

# Policy Brief

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## U.S. Loan Guarantee Program Needs Deeper Clarification of Goals and Metrics

By Amy Myers Jaffe | September 2021

This policy brief describes what has worked and what has not in existing U.S. loan guarantee programs and suggests how policy makers could improve the equity and efficacy of these programs in the next phase of loan guarantees for clean energy.

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### KEY CONSIDERATIONS

- U.S. loan guarantee program needs a wider set of evaluation metrics.
- New improvements to the program need to consider not only geographical equity, but other objectives that may, at times, work at cross purposes.
- An active marketing plan to generate interest in the program from a wider constituency, including firm size, geographically, and among entrepreneurs, financiers, and businesspeople from underrepresented groups would produce desirable outcomes.
- Loan guarantees can spur experimentation and innovation by helping firms avoid the 'valley of death' in the innovation process.
- Careful evaluation of the implementation and prioritization of per individual projects requesting federally-authorized grants to cover credit subsidy fee is needed.

### HISTORY

The United States has utilized government guaranteed debt to support public policy objectives over many decades. With loan guarantees, the federal government co-signs privately financed borrowings by private entities to reduce the cost of capital for borrowers.

A new program for loan guarantees for new energy technologies was instituted under Title XVII of the Energy Policy Act of 2005. The program criteria, under section 1703, included specifications that eligible projects would "avoid, reduce, or sequester air pollutants or anthropogenic greenhouse gas emissions" and employ "new or significantly improved technologies and provide reasonable prospect of repayment" (Brown et al., 2020). The program had a number of project categories including advanced fossil fuel, nuclear, energy efficiency, and renewable energy technologies. A major nuclear expansion project at the Vogtle nuclear plant in Georgia received a loan guarantee under this program. In addition to section 1703, as part of the 2007 Energy Independence and Security Act (EISA), Congress authorized the Advanced Technology Vehicle Manufacturing (ATVM) program to provide direct loans to support advanced technology vehicles manufacturing and associated equipment and components (Canis and Yacobucci, 2015). The program was not funded until 2009, when Congress appropriated \$10 million for program implementation and another \$7.5 billion to cover the credit subsidy cost (at a subsidy rate of 30% to be applied) for up to \$25 billion in direct loans. The ATVM program provides direct loans to vehicle manufacturers and parts suppliers to produce vehicles that achieve "at least 25% higher fuel economy than model year 2005 vehicles of similar size and performance" (Canis and Yacobucci, 2015). In particular, sponsors of the measure in Congress hoped that the program would assist start-ups and component suppliers for electric vehicles but in its

original eligibility definitions, no particular technology or fuel was specified. In 2010, Section 312 amended the EISA revised the definition of an advanced vehicle to include high efficiency vehicles which could achieve a fuel economy of 75 miles per gallon or more (Canis and Yacobucci, 2015). The lender for the loans is the Federal Financing Bank, which is a government corporation supervised by the U.S. Treasury Department.

Also in 2009, the loan guarantee program was expanded under temporary authority under the American Recovery and Reinvestment Act (ARRA) to support the rapid deployment of renewable energy and transmission infrastructure projects. Under the 2009 authority, which was written to sunset on September 30, 2011, eligible projects were not required to employ new or significantly improved technologies (Brown et al., 2020). In general, the ARRA effort targeted creation of shovel-ready jobs (Aldy, 2013). To facilitate the 2009 program, roughly \$2.5 billion (after rescissions and transfers) was appropriated to cover credit subsidy costs in an effort to increase the attractiveness of the program to project developers. In August 2010, projects that manufactured “commercial technology renewable energy systems and components” were added. Under the energy loan guarantee program, lenders receive backing of the U.S. Treasury for up to 80% of the qualified energy project costs, if the borrowing party defaults on their privately-financed loan.

