Spurring Local Economic Development with Clean Energy Investments: Lessons from the Field

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Executive Summary

Community-based efforts to improve energy efficiency or generate renewable energy can benefit a local economy in much the same way as other development activities. Referred to in this paper as "clean energy investments," these initiatives can result in a range of economic benefits, including:

- New jobs
- Energy cost savings
- Increased certainty for energy prices and supply
- Improved local business competitiveness
- Higher property values
- Local market and industrial development
- Marketing and branding opportunities for the community

In turn, these benefits can also lead to many positive secondary effects, such as potential expanded sales and employment gains associated with local businesses lowering their energy costs, as well as multiplier effects of recirculating more local income due to reduced household utility bills.

Furthermore, unlike financial incentive programs and speculative infrastructure investments that depend on potential but unclear economic growth impacts, many clean energy investments produce immediate economic returns to localities—and thus can be attractive options for local economic development organizations. Unfortunately, too often, clean energy and economic development investments are considered as separate or, worse, competing interests.

This paper is an introduction to the link between the two – how clean energy investments can be used to spur local economic development. The objective of the paper is the help local and state leaders recognize the often overlooked returns on investment from clean energy initiatives and to understand the factors that shape these local economic impacts. To illustrate the investments local governments and community organizations can pursue, as well as the returns they may enjoy, we offer examples of successful clean energy efforts. Cases include:

- Identification of energy sector supply chains and business development to meet such demands (Newton, IA)
- Community-wide energy efficiency initiatives (Babylon, NY)
- Energy investments that lower local public sector operating costs while generating publicity to promote new economic activity (Rifle, CO)
- Efforts to stimulate renewable energy production (Lackawanna, NY)

Local and state leaders can use this information to both more comprehensively evaluate the potential impacts of proposed clean energy investments, as well as to consider whether clean energy investment might be a strategy they wish to pursue under broader economic development planning. Suggested resources for next steps are also provided at the end of the paper.

I. Introduction

Community-based efforts to improve energy efficiency or to generate renewable energy (referred to throughout this paper as "clean energy investments") can benefit a local economy in much the same way as other development activities.

In fact, once they are funded, some clean energy investments can have positive economic effects that offer more certainty of success than traditional development initiatives. For example:

- Development-based road improvements or sewer enhancements impose immediate costs to a community that will show no positive economic effects unless and until businesses move in or expand as a result. In contrast, installing photovoltaic (PV) panels on the rooftops of public buildings can automatically and immediately generate revenue, either from the sale of the power to a local utility or from a reduction in the cost of power relative to that bought from a utility.
- Similarly, the impact of setting money aside for financial incentives to attract businesses is far from guaranteed – it depends on businesses actually being responsive to those initiatives. Meanwhile, if that money was invested in energy efficiency investments for city buildings through an energy savings performance contract (ESPC), the community is provided a guaranteed return – reduced energy consumption and lower costs to taxpayers.

This is not to suggest that communities shouldn't pursue more traditional economic development activities, but simply to emphasize that ***clean energy investments can lead not only to positive environmental impacts but economic ones as well.*** Too often these economic benefits are ignored, which can put clean energy initiatives at a disadvantage when they are competing for a community's limited funding and support. Further, a failure to recognize the positive economic impacts of energy efficiency and renewable energy can put a community at a disadvantage, if they are developing a strategy for economic development and overlook clean energy investment as a possible option. ***The following section reviews the range of possible economic development returns from clean energy investments and how they may vary by the type of initiative a community might pursue.***

Recognizing & Understanding the Potential Economic Returns on Investment

A community may enjoy a wide range of economic benefits as a result of clean energy investments. However, it is important to remember that not every clean energy investment will lead to the same outcomes. Energy efficiency investments may lead to different types of returns than those for renewable energy, and investments made in the same types of clean energy programs will lead to varying economic impacts across different jurisdictions. Consider:

- **Jobs** – This effect is obvious and is seemingly the one most important to the largest number of people in a community. But not all jobs are equal, even ignoring different qualifications and pay. They differ in how they are generated and how long they last.
  - **Direct Jobs are** the result of new investment and are of two types:

- **Construction jobs** only last as long as the initial investment spending. They may involve activities like installing PV systems, erecting wind turbines, or retrofitting buildings to improve their energy efficiency. Once the project is completed, however, the jobs end.
- **Permanent jobs** are those associated with the continued operation of the new economic activity made possible by the investment – for example, jobs administering a sustainably funded energy efficiency programs.

