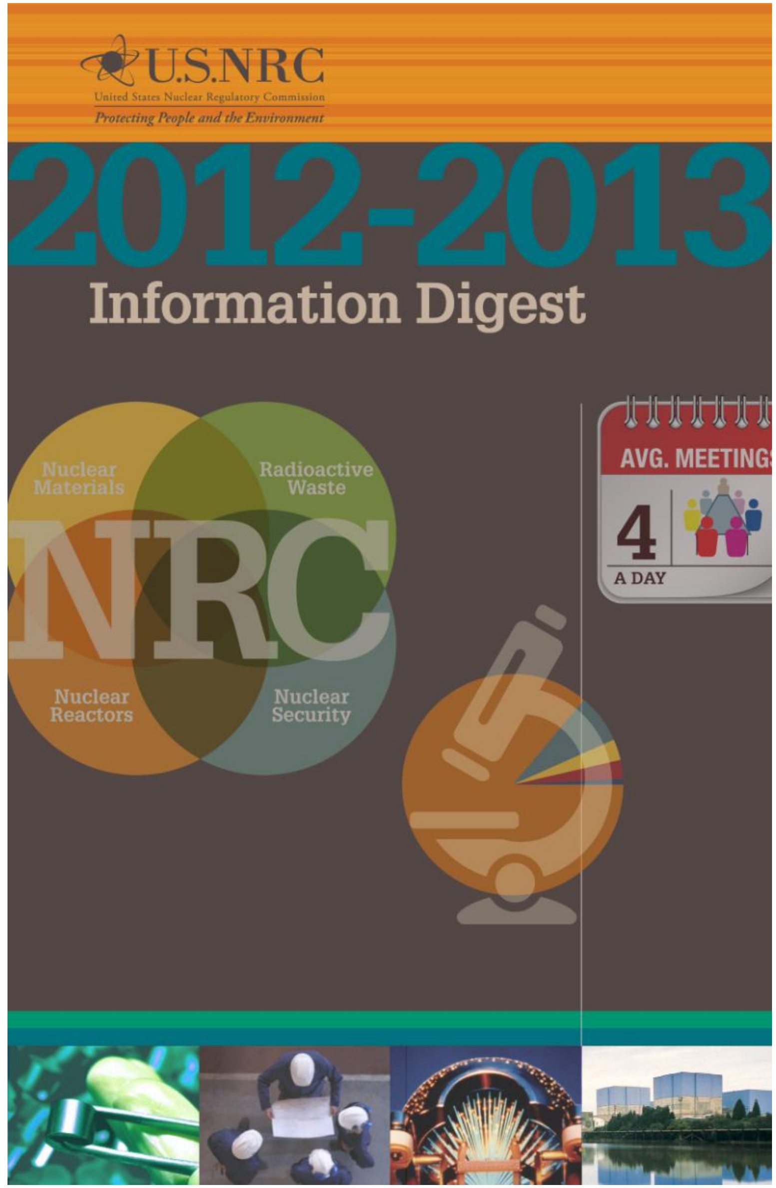
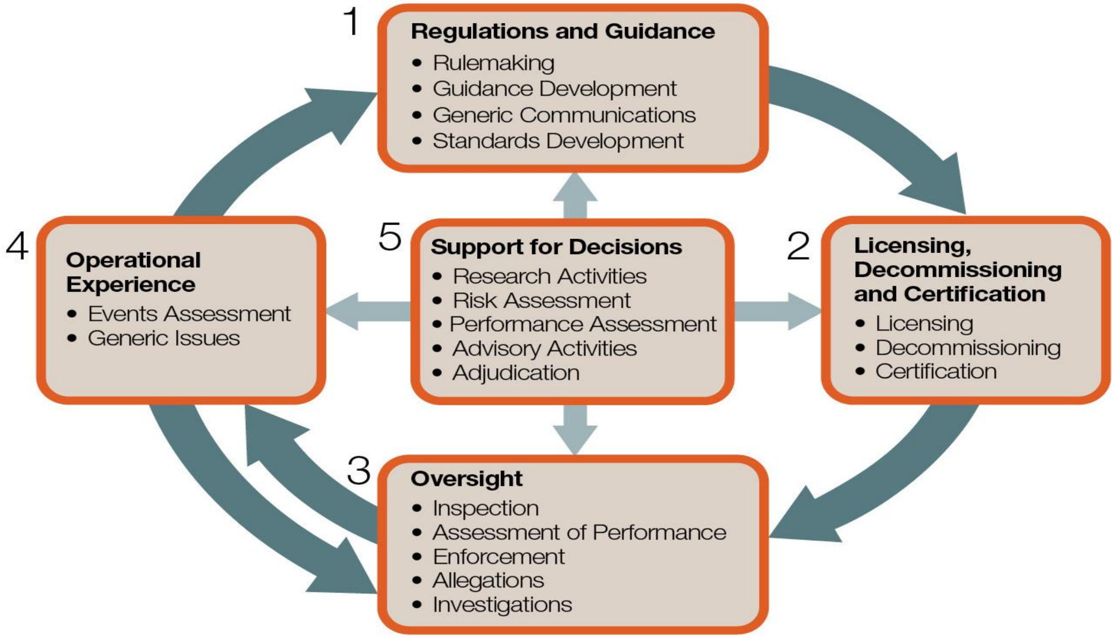
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

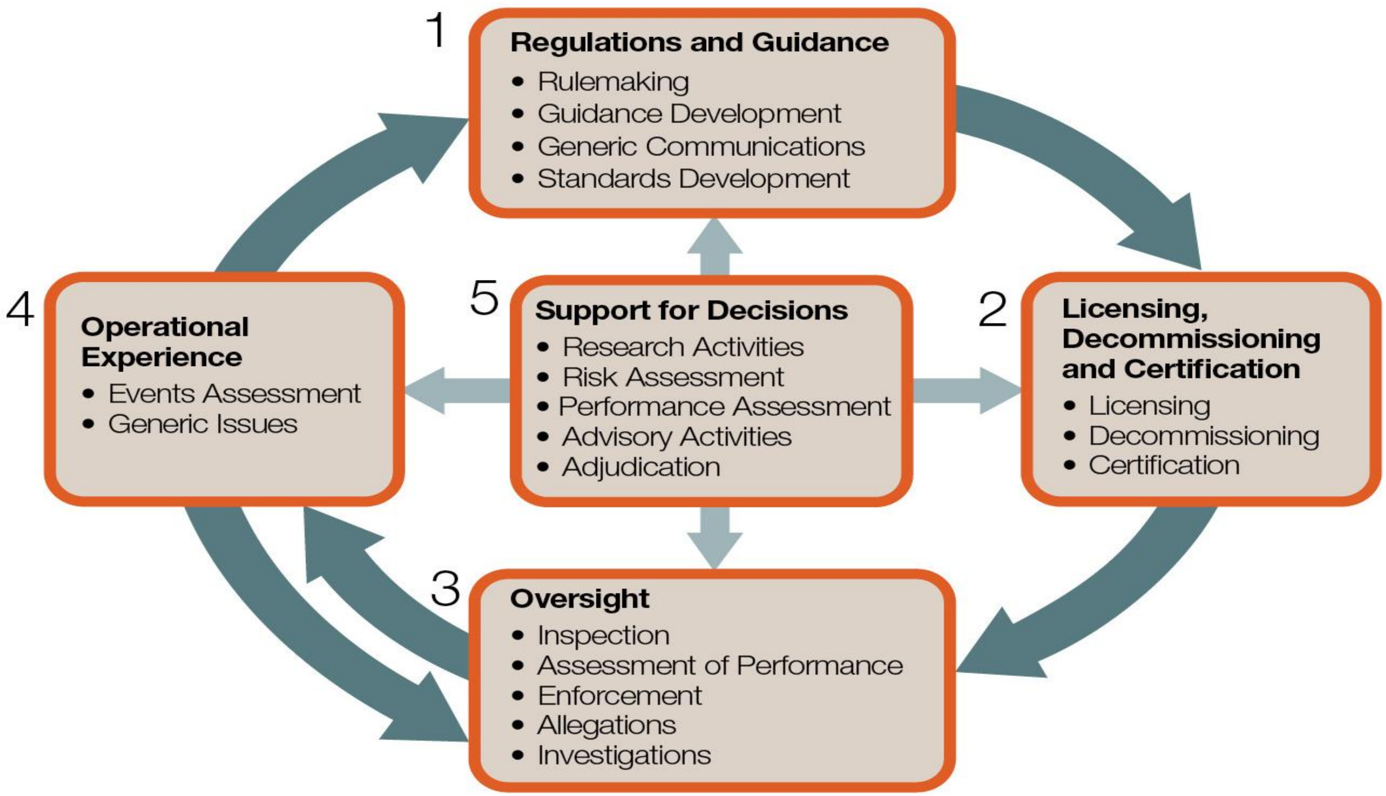


How We Regulate

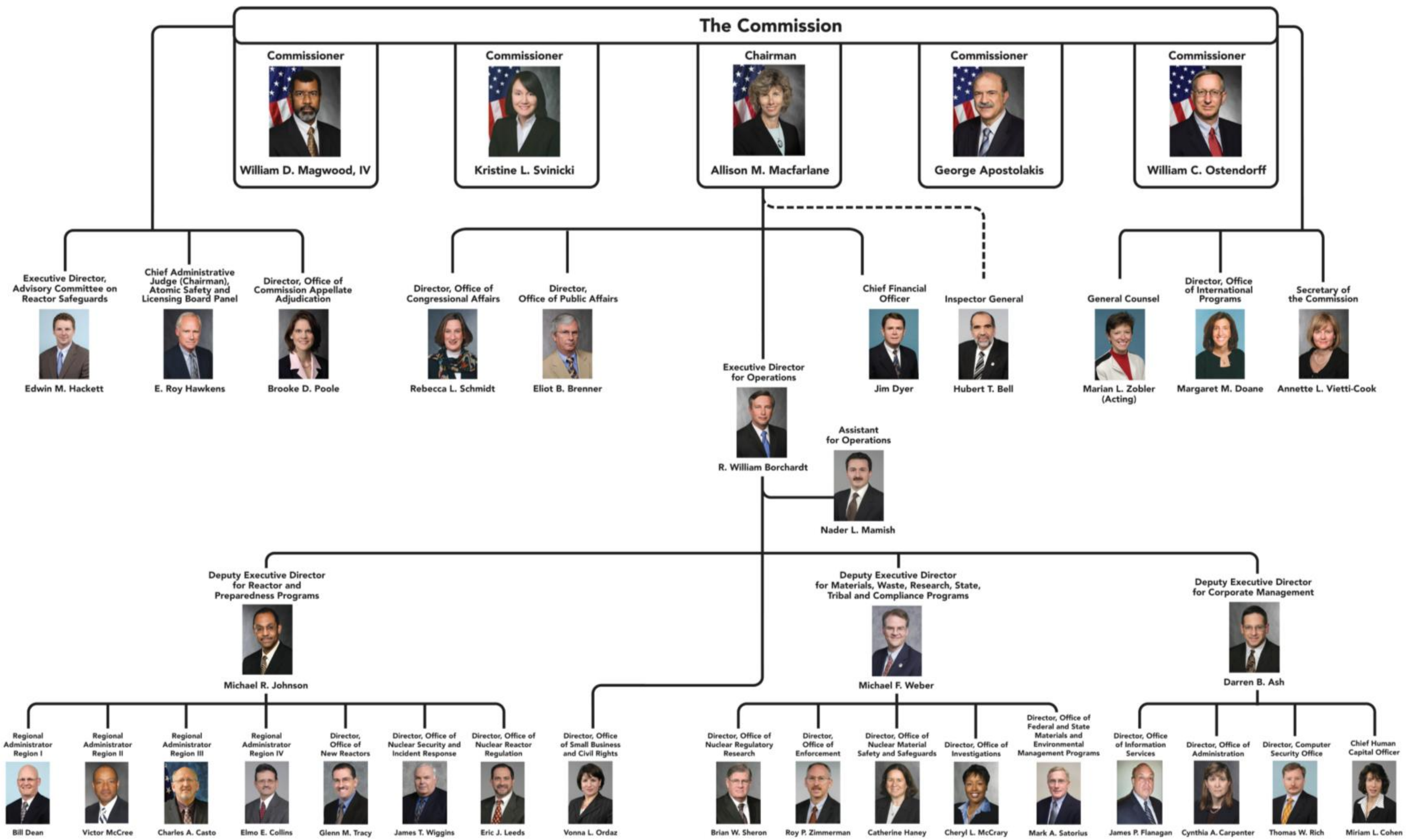


1. *Developing regulations and guidance for applicants and licensees.*
2. *Licensing or certifying applicants to use nuclear materials, operate nuclear facilities, and decommission facilities.*
3. *Inspecting and assessing licensee operations and facilities to ensure that licensees comply with NRC requirements, investigating allegations of wrong-doing and taking appropriate followup or enforcement actions when necessary.*
4. *Evaluating operational experience of licensed facilities and activities.*
5. *Conducting research, holding hearings, and obtaining independent reviews to support regulatory decisions.*

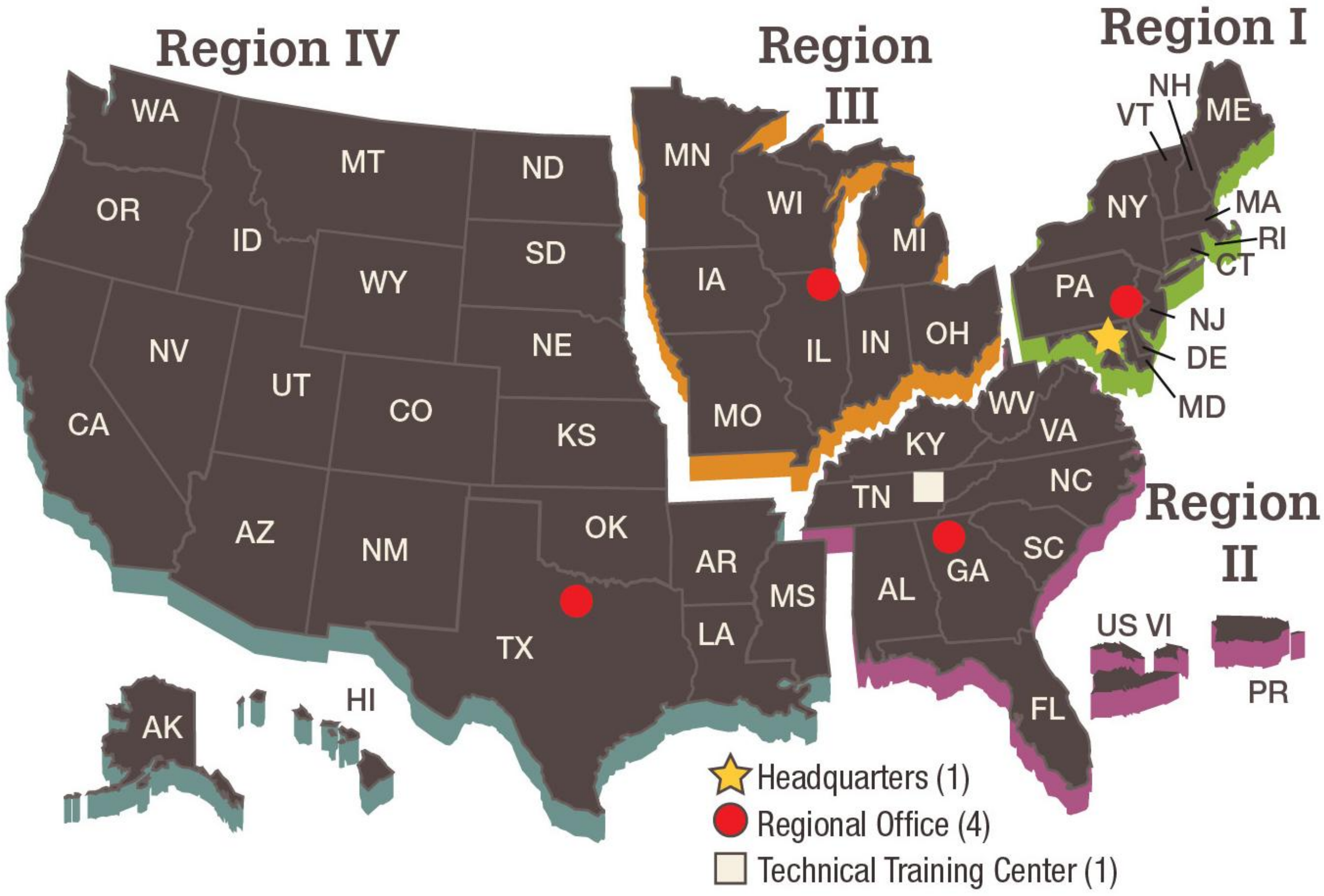
How We Regulate



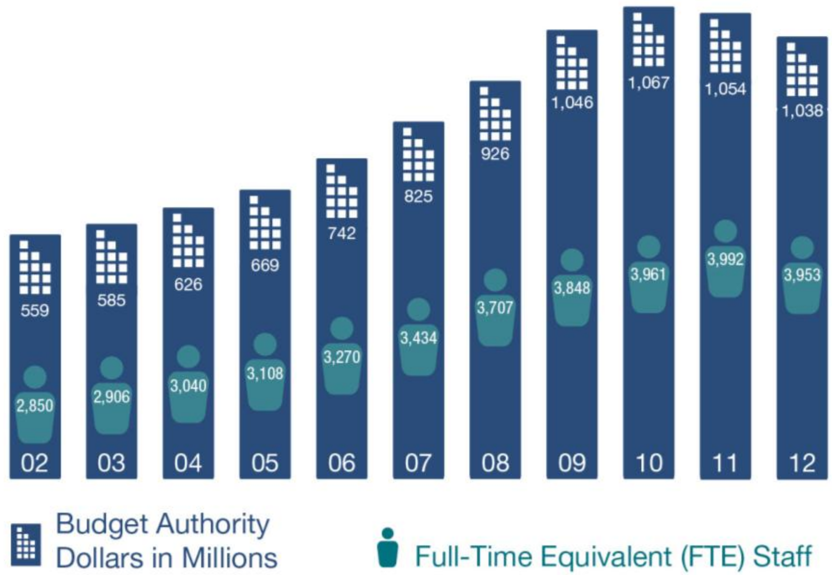
U.S. Nuclear Regulatory Commission Organizational Chart



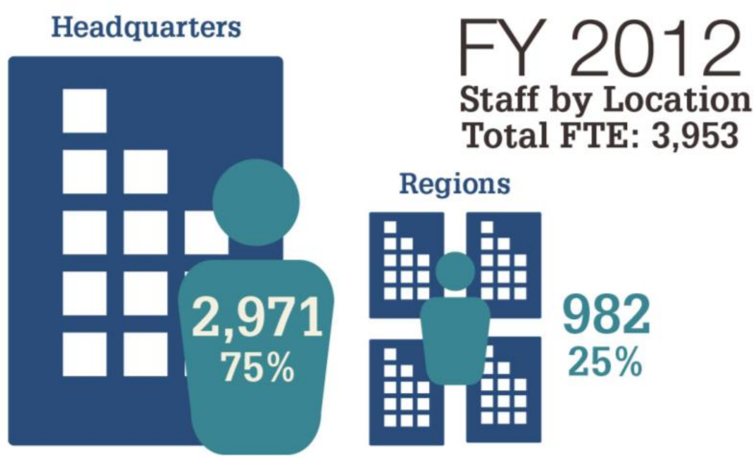
NRC Regions


Region IV
Region III
Region I
Region II
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
AK
HI
MN
IA
MO
WI
IL
MI
IN
OH
AR
LA
MS
KY
TN
AL
GA
FL
SC
NC
VA
WV
PA
NY
VT
NH
ME
MA
RI
CT
NJ
DE
MD
US VI
PR
Headquarters (1)
Regional Office (4)
Technical Training Center (1)

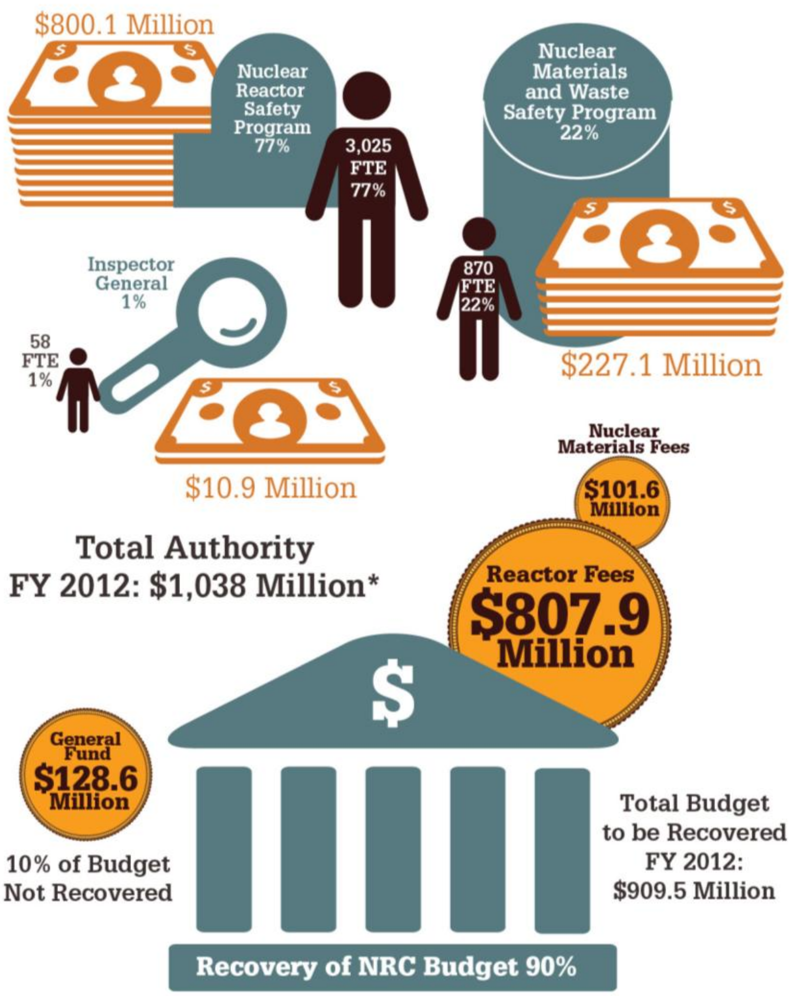
NRC Budget Authority and Personnel Ceiling, FYs 2002–2012



Note: Dollars are rounded to the nearest million.

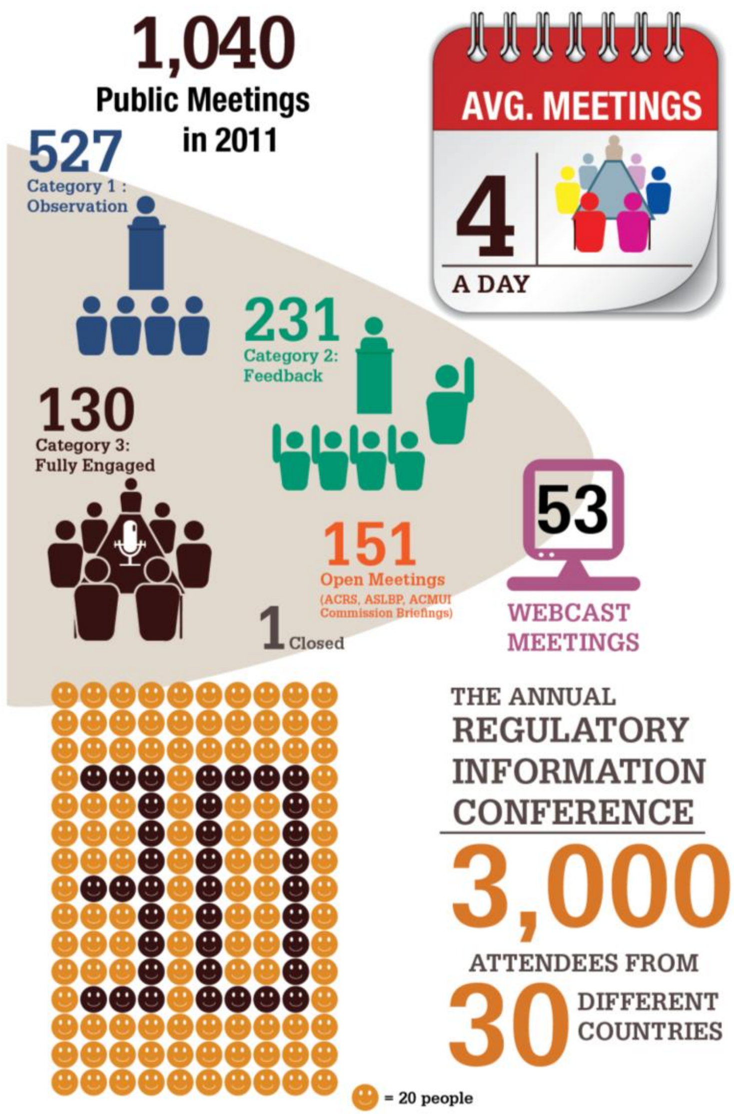


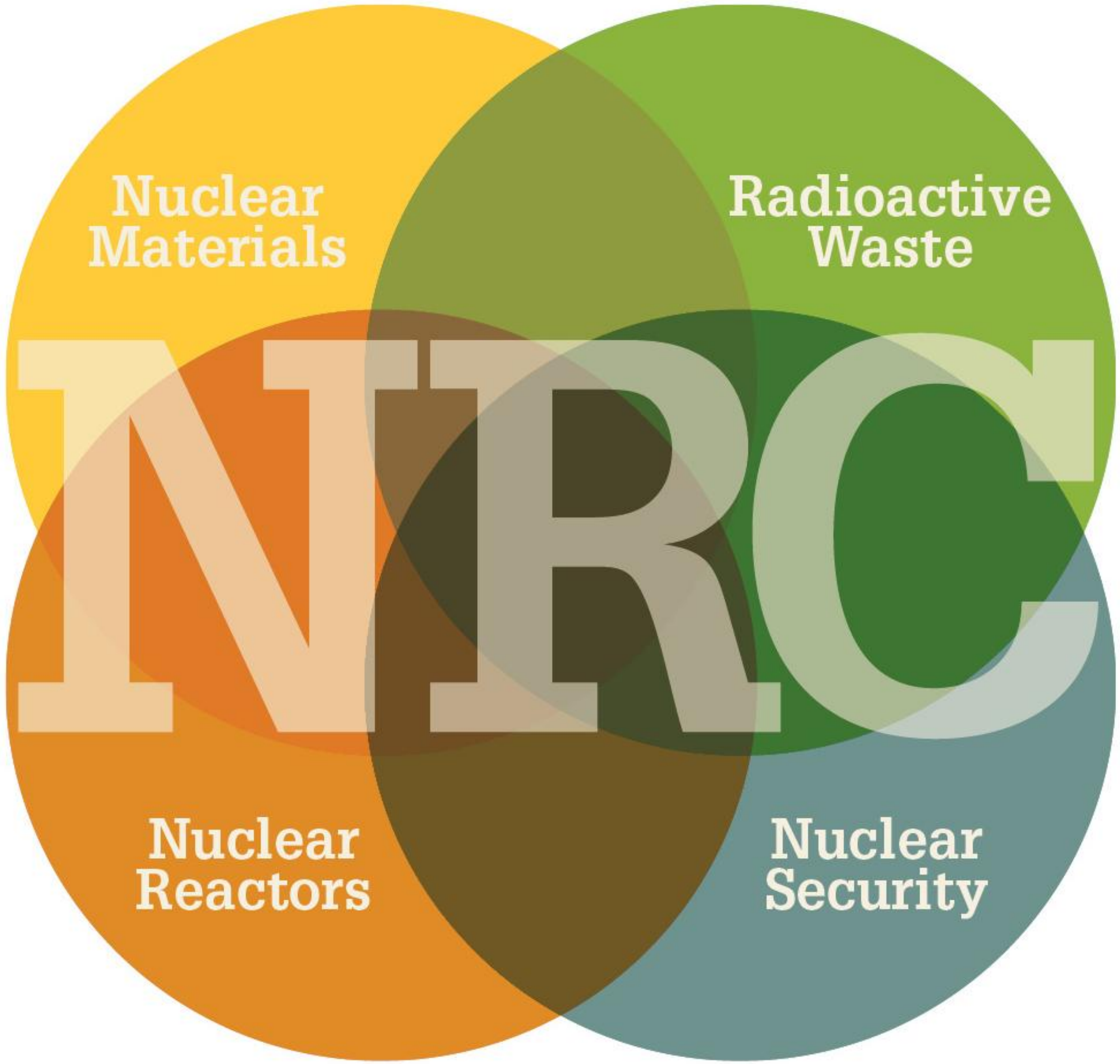
NRC FY 2012 Distribution of Budget Authority and Staff; Recovery of NRC Budget



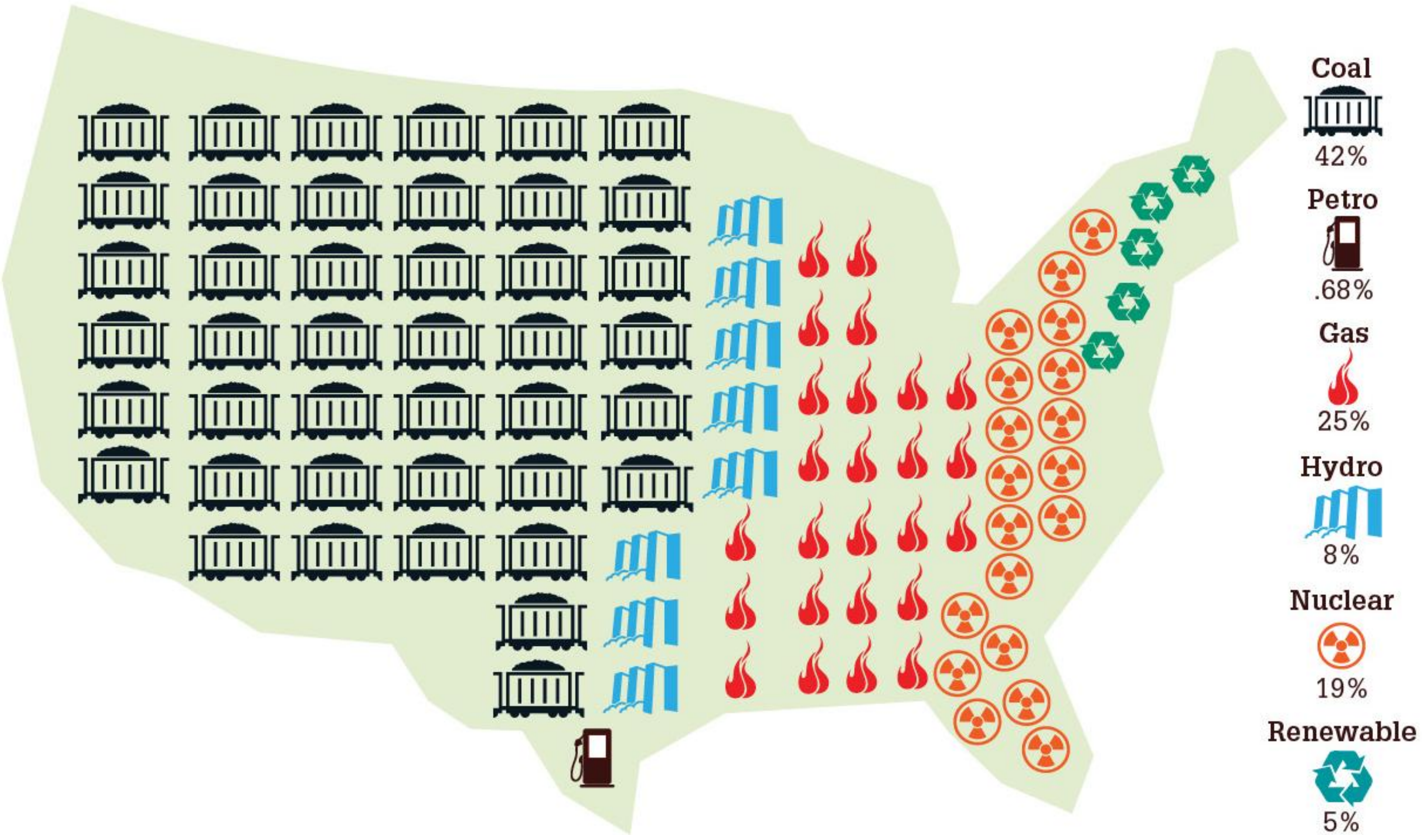
Note: The NRC incorporates corporate and administrative costs proportionately within programs.

