Update on U.S. Nuclear Energy Policy

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This article covers recent developments in United States (U.S.) nuclear energy policy. The U.S. has the most operating nuclear power plants of any country, but U.S. nuclear power capacity is declining. Over the past decade, U.S. nuclear power plants have closed early due to low electricity market prices.[1] Recent U.S. nuclear energy policy initiatives help address the existential threat to nuclear power projects operating in electricity markets. In the U.S. federalist form of government, oversight of the electricity and nuclear power industries is divided between the national/federal government and state governments. New nuclear power policies have been developed and implemented at both levels.

National/Federal Level

The U.S. federal government has a limited role in nuclear power.

The federal Nuclear Regulatory Commission (NRC) has exclusive authority over nuclear safety matters.

A major U.S. nuclear power utility, the Tennessee Valley Authority (TVA) is owned by the federal government, but receives no taxpayer funding and operates as a regional public power utility.

The primary influence of the U.S. federal government on nuclear power is from the Federal Energy Regulatory Commission (FERC). FERC regulates the wholesale power system and wholesale electricity markets. In the 1990s, FERC pushed for electricity industry reforms that included wholesale electricity markets and the divestment of generation assets by vertically-integrated utilities. The result of these reforms was newly independent merchant generators operating in new wholesale electricity markets.

FERC aimed to implement electricity industry reforms nationwide, but some states declined to participate and some parts of the U.S. retain the traditional electricity industry approach (i.e., vertically-integrated utilities under cost-of-service state regulation). A map of the U.S. electricity markets shows the various regional electricity markets, with white areas retaining the traditional vertically-integrated regulated electric utility industry structure. Also, public power utilities (e.g., municipals and cooperatives) remain in place even in the market areas.

Most of the U.S. nuclear power plant early retirements have been merchant generators operating in these wholesale electricity markets.

Federal nuclear energy policy developments to address this issue include the recently approved Civil Nuclear Credit program, proposals for a nuclear Production Tax Credit (PTC), and various U.S. DOE funding activities.

Civil Nuclear Credit program

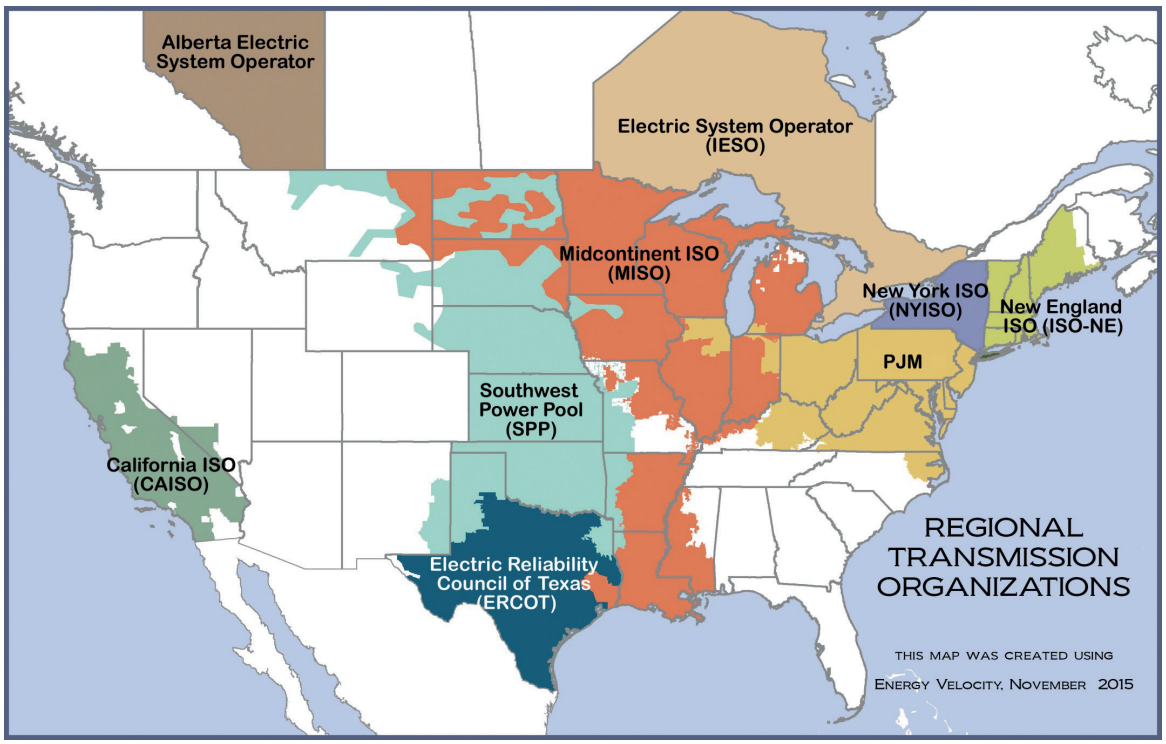
Shortly after taking office in 2021, President Biden proposed a large infrastructure spending program. After extensive congressional negotiations, the Infrastructure Investment and Jobs Act (IIJA) was passed by Congress and signed into law in November 2021.

