INTERNATIONAL ECONOMIC DEVELOPMENT COUNCIL

The Power of Knowledge and Leadership

Powering Up: State Assets & Barriers to Renewable Energy Growth

A Survey of Economic Development Leaders

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I. INTRODUCTION: THE GROWTH OF RENEWABLE ENERGY

Climate enthusiasts have been met by a tough couple of years. A disappointing outcome of the U.N. climate-change summit in Copenhagen, Denmark in 2009 was followed by the failure of the U.S. climate bill in 2010. Yet energy remains a hot-button issue not only for the United States but for the world. While the U.S. and other developed economies are highly invested in a system designed to complement the fossil fuel industry, investments in innovative and more sustainable forms of energy are slowly redefining the system. While the transition cannot happen overnight, nor should it, short- and mid-term modifications via investments in renewable energy and clean technology are critical to creating more sustainable ways of meeting our energy needs.

A path towards increasingly sustainable sources of energy in the United States is needed for a multitude of reasons, including:

- The threat of climate change and the need to reduce humans' carbon footprint;
- Rising and volatile energy prices as budgets continue to get squeezed;
- The push by multi-national firms to address corporate social responsibility; and
- The opportunity to reinvigorate our struggling manufacturing industry and create jobs.

Yet with no imminent sign of a comprehensive, national energy policy coming to fruition in the U.S., where does this leave energy development, particularly *renewable* energy development, both as an end in itself and as a wider strategy for economic development?

According to the U.S. Energy Information Administration (EIA), renewable energy is the fastest-growing source of energy in the world, with use increasing 2.6 percent per year.[1] Renewables currently account for about 12.9 percent of world energy production.[2] The majority of this comes from bioenergy in developing nations. Bioenergy includes biofuels and electricity produced by biomass power plants. Other top sources of renewable energy are hydropower, wind, geothermal, solar power and ocean energy. Rising oil prices, environmental concerns and robust

[1] International Energy Outlook 2010. (2010, July 27). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/oiaf/ieo/world.html on May 27, 2011.
[2] Carvalho, S. (2011, May 9). Renewable Could be 80 Percent of Energy by 2050. *Scientific American*. Retrieved from http://www.scientificamerican.com/article.cfm?id=renewables-could-be-80-percent on May 27, 2011.

government policies and incentives in many countries are improving the growth prospects for renewable energy sources worldwide.[3]

As the world faces rapid urbanization, threats from climate change and volatility in fossil fuel energy prices, renewable energy sources are taking root as a critical element in meeting the world's energy needs. At a minimum, 83 countries (41 developed/transition countries and 42 developing countries) now have one or more types of policies to promote renewable energy generation. In 2010, more than 100 countries had some type of policy designed to foster renewable energy growth.[4] Some sectors of renewable energy have not reached desired levels of investment growth in large part due to the global recession, the struggle to stay cost-competitive with fossil fuels, and regulatory uncertainty. However, overall renewable energy investment has remained fairly consistent, and some sectors have expanded. In fact, in 2009, investment in new renewable capacity reached $150 billion worldwide, a $20 billion increase from 2008 and nearly a $50 billion increase from 2007.[5]

Renewable Energy Definitions

Renewable energy comes from sources that replenish naturally and can be indefinitely sustained.

Renewable energy manufacturing: the use of materials, tools and labor to produce machines and goods that are used to capture energy from renewable sources.

Renewable energy production: electricity generated by renewable energy facilities (e.g. a wind farm).

Watt: A unit of power in the International System of Units which measures the rate of energy conversion. One watt is equal to one joule per second.

Kilowatt (kW): A unit of power equal to 1,000 watts.

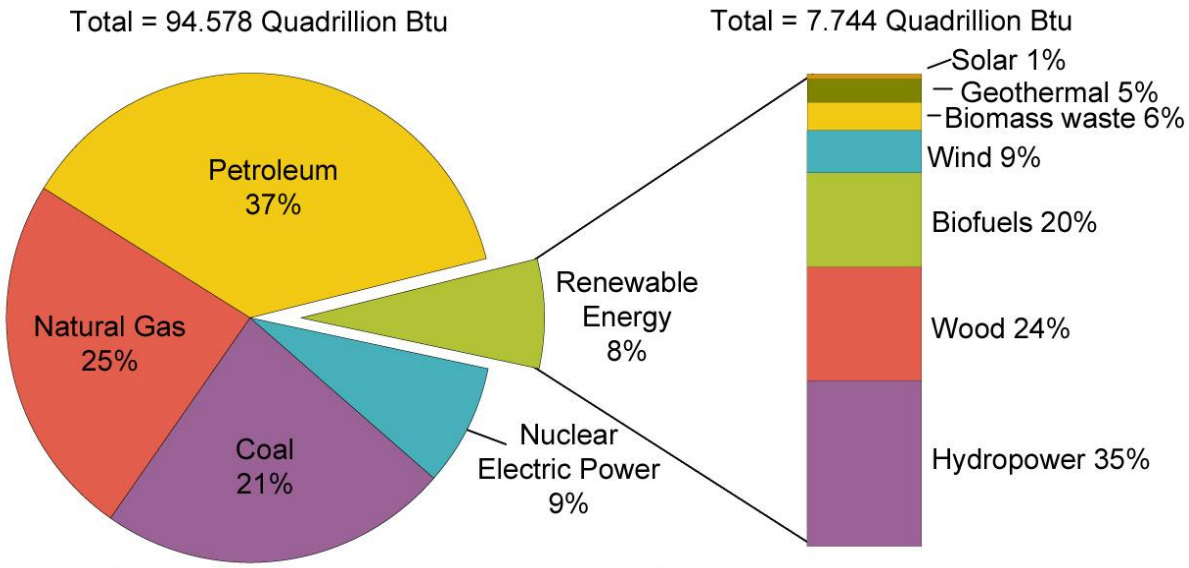
Megawatt (MW): A unit of power equal to 1,000 kilowatts.

Gigawatt (GW): A unit of power equal to 1,000 megawatts.

[3] International Energy Outlook 2010. (2010, July 27). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/oiaf/ieo/world.html on May 27, 2011.
[4] Sawin, J., Martinot, E. & Appleyard, D. (2010, September 27). Renewables Continue Remarkable Growth. *Renewable Energy World*. Retrieved from http://www.renewableenergyworld.com/rea/news/article/2010/09/renewables-continue-remarkable-growth on May 10, 2011.
[5] Renewables 2010 Global Status Report. (2010). *REN 21*. Retrieved from http://www.ren21.net/Portals/97/documents/GSR/GSR%202010%20talking%20cards.pdf on May 10, 2011.

Despite energy regulatory uncertainty on the federal level, renewable energy development continues to move forward due to rising demand for energy, the push for greater energy security and volatile energy prices. Other drivers include job creation, consumer demand for more sustainable practices and corporate social responsibility. According to the U.S. Department of Energy (DOE), "[d]eveloping domestic energy sources with known and stable costs would significantly improve U.S. energy stability and security."[6] While fossil fuels suffer from price volatility due to short-term shifts and events that can affect the world's energy markets, renewable energy is thought to be more stable because the gap between generation and consumption is generally much smaller. This not only provides for energy portfolio diversification but also for greater certainty and security.[7]

Chart 1: U.S. Energy Consumption by Energy Source, 2009



Note: Sum of components may not equal 100% due to independent rounding.
Source: U.S. Energy Information Administration, *Annual Energy Review 2009*, Table 1.3, Primary Energy Consumption by Energy Source, 1949-2009 (August 2010).

Since 1998, domestic renewable energy (not including hydropower) has increased 87.2 percent.[8] The sector continued to grow during the recent economic recession, as total renewable generation

[6] Council on Competitiveness. (2008, November). *Compete*. Washington, D.C.: Council on Competitiveness. Retrieved from http://www.compete.org/publications/detail/606/compete1 on May 11, 2011.
[7] Drivers of Renewable Energy Promotion Policies. *REN21*. Retrieved from http://www.ren21.net/RenewablesPolicy/PolicyDrivers/tabid/5604/Default.aspx on May 27, 2011.
[8] Renewable and Alternative Fuels Overview. (2010, August). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/renewable/ on May 27, 2011.

(again excluding hydropower) increased by 19.8 percent in 2008, and further by 14.4 percent in 2009.[9]

According to the EIA, the U.S. is second in the world in renewable electricity generation, with China ranking number one. Renewable energy sources — water (hydroelectric), wood, biofuels, wind, organic waste, geothermal, and sun — met 8 percent of total domestic energy needs and made up 10 percent of total U.S. electricity generation in 2009.[10] The EIA projects that renewable-generated electricity will continue to grow in the U.S. and may account for 17 percent of total U.S. electricity generation by 2035. They base this on the existence and growth of federal tax credits and investments made by the American Recovery and Reinvestment Act of 2009 (ARRA).[11]

[9] Electric Power Annual. (2010, November 23). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html on May 27, 2011.
[10] Renewable and Alternative Fuels Overview. (2010, August). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/renewable/ on May 27, 2011.
[11] How much of our electricity is generated from renewable sources? (2010, September 1). *U.S. Energy Information Administration*. Retrieved from http://www.eia.doe.gov/energy_in_brief/renewable_energy.cfm on May 27, 2011.

II. RENEWABLE ENERGY AS AN ECONOMIC DEVELOPMENT STRATEGY

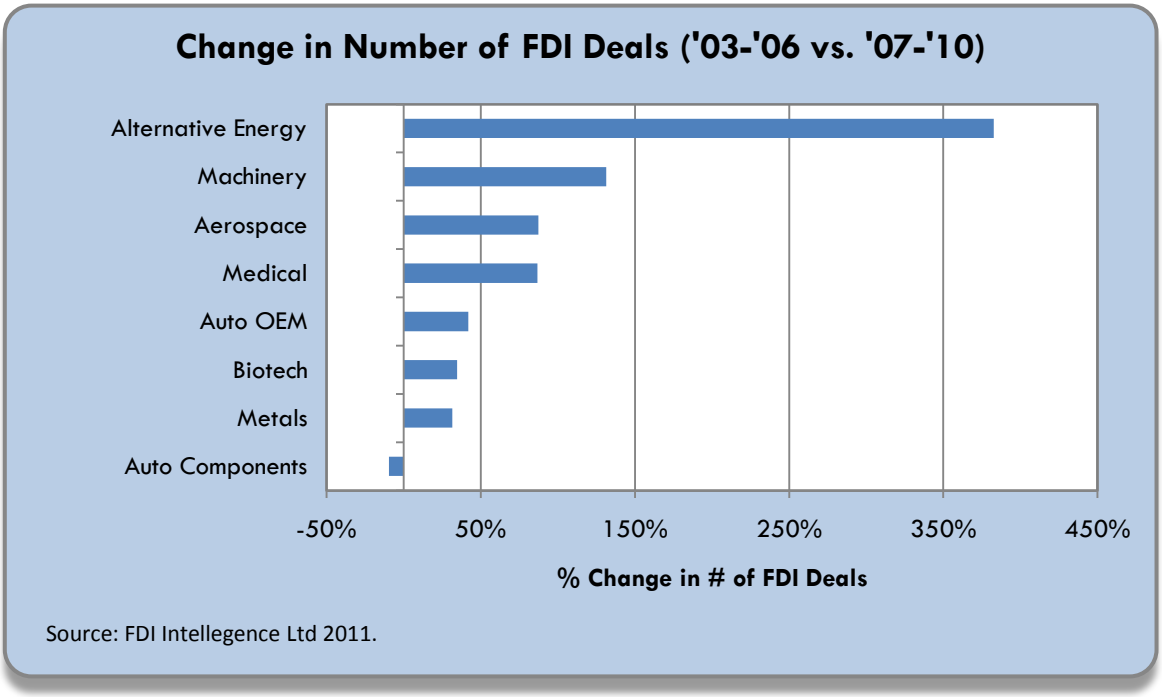
Once considered a fringe target for economic development, renewable energy is now taking a larger role as it grows and becomes more relevant to the U.S. economy. In 2009, the U.S. ranked third in the world with $15 billion in investment in research and development targeted at renewable energy (government and private sector combined), while Germany and China led the pack with $25-30 billion each.[12]

The growth of domestic renewable energy has been so significant that policy makers are not only working to continue to grow these sectors, but are increasingly concerned about how to retain renewable energy companies and jobs in the U.S. and not to lose them to offshoring opportunities. Yet at the same time (but less publicized), a significant amount of foreign direct investment (FDI) has been coming into the U.S. in the alternative and renewable energy sectors. Prior to 2006, renewable/alternative energy had never attracted more than five FDI deals per year, but between 2008 and 2010, the sector recorded more than 35 deals a year, and that was during the height of the economic recession. In fact, the 2007-2010 period averaged nearly 400 percent more alternative/renewable energy deals than the 2003-2006 period. No other sector surpassed 140 percent growth.[13]

[12] Sawin, J., Martinot, E. & Appleyard, D. (2010, September 27). Renewables Continue Remarkable Growth. *Renewable Energy World*. Retrieved from http://www.renewableenergyworld.com/rea/news/article/2010/09/renewables-continue-remarkable-growth on May 13, 2011.

[13] Jobs in the Making: Economic Development Strategies to Support Manufacturing. (Forthcoming 2011). *International Economic Development Council*. Data from fDi Intelligence. http://www.fdiintelligence.com/ on May 11, 2011. fDi Intelligence defines the Alternative/Renewable Energy sector according to SIC codes 2819 and 2869.

Chart 2: Alternative Energy Sector Leads in Growth of Foreign Direct Investment Deals



Source: FDI Intellegence Ltd 2011.

As energy becomes an increasingly important national and global priority, many states have implemented policies aimed at launching viable, sustainable growth in the renewable energy industry. Tools that states are using to identify their industry niche and nurture its potential include renewable portfolio standards, feed-in tariffs, dedicated renewable energy state funds, tax-based incentives, renewable energy credits, and many others. Section V. of this report elaborates upon renewable energy policies and funding mechanisms.

III. THE RENEWABLE ENERGY SURVEY OF STATE ECONOMIC DEVELOPMENT LEADERS

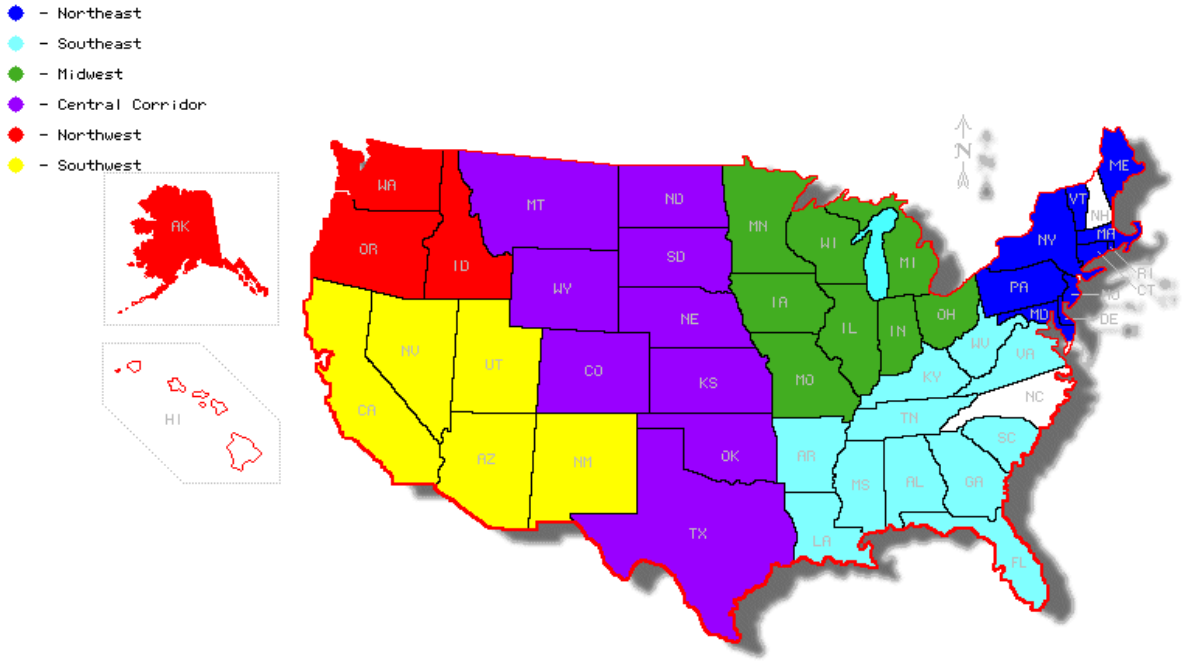
As more states aggressively enter the renewable energy area, many still struggle to understand what assets they have to build on; what strategies and policies will develop those assets effectively; what obstacles are emerging and how to work through those challenges. To address these questions, the International Economic Development Council (IEDC) embarked on a survey in late 2010-early 2011 to explore the opportunities and challenges state-level economic development professionals face in developing renewable energy projects. The goal was to identify:

- Assets and barriers that state economic development leaders viewed as most critical to renewable energy development; and
- What state economic development leaders are doing to foster renewable energy development.

In total, economic development leaders from 48 states completed the survey.

While the majority of survey results are presented in the aggregate (national average), it is useful to assess the data from regional perspectives as well. As such, the survey results are assessed both by region and nationally to highlight interesting themes. See Map 1 for the breakdown of six geographic regions utilized to show regional trends from the survey findings.

Map 1: Geographic Regions Used to Highlight Regional Trends from the Survey Findings



SURVEY RESULTS SUMMARY

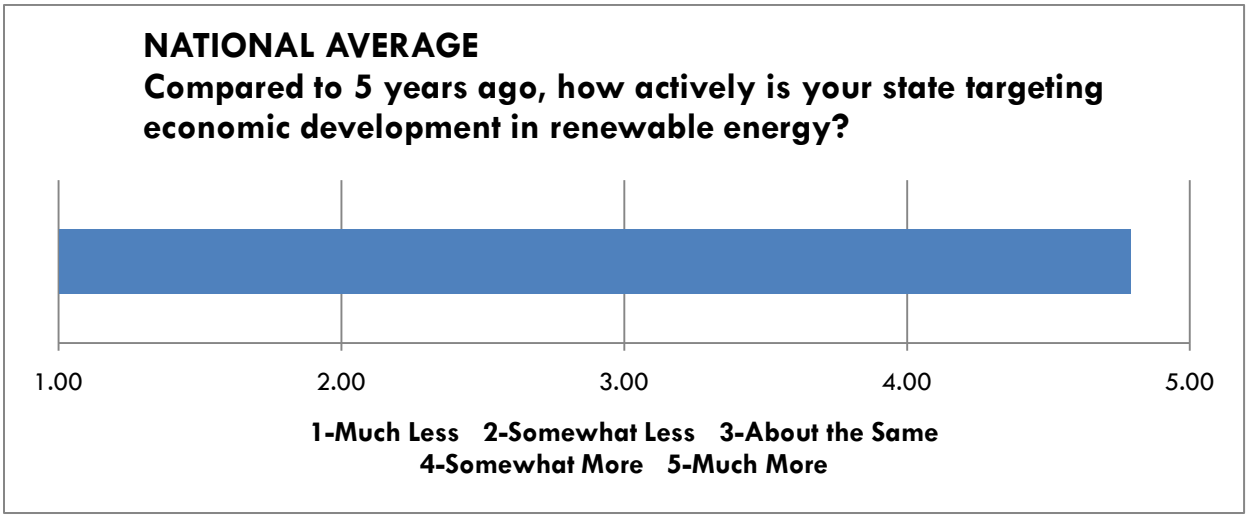
The survey results presented within this report serve as a snapshot of the opportunities and challenges states are facing as they develop their renewable energy industries. With varying geographies, political landscapes, and natural assets come different ways of approaching the same end. While the specific policies and programs within each state differ, the majority of them reflect a strong movement to utilize each state's unique assets to catalyze the renewable energy sectors that best play to its own political, economic, natural, and human capital strengths.

Key Survey Findings:

- Renewable energy has grown in its importance to economic development over the past 5 years.
- Most states are very active in strategic planning activities that target renewable energy development.
- Political Leadership is seen as the leading asset in growing renewable energy.
- Investment in R&D is seen as a critical area of attention for state economic development leaders who are looking to stimulate renewable energy sectors.
- Some regions focus on one or two key renewable energy sectors, while others diversify.
- Renewable Portfolio Standards and financial incentives were the highest ranking policy tools in stimulating renewable energy growth.
- Lack of investment capital and financing is the leading challenge to renewable energy business growth.
- The American Recovery and Reinvestment Act was a significant player in supporting renewable energy growth.
- Most states don't view local level policy (city, county, regional) as influential to renewable energy growth.

