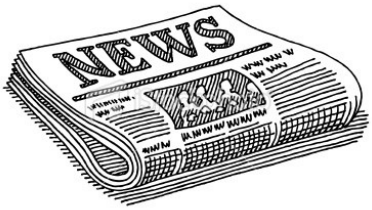
Recent Legislative Actions:



- July: The US Senate voted by 96-3 to approve legislation that would strengthen domestic nuclear fuel production and ensure that disruptions in uranium supply will not impact the development of advance reactors or the operation of the USA's existing power reactor fleet. The bipartisan amendment to the National Defense Authorization Act for Fiscal Year 2024 was introduced to Congress in February by a set of bipartisan Representatives in the Senate. The purpose of S.Amdt.999 is: "To require the Secretary of Energy to establish a Nuclear Fuel Security Program, expand the American Assured Fuel Supply Program, establish a HALEU for Advanced Nuclear Reactor Demonstration Projects Program, and submit a report on a civil nuclear credit program, and to enhance programs to build workforce capacity to meet critical mission needs of the Department of Energy."

- July: A resolution to support nuclear energy, S.Res. 321, was introduced on July 27, 2023, by a set of bipartisan Representatives in the Senate and referred to the Energy and Natural Resources Committee. The bipartisan coalition of 15 senators is backing the resolution declaring that “in order to maintain geopolitical energy leadership, reduce carbon emissions, and enhance the energy security of the United States, the Senate is committed to embracing and promoting nuclear power as a clean baseload energy source necessary to achieve a reliable, secure, and diversified electric grid.”

- July: The Senate passed the fiscal year 2024 National Defense Authorization Act (NDAA), with an 86–11 vote on July 27, 2023, and with it, the Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act. Introduced on March 30, 2023, by a set of bipartisan Representatives in the Senate, the ADVANCE Act was endorsed by the Environment and Public Works Committee in May in a bipartisan 16–3 vote and was made part of the annual must-pass NDAA earlier July. The bill, introduced in March, aims to reduce regulatory costs for companies seeking to license advanced nuclear reactor technologies, preserve and support existing nuclear power plants, strengthen the domestic nuclear fuel cycle and supply chain infrastructure, and improve NRC efficiency. The bill also authorizes funds for environmental cleanup programs by sanctioning funding to assist in cleaning up legacy abandoned mining sites on tribal lands.

Recent News

- **June 2, 2023** - The Nuclear Regulatory Commission’s (NRC) Advisory Committee on Reactor Safeguards (ACRS) completed its review of the construction permit application for Kairos Power’s Hermes test react. On June 2nd, ACRS submitted its conclusions to the agency, recommending approval. Kairos submitted its application to build the reactor at the East Tennessee Technology Park in Oak Ridge, Tennessee, in September 2021. The NRC accepted the application for review in November 2021. The company expects Hermes to be operational in 2027 and to lead to the development of a commercial-scale, 140-MWe fluoride salt-cooled high-temperature reactor dubbed the KP-X.

- **June 7, 2023** – The Department of Energy released two draft requests for proposals to acquire high-assay low-enriched uranium (HALEU); one covering enrichment services that could include the production of between 5 and 145 metric tons of HALEU during a 10-year performance period, and another for deconverting HALEU from uranium hexafluoride (UF_6) gas to metal or oxide forms in

preparation for fuel fabrication. The DOE is looking for feedback on its draft HALEU Request For Proposals ahead of the final solicitations expected later this year.

★ **June 15, 2023** - Centrus Energy announced that it has received NRC approval to introduce uranium hexafluoride into its 16-machine centrifuge cascade in Piketon, Ohio, following operational readiness reviews by the NRC. The announcement follows a series of inspections at the American Centrifuge site in April 2023.

★ **July 13, 2023 -** The NRC is seeking comments on three draft documents that would update guidance for U.S. nuclear power plant owners requesting subsequent license renewals for operating reactors. The first document updates lessons learned on how a reactor's safety systems can safely manage the effects of aging beyond 60 years of operation. The second document provides the NRC staff's latest plan for reviewing applications to extend operating licenses from 60 to 80 years. The third document provides the information and analysis supporting the changes in the first two documents. The deadline for submitting comments is September 11, 2023.

★ **July 28, 2023 –** The NRC authorized Southern Nuclear Operating Company to begin loading fuel into Unit 4 at the Vogtle nuclear expansion site in Georgia. The authorization came via an NRC letter to Southern Nuclear verifying the company's July 20, 2023, notification to the agency that all 364 inspections, tests, and analyses for the unit had been performed, and all acceptance criteria for the new reactor have been met. Vogtle-4 now moves out of the NRC's construction reactor oversight process and into its operating reactor oversight process.

★ **July 31, 2023 –** Georgia Power announced that Vogtle-3 officially entered commercial service, making history as the first nuclear reactor built from scratch in the U.S. to enter service in more than three decades. The reactor, Unit 3, produces 1,100 megawatts of electricity. On June 16, 2023, the company announced the reactor had reached full power output as part of its testing. Georgia Power had eyed the end of June for Unit 3's commercial operations however its commercial operation was delayed one month due to turbine troubles and the reactor was shut down to work on repairs.

Pre-Application Licensing Activities

Vendors and utilities that wish to certify a new reactor design or a potential site or construct and operate a new nuclear power plant must submit an application to the NRC, which will then conduct an in-depth review of safety and environmental aspects related to the design and / or site. Vendors and utilities may choose to engage with regulators prior to submitting their applications to pre-empt potential problems with their design and make the review process more efficient.

As of July 2023, eleven reactor designs have formally notified the NRC of their intent to engage in regulatory interactions.

