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Innovations in state-level solar energy policy : motivating community investment in resiliency

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ABSTRACT

INNOVATIONS IN STATE-LEVEL SOLAR ENERGY POLICY: MOTIVATING COMMUNITY INVESTMENT IN RESILIENCY

by
Sarah Katheryn Gentile

Community-level resilience in the face of climate change is critical for New Jersey. Through a review of current literature, evidence is provided that a majority of work being done with respect to climate-change planning is taking place at the local level. On the basis of case-study analyses, three community renewable energy projects are examined as well as two policy tools that are helping to facilitate development of local capacity to generate renewable energy. The best elements of these initiatives are extracted and form the basis of a policy discussion intended to encourage local level generation of renewable energy, thereby increasing community resilience.

The five case studies presented can be summarized as follows: (1) In Fintry, Scotland, a local community is receiving financial compensation for hosting a large-scale wind farm; (2) In Brighton, England, a solar cooperative is distributing proceeds from three solar arrays back to investors; (3) In New Jersey, a solar array equipped with backup power capability is allowing a school in Bayonne to continue to function in the event of power grid failure; (4) Also in New Jersey, government-energy aggregation is discussed in terms of its potential to empower municipalities to make more informed and environmentally conscious choices with respect to their aggregated energy purchases; and (5) In Vermont, proposed legislation—in the form of the Vermont Common Assets Trust—places a price tag on the use/extraction of natural resources (renewable or otherwise) with the aim of charging developers for their appropriation.

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INNOVATIONS IN STATE-LEVEL SOLAR ENERGY POLICY: MOTIVATING COMMUNITY INVESTMENT IN RESILIENCY

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This thesis is dedicated to my endlessly supportive husband,
J.R., and our two bright and beautiful daughters,
Ava and Tessa.

This thesis is also dedicated
to the memory of my niece,
Keira Evelyn Brower.

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CHAPTER 1

INTRODUCTION

1.1 Objective

The objective of this thesis is to emphasize the need for community-level renewable energy as a means of increasing local resiliency.

1.2 Background Information

New Jersey is characterized as one of the most progressive states in the United States when it comes to promoting renewable energy production. The state has an aggressive Renewable Portfolio Standard (RPS) which requires that electricity suppliers purchase a portion of their supply from clean sources or pay an Alternative Compliance Payment (ACP). New Jersey's RPS is legislatively mandated to increase every year until 2028, at which point 22.5% of the electricity supplied to customers in the state will be generated from clean and renewable sources. In this regard, New Jersey is one of the most proactive states when it comes to incorporating renewables into its energy mix.

Despite the gains made by virtue of a strong RPS, one area where New Jersey is falling behind is in the development and facilitation of local-level (or community) renewable energy generation. Elsewhere in the world, localities are benefiting twofold: firstly by generating their own clean energy, and secondly by receiving compensation for hosting private clean energy projects. Current literature suggests that community renewable energy generation is a key component of local action to address climate-change. As such, New Jersey's energy policies require a shift in focus toward facilitating local level renewable energy generation if comprehensive climate-change planning is to be achieved.

The motivation behind this study began in the summer of 2012 with a general desire to explore how community renewable energy projects could become more prolific in New Jersey. Then, on October 29, 2012, Superstorm Sandy made landfall near Brigantine, New Jersey. Over two million households in the state lost power in the storm, 346,000 homes were damaged or destroyed, and 37 people were killed.[1] Whether it is agreed upon or not that Superstorm Sandy was a climate-change related weather event, the fact remains that in the aftermath of the storm, resiliency planning was thrust into the spotlight in New Jersey. Local governments, corporations, utilities, even residents in New Jersey, began to think about and talk about what resiliency measures could be undertaken to better prepare for the next weather event. Utilities began to invest in electrical substation hardening, private corporations investigated redundancy in electric service, local governments applied by the hundreds for Federal funding to purchase generators for backup power, and residents started the process of elevating their homes in order to meet new flood insurance standards. As a State, New Jersey began the process of becoming more resilient at every level.

Partly in reaction to Superstorm Sandy, this study shifted focus from a pure assessment of community renewable energy projects to one that explores the potential overlaps between local-level solar projects and resiliency. The intent was to expose community-level solar projects which provide backup power to the general public in the event of an emergency as projects that propel forward two important policy objectives instead of just one. As explained in forthcoming chapters of this study, if planned and executed properly, a community-level solar project equipped with the necessary technology to provide backup power to the public in the event of an emergency achieves

[1] See http://en.wikipedia.org/wiki/Effects_of_Hurricane_Sandy_in_New_Jersey

the goals of comprehensive climate-change adaptation and mitigation planning, with resiliency in mind.

Chapter 2 of this study outlines current and relevant research on climate-change planning and community renewable energy production. Chapter 2's literature review is divided into four sections: 1) Mitigation, Adaptation, Resilience & Sustainable Development; 2) Common Ground: Where Mitigation, Adaptation, Resilience & Sustainable Development Overlap; 3) Community-Level Motivation; and 4) Community Renewable Energy. The goal of this chapter is to present relevant literature on both topics – community renewable energy and climate-change planning - and in doing so explain the natural areas of overlap and the potential for both goals to be achieved concurrently. This chapter also introduces relevant terms and concepts that are referenced throughout the study.

Chapter 3 describes the methodology of this study. The study initially utilizes a case study format to analyze community renewable energy policies as well as projects implemented in various locations (Chapter 4). The purpose of analyzing these policies and projects is to better inform potential policy decisions and planning tools open to the state of New Jersey. The best elements of these projects and policies were then extracted to form the basis of a larger policy discussion that highlights options that the state could implement moving forward. The resulting policy discussion (Chapter 5) was then reviewed by a panel of five experts in the solar energy field: a regulatory official from the New Jersey Board of Public Utilities (NJBPU), a regulatory official from the United States Environmental Protection Agency (USEPA), a representative from the solar development industry in New Jersey, a representative from a community non-profit organization in New Jersey, and a general New Jersey energy policy expert. The feedback received from each of the five experts was used to inform Chapter 6 – the final policy development and summary chapter of this study.

As discussed, Chapter 4 presents the five case studies analyzed during this study. Two state level policies – New Jersey Government Energy Aggregation and the Vermont Common Assets Trust – are examined for their relative effectiveness in facilitating community renewable energy projects. Three community renewable energy projects – a wind project in Scotland, a solar co-operative in England, and a solar installation at a school in New Jersey – are examined for lessons learned. The five case studies, taken together, reveal a suite of policy options open to the state of New Jersey and also provide critical information about the challenges faced, drawbacks, and successes experienced by each project and serve together to better inform New Jersey's path forward.

Chapter 5 presents the policy discussion that emerged from the case study analyses and literature review previously discussed. The text of Chapter 5 represents the material that was reviewed by the panel of experts. The feedback from the panel is examined in the final Chapter 6, which further refines the policy ideas discussed in Chapter 5 and presents a summary of the conclusions of this study. The study concludes that community renewable energy projects are an invaluable tool when it comes to local level resilience in light of climate-change. It is determined that the tools necessary to facilitate these types of projects exist today, the State and Federal governments have a critical support function to fulfill, but in the end local governments will likely need to act in their own self-interest in order to propel successful community renewable energy projects that increase local level resiliency forward.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The following literature review is divided into four sections: 1) Mitigation, Adaptation, Resilience and Sustainable Development; 2) Common Ground: Where Mitigation, Adaptation, Resilience and Sustainable Development Overlap; 3) Community-Level Motivation; and 4) Community Renewable Energy. The first section provides a historical basis for the need to synergize the work of mitigation, adaptation, resilience, and sustainable development in order to holistically and effectively address climate-change. The second section explores natural areas of overlap among the different disciplines and where those inherent synergies could be capitalized upon to achieve multiple goals. The third section explores community-level motivation for climate-change action in the face of a lack of state and/or federal support. The fourth and final section discusses specific community renewable energy projects and how they could achieve the goals of mitigation, adaptation, resilience, and sustainable development. Cooperation within the climate-change community is paramount. Areas are highlighted where such cooperation can be achieved without sacrificing any particular discipline's tenets. The importance of action at the local level on climate-change is highlighted and ideas for projects that communities can implement to achieve a wide range of goals are provided.

2.2 Mitigation, Adaptation, Resilience and Sustainable Development

A significant volume of research exists on climate-change mitigation versus adaptation and where limited time and resources should be focused to achieve the greatest impact addressing biospheric warming and its consequences (Haque & Burton, 2005; Larsen &

Gunnarsson-Ostling, 2009). Mitigation proponents, on one hand, argue that without immediate action to reduce greenhouse-gas (GHG) emissions, success slowing down or reducing the effects of climate-change is not possible. Adaptation proponents, on the other hand, argue that much can be done right now to adjust to climate-change and the new reality it brings (Hamin & Gurran, 2009). Not only is there much disagreement regarding the proper path forward, there is also divergence with regard to how the terms adaptation and mitigation are defined (Haque & Burton, 2005). Also in question is where climate-change mitigation and adaptation fit within the larger realm of sustainable development (Larsen & Gunnarsson-Ostling, 2009).

The Intergovernmental Panel on Climate-change (IPCC) defines mitigation as: "Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic, and technological policies would produce an emission reduction, with respect to climate-change, mitigation means implementing policies to reduce GHG emissions and enhance sinks" (IPCC, 2007). The IPCC then defines adaptation as: "Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate-change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, the substitution of more temperature-shock resistant plants for sensitive ones, etc" (IPCC, 2007). Based upon these definitions, it is not hard to understand where the conflict between mitigation and adaptation arises. Mitigation advocates value GHG reductions above all else as the ultimate tool to handling the problem of climate-change. Adaptation advocates argue instead that while GHG reductions are important, the ability to take other measures to adjust to the inevitable changes that a warmer climate brings should not be discounted (Hamin & Gurran, 2009). Historically, these two realms have operated virtually independently from one another, but recent studies have revealed that each separately on its own will not be sufficient. Thus, the study of how to integrate the two concepts by finding areas of common ground has arisen (Wilbanks, 2005).

