EFI FOUNDATION

MODERNIZING AMERICAN ENERGY INNOVATION

Five Ways to Re-energize the Department of Energy

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Executive Summary

The Department of Energy (DOE) has long been a pillar of American scientific and technological leadership. From scaling nuclear energy and developing lithium batteries to sequencing the human genome, its work has powered innovation, economic growth, and national security. Today, DOE is critical to U.S. economic competitiveness, as the global race for market share in clean energy industries is reshaping geopolitics. Countries like China are outpacing the United States in establishing manufacturing, controlling supply chains, and dominating key export markets.

DOE has always focused on large-scale innovation. In recent years, however, there has been increasing need for DOE to support end-to-end energy innovation, including supporting projects across all "valleys of death" to commercialization. In response, Congress delivered DOE unprecedented resources through the Bipartisan Infrastructure Law (BIL) of 2021, positioning the department to translate energy innovation into deployment at a historic scale. But DOE's current staffing level and contracting and award processes are preventing it from fully realizing the potential of this investment—and hindering any future efforts to compete in a rapidly changing energy landscape. Effective implementation is critical to success.

To better understand these challenges, the EFI Foundation (EFIF) conducted interviews with 20 developers of BIL-funded projects across 29 states, representing $9.7 billion in investments and over half a million projected jobs. Developers consistently reported that DOE's long timelines, unclear processes, and rigid contracting frameworks created barriers to award implementation. Institutional cultures and structures that work for pure research and development have proved ill-suited for managing large-scale energy demonstration and deployment projects.

EFIF also analyzed DOE's BIL spending and found that large portions of funding remain in procedural limbo, reinforcing concerns about the department's ability to evolve with its changing mission to efficiently translate congressional funding into steel in the ground.

This analysis draws on interviews and data to propose five ways to modernize DOE's energy programs and accelerate American energy innovation (***Figure ES1***):

1. Build a staff with the skills needed to bolster American competitiveness.
2. Deploy underutilized funding tools to maximize the return on investment (ROI) for taxpayers.
3. Streamline DOE's application and award processes to get money flowing.
4. Reform the department's loan programs to boost infrastructure deployment and innovation without increasing deficits.
5. Harness the power of the DOE National Laboratories to guide technologies to market.

There is bipartisan consensus on the need for bold energy policy to reduce emissions, compete with international rivals, and ensure U.S. national security. However, **DOE's expanded role in energy demonstration and deployment requires not just more resources, but also new approaches.** Modernizing the department's tools and practices is essential to ensure it can overcome bureaucratic hurdles, return its staffing to appropriate levels, and accelerate clean energy innovation and deployment.

Figure ES1: **STEPS TO BUILD A MODERN, COMPETITIVE DOE**

Build a staff with skills to boost U.S. competitiveness

- Mandatory workforce capacity plans
- Reverse staff cuts
- Flexible hiring and compensation tools

Use Other Transactions (OT) Authority to maximize ROI

- Expand OT Authority
- Empower Agreements Officers to execute OTs
- Tech-neutral demonstration program

Streamline applications and awards to get money out the door

- Simplify application and award processes
- Application transparency
- DOE-wide digital task force

Expand Loan Programs Office's (LPO) deficit-friendly support

- Update credit subsidy calculation
- LPO revolving fund and secondary market
- Expand LPO eligibility

Harness national labs for end-to-end innovation

- Strengthen formal Lab collaborations
- Culture of entrepreneurship
- Lab support for regional ecosystems

Source: EFI Foundation.

Five Ways to Modernize American Energy Innovation

The Department of Energy (DOE) has been an essential engine of American innovation for nearly 50 years. The foundational technologies of our current energy system—nuclear reactors, shale oil and gas extraction, solar panels, lithium batteries—were developed with the support of DOE and its predecessor agencies. DOE has helped sequence the human genome, develop radioisotopes for cancer treatment, and build the world's fastest supercomputer. This legacy of contributions to American science and technology has depended, first and foremost, on its workforce: the ecosystem of scientists, engineers, policy experts, former industry professionals, and financial experts who power DOE.

DOE was created in response to the crisis of the 1973 oil embargo, to "deal with the energy problem on a war footing," as President Jimmy Carter put it.[1] Today, the U.S. energy system is confronting a new set of crises: the rising threat of climate change, deteriorating infrastructure, reduced domestic manufacturing, increasing weaponization of energy (e.g., Russia's threats to energy supply for NATO allies), and a race to control markets and supply chains for new energy technologies. Though the United States has become the world's largest producer of oil and gas (in significant part thanks to technologies developed with DOE support), it has fallen behind in the race to control new energy technologies to rivals like China that have made investing in clean energy a national priority.

The tools that have worked for past innovation programs—contracting structures, hiring strategies, etc.—have proved inadequate for demonstration and deployment programs.

In response to these crises, leaders across the political spectrum have united around the need for a new industrial strategy.[2,3] This strategy has taken different forms in successive administrations; the Biden administration called it "industrial policy," and the Trump administration is calling it "energy dominance." Both political parties have agreed that federal resources should be tuned to more directly enable private-sector investment, moving the role of DOE from primarily R&D to RDD&D (research, development, demonstration, and deployment).[4] In 2021, the Biden administration called for the federal government to identify "areas where relying on private industry, on its own, will not mobilize the investment necessary to achieve our core economic and national security interests."[5,6] In 2025, the Trump

administration called for a similar strategy: "We are restoring a strong American nuclear industrial base … [and] the Secretary of Energy [will] work with the private sector to deploy nuclear infrastructure."[7,8]

The rollout of funding from the Bipartisan Infrastructure Law (BIL) of 2021 and Inflation Reduction Act (IRA) of 2022 has had mixed success. Private investment in manufacturing and technology development doubled because of these policies, leading to 390 new project announcements across 42 states—62% of them in Republican districts.[9,10] According to the EFI Foundation's analysis, however, less than 5% of DOE's BIL funding has reached the private sector since the law was signed in late 2021. For the projects under contract with DOE, the average time from award announcement to contract was 18 months, and the costs of complying with DOE's contracts were seen by many companies as prohibitive.

At a moment when global competitors are ramping up investment in energy technology … slashing budgets and limiting avenues for U.S. innovation puts the nation and its allies at a strategic disadvantage.

The attempt to roll back DOE's progress by rescinding around $28 billion in BIL and IRA funding, or cutting staff who are at the heart of DOE's success, threatens to halt the momentum in modernizing DOE and accelerating American energy innovation.[i,11,12] At a time when global competitors are ramping up investment in energy technology—China spent more than $800 billion on clean energy technology in 2024—slashing budgets and limiting avenues for U.S. innovation puts the nation and its allies at a strategic disadvantage.[13]

Experts recognize that large appropriations and well-intentioned plans are not enough.[14] The tools that have worked for past innovation programs—contracting structures, hiring strategies, project selection and management practices, and loan authorities—have proved insufficient for supporting late-stage development and commercial-scale projects.

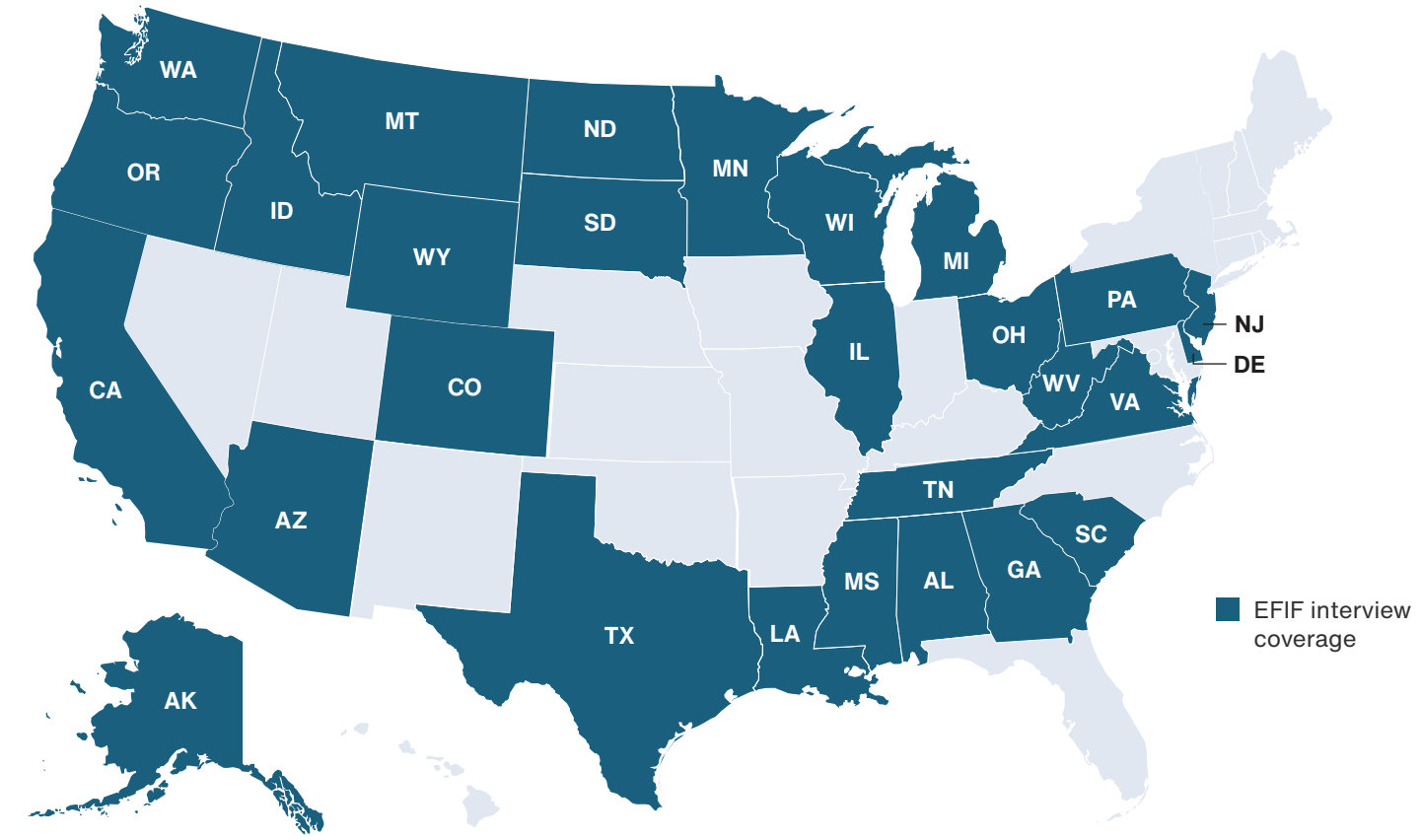
As this report shows, DOE has many of the tools and authorities needed to implement its mission to support the commercial deployment of new energy infrastructure, though it will take a commitment from current and future administrations to fully use its existing tools in a manner that will meaningfully accelerate sustained American innovation.

i This paper was drafted prior to the release of the Senate reconciliation package. Details reflect the House reconciliation proposal at the time of drafting.

Overview

From January to March 2025, the EFI Foundation (EFIF) held a series of interviews with developers of projects awarded funding from BIL. EFIF interviewed 20 companies and organizations whose project portfolios collectively represent over $9.7 billion of funding across 29 states. According to the interviews, these projects are planning to add a total of 530,012 new jobs. At the time of the interviews, all projects were waiting to hear from DOE about the status of their funding. EFIF paired these interviews with an analysis of the pace at which DOE has translated congressional dollars into on-the-ground projects, based on publicly available data.