VENDOR	DESIGN	LATEST ENGAGEMENT
General Atomics	Energy Multiplier Module (EM2)	06/08/2021 Feedback Provided: 11/30/2021
Kairos Power	Kairos KP-FHR Design	07/17/2023
TerraPower and GE Hitachi	Natrium Reactor	07/16/2023
Westinghouse Electric Company	eVinci Micro Reactor	07/21/2023
Terrestrial Energy USA	Integral Molten Salt Reactor (IMSR)	06/23/2023
X-Energy	XE-100 Design	07/24/2023
General Atomics-Electromagnetic Systems	Fast Modular Reactor	07/31/2023
ARC Clean Technology	ARC-100 Sodium-Cooled Fast Reactor	06/29/2023
Oklo	Oklo Aurora Powerhouse	07/28//2023
TerraPower	Molten Chloride Fast Reactor (MCFR)	Pre-application interactions are being planned
University of Illinois at Urbana-Champaign and Ultra Safe Nuclear Corporation	High-Temperature Gas-Cooled Test Reactor	06/26/2023 No Review Requested

★ **June 21, 2023** - Ultra Safe Nuclear (USNC) announced that it has selected the city of Gadsden, Albama, to host a $232 million Micro-Modular Reactor (MMR) assembly plant. Modules for the company's high-temperature, gas-cooled, and TRISO-fueled microreactor (MMR) would be manufactured, assembled, and tested at the "highly automated facility" once it is in operation. USNC expects construction of the 578,000-square-foot factory to start in 2024 and operations to begin in 2027. The facility will be capable of producing up to ten complete MMR units per year.

- **July 14, 2023 -** Kairos Power submitted an application to the NRC for permission to build the Hermes 2 plant next to the Hermes molten salt test reactor it plans to build at Oak Ridge, Tennessee. The two-unit demonstration plant would produce and sell electricity. The NRC is assessing the application to determine if it is acceptable and complete enough to begin the formal technical review process. According to the application, the earliest start date for construction of Hermes 2 is expected to be July 2025 with the first unit projected to be completed by December 2027. Construction of the second unit is expected to be completed one year after the first unit. An 11-year operating period is projected for each of the two test reactors.

- **July 17, 2023 -** TerraPower and Centrus Energy Corp. announced that they have signed a memorandum of understanding (MOU) to "significantly expand their collaboration aimed at establishing commercial-scale, domestic production capabilities for HALEU" to supply fuel for TerraPower's first Natrium reactor. Under the new MOU, Centrus and TerraPower plan to collaborate to "ensure the Natrium demonstration reactor has access to HALEU at the milestones necessary to meet the project's 2030 operation date" by establishing "a cost-competitive and timely source of enrichment capacity in the United States at Centrus's NRC-licensed HALEU production facility."

- **July 19, 2023 -** Small modular reactor firm X-energy and Energy Northwest, owner and operator of the Columbia nuclear power plant in Richland, Washington, announced the signing of a joint development agreement (JDA) for up to 12 Xe-100 SMRs in central Washington, capable of generating up to a total of 960 MWe. The JDA defines and details the scope, location, and schedule under which the commercial development of the project will move forward, the companies said, adding that they will also work together to determine the best approaches to licensing and regulatory matters, as well as the project delivery model. Currently, the Xe-100 project is expected to be developed at a site adjacent to the Columbia facility, with the first module coming online by 2030.

Reactor Design Certifications (DC)

By issuing a DC, the NRC approves a nuclear power plant design, independent of an application to construct or operate a plant. A DC is valid for 15 years from the date of issuance but can be renewed for an additional 10 to 15 years. A DC application (DCA) must include enough information to show the design meets NRC's safety standards and that the design resolves any existing generic safety issues and issues that arose after specific events in the nuclear industry such as the Three Mile Island accident. Applications must closely analyze the design's appropriate response to accidents or natural events, including lessons learned from the Fukushima accident. Applications must also lay out the inspections, tests, analyses, and acceptance criteria that will verify the construction of key design features. Certification reviews identify key information to consider in site-specific reviews for operating licenses. *(From NRC website)*

As of July 2023, six reactor designs that are being considered for future builds in the U.S. have been certified by the NRC; two of those approvals have expired and one is under review for renewal. Two previously submitted designs have been withdrawn from consideration[1].

	VENDOR	TECHNOLOGY	STATUS
Issued	Westinghouse	AP1000	Issued: 12/30/2011
	Westinghouse	AP600	Issued: 12/1999, expired 01/2015
	General Electric-Hitachi	ESBWR	Issued: 11/14/2014
	NuScale Power	NuScale SMR Power Module	Issued: 02/21/2023
	Korea Electric Power Corp	APR1400	Issued: 9/19/2019
Renewal	General Electric-Hitachi	ABWR	Originally Issued: 5/12/1997 Final Safety Evaluation Report approved in March 2020

[1] AREVA US-EPR – Submitted December 11, 2007, and docketed February 25, 2008; review suspended at the request of the applicant. Mitsubishi Heavy Industries US-APWR – Submitted December 31, 2007, and docketed February 29, 2008; MHI has requested a deferral of the review due to their work on reactor restarts in Japan.

Early Site Permits (ESP)

By issuing an early site permit (ESP), the U.S. Nuclear Regulatory Commission (NRC) approves one or more sites for a nuclear power facility, independent of an application for a construction permit or combined license. An ESP is valid for 10 to 20 years from the date of issuance and can be renewed for an additional 10 to 20 years. In reviewing an ESP application, the NRC staff will address site safety issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design. During this process, the NRC notifies all stakeholders (including the public) as to how and when they may participate in the regulatory process, which may include participating in public meetings and opportunities to request a hearing on the issuance of an ESP. *(From NRC website)*

Six ESPs have been issued and one was withdrawn[2].

