OVERCOMING FUNDING OBSTACLES TO ISLAND WIND POWER PROJECTS IN NEW ENGLAND:

THE CASE OF MONHEGAN, MAINE

A Thesis

submitted by

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ABSTRACT

The 21st century has increasingly seen the primacy of fossil fuel use in electricity generation challenged by renewable sources such as wind power. Coastal New England, particularly its islands, is one area that holds particular promise for wind power development due to a strong wind resource and the important social implications that can result from reduced energy costs. This study seeks to elucidate how the community wind approach can create many benefits in this setting but how a number of challenges – particularly in terms of access to capital – must be confronted. It provides an overview of the federal and state-level incentives that have been developed to promote wind power, evaluates them for their applicability to New England island projects and highlights how creativity must be used in order to acquire the necessary funds. A case study of Monhegan, Maine is presented and recommendations for policymakers are offered.

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Lastly, I would like to recognize the patience and support of friends and loved ones and dedicate this effort to the memory of my grandfather, Gene E. Raby. In reflecting on the tremendous technological advances that took place during his 94 years, it gives me great hope for the future of renewable energy and our environment.

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LIST OF ACRONYMS

ACP – Alternative Compliance Payment

CREB – Clean Renewable Energy Bond

DG – Distributed Generation

FIEC – Fox Islands Electric Cooperative

IOU – Investor Owned Utility

ITC – Investment Tax Credit

kW – Kilowatt

kWh – Kilowatt per Hour

MLP – Municipal Light Plant

MPPD – Monhegan Plantation Power District

MPUC – Maine Public Utilities Commission

MWh – Megawatt per Hour

NREL – National Renewable Energy Laboratory

PBF – Public Benefits Fund

PTC – Production Tax Credit

PURPA – Public Utility Regulatory Act

REC – Renewable Energy Credit

RET – Renewable Energy Trust (Massachusetts)

RPS – Renewable Portfolio Standard

RUS – Rural Utilities Service

SBC – System Benefits Charge

VRRF – Voluntary Renewable Resource Fund (Maine)

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Chapter One:
Introduction

Throughout the United States and globally, the 21^{st} century has increasingly seen the primacy of fossil fuel use in electricity generation challenged by renewable sources such as wind power. The motivations behind this shift are numerous: to bolster national security by reducing dependence on foreign oil, to stabilize and lower electricity rates and to meet commitments for large-scale reductions in carbon emissions. Technologies have evolved to make a wide range of wind applications available, from large-scale commercial wind farms to stand-alone wind-diesel hybrid systems. Policymakers and investors seeking to broaden the benefits of wind development have responded with a range of efforts to incentivize and encourage project development. As a result of these developments and in response to increasing fossil fuel prices, installed capacity of wind in the United States has increased 6.5 times between 2000 and 2007, making it the fastest growing renewable electricity technology in the country (Beckert and Jakle 2008).

Coastal New England, particularly its islands, stands out for its suitability for wind power development. The region is located in one of the best wind resource areas in the country and is covered by more than 3,000 islands near its coastline, 150 of which have energy needs (Manwell et al. 2003). Wind power in these out-to-sea locations can have important social implications, as island electricity is often costly due to reliance on undersea power cables or on-site diesel generation. As such, residents frequently pay both a greater percentage of their income for energy as well as a larger overall rate for electricity than their mainland counterparts (Singh 2001). Moreover, projects in this area complement efforts of New England states to promote renewable energy and carbon-cutting measures through early commitments to Renewable Portfolio Standards (RPS), the creation of the New England Governors and Eastern Canadian Premiers (NEG-ECP) Climate Change Action Plan and the Regional Greenhouse Gas Initiative (RGGI).

The community wind approach, popularized in Europe but so far slow to advance in the United States, is a particularly fitting model for these projects. It emphasizes local ownership so that the benefits of wind power (mostly in terms of energy savings and investment returns) stay local as well. It also prioritizes public participation, an important element in the close-knit communities typically found in isolated areas. While approaches to community wind in the American Midwest have typically seen farmers play the role of local wind owners, New England projects will likely emphasize non-profit island power providers such as cooperatives and utility districts. Due to its island focus, this research will concentrate on the region's coastal states (Connecticut, Maine, Massachusetts, New Hampshire and Rhode Island) and place an emphasis on Maine as it is home to 58% of New England's islands (Dua et al. 2002).

With local ownership can come a number of challenges regarding access to capital. While its operating costs are comparatively quite low, wind power is inherently capital intensive in the development and construction phases, making access to upfront funds crucial. Unfortunately, as this thesis will illustrate, it can be extremely challenging for island communities to raise the necessary funds. This is largely due to the fact that the majority of incentives that have been developed in the United States are designed to meet the needs of large-scale, privately developed wind power projects. While projects on remote New England islands may not provide a huge boost to the level of installed wind capacity in the U.S., they still stand to contribute to emissions reductions, provide desperately needed energy bill relief and empower communities to pursue sustainable choices. As such, incentives for these projects should be considered.

This study seeks to elucidate the benefits of island community wind power and provide an overview of existing incentives in order to illustrate the fundamental challenges at hand. The thesis will look at literature on the importance of wind in the New England island setting (Chapter Two), introduce research methodology (Chapter Three), evaluate incentive options for their applicability to island community wind (Chapter Four) and address the mechanisms that exist to surmount key challenges (Chapter Five). It presents a case study of Monhegan Island, Maine (Chapter Six), one of the most promising sites for an island wind project. Finally, the thesis presents a series of recommendations and topics for further research in order to forward the work outlined here (Chapter Seven). The information presented should ultimately help communities interested in wind power, policymakers and investors to better understand and address the inherent funding inequities of wind development, as well as to provide relief to island populations facing high energy costs.

Chapter Two:
Wind Development on New England Islands: A Background

I. Overview of the Islands

New England is known for its picturesque coastal landscape: deep blue waters dotted by fishing boats and backed by the rugged outline of islands on the horizon. From a distance these islands may seem small and unassuming but their rich seafaring history and reputation as popular tourist destinations have secured them a significant spot in the region's culture and economy. In recent years, however, New England's islands have been receiving attention for a new reason: their potential as sites for wind power projects. Although it has already been established that some of the islands have wind resources considered to be some of the best in the world, researchers and policymakers must go further to understand the unique challenges that these wind projects face by looking more closely at the activities that take place on the islands and the needs of the unique communities that inhabit them.

As tidal forces have ebbed and flowed over the centuries, there have been various classifications and therefore counts of the number of New England "islands." Manwell et al. (2003) rely on the U.S. Geological Survey catalog of 3,284 islands in the New England region while others place the number at almost 5,000 for the Gulf of Maine alone (Conkling 2007; Newman 2001). The vast majority of these islands are located within 20 miles of the mainland coast (with the exception of Matinicus Rock, ME and Nantucket Island, MA) and off of the coast of Maine, as seen in the state breakdown below (see Figure 2.1). They serve a variety of purposes: as hosts to unique ecosystems, home to hardy year-round communities and as sites of lighthouses, nature preserves and scientific laboratories. Regardless of the exact number and purpose, the islands across the region have played a part in New England history and culture for centuries.

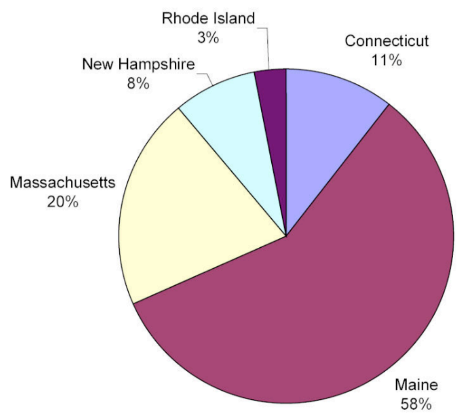

Figure 2.1: State breakdown of New England islands
Source: Dua et al. 2002

History

New England islands are often considered as the landing place of North America's first explorers. Indeed, their shores were visited by the likes of Smith, Champlain, Weymouth and Gosnold during the early 17th century. However, according to archaeologists, these sailors were in fact predated by aboriginal settlements that go as far back as 10,000 B.P. and then to Native American tribes (Conkling 2007). In colonial times the islands served as outposts during battles, popular trading posts and home to fishing and seafaring communities. At the turn of the 19th century, as many as 300 year-round communities existed on Maine islands alone (Conkling 2007).

Ecosystem

Many of New England's islands are known for their wild state that, in some cases, has been preserved through land trusts and established conservation areas. Covered with dense spruce and pine forests, rolling dunes and towering cliffs, several islands are covered with hiking trails that are enjoyed by recreationists during the summer months. From these trails, one can identify a variety of flora and fauna, including a diversity of bird species that flock to the islands to rest and feed during their seasonal migration. On islands that have hosted communities or visitors, much of the plant and wildlife species reflect the history of human exploration, as the clearing of wildlands for agriculture and heating fuel, along with the introduction of non-native species has altered the natural state and disrupted native species (NPS 2009). Under the islands' surrounding seas, aquatic ecosystems provide rich feeding grounds for cod, haddock, lobster, shrimp and other fish and invertebrates, as well as migratory paths for various species of seals, whales and dolphins (Ibid.).

Communities

The individuals that inhabit New England islands are thought to exemplify a longstanding aspect of the region's culture: fishing communities that all but require a rugged hardiness, sense of practicality, commitment to self-sufficiency and classic maritime accent. Beyond any romanticized notion of island living however, this independence is often out of necessity. Physical isolation from the mainland obliges communities to provide many of the services that are needed to sustain a year-round population. These services can include school administration, emergency services, road maintenance and electricity generation. While state and federal funds augment each community's revenue, local taxpayer funds and both paid and volunteer hours from islanders are critical to maintaining quality of life in remote areas. The smaller the community, the greater the likelihood a resident will have to bear some of these responsibilities. Perhaps an outcome of this burden, islanders often consider themselves to be local experts and most competent in making important decisions that affect their community's well being.

"Islandness" is a cultural concept that emerges from the literature on island communities; it is also intricately connected to the above-outlined realities. First popularized by English essayist Robert Fowles in the 1970s, Maine resident and island advocate Philip Conkling has built on this concept, arguing that there is a unique island culture that transcends other place-based or local cultures. Conkling contends that the term *islandness* can be used to embody the shared feelings and perspectives that materialize from the qualities and experiences related to the isolation of island living (Conkling 2007). It encompasses characteristics such as loyalty, frugality, tolerance of eccentricity, common sense, handiness and independence (Putz 1984, as cited by Conkling 2007, 192). In her writing on *islandness*, Bourgeault also offers "stability, service and humility" as core island values, likening them to those held by closed communities such as monastic circles (Bourgeault, as cited by Conkling 2007, 199).

An additional unique aspect of New England island communities is the seasonal population shift brought on by exposure to the region's harsh winter climate and fluctuating economic opportunities. It has been estimated that during the summer months an island community can swell an average of more than seven times the winter population (Manwell et al. 2003). This often creates a complicated dynamic of how different "factions" of the community interact, as evinced by Conkling's discussion of year-round residents that have "powerful feelings of a close and (to outsiders) closed community" (Conkling 2007, 194). Moreover, this variability affects the pressures placed on public services and the overall island economy.

Contemporary Strengths and Obstacles

New England islands continue to play an important role in the region. Despite declining stocks of marine resources and increased regulation, island communities still rely on the waters that surround them as a source of employment, if only on a seasonal basis. Natural resource-based industries on the islands contribute to the inflow of seafood in the region, as well as its economy. Many islands continue to host a summer colony and benefit economically from seasonal tourism and recreation. Tourism is augmented by the fact that acclaimed and amateur artists alike continue to carry out a longstanding tradition of painting on many of the islands. Further, islands such as Great Duck Island, ME and Appledore Island, NH provide marine research and education opportunities for scientists and students from around the world. Other uses of New England islands include a health services complex (Long Island, MA) and a wastewater treatment center (Deer Island, MA).

Despite this range of activity, the traditional way of life on islands is threatened. Diminished stocks of natural resources and shifting economies have led to a steep decline in the number of year-round communities in the region, as well as in the health of those that remain. For instance, only 15 communities of the 300 that once existed in Maine remain in 2009 – and they face formidable challenges (Conkling 2007). Lack of affordable housing is a serious concern as traditionally year-round residences are increasingly being purchased by affluent seasonal residents, driving up real estate prices and property taxes while reducing the number of permanent residents to provide regular community services (Curran and Carter 2008). Combined with rapidly escalating energy and transport costs, it is becoming more and more difficult for year-rounders to support themselves and their families in these remote locales (Tyler 2009). Islanders and those that advocate for them are therefore tasked to find sustainable solutions to these problems or face even more dramatic changes in these cherished New England communities.

II. Electricity on the Islands

Reliable electricity supply is critical to many activities that take place on the New England islands with year-round or seasonal populations and to some others as well. After performing an exhaustive survey of the region's islands and their power needs, Manwell et al. (2003) found that of the more than 3,000 islands in the region, 190 have some sort of on-site energy requirements. While the importance of electricity to sustain the modern day year-round communities, tourism, recreation, research and navigation that establish islands as integral pieces of the region may seem relatively clear-cut, the challenges of meeting these needs on islands are in fact often far more complex than those on the mainland.

Energy Supply Status: Grid-tied or Off-grid

Just as the activities and uses for electricity on islands vary, so do the types of energy supply systems. One comprehensive report on New England islands and electricity posits that the most important feature to consider when evaluating island energy generation systems is whether an island receives its electricity from the mainland grid[1] or if it generates electricity on its own (Manwell et al. 2003). Appendix A shows the location and type of energy supply for a sampling of New England islands.

Grid-tied islands are typically situated within a few miles from the mainland and/or have larger populations than their off-grid counterparts. They are connected to the inshore electricity grid via armored submarine power transmission cables, enabling power to flow from the mainland to the island. Despite the electricity being generated by an inshore power company, island grids are generally managed by local non-profit utilities[2]. Of the islands surveyed by Manwell et al. (2003), 20 fell into the grid-connected category. With their distance from shore and populations for those with communities, a sampling of those islands include:

[1] An electrical grid is a network of infrastructure that delivers electricity. The vast majority of non-island New England is serviced by the NEPOOL regional transmission electric grid.
[2] Local non-profit electric utilities in New England include Public Utility Districts (PUDs), cooperatives and Municipal Light Plants (MLPs).

