

Leveraging State Clean Energy Funds for Economic Development

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Summary

State clean energy funds (CEFs) have emerged as effective tools that states can use to accelerate the development of energy efficiency and renewable energy projects. These clean energy funds, which exist in over 20 states, generate about \$500 million per year in dedicated support from utility surcharges and other sources, making them significant public investors in thousands of clean energy projects. However, state clean energy funds' emphasis on a project finance model—which directly promotes clean energy project installation by providing production incentives and grants/rebates—is by itself not enough to build a statewide clean energy industry. State clean energy funds also need to pay attention to other critical aspects of building a robust clean energy industry, including cleantech innovation support through research and development funding, financial support for early-stage cleantech companies and emerging technologies, and various other industry development efforts.

As it happens, some of these state clean energy funds are already supporting a broader range of clean energy-related economic development activities within their states. As more and more states reorient their clean energy funds from a project finance-only model in order to encompass broader economic development activities, clean energy funds can collectively become an important national driver of economic growth.

To become true economic development engines in clean energy, state clean energy funds should:

- Reorient a significant portion of their funding toward clean energy-related economic development
- Develop detailed state-specific clean energy market data
- Link clean energy funds with economic development entities and other stakeholders in the emerging industry
- Collaborate with other state, regional, and federal efforts to best leverage public and private dollars and learn from each other's experiences

Introduction

Washington is again paralyzed and pulling back on clean energy economic development. New funding solutions seem unlikely and existing financial supports appear tenuous, given that many of the federal tax incentives, subsidies, and loan guarantees made available through the 2009 stimulus law and elsewhere are set to expire.²

All of which raises a daunting question: If the country is to take advantage of the economic, environmental, and health benefits of clean energy, how will its development be financed, its emerging companies be supported, and its markets be structured—and who is in the best position to decide and act?

“State clean energy funds hold out tremendous promise for the continued design and implementation of clean energy solutions and economic development.”

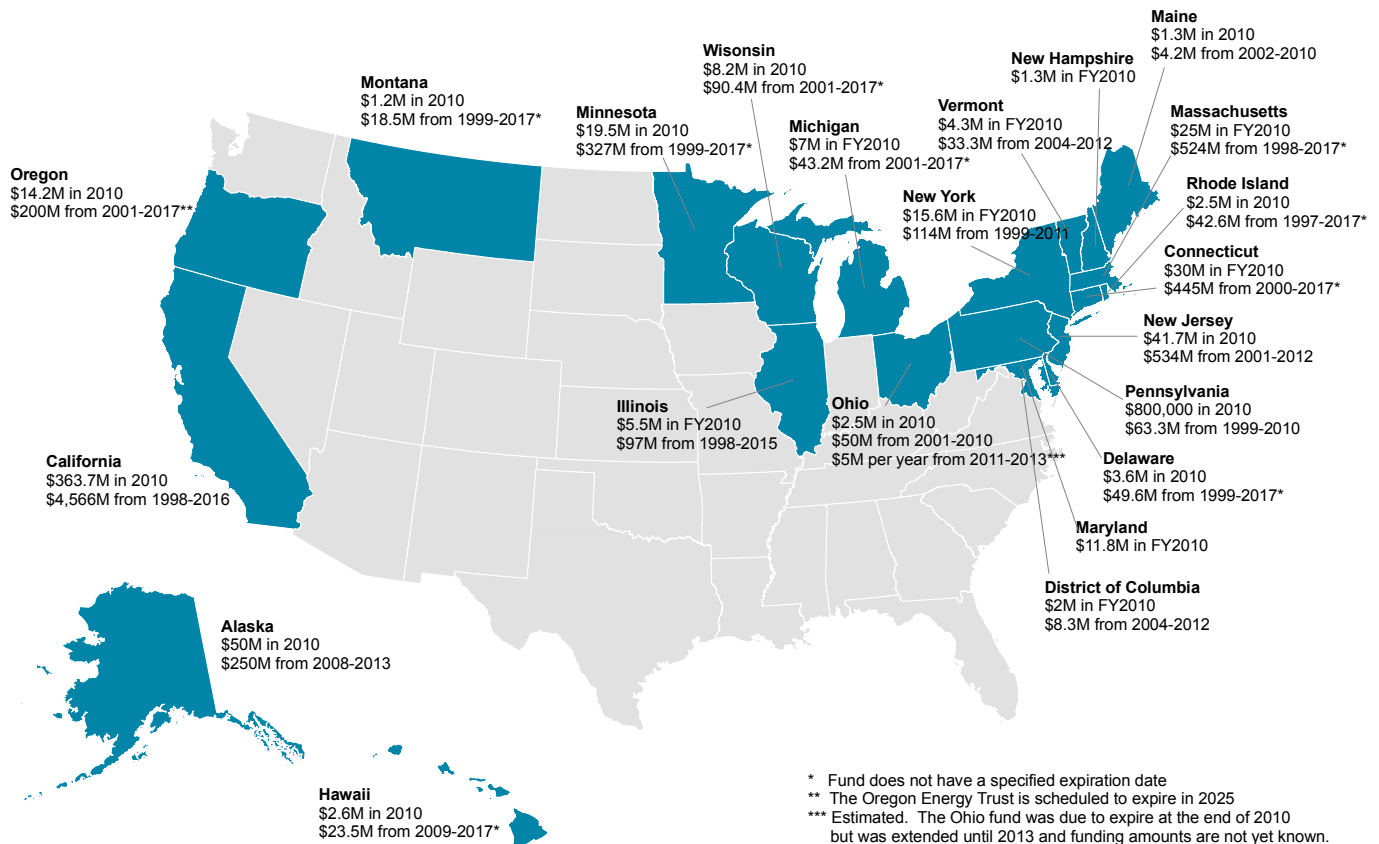
And yet, there is actually a promising partial answer to that question. With federal clean energy activities largely on hold, U.S. states hold out tremendous promise for the continued design and implementation of clean energy solutions and economic development.

State governments led the nation's initial responses to the challenge of energy system transformation a decade ago and since then have developed a broad array of cleantech development tools, ranging from financial support tools and net metering to incubators, cluster supports, and workforce training.