Economic Development Participation in Renewable Energy

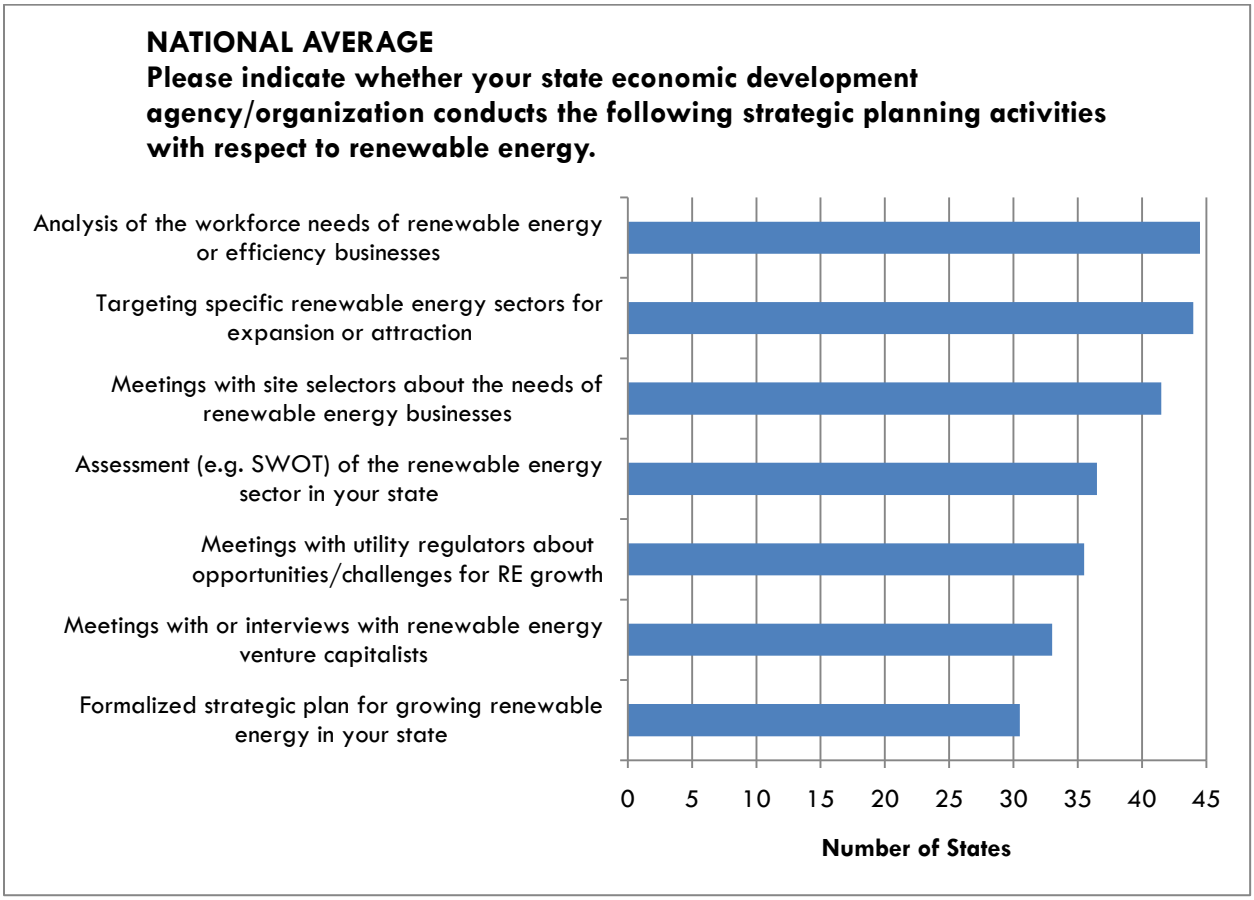
Renewable Energy has Grown in its Importance to Economic Development



Despite several roadblocks to prioritize renewable energy at the federal policy level, the survey results show that renewable energy is an area of rapidly growing importance to economic development at the state level. When asked "Compared to 5 years ago, how actively is your state targeting economic development in renewable energy?," 80 percent of respondents marked the highest option ("much more"). This would seem to indicate that state economic development leaders recognize the potential to capture new jobs and investment by fostering the growth of an entirely new industry.

Economic Development Strategic Planning Activities that Support Renewable Energy Development

Many States are Very Active in Strategic Planning Activities that Target Renewable Energy Development



When asked which specific strategic planning activities their state economic development agencies conduct to support renewable energy, the three most popular choices were:

- Analysis of the workforce needs of renewable energy businesses
- Targeting specific renewable energy sectors for expansion or attraction
- Meetings with site selectors about the needs of renewable energy businesses

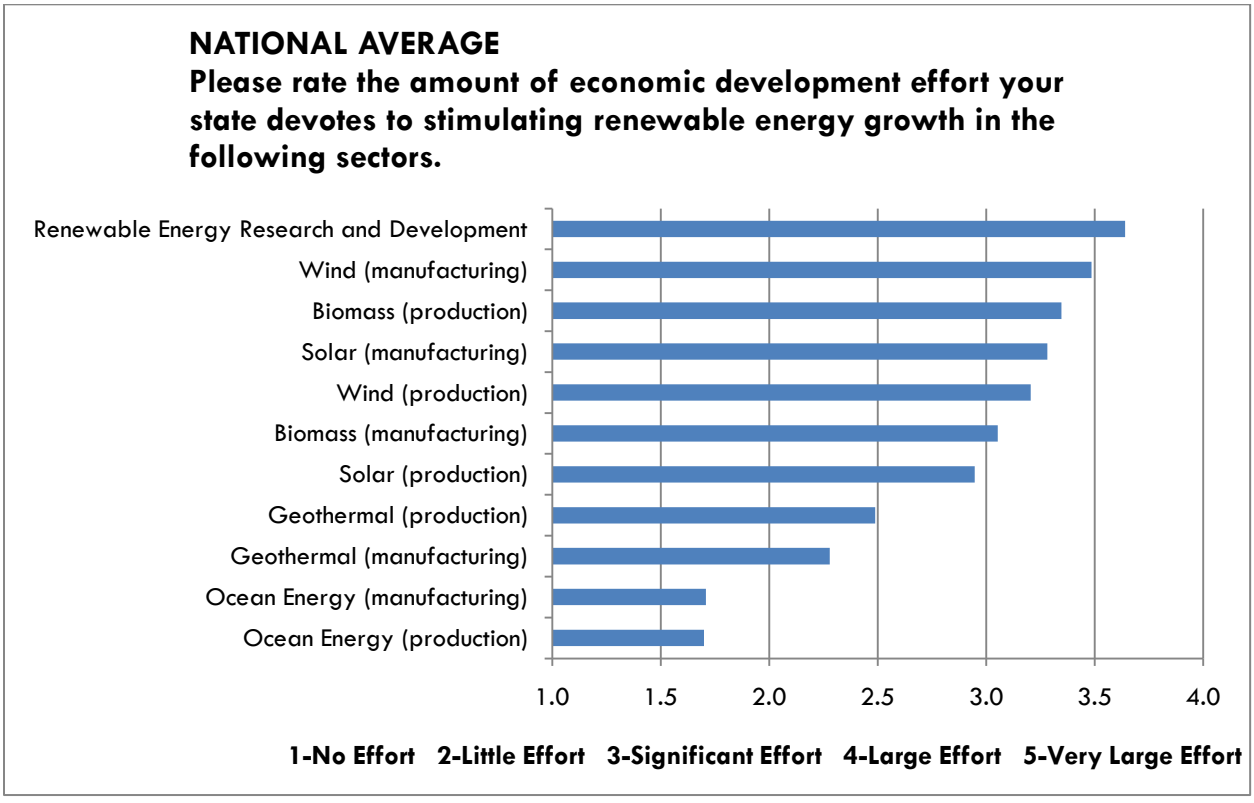
It is unsurprising that analysis of the workforce needs of renewable energy businesses was the selected by respondents more than any other option. Developing a more comprehensive workforce strategy that is connected to the pulse of the private sector is critical to the success of economic development, especially for a sector such as renewable energy that spans various skill

sets. Further, matching the supply of workforce skill sets to meet the needs of renewable energy firms requires a continual balancing act as the industry changes and evolves within and between different regions. Follow up interviews with respondents revealed that many states have actively identified and established connections with key stakeholders, career ladders and training liaison contacts in the educational institutions that supply a skilled workforce within each state.

The least popular of the strategic planning activities was creating a formalized strategic plan for growing renewable energy within the state; just over half of the respondents reported that they engaged in this activity.

Economic Development Efforts within Specific Renewable Energy Sectors

Research and Development Receives the Most Attention and Resources among All Sectors to Drive Renewable Energy Growth



Survey respondents were asked to rate the amount of economic development effort their state devotes to stimulating renewable energy growth in a variety of renewable energy sectors, shown in the chart above.

The effort ranked highest in priority among states was research and development (R&D) related to renewable energy. R&D is at the heart of renewable energy. Without consistent breakthroughs in technological innovation, renewable energy wouldn't be a growing, sustainable industry. Innovations not only create new and better products but also help to reduce prices, to increase the efficient use and production of energy, and to better store energy for later or longer use. More and more states are seeing R&D facilities as vital to fostering the growth of new renewable energy firms and to enabling existing firms to evolve and expand their technology. The key will be for states to invest in technologies that have strong outlooks for becoming competitive with the current technologies.

Wind (manufacturing), biomass (production), and solar (manufacturing) were the next highest-rated areas of activity. Excluding hydropower and wood, the leading U.S. renewable energy sector by consumption is in biofuels, representing 20 percent. While biomass waste only represents 6 percent of the renewable energy market; in 2009, the U.S. became the world's largest producer of electricity derived from solid biomass.[14] Concurrently, the wind sector has also been making great strides in the domestic market. According to the Renewable Energy Policy Network for the 21st Century, "[w]ind-generated electricity increased by 61 percent between 2007 and 2008 and by 28 percent between 2008 and 2009, more than any other renewable source of generation in both years. These increases were due primarily to newly-constructed wind power plants."[15] Solar represents a much smaller (1-2 percent) yet important part of the U.S. renewable energy market. Steep competition from China has made solar manufacturing a hot-button issue. Solar panel factories require millions in startup costs, leading some companies to keep domestic R&D facilities intact while outsourcing commercial production abroad.

Geothermal and ocean energy were ranked the lowest by survey respondents. However, according to the Geothermal Energy Association's 2011 annual report, there are currently 15 states[16] with geothermal projects under consideration or in development, representing a total of 3,633 to 4,050 MW of new geothermal power plant capacity.[17] Further, while ocean energy is a nascent facet of renewable energy, it was mentioned by several survey respondents as a sector receiving growing attention at the R&D phase of development.

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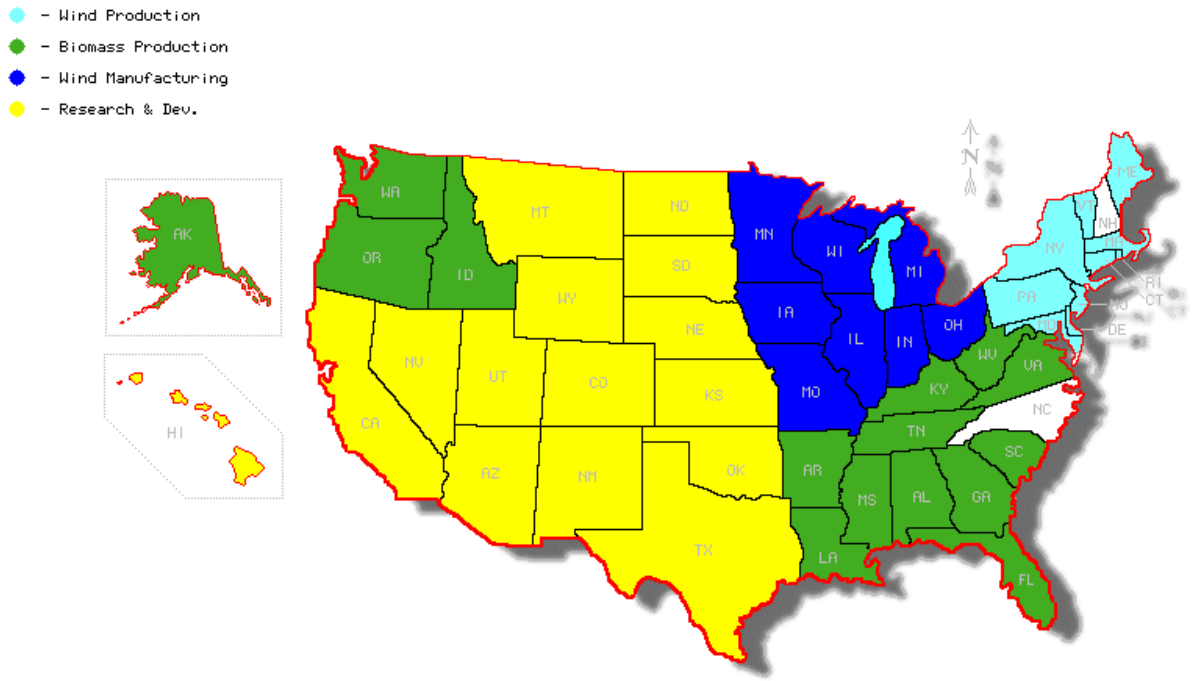
[14] Renewables 2010 Global Status Report. (2010). *REN 21*. Retrieved from http://www.ren21.net/Portals/97/documents/GSR/GSR%202010%20talking%20cards.pdf on May 17, 2011.
[15] Ibid.
[16] These 15 states are Alaska, Arizona, California, Colorado, Hawaii, Idaho, Louisiana, Mississippi, Nevada, New Mexico, Oregon, Texas, Utah, Washington and Wyoming.
[17] Geothermal Assesses Its Potential. Renewable Energy World. http://www.renewableenergyworld.com/rea/news/article/2011/05/geothermal-geothermal-assesses-its-potential on May 20, 2011.

Ranked Priorities by Geographic Region Average *M= Manufacturing P=Production*						
Rank	**Northeast**	**Southeast:**	**Midwest:**	**Central:**	**Northwest:**	**Southwest:**
1	Wind P	Biomass P	Wind M	R&D	Biomass P	R&D
2	Wind M	Biomass M	Solar M	Wind M	R&D	Solar M
3	R&D	Solar M	R&D	Wind P	Wind P	Solar P
4	Solar P	R&D	Biomass P	Biomass P	Wind M	Wind M
5	Solar M	Wind M	Biomass M	Biomass M	Solar M	Wind P
6	Biomass M	Solar P	Wind P	Geo P	Biomass M	Geo P
7	Biomass P	Wind P	Geo M	Solar M	Solar P	Biomass P
8	Ocean M	Geo M	Solar P	Geo M	Geo P	Geo M
9	Ocean P	Geo P	Geo P	Solar P	Ocean M	Biomass M
10	Geo P	Ocean M	Ocean M	Ocean M	Ocean P	Ocean P
11	Geo M	Ocean P	Ocean P	Ocean P	Geo M	Ocean M

When we look at these results regionally we find that some regions focus on one or two key sectors, while others diversify:

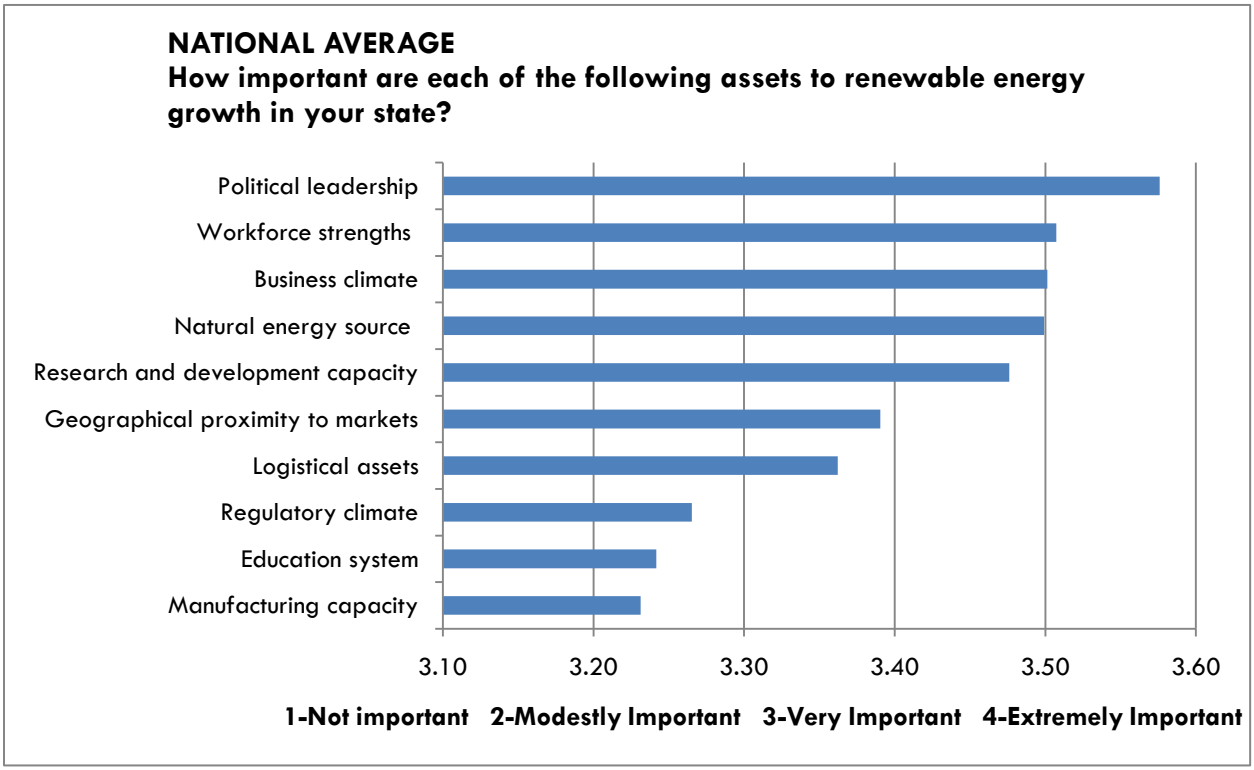
- The Northeast, Midwest and Northwest regions spread their economic development efforts more evenly across different renewable energy sectors.
- The Southeast region devotes most effort to developing Biomass Manufacturing and Production.
- The Central Corridor region, which coincides with the Wind Corridor, focuses on R&D and Wind Manufacturing and Production.
- The Southwest region prioritizes R&D and Solar Manufacturing and Production.

Map 2: Renewable Energy Sectors that Receive the Highest Amount of Economic Development Effort by Regional Average



Critical Assets Needed for Renewable Energy Growth

Political Leadership is the Leading Asset in Growing Renewable Energy



Survey respondents were asked to rank the importance of various assets to renewable energy growth in their respective states. The 10 asset areas to choose from included:

- *Natural energy source (wind, solar, biomass, geothermal)*
- *Proximity to markets*
- *Research and development capacity*
- *Education system*
- *Workforce strengths*
- *Logistical assets*
- *Manufacturing capacity*
- *Regulatory climate*
- *Political leadership*
- *Business climate*

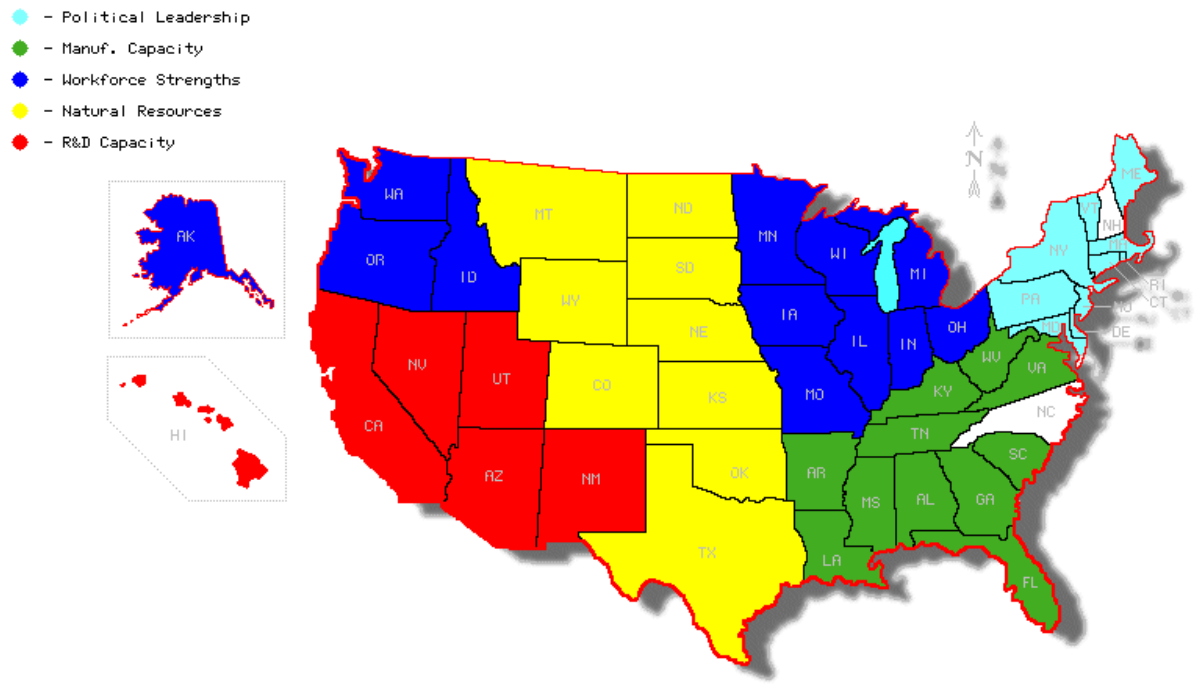
When responses were averaged nationally, state economic development leaders chose political leadership as the most important asset in growing renewable energy. In follow-up interviews, respondents observed that the states whose leaders have visible, action-oriented messages about pursuing renewable energy are those that are moving ahead the furthest and fastest in terms of its growth. Many governors, in fact, have explicit goals for renewable energy growth in their states and have reorganized their state-level agencies to help meet these goals. For instance, some states have realigned their cabinet-level offices to connect or to merge the economic development office with the state environment or energy office. In some cases, both offices support each other on leads for growing and attracting renewable energy companies.

