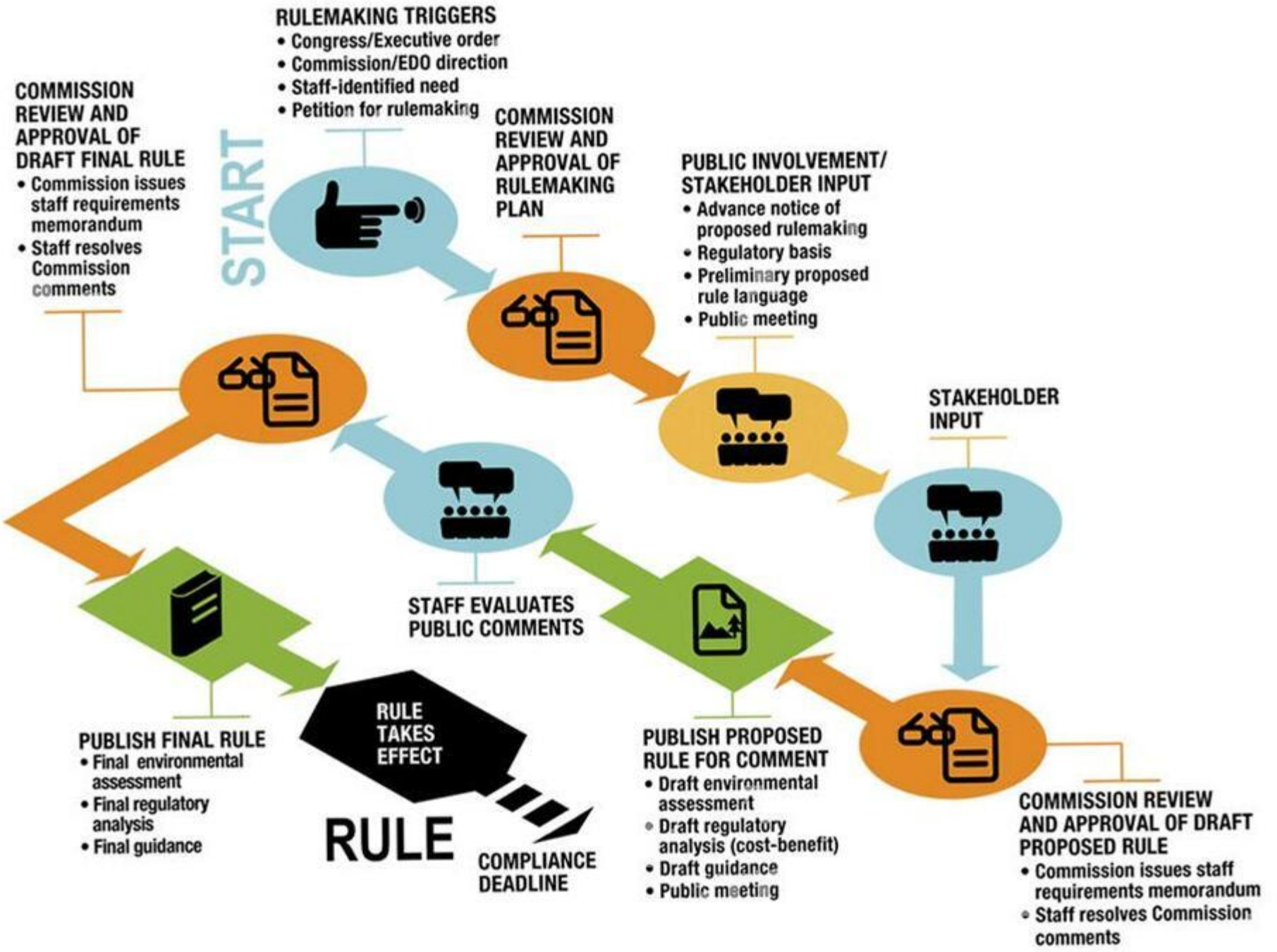
A TYPICAL RULEMAKING PROCESS



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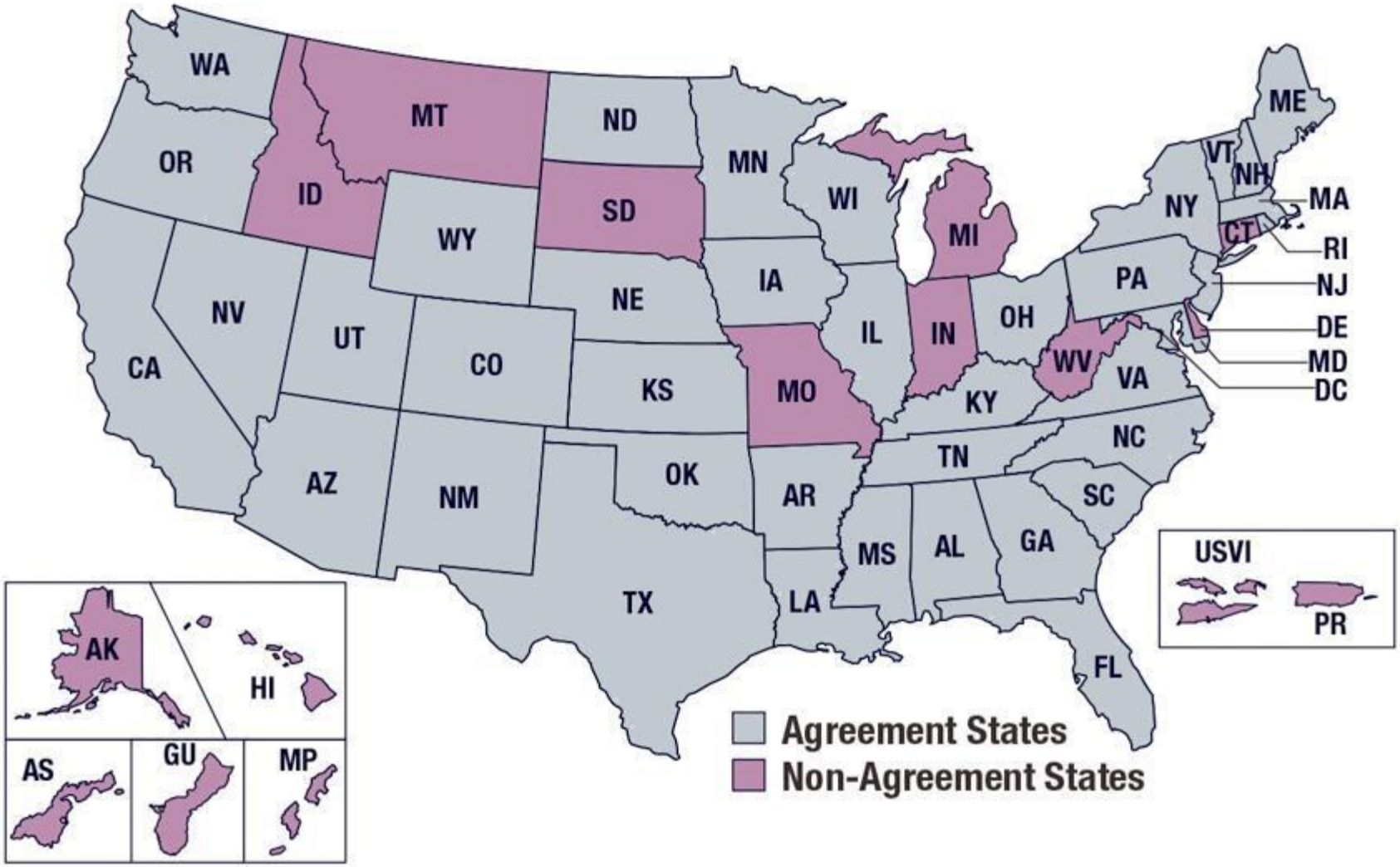
Agreement States



Note: For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S.NRC

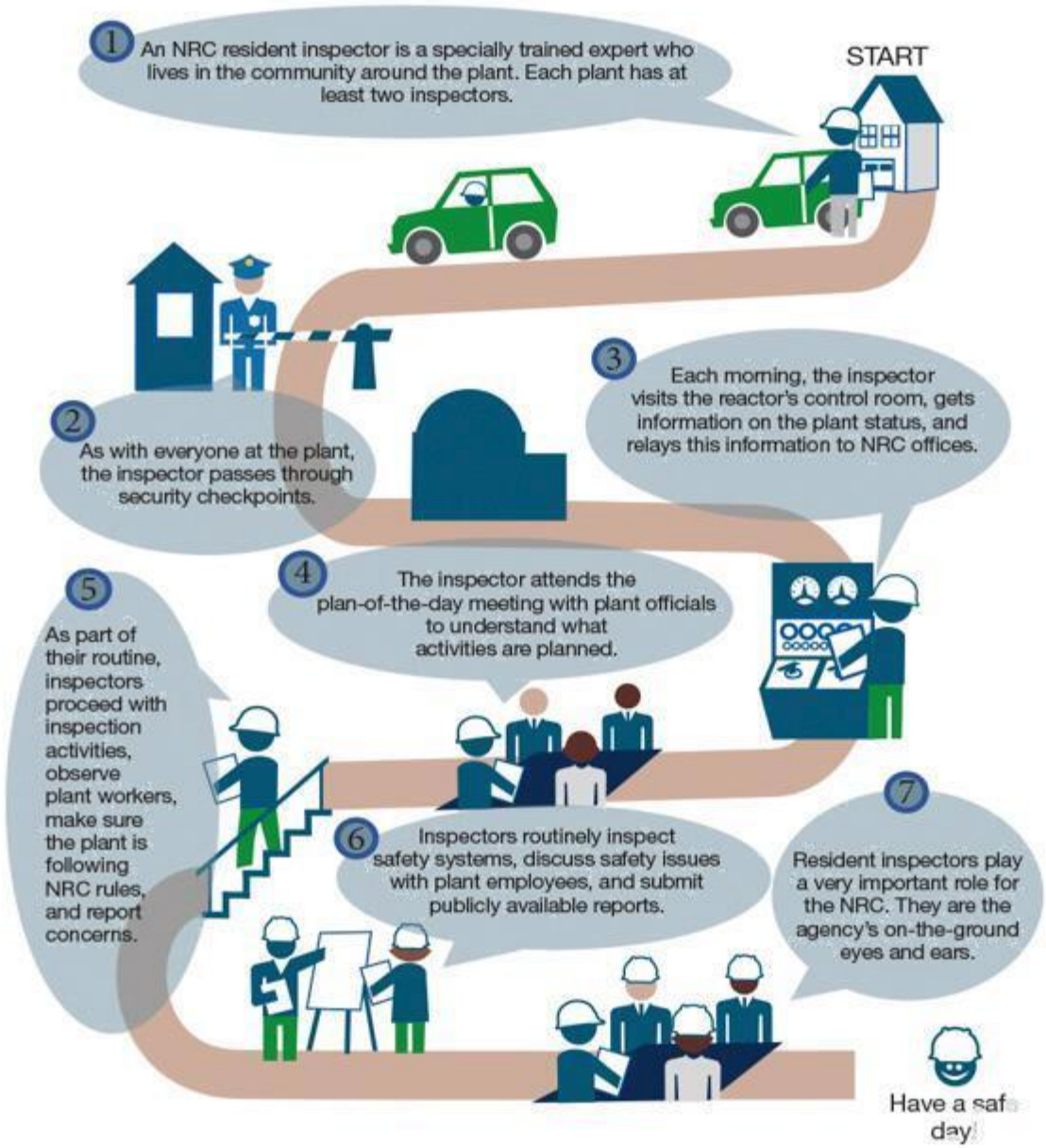
United States Nuclear Regulatory Commission

Protecting People and the Environment

2020-2021

INFORMATION DIGEST

Day in the Life of an NRC Resident Inspector



YouTube Learn more about resident inspectors. Watch the videos on the NRC YouTube Channel at *https://www.youtube.com/user/NRCgov*.

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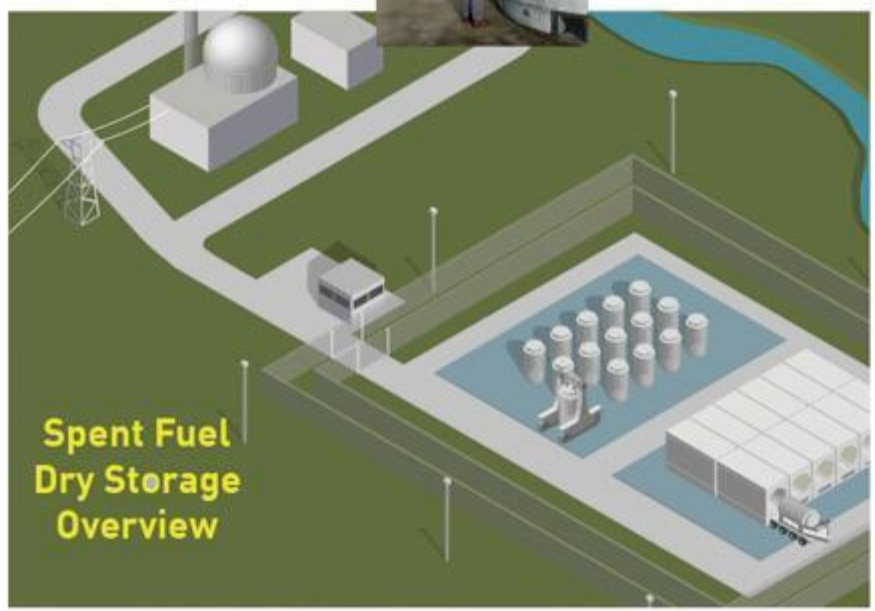
DATA AS OF AUGUST 2020
SOURCE: U.S. NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Dry Storage of Spent Nuclear Fuel

At nuclear reactors across the country, spent fuel is kept on site, typically above ground, in systems basically similar to the ones shown here. The NRC reviews and approves the designs of these spent fuel storage systems before they can be used.

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 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.



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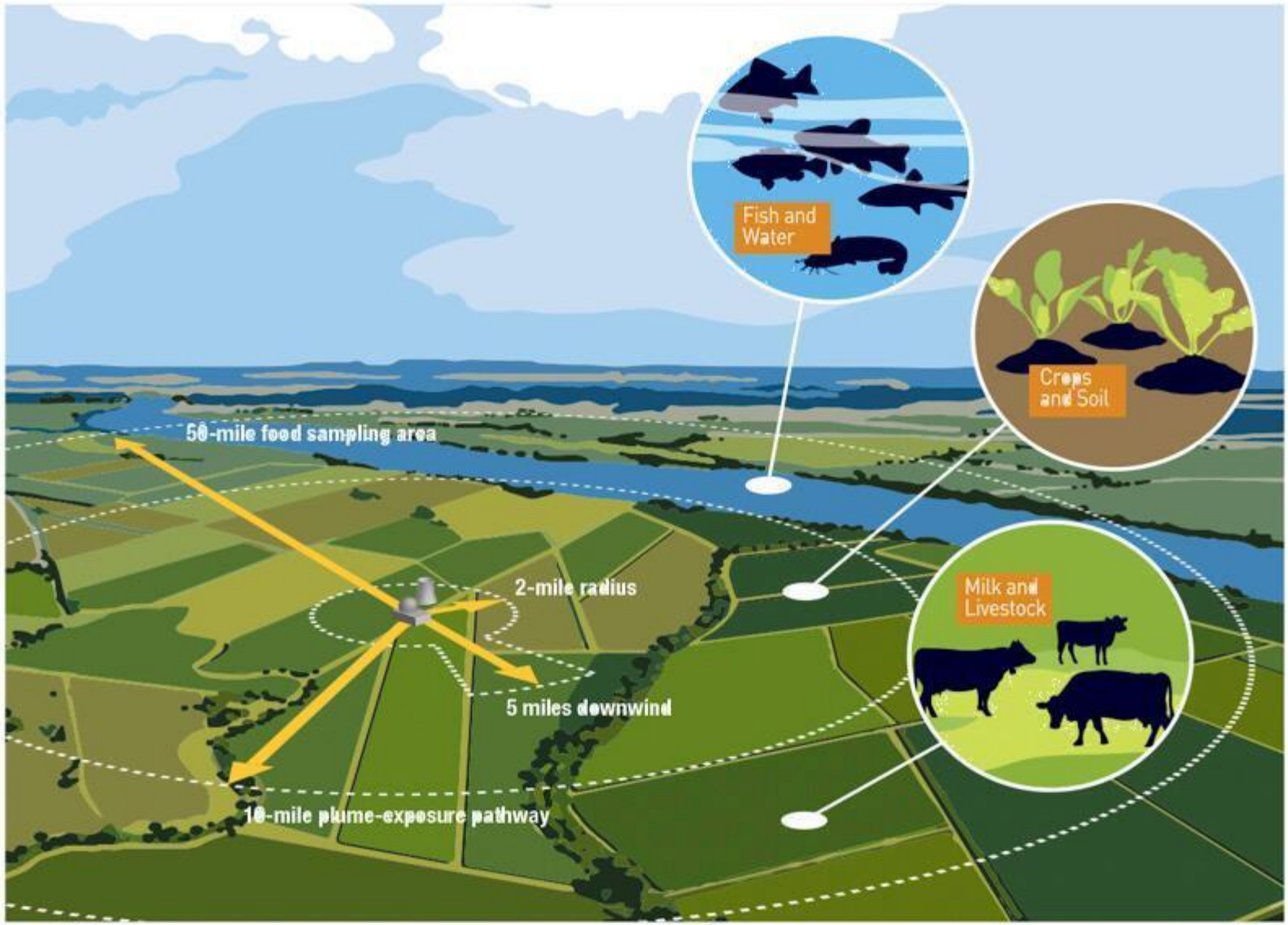
DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Emergency Planning Zones



Note: A 2-mile (3.2-kilometer) ring around the plant is identified for evacuation, along with a 5-mile (8-kilometer) zone downwind of the projected release path.

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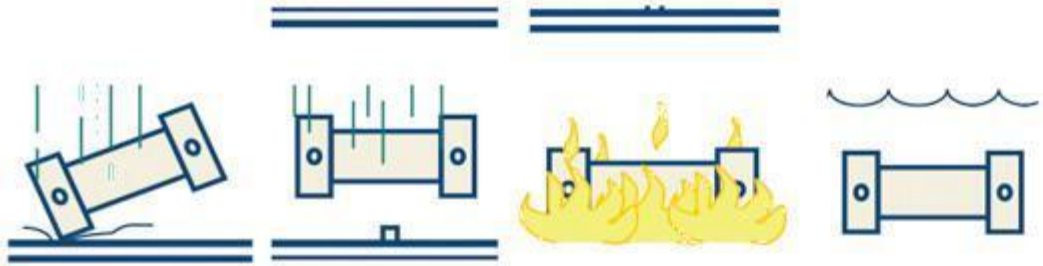
DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Ensuring Safe Spent Fuel Shipping Containers



The impact (free drop and puncture), fire and water immersion tests are required in sequence to determine the maximum effects on a package.

A transport package is placed inside a conveyance vehicle.

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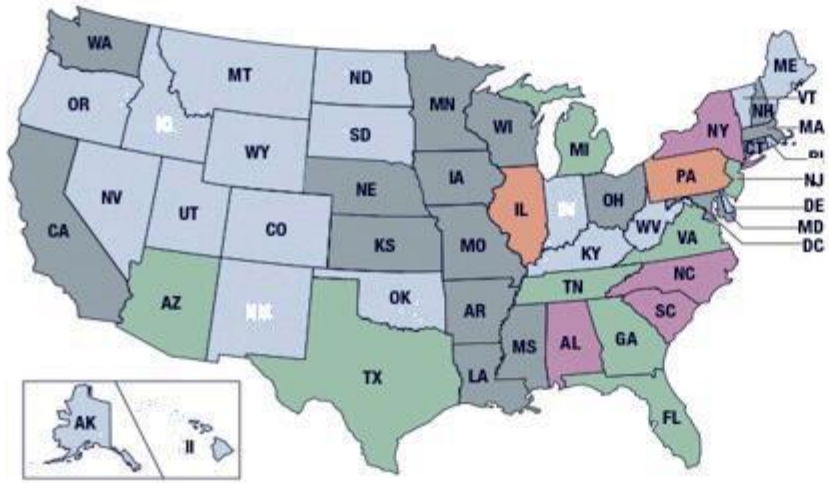
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Gross Electricity Generated in Each State by Nuclear Power

Net Electricity Generated in Each State by Nuclear Power



Total Nuclear Power Generated (... thousand megawatt-hours)

None	< less than 20,000	20,001 to 40,000	40,001 to 60,000	> more than 60,001+
20 States	16 States	8 States	4 States	2 States

Note *
U.S. Territories not pictured. American Samoa, Guam, Northern Mariana Islands, Puerto Rico, U.S. Virgin Islands, and Minor Outlying Islands do not generate nuclear power

Total Nuclear Power Generated by State (in thousand megawatt-hours)

State	Total Nuclear Generated	% of Nuclear Electricity	State	Total Nuclear Generated	% of Nuclear Electricity
Illinois	97,191	53%	Ohio	17,687	15%
Pennsylvania	83,199	39%	Connecticut	16,499	48%
S. Carolina	54,344	58%	Louisiana	15,409	16%
Alabama	42,651	42%	Maryland	15,106	44%
N. Carolina	42,37[illegible]	33%	Minnesota	13,904	[illegible]%
New York	42,167	33%	Arkansas	12,691	[illegible]%
Texas	38,581	9%	Kansas	10,647	[illegible]%
New Jersey	34,032	45%	New Hampshire	9,990	57%
Georgia	33,708	26%	Wisconsin	9,648	15%
Michigan	32,381	29%	Washington	8,128	7%
Arizona	32,340	31%	Missouri	8,304	10%
Tennessee	31,817	40%	Nebraska	6,912	20%
Virginia	30,533	34%	Mississippi	7,364	12%
Florida	29,146	[illegible]%	Massachusetts	5,047	16%
California	17,301	[illegible]%	Iowa	5,2[illegible]	9%

Source: DOE/EIA, Net Generation by State, Type of Producer and Energy Source—Tables for 2017 Released September 2018. "Monthly Nuclear Utility Generation by State and Reactor," Annual December 2017, EIA-923 and EIA-860 Reports, *https://www.eia.gov* - Data as of May 2020 for 2018 and 2017.