Figure 1: **MAP OF BIL-FUNDED PROJECT DEVELOPERS THAT EFIF INTERVIEWED, GROUPED BY STATE**



Source: EFI Foundation.

"If DOE wants to innovate, they have to think innovatively."

The interviews made clear that more DOE offices and more funding are not enough on their own to catalyze new U.S. clean energy industries. Instead, they highlighted the need for an institutional shift away from entrenched DOE practices and toward novel, commercially oriented ways of doing business.

As one interviewee said: "If DOE wants to innovate, they have to think innovatively." Improving its implementation processes can allow DOE to use its existing funding

more effectively. Interviews with funding award recipients made clear that the department can—and did—evolve as staff and senior leadership gained experience and drew on early lessons.

EFIF's analysis aims to summarize these lessons so current and future DOE decision-makers have the tools they need to accelerate implementation and deliver results.

Based on EFIF's interviews and analysis, this paper proposes five concrete steps DOE can take to ensure U.S. competitiveness while efficiently using federal funds:

1. Build a staff with the skills needed to bolster American competitiveness.
2. Deploy underutilized funding tools to maximize the return on investment (ROI) for taxpayers.
3. Standardize and streamline DOE's application and award processes to get money flowing.
4. Reform the department's loan programs to boost infrastructure deployment and innovation without increasing deficits.
5. Harness the power of the DOE National Laboratories to guide technologies to market.

1. Build a staff with the skills needed to bolster American competitiveness

Workforce skill and capacity is the foundation of DOE's ability to function as an effective innovation agency. None of the recommendations that follow—including faster timelines, more flexible funding, or smarter program design—are possible without the right people to implement them. In the ramp-up to implement BIL and IRA funds, the department expanded its hiring to reach people with private-sector experience. However, fundamental realities, like an inability to match private-sector salaries, often kept DOE from staffing up to the levels needed.

While DOE is filled with world-class scientists and researchers, the transition from research and development (R&D) to deployment requires a different skill set. Scaling clean energy infrastructure demands experience in construction management, project finance, siting and permitting, and commercial execution. Developers consistently reported that DOE staff, while highly capable in technical domains, were often unprepared to navigate the demands of project delivery. "DOE staff lacks experience in project development, and that's a problem," one award recipient said. These knowledge gaps contributed to delays in rolling out funding: "The first round [solicitation] took forever. … Part of what took so long was the lack of knowledge."

"The money is nice, but we want to work with the government and we want to be a partner."

Multiple interviewees expressed a desire for DOE to "act more like a partner" or "like a private investor." When asked why they sought DOE funding, one recipient said, "The money is nice, but we want to work with the government and we want to be a partner." This desire for a real partnership between DOE and project developers can be realized only with adequate staffing and with staff who understand the needs of large, capital-intensive projects.

Challenges also can stem from the breadth of subjects DOE staff are expected to cover, which is another consequence of insufficient staffing levels. Staff were frequently stretched thin—tasked with evaluating technologies or projects beyond their specialization. "We spent a lot of time explaining mining to non-mining people," one developer recalled.

Another common challenge was the gap between DOE's technical teams and its legal and contracting offices. Developers described situations where the staff working on project strategy were not in sync with those handling the contractual agreements, creating delays and confusion. One participant described it as "a disconnect between developers who know how to deliver projects and bureaucrats trying to write a contract."

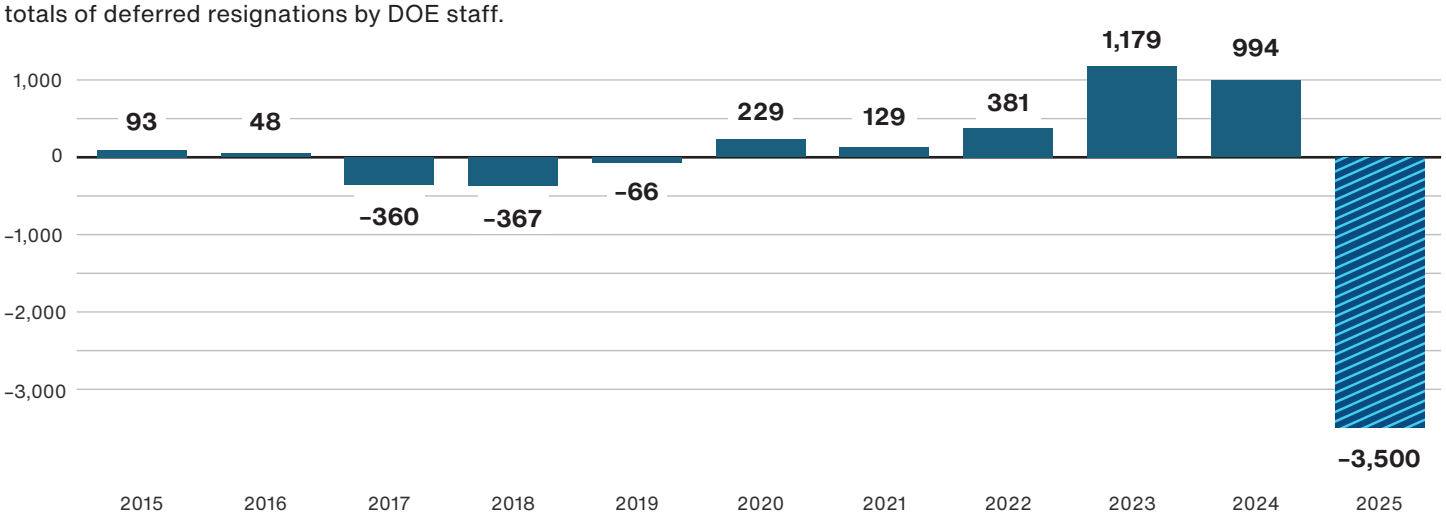
"The application went from 300 pages to 60 pages. The DOE staff improved the process over time."

It was clear from the interviews that each office became more efficient over time, as the staff gained experience. One developer who applied to two separate funding solicitations found that, between the two, "the application went from 300 pages to 60 pages. The DOE staff improved the process over time." Overall, interviewees stressed that the problems they faced were not a result of waste, fraud, or incompetent staff, but rather from bureaucratic rules and a staff stretched thin by its new responsibilities.

Ultimately, DOE can move only as fast as its people can. If the department is going to meet the scale and complexity of the current energy transition, it must be resourced and structured accordingly. The recent deferred resignation program is estimated to have reduced the DOE workforce by more than 3,500 employees (nearly a quarter of the department's total as of September 2024), which is an unprecedented level and pace of change in recent history (***Figure 2***, next page).[15,16] If current estimates of workforce losses due to the deferred resignation program are accurate, DOE's workforce will soon be at its lowest level since the turn of the century. The department has stated it is planning additional "wide-ranging" reductions in its workforce.[17]

Figure 2: **HISTORICAL CHANGES IN DOE STAFFING LEVELS, INCLUDING ESTIMATED IMPACT OF DEFERRED RESIGNATION PROGRAM**

Year-over-year changes in reported DOE staff levels in September of each year. 2025 changes are projected using reported totals of deferred resignations by DOE staff.



Data from: FedScope (DOE staff levels), Christa Marshall, *E&E News by Politico* (deferred resignation estimates).

While cutting staff might seem like a quick fix to reduce budgets, DOE's staff accounted for just 0.6% of the federal civilian workforce in September of 2024.[18,19,20] In fiscal year (FY) 2024, personnel outlays from DOE's non-defense programs totaled $2.5 billion, 2.2% of the department's available budgetary resources[ii] for those programs and less than 0.3% of non-defense discretionary outlays.[21,22] Total staff spending across all of DOE's programs was $3.5 billion, around the same percentage of total budgetary resources (***Figure 3***, next page). Contracts for advisory and assistance services, R&D, and equipment (IT, etc.) added another $2.0 billion in outlays (1.7% of DOE budgetary resources).[23]

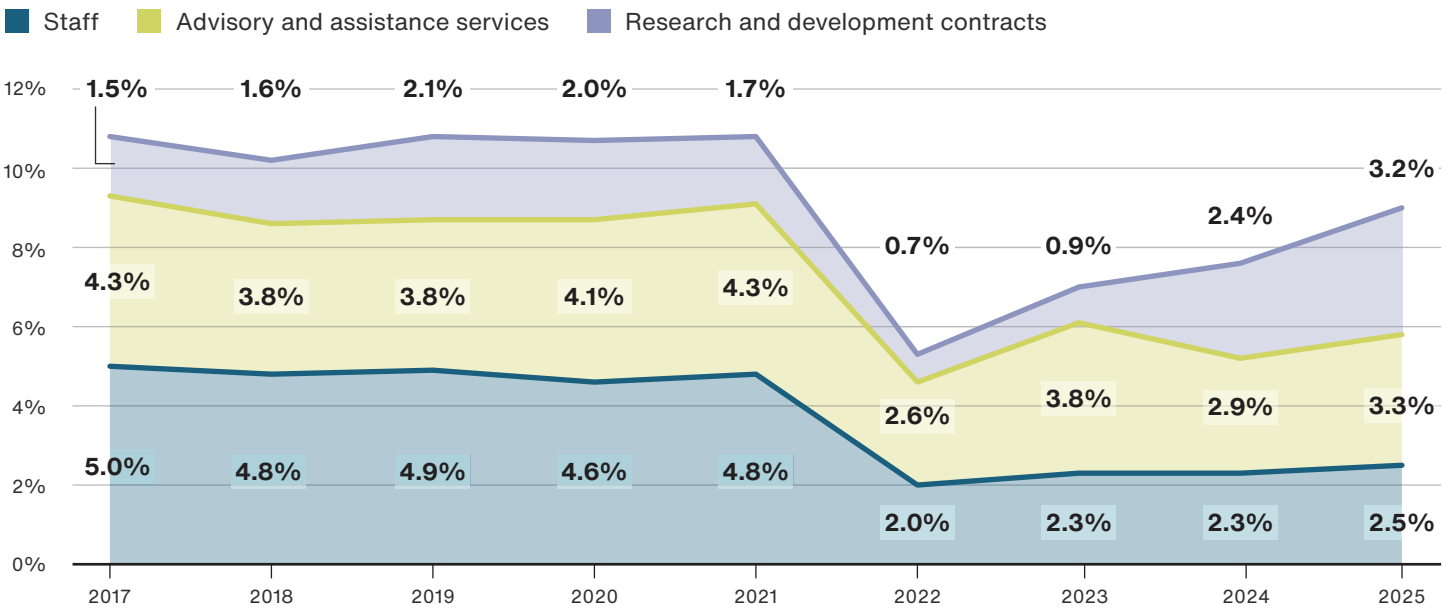
DOE can ill afford these staffing cuts. Independent analyses from DOE's Office of the Inspector General and the Government Accountability Office (GAO) have repeatedly found that staffing levels throughout the department are insufficient to implement existing programs, including at the Office of Clean Energy Demonstrations (OCED), Loan Programs Office (LPO), and Grid Deployment Office (GDO).[24,25,26,27,28,29,30] Senate appropriators also have expressed concern about shrinking staff sizes, such as in the Office of Energy Efficiency and Renewable Energy (EERE).[31]

The infusion of funding from BIL, IRA, and the CHIPS and Science Act of 2022 has exacerbated staffing shortages, since hiring has not kept up with DOE's expanded responsibilities (***Figure 2***). Currently proposed cuts to DOE's funding total $28 billion: $15 billion from BIL in the White House's FY 2026 budget and $13 billion from IRA in the House reconciliation package.[32,33] While these cuts represent a 17% decrease from DOE's FY 2025 funding, reductions in staff thus far amount to a 22% cut.[34,35] Therefore, even if Congress implements these dramatic budget cuts, the department will still be left with inadequate staffing levels to run efficiently.

ii Treasury's definition of "budgetary resources" includes "new budget authority (from appropriations, borrowing authority, contract authority, or offsetting collections) and unobligated balances of budget authority provided in previous years." It excludes loan authority.