Among the states' initiatives, meanwhile, the nearly two dozen state-side clean energy funds (CEFs) stand as one of the most important clean energy forces at work in the nation—yet they remain little-known.

To date, over 20 states have created a varied array of these public investment vehicles to invest in clean energy pursuits with revenues often derived from small public-benefit surcharges on electric utility bills.³ Over the last decade, state CEFs have invested over \$2.7 billion in state dollars to support renewable energy (RE) markets while leveraging another \$9.7 billion in additional federal and private sector investment, with the resulting \$12 billion flowing to the deployment of over 72,000 projects in the United States ranging from solar installations on homes and businesses to wind turbines in communities to large wind farms, hydrokinetic projects in rivers, and biomass generation plants on farms.⁴ State CEFs have played an equally important role in expanding opportunities in energy efficiency (EE). Ratepayer-funded energy efficiency spending has grown from \$1.7 billion in 2004 to \$4.4 billion in

Figure 1. State Clean Energy Funds Investment in Renewable Energy



Source: DSIRE 2011 and CESA 2011.

Investment figures include only funding in designated state CEFs supported by utility ratepayer surcharges, with the exception of Alaska's legislatively appropriated fund. Otherwise, figures do not include ARRA funds, funds that support RPS efforts, or funds that are raised through bonds or legislative appropriations. As such, the figures presented here represent a lower bound on total state investment in renewable energy.

* Fund does not have a specified expiration date
 ** The Oregon Energy Trust is scheduled to expire in 2025
 *** Estimated. The Ohio fund was due to expire at the end of 2010 but was extended until 2013 and funding amounts are not yet known.

Table 1. Clean Energy Fund Administrative Structures, Funding Mechanisms, and Project Finance Mechanisms

Administrative Structures	
Utility	Most state energy efficiency specific funds are managed by utilities whether integrated utilities in regulated markets or distribution-only utilities in restructured markets (e.g., Sacramento Municipal Utility District, Austin Energy, Long Island Power Authority, Excel in Minnesota, Arizona Public Service)
State agency	Some funds are administered by an existing or newly created state entity (public utility commissions, departments of economic development, state energy offices, and public benefit corporations) relying on contractors to perform many administrative functions (e.g., California Energy Commission, New Jersey Clean Energy Program)
Third party	A few funds are administered by an independent private or non-profit entity whose purpose is to administer EE/RE programs (e.g., Energy Trust of Oregon, Efficiency Vermont, Wisconsin Energy Conservation Corporation)
Funding Mechanisms	
Electricity surcharge	Also called a systems benefit or wires charge, these surcharges on a ratepayer’s utility bill can support funding for RE programs and activities
Pollution charge	Two states have created clean energy funds collected from utilities for storage of nuclear energy waste: Minnesota and Vermont
RPS compliance payments	In many states with RPS mandates a utility can pay an alternative compliance fee if it is less costly than procuring renewable energy. The payment level is set by the state
Regional carbon allowances	Many northeast states use revenues from the auction of carbon allowances through the Regional Greenhouse Gas Initiative for energy efficiency and renewable energy investment by the state
Bonds	Pennsylvania used a general revenue bond to finance clean energy incentives in the state
Tax revenue	Hawaii funds clean energy incentives through a new oil barrel import tax
Project Finance Mechanisms for Installation of Clean Energy Technologies	
Rebates	As the primary target of support for EE/RE investments at the state level, technologies supported through rebates include energy efficient appliances, CFLs, solar PV systems, solar hot water systems, and geothermal heat pumps (e.g., Hawaii’s Energy Efficiency Program offers solar water heater rebates to residential utility customers)
Grants	Grant programs are used to tailor support to EE/RE projects that are more highly engineered, larger in scale, or represent demonstration projects or emerging technologies (e.g., Delaware’s Green Energy Fund provides cash grants for renewable energy technology installation)
Loans	Direct loan programs play an important role in addressing upfront capital shortages. Moreover, because these loan funds revolve, the program’s initial capital is preserved (e.g., Virginia Voluntary Solar Resource Development Fund provides loans for residential, commercial, or non-profit solar projects)
Performance-based incentives	PBIs are directly tied to RE system performance and actual energy generation rather than units of installed capacity. They are paid on a per-kilowatt-hour basis for a fixed number of years (e.g., California Solar Initiative offers PBI for solar PV systems between 50 kW and 1MW in size)

Source: Clean Energy States Alliance

Table 2. Defining CEF's Expanded Focus on Clean Energy-Related Economic Development**Clean Energy Project Finance Model**

Project finance and development has been the core activity of most state CEFs. This model directly promotes clean energy project installation by providing production incentives and grants/rebates

Clean Energy-Related Economic Development Model

A broader economic development strategy by state CEFs would encompass the following, in addition to project finance and development:

- ▶ Innovation - Support research and development of new clean energy technologies
- ▶ Investment - Use state loans and equity to provide initial investment in clean energy companies and projects
- ▶ Industry development - Employ a range of marketing support, business incubators, manufacturing and export promotion, supply chain analysis and enhancement, and workforce training programs to facilitate clean energy market transformation

Funding Clean Energy Research: California's PIER Program

California's Public Interest Energy Research (PIER) program—administered by the California Energy Commission (CEC)—has been playing a critical role in advancing the state's clean energy research for years. Since its creation in 1996, the PIER program has helped support state energy policy goals by conducting public benefit research with high-risk thresholds that is not adequately provided by competitive and regulated markets.

The PIER program receives funding from an energy ratepayer surcharge. In 2010, the program funded a total of \$86.5 million for electricity and natural gas research—\$62.5 million for electricity research, development, and deployment (RD&D) and \$24 million for natural gas RD&D.

The program has funded groundbreaking research in energy efficiency and demand response; renewable energy resources; advanced electricity generation, transmission and distribution; energy-related transportation; and energy-related environmental research. For instance, PIER's research investments will help California ratepayers save nearly \$1 billion annually from energy efficiency research incorporated into California Title 20 Appliance Efficiency Standards and Title 24 Building Standards.