- Deer Island, MA (bridge connected; N/A)
- Mason’s Island, CT (1; seasonal only)
- Long Island, MA (2 miles; N/A)
- Peaks Island, ME (2 miles; 1,000 year-round, 4,000 summer)
- Islesboro, ME (3 miles; 650 year-round, 2,500 summer)
- Swan’s Island, ME (6 miles; 350 year-round, 600 summer)
- Martha’s Vineyard, MA (8 miles; 12,000 year-round)
- Vinalhaven, ME (14 miles; 1,300 year-round; 6,000 summer)

Bringing electricity to these remote areas is a complex operation. Laying the submarine cables is a logistically intensive and expensive process, with installation costs ranging from $180-$600 per meter (Manwell et al. 2003). This cost is exacerbated by the fact that cables need to be replaced every 15 to 20 years due to damage from fishing and other marine activities. Unfortunately, replacement is often prefaced by a number of troublesome outages that disrupt island activities for a few hours to a few days (FIEC 2009)[3]. The combination of increased transmission costs, significant and almost continuous debt service, and the costs of managing its own distribution system can create a considerable sum for an island utility to spread out amongst its relatively small number of users (Trotter 2008). The result is that grid-connected island customers face electric rates that are substantially higher than those paid inshore (Trotter 2008; FIEC 2009).

Off-Grid

Due to their distance from the mainland, New England’s most remote islands have typically calculated the extension of transmission lines or the installation of undersea cables to be cost prohibitive. In most cases they have instead opted to follow the lead of communities in remote areas around the globe

[3] Grid-tied islands are also subject to outages that occur as a result of mainland power failures.

– particularly those in developing countries – and install on-site diesel generators to meet the electricity demand of island activities (Rehman et al. 2007). In these instances, local utilities are established to maintain power stations, manage billing for ratepayers and supervise the distribution system. According to Manwell et al. (2003), New England islands relying on diesel generation include (with their distances from shore and populations):

- Star Island, NH (6 miles; 2 year-round, 400 summer)
- Great Brewster Island, MA (8 miles; N/A)
- Monhegan, ME (10 miles; 65 year-round; 700 summer)
- Block Island, RI (12 miles; 960 year-round; 15,000 summer)
- Cuttyhunk, MA (14 miles; 25 year-round)
- Matinicus, ME (20 miles; 51 year-round)
- Criehaven, ME (21 miles; 45 year-round)
- Matinicus Rock, ME (22 miles; N/A)

These diesel generation systems can be considered a type of distributed generation (DG), defined as "small-scale generation located near and connected to a load being served with or without grid interconnection" (Tester et al. 2005, 678). DG systems are considered less vulnerable than the larger (in this case, mainland) grid, thus providing more reliable transmission of electricity. However, there are also significant concerns with diesel systems. The first is cost: in addition to the expenses associated with being responsible for their own distribution infrastructure and having relatively few customers to pay for it, off-grid utilities are acutely impacted by diesel costs which represent a minimum of 25% of the cost of energy (Manwell et al. 2003). This exposes utilities to the volatile global oil market, making it difficult to stabilize costs and customer rates. The drastic increase in diesel prices that began in 2005 and peaked in 2008

(Figure 2.2) raised both fuel and transportation costs, exacerbating this situation and sending utilities scrambling to cover costs (Conkling 2008). High electricity rates are therefore unavoidable in contemporary diesel systems, leading ratepayers to often pay both a greater percentage of their income for energy as well as a larger overall rate for electricity than their grid-connected counterparts on both islands and the mainland (Trotter 2008; Singh 2001). Human and environmental costs must also be considered as the transport, storage and burning of diesel fuel increases the risk of air, water and noise pollution in communities (Manwell et al. 2003; Singh 2001).

Figure 2.2: Fluctuation in price of diesel fuel
Source: EIA 2009

Significant seasonal variation in electricity generation and consumption is an additional factor that differentiates islands from much of the mainland. This characteristic directly corresponds to the seasonal fluctuation of island populations and their activities. As an example, Figure 2.3 illustrates the consumption peak that occurs on Cuttyhunk, MA during the summer months when the population of this small island increases from 25 to 100. Island diesel systems are typically comprised of generators with different capacities and sophisticated engineering and controls in order to manage this fluctuation.

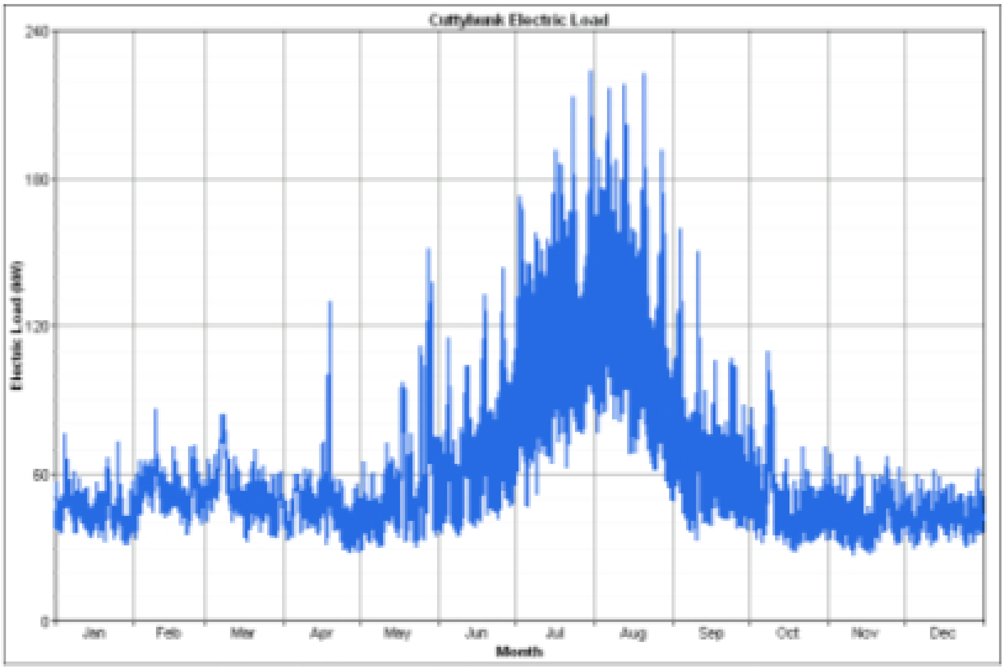

Figure 2.3: Seasonal variation in electricity load, Cuttyhunk, MA
Source: Manwell et al., 2003, 12

III. Potential Alternatives for Island Energy Supply Systems

Depending on the specific needs and characteristics of the island, renewable energy applications can serve as viable alternatives to current energy supply systems while also diminishing several of the challenges outlined thus far. In grid-tied settings, onsite renewable generation can enable the utility to sell excess generated power to the mainland, helping to make cable installation, maintenance and replacement more affordable while bringing down electricity rates. It can reduce the need to depend on an undersea cable or make the cable profitable through the sale of renewable energy to the mainland. In off-grid settings, renewable-diesel hybrid systems can lower the run-time of generators, thus lowering and stabilizing production costs and rates, along with reducing vulnerability to diesel prices and pollution. Hybrid systems can also enable ratepayers to use excess electricity to displace heating needs and therefore lower energy costs even further (Manwell et al. 2003). In both settings, system reliability can be increased by diversifying the types of energy generation. In a more general sense, island renewable energy applications can provide important research opportunities for those seeking to better understand the challenges of energy supply in remote areas of the world (Manwell et al. 2003).

The list of benefits continues – opting for renewable energy projects can align electricity generation with aspects of island culture by making use of local resources and promoting energy independence. It can also help to create jobs, providing a much-needed boost to many struggling island economies. Additionally, these installations stand to support regional initiatives to lower greenhouse gas emissions and increase renewable energy penetration.[4] Yet as the complicated nature of power generation, variable demand and generally small-scale needs on islands can make the application of renewable energy vastly more complicated, the strengths and weaknesses of some technologies will be considered in the paragraphs that follow.

Types of Applicable Technology

<u>Solar Power</u>

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[4] The New England states have been actively promoting renewable energy and carbon-cutting measures for almost a decade, having made early commitments to Renewable Portfolio Standards (RPS) and established and made progress on the New England Governors and Eastern Canadian Premiers (NEG-ECP) Climate Change Action Plan and the Regional Greenhouse Gas Initiative (RGGI).

Several research stations and lighthouses on New England islands, as well as some individual homes (particularly those of summer residents) are powered to a certain degree by solar. Yet because fog frequently covers many of these locations, making photovoltaic (PV) installation *affordable* is a challenge. This is highlighted by a study on the solar radiation resource on New England islands that calculated an approximate annual average radiation of 3.7 kWh/m^2/day. According to the National Renewable Energy Lab (NREL) solar radiation resource scale that ranges from 0–14 kWh/m^2/day, such a level of radiation is not considered to be economically suitable for solar development (Manwell et al. 2003). Moreover, if excess energy is not designed to feed back into the mainland or island grid, it will need to be stored in batteries that can be both expensive and toxic. Nonetheless, some homeowners have still installed PV, opting for low maintenance over economic benefit (Manwell et al. 2003). A more suitable application for solar on New England islands would be as a part of a PV/wind/hybrid system as increased summer solar radiation could compensate for lower wind speeds during that season (Manwell et al. 2003).

Marine Power

Surrounded by the relentless tides and powerful waves of the Atlantic Ocean, tidal and wave power may seem like logical renewable energy generation options for New England islands. In fact, small-scale applications of tidal power (which date back to the Roman times) first appeared on the New England coast in the 19th century. It is worth noting that North America's most promising site for tidal power is located just to the northeast of the New England islands in the Bay of Fundy. Moreover, the fact that the equipment for both wave and tidal power installations are submerged can help to protect cherished coastal viewscapes while generating electricity from a bountiful, local resource.

Although the Federal Energy Regulatory Commission has issued dozens of preliminary permits to explore feasibility of marine power on the New England coast, the islands face a number of obstacles to utilizing these technologies. First, for tidal, there is the issue of location: most applications require currents to be moving in and out of a semi-enclosed area such as an inlet, bay, channel or river estuary – not in the wide open ocean. Timing also creates a problem for both types of power: because the technology is still evolving[5] and policymakers are just developing the permitting process, bringing a project online will take several years. Related to the timing of technology and permitting is the concern of cost, as these projects are extremely capital intensive. They also carry with them concerns of significant disruption to underwater ecosystems, impacts to the coastline and the potential for conflict with other sea space users. Lastly, in order to maximize profits, contemporary marine power applications are typically designed to generate huge amounts of power, outsizing the needs of many of the islands. For islands looking for affordable, appropriately sized energy generation alternatives that are ready to be employed and minimize impact to the natural environment, marine power is not yet a practical option.

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[5] In the case of wave power, there is currently only one commercially functioning wave farm in the world. It is located off of the northern coast of Portugal.

Wind Power

Ranging from 7m/s off the Connecticut coast to over 9m/s off the coast of Maine, New England's offshore wind resource is considered one of the world's strongest (Manwell et al. 2003). An increasing number of feasibility studies have been conducted to examine how these resources could potentially power both grid-tied and off-grid projects, particularly as wind power technology has evolved to suit the harsh conditions of the region's isolated areas. For example, Manwell et al. (2003) outline studies that have been performed for islands in the Boston Harbor (Long Island, Moon Island and Spectacle Island; Deer Island and Thompson Island), Cuttyhunk, MA and Block Island, RI. These analyses and others have found New England offshore waters to fall into Class 5 ("excellent") and Class 6 ("outstanding") of the NREL's 0 to > 9.5m/s ranking of wind speed resource (See Appendix B for a map that includes New England's offshore wind resource). In most cases, resources on the islands are significantly higher than those on the mainland coastline, as illustrated by the finding that there is an average of a 2.13 increase in the amount of power available on islands than on coastal Boston's Logan International Airport (Manwell et al. 2003).

Wind Benefits

Such robust wind resources mean that wind power projects on New England islands can achieve the above outlined benefits of renewable energy to an even greater degree and with a lower payback period. For example, a 2003 calculation found that overall system costs in an off-grid hybrid scenario, although initially offset by the purchase of the turbines, can be lowered by up to

16% due to the reduction in fuel consumption and up to 25% if excess electricity is used for heating (Manwell et al. 2003). Grid-tied projects can also generate revenue by selling excess power back to the mainland grid. Studies from around the globe have found that the local economy can benefit from installation and maintenance jobs as well as from a boost to island tourism (Venkataraman 2008; Jobert et al. 2007). Reduced use of diesel can result in lower electricity rates that have the potential to help sustain year-round communities and lower risk of health and environmental side effects. Finally, Manwell et al. (2003) point out that, although it is not a fully analyzed option, wind development on uninhabited islands can benefit from the same resource as offshore wind farms while being far less expensive, technically challenging and politically sensitive.

Community Wind

While this information in general may suggest a strong case for wind power on New England islands, some experts argue that the community wind model can create even greater benefits while increasing a project's chances of success. Community wind can be defined as a wind installation in or close to a community, designed with input from members of that community and assigning direct or indirect benefits to it (Rogers et al. 2008, 4217). Further research, however, reveals the term to be more amorphous. For instance, a study of renewable energy projects by Walker and Devine-Wright (2008) found that the label "community" was applied to projects based on legal terms (those lacking commercial interests), physical terms (those involving public buildings) or the involvement of local people in the project's development or finances. Building on the first definition, "ideal community projects" have also been classified along the lines of process (those that are highly open and participatory) and outcome (those that have local and collective benefits); in essence creating "a project that is both by and for local people" (Walker and Devine-Wright 2008, 498).

When compared side by side, a number of strong similarities emerge between the defining features of community wind and the needs of island communities as expressed by the concept of *islandness*. The emphasis placed on public education and the participation process is one example of how community wind projects are able to meet the specialized needs of unique island communities. Local ownership, a common aspect of community wind projects, is also critical to many communities as they consider proposals that stand to have a significant impact on island infrastructure. Making use of and benefiting from local resources aligns with the sense of practicality and independence highlighted by *islandness*.

The strengths of the community wind approach can also be seen in Europe and Alaska, where island and community wind projects have a longer history. Samso, a Danish island roughly the size of Nantucket, should be noted for its broad approach that has enabled it to achieve carbon neutrality in only ten years through a combination of locally-owned wind, solar and biofuel applications (Kolbert 2008). In Iceland, excess wind power has been used to generate hydrogen fuel that then powers fishing boats (Krajacic et al. 2008). Alaska is important as it abounds with examples of proven wind-diesel hybrid projects that have been installed in its 175 remote villages. Like many off-grid New England island communities, these villages have been described as "often low-income communities that are exposed to diesel fuel price volatility, frequent fuel spills, and high operations and maintenance costs for transporting diesel fuel and maintaining diesel bulk storage tanks" (Singh 2001, 4). Consideration of Alaskan solutions to logistical and funding challenges will be presented in Chapter Five.