➢ **Indirect jobs** are those that spin off from the direct jobs. These get created as the result of new local spending that results from the payroll associated with the direct jobs:

- **Payrolls** for direct jobs create demand for the goods and services workers and their families need. So higher local payrolls mean higher sales for businesses that serve those workers. Those sales mean more employment in those businesses, whose workers then spend their take-home pay, so that a ***multiplier*** on the initial direct jobs and their payroll results in the local economy.
- **Local purchases** by the businesses making the new clean energy investments have the same multiplying effect as spending by workers and their families.
- **The size of the local multiplier** depends on the size of the local economy – and the extent to which local businesses can provide the goods and services the new firms and their workers want and need.

❖ **Energy Savings** – Reducing traditional energy consumption through efficiency gains or power generation with distributed renewables can expand the local economy by saving money for local energy bill payers.

➢ If the combination of lower energy bills and the new cost of paying for the clean energy project for the community as a whole can result in a **net monthly cost saving**, then that increases local households' and businesses' ability to spend on other consumption. That consumption leads to more local sales, and in turn more income and payroll in the local economy. Thus, a **multiplier** again comes into play, expanding the benefits of the original savings, as more money continues to circulate in the local economy.

➢ The **size of the multiplier** on the savings depends on the source of the power consumed: to the extent that power is bought by community residents from a non-local firm, the money saved will now be able to recirculate locally. However, if power is purchased from a local cooperative or municipally owned distributor, there may be no multiplier at all, since the funds were already being spent locally.

Table 1: Average Multipliers and Ranges for Counties of Different Economic (Employment) Sizes[1]

County Jobs Size Class	*Average Multiplier*	*Probable Range*
1,000-2,999	1.7	1.5-1.9
3,000-4,999	1.8	1.5-2.0
5,000-9,999	1.9	1.6-2.1
10,000-19,999	2.0	1.8-2.2
20,000-49,999	2.2	2.0-2.4
50,000 and over	2.2	2.0-2.5

It should also be noted that, for both cases, multipliers grow with the ability of a local economy to provide for its own needs, so they tend to

[1] Hughes, David W., "Policy Uses of Economic Multiplier and Impact Analysis," *Choices* Second Quarter 2003: http://ageconsearch.umn.edu/bitstream/93725/2/2003-2-06.pdf.

increase with population size, as *Table 1* demonstrates. The table, taken from an applied economics article, presents averages and typical ranges. In actual practice, multipliers need to be estimated for each local area, and can vary by the industry that starts the economic development activity.

The Workings of the Multiplier: An Illustrative Hypothetical Case

In a local economy – let's say a county – with 50,000 residents that pay for their power to a utility headquartered in another state, assume that new energy efficiency measures result in annual savings of $250,000 on utility bills. It does not matter if those are bills paid by the school district, local government, households or local businesses.

Those dollars remain in the community and get spent on other goods and services. So, for simplicity, forgetting about any income taxes or savings, there ***could be*** $250,000 in new local sales due to those dollars. But some of that savings might be spent online, on vacations, or in retail establishments outside the local economy. ***In reality***, let's then assume, the local economy can only count on $200,000 in new local sales. That represents an 80 percent local retention of economic activity.

But that $200,000 is now money received by actors in the local economy. More local sales result from that income. With 80 percent local retention, that adds $160,000 in local sales. The new $160,000 then adds $128,000 in local sales – and the $128,000 produces $102,400, and so it keeps on going as we watch the multiplier at work.

Of course, every dollar in local sales is not really kept in the local economy, since the retailer gets his goods at wholesale, often from a distributor that is not in the local economy, and thus his spending does not recirculate locally. Buying a car from a local distributor does not add all its cost to the local economy even if the car was assembled in town since the components can come from anywhere across the globe.

The multiplier reflects the net effect on a local economy of new income to (or spending by) local residents, following the long chain of income and spending. The bigger and more diverse the local economy, the more it is likely to provide goods and services to itself and not have to buy non-locally, and thus the larger the multiplier will be on the dollars that start the whole expansion process. In this example, with a local area population of 50,000, based on current rates employment is likely to be in the 10,000-19,999 range, so according to Table 1, the average multiplier would be 2.0. This means that the $250,000 in energy savings would translate into the equivalent of $500,000 in new income to the community – $10 for every man, woman and child in the community.

- **Increased Energy Cost Certainty** – The cost of electricity to consumers depends in part on the cost of the fuel used to generate the power.
  - One distinguishing feature of renewable energy is that the fuel is free. Thus, for locally generated renewable power projects, even though there are costs in capturing the energy, there is no **risk of rising utility bills** due to factors no one locally could control. These avoided risks could include:
    - Future price increases in the fuel used by generating stations (coal, gas or oil)
    - Costs that would be passed on to utility ratepayers if power companies were forced to comply with more stringent regulations about their emissions of greenhouse gases
    - Spiking utility costs that could break the bank for power users in exceptionally cold winters or hot summers

