

The DOE Loan Program Office's Role in U.S. Nuclear Energy Leadership



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Summary

Nuclear energy is an important technology for U.S. energy security and competitiveness, and the U.S. Department of Energy Loan Programs Office (LPO) is essential to nuclear energy's success. By investing in early-stage projects, the LPO accelerates technological advancement, attracts private capital, and ensures U.S. leadership in meeting rapidly growing global energy demand, enhancing our economic competitiveness, geopolitical influence and national security.

While the nuclear industry is seeing major investments, financing early mover projects remains difficult. Private-sector lenders view early-stage commercial technologies as high risk, and investors focus on financial return and risk rather than policy imperatives such as energy security. Thus, it can be challenging to raise adequate capital for early nuclear energy projects. To realize nuclear energy deployment potential in the 2030s and beyond, it is imperative to finance these early mover projects now. The U.S. Department of Energy's Loan Programs Office (LPO) plays the crucial role of financing early mover projects to help bridge the gap between demonstrations and projects financeable with private capital.

A robust nuclear industry remains crucial for national and energy security interests. China is aggressively investing in nuclear energy and exporting their technology to countries that are new to nuclear energy as a means of deepening their reliance on China. If the U.S. is to compete on a global stage, there needs to be a strong domestic nuclear industry. However, private investors are not incentivized to take these interests into account. The strategic early LPO loans for Vogtle are helping the U.S. to compete with foreign state-backed nuclear companies by unlocking capital.

Through loans finalized by the Trump Administration in 2019, the LPO was vital to the first deployment of a new, U.S.-developed reactor type at the Vogtle plant in Georgia. The LPO is now facilitating the restart of a retired reactor in Michigan, the first such project in the country. Nuclear-specific applications to the LPO office totaled over \$64 billion worth of loans by the end of the FY2024.¹ These applications cover a broad range of nuclear energy innovations, including component manufacturing, small modular and microreactor deployment, and fuel cycle improvements. Funding a fraction of these projects could move whole subsets of the industry to maturity, allowing the industry to access the private development capital it needs to be successful.

The LPO's extensive technological due diligence is more rigorous than what lending institutions, private equity firms, and infrastructure funds typically commit, due to both technical expertise and the resource commitment LPO can make to new technologies. Loan commitments from the LPO are viewed positively by many in the financial community because the due diligence is completed by technical experts at the DOE. Thus, the LPO has helped reduce technological risk in funding projects.

While the LPO's impact on the nuclear industry has been large, it is important to note that this is achieved with a relatively small amount of federal appropriations. The credit subsidy is the

¹ [Sector Spotlight: Advanced Nuclear | Department of Energy](#)

only aspect of an LPO loan that is paid through appropriations. For example, \$5 billion was appropriated in 2022 for credit subsidies under the Energy Infrastructure Reinvestment program to enable lending authority of \$250 billion. The appropriated amount is less than 2% of the total lending amount.

Introduction

Nuclear energy is an essential technology for meeting U.S. competitiveness, energy security and climate goals. The industry is at a critical juncture as it moves from research and development to demonstration projects and new reactor deployments. During the early part of this century, U.S. nuclear power largely maintained its status quo, with retirements of some plants and uprates of others to increase their capacity. A new wave of players and novel nuclear technologies emerged in the late 2000s and 2010s. The first advanced light water reactors in the U.S. have been put into service, conditions have become favorable for refurbishing and restarting retired reactors, and construction activities are beginning for advanced non-light water reactor projects. The nuclear energy industry is emerging from a period of stasis but still requires an additional push.

Burgeoning energy technology industries, workers, the financial community, and local communities have benefited greatly from LPO loans. Nuclear energy projects have received loans under multiple presidential administrations that have greatly improved U.S. energy and technology capabilities.

History of Loan Program Office

The LPO was established in 2005 to accelerate the development and deployment of novel energy technologies through financial support for large-scale infrastructure projects. The LPO focuses on technologies that are on the cusp of commercialization, providing them with access to capital that is not reasonably available in private markets.

