

**Does It Have to be So Complicated?  
Municipal Renewable Energy Projects in Massachusetts**

By

Lori A. Ribeiro

AB, Anthropology  
Harvard College, 1985  
Cambridge, Massachusetts

Submitted to the Department of Urban Studies and Planning  
in partial fulfillment of the requirements for the degree of

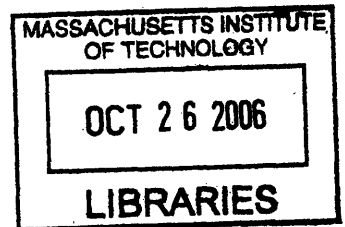
Master of Science

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

September 2006

© 2006 Lori A. Ribeiro. All Rights Reserved



The author hereby grants to MIT the permission to  
reproduce and to distribute publicly paper and electronic  
copies of the thesis document in whole or in part.

Author \_\_\_\_\_  
Department of Urban Studies and Planning  
August 9, 2006

Certified by \_\_\_\_\_  
Professor Lawrence Susskind  
Ford Professor of Urban and Environmental Planning  
Department of Urban Studies and Planning  
Thesis Supervisor

Accepted by \_\_\_\_\_  
Professor Langley Keyes  
Committee Chair  
Department of Urban Studies and Planning

This page intentionally left blank.

**Does It Have to be So Complicated?  
Municipal Renewable Energy Projects in Massachusetts**

by

Lori A. Ribeiro

Submitted to the Department of Urban Studies and Planning  
On August 9, 2006 in partial fulfillment of the requirements for the degree of  
Master of Science

**ABSTRACT**

This thesis examines municipal implementation of renewable energy projects in Massachusetts. It explores projects that have been planned and completed, drivers for municipal adoption of renewable energy, the implementation experience, barriers, and key success factors. The data presented include a survey of Massachusetts municipalities, stakeholder interviews, and an in-depth case study of a solar Brightfield project implemented in Brockton, Massachusetts. The case study describes in detail the city's experience implementing a "Brownfields to Brightfields" solar project initiated through the US Department of Energy's Brightfields program. The Brockton Brightfield is a 425 kW utility scale solar array on a former brownfield site.

The case study of Brockton's Brightfields experience reveals a series of obstacles and success factors that ought to be considered in future efforts to implement municipal renewable energy projects. The barriers include inadequate government resources and capacity building dedicated to program implementation; institutional policy barriers (requiring legislative fixes), and the complexity surrounding the joint action required to navigate the administrative processes involved.

The thesis concludes with a series of policy recommendations. Recommended state legislative changes include 1) providing municipalities explicit legal authority to finance, develop, operate and maintain alternative energy projects; 2) increasing the allowable length of time for municipal borrowing for alternative energy from ten to twenty years; 3) clarifying procurement regulations; 4) increasing the net metering limit; 5) modifying interconnection standards to allow electricity generated at one municipal site to be used at another; and, 6) allowing third party behind the meter power sales. The thesis further recommends both federal and state adoption of sufficient and consistent grant and financing programs required to assist local governments. Finally, the thesis identifies a provision in the Massachusetts constitution regarding protection of open space and conservation land that municipalities must be aware of in identifying municipal land available for renewable energy projects. Special legislation may be required for individual projects.

Thesis Supervisor: Lawrence Susskind  
Title: Professor of Urban and Environmental Planning

This page intentionally left blank

## Acknowledgements

Juggling graduate school, my consulting work, and life as a single parent has been an incredibly challenging endeavor. I am extremely grateful to the many people who helped me to do it all. First and foremost, I extend my appreciation to my children, Alicia and Daniel, who provided me with love, support and understanding. (Okay, lets be honest. I really appreciated it when they didn't complain *too* much). Alicia and Daniel tolerated my busy schedule, decreased availability, exhaustion-induced grouchiness, and a shortage of vacation time. They endured Sustainable Energy lectures and study sessions, and sitting in the Kennedy School Forum for hours at a time while I worked on team assignments. Thankfully, they forced me away from my desk with soccer, baseball, football, music lessons, trips to the park, movies, etc. I also thank my parents and siblings for their understanding, as I was a neglectful daughter and sister for the past year.

I am extremely grateful to Larry Susskind who served as both my academic advisor and thesis advisor. Larry made the extra effort to supervise my thesis this summer, even after suffering a heart attack in May. That speaks volumes about Larry's extraordinary dedication to his students. Larry is an inspiration, as well as a tremendous source of guidance and growth. I also thank my thesis reader, Jim Hamilton, who offered helpful feedback, moral support and much-needed sustenance! Professor Anne Spirn provided support and guidance for a term project that helped me to develop my case study. My partners at ICLEI-Local Governments for Sustainability, Kim Lundgren and Garrett Fitzgerald, were a complementary team sharing my research interests, and working jointly to implement the survey. Finally, Stan Corcoran at the Massachusetts Municipal Association helped by providing contact information and advice.

This graduate school adventure was inspired by my experience developing the City of Brockton's Brightfield project. I will forever be grateful to Jack Yunits and Rob Pratt for their leadership. Without them, the Brightfield would have joined an infinite list of interesting plans that were shelved. Nancy Stack Savoie, my friend and Brockton City Planner, has been consistently supportive, personally and professionally. I've already thanked most of the project participants numerous times, and can't name everybody who helped, so focus here on those I worked with most directly. I am compelled to single out Jon Abe, Ryan Chaytors, Sam Nutter, Paul Exner, and Bob Cleary. The martini nights at Pasta Bene are, of course, the project highlights! More importantly, you all provided a lot of the horsepower that brought the Brightfield to fruition – thank you! Dick Michaud was there from day one, and is missed in the new world order at DOE. I also acknowledge Linda Balzotti, Tom Brophy, Gregg Miller, Conor Yunits, Jay Condon, Jack Creedon, Nils Bolgen, John Moskal, Jan Gudell, Bruce McLeish and the Global Solar Team for their important contributions. Mary Waldron bridges from this group to the next.

Finally, I am always extremely grateful to my friends who have been there to help me through this challenging time. You reassured me I could do this, helped with the kids, sometimes made me go out to play when I needed it, reminded me of what is really important, and kept my spirits strong. You know who you are.

This page intentionally left blank

## Table of Contents

<b>Chapter One: Introduction: Municipal Renewable Energy Initiatives and Implementation Challenges</b>	11
<i>Context and Drivers</i>	11
<i>Significance of Municipal Renewable Energy Initiatives</i>	13
<i>Challenge for Municipalities: Implementation</i>	15
<b>Chapter Two: Municipal Renewable Energy Projects in Massachusetts</b>	18
<i>State Policies Fostering Development of Renewable Energy</i>	19
<i>Municipal Projects Funded by the Massachusetts Renewable Energy Trust</i>	20
<i>Survey of Massachusetts Municipalities</i>	22
<b>Chapter Three: Case Study: City of Brockton “Brownfields to Brightfields” Initiative</b>	31
<i>The U.S. Department of Energy’s “Brightfields” Program</i>	31
<i>Brockton, Brownfields, and Brightfield Goals and Objectives</i>	34
<i>Getting Started: from Project Concept through Feasibility Study</i>	36
<i>Implementation Experience</i>	46
<i>Conclusions</i>	64
<b>Chapter Four: Does It Have to be So Complicated? Analysis of Process, Key Decision Points and Regulatory/Policy Barriers</b>	66
<i>Brightfield Project Implementation Issues</i>	66
<i>Key Success Factors for Overcoming Obstacles</i>	68
<i>Implementation Pitfalls: Four Barriers and How they were Overcome</i>	70
<i>Regulatory and Policy Barriers</i>	81
<i>Conclusions</i>	83

<b>Chapter Five: Policy Implications and Recommendations</b>	84
<i>State Policies Hindering Municipal Development of Renewable Energy</i>	84
<i>Federale Policy Barriers for Municipalities and Recommended Changes</i>	92
<i>Conclusions</i>	93
<b>References</b>	95
<b>Appendices</b>	
Appendix 1: Brockton Brightfield Project Chronology	98
Appendix 2: Survey Instrument and Cover Letter	104
Appendix 3: Survey Contact List	108
Appendix 4: Chapter 5 of the Acts of 2005	110
Appendix 5: Chapter 151 of the Acts of 2005: An Act	112
Appendix 6: Responses to Open Ended Questions	113



## List of Tables

<b>Table 1 – Municipal Projects Funded by Massachusetts Renewable Energy Trust</b>	21
<b>Table 1 – Survey Respondents</b>	23
<b>Table 3 - DOE-funded Brightfield Projects and their Results</b>	33
<b>Table 4 – Actors Involved and Roles in Project Concept and Feasibility Study</b>	45
<b>Table 5 – Brightfield Development Budget</b>	46
<b>Table 2 – Grants Brockton Applied for in 2003-2004</b>	49
<b>Table 8 – Capacity Expansion Stopping at 1000 kW</b>	59
<b>Table 9– Cost and RECs to Customers: Capacity Expansion Stopping at 1000 kW</b>	60
<b>Table 10 -- Policy Barriers, their Sources, and Proposed Solutions</b>	84

## List of Figures

Figure 1 – Renewable Energy Installations in Massachusetts	18
Figure 2 – Which Clean Energy Technologies is Your Municipality Most Interested in Installing?	24
Figure 3 – Municipal Clean Energy Projects Planned and Installed	24
Figure 4 – Location of Clean Energy Projects	25
Figure 5 – Important Factors in Deciding to Install Clean Energy Technologies	25
Figure 6 – Clean Energy-Related Ordinances Adopted	26
Figure 7 – Barriers to Installing Clean Energy Technologies	27
Figure 8 – Participation in Clean Energy Choice Program	29
Figure 9 – Former Brockton Gas Works Site	38
Figure 10 – Site Location Map on Grove Street	39
Figure 11 – Site Plan for Former Brockton Gas Works Site	40
Figure 12 – Illustrative Site Plan, November 2001	42
Figure 13 – Rendering of Proposed Brightfield Site as “Solar Energy Park”	43
Figure 14 – Brightfield Development Process	46
Figure 15 – Capacity Expansion Stopping at 1000 kW	60
Figure 16 - Brockton Solar Brightfield	64
Figure 17 - Brockton Brightfield with City Hall in Background	65
Figure 18 – Planned Steps in Brightfield Project Development	67
Figure 19 – Operating State of Brockton Brightfield Project	68
Figure 20 – Process for Obtaining MRET Capital Grant	71
Figure 21 – Process for Completing Land Transaction with Bay State Gas Company	72
Figure 22 – Process for Securing Bond Financing	73
Figure 23 – Process for Marketing the Electricity and RECs	74
Figure 24 – Participants and Perspectives in the Brockton Brightfield Project	75
Figure 25 – Decision Points and Clearances Necessary to Complete Project	77

# Chapter One

## **Introduction: Municipal Renewable Energy Initiatives and Implementation Challenges**

Energy plays a critical role in the sustainable development of communities because it impacts economic development, the environment, and social conditions. Each of these three pillars of sustainability could individually serve as a driver for local development of renewable energy resources. However, the combination of all three provides even more significant rationale for communities to develop renewable energy projects.

Despite the compelling logic for local governments in the United States to deploy renewable energy, few have actually implemented large-scale projects. Utility-scale projects provide economies of scale; municipalities are missing opportunities to realize these savings. Further, there are economic development opportunities from the manufacture, installation, operations and maintenance of renewable energy technologies. Large cities like San Francisco, Chicago, Austin, and San Diego have sought to attract renewable energy technology companies, in part through creating a high volume of local demand.

This thesis examines municipal renewable energy projects, their characteristics, project drivers, and barriers to implementation. It focuses on projects in Massachusetts. My hypothesis is that few local governments have embraced renewable energy because of significant regulatory and policy barriers, but more would do so if state and federal policy changes facilitated these initiatives. The research questions I address in this thesis are:

1. What renewable energy projects have municipalities in Massachusetts implemented and why? What barriers did they face?
2. What is the implementation experience for a municipality developing a utility scale renewable energy project?

My methodology includes literature review, survey research, stakeholder interviews and a case study. The case study describes in detail the City of Brockton's experience implementing a "Brownfields to Brightfields" solar project inspired by the US Department of Energy's Brightfields program. The Brockton Brightfield is a 425 kW utility scale solar array being installed on a brownfield site. The case study will illustrate the types of barriers that exist, how challenging they are to overcome, and factors leading to project success. The thesis concludes by recommending specific policy changes that can foster greater adoption of new renewable energy resources by local governments.

### ***Context and Drivers***

Municipalities initiate renewable energy projects for a variety of reasons. The U.S. Conference of Mayors hosted a "National Summit on Energy and the Environment" in Chicago on May 10-11, 2006. "Mayors are very concerned about the recent spike in fuel and energy costs and the financial burden it places on American citizens and their families. We know that aggressive action is necessary to turn this tide, and we are taking the lead in addressing the nation's energy challenges to reduce our dependency on foreign oil. We cannot wait on the federal government; we must do what mayors do best and act now," said Conference President Beverly O'Neill.<sup>1</sup> Thirty-five mayors from across the country convened in this emergency summit to "sound an alarm" and to discuss solutions that can be implemented at the local level.

---

<sup>1</sup> "US Mayors Sound Alarm on Rising Fuel Costs and Energy Crisis", (May 10, 2006). US Conference of Mayors Home Page. Retrieved July 6, 2006 from <http://usmayors.org/uscm/home.asp>.

Prior to energy issues making daily headlines, many municipalities had already begun to implement renewable energy initiatives. The primary drivers for renewable energy projects include rising energy costs, concern over dependence on foreign sources of fossil fuels, environmental concerns, economic development, education, and a desire for a “green” image.

Today, local governments face unprecedented concerns about rising energy costs spiraling out of control. Investing in renewable energy resources diversifies the fuel mix and provides a hedge against volatility in fossil fuel prices. The money municipalities spend on energy is usually exported out of the community rather than re-invested in the community. In contrast, investing in generation assets in the community can lead to greater savings through avoided costs during periods of price volatility. Further, if the municipality owns the asset, the public benefit is clearer to affected residents. In cases where a project is perceived to have community impacts (e.g., noise, aesthetics), public acceptance is greater when community benefits are direct. Finally, after the capital costs are paid, the project may continue to generate electricity without fuel costs and minimal operations and maintenance costs.