Under the authorizations described above, the U.S. Department of Energy now administered three separate loan programs via the Loan Programs Office (LPO): section 1703 loan guarantees, section 1705 loan guarantees, and Advanced Technology Vehicle Manufacturing (ATVM) loans (Brown, 2012). The 1703 and the ATVM programs aimed to provide loan guarantees or direct loans respectively for new and upcoming technologies vulnerable to the valley of death in the innovation process. A key distinction of the 1703 program was that the developer was required to pay for the credit subsidies associated with the loan guarantee whereas Congress authorized public funding to cover a capped level of credit subsidies for the 1705 program to encourage higher uptake of the program. The credit subsidy functions as a premium paid as part of the transaction for receiving the security benefit that is generated by U.S. government backing to a loan. In 2009, the 1705 loan program was added to the Title VII program under ARRA and had wider goals to ease the credit constraints for clean energy technologies and to create shovel-ready jobs by focusing on already commercialized renewable energy, power transmission, and biofuel technologies (Mundaca and Richter, 2015). By adding a supplement to cover the credit subsidy, Section 1705 hoped to address tightening credit markets in renewable energy in the context of the 2009 financial crisis. All told, section 1705 committed funds to 28 projects (Brown et al., 2020). Section 1705 total loan or loan guarantees accrued to \$13.4 billion (Dinan, 2017).

Authorizing language for the programs have now, going forward, been revised to include new criteria. Among the changes are stipulations that adds language to add technologies that “utilize” anthropogenic emissions of greenhouse gases (e.g. CCUS) as well as language related to “projects that employ elements of commercial technologies in combination with new or significantly improved technologies” to facilitate guarantees for electricity storage and processes for reducing emissions from industrial applications. This policy brief explores what has worked and what has not, based on past experience from these loan programs and lessons from the private sector.

### **WHAT'S WORKED AND WHAT HASN'T WORKED**

We brought together former practitioners from the LPO program, key loan recipients, and other experts to participate in an off the record roundtable on the program’s weaknesses and strengths. We also analyzed the outcomes of selected projects on the basis of geographic distribution nationally, technologies deployed, emissions reductions, and job creation.

To date, the program’s success has largely been defined by the high percentage of loans that have been, or are being, repaid. As mentioned above, the 2009 ARRA created Section 1705, a loan program through which the DOE guaranteed loans to certain US-based clean energy projects that would commence construction prior to October 2011. In terms of the metric of repayment, the U.S. Department of Energy lists 16 outstanding Section 1705 loans for renewable energy (RE) generation projects with aggregated capacity of around 3.56 GW and generating capacity of about 8.6 TWh of RE annually on its website for the loan guarantee program. Additionally, three Title XVII loans have been

fully repaid, including one bio-energy project in Kansas, one concentrating solar project in California, and one wind energy project in Hawaii.

Overall, another eleven firms listed in the initial stages of the loan guarantee program discontinued participation, of which five dropped out before receiving disbursement of federal support. Loans guarantees related to six additional projects, including the infamous loan guarantees to solar manufacturers like Solyndra, were discontinued after part of allocated proceeds of a loan or loan guarantee were issued.

Under Section 1703, in February 2014, June 2015, and March 2019, a total of \$12 billion in loan guarantees were issued for the three principal partners to add two Westinghouse 100-MW AP 1000 next generation advanced nuclear reactors at the Waynesboro, Georgia-based Vogtle nuclear plant that has been in operation since the late 1980s. The original plans for the project had projected start-up dates in 2016 and 2017 but the project has faced numerous delays. Costs are estimated to have ballooned to \$27 billion. Original parties to the loans (which include Georgia Power Co. as the majority owner and borrower) are still the current partners. The Vogtle nuclear plant, which represents the largest allocation under the loan guarantee program, is expected to get one of its two planned units operational by 2022.<sup>1</sup>

### **A WIDER SET OF EVALUATION METRICS IS NEEDED**

One problem with focusing on repayment as the priority metric for program success is that it discourages the loan office from taking on more ambitious projects that might have higher technical risk. If too much attention is paid to avoiding the risk of payment default, then the other goals of loan guarantees related to promoting technology innovation and demonstration could be undermined. High risk can often be met with big wins such as the direct loan to Tesla for its Fremont manufacturing facility. Overall, evaluation of program success needs to consider the full range of projects that receive assistance and a willingness to stomach some failures along the way. Only by metrics that allow for failures, can the loan guarantee program raise its ambition to launch promising, cutting-edge technologies that might otherwise get short shrift if they have not already established a commercial track record. The government should not completely rule out experimental demonstrations, with the understanding that some projects may not succeed. One solution would be to allow government to tap royalties or equity stakes as part of the loan structure to allow taxpayers to benefit from successful ventures and thereby cover other losses from unsuccessful ventures (Mazzucato, 2015).

