INTERNATIONAL ECONOMIC DEVELOPMENT COUNCIL

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# UNDERSTANDING RENEWABLE ENERGY BUSINESSES:

## ALIGNING RENEWABLE ENERGY FIRMS + ECONOMIC DEVELOPERS

*A SURVEY OF RENEWABLE ENERGY COMPANIES*

# Understanding Renewable Energy Businesses: Aligning Renewable Energy Firms and Economic Developers

## A Survey of Renewable Energy Companies


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# I. EXECUTIVE SUMMARY

Within the past decade, renewable energy industries have experienced faster growth rates than most other industries. Continued growth of renewable energy has the potential to meet many of the nation's economic, environmental and social goals. This has policymakers, investors, and economic developers pondering how best to support the sustained growth of renewable energy. To help answer this question, the International Economic Development Council (IEDC) deployed two surveys: a survey of economic developers in 2011 and a survey of renewable energy businesses in 2012.

In 2011, IEDC surveyed economic developers across the United States on the state of renewable energy. IEDC asked economic developers the assets and barriers they viewed as most important to renewable energy development, as well as actions they were taking to foster growth in these fast-growing sectors. In all, economic developers from 48 states participated in the survey, published as "Powering Up: State Assets and Barriers to Renewable Energy Growth."[1]

The survey targeted primarily state-level economic development agencies and also included some local economic development agencies. The larger economic development community spans a wide swath. Economic development organizations (EDOs) include chambers of commerce, community development agencies, utility companies, educational institutions, and many other entities engaged in economic development. EDOs have a unique role to work closely with local, state, and regional entities to align policy priorities to support local jobs. They often are the only local agency with the resources, network, and directive to create an environment where businesses can thrive at the local level.

The 2011 survey clarified a few answers and also created some questions. One insight is that most economic developers are targeting renewable energy industries more now than they were five years ago.[2] The fact that economic developers are working more to develop renewable energy is a crucial indicator that renewable energy is on the rise. However, a question that remained is how renewable energy firms perceive the assets and barriers that are within the purview of economic developers. In other words, is the work of economic developers aligned with the needs of renewable energy firms? Further, what do renewable energy firms themselves view as the priorities for growing the industry?

To answer these questions, IEDC deployed a survey in 2012 to renewable energy firms in the wind energy, solar energy and biopower industries. IEDC asked firms questions about important local and state assets, policy tools, challenges and economic development programs. These questions mirror the ones asked of economic developers in IEDC's 2011 survey, including:

1. **What are the most important local/state assets for growing renewable energy?** Is it political leadership, workforce strengths, business climate, research and development capacity, etc.?

2. **What are the most important state/regional policy tools for renewable energy growth?** Is it renewable portfolio standards, financial incentives for business attraction/expansion, feed-in-tariffs, utility procurement policies, etc.?

3. **What are the top challenges to renewable energy growth?** Is it a lack of investment capital, federal policy, state policy, underdeveloped supply chains, etc.?

4. **What potential economic development programs would be most helpful to renewable energy growth?** Is it a comprehensive strategy, workforce development, meetings with policymakers, meetings with venture capitalists, etc.?

By comparing answers from renewable energy businesses and from economic developers, IEDC was able to highlight where the two groups agree on priorities and where there were gaps in alignment. While results differed somewhat by industry, some overarching results are clear:

- **The most important state or local asset** is political leadership, according to both economic developers and firms. However, economic developers tend to overestimate the importance of non-policy-related assets, according to firms.

- **The most effective policy tools** are direct financial incentives, according to firms (especially related to startup costs or boosting demand), while economic developers prioritize renewable portfolio standards. Economic developers should also be up to speed on lesser known, demand-side renewable energy policies, such as feed-in-tariffs and utility procurement policies.

- **The leading challenge** is federal policy and regulatory uncertainty, according to firms, while economic developers are most concerned with a lack of investment capital or financing.

- **The most impactful economic development program** is a comprehensive, formal strategic plan to grow renewable energy, according to firms. However, the program most often implemented by economic developers is workforce analysis.

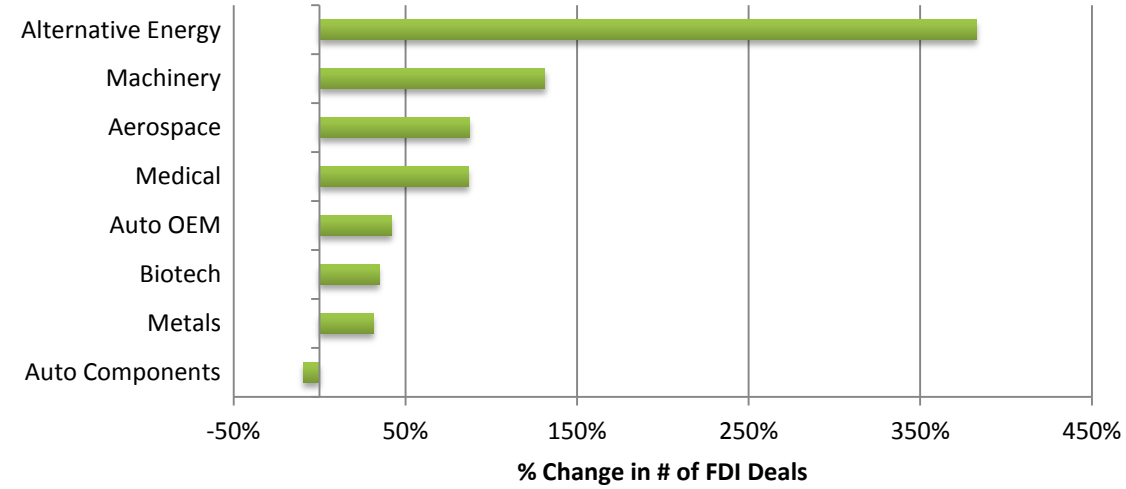
Understanding alignments and gaps between firms and economic developers can illuminate the success of existing programs and suggest improvements to future strategies. IEDC hopes this research can be a first step in closing these gaps.

# II. THE GROWTH OF RENEWABLE ENERGY AS AN ECONOMIC DEVELOPMENT STRATEGY

The 2011 IEDC "Powering Up" study was a direct response to increased interest in renewable energy industries from the economic development community. The significant growth of domestic renewable energy has drawn the attention of policymakers and economic developers across the nation who see opportunities to grow and keep renewable energy companies in the United States.

In addition to growing domestic companies, attracting renewable energy foreign direct investment (FDI) is becoming an increasingly important economic development strategy. Figure 1 documents the change in the number of FDI deals during 2003-2006 and during 2007-2010. Prior to 2006, alternative/renewable energy had never attracted more than five FDI deals per year. Yet between 2008 and 2010, during the height of the economic recession, the sector recorded more than 35 deals a year. 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.[3] Although alternative/renewable energy represents a relatively small base of industry, these numbers highlight its growth potential.

**Figure 1: Change in Number of FDI Deals ('03-'06 vs. '07-'10)**




Source: FDI Intellegence Ltd 2011.

Renewable energy has grown markedly over the past 10 years. In 2011, renewable electricity generation represented 13 percent of total U.S. electricity generation.[4] This marks a growth of 62 percent from the previous decade.[5] Furthermore, in 2012, 12,956 megawatts of renewable energy capacity were installed, or 49.1 percent of all new electrical generating capacity in the United States.[6] This does not include distributed generation (small-scale electricity generation, primarily solar power), which is a rising source of electricity generation. These figures challenge the notion that renewable energy cannot compete in the market.

Yet there have been challenges for renewable energy development as well. The large infusion of investment from the American Recovery and Reinvestment Act of 2009 mostly has been distributed. Uncertainty on federal energy policy muddies the outlook for renewable energy and makes it difficult for companies to plan their investments. State and local policies and incentives are also inconsistent. In this environment, there is good reason to ask, ***"Have the concerted efforts of previous years to cultivate renewable energy been diluted by recent political and economic uncertainty?"***

Figure 2 illustrates the various sources of energy production in the United States over the past 62 years, for electricity, heat and transportation fuels. Here, renewable energy includes hydroelectric, geothermal, solar, wind, and biomass technologies. As the graph shows, renewable energy production has grown steadily since 1949 and experienced two major spikes, in the late 1970s and early 2000s. These spikes were preceded by periods of high oil prices, which triggered renewed interest, investment and policy surrounding renewable energy.

**Figure 2: Primary Energy Production by Source, U.S. 1949 - 2011**

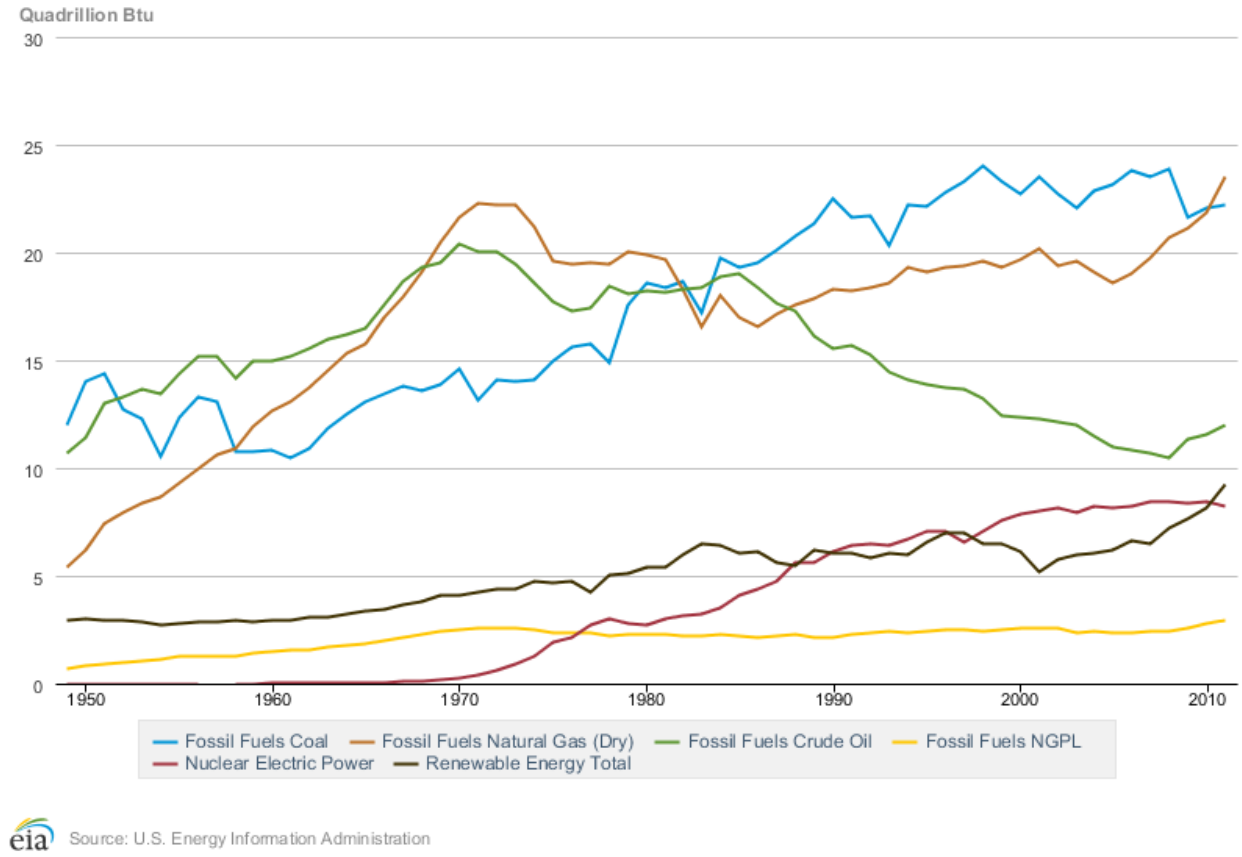
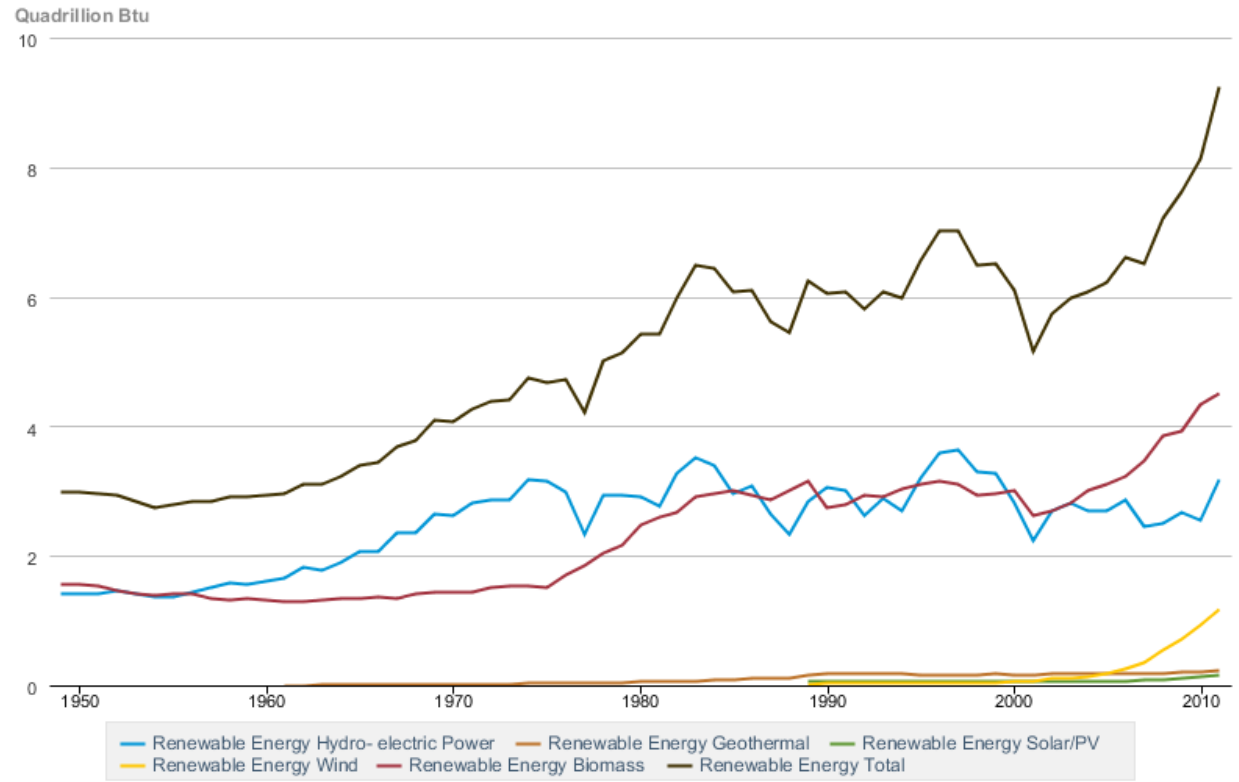



Figure 3 breaks down renewable energy production by technology. Biomass and hydroelectric power comprise large chunks of total renewable energy production. Hydroelectric power grew significantly during the 1950s to 1970s, but flattened out since then, with significant annual variation based on rainfall. Biomass power took off in the 1970s and is currently in a second growth spurt that began in the early 2000s, thanks largely to ethanol. Wind, solar and geothermal growth were relatively flat until 2000. Since that time, wind has experienced accelerated growth, rising to 3.5 percent of U.S. electricity demand in 2013. Solar power has grown rapidly in the last few years, but from a very small level. Geothermal and biomass power have experienced more modest growth.

**Figure 3: Primary Energy Production by Source (Renewable Energy), U.S. 1949-2011**




This brings us back to our earlier question: ***"Have the concerted efforts of previous years to cultivate renewable energy been diluted by recent political and economic uncertainty?"*** As the aggregate numbers show, as of 2011, the U.S. is still on a steep growth path for renewable energy. However, the shifting tides of federal, state and local policy, combined with the far-reaching impacts of the recession and long-term economic and policy drivers, are reasons to thoughtfully examine scenarios for the future of renewable energy development. In this spirit, IEDC contributes original research to understand how renewable energy firms are planning for various scenarios. When policy makers and firms understand each other and align their actions, this increases the chances for mutual success.

In the 2011 "Powering Up" survey, 80 percent of economic developers said their state was targeting economic development in renewable energy "much more" (the highest option available) compared to five years ago. Within renewable energy, economic development organizations, on

average, were most focused on renewable energy research and development, followed by wind manufacturing and then biomass production. Although specific priorities varied by the region of the country, it was clear that economic developers in virtually all states were building strategies to grow renewable energy.

***However, what was unclear after the publication of "Powering Up" was whether economic developers' and firms' views on renewable energy industries were aligned.*** In 2011, IEDC asked economic developers what they viewed as the top assets, policy priorities, greatest challenges, and most-needed economic development programs to grow renewable energy. Though economic developers work hard to understand the pulse of local industries, sometimes there is a disconnect in that understanding, especially for newer industries. Aligning the views of firms and economic developers ensures that the latter's limited time and resources are guided toward the most impactful strategies, and that strategies that could have unintended, counterproductive consequences are avoided as well.

**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.

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

# III. THE SURVEY OF RENEWABLE ENERGY FIRMS

A year after the "Powering Up" study, IEDC embarked on new renewable energy research that complements the study's findings and also offers valuable standalone insight on the wind, solar and biomass electricity sectors. IEDC interviewed representatives from solar and wind energy firms in mid-2012 to assess the opportunities and challenges facing these industries. IEDC also spoke one-on-one with experts in the biopower industry, which has been a consistent, significant source of renewable energy over the past few decades. For all three industries, the goals were to identify:

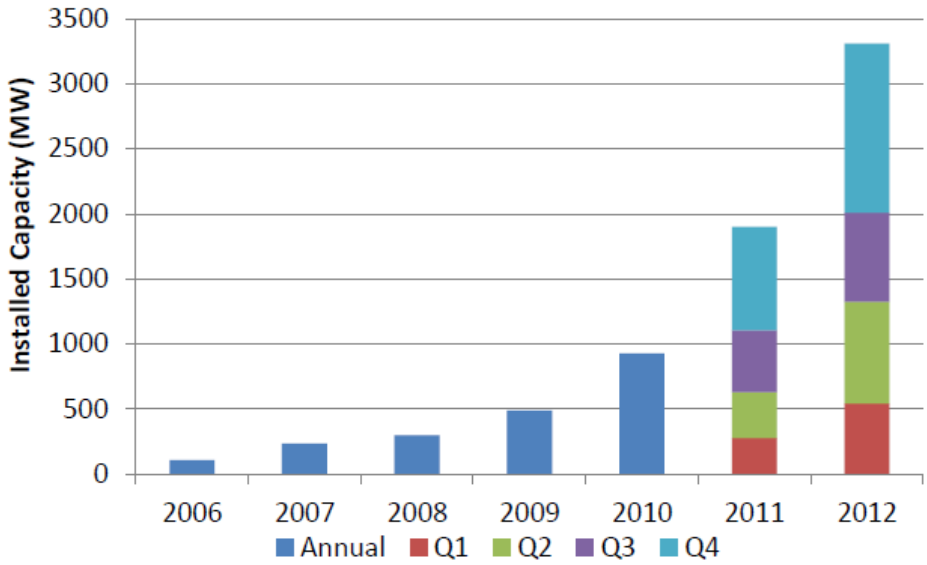
- Local and state assets most important to company growth;
- The relative importance of local and regional policy tools;
- The top challenges to company growth; and
- The economic development programs most helpful to companies.

These goals and the actual survey questions mirror those asked of economic developers in the "Powering Up" study. The similar format will allow IEDC to compare and contrast firms' and economic developers' perspectives, thereby identifying both overlaps and gaps in understanding. The goal is to help economic developers adjust their strategies to best support local renewable energy industries.

