



Federal Climate and Energy Legislation and the States: Legislative Principles and Recommendations for a New Clean Energy Federalism

In the next few years, federal climate and energy legislation likely will be enacted in the United States. In addition to many other implications, this law will create a fundamentally new federal relationship with the states on climate and clean energy. That new partnership may be one of the least understood but important impacts of this historic change.

Written by:
Lewis Milford, Mark Sinclair, Ken Locklin and Charles Kubert

Clean Energy Group
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**FEDERAL CLIMATE AND ENERGY LEGISLATION
AND THE STATES:
LEGISLATIVE PRINCIPLES AND RECOMMENDATIONS
FOR A NEW CLEAN ENERGY FEDERALISM**

FIRST REPORT

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TABLE OF CONTENTS

Introduction	1
Summary of 20 Recommendations for Federal/State Clean Energy Federalism	3
Clean Energy Federalism Framework	5
Legislative Principles and Concepts for State-based Programs in Climate and Energy Legislation	7
Section I. New State Program Funding with Climate Allowances	9
Development of SEED Funds for State Climate Finance	10
Create New State Structures to Administer Funding	13
New Technology Partnership Projects: DOE and States.....	14
Encourage State Investment in Higher Risk Technology Projects.....	16
Encourage Pooling of Allowance Funds for Joint State Projects	17
Coordinated Federal/State Procurement Programs	18
New Climate Reporting and Metric Systems.....	19
Workforce Training and Green Jobs Programs	20
Section II. Creation of New State-Based Financing Mechanisms	22
From Green Bank to Green Federal Reserve Banks	23
Loan Guarantees and New State “Designated Lending Authority”	24
Bridging the Commercialization “Valley of Death”	25
New State-based Formulas for Clean Renewable Energy Bonds	27
Sale of Stimulus Public Stock Holdings in Bailed-Out Banks to Seed New Public Endowments for Clean Energy	28
Creation of State-Level Clean Energy Economic Development Institutions	29
SBIR DOE Programs Need to Focus on Climate Technology Development	31
State and Federal Policy Coordination on Climate Finance Legislation	32
Section III. Technology Innovation Strategies and Structures	33
Innovation Experimentation across Energy Related Agencies	34
DOE Office of Technology Innovation	36
Clean Energy Innovations Centers	37
Creation of Independent Distributed Innovation Initiatives.....	39
Conclusion	40
Endnotes	41

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INTRODUCTION

Opportunities for creating a new “climate federalism” that merge federal policies and funding with state expertise and clean energy deployment could well be one of the most important impacts of any new federal climate or energy legislation. But this result will not occur without thoughtful and creative new approaches.

To be optimally effective, these approaches must encompass the active role of the states in climate and energy legislation on many levels – from the allocation of the funding derived from the sale of carbon emissions allowances to be channeled to the states, to the creation of new state level financing mechanisms for clean energy development and deployment, to new strategies for technology innovation.

Clean Energy Group (CEG) has developed recommendations in three areas for states and federal climate and energy legislation. These areas are: 1) creative use of allowance funding by the states, 2) new state finance mechanisms, and 3) new technology innovation strategies.

Background. The current versions of climate legislation, such as the Waxman-Markey bill passed last year by the House of Representatives, begin to recognize a new and more aggressive role for the states and other non-federal entities to develop solutions to climate change.

The Waxman-Markey bill allocates about 10% of emission allowances to the states, which could yield over \$8 billion a year for state-directed climate and clean energy investment. The bill also proposes working with state-based economic development agencies to provide loan guarantees for clean energy and the creation of a new “Green Bank” (a Clean Energy Deployment Administration) to overcome the conventional commercialization “valley of death” in clean energy finance. On innovation, the same bill proposes new regional “Energy Innovation Hubs” which would serve to coordinate RD&D efforts to speed up the commercialization and deployment of clean energy technologies.

This new focus on state-level decentralized solutions is as it should be. In the last decade, states have been the key public investors in clean energy technology, leading

the way to a low carbon future. The states have followed in their historical footsteps as the “laboratories” of experimentation and innovation.

It is possible that, despite this decade-long experimentation, states could now defer to the federal government, and let it lead the way on climate going forward. But that approach ignores the special roles and singular successes of the states in technology innovation, economic development and funding technologies.

So, while the proposed federal climate legislation puts the federal government in the lead with national cap and trade policies, it also puts the states in an even more important position providing complementary strategies on low carbon technology development and deployment. A stronger federal/state partnership on climate and energy is a key element of most pending climate bills.

Moreover, the Waxman-Markey climate bill suspends state and regional cap and trade systems from 2012-2017 while the federal system is put in place. If that provision becomes law, it means that states will likely focus their climate attention during this period on non-cap and trade activities, including finance and investment, policies and standards, technology innovation and related economic development strategies.

Those areas could become the principal focus of state climate activity during the next decade. If this is so, it is important to have federal legislation that can support a robust set of state-based climate activities during that period.

The work of better defining the mutually reinforcing roles of the states and federal government in the climate arena must begin now – to flesh out key principles and legislative strategies for how states could expand their leadership roles, create new opportunities, and establish better state-federal partnership strategies on climate and clean energy.

For that to occur, it will take new and expanded efforts in at least three legislative areas to achieve success:

1. New strategies for state program funding with climate allowances;
2. New state financing mechanisms for low carbon technology; and
3. New structures and strategies for technology innovation.

All three are needed as complementary policies to cap and trade, to make it possible to reach stabilization of climate emissions in this century in the United States and globally. This project is designed to propose specific recommendations in these three climate areas.

SUMMARY OF 20 NEW RECOMMENDATIONS FOR FEDERAL/STATE CLEAN ENERGY FEDERALISM

NEW STATE PROGRAM FUNDING WITH CLIMATE ALLOWANCES

1. SEED funds in climate legislation should encourage a portfolio of programs, independent entities to run them, and new strategies for innovation and cooperative projects.
2. A new Clean Energy Deployment Center should be created in each state to administer the suite of new allowance funding programs.
3. New collaborative technology project partnerships between DOE and the states should be established to encourage more joint demonstration funding in all low carbon technologies.
4. Allowance funding should be used to support greater state investment in higher risk, breakthrough clean energy projects in contrast to funding only “safe bets” without technology risk.
5. Allowance funding also should be used to support pooling of demonstration projects among and between the federal government and the states, to overcome various obstacles that now inhibit such joint activity.
6. Coordinated state and federal joint procurement of clean energy technologies should be expressly provided for in allowance funding provisions.
7. The reporting and metric systems set up by the ARRA could be used as the basis for a new national information infrastructure for climate allowance funding.
8. Climate legislation should contain detailed state funding and support for training and workforce development programs among the states.

CREATION OF NEW STATE-BASED FINANCING MECHANISMS

9. Instead of one national, DC controlled “Green Bank,” climate and energy legislation should consider establishment of a set of regional banks modeled after the Federal Reserve or the Farm Credit System.
10. The loan guarantee provisions of ARRA should be used as the basis for creation of new state-based lending authorities for clean energy through state development agencies, which would work with public clean energy funds and private investment agencies.
11. Allowance funding should be targeted to overcome the conventional “valley of death” commercialization problem, with various approaches such as “de-risking” technology and possible creation of a Federal Risk Management Authority to underwrite insurance to warrant the operating performance of new technologies.
12. Already created “Clean Energy Renewable Bonds” or CREBS should be restructured to fund a greater variety of projects, and perhaps model a new program after the Low Income Housing Tax Credit that provides more state flexibility to fund the projects with the greatest merit.

13. The US government ownership of stocks in distressed banks could, if sold at a profit, seed endowment funds for clean energy investment, a strategy used in Europe to fund social innovation from government spin-offs of public investment in floundering industries.
14. More state-based, economic development institutions are needed to marry federal funding and state implementation, leading to more venture assistance, creation of accelerator parks and related support activities like regional centers of excellence.
15. The Small Business Innovation Research (SBIR) program at DOE and related agencies should be targeted more aggressively toward clean energy business ventures.
16. The federal government and the states should consider the development of a climate-finance policy coordinating entity that can help ensure creative, ongoing thinking and research in these collaborative areas.