Figure 3: **DOE STAFF AND CONTRACTOR OBLIGATIONS AS A PERCENTAGE OF TOTAL BUDGETARY AUTHORITY**

The "staff" category includes all personnel expenses as categorized by the Office of Management and Budget (including salaries, benefits, etc.), except for benefits for former personnel. In-figure percentages show contributions of each subgroup. Includes both energy and non-energy functions at DOE and all budgetary resources, not just annual appropriations. FY 2025 numbers represent the first two fiscal quarters, with appropriations amortized over the full year.



Data from the Department of the Treasury's USAspending.gov (agency profile and data by object class).

A sufficiently sized, well-trained staff can implement congressionally mandated programs more effectively and efficiently. A reduced and less experienced staff will contribute to delays, which in turn will lead to higher costs and canceled projects. One interviewee noted that, early in BIL implementation, "DOE was too swamped to review all of these proposals," but that a subsequent hiring push helped the situation.

To ensure DOE has the right staff to compete:

- **DOE should return its staffing to adequate levels.** Since January 2025, thousands of employees have been encouraged to leave DOE, depriving the department of the staff it needs to implement congressionally authorized demonstration and deployment programs.[36] In planning to restore staffing to congressionally mandated levels, DOE can consider recalling many of these recently dismissed workers; employees who have opted into the "deferred resignation program," for instance, are still under contract with DOE and could be recalled without a new hiring process. Many of these dismissed staffers have vital technical expertise and experience gleaned from managing existing demonstration programs. EFIF's interviews emphasized how important it was to have DOE staffers who had learned from prior implementation experience. The process of staffing back up also offers the opportunity for a strategic review of how human capital needs may have shifted. Some streamlining may be desirable, in part to match DOE's staff to its new set of responsibilities (for example, by hiring more employees with industry experience).

- **Congress should require DOE to create plans for increasing staff in key offices.** The department's staffing levels are determined in part by Congress, through the appropriations process. Congress must be explicit in exercising its oversight over DOE about the need to maintain a competitive staff that drives the department's mission forward. Congress and GAO have both recommended that individual DOE offices prepare staffing plans to address critical shortages.[37,38,39] This issue has only become more urgent with the expansion of DOE's responsibilities and the recent staff reductions. According to the Senate Appropriations Committee, any DOE reorganization or change in historical practice—such as using staff funds to pay overhead rates rather than personnel[iii]—merits congressional review, which these actions have not undergone.[40]

- **Congress or the Office of Personnel Management (OPM) should provide DOE with specific hiring authorities and competitive compensation tools to recruit staff with direct experience in innovation and infrastructure deployment.** Direct hire authority, temporary appointments, and special appointing authorities could all be used to recruit employees from smaller candidate pools, such as those with extensive private-sector project finance or development experience. DOE should be required to identify specific skill gaps and report on its strategy to recruit the talent necessary to implement its congressionally approved budget.

2. Deploy underutilized funding tools to maximize taxpayer ROI

According to EFIF's interviews, DOE's traditional grant and cooperative agreements are misaligned with the realities of energy project development. These tools were designed for R&D efforts, not large, multiyear commercial projects subject to shifting market dynamics. One awardee remarked that "there's a disconnect between DOE contracts and commercial project development. They don't have contracts that are meant for large capital development."

"There's a disconnect between DOE contracts and commercial project development. They don't have contracts that are meant for large capital development."

Another noted that their negotiation period lasted three years; by the time they were under contract, market conditions had shifted significantly from the time of

iii This means that instead of using funds intended to hire or pay DOE staff, the department redirected those funds to cover general administrative and operational costs like rent, IT services, or shared support systems.

their original application. The awardee was forced to bear the financial burden of these changes, and "three years later, DOE still hasn't provided additional support."

Additionally, the phased approach to funding left many developers stuck renegotiating award terms after each phase, creating uncertainty and making it difficult to secure investment and project partners: "We are spending a million dollars a day on the projects. Things are so slow [working with DOE]."

DOE's requirements in these agreements could also be onerous: "DOE's reporting requirements are much stricter than any other investor." These contracting structures constrain DOE with outdated rules and a risk-averse culture, slow down projects, and create mismatches with private-sector decision-making and operations.

The department's most powerful tool for working in flexible, commercially oriented ways is its Other Transactions (OT) Authority.[41] DOE's OT Authority was established by the Department of Energy Organization Act of 1977 and extended through 2030 in the 2020 Energy Act.[iv,42,43] It broadly authorizes DOE to enter into agreements outside the department's typical formats of grants, cooperative agreements, loans, and procurement contracts.[v] The laws enabling DOE's OT Authority parallel those of authorities given to NASA and the Department of Defense (DOD), which have used OT Agreements for decades to fund large, private sector projects, like the first communications satellite, early prototypes for drones, and contracts with private spaceflight companies.[44,45,46] Though rarely used by DOE and largely unknown to award recipients, OT Agreements offer the type of commercial terms that nearly all awardees expressed a desire for: "I want DOE to truly act like a partner in a public-private partnership. Our award was mostly managed by DOE as a grantor and grantee [relationship]."

"I want DOE to truly act like a partner in a public-private partnership."

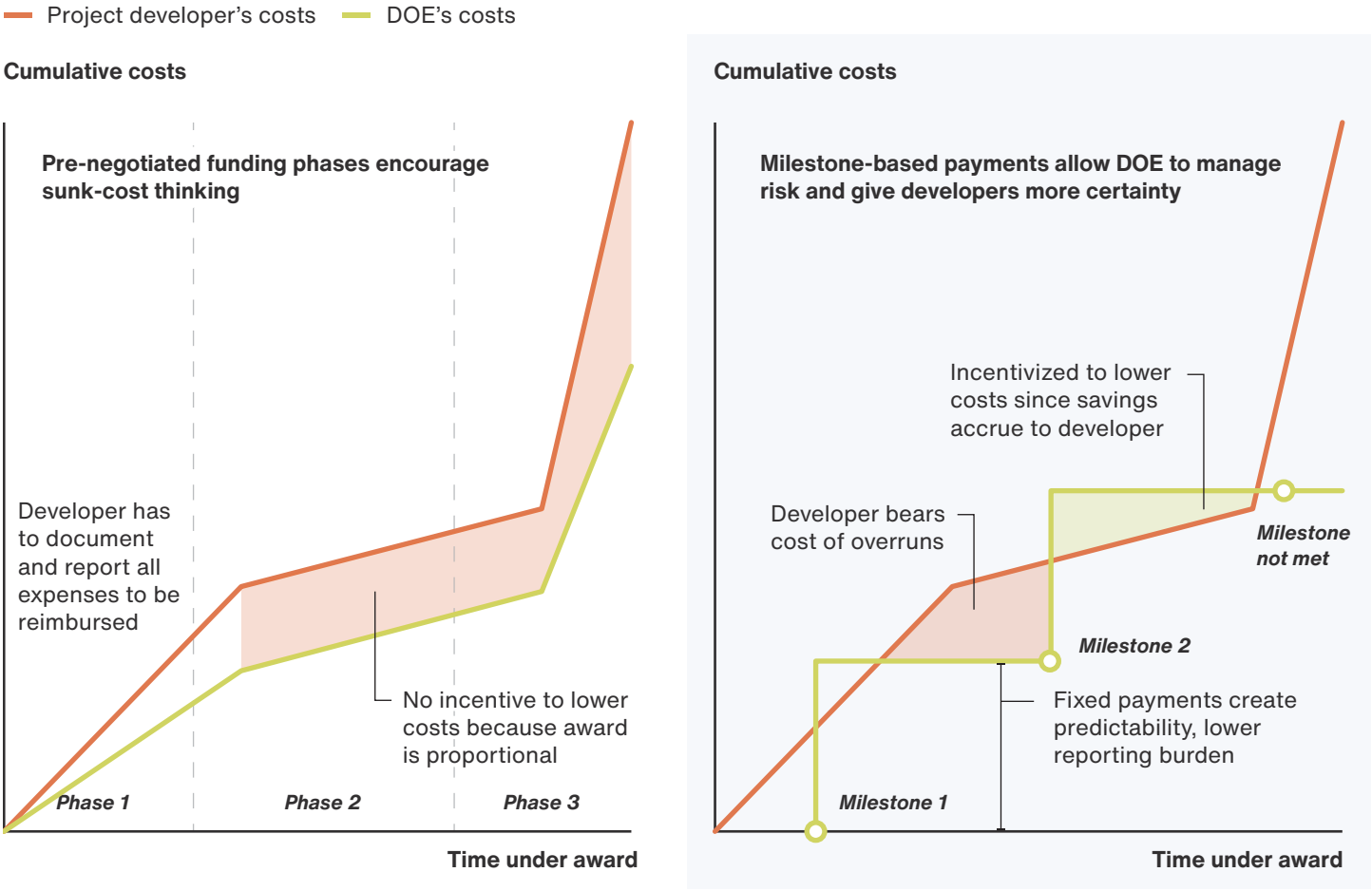
A key flexibility offered by the department's OT Authority is a payment structure that differs from typical DOE grants, where recipients are reimbursed for the costs they incur. Instead, OT Agreements can offer contracts with a fixed total value, awarded in installments when certain milestones are met (or even via up-front payments), called a "milestone-based" or "pay-for-outcomes" approach.

A cost-shared cooperative agreement can create uncertainty for both the government and the funding recipient, as neither knows what the true final value

iv The 2020 Energy Act extended DOE's OT Authority through 2030. DOE's OT Authority was also clarified in the Energy Policy Act of 2005, where it was explicitly linked to the existing Department of Defense statute, and in the Bipartisan Infrastructure Law, where the intellectual property protection provisions were enhanced.

v This paper uses "OT Agreements" to refer to the contracts signed under DOE's OT Authority. DOE has previously branded some contracts under its OT Authority as "Technology Investment Agreements" (TIAs). Other agencies use other terminology, such as NASA's "Space Act Agreements."

Figure 4: **COMPARISON OF PAY-FOR-OUTCOMES AND COST-SHARED COOPERATIVE AGREEMENT AWARD STRUCTURES AT DOE**



Source: EFI Foundation.

of the award will be. It also reduces the incentive for the recipient to lower costs, since their funding decreases proportionally if they spend less, and increases their reporting burden. As one awardee stated, "Current DOE FOA [funding opportunity announcement] constructs sometimes lack adequate incentives and/or direct benefits for [us] to proceed with a project."

A pay-for-outcomes approach, however, can produce a better return on investment for the taxpayer by limiting risk for both sides.[47] Using this model, DOE pays only when specific milestones are met, protecting the government from spending too much on projects that never come to fruition. Recipients are more incentivized to lower costs when payments are fixed, and they can raise capital more effectively when they have more certainty about the terms and size of the award. Because recipients do not need to invoice DOE for every expense, the reporting burden can be much lower and there is less incentive for DOE to micromanage project development.