Developing an industry cluster in renewable energy can spur local economic development. The design, manufacture, installation, operations and maintenance of renewable energy technologies create jobs. Local governments seek to capture these jobs to expand their employment and tax base. A recent report by the Renewable Energy Policy Project shows that increased investment in wind power could result in 120,017 new jobs. “The 20 states that... would receive the most investment and most new manufacturing jobs from investment in wind account for 75% of the total U.S. population, and 76% of the manufacturing jobs lost in the last 3 1/2 years.”<sup>2</sup> In a companion report on the solar photovoltaic (PV) industry, the Renewable Energy Policy Project predicts an increase of up to 42,000 jobs, similarly distributed in states that had lost the most manufacturing jobs.<sup>3</sup>

Many political leaders point to the war in Iraq and cite dependence on foreign sources of fossil fuels as a rationale for increasing the use of renewable energy. Both oil and natural gas are imported from politically unstable countries. Sunshine and the wind, in contrast, are locally available and non-polluting.

Municipal environmental concerns extend from local/regional environmental quality to a broader concern over global climate change. Fossil fuel fired power plants are the leading emitter of industrial air pollution, and many communities feel the direct impact of these emissions. Communities concerned about pollution and related public health and quality of life issues embrace renewable energy as a way to protect the local and regional environment. Although climate change is a global issue, some local political leaders feel that absent federal and state policies, municipalities can take local action to reduce greenhouse gas emissions. Some municipal leaders do this out of a moral imperative, while others believe climate change impacts can be felt at the local level through changes such as rising sea levels, depletion of natural resources, severe storm events, changes in water supply, health threats, etc. These municipalities believe that the decline of environmental support systems will have severe impact on human health, economic conditions, and quality of life. As a result, they are initiating their own CO<sub>2</sub> emission reductions programs including energy efficiency and renewable energy resources.

---

<sup>2</sup> Renewable Energy Policy Project, “Wind Turbine Development: Location of Manufacturing Activity.” Technical Report, September 2004. p. 4.

<sup>3</sup> Renewable Energy Policy Project, “Solar PV Development: Location of Manufacturing Activity.” Technical Report, January 2005. p. 6.

Many local political leaders believe that even small renewable energy projects have tremendous value beyond the energy they generate. Renewable energy installations such as “solar schools” are a popular way to educate children and the general public about energy choices. Finally, installing renewable energy technologies can help to create a clean, progressive municipal image.

### ***Significance of Municipal Renewable Energy Initiatives***

Research on municipal renewable energy initiatives is important because 1) government consumes more electricity than any other consumer; 2) electricity generation is the primary industrial contributor to air pollution in the United States, as well as a significant contributor to other forms of pollution; 3) local communities are affected by pollution from electric generating plants; 4) local governments control many resources that could be used to generate electricity from renewable resources; and, 5) local governments face numerous challenges in adopting renewable energy, many of which could be eliminated through changes in state and federal policies.

There are no comprehensive electricity consumption data available for local governments. However, a study by the Renewable Energy Policy Project concludes that state and local governments consume more electricity than the Federal government.<sup>4</sup> Governments at all levels are the largest consumer of electricity in the United States. According to the Consortium for Energy Efficiency, “In the United States, there are 50 state governments and approximately 3,043 county, 19,279 city and 16,656 town governments. Together, they spend an estimated \$12 billion per year on energy bills and another \$50-70 billion a year on energy-related products.”<sup>5</sup> This data precedes the recent spike in energy prices.

According to the US Department of Energy, “State and local governments are responsible for more than 16 billion square feet of building space and spend more than \$11 billion annually on fixed-site energy costs. Energy costs can account for up to 10 percent of a government's annual operating budget, with electricity accounting for nearly 75% of that cost.”<sup>6</sup> Municipal electricity supply price increases threaten their capacity to provide local services such as public safety, education, sanitation, and other basic services.

Pollution created by electricity generation is also a concern. About 85% of America’s electricity is generated through the combustion of fossil fuels. These power plants emit carbon dioxide, sulfur dioxide, nitrogen oxides, hydrocarbons, mercury, soot and other suspended matter. The extractive industries that provide fuel to utilities also pollute heavily. “According to 2000 figures, the U.S. electricity production industry is responsible for: 62.6% of U.S. sulfur dioxide emissions that contribute to acid rain; 21.1% of U.S. nitrous oxides emissions that contribute to urban smog; and 40% of U.S. carbon emissions that contribute to global climate change.”<sup>7</sup> Renewable energy presents an alternative way to produce electricity without generating these harmful emissions. Given the large electricity usage by municipalities, aiding them in installing renewables can have significant environmental impact.

---

<sup>4</sup> Virinder Singh, Renewable Energy Policy Project. “Clean Government: Options for Government to Buy Renewable Energy”. April 1999, p. 4.

<sup>5</sup> “Fact Sheet: State and Local Purchasing Initiative”. Consortium for Energy Efficiency. Obtained from web page on November 14, 2004 at <http://www.cee1.org/resrc/facts/purch-fx.php3>.

<sup>6</sup> US Department of Energy, [http://www.rebuild.gov/sectors/SectorPages/OverView\\_govt.asp?MktID=4](http://www.rebuild.gov/sectors/SectorPages/OverView_govt.asp?MktID=4)

<sup>7</sup> Environmental Defense, Fact Sheet: Air Quality. November 2002.

[http://www.environmentaldefense.org/documents/1041\\_FactSheet\\_Electricity.pdf](http://www.environmentaldefense.org/documents/1041_FactSheet_Electricity.pdf)

There are an array of studies linking pollutants from power plants to cancer, asthma, bronchitis, other respiratory ailments, and even premature death. EPA has estimated that there are 15,000 premature deaths per year due to air pollution. Further, emissions from fossil fuel fired power plants contribute to global warming, acid rain, and mercury pollution in water bodies. The impacts of pollution caused by electricity production are also felt at the local level. Some of these impacts are felt when cities become regulated as air quality non-attainment areas; citizens succumb to respiratory ailments; lakes and rivers are closed to fishing; and quality of life declines. Power plants can have negative land use impacts and require significant water resources for operations. Renewable energy resources can diminish these local impacts.

Local governments control many decisions that could be used to foster generation of electricity from renewable resources. First, they collectively make numerous decisions that affect our energy usage. Local governments are significant users of electricity for municipal facilities including water/wastewater treatment plants, schools, street lighting, public buildings, etc. Some local governments own and/or operate power plants. Many control resources that could be used for renewable energy generation (e.g., landfills, wastewater treatment plants, wind or solar resource areas). Encouraging the use of renewable energy resources can have significant impact, directly and indirectly. The most obvious direct impact of local governments' using renewable energy resources is the environmental benefit: avoided air pollution and greenhouse gas emissions. A potential indirect benefit can be realized when government agencies educate the general public, thus encouraging individual consumers to choose renewable energy.

Local governments face numerous challenges in adopting renewable energy, many of which could be eliminated through changes in state and federal policies. These barriers can add significant cost and complexity, or even completely hinder the projects. The barriers include awareness, cost, financing, regulatory and political barriers.

Local officials, and the general public they serve, frequently lack awareness regarding renewable energy technologies and their benefits. As a result, local governments tend to continue procuring electricity supply contracts rather than installing renewable energy technologies.

Further, most renewable energy technologies carry higher initial capital costs compared to traditional energy sources. Municipalities are accustomed to paying for usage rather than incurring capital costs for electricity. There is an unmet need for financing instruments such as grants, revenue guarantee programs, and low interest loans and bonds. Long-term revenue streams may be required to secure financing. Power purchase agreements are beginning to meet the challenge. Another revenue source for renewable energy is provided through sale of "Renewable Energy Certificates" (RECs), which represent the environmental attributes of renewable energy projects. Marketing RECs is challenging even for sophisticated energy companies. It is even more challenging for municipalities. The market for RECs is nascent, poorly understood, and typically results in short-term contracts unsatisfactory for meeting financing agencies' revenue terms.

Municipalities are constrained by a variety of regulations that do not affect the private sector. Some of these barriers include procurement laws and practices; onerous transactional costs and/or ambiguity in state laws regarding municipalities' legal authority. Further, deregulated markets are inconsistent state-to-state. In New England's case, the power grid is regional, but sale of electricity and RECs across state borders is complicated by different state regulations. Finally, the lack of a national renewable portfolio standard means the markets, which vary state to state, may be short term in nature.

Perception of risk from “innovation” may discourage support from political leaders. Numerous challenges stated above require elected officials to expend political capital to overcome the barriers. Political leaders need to balance energy issues against other pressing priorities.

State and federal policy changes are needed to overcome these barriers to accelerate local government adoption of renewable energy for sustainable development. Otherwise, the challenge of implementation proves too onerous. These policy changes are necessary and also appropriate – the environmental and social benefits will accrue beyond local borders.

### ***Challenges for Municipalities: Implementation***

As described above, renewable energy provides significant environmental, community, and economic benefits and helps municipalities to achieve important goals. A number of state and federal programs have been developed to encourage municipal adoption of renewable energy technologies. As a result, many municipalities have announced ambitious policies and projects. However, far fewer have actually implemented significant renewable energy projects. This thesis explores the gaps between intentions and achievements.

*In Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, this Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes*, Pressman and Wildavsky state, “Implementation may be viewed as a process of interaction between the setting of goals and actions geared to achieve them.”<sup>8</sup> Pressman and Wildavsky present a detailed case study of the attempts by the Economic Development Administration (EDA) to implement a program to employ the “hard core unemployed” in Oakland, CA through investment in public works programs.

The EDA case study details the numerous challenges program proponents confront, the outcomes, and an analysis of the pitfalls faced. The authors chose this program to profile not because the program faced opposition, which made it difficult to implement. Rather, they chose it precisely because it did not face opposition. It languished and fell short of ambitious goals because the “technical details” of implementing the ambitious policy were more challenging than anticipated and because the means the program administrators chose to achieve the goal of employing the hard core unemployed were inappropriate from an economic policy point of view (investing in capital rather than labor). The authors explore the “technical details” that can derail, delay or change a program even if it enjoys general support.

Similarly, installing renewable energy on municipal facilities enjoys broad conceptual support. Federal, state and nonprofit group programs encouraging municipal renewable energy projects have multiplied over the past few years. However, the challenges presented by these regulatory, cost, financing, and political barriers create an implementation nightmare for local governments.

The Brockton case study describes a process that begins in 2000 and ends in 2006, analyzed using the theoretical framework developed by Pressman and Wildavsky for examining implementation of Federal programs at the local level. By using this framework, policy implications specific to renewable energy policy and their effectiveness vis-à-vis implementation can be analyzed.

---

<sup>8</sup> Jeffrey Pressman and Aaron Wildavsky. *Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, this Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes*. University of California Press: Los Angeles and Berkeley, California. 1984. p. xxiii.

Pressman and Wildavsky describe policy as “a hypothesis containing initial conditions and predicted consequences... Implementation does not refer to creating the initial conditions. Legislation has to be passed and funds committed before implementation takes place to secure the predicted outcome.”<sup>9</sup> They later say, “Policies become programs when, by authoritative action, the initial conditions are created... Programs make the theories operational by forging the first link in the causal chain connecting actions to objectives.... Implementation, then is the ability to forge subsequent links in the causal chain so as to obtain the desired results”<sup>10</sup>. They continue by pointing out that their distinctions between policy and implementation are oversimplified because the implementation experience sometimes requires revisiting and altering policy.

“The passage of time wreaks havoc with efforts to maintain tidy distinctions. As circumstances change, goals alter and initial conditions are subject to slippage. In the midst of action the distinction between the initial conditions and the subsequent chain of causality begin to erode... The longer the chain of causality, the more numerous the reciprocal relationships among the links and the more complex implementation becomes... The reader interested in implementation should, therefore, be conscious of the steps required to accomplish each link in the chain. Who had to act to begin implementation? Whose consent was required to continue it? How many participants were involved? How long did they take to act?”<sup>11</sup>

Those issues raised by Pressman and Wildavsky are germane to the Brockton Brightfield experience. As they point out, “The study of implementation requires understanding that apparently simple sequences of events depend on complex chains of reciprocal interaction. Hence, each part of the chain must be built with the others in view. The separation of policy design from implementation is fatal.”<sup>12</sup> Because Brockton’s experience included many near fatal misses, this case study will demonstrate ways that policy design, which was separated from implementation, could be improved to facilitate more wide scale implementation of renewable energy projects.

The case study will highlight critical factors as suggested by Pressman and Wildavsky, including:

- **Policy: Creating the Initial Conditions.** An overview of the Federal policy that created the Brightfields program. Implementation will be considered to begin after the innovative policy was designed, the Brightfield program was initiated, funds were committed and local agreements were reached.
- **Implementation: the Causal Chain of Events.** First, I show the project chronology. Then, I will examine it in light of the series of questions above, “Who had to act to begin implementation? Whose consent was required to continue it? How many participants were involved? How long did they take to act?”
- **Evaluation: Implementation as Mutual Adaptation or Exploration?** Using the Pressman and Wildavsky approach, I will examine some of the key facets of project implementation that posed challenges including the number of decision points requiring clearances; the appropriateness of the policy theory for implementation of the Brightfield program; and causal chain of events including unexpected developments that caused divergences in the project plan. This analysis along with anecdotal information about the clearance points are used to recommend policy changes that would increase the likelihood of project success.

---

<sup>9</sup> Ibid, p. xxii.

<sup>10</sup> Ibid, p. xxiii

<sup>11</sup> Ibid, pp xxiii-xxiv

<sup>12</sup> Ibid, p. xxv



I write this thesis as a participant observer. For the past six years, I have worked to develop the Brightfield project in Brockton, working as a consultant to the Mayor and City Planner, and serving as the primary “project champion”. Roughly two of the six years were spent performing unanticipated tasks addressing challenges that threatened to eradicate the project. Writing this thesis serves to analyze the Brightfield process in a structured way, considering particular implementation challenges and identifying specific policy changes that would facilitate municipal adoption of renewable energy technologies.

While some may wonder whether my level of involvement leads to bias in the case study and its analysis, it is important to note that, like the EDA program in Oakland, the Brockton Brightfield did not face significant opposition. The usage of *Implementation* as the theoretical framework for my analysis was selected because Brockton’s Brightfields story is generally not one of overcoming opposition. It is an analogous case of the attempt to implement an ambitious Federal program at the local level through a series of more arcane challenges similar to the policy-generic implementation issues raised by Pressman and Wildavsky. “Failure to recognize that these perfectly ordinary circumstances present serious obstacles to implementation inhibits learning. If one is always looking for unusual circumstances and dramatic events, he cannot appreciate how difficult it is to make the ordinary happen.”<sup>13</sup>

There were three primary types of implementation challenges faced in Brockton’s Brightfields experience:

1. **Inadequate government resources and capacity building dedicated to program implementation.** The US Department of Energy conceived the Brightfield program, which requires significant technological innovation and sophistication at the local level, without providing sufficient resources. Funding, technical assistance and capacity building resources provided were not commensurate with the program goals. DOE announced a program at the outset of its initial experiment without designing the experiment for learning. By establishing its program role as a facilitator, DOE did not design the program with due consideration to the implementation difficulties that would follow. Further, one of DOE’s core concepts for local job creation was based on a flawed understanding of the solar photovoltaics industry it was trying to support.
2. **Institutional policy barriers (requiring legislative fixes).** There were numerous policy barriers to implementing the project. Several required legislative fixes at the state level, which was achieved by passage of two pieces of special legislation by the state legislature.
3. **Complexity of joint action.** The implementation of the Brightfield project involved numerous institutional stakeholders at the local, state and Federal levels, all with different roles, perspectives and levels of urgency. There were too many decision clearances required to ensure project success; it was achieved only through a confluence of key success factors. As the analysis will show, even with an extremely high probability of success at each decision point, the odds were 2:1 that the project should have failed.