- The reality, of course, is that most situations involving renewable energy will mean that power usage is a combination of locally generated and non-local electricity. However even that partial local generation can **cushion the effects on utility bills**. If, for example, a locality transitions to receive 50 percent of its power from local solar PV, then if the non-local utility's costs to deliver power is raised by 20 percent, it would only raise local energy costs 10 percent relative to what they were before the renewable energy was generated.
- Even if clean energy investments are not focused on renewable energy and all power continues to be bought from utility companies, if investment is made in energy efficiency to reduce consumption, the effects of rising utility costs would still be lower on household and business budgets. The 50 percent example in the bullet above can be applied to efficiency as well.
- Increased certainty about price means different things to different power users:
  - Households can be more certain about their costs and their ability to pay their bills on a month- to- month basis. The likelihood of having to borrow to cover an exceptional power bill is reduced.
  - Businesses can save money by not needing to maintain the same capacity to borrow (or keeping as large a cash reserve in the bank) to cover unexpected changes in utility bills.

- **Increased Electricity Supply Certainty** – Solar PV or wind power may provide electricity service when the grid is down due to weather damage or other system problems.
  - The availability of power when there is an electrical system outage depends on how the renewable energy is linked to the grid.
    - If the system installed to provide renewable energy simply sells to the grid and does not provide power to the building or property on which it is installed, there is no effect on power supply.
    - If the system is **"net metered,"** which means the renewable power goes first to serve the building or system owner's needs and only unused power is sold to the grid, then there is a source of at least some power for system owners when there is a system-wide power outage.
  - The benefits associated with having power when the grid is down are many, depending on whether the system owner is local government, a business or a household. Illustrative benefits and costs avoided include:
    - **Reduced need for backup power systems** such as generators or batteries for emergency or continued business operations during short-term power outages
    - **Less likelihood of losses** due to absence of refrigeration over longer outages, even with only intermittent renewable power to key appliances
    - **Ability to conduct business operations** that competitors cannot match when one business has access to electricity but others do not

- **Improved Local Business Competitiveness** – When local businesses benefit from clean energy investments, the savings associated with their lower energy consumption or on-site generation can help to further expand the local economy.
  - For example, businesses can use the capital or credit no longer needed for power costs (or power cost uncertainties) to increase their ability to out-perform other firms in their markets by

improving operations or and/or **expanding their product line**. They may also **expand into new markets**.
  - If they have engaged in energy efficiency projects, businesses can also take advantage of their lower operating costs (associated with the energy savings) to be **more price competitive** with others in their markets.

- **Improved Property Values and Higher Real Estate Tax Bases** – Lower utility bills make higher cost mortgages or rents more affordable for households and businesses alike. That translates directly into higher property valuations and expands the local real estate tax base, even if there has not been any other growth in the local economy**.** National energy policies and greater mortgage lending experience with clean energy may change lending practices and expand these effects. For example:
  - **FHA- and VA-insured energy efficient mortgages and rehabilitation loans make funds more readily available and under easier terms** (as low as a 3.5 percent down payment) for homes that have had energy efficiency retrofits. Funds can also be accessed by buyers that commit to investments in energy efficiency, provided that the cost of the energy improvements are determined to be justified in comparison to the estimated energy savings.
  - As the market becomes more familiar with and confident in the benefits of energy efficiency, **conventional loans** (for businesses as well as homeowners) **may become more responsive to the efficiency of the buildings being financed**. A 2013 study of a national sample of about 71,000 ENERGY STAR- and non-ENERGY STAR-rated single-family home mortgages found that default risks are, on average, 32 percent lower in energy-efficient homes, controlling for loan, household, and neighborhood characteristics. If energy efficiency lowers default risk, then lenders may eventually give favorable terms to those buying buildings with these features, with or without the federal loan guarantees.
  - As touched on above, buildings that have renewable energy installations and are net metered, so that they draw power from their own generators, have an advantage over those that are completely dependent on the electricity grid. This is especially true for tenant businesses and others that cannot afford to have refrigeration or heating interrupted for multiple days in the event of the grid going down due to storms or other factors, and in time could be reflected in property values and lending practices.

- **Sectoral Clustering** – Many types of economic activity get drawn to locations by the availability of: markets, suppliers of resources that are expensive to move, or specialized technological knowledge and worker skills. Historically, for example, the steel industry developed in locations in which heavy production inputs were readily available. Silicon Valley is another sectoral cluster, based on shared technological and employee knowledge bases. Promoting clean energy investments may enable economic development efforts to stimulate sectoral clusters that had not previously been an opportunity in the local economy.
  - Wind power is an excellent example. In areas where wind generation is a viable option, localities may consider investing both in **projects**, as well as **recruitment of companies that manufacture** turbine blades and tower components is a logical development move as well. These products are large and heavy to transport, so co-locating can be a good option, and their production will require skilled labor, creating job opportunities.