Box 1:

Pay-for-outcomes programs: COVID-19 vaccines

The development of COVID-19 vaccines provides an example of how pay-for-outcomes approaches can complement DOE's other innovation tools. After more than a decade of projects on the science of mRNA vaccines funded by federal agencies, the first Trump administration used a pay-for-outcomes approach in Operation Warp Speed (OWS) to ensure speedy delivery to the public.[48] OWS provided $18 billion in federal funds to vaccine developers that met explicit development targets, including making advance purchase orders of vaccines still in production.

Additionally, OT Agreements reduce significant regulatory burdens for the private sector by creating flexibility in how awardees comply with the government's financial management, accounting, and reporting rules. As one EFIF interviewee stated: "Private companies are not set up to do 2 CFR [200]" (i.e., the accounting requirements for grants and cooperative agreements). Complying with the requirements in 2 CFR [200] can be especially burdensome for private companies unfamiliar with government-funded projects as it requires an entirely new accounting system to ensure compliance with a large volume of federal rules. Referring to the Federal Acquisition Regulation (FAR), the contract requirements counterpart to 2 CFR, another awardee similarly stated: "Private companies are not set up to do FAR. There's a lot of pain to comply with federal regulations. It turns an engineering firm into an accounting firm."

> "There's a lot of pain to comply with federal regulations. It turns an engineering firm into an accounting firm."

OT Authority allows the department to choose which financial and reporting rules to apply in each scenario. This makes it easier for private companies, which may not be equipped to handle strict federal requirements, to participate in government-funded projects.

OT Agreements also offer a number of other flexibilities to DOE.[49] DOE can award OT Agreements through different competitive processes, such as restricting competitions to certain types of applicants. DOE has more flexibility in setting the cost-share requirements of OT Agreements, especially compared to other R&D agreements, within statutory limits. Additionally, OT Agreements provide greater flexibility for the government and the funding recipient to tailor intellectual property and data rights related to the project.

Despite having this innovative tool, DOE has negotiated only a handful of OT Agreements.[50] Between FY 2010 and FY 2014, DOE had a maximum of six OT Agreements at any given time, while NASA had more than 3,000 and the

Department of Homeland Security had over 600.[51] According to GAO, DOE "used American Recovery and Reinvestment Act funding in 2011 and 2012 to establish new other transaction agreements; it has not entered into any new agreements since [as of 2016]."[52]

In GAO's 2016 report, staff across agencies reported several barriers that made OT Agreements rare. Staff considered OT Agreements an option of last resort.[53] Officials were often unfamiliar with their advantages; staff found them "more time-consuming and challenging to establish" than grants or contracts, since few templates exist for what OT Agreements should look like. The lack of a permanent OT Authority also made staff at some agencies less inclined to pursue OT Agreements. For DOE specifically, staff conveyed that "the agency's relatively low use of other transaction agreements is in part a result of its regulations governing its use," which were adopted from DOD. While DOE has issued new guidance on the use of OT Agreements since 2016, the frequency of OT Agreements has not increased.[54]

DOE's lack of OT expertise limits its experience and confidence. As a result, there are very few Agreements Officers (AOs) at DOE "warranted" to execute an OT Agreement (i.e., authorized to negotiate an agreement on behalf of the department). A culture of risk aversion also discourages AOs from using OT Agreements. They perceive it as personally risky to diverge from business as usual; even those OT Agreements that are signed are designed to differ as little as possible from existing contracting structures.

Congress can help break the logjam by ensuring that DOE employees are on firmer statutory ground when executing OT Agreements. Though the current authority is quite broad, Congress has a greater responsibility to provide explicit guidance to agencies after recent Supreme Court cases (*Loper Bright Enterprises v. Raimondo, West Virginia v. EPA*) that limit agencies' power to interpret ambiguous statutory language. In addition to RD&D uses already mentioned in the statute, OT Agreements could be authorized for deployment programs (such as those in BIL), supply chain support, demand-side incentives, and funding for quasi-governmental intermediaries.

Box 2:

Opportunity for an infrastructure bank or other independent entity

Another potential use for DOE's OT Authority is to fund a quasi-governmental entity such as a government corporation or agency-related nonprofit. DOE already interfaces with a number of quasi-governmental organizations, including its government-owned, contractor-operated national laboratories and the newly established Foundation for Energy Security and Innovation (FESI).

Quasi-governmental entities could have many potential uses for DOE, such as providing demand-side support for nascent markets, supporting critical mineral supply chains, or addressing DOE's spent nuclear fuel responsibilities. Multiple bills have been proposed in Congress for a National Infrastructure Bank, which could provide financing support across energy, water, transportation, and telecommunications infrastructure (among other sectors) and could potentially be funded by a new U.S. sovereign wealth fund—an idea that is gaining traction in its own right.[55]

An OT Agreement would permit DOE to fund any of these potential entities, which could in turn provide more commercial-oriented support to target industries. DOE already has a precedent of congressionally established government corporations for market-oriented support, such as the Synthetic Fuels Corporation.

To ensure DOE uses this game-changing tool:

- **Congress should direct DOE to expand its use of OT Authority.** The next Energy Act reauthorizing DOE programs could expand and clarify the list of eligible uses for OT Authority, especially deployment, supply chain, and demand-side programs. Congress should also make DOE's OT Authority permanent. In addition, Congress could ask DOE or GAO to study the use of OT Authority or amend individual BIL programs to direct DOE to use OT Agreements in carrying them out.
- **DOE should train all Agreements Officers (AOs) to be empowered to execute OT Agreements.**[56] Increasing the number of warranted AOs will ensure that more programs have the option to shift from cooperative agreements to OT Agreements and will help instill a culture where OT Agreements are not seen as risky. As DOE issues more OT Agreements, the department will develop templates that make future negotiations easier.
- **DOE should issue outcome-based solicitations using OT Agreements for high-impact clean energy demonstration projects.** Rather than rescinding unspent funds, DOE could request that Congress reprogram them for these "open call" solicitations. Alternatively, Congress could authorize new funding for this purpose. As with open calls from the Advanced Research Projects Agency–Energy (ARPA-E), applicants would propose novel solutions to existing departmental objectives. Applications can also respond to emerging national priorities, such as data center energy needs, critical minerals processing, or geologic ("natural") hydrogen. OT Authority can enable DOE to be more flexible, negotiating agreements with terms that can be adapted to industry specific circumstances.

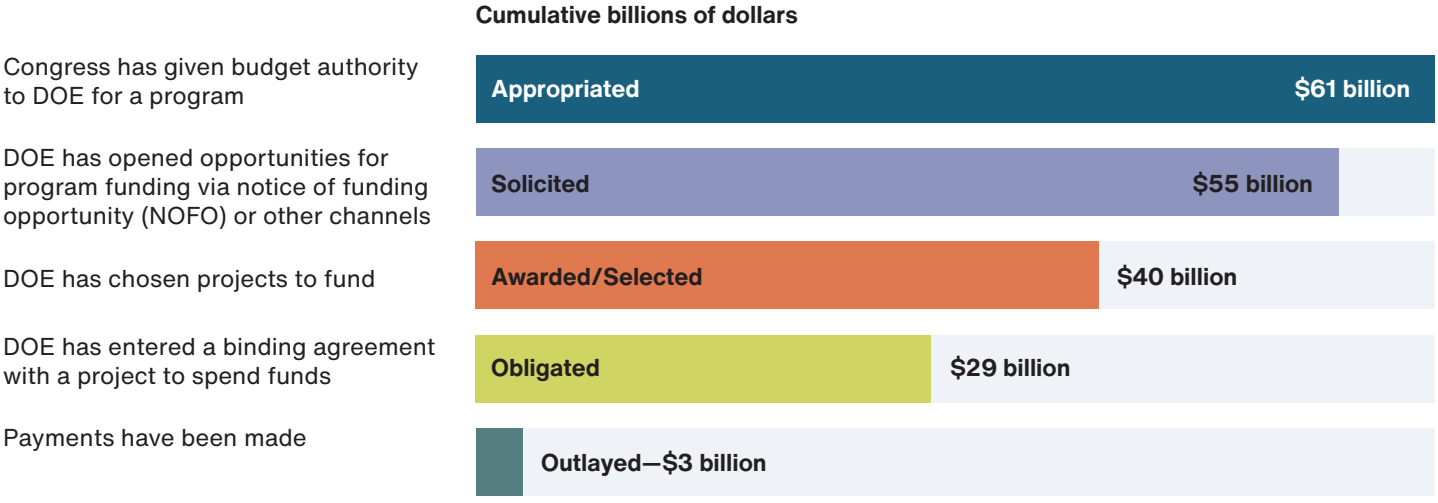
3. Streamline DOE's application and award processes to get money flowing

Long before any award contract—such as a cooperative agreement, OT Agreement, grant, or loan—is chosen and signed, DOE undertakes a lengthy process of requesting information, inviting proposals, and assessing applications with the aim of selecting an award recipient.

According to EFIF interviews with developers of BIL-funded projects, the application and award negotiation processes have hindered progress on implementation. One developer said, "Award negotiations take forever. If you have to spend six months negotiating, those costs don't get captured, and it's extremely inefficient. And it's usually to justify a tiny number. There was a three-week negotiation over $5k." Another awardee remarked, "There is a lack of urgency. Things are so slow."

The data validates the experiences of awardees: Of the $61 billion appropriated to DOE under the Bipartisan Infrastructure Law, less than half has been obligated (***Figure 5***), according to EFIF's analysis of publicly available data (see appendix for methodology and sources). Of the total, $21 billion has yet to be awarded to any project and $11 billion was awarded to projects that have either been canceled or have yet to sign a contract with DOE.[57,vi] In early May 2025, the White House sent its "skinny budget" request for fiscal year 2026, calling for $15.25 billion of