Since its inception, the LPO has provided substantial financial support that has driven significant technological growth in the energy sector. The LPO has provided over \$30 billion in loans, with a lower loss ratio than comparable private sector loans.

This debt has been instrumental in commercializing technologies such as advanced geothermal energy across the western United States. A \$98.5 million loan was awarded to Blue Mountain Energy for their Humboldt County, NV site in 2010.² This loan, which was paid back in March 2022, was key to building an advanced geothermal plant and workforce to operate it. In 2023, Fervo Energy demonstrated their horizontal advanced geothermal technology at the Blue Mountain site, benefiting from the previous technology and workforce development financed by the LPO. Fervo has gone on to attract major commitments from Google, Southern California utilities, and others for their new large-scale facility. Strategic

² [Blue Mountain LPO Page](#)

investment by the LPO created a runway for a new technology supported by private investments and industry.

An LPO loan was also critical to the success of Tesla's Model S, which went on to capture a significant market share in the electric vehicle market and outcompete foreign automakers domestically and globally. The loan facilitated construction of Tesla's factory and development of their workforce, which had knock-on effects for production of subsequent vehicles. Today, Tesla is the largest automaker globally by market capitalization and produces the vast majority of their components in the United States. The LPO investment had a direct impact on creating U.S. jobs and technology that reduced reliance on imported vehicles from China or the EU.

LPO also helped move solar and wind energy from financially risky investments to repeatable projects funded almost entirely by private capital. In the early 2000s, there were very few utility-scale solar projects and debt financing was difficult. Solar deployment at utility scale requires a large amount of project capital. The LPO gave several loans to wind and solar energy projects when private capital was difficult. Utility solar projects now have 20 times more private capital investment than they did prior to the first LPO loan. Similarly, private capital in utility-scale wind projects has more than doubled.

The Private Capital Multiplier

Additional private capital follows LPO investment, validating LPO's rigorous diligence

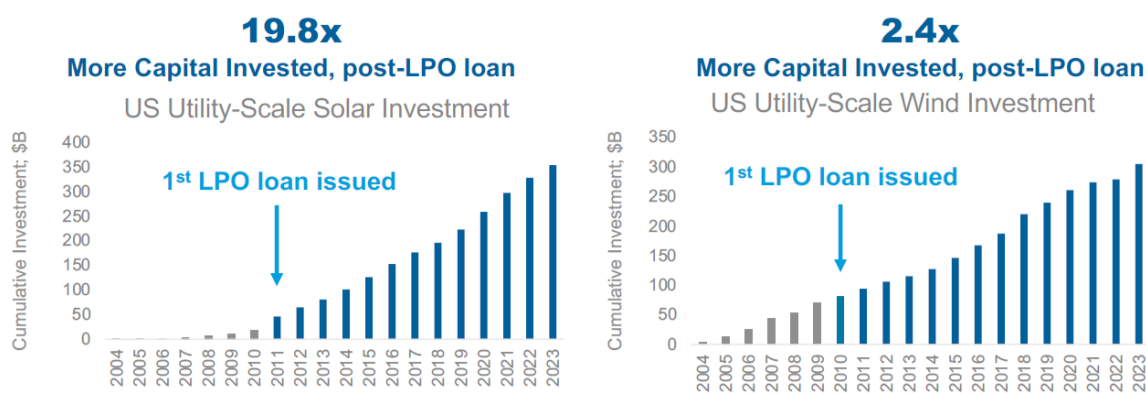


Figure 1: Follow on private capital after LPO investment after the first LPO loans in wind and solar.³

Nuclear power today is much like solar energy in the 2000s; private project capital investment is unavailable because projects are viewed as risky. Funding key projects and supply chain developments would have a profound impact on nuclear energy deployments, much like it did for wind and solar energy.