Moreover, additional attention needs to be given to other metrics of success of the loan guarantee program, including greenhouse gas reductions and elimination of other kinds of structural barriers to clean energy investment. The question should be asked whether the program is underwriting a sufficient portfolio of projects to address different kinds of structural problems such as the fair and equal distribution of the economic benefits of clean energy and related permanent jobs across a broad spectrum of U.S. geographies, income classes, race, and other equity metrics. One comprehensive survey from the National Renewable Energy Laboratory (NREL) regarding lessons from state level support for renewable energy – including loans and loan guarantees – concludes that “rigorous evaluation with clear and consistent metrics and performance targets is essential to shape program design, motivate performance, and monitor results” (Kubert and Sinclair, 2011). The same is almost certainly true for the federal level loan guarantee program.

The majority of Title XVII loans supported large utility scale solar installations. The Department of Energy in 2020 estimated that the program had cumulatively led to 60 million metric tons of CO<sub>2</sub>, a relatively small contribution to U.S. national carbon reduction. On a total emissions basis, these solar farms and other Title XVII plants represent avoidance of less than 1 percent of annual U.S. greenhouse gas emissions, according to Climate Policy Lab calculations. While this contribution might be considered relatively low, policy specialists argue that the focus on large-scale solar facilities helped the technology reach rapid scale-up. In a report published by the American Energy Innovation Council and Bipartisan Policy Center on the impact of ARRA finance on the role of demonstration

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1 <https://money.yahoo.com/1-more-delays-seen-southerns-135756478.html>

projects in the commercialization of new clean energy technologies, it was argued that it would have taken a longer time for the private sector to build its first large utility scale solar PV projects without the support of the loan guarantee program (Sivaram, 2020). Five of the Section 1705 projects — Agua Caliente, California Valley Solar Ranch, Mesquite Solar, Antelope Valley Solar Ranch and Desert Solar — were the first U.S. utility scale projects over 100MW to receive full financing and move to construction. All of the developers were large utilities. Together they received \$4.6 billion in loan guarantees for the construction of 1.5 GW of installed capacity. It is noteworthy that several of the ventures that propelled actual innovative technologies at large scale failed to succeed, while those still in successful operation revolved around the more relatively mature renewable energy developments of wind and solar PV.

Demonstrating the program’s success, in the post-Section 1705 period from 2012 to 2014, a boom in privately funded utility scale solar projects took place, with 17 new projects bringing total utility scale U.S. solar plants to 5.1 GW of installed capacity, representing over a 200% increase. Program advocates noted that lenders attained knowledge and experience under the reduced risk banner of the loan guarantee program and then felt confident to fund future projects without participation from the U.S. government (Sivaram, 2020). But critics argued that the side-by-side existence of the Section 1705 credit subsidies with the existing 1603 grant program (which allowed for renewable energy developers to convert investment tax credits of up to 30% of a project’s investment cost into a grant) created distortions such as excessive subsidy effects and too low a commitment of equity investment by private developers (de Rugy, 2012). In some cases, the combination of the Section 1705 financing terms and the 1603 grant encouraged parties to use the loan guarantee program for projects that would have moved ahead without government guarantees, in effect, using the program to “refinance” at lower costs. The estimated internal rate of return (IRR) for the Shepard’s Flat wind development and some of the Section 1705 solar projects were estimated at above market for rate of return, in effect creating a corporate windfall. Going forward, further analysis of the appropriate level of end IRR above market rates needed to encourage rapid investment would be beneficial.

Notably, reflecting the difficulties still encountered in the clean energy sector, even with preferential financing condition, seventeen projects with outstanding loans, totaling almost \$25 billion, continue to pay back loan guarantees, but in a majority of cases are doing so while churning through changing ownership structures via mergers or acquisitions. In one case, the venture stayed afloat by abandoning experimental technology in favor of a more proven geothermal solution. This high incidence of ownership volatility merits further consideration. Over the past decade, 11 of the 17 projects with outstanding Title XVII loan guarantees have undergone transactions that altered their ownership structure since the time of the original application, according to Climate Policy Lab analysis. The causes of each project’s ownership changes appear to be sui generis but the pattern merits consideration. Private equity firms tend to have shorter investment horizons than energy development time frames of ten to twenty years while their clients, often pension funds and family offices, have longer-range, more patient capital. Considering how to match long payout energy infrastructure opportunities with long duration investors from the start might reduce the risk of default or failure to close. Several ventures wound up with new shareholders to include large consolidation players such as NextEra, Warren Buffett’s Berkshire Hathaway, Toronto-based Brookfield Renewable Partners and Macquarie Group Ltd. Figure 1 shows the breakdown by kind of company for energy generation plants that received section 1703 and section 1705 loan guarantees.

