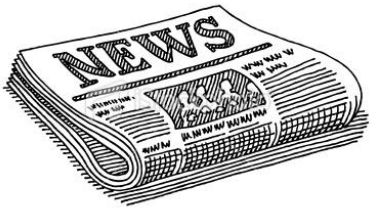

- ★ Recent Developments:
  - June 2021:
    - The Zero Emission Nuclear Power Production Tax Credit Act (HR 4024), which was introduced to the House on June 21, 2021, would make existing nuclear power operators eligible for the tax credit of $15 per MWh, already available to wind operators. Currently, this tax credit is only available to nuclear power plants in their first eight years of operation.

    - A new bill, The Twenty First Century Nuclear Security Act, was introduced that seeks to gauge the risk to national security from the growing presence of China and Russia in the nuclear energy industry. Another aim of the legislation is to identify areas of opportunity for the United States to reestablish leadership.

- ★ June 30, 2021: The University of Illinois plans to deploy the first new university research reactor in 30 years, a high-temperature gas-cooled microreactor.
- ★ June 25, 2021: A new micro reactor design, the molten salt nuclear battery (MsNB), promises continuous operation for up to a decade. Applications include power generation at Department of Defense installations and other facilities not connected to electrical grids.
- ★ June 23, 2021: A special inspection by the Nuclear Regulatory Commission (NRC) is currently underway at the Vogtle Unit 3 site. The aim of the inspection is to determine the reason remediation work was necessary on Unit 3's electrical cable raceway system.
- ★ June 23, 2021: Duke Energy has filed as subsequent license renewal (SLR) for the three reactors located at their Oconee site. The SLR would extend the operating life of Oconee 1 and 2 until 2053 and Oconee 3 until 2054.
- ★ June 8, 2021: Equipment at Vogtle Unit 4 has been permanently powered up and the unit is expected to be commercially operational by late 2022 or early 2023. Unit 3 is expected to reach commissioning by early 2022.
- ★ June 2, 2021: TerraPower has selected Wyoming as the location for its first Natrium Reactor project. The project features a sodium cooled fast reactor along with a molten salt energy storage system. The demonstration project will be a fully functioning power plant, meant to validate the design, construction, and operational features of the technology.
- ★ May 13, 2021: A bill proposed in Nebraska incentivizes advanced reactor technology. If L.B. 84 becomes law, companies that build advanced nuclear reactors would be eligible for tax incentives.
- ★ May 11, 2021: The National Reactor Innovation Center (NRIC) and the Crosscutting Technology Development (CTD) Integrated Energy Systems (IES) Program are interested in uses for energy generated by nuclear power plants other than electricity generation. A call for Expressions of Interest has been issued by Battelle Energy Alliance for programs that demonstrate innovative uses for nuclear energy beyond electricity production.
- ★ May 6, 2021: Tennessee Valley Authority (TVA) and Kairos are collaborating on a demonstration project for a fluoride salt cooled high temperature fast reactor located at the East Tennessee Technology Park in Oak Ridge.

LICENSING ACTIONS

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.

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)*

Four reactor designs that are being considered for future builds in the U.S. have been certified by the NRC. In addition, one SMR design is currently under NRC review*. One of the four certified designs is under renewal review. Two previously submitted designs have been withdrawn from consideration[1].

[1]AREVA US-EPR – Submitted December 12, 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.

	VENDOR	TECHNOLOGY	STATUS
Issued	Westinghouse	AP1000	Issued: 12/30/2011
	General Electric-Hitachi	ESBWR	Issued: 11/14/2014
	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
Active DCAs	NuScale Power	NuScale SMR Power Module	*Under Review: Standard Design Approval received on 9/30/2020

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]

[2]Victoria County Station, Texas (Exelon) was withdrawn from NRC review 10/2012

	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, 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 COLA 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 COLAs 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]

[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

	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
Under Review	Idaho National Laboratory	ID	Oklo Power LLC	Aurora	1	Under Review

NEW PLANT CONSTRUCTION

Vogtle

Remediation work at Vogtle Unit 3 is underway on the electrical cable raceway system, which supports cables needed to power safety related equipment. The NRC is currently investigating the reason the remediation work was necessary. The work has caused a delay to the completion of the unit's hot functional testing.