Further, when crafting economic development policies, many respondents noted that their state leaders considered how the design of other state and regional policies would support or discourage their renewable energy goals. Some respondents also noted that cooperation with other states' leadership was integral to addressing transmission issues, as well as the buying and selling of renewable energy between states.

Workforce strengths, access to natural energy sources (wind, solar, biomass, geothermal), and business climate also ranked among the top assets. Workforce development has emerged as a large piece in the renewable energy puzzle. Many workers in traditional fields such as manufacturing have skills parallel to those required for renewable energy manufacturing, yet retraining is often required. Consequently, many states and regions are implementing training systems and degree programs that complement their targeted renewable energy sectors.

In states that don't have strong energy sources to draw from (such as solar or wind), some have found their niche in manufacturing components and machines that can be sold to other regions where such natural resources do exist. In these states especially, a business-friendly climate is of great importance for the renewable energy sector. Because the sector is nascent, extra support and forms of assistance are needed to get many businesses and clusters off the ground and thriving. Helping businesses retool, as well as finding new opportunities in a shifting global marketplace, is a critical state activity. While large companies are able to diversify into renewables and adapt to shifts in the marketplace relatively easily, assistance is especially important for small and medium-sized businesses. These firms drive job creation but also often compete at the economic margins, with insufficient resources to make transition investments. Offering assistance and making the system easier to navigate for these types of businesses can have a major impact on their growth.

Map 3: Top Ranked Asset to Renewable Energy Growth by Region



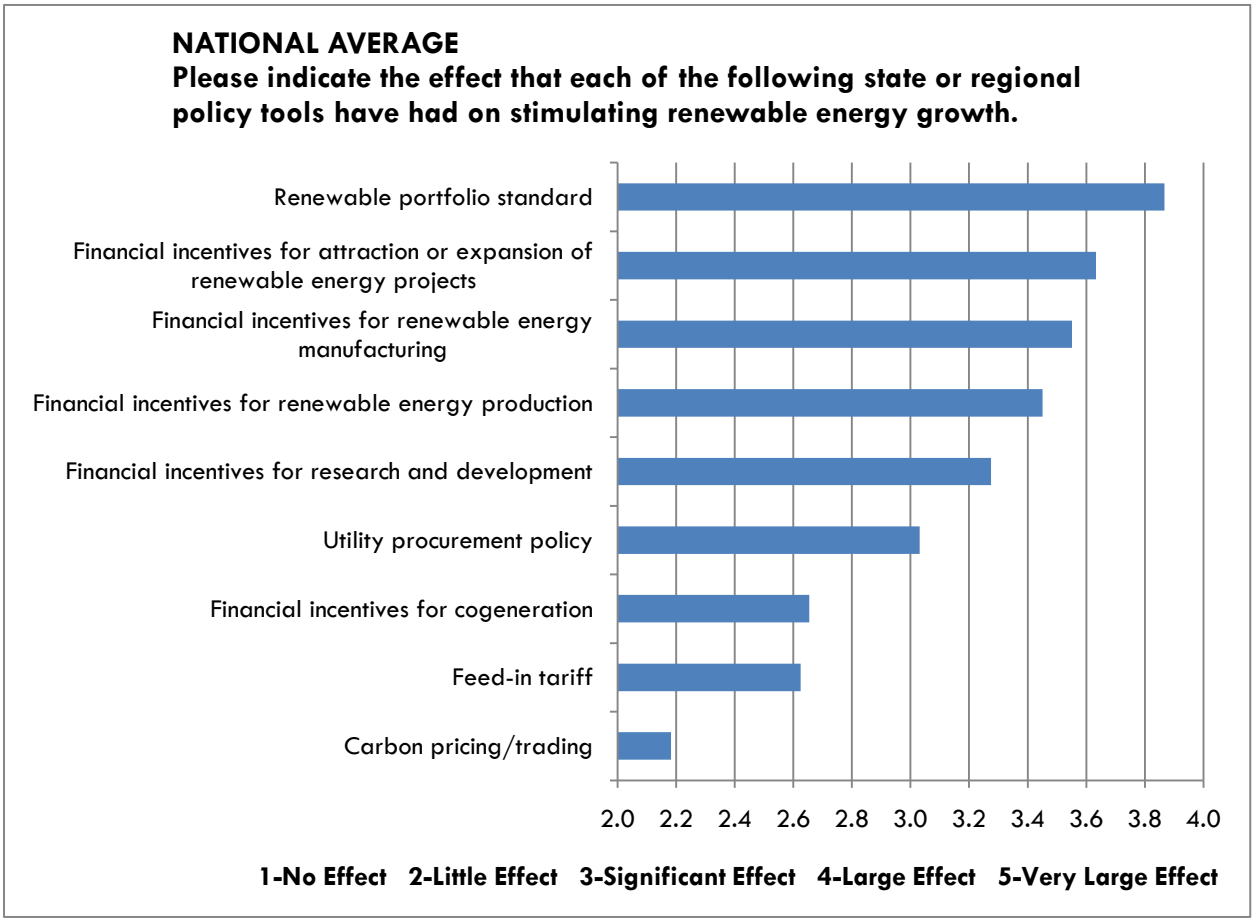
Breaking results down by geographic area, the following assets emerge as most important to each region:

- Northeast: Political Leadership
- Southeast: Manufacturing Capacity
- Midwest: Workforce Strengths
- Central Corridor: Natural Energy Source
- Northwest: Workforce Strengths
- Southwest: Research & Development Capacity

Business climate is ranked among the top five assets for five of the six regions. Education system is ranked among the bottom five assets for all regions.

Effectiveness of Renewable Energy Policy Tools

Renewable Portfolio Standards Are the Leader in Effective Policy Tools



Survey respondents were asked to indicate the effectiveness of various state and regional policy tools in stimulating renewable energy growth (survey respondents were given the option to choose "not applicable" for policy tools that were not available or in use in their states.) Renewable portfolio standards (RPS) were ranked most effective. This is not a surprising outcome given that RPS policies have grown rapidly in use, with 29 states plus the District of Columbia and Puerto Rico carrying mandatory RPS policies and seven states holding voluntary agreements. Having a mandatory RPS signals to investors that the state is committed to supporting the renewable energy market in the long-term. While there are often fears of electricity rate increases associated with RPS policies, a study of RPS impacts by the Lawrence Berkeley National Laboratory found that electricity rate increases (in states where data was available) were approximately 1 percent or less. The study also found that in several states with RPS policies, electricity generated to meet the RPS was thought to be price competitive with fossil fuel

generated electricity.[18] While the states with voluntary agreements are fewer, some of them reward excess renewable energy generation with renewable energy credits to further strengthen the voluntary policy. In follow up interviews with survey respondents, it was also noted that having neighboring states with RPS policies has been of great importance as it creates markets for states to export their renewable energy to.

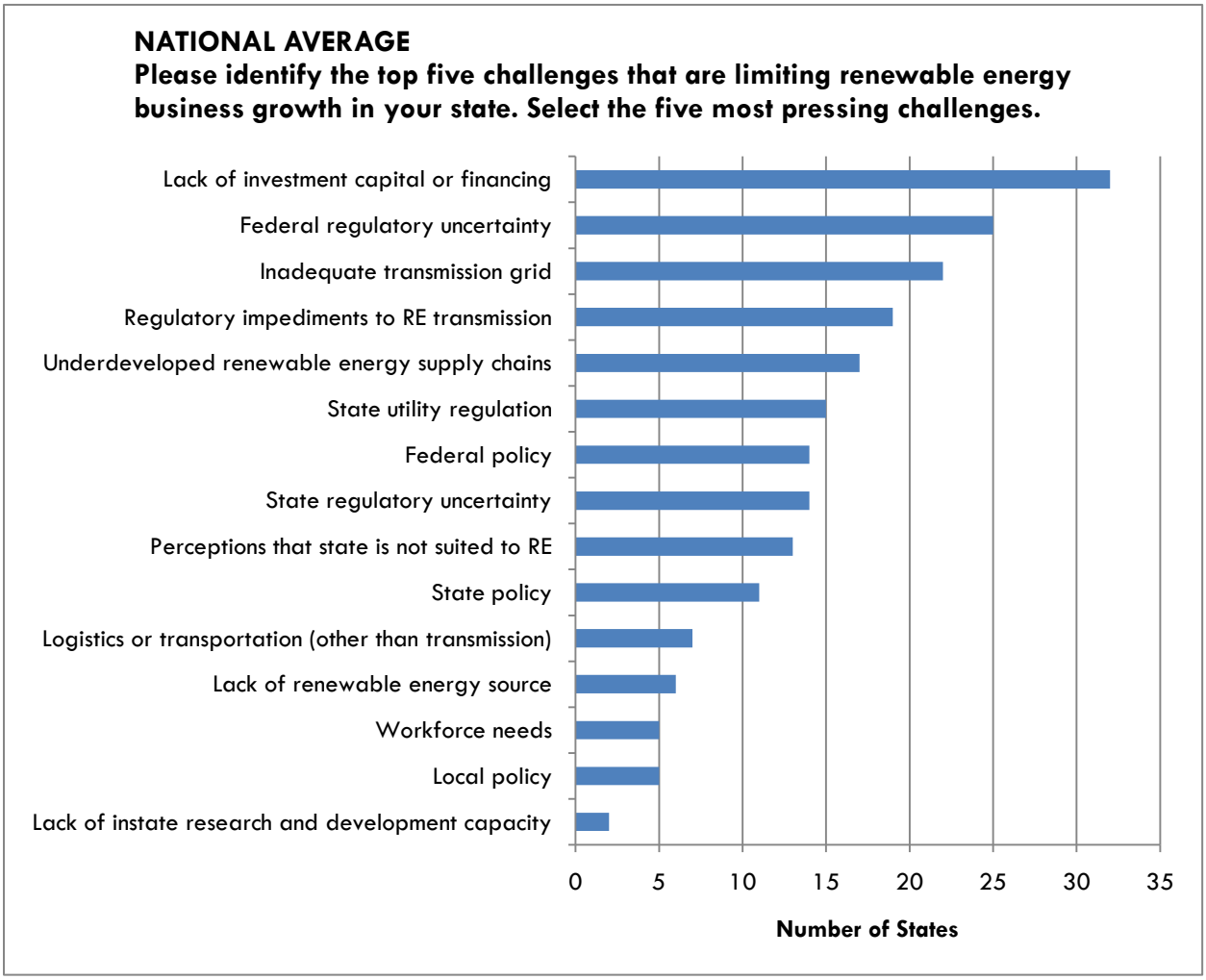
Financial incentives – for attraction or expansion of renewable energy, renewable energy manufacturing, renewable energy production, and renewable energy R&D – were ranked second through fifth in effectiveness by survey respondents. Several respondents added that they use tax credits as a financing vehicle in lieu of having available direct funding. That financial incentives ranked so highly in effectiveness for stimulating renewable energy is no revelation. As the national and global economies continue to recover, economic developers are scrambling to find innovative ways of financing all types of projects, let alone renewable energy projects which are often complex and come with greater stakes. Given the priority of financing in the current economy, more information on renewable energy funding tools and examples can be found in Section V of this report.

Feed-in tariffs and carbon pricing/trading were ranked the lowest among the policy options. While feed-in tariffs remain popular in Europe, especially in Germany and Spain, many view the regulatory framework required to make them work incongruent with the current U.S. political climate. However, that's not to say that there aren't examples occurring in the U.S. (see p.43 of this report for an elaboration on feed-in tariffs). Further, while carbon cap and trade once had potential as national policy, it experienced a slow death in the U.S. Congress toward the end of 2009 and beginning of 2010. However, regional cap and trade agreements within the U.S. are still alive and thriving.

[18] Wiser, R. & Barbose, G. (2008, April). *Renewable Portfolio Standards in the United States: A Status Report with Data through 2007*. Berkeley, CA: Lawrence Berkeley National Laboratory. Retrieved from http://eetd.lbl.gov/ea/ems/reports/lbnl-154e.pdf on May 2, 2011.

Top Challenges Limiting Renewable Energy Business Growth

Lack of Investment Capital and Financing is the Leading Challenge



Survey respondents were asked to identify the top five challenges that they see as limiting renewable energy business growth in their state. The number one challenge identified was lack of investment capital or financing. As previously mentioned, financing has been a challenging issue across all sectors of the economy in recent years. Policy makers, economic development professionals, and developers alike are trying to find new and creative ways to fund deals and to make renewable energy projects financially feasible. In fact, answers to an open-ended question about the factors that prevented potential renewable energy projects from reaching fruition were overwhelmingly connected to financing and funding challenges. As state and federal governments face increasing demand to reduce public spending, financing and incentive programs for renewable energy programs may face the risk of being cut. Because the current economic and

political climate demands that economic development and policy leaders find more innovative ways to finance renewable energy programs, Section V of this report is focused specifically on exploring renewable energy financing tools and strategies in further depth.

Interestingly, the challenges that did not rank near the top for any region - R&D capacity and workforce needs - are both within the jurisdiction of states to control. This suggests that the primary limiting factors to renewable energy development are not inherent within each state but stem from outside factors (e.g., federal policy, economic environment).

On average, respondents ranked federal regulatory uncertainty as the second-highest challenge. More than half of the survey respondents chose federal regulatory uncertainty as a top challenge limiting renewable energy growth in their state. Federal policy uncertainty is a greater challenge than state-level policy and uncertainty in almost all regions. Lack of clear direction from the federal level is creating market uncertainties, even in traditional energy sectors. Firms are in need of clear and direct signals on energy policy in order for investment to move forward. With most energy investments having low operating costs yet high start up costs, federal legislative certainty is critical if investors are going to have any kind of security in their sizable up-front costs.

With energy policy unresolved at the federal level, several state leaders noted the need to focus on controlling the factors that they could, such as creating a business-friendly environment for renewable energy companies to grow and prosper. Aside from strong policies such as an RPS, examples of such strategies include streamlined permitting processes for projects; tax credits; value-added assets (e.g., laboratory testing facilities for renewable energy technologies); and clear technical assistance to guide renewable energy firms on timelines, regulations and costs.

Inadequate transmission grids and regulatory impediments to renewable energy transmission were ranked as the third- and fourth-highest challenges, respectively. The limitations of the current grid system create major impediments to ramping up the installation of renewables such as solar and wind as cross-state commodities. The lack of energy storage capacity for renewable energy also is a hurdle slowing the growth of the industry.

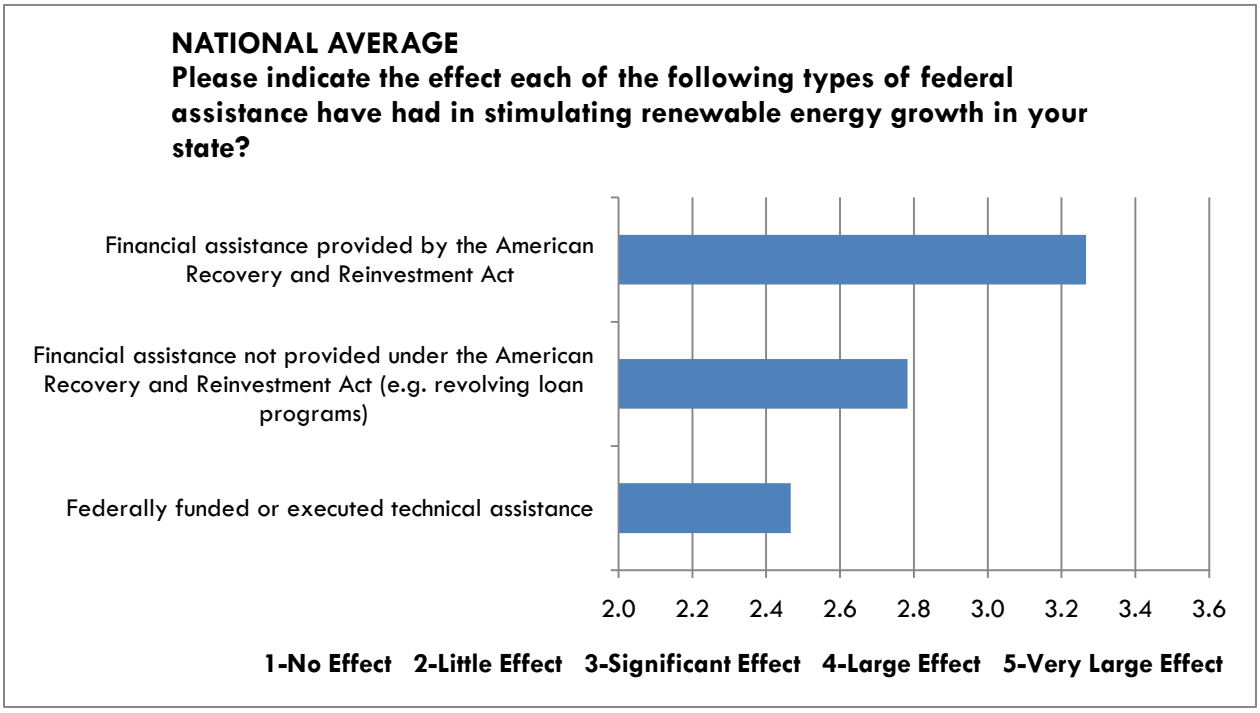
Underdeveloped renewable energy supply chains ranked as the fifth most significant challenge by respondents. Renewable energy supply chains have garnered significant of attention not only in policy and economic development circles but also in national and international news for their importance in job creation. A frequent downside of today's globalized supply chains is uncertainty in overall reliability and timeliness. Further, as renewable energy technologies rapidly evolve,

supply chains are in a constant state of flux and a struggle can exist between suppliers and renewable energy companies to reach a balance in the supply and demand of the right parts at the right time. Financing challenges are a complicating factor as many companies don't have the resources to front costs to suppliers if demand for the product isn't completely certain. While large companies with diverse portfolios can afford to vertically integrate, many smaller companies have to cope with supply chain challenges. Because supply chain challenges are highly nuanced and specific to each renewable energy sector, a separate document has been developed in parallel to this one and is entirely devoted to supply chain issues.

Interestingly, while ranked fairly low as a concern on the national average, perception issues linger as challenges in some regions. The Northeast, Southeast, and Midwest cite inaccurate perceptions that their states are not well suited to renewable energy. The Southeast average also revealed that state policy itself is a challenge for the region's renewable energy growth.