The LPO plays a catalytic role in the development of emerging technologies and creating thousands of jobs. LPO-funded projects have created 46,800 permanent jobs from 2010 to

³ See slide 30 of [Investing With LPO](#)

2023⁴ and kept critical manufacturing, construction, and heavy industry jobs in the United States. These are direct jobs and do not account for the large follow-on effects in each company and industry as technologies are commercialized.

How LPO Works

The LPO’s nuclear energy projects are generally funded out of the Title 17, Clean Energy Financing program under one of its four categories: innovative energy, innovative supply chain, State Energy Financing Institution (SEFI), or Energy Infrastructure Reinvestment (EIR). Each loan application moves through the process outlined in Figure 2.

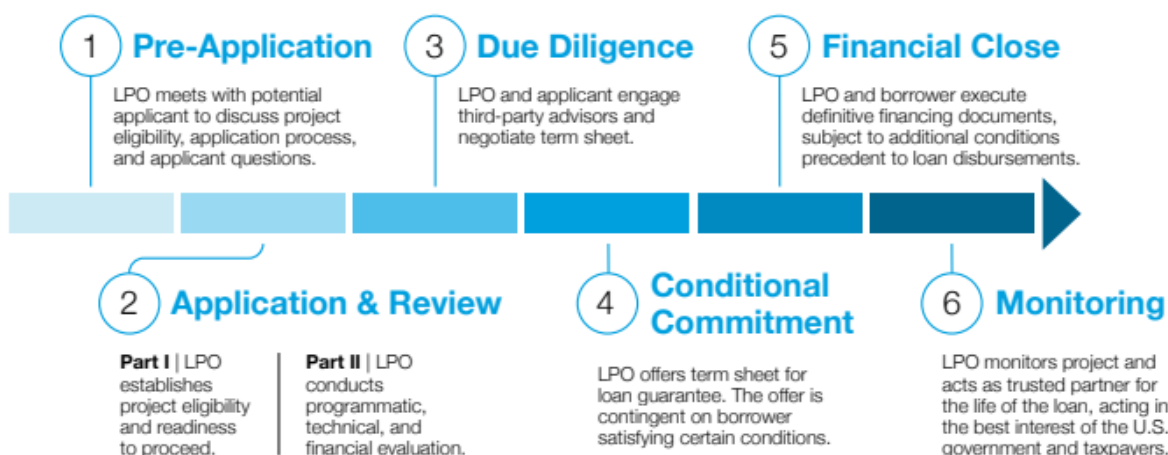


Figure 2: LPO application and award process.⁵

Pre-application and Application & Review Part 1 focus on the eligibility and readiness of the project. Innovative energy and innovative supply chain categories require the project to be ready to be commercialized and have high potential for catalytic effect on the market. LPO funding is specific to projects that are early in the commercialization phase, i.e., that are ready for commercial deployment but because they have not yet been deployed, or deployments have been very limited, are difficult to finance in private markets. LPO is able to do more in-depth technological due diligence (described further below) than is feasible for private lenders and leverages its unique access to technical expertise. Utilizing this expertise to assess the risk of these early-stage projects reduces economic uncertainty and paves the way for private-sector financing of future projects.

Application & Review Part 2 is a rigorous technical and financial evaluation. The LPO assesses viability based on:

- “The strength of the contractual terms of the eligible project (if commercially reasonably available);

⁴ See [FY2023 Portfolio Status Report](#) for more info.

⁵ [Program Guidance for Title 17 Clean Energy Financing Program](#)

- The forecast of noncontractual cash flows;
- Cash sweeps and other structural enhancements;
- The projected financial strength of the borrower at the time of [financial] close and throughout the loan term;
- The financial strength of the investors and strategic partners of the borrower, if applicable;
- Appropriate attention to management of project risk, including through the Community Benefits Plan; and
- Other financial metrics and analyses that are relied on by the private lending community and rating agencies”⁶

Applicants must prove to the LPO that the project has financial backing, off-take, and capabilities needed to repay the loan. This can be achieved through contractual off-take agreements such as firm power purchase agreements (PPAs), credit ratings from financial institutions, and contractual partnerships with entities for critical components and services.

