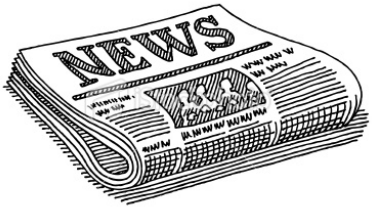

- ★ Congressional Legislative Action:
  - March 2020:
    - The Advanced Nuclear Fuel Availability Act (HR 1760), which was passed by the House on September 9, 2019, would ensure that adequate supplies of domestically produced high-assay low-enriched uranium (enriched above 5 percent and below 20 percent) are available. The bill was received in the Senate and referred to the Committee on Energy and Natural Resources.
    - The Nuclear Energy Leadership Act (S 903), which was placed on the Senate's Legislative Calendar on September 24, 2019, will help facilitate the path to market for advanced reactors by allowing the federal government to be an early adopter of commercialized technologies; providing for needed scientific research facilities; demonstrating advanced reactor concepts; breaking down fuel availability barriers when the market cannot; and training the next generation of nuclear scientist.
    - The Nuclear Powers Act of 2019 (HR 2314 and S 1134), which was introduced to the House Ways and Means Committee on April 12, 2019 and the Senate Committee on Finance on April 10, 2019, would provide a tax credit for investments in qualified nuclear energy property placed in service before January 1, 2026.
    - The Nuclear Waste Administration Act of 2019 (S 1234), which was heard by the Committee on Energy and Natural Resources on June 27, 2019, would establish the Nuclear Waste Administration (NWA) to provide for the permanent disposal of nuclear waste.

- ★ March 18, 2020: Oklo Inc. submitted a combined license application (COLA) for its Aurora reactor design. This marks the first application submitted to the Nuclear Regulatory Commission (NRC) for an advanced, non-light water reactor design.
- ★ March 13, 2020: Energy Harbor, formerly FirstEnergy, rescinded the deactivation notices for their Beaver Valley Power Station after the Pennsylvania administration began the process to join the Regional Greenhouse Gas Initiative. The plant, located in Shippingport, PA, was originally scheduled to be shut down in 2021.
- ★ March 12, 2020: BWXT Nuclear Operations Group, Inc was awarded a contract from the Department of Energy to manufacture uranium oxycarbide tristructural isotopic (TRISO) nuclear fuel to support the Transformational Challenge Reactor.
- ★ March 10, 2020: The Department of Defense (DOD) selected BWX Technologies Inc, Westinghouse Government Services, and X-energy LLC for a two year award to begin design work on a mobile nuclear reactor prototype. At the conclusion of the two years, DOD will select one of three teams to build and demonstrate the prototype rector.
- ★ March 9, 2020: The NRC approved Exelon Generation Company's application for a subsequent license renewal for Peach Bottom Units 2 and 3. This 20 year extension will allow Units 2 and 3 to operate until August 2053 and July 2054, respectively.
- ★ February 26, 2020: Lead test assemblies of Global Nuclear Fuel's IronClad accident tolerant fuel (ATF) completed a 24-month cycle at Southern Nuclear's Edwin I Hatch Unit 1. Samples of the test rods will now undergo post irradiation testing at Oak Ridge National Laboratory.

- ★ January 30, 2020: GE Hitachi Nuclear Energy (GEH) submitted the first licensing topical report (LTR) for its BWRX-300 design, a 300 megawatt boiling water reactor, formally beginning the regulatory licensing process. The LTR is expected to serve as the foundation for the development of a Preliminary Safety Analysis Report.
- ★ January 17, 2020: The Department of Energy completed its environmental impact statement and can now move forward to fabricate high-assay low-enriched uranium (HALEU) fuel for advanced reactors at the Idaho National Laboratory.
- ★ December 18, 2019: The NRC issued an early site permit (ESP) to the Tennessee Valley Authority for a potential small modular reactor at its Clinch River site near Oak Ridge, TN. An ESP certifies a site is suitable for a nuclear power plant related to site safety, environmental impact, and emergency planning but does not specify a reactor technology. The utility has not yet decided on whether to build a reactor or determined which technology it would use.
- ★ December 13, 2019: The NRC completed the fourth phase of NuScale's small modular reactor design certification application. Phase 4 included completion of the advanced safety evaluation report with no open items. There are two more phases needed to finalize the review, which is expected to be completed in September 2020.
- ★ December 6, 2019: The American Society of Mechanical Engineers (ASME) issued NuScale Power the highly regarded N Certificate of Authorization, also known as an N-Stamp. The issuance of this certificate demonstrates NuScale's commitment to safety and quality. They also become one of a small number of companies that holds the certificate while still retaining overall responsibility for their designs.
- ★ December 5, 2019: The NRC approved the first subsequent license renewal application for Florida Power and Light's Turkey Point Units 3 and 4. This approval marks the first time the regulator has authorized a nuclear power plant to operate for up to 80 years. The extension will allow Unit 3 to operate until July 2052 and Unit 4 until April 2053.