Figure 5: **FLOW OF BIL DOLLARS, IN CUMULATIVE TOTALS, THROUGH THE DOE AWARD PIPELINE**



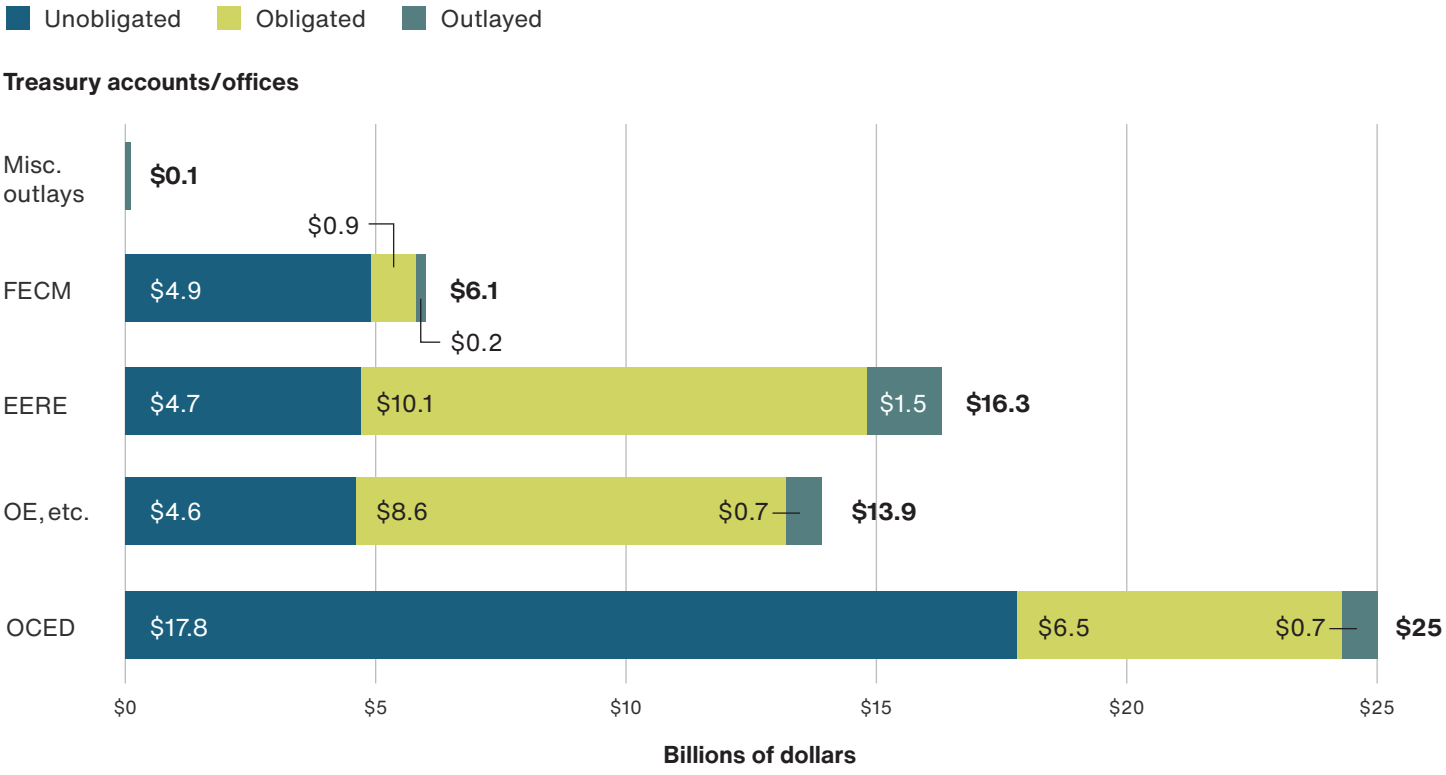
Note: Status as of March 31, 2025. These estimates are based on the best available government data through Q2 of 2025, but some data may be missing or out of date. The numbers for awards, obligations, etc., should be considered minimum estimates. DOE's total does not include borrowing authority given to Bonneville Power Administration. Funding totaling $9 billion was appropriated in advance for FY 2026 and is not yet available for DOE to obligate (see below). Full methodology is available in the appendix. Totals may not sum due to independent rounding. Data from: Outlayed and obligated funds published on the Department of the Treasury's USASpending.gov and awards and appropriations reported by the White House on the now-archived Invest.gov.

vi A DOE January 2025 press release stated that 70% of BIL dollars had been "committed to projects," which roughly corresponds to the data EFIF could find on project selections, not obligations.

BIL recissions from the $61 billion total. The budget request stated that recissions "would not impact any currently awarded projects," though DOE has subsequently announced cancellations of awarded projects (see Box 3), indicating that all $32 billion in unobligated funds could be at risk.

Getting from legislation passed by Congress to steel in the ground has proved to be a laborious process. To date, just 5% ($3 billion of the $61 billion) has been paid to projects. The lack of outlays is partially attributable to the long development horizons for these projects: Some had timelines spanning up to 10 years to reach commercial operations. But delays in DOE's rollout of the funding have also had cascading effects on deployment progress. DOE is accustomed to moving at the pace of early-stage research; commercial-scale projects are a different animal altogether.

Figure 6: **BIPARTISAN INFRASTRUCTURE LAW FUNDING STATUS BY TREASURY ACCOUNT/OFFICE**



Status as of March 31, 2025. Due to DOE's reorganization, the office administering a program is not always the same as the account that received the funding. For example, most GDO programs are listed here under the Office of Electricity (OE), and most Office of State and Community Energy Programs (SCEP) and Office of Manufacturing and Energy Supply Chains (MESC) programs are under EERE. "OE, etc." also includes the Office of Cybersecurity, Energy Security, and Emergency Response (CESER), Transmission Facilitation Program (TFP), and Western Area Power Administration (WAPA). "Misc. outlays" are administrative costs and grants to small businesses through the Office of Science (SC). The full spending analysis methodology is available in the appendix. Data from: Outlayed and obligated funds published on the Department of the Treasury's USAspending.gov and awards and appropriations reported by the White House on the now-archived Invest.gov.

Among EFIF interviewees, the average time from solicitation to award was 18 months, with some negotiations lasting up to three years even after an award decision. Changing market conditions and slow negotiations created a vicious cycle. As one developer shared, "Costs may increase/decrease as project definition increases and designs change. Due to the long developmental timelines, costs can be affected by market conditions, such as inflation, supply chains, etc." These changes, in turn, prolong negotiations and further delay construction.

The average time from solicitation to award was 18 months, with some negotiations lasting up to three years even after an award decision.

Developers also deemed DOE's application process overly burdensome and inconsistent. Application materials are long, duplicative, and sometimes contradictory. As one developer put it, "They should really simplify the requirements, because the more information they cram into the long, 100-page documents, the more likely it is [we] mess it up."

According to the interviews, DOE's evaluation process was similarly unclear. Several interviewees stated that the process functioned "like a beauty contest," with projects selected by how good they would look on a press release. Many applicants said they received little to no feedback during the application process, and decisions felt subjective or opaque as a result. Once applications were submitted, communication with DOE often went dark. Applicants could not ask questions, leaving them guessing about their project's status.

For projects that did receive funds, reporting requirements could be excessive. Developers stated that compliance questions frequently focused on box-checking exercises to meet departmental mandates, rather than on technical aspects and project progress. The administrative burden was often disproportionate to the size of the award; recipients questioned why "DOE seeks more information than a normal investor."

"Unless the award is $100 million, it's not worth it to comply since it's such a pain to do. Companies have dropped out solely because of DOE's reporting compliance."

Costs of compliance sometimes outweighed the potential benefits of federal assistance: "Unless the award is $100 million, it's not worth it to comply since it's such a pain to do. Companies have dropped out solely because of DOE's reporting compliance." For early-stage or smaller developers, this level of red tape can stall execution or deter participation altogether.

Box 3:

May 2025 DOE project cancellations

On May 30, 2025, DOE announced that it was canceling 24 awards, worth $3.7 billion, from programs including Carbon Capture Demonstrations, Industrial Demonstrations, and Clean Energy Demonstrations on Current and Former Mine Land.[58,59] All of the terminated projects were housed in the Office of Clean Energy Demonstrations (OCED), which DOE indicated it plans to significantly ramp down in its latest budget request. Despite DOE's claims to the contrary, there are no budgetary savings from these cancellations (unless Congress rescinds funding from the programs).

The press release announcing the cancellations claimed that DOE "failed to conduct a thorough financial review" and "suggested the process had been rushed."[60,61] DOE provided no data to back up these claims; both run counter to the experiences of project developers interviewed by EFIF, who claimed that due diligence was more rigorous than what private-sector investors would conduct and that faster decisions would have better aligned with developer timelines.

The release further mentions that the projects "would not generate a positive return on investment of taxpayer dollars." These projects, however, came with a minimum 50% match in funding from the private sector and will have benefits that extend beyond their own revenues. The goal of these demonstrations is to provide proof of concept for new energy technologies, in order to lower costs of future deployments and encourage private-sector investment. Many projects also target geographic areas of need, buoying energy and industrial communities that have suffered job declines.

An EFIF analysis of the Regional Clean Hydrogen Hubs program, for instance, found substantial return on investment.[62] This modeling indicates that over the next four years, every dollar invested in the program would generate roughly $7 in GDP, and that the broader impact on a hydrogen ecosystem and supply chain would produce $10 of value for every dollar spent. This is just one example of the potential benefits of demonstration projects like those canceled by DOE.

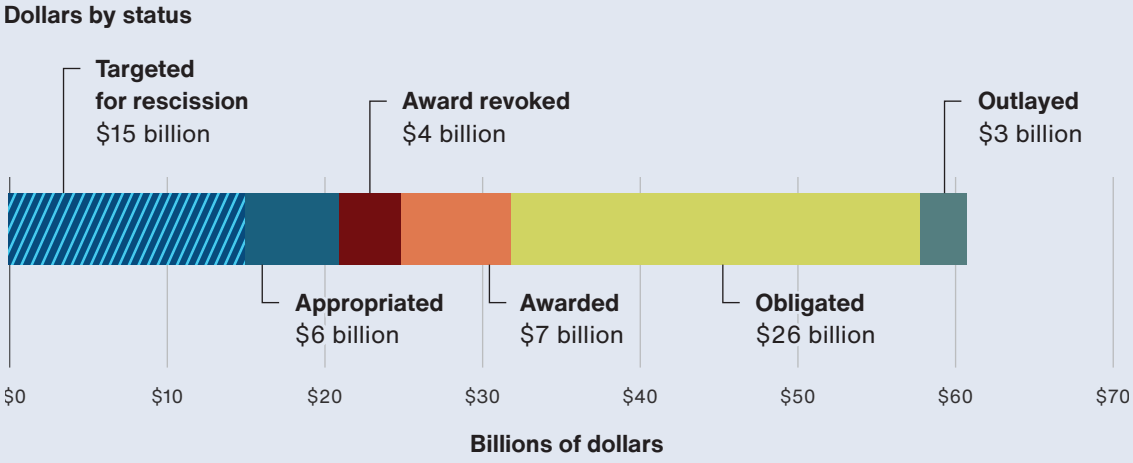
Canceling these awards has ripple effects on other DOE awardees and future public-private partnerships. Capital-intensive energy projects require stable policy environments; investors will lose faith in DOE-supported projects if they see the potential for awards to be revoked capriciously or because of changing political circumstances.

The administration also has signaled its support for other DOE demonstration and deployment programs, like the Loan Programs Office and technologies such as small modular reactors.[63] Erasing programs that provide a critical link in the technology maturation chain will only lower the chances of success for these efforts. Splitting up demonstration programs into DOE's fuels-based offices (Nuclear Energy, Fossil Energy, etc.) will make efficient management more difficult by decreasing coordination and instantiation of best practices across the demonstration portfolio. Downsizing or disbanding OCED also risks losing staff with the specialized skills necessary to manage these demonstration projects.

OCED's mandate is broad: Its authorizing legislation does not pinpoint specific types of energy that fall under its purview. If DOE is serious about demonstration and deployment for any technology (e.g., nuclear power, geothermal energy, critical minerals—all areas with bipartisan interest), preserving these functions is a necessity.

Figure 7. **ESTIMATED STATUS OF BIL FUNDING ACROSS DOE WITH TRUMP ADMINISTRATION CUTS**

Rescissions requested by the White House will have to be approved by Congress. Funding for revoked awards may still be awarded to new projects (less amounts already obligated) unless rescinded.



Outlays and obligations data from the Department of the Treasury's USASpending.gov. Awards and appropriations data from the White House on the now-archived Invest.gov. Rescission data from Office of Management and Budget. Revocation data from Brad Plumer, *New York Times*.