**Figure 1: Loan Distribution by Type of Company, December 2010 – February 2014**

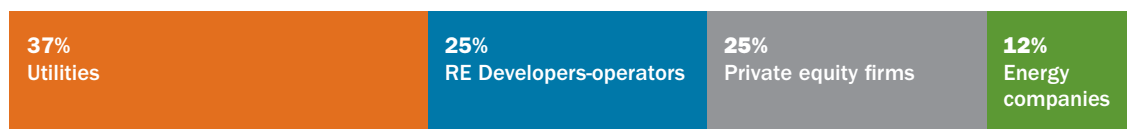


Chart represents kinds of companies that had an ownership stake in each of the energy plants receiving loans.

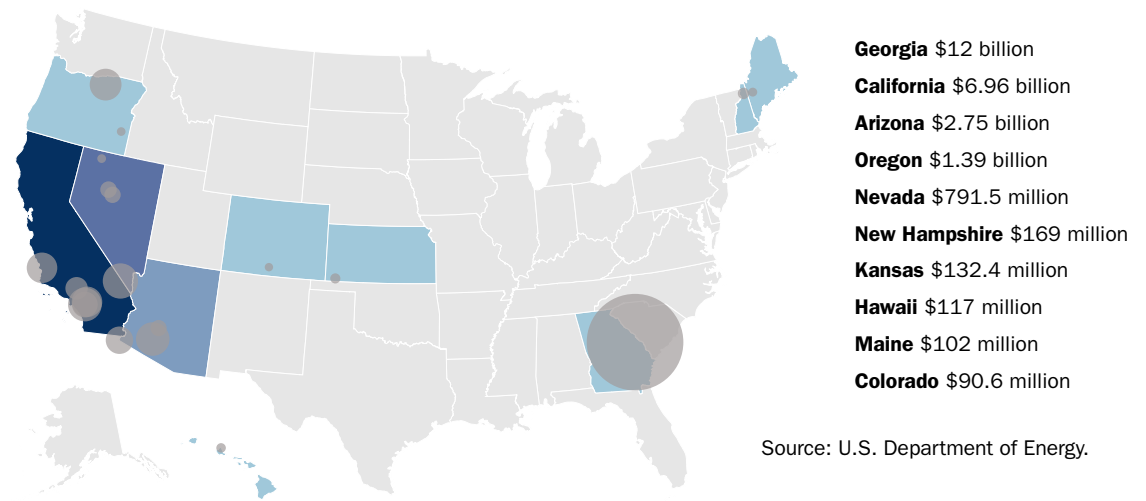
In seven of the 16 outstanding loans for renewable energy plants, withdrawing partners turned to foreign entities to sell their shareholding. That means the DOE is relying on foreign-based firms to repay a long-duration U.S. government loan. In addition, some of the economic benefit of the profitable returns on the revenue of the projects and when applicable, possibly intellectual property ownership, is moving offshore outside the U.S. economy. Of the eight firms with at least partial ownership by companies with foreign ownership, partners include companies from Canada, Australia, South Korea, Japan, and the U.K.

Some improvements to the loan guarantee program have been made in recent years. Secretary of Energy Jennifer Granholm has proposed reforms to limit the number of similar kinds of projects that can be launched in a particular geography to try to widen the beneficial impact of the program to a broader base on locations. The Section 1705 renewable power ventures receiving DOE loan guarantees is indeed notable for its high concentration in the western United States, based on desirability for solar radiation but perhaps ignoring other political and social factors in how to direct the benefits of the program. Figure 2, compiled by Climate Policy Lab, illustrates that federal loan guarantee dollars were highly concentrated in California, Arizona, Oregon, and Nevada. However, adjustments to the program will need to consider not only geographical equity, but other objectives that may, at times, work at cross purposes (Newell, et al., 2019).

**Figure 2: Power plants and loans distribution, December 2010 – February 2014, in USD**

Map bubbles represent power plants, sized according to the loan amount from the Department of Energy.

