US PREF
U.S. Partnership for Renewable Energy Finance

The Importance of the Loan Guarantee Program in Financing Innovative Renewable Technologies

Executive Summary

New energy technologies often have difficulty advancing from pilot / demonstration scale to full commercial maturity. Financing needs can exceed what is available from government grants and venture capital sources and, because a technology is unproven at a commercial scale, it cannot attract traditional private lenders and equity investors.

This period in the development of a technology is often referred to as the "valley of death". The availability of the Department of Energy's Loan Guarantee Program ("the program" or "the loan guarantee program") with federal payment of the credit subsidy charge plays a critical role in supporting technologies vulnerable to the "valley of death". As of January 2011, the loan program has provided conditional commitments to 11 innovative renewable energy projects, with most deals completed in the second half of 2010 and early 2011. Though this marks significant progress, the program is only now starting to fulfill its potential of providing critical funds to help innovative technologies break through this difficult "valley of death" period.

However, with its scheduled September 2011 expiration, the loan program will soon lose much of its effectiveness – and the U.S. will lose a main tool for developing important innovative energy technologies.

Background

The Department of Energy's (DOE) loan guarantee program is currently the United States' main policy tool for addressing a fundamental impediment to growing the clean energy economy: the "valley of death". The "valley of death" is a form of market failure that occurs when promising technologies fail to reach the commercial marketplace because of the large amount of upfront capital required to demonstrate commercial viability.

Originally passed under of the 2005 Energy Policy Act for a broad range of innovative technologies, the program was given $6 billion by Congress under the 2009 Recovery Act to cover project sponsor credit subsidy costs – the expected long-term liability to the government to issue the loan guarantee – for innovative renewable, commercially proven renewable, and transmission projects.[1] This paper will principally focus on the support for innovative renewable projects.

Since passage of the Recovery Act, Congress has removed $3.5 billion of the original $6 billion in credit subsidy funding. The remaining $2.5 billion credit subsidy funding is set to expire on September 30, 2011. Project sponsors that start construction after this time will have to self-pay the credit subsidy costs in order to receive a loan guarantee. Depending on the project size, the sponsors would be forced to contribute substantially more equity, which will result in lower projected returns and thus significantly reduce the likelihood of project completion (see Figure 3 on the following page).

[1] Credit subsidy payments are required under the 1990 Federal Credit Reform Act for any government loan program.

With the inclusion of the credit subsidy charge in the overall cost of an innovative renewable project, DOE and project sponsors will have a difficult time finalizing agreements on any projects that start construction after September 2011, and the program will lose much of its effectiveness. Without a continued recognition on the part of policy makers on the need to address the "valley of death" – either by providing additional federal funds for the credit subsidy or by creating a new Clean Energy Deployment Administration (CEDA)[2] – the country's ability to commercialize new renewable technologies is in question.

The Clean Energy Development Chain

The loan guarantee program with federally funded credit subsidy costs directly addresses the "valley of death" problem by focusing on a particular stage in the lifecycle of a technology – "diffusion / commercialization" – not addressed by other financing mechanisms – either public or private (see Figure 1). [3]

With the loan guarantee program's credit subsidy funding in place, public and private financing opportunities are available for each stage of the development chain. From the "R&D" stage through the "Pilot Facility" stage (Stages 1-3 in Figure 1), government, venture capital, and universities have funding available to support promising technologies. DOE's ARPA – E program, for example, received $400 million from the Recovery Act to spur early stage clean energy technologies. Venture capital has also been a major source of funding for these earlier stages of clean energy technology development. For example, in 2010, venture capital funds invested $3.7 billion in renewable and clean technology companies, which was up from $2.1 billion in 2009.[4]

When a technology has reached commercial deployment (Stage 5), public and private funding opportunities are also available. From the public sector, the investment tax credit / 1603 cash grant has been extremely successful in leveraging private funding sources to drive deployment of established wind and solar technologies.[5] Similarly, the 48c investment tax credit has helped bring private capital to the renewable manufacturing sector. From the private sector, the project debt market – after slowing considerably in the wake of the financial crisis – has started to return.

Stage 4 – the "diffusion / commercialization" – stage is the most financially challenging. As noted above, prior to this stage, a technology – as a result of VC and / or public sector investments – has shown its effectiveness at smaller scales. After this stage, private lenders and equity providers have a proven concept to provide Stage 5 commercial financing.