To ensure innovation funding is quickly put to work:

- **DOE should work to simplify and standardize application and negotiation processes across its energy demonstration and deployment programs**—including formats, lengths, and program descriptions—with a focus on commercial terms and conditions.. Applicants should be able to reuse materials across different solicitations. Standards should be set at the department level for maximum application lengths and decision timelines.
- **DOE should increase transparency in application processes.** All solicitations should publish clearer evaluation and scoring criteria and commit to a timeline for decisions and negotiations. DOE should give applicants regular updates while applications are being considered, including allowing applicants to ask questions and alter their applications in response to feedback. DOE could also provide post-award feedback, including tips to improve future applications.
- **DOE should create a DOE-wide digital task force to help the department streamline complex services** by simplifying digital systems, reducing paperwork, and accelerating timelines to improve access and efficiency. During the COVID-19 pandemic, a similar effort at the Centers for Disease Control and Prevention played a critical role in streamlining vaccine procurement by improving the technology infrastructure used to track and allocate vaccine doses, which modernized the Vaccine Tracking System (VTrckS).[64] This enabled faster, more accurate ordering and distribution to states and providers. DOE's effort should leverage AI but also protect sensitive government and taxpayer data.

4. Reform the department's loan programs to boost infrastructure deployment and innovation without increasing deficits

The Department of Energy's Loan Programs Office (LPO) plays a critical role in enabling first-of-a-kind (FOAK) deployments for clean energy technologies, yielding strong returns relative to its limited impact on the federal deficit. Created to provide debt financing for proven but not yet widely deployed technologies, LPO has supported milestone projects such as Tesla's first large-scale factory.[65] Today, it operates five distinct programs, including two new ones created by BIL and IRA (***Figure 8***).

Figure 8: **PROGRAMS ADMINISTERED BY DOE'S LOAN PROGRAMS OFFICE (LPO)**

Loan program	**Tribal Energy Loan Guarantee Program** (TELGP)	**Advanced Technology Vehicle Manufacturing** (ATVM)	**Carbon Dioxide Infrastructure Finance and Innovation** (CIFIA)	**Title 17**[a]	
				Innovative Clean Energy (ICE)[b]	**Energy Infrastructure Reinvestment** (EIR)
Year created	2005	2007	2021 (BIL)	2005	2022 (IRA)
Funding expires	2028	2028	n/a	2026	
Financing type	Direct loans, partial loan guarantees	Direct loans	Loan guarantees, grants	Loan guarantees	
Loan cap	$20 billion	No cap	No cap	$40 billion	$250 billion
Eligible projects	▪ Any energy project owned by a Tribal government or development organization	▪ Low-emissions vehicle[c] manufacturing ▪ Alternative fueling equipment manufacturing ▪ Critical minerals	▪ Large common-carrier transport of captured CO_2	▪ Innovative clean energy facilities ▪ Supply chain for innovative clean energy technologies	▪ Replacing, repurposing, restarting, or lowering emissions from existing energy infrastructure
Example projects[d]	▪ Solar-plus-storage microgrid for a Tribal community	▪ Electric SUV factory ▪ Lithium carbonate processing plant	▪ Common-carrier CO_2 pipelines ▪ CO_2 liquefaction for ship transport	▪ Biorefinery for SAF and renewable diesel ▪ Electric bus deployment ▪ Compressed air energy storage	▪ Upgrading and restarting a nuclear power plant ▪ Transmission expansion to support renewable generation

Notes: a Title 17 (XVII) refers to the section of the Energy Policy Act of 2005 that established the clean energy loan programs. b Title 17 also includes a carve-out for projects supported by the State Energy Financing Institution (SEFI), authorized by BIL. SEFI projects are supported by the ICE loan authority, but do not need to use innovative technologies. c Includes light-, medium-, and heavy-duty vehicles; rail; marine; and aviation. d All examples drawn from real LPO projects, with the exception of CIFIA.

Source: EFI Foundation, using information from U.S. Department of Energy.

As one of DOE's most powerful tools for supporting large-scale clean energy deployment, LPO's loans and loan guarantees can unlock far more private capital than grants alone.[66] Moreover, because they are intended to be repaid, loans add less to the federal deficit than grants and cooperative agreements—an advantage that has become more salient as fiscal pressure grows.[67]

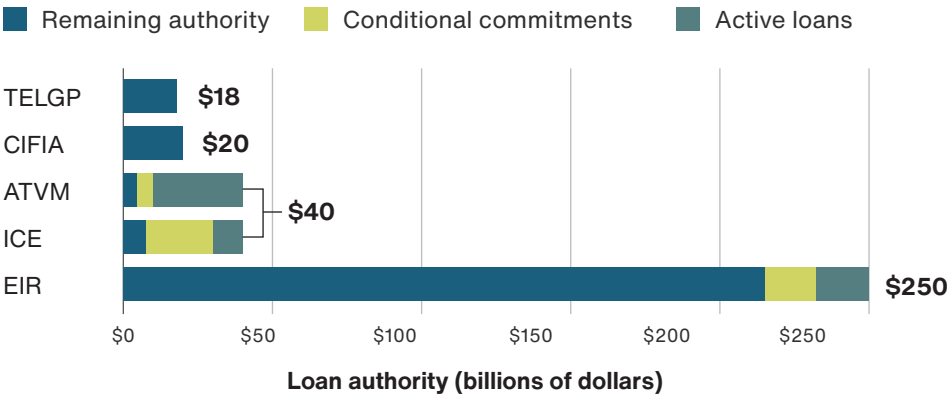
Congress provided LPO with approximately $370 billion in new loan authority, backed by $14 billion in credit subsidy, through BIL and IRA.[68,69] Most of this new funding will expire in FY 2026 or FY 2028, placing the office under tighter timelines than many other DOE programs.[70] While LPO has made significant progress in deploying funds through some programs, others have fallen short, according to EFIF's analysis (see appendix for methodology and sources).

Two long-standing programs—for Innovative Clean Energy (ICE) and Advanced Technology Vehicle Manufacturing (ATVM)—have committed over 80% of their loan authority through active or conditionally approved projects (***Figure 9***).[vii,71,72,73] However, the Tribal Energy Loan Guarantee Program (TELGP) has closed only one loan, using less than 1% of its authority; Carbon Dioxide Transportation Infrastructure Finance and Innovation (CIFIA) has not closed any loans; and the Energy Infrastructure Reinvestment (EIR) program—the largest new authority under IRA—has obligated just 14% of its available credit subsidy (***Figure 10***).[74,75]

These underutilized programs have already been targeted for rescission in budget reconciliation and appropriations bills, exemplifying how overly burdensome application and award processes have put a target on LPO's programs. The irony of this is that the loan programs are some of the most budget-efficient forms of clean energy support that the federal government has.

Figure 9:

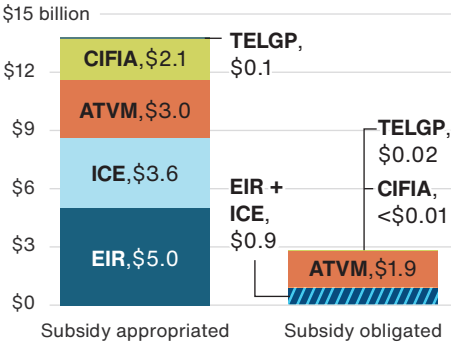
STATUS OF BIL AND IRA LPO LOAN AUTHORITY BY PROGRAM



Note: Status as of Jan. 1, 2025. Source: EFIF analysis of data on LPO's loan authority appropriations from LPO webpages on IRA programs and CIFIA (funded by BIL). Data on active loans and conditional commitments is from LPO's Portfolio Projects webpage and is supplemented by information from DOE press releases (e.g., to distinguish 1703 and 1706 awards and identify missing dates).

Figure 10:

BIL AND IRA LPO CREDIT SUBSIDY STATUS



Note: Status as of Q2 of FY 2025. Totals include all LPO spending since FY 2022, including administrative expenses, which are paid out of credit subsidy appropriations. Source: EFIF analysis of appropriation data from LPO webpages on IRA programs and CIFIA (funded by BIL), obligation data from USAspending.gov.

vii Both active and conditionally committed loans and loan guarantees are considered "obligated." Conditional commitments trigger when projects meet certain milestones, such as completing environmental permitting.

Some interviewees expressed clear frustrations with LPO's application process. Several applied to LPO programs alongside BIL funding administered by other DOE offices and observed stark differences. Many concerns overlapped those discussed earlier in this report, particularly around procedural burdens and documentation requirements. One company that received funding from multiple DOE offices noted that "LPO sought way more due diligence information than [other DOE offices]." Another again described the process as a box-checking exercise favoring safe bets over projects with transformational potential.

This procedural burden is compounded by a risk-averse culture that many viewed as incompatible with LPO's mission. Past project failures have become political flashpoints, and according to stakeholders, this history has left staff overly cautious. As one interviewee put it, "It felt like there was an overarching theme. … [LPO] can't give money to a company that can fail. DOE should be more aggressive in its risk profile to support more innovation." Congress itself has contributed to this trend by questioning and chastising leadership about every failed LPO recipient, despite the fact that the program is designed to withstand failures.

"LPO sought way more due diligence information than [other DOE offices]."

These implementation challenges are not merely operational—they stem from deeper legal and structural constraints that limit what LPO can do, even when there is strong demand. One of the most significant barriers is a statutory provision known as the "denial of double benefit," which prohibits projects from combining support from LPO's Title 17 (ICE and EIR) programs with federal grant funding or other forms of federal support.[76] This rule may have been designed to prevent excess subsidization, but in practice, it blocks the kind of capital stacking that is often essential to large-scale project finance.

Most FOAK demonstration projects face steep up-front costs and uncertain returns. Grants help attract equity, while loan guarantees reduce the cost of debt. Prohibiting this combination eliminates one of the most effective structures for enabling complex infrastructure, while doing little to guard against real abuse. Riskier FOAK projects are inherently unlikely to generate excessive profits from multiple funding streams.

DOE's internal rules impose additional constraints. The ICE program is barred from supporting fourth- or fifth-of-a-kind deployments, even when the same technology is applied in a new sector, geography, or use case.[77] These later deployments often still face substantial commercialization barriers and need public support to scale. Rigid eligibility definitions prevent LPO from supporting these transitions and limit its ability to serve as a true bridge between lab-scale success and market adoption.

LPO's flexibility is further constrained by the way loan costs are scored under the Federal Credit Reform Act of 1990 (FCRA).[78] Before issuing a loan or loan guarantee, LPO must calculate the long-term cost to the federal government—known as the credit subsidy cost—using a model developed in partnership with the Office of Management and Budget (OMB).[79] This model incorporates risk of default, recoveries, prepayments, interest rate fluctuations, and other factors. The credit subsidy may be used to pay for the costs of a loan or guarantee, including in the event of default; however, "LPO structures loans such that even if a borrower defaults, some or all the remaining value of the loan can be recovered."[80]

Borrowers are typically required to pay this credit subsidy cost up front, which can amount to tens of millions of dollars for large infrastructure projects. In some cases, Congress has allowed LPO to cover credit subsidy costs, opening loan programs to more potential borrowers. The bulk of the IRA funding for LPO was intended for this purpose.

Past independent analyses have identified issues with LPO credit subsidy estimates.[81,82,83] In fact, LPO has admitted that its estimates can be overly conservative, recently revising credit subsidy estimates for the EIR program.[84] Despite LPO's strong track record—its portfolio has a default rate of less than 3%—the current modeling framework overstates risk, driving up the cost of DOE loans and loan guarantees.

Instead of serving as a unique public instrument designed to fill market gaps, LPO loans can end up mirroring private capital in both terms and risk exposure. Overly conservative risk estimates can also dissuade LPO from supporting projects in industries with a higher estimated degree of risk (and discourage such projects from applying to the program).

The result is a misalignment between LPO's statutory missions—filling a gap in clean energy project finance and supporting innovative projects—and its real-world impact. High credit subsidy costs deter smaller developers, limit project diversity, constrain LPO's ability to support projects with its appropriated funds, and suppress the full potential of LPO as a market-shaping tool. Properly assessing LPO risk would also lower its programs' estimated budgetary impact, further improving how they "score" compared to alternatives in deficit discussions.