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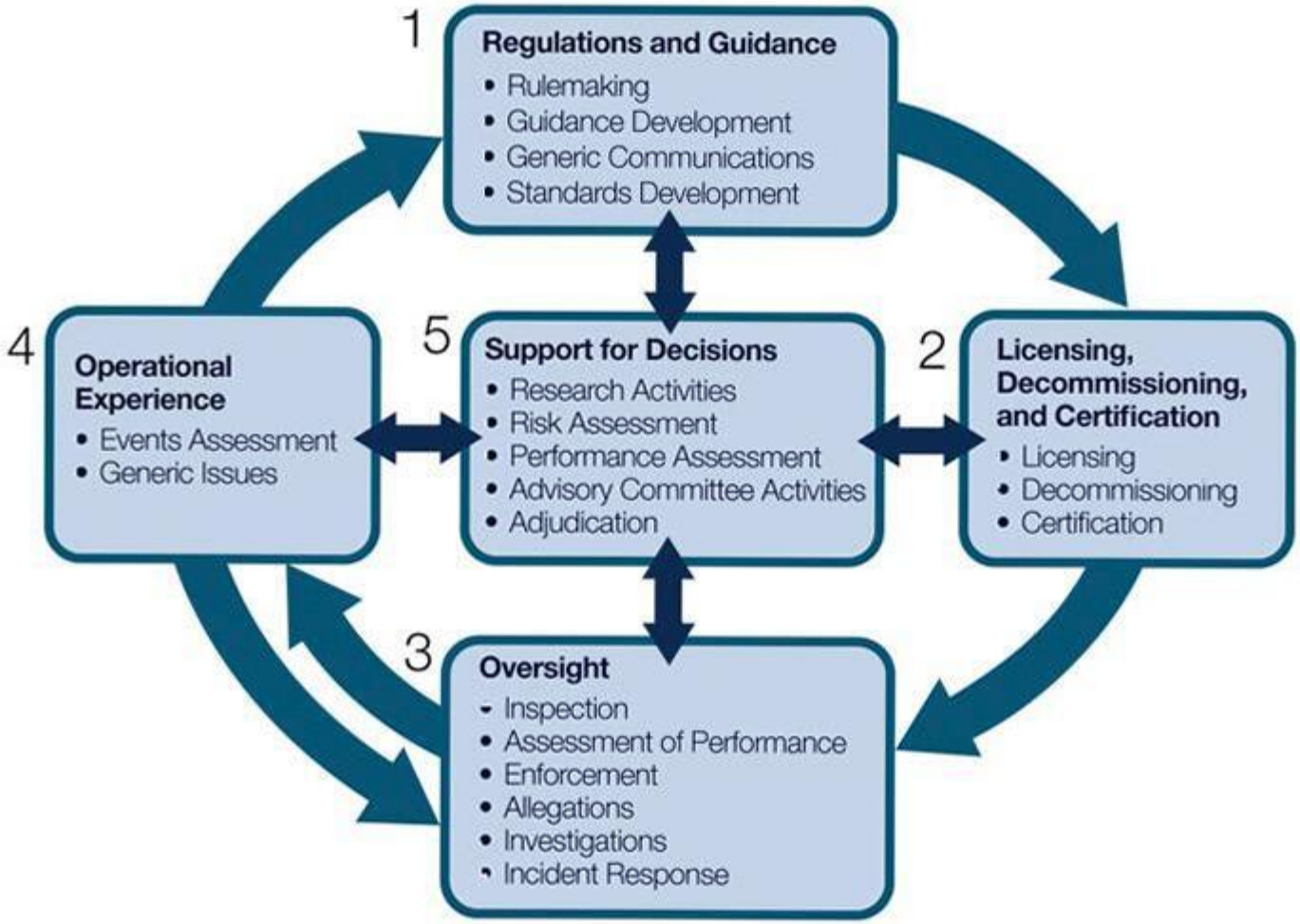
DATA AS OF AUGUST 2020
SOURCE: U.S NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

How We Regulate



1. Developing regulations and guidance for applicants and licensees.
2. Licensing or certifying applicants to use nuclear material, operate nuclear facilities, and decommission facilities.
3. Inspecting and assessing licensee operations and facilities to ensure licensees comply with NRC requirements, responding to incidents, investigating allegations of wrongdoing, 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.

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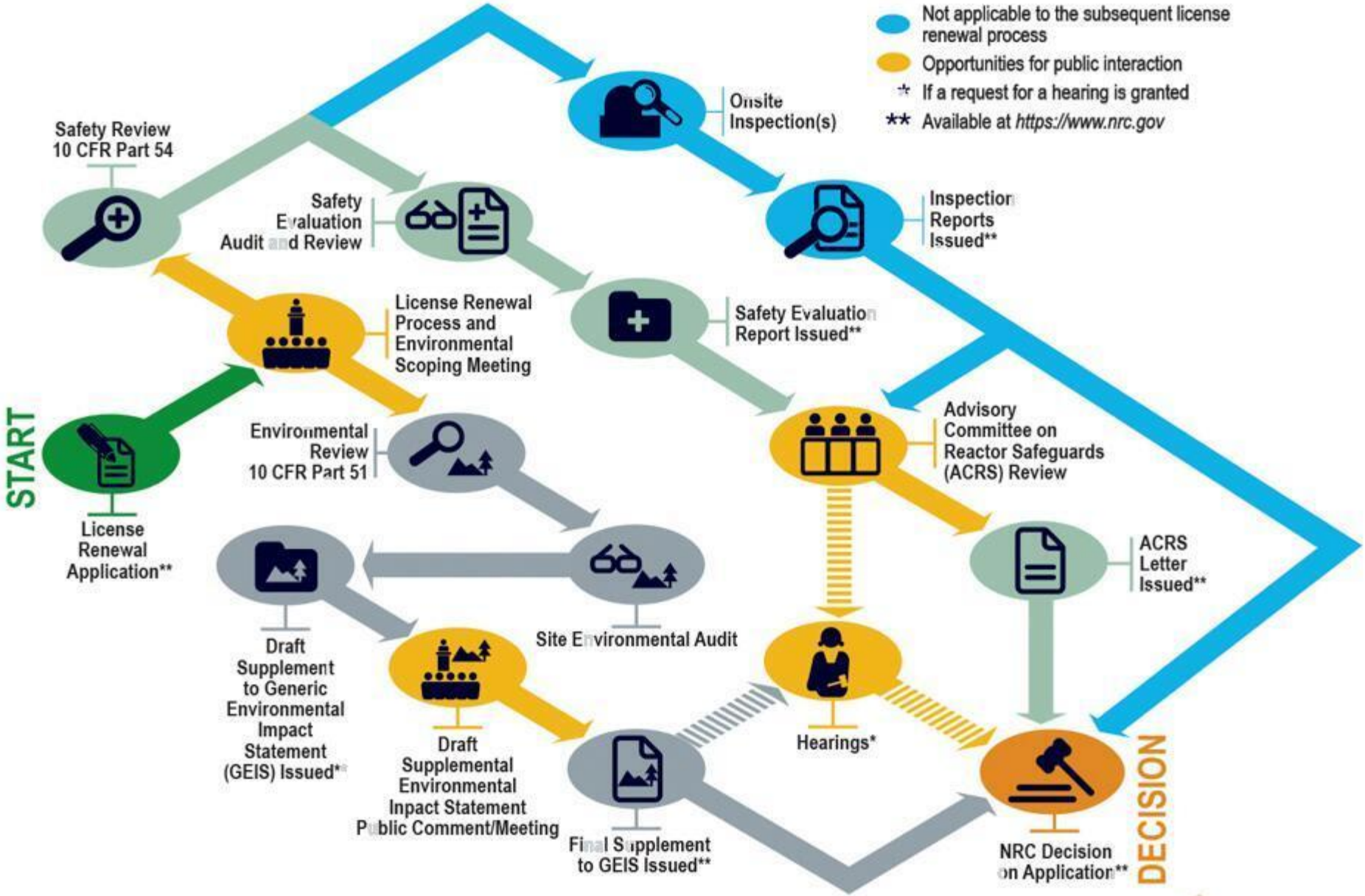
License Renewal Process



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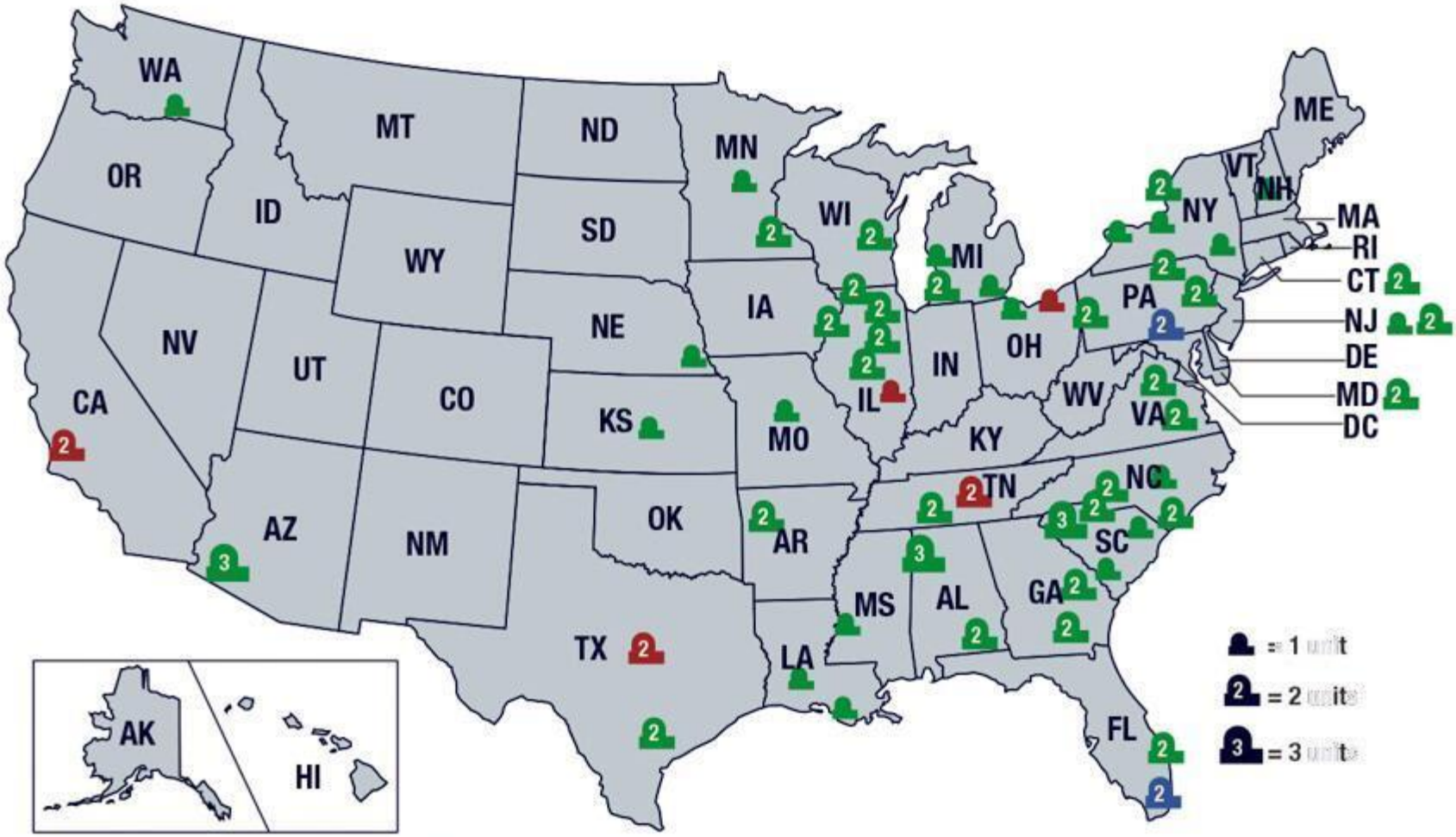
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

License Renewals Granted for Operating Nuclear Power Reactors



Licensed to Operate (94)

Original License (8) **License Renewal Granted (82)** **Subsequent License Renewal Granted (4)**

Note: The NRC has issued a total of 96 license renewals; 8 of these units have permanently shut down. Data are as of August 2020. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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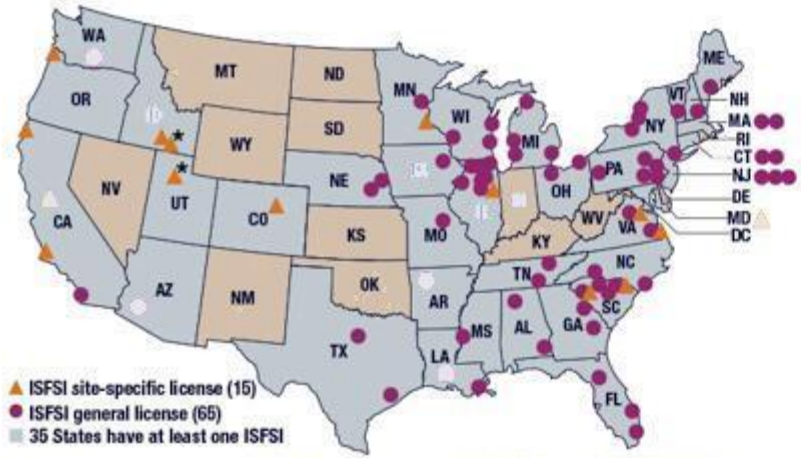
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Licensed and 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
- Crystal River
- St. Lucie
- Turkey Point

GEORGIA
- Hatch
- Vogtle

IDAHO
- DOE: Three Mile Island 2 (Fuel Debris)
- DOE: Idaho Spent Fuel Facility*

ILLINOIS
- Braidwood
- Byron
- Clinton
- GEH Morris (Wet)
- Dresden
- La Salle
- Quad Cities
- Zion

IOWA
- Duane Arnold

LOUISIANA
- River Bend
- Waterford

MAINE
- Maine Yankee

MARYLAND
- Calvert Cliffs

MASSACHUSETTS
- Yankee Rowe
- Pilgrim

MICHIGAN
- Big Rock Point
- Palisades
- Cook
- Fermi

MINNESOTA
- Monticello
- Prairie Island

MISSISSIPPI
- Grand Gulf

MISSOURI
- Callaway

NEBRASKA
- Cooper
- Ft. Calhoun

NEW HAMPSHIRE
- Seabrook

NEW JERSEY
- Hope Creek
- Salem
- Oyster Creek

NEW YORK
- Indian Point
- FitzPatrick
- Ginna
- Nine Mile Point

NORTH CAROLINA
- Brunswick
- McGuire

OHIO
- Davis-Besse
- Perry

OREGON
- Trojan

PENNSYLVANIA
- Limerick
- Susquehanna
- Peach Bottom
- Beaver Valley
- Three Mile Island

SOUTH CAROLINA
- Oconee
- Robinson
- Catawba
- Summer

TENNESSEE
- Sequoyah
- Watts Bar

TEXAS
- Comanche Peak
- South Texas Project

UTAH
- Private Fuel Storage

VERMONT
- Vermont Yankee

VIRGINIA
- Surry
- North Anna

WASHINGTON
- Columbia

WISCONSIN
- Point Beach
- Kewaunee
- La Crosse

*Facility licensed only, never built or operated. Alaska and Hawaii are not pictured and have no sites. Data are current as of August 2020. NRC-abbreviated site names listed. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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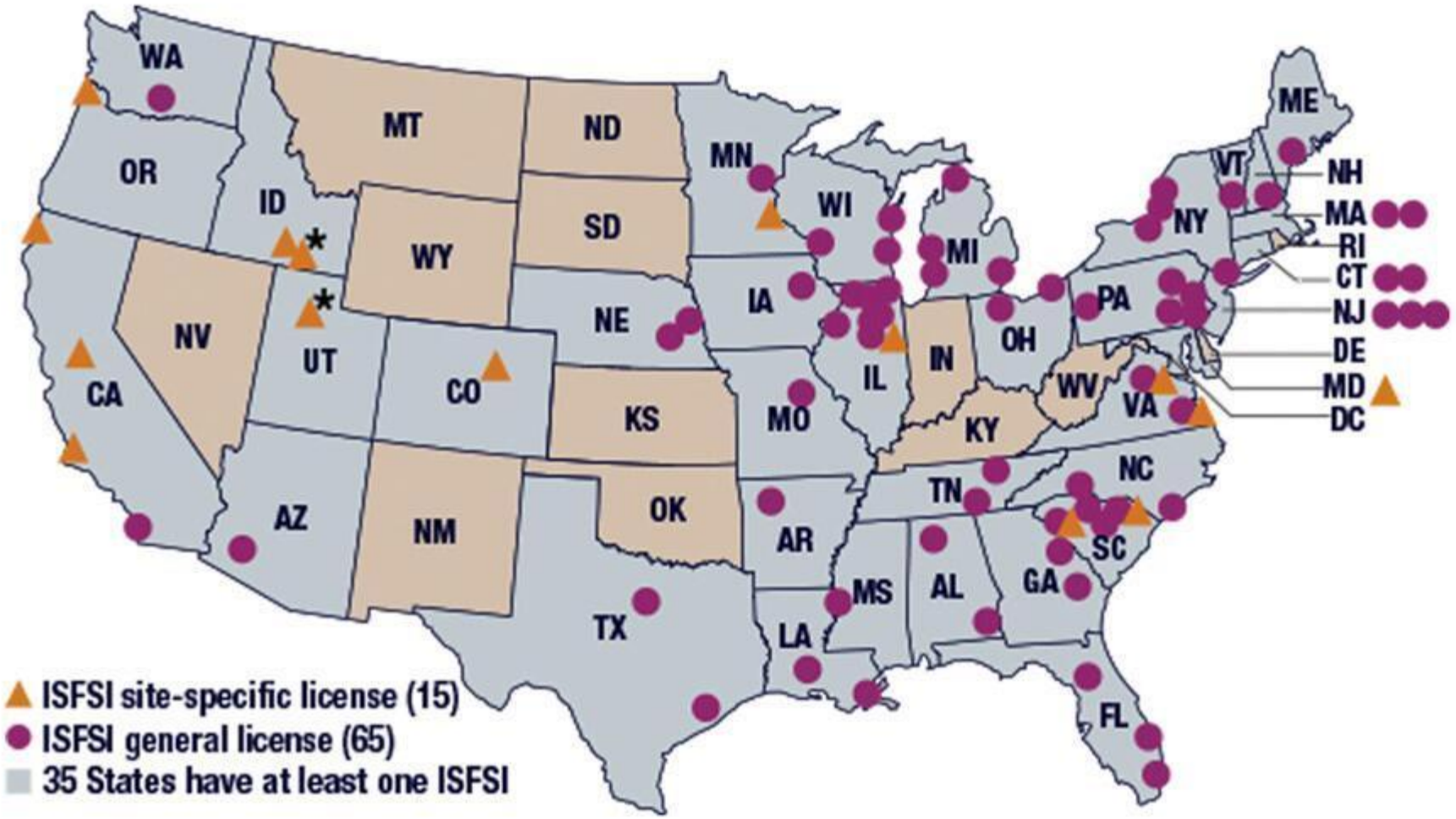
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Licensed and Operating Independent Spent Fuel Storage Installations by State



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DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Locations of New Nuclear Power Reactor Applications