The IIJA includes, among other things, a new Civil Nuclear Credit (CNC) program that will provide $6 billion in payments to existing nuclear power plants to help prevent more early retirements of these plants. The CNC program will be designed and implemented by the U.S. Department of Energy (DOE).

Civil Nuclear Credits will be allocated to selected, certified nuclear power plants over four years. The U.S. DOE has indicated that it intends, to the maximum extent practicable, to allocate credits to as many certified reactors as possible.[2]

The CNC program reflects broad political support for nuclear power as an essential part of the effort to reduce U.S. electricity sector greenhouse gas emissions.

1 For a more complete discussion of this issue, see Edward Kee's 2021 book: Market Failure – Market-Based Electricity is Killing Nuclear Power
2 See https://www.energy.gov/ne/civil-nuclear-credit-program



Proposed Production Tax Credit program

The Biden administration also proposed a larger spending bill in 2021, referred to as the Build Back Better Act, that was to be passed shortly after the IIJA but Congress has not approved this larger bill. The larger bill is not likely to be approved as originally proposed, but will likely be divided into several smaller and more focused bills that are considered in 2022.

The larger spending bill included a new Production Tax Credit (PTC) for nuclear power plants. Like the Civil Nuclear Credits, the new PTC payments were aimed at stopping additional early retirements of existing nuclear power plants due to poor financial performance.

The earlier Energy Policy Act of 2005 provides production tax credits for nuclear power, but only for new advanced nuclear power plants that meet certain requirements.

The U.S. nuclear power industry preferred the larger and more certain revenue that would come from the proposed PTC program. The PTC program had a larger total budget than the CNC program and would have provided benefits to all operating nuclear power plants, without the Civil Nuclear Credit's certification and auction process.
These PTC benefits are not yet approved, but the inclusion of the PTC program in proposed legislation is another sign that U.S. federal policy is moving to support nuclear power.

U.S. DOE programs

The DOE is designing and implementing the new Civil Nuclear Credit program. DOE is also implementing Energy Policy Act of 2005 incentives that will apply to the new Vogtle 3&4 nuclear power plant.

In addition, the DOE funds numerous programs to assist the U.S. nuclear power industry with a focus on supporting R&D, facilitating NRC regulatory approval for new reactor designs, and helping get the first units using new nuclear power plant designs built.

DOE has also funded several studies of the financial issues facing existing nuclear power plants.[3]

State Level

U.S. electricity market reform and restructuring were implemented in some, but not all U.S. states. In states that retained the traditional electricity industry model, nuclear power plants under state cost-of-service regulation have a more positive outlook than the merchant nuclear power plants in market states that have electricity markets and a restructured electricity industry.

3 Two of these studies are at See https://gain.inl.gov/Shared%20Documents/Economics-Nuclear-Fleet.pdf and See https://nuclear-economics.com/wp-content/uploads/2017/10/2017-09-Market-Challenges-for-Nuclear-Fleet-ESSAI-Study.pd

Traditional States

The only new nuclear power plant under construction in the U.S. is the Vogtle 3&4 plant in the state of Georgia, which retained the traditional electricity industry approach. The Vogtle 3&4 plant is the first Westinghouse AP1000 reactors built in the U.S. and is owned by a regulated electric utility, Georgia Power, in partnership with several public power utilities. The Georgia Public Utility Commission approved Georgia Power's investment in the regulated Vogtle 3&4 units. The Vogtle 3&4 project is financed with a DOE Loan Guarantee and will receive production tax credits when it starts commercial operation, both benefits from the Energy Policy Act of 2005. Georgia's state government and public utility commission have provided strong support for this new nuclear project.

Minnesota, another state retaining the traditional electricity industry approach, has two existing nuclear power plants owned by Xcel Energy. In 2003, the state government raised the issue of whether these existing nuclear power plants should continue to operate and whether customer rates would be lower if the nuclear power plants were retired early.[4] This situation was different in early 2022, with Xcel Energy's plan to rely on nuclear power for the future confirmed.[5]

Nebraska also retains a traditional electricity industry approach that involves public power utilities rather than investor-owned regulated utilities. These public power utilities are non-profit entities that recover costs from customers. In 2016, the Fort Calhoun nuclear power plant, owned by the Omaha Public Power District, was retired early because customer rates would be lower without the nuclear power plant. The Fort Calhoun early retirement was linked to low power costs in a region with extensive wind power development. Another Nebraska public power utility, the Nebraska Public Power District, owns the Cooper nuclear power plant that continues to operate under a license extension that allows operation until 2034.

