/1985 03/13/1986 12/09/2010	OL-FP DPR-82	81.0 96.9	
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	
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	
Duane Arnold Iowa Electric Light & Power Co. 8 MI NW of Cedar Rapids, IA 050-00331	III	BWR-MARK1 GE 4 BECH BECH	1658	0515	06/22/1970 02/22/1974 02/01/1975 02/21/2014	OL-FP DPR-49	91.9 73.7	
Edwin I. Hatch 1 Georgia Power Co. 11 MI N of Baxley, GA 050-00321	II	BWR-MARK1 GE 4 BECH GPC	2436	0741	09/30/1969 10/13/1974 12/31/1975 08/06/2014	OL-FP DPR-57	72.4 94.6	
Edwin I. Hatch 2 Georgia Power Co. 11 MI N of Baxley, GA 050-00366	II	BWR-MARK1 GE 4 BECH GPC	2436	0751	12/27/1972 06/13/1978 09/05/1979 06/13/2018	OL-FP NPF-5	73.8 69.8	

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Fermi 2 Detroit Edison Co. 25 MI NE of Toledo, OH 050-00341	III	BWR-MARK1 GE 4 S&L DANI	3430	1060	09/26/1972 07/15/1985 01/23/1988 03/20/2025	OL-FP NPF-43	56.7 79.0	
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 06/20/1974 06/07/2008	OL-FP DPR-40	77.6 60.4	
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	
Grand Gulf 1 Entergy Operations, Inc. 25 MI S of Vicksburg, MS 050-00416	II	BWR-MARK3 GE 6 BECH BECH	3833	1143	09/04/1974 11/01/1984 07/01/1985 06/16/2022	OL-FP NPF-29	91.1 81.4	
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	
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	
Hope Creek 1 Public Service Electric & Gas Co. 18 MI SE of Wilmington, DE 050-00354	I	BWR-MARK1 GE 4 BECH BECH	3293	1067	11/04/1974 07/25/1986 12/20/1986 04/11/2026	OL-FP NPF-57	81.9 77.9	
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	0939	10/14/1966 09/28/1973 08/01/1974 09/28/2013	OL-FP DPR-26	47.5 95.7	
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	

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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 & 1992 Average Capacity Factors (Percent)	Note
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	2436	0780	05/20/1970 10/17/1974 07/28/1975 10/17/2014	OL-FP DPR-59	49.4 0	
Joseph M. Farley 1 Southern Nuclear Operating Co. 18 MI SE of Dothan, AL 050-00348	II	PWR-DRYAMB WEST 3LP SSI DANI	2652	0814	08/16/1972 06/25/1977 12/01/1977 06/25/2017	OL-FP NPF-2	75.9 79.2	
Joseph M. Farley 2 Southern Nuclear Operating Co. 18 MI SE of Dothan, AL 050-00364	II	PWR-DRYAMB WEST 3LP SSI BECH	2652	0824	08/16/1972 03/31/1981 07/30/1981 03/31/2021	OL-FP NPF-8	93.4 74.7	
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	
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	
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	
Limerick 1 Philadelphia Electric Co. 21 MI NW of Philadelphia, PA 050-00352	I	BWR-MARK2 GE 4 BECH BECH	3293	1055	06/19/1974 08/08/1985 02/01/1986 10/26/2024	OL-FP NPF-39	88.0 67.2	
Limerick 2 Philadelphia Electric Co. 21 MI NW of Philadelphia, PA 050-00353	I	BWR-MARK2 GE 4 BECH BECH	3293	1055	06/19/1974 08/25/1989 01/08/1990 06/22/2029	OL-FP NPF-85	77.3 91.6	
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	