* Review suspended

Note: On July 31, 2017, South Carolina Electric and Gas announced its decision to cease construction on V.C. Summer Units 2 and 3, and the licensee has requested that the COLs be withdrawn. As of October 2017, Duke Energy has announced plans to cancel reactors at Levy County, FL, and William States Lee, SC. Applications were withdrawn for Calvert Cliffs, Grand Gulf, Nine Mile Point, Victoria County, and Callaway (COL and ESP). In June 2018, Nuclear Innovation North America submitted a letter requesting that the COLs for South Texas Project Units 3 and 4 be withdrawn. NRC-abbreviated reactor names listed. Data are current as of August 2020. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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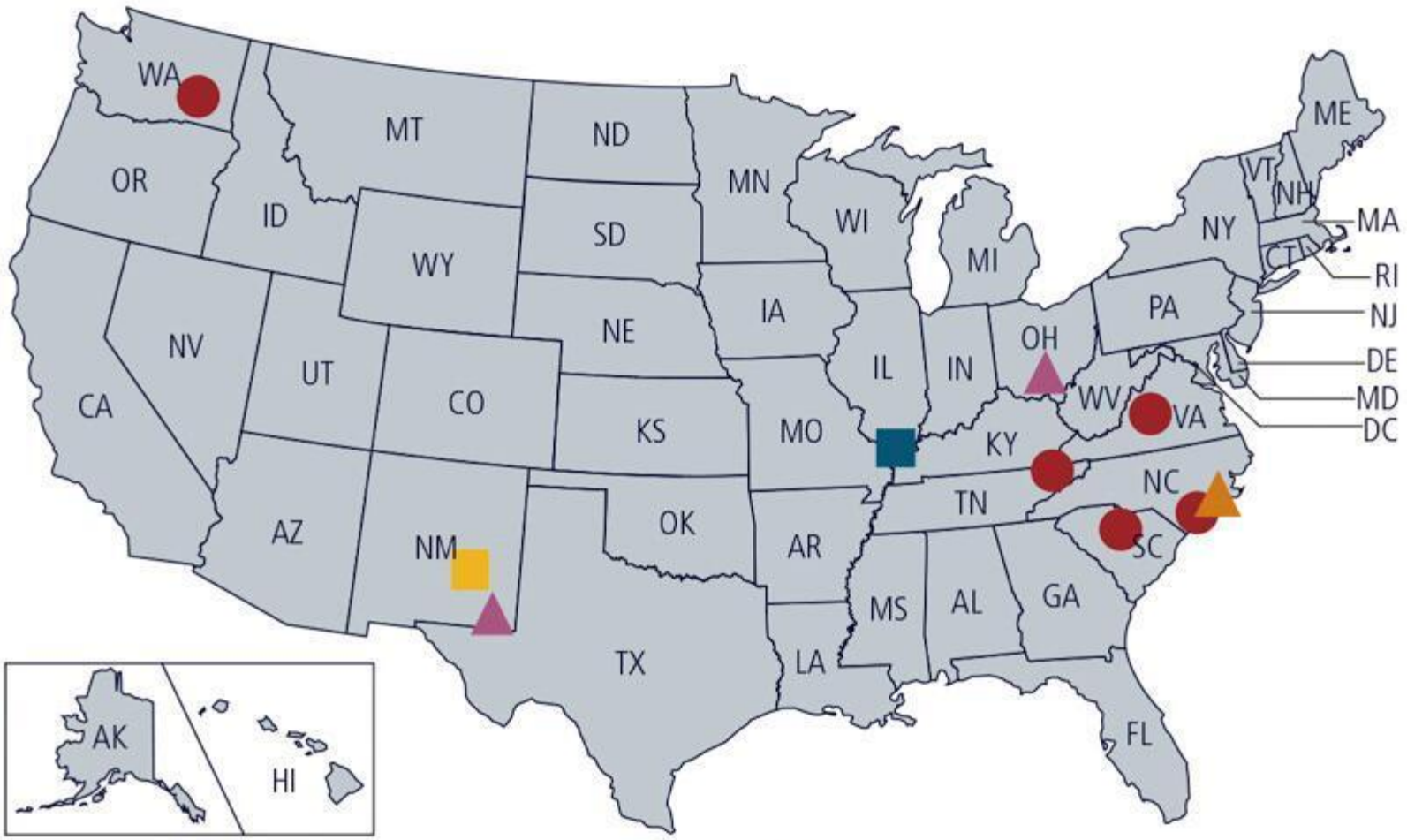
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Locations of NRC-Licensed Fuel Cycle Facilities



- Uranium Hexafluoride Conversion Facility (1)
- Uranium Fuel Fabrication Facility (5)
- Gas Centrifuge Uranium Enrichment Facility (2)
- Uranium Enrichment Laser Separation Facility (1)
- Depleted Uranium Deconversion Facility (1)

Note: The deconversion facility is not actually operating, the laser enrichment facility and one of gas centrifuge facilities are not fully operational. There are no fuel cycle facilities in Alaska or Hawaii. For the most recent information, go to the Dataset Index Web page at https://www.nrc.gov/reading-rm/doc-collections/datasets/

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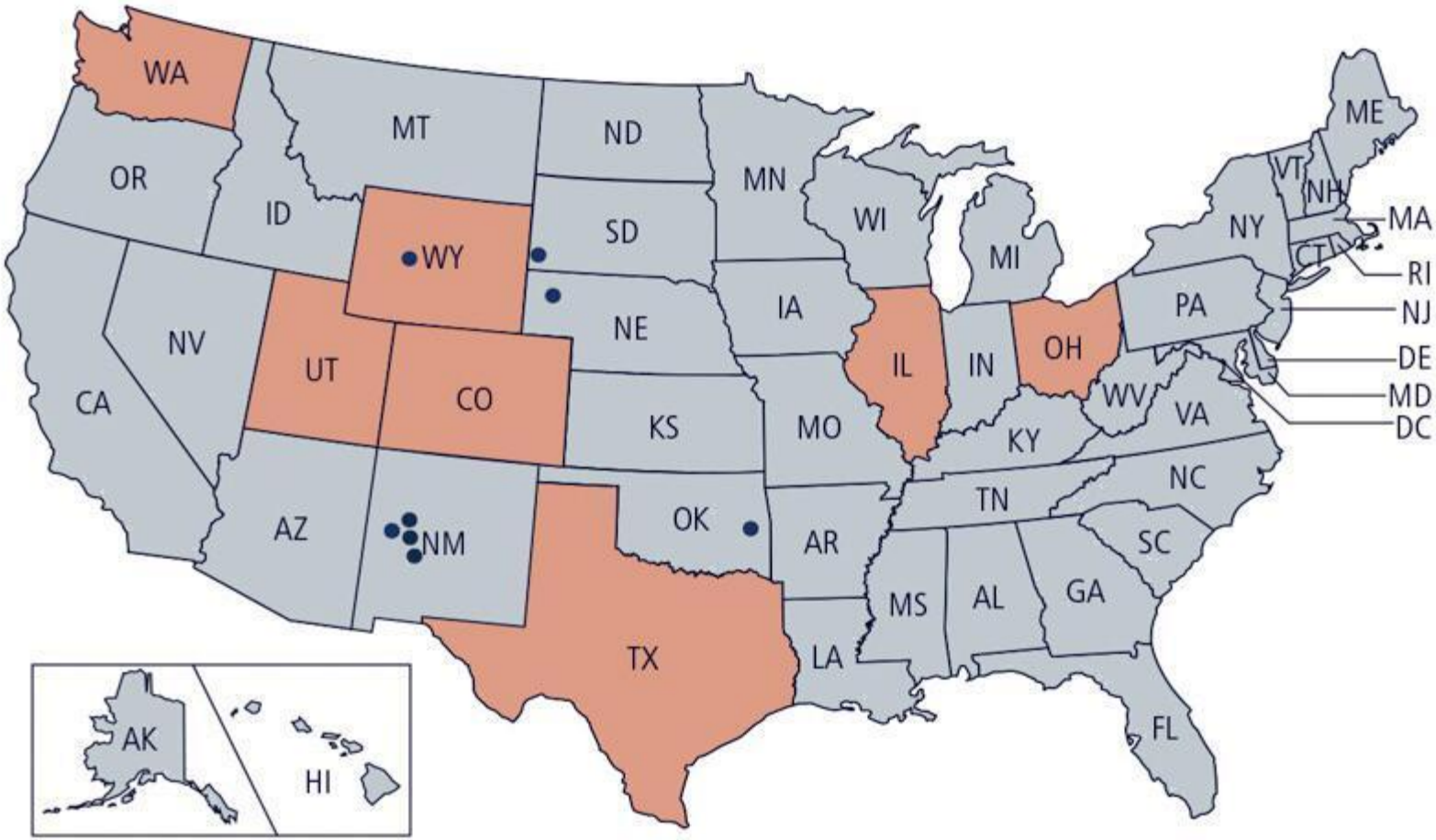
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Locations of NRC-Licensed Uranium Recovery Facility Sites (Includes sites undergoing decommissioning)



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 (8)

Note: For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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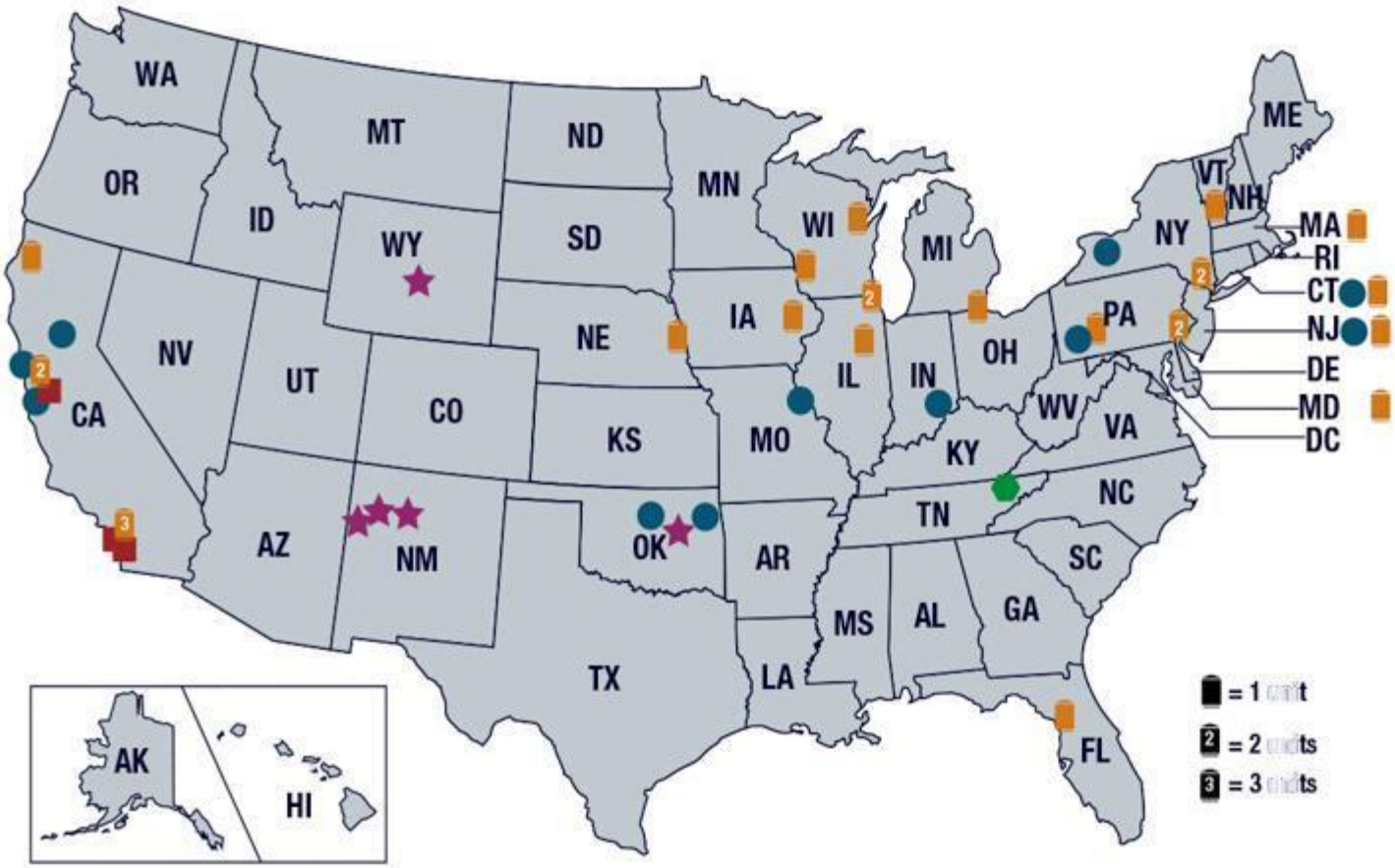
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Locations of NRC-Regulated Sites Undergoing Decommissioning



- Power Reactors (25)
- Research and Test Reactors (3)
- Complex Materials (11)
- Uranium Recovery (5)
- Fuel Cycle Facilities (1)

Note: The NRC is in the final stages of the licensing termination process with the reviews of the final status survey results at Zion 1 and 2, La Crosse and Humboldt Bay and it expects to terminate the two research reactor licenses at General Atomics by the end of 2020. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*. Data are current as of August 2020.

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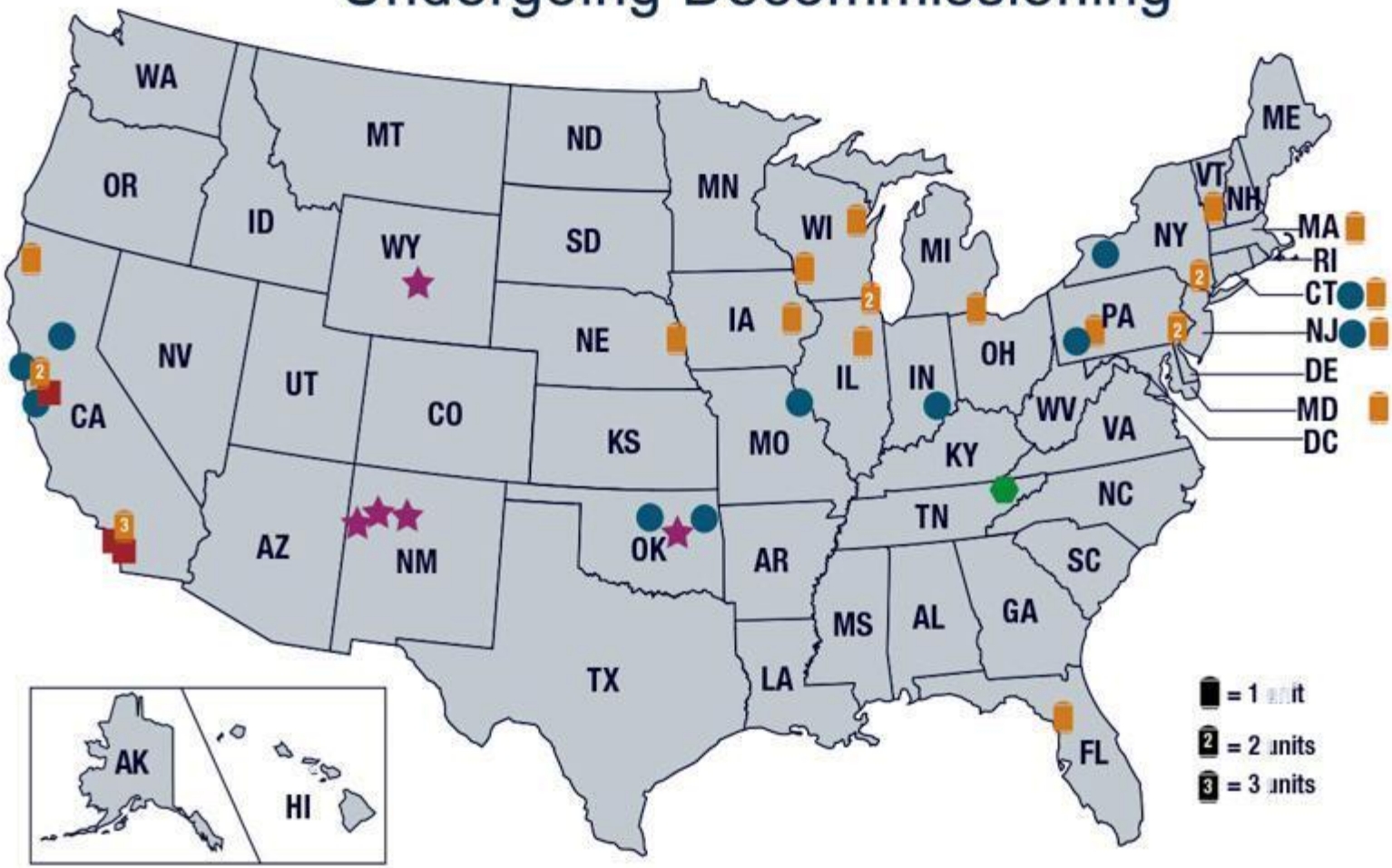
Locations of NRC-Regulated Sites Undergoing Decommissioning



- Power Reactors (25)
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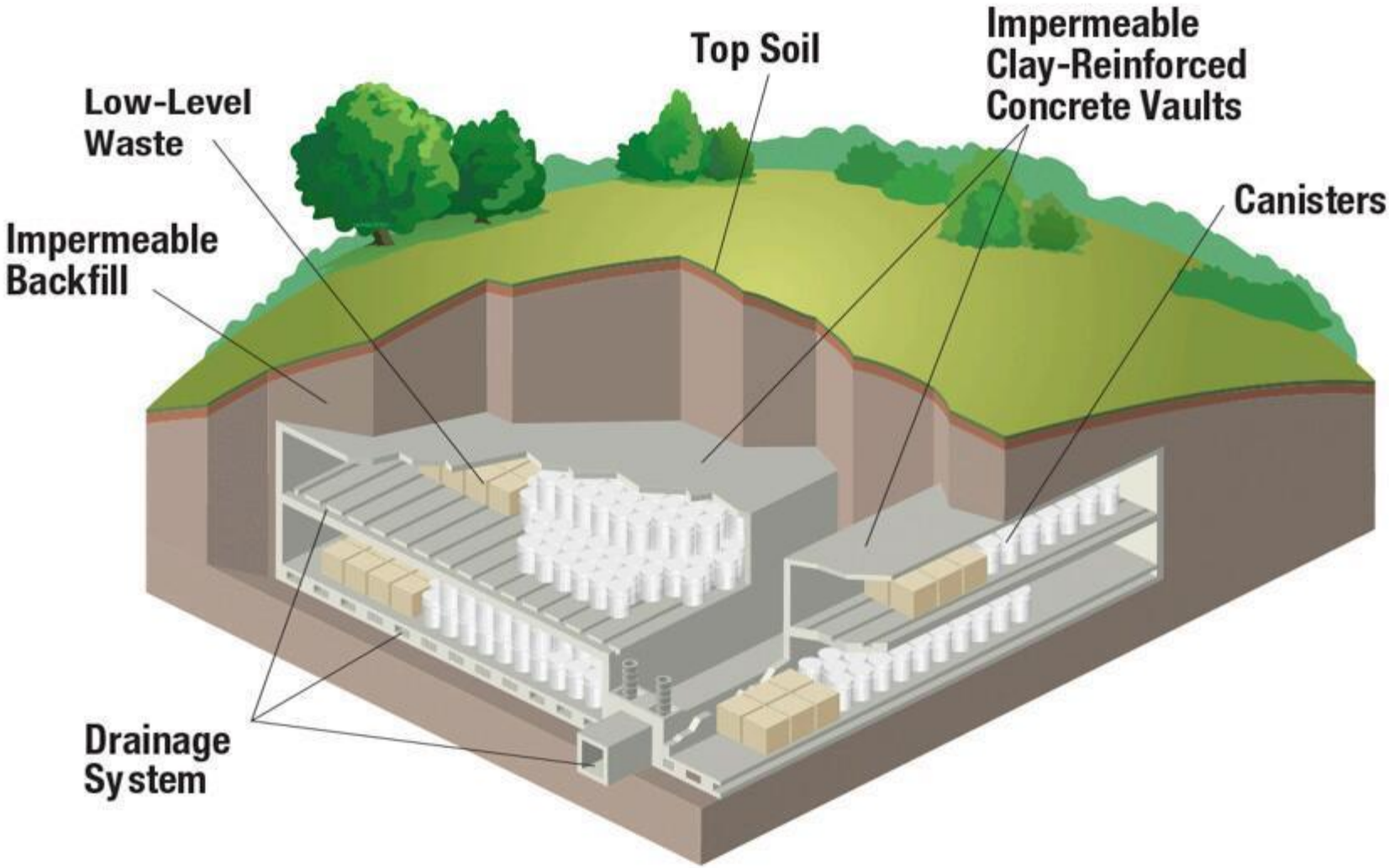
Low-Level Radioactive Waste Disposal



This LLW disposal site accepts waste from States participating in a regional disposal agreement.

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DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S. Operating Commercial Nuclear Power Reactors

Licensed to Operate (94)

REGION I

CONNECTICUT
- Millstone 2 and 3

MARYLAND
- Calvert Cliffs 1 and 2

NEW HAMPSHIRE
- Seabrook

NEW JERSEY
- Hope Creek
- Salem 1 and 2

NEW YORK
- FitzPatrick
- Ginna
- Indian Point 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

REGION II

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

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

GEORGIA
- 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 and 2

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

MICHIGAN
- Cook 1 and 2
- Fermi 2
- Palisades

MINNESOTA
- Monticello
- Prairie Island 1 and 2

OHIO
- Davis-Besse
- Perry

WISCONSIN
- 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

KANSAS
- Wolf Creek

LOUISIANA
- River Bend 1
- Waterford 3

MISSISSIPPI
- Grand Gulf

MISSOURI
- Callaway

NEBRASKA
- Cooper

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

WASHINGTON
- Columbia

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NRC Regions

Region 1
King of Prussia, PA

Region 2
Atlanta, GA

Region 3
Lisle, IL

Region 4
Arlington, TX

Technical Training Ctr.
Chattanooga,, TN

Nuclear Power Plants

- Each regional office oversees the plants in its region—except for the Callaway plant in Missouri, which Region IV oversees.

