Appendices

Radioactive
Regulated
Waste
Licensees
Abbreviations
Security
Spent Fuel
Glossary
Safety
Storage
Agreement
States
Research
Fuel Cycle
Materials
Nuclear Share


Agreement
Decommissioning
Enforcement
Performance
Research
Test
States
Reactors
Indicators
Nuclear
Licenses
Permanently
Significant
Shut
Commercial
Down
Power
Territory
Operating

Abbreviations

ABWR	advanced boiling-water reactor
AC	Allis Chalmers
ACRS	Advisory Committee on Reactor Safeguards
AE	architect-engineer
AEC	Atomic Energy Commission (U.S.)
AEP	American Nuclear Power Company's Buchanan engineering offices
AGN	solid homogeneous core (Aerojet-General Nucleonics)
AI	Atomics International
ANS	American Nuclear Society
B&R	Burns & Roe
B&W	Babcock & Wilcox
BECH	Bechtel
BALD	Baldwin Associates
BLH	Baldwin Lima Hamilton
BRRT	Brown & Root
BWR	boiling-water reactor
CE	Combustion Engineering
CFR	*Code of Federal Regulations*
CO	Commission order
Co	company
CoC	certificate of compliance
COMM. OP.	date of commercial operation
CON TYPE	containment type
DRYAMB	dry, ambient pressure
DRYSUB	dry, subatmospheric
ICECND	wet, ice condenser
MARK 1	*wet, Mark I*
MARK 2	*wet, Mark II*
MARK 3	*wet, Mark III*
CP	construction permit
CP ISSUED	date of construction permit issuance
CVP	civil penalties
CVTR	Carolinas-Virginia Tube Reactor
CWE	Commonwealth Edison Company
CY	calendar year
DANI	Daniel International
DBDB	Duke & Bechtel
DC	design certification
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
DUKE	Duke Power Company
EBSO	Ebasco
EIA	Energy Information Administration (DOE)
EIS	environmental impact statement
EPR	Evolutionary Power Reactor
EPZ	emergency planning zone
ERO	emergency response organization
EVESR	ESADA (Empire States Atomic Development Associates) Vallecitos Experimental Superheat Reactor
EXP. DATE	expiration date of operating license
FBR	fast breeder reactor
FLUR	Fluor Pioneer
FR	*Federal Register*
FW	Foster Wheeler
FY	fiscal year
G&H	Gibbs & Hill
GA	General Atomic
GCR	gas-cooled reactor
GEH	General Electric-Hitachi Nuclear Energy
GEIS	generic environmental impact statement
GETR	General Electric Test Reactor
GHDR	Gibbs & Hill & Durham & Richardson
GIL	Gilbert Associates
GL	general license
GPC	Georgia Power Company
GWe	gigawatt(s) electrical
HTG	high-temperature gas (reactor)
HWR	pressurized heavy-water reactor
INES	International Nuclear Event Scale
IRRS	IAEA Integrated Regulatory Review Service
ISFSI	independent spent fuel storage installation
JONES	J.A. Jones
KAIS	Kaiser Engineers
KI	potassium iodide
kW	kilowatt(s)
LES	Louisiana Energy Services
LLP	B&W lowered loop
LMFB	liquid metal fast breeder (reactor)
LR ISSUED	license renewal issued
LWGR	graphite-moderated light-water reactor
MW	megawatt(s)
MWe	megawatt(s) electrical
MWh	megawatthour(s)
MWt	megawatt(s) thermal
NIAG	Niagara Mohawk Power Corporation
NISA	Japanese Nuclear and Industrial Safety Agency
NOV	notices of violation
NOVF	notices of violation associated with inspection findings
NOVSL	notices of violation for severity level

NRC	Nuclear Regulatory Commission (U.S.)
NSP	Northern States Power Company
NSSS	nuclear steam system supplier and design type
GE 2	*GE Type 2*
GE 3	*GE Type 3*
GE 4	*GE Type 4*
GE 5	*GE Type 5*
GE 6	*GE Type 6*
WEST 2LP	*Westinghouse Two-Loop*
WEST 3LP	*Westinghouse Three-Loop*
WEST 4LP	*Westinghouse Four-Loop*
OCM	organically cooled and moderated
OL	operating license
OL ISSUED	date of latest full power operating license
PG&E	Pacific Gas & Electric Company
PHWR	pressurized heavy-water-moderated and cooled (reactor)
PRA	probabilistic risk assessment
PSE	Pioneer Services and Engineering
PSEG	Public Service Electric and Gas Company
PTHW	pressure tube heavy water
PUBS	Public Service Electric and Gas Company
PWR	pressurized-water reactor
RTR	research and test reactors
S&L	Sargent & Lundy
S&W	Stone & Webster
SCF	sodium-cooled fast (reactor)
SCGM	sodium-cooled, graphite-moderated (reactor)
SDP	significance determination process
SGEC	architect for Vogtle
SI	système internationale (d'unités) (International System of Units)
SL	site licenses
SOARCA	State-of-the-Art Consequence Analysis
SSI	Southern Services Incorporated
STARS	Strategic Teaming and Resource Sharing Group
STP	South Texas Project
TMI-2	Three Mile Island Unit 2
TRACE	reactor systems codes
TRIGA	Training Reactor and Isotopes Production, General Atomics
TVA	Tennessee Valley Authority
UE&C	United Engineers & Constructors
USAID	U.S. Agency for International Development
USEC	U.S. Enrichment Corporation
US-APWR	United States [version of] Advanced Pressurized-Water Reactor
VBWR	Vallecitos Boiling-Water Reactor
WCS	Waste Control Specialist
WDCO	Westinghouse Development Corporation
WEST	Westinghouse Electric

State and Territory Abbreviations

Alabama	AL	Kentucky	KY	Ohio	OH
Alaska	AK	Louisiana	LA	Oklahoma	OK
Arizona	AZ	Maine	ME	Oregon	OR
Arkansas	AR	Maryland	MD	Pennsylvania	PA
California	CA	Massachusetts	MA	Puerto Rico	PR
Colorado	CO	Michigan	MI	Rhode Island	RI
Connecticut	CT	Minnesota	MN	South Carolina	SC
Delaware	DE	Mississippi	MS	South Dakota	SD
District of Columbia	DC	Missouri	MO	Tennessee	TN
Florida	FL	Montana	MT	Texas	TX
Georgia	GA	Nebraska	NE	Utah	UT
Guam	GU	Nevada	NV	Vermont	VT
Hawaii	HI	New Hampshire	NH	Virgin Islands	VI
Idaho	ID	New Jersey	NJ	Virginia	VA
Illinois	IL	New Mexico	NM	Washington	WA
Indiana	IN	New York	NY	West Virginia	WV
Iowa	IA	North Carolina	NC	Wisconsin	WI
Kansas	KS	North Dakota	ND	Wyoming	WY

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Arkansas Nuclear One, Unit 1	IV	PWR-DRYAMB	2,568	12/06/1968	102
Entergy Operations, Inc.		B&W LLP		05/21/1974	94
London, AR		BECH		12/19/1974	83
(6 miles NW of Russellville, AR)		BECH		06/20/2001	99
050-00313				05/20/2034	90
www.nrc.gov/info-finder/reactor/ano1.html					87
Arkansas Nuclear One, Unit 2	IV	PWR-DRYAMB	3,026	12/06/1972	91
Entergy Operations, Inc.		CE		09/01/1978	99
London, AR		BECH		03/26/1980	91
(6 miles NW of Russellville, AR)		BECH		06/30/2005	90
050-00368				07/17/2038	97
www.nrc.gov/info-finder/reactor/ano2.html					90
Beaver Valley Power Station, Unit 1	I	PWR-DRYAMB	2,900	06/26/1970	78
FirstEnergy Nuclear Operating Co.		WEST 3LP		07/02/1976	95
Shippingport, PA		S&W		10/01/1976	101
(17 miles W of McCandless, PA)		S&W		11/05/2009	92
050-00334				01/29/2036	91
www.nrc.gov/info-finder/reactor/bv1.html					101
Beaver Valley Power Station, Unit 2	I	PWR-DRYAMB	2,900	05/03/1974	87
FirstEnergy Nuclear Operating Co.		WEST 3LP		08/14/1987	103
Shippingport, PA		S&W		11/17/1987	87
(17 miles W of McCandless, PA)		S&W		11/05/2009	84
050-00412				05/27/2047	102
www.nrc.gov/info-finder/reactor/bv2.html					92
Braidwood Station, Unit 1	III	PWR-DRYAMB	3,586.6	12/31/1975	96
Exelon Generation Co., LLC		WEST 4LP		07/02/1987	92
Braceville, IL		S&L		07/29/1988	101
(20 miles SW of Joilet, IL)		CWE		N/A	95
050-00456				10/17/2026	89
www.nrc.gov/info-finder/reactor/brai1.html					101
Braidwood Station, Unit 2	III	PWR-DRYAMB	3,586.6	12/31/1975	95
Exelon Generation Co., LLC		WEST 4LP		05/20/1988	100
Braceville, IL		S&L		10/17/1988	92
(20 miles SW of Joilet, IL)		CWE		N/A	93
050-00457				12/18/2027	99
www.nrc.gov/info-finder/reactor/brai2.html					93
Browns Ferry Nuclear Plant, Unit 1	II	BWR-MARK 1	3,458	05/10/1967	–
Tennessee Valley Authority		GE 4		12/20/1973	49
Limestone County, AL		TVA		08/01/1974	88
(10 miles S of Athens, AL)		TVA		05/04/2006	94
050-00259				12/20/2033	86
www.nrc.gov/info-finder/reactor/bf1.html					91

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Browns Ferry Nuclear Plant, Unit 2	II	BWR-MARK 1	3,458	05/10/1967	94
Tennessee Valley Authority		GE 4		06/28/1974	78
Limestone County, AL		TVA		03/01/1975	98
(10 miles S of Athens, AL)		TVA		05/04/2006	94
050-00260				06/28/2034	91
www.nrc.gov/info-finder/reactor/bf2.html					80
Browns Ferry Nuclear Plant, Unit 3	II	BWR-MARK 1	3,458	07/31/1968	89
Tennessee Valley Authority		GE 4		07/02/1976	93
Limestone County, AL		TVA		03/01/1977	81
(10 miles S of Athens, AL)		TVA		05/04/2006	95
050-00296				07/02/2036	81
www.nrc.gov/info-finder/reactor/bf3.html					87
Brunswick Steam Electric Plant, Unit 1	II	BWR-MARK 1	2,923	02/07/1970	87
Carolina Power & Light Co.		GE 4		09/08/1976	96
Southport, NC		UE&C		03/18/1977	85
(30 miles S of Wilmington, NC)		BRRT		06/26/2006	98
050-00325				09/08/2036	83
www.nrc.gov/info-finder/reactor/bru1.html					100
Brunswick Steam Electric Plant, Unit 2	II	BWR-MARK 1	2,923	02/07/1970	90
Carolina Power & Light Co.		GE 4		12/27/1974	87
Southport, NC		UE&C		11/03/1975	95
(30 miles S of Wilmington, NC)		BRRT		06/26/2006	80
050-00324				12/27/2034	99
www.nrc.gov/info-finder/reactor/bru2.html					79
Byron Station, Unit 1	III	PWR-DRYAMB	3,586.6	12/31/1975	91
Exelon Generation Co., LLC		WEST 4LP		02/14/1985	98
Byron, IL		S&L		09/16/1985	95
(17 miles SW of Rockford, IL)		CWE		N/A	94
050-00454				10/31/2024	101
www.nrc.gov/info-finder/reactor/byro1.html					88
Byron Station, Unit 2	III	PWR-DRYAMB	3,586.6	12/31/1975	102
Exelon Generation Co., LLC		WEST 4LP		01/30/1987	89
Byron, IL		S&L		08/02/1987	96
(17 miles SW of Rockford, IL)		CWE		N/A	102
050-00455				11/06/2026	96
www.nrc.gov/info-finder/reactor/byro2.html					93
Callaway Plant	IV	PWR-DRYAMB	3,565	04/16/1976	97
Union Electric Co.		WEST 4LP		10/18/1984	90
Fulton, MO		BECH		12/19/1984	90
(25 miles NE of Jefferson City, MO)		DANI		N/A	98
050-00483				10/18/2024	86
www.nrc.gov/info-finder/reactor/call.html					90

APPENDIX A

U.S. Commercial Nuclear Power Reactors

Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Calvert Cliffs Nuclear Power Plant, Unit 1	I	PWR-DRYAMB	2,737	07/07/1969	84
Calvert Cliffs Nuclear Power Plant, LLC		CE		07/31/1974	99
Lusby, MD		BECH		05/08/1975	93
(40 miles S of Annapolis, MD)		BECH		03/23/2000	98
050-00317				07/31/2034	90
www.nrc.gov/info-finder/reactor/calv1.html					101
Calvert Cliffs Nuclear Power Plant, Unit 2	I	PWR-DRYAMB	2,737	07/07/1969	98
Calvert Cliffs Nuclear Power Plant, LLC		CE		08/13/1976	90
Lusby, MD		BECH		04/01/1977	99
(40 miles S of Annapolis, MD)		BECH		03/23/2000	93
050-00318				08/13/2036	97
www.nrc.gov/info-finder/reactor/calv2.html					92
Catawba Nuclear Station, Unit 1	II	PWR-ICECND	3,411	08/07/1975	82
Duke Energy Carolinas, LLC		WEST 4LP		01/17/1985	102
York, SC		DUKE		06/29/1985	89
(18 miles S of Charlotte, NC)		DUKE		12/05/2003	91
050-00413				12/05/2043	100
www.nrc.gov/info-finder/reactor/cat1.html					89
Catawba Nuclear Station, Unit 2	II	PWR-ICECND	3,411	08/07/1975	89
Duke Energy Carolinas, LLC		WEST 4LP		05/15/1986	84
York, SC		DUKE		08/19/1986	103
(18 miles S of Charlotte, NC)		DUKE		12/05/2003	90
050-00414				12/05/2043	92
www.nrc.gov/info-finder/reactor/cat2.html					101
Clinton Power Station, Unit 1	III	BWR-MARK 3	3,473	02/24/1976	90
Exelon Generation Co., LLC		GE 6		04/17/1987	101
Clinton, IL		S&L		11/24/1987	99
(23 miles SSE of Bloomington, IL)		BALD		N/A	97
050-00461				09/29/2026	92
www.nrc.gov/info-finder/reactor/clin.html					93
Columbia Generating Station	IV	BWR-MARK 2	3,486	03/19/1973	94
Energy Northwest		GE 5		04/13/1984	82
Benton County, WA		B&R		12/13/1984	93
(12 miles NW of Richland, WA)		BECH		05/22/2012	67
050-00397				12/20/2043	95
www.nrc.gov/info-finder/reactor/wash2.html					50
Comanche Peak Nuclear Power Plant, Unit 1	IV	PWR-DRYAMB	3,612	12/19/1974	102
Luminant Generation Co., LLC		WEST 4LP		04/17/1990	85
Glen Rose, TX		G&H		08/13/1990	96
(40 miles SW of Fort Worth, TX)		BRRT		N/A	100
050-00445				02/08/2030	91
www.nrc.gov/info-finder/reactor/cp1.html					91

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Comanche Peak Nuclear Power Plant, Unit 2 Luminant Generation Company, LLC Glen Rose, TX (40 miles SW of Fort Worth, TX) 050-00446 www.nrc.gov/info-finder/reactor/cp2.html	IV	PWR-DRYAMB WEST 4LP BECH BRRT	3,612	12/19/1974 04/06/1993 08/03/1993 N/A 02/02/2033	95 102 95 94 104 92
Cooper Nuclear Station Nebraska Public Power District Brownville, NE (23 miles S of Nebraska City, NE) 050-00298 www.nrc.gov/info-finder/reactor/cns.html	IV	BWR-MARK 1 GE 4 B&R B&R	2,419	06/04/1968 01/18/1974 07/01/1974 11/29/2010 01/18/2034	89 100 90 72 100 86
Crystal River Nuclear Generating Plant, Unit 3 Florida Power Corp. Crystal River, FL (80 miles N of Tampa, FL) 050-00302 www.nrc.gov/info-finder/reactor/cr3.html	II	PWR-DRYAMB B&W LLP GIL JONES	2,609	09/25/1968 12/03/1976 03/13/1977 N/A 12/03/2016	95 91 95 95 0 0
Davis-Besse Nuclear Power Station, Unit 1 FirstEnergy Nuclear Operating Co. Oak Harbor, OH (21 miles ESE of Toledo, OH) 050-00346 www.nrc.gov/info-finder/reactor/davi.html	III	PWR-DRYAMB B&W LLP BECH B&W	2,817	03/24/1971 04/22/1977 07/31/1978 N/A 04/22/2017	82 99 97 99 66 81
Diablo Canyon Nuclear Power Plant, Unit 1 Pacific Gas & Electric Co. Avila Beach, CA (12 miles SW of San Luis Obispo, CA) 050-00275 www.nrc.gov/info-finder/reactor/diab1.html	IV	PWR-DRYAMB WEST 4LP PG&E PG&E	3,411	4/23/1968 11/02/1984 05/07/1985 N/A 11/02/2024	101 90 98 84 88 100
Diablo Canyon Nuclear Power Plant, Unit 2 Pacific Gas & Electric Co. Avila Beach, CA 12 miles SW of San Luis Obispo, CA) 050-00323 www.nrc.gov/info-finder/reactor/diab2.html	IV	PWR-DRYAMB WEST 4LP PG&E PG&E	3,411	12/09/1970 08/26/1985 03/13/1986 N/A 08/26/2025	87 99 74 84 100 89
Donald C. Cook Nuclear Plant, Unit 1 Indiana Michigan Power Co. Bridgman, MI (13 miles S of Benton Harbor, MI) 050-00315 www.nrc.gov/info-finder/reactor/cook1.html	III	PWR-ICECND WEST 4LP AEP AEP	3,304	03/25/1969 10/25/1974 08/28/1975 08/30/2005 10/25/2034	81 103 64 3 88 87

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Donald C. Cook Nuclear Plant, Unit 2 Indiana Michigan Power Co. Bridgman, MI (13 miles S of Benton Harbor, MI) 050-00316 www.nrc.gov/info-finder/reactor/cook2.html	III	PWR-ICECND WEST 4LP AEP AEP	3,468	03/25/1969 12/23/1977 07/01/1978 08/30/2005 12/23/2037	89 86 101 87 84 104
Dresden Nuclear Power Station, Unit 2 Exelon Generation Co., LLC Morris, IL (25 miles SW of Joliet, IL) 050-00237 www.nrc.gov/info-finder/reactor/dres2.html	III	BWR-MARK 1 GE 3 S&L UE&C	2,957	01/10/1966 02/20/1991[A] 06/09/1970 10/28/2004 12/22/2029	96 92 98 91 102 95
Dresden Nuclear Power Station, Unit 3 Exelon Generation Co., LLC Morris, IL (25 miles SW of Joliet, IL) 050-00249 www.nrc.gov/info-finder/reactor/dres3.html	III	BWR-MARK 1 GE 3 S&L UE&C	2,957	10/14/1966 01/12/1971 11/16/1971 10/28/2004 01/12/2031	94 100 93 97 90 99
Duane Arnold Energy Center NextEra Energy Duane Arnold, LLC Palo, IA (8 miles NW of Cedar Rapids, IA) 050-00331 www.nrc.gov/info-finder/reactor/duan.html	III	BWR-MARK 1 GE 4 BECH BECH	1,912	06/22/1970 02/22/1974 02/01/1975 12/16/2010 02/21/2034	100 89 103 92 89 99
Edwin I. Hatch Nuclear Plant, Unit 1 Southern Nuclear Operating Co. Baxley, GA (20 miles S of Vidalia, GA) 050-00321 www.nrc.gov/info-finder/reactor/hat1.html	II	BWR-MARK 1 GE 4 BECH GPC	2,804	09/30/1969 10/13/1974 12/31/1975 01/15/2002 08/06/2034	84 98 84 94 85 98
Edwin I. Hatch Nuclear Plant, Unit 2 Southern Nuclear Operating Co., Inc. Baxley, GA (20 miles S of Vidalia, GA) 050-00366 www.nrc.gov/info-finder/reactor/hat2.html	II	BWR-MARK 1 GE 4 BECH GPC	2,804	12/27/1972 06/13/1978 09/05/1979 01/15/2002 06/13/2038	99 87 96 67 96 78
Fermi, Unit 2 The Detroit Edison Co. Newport, MI (25 miles NE of Toledo, OH) 050-00341 www.nrc.gov/info-finder/reactor/ferm2.html	III	BWR-MARK 1 GE 4 S&L DANI	3,430	09/26/1972 07/15/1985 01/23/1988 N/A 03/20/2025	76 85 98 75 80 94

A: AEC issued a provisional OL on 12/22/1969, allowing commercial operation. The NRC issued a full-term OL on 03/20/1991.