Total loan amount, by state.



The question of fees associated with the loan guarantee program remains an area of controversy. For example, a broad study on direct loan programs for renewable energy critiques the loan guarantee 1705 program for subsidizing the credit subsidy fee imposed on borrowers in other traditional loan guarantee programs. The study argues that subsidizing the credit subsidy fee increases dependency on private lenders to assess loan decisions, thereby potentially imposing higher risk exposure for the federal government similar to that of an outright grant and thereby defeats the risk reduction purpose of only offering a loan “guarantee” (Kubert and Sinclair, 2011). The study also notes that the 2009 ARRA legislation, by allowing both a credit subsidy fee and use of other federal tax credits, lets the government program assist rather than compete with private sector lenders, in effect loosening credit. In practice, the complexity of such arrangements opens the risk of double-dipping that could in effect inadvertently permit a borrower to achieve market rate of return outcomes higher than necessary to get the project finance over the finish line (Newell et al., 2019). Still, other evidence suggests that subsidizing the credit subsidy fee is critical to providing more loans to ventures of varying sizes and scale, including smaller projects, that could be beneficial to the program’s outcomes for metrics other than repayment. Only very large entities typically can field large direct costs and extensive paperwork associated with



participating in a federal loan guarantee program. Continuing to underwrite the credit subsidy fee, but focusing that underwriting on firms that meet other metric criteria related to diversity, geography, scale, and permanent jobs, could be beneficial to broader outcomes for the program. By way of comparison, analysis of loans offered via the Small Business Administration (SBA) reveals the loans contributed to firm success, offering lessons for the loan guarantee program. Bachas (2021) found that loan guarantees to young firms increased the lending supply available to them significantly and provided credit to borrowers who might not otherwise have been able to attain funding. That study is consistent with findings from Howell (2017) that found that early-stage grants via the Department of Energy's Small Business Innovation Research (SBIR) program have significant positive effects on patent production, access to finance, revenue, and survival of high-tech energy start-ups. That study found that grants served to make the firm more investable by, in effect, lowering technology uncertainty — a goal consistent with the aim of the LPO loan guarantee program. Howell and other scholars argue that small sums of capital provided to many companies along the renewable energy innovation value chain has been a successful policy.

The successful experience of the SBA and SBIR programs, albeit quite different from the loan guarantee program, raises questions about whether the DOE could do more to widen the program beyond large-scale, well-financed firms that, it has been argued, might be seeking cheaper finance but could have been able to finalize their projects in private markets in any case. That has led some scholars to argue that support for different kinds of entities is preferable to choices by DOE LPO to allocate large sums of money to large developers deploying in large measure already commercialized technologies (Bumpus and Comello, 2017). Others argue that future metrics should more strictly target emerging technologies (Cunliff, 2020). One economic modeling study on renewable energy finance argued that loan guarantees are “particularly effective” for promoting inclusion of non-traditional sources of power generation (Krupa and Harvey, 2017).

Another question for the next phase of loan guarantees for clean energy is how strong a focus should be on innovation as opposed to rapid acceleration of proven technologies. Clements and Sims (2010) argue that loan guarantees play an important role in spurring experimentation and innovation by helping firms avoid the ‘valley of death’ in the innovation process. Shi et al. (2016) found that loan guarantees were useful in increasing the uptake of off-grid rural energy where a guaranteed market for power generated was locked in. Both firms receiving ATVM loan guarantees have fully repaid, and early investors in Tesla credit the program for the firm's current success.

In recent months, the Biden administration has announced new initiatives to widen the loan guarantee program to cover up to \$5 billion in loans to enhance long-range transmission projects and \$8.5 billion in funding for deployment of carbon capture technology “to enable low carbon manufacturing of cement, steel, and other industrial products in addition to power plants.”<sup>2</sup> In March 2021, Energy Secretary Jennifer Granholm announced a 30 GW deployment target for offshore wind by 2030. DOE's loan programs office will offer up to \$3 billion in funding under Title XVII to cover developers, suppliers, and other offshore wind financing partners.<sup>3</sup> In addition to these announcements, the “fact sheet” of the Biden administration's 100-day battery supply chain review mentions the Advanced Technology Vehicles Manufacturing Loan Program (ATVM), which aided the launch of Tesla's manufacturing facility in the United States. DOE Loan Program Office published guidance clarifying the uses of the ATVM program, which has \$17 billion in loan authority. LPO stated the ATVM program can “make loans to manufacturers of advanced technology vehicle battery cells and packs for re-equipping, expanding or establishing such manufacturing facilities in the United States.”<sup>4</sup>