# IV. SOLAR INDUSTRY SURVEY RESULTS

The solar industry has grown significantly, especially over the past two years. Figure 4 details the installed capacity from solar electricity each year. New installed capacity in solar energy has multiplied since 2006. At the same time, the average price of a completed photovoltaic system has fallen from $11 per watt to under $4 per watt.[7] California, Arizona, New Jersey, and Nevada lead the nation in cumulative installed capacity.[8] In 2012, Arizona led with the most new utility-scale installed capacity, while California led with the most new residential and commercial installed capacity.[9] According to a 2012 jobs census, the solar industry employs about 120,000 people nationwide, up 13 percent over 2011.[10] About half the jobs are in installing solar systems while a quarter are in manufacturing.

**Figure 4: New U.S. Solar Electric Installations**




Source: Solar Energy Industries Association. (2013, March 12). Solar Energy Facts: 2012 Year-in-Review. Retrieved from http://www.seia.org/sites/default/files/Q4%20SMI%20Fact%20Sheet%20-FINAL.pdf

IEDC primarily interviewed firms serving the residential solar photovoltaic market but also spoke with developers of larger solar installations (see the Survey Methodology section for a detailed description of the methodology.) The following survey results summarize the answers to quantitative questions as well as qualitative interviews.

### *Key Survey Findings:*

- **The most important state or local assets** are permitting, policies and incentives.
- **The most effective policy tools** are financial incentives for attraction or expansion.
- **The leading challenge for firms** is a lack of investment capital or financing.
- **The most impactful economic development program** is a formal strategic plan for growing renewable energy at the state level (led by either an economic development organization or a state economic development office.)

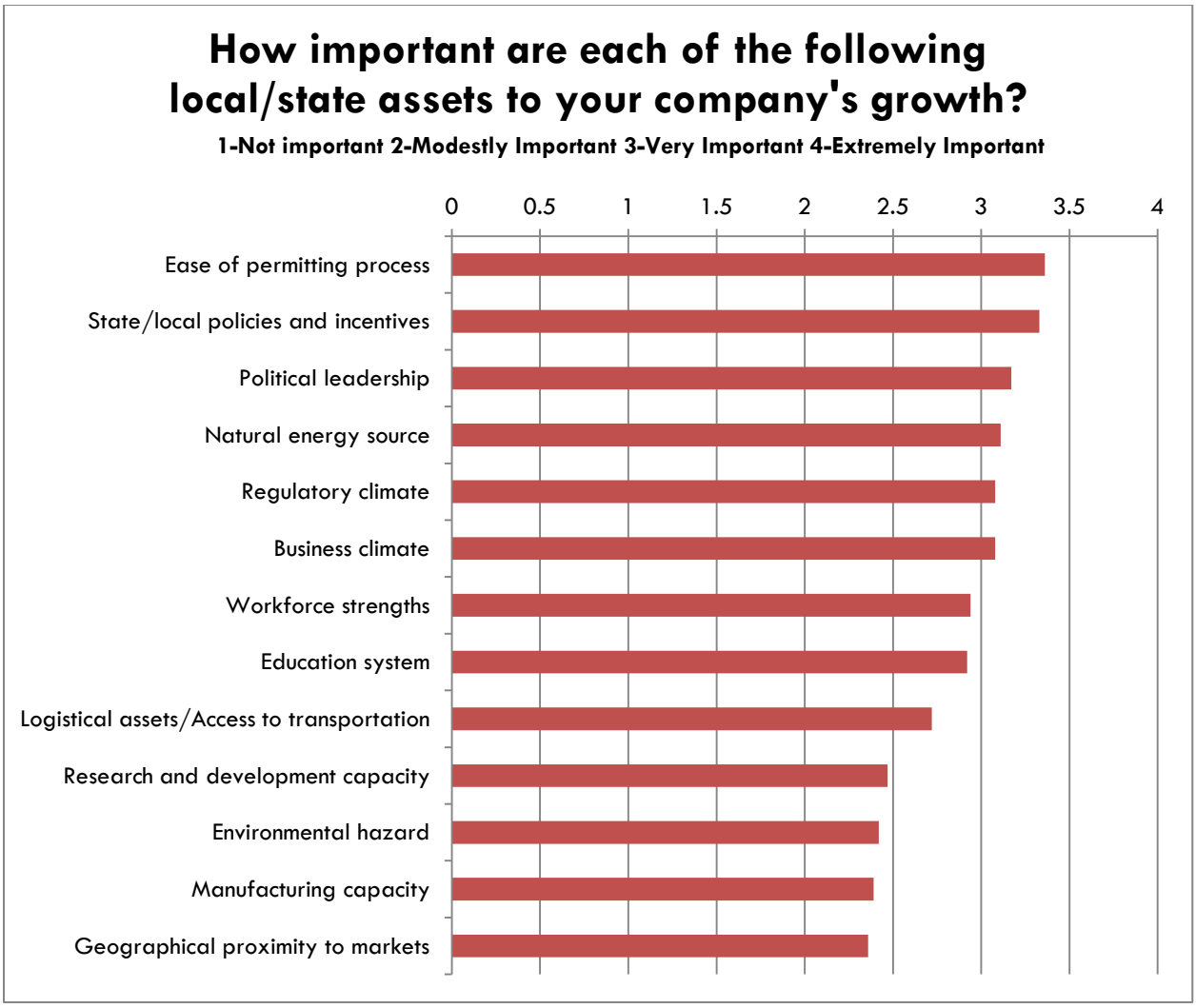
### *Assets*

***Primary Assets Center on Permitting, Policies and Incentives***

Survey respondents were asked to rank the importance of 13 local or state assets to company growth. Those assets are listed in the box below.

***Local or State Assets:***

- *Ease of permitting process*
- *State/local policies and incentives*
- *Political leadership*
- *Natural energy source (wind, solar, biomass, geothermal)*
- *Regulatory climate*
- *Business climate*
- *Workforce strengths (skills, training capacity, etc.)*
- *Education system*
- *Logistical assets/Access to transportation*
- *Research and development capacity*
- *Environmental hazard (i.e. wildlife, weather disruption)*
- *Manufacturing capacity*
- *Geographical proximity to markets*




When responses are averaged nationally, the most important asset is ease of the permitting process. In interviews, a respondent indicated that cutting the timeline and paperwork for permitting on the municipal level would remove a substantial barrier to solar growth. Studies comparing U.S. and German solar markets have shown that "soft costs" such as permitting are 80% lower in Germany, cutting total installation costs in half.[11] State and local policies and incentives ranked as the second most important asset.

**Policies and incentives have both positive and negative impacts.** For example, respondents indicated that city, state and utility rebate programs do increase their business by making solar technologies more affordable. Procurement programs for solar projects, sales tax exemptions and renewable energy credits are also significant boosts to business.

*A respondent indicated that cutting the timeline and paperwork for permitting on the municipal level would remove a substantial barrier to solar growth.*

However, these programs have run out of money in some states or are being exhausted in the beginning of the rebate period. Further, some rebates apply to particular types of solar installations, which may, for example, boost business for commercial installers but not residential installers. Navigating this shifting landscape leads to greater costs and uncertainties.

Renewable energy portfolio standards (RPS) are also potent, particularly if they have specific quotas for solar energy ("carve-outs") or impose fines for noncompliance. Sixteen states currently have solar carve-outs in their standards.[12] One developer said he/she deliberately picks projects in states with aggressive RPS policies. For developers of large solar projects, transmission lines are also a vital consideration, especially in remote areas.

Some firms assert that incentives are temporary "band-aids" and that the success of the solar market depends on its ability to function without them. The temporary nature of incentives is aggravated by the fact that many state and local incentives are constantly in flux. One respondent noted that if incentives were guaranteed for four or five years, solar companies (particularly manufacturers) could plan investment with much more certainty. (See "Policy Tools" for a more detailed discussion.)

An important issue unique to solar is the design of electricity rates, set by utilities and their regulators. Many solar panels are owned by homes and businesses, and are located on the customers' side of the power meter. Rates can be designed to reward self-generation, such as by valuing on-peak daytime power more, or hinder it, through additional fees for self-generating customers. As solar power becomes more cost-competitive, financial incentives are becoming less important. Instead, rate design becomes paramount, and utilities concerned about impacts on their revenues are seeking changes to rate policies to discourage solar.[13]

**Political leadership and education needed.** Many respondents indicated the need for tools other than incentives to help move the solar market forward. Political leadership and perception are important. Some firms feel their states need education about the potential for solar energy development, whether this targets residents, businesses or government. In some cases, governments are not investing in solar because they are focused on investing in more traditional industries.

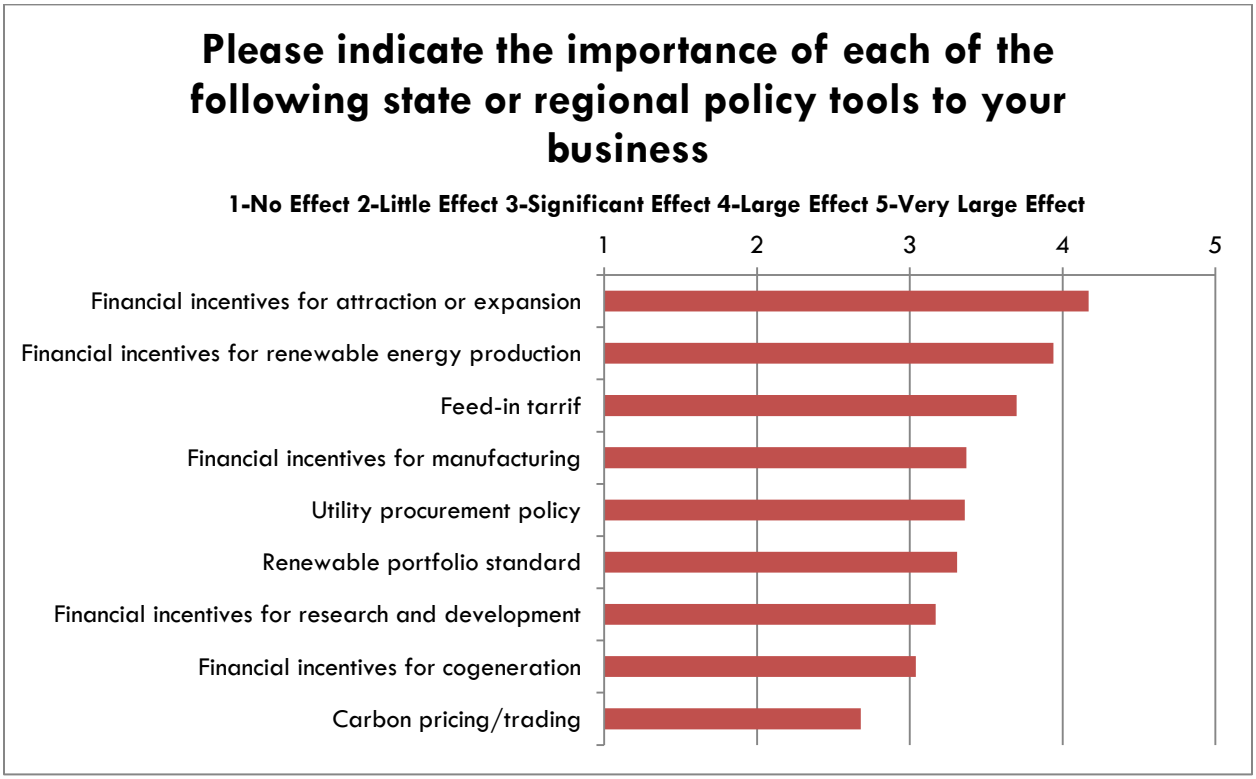
Investors and consumers could be educated on the viability of solar energy and the energy and cost savings it can produce. They believe this would boost both supply and demand for solar.

**Lack of qualified workers an issue.** Workforce was a recurring theme throughout the interviews IEDC conducted. Several firms said they have had trouble finding qualified workers, even when the applicant pool is large. This is not a problem confined to one region, as firms across regions have echoed workforce concerns. One firm said it received 400 applications for a job, of which only two were qualified.

The lack of qualified workers is mostly due to a lack of training. Several firms echoed a need for more rigorous and widely available solar education and training programs, perhaps to be hosted by colleges, universities or vocational schools. Many existing solar education programs last only a week, while firms emphasize that proper training requires at least semester-long courses. Whether workforce training is organized by economic development organizations, private employers or educational institutions, there is a need to align training curricula with firms' workforce needs.

## *Policy Tools*

***Financial Incentives Are the Leader in Important Policy Tools***



Survey respondents were asked to indicate the importance of various policy tools in stimulating company growth. Financial incentives for attraction or expansion were ranked as the most important, followed by financial incentives for renewable energy production (such as no sales tax on solar energy).

Lower in the ranking are renewable portfolio standards, although respondents still say these have a "significant effect" on their business. One small business respondent indicated that the RPS is more of a long-term policy, while small businesses are concerned with policies that impact their immediate next steps.

Feed-in-tariffs (FiT) ranked third in importance, higher than financial incentives for manufacturing and the RPS. Although FiTs are lesser known in the U.S. than the RPS, they have been tremendously successful in states that implement them. FiTs provide cash payments for renewable energy production. For more information on FiTs, see IEDC's "Powering Up" report, which features a case study on this policy tool.

**Additional policies have impact.** Net metering laws are important to demand for small solar energy systems, since these determine how owners are compensated for the electricity they generate. In interviews, respondents added other policies that are also important, including solar carve-outs within an RPS and distributed generation carve-outs. Here, some utility respondents insert a word of caution. Solar carve-outs may support solar developers, but they may also raise utility rates if the costs of compliance are high. One respondent suggested that the federal government could create a "green bank" for the housing market along the lines of Freddie Mac and Fannie Mae. Such a bank would create a secondary market for residential solar "mortgages", thereby increasing the pool of funding for solar installations.

In some states, respondents indicated that incentive programs have run out of money and have not been renewed due to a lack of political support. Respondents perceive that their states are losing solar firms to other states with more robust solar policies. The firms most likely to stay, respondents say, are those that have diversified their portfolios to include industries other than solar. Some programs also are limited in scope; several respondents note that incentives often only cover certain solar technologies (such as solar photovoltaic) and not others (such as solar thermal).

**Consistency and transparency matter.** In interviews, firm after firm indicated that policies are most effective when they are consistent. Investment decisions depend on long-term projections of demand and cost, and policies often can be the turning point for both. Effective policies also

depend on their implementation. Several respondents mentioned a lack of transparency or corruption in their local or state solar incentive programs. Programs where the cost of solar is directly embedded into the electricity commodity cost are less transparent than programs that collect a fixed amount of money to support solar energy. In some states, firms view subsidies as unreliable because favoritism may enter into how they are distributed.

**Federal policy matters as well.** Although this was a question about local and state policies, respondents frequently brought up federal policies during interviews. On the federal level, some respondents believe that a carbon tax, cap and trade program, or a national renewable energy standard is the best way to grow the solar market. Even more beneficial would be a solar carve-out within a renewable energy standard.

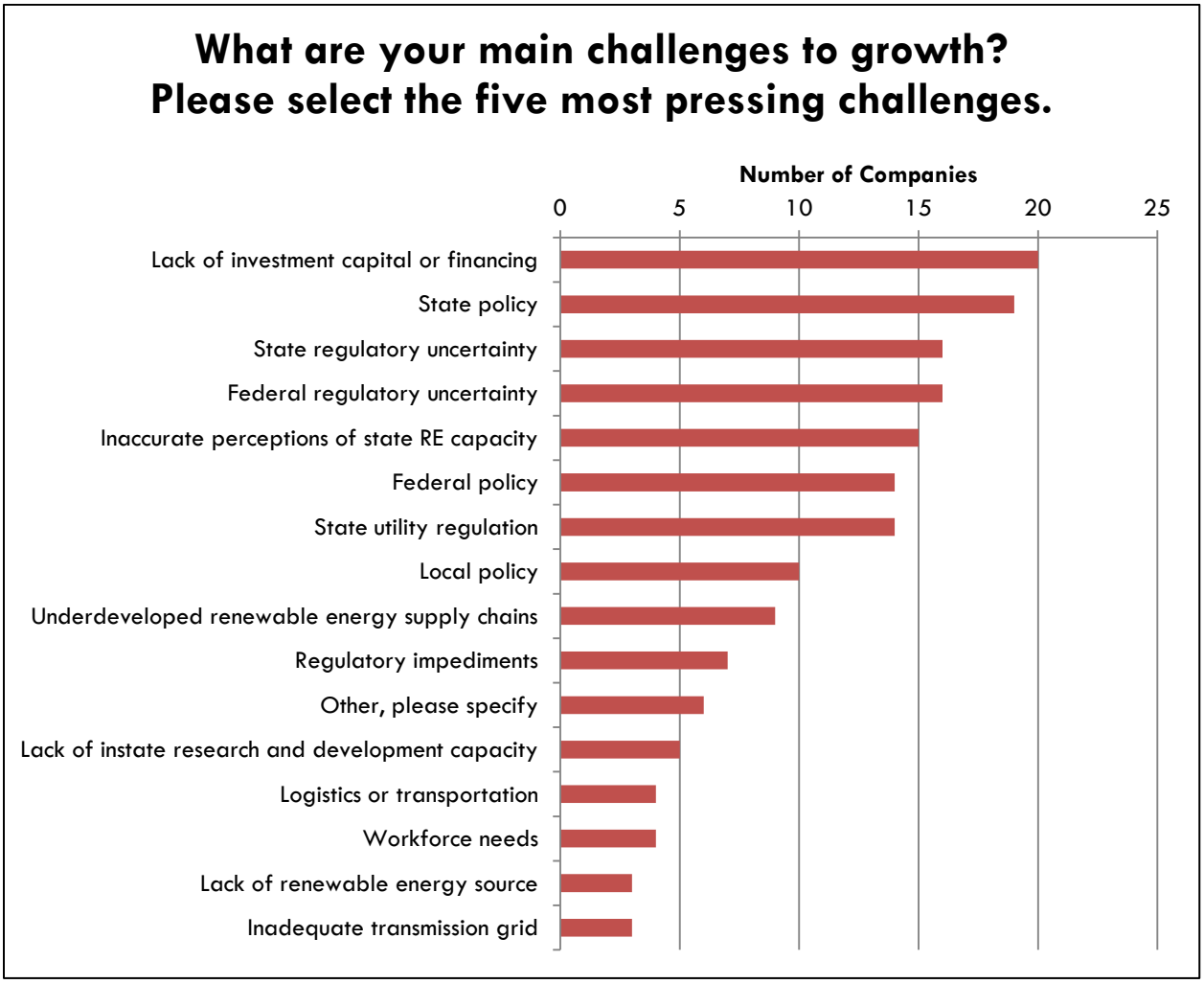
Respondents also pointed to other federal programs that have significantly boosted the industry, including the 1603 Treasury grant program, investment tax credit and production tax credit. The 1603 Treasury grant program was created in the American Recovery and Reinvestment Act (ARRA) as a substitute for federal tax credits. Due to the recession, major investors could no longer monetize the tax credit, drying up the pool of tax equity investors. The 1603 program allowed them to take the credit as a grant instead. While the 1603 program has expired, there is greater availablity of tax equity investors now. Regarding more generic federal assistance, several firms indicated they would like help navigating programs like minority-owned and small business assistance programs.

***In interviews, firm after firm indicated that policies are most effective when they are consistent.***

In addition to renewing helpful existing programs, some firms pushed for new policies to address industry-wide issues that are coming to a head. For example, one firm suggested that increasing competition with Chinese manufacturers will eventually require U.S. and Chinese policymakers to sit down and coordinate directions and policies for their solar industries.