- **Training and other support for the technical skills** associated with clean energy projects – e.g., energy auditing and consulting, component installation and maintenance – is another possible option for investment. More firms are likely to locate operations in a community where the services needed for a given sector are available.
- Sufficiently **large scale** energy efficiency building and upgrade activity could even draw in **warehousing and component distribution facilities and potentially serve regional markets as well**. In areas where transportation systems are not adequate to attract manufacturing operations themselves, this may be a particularly good alternative.

- **Marketing and Reputation** – Any special features of a local economic or real estate development approach can provide the basis for a marketing campaign. Promoting the clean energy aspects of a community may make a locality more attractive to firms that are otherwise relatively indifferent to where they locate.
  - For example, many municipalities are currently pursuing new, mixed use real estate developments that qualify as "zero net carbon." Although there are certainly environmental benefits to doing this, communities are also making these choices in part for the reputations they hope to gain as forward looking communities.
  - As more and more communities adopt these approaches, not having a vibrant local clean energy program may pose marketing problems for places that are seeking new private investment.

Conclusions

State and local leaders can use and model this range of potential returns to help compare investment options (both clean energy and non-clean energy). Other factors will likely influence program choices as well – for example, the available investment opportunities at a given time or the desire to pursue a particular development objective. The cases in the next section, *Clean Energy Investment in Action*, illustrate how communities across the country are making the decision to invest in clean energy and the economic benefits they are enjoying as a result.

II. Clean Energy Investment in Action

A diverse set of municipalities have begun to invest in clean energy as a local economic development strategy. These communities are of different sizes, with varying assets, and face different economic development challenges. The approaches they choose include residential energy upgrades, wind installations, industrial retooling, and development of solar power.

Four examples are presented here to illustrate the pursuit and attainment of one or more of the economic development returns on investment discussed in the Introduction. While they are not a comprehensive review of the efforts that have used clean energy investments to stimulate local economies, they are representative, to some degree, of the different scales and wide variation in the size of the communities across the nation who have pursued this strategy. They also illustrate the spillover benefits elsewhere in the economy that come from all forms of economic activities that do not generate negative environmental effects.

The interaction between federal and state policies that effect local clean energy investment decisions is not discussed in detail here. These policies and incentives are frequently changing, and at the state level are so diverse, that an in-depth discussion for a handful of locations will likely not prove useful for local and state officials broadly. This variation however, particularly in state utility regulation, underlines the importance for officials of understanding their own policy context, when designing and pursuing clean energy investment for development. Materials to assist with this can be found at the end of this document, in *Resources for Taking Action*.

Newton, Iowa: Replacing Appliance Manufacturing with Wind Turbine Component Production

Background – Located in central Iowa, Newton, with a population of not quite 16,000, is the county seat of Jasper County. For nearly a century, the Maytag Corporation manufactured appliances and was the largest employer in Newton, Iowa. When Whirlpool acquired Maytag in 2006, then liquidated and closed the plant in 2007, 1,900 people – over 10 percent of the town's total population – were out of work. The company's departure also left empty 1.9 million square feet of manufacturing space, warehouses and other buildings on its 175-acre site. Cleanup of the site was necessary, but Whirlpool agreed to take responsibility, and, by 2008, 154 acres were ready for reuse.

That rapid turnaround allowed Newton to act quickly to replace many of the jobs associated with the Maytag operations, by attracting investment in wind farm technology to accommodate the rapid expansion of wind farms in the region. At the 2007 American Wind Energy Association conference, Newton representatives met with TPI Composites, a wind turbine blade manufacturer, to discuss the potential use of the Maytag site.

TPI considered using the existing Maytag plant buildings, but they were too short to house the 140-foot blades that were to be constructed. Although TPI had contemplated locating at a site in Mexico with low labor costs, Newton's location and existing infrastructure offered better opportunities, especially when combined with state and local economic development incentives. Rail lines and Interstate 80 connect the plant to wind power generation sites in the Great Plains region, where the turbines, which are difficult and expensive to transport, are in high demand. In addition, the former Maytag employees had manufacturing experience and were eager to fill the new positions.

The Results – The City of Newton worked with TPI to complete construction of a new 316,000-square-foot, $56 million facility in 2008. The plant now employs over 800 workers and makes fiberglass blades for GE Energy, which sells its 1.5 megawatt (MW) turbines to customers within a 500-mile radius of the facility.

The TPI project paid off for Newton in another way, as well. In April 2008, a second developer, Texas-based Trinity Structural Towers, announced it would invest $21 million, to retrofit 300,000 square feet of the old Maytag plant building, for the production of steel and concrete wind turbine towers. At the time, Trinity had a $1.6 billion backlog of orders. The facility opened in February 2009, and the first tower section was rolled out of the facility, which just over two years earlier had produced Maytag appliances. The plant now employs 200 workers.