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 & 1992 Average Capacity Factors (Percent)	Note
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	
McGuire 2 Duke Power Co. 17 MI S of Charlotte, NC 050-00370	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	
Millstone 1 Northeast Nuclear Energy Co. 3.2 MI ENE of New London, CT 050-00245	I	BWR-MARK1 GE 3 EBSO EBSO	2011	0654	05/19/1966 10/31/1986 03/01/1971 10/06/2010	OL-FP DPR-21	30.6 62.9	
Millstone 2 Northeast Nuclear Energy Co. 3.2 MI ENE of New London, CT 050-00336	I	PWR-DRYAMB COMB CE BECH BECH	2700	0863	12/11/1970 09/30/1975 12/26/1975 07/31/2015	OL-FP DPR-65	52.2 35.3	
Millstone 3 Northeast Nuclear Energy Co. 3.2 MI ENE 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	
Monticello Northern States Power Co. 30 MI NW of Minneapolis, MN 050-00263	III	BWR-MARK1 GE 3 BECH BECH	1670	0536	06/19/1967 01/09/1981 06/30/1971 09/08/2010	OL-FP DPR-22	76.6 94.6	
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	0615	04/12/1965 12/26/1974 12/01/1969 08/22/2009	OL-FP DPR-63	71.9 54.2	
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	3323	1097	06/24/1974 07/02/1987 03/11/1988 10/31/2026	OL-FP NPF-69	68.6 54.5	
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	0911	02/19/1971 04/01/1978 06/06/1978 04/01/2018	OL-FP NPF-4	70.5 70.6	

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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 & 1992 Average Capacity Factors (Percent)	Note
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	0909	02/19/1971 08/21/1980 12/14/1980 08/21/2020	OL-FP NPF-7	96.5 79.2	
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	
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	
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	
Oyster Creek GPU Nuclear Corp. 9 MI S of Toms River, NJ 050-00219	I	BWR-MARK1 GE 2 B&R B&R	1930	0610	12/15/1964 07/02/1991 12/01/1969 12/15/2004	OL-FP DPR-16	54.7 84.5	
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	
Palo Verde 1 Arizona Public Service Co. 36 MI W of Phoenix, AZ 050-00528	V	PWR-DRYAMB COMB CE80 BECH BECH	3800	1221	05/25/1976 06/01/1985 01/28/1986 12/31/2024	OL-FP NPF-41	87.1 66.4	
Palo Verde 2 Ariz. 1a Public Service Co. 36 MI W of Phoenix, AZ 050-00529	V	PWR-DRYAMB COMB CE80 BECH BECH	3800	1221	05/25/1976 04/24/1986 09/19/1986 12/09/2025	OL-FP NPF-51	77.3 94.4	
Palo Verde 3 Arizona Public Service Co. 36 MI W of Phoenix, AZ 050-00530	V	PWR-DRYAMB COMB CE80 BECH BECH	3800	1221	05/25/1976 11/25/1987 01/08/1988 03/25/2027	OL-FP NPF-74	70.3 78.2	

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Peach Bottom 2 Philadelphia Electric Co. 17.9 MI S of Lancaster, PA 050-00277	I	BWR-MARK1 GE 4 BECH BECH	3293	1055	01/31/1968 12/14/1973 07/05/1974 01/31/2008	OL-FP DPR-44	54.8 61.2	
Peach Bottom 3 Philadelphia Electric Co. 17.9 MI S of Lancaster, PA 050-00278	I	BWR-MARK1 GE 4 BECH BECH	3293	1035	01/31/1968 07/02/1974 12/23/1974 01/31/2008	OL-FP DPR-56	56.1 79.0	
Perry 1 Cleveland Electric Illuminating Co. 7 MI NE of Painesville, OH 050-00440	III	BWR-MARK3 GE 6 GIL KAIS	3579	1166	05/03/1977 11/13/1986 11/18/1987 03/18/2026	OL-FP NPF-58	87.9 70.0	
Perry 2 Cleveland Electric Illuminating Co. 7 MI NE of Painesville, OH 050-00441	III	BWR-MARK3 GE 6 GIL KAIS	0000	1205 (DER)	05/03/1977	CP CPPR-149		(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	
Point Beach 1 Wisconsin Electric Power Co. 13 MI NNW of Manitowoc, WI 050-00266	III	PWR-DRYAMB WEST 2LP BECH BECH	1518	0485	07/19/1967 10/05/1970 12/21/1970 10/05/2010	OL-FP DPR-24	85.4 84.6	
Point Beach 2 Wisconsin Electric Power Co. 13 MI NNW of Manitowoc, WI 050-00301	III	PWR-DRYAMB WEST 2LP BECH BECH	1518	0485	07/25/1968 03/08/1973 10/01/1972 03/08/2013	OL-FP DPR-27	86.8 86.1	
Prairie Island 1 Northern States Power Co. 28 MI SE of Minneapolis, MN 050-00282	III	PWR-DRYAMB WEST 2LP FLUR NSP	1650	0503	06/25/1968 04/05/1974 12/16/1973 08/09/2013	OL-FP DPR-42	90.4 79.1	
Prairie Island 2 Northern States Power Co. 28 MI SE of Minneapolis, MN 050-00306	III	PWR-DRYAMB WEST 2LP FLUR NSP	1650	0500	06/25/1968 10/29/1974 12/21/1974 10/29/2014	OL-FP DPR-60	102.3 73.3	