## *Challenges to Growth*

***Lack of Investment Capital or Financing is the Leading Challenge***




In order to assess which assets and policy priorities require most urgent action, IEDC asked respondents to rank their top challenges to growth. The number one challenge is a lack of investment capital or financing. Some solar projects have high upfront costs, and large solar installations typically incur several million dollars in construction costs. One respondent said it had dozens of large-scale projects in which funders stepped away, stopping the projects in their tracks. Respondents indicate that part of the financing challenge was due to the overall weak economy.

**Again, policy consistency matters.** Policy and state and federal regulatory challenges, ranked as the next three highest challenges, further aggravate financing problems. A constantly changing policy and incentive environment is cutting both demand for solar energy and investment into it. One respondent told of a project that was canceled when the local feed-in tariff was amended to exclude larger installations. Another respondent had to hold off hiring after changes in state incentive programs left it unclear which firms would qualify. The current eight-year authorization of the federal investment tax credit (ITC) is probably the single biggest policy driver behind solar's rapid growth, thanks to its relatively long commitment. Firms are in harmony on the need for consistent long-term policies as crucial to long-term investment.

**Policy impact can vary by type of firm.** Solar policies can have different impacts on various types of solar firms. For example, federal import tariffs on solar panels may help protect domestic panel manufacturers from foreign competition, but they also raise the price of solar panels for domestic customers. This hurts panel distributors, who may see customers shy away from buying panels that are much higher than their original price tag.

Ironically, tariffs may also hurt domestic solar manufacturers if they have international suppliers. One respondent who switched from foreign to domestic suppliers to satisfy tariff regulations found it difficult to offer a competitively-priced end product. The respondent also indicated he or she had difficulty attracting investors because a higher-priced product reduced profit opportunities.

Lastly, tariffs may entice multinational companies to set up shop in the U.S. while still sourcing parts overseas. Respondents warn that these companies present a significant challenge to U.S. firms that must source materials domestically, often at a higher price.

**Perception remains a challenge.** There is often a lack of awareness of the cost of solar systems; many consumers assume they are cost prohibitive. Respondents also see consumers as being more hesitant to step into new investments, perhaps as a side effect of the recession.

On the supply side, several respondents indicated they had trouble finding suppliers within their state. They perceive that potential suppliers don't enter the solar market because they don't see a substantial demand.

Overall acceptance of renewable energy also may be limited by the perception that public investments in solar energy are being poorly spent. The high-profile bankruptcy of Solyndra,

which received a major loan guarantee from the U.S. Department of Energy, hurt the perception of solar energy as a viable industry. Further, there are policymakers who cast doubt on the human contribution to global warming, and they dampen the urgency for renewable energy development. Respondents recommended conducting a public relations campaign to present solar energy as mainstream, in order to combat negative press (though they were unsure who would lead such a campaign).

### The Game Changer: Natural Gas

Last but not least, solar energy must compete with traditional fossil fuels. Respondents indicate that the natural gas boom has made solar a difficult sell. Indeed, natural gas is "the one to beat" in terms of low-cost, low-emissions fuels. A 2011 Massachusetts Institute of Technology study cites that "natural gas sets the cost benchmark against which other clean power sources must compete to remove the marginal ton of $CO_2$."

The abundance of natural gas supply, especially of shale gas, and its central role in electricity generation and commercial and residential heating all but ensure its future in the nation's energy portfolio. The rise of hydraulic fracturing technology has experts assuring a "100-year supply of cheap natural gas," and this accompanied with natural gas's lower emissions levels has all but halted the construction of new coal plants.

Daniel Yergin, a Pulitzer Prize-winning writer on energy and founder of IHS Cambridge Energy Research Associates, believes natural gas will be the default fuel for new electricity generation in the coming years.[1] Although Yergin emphasizes that energy economies of scale take time to develop (especially for a relatively expensive technology like solar), he predicts that "[t]hough their share is small, renewables have over the last decade turned into a big global business, and it will be much bigger by decade's end."

The competition among natural gas, wind, and solar depends on price points. The U.S. Energy Information Administration tracks the most recent levelized cost (cost to build and maintain a plant) for different generation sources.

- The levelized cost for a coal plant is $100.10-$135.50 per megawatt hour, depending on the particular technology.
- For a natural gas plant, this cost is $65.60-$130.30, also depending on technology.
- A wind plant's average levelized cost is $86.60 per megawatt hour.
- Solar photovoltaic is $144.30, and solar thermal is $261.5 per megawatt hour.

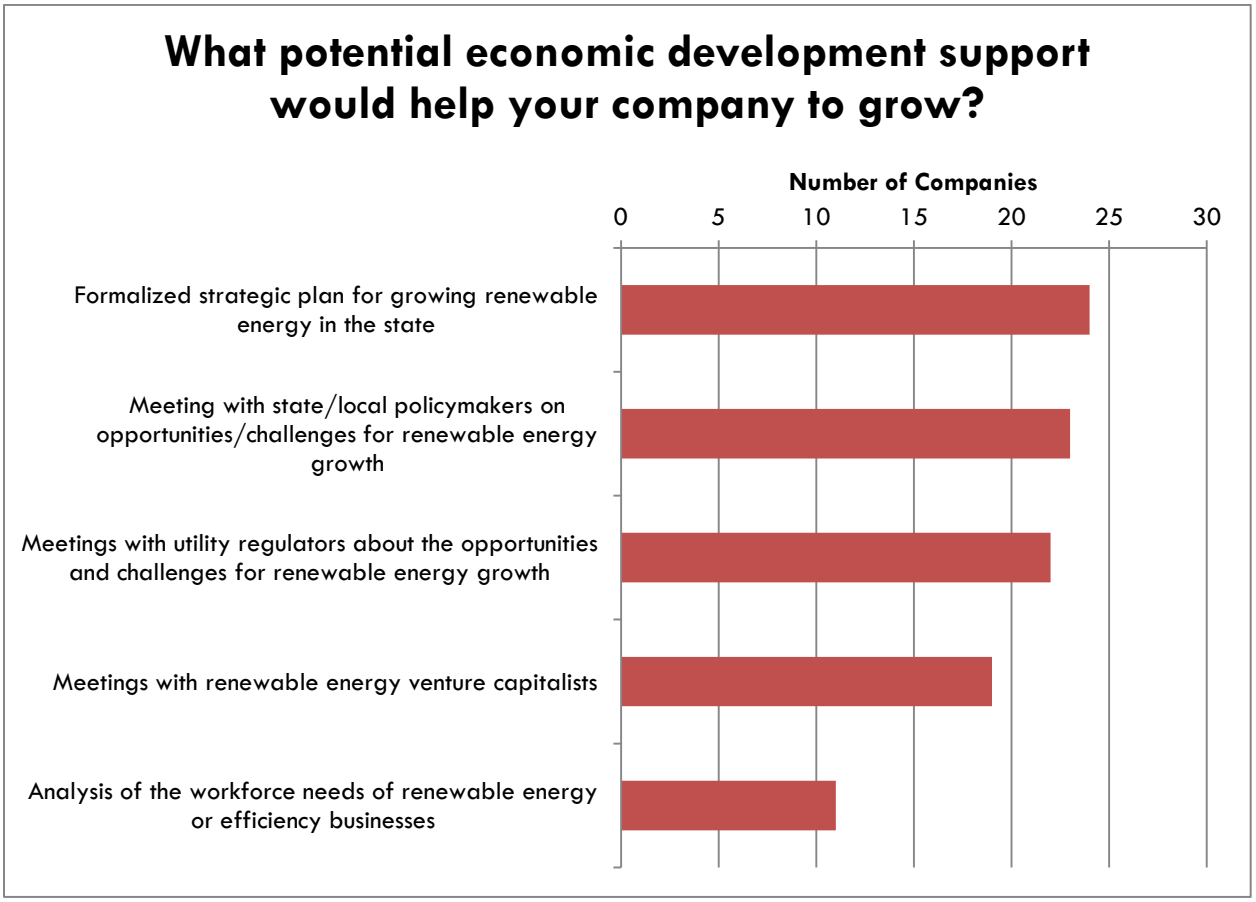
These numbers must be taken with a grain of salt: there is disagreement on costs depending on the source of data, there is significant regional variation, and different sources have different value to the utility system. While wind is closer to competitiveness with natural gas than solar is, neither is currently competitive without federal tax credits. One drawback of wind and solar energy is that they are non-dispatchable technologies, meaning their output cannot be adjusted on demand, like coal and natural gas. On the other hand, they do not require fuel so their costs are known in advance, and not subject to future market changes. Nor will they be subject to future pollution regulations. Solar tends to produce during peak demand periods, giving it higher value to utilities.

Time and policy will have the greatest impact in regard to solar energy's competition with natural gas. As solar technologies mature and reach economies of scale they will have less need for subsidies. Some analysts predict that unsubsidized solar could provide 9% of US power demand by 2022.

Sources: Massachusetts Institute of Technology. (2001). The Future of Natural Gas. Retrieved from http://mitei.mit.edu/system/files/NaturalGas_Report.pdf; Dumaine, B. (2012, April 17). Will gas crowd out wind and solar? [Interview with Daniel Yergin]. CNN Money. Retrieved from http://tech.fortune.cnn.com/2012/04/17/yergin-gas-solar-wind/. Energy Information Administration. (2013, January 28). Levelized Cost of New Generation Resources in the Annual Energy Outlook 2013. Retrieved from http://www.eia.gov/forecasts/aeo/er/electricity_generation.cfm; Trabish, H. (2013, January 25). Mapping Solar Grid Parity in the US. GreenTechMedia. Retrieved from http://www.greentechmedia.com/articles/read/Mapping-Solar-Grid-Parity-in-the-U.S

## *Economic Development Programs*

***Formal Strategic Plan Viewed as Most Impactful Economic Development Program***




IEDC asked respondents to indicate what types of economic development programming would help their companies grow. The top program is a formal strategic plan for growing renewable energy within the state. (This may encompass a variety of strategies, including the strategies presented as other answer choices.)

The firms that indicated a formal plan would be helpful represent 12 states. Of those 12 states, nine had existing strategic plans in 2010 (as indicated in the previous survey of state economic developers). The survey of economic developers also showed that on the whole, 31 states out of the 48 who responded had strategic plans in place in 2010.

**Helpful initiatives in place.** Many respondents indicated that their state is already conducting meetings between firms, utilities and policymakers. Some offered tips for successfully convening

stakeholders to advance solar energy development. One respondent said his or her state's solar renewable energy credit program is geared towards building state revenue. This aligns the goals of the private and public sectors and combats the notion that solar energy development must come at the expense of state coffers. Another respondent indicated that its local EDO created a new incentive program that combined renewable energy development with manufacturing attraction goals.

Workforce development issues came up here as well. One respondent indicated that although he or she didn't meet with economic development groups, the firm benefitted from workforce training funds dispensed by the county.

Several firms requested help in international commerce through export or import assistance. Export assistance is especially valuable for small and medium-size manufacturers, while distributors may need import assistance to build relationships with foreign manufacturers expanding into the U.S. market.

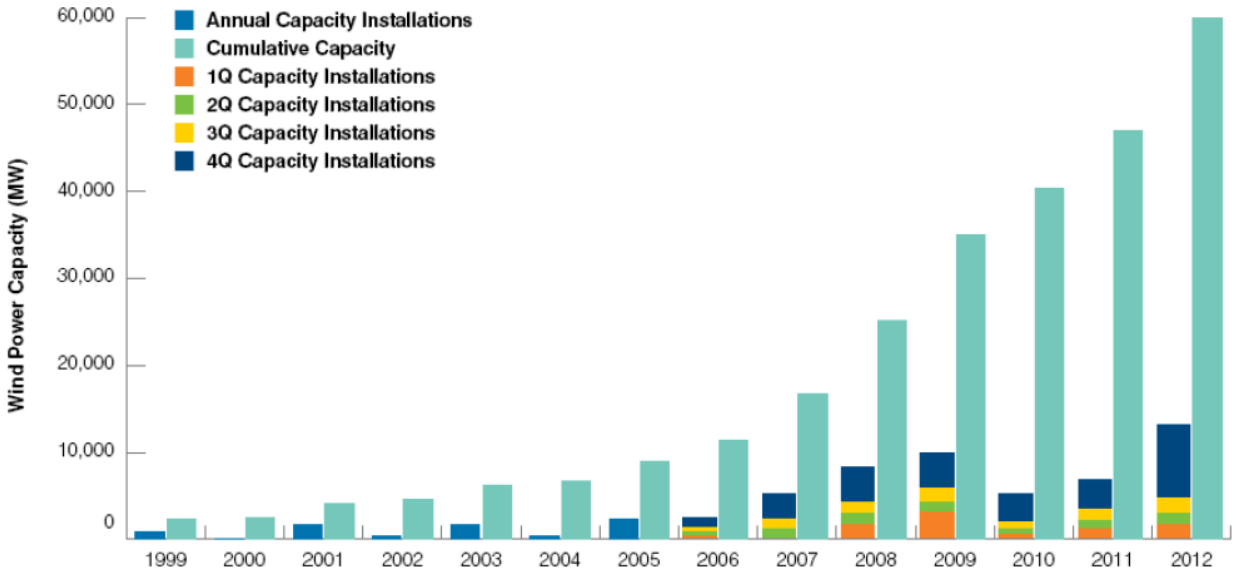
Program priorities may depend on the type of solar technology. Respondents who operate in solar thermal lament the lack of awareness of this technology. They explained that a lack of advertising keeps demand low, and a lack of understanding by county officials makes permitting more of a challenge.

All in all, respondents emphasized the bottom line: increased demand would provide the biggest boost to solar energy development. Economic development programs that contribute to this will have the most impact on solar firms' growth.

# V. WIND INDUSTRY SURVEY RESULTS

Wind power has been growing in the past decade (see Figure 5). New installed wind capacity reached its peak in 2012, with about 13,131 MW of capacity added in that year.[14] This brings the United States to a total of 60 GW of cumulative installed capacity, a milestone for the industry. The states that led in new installed capacity in 2012 were Texas, California, Kansas, Oklahoma and Illinois. Further, a total of 15 states now have more than 1 GW of cumulative installed capacity. According to the American Wind Energy Association, about 550 U.S. plants provided parts for the wind industry in 2012, and these plants together represent 80,700 full-time equivalent jobs (25,000 of which are manufacturing jobs.)[15] The extension of the production tax credit through 2013 means that installed capacity will continue to grow throughout 2013.

**Figure 5: Annual Installed and Cumulative Wind Power Capacity**




Source: AWEA 2013 Annual Market Report

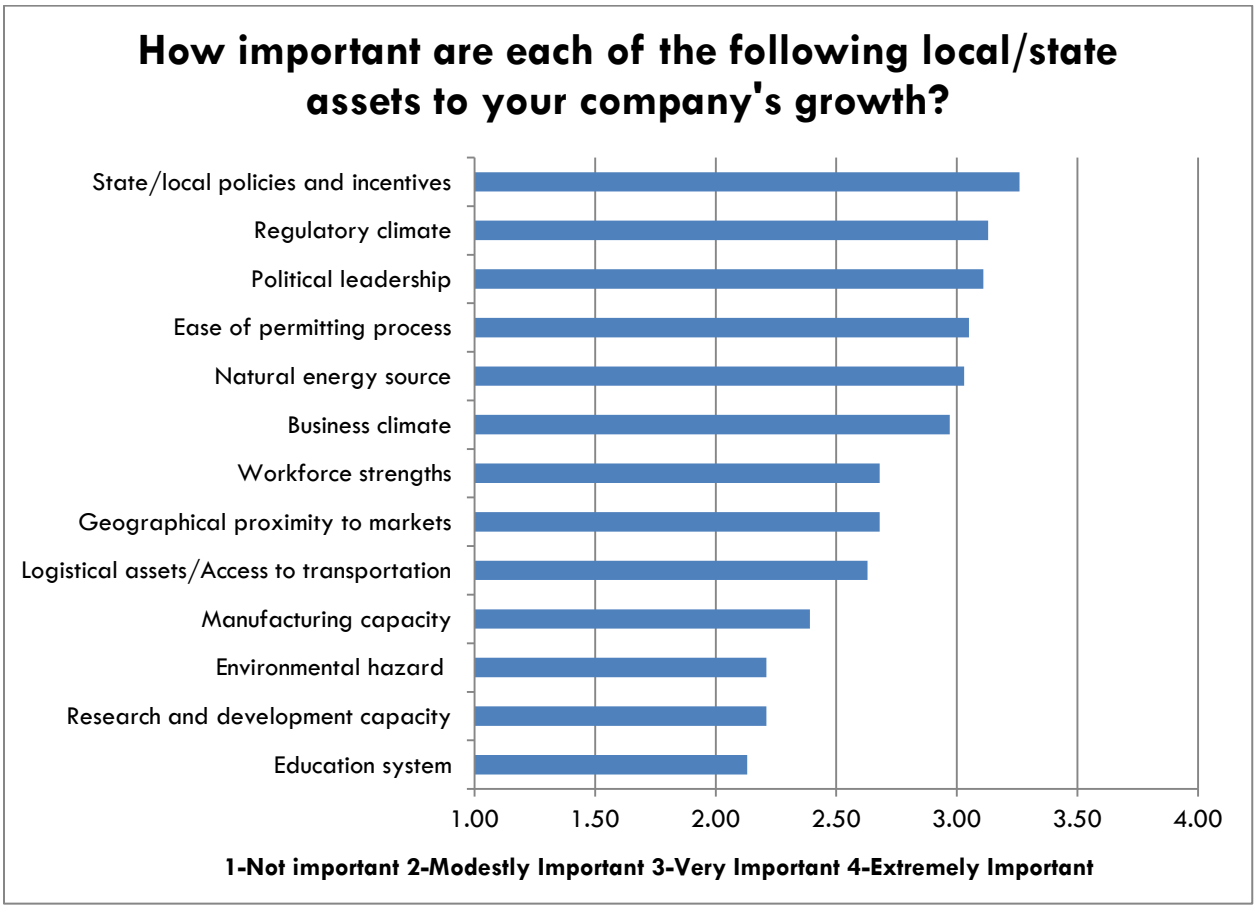
In the survey, IEDC asked wind firms the same questions as for solar firms. Although the industries share some similarities in assets, challenges and priorities, differences arise from unique industry structures and motivate a separate analysis.

### *Key Survey Findings:*

- **Most important state or local assets** are policies, incentives and regulatory climate.
- **Most effective policy tools are** financial incentives for renewable energy production.
- **The leading challenge for firms** is federal policy and regulatory uncertainty.
- **The most impactful economic development program,** as with solar, is a formalized strategic plan for growing renewable energy at the state level.

### *Assets*

***Primary Assets are Policies, Incentives and Regulatory Climate***




When responses are averaged across region and industry class, the most important state or local asset is policies and incentives. The wind industry seems to hold the policy environment in especially high regard, since regulatory climate and political leadership also rank high. This

constrasts with the solar industry, which values ease of the permitting process most highly. Solar energy, which is more adaptable to smaller scales, has a robust residential market that is heavily impacted by permitting issues. Wind energy, on the other hand, depends more on large installations for economies of scale, and utility regulatory policies and incentives can be crucial factors for a project's economic feasibility.

**A focus on federal policy.** Regarding policy and incentives, respondents were quick to jump to federal priorities. The primary incentive on the wind industry's radar is the federal renewable energy production tax credit (PTC). The PTC was enacted in 1992, followed by a series of extensions and renewals. The most recent one-year extension was signed in January 2013 under the American Taxpayer Relief Act of 2012 (known as the "fiscal cliff" bill). In interviews, firms said that uncertainty leading up to the renewal of the PTC puts projects on hold and costs jobs across the entire wind supply chain – developers, manufacturers, engineers, consultants and so forth. State policy, notably renewable portfolio standards, are also a key asset.