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 conduct an in-depth review of safety and environmental aspects related to the design and / or site.

Reactor Design Certifications (DC)

By issuing a design certification, the NRC approves a nuclear power plant design, independent of an application to construct or operate a plant. A design certification is valid for 15 years from the date of issuance, but can be renewed for an additional 10 to 15 years. A Design Certification 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. are certified. One small modular reactor (SMR) design is under NRC review. One is under renewal review and two have been withdrawn[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
Issued	General Electric-Hitachi	ESBWR	Issued: 11/14/2014
Issued	Korea Electric Power Corp	APR1400	Issued: 9/19/2019
Renewal	General Electric-Hitachi	ABWR	Originally Issued 5/12/1997: DC Renewal Application is under review
Active DCAs	NuScale Power	NuScale SMR Power Module	Under Review: Final SER expected 9/2020

Early Site Permits (ESP)

By issuing an ESP, the 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
Issued	Grand Gulf	MS	Entergy	PPE	Issued: 4/5/2007
Issued	North Anna	VA	Dominion Power	PPE	Issued: 11/27/2007 Amended 1/30/2013
Issued	Vogtle	GA	Southern	AP1000/ Westinghouse	Issued: 8/26/2009
Issued	Salem County	NJ	PSEG	PPE	Issued: 5/5/2016
Issued	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 early site permit, or neither. *(From NRC website)*

Eighteen COLAs have been docketed by the NRC: Eight, totaling 14 reactors, have received COLs; 8 applications were suspended and later withdrawn[3] due to utility, economic or other considerations while 2 applications remain in "suspended" status[4]. A Reference COL (R-COL) application has been submitted for 5 reactor designs (in addition to the designs for which a COL has been issued listed in the table below, COL applications were submitted for a USEPR and an US-APWR but were later withdrawn); subsequent COLs (S-COLs) incorporate the corresponding R-COL application by reference, noting any site-specific departures.

[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

	SITE/LOCATION		UTILITY	REACTOR TECHNOLOGY/ NO. of REACTORS		STATUS
Issued	Vogtle	GA	Southern Nuclear	AP1000	2	Issued: 2/10/2012
	V.C. Summer	SC	SCE&G	AP1000	2	Issued: 3/30/2012
	Fermi	MI	DTE Energy	ESBWR	1	Issued: 5/1/2015
	South Texas Project	TX	STPNOC	ABWR	2	Issued: 2/12/2016
	Levy	FL	Duke Energy	AP1000	2	Issued: 10/26/2016
	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

A COL is valid indefinitely. If a licensee chooses not to construct a plant immediately following being granted 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.

NEW PLANT CONSTRUCTION

Vogtle

On March 27, 2020 Georgia Power announced the placement of the Unit 4 containment vessel top head had been completed. The top head is 130 feet in diameter, 37 feet tall, and weighs nearly 1.5 million pounds. Fabrication of the top head requires welding together 58 large plates, each more than an inch and a half thick. Fuel loading at Unit 3 is expected to occur by the end of the 2020 calendar year. The Vogtle 3 and 4 project is now estimated to be about 84% complete with expected in-service dates of November 2021 for Unit 3 and November 2022 for Unit 4.

The cost projections for the completion of the Vogtle plant have increased by an estimated $2.2 billion, to more than $27 billion total costs, more than double the original estimate. Drivers for the increase include providing craft labor incentives to attract and retain staffing levels and increased field supervision and engineering oversight.

In late July 2018, Bechtel announced it was making a push to attract and hire skilled workers to meet the peak construction labor requirements beginning at the end of 2018 and continuing into 2019. On July 9, 2018, Georgia Power announced it was providing a second of three $25 credits to its customers in response to an order by the Georgia Public Service Commission (PSC) to shoulder some of the cost overruns when the PSC agreed to let the utility finish the delayed, over-budget Plant Vogtle nuclear expansion. The total credit provided sums to $188 million.

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. While the Fulton County Superior Court dismissed the cases in December 2018 on the basis that the commission's decision was not "final" and appealable until the project is complete, the Georgia Court of Appeals sent the group's legal challenge back to the lower court in October 2019.