“We have learned one important lesson from the EDA experience in Oakland: implementation should not be divorced from policy. There is no point in having good ideas if they cannot be carried out.”<sup>14</sup>

---

<sup>13</sup> Ibid, p xx.

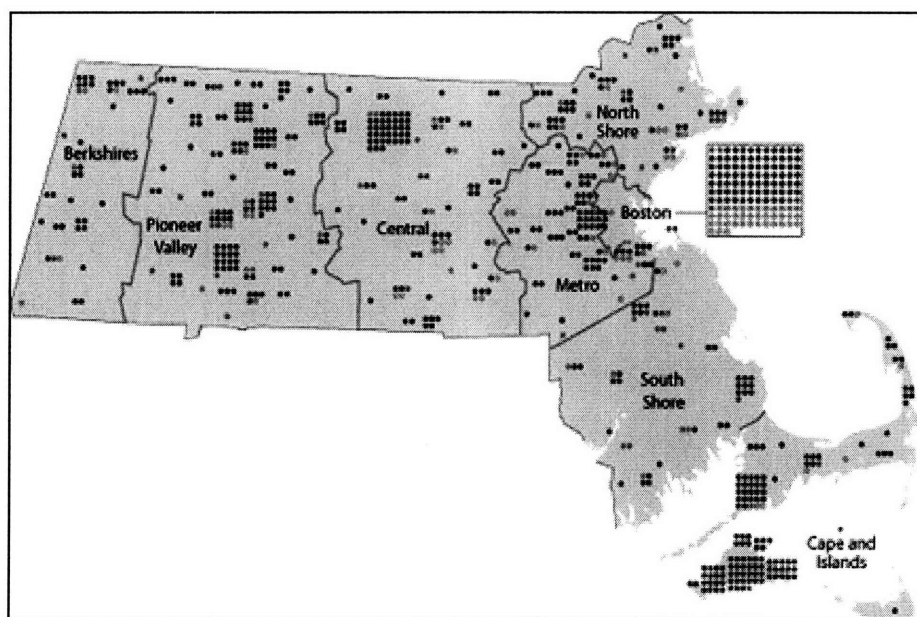
<sup>14</sup> Ibid, p. 143

## Chapter Two

### Municipal Renewable Energy Projects in Massachusetts

Massachusetts is considered a national leader in renewable energy. With its network of prestigious universities, high technology clusters (including a significant solar photovoltaics industry cluster), progressive politics, well-educated workforce and a sizable renewable energy fund, it has many advantages. As a result, this small state has nearly 600 renewable energy installations<sup>1</sup>. The majority of installations are photovoltaics (represented by black dots on the map below). The most well-known municipal renewable energy projects are two wind turbines in Hull with a total capacity of 2.5 megawatts (MW) and a 100 kilowatt (kW) solar photovoltaic (PV) installation at Beverly High School. Brockton's Brightfield will join that list once complete.

Figure 1: Renewable Energy Installations in Massachusetts<sup>2</sup>



There are several state policies that foster the development of new renewable energy resources. These policies have spurred numerous new installations over the past few years. However, there are yet other policies that hinder the development of new renewable resources and result in a large number of very small projects. These small projects, while commendable, make a small dent in

serving municipal electricity load, are unable to take advantage of economies of scale, and provide limited environmental benefits.

In this Chapter, I address the research questions: What have Massachusetts municipalities achieved with renewable energy? What are the drivers? What barriers do they face? What policy changes or technical assistance would most help them increase cities and towns implement renewable energy projects? My methodology includes secondary research on municipal renewable energy projects and a survey. This chapter also provides an overview of state policies that foster development of renewable energy in Massachusetts, identifies renewable energy installations, and presents the results of a survey conducted among Massachusetts municipalities.

<sup>1</sup> Massachusetts Renewable Energy Trust website. <http://www.masstech.org/cleanenergy/facilities.htm>

<sup>2</sup> Source: Massachusetts Renewable Energy Trust.

<http://www.masstech.org/cleanenergy/facilities/facilitiesmapstateall.htm>

### *State Policies Fostering Development of Renewable Energy in Massachusetts*

The Electricity Deregulation Act of 1997 (Massachusetts General Laws Chapter 164) created several new policies that were designed to encourage development of new renewable energy sources. First, the Act changed the way electricity industry is structured. Utilities were required to divest themselves of generation assets. This restructured the industry into companies that generate electricity and those that transmit and distribute electricity. Separating out the generation from transmission allowed development of a competitive marketplace in which customers can choose suppliers based upon price, fuel source, service and other criteria. Labeling requirements force suppliers to divulge their fuel sources, emissions and other data that allow consumers to make informed decisions.

A number of stakeholders were concerned that the deregulation act was too narrowly focused on creating competition to decrease price, itself a laudable goal, but that it also needed to ensure development of new, renewable energy resources. Stakeholders including the Conservation Law Foundation, Union of Concerned Scientists, MASSPIRG, Clean Water Action, Public Citizen, and Citizens for Clean Energy and others advocated strongly through public hearings and written testimony that deregulation must include provisions that would encourage development of new, renewable energy sources in the Commonwealth. Their primary concerns were establishing a renewable portfolio standard, establishing a public benefits fund, information disclosure, labeling requirements for “green” power, net metering, and distinguishing among fuel source characteristics. At the time, these policies were considered most critical to stimulating a market for renewable energy.

The key renewable energy policies in Massachusetts for fostering renewable energy include the renewable portfolio standard, a public benefit fund, net metering, and tax incentives. Renewable Portfolio Standards (RPS) are considered the primary policy mechanism for increasing adoption of renewable energy technologies. The 1997 Act mandated that electricity suppliers provide a certain percentage of their electricity from renewable resources. The percentage began at 1% in 2003 and increases annually to 4% in 2009, and an additional 1% each year from 2010-2014.

The Massachusetts Division of Energy Resources (DOER) is charged with certifying that the resource meets qualifying standards. The eligible technologies or fuel sources include: Solar photovoltaic or solar thermal electric energy; wind energy; ocean thermal, wave, or tidal energy; landfill methane gas and anaerobic digester gas, provided that the fuel is directly supplied to the generating unit rather than conveyed through conventional delivery networks for natural gas; low-emissions, advanced biomass power conversion technologies using an "eligible biomass fuel"; fuel cells using an "eligible biomass fuel," landfill or anaerobic digester methane gas, hydrogen derived from such fuels, or hydrogen derived using the electrical output of a qualified renewable generation unit. (Fuel cells using hydrogen derived from other fuels or from electricity produced by non-renewable units are ineligible).<sup>3</sup> A generator must complete a “RPS Qualifications Statement” for DOER that provides detailed information on the generation asset to obtain certification. Because this thesis is focused on Massachusetts, I use the legislative definition for renewable energy.

The RPS, in turn, creates a market for Renewable Energy Certificates, or RECs. Electricity suppliers can meet their RPS requirement by purchasing RECs, which are generated from qualifying renewable energy facilities. Sale of the RECs serves to create a revenue stream that facilitates the financing of renewable energy technology installations. Electricity suppliers that do not meet the RPS can elect to make an Alternative Compliance Payment (ACP), which is directed to the System Benefit Charge

---

<sup>3</sup> 225 CMR 14.00 Renewable Energy Portfolio Standard.

Fund. The ACP Rate started at \$50 dollars per megawatt-hour (MWh) in 2003, with the ACP Rate adjusted annually using to the previous year's Consumer Price Index.<sup>4</sup>

A public benefit, or System Benefit Charge (SBC) fund was created in the form of the Massachusetts Renewable Energy Trust. Massachusetts ratepayers that are not served by municipal utilities pay a small surcharge on their electricity bill that is deposited into this state trust fund. For residential customers, the amount is about \$.50 per month. The quasi-state Massachusetts Technology Collaborative (MTC) administers the Massachusetts Renewable Energy Trust funds.

The Massachusetts Renewable Energy Trust's (MRET) mission is "to increase the supply and demand for renewable energy while stimulating economic growth in the alternative energy industry with the primary goal of generating maximum environmental and economic benefits to Massachusetts ratepayers."<sup>5</sup> The Trust funds a variety of projects through grants, loans, and revenue guarantee programs. The Trust also works to increase the demand for renewable energy through outreach and education programs. Finally, the Trust funds an industry support program to foster the growth of alternative energy businesses in Massachusetts Through direct financial investments, technical assistance and network building activities. Availability of funds through the MRET is a key driver of renewable energy projects in Massachusetts. In the case of photovoltaics, grants often subsidize 50% or more of the installed cost of the systems.

Net metering was an additional policy mechanism for renewable energy. Net metering means that any customer with an on-site renewable energy generation system that generates more power than it uses can sell that electricity into the grid. The net metering provision in Massachusetts currently requires utilities to allow net metering for customer-sited installations under 60kW. There is a bill pending in the Senate to increase the installation size to 2 MW for solar and wind generation facilities.

The Act also required the Department of Environmental Protection to promulgate regulations for fossil fuel-fired electric generation facilities to establish performance standards for emissions produced per unit of electricity generated for any pollutant the Department determined to be a public health concern. These regulations, along with disclosure of emissions to customers, drive electricity suppliers towards using more renewable energy resources.<sup>6</sup>

The Act also created state tax incentives. While these incentives do not pertain directly to municipalities, which are tax exempt, they do foster installation of renewable energy indirectly. Massachusetts offers a corporate income tax deduction and an excise tax exemption for solar and wind devices. Massachusetts laws also provide a local property tax exemption for certain solar, wind and hydro energy systems. If a municipality partners with a private sector third party installer/owner, these tax incentives can accrue directly to the third party and indirectly to the municipality.

### ***Municipal Projects Funded by the Massachusetts Renewable Energy Trust***

The state policies described above have encouraged municipalities to deploy alternative energy for their facilities. Creation of the public benefits fund was a critical factor in the accelerated pace of project development. The Massachusetts Renewable Energy Trust actively works with municipalities through programs such as Community Wind, Green Schools, and "Clean Energy Choice" to encourage municipal adoption of renewable energy. Further, municipalities are eligible for funds

---

<sup>4</sup> Ibid.

<sup>5</sup> Massachusetts Renewable Energy Trust website. <http://www.masstech.org/RenewableEnergy/mission.htm>

<sup>6</sup> Massachusetts General Laws, Chapter 164.

from the Trust's other programs including the Small Renewables Initiative, Large On-site Renewables Initiative, and Green Buildings. The Green Schools program is among the most popular programs used by municipalities.

Since electricity generated by renewable resources is typically more expensive than electricity generated from convention power plants, most municipalities seek grants and other incentives. Thus, one way to begin to create an inventory of municipal renewable energy projects is to examine grants provided with support from the Massachusetts Renewable Energy Trust (MRET).

A search of the MRET grants database reveals 26 municipal projects, primarily photovoltaic, that create a total of over 1 MW of installed capacity statewide (see Table 1 – Municipal Projects Funded by Massachusetts Renewable Energy Trust). About two thirds of the projects are located at schools.

**Table 1 – Municipal Projects Funded by Massachusetts Renewable Energy Trust**

	Project Name	Town	Technology	Capacity (kW)	If installed, What year?
<b>Green Schools</b>	Ashland High School PV system	Ashland	Photovoltaic	33.6	2005
	Berkshire Hills Middle School PV	Great Barrington	Photovoltaic	56.32	2005
	Blackstone Valley Regional PV system	Upton	Photovoltaic	21.78	2005
	Blackstone Valley Regional PV system 2	Upton	Photovoltaic	19.435	2005
	Capuano School - PV	Somerville	Photovoltaic	34.96	2003
	Carlton Elementary School Greenhouse PV system	Salem	Photovoltaic	1.32	2005
	Carlton Elementary School Rooftop PV	Salem	Photovoltaic	30.16	2005
	Centerville Elementary - PV	Beverly	Photovoltaic	10.8	2004
	Dedham Public School	Dedham	Photovoltaic	28.8	
	Great Falls Middle School/ Turners Falls H.S.	Montague	Photovoltaic	34.2	2004
	Newton High School Awning PV system	Newton	Photovoltaic	7.2	
	Newton High School Rooftop PV system	Newton	Photovoltaic	52.8	
	Whitman-Hanson School PV system	Whitman	Photovoltaic	49.61	2005
	Williamstown Elementary School	Williamstown	Photovoltaic	24	2003
	Woburn High School Photovoltaic System	Woburn	Photovoltaic	33.6	
	Capuano School - Wind	Somerville	Wind Energy	0.4	2004
	Carlton Elementary School Wind Energy System	Salem	Wind Energy	1	2005
Centerville Elementary School - Wind	Beverly	Wind Energy	10	2004	
<b>Green Buildings</b>	Brookline Public Health Center	Brookline	Photovoltaic	21	
	Cambridge City Hall PV	Cambridge	Photovoltaic	26.5	2004
	North Adams Public Library PV system	North Adams	Photovoltaic	10.12	2005
<b>Other</b>	Brockton Brightfield	Brockton	Photovoltaic	500	2006
	Charlemont Sewer 2004	Charlemont	Photovoltaic	15.84	2005
	David & Joyce Milne Public Library - PV	Williamstown	Photovoltaic	2.4	
	Newton Community Service Centers	Newton	Photovoltaic	2.42	2003
	Westwood Fire Department	Westwood	Photovoltaic	2.64	2004

There are additional installations that are not included in this list, either because they preceded formation of the MRET, did not receive MRET funding, or were indirectly funded by MRET as “sub-grantees”. For example, MRET funded a “Cluster” program for photovoltaics in which each grantee was responsible for developing a geographic cluster of installations. MIT was a grantee, and supported installation of a 2.4 kW PV system at Brockton High School. But “sub-grantees” like

Brockton High School do not appear in searches of the database. The Hull wind turbines were not funded by MRET because Hull has a municipal light plant; its customers do not pay into the Trust and the town does not meet MRET eligibility criteria. Similarly, Princeton Municipal Light Department's eight 40 kW turbines installed in 1984 are not included. The Beverly High School PV system was installed through a federal grant in the 1970's, so it is also excluded from the database. Those four projects alone represent another 2.9 MW of installed capacity.