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Fort Calhoun Station, Unit 1 Omaha Public Power District Ft. Calhoun, NE (19 miles N of Omaha, NE) 050-00285 www.nrc.gov/info-finder/reactor/fcs.html	IV	PWR-DRYAMB CE GHDR GHDR	1,500	06/07/1968 08/09/1973 09/26/1973 11/04/2003 08/09/2033	74 104 83 100 102 28
Grand Gulf Nuclear Station, Unit 1 Entergy Operations, Inc. Port Gibson, MS (20 miles S of Vicksburg, MS) 050-00416 www.nrc.gov/info-finder/reactor/gg1.html	IV	BWR-MARK 3 GE 6 BECH BECH	3,898	09/04/1974 11/01/1984 07/01/1985 N/A 11/01/2024	94 84 86 100 88 94
H.B. Robinson Steam Electric Plant, Unit 2 Carolina Power & Light Co. Hartsville, SC (26 miles NW of Florence, SC) 050-00261 www.nrc.gov/info-finder/reactor/rob2.html	II	PWR-DRYAMB WEST 3LP EBSO EBSO	2,339	04/13/1967 07/31/1970 03/07/1971 04/19/2004 07/31/2030	104 92 87 104 57 100
Hope Creek Generating Station, Unit 1 PSEG Nuclear, LLC Hancocks Bridge, NJ (18 miles SE of Wilmington, DE) 050-00354 www.nrc.gov/info-finder/reactor/hope.html	I	BWR-MARK 1 GE 4 BECH BECH	3,840	11/04/1974 07/25/1986 12/20/1986 07/20/2011 04/11/2046	92 87 108 95 93 103
Indian Point Nuclear Generating, Unit 2 Entergy Nuclear Indian Point 2, LLC Buchanan, NY (24 miles N of New York City, NY) 050-00247 www.nrc.gov/info-finder/reactor/ip2.html	I	PWR-DRYAMB WEST 4LP UE&C WDCO	3,216	10/14/1966 09/28/1973 08/01/1974 N/A 09/28/2013	89 99 91 98 82 98
Indian Point Nuclear Generating, Unit 3 Entergy Nuclear Indian Point 3, LLC Buchanan, NY (24 miles N of New York City, NY) 050-00286 www.nrc.gov/info-finder/reactor/ip3.html	I	PWR-DRYAMB WEST 4LP UE&C WDCO	3,216	08/13/1969 12/12/1975 08/30/1976 N/A 12/12/2015	100 87 107 85 99 90
James A. FitzPatrick Nuclear Power Plant Entergy Nuclear FitzPatrick, LLC Scriba, NY (6 miles NE of Oswego, NY) 050-00333 www.nrc.gov/info-finder/reactor/fitz.html	I	BWR-MARK 1 GE 4 S&W S&W	2,536	05/20/1970 10/17/1974 07/28/1975 09/08/2008 10/17/2034	91 93 89 99 85 97

APPENDIX A

U.S. Commercial Nuclear Power Reactors

Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Joseph M. Farley Nuclear Plant, Unit 1 Southern Nuclear Operating Co. Columbia, AL (18 miles S of Dothan, AL) 050-00348 www.nrc.gov/info-finder/reactor/far1.html	II	PWR-DRYAMB WEST 3LP SSI DANI	2,775	08/16/1972 06/25/1977 12/01/1977 05/12/2005 06/25/2037	86 88 97 90 88 101
Joseph M. Farley Nuclear Plant, Unit 2 Southern Nuclear Operating Co. Columbia, AL (18 miles S of Dothan, AL) 050-00364 www.nrc.gov/info-finder/reactor/far2.html	II	PWR-DRYAMB WEST 3LP SSI BECH	2,775	08/16/1972 03/31/1981 07/30/1981 05/12/2005 03/31/2041	101 87 90 96 88 89
Kewaunee Power Station Dominion Energy Kewaunee, Inc. Kewaunee, WI (27 miles SE of Green Bay, WI) 050-00305 www.nrc.gov/info-finder/reactor/kewa.html	III	PWR-DRYAMB WEST 2LP PSE PSE	1,772	08/06/1968 12/21/1973 06/16/1974 02/24/2011 12/21/2033	75 95 90 93 102 93
LaSalle County Station, Unit 1 Exelon Generation Co., LLC Marseilles, IL (11 miles SE of Ottawa, IL) 050-00373 www.nrc.gov/info-finder/reactor/lasa1.html	III	BWR-MARK 2 GE 5 S&L CWE	3,546	09/10/1973 04/17/1982 01/01/1984 N/A 04/17/2022	93 99 100 99 94 101
LaSalle County Station, Unit 2 Exelon Generation Co., LLC Marseilles, IL (11 miles SE of Ottawa, IL) 050-00374 www.nrc.gov/info-finder/reactor/lasa2.html	III	BWR-MARK 2 GE 5 S&L CWE	3,546	09/10/1973 12/16/1983 10/19/1984 N/A 12/16/2023	102 95 94 93 101 96
Limerick Generating Station, Unit 1 Exelon Generation Co., LLC Limerick, PA (21 miles NW of Philadelphia, PA) 050-00352 www.nrc.gov/info-finder/reactor/lim1.html	I	BWR-MARK 2 GE 4 BECH BECH	3,515	06/19/1974 08/08/1985 02/01/1986 N/A 10/26/2024	93 101 95 101 91 96
Limerick Generating Station, Unit 2 Exelon Generation Co., LLC Limerick, PA (21 miles NW of Philadelphia, PA) 050-00353 www.nrc.gov/info-finder/reactor/lim2.html	I	BWR-MARK 2 GE 4 BECH BECH	3,515	06/19/1974 08/25/1989 01/08/1990 N/A 06/22/2029	100 91 101 94 99 90

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
McGuire Nuclear Station, Unit 1 Duke Energy Carolinas, LLC Huntersville, NC (17 miles N of Charlotte, NC) 050-00369 www.nrc.gov/info-finder/reactor/mcg1.html	II	PWR-ICECND WEST 4LP DUKE DUKE	3,411	02/23/1973 07/08/1981 12/01/1981 12/05/2003 06/12/2041	103 79 87 104 92 94
McGuire Nuclear Station, Unit 2 Duke Energy Carolinas, LLC Huntersville, NC (17 miles N of Charlotte, NC) 050-00370 www.nrc.gov/info-finder/reactor/mcg2.html	II	PWR-ICECND WEST 4LP DUKE DUKE	3,411	02/23/1973 05/27/1983 03/01/1984 12/05/2003 03/03/2043	87 103 90 94 104 94
Millstone Power Station, Unit 2 Dominion Nuclear Connecticut, Inc. Waterford, CT (3.2 miles SW of New London, CT) 050-00336 www.nrc.gov/info-finder/reactor/mill2.html	I	PWR-DRYAMB CE BECH BECH	2,700	12/11/1970 09/26/1975 12/26/1975 11/28/2005 07/31/2035	84 100 86 81 97 87
Millstone Power Station, Unit 3 Dominion Nuclear Connecticut, Inc. Waterford, CT (3.2 miles SW of New London, CT) 050-00423 www.nrc.gov/info-finder/reactor/mill3.html	I	PWR-DRYSUB WEST 4LP S&W S&W	3,650	08/09/1974 01/31/1986 04/23/1986 11/28/2005 11/25/2045	100 86 88 105 86 87
Monticello Nuclear Generating Plant, Unit 1 Northern States Power Company Monticello, MN (30 miles NW of Minneapolis, MN) 050-00263 www.nrc.gov/info-finder/reactor/mont.html	III	BWR-MARK GE 3 BECH BECH	1,775	06/19/1967 01/09/1981[B] 06/30/1971 11/08/2006 09/08/2030	101 84 97 83 94 69
Nine Mile Point Nuclear Station, Unit 1 Nine Mile Point Nuclear Station, LLC Scriba, NY (6 miles NE of Oswego, NY) 050-00220 www.nrc.gov/info-finder/reactor/nmp1.html	I	BWR-MARK 1 GE 2 NIAG S&W	1,850	04/12/1965 12/26/1974[C] 12/01/1969 10/31/2006 08/22/2029	98 88 98 92 97 84
Nine Mile Point Nuclear Station, Unit 2 Nine Mile Point Nuclear Station, LLC Scriba, NY (6 miles NE of Oswego, NY) 050-00410 www.nrc.gov/info-finder/reactor/nmp2.html	I	BWR-MARK 2 GE 5 S&W S&W	3,988	06/24/1974 07/02/1987 03/11/1988 10/31/2006 10/31/2046	90 92 90 99 89 95

B: AEC issued a provisional OL on 09/08/1970, allowing commercial operation. The NRC issued a full-term OL on 01/09/1981.

C: AEC issued a provisional OL on 08/22/1969, allowing commercial operation. The NRC issued a full-term OL on 12/26/1974.

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
North Anna Power Station, Unit 1 Virginia Electric & Power Co. Louisa, VA (40 miles NW of Richmond, VA) 050-00338 www.nrc.gov/info-finder/reactor/na1.html	II	PWR-DRYSUB WEST 3LP S&W S&W	2,940	02/19/1971 04/01/1978 06/06/1978 03/20/2003 04/01/2038	88 89 101 92 86 78
North Anna Power Station, Unit 2 Virginia Electric & Power Co. Louisa, VA (40 miles NW of Richmond, VA) 050-00339 www.nrc.gov/info-finder/reactor/na2.html	II	PWR-DRYSUB WEST 3LP S&W S&W	2,940	02/19/1971 08/21/1980 12/14/1980 03/20/2003 08/21/2040	100 85 82 100 100 76
Oconee Nuclear Station, Unit 1 Duke Energy Carolinas, LLC Seneca, SC (30 miles W of Greenville, SC) 050-00269 www.nrc.gov/info-finder/reactor/oco1.html	II	PWR-DRYAMB B&W LLP DBDB DUKE	2,568	11/06/1967 02/06/1973 07/15/1973 05/23/2000 02/06/2033	79 99 84 85 100 79
Oconee Nuclear Station, Unit 2 Duke Energy Carolinas, LLC Seneca, SC (30 miles W of Greenville, SC) 050-00270 www.nrc.gov/info-finder/reactor/oco2.html	II	PWR-DRYAMB B&W LLP DBDB DUKE	2,568	11/06/1967 10/06/1973 09/09/1974 05/23/2000 10/06/2033	100 91 86 103 91 93
Oconee Nuclear Station, Unit 3 Duke Energy Carolinas, LLC Seneca, SC (30 miles W of Greenville, SC) 050-00287 www.nrc.gov/info-finder/reactor/oco3.html	II	PWR-DRYAMB B&W LLP DBDB DUKE	2,568	11/06/1967 07/19/1974 12/16/1974 05/23/2000 07/19/2034	91 87 102 94 91 103
Oyster Creek Nuclear Generating Station Exelon Generation Co., LLC Forked River, NJ (9 miles S of Toms River, NJ) 050-00219 www.nrc.gov/info-finder/reactor/oc.html	I	BWR-MARK 1 GE 2 B&R B&R	1,930	12/15/1964 07/02/1991[D] 12/23/1969 04/08/2009 04/09/2029	86 94 83 92 85 98
Palisades Nuclear Plant Entergy Nuclear Operations, Inc. Covert, MI (5 miles S of South Haven, MI) 050-00255 www.nrc.gov/info-finder/reactor/pali.html	III	PWR-DRYAMB CE BECH BECH	2,565.4	03/14/1967 03/24/1971 12/31/1971 01/17/2007 03/24/2031	98 86 99 90 92 96

D: AEC issued a provisional OL on 04/09/1969, allowing commercial operation. The NRC issued a full-term OL on 07/02/1991.

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Palo Verde Nuclear Generating Station, Unit 1 Arizona Public Service Company Wintersburg, AZ (50 miles W of Phoenix, AZ) 050-00528 www.nrc.gov/info-finder/reactor/palo1.html	IV	PWR-DRYAMB CE80-2L BECH BECH	3,990	05/25/1976 06/01/1985 01/28/1986 04/21/2011 06/01/2045	42 77 86 101 81 83
Palo Verde Nuclear Generating Station, Unit 2 Arizona Public Service Company Wintersburg, AZ (50 miles W of Phoenix, AZ) 050-00529 www.nrc.gov/info-finder/reactor/palo2.html	IV	PWR-DRYAMB CE80-2L BECH BECH	3,990	05/25/1976 04/24/1986 09/19/1986 04/21/2011 04/24/2046	85 95 74 83 101 91
Palo Verde Nuclear Generating Station, Unit 3 Arizona Public Service Company Wintersburg, AZ (50 miles W of Phoenix, AZ) 050-00530 www.nrc.gov/info-finder/reactor/palo3.html	IV	PWR-DRYAMB COMB CE80-2L BECH BECH	3,990	05/25/1976 11/25/1987 01/08/1988 04/21/2011 11/25/2047	86 64 97 83 89 97
Peach Bottom Atomic Power Station, Unit 2 Exelon Generation Co., LLC Delta, PA (17.9 miles S of Lancaster, PA) 050-00277 www.nrc.gov/info-finder/reactor/pb2.html	I	BWR-MARK 1 GE 4 BECH BECH	3,514	01/31/1968 10/25/1973 07/05/1974 05/07/2003 08/08/2033	93 101 89 102 92 101
Peach Bottom Atomic Power Station, Unit 3 Exelon Generation Co., LLC Delta, PA (17.9 miles S of Lancaster, PA) 050-00278 www.nrc.gov/info-finder/reactor/pb3.html	I	BWR-MARK 1 GE 4 BECH BECH	3,514	01/31/1968 07/02/1974 12/23/1974 05/07/2003 07/02/2034	102 93 99 89 100 90
Perry Nuclear Power Plant, Unit 1 FirstEnergy Nuclear Operating Co. Perry, OH (35 miles NE of Cleveland, OH) 050-00440 www.nrc.gov/info-finder/reactor/perr1.html	III	BWR-MARK 3 GE 6 GIL KAIS	3,758	05/03/1977 11/13/1986 11/18/1987 N/A 03/18/2026	97 75 98 67 98 79
Pilgrim Nuclear Power Station Entergy Nuclear Operations, Inc. Plymouth, MA (38 miles SE of Boston, MA) 050-00293 www.nrc.gov/info-finder/reactor/pilg.html	I	BWR-MARK 1 GE 3 BECH BECH	2,028	08/26/1968 06/08/1972 12/01/1972 05/29/2012 06/08/2032	97 85 97 90 99 85

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Point Beach Nuclear Plant, Unit 1	III	PWR-DRYAMB	1,800	07/19/1967	100
NextEra Energy Point Beach, LLC		WEST 2LP		10/05/1970	85
Two Rivers, WI		BECH		12/21/1970	87
(13 miles NW of Manitowoc, WI)		BECH		12/22/2005	98
050-00266				10/05/2030	88
www.nrc.gov/info-finder/reactor/poin1.html					79
Point Beach Nuclear Plant, Unit 2	III	PWR-DRYAMB	1,800	07/25/1968	91
NextEra Energy Point Beach, LLC		WEST 2LP		03/08/1973[E]	99
Two Rivers, WI		BECH		10/01/1972	89
(13 miles NW of Manitowoc, WI)		BECH		12/22/2005	84
050-00301				03/08/2033	96
www.nrc.gov/info-finder/reactor/poin2.html					67
Prairie Island Nuclear Generating Plant, Unit 1	III	PWR-DRYAMB	1,677	06/25/1968	85
Northern States Power Co.—Minnesota		WEST 2LP		04/05/1974[F]	92
Welch, MN		FLUR		12/16/1973	84
(28 miles SE of Minneapolis, MN)		NSP		06/27/2011	97
050-00282				08/09/2033	96
www.nrc.gov/info-finder/reactor/prai1.html					91
Prairie Island Nuclear Generating Plant, Unit 2	III	PWR-DRYAMB	1,677	06/25/1968	84
Northern States Power Co.—Minnesota		WEST 2LP		10/29/1974	93
Welch, MN		FLUR		12/21/1974	85
(28 miles SE of Minneapolis, MN)		NSP		06/27/2011	75
050-00306				10/29/2034	86
www.nrc.gov/info-finder/reactor/prai2.html					99
Quad Cities Nuclear Power Station, Unit 1	III	BWR-MARK 1	2,957	02/15/1967	89
Exelon Generation Co., LLC		GE 3		12/14/1972	92
Cordova, IL		S&L		02/18/1973	96
(20 miles NE of Moline, IL)		UE&C		10/28/2004	82
050-00254				12/14/2032	99
www.nrc.gov/info-finder/reactor/quad1.html					92
Quad Cities Nuclear Power Station, Unit 2	III	BWR-MARK 1	2,957	02/15/1967	86
Exelon Generation Co., LLC		GE 3		12/14/1972	99
Cordova, IL		S&L		03/10/1973	86
(20 miles NE of Moline, IL)		UE&C		10/28/2004	91
050-00265				12/14/2032	92
www.nrc.gov/info-finder/reactor/quad2.html					104
River Bend Station, Unit 1	IV	BWR-MARK 3	3,091	03/25/1977	88
Entergy Operations, Inc.		GE 6		11/20/1985	85
St. Francisville, LA		S&W		06/16/1986	82
(24 miles NW of Baton Rouge, LA)		S&W		N/A	113
050-00458				08/29/2025	98
www.nrc.gov/info-finder/reactor/rbs1.html					90

E: AEC issued a provisional OL on 11/18/1971. The NRC issued a full-term OL on 03/08/1973.

F: AEC issued a provisional OL on 08/09/1973. The NRC issued a full-term OL on 04/05/1974.

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
R.E. Ginna Nuclear Power Plant	I	PWR-DRYAMB	1,775	04/25/1966	95
R.E. Ginna Nuclear Power Plant, LLC		WEST 2LP		09/19/1969	113
Ontario, NY		GIL		07/01/1970	109
(20 miles NE of Rochester, NY)		BECH		05/19/2004	91
050-00244				09/18/2029	97
www.nrc.gov/info-finder/reactor/ginn.html					84
St. Lucie Plant, Unit 1	II	PWR-DRYAMB	2,700	07/01/1970	102
Florida Power & Light Co.		CE		03/01/1976	85
Jensen Beach, FL		EBSO		12/21/1976	91
(10 miles SE of Ft. Pierce, FL)		EBSO		10/02/2003	100
050-00335				03/01/2036	72
www.nrc.gov/info-finder/reactor/stl1.html					85
St. Lucie Plant, Unit 2	II	PWR-DRYAMB	2,700	05/02/1977	82
Florida Power & Light Co.		CE		06/10/1983	70
Jensen Beach, FL		EBSO		08/08/1983	99
(10 miles SE of Ft. Pierce, FL)		EBSO		10/02/2003	80
050-00389				04/06/2043	100
www.nrc.gov/info-finder/reactor/stl2.html					66
Salem Nuclear Generating Station, Unit 1	I	PWR-DRYAMB	3,459	09/25/1968	99
PSEG Nuclear, LLC		WEST 4LP		12/01/1976	89
Hancocks Bridge, NJ		PUBS		06/30/1977	91
(18 miles SE of Wilmington, DE)		UE&C		06/30/2011	99
050-00272				08/13/2036	85
www.nrc.gov/info-finder/reactor/salm1.html					86
Salem Nuclear Generating Station, Unit 2	I	PWR-DRYAMB	3,459	09/25/1968	92
PSEG Nuclear, LLC		WEST 4LP		05/20/1981	98
Hancocks Bridge, NJ		PUBS		10/13/1981	83
(18 miles SE of Wilmington, DE)		UE&C		06/30/2011	93
050-00311				04/18/2040	98
www.nrc.gov/info-finder/reactor/salm2.html					89
San Onofre Nuclear Generating Station, Unit 2	IV	PWR-DRYAMB	3,438	10/18/1973	72
Southern California Edison Co.		CE		02/16/1982	89
San Clemente, CA		BECH		08/08/1983	91
(45 miles SE of Long Beach, CA)		BECH		N/A	60
050-00361				02/16/2022	75
www.nrc.gov/info-finder/reactor/sano2.html					105
San Onofre Nuclear Generating Station, Unit 3	IV	PWR-DRYAMB	3,438	10/18/1973	72
Southern California Edison Co.		CE		11/15/1982	94
San Clemente, CA		BECH		04/01/1984	69
(45 miles SE of Long Beach, CA)		BECH		N/A	104
050-00362				11/15/2022	72
www.nrc.gov/info-finder/reactor/sano3.html					88

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Seabrook Station, Unit 1 NextEra Energy Seabrook, LLC Seabrook, NH (13 miles S of Portsmouth, NH) 050-00443 www.nrc.gov/info-finder/reactor/seab1.html	I	PWR-DRYAMB WEST 4LP UE&C UE&C	3,648	07/07/1976 03/15/1990 08/19/1990 N/A 03/15/2030	86 99 89 81 100 77
Sequoyah Nuclear Plant, Unit 1 Tennessee Valley Authority Soddy-Daisy, TN (16 miles NE of Chattanooga, TN) 050-00327 www.nrc.gov/info-finder/reactor/seq1.html	II	PWR-ICECND WEST 4LP TVA TVA	3,455	05/27/1970 09/17/1980 07/01/1981 N/A 09/17/2020	90 87 101 89 84 98
Sequoyah Nuclear Plant, Unit 2 Tennessee Valley Authority Soddy-Daisy, TN (16 miles NE of Chattanooga, TN) 050-00328 www.nrc.gov/info-finder/reactor/seq2.html	II	PWR-ICECND WEST 4LP TVA TVA	3,455	05/27/1970 09/15/1981 06/01/1982 N/A 09/15/2021	90 100 89 89 97 89
Shearon Harris Nuclear Power Plant, Unit 1 Carolina Power & Light Co. New Hill, NC (20 miles SW of Raleigh, NC) 050-00400 www.nrc.gov/info-finder/reactor/har1.html	II	PWR-DRYAMB WEST 3LP EBSO DANI	2,900	01/27/1978 10/24/1986 05/02/1987 12/17/2008 10/24/2046	89 94 99 94 90 103
South Texas Project, Unit 1 STP Nuclear Operating Co. Bay City, TX (90 miles SW of Houston, TX) 050-00498 www.nrc.gov/info-finder/reactor/stp1.html	IV	PWR-DRYAMB WEST 4LP BECH EBSO	3,853	12/22/1975 03/22/1988 08/25/1988 N/A 08/20/2027	91 105 95 90 101 94
South Texas Project, Unit 2 STP Nuclear Operating Co. Bay City, TX (90 miles SW of Houston, TX) 050-00499 www.nrc.gov/info-finder/reactor/stp2.html	IV	PWR-DRYAMB WEST 4LP BECH EBSO	3,853	12/22/1975 03/28/1989 06/19/1989 N/A 12/15/2028	100 93 95 101 88 88
Surry Power Station, Unit 1 Virginia Electric and Power Co. Surry, VA (17 miles NW of Newport News, VA) 050-00280 www.nrc.gov/info-finder/reactor/sur1.html	II	PWR-DRYSUB WEST 3LP S&W S&W	2,857	06/25/1968 05/25/1972 12/22/1972 03/20/2003 05/25/2032	90 89 98 94 89 101
Surry Power Station, Unit 2 Virginia Electric and Power Co. Surry, VA (17 miles NW of Newport News, VA) 050-00281 www.nrc.gov/info-finder/reactor/sur2.html	II	PWR-DRYSUB WEST 3LP S&W S&W	2,857	06/25/1968 01/29/1973 05/01/1973 03/20/2003 01/29/2033	88 101 94 92 100 76