Matching their growing interest in renewable energy, policymakers are also taking note of the benefits of community wind projects and considering policy options on both federal and state levels to support them. As Chapter Four will illustrate, many incentives have previously targeted large private wind projects but in some cases, community wind is receiving attention. Examples of targeted policy can be found in Massachusetts (most notably through the Green Communities Act of 2008 and the Massachusetts Technology Collaborative's Community Wind Collaborative), in Maine (with the implementation of the recommendations of the Governor's Task Force on Wind Development's subcommittee on community wind) and in Rhode Island (with the reworking of the Rhode Island Renewable Energy Fund). The resulting programs and incentives are helping community wind to make progress as evinced by the dozens of projects in various stages of development in Massachusetts that make the state a national leader in community-scale projects (MTC 2009).

Not surprisingly, several islands in New England are considering community wind and the benefits it can bring. As of May 2009, no turbines were operating on the islands but the situation should change by Fall 2009 as the

Maine-based Fox Islands Electric Cooperative completes the installation of three turbines on Vinalhaven. There is a likelihood that additional projects will develop, as a number of islands are engaged in formal feasibility assessments (Monhegan, ME; Swan's Island, ME; Block Island, MA and Cuttyhunk, MA) and some are in the initial planning stages (Peaks Island, ME). Progress will not come without a number of challenges however, some of which will be considered below.

IV. Potential Challenges for Community Island Wind Projects

Community Support

Despite the fact that the concepts of renewable energy and wind power increasingly receive high and stable levels of approval in public opinion polls, wind projects can still face local opposition and become mired in controversy (Devine-Wright 2005). This divergence or "social gap" between opinion and outcome has traditionally been attributed to the NIMBY (Not In My Back Yard) concept that has plagued development worldwide (Raven et al. 2008). Empirical research has often connected *NIMBYism* to the "proximity hypothesis" which states that those individuals living closest to a development such as a wind project will have the most negative attitudes towards it – even if it creates a public good (Devine-Wright 2005). Those individuals are likely to oppose the presence of the project because they feel that they will be unduly affected by their perceived externalities of the turbines. Even though the externalities of wind projects are not life threatening, delays caused by NIMBY-driven opposition can pose formidable challenges to community wind projects.

However, to many wind developers and researchers, “the NIMBY argument simply isn't good enough anymore” (O’Brien 2008). Instead, case studies and related research point to more complex factors that provoke opposition to wind projects, emphasizing that “social” distance as opposed to “physical” distance is likely to impact levels of support and opposition (Devine-Wright 2005). This social distance can be created by a lack of accurate information, lack of opportunity to participate in the project and confusion regarding the wind development process (Gross 2007; Rogers et al. 2008; Devine-Wright 2005). Particularly in the New England island setting, the value that the community wind approach places on local input and ownership can help to increase project acceptance to levels above that for private wind development (Devine-Wright 2005).

Logistics

The remote locations and limited infrastructure of islands present serious logistical challenges for the transport and installation of wind turbines. Fortunately, innovation and creativity can help to make the adaptations needed to overcome such obstacles as island projects find their solutions in amphibious vessels, self-erecting towers, smaller cranes and modified turbine foundations (Dua 2008). Just as with the mainland grid, increased renewable energy penetration may challenge island distribution systems but issues may be addressed with careful engineering, planning and some upgrades. It is important to note, however, that the overall project budget is significantly affected as these innovations and alterations come at a substantial cost (Manwell et al. 2003).

Technology

Logistical feats may pale in comparison to the technological innovation required for economically viable island community wind projects. To begin, the issue of intermittent power generation must be addressed. Intermittency is an issue inherent to wind power due to the fact that wind speeds will not always meet the threshold required to generate electricity. Non-constant production therefore leaves wind power systems reliant on reserve capacity to kick in from the grid or storage in order to keep electricity flowing to customers. In off-grid settings, diesel generators are typically used to respond to lulls in wind production but batteries (although generally not efficient), hydrogen production or flywheels (both nascent and costly technologies) can also provide reserve capacity. Conversely, the mismatch of strong winter wind resources and high summer electricity demand on islands creates an excess of energy that must be managed. Without a way to store that excess or send it inshore, power must be "dumped" as heat. Using this excess or dispatachable "dump load" for island heating purposes is one promising option that some New England islands are currently considering to make their wind projects more economically viable (Manwell et al. 2003). Yet just as the logistical needs of island projects dictate, technological innovations to manage power come at a significant cost.

Funding

There is one challenge however that, if left unsolved, threatens to undermine all chances of overcoming the outlined obstacles and the project as a whole: the challenge of funding. Despite their ability to generate a profit during their lifetimes, wind projects require huge amounts of capital to be invested upfront to cover the costs of feasibility assessments, permitting and those of the turbine itself. While private developers and large municipalities or utilities may have the capacity to access the necessary capital, finding funds early on can amount to a Herculean task for island communities seeking to develop their wind resource. The aforementioned high system costs, accrued debt and low number of customers to foot the bill for the utility's expenses place most island power companies in a difficult if not impossible starting spot to raise the funds needed to get projects off the ground. Moreover, as outlined throughout this chapter, the costs of infrastructure projects on islands are almost always higher than those on the mainland due to transport and necessary innovations and alterations.

A compelling case has been made for island community wind projects in New England but is the money there to support these efforts? Are the needs of island communities, their importance in the region and their potential for wind projects being considered when policy and incentives are being developed? In this age of both renewable energy ingenuity and economic downturn, how might these projects prevail in a timely manner and without leaving island utilities with difficult to manage debt? The remainder of this thesis will explore exactly which options have been developed to support wind projects across the country and how they may or may not apply to the community-focused efforts on New England islands. The hope is that a thorough review of applicable funding mechanisms may help us to understand one of the greatest costs potentially faced by island communities – the cost of not pursuing wind power projects.

Chapter Three:
Methodology

I. Research Questions

After providing a background on the relevance of New England island communities, their unique power needs and the potential benefits that wind power could afford them, the central research questions for the remainder of this thesis include the following:

- What makes a wind project economically viable? When is capital needed and for what purposes?
- How are wind projects on the islands of New England promoted, particularly in terms of financial incentives? How do the various financial incentives available to the grid-connected wind projects in these areas differ from those that are off-grid?
- How can the experiences of the Monhegan, Maine proposed wind project help to inform and potentially improve other wind projects on New England islands?
- What types of policy prescriptions, financial incentives or technical assistance can be developed to better benefit island wind projects in New England?

II. Methods

A number of methods were simultaneously employed in an attempt to address the research questions. One approach relied on research and interviews to develop a summary of the factors that make a project economically viable and the capital needs that result. The history of U.S. energy policy was also researched in order to produce an overview of key incentives and stakeholders. An in-depth review of these incentives provided the basis for an evaluation of their applicability to community wind projects on New England islands. Finally, Geographic Information System (GIS) data and software were used to create a map that identifies some of the islands and their electricity supply status.

In order to illustrate the complexities behind financing a community wind project in this setting, a detailed case study of the proposed wind project on Monhegan Island, Maine was prepared. The case study method was chosen for its ability to "investigate a contemporary phenomenon within its real-life context" (Yin 1994, 13). Information was based on several on-site interviews and was presented using the descriptive approach outlined by Yin (1994). The Monhegan case was chosen due to the fact that it is one of the few islands that have begun in earnest to consider a wind power. Its seasonal economy and electricity needs are shared by many other New England islands while its remote location enables it to highlight the challenges faced by off-grid communities. Similarities and differences between Monhegan and other community wind projects were recognized wherever appropriate to illustrate the transferability of the research.

III. Sources of Information

As neither U.S. community wind projects nor New England islands have been the focus of leading research on renewable energy development, an effort was made to consult a diversity of information sources in order to explore the research questions. Numerous research reports from government agencies[6] and industry advocates[7] were reviewed. The Database for State Incentives for Renewables and Efficiency (DSIRE) was also frequently consulted for its up-to-date and concise information on incentives. When possible, peer-reviewed literature has been cited and is supplemented by over a dozen interviews, several site visits and local news articles that expand on the details of these projects.

[6] Some of these agencies included the U.S. Department of Energy, the National Renewable Energy Lab and U.S. Department of Agriculture's Rural Development program.
[7] Advocates included the American Wind Energy Association, Windustry and the American Public Power Association.

Chapter Four:
Meeting the Capital Needs of Community Wind:
An Evaluation of U.S. Wind Incentives

I. Introduction

Chapter Two highlighted the significant benefits of community wind power projects on New England islands as well as some of the many challenges that they face. This chapter will look more specifically at the obstacles to accessing capital and how they apply to wind projects in this geographic setting. It will begin with an introduction to the capital needs of wind projects, followed by an overview of some of the most prominent mechanisms and opportunities that have been developed in the United States to address those needs. Various incentives will then be evaluated for their applicability to the community wind and small wind projects that are best suited for New England islands. In doing so, this chapter should answer two of the key research questions: *1) what makes a wind project economically viable and what are the capital needs; and 2) how are wind projects on the islands of New England (both grid-tied and off-grid) promoted, particularly in terms of financial incentives.*

II. Assessing the Capital Needs of Community Wind

From many different perspectives, wind power is viewed as a mechanism to produce benefits for both public and private interests. Over the past few decades, technologies have evolved to bring down the costs of wind energy generation by making it more efficient. However, in order to maximize to benefits of wind power it is critical that a project can demonstrate that it is economically viable.

Economic viability is fundamentally connected to the capital needs of a proposed project in terms of how those needs will be met and how long it will take to recoup costs. Simply defined by the rule that "the cost to buy, install, and operate the wind turbine must be able to be offset by the value of energy that can be produced," economically viable projects must also be able to ensure a suitable rate of return to its investors (Windustry 2006). It is dependent on a number of factors that must be evaluated in order to develop a pro forma and move forward with a project. The site's wind resource and the project's capacity factor[8] are among the most critical as the more the wind blows, the more energy will be generated, sold and used to pay back the project. Detailed data must therefore be collected in order to understand the hourly wind production and how it will match the overall energy demand. This information will help to determine the appropriate size of the project, ensuring that the wind resource is being optimized. The fact that New England islands have been estimated to have an excellent wind resource (see Chapter Two) becomes one of the strongest arguments for projects in this region.

Other factors also play into the economic viability of a project, including logistics, permitting and community support. If the project requires a high level of technical design to overcome logistical challenges (as may be the case for many island projects), it can quickly increase the cost involved. Delays that can

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[8] Capacity factor is defined as "the ratio of the actual energy produced in a given period, to the hypothetical maximum possible, i.e. running full time at rated power" (RERL n.d.).

result from an extended permitting process or community opposition can also translate into higher costs and therefore longer payback periods. This paper has presented information to support that the community wind approach has the potential to reduce such delays and lower costs, as it can promote higher levels of public support and more appropriate siting (Windustry 2006).

If these initial factors prove to be favorable, the timing of capital needs must be considered. Andre et al. (2005) have broken the cost components into three main stages: 1) Development (including feasibility, project conception, project design and pre-construction), 2) Construction and 3) Operations and Maintenance. Unlike fossil fuel-based energy generation whose costs are relatively spread out over its lifetime, the costs of wind power generation (and renewable energy in general) are almost entirely related to plant construction. According to several sources (Reeves 2003; Andre et al. 2005), the first two pre-production phases can account for more than 90% of the overall costs. Development costs alone can total up to $100,000-$175,000 in community wind projects (MTC 2009). Therefore projects are dependent on significant upfront capital outlays (Reeves 2003).

Economies of scale[9] have a significant effect on the economic viability of wind projects. This is because many of the related costs (i.e. feasibility assessments and permitting) are fixed, meaning that they stay relatively the same regardless of the project's size (Wind Powering America 2008). This effectively incentivizes developers to increase the number of turbines in a project so that the

[9] Economies of scale has been defined as "features of a firm's technology that lead to a falling long-run average cost as output increases" (Parkin 2008, G-4)

costs of the project can be can be spread out. However, increasing the size of projects on New England islands can be very difficult due to the limited amount of developable land and lower energy appetites. Moreover, as highlighted in Chapter Two, many of the costs for island projects are larger due to transport and logistics needed in these remote areas.

Once capital needs are understood, a utility or community must evaluate its ability to meet them. In order to do so, a budget must be created and various financing mechanisms are explored to address gaps in available capital. Private developers have traditionally raised significant amounts of capital with investors and have had access to credit to address long-term financial needs. However, in the cases of New England island utilities, the ability to meet these needs is limited by their challenging financial realities (as outlined in Chapter Two). In both cases, there are significant obstacles to meeting capital needs but a much higher burden must be borne by community-led projects (Windustry 2006).

III. Meeting Capital Needs: An Overview of Actors & an Evaluation of Tools

Actors: Federal and State Government, Utilities, Investors

Even though those seeking to develop wind power projects are routinely mired in the quest to obtain capital, renewable energy is increasingly being put in the spotlight by those seeking to lower energy costs, decrease dependence on foreign oil, combat climate change, expand green job opportunities and to profit from its low-cost of operation. As a result, various policies with targets for installed capacity, incentives and other mechanisms are being developed to promote projects on both the national and state levels in the U.S. Expanding access to funding and financing has become a critical aspect of these efforts. The following section will review how various actors including federal and state governments, utilities and investors are working to make wind power more price competitive and installation targets more quickly attainable.

Beginning with his presidential campaign and now in his first term in office, President Obama has repeatedly emphasized the importance of expanding wind power and renewable energy in general. However, the federal government's track record on the topic can be categorized as inconsistent at best. Heiman and Solomon (2004) argue that the United States' patchwork of energy policies is a result of weak institutions and strong geopolitical interests around energy and oil that generally only motivate Congress to act in response to specific crisis events.

The federal government's substantive efforts to promote renewable energy began in 1978 with the passage of the Public Utilities Regulatory Policy Act (PURPA). PURPA increased market access for renewable energy producers by mandating that electric utilities purchase energy from non-utility electricity generators that equaled the utility's "avoided cost" or the price it would pay to generate the electricity itself. Due to PURPA and the conservation effect of the 1970s energy crises, the United States led the world in the development of renewable energy during the decade between the mid 1970s and the mid 1980s (Heiman and Solomon 2004). However, as oil prices dropped throughout the Reagan and Bush (I) administrations, renewable energy funding was repeatedly cut (Ibid.). This was exacerbated by "overt hostility" from utilities and the energy industry that since the passage of PURPA had been pushing for deregulation to allow rate competition (Ibid., 101).

Utilities won their battle when deregulation – or more aptly, "restructuring" – legislation began to be passed during the late 1990s.[10] States, who have been involved with utility regulation since 1935, have been tasked with overseeing this process. Restructuring has therefore produced a wide range in how and the extent to which each state's utilities are governed. One thing that remained the same across the country however was that restructuring eliminated the ability of states to directly mandate requirements for renewable energy production within their borders.