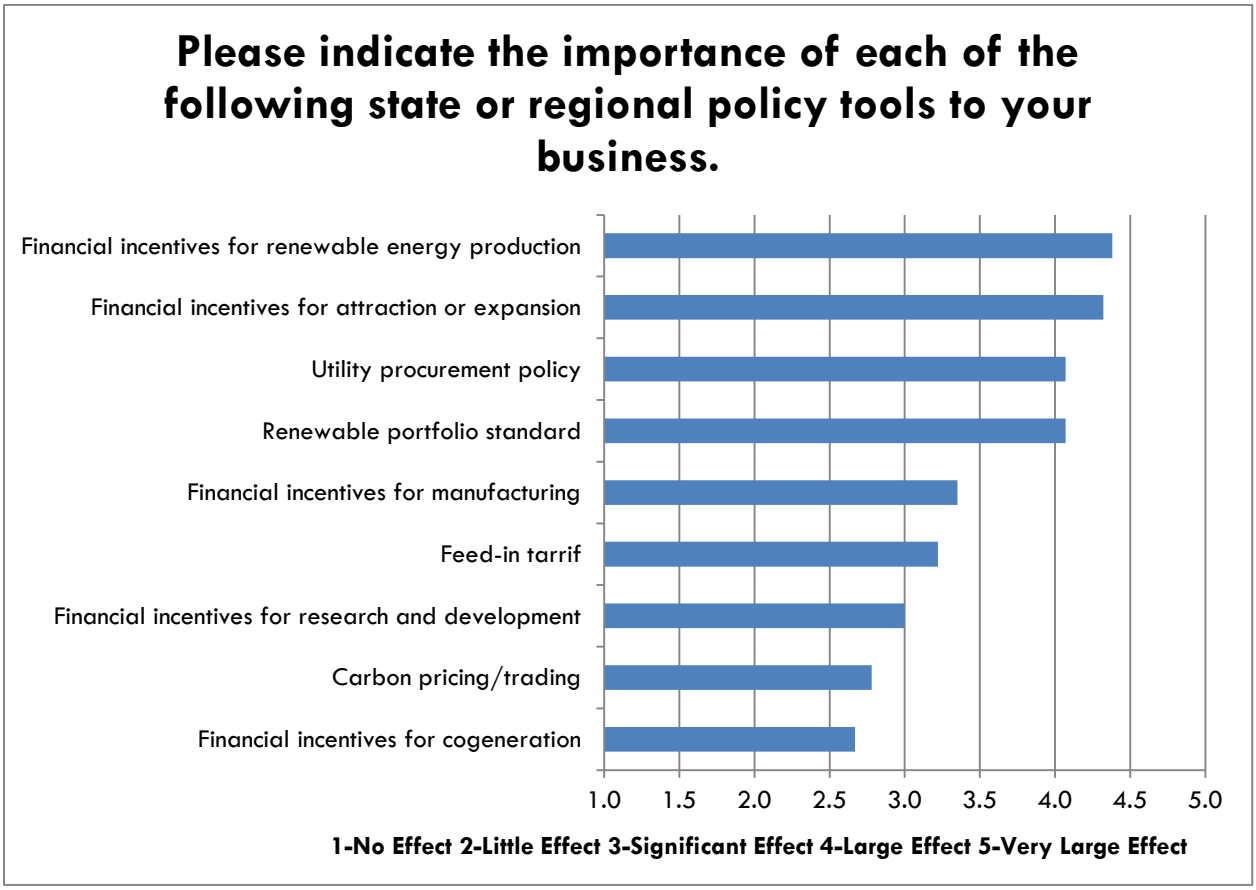
**Permitting a concern.** After the policy and political arena, wind firms also value an expedited permitting process. One firm said it waited two and a half years to obtain a permit, greatly delaying the launch of the project. Another firm said that permitting was becoming increasingly difficult, with opposition parties raising hurdles in the process. The permitting process also hinges on the entity that owns the proposed site – e.g., private ownership, Bureau of Land Management or other entities.

**Other key local assets.** In interviews, firms indicated that a number of uniquely local assets also are important. Large wind projects must have access to transmission. Community support is also important; local opposition can delay or cancel a project. Component suppliers emphasize a need for skilled workers. Since it is not cost-efficient to let plant capacity sit idle, firms need a constant supply of workers to be most efficient in production.

It is interesting to note that R&D capacity and education rank as the least important local/state assets. While some firms engage in local partnerships with universities (such as the University of Maine's Advanced Structures and Composites Center), it appears most firms are operating on their own using proprietary technology.

## *Policy Tools*

***Financial Incentives Are the Leader in Effective Policy Tools***




As in the solar survey, financial incentives for production, attraction and expansion are ranked as the most important policies. Many firms emphasized that national policy takes precedence over state/local policy. Some firms called for a national RPS, which, in their view, would negate the need for incentives to stimulate renewable energy production.

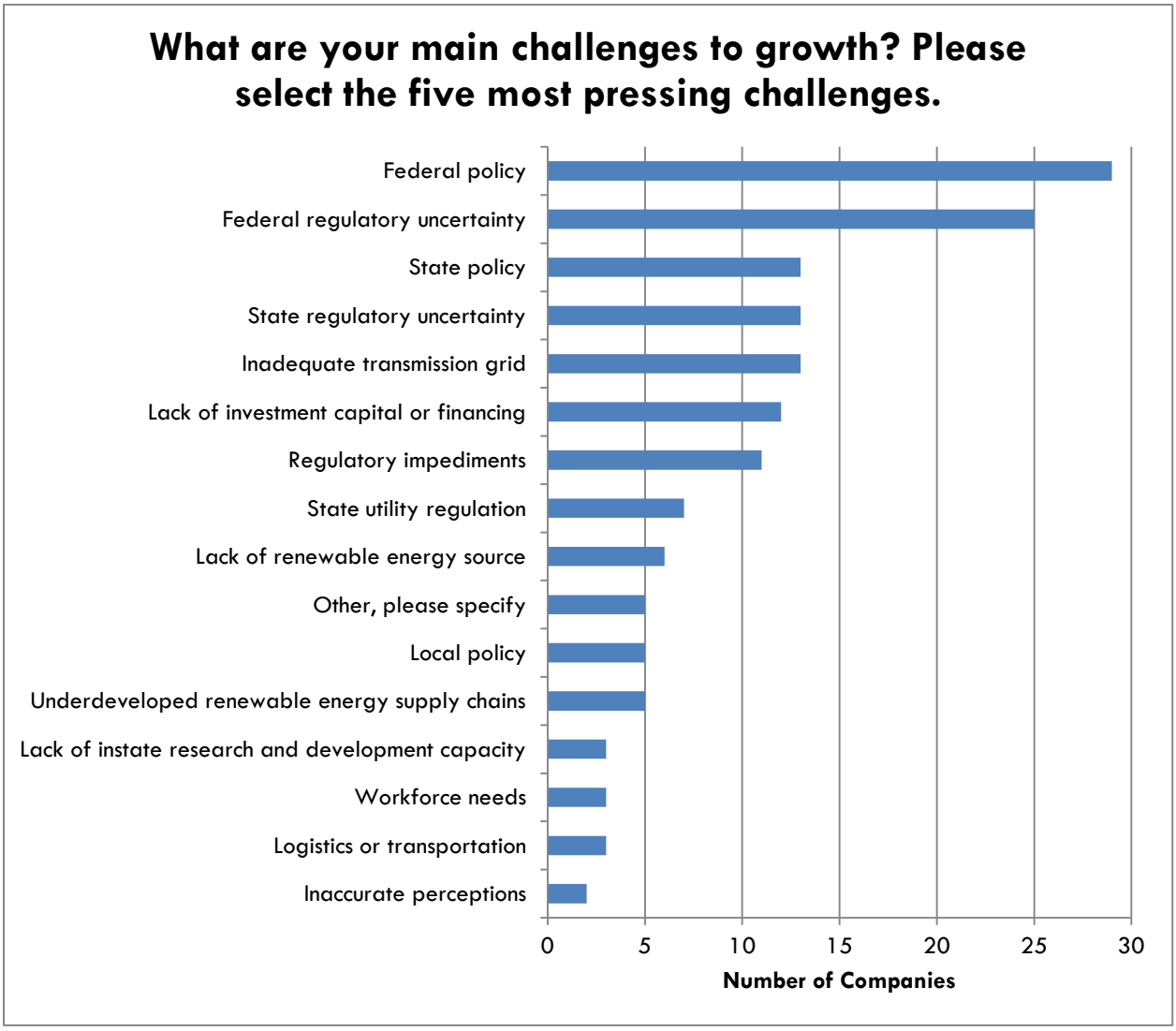
**Federal incentives have helped.** Also on the federal side, the PTC and the investment tax credit (ITC) have been helpful boosts to the industry, but investors are very sensitive to their renewal cycles. In fact, one respondent said that smaller tax credits would be preferable to larger but inconsistent ones. More consistent programs, such as Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, have been crucial to startups focused on wind energy technology. These programs are especially vital in times when the economy is in a downswing and venture capital markets are weak.

Some firms rely heavily on local and state incentives, whether directly or indirectly. One firm provided software for a wind power research center, a project that was made possible by a large contribution from a university and matching grants from multiple states. This example highlights how a single grant or tax credit impacts not only the immediate business, but businesses along the supply chain as well.

**Public utility commissions play a role.** A utility procurement policy is also important to wind firms. One firm indicated that leadership from its state public utility commission (PUC) could go a long way toward increasing grassroots demand for renewable energy production. The formula used by state PUCs to determine how utilities price wind energy also impacts wind business. Net metering laws also are important to demand for small wind energy systems, since these dictate how owners of small wind are compensated for the electricity they generate.

## *Challenges to Growth*

***Federal Policy and Regulatory Uncertainty are Leading Challenges***




Not surprisingly, wind firms view federal policy and regulatory uncertainty as their top challenge, followed immediately by state policy and regulatory uncertainty.

Almost all firms cited federal regulatory uncertainty as the top challenge for the long-term direction and viability of the wind industry. The uncertainty on the federal level primarily involved the extension of the PTC, which came into effect in January 2013 (after the survey was conducted). Although the extension may provide some relief in the short run, firms continue to be

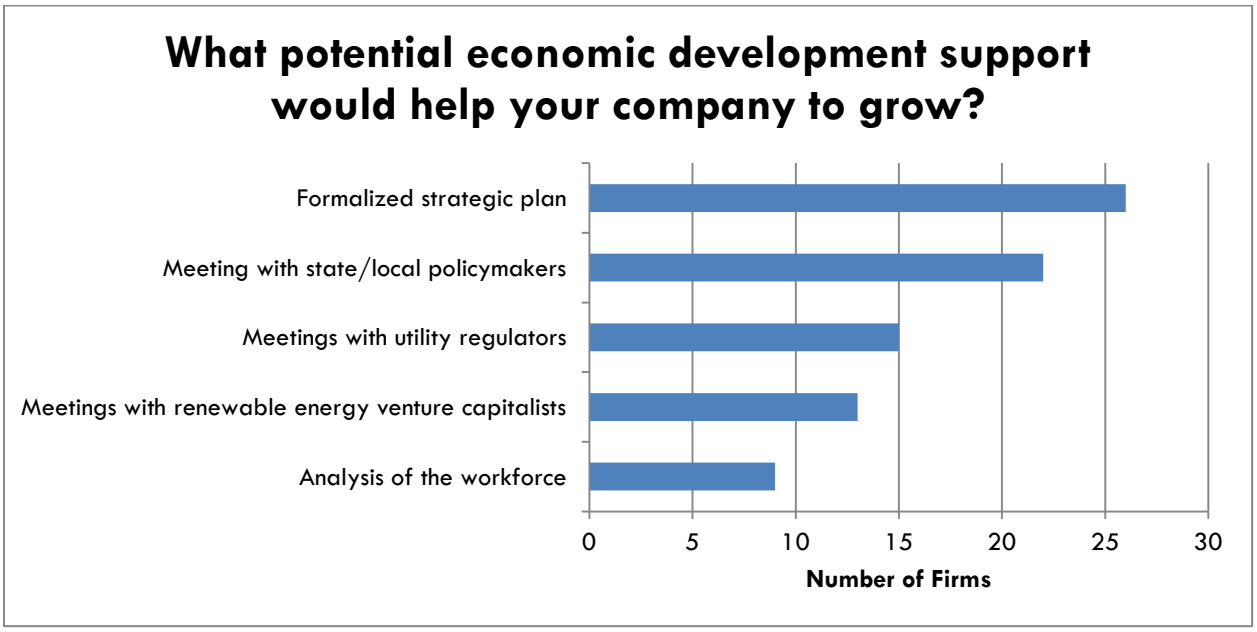
uncertain about the future of policy in the medium and long terms. Their outlook for federal and state policy primarily hinges on election cycles.

**External threats from natural gas, foreign manufacturers and NIMBYs.** In addition to internal complications, the domestic wind industry faces a number of outside threats. The price of natural gas is considered a wild card. If natural gas prices remain low, then wind power will have to cut costs to be economically competitive (although it already is making continued progress with improvements in turbine efficiency). Competition from foreign manufacturers is also a threat to U.S. manufacturers, especially if foreign firms receive substantial government support while U.S. policy remains unsupportive of domestic manufacturing. On the project level, lawsuits filed by NIMBY ("not-in-my-backyard") advocates can stall or cancel a project.

Workforce challenges ranked relatively low across the board, but high for selected firms. One firm interviewed said that as a software firm, finding qualified workers was a challenge. Since the software industry is well connected across regions, the firm hired headhunters to bring in workers from across the country.

## *Economic Development Programs*

***Formal Strategic Plan Viewed as Most Impactful Economic Development Program***



As in the solar survey, wind energy respondents indicated that the most helpful economic development program is a formal strategic plan to grow renewable energy in the state. Firms recognize a need for a comprehensive economic development strategy, rather than a piecemeal one; help is needed on multiple levels.

A formal strategic plan often includes the other strategy choices as well. For example, the plan could include a grassroots educational campaign to dispel myths about wind energy, raise public support for wind power and support elected officials or candidates who are sympathetic to renewable energy.

Whether such a plan is led by an EDO or government entity is likely to depend on a state's resources and priorities. The strategies that comprise such a plan are not cookie-cutter; some firms said their states struggles with false perceptions of the wind industry, while others said perception is not an issue, but a lack of funding for projects is.

The respondents who said a formalized strategic plan would be beneficial represent 16 states. Of these states, five had a formalized strategic plan in 2010 (according to IEDC's survey of economic developers). Of the four states who said a formal plan would not be helpful, two have a strategic plan in place.

**Useful connections made with EDOs.** Some firms are already meeting with EDOs. For example, one firm said that although wind energy is only part of their business, staff at plants that make wind parts meet with local and regional EDOs. Another firm meets with various in-state EDOs before beginning every new project. Many firms already pursue these strategies on their own, especially if they contract with utilities or if wind energy is a significant portion of their businesses. Finally, some firms simply aren't aware of who their local or state EDOs are.

One firm suggested that a particularly beneficial resource would be an information portal of state-level policies and incentive programs, especially one that tracks program changes in real time. This resource would be similar to Database of State Incentives for Renewables & Efficiency (DSIRE). Such a portal would help firms locate potential new hot markets and keep abreast of regional trends. Another firm suggested an analysis of wind energy's competitiveness against other energy sources like natural gas.

# V. BIOPOWER INDUSTRY SURVEY RESULTS

To capture the diverse set of assets, challenges, policy and program priorities across renewable energy industries, IEDC also interviewed a smaller sample of biopower industry experts. Biopower is the third largest source of renewable energy behind hydropower and wind and thus merits a closer study. Biopower is electricity generation from biomass, mainly wood products with some anaerobic digestion products.

IEDC and Energy Foundation identified a handful of organization leaders, private-sector stakeholders, economic developers and site selectors who have wide-ranging insight on the state of the biopower industry. Although the scope of biopower in this project is smaller than that of wind or solar, combining this range of voices will help provide a well-rounded understanding of the industry. Topline results from these interviews are:

- **The most important state or local asset** is proximity to natural resources.
- **The most effective policy tools** are financial incentives.
- **The leading challenges for firms** are a lack of awareness and development challenges.
- **The most impactful economic development programs** are tailored incentives and assistance to developers.

The sectors that IEDC interviewed include:

1) **Nonprofit Sector**: IEDC spoke with the U.S. Endowment for Forestry & Communities, a nonprofit operating under a federal endowment to carry out the dual mission of supporting healthy domestic forests and providing quality jobs in rural communities. With this mission in mind, the endowment primarily focuses on small, community-scale wood-to-energy facilities in the range of a few hundred thousand to a few million dollars of investment. These plants hold more promise of keeping profits in the local economy, but are also less cost-efficient than larger plants.
2) **Developers**: IEDC also spoke with two leading U.S. developers of biomass plants. These developers have managed the development of both community- and utility-scale projects across multiple states. Many of these projects have come to fruition (including one slated for operation in late 2013), while others fell through due to financing constraints during the recession. These developers shared their take on crucial tipping points for the future of biopower development.
3) **Site selectors:** IEDC interviewed two site selectors who have worked on an extensive portfolio of renewable and alternative energy projects, including wind, solar, biopower, electric vehicle, battery and smart grid. One site selector works primarily on manufacturing projects and focuses on the feasibility stage; the other leads a group of brokers that works on site selection and incentive negotiation.
4) **Economic developers:** Finally, IEDC interviewed Nacogdoches Economic Development Corporation (NEDCO) regarding the development of the Nacogdoches Generating Plant. Key services delivered by NEDCO are presented in the case study box at the end of this section.

## Assets

***Primary Asset Is Proximity to Natural Resources***

- **U.S. Endowment for Forestry & Communities:** In terms of assets, biopower plants must be located close to natural resources. Woody biomass, which can be composed of up to 50 percent water, have a low ratio of value to transportation cost. Regions with more woody biomass have an advantage.
- **Developers:** Projects are located close to sources of forestry residue. The southeast region of the U.S. is especially rich in these resources and is known as the "woodbasket" of the nation. Urban areas can also provide biomass, such as debris from new developments. The use of privately-owned land can expedite the permitting process for development, since owners are interested in turning a profit. Plants also tend to be located on isolated property or existing industrial land so as to minimize negative impacts on the community. In fact, unless community concerns are addressed up front, a project may fail or have to be relocated. Adequate transmission infrastructure (to tranfer electricity), roads (to bring in feedstocks), and water source (for plant operation) also are integral to biomass plants.
- **Site Selectors:** Natural resources are the primary consideration for locating biopower projects.

## Policy

***Incentives are Needed in Tough Financial Climate***

- **U.S. Endowment for Forestry & Communities:** Biopower can benefit if federal and state incentives and policies include it along with other renewable energy technologies where appropriate. For example, New Hampshire's RPS recently included woody thermal power plants. Streamlined permitting can also benefit biopower growth.
- **Developers:** Historically, tax credits have not been essential to projects, but the weak economy has made them more important. In the past few years, biopower development has been greatly impacted by the investment tax credit and the 1603 Treasury grant program. One developer said that at least one project would not have been built without a 1603 grant. Further, biopower projects only receive half the PTC value that wind power projects receive. An RPS or feed-in-tariff (either federal or state) that includes biomass would hold great potential to encourage development.
- **Site selectors:** In terms of policy and incentives, supply-side incentives like the production tax credit (PTC) are more impactful to site selectors than demand-side ones like the RPS because the PTC is money toward the bottom line. One site selector sees solar energy as approaching parity with competing fuels in some states, even without heavy subsidies. Biopower also is expected to grow. Another site selector is looking ahead to offshore wind energy, the next step in development for that industry. In that case, manufacturing is expected to grow along the eastern seaboard.