Materials Licensees

- Region I oversees licensees and Federal facilities located in Region I and Region II.
- Region III oversees licensees and Federal facilities located in Region III.
- Region IV oversees licensees and Federal facilities located in Region IV.

Nuclear Fuel Processing Facilities

- Region II oversees all the fuel processing facilities in all regions.
- Region II also handles all construction inspection activities for new nuclear power plants and fuel cycle facilities in all regions.

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DATA AS OF AUGUST 2020

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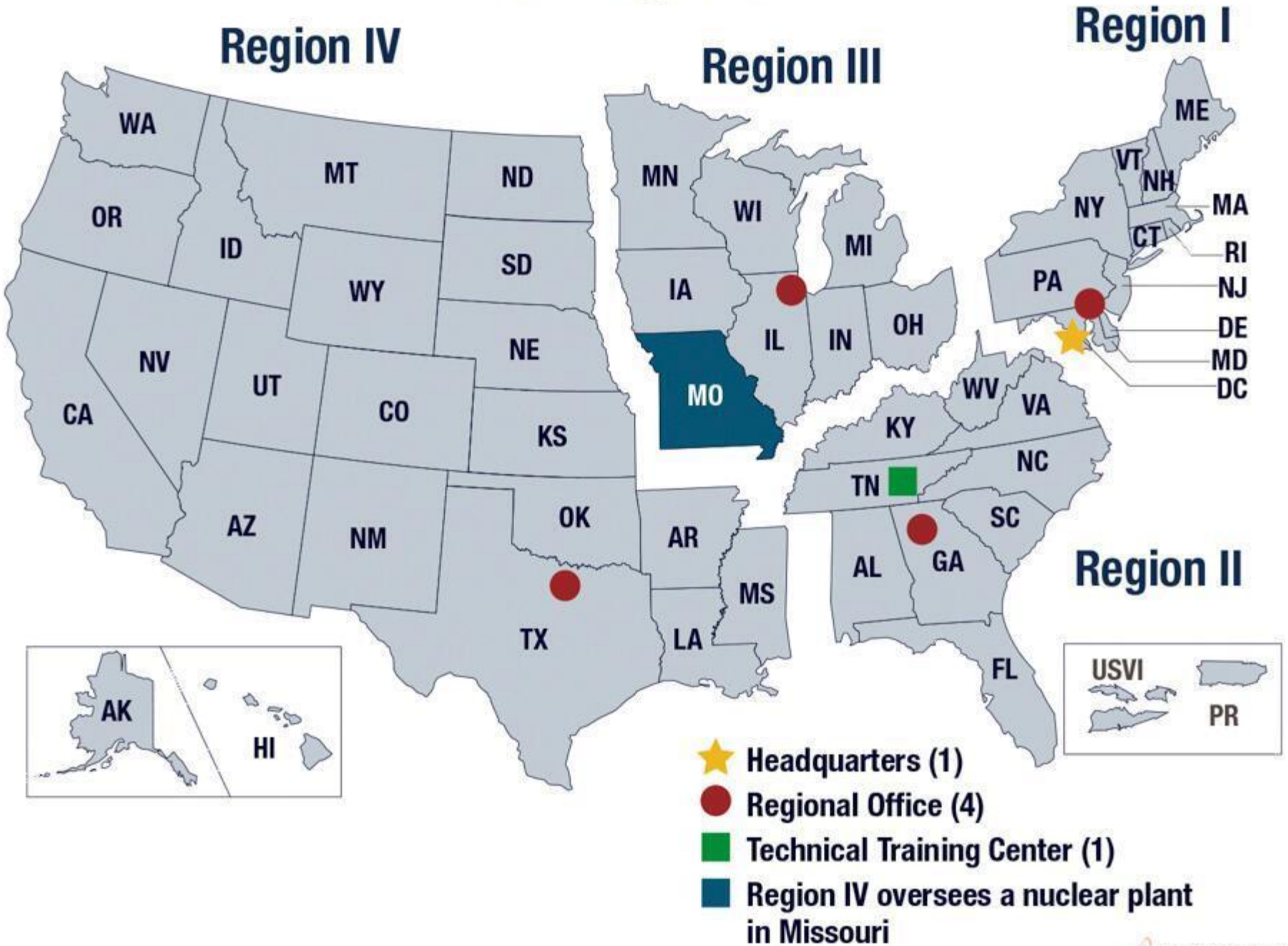
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

NRC Regions



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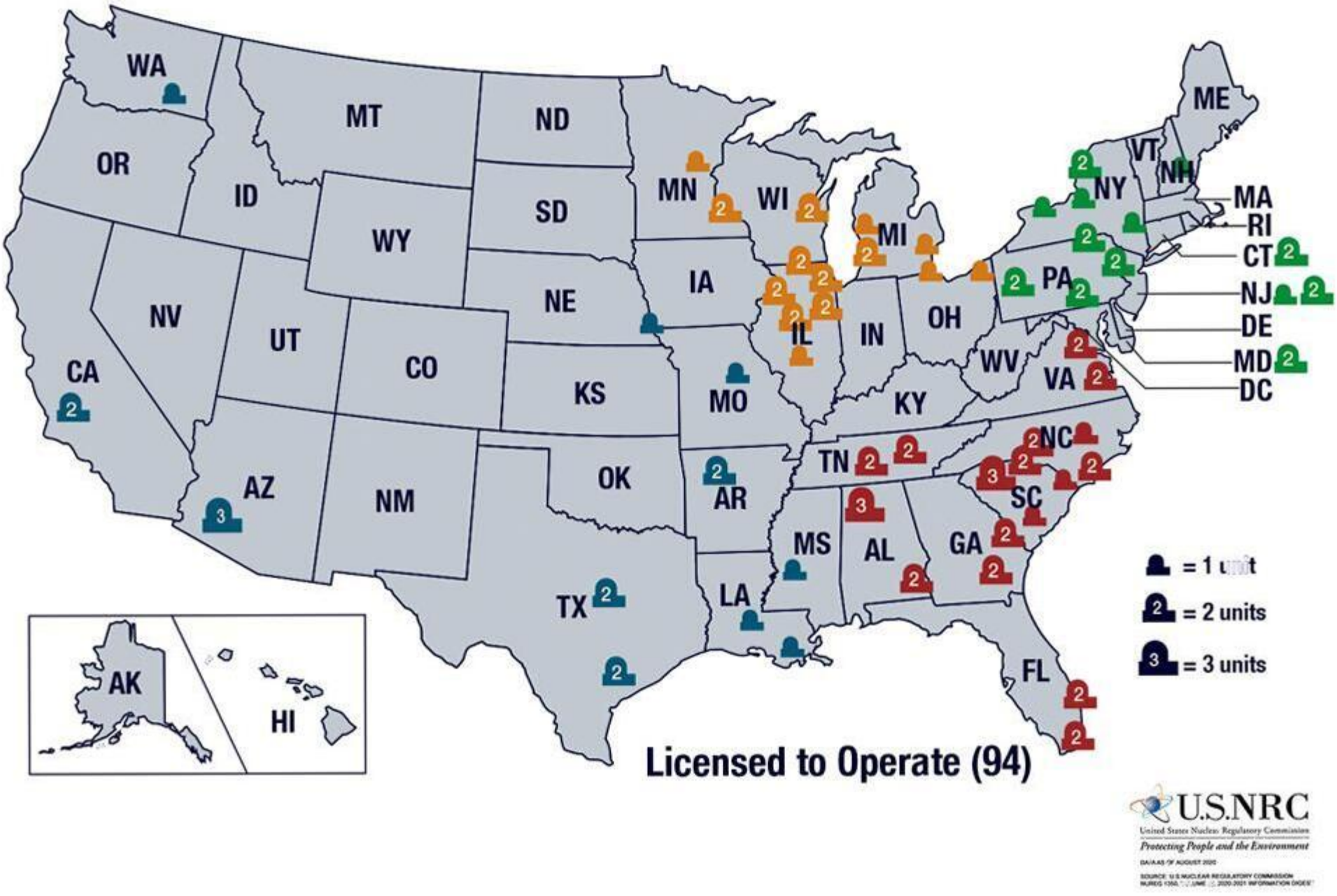
DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S. Operating Commercial Nuclear Power Reactors



Native American Reservations and Trust Lands within a 50-Mile Radius of an Operating Nuclear Power Plant

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

CONNECTICUT
Millstone
Mohegan Reservation
Mashantucket Pequot Reservation
Narragansett Reservation
Shinnecock Indian Nation

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

Turkey Point
Hollywood Reservation (Seminole Tribes of Florida)
Miccosukee Reservation
Miccosukee Trust Land

IOWA
Duane Arnold**
Sac & Fox/Meskwaki Trust Land
Sac & Fox/Meskwaki Reservation

LOUISIANA
River Bend
Tunica-Biloxi Reservation

MARYLAND
Calvert Cliffs
Rappahannock Tribe
Upper Mattaponi Tribe

MICHIGAN
Palisades
Pottawatomi Reservation
Matchebenashshewish Band
Pokagon Reservation
Pokagon Trust Land*

DC Cook
Pokagon Reservation
Pokagon 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
Iowa Reservation
Iowa Trust Land
Kickapoo

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

VIRGINIA
Surry
Pamunkey Reservation
Chickahominy Indian Tribe
Chickahominy Indian Tribe —Eastern Division
Nansemond Indian Tribe
Upper Mattaponi Tribe

WASHINGTON
Columbia
Yakama Reservation
Yakama Trust Land

WISCONSIN
Point Beach
Oneida Trust Land
Oneida Reservation

* Tribe is located within the 10-mile emergency preparedness zone of operating reactors.

**Duane Arnold nuclear power plant is scheduled to permanently shut down in October 2020.

Notes: This table uses NRC-abbreviated reactor names and Native American Reservation and Trust land names. There are no reservations or Trust lands within 50 miles of a reactor in Alaska or Hawaii. For more information on other Tribal concerns, go to the NRC Web site at *https://www.nrc.gov*. Data are current as of August 2020; the next printed update will be August 2021.

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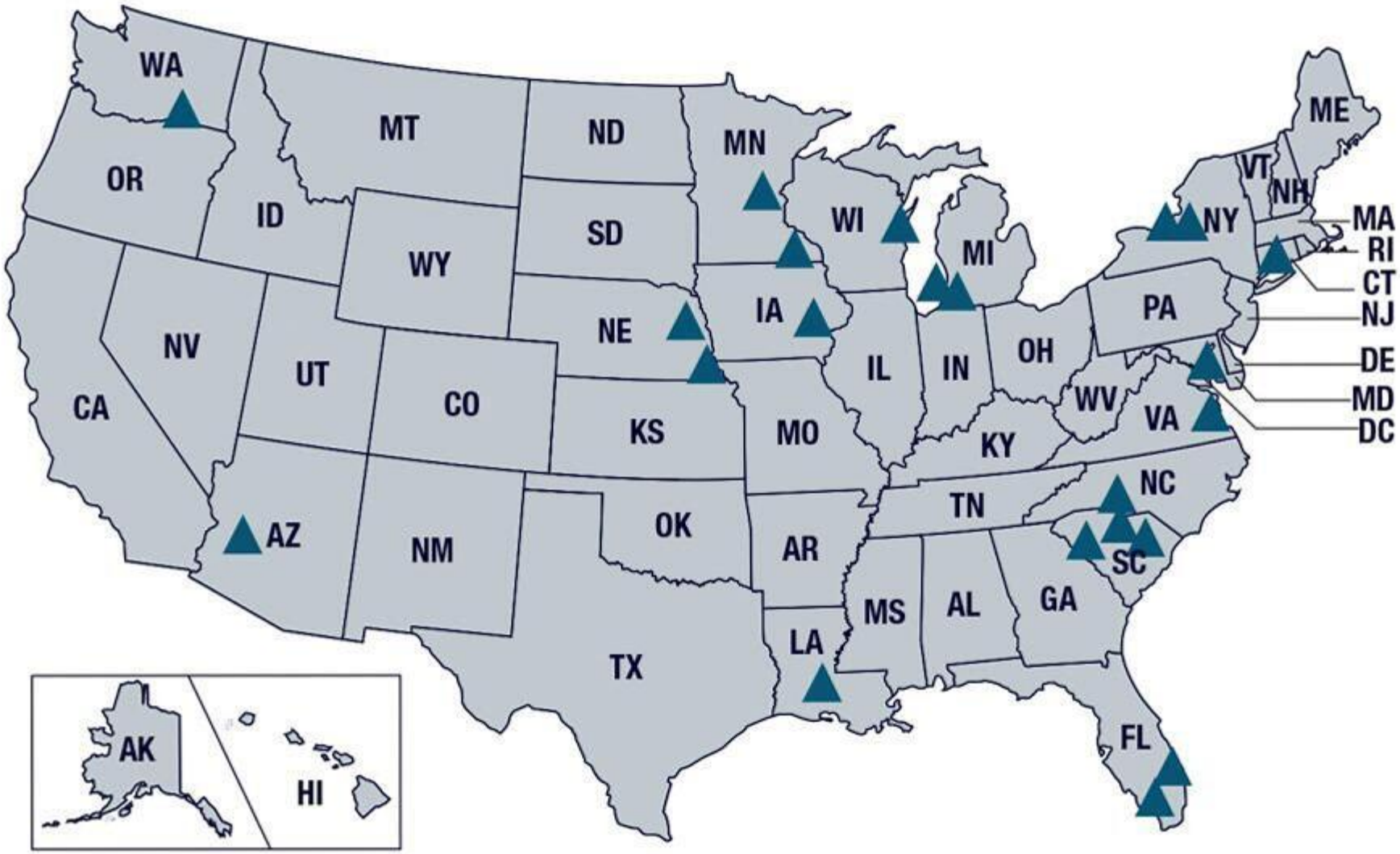
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Native American Reservations and Trust Lands within a 50-Mile Radius of an Operating Nuclear Power Plant



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New Reactor Licensing Process

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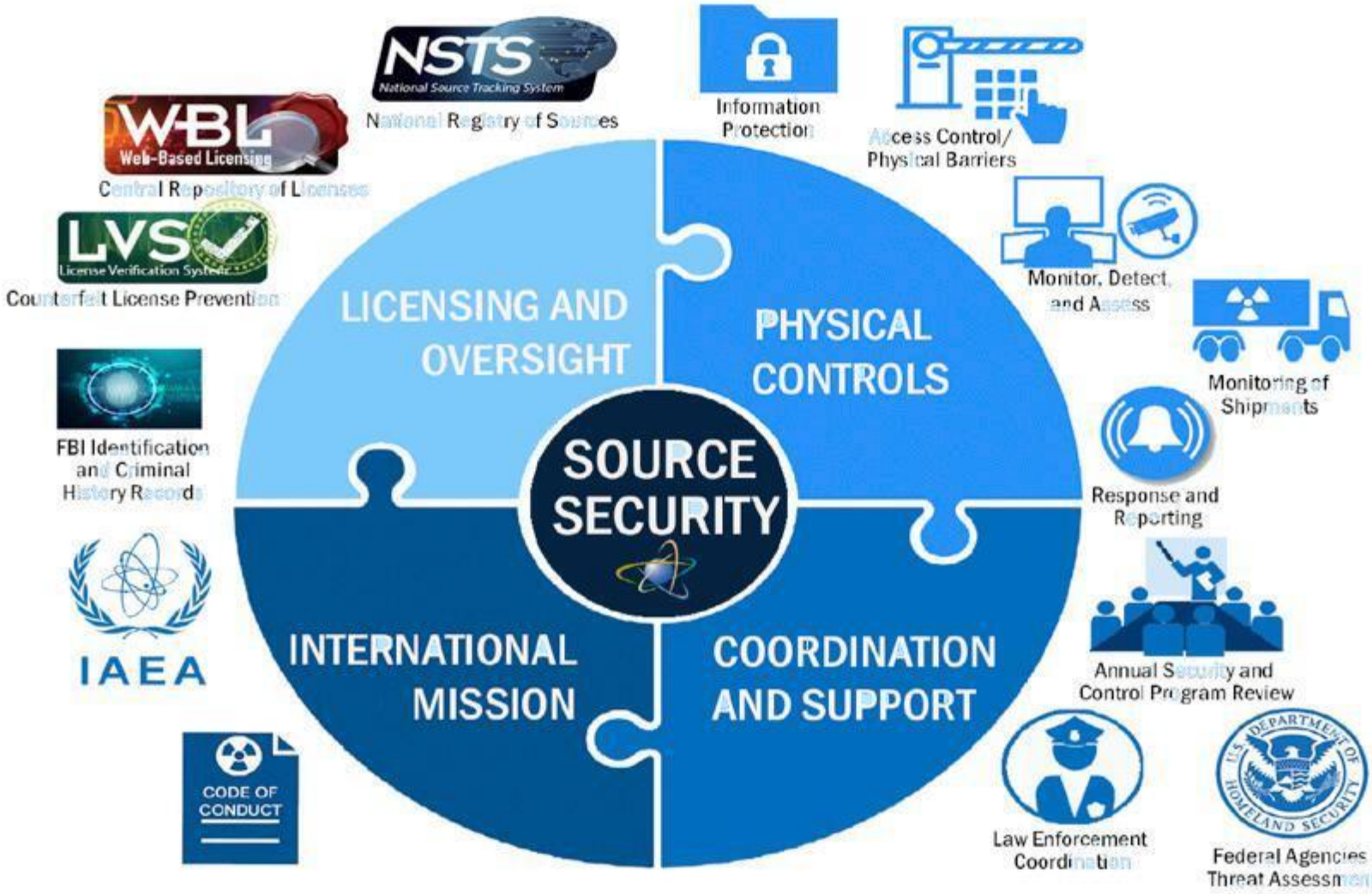
NRC Approach to Source Security



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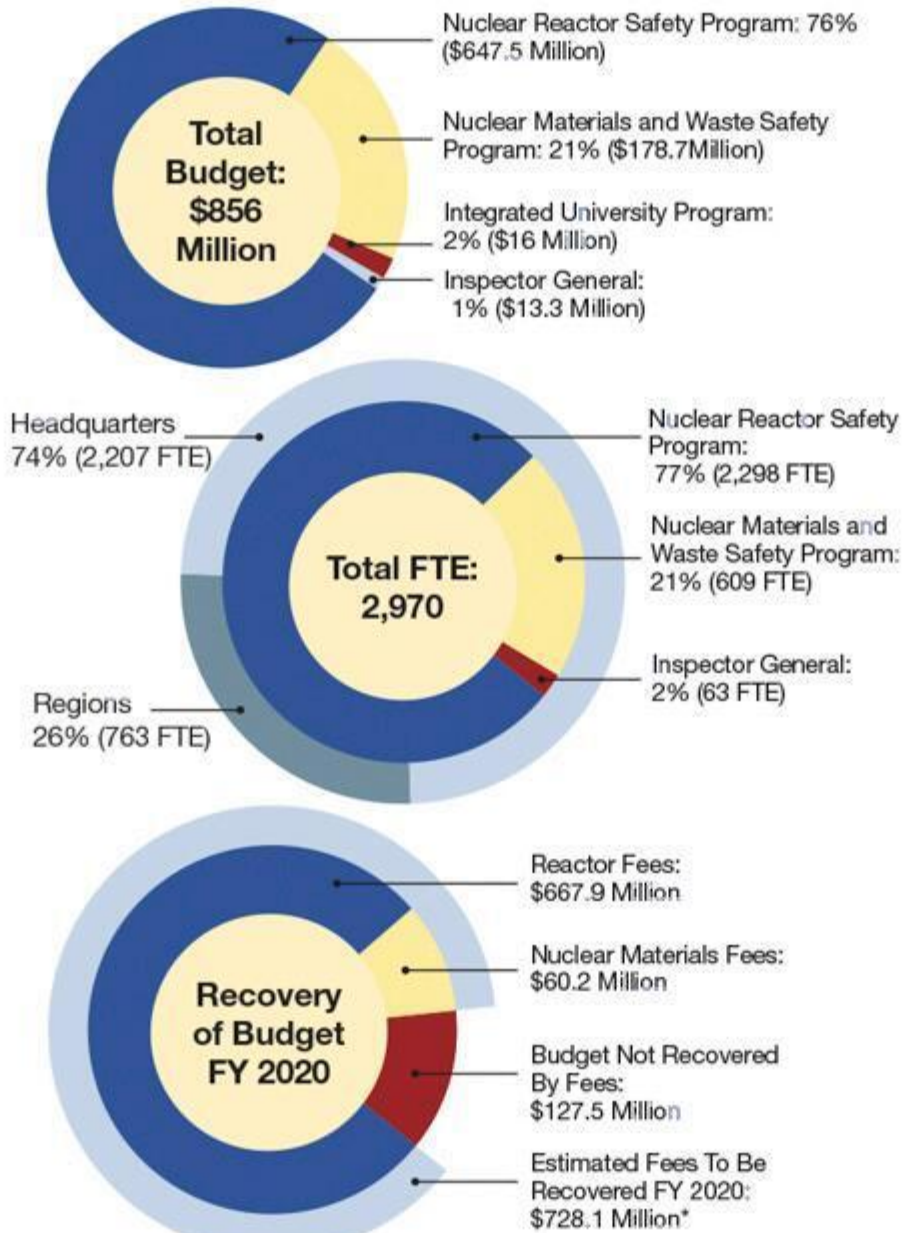
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