NRC Public Meetings and Conference Statistics



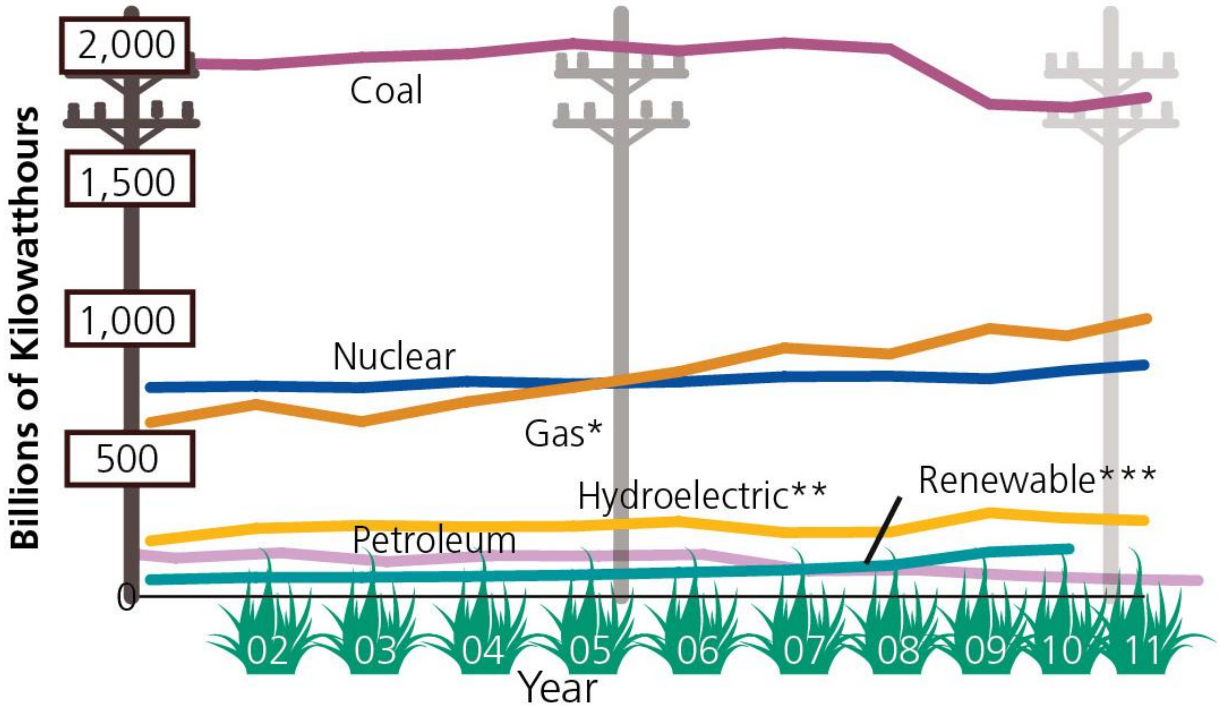

Nuclear Materials
Radioactive Waste
NRC
Nuclear Reactors
Nuclear Security

U.S. Net Electric Generation by Energy Source, 2011



Source: DOE/EIA, May 2012, www.eia.doe.gov

U.S. Net Electric Generation by Energy Source, 2002–2011



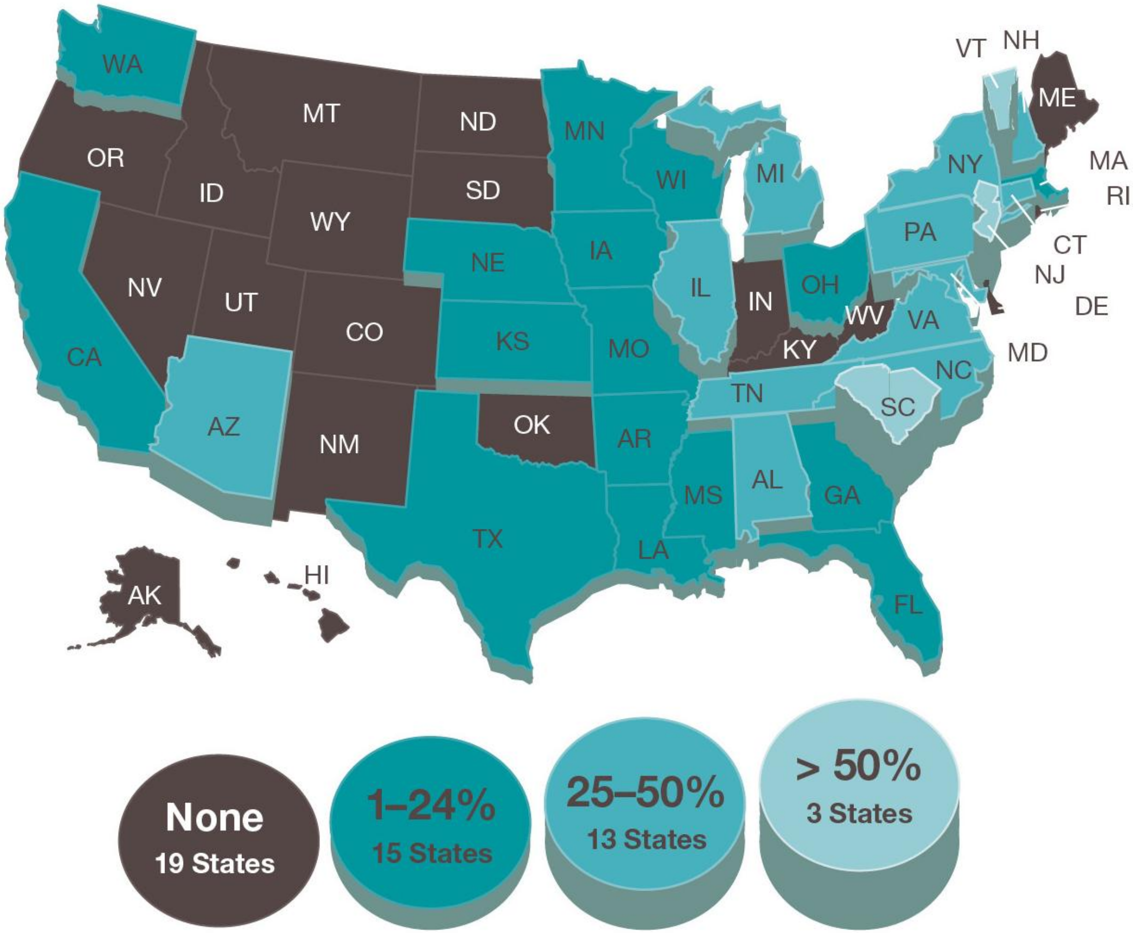
* Gas includes natural gas, blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuel.

** Hydroelectric includes conventional hydroelectric and hydroelectric pumped storage.

*** Renewable energy includes geothermal, wood and nonwood waste, wind, and solar energy.

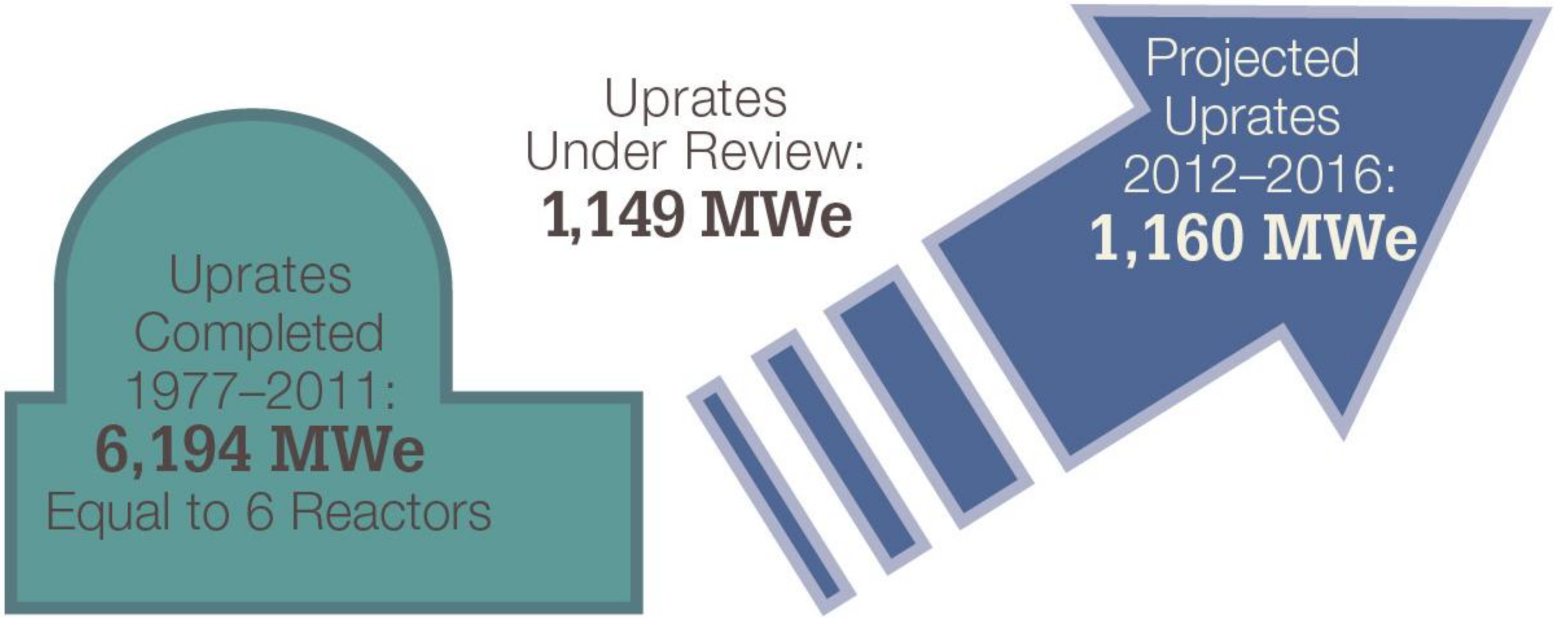
Source: DOE/EIA, May 2012, www.eia.doe.gov

Net Electricity Generated in Each State by Nuclear Power



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

Power Uprates: Past, Current, and Future



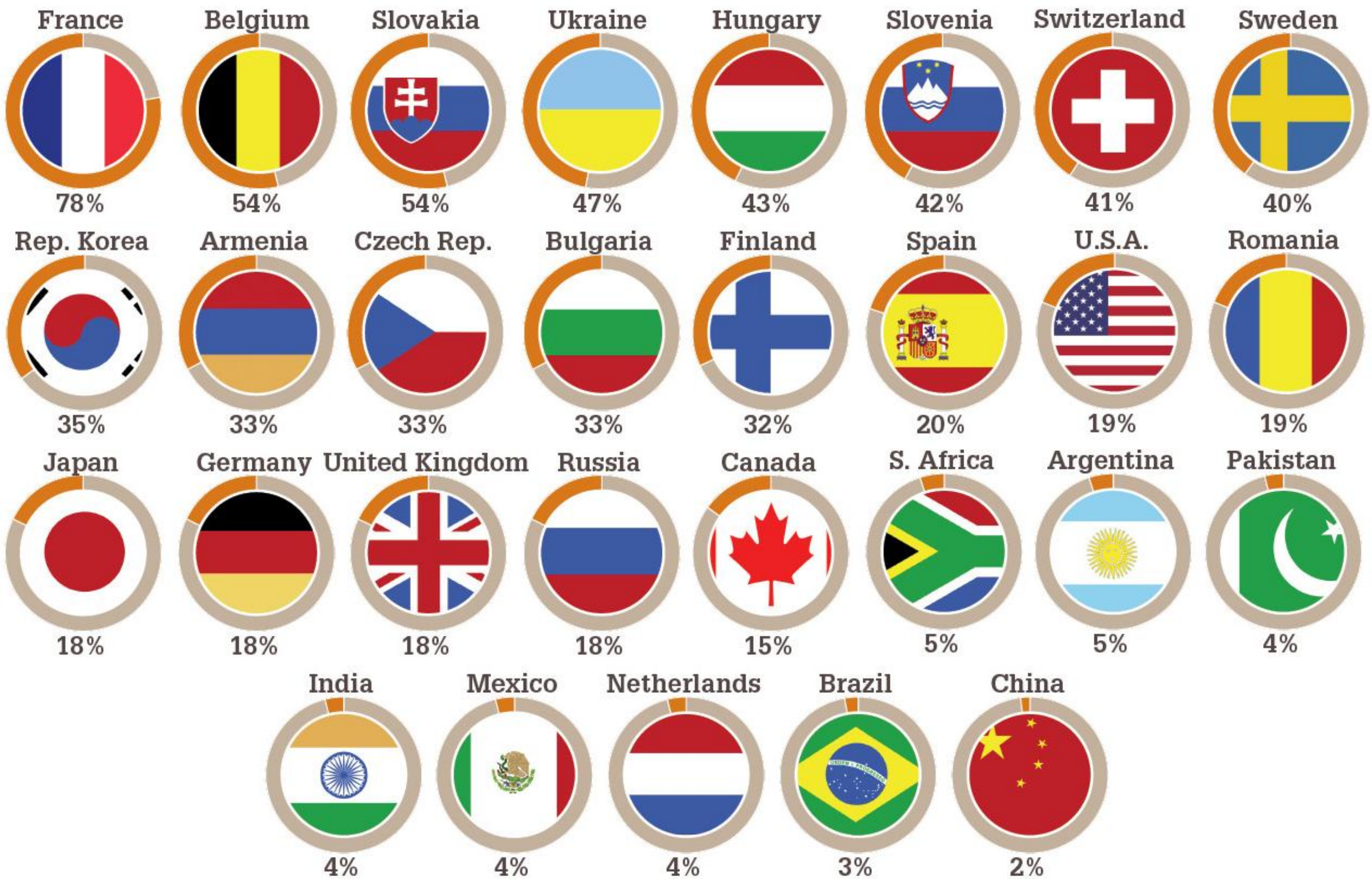
Operating Nuclear Power Plants Worldwide

31 countries with 436 nuclear reactors

● Indicates a country with no nuclear reactors

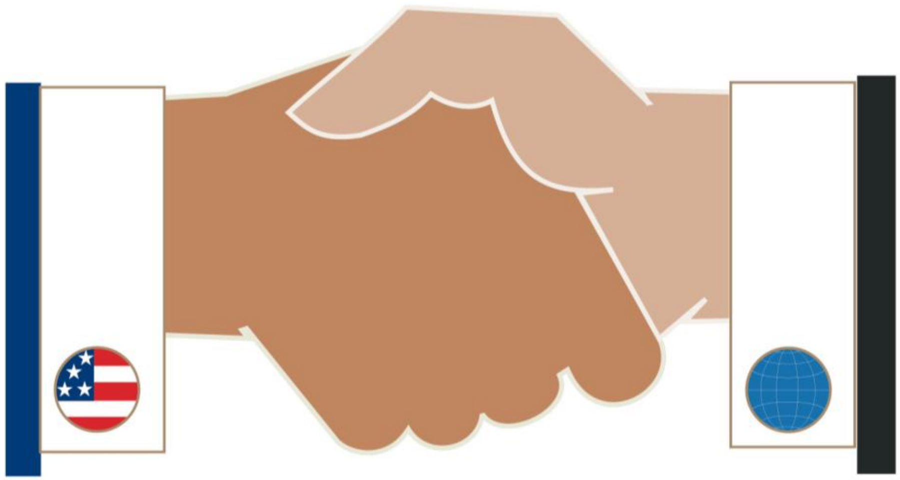
Source: IAEA, Power Reactor Information System database, as of May 2012

Nuclear Share of Electricity Generated by Country, 2011



Note: The country's short-form name is used.
Source: IAEA, Power Reactor Information System database, as of May 2012

Bilateral Information Exchange and Cooperation Agreements with the NRC



Agreement Country, Renewal Date		
Argentina, 2012	Germany, 2012	Poland, 2015
Armenia, 2012	Greece, 2013	Romania, 2016
Australia, 2013	Hungary, 2012	Russia*, 2001
Belgium, 2014	Indonesia, 2013	Slovakia, 2015
Brazil, 2014	Israel, 2016	Slovenia, 2015
Bulgaria*, 2011	Italy, 2015	South Africa, 2014
Canada, 2012	Japan, 2015	Spain, 2015
China, 2013	Kazakhstan, 2014	Sweden*, 2011
Croatia, 2013	Korea, Rep. of, 2015	Switzerland, 2012
Czech Republic, 2014	Lithuania, 2015	Thailand, 2012
Egypt, 1991	Mexico, 2012	Ukraine, 2016
EURATOM, 2014	Netherlands, 2013	United Arab Emirates, 2015
Finland*, 2011	Peru, Open-Ended	United Kingdom, 2013
France, 2013	Philippines, Open-Ended	Vietnam, 2013

Note: The country's short-form name is used. The NRC also provides support to the American Institute in Taiwan. Egypt's agreement has been deferred until its regulatory body requests reinstatement.

EURATOM—The European Atomic Energy Community

* In negotiation

Actions in Response to the Japan Nuclear Accident: Timeline

March 11, 2011 (AM)

A magnitude 9.0 earthquake strikes near Honshu, Japan, generating an estimated 45-foot (14 meter) tsunami at the Fukushima Dai-ichi nuclear power plant.

March 11, 2011 (PM)

The NRC staffs its Headquarters Operations Center on a 24/7 basis, first monitoring tsunami effects on the U.S. West Coast, and then supporting the U.S. response to the Japan nuclear accident until May 16th, 2011. The first of many reactor experts are sent to Japan as part of a USAID mission.

Commission Public Meetings

The Commission briefs Congress and provides opportunities for citizens to be heard starting in March 2011.

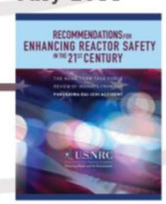
March 23, 2011

NRC resident inspectors begin reexamining post-9/11 emergency equipment and related items at U.S. nuclear power plants, in light of details from the Fukushima accident.

April and May 2011

The NRC reports all U.S. nuclear power plants have appropriate post-9/11 emergency equipment and procedures in place.

July 2011



The NRC's Near-Term Task Force issues its report on lessons learned from Fukushima.

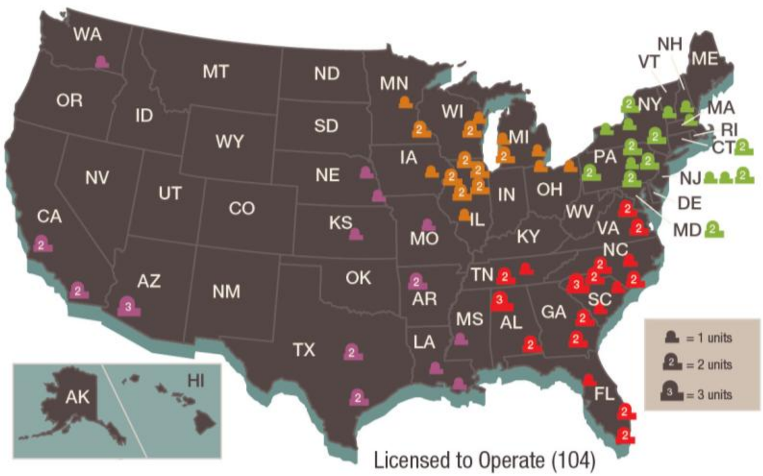
September 2011

NRC resident inspectors begin examining U.S. nuclear fuel cycle facilities' plans and procedures for safely dealing with severe events.

Next Steps

Over the next months, the NRC takes numerous actions on the lessons learned to ensure appropriate enhancements are implemented.

U.S. Operating Commercial Nuclear Power Reactors



Licensed to Operate (104)

REGION I

CONNECTICUT
- Millstone 2 and 3

MARYLAND
- Calvert Cliffs 1 and 2

MASSACHUSETTS
- Pilgrim

NEW HAMPSHIRE
- Seabrook

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

NEW YORK
- FitzPatrick
- Ginna
- Indian Point 2 and 3
- Nine Mile Point 1 and 2

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

VERMONT
- Vermont Yankee

REGION II

ALABAMA
- Browns Ferry 1, 2, and 3
- Farley 1 and 2

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

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

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

SOUTH CAROLINA
- Catawba 1 and 2
- Oconee 1, 2, and 3
- Robinson 2
- Summer

TENNESSEE
- Sequoyah 1 and 2
- Watts Bar 1

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

REGION III

ILLINOIS
- Braidwood 1 and 2
- Byron 1 and 2
- Clinton
- Dresden 2 and 3
- LaSalle 1 and 2
- Quad Cities 1 and 2

IOWA
- Duane Arnold

MICHIGAN
- Cook 1 and 2
- Fermi 2
- Palisades

MINNESOTA
- Monticello
- Prairie Island 1 and 2

OHIO
- Davis-Besse
- Perry

WISCONSIN
- Kewaunee
- Point Beach 1 and 2

REGION IV

ARKANSAS
- Arkansas Nuclear 1 and 2

ARIZONA
- Palo Verde 1, 2, and 3

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

KANSAS
- Wolf Creek 1

LOUISIANA
- River Bend 1
- Waterford 3

MISSISSIPPI
- Grand Gulf

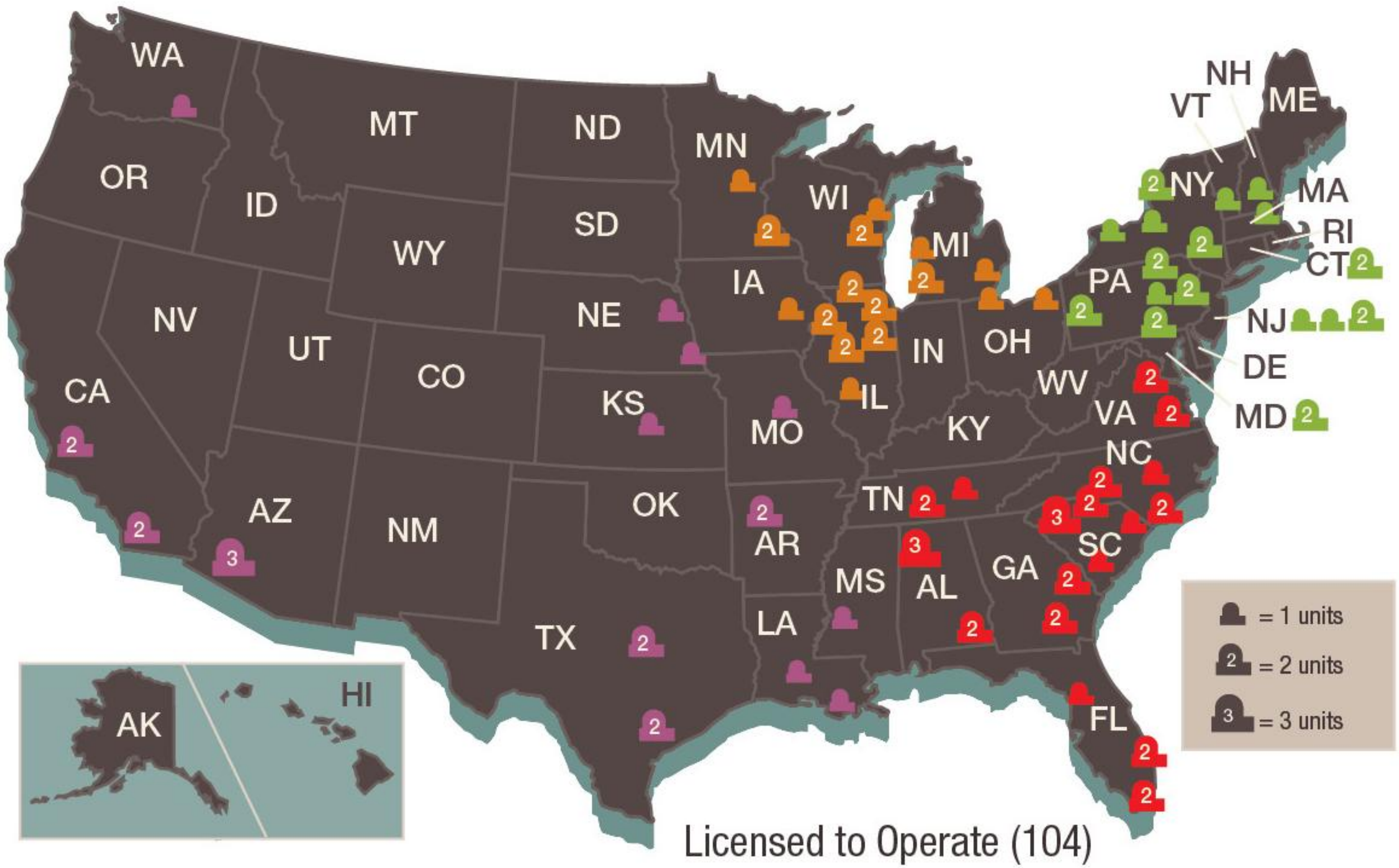
MISSOURI
- Callaway

NEBRASKA
- Cooper
- Fort Calhoun

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

WASHINGTON
- Columbia

U.S. Operating Commercial Nuclear Power Reactors



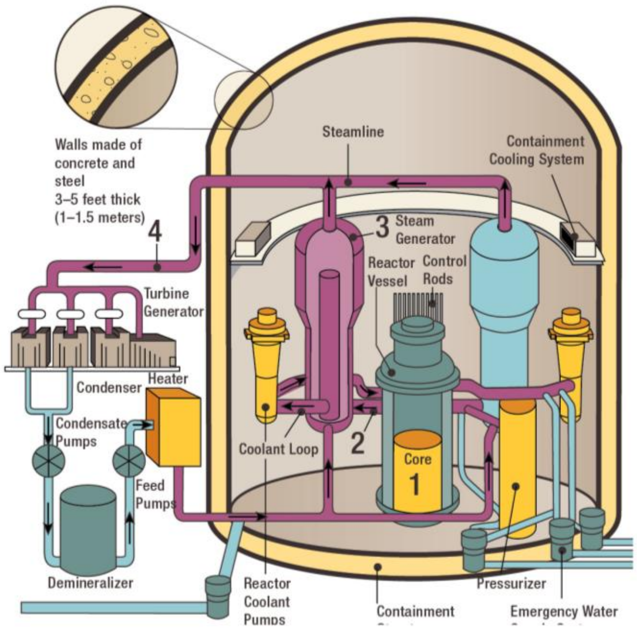
Typical Pressurized-Water Reactor

How Nuclear Reactors Work

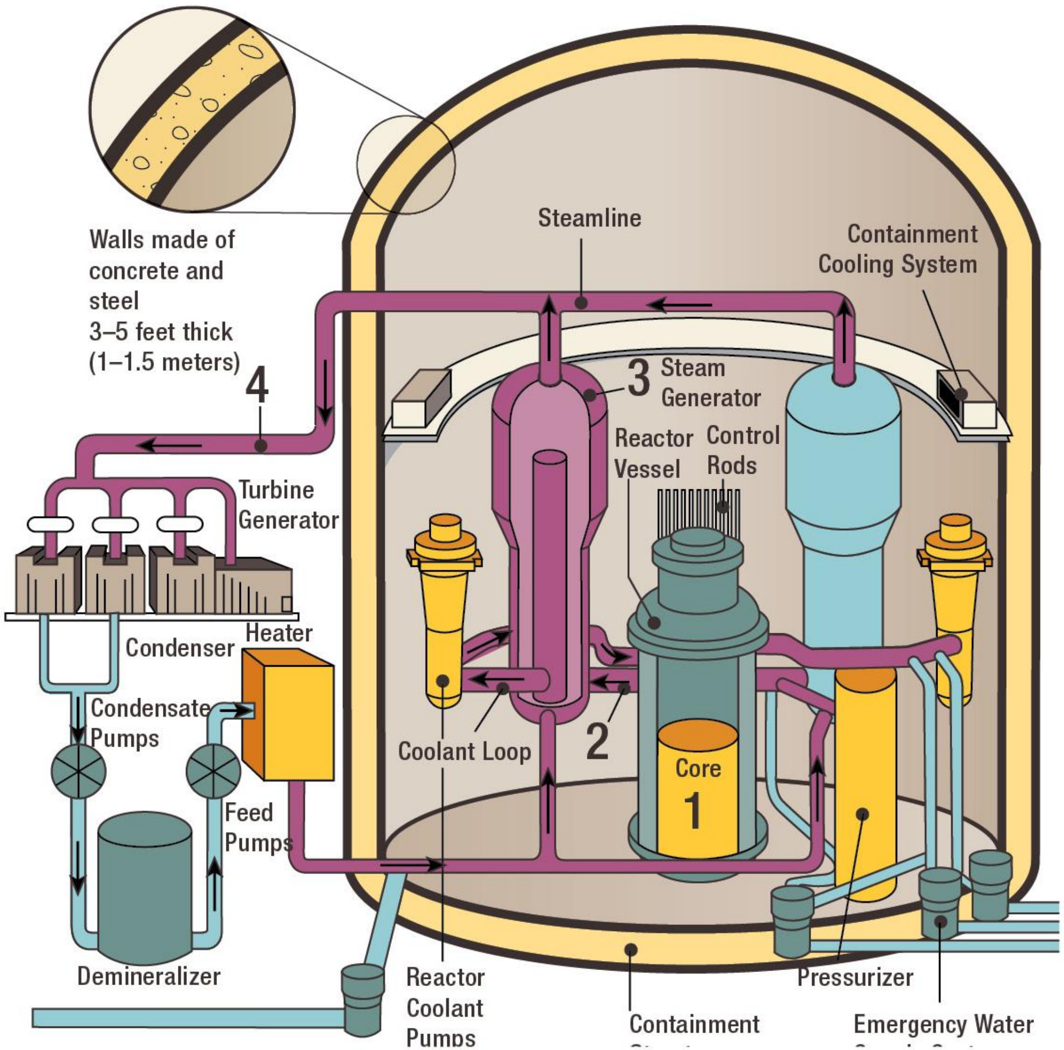
In a typical design concept of a commercial PWR, the following process occurs:

1. The core inside the reactor vessel creates heat.
2. Pressurized water in the primary coolant loop carries the heat to the steam generator.
3. Inside the steam generator, heat from the primary coolant loop vaporizes the water in a secondary loop, producing steam.
4. The steamline directs the steam to the main turbine, causing it to turn the turbine generator, which produces electricity.