In September 2018, JEA, Jacksonville, the largest community-owned electric utility in Florida, filed a suit against the Municipal Electric Authority of Georgia (MEAG) seeking to void a 2008 agreement obligating Florida ratepayers to help build and buy power from the two new reactors at Vogtle.JEA entered into a power purchase agreement with MEAG in 2008, but cost overruns and delays have increased JEA's financial obligations. MEAG subsequently filed a federal suit accusing JEA of having a clear intent to breach the contract and undermine and disrupt the project. On April 8, 2019, the U.S. District Court for the Northern District of Georgia allowed JEA's suit to proceed while denying MEAG's claim. JEA and MEAG entered settlement discussions in April 2019 but did not reach an agreement.

VC Summer

In January 2018, Dominion Energy proposed to buy SCANA Corporation for $14.6 billion and agreed to make up for customers being charged for the failed V.C. Summer nuclear construction project with $1.3 billion in rebates and no rate increases for three years. In March 2018, the Georgia Public Service Commission unanimously approved the merger. In July 2018, SCANA received the Federal Energy Regulatory Commission and its stockholders' approval of the proposed sale to Dominion and shareholders voted in favor of the merger. In September, the Nuclear Regulatory Commission approved the change in ownership from SCANA to Dominion. The merger was completed on January 2, 2019.

SCANA was sued by its shareholders and customers after it and its minority partner, the state-owned Santee Cooper utility, pulled the plug in July 2018 on the $9 billion, decade-long construction of two nuclear reactors in Fairfield County. The lawsuits alleged SCANA leaders were aware of critical problems dooming the nuclear project and covered them up. SCANA settled the class-action lawsuit for $2 billion.

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 reactors were being installed, while two of the four reactor coolant pumps for Unit 2 reactor are on site. Units 2 and 3 reactors 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 (U.S.) is the world's largest producer of nuclear power, accounting for more than 30% of worldwide nuclear generation of electricity. Our 96 reactors produced approximately 805 billion kilowatt-hours (kWh) in 2017, 20% of America's total electrical output and nearly 60% 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 2017 of over 92% and all safety indicators exceeding targets.

In deregulated electricity markets, nuclear power plants are facing financial challenges from solar and wind power sources.

License Renewal and Uprate Status

License Renewal

Ninety-three 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:
  - Seabrook 1 – 3/12/2019
- ★ Pending Applications:
  - Currently no applications for license renewal under review
- ★ Anticipated Future Submittals:
  - Clinton Power Station 1
  - Comanche Peak Nuclear Power Plant 1 & 2

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
- ★ Pending Applications:
  - Surry Units 1 and 2
- ★ Anticipated Future Submittals:
  - North Anna Power Station Units 1 and 2
  - Oconee Nuclear Station Units 1,2, and 3

Operating Fleet Uprate Activities

U.S. nuclear power plants have submitted power uprate applications to the NRC since the 1970s, accounting for an additional 7,923 MWe of output.

- ★ Pending Applications:
  - Watts Bar Unit 2
  - Farley Units 1 and 2
- ★ Expected Applications
  - As of November 20, 2019, there are 3 expected applications for power uprate in 2020 (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, and New Jersey have taken action to level the playing field and include nuclear energy in their clean energy policies, and have averted the closure of seven power plants.

- ★ Connecticut ruled in November 2018 to allow Millstone to bid into the Request for Proposals issued by the state's Department of Energy and Environmental Protection. The selection resulted in a 10-year bid for almost 50% of Millstone's output. The state also accepted a bid from New Hampshire's Seabrook nuclear plant for 1900 GWh of energy.
- ★ In September 2018, a federal appellate court ruling upheld Illinois's law providing zero emissions credits to nuclear plants and other green energy providers while, in May 2019, the Supreme Court rejected appeals to that ruling.
- ★ Ohio created the Clean Air Program on July 23, 2019 which allowed FirstEnergy, now Energy Harbor, to rescind the deactivation notices for the Davis-Besse and Perry plants.
- ★ In October 2019, Pennsylvania's Governor Tom Wolf moved to join the Regional Greenhouse Gas Initiative (RGGI) which is a cap-and-trade program intended to limit carbon dioxide emissions from power plants. This move enabled Energy Harbor's Beaver Valley plant to rescind their deactivation notices.

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.

★ Eight plants (9 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	566
2014	Vermont Yankee	VT	Entergy	2032	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
				Total Closed since 2013:	**6,773**

★ Four plants (6 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)
2020	Duane Arnold	IA	NextEra	2034 (60)	615
2020-21	Indian Point 2 & 3	NY	Entergy	2024 / 2025 (60)	2,061
2022	Palisades	MI	Entergy	2031 (60)	789
2024-25	Diablo Canyon 1 & 2	CA	PG&E	2024 / 2025 (40)	2,240
				Total Pending Closures:	**5,705**