An important third concept that is often discussed along with climate-change mitigation and adaptation is the notion of resilience. Again, the IPCC defines resilience as the: "Amount of change a system can undergo without changing state" (IPCC, 2001). This definition in itself – which implies that to achieve a resilient state means the system remains intact or unchanged in state – is often criticized heavily by sustainable development advocates (Rose, 2011; Hess, 2010). The IPCC defines sustainable development as: "A process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. Sustainable Development integrates the political, social, economic and environmental dimensions" (IPCC, 2007).

Sustainable development advocates emphasize that a new paradigm, in other words a complete change in state, is necessary to redirect from the current path of overconsumption and resource depletion to one that that is instead sustainable. When the notion of an extreme change in state underlying sustainable development is compared with the lack of change in state underlying resilience, the potential conflict between the two theories becomes clear. As exemplified in a New York Times article entitled "Learning to Bounce Back" by Andrew Zolli (2012): "A shift from sustainability to resilience leaves many old-school environmentalists and social activists feeling uneasy, as it smacks of adaptation, a word that is still taboo in many quarters. If we adapt to unwanted change, the reasoning goes, we give a pass to those responsible for putting us in this mess in the first place, and we lose the moral authority to pressure them to stop.

Better, they argue, to mitigate the risk at the source. In a perfect world, that's surely true, just as it's also true that the cheapest response to a catastrophe is to prevent it in the first place. But in this world, vulnerable people are already being affected by disruption. They need practical, if imperfect, adaptations now, if they are ever to get the just and moral future they deserve tomorrow."

As shown, some of these concepts, as well as their supporters, seem to be in conflict with one another (Wilbanks, 2005). How does a scientist who sees a drastic reduction in GHG emissions as the only way to have any chance at mitigating the effects of global climate-change, ever agree that adapting lifestyles and culture to a changing climate should be the path forward? With severely limited resources and finances to address climate-change, who wins and who loses in this debate (Hasson, et al. 2010)? Is it instead possible to find areas of common ground between mitigation, adaptation, resilience, and sustainable development that allow for strides toward achieving some of the goals of all four concepts? Hess (2010) concludes that "resilience-oriented consumption may potentially undermine sustainable consumption, but it may also be configured to enhance it as well." Perhaps these concepts can be utilized in ways that complement one another instead of remaining at odds.

2.3 Common Ground: Where Mitigation, Adaptation, Resilience, and Sustainable Development Overlap

There is literature to suggest movement in the direction of cooperation. Biesbroek et al. (2009) suggest that ''the recent understanding of the link between climate-change and sustainable development has accelerated a shift in the way solutions to climate-change are conceived from the one-sided scientific focus on climate-change, towards a trans-disciplinary and sustainable development perspective.'' The authors of this study claim that the historical conflict between mitigation and adaptation camps is one rooted in vastly different viewpoints and approaches to solving a problem. Mitigation advocates, namely scientists, think about the solution to a problem in a very specific way that differs from the way spatial planners, who generally make up the adaptation community, think about and approach problems. However, Biesbroek et al. conclude that the study of climate-change is broadening away from a singular focus on science to include more disciplines like sociology and planning which opens the door for new areas of collaboration. In fact, a special issue of Habitat International, published in 2009, was devoted to uncovering the areas in which these philosophically diverse concepts (ex: adaptation vs. mitigation and resilience vs. sustainability) might overlap and thus provide opportunities for coordination to achieve mutually beneficial goals. “The special issue is based on the premise that it is crucial to develop a sound understanding of the synergies, conflicts and trade-offs between mitigation and adaptation measures in order to achieve a more integrated climate policy and to build resilient regions, towns and cities to face climate-change” (Pizarro, 2009).

If building more resilient regions, towns and cities to face climate-change becomes a collective goal of advocates of mitigation and adaptation what then are the logical steps forward? How equipped are regions, towns and cities to face climate-change in this manner (Jabareen, 2012)? Speaking to this point, the same special editorial issue of *Habitat International* referenced above also highlights an article by Jose de Oliveira (2009), which concludes, according to the author of the editorial, “that, paradoxically, to implement policies and strategies to tackle mitigation measures can be easier and more efficient to implement at the sub-national (county, city and local) levels than at higher scales of government” (Pizarro, 2009).

If de Oliveira is correct, and it is easier to tackle climate-change issues at the local level, is the local level also the place where the goals of mitigation, adaptation, resilience, and sustainable development can overlap? Higher levels of government in the United States – namely the federal and state levels – are having a great deal of difficulty reaching consensus, first on whether or not climate-change is occurring and, if it is occurring, what should be done about it both in the immediate term and in the long term. The federal government in the United States lacks a consolidated energy policy to lay forth a national agenda to address climate-change. At the state level, the issue is highly political and partisan, leaving states largely at the mercy of elected officials' political persuasions to determine whether or not action on climate-change will be undertaken.

As de Oliveira (2009) points out, "Subnational governments (cities, states, counties) have taken the lead to tackle climate-change even in countries where national governments have been reluctant to support international efforts for controlling the greenhouse effect, such as the United States." This assertion is echoed by Kousky and Schneider (2003) and Peterson and Rose (2006) who agree that a lack of national action in the United States to combat climate-change has created a proactive attitude on the part of many local governments to do something even in the absence of leadership from their state or federal agencies. This idea of local government being the hotspot for climate-change activity is also echoed by Senbel et al. (2012) who state that "while all levels of government can potentially make valuable contributions to mitigation (Collier, 1997; Betsill, 2001), untenable climate-change impacts are likely without the widespread involvement of municipal governments" (Betsill, 2000; Lindseth, 2004). It is interesting to note, that while local governments are engaging more actively in climate-change work, it would seem that not all of their constituents are supportive. A backlash against municipal action on climate-change has been spearheaded by specific political factions who believe that local efforts on this front are no more than a masked attempt by government to curtail their property rights and force them to live in cities (Kaufman & Zernike, 2012).

2.4 Community-Level Motivation

In spite of this backlash, local governments are continuing to push forward with their work on climate-change. What are the motivating factors behind local action on climate-change? As Senbel et al. (2012) explain, "Municipal governments are primarily responsible for overseeing a large number of activities that affect GHG-emissions levels, including controlling land use and development through zoning regulations and official plans; issuing building permits and approving major developments; controlling parking supply and rates, roads, and public transit; owning and/or regulating municipal power and natural gas utilities and district-heating systems; coordinating waste management; and managing parks and recreation services" (DeAngelo & Harvey, 1998; Robinson & Gore, 2005). As such, municipal governments have the power to make changes that can drastically reduce GHG emissions within their jurisdiction. But is their ability to effectuate measureable change the only reason for their action on climate-change?

As hypothesized by de Oliveira (2009) and discussed earlier, a contributing factor could also be that it is simply easier for a local government to take these proactive steps forward on climate-change and that similar steps would be much harder for state and federal governments to gain sufficient consensus to implement. Also, it could be assumed that it is much quicker to make these kinds of changes, which generally require stakeholder involvement, at the local level as opposed to the state or federal levels where the universe of stakeholders is much larger. And lastly, as de Oliveira (2009) also articulates, another contributing factor is that communities are closer to their constituents in a way that makes them more sympathetic to the eventual hardships that their community members will endure as a result of governmental inaction on climate-change. In this way it would appear that local governments perceive a greater direct risk to their constituents than perhaps national political figures do. All of this is not to say that there are not significant obstacles to local governments acting on climate-change without state or federal support. For instance, the backlash that local climate-change work has created in some municipalities is just one example of the many obstacles that local governments face. Yet still, local governments across the United States are taking proactive steps to act to protect their communities from the effects of climate-change.

The ways in which local governments are engaging in climate-change work varies. According to Senbel et al. (2012), "despite the aversion to climate-change planning and the refusal of the federal government in the United States to sign any climate-protection agreement, by October 2009, 1,000 mayors, representing more than a quarter of the country's population, had signed such a compact [adopting targets for emissions reductions] (USCM, 2009)". It seems clear that local governments are working on mitigation. Kousky and Schneider (2003) conducted interviews aimed at understanding the motivation behind this phenomenon. "The interviews suggest that local mitigation policy is predominantly a top-down decision based on what officials or staff members believe to be 'good business' or rational economic and political choices. In the majority of cities, policy is not driven primarily by widespread public pressure, nor wholly for climate protection, but instead, justified by cost savings and other perceived co-benefits" (Kousky and Scheider, 2003).

What other motivating factors are at work at the local level? Adaptation certainly becomes important for localities that perceive themselves to be at a much higher risk with respect to the anticipated effects of unmitigated climate-change: rising sea level, increased extreme temperatures and frequency of severe storm events, and so forth. For coastal communities prone to flooding, certainly their desire to adapt to climate-change (or mitigate it in fact) is greater than for other communities who perceive their risks to be lower. This is also where resilience becomes prominent. Using the example of California's electricity sector and its efforts to adapt to climate-change, an article by Vine (2012) recommends a portfolio of strategies to combat climate-change including mitigation, adaptation, technological development, and research. It goes on to state that "adaptation and mitigation should follow the guiding principle of 'resilience' - enhancing the capacity of the system to operate under a range of future environmental and socio-economic conditions that can be anticipated as possible and plausible but that cannot be predicted with certainty" (Franco and Sanstad, 2006).