	SITE/LOCATION		UTILITY	TECHNOLOGY REFERENCED	STATUS
Issued	Clinton	IL	Exelon	Plant Parameter Envelope (PPE)	Issued: 3/15/2007
	Grand Gulf	MS	Entergy	PPE	Issued: 4/5/2007
	North Anna	VA	Dominion Power	PPE	Issued: 11/27/2007 Amended 1/30/2013
	Vogtle	GA	Southern	AP1000/ Westinghouse	Issued: 8/26/2009
	Salem County	NJ	PSEG	PPE	Issued: 5/5/2016
	Clinch River	TN	TVA	PPE	Issued: 12/19/2019

Combined Construction and Operating Licenses (COL)

By issuing a COL, the NRC authorizes the licensee to construct and (with specified conditions) operate a nuclear power plant at a specific site, in accordance with established laws and regulations. In a COL application (COLA), NRC staff reviews the applicant's qualifications, design safety, environmental impacts,

[2] Victoria County Station, Texas (Exelon) was withdrawn from NRC review in October 2012

operational programs, site safety, and verification of construction with inspections, testing, analyses, and acceptance criteria. The staff conducts its review in accordance with the Atomic Energy Act, NRC regulations, and the National Environmental Policy Act. All stakeholders (including the public) are given notice as to how and when they may participate in the regulatory process, which may include participating in public meetings and opportunities to request a hearing on the issuance of a COL. Once issued, a COL is good for 40 years and can be renewed for an additional 20. A COL application may reference a certified design and/or an ESP, or neither. *(From NRC website)*

A COL is valid indefinitely. If a licensee chooses not to construct a plant immediately following the issuance of a COL, it must submit a COL update annually to the NRC to reflect the most recent regulatory requirements and any new or different environmental or design information, or it can request an exemption. To begin construction, the COL must be fully updated. Alternatively, a licensee can choose to withdrawal their COL if they no longer wish to proceed with the plants.

A total of nineteen COL applications have been docketed by the NRC. Eight applications, totaling 14 reactors have been issued COLs and one is under review. Eight applications were suspended and later withdrawn[3] due to utility, economic or other considerations while two applications remain in "suspended" status[4]. After the COL was issued, three applications, totaling six reactors, were subsequently terminated[5].

	SITE/LOCATION		UTILITY	REACTOR TECHNOLOGY/ NO. of REACTORS		STATUS
Issued	Vogtle	GA	Southern Nuclear	AP1000	2	Issued: 2/10/2012
	Fermi	MI	DTE Energy	ESBWR	1	Issued: 5/1/2015
	William States Lee	SC	Duke Energy	AP1000	2	Issued: 12/19/2016
	North Anna	VA	Dominion Energy	ESBWR	1	Issued: 6/2/2017
	Turkey Point	FL	Florida Power and Light	AP1000	2	Issued: 4/12/2018

★ On July 31, 2023, Carbon Free Power Project (CFPP) LLC, a Utah Associated Municipal Power Systems (UAMPS) subsidiary established in 2020, announced they had applied to the NRC for a limited work authorization (LWA) to permit certain early project construction activities prior to the issuance of a COL. In a July 31, 2023 news release, CFPP said that should its application be approved, early-scope construction on the small modular reactor project would likely begin in mid-2025. The company also noted that it submitted the LWA application as the first part of the project's COLA. This is the first time under the current LWA regulations that a standalone LWA application has been submitted in advance of the remainder of the COLA. UAMPS launched the Carbon Free Power Project in 2015 to develop, own,

[3] Suspended and Withdrawn: Bell Bend; Bellefonte 3&4 Callaway 2, Calvert Cliffs 3, Grand Gulf 3, Nine Mile Point 3, River Bend 3, Victoria County 1&2
[4] Remains Suspended: Shearon Harris 2&3, Comanche Peak 3&4
[5] Terminated: Levy 1&2, South Texas Project 3&4, V.C. Summer 2&3

and operate the United States' first SMR plant, to be located at Idaho National Laboratory, with reactor technology supplied by NuScale Power. Currently, the project plan is to deploy by 2029 a NuScale VOYGR-6 plant—a facility housing six NuScale Power Modules, each capable of generating 77 MWe, for a total of 462 MWe of carbon-free electricity.

Construction Permit Applications

A construction permit application for a production or utilization facility submitted to the NRC under Title 10 of the Code of Federal Regulations Part 50, "Domestic Licensing of Production and Utilization Facilities" consists of two parts: an environmental report and a preliminary safety analysis report (PSAR).

After receiving the construction permit application, NRC staff begins its review by making an initial determination on completeness and acceptability of the application. Should the NRC staff determine that the application is incomplete or otherwise unacceptable, the staff will inform the applicant and explain how the application is deficient. The applicant will then have the opportunity to correct the deficiencies. Once the staff determines that it has enough information to continue with a thorough technical review of the submittal, the NRC will formally docket the application.

Following an application's acceptance for docketing, there are several significant review milestones including the following: issuance of a request or requests for additional information, preparation of a safety evaluation report, development of either an environmental assessment or environmental impact statement, independent review of the application and safety evaluation report by the Advisory Committee on Reactor Safeguards (ACRS), potential contested hearing(s), mandatory hearing.

Finally, the Commission will make a decision to either grant or deny the construction permit based on the application, NRC staff's safety evaluation report, the recommendations of the ACRS, and the outcome of any contested hearings and the mandatory hearing. As of July 2023, two applications are under review.

The first application is for a low-power test reactor to support development of Kairos Power's fluoride salt-cooled, high-temperature reactor technology (KP-FHR). As of July 19, 2023, the safety review process is complete, and the environmental review is approximately 95% complete.

The most recently accepted application, for a Molten Salt Research Reactor (MSRR) at Abilene Christian University (ACU) in Abilene, Texas, is the first ever application for an advanced university research reactor. ACU submitted the application for the Nuclear Energy eXperimental Testing (NEXT) Lab, which includes the 1MW, non-power MSRR, in August 2022. ACU is the lead university in the NEXT Research Alliance (NEXTRA), which includes Georgia Institute of Technology, Texas A&M University, and the University of Texas at Austin. The alliance has a $30.5 million research grant agreement with Natura Resources to design and build a university based MSRR. The NRC estimates a review schedule of 18 months and expects that environmental and safety reviews will be complete by May 2024. As of July 31, 2023, the safety review process is approximately 20% complete and the environmental review is approximately 23% complete.