TECHNOLOGY INNOVATION STRUCTURES AND STRATEGIES

17. There should be a federal policy to encourage experimentation with new forms of technology innovation programs and policies across all federal agencies involved in low carbon technology research, development and deployment.
18. DOE should set up an Office of Technology Innovation or a technology innovation initiative to ensure that new strategies for innovation drive all key low carbon technology programs of the agency, and especially bridge the work of the Office of Science and the Division of Energy Efficiency and Renewable Energy.
19. The innovation centers included in the existing climate bills should be funded more rigorously and directed toward more “breakthrough” research and deployment, rather than only on the commercialization of existing technologies, the apparent current thrust of the proposals.
20. Climate and energy legislation should create and fund independent technology innovation “hubs” – many distributed innovation or DI initiatives – to bring all players in the value chain together to work on each technology and to focus on product development in limited time frames.

CLEAN ENERGY FEDERALISM POLICY FRAMEWORK

THE THREE STATE PROJECT AREAS SHARE COMMON PRINCIPLES

1. States should and will remain the laboratories of experimentation and innovation on technology and economic development because most energy investment decisions are made at the state and/or local utility and customer level.
2. State and local clean energy development decisions are made closer to the markets, are often more politically durable and stable over time, and should be encouraged.
3. There is no simple, standard or optimal clean energy program design and practice that will achieve carbon stabilization; instead, all states and local jurisdictions should be given adequate federal resources and assistance to create and implement a diverse portfolio of finance, technology, and policy tools to create the necessary fifty state programs to advance a clean energy future.
4. There are many existing, experienced and “best practice” state-based, clean energy institutions that deserve continued and expanded support for their decade-long successes in these areas.
5. States can develop more nuanced and effective finance mechanisms that can leverage private sector development because they know their markets, their market players and their barriers to success.
6. Bottom-up, distributed solutions that the states can provide have always proved the most responsive and nimble solutions that best respect the ever changing demands of locally regulated state energy investment decisions, which are the hallmark of the US energy sector.
7. States should be given express authority to enact climate and clean energy policy and laws that are more stringent and aggressive than the federal programs.

LEGISLATIVE PRINCIPLES AND CONCEPTS FOR STATE-BASED PROGRAMS IN CLIMATE AND ENERGY LEGISLATION

Specific legislative principles and concepts should inform all recommendations regarding the role of states in future national climate and energy legislation. These overarching principles and concepts frame how the specific proposals made here should be envisioned and realized, and they address the core elements of this report: allowance funding for states, new state-based financing programs, and encouraging disruptive climate technology innovation.

State Allowance Funding

For allowance funding to the states, Congress should:

1. Rely on the expertise of the existing state programs and agencies that have deployed clean energy over the last decade with tremendous success.
2. Defer to state expertise in the allocation or investment of allowance funding at the state level.
3. Provide states with significant flexibility and specific incentives to employ a broad portfolio of financing tools and strategies to accelerate clean energy deployment to reflect each state's political and resource context.
4. Call on every state to seek out and develop, wherever possible, opportunities to leverage their emissions allocation-derived funding with associated private capital to the greatest extent possible.
5. Encourage coordination among states to follow best practices and develop effective, program investments based on the storehouse of experience that state clean energy programs offer.
6. Encourage states to use allowance funding to partner and pursue joint multi-state clean energy projects and programs to reduce administrative costs and ensure coordinated technology commercialization activities across states and regions.

7. Encourage states, through their public utility commissions, to direct use of some of the utility sector allowance funding proposed under the current climate bills for advanced clean energy technology project development, especially for distributed generation projects.
8. Support new collaborative technology funding partnerships with the states and DOE on all low carbon technologies to overcome the various research, development and deployment gaps in the current system.

New State Financing Programs

For the development of any new finance mechanisms and entities for low carbon technologies, Congress should:

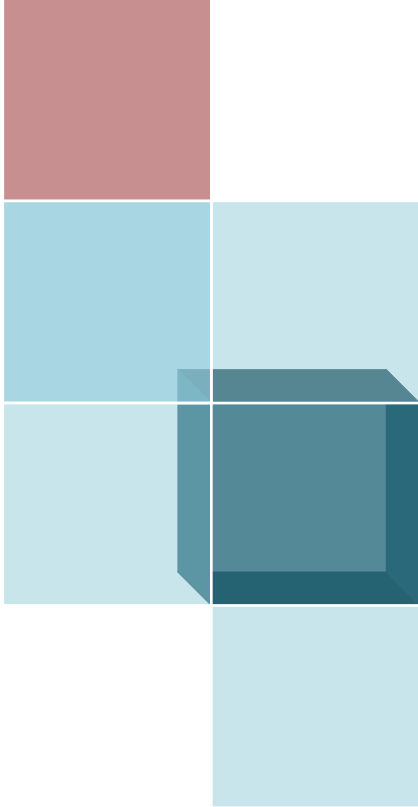
1. Expand the notion of investment vehicles such as the national Green Bank to consider a more state and regional investment focus, a state or regionally-based “Green Federal Reserve” model for low carbon investment.
2. Expand the concept of loan guaranteed programs to include multiple state-based economic development funding agencies working in collaboration with existing state clean energy funds.
3. Rely on creative state-based bonding and new finance models from non-energy federal/state funding partnerships like the successful low income housing finance infrastructure in place in many states across the nation.
4. Create and fund early stage venture development centers in states and/or regions to provide commercialization seed funding to bring promising clean energy technologies from the lab into the commercial market.
5. Allow states to immediately borrow funding from the federal government in advance of and against expected federal climate legislation allowance revenues to maintain and scale up clean energy investment programs.

New Forms of Technology Innovation

Rather than rely only on one or two innovation models of clean energy innovation, Congress should:

1. Create a “low carbon technology innovation experiment” among many federal agencies to introduce new innovation concepts across a number of clean energy and climate programs.

2. Create within DOE an Innovation Initiative to test various technology innovation models throughout the many DOE technology program areas.
3. Introduce new corporate and public goods-based innovation strategies such as “distributed innovation” or DI into many new federal and state innovation programs, beyond the regional innovation concept now found in the current climate bills.
4. Guarantee that new models such as DI be used to complement existing proposals such as the Energy Hubs, the regional innovation centers, the engineering centers and other proposals.
5. Create a national technology innovation strategy at the heart of upcoming climate legislation through new DI structures and strategies and increased funding for innovation policy experimentation.



I. NEW STATE PROGRAM FUNDING WITH CLIMATE ALLOWANCES

There are several new state programs that should be initiated with climate allowance funding and should be made an explicit part of new climate and energy legislation and agency implementation guidelines. Whether all these principles and programs for greater state activity should be mandated or just authorized within the states' discretion should be a subject of further discussion.

The specific legislative principles, recommendations and program strategies for these proposed new state-based programs from allowance funding are outlined in this section.

Development of SEED Funds for State Climate Finance

The Waxman-Markey bill requires that each state establish a SEED (Sustainable Energy for Economic Development) account within state energy offices to receive and manage each state's share of emission allowances. States would then set up a parallel account to manage the actual proceeds from the sale of these allowances.

While the bill establishes guidelines for how these funds can be spent, it also gives states ample latitude to respond to the clean energy opportunities in their states and to use the financial incentives and tools best matched to the opportunity. A great deal of work will be required to ensure the quality of the state programs' use of these funds. States will need to work with Congress and the Department of Energy (DOE) on implementation guidelines, and the federal government should ensure that the funds use the "best practices" demonstrated over the last decade by state funds that support clean energy programs.

The current Waxman-Markey bill directs 9.5% of allowances to these SEED accounts. The bill ensures that at least 12.5% of the allowances be directed to local government for energy efficiency improvements, 20% be used for building code enforcement and low-income energy efficiency measures, 10% to clean transportation alternatives and 20% for renewable energy manufacturing and deployment.

But a full 37.5 % of the emission allowance is entirely unrestricted, merely subject to filing of a plan and annual reporting. As it should, that provision leaves a great deal of flexibility that will provide an opportunity to craft targeted programs in the various states to ensure the funds are most effectively invested.