It is the stated desire of the new Administration to commit 40 percent of clean energy funds to disadvantaged communities and to increase enforcement against major polluters in fence line communities of economically disadvantaged and diverse composition. It is unclear how this intention

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2 <https://www.energy.gov/articles/doe-announces-1095-million-support-jobs-and-economic-growth-coal-and-power-plant>

3 <https://www.energy.gov/articles/energy-secretary-granholm-announces-ambitious-new-30gw-offshore-wind-deployment-target>

4 [https://www.energy.gov/sites/default/files/2021-06/DOE-LPO\\_Program\\_Handout\\_Critical\\_Materials\\_June2021\\_0.pdf](https://www.energy.gov/sites/default/files/2021-06/DOE-LPO_Program_Handout_Critical_Materials_June2021_0.pdf)

will be integrated into the loan guarantee program. For the historical LPO program, the chief executive officers of ventures that received over \$1 billion were all men, according to Climate Policy Lab analysis. Two companies among the 17 outstanding Title XVII loan guarantee recipients currently have women CEOs. C-suite leadership and board of director representation from underrepresented groups is relatively low across the majority of companies receiving loan guarantee commitments. Generally speaking, many of the firms involved in the loan guarantee program are making an effort to develop environmental, social and governance (ESG) reporting and to promote diversity and inclusion policies. A deeper dive prospectively into who benefits from these projects and reporting on diversity and inclusion policies of loan guarantee applicant entities could be beneficial to future outcomes. This should include reinvigoration of the Title XVII “Tribal Energy Program” that targets clean energy projects by Native Americans or Alaskan indigenous corporations.

## RECOMMENDATIONS

- Develop a clearer set of guidelines to determine concrete metrics for what is a successful program that goes beyond repayments of individual loans. Redefine how goals related to innovation, technology scale-up, emissions reductions, and job creation are measured and evaluated, recognizing that in practice, in evaluating a hierarchy of objectives, choices might have to be made in cases where some of these goals could work at cross purposes with other of the delineated goals.
- Create an active marketing plan to generate interest in the program from a wider constituency, including firm size, geographically, and among entrepreneurs, financiers, and businesspeople from underrepresented groups. Private financial firms have succeeded in promoting diverse and inclusive leaderships into their portfolio of funded ventures by proactively visiting university communities and other innovation clusters to familiarize potential applicants with the opportunities for funding and the goals of investors.
- Further streamline paperwork required to prove qualification for the program and subsequent reporting. Startup ventures often lack manpower to meet the scale and deadlines of paperwork required to attain a DOE loan guarantee, and the burden of the application process is one factor leading to concentration of the number of firms involved in the program and their size. In particular, experts suggest that the program should be adjusted to shorten the timeline for notification that a venture will not qualify for a loan or loan guarantee.
- Consider mechanisms that would facilitate smaller awards to a larger number of firms to avoid concentration of participation to a small handful of well-financed large entities
- Restructure how responsibility for credit subsidy costs is handled to promote broader program participation of diverse and different sized firms, looking more critically at which firms can absorb partial or full payment of credit subsidy costs and still reach a commercially representative rate of return for the life of the project.
- Evaluate the existing program to determine why ownership changes have been so frequent and to determine whether new rules or criteria are needed for ownership structures to receive a federal loan guarantee.
- Move away from proactively prioritizing shovel-ready projects as a key criterion. Emphasis on rapidly deployable, shovel ready projects has been shown less effective in creating sustained dignified jobs for American workers due to the temporary nature of construction jobs promoted via shovel-ready strategies. Federal loan guarantees should seek more projects that will generate new skilled labor, training, and workforce development in emerging technologies that are geographically dispersed across the United States.
- Consider the composition of boards of directors of firms applying for federal loan guarantees. A transparent process that requires regular reporting of diversity and inclusion performance of firms’ board of directors will raise visibility to the issue and should be part of the reporting data required and collected by DOE. Such standards are now being considered by NASDAQ and other entities adopting diversity and inclusion requirements. ✨

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