Vogtle Unit 3 (Courtesy of Georgia Power/ Southern Company, April 2021)

Unit 4 began its integrated flush test, which pumps water through the plant's permanent piping system that leads into the reactor vessel and coolant loops.

The cost projections for the completion of the Vogtle plant are now at $27.5 billion in total costs, more than double the original estimate. Southern Company recently announced they are expecting costs will increase an additional $149 million due to the COVID-19 pandemic.

Two groups filed legal challenges to the Georgia Public Service Commission's (PSC) decision to allow Georgia Power and partners to complete two unfinished nuclear reactors at Plant Vogtle in early 2018. Southern Environmental Law Center, Partnership for Southern Equity, and Georgia Interfaith Power and Light filed a lawsuit in February 2018 arguing PSC violated state laws and the commission's own rules by approving spending that would nearly double the estimated cost of the project. Consumer group Georgia Watch filed a legal challenge in March 2018 alleging the PSC's decision benefits Georgia Power's shareholders over ratepayers. The Fulton County Superior Court dismissed the cases in December 2018 and, again, in April 2020 on the basis that the commission's decision was not "final" and appealable until the project is complete.

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.

OPERATING FLEET STATUS

Nation-Wide Status

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 2019, they produced approximately 809 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 solar and wind power sources.

License Renewal and Uprate Status

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.

Applications for License Renewal

- ★ Issued Applications:
  - No recently issued applications
- ★ Pending Applications:
  - Currently no applications for license renewal under review
- ★ Anticipated Future Submittals:
  - Clinton Power Station 1
  - Comanche Peak Nuclear Power Plant 1 & 2
  - Perry Nuclear Power Plant 1

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. (per NRC)

Applications for Second License Renewal

- ★ Issued Applications:
  - Turkey Point Units 3 and 4
  - Peach Bottom Units 2 and 3
  - Surry Units 1 and 2
- ★ Pending Applications:
  - North Anna Power Station Units 1 and 2
  - Point Beach Units 1 and 2
  - Oconee Nuclear Station Units 1,2, and 3
- ★ Anticipated Future Submittals:
  - St. Lucie Units 1 and 2

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
  - Farley Units 1 and 2
  - Watts Bar 2
  - Oconee Units 1, 2, and 3
- ★ Pending Applications:
  - Millstone 3
- ★ Expected Applications
  - As of February 5, 2021, there are 0 expected applications for power uprate in 2020 and 2021. (per NRC)

Operating Fleet Status: 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, Ohio, and Pennsylvania 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.

- ★ If passed, the Climate Union Jobs Act would transition Illinois to 100 percent clean energy by 2050 and, among other things, would create 74 million-megawatt hour "carbon mitigation credits" for nuclear power plants. These credits would not be eligible to plants already receiving zero-emissions credits.

Ten plants (13 reactors) announced they were closing prior to their license expiration date but were saved due to 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
2022	Salem – 1 & 2	NJ	PSEG	2036 / 2040 (60)	2,304
	Hope Creek		PSEG	2046 (60)	1,172
				Total Saved	**13,601**

Operating Fleet Status: Premature Closure

Some of the nuclear plants now closing are doing so because of state policy pressure (as with California's Diablo Canyon, 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, in a low electricity demand environment.

★ Ten plants (12 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
				Total Closed since 2013:	**9,416**

★ Four plants (7 reactors) have announced plans to retire prior to their license expiration date with many utilities attributing these decisions to market and policy factors:

PENDING CLOSURE YEAR	SITE / LOCATION		UTILITY	LICENSE EXPIRATION (TERM)	POWER (MWe)
2021	Byron 1 & 2	IL	Exelon	2044 / 2046 (60)	2,300
	Dresden 2 & 3	IL	Exelon	2029 / 2031 (60)	1,773
2022	Palisades	MI	Entergy	2031 (60)	789
2024-25	Diablo Canyon 1 & 2	CA	PG&E	2024 / 2025 (40)	2,240
				Total Pending Closures:	**7,102**