Federal Assistance

The Recovery Act was a Significant Player in Supporting Renewable Energy Growth



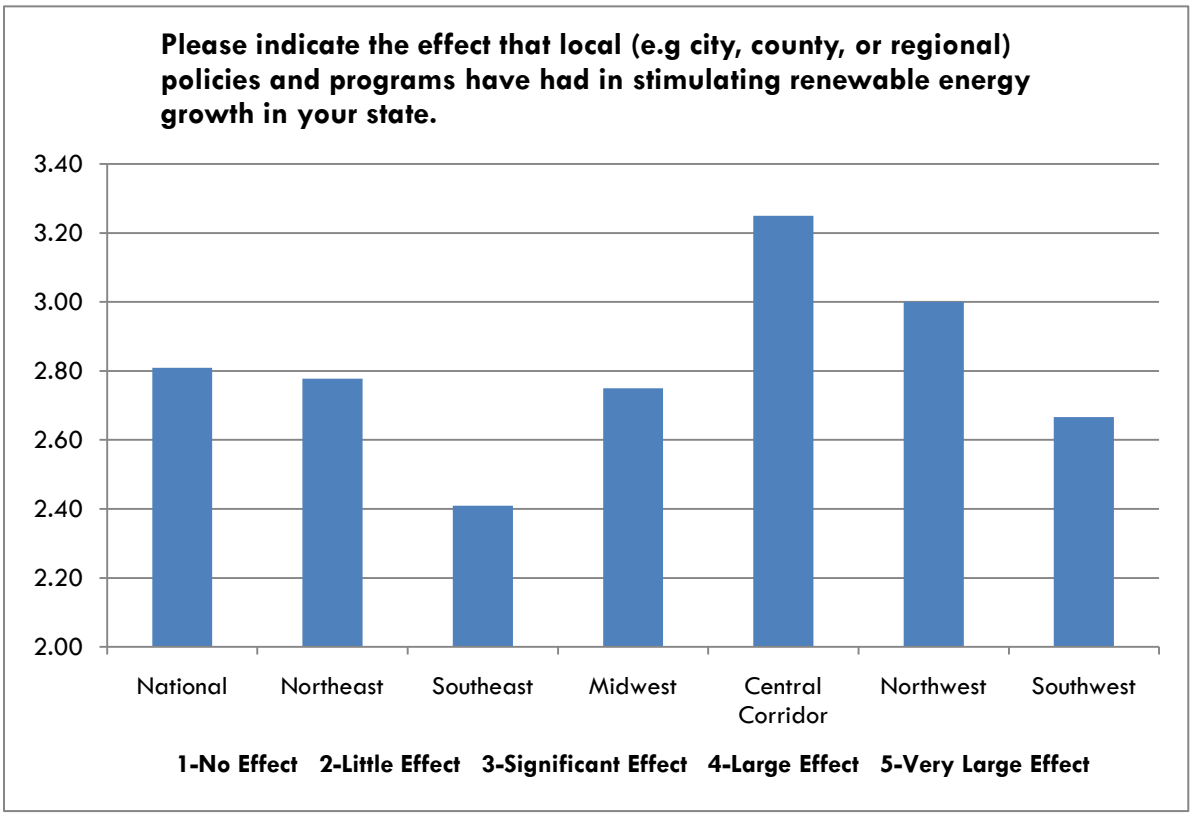
Survey respondents were asked to indicate the effect that three types of federal assistance had on stimulating renewable energy growth in their respective states. The 2009 stimulus act (ARRA) ranked as the most effective of the three, having slightly higher than a "significant effect" (3.2 out of a 5.0 scale). More general federal funding and technical assistance were ranked as having little effect.

The Treasury cash grant program, also known as the Section 1603 program, was one of the primary programs that came out of ARRA to stimulate renewable energy. The program allows renewable energy projects that qualify for the federal investment tax credit or the production tax credit to instead choose to receive a 30 percent cash grant from the U.S. Department of Treasury. The program was designed to meet major financing gaps for renewable energy project developers that could no longer be met by tax credits during the global financial crisis. The program has been lauded as being more flexible throughout the various stages of a project's development than are tax credits. Due to the positive response the program has received, it was granted a congressional extension to continue until the end of 2011.

Further, while all states received significant ARRA funding to put toward various renewable energy programs, the dilemma for many was figuring out how to use the money for programs that would have a sustaining effect. The State of Colorado took a novel approach by using ARRA dollars to finance a renewable energy development team program. The program hired a team of professional consultants in the renewable energy field to help identify the renewable energy firms with the highest potential for success and to provide them with extensive assistance. Assistance for such firms includes developing a thorough business plan; identifying funding sources, tax credits and other investors; and assistance with the details of structuring their business model. The potential firms then end up with solid business plans to present to potential investors, utilities, and developers.

Bottom-Up Policy

Most States Don't View Local Policy as Influential



Survey respondents were asked to indicate the effect that local (e.g., city, county, or regional) policies and programs have had in stimulating renewable energy growth in their states. On average, local policies were seen as having somewhere between a little effect and a significant

effect. These results may be because the survey respondents' work is focused on the state level and exposure to local policies may be limited. This would indicate a significant need on the part of state-level policy makers and economic developers to create deeper connections with local governments and economic development. Interestingly, the Central Corridor and the Northwest regions ranked local policies and programs as having a more significant effect than other regions did. This might be a reflection of the independent and rural nature of these regions, where a bottom-up process of policy and economic development is more highly valued.

IV. SURVEY CONCLUSION

The results of our survey show that the relationship between renewable energy and economic development is robust and continuing to grow. Eighty percent of respondents reported that their states are much more active in targeting economic development through renewable energy now than five years ago, signaling that the economic development field is taking a much more proactive and involved role in the development of the industry.

At the same time, underinvestment continues to be a pervasive issue due to federal policy uncertainty and the economy's ongoing climb out of the Great Recession. Given this uncertainty, many states are doing what they can to develop their assets and business environment to try to grow, attract and retain renewable energy manufacturing and production.

However, while state agencies also suffer from political whims of changing administrations; renewable energy policies require consistent funding, policy structures and long-term commitments to be highly successful. This is where many states would benefit greatly by engaging more with local jurisdictions to get their buy-in to various policies and programs that support renewable energy growth and demand, even as state administrations change. For example, actions such as streamlining permitting processes between state and local agencies would move projects through regulatory red tape faster and make states more business-friendly as a result. According to John Farrell, senior researcher with the Institute for Local Self Reliance, permitting can represent close to 20 percent of renewable energy project costs at the local level.[19] Given that our survey results show that most states don't view local policy as influential, creating stronger ties between state and local governments is certainly a needed area of focus and attention in order for renewable energy to move forward more successfully. This is especially true given that one of the primary challenges to the success of renewable energy is in driving down its costs through various avenues to become more competitive with fossil fuel energy sources.

Developing these vertical relationships between state and local entities means that state level officials should be engaging not only with local elected officials but also with key regional stakeholders such as universities, banks and business consortiums that can help drive opportunities and develop the workforce needed to support various renewable energy sectors. While many states seek large energy projects that can make a large impact, those types of projects also

[19] The Interview: Public Incentives Roundtable. Renewable Energy World. http://www.renewableenergyworld.com/rea/news/article/2011/05/the-interview-public-incentives-roundtable on May 18, 2011.

require large amount of capital and time to develop and can often die before they get off the ground. However, working with local jurisdictions to develop smaller projects that are closer to users can create an accumulation of small wins for the state. These projects can bring renewable energy online more quickly and often in very visible ways to local residents, which in some cases can have the dual benefit of contributing to community revitalization.

For example, in the West Pullman neighborhood of Chicago, Exelon City Solar, the largest urban solar installation in the United States, is now located in an area of the neighborhood that was formerly blighted. Completed in 2010, the 10-megawatt installation uses more than 32,000 photovoltaic panels and can power up to 1,500 homes per year.[20] Located on a 41-acre brownfield on Chicago's South Side, the project is in an area that was home to heavy industrial uses for over 100 years but had been vacant for more than three decades.

The Exelon Corporation funded the $60 million project[21], and although Exelon failed to secure a loan guarantee from the Department of Energy, it did make use of the federal investment tax credit for solar energy and the Illinois state investment tax credit.[22] Exelon selected SunPower as the solar system provider. SunPower's sun tracking system tilts the photovoltaic panels according to the movement of sunlight, which increases energy production by 25 percent. Exelon currently operates and maintains the site on a 25-year lease with the City of Chicago, and sells the power to the electric grid. The power generation produces Solar Renewable Energy Certificates that can be sold as well.

The project had a positive impact on the local economy by creating 200 construction jobs and sourcing labor and construction materials from local south side Chicago companies. Exelon City Solar has created a number of value-added benefits to the community as well. The site is now producing property taxes after being vacant for over 30 years. In addition, the installation includes a visitor's center that provides educational opportunities for local school field trips, and SunPower also has partnered with local community colleges to deliver solar technician training programs.

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[20] Exelon City Solar. *Exelon Corporation.* Retrieved from http://www.exeloncorp.com/PowerPlants/exeloncitysolar/Pages/Profile.aspx on May 4, 2011.
[21] Exelon City Solar. *Exelon Corporation.* Retrieved from http://www.exeloncorp.com/PowerPlants/exeloncitysolar/Pages/Profile.aspx on May 4, 2011.
[22] Roselund, C. (2011, January 4). Turning a brownfield into a bright field - The Exelon City Solar Plant in Chicago. *SolarServer*. Retrieved from http://www.solarserver.com/solar-magazine/solar-energy-system-of-the-month/turning-a-brownfield-into-a-bright-field-the-exelon-city-solar-plant-in-chicago.html on May 24, 2011.

While no project is without its flaws and challenges, the Exelon City Project represents several best practice elements that create win-wins for consumers, communities, developers, and power providers. Multiple elements such as the State of Illinois' mandatory RPS goal, the use of state and federal tax incentives, Excelon's interest and enthusiasm to invest in a distressed community, a locally available and trained workforce to build the project, and the large amount of support and buy-in provided by the City of Chicago and the local community all came together to create a successful project.

As economic development leaders continue to navigate and to support the growth of the renewable energy sector, it's clear that there is no silver bullet to success. However, understanding the specific assets and barriers that regions, economies, industries and workers face and the linkages between those assets and barriers is critical to catalyzing success and building on the competitive advantages that are uniquely present in every place.

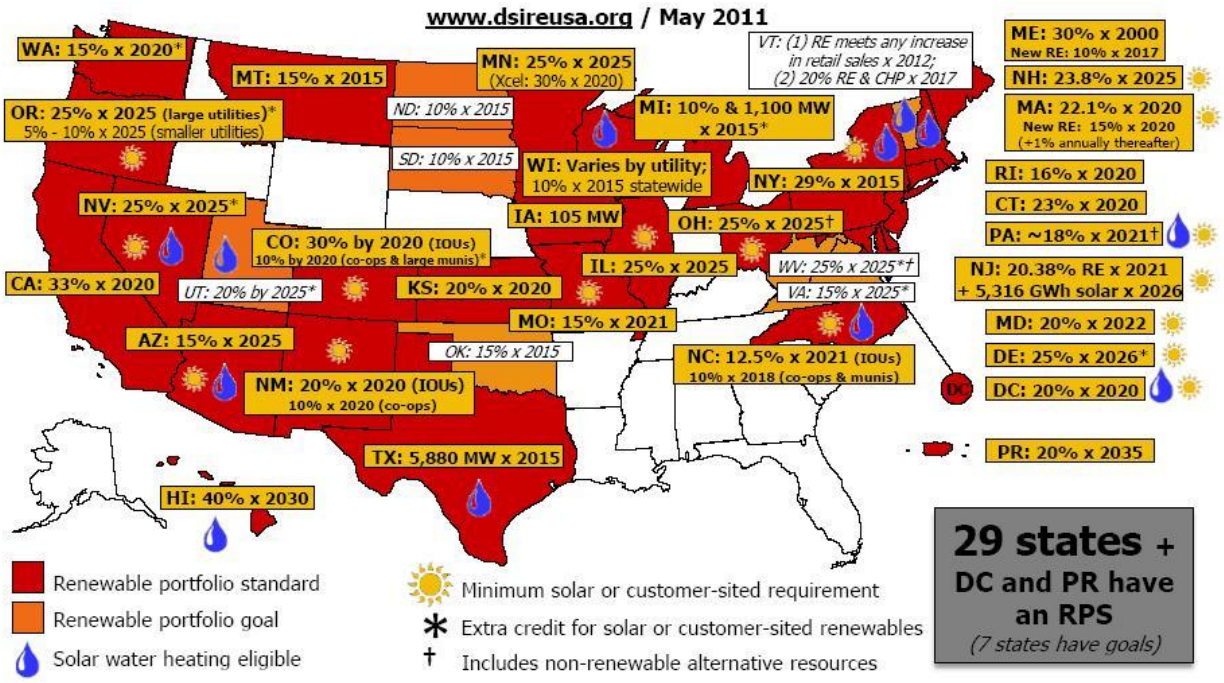
V. OVERVIEW OF RENEWABLE ENERGY POLICIES AND FUNDING MECHANISMS

RENEWABLE ENERGY POLICY

Renewable Portfolio Standards

A renewable portfolio standard (RPS) is a policy that requires a utility to generate a minimum percentage or quantity of its electricity from renewable sources. Although renewable energy is becoming cheaper and more efficient, renewable energy technologies still are more expensive per kilowatt generated than traditional power sources. An RPS expedites renewable energy development by establishing demand for power generated by resources such as wind, solar, geothermal, and biomass. Currently, 29 states have mandatory RPS policies, which set penalties for falling short; and seven states have non-binding RPS goals. Map 4 gives an overview of RPS policies by state.

Map 4: Renewable Portfolio Standards by State



Source: DSIRE.org

How they work

The components of RPS policies vary by state and include:

1. *Overall program targets*: RPS policies typically specify a target percentage or quantity of renewable energy generation. These goals are to be met by a certain year, with some states increasing requirements over a number of years.
2. *Technology-specific provisions*: Some RPS policies dictate sector-specific quotas as part of the overall renewable goal. These "set-aside" rules have been commonly applied to solar energy, which tends to be more expensive than other renewable technologies.[23]
3. *Mandatory vs. voluntary*: A mandatory policy imposes fines on utilities that fail to meet RPS requirements. Fines can result from violation of various parts of the RPS, such as a fine per kilowatt hour if the overall target is not reached, penalties for not meeting sector quotas, or increased fines for repeat violations.[24] A voluntary RPS is nonbinding and does not impose penalties for noncompliance. Some mandatory RPS policies make certain components voluntary, such as sector quotas.
4. *Program coverage*: An RPS policy will identify the entities that can or must participate in the RPS target. Some states lower the requirement for municipalities or set special targets for certain utilities.
5. *Compliance methods*: Most RPS policies allow utilities to meet the renewable target through a number of ways: purchasing renewable energy credits (RECs) to prove renewable energy generation,[25] entering into power purchase agreements with renewable facilities, or owning a renewable facility and its energy generation.[26]
6. *Program cap*: Many RPS policies set a cap on the cost of the program so that utilities can be exempt if implementation becomes too costly. A cap can be important since the exact cost of implementation may be difficult to determine in advance.
7. *Cost recovery*: RPS policies often allow utilities to recover their implementation expenses by passing eligible costs on to ratepayers.[27]

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[23] Cory, K.S. & Swezey, B.G. (2007 December). *Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies*. National Renewable Energy Laboratory. Retrieved from http://www.nrel.gov/docs/fy08osti/41409.pdf on May 18, 2011.
[24] Renewable Portfolio Standards. *Klean Industries*. Retrieved from http://www.kleanindustries.com/s/CleanEnergy.asp?ReportID=389195 on May 18, 2011.
[25] See case study on renewable energy credits.
[26] EPA Clean Energy-Environment Guide to Action. (2006 April). *United States Environmental Protection Agency*. Retrieved from http://www.epa.gov/statelocalclimate/documents/pdf/guide_action_full.pdf on May 18, 2011.
[27] Ibid.

Benefits and shortcomings

Among renewable energy policies, the RPS is particularly effective because it is a market-based program. An RPS spreads the costs of implementation among all ratepayers. Studies have found that the associated rate increase of an RPS averages about 0.35 percent per year.[28] Whereas a feed-in-tariff sets specified rates for each renewable technology,[29] an RPS doesn't include predetermined rates and thus allows more room for price competition among various renewable energy technologies. RPS policies also can be implemented in both regulated and unregulated state electricity markets and require relatively little ongoing government intervention.

Many states cite the key role of their RPS policies in attracting renewable energy capital investment and job creation. For example, the New York State Energy Research and Development Authority projected that the first three facilities selected to meet its RPS requirement will produce a combined, direct economic impact of $2.1 billion over 20 years.[30] The Union of Concerned Scientists estimates that a national RPS of 20 percent by 2020 would create 185,000 new jobs with a total of $25.6 billion in income, saving consumers $10.5 billion on their energy bills.[31]

RPS policies also have some drawbacks. Implementation on a state-by-state basis leads to somewhat fragmented energy markets due to varying rules for eligible energy resources, the delivery of energy, and how renewable energy credits can be traded.[32] A national RPS would address this problem, but even a national policy would likely have to differentiate among regions based on available natural resources. Some are concerned that RPS policies may be too ambitious or that they will inflate electricity rates. However, some states have already exceeded their RPS targets. In the absence of a national RPS policy, state-level RPS policies can be examined in light of the best practices listed below.

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[28] Hansen, D. et al. (2007, October 17). An Analysis of the Effect of Renewable Portfolio Standards on Retail Electricity Prices. *Christensen Associates Energy Consulting, LLC*. Retrieved from http://www.caenergy.com/downloads/Hansen_Kirsch_OSheasy_RPS_Price_Effect.pdf on May 18, 2011.

[29] See case study on feed-in-tariff for explanation of rate policy.

[30] FAQs. (2004). *New York State Energy Research and Development Authority*. Retrieved from http://www.nyserda.org/rps/faq.asp on May 18, 2011.

[31] Cashing in on clean energy. (2007). *Union of Concerned Scientists*. Retrieved from http://www.ucsusa.org/clean_energy/solutions/renewable_energy_solutions/cashing-in-on-clean-energy-a.html on May 18, 2011.

[32] Birgisson, G. & Petersen, E. (2006, April). Renewable Energy Development Incentives: Strengths, Weaknesses and the Interplay. *The Electricity Journal,* 19(3). Retrieved from http://www.bracewellgiuliani.com/dir_docs/news_publication/1c369526-be29-4042-8190-50c2dc90c262_pdfupload.pdf on May 18, 2011.

Elements of a Successful Policy

Based on the experiences of states that have instituted an RPS, a number of best practices have emerged for designing and implementing an effective RPS. These best practices as identified by the Environmental Protection Agency include:

- Develop broad support for an RPS, including top-level support of the governor and/or legislature.
- Hold facilitated discussions among key stakeholders regarding appropriate RPS design. Key stakeholders include:
    - State legislatures.
    - Public utility commissions.
    - Electric utilities and competitive electric service providers.
    - Developers of CHP and renewable energy systems.
    - Other stakeholders such as state and local government officials, environmental organizations, ratepayer advocates, and labor unions.
- Clearly articulate all RPS goals and objectives because these will drive RPS rules and structure.
- Specify which renewable energy technologies and resources will be eligible, driven by the stated goals and objectives. Also, consider state and regional resource availability if a goal is to encourage resource diversity through a technology tier.
- Determine the mix and amount of renewable energy desired. Careful analysis and modeling of the expected impacts prior to establishing the targets are the keys to success.
- Consider using energy generation (not installed capacity) as a target; establish a long timeline to encourage private investment; make compliance mandatory for all retail sellers; allow utility cost recovery; and establish cost caps.
- Consider adopting (or improving) net metering and interconnection standards to facilitate customer-sited clean DG projects that might be eligible technologies under an RPS.
- Establish a transparent and easy-to-use accounting system for compliance.
- Make sure a credible noncompliance mechanism is in place in the form of penalties, but provide retail suppliers with some flexibility in their compliance.
- Select the most appropriate lead agency or organization to implement the RPS.
- Conduct a mid-course performance review, identify the reasons for any delay in meeting targets, and enact program modifications as needed to meet the original intent of the RPS.

Source: U.S. Environmental Protection Agency.

Case Studies: New Mexico and Texas

Over the past decade, the states that have experienced some of the greatest growth in installed renewable energy capacity are also the ones with some of the longest-standing mandatory RPS policies: Iowa, Minnesota, New Mexico and Texas.

New Mexico's first RPS was passed in 2002. The New Mexico Public Regulation Commission approved an RPS of 5 percent by 2006, which would be raised to 10 percent by 2011. In 2007, the target was raised to 20 percent by 2020 for investor-owned utilities and 10 percent by 2020 for rural electric cooperatives. The RPS requirements must meet sector quotas: at least 20 percent each from wind and solar energy and 10 percent from geothermal, biomass, qualified hydro facilities and other renewables. The state's utilities have consistently over-performed on the overall RPS target, although they have fallen short on sector quotas. Most of the renewable energy generation has come from wind. New Mexico was also the first state to create a transmission authority, in addition to passing an RPS. The New Mexico Renewable Energy Transmission Authority evaluates proposals related to transmission of renewable energy projects and is sanctioned to initiate its own projects.

In 1999, the Public Utilities Commission of Texas passed a Renewable Energy Mandate establishing an RPS goal of 2,000 megawatts by 2009. In 2005, this goal was stretched to 10,000 megawatts by 2025. Qualified technologies include solar, wind, geothermal, hydroelectric, tidal energy, landfill gas and biomass. The state's best wind resources are located in the Texas panhandle, but there was inadequate transmission in this region. To address this, the Renewable Energy Mandate also required utilities to add new transmission capacity. However, the growth of renewable energy has outpaced the growth of transmission lines; while it takes one year to build a wind farm, it takes five years to build corresponding transmission lines. Despite this challenge, the state met its goal of 10,000 megawatts of renewable generation in just over six years.