Without control over the utilities, states that wished to continue promoting renewable energy began to enact legislation to establish a Renewable Portfolio Standard (RPS) that dictated how much clean electricity investor-owned utilities (IOUs) must supply to the grid by a certain date. To help utilities meet these goals, Public Benefit Funds (PBFs) were established in many states to provide the capital needed to develop renewable projects. The federal government also increased its efforts by creating a Production Tax Credit (PTC) for wind through the US Energy Policy Act of 1992. The 2009 stimulus package expanded many of these options, all of which will be discussed in further detail below.

Renewable energy incentives have broadened the role of investors who are primarily attracted to the related tax benefits that they can obtain through project

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[10] The electricity sector is different from other sectors that had previously been deregulated in that the logistical challenges posed by unbundling its three main activities (generation, transmission and delivery)ultimately limited the extent to which government could release control to the utilities. Therefore, deregulation is not as extensive as it has been in other sector is more aptly described as "restructuring" (Heiman and Solomon 2004).

involvement. Beginning in earnest in 2003, institutional tax equity investors such as large banks and insurance companies have grown to be the most common type of investor in wind projects due to their high tax liability that can be reduced through the PTC (Bolinger and Wiser 2009). Entering into partnerships with wind developers, these investors employ "highly specialized financing structures" that allow them to take advantage of federal incentives (Bolinger et al. 2009). JP Morgan, one of the largest investors in wind, has estimated that tax equity investments in the industry have totaled more than $16 billion since 2006 (Bolinger and Wiser 2009). These equity investments have translated into significant reductions in the cost of electricity and have helped the industry weather recent commodity price increases (Ibid.). However, the 2008 financial crisis has reduced the amount of liability most investors have to shelter, therefore reducing the need for tax credits. Even with a diminished tax appetite, economically viable wind projects provide a healthy return on investment, therefore the role of investors will also be discussed in more detail in the following section.

Evaluation of Tools

Financial incentives play an integral role in stimulating the process of technology diffusion, particularly in the field of renewable energy (Kruijsen et al. 1998). In the case of wind, incentives have been critical to lowering upfront capital costs and providing stability through secure financing and guaranteed long-term contracts (Heiman and Solomon 2004). These benefits have helped to diminish the distortion created by restructured energy markets and provide a more level playing field (Solomon and Heiman 2001; Reeves 2003). The ultimate goal of incentive creation is to lower the price at which the energy is sold and therefore increase consumption and demand for additional wind power projects (Reeves 2003).

Community wind projects on New England islands bring with them a specialized set of needs that may not always match the mainstream incentives that have been developed to promote large-scale, privately financed projects. For example, because the financial capacity of island utilities have been limited by the challenges of providing energy in remote settings (i.e. debt service, cable repairs, high cost of transmission), they are in particular need of upfront capital in order to get a project off the ground. Access to bank loans may be difficult and unattractive in terms of the debt that is already being carried. Increasing electric rates to raise required capital poses a difficult problem as it could create an undue burden for ratepayers already facing high energy costs. As such, community wind projects are advised to "make optimal use of state and federal incentives, attract lenders offering low interest rates and long financing periods, provide an acceptable rate of return for investors and facilitate local investment" (Windustry 2006, Chap 11, 1). Due to the remoteness of some New England islands, the applicability of various incentives to off-grid projects will also need to be considered.

As referenced earlier, in many cases where states have made progress on electricity restructuring, some policy mechanisms have been employed to continue integrating renewable energy into the market in the void of industry regulation. Some of the more well-known options include the Renewable Portfolio Standard, Renewable Energy Credits, the Production Tax Credit, the Investment Tax Credit, U.S. Treasury's Cash Grant, Public Benefit Funds and Clean Renewable Energy Bonds. Rather than providing a lengthy description of their history and merits, the following section provides a basic overview of each mechanism followed by an evaluation of how it might meet the needs of community wind projects on New England islands.

Renewable Portfolio Standards (RPS)

The Renewable Portfolio Standard (RPS) has been the primary way for states to promote wind power, as it requires investor owned utilities to integrate a specified amount of renewable energy into the grid within a certain time frame. Progress is reported to the state on an annual basis and in lieu of meeting targets, utilities face fines or other penalties. As of April 2009, 28 states and the District of Columbia have enacted an RPS whereas five states have renewable energy "goals" (DSIRE 2009). The presence of an RPS has been shown to have a significant effect on a state's level of renewable energy; in fact those with an RPS lead the nation in renewable energy installations.

RPS legislation has been enacted in all five coastal New England states but its relevancy to island community wind projects is limited. This is largely because in most cases public power utilities have not been obligated to comply with RPS legislation. For those islands that are connected via an undersea cable, the utility supplying power is responsible for meeting the standard. Off-grid island utilities have been exempt from restructuring legislation so they are not responsible for meeting the standard (L. Smith, personal communication).

Renewable Energy Certificates (RECs)

Intrinsically connected to an RPS are Renewable Energy Certificates (RECs), the unit in which utilities must prove their compliance with an RPS. One REC represents one MWh of electricity that has been produced by a renewable energy source. In order to meet required levels of renewable energy penetration, a utility may generate its own RECs or it may purchase them from renewable energy generators at a variable price that is dependent on region and timing. In states where an RPS has been established, RECs are sold in a compliance market to utilities needing to meet the Standard; in states where there is no RPS, RECs can be sold in a voluntary market to corporations and others wishing to "green" their energy supply. In essence, RECs are tradable commodities that serve to monetize the environmental and social benefits of clean energy. More importantly however, REC trading markets create an income source and demand for renewable energy producers.

Most community projects in New England (including islands) can benefit from RECs, as long as generated power flows onto the New England Power Pool (NEPOOL) electric transmission network (Dua 2008). However, one MWh is a fairly significant amount for the smaller projects that are best suited for most of these islands, so REC sales may be limited. The comparatively high price of RECs in the New England region may also limit buyers. Furthermore, off-grid project are ineligible for REC sales, as they are not connected to the NEPOOL grid. Nevertheless, while actual REC income is not recognized until the production phase, agreements to purchase RECs are hugely important in providing stability during the financing process.

Renewable Energy Production Tax Credits (PTCs)

The importance of tax incentives as a driver for renewable energy development should not be understated as they can represent one-half to two-thirds of a wind project's total revenue for its first decade (Windustry 2006). The Renewable Energy Production Tax Credit (PTC) is the primary source of this revenue, currently providing a ten-year tax credit[11] for qualified wind projects that sell energy to an unrelated party that is fed into the grid. This incentive has been instrumental in attracting the institutional tax equity investors that have helped to drive the growth in wind installations since the Credit was first implemented in 1992. However, this growth has not been without a great deal of uncertainty as multiple lapses in the renewal of the PTC have resulted in a "boom and bust" cycle of development. Greater confidence has been afforded to developers through PTC extensions in both 2008 and 2009 that enable projects to apply for the credit up to December 31, 2012.

While tax-based incentives may be responsible for a significant portion of the wind industry's growth, their applicability to community wind projects has been limited. This is largely because of the small to non-existent tax liabilities

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[11] The 2009 tax credit is 2.1 cents/kWh and will be adjusted annually to reflect inflation.

held by the municipalities, electric cooperatives and non-profits that often seek to develop community wind projects. In order to make use of the benefits, these actors must enter into complex partnerships with institutional tax equity investors and utilize methods such as the "Minnesota Flip" that is described in Chapter Five. While such an agreement can offer many benefits, it also poses challenges in terms of finding appropriate investors and refining the model so that communities can quickly realize energy savings.

There are a number of additional difficulties that arise for use of the PTC for New England island projects. First, similar to RECs, the relatively low level of energy generation by small island projects may limit investor interest. Second, for those projects that do utilize the PTC, they must keep in mind that doing so may limit other opportunities for federal or state funding as those incentives prohibit "double dipping" and are therefore determined based on the project's cost *minus* the PTC (Windustry 2006). Lastly, while it has been extended, the long-term future of the PTC remains uncertain. Reeves (2003) has explained that insecurity around this incentive can lead developers to expedite projects before PTC expiration and incur additional costs by doing so.

The current economic recession has created the most significant challenge for all types of wind projects seeking to make use of the PTC. The declining financial position of most institutional tax equity investors has reduced their need for tax credits. Combined with the liquidity crisis, wind projects across the country have been delayed or cancelled altogether. This illustrates the view of several renewable energy analysts that the incentive structures in the U.S. are too dependent on the tax code and that the nation needs to reevaluate them (Bolinger and Wiser 2009). In doing so, there is the potential to see increased opportunities for community wind.

The American Reinvestment and Recovery Act of 2009 (ARRA), Investment Tax Credits (ITCs) & Cash Grant Program

In February 2009, President Obama signed the American Reinvestment and Recovery Act (ARRA) into law in an effort to slow the nation's economic decline. In keeping with his platform, renewable energy was repeatedly emphasized throughout the $787 billion stimulus package, with more than $60 billion going to clean energy spending and tax credits (Bolinger et al. 2009). The legislation also included several changes to incentive policies, many of which reflect the diminished appetite for tax-based incentives (Bolinger et al. 2009). One such change was to the Business Energy Investment Tax Credit (ITC), which has provided a tax credit of up to 30% of qualified expenditures to a number of non-wind renewable energy technologies since 2005. In 2008 it was extended to include small wind projects (up to 100kW) and with the enactment of the ARRA in 2009, it became applicable to *all* PTC-eligible projects (including 100^{+}kW wind) that were willing to forego the PTC and that are in service by the end of 2012. ARRA also enhanced stability and certainty by extending the PTC until the end of 2012.

An additional ARRA development was the creation of a Cash Grant program from the U.S. Treasury Department. For a limited period of time, this will allow ITC-eligible projects[12] to forego both the ITC and PTC and opt instead to receive a cash grant that equals 30% of qualified expenses. The Treasury must provide that cash within 60 days of receiving a project's application or it begins production (which ever is later) so that debt will not accumulate for a significant amount of time (Bolinger et al. 2009). In order to be eligible, projects must commence construction by 2010 and be placed into service before 2013. It is important to note that for projects benefiting from either the ITC or cash grant, ARRA has lifted the "double-dipping" penalty that has been assessed on projects receiving "subsidized energy financing" and was mentioned under the PTC section (Bolinger et al. 2009).

While there are still a number of questions about the applicability of these incentives, many energy policy analysts agree that they stand to have a significant impact on how the capital needs of projects are met (Bolinger et al. 2009). For New England island community wind projects, ITC eligibility means that they could potentially attract a broader range of investors who have not had the tax liability needed to use the PTC. Moreover, because the ITC provides compensation for project expenditures, it means that project owners will be able to recoup some of their early capital outlays. The cash grant offers an opportunity to access an important incentive even if the tax burden is not high enough but is limiting for communities, as it does not permit the presence of a non-profit entity anywhere in the ownership structure. As many aspects of the legislation are still being interpreted, community projects will need to work with tax experts to assess

[12] This now includes most PTC-eligible projects, including small wind, thus removing the $4,000 cap that had been placed on the latter's credit and making it eligible for the full 30% credit (Windustry 2009).

their specific revenues and costs in order to determine which option (the PTC, ITC or cash grant) would create the greatest benefit.

System Benefits Charges (SBC) & Public Benefit Funds (PBFs)

A System Benefits Charge (SBC) is another popular mechanism among states seeking to promote renewable energy. An SBC is a small but mandatory surcharge that is levied on electricity ratepayers based on their consumption on a cent/kWh basis. Alternatively, a flat fee may be charged to the utility. In both cases, proceeds are directed to a Public Benefits Fund (PBF) that has been established to support public interest projects previously funded by IOUs. Due to its direct connection to electric utility restructuring, PBFs are administered on the state level, more specifically by a range of entities that can include environmental agencies, quasi-public organizations, independent third party groups or utilities (Bolinger et al. 2001). The administrators distribute funds in the form of rebates, grants and loans for both public and private project development, while also supporting research and public education on renewable energy technologies (DSIRE 2009). Currently, PBFs in 16 states and the District of Columbia are estimated to raise approximately $6.5 billion by 2017 (Ibid.). Thus far, large-scale wind projects have received the highest percentage of PBF support (Bolinger and Wiser 2006).

PBFs exist in all coastal New England states with the exception of New Hampshire. In 2008 funding awards ranged from $25 million in Massachusetts to $99,095[13] in Maine (DSIRE 2009, Efficiency Maine 2009). Although it has a

[13] Maine's 2008 grants were actually awarded in January 2009 (Efficiency Maine 2009).

much smaller population, Maine's low level of awards stems primarily from the fact that its PBF is the only one in the country funded exclusively through voluntary contributions (with the exception of a small SBC dedicated to a new homeowner rebate program), which may concern any community in the state looking for significant funding. In most cases however, the cash payments and grants provided by PBFs are useful to community wind projects, particularly in avoiding the "double dipping" barriers of tax incentives that small and community wind projects face (AWEA 2009). However, Bolinger and Wiser (2006) report that though PBFs are expanding their types of support, 90% of funds have been focused on incentives for actual production, not development or construction. While the authors argue that the emphasis on production-based incentives helps to promote efficient energy generation and makes triggering the anti-"double-dipping" provisions of the PTC less likely, this seems to exacerbate the obstacles faced by community wind projects in need of upfront capital. Finally, off-grid projects are once again excluded from the benefits of PBFs, as their ratepayers are not obligated to pay an SBC[14].

Clean Renewable Energy Bonds (CREBs)

Clean Renewable Energy Bonds (CREBs) were created in 2005 to provide a financing option to public power providers, governmental bodies and electric cooperatives that, because of their tax status, have not been eligible for the PTC. CREBs are yet another financial incentive that takes advantage of the U.S. tax

[14] Recent changes to Massachusetts law may permit off-grid projects in the state to receive public benefit funds when they pay into its PBF. This will be discussed further in Chapter Five.

code, as they are considered tax-credit bonds. This translates into an interest-free loan for qualified borrowers as the borrowing entity repays only the principal of the bond and in lieu of interest, the bondholder receives federal tax credits (DSIRE 2009). As of 2008, $1.2 billion in CREBs had been issued to nearly 1,000 projects nationwide. ARRA made an additional $1.6 billion available to the program, bringing the total allocation as of 2009 to $2.4 billion.