NRC FY 2020 Distribution of Enacted Budget Authority; Recovery of NRC Budget



* Recovered fees do not include the use of prior-year carryover where fees were previously collected.
Notes: The NRC incorporates corporate and administrative costs proportionately within programs. Numbers and percentages are rounded. Enacted budget for FY 2020. More budget information available in the Congressional Budget Justification at *https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1100/v36/*

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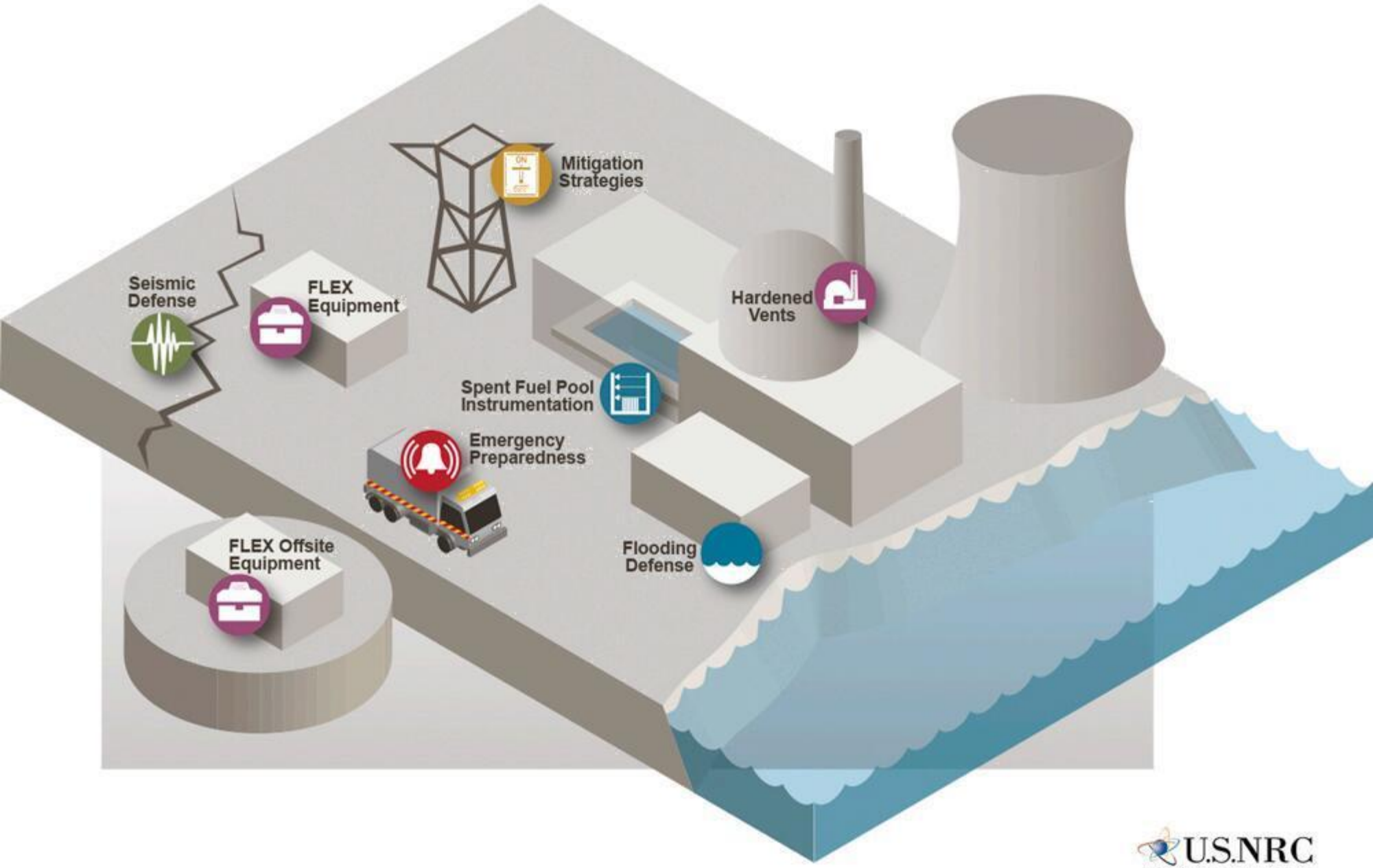
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG-1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

NRC Post-Fukushima Safety Enhancements



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SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
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NRC Research Funding, FY 2020

Total $69 Million

- Reactor Program—$52 Million
- New/Advanced Reactor Licensing—$15 Million
- Materials and Waste—$2 Million

Note: Dollars are rounded to the nearest million.

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NRC Total Authority, FYs 2010–2020

Total Authority Dollars in Millions

Carryover Authority Dollars in Millions

Full-Time Equivalents (FTE)

Note: Dollars are rounded to the nearest million.

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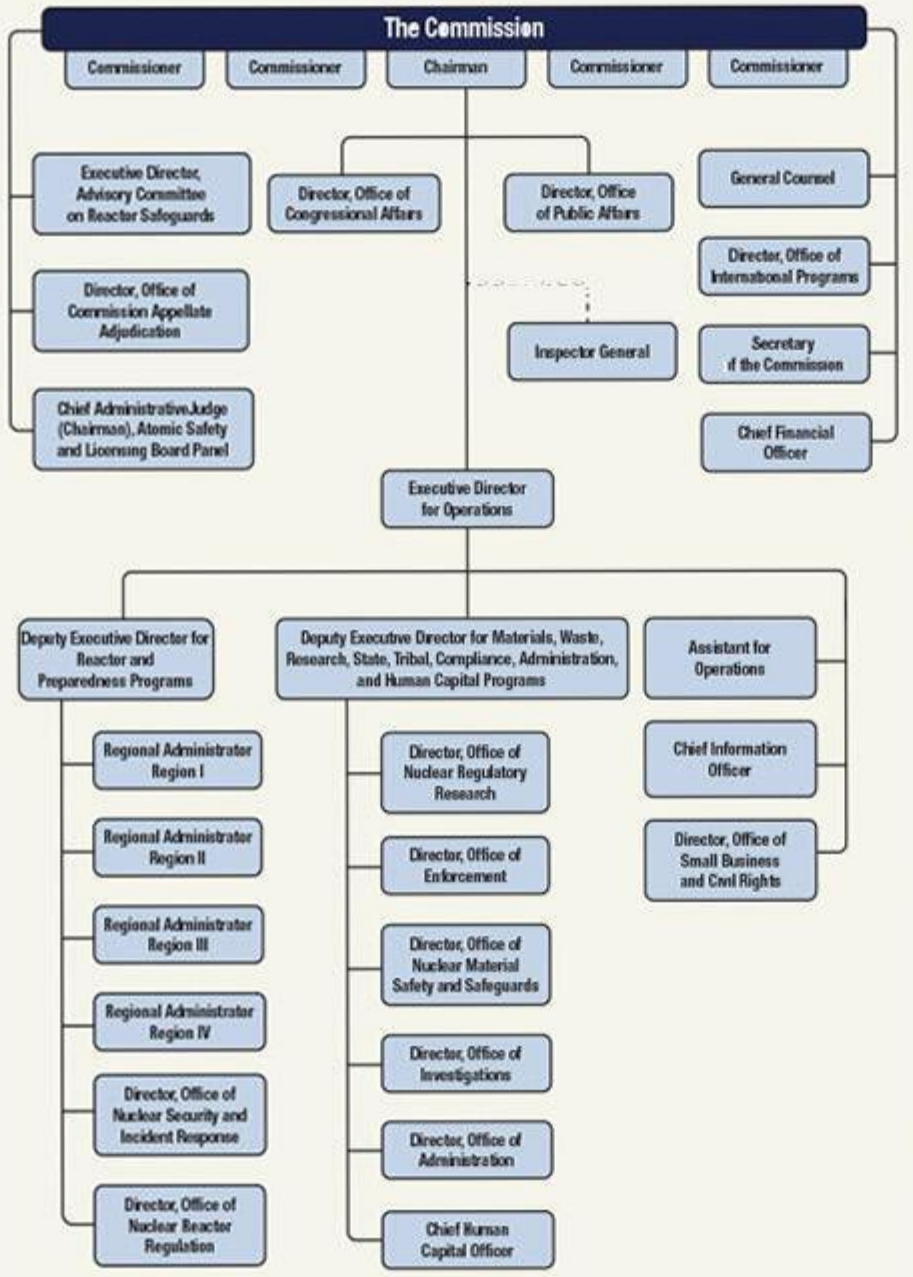
NRC Organizational Chart



Note: For the most recent information, go to the NRC Organization Chart at *https://www.nrc.gov/about-nrc/organization.html*.

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NRC-Regulated Complex Materials Sites Undergoing Decommissioning

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DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION
NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

NRC-Regulated Complex Materials Sites Undergoing Decommissioning

Company	Location
Alameda Naval Air Station	Alameda, CA
BWX Technology, Inc., Shallow Land Disposal Area	Vandergrift, PA
Cimarron Environmental Response Trust	Cimarron City, OK
Department of the Army, Jefferson Proving Ground	Madison, IN
Department of the Army, Picatinny Arsenal (ARDEC)	Picatinny, NJ
FMRI, Inc. (Fansteel)	Muskogee, OK
Hunters Point Naval Shipyard	San Francisco, CA
McClellan Air Force Base	Sacramento, CA
Sigma Aldrich	Maryland Heights, MO
UNC Naval Products	New Haven, CT
West Valley Demonstration Project	West Valley, NY

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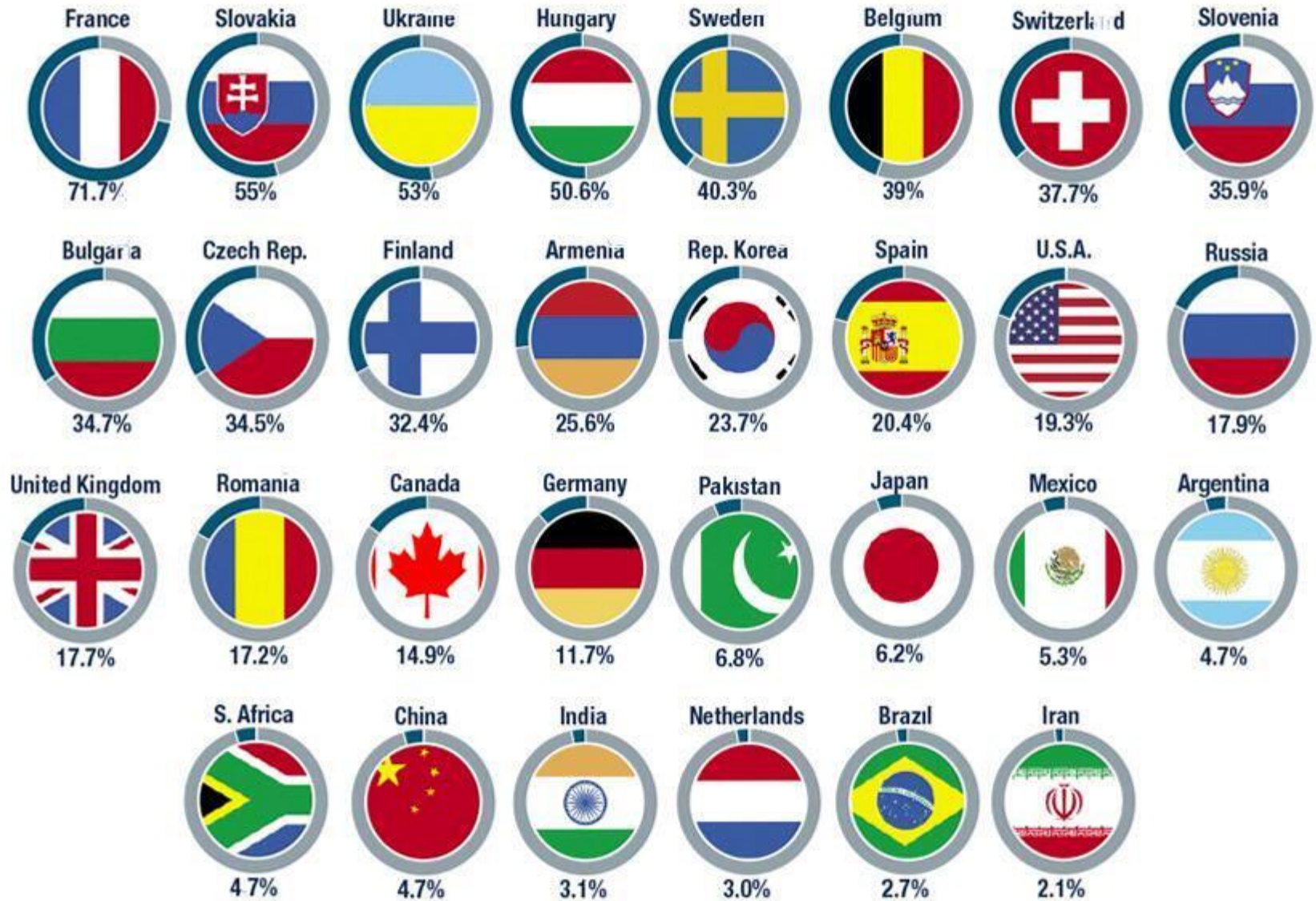
DATA AS OF AUGUST 2020

SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Nuclear Share of Electricity Generated by Country



Note: Each country's short-form name is used.
Source: IAEA, Power Reactor Information System database, as of May 2020 for 2018

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Power Reactor Decommissioning Status

S SAFSTOR
D DECON

Decommissioning Completed
I ISFSI (Independent Spent Fuel Storage Installation) Only
T License Terminated (no fuel on site)

CALIFORNIA
S GE EVESR
S GE VBWR
D Humboldt Bay 3*
I Rancho Seco
D San Onofre 1, 2 and 3

COLORADO
I Fort St. Vrain

CONNECTICUT
S Millstone 1
I Haddam Neck

FLORIDA
D Crystal River 3

ILLINOIS
S Dresden 1
D Zion 1 and 2*

IOWA
S Duane Arnold

MARYLAND
D N.S. Savannah

MASSACHUSETTS
D Pilgrim
I Yankee Rowe

MAINE
I Maine Yankee

MICHIGAN
S Fermi 1
I Big Rock Point

NEBRASKA
D Fort Calhoun

NEW JERSEY
D Oyster Creek

NEW YORK
S Indian Point 1 and 2
T Shoreham

OREGON
I Trojan

PENNSYLVANIA
T Saxton
S Peach Bottom 1
S Three Mile Island 1 and 2

SOUTH DAKOTA
T Pathfinder

VERMONT
D Vermont Yankee

WISCONSIN
D La Crosse*
S Kewaunee

* The NRC in the final stages of the license termination process with the reviews of the final status survey reports at Zion 1 and 2, La Crosse and Humboldt Bay.

Notes: Fort St. Vrain ISFSI NRC SNM-2504 license was transferred to DOE on June 4, 1999. ISFSIs are also located at all sites undergoing decommissioning or in SAFSTOR. GE Bonus, Hallam, and Piqua decommissioned reactor sites are part of the DOE nuclear legacy. For more information, visit DOE's Office of Legacy Management LM Sites Web page at https://www.energy.gov/lm/sites/. CVTR, Elk River, and Shippingport decommissioned reactor sites were either decommissioned before the formation of the NRC or were not licensed by the NRC. Licensees have announced their intention to permanently cease operations for Byron (2021) and Dresden (2021), Indian Point (2021), Palisades (2022), and Diablo Canyon (2024 and 2025).

NRC-abbreviated reactor names are listed. Alaska and Hawaii are not pictured and have no sites. For the most recent information, go to the Dataset Index Web page at https://www.nrc.gov/reading-rm/doc-collections/dataset/. Data are current as of August 2020.

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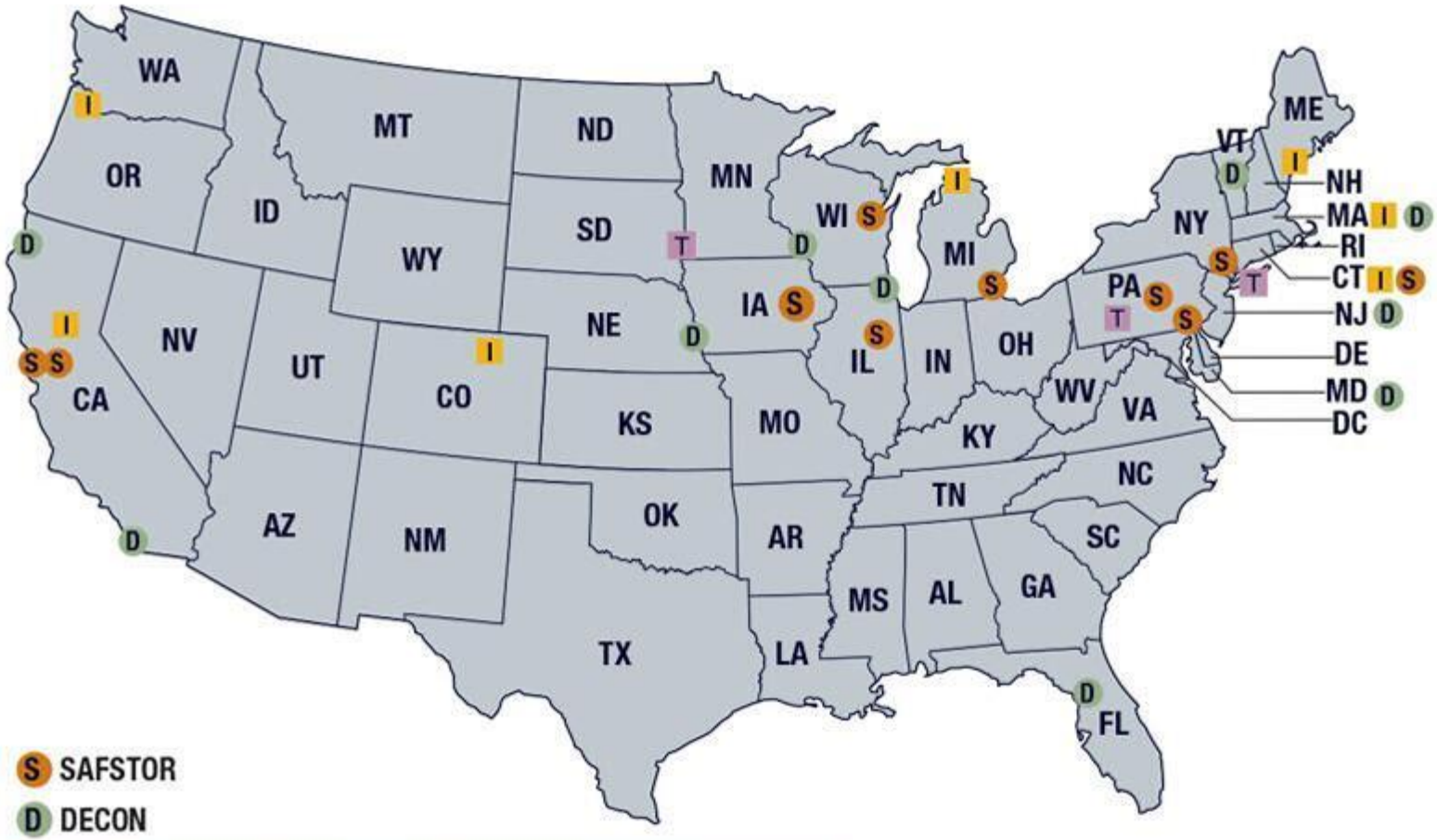
Power Reactor Decommissioning Status