Over the last several years, success has bred success – the City has pursued diverse development opportunities, in a range of sectors, clean energy and beyond. Engineers that once worked for Maytag's research and development department have started their own company, Springboard Engineering, which is now a part of the Underwriters' Laboratory testing family. A new biodiesel plant was also developed, to convert local soybean oil and animal fats into diesel for trucks and other vehicles, and the Iowa Speedway was developed, to host NASCAR and Indy races.

Ultimately, this has all resulted in unemployment dramatically falling, from a high of 10.1 percent just a few years ago, to about 5.8 percent today. About 1,000 jobs are coming from the wind industry, and many of these workers were former Maytag employees that have been able to repurpose their manufacturing skills. There's been over $21 million in new local property tax base gained and a great deal of investment in wages circulating through the local economy.

At a statewide level, Iowa plans to continue to grow the wind power industry as part of its strategy for state energy independence and economic development. The State expects new wind installations over the next decade to produce $500 million in local tax revenue, and $100 million in royalty payments for landowners. Iowa is currently working with 25 wind energy manufacturers and suppliers considering investment in the state as they serve the supply chain of a major new regional energy industry.

Babylon, New York: The Community-wide Benefits of a Residential Energy Efficiency Program

Background – With a population of just over 200,000 residents, the suburban Town of Babylon consists of 53 square miles of land in Suffolk County, in the New York metropolitan area. While the median family income is over $79,000, close to 6% of Babylon residents live below the poverty line, and the Town includes the poorest census tracts on all of Long Island.

In 2008, driven by a desire to combat climate change and reduce CO^2 emissions at a local level, Babylon's Long Island Green Homes Initiative established an ambitious goal to improve the energy efficiency of all of the Town's 65,000 homes. To meet this goal, the Town launched a program that lends homeowners the up-front capital (up to $12,000) to perform energy upgrades to their properties. [2] By expanding the Town's definition of "solid waste" to include energy waste, based on its carbon content, the Town has been able to provide the up-front capital through its existing solid waste fund. Upgrades can include a range of measures, such as: more energy efficient HVAC systems, domestic hot water improvements, insulation, air sealing, lighting, and minimum window improvements. The program also connects homeowners with town licensed, Building Performance Institute certified contractors to make the improvements.

The Results – Although the primary goal of Babylon's program was emissions reductions, the program has had significant economic development impacts. To date, the program has completed upgrades to nearly 1,200 homes, representing roughly $12 million worth of improvements. On average, households are saving $1,340 annually in energy costs, which represents ~20-40 percent of each participating homeowner's annual energy bill. This is a substantial return on investment for the borrowers, who will see investments pay for themselves in 2.5-5 years.

Those homeowner savings – which have thus far totaled over $750,000 – in turn, benefit the local economy as a whole. Rather than leaving the community to pay utility bills, they are, at least in part, spent on local goods and services. Assuming a local multiplier of 2.5 on the new household spending – a level that is plausible given the size of the municipality's economy (see the *Table 1* in the *Introduction*) – those savings result in an increased annual total income in Babylon of more than $2.75 million.

Overall projects are seeing an energy savings-to-investment ratio of 1.82 – that is, for every $1 spent, $1.82 is saved in energy costs. It's important to note that the savings-to-investment ratio of 1.82 was achieved in over three years, with most of the retrofitted homes for which data were available having paid under two years of utility bills. Since the ratio applies to the savings for the individual borrowers, to arrive at the return on investment for the entire community, the multiplier should be applied to those savings. Again, using the multiplier of 2.5 times the ratio of 1.82, the investment turns out to provide $4.50 in economic benefits, for every $1.00 in costs to the community. Looking to the future, both ratios will likely increase – once loans are paid off, energy savings will continue. Moreover, the annual savings themselves may grow, as energy prices and utility bills for energy consumption tend to rise over time.

To date, Long Island Green Homes has generated 50 new sustainable jobs, and the program was designed to provide job training, as well as employment, to youth from Babylon's low income neighborhoods. Entry level jobs pay~$15 or more per hour and training has been provided for energy auditors as well as retrofit installers. These steps broaden the positive economic returns of the program, so that they are enjoyed not only by homeowners that can take advantage of the upgrades.

[2] Babylon's program was one of the nation's first residential energy efficiency program's to use property assessed clean energy (PACE) financing. PACE programs allow local governments to fund the up-front costs of energy improvements, and property owners repay improvement costs through assessments, which are secured by the property itself and paid as an addition to the owners' property tax bills. Residential PACE programs have faced regulatory opposition from the Federal Housing Finance Agency (FHFA) that has caused many programs to suspend operations, but there are alternative financing mechanisms for residential efficiency programs. Visit the *Resources for Taking Action* section at the end of this paper for more information.

Babylon's example has resulted in six other municipalities on Long Island adopting its program principles and offering retrofit financing to residents. Forming the Long Island Green Homes Consortium, these communities have also teamed up with the New York State Energy Research and Development Authority (NYSERDA), to offer their free audits and low-interest financial products Island-wide.