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Susquehanna Steam Electric Station, Unit 1 PPL Susquehanna, LLC Berwick, Luzerne County, PA (70 miles NE of Harrisburg, PA) 050-00387 www.nrc.gov/info-finder/reactor/susq1.html	I	BWR-MARK 2 GE 4 BECH BECH	3,952	11/03/1973 07/17/1982 06/08/1983 11/24/2009 07/17/2042	86 95 89 101 80 86
Susquehanna Steam Electric Station, Unit 2 PPL Susquehanna, LLC Berwick, Luzerne County, PA (70 miles NE of Harrisburg, PA) 050-00388 www.nrc.gov/info-finder/reactor/susq2.html	I	BWR-MARK 2 GE 4 BECH BECH	3,952	11/03/1973 03/23/1984 02/12/1985 11/24/2009 03/23/2044	93 88 100 90 96 72
Three Mile Island Nuclear Station, Unit 1 Exelon Generation Co., LLC Middletown, PA (10 miles SE of Harrisburg, PA) 050-00289 www.nrc.gov/info-finder/reactor/tmi1.html	I	PWR-DRYAMB B&W LLP GIL UE&C	2,568	05/18/1968 04/19/1974 09/02/1974 10/22/2009 04/19/2034	105 97 107 86 94 92
Turkey Point Nuclear Generating, Unit 3 Florida Power & Light Co. Homestead, FL (20 miles S of Miami, FL) 050-00250 www.nrc.gov/info-finder/reactor/tp3.html	II	PWR-DRYAMB WEST 3LP BECH BECH	2,300	04/27/1967 07/19/1972 12/14/1972 06/06/2002 07/19/2032	92 97 101 86 88 96
Turkey Point Nuclear Generating, Unit 4 Florida Power & Light Co. Homestead, FL (20 miles S of Miami, FL) 050-00251 www.nrc.gov/info-finder/reactor/tp4.html	II	PWR-DRYAMB WEST 3LP BECH BECH	2,300	04/27/1967 04/10/1973 09/07/1973 06/06/2002 04/10/2033	100 86 89 99 98 84
Vermont Yankee Nuclear Power Station Entergy Nuclear Operations, Inc. Vernon, VT (5 miles S of Brattleboro, VT) 050-00271 www.nrc.gov/info-finder/reactor/vy.html	I	BWR-MARK 1 GE 4 EBSO EBSO	1,912	12/11/1967 03/21/1972 11/30/1972 03/21/2011 03/21/2032	115 87 89 99 88 90
Virgil C. Summer Nuclear Station, Unit 1 South Carolina Electric & Gas Co. Jenkinsville, SC (26 miles NW of Columbia, SC) 050-00395 www.nrc.gov/info-finder/reactor/sum.html	II	PWR-DRYAMB WEST 3LP GIL DANI	2,900	03/21/1973 11/12/1982 01/01/1984 04/23/2004 08/06/2042	89 85 87 81 100 88
Vogtle Electric Generating Plant, Unit 1 Southern Nuclear Operating Co., Inc. Waynesboro, GA (26 miles SE of Augusta, GA) 050-00424 www.nrc.gov/info-finder/reactor/vog1.html	II	PWR-DRYAMB WEST 4LP SGEC GPC	3,625.6	06/28/1974 03/16/1987 06/01/1987 06/03/2009 01/16/2047	86 99 93 91 102 92

APPENDIX A
U.S. Commercial Nuclear Power Reactors
Operating Reactors (continued)

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Vogtle Electric Generating Plant, Unit 2 Southern Nuclear Operating Co., Inc. Waynesboro, GA (26 miles SE of Augusta, GA) 050-00425 www.nrc.gov/info-finder/reactor/vog2.html	II	PWR-DRYAMB WEST 4LP SBEC GPC	3,625.6	06/28/1974 03/31/1989 05/20/1989 06/03/2009 02/09/2049	92 83 88 101 93 94
Waterford Steam Electric Station, Unit 3 Entergy Operations, Inc. Killona, LA (25 miles W of New Orleans, LA) 050-00382 www.nrc.gov/info-finder/reactor/wat3.html	IV	PWR-DRYAMB COMB CE EBSO EBSO	3,716	11/14/1974 03/16/1985 09/24/1985 N/A 12/18/2024	92 98 89 87 100 82
Watts Bar Nuclear Plant, Unit 1 Tennessee Valley Authority Spring City, TN (60 miles SW of Knoxville, TN) 050-00390 www.nrc.gov/info-finder/reactor/wb1.html	II	PWR-ICECND WEST 4LP TVA TVA	3,459	01/23/1973 02/07/1996 05/27/1996 N/A 11/09/2035	68 102 82 94 99 84
Wolf Creek Generating Station, Unit 1 Wolf Creek Nuclear Operating Corp. Burlington, Coffey County, KS (28 miles SE of Emporia, KS) 050-00482 www.nrc.gov/info-finder/reactor/wc.html	IV	PWR-DRYAMB WEST 4LP BECH DANI	3,565	05/31/1977 06/04/1985 09/03/1985 11/20/2008 03/11/2045	92 102 83 86 86 72

APPENDIX A

U.S. Commercial Nuclear Power Reactors

Operating Reactors (continued)

Under Active Construction or Deferred Policy

Plant Name, Unit Number Licensee Location Docket Number NRC Web Page Address	NRC Region	Con Type NSSS Architect Engineer Constructor	Licensed MWt	CP Issued OL Issued Comm. Op. LR Issued Exp. Date	2006–2011** Capacity Factor (Percent)
Bellefonte Nuclear Power Station, Unit 3*** Tennessee Valley Authority (6 miles NE of Scottsboro, AL) 050-00438	II	PWR-DRYAMB B&W 205 TVA TVA	3,763	12/24/1974	N/A
Bellefonte Nuclear Power Station, Unit 4*** Tennessee Valley Authority (6 miles NE of Scottsboro, AL) 050-00439	II	PWR-DRYAMB B&W 205 TVA TVA	3,763	12/24/1974	N/A
Watts Bar Nuclear Plant, Unit 2**** Tennessee Valley Authority Spring City, TN (60 miles SW of Knoxville, TN) 050-00391	II	PWR-ICECND WEST 4LP TVA TVA	3,411	01/23/1973	
Virgil C. Summer Nuclear Station, Unit 2 South Carolina Electric & Gas Co. South Carolina Public Service Auth. Jenkinsville (Fairfield County), SC (26 miles NW of Columbia, SC) NPF-93	II	PWR AP1000 WEST SHAW	3,400	03/30/2012	N/A
Virgil C. Summer Nuclear Station, Unit 3 South Carolina Electric & Gas Co. South Carolina Public Service Auth. Jenkinsville (Fairfield County), SC (26 miles NW of Columbia, SC) NPF-94	II	PWR AP1000 WEST SHAW	3,400	03/30/2012	N/A
Vogtle Electric Generating Plant, Unit 3 Southern Nuclear Operating Co., Inc. Waynesboro (Burke County), GA (26 miles SE of Augusta, GA) NPF-91	II	PWR AP1000 WEST SHAW	3,400	02/10/2012	N/A
Vogtle Electric Generating Plant, Unit 4 Southern Nuclear Operating Co., Inc. Waynesboro, (Burke County), GA (26 miles SE of Augusta, GA) NPF-92	II	PWR AP1000 WEST SHAW	3,400	02/10/2012	N/A

* Note: Plant names are as identified on the license as of July 31, 2012.

** Average capacity factor is listed in year order starting with 2005.

***Bellefonte Units 1 and 2 are under the Commission Policy Statement on Deferred Plants (52 FR 38077; October 14, 1987).

****Watts Bar Unit 2 is currently under active construction.

Source: NRC, with some data compiled from EIA/DOE

APPENDIX B

U.S. Commercial Nuclear Power Reactors Permanently Shut Down — Formerly Licensed To Operate

Unit Location	Reactor Type MWt	NSSS Vendor	OL Issued Shut Down	Decommissioning Alternative Selected Current Status
Big Rock Point Charlevoix, MI	BWR 240	GE	05/01/1964 08/29/1997	DECON DECON Completed
GE Bonus* Punta Higuera, PR	BWR 50	CE	04/02/1964 06/01/1968	ENTOMB ENTOMB
CVTR** Parr, SC	PTHW 65	WEST	11/27/1962 01/01/1967	SAFSTOR SAFSTOR
Dresden 1 Morris, IL	BWR 700	GE	09/28/1959 10/31/1978	SAFSTOR SAFSTOR
Elk River* Elk River, MN	BWR 58	AC/S&L	11/06/1962 02/01/1968	DECON DECON Completed
Fermi 1 Newport, MI	SCF 200	CE	05/10/1963 09/22/1972	DECON DECON in Progress
Fort St. Vrain Platteville, CO	HTG 842	GA	12/21/1973 08/18/1989	DECON DECON Completed
GE VBWR Sunol, CA	BWR 50	GE	08/31/1957 12/09/1963	SAFSTOR SAFSTOR
Haddam Neck Meriden, CT	PWR 1,825	WEST	12/27/1974 12/05/1996	DECON DECON Completed
Hallam* Hallam, NE	SCGM 256	BLH	01/02/1962 09/01/1964	ENTOMB ENTOMB
NS Savannah Baltimore, MD	PWR 74	B&W	08/1965 11/1970	SAFSTOR SAFSTOR
Humboldt Bay 3 Eureka, CA	BWR 200	GE	08/28/1962 07/02/1976	DECON DECON In Progress
Indian Point 1 Buchanan, NY	PWR 615	B&W	03/26/1962 10/31/1974	SAFSTOR SAFSTOR
La Crosse Genoa, WI	BWR 165	AC	07/03/1967 04/30/1987	SAFSTOR SAFSTOR
Maine Yankee Wiscasset, ME	PWR 2,700	CE	06/29/1973 12/06/1996	DECON DECON Completed
Millstone 1 Waterford, CT	BWR 2,011	GE	10/31/1970 07/21/1998	SAFSTOR SAFSTOR
Pathfinder Sioux Falls, SD	BWR 190	AC	03/12/1964 09/16/1967	DECON DECON Completed
Peach Bottom 1 Delta, PA	HTG 115	GA	01/24/1966 10/31/1974	SAFSTOR SAFSTOR

APPENDIX B

U.S. Commercial Nuclear Power Reactors Permanently Shut Down — Formerly Licensed To Operate (continued)

Unit Location	Reactor Type MWt	NSSS Vendor	OL Issued Shut Down	Decommissioning Alternative Selected Current Status
Piqua*	OCM	AI	08/23/1962	ENTOMB
Piqua, OH	46		01/01/1966	ENTOMB
Rancho Seco***	PWR	B&W	08/16/1974	DECON
Herald, CA	2,772		06/07/1989	DECON Completed
San Onofre 1****	PWR	WEST	03/27/1967	DECON
San Clemente, CA	1,347		11/30/1992	DECON In Progress
Saxton	PWR	WEST	11/15/1961	DECON
Saxton, PA	23.5		05/01/1972	DECON Completed
Shippingport*	PWR	WEST	N/A	DECON
Shippingport, PA	236		1982	DECON Completed
Shoreham	BWR	GE	04/21/1989	DECON
Wading River, NY	2,436		06/28/1989	DECON Completed
Three Mile Island 2	PWR	B&W	02/08/1978	(1)
Middletown, PA	2,770		03/28/1979	
Trojan	PWR	WEST	11/21/1975	DECON
Rainier, OR	3,411		11/09/1992	DECON Completed
Yankee-Rowe	PWR	WEST	12/24/1963	DECON
Rowe, MA	600		10/01/1991	DECON Completed
Zion 1	PWR	WEST	10/19/1973	DECON
Zion, IL	3,250		02/21/1997	DECON In Progress
Zion 2	PWR	WEST	11/14/1973	DECON
Zion, IL	3,250		09/19/1996	DECON In Progress

* AEC/DOE owned; not regulated by the NRC.

** Holds byproduct license from the State of South Carolina.

*** Low-Level radiation waste storage remains licensed by the NRC.

**** Site has been decommissioned with exception of reactor vessel in long-term storage.

Notes: See Glossary for definitions of decommissioning alternatives (DECON, ENTOMB, SAFSTOR).

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

Source: DOE Integrated Database for 1990, "U.S. Spent Fuel and Radioactive Waste, Inventories, Projections, and Characteristics" (DOE/RW-0006, Rev. 6), and NRC, "Nuclear Power Plants in the World," Edition 6

APPENDIX C

Cancelled U.S. Commercial Nuclear Power Reactors

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
Allens Creek 1 Houston Lighting & Power Company 4 miles NW of Wallis, TX	BWR 1,150	1982 Under CP Review
Allens Creek 2 Houston Lighting & Power Company 4 miles NW of Wallis, TX	BWR 1,150	1976 Under CP Review
Atlantic 1 & 2 Public Service Electric & Gas Company Floating Plants off the Coast of NJ	PWR 1,150	1978 Under CP Review
Bailly 1 Northern Indiana Public Service Company 12 miles NNE of Gary, IN	BWR 645	1981 With CP
Barton 1 & 2 Alabama Power & Light 15 miles SE of Clanton, AL	BWR 1,159	1977 Under CP Review
Barton 3 & 4 Alabama Power & Light 15 miles SE of Clanton, AL	BWR 1,159	1975 Under CP Review
Black Fox 1 & 2 Public Service Company of Oklahoma 3.5 miles S of Inola, OK	BWR 1,150	1982 Under CP Review
Blue Hills 1 & 2 Gulf States Utilities Company SW tip of Toledo Bend Reservoir, TX	PWR 918	1978 Under CP Review
Callaway 2 Union Electric Company 25 miles ENE of Jefferson City, MO	PWR 1,150	1981 With CP
Cherokee 1 Duke Power Company 6 miles SSW of Blacksburg, SC	PWR 1,280	1983 With CP
Cherokee 2 & 3 Duke Power Company 6 miles SSW of Blacksburg, SC	PWR 1,280	1982 With CP
Clinch River Project Management Corp., DOE, TVA 23 miles W of Knoxville, in Oak Ridge, TN	LMFB 350	1983 Under CP Review

APPENDIX C
Cancelled U.S. Commercial Nuclear Power Reactors (continued)

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
Clinton 2 Illinois Power Company 6 miles E of Clinton, IL	BWR 933	1983 With CP
Davis-Besse 2 & 3 Toledo Edison Company 21 miles ESE of Toledo, OH	PWR 906	1981 Under CP Review
Douglas Point 1 & 2 Potomac Electric Power Company Charles County, MD	BWR 1,146	1977 Under CP Review
Erie 1 & 2 Ohio Edison Company Berlin, OH	PWR 1,260	1980 Under CP Review
Forked River 1 Jersey Central Power & Light Company 2 miles S of Forked River, NJ	PWR 1,070	1980 With CP
Fort Calhoun 2 Omaha Public Power District 19 miles N of Omaha, NE	PWR 1,136	1977 Under CP Review
Fulton 1 & 2 Philadelphia Electric Company 17 miles S of Lancaster, PA	HTG 1,160	1975 Under CP Review
Grand Gulf 2 Entergy Nuclear Operations, Inc. 20 miles SW of Vicksburg, MS	BWR 1,250	1990 With CP
Greene County Power Authority of the State of NY 20 miles N of Kingston, NY	PWR 1,191	1980 Under CP Review
Greenwood 2 & 3 Detroit Edison Company Greenwood Township, MI	PWR 1,200	1980 Under CP Review
Hartsville A1 & A2 Tennessee Valley Authority 5 miles SE of Hartsville, TN	BWR 1,233	1984 With CP
Hartsville B1 & B2 Tennessee Valley Authority 5 miles SE of Hartsville, TN	BWR 1,233	1982 With CP

APPENDIX C
Cancelled U.S. Commercial Nuclear Power Reactors (continued)

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
Haven 1 (formerly Koshkonong) Wisconsin Electric Power Company 4.2 miles SSW of Fort Atkinson, WI	PWR 900	1980 Under CP Review
Haven 2 (formerly Koshkonong) Wisconsin Electric Power Company 4.2 miles SSW of Fort Atkinson, WI	PWR 900	1978 Under CP Review
Hope Creek 2 Public Service Electric & Gas Company 18 miles SE of Wilmington, DE	BWR 1,067	1981 With CP
Jamesport 1 & 2 Long Island Lighting Company 65 miles E of New York City, NY	PWR 1,150	1980 With CP
Marble Hill 1 & 2 Public Service of Indiana 6 miles NE of New Washington, IN	PWR 1,130	1985 With CP
Midland 1 Consumers Power Company S of City of Midland, MI	PWR 492	1986 With CP
Midland 2 Consumers Power Company S of City of Midland, MI	PWR 818	1986 With CP
Montague 1 & 2 Northeast Nuclear Energy Company 1.2 miles SSE of Turners Falls, MA	BWR 1,150	1980 Under CP Review
New England 1 & 2 New England Power Company 8.5 miles E of Westerly, RI	PWR 1,194	1979 Under CP Review
New Haven 1 & 2 New York State Electric & Gas Corporation 3 miles NW of New Haven, NY	PWR 1,250	1980 Under CP Review
North Anna 3 Virginia Electric & Power Company 40 miles NW of Richmond, VA	PWR 907	1982 With CP
North Anna 4 Virginia Electric & Power Company 40 miles NW of Richmond, VA	PWR 907	1980 With CP

APPENDIX C
Cancelled U.S. Commercial Nuclear Power Reactors (continued)

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
North Coast 1 Puerto Rico Water Resources Authority 4.7 miles ESE of Salinas, PR	PWR 583	1978 Under CP Review
Palo Verde 4 & 5 Arizona Public Service Company 36 miles W of Phoenix, AZ	PWR 1,270	1979 Under CP Review
Pebble Springs 1 & 2 Portland General Electric Company 55 miles WSW of Tri Cities (Kenewick-Pasco-Richland, WA), OR	PWR 1,260	1982 Under CP Review
Perkins 1, 2, & 3 Duke Power Company 10 miles N of Salisbury, NC	PWR 1,280	1982 Under CP Review
Perry 2 Cleveland Electric Illuminating Co. 35 miles NE of Cleveland, OH	BWR 1,205	1994 Under CP Review
Phipps Bend 1 & 2 Tennessee Valley Authority 15 miles SW of Kingsport, TN	BWR 1,220	1982 With CP
Pilgrim 2 Boston Edison Company 4 miles SE of Plymouth, MA	PWR 1,180	1981 Under CP Review
Pilgrim 3 Boston Edison Company 4 miles SE of Plymouth, MA	PWR 1,180	1974 Under CP Review
Quanicassee 1 & 2 Consumers Power Company 6 miles E of Essexville, MI	PWR 1,150	1974 Under CP Review
River Bend 2 Gulf States Utilities Company 24 miles NNW of Baton Rouge, LA	BWR 934	1984 With CP
Seabrook 2 Public Service Co. of New Hampshire 13 miles S of Portsmouth, NH	PWR 1,198	1988 With CP
Shearon Harris 2 Carolina Power & Light Company 20 miles SW of Raleigh, NC	PWR 900	1983 With CP

APPENDIX C
Cancelled U.S. Commercial Nuclear Power Reactors (continued)

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
Shearon Harris 3 & 4 Carolina Power & Light Company 20 miles SW of Raleigh, NC	PWR 900	1981 With CP
Skagit/Hanford 1 & 2 Puget Sound Power & Light Company 23 miles SE of Bellingham, WA	PWR 1,277	1983 Under CP Review
Sterling Rochester Gas & Electric Corporation 50 miles E of Rochester, NY	PWR 1,150	1980 With CP
Summit 1 & 2 Delmarva Power & Light Company 15 miles SSW of Wilmington, DE	HTG 1,200	1975 Under CP Review
Sundesert 1 & 2 San Diego Gas & Electric Company 16 miles SW of Blythe, CA	PWR 974	1978 Under CP Review
Surry 3 & 4 Virginia Electric & Power Company 17 miles NW of Newport News, VA	PWR 882	1977 With CP
Tyrone 1 Northern States Power Company 8 miles NE of Durond, WI	PWR 1,150	1981 Under CP Review
Tyrone 2 Northern States Power Company 8 miles NE of Durond, WI	PWR 1,150	1974 With CP
Vogtle 3 & 4 Georgia Power Company 26 miles SE of Augusta, GA	PWR 1,113	1974 With CP
Washington Nuclear 1 Energy Northwest 10 miles E of Aberdeen, WA	PWR 1,266	1995 With CP
Washington Nuclear 3 Energy Northwest 16 miles E of Aberdeen, WA	PWR 1,242	1995 With CP
Washington Nuclear 4 Energy Northwest 10 miles E of Aberdeen, WA	PWR 1,218	1982 With CP

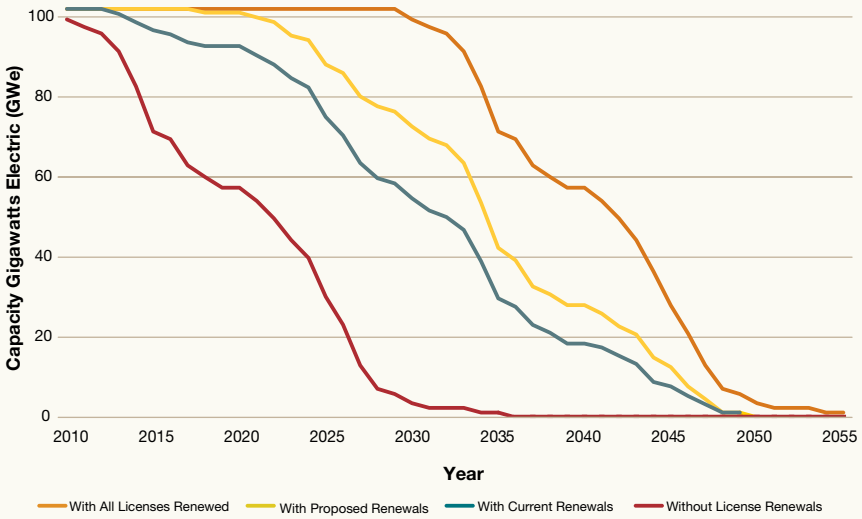
APPENDIX C
Cancelled U.S. Commercial Nuclear Power Reactors (continued)

Unit Utility Location	Con Type MWe per Unit	Cancelled Date Status
Washington Nuclear 5 Energy Northwest 16 miles E of Aberdeen, WA	PWR 1,242	1982 With CP
Yellow Creek 1 & 2 Tennessee Valley Authority 15 miles E of Corinth, MS	BWR 1,285	1984 With CP
Zimmer 1 Cincinnati Gas & Electric Company 25 miles SE of Cincinnati, OH	BWR 810	1984 With CP

Note: Cancellation is defined as public announcement of cancellation or written notification to the NRC. Only NRC-docketed applications are included. Status is the status of the application at the time of cancellation.