The PIER program has also successfully leveraged private and federal investment capital. The PIER Small Grants research program has led to nearly \$38 of private non-utility follow-on investment for every dollar of PIER funding. PIER's \$13.2 million investment in 15 Smart Grid projects in 2010 brought in an additional \$426 million in federal American Recovery and Reinvestment Act funding and created over 23,000 jobs in the state.

The bottom line: The PIER program has enabled California to leverage its public benefit research to develop some of the most aggressive statewide standards and goals for the adoption of renewables, energy efficiency, and green buildings.

Source: Public Interest Energy Research 2010 Annual Report, available at: www.energy.ca.gov/business_meetings/2011_packets/2011-03-30/Item_02_PIER_Annual_Report/CEC-500-2011-031-CMF.pdf

2009 with approximately 55 percent (or \$2.4 billion) of program budgets devoted to incentives for utility customers and the rest going towards program design and implementation, and evaluation, measurement, and verification.⁵

In terms of their focus, CEFs have tended to engage primarily on individual project financing and deployment through the use of rebates, grants and performance-based incentives that have directly subsidized the installation of clean energy technologies (Table 1).⁶ In addition, many state programs have also leveraged their CEFs for project financing and deployment through the use of leasing programs, project equity investments, revolving loans, on-bill financing programs, and credit enhancement tools such as loan loss reserves, interest-rate buy-downs, and loan and performance guarantees.⁷

In short, for most of the last decade, state clean energy funds have served the nation and its regional and state economies as a critical and innovative source of much-needed public capital supporting the installation of clean energy technologies in American regions.

Investing in Game-Changing Technology: Massachusetts Clean Energy Center

Clean energy is emerging as a powerful economic engine in Massachusetts, and the Massachusetts Clean Energy Center (MassCEC) is driving the state's development efforts in this sector. Created by the Green Jobs Act of 2008 to accelerate job growth and economic development in clean energy, MassCEC is leading the way in providing financing to help develop a clean energy economy in the Commonwealth. MassCEC makes direct investments in new and existing companies and provides assistance that enables companies to access capital and other vital resources for growth.

MassCEC does this by administering the ratepayer-funded Massachusetts Renewable Energy Trust Fund (RETF) and the Alternative and Clean Energy Investment Trust Fund. MassCEC's investment division has \$30 million of assets under management, which includes \$22.3 million of investment assets inherited from the Massachusetts Technology Collaborative, the previous administrator of the RETF. Its portfolio of 30 companies reflects the breadth of the clean energy marketplace, including wind, solar, biofuel, and energy storage companies.

MassCEC has been smartly and strategically leveraging the funds each year to invest in clean energy companies through its various programs, which have been designed to follow a company's growth from inception through to technology commercialization:

- ▶ **Catalyst Program:** The program supports the demonstration of the commercial viability of clean technologies. The aim of the funding is to help technologies progress along the development curve to a point where additional commercialization funding can be obtained
- ▶ **Investments in the Advancement of Technology:** MassCEC makes venture capital syndicated equity investments of up to \$500,000 in promising early-stage Massachusetts clean energy companies
- ▶ **Investments in Job Creation:** MassCEC provides equity investments up to \$750,000 to support the expansion of clean energy companies' operations in the state, primarily through job creation

MassCEC's investments across these three programs have been significant to date. Since March 2009, it has awarded over \$8 million through equity investments, loans, and grants to various companies and leveraged nearly \$285 million in additional funds. As a direct result of its investment programs, MassCEC anticipates that nearly 450 jobs will be created or retained in Massachusetts.

In this fashion, MassCEC is making direct investments in game-changing clean energy technologies. These investments are helping clean energy companies establish themselves in the state, with a further benefit of attracting both human capital and other companies to grow the state's clean energy industry.

Source: Massachusetts Clean Energy Center, available at www.masscec.com; e-mail correspondence with Salimah Nooruddin, MassCEC

For all the good the funds have achieved, project-only financing—needed as it is—will not be sufficient to drive the growth of large and innovative new companies or to create the broader economic development taxpayers demand from public investments. Also needed will be more focus on the deeper-going economic development work that can create a foundation to grow whole new industries.

Without a doubt the impacts of state project finance are significant and have been vital for the growth of the clean energy industry in the United States. The price of renewable energy technologies like solar and wind has come down in part through the sheer volume of project activity. However, it is becoming clear to many states that to truly grow the clean energy enterprise they must do more than just help bring down the costs of clean energy technologies through project financing. This recognition has resulted in a new generation of state programs, spearheaded by several of the state clean energy funds, that go beyond project finance.

All of which points to a new brand of fund activity. Along these lines, increasingly ambitious efforts in a number of states have featured engagement on at least three major fronts: (1) cleantech innovation support through research, development, and deployment (RD&D) funding; (2) financial support for early-stage cleantech companies and emerging technologies, including working capital for companies; and (3) industry development support through business incubator programs, regional cluster promotion, manufacturing and export promotion, supply chain analysis and enhancement, and workforce training programs.

On the cleantech innovation front, a few funds such as California's through its Public Interest Energy Research (PIER) program have supported cleantech RD&D efforts.⁸ PIER, for example, funds

Fostering an Innovation Ecosystem: NYSERDA's Clean Energy Business Incubator Program

The New York State Energy Research and Development Agency (NYSERDA) approach to clean energy innovation is to catalyze sustainable programs that will serve as the foundation for an innovation ecosystem across New York. One such program is the Clean Energy Business Incubator (CEBI) program that promotes successful partnerships between early-stage cleantech companies and regional incubators that provide guidance, technical assistance, and consultation to companies to help them develop and commercialize clean energy technologies.

Since 2009, NYSEDA has established six cleantech incubators through the program. Each incubator receives up to \$1.5 million over the course of four years, which is paid out according to milestones. Of this amount, \$1 million per incubator is reserved for client-specific milestones, such as the completion of a business plan, a first round of capital investment, first product introduction, and revenue milestones.