The unused steam is exhausted to the condenser, where it is condensed into water. The resulting water is pumped out of the condenser with a series of pumps, reheated, and pumped back to the steam generator. The reactor's core contains fuel assemblies that are cooled by water circulated using electrically powered pumps. These pumps and other operating systems in the plant receive their power from the electrical grid. If offsite power is lost, emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators. Other safety systems, such as the containment cooling system, also need electric power. PWRs contain between 150–200 fuel assemblies.



Typical Pressurized-Water Reactor



United States Nuclear Regulatory Commission
Protecting People and the Environment

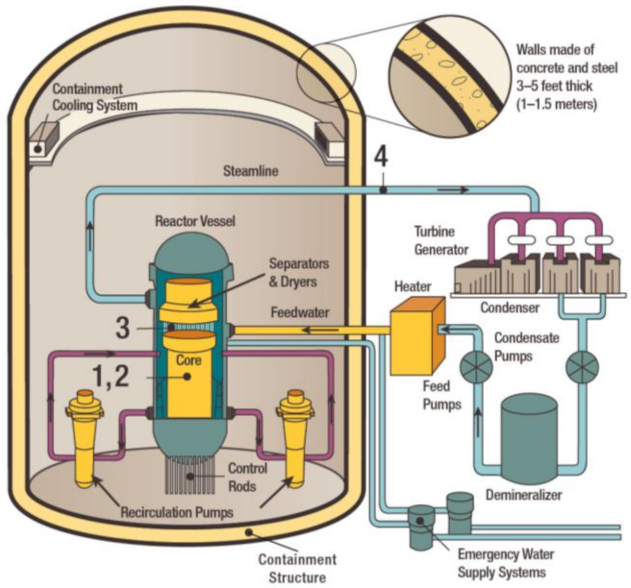
Typical Boiling-Water Reactor

How Nuclear Reactors Work

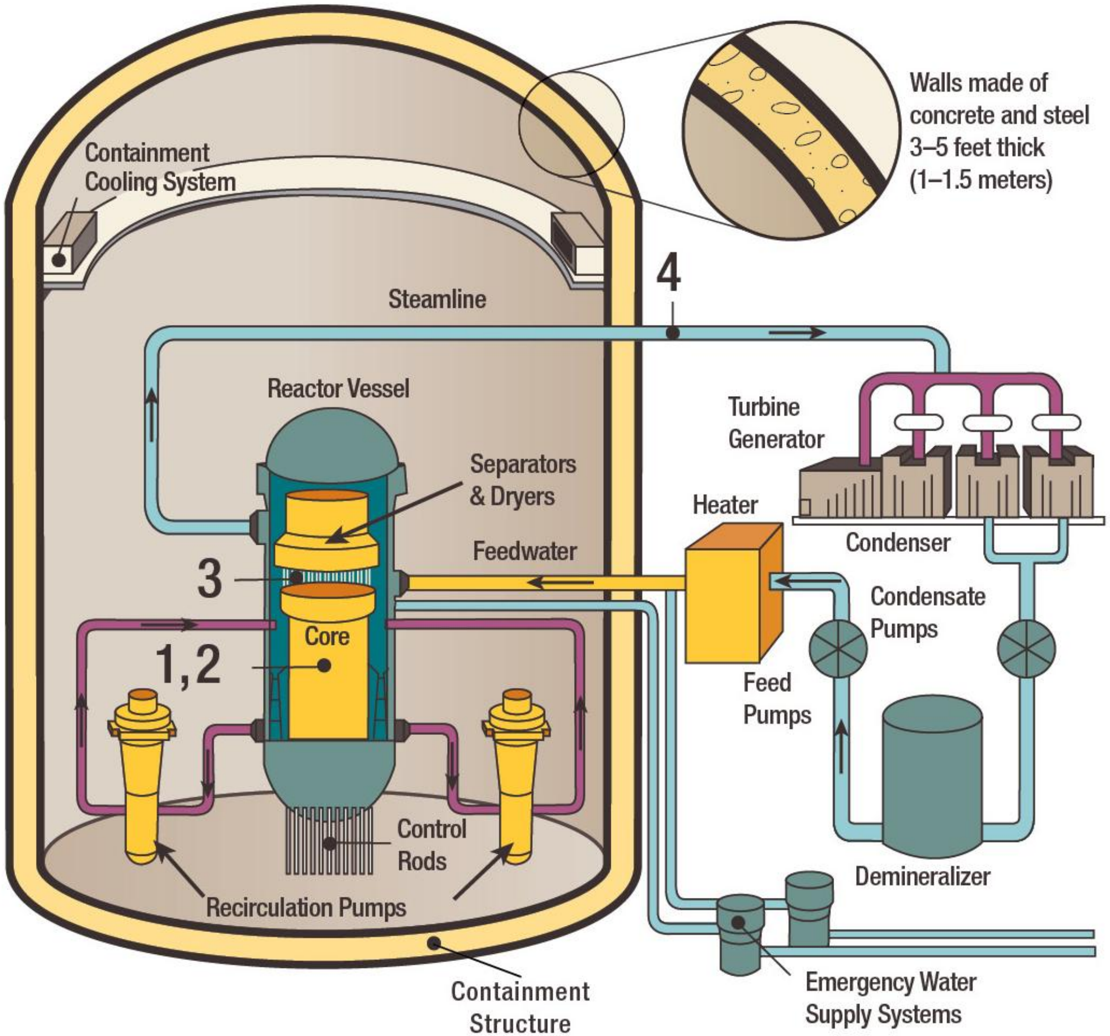
In a typical design concept of a commercial BWR, the following process occurs:

1. The core inside the reactor vessel creates heat.
2. A steam-water mixture is produced when very pure water (reactor coolant) moves upward through the core, absorbing heat.
3. The steam-water mixture leaves the top of the core and enters the two stages of moisture separation where water droplets are removed before the steam is allowed to enter the steamline.
4. The steamline directs the steam to the main turbine, causing it to turn the turbine generator, which produces electricity.

The unused steam is exhausted to the condenser, where it is condensed into water. The resulting water is pumped out of the condenser with a series of pumps, reheated, and pumped back to the reactor vessel. The reactor's core contains fuel assemblies that are cooled by water circulated using electrically powered pumps. These pumps and other operating systems in the plant receive their power from the electrical grid. If offsite power is lost, emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators. Other safety systems, such as the containment cooling system, also need electric power. BWRs contain between 370–800 fuel assemblies.

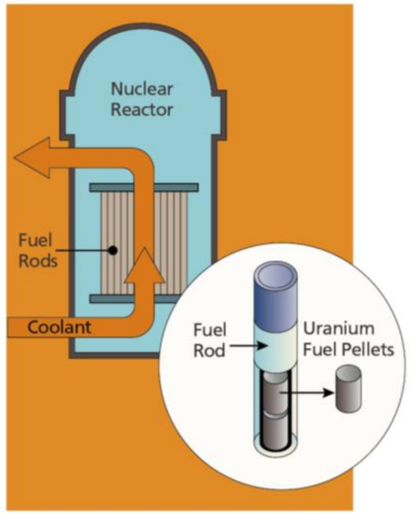


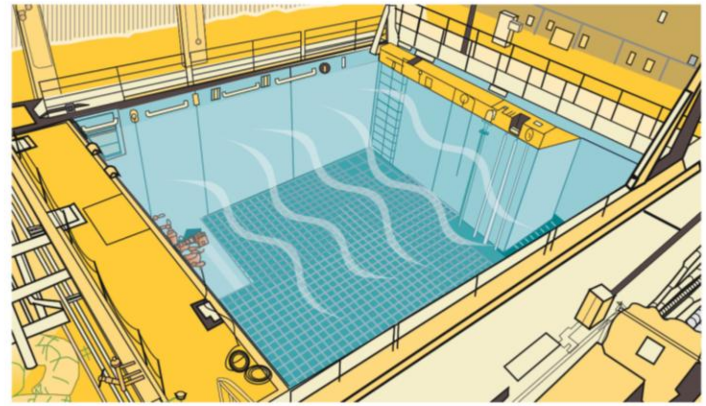
Typical Boiling-Water Reactor



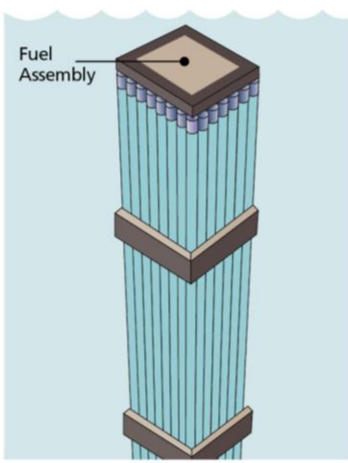
Spent Fuel Generation and Storage after Use

1 A nuclear reactor is powered by enriched uranium-235 fuel. Fission (splitting of atoms) generates heat, which produces steam that turns turbines to produce electricity. A reactor rated at several hundred megawatts may contain 100 or more tons of fuel in the form of bullet-sized pellets loaded into long metal rods that are bundled together into fuel assemblies. PWRs contain between 150 and 200 fuel assemblies. BWRs contain between 370 and 800 fuel assemblies.

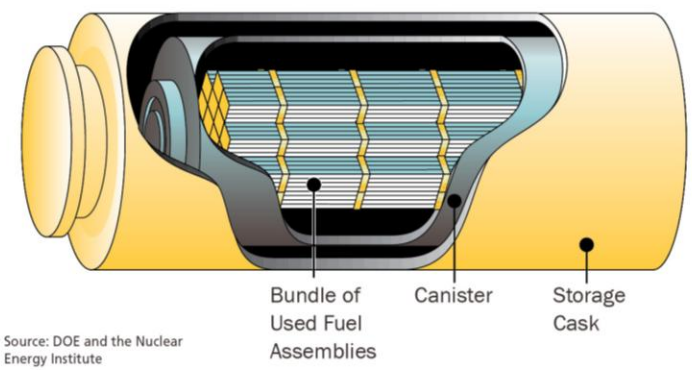




3 Commercial light-water nuclear reactors store spent radioactive fuel in a steel-lined, seismically designed concrete pool under about 40 feet (12.2 meters) of water that provides shielding from radiation. Water pumps supply continuously flowing water to cool the spent fuel. Extra water for the pool is provided by other pumps that can be powered from an onsite emergency diesel generator. Support features, such as water-level monitors and radiation detectors, are also in the pool. Spent fuel is stored in the pool until it can be transferred to dry casks on site (as shown in Figure 42) or transported off site to a high-level radioactive waste disposal site.

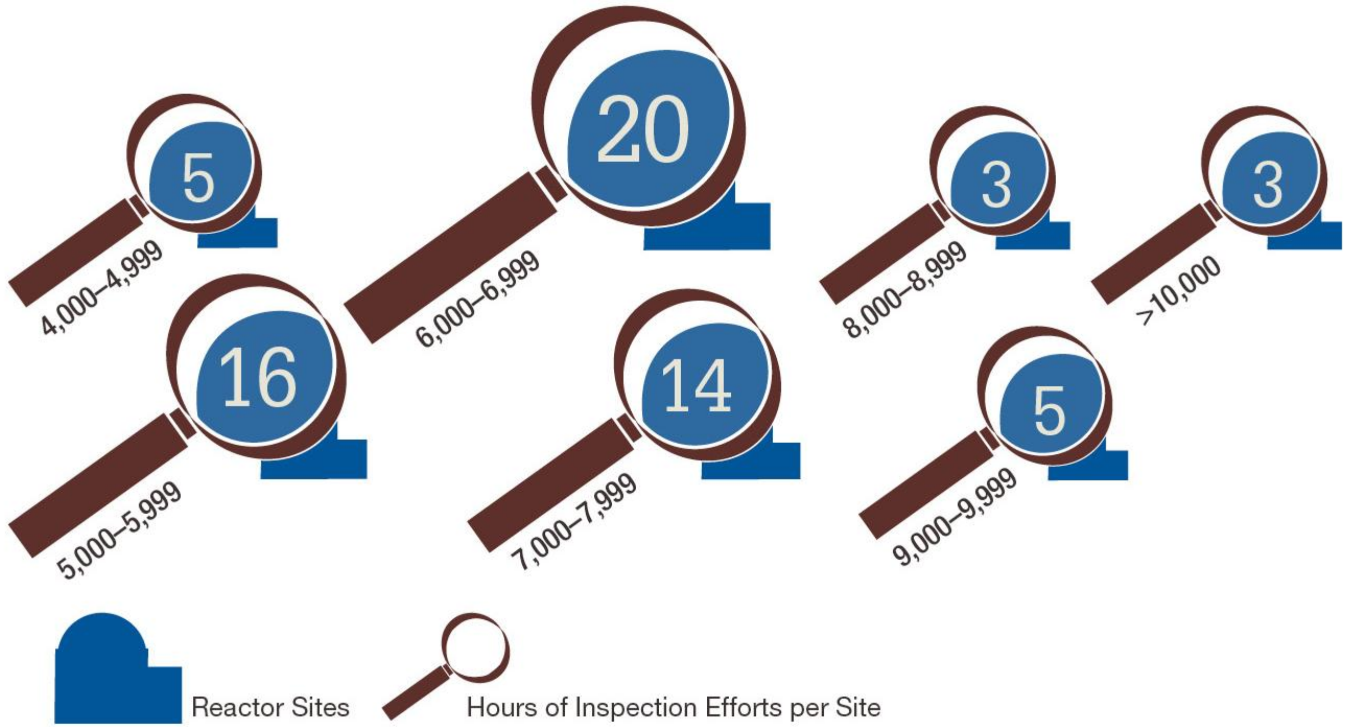


2 After about 6 years, spent fuel assemblies—typically 14 feet (4.3 meters) long and containing nearly 200 fuel rods for PWRs and 80–100 fuel rods for BWRs—are removed from the reactor and allowed to cool in storage pools for a few years. At this point, the 900-pound (409-kilogram) assemblies contain only about one-fifth the original amount of uranium-235.



Source: DOE and the Nuclear Energy Institute

NRC Inspection Effort at Operating Reactors, 2011

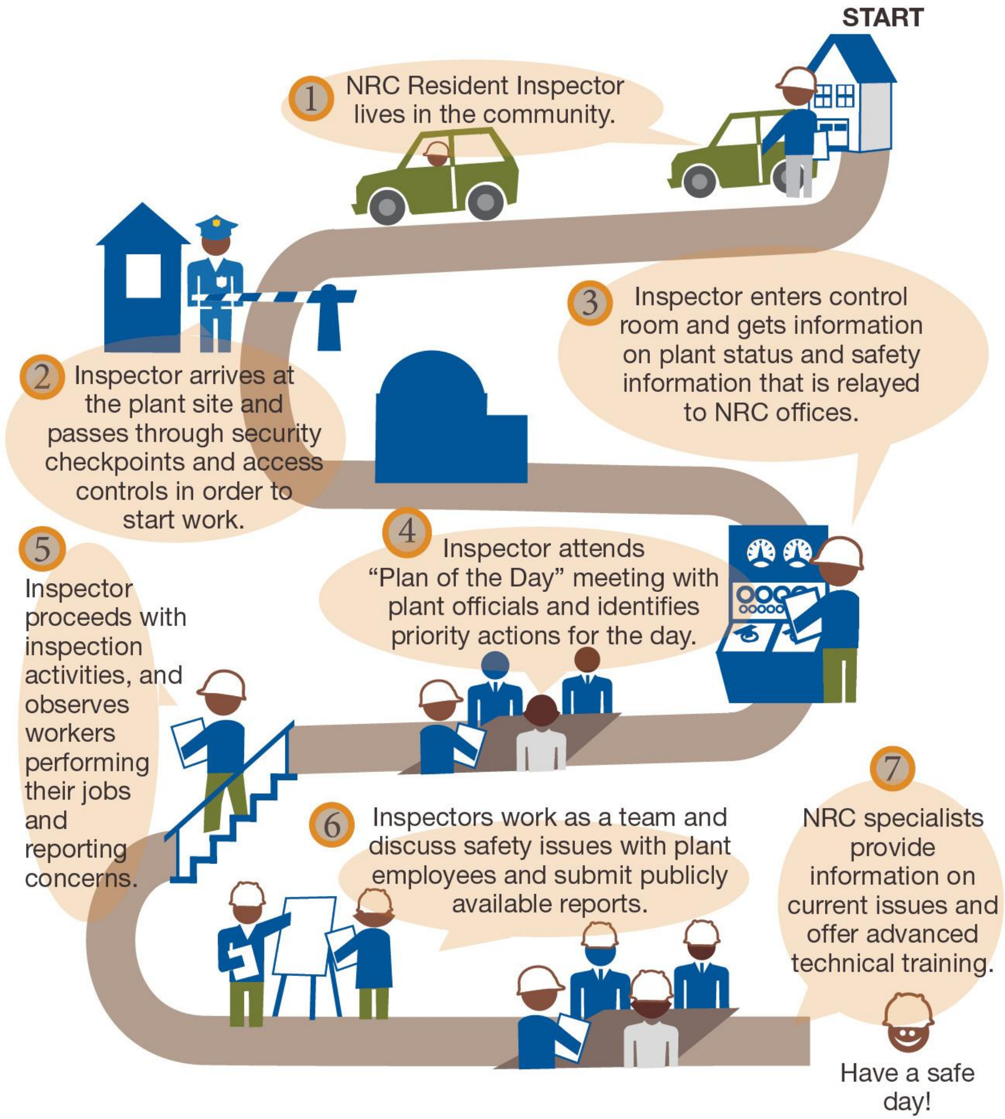


Note: Data include Calendar Year (CY) 2011 hours for all activities related to baseline, plant-specific, generic safety issue, and allegation inspections.

* 66 total sites (including Indian Point Units 2 and 3, which are treated as separate sites for inspection effort)

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

Day in the Life of an NRC Resident Inspector

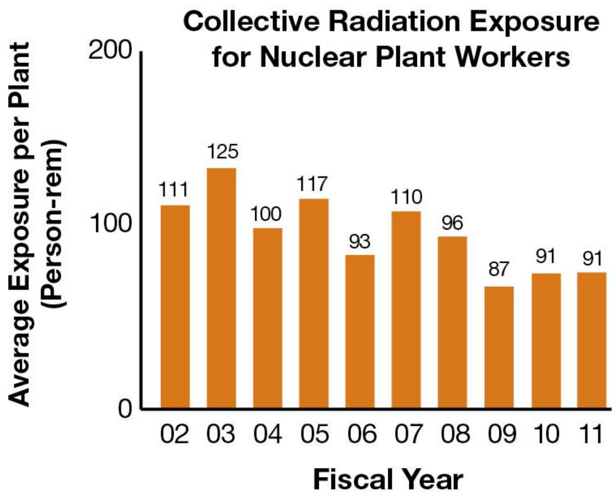


Reactor Oversight Action Matrix Performance Indicators

Performance Indicators

Inspection Findings

Industry Performance Indicators: FYs 2002–2011 Averages



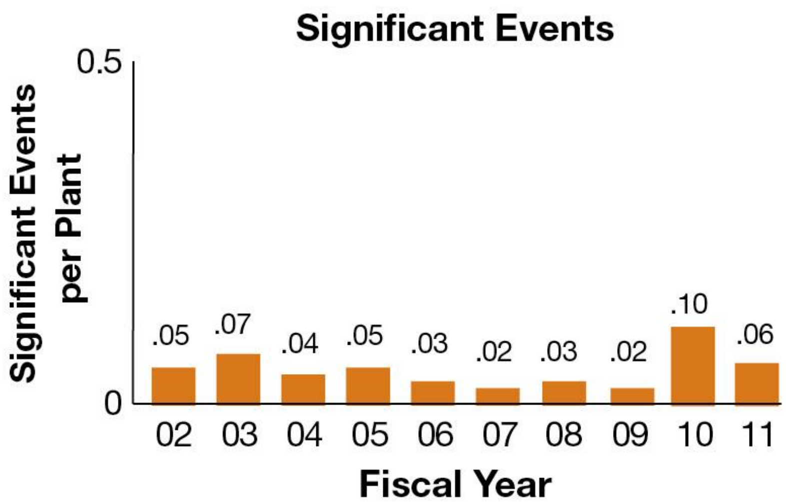
This indicator monitors the total radiation dose accumulated by plant personnel.

Further Explanation:
In 2011, those workers receiving a measurable dose of radiation received an average of about 0.1 rem. For comparison purposes, the average U.S. citizen receives 0.3 rem of radiation each year from natural sources (i.e., the everyday environment). See the definition of "exposure" in the Glossary.

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

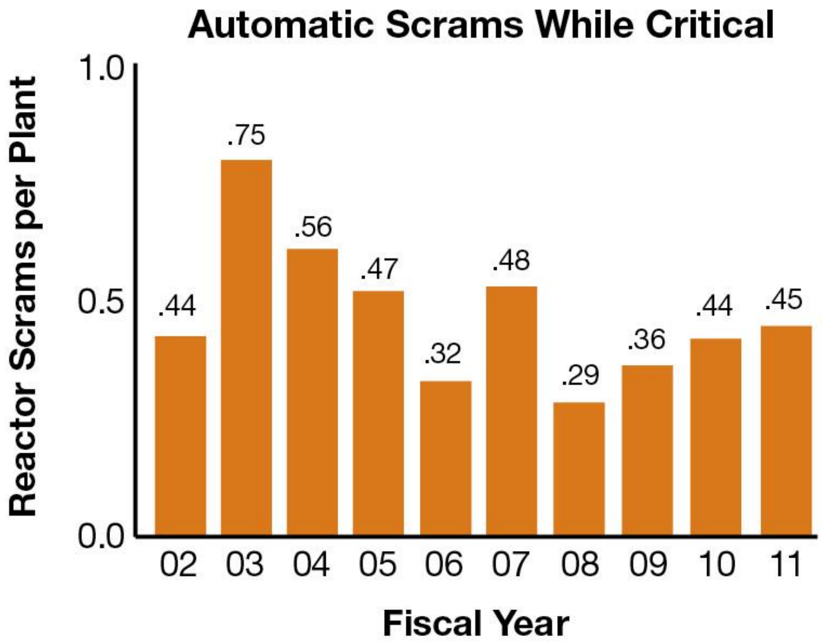
Source: Licensee data as compiled by the NRC

Industry Performance Indicators: FYs 2002–2011 Averages



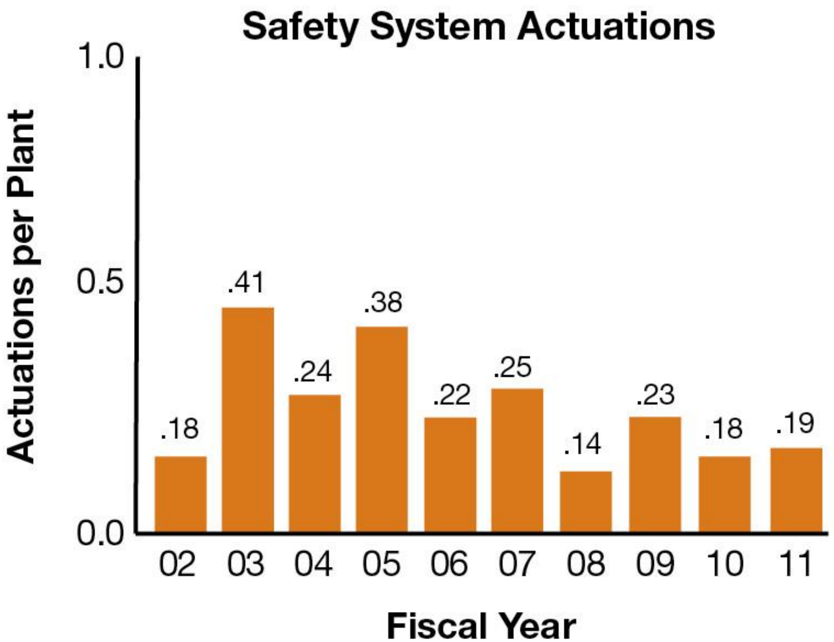
Significant events are events that meet specific NRC criteria, for example, degradation of safety equipment, a sudden reactor shutdown with complications, or an unexpected response to a sudden degradation of fuel or pressure boundaries. The NRC staff identifies significant events through detailed screening and evaluation of operating experience.

Industry Performance Indicators: FYs 2002–2011 Averages



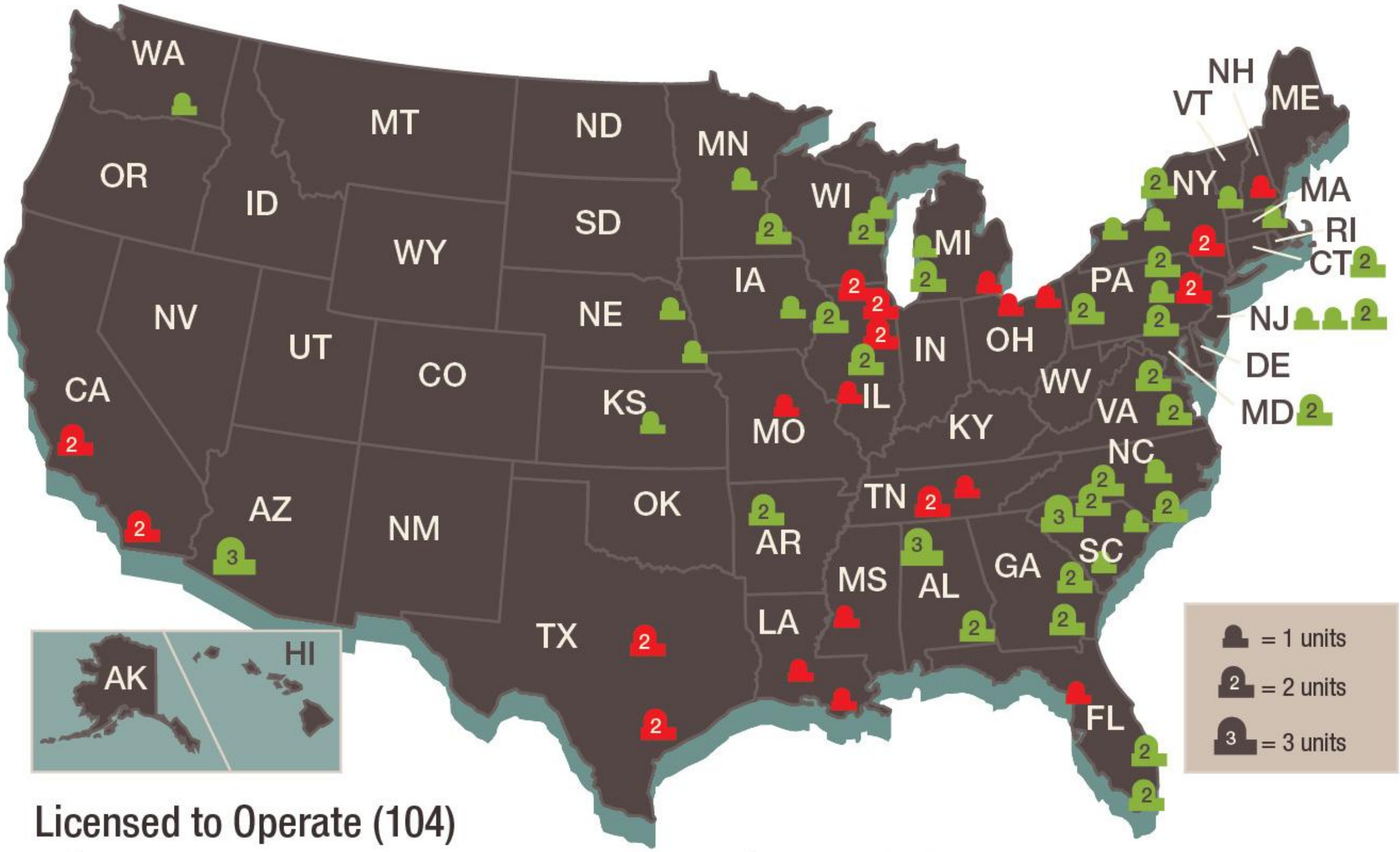
A reactor is said to be "critical" when it achieves a self-sustaining nuclear chain reaction, such as when the reactor is operating. The sudden shutting down of a nuclear reactor by the rapid insertion of control rods, either automatically or manually by the reactor operator, is referred to as a "scram." This indicator measures the number of unplanned automatic scrams that occurred while the reactor was critical.

Industry Performance Indicators: FYs 2002–2011 Averages



Safety system actuations are certain manual or automatic actions taken to start emergency core cooling systems or emergency power systems. These systems are specifically designed to either remove heat from the reactor fuel rods if the normal core cooling system fails or provide emergency electrical power if the normal electrical systems fail.