In addition, applicants must go through a rigorous technical due diligence process. The LPO works with the applicant, ensuring that the project is at a sufficient technology readiness level, the team has the technical capability to deliver, and the technical project assumptions are sound. This technological due diligence is more rigorous than what lending institutions, private equity, and infrastructure funds can accomplish. Approvals from the LPO are viewed positively by many in the financial community because the due diligence is completed by technical experts at the DOE. A conditional commitment is only extended if the due diligence process finds that there is an appropriate amount of technical and financial risk for the LPO program.

After a conditional commitment is awarded, financial terms are negotiated and set. The loans awarded under LPO have a fixed interest rate of the U.S. Treasury rate at time of close, plus 0.375%, plus a risk-based adjustment that is based on the credit rating of the project⁷. The maximum loan term is 30 years, with most loans of shorter duration. These loans are considered secured, meaning that the DOE has a claim on assets in the event of loan defaults.

In addition, to offset the risk of these loans, LPO assesses a “credit subsidy cost,” which depends on the due diligence process and is assessed individually for each loan.⁸ The credit subsidy is paid from appropriations. Historically, the credit subsidy costs, and other fees collected by LPO, have more than offset any losses the LPO has incurred. For example, by the end of FY23, LPO had \$4.3 billion credit subsidy in reserve, which more than offset the realized losses of \$1 billion.⁹

The low appropriation amount when compared to loan authority also extends to more recently appropriated funds. Congress appropriated \$5 billion for credit subsidies within the

⁶ Criteria from pg 41 of [Program Guidance for Title 17 Clean Energy Financing Program](#)

⁷ Criteria from pg 35 of [Program Guidance for Title 17 Clean Energy Financing Program](#)

⁸ [Understanding Credit Subsidy](#), Loan Programs Office

⁹ [Getting to Know LPO: Managing Risk, Monitoring a Growing Portfolio, and Protecting Taxpayers | Department of Energy](#)

LPO Energy Infrastructure Reinvestment program to enable lending authority of \$250 billion. The appropriated amount is less than 2% of the total lending amount.

The management of risk through the due diligence process and credit subsidy assessment, combined with the appropriation of funds to pay for credit subsidy costs, enables the government to leverage a small amount of appropriations to support a much larger amount of lending, greatly magnifying the impact of this public funding on the deployment of new, innovative energy technologies.

Nuclear-Specific LPO Awards and Their Effects

So far there are two LPO loans of note in the nuclear industry; Vogtle units 3 and 4 construction and the Holtec Palisades restart. These loans have facilitated follow-on projects such as the Three Mile Island Unit 1 restart.

Vogtle Units 3 and 4: Reducing Cost, Enhancing Competitiveness

The LPO provided loans totaling \$12 billion to build Vogtle units 3 and 4, including \$3.7 billion awarded under the Trump Administration¹⁰. The loans served as an important financing mechanism for getting the first Westinghouse AP1000 advanced light water reactors built in the United States.

Vogtle 3 and 4 were the first two reactors of this type in the U.S. that, despite initial cost overruns, have created tremendous opportunity within the local and regional economy. The Vogtle project created 900 permanent jobs, as well as 9,000 onsite jobs during construction, essentially creating an experienced local and regional nuclear workforce.¹¹ Georgia now has two electricity generators that can run for 80+ years, stimulating economic development.¹²

In addition to its local and regional benefits, the financing to complete Vogtle had global implications. China had already completed four AP1000 reactors by 2018 and started to build their own modified design. The Vogtle project's completion was crucial in moving the U.S. workforce towards competing with the China National Nuclear Corporation on a global stage. Exports of nuclear energy technologies support not only U.S. competitiveness but also long-term geopolitical relationships critical to U.S. leadership in nuclear non-proliferation and safety. LPO funds enabled the completion of Vogtle, building the U.S. capability for nuclear energy export.