Sources: *National Renewable Energy Laboratory, DSIRE, and Texas State Energy Conservation Office*

Renewable Energy Credits (RECs)

Renewable energy credits (RECs) are tradable certificates issued for electricity generation from renewable sources. States with a renewable energy portfolio standard (RPS) require utilities to generate a portion of electricity from renewable sources such as wind or solar power. Utilities can purchase RECs to show that the RPS requirement has been met. A single REC corresponds to one megawatt hour of renewable energy generated; the number of RECs a utility needs to purchase depends upon the state's RPS law. The physical electricity generated from renewable sources is associated with RECs that can be sold with the electricity or separately. If sold separately, the electricity sold apart from the REC is no longer considered renewable. RECs are certified through third-party auditors like Green-e Energy.[33] Although there is no national registry to assure that RECs are not double-counted, the sale of RECs is monitored by various regional tracking systems.[34]

RECs can be a crucial financing mechanism for renewable energy projects. REC retailers such as Renewable Choice Energy aggregate RECs from renewable energy projects around the country and sell them to utilities and other buyers.[35] This provides upfront capital for renewable energy project developers, who can secure dedicated contracts with REC buyers even before the project becomes operational. Renewable Choice also insures against production irregularities. If a wind farm produces under capacity, Renewable Choice covers the shortfall through its other REC acquisitions, and in the event of overproduction, it purchases the extra RECs. Through the sale of RECs, Renewable Choice supports dozens of renewable energy projects across the country in wind, biomass, hydroelectric, and geothermal technologies. The types of projects that produce qualifying RECs are determined by each state's RPS.

The Carbon Market

In the absence of comprehensive national energy legislation in the United States, RECs are popular because they are tied to RPS requirements. However, RECs are only a part of a plethora of mechanisms that loosely comprise the carbon market. The carbon market facilitates the reduction of greenhouse gas emissions by treating these emissions as commodities that can be sold and traded. Chart 3 gives an overview of some carbon market mechanisms. Most developed nations have adopted emissions reductions targets as part of the Kyoto Protocol. The Clean Development Mechanism established under the Kyoto Protocol allows developed nations to purchase Certified Emissions Reductions (CERs) to lower the cost of emissions reductions. CERs are

[33] Green-e. Retrieved from http://www.green-e.org/getcert_re.shtml on May 17, 2011.
[34] REC Tracking. (2010, August 4). *United States Environmental Protection Agency*. Retrieved from http://www.epa.gov/greenpower/gpmarket/tracking.htm on May 17, 2011.
[35] *Renewable Choice Energy*. Retrieved from http://www.renewablechoice.com on May 17, 2011.

generated by carbon offsetting projects in developing countries, which in turn improves sustainable development in these countries.

Although the United States did not commit to a binding emissions reduction under the Kyoto Protocol, companies and individuals can purchase credits on the voluntary or "over-the-counter" carbon market. In 2009, about half of the global voluntary carbon market was traded as Carbon Financial Instruments (CFIs) through the Chicago Climate Exchange, where members commit to legally binding emissions reductions.[36] Members participate in a "cap-and-trade" system in which carbon credits can be sold or purchased on the market, depending on the member's needs. The Chicago Climate Exchange was sold in 2010, and commitments have become non-binding.[37] The program will continue to operate through its subsidiary, the Chicago Climate Futures Exchange, which serves as a carbon trading platform for both voluntary and mandatory regional climate programs. The future of the exchange depends largely on the extent to which these regional programs are adopted.

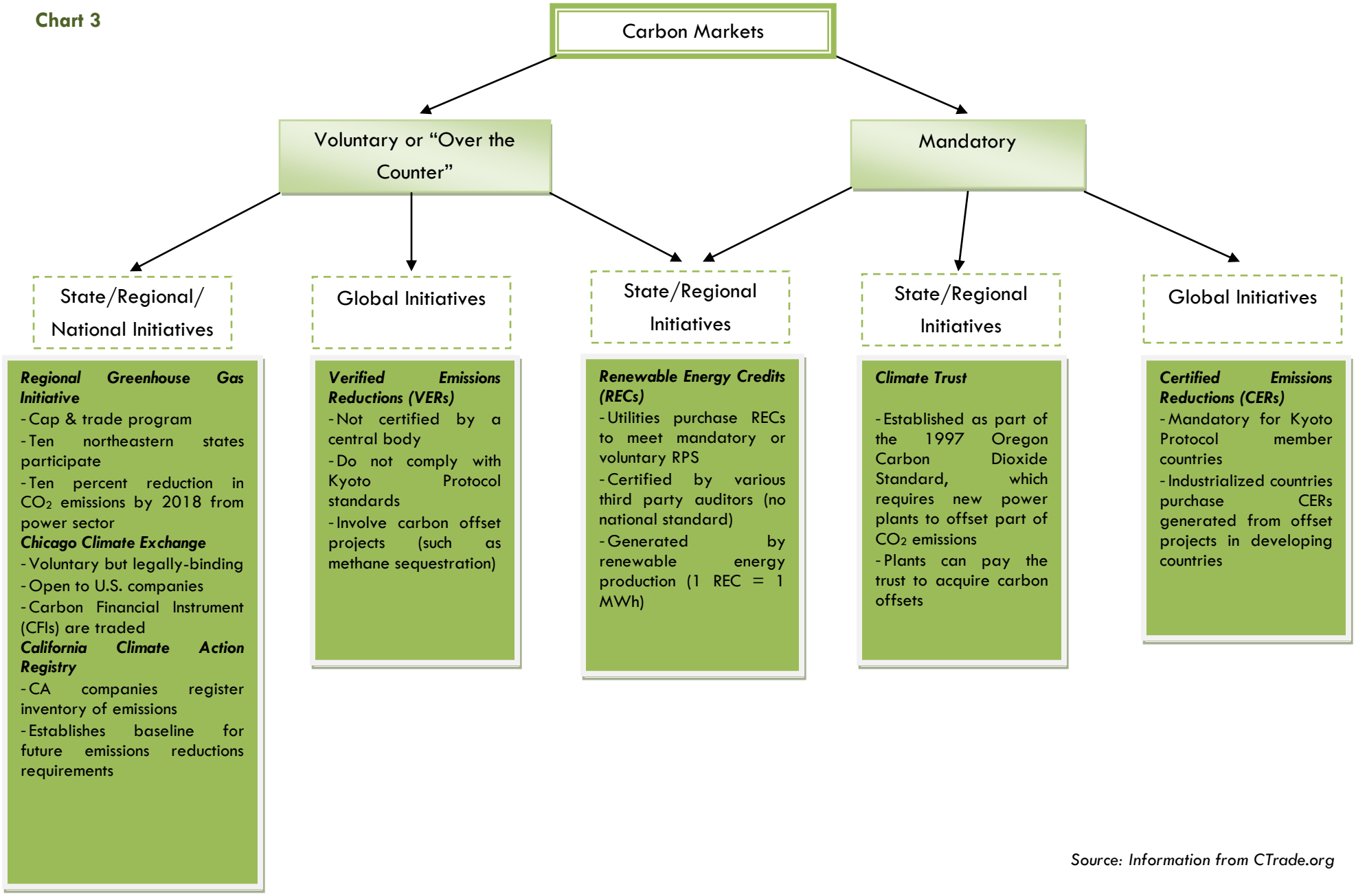
The other half of the global voluntary carbon market is traded as Verified Emissions Reductions (VERs), a type of carbon offset.[38] VERs can be sold on the mandatory carbon market, but since they are not tied to a particular regulatory body, they are less robust in satisfying emission regulations. VERs are purchased to offset activities that create carbon pollution, such as manufacturing. These are distinct from RECs in that VERs involve projects that reduce carbon pollution, but not necessarily ones that produce renewable energy. Likewise, RECs give evidence of renewable energy generation but do not directly translate into displaced pollution.

EcoSecurities is a leading international firm that sources and sells VERs on both the mandatory and voluntary carbon markets. The firm develops clean energy projects through the sale of VERs. EcoSecurities works closely with renewable energy project developers to formulate a viable VER project and commits to purchasing carbon credits over a set number of years. Although most of its offset projects are based in the developing world, EcoSecurities is currently involved with two projects in the United States. In 2007, it signed an agreement with Intrepid Technology and Resources, an Idaho-based biogas production firm, to purchase carbon credits from methane gas sequestration at two dairy farms in southern Idaho. The dairy farms adopted technology to

[36] Hamilton, K. et al. (2010, June 14). "Building Bridges: State of the Voluntary Carbon Markets 2010." *Ecosystem Marketplace and Bloomberg New Energy Finance.*
[37] Gronewold, N. (2011, January 3). "Chicago Climate Exchange Closes Nation's First Cap-And-Trade System but Keeps Eye to the Future." *The New York Times*. Retrieved from http://www.nytimes.com/cwire/2011/01/03/03climatewire-chicago-climate-exchange-closes-but-keeps-ey-78598.html on May 17, 2011.
[38] Ibid.

capture methane emissions resulting from the anaerobic digestion of manure. The methane is then sold for heating and power applications on the natural gas distribution pipeline.

Chart 3



Source: Information from CTrade.org

Feed-in-Tariffs

A feed-in-tariff (FiT) is a legal obligation on an electric utility to purchase renewable energy at a specified price. Tariff rates are traditionally based on the cost of generation plus a reasonable profit. The FiT has been successful in stimulating renewable energy growth in countries like Germany and Spain since the early 1990s.[39] This demand-side policy is attractive to renewable energy producers because it implements long-term contracts, guarantees buyers and ensures a profit. Utility regulatory agencies can also craft FiTs to support economic development goals, such as developing their jurisdiction's solar industry.

The Regulatory Assistance Project, an energy and environmental nonprofit consulting agency, identifies some aspects to be considered when formulating a FiT policy.[40] Tariffs that are not high enough may not make investment worthwhile for energy producers. On the other hand, excessive tariffs may create an unnecessary burden on ratepayers. Utility commissions should consider tariff structures (also known as "standard offer rates") that reflect:

- The renewable energy portfolio goals of the state. Although some technologies are more developed than others, states may have overall renewable energy goals that take precedence.
- The cost, performance and environmental mitigation of each technology. More expensive technologies may be more or less efficient, but they will require higher tariffs to incentivize energy producers. Not all technologies produce equal environmental benefits, so utility commissions should consider the desired balance of costs and environmental benefits.
- The evolution of technology as it becomes less expensive.
- Possible differentiation between large versus small or local producers. Some states, like Vermont, pay small producers a higher rate in order to achieve a more stable grid.

There are some best practices in implementing a FiT that can make the transition to the new policy as smooth as possible. These include:

- Long-term contracts to guarantee investors a sufficient return.

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[39] *The support of electricity from renewable energy sources* [Commission Staff Working Document]. (2008, January 23). Brussels: Commission of the European Communities. Retrieved from http://ec.europa.eu/energy/climate_actions/doc/2008_res_working_document_en.pdf on May 17, 2011.

[40] Schwartz, L. (2010, July 19). "Feed-in Tariffs in Oregon and Vermont." [Powerpoint]. *The Regulatory Assistance Project*. Retrieved from http://www.narucmeetings.org/Presentations/RAP_Schwartz_Feed-inTariffs_2010_7_19.pdf on May 17, 2011.

- Possible phase-in enrollment to determine the optimal standard offer rates, balancing investment targets and costs to ratepayers. Utility customers can be "phased in" to the feed-in-tariff program as a test to see what standard offer rates can reasonably be implemented.
- Using auctions or requests for proposals to attract lowest-price producers.
- Issuing project caps that limit the FiT payout on a first-come, first-served basis. Project caps can diversify types and sizes of renewable energy generation projects.
- Allowing utilities to use renewable energy credits to satisfy RPS requirements or to sell to other utilities.

The following chart details existing state and local FiTs in the United States. Most FiTs specify a program cap, as well as an individual cap for qualifying projects. Contracts between utilities and energy producers are typically fixed at ten years or more. Tariff rates under each FiT may vary depending on technology, on- and off-peak production, projected cost of production, and other components of the state's renewable energy goals.

States with Feed-in-Tariffs

State/City	*Original Year Established*	*Cap*	*Contract Terms*	*Rates*	*Comments*
California	2006, amended in 2009	750 MW total, 1.5 MW per project	10, 15, 20 years	Varies with peak/off-peak production and predicted annual cost of production	Cannot be used in conjunction with other ratepayer-funded generation incentive programs (such as RPS and net metering)
Hawaii	2009	80 MW total, project cap varies by technology and island	20 years	Varies with system size and technology	Whereas other state FiTs attracted an overwhelming number of applications, Hawaii has had relatively little response
Oregon	2009	25 MW total, 500 kW per project	15 years	Varies with system size and county	Unique from other FiTs in that customers receive an incentive for producing renewable energy (through residential installations) as well as consuming it
Vermont	2009	50 MW total, 2.2 MW per project	25 years for solar plants, 15-20 years for other technologies	Varies with technology	Considered one of the most ambitious in the nation relative to population size
Gainesville, Fla.	2009	4 MW total	20 years	$0.32/kWh	Applicable to photovoltaic only

Source: DSIRE, GreenTech Media

Case Study: Vermont

In May 2009, Vermont passed what is considered one of the more ambitious feed-in-tariffs in the United States. The Vermont Energy Act guarantees tariff rates for up to 50 megawatts of renewable energy generation, which is relatively high for a state with a population of 600,000.[1] The act is similar to European FiTs in that tariffs vary with technology and project size, include long-term contracts, and are periodically brought up for regulatory examination (at least every two years). In addition, the act sets tariff rates for specified renewable technologies that cover cost generation plus a profit for energy producers. The maximum profit is comparable to the approved rates of return for investor-owned utilities in the state.[1]

The act set initial standard offer rates and maximum contract lengths according to each renewable technology. The governor at the time, Jim Douglas, expressed concern that the standard offer rates may offer excessive incentive to renewable energy producers, but he allowed the bill to pass with the contingency that the Vermont Public Service Board (PSB) could later adjust the rates to reflect generation costs.[1] Four months after the act passed, PSB conducted a review of the rates and made modifications; solar, large wind, and landfill gas rates were adjusted down, while small wind and farm methane rates were boosted slightly. As of April 2011, the most recent standard offer rates (per megawatt hour of energy generated) were:[1]

- Photovoltaic: $240.00
- Hydropower: $118.80
- Landfill gas: $86.90
- Farm methane: $135.90
- Large wind: $112.50
- Small wind: $208.30
- Biomass: $120.80

In an economic impact study, the Vermont Division of Energy Planning projects that the FiT will create 894 net jobs in its 26-year lifespan.[1] Sectors that gained the most jobs were operations and maintenance, construction and utilities, while some sectors lost jobs, such as real estate and educational services.[1] Overall, Vermont's FiT is projected to increase in-state capital investment by $75 million and lead to modest job growth.

Sources: Grist Magazine, EERE Network News, DSIRE, Vermont Division of Energy Planning

RENEWABLE ENERGY FINANCING TOOLS

Traditional sources for renewable energy financing have diminished since the economic crisis of 2008. Bank lending, or debt financing, has been reduced as banks attempt to recover from liquidity issues. Equity funds, in which investors take an ownership stake in a project, also ebbed with the onset of the recession. Equity investors have gravitated toward later-stage, lower-risk projects, especially since it has become more difficult to leverage debt financing.

Although private financing has drawn back, public financing mechanisms received a boost through the American Recovery and Reinvestment Act of 2009 and state programs. Also, business competitions like the Cleantech Open, discussed below, help the most promising technologies get funded. What follows in this section are a slew of funding opportunities that can provide at least part of the capital needed to commercialize renewable energy technologies. A few demand-side financing opportunities are also discussed.

STATE FINANCING

Massachusetts Clean Energy Center

The Massachusetts Clean Energy Center (MassCEC) is a quasi-public entity devoted to developing the state's clean energy economy. MassCEC makes direct investments in new and existing companies, helps companies access financing and other resources, and develops workforce training programs for renewable sectors. The agency was formed in 2008 and is chaired by the Secretary of the Massachusetts Executive Office of Energy and Environmental Affairs. MassCEC operates the Massachusetts Renewable Energy Trust Fund, which finances many of the agency's activities. The Massachusetts Renewable Energy Trust Fund was created in 1997 as a public benefit fund to encourage renewable energy development. The fund is financed by a 0.05 cent tax per kilowatt hour of electrical consumption by all customers of investor-owned utilities in the state.[41] In 2009, the trust was signed over to MassCEC's jurisdiction.

MassCEC offers a number of demand-side incentives for renewable energy generation by sector.[42] The Commonwealth Solar program provides rebates for the installation of photovoltaic panels. Commonwealth Solar Hot Water offers rebates for residential solar hot water projects. The Commonwealth Wind program is divided into three tiers—commercial wind, community-scale

[41] Renewable Energy Trust Fund. (2010, June 18). *DSIRE*. Retrieved from http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MA07R&re=1&ee=1 on May 18, 2011.
[42] Renewable Energy Generation Programs. *Massachusetts Clean Energy Center*. Retrieved from http://www.masscec.com/index.cfm/page/Programs/pid/11159 on May 18, 2011.

and micro-wind—and provides grants, rebates and loans for qualifying projects. The commercial wind program offers funding for early-stage development activities such as site assessment and feasibility studies, but does not cover construction costs. The program favors projects that could not undertake preliminary studies without the funding.[43]

Early and late-stage investment programs

On the production side, MassCEC provides funding for clean technology projects based on job creation and technology demonstration. It makes capital investments in Massachusetts companies that expand operations in the state and create significant job growth. Applications are reviewed by the MassCEC investment team and decisions must be approved by the MassCEC board of directors. The board is comprised of senior-level state officials and representatives from academia, renewable energy consulting groups, investment firms, and worker unions.

MassCEC also makes venture capital investments in early-stage renewable energy technologies developed by Massachusetts companies. Qualifying renewable and energy efficiency technologies can receive up to $500,000 in seed investment.[44] In 2010, MassCEC awarded advanced battery-maker A123 Systems a $5 million forgivable loan to finance the expansion of the company's facilities in Massachusetts.[45] A123 develops and manufactures advanced lithium ion batteries for a variety of applications, including grid storage and electric vehicles. The loan helps the company support over 250 new jobs and leverage $80 million in capital investment in manufacturing and research and development facilities by 2014.[46] The expansion accommodates the assembly of trailer-sized battery systems used for energy storage on the electric grid.

Catalyst Program

MassCEC's Catalyst Program awards up to $40,000 toward the demonstration of early-stage technologies.[47] These funds are used to develop a prototype of the technology or to gather data for proof of concept, allowing the applicant to move forward in raising funds for commercialization. The program helps accelerate technologies for licensing to existing companies or to help the principal investigator start his or her own company in Massachusetts.

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[43] Commonwealth Wind – Commercial Wind. *Massachusetts Clean Energy Center*. Retrieved from http://www.masscec.com/index.cfm/page/Commonwealth-Wind-Commercial-Wind/cdid/11393/pid/11159 on May 18, 2011.
[44] Investments in the Advancement of Technology. *Massachusetts Clean Energy Center*. Retrieved from http://www.masscec.com/index.cfm/page/Investments-in-The-Advancement-of-Technology/cdid/11527/pid/11174 on May 18, 2011.
[45] MassCEC Awards $5 million Financing Package to A123. *Massachusetts Clean Energy Center*. Retrieved from http://www.masscec.com/index.cfm/cdid/11416 on May 18, 2011.
[46] Ibid.
[47] Catalyst Program. *Massachusetts Clean Energy Center*. Retrieved from http://www.masscec.com/index.cfm/page/Catalyst-Program/cdid/11531/pid/11174 on May 18, 2011.

The Catalyst Program is managed by the Massachusetts Technology Transfer Center, which works with technology transfer offices in public and private research institutions across the state. The program received 17 applications in its first round of funding and awarded $200,000 to five Massachusetts researchers. In its second round, the program received 27 applications and split $160,000 among four researchers. To date, selected projects have received the maximum possible award of $40,000. The program launched its third round of funding in April 2011.

Ohio Energy Gateway Fund

In 2010, Governor Ted Strickland and the Ohio legislature launched the Ohio Energy Gateway Fund to finance in-state projects in advanced and alternative energy. In addition to creating clean energy jobs, the fund forwards the state's economic development goals by helping manufacturing firms in declining sectors retool for renewable energy industries and can also be used for energy efficiency projects within the state. The fund was established from a partnership between the Ohio Department of Development and the Ohio Air Quality Development Authority.[48]

The fund leverages a total of $80 million in public-private financing, of which $30 million came from an American Recovery and Reinvestment Act grant and $10 million from the Ohio Advanced Energy Stimulus Fund.[49] The $40 million public contribution is being managed by two investment firms, EnerTech Capital and Arsenal Venture Partners, which are matching the contribution dollar-for-dollar.[50] The agreement specifies a minimum return on the public investment, all of which is reinvested into the fund.[51] With this revolving mechanism, the fund is expected to reach as much as $115 million of potential investment monies.[52]

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[48] "Ohio Bipartisan Job Stimulus Plan - Advanced Energy Program." Ohio.gov. Retrieved from http://www.ohioairquality.org/advanced_energy_program/faqs.asp on May 6, 2011.
[49] Monteith, G. (2010, October 21). "Launch of Ohio Energy Gateway Fund aimed at job growth." hiVelocitymedia.com. Retrieved from http://www.hivelocitymedia.com/innovationnews/Gateway10_21_10.aspx on May 6, 2011.
[50] "State of Ohio's Energy Gateway Fund: Request for Proposals." (2010, February 10). Ohio Department of Development. Retrieved from http://www.development.ohio.gov/OhioEnergyGatewayFund/Documents/OhioEnergyGatewayFundRFP.pdf on May 6, 2011.
[51] Ibid.
[52] Bell, J. (2011, April 8). "Energy Gateway Fund nearing decision on initial investments." Business First. Retrieved from http://www.enertechcapital.com/Press%20Releases%20for%20Website/EnerTech%20Ohio%20Press%20Release%20-%20Business%20First.pdf on May 6, 2011.