Rifle, Colorado: Using Solar Energy to Power Municipal Water and Sewer Systems

Background – Rifle is a municipality in Garfield County, Colorado, in the heart of the Rocky Mountains. It is a small city, with an area totaling just over four square miles and a population under 10,000. While it has been a regional center for the cattle ranching industry, it also has a lengthy history of hosting an energy economy. At the New Rifle Mill, two miles south of the city, the Union Carbide Corporation (UCC) produced uranium and vanadium concentrates and processed uranium ore from 1958 to 1970. The city then experienced the oil shale boom and bust of the 1970s and 1980s.

UCC's uranium was sold to the Atomic Energy Commission (AEC), and the vanadium was delivered to the commercial market for use in steel and other products. While the AEC terminated its last contract with UCC in 1970, the Mill continued to produce uranium for the commercial market until 1972 and produced vanadium concentrate until 1984. During these years, about 2.5 million tons of radioactive tailings were accumulated at the site, and the groundwater was contaminated with uranium, vanadium, arsenic, molybdenum, nitrate, and selenium.

In 1978, Congress passed the Uranium Mill Tailings Radiation Control Act that required the U.S. Department of Energy to clean up 24 inactive uranium ore processing properties, including New Rifle. After the plant closed, the State of Colorado acquired the 130 acre Mill site in 1988. Encapsulation of the waste radioactive materials began in the spring of 1992 and was completed in1996, but the site remained idle under state ownership.

In 2004, the State transferred the property to the City of Rifle, providing the opportunity for the exercise of local initiative. The following year, the City Council adopted Rifle's Economic Opportunities Assessment that re-defined the city as an "Energy Village." In pursuit of its new energy identity, the city sought out private sector partners for innovative projects. Rifle subsequently partnered with SunEdison, LLC on two solar energy projects that utilized the old UCC site.

In December 2008, the city began construction of a wastewater reclamation facility, and SunEdison began the first installation – a 1.72 MW Direct Current (DC) solar PV system, on 12 acres of the property, to provide the power needed to operate the plant. Nearby, SunEdison installed the second project – an additional 0.60 MW DC PV solar system, which provides 100 percent of the power needed to pump drinking water from the Colorado River for local residents. SunEdison – not the City of Rifle – financed, constructed, maintains, and monitors both solar power systems.

The Results – Over the first 20 years of power generation, the two systems will replace more than 76,000 tons of carbon dioxide that would have been emitted by electricity production from fossil fuels. But this environmental benefit is not the only reason why Rifle partnered with SunEdison. Important economic advantages have accrued from these solar projects for the community.

First and foremost, the City is saving money on its energy bills. Under a 20-year power purchase agreement (PPA), SunEdison will sell power to Rifle at a fixed rate per kilowatt-hour that is below what the city had been paying for its electricity. The savings to the city will likely go up over time, as the fixed rate is compared to the historical trend of rising fossil fuel energy costs. Unlike traditional economic development programs that often rely on businesses or residents to take advantage of incentives, the City's direct control over these projects guaranteed that there would be economic payback.

Further, the success of the PV projects has encouraged other local land and business owners to pursue their own systems, which has improved their economic well-being. And although job creation was not the primary goal of this work, SunEdison's ongoing maintenance of its PV facilities in the area has added to local employment.

The initial partnership with SunEdison has also positioned the City to pursue other energy initiatives. The PV projects have served as anchors for Rifle's new Energy Innovation Center—an industrial complex that promotes energy firms that use renewable bio-based materials to produce products and energy. The Center is already home to a new processing plant operated by a local college that is piloting conversion of easily grown mountain crops into biobutanol that can fuel traditional gasoline engines. Eventually, the Center hopes to become a highly visible showcase for other economically implementable alternative power sources, and plans also include a bio-based research and visitor center, an energy feedstock storage area, and gathering space for renewable energy conferences. The Center is helping to create green jobs for local residents and to foster innovation and entrepreneurial opportunity.

All of these projects and the sectoral clustering serve as marketing and branding tools, facilitating the emergence of Rifle as a model for a clean energy local economy.

Lackawanna, New York: Development of Wind Power on a Former Steel Mill Site

Background – Lackawanna, New York is an old inner suburb in the Buffalo-Niagara Falls metropolitan area with a 2010 population of just over 18,000. The town was named after the Lackawanna Steel Company, which was in operation there from 1902 to 1982, operating as a subsidiary of Bethlehem Steel in its final 60 years. In the 1940s, the Lackawanna mill employed over 20,000 people, and was, at one point, the world's largest steel factory.