By the third quarter of 2011, with just over two years of operation and \$3.9 million in program expenditures, the Clean Energy Business Incubator program has already achieved significant results. The six incubators have nurtured the creation of several hundred net new jobs at client startup companies and the introduction of 33 new products to serve the clean energy market. They have assisted client companies in raising \$41 million in private capital and attracting \$11 million in federal funding, leveraging state expenditures by more than 13 to 1.

NYSERDA's efforts to help cleantech businesses develop and commercialize new energy technologies has been critical in helping New York create and retain the types of companies that form the bedrock of a clean energy economy.

Source: NYSEDA's Clean Energy Business Incubators, available at www.nyseda.ny.gov/Page-Sections/Innovation-and-Business-Development/Partners-in-Innovative-Research.aspx?sc_database=web; e-mail correspondence with Janet Joseph, NYSEDA.

basic and applied research on topics ranging from work on electricity grid improvement and building and lighting technologies to industrial process improvement, energy storage, renewable technologies, and other areas.

In like fashion, a few states have used their CEFs to make equity investments in solar, wind, and bioenergy companies and also provide working capital for expanding growth companies. The Massachusetts Clean Energy Center's (MassCEC) Investments in the Advancement of Technology program, for example, makes venture capital equity investments in promising early-stage companies that are developing and commercializing new clean energy technologies.⁹

And for that matter, some state CEFs have been providing industry development support in a variety of ways, whether through the development of business incubator programs such as those run by the New York State Energy Research and Development Authority (NYSERDA); workforce training programs such as the California Clean Energy Workforce Training Program; or initiatives focused on clean energy industry supply chains such as those maintained by Ohio's Advanced Energy Fund (AEF).¹⁰

All of which suggests that the next era of state clean energy fund leadership is coming into focus thanks to existing fund experimentation. What is needed now, then, is a new, creative period of expanded CEF focus on clean energy economic development and industry creation to complement and build upon project financing for the installation of clean energy technologies. Such work could not be timelier at this moment of federal gridlock and market uncertainty.

II. The Challenge

State CEFs have focused on project development because they have tended to assume—as suggests traditional energy policy and economic thinking—that increases in the number of clean energy projects will bring down the price of clean energy and in turn automatically generate greater demand, industry growth, and job creation.¹¹ In addition, many fund administrators are required to provide near-term energy benefits to the ratepayers who are contributing to the fund.

Given the dominance of this “supply curve” thinking and near-term energy focus, state-run CEFs have focused heavily on supporting individual wind, solar, biomass, or energy efficiency projects and stayed away for the most part from more focused economic development activities. Frequently,

moreover, this support has tended to flow to installations employing more established technologies rather than to the projects testing or scaling up new or emerging technology that show great potential.

The problem here is that thinking in the field of innovation economics suggests that to bring about transformative technology change—like the shift from fossil-based fuels to clean energy—many kinds of market and institutional barriers must be overcome, beyond just pricing effects.¹² These barriers include the need to overcome market failures in the private sector R&D process, critical supply chain gaps, workforce training needs, issues surrounding finance risks for new technologies, and a variety of information gaps.¹³ In the electricity sector, there are also unique infrastructure gaps like access to the grid and electricity regulation.

Given this reality, it is becoming clearer that states need to use their resources to merge clean energy and economic development efforts in order to build a vibrant domestic industry. To be sure, a number of states—such as California, Connecticut, and New York—have already moved in this direction. However, these efforts, while promising, are still in the early stages. While some states have moved to reshape the clean energy market, others have restricted themselves to individual project finance.

Two major finance problems intrude. For one thing, most states simply lack the financial resources needed to address these fundamental market problems in a serious way. This problem is epitomized by the fact that while 20 states maintain clean energy funds, the majority of states lack such a dedicated revenue stream to support comprehensive clean-energy economic development activities. At present not one state in the Intermountain West or the South has a clean energy fund to support either projects or economic development activities.

Beyond that, even among those states that do have revenue sources in the form of CEF money, few are deploying their resources to resolve the deepest economic development challenges. In this connection, most states with clean energy funds still concentrate their efforts on financing individual projects. However, it remains essential to balance project support with complementary economic development programs that attend to issues surrounding regional clusters, the relevant industry supply chains, manufacturing, and job training programs.

In this framework, state clean energy economic development efforts face at least four major challenges. These include:

- ▶ **Limited funding for clean energy economic development programs.** With the withdrawal of the federal Recovery Act funding and tight state budgets, no clear path exists for future funding of new economic development efforts in clean energy. Among existing statewide funds for clean energy, there will almost certainly be insufficient capacity to conduct major economic development activities without reorienting existing, project-based funding like CEFs towards industry support programs or strategically focusing existing economic development funds toward targeted growth industries like cleantech.
- ▶ **Inadequate industry information.** Most states possess insufficient information about their in-state clean energy industries, jobs, suppliers, and other infrastructure.¹⁴ Such data is critical to the effective targeting of state CEF money, but too little information is available on the economic, finance, supply chain, and labor force problems facing clean energy sector growth. Moreover, the way that industry information is now collected by public data agencies is inadequate, with vague industry identification codes that do not accurately capture new industry groups. As a result, it is extremely expensive for any one state to develop this information. But without the information, states have a difficult time developing targeted economic development programs to support their comparative advantage industries. Finally, in part because of these data gaps, states rarely have rigorous performance management and evaluation metrics in place to evaluate their clean energy programs for revision or replacement.
- ▶ **Limited collaboration among stakeholders,** including clean energy funds, state economic development agencies, industry partners, community finance agencies and educational institutions. Historically state economic development programs have failed to incorporate robust stakeholder input in the planning process. Clean energy as a new industry sector adds a whole set of new players who will need to be engaged.¹⁵ And yet most states fail to coordinate CEFs with economic and community development and finance agencies. Moreover most state CEFs do not have enough in-house economic development capacity, necessitating the need to reach out to other state economic development partners.

- **States acting in isolation.** States with clean energy economic development programs and community development finance institutions (CDFIs) working on clean energy are just beginning to share best practices, advance learning, or compare successes and failures. The clean energy industry is young, and collaboration and cooperation across states are essential to building the industry. Moreover, existing funds are not supported adequately by federal agencies such as the Economic Development Administration. Further, there is no coordinated federal-level clean energy policy that partners with and financially supports the economic development work of the state public funds.