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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 & 1992 Average Capacity Factors (Percent)	Note
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	
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	
River Bend 1 Gulf States Utilities Co. 24 MI NNW of Baton Rouge, LA 050-00458	IV	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	
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	
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	
San Onofre 2 Southern California Edison Co. & San Diego Gas & Electric Co. 4 MI SE of San Clemente, CA 050-00361	V	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	
San Onofre 3 Southern California Edison Co. & San Diego Gas & Electric Co. 4 MI SE of San Clemente, CA 050-00362	V	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	
Seabrook 1 North Atlantic Energy Service Corp. 13 MI S of Portsmouth, NH 050-00443	I	PWR-DRYAMB WEST 4LP UE&C UE&C	3411	1122	07/07/1976 03/15/1990 08/19/1990 10/17/2026	OL-FP NPF-86	67.6 77.9	
Sequoyah 1 Tennessee Valley Authority 9.5 MI NE of Chattanooga, TN 050-00327	II	PWR-ICECND WEST 4LP TVA TVA	3411	1122	05/27/1970 09/17/1980 07/01/1981 09/17/2020	OL-FP DPR-77	73.9 84.8	

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 & 1992 Average Capacity Factors (Percent)	Note
Sequoyah 2 Tennessee Valley Authority 9.5 MI NE of Chattanooga, TN 050-00328	II	PWR-ICECND WEST 4LP TVA TVA	3411	1122	05/27/1970 09/15/1981 06/01/1982 09/15/2021	OL-FP DPR-79	94.8 73.8	
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	
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	
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	95.2 94.1	
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 95.9	
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	
Summer South Carolina Electric & Gas Co. 26 MI NW of Columbia, SC 050-00395	II	PWR-DRYAMB WEST 3LP GIL DANI	2775	0885	03/21/1973 11/12/1982 01/01/1984 08/06/2022	OL-FP NPF-12	58.9 96.7	
Surry 1 Virginia Electric & Power Co. 17 MI NW of Newport News, VA 050-00280	II	PWR-DRYSUB WEST 3LP S&W S&W	2441	0781	06/25/1968 05/25/1972 12/22/1972 05/25/2012	OL-FP DPR-32	96.3 75.1	
Surry 2 Virginia Electric & Power Co. 17 MI NW of Newport News, VA 050-00281	II	PWR-DRYSUB WEST 3LP S&W S&W	2441	0781	06/25/1968 01/29/1973 05/01/1973 01/29/2013	OL-FP DPR-37	58.3 93.7	