License Renewals Granted for Operating Nuclear Power Reactors



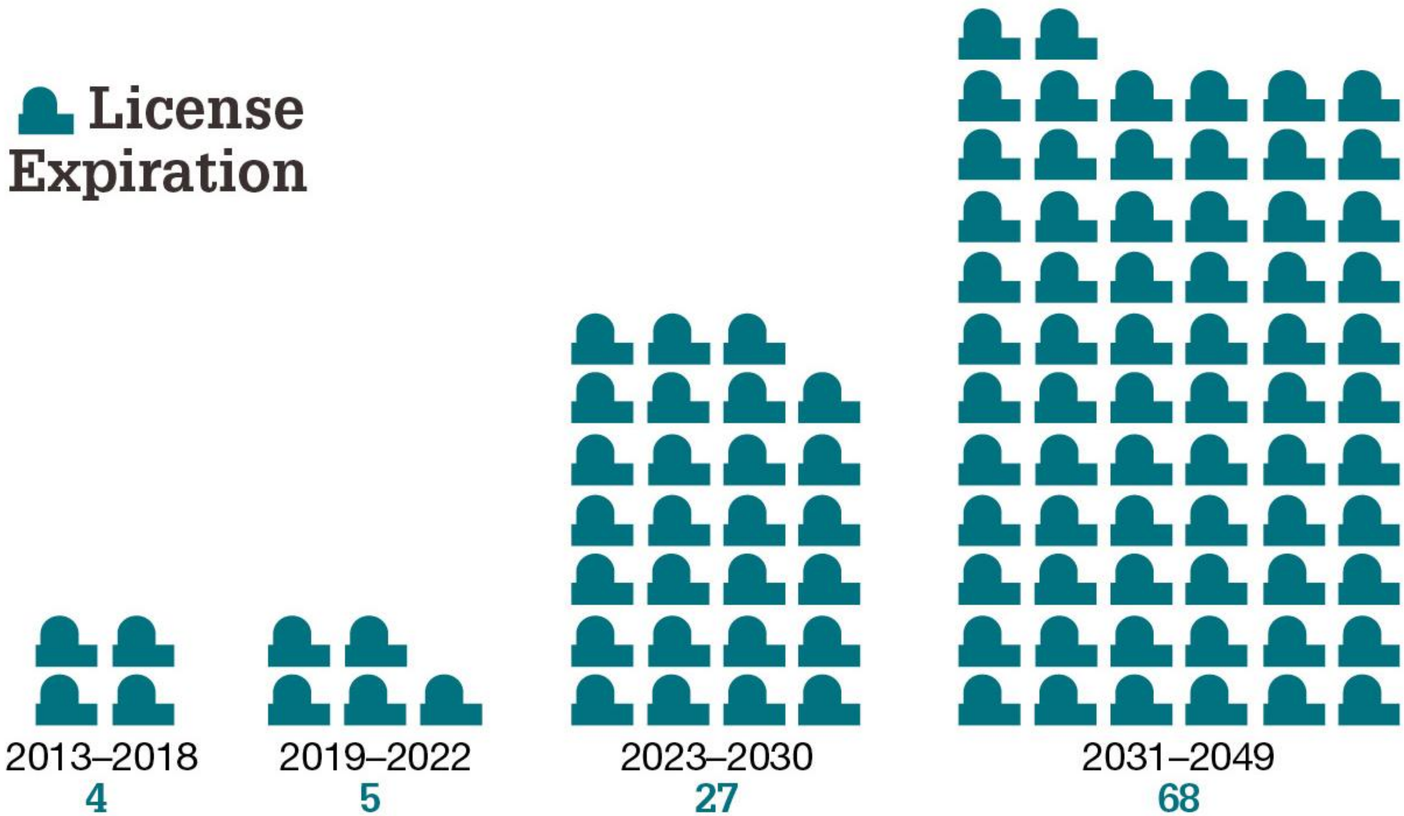
Licensed to Operate (104)

Original License (31) License Renewal Granted (73)

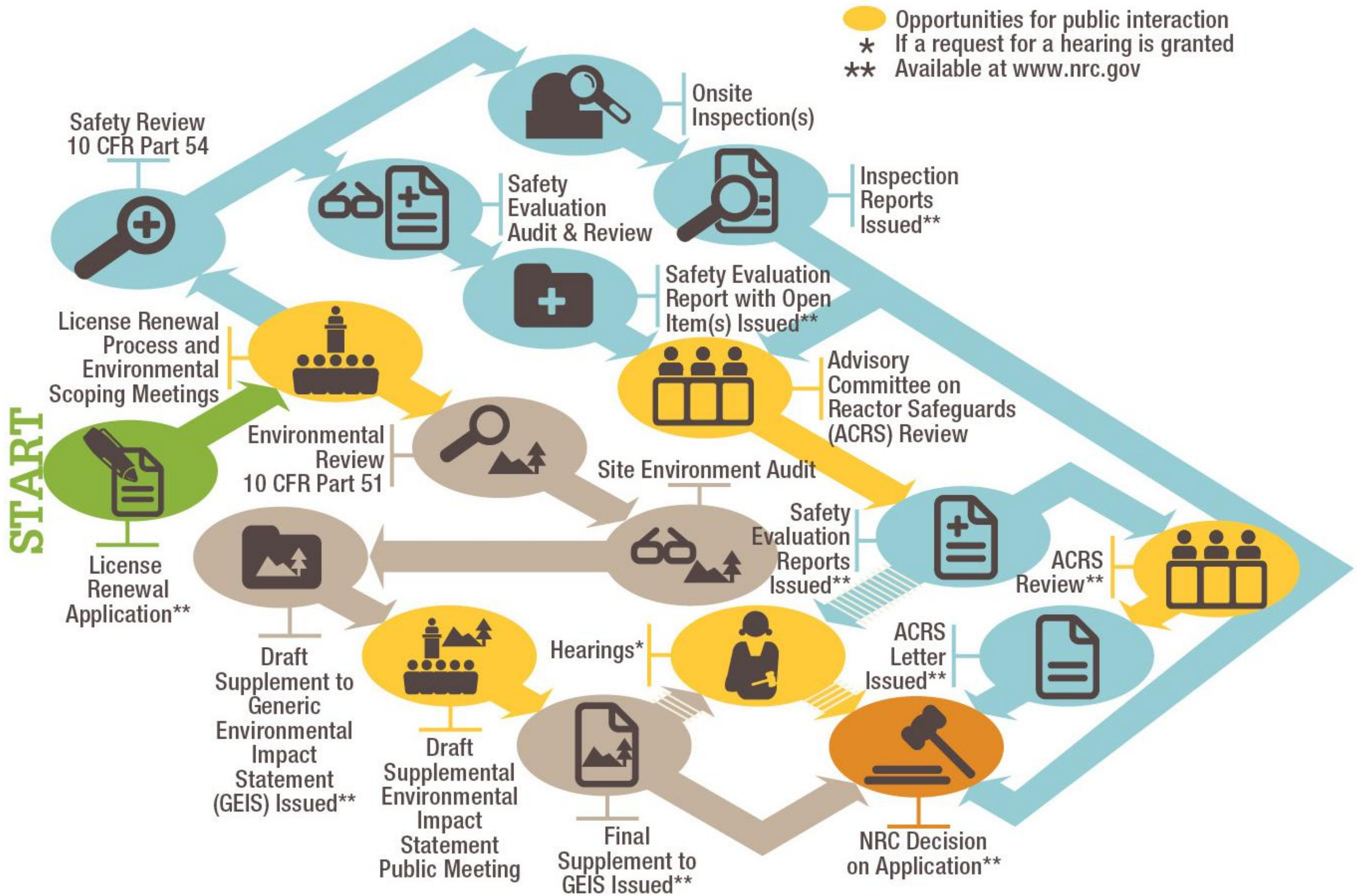
U.S. Commercial Nuclear Power Reactors— Years of Operation by the End of 2012

Note: Ages have been rounded up to the end of the year.

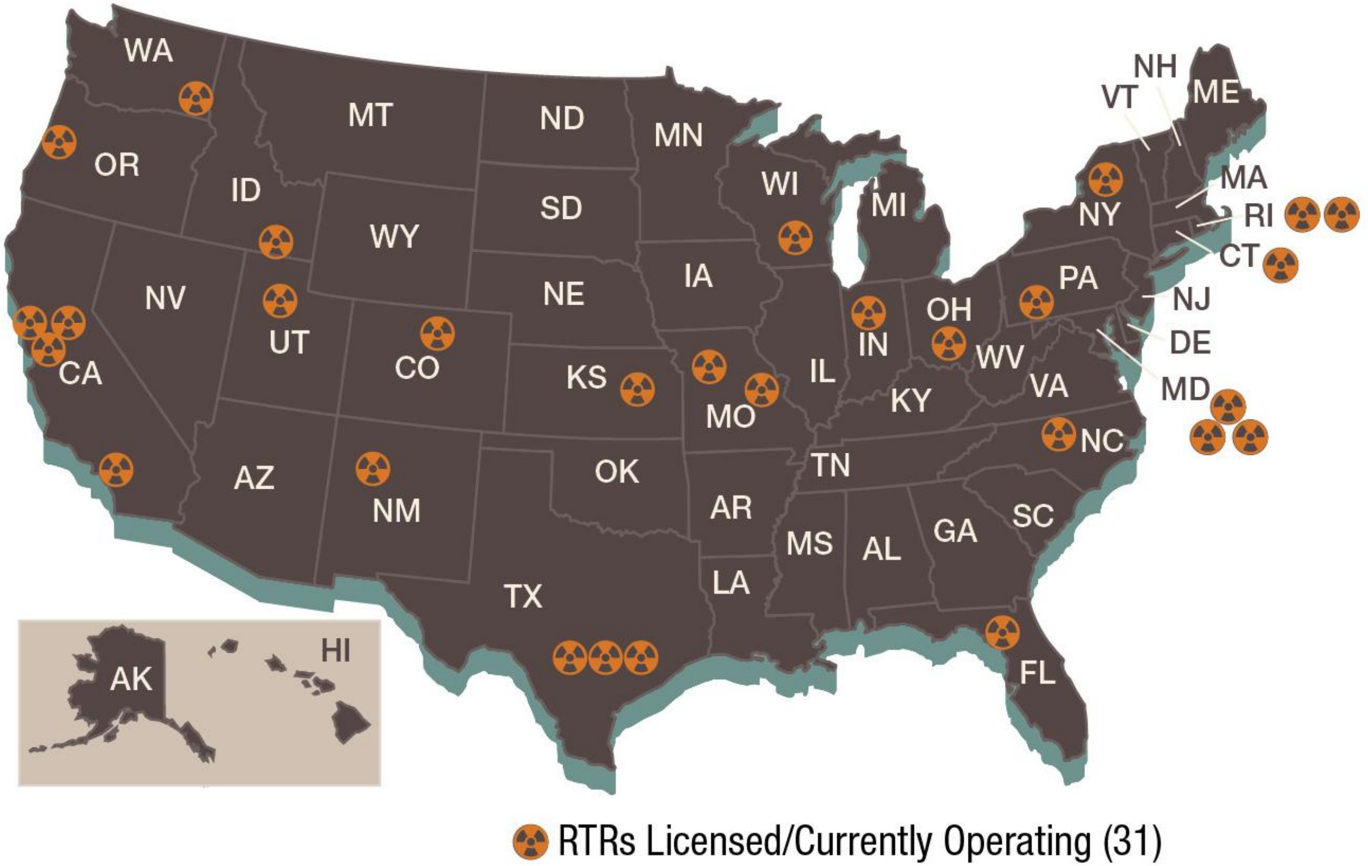
U.S. Commercial Nuclear Power Reactor Operating Licenses—Expiration by Year

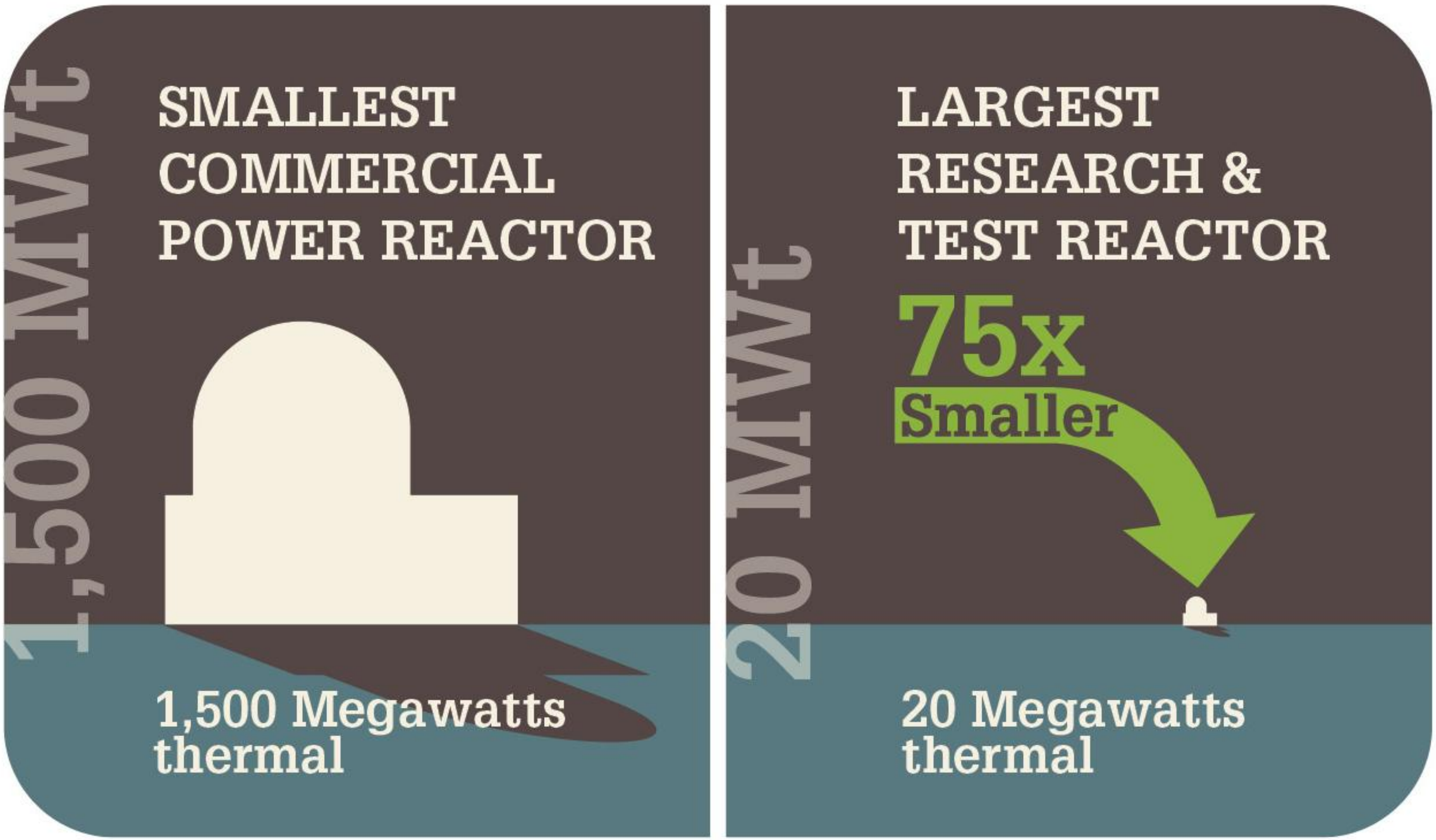


License Renewal Process

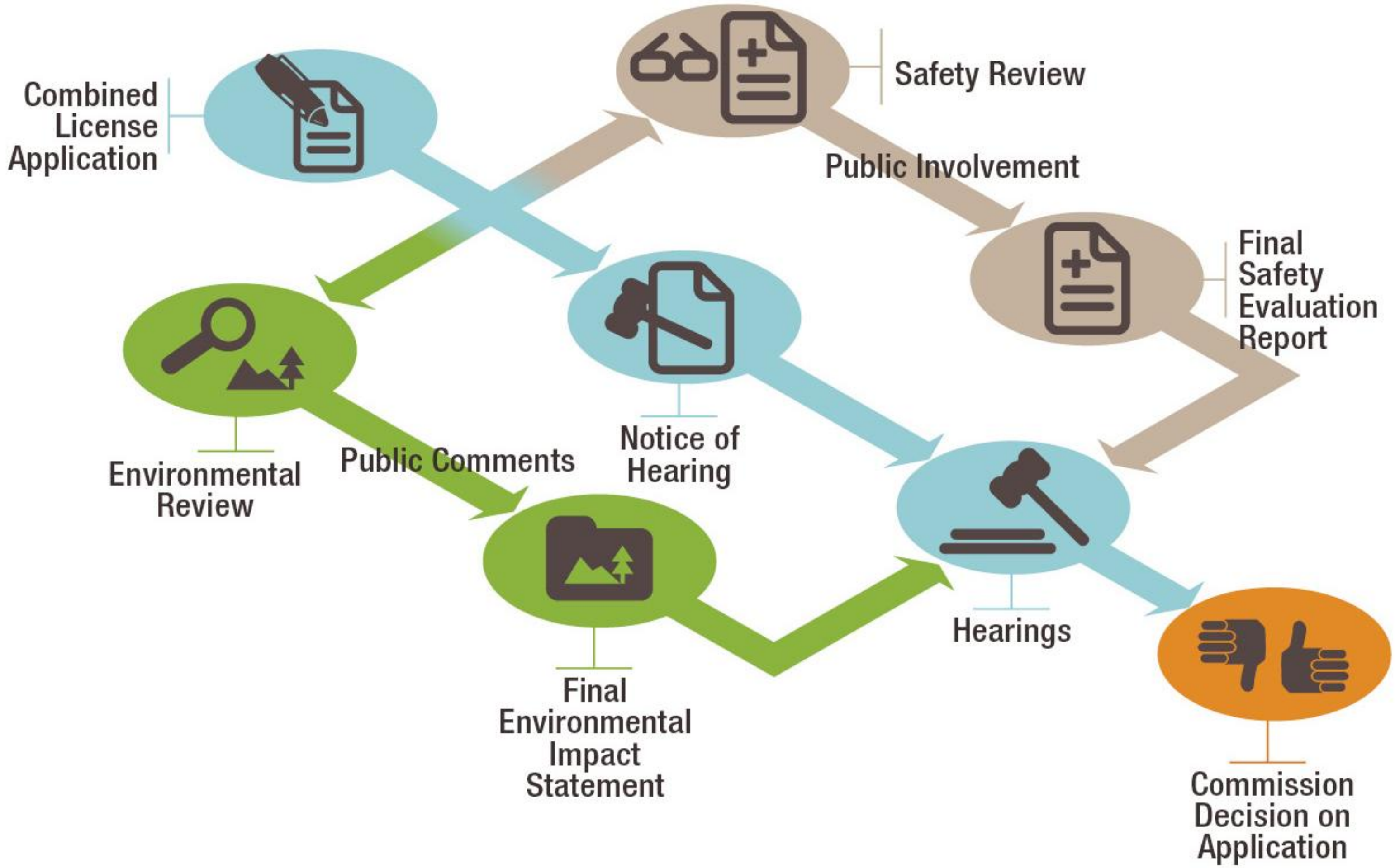


U.S. Nuclear Research and Test Reactors

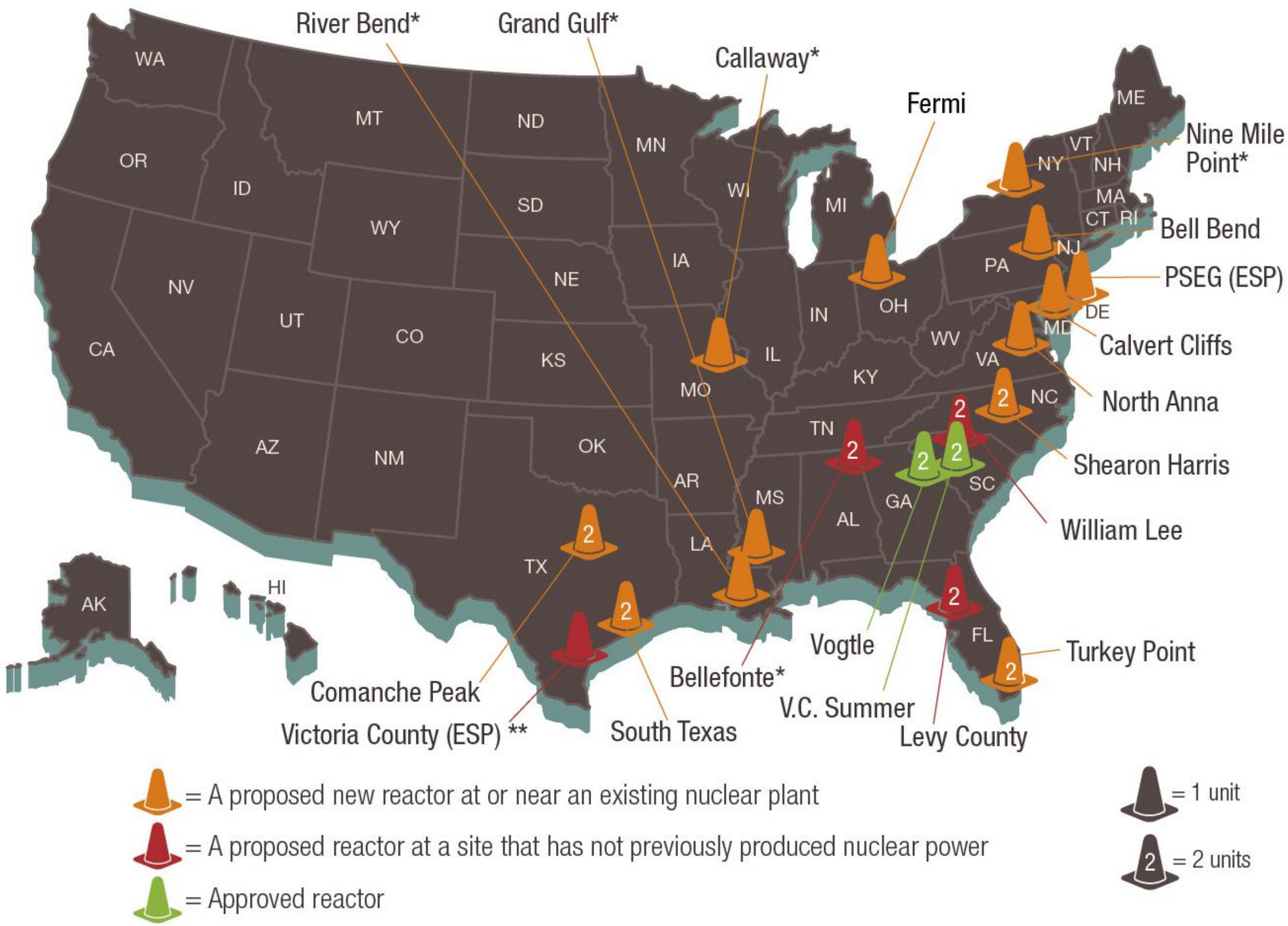



1,500 MWt
SMALLEST COMMERCIAL POWER REACTOR
1,500 Megawatts thermal
20 MWt
LARGEST RESEARCH & TEST REACTOR
75x
Smaller
20 Megawatts thermal

New Reactor Licensing Process



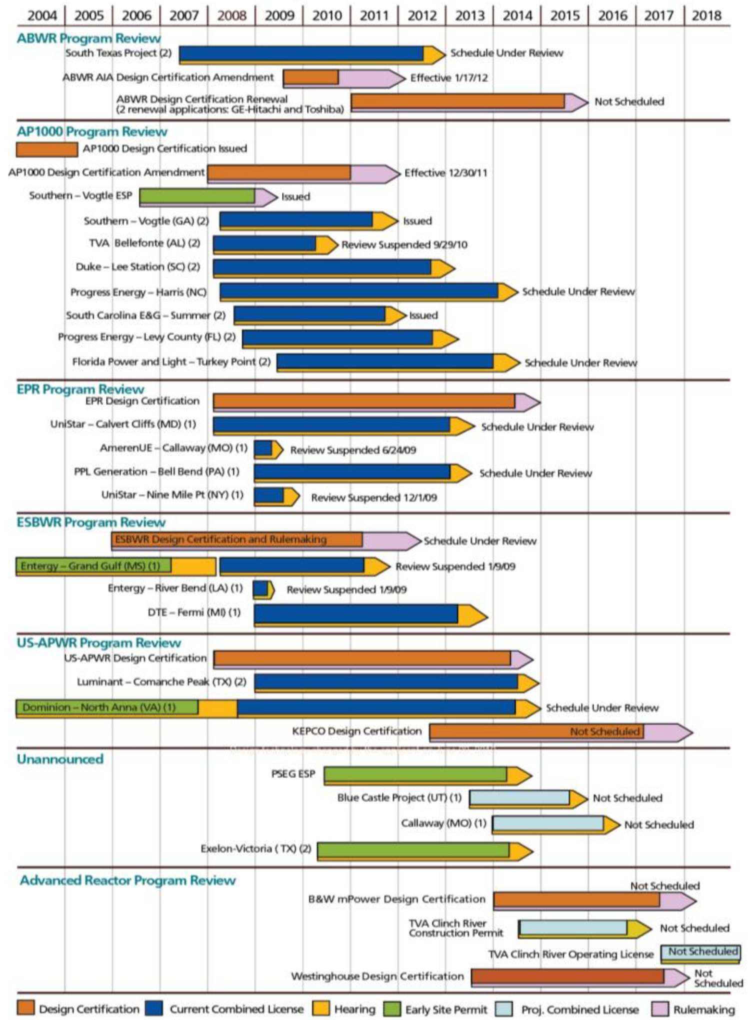
Locations of New Nuclear Power Reactors Applications



* Review suspended ** COL application amended by applicant to ESP on March 25, 2010.
Note: Data is as of June 2012.

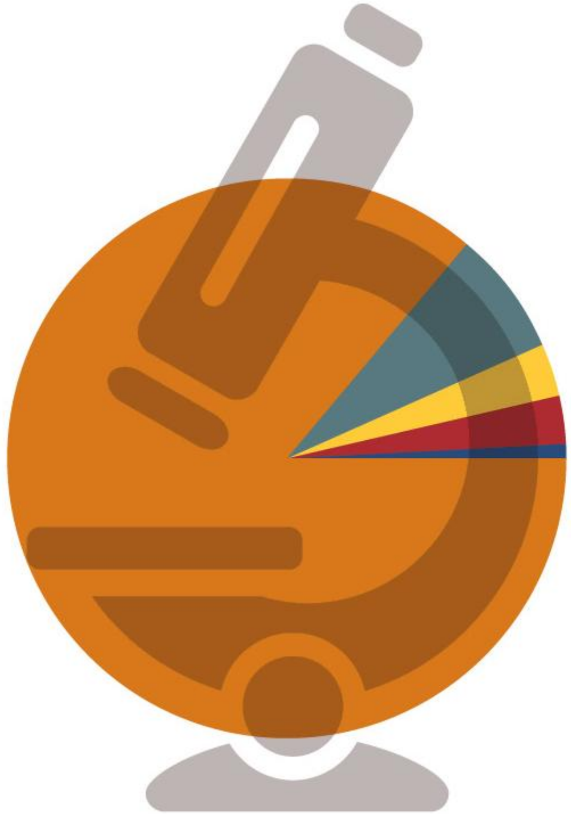
New Reactor Licensing Schedule of Applications by Design

Estimated Schedules by Calendar Year (as of June 1, 2012)



Note: Lines depict approximate dates on schedule. Data on projected applications are based on information from potential applicants and are subject to change. Schedules depicted for future activities represent nominal assumed review durations based on submittal timeframes in letters of intent from prospective applicants. Numbers in ( ) next to the COL name indicate the number of units per site. The acceptance review is included at the beginning of the COL review. The rules in 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," govern hearings on COLs.

NRC Research Funding, FY 2012



Total $49.8 Million

- Reactor Program—$42.8 M
- New/Advanced Reactor Licensing—$3.7 M
- Homeland Security—$1.5 M
- Materials and Waste—$1.3 M
- Infrastructure Support—$0.4 M

Note: Totals may not equal sum of components because of rounding.

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United States Nuclear Regulatory Commission
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U.S. New Nuclear Power Plant Applications

Company (Project/Docket #)	Date of Application	Design	Date Accepted	Site Under Consideration	State	Existing Op. Plant
Calendar Year (CY) 2007 Applications						
NRG Energy (52-012/013)	9/20/07	ABWR	11/29/07	South Texas Project (2 units)	TX	Y
NuStart Energy (52-014/015)	10/30/07	AP1000	1/18/08	Bellefonte (2 units)	AL	N
UNISTAR (52-016)	7/13/07 (Env.), 3/13/08 (Safety)	EPR	1/25/08 6/3/08	Calvert Cliffs (1 unit)	MD	Y
Dominion (52-017)*	11/27/07	US-APWR	1/28/08	North Anna (1 unit)	VA	Y
Duke (52-018/019)	12/13/07	AP1000	2/25/08	William Lee Nuclear Station (2 units)	SC	N
2007 TOTAL NUMBER OF APPLICATIONS = 5 TOTAL NUMBER OF UNITS = 8						
CY 2008 Applications						
Progress Energy (52-022/023)	2/19/08	AP1000	4/17/08	Harris (2 units)	NC	Y
NuStart Energy (52-024)	2/27/08	ESBWR	4/17/08	Grand Gulf (1 unit)	MS	Y
Southern Nuclear Operating Co. (52-025/026)	3/31/08	AP1000	5/30/08	Vogtle (2 units)	GA	Y
South Carolina Electric & Gas (52-027/028)	3/31/08	AP1000	7/31/08	Summer (2 units)	SC	Y
Progress Energy (52-029/030)	7/30/08	AP1000	10/6/08	Levy County (2 units)	FL	N
Detroit Edison (52-033)	9/18/08	ESBWR	11/25/08	Fermi (1 unit)	MI	Y
Luminant Power (52-034/035)	9/19/08	US-APWR	12/2/08	Comanche Peak (2 units)	TX	Y
Entergy (52-036)	9/25/08	ESBWR	12/4/08	River Bend (1 unit)	LA	Y
AmerenUE (52-037)	7/24/08	EPR	12/12/08	Callaway (1 unit)	MO	Y
UNISTAR (52-038)	9/30/08	EPR	12/12/08	Nine Mile Point (1 unit)	NY	Y
PPL Generation (52-039)	10/10/08	EPR	12/19/08	Bell Bend (1 unit)	PA	Y
2008 TOTAL NUMBER OF APPLICATIONS = 11 TOTAL NUMBER OF UNITS = 16						
CY 2009 Applications						
Florida Power & Light Co. (52-040/041)	6/30/09	AP1000	9/4/09	Turkey Point (2 units)	FL	Y
2009 TOTAL NUMBER OF APPLICATIONS = 1 TOTAL NUMBER OF UNITS = 2						
CY 2010–2012 Applications						
No COL applications returned in CY 2010–2012.						
2010–2012 TOTAL NUMBER OF APPLICATIONS = 0 TOTAL NUMBER OF UNITS = 0						
CY 2013 Applications						
Blue Castle Project		TBD		Utah (1 unit)	UT	N
AmerenUE		TBD		Calloway (1 unit)	MO	Y
2013 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 2						
CY 2014 Applications						
One COL application is expected in fourth quarter of CY 2014.						
2014 TOTAL NUMBER OF APPLICATIONS = 1 TOTAL NUMBER OF UNITS = 6						
2007–2014 TOTAL NUMBER OF APPLICATIONS = 23 TOTAL NUMBER OF UNITS = 296						

☐ – Accepted/Docketed ☐ – Expected ☐ – Approved

* Design technology was changed by the applicant on June 28, 2010.

Note: Application updates in this table do not show all projects previously mentioned because of changes in intent status or conversion to an ESP from a COL application. Data are shown as of June 30, 2012.