## Challenges

***Lack of Awareness and Development Challenges***

- **U.S. Endowment for Forestry & Communities:** While other forms of renewable energy have been the focus of significant regulations, policies and incentives, biopower has not. There needs to be greater awareness of biopower as a renewable energy source, especially community-scale plants. Also, certification of raw materials is becoming more expensive and could make it harder for biopower to compete with other energies.
- **Developers:** Negotiating power purchase agreements can be tricky, especially in a tough financial environmental. Developers also often ran into permitting challenges when groups oppose a project. These groups can stall the development process at multiple points, even when a project has wide-ranging support from the rest of the community. One developer gave tips for tackling the NIMBY issue: being selective about potential towns; communicating the jobs and tax benefits of a project; clarifying that drawbacks are minimal; and giving tours to media and elected officials.
- **Site selectors:** The price of fossil fuels has a huge impact on renewable energy projects; lower oil and natural gas prices have suppressed renewable energy activity. During the recession, many projects that didn't receive federal funding simply didn't move forward. One site selector believes that high project activity in earlier years was driven by an artificial boost from federal investment, with the number of projects drifting back to its "natural" level in more recent times.

## Economic Development Programs

***Tailored Incentives and Assistance to Developers***

- **U.S. Endowment for Forestry & Communities:** Incentive programs should address biopower alongside other renewable technologies. Policies should be specific to each locale, since biomass resources vary by geography and natural resources are the primary location factor for plants.
- **Developers:** The developers worked with a number of local EDOs on projects. EDOs have helped to train workers, held job fairs, negotiated a pilot agreement, and located property. Developers emphasize that EDOs have an important role to play as a community liaison, since they are well connected to local elected officials, industry groups and environmental groups.
- **Site Selectors:** Although site selectors work closely with economic developers to negotiate state and local incentives, it is evident from the past few years that federal financing can make or break a project.

**Case Study in Economic Development: Nacogdoches Economic Development Corporation**

IEDC interviewed the Nacogdoches Economic Development Corporation (NEDCO), which aided with the development of the Nacogdoches Generating Plant. The 100 MW plant is the largest biomass plant in the U.S. The project started in 2001 and was completed 11 years later when it began delivering power to customers in June 2012. NEDCO's location in eastern Texas made it a suitable fit for biomass development, as wood supply is plentiful in this rural timber country. As an example of how an EDO can assist with biomass projects, NEDCO delivered key services during the development process:

1) The developer initially contacted NEDCO regarding interest in possibly building in East Texas. NEDCO helped identify potential properties and their respective owners so that the developer could negotiate property contracts.

2) Since biomass plants need good access to water, NEDCO introduced the developer to local water boards and spoke on the project's behalf.

3) The project site required an upgrade to local highway routes. An average of 160 trucks would be going in and out each day delivering fuel. NEDCO worked on the developer's behalf to get the highway widened in front of the entrance to the plant. NEDCO spoke with a state senator, who was formerly the head of the state department of transportation.

4) NEDCO helped negotiate a property tax abatement for the site.

5) During negotiations to sell the development to the local power company, the developer contacted NEDCO and the county if any hiccups arose. NEDCO also attended meetings when the power purchase agreement was being negotiated.

NEDCO held stakeholder meetings to take the pulse of community concerns and communicated these back to the developer. By being proactive rather than reactive to community concerns, NEDCO helped minimize misunderstanding and opposition to the project.

# VI. COMPARING FIRM AND ECONOMIC DEVELOPMENT PERSPECTIVES

*Economic developers and firms agree that political leadership is the most important local/state asset.*

IEDC designed the survey of solar and wind firms to allow for comparison and contrast with its 2011 survey of economic developers, published in "Powering Up: State Assets and Barriers to Renewable Energy Growth." Juxtaposing these views can help illuminate how perceptions and priorities align between economic developers and firms. Economic development organizations work hard to stay attuned to the needs of local companies and to pave a way for fast-growing companies to bloom. Taken together, these two surveys can both educate economic development organizations and help them evaluate and plan future renewable energy programming.

The following graphs compare results from the survey of economic developers with those from the survey of firms. The firm numbers are obtained by averaging the wind and solar firm survey results.

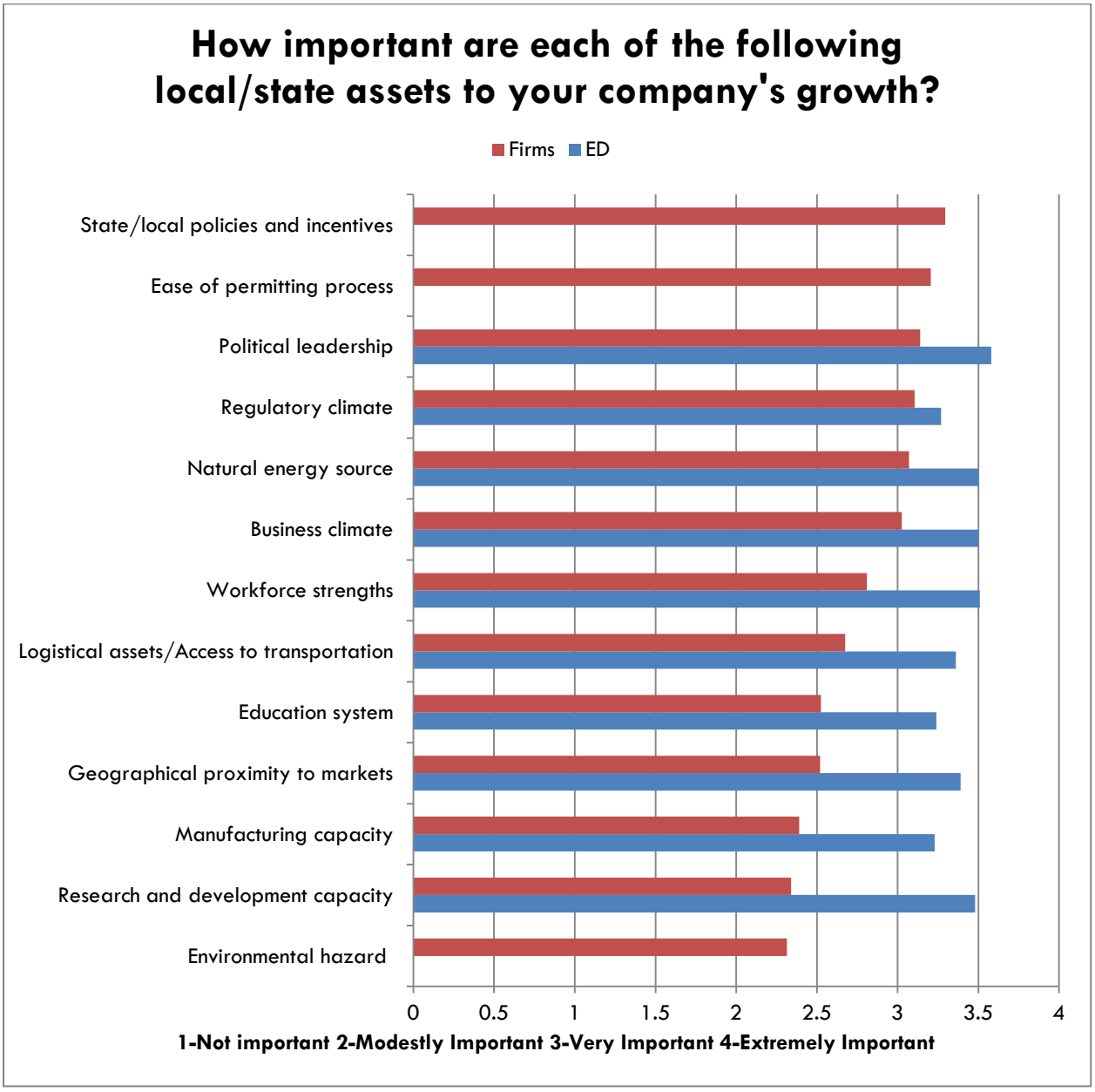
### *Key Survey Findings:*

- **Most important state or local asset** is political leadership according to both economic developers and firms. However, economic developers tend to overestimate the importance of non-policy-related assets.
- **Most effective policy tools** are direct financial incentives according to firms (especially related to startup costs or boosting demand), while economic developers prioritize renewable portfolio standards. Economic developers should also be up to speed on lesser known, demand-side renewable energy policies, such as feed-in-tariffs and utility procurement policies.
- **The leading challenge** is federal policy and regulatory uncertainty according to firms, while economic developers are most concerned with a lack of investment capital or financing.

- **The most impactful economic development program** is a comprehensive, formal strategic plan to grow renewable energy, according to firms. However, the program most often implemented by economic developers is workforce analysis.

## *Assets*

***Primary Asset is Political Leadership***

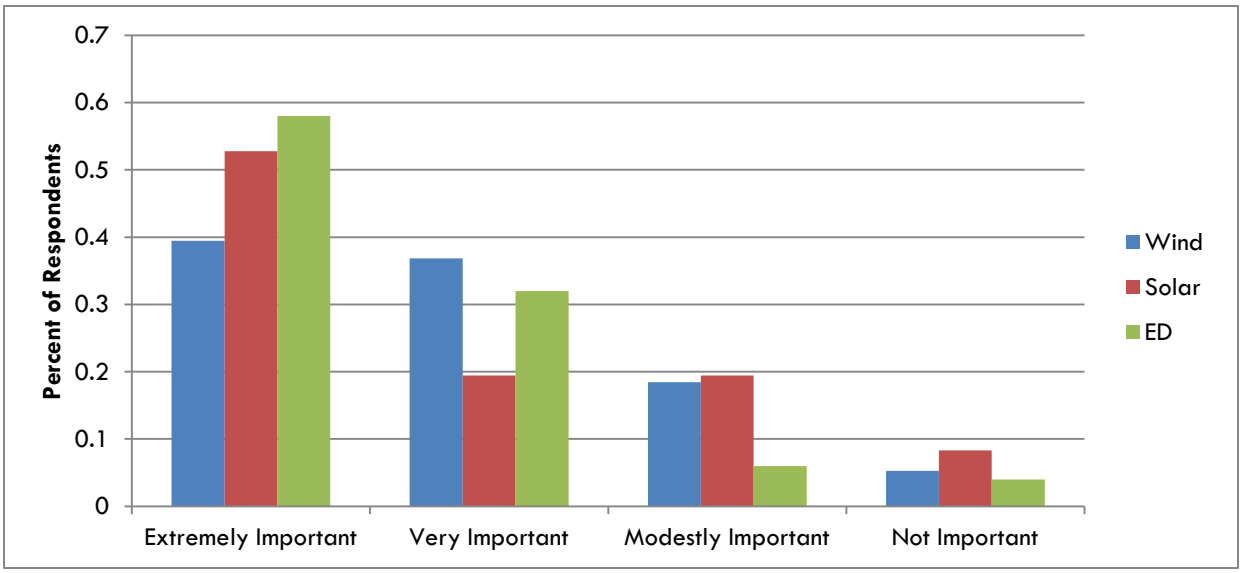


Both firms and economic developers agree that political leadership is integral to renewable energy growth. The only assets more important to firms than political leadership are policies/incentives and ease of permitting. (Note that economic developers were not asked to rate policies/incentives, the ease of permitting and environmental hazard alongside other asset options; the survey of economic developers was longer and more comprehensive, and so these options were embedded in other questions.) However, since economic developers often interface with political leadership on permitting and state/local policies and incentives, it is reasonable to assume that they would also rate these as highly important assets.

**Other important assets.** Other assets firms ranked as at least "very important" include regulatory climate, natural energy source and business climate. There are some local/state assets that economic developers view more highly than do firms, such as research and development capacity and workforce strengths. This indicates that while firms value local and state assets, they are most concerned with the bottom line. On the whole, firms gave an average rating of 2.80 across all assets while economic developers gave an average rating of 3.41.

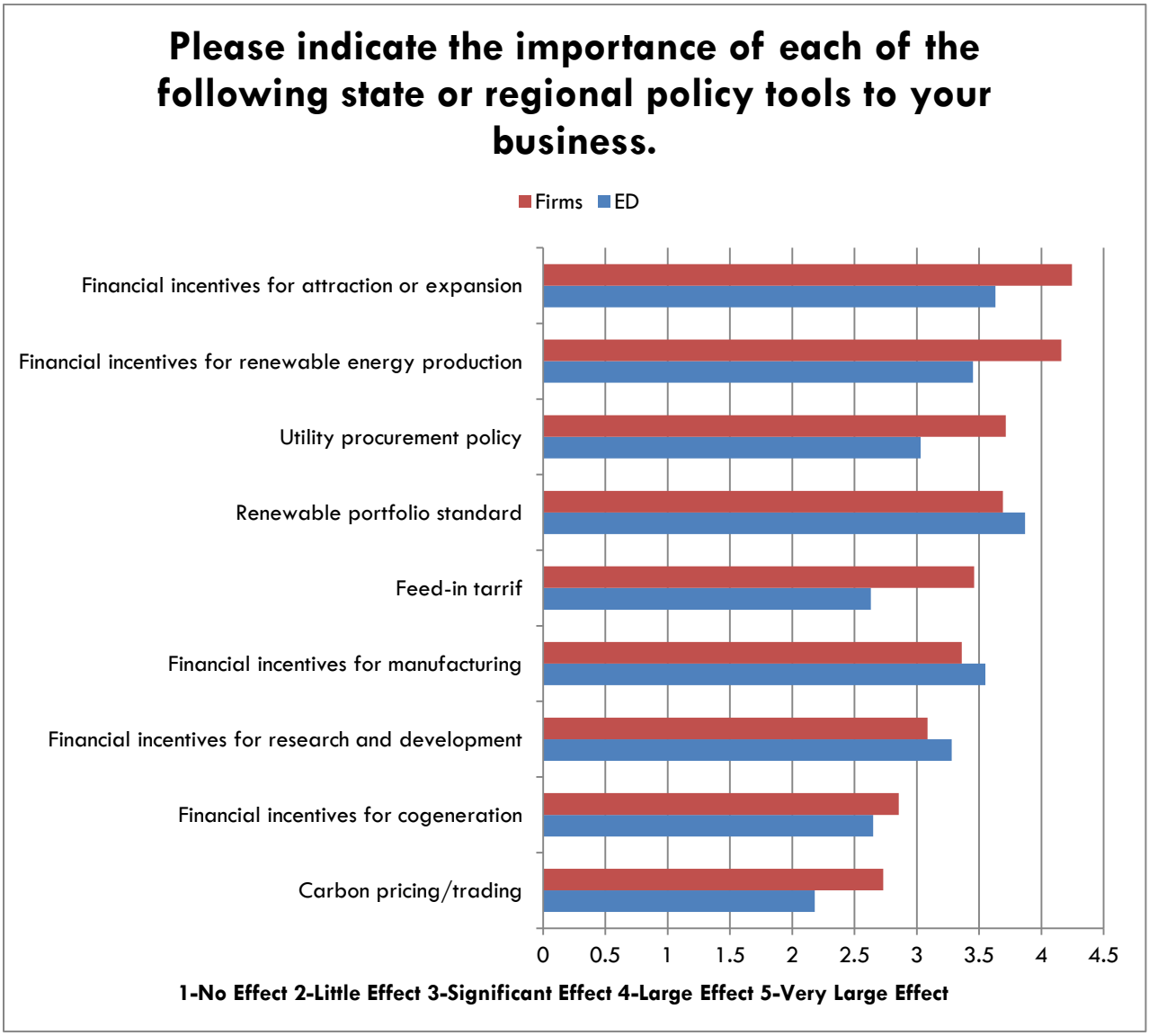
**The distribution of responses.** To illustrate the distribution of responses on the importance of political leadership, the graph below compares the percent of respondents within each category (economic development, solar firms and wind firms) who marked each importance level. A higher percentage of solar firms than wind firms value political leadership as "Extremely Important." A higher percentage of economic developers give political leadership the highest rating than do firms in either industry.

**The Importance of Political Leadership as an Asset**



## *Policy Tools*

***Financial Incentives or RPS?***




Wind and solar firms value financial incentives for attraction, expansion and production most highly. Their rating for these policy tools is on average over 0.5 points higher than that of economic developers. Economic developers rate renewable portfolio standards most highly, although financial incentives for attraction, expansion and production are close seconds. Firms do value an RPS, but as their fourth policy priority on average. In contrast to the question on Assets, firms give an average rating of 3.48 to policies across the board, while economic developers

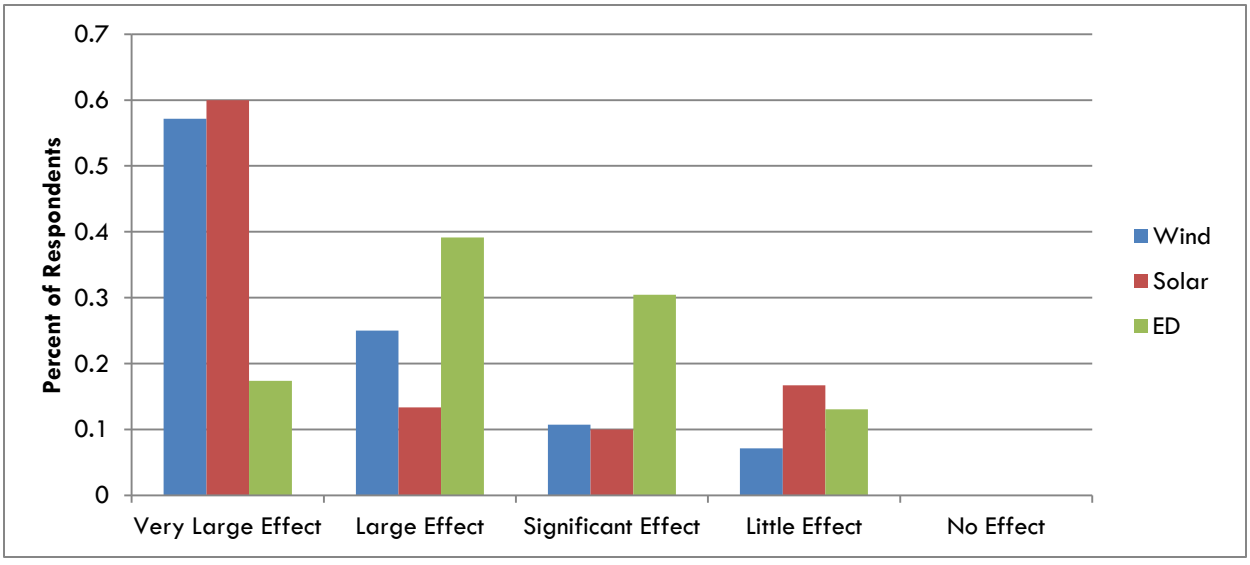
assign a lower average rating of 3.14. That is, firms tend to emphasize the importance of policy tools more than economic developers do (a result that may not be too surprising.)

**Types of financial incentives.** While economic developers rate financial incentives for attraction, expansion, production and manufacturing roughly the same (around 3.5), firms tend to favor incentives for attraction and expansion and production over incentives for manufacturing. This may reflect the high startup costs to renewable energy enterprises, as well as firms' emphasis on the urgency for demand-side incentives alongside supply-side ones.

**Lesser known but important policies.** There are relatively large gaps in how firms and economic developers value a utility procurement policy and feed-in-tariff. Firms value these programs about 0.7 to 0.8 points higher than economic developers do. These are also programs that help establish demand for renewable energy and are perhaps lesser known to economic developers than more established policies like attraction and expansion incentives. These results show that while firms still prioritize direct financial incentives to companies (especially related to startup costs or boosting demand), economic developers should also be up to speed on other demand-side renewable energy policies.