(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 & 1992 Average Capacity Factors (Percent)	Note
Susquehanna 1 Pennsylvania Power & Light Co 7 MI NE of Berwick, PA 050-00387	I	BWR-MARK2 GE 4 BECH BECH	3293	1040	11/02/1973 11/12/1982 06/08/1983 07/17/2022	OL-FP NPF-14	96.8 70.0	
Susquehanna 2 Pennsylvania Power & Light Co 7 MI NE of Berwick, PA 050-00388	I	BWR-MARK2 GE 4 BECH BECH	3293	1044	11/02/1973 06/27/1984 02/12/1985 03/23/2024	OL-FP NPF-22	76.9 78.3	
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	0808	05/18/1968 04/19/1974 09/02/1974 04/19/2014	OL-FP DPR-50	80.1 100.5	
Turkey Point 3 Florida Power & Light Co 25 MI S of Miami, FL 050-00250	II	PWR-DRYAMB WEST 3LP BECH BECH	2200	0666	04/27/1967 07/19/1972 12/14/1972 04/27/2007	OL-FP DPR-31	22.5 58.4	
Turkey Point 4 Florida Power & Light Co 25 MI S of Miami, FL 050-00251	II	PWR-DRYAMB WEST 3LP BECH BECH	2200	0666	04/27/1967 04/10/1973 09/07/1973 04/27/2007	OL-FP DPR-41	13.7 79.3	
Vermont Yankee VT. Yankee Nuclear Power Corp. 5 MI S of Brattleboro, VT 050-00271	I	BWR-MARK1 GE 4 EBSO EBSO	1593	0504	12/11/1967 02/28/1973 11/30/1972 03/21/2012	OL-FP DPR-28	93.1 84.4	
Vogtle 1 Georgia Power Co 26 MI SE of Augusta, GA 050-00424	II	PWR-DRYAMB WEST 4LP SBEC GPC	3411	1100	06/28/1974 03/16/1987 06/01/1987 01/16/2027	OL-FP NPF-68	77.8 96.7	
Vogtle 2 Georgia Power Co 26 MI SE of Augusta, GA 050-00425	II	PWR-DRYAMB WEST 4LP SBEC GPC	3411	1097	06/28/1974 03/31/1989 05/20/1989 02/09/2029	OL-FP NPF-81	92.6 79.7	
Washington Nuclear 1 Washington Public Power Supply System 12 MI NW of Richland, WA 050-00460	V	PWR-DRYAMB B&W LLP UE&C BECH	0000	1266 (DER)	12/24/1975	CP CPPR-134	– –	(1)
Washington Nuclear 2 Washington Public Power Supply System 12 MI NW of Richland, WA 050-00397	V	BWR-MARK2 GE 5 B&R BECH	3323	1085	03/19/1973 04/13/1984 12/13/1984 12/20/2023	OL-FP NPF-21	44.3 59.7	

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 & 1992 Average Capacity Factors (Percent)	Note
Washington Nuclear 3 Washington Public Power Supply System 26 MI W of Olympia, WA 050-00508	V	PWR-DRYAMB COMB CE80 EBSO EBSO	0000	1242 (DER)	04/11/1978	CP CPPR-154		(1)
Waterford 3 Entergy Operations, Inc. 20 MI W of New Orleans, LA 050-00382	IV	PWR-DRYAMB COMB CE EBSO EBSO	3390	1075	11/14/1974 03/16/1985 09/24/1985 12/18/2024	OL-FP NPF-38	77.3 80.7	
Watts Bar 1 Tennessee Valley Authority 10 MI S of Spring City, TN 050-00390	II	PWR-ICECND WEST 4LP TVA TVA	0000	1165 (DER)	01/23/1973	CP CPPR-91		(2)
Watts Bar 2 Tennessee Valley Authority 10 MI S of Spring City, TN 050-00391	II	PWR-ICECND WEST 4LP TVA TVA	0000	1165 (DER)	01/23/1973	CP CPPR-92		(2)
Wolf Creek 1 Wolf Creek Nuclear Operating Corp 3.5 MI NE of Burlington, KS 050-00482	IV	PWR-DRYAMB WEST 4LP BECH DANI	3411	1135	05/31/1977 06/04/1985 09/03/1985 03/11/2025	OL-FP NPF-42	58.9 85.5	
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	
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	

Notes: (1) Deferred Construction
(2) Under Construction

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

Appendix B

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 NRC Review
Elk River * Elk River, MN	BWR 58	11/06/1962 02/01/1968	DECON DECON Completed
Fermi 1 Lagoona 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 NRC Review
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 in Progress
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
Rancho Seco Herald, CA	PWR 2772	08/16/1974 06/07/1989	SAFSTOR NRC Review

Unit Location	Con Type MWt	OL Issued Shut Down	Decommissioning Alternative Selected Current Status
San Onofre 1 San Clemente, CA	PWR 1347	03/27/1967 11/30/1992	SAFSTOR (1)
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 in progress
Three Mile Island 2 Londonderry Township, PA	PWR 2770	02/08/1978 03/28/1979	(2)
Trojan Portland, OR	PWR 3411	11/21/1975 11/09/1992	(3)
Yankee-Rowe Franklin County, MA	PWR 0600	12/24/1963 10/01/1991	(4)

* AEC/DOE owned, not regulated by NRC

** Holds byproduct license from State of South Carolina

Notes: See Glossary for definitions of decommissioning alternatives.