Moisture Density Gauge

Direct Transmission

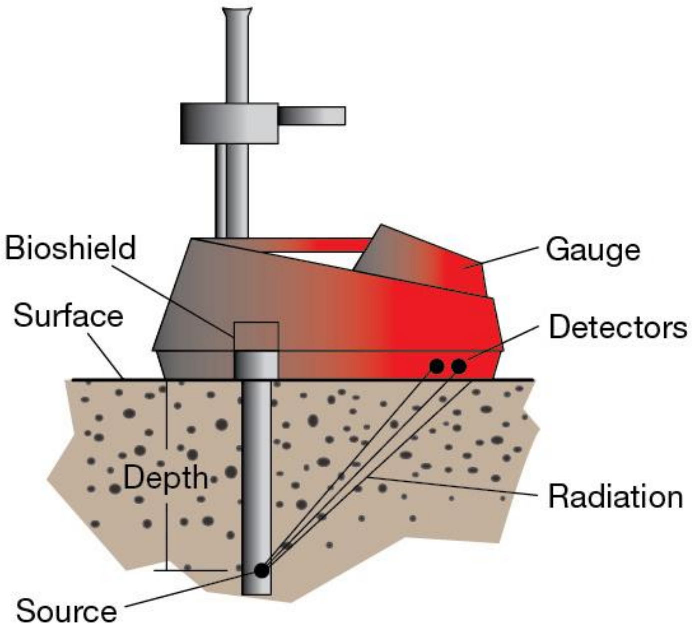
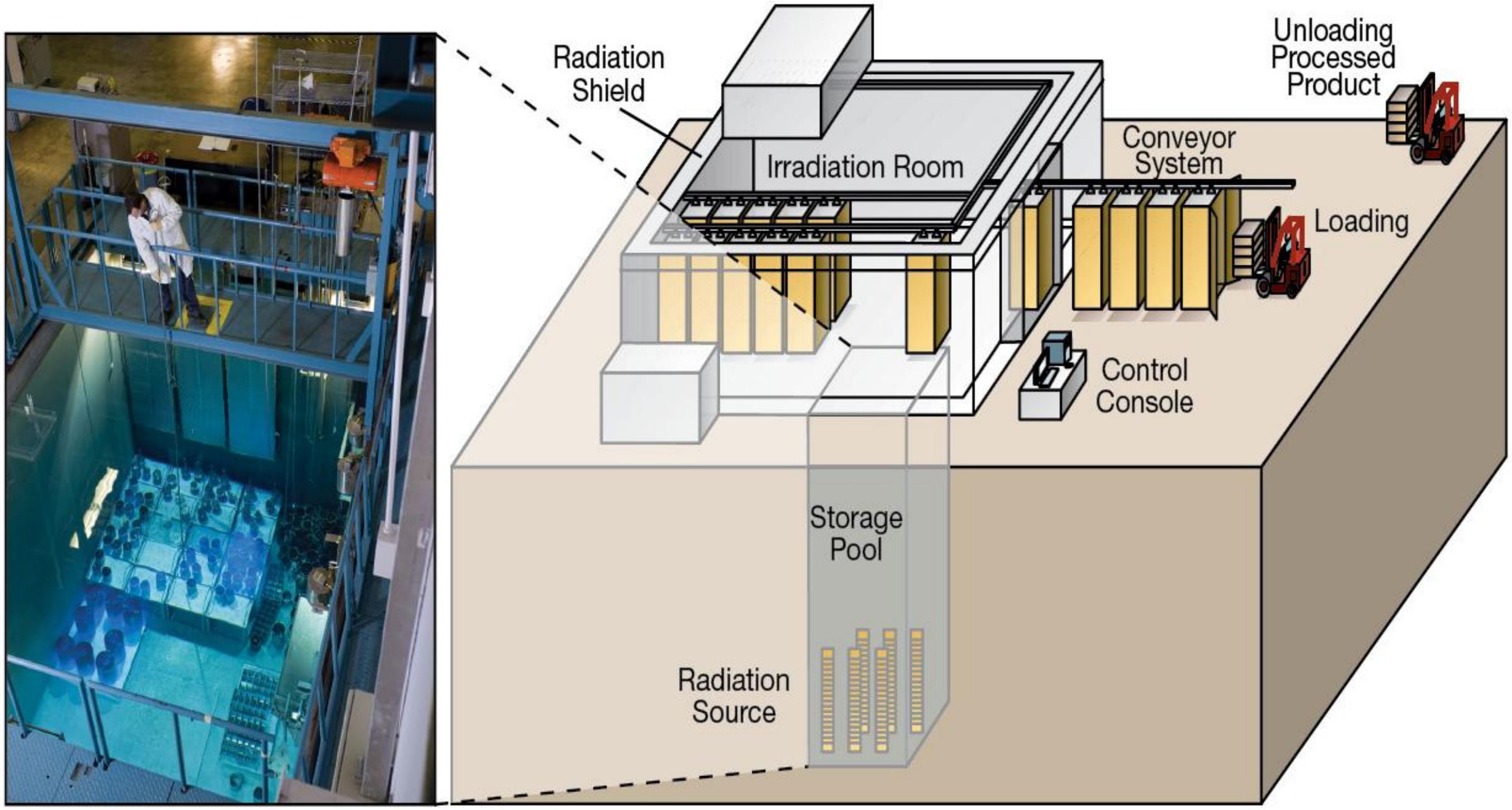


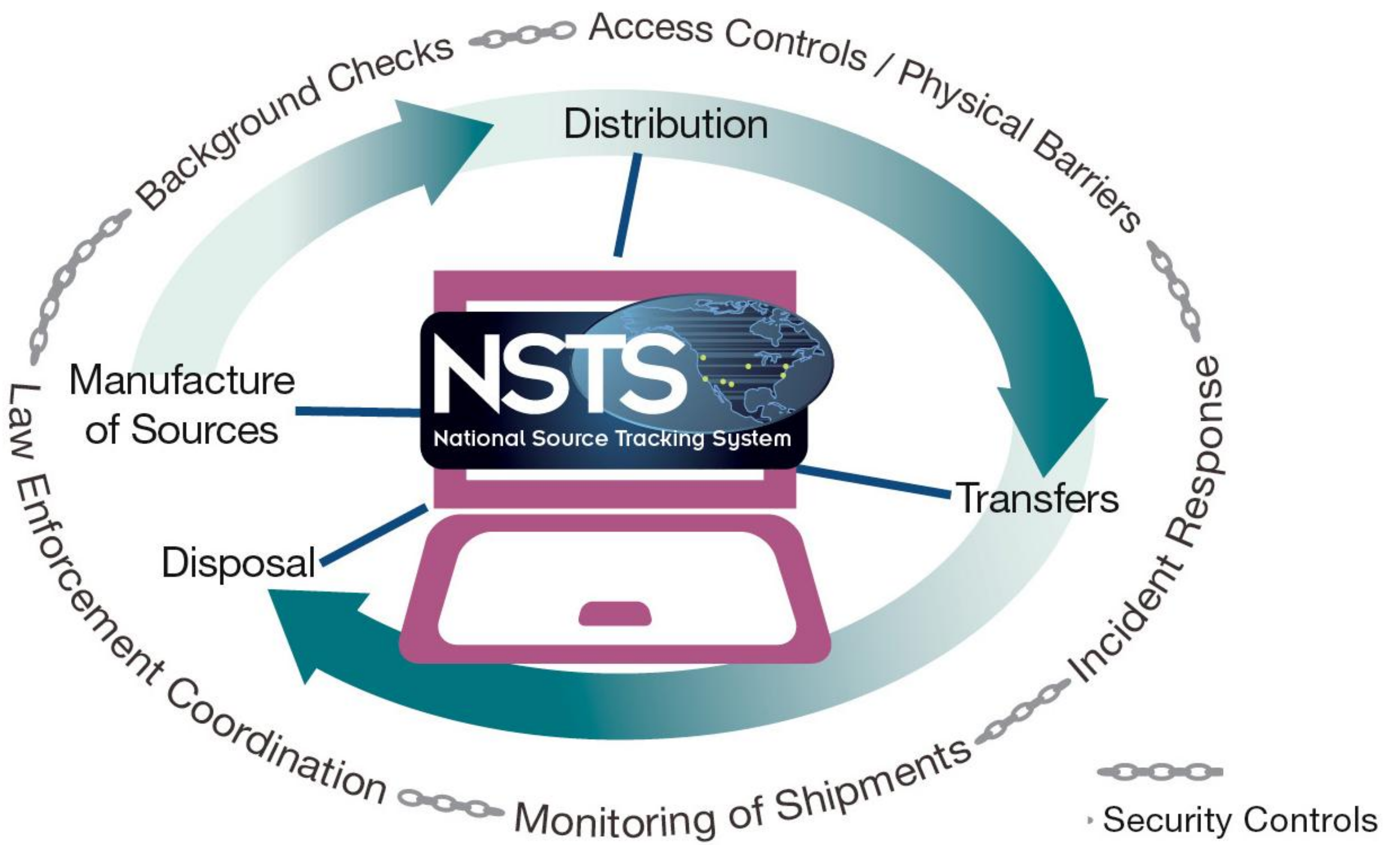
Photo courtesy: APNGA

A moisture density gauge indicates whether a foundation is suitable for constructing a building or roadway.

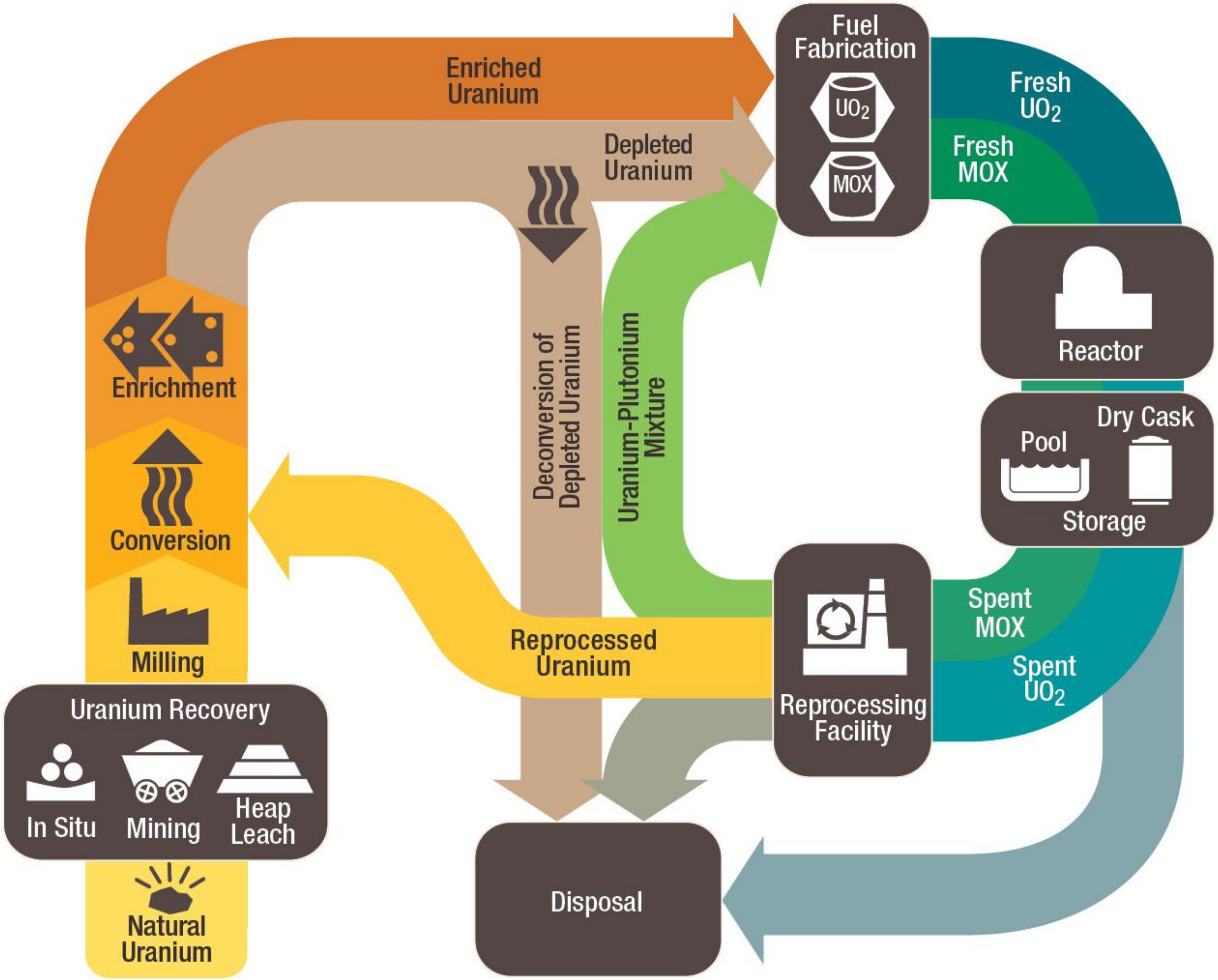
Commercial Irradiator



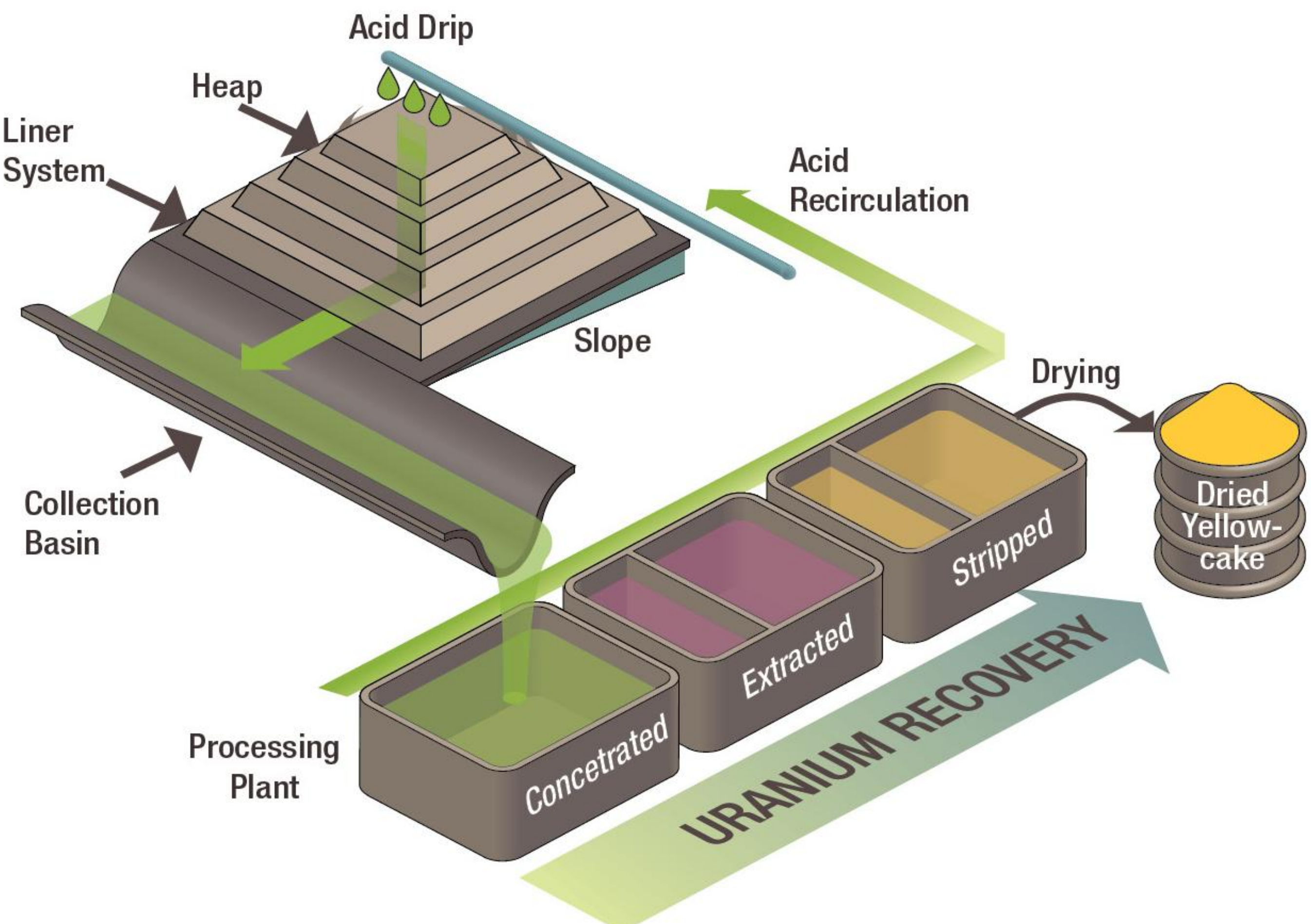
Life-Cycle Approach to Source Security



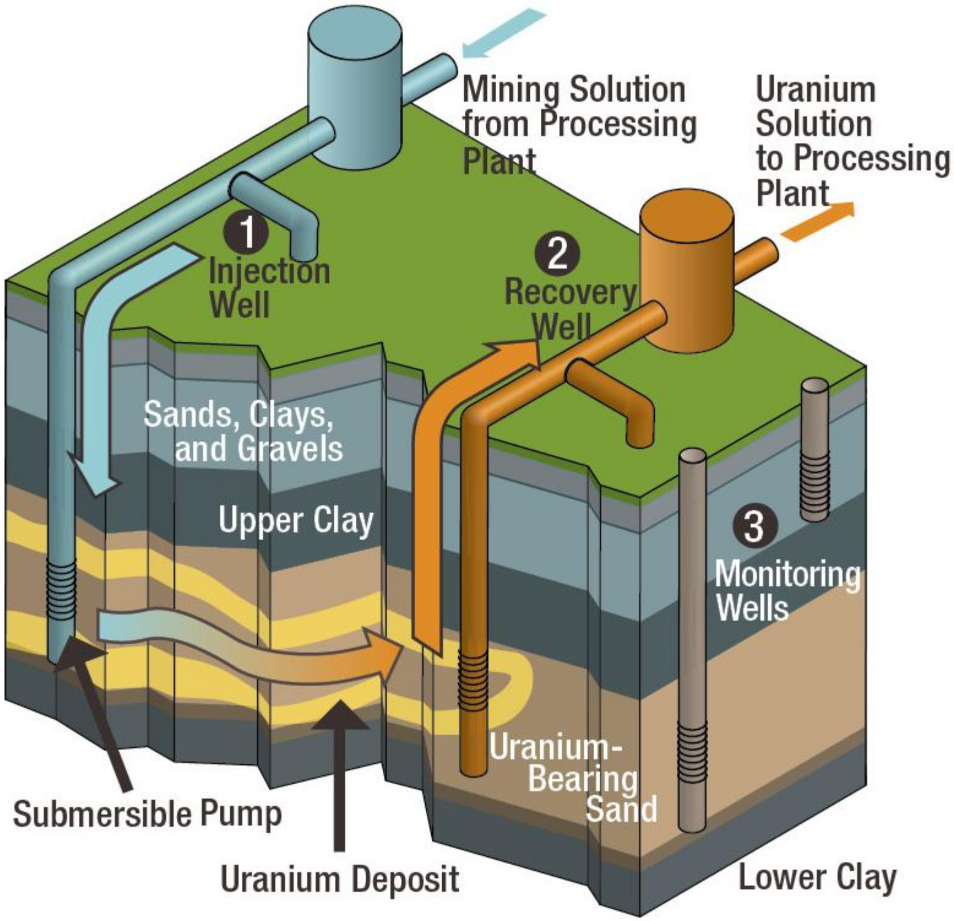
The Nuclear Fuel Cycle



The Heap Leach Recovery Process



The In Situ Uranium Recovery Process



Injection wells (1) pump a chemical solution—typically groundwater mixed with sodium bicarbonate, hydrogen peroxide, and oxygen—into the layer of earth containing uranium ore. The solution dissolves the uranium from the deposit in the ground and is then pumped back to the surface through recovery wells (2) and sent to the processing plant to be processed into uranium yellowcake. Monitoring wells (3) are checked regularly to ensure that uranium and chemicals are not escaping from the drilling area.

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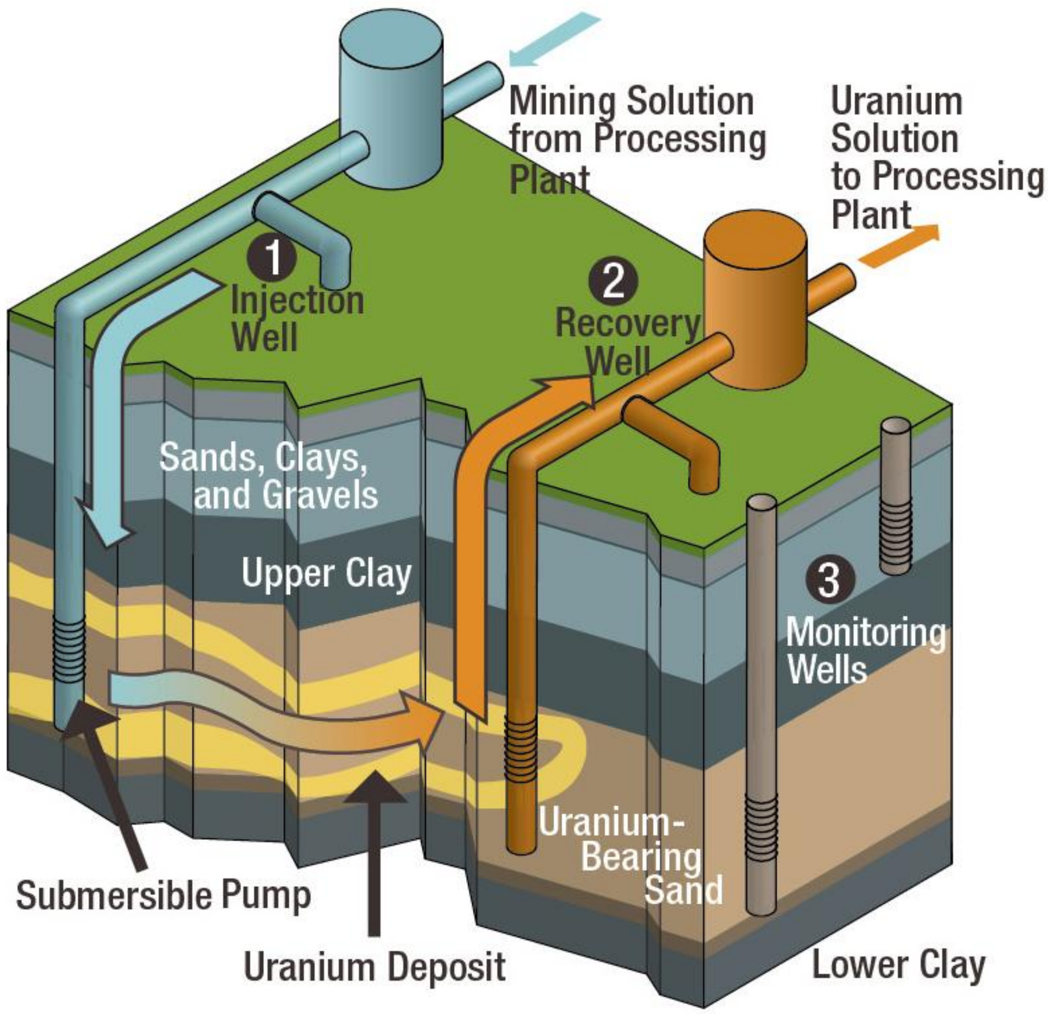
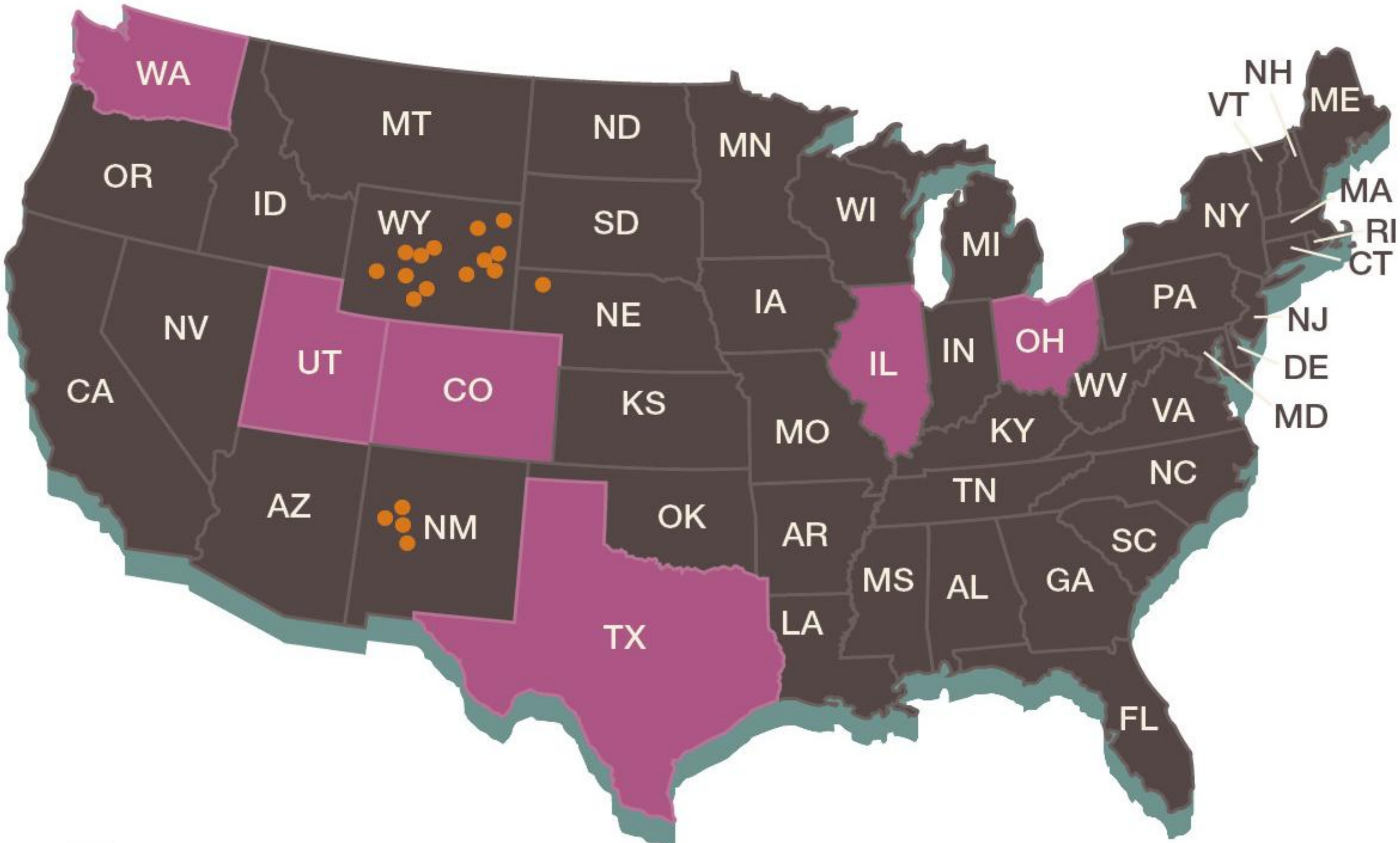
The In Situ Uranium Recovery Process

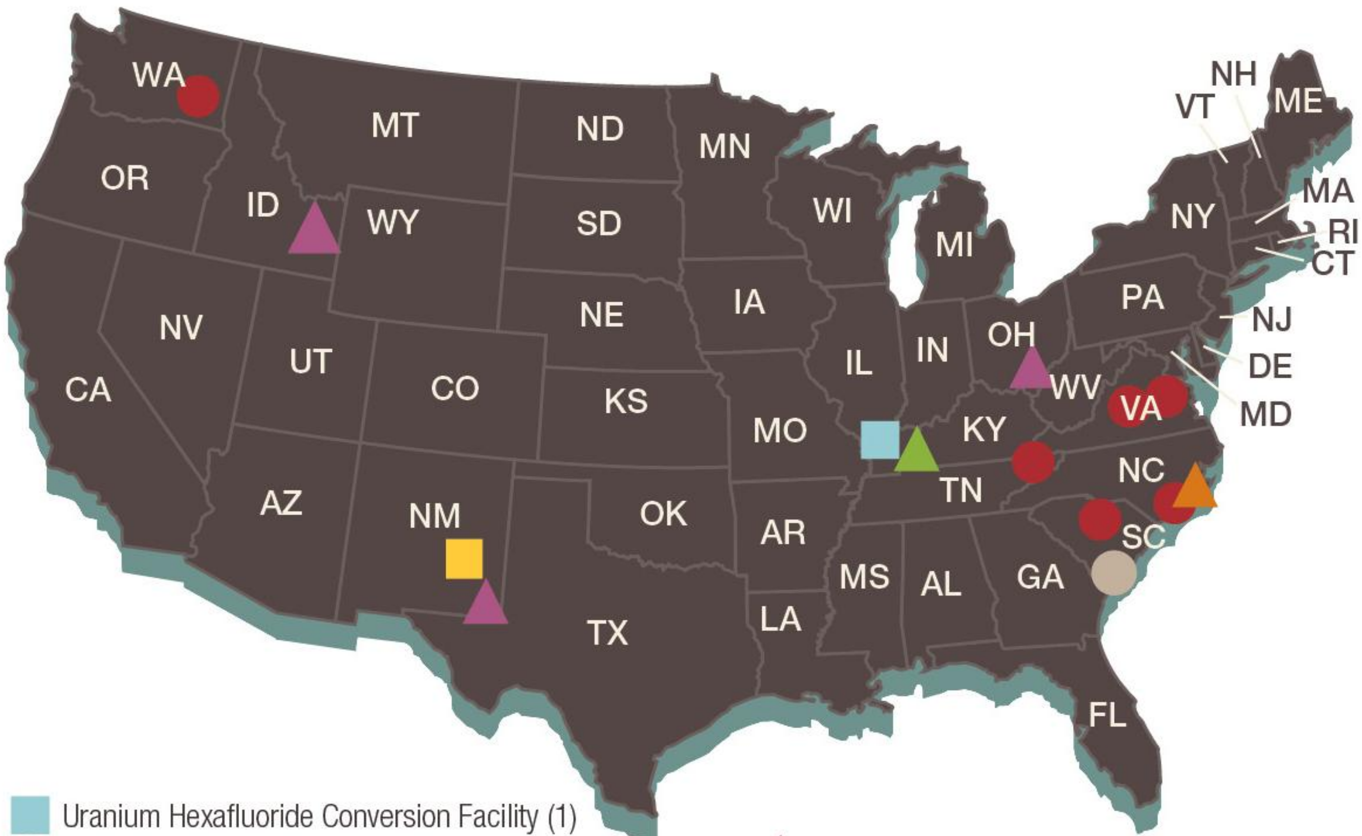


Locations of NRC-Licensed Uranium Recovery Facility Sites



- States with authority to license uranium recovery facility sites
- States where the NRC has retained authority to license uranium recovery facilities
- NRC-licensed uranium recovery facility sites (18)

Locations of Fuel Cycle Facilities

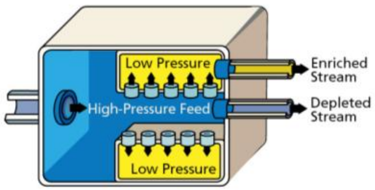


- Uranium Hexafluoride Conversion Facility (1)
- Uranium Fuel Fabrication Facility (6)
- Mixed Oxide Fuel Fabrication Facility (1)
- Gaseous Diffusion Uranium Enrichment Facility (2)
- Gas Centrifuge Uranium Enrichment Facility (3)
- Laser Separation Enrichment Facility (1)
- Uranium Hexafluoride Deconversion Facility (1)