Other municipal projects under-represented in the MRET grants list are landfill gas installations. There are fifteen municipal landfill gas projects that tap the bioenergy potential of landfills to produce electricity. These projects are economically viable even without incentives; most were developed without the Trust's support.

### ***Survey of Massachusetts Municipalities***

In order to learn more about developing renewable energy projects in Massachusetts, I worked in partnership with ICLEI-Local Governments for Sustainability to perform a survey of Massachusetts municipalities. ICLEI (founded in 1990 as the International Council for Local Environmental Initiatives) is an international association of local governments that have made a commitment to sustainable development. It runs a "Cities for Climate Protection" campaign designed to help municipalities adopt policies and implement actions that reduce greenhouse gas emissions. ICLEI also worked with the US Conference of Mayors to adopt the "US Mayors Climate Protection Resolution", which has obtained signatures from over 275 mayors nationwide. ICLEI's Northeast Regional Capacity Center is based in Boston. ICLEI sought to perform a survey about clean energy installations in Massachusetts; we shared similar goals and interests and so worked together.

The primary goals of the survey were to learn more about renewable energy projects that local governments in Massachusetts have implemented or are planning to implement; describe their characteristics; identify drivers for and barriers to clean energy projects. We also wanted to identify the types of support (e.g., policy changes, technical assistance) that local governments need to help them implement renewable energy projects. ICLEI is also interested in quantifying the installed capacity of municipal clean energy projects and avoided greenhouse gas emissions, although that is not a focus of this thesis, and in certain other programmatic initiatives that are outside the scope of this thesis (i.e., "Cities for Climate Protection" and "Clean Energy Choice") and will be reported on elsewhere.

### **Methodology**

A survey instrument was developed to administer both as a paper survey and an electronic survey via SurveyMonkey.com, a popular Internet-based survey application. The survey was pre-tested electronically among select Massachusetts participants in ICLEI's Cities for Climate Protection Program. Due to the low response rate and comments concerning length and complexity of the initial survey, several questions were deleted or modified. The final survey instrument and cover letter are attached in Appendix 2.

The universe we sampled includes only those municipalities that have expressed an interest in renewable energy. Paper surveys were mailed to 82 municipalities that expressed interest in renewable energy through membership in Cities for Climate Protection Program, as a participant in an ICLEI "Massachusetts Municipal Clean Energy Project" workshop, as a recipient of a grant from the Massachusetts Renewable Energy Trust, or by having requested information from ICLEI. The survey sample list is attached as Appendix C.

A cover letter to the survey provided a link to the SurveyMonkey.com electronic survey, or respondents could use the paper survey. A follow up postcard was mailed to solicit additional responses. We called non-respondents by telephone to encourage participation. To boost the response rate, we offered two incentives – a drawing for one of three restaurant gift cards for early responses and a copy of the final report for all respondents.

The data from paper surveys was entered into the SurveyMonkey.com format and all data were exported into Excel for analysis.

**Survey Results**

ICLEI-Local Governments for Sustainability mailed surveys to 82 municipalities. Twenty-three municipalities completed surveys, for a response rate of 28%. Of the 23 respondents, 12 (52%) are members of ICLEI’s Cities for Climate Protection Campaign. The municipalities that completed the survey include:

**Table 2 –Survey Respondents**

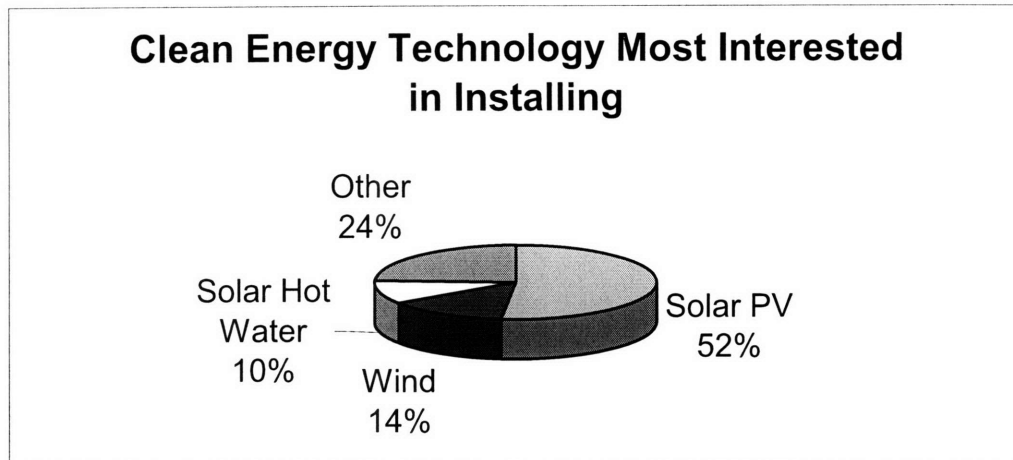
Amesbury	Easthampton	Newton
Amherst	Everett	Northampton
Attleboro	Falmouth	Revere
Belmont	Harwich	Shutesbury
Boston	Lexington	Truro
Brockton	Lowell	Williamstown
Brookline	Medford	Worcester
Cambridge	Natick	

**Findings**

The major survey findings are consistent with the data from secondary research cited previously – solar PV is the most popular technology, schools are the most frequent host facilities; cost is the highest rated barrier. The surveys also identified barriers to installing renewable energy technologies, lessons learned in planning and installing renewable energy, and desired technical assistance and/or policy changes.

The majority of survey respondents have experience with planning and/or installing renewable energy. Twelve of the municipalities (52%) reported that they had installed clean energy technologies; 15 (65%) stated that they have specific future plans to install clean energy technologies. Ten (43%) of the respondents had neither planned nor installed any clean energy technologies.

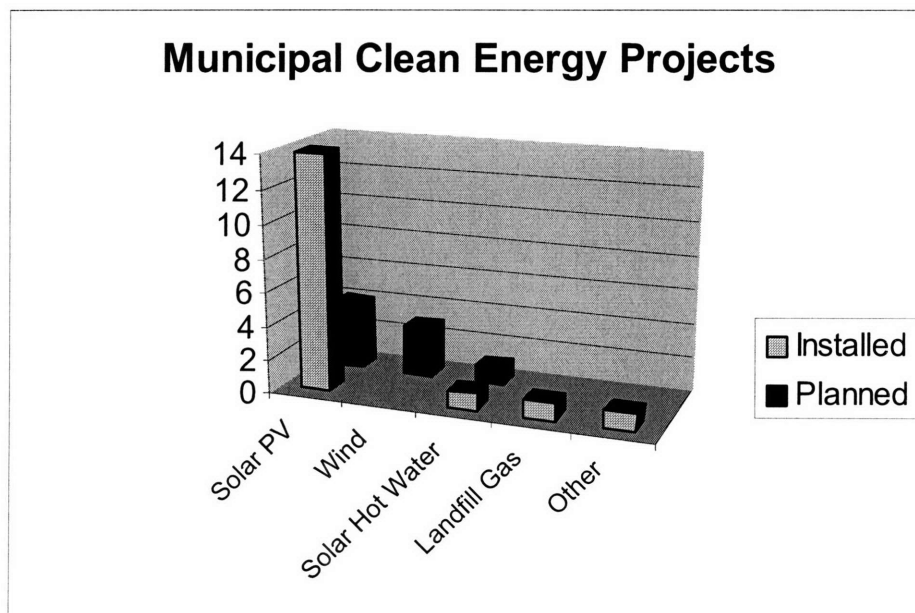
**Figure 2 – Which Clean Energy Technologies is Your Municipality Most Interested in Installing?**



Solar photovoltaics is the technology municipalities are most interested in installing, preferred by fifteen of the respondents (65%) and representing more than half the technologies mentioned (more than one response was allowed). Wind was the second most popular technology chosen., followed by solar hot water. The “others” include geothermal heat pumps, biomass, landfill gas, and biodiesel.

Correspondingly, the projects that municipalities have installed and planned to install are predominantly solar photovoltaics. Of the sixteen projects installed, fourteen of them are solar PV. Of the nine planned projects, four are PV. Respondents who knew the installed capacity of the systems reported a total of 544.4 kW of installed capacity and 27.8 kW of planned capacity. Although solar PV is a relatively expensive electricity generation technology, it is popular because it is easy to site and broadly perceived by the general public as environmentally superior.

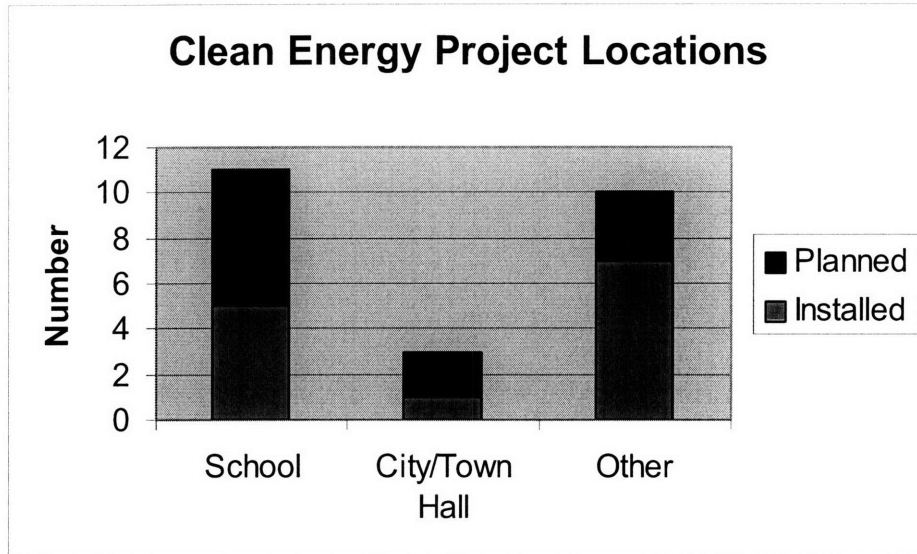
**Figure 3 -- Municipal Clean Energy Projects Planned and Installed**





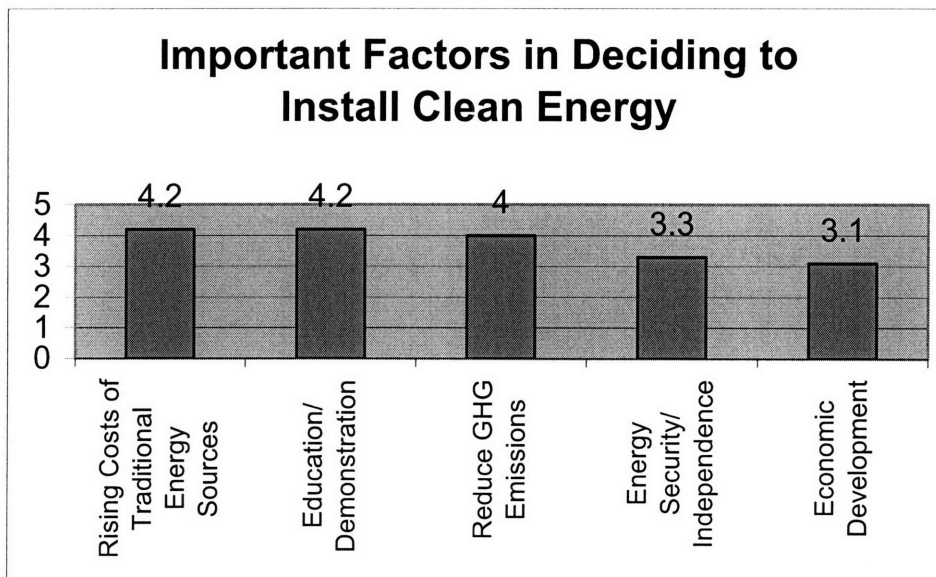
Schools are the most popular location for clean energy projects, although they are sited at a variety of locations including a library, wastewater treatment plant, stadium, senior center and two are free standing.

**Figure 4 –Location of Clean Energy Projects**



Municipalities install clean energy technologies for a variety of reasons. The primary reasons are to save money and to educate the general public. These two drivers can serve as arguments to sell projects to elected officials and obtain broader public support. Sometimes, “project champions” have other motivations. As one respondent explained, “For me its the whole peak oil thing and energy security. [However,] City leaders are into education of next generation. As you know, its a tough sell economically.”

**Figure 5 – Important Factors in Deciding to Install Clean Energy Technologies**



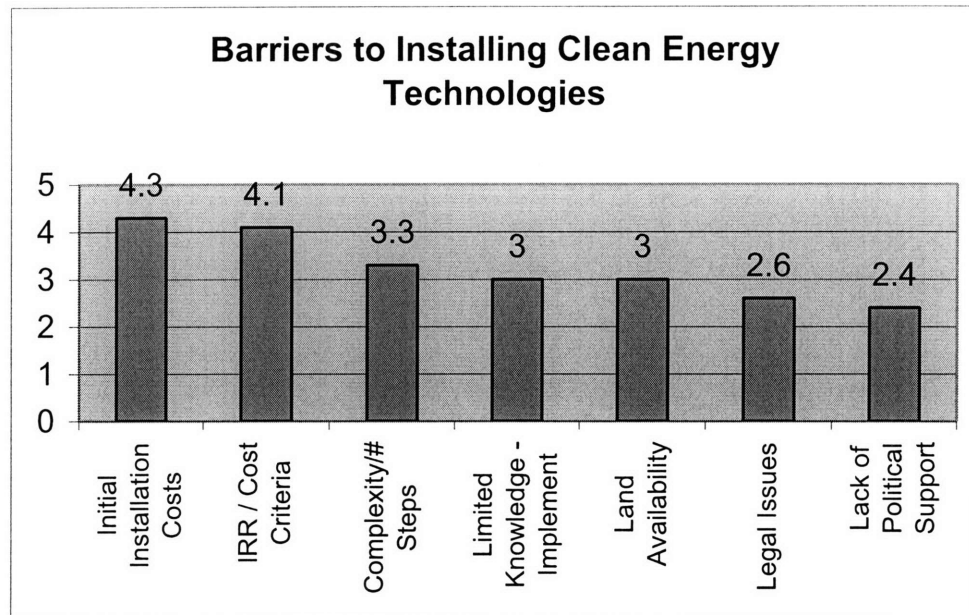
In addition to installing clean energy technologies, municipalities sometimes adopt policies or ordinances that require or facilitate adoption of renewable energy technologies. Twelve (52%) of the municipalities reported that they had passed such policies or ordinances. These include:

**Figure 6 – Clean Energy-Related Ordinances Adopted**

<b>Policy or Ordinance</b>	<b>Number of mentions</b>
Climate action plan	7
GHG emission reduction targets	5
Energy efficiency policy	4
Wind turbine ordinance	4
Green building plan	2
Renewable energy commitment	2
Building code	1
Other	6

There are numerous barriers municipalities confront in implementing clean energy projects. On a scale of 1 to 5 where 1 is a entirely insignificant and 5 is a very significant barrier, the primary barrier municipalities report facing is initial installation cost, average rating of 4.3 followed by internal rate of return or other cost criteria, rate 4.1. Lack of support from political leaders or the community do not appear to be major factors. This is likely reflective of the nature of the projects planned and installed – photovoltaics are expensive, but are generally well supported and easily sited. Further, funding from the MRET can cover 50% (or more) of the cost, thereby reducing or eliminating that barrier.