In sum, the need of the hour is for smarter strategies and greater funding for clean energy economic development that will enable states to innovate, manufacture, and export in the clean energy space. Too few states are engaged in rigorous and robust efforts to bolster this dynamic source of growth. And yet, state clean energy funds—by redirecting portions of their funds towards economic development activities—can play an important role in filling this gap and contributing to economic transformation and job-creation in U.S. states and metropolitan areas.

III. Toward A New State Approach

And so U.S. states, as classic “laboratories of experimentation,” should build on leading-edge CEFs’ recent experiments with economic development and move more expansively to spur economic growth in clean energy.

To that end, this paper suggests a number of strategies for best utilizing CEFs that states can explore in pursuit of clean energy economic development.

In this regard, it is worth noting that state CEFs are public entities with a unique history of success in financing clean energy projects that can now be brought to bear on the need in many states for more aggressive clean energy economic development. In a time of tough fiscal austerity and reluctance to dedicate new funds, then, state public CEFs are in a perfect position to institute a new set of economic development strategies to create thriving clean energy industries.

To act on this promise, **states without clean energy funds should consider establishing dedicated clean energy revenue streams to engage in project finance and smart industry support.** These states typically do not have dedicated support for either clean energy projects or clean energy-related economic development activities.¹⁶ A range of sources for these funds exists and includes general revenue bonds, tax or lottery revenues, pollution charges, and renewable portfolio standard (RPS) compliance fees. However, experience has shown that electricity surcharges set on electricity consumption or “wires charges” tend to be the most stable and reliable revenue source, as well as the most fair as they internalize the environmental consequences of electricity purchases.¹⁷ States should examine these sources as potential bases for the establishment of new clean energy funds.

In those states where CEFs already exist, fund administrators should seek to expand the funds’ economic development role. Specifically, states with funds should pursue four major agendas:

- Reorient a significant portion of state CEF money to clean energy-related economic development
- Develop detailed state-specific clean energy market data
- Link clean energy funds with economic development entities, development finance organizations and other stakeholders in the emerging industry
- Collaborate with other state, regional, and federal efforts to best leverage public and private dollars and to learn from each other’s experiences

Along these lines state clean energy leaders should:

Reorient a significant portion (at least 10 percent of the total portfolio) of state CEF money to clean energy-related economic development. Over the last decade, states with clean energy funds have dedicated almost \$3 billion to individual project support. That has made it possible to create thousands of clean energy projects across the country. But only a small fraction of this funding has been dedicated to activities and investments aimed at bolstering clean energy economic development. Given that, it is time to increase state budgets for economic development activities. For that reason, state clean energy fund administrators should consider reorienting a portion of their existing program funding to economic development programs. In addition, this expansion of funding sources should also

tap financing from existing economic development and CDFI resources as well as matching funding from federal programs to incentivize states to invest more in clean energy-related economic development strategies.

What is required from a technical perspective to enable this transition? In most cases, existing enabling legislation or regulatory authority will allow states to reorient their CEFs to include a significant economic development agenda. For states that have existing CEF legislative authorization, those laws generally give the agencies managing the funds the authority to not only fund clean energy projects but also related economic development and innovation activities. In these cases, an internal administrative decision should allow CEF administrators to develop and fund clean energy-related economic development programs. In fact, many of the CEFs mentioned in this report have already made this turn and are already engaged in some sort of economic development activities.¹⁸

States with CEFs but without economic development programs can consider whether existing legislative authority is sufficiently broad to shift some funding to dedicated economic development programs. In many cases, references to jobs, economic growth, or innovation should provide sufficient support for such authority. And in some states where there may be limitations in using CEFs to support non-project finance related activities policymakers should consider requesting additional and specific legislative authority to authorize economic development programs in the clean energy sector.

Finally, states have every right to request a greater degree of partnership with the federal government on cleantech economic development as they shape their new efforts.

It is reasonable to suggest, for example, that the federal government should consider redirecting a portion of federal funds (for instance, a percentage of funding for federal technology support programs administered by the Department of Energy and other programs meant for federal-state cooperation) to provide matching dollars to state funds that now have active economic development programs, and to use a portion of those funds to provide incentives to states without such programs to create them. This reoriented joint funding could be used to:

- ▶ Create joint technology partnerships with states to advance each state's targeted clean energy technology industries, by matching federal deployment funding with state funding
- ▶ Work with the states on joint funding of cluster development, export programs, workforce training, and other economic development programs as described in detail below
- ▶ Address new program design opportunities post-Solyndra, learning from that experience to "decentralize" financing decisions to local entities with street knowledge of their industries
- ▶ Demonstrate and support expansion of best practices.

Develop detailed state-specific clean energy market data. The Brookings paper "Sizing the Clean Economy" underscores the value of generating specific industry data as the basis for intelligent analysis about jobs in the clean economy. That report developed, for the first time, extraordinarily granular metropolitan-level information about the size, nature, and scope of the economic underpinnings of the clean economy sector.¹⁹

Much more data like this is needed on market dynamics in metropolitan and state clean energy economies. Ideally all states engaged in advancing their clean energy economy should be investing in smart intelligence and data gathering about their regional industry clusters. But as states work towards reorienting portions of their limited CEFs to economic development activities, it makes it even more critical that all state funds identify the clean energy market presence in their states: the number of jobs, the fastest-growing companies, the clusters of activities within those sectors, the gaps in the supply chain for those industries, their export potential, and a whole range of economic development and market indicators. This critical information will assist states to create informed and targeted programs.