Source: DOE/EIA Commercial Nuclear Power 1991 (DOE/EIA-0438), Appendix E (page 105), and the NRC

APPENDIX D
Projected Electric Capacity Dependent on License Renewals



APPENDIX E

U.S. Commercial Nuclear Power Reactors by Parent Company

Utility	NRC-Abbreviated Reactor Unit Name
AmerenUE www.ameren.com	Callaway*
Arizona Public Service Company www.aps.com	Palo Verde 1, 2, & 3*
Constellation Energy www.constellation.com	Calvert Cliffs 1 & 2 Ginna Nine Mile Point 1 & 2
Detroit Edison Company www.dteenergy.com	Fermi 2
Dominion Generation www.dom.com	Kewaunee Millstone 2 & 3 North Anna 1 & 2 Surry 1 & 2
Duke Energy Carolinas, LLC www.duke-energy.com	Catawba 1 & 2 McGuire 1 & 2 Oconee 1, 2, & 3
Energy Northwest www.energy-northwest.com	Columbia
Entergy Nuclear Operations, Inc. www.entergy-nuclear.com	Arkansas Nuclear One 1 & 2 FitzPatrick Grand Gulf 1 Indian Point 2 & 3 Palisades Pilgrim 1 River Bend 1 Vermont Yankee Waterford 3
Exelon Corporation, LLC www.exeloncorp.com	Braidwood 1 & 2 Byron 1 & 2 Clinton Dresden 2 & 3 LaSalle 1 & 2 Limerick 1 & 2 Oyster Creek Peach Bottom 2 & 3 Quad Cities 1 & 2 Three Mile Island 1
FirstEnergy Nuclear Generating Corp. www.firstenergycorp.com	Beaver Valley 1 & 2 Davis-Besse Perry 1

APPENDIX E

U.S. Commercial Nuclear Power Reactors by Parent Company (continued)

Utility	NRC-Abbreviated Reactor Unit Name
FPL Group, Inc. www.fplgroup.com	Duane Arnold Point Beach 1 & 2 Seabrook 1 St. Lucie 1 & 2 Turkey Point 3 & 4
Indiana Michigan Power Company www.indianamichiganpower.com	Cook 1 & 2
Luminant Generation Company, LLC www.luminant.com	Comanche Peak 1 & 2*
Nebraska Public Power District www.nppd.com	Cooper
Northern States Power, an Xcel Energy Operating Company www.xcelenergy.com	Monticello Prairie Island 1 & 2
Omaha Public Power District www.oppd.com	Fort Calhoun
Pacific Gas & Electric Company www.pge.com	Diablo Canyon 1 & 2*
PPL Susquehanna, LLC www.pplweb.com	Susquehanna 1 & 2
Progress Energy www.progress-energy.com	Brunswick 1 & 2 Crystal River 3 Robinson 2 Harris 1
PSEG Nuclear, LLC www.pseg.com	Hope Creek 1 Salem 1 & 2
South Carolina Electric & Gas Company www.sceg.com	Summer
Southern California Edison Company www.sce.com	San Onofre 2 & 3
Southern Nuclear Operating Company www.southerncompany.com	Hatch 1 & 2 Farley 1 & 2 Vogtle 1 & 2
STP Nuclear Operating Company www.stpnoc.com	South Texas Project 1 & 2*
Tennessee Valley Authority www.tva.gov	Browns Ferry 1, 2, & 3 Sequoyah 1 & 2 Watts Bar 1
Wolf Creek Nuclear Operating Corporation www.wcnoc.com	Wolf Creek 1*

*These plants have a joint program called the Strategic Teaming and Resource Sharing (STARS) group. They share resources for refueling outages and develop some shared licensing applications.

APPENDIX F

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

1969	Dresden 2
	Ginna
	Nine Mile Point 1
	Oyster Creek
1970	Point Beach 1
	Robinson 2
1971	Dresden 3
	Monticello
1972	Palisades
	Pilgrim
	Quad Cities 1
	Quad Cities 2
	Surry 1
	Turkey Point 3
	Vermont Yankee
1973	Browns Ferry 1
	Fort Calhoun
	Indian Point 2
	Kewaunee
	Oconee 1
	Oconee 2
	Peach Bottom 2
	Point Beach 2
	Surry 2
	Turkey Point 4
1974	Arkansas Nuclear 1
	Browns Ferry 2
	Brunswick 2
	Calvert Cliffs 1
	Cooper
	Cook 1
	Duane Arnold
	FitzPatrick
	Hatch 1
	Oconee 3
	Peach Bottom 3
	Prairie Island 1
	Prairie Island 2
	Three Mile Island 1
1975	Millstone 2
1976	Beaver Valley 1
	Browns Ferry 3
	Brunswick 1
	Calvert Cliffs 2
	Indian Point 3
	Salem 1
	St. Lucie 1
1977	Crystal River 3
	Davis-Besse
	D.C. Cook 2
	Farley 1
1978	Arkansas Nuclear 2
	Hatch 2
	North Anna 1
1980	North Anna 2
	Sequoyah 1
1981	Farley 2
	McGuire 1
	Salem 2
	Sequoyah 2
1982	LaSalle 1
	San Onofre 2
	Summer
	Susquehanna 1
1983	McGuire 2
	San Onofre 3
	St. Lucie 2
1984	Callaway
	Columbia
	Diablo Canyon 1
	Grand Gulf 1
	LaSalle 2
	Susquehanna 2
1985	Byron 1
	Catawba 1
	Diablo Canyon 2
	Fermi 2
	Limerick 1
	Palo Verde 1
	River Bend 1
	Waterford 3
	Wolf Creek 1
1986	Catawba 2
	Hope Creek 1
	Millstone 3
	Palo Verde 2
	Perry 1
1987	Beaver Valley 2
	Braidwood 1
	Byron 2
	Clinton
	Harris 1
	Nine Mile Point 2
	Palo Verde 3
	Vogtle 1
1988	Braidwood 2
	South Texas Project 1
1989	Limerick 2
	South Texas Project 2
	Vogtle 2
1990	Comanche Peak 1
	Seabrook 1
1993	Comanche Peak 2
1996	Watts Bar 1

Note: List is limited to reactors licensed to operate. Year is based on the date the initial full-power operating license was issued. NRC-abbreviated reactor names are listed.

APPENDIX G

U.S. Commercial Nuclear Power Reactor Operating Licenses—Expiration by Year, 2012–2049

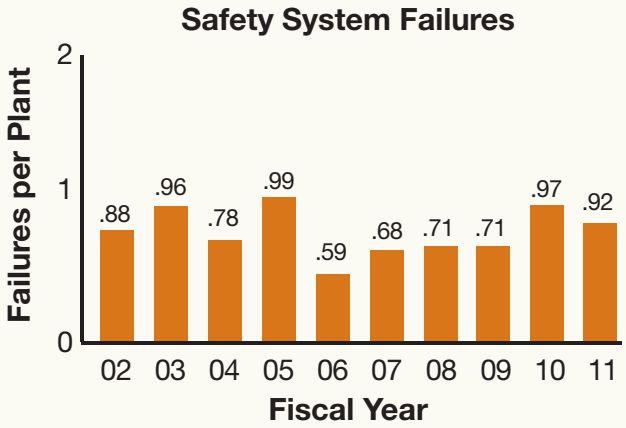
2013	Indian Point 2
2015	Indian Point 3
2016	Crystal River 3
2017	Davis-Besse
2020	Sequoyah 1
2021	Sequoyah 2
2022	LaSalle 1
	San Onofre 2
	San Onofre 3
2023	LaSalle 2
2024	Byron 1
	Callaway
	Diablo Canyon 1
	Grand Gulf 1
	Limerick 1
	Waterford 3
2025	Diablo Canyon 2
	Fermi 2
	River Bend 1
2026	Braidwood 1
	Byron 2
	Clinton
	Perry
2027	Braidwood 2
	South Texas Project 1
2028	South Texas Project 2
2029	Dresden 2
	Ginna
	Limerick 2
	Nine Mile Point 1
	Oyster Creek
2030	Comanche Peak 1
	Monticello
	Point Beach 1
	Robinson 2
	Seabrook
2031	Dresden 3
	Palisades
2032	Quad Cities 1
	Quad Cities 2
	Surry 1
	Turkey Point 3
	Vermont Yankee
	Pilgrim
2033	Browns Ferry 1
	Comanche Peak 2
	Fort Calhoun
	Kewaunee
	Oconee 1
	Oconee 2
	Peach Bottom 2
	Point Beach 2
	Prairie Island 1
	Surry 2
	Turkey Point 4
2034	Arkansas Nuclear 1
	Browns Ferry 2
	Brunswick 2
	Calvert Cliffs 1
	Cook 1
	Cooper
	Duane Arnold
	Hatch 1
	FitzPatrick
	Oconee 3
	Peach Bottom 3
	Prairie Island 2
	Three Mile Island 1
2035	Millstone 2
	Watts Bar 1
2036	Beaver Valley 1
	Browns Ferry 3
	Brunswick 1
	Calvert Cliffs 2
	St. Lucie 1
	Salem 1
2037	Cook 2
	Farley 1
2038	Arkansas Nuclear 2
	Hatch 2
	North Anna 1
2040	North Anna 2
	Salem 2
2041	Farley 2
	McGuire 1
2042	Summer
	Susquehanna 1
2043	Catawba 1
	Catawba 2
	McGuire 2
	St. Lucie 2
	Columbia
2044	Susquehanna 2
2045	Millstone 3
	Palo Verde 1
	Wolf Creek 1
2046	Nine Mile Point 2
	Harris 1
	Hope Creek
	Palo Verde 2
2047	Beaver Valley 2
	Palo Verde 3
	Vogtle 1
2049	Vogtle 2

Note: Limited to reactors licensed to operate. NRC-abbreviated reactor names listed. Data are as of July 2011.

APPENDIX H

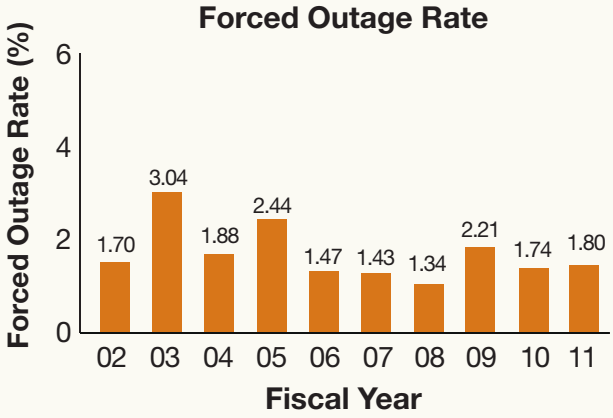
Industry Performance Indicators: Annual Industry Averages, FYs 2002–2011

Indicator	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Automatic Scrams	0.44	0.75	0.56	0.47	0.32	0.48	0.29	0.36	0.44	0.45
Safety System Actuations	0.18	0.41	0.24	0.38	0.22	0.25	0.14	0.23	0.18	0.19
Significant Events	0.05	0.07	0.04	0.05	0.03	0.02	0.03	0.02	0.10	0.06
Safety System Failures	0.88	0.96	0.78	0.99	0.59	0.68	0.71	0.71	0.97	0.92
Forced Outage Rate	1.70	3.04	1.88	2.44	1.47	1.43	1.34	2.21	1.74	1.80
Equipment-Forced Outage Rate	0.12	0.16	0.15	0.13	0.10	0.11	0.08	0.09	0.10	0.09
Collective Radiation Exposure	111	125	100	117	93	110	96	87	91	91
Drill/Exercise Performance	95	96	96	96	96	98	96	97	97	97
ERO Drill Participation	97	98	98	98	98	98	98	99	99	99
Alert and Notification System Reliability	99	99	99	99	99	99	100	100	100	100

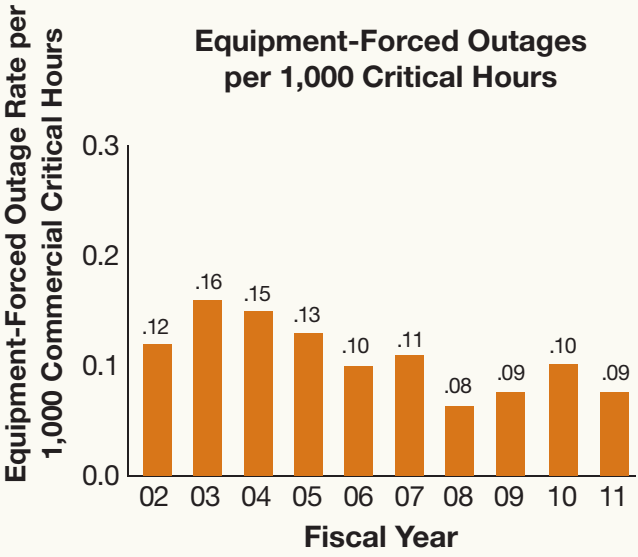


Safety system failures are any actual failures, events, or conditions that could prevent a system from performing its required safety function.

Industry Performance Indicators: Annual Industry Averages, FYs 2002–2011 (continued)



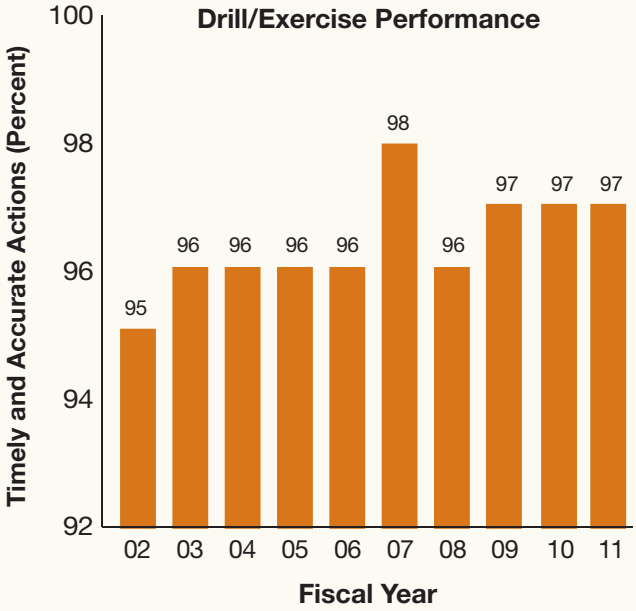
The forced outage rate is the number of hours that the plant is unable to operate (forced outage hours) divided by the sum of the hours that the plant is generating and transmitting electricity (unit service hours) and the hours that the plant is unable to operate (forced outage hours).



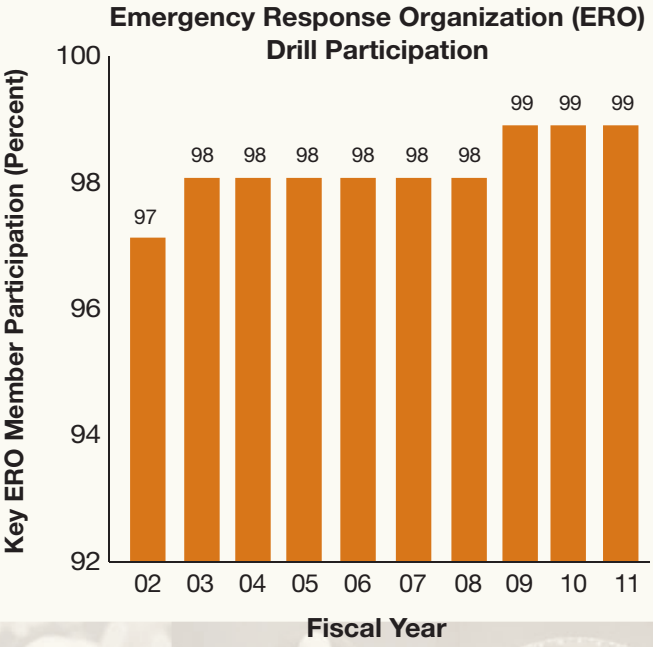
This indicator is the number of times the plant is forced to shut down because of equipment failures for every 1,000 hours that the plant is in operation and transmitting electricity.

APPENDIX H

Industry Performance Indicators: Annual Industry Averages, FYs 2002–2011 (continued)



The percentage of timely and accurate actions taken by plant personnel (emergency classifications, protective action recommendations, and notification to offsite authorities) in drills and actual events during the previous 2 years.



The percentage of participation by key plant personnel in drills or actual events in the previous 2 years, indicating proficiency and readiness to respond to emergencies.

APPENDIX I

Operating U.S. Nuclear Research and Test Reactors Regulated by the NRC

Licensee Location	Reactor Type OL Issued	Power Level (kW)	Licensee Number Docket Number
Aerotest San Ramon, CA	TRIGA (Indus) 07/02/1965	250	R-98 50-228
Armed Forces Radiobiology Research Institute Bethesda, MD	TRIGA 06/26/1962	1,100	R-84 50-170
Dow Chemical Company Midland, MI	TRIGA 07/03/1967	300	R-108 50-264
GE-Hitachi Sunol, CA	Tank 10/31/1957	100	R-33 50-73
Idaho State University Pocatello, ID	AGN-201 #103 10/11/1967	0.005	R-110 50-284
Kansas State University Manhattan, KS	TRIGA 10/16/1962	250	R-88 50-188
Massachusetts Institute of Technology Cambridge, MA	HWR Reflected 06/09/1958	6,000	R-37 50-20
National Institute of Standards & Technology Gaithersburg, MD	Nuclear Test 05/21/1970	20,000	TR-5 50-184
North Carolina State University Raleigh, NC	Pulstar 08/25/1972	1,000	R-120 50-297
Ohio State University Columbus, OH	Pool 02/24/1961	500	R-75 50-150
Oregon State University Corvallis, OR	TRIGA Mark II 03/07/1967	1,100	R-106 50-243
Pennsylvania State University State College, PA	TRIGA 07/08/1955	1,100	R-2 50-5
Purdue University West Lafayette, IN	Lockheed 08/16/1962	1	R-87 50-182
Reed College Portland, OR	TRIGA Mark I 07/02/1968	250	R-112 50-288
Rensselaer Polytechnic Institute Troy, NY	Critical Assembly 07/03/1964	0.1	CX-22 50-225
Rhode Island Atomic Energy Commission Narragansett, RI	GE Pool 07/23/1964	2,000	R-95 50-193

APPENDIX I

Operating U.S. Nuclear Research and Test Reactors Regulated by the NRC (continued)

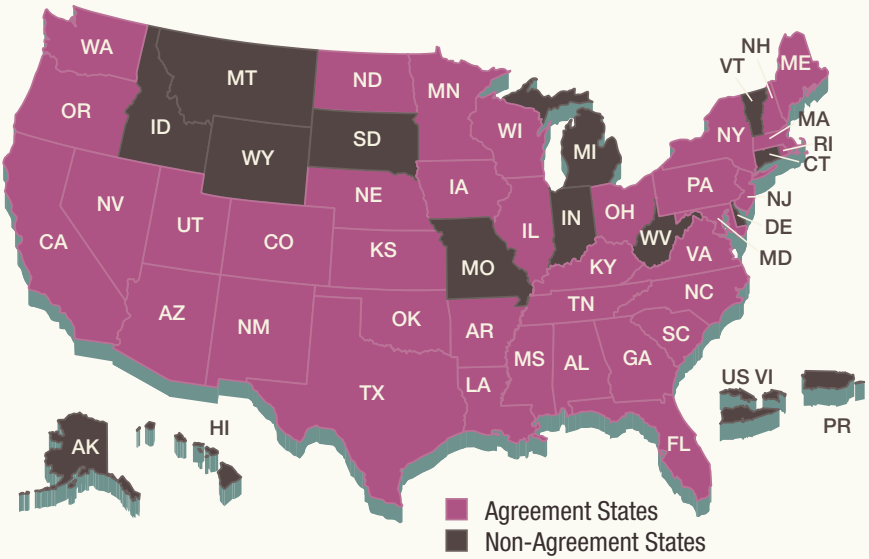
Licensee Location	Reactor Type OL Issued	Power Level (kW)	Licensee Number Docket Number
Texas A&M University College Station, TX	AGN-201M #106 08/26/1957	0.005	R-23 50-59
Texas A&M University College Station, TX	TRIGA 12/07/1961	1,000	R-128 50-128
U.S. Geological Survey Denver, CO	TRIGA Mark I 02/24/1969	1,000	R-113 50-274
University of California/Davis Sacramento, CA	TRIGA 08/13/1998	2,300	R-130 50-607
University of California/Irvine Irvine, CA	TRIGA Mark I 11/24/1969	250	R-116 50-326
University of Florida Gainesville, FL	Argonaut 05/21/1959	100	R-56 50-83
University of Maryland College Park, MD	TRIGA 10/14/1960	250	R-70 50-166
University of Massachusetts/Lowell Lowell, MA	GE Pool 12/24/1974	1,000	R-125 50-223
University of Missouri/Columbia Columbia, MO	Tank 10/11/1966	10,000	R-103 50-186
University of Missouri/Rolla Rolla, MO	Pool 11/21/1961	200	R-79 50-123
University of New Mexico Albuquerque, NM	AGN-201M #112 09/17/1966	0.005	R-102 50-252
University of Texas Austin, TX	TRIGA Mark II 01/17/1992	1,100	R-129 50-602
University of Utah Salt Lake City, UT	TRIGA Mark I 09/30/1975	100	R-126 50-407
University of Wisconsin Madison, WI	TRIGA 11/23/1960	1,000	R-74 50-156
Washington State University Pullman, WA	TRIGA 03/06/1961	1,000	R-76 50-27

APPENDIX J

U.S. Nuclear Research and Test Reactors Under Decommissioning Regulated by the NRC

Licensee Location	Reactor Type Power Level (kW)	OL Issued Shutdown	Decommissioning Alternative Selected Current Status
General Atomics San Diego, CA	TRIGA Mark F 1,500	07/01/60 09/07/94	DECON SAFSTOR
General Atomics San Diego, CA	TRIGA Mark I 250	05/03/58 12/17/96	DECON SAFSTOR
General Electric Company Sunol, CA	GETR (Tank) 50,000	01/07/59 06/26/85	SAFSTOR SAFSTOR
General Electric Company Sunol, CA	EVESR 17,000	11/12/63 02/01/67	SAFSTOR SAFSTOR
National Aeronautics and Space Administration Sandusky, OH	Test 60,000	05/02/62 07/07/73	DECON DECON In Progress
National Aeronautics and Space Administration Sandusky, OH	Mockup 100	06/14/61 07/07/73	DECON DECON In Progress
University of Buffalo Buffalo, NY	Pulstar 2,000	03/24/61 07/23/96	DECON SAFSTOR In Progress
University of Illinois Urbana-Champaign, IL	TRIGA 1,500	07/22/69 04/12/99	SAFSTOR DECON In Progress
University of Michigan Ann Arbor, MI	Pool 2,000	09/13/57 01/29/04	DECON DECON In Progress
Veterans Administration Omaha, NE	TRIGA 20	06/26/59 11/05/01	DECON SAFSTOR
Worcester Polytechnic Institute Worcester, MA	GE 10	12/16/59 06/30/07	DECON DECON Pending

APPENDIX K
Agreement States



APPENDIX L
State Electricity Profile by Nuclear Source

State	Net Generation
Alabama	25.87%
Alaska	0.00%
Arizona	27.99%
Arkansas	23.27%
California	17.96%
Colorado	0.00%
Connecticut	47.76%
Delaware	0.00%
District of Columbia	0.00%
Florida	9.61%
Georgia	23.48%
Hawaii	0.00%
Idaho	0.00%
Illinois	47.59%
Indiana	0.00%
Iowa	9.07%
Kansas	15.27%

State	Net Generation
Kentucky	0.00%
Louisiana	16.15%
Maine	0.00%
Maryland	33.02%
Massachusetts	11.88%
Michigan	29.48%
Minnesota	22.29%
Mississippi	18.97%
Missouri	10.15%
Montana	0.00%
Nebraska	18.93%
Nevada	0.00%
New Hampshire	37.68%
New Jersey	51.16%
New Mexico	0.00%
New York	31.19%
North Carolina	31.49%

State	Net Generation
North Dakota	0.00%
Ohio	10.37%
Oklahoma	0.00%
Oregon	0.00%
Pennsylvania	33.14%
Rhode Island	0.00%
South Carolina	50.79%
South Dakota	0.00%
Tennessee	32.69%
Texas	9.63%
Utah	0.00%
Vermont	74.13%
Virginia	35.01%
Washington	4.64%
West Virginia	0.00%
Wisconsin	17.97%
Wyoming	0.00%

Source: DOE/EIA, "State Electricity Profiles," data from May 2012, www.eia.doe.gov

APPENDIX M
Major U.S. Fuel Cycle Facility Sites

Licensee	Location	Status
Uranium Hexafluoride Conversion Facility		
Honeywell International, Inc.	Metropolis, IL	active
Uranium Fuel Fabrication Facilities		
Global Nuclear Fuels-Americas, LLC	Wilmington, NC	active
Westinghouse Electric Company, LLC Columbia Fuel Fabrication Facility	Columbia, SC	active
Nuclear Fuel Services, Inc.	Erwin, TN	active
AREVA NP, Inc. Mt. Athos Road Facility	Lynchburg, VA	inactive, license termination pending
B&W Nuclear Operations Group	Lynchburg, VA	active
AREVA NP, Inc.	Richland, WA	active
Mixed Oxide Fuel Fabrication Facility		
Shaw AREVA MOX Services, LLC	Aiken, SC	under construction (operating license under review)
Gaseous Diffusion Uranium Enrichment Facilities		
USEC Inc.	Paducah, KY	active
Gas Centrifuge Uranium Enrichment Facilities		
USEC Inc.	Piketon, OH	under construction
Louisiana Energy Services (URENCO-USA)	Eunice, NM	active*
AREVA Enrichment Services LLC Eagle Rock Enrichment Facilities	Idaho Falls, ID	active**
Laser Separation Enrichment Facility		
GE-Hitachi	Wilmington, NC	under review
Uranium Hexafluoride Deconversion Facility		
International Isotopes	Hobbs, NM	under review

* Partially operating and producing enriched uranium while undergoing further phases of construction.