Figure 7 – Barriers to Installing Clean Energy Technologies



Respondents were given the opportunity to cite “other” barriers to implementation. Of the eight respondents who wrote in additional barriers, the most frequently added comments concerned cost issues. Some of these comments include:

- “Board of Selectmen and Town Meeting have to feel that through implementation they are saving a significant amount of money.”
- “Building a cost savings position for projects. Most are for them but say we can't afford them. “

Other comments link issues of cost with staffing and expertise:

- “Not having an Energy Officer on Worcester staff. No money to hire someone to oversee task force and implementation.”
- “Lack of manpower in the heavily volunteer-based structure of the government of this vanishingly small town.”
- “Brockton has experienced numerous municipal budget cuts over the past several years, so it is difficult to do new projects. Also, we are lean on staff, so we can only implement these projects if we can get grants to hire consultants to do the predevelopment and installation work.”

Others cite lack of knowledge. One respondent was acutely aware that unforeseen barriers were likely to emerge. “I responded 'completely insignificant barrier' above to seven responses because that's the closest response to what I have in mind. The actual response to those seven inquiries is that the city hasn't considered 'clean energy projects'. The responses could very well be different if we did set a policy direction towards considering such projects' but the response for now must remain 'completely insignificant' because none of those issues have been contemplated. The greatest barrier accordingly is limited to no knowledge.”

Respondents were also asked to describe the primary lessons they had learned from their efforts to install clean energy technologies in their municipalities. Thirteen respondents replied; the most frequent comment was that implementing clean energy projects takes a long time and requires patience. Others mention the importance of public support, particularly for wind projects that may be controversial. Yet others raise the issue, again, of cost involved, long time horizon and resources required. “It’s harder to do than one would like it to be”. Others cite unanticipated challenges. “Many surprises possible with roof and building integrity, codes. Paperwork can be cumbersome. “

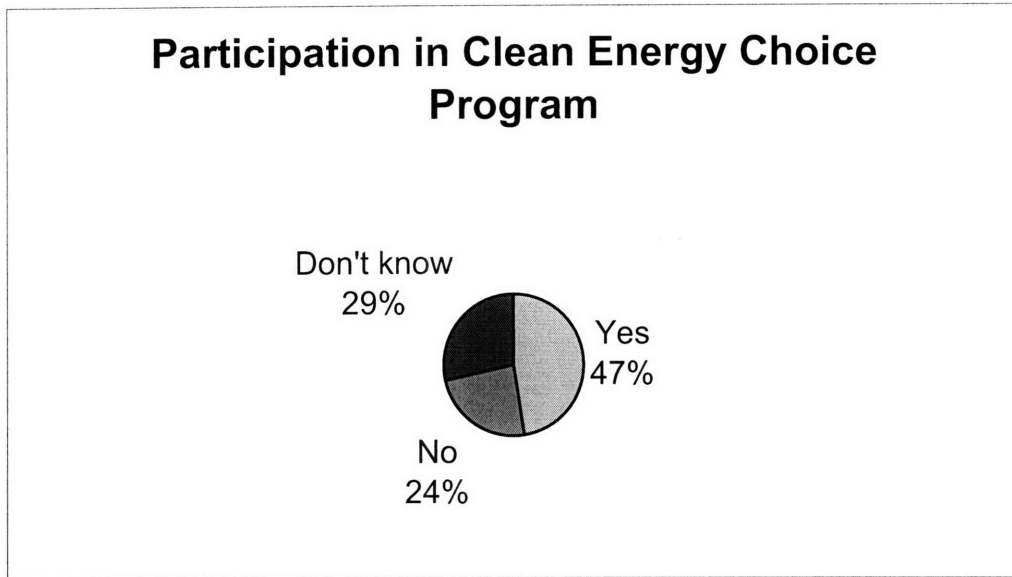
The survey asked respondents to describe what kinds of technical support, state policy change, or other support that would most help their municipalities to install clean energy technologies. Not surprisingly, the most frequent responses were “funding” and “education/examples of other communities’ installations” (five out of thirteen responses). Three mentioned procurement assistance – state bid contracts or group purchasing, whereas one requested that clean energy projects be made exempt from Chapter 149 requirements. Two respondents mentioned that changes in state law were required due to specific components of their projects. Two respondents suggested increasing installed capacity eligible for net metering. Two municipalities contemplating wind projects are constrained by interconnection standards – if the power lines cross a public way, then one turbine cannot serve two municipal meters. There were some highly specific and individualized responses including:

- “State renewable energy mandates for municipalities (or federal mandate).”
- “Being able to use all power at retail in locations different from where power is generated.”
- “Our largest two loads are across the state Rte 6 from each other, precluding us from supplying them with one generator. We need a change in the State Law to permit this. I think Falmouth has a similar situation.”
- “City is not eligible for tax incentives; so the payback is not quite as attractive as it is for businesses. Residential tax incentives could be stronger.”

Due to ICLEI’s interests, the survey inquired about participation in The Clean Energy Choice Program that enables individual consumers served by certain investor-owned utilities to pay a premium each month to purchase clean energy through select providers. When they do so, the Massachusetts Technology Collaborative provides matching funds that are available to a city or town for clean energy projects.

Almost half the respondents (10) said their municipality participates in Clean Energy Choice. Of these, nine indicated that they had accrued funds, and eight said they had earmarked these funds for specific projects. These projects include five photovoltaic projects, an anemometer study, and hiring an Energy Officer.

Figure 8 -- Participation in Clean Energy Choice Program



The respondents participate in the program in a variety of ways. Most said they had performed general promotion, while only a few purchase municipal energy supply through this program or offer it to municipal staff and elected officials.

Survey respondents understand the importance of public education in performing clean energy projects. Nearly two thirds said they would be willing to participate in a statewide effort to educate community members about clean energy.

The survey data and responses to open ended questions are included in the appendix. There were also some interesting responses from survey contacts that were called, and who declined to participate in the survey. The most frequent response from those who declined was that they were so busy, they couldn't take the time to complete the survey for projects that they similarly would never find the time to implement. From having explored renewable energy briefly, they realized it would consume more resources than they had to expend. One contact, who had experience with the MTC through a prior job, said the agency "jerks people around so much" when they look for funding, "I would not bother applying". She added that she usually throws away things they sponsor for that reason.

### Survey Conclusions

Municipalities have initiated and installed a variety of clean energy projects. Solar on schools is the most frequent municipal application. There are many more projects planned; they include a variety of technologies. Some of these projects are small in scale, yet symbolic of the City's commitment to clean energy technologies and intended to educate the general public.

The respondents to this survey include pioneers striving to install technologies of a size and scale that will have significant local impact. They are constrained, however, by cost and policy barriers that make their efforts quite challenging. Although there are some issues mentioned only a few times, they are cited by those furthest along in the process that have encountered barriers that can be resolved only through special state legislation -- two wind projects and a large-scale solar project. Further, the Massachusetts net metering policy that caps projects at 60 kW discourages

installations of a scale that could help municipalities serve an increasing percentage of their loads through renewable technologies.

Survey respondents share the common challenge of finding sufficient resources to carry out clean energy projects. Municipalities are ineligible to receive Federal tax incentives for renewable energy, which makes cost justification more challenging than for businesses and residents. While many respondents cited a need for increased funding, others also lamented a shortage of capacity (staffing resources and expertise) to achieve ambitious goals.

There is a clear need for additional education, availability of model cities and dissemination of project results to help more municipalities begin to install clean energy technologies. Those cities and towns that have traveled further down the path of implementation point to additional barriers that ought to be removed, which include:

- Increase net metering allowance over 60 kW.
- Provide legal authority to borrow and develop large-scale projects.
- Assist with procurement through group purchasing, sample bid and contract documents, and an exclusion from Chapter 149.
- For wind projects, municipalities confront major challenges in siting the turbines where the load is most needed and to take advantage of behind-the-meter economic advantages. Alternative policies that address these issues should be explored.

The wind issues bear further examination because wind is a relatively affordable form of renewable energy, MTC offers a Community Wind program specifically designed for municipalities, and wind projects face some unique challenges. Wind turbines often create public opposition due to concerns about aesthetics and noise. Towns like Hull and Princeton, which have municipal light plants, have overcome community opposition by showing direct community benefit in the form of reduced electricity rates. Towns that don't have municipal light plants therefore face policy barriers to project implementation such as the ones identified above. Use of third party contracts can eliminate those barriers. However, if a community turns to a private developer to develop, own and operate the wind energy project it will lose the clear and direct public benefit of reduced electricity costs for city taxpayers. If the town, instead, enters into a power purchase agreement for the wind turbine, the price will necessarily include a profit for the developer. Developers take advantage of tax incentives, production incentives, and grant opportunities as part of their project financing. Wind project opponents typically cite private profits and public incentives as a basis for their opposition. This has occurred locally in the vocal opposition to the private Cape Wind project. Policy barriers have the effect of eliminating some cost advantages and public acceptance factors for wind.

***Conclusion: Progress is Limited; Municipalities Need More Resources and Capacity Building***

Data show that fewer than ten percent of Massachusetts municipalities have installed renewable energy technologies. The primary installed technology is solar photovoltaics. Solar on schools is the most common application. There are no municipal wind installations for towns that lack a municipal light plant, and only two of the 41 municipalities with a light plant have installed wind turbines.

Cost is a significant barrier for many municipalities. Most cite a need for more funding. It takes a great deal of time and effort to implement renewable energy projects. Some municipalities mention a need for special legislation to perform their projects. There is a clear need for more outreach, education, funding technical assistance, and capacity building to increase municipal adoption of renewable energy technologies.

## Chapter Three

*“Implementation is worth studying precisely because it is a struggle over the realization of ideas. It is the analytical equivalent of original sin; there is no escape from implementation and its attendant responsibilities. What has policy wrought? Having tasted of the fruit of the tree of knowledge, the implementer can only answer, and with conviction, it depends....”<sup>1</sup>*

### **Case Study: City of Brockton “Brownfields to Brightfields” Initiative**

The City of Brockton, Massachusetts implemented a “Brownfields to Brightfields” project conceived through a U.S. Department of Energy program with great promise for cities seeking to sustainably redevelop former industrial and commercial properties. The implementation of this project took nearly six years from project concept to final implementation. Brockton’s Brightfield will be the largest solar photovoltaic array in New England. This 425 kW installation will produce enough energy to power Brockton City Hall and a small fraction of the police station load (the equivalent of about 250 homes).

Despite the great policy ideas and resulting enthusiastic response of municipalities nationwide, few Brightfields projects have been implemented. This case study demonstrates the challenges faced by a municipal government trying to implement a large-scale renewable energy project as conceived through a Federal program. It certainly represents a “struggle over the realization of ideas”. There are numerous implementation hurdles that are not unique to Brockton or to solar technology, but that will face other municipalities in Massachusetts that seek to install renewable energy technologies. Many of these municipalities are unaware of the challenges that lie ahead.

This case study explains the promise and potential of the Brightfields program, Brockton’s Brightfield project goals and objectives, the initial steps taken to begin the project, and the implementation experience. As described in Chapter One, implementation is the “causal chain of events”. This case study will describe the causal chain of events and show the vast number of actors involved in initiating, approving, and performing project activities as well as the elapsed time to implement various project steps. This case study will be used as a basis for the final chapter to propose policy changes that reduce the number of steps, elapsed time, number of actors, cost and complexity of implementing renewable energy projects.

### ***The US Department of Energy’s “Brightfields” Program***

The US Department of Energy (DOE) announced the Brightfields program in 2000. “Brightfields”<sup>CM</sup>, a term coined by the U.S. Department of Energy, are brownfield sites that are redeveloped through the incorporation of renewable energy or distributed energy generation applications, including solar electric systems for which this template was designed. Solar electric systems are also called<sup>CM</sup> photovoltaic (PV) systems. A Brightfield<sup>CM</sup> can include a variety of projects such as building a solar

---

<sup>1</sup> Jeffrey Pressman and Aaron Wildavsky. *Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It’s Amazing that Federal Programs Work at All, this Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes*. University of California Press: Los Angeles and Berkeley, California. 1984. p. 180.

electric module manufacturing plant on the brownfield, or placing solar electric systems directly on the brownfield ground or on existing buildings.”<sup>2</sup>

The program was based in the DOE headquarters Office of Energy Efficiency and Renewable Energy (EERE), with a staff of only one, and implemented by working through the Regional Offices. The Regional Offices could, in turn, tap into technical assistance from the National Renewable Energy Laboratory. DOE considered its role primarily as a facilitator bringing together federal, state, and local partners and providing technical assistance. Limited DOE grant funding for the program was authorized and distributed through the State Energy Program. Only \$379,800 was awarded nationwide (see Table 3 - DOE-funded Brightfield Projects and their Results).

The DOE program description further explained, “The Brightfields approach offers a range of opportunities to link solar energy to brownfields redevelopment and thereby transform community hazards and eyesores into productive, green ventures. This unprecedented campaign will help our nation put its hundreds of thousands of brownfields back into productive use and at the same time create high-tech jobs in blighted urban neighborhoods, improve air quality, and reduce greenhouse gas emissions. The term ‘Brightfields’ refers to different types of solar applications on brownfields, including photovoltaic arrays that can reduce cleanup costs, building-integrated solar energy systems as part of redevelopment, and solar manufacturing plants on brownfields.”<sup>3</sup>

The first Brightfield program was developed in Chicago and promoted as the model program from which DOE would launch its national initiative. In 1999, Chicago officials and DOE announced a partnership with private partner Spire Solar Chicago to reclaim a brownfield with a 2.5 MW photovoltaic array that would begin as a 500 kW array and be expanded monthly until it covered 10 acres. Spire Corporation is a Massachusetts-based company that manufactures photovoltaic assembly equipment, and was interested in expanding its business to include solar module assembly through the wholly owned subsidiary, Spire Solar Chicago.