(1) San Onofre 1 is scheduled to submit their decommissioning plan to the NRC in 1994.

(2) Three Mile Island 2 is undergoing decontamination in selected areas. On completion of these activities, the plant will be placed in a monitored storage mode for an indefinite period.

(3) Trojan submitted a request for a possession only license on 01/27/93. As of 03/10/93, a decommissioning alternative had not been selected.

(4) Yankee Rowe received a possession only license on 08/05/92. As of 03/10/93, a decommissioning alternative had not been selected.

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
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

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 C' mpany	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

(Continued)

Unit Utility	Con Type MWe Per Unit	Canceled Date Status
Montague 1 & 2 Northeast Nuclear Energy Company	BWR 1150	1980 Under CP Review
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
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

Unit Utility	Con Type MWe Per Unit	Canceled Date Status
Shearon Harris 3 & 4 Carolina Power & Light Company	PWR 900	1981 With CP
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 4 Washington Public Power Supply System	PWR 1218	1982 With CP
Washington Nuclear 5 Washington Public Power Supply System	PWR 1242	1982 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 cancelation or written notification to NRC.

Only docketed applications are indicated.

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

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 & 2
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*	Waterford 3
Entergy Operations, Incorporated*	Grand Gulf 1
Florida Power & Light Company	St. Lucie 1 & 2
Florida Power & Light Company	Turkey Point 3 & 4
Florida Power Corporation	Crystal River 3
Georgia Power Company	Edwin I. Hatch 1 & 2
Georgia Power Company	Vogtle 1 & 2
GPU Nuclear Corporation	Oyster Creek
GPU Nuclear Corporation	Three Mile Island 1
Gulf States Utilities Company*	River Bend 1
Houston Lighting & Power Company	South Texas Project 1 & 2

*Proposed merger requested by Gulf States Utilities with Entergy Operations, Incorporated.

Utility	Unit
Illinois Power Company	Clinton
Indiana/Michigan Power Company	D. C. Cook 1 & 2
Iowa Electric Light & Power Company	Duane Arnold
Maine Yankee Atomic Power Company	Maine Yankee
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
Pennsylvania Power & Light Company	Susquehanna 1 & 2
Philadelphia Electric Company	Limerick 1 & 2
Philadelphia Electric Company	Peach Bottom 2 & 3
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
Tennessee Valley Authority	Bellefonte 1 & 2
Tennessee Valley Authority	Browns Ferry 1, 2, & 3
Tennessee Valley Authority	Sequoyah 1 & 2
Tennessee Valley Authority	Watts Bar 1 & 2
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 1, 2, & 3
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

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
Arkansas Tech University Russellville, AR	Triga CP Application Under Review by NRC		
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 Atomics Mark F San Diego, CA	Triga Mark F 07/01/1960	OL 50-163	R-67
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	UTR-10 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

Licensee Location	Reactor Type OL Issued	License Type Docket Number	License Number
National Institute of Standards & Technology Gaithersburg, MD	Nuclear Test 06/30/1970	OL 50-184	TR-5
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 Illinois Urbana, IL	Lopra 12/27/1971	OL 50-356	R-117
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 Washington* Seattle, WA	Argonaut 03/31/1961	OL 50-139	R-73
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

*The NRC is currently reviewing application to decommission facility.

Note: Limited to nonpower reactors licensed to operate.

Source: Nuclear Regulatory Commission

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
Belgium	7	5,484	0	0	7	5,484
Brazil	1	626	2	2,458	3	3,084
Bulgaria	6	3,666	0	0	6	3,666
Canada	20	13,680	2	1,762	22	15,442
China	0	0	3	2,100	3	2,100
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	56,488	6	8,320	61	64,808
Germany	21	22,513	0	0	21	22,513
Hungary	4	1,729	0	0	4	1,729
India	8	1,614	8	2,260	16	3,874
Japan	42	32,044	12	11,672	54	43,716
Kazakhstan	1	135	0	0	1	135
Korea	9	7,220	5	4,463	14	11,683
Lithuania	2	2,760	0	0	2	2,760
Mexico	1	654	1	654	2	1,308
Netherlands	2	507	0	0	2	507
Pakistan	1	125	1	300	2	425
Philippines	0	0	1	620	1	620
Romania	0	0	5	3,100	5	3,100
Russia	24	18,849	16	14,575	40	33,424
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	7,151	6	5,747	15	12,898
Sweden	12	10,002	0	0	12	10,002
Switzerland	5	2,936	0	0	5	2,936
Taiwan, China	6	4,884	0	0	6	4,884
Ukraine	14	12,095	6	5,700	20	17,[illegible]95
United Kingdom	37	12,340	1	1,188	38	13,528
United States	108	97,939	8	9,634	116	107,573
Total	**412**	**324,410**	**92**	**79,523**	**504**	**403,933**