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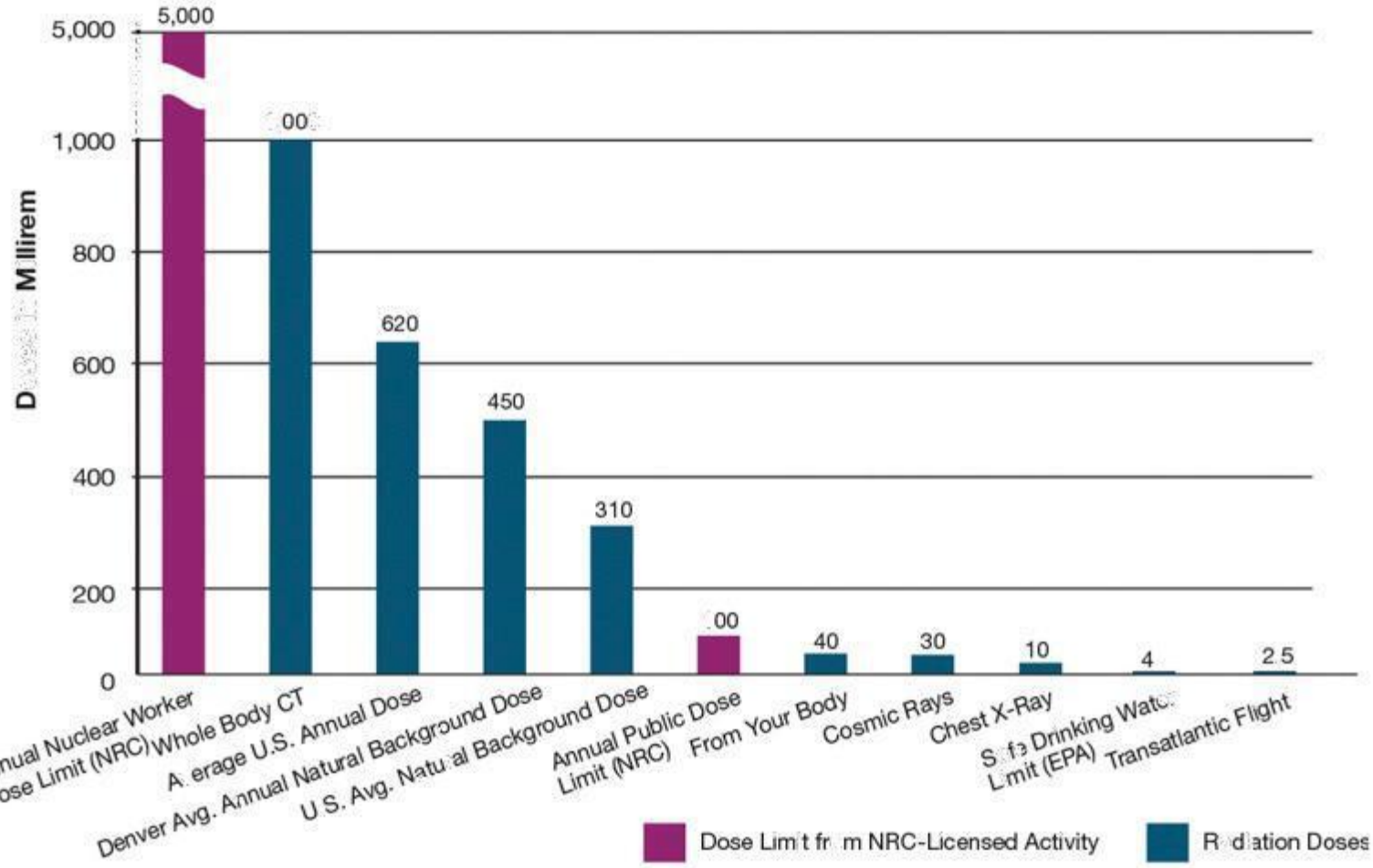
Radiation Doses and Regulatory Limits



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DATA AS OF AUGUST 2020
SOURCE: U.S. NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

Reactor Oversight Action Matrix Performance Indicators

Performance Indicators

Inspection Findings

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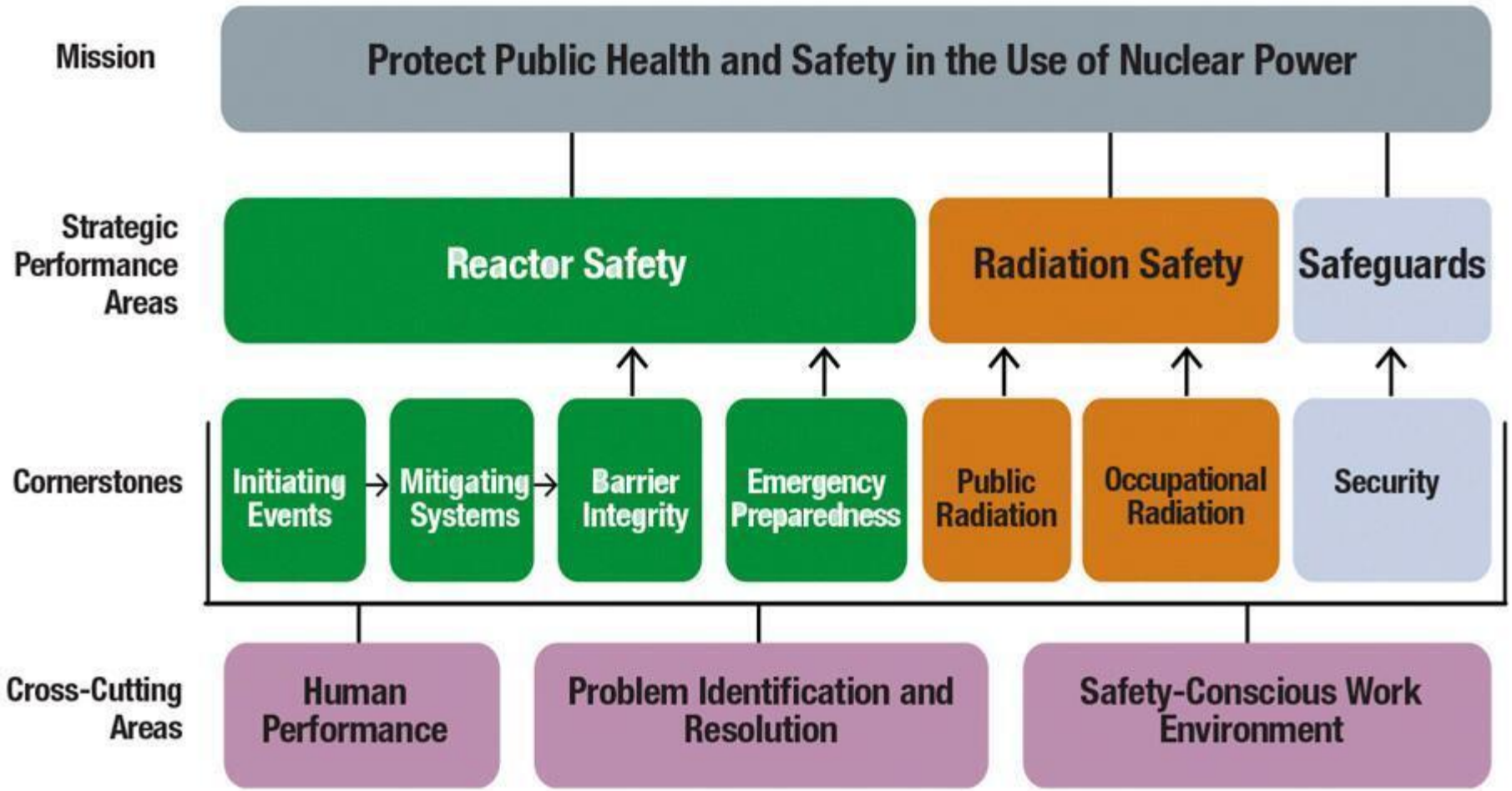
Reactor Oversight Framework



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Reactor Phases of Decommissioning

SAFSTOR Under SAFSTOR, a nuclear power plant is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, the plant shifts to DECON as the facility is dismantled and the property decontaminated.

DECON Under DECON, equipment, structures, and portions of the facility containing radioactive contaminants are removed or decontaminated to a level that permits release of the property and termination of the NRC license.

*Under DECON, some licensees have submitted the PSDAR before shutdown (license transfer model).

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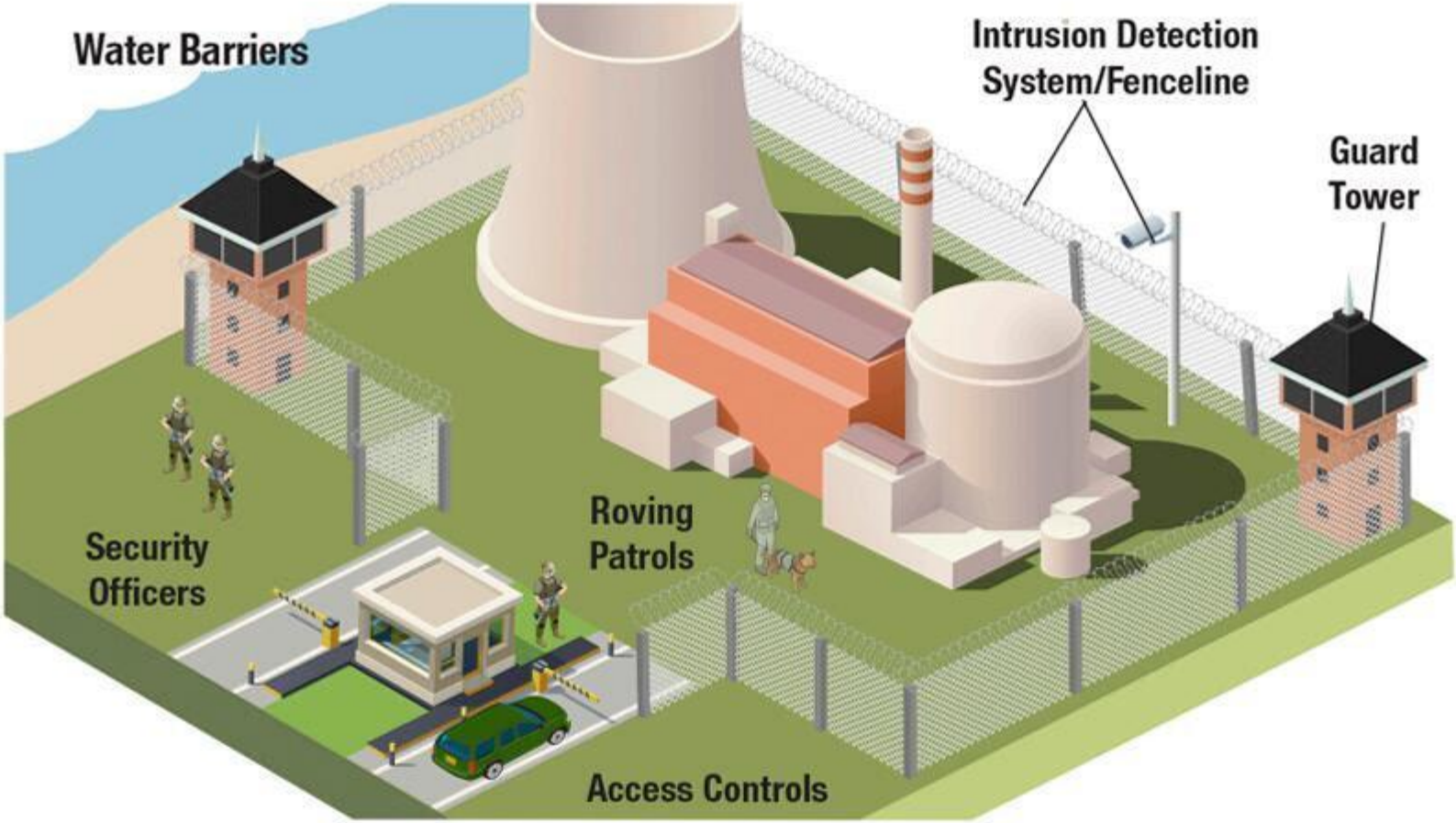
Security Components



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

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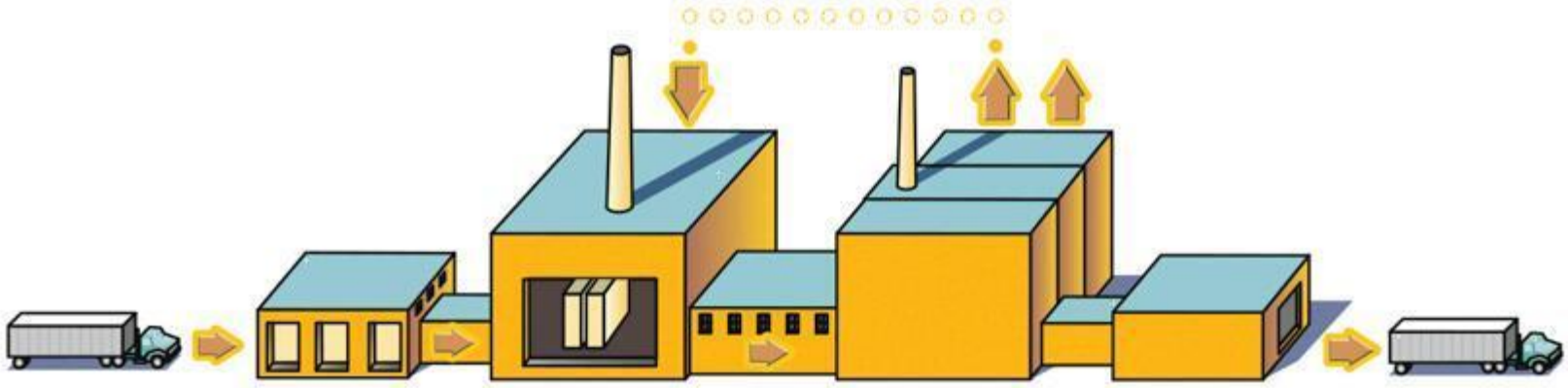
Simplified Fuel Fabrication Process



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

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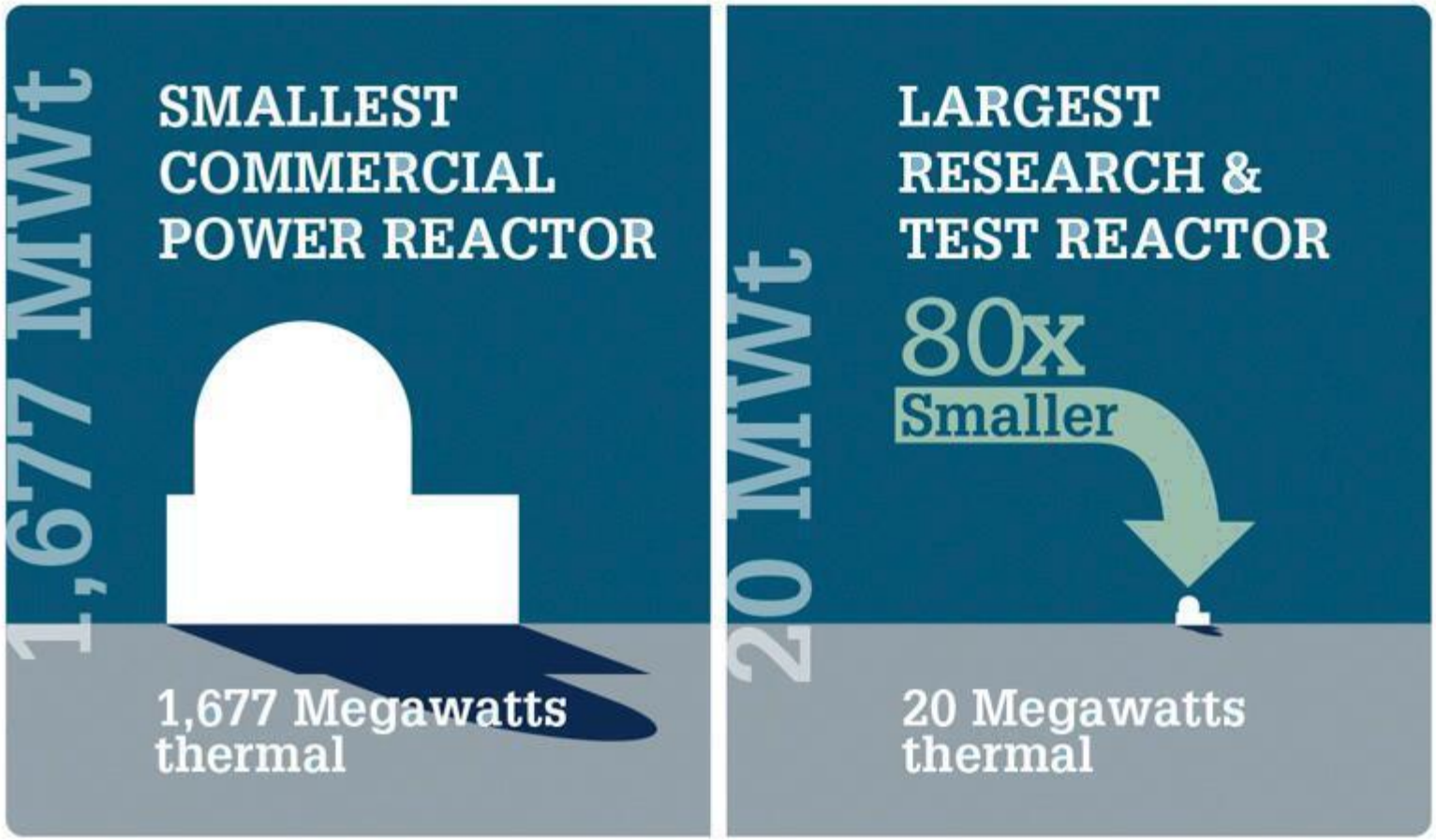
Size Comparison of Commercial and Research Reactors



Note: Nuclear research and test reactors, also known as "nonpower" reactors, do not produce commercial electricity.

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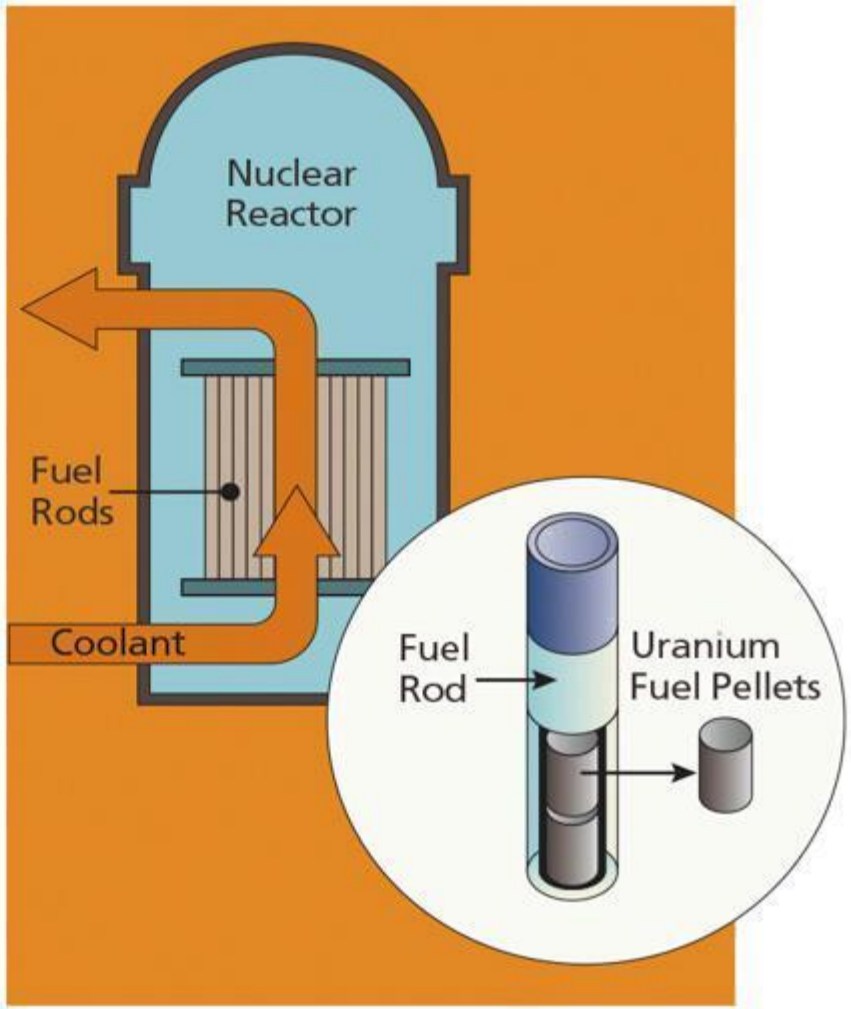
Spent Fuel Generation and Storage After Use

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. Pressurized-water reactors (PWRs) contain between 120 and 200 fuel assemblies. Boiling-water reactors (BWRs) contain between 370 and 800 fuel assemblies.



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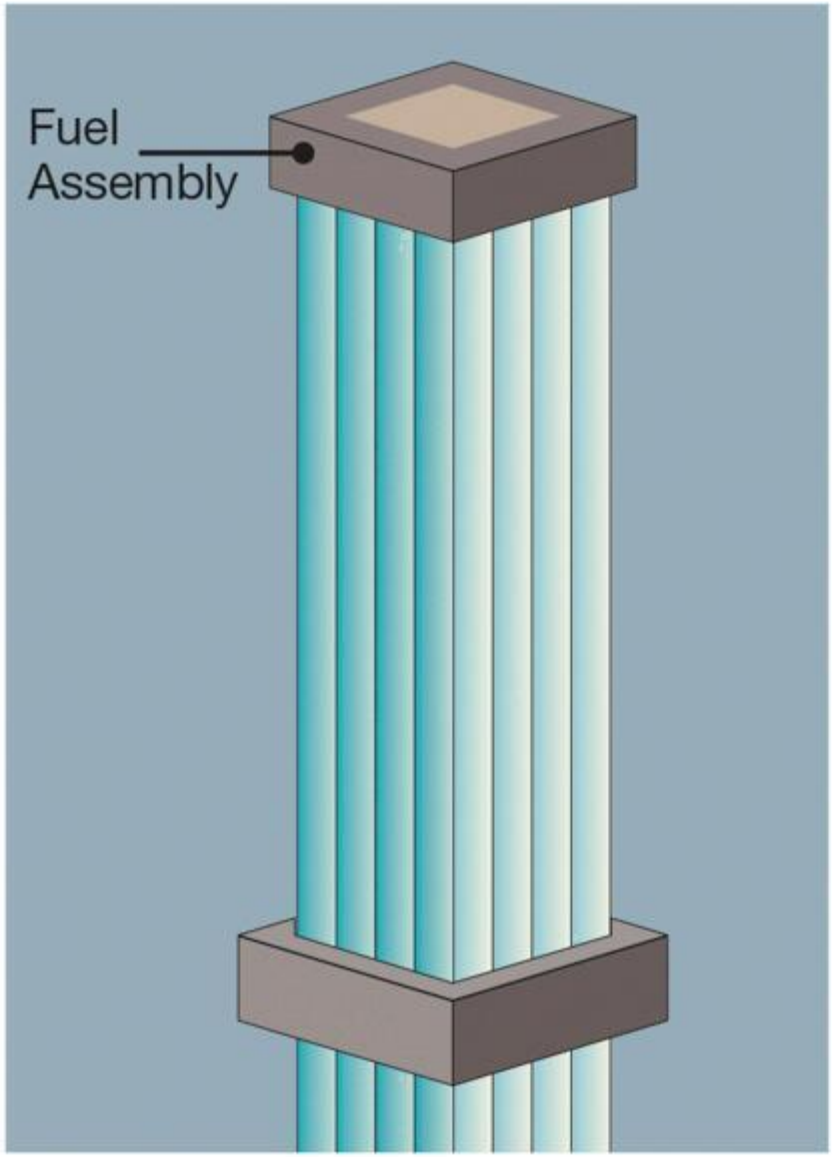
Spent Fuel Generation and Storage After Use



2 After 5–6 years, spent fuel assemblies (which are typically 14 feet [4.3 meters] long and which contain 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. At this point, the 900-pound (409-kilogram) assemblies contain only about one-fifth the original amount of uranium-235.