	SITE/LOCATION		VENDOR	REACTOR TECHNOLOGY/ NO. of REACTORS		STATUS
Under Review	Abilene Christian University	Abilene, TX	NEXTRA	MSRR	1	Under Review
	East Tennessee Technology Park, ORNL	Oak Ridge, TN	Kairos Power, LLC	KP-FHR	1	Under Review

Fuel Facility License Applications

Fuel cycle facilities must comply with the regulatory requirements established by the NRC. The regulations contain the basic safety standards that the fuel cycle facilities need to meet. Each facility also has an NRC license which contains site-specific requirements that the facility is required to comply with. Each license is unique and is specific to the nuclear material and hazards present at the fuel cycle facility.

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A total of five facilities have been docketed by the NRC. Two licensed facilities were terminated[6], and one other facility was issued a construction authorization before it was terminated at request of the company[7]. One facility has been licensed; however, construction is not currently proceeding[8].

	SITE/LOCATION		VENDOR	FACILITY and FUEL TYPE		STATUS
Issued	American Centrifuge Plant	Piketon, OH	Centrus Energy Corp.	Centrifuge Enrichment	HALEU	Approved
Under Review	TF3	Oak Ridge, TN	TRISO-X, LLC	Fuel Fabrication	HALEU TRISO	Under Review

★ In June 2021, the NRC approved license a amendment authorizing Centrus Energy Corp to demonstrate commercial production of HALEU at the American Centrifuge Plant. In September, installation of the HALEU demonstration centrifuges in cascade form was halted temporarily until a contract could be competitively awarded for the HALEU demonstration project. In November 2022, the DOE announced an approximately $150 million cost-shared award with American Centrifuge Operating, LLC, a subsidiary of Centrus Energy Corp, to demonstrate the ability to produce HALEU. Advancing domestic capability to produce HALEU will set the

[6] Terminated: Eagle Rock Enrichment Facility, GLE Uranium Enrichment Facility
[7] Mixed-Oxide Fuel Fabrication Facility
[8] Suspended: Fluorine Extraction Process and Depleted Uranium Deconversion (FEP/DUP) Plant

stage for larger, commercial-scale HALEU production in the US, providing important fuel stability for advanced reactors to achieve smaller designs, longer operating cycles, and increased efficiencies over existing technologies.

During the first year, some $30 million of the cost-share will be used to start up and operate 16 advanced centrifuges in a cascade at a Department of Energy facility in Piketon, Ohio. The facility represents the only U.S. plant licensed to produce HALEU at present. The cascade is expected to meet the demonstration requirements by enriching uranium hexafluoride gas to produce 20 kilograms of 19.75% enriched HALEU by December 31, 2023. They will then continue production in 2024 at an annual rate of 900 kilograms of HALEU per year, subject to appropriations, with additional options to produce more material under the contract in future years.

In February 2023, Centrus announced that it had finished assembling the cascade of uranium enrichment centrifuges and most of the associated support systems ahead of its contracted demonstration of HALEU production by the end of 2023. When the 16-machine cascade begins operating inside the Piketon, OH, American Centrifuge plant, which has room for 11,520 machines, it will be the first new US-technology based enrichment plant to begin production in 70 years.

DOE is pursuing multiple pathways to produce HALEU through its HALEU Availability Program authorized by the Energy Act of 2020 to meet this pressing need. Following the HALEU demonstration, the centrifuge technology used at the facility will be available for commercial deployment.

NEW PLANT CONSTRUCTION

Vogtle

Following authorization from the NRC that fuel loading and operation may commence at Unit 3, Southern Company loaded fuel in the fall of 2022, with the intent to begin operating in the first quarter of 2023. However, during preoperational testing for the unit, plant operator Southern Nuclear identified 'vibrations associated with certain piping within the cooling system', according to a January 11th filing by Southern Company and Georgia Power with the Securities and Exchange Commission. The issue was remediated in coordination with the NRC and Vogtle-3 achieved initial criticality in the first week in March 2023.

Vogtle Unit 3 (Courtesy of Georgia Power/ Southern Company, October 2022)

On April 1, 2023, Vogtle-3 successfully synchronized and connected to the electric grid, becoming the first new US power reactor to start up in seven years. On May 29, 2023, Georgia Power announced that Unit 3 had attained 100 percent energy output of 1,100 MWe. Testing at the 100 percent power level is focused on the operation of the reactor, plant control system for the reactor and support systems, and integrated plant operations. The reactor was expected to enter commercial operation in June 2023, however on June 21st, the company announced that the commercial operation of the Vogtle-3 unit has been delayed due to a problem in the hydrogen system used to cool the unit's main electrical generator. The reactor shut down while repairs were made. On July 31, 2023, Georgia Power announced that Vogtle-3 officially entered commercial service, making history as the first nuclear reactor built from scratch in the U.S. to enter service in more than three decades. The reactor, Unit 3, produces 1,100 megawatts of electricity at full tilt, enough to power roughly 500,000 homes and businesses.

Meanwhile, on July 28, 2023, the Nuclear Regulatory Commission authorized Southern Nuclear Operating Company to begin loading fuel into Unit 4 at the Vogtle nuclear expansion site. The achievement marks another significant step toward commercial operation for the Generation III+ AP1000 reactor. The authorization came via an NRC letter to Southern Nuclear verifying the company's July 20 notification to the agency that all 364 inspections, tests, and analyses for the unit had been performed, and all acceptance criteria for the new reactor have been met—a prerequisite for commencing fuel load. Vogtle-4 now moves out of the NRC's construction reactor oversight process and into its operating reactor oversight process. The goal for the reactor is to reach commercial operation between December 2023 and March 2024.