Chicago’s Brightfield project plans also called for installation of PV on schools and museums citywide. The City of Chicago committed \$2 million towards the program and the local utility, Commonwealth Edison, pledged \$6 million. The local demand was considered sufficient to establish a local solar module assembly plant in a rehabilitated building on the brownfield site. This factory would create 100 new high technology jobs. The City’s vision was to generate revenues from electricity generation at the original brownfield site, and use that money to convert additional Chicago brownfields into Brightfields. The project principals initiated the “Chicago Solar Partnership”, which focused on school applications that would provide educational opportunities to teach children about science, technology, energy and the environment.

This model was promoted nationwide beginning in 2000. Following the “success” of the Chicago experiment, the DOE issued a competitive request for proposals in 2000 for which it awarded three grants totaling \$130,000 nationwide in federal fiscal year 2001. These grants included \$50,000 to Hanford, Washington for a 40 kW ground-mounted solar array pilot project; \$50,000 to Atlantic City, New Jersey for a solar powered bed and breakfast to be developed on a former brownfield site; and \$30,000 to Brockton, Massachusetts to study the feasibility of a ground-mounted solar Brightfield array, installation of photovoltaics on numerous buildings citywide, and attracting a PV manufacturer to Brockton. Other cities watched in anticipation that they, too, could capitalize on this promising program.

---

<sup>2</sup> U.S. Department of Energy, <http://www.eere.energy.gov/wip/pdfs/brightfields.pdf>

<sup>3</sup> Ibid.



**Table 3 - DOE-funded Brightfield Projects and their Results**

Year	Project	Project Description <sup>4</sup>	Award	Status
2000	Hanford Brightfield, Washington	"This project will ultimately be the largest photovoltaic installation of its kind, and will bring the Brightfield concept to one of the worst Super Fund sites in the nation. The funding provided will cover a portion of the pilot phase of the project, involving 40kW. Later phases will use a wind/solar green energy blending strategy to finance development up to 1MW or larger. This solar array will act as a nucleation site around which Energy Northwest intends to grow a renewable energy industrial park."	\$50,000	38.7 kW system installed in May 2002
	Cityscape Solar-Powered Bed & Breakfast on an Urban Brownfield Site Atlantic City, NJ	"This project involves the construction of a solar powered bed and breakfast on an urban brownfield site in Atlantic City, New Jersey as part of an overall neighborhood redevelopment plan with a sustainability theme. The project will showcase the use of photovoltaics in supplying renewable energy and also contain sustainable features such as recycled building materials and Energy Star appliances, and will be located in the "Cityscape Neighborhood," an area designed to promote renewable energy, sustainable building materials, and concepts of New Urbanism."	\$50,000	Project canceled
	Brockton Brownfields to Brightfields	"This project involves attracting a photovoltaic system manufacturer to a Brockton brownfield and building a solar array on a second site. It is anticipated this array will bring into productive use up to 27 acres of idle property and the array could also generate up to 6 MW of electricity. In order to create sufficient local demand to attract the manufacturer, other potential sites for photovoltaic applications will be surveyed."	\$30,000	425 PV array in construction
2004	Solar "Brownfield to Brightfields" Technology Demonstration, Raleigh, NC	"Carolina Green Energy, LLC proposes to partner with the North Carolina Solar Center to design and install a 30-kW grid-tied photovoltaic (PV) system. As part of its continued efforts to bolster support for renewable energy, the Solar Center will incorporate the "Brownfield to Brightfield" project at Lot 86 into its ongoing education and outreach programs."	\$125,000	Progress hindered by site control issues
	City of Brockton Solar Energy Park: Deploying a Solar Array on a Brockton Brownfield	"The City of Brockton will build New England's largest solar array at a remediated 27-acre brownfield site in fall 2004. The 500-kilowatt (kW) solar photovoltaic (PV) array — or "Brightfield" — will be installed in an urban park setting with interpretive displays. The Brightfield could include as many as 6,720 solar panels connected in strings that span the site. The Brightfield will grow incrementally to 1 MW with expansions financed through positive annual cash flow generated by the sale of renewable energy certificates (RECs) and electricity."	\$59,400	425 kW PV array under construction
	Cedar Rapids Bohemian Commercial Historic District Solar Development Program, Cedar Rapids, IA	"The Iowa Department of Natural Resources (IDNR) will partner with the City of Cedar Rapids, the Iowa Renewable Energy Association, Alliant Energy, and Thorland Company to install a 7200-Watt solar array in Cedar Rapids on a multiuse converted former warehouse building in a designated brownfields redevelopment area. The IDNR has established partnerships with the City of Cedar Rapids, Alliant Energy, the Iowa Renewable Energy Association, and the building owner to increase the economic and environmental viability of a redeveloped brownfield area and expand the value and viability of solar projects."	\$65,400	7.2 kW installed

By 2005, the Chicago Brightfields experiment was seen as a partial success, but it fell far short of its ambitious goals. The City redeveloped the building on the brownfield site into a LEED platinum certified green building called the Chicago Center for Green Technology. Its anchor tenant was Spire Solar Chicago, with a 5,000 square foot assembly operation. The Chicago Green Corps, a nonprofit that provides training in landscaping and horticulture, also leased space

<sup>4</sup> Excerpted directly from DOE website at [http://www.eere.energy.gov/state\\_energy\\_program/projects\\_topic.cfm](http://www.eere.energy.gov/state_energy_program/projects_topic.cfm)

in the building, as does a landscaping company. A solar array was placed on the roof, and solar window awnings provide shading on the south facing side of the building. The 500 kW array that was slated to grow to 2.5 MW (the world's largest) did not transpire, however. Only a 32 kW array was installed. No other ground-mounted arrays were installed on brownfields. Two megawatts of PV has been installed on nearly 30 rooftops, primarily schools and museums. Spire Solar Chicago abandoned its Chicago assembly plant in 2005 and moved the equipment and operations to their Bedford, Massachusetts headquarters to focus on a new business plan for building integrated photovoltaics. The Chicago Center for Green Technology has had to issue a Request for Proposals to seek a new tenant in Spire's place.

Spire executives cite two major lessons learned regarding the feasibility of scattered-site assembly plants at brownfields. First, the plant requires "levelized off-take". The City of Chicago had promised a levelized off-take, measured in kW per quarter. However, demand for the solar modules was uneven, so Spire experienced markets with twenty people working in one quarter, and only four people in the next. Second, Spire believes there is a need for a market with strong long-term incentives to justify establishing a facility.<sup>5</sup>

This result did not come as a surprise to other photovoltaic manufacturers who, in 2000, resisted the DOE's push for Brightfields precisely because they insisted photovoltaics manufacturing was too capital-intensive to justify scattered sites when major investments were planned or underway at their primary manufacturing centers. They insisted from the outset that DOE's model was flawed, particularly for an industry under intense pressure to become more cost competitive.

Through a separate grant in 2000, the City of San Diego had received support from the National Renewable Energy Lab to complete a project feasibility study for a 1 MW PV array to be developed on the Miramar Landfill. The feasibility study released in February 2001 recommended that the City develop the array. The City and the Navy, which owns the site, could not come to terms on a land use agreement or power purchase agreement. The facility was not developed and San Diego abandoned its Brightfield plans in 2002.<sup>6</sup>

There is a successful private example of a Brightfield in Paulsboro, New Jersey. BP, which owned the contaminated 130-acre former petroleum and chemical processing and distribution site, installed 276 kW of solar modules produced by the BP Solar division. The installation generates enough electricity to power about 25% of the site remediation activities. It was installed and commissioned in 2002.<sup>7</sup>

The DOE had said that its Brightfields program had the power to transform thousands of brownfields nationwide. Neither Chicago nor San Diego could bring their utility-scale solar Brightfield projects to fruition. Only a private company with its own PV subsidiary has managed to install a utility scale array. The difficulties in implementing the Brightfield program are best viewed through the case of the City of Brockton, Massachusetts the only program grantee to successfully implement installation of a large solar array.

### ***Brockton, Brownfields, and Brightfield Goals and Objectives***

The City of Brockton is a major urban community 20 miles south of Boston and about 30 miles north of Providence, Rhode Island. Brockton's diverse population of 94,300 ranks it as the sixth largest city in Massachusetts. Of 351 municipalities, Brockton is ranked as having the fourteenth highest poverty

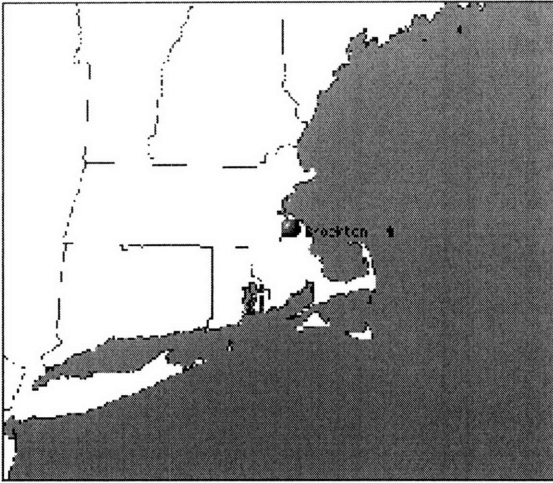
---

<sup>5</sup> Interview with Steven Hogan, Executive Vice President, Spire Corporation. November 2005.

<sup>6</sup> Interview with Joseph Bourg, Millenium Energy, December 2005.

<sup>7</sup> BP website, <http://www.bpaulsboronj.com/redevelopment/solar.html>.

level. Because Brockton is 97% developed, redeveloping brownfields sites is critical to its economic



development. Brockton has several marketable characteristics including a skilled labor force, major highway and rail access, three commuter rail stations with connections to Boston, cost-competitive real estate and status as a state-designated Economic Target Area that includes several districts where incentives such as tax increment financing are available. However, Brockton faces several challenges resulting from the decline of its former pre-eminence in industry, including higher than average unemployment rates, as well as blight and image issues.

Brockton has embarked upon several, inter-related economic development initiatives designed to revitalize the downtown area, attract new businesses, attract more middle-income residents, and protect and enhance the environment. Its efforts to become a “solar city” fall within a broader “Smart Growth” plan that is designed to build upon the City's strengths to make it an attractive urban alternative in Massachusetts.

Brownfields redevelopment poses numerous challenges. Environmental justice is an important concern within Brockton's “Economic Corridor”, a north-south line that runs through the center of the city along both sides of the railroad and contains most of its industrially zoned land (brownfields comprise about one third of this area). The Economic Corridor closely abuts residential areas where the median income is below \$15,700, over half of the residents are near or below poverty level, and over half are minorities. The area is beset with substandard housing, abandoned and boarded-up buildings, high crime rates, high unemployment rates, and vacant brownfields. Many proposals presented for brownfield redevelopment have been undesirable land uses.

The City has among the highest number of trash-related businesses on a per capita basis, and two large remaining brownfields have been proposed sites for a tire recycling facility and a household solid waste recycling facility. Both proposals were rejected following strong community opposition.

In 1999, the city of Brockton began to actively seek sustainable and desirable brownfields redevelopment options that are consistent with environmental justice goals. The brownfield on Grove Street was an unlikely candidate for the City's most exciting project: a solar Brightfield.

The neighborhood where the Brockton's Brightfield is located is a state designated Environmental Justice area due to its concentration of low income and minority residents. It is also an overburdened community in the sense of neighborhood impacts. In addition to hosting this 27 acre hazardous waste site, the neighborhood is burdened by a wastewater treatment plant that is under an EPA consent decree for violations; a landfill that is being capped (also with numerous environmental violations and fines); a heavily-trafficked construction and demolition debris transfer station. The Brightfield site directly abuts a foundry, and home heating oil company, as well as residences.

The Brightfield is consistent with the community's desire that future redevelopment of brownfields not add undue pollution or traffic to the neighborhoods. Residents are also concerned with Brockton's image as the "Commonwealth's dumping ground". Positive redevelopment alternatives can change that image.

The City of Brockton initiated its Brownfields to Brightfields project to develop a photovoltaic array as a "Solar Energy Park" within a sustainable brownfields redevelopment strategy. The project was designed to redevelop brownfields in an environmentally friendly manner; develop a new local clean energy source for City use; expand the City tax base; enhance Brockton's image as "Cleaner and Greener"; attract a PV manufacturer; and to develop the "Brockton Solar Champions" concept which builds on the "City of Champions" logo by making Brockton first in the state in installed PV.

The project feasibility and predevelopment was directed through the Office of the City Planner under leadership of the Mayor's Office, primarily during the administration of Mayor John T. (Jack) Yunits, Jr. When the Brightfield entered the development phase, implementation transferred to the Department of Public Works and Mayor James Harrington had taken office. Ongoing educational programming such as scheduled tours, community days and coordinating school field trips will continue to be directed by the Office of the City Planner.

As described in the opening chapter, I am a participant observer in this story. I served on a contract basis as the project director, or "project champion", shepherding the Brightfield through its various phases. Naturally, one might wonder if my role leads to a bias in the reporting of the case study. While I am certainly a strong proponent that the Brightfield is exactly the right development in the right place, my goal for this case study is not to serve as a proponent. The facility is being installed as this thesis is being written; there is no need to "sell" the project. The Brightfield faced little opposition, and where the opposition existed, I document the opposing view. Like the EDA program in Oakland, the project enjoyed significant conceptual support, but was difficult to implement nonetheless. My goal is to document and analyze the long and complex implementation process, identify areas where significant barriers presented themselves, and recommend ways to remove those barriers. It is my hope that some of these policy measures may be considered and adopted, clearing the way for future utility-scale projects.

Data for this case study was derived from project reports, project archives, newspaper articles, my personal notes and correspondence, and follow-up interviews with project participants. The usage of the title rather than personal reference is chosen both because it is neutral and also because it highlights the unusual roles that had to be played by a stakeholder with no prior experience in renewable energy nor many of the tasks required to develop the project. This is important because many of the municipally driven renewable energy projects proposed in Massachusetts also have project champions that are not energy experts. Several towns have formed energy committees comprised of volunteers with a variety of backgrounds. They, too, will need to learn the intricacies of state law, interconnection, financing, REC sales, and other technical details that likely lie outside their areas of expertise.

### ***Getting Started: from Project Concept through Feasibility Study***

The Brightfield seed was planted in 1998, prior to DOE's program announcement, when the City of Brockton convened a diverse group of stakeholders to develop a project concept and application to the US Environmental Protection Agency (EPA) for a "Sustainable Development Challenge Grant". Brockton proposed developing a "virtual eco-industrial park". The Sustainable Development Challenge Grants were to design "placed-based" approaches to promote environmentally and economically sustainable approaches to revitalization challenges.