The fund provides equity and growth financing for mature companies and projects that can be implemented quickly. Qualifying projects fall within three categories:[53]

1. Clean energy micro-generation projects (e.g., on-site solar, solar thermal, geothermal, biomass conversion).
2. Energy efficiency projects (such as building retrofits).
3. Clean energy manufacturing projects. Funds can be used for building new manufacturing operations, production, expansion, retooling or purchase of equipment along all links of the renewable energy supply chain.

The fund will support up to 25 projects at its peak.[54] In addition to the return on investment, the managing firms will evaluate the number of in-state jobs the projects expect to create. EnerTech Capital began accepting applications for projects in October 2010. As of April 2011, EnerTech was in the final stages of evaluating several dozen projects for the initial round of investment, with investment decisions slated for May. [55]

EnerTech, which is managing $30 million of the public money and its matching contribution, has a history of nearly $400 million invested in clean energy and micro-infrastructure projects since 1994.[56] The other $10 million of public funds and matching contribution is being managed by Arsenal Venture Partners, which also has a robust portfolio in energy and environmental industries.[57] Tapping the expertise of these firms allows the state to invest public funds according to seasoned investment strategies. Furthermore, the public funds encourage private investment in clean energy by helping to mitigate risk.

Since the fund is the first of its kind, its success as a model is yet to be proven.[58] The state hopes projects will begin contributing a return within three years of initial investment.[59]

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[53]EnerTech Capital. Ohio Energy Gateway Fund.Retrieved from http://www.ohioenergygatewayfund.com/ on May 6, 2011.
[54] Ibid.
[55] Bell, J. (2011, April 8). "Energy Gateway Fund nearing decision on initial investments." Business First. Retrieved from http://www.enertechcapital.com/Press%20Releases%20for%20Website/EnerTech%20Ohio%20Press%20Release%20-%20Business%20First.pdf on May 6, 2011.
[56] EnerTech Capital. Retrieved from http://www.enertechcapital.com/ on May 6, 2011.
[57]Arsenal Venture Partners. Retrieved from http://www.arsenalvp.com/ on May 6, 2011.
[58] "Ohio Energy Gateway Fund." [Fact Sheet]. Ohio Air Quality Development Authority. Retrieved from http://www.ohioairquality.org/advanced_energy_program/pdf/Energy-Gateway-Factsheet-10-22.pdf on May 6, 2011.
[59] "State of Ohio's Energy Gateway Fund: Request for Proposals." (2010, February 10). Ohio Department of Development. Retrieved from http://www.development.ohio.gov/OhioEnergyGatewayFund/Documents/OhioEnergyGatewayFundRFP.pdf on May 6, 2011.

Iowa Power Fund

In 2007, Governor Chet Culver and the Iowa Legislature created the Iowa Power Fund to finance renewable energy research and development projects in the state. The fund helps renewable energy projects move forward by filling in the gaps between traditional forms of financing. The legislature made an initial deposit of $24.7 million into the fund as a supplemental appropriation from the general state budget.[60] Through FY 2011, $25 million was to be committed each year to the fund, a goal which has been met.[61]

The legislature created the state Office of Energy Independence (OEI) in conjunction with the fund. OEI helps the state achieve its broader energy goals by exploring cost-effective ways to reduce the state's consumption of fossil fuels, reliance on foreign energy and emissions of greenhouse gases. The fund helps cover part of the administrative activities of OEI.

To oversee the fund, the legislature created the 18-member Iowa Power Fund board. The board is responsible for approving grants, loans, investments and incentives made out of the fund, as well as advising the governor on the strategic direction of the fund's activities. The board is composed of seven members selected by the governor and confirmed by the Senate, four state agency directors, and seven ex-officio, non-voting members.[62]

Of the money awarded to the fund, $2.5 million is used each year for workforce training by the Iowa Department of Economic Development.[63] A minimum of 10 percent is also used for energy planning, energy education and energy efficiency.[64] To this end, the board develops an annual Iowa Energy Independence Plan in coordination with public and private partners. Four percent of the annual appropriation also goes toward the Community Grant Program, which assists communities in implementing energy efficiency, conservation and environmental initiatives.[65]

Investing in Renewable Energy Projects

The fund primarily provides grants to renewable energy projects in research and development, early-stage commercialization and education. The grants are arranged as no-interest, non-

[60] Iowa Power Fund Bill, Senate File 599. (2007, April 19). Retrieved from http://www.legis.iowa.gov/DOCS/NOBA/82_SF599_SF.pdf on May 6, 2011.
[61] Ibid.
[62] "Power Fund Board." Iowa Office of Energy Independence. Retrieved from http://www.energy.iowa.gov/Power_Fund/PF_Board.html on May 6, 2011.
[63] Iowa Power Fund Bill, Senate File 599. (2007, April 19). Retrieved from http://www.legis.iowa.gov/DOCS/NOBA/82_SF599_SF.pdf on May 6, 2011.
[64] Ibid.
[65] "Community Grants through Iowa Power Fund." Iowa Office of Energy Independence. Retrieved from http://www.state.ia.us/government/governor/energy/Power_Fund/CommunityGrants.html on May 6, 2011.

recourse loans. Successful projects pay back the loan; unsuccessful projects receive loan forgiveness.[66] Over the lifetime of the fund, the board has received 340 applications and accepted 45 projects for an approval rate of 13 percent.[67] This represents a total of over $60 million in direct investment, with an additional $546 million of leveraged monies.[68]

Project applications are reviewed by a seven-member Due Diligence Committee, which is led by the director of OEI and includes representatives from academia, the state utility, and the Iowa Power Fund board.[69] Projects that have been financed span biofuels, solar, wind, energy efficiency, biomass, transportation, and research initiatives.[70] The Due Diligence Committee evaluates projects based on their projected benefit to the state, as well as their commercialization potential beyond the fund's contribution. To this end, the committee is guided by the priorities highlighted in the Iowa Energy Independence Plan, such as improving feedstocks, reducing greenhouse gas emissions, and commercializing renewable energy and energy efficient technologies.[71]

Sample projects:

- POET, LLC, was awarded $14.7 million for Project Liberty, a plan to transform a traditional ethanol biorefinery in Emmetsburg, Iowa, into an integrated corn-to-ethanol and cellulose-to-ethanol biorefinery.[72] Project Liberty represents the fund's largest investment to date. The project also received $5.2 million in tax credits and direct assistance from the Iowa Department of Economic Development and $20 million from the U.S. DOE.[73] The funds have allowed POET to prepare the construction site and gradually collect feedstocks pending the approval of a federal loan guarantee to finalize construction plans. POET is the nation's largest producer of traditional ethanol, and this

[66] Interview with Kristin Hanks, Iowa Power Fund, on April 26, 2011.
[67] Email from Kristin Hanks, April 29, 2011.
[68] Ibid.
[69] "Due Diligence Committee." Iowa Office of Energy Independence. Retrieved from http://www.energy.iowa.gov/Power_Fund/DD_committee.html on May 6, 2011.
[70] For a summary of all Fund projects, refer to http://www.state.ia.us/government/governor/energy/files/31PowerFundProjectSummaries121610.pdf
[71] For the latest version of the Iowa Energy Independence Plan, refer to http://www.energy.iowa.gov/OEI/plan.html
[72] "Individual Project Summaries." Iowa Office of Energy Independence. Retrieved from http://www.state.ia.us/government/governor/energy/files/31PowerFundProjectSummaries121610.pdf on May 6, 2011.
[73] Crowe, B. "Iowa Office of Energy Independence and the Iowa Power Fund." (2010, April 8). Iowa Office of Energy Independence. Retrieved from http://www.mcguirewoods.com/media/docs/2010/renewable%20fuels%209%20crowe.pdf on May 6, 2011.

project is its first commercial plant for cellulosic ethanol.[74] The pilot project will help demonstrate the viability of cellulosic ethanol on a commercial scale.

- Iowa Stored Energy Park received $3.2 million to build a compressed air energy storage facility (CAES) in an underground reservoir northwest of Des Moines.[75] CAES is a battery technology used to store wind energy during off-peak hours. The fund's contribution is allowing developers to drill test wells and conduct other site selection activities. Other sources of funding include $1.5 million from DOE and $200 million pooled by 95 municipal utilities in Iowa, Minnesota and the Dakotas.[76] The project is expected to come online in 2015 and will be only the second CAES facility in the United States.

- BioProcess Algae received $2 million to continue research to improve the efficiency of algae fuel.[77] The funding will help carry the company through construction of its phase II facility, which will scale the technology 20 times larger than in phase I.[78] Financing from the fund, combined with contributions by joint venture partners, made the $4.5 million expansion possible.[79]

Economic Impact

In December 2010, OEI released an economic impact study of the fund.[80] According to the study, projects financed by the fund have created an average annual economic impact of $22.7 million in ongoing project operations and $89.4 million in construction.[81] The study also estimates that on average, over 200 permanent jobs are created each year with a combined annual payroll of $7.8 million. Current fund projects also have a significant potential impact in the long run. If

[74] POET. Retrieved from http://www.poet.com/ on May 6, 2011.
[75] "Study finds Iowa Stored Energy Park cost-effective." [News Release]. (2011, January 17). Iowa Stored Park Energy Agency. Retrieved from http://isepa.com/ISEP%20Econ%20Study%20Press%20Release.pdf on May 6, 2011.
[76] Ibid.
[77] "Green Plains Renewable Energy and BioProcess Algae to Break Ground on Phase II of Algae Project." (2010, July 20). American Fuels. Retrieved from http://americanfuels.blogspot.com/2010/07/green-plains-renewable-energy-and.html on May 6, 2011.
[78] Ibid.
[79] Ibid.
[80] "Iowa Power Fund Summary of Economic Impact Study." (2010, December). Iowa Office of Energy Independence. Retrieved from http://www.state.ia.us/government/governor/energy/files/IowaPowerFundEconImpactSummary121610.pdf on May 6, 2011.
[81] Impact on operations includes direct, indirect and induced economic activity. Direct economic impact results from plant operations and employee earnings. Indirect impacts are measured along the supply chain, while induced economic activity comes from services supporting workers and their families (such as retail, grocery and restaurant sales.)

projects financed to date continue to move forward in commercialization, they are expected to add almost 8,500 jobs and $40.3 billion in output to the state's economy through 2033.[82]

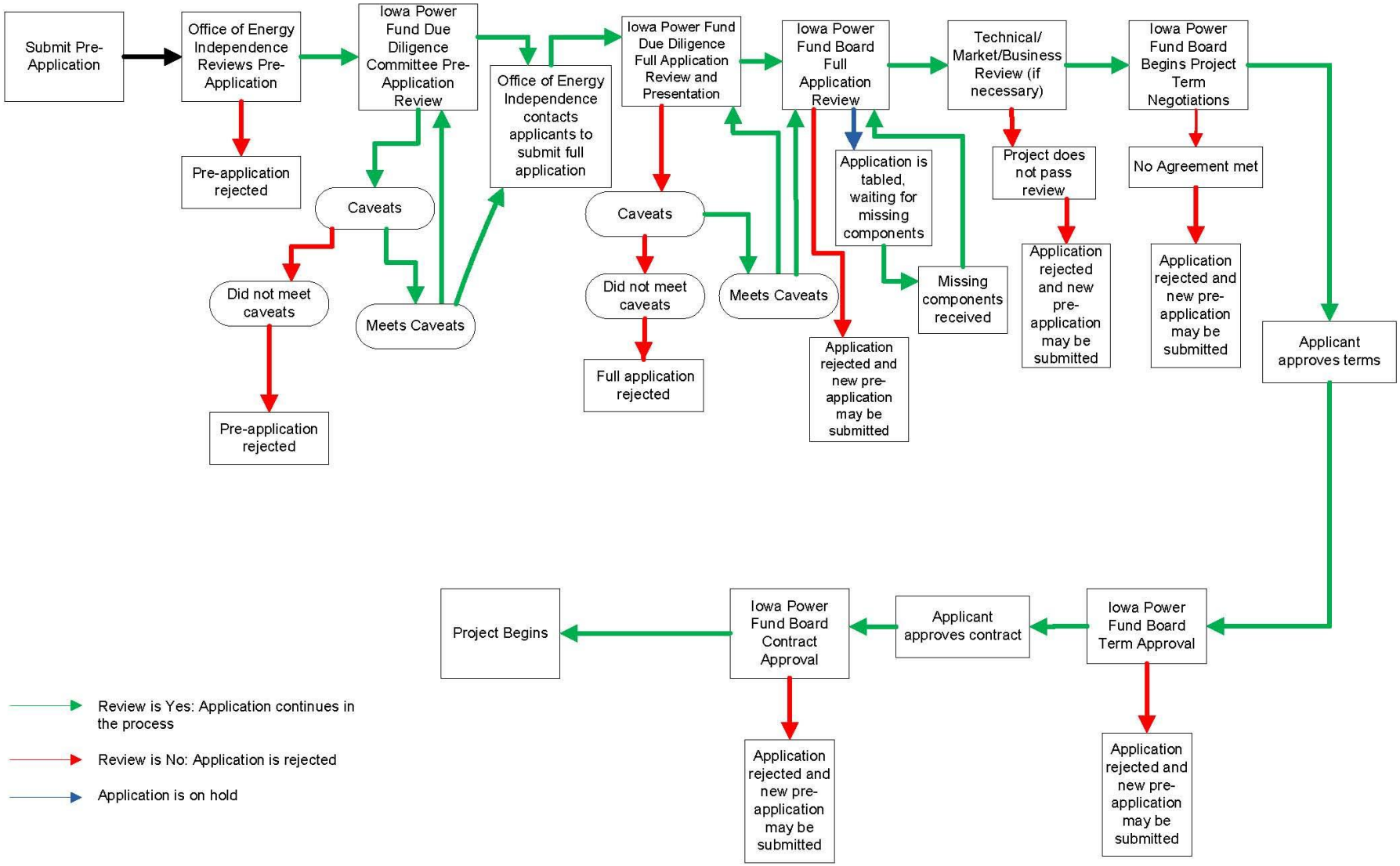
Reaching Sunset

The fund reached its last round of applications in April 2011. Like many states, Iowa is facing a budget shortfall, and multiple programs are being eliminated or cut back. The new gubernatorial administration has chosen not to renew the fund, instead steering projects to the state's traditional economic development programs. OEI will continue to operate, though under a different banner. The Iowa Department of Economic Development encompasses OEI and currently is being restructured. The Department's various operations will fall under either an authority component, which works as a public-private partnership, or a non-profit component.[83] OEI will likely be part of the former.[84]

Despite the sunset, the fund has tested and demonstrated several best practices.[85] A strongly engaged board was crucial to the fund's success. Board members were experts in renewable energy policy, planning and economic development and provided statewide leadership in these areas, in addition to overseeing contributions made from the fund. The fund itself was designed to be self-financing as loans on successful projects were repaid. Sustainability is key to any financing program, and states should consider their budgets when deciding how and when loans should be repayed. One area for possible improvement was in expediting the application approval process, as projects could take six months to move from pre-application to final contract approval.

[82] "Iowa Power Fund Summary of Economic Impact Study." (2010, December). Iowa Office of Energy Independence. Retrieved from http://www.state.ia.us/government/governor/energy/files/IowaPowerFundEconImpactSummary121610.pdf on May 6, 2011.
[83] Interview with Kristin Hanks, Iowa Power Fund, on April 26, 2011.
[84] Ibid.
[85] Ibid.

Iowa Power Fund Application Process



**The Iowa Power Fund Board reserves the right to review all applications rejected.*

***To ensure the process moves quickly, all applicants MUST meet application deadlines. If deadlines are not met, the application will not be reviewed until the following cycle.*

****Caveats can be met in two ways. If the decision is a "No, but" and the caveat is met, the application will be reviewed by the Due Diligence Committee again. If the decision is a "Yes, if" and the caveat is met, it can go immediately to the next step the in the application process.*

IN

Source: Iowa Office of Energy Independence

Kentucky New Energy Ventures

Kentucky New Energy Ventures (KNEV) is a state-backed financing program to support companies that are developing and commercializing alternative energy technologies. KNEV was established in 2007 with a one-time state appropriation of $5 million. The program falls under the Kentucky Department of Commercialization and Innovation (DCI), a division of the Kentucky Cabinet for Economic Development.[86] DCI contracts with the Kentucky Science and Technology Corporation (KSTC) to administer the fund. KSTC is a nonprofit that specializes in expanding the state's innovation and entrepreneurship capacity.[87]

Companies that have fewer than 150 employees and are primarily based in Kentucky are eligible for KNEV consideration. The program has a particular emphasis on alternative transportation fuels such as biodiesel, corn ethanol and cellulosic ethanol. Companies are selected based on how closely their technologies meet solicitation guidelines; the anticipated return on investment; and the potential for job creation and future investment in the state.

KNEV offers two levels of early-stage financing:

1. *Grants:* Grants up to $30,000 are made to selected companies, which must match the funding dollar-for-dollar in cash or in-kind resources (qualifying resources are determined by KSTC). Grants do not require payback.

2. *Investments:* Equity investments of up to $250,000, $500,000 and $750,000 are available, which receiving companies also must match one-to-one through other equity investments. Investments must be paid back in full, and if a company first receives a grant and later an investment from KNEV, the combined total award must be repaid.

The majority of companies that have received KNEV awards are located in rural Kentucky. As of May 2011, KNEV has awarded a total of $3.19 million, which includes $630,000 in grants and $2.56 million in investments.[88] These figures represent approved funding; actual monies transferred may be less. Companies strive to secure the full amount of a grant, which does not have a payback requirement. They often accept less than the full approved investment, which must be repaid.

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[86] Kentucky Launches New Fund To Invest In Companies Developing Renewable & Alternative Energy Technologies. (2008, March 12). *WYMT News*. Retrieved from http://www.wkyt.com/wymtnews/headlines/16622096.html?storySection=story on May 31, 2011.
[87] Kentucky Science and Technology Corporation. Retrieved from http://www.kstc.com on May 31, 2011.
[88] J.M. Cain (personal communication, May 31, 2011)

FEDERAL FUNDING

Production Tax Credit (PTC) and Investment Tax Credit (ITC)

These two tax credits have been vital to the development of the U.S. renewable energy industry, particularly the wind industry. The PTC issues a tax credit of 2.1 cents per kilowatt hour of renewable electricity produced. Qualified sources include wind, geothermal, biomass, hydropower, landfill gas, waste-to-energy and marine facilities.[89] Established in 1992, the PTC has been extended periodically with a few lapses. Whereas the PTC is available to businesses that pay federal corporate taxes, the Renewable Energy Production Incentive (REPI) complements the PTC by offering an incentive payment of 1.5 cents per kilowatt hour for not-for-profit entities such as electrical cooperatives, public utilities, and state governments.

The ITC can be used in place of the PTC and offers a 30 percent tax credit for investments made in renewable facilities. The ITC also qualifies to be converted into a cash grant from the U.S. Department of Treasury. These two tax credits are widely utilized; the U.S. Energy Information Administration projects wind production capacity to be five to six times higher from 2005 to 2015 with these tax credits than it would be without them.[90] Understandably so: the PTC represents an allotment of tax-free money that the project owner otherwise would have to recoup through electricity sales, which furthermore are taxed.

The Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory developed a comparative analysis of the PTC, ITC and cash grant programs.[91] The study found that the ITC generally produced a higher return for "open-loop" biomass projects (those that use waste material), while the PTC was more beneficial for geothermal projects. Wind, landfill gas and "closed-loop" biomass (which uses feedstock planted exclusively for power generation) were split between the ITC and PTC, depending on the project's parameters:[92]

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[89] "Production Tax Credit (PTC)." American Wind Energy Association. Retrieved from http://www.awea.org/ei_policy_ptc.cfm on May 6, 2011.
[90] "Production Tax Credit for Renewable Electricity Generation." (2005). U.S. Energy Information Administration. Retrieved from http://www.eia.doe.gov/oiaf/aeo/otheranalysis/aeo_2005analysispapers/prcreg.html on May 6, 2011.
[91] Bollinger, M. et al. "PTC, ITC, or Cash Grant?" (2009 March). National Renewable Energy Laboratory. Retrieved from http://eetd.lbl.gov/EA/EMP/reports/lbnl-1642e.pdf on May 6, 2011.
[92] Ibid.