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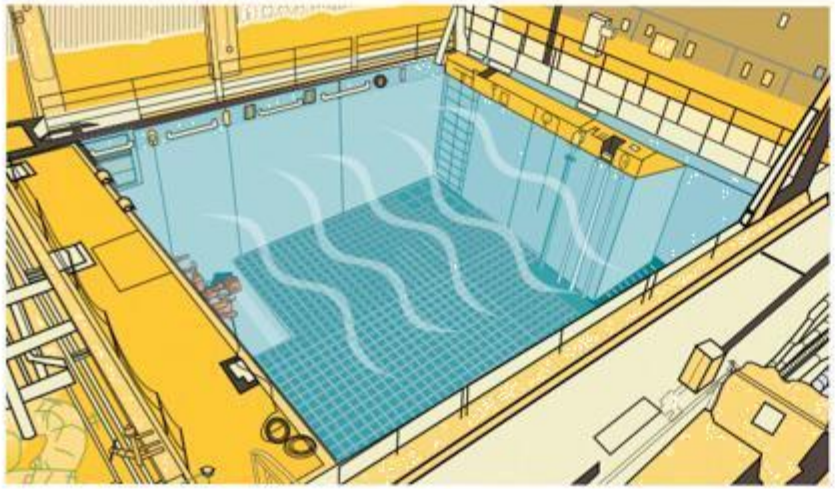

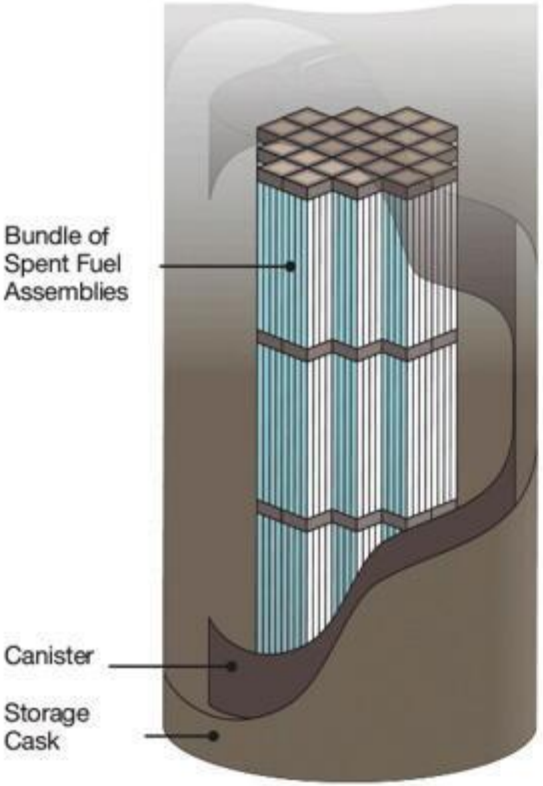

3 Commercial light-water nuclear reactors store spent radioactive fuel in a steel-lined, seismically designed concrete pool under about 40 feet (12.2 meters) of water that provides shielding from radiation. Pumps supply continuously flowing water to cool the spent fuel. Extra water for the pool is provided 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 is transferred to dry casks on site or transported off site for interim storage or disposal.

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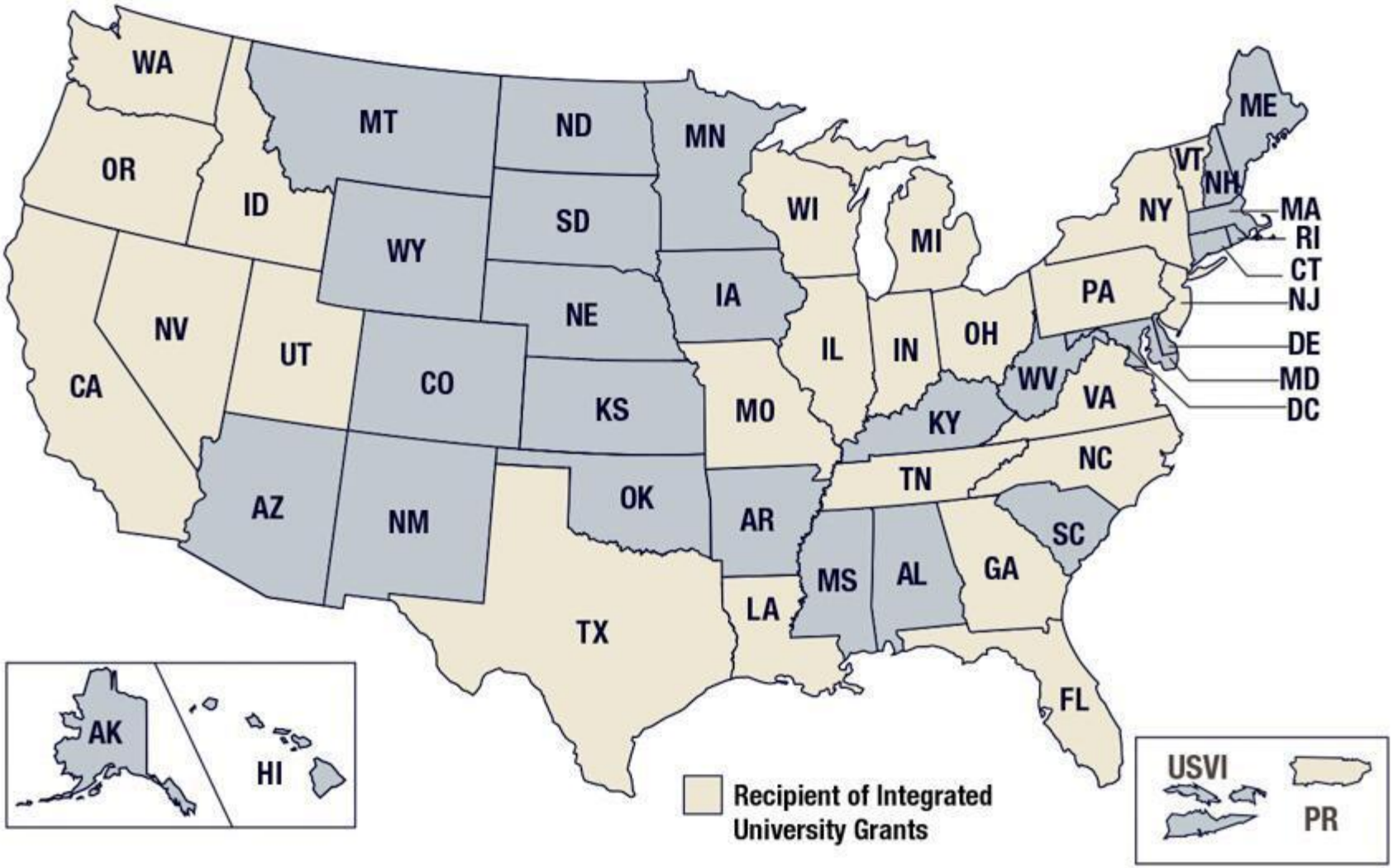
States with Integrated University Program Grant Recipients in Fiscal Year 2019



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The Different NRC Classifications for Types of Reactors

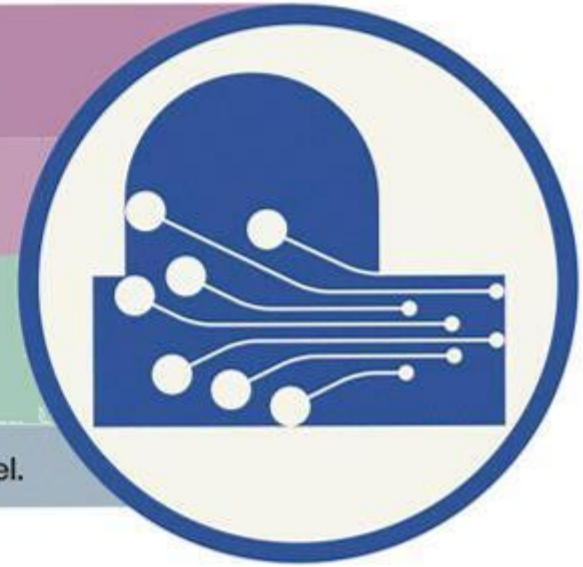
Advanced Reactors

Design: Advanced reactors are a new generation of nonlight-water reactors. They use coolants including molten salts, liquid metals, and even gases such as helium.

Capacity: These plants range in power from very small reactors to a power level comparable to existing operating reactors.

Safety: These reactors are expected to provide enhanced margins of safety and use simplified, inherent, and passive means to ensure safety. They may not require an operator to shut down.

Fuel: These reactors could use enriched uranium, thorium, or used nuclear fuel.



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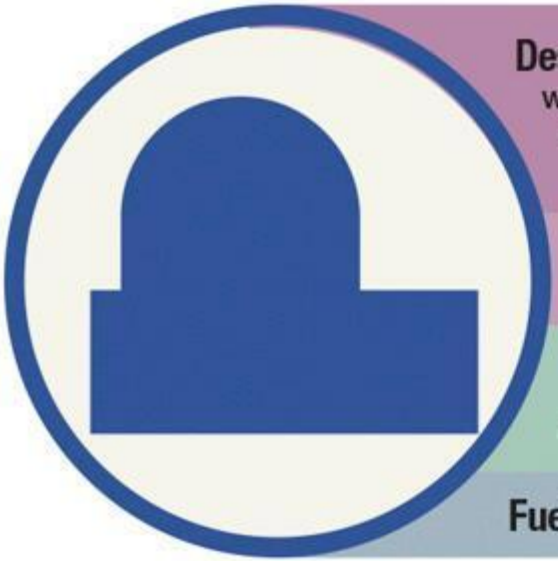
The Different NRC Classifications for Types of Reactors

Operating Reactors



Design: The U.S. fleet consists mainly of large reactors that use regular water ("light" water, as opposed to "heavy" water that has a different type of hydrogen than commonly found in nature) for both cooling the core and facilitating the nuclear reaction.

Capacity: The generation base load of these plants is 1,677 MWt (570 MWe) or higher.

Safety: These reactors have "active" safety systems powered by alternating current (ac) and require an operator to shut down.

Fuel: These reactors require enriched uranium.

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DATA AS OF AUGUST 2020

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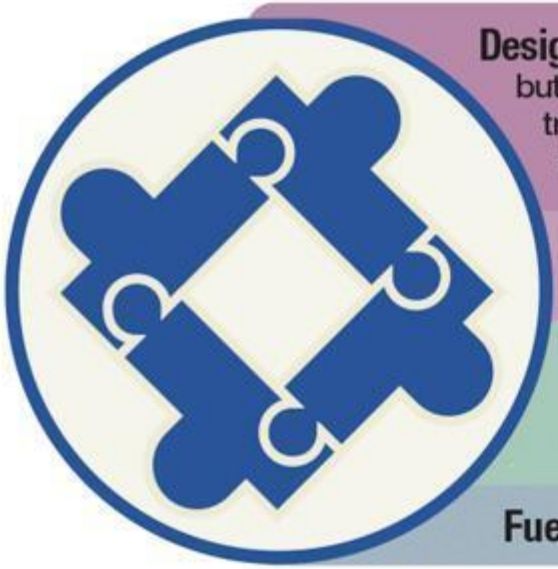
The Different NRC Classifications for Types of Reactors

Small Modular Reactors



Design: Small modular reactors (SMRs) are similar to large light-water reactors but are smaller, compact designs. These factory-fabricated reactors can be transported by truck or rail to a nuclear power site. Additional SMRs can be installed on site to scale or to meet increased energy needs.

Capacity: These reactors are about one-third the size of typical reactors with a generation base load of 1,000 MWt (300 MWe) or less.

Safety: These reactors can be installed underground, providing more safety and security. They are built with passive safety systems and can be shut down without an operator.

Fuel: These reactors require enriched uranium.

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The Different NRC Classifications for Types of Reactors

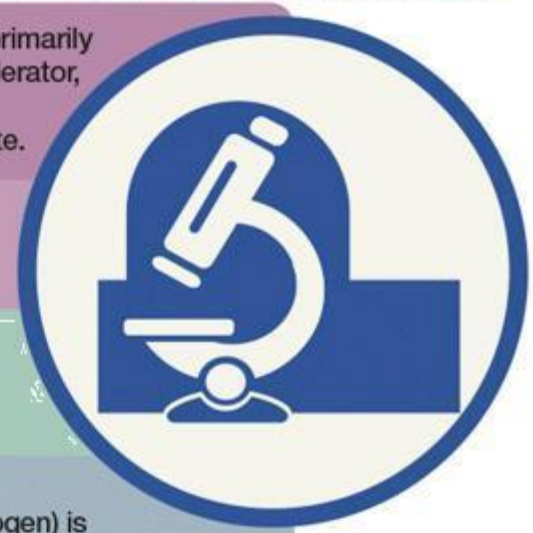
Research and Test Reactors

Design: Research and test reactors—also called "nonpower" reactors—are primarily used for research, training, and development. They are classified by their moderator, the material used to slow down the neutrons, in the nuclear reaction. Typical moderators include water (H_2O), heavy water (D_2O), polyethylene, and graphite.

Capacity: These current licensed facilities range in size from 5 watts (less than a night light) to 20 MWt (equivalent to 20 standard medical x-ray machines).

Safety: All NRC-licensed research and test reactors have a built-in safety feature that reduces reactor power during potential accidents before an unacceptable power level or temperature can be reached.

Fuel: Reactors may also be classified by the type of fuel used, such as MTR (plate-type fuel) or TRIGA fuel. TRIGA fuel is unique in that a moderator (hydrogen) is chemically bonded to the fuel.



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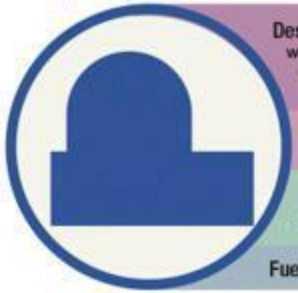
The Different NRC Classifications for Types of Reactors

Operating Reactors



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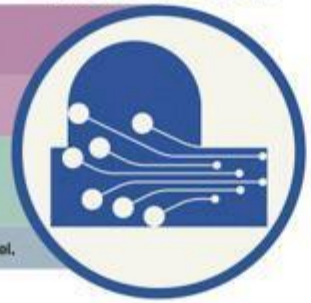
Advanced Reactors



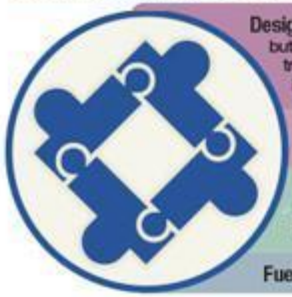
Design: Advanced reactors are a new generation of nonlight-water reactors. They use coolants including molten salts, liquid metals, and even gases such as helium.

Capacity: These plants range in power from very small reactors to a power level comparable to existing operating reactors.

Safety: These reactors are expected to provide enhanced margins of safety and use simplified, inherent, and passive means to ensure safety. They may not require an operator to shut down.

Fuel: These reactors could use enriched uranium, thorium, or used nuclear fuel.

Small Modular Reactors



Design: Small modular reactors (SMRs) are similar to large light-water reactors but are smaller, compact designs. These factory-fabricated reactors can be transported by truck or rail to a nuclear power site. Additional SMRs can be installed on site to scale or to meet increased energy needs.

Capacity: These reactors are about one-third the size of typical reactors with a generation base load of 1,000 MWt (300 MWe) or less.

Safety: These reactors can be installed underground, providing more safety and security. They are built with passive safety systems and can be shut down without an operator.

Fuel: These reactors require enriched uranium.

Research and Test Reactors

Design: Research and test reactors—also called "nonpower" reactors—are primarily used for research, training, and development. They are classified by their moderator, the material used to slow down the neutrons, in the nuclear reaction. Typical moderators include water (H_2O), heavy water (D_2O), polyethylene, and graphite.

Capacity: These current licensed facilities range in size from 5 watts (less than a night light) to 20 MWt (equivalent to 20 standard medical x-ray machines).

Safety: All NRC-licensed research and test reactors have a built-in safety feature that reduces reactor power during potential accidents before an unacceptable power level or temperature can be reached.

Fuel: Reactors may also be classified by the type of fuel used, such as MTR (plate-type fuel) or TRIGA fuel. TRIGA fuel is unique in that a moderator (hydrogen) is chemically bonded to the fuel.

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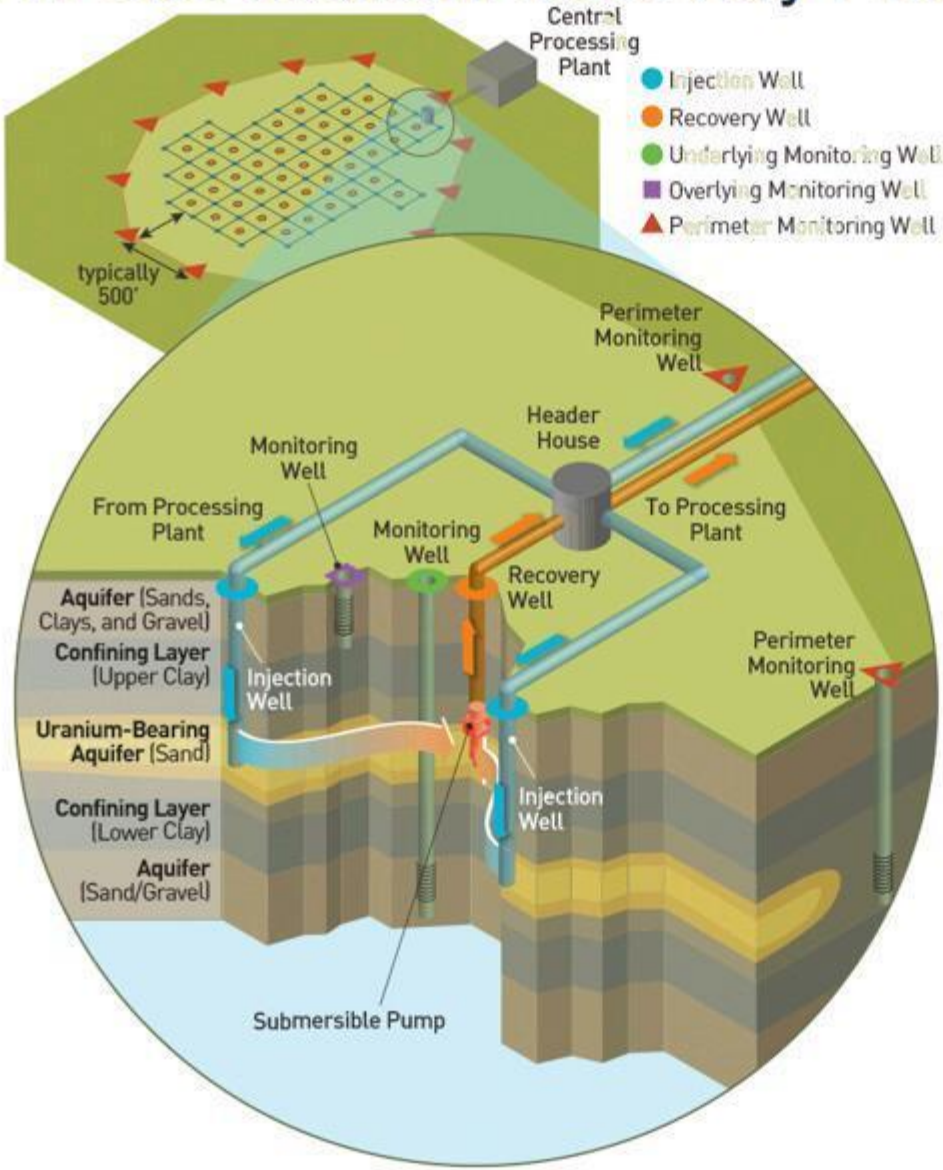
The In Situ Uranium Recovery Process



Injection wells ● pump a solution of native ground water, typically mixed with oxygen or hydrogen peroxide and sodium bicarbonate or carbon dioxide, into the aquifer (ground water) 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 ●, all controlled by the header house. From there, the solution is sent to the processing plant. Monitoring wells ● ■ ▲ are checked regularly to ensure the injection solution is not escaping from the wellfield. Confining layers keep ground water from moving from one aquifer to another.