This work has begun in many states. As part of the 2009 American Recovery and Reinvestment Act, the Department of Labor provided \$48.8 million in State Labor Market Information Improvement Grants to 30 states to support the collection and dissemination of clean energy-related labor market information.²⁰ These states have started collecting information on what types of clean energy jobs are needed, where job demands will be in the future, the education and skill requirements of those jobs, and related curriculum development.²¹ In connection with this work, it should be noted that the Bureau of Labor Statistics (BLS) will soon release new data measuring employment and wages for businesses whose primary activities can be described as "green," and produce information on the occupations

involved in those activities.²² While the forthcoming BLS study may not provide detailed small-area geographic and clean energy segment information, the resulting information will nonetheless be useful to states seeking to design and evaluate various policy initiatives and the labor market impact of their clean energy investment.²³

Capitalizing on the efforts already under way, at any rate, states should actively consider ways to improve the quality and availability of clean energy-related labor market information, manufacturing data, and export data in order to guide future efforts to support growth in the clean energy sector. Specifically, states should:

- **Improve ongoing data collection and monitoring** on clean energy industry strengths and weaknesses in the state
- **Work with universities and research institutions** to focus their intellectual attention on clean energy economic development research
- **Identify clean energy industry clusters**, value chains, jobs, and finance, their gaps and needs within each state
- **Establish program metrics** to measure program support, identify the best programs to advance, and which to modify or improve

Link clean energy funds with economic development entities, community development finance institutions (CDFIs), development finance organizations, and other stakeholders.

Clean energy is a relatively new industrial sector. For this reason many state economic development agencies, development finance agencies, and CDFIs have yet to fully enter the space or develop programs to promote and finance clean energy in their states. But they are the ideal partners to work with clean energy funds to develop effective economic development programs.

Economic development agencies are tasked with generating jobs, retaining existing jobs, and stimulating industrial and commercial growth and innovation in their state. To date, very few state economic development agencies have partnered with their states' clean energy funds with a few notable exceptions.

CDFIs are financial institutions that provide credit and financial services to underserved communities and in many areas they are the leading infrastructure finance experts.²⁴ As mission-driven institutions, many CDFIs have lent to clean energy and sustainable development projects and businesses. But few CDFIs have successfully developed to scale a financing operation that incorporates clean energy measures within their traditional community development lending operations. CDFIs often do not have dedicated clean energy funds, and existing funding is typically limited to projects, whether energy efficiency or weatherization. At the local level, there is not yet in place a broader strategy for job and wealth creation, and virtually no focus on power generation (such as renewable energy or manufacturing support or workforce training).

Development finance agencies are state, county and municipal agencies and authorities that provide or support economic development financing programs, including tax-exempt and taxable bonds, credit enhancement programs, and direct debt and equity investments. Throughout the U.S. over 50,000 state and local agencies exist to help finance development.²⁵ Tax-exempt bonds have been used to invest in three quarters of the U.S. infrastructure representing a \$3 trillion industry. To date, these agencies have not been that active in the clean energy space, although a few municipalities have financed solar projects through bond offerings.²⁶ But there is a growing interest from this sector to become more involved in clean energy financing. Their entry into clean energy could bring much needed public and private capital.²⁷

In addition, other stakeholders such as state housing finance authorities and workforce development agencies have not effectively integrated clean energy strategies within their program deployment. And finally state academics could bring important analysis, research, and evaluation to bear on program and policy creation.

These finance and economic development agencies should be working together with state clean energy funds, which bring dedicated revenue streams and years of experience in clean energy technologies and local markets, to develop and adapt the best clean energy economic development programs for their state.

Collaborate with other state, regional, and federal efforts to best leverage public and private dollars and learn from each other's experiences. States with clean energy economic development programs, and CDFIs working on clean energy, rarely work together across states to share best practices, to advance learning, or compare successes and failures. Some state CEFs, as this report indicates, have initiated new programs in the area of economic development for clean energy. While this is a promising and encouraging trend, most of these programs are new, “green shoots” activity. These policies are being tried in an emerging and complicated clean energy landscape. Little analysis of best practices, what has worked so far, and what has not, has yet been completed.

As states embark on a new generation of CEFs with emphasis on economic development activities, they will need to investigate and determine what is working now, develop best practices, and then replicate the best of breed around the nation. Specifically, states can:

- ▶ **Establish a multi-state alliance** as a forum to compare and contrast all the program offerings in the field and push for effective federal partnership
- ▶ **Analyze the current policies**—both in energy and in economic development more generally—for greater job creation and improved economic activity in the cleantech sector
- ▶ **Focus on regional cluster strategies** to build job growth and industries that can reach an economy of scale across regions and states
- ▶ **Study conventional infrastructure and related financing mechanisms** like bonding, tax increment finance districts, New Market Tax Credits, and other measures, and tailor them for the clean energy sector

Finally, there is insufficient recognition at the federal level of the key role that states play as the deployment arm of the clean energy industry, and of how public funds deployed at the state level could be effective mechanisms to advance clean energy economic development. A new partnership should be established between state clean energy programs and funds and the federal government to support the clean energy industry. For every relevant clean energy issue—from data gathering on in-state industry to company investment to technology innovation to workforce development and training to export assistance and patent protection—the federal government must develop a new set of policy and funding partnerships with the state programs and funds.

IV. Conclusion

In sum, governors and state legislators who want to accelerate clean energy job creation and economic development should look to public clean energy funds as a source of financial wherewithal, market understanding, and a history of creativity and success.

Once almost exclusively focused on building individual projects, state clean energy funds are already beginning to focus more on building whole industries. Now, in hard times, the funds' transition from project development to industry creation should be nurtured and supported.