** NRC issued license in Oct. 2011 and construction on the facility has not begun.

Note: The NRC regulates nine other facilities that possess significant quantities of special nuclear material (other than reactors) or process source material (other than uranium recovery facilities).

Data are as of July 2012.

APPENDIX N
Dry Spent Fuel Storage Designs: NRC-Approved for Use by General Licensees

Vendor	Docket #	Storage Design Model
General Nuclear Systems, Inc.	72-1000	CASTOR V/21
NAC International, Inc.	72-1002	NAC S/T
	72-1003	NAC-C28 S/T
	72-1015	NAC-UMS
	72-1025	NAC-MPC
	72-1031	Magnastor
Holtec International	72-1008	HI-STAR 100
	72-1014	HI-STORM 100
	72-1032	HI-STORM FW
Energy Solutions, Inc.	72-1007	VSC-24
	72-1026	Fuel Solutions™ (WSNF-220, -221, -223) W-150 Storage Cask W-100 Transfer Cask W-21, W-74 Canisters
Transnuclear, Inc.	72-1005	TN-24
	72-1027	TN-68
	72-1021	TN-32, 32A, 32B
	72-1004	Standardized NUHOMS®-24P, -24PHB, -24PTH, -32PT, -32PTH1, -52B, -61BT, -61BTH
	72-1029	Standardized Advanced NUHOMS®-24PT1, -24PT4
	72-1030	NUHOMS® HD-32PTH

Data are as of June 2012 (See latest list on the NRC Web site at www.nrc.gov/waste/spent-fuel-storage/designs.html.)

APPENDIX O
Dry Cask Spent Fuel Storage Licensees

Name Licensee	License Type	Date Issued	Vendor	Storage Model	Docket #
Surry Virginia Electric & Power Company (Dominion Gen.)	SL	07/02/1986	General Nuclear Systems, Inc. Transnuclear, Inc. General Nuclear Westinghouse, Inc.	CASTOR V/21 TN-32 NAC-128 CASTOR X/33 MC-10	72-2
	GL	08/06/2007	Transnuclear, Inc.	NUHOMS®-HD	72-55
H.B. Robinson Carolina Power & Light Company	SL GL	08/13/1986 09/06/2005	Transnuclear, Inc. Transnuclear, Inc.	NUHOMS®-7P NUHOMS®-24P	72-3 72-60
Oconee Duke Energy Company	SL GL	01/29/1990 03/05/1999	Transnuclear, Inc. Transnuclear, Inc.	NUHOMS®-24P NUHOMS®-24P	72-4 72-40
Fort St. Vrain* U.S. Department of Energy	SL	11/04/1991	FW Energy Applications, Inc.	Modular Vault Dry Store	72-9
Calvert Cliffs Calvert Cliffs Nuclear Power Plant, Inc.	SL	11/25/1992	Transnuclear, Inc.	NUHOMS®-24P NUHOMS®-32P	72-8
Palisades Entergy Nuclear Operations, Inc.	GL	05/11/1993	Energy Solutions, Inc.	VSC-24 NUHOMS®-32PT	72-7
Prairie Island Northern States Power Co., a Minnesota Corp.	SL	10/19/1993	Transnuclear, Inc.	TN-40 HT TN-40	72-10
Point Beach FLP Energy Point Beach, LLC	GL	05/26/1996	Energy Solutions, Inc.	VSC-24 NUHOMS®-32PT	72-5
Davis-Besse FirstEnergy Nuclear Operating Company	GL	01/01/1996	Transnuclear, Inc.	NUHOMS®-24P	72-14
Arkansas Nuclear Entergy Nuclear Operations, Inc.	GL	12/17/1996	Energy Solutions, Inc. Holtec International	VSC-24 HI-STORM 100	72-13
North Anna Virginia Electric & Power Company (Dominion Gen.)	SL GL	06/30/1998 03/10/2008	Transnuclear, Inc. Transnuclear, Inc.	TN-32 NUHOMS®-HD	72-16 72-56
Trojan Portland General Electric Corp.	SL	03/31/1999	Holtec International	HI-STORM 100	72-17

APPENDIX O
Dry Cask Spent Fuel Storage Licensees (continued)

Name Licensee	License Type	Date Issued	Vendor	Storage Model	Docket #
Idaho National Lab TMI-2 Fuel Debris, U.S. Department of Energy	SL	03/19/1999	Transnuclear, Inc.	NUHOMS®-12T	72-20
Susquehanna PPL Susquehanna, LLC	GL	10/18/1999	Transnuclear, Inc.	NUHOMS®-52B NUHOMS®-61BT	72-28
Peach Bottom Exelon Generation Company, LLC	GL	06/12/2000	Transnuclear, Inc.	TN-68	72-29
Hatch Southern Nuclear Operating, Inc.	GL	07/06/2000	Holtec International	HI-STAR 100 HI-STORM 100	72-36
Dresden Exelon Generation Company, LLC	GL	07/10/2000	Holtec International	HI-STAR 100 HI-STORM 100	72-37
Rancho Seco Sacramento Municipal Utility District	SL	06/30/2000	Transnuclear, Inc.	NUHOMS®-24P	72-11
McGuire Duke Energy, LLC	GL	02/01/2001	Transnuclear, Inc.	TN-32	72-38
Big Rock Point Entergy Nuclear Operations, Inc.	GL	11/18/2002	Energy Solutions, Inc.	Fuel Solutions™ W74	72-43
James A. FitzPatrick Entergy Nuclear Operations, Inc.	GL	04/25/2002	Holtec International	HI-STORM 100	72-12
Maine Yankee Maine Yankee Atomic Power Company	GL	08/24/2002	NAC International, Inc.	NAC-UMS	72-30
Columbia Generating Station Energy Northwest	GL	09/02/2002	Holtec International	HI-STORM 100	72-35
Oyster Creek AmerGen Energy Company, LLC.	GL	04/11/2002	Transnuclear, Inc.	NUHOMS®-61BT	72-15
Yankee Rowe Yankee Atomic Electric	GL	06/26/2002	NAC International, Inc.	NAC-MPC	72-31
Duane Arnold Next Era Energy Duane Arnold, LLC.	GL	09/01/2003	Transnuclear, Inc.	NUHOMS®-61BT	72-32

APPENDIX O
Dry Cask Spent Fuel Storage Licensees (continued)

Name Licensee	License Type	Date Issued	Vendor	Storage Model	Docket #
Palo Verde Arizona Public Service Co.	GL	03/15/2003	NAC International, Inc.	NAC-UMS	72-44
San Onofre Southern California Edison Company	GL	10/03/2003	Transnuclear, Inc.	NUHOMS®-24PT	72-41
Diablo Canyon Pacific Gas & Electric Co.	SL	03/22/2004	Holtec International	HI-STORM 100	72-26
Haddam Neck CT Yankee Atomic Power	GL	05/21/2004	NAC International, Inc.	NAC-MPC	72-39
Sequoyah Tennessee Valley Authority	GL	07/13/2004	Holtec International	HI-STORM 100	72-34
Idaho Spent Fuel Facility	SL	11/30/2004	Foster Wheeler Environmental Corp.	Concrete Vault	72-25
Humboldt Bay Pacific Gas & Electric Co.	SL	11/30/2005	Holtec International	HI-STORM 100HB	72-27
Private Fuel Storage Facility	SL	02/21/2006	Holtec International	HI-STORM 100	72-22
Browns Ferry Tennessee Valley Authority	GL	08/21/2005	Holtec International	HI-STORM 100S	72-52
Joseph M. Farley Southern Nuclear Operating Co.	GL	08/25/2005	Transnuclear, Inc.	NUHOMS®-32PT	72-42
Millstone Dominion Generation	GL	02/15/2005	Transnuclear, Inc.	NUHOMS®-32PT	72-47
Quad Cities Exelon Generation Company, LLC	GL	12/02/2005	Holtec International	HI-STORM 100S	72-53
River Bend Entergy Nuclear Operations, Inc.	GL	12/29/2005	Holtec International	HI-STORM 100S	72-49
Fort Calhoun Omaha Public Power District	GL	07/29/2006	Transnuclear, Inc.	NUHOMS®-32PT	72-54
Hope Creek/Salem PSEG, Nuclear, LLC	GL	11/10/2006	Holtec International	HI-STORM 100	72-48
Grand Gulf Entergy Nuclear Operations, Inc.	GL	11/18/2006	Holtec International	HI-STORM 100S	72-50
Catawba Duke Energy Carolinas, LLC	GL	07/30/2007	NAC International, Inc.	NAC-UMS	72-45

APPENDIX O
Dry Cask Spent Fuel Storage Licensees (continued)

Name Licensee	License Type	Date Issued	Vendor	Storage Model	Docket #
Indian Point Entergy Nuclear Operations, Inc.	GL	01/11/2008	Holtec International	HI-STORM 100	72-51
St. Lucie Florida Power and Light Company	GL	03/14/2008	Transnuclear, Inc.	NUHOMS®-HD	72-61
Vermont Yankee Entergy Nuclear Operations, Inc.	GL	05/25/2008	Holtec International	HI-STORM100	72-59
Limerick Exelon Generation Co., LLC	GL	08/01/2008	Transnuclear, Inc.	NUHOMS®-61BT	72-65
Seabrook FPL Energy	GL	08/07/2008	Transnuclear, Inc.	NUHOMS®-HD-3PTM	72-61
Monticello Northern States Power Co.	GL	09/17/2008	Transnuclear, Inc.	NUHOMS®-61BT	72-58
Kewaunee Northern States Power Co.	GL	09/11/2009	Transnuclear, Inc.	NUHOMS®-39PT	72-64
Byron Exelon Generation Co., LLC	GL	09/09/2010	Holtec International	HI-STORM 100	72-68
Cooper Nuclear Station Nebraska Public Power District	GL	10/21/2010	Transnuclear, Inc.	NUHOMS-61BT	72-66
La Salle Exelon Generation Co., LLC	GL	11/01/2010	Holtec International	HI-STORM100	72-70
Turkey Point ISFSI Florida Power and Light Company	GL	07/29/2010	Transnuclear, Inc.	NUHOMS HD	72-62
Waterford Steam Electric Station Entergy Nuclear Operations, Inc.	GL	11/08/11	Holtec International	HI-STORM 100	72-75
Braidwood Exelon Generation Co., LLC	GL	11/23/11	Holtec International	HI-STORM 100	72-73
Comanche Peak Luminant Generation Company, LLC	GL	2/28/12	Holtec International	HI-STORM 100	72-74

*Fort St. Vrain is undergoing decommissioning and was transferred to DOE on June 4, 1999.

Note: NRC-abbreviated unit names.

APPENDIX P
U.S. Low-Level Radioactive Waste Compacts

Appalachian
Delaware
Maryland
Pennsylvania
West Virginia

Atlantic
Connecticut
New Jersey
South Carolina*

Central
Arkansas
Kansas
Louisiana
Oklahoma

Central Midwest
Illinois
Kentucky

Midwest
Indiana
Iowa
Minnesota
Missouri
Ohio
Wisconsin

Northwest
Alaska
Hawaii
Idaho
Montana
Oregon
Utah*
Washington*
Wyoming

Rocky Mountain
Colorado
Nevada
New Mexico
(Northwest accepts Rocky Mountain waste as agreed between compacts)

Southeast
Alabama
Florida
Georgia
Mississippi
Tennessee
Virginia

Southwestern
Arizona
California
North Dakota
South Dakota

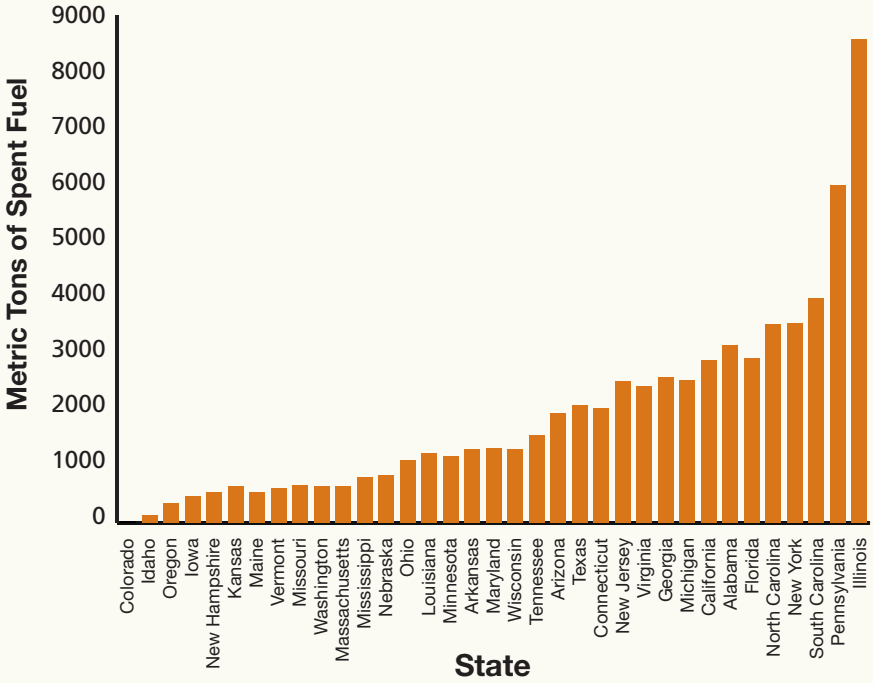
Texas
Texas*
Vermont

Unaffiliated
District of Columbia
Maine
Massachusetts
Michigan
Nebraska
New Hampshire
New York
North Carolina
Puerto Rico
Rhode Island

Note: Data are as of June 2012.
*Site of an active LLW disposal facility.

APPENDIX Q

Storage of Commercial Spent Fuel by State through 2011



Idaho is holding used fuel from Three Mile Island 2 and the used Fuel Data are rounded up to the nearest 10 for CY 2011.

Source: Gutherman Technical Services and Department of Energy

Updated: April 12, 2012.

APPENDIX R
NRC-Regulated Complex Material Sites Undergoing Decommissioning

Company	Location
AAR Manufacturing, Inc. (Brooks & Perkins)	Livonia, MI
ABB, Inc.	Windsor, CT
Analytical Bio-Chemistry Laboratories	Columbia, MO
Army, Department of, Jefferson Proving Ground	Madison, IN
Babcock & Wilcox SLDA	Vandergrift, PA
Beltsville Agricultural Research Center	Beltsville, MD
FMRI	Muskogee, OK
Hunter's Point Naval Shipyard	San Francisco, CA
Kerr-McGee	Cimarron, OK
Mallinckrodt Chemical, Inc.	St. Louis, MO
McClellan Air Force Base	Sacramento, CA
NWI Breckenridge	Breckenridge, MI
Pohakuloa Training Area	Kawaihe Harbor, HI
Schofield Army Barracks	Wahiawa, HI
Sigma Aldrich	Maryland Heights, MO
Stepan Chemical Corporation	Maywood, NJ
UNC Naval Products	New Haven, CT
West Valley Demonstration Project	West Valley, NY
Westinghouse Electric Corporation—Hematite	Festus, MO

Note: Data are as of June 2012.

APPENDIX S
Nuclear Power Units by Nation

	In Operation		Under Construction or on Order			
Country	**Number of Units**	**Capacity Net MWe**	**Number of Units**	**Capacity Net MWe**	**Nuclear Power Production GWh***	**Shutdown**
Argentina	2	935	1	692	5,894	0
Armenia	1	375	0	0	2,357	1[P]
Belgium	7	5,927	0	0	45,942	1[P]
Brazil	2	1,884	1	1,245	14,795	0
Bulgaria	2	1,906	2	1,906	15,264	4[P]
Canada	18	12,604	0	0	88,318	3[P] & 4[L]
China	16	11,816	26	26,620	82,569	0
Czech Republic	6	3,678	0	0	26,696	0
Finland	4	2,716	1	1,600	22,266	0
France	58	63,130	1	1,600	423,509	12[P]
Germany	9	12,068	0	0	102,311	27[P]
Hungary	4	1,889	0	0	14,707	0
India	20	4,391	7	4,824	28,948	0
Iran	1	915	1	915	98	0
Italy	0	0	0	0	0	4[P]
Japan	50	44,215	2	2,650	156,182	9[P] &1[L]
Kazakhstan	0	0	0	0	0	1[P]
Rep. Korea	23	20,671	3	3,640	147,763	0
Lithuania	0	0	0	0	0	2[P]
Mexico	2	1,300	0	0	9,313	0
Netherlands	1	482	0	0	3,917	1[P]
Pakistan	3	725	2	630	3,843	0
Romania	2	1,300	0	0	10,811	0
Russia	33	23,643	11	9,297	162,018	5[P]
Slovakia	4	1,816	2	782	14,342	3[P]
Slovenia	1	688	0	0	5,902	0
South Africa	2	1,830	0	0	12,939	0
Spain	8	7,567	0	0	55,121	2[P]
Sweden	10	9,331	0	0	58,098	3[P]
Switzerland	5	3,263	0	0	25,694	1[P]

APPENDIX S
Nuclear Power Units by Nation (continued)

Country	In Operation: Number of Units	In Operation: Capacity Net MWe	Under Construction or on Order: Number of Units	Under Construction or on Order: Capacity Net MWe	Nuclear Power Production GWh*	Shutdown
Ukraine	15	13,107	2	1,900	84,894	4[P]
United Kingdom	17	9,736	0	0	62,658	28[P]
United States	104	101,465	1	1,165	790,439	28[P]
Total	**436**	**370,499**	**62**	**59,245**	**2,517,980**	**139[P] & 5[L]**

* Annual electrical power production for 2011

P = Permanent Shutdown
L = Long-Term Shutdown

Note: Operable, under construction, or on order; country's short-form name used; rounded to the nearest whole number.

Sources: IAEA Power Reactor Information System Database; analysis compiled by the NRC, June 8, 2012

APPENDIX T
Nuclear Power Units by Reactor Type, Worldwide

Reactor Type	In Operation: Number of Units	In Operation: Net MWe
Pressurized light-water reactors (PWR)	272	250,289
Boiling light-water reactors (BWR)	84	77,726
Heavy-water reactors, all types (HWR)	47	23,140
Graphite-moderated light-water reactors (LWGR)	15	10,219
Gas-cooled reactors, all types (GCR)	16	8,545
Liquid-metal-cooled fast-breeder reactors (FBR)	2	580
Total	**436**	**370,499**

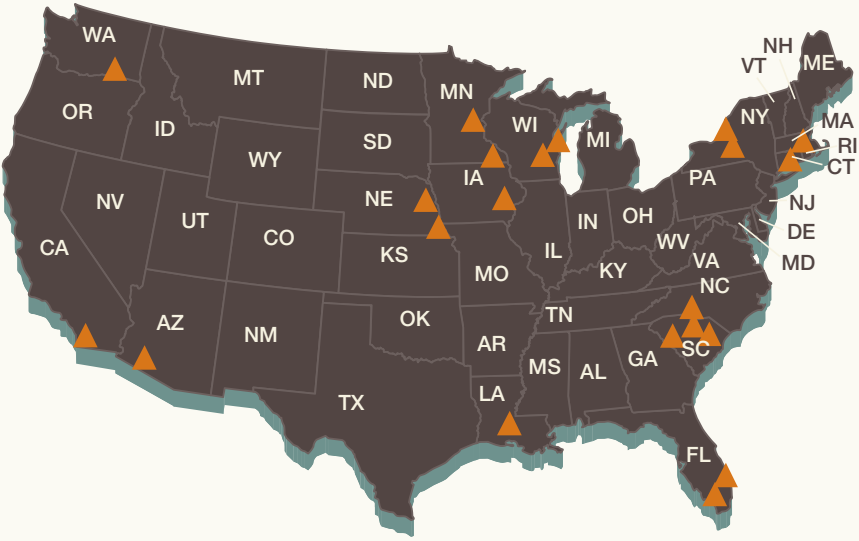
Note: MWe values rounded to the nearest whole number.

Source: IAEA Power Reactor Information System Database, www.iaea.org

Compiled by the NRC from data available as of June 8, 2012.