In its second-quarter 2023 earnings call, Southern Company reported earnings of $838 million. The company shared that Plant Vogtle Unit 3 entered commercial operation and is serving Georgia customers with carbon-free electricity and their focus now is the successful completion of Unit 4. Both units will finish years behind schedule and billions over initial cost estimates. Georgia Power owns 45.7% of Vogtle; other owners include Oglethorpe Power Corporation (30%), Municipal Electric Authority of Georgia (22.7%), and Dalton Utilities (1.6%).

VC Summer

At the time of its August 2017 cancellation, the V.C. Summer project was about 65% complete. All four steam generators for Units 2 and 3 were being installed, while two of the four reactor coolant pumps for Unit 2 reactor are on site. Units 2 and 3 were planned to come online in April 2020 and December 2020, respectively.

As the pioneer of nuclear power development, the United States is the world's largest producer of nuclear power, accounting for approximately 25% of worldwide nuclear generation of electricity. Currently, there are 93 reactors operating in the United States. In 2020, the fleet produced approximately 790 thousand Megawatt-hours (MWh), approximately 20% of America's total electrical output and nearly 55% of our emissions-free electricity. Since the early 1970s, the U.S. nuclear industry has significantly improved its safety and operational performance. By the turn of the century, it was among world leaders with a record-breaking capacity factor in 2019 of over 94%.

In deregulated electricity markets, nuclear power plants are facing financial challenges from zero marginal cost variable power sources and a reduction in the price of natural gas. While increased focus on nuclear energy as a critical part of a clean-energy future for the country, significant collaboration will be necessary from government and industry to maintain and grow the U.S.'s nuclear power generating capabilities.

Nation-Wide Status Updates

On March 3, 2023, the NRC issued the 2022 assessment letters to operators of the nation's commercial nuclear reactors, nothing that of the 93 units in the agency's Reactor Oversight Process, 87 "reached the highest performance category in safety and security," known as Licensee Response. Those reactors, including Vogtle-3—which achieved initial criticality in early March—remain in Licensee Response at this writing.

Six reactors, however, have slipped into the second, more highly scrutinized performance category, "Regulatory Response," and continue to reside there. Units under additional NRC oversight include the following:

- Calvert Cliffs-1, for failing to implement foreign material exclusion practices in accordance with site procedures. Specifically, the licensee failed to prevent the introduction of foreign material into the 1A emergency diesel generator (EDG), which led to an EDG automatic trip and consequential failure on February 20, 2022, during routine testing.
- Davis-Besse, for a security-related finding originating in the third quarter of 2021. (Details of security findings are not divulged to the public.)
- Peach Bottom-2, for the performance of a procedure inappropriate to the circumstances, causing a reactor scram, primary containment isolation system Group I isolation, safety-relief valve actuation, and loss of the normal heat sink, which required emergency core cooling systems to maintain level and pressure.
- Quad Cities-2, for the failure of one of the four electromatic relief valves associated with the automatic depressurization subsystem to actuate during surveillance testing. As a result, the valve was inoperable from April 7, 2020, until March 21, 2022.
- V.C. Summer, for failing to identify and correct a condition adverse to quality that resulted in the inoperability of the B emergency diesel generator.
- Waterford, for errors associated with the main condenser wide range gas monitor (WRGM), which introduced the potential to overclassify radiological emergencies and made the results of dose assessment using the main condenser WRGM inaccurate.

Individual Status Updates

- **June 1, 2023 -** Constellation Energy, operator of the largest U.S. reactor fleet, is acquiring NRG Energy's 44 percent ownership stake in the South Texas Project nuclear plant. The South Texas Project is a two-unit, 2,501-MWe facility located in Bay City, Texas. Unit 1 entered commercial operation in August 1988 and Unit 2 in June 1989, making them among the youngest reactors in the U.S. fleet.

  The transaction is valued at $1.75 billion, with an effective purchase price of $1.4 billion, according to Constellation. The purchase is subject to approval by the Nuclear Regulatory Commission and the Department of Justice. Once the deal is completed, Constellation will be one of the three owners of the South Texas Project Nuclear Operating Company. Two Texas-based companies, Austin Energy and CPS Energy, have ownership stakes of 40 percent and 16 percent, respectively.

- **June 16, 2023 -** Comanche Peak nuclear plant announced that a technical problem with a feedwater pump at Unit 1 had caused the unit to shut down temporarily. A new backup system was employed by grid operator Electric Reliability Council of Texas (ERCOT) to make up for the electricity loss. The new system—ERCOT Contingency Reserve Service (ECRS)—was launched earlier this month. It serves to stabilize the grid during times of high energy demand. The shutdown led to a sudden reduction in the grid's electricity supply of about 1,200 MWe. Unit 1 came back online on June 18, 2023.

- **July 16, 2023 -** A lead assembly of Framatome's 100% Enhanced Accident Tolerant Fuel (EATF) has successfully completed its first cycle of operation at a US nuclear power plant. The assembly was inserted into unit 2 of the Calvert Cliffs plant in Maryland during a refueling outage in early 2021. Following 24 months of operation at Constellation Energy's two-unit Calvert Cliffs nuclear power plant, testing and inspections confirm that Framatome's lead EATF assembly safely withstood in-reactor conditions and performed as designed. The lead EATF assembly was developed with funding from the Department of Energy under Framatome's Protect program and fabricated at the company's Richland, Washington, manufacturing facility as part of a 2019 contract with Constellation.

- **July 6, 2023 –** Urenco has announced that it will expand enrichment capacity at its U.S. site in Eunice, New Mexico—known as UUSA—by adding new centrifuge cascades to increase capacity by about 700 metric tons of separative work units per year, or a 15 percent increase, with the first new cascades coming online in 2025. The U.S. capacity increase project would be the first in what Urenco says is "a long-term plan to extend and refurbish enrichment capacity at our sites to meet increasing customer demand as more countries and utility companies turn to nuclear for the first time or seek to extend and/or diversify fuel supplies for existing nuclear operations."