How does a local government follow the same advice given to California's electricity sector? What does implementing adaptation and mitigation strategies that follow the guiding principle of resilience mean? The first challenge is to uncover where adaptation and mitigation meet at the project level. As referenced earlier in our discussion of definitions, recall that mitigation refers to a reduction in GHG emissions while adaptation refers to initiatives that reduce the vulnerability of a system to the effects of climate-change. A focus on resilience would be one that encourages the implementation of strategies that help a system (or community) "bounce back" in the face of stress.

2.5 Community Renewable Energy

How can local governments make sound decisions to invest in renewable energy projects that achieve mitigation, adaptation, resilience, and sustainable development goals and implement them in their communities? According to Diane Cardwell (2012) some local governments have already done so. Referring to the time period just after Superstorm

Sandy in 2012, Caldwell writes, “In Bayonne, New Jersey, a school with an unusual coupling of a solar array and a backup diesel generator found itself chugging along through the storm and its aftermath, allowing more than 50 residents to spend the night that Sandy hit on cots in a heated, dry and well-lighted community room.” This is an example of a hybrid grid-tied solar array with battery backup technology that not only enabled the school to maintain power when the grid failed, but it also allowed the facility to act as an emergency shelter for local residents unable to remain in their homes as a result of the storm. As such, this type of project at the community-level achieves mitigation and adaptation goals, guided by resilience.

There is substantial literature spanning a variety of topics related to local level renewable energy generation (Walker, 2008; Hain et al., 2005; Rogers et al., 2008; Hielscher et al., 2013). Some of this work focuses on the term “community renewable energy” and what it should mean with respect to who participates and most importantly, who benefits from such projects. Much of the literature on this topic is authored by Gordon Walker, a geographer based at Lancaster University in the UK, who argues that a true community renewable energy project should not simply be one that a local government constructs at (or on) a public facility and then the profits remain entirely within the government coffers. Instead, he argues that a true community green energy project should involve engagement from residents, active participation in the planning on the part of community members, and most importantly an opportunity for the locals themselves to share in the positive outcomes of such a project – i.e., allows them access to the green energy produced or at least an economic share of the profits, if any. “Considerations of equity and the distribution of costs and benefits have been shown to be important in local debates about many development proposals (Lesbirel and Shaw, 2005; Wolsink, 2007) and in this respect community projects are no different—indeed labeling a project as community and then local people feeling they are getting nothing out of it will itself simply increase the scope for resentment and objection" (Walker & Devine-Wright, 2008).

Walker, along with colleagues Devine-Wright, Hunter, High and Evans (2010), expand upon this concept in further work to explain that these dynamics are exemplified by the devastating effects that a lack of community trust can have on a project of this nature. If the community does not trust that its local government is going to include residents in the planning process for these types of projects, or if they do not believe that the benefits of such a project will ever touch them, their support tends to drastically diminish.

As such, a solar installation like the one previously described in which the community tangentially benefits from mitigation benefits like cleaner air, reduced GHG emissions, and so forth, while also directly benefiting from adaptation and resilience features like having a public place to use as a shelter during an extreme emergency, makes it a clear example of where climate-change mitigation and adaptation overlap with resilience as a guiding principle. Such a project exemplifies true community green energy at the same time that it addresses both mitigation and adaptation. In fact, it employs both strategies in a way that also builds community resilience.

2.6 Conclusion

Climate-change is an issue of great magnitude. It will take a coordinated and calculated effort to effectively address its impacts. The tools are available; they need to be assembled in the right way. The four areas of climate-change study examined herein, adaptation, mitigation, resilience and sustainable development, while they differ greatly in some ways also overlap naturally in other ways. It is in locating these areas of natural synergy that opportunities for compromise and progress can be found. There are projects that can achieve all four goals. If these types of projects are implemented at the local level – and ensure that the community itself benefits – change can be effectuated that holistically addresses climate-change in our communities.

CHAPTER 3

METHODOLOGY

Community renewable energy generation can be a vehicle for climate-change action at the local level. As discussed, significant action on climate-change is occurring at the local level. Powerful progress in this regard will occur when municipalities (or other local entities) begin to generate their own clean energy for more than solely economic reasons. While cost savings are important and worthwhile, when financial considerations are the only consideration, a project can miss out on the chance to have far greater impacts for both the local entity itself and the community members it serves.

Understanding this, five case studies are presented that illuminate different aspects of local level clean energy production both at the project and policy levels. Three projects that implement community renewable energy in different ways and therefore achieve different, yet related, goals are examined. The final two case studies analyze state-level policies that have implications for local clean energy energy production, one in Vermont and one in New Jersey.

In Fintry, Scotland, the issue of significant fuel poverty propelled a group of concerned citizens to explore the idea of hosting a large-scale wind project and negotiating partial ownership with the developer. The project that resulted provides Fintry with the ability to invest the money generated from its portion of the project back into energy-efficiency projects that allow community members to experience a considerably improved quality of life.

In Brighton, UK, a solar cooperative project was born out of one man's desire to act in the face of climate-change. A small team of three individuals then faced numerous obstacles in their attempt to create a shareholder financed, owned and operated solar array. Despite all of the challenges they faced, the project eventually was constructed and their goal of full financing and ownership by shareholders became a reality.

In Bayonne, NJ, things seemed considerably brighter in the wake of Superstorm Sandy than elsewhere in northern New Jersey. Demonstrating considerable foresight and planning, the municipality had, years prior to the storm, installed a solar array that included a dynamic inverter, enabling the array to switch from grid-tied to standalone mode in the event of a grid failure. As such, in the wake of an extended power outage in much of New Jersey, Bayonne was able to provide its residents with a safe, dry and warm place to seek shelter because of the ability of their solar array to power backup generators.

The two policies that were chosen are New Jersey Government Energy Aggregation and the Vermont Common Assets Trust. These two policies show how two different states have gone about implementing (or proposing) policies that deal with different aspects of renewable energy production. Government Energy Aggregation is a New Jersey state initiative that allows for local-level action on behalf of a community with the goal of saving residents money and providing them with electricity produced cleanly if they so choose. The Vermont Common Assets Trust is a concept that allows for state-level action to protect the environment for the current and future enjoyment of community members. Both policies empower a government entity to act on behalf of its constituents. Neither policy empowers the individual to act on his or her own behalf.

The policy case studies serve to show both what has been done and what is possible at the State level. The projects serve to show that, in the absence of Federal and/or State policy facilitating Community Renewable Energy – a small yet dedicated group of individuals will find a way to turn their visions of true community renewable energy into reality. Without policy support they will struggle and remain in the minority but if they are dedicated enough and have sufficient resources, they will push forward and achieve their goals – setting an example for policy makers regarding what is possible when dedication and passion combine with the right policy tools.

From these five case studies, some of the best elements for encouraging true community renewable energy are extracted and used to form the basis of a discussion of policy choices open to New Jersey. Chapter 5, the resulting policy discussion, was reviewed by a panel of five experts representing different segments of the solar sector. Targeted questions, described in more detail in Chapter 6, were asked of the panel members in order to ensure that the feedback received was useful in further developing the policy ideas discussed therein. Feedback was received from each of the five experts and forms the basis of the policy development and summary provided in Chapter 6.

CHAPTER 4

CASE STUDIES

4.1 Introduction

Three community renewable energy projects and two State level policies that to some degree facilitate such projects are presented in this Chapter. The project level case studies – Fintry, Scotland, Brighton, England, and Bayonne, New Jersey – set the stage for what is occurring both locally and elsewhere in the world with respect to successful community renewable energy projects. An analysis of these projects reveals challenges in planning, complicated negotiation of community compensation, as well as success in implementation and distribution of revenue. The two policy case studies - New Jersey Government Energy Aggregation and the Vermont Common Assets Trust - provide the framework for the tools necessary at the State level to allow for certain types of projects. All five case studies serve to expose how difficult it can be to craft comprehensive policy that encourages and facilitates the types of project that further public policy goals.

4.2 Fintry, Scotland

4.2.1 Community

Fintry is a small village in central Scotland, located approximately twenty miles north of Glasgow and situated within the local government council area of Stirling. The community is nestled in a valley between the Campsie Fells and the Fintry Hills and boasts a population of approximately 800 people, or 333 properties. In this part of Scotland, being connected to the National Transmission System for gas supply is called being connected to “mains gas.” Fintry is not connected to mains gas and due to its geographic location in a valley between hills; many of its 333 properties sit on high ground and are exposed to the harsh elements (FDT, et al., undated). Fuel costs have increased substantially over the last decade resulting in significant fuel poverty (FDT, et al., undated)[2].

While Fintry's geographic placement puts many of its residents at higher risk for exposure to extreme temperatures, this same characteristic also makes it highly desirable as a location for wind-farm development. Indeed, the frequent and steady winds that accompany such a geographic orientation are what drew wind-farm developers to the hills above Fintry. But when these same wind-farm developers cautiously approached the village with their plans to construct wind turbines high in the hills above the town, they were quite shocked by the reaction they received (Scott, 2009). The people of Fintry did not run the developers out of town, nor did they deploy any of the familiar "Not in My Backyard" (NIMBY) approach that renewable energy developers often encounter. Instead, from the very beginning, the people of Fintry engaged with the developer to find a way for the residents of the village to benefit from the project.

4.2.2 Project

Long before any wind-farm developers discovered the hills above Fintry as a potential development location, members of the community were already working toward the lofty goal of transitioning the village to a carbon-neutral sustainable community (FDT, 2009). In fact, four individuals in particular, referred to as the "Fintry Four" including Gordon Cowtan and David Howell, were proactively seeking to engage with a wind-farm developer when the project described herein was proposed to them by Falck Renewables. It turns out that in the case of Fintry, both the developer and the community were looking

[2] A household is said to be in fuel poverty when its members cannot afford to keep adequately warm at reasonable cost, given their income. (See http://en.wikipedia.org/wiki/Fuel_poverty)

to wind as a way to further each entity's goal – Falck Renewables from a business standpoint and the people of Fintry from a sustainability standpoint, as well as a desire to achieve carbon-neutral status. As such in 2003, the Fintry Four officially formed Fintry Renewable Energy Enterprise (FREE) and drew up an extensive proposal for Falck Renewables that outlined what the community wanted to derive from the project.