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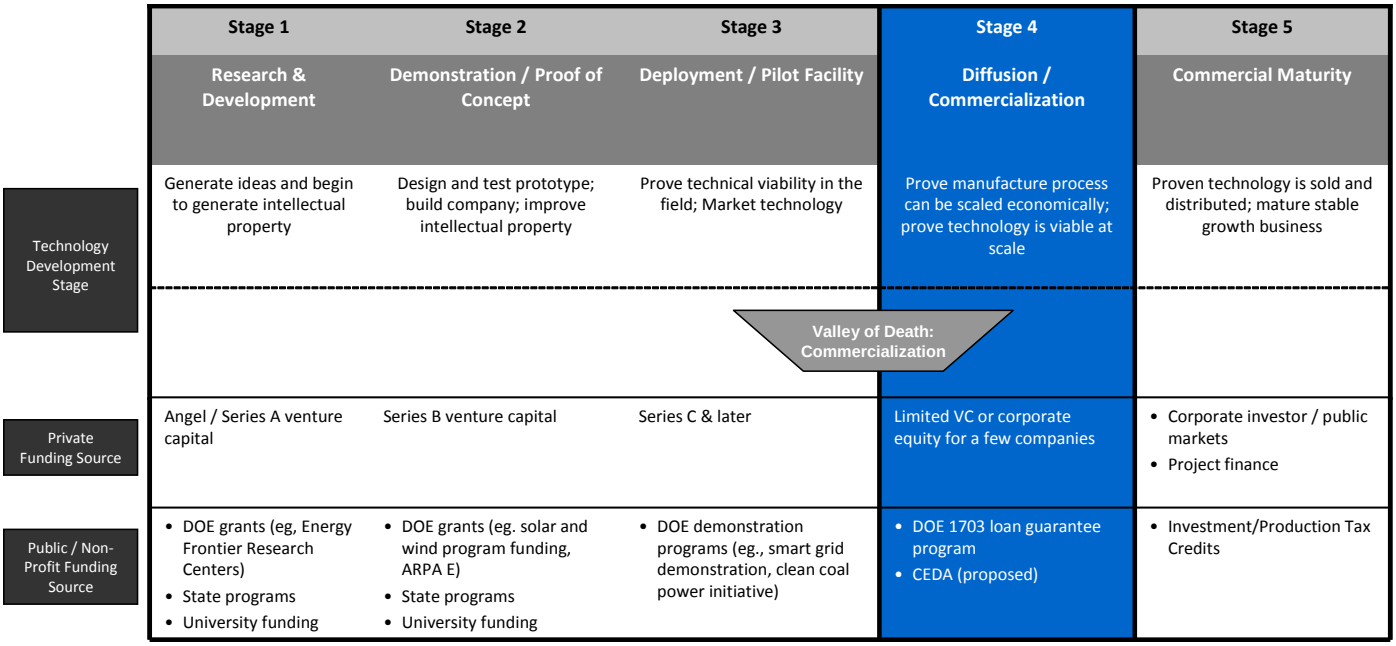
[2] See US PREF, "CEDA Analysis", April 2010. www.uspref.org/white-papers. CEDA would have a broader set of tools than the loan guarantee program, but would have many of the same goals.

[3] Depending on the type of project, DOE will actually issue direct loans from the Federal Financing Bank, instead of guaranteeing private debt.

[4] Data from study by Thomson Reuters and PricewaterhouseCoopers and found at http://greenenergyreporter.com/funding/u-s-green-companies-raise-3-7b-in-venture-fund-in-2010/#more-13181

[5] In December 2010, the 1603 cash grant program was extended. Projects that start construction prior to 12/31/2011 and achieve commercial operation by 12/31/2012 (wind) or 12/31/2016 (solar) will qualify.

Figure 1: The Clean Energy Development Chain[6]



At Stage 4, financing must be available to show that the technology is technically, operationally, commercially and financially viable at utility scale. The challenge of Stage 4 is that to demonstrate this viability requires commercial levels of capital (often hundred of millions of dollars) without the proven concept needed to engage private lenders and equity providers on commercial terms, even with the available tax incentives. Figure 2 lists some important renewable technologies currently at or anticipated to be at Stage 4 of development in the next three years.