There are a number of reasons why CREBs offer a good fit to New England island wind projects. First, electricity generation on most of the islands (including all of those that are off-grid) are managed by a non-profit power utility. Depending on the specific needs of a project, this may alleviate the need to enter into complex partnerships with tax equity investors. Second, because the IRS and U.S. Treasury allocate funds using their "smallest-to-largest" method, requests from island appropriate –sized (i.e. smaller) projects would likely get preference (IRS 2007). Further, and perhaps most importantly due to their limited options, a review of U.S. Tax Code does not readily show limitations to off-grid projects.

IV. Analysis of Evaluation

Four key findings have emerged from this review. They include:

1. **Information on "specialized" projects can be difficult to find –** Research of these topics revealed a large gap in the discussion of community wind projects due to an almost exclusive focus on large-scale tax investor-friendly projects. This was the case in the majority of the peer-reviewed literature, government documents and wind advocacy

materials that were consulted, as well as in many of the interviews that were conducted. Uncertainty around New England community wind incentives stemmed from both the constantly evolving nature of the field and because of the off-grid element. Based on this research experience, it is likely that the process of identifying appropriate incentives will be complicated for New England island communities and others around the country seeking to explore local ownership or projects in remote areas.

2. **The path to move forward is not always clear –** Once the appropriate incentives have been identified, it can still be difficult for a community project to know how to proceed. For instance, the choice of tax investors and partnership structures will likely need to reflect the unique needs of the community. Community wind projects will require assistance from experts to navigate through the financing process.

3. **There is a gap in development phase funding opportunities in some states** – In the case of many New England island communities, utilities and municipalities lack the financial capacity to cover development costs on their own. While investors may be brought in once a project is shown to be economically viable, these utilities may also rely on outside funding in order to complete the feasibility work needed to illustrate the strength of the project. This review shows that significant funding is available in some states but in Maine, where many of these communities are located, the resources are scarce.

4. **There is also a gap for off-grid opportunities –** With the exception of the CREBs option, none of the most well known incentives apply directly to off-grid projects. This review shows that this is largely due the prevalence of incentives related either to the tax code or to electric utility restructuring. However, these approaches should not negate the importance of and public benefits brought by off-grid wind power projects.

It is clear from these findings that in order to attain the benefits outlined in Chapter Two, creativity must be used to overcome these obstacles. Chapter Five will provide some guidance on solutions.

Chapter Five:
Creative Approaches to Meeting Community Wind Capital Needs

I. Introduction

Creativity on the part of communities, policymakers and investors alike will be the key to raising the capital needed to successfully complete community wind projects on New England islands. Through four mini-case studies and a short review of other important options, this chapter will briefly highlight some of the mechanisms that have helped similar projects to overcome the financial challenges posed by community ownership. Some of these cases may illustrate how states and other stakeholders have responded to the specific needs of a project's setting, therefore modifications may need to be made in order for them to apply to various New England island projects. Nonetheless, these examples from both the New England region and beyond should be considered for the useful lessons and ideas that they offer.

II. Creative Solutions: Four Mini-Case Studies

Massachusetts Technology Collaborative's Community Wind Collaborative

The Massachusetts Technology Collaborative (MTC), the administrators of the state's public benefit fund (named the Renewable Energy Trust or "RET"), has been at the forefront of efforts in the United States to promote community wind. In 2003 MTC established the Community Wind Collaborative (CWC) based on the calculation that because municipal governments held a significant amount of developable land with sufficient wind resource, locally owned projects would be key to meeting the Trust's objective of expanding renewable energy consumption across the Commonwealth. Moreover, MTC reasoned that the demonstration of wind power on the local level would further enforce the Trust's mission to make renewable energy both more acceptable and accessible to the public.

Since its inception, the CWC has evolved to address a number of the major challenges faced by communities considering wind. During the development phase, the CWC provides a thorough feasibility study that includes wind monitoring equipment, technical analysis and economic modeling at *no cost* to the community. Once this analysis has been completed, the CWC provides a community with up to $150,000 (or the equivalent in services) to further develop and find partners for the project. Moreover, the CWC can help projects to secure financing by providing a formal offer to purchase RECs from it if it is connected to the NEPOOL system. Throughout the process, the CWC provides staff support to help guide municipalities through the requirements.

In 2008 the Massachusetts Legislature passed the Green Communities Act, effectively broadening the reach of the CWC by establishing a mechanism through which Municipal Light Plants (MLPs) can apply for RET funding. According the bill, RET funding and MTC's programs (including the CWC) become available to MLPs if they assess a 0.5 mill (i.e. $1/20^{th}$ of a cent) per kWh charge on ratepayer consumption (adding an average of 30 cents to a ratepayer's monthly bill). This development is significant for off-grid islands in the state such as Cuttyhunk, as it could enable the local utility to apply for assistance.

Nonetheless, the CWC has had its share of stumbling blocks. One administrator noted that challenges have included coordination with busy towns that have limited capacity to work on these projects, building public support and staying on top of all of the necessary agency requirements for each local project's permitting (H. Cadavieco, personal communication). As of May 2009, the program had not yet installed any turbines but it continues to make progress with its partners while preparing to make another round of revisions to its structure. It is also offering an example to other New England states as to how community wind power can be promoted on a broader scale by providing critical services and incorporating publicly owned power utilities.

Alaska and the Renewable Energy Grant Fund

In terms of remote energy applications in the U.S., Alaska is king. Photographs of remote villages surrounded by vast stretches of frozen tundra illustrate how the extension of transmission lines can be both costly and logistically challenging. Distributed energy provided by stand-alone diesel systems is common throughout the state, most notably in its 175 remote villages. Yet despite Alaska's sizeable oil resource, transport to remote areas drives energy costs in many of these villages to some of the highest levels in the country (EIA 2008). In seeking to provide relief to these communities and to take advantage of the excellent wind resource that surrounds them, the State of Alaska has been working to promote wind power and other renewable energy technologies.

First, state agencies have helped to lower the logistical burdens, length and costs of the development period by investing funds to create a statewide wind speed database and to conduct a preliminary feasibility assessment for wind power in 100 remote villages. In May 2008 soaring diesel prices prompted the State Legislature to establish the Renewable Energy Grant Fund and recommendation program with the goal of lowering energy costs in rural Alaska and beyond. Pursuant to House Bill 152, $100 million in funds were allocated for Fiscal Year 2009 with $50 million to be made available annually for the next four years. Weeks later in June 2008, the Alaska Energy Authority (AEA) and the Denali Commission distributed $5 million in renewable energy grants for early stage research and feasibility work under a separate program.

According to the Fund's administrator, the structure of the Renewable Energy Grant Fund program is reflective of the "out of the box" thinking needed to address the needs of remote Alaskan communities (B. White, personal communication). Scoring criteria gives preference to projects in communities that face the highest energy costs and that provide the highest public benefit. With funding coming directly from the Legislature instead of utility companies and because there are 148 separate electric grids scattered throughout the state, there is no distinction made between funding for grid-tied and off-grid projects (Ibid.). Furthermore, the process ranks projects by region in order to ensure that the benefits of renewable energy are spread equally throughout the state. Administrators at AEA tally final scores and their recommendations are brought to a vote of the Legislature in order to provide an extra layer of oversight in this new process.

The Fund has already provided recommendations for two rounds of 2009 funding. In February $100 million in grants were approved and legislators voted to approve an additional round of $25 million in grants in May. As recommended by H.B. 152, approximately 20% of the funds went to feasibility studies and 80% were allocated for the final design, permitting and construction phases (DSIRE 2009).

While Alaska's commitment to renewable energy and its capacity to forward community and rural wind can serve as a model, it is questionable whether New England states would have the capacity to invest similar funds. As Milkowski (2009) points out, $300 million "is a substantial sum for a state with only 670,000 residents" and the vast amount of the money comes from recent record-breaking oil revenues. Nonetheless, the emphasis placed on remote projects, the opportunities for development funding, the wealth of information that will be collected and the advancements in technology that will likely result (particularly regarding wind-diesel hybrids) will be important for supporters of island wind projects.

Minnesota Community Wind and the Minnesota Flip

In 2004 Bolinger bestowed the state of Minnesota the titles of "both the birthplace *and* current hotbed of community wind power in the United States" (Bolinger 2004, 3). While state incentives have been key, wind project owners in Minnesota have attributed much of this success to a business model that they have coined the "Minnesota Flip." Bolinger defines the Flip model as a project “whereby a tax-motivated corporate investor passively owns most or all of the project for the first 10 years, and then ‘flips’ the ownership of the project to the local investor(s) thereafter” (Bolinger 2004, 7). This is most typically accomplished through the establishment of a Limited Liability Corporation (LLC) to which local investors with limited tax liability contribute start-up capital for development work and a tax equity investor contributes a significant amount of capital for construction (Windustry 2006). Due to the substantial tax incentive, the equity investor will own the project for the first 10 years, the period of time for which it can take advantage of the PTC. At the end of the decade, project ownership “flips” to the local investors who then hold a largely (if not completely) debt-free project. This model has proven particularly useful for many of the farmers in the state that lack the capital needed for development and construction but that hold vast tracts of land suitable for wind development and are eager to stabilize their income.

The ability of public projects on New England islands to realize the same level of success as Minnesota community wind projects may be somewhat limited as Minnesota’s success with wind comes from many unique factors that New England states are unlikely to benefit from. For instance, much of Minnesota’s wind development comes as a result of a state mandate for its largest utility to develop wind in return for the ability to continue storing nuclear waste at the state’s Prairie Island nuclear facility, with specific expectations that small, locally owned projects be installed (Bolinger 2004). Wind projects also benefit from legislation that exempts them from sales taxes on turbines and other materials, as well as property taxation (Bolinger 2004). Further, in order for the Flip model to bring the necessary cost savings benefits to the New England island setting, the interests of a larger group such as a local utility – not just those of individuals – must be represented by the LLC.

Fox Islands Electric Cooperative, Maine and the Island Flip

Financing for the Fox Islands Electric Cooperative (FIEC) wind power project offers a twist on the Minnesota Flip model that increases its applicability to the New England island setting. Instead of being focused around a single resident (such as a farmer in Minnesota), ownership in this Maine "island flip" model focuses on the local electric cooperative. With its proposal of a three-turbine, $14 million wind project and only $10 million in total assets, FIEC decided in 2008 to enter into a partnership with an investor in order to address its financing needs. Fox Islands Wind, LLC was incorporated, and similar to the Minnesota model, a single Maine-based tax equity investor agreed to hold 95% of the LLC with FIEC retaining a 5% stake. However, instead of retaining a portion of the LLC's profits, the investor will gain an equivalent of an 8% return on its original $5 million investment through the use of the PTC. At the end of the decade, the project will flip back to FIEC when it purchases the project from the investor. In the meantime, REC income and low interest financing from the United States Department of Agriculture (USDA)'s Rural Utility Service (RUS) will lower debt by supplementing the rest of the project's capital needs (Fuller 2009; see more below).

III. Additional Approaches

A number of additional options exist for community wind projects seeking to overcome capital challenges. One particularly practical approach is to carefully manage project costs, particularly in the beginning stages of the project. During this time, project coordinators should look for synergies and partnerships that could help to forward their work. For instance, some states have established anemometer loan programs that can help to reduce the costs and time of collecting wind speed data. In some cases (such as in Alaska), detailed meteorological data may have already been collected for previous projects or weather records. Moreover, the evolution of services from companies such as AWS Truewind helps to provide comprehensive wind modeling within a few weeks.

Wind project coordinators should take advantage of the fact that the uniqueness of the New England island setting may appeal to those interested in wind technology innovation, as it has in Alaska. According to Flowers and Baring-Gould (2004), "pilot projects, if implemented properly, can provide critical information and publicity to support the further development of rural electrification programs" (Flowers and Baring-Gould 2004, 2). The innovation required for projects in these settings may also make it more attractive to both government and private funders. For instance, public power entities with innovative projects have the ability to apply for grants of up to $75,000 from the American Public Power Association (APPA)'s Development of Energy Efficiency Developments (DEED) program, provided the utility is a member of the Association (APPA 2009). Projects utilizing new technologies may also qualify for loan guarantees from the U.S. Department of Energy, as outlined by Title XVII of the Energy Policy Act of 2005 (U.S. DOE 2009). Lastly, due to the "rural" location of the islands and the high energy costs that they face, renewable projects are able to follow in the footsteps of the Fox Islands and apply for low interest financing and grants from the Rural Utility Service (USDA 2004).[15]

In addition to reducing debt burden and ultimately energy costs, the act of managing costs has the dual effect of lowering risk in the development stage of a project (Andre et al. 2005). Project coordinators and investors run the risk of losing significant amounts of capital if the outcomes of the feasibility work or the permitting process do not support the continuation of the project. Furthermore, such careful attention to spending may appeal to the practicality addressed in Chapter Two's discussion on *islandness*, potentially helping to increase community acceptance.

While a number of additional options exist, these examples should provide important lessons on how incentives can be provided for wind projects in remote, high energy cost communities where local ownership is key. As such, they should also provide guidance to similar communities, policymakers and investors seeking to develop solutions to meet the specific needs of New England island wind projects. The following chapter will look more closely at the case of the proposed wind project on Monhegan Island, Maine to see how these incentives might help to overcome the significant capital challenges that it faces.

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[15] The USDA defines "rural" as a community with a population under 50,000 and "high energy cost" as average residential energy costs that are at least 275% of the national average (NREL 2005).

Chapter Six:
Case Study: Monhegan, Maine

I. Overview

"We need to face the fact that a diesel-only facility is not going to work for us in the long-term and it's really not working in the short-term." Katy Boegel, long-time President of the Monhegan Plantation Power District Board of Trustees, was speaking in front of a standing room only crowd that had gathered at the Monhegan School early in the evening of September 13, 2008. Her next words brought about an audible gasp from the mix of 60-plus summer and year-round residents: "We have had to raise our rates on an emergency basis. We have been to the PUC and we are going to have to charge 70 cents/kWh." What follows is an account of how an isolated island community came to face one of the top ten highest electricity rates in the country and how, despite a number of challenges, it is working to lower that rate through a community wind power project. Simultaneously this chapter will seek to answer the following research question: *How can the experiences of the Monhegan, Maine wind project as summarized in a detailed case study help to inform and potentially improve other wind projects on New England islands?*

II. Monhegan Island: A Background

Generations of artists have flocked to capture the picturesque landscape of Monhegan, a tiny island on the outskirts of Midcoast Maine's Muscongus Bay. Majestic cliffs measuring up as some of the highest in the state, densely wooded forests and a tranquil harbor filled with fishing boats have been stylized by artists such as Rockwell Kent, Edward Hopper and Andrew Wyeth. Yet Monhegan is far more than just the setting of a pretty picture. It is a place that has also long been noted for its rich history, unique ecosystem, hardy year-round community and increasingly, for its consideration of community wind power.