The main element of the proposal that made it so innovative and community driven, is that FREE requested, and was given, an extra turbine to own. The developer's original project concept included fourteen large-scale wind turbines, but the final design included a fifteenth turbine to be owned by FREE. The negotiation process for this arrangement culminated in a legal agreement between FREE and Falck Renewables which was signed in February of 2006 (FDT, 2009). Once FREE took over legal ownership of the fifteenth turbine, it evolved yet again into a new body, Fintry Development Trust (FDT), which then acquired charitable status and as such became legally able to disperse the revenue generated by the turbine. The FDT was created in June of 2007 and in May of the following year FDT received its first income from the operation of its turbine.

4.2.3 Finances

In most large-scale renewable energy projects (community or otherwise), the biggest limiting factor to success is usually the substantial up-front capital costs. In this particular case, FREE could never have afforded to purchase the fifteenth turbine outright from the developer. With no mains-gas access, and high levels of fuel poverty, the people of Fintry were not in a position to invest capital in such a project regardless of their desire to make Fintry carbon neutral/sustainable. This is where innovative thinking and the employment of community compensation emerged. The deal between FREE and Falck Renewables acknowledged that the people of Fintry would have to sacrifice a certain degree of rural/scenic community character to host such a large wind farm. The landscape of their home would be changed considerably for the duration of the project (estimated to be at least 30 years) and all involved agreed that this sacrifice deserved compensation.

Falck Renewables agreed to the following proposal: FREE would mortgage the purchase of the fifteenth turbine from the company and pay back that mortgage out of the yearly profits generated by the turbine under community control. To simplify things, the arrangement allowed for FREE to own 1/15th of the profits of the entire project, rather than sort out which turbine exactly was the 15th and thus base FREE's share of the profits on the production of that specific turbine. So FREE receives 1/15th of the profits generated from the project annually and out of that money Falck Renewables deducts the cost of the turbine's construction, or the mortgage payment. After the wind farm had been operating for just over a year, it had already earned the villagers £140,000 (~225,000 US dollars). After the £2.5 million (~4,018,000 US dollars) mortgage is paid off, the annual profits for the village of Fintry are expected to be approximately £500,000 (~803,600 US dollars) per year (Scott, 2009).

4.2.4 Revenue

If the innovation and progressive thinking underlying this arrangement were to stop here, the Fintry wind-farm project would still be a great example of a community renewable energy project that not only engaged the locals in planning, but also directly provided benefits back to residents once constructed. In fact, the innovation and progressive thinking of this community renewable energy project does not stop here. It would have been very easy for FDT to simply dole out even shares of the revenue from this project to each resident or each household and allow the residents to use that money however they saw fit – to pay bills, to educate their children, or to provide basic necessities like food and clothing for their families. Especially in light of the fuel poverty discussed earlier, one must assume that it would have been much easier and more popular to simply apportion the revenue to residents and allow those living in the harshest conditions to improve their state somewhat. But in spite of any pressure that may have existed to stop there, FDT remained focused on the larger goal of this project: to funnel the proceeds into energy- efficiency projects within the community thereby generating long-term sustainability impacts for residents.

With that goal in mind, FDT kicked off its first initiative utilizing revenue from the wind farm in 2008. The project's goals were twofold: to reduce energy demand and to decrease fuel poverty. To accomplish these goals, the project set out to provide free insulation to all suitable homes in the community (FDT, 2009). "Suitable" homes were determined by doorstep surveys in which trained individuals acquired necessary information about each property and its energy use. Thermal imaging was utilized to expose where heat was being lost and reports were issued to each homeowner detailing the property's energy consumption and emissions both before and after the insulation. Lastly, an educational program to promote energy efficiency was created for the primary school students of Fintry (FDT, 2009).

4.2.5 Results

Once the doorstep surveys were completed, the free insulation installed, and energy-efficiency tips distributed, the final results of the project were analyzed. According to "Fintry Community Energy Project" a report compiled by FDT, Natural Scotland, the Scottish Government, and Energy Agency organizations in 2009, the results are impressive. "The average energy efficiency of households has increased by a third as a result of the insulation measures. The community is producing 464 tons less carbon dioxide (CO_2) each year as a direct result of the insulation. After insulation measures, 35% of the households that received insulation and provided sufficient data are estimated to still be in fuel poverty – this is a reduction of 25%. From the data gathered, total household-energy consumption for the whole of Fintry has been estimated at 13.0 gigawatt hours (GWh) per annum before the insulation project. Once completed, this will be reduced to an estimated 10.2 GWh per annum" (FDT, 2009). The Fintry-owned wind turbine generates approximately 7.5 GWh per annum, leaving Fintry with only 2.7 GWh per annum to account for before achieving its carbon-neutral goal.

4.2.6 Next Steps

The insulation project was only the first step in a larger plan to make Fintry carbon neutral. In 2009, FDT again utilized funds from the profits of the wind farm to make energy improvements to the community's sports club. According to the FDT website, £5,634 (~9,055 US dollars) was spent to make the following improvements to the facility: low-energy lamps in changing rooms, toilets, corridors and the entrance area; passive infrared light sensors so that lights are switched off automatically when rooms and facilities are not in use; electric savers for water heaters and panel heaters; and low-energy lamps and kits for the lighting in the bowling hall. Also in 2009, FDT contributed £2,186 (~3,513 US dollars) to purchasing new radiant heaters for Fintry's Menzies Hall Facility. Future plans for the wind-turbine revenue funds include: a Phase 2 insulation plan, an initiative to insulate the park homes which were not part of the initial round, a program called "Fintry Community Wood Fuel", and a plan called FEET (Fintry Energy Efficient Transport) (FDT, 2009).

4.2.7 The Fintry Model

To make this overall scheme a reality, the Fintry Four started off with a rare degree of self-awareness regarding their circumstances, limitations, and opportunities with respect to the issue of fuel poverty in their community. Instead of wasting precious time and energy dwelling on their lack of access to mains gas, they instead organized internally, came up with written goals and objectives, and then proactively sought out a project that would improve their circumstances considerably. They advocated for their rights and what was owed to them, and did not back away from becoming active participants in determining their own fate. Through participation in a true community renewable energy project, they have improved their quality of life, reduced their impact on the environment, and empowered their community through the dissemination of information as power for change.

4.3 Brighton, England

Brighton, England is the major portion of the City now referred to as Brighton and Hove on the southern coast of Great Britain. The Brighton Energy Co-Op began with a fundamentally good idea and not much else. A person by the name of Will Cottrell was profoundly disappointed by the outcome of the Copenhagen Climate-change negotiations in December of 2009 and as such he decided that he wanted to do something about it, rather than waiting for others to act on his behalf (Hielscher, 2012). After learning about some of the first community renewable energy projects happening in the UK, as well as educating himself about the UK government's plans to adopt a feed-in-tariff, an idea for a community-owned solar project in Brighton was born. Cottrell quickly discovered that he needed a team of individuals with varying backgrounds to turn this idea into reality. He held a public meeting to discuss his concept and as a result of this gathering added two key players to his team: Damian Tow, an information-technology specialist, and Danni Cracker, a chartered (or certified) accountant. These three individuals would act as the core Brighton Energy Co-Op team and work closely together to turn their vision of doing something good for the environment and good for the community into a reality.

The road would not be smooth and the project would face numerous hurdles on its way to eventual completion. First up, the team resolved that it needed a strong business plan and decided upon the following project structure: a 350 kilowatt (kW) solar installation paid for by a £1 million (~1,607,200 US dollars) shareholder investment. Shareholders would pay the cost to purchase and install the panels and once constructed, they would own the system/s. Host sites would get a reduction in their energy costs for 25 years by purchasing the clean energy back from the cooperative at a rate lower than that which they would otherwise pay their utility provider. Any revenue generated by the feed-in-tariff and sale of electricity would fund: "any maintenance & repairs required for the panels and associated equipment; the running costs of Brighton Energy Cooperative; payments into a sinking fund for replacement of the inverters; annual interest payments to investors (commencing at the end of year 3 of operations) as well as capital repayments; and finally fund low-carbon community projects" (Brighton Energy Cooperative, undated).

The aforementioned hurdles were plentiful and significant. Attracting shareholders to invest money in a business model that had never been tested with a team of people that had virtually no experience running such a project was difficult. Add in the fact that the UK government changed its feed-in-tariff rules numerous times during the course of the project-planning process, and the setbacks really began to mount. The UK government was progressively scaling back the size of projects that would be eligible for the feed-in-tariff as a way to limit the number of very large solar arrays. As a result, the team needed to modify its business model quite a few times to reflect the changes in policy. Each time the feed-in tariff requirements were modified, the project model needed to incorporate more host sites with smaller arrays at each. Their original plan of one 350 kW array eventually became a plan to install a total of up to 145 kW at three separate sites. This situation complicated matters because it required negotiations and permitting for three sites rather than one, adding time and funding pressure to an already stressed project.