One little known facet of Brockton's history was the development in the 1880's of a central electric power station downtown. Thomas Edison chose Brockton as a site to develop his first commercially viable three wire electric power plant because the city featured a "classic New England village

center”, it was near Boston, it had a large industrial base (shoe manufacturing), and it was considered a progressive small city.<sup>8</sup> “Edison used Brockton as an ‘experimental laboratory.’ On October 1, 1883, Edison threw a switch, giving Brockton a three-wire underground system. It was the first such system in the world.”<sup>9</sup>

When contemplating a place-based approach for sustainable development, Brockton considered building on this history of pioneering in electricity and proposed that the eco-industrial park include a solar panel manufacturer. The City did not obtain the grant, but the idea had been proposed and enthusiastically embraced by a number of key stakeholders, among them an ad hoc group known as the Mayor’s Economic Advisors. This group included the chief executives of the local economic development agency, chamber of commerce, transit authority, redevelopment authority, housing authority as well as the city planner.

Another key event leading to the project concept occurred in April 2000 when a tire recycling plant sought to locate a facility on a brownfield site known as “Bargaineer Center”. Residents mounted vocal opposition to the proposal, which would allow Tire Recyclers, Inc. to haul in 100 tons of tires per day and pyrolize them to recover the steel, carbon and oil for resale. The community members voiced four major concerns: pollution and potential health effects; noise from the 24-hour operation; traffic congestion caused by 30 truck trips per day; and the City’s image. The message was clear: “we don’t want Brockton to be the Commonwealth’s dumping ground!”

Following this meeting, the City actively sought environmentally benign approaches to Brownfields redevelopment. It was during this search that Brockton’s Brownfields Coordinator found a press release on EPA’s website about a new program announced by DOE for “Brownfields to Brightfields”. The DOE materials said that solar technology could revitalize a brownfield without producing emissions or noise, and that a solar power plant would not create traffic because it operates passively, silently converting the sun’s rays to electricity. DOE’s Brightfields program seemed the perfect solution to the challenging business of redeveloping urban brownfields where industrial areas are abutted by residences. In May of 2000, the City initiated communications with DOE and began developing its project concept.

The Brownfields Coordinator presented a concept paper to the City Planner in summer of 2000, which was accepted. The paper linked the federal brownfields concept with the sustainable redevelopment of brownfields and attracting renewable energy related businesses as a sustainable development strategy. In September 2000, the City Planner and Brownfields Coordinator met with the Mayor to seek his approval. Mayor Jack Yunits immediately embraced the concept and charged the two to begin implementation. He specified that he wanted them to explore use of photovoltaics at the Brockton High School, wastewater treatment plant, a planned new minor league baseball stadium, Brockton Area Transit Authority, and a desalination plant the City was spearheading in Dighton, Massachusetts. These could potentially serve as large installations that could create sufficient demand to attract a PV manufacturer. The Bargaineer Center site was considered the key site.

The Brownfields Coordinator traveled to the EPA-sponsored national brownfields conference held in Atlantic City in October 2000 where project principals from Chicago’s Brightfields program were featured panelists. Spire headquarters are based in Bedford, Massachusetts so the executives on the panel promised to travel to Brockton to meet with the Mayor and visit the Bargaineer Center site. They suggested that while the Chicago program was progressing well, from their experience, it might be difficult to obtain funding from the Massachusetts Renewable Energy Trust.

---

<sup>8</sup> Beals, Gerald. “The Development of Early Power Plants Throughout the World”. 1997.

<sup>9</sup> Carroll, Walter F. “Brockton: From Rural Parish to Urban Center”. 1989. Windsor Publications. P. 53.

**Figure 9 - Former Brockton Gas Works Site**



In November 2000, Spire executive Rodger LaFavre came to Brockton to meet Mayor Yunits and tour the Bargaineer Center site. While he thought it might be an appropriate site for a factory, LaFavre said that the ideal site for a utility-scale Brightfield array is an otherwise unusable site with limited economic potential due to environmental conditions. Photovoltaic arrays are well suited for environmentally impaired properties because they can be placed with minimal excavation or disturbance of contaminated soils. The former Brockton

Gas Works site on Grove Street immediately rose to the top of the list – as a former manufactured gas plant site, the chosen remedial measure was to cap contaminants 18 inches below the surface. Because the cap could not be disturbed, the site was unusable. At 27-acres, it was a very large and blighted parcel just outside the downtown area.

Further, the site's history made it a very interesting location for a solar power plant. Brockton historian Gerald Beals reveals anecdotes from the 1880's, when Edison was facing intense criticism, particularly from the local gas company, which was threatened by his activities. "A quote from Volume 134 of Edison's 3,400 diaries reveals the extraordinary intensity of his commitment in the following terse manner: 'Object, ....to effect imitation of all done by gas, so as to replace lighting by gas with lighting by electricity' ...." Beals continues, "On one occasion, for example, a group of bellicose representatives from the local gas company tried to convince an audience that "the mad wizard from New Jersey was about to blow up the whole village."<sup>10</sup> The solar power plant would be located at the very site of the manufactured gas plant that Thomas Edison wanted to render defunct through electricity!<sup>11</sup>

The Brownfields Coordinator contacted Bay State Gas Company's environmental project manager to propose the idea of using the property for placement of a solar array. Bay State Gas Company had acquired the former Brockton Gas Works property, and with it, liability for environmental conditions. The property consisted of two parcels on opposite sides of Grove Street. Although Bay State Gas Company owned the liability, it no longer owned either parcel. LaBaron Foundry, an abutting business owned "Lot 19", having acquired the property from Bay State Gas Company in the 1990's. "Lot 55" was owned by the City of Brockton after the gas company donated it to the City in the 1970s. Bay State Gas Company immediately welcomed the solar project concept and agreed to work with the City to test the project's feasibility.

<sup>10</sup> <http://www.thomasedison.com/brockton.htm>

<sup>11</sup> Map courtesy of ENSR.

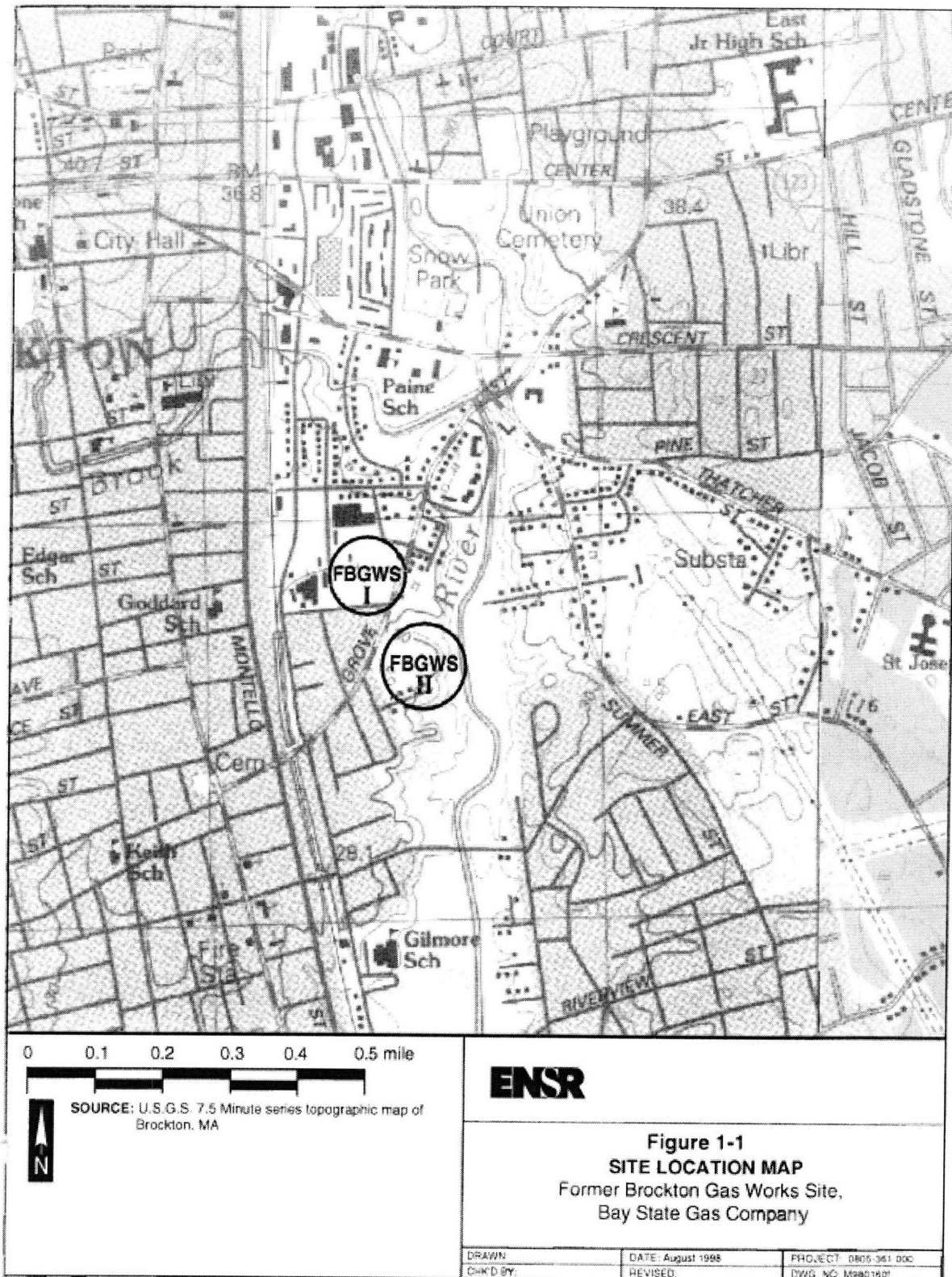
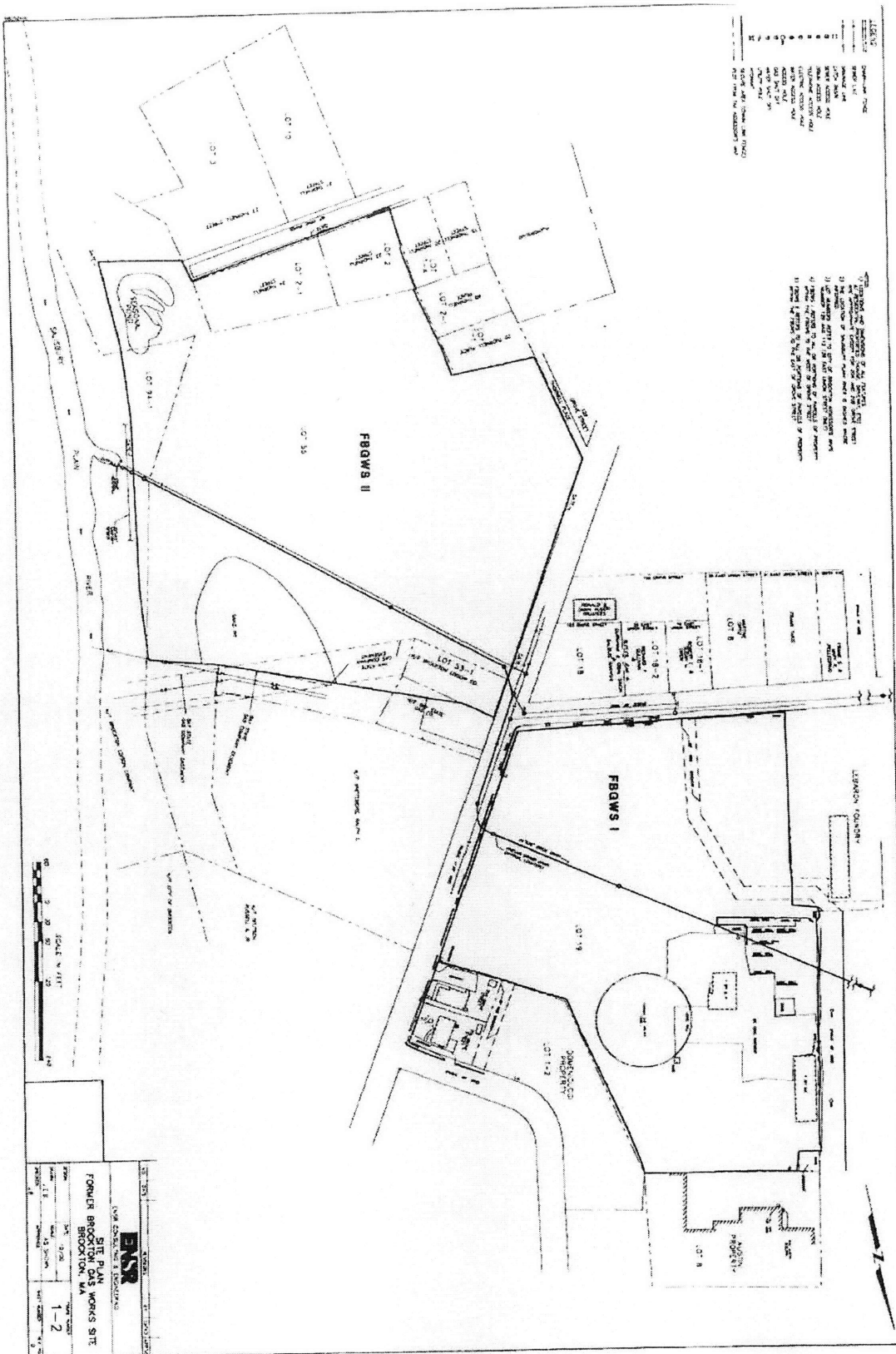


Figure 10 - Site Location Map on Grove Street<sup>12</sup>

<sup>12</sup> Map provided by ENSR.

Figure 11 -- Site Plan for Former Brockton Gas Works Site<sup>13</sup>



<sup>13</sup> Site plan from ENSR



In November 2000, Brockton explored a solicitation from the Department of Energy's State Energy Program, Brownfields to Brightfields initiative. The DOE Brightfields contact in Washington, DC headquarters promised that if Brockton were selected, technical assistance from the National Renewable Energy Laboratory (NREL) would be provided by one of their foremost PV experts. The DOE contact in Boston warned the City that its application was a long shot – many other cities were interested, and its competition in the northeast region included a proposal from New York City “with all the bells and whistles”.

In February 2001, the application was submitted through the Massachusetts Division of Energy Resources. Brockton requested \$30,000 for a feasibility study for the large photovoltaic array on Grove Street, five rooftop installations, and a PV manufacturing facility. Brockton also planned to survey local businesses in partnership with the Metro South Chamber of Commerce to ascertain their level of interest in Brockton's new solar initiatives. Shortly after the application was submitted, the DOE headquarters contact warned the City that NREL assistance was unlikely. The changeover from the Clinton to Bush administration had resulted in reduced support for Brightfields in general, and NREL staff time for the program was being cut.