APPENDIX U

Native American Reservations and Trust Land within a 50-Mile Radius of a Nuclear Power Plant



ARIZONA
- **Palo Verde**
- Ak-Chin Indian Community
- Tohono O'odham Trust Land
- Gila River Reservation
- Maricopa Reserve

CALIFORNIA
- **San Onofre**
- Pechanga Reservation of Luiseño Indians
- Pala Reservation
- Pauma & Yuima Reserve
- Rincon Reservation
- San Pasqual Reservation
- La Jolla Reservation
- Cahuilla Reservation
- Soboba Reservation
- Santa Ysabel
- Mesa Grande Reservation
- Barona Reservation

CONNECTICUT
- **Millstone**
- Mohegan Reservation
- Mashantucket Pequot Reservation
- Narragansett Reservation

FLORIDA
- **St. Lucie**
- Brighton Reservation (Seminole Tribes of Florida)
- Fort Pierce Reservation

- **Turkey Point**
- Miccosukee Reservation
- Hollywood Reservation (Seminole Tribes of Florida)

IOWA
- **Duane Arnold**
- Sac & Fox Trust Land
- Sac & Fox Reserve

LOUISIANA
- **River Bend**
- Tunica-Biloxi Reservation

MASSACHUSETTS
- **Pilgrim**
- Wampanoag Tribe of Grey Head (Aquinnah) Trust Land

MINNESOTA
- **Monticello**
- Shakopee Community
- Shakopee Trust Land
- Mille Lacs Reservation

- **Prairie Island**
- Prairie Island Community
- Prairie Island Trust Land
- Shakopee Community
- Shakopee Trust Land

NEBRASKA
- **Cooper**
- Sac & Fox Trust Land
- Sac & Fox Reservation
- Kickapoo

- **Fort Calhoun**
- Winnebago Trust Land
- Omaha Reservation
- Winnebago Reservation

NEW YORK
- **FitzPatrick**
- Onondaga Reservation
- Oneida Reservation

- **Nine Mile Point**
- Onondaga Reservation
- Oneida Reservation

NORTH CAROLINA
- **McGuire**
- Catawba Reservation

SOUTH CAROLINA
- **Catawba**
- Catawba Reservation

- **Oconee**
- Eastern Cherokee Reservation

- **Summer**
- Catawba Reservation

WASHINGTON
- **Columbia**
- Yakama Reservation
- Yakama Trust

WISCONSIN
- **Kewaunee**
- Oneida Trust Land
- Oneida Reservation

- **Point Beach**
- Oneida Trust Land
- Oneida Reservation

Note: This table uses NRC-abbreviated reactor names and Native American Reservation and Trust land names.

APPENDIX V
Regulatory Research Cooperative Agreements and Grants

Electric Power Research Institute	Research on central and eastern United States seismic hazards and irradiation-assisted stress-corrosion cracking
Pennsylvania State University	Assistance with cladding hydride reorientation and fracture behavior; TRACE development
International Commission on Radiological Protection	Research on radiological protection standards
Oregon State University	Research on high-temperature gas reactors
University of Maryland	Research on improved human reliability analysis methods and the cause-defense approach to common-cause failure modeling
University of California-Berkeley	Work on ground motion prediction models for central and eastern North America and postliquefaction residual strength
University of South Carolina	Research on aging electric cables and gas accumulation detection in nuclear power plants
University of Wisconsin	Research on advanced gas-cooled reactors
Texas A&M	Research on bypass flow in prismatic reactor blocks
American Nuclear Society	Support for the development and maintenance of probabilistic risk assessment (PRA)-related standards
ASME Standards Technology, LLC	Support in the following areas: Committee on Nuclear Risk Management on PRA standards, nuclear risk management, code comparison for the Multinational Design Evaluation Program, and a nondestructive examination certification program
National Academy of Sciences	Perform a study on the cancer risk for populations surrounding nuclear power plant facilities and research to develop a consensus on the assessment of soil liquefaction potential and the related infrastructure consequences
University of Tennessee	Research on seismic hazards and associated ground motion for the East Tennessee Seismic Zone
Massachusetts Institute of Technology	Research on encorporating a systems-based hazards analysis technique to support the review of digital safety systems
University of Toronto, Ontario	Research to develop a tool to confirm safety margins for modular steel-concrete composite constructions under seismic loads

APPENDIX W

Significant Enforcement Actions Issued, 2011

Issued Significant Enforcement Actions, referred to as "escalated," include notices of violation for severity level (NOVSL) I, II, or III violations; notices of violation (NOV) associated with inspection findings (NOVF) that the significance determination process (SDP) categorizes as white, yellow, or red; civil penalties (CVP); and Commission orders (CO). Escalated enforcement actions are issued to reactor, materials, and individual licensees; nonlicensees; and fuel cycle facility licensees.

Action #	Name	Type	Issue Date	Enforcement Action
EA-10-257	Carolina Power and Light Company (H. B. Robinson)	Reactor	1/31/11	NOV white SDP finding result of plant inspections
EA-10-077	Superior Well Services, Inc.	Materials	2/8/11	CO result of an alternative dispute resolution mediation - $17,000
EA-10-272	Carro & Carro Enterprises, Inc.	Nonlicensee	2/11/11	NOV SLIII
EA-11-008	Bristol Hospital, Inc.	Materials	2/17/11	NOV SLIII
EA-10-100	Mattingly Testing Services, Inc.	Materials	2/22/11	Atomic Safety and Licensing Board - Order
IA-09-035	Dr. Gary Kao	Individual	2/23/11	CO
IA-09-010	Gregory Desobry	Individual	2/23/11	CO
EA-10-153	Westinghouse Electric Company (Commercial Nuclear Fuels Division)	Fuel Cycle Facility	2/25/11	NOV SLIII
EA-11-010	Oakwood Hospital - Annapolis Center	Materials	3/4/11	NOV SLIII
EA-11-014	Exelon Generation Company, LLC (Byron)	Reactor	3/14/11	NOV white SDP finding result of plant inspections
IA-11-012	Roger A. Shaffer	Individual	3/18/11	NOV SLIII
EA-11-027	West Virginia University Hospitals, Inc.	Materials	3/25/11	NOV SLIII
EA-11-016	Community Hospitals of Indiana	Materials	4/20/11	NOV SLIII
EA-11-018	Tennessee Valley Authority (Browns Ferry)	Reactor	5/9/11	NOV red SDP finding result of plant inspections
EA-11-009	Del Valle Group	Materials	5/11/11	NOV SLIII
EA-11-037	Providence Hospital	Materials	5/17/11	NOV SLIII
EA-10-231	Alaska Industrial X-Ray, Inc.	Materials	6/7/11	CO result of an alternative dispute resolution mediation - $1,000
EA-11-094	Mercy Hospital	Materials	6/8/11	NOV SLIII
EA-11-100	Owensby and Kritikos, Inc.	Materials	6/8/11	NOV SLIII
EA-11-024	Nebraska Public Power District (Cooper)	Reactor	6/10/11	NOV white SDP finding result of plant inspections
EA-11-088	Henry Ford Macomb Hospital	Materials	6/24/11	NOV SLIII
EA-11-115	Charleston Radiation Therapy Consultants, PLLC	Materials	6/30/11	NOV SLIII
EA-11-022	Luzenac America, Inc.	Materials	7/7/11	NOV SLIII CVP-$8,500
EA-10-258	Bozeman Deaconess Hospital	Materials	7/8/11	CO result of an alternative dispute resolution mediation - $3,500
EA-11-025	Omaha Public Power District (Fort Calhoun)	Reactor	7/18/11	NOV white SDP finding result of plant inspections
EA-11-109	Liberty Hospital	Materials	7/22/11	NOV SLIII

APPENDIX W

Significant Enforcement Actions Issued, 2011 (continued)

EA-10-129	U. S. Department of the Army	Materials	8/1/11	NOV SLIII
EA-11-083	Southern California Edison Co. (San Onofre)	Reactor	8/4/11	NOV SLIII
EA-11-047	Dominion Nuclear Connecticut, Inc. (Millstone)	Reactor	8/8/11	NOV white SDP finding result of plant inspections
EA-11-056	U. S. Enrichment Corporation - Paducah Facility	Fuel Cycle Facility	8/17/11	CO result of an alternative dispute resolution mediation
EA-11-110	Northern States Power Company (Prairie Island)	Reactor	8/17/11	NOV white SDP finding result of plant inspections
EA-10-161	Professional Service Industries, Inc.	Materials	8/18/11	CO result of an alternative dispute resolution mediation - $15,000
EA-11-096	Entergy Operations, Inc. (River Bend)	Reactor	8/24/11	CO result of an alternative dispute resolution mediation
EA-11-148	First Energy Nuclear Operating Company (Perry)	Reactor	8/25/11	NOV white SDP finding result of plant inspections
EA-11-145	Carmeuse Lime, Inc.	Materials	9/2/11	NOV SLIII
EA-11-163	William Beaumont Hospital	Materials	9/2/11	NOV SLIII
EA-11-165	Crittenton Hospital	Materials	9/2/11	NOV SLIII
EA-11-179	Associated Specialists, Inc.	Materials	9/21/11	NOV SLIII
IA-11-056	Craig M. Rice	Individual	9/21/11	NOV SLIII
EA-11-061	Escanaba Paper Company	Materials	10/17/11	NOV SLIII
EA-11-209	Warner Brothers, LLC	Materials	11/8/11	NOV SLIII
EA-11-146	Cardinal Health PET Manufacturing Services, Inc.	Materials	11/9/11	NOV SLIII
IA-11-037	Christopher A. Moore	Individual	11/9/11	NOV SLIII
EA-11-095	Global Nuclear Fuel - America	Fuel Cycle Facility	11/14/11	NOV SLIII CVP-$17,500
EA-11-174	Entergy Nuclear Operations (Pilgrim)	Reactor	11/21/11	NOV white SDP finding result of plant inspections
EA-11-226	Duke Energy Carolinas (Oconee)	Reactor	12/6/11	NOV yellow SDP finding result of plant inspections
EA-11-221	Exelon Generation Company (Limerick)	Reactor	12/8/11	NOV white SDP finding result of plant inspections
EA-11-043	Accurate NDE and Inspection, LC	Materials	12/19/11	CO result of an alternative dispute resolution mediation - $13,500
EA-11-086	International Cyclotron, Inc.	Materials	12/19/11	NOV SLIII CVP-$7,000 and CO suspending license
EA-11-208	Progress Energy (Crystal River)	Reactor	12/20/11	NOV white SDP finding result of plant inspections
EA-11-251	Carolina Power and Light Company (Brunswick)	Reactor	12/27/11	NOV white SDP finding result of plant inspections

Note: Reactor facilities in a decommissioning status are listed as materials licensees. The NRC report on Issued Significant Enforcement Actions can be found on the NRC Web site at www.nrc.gov/about-nrc/regulatory/enforcement/current.html.

APPENDIX X
Quick-Reference Metric Conversion Tables

SPACE AND TIME

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

NUCLEAR REACTION AND IONIZING RADIATION

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

APPENDIX X
Quick-Reference Metric Conversion Tables (continued)

HEAT

Quantity	From Inch-Pound Units	To Metric Units	Multiply by
Thermodynamic temperature	°F	K	*K = (°F + 59.67)/1.8
Celsius temperature	°F	°C	*°C = (°F–32)/1.8
Linear expansion coefficient	1/°F	1/K or 1/°C	*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) lb (avdp)	t (metric ton) kg	*0.907 184 74 *0.453 592 37
Moment of mass	lb • ft	kg • m	0.138 255
Density	ton (short)/yd³ lb/ft³	t/m³ g/m³	1.186 553 16.018 46
Concentration (mass)	lb/gal	g/L	119.826 4
Momentum	lb • ft/s	kg • m/s	0.138 255
Angular momentum	lb • ft²/s	kg • m²/s	0.042 140 11
Moment of inertia	lb • ft²	kg • m²	0.042 140 11
Force	kip (kilopound) lbf	kN (kilonewton) N (newton)	4.448 222 4.448 222
Moment of force, torque	lbf • ft	N • m	1.355 818
	lbf • in	N • m	0.122 984 8
Pressure	atm (std) bar lbf/in² (formerly psi) inHg (32 °F) ftH$_2$O (39.2 °F) inH$_2$O (60 °F) mmHg (0 °C)	kPa (kilopascal) kPa kPa kPa kPa kPa kPa	*101.325 *100.0 6.894 757 3.386 38 2.988 98 0.248 84 0.133 322

APPENDIX X
Quick-Reference Metric Conversion Tables (continued)

MECHANICS (continued)

Quantity	From Inch-Pound Units	To Metric Units	Multiply by
Stress	kip/in^2 (formerly ksi)	MPa	6.894 757
	lbf/in^2 (formerly psi)	MPa	0.006 894 757
	lbf/in^2 (formerly psi)	kPa	6.894 757
	lbf/ft^2	kPa	0.047 880 26
Energy, work	kWh	MJ	*3.6
	calth	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

Note: The information contained in this table is intended to provide familiarization 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 the development of licensing actions, regulations, or policy.

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

* Exact conversion factors

Source: Federal Standard 376B (January 27, 1993), "Preferred Metric Units for General Use by the Federal Government," and International Commission on Radiation Units and Measurements, ICRU Report 33 (1980), "Radiation Quantities and Units"

Glossary (Abbreviations and Terms Defined)

Agreement State

A State that has signed an agreement with the U.S. Nuclear Regulatory Commission (NRC) authorizing the State to regulate certain uses of radioactive materials within the State.

Atomic energy

The energy that is released through a nuclear reaction or radioactive decay process. Of particular interest is the process known as fission, which occurs in a nuclear reactor and produces energy, usually in the form of heat. In a nuclear power plant, this heat is used to boil water to produce steam that can be used to drive large turbines. This, in turn, activates generators to produce electrical power. Atomic energy is more correctly called nuclear energy.

Background radiation

The natural radiation that is always present in the environment. It includes cosmic radiation that comes from the sun and stars, terrestrial radiation that comes from the Earth, and internal radiation that exists in all living things. The typical average individual exposure in the United States from natural background sources is about 300 millirems per year.

Boiling-water reactor (BWR)

A common nuclear power reactor design in which water flows upward through the core, where it is heated by fission and allowed to boil in the reactor vessel. The resulting steam then drives turbines, which activate generators to produce electrical power. BWRs operate similarly to electrical plants using fossil fuel, except that the BWRs are powered by 370–800 nuclear fuel assemblies in the reactor core.

Brachytherapy

A nuclear medicine procedure during which a sealed radioactive source is implanted directly into a person being treated for cancer (usually of the mouth, breast, lung, prostate, ovaries, or uterus). The radioactive implant may be temporary or permanent, and the radiation attacks the tumor as long as the device remains in place. Brachytherapy uses radioisotopes, such as iridium-192 or iodine-125, which are regulated by the NRC and its Agreement States.

Byproduct material

As defined by NRC regulations, byproduct material includes any radioactive material (except enriched uranium or plutonium) produced by a nuclear reactor. It also includes the tailings or wastes produced by the extraction or concentration of uranium or thorium or the fabrication of fuel for nuclear reactors. Additionally, it is any material that has been made radioactive through the use of a particle accelerator or any discrete source of radium-226 used for a commercial, medical, or research activity. In addition, the NRC, in consultation with the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), U.S. Department of Homeland Security (DHS), and others, can designate as byproduct material any source of naturally occurring radioactive material, other than source material, that it determines would pose a threat to public health and safety or the common defense and security of the United States.

Canister

See *Dry cask storage*.

Capability

The maximum load that a generating unit, generating station, or other electrical apparatus can carry under specified conditions for a given period of time without exceeding approved limits of temperature and stress.

Capacity

The amount of electric power that a generating unit can produce. The amount of electric power that a generator, turbine transformer, transmission, circuit, or system is able to produce, as rated by the manufacturer.

Capacity charge

One of two elements in a two-part pricing method used in capacity transactions (the other element is the energy charge). The capacity charge, sometimes called the demand charge, is assessed on the capacity (amount of electric power) being purchased.

Capacity factor

The ratio of the available capacity (the amount of electrical power actually produced by a generating unit) to the theoretical capacity (the amount of electrical power that could theoretically have been produced if the generating unit had operated continuously at full power) during a given time period.

Capacity utilization

A percentage representing the extent to which a generating unit fulfilled its capacity in generating electric power over a given time period. This percentage is defined as the margin between the unit's available capacity (the amount of electrical power the unit actually produced) and its theoretical capacity (the amount of electrical power that could have been produced if the unit had operated continuously at full power) during a certain time period. Capacity utilization is computed by dividing the amount actually produced by the theoretical capacity and multiplying by 100.

Cask

A heavily shielded container used for the dry storage or shipment (or both) of radioactive materials such as spent nuclear fuel or other high-level radioactive waste (HLW). Casks are often made from lead, concrete, or steel. Casks must meet regulatory requirements and are not intended for long-term disposal in a repository.

Classified information

Information that could be used by an adversary to harm the United States or its allies and thus must be protected. The NRC has two types of classified information. The first type, known as national security information, is information that is classified by an Executive order. Its release would damage national security to some degree. The second type, known as restricted data, is information that is classified by the Atomic Energy Act of 1954, as amended. It would assist individuals or organizations in designing, manufacturing, or using nuclear weapons. Access to both types of information is restricted to authorized persons who have been properly cleared and have a "need to know" the information for their official duties.

Combined license (COL)

An NRC-issued license that authorizes a licensee to construct and (with certain specified conditions) operate a nuclear power plant at a specific site, in accordance with established laws and regulations. A COL is valid for 40 years (with the possibility of a 20-year renewal).

Commercial sector (energy users)

Generally, nonmanufacturing business establishments, including hotels, motels, and restaurants; wholesalers and retail stores; and health, social, and educational institutions. However, utilities may categorize commercial service as all consumers whose demand or annual usage exceeds some specified limit that is categorized as residential service.

Compact

A group of two or more States that have formed business alliances to dispose of low-level radioactive waste (LLW) on a regional basis.

Construction recapture

The maximum number of years that could be added to a facility's license expiration date to recapture the period between the date the NRC issued the facility's construction permit and the date it granted an operating license. A licensee must submit an application to request this extension.

Containment structure

A gas-tight shell or other enclosure around a nuclear reactor to confine fission products that otherwise might be released to the atmosphere in the event of an accident. Such enclosures are usually dome-shaped and made of steel-reinforced concrete.

Contamination

Undesirable radiological, chemical, or biological material (with a potentially harmful effect) that is either airborne or deposited in (or on the surface of) structures, objects, soil, water, or living organisms in a concentration that makes the medium unfit for its next intended use.

Criticality

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

Decommissioning

The process of safely closing a nuclear power plant (or other facility where nuclear materials are handled) to retire it from service after its useful life has ended. This process primarily involves decontaminating the facility to reduce residual radioactivity and then releasing the property for unrestricted or (under certain conditions) restricted use. This often includes dismantling the facility or dedicating it to other purposes. Decommissioning begins after the nuclear fuel, coolant, and radioactive waste are removed.

DECON

A method of decommissioning, in which structures, systems, and components that contain radioactive contamination are removed from a site and safely disposed of at a commercially operated LLW disposal facility or decontaminated to a level that permits the site to be released for unrestricted use shortly after it ceases operation.

Decontamination

A process used to reduce, remove, or neutralize radiological, chemical, or biological contamination to reduce the risk of exposure. Decontamination may be accomplished by cleaning or treating surfaces to reduce or remove the contamination; filtering contaminated air or water; subjecting contamination to evaporation and precipitation; or covering the contamination to shield or absorb the radiation. The process can also simply allow adequate time for natural radioactive decay to decrease the radioactivity.

Defense in depth

An approach to designing and operating nuclear facilities that prevents and mitigates accidents that release radiation or hazardous materials. The key is creating multiple independent and redundant layers of defense to compensate for potential human and mechanical failures so that no single layer, no matter how robust, is exclusively relied upon. Defense in depth includes the use of access controls, physical barriers, redundant and diverse key safety functions, and emergency response measures.

Depleted uranium

Uranium with a percentage of uranium-235 lower than the 0.7 percent (by mass) contained in natural uranium. (The normal residual uranium-235 content in depleted uranium is 0.2–0.3 percent, with uranium-238 comprising the remaining 98.7–98.8 percent.) Depleted uranium is the byproduct of the uranium enrichment process. Depleted uranium can be blended with highly enriched uranium, such as that from weapons, to make reactor fuel.

Design-basis threat (DBT)

A profile of the type, composition, and capabilities of an adversary. The NRC uses the DBT as a basis for designing safeguards systems to protect against acts of radiological sabotage and to prevent the theft of special nuclear material. Nuclear facility licensees are expected to demonstrate they can defend against the DBT.

Design certification

Certification and approval by the NRC of a standard nuclear power plant design independent of a specific site or an application to construct or operate a plant. A design certification is valid for 15 years from the date of issuance but can be renewed for an additional 10 to 15 years.

Dry cask storage

A method for storing spent nuclear fuel above ground in special containers known as casks. After fuel has been cooled in a spent fuel pool for at least 1 year, dry cask storage allows approximately one to six dozen spent fuel assemblies to be sealed in casks and surrounded by inert gas. The casks are large, rugged cylinders made of steel or steel-reinforced concrete (18 or more inches thick or 45.72 or more centimeters). They are welded or bolted closed, and each cask is surrounded by steel, concrete, lead, or other material to provide leak-tight containment and radiation shielding. The casks may be placed horizontally in aboveground concrete bunkers or vertically in concrete vaults or on concrete pads.

Early site permit (ESP)

A permit through which the NRC resolves site safety, environmental protection, and emergency preparedness (EP) issues to approve one or more proposed sites for a nuclear power facility, independent of a specific nuclear plant design or an application for a construction permit or COL. An ESP is valid for 10 to 20 years but can be renewed for an additional 10 to 20 years.

Economic Simplified Boiling-Water Reactor (ESBWR)

A 4,500-megawatts thermal nuclear reactor design, which has passive safety features and uses natural circulation (with no recirculation pumps or associated piping) for normal operation. GE-Hitachi Nuclear Energy (GEH) submitted an application for final design approval and standard design certification for the ESBWR on August 24, 2005.

Efficiency, plant

The percentage of the total energy content of a power plant's fuel that is converted into electricity. The remaining energy is lost to the environment as heat.

Electric power grid

A system of synchronized power providers and consumers, connected by transmission and distribution lines and operated by one or more control centers. In the continental United States, the electric power grid consists of three systems—the Eastern Interconnect, the Western Interconnect, and the Texas Interconnect. In Alaska and Hawaii, several systems encompass areas smaller than the State.

Electric utility

A corporation, agency, authority, person, or other legal entity that owns or operates facilities within the United States, its territories, or Puerto Rico for the generation, transmission, distribution, or sale of electric power (primarily for use by the public). Facilities that qualify as cogenerators or small power producers under the Public Utility Regulatory Policies Act are not considered electric utilities.

Emergency classifications

Sets of plant conditions that indicate various levels of risk to the public and that might require response by an offsite emergency response organization to protect citizens near the site.

Emergency preparedness

The programs, plans, training, exercises, and resources necessary to prepare emergency personnel to rapidly identify, evaluate, and react to emergencies, including those arising from terrorism or natural events such as hurricanes. EP strives to ensure that operators of nuclear power plant and certain fuel cycle facilities can implement measures to protect public health and safety in the event of a radiological emergency. Plant operators, as a condition of their licenses, must develop and maintain EP plans that meet NRC requirements.