Note: Operable, under construction, or on order (30 MWe and over) as of 12/31/92. For the United States, the number of units in operation excludes San Onofre 1 (0436 MWe) and Trojan (1095 MWE). Comanche Peak 2 (1150 MWe) is included under construction.

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Appendix G

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	236	206,883	294	262,300
Boiling light-water reactors	88	71,964	99	82,938
Gas-cooled reactors, all varieties	38	12,789	38	12,789
Heavy-water reactors, all varieties	31	16,811	48	25,288
Graphite-moderated light-water reactors	15	14,785	16	15,710
Liquid metal fast-breeder reactors	4	1,178	9	4,908
Total	**412**	**324,410**	**504**	**403,933**

Note: Operable, under construction, or on order (30 MWe and over) as of 12/31/92. For the United States, the number of units in operation excludes San Onofre 1 and Trojan. Comanche Peak 2 is included in the total.

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Top 50 Reactors by Capacity Factor, Worldwide

Country	Unit	Reactor Type	Vendor	1992 Gross Capacity Factor (Percent)	1992 Gross Generation (MWh)
Japan	Ohi-3	PWR	MHI	100.41	10,363,545
U.S.	Davis-Besse	PWR	B&W	98.94	8,038,936
Japan	Sendai-2	PWR	MHI	98.38	7,690,889
U.S.	St Lucie-1	PWR	CE	98.27	7,527,080
Japan	Kashiwazaki-Kariwa-2	BWR	Toshiba	97.93	9,462,720
U.S.	Vogtle-1	PWR	West	96.29	9,810,952
U.S.	Three Mile Island-1	PWR	B&W	96.08	7,350,818
Japan	Onagawa	BWR	Toshiba	94.70	4,358,880
U.S.	Diablo Canyon-2	PWR	West	94.69	9,681,800
U.S.	Palo Verde-2	PWR	CE	93.72	10,760,000
U.S.	South Texas 2	PWR	West	93.58	10,807,760
U.S.	Summer	PWR	West	93.56	7,840,360
Canada	Pickering-8	PHWR	AECL	93.52	4,435,970
U.S.	Surry-2	PWR	West	93.42	6,762,055
U.S.	San Onofre-2	PWR	CE	93.38	9,244,258
Finland	Olkiluoto-1	BWR	Asea	93.30	6,023,900
Finland	Olkiluoto-2	BWR	Asea	93.12	6,011,819
Belgium	Tihange-3	PWR	ACEC	93.07	8,747,070
Germany	Brokdorf	PWR	KWU	92.53	11,338,209
U.S.	Catawba-2	PWR	West	92.45	9,785,070
Japan	Fukushima I-3	BWR	Toshiba	92.01	6,336,206
Spain	Cofrentes	BWR	GE	91.85	8,027,900
Hungary	Paks-4	PWR	AEE	91.64	3,702,822
U.S.	Cooper	BWR	GE	91.26	6,420,830
U.S.	Monticello	BWR	GE	91.09	4,640,955
U.S.	Indian Point-2	PWR	West	91.09	8,177,192
Germany	Neckar-2	PWR	KWU	91.03	10,914,828
Canada	Pickering-2	PHWR	AECL	90.81	4,323,260
U.S.	Hatch-1	BWR	GE	90.59	6,439,720
Spain	Trillo	PWR	KWU	90.47	8,471,372
U.S.	Byron-1	PWR	West	90.38	9,328,330
Switzerland	Goesgen	PWR	KWU	90.26	7,849,101
Canada	Pickering-6	PHWR	AECL	90.17	4,276,910
Germany	Grohnde	PWR	KWU	89.88	11,005,652