To combat the significant negative impacts of the UK government's feed-in tariff policy changes on the project, it is important to note that the team was actively engaged in lobbying efforts to exempt community renewable energy projects from some of the stricter regulations. During the course of the two-year planning and development process for Brighton Energy Co-Op's solar project, the team tirelessly fought for community-energy projects to be exempt from changes to the tariffs. They argued that the status of a community energy project as either a Community Benefit Society (CBS) or an Industrial Provident Society (IPS) should be proof enough of its non-commercial nature and could therefore, provide the basis for such an exemption (Hielscher, 2012). This type of a broad exemption for community renewable projects from feed-in tariff regulation changes has been widely debated in the UK but has not yet come to fruition. However, two smaller victories on the lobbying front were achieved. Community renewable projects in the UK are exempt from energy-efficiency requirements otherwise required for feed-in tariff eligibility. This provision allows these projects, first, to proceed without incurring the substantial extra costs associated with energy-efficiency improvements prior to solar installation. Second, community organizations are allowed to "fix freeze" the feed-in tariff levels after a building site agrees to host the solar array. Once the agreement between the solar landlord and Brighton Energy is finalized, the feed-in tariff level is fixed for six months, again making it cheaper for these types of projects to proceed (Brighton Energy Cooperative, undated). These small legislative victories have helped the Brighton Energy Co-Op remain competitive in the solar market and have made community-owned projects more attractive to investors.

In the end, the success of the Brighton Energy Co-Op solar project and its business model came down to securing enough initial investment and shareholder contributions to fund the purchase and installation of the first set of panels. The team approached the task of engaging shareholders through share offers and held public meetings to get the word out about their project. During the first two years of fundraising, the team raised approximately £26,000 (~41,787 US dollars) from a small number of initial investors and used this money to get far enough in the planning process that an official share launch could be held.

The culmination of more than two years of hard work to get the message out occurred on May 16, 2012 when the team held its official share launch and explained the following business model to all those in attendance: “The Brighton Energy Co-op intends to install up to 145kWp of solar photovoltaic (PV) systems in order to generate clean electricity and financial return for members. We also aim to reinvest surplus income into other local renewable energy projects… Although we cannot guarantee any financial returns we intend to provide a return on investment to our members starting at 4% from the 1 July 2015, the end of the third year. Brighton Energy intends to retain ownership of these panels and receive an income via the Government’s Feed-in-Tariff scheme. Income will be used to administer Brighton Energy’s activities, fund withdrawal of shares and pay interest to members. Meanwhile, host buildings will receive discounted electricity; any excess will be sold to electricity provider Good Energy” (Brighton Energy Cooperative Share Offer Document). The share launch was a success and raised more than £200,000 (~321,440 US dollars) from hundreds of community investors who believed in the project and believed in the team. Since that time, the team has installed solar systems at three sites for a combined generation of more than 130 kW–enough to power forty homes and save 1,085 tons of CO_2 per year (Brighton Energy Cooperative, undated).

It is not particularly innovative or groundbreaking that three individuals would come together to build three solar arrays on three rooftop locations to generate clean and renewable energy. What is remarkable about this project is that three people set out to construct a solar project that would be entirely owned and operated by a community of shareholders. They set out to prove that generating renewable energy can be a good business model as well as the right thing to do for the environment and for residents. The Brighton Energy Co-Op model understands that local ownership of renewable energy has far reaching and lasting impacts. Community ownership "creates local dialogue and acceptance of renewables, it raises public awareness, it promotes cheaper and better technology through private investment, it is inherently democratic bringing more responsibility to the local level, it makes sustainable development understandable, and it gives people the opportunity to act for sustainable development" (Brighton Energy Cooperative, undated).

The success of this project illustrates a number of points with respect to local clean energy production. First, it shows that local-level renewable energy projects can make sound business sense and compete successfully in the marketplace alongside projects that lack any community involvement. Second, it exposes how critical government policy is in determining the long-term success or failure of a local renewable energy project and leads to the conclusion that if governments want to promote these types of projects they need to explore ways to help stabilize them by providing as much regulatory certainty as possible. Finally, it demonstrates that people are interested in supporting projects that they believe in when the goals of the project line up with their own personal philosophies. The hundreds of community investors that contributed to making this project happen did so because they believed in the project, had confidence in the team, and wanted to act in their own self-interest to protect their environment rather than waiting for someone else to act on their behalf.

4.4 Bayonne, New Jersey

A local-level solar installation with the ability to provide backup emergency power to the general public in the event of a grid failure is a project that simultaneously achieves the goals of mitigation, adaptation, resilience, and sustainable development. A solar installation by nature achieves the goals of mitigation by reducing the GHG emissions of the facility it serves by providing it with clean and renewable power. It is true that a solar installation connected to the grid and "net-metered" does not in fact supply the actual facility that hosts the installation with the clean and renewable electrons generated by the solar system. Instead, the array sends those electrons into the local utility distribution system (or "grid") and then the host facility draws different electrons from the grid to power its operations. All the same, the facility that houses the renewable energy source is contributing to a reduced overall demand for electrons generated by fossil-fuel combustion and therefore contributes to a reduction in GHG emissions. During months when the solar array produces more energy than the building consumes, the net effect is a drastically reduced electricity bill for the facility housing the net metered solar array. Provided this cost savings does not spur the facility in question to consume more total electrons, this outcome achieves the goals of climate-change mitigation (Owen, 2012).

How then does a net-metered solar array contribute to a local community's goal of adapting to climate-change impacts or building its resilience? This is where the potential for backup generation during grid failure becomes critical. Traditionally, when a solar array is installed it is either tied into the grid or it is not tied into the grid (otherwise referred to as a "standalone" system). If it is not tied into the grid and therefore functions as a standalone system, it requires expensive battery storage capacity to collect and hold the power generated but not needed from moment to moment. Most solar installations are grid connected so that they do not require battery storage and can instead send any power generated in excess of the facility's needs back into the distribution system for use by others. This also enables the owner of the array to be compensated for this contribution of clean energy to the grid at a retail rate. While this set up (commonly referred to as "net metering") is usually much more lucrative than the alternative of installing storage capacity and not receiving compensation for electricity provided to the grid, it does have one major drawback.

When a solar array is solely grid-tied, it is vulnerable to the failure of the grid. In other words, when the grid fails, the connection between the solar system and the grid is severed. As such, in the example of an extreme storm event that results in a widespread grid failure, any solar installation tied into the portion of the grid that fails, will also stop working. To be clear, the panels themselves will continue to generate power but all grid-tied systems are mandated to be installed with an inverter switch that automatically shuts off the connection between the array and the grid in the event of grid failure and automatically turns it back on when the grid resumes function. This inverter switch is mandated under the National Electrical Code requirements called "anti-islanding" and a grid-tied solar array lacking this feature will fail electrical inspection. It is a feature that works automatically when the system senses grid failure and it prevents the solar array from feeding electrons into the grid during these times in order to protect utility workers from unwittingly working on “live” wires (C. Bosket, personal communication, November, 2012). As such, even if the storm has passed and the sun is shining brightly, if the grid stays down, the solar array will remain inoperative. Only when grid function is restored will the solar system again feed electrons to the grid. This severely limits the adaptive capacity of a purely grid-tied solar installation.

However, there is a way to create a hybrid system between the two classic models described above – grid-tied versus standalone. With one simple added inverter switch, often called a “dynamic inverter,” a grid-tied solar installation can become standalone in the event of grid failure and direct the flow of power generated by the solar panels away from the grid entirely and instead toward a backup storage unit like a generator, a battery, or an electric vehicle (C. Bosket, personal communication, November, 2012). In this way, the solar array can continue to function even when the grid has failed. This makes the solar installation not only a mitigation tool by virtue of the GHG emissions it achieves, but also an adaptation tool based upon its ability to provide backup power in the event of a grid failure. If such grid failures are the result of climate change-induced severe storm events, then the hybrid solar array discussed above also contributes directly to the resilience of the community that installed it.

One such community is Bayonne, New Jersey. As discussed earlier, in 2004, well in advance of Superstorm Sandy, the municipality of Bayonne installed a solar array with the dynamic inverter technology described above at its Midtown Community School, a designated emergency evacuation center for the City. As such, when Superstorm Sandy made landfall in October 2012, the community of Bayonne was able to rely on the energy generated by the solar panels to power diesel generators at the school to keep the lights on. This allowed the school to function in the capacity of an emergency evacuation center, as planned, providing shelter, food, and water to the residents of Bayonne during the extended period of time that the utility was unable to deliver power due to grid failure.

4.5 New Jersey Government Energy Aggregation

There are four main electric distribution companies (EDCs) in New Jersey, commonly referred to as “utilities”. The four EDCs serving customers in the state with electricity are: Jersey Central Power and Light (JCP&L), Orange & Rockland Electric (RECO), Public Service Electric & Gas (PSE&G) and Atlantic City Electric (ACE). Prior to the Electric Discount and Energy Competition Act (EDECA), which deregulated the New Jersey electricity industry in 1999, the EDCs were responsible for both the generation and transmission of power to customers in their territories. After EDECA, the services EDCs provided were unbundled and placed into four different categories: generation, transmission, distribution and energy services.[3] The generation sector was deregulated which introduced competition into the market when the EDCs were no longer the only entities generating power. On the generation side, deregulation ushered into the state many third party-suppliers (TPSs) of energy. The transmission and distribution sectors remain regulated.

The effect of deregulation on the market is that customers – both residential and commercial – can shop around for the most inexpensive price for energy. If an EDC does not provide the cheapest rate, a customer can choose a TPS that offers a better rate. The EDC still transmits and delivers the power via its transmission system, but the customer is purchasing the energy from a different supplier. This allows for the customer to make a decision about which provider to choose based on the criteria he considers most

[3] See http://www.njelectricity.org/

important: price, whether the power comes from renewable sources, trust in a particular company, and so forth. Yet as of 2012, the New Jersey Board of Public Utilities (NJBPU) reported that only 11% of New Jersey residents had switched to a TPS for power and instead remained with their EDC for both supply and transmission. The reasons for not switching to a TPS vary. Some customers simply do not know that the option to shop around is open to them. Others understand that the option is open to them but choose not to act upon it because they feel insecure in their knowledge of what switching to a TPS will really mean for them. Potential customers remain skeptical of the claims advertised by TPSs to provide the same reliable power at a reduced cost and they fear entering into a contract that could actually end up costing them more money. Whatever the reason, most New Jersey electricity customers have been staying with their EDC for energy supply despite deregulation.