ITC Advantages:

- Option to elect for an equivalent cash grant
- No performance risk
- Derived from current tax base as opposed to future projected tax base, which is more uncertain Can be used on top of existing subsidized financing (such as low-interest government loans)
- No power sale requirement
- Availability of leasing structures

PTC Advantages:

- Investment liquidity
- Suitable for projects with extremely low installed cost or high capacity factors

DOE Loan Guarantee

The Department of Energy guarantees loans on select renewable energy projects that use both innovative and commercial technology. A loan guarantee is a commitment by the government to pay the lender in the event that the borrower defaults. The program currently supports 29 projects at a total of $31 billion in loan guarantees.[93] These projects represent an estimated 62,350 jobs created or saved.[94] DOE accepts applications for the program under three categories:

- "1703"-eligible projects (named for the authorizing legislation) employ non-commercial technology, which is defined as technology that doesn't have existing replications that have been active for over five years. DOE currently guarantees four 1703 projects related to nuclear energy and energy efficiency.
- Commercial technology applications can apply to the 1705 program, which receives projects related to renewable energy systems (such as solar or wind farms), transmission and biofuels. Awards given under 1705 include a $535 million guarantee for solar manufacturer Solyndra's manufacturing expansion and $1.6 billion for BrightSource Energy to increase its concentrated solar operations in the U.S.

[93] The Financing Force Behind America's Clean Energy Economy. U.S. Department of Energy Loan Programs Office. Retrieved from https://lpo.energy.gov/?page_id=45 on May 23, 2011.
[94] Ibid.

- The Advanced Technology Vehicles Manufacturing (ATVM) program serves companies that manufacture fuel-efficient vehicles or component parts. Qualifying vehicles must meet specified emission and fuel economy standards.

The 1705 loan guarantee program was established under the American Recovery and Reinvestment Act of 2009 and is set to expire in September 2011. Project applicants that are likely to meet the shovel-ready deadline will continue to be considered, while the remaining applications will be put on hold. The continued operation of the 1705 program is pending federal action.

ARPA-E

The Advanced Research Projects Agency – Energy (ARPA-E), part of the U.S. Department of Energy (DOE), seeks to catalyze energy research by funding domestic projects in renewable energy and energy efficiency technologies. ARPA-E is specifically focused on high-risk, high-reward projects. The agency was modeled after the Defense Advanced Research Projects Agency, which over its 60-plus-year history has produced innovations such as the Internet and aircraft stealth technology. ARPA-E was authorized in 2007 by the America Creating Opportunities to Meaningfully Promote Excellence in Technology (America COMPETES) Act, but did not receive initial funding until 2009, when the American Recovery and Reinvestment Act allotted $400 million to the program.[95]

ARPA-E targets groundbreaking technologies that may be too risky for traditional financing but that have dramatic benefits if successfully developed. The agency directs investment primarily through the following programs:[96]

- *BEEST*: The Batteries for Electrical Energy Storage in Transportation (BEEST) program invests in high-energy, low-cost battery technologies for electric and hybrid vehicles. The program is guided by standards set forth by the United States Advanced Battery Consortium, a collaboration between DOE and U.S. automotive companies.
- *IMPACCT*: The Innovative Materials & Processes for Advanced Carbon Capture Technologies (IMPACCT) program focuses on technologies that sequester carbon dioxide from coal-fired power plants.

[95] About. *Advanced Research Projects Agency – Energy*. Retrieved from http://arpa-e.energy.gov/About/About.aspx on May 20, 2011.
[96] Programs Main Overview. *Advanced Research Projects Agency – Energy*. Retrieved from http://arpa-e.energy.gov/ProgramsProjects/Programs.aspx on May 20, 2011.

- *GRIDS*: Grid-Scale Rampable Intermittent Dispatchable Storage (GRIDS) develops storage systems that can accommodate renewable energy generation on the electrical grid.
- *ADEPT*: Agile Delivery of Electric Power Technology (ADEPT) seeks to develop more efficient and reliable power converter technology, which ultimately can reduce electricity consumption by up to 30 percent.[97]
- *Electrofuels*: The Electrofuels program invests in transportation fuel innovations that use microorganisms to convert carbon dioxide into energy. The program does not focus on biofuels, which are derived from biomass, because they have relatively low efficiencies. ARPA-E's approach could produce synthetic fuels that are ten times more efficient than the technology used in biofuels production.[98]
- *BEETIT*: Building Energy Efficiency through Innovative Thermodevices (BEETIT) invests in energy-efficient building cooling technologies.
- *Other projects*: ARPA-E also funds individual projects in biomass energy, building efficiency, carbon capture, conventional energy, solar fuels, energy storage, renewable power, waste heat capture and water.

ARPA-E funding is highly competitive. As of April 2011, ARPA-E has funded just under 7 percent of the project applications it has received, investing a combined total of $385 million. [99] The funding typically lasts a year to three years and ranges from $500,000 to $10 million per project.[100] The agency currently is supporting 121 projects.

Photovoltaic Technology Incubator

The Photovoltaic Technology Incubator is an initiative of the National Renewable Energy Laboratory (NREL) to accelerate research and development of photovoltaic technology. The program accepts solar technologies that have demonstrated proof-of-concept and helps them move to pilot or full-scale commercial production. Projects in the pre-prototype phase can apply for a "Tier 1" award of up to $1 million. Tier 1 awards aim to help solar technologies achieve the

[97] Agile Delivery of Electrical Power Technology (ADEPT). *Advanced Research Projects Agency – Energy*. Retrieved from http://arpa-e.energy.gov/ProgramsProjects/ADEPT.aspx on May 20, 2011.
[98] Electrofuels. *Advanced Research Projects Agency – Energy*. Retrieved from http://arpa-e.energy.gov/ProgramsProjects/Electrofuels.aspx on May 20, 2011.
[99] Current Projects. *Advanced Research Projects Agency – Energy*. Retrieved from http://arpa-e.energy.gov/About/FAQs/CurrentProjects.aspx on May 20, 2011.
[100] Ibid.

prototype stage in just 12 months.[101] Projects having completed a prototype are eligible for "Tier 2" awards of up to $4 million.[102] These awards are intended to help technologies move to pilot and ultimately full-scale manufacturing operations over the course of 18 months. The selected companies receive access to NREL's facilities and staff in addition to the financial awards. Once companies are awarded, they must pass a "Stage Gate Review" within nine months to show that they are moving forward, as well as demonstrate regular progress on their pre-specified benchmarks.[103]

The program accepts applications every nine months and has invested $50 million in 20 companies since its inception in 2007.[104] These 20 companies also represent a total of $1.3 billion in private investment.[105] NREL recently created the SunShot Initiative as an expansion of the Photovoltaic Technology Incubator. The SunShot Initiative opens up funding for projects in concentrating solar power, power electronics, and balance of systems (photovoltaic components other than panels).

Small Business Innovation Research and Small Business Technology Transfer Programs

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) are programs of the Small Business Administration in which federal agencies with large research and development budgets set aside a portion of this money for competitive grants to businesses with 500 or fewer employees. The programs target innovative research that may be too risky for traditional sources of financing. In contrast to SBIR, STTR projects must have at least 30 percent collaboration between the business and a nonprofit research institution.[106]

Eleven federal agencies currently participate in SBIR or STTR. Each agency sets aside 2.5 percent of its research budget for SBIR and 0.3 percent for STTR.[107] Projects are divided into Phase I and Phase II for funding eligibility. Phase I projects explore the feasibility of the technology with grants of up to $150,000 for SBIR and $100,000 for STTR, depending on the agency. Phase II

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[101] NREL Seeks Proposals for Photovoltaic Technology Incubator Program [News Release]. (2010, August 3). *National Renewable Energy Laboratory*. Retrieved from http://www.nrel.gov/news/press/2010/875.html on May 20, 2011.
[102] Ibid.
[103] Ibid.
[104] Moore, D. "Advancing Solar through Photovoltaic Technology Innovations" [Blog post]. (2011, April 19). *National Renewable Energy Laboratory*. Retrieved from http://blog.energy.gov/blog/2011/04/19/advancing-solar-through-photovoltaic-technology-innovations on May 20, 2011.
[105] Ibid.
[106] About SBIR & STTR. *U.S. Department of Energy – Office of Science*. Retrieved from http://science.energy.gov/sbir/about/ on May 20, 2011.
[107] Ibid.

awards are only eligible for Phase I winners and help further develop the technology over a two-year period. Phase II awards range up to $1 million for SBIR and $750,000 for STTR.

Each year, federal agencies solicit research projects that address a non-negotiable list of technical topics, depending on the agency's current interests. For renewable energy technologies, the U.S. Department of Energy (DOE) and the National Science Foundation (NSF) offer the most SBIR/STTR funding opportunities. The Environmental Protection Agency (EPA) and the Department of Agriculture (USDA) participate in SBIR but not STTR.

- DOE solicits broadly for projects in renewable energy production. The DOE allocation for fiscal year 2010 was $150 million for SBIR and $17 million for STTR.[108] Phase II winners are then eligible for non-SBIR/STTR Phase III funding, which uses other DOE funds to support commercialization.
- USDA's renewable energy focus is on biofuels but encourages all agriculture-related renewable energy projects to apply. USDA's total SBIR funding for fiscal year 2011 was just over $21 million.[109] In addition to SBIR, the National Institute of Food and Agriculture within USDA manages a fund for biomass research and development appropriated by the Food, Conservation and Energy Act of 2008. The act appropriated $118 million for fiscal years 2008-2012, with up to $35 million in discretionary funding annually.[110] In April 2011, USDA and DOE announced a joint funding program that would allot $30 million over three or four years for the research and development of advanced biofuels, bioenergy and bio-based products.[111]
- EPA's renewable energy interest has typically centered on biofuels and green building projects.
- Environmental technologies in particular are funded through the NSF SBIR/STTR programs. NSF solicits renewable energy technologies under two banners - the biotechnology and chemical technology category, and the nanotechnology, advanced materials and

[108] Ibid.
[109] Grants. *United States Department of Agriculture – National Institute of Food and Agriculture*. Retrieved from http://www.csrees.usda.gov/fo/sbir.cfm on May 20, 2011.
[110] Yacobucci, B. Biofuels Incentives: A Summary of Federal Programs. (2010, September 15). *Congressional Research Service*. Retrived from http://ncseonline.org/NLE/CRSreports/10Oct/R40110.pdf on May 20, 2011.
[111] USDA and DOE Announce Funding for Biomass Research and Development Initiative [News Release]. (2011, April 15). *United States Department of Agriculture – National Institute of Food and Agriculture*. Retrieved from http://www.csrees.usda.gov/newsroom/newsletters/update11/042011 .html on May 20, 2011.

manufacturing category. NSF anticipates a total of $22 million to be available for Phase I financing for fiscal year 2011.[112]

FEDERAL TECHNICAL ASSISTANCE

DOE Technical Assistance Program (TAP)

The U.S. Department of Energy offers technical assistance to renewable energy projects funded by the American Recovery and Reinvestment Act of 2009. The Technical Assistance Program (TAP) provides tools and resources for projects that receive funding through DOE's State Energy Program (SEP) and the Energy Efficiency and Conservation Block Grant Program (EECBG).

Funded by $25 million from SEP and EECBG, TAP provides one-on-one assistance, online resources and a peer-exchange forum for sharing best practices. Grantees can access over 200 technical experts from DOE's national laboratories, nonprofits, consulting firms and partner organizations. The Online Solution Center offers case studies, best practices, online training and webcasts, and also houses the TAP Blog, which serves as an interactive forum between grantees and technical and program experts. Online resources also include the Environmental Protection Agency's renewable energy interactive mapping tool that allows users to search EPA-managed sites by renewable energy type or contaminated land type.

States, cities and tribes that have received SEP and EECBG funding have utilized TAP for short-term guidance on a number of technical issues, such as:

- Renewable portfolio standard (RPS) policies
- Cost-benefit analysis of renewable energy development
- Ratepayer-funded utility programs for renewable energy
- Technical expertise on renewable energy and energy efficiency technologies
- Use of renewable energy technology for mitigating emissions
- Developing renewable energy projects on public lands
- Using renewable energy for disaster relief planning

Requests for TAP's services can be made online through the DOE's Technical Assistance Center,[113] directly through a DOE agency (such as the National Renewable Energy Laboratory), or through a

[112] Small Business Innovation Research Program Phase I Solicitation. *National Science Foundation*. Retrieved from http://www.nsf.gov/pubs/2011/nsf11691/nsf11691.pdf on May 20, 2011.
[113] See https://tac.eecleanenergy.org/ for DOE's Technical Assistance Center

regional office of the Environmental Protection Agency. The City of Richmond, Calif., requested assistance from TAP to determine which local contaminated sites would be ideal to redevelop for renewable energy projects. TAP developed a decision matrix that assesses the site's main characteristics and matched renewable projects based on power demands, system size and costs. The matrix also considered the influence of policy support and financial incentives in evaluating various financing mechanisms.

Solar Site Screening Tool

The National Renewable Energy Laboratory (NREL) and EPA are currently developing a tool to screen brownfield sites for potential use as solar farms. Brownfields are preferable to greenfields for solar installations because greenfields can be used for nature or recreational purposes without cleanup. The screening model will likely take the form of a web-based tool or guidebook with a decision tree and will be based on EPA's aforementioned interactive mapping tool. Some of the screening factors that will be taken into consideration are:[114]

1. *Pre-screening*: Solar resource, distance to transmission lines, distance to graded roads, conservation areas near or on the site, useable acreage at the site
2. *Site characteristics*: Slope, on-site buildings, obstructions
3. *Power demand, system size and cost*: On-site power demands, electricity rates, estimated system size, estimated installation costs, interconnection requirements
4. *Policy support*: At the state and local levels, plus liability relief
5. *Financial incentives*: Federal financial incentives, state incentives for renewable energy, state and local incentives for brownfield development

OTHER FINANCING MECHANISMS

Cleantech Open

The Cleantech Open is a not-for-profit that organizes the world's largest cleantech business plan competition and mentorship program. The organization targets developers of promising clean technologies and provides them with mentoring, training, investment capital and exposure to the investment and cleantech communities.

[114] Taken from: Mosey, G. (2011, April 4). Siting Solar on Brownfields [Powerpoint]. *National Renewable Energy Laboratory*.

The competition targets early-stage entrepreneurs who have less than $1 million of private equity funding and less than $5 million of other funds (such as grants and personal investment). Teams enter under one of six cleantech categories: Air, Water and Waste; Energy Efficiency; Green Building; Renewable Energy; Smart Power, Green Grid and Energy Storage; and Transportation. Although Cleantech Open began in California, a number of affiliate competitions have been launched across the nation. The competitions are organized in participating states by region: Pacific Northwest, California, Rocky Mountain, North Central, South Central, South Atlantic, and Northeast. Semifinalists, finalists and winners are selected regionally, as well as a national winner that receives a prize package of investment and services worth $250,000. The services are provided by in-kind sponsors to Cleantech Open and include software, office space, legal advising, marketing help and more.

Cleantech Open also runs a Global Ideas Competition for innovative ideas for clean technology, rather than business plans. Winners in each nation compete at the Cleantech Open Awards Gala, where they give a five-minute pitch on their idea. The team that receives the most votes from the audience receives $100,000 of services towards launching the idea.

The Cleantech Open model has been successful in creating sustainable companies and jobs. Cleantech Open's strong emphasis on mentoring and training ensures that promising technologies are accompanied by the necessary business acumen to reach commercial success. Over 80 percent of winning teams are still economically viable today.[115] Since it was launched in 2006, Cleantech Open has assisted over 400 teams of "ecopreneurs."[116] These teams together have leveraged $300 million in private capital and created more than 2,500 jobs with the direct help of Cleantech Open and the exposure created by the competition.[117]

Massachusetts Institute of Technology Clean Energy Prize

The Massachusetts Institute of Technology (MIT) hosts the annual MIT Clean Energy Prize, a national competition for clean energy technologies developed by university-level students. Initiated in 2008 by students in MIT's Sloan School of Management and School of Engineering, the

[115] Overview of the Cleantech Open. *Cleantech Open*. Retrieved from http://www.cleantechopen.com/app.cgi/content/about/index on May 23, 2011.
[116] Overview of the Cleantech Open. *Cleantech Open*. Retrieved from http://www.cleantechopen.com/app.cgi/content/about/index on May 23, 2011.
[117] Cleantech Open Invites Entrepreneurs to Enter 2011 National Competition. (2011, May 11). *Marketwire*. Retrieved from http://www.marketwire.com/press-release/cleantech-open-invites-entrepreneurs-to-enter-2011-national-competition-1513268.htm on May 23, 2011.

competition continues to be organized each year by MIT graduate students (the "organizing team"). The organizing team is supported by a panel of judges and mentors comprising industry executives, DOE senior leadership, and MIT faculty.

Participating teams must be led by a U.S. university student (at any level) and submit one or more technologies that compete in one of five categories: Energy Efficiency and Infrastructure, Renewables, Non-Renewables, Transportation, and Deployment (which involves services or processes). Entries are judged on creativity in addressing a problem, soundness of the technology, market opportunity, financial strategy, team composition and environmental impact. A finalist is selected in each category and receives a $15,000 prize. The overall Grand Prize winner receives $200,000 and becomes a finalist in the Energy Category in MIT's $100K Business Plan Competition, a separate competition focused on entrepreneurship. The teams must become incorporated in order to receive prize money.

The Clean Energy Prize is sponsored by the U.S. Department of Energy and NSTAR, a Massachusetts-based electric and gas utility. Both sponsors have been with the competition since its inception and each contributes $100,000 each year. Other sponsors include General Motors Ventures (General Motors' investment arm) and the Massachusetts Clean Energy Center, a state agency dedicated to expanding clean energy industries.[118] In-kind sponsors also provide marketing, software, office space and accounting services to competition winners.

Since 2008, the Clean Energy Prize competition has helped launch more than 28 companies that have leveraged a combined $85 million in investment and research grants.[119] Cool Chip Technologies, the 2011 winner, developed a cooling mechanism for processor chips used in data centers. Because half of operating costs at data centers are for cooling, the team's technology could reduce these energy costs by 40 percent.[120] This represents a potential $6 billion in savings for industry and military data centers.[121]

[118] See case study on Massachusetts Clean Energy Cluster
[119] Everything You Need To Know About Clean Energy Prize 2011. (2011, April 27). *MIT Entrepreneurship Center*. Retrieved from http://entrepreneurship.mit.edu/news/everything-you-need-know-about-clean-energy-prize-2011 on June 1, 2011.
[120] Institute teams dominate Clean Energy Prize. (2011, May 10). *MIT News*. Retrieved from http://web.mit.edu/newsoffice/2011/coolchip-cep-0510.html on June 1, 2011.
[121] Ibid.

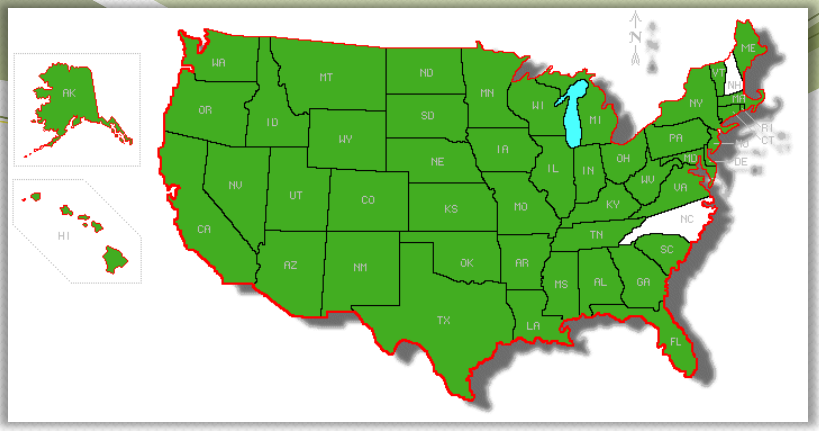
APPENDIX

The following dashboards represent summaries of national and regional averages of the results of the renewable energy survey.