Like many American steel companies, however, it encountered significant financial problems in the 1970s, largely due to foreign competition. When most of the manufacturing ceased in 1982, 10,000 workers at the plant and an additional 8,000 workers in surrounding towns were laid off. In addition to massive unemployment, Lackawanna's population faced large tax increases for basic services, as Bethlehem Steel's share of total local tax payments fell from 66 percent to 8 percent. The blighted and contaminated 1,600 acre site sat idle for over 20 years, symbolizing the area's economic downturn.

In the 1990s, the mill site became the subject of a U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act investigation. For several years legal and financial concerns delayed clean up, but in the early 2000s, changes in New York State and federal environmental laws provided new incentives to remediate contaminated sites. These changes created interest in a 30 acre tract of the property along the Lake Erie waterfront, among two energy companies, BQ Energy and UPC Wind (now

Apex Wind Energy and First Wind). About $300,000 in state and federal assistance was used to research wind patterns and evaluate the environmental impact of the project, and in 2006, EPA placed the tract under the New York State Brownfields Cleanup Program (BCP). This allowed developers to benefit from BCP's further financial and technical assistance resources, and, in partnership with the State, they removed several inches of contaminated soil, added a protective soil cap, and installed groundwater monitoring wells. It should be noted that while some wind projects in the U.S. have faced problems due inadequate transmission lines, the location of the old mill site within a metropolitan area eliminated this barrier to development. In September 2006, construction of the wind farm, called Steel Winds, began.

The Results – Today, Steel Winds consists of 14 wind turbines, completed in two phases. The success of the first eight turbines, which went on line in June 2008, led to construction of an additional six turbines, completed in February 2012. Each turbine cost $4.5 million to build, with expenses borne by the private investors. The turbines generate up to 50 million kilowatt hours of electricity each year – enough to serve the needs of approximately 9,000 New York homes. A traditional fossil-fueled generating plant, in New York, producing an equivalent amount of electric energy, would consume over 115,000 barrels of oil or over 32,000 tons of coal per year. The reduction of fossil fuels burned as a result of these projects is eliminating the emission of approximately 23,000 tons of CO^2 annually.

The wind farm occupies a fraction of the old mill site and will never rival the employment impact of Bethlehem Steel – wind farm construction provided 140 temporary jobs and ongoing operations requires five employees. However, the project provides approximately $190,000 in annual local tax revenues, and further, has transformed the visual image of the city along the lake by re-vegetating old slag heaps. Starting back in the 1980s, Lackawanna helped many small businesses take over some of the uncontaminated and more easily reusable portions of the old site and generated over 1,000 replacement jobs, but it could not catalyze a sustained redevelopment thrust. Steel Winds has had a very different effect – it has changed the city's identity and image. The site was part of a stark reminder of the region's faded past as an industrial hub, but Steel Winds is evidence of new industry coming to the area, a source of pride in the Lackawanna community, and a symbol of economic rebirth.

III. Learning from the Field

What lessons can be learned from these examples? The useful lessons will depend on a community's current situation (including policy context), local potential, and needs. Local and state leaders should use their insights and understanding of the local economy to adapt approaches or program examples to fit the circumstances. However, there are some useful lessons that can be derived from the cases examined:

- Rifle could promote an investment in PV with no question about the demand for the power and its utilization. It *was* the power customer. Babylon, by contrast, made capital available for its homeowners to use for energy efficiency, but provision of the funds was not enough to assure success. Babylon then had to encourage people to borrow and make the investments that have contributed to local development. This comparison suggests that ***clean energy investments in buildings or operations that the local government or other sponsor controls directly are the most certain to succeed.*** Local government programs that require other economic actors to take action cannot similarly assure an economic return and may be no more certain a route to economic development than routine business recruitment. The one advantage of note is that a local clean energy program likely knows its target audience better, as it is made up of people and firms already in the area.
- The energy efficiency program in Babylon continues to support long-term jobs for retrofitters, by maintaining a capacity to finance continued energy efficiency investments. The wind turbine manufacturers in Newton maintain employment over time, as the sales of products continue to bring in new revenues. In contrast, the massive investment in Lackawanna's wind farms maintains only five permanent jobs, because it was a one-time construction project. ***Permanent jobs rely on continuous funding.*** If a local government wishes to maintain jobs overtime, it will need to identify investments that lead to sustainable sources of funding, such as: product sales, support from a revolving loan fund that returns capital as loans are paid off, fees on the provision of services (e.g., energy audits and loan processing), mandatory utility industry contributions, or legislatively mandated appropriations.
- From the perspective of attracting new capital to the local economy over time, Newton's investments in the clean energy supply chain is the most successful case example. Its wind turbine manufacturers sell to nonlocal buyers and bring in new revenues to the community. Newton's investments have also led to significantly more job creation than Babylon's residential energy efficiency program or Rifle and Lackawanna's construction of renewable energy facilities. This suggests that, ***where possible, investments that support engaging strategically in the supply chain should be a primary focus of a community's clean energy economic development initiatives***. However, entering and serving the clean energy supply chain requires careful examination of the local economy and regional comparative advantage, and ***is not an option for everyone, everywhere***. Traditional economic development planning strategies, such as opportunity roadmaps, should be used to help a community determine if engaging in the supply chain is a good fit, and if so through what avenues. For example, developing a roadmap can help a community decide to prioritize

investment in a service industry over manufacturing, choose to invest in wind manufacturing over solar, or determine that engaging in the supply chain is generally not a good fit for their community.