EDECA, the legislation that deregulated the energy sector in New Jersey, also ushered in a subsequent piece of legislation called the Government Energy Aggregation Act of 2003 (L. 2003, c. 24). This Act "authorizes municipalities and/or counties of New Jersey to establish Government Energy Aggregation (GEA) programs after passing an ordinance or a resolution. A GEA program allows municipalities, working alone or in a group, to aggregate the energy requirements of residential, commercial and municipal accounts so that the GEA program can purchase energy supply from non-utility sellers of electricity and gas supply (Third Party Suppliers or TPS) at prices lower than the average utility price, with the possibility of added benefits such as higher renewable energy content."[4]

In effect, this legislation allows a municipality to harness the purchasing power of its residents and businesses to procure the lowest possible rate from a TPS. The intent of

[4] See http://nj.gov/bpu/pdf/energy/NJ_Gov_Energy_Aggregation_Summary.pdf

this legislation was to increase competition within the electricity sector in New Jersey. Understanding that individual residents and businesses might be hesitant to deal with associated risk and perceived hassle of switching to a TPS, the legislation provided the municipality with the necessary authority to make the switch on behalf of its constituents. After all, the potential for savings seemed far greater if the municipality aggregated all of the customers within its jurisdiction together and negotiated a significantly cheaper rate on everyone's behalf. It makes sense to assume that a TPS would offer one entity representing hundreds if not thousands of new customers a better rate than a single customer might receive. Additionally, if an individual's municipal government passed the required ordinance and aggregated on his behalf, then all of the "hassle" associated with switching would be removed from the individual customer and placed on the municipality. This might alleviate the concerns discussed earlier.

And yet still, despite the passage of the GEA, few municipalities have been capitalizing on the opportunity to aggregate on behalf of their residents and businesses and procure cheaper electricity rates. To date, only two municipalities in New Jersey have passed the required local ordinance to aggregate and then subsequently awarded contracts to a third-party supplier – Plumstead Township and the Township of Toms River.[5] Plumstead was the first community to award a contract to a third-party supplier and the town expected to save its residents over $400,000 in the first year. Toms River followed this lead and expects to save its residents $4,000,000 annually.

If other municipalities follow the example set by Plumstead and Toms River, it will be interesting to see whether the anticipated cost savings become a reality. Also compelling will be the impact that additional community aggregations will have on the associated EDCs. One might assume that as other municipalities aggregate on behalf of

[5] See http://njccea.org/

their residents, and thereby remove their business (for supply) from the EDCs and transfer it to TPSs, this could have a significant negative impact on the EDCs in question. One thing is certain, if the first two municipalities to try this are successful, others will follow. Local governments in New Jersey are suffering considerably due to decreasing budgets and increasing demand for services. Any place a municipality can see a cost savings is certain to pique the interest of local officials.

But is it enough – from a community renewable energy perspective – to encourage government energy aggregation at the local level if the only benefit of such an arrangement is financial? What about the source of the power and how it is generated? In order for GEA to really be used as a vehicle for community renewable energy production, the aggregating locality must also consider the source of the power it is purchasing and factor renewable energy into its decision making.

4.6 Vermont Common Assets Trust

The "tragedy of the commons" is a theory first articulated by Garrett Hardin (1968). His classic example of the phenomenon depicts a large open field in which anyone can allow his cow to graze without paying a fee or individually owning any portion of the parcel. Hardin explained that in the absence of a strict regulatory regime, people will overexploit the resource to further their own self-interest. Farmers will place more and more cows onto the commons in an attempt to reap the benefits of getting something for nothing, but this will eventually lead to the total destruction of the land at which point it will be useless to all. Hardin cautions that without proper mechanisms to place value on the land

and regulate its use based on the benefits it provides to the farmers, humans will always undermine the resource until it is gone entirely.[6]

It is widely argued that this tragedy of the commons is not just a theory, but a phenomenon that is in fact playing out globally with respect to those environmental assets for which access is open to all without proper controls. Global fishing stocks are being depleted much faster than they are able to naturally replenish. It is estimated that if this trend continues and current levels of commercial fishing are not curtailed, oceanic fisheries could be entirely wiped out by 2048 (Worm et al. 2006). Unfortunately, global fishing stocks are not the only example of such extreme exploitation. Supplies of non-renewable energy sources are being depleted much faster than they are being replaced with renewable alternatives (Farley, 2011). To compound matters even further, such extreme resource extraction generates waste much more quickly than the environment can absorb and, as a result, discarded materials accumulate at the same time space for disposal becomes increasingly scarce. The effects of over-consumption, extreme resource depletion, and significant waste accumulation cannot continue indefinitely without disastrous consequences (Farley, 2011).

Certain populations are already feeling the effects of the phenomenon discussed above, most notably the poor. Paradoxically, it is not generally the poor who are rapidly consuming the world’s limited resources, it is the wealthy. The wealthiest minority is depleting global resources at a rapid pace and those currently suffering the most are the poor, although eventually the effects will affect everyone. The question becomes, what can be done before it is too late? Is there any politically feasible way to curtail the perfect storm of resource depletion, over-consumption, and waste accumulation before the story ends in same way Hardin outlined in 1968?

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[6] See http://en.wikipedia.org/wiki/Tragedy_of_the_commons

The state of Vermont is attempting to do just that. Vermont State House Bill 385 (identical to the 2007 State Senate Bill 44) proposes the creation of a Vermont Common Assets Trust (VCAT) which would "make certain resources the common property of all Vermonters" (Farley, 2011). Based on the idea that the people of Vermont own certain common resources and should be compensated for their depletion/extraction/use, VCAT attempts to assign a value or price to their use in an attempt to bring resource consumption and regeneration back into balance. Relating back to Hardin's example of the cows grazing on common land free of charge, would the same eventual destruction of the resource occur if a price was assigned to use of that land? And if that price fluctuated based on the condition of the resource and how much protection from overgrazing it required, could a balance eventually be struck between the appropriate use of the site and the appropriate protection of it for use by future generations?

That is the goal of the VCAT policy. And while VCAT is the first of its kind with respect to setting up a trust that assigns prices to a variety of environmental assets, the general concept of assigning ownership of public goods to the public is not new. In fact, the State of Alaska has been managing its mineral rights in this manner for decades (and other states have similar—though perhaps less prominent—programs). The Alaska Permanent Fund (APF) was established in 1976 and every year it disperses up to $2,000 to each resident of the state based upon the concept that the people of Alaska own the mineral rights contained within the state and should therefore be compensated for their extraction.[7] Similar structures exist to manage oil resources in, for example, Abu Dhabi and Norway. What makes VCAT unique is that it attempts to manage numerous common assets owned by the people of Vermont rather than just one resource, like oil.

[7] See http://pfd.alaska.gov/DivisionInfo/HistoricalTimeline

Critical to the VACT model is an understanding of the concept of economic rent. Economic rent is defined as "all unearned income from ownership of a resource, from a monopoly, from scarcity, or any other reason resulting in unearned excess profits not due to work, risk, or enterprise" (State of Commons, Tomales Bay Institute, 2003). This means that any excess profits made after the cost of resource extraction, taking into account a normal rate of return, would be considered economic rent. In the VCAT model, revenue from economic rent on common assets would either be allocated to the restoration and protection of the resource, or it would be disbursed to the citizens of Vermont, as in the case of Alaska Permanent Fund. Either way, Vermonters would benefit from the value of the economic rent by either having the resources that they own protected, or at least enjoying compensation for their depletion/extraction. Those who support VCAT as a vehicle for long-term sustainability would promote the allocation of the rent funds to protection of the resource over the direct payment of funds to citizens, which could have the unintended consequence of promoting further overconsumption, one of the factors leading to the need for VCAT in the first place.

A novel way that VCAT can be applied to the nascent renewable energy industry is by exploring the possibility of wind or solar ray rent (Skalka, 2008). Wind is not much different than a resource like groundwater or oil; it can be exploited for personal gain without compensating those who own it–arguably the citizens of Vermont. The only real difference between wind/solar rays and resources like groundwater or oil is that wind and solar rays are renewable. But does this mean that they are not owned by the people of Vermont the same way non-renewable resources are? Why repeat the same mistakes made with other resource-dependent industries in the past by allowing renewable energy developers free access to the wind and sun without sharing any of the accrued economic rent with the public? Utilizing VCAT in this manner could provide a way to take renewable energy projects that lack a community benefit and force them to distribute at least a modest portion of their profits (those which fall into the economic rent category) to members of the community that hosts the wind mills or solar panels and suffers an associated loss of community character, view shed quality, and/or open space.

Returning to Hardin's depiction of the tragedy of the commons, it is interesting to note that significant research has revealed alternate viewpoints on this issue. Nobel Prize winning scientist Elinor Ostrum argued that government intervention and assignment of property value is not always the most effective way of correcting the problem of the commons. While she agrees that sometimes government intervention is the only way to control rampant exploitation of resources, she also contributed a significant amount of research showing that sometimes tribal and local communities, when left to their own devices, develop better ways of controlling this phenomenon on their own without intervention from higher levels of government (Tierney, 2009).

If Ostrom is correct, it becomes even more critical that decision making at the local level is informed and targeted to achieve public-policy goals.

CHAPTER 5

POLICY DISCUSSION

Increasing community resilience during a period of climate-change should be a paramount policy objective for New Jersey. Current literature suggests that most government action with respect to climate-change is happening at the local level. The production of and access to clean renewable energy is a fundamental part of resiliency. Without access to renewable energy at the local level (also referred to as "distributed" renewable energy) communities in New Jersey will no doubt suffer the same effects—or worse—as they did in the aftermath of Superstorm Sandy when the next storm/weather event hits the state. And yet, public policy in the United States, at both the state and federal levels incentivizing the production of renewable energy, is focused primarily on the private sector. With respect to solar energy production in particular, it is understood that without robust state and federal inducements—the most generous of which are not available to municipalities and counties—the cost of solar technology and installation would be too great an obstacle to overcome. It is often only with these incentives that solar projects become cost effective and even revenue generating over the long term.