Country	Unit	Reactor Type	Vendor	1992 Gross Capacity Factor (Percent)	1992 Gross Generation (MWh)
Finland	Loviisa-2	PWR	AEE	89.84	3,659,730
Canada	Pickering-3	PHWR	AECL	89.84	4,277,030
Spain	Asco-2	PWR	West	89.67	7,325,520
Germany	Emsland	PWR	KWU	89.64	10,732,527
U.S.	Browns Ferry-2	BWR	GE	89.24	8,607,390
Germany	Grafenrheinfeld	PWR	KWU	89.16	10,181,823
U.S.	Calvert Cliffs-2	PWR	CE	88.93	6,374,397
South Korea	Ulchin-2	PWR	Fram	88.88	7,416,832
Hungary	Paks-3	PWR	AEE	88.78	3,587,324
U.S.	Braidwood-2	PWR	West	88.16	9,099,281
South Korea	Ulchin-1	PWR	Fram	88.05	7,347,319
Spain	Almaraz-2	PWR	West	87.80	7,172,710
U.S.	Limerick-2	BWR	GE	87.33	8,821,470
Spain	Asco-1	PWR	West	87.13	7,118,050
Japan	Fukushima II-2	BWR	Hitachi	87.06	8,412,250
South Korea	Wolsung-1	PHWR	AECL	86.84	5,177,319

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Top 50 Reactors by Generation, Worldwide

Country	Unit	Reactor Type	Vendor	1992 Gross Generation (MWh)	1992 Gross Capacity Factor (Percent)
Germany	Brokdorf	PWR	KWU	11,338,209	92.53
Germany	Grohnde	PWR	KWU	11,005,652	89.88
Germany	Neckar-2	PWR	KWU	10,914,828	91.03
U.S.	South Texas-2	PWR	West	10,807,760	93.58
U.S.	Palo Verde-2	PWR	CE	10,760,000	93.72
Germany	Emsland	PWR	KWU	10,732,527	89.64
Germany	Isar-2	PWR	KWU	10,462,699	85.08
Japan	Ohi-3	PWR	MHI	10,363,546	100.41
Germany	Grafenrheinfeld	PWR	KWU	10,181,823	89.16
Germany	Philippsburg-2	PWR	KWU	9,894,250	83.44
Germany	Gundremmingen-C	BWR	KWU	9,841,721	85.53
France	Cattenom-4	PWR	Fram	9,814,271	82.03
U.S.	Vogtle-1	PWR	West	9,810,952	96.29
U.S.	Catawba-2	PWR	West	9,785,070	92.45
U.S.	Diablo Canyon-2	PWR	West	9,681,800	94.69
Japan	Kashiwazaki-Kariwa-2	BWR	Toshiba	9,462,720	97.93
U.S.	Byron-1	PWR	West	9,328,330	90.38
U.S.	San Onofre-2	PWR	CE	9,244,258	93.38
Germany	Unterweser	PWR	KWU	9,232,426	80.85
France	Flamanville-2	PWR	Fram	9,222,705	78.06
U.S.	Braidwood-2	PWR	West	9,099,281	88.16
France	Paluel-1	PWR	Fram	9,028,026	76.41
France	Belleville-1	PWR	Fram	8,910,457	76.27
U.S.	Palo Verde-3	PWR	CE	8,909,100	77.60
U.S.	Wolf Creek	PWR	West	8,888,111	84.89
U.S.	Limerick-2	BWR	GE	8,821,470	87.33
Germany	Kruemmel	BWR	KWU	8,749,496	75.69
Belgium	Tihange-3	PWR	ACEC	8,747,070	93.07
U.S.	Sequoyah-1	PWR	West	8,676,618	83.50
France	Nogent-2	PWR	Fram	8,666,976	74.19
Sweden	Oskarshamn-3	BWR	ABB Asea	8,656,757	81.79
France	Belleville-2	PWR	Fram	8,616,936	73.76
U.S.	Browns Ferry-2	BWR	GE	8,607,390	89.24
France	Cattenom-2	PWR	Fram	8,578,755	73.49