Market States

U.S. states that implemented electricity reforms and joined wholesale electricity markets typically required original vertically-integrated utility companies to divest existing generation assets, including nuclear power plants. The divested nuclear power plants operate as merchant generators selling power into the wholesale electricity market. Low prices in U.S. wholesale electricity markets were caused by low natural gas prices, low demand growth, and increased development of renewable generation subsidized by out-of-market incentives (e.g., federal government PTCs and state renewable mandates). These low wholesale electricity market prices put financial stress on merchant nuclear power plants, with some plants experiencing financial losses.

This poor financial performance led to the early retirement of merchant nuclear power plants (e.g., Kewaunee, Vermont Yankee, Three Mile Island, Pilgrim) in market states.

ZEC Program States

Some market states, concerned about more early retirements of merchant nuclear power plants, established Zero-Emission Credit (ZEC) programs to help provide additional revenue to merchant nuclear plants.

The ZEC programs provide additional revenue to merchant nuclear power plants to reduce the incentives for owners to close these plants due to poor financial performance.

These state-level ZEC programs have been the most important nuclear power policy initiative in the U.S. in decades.

The New York state 2016 ZEC program prevented the early retirement of four reactors at the Ginna, FitzPatrick, and Nine Mile Point nuclear power plants.[6]

The Illinois 2016 ZEC program covered the Clinton and Quad Cities nuclear power plants.[7] Illinois implemented a second ZEC program in 2021 to cover the Byron and Dresden plants.[8]

The New Jersey 2019 ZEC program covered the Hope Creek and Salem nuclear power plants, with the initial 2019 three-year ZEC program extended for another three years in 2021.[9]

Connecticut power contracts

Another market state, Connecticut, located in the ISO-NE electricity market, took a different approach. Connecticut saved the Millstone nuclear

4 See https://www.house.leg.state.mn.us/hrd/pubs/nucxcel.pdf
5 https://www.startribune.com/state-regulators-ok-xcel-plan-that-shifts-from-coal-to-more-renewable-nuclear-energy/600144545/
6 https://www.nyserda.ny.gov/-/media/Files/Programs/Clean-Energy-Standard/2019/Case-15-E-0302-Final-ZEC-Implementation-Plan.pdf
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power plant by allowing the Millstone nuclear power plant to participate in a state-sponsored clean energy procurement process[10] that resulted in a power contract with greater revenue than market sales.

The Seabrook nuclear power plant, another merchant nuclear power plant located in New Hampshire (i.e., also in the ISO-NE electricity market), was also awarded a clean energy contract by Connecticut.[11]

Other States

Some market states have not taken action to stop merchant nuclear power plant early retirement.
The state of Michigan has done little to stop the planned early retirement of the Palisades nuclear power plant scheduled for May 2022.[12] Michigan is another state with wholesale electricity markets, with the southern end of the state covered by PJM and the rest by the MISO market. The Palisades nuclear power plant, in the MISO market part of Michigan, was sold in 2007 to Entergy along with a power contract that is due to expire in May 2022. Current plans are to close the Palisades nuclear power plant when the power contract expires (i.e., at the end of May 2022) and transfer ownership of the closed nuclear power plant to Holtec to start decommissioning.[13] There has been some discussion of ways to keep Palisades in operation, but nothing has been put in place so far.

The state of California supported a 2018 California Public Utility Commission order for Diablo Canyon to close in 2024/2025, the end of its normal operating license, rather than applying for the 20-year license extensions that have been granted to most other U.S. nuclear power plants. Most of California is covered by the CAISO wholesale electricity market, but the nuclear power plants in California remained as regulated utility assets that operate in the wholesale CAISO electricity market. The last nuclear power plant in California, Diablo Canyon, is expected to operate until the end of its normal operating license (i.e., 2024 and 2025). There are calls to extend the life of Diablo Canyon[14], but it is unclear that these efforts will change the planned closure dates.

The state of Pennsylvania declined to implement a ZEC program in 2019, leading to the early retirement of the Three Mile Island nuclear power plant[15]. The Beaver Valley nuclear power plant was also scheduled to close early, but this decision was reversed in 2020 because Pennsylvania announced that it would join the Regional Greenhouse Gas Initiative.[16]

Conclusions

At the federal level, the new Civil Nuclear Credit program, the proposed Production Tax Credit for nuclear power show, and various DOE programs show a growing support for nuclear power by the U.S. Federal government.

At the state level, traditional states seem to provide continuing support for nuclear power and some market states helped financially-threatened merchant nuclear power plants. However, some other market states have allowed, or even encouraged, nuclear power plants to close early.

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Edward Kee is an expert in nuclear economics. Mr. Kee provides advice to governments, investors, regulators, regulated and unregulated electricity companies, nuclear companies, and other parties.

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