To unleash the full power and value of the Loan Programs Office:

- **DOE and OMB should continue to review and update the credit subsidy calculation methodology** to ensure LPO can meet the goals of the loan programs. Overly conservative estimates can artificially constrain LPO's budget and deter LPO from supporting certain technologies or types of recipients that are likely to require a higher subsidy, undermining program goals. The Federal Credit Reform Act requires annual updates to this methodology; DOE and OMB should ensure these updates reflect LPO's actual loan performance and risk mitigation practices.[85]

- **Congress should authorize a revolving fund for LPO**, allowing DOE to reinvest repayments into future loans without new appropriations. Congress also should authorize DOE to sell loans off its own balance sheet, creating a directed secondary market for LPO loans. This would also remove the need for DOE to manage loans for up to 30 years and place that responsibility with commercial firms that already oversee long-term commercial debt.

- **DOE should expand project eligibility for LPO programs.** DOE should broaden its definition of "new or significantly improved technology" to extend to fourth- and fifth-of-a-kind projects that still face commercialization barriers. Congress also should allow projects to receive both a grant and a loan if the funds for the grant have already been appropriated or if a project has national security importance. These changes should be based on the expected learning curve for each individual technology

- **DOE should streamline LPO application and evaluation processes.** Standardized documents and timelines for each application stage can accelerate DOE's progress in implementing loan programs. Clearer evaluation criteria and less cumbersome due diligence processes will expand the pool of interested projects.

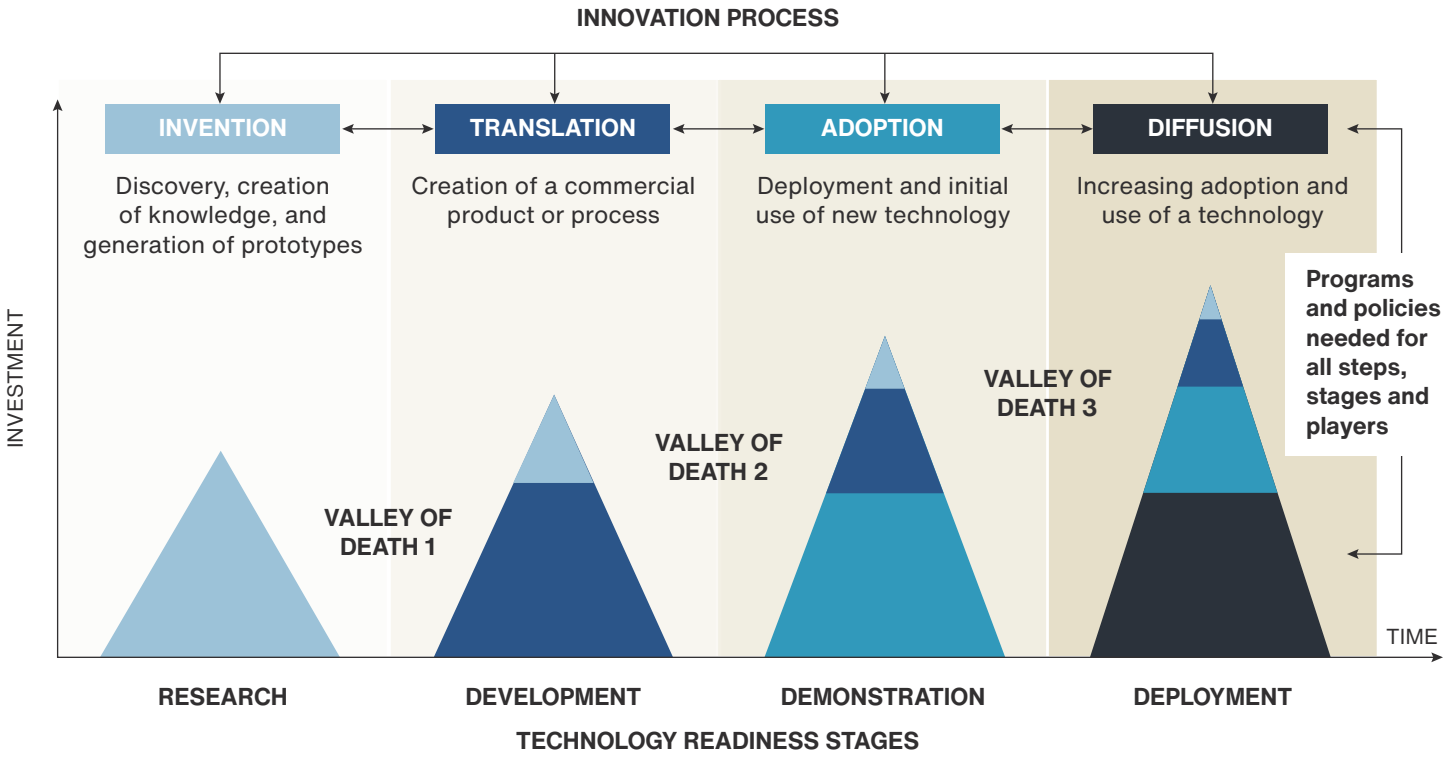
5. Harness the DOE National Laboratories to guide technologies to market

For the past two decades, Congress has extended DOE's remit to bridge new "valleys of death" in the innovation life cycle. Even before BIL, IRA, and CHIPS, policymakers inside and outside the department determined DOE's track record of innovation success could be made more effective by pairing it with industrial strategy.[viii] Technologies that benefited from early DOE support, such as photovoltaics and lithium batteries, often developed into commercial industries overseas rather than at home.

Bipartisan legislation created new program offices—ARPA-E, OCED, LPO, etc.—to address this problem and improve DOE's translation and adoption (***Figure 11***, next page). In the last administration, DOE's shifting mandate was reflected in the creation of an Under Secretary for Infrastructure. Funding recipients emphasized DOE's role in overcoming later-stage valleys of death for their technologies: "BIL funding helped to de-risk our projects, allowing innovators to push the boundaries more than they normally do."

viii In fact, DOE has overseen deployment and demand-side programs for its entire history—though usually focused on established technologies. The Energy Policy and Conservation Act of 1975 established two demand-side programs—the Strategic Petroleum Reserve and the Energy Conservation Program for Consumer Products—as some of DOE's original responsibilities.

Figure 11: **A STYLIZED MODEL OF THE INTERACTIVE INNOVATION PROCESS**



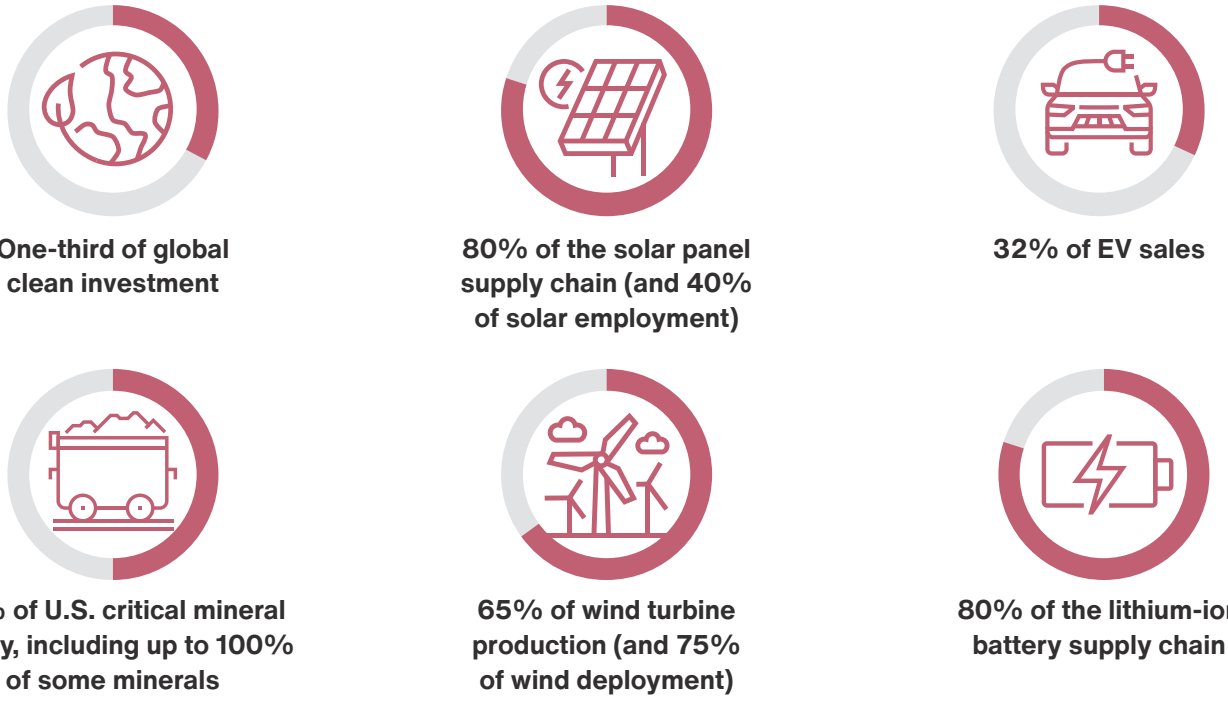
Source: EFI Foundation, ***Advancing the Landscape of Clean Energy Innovation***.

The project developers interviewed by EFIF were largely managed by these new offices, but they emphasized the value of demonstration and deployment programs that are integrated with R&D support. "Funding across the entire innovation chain," one interviewee said, "helps in the push to scale up technologies and overcome market barriers."

Others highlighted the geopolitical stakes of DOE support for end-to-end innovation, emphasizing China specifically: "They just pour money into the investments that are needed to accelerate [readiness] and bridge the valley of death. … We tend to win on [earlier-stage] innovation, historically, but that's diminishing."

"[China] just pours money into the investments that are needed to…bridge the valley of death. We tend to win on innovation, historically, but that's diminishing."

Figure 12: **CHINA'S DOMINANCE OVER CLEAN ENERGY SUPPLY CHAINS**



Source: EFI Foundation, using data from Carnegie Endowment for Peace, International Energy Agency (EV Outlook and World Investment Report), U.S. House of Representatives Select Committee on the CCP.

One way DOE can support innovation diffusion is by relying on its existing resources, especially the national laboratories. The national labs are the crown jewel of the DOE innovation ecosystem. National labs created the first nuclear reactor; discovered quarks, dark energy, and neutrinos; and laid the groundwork for mRNA vaccines, DVDs, and batteries for electric vehicles.[86] The 17 laboratories collectively employed more than 95,000 people in 2020.[87] But the labs have, at times, struggled with collaboration: among themselves, with other parts of DOE, and with external stakeholders.

Better aligning the national labs with the department's end-to-end innovation mission requires three things.[88] First, DOE should facilitate technology development by lab personnel, expanding entrepreneurship programs and incentivizing commercialization of technologies that emerge from lab research. Second, DOE should increase the amount of lab resources available to private-sector innovators, such as test facilities for technology prototyping. Finally, DOE should strengthen and formalize strategic collaboration efforts among the labs and between the labs and the rest of the department.

This last objective is particularly important for BIL programs; DOE can use existing resources at the national labs to accelerate implementation. Lab experts already support cross-cutting departmental efforts, but they could expand their support to cover new "Valleys of Death" for demonstration and deployment programs.