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

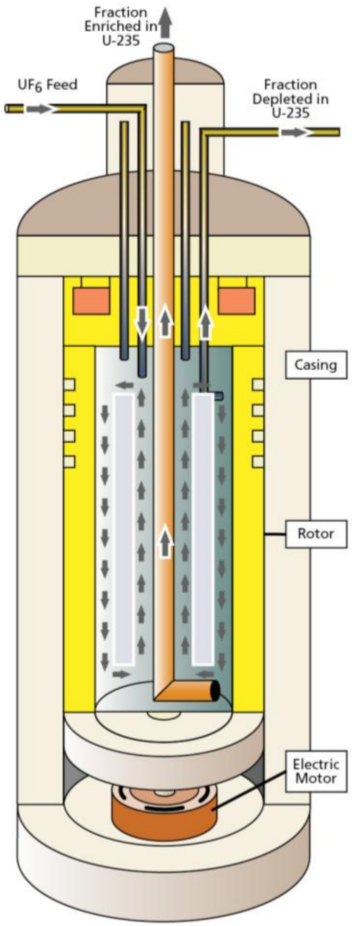
Enrichment Processes

A. Gaseous Diffusion Process



***A.** The gaseous diffusion process uses molecular diffusion to separate a gas from a two-gas mixture. The isotopic separation is accomplished by diffusing uranium, which has been combined with fluorine to form UF_6 gas, through a porous membrane (barrier) and using the different molecular velocities of the two isotopes to achieve separation.*

B. Gas Centrifuge Process



***B.** The gas centrifuge process uses a large number of rotating cylinders in series and parallel configurations. Gas is introduced and rotated at high speed, concentrating the component of higher molecular weight toward the outer wall of the cylinder and the component of lower molecular weight toward the center. The enriched and the depleted gases are removed by scoops.*

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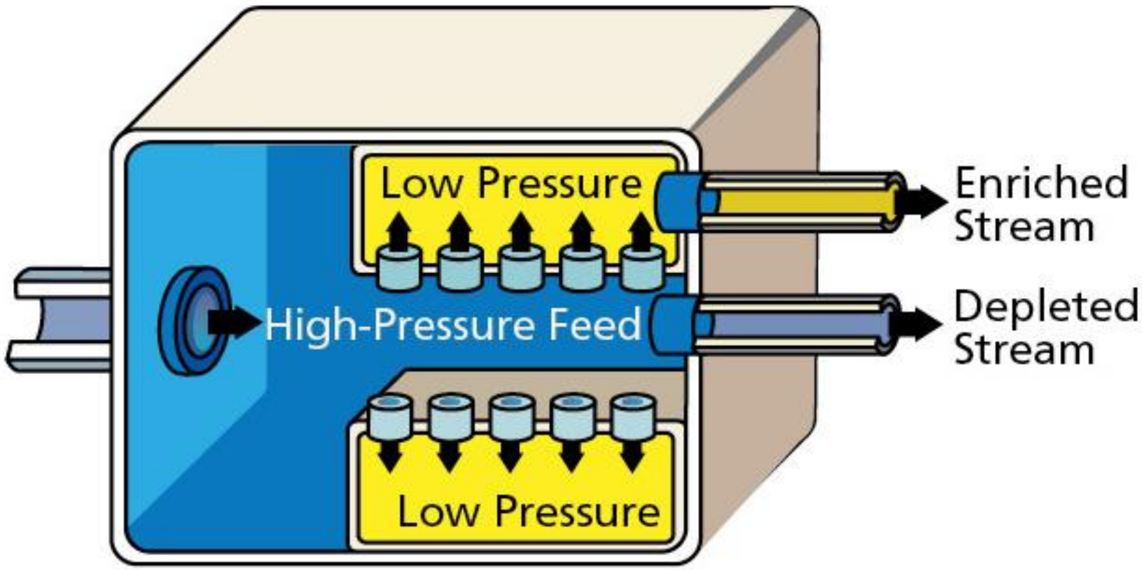
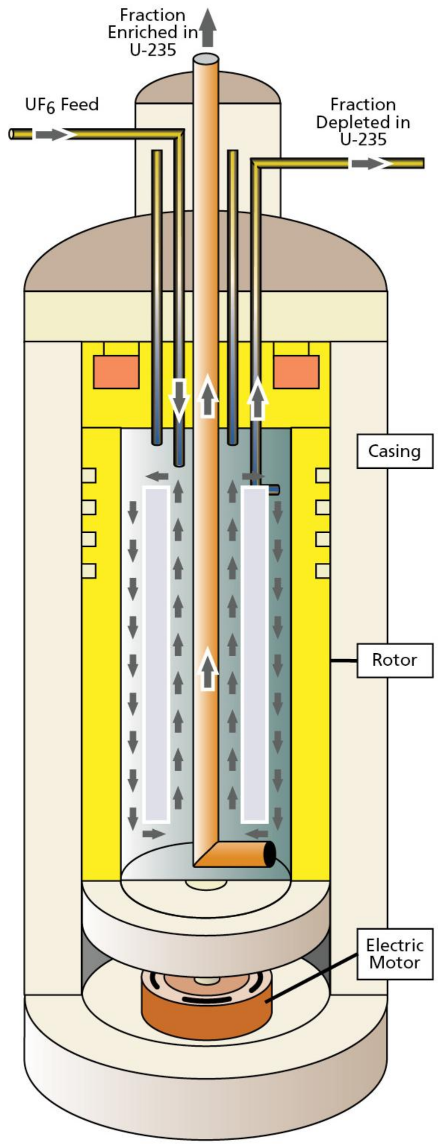
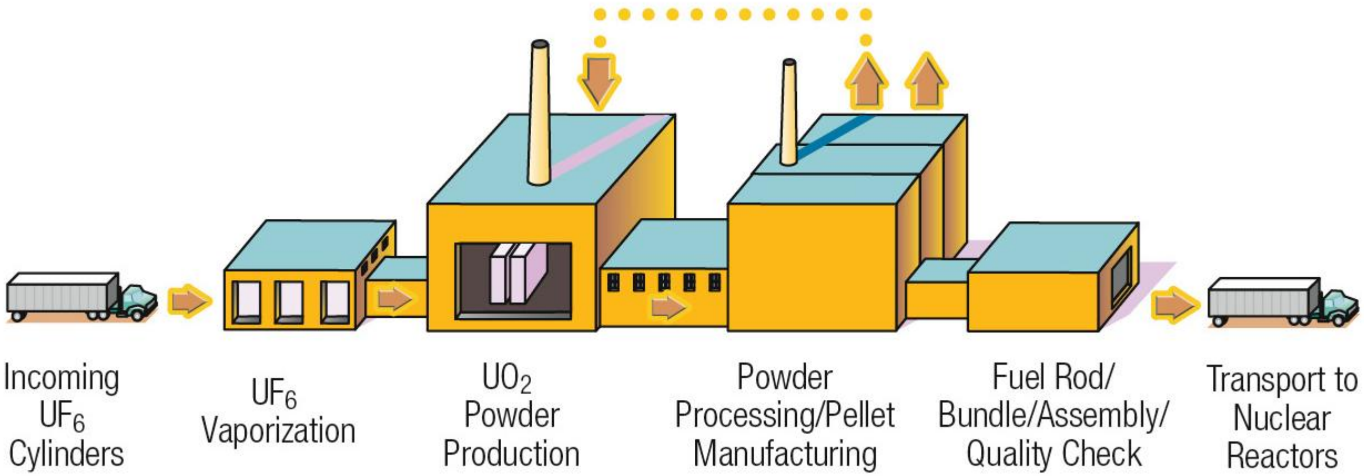
A. Gaseous Diffusion Process



B. Gas Centrifuge Process



Simplified Fuel Fabrication Process

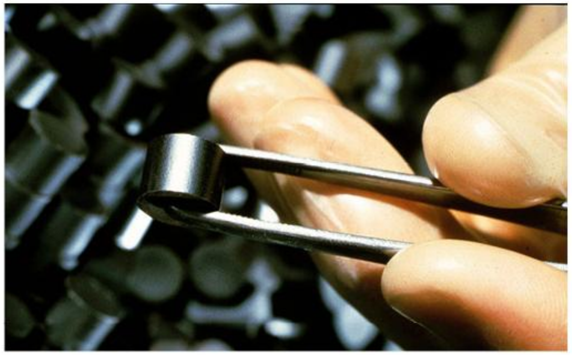


Fabrication of commercial light-water reactor fuel consists of the following three basic steps:

(1) the chemical conversion of UF_6 to UO_2 powder

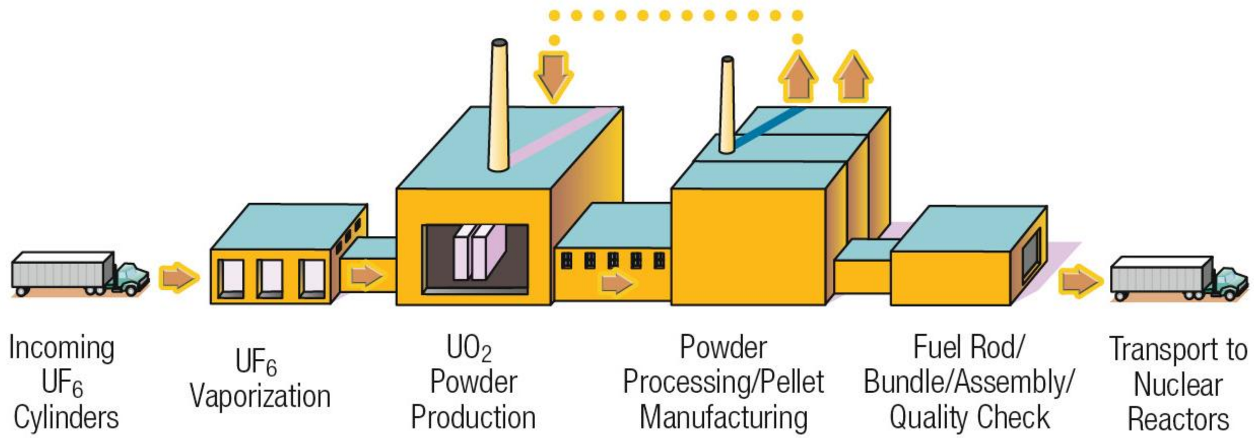
(2) a ceramic process that converts UO_2 powder to small ceramic pellets

(3) a mechanical process that loads the fuel pellets into rods and constructs finished fuel assemblies



Small ceramic fuel pellets.

Simplified Fuel Fabrication Process



U.S. Materials Licenses by State

	Number of Licenses	
State	NRC	Agreement States
Alabama	18	439
Alaska	64	0
Arizona	12	366
Arkansas	5	213
California	57	1,852
Colorado	20	356
Connecticut	180	0
Delaware	52	0
District of Columbia	42	0
Florida	22	1,720
Georgia	17	520
Hawaii	60	0
Idaho	74	0
Illinois	32	711
Indiana	283	0
Iowa	3	170
Kansas	11	286
Kentucky	9	431
Louisiana	11	519
Maine	2	125
Maryland	84	598
Massachusetts	25	500
Michigan	501	0
Minnesota	12	177
Mississippi	6	331
Missouri	282	0

	Number of Licenses	
State	NRC	Agreement States
Montana	89	0
Nebraska	5	148
Nevada	3	237
New Hampshire	8	82
New Jersey	39	638
New Mexico	14	198
New York	22	1,403
North Carolina	17	760
North Dakota	8	83
Ohio	40	629
Oklahoma	17	233
Oregon	5	335
Pennsylvania	53	745
Rhode Island	1	49
South Carolina	15	414
South Dakota	41	0
Tennessee	22	589
Texas	49	1,665
Utah	10	197
Vermont	34	0
Virginia	59	426
Washington	15	405
West Virginia	176	0
Wisconsin	14	321
Wyoming	84	0
Others*	162	0
Total	2,886	18,871

Agreement State

* Others include major U.S. territories.

Note: The NRC and Agreement State data is as of June 2012.
The NRC licenses Federal agencies in Agreement States.

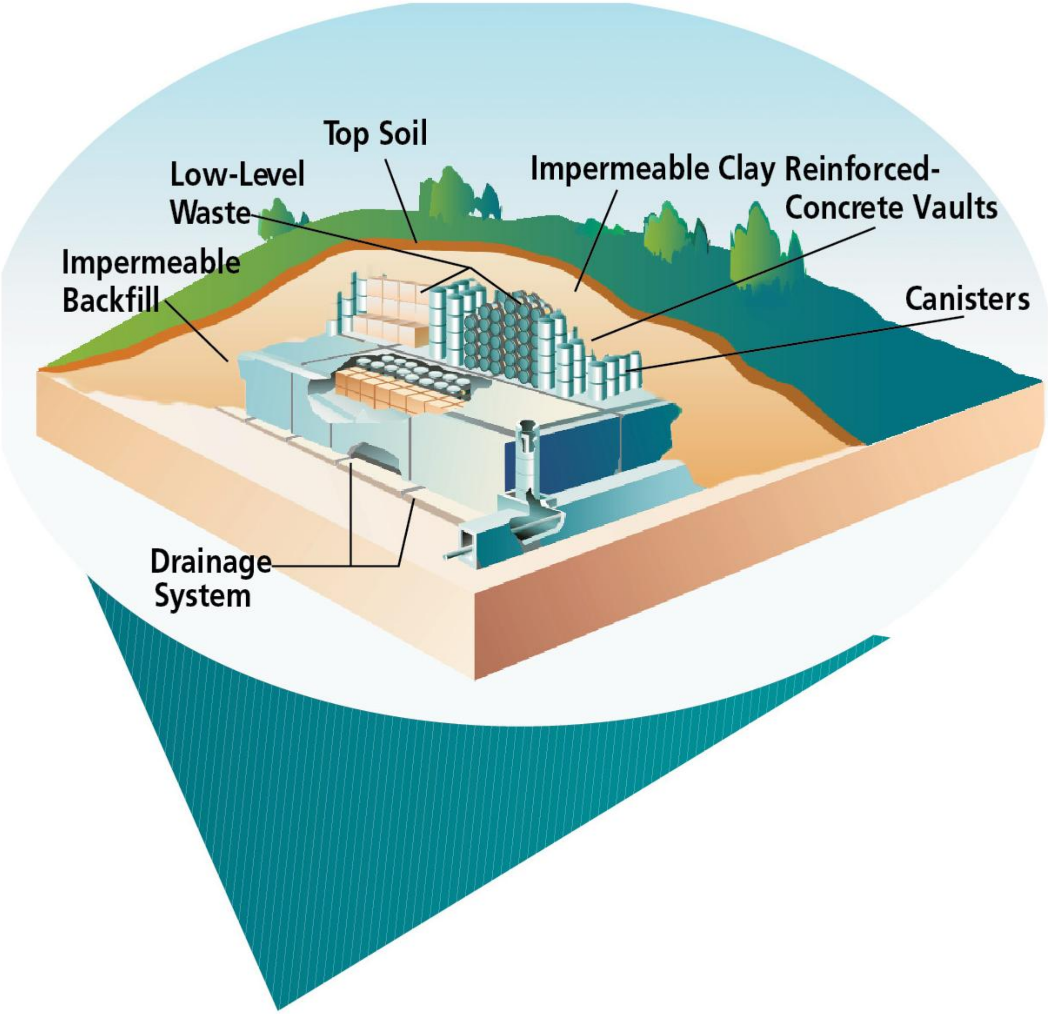
Locations of NRC-Licensed Uranium Recovery Facilities

Licensee	Site Name, Location
In Situ Recovery Facilities	
Uranium One	Willow Creek, WY
Cameco Resources, Inc.	Crow Butte, NE*
Hydro Resources, Inc.°	Crownpoint, NM
Cameco Resources, Inc.	Smith Ranch and Highlands, WY*
Uranium One	Moore Ranch, WY
Lost Creek ISR, Inc.	Lost Creek, WY
Uranerz Energy Corp.	Nichols Ranch, WY
Conventional Uranium Mill Recovery Facilities	
American Nuclear Corp.†	Gas Hills, WY
Bear Creek Uranium Co.†	Bear Creek, WY
Exxon Mobil Corp.†	Highlands, WY
Homestake Mining Co.†	Homestake, NM
Kennecott Uranium Corp.°	Sweetwater, WY
Pathfinder Mines Corp.†	Lucky Mc, WY
Pathfinder Mines Corp.†	Shirley Basin, WY
Rio Algom Mining, LLC†	Ambrosia Lake, NM
Umetco Minerals Corp.†	Gas Hills, WY
United Nuclear Corp.†	Church Rock, NM
Western Nuclear, Inc.†	Split Rock, WY

Note: For further details on NRC-related uranium recovery facility applications in review and applications, restarts, and expansions, see the Web Link Index. This table does not include uranium recovery facilities licensed by Agreement States.

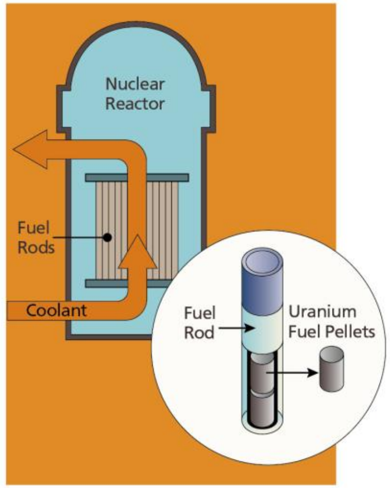
* Satellite facilities are located within the State.
† These sites are undergoing decommissioning.
° Hydro has an operating license, but the facility has not yet been constructed. Kennecott has an operating license but is in "standby" mode.

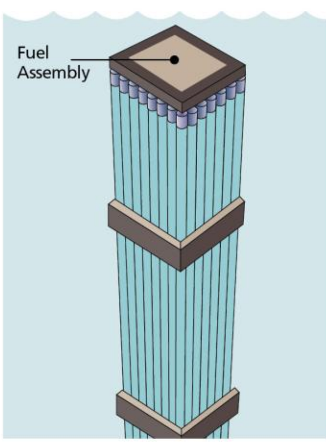
Low-Level Waste Disposal



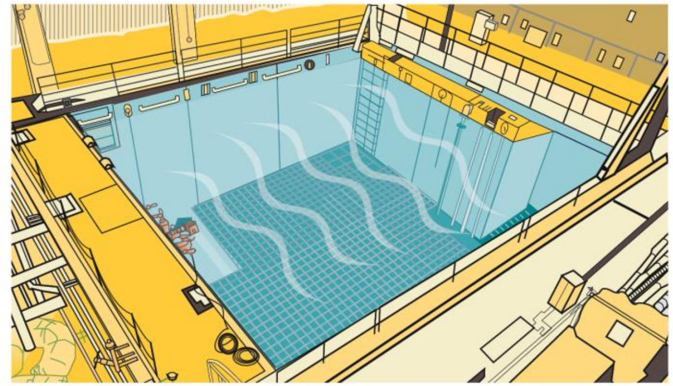
Spent Fuel Generation and Storage after Use

1 A nuclear reactor is powered by enriched uranium-235 fuel. Fission (splitting of atoms) generates heat, which produces steam that turns turbines to produce electricity. A reactor rated at several hundred megawatts may contain 100 or more tons of fuel in the form of bullet-sized pellets loaded into long metal rods that are bundled together into fuel assemblies. PWRs contain between 150 and 200 fuel assemblies. BWRs contain between 370 and 800 fuel assemblies.

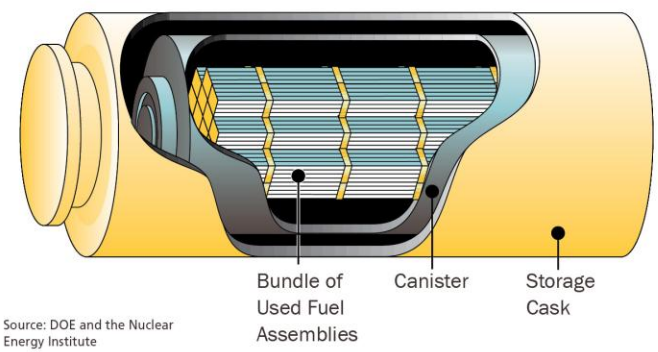




2 After about 6 years, spent fuel assemblies—typically 14 feet (4.3 meters) long and containing nearly 200 fuel rods for PWRs and 80–100 fuel rods for BWRs—are removed from the reactor and allowed to cool in storage pools for a few years. At this point, the 900-pound (409-kilogram) assemblies contain only about one-fifth the original amount of uranium-235.



3 Commercial light-water nuclear reactors store spent radioactive fuel in a steel-lined, seismically designed concrete pool under about 40 feet (12.2 meters) of water that provides shielding from radiation. Water pumps supply continuously flowing water to cool the spent fuel. Extra water for the pool is provided by other pumps that can be powered from an onsite emergency diesel generator. Support features, such as water-level monitors and radiation detectors, are also in the pool. Spent fuel is stored in the pool until it can be transferred to dry casks on site (as shown in Figure 42) or transported off site to a high-level radioactive waste disposal site.



Source: DOE and the Nuclear Energy Institute

Spent Fuel Generation and Storage after Use

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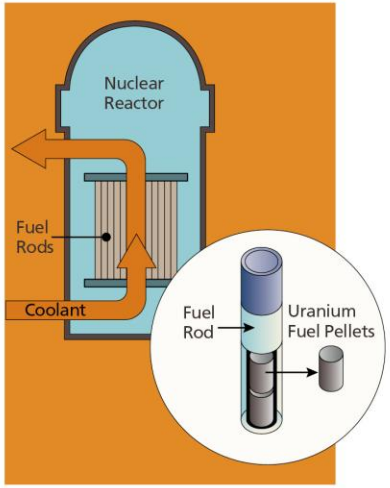

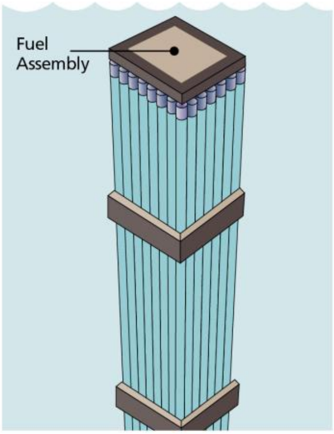

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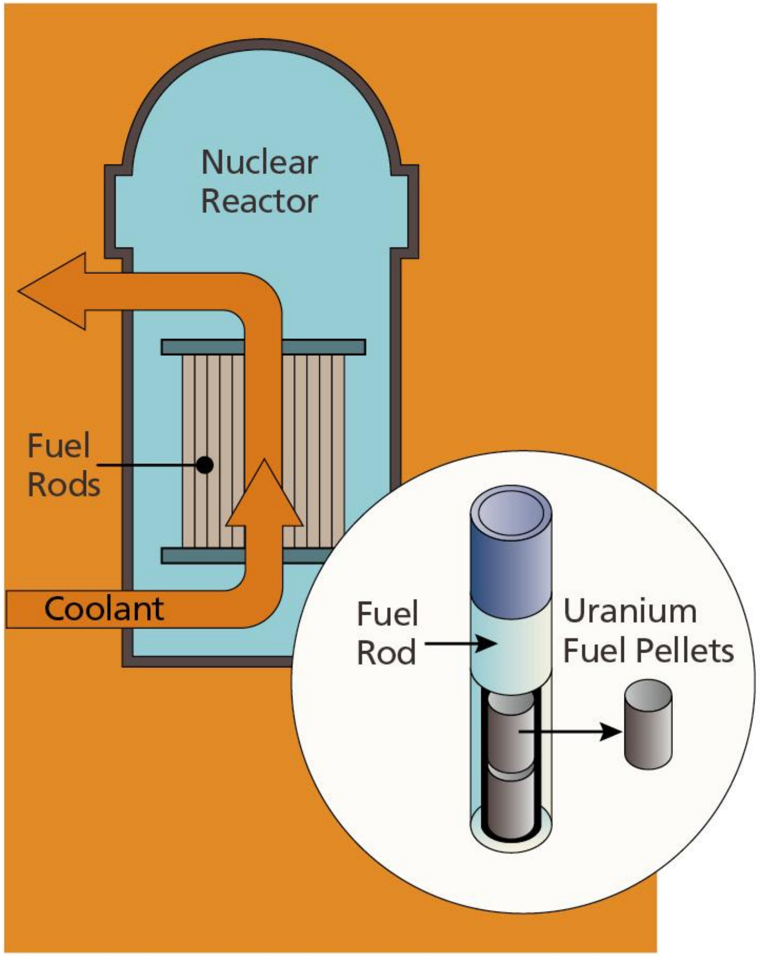
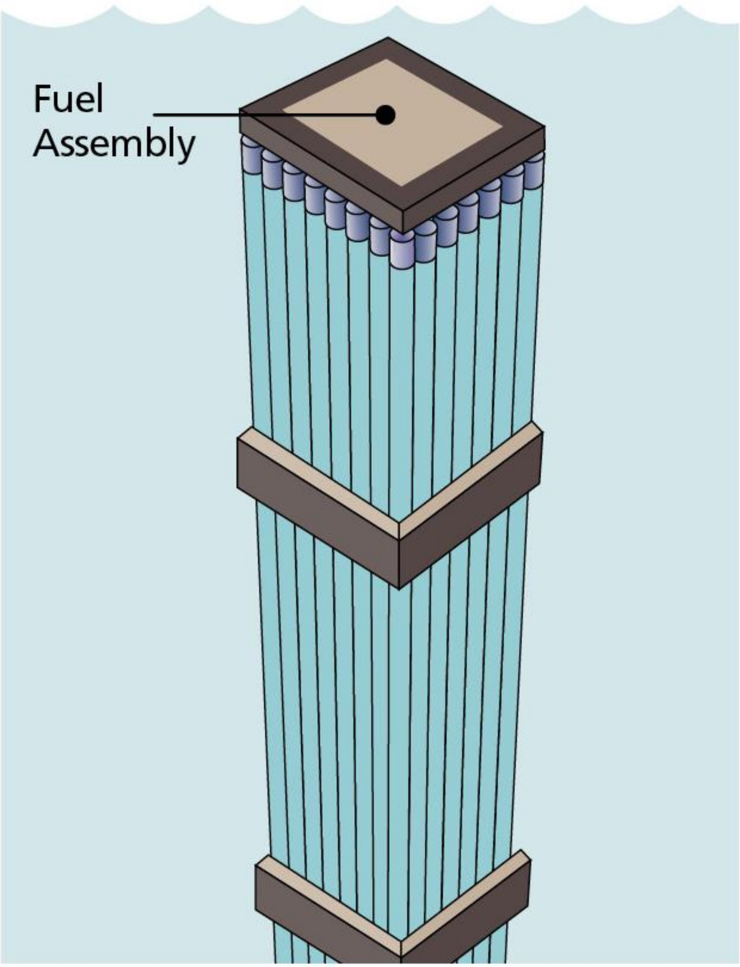
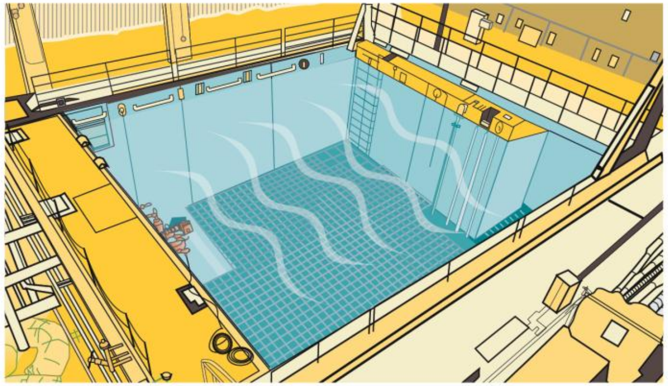

Nuclear Reactor
Fuel Rods
Coolant
Fuel Rod
Uranium Fuel Pellets


Fuel
Assembly

Spent Fuel Generation and Storage after Use



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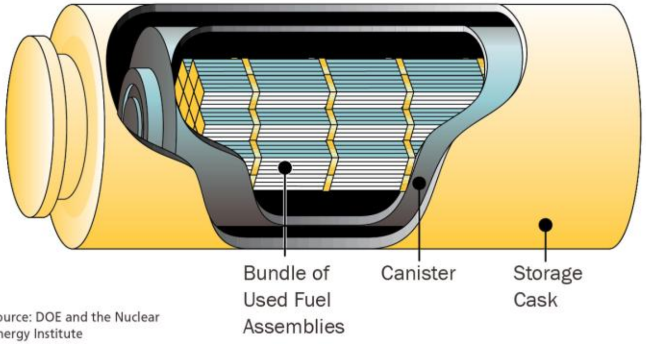
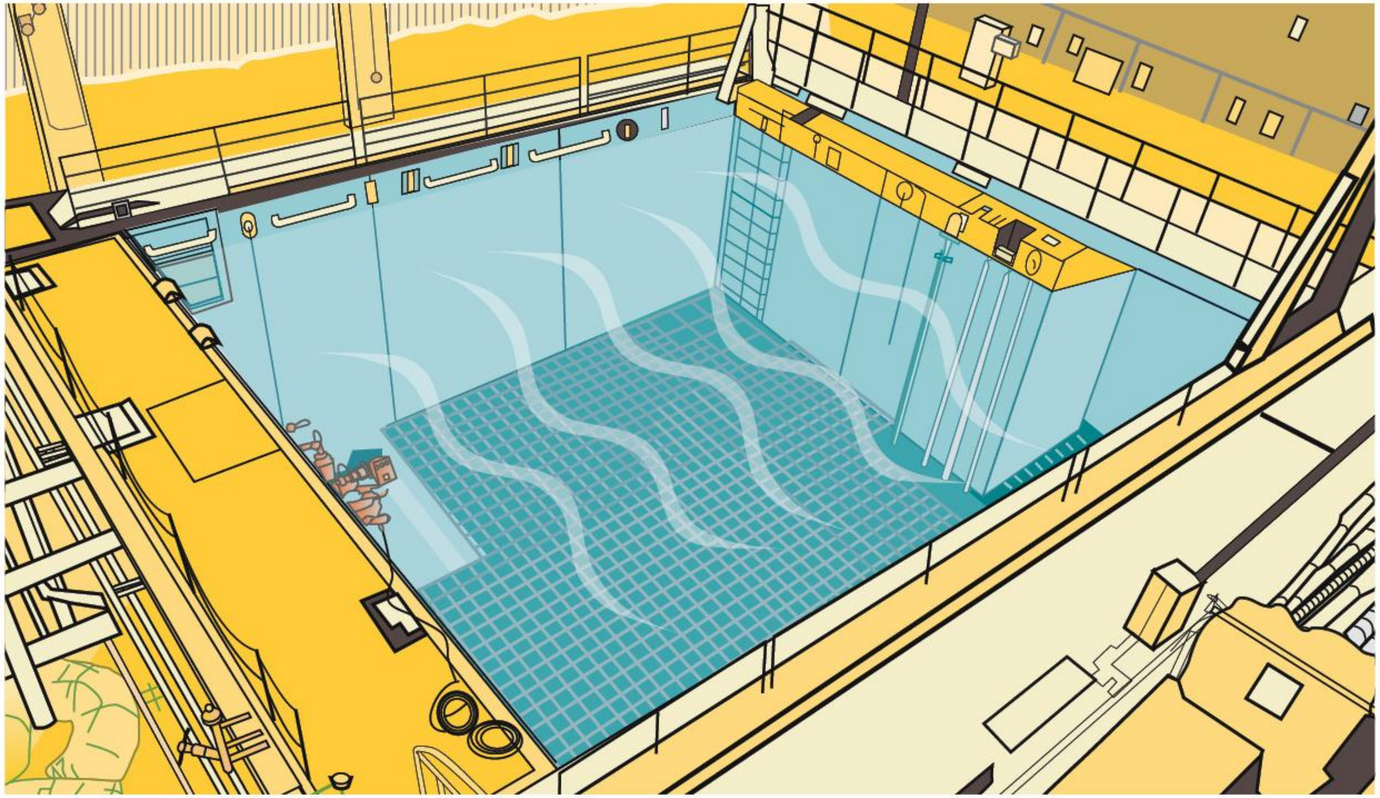
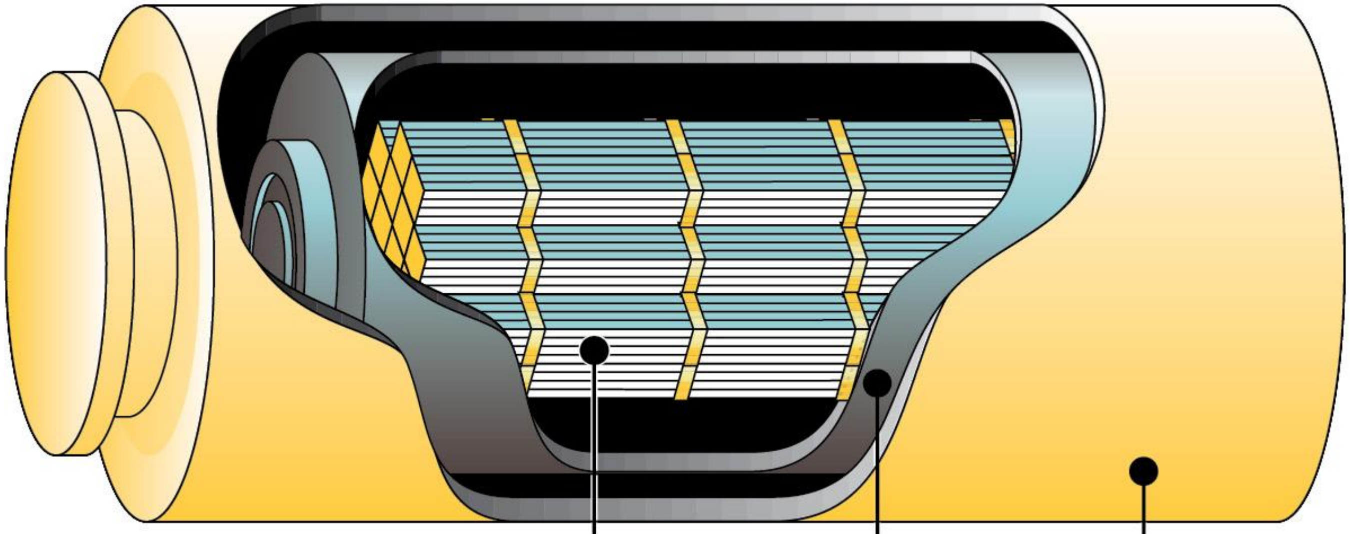