Articulating Specific Objectives and Tracking Progress: The District of Columbia Pursues Local Workforce Development

Whether a community's clean energy investment goal is job creation, energy cost savings and/or emission reductions, it is critical to articulate specific objectives that will contribute toward meeting that goal and establish a process for measuring progress towards objectives.

For example, the District of Columbia Sustainable Energy Utility (DCSEU) is designed to help District households, businesses, and institutions save energy and money through clean energy programs. The utility has an emphasis on local green-collar job creation and is committed to delivering these its services by recruiting, hiring, and training local residents and businesses.

By statute, there is a minimum performance requirement to increase the number of green collar jobs, and one member of the DCSEU Advisory Board has to have expertise in generating such jobs.

The performance benchmarks for the program's first year included:

- Creation of 33 full-time equivalent (FTE) green jobs, paid the District's living wage or above.
- Contracting with preference to District-based Certified Business Enterprise (CBE) firms – goal of 51 percent.
- Development of training programs to benefit workforce development goals.
- Other indicators related to ensuring fair employment.

Progress toward DCSEU benchmarks is reported in Quarterly and Annual Reports, including the number of District residents placed in green jobs and trained by SEU programs. They further track the number of dollars spent on contracts with District-based CBEs, the number of referrals from the District's Department of Employment Services hired, and the total hours of work performed by both District and non-District residents.

- In order to maximize the multiplier effect of clean energy investments, expenditures should be as localized as possible. That means that the local payoff from an investment will depend largely on the availability of local personnel to do the needed work. As several cases illustrate, many of the skills involved with clean energy are relatively new or require new forms of certification. Thus, in order to maximize local economic benefits from clean energy initiatives, ***it is essential that efforts are made to ensure that local businesses and workers get the training and other support required to engage in a given sector.*** Communities can choose from a range of approaches for this, from the relatively low touch (e.g., educating local contractors qualifications that will be required to engage in a new clean energy initiative, coordinating with local job training providers to identify new courses they may want to offer) to the more hands-on (e.g., government offers training and certification).

- Lackawanna, Newton and Rifle all combined their clean energy efforts with those their communities were taking to address old industrial sites. In each of these cases, the combination of special grants and tax treatments for contaminated land cleanups and clean energy investments made both activities easier to implement (even if the incentives were not essential to their success). This is an example of why ***clean energy investments should be pursued in combination with and integrated into overall economic development activity, rather than be considered in isolation.***

IV. Resources for Taking Action

Companion Webinar

- DOE Spurring Local Economic Development with Clean Energy Investments
  www.eere.energy.gov/wip/solutioncenter/webinar_archives.html

Methodologies & Tools for Planning

- DOE Strategic Energy Planning
  www.eere.energy.gov/wip/solutioncenter/energy_planning.html
- DOE Using Cluster Road Mapping to Determine Strategic Clean Energy Direction
  www.eere.energy.gov/wip/solutioncenter/webinar_archives.html
- DOE Clean Energy Financing Solutions
  www.eere.energy.gov/wip/solutioncenter/financing.html
- Council on Competitiveness Asset Mapping Roadmap: A Guide to Assessing Regional Development Resources
  www.careeronestop.org/RED/Illuminate_regional_Aug2007.pdf
- National Renewable Energy Laboratory (NREL) Jobs & Economic Development Impact (JEDI) Models
  www.nrel.gov/analysis/jedi/
- EPA Quantifying Economic Benefits of Clean Energy
  http://epa.gov/statelocalclimate/state/activities/quantifying-econ.html

Data Sources for Planning

- National Governors Association (NGA) State Green Economy Profiles
  www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-ehsw-publications/col2-content/main-content-list/state-green-economy-profiles.html
- NREL Renewable Resources Maps & Data
  www.nrel.gov/renewable_resources/
- DSIRE Database of State Incentives for Renewable Energy & Energy Efficiency
  www.dsireusa.org/

Further General Reading

- CCS Climate and Economic Development Recommended Readings
  www.climatestrategies.us/arMcles/arMcles/view/78
- NGA Clean Energy and Economic Development
  www.nga.org/cms/home/nga-center-for-best-practices/center-divisions/center-issues/page-eet-issues/col2-content/main-content-list/clean-energy--economic-developme.html