Over the past decade, more than 20 states have established ratepayer-funded clean energy funds to support energy efficiency, renewable energy project deployment, or both in most cases. These programs have provided both technical assistance and direct financial support for a wide range of low carbon technologies and project sizes. And they have maintained the pace of clean energy innovation in an era when federal resources were scarce or non-existent.

Clean energy funds often provide rebates to lower the upfront costs of off-the-shelf technologies—ranging from individual CFL light bulbs and Energy Star-rated appliances to commercial-scale solar photovoltaic and hot water systems. Many funds also offer focused grant solicitations to support larger projects, pre-commercial technologies and clean energy manufacturing. In addition, to multiply the impact of their funds and provide only the level of public financial support that clean energy projects need, a number of states have also established loan or investment programs. These programs combine lower rates of return and a greater ability to underwrite loans for renewable energy technologies. With the overwhelming percentage of the life cycle cost of a clean

energy installation being embedded in its initial capitalization (since there are typically no fuel costs), such projects are inordinately sensitive to levels and cost of financial leverage, so such loan programs can be of particular value.

The 2009 American Recovery and Reinvestment Act (ARRA) is providing over \$3 billion to these 18 states with existing clean energy fund programs, and the 32 others that have not had permanent clean energy funds in the past. However, because of the one-time nature of this support, many states without a permanent fund structure have simply settled for using the funds to fund backlogged energy efficiency projects in public buildings or other fairly easy, off the shelf technology deployment.

In the future, a stable, reasonably predictable source of funding from the sale of emission or carbon allowances such as called for under Waxman-Markey should encourage states to create permanent funds and establish a more robust portfolio of financing tools to address the needs of the market for both existing and advanced technologies.

For example, the Waxman-Markey bill allocates the 9.5% of total allowances to states based on a formula consisting of: 1/3 of allowances to all states, 1/3 based on population and 1/3 based on energy consumption. As an alternative, perhaps 1/3 of the allowances designated for states could be set aside and allocated each year for more targeted uses by more experienced states. The use of new financing tools, support for innovative technologies, the ability to reach targeted market segments, regulatory policy that encourages renewable energy and energy efficiency investment and the availability of matching state funds could all be criteria used for such competitive selections. States should be rewarded not just for being big or heavy (and sometimes inefficient) energy users, but also for being innovative and having a commitment to clean energy market transformation. (This particular proposal will be politically difficult to implement as it is based on existing, well-established state funding formulas in federal law, but some flexibility for some funding might be encouraged as an experiment.)

In addition, the organizational structure of these programs is important. Among the many state clean energy funds today, the most successful are not necessarily run by traditional state energy offices but, rather, by quasi-independent state or nonprofit entities (NYSERDA or the Energy Trust of Oregon) or 3rd-party contractors (Vermont Energy Investment Corporation or Wisconsin Energy Conservation Corporation). These entities can have greater technical expertise and be less subject to political uncertainties than internal state agencies.

Climate legislation should provide states with the latitude to create or contract with these independent organizations in developing permanent clean energy programs.

Allowance funding legislation and guidelines also should make clear that any funded portfolio should include not only existing tools such as grants and loan funds, but new strategies that include support for technology innovation and cooperative demonstration projects. This will require creative thinking about new state financing structures that the allowance funding could support. So there is a key linkage between the programs put in place through ARRA and thinking ahead to how a potential permanent source of state funds through allowances would be structured and administered.

Create New State Structures to Administer Funding

To administer the new state climate funding, each state should be required (or at least strongly encouraged as a condition of funding) to establish an independent “clean energy deployment center” (CEDC). This would ensure that the state has sufficient institutional capacity to carry out its allowance funding obligations.

A CEDC would be an entity specifically chartered to implement direct support and investment programs for clean energy deployment through the issuance and management of loans, letters of credit, loan guarantees, equity investments, and other financial products and arrangements. These state centers should be governed by an independent board and staffed with appropriate personnel with experience in clean energy finance, technology, and market development.

CEDC’s could be housed in state energy offices, state economic development agencies, a new nonprofit organization, existing state clean energy funds, or in a public benefit corporations (such as NYSERDA in New York). Their work could be coordinated with the programs of the proposed federal Clean Energy Deployment Administration.

Each state CEDC would be charged with:

1. Attracting private capital to the commercialization of clean energy technologies in its state;
2. Providing direct financial support to clean energy project deployment;
3. Providing assistance to accelerate the deployment of clean energy technologies; and
4. Addressing state-level clean energy policy objectives such as job creation, supply chain infrastructure, economic development, product development, RD&D, and other issues essential to successfully accelerating clean energy development.

Each CEDC would act as its state’s designated clean energy financing and innovation agency and provide a wide range of support for deployment of clean energy technologies. Low cost financing and equity provided by a CEDC, or indirectly through CEDC programs, should follow consistent and transparent investment criteria for giving financial support. It should also have consistent standards for program implementation, reporting and monitoring and evaluation pursuant to federal guidance.

CEDCs should be designed for management stability, flexibility, and agility. Wherever possible, they should build on existing state clean energy program experience in overcoming traditional state agency obstacles. They should aim to enable state-level management of the complex financial and market transactions that can lead to rapid clean energy deployment and commercialization.

New Technology Partnership Projects: DOE and States

Currently, there are no funded, federal-state clean energy collaborative partnerships that have a clear goal to bring clean energy technologies from lab to market.

The most common current practice in this area is for DOE to issue competitive solicitations that might result in ad hoc state funding for various aspects of a technology program such as wind or solar. Technology projects are generally fragmented in funding and support. As a result, there are no effective, product or market oriented partnerships that marry the research needs of the DOE with the deployment expertise of the states.

Moreover, given various state restrictions on spending, it is difficult for states to fund projects with the federal government outside of their own state borders, making any DOE/state cooperative technology partnerships – to jointly fund clean energy demonstration projects -- difficult to establish.

So, oddly enough, no cohesive, comprehensive and collaborative program exists on joint project demonstration between the federal government and the states over a broad range of clean energy technologies. This absence denies the states and the country key joint strategies needed to ultimately drive the commercialization of clean energy technology.

Proper use of emissions allowance funding could change this situation.

Such funding could support a coordinated new partnerships between DOE and the states, which is critical to accelerating progress and achieving cost reductions for low carbon technologies for a number of reasons. First, because technology risks are high, the appetite of private investors in technology development is always limited and currently largely non-existent. Second, in order for private developers to make robust cases for private investment, they must be able to demonstrate a clear route to market. This requires an unambiguous long-term policy commitment of the combined resources of states and DOE to support programs targeting clean energy cost reduction and growth.

To demonstrate this commitment, a new form of state/federal funding and technology partnership is needed as part of climate legislation authorizing allowance funding to the states.

Clean Energy Group/Clean Energy States Alliance is about to engage in one such specific collaborative effort with DOE on offshore marine technology development. Such efforts would bring DOE and the states together to increase and focus broader public support to accelerate the progress of technology development through joint RD&D activities.

Initiatives of this type will leverage increased public funding for renewable technology development into the medium term and help deliver cost reductions. They could establish a clear state/federal climate federalism framework of support to the offshore marine energy sector to give it greater investment certainty. This kind of technology partnership approach should aim to engage states, outside experts and developers of various technologies to provide input and information to DOE, and assist DOE in identifying the best prospects for the most promising technology concepts suitable for large-scale prototype project implementation.ⁱ

This approach, if incorporated in legislative guidance to DOE, would provide a fundamentally new way to do energy technology development and deployment in the United States, with new roles for the federal government and the states. It could also help to improve the way that most state and federal funding occurs. It would move from blind competitive solicitations that are essentially based on the assumption that only the federal government knows what to fund, to the encouragement of funding partnerships with joint support by the federal government and the states. This is the best way to advance technology development based on their collective experience, shared through collaboration.

The current DOE grant award solicitation process is simply not working effectively to advance the missions of the federal or state governments. New partnerships, program designs and funding relationships, which should be reflected in and encouraged by the funding provisions of climate and energy legislation, should be supported.

Encourage State Investment in Higher-Risk Technology Projects

State allowance funding also should encourage greater state investment in higher-risk clean energy projects and emerging technologies.