Energy Information Administration (EIA)

The agency, within the U.S. Department of Energy, that provides policy-neutral statistical data, forecasts, and analyses to promote sound policymaking, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment.

Enrichment

See “Uranium enrichment”.

ENTOMB

A method of decommissioning, in which radioactive contaminants are encased in a structurally long-lived material, such as concrete. The entombed structure is maintained and surveillance is continued until the radioactive waste decays to a level permitting termination of the license and unrestricted release of the property. During the entombment period, the licensee maintains the license previously issued by the NRC.

Event Notification System

An automated event tracking system used internally by the NRC’s Headquarters Operations Center to track incoming notifications of significant nuclear events with an actual or potential effect on the health and safety of the public and the environment. Significant events are reported to the Operations Center by the NRC’s licensees, Agreement States, other Federal agencies, the public, and other stakeholders.

Exposure

Absorption of ionizing radiation or ingestion of a radioisotope. Acute exposure is a large exposure received over a short period of time. Chronic exposure is exposure received over a long period of time, such as during a lifetime. The National Council on Radiation Protection and Measurements estimates that an average person in the United States receives a total annual dose of about 0.62 rem (620 millirem) from all radiation source, a level that has not been shown to cause humans any harm. Of this total, natural background sources of radiation—including radon and thoron gas, natural radiation from soil and rocks, radiation from space, and radiation sources that are found naturally within the human body—account for approximately 50 percent. Medical procedures such as computed tomography (CT scans) and nuclear medicine account for approximately another 48 percent. Other small contributors of exposure to the U.S. population include consumer products and activities, industrial and research uses, and occupational tasks. The maximum permissible yearly dose for a person working with or around nuclear material is 5 rem.

Federal Emergency Management Agency (FEMA)

A component of DHS responsible for protecting the nation and reducing the loss of life and property from all hazards, such as natural disasters and acts of terrorism. FEMA leads and supports a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. FEMA also administers the National Flood Insurance Program.

Federal Energy Regulatory Commission (FERC)

An independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also regulates and oversees hydropower projects and the construction of liquefied natural gas terminals and interstate natural gas pipelines. FERC protects the economic, environmental, and safety interests of the American public, while working to ensure abundant, reliable energy in a fair, competitive market.

Fiscal year (FY)

The 12-month period from October 1 through September 30 used by the Federal Government for budget formulation and execution. The FY is designated by the calendar year in which it ends; for example, FY 2009 runs from October 1, 2008, through September 30, 2009.

Fissile material

A nuclide that is capable of undergoing fission after capturing low-energy thermal (slow) neutrons. Although sometimes used as a synonym for fissionable material, this term has acquired its more restrictive interpretation with the limitation that the nuclide must be fissionable by thermal neutrons. With that interpretation, the three primary fissile materials are uranium-233, uranium-235, and plutonium-239. This definition excludes natural uranium and depleted uranium that have not been irradiated or have only been irradiated in thermal reactors.

Fission (fissioning)

The splitting of an atom, which releases a considerable amount of energy (usually in the form of heat) that can be used to produce electricity. Fission may be spontaneous but is usually caused by the nucleus of an atom becoming unstable (or "heavy") after capturing or absorbing a neutron. During fission, the heavy nucleus splits into roughly equal parts, producing the nuclei of at least two lighter elements. In addition to energy, this reaction usually releases gamma radiation and two or more daughter neutrons.

Force on force

Inspections designed to evaluate and improve the effectiveness of a licensee's security force and ability to defend a nuclear power plant and other nuclear facilities against a DBT. An essential part of the security program instituted by the NRC, a full force-on-force inspection spans 2 weeks and includes tabletop drills and multiple simulated combat exercises between a mock commando-type adversary and the plant's security force.

Foreign Assignee Program

An on-the-job training program, sponsored by the NRC for assignees from other countries, usually under bilateral information exchange arrangements with their respective regulatory organizations.

Freedom of Information Act (FOIA)

A Federal law that requires Federal agencies to provide, upon written request, access to records or information. Some material is exempt from FOIA, and FOIA does not apply to records that are maintained by State and local governments, Federal contractors, grantees, or private organizations or businesses.

Fuel assembly (fuel bundle, fuel element)

A structured group of fuel rods (long, slender, metal tubes containing pellets of fissionable material, which provide fuel for nuclear reactors). Depending on the design, each reactor vessel may have dozens of fuel assemblies (also known as fuel bundles), each of which may contain 200 or more fuel rods.

Fuel cycle

The series of steps involved in supplying fuel for nuclear power reactors includes the following:

- uranium recovery to extract (or mine) uranium ore and concentrate (or mill) the ore to produce yellowcake
- conversion of yellowcake into uranium hexafluoride (UF_6)
- enrichment to increase the concentration of uranium-235 in UF_6
- fuel fabrication to convert enriched UF_6 into fuel for nuclear reactors
- use of the fuel in reactors (nuclear power, research, or naval propulsion)
- interim storage of spent nuclear fuel
- reprocessing of HLW to recover the fissionable material remaining in the spent fuel (currently not done in the United States)
- final disposition (disposal) of HLW

The NRC regulates these processes, as well as the fabrication of mixed oxide (MOX) nuclear fuel, which is a combination of uranium and plutonium oxides.

Fuel reprocessing (recycling)

The processing of reactor fuel to separate the unused fissionable material from waste material. Reprocessing extracts isotopes from spent nuclear fuel so they can be used again as reactor fuel. Commercial reprocessing is not practiced in the United States, although it has been practiced in the past. However, the U.S. Department of Defense oversees reprocessing programs at DOE facilities such as in Hanford, WA, and Savannah River, SC. These wastes, as well as those wastes at a formerly operating commercial reprocessing facility at West Valley, NY, are not regulated by the NRC.

Fuel rod

A long, slender, zirconium metal tube containing pellets of fissionable material, which provide fuel for nuclear reactors. Fuel rods are assembled into bundles called fuel assemblies, which are loaded individually into the reactor core.

Full-time equivalent (FTE)

A human resources measurement equal to one staff person working full time for 1 year.

Gas centrifuge

A uranium enrichment process used to prepare uranium for use in fabricating fuel for nuclear reactors by separating its isotopes (as gases) based on their slight difference in mass. This process uses a large number of interconnected centrifuge machines (rapidly spinning cylinders). URENCO operates a gas centrifuge enrichment facility in New Mexico, and USEC and AREVA have received licenses to construct and operate facilities in Ohio and Idaho, respectively.

Gas chromatography

A way of separating chemical substances from a mixed sample by passing the sample, carried by a moving stream of gas, through a tube packed with a finely divided solid that may be coated with a liquid film. Gas chromatography devices are used to analyze air pollutants, blood alcohol content, essential oils, and food products.

Gaseous diffusion

A uranium enrichment process used to prepare uranium for use in fabricating fuel for nuclear reactors by separating its isotopes (as gases) based on their slight difference in velocity. (Lighter isotopes diffuse faster through a porous membrane or vessel than do heavier isotopes.) This process involves filtering UF_6 gas to separate uranium-234 and uranium-235 from uranium-238, increasing the percentage of uranium-235 from 1 to 3 percent. The only gaseous diffusion plant in operation in the United States is in Paducah, KY, and it enriches to 5 percent. A similar plant near Piketon, OH, was closed in March 2001. Both plants are leased by USEC from DOE and have been regulated by the NRC since March 4, 1997.

Gauging devices

Devices used to measure, monitor, and control the thickness of sheet metal, textiles, paper napkins, newspaper, plastics, photographic film, and other products as they are manufactured. Gauges mounted in fixed locations are designed for measuring or controlling material density, flow, level, thickness, or weight. The gauges contain sealed sources that radiate through the substance being measured to a readout or controlling device. Portable gauging devices, such as moisture density gauges, are used at field locations. These gauges contain a gamma-emitting sealed source, usually cesium-137, or a sealed neutron source, usually americium-241 or beryllium.

Generation (gross)

The total amount of electric energy produced by a generating station, as measured at the generator terminals.

Generation (net)

The gross amount of electric energy produced by a generating station, minus the amount used to operate the station. Net generation is usually measured in watthours.

Generator capacity

The maximum amount of electric energy that a generator can produce (from the mechanical energy of the turbine), adjusted for ambient conditions. Generator capacity is commonly expressed in megawatts (MW).

Generator nameplate capacity

The maximum amount of electric energy that a generator can produce under specific conditions, as rated by the manufacturer. Generator nameplate capacity is usually expressed in kilovolt-amperes and kilowatts (kW), as indicated on a nameplate that is physically attached to the generator.

Geological repository

An excavated, underground facility that is designed, constructed, and operated for safe and secure permanent disposal of HLW. A geological repository uses an engineered barrier system and a portion of the site's natural geology, hydrology, and geochemical systems to isolate the radioactivity of the waste. The Nuclear Waste Policy Act of 1982, as amended, specified that this waste would be disposed of in a deep geologic repository, and that Yucca Mountain, NV, would be the single candidate site for such a repository. On June 3, 2008, DOE submitted a license application to the NRC seeking authorization to construct the Yucca Mountain repository. On January 29, 2010, the President created the Blue Ribbon Commission on America's Nuclear Future to reassess the national policy on HLW disposal.

Gigawatt (GW)

A unit of power equivalent to one billion (1,000,000,000) watts.

Gigawatthour (GWh)

One billion (1,000,000,000) watthours.

Grid

See *Electric power grid*.

Half-life (radiological)

The time required for half the atoms of a particular radioisotope to decay into another isotope that has half the activity of the original radioisotope. A specific half-life is a characteristic property of each radioisotope. Measured half-lives range from millionths of a second to billions of years, depending on the stability of the nucleus. Radiological half-life is related to, but different from, the biological half-life and the effective half-life.

Health physics

The science concerned with recognizing and evaluating the effects of ionizing radiation on the health and safety of people and the environment, monitoring radiation exposure, and controlling the associated health risks and environmental hazards to permit the safe use of technologies that produce ionizing radiation.

High-level radioactive waste (HLW)

The highly radioactive materials produced as byproducts of fuel reprocessing or of the reactions that occur inside nuclear reactors. HLW includes the following:

- irradiated spent nuclear fuel discharged from commercial nuclear power reactors
- the highly radioactive liquid and solid materials resulting from the reprocessing of spent nuclear fuel, which contain fission products in concentration (this includes some reprocessed HLW from defense activities and a small quantity of reprocessed commercial HLW)
- other highly radioactive materials that the Commission may determine require permanent isolation

Highly (or High-) enriched uranium

Uranium enriched to at least 20 percent uranium-235 (a higher concentration than exists in natural uranium ore).

In situ recovery (ISR)

One of the two primary recovery methods that are currently used to extract uranium from ore bodies where they are normally found underground (in other words, in situ), without physical excavation. ISR is also known as “solution mining” or in situ leaching.

Incident response

Activities that address the short-term, direct effects of a natural or human-caused event and require an emergency response to protect life or property.

Independent spent fuel storage installation (ISFSI)

A complex designed and constructed for the interim storage of spent nuclear fuel; solid, reactor-related, greater than Class C waste; and other associated radioactive materials. A spent fuel storage facility may be considered independent, even if it is located on the site of another NRC-licensed facility.

International Atomic Energy Agency (IAEA)

The IAEA is the world's center of cooperation in the nuclear field. It was set up in 1957 as the world's "Atoms for Peace" organization within the United Nations family. The agency works with its 154 member States and multiple partners worldwide to promote safe, secure, and peaceful nuclear technology.

International Nuclear Regulators Association

An association established in January 1997 to give international nuclear regulators a forum to discuss nuclear safety. Countries represented include Canada, France, Japan, the Republic of South Korea, Spain, Sweden, the United Kingdom, and the United States.

Irradiation

Exposure to ionizing radiation. Irradiation may be intentional, such as in cancer treatments or in sterilizing medical instruments. Irradiation may also be accidental, such as from exposure to an unshielded source. Irradiation does not usually result in radioactive contamination, but damage can occur, depending on the dose received.

Isotope

Two or more forms (or atomic configurations) of a given element that have identical atomic numbers (the same number of protons in their nuclei) and the same or very similar chemical properties but different atomic masses (different numbers of neutrons in their nuclei) and distinct physical properties. Thus, carbon-12, carbon-13, and carbon-14 are isotopes of the element carbon, and the numbers denote the approximate atomic masses. Among their distinct physical properties, some isotopes (known as radioisotopes) are radioactive, because their nuclei emit radiation as they strive toward a more stable nuclear configuration. For example, carbon-12 and carbon-13 are stable, but carbon-14 is unstable and radioactive.

Kilowatt (kW)

A unit of power equivalent to one thousand (1,000) watts.

Licensed material

Source material, byproduct material, or special nuclear material that is received, possessed, used, transferred, or disposed of under a general or specific license issued by the NRC or Agreement States.

Licensee

A company, organization, institution, or other entity to which the NRC has granted a general or specific license to construct or operate a nuclear facility, or to receive, possess, use, transfer, or dispose of source, byproduct, or special nuclear material.

Licensing basis

The collection of documents or technical criteria that provides the basis upon which the NRC issues a license to construct or operate a nuclear facility; to conduct operations involving the emission of radiation; or to receive, possess, use, transfer, or dispose of source, byproduct, or special nuclear material.

Light-water reactor

A term used to describe reactors using ordinary water as a coolant, including BWRs and pressurized-water reactors (PWRs), the most common types used in the United States.

Low-level radioactive waste (LLW)

A general term for a wide range of items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. A variety of industries, hospitals and medical institutions, educational and research institutions, private or government laboratories, and nuclear fuel cycle facilities generate LLW as part of their day-to-day use of radioactive materials. Some examples include radioactively contaminated protective shoe covers and clothing; cleaning rags, mops, filters, and reactor water treatment residues; equipment and tools; medical tubes, swabs, and hypodermic syringes; and carcasses and tissues from laboratory animals. The radioactivity in these wastes can range from just above natural background levels to much higher levels, such as seen in parts from inside the reactor vessel in a nuclear power plant. LLW is typically stored on site by licensees, either until it has decayed away and can be disposed of as ordinary trash, or until the accumulated amount becomes large enough to warrant shipment to an LLW disposal site.

Maximum dependable capacity (gross)

The maximum amount of electricity that the main generating unit of a nuclear power reactor can reliably produce during the summer or winter (usually summer, but whichever represents the most restrictive seasonal conditions, with the least electrical output). The dependable capacity varies during the year, because temperature variations in cooling water affect the unit's efficiency. Thus, this is the gross electrical output as measured (in watts unless otherwise noted) at the output terminals of the turbine generator.

Maximum dependable capacity (net)

The gross maximum dependable capacity of the main generating unit in a nuclear power reactor, minus the amount used to operate the station. Net maximum dependable capacity is measured in watts unless otherwise noted.

Megawatt (MW)

A unit of power equivalent to one million (1,000,000) watts.

Metric ton

Approximately 2,200 pounds.

Mill tailings

Primarily, the sandy process waste material from a conventional uranium recovery facility. This naturally radioactive ore residue contains the radioactive decay products from the uranium chains (mainly the uranium-238 chain) and heavy metals. Although the milling process recovers about 93 percent of the uranium, the residues (known as "tailings") contain several naturally occurring radioactive elements, including uranium, thorium, radium, polonium, and radon.

Mixed oxide (MOX) fuel

A type of nuclear reactor fuel (often called "MOX") that contains plutonium oxide mixed with either natural or depleted uranium oxide, in ceramic pellet form. (This differs from conventional nuclear fuel, which is made of pure uranium oxide.) Using plutonium reduces the amount of highly enriched uranium needed to produce a controlled reaction in commercial light-water reactors. However, plutonium exists only in trace amounts in nature and, therefore, must be produced by neutron irradiation of uranium-238 or obtained from other manufactured sources. As directed by Congress, the NRC regulates the fabrication of MOX fuel by DOE, a program that is intended to dispose of plutonium from international nuclear disarmament agreements.

Monitoring of radiation

Periodic or continuous determination of the amount of ionizing radiation or radioactive contamination in a region. Radiation monitoring is a safety measure to protect the health and safety of the public and the environment through the use of bioassay, alpha scans, and other radiological survey methods to monitor air, surface water and ground water, soil and sediment, equipment surfaces, and personnel.

National Response Framework

The guiding principles, roles, and structures that enable all domestic incident response partners to prepare for and provide a unified national response to disasters and emergencies. It describes how the Federal Government, States, Tribes, communities, and the private sector work together to coordinate a national response. The framework, which became effective March 22, 2008, builds upon the National Incident Management System, which provides a template for managing incidents.

National Source Tracking System (NSTS)

A secure, Web-based data system that helps the NRC and its Agreement States track and regulate the medical, industrial, and academic uses of certain nuclear materials, from the time they are manufactured or imported to the time of their disposal or exportation. This information enhances the ability of the NRC and Agreement States to conduct inspections and investigations, communicate information to other government agencies, and verify the ownership and use of nationally tracked sources.

Natural uranium

Uranium containing the relative concentrations of isotopes found in nature (0.7 percent uranium-235, 99.3 percent uranium-238, and a trace amount of uranium-234 by mass). In terms of radioactivity, however, natural uranium contains approximately 2.2 percent uranium-235, 48.6 percent uranium-238, and 49.2 percent uranium-234. Natural uranium can be used as fuel in nuclear reactors.

Net electric generation

The gross amount of electric energy produced by a generating station, minus the amount used to operate the station. Note: Electricity required for pumping at pumped-storage plants is regarded as electricity for station operation and is deducted from gross generation. Net electric generation is measured in watthours, except as otherwise noted.

Net summer capacity

The steady hourly output that generating equipment is expected to supply to system load, exclusive of auxiliary power, as demonstrated by measurements at the time of peak demand (summer). Net summer capacity is measured in watts unless otherwise noted.

Nonpower reactor (research and test reactor)

A nuclear reactor that is used for research, training, or development purposes (which may include producing radioisotopes for medical and industrial uses) but has no role in producing electrical power. These reactors, which are also known as research and test reactors, contribute to almost every field of science, including physics, chemistry, biology, medicine, geology, archeology, and ecology.

NRC Headquarters Operations Center

The primary center of communication and coordination among the NRC, its licensees, State and Tribal agencies, and other Federal agencies regarding operating events involving nuclear reactors or materials. Located in Rockville, MD, the Headquarters Operations Center is staffed 24 hours a day by employees trained to receive and evaluate event reports and coordinate incident response activities.

Nuclear energy

See *Atomic energy.*

Nuclear Energy Agency (NEA)

A specialized agency within the Organisation for Economic Co-operation and Development (OECD), which was created to assist its member countries in maintaining and further developing the scientific, technological, and legal bases for safe, environmentally friendly, and economical use of nuclear energy for peaceful purposes. The NEA's current membership consists of 30 countries in Europe, North America, and the Asia-Pacific region, which account for approximately 85 percent of the world's installed nuclear capacity.

Nuclear fuel

Fissionable material that has been enriched to a composition that will support a self-sustaining fission chain reaction when used to fuel a nuclear reactor, thereby producing energy (usually in the form of heat or useful radiation) for use in other processes.

Nuclear materials

See *Special nuclear material, Source material,* and *Byproduct material.*

Nuclear Material Management and Safeguards System (NMMSS)

A centralized U.S. Government database used to track and account for source and special nuclear material and used to ensure that it has not been stolen or diverted to unauthorized users. The system contains current and historical data on the possession, use, and shipment of source and special nuclear material within the United States, as well as all exports and imports of such material. The database is jointly funded by the NRC and DOE and is operated under a DOE contract.

Nuclear poison (or neutron poison)

In reactor physics, a substance (other than fissionable material) that has a large capacity for absorbing neutrons in the vicinity of the reactor core. This effect may be undesirable in some reactor applications because it may prevent or disrupt the fission chain reaction, thereby affecting normal operation. However, neutron-absorbing materials (commonly known as "poisons") are intentionally inserted into some types of reactors to decrease the reactivity of their initial fresh fuel load. (Adding poisons, such as control rods or boron, is described as adding "negative reactivity" to the reactor.)

Nuclear power plant

A thermal power plant, in which the energy (heat) released by the fissioning of nuclear fuel is used to boil water to produce steam. The steam spins the propeller-like blades of a turbine that turns the shaft of a generator to produce electricity. Of the various nuclear power plant designs, PWRs and BWRs are in commercial operation in the United States. These facilities generate about 20 percent of U.S. electrical power.

Nuclear and Radiological Incident Annex

An annex to the National Response Framework, which provides for a timely, coordinated response by Federal agencies to nuclear or radiological accidents or incidents within the United States. This annex covers radiological dispersal devices and improvised nuclear devices, as well as accidents involving commercial reactors or weapons production facilities, lost radioactive sources, transportation accidents involving radioactive material, and foreign accidents involving nuclear or radioactive material.

Nuclear reactor

The heart of a nuclear power plant or nonpower reactor, in which nuclear fission may be initiated and controlled in a self-sustaining chain reaction to generate energy or produce useful radiation. Although there are many types of nuclear reactors, they all incorporate certain essential features, including the use of fissionable material as fuel, a moderator (such as water) to increase the likelihood of fission (unless reactor operation relies on fast neutrons), a reflector to conserve escaping neutrons, coolant provisions for heat removal, instruments for monitoring and controlling reactor operation, and protective devices (such as control rods and shielding).

Nuclear waste

A subset of radioactive waste that includes unusable byproducts produced during the various stages of the nuclear fuel cycle, including extraction, conversion, and enrichment of uranium; fuel fabrication; and use of the fuel in nuclear reactors. Specifically, these stages produce a variety of nuclear waste materials, including uranium mill tailings, depleted uranium, and spent (depleted) fuel, all of which are regulated by the NRC. (By contrast, “radioactive waste” is a broader term, which includes all wastes that contain radioactivity, regardless of how they are produced. It is not considered “nuclear waste,” because it is not produced through the nuclear fuel cycle and is generally not regulated by the NRC.)

Occupational dose

The internal and external dose of ionizing radiation received by workers in the course of employment in such areas as fuel cycle facilities, industrial radiography, nuclear medicine, and nuclear power plants. These workers are exposed to varying amounts of radiation, depending on their jobs and the sources with which they work. The NRC requires its licensees to limit occupational exposure to 5,000 mrem (50 millisievert) per year. Occupational dose does not include the dose received from natural background sources, doses received as a medical patient or participant in medical research programs, or “second-hand doses” to members of the public received through exposure to patients treated with radioactive materials.