At about that time, Greg Watson, Director of the Massachusetts Renewable Energy Trust (MRET), administered by the Massachusetts Technology Collaborative (MTC), came to meet with Mayor Yunits about the City's project. He suggested Brockton apply in April for the MTC's first “Green Power Predevelopment Program” solicitation to perform a detailed technical and financial feasibility study for the Grove Street parcel. This grant, budgeted at \$128,415, could enable Brockton to retain consultants to perform the work NREL would no longer be able to perform. In June 2001, city officials were delighted to learn they had won the MTC grant, awarded to only seven applicants statewide. By November, they received official notice they had also won a DOE grant, awarded to only three cities nationwide.

By state law, the Brockton City Council Grant must accept grant funds before they are expended. For the US Department of Energy Grant, Brockton committed to a \$30,000 cash match to cover certain consulting services and the appropriation was approved. The match to the MTC grant came in the form of in-kind services provided by project partners, so no city appropriation was required. Thus, City Council accepted \$158,415 in grant funds with a commitment of only \$30,000 in city funds to explore this promising new approach for brownfields revitalization. The concept seemed to be a winner, and the supporting funds had become available.

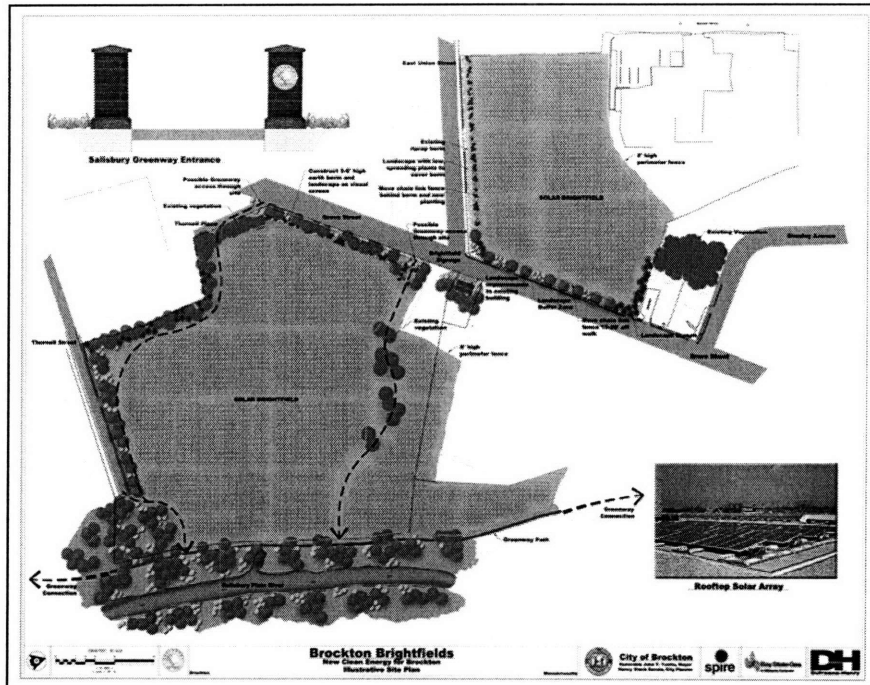
Brockton then contracted for consulting services through the MTC grant and retained Spire Corporation to perform technical feasibility analysis, and international energy consulting firm XENERGY (now KEMA) to perform financial analysis. The Brownfields Coordinator would be responsible for coordinating the overall effort and for community outreach and education. Bay State Gas Company was a very willing partner – in addition to providing its environmental consultants' time, it retained the landscape architecture firm Dufresne-Henry, which had designed Brockton's new urban greenway. Bay State Gas contracted with Dufresne-Henry to provide conceptual designs and renderings for community meetings.

Using the DOE funds, Brockton retained Solar Design Associates to perform the feasibility analysis on the four rooftop installations. This project involved both technical and financial feasibility analysis. Further, Solar Design Associates provided “peer review” and technical advice regarding the Grove Street installation as well as the PV manufacturing plant concept.

The technical feasibility study for the Grove Street Brightfield began in October 2001 and was completed in February 2002. Spire Corporation performed a detailed site survey, worked with Bay State Gas and its environmental consulting firm ENSR, and listened to feedback from meetings with the general public and

city officials. Based on technical, financial and aesthetic considerations, Spire determined that the two parcels could accommodate up to 1 MW of PV, with half to be installed on each parcel. Although the two parcels had a total area of 27 acres, because of easements, site slope, wetlands issues and setbacks, less than 10 acres is available for solar deployment. Spire presented draft diagrams and specifications for the installation. One of the key facets of the facility's design was that it could not penetrate the HDPE membrane that capped contaminated materials below the soil's surface<sup>14</sup>.

**Figure 12: Illustrative Site Plan, November 2001**



Community outreach began early in the project. The first public meeting was held on November 29, 2001 to present preliminary information and to gauge public reaction to the project. About 50 people participated. At that time, Spire believed that on a 27-acre site, it was possible to install 5-10 MW of solar panels. An illustrative site plan and architect's renderings with sight lines were displayed on easels for public view. Landscape architect Peter Jackson had proposed setting back the existing fences and creating a "green screen", installing fencing with brick

pillars and granite caps as well as linking the Brightfield to the Salisbury greenway with a walking corridor. Once residents were assured that the photovoltaics were safe, quiet and effective, community concern immediately turned to the greenway. Residents were very concerned that a greenway would bring undesirable foot traffic onto the quiet street. When it appeared the greenway proposal could defeat the project, city officials agreed to de-link the greenway from the Brightfield. There was no opposition to the facility. The City Councilor representing Ward 4 mentioned the only other proposed use for the site was a self-storage facility, and she believed the solar project was preferable<sup>15</sup>.

XENERGY used parameters from the technical feasibility study to begin the financial feasibility study. XENERGY concluded that the 1 MW array would cost \$3.6 million to develop. They examined grants and incentives that would be available to a public entity, such as a municipally, in a not-for-profit model and those available to a private, for profit operation. The financial analysis showed that with a private developer, the project would have a negative net present value (NPV). There was a small positive NPV for the not-for-profit model. As a result, they recommended that the City own the project. XENERGY concluded the project was financially feasible and proposed that of the \$3.6 million capital budget, the City obtain \$1.5 million in grants, secure \$500,000 from selling the City-owned parcel on Grove Street to Bay State Gas Company, and issue a \$1.6 million bond.<sup>16</sup>

<sup>14</sup> "Technical Feasibility Study for the Brockton Brightfield", prepared by Spire Corporation, February 2002.

<sup>15</sup> "Brockton Brightfield Community Outreach Plan and Summary of Results", prepared by Lori R. Colombo, Brownfields Coordinator, October 2002.

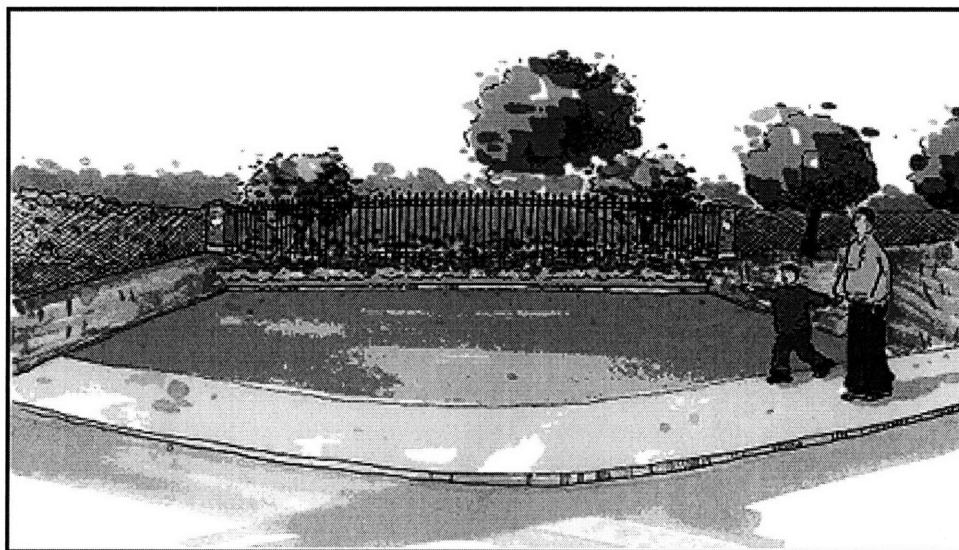
<sup>16</sup> "Brockton Brightfield Pre-Tax Financial Feasibility Study", prepared by XENERGY, April 2002.

XENERGY also performed an ownership and partnership options study that explored five potential operating scenarios. This study recommended that the city pursue the Contractor/Leaser Build and Operate model, which would leverage the expertise of for-profit developers while allowing the city to maximize its ability to secure low-cost capital<sup>17</sup>.

In July 2002, the project team convened a meeting in the Mayor's office to update city officials on the project's preliminary results. While Mayor Yunits embraced the idea of city ownership, the Chief Financial Officer was more skeptical. He said that due to significant state cuts in municipal aid, in order to move the project into development it was imperative that the project team raise all required grant funds and ensure the project is revenue neutral. The Brightfield could not be a drain on the city's general fund. The project would most likely require establishment of an enterprise account, similar to those used for the water and sewer and municipal solid waste accounts. Thus project revenues and expenses could be separated from the general fund, and managed accordingly. The project would realize revenues from selling electricity and renewable energy certificates, and those revenues would need to cover expenses for debt service and facility operations and maintenance.

XENERGY moved on to study the marketing of the energy and green attributes generated by the facility as well as perform a detailed financing study. In the meantime, Spire developed a conceptual facility design and engineering study.

**Figure 13: Rendering of Proposed Brightfield Site as "Solar Energy Park"**



A second public meeting was held on September 18, 2002. By that time, the project team had developed far more detailed information on the project size and characteristics. Revised site plans and renderings were presented. The community had accepted and embraced the idea of the solar facility, but neighbors were very

concerned about the aesthetics. The fence and landscaping were the predominant issues, as well as the height of the solar panels. Residents did not seem to care that the facility would be 1 MW instead of 5 to 10, nor were they particularly concerned with the technology or its benefits. As the Enterprise reported it, "Neighbors of the Grove Street property where thousands of solar panels may be located say they support the project. They just do not want to see it."<sup>18</sup> Brockton officials concluded that the Brightfield must be more than a solar array; it should be designed as a "Solar Energy Park".<sup>19</sup>

<sup>17</sup> "Brockton Brightfield Ownership and Partnership Options Study", prepared by XENERGY, July 2002.

<sup>18</sup> "Brockton Residents Want Solar Panels Hidden." *Enterprise*, September 19, 2002.

<sup>19</sup> "Brockton Brightfield Community Outreach Plan and Summary of Results", prepared by Lori R. Colombo, Brownfields Coordinator, October 2002.

By October 2002, the energy and attribute marketing study and the financing study were complete. It was clear that the project's revenue requirements would pose a challenge if the project were going to be self-sufficient. XENERGY's study showed that Brockton would need to secure contracts at \$65 per MW for the electricity and \$200 per MW for the Renewable Energy Certificates, which could be sold in the private green power market<sup>20</sup>. In November, Brockton applied for a US EPA "Innovations Working Group" grant to test an innovative marketing concept for the "Renewable Energy Certificates" produced by the project. The EPA grant was awarded in March 2003.

All of the six detailed studies were synopsized in a "Conceptual Development Plan" in October 2002. The project team had met regularly and performed each study in concert with other team members. City officials were on board. The community accepted the project provided aesthetic concerns were satisfied. Positive media coverage served to build outside support for the project. The Brightfield plan was presented to key staff of the Massachusetts Renewable Energy Trust. Impressed with the results, MTC amended Brockton's grant agreement with an additional \$79,550 award to complete predevelopment activities, effective March 1, 2003.

In the meantime, Solar Design Associates was performing its studies at five other sites. These included the Brockton High School, wastewater treatment plant, a minor league stadium to be operated by the new "Brockton Rox", the Brockton Area Transit Authority, and a new desalination plant to be built by Brockton's private sector partner in Dighton, MA. "As a result of the site assessments, building plan review and additional computer modeling of initial PV layouts for the buildings, it was concluded that a total of about 557 kilowatts (kWdc) of peak PV capacity could be fielded at the five locations. The smallest single array size defined in this report is 6.4 kWdc and the largest is 82.8kWdc. Utilizing all of the locations would result in a harvest of approximately 586 Megawatt-hours (MWh) of solar-generated electricity each year."<sup>21</sup>

By March of 2003, Brockton had moved through the project concept and feasibility study phase and obtained predevelopment support. It had worked with about 20 different actors over the course of nearly three years. Brockton had won three highly competitive grant awards, as well as a follow-on grant, totaling \$247,965. The project team moved enthusiastically to the next step with the goal of beginning installation in the summer of 2004.

---

<sup>20</sup> "Brockton Brightfield Energy and Attribute Marketing Study", prepared by XENERGY, October 2002.

<sup>21</sup> "The Use of Solar Electricity at City of Brockton Facilities". Solar Design Associates.

**Table 4 – Actors Involved and their Roles in Project Concept and Feasibility Study**

	<b>Initiate</b>	<b>Approve</b>	<b>Assist</b>	<b>Perform</b>
<b>Project Concept</b>	Brownfields Coordinator	City Planner Mayor Bay State Gas Company	DOE HQ DOE RO Spire Corporation	Brownfields Coordinator
<b>Feasibility Study Proposals to US DOE and MTC</b>	Brownfields Coordinator KEMA/XENERGY	City Planner Mayor MTC MA DOER US DOE Brockton City Council	DOE HQ DOE RO MTC Bay State Gas Company Brockton 21 <sup>st</sup> Century Corporation US Senator Edward Kennedy US Senator John Kerry	Brownfields Coordinator KEMA/XENERGY Spire Corporation
<b>Feasibility Study</b>	Brownfields Coordinator KEMA/XENERGY	City Planner Mayor MTC MA DOER US DOE Ward 4 City Councilor	DOE HQ DOE RO MTC Brockton 21 <sup>st</sup> Century Corporation Mass Electric Brockton DPW* Brockton Area Transit Authority* Brockton Rox* Aquaria*	Brownfields Coordinator KEMA/XENERGY Spire Corporation Bay State Gas Company ENSR Dufresne-Henry Solar Design Associates
<b>“Innovations” Grant from EPA</b>	Brownfields Coordinator KEMA/XENERGY	City Planner EPA City Council	EPA Region 1 MTC	Brownfields Coordinator KEMA/XENERGY