This would be in contrast to lower technology risk projects favored by “fast results” stimulus funding such as ARRA. That is, most of the current stimulus funding through ARRA is expressly designed for quick implementation, resulting in the funding of existing technology with no technological risk. This is also the model many of the existing state clean energy funds utilize to distribute their current system benefit charge resources.

However, one key to long-term climate change solutions is to fund and encourage higher-risk, “breakthrough” technologies. They are prone to greater chances of early stage failure, but carry the potential for greater success over the long term. In the end, only the successful development of these advanced technologies can be expected to resolve the country’s climate problems.

A specific portion of the state allowance funding should be explicitly devoted to higher risk/higher return technologies by a legislative mandate or authorization. Otherwise, if left undirected, the implementing agencies and the states are likely to fund the “safe bets” that are not necessarily the most robust technology solutions to climate change.

That is clearly the case now with state clean energy funds, with few state programs funding longer-term, higher risk technologies. The pressures on them to avoid failure are just too great. The odd result is that continued state funding of existing technologies (like silicon based solar technologies) could encourage a “lock-in” of the present technologies and create additional barriers to entry for the more advanced, next generation technologies. While the states fortunately are building markets, they do need to do more on higher risk technology development and deployment. Greater federal financial incentives could help move them in that direction.

In a sense, the Waxman-Markey bill partially sought to address this issue with direct federal funding of high risk/high reward technologies such as carbon capture and sequestration. However, to create a more robust research, development and deployment agenda, climate legislation also should explicitly authorize some portion of state allowances toward the same goals. Such authorization may be necessary to give states more freedom to experiment with allowance funding for high-risk technology projects, as well as provide matching state fund opportunities with higher-risk, federally funded projects.

Clear legislative and administrative support for higher-risk, transformative, clean energy investments could be an important finance and technology-forcing element of future allowance funding.

Encourage Pooling of Allowance Funds for Joint State Projects

At present, it is very difficult, if not impossible, for most states to pool individual state funding with other states to support joint clean energy projects of mutual interest. This is a little known, but significant, obstacle to the scale-up of clean energy technologies.

States typically prefer to fund projects within their own borders, often for political or sometimes for legal reasons; at present, all the obstacles to joint funding are not completely understood. Nonetheless, this occurs even though the optimal use of some clean energy funds could be in joint investments with other states in larger interstate or regional projects across different geographic areas. Such programs can have considerable advantages of larger (and sometimes more relevant) scale, or more replicable demonstration value.

These could include multi-state projects such as offshore marine, solar thermal or other high value demonstration projects and programs that would benefit many states without the need to fund many solo projects with more limited value.

Climate legislation should not only encourage but also perhaps require pooling of some state allowance funds for certain limited and valuable joint technology forcing purposes. Such provisions would have to be structured to remove any existing state barriers to fund multi-state pooling arrangements. This presumably could be done through means such as added incentives for pooled funds or provisions for state or regional “compacts” to overcome various challenges to joint state activity.

States then could support harmonized multi-jurisdictional clean energy projects and programs. These could minimize transaction costs for market participants through common rules and regulations, forms, agreements, processes; maximize impact of taxpayer money through shared fixed costs (e.g., website template, database, tracking software, evaluation costs, participant help lines); maximize market-transformative effects through demonstrating a more robust commitment to expanding the critical clean energy industry supply chain and create more negotiating leverage among the states with potential equipment suppliers.

It is important for climate legislation to encourage technology support and development through multi-state, joint activities in as many ways as possible. For example, states should be strongly encourage, and provide extra incentives for, their state clean energy development agencies to pursue joint activities and programs through CEDC partnerships and regional clean energy program administration. This multi-state activity could lower implementation costs, advance regional markets and better coordinate technology commercialization efforts.

Coordinated Federal/State Procurement Programs

Driving demand growth with strong federal procurement is a well-established approach to accelerate (or in some cases even enable) the development of a new technology market. The success of the federal program to purchase large volumes of semiconductor devices and thereby drive rapid technology advances and cost reductions in the chip industry is well known.

Joint federal/state procurement of clean energy technology could benefit from a similar strategy. A new, state-integrated program of federal procurement incentives could be designed to support only multi-state procurement activities, in order to achieve the fastest possible scale-up. For example, such an approach could leverage a procurement commitment to be made by the federal government for deployments on federal buildings/lands in a particular region with a parallel, partially federally-supported series of commitments for installations on state buildings/property in the participating states.

The focus here would be on a regional or multi-state framework (i.e., single states either can't apply, or are eligible for significantly lower levels of support.)

A large-scale, simultaneous federal/state PV deployment on public buildings seems a natural fit, lowering the ongoing operations and maintenance costs associated with each of the properties involved for presently cash-strapped state participants. A number of technically developed but still under-deployed technologies such as PV, distributed solar thermal, small wind turbines, or ground loop heat pumps could receive combined federal/state procurement and deployment commitments to materially reduce their associated manufacturing costs by driving manufacturers down the experience/cost curve. Other technology options also should be considered.

One important co-benefit of an early launch of such a program would be its economic development and employment impacts. Because of the scale of these block procurement efforts, service providers and manufacturers are almost certain to require incremental manufacturing and installation personnel. A geographically concentrated approach also would help assure that employment opportunities would reach critical mass in given areas, to allow for a coordinated growth in the local low carbon labor force and to support an ongoing program of clean energy deployment.

New Climate Reporting and Metric Systems

Under ARRA funding, states for the first time are required to provide a new set of data on the use and results of stimulus-related clean energy funding to the federal government. This information ranges from project costs, to job creation, to levels of greenhouse gas reduction expected from the ARRA investment in state clean energy programs.

For the first time, a national reporting and metrics IT infrastructure is being created to monitor state investment in clean energy across the United States. This was not the intention of the ARRA reporting requirements, but it will likely be one of its important ancillary effects.

Many states will invest considerable time and effort in creating these new databases and reporting systems. In turn, states expect that these new systems and infrastructure could be the basis by which the technology funding mechanisms for any future climate allowance funding could be followed and monitored.

Therefore, provisions should be made in any climate legislation for ensuring that this information and reporting infrastructure is funded sufficiently so it is harmonized, preserved and enhanced. This would create a durable and reliable reporting system for state emissions allowance funding in the future.

These efforts could help to establish a first-ever, national reporting system on state clean energy investment, job creation and greenhouse gas reductions across the United States. The quality and caliber of that data will be important to the integrity of the allowance funding system going forward. Thus, the use of the emerging ARRA state systems could provide a foundation for any legislative and administrative climate oversight work in this area.

Workforce Training and Green Jobs Programs

The House climate bill contains various general provisions for creation of clean energy workforce training and green jobs programs. The key provision creates federal grant programs run through the Department of Education or the Department of Labor in coordination with other agencies such as DOE.

Specifically, the Secretary of Education is authorized to award grants, on a competitive basis, to eligible partnerships to develop programs of study (containing the information described in section 122(c)(1)(A) of the Carl D. Perkins Career and Technical Education Act of 2006 (20 U.S.C. 2342)), that are focused on emerging careers and jobs in the fields of clean energy, renewable energy, energy efficiency, climate change mitigation, and climate change adaptation.

These grants are intended to create education programs to develop the specialized workforce skills to support new careers and jobs in energy efficiency, renewable energy and climate change areas. They would create programs focused on “best practices” in green jobs skills training for federal and state programs to address skill shortages and also target low-income workers.

Developing an ample, nationally distributed skilled workforce is essential to a transition to a low carbon energy system. An enormous shortage of skilled electrical workers is already projected over the next decade as the current generation of workers retires. The acceleration of the “electrification” of the US economy will continue to increase demand for these skilled workers, even before factoring in the impact of rapidly expanding clean energy development requirements. While these are not “green jobs” per se, they represent jobs critically needed to support the transformation of the nation’s overall electrical infrastructure to a low carbon, 21st century framework.

There is a similar need for workers with the skills to assess and manage building energy performance and to install and maintain wind turbines and solar photovoltaic systems. Technical certificate or degree programs and installer certification are essential to both maximizing the benefits of efficiency and renewable energy investments and building public confidence in them.

Training and workforce development is an especially important area for use of allowance funding for the states. Workforce training is traditionally a state responsibility.