Licenses Renewal and Uprate Status

★ The NRC submitted a proposed rule to update its license renewal generic environmental impact statement (GEIS) to the Federal Register for comment on March 3, 2023. Four hybrid meetings were held in March and April 2023 around the US for the public to ask questions and to seek comment on the rule. The proposed rule is in response to a 2022 NRC order, CLI-22-02, that concluded that the license renewal GEIS did not analyze the environmental impacts of a subsequent license renewal term (from 60 to 80 years of operation). The proposed rule amends the relevant rule language to account for initial license renewal and one term of subsequent license renewal, redefines the number and scope of the environmental issues that must be addressed during the review of each application for license renewal, and updates related guidance to fully address subsequent renewal. Comments were required to be submitted by May 2, 2023, in order to be considered.

License Renewal

Sixty-one reactors have received 20-year extensions of their operating licenses from the NRC, including Kewaunee, Vermont Yankee, Fort Calhoun, Oyster Creek, and Pilgrim, which are now permanently closed.

On December 8, 2022, the NRC docketed the license renewal application for Comanche Peak Units 1 and 2.

Applications for License Renewal

★ Issued Renewals:
- No recently issued applications.

★ Applications Currently Under Review:
- Comanche Peak Units 1 & 2

★ Anticipated Future Renewal Submittals:
- Clinton Power Station Unit 1
- Perry Unit 1
- Diablo Canyon Units 1 & 2

Subsequent (Second) License Renewal

The NRC staff has defined subsequent license renewal (SLR) to be the period of extended operation from 60 years to 80 years.

Applications for Subsequent License Renewal

★ Issued Subsequent Renewals[9]:
- Surry Units 1 & 2 (Issued: 12/04/19)
- Turkey Point Units 3 & 4 (Issued: 03/05/20)

[9] On February 24, 2022, the NRC revised the requirements for environmental reviews of SLR applications. The Generic Environmental Impact Statements used on SLRs were deemed invalid beyond 60 years of operation, and applicants will be required to complete an "adequate NEPA review for each application."

- Peach Bottom Units 2 & 3 (Issued: 05/04/21)

★ Applications Currently Under Review:
- North Anna Power Station Units 1 & 2 (Received: 08/24/20)
- Point Beach Units 1 & 2 (Received: 11/16/20)
- Oconee Nuclear Station Units 1, 2, & 3 (Received: 06/07/21)
- St. Lucie Units 1 & 2 (Received: 08/03/21)
- Monticello Unit 1 (Received 01/09/2023)

★ Applications Received and Under Acceptance Review:
- No pending applications

★ Anticipated Future Subsequent Renewal Submittals:
- Browns Ferry Units 1, 2, & 3 (Estimated: January 2024)
- Virgil C. Summer Unit 1 (Estimated: Oct-Dec 2023)
- Edwin I. Hatch Units 1 & 2 (Estimated: Oct-Dec 2025)
- Dresden Units 2 & 3 (Estimated: Apr-June 2024)
- H.B. Robinson Steam Electric Plant, Unit 2 (Estimated: Apr 2025-June 2025)

Operating Fleet Uprate Activities
U.S. nuclear power plants have submitted power uprate applications to the NRC since the 1970s, accounting for an additional 8,010 MWe of output.

★ Recently Approved
- No recently approved uprates

★ Pending Applications:
- No pending applications

★ Expected Applications
- As of July 31, 2023, there are 0 imminently expected applications for power uprates (per NRC). However, several plants have announced their intentions to submit an application.

★ **June 20, 2023 -** The Nuclear Regulatory Commission announced Energy Harbor has filed its initial license renewal application for the Perry nuclear power plant, requesting an additional 20 years of operation for the facility. The Akron, Ohio–based company—owner and operator of both Perry and Ohio's other nuclear plant, Davis-Besse, as well as Beaver Valley in Pennsylvania—declared its intention to seek license renewal for Perry in May of 2020. The original 40-year operating license for Perry's 1,273-MWe boiling water reactor expires on November 7, 2026. Agency staff is reviewing the Perry application to determine if it is sufficiently complete to begin detailed safety and environmental reviews.

Supportive Federal and State Action

Initiatives are taking place at the national and state level to ensure a more competitive market for nuclear power. For example, the states of New York, Illinois, New Jersey, Colorado, Ohio, Pennsylvania, and California have taken action to level the playing field and include nuclear energy in their clean energy policies and have averted the closure of ten power plants.

- ★ The US state of Alaska announced on July 28, 2023, that has adopted regulations to streamline the regulatory process for the siting of microreactors. The new regulations, which waive some requirements imposed on larger nuclear facilities, come into effect in August 2023. Previously, the Alaska Department of Environmental Conservation could not issue a permit for siting a nuclear facility unless the land for the facility was both designated by legislature and the local municipal government approved the permit. The new regulations stem from Senate Bill (SB) 177 which Governor Mike Dunleavy signed into law in 2022, updating Alaska Statute (AS) 18.45. The 2022 updates to AS 18.45 remove the requirement for the legislature to designate land for a nuclear microreactor. The regulations establish requirements for the applicant to engage the public early in the permitting process.

- ★ In September 2022, California legislature voted to provide funds to ensure the continued operation of the Diablo Canyon nuclear plant. The Bill reversed the State's 2016 decision to retire the plant by 2025 and approved a $1.4 billion government loan to extend its operation to 2030. In addition to this funding, in November 2022, the plant was formally selected as a beneficiary of the CNC program and will receive additional federal funding to ensure it continues to operate.