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Endnotes

1. Lew Milford is a non-resident senior fellow at Brookings and president of Clean Energy Group. Mark Muro is a senior fellow and director of policy for the Metropolitan Policy Program at Brookings. Jessica Morey is a consultant to Clean Energy Group. Devashree Saha is a senior policy analyst at the Brookings Metropolitan Policy Program. Mark Sinclair is executive director of Clean Energy States Alliance.
2. For a discussion of "sunsetting" federal tax and subsidy programs for clean economy enterprises see Mark Muro, Jonathan Rothwell, and Devashree Saha with the Battelle Technology Partnership Practice, "Sizing the Clean Economy: A National and Regional Green Jobs Assessment" (Washington: Brookings Institution, 2011), p. 37.
3. Other major sources of funds are alternative compliance payments by electric suppliers under renewable portfolio standard (RPS) programs, state appropriations and regional carbon (or other pollution source) allowance trading programs such as Regional Greenhouse Gas Initiative (RGGI). In some states, these funds generate a few million dollars each year; in others, several hundred million dollars are invested annually. State funds are managed by a range of organizational structures. Some are established within state energy offices, others within public utility commissions, and still others have been set up as independent, nonprofit organizations.
4. For more information, see Clean Energy States Alliance, "State Clean Energy Fund Support for Renewable Energy Projects: Key Findings from the 2009 CESA Database" (2011), available at www.cleanenergystates.org/assets/Uploads/CESA-RE-Database-3.pdf. The \$2.7 billion 10-year state CEF investment figure for support of renewable energy projects represents a conservative figure given the complexity of obtaining consistent, uniform data from states. The figure represents only state funds supported by utility ratepayer surcharges (or by a legislatively created fund in Alaska), as opposed to other sources of state CEF funding for programs like Renewable Portfolio Standard (RPS) support. For instance, in the case of New York, the \$15.6 million for FY2010 only covers the Technology & Market Development investment (under the

System Benefits Charge) related to clean energy and does not include the \$80.5 million investments made under the New York RPS.

5. For more information see Harris Williams & Co, "Energy Efficiency Program Management," White Paper (December 2010).
6. For instance, Vermont offers a Small Scale Renewable Energy Incentive Program that is funded through the Vermont Clean Energy Development Fund, among other funding sources. The program offers incentives on renewable energy systems installed by Vermont solar, wind, and hydro partners. For more information, see www.publicservice.vermont.gov/energy/ee_cleanenergyfund.html. Delaware's Green Energy Fund supports the state's rebate program that provides up to 50 percent of installation costs for solar PV, solar water heating, fuel cells, and wind turbine systems. For more information, see www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=DE01R&re=1&ee=1. Massachusetts Clean Energy Center's Community Scale Wind Initiative provides competitive grants to fund feasibility studies as well as design and construction activities for private and public applicants. Since April 2009, the Initiative has awarded \$7.4 million to 32 feasibility studies and 15 design and construction projects, potentially leading to the development of 65 MW of wind energy and leveraging over \$82 million in total wind project investments in 39 municipalities. See www.cleanenergystates.org/assets/Uploads/cesa-award-MASSCEC.pdf.
7. For instance, Connecticut offers a ratepayer supported residential leasing program for solar energy. The Connecticut Solar Lease Program is a Connecticut Clean Energy Fund initiative started in 2008 and administered by AFC First Financial, an independent financing company. More information is available at www.ctsolarlease.com/index.php. New Jersey's Edison Innovation Green Growth Fund (EIGGF), administered by the New Jersey Economic Development Authority, offers loans ranging from \$250,000 to \$1 million to companies developing renewable energy and energy efficiency products. The EIGGF is funded by the state societal benefits charge (SBC). NYSERDA's Energy SmartSM Loan Program buys down the interest rate on a qualifying commercial loan for an energy efficiency improvement or renewable energy project. If a participating lender offers a loan at 8 percent interest rate, NYSERDA effectively reduces the interest rate to 4 percent by providing a lump-sum payment to the lender equivalent to the net present value of the interest rate spread over the term of the loan. The program, which is funded through the public benefits fund, has supported over 7,000 loans over the last seven years with a cost to the fund of \$8 million in interest rate subsidies on total customer loans of \$56 million.
8. For more information on California's PIER program, see www.energy.ca.gov/research/index.html. The program funds research in the following areas: buildings, environment and energy, industrial/agricultural/water, renewables, systems integration, and transportation. The PIER program receives approximately \$62.5 million per year in surcharges on electricity rates and \$24 million per year in surcharges on natural gas rates. Since the program's beginning in 1996, more than \$700 million has been invested in innovative energy technologies.
9. For more information, see www.masscec.com/index.cfm/page/Investments-in-Clean-Technology/event/Investments/pid/11172. In addition, MassCEC also makes growth capital investments—through its Investments in Job Creation program—that support the expansion and growth of relatively more mature clean energy companies in the state. Finally, the Catalyst program provides funds to support the demonstration of the commercial viability of clean energy technologies.
10. For more information on NYSERDA's Clean Energy Business Incubator program, see www.nyserda.ny.gov/Page-Sections/Innovation-and-Business-Development/Partners-in-Innovative-Research.aspx?sc_database=web. The California Clean Energy Workforce Training Program is the largest state-sponsored clean energy jobs training program in the country with a total of \$75 million investment. Of the \$75 million investment, \$12 million comes from the PIER program. It works with state and local partners to develop regional plans for training workers in new green technologies. For more information, see www.energy.ca.gov/cleanenergyjobs/. Ohio's Advanced Energy Fund (AEF) is playing an important role in advancing the state's clean energy supply chains. AEF supports the Great Lakes Wind Network to create and implement a comprehensive plan to identify, expand, and promote Ohio's wind energy supply chain. As a result, AEF has been especially critical in stimulating Ohio's wind manufacturing base by working with Ohio companies to retool their operations and business plans to supply the growing wind industry. For more information, see www.cleanenergystates.org/assets/2010-Individual-State-Reports/OH-draft-designed-pages-5-7-10.pdf.
11. There is a large literature related to clean energy learning or experience curve that posits positive correlation between cumulative deployment and cost reductions, meaning that driving deployment will drive down costs as well. See, for instance, Maya Papineau, "An Economic Perspective on Experience Curves and