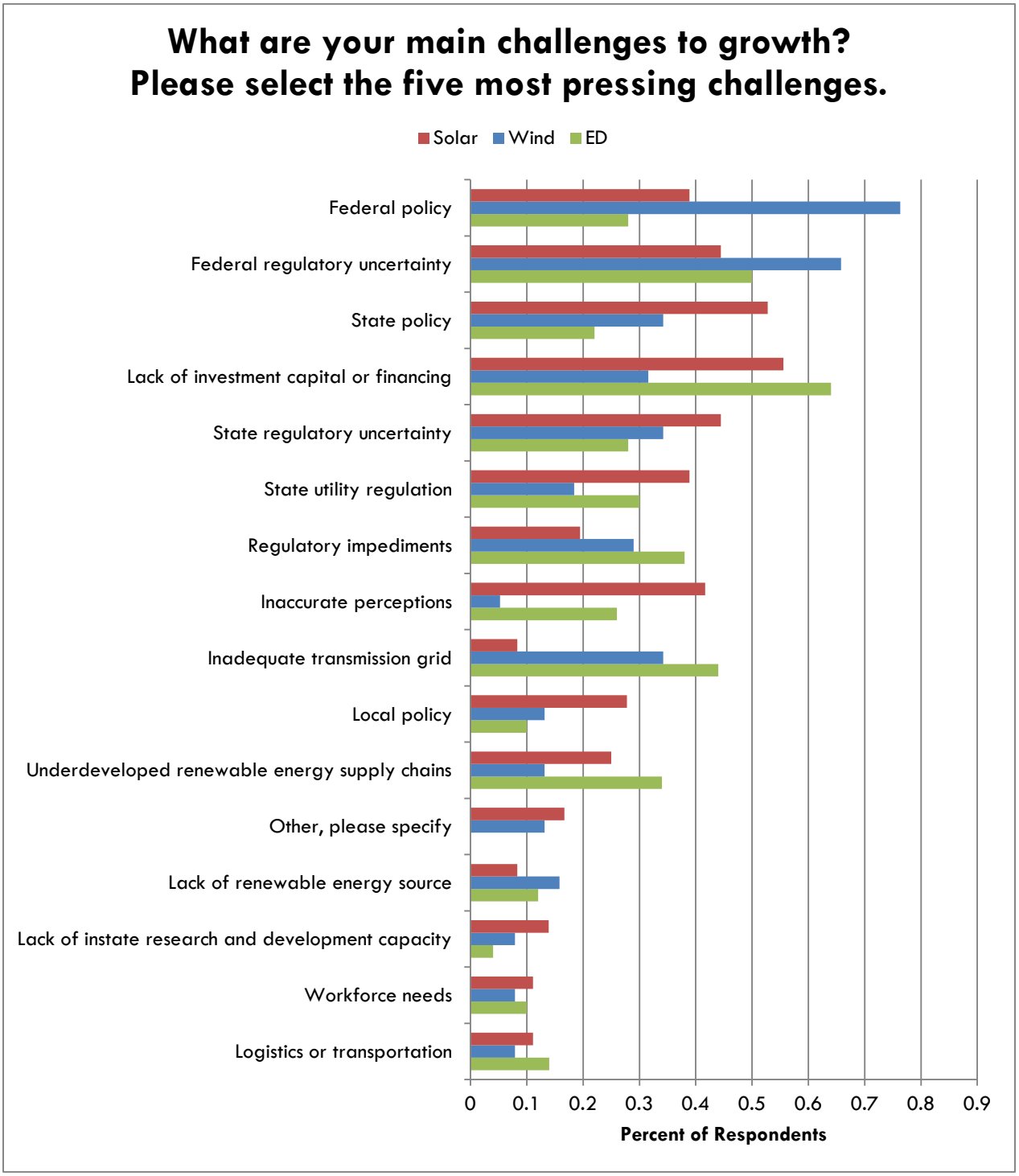
**The distribution of responses.** Once again, the distribution of responses on the importance of attraction and expansion incentives yields some insight on the range of perspectives within each respondent category. Almost 60 percent of both wind and solar firms view these incentives as having a "very large effect" on their business, while less than 20 percent of economic developers surveyed are similarly enthusiastic. The bulk of economic developers assign more moderate but still significant effects to attraction and expansion incentives.

**The Importance of Attraction and Expansion Incentives as a Policy Tool**



## *Challenges to Growth*

***Firms Focused on Policy, While EDOs focus on Financing***



There is some variation between firms and economic developers on the top challenges to growth. Federal policy and regulatory uncertainty are at the forefront of firms' minds. Firms are also concerned about financing, with 50 percent of respondents indicating this is one of the top five challenges.

**A lack of financing.** Economic developers, however, are most concerned with a lack of investment capital or financing. Financing challenges and federal policy concerns may be closely related; uncertainty regarding the renewal of the production tax credit and investment tax credit may feed into both concerns. Breaking down the industries, solar firms are most concerned with a lack of financing, while wind firms are most concerned with federal policy and regulatory uncertainty.

**State and local policy.** Firms are also more concerned than economic developers about state-level policy. Nearly half (45 to 50 percent) of firms indicate that state policy and regulatory uncertainty are top challenges, while only about 22 to 28 percent of economic developers believe these are top challenges. Similarly, only 10 percent of economic developers see local policy as a top challenge, while 23 percent of firms think it is.

**Short run versus long run.** Firms expressed their frustrations in interviews that the come-and-go nature of incentives greatly challenges their ability to project demand in the medium term and to make investment decisions. Economic developers, on the other hand, are more concerned than firms about an inadequate transmission grid and underdeveloped renewable energy supply chains. This perhaps reflects firms' need to plan for the short run, and economic developers' tendency to plan for the long run.

**Other challenges.** For the "Other, please specify" option, there were five responses for additional challenges:

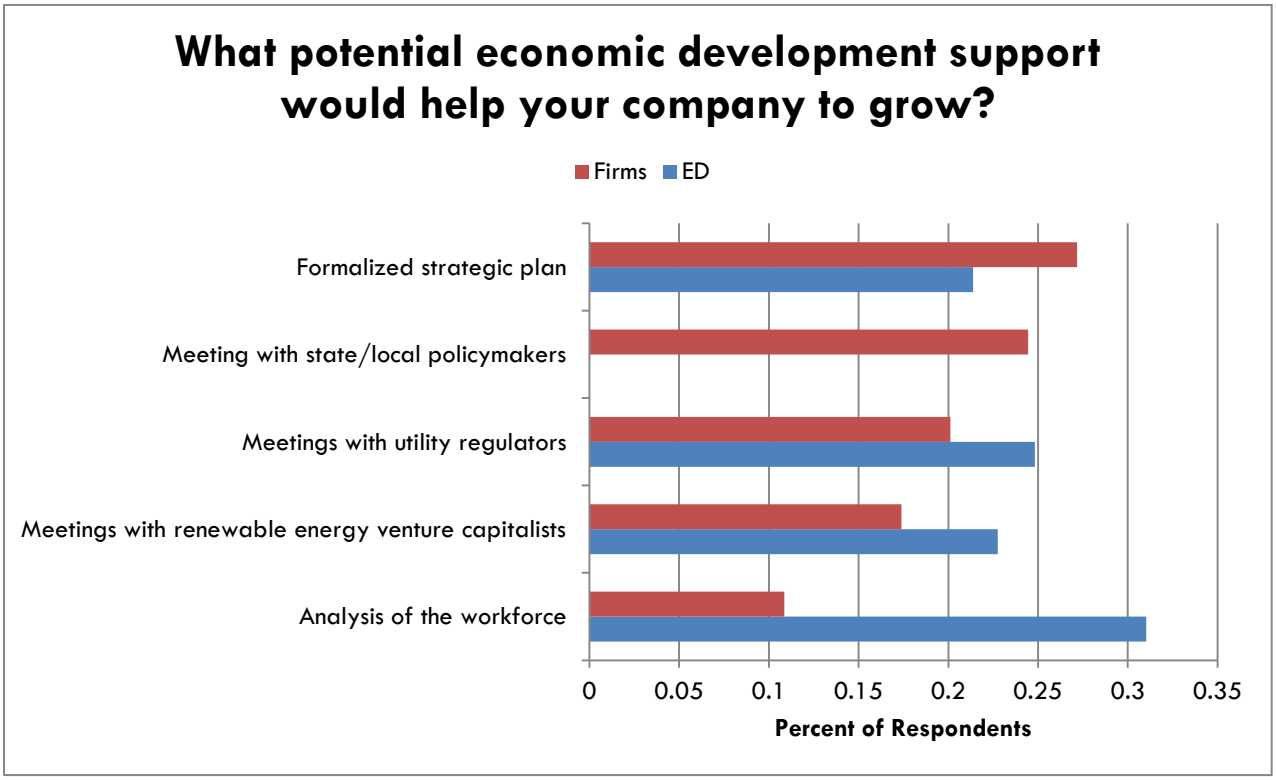
- Awareness of and initial cost of solar thermal systems;
- Eliminating barriers to distributed energy generation (generating electricity from small energy sources as opposed to utility-scale sources);
- Minimal feed-in-tariffs;
- Overall acceptance of renewable energy (negative public opinion due to media coverage of the failure of subsidized companies); and,

- Tariffs on foreign-made goods, which make it difficult for distributors to offer customers a competitively-priced end product. Further, tariffs may induce foreign manufacturers to establish U.S. manufacturing locations, but if they import parts from overseas, they put U.S. manufacturers who source their parts domestically at a disadvantage.

**Policy and financing are top challenges.** On the whole, firms seem to be preoccupied with policy and financing-related challenges and are less concerned with local or state assets such as workforce needs, logistics/transportation, in-state R&D capacity and renewable energy sources. Although firms indicated in interviews that their industries need more robust and accessible workforce training, they do not see it as a top challenge to growth. In fact, only about 10 percent of firms and economic developers mark this as a top challenge. R&D and logistics/transportation also rank lower in importance among local or state assets. These results suggest that firms should ask economic developers to focus on policy and regulatory outcomes at all levels of government.

## *Economic Development Programs*

***Economic Developers Analyze Workforce, While Firms Want Formalized Plan***




The 2011 survey of economic developers asked what programs EDOs *already* implement. In 2012, IEDC asked firms what *potential* programs would most helpful. This question sheds light on whether EDOs are delivering the most beneficial programs possible in terms of helping renewable energy companies grow. Economic developers were not asked whether they meet with state/local policymakers, since some EDOs, by managing incentive and policy programs, are policymakers themselves.

**A formalized plan is needed.** The results show that the economic development program most commonly implemented is workforce analysis, yet firms' priority is a formal strategic plan to grow renewable energy. As mentioned before, a formal plan can include strategies to meet with utility regulators, policymakers and venture capitalists, as well as conducting workforce analysis. Rather than selecting one strategy above the rest, firms on average most value a comprehensive approach to growing renewable energy. A formal plan also locks in long-term targets for renewable energy growth, which helps provide the policy and regulatory stability that firms seek.

**Some firms not aware of EDOs.** One caveat regarding this question is that firms may not be aware of the services delivered by their EDOs. In fact, many firms indicated in interviews that they are not aware of who their local EDOs are. While some firms may nominally know their EDOs, they only work with EDOs tangentially or not at all. With that said, several firms indicated that they do work closely with EDOs, even on a project-by-project basis.

# VII. CONCLUSION

While it's clear from this research that there is indeed growing collaboration between the renewable energy industry sector and economic development, more is needed. While several RE firms indicated that they work closely with EDOs on a project-by-project basis, there were other firms that indicated in interviews that they are not aware of whom their local EDOs are. This suggests that many firms may be missing out on key assistance that can be provided by EDOs at the local and state levels. More outreach from the economic development community to directly engage with the RE industry will not only support firms but local economic development.

**Incentives.** Further, RE firms expressed their frustrations in interviews that the come-and-go nature of incentives greatly challenges their ability to project demand in the medium term and to make investment decisions. While incentives represent a vastly complex web of policy decisions, which are oftentimes out of the control of EDOs, both RE firms and economic development practitioners would be wise to advocate for more consistent incentive programs targeting RE at the state and local levels. Considerations should also be made toward non-financial incentives - value-added assets that support and attract businesses that are also under the sphere of direct influence of economic developers. For example, as the photovoltaic (PV) industry began to grow in and around San Jose, CA, the city worked to bring Underwriters Laboratory to the community to open the largest commercially focused PV testing and certification facility in North America. The lab not only increases testing capacity for the renewable energy industry but it also enables manufacturers to get UL-Listed PV products to market faster.

**Economic development as a market signal**. Our research shows that RE firms look for a formal strategic plan as guidance from the economic development community. These plans provide the investment signals and policy stability that RE firms seeks as they work to grow their businesses. While our 2011 survey of state economic development organizations revealed a great deal of strategic planning activities geared towards the RE industry, such as workforce analysis and business attraction efforts, the EDOs did not indicate that they prioritized formal strategic plans targeted toward RE growth.

The challenge for EDOs in some regions is that the growth of RE is perceived not only as an opportunity, but also as a threat to the traditional fossil fuel sectors. However, by focusing on the common opportunities and benefits that emerge from the growth of the RE industry and the build-

up of support industries that can grow out of the RE sector, economic development practitioners have mitigated some risks of transitioning the energy economy. As such, developing formal strategic plans at the local and state levels would enable economic development organizations to send a welcoming and more consistent signal to RE firms looking to grow and expand.

# VIII. SURVEY METHODOLOGY

IEDC sent surveys to a stratified random sample of solar and wind firms from listings provided by the Solar Energy Industries Association (SEIA) and the American Wind Energy Association (AWEA). These lists came from the SEIA National Solar Database and the AWEA membership list and Buyer's Guide. In total, 36 solar firms and 38 wind firms responded to the survey. In addition, IEDC deepened quantitative responses by conducting telephone interviews with survey respondents. For biopower, IEDC conducted only one-on-one interviews, due to the lack of a biopower company contact list.

The firms surveyed are located across the nation and represent multiple points along the supply chain. The charts below break down the respondent firms according to their industry class. For the solar industry, these include solar contractors/installers, distributors, manufacturers/suppliers, project developers, and other non-financial firms (such as associations and university research offices). For the wind industry, these include project developers, component suppliers, and wind project operators. A handful of respondents (six solar firms and three wind firms) chose to answer anonymously, so their industry class and location were not ascertained.

**Figure 6: Industry Class Breakdown of Solar Interviews**

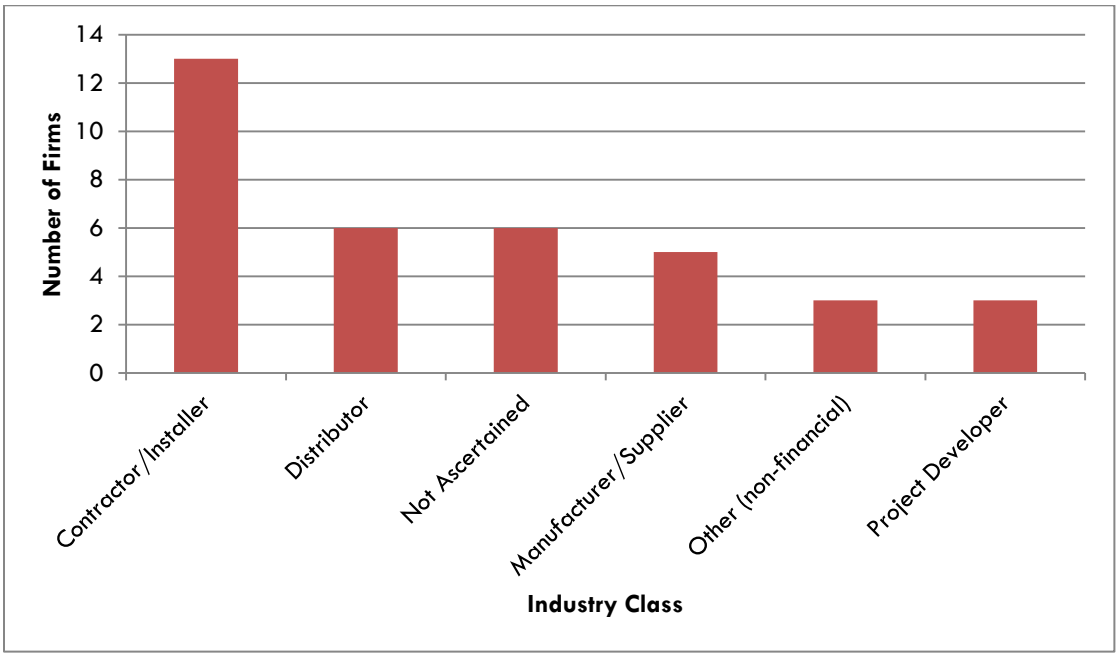


**Figure 7: Industry Class Breakdown of Wind Interviews**

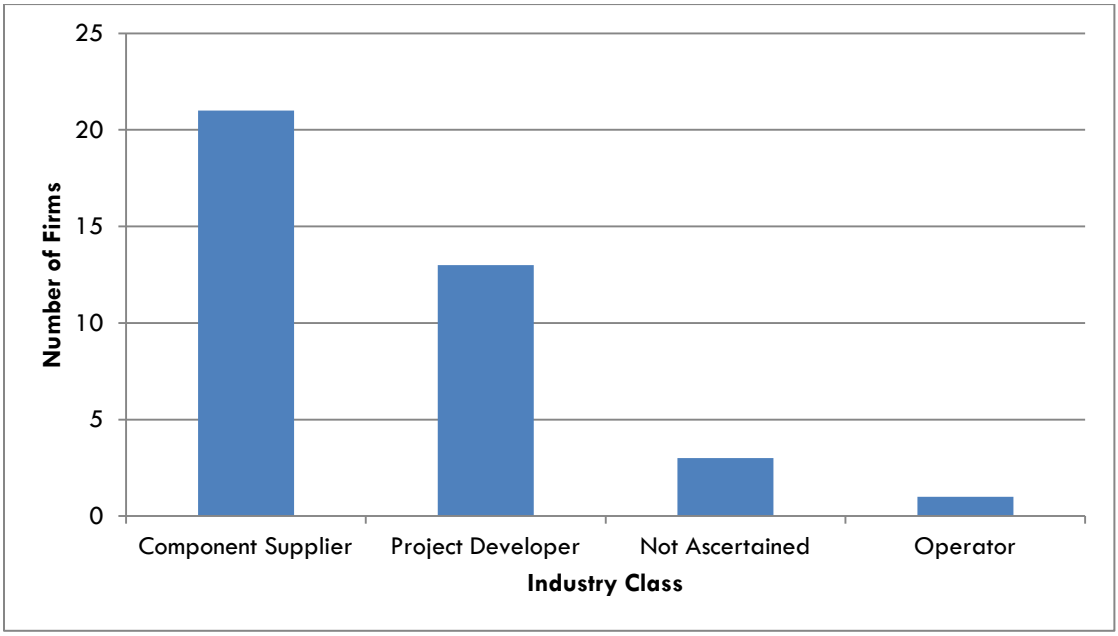
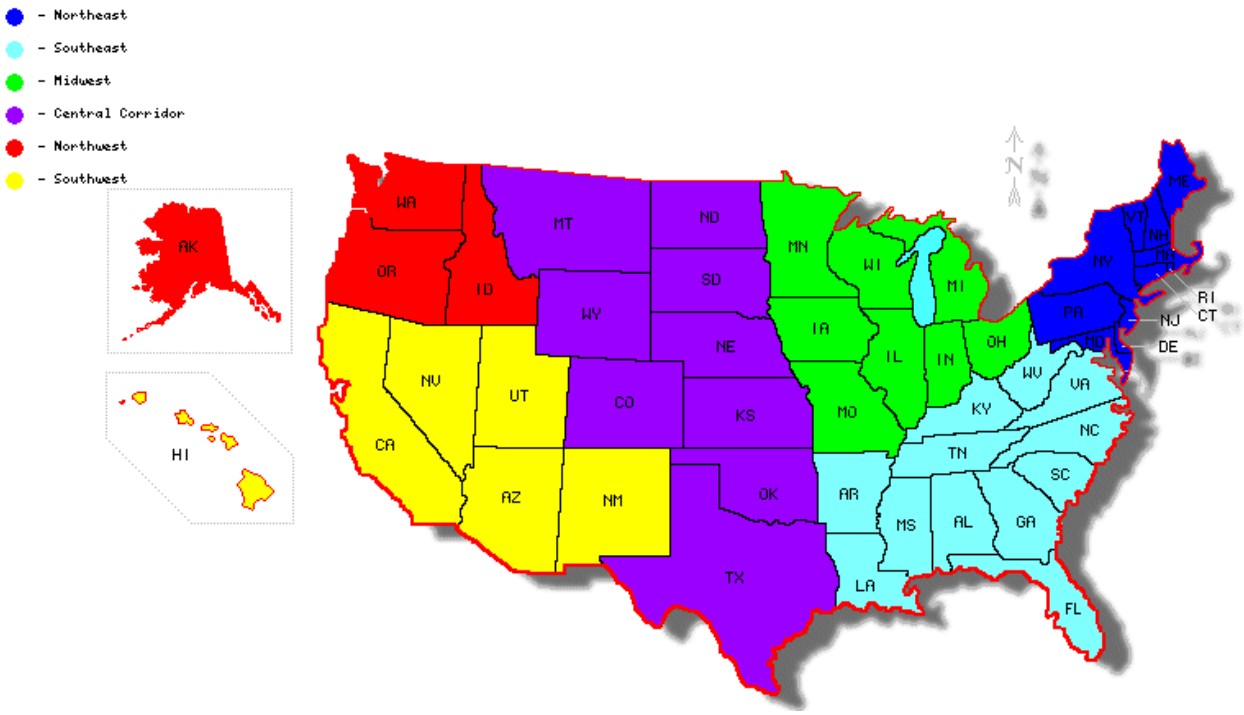



**Figure 8: Geographic Regions Used to Highlight Regional Trends from Survey Findings**



Following the example of IEDC's 2011 "Powering Up" report, firms are further divided into geographic regions by their headquarter location to examine regional trends. Figure 8 maps these regional breakdowns and Table 1 tallies the number of interviews done in each region.