Source: DOE and the Nuclear Energy Institute

Spent Fuel Generation and Storage after Use



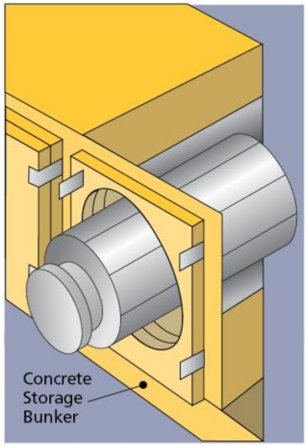


Source: DOE and the Nuclear Energy Institute

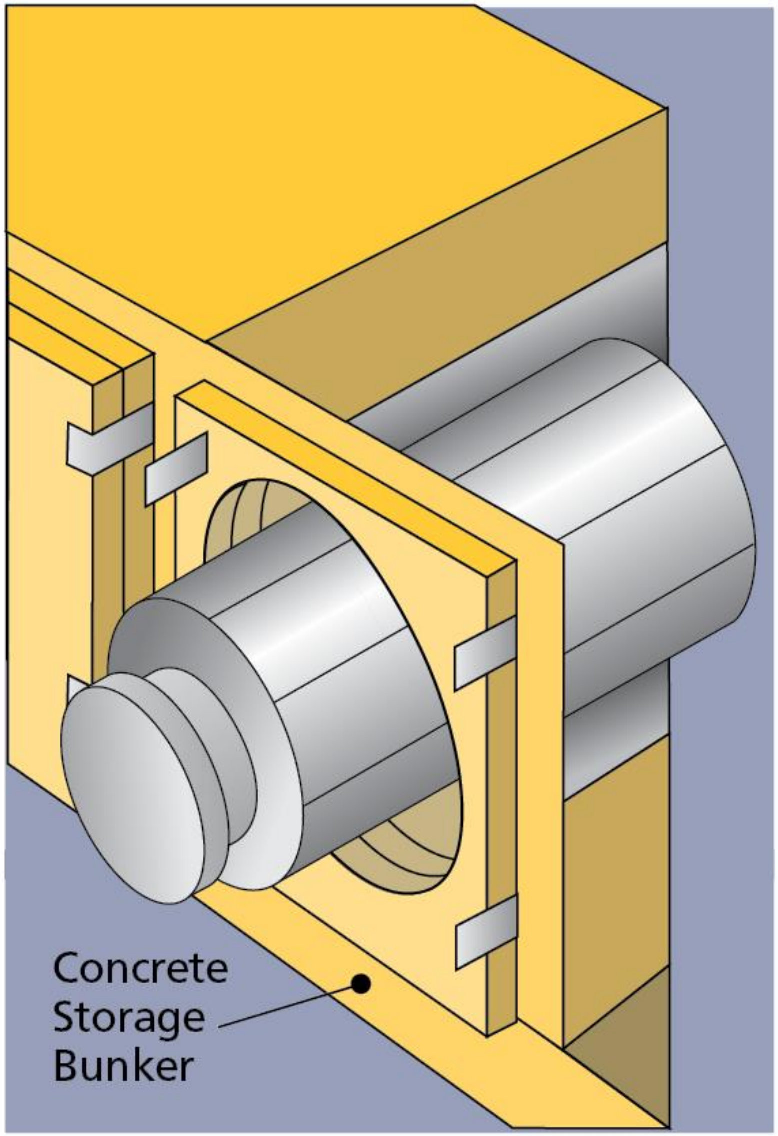
Dry Storage of Spent Nuclear Fuel

At some nuclear reactors across the country, spent fuel is kept on site, typically above ground, in systems basically similar to the ones shown here.

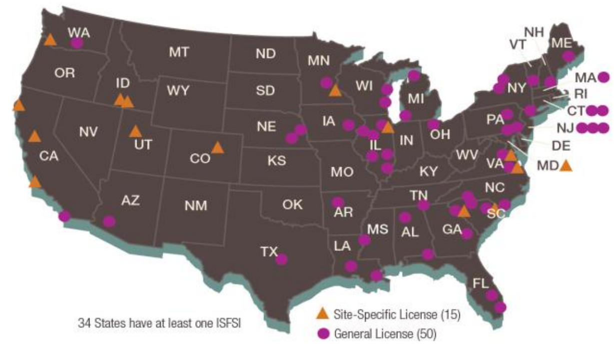
1 Once the spent fuel has sufficiently cooled, it is loaded into special canisters that are designed to hold nuclear fuel assemblies. Water and air are removed. The canister is filled with inert gas, welded shut, and rigorously tested for leaks. It is then placed in a cask for storage or transportation. The NRC has approved the storage of up to 40 PWR assemblies and up to 68 BWR assemblies in each canister. The dry casks are then loaded onto concrete pads.



2 The canisters can also be stored in aboveground concrete bunkers, each of which is about the size of a one-car garage.


Concrete
Storage
Bunker

Licensed/Operating Independent Spent Fuel Storage Installations by State



ALABAMA
- ● Browns Ferry
- ● Farley

ARIZONA
- ● Palo Verde

ARKANSAS
- ● Arkansas Nuclear

CALIFORNIA
- ▲ Diablo Canyon
- ▲ Rancho Seco
- ● San Onofre
- ▲ Humboldt Bay

COLORADO
- ▲ Fort St. Vrain

CONNECTICUT
- ● Haddam Neck
- ● Millstone

FLORIDA
- ● St. Lucie
- ● Turkey Point

GEORGIA
- ● Hatch

IDAHO
- ▲ DOE: TMI-2 (Fuel Debris)
- ▲ Idaho Spent Fuel Facility

ILLINOIS
- ● Braidwood
- ● Byron
- ▲ GE Morris (Wet)
- ● Dresden
- ● La Salle
- ● Quad Cities

IOWA
- ● Duane Arnold

LOUISIANA
- ● River Bend
- ● Waterford

MAINE
- ● Maine Yankee

MARYLAND
- ▲ Calvert Cliffs

MASSACHUSETTS
- ● Yankee Rowe

MICHIGAN
- ● Big Rock Point
- ● Palisades

MINNESOTA
- ● Monticello
- ▲ Prairie Island

MISSISSIPPI
- ● Grand Gulf

NEBRASKA
- ● Cooper
- ● Ft. Calhoun

NEW HAMPSHIRE
- ● Seabrook

NEW JERSEY
- ● Hope Creek
- ● Salem
- ● Oyster Creek

NEW YORK
- ● Indian Point
- ● FitzPatrick
- ● Ginna

NORTH CAROLINA
- ● Brunswick
- ● McGuire

OHIO
- ● Davis-Besse

OREGON
- ▲ Trojan

PENNSYLVANIA
- ● Limerick
- ● Susquehanna
- ● Peach Bottom

SOUTH CAROLINA
- ●▲ Oconee
- ●▲ Robinson
- ● Catawba

TENNESSEE
- ● Sequoyah

TEXAS
- ● Comanche Peak

UTAH
- ▲ Private Fuel Storage

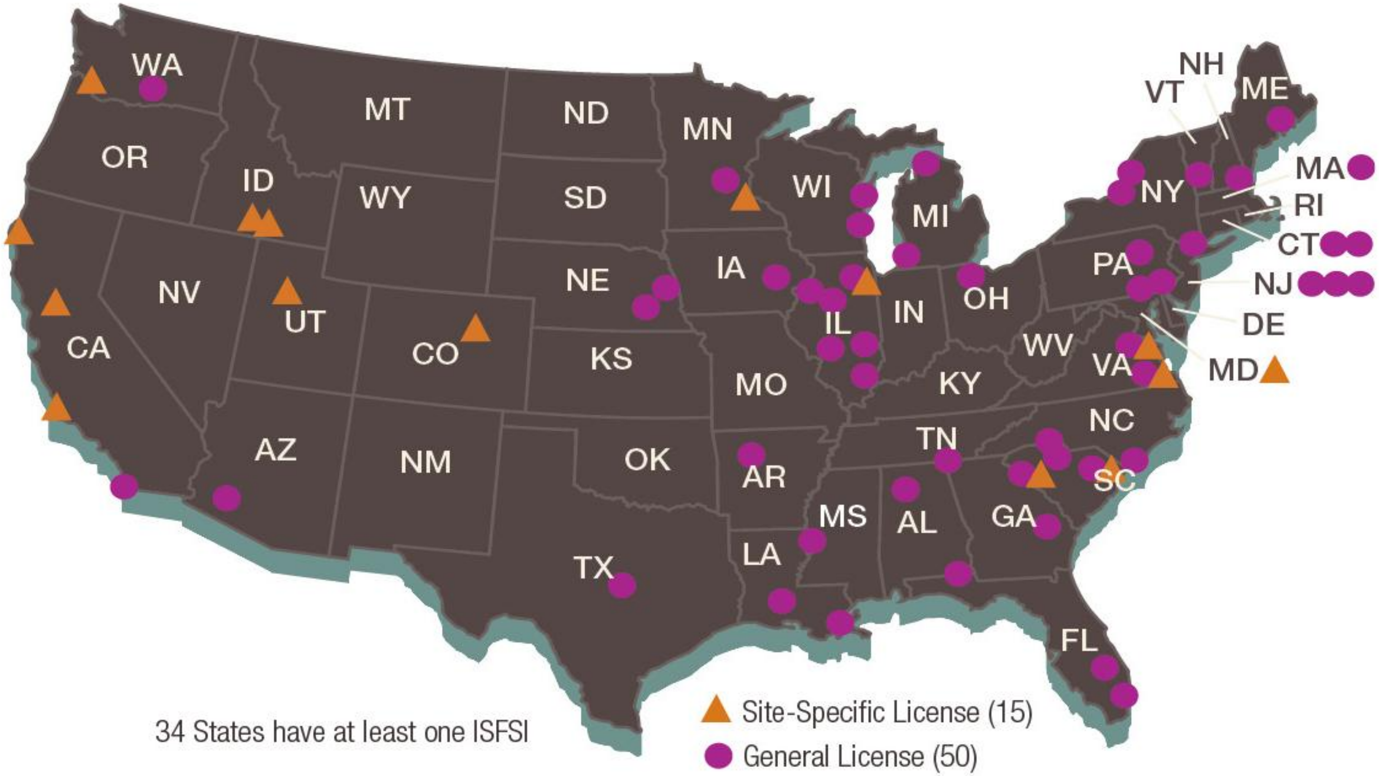
VERMONT
- ● Vermont Yankee

VIRGINIA
- ●▲ Surry
- ●▲ North Anna

WASHINGTON
- ● Columbia

WISCONSIN
- ● Point Beach
- ● Kewaunee

Licensed/Operating Independent Spent Fuel Storage Installations by State



34 States have at least one ISFSI

Facilities Undergoing Decommissioning Under NRC Jurisdiction

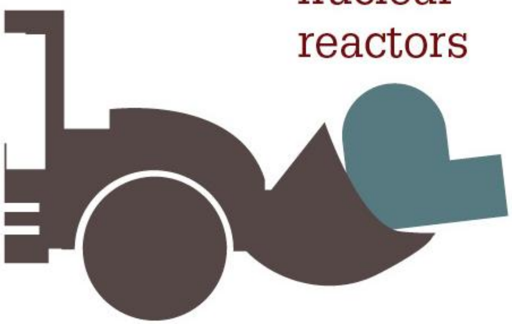
17 nuclear reactors

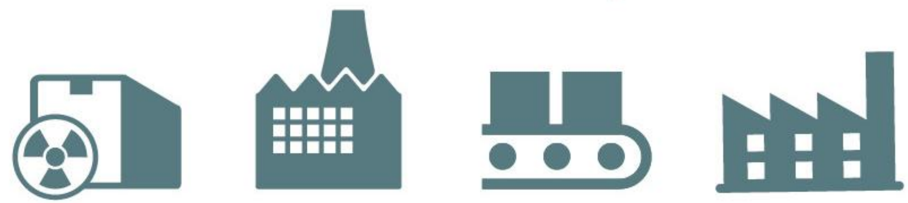
18 complex material sites

11 research and test reactors

1 fuel cycle facility

11 uranium recovery facilities





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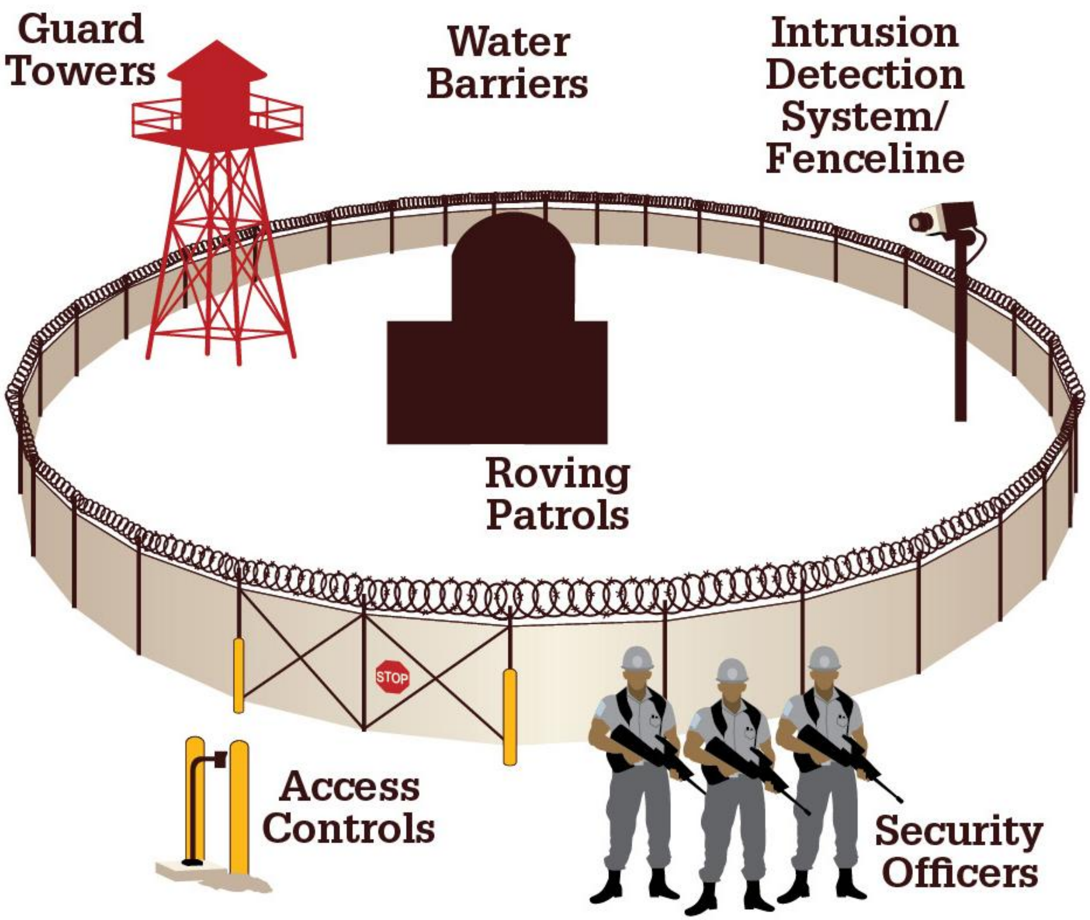
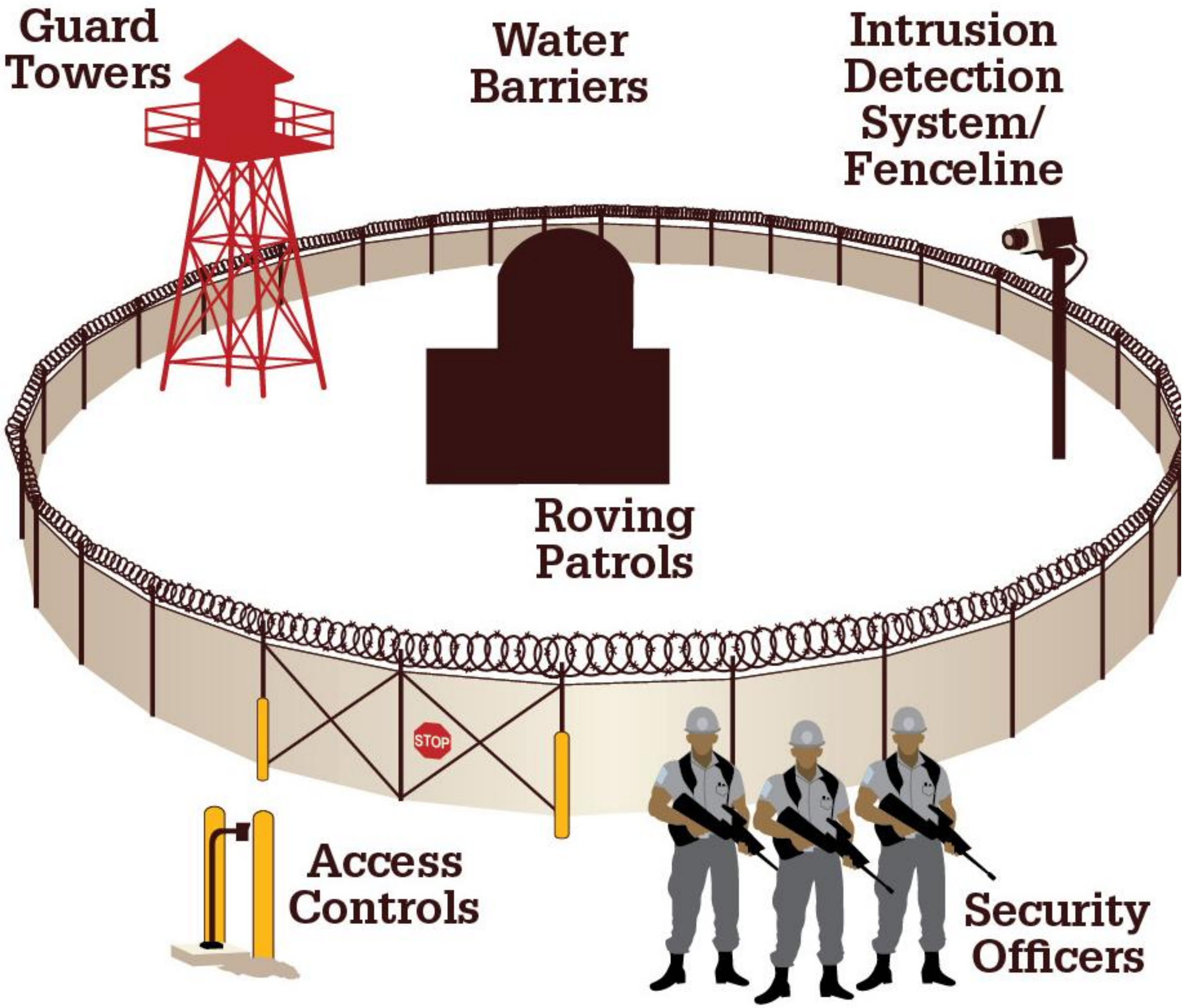
Security Components



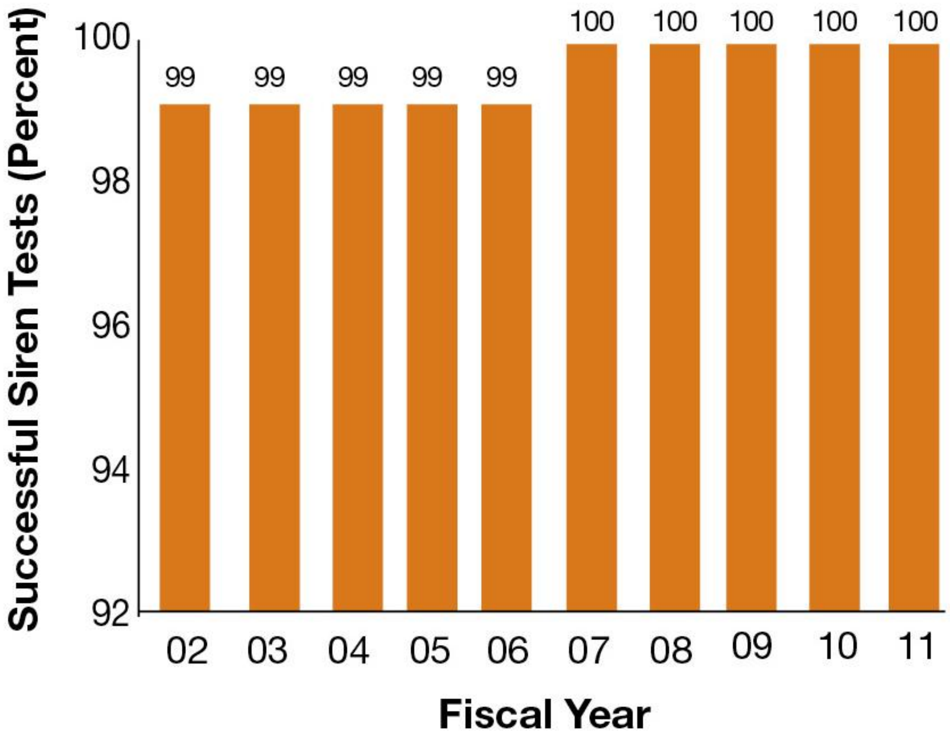
Protecting nuclear facilities requires all the security features to come together and work as one.

Security Components



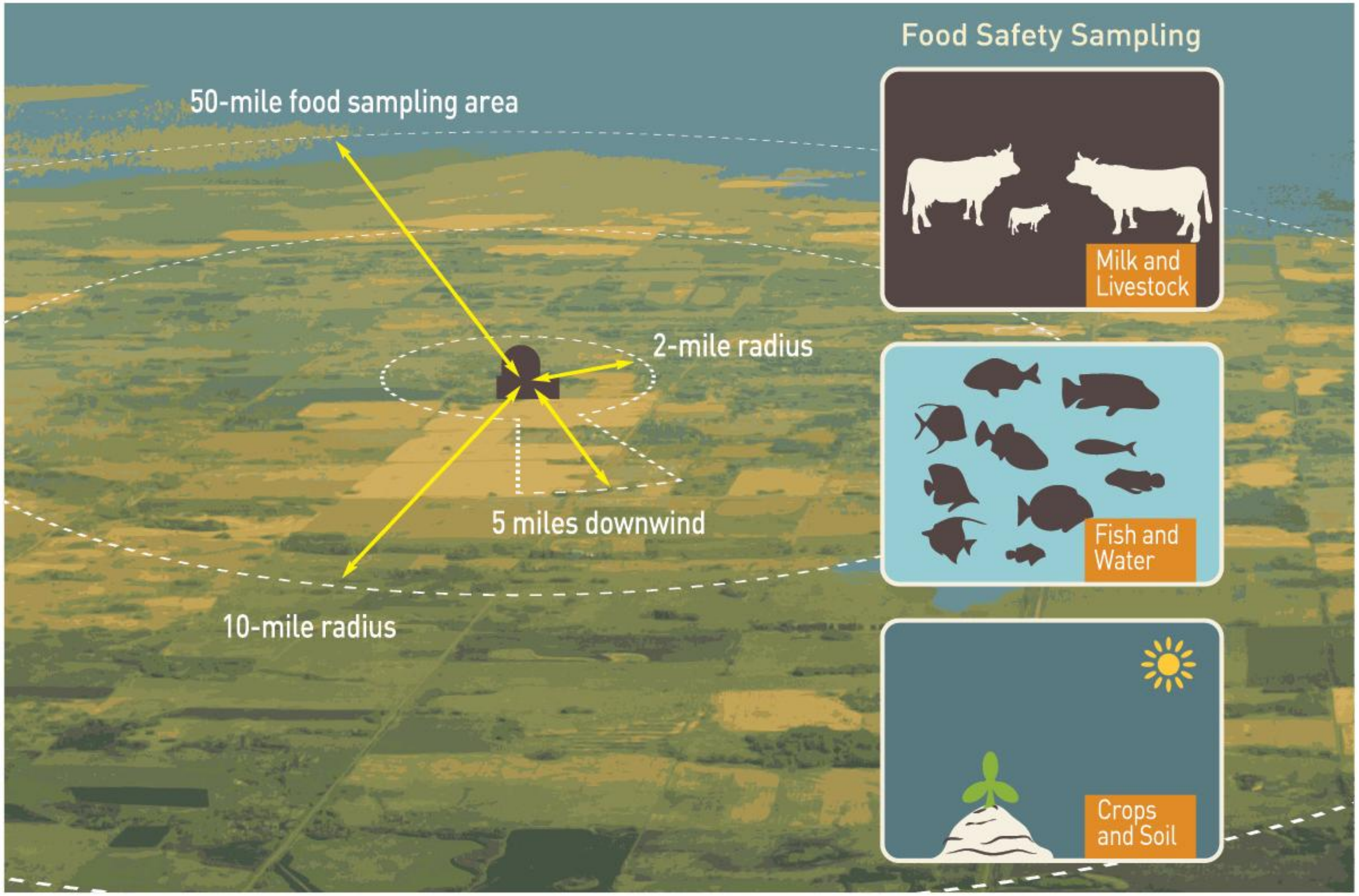
Industry Performance Indicators:
FYs 2002–2011 Averages for 104 Plants

Alert and Notification System (ANS) Reliability



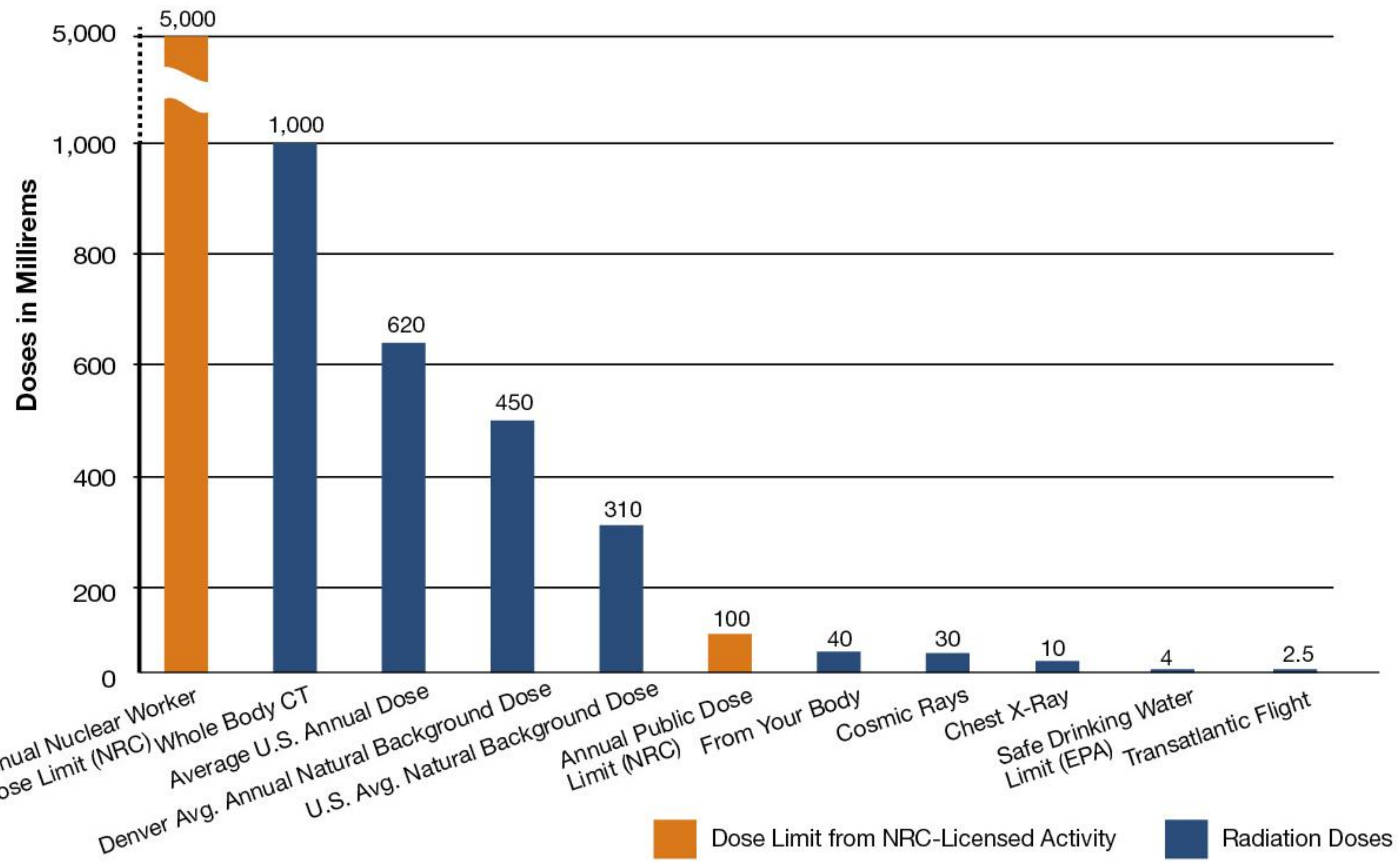
This shows the percentage of ANS sirens that successfully operated during periodic tests in the previous year. The result is an indicator of the reliability of the ANS to alert the public in an emergency.