However, in the proposed legislation, there is no clear “best approach” identified in the federal program. There is also no comprehensive or “model” approach to skills training in this area that has been identified across the states, nor is there yet any coordinated federal/state partnership on workforce development that would ensure success in this field in the time required.

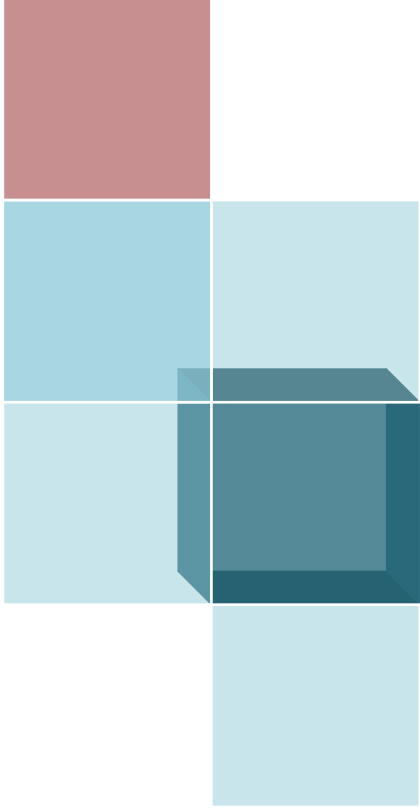
There are four key elements to an effective green workforce development program that should be considered in future climate legislation.

- First is an understanding of the workforce requirement and existing training programs, both geographically and by industry/occupation. There is a serious gap in data collection and measurement systems to assess the state of the nation's clean energy workforce or the gaps that need to be filled to build out that workforce.
- Second, it is important to have the right technical training programs in the right locations, i.e., wind technician programs in rural windy states and building management programs in metropolitan areas.
- The third element is designing and deploying strong apprenticeship and placement programs so that graduates of these workforce development efforts can move seamlessly from the classroom to the workforce.
- Finally, these programs and occupations need to be marketed to existing and potential pools of skilled labor, in order to attract both recent high-school graduates and people displaced from other industries and occupations.

Green workforce development is an area in which dedicated funding for coordinated state approaches, "model" training programs, and best practices learning are especially critical. A new comprehensive and detailed federal-state model for skills training in this area should be one of the highest priorities for climate legislation, one that departs from the conventional competitive solicitation approach to support a well-funded partnership between the federal government and the states on program development, coordination and implementation.

In addition to the legislative language in the House climate bill referenced above, some additional workforce development elements of a climate bill could include:

- Requiring inter-agency coordination within and across states to best design workforce development programs.
- Developing state and federal repositories of information on degree programs, training and certification opportunities, and other workforce development resources for access by the public, educational institutions, agencies, and industry.
- Enhancing communication and collaboration between educational and training institutions to advance opportunities for cross-fertilization and partnerships.



II. CREATION OF NEW STATE-BASED FINANCING MECHANISMS

In addition to new allowance funding, climate and energy legislation offers the opportunity to create new state-based clean energy funding mechanisms that could be used by states and in collaboration with the federal government. Some of these strategies involve suggested changes to federal funding proposals to make them more responsive to state approaches. Others propose new state finance tools that can be created solely by the states. Principles and recommendations for this range of new state-focused financing mechanisms and programs are outlined in this section.

From Green Bank to Green Federal Reserve Banks

A bill sponsored by Rep. Jay Inslee, H.R. 2212, would create within the DOE an independent entity to distribute loans and other finance instruments to “advanced technology” (i.e., not yet commercialized) energy projects such as cellulosic biofuels and 2nd generation lithium ion batteries. The proposal has been loosely termed the “Green Bank” concept. It is proposed that it be seeded with a \$10 billion endowment from the Treasury.

Separately, Section 186 of the Waxman-Markey bill creates a Clean Energy Deployment Administration (CEDA), loosely patterned after the Export-Import Bank. CEDA would be owned and operated by the United States, administered centrally and would provide both direct funding (loans, loan guarantees, letters of credit) and indirect (e.g., credit enhancement for state-issued clean energy bonds) support to clean energy projects and industries.

While the bank and CEDA concepts have merit, another federally managed, DC-centered single purpose entity may not be the most effective structure given the diverse nature of the clean energy marketplace and the generally local nature of such investments.

Perhaps a better model is the Farm Credit System, a series of state-based, independent lending institutions that raise capital and pool risk collectively with the insurance backstop of the federal government.

In combination with the other mechanisms described here, a series of regional clean energy banks might be much more effective in responding to local opportunities, developing regional markets, and creating closer arrangements with regional and state-based private investors. Such a concept should be a key element of any future climate legislation.

Another way to think about this Green Bank or Farm Credit System concept and how it might operate in a more decentralized manner is to consider the example of the Federal Reserve System, which is a collection of eleven regional banks serving regional financial needs across the country. While their entirely “wholesale” activities do not involve lending in the manner needed to support clean energy, they represent, symbolically if not practically, a decentralized system of federal financing that could be another model for this new financial infrastructure.

Something like a “Green Federal Reserve Bank” might be a way to capture the essence of what is needed to bring a long-term, state based financial superstructure to clean energy and low carbon technologies for decades to come.

Loan Guarantees and New State “Designated Lending Authority”

Section 406 of the ARRA amends TITLE XVII of EAct 2005 to create a \$48.5 billion program for the rapid deployment of renewable energy and electric transmission projects. It is a loan guarantee program modeled in part after the earlier loan guarantee programs that had DOE as the sole authority over loan decisions. That DOE program has been plagued with many problems, including delays and the inability to approve many loans in the time the program has been in operation.

The heart of this new plan is the creation of local or state-based “Designated Lending Authority” or DLA entities that will manage the loan guarantee approval and implementation process for DOE under the program.

In the early start-up, these entities are likely to be major private financial institutions, to get the program quickly up and running. But eventually DLAs likely will include existing state development finance organizations that would act as “designated lenders” on behalf of DOE. That appears to be the thinking at present among advisers to the program. Once financing arrangements are made with state development agencies, they would be joined by local banks, investment banks, institutional investors and private equity and venture capital firms to create a new state finance infrastructure for clean energy lending.

This is only a temporary program. But if managed properly, it has the potential to be a model for creation of a whole new class of state-based financing entities for clean energy, which could become a core part of any permanent, future climate legislation.

At present, the state funding for clean energy is typically derived from system benefit charges and administered by clean energy funds, energy offices or similar entities. However, this new “DLA” approach would expand the range of entities eligible to finance state energy projects under Section XVII (and potentially under future climate legislation, if it incorporated this approach), and serve as state finance coordinating entities working closely with established organizations.

In other words, this strategy could become an effective way of creating a new, state based financial institutional infrastructure for clean energy investment. This could become similar to that which exists for low-income housing or other state infrastructure investment. At the state level, the state financial institutional infrastructure for this kind of lending are now haphazardly developed and almost non-existent outside of the state clean energy funds. Other clean energy fund institutions, such as public lending authorities and private investors, need to become part of a more systematic lending regime in each state. So the potential to shape this approach and make it permanent in future climate legislation should be an important strategic goal.

Bridging the Commercialization “Valley of Death”

The clean energy finance community is in broad agreement that one of the most critical challenges to rapidly scale up low carbon energy technologies is the need to bring technically proven energy systems to full-scale commercial deployment. The project development cycle is littered with orphan technologies that appeared fully operational, but could not find funding sufficient to roll them out at a commercial scale.

Particularly in energy, this step from “technologically proven” to “commercializable” can require tens or hundreds of millions of dollars. At present, virtually no commercial or public organizations are well positioned to support this critical transformation.

As is so often the case, selected state funding mechanisms have already demonstrated that new approaches for bridging the commercialization finance gap can have important results. In many states, for example, agencies commit to build a strong industrial “cluster” around high growth technologies such as nanotechnology or life sciences research and commercialization. Similar programs could be envisioned to spawn robust clean energy industrial clusters across a variety of dedicated subsectors nationwide. Allocating allowance funds to support such programs, perhaps augmented with state matching funds, would be a natural extension of these already successful programs.