Lab experts, for instance, could provide technical assistance to DOE colleagues in evaluating applications and managing projects. Labs could also participate on the other side of the equation, assisting recipients of funding. Labs are already participating in some of the BIL-funded projects whose developers were interviewed by EFIF, and developers emphasized the importance of the labs' role in fostering ecosystems and partnerships: "Being part of an ecosystem is so valuable. Being the lone actor in a new industry is really hard." DOE also could centralize the management of crosscutting initiatives; national labs and infrastructure offices may already be working on the same technology areas without coordination.

> "Being part of an ecosystem is so valuable. Being the lone actor in a new industry is really hard."

BIL programs could also draw upon experience gained through review processes established for construction projects and major research equipment at Labs managed by the Office of Science (SC). These project reviews, conducted by the Office of Project Assessment within SC, provide technical, cost, schedule, and management peer reviews of construction projects and major research equipment within SC and could provide transferrable tools and expertise for reviews of FOAK projects funded by BIL. Such reviews could ensure that lessons learned from demonstration and deployment programs are shared across the department and influence future solicitations.

To ensure DOE is maximizing the value of its extensive talent and scientific resources for end-to-end innovation:[ix]

- **DOE should create formal structures to reinforce national lab collaboration efforts.** This could include a new Office of National Laboratory Policy, which would subsume existing bodies like the Lab Directors' Council and the Laboratory Operations Board. This new office also could engage with the labs to formulate new "big idea," laboratory-wide innovation initiatives; oversee departmental orders and directives that affect all national laboratories; coordinate lab support for OCED-funded demonstration projects and crosscutting programs; and encourage lab-led formation of regional innovation ecosystems.

- **New DOE initiatives should establish a culture of entrepreneurship at the national labs**. DOE should establish (and Congress should fund) a Laboratory-Directed Technology Maturation program, modeled on the Laboratory Directed Research and Development program. The new program could also draw from or partner with entrepreneurship programs at major universities. The department also could add technology transfer metrics to lab management contracts and implement new authorities from the CHIPS and Science Act, such as expanded entrepreneurial leave and royalty sharing.

ix For more detail on these recommendations, see EFIF's 2023 report *Transforming the Energy Innovation Enterprise*.

- **DOE should expand national lab efforts aimed at fostering regional ecosystems and hubs.** DOE could augment successful existing programs for labs to partner with local stakeholders, especially expanding efforts aimed at private industry. Such programs and initiatives include technology prototype test facilities, voucher programs for companies to use lab resources, Lab-Embedded Entrepreneurship Programs, and the use of Partnership Intermediary Agreements. These programs have multiple benefits, including creating jobs and economic activity in their home regions and fostering synergies between public and private RD&D. Funding these regional collaborations could be one of the functions of DOE's new agency-related nonprofit, the Foundation for Energy Security and Innovation. DOE could also encourage continued lab participation in other departmental efforts, such as regional hubs for hydrogen and carbon storage.

Conclusion

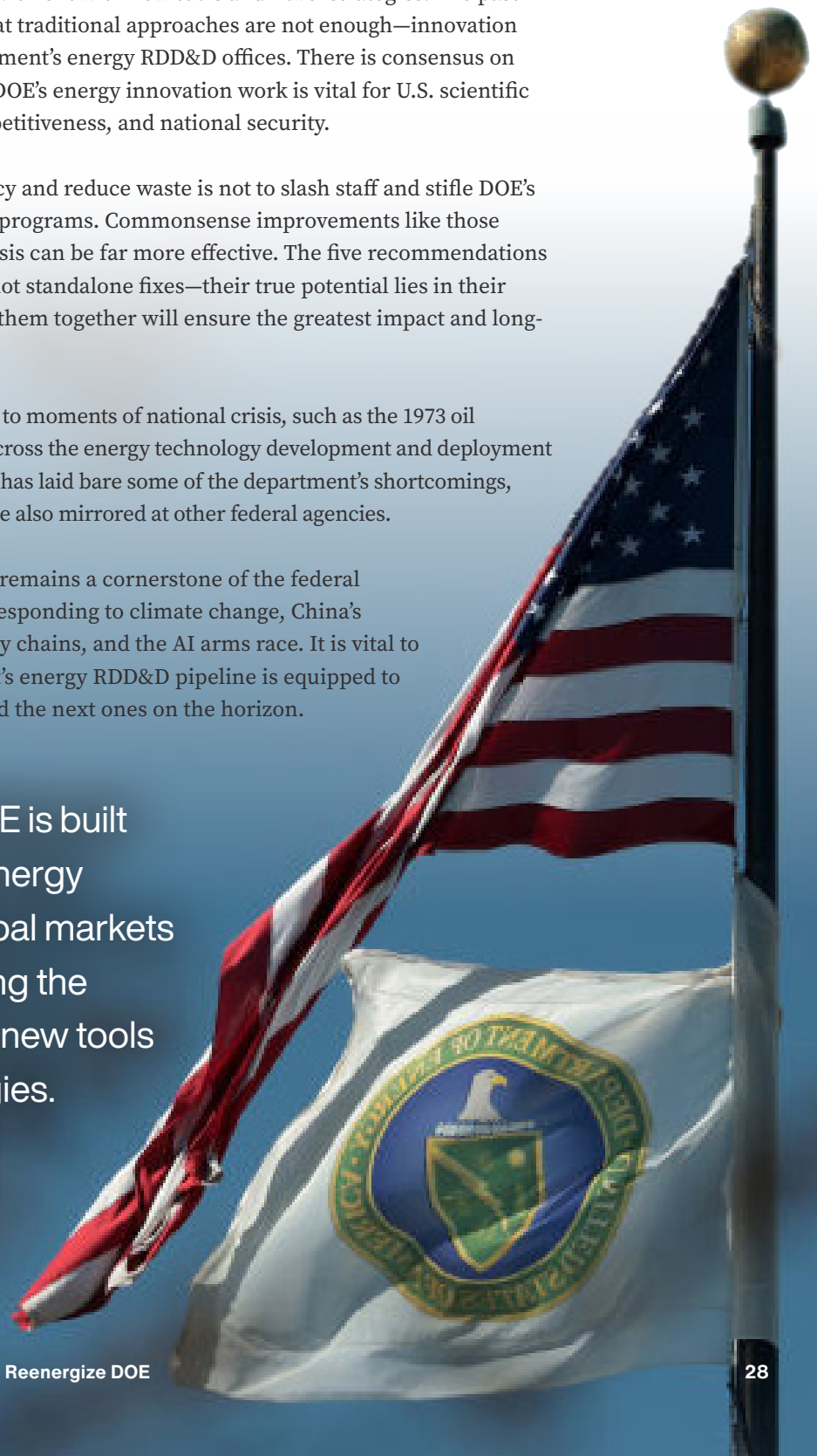
Ensuring that DOE is built to compete for energy leadership in global markets requires equipping the department with new tools and novel strategies. The past four years have revealed that traditional approaches are not enough—innovation is needed across the department's energy RDD&D offices. There is consensus on both sides of the aisle that DOE's energy innovation work is vital for U.S. scientific leadership, economic competitiveness, and national security.

The way to achieve efficiency and reduce waste is not to slash staff and stifle DOE's ability to carry out popular programs. Commonsense improvements like those recommended in this analysis can be far more effective. The five recommendations outlined in this report are not standalone fixes—their true potential lies in their integration. Implementing them together will ensure the greatest impact and long-term effectiveness.

DOE was created to respond to moments of national crisis, such as the 1973 oil embargo, with innovation across the energy technology development and deployment pipeline. Implementing BIL has laid bare some of the department's shortcomings, which interviewees said were also mirrored at other federal agencies.

The Department of Energy remains a cornerstone of the federal government's strategy for responding to climate change, China's dominance in energy supply chains, and the AI arms race. It is vital to ensure that the department's energy RDD&D pipeline is equipped to handle these challenges and the next ones on the horizon.

Ensuring that DOE is built to compete for energy leadership in global markets requires equipping the department with new tools and novel strategies.



Appendix: Methodology

The EFI Foundation (EFIF) based this analysis on two workstreams: semi-structured interviews and data analysis.

Semi-structured Interviews with DOE BIL Award Recipients

In this study, EFIF employed a semi-structured interviewing method coupled with snowball (referral) sampling as the basic methodology to gather perspectives. A semi-structured interview is an open knowledge sharing approach, where information is conveyed in a conversational, free-flowing manner. The conversation is guided by a set of themes and ideas outlined in the form of questions by the interviewer. The loose but intentional structure of this approach allows for ideas to surface naturally and provides multiple opportunities for the interviewees to express themselves and offer depth of insight on one or more subjects. As such, a richer perspective on a matter is shared with the interviewer, and the interviewee is less stressed doing so, as the latter can choose how to convey thoughts and ideas.

EFIF determined the scope of the semi-structured interviews by limiting eligible participants to companies or organizations that applied for—and in most cases received—BIL funding from DOE. Two main factors influenced this decision: First, most clean energy program funding directed to DOE during the last four years was appropriated via BIL (while IRA and CHIPS offer complementary support, sometimes to the same award recipients receiving BIL funding, most of these funds are implemented in the form of tax credits and by the Commerce Department, respectively). Second, BIL was signed into law in November 2021, allowing about three years for implementation to get underway at DOE.

EFIF identified potential interviewees and determined eligibility by accessing SAM.gov, the official U.S. government system for tracking federal funding.

All interviewees were guaranteed full anonymity; no company or individual names are associated with quotes or sentiment throughout the report.

BIL Data Analysis

BIL data on obligations and outlays is from the Department of the Treasury's USAspending.gov website.[89] All obligations and outlays, from both contracts and financial assistance, designated with the emergency spending code for BIL were included. Data was available through the first fiscal quarter of 2025. Data on appropriations and awards is from the White House's now-archived Invest.gov page, which ceased being updated at the end of the Biden administration.[90] All DOE

programs were included except for the additional borrowing authority granted to the Bonneville Power Administration, which is not an appropriation and therefore not directly comparable.

These two datasets are not directly comparable: The Treasury data is sorted by Treasury account, whereas the White House data is sorted by the office designated to manage the program (assignments that have also changed over time).

Funding Opportunity Announcement (FOA) data was analyzed from the Grants.gov website from the Department of Health and Human Services (which also includes FOAs from other agencies, like DOE).[91] EFIF used a keyword search for "Bipartisan Infrastructure Law," "Infrastructure Investment and Jobs Act," and other variations to find relevant FOAs, which were matched to the White House data on appropriations and awards. EFIF also found via the DOE website $8.5 billion in programs where funding was made available through solicitations not captured in the Grants.gov database (such as programs that offered funding on a rolling basis).[x] FOA and solicitations data likely represents a minimum estimate, not a maximum.

LPO Data Analysis

Data on LPO's loan authority and credit subsidy appropriations is from LPO pages on Inflation Reduction Act programs and CIFIA.[92,93] Data on active loans and conditional commitments is from LPO's Portfolio Projects page, supplemented by information from DOE press releases (e.g., to distinguish 1703 and 1706 awards and identify missing dates).[94] Credit subsidy obligation data is from USAspending.gov and includes all new transactions under Assistance Listing 81.126 from FY 2022 through the first quarter of FY 2025.[95] LPO administrative expenses are not included in this data.

x The programs are: Advanced Reactor Demonstration Program, Civil Nuclear Credit Program, Extended Product System Rebates, Transmission Facilitation Program, WAPA Purchase of Power and Transmission Services, Section 242/243/247 Hydroelectricity Incentives

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