History

Just under two miles long and just over a half mile wide, Monhegan's place in history books makes up for its small physical area. Historians have pointed to Monhegan as one of the longest continuously inhabited settlements in the United States. First known to Native Americas and Viking sailors, the island was eventually visited by a number of notable European explorers in the early 17th century. With "Muscongus" translating into an Abnaki Native American word for "fishing place," it is not a surprise that Monhegan had established itself as a prime fishing camp and trading post even prior to the landing of the Pilgrims. Early American history highlights Monhegan as a shelter to many of Maine's early European settlers displaced by the fighting of the 17th century Indian Wars. In fact, one account states that for a period in 1676, Monhegan provided refuge to virtually the entire white population of the then District of Maine (Conkling 1981).

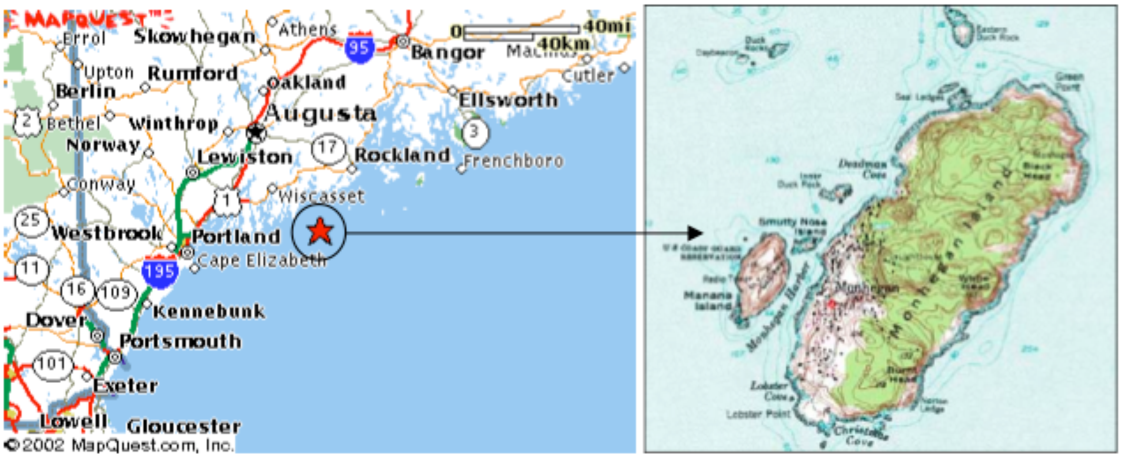

Figure 6.1: Locus and Plantation map of Monhegan, ME
Source: Blanco et al. 2002, 14

Ecosystem

Monhegan is also well known to ecologists, particularly because of the noted diversity of bird species that visit the island each year. The sight of its forested landscape emerging out of the vast Atlantic Ocean serves as a beacon to bald eagles, lark sparrows, summer tanagers and over 100 more species searching for a spot to rest and refuel when traveling down the Atlantic Flyway migratory path. Of great fortune to those species and the humans that revel in tracking them, much of Monhegan's natural state has been protected by a private land trust established by one of Thomas Edison's grandsons during the 1950s. Edison's descendant initially placed 300 acres of the island under conservation but additional land donations have brought the current total to 480 mostly contiguous acres or approximately two-thirds of the island's land mass. (See green-shaded area in Figure 6.1). Approximately 17 miles of trails have been developed throughout the trust area.

Community

The remaining third of Monhegan's area is home to the small, dirt road-connected village that serves as home to the island's roughly 70 year-round residents. During the summer months, island population can increase to 1,000 as summer residents return to the island, "day trippers" are shuttled to and from the mainland by the three ferries that service the island, and artists, birders and vacationers fill cottages and inns. Seasonal tourism makes a significant contribution to the livelihood of many residents with 82% of the island's 2007 taxable sales coming from seasonal restaurants and lodging (Curran and Carter 2008).[16] Traditional island activities such as fishing (mostly for lobster) and carpentry continue to play an important role in the economy as well.

While many of Monhegan's summer visitors are considered wealthy,[17] the island's year-round residents tend to fall in a more modest income bracket. According to the U.S. Census (2000), the median household income for the community was $26,250, more than a third below the national median at the time. Even though no study specific to Monhegan has been completed, island residents understand that the cost of living on the island – like in other remote areas – is significant. The added cost of transporting goods by ferry and increased heating needs during the harsh winter months means that many islanders must creatively piece together several seasonal and part-time jobs in order to make a living.

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[16] This percentage is the highest among all of the Maine island communities (Curran and Carter, 2008).

[17] A study by FutureMetrics (2005) found the average income of an island tourist in 2004 to be $88,000. A median household income for tourists was not provided by that study.

Monhegan was incorporated in 1839 with the State of Maine recognizing it as a plantation. Typical for sparsely populated areas, a plantation is a civil division exclusive to Maine that falls between a town and a township or unorganized territory and to which the State has granted limiting governing powers. Local residents provide the bulk of administrative services and manage public utilities in addition to their primary forms of employment. Children are provided a K-8 education through one of the last remaining one-room schoolhouses in Maine. Despite this local control, the State has reserved control over zoning and land use issues on the island through its Land Use Regulatory Commission (LURC), as it has for other plantations in the state.

Underlying this official demarcation of self-governance is a sense of *islandness* that is rooted in independence, common sense, and close and closed-ness. A resident since 1980, Marian Chioffi explained, "the people that live here are fairly self-sufficient, they are good at solitude but at the same time they're always willing to help their neighbors." Mirroring the state-wide trend that islanders have on average achieved a higher level of educational attainment than citizens inshore (Curran and Carter 2008), Chioffi continued: "This is an incredibly well educated community and you would think that all of the people would be somewhere setting the world on fire but they just go about their lives pretty quietly. They've just decided that it's a simpler way of life even if sometimes it's a harder way of life because they are 12 miles out to sea."

The sense of *islandness* has also manifested itself in the community's inherent commitment to the concept of sustainability, defined as "meeting the needs of today's generation without compromising the ability of future generations to meet their own needs" (UN WCED 1987). For example, in order to preserve the stocks their jobs are dependent on, Monhegan fishermen set a limited number of traps in the state's only lobster conservation area. Freshwater resources are also conserved across the island due to the limited access to the town's modest drinking water supply. Many in the community actively recycle and compost and vehicle use is extremely limited. The Monhegan Island Sustainability Community Association (MISCA) takes a slightly different (but perhaps more relevant) approach to sustainability by focusing its efforts on maintaining the year-round community through affordable housing and economic development initiatives (MISCA 2009).

III. Current Off-Grid Electricity Generation and Distribution

To understand how Monhegan ratepayers became responsible for power at 70 cents/kWh, it is necessary to consider the island's electricity supply and its history. Monhegan falls into the off-grid category of the Manwell et al. (2003) study mainly because at 10 miles off the mainland coast, the cost of an undersea cable has long been considered too high.[18] Prior to the mid-1980s, residents relied mostly on individually owned diesel generators to provide limited electricity to the island. A more centralized, privately run system eventually evolved but was plagued by noise issues, mechanical problems, severe line losses and run off that jeopardized the village's sole source of public drinking water. In

[18] Using the lowest estimate presented by Manwell et al. (2003) for a meter of installed cable ($180), a 10-mile cable to Monhegan would cost a minimum of $2,880,000.

response, Plantation leaders decided to appeal to the Maine Public Utilities Commission (MPUC) in 1997 with a plan to have a new system declared a public utility. The quasi-municipal non-profit Monhegan Plantation Power District (MPPD) was thus established, subject to regulation according to federal and state law. After a lengthy collaboration with LURC and Monhegan Associates, Inc.,[19] MPPD was able to site a new centralized generation station atop the island's Lighthouse Hill.

Once a location had been decided upon, MPPD needed to develop a financing scheme to fund the project. It was awarded a $100,000 special needs grant, a $300,000 Federal Community Development Block Grant, and received some private contributions. To fund the remainder of the project, MPPD had to take out a $350,000 low-interest private loan. A business plan was developed by an off-island consultant, incorporating appropriate debt service and with an expectation of a sizeable profit margin.

In 2000, the District's selected engineer – Northern Power Systems – began the installation of a three generator, 300 kW stand-alone diesel power station. Several adaptations were incorporated into the system's design in order to meet the unique needs of the island. Special features included an automated switchgear box to handle fluctuation in demand, custom design to minimize maintenance and noise, and a new distribution system to make power delivery safer and more effective (O'Malley 2006). Known for its work in incorporating renewables into isolated diesel systems, Northern Power was also asked to design

[19] Monhegan Associates, Inc. is the organization that has managed Monhegan's land trust since its incorporation in 1954.

the Monhegan system with the potential to one day incorporate wind and/or solar power. Overall, extensive planning was done in the hopes of reducing delays and costs, yet progress on the project was still held up for months at a time due to opposition from a few community members and logistical problems in delivering equipment.

MPPD finally began to produce power and customers slowly started switching over to the new distribution system. The annual number of kWh purchased, however, increased only slightly due to a number of setbacks MPPD encountered as it began to expand its distribution system in 2001. By 2008, annual sales to its 124 customers had crept up to 335,138 kWh. To generate this power, $118,776 was spent on diesel fuel (Monhegan Plantation 2008).

As shown in Figure 6.2, the increase in the island's summer population is matched by an increase in electricity consumption during the same months, further illustrating the concept of variability outlined in Chapter Two. In 2003 Monhegan's annual average load was calculated at 35 kW, with a peak electric load of 210 kW (six times the annual average) occurring in August (Manwell et al. 2003). The specialized design of the MPPD power station and its automated switchgear box are usually able to successfully respond to these fluctuations yet it is not uncommon for island-wide power outages to result.

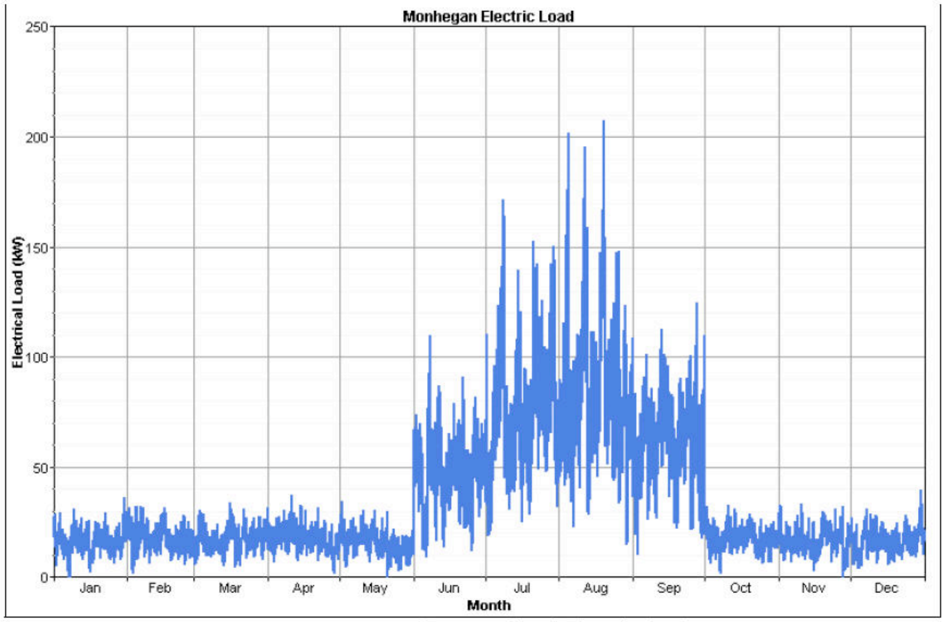


Figure 6.2: Fluctuation in annual electric load on Monhegan, ME
Source: Blanco et al. 2003

Electricity generation has come a long way on Monhegan yet MPPD continues to face a number of challenges, several of which are related to the economic viability of the power system. After going into business in 2000, the District very quickly realized that the business plan that had been developed for the system was fatally flawed. First, it assumed a diesel price of 89 cents/gallon and calculated a $40,000 profit for the first year, figures that have never been realized since the system has been operational. Moreover, Chioffi (who has also served as MPPD's bookkeeper and clerk since 2003) explained that the plan didn't consider a number of important realities regarding the Monhegan community:

> "When the business plan was done they had some unrealistic expectations for how much money was going to pour in. This community has a seasonal economy so that at certain times of the year people are behind on their bills. It just has to do with the way of life here, that a lot of it is tied to fishing and that in between the summer season and the fishing season people get behind on their

> bills. Yet the business plan for this company was done thinking that they were going to get 100% of their bills paid 100% of the time and that's not what happens."

From then on, Chioffi reports that MPPD was on a financial "rollercoaster." In order for the small company to cover comparatively huge start up costs while maximizing the profitability of its new generator system, the District knew that it needed to increase its customer base. However, major problems with the distribution system expansion and technical issues with generator management began to stress MPPD financially early on, making it virtually impossible to bring new ratepayers online in a timely manner. Problematic bookkeeping and debt management in the District's first few years exacerbated these early challenges. While Chioffi explained that it was eventually able to "pick away at debt" it also had to service an unexpected $40,000 line of credit that was often maxed. As a result, some years MPPD was able to make a small profit but for others, particularly in light of high diesel costs in recent years, it operated at a loss.

MPPD has not held the only financial concerns for the power system on Monhegan. Its ratepayers have also had to contend with hefty power bills ever since the generators went online. This is due to the 50 cents/kWh rate that MPPD started with and that the business plan assumed would cover limited maintenance and administrative costs while adequately servicing the utility's debt. Despite a steady increase in fuel costs (see Figure 6.3), MPPD did not adjust its rate until 2006 and even then did so by only five cents despite fuel costs having more than doubled by that time. This increase alleviated the District's cash flow problems until the price of fuel seemed to double over night in 2008.