Allowance funding also could be used in a number of ways to make progress toward other related efforts to help bridge the commercialization finance gap.

At the national level, most programs, such as the current DOE Title 1703 effort and the proposed Clean Energy Deployment Administration, focus on the provision of attractively priced debt capital for emerging technologies. An important complementary program could be modeled on the Massachusetts Renewable Energy Trust program for equity investments. It made a key equity investment in the then struggling Evergreen Solar company. With the later commercial success of the firm, the Trust realized significant gains on its investment and was able to utilize these gains to fund its own expanded solar programs.

Similar efforts could be envisioned in other states, perhaps spurred by match funding from federal emissions allowance resources. Such investments can hit key state priorities (protecting jobs and promoting state economic development), at the same time that they help push towards the nation’s goal of accelerated clean energy development.

This approach is particularly interesting because it would have states work alongside local technology development firms to aid them in “de-risking” an emerging technology as it moves towards commercialization. State agencies could also provide lower costs of capital and/or more forgiving performance requirements than other, largely private

investors in an investment, in return for the important economic development impacts that a successful new clean energy enterprise can provide.

A third model for the use of emissions allowance proceeds would be for the development of a Federal Risk Management Authority, which would provide a form of re-insurance for commercial insurers willing to underwrite so-called “efficacy insurance,” that warrants the operating performance of new technologies. As state regulated entities, insurance companies could be encouraged by favorable state policies to prudently increase their exposure to this class of partially federally-guaranteed technology risk. Some states might also have an interest in co-insuring these risks, taking a position senior to the federal government but junior to their in-state commercial insurers, again to stimulate the potential associated economic development benefits.

New State-Based Formulas for Clean Renewable Energy Bonds

Clean Renewable Energy Bonds (or CREBs) were created by Congress as a mechanism for providing subsidized financing to renewable energy projects developed and owned by units of state and local government, municipal utilities and electric cooperatives. Because these entities are unable to utilize the significant tax benefits available to privately-owned renewable energy projects, CREBs were developed as an alternative.

Under this program, eligible entities apply to the United States Treasury for an “allocation,” essentially authority to issue tax-credit bonds for an approved renewable energy project. The entity can then issue a bond that provides the bondholder with a federal tax credit instead of an interest payment from the issuer. The issuer must still repay the principal plus any additional interest required to sell the bond.

The current program has had high demand during its first two years of operation. However, the method of allocating the bonding authority federally has led to distortions in both the location and size of projects. Treasury’s allocation methodology has rank-ordered eligible projects from smallest to largest and granted bonding authority until they ran out.

This has led to a large number of smaller projects concentrated in certain states, not the most optimal result for the market.

As an alternative to structuring these bonds to fund a greater variety of projects, Congress should look to another successful tax credit program, the Low Income Housing Tax Credit (LIHTC). Under this program, state housing authorities are given allocations based on state population. The state then allocates the LIHTC authority to individual housing development organizations based on state-specific criteria.

By utilizing this type of methodology for CREBs, each state would be assured an allocation and each state could provide bonding authority for those projects that would have the greatest merit. In other words, decisions would be based on state determinations, rather than on a rigid federal funding formula that has not produced the best results for the clean energy market. Climate and energy legislation should be used to produce that better financing result.

Sale of Stimulus Public Stock Holdings in Bailed-Out Banks to Seed New Public Endowments for Clean Energy

In addition to allowance funding, conventional federal DOE funding, and state funding, additional funds will likely be needed to sustain a serious clean energy revolution. The question is whether there are new sources of funds that could be developed through climate and energy legislation.

One creative answer proposed in some philanthropic circles, based on similar European experiences, is to look to the recent federal government investment in the stocks of distressed banks as the source of new funds in the future. That is, the federal government holds about \$5 billion in warrants or options to buy back bank stock at historically low set prices that the federal government acquired when it bailed out the nation's banks in the fall of 2008. With luck and the expected economic recovery, over time these warrants could have final values significantly above the amount of Treasury funds originally committed.

Some European countries have tapped such windfall profits to generate endowments dedicated to social purposes. What they did, and what the US could do, is transfer those warrants to a specially created fund to finance innovation in clean energy. That fund could then sell the warrants in an orderly fashion over time, return the principal proceeds to the Treasury, and use the balance resulting from the increase in the warrants value to invest in clean energy technology.

Germany took a similar approach in the early 1960s when it unloaded its ownership of Volkswagen Corporation. Today the Volkswagen Foundation has \$3 billion in assets used for scientific innovation. Italy vested ownership of various quasi-public banks in private "bank foundations." They sold the stock, and created various charitable endowments. Britain recently developed the same funding base with the proceeds of the national lottery, as did the Netherlands.

Obviously, if this approach were pursued, there would be competition for the funds from other social purposes. But it is an avenue worth considering in future climate legislation for raising additional funds for clean energy funding.ⁱⁱ

Creation of State-Level Clean Energy Economic Development Institutions

While it is good that many climate proposals have linked clean energy with economic development, there are few federal climate proposals that clearly and directly create and support comprehensive state-level institutions and related federal programs for that purpose. President Obama and others have stressed jobs creation as a reason to support climate legislation.

To better ensure that result, a set of public-private collaborations modeled on other economic development strategies should be a key element of climate legislation. Since state-based programs can be engines of economic development, and states are long experienced in such efforts, it makes sense to put state/federal collaborations at the center of any such economic development program.

The types of collaborative structures that could effectively marry federal funding and state execution could include the following:

- Creation of co-funding for early stage commercialization grants and venture development assistance;
- Creation of green accelerator parks that would serve as incubators for technologies related to clean energy technology pilots, demonstrations and early manufacturing deployments;
- Development of regional centers of excellence to bring together states in regions around promising technology development and market opportunities; and
- Support for early mobilization of new state-level funds through financial products and arrangements to support private sector lending to, and equity investments in, large scale deployment of clean energy. ⁱⁱⁱ

Another model that would effectively leverage the potential ongoing nature of the emissions allowance monetization programs could be based on Pennsylvania's recent Alternative Energy Development Program. It is currently providing \$500 million to the state's Commonwealth Financing Authority, mobilized via a bond issue that will be supported by the appropriation of \$40 million per year through 2038.

This aggressive program allows the state to make progress across a variety of important clean energy/low carbon targets simultaneously, effectively jumpstarting expanded clean energy commercial activity in the Keystone state. Pennsylvania is wagering that the accelerated economic activity derived from its massive new clean energy investments today will stimulate significantly increased economic activity in the state, which will in turn provide increased state revenues to address its future bond obligations.

With dedicated allowance revenues available to it to support the resulting bond payment obligations, any state would be able to take a similarly bold approach to accelerating its clean energy development.

As the case of Pennsylvania demonstrates, a number of states are beginning to explore creation of some or all of the types of institutions enumerated above. But the clean energy economic development field is quite immature, and it currently lacks a sustained funding base or set of supportive programs from the federal government, as exists in other economic development fields. Clean energy as economic development is the motivation for much energy legislation today.

But at the state level, where most economic development actions are taken, the superstructure is quite fragmented, underfunded and immature. A new set of entities, programs, coordinated action and funding will be needed – new models of clean energy economic development institutions at every level of state government, with the support of companion federal agencies.

This is an important new direction that should receive strong support from climate legislation on many levels. It would require multiple funding sources from the allowance allocations, but would establish new relationships with non-energy agencies such as the Department of Commerce, the Department of Agriculture, and other federal economic development agencies. A comprehensive economic development strategy between the federal government and the states – to develop some of these new concepts as state experiments – would be a good first step in future climate legislation.

SBIR DOE Programs Need to Focus on Climate Technology Development

Under current law, agencies such as DOE are required to set aside 2.5 percent of their funding for Small Business Innovation Research (SBIR) Program funding. SBIR is designed to encourage small businesses to develop early stage new processes and products that are still too high risk, and to provide quality research in support of national missions like energy.

In recent years, this has meant about \$100 million a year in DOE Office of Science funding to small businesses to develop and commercialize energy technologies, the third largest amount of SBIR funding of all federal agencies. Grants for Phase I funding are about \$100,000, while the larger grants can be as high as \$750,000. This is the primary source of research and development funding for small business in America.