Cost reduction between Vogtle 3 and 4 also offers compelling evidence that the LPO loans are working as intended and derisking the technology for future investments. The reduction in the time it took to achieve several key construction milestones from Vogtle Unit 3 to 4 is shown in Figure 3. These duration reductions led to substantial savings on labor cost when comparing the two units.

¹⁰ [VOGTLE | Department of Energy](#)

¹¹ [Vogtle Unit 4 Enters Commercial Service](#)

¹² [Advanced Nuclear - Pathways to Commercial Liftoff](#)

Days between major milestones for Vogtle Units 3 and 4, days

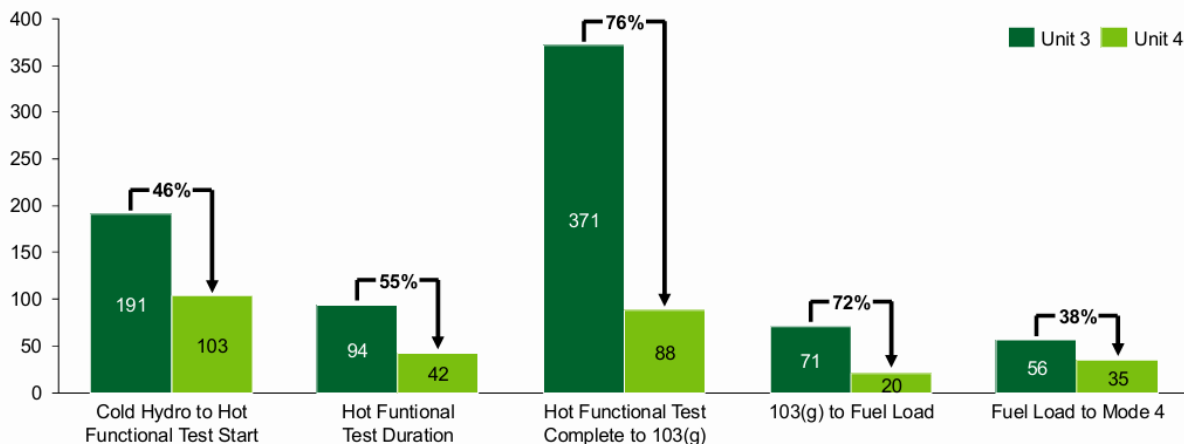


Figure 3: Reduction in time of key activities from Vogtle unit 3 to 4.¹³

The reductions in construction time and cost seen from Vogtle unit 3 to 4 were just the beginning. The intent of an LPO loan is to help a technology achieve commercial success in the future. The Vogtle project was able to identify key roadblocks and challenges in first-of-a-kind deployment. The demonstrated reduction in capital costs, combined with the institutional knowledge of what it takes to complete a reactor, reduce the risk profile of subsequent projects. Because of the “learning by doing” enabled by LPO, the risk profile of new AP1000s will be much closer to what private financiers are comfortable with.