Organisation for Economic Co-operation and Development (OECD)

An intergovernmental organization (based in Paris, France) that provides a forum for discussion and cooperation among the governments of industrialized countries committed to democracy and the market economy. The primary goal of OECD and its member countries is to support sustainable economic growth, boost employment, raise living standards, maintain financial stability, assist other countries' economic development, and contribute to growth in world trade. In addition, OECD is a reliable source of comparable statistics and economic and social data. OECD also monitors trends, analyzes and forecasts economic developments, and researches social changes and evolving patterns in trade, environment, agriculture, technology, taxation, and other areas.

Orphan sources (unwanted radioactive material)

Sealed sources of radioactive material contained in a small volume (but not radioactively contaminated soils and bulk metals) in any one or more of the following conditions:

- an uncontrolled condition that requires removal to protect public health and safety from a radiological threat
- a controlled or uncontrolled condition, for which a responsible party cannot be readily identified
- a controlled condition, compromised by an inability to ensure the continued safety of the material (e.g., the licensee may have few or no options to provide for safe disposition of the material)
- an uncontrolled condition, in which the material is in the possession of a person who did not seek, and is not licensed, to possess it
- an uncontrolled condition, in which the material is in the possession of a State radiological protection program solely to mitigate a radiological threat resulting from one of the above conditions, and for which the State does not have the necessary means to provide for the appropriate disposition of the material

Outage

The period during which a generating unit, transmission line, or other facility is out of service. Outages may be forced or scheduled and full or partial.

Outage (forced)

The shutdown of a generating unit, transmission line, or other facility for emergency reasons, or a condition in which the equipment is unavailable as a result of an unanticipated breakdown. An outage (whether full, partial, or attributable to a failed start) is considered "forced" if it could not reasonably be delayed beyond 48 hours from identification of the problem, if there had been a strong commercial desire to do so. In particular, the following problems may result in forced outages:

- any failure of mechanical, fuel handling, or electrical equipment or controls within the generator's ownership or direct responsibility (i.e., from the point the generator is responsible for the fuel through to the electrical connection point)

- a failure of a mine or fuel transport system dedicated to that power station with a resulting fuel shortage that cannot be economically managed
- inadvertent or operator error
- limitations caused by fuel quality

Forced outages do not include scheduled outages for inspection, maintenance, or refueling.

Outage (full forced)

A forced outage that causes a generating unit to be removed from the committed state (when the unit is electrically connected and generating or pumping) or the available state (when the unit is available for dispatch as a generator or pump but is not electrically connected and not generating or pumping). Full-forced outages do not include failed starts.

Outage (scheduled)

The shutdown of a generating unit, transmission line, or other facility for inspection, maintenance, or refueling, which is scheduled well in advance (even if the schedule changes). Scheduled outages do not include forced outages and could be deferred if there were a strong commercial reason to do so.

Pellet, fuel

A thimble-sized ceramic cylinder (approximately 3/8-inch in diameter and 5/8-inch in length), consisting of uranium (typically uranium oxide), which has been enriched to increase the concentration of uranium-235 (U-235) to fuel a nuclear reactor. Modern reactor cores in PWRs and BWRs may contain up to 10 million pellets, stacked in the fuel rods that form fuel assemblies.

Performance-based regulation

A regulatory approach that focuses on desired, measurable outcomes, rather than prescriptive processes, techniques, or procedures. Performance-based regulation leads to defined results without specific direction regarding how those results are to be obtained. At the NRC, performance-based regulatory actions focus on identifying performance measures that ensure an adequate safety margin and offer incentives for licensees to improve safety without formal regulatory intervention by the agency.

Performance indicator

A quantitative measure of a particular attribute of licensee performance that shows how well a plant is performing when measured against established thresholds. Licensees submit their data quarterly; the NRC regularly conducts inspections to verify the submittals and then uses its own inspection data plus the licensees' submittals to assess each plant's performance.

Possession-only license

A license, issued by the NRC, that authorizes the licensee to possess specific nuclear material but does not authorize its use or the operation of a nuclear facility.

Power uprate

The process of increasing the maximum power level at which a commercial nuclear power plant may operate. This power level, regulated by the NRC, is included in the plant's operating license and technical specifications. A licensee may only change its maximum power output after the NRC approves an uprate application. The NRC analyses must demonstrate that the plant could continue to operate safely with its proposed new configuration. When all requisite conditions are fulfilled, the NRC may grant the power uprate by amending the plant's operating license and technical specifications.

Pressurized-water reactor (PWR)

A common nuclear power reactor design in which very pure water is heated to a very high temperature by fission, kept under high pressure (to prevent it from boiling), and converted to steam by a steam generator (rather than by boiling, as in a BWR). The resulting steam is used to drive turbines, which activate generators to produce electrical power. A PWR essentially operates like a pressure cooker, where a lid is tightly placed over a pot of heated water, causing the pressure inside to increase as the temperature increases (because the steam cannot escape) but keeping the water from boiling at the usual 212 degrees Fahrenheit (100 degrees Celsius). About two-thirds of the operating nuclear reactor power plants in the United States are PWRs.

Probabilistic risk assessment (PRA)

A systematic method for assessing three questions that the NRC uses to define "risk." These questions consider (1) what can go wrong, (2) how likely it is to happen, and (3) what the consequences might be. These questions allow the NRC to understand likely outcomes, sensitivities, areas of importance, system interactions, and areas of uncertainty, which the staff can use to identify risk-significant scenarios. The NRC uses PRA to determine a numeric estimate of risk to provide insights into the strengths and weaknesses of the design and operation of a nuclear power plant.

Production expense

Production expense is one component of the cost of generating electric power, which includes costs associated with fuel, as well as plant operation and maintenance.

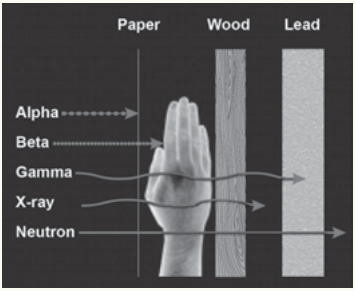
Rad (radiation absorbed dose)

One of the two units used to measure the amount of radiation absorbed by an object or person, known as the "absorbed dose," which reflects the amount of energy that radioactive sources deposit in materials through which they pass. The radiation-absorbed dose (rad) is the amount of energy (from any type of ionizing radiation) deposited in any medium (e.g., water, tissue, air). An absorbed dose of 1 rad means that 1 gram of material absorbed 100 ergs of energy (a small but measurable amount) as a result of exposure to radiation. The related international system unit is the gray (Gy), where 1 Gy is equivalent to 100 rad.

Radiation, ionizing

A form of radiation, which includes alpha particles, beta particles, gamma rays and x-rays, neutrons, high-speed electrons, and high-speed protons. Compared to nonionizing radiation, such as found in ultraviolet light or microwaves, ionizing radiation is considerably more energetic. When ionizing radiation passes through material such as air, water, or living tissue, it deposits enough energy to break molecular bonds and displace (or remove) electrons. This electron displacement may lead to changes in living cells. Given this ability, ionizing radiation has a number of beneficial uses, including treating cancer or sterilizing medical equipment. However, ionizing radiation is potentially harmful if not used correctly, and high doses may result in severe skin or tissue damage. It is for this reason that the NRC strictly regulates commercial and institutional uses of the various types of ionizing radiation.

Radiation, nuclear



Energy given off by matter in the form of tiny fast-moving particles (alpha particles, beta particles, and neutrons) or pulsating electromagnetic rays or waves (gamma rays) emitted from the nuclei of unstable radioactive atoms. All matter is composed of atoms, which are made up of various parts; the nucleus contains minute particles called protons and neutrons, and the atom's outer shell contains other particles called electrons. The nucleus carries a positive electrical charge, while the electrons carry a negative electrical charge. These forces work toward a strong, stable balance by getting rid of excess atomic energy (radioactivity). In that process, unstable radioactive nuclei may emit energy, and this spontaneous emission is called nuclear radiation. All types of nuclear radiation are also ionizing radiation, but the reverse is not necessarily true; for example, x-rays are a type of ionizing radiation, but they are not nuclear radiation, because they do not originate from atomic nuclei. In addition, some elements are naturally radioactive, as their nuclei emit nuclear radiation as a result of radioactive decay, but others become radioactive by being irradiated in a reactor. Naturally occurring nuclear radiation is indistinguishable from induced radiation.

Radiation source

A radioactive material or byproduct that is specifically manufactured or obtained for the purpose of using the emitted radiation. Such sources are commonly used in teletherapy or industrial radiography; in various types of industrial gauges, irradiators, and gamma knives; and as power sources for batteries (such as those used in spacecraft). These sources usually consist of a known quantity of radioactive material, which is encased in a manmade capsule, sealed between layers of nonradioactive material, or firmly bonded to a nonradioactive substrate to prevent radiation leakage. Other radiation sources include devices such as accelerators and x-ray generators.

Radiation standards

Exposure limits; permissible concentrations; rules for safe handling; and regulations regarding receipt, possession, use, transportation, storage, disposal, and industrial control of radioactive material.

Radiation therapy (radiotherapy)

The therapeutic use of ionizing radiation to treat disease in patients. Although most radiotherapy procedures are intended to kill cancerous tissue or reduce the size of a tumor, therapeutic doses may also be used to reduce pain or treat benign conditions. For example, intervascular brachytherapy uses radiation to treat clogged blood vessels. Other common radiotherapy procedures include gamma stereotactic radiosurgery (gamma knife), teletherapy, and iodine treatment to correct an overactive thyroid gland. These procedures use radiation sources, regulated by the NRC and its Agreement States, that may be applied either inside or outside the body. In either case, the goal of radiotherapy is to deliver the required therapeutic or pain-relieving dose of radiation with high precision and for the required length of time, while preserving the surrounding healthy tissue.

Radiation warning symbol

An officially prescribed magenta or black trefoil on a yellow background, which must be displayed where certain quantities of radioactive materials are present or where certain doses of radiation could be received.

Radioactive contamination

Undesirable radioactive material (with a potentially harmful effect) that is either airborne or deposited in (or on the surface of) structures, objects, soil, water, or living organisms (people, animals, or plants) in a concentration that may harm people, equipment, or the environment.

Radioactive decay

The spontaneous transformation of one radioisotope into one or more different isotopes (known as “decay products” or “daughter products”), accompanied by a decrease in radioactivity (compared to the parent material). This transformation takes place over a defined period of time (known as a “half-life”), as a result of electron capture; fission; or the emission of alpha particles, beta particles, or photons (gamma radiation or x-rays) from the nucleus of an unstable atom. Each isotope in the sequence (known as a “decay chain”) decays to the next until it forms a stable, less energetic end product. In addition, radioactive decay may refer to gamma-ray and conversion electron emission, which only reduces the excitation energy of the nucleus.

Radioactivity

The property possessed by some elements (such as uranium) of spontaneously emitting energy in the form of radiation as a result of the decay (or disintegration) of an unstable atom. Radioactivity is also the term used to describe the rate at which radioactive material emits radiation. Radioactivity is measured in units of becquerels or disintegrations per second.

Radiography

The use of sealed sources of ionizing radiation for nondestructive examination of the structure of materials. When the radiation penetrates the material, it produces a shadow image by blackening a sheet of photographic film that has been placed behind the material, and the differences in blackening suggest flaws and unevenness in the material.

Radioisotope (radionuclide)

An unstable isotope of an element that decays or disintegrates spontaneously, thereby emitting radiation. Approximately 5,000 natural and artificial radioisotopes have been identified.

Radiopharmaceutical

A pharmaceutical drug that emits radiation and is used in diagnostic or therapeutic medical procedures. Radioisotopes that have short half-lives are generally preferred to minimize the radiation dose to the patient and the risk of prolonged exposure. In most cases, these short-lived radioisotopes decay to stable elements within minutes, hours, or days, allowing patients to be released from the hospital in a relatively short time.

Reactor core

The central portion of a nuclear reactor, which contains the fuel assemblies, water, and control mechanisms, as well as the supporting structure. The reactor core is where fission takes place.

Reactor Oversight Process (ROP)

The process by which the NRC monitors and evaluates the performance of commercial nuclear power plants. Designed to focus on those plant activities that are most important to safety, the ROP uses inspection findings and performance indicators to assess each plant's safety performance.

Regulation

The governmental function of controlling or directing economic entities through the process of rulemaking and adjudication.

Regulatory Information Conference

An annual NRC conference that brings together NRC staff, regulated utilities, materials users, and other interested stakeholders to discuss nuclear safety topics and significant and timely regulatory activities through informal dialogue to ensure an open regulatory process.

Rem (roentgen equivalent man)

One of the two standard units used to measure the dose equivalent (or effective dose), which combines the amount of energy (from any type of ionizing radiation) that is deposited in human tissue with the biological effects of the given type of radiation. For beta and gamma radiation, the dose equivalent is the same as the absorbed dose. By contrast, the dose equivalent is larger than the absorbed dose for alpha and neutron radiation, because these types of radiation are more damaging to the human body. Thus, the dose equivalent (in rems) is equal to the absorbed dose (in rads) multiplied by the quality factor of the type of radiation (Title 10 of the *Code of Federal Regulations* (10 CFR) 20.1004, "Units of Radiation Dose"). The related international system unit is the sievert (Sv), where 100 rem is equivalent to 1 Sv.

Renewable resources

Natural, but limited, energy resources that can be replenished, including biomass, hydro, geothermal, solar, and wind. These resources are virtually inexhaustible but limited in the amount of energy that is available per unit of time. In the future, renewable resources could also include the use of ocean thermal, wave, and tidal action technologies. Utility renewable resource applications include bulk electricity generation, onsite electricity generation, distributed electricity generation, nongrid-connected generation, and demand-reduction (energy efficiency) technologies.

Risk

The combined answer to three questions that consider (1) what can go wrong, (2) how likely it is to occur, and (3) what the consequences might be. These three questions allow the NRC to understand likely outcomes, sensitivities, areas of importance, system interactions, and areas of uncertainty, which can be used to identify risk-significant scenarios.

Risk-based decisionmaking

An approach to regulatory decisionmaking that considers only the results of a probabilistic risk assessment.

Risk-informed decisionmaking

An approach to regulatory decisionmaking, in which insights from probabilistic risk assessment are considered with other engineering insights.

Risk-informed regulation

An approach to regulation taken by the NRC, which incorporates an assessment of safety significance or relative risk. This approach ensures that the regulatory burden imposed by an individual regulation or process is appropriate to its importance in protecting the health and safety of the public and the environment.

Risk significant

“Risk significant” can refer to a facility’s system, structure, component, or accident sequence that exceeds a predetermined limit for contributing to the risk associated with the facility. The term also describes a level of risk exceeding a predetermined “significance” level.

Safeguards

The use of material control and accounting programs to verify that all special nuclear material is properly controlled and accounted for, as well as the physical protection (or physical security) equipment and security forces. As used by IAEA, this term also means verifying that the peaceful use commitments made in binding nonproliferation agreements, both bilateral and multilateral, are honored.

Safeguards Information

A special category of sensitive unclassified information that must be protected. Safeguards Information concerns the physical protection of operating power reactors, spent fuel shipments, strategic special nuclear material, or other radioactive material.

Safety related

In the regulatory arena, this term applies to systems, structures, components, procedures, and controls (of a facility or process) that are relied upon to remain functional during and following design-basis events. Their functionality ensures that key regulatory criteria, such as levels of radioactivity released, are met. Examples of safety-related functions include shutting down a nuclear reactor and maintaining it in a safe-shutdown condition.

Safety significant

When used to qualify an object, such as a system, structure, component, or accident sequence, this term identifies that object as having an impact on safety, whether determined through risk analysis or other means, that exceeds a predetermined significance criterion.

SAFSTOR

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

Scram

The sudden shutting down of a nuclear reactor, usually by rapid insertion of control rods, either automatically or manually by the reactor operator (also known as a "reactor trip").

Sensitive unclassified nonsafeguards information

Information that is generally not publicly available and that encompasses a wide variety of categories, such as proprietary information, personal and private information, or information subject to attorney-client privilege.

Shutdown

A decrease in the rate of fission (and heat or energy production) in a reactor (usually by the insertion of control rods into the core).

Source material

Uranium or thorium, or any combination thereof, in any physical or chemical form, or ores that contain, by weight, 1/20 of 1 percent (0.05 percent) or more of (1) uranium, (2) thorium, or (3) any combination thereof. Source material does not include special nuclear material.

Special nuclear material

Plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235.

Spent fuel pool

An underwater storage and cooling facility for spent (depleted) fuel assemblies that have been removed from a reactor.

Spent (depleted or used) nuclear fuel

Nuclear reactor fuel that has been used to the extent that it can no longer effectively sustain a chain reaction.

Subcriticality

The condition of a nuclear reactor system, in which nuclear fuel no longer sustains a fission chain reaction (that is, the reaction fails to initiate its own repetition, as it would in a reactor's normal operating condition). A reactor becomes subcritical when its fission events fail to release a sufficient number of neutrons to sustain an ongoing series of reactions, possibly as a result of increased neutron leakage or poisons.

Teletherapy

Treatment in which the source of the therapeutic radiation is at a distance from the body. Because teletherapy is often used to treat malignant tumors deep within the body by bombarding them with a high-energy beam of gamma rays (from a radioisotope such as cobalt-60) projected from outside the body, it is often called "external beam radiotherapy."

Title 10 of the *Code of Federal Regulations* (10 CFR)

Four volumes of the *Code of Federal Regulations* (CFR) address energy-related topics. Parts 1 to 199 contain the regulations (or rules) established by the NRC. These regulations govern the transportation and storage of nuclear materials; use of radioactive materials at nuclear power plants, research and test reactors, uranium recovery facilities, fuel cycle facilities, waste repositories, and other nuclear facilities; and use of nuclear materials for medical, industrial, and academic purposes.

Transient

A change in the reactor coolant system temperature, pressure, or both, attributed to a change in the reactor's power output. Transients can be caused by (1) adding or removing neutron poisons, (2) increasing or decreasing electrical load on the turbine generator, or (3) accident conditions.

Transuranic waste

Material contaminated with transuranic elements—artificially made, radioactive elements, such as neptunium, plutonium, americium, and others—that have atomic numbers higher than uranium in the periodic table of elements. Transuranic waste is primarily produced from recycling spent fuel or using plutonium to fabricate nuclear weapons.

Tritium

A radioactive isotope of hydrogen. Because it is chemically identical to natural hydrogen, tritium can easily be taken into the body by any ingestion path. It decays by emitting beta particles and has a half-life of about 12.5 years.

Uprate

See *Power uprate*.

Uranium

A radioactive element with the atomic number 92 and, as found in natural ores, an atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (which comprises 0.7 percent of natural uranium), which is fissile, and uranium-238 (99.3 percent of natural uranium), which is fissionable by fast neutrons and is fertile, meaning that it becomes fissile after absorbing one neutron. Natural uranium also includes a minute amount of uranium-234.

Uranium enrichment

The process of increasing the percentage of U235 from 0.7 percent in natural uranium to about 3-5 percent for use in fuel for nuclear reactors. Enrichment can be done through gaseous diffusion, gas centrifuges, or laser isotope separation.

Uranium fuel fabrication facility

A facility that converts enriched UF_6 into fuel for commercial light-water power reactors, research and test reactors, and other nuclear reactors. The UF_6, in solid form in containers, is heated to a gaseous form and then chemically processed to form uranium dioxide (UO_2) powder. This powder is then processed into ceramic pellets and loaded into metal tubes, which are subsequently bundled into fuel assemblies. Fabrication also can involve MOX fuel, which contains plutonium oxide mixed with either natural or depleted uranium oxide, in ceramic pellet form.

Uranium hexafluoride production facility (or uranium conversion facility)

A facility that receives natural uranium in the form of ore concentrate (known as yellowcake) and converts it into UF_6, in preparation for fabricating fuel for nuclear reactors.

U.S. Department of Energy (DOE)

The Federal agency established by Congress to advance the national, economic, and energy security of the United States, among other missions.

U.S. Department of Homeland Security (DHS)

The Federal agency responsible for leading the unified national effort to secure the United States against those who seek to disrupt the American way of life. DHS is also responsible for preparing for and responding to all hazards and disasters and includes the formerly separate FEMA, the Coast Guard, and the Secret Service.

U.S. Environmental Protection Agency (EPA)

The Federal agency responsible for protecting human health and safeguarding the environment. The EPA leads the Nation's environmental science, research, education, and assessment efforts to ensure that attempts to reduce environmental risk are based on the best available scientific information. The EPA also ensures that environmental protection is an integral consideration in U.S. policies.

Viability assessment

A decisionmaking process used by DOE to assess the prospects for safe and secure permanent disposal of HLW in an excavated, underground facility, known as a geologic repository. This decisionmaking process is based on (1) specific design work on the critical elements of the repository and waste package, (2) a total system performance assessment that will describe the probable behavior of the repository, (3) a plan and cost estimate for the work required to complete the license application, and (4) an estimate of the costs to construct and operate the repository.

Waste, radioactive

Radioactive materials at the end of their useful life or in a product that is no longer useful and requires proper disposal.

Waste classification (classes of waste)

Classification of LLW according to its radiological hazard. The classes include Class A, B, and C, with Class A being the least hazardous and accounting for 96 percent of LLW. As the waste class and hazard increase, the regulations established by the NRC require progressively greater controls to protect the health and safety of the public and the environment.

Watt

A unit of power (in the international system of units) defined as the consumption or conversion of 1 joule of energy per second. In electricity, a watt is equal to current (in amperes) multiplied by voltage (in volts).

Watthour

An unit of energy equal to 1 watt of power steadily supplied to, or taken from, an electrical circuit for 1 hour (or exactly 3.6×10^3 joules).

Well logging

All operations involving the lowering and raising of measuring devices or tools that contain licensed nuclear material or are used to detect licensed nuclear materials in wells for the purpose of obtaining information about the well or adjacent formations that may be used in oil, gas, mineral, ground water, or geological exploration.

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.

Yellowcake

The solid form of mixed uranium oxide, which is produced from uranium ore in the uranium recovery (milling) process. The material is a mixture of uranium oxides, which can vary in proportion and color from yellow to orange to dark green (blackish) depending on the temperature at which the material is dried (which affects the level of hydration and impurities), with higher drying temperatures producing a darker and less soluble material. (The yellowcake produced by most modern mills is actually brown or black, rather than yellow, but the name comes from the color and texture of the concentrates produced by early milling operations.) Yellowcake is commonly referred to as U_3O_8, because that chemical compound comprises approximately 85 percent of the yellowcake produced by uranium recovery facilities, and that product is then transported to a uranium conversion facility, where it is transformed into UF_6, in preparation for fabricating fuel for nuclear reactors.

Zirconium

A chemical element used (in the form of “zircaloy” metals) in cladding for nuclear fuel rods. The thin zirconium tubes contain pellets of nuclear fuel and are bundled together into assemblies for use in a reactor.