The relevant point here is that any federal funding, including funding through climate allowances, will be subject to the SBIR requirements for set-asides of these percentages of monies. A focus on how these climate-related SBIR funds will be directed is of critical importance to clean energy small businesses.

In particular, each state is involved in helping small companies apply for the typical competitive SBIR grants from DOE. However, a recent National Academy of Sciences report on the DOE SBIR program said it was understaffed, leading to a program dedicated to conventional grant management. As a result, there was no outreach, largely ad hoc funding decisions, little measuring activity, limited involvement of the National Labs, few matchmaking efforts, no encouragement for later phase, coordinated business development between the states and the private sector, and no strategic planning or documentation of success.^{iv}

To achieve success in creating small clean energy and low carbon businesses, a more robust SBIR DOE program, working with the states, will be needed. It should more strategically focus on clean energy technologies, encourage more matching with state funds and private investors, link with the National Labs, and overcome all these other shortcomings noted above.

This area is ripe for a revised and more effective federal state partnership focused on business support in the clean energy arena, with a more robust SBIR grant-making apparatus that will be part of any climate allowance funding.

State and Federal Policy Coordination on Climate Finance Legislation

At present and for some time, federal and state energy finance policy has often operated at cross-purposes, especially in the area of clean energy finance.

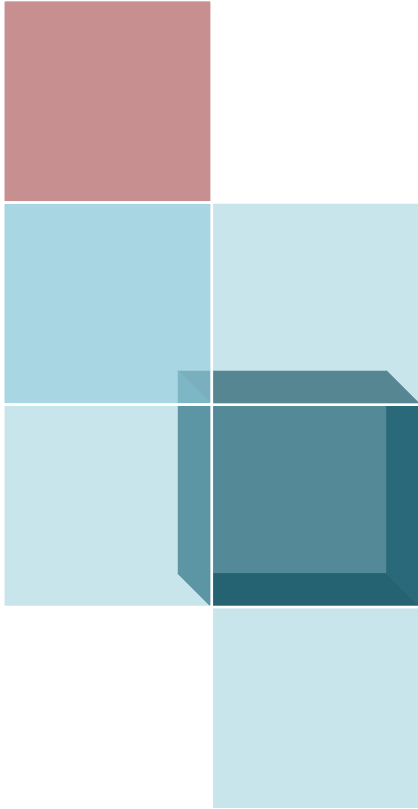
There is currently no coordinating entity that can share information between the federal government and the states on the successes and failures of clean energy financing options, alternatives and results. There is virtually no systematic way for various government entities to learn from each other, to coordinate responses or develop new financing mechanisms.

The recent experience with the rollout of the ARRA stimulus funding demonstrates the total absence of any institutionalized arrangement that can serve this purpose. There is no institution that can ensure that financial innovation is occurring, and that public dollars are creatively leveraged and effectively invested.

Therefore, each state needs a dedicated entity, with sufficient funding, to serve a coordinating and strategic role on these issues. The state clean energy development centers (CEDC) concept described above provides an important mechanism for achieving this objective.

What is also needed is some new form of federal/state finance body or initiative to coordinate and fulfill these purposes. It need not have any regulatory authority, but should serve as an information resource, collaborative body and research institution. Perhaps some program within the national labs could be reformatted to fulfill this role, or a new administrative unit within DOE could be created. It is not clear yet whether there exist other models that can be employed for this purpose.

But its need has been demonstrated time and again, and the climate legislation could be one place where such an entity could be established to assure better funding utilization going forward.



III. TECHNOLOGY INNOVATION STRATEGIES AND STRUCTURES

Innovation to create breakthrough low carbon technologies, as well as scaling up existing clean energy technologies, is critical to climate success. This section focuses on new forms of technology innovation that should be part of federal climate and energy legislation, both to encourage federal experimentation and to better engage states and other public and private partners in the technology innovation process.

Innovation Experimentation across Energy Related Agencies

At present, there is no federal policy or federally-supported state policy to encourage experimentation with new forms of technology innovation for low carbon technology.

The private sector and a number of public sector initiatives use much more modern and varied approaches to technology innovation, including distributed innovation or DI.^v However, the federal government has lagged far beyond these efforts in the use of innovation strategies for low carbon technology breakthroughs and scale up, likely the greatest challenges to human ingenuity and innovation that we will face this century.

At the same time, there is no effective means to connect any federal innovation initiatives that do emerge with state-based technology innovation efforts, except through rather uncoordinated competitive solicitations that are not strategically geared to promote innovation in clean energy or climate technologies.

The Obama administration has made some early efforts toward government-wide open innovation strategies. In the White House, a chief technology officer has been appointed but the scope of that role is not clear. As noted below, other agencies, and in particular DOE, have begun to experiment with new approaches. Some of these initiatives are included as placeholders in the Waxman-Markey bill.

Overall, though, there is no fundamental innovation strategy that informs these efforts, no institutionalized structure that encourages learning of new innovative approaches that could be applied to clean energy, and no clear or sufficient funding path for these efforts going forward. Developing all of these approaches and more – rather than selecting one or two options now – should be made a key principle of permanent climate legislation, with long-term dedicated funding, if technology innovation to address climate change is to become a reality.

CEG has proposed utilizing distributed innovation as a new “operating system” for these new energy innovation initiatives. It could be one approach for trying out many new forms of innovation experiments. But there must be a structure and some institutional home to fund and monitor the results of these implementation efforts. We need to move beyond current *ad hoc* efforts to something more systematic and structured, based on the best evidence available from the broader field of technology innovation.

One of the first efforts in this regard is to educate Congress about the need for new forms of technology innovation approaches. The recent appropriations bills that came out of the House and the Senate committees for the DOE 2010 budget in early July 2009 dramatically cut back on DOE Secretary Chu’s proposal for eight innovation “Energy Hubs” for different breakthrough technologies. Such funding decisions are at odds with the basic science and innovation challenges for climate. They must be reversed if we are to have any hope of making science serve the larger climate mission.

Many have said we need to model the clean energy transition research and development roles after the health care research community. There, at the federal level, we have a series of funded entities from the National Institute of Health down to a network of research and hospital facilities across the country. All are focused on basic and applied research, and product delivery, with significant and growing funding. And in all, the focus increasingly is on innovation for breakthrough drugs and services. While not a perfect system, this innovation-focused institutional model is interesting to help develop principles and practices that can serve as models for what a comprehensive low carbon energy delivery system might look like in the next decades.

DOE Office of Technology Innovation

Since the Obama Administration has indicated strong support for technology innovation efforts on clean energy and climate, it might be appropriate to consider long-term legislation to institutionalize an Office of Technology Innovation at DOE (and perhaps within each agency with clean energy and climate responsibility, but using DOE as the first to test the concept). Such an organization would be separate and independent of other proposed individual initiatives such as the Energy Hubs, or ARPA-E.

In other words, an “innovation champion” for clean energy is needed within DOE separate and apart from the major program initiatives.

Right now, these new innovation ideas like the Energy Hubs have been relatively *ad hoc* recommendations based on the past experience of incoming officials. Instead, what is needed is an affirmative responsibility to insert innovation strategies within all DOE programs. All climate-related programs would benefit from a more systematic understanding of current best practices in the field of innovation, and a way to continually test and monitor these new strategies throughout the department.

In particular, a core mandate of this new entity would be to coordinate the Energy Efficiency and Renewable Energy Division and the Office of Science. There is currently no bridge between these two Offices, which exacerbates the broken linkages many reports have identified in the DOE energy RD&D set of activities in clean energy.

This bridging function could also include a clearinghouse, information resource and research funding arm on innovation strategies and structures in clean energy and climate. It would continually sponsor research, demonstration projects, cooperative efforts with the states and the private sector – all using the most up to date innovation strategies and approaches. It could also support or create similar initiatives in the states.

In other words, what could be created, (for example, in the office of the DOE Secretary or Deputy Secretary) is an action arm (or “skunk works”) that has funding to experiment with new approaches to innovation and other technology forcing strategies. This initiative would be able to cut across all existing programs, encourage innovation in each (Office of Science, Fossil Fuel, EERE and others) with a more top level approach, outside of the “silos” that exist and cripple cross-disciplinary thinking and action. Right now, no such strategic focus exists, although Obama administration officials have discussed some efforts toward that end.