Vogtle Units 3 and 4 overnight capital cost categories, 2024 \$/kW

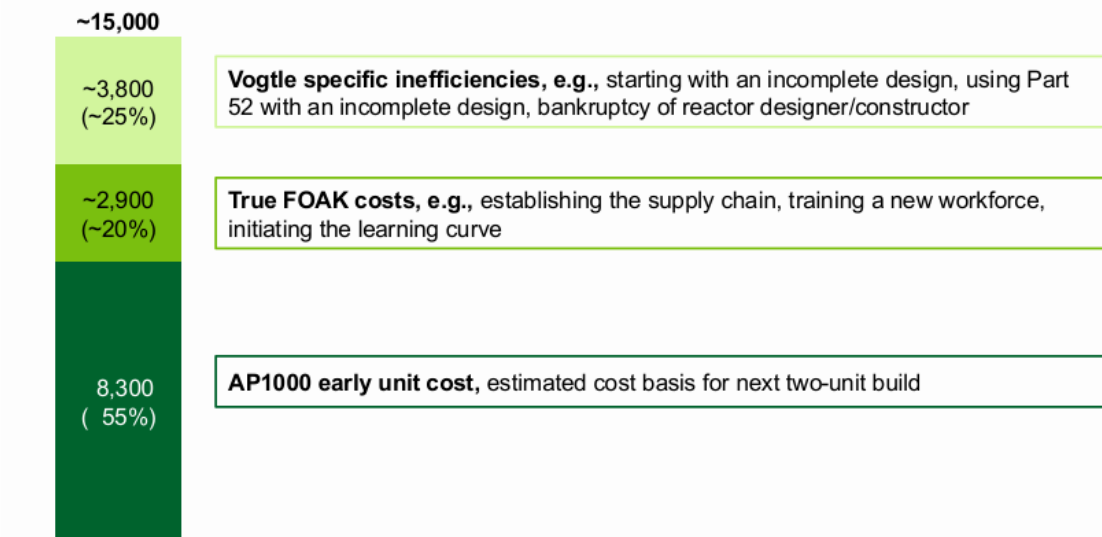


Figure 4: Vogtle cost versus early unit AP1000.¹⁴

¹³ Plot from [Advanced Nuclear - Pathways to Commercial Liftoff](#)

¹⁴ Plot from [Advanced Nuclear - Pathways to Commercial Liftoff](#)

Private capital markets do not incorporate the policy drivers of national energy security and competitiveness, which made the Vogtle LPO loan an important tool for supporting U.S. interests. Subsequent AP1000 projects will be cheaper and less risky, and thus more financeable via private capital.

Holtec Palisades: First of a Kind Initiative That Can Be Replicated

While the Vogtle project has shown that the LPO enabled cost reduction from one reactor build to the next, the Holtec Palisades project has already shown the effects of LPO on follow-on investment. Prior to Holtec Palisades, there were no announced projects to restart retired nuclear reactors. Holtec applied for debt to fund their effort to restart the 800 MW Palisades nuclear plant in Michigan. In September 2024, LPO awarded \$1.52 billion for the project, which is expected to support or retain 600 jobs.¹⁵

With load growing across the United States from AI data centers and onshoring of manufacturing, Holtec Palisades is a timely project. This load growth could strain the country's current capacity resources, which would dampen U.S. technology and manufacturing competitiveness. Strategically funding a nuclear reactor restart is an example of using the LPO to bolster critical infrastructure required to drive the U.S. economy.

After Holtec Palisades was announced, Microsoft and Constellation announced plans to reopen Three Mile Island Unit 1 and set up the Crane Clean Energy Center; in addition, the CEO of NextEra energy stated that the company was evaluating restarting the Duane Arnold Nuclear Plant in Iowa.¹⁶ These projects are examples of follow-on private investment of the type that was derisked by the LPO loan to Holtec. In addition, Holtec's work with the Nuclear Regulatory Commission on a nuclear restart will pave the way for the Crane Clean Energy project and others after it. Other benefits of learning by doing, such as more active supply chains or a more experienced workforce, will also assist follow-on projects.

The investment by LPO has shown private investors that nuclear reactor restarts are a viable pathway to quickly adding clean firm capacity. The Holtec Palisades financing provides an example of how LPO financing can lead the way for further private-sector investment in innovative energy solutions.

Continued LPO Support Is Essential for Nuclear Success

The LPO's support of early-stage projects with catalytic capital and accessible debt is crucial for the growth of the nuclear energy industry, as well as achieving national goals related to industrial competitiveness, energy security, and national security. By strategically funding early-stage projects, the LPO is not only accelerating technological advancements, but also creating a pathway for follow-on investment by the private sector. The LPO plays a critical role in bridging the gap between innovative projects and market viability, ensuring the United States remains at the forefront of the global energy landscape.

¹⁵ [HOLTEC PALISADES | Department of Energy](#)

¹⁶ [Duane Arnold nuclear plant's potential restart, NextEra president comments](#)