Emergency Planning Zones



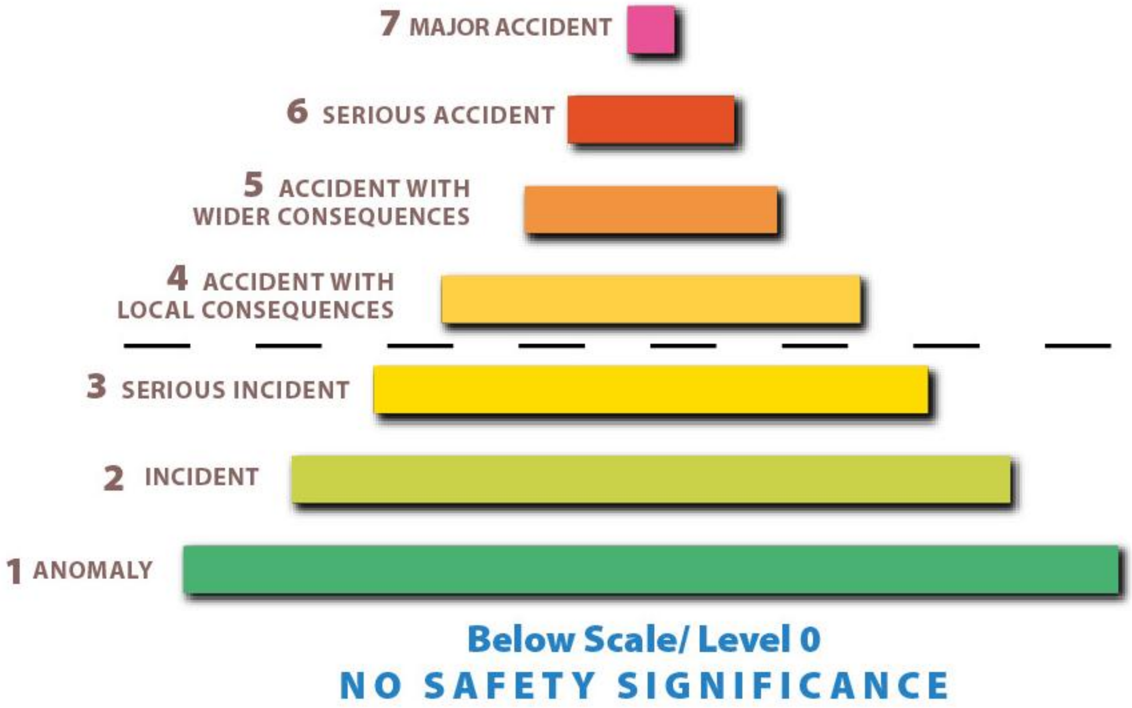
Note: A 2-mile ring around the plant is identified for evacuation along with a 5-mile zone downwind of the projected release path.

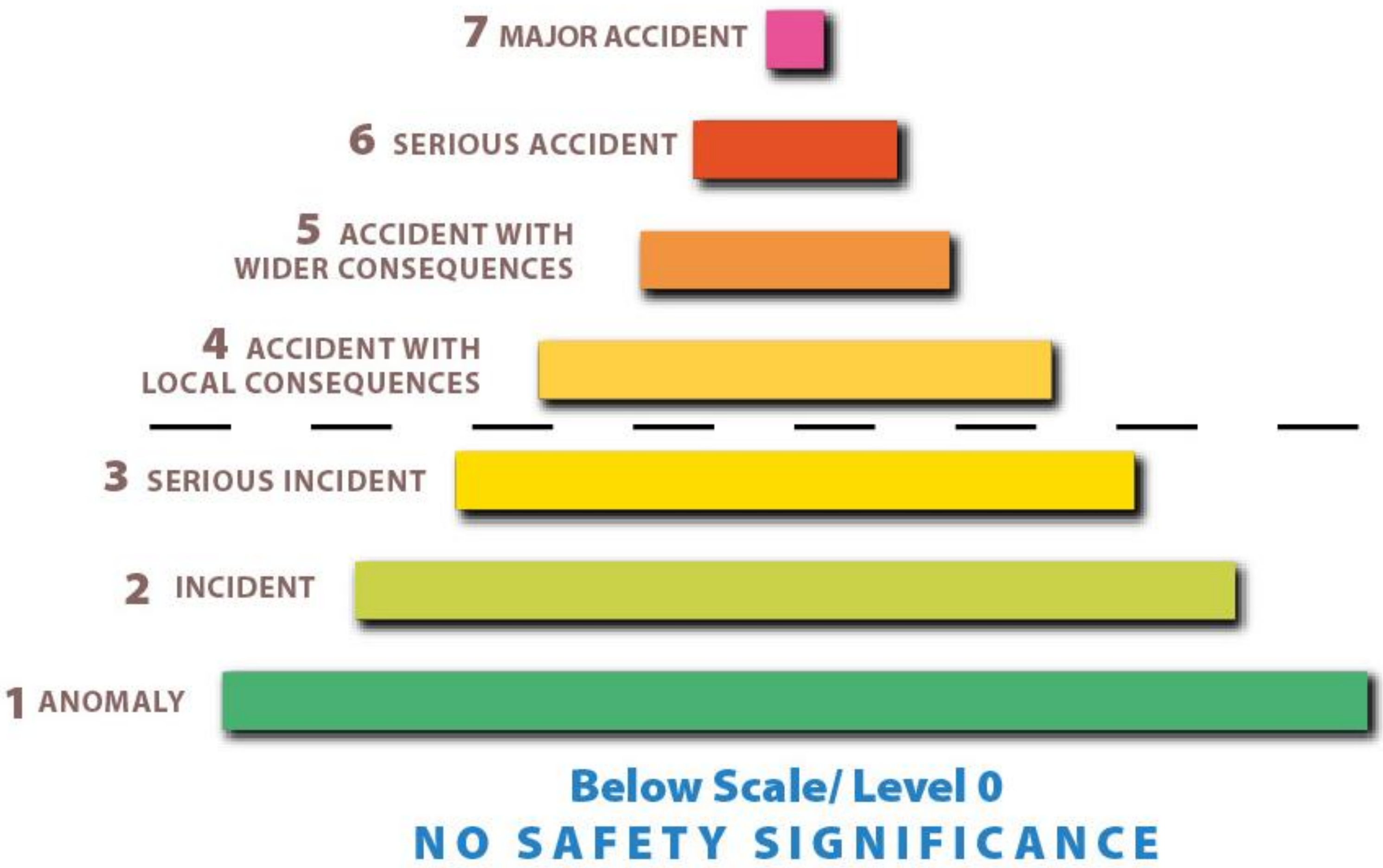
Radiation Doses and Regulatory Limits



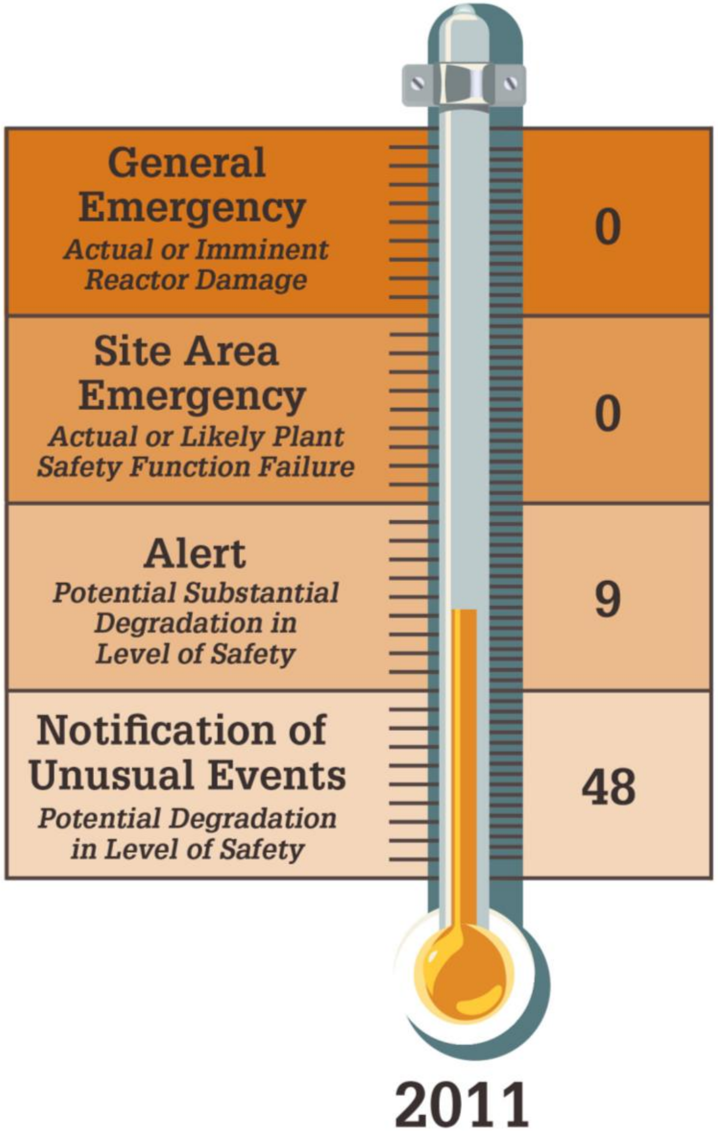
The International Nuclear and Radiological Event Scale

INES events are classified on the scale at 7–levels. Levels 1–3 are called "incidents" and Levels 4–7 "accidents." The scale is designed so that the severity of an event is about 10 times greater for each increase in level on the scale. Events without safety significance are called "deviations" and are classified as Below Scale or at Level 0.

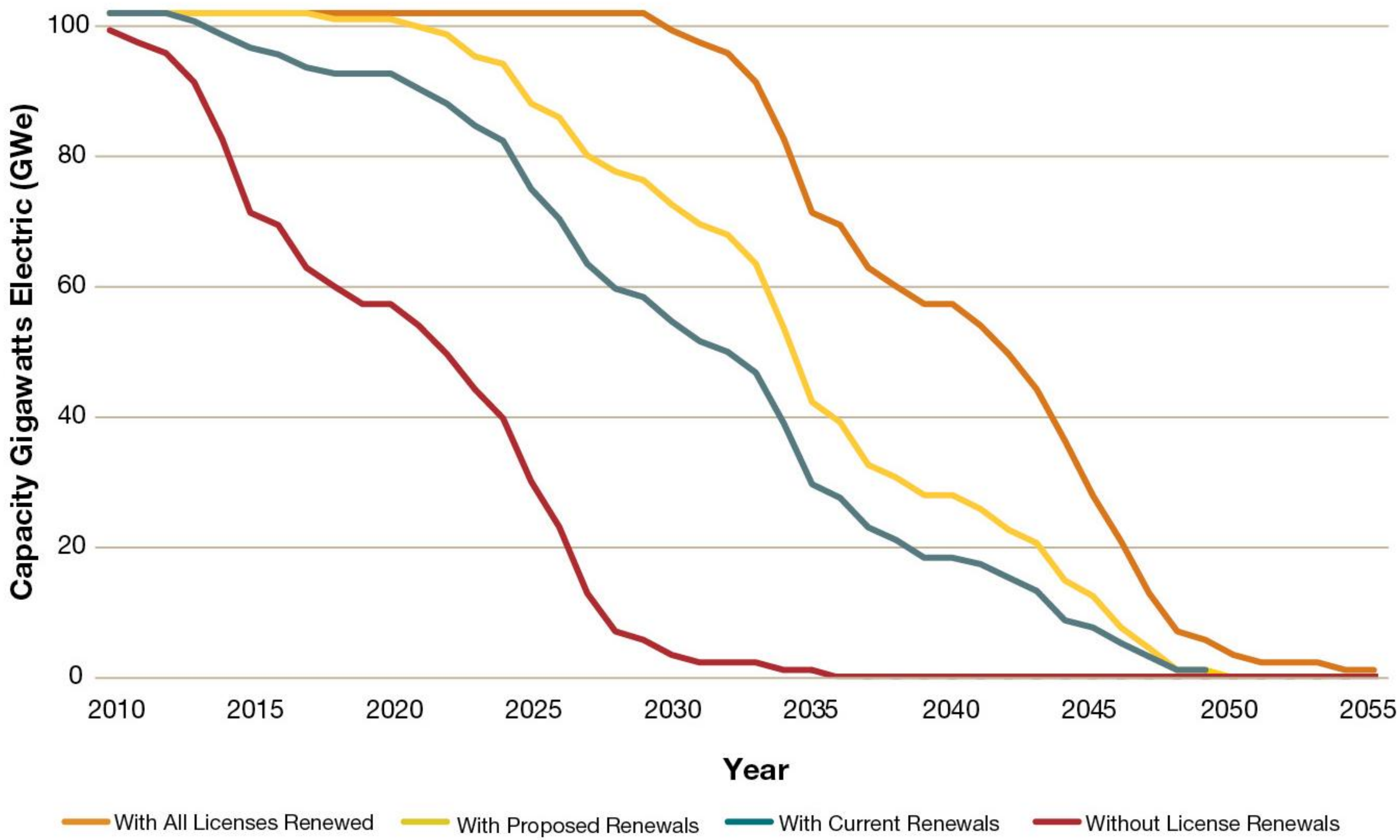



7 MAJOR ACCIDENT
6 SERIOUS ACCIDENT
5 ACCIDENT WITH WIDER CONSEQUENCES
4 ACCIDENT WITH LOCAL CONSEQUENCES
3 SERIOUS INCIDENT
2 INCIDENT
1 ANOMALY
Below Scale/ Level 0
NO SAFETY SIGNIFICANCE

Emergency Classifications for Nuclear Reactor Events, 2011



Projected Electric Capacity Dependent on License Renewals



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

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

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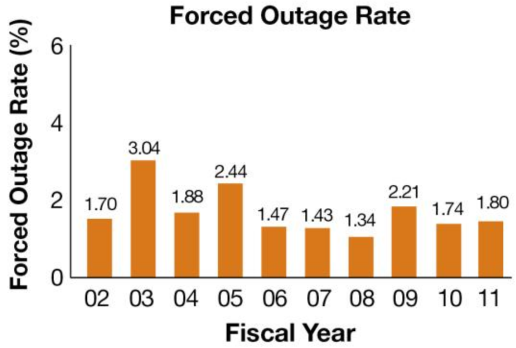
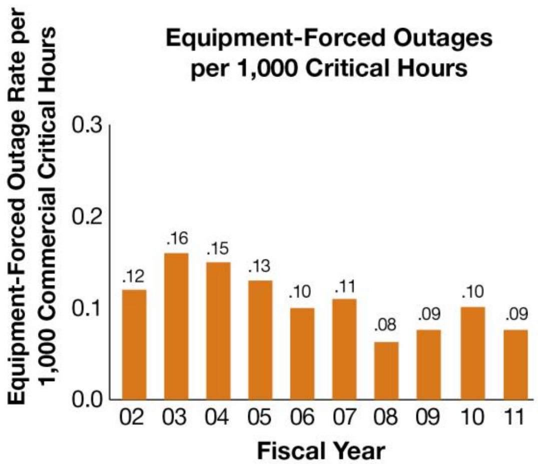
Industry Performance Indicators:
Annual Industry Averages, FYs 2002–2011

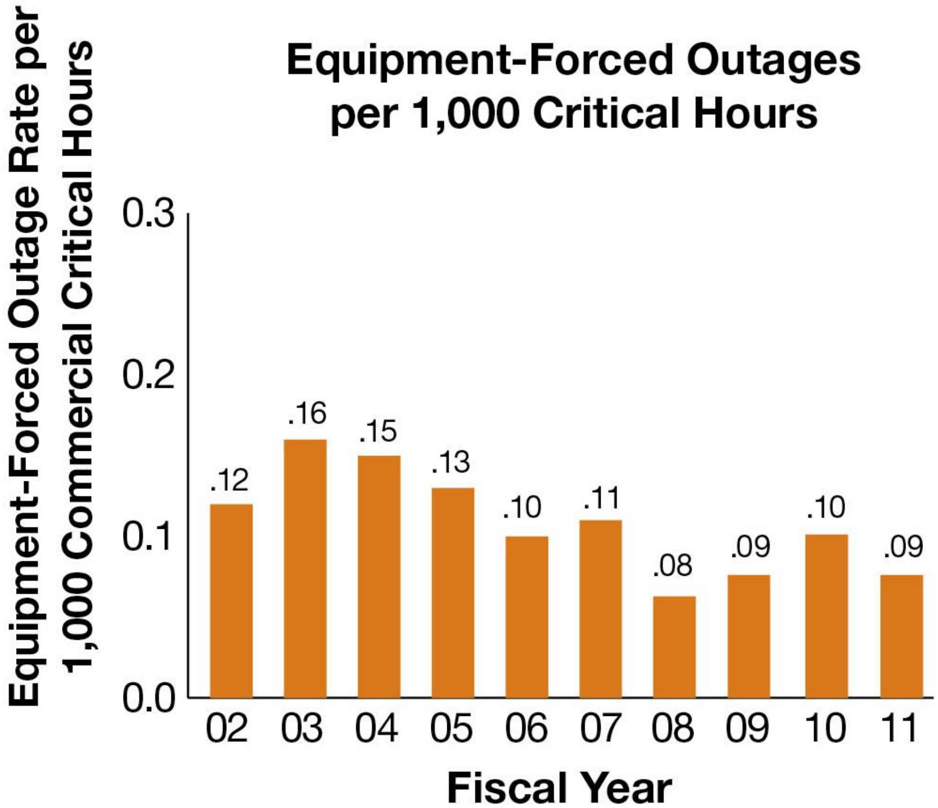


The forced outage rate is the number of hours that the plant is unable to operate (forced outage hours) divided by the sum of the hours that the plant is generating and transmitting electricity (unit service hours) and the hours that the plant is unable to operate (forced outage hours).



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.

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



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.

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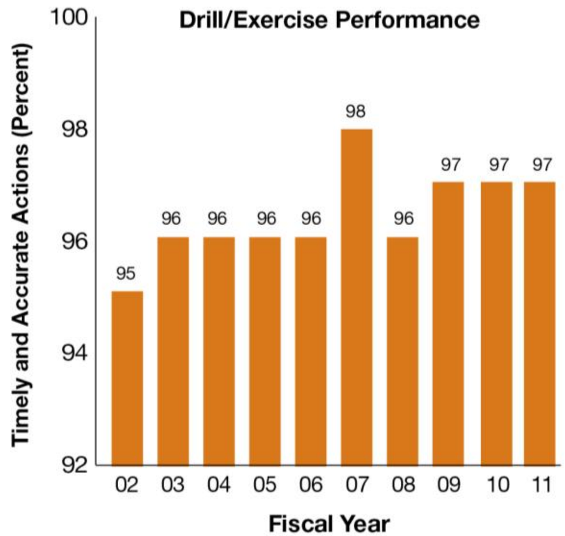
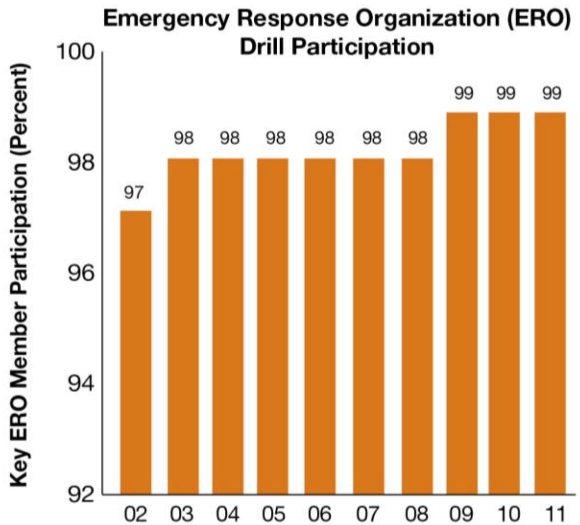
Industry Performance Indicators: Annual Industry Averages, FYs 2002–2011

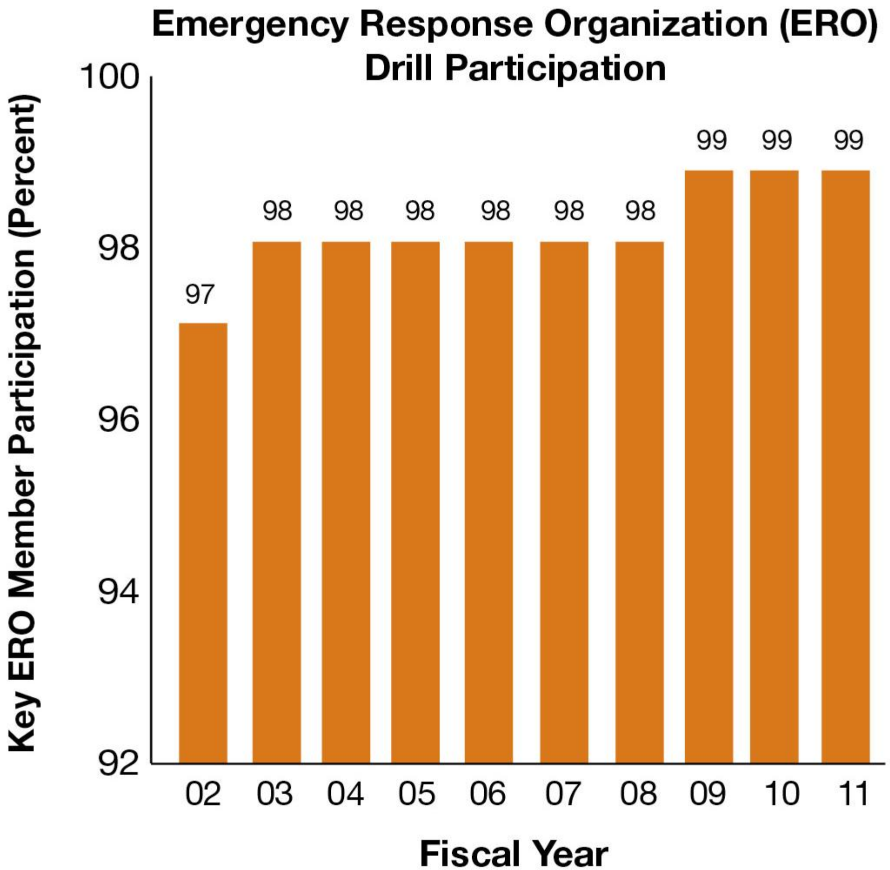


The percentage of timely and accurate actions taken by plant personnel (emergency classifications, protective action recommendations, and notification to offsite authorities) in drills and actual events during the previous 2 years.



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.

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



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.

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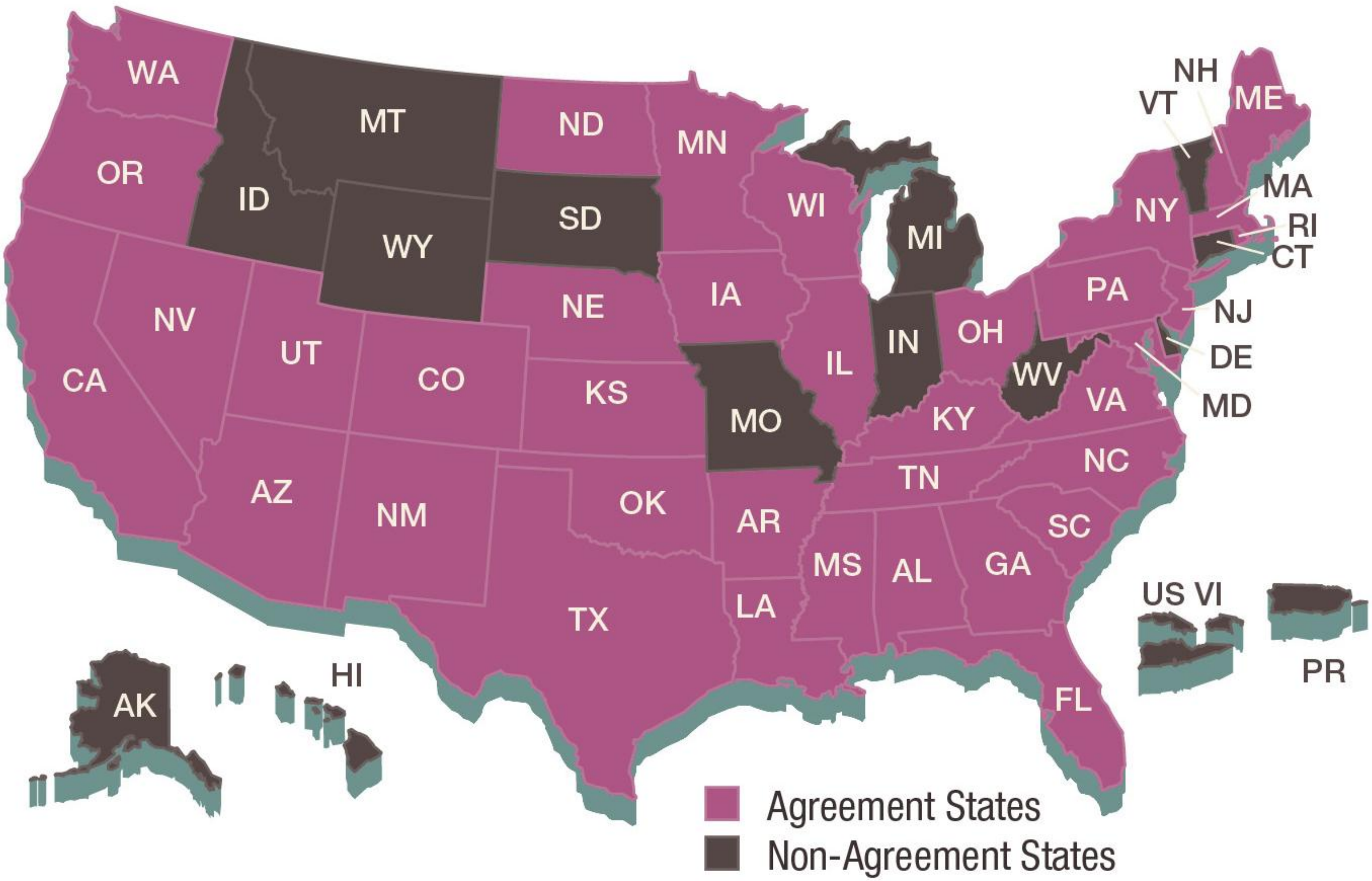
Agreement States



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

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

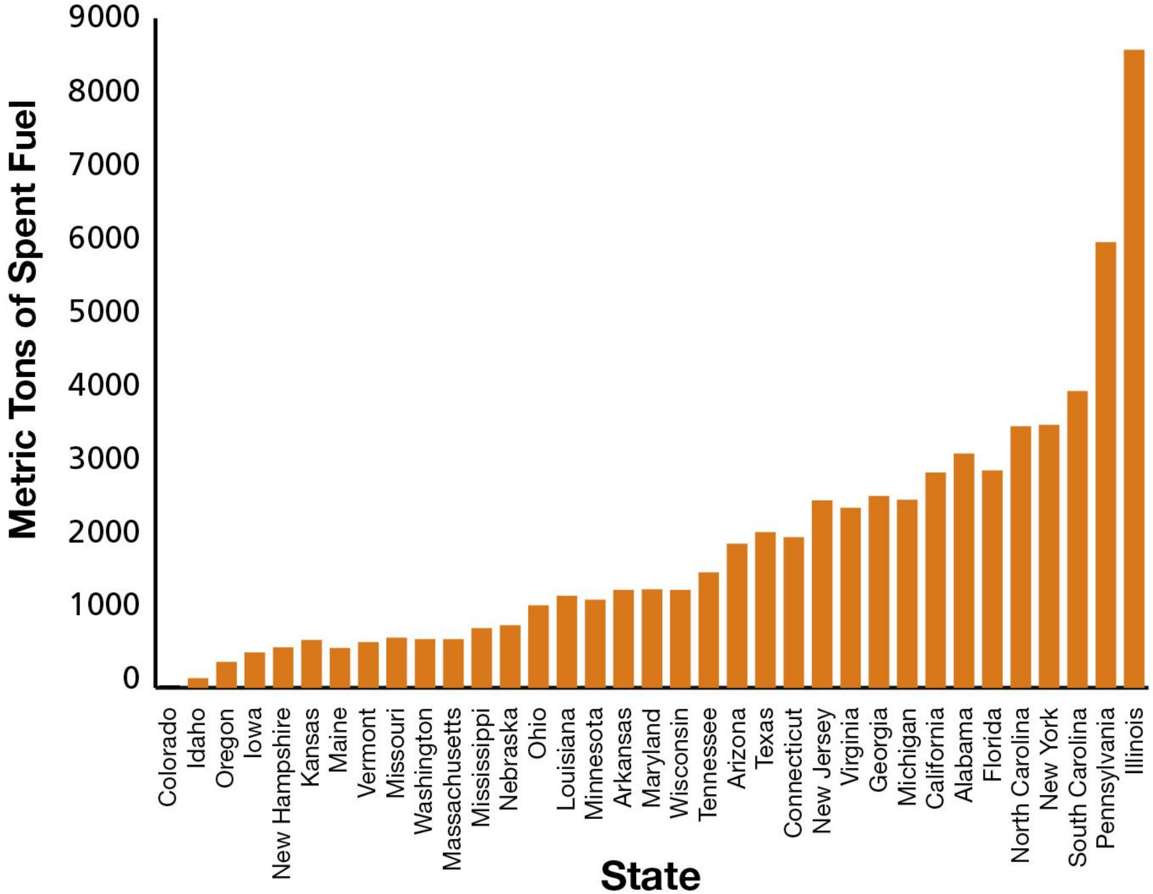
* Partially operating and producing enriched uranium while undergoing further phases of construction.

** 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.

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.

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.

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