An experiment launched now could form the basis for concrete proposals in climate or energy legislation for permanent funding and support.

Clean Energy Innovation Centers

The current version of the Waxman-Markey bill in Section 171 provides for creation of regional innovation centers. It would establish a program to support development and commercialization of clean energy technologies through eight regional Clean Energy Innovation Centers (CEICs) selected competitively by the Secretary of Energy.

Funding for these Centers could be awarded to consortiums consisting of research universities, private research entities, industrial players, and relevant state institutions. Each Center has a unique technology focus to which at least 40% of its support would be directed. The Centers are also designed to have a regional “cluster development” focus, which means cultivating clusters of clean energy technology firms, private research organizations, suppliers, and other related businesses.

The section essentially incorporates a localized and commercial version of the “Energy Hub” concept that has been proposed by Secretary Chu in his 2010 DOE Budget. This Hub concept is somewhat in turn based on Chu’s experience with the biofuels project he developed at the University of California at Berkeley and his prior experiences at Bell Labs.

However, it is seems this legislative form of Hub in the bill is more focused on commercialization of existing technologies, rather than on breakthrough research activity. So in that sense, it is only part of the puzzle, not the entire set of value chain activities required for more advanced innovation.

Therefore, it is important to add a separate section of the bill for funding the breakthrough technology innovation that is at the heart of Secretary Chu’s “Energy Hubs” approach to low carbon technology.

In addition, for those centers in the bill, it is not clear how these Hubs or Centers actually would operate. One issue is that the Centers would likely be housed at universities, which are not necessarily the organizations considered closest to the market most inclined towards innovation, or that have the optimum ability or skills to commercialize new technologies. All these skills would appear to be key predictors of success for this provision.

In addition, more funding for the existing bill’s Centers, and any new innovation “Hubs,” will be required than is available in the current bill. The Waxman-Markey climate bill substantially reduced their funding allowances, which should be increased before final laws are enacted. At one point, candidate Obama spoke of more than \$15 billion for energy research and development; the current bill’s funding levels are probably closer to \$1 billion, according to some estimates.

However, it is a positive sign that the innovation centers in the bill are decentralized, again reflecting the thinking that centralized DOE control over this research would not be optimal. This recognition reinforces the view that the role of the states and state-level entities could be key to successfully accelerate innovation in clean energy technologies.

So, as with other proposals noted above, future climate/energy legislation and regulatory guidance should include more comprehensive details on how these new innovation institutions would operate, relying on the most up-to-date innovation strategies, and including key state institutions. At their best, these CEICs could reflect desirable progress toward a technology-based innovation approach to clean energy and climate.

What is missing is the “operating system” that could enable these Centers to actually accelerate innovation and constructive change within each entity. Strategies for this kind of change are needed within the ARPA-E program, existing DOE Office of Science programs, among the Centers, with state entities, and within the larger clean energy community, nationally and internationally.

Again, CEG advocates the use of a “distributed innovation” approach. We would urge that use of this and other strategies be expressly identified in legislation and in DOE implementing guidance. By so doing, the foundation will be laid for incorporating the best learning and experimentation into these structural proposals, while involving state officials, the financial sector and private investors in these approaches.

Creation of Independent Distributed Innovation Initiatives

The purpose of the ACTII initiative with NCEP is to create independent technology innovation initiatives employing DI for a range of low carbon technologies, including both breakthrough technology research and commercialization. This effort is distinct from the other innovation strategies discussed here because this envisions an independent institution separately funded by public and private sector dollars as its principal goal. It is not necessary to recap all the reasons for this effort. They are outlined fully in the draft ACT II report that is about to be completed.

What is important to stress, as outlined here, is that creative efforts at innovation could be incorporated in *many* institutional structures, both existing and new. The preferred option is the ACTII approach – completely independent from existing agencies, with a nimble management structure, focused on an early prototype and then expanding to include other technologies. Its basic elements of open innovation tools, creative finance strategies, and forward-looking IPR approaches have been fully described elsewhere.

But it is also possible that some hybrid or interim options must be explored such as are suggested here. ACTII was conceived before the Obama Administration took office. Since that time, Administration officials and Congress have proposed similar innovation frameworks, none including DI, but all amenable to incorporate DI as a core operating system going forward. This could include embedding innovation efforts within existing DOE programs, as well as in the newly proposed approaches such as the Energy Hubs, ARPA-E and the regional Centers outlines in the Waxman-Markey bill.

The purpose of this section is to simply point out the multiplicity of opportunities now available to put DI into practice. While the fully independent ACTII model remains optimal, the Energy Hubs, if they are sufficiently funded, are likely to be housed in independent institutions, with some university affiliation.

While this is not a perfect solution, it may prove to be a sensible interim alternative. Similarly, if ARPA-E were to incorporate these DI principles in many projects, a set of independent institutional experiments in innovation might result. Moreover, embedding DI into existing DOE programs could provide a way to break through the “silos” that now stymie creative work at that agency.

So, while ACTII remains the preferable model, and should be adopted and funded in future climate/energy legislation as a freestanding institution, it is likely that some compromised hybrids might be put in place prior to ultimate passage of climate legislation. Of course, we would also advocate for stand-alone funding of ACTII in any future climate legislation.



CONCLUSION

This paper is a first step in this project to develop new core principles and recommendations for climate and clean energy legislation that put states in a prominent place in future finance related climate activities.

It does this by focusing on how allowance funding could be creatively invested, and how states could develop new finance mechanisms and institutions to advance enhanced state-level climate actions. It also addresses the need to consider new forms of technology innovation at the federal level, which in turn will bring states and other private and public parties into new experiments with innovation.

This paper should begin a discussion about the proposals here, and those that could be added to them. These suggestions should be taken as only a preliminary step to create a robust set of recommendations regarding states and innovation, which have not yet been considered fully as part of the ongoing climate and clean energy discussion.

It should be a starting point for discussion to ensure that these proposals are tested and refined, and also that any other good ideas are considered and included. The right process for vetting these ideas should be part of the discussion of this paper.

Once that process is complete, and some consensus is reached, the next step is to then develop a set of specific legislative recommendations for those ideas worth exploring for serious congressional consideration.

The challenge for this project is to be bold and experimental, to set out some new state and innovation strategies that the current climate debate should include but has not yet discussed. For the states will remain key players in the climate solutions process for decades to come, and technology innovation of all kinds must receive more funding and attention.

The country will need all these tools and more at its disposal to address climate in an aggressive and effective manner.



ENDNOTES

ⁱ CEG/CESA is initiating such collaboration on marine technology with DOE that could serve as a model for this recommendation.

ⁱⁱ This idea is discussed in Salamon, “How to Finance Obama’s Social Innovation Fund,” in *The Chronicle of Philanthropy*, July 2, 2009 at 32.

ⁱⁱⁱ Some of these ideas have been proposed by the New England Clean Energy Council. See Draft, “Overview of Federal Policy Recommendations For Accelerating Innovation, Renewable Energy and Energy Efficiency,” (March 27, 2009).

^{iv} National Research Council of the National Academy of Sciences, “An Assessment of Small Business Innovation Research Program at the Department of Energy,” (2008) (Web Summary).

^v This form of distributed innovation is described in a CEG/Meridian paper titled *ACTII-Accelerated Technology Innovation Initiative* (Summer 2009).

ABOUT CLEAN ENERGY GROUP

Clean Energy Group (CEG), a national U.S. nonprofit organization, promotes effective clean energy policies, develops low-carbon technology innovation strategies and works on new financial tools to stabilize greenhouse gas emissions.

CEG concentrates on climate and clean energy issues at the state, national and international levels, as it works with diverse stakeholders from governments as well as the private and nonprofit sectors.

CEG assists states to create and implement innovative practices and public funding programs to advance clean energy markets and project deployment; creates networks of U.S. and international policy makers to address climate stabilization; advances effective, 21st century distributed innovation theories for climate technology; develops new finance and commercialization tools; and works to attract new investors to move clean energy technologies to the market more quickly.

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