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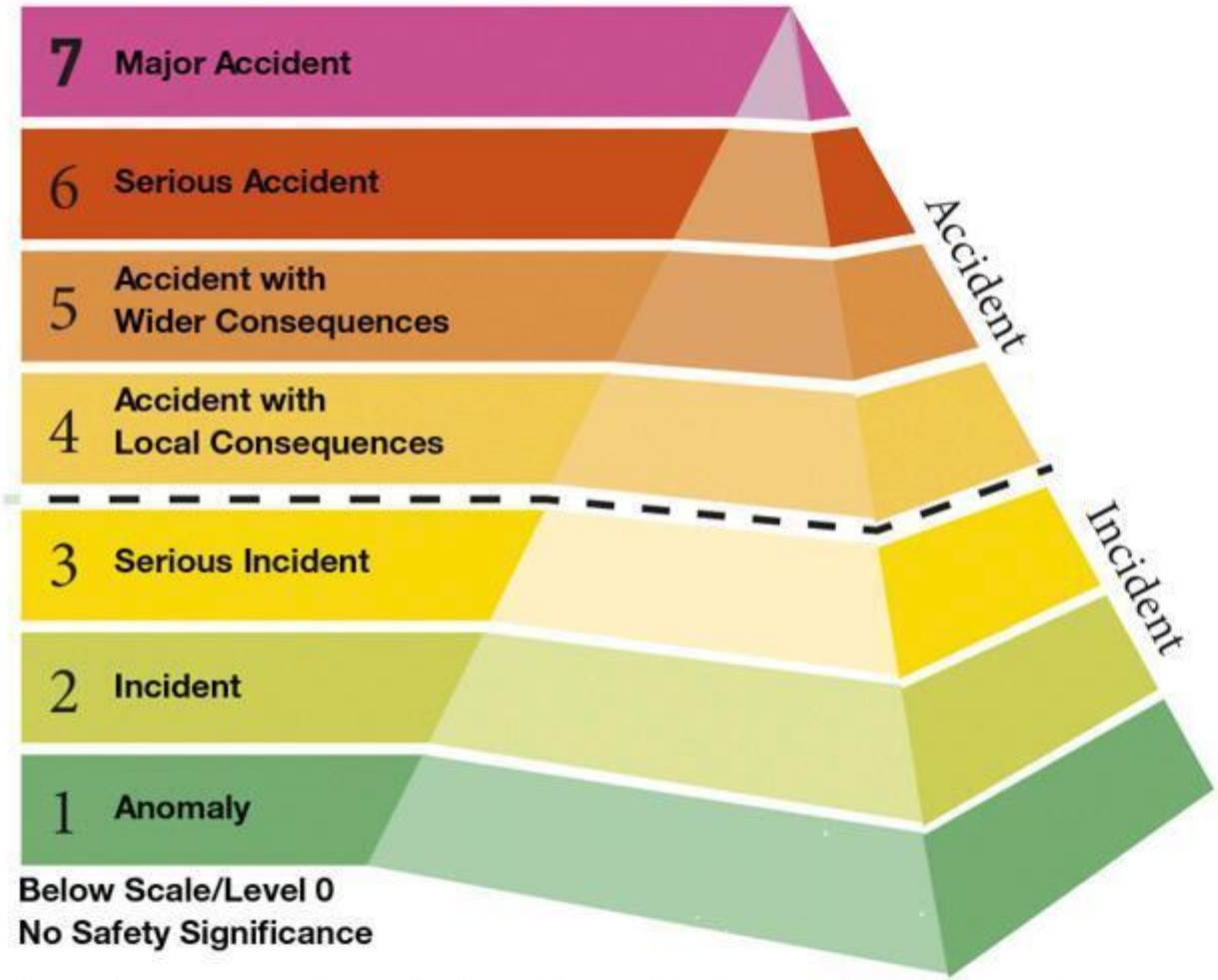
The International Nuclear and Radiological Event Scale



INES events are classified on the scale at seven levels. Levels 1–3 are called incidents, and Levels 4–7 are called 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

Source: *https://www.iaea.org/topics/emergency-preparedness-and-response-epr/international-nuclear-radiological-event-scale-ines*

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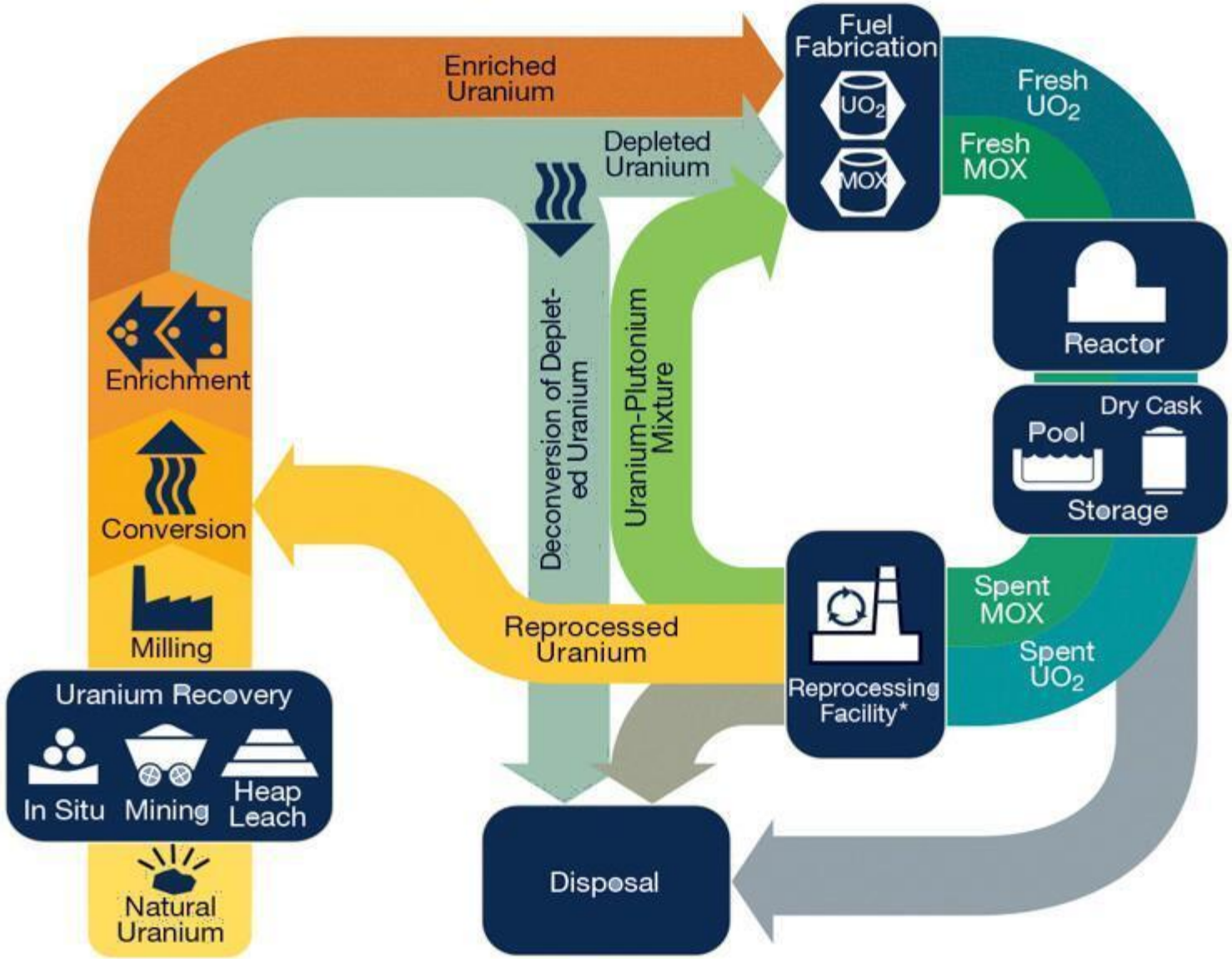
The Nuclear Fuel Cycle



* Reprocessing of spent nuclear fuel, including mixed-oxide (MOX) fuel, is not currently practiced in the United States.
Note: The NRC has no regulatory role in mining uranium.

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The NRC is transforming into a modern, risk-informed regulator by—

- *Be riskSMART—making sound decisions while accepting well-managed risks in decisionmaking.*
- *Focus on Our People—maintaining an engaged and highly skilled workforce now and in the future.*
- *Innovate—making timely decisions that take into account different viewpoints and fully explored options.*
- *Use Technology—working smarter, including using data analytics to highlight areas for regulatory attention and improvement.*

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U.S. Commercial Nuclear Power Reactors —Years of Operation by the End of 2020

Note: Ages are based on operating license issued date and have been rounded up to the end of the year. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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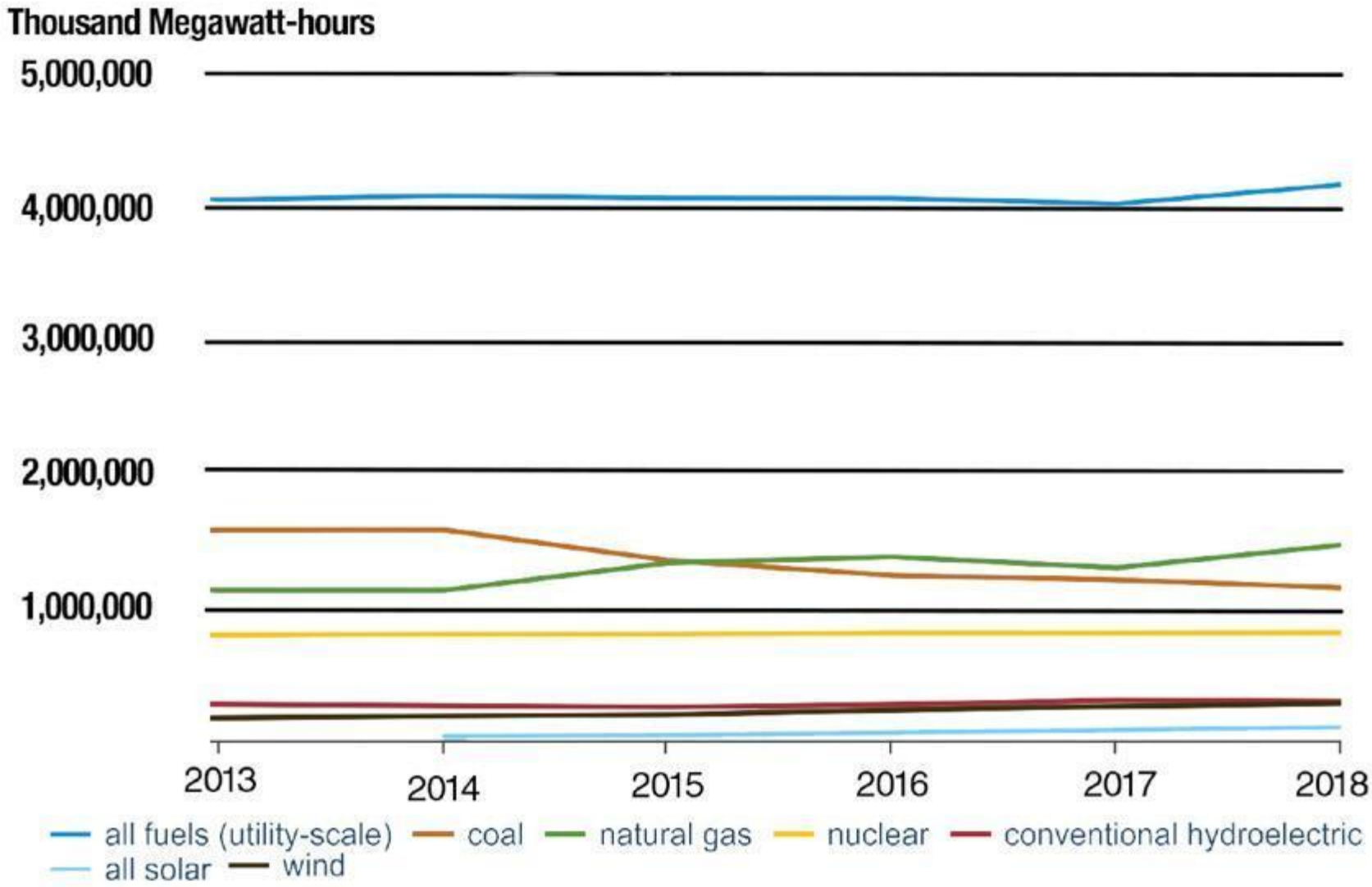
DATA AS OF AUGUST 2020
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S. Electricity Generation by Energy Source, 2013–2018



Note: Figures are rounded.
Source: DOE/EIA, data as of May 2020 for April 19, 2019, *https://www.eia.gov*—Electricity Data Browser—Electricity Net Generation: Total (All Sectors—Annually 2013–2018)

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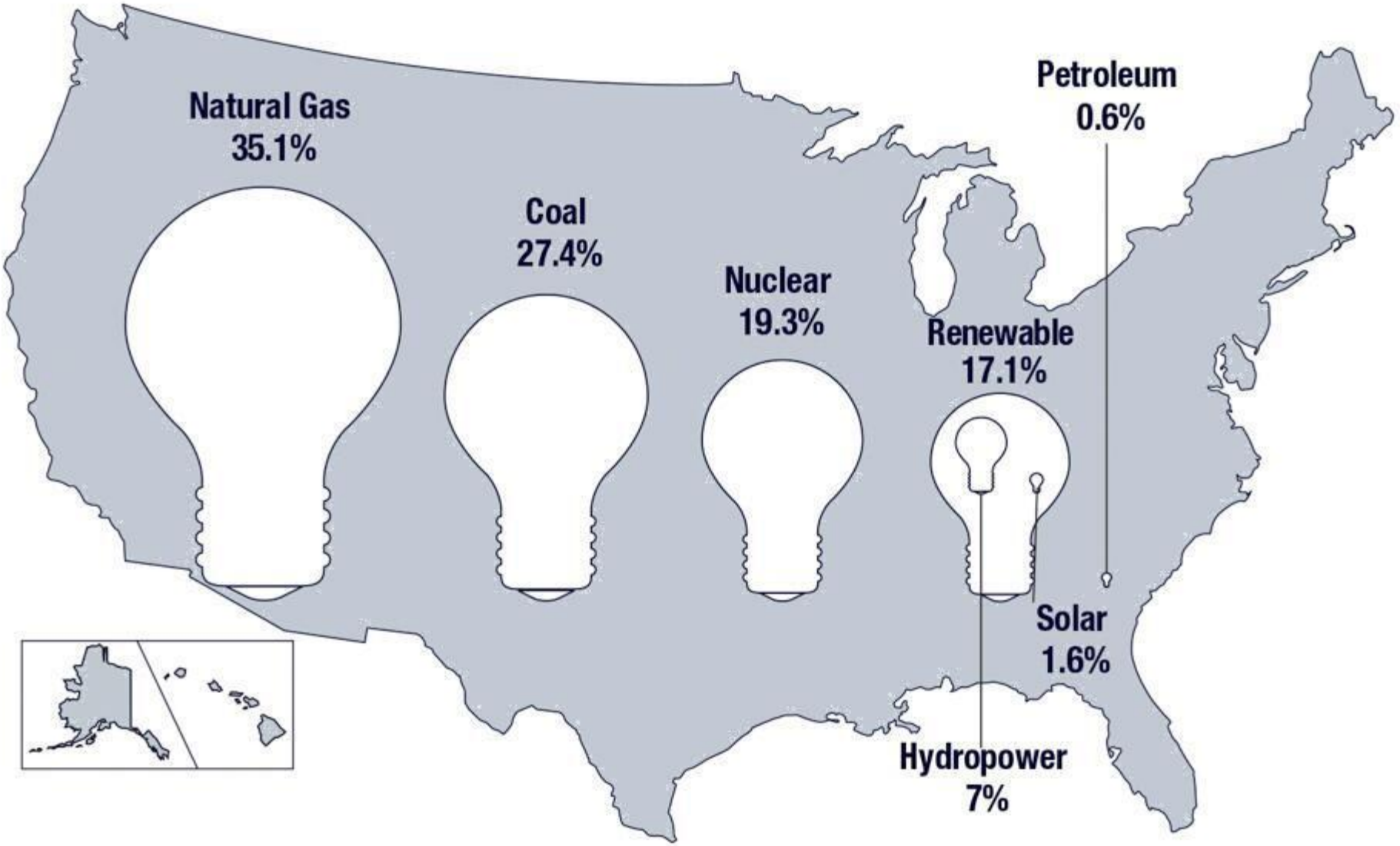
DATA AS OF AUGUST 2020
SOURCE: U.S NUCLEAR REGULATORY COMMISSION MUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S. Gross Electricity Share by Energy Source, 2018



Note: Figures are rounded.

Source: DOE/EIA, data as of May 2020 for April 19, 2019, *https://www.eia.gov*—Table 7.2a Electricity Net Generation: Total (All Sectors)

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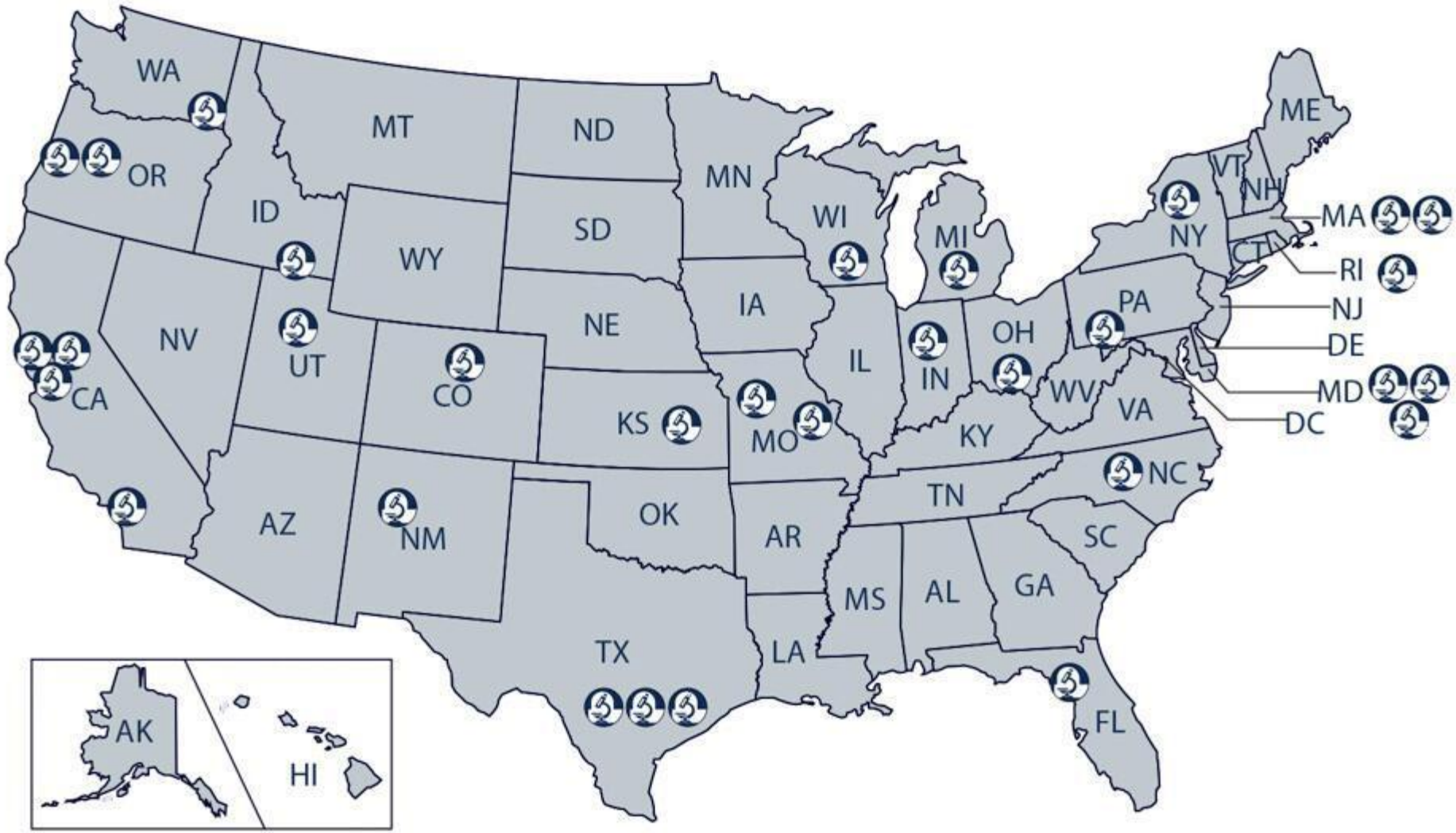
SOURCE: U.S.NUCLEAR REGULATORY COMMISSION NUREG 1350, VOLUME 32, 2020-2021 INFORMATION DIGEST

U.S. Nuclear Research and Test Reactors



RTRs Licensed/Currently Operating (31)

Note: RTR's are also referred to as non-power facilities. For the most recent information, go to the Dataset Index Web page at *https://www.nrc.gov/reading-rm/doc-collections/datasets/*.

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