**Table 1: Regional Breakdown of Interviews**

| Region | Solar Interviews | Wind Interviews |
|---|---|---|
| Northeast | 5 | 5 |
| Southeast | 6 | 6 |
| Midwest | 7 | 7 |
| Central Corridor | 3 | 7 |
| Northwest | 4 | 3 |
| Southwest | 5 | 8 |
| Not Ascertained | 6 | 3 |

In casting a broad net both geographically and by industry class, the survey provides rich information that reduces the possibility that aggregate measures are skewed toward one particular region or type of firm.

# IX. CASE STUDIES: FUNDING AND ASSISTANCE FOR RENEWABLE ENERGY FIRMS

In our interviews, a number of firms indicated they could use assistance for workforce training and exporting/importing. This section provides a few case studies of economic development programs at various levels of government that address these needs. Though these programs cannot be replicated everywhere to the same degree, the cases contain helpful strategies that EDOs can implement locally.

## Workforce Development Programs

### *NYSERDA Workforce Development Programs*

New York State Energy Research and Development Authority (NYSERDA) is a public benefit corporation helping the state reduce its energy consumption, increase renewable energy use, and protect its environment. Primarily funded by state rate payers, NYSERDA carries out its mission by conducting energy efficiency and renewable energy programs related to energy use by residents and businesses, economic development strategies, workforce development, research, planning and policy.

Regarding workforce development, NYSERDA contributes millions in funding to clean energy training programs around the state. Its workforce development initiatives include training opportunities, professional certification reimbursements, apprenticeships and internships. NYSERDA carries out a three-pronged approach by engaging workers, businesses and potential businesses in the workforce development process.

***Training Workers***

NYSERDA works with numerous training partners to develop and deliver training to support energy efficiency and renewable energy jobs. Training covers both existing and emerging technologies. Through NYSERDA's network of programs, workers can be trained to install a variety of energy efficiency technologies (e.g. building envelope solutions, mechanical systems) and renewable energy systems (e.g. solar electric, solar hot water, small wind, geothermal.) Its website features a training map that offers quick a glimpse into where NYSERDA training centers

and state career centers are located. In addition to helping develop these training programs, NYSERDA reimburses students for 50% of the cost of certification, including training expenses and exam fees.

***Collaborating with Employers***

NYSERDA also works with employers to establish apprenticeships, internships and certification programs. It provides funds that help support apprenticeship programs registered with the state's Department of Labor, as well as internship programs such as the CUNY Building Performance Lab Intern Energy Program. NYSERDA also supports accreditation of energy efficiency training programs in the state. It provides reimbursement on a first-come, first-served basis to practitioners and to qualified training organizations that are approved by national certification boards. These include:

- PV Company Accreditation by the North American Board of Certified Energy Practitioners (NABCEP);
- NABCEP PV and solar thermal installer certification; and
- Interstate Renewable Energy Council Institute for Sustainable Power Quality (IREC ISPQ) accreditation of qualified energy efficiency and renewable energy training programs.

***Encouraging Entrepreneurship***

NYSERDA offers programs catered to existing and potential business owners in energy efficiency and renewable energy. Specifically, it targets builders/contractors, installers, retailers and manufacturers. NYSERDA offers incentives, branding and marketing assistance to these businesses. Further, it allows wind and solar installers and green building professionals to apply to become "eligible installers" and technicians in its Green Residential Building Program. These individuals can then serve customers who benefit from the state's incentive program for renewable energy and energy efficiency installations.

## *Greater Phoenix Economic Council Leads Arizona to Success in Solar*

In just one decade, Arizona has become a national leader in solar energy production. This industry is supported by a state tax credit, available financing, and a coordinating program with local universities. These amenities have attracted 12 new companies, $621,700,000 in investment and 1,714 jobs.[16] The story of how Arizona rose to prominence in the solar industry proves that local economic development organizations can and should take a lead role in influencing state policies critical to stimulating emerging industries that hold promise for economic growth. The Greater

Phoenix Economic Council demonstrated the importance of engaging with state economic development policy through two vital roles. First, they leveraged their skills in economic and industry analysis to provide expert advice and guidance to policy makers in the Arizona legislature crafting job creation legislation. Second, they served as a community and industry liaison, developing beneficial connections with local leaders and businesspeople as well as leading institutions like universities. Furthermore, through marketing and educational efforts, GPEC engaged domestic and international solar companies. The case of GPEC taking a lead role in the development of Arizona's solar industry illustrates that local economic development agencies are not only capable of assisting in state-level economic development initiatives, but that local EDOs' unique skills and networks place them in the best position to influence industry development at a state level.

The Greater Phoenix Economic Council is a regional economic development organization founded in 1989. Structured as a public-private partnership, it represents Maricopa County, as well as 20 communities in the region, and more than 150 private investors. Their mission is to attract quality businesses to the Greater Phoenix region from around the world, and to advocate and champion foundational efforts to improve the region's competitiveness. To assist companies in expanding or relocating, they provide a variety of services including market analysis, site-selection assistance, and connections to key community and business leaders.[17] They are consistently recognized as one of the top economic development organizations in the United States, gaining accolades from site consultant groups as well as IEDC.

In the late 2000's GPEC leadership heard the rumblings of a vibrant solar industry from far away. In their peer states of California, Oregon, New Mexico, and Nevada, state economic development organizations and venture capitalists were investing in the next energy revolution. However, Arizona was not yet in the game. For example, in 2007, Tempe-based company First Solar announced that, rather than expanding in their home state, they would build a new manufacturing plant in Malaysia.[18] GPEC was frustrated to see valuable jobs and investment in the solar industry bypass their state. As a result, they launched an investigation as to why solar companies did not find doing business in a place with an average of 286 sunny days per year competitive. This investigation was the first step in a successful program of business retention and attraction for solar and renewable energy in Arizona, lead by GPEC but engaged at state legislative levels and beyond.

GPEC looked to their recently completed Economic Impact Analysis and Competitive Analysis which showed that financing was one of the largest hurdles to solar companies locating in Arizona. Oregon, New Mexico, Texas, Nevada and other states had been using aggressive economic development initiative packages to recruit solar industry. This was causing Arizona to lose out on more than 3,800 manufacturing jobs and $2.3 billion in capital investments to competitor markets.[19] To round out their efforts in researching the industry, GPEC also reached out to market leaders, including First Solar, to gauge the state's competitive position.[20]

**GPEC Enters the Policy Realm**

Leaders in the state legislature had become aware of the expanding renewable energy market as well. In September of 2007, then Arizona House Representative Lucy Mason invited GPEC to an off-session energy stakeholder meeting. In November, they were contacted by then Representative John Nelson to discuss successful quality jobs programs in other states with his colleagues in the Arizona Legislature. As a result of these meetings, GPEC was drawn into the policy recommendation process.

In meetings with Rep Mason and Rep Nelson, GPEC expanded the role of an economic development organization by becoming the key architects of a renewable policy that could gain supporters across the political spectrum. Due to their recently completed studies and their extensive research of competing states' policies and solar company needs, they were able to craft a competitive tax credit incentive that would deliver a net gain to the state. Their political partners joined them in a policy position that would support return-driven programs to enhance competitiveness and lead to quality jobs with health-care coverage. The key to this strategy was to balance the need to meet the aggressive incentive levels in competitor states with the need to provide a net financial gain for Arizona in the form of jobs and capital investment. Due to extensive research of the industry, GPEC was able to tailor the policy to the specific concerns of solar companies, meeting their needs in ways that other states did not.[21] Furthermore, they ensured financial returns for the state of Arizona through stringent claw back measures, guaranteeing that the state's investment would not be squandered.

In April of 2008, the group approached then House Speaker Jim Weiers with a renewable energy tax credit program to capture opportunities for Arizona. The tax credit was included in Speaker Weier's job creation package, introduced in June of 2008. In the legislative debate, national site selectors, incentives advisors, and economists testified in favor of the bill. For example, Incentives Advisors presented their analysis of the package, concluding that the

program would "position Arizona as one of the most competitive locations" to attract the renewable energy industry.[22] Ultimately, the bill was introduced too late in the session to complete the legislative process. However, GPEC decided to build on the momentum with the hopes of successfully passing the bill in the 2009 legislative session.

In this effort, two objectives emerged; first, the engagement of solar companies internationally and domestically, and second, a public relations campaign to reach business leaders and community stakeholders. In 2008, GPEC became the only U.S. economic development organization to join Bundersverband Solarwirtschaft (BSW), the German solar industry association, and also launched a direct marketing campaign reaching 600 German solar companies. In late 2008 GPEC solidified ties with old and new allies in the legislature, as well as marketed their state by bringing 15 executives from top solar companies to the region for a familiarization tour.

The public relations campaign coincided with the introduction of the bill into the legislature in January of 2009. GPEC ramped up their public relations efforts, holding a series of "Convening the Community" events. The first was an event in April of 2009 attended by 800 people and featuring Governor Jan Brewer, House Speaker Kirk Adams, and GPEC leadership. The second event, in May, was a live video stream on GPEC's website emphasizing policy improvements to drive job creation and increase revenues for the state. This was followed by a third event broadcast on local television with panelists from national economic development firms, the Mayor of Phoenix, Phil Gordon, leadership from Arizona State University, and leadership from GPEC, which had a viewership of more than 15,500.

Early in the next legislative session, Senator Barbara Leff and Representative Michelle Reagan introduced SB1403: Quality Jobs through Renewable Energy Industries (RETIP), which included the Arizona Renewable Energy Tax Incentive Program refundable corporate income tax credit tied to jobs-to-investment ratio and a property tax reclassification. The program is designed to stimulate new investments in manufacturing and headquarter operations of in-state and out-of-state renewable energy companies, including solar, wind, biopower, geothermal, and other renewable technologies.[23] The benefits include a refundable corporate income tax credit and a real and personal property tax reduction. Businesses making new investments in manufacturing and/or headquarter operations in Arizona in renewable energy industries are eligible for the program if they meet two requirements. First, 51% of new jobs must pay a wage that is equal to or exceeds

125% of the state's median wage. Second, the firm must offer health coverage and pay 80% or more of the premium for the employee or equivalent for alternative models.

The refundable corporate income tax credit is structured to benefit both the state and the company. The company can receive up to 10% of the total capital investment of the project, which is defined as investment in facilities, equipment, land, and infrastructure. The credit must be taken in equal installments over five years. The amount of the tax credit is determined by a job to capital investment ratio, which differs according to the type of project. The tables explain the difference, and detail the reduced benefit scenario.

| TYPE | CRITERIA | PROJECT EXAMPLE | CACULATION |
|---|---|---|---|
| Manufacturing | Creates at least 1.5 jobs per $500,000 in capital investment | • $150M in capital investment<br>• 1,273 jobs | $150M x 10% = $15M |
| Headquarter | Creates at least 1 job per $200,000 in capital investment | • $10M in capital investment<br>• 50 jobs | $10M x 10% = $1M |

b. If the project does not meet the above job-to-capital investment ratio, the company would receive a reduced benefit as follows:

| TYPE | CRITERIA | PROJECT EXAMPLE | CACULATION |
|---|---|---|---|
| Manufacturing | Creates at least 1.5 jobs per $500,000 in capital investment | • $150M in capital investment<br>• 150 jobs | $150 x $500,000 / 1.5 = $50M x 10% = $5M |
| Headquarter | Creates at least 1 job per $200,000 in capital investment | • $10M in capital investment<br>• 35 jobs | $35M x $200,000 / 1 = $7M x 10% = $700,000 |

*Figure 9: From Renewable Energy Tax Incentive, Greater Phoenix Economic Council, 2011*

For projects with a minimum of $25 million in capital investment, a real and personal property tax reclassification is available, which effectively constitutes a 77% reduction. The period of reclassification is based on wage levels. If a project pays 51% of employees between 125% and 199% of the median state wage on average, the classification would exist for 10 years. If the project pays 51% of employees at least 200% of the median state wage on average, the reclassification would exist for 15 years.

There is a program cap for the income tax credit portion. The program is effective until December 31, 2014, which makes the cap $350 over five years. Additionally, the state of Arizona may pre-approve $70 million in benefits per year. Due to the generous structure of the incentives, strong clawback provisions exist. If a firm chooses to leave before five years, any benefits received must

be returned in full with annual interest. Furthermore, if the firm's employment figures drop below the required number of full-time employees or established wage levels, all future benefits cease.[24]

In the 2012 legislative session, GPEC worked with their legislative partners and the Arizona Commerce Authority to add legislation to the original Quality Jobs Through Renewable Energy Industries (RETIP) legislation to expand the tax credit to other high technology manufacturing and qualified renewable companies interested in locating a headquarters or research and development arm in Arizona. This is known as the Qualified Facilities Tax Credit and is structured the same as the RETIP. In the 2013 legislative session, GPEC will be supporting a bill to allow any high tech or renewable energy manufacturer to have a 10% property tax abatement.[25] They are continuing to build on the success of previous tax incentives and reviewing what high tech and renewable companies most value, while ensuring that the program results in a net gain for Arizona. Chris Camacho of GPEC explains, "The early education we provided to legislators on the importance of base industries (exporting products and services) allowed the pilot program to expand and support high tech manufacturing with investment tax credits."[26]

**Following Through on International Front**

When researching solar industries in the early 2000s, GPEC had identified many emerging companies in Western Europe, most notably in Spain, Germany, and Italy. Though this market was identified as an opportunity, at that time, Arizona's capacity to attract, invest and utilize capital, and compete globally was not as strong as other markets of their size, mainly due to a lack of financial incentives. During the same time period, GPEC was expanding their international efforts with a newly formed partnership with Tucson Regional Economic Opportunities and the Greater Flagstaff Economic Council, known as the Arizona Global Network. This statewide venture to attract foreign direct investment created a foundation for further marketing to international markets. As GPEC expanded their efforts in attracting the solar industry, they built off the momentum created by the Arizona Global Network.

Following passage of the Quality Jobs through Renewable Energy Industries bill, GPEC ramped up its international and domestic marketing efforts. In October of 2009, GPEC traveled to Germany on a trade mission, and met with 50 renewable energy companies. Further international forays include a trip in September of 2010 to attend a photovoltaic conference in Spain, and a trip in February of 2011 with the Arizona Commerce Authority and Arizona State University to Shanghai to meet with top government officials and corporate leaders, and attend SNEC, an

international solar industry conference. This was followed by GPEC hosting a delegation from Jiangsu Province to discuss renewable energy opportunities and agree to take first steps toward developing a memorandum of understanding between the two regions. Domestically, GPEC has focused their energy on providing information about their competitive incentive program and qualified workforce to solar companies currently located in California, attending the Inter-Solar and Solar Power International conferences in 2009, and holding ongoing meetings with domestic solar companies.

**Making Solar Companies Welcome**

Part of making Arizona the top state for the solar industry was to ensure a dependable local market. Impacting Arizona's Renewable Energy Standard was one way to show a commitment to solar. Renewable Energy Standards are regulations which place an obligation on electricity supply companies to produce a specified fraction of their electricity from renewable energy sources. Arizona's RES targets the goal of renewables composing 15% of its total energy portfolio by 2025.[27] Prior to marketing the state to solar companies abroad, GPEC worked to increase the amount of solar included in the Renewable Energy Standard, resulting in one of the highest solar requirements in the nation.[28] This was shared with executives at solar companies to highlight the upcoming need for renewable energy.

Aside from legislative work, and international and public relations campaigns, GPEC worked hard to make the state a hospitable place for solar power companies to locate through overcoming roadblocks in financing, and ensuring a local market for solar products. Although solar companies received financial assistance through the tax credit, there was a challenge in how to financially incentivize local homeowners and businesses to create a market for renewable in Arizona. The model used in California and elsewhere was PACE, or Property Assessed Clean Energy. In PACE programs, municipal governments offer a specific bond to investors and then loan the money to consumers and businesses to put towards an energy retrofit. Though successful in other places, this program had fallen out of favor due to Fannie May and Freddie Mac refusing to back mortgages with PACE loans. Not to be discouraged, GPEC worked with the National Bank of Arizona to develop effective alternative financing.[29] State tax credits are also available for installation and production of solar panels. Furthermore, to meet RES, utilities offer rebates and performance-based incentives to residents and businesses.

**Partnering with Community Organizations**

When investigating the possibility of a solar industry in the late 2000s, GPEC drew on the support and expertise of community organizations that were already aligned with advanced science and technology. The Science Foundation of Arizona and Arizona State University worked with GPEC to develop programs that encouraged innovation and entrepreneurial activity, such as an initiative at ASU to provide lab space for students to work with science based firms. Furthermore, the ASU and GPEC partnership lead to a joint venture between ASU and Germany-based TUV Rhineland Group to test and certify photovoltaic devices.