In addition to the lack of access to incentives that could allow communities to install solar themselves, municipal governments in New Jersey are finding it difficult to control where private developers install solar projects in their communities. A series of steps taken by the state to jumpstart the solar industry and create jobs has produced the unintended consequence of tying the hands of local communities with respect to the siting of solar projects. New Jersey is often referred to as a "home rule" state meaning that the state, for the most part, delegates land-use decisions to local municipalities. New Jersey allows each community to develop zoning and master plans in accordance with state land-use laws. As referred to earlier, in an attempt to ignite the solar industry in New Jersey, on November 20, 2009, Governor Christie signed into law the designation of solar as an "inherently beneficial use." The impact of this initiative has been—and continues to be—significant. In essence, in the absence of a municipal solar siting ordinance, this legislation frees a developer from having to acquire a use variance when solar is proposed in a zone where it is not a designated permitted use. As such, the onus is on each municipality to proactively adopt a solar siting ordinance to exert control over where solar projects are situated in their communities. This has been especially difficult for farming communities in the southern part of the state. Often times, solar developers seek out farmland as ideal for conversion to solar for economic reasons. Questions about the efficacy of this strategy becomes especially apparent when contrasted with the fact that New Jersey has approximately 800 million square feet of industrial rooftop space[8] and only needs roughly 300 million square feet of this area to accommodate a sufficient amount of solar-generating capacity to fulfill the entire solar portion of the state's renewable portfolio standard (RPS).[9]

The designation of solar as inherently beneficial combined with generous incentives has spurred the creation of a vibrant private solar sector in New Jersey. However, there has not been similar progress facilitating the responsible and successful installation of solar at the local level. Due in large part to the ineligibility of government entities to qualify for federal incentives, municipalities have not been able to develop solar as easily as private entities. As of August 2013, there were 22,569 solar projects

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[8] http://www.njfuture.org/2012/05/18/solar-testimony.

[9] New Jersey's renewable portfolio standard (RPS)—one of the most aggressive in the United States–requires each supplier/provider serving retail customers in the state to procure 22.5% of the electricity it sells in New Jersey from qualifying renewables by 2021 ("energy year" 2021 runs from June 2020 – May 2021). In addition, the standard also contains a separate solar specific provision which requires suppliers and providers to procure at least 4.1% of sales from qualifying solar electric generation facilities by Energy Year 2028 (see http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R).

installed in New Jersey and of those only about 546 (or 2.42%) were public projects.[10] Additionally, as discussed above, municipalities face difficulty regulating where within their boundaries privately funded solar arrays are sited. The result is that in New Jersey, local governments are not benefiting from solar energy production as much as the private sector is *and* they are suffering the negative repercussions from policies which severely limit their control over siting private solar projects.

Compounding things further, community compensation for hosting renewable energy projects is not a common occurrence in New Jersey. Elsewhere in the world, however, it has become increasingly common for renewable energy developers to engage communities in the planning process very early, site their projects in locations found to be acceptable by local residents, and even distribute a portion of the proceeds back to the community as compensation for hosting the project (see Chapter 4). For example, in Fintry, Scotland, a wind developer, after assessing various locations for project potential, approached community members with a plan to install a large-scale wind farm. The residents of Fintry had struggled for years with issues stemming from systemic fuel poverty.[11] As a result, when approached by the wind developer, they saw an opportunity to improve their standard of living by negotiating compensation for hosting the wind installation. After a series of lengthy discussions, it was agreed that the originally proposed fourteen-turbine installation would be increased by one turbine to fifteen in total, with the community of Fintry owning the fifteenth turbine and all associated profits generated by it. In this way, the community has added an annual revenue stream, the

[10] New Jersey Board of Public Utilities, Office of Clean Energy.

[11] A household is said to be in fuel poverty when its members cannot afford to keep adequately warm at reasonable cost, given their income. (See http://en.wikipedia.org/wiki/Fuel_poverty)

funds from which are locally reinvested in the form of residential energy-efficiency improvements that directly combat fuel poverty.

The Fintry model illuminates the fact that New Jersey, while progressive in many ways, lags behind in terms of innovation when it comes to community renewable energy. Community compensation for hosting renewable energy projects is not something that is occurring very often, if at all in New Jersey. Also as discussed, community involvement in the planning process for private projects, as well as proactive action on the part of local government to install public projects, are also lacking. And yet municipal governments have a key role to play in acting in the best interests of residents with respect to increased resiliency in the face of climate-change. As the climate-changes and weather-related events like Superstorm Sandy become more frequent, local governments will face increased pressure to provide basic services to residents who are left without power for prolonged periods of time or even forced to evacuate their homes. As such, local facilities that are large enough to act as public shelters for community members during an emergency should be targeted for distributed energy projects that are equipped to function even in the event of grid failure.

A privately owned solar array (regardless of whether it is grid-tied or net metered) is not going to help the public at large when the power grid fails. Even a private solar array that utilizes a dynamic inverter to allow it to continue operating when the grid fails will not benefit others beyond the owner of the array unless the owner chooses to somehow share that access to backup power with others.[12] It is only when a solar project (with a dynamic inverter installed) is owned and operated by a public entity that it can be

[12] The presence of a dynamic inverter allows a facility with a solar array to continue to power a location even though electrical grid power from the electric utility is no longer present. In the event of grid failure, the dynamic inverter will automatically sense the lost connection to the grid, disconnect the system from the grid, and force the distributed generator to power an alternate source such as a battery, generator, or electric vehicle.

counted on to provide backup power to the local community in the event of an emergency. To this point, of the 546 public solar projects installed in New Jersey today, only a small fraction are actually owned and operated by the public entity itself. The majority of these projects are instead structured through a power-purchase agreement (PPA), meaning that the solar array itself is owned and operated by a third party that rents space (rooftop or land) from the public entity to host the array. Generally speaking, this is one of the few ways that a local government can make a solar project work since often times local governments lack the capital required to own and operate their own array. As such, this type of arrangement is successful in generating a new revenue stream for the local entity hosting the solar array via the rent payments they receive, but it should not be mistaken for a project that will necessarily increase the resiliency of the local entity. Unless provisions for resiliency are explicitly written into the contract associated with a PPA, public ownership of the array is a critical element in resiliency planning.

New Jersey should prioritize solar projects that produce the dual benefit of generating clean renewable energy that can also be counted on to support the public in the case of an emergency. It is necessary to be creative to find ways that both allow local communities to install their own solar arrays with dynamic inverters and thereby increase their resiliency as well as to identify strategies that give them more control in deciding where private solar projects will be sited within their communities. Additionally, it is important to open up the conversation in New Jersey about community compensation for hosting renewable energy projects. This discussion needs to address compensation with respect to the communities that host these projects as well as compensation for the natural resources they use/consume. As highlighted by the State of Vermont's legislation proposing a Vermont Common Assets Trust (VCAT), there is no reason why New Jersey could not impose a cost associated with the use of the state's natural resources, including the sun. If solar developers, for example, were required to pay a small tax on their use of a natural resource (the sun), the money generated could help restore parts of the state's ecosystem that have been compromised for decades by overconsumption and extraction of resources without payment. Just because sunlight is a renewable resource does not mean its use could not be taxed to provide for the greater good of restoring New Jersey's environment for future generations to enjoy.

Funds generated from compensation for resource consumption (i.e., a sun tax based on the VCAT model) could also be combined with funds generated from community compensation for hosting private renewable energy projects (based loosely on the Fintry model) to provide the capital necessary for local governments to install their own solar arrays either on rooftops or land that they own. As it stands currently in New Jersey, when an entity installs a solar array—under certain circumstances—they are eligible to receive solar renewable energy credits (SRECs) commensurate with the energy they produce. Those SRECs are then sold by the owner of the array and the money generated is used to recover some of the cost of installing the system. The SRECs are purchased in the marketplace by energy suppliers that are required to procure them – or pay a solar alternative compliance payment – under state law. Those energy suppliers pass the cost of purchasing SRECs on to their customers—which amounts to anyone in New Jersey who pays a bill for electric service. As such, it is the general populace of the state that is supporting the local SREC market.

Charging solar developers a small tax to utilize the natural resource of the sun, plus requiring them to compensate the host community and then having those funds reinvested in the community could allow local governments to build their own solar arrays. The government-owned equipment would be outfitted with the necessary hardware to function and provide backup power in the event of an emergency. This type of arrangement would be an innovative way to channel the money initially invested by the general public via SREC charges on their electric bills to resiliency projects that they (the public) could then count on in the event of an emergency. In this way a small portion of the money would eventually come full circle back to the general public, while most of it would still remain with the solar developer to ensure continued activity in the industry. As it stands, the ratepayers that financially support the SREC market benefit tangentially from cleaner air via increased penetration of renewables, but the funding mechanism described above would take that tangential benefit and turn it into something much more tangible.

Another way to accomplish the same goal would be to tailor extra incentives to private solar initiatives that have the potential to achieve similar public policy objectives. For example, projects that might be eligible for extra incentives would be those that 1) are located in close proximity to municipal facilities; 2) install dynamic inverters; and 3) propose emergency-response plans that allow a nearby municipal facility to tap into the backup power generated by the array in the event of a prolonged power outage. Another idea would be to narrow the universe of projects that are eligible to receive SRECs to only those that incorporate elements of public resiliency into their project design.