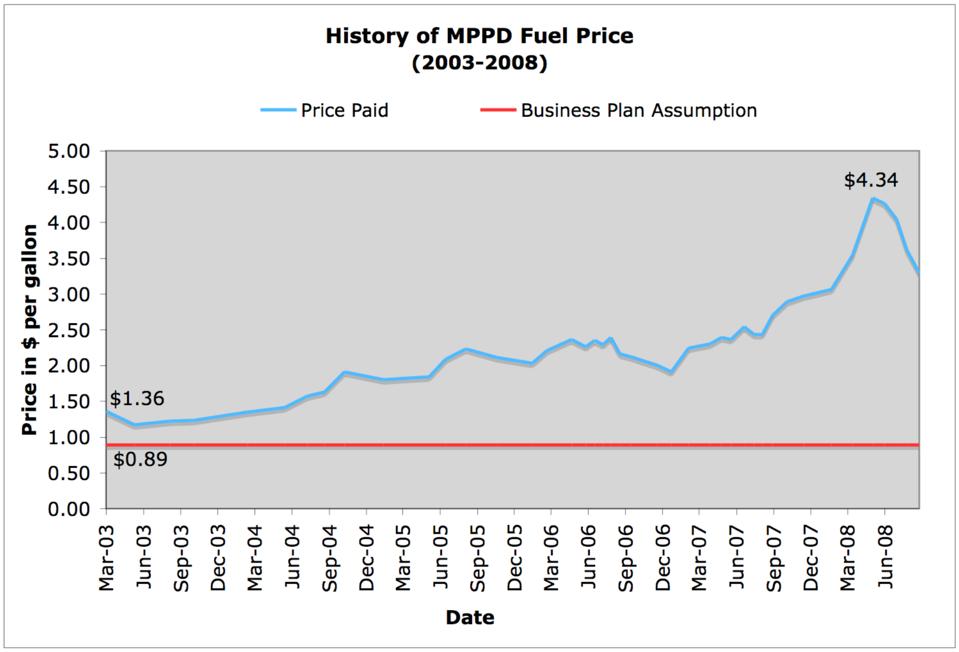


Figure 6.3: History of MPPD Fuel Price
Source: MPPD 2003-2008

After exercising a number of options (asking big users for early payment, maxing MPPD's line of credit and receiving a $20,000 loan from the Plantation), MPPD felt its only option was to petition MPUC for an emergency 15 cent/kWh increase. Despite its efforts, Chioffi explained that it was still a tough decision for MPPD to make:

> "This is a seasonal place and so you have to be very wary of how much you're increasing (rates). Besides being a seasonal community, it is a community that's aging. You can't increase the price so much that you get the income you need at the expense of people not being able to afford to pay their bills. You have to be careful of that with businesses too because you don't want to drive them out of business."

Nonetheless, the 70 cents/kWh rate has a huge effect on the Monhegan community. Based on one report's estimate that islanders use an average of 15-17 kWh per day, a year-round resident on Monhegan would pay between $319 and $362 per month for electricity, amounting to 15-17% of the island's 2000 median household income. Island businesses that use more electricity than an average household are certain to pay hundreds of dollars more per month. Combined with the pressures of the 2008 crash in the price of lobster and a national decline in discretionary income that fuels the island's summer economy, energy costs are severely challenging the year-round community's ability to sustain itself.

IV. Searching for an Alternative: Cable, Solar, Marine or Wind?

MPPD was looking for a solution for an unsustainable system and ratepayers were eager for a response. A handful of islanders continued to raise the option of an undersea cable but MPPD felt this was not a realistic solution. According to MPPD Trustee and 30-year Monhegan resident Katy Boegel, "There will always be people who want a cable but it just doesn't make any sense." She explained that the Power District was unable to cover the cost of the cable in the first place, let alone the millions of dollars that the inevitable repairs and replacement would cost. Moreover, some sort of island energy generation system would be still be necessary in the event that there is an outage, as Boegel reminded while cautioning "(the cable) *will* go down and we would be the last ones to get our power back." Instead, MPPD considered a renewable-hybrid option as the most viable alternative, echoing back to its initial choice to go with a Northern Power-designed system.

Solar Power

"Monhegan fog is not subtle" according to a 2001 National Geographic feature on the island yet frequent gray days haven't been enough to deter some community members from considering solar power (Newman 2001). In 2002, MPPD itself sought to incorporate the technology into its system after having received a grant from the U.S. Department of Energy's Million Solar Roofs Initiative. Initially, there was a great deal of interest from the community but once year-round residents were informed that they would need to provide $8,000 up front (roughly 30% of the median household income) in order to participate and not see a return on their investment for 25 years, interest plummeted. According to Boegel, there just wasn't enough area and solar resource to make the arrays economical. MPPD voted to return the grant funds and abandon the project altogether. Although some homeowners have installed panels over the past few decades, Boegel estimated that as of February 2009, only a handful continued to function, in part due to the expense and toxicity of the batteries used for storage and wiring complications in old houses.[20] Moreover, Chioffi explained that some of these installations have produced significant problems for the diesel controllers, "talking back" and sometimes shutting down the entire system.

Marine Power

With increasing coverage of marine power in the local news (three ocean energy projects have been proposed for the nearby coastal town of Wiscasset

[20] For those that continue to function, Boegel reports that they "tend to work best in summer when the weather is good and to perform isolated tasks such as heating hot water rather than powering a whole house" (Trotter, 2008).

alone), some Monhegan ratepayers are enthusiastic about using the sea to power the island (Farwell 2009). MPPD has steered away from this option however, believing that the nascent technology of tidal and wave systems would be impractical in a difficult to service location such as Monhegan. As Boegel has stated, "we need to have technology out here that (local) people can service" (Trotter 2008). MPPD also recognizes that these technologies are currently of a scale that is much larger than the island's needs. Micro-scale tidal and wave systems may become feasible in the future, but at the moment Monhegan would likely have to participate in a larger regional initiative for marine power to be practical. Combined with the fact that Monhegan's geography limits the ability to harvest marine power, along with significant permitting and funding obstacles, neither tidal nor wave power provide the more immediate solution for which MPPD is searching.

Wind Power

Consideration of wind power on Monhegan predated the current wave of public interest in renewable energy. Earlier iterations of the technology were adopted for household wind power during the 1970s but according to Boegel they were "noisy and blew over" in the high winds that habitually whip across the exposed island. As a result, none of the installations remain. Over the years a number of private developers have also approached MPPD with proposals for utility-scale wind projects but the District has had a strong aversion to projects that would leave them dependent on outsiders. Nonetheless, MPPD remained committed to their original intention to integrate renewables into the diesel system.

In 2001, just after MPPD's generators had gotten up and running, important research on the island's potential for a wind project commenced. With a grant from the U.S. Department of Energy, a team of researchers from the Renewable Energy Lab (RERL) of the University of Massachusetts at Amherst set out to gather information on the energy supply systems for New England islands and thoroughly assess the feasibility of wind development on a select few. In 2003 a report was finalized, making a strong case for a wind-diesel hybrid system on Monhegan that would make use of the outstanding 8.6 m/s wind resource that the researchers had calculated for the island (Manwell et al. 2003). In the years that followed, particularly in 2007 and 2008 as diesel prices quickly rose and Maine Governor John Baladacci convened his Task Force on Wind Power Development in Maine, the concept of wind power on Maine's islands also began to receive increased attention from the media and policymakers.

On June 20, 2008, MPPD paid $4.34 a gallon for its fuel delivery, a rate nearly five times more than what the original business plan had anticipated. As the MPPD Board prepared to meet to discuss an alternative, they considered the proposed wind project on the nearby Fox Islands and the past studies that had been published. At the same time, a report by four Tufts University graduate students on the feasibility of wind power on Monhegan landed in Trustee inboxes. "We were looking for a solution and it was like all of a sudden a solution was dropped right in front of us," Boegel said. By July 2008, MPPD trustees had voted to officially begin exploring wind power as a homegrown alternative to their costly diesel-dependent system.

V. MPPD's Wind Project

After the positive response to the initial community meeting in September 2008, MPPD spent the rest of the fall and winter taking its first steps to complete the series of feasibility assessments that would need to be performed. In the hopes of setting the project up for a late summer installation in 2010, a thorough avian survey began, as did some work on analyses of the project's logistics, economics and impacts to the environment. MPPD also spent some time considering how to deal with two pressing issues: sharing information with the community and covering the project's upfront costs in spite of a compromised financial state.

Community Wind

From the outset, it was clear to MPPD that a community-focused wind project would be the only way to proceed. The reasons why hint at the underlying concepts of *islandness*: self-sufficiency, common sense, and practicality. Chioffi laid it out plain and simple: "the fact that it is a Monhegan owned project is going to make it go ahead quicker than if it were someone else's project. If it were someone from away coming in to set it up I don't think that it would go forward – not at all." She continued, "Monhegan is not interested in…having to rely on someone else. Some of that comes from the fact that we are so remote that you need to rely on yourself and *you* need to do it because you know your community best." Moreover, intimate knowledge of the community could help to design a more realistic and therefore reliable business plan.

In keeping with the community wind approach, MPPD has committed to make public participation a priority. The September 2008 meeting was seen by the District as a critical opportunity to gauge the community's response to the plan, provide the public an early chance to comment and open the lines of communication for future discussion. MPPD has also worked to develop a community outreach plan and scheduled public meetings for Spring 2009, all with the goal of receiving a minimum of 80% project support at a mid-summer ratepayer vote and commencing project permitting and financing in the early fall. In order to gain that support, Boegel and Chioffi agree that MPPD would need to be open with its plans and responsive to the community's concerns while creating space for others to become involved in order to foster a sense of collective ownership. As such, a town-wide wind committee was formed and residents were invited to participate. Thus far, *NIMBYism* has not been a pressing concern and it is MPPD's hope that the above outlined approach will help to stave off any project-blocking opposition that might emerge from the community.

Logistical & Technological Adaptations

As highlighted in Chapter Two, a wind project on Monhegan will require both logistical creativity and technological innovation. In terms of logistics, an initial site visit with engineers found that a turbine could be delivered to the island

and up the narrow winding dirt path to the Lighthouse Hill site but not without the use of costly equipment and landscape alterations. The classic problem of wind intermittency will be countered by the reserve capacity of the hybrid system's diesel generators. In terms of the storage of excess energy, the use of batteries will be avoided[21] but flywheels may be applicable for short-term lulls in the wind and hydrogen fuel cells or ammonia generation – although extremely costly – may provide longer-term storage.[22] Instead, space heating could drastically increase the economic viability of the project by making use of the total amount of energy generated during the winter and by displacing heating costs on the island. By lowering energy costs, reducing the risk associated with the transport of heating fuels and emphasizing energy resourcefulness, space heating may also help to increase community support for the wind project but again, would come with a considerable cost for additional engineering.

VI. Overcoming Funding Challenges

The fall of 2008 was a sobering period for MPPD. Financially, Chioffi reported that the District had to come to the terms that "not only (were we) in debt for the original $400,000 we had used to start the company and we had already maxed our $40,000 line of credit to pay for two fuel payments, but we (were) $20,000 in debt to the community." If MPPD was truly committed to a community-owned wind (and therefore community-financed) project, Chioffi

[21] This is largely due to cost, toxicity issues, space needs and historical problems that the island has had with battery storage.
[22] This would enable excess energy generated in the winter to be stored until demand increases during the summer months.

recognized that it would require “a huge outlay of money” but that because of its financial history “the reality (was) that MPPD can’t pay for it themselves.” The power company knew that one common source of start up funding, Maine’s public benefits fund, was not available to the off-grid island. It would have to think creatively if it wanted to provide timely ratepayer relief.

MPPD chose to partner with the Rockland, ME-based Island Institute in order to come up with an initial development budget that would provide the foundation for the necessary feasibility work. As suggested in Chapter Five, the organizations worked closely with potential consultants to manage costs but still came up with a price tag of more than $56,000 for the initial feasibility assessments alone. As of May 2009, the organizations were still considering options that would help them to meet their remaining capital needs. What follows is an evaluation that, similar to that performed in Chapter Four, outlines potential options and their applicability to the Monhegan project. Table 6.1 provides a summary of the findings.

Incentive Type	Description	Provide Incentive to Monhegan Wind?	Comments
Renewable Portfolio Standard	Requires utilities to increase renewable supply 10% by 2017	No	Off-grid is not liable
Renewable Energy Certificate	Tradeable certificate representing 1 MWh of wind energy	No	Must feed power to NEPOOL grid
Wind Production Tax Credit	Tax credit of 2.1 cents/kWh produced	Yes, with partner	Requires investors with tax appetite and power must be sold to a separate entity
Investment Tax Credit	Tax credit equal up to 30% of expenditures	Yes, with partner	Same as PTC
U.S. Treasury Cash Grant	Cash equal up to 30% of expenditures	No	Ownership structure cannot include a public entity
Public Benefits Fund	Grant opportunities	No	Must be grid-tied, as funding comes from investor owned utilities and their ratepayers
State Wind Rebate	Up to $4,000 rebate on wind systems.	No	Must be grid-tied
State Sales/Use Tax Rebate	Tax rebate	Likely	Must be certified as community generated wind
Clean Renewable Energy Bonds	Tax credit/interest free bonds	Yes	As long as project owned by non-profit power producer

Table 6.1 - Accessibility of incentives for the proposed Monhegan community wind project

Maine's Renewable Portfolio Standard (RPS) and Renewable Energy Certificates (RECs)

Subsequent to enacting restructuring legislation, the State of Maine established a Renewable Portfolio Standard (RPS) in 1999. Its original goal was 30% of renewable energy generation by 2000 but due to the fact that the target was met upon creation with existing renewable projects (mostly hydropower), it was revised in 2006. Maine's new goal is to increase renewable energy by 10% by 2017. Utilities can use RECs or alternative compliance payments (ACPs) to meet the Standard's requirements if they do not opt to construct new renewable facilities.

As raised in Chapter Four, Maine's RPS does not serve as a mandate to non-IOUs (i.e. cooperatives and quasi-municipal districts) to increase their supply of renewable energy. Nonetheless, grid-tied projects can sell both voluntary and compliance RECs for the "green" attributes of the renewable energy they generate as the power is fed into the NEPOOL transmission system. Due to their isolation and the fact that systems will still partially depend on diesel fuel, off-grid projects like the one proposed on Monhegan Island are unable to profit from either type of REC (L. Smith, personal communication).

Production Tax Credit (PTC), Investment Tax Credit (ITC) and Cash Grant Program

MPPD's non-profit status effectively excludes it from having the tax appetite needed to make use of the federal PTC, the ITC and Cash Grant program. In order to take advantage of the first two incentives, MPPD would need to consider following the Island Flip model described in Chapter Five. This would require establishing a separate LLC comprised of community-focused investors with adequate tax liability to make use of the credits. The LLC would then sell the wind-generated power to MPPD. As an initial study estimated that the Monhegan wind turbine would generate 360,000 kWh per year (Baker 2008), this would create a tax credit of roughly $8,000 based on the current rate of 2.1 cents per kWh. With this level of credit, it may be difficult to attract a large investor but the potential is there for a group of investors with lower tax liabilities to play a role. Lastly, because the Cash Grant program prohibits non-profit entities from owning any percentage of the project, this incentive would not apply on Monhegan.