**Outcome: A Big Win in Mesa**

The biggest success story to come out of GPEC's solar initiative was turning the tide for First Solar to return jobs back to the United States and Arizona. This was achieved through a combination of teamwork and preparedness. In August of 2010, a site selection firm contacted GPEC regarding a renewable energy project. GPEC responded to the request for information with an overview of state inventive programs and site specific information from several cities. GPEC worked with APS and Salt River Project, two of the state's largest utility providers, to identify industrial sites. The company selected a site in Mesa, but it was not available. Luckily, the city laid the groundwork for industrial investment, previously completing a comprehensive master plan to provide increased zoning of manufacturing, industrial, and employment districts. A large landowner in Mesa, who was also a partner with GPEC, was able to provide a replacement site.[30]

The project was revealed to be a technology campus for First Solar. As the First Solar team conducted due diligence on the site, GPEC partners Intel and Boeing testified to the availability of a skilled workforce in the region, while ASU highlighted their engineering program and workforce training through the community college system. The project qualified for the Renewable Energy Tax Incentive, and in March of 2011, First Solar publically announced its future technology campus in Mesa, with a potential employment of 4,800 people.[31]

Recent shifts in the solar industry have delayed First Solar's production plans. It recently moved its global operations center to the Mesa site and currently employs 110 workers there.[32] Since production is yet to begin, First Solar is leasing half the site until solar market tides turn.[33]

**Conclusion**

GPEC lead Arizona's journey to economic success in the solar energy field with a combination of market knowledge and strategic partnering. They had the advantage of a strong existing

framework for economic development through programs such as the Arizona Global Network and strong partners like the City of Mesa. Additionally, through their continued observation of the national economic climate, they had the perceptiveness to identify solar energy as a target industry during a time of tremendous growth for the field. Through utilizing the existing resources available in the form of a capable workforce and a suitable climate, and gaining a deep knowledge of the solar industry's needs and their competitors in the solar arena, GPEC was able to grow a world class solar industry cluster. Their role in this process was twofold; first, their market knowledge was essential in crafting effective legislation, second, they served as a pivot point connecting organizations on an international and state level. Their dual function is shown in the diagram in Figure 2.

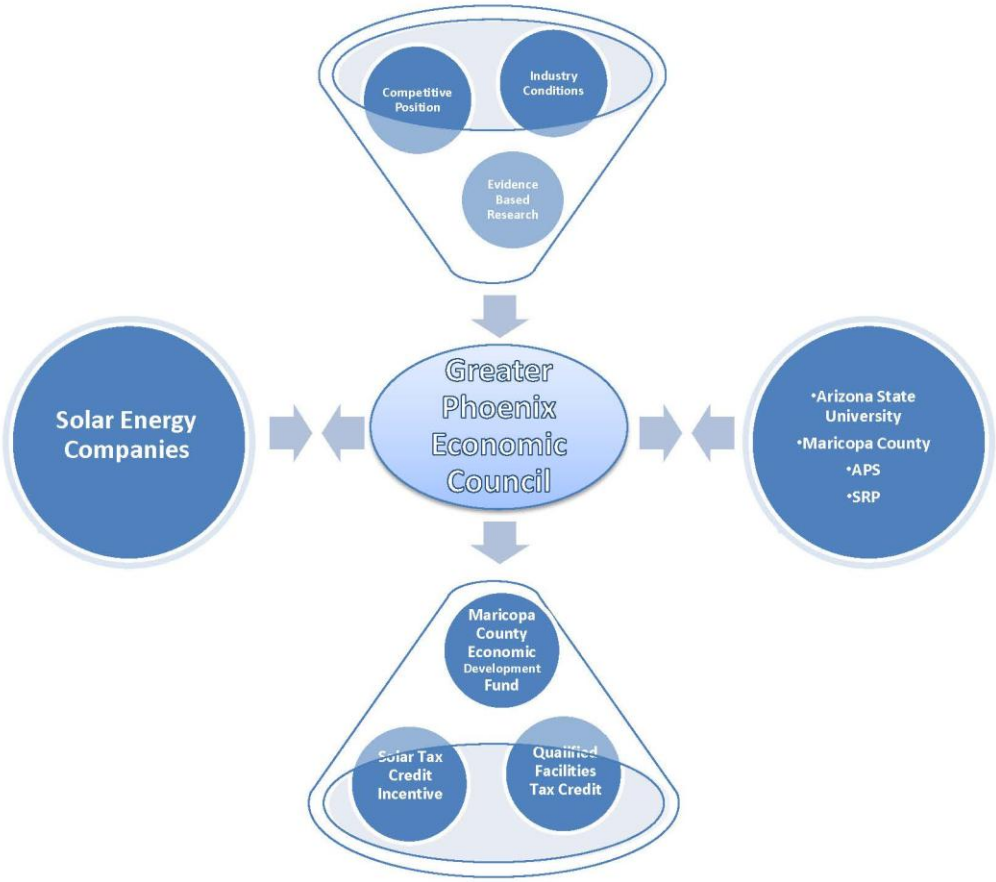



*Figure 10: GPEC's Leadership Position*

Figure 11 presents an analysis of the time and energy GPEC spent on each part of the effort. The majority of the organization's time and energy went to researching. When GPEC leaders realized Arizona was being bypassed by other, more competitive states, they launched a full-scale analysis of the best way to recruit solar companies while ensuring a net gain for the state. With the help of national experts, they took an evidence-based approach, analyzing industry conditions to determine how and why companies made decisions. They served in the role of expert policy advisor and legislation architect helping to craft a tax credit that impacted solar companies where they needed it most.

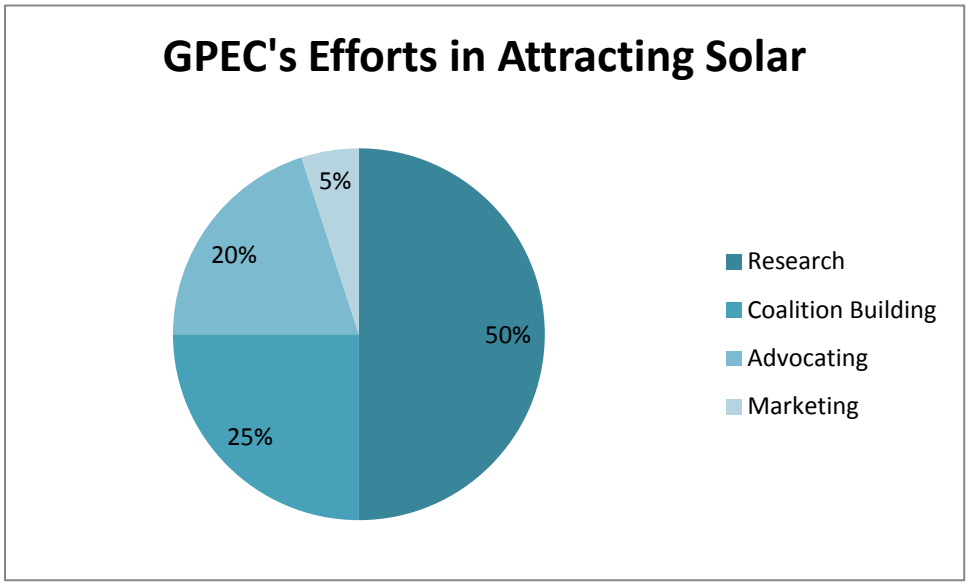



*Figure 11: GPEC's Efforts in Attracting Solar*

The area where GPEC concentrated about one fourth of their efforts was in building a strong coalition of state elected officials, representatives from complementary economic development organizations, community partners, public utilities, and local government. Chris Camacho of GPEC noted that mayoral level leadership was a very important piece of this coalition, especially from Mayor Scott Smith of Mesa.[34]

About the same amount of their efforts was spent advocating for the industry and the programs to support it. Using their analysis, they were able to show the return on investment from RETIP, convincing the community and the industry of the validity of a solar cluster. This extended into their marketing efforts, domestically and internationally.

## Export Initiatives

### *Federal Renewable Energy and Energy Efficiency Export Initiative*

The Renewable Energy and Energy Efficiency (RE&EE) Export Initiative is the federal government's first-ever coordinated effort to support the promotion, research, development and adoption of renewable energy and energy efficiency exports. The Initiative is a step toward increasing RE&EE exports during the next five years, helping to meet the goals of the National Export Initiative and President Obama's challenge to become the leading exporter of clean energy technologies. The Initiative encompasses 23 interagency export strategies by eight federal agencies:

- Department of Commerce
- Department of Energy
- U.S. Trade Representative
- State Department
- U.S. Trade and Development Agency
- Export-Import Bank of the United States
- Overseas Private Investment Corporation
- U.S. Department of Agriculture

These agencies collaborated to identify a framework that would unite each agency's RE&EE export promotion efforts. They identified four broad priorities:

1) Tailor financing to RE&EE companies
2) Improve market access
3) Enhance information and trade promotion efforts to link buyers and sellers
4) Strengthen U.S. government services

**Tailored Financing**

The Initiative aims to launch new financing and investment mechanisms for RE&EE projects and to streamline review processes for all financing transactions. For example, the Overseas Private Investment Corporation (OPIC) will invest an additional $300 million in financing for RE&EE projects in emerging markets and offer new products for subordinated debt financing and clean energy technology equipment leasing. Both OPIC and the Export-Import Bank will also create "fast-track" programs that streamline financing applications.

**Improve Market Access**

Domestic RE&EE companies face a host of foreign trade barriers, including tariffs and government-subsidized foreign companies. One action step is the formation of a new subcommittee at the Office of the U.S. Trade Representative to address market access barriers facing the U.S. RE&EE industry in foreign markets. The U.S. Trade and Development Agency will also lead RE&EE trade policy missions into countries with high potential export markets.

**Enhance Information and Trade Promotion Efforts**

To link buyers and sellers, the Initiative seeks to improve U.S. exporters' knowledge of foreign markets and foreign buyers' knowledge of U.S. RE&EE goods. The Department of Commerce will rate foreign markets by their potential for U.S. RE&EE exports. This assessment will include new technologies as well – the U.S. Department of Agriculture will discuss the growth of the biomass wood pellets industry in its annual report. To market domestic technologies to foreign markets, the Initiative commissions the creation of foreign buyer guides for domestic RE&EE technologies.

**Strengthen U.S. Government Services**

The eight agencies brainstormed what new programs would provide most value and sought ways to extend or streamline existing services. The Department of Commerce created a new advisory committee that will include RE&EE industry representatives to directly advise the Secretary of Commerce on competitiveness issues. To better market government services to RE&EE companies, the Department of Commerce will also host a web portal on www.export.gov that serves as a clearinghouse of information on government programs, market information, recent news, and upcoming trade promotion events. The eight agencies also vowed to collaborate on future trade missions (such as sharing booth space at trade shows) to reduce waste and improve efficiency.

### *Greater Portland's Metropolitan Export Plan*

The Brookings Institution has partnered with the Rockefeller Foundation to implement the Project on State and Metropolitan Innovation. One part of the project is the Metropolitan Export Initiative (MEI), which seeks to help metros improve their exports using innovative, low-carbon and fiscally-responsible policies and strategies.[35] Greater Portland was one metro assisted by the project. Portland is the nation's 23rd largest metro economy and the largest economic engine in the state, comprising 67 percent of Oregon's economy.[36] Exports are a significant portion of Greater Portland's economic activity, generating 142,270 jobs, or about one-fifth of the local economy.[37]

Further, Portland boasts a well-known clean tech sector, but existing export initiatives did not include strategies to grow exports in this industry.

To align Greater Portland's export initiatives and existing clean-tech strengths, Brookings conducted a three-stage strategic assessment:

1) Market Assessment
2) Export Plan
3) Policy Memo

**Market Assessment**

The market assessment is an inward evaluation of local exports strengths and weaknesses, as well as an outward comparison with peer cities. To conduct this assessment, Brookings surveyed 268 local companies and interviewed 40 firms one-on-one. The market assessment helps illuminate the current state of Greater Portland's export industry, including impacts of the recession, major players, programming alignment and quality of the export services system. For example, one key finding was that 10 local industries accounted for 90 percent of Greater Portland's exports in 2010. The top exporting industry, computer and electronic products, accounted for 57 percent of exports in 2010.[38]

A market assessment also can shed light on gaps in economic development programming. Greater Portland's economic development strategies did not incorporate export initiatives into plans to grow identified cluster industries, such as clean tech and software. Many small and mid-sized companies do not know how to navigate the process of exporting, and thus view it as too risky. This highlights another finding: Greater Portland's export services system is a good resource, but firms are often not aware of the services available to them.

**Export Plan**

Greater Portland set a target to double exports within five years. Its Metropolitan Export Plan includes four strategies built on findings and gaps highlighted from the Market Assessment:[39]

1) "*Leverage primary exporters in computer and electronics*." Computers and electronics are Greater Portland's largest exporting industry. The Export Plan devised five economic development strategies to leverage this industry:
    a. Establish an economic development team dedicated to maintaining the region's location advantage for this industry;
    b. Integrate the supply chain to increase secondary exports;

c. Recruit companies to fill any supply chain gaps;
d. Reduce export leakage by directing maximum trade to metro ports;
e. Tailor incentives to spin-off and startup firms in this industry.

2) "*Catalyze under-exporters in manufacturing*." Greater Portland's second largest exporting industry is heavy manufacturing, but many industry firms do not have an export strategy. This includes renewable energy manufacturing firms. Economic developers can help spur exports in this industry by:
    a. Identifying 10 mid-sized to large firms with high potential for and interest in export growth;
    b. Providing market analysis to these firms to penetrate new markets;
    c. Continually providing advice and advocacy on government resources, financing and other information;
    d. Creating a mentorship program between these firms and local top exporters; and
    e. Aligning R&D efforts with export opportunities.

3) "*Improve the export pipeline for small businesses*." Small and mid-size businesses can be reticent about exporting due to lack of knowledge or resources to navigate the process. Economic developers can help these firms by:
    a. Developing a web portal that provides information on programs, financing, and other export resources;
    b. Training economic developers in export promotion, especially those working in business retention and expansion;
    c. Offering one-on-one consulting and peer mentoring regarding the export process;
    d. Establishing an export accelerator for high-growth companies.

4) "'*We Build Green Cities*' – brand and market Greater Portland's global edge." Greater Portland is renowned for its sustainability efforts, and can build on this to promote exports by:
    a. Conducting a "We Build Green Cities" campaign to promote exports by local clean-tech companies;
    b. Considering similar campaigns for other industry clusters;
    c. Expanding marketing efforts abroad (e.g. placement in foreign search engines); and
    d. Incorporating target brands into tourism and education.

These strategies are led by Greater Portland Inc. with assistance from a working group comprised of other local economic development organizations (e.g., Portland Development Commission, Metro Regional Government, Port of Portland, Portland State University, Columbia River Economic

Development Council, and Portland Business Alliance.) The group also includes state and federal groups, such as the U.S. Export Assistance Center and Business Oregon. Estimated program funding is $200,000 annually for three years, and is primarily delivered through in-kind contributions by partner agencies. To measure progress, the group will track a wide range of metrics, such as export value, export jobs, number of new local exporters, use of port facilities, and integration of export activities into economic development programming.

**Policy**

Inconsistent tax policies, prohibitive regulations or regulatory processes, and unwieldy transportation structures are examples of policies (and their impacts) that can impede export growth. Greater Portland's Metropolitan Export Plan includes federal, state and local policy initiatives to pave a way for export growth:[40]

- *Federal Policies*
  - Align federal export funding and programs to support the export initiative, such as Economic Development Administration grants;
  - Work with the Export-Import Bank of the U.S. to coordinate incentives for commercial banks to lend to exporters;
  - Improve funding for federal trade programs, such as the U.S. Export Assistance Center;
  - Improve access to federal data on market growth;
  - Advocate on urgent federal trade policy topics, such as intellectual property and clean tech subsidies;
  - Support measures to streamline visa processes; and
  - Support a national freight strategy, including urban freight and the "last mile."
- *State/Local Policies*
  - Align state and local taxes for a unified export strategy;
  - Streamline land use and transportation policies with export growth, such as designated "export zones;"
  - Coordinate local, state and regional freight policy;
  - Maintain and expand export resources such as foreign trade offices and ConnectOregon (ConnectOregon houses the state's Multimodal Transportation Fund, which invests in non-highway transportation infrastructure projects that promote economic development); and
  - Create an export culture through education and marketing on the importance of exports to the local economy.

## References


[1] Ibid.
[2] Thorstensen, L., McHugh, P., & Chen, J. (2011). Powering Up: Assets and Barriers to Renewable Energy Growth. International Economic Development Council. Retrieved from http://www.iedconline.org/clientuploads/Downloads/edrp/IEDC_Powering_Up.pdf
[3] 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.
[4] U.S. Energy Information Administration. (2012, June 26). What is U.S. electricity generation by energy source? U.S. Department of Energy. Retrieved from http://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3
[5] Ibid.
[6] Office of Energy Projects. (2012, December). Energy Infrastructure Update. Federal Energy Regulatory Commission. Retrieved from http://www.ferc.gov/legal/staff-reports/dec-2012-energy-infrastructure.pdf
[7] Solar Energy Industries Association. (2013, March 12). Solar Energy Facts: 2012 Year-in-Review. Retrieved from http://www.seia.org/sites/default/files/Q4%20SMI%20Fact%20Sheet%20-FINAL.pdf
[8] Ibid
[9] Ibid
[10] The Solar Foundation. (2012, November). National Solar Jobs Census 2012. Retrieved from http://thesolarfoundation.org/sites/thesolarfoundation.org/files/TSF%20Solar%20Jobs%20Census%202012%20Final.pdf
[11] Seel, J., Barbose, G., & Wiser, R. (2012, September). Why Are Residential PV Prices in Germany So Much Lower Than in the United States? [Powerpoint]. Lawrence Berkeley National Laboratory. Retrieved from http://rael.berkeley.edu/sites/default/files/lbnl-german-price-presentation-final.pdf
[12] DSIRE. (2013, March). Renewable Portfolio Standard Policies with Solar/Distributed Generation Provisions. Retrieved from http://www.dsireusa.org/documents/summarymaps/Solar_DG_RPS_map.pdf
[13] Kind, P. (2013, January). Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business. Retrieved from http://www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf
[14] American Wind Energy Association. (2013). AWEA U.S. Wind Industry Annual Market Report. Retrieved from http://www.awea.org/suite/upload/AWEA_USWindIndustryAnnualMarketReport2012_ExecutiveSummary.pdf
[15] Ibid.
[16] Greater Phoenix Economic Council, Renewable Companies Since 1403, Power Point Presentation.
[17] Greater Phoenix Economic Council Website http://www.gpec.org/home , 2013.
[18] The Art of a Deal: First Solar in Arizona, Greater Phoenix Economic Council, 2011.
[19] The Art of a Deal: First Solar in Arizona, Greater Phoenix Economic Council, 2011.
[20] Ibid.
[21] Interview with Chris Camacho, March 1, 2013.
[22] The Art of a Deal: First Solar in Arizona, Greater Phoenix Economic Council, 2011.
[23] Ibid.
[24] Renewable Energy Tax Incentive, Greater Phoenix Economic Council, 2011.
[25] Interview with Chris Camacho, March 1, 2013.
[26] Ibid.
[27] Renewable Energy in Greater Phoenix, Greater Phoenix Economic Council, 2012.
[28] Interview with Chris Camacho, March 1, 2013.
[29] Arizona Success Story: Developing a Renewable Energy Value Proposition, Chris Camacho, 2011.
[30] The Art of a Deal: First Solar in Arizona, Greater Phoenix Economic Council, 2011
[31] Ibid.
[32] Randazzo, R. & Nelson, G. (2012, October 18). First Solar to lease half of new Mesa factory. The Republic. Retrieved from http://www.azcentral.com/business/news/articles/20121018first-solar-lease-half-new-factory.html
[33] Ibid.

[34] Interview with Chris Camacho, March 1, 2013.
[35] The Brookings Institution. (2013). About the Brookings-Rockefeller Project on State and Metropolitan Innovation. The Brookings Institution. Retrieved from http://www.brookings.edu/about/projects/state-metro-innovation/about
[36] Brookings. (2012). Greater Portland Export Plan. Retrieved from http://www.brookings.edu/about/projects/state-metro-innovation/~/media/3254D79E5E4A4408B2BECA2DD2577BB4.PDF
[37] Ibid.
[38] Ibid.
[39] Ibid.
[40] Brookings Institution. (2012). MEI Policy Memo. Retrieved from http://s3.amazonaws.com/gpi-assets/uploaded_media/6/original.pdf