Thirteen plants (19 reactors) had previously announced they intended to close prior to their license expiration date but have been saved due to Federal and State Actions:

ORIGINALLY PROPOSED CLOSURE YEAR	SITE / LOCATION		UTILITY	LICENSE EXPIRATION (TERM)	POWER (MWe)
2017	FitzPatrick	NY	Entergy	2034 (60)	852
	Ginna	NY	Exelon	2029 (60)	582
	Clinton	IL	Exelon	2026 (40)	1,065
2017-18	Nine Mile Point – 1 & 2	NY	Exelon	2029 / 2046 (60)	1,780

2018	Quad Cities 1 & 2	IL	Exelon	2032 (60)	1,820
2020	Davis-Besse	OH	Energy Harbor	2037 (60)	893
2021	Perry	OH	Energy Harbor	2026 (40)	1,261
	Beaver Valley	PA	Energy Harbor	2036 / 2047 (60)	1,872
	Byron – 1 & 2	IL	Exelon	2044 / 2046 (60)	2,300
	Dresden – 1 & 2	IL	Exelon	2029 / 2031 (60)	1,773
2022	Salem – 1 & 2	NJ	PSEG	2036 / 2040 (60)	2,304
	Hope Creek		PSEG	2046 (60)	1,172
2024-2025	Diablo Canyon 1 & 2	CA	PG&E	2024/2025(40)	2,240
				Total Saved	**19,914**

Premature Closure

Some of the nuclear plants now closing are doing so because of state policy pressure (as with New Jersey's Oyster Creek, and New York's Indian Point), and some have had maintenance issues that were too costly to fix. However, most plants are closing or threatening closure because–given the economics in some regions—they have become unable to compete against primarily low-cost, gas-fired generation and, to a lesser extent, subsidized and mandated "variable renewable energy," such as wind- and solar-power.

★ Twelve plants (14 reactors) have closed prior to their license expiration date:

CLOSURE YEAR	SITE / LOCATION		UTILITY	LICENSE EXPIRATION (TERM)	POWER (MWe)
2013	Crystal River 3	FL	Duke	2016 (40)	860
	San Onofre 2 & 3	CA	SoCal Edison	2023 / 2024 (40)	2,150
	Kewaunee	WI	Dominion	2033 (60)	566
2014	Vermont Yankee	VT	Entergy	2032 (60)	620
2016	Fort Calhoun	IN	Omaha Power	2033 (60)	479
2018	Oyster Creek	NJ	Exelon	2029 (60)	610
2019	Pilgrim	MA	Entergy	2032 (60)	685
	Three Mile Island 1	PA	Exelon	2034 (60)	803
2020	Indian Point 2	NY	Entergy	2024 (60)	998
	Duane Arnold	IA	NextEra	2034 (60)	615
2021	Indian Point 3	NY	Entergy	2025 (60)	1,030

2022	Palisades[10]	MI	Entergy	2031 (60)	789
			Total Closed since 2013:		**10,205**

★ Currently, no reactors have announced plans to retire prior to their license expiration date.

PENDING CLOSURE YEAR	SITE / LOCATION	UTILITY	LICENSE EXPIRATION (TERM)	POWER (MWe)
		Total Pending Closures:		**0**

[10] On May 20, 2022 The Palisades Nuclear Power Plant shut down operations and ownership was transferred to Holtec International, with plans to decommission the plant. However, on June 28, 2022, Holtec applied for funds under the CNC Program, with the intention to eventually reopen the plant.

INTERNATIONAL NUCLEAR ACTIVITIES

- **June 7, 2023** - Westinghouse Electric Company announced the signing of memoranda of understanding with Finnish state-owned energy company Fortum, operator of the two-unit Loviisa nuclear plant, to explore the possibilities of developing and deploying AP1000 and AP300 reactor projects in Finland and Sweden. Westinghouse on May 4, 2023, unveiled the AP300 concept; a 300-MWe, 900-MWt single-loop pressurized water reactor based on its larger AP1000 unit. A week later, the company announced the filing of the new small modular reactor's preapplication regulatory engagement plan with the Nuclear Regulatory Commission. Westinghouse is shooting for AP300 design certification by 2027, construction by 2030, and the first unit may start delivering power to the grid in 2033.

- **June 8, 2023** - A new bilateral agreement, the Atlantic Declaration for a Twenty-First Century U.S.-U.K. Economic Partnership was debuted by President Biden and U.K. Prime Minister Rishi Sunak. The declaration outlines how the countries can enhance cooperation to accelerate the clean energy transition that must take place, lead the development of emerging technologies that are going to shape the future, and protect technologies critical to national security. To help build that future clean economy, the declaration calls for the launch of a civil nuclear partnership, to be overseen by both U.S. and U.K. senior government officials. In addition, the U.S.-U.K. Joint Action Group on Energy Security and Affordability (JAG), established last December, will be mobilized "to set near-term priorities for joint action to encourage the establishment of new infrastructure and end-to-end fuel cycle capabilities by 2030 in both continents, and substantially minimize reliance on Russian fuel, supplies, and services."

- **June 8, 2023 -** The Emirates Nuclear Energy Corporation (ENEC) announced that Barakah-4, the fourth and final Korean-designed APR-1400 reactor to be built at the United Arab Emirates' Barakah nuclear power plant, has commenced the testing necessary to demonstrate its readiness for an operating license from the UAE's Federal Authority for Nuclear Regulation. Once operational, Unit 4 is expected to raise the facility's total clean electricity generation capacity to 5.6 GW.

- **June 13, 2023** - NuScale Power, Romania's nuclear plant operator Nuclearelectrica, E-Infra, Nova Power & Gas, Fluor Enterprises, and Samsung C&T Corporation signed a memorandum of understanding to collaborate on the deployment of NuScale's VOYGR small modular reactor plants in Central and Eastern Europe, starting with Romania. The firms' combined experience will provide support for plant deployment in critical areas of development, such as project planning, licensing, permitting, engineering, procurement, construction, operation, maintenance, decommissioning, financing, and local resources capitalization.

- **June 14, 2023** - Westinghouse Electric Company announced that it has signed a front-end engineering and design contract with Kozloduy NPP–Newbuild for an AP1000 unit at the Kozloduy site in Kozloduy, Bulgaria. Currently, there are two 1,003-MWe VVER-1000 reactors in operation at Kozloduy. Westinghouse signed a 10-year agreement in December 2022 to supply nuclear fuel to one of the units starting in 2024. The fuel will be supplied out of Westinghouse's fabrication site in Västerås, Sweden, with licensing expected over the next year, and supply beginning in 2024.