State Incentives

As part of its 1997 electric utility restructuring legislation, the State of Maine established the Voluntary Renewable Resource Fund (VRRF) to serve as the State's renewable energy public benefits fund. Instead of funding the VRRF by imposing a system benefit charge (SBC), MPUC instead ruled that IOUs offer ratepayers the chance to make voluntary contributions to support renewable energy via their monthly electric bill. Shortly after in 1999, the legislation for Maine's RPS also directed funds to the VRRF via the ACPs required of utilities that failed to meet annual quotas. As stated in Chapter Four, the funds collected by the RRF ($511,000 over a seven year period) have paled in comparison to other states in the region.

Efficiency Maine is the state program that has been directed to administer VRRF funds. Per legislative mandate, 35% of the annual cash balance is allocated for research and development directed by Maine Technology Institute and 65% is distributed to programs through the VRRF grant program. While grants have been awarded annually for the past eight years, the amounts have been relatively low with $100,000 going to three projects in January 2009 (Efficiency Maine 2009). Nonetheless, MPPD is not eligible for any of the VRRF because its ratepayers do not have the ability to participate in the voluntary contribution program (S. Bartlett, personal communication).

Effective January 1, 2009, grid-tied wind projects became eligible to participate in the state rebate program that had been established for PV systems in 2005. These rebates are funded by an SBC that was assessed on utilities when the PV program began. Both residential and non-residential projects may apply; the latter may receive $500 per 500W but only up to 4,000W (4kW). Due to the grid-tie and small project focus, Monhegan would not be able to benefit from this program.

The only state incentive with a specific focus on community wind is the sales and use tax refund for qualified community wind generators that was established in May 2006. The program offers a refund on both sales and use taxes (currently at 5%) to community wind generators that are certified by MPUC. While an initial review of the State of Maine's statutes did not reveal any immediate discrepancies, MPPD's eligibility for this incentive has not been verified.

Clean Renewable Energy Bonds (CREBs)

An initial review of CREB requirements seems to be compatible with MPPD. The Power District meets the tax status condition and because the program is funded by the U.S. Treasury and not from utility obligations, there does not appear to be an issue with off-grid eligibility. With small financial needs compared to most other projects, it would likely get preference under the "smallest-to-largest" approach described in Chapter Four. The August 4, 2009 deadline for the next round of bonding may fit well into MPPD's timeline.

Further Options

As raised in Chapter Five, MPPD should continue to manage costs wisely and use the unique needs of its wind project as leverage for assistance from stakeholders interested in wind innovation. High-cost but effective solutions such as hydrogen storage could be provided through a pilot project on the island. Moreover, while public benefit funds may not be accessible to MPPD, Monhegan's State Representative and Senator could appeal to the Governor and the State Legislature, the administrators of stimulus funds, to allocate a portion of those monies to the project. Alaska projects successfully used a similar approach prior to the establishment of the state's Renewable Energy Grant Fund. With the federal government requiring that funds be expensed within two years of the bill's passage, the timing for the Monhegan project could once again align well.

VII. Case Study Conclusion

As this case study has attempted to emphasize, a compelling case can be made for wind power on Monhegan Island, Maine. Nonetheless, significant obstacles stand between the project's supporters and its realization. Meeting the project's capital needs in an effective, timely manner that reflects the needs and realities of the community will be critical to its overall success. While the evaluation presented here may show limited financing options for MPPD, it also helps to illustrate the work that must be done in order to better support efforts to bring wind power to the unique communities on New England islands. Based on the lessons that have emerged from this chapter as well as the preceding ones, the final chapter will offer a number of suggestions on how to make overcoming funding challenges more feasible.

Chapter Seven:
Recommendations & Conclusions

I. Overview

The previous chapters of this thesis have illustrated the significant obstacles that can emerge when attempting to raise capital for community wind power projects on New England islands. Just as with the design of U.S. energy policy, overcoming these obstacles has required a patchwork of solutions, creatively stitched together in order to meet the needs of projects that break the mold of privately led wind development. However, if renewable energy proponents wish to find greater success in terms of public acceptance and installed capacity of wind power, policies will need to be revised in order to better facilitate the development of community wind projects, particularly those that stand to have a significant effect on livelihoods.

II. Recommendations

What follows are five key recommendations that have emerged this study. They seek to address the final research question of the thesis: *What types of policy prescriptions, financial incentives or technical assistance can be developed to better benefit island wind projects in New England?* After the recommendations, a review of further research and final thoughts will be offered.

1. **Increase access to information on community-specific incentives:** It became clear during the research process for this paper that it can be challenging to find information on incentives and understand how they apply

to community wind. This would likely create an obstacle for community stakeholders that have limited expertise and available resources to devote to understanding the intricacies of the current wind incentive regime. As such, this lack of clarity challenges the development of community wind on both New England islands and nationally.

It is possible that in some cases, the exclusion of specific language on community wind was an outcome of policy that was either poorly written or that lacked the foresight to incorporate local approaches as a way to increase the installed capacity of wind. One step in overcoming this would be to develop more clearly stated policy objectives and requirements that help to make incentives more understandable and accessible. Additionally, government agencies and other resources such as the Database of State Incentives for Renewables and Efficiency could more explicitly state how existing policies relate to community wind projects. Educating policymakers on the barriers facing community wind may compel them to be more responsive to the challenges that their constituents face when trying to develop a renewable resource. If so, existing incentive policies could eventually be made more inclusive and more community-specific incentives could be developed.

2. **Continue to restructure incentive policy so that it is not entirely dependent on passive investment and federal tax code:** While community-oriented projects have struggled for years to make use of the traditional incentives, the recent financial crisis has made clear the limitations of using

passive investment and tax policy to stimulate wind development. Lower profits for potential wind investors have translated into reduced tax burdens and diminished need for tax credits. The recent development of the ITC and cash grant programs have helped to broaden the types of incentives available to wind projects but in order to promote stable, long-term growth in both community and privately owned projects, the changes must go further.
A number of alternative approaches are currently being discussed throughout the renewable energy sector. For instance, Bolinger and Wiser (2009) have suggested the use of multiple types of investors as one way to move the focus from large financial institutions. Proposals have also been delivered to Congress that would enable investors to make use of credits on more than just passive income. Renewable energy experts have suggested the establishment of a two-tiered credit system through which a larger tax benefit is afforded to community wind projects (Mazza 2008). Moving beyond issues of tax liability, European-like feed-in tariff policies may promote locally owned projects through guaranteed energy payments and access to the grid.

3. **Address gaps in development phase support:** As highlighted throughout this study, non-profit power utilities on New England islands are in need of support at an early stage. When possible, capital should be allocated and the process of applying for funds should be made accessible. In addition to providing financial support, states can support community wind through assistance programs such as the Massachusetts Technology Collaborative's Community Wind Collaborative. Such an approach would help small

independent island projects to benefit from a sort of economies of scale by partnering with a program that can provide guidance on project management, technical expertise, wind monitoring equipment and economic analysis.

In the case of Maine, where the probability of island wind project development is high, the need for development stage support is critical. If Governor Baldacci, who established the Governor's Task Force on Wind Power Development in 2007, is serious about citizens across the state benefiting from wind power, incentives for community projects will be key. Despite the small size of the islands, they are worth investing in, particularly because of the benefits they provide to residents and because of the potential to educate the thousands of people who visit the islands each summer.

4. **Address gaps in off-grid support:** Wind projects, no matter where they are located in the United States, create benefits for all Americans by reducing CO_2 and other greenhouse gas emissions. Moreover, taxpayers in remote communities warrant the support of the state when confronting challenges such as energy prices. By rethinking the revenue sources of wind power incentives or enabling off-grid ratepayers to pay into a public benefits fund, the opportunities to support these communities are significantly broadened.

5. **Identify reliable revenue sources to support community and off-grid wind:** Funding sources must be identified in order to ensure that support can be provided to locally owned and remote projects. It is important to consider the fact that new funding does not necessarily need to be identified if the

allocation of current funds are diversified to better fit the needs of community and off-grid projects. However, in order to reach the lofty goals set by RPS and other emission reduction plans, a much larger amount of capital will eventually need to be made available for all types of wind projects. One such source of funds could come from the proposed national carbon cap and trade program. Herzog (2001) has also suggested the creation of a national public benefits fund that is funded by a system benefits charge levied on ratepayers nationwide. Lastly, as reliability is another critical piece in the wind development puzzle, it is crucial that any funding stream or incentive opportunity be guaranteed for a substantial period of time. Understanding the broad benefits of community wind development may lawmakers to make these decisions.

III. Areas for Further Research

In addition to meeting capital needs, community wind projects face a number of additional complex challenges. The permitting process – for both large and small projects – currently ranks as one of the most difficult. Donnelly (2009) describes permitting as "a particularly perplexing web of regulatory requirements that even confuses the agencies charged with granting the permits." When examining the ways to advance community wind, areas of potential improvement to the permitting process should be thoroughly researched.

Research should also be conducted on how carbon markets will influence renewable energy incentives. This issue is particularly pertinent in New England as the region's states are founding members of the Regional Greenhouse Gas Initiative (RGGI), an initiative that is already changing the way that RECs are traded (Green-e Energy 2009). Moreover, the Spring 2009 introduction of the American Clean Energy and Security Act or "cap and trade" bill to Congress increases the importance of carbon emissions and demand for renewable energy.

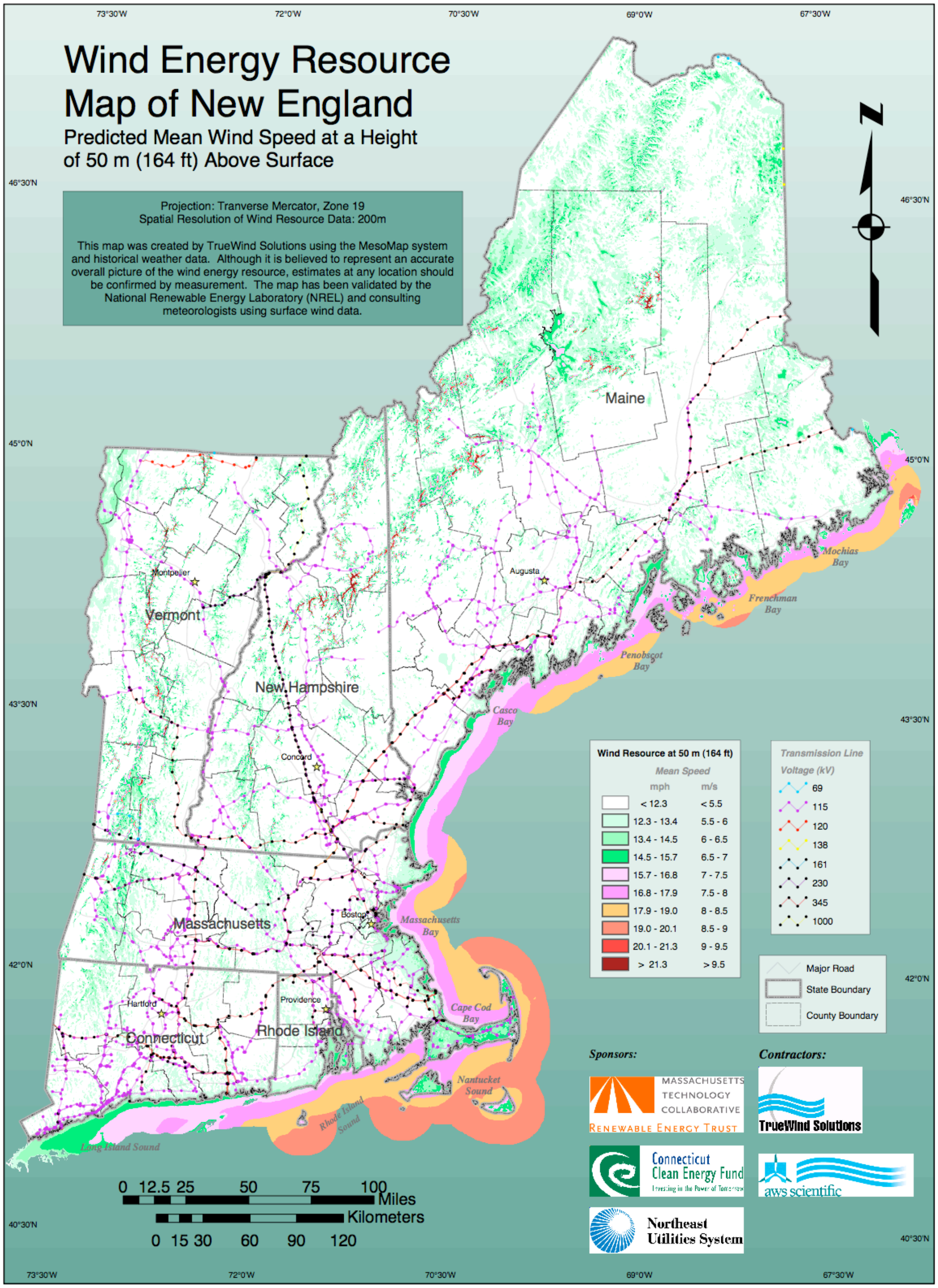
Appealing to island practicality and as suggested in Chapter Five, in-depth consideration should be given to the potential partnerships and synergies that could support New England island projects. For instance, current research being conducted for the Maine Governor's Ocean Energy Task Force could also gather data for future island projects. Moreover, any development of hydrogen or ammonia storage applications on islands could also consider the opportunity to use it as a fuel for fishing boats, as it is occurring in Iceland (Krajacic 2008).

IV. Final Thoughts

In many respects, the manner in which wind power receives support in the United States is an outcome of political will, or the desire of political actors to enact change. Often times, political will is influenced heavily by the market that, in this case, dictates that large, privately developed projects are the most efficient in reaching installation targets and should therefore be given preference when incentives are designed. However, the consideration of projects on New England islands forces a new perspective on the benefits of wind power; one that highlights community sustainability, energy justice, technology innovation and rural development. In order to make progress on community wind, political will must be swayed by this alternate perspective and the understanding that local projects can generate important support for wind power nationwide. As when trying to solve any complex policy problem, the first step in doing so is to make policymakers keenly aware of the challenges at hand and the opportunities through which they might be overcome.

Appendix A:
An Overview of New England Island Electricity Access
A sampling of 14 islands

Appendix B:
New England Wind Resource Map



Source: MTC 2003

Appendix C:
List of Cited Interviews

Shirley Bartlett, Program Manager, Efficiency Maine

Katy Boegel, Chair, Board of Trustees, Monhegan Plantation Power District

Heidi Cadavieco, Senior Project Administrator, Massachusetts Renewable Energy Trust

Marian Chioffi. Monhegan Plantation Power District

Lucretia Smith, Utility Analyst, Maine Public Utilities Commission

Butch White, Grants Administrator, Alaska Energy Authority

DISCLAIMER: The views expressed by the interviewees in this thesis do not necessarily reflect the positions or views of their respective organizations.

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