National Overview

48 states*

*This does not include survey results from North Carolina and New Hampshire

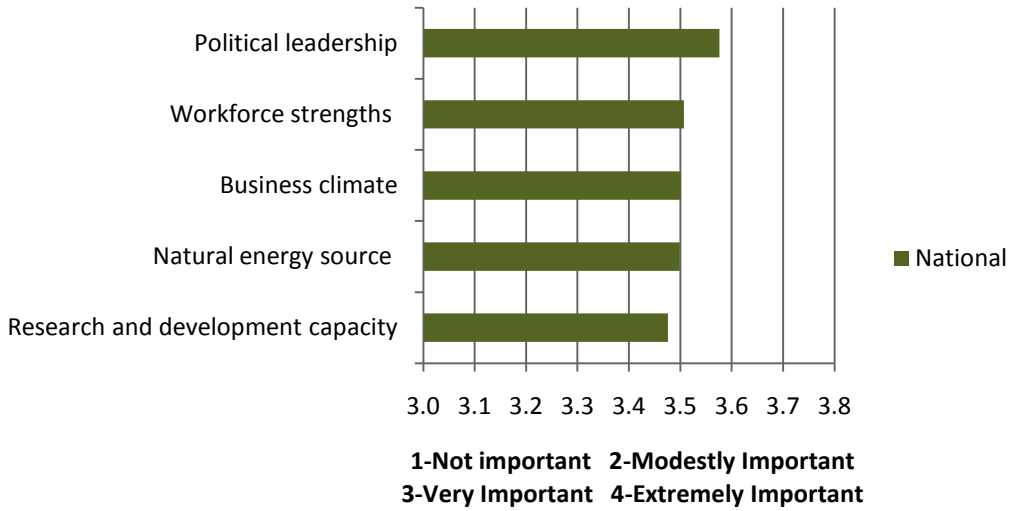


Average INCREASE in economic development FOCUS on *renewable energy*

Nation **4.79**

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



#1 Effective State or Regional Policy:

Renewable portfolio standard

Top Economic Development Strategies for Developing Renewable Energy

- ✓Analysis of the workforce needs of renewable energy businesses
- ✓Targeting specific sectors for expansion or attraction
- ✓Meetings with site selectors about renewable energy businesses

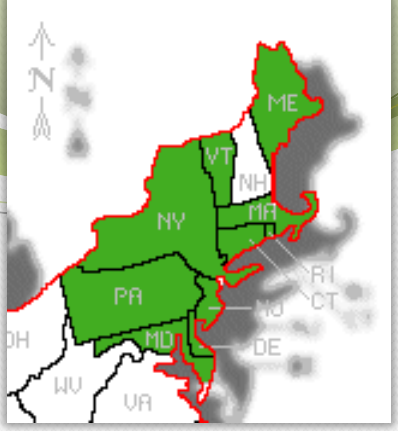
Top Challenges to Renewable Energy Growth in the Nation

- Lack of investment capital or financing
- Federal regulatory uncertainty
- Inadequate transmission grid
- Regulatory impediments to renewable energy transmission
- Underdeveloped renewable energy supply chains

Northeast Region

Connecticut	New Jersey
Delaware	New York
Maine	Pennsylvania
Maryland	Rhode Island
Massachusetts	Vermont

*This does not include survey results from New Hampshire



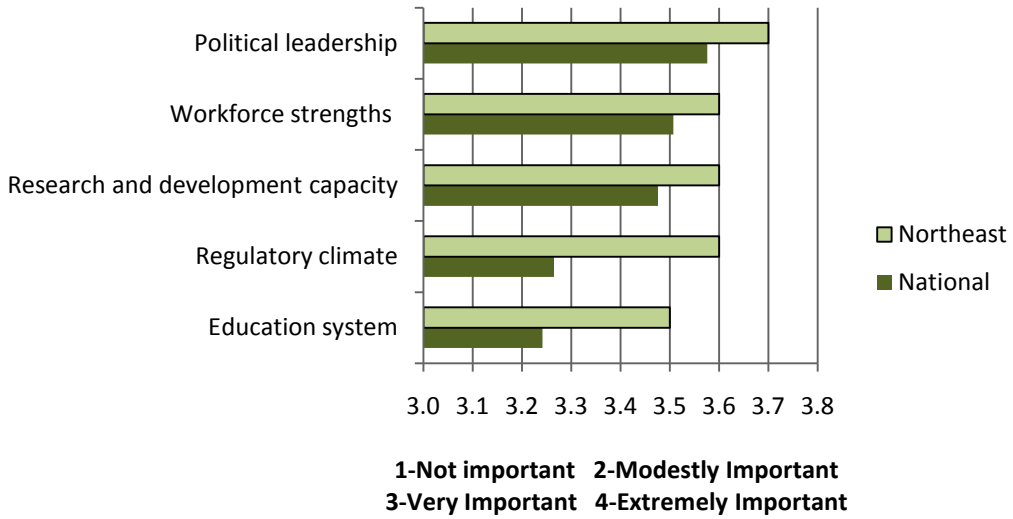
Average INCREASE in economic development

FOCUS on *renewable energy*

Region 4.50 Nation 4.79

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



1-Not important 2-Modestly Important
3-Very Important 4-Extremely Important

#1 Effective State or Regional Policy:

Renewable portfolio standard

Top Economic Development Strategies for Developing Renewable Energy

✓Analysis of the workforce needs of renewable energy or efficiency businesses
✓Targeting specific sectors for expansion or attraction
✓Meetings with site selectors

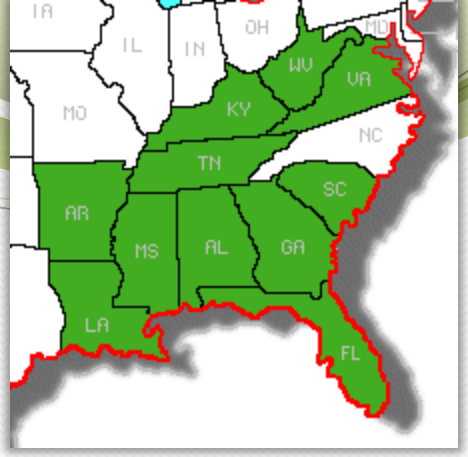
Top Challenges to Renewable Energy Growth in the Region	National
Lack of investment capital or financing	✓
Federal regulatory uncertainty	✓
Regulatory impediments to renewable energy transmission	✓
Underdeveloped renewable energy supply chains	✓
Lack of renewable energy resource	

✓ Denotes also a top national challenge

Southeast Region

Alabama
Arkansas
Florida
Georgia
Kentucky
Louisiana
Mississippi
South Carolina
Tennessee
Virginia
West Virginia

*This does not include survey results from North Carolina

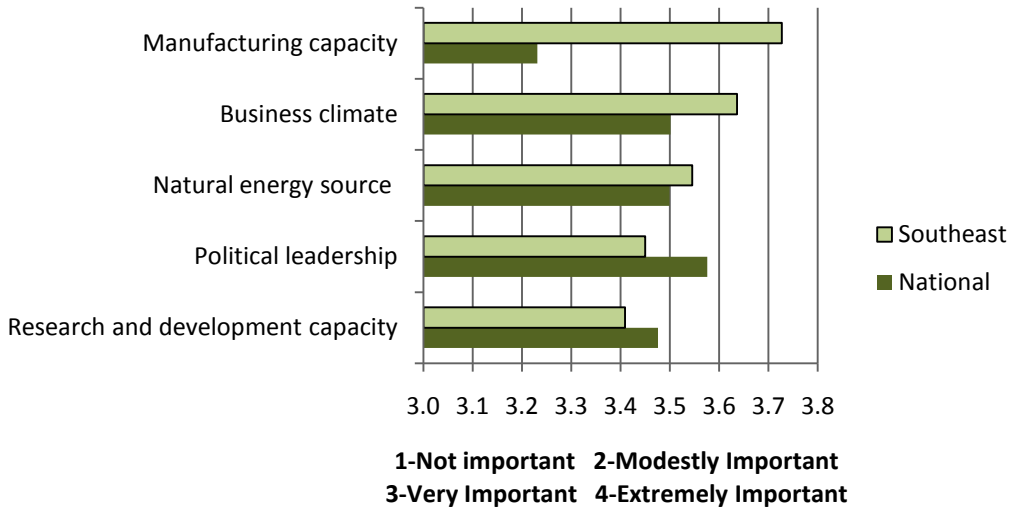


Average INCREASE in economic development FOCUS on *renewable energy*

Region	Nation
4.59	4.79

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



1-Not important 2-Modestly Important
3-Very Important 4-Extremely Important

#1 Effective State or Regional Policy:

Financial incentives for attraction or expansion of renewable energy projects

Top Economic Development Strategies for Developing Renewable Energy

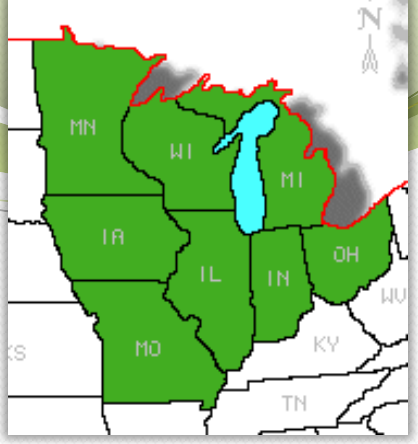
✓Targeting specific sectors for expansion/attraction
✓Meetings with site selectors about the needs of renewable energy businesses
✓Meetings with utility regulators

Top Challenges to Renewable Energy Growth in the Region	National
Lack of investment capital or financing	✓
Federal regulatory uncertainty	✓
State policy	
Regulatory impediments to renewable energy transmission	✓
Federal policy	

✓ Denotes also a top national challenge

Midwest Region

Illinois
Indiana
Iowa
Michigan
Minnesota
Missouri
Ohio
Wisconsin

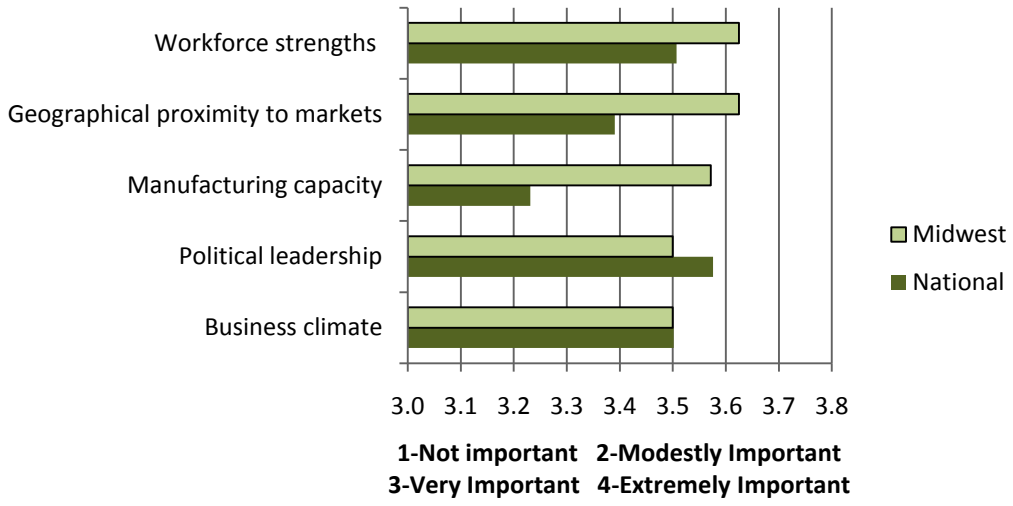


Average INCREASE in economic development FOCUS on *renewable energy*

Nation	Region
4.79	4.88

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



#1 Effective State or Regional Policy:

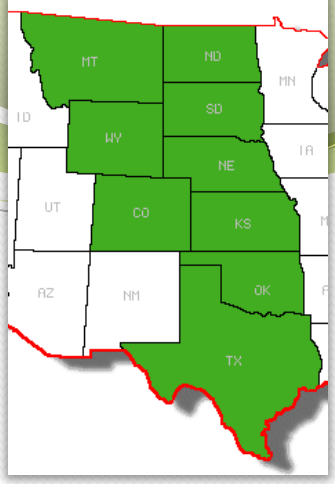
Financial incentives for renewable energy manufacturing

Top Economic Development Strategies for Developing Renewable Energy
✓Analysis of the workforce needs of renewable energy or efficiency businesses
✓Meetings with site selectors
✓Meetings with or interviews with renewable energy venture capitalists

Top Challenges to Renewable Energy Growth in the Region	National
Lack of investment capital or financing	✓
Federal regulatory uncertainty	✓
Inadequate transmission grid	✓
Regulatory impediments to renewable energy transmission	✓
Underdeveloped renewable energy supply chains	✓
✓ Denotes also a top national challenge	

Central Corridor Region

Colorado
Kansas
Montana
Oklahoma
Nebraska
North Dakota
South Dakota
Texas
Wyoming

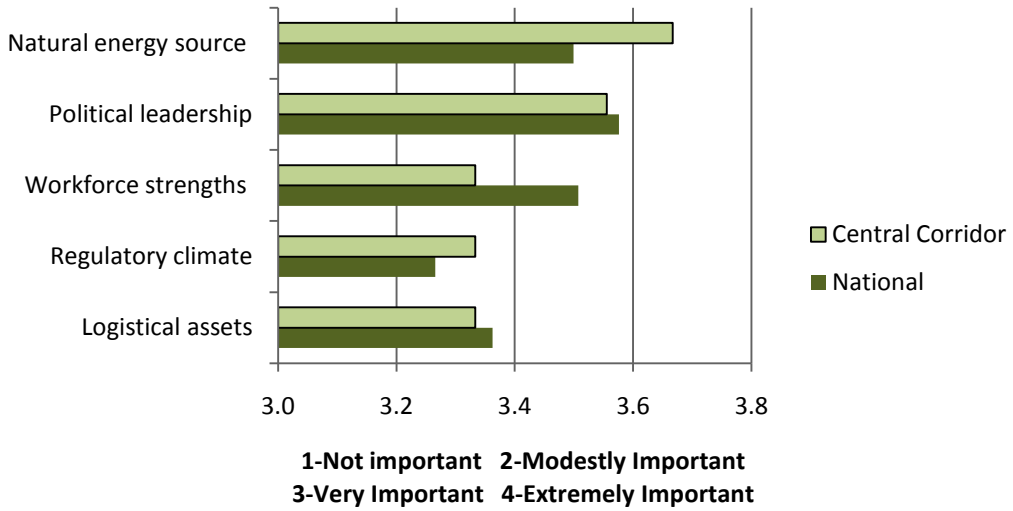


Average INCREASE in economic development FOCUS on *renewable energy*

Region	Nation
4.78	4.79

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



#1 Effective State or Regional Policy:

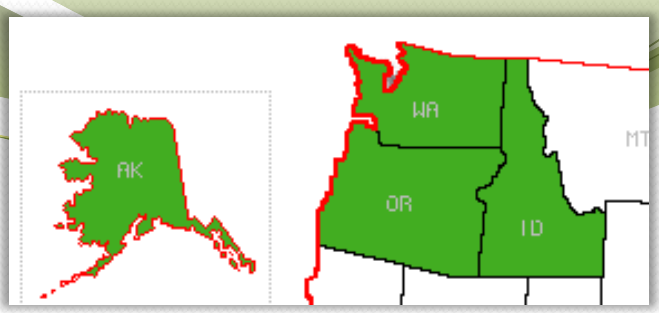
Renewable portfolio standard

Top Economic Development Strategies for Developing Renewable Energy
✓Targeting specific sectors for expansion or attraction
✓Assessment (e.g. SWOT) of the renewable energy sector
✓Analysis of the workforce needs of renewable energy businesses

Top Challenges to Renewable Energy Growth in the Region	National
Inadequate transmission grid	✓
Lack of investment capital or financing	✓
Federal regulatory uncertainty	✓
Regulatory impediments to renewable energy transmission	✓
Underdeveloped renewable energy supply chains	✓
✓ Denotes also a top national challenge	

Northwest Region

Alaska
Idaho
Oregon
Washington

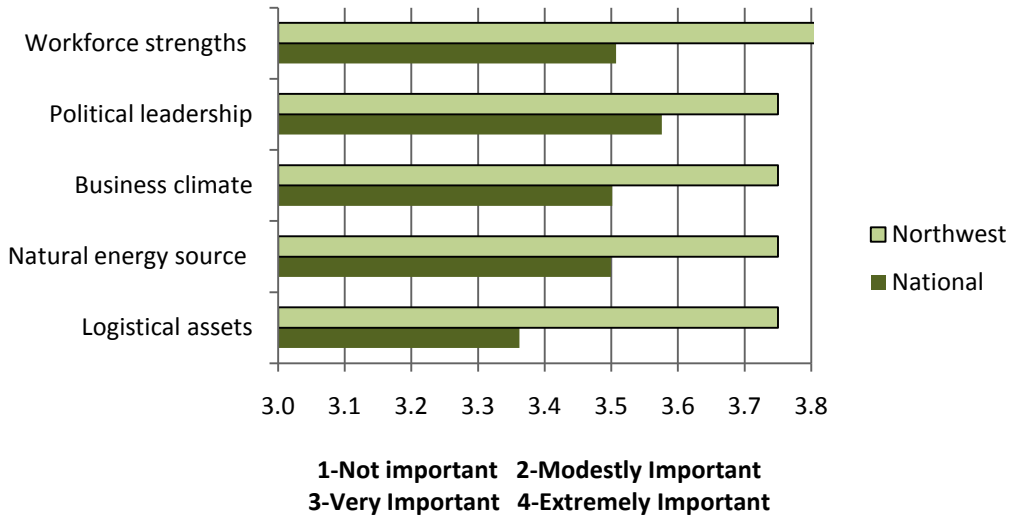


Average INCREASE in economic development FOCUS on *renewable energy*

Nation **4.79** Region **5.00**

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



1-Not important 2-Modestly Important
3-Very Important 4-Extremely Important

#1 Effective State or Regional Policy:

Renewable portfolio standard

Top Economic Development Strategies for Developing Renewable Energy

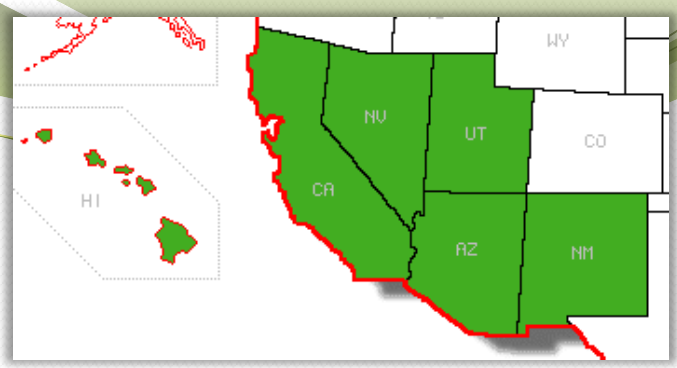
✓Analysis of the workforce needs of renewable energy businesses
✓Targeting specific sectors for expansion or attraction
✓Assessment (e.g. SWOT) of the renewable energy sector

Top Challenges to Renewable Energy Growth in the Region	National
State utility regulation	
Lack of investment capital or financing	✓
Federal regulatory uncertainty	✓
Inadequate transmission grid	✓
State regulatory uncertainty	

✓ Denotes also a top national challenge

Southwest Region

Arizona
California
Hawaii
Nevada
New Mexico
Utah

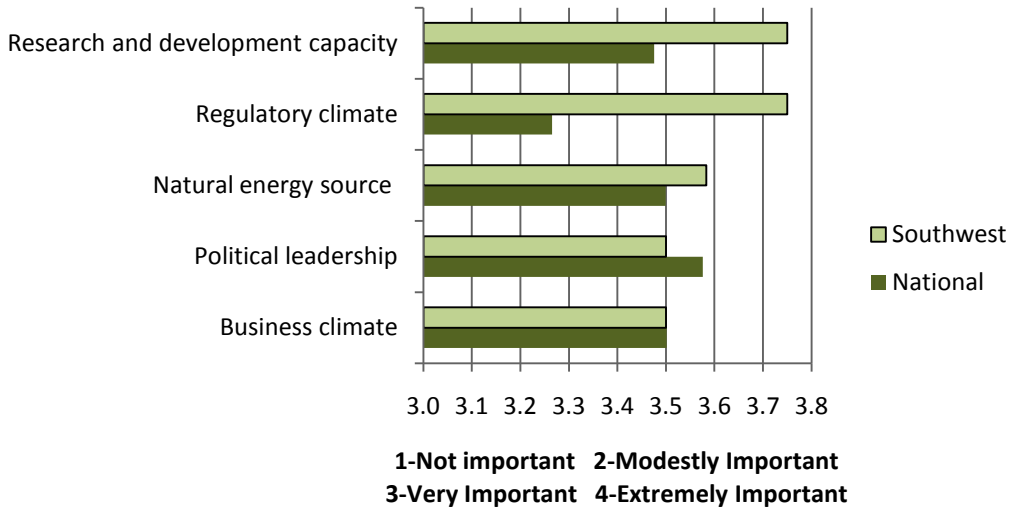


Average INCREASE in economic development FOCUS on *renewable energy*

Nation **4.79** Region **5.00**

1	2	3	4	5
Much less	Somewhat less	About the same	Somewhat more	Much more

Top 5 Assets to Renewable Energy Growth



#1 Effective State or Regional Policy:

Financial incentives for attraction or expansion of renewable energy projects

Top Economic Development Strategies for Developing Renewable Energy

✓Analysis of the workforce needs of renewable energy businesses
✓Targeting specific sectors for expansion or attraction
✓Meetings with site selectors about renewable energy businesses

Top Challenges to Renewable Energy Growth in the Region	National
Inadequate transmission grid	✓
Lack of investment capital or financing	✓
State utility regulation	
State regulatory uncertainty	
Underdeveloped renewable energy supply chains	✓

✓ Denotes also a top national challenge