Figure 2: Selected Renewable Technologies at or Near Stage 4

Technology	Potential Breakthrough	Impediment to Commercial Maturity
Concentrating Solar – Power Tower	Uses low-cost off-the-shelf mirrors, as opposed to the engineered trough mirrors in traditional concentrating solar	Only demonstration-sized plants in operation – no examples of technology at utility scale
Advanced Solar Manufacturing	Significant cost and efficiency breakthroughs in solar manufacturing have been demonstrated at smaller scales	Building a full-scale manufacturing facility to realize breakthroughs requires significant capital
Offshore Wind	Northeast US has significant offshore wind resources	Successful European deployment model has yet to be demonstrated in the US
Engineered Geothermal	Opportunity for baseload renewable technology in a wide variety of locations	Only demonstration-sized plants in operation – no examples of technology at utility scale
Energy Storage	Storing power during low demand hours allows utilities will reduce reliance on less efficient units during high demand hours	Only demonstration-sized plants in operation – few examples of technology at utility scale[7]

[6] US PREF, "CEDA Analysis", April 2010. www.uspref.org/white-papers and adapted from Bloomberg New Energy Finance.

[7] First Wind's Kahuku Wind Farm in Hawaii, which is expected to begin commercial operation in February 2011 with the support of a DOE loan, utilizes a 10 MW battery storage system to manage fluctuations in wind power output.

Financial Impact of Credit Subsidy Provision

The loan guarantee program with federal payment of the credit subsidy costs is currently the main financial tool for progressing technologies through this critical "valley of death". Under current legislation the federal payment of the credit subsidy cost is not available to renewable projects that begin construction after September 2011. The impact of this expiration on project costs essentially eliminates the loan program as a financing tool for Stage 4 renewable technologies.

Figure 3 on the following page illustrates the impact that the subsidy payment can have on a project, in this example a 100 MW solar project typical of a Stage 4 project. In the example, when the federal government pays the credit subsidy cost, the net amount of equity a project sponsor needs to provide is $80 million. The balance of project costs, net of the ITC/cash grant, are paid back to the lender (in this case, the government) as in any traditional project finance transaction.

By contrast, after September 2011, when the federal government stops paying for the credit subsidy, the project sponsor will need to provide $110 million of net equity, assuming a credit subsidy rate of 15%.[8]

Depending on a variety of other factors, requiring the project sponsor to self-pay the credit subsidy cost would substantially reduce the internal rate of return on a project. In the solar example above, the project would be expected to generate a 15% return with the credit subsidy, however, without the subsidy, the same project would be expected to generate a 9% return, a difference of 600 basis points.

Innovative projects already face significant financial pressures, including the risk of commercializing early technologies as well as the downward price pressure on electricity as a result of current (and projected future) low natural gas prices. Many project sponsors, when faced with the additional pressure that high credit subsidy costs place on financial returns, would not likely proceed with their projects. [9]

[8] The Department of Energy does not make the credit subsidy amount public. This 15% estimate is based on anecdotal evidence of recent deals. Some credit subsidy scores are reported to be as high as 20%.

[9] Credit subsidy rates significantly lower than 15%-20% would obviously improve the financial prospects of projects, assuming the sponsors were to pay the credit subsidy. Equally important, lower credit subsidy rates would help reduce the level of overall policy support needed to actually realize the investments. However, the origin and basis for the Office of Management and Budget (OMB) credit subsidy calculation is not clear. An empirically based estimate of the expected default rate and costs of qualifying clean technology projects could produce lower credit subsidy costs.

Figure 3: Equity Required With and Without Credit Subsidy Payment (Illustrative Solar Project)

	Government Pays Credit Subsidy	Sponsor Pays Credit Subsidy
Plant Size (MW)	100	100
Capital Cost ($4 million/MW)	$400 million	$400 million
Loan Amount (50% of capital)	$200 million	$200 million
Credit Subsidy (15% of loan, paid by project sponsor)	$0	$30 million
Total Capital Required	$400 million	$430 million
Less Investment Tax Credit (30% of construction costs) or Cash Grant[10]	($120 million)	($120 million)
Total Capital Less ITC/Cash Grant	$280 million	$310 million
Total Equity Required (net of ITC/Cash Grant)	$80 million	$110 million
Illustrative Internal Rate of Return	**15%**	**9%**

There is also some empirical evidence to show the difficulty of closing a loan guarantee without government funding for the credit subsidy. Of the 18 loan agreements announced as of January 2011 (see Appendix A), many more (14) are for projects eligible to receive the credit subsidy than those not eligible (4). Moreover, four of the loan agreements have fully closed, but no loans have yet closed where the sponsor is required to self-pay the credit subsidy.

Steps Required for Finalizing Loans

One argument against the extension of the credit subsidy is that the Department of Energy has already had enough time to spend the funds. However, the original $6 billion in funding – and even the $2.5 billion it has been reduced to – is more than could have been spent in the two plus years that the Recovery Act provided.