Country	Unit	Reactor Type	Vendor	1992 Gross Generation (MWh)	1992 Gross Capacity Factor (Percent)
U.S.	Grand Gulf-1	BWR	GE	8,511,722	74.20
U.S.	Callaway	PWR	West	8,498,732	81.17
Spain	Trillo	PWR	KWU	8,471,372	90.47
Sweden	Forsmark-3	BWR	ABB Asea	8,450,034	80.70
Japan	Tsuruga-2	PWR	MHI	8,426,409	82.70
Japan	Fukushima II-2	BWR	Hitachi	8,412,250	87.06
France	Cattenom-1	PWR	Fram	8,336,294	70.56
France	Penly-1	PWR	Fram	8,271,940	68.14
U.S.	Seabrook-1	PWR	West	8,190,431	78.09
U.S.	Vogtle-2	PWR	West	8,178,125	80.26
U.S.	India. Point-2	PWR	West	8,177,192	91.09
France	Nogent-1	PWR	Fram	8,172,011	69.95
Germany	Biblis-B	PWR	KWU	8,155,250	71.42
U.S.	Davis-Besse	PWR	B&W	8,038,936	98.94
Spain	Cofrentes	BWR	GE	8,027,900	91.65
U.S.	Waterford-3	PWR	CE	7,990,050	78.89

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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	mi²	km²	2.589 998
	acre	m²	4 046.873
	yd²	m²	0.836 127 4
	ft²	m²	*0.092 903 04
	in²	cm²	*6.451 6
Volume	acre foot	m³	1 233.489
	yd³	m³	0.764 554 9
	ft³	m³	0.028 316 85
	ft³	L	28.316 85
	gallon	L	3.785 412
	fl oz	mL	29.573 53
	in³	cm³	16.387 06
Velocity	mi/h	km/h	1.609 347
	ft/s	m/s	*0.304 8
Acceleration	ft/s²	m/s²	*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)/(ft² • h • °F)	W/(m • °C)	0.144 227 9
Coefficient of heat transfer	Btu / (ft² • h • °F)	W/(m² • °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)	t (metric ton)	*0.907 184 74
	lb (avdp)	kg	*0.453 592 37
Moment of mass	lb • ft	kg • m	0.138 255
Density	ton (short)/yd³	t/m3	1.186 553
	lb/ft³	kg/m3	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 • ft²/s	kg • m²/s	0.042 140 11
Moment of Inertia	lb • ft²	kg • m²	0.042 140 11
Force	kip (kilopound)	kN (kilonewton)	4.448 222
	lbf	N (newton)	4.448 222

*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 • ft	N • m	0.122 984 8
Pressure	atm (std)	kPa (kilopascal)	*101.325
	bar	kPa	*100.0
	lbf/in² (formerly psi)	kPa	6.894 757
	inHg (32°F)	kPa	3.386 38
	ftH$_2$O (39.2°F)	kPa	2.988 98
	inH$_2$O (60°F)	kPa	0.248 84
	mmHg (0°C)	kPa	0.133 322
Stress	kip/in² (formerly ksi)	MPa	6.894 757
	lbf/in² (formerly psi)	MPa	0.006 894 757
	lbf/in² (formerly psi)	kPa	6.894 757
	lbf/ft2	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.

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

(Continued)

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 twelve 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 one 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.

GENERATION EXPENSE: Generation expenses include costs associated both with production expenses (operation, maintenance and fuel costs) and with capital expenses (taxes, depreciation, interest, return on equity, etc.). Generation expenses comprise the total cost of producing electricity that is the basis for rates charged to electric utility customers. Production expenses are variable costs that a utility has some short-term control over and may vary according to the amount of electricity generated in a year. Capital expenses are generally fixed charges that are amortized over a facility's life and must be paid whether or not a facility operates.

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.

MAJOR INVESTOR-OWNED ELECTRIC UTILITY: An investor-owned electric utility that has had in the last three consecutive calendar years sales of electricity or transmission service that exceed at least one of the following: (1) 1 million megawatthours of total annual sales of electricity, (2) 100 megawatthours of annual sales of electricity for resale, (3) 500 megawatthours of annual gross exchange of electricity between utilities, or (4) 500 megawatthours of wheeling for others (deliveries plus losses). Investor-owned electric utilities account for about 75 percent of total generation in the United States.

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 cooling water temperature variations. 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.

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.

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.

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