- Dynamic Economies in Renewable Energy Technologies," *Energy Policy*, 34 (4) (2006). See also Richard Duke and Daniel Kammen, "The Economics of Energy Market Transformation Initiatives," *The Energy Journal*, 20 (4) (1999). There is equally large literature that problematizes this straightforward assumption. For instance, see Gregory Nemet, "Beyond the Learning Curve: Factors Influencing Cost Reductions in Photovoltaics," *Energy Policy*, 34 (17) (2006); and Gregory Nemet, "Demand Pull, Technology Push, and Government-led Incentives for Non-Incremental Technical Change," *Research Policy*, 38(5) (2009).
12. Robert Atkinson and Darrene Hackler, "Economic Doctrines and Approaches to Climate Change Policy" (Washington: The Information Technology & Innovation Foundation, 2010).
 13. For a comprehensive review of various market failures that impede innovation, see Robert Atkinson and Howard Wial, "Boosting Productivity, Innovation and Growth Through a National Innovation Foundation" (Washington: Brookings Institution, 2008); and Mark Muro and Bruce Katz, "The New 'Cluster Moment': How Regional Innovation Clusters Can Foster the Next Economy" (Washington: Brookings Institution, 2010).
 14. Muro, Rothwell, and Saha, "Sizing the Clean Economy."
 15. Devashree Saha, "Enhancing State Clean Energy Workforce Training to Meet Demand" (Washington: National Governors Association's Center for Best Practices, 2010).
 16. It should be noted here that some of the states without CEFs do have programs supporting clean energy economic development efforts. For instance, in Kansas, the legislature has authorized tax credits to support wind or solar manufacturing facilities. In Arkansas, the legislature has authorized tax credits for wind manufacturers. However, none of them provide for a broad-based, well funded economic development program targeted to grow the clean energy industry through sustained, long-term policies, investment, and strategies.
 17. In June 2011, Virginia created the Voluntary Solar Resource Development Fund (VSRDF), from which money will be loaned for projects that involve the acquisition, installation, or operation of photovoltaic devices, solar water heating devices, or certain solar space heating devices at residential, commercial, or non-profit facilities. The fund is administered by the Department of Mines, Minerals, and Energy. VSRDF is a public benefit fund and money comes from contributions by customers of electric utilities.
 18. For instance, in Massachusetts, the 2009 "An Act Relative to Clean Energy" made the MassCEC the administrator of the Renewable Energy Trust Fund. The legislation also entrusted MassCEC with the responsibility of accelerating the state's clean energy economy through "the formation, growth, expansion, and retention within the commonwealth of preeminent clusters of renewable energy and related enterprises, institutions, and projects." See Chapter 158 of "An Act Relative to Clean Energy." Available at: www.malegislature.gov/Laws/SessionLaws/Acts/2009/Chapter158. In New York, NYSERDA has approval from its Public Utility Commission to use utility system benefits charges (SBCs) for a wide range of energy activities, including supporting emerging energy technologies, fostering competition, improving productivity, growing New York energy businesses, and helping to meet future energy needs through efficiency and innovation. Similar legislative and regulatory support underlies all other existing programs like the Energy Trust of Oregon whose enabling legislation authorizes the use of SBC funds for "new market transformation efforts." See Oregon Senate Bill 1149, Section 3. Available at: www.energytrust.org/about/PDF/sb1149.pdf
 19. Muro, Rothwell, and Saha, "Sizing the Clean Economy."
 20. U.S. Department of Labor, "American Recovery and Reinvestment Act of 2009: State Labor Market Information Improvement Grants" (2009), available at www.doleta.gov/pdf/LMI_Grant_Summaries_02052010.pdf
 21. For instance, recently Colorado completed a comprehensive survey to estimate the number of green jobs in the state and to obtain information on industry distribution, and the types and wages of these green jobs. Colorado's efforts were funded by the DOL's LMI grant. See Colorado Department of Labor and Employment's "Interim Report on Green Jobs in the Colorado Economy" (July 2011), available at www.lmigateway.coworkforce.com/lmigateway/admin/gsipub/htmlarea/uploads/GreenJobsSurveyReport.pdf. Pennsylvania, on its part, has conducted "listening sessions" across the state to capture the perspective of employers and educators regarding emerging green industry sectors and workforce needs and challenges. See Pennsylvania Department of Labor and Industry's "Greening Pennsylvania's Labor Market Information" (2010). Pennsylvania also conducted a survey to identify the number and type of green jobs that exist within the state's economy and to forecast changes in green jobs based on employers' two-year projections. See Pennsylvania Department of Labor and Industry's "The Pennsylvania Green Jobs Survey Report" (2010), available at www.pacareertech.org/content_documents/9/PAGreenJobsSurveyReport_2010_1.13.2011.pdf

22. For more information on the Bureau of Labor Statistics' Green Jobs Initiative, see www.bls.gov/green/
23. The forthcoming BLS data on green jobs may be constrained on at least two counts: The data will be reported at the two-digit NAICS level which will not allow it provide information at the detailed segment level as is provided in the Brookings "Sizing the Clean Economy" study. Second, the BLS data may not provide information down to the metropolitan area level (state data will be available) and will not be able to disclose job numbers in many locations due to survey-participation agreements.
24. For more information on the different types of CDFIs and their sources of funding, see www.cdfa.org/index.php?page=info-1a.
25. Development finance agencies can be constituted as public entities, private corporations or public/private partnerships and are the key infrastructure finance agencies that fund everything from bridges and roads to hospitals, as well as company expansions through tools like industrial development bonds. Nearly four million miles of roadways, 500,000 bridges, 1,000 mass transit systems, 16,000 airports, 25,000 miles of intercoastal waterways, 70,000 dams, 900,000 miles of pipe in water systems, and 15,000 waste water treatment plants have been financed through tax-exempt municipal bonds.
26. For example, a Morris County, NJ authority issued \$22.3 million in low interest municipal bonds to finance 3.2 MW of solar power systems on 19 Morris County school buildings and county government facilities in 2010. See www.tiogaenergy.com/new-jersey-renewable-energy-pilot-program.php
27. For more information about development finance agencies, see Council of Development Finance Agencies (CDFA) at www.cdfa.net/. Moreover, the Idaho Housing and Finance Association issued \$2.16 million in tax-exempt bonds to help a manufacturing company invest in energy efficiency efforts. This project supported or retained 50 jobs in the state. The Iowa Finance Authority issued \$5 million in tax-exempt bonds to help a manufacturer expansion their facility for the production of thin solar film (photovoltaics) for solar power units resulting in the preservation of 64 jobs in the state. These figures come from personal correspondence with Toby Rittner, the CEO of CDFA.

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