Each of these newer, innovative technologies has challenges that make immediate implementation difficult. These challenges include:

Need to show the viability of the technology. Large-scale innovative projects may not be ready for a loan guarantee if they have not fully proven technology viability at a smaller scale. For example, developers of concentrating solar technologies have only recently demonstrated the commercial viability of certain solar power tower technologies, as well as molten salt storage techniques.

Requirement for some projects to secure Department of Interior (DOI) permits. Those solar facilities located on federal lands require permits from the Bureau of Land Management. Offshore wind projects leasing federal waters require permits from the Bureau of Ocean Energy Management, Regulation and Enforcement (the successor to the Minerals Management Service). DOI's process for awarding permits appears to be significantly improving, but it has been a source of delay for projects to date.

Completion of agreements with engineering, procurement and construction (EPC) vendors. Because of the innovative nature of the technologies, EPC agreements may take more time to negotiate than a standard agreement covering, for example, a traditional wind farm.

[10] Assumes project sponsor is able to monetize the Investment Tax Credit or 1603 Cash Grant Program is extended.

Beyond the project development challenges, each project presents a unique credit story, which DOE must understand and review project-by-project. In traditional private sector project financings, a thorough credit review is an important aspect of the process. But DOE has the added challenge of understanding the elements of the project that make the project difficult to finance in the private sector, whether those challenges are financial, technical, environmental, or something else.

The Need to Give the Program Time to Work

The loan guarantee program has not fully spent awarded funds, which is why $3.5 billion of the original appropriation has been removed from the program. But the reason it has not spent these funds is that it was expected to deploy capital more quickly than could have been reasonably expected given the customized nature of each deal (this is in contrast to the cash grant program, which has a more standardized structure).

In reality, the loan guarantee program is less of a short-term stimulus program, and more of a program designed to bring the benefits of renewable technology to the U.S. in the medium- and long-term. Congress, by giving projects some additional time to develop, would allow these new technologies to continue to mature.

The Loan Program's Current Successful Model

Despite these constraints, DOE's Loan Programs Office has started to make significant progress. As of January 2011, the loan office has closed or provided conditional commitments to 13 renewable projects (of which 11 are innovative projects and two are commercial projects), and one additional transmission project (see Appendix A). The pace of these awards has quickened significantly, with 11 of the 14 commitments occurring since June 2010. The faster output is likely due to the growing experience of the loan office in managing the transaction process. In addition, because more loan guarantee eligible projects are advancing in the development process, the loan office has stronger projects with which to work.

The loan program has also now solidified its mission. In the wake of the financial crisis and the collapse of commercial project debt markets, the loan program was an important vehicle for both innovative and commercial renewable projects. Now that project debt markets for commercial renewable technologies have – to a meaningful extent – recovered, the loan program can focus its mission on providing debt finance to the innovative projects that would not otherwise have access to commercial project debt markets.

An Important Role for the Federal Government

Another argument against the loan guarantee program is that, even if a market failure exists in commercializing energy technologies, the U.S. government should still rely solely on the private sector to decide which technologies are ultimately successful.

The problem with this argument is that most of our current energy technologies exist because the U.S. government, at a key stage in these technologies' development, helped them cross the "valley of death".

The government's role in the development of the post-war nuclear industry (which included loan guarantees) is the most prominent example, but government support has also been critical in the deployment of a number of current electricity technologies, including for fossil fuels.

These initial investments, some made generations ago, are now "paid off" – and thus part of the reason that newer technologies are more expensive than the existing grid infrastructure.

Figure 4 below summarizes some examples of key government intervention in the energy sector. Some of these investments were made with the direct goal of deploying new electricity technology (e.g. hydro power), while other investments were made for military purposes (e.g., jet engines) but led to the eventual deployment new energy technologies.

Figure 4: Government Involvement in Bridging the "Valley of Death"

Technology / Innovation	Government Program(s)	Time Period
Civilian Nuclear Power	▪ Atomic Energy Commission ▪ Price Anderson ▪ Nuclear navy procurement of nuclear submarines	1940s – 1950s
Hydro-Electric Power	▪ Federal Power Commission ▪ Bonneville Power Administration ▪ Bureau of Reclamation	1920s-1940s
Gas Turbine / Aero-Derivative Commercialization	▪ US Military procurement of jet engines	1940s-
Natural Gas Combined Cycle Commercialization	▪ Public Utility Regulatory Policies Act (PURPA) compelling utilities to buy from co-generation facilities ▪ FERC Order 888 allowing independent generators open access to transmission	1970s-1990s
Build out of transmission and distribution infrastructure	▪ Rural Electrification Administration	1930s-1940s

The loan guarantee program, in spurring a new generation of energy innovation, is thus well within the tradition of U.S. government support of the energy sector.