New Jersey has set aspirational targets for solar energy production and to date has surpassed these goals (and even recently passed the one-gigawatt benchmark of solar energy installed within the state).[13] The state no longer needs to be as concerned about creating the solar energy industry in New Jersey—it is here. Now is the time to target incentives to projects that fulfill public-policy goals of increased local level resiliency.

[13] One gigawatt of electricity can power roughly 143,000 homes (http://www.seia.org/policy/solar-technology/photovoltaic-solar-electric/whats-megawatt).

Movement in this direction will require private solar developers to work in partnership with local governments to better prepare for the adverse effects of climate-change. This type of public-private partnership could help direct the solar industry in New Jersey to very specific projects that satisfy policy objectives while still maintaining enough activity in the industry to keep developers satisfied.

Additional benefits could emerge from such public-private solar partnerships in New Jersey. Due in part to the problems that municipalities face when trying to control where solar projects are developed, the local approval process can be difficult for the developer. However, if the paradigm for these kinds of projects shifts from one where developers choose sites based heavily on cost concerns to one where they work in partnership with the local government to choose sites based on master planning, the permitting process might become more streamlined and less cumbersome. This could save the developer considerable time and money which is often expended wading through a lengthy and often contentious local permitting process. Additionally, this type of a partnership could help municipalities implement smart-growth strategies by enabling them to target parcels within their community that make sense for solar instead of waiting for the developer to choose the site and being left in a reactionary mode.

The solar cooperative in Brighton, England, struggled for years to get off the ground due in large part to issues surrounding approval and permitting at both the local and regional levels. The project was originally planned as one large installation at a single location but by the time it was constructed it had transformed into three smaller arrays at three separate locations, due in some degree to government push back and changing regulations with respect to large-scale solar projects in the UK. These changes in design undoubtedly cost the developer considerable time and money. This example underscores the potential benefits of working with government agencies at every level early in the process to ensure an acceptable degree of regulatory certainty for the developer and to engender a comfort level from the agencies involved that the project is one they can support.

As discussed earlier, New Jersey has a long history of home rule vis-à-vis municipal control over land-use planning. Also, the local level appears to be where most climate-change (adaption and/or mitigation) planning is occurring. As such, a clear opportunity is emerging to move the solar industry in New Jersey forward in a way that makes communities in the state stronger and better prepared for the challenges of the future. When faced with an emergency situation, residents in New Jersey will always look to their local officials for help and assistance. However, municipal and county budgets are shrinking by the day, limiting their ability to respond quickly and sufficiently to pressing needs.

There are ways to work with the existing structure of the solar industry in New Jersey to make it easier for local governments to install solar arrays that they can count on to provide power in the event of emergency. To implement the necessary changes, the state needs a strong policy that brings solar developers together with local government and encourages them to work together to plan smarter solar installations that are mutually beneficial. Additionally, New Jersey needs to comprehensively address the issue of community compensation for hosting these projects and to develop a mechanism to utilize the funds generated to help public entities increase their resilience. If the policy is crafted successfully, New Jersey can remain a leader in solar policy and at the same time become a leader in local resiliency planning efforts.

CHAPTER 6

POLICY DEVELOPMENT AND SUMMARY

6.1 Expert Panel Composition and Coordination

The expert panel that provided comment on Chapter 5 is comprised of five individuals representing a diverse cross section of views from different sectors of the solar field. Scott Hunter is the Administrator of the Office of Clean Energy at the New Jersey Board of Public Utilities (NJBPU). Katie Brown recently completed a fellowship with the United States Environmental Protection Agency (USEPA) working specifically on EPA's RE-Powering America's Land Initiative. Katie also has previous professional experience in the solar industry. Pam Frank is Vice President at Gabel and Associates in New Jersey where she manages the firm's efforts related to the development of renewable energy, advanced technology, and energy efficiency projects. Mark Warner is Director of Energy at Sustainable Jersey and at the Sustainability Institute at The College of New Jersey. Finally, Jonathan Cloud has considerable experience in the energy field and is also a fellow at the Fairleigh Dickinson University Institute for Sustainable Enterprise (ISE).

Each member of the panel was provided a copy of Chapter 5 and asked to provide a one page response document. The following five questions were provided for consideration: 1) Putting aside the issue of what is currently politically feasible in New Jersey; do you think that the proposed policy and/or mechanism, if implemented, would be successful in achieving its goals?; 2) If successfully implemented, from the perspective of the constituent group you represent, would such a policy be of benefit?; 3) Where do you see deficiencies in the proposed policy?; 4) Does the policy, as presented, inspire any of your own ideas with respect to how it might be expanded upon or pushed further to accomplish its goals?; and finally 5) Can you foresee any unintended consequences of such a policy if implemented?

6.2 Expert Panel Responses and Policy Development

The responses of the panel can be generally characterized as follows: while the feedback received from the panel was diverse in nature, there were certain common elements echoed by several of the experts which provided the basis for constructive criticism. Not surprisingly, the experts representing the solar industry did not endorse the idea of taxing the solar development community in New Jersey. The rationale provided for this opinion was largely based on the fact that solar energy is more expensive to produce than traditional fossil fuel-derived types of energy and thus already sits at a disadvantage competitively – especially in light of the recent and precipitous drop in the price of natural gas. As such, the perverse impact of further handicapping the solar industry via a tax was highlighted as a significant drawback. Additionally, it was mentioned by one expert that taxing a renewable energy producer in order to right the wrongs, so to speak, of traditional fossil fuel-energy producers was not deemed to be particularly fair.

Additionally, the idea of tailoring extra incentives (via SREC weighting) to those projects that provide local-level resilience was met with resistance by several panelists. The solar industry in New Jersey was constructed on the basis of market-based principles and it was highlighted that further regulatory interference with the market, via SREC multipliers or other SREC weighting mechanisms, would only serve to diminish investors confidence as well as their level of regulatory certainty. This could drive investment in the industry downward which would in turn drive solar installation in New Jersey downward. Instead, the panel almost unanimously favored that any attempt to encourage public solar projects that foster resiliency be done in such a way that works in concert with the current market-based structure, not counter to it.

These suggestions lead naturally into a discussion of public ownership of solar and whether, in fact, it is critical for a public entity to actually own the solar array if resiliency benefits are expected. Two individuals on the panel have either past or present-day experience as members of the New Jersey solar development industry. From this perspective, they both emphasized that local-level ownership of the solar array is not critical for resiliency benefits to be derived by the local entity. Instead, they countered that a properly and prudently crafted power-purchase agreement (PPA) could provide for the resilience provisions described herein. Essentially, regardless of who owns the solar array, as long as the purveyor of the clean energy agrees contractually to incorporate battery backup in some capacity and then agrees to provide the backup power generated back to the local entity in the event of a grid failure, the benefits of resiliency are still achieved without the local entity owning the system.

In parallel, it was proposed via the feedback received, that community compensation for hosting renewable energy projects in New Jersey is actually occurring regularly via PPAs and the associated benefits to the host community. For example, a municipality that enters into a PPA to install solar at a school will not own the array, but will receive a rent payment for the roof space or land used for the installation. This rent payment can be considered community compensation. Also, it was raised that often times PPA's with local entities include sale of the clean energy back to the entity hosting the array at a cost less than the local utility would provide. This cost savings could also be considered community compensation.

Additionally, the feedback provided by the panel revealed that a powerful tool exists to push forward the goal of local-level solar with resiliency benefits – the PPA (power-purchase agreement) itself. If local ownership of the array is not in fact necessary for resiliency benefits to be realized, and the PPA itself can be a mechanism for distributing community-compensation benefits, then it seems to be that the PPA sits at the epicenter for action that furthers several of the goals described herein. Perhaps the key to broader proliferation of community-level solar projects that can help communities become more resilient lies in the crafting of PPAs that capitalize on all of the ways that the local entity can benefit from hosting a solar installation.

The panel of experts unanimously supported the idea of encouraging greater partnership between private solar developers and public entities hoping to install solar arrays with backup-power options. Perhaps private developers could work with public officials to craft a PPA template that could be used as an industry standard whenever a solar host site is public. In such cases, provisions for battery-backup power (perhaps via a dynamic inverter) could become standard as well as provisions that require the owner of the array to provide the backup power to the public host facility in a time of emergency. The state could play a role in educating local governments with respect to why they should require these types of provisions from any solar developer responding to a Request for Proposal (RFP) put out by the local government for a solar installation.

6.3 Summary

The analysis of climate-change work occurring at the local level, in addition to the case study review of both community renewable energy projects and policy tools that allow them to occur, reveal a number of conclusions. First and foremost, community renewable energy projects are a critical tool in providing resiliency benefits to local communities. Resilience in turn allows communities to better adapt to a changing climate. The very nature of a solar project as a clean-energy producer makes it a powerful mitigation tool.

As learned from Garrett Hardin, sometimes government intervention is necessary to right the wrongs of society when personal greed overshadows what is best for the community. And yet, Elinor Ostrum's work also compels consideration that the community itself might be in a better position to craft the right policy to self-govern in a time of stress resulting from overconsumption. Taking a page from both Hardin and Ostrum, the conclusion can be drawn that local-level policy, with higher level state and federal support, is what is needed to effectuate comprehensive change in the face of a changing climate.

As is the case with any policy that hopes to be effective, state and even federal support is necessary. With this in mind, perhaps the most meaningful conclusion to be drawn is that there is a significant reason why climate-change action is occurring at the local level. This phenomenon itself could be an example of Ostrum's theory of local communities acting in their own self-interest even in the absence of intervention from higher levels of government. The state and federal government can provide support and resources, but in the end it might be up to local communities to act in their own self-interest to plan for the effects of climate-change. Just as the people of Fintry, the founders of the Brighton Solar Co-op, and local officials in Bayonne, New Jersey, acted on their own behalf, so too can communities in New Jersey that wish to become more resilient in the face of climate-change.

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