- **June 16, 2023** - The U.S. Nuclear Regulatory Commission (NRC) and Poland's National Atomic Energy Agency (PAA) have renewed their cooperation agreement for the next five years. Signed by the agencies' leaders during a bilateral meeting in Washington, D.C., the pact now includes exchanging technical information on Westinghouse's AP1000 and GE Hitachi Nuclear Energy's small

modular BWRX-300 design. Other areas of cooperation, according to a PAA announcement on the agreement, include nuclear safety research and "training and staff participation in individual projects."

★ **June 20, 2023 -** Pakistan and China signed a $4.8 billion deal to build a 1,200-megawatt nuclear plant in Pakistan. Following the signing of the memorandum of understanding (MOU) between China National Nuclear Cooperation and Pakistan Atomic Energy Commission it was announced that the work on the Chashma 5 project would begin immediately. The Chashma site, also referred to as Chasnupp, at Mianwali in Punjab is already home to four operating Chinese-supplied CNP-300 pressurized water reactors.

★ **July 7, 2023** - Westinghouse Electric Company submitted to the Canadian Nuclear Safety Commission the first set of vendor design review (VDR) documents for its eVinci microreactor. In September 2021, Westinghouse signed a service agreement with the CNSC that initiated the VDR. The VDR –an optional service provided by the CNSC at the request of a vendor– is a way for commission staff to provide feedback early in the design process. The VDR verifies the acceptability of a nuclear power plant design with respect to Canadian nuclear regulatory requirements and expectations, as well as Canadian codes and standards. In addition, the review aims to identify fundamental barriers to licensing a new design in Canada and to assure that a resolution path exists for any design issues identified.

★ **July 7, 2023** - The government of Ontario announced that it is working with Ontario Power Generation to begin planning and licensing for the deployment of three additional GE Hitachi Nuclear Energy (GEH) BWRX-300 small modular reactors at the Darlington site. A total of four BWRX-300 SMRs are now planned for deployment at the site. In January of this year, Wilmington, N.C.–based GEH, along with OPG and fellow Canadian firms SNC-Lavalin and Aecon, announced the signing of a contract for the deployment of a single BWRX-300 at the site. Construction of that unit is expected to be completed by the fourth quarter of 2028. Subject to regulatory approvals on construction from the Ontario government and the Canadian Nuclear Safety Commission (CNSC), the additional SMRs could come online between 2034 and 2036.

★ **July 17, 2023 -** Denmark's Seaborg Technologies and Norwegian Nuclear Power signed a letter of intent to investigate the possibility of deploying Seaborg's 100-MWe compact molten salt reactor (CMSR) in Norway. Seaborg's CMSR plants are designed to be installed on barges, with the ability to deliver from 200 MWe of power (a two-unit barge) to 800 MWe (an eight-unit barge).

★ **July 18, 2023 -** Ontario Power Generation (OPG) has achieved another milestone in its massive Darlington nuclear plant refurbishment project. The Unit 3 CANDU reactor has been reconnected to Ontario's electricity grid 169 days ahead of schedule, according to a OPG media release. Located about 45 miles east of Toronto in Clarington, Ontario, the Darlington facility houses four 878-MWe CANDU pressurized heavy water reactors, all of which entered commercial operation in the early 1990s. The 10-year, $9.7 billion refurbishment project commenced in earnest in October 2016 when Unit 2 was taken offline. The refurbished Unit 2 was returned to service in early June 2020, and in late July of that year Unit 3 was shut down and disconnected from the grid in preparation for its overhaul.

★ **July 24, 2023 -** The U.S. Nuclear Regulatory Commission and the Ghana Nuclear Regulatory Authority (NRA) reaffirmed its shared commitment to continue cooperation on nuclear safety and regulation for the African nation. The NRC-NRA bilateral relationship is part of broader cooperation between the U.S. and Ghanaian governments as Ghana embarks on creating a nuclear power

program and establishing a legal framework with the U.S. government for civil nuclear cooperation, known as a 123 Agreement. The NRC noted in a press release that it strongly supports exchanges with partners around the world to share best practices for ensuring safe, accountable, and transparent use of nuclear energy technologies.

★ **July 25, 2023 -** The Japanese government has chosen Mitsubishi Heavy Industries (MHI) to head up the conceptual design and research and development of a demonstration sodium-cooled fast reactor, the Tokyo-based engineering firm announced. MHI is to oversee the work in partnership with Mitsubishi Fast Breeder Reactors (MFBR) Systems Inc. MFBR was established in 2007 by MHI Group engineering company to develop and design fast breeder reactors. Conceptual design work is scheduled to commence in fiscal year 2024, with operation of the unit slated for the 2040s.

★ **July 28, 2023 -** Kansai Electric Power Co. rebooted a nuclear reactor at its Takahama power plant in central Japan's Fukui Prefecture for the first time in 12 years, making it the oldest operating reactor in Japan. The operator plans to restart power generation and transmission at the No. 1 reactor days before resuming commercial operation on August 28, 2023. The reactor, which started commercial operation 48 years ago, went offline in January 2011 for regular inspection and remained so following the Fukushima nuclear crisis, triggered by the earthquake and tsunami in March of that year. The reboot comes after the Nuclear Regulation Authority gave the green light in 2016 for the reactor to operate beyond the 40-year service period, which was set in the wake of the crisis.

★ **July 31, 2023 -** China has approved expansion projects at three nuclear power plants, according to a statement from the State Council. Six new nuclear power generation units have been approved to expand three existing plants in Shandong province, Fujian province and Liaoning province. Total investment into the new units is estimated at 120 billion yuan ($16.74 billion). Nuclear power accounts for just around 2.2%, or about 56 gigawatts, of China's total generation capacity, according to data from the National Bureau of Statistics. In 2020, China set out plans to increase total nuclear capacity to 70 GW by 2025.