Funding Requirements

One of the particular strengths of the loan program is that it is cost effective. Providing loans to a few breakthrough projects in each sector can spur a technology well down the commercialization path. Even if Congress were to provide only a portion of the $3.5 billion removed from the program, the funding would make an important impact to the future of energy innovation.

Conclusion

With the expiration of the loan guarantee program's credit subsidy funding in 2011, the U.S. loses its main tool for assisting promising technologies in crossing the "valley of death". Letting this funding expire – especially at a time when the Department of Energy appears to be productively assessing and processing applications – would likely stop the commercialization of a number of promising technologies in their tracks. Continuing the funding – or transferring the funding to a new Clean Energy Deployment Administration – would give clean energy entrepreneurs and developers a path forward to bring their technologies into the mainstream.

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ABOUT US PREF

The objective of the US Partnership for Renewable Energy Finance (US PREF) is to unlock capital flows to new, large-scale and distributed renewable energy projects in the United States. To achieve this objective, a balanced and credible group of highly experienced renewable energy financiers from financial institutions, investors, professional services firms, utilities and others have convened as US PREF. US PREF, founded in 2009 with support from the consulting firm GreenOrder, is a program of the American Council On Renewable Energy (ACORE), a Washington, DC - based 501 (c)(3) non-profit organization whose mission is to bring renewable energy into the mainstream of the US economy and lifestyle through research, education, convening, and communications.

Appendix A: Loan Guarantee Agreements as of January 2011[11]

Loan Guarantee Agreements Eligible for Credit Subsidy Funds

Company	Technology	Loan Amount	Agreement Date	Location	Status
Abengoa Solar, Inc.	Concentrating Solar	$1.45 billion	Jul-10	Gila Bend, AZ	Closed
Abound Solar	Solar Manufacturing	$400 million	Jul-10	Longmont, CO Tipton, IN	Closed
AES Corporation	Energy Storage	$17 million	Jul-10	Johnson City, NY	Closed
Beacon Power Corporation	Energy Storage	$43 million	Aug-10	Tyngsboro, MA Stephentown, NY	Closed
BrightSource Energy, Inc.	Concentrating Solar	$1.4 billion	Feb-10	Oakland, CA Baker, CA	Conditional Commitment
Caithness Shephards Flat*	Geothermal	$1.3 billion	Oct-10	Gilliam and Morrow Counties, OR	Closed
Diamond Green Diesel	Renewable Diesel	$241 million	Jan-11	Norco, LA	Conditional Commitment
Kahuku Wind Power, LLC.	Wind + Storage	$117 million	Jul-10	Boston, MA Kahuku, Oahu, HI	Closed
LS Power	Transmission	$350 million	Oct-10	Ely to Las Vegas, NV	Conditional Commitment
Nevada Geothermal Power Company	Geothermal	$78.8 million	Sep-10	Humbolt /county, NV	Closed
Nordic Windpower USA, Inc.	Wind Manufacturing	$16 million	Jul-09	Berkeley, CA Pocatello, ID	Conditional Commitment
NRG Energy, Inc. Agua Caliente	Solar PV	$967 million	Jan-10	Yuma County, AZ	Conditional Commitment
Solyndra Inc.	Solar Manufacturing	$535 million	Sep-09	Fremont, CA	Closed
US Geothermal, Inc.*	Geothermal	$102.2 million	Jun-10	Boise, ID Malheur County, OR	Conditional Commitment

* Made under Financial Institutions Partnership Program for Commercial Renewable Technologies

[11] Loan Guarantee Program Website (http://lpo.energy.gov/?page_id=45)

Loan Guarantee Agreements Not Eligible for Credit Subsidy Funds

Company	Technology	Loan Amount	Agreement Date	Location	Status
Georgia Power Company	Nuclear Plant	$8.33 billion	Feb-10	Atlanta, GA Tucker, GA Waynesboro, GA	Conditional Commitment
AREVA	Uranium Enrichment	$2 billion	May-10	Idaho Falls, ID	Conditional Commitment
Red River Environmental Products, LLC	Carbon Manufacturing	$245 million	Dec-09	Littleton, CO Coushatta, LA	Conditional Commitment
SAGE Electrochromics, Inc.	Efficient Windows	$72 million	Mar-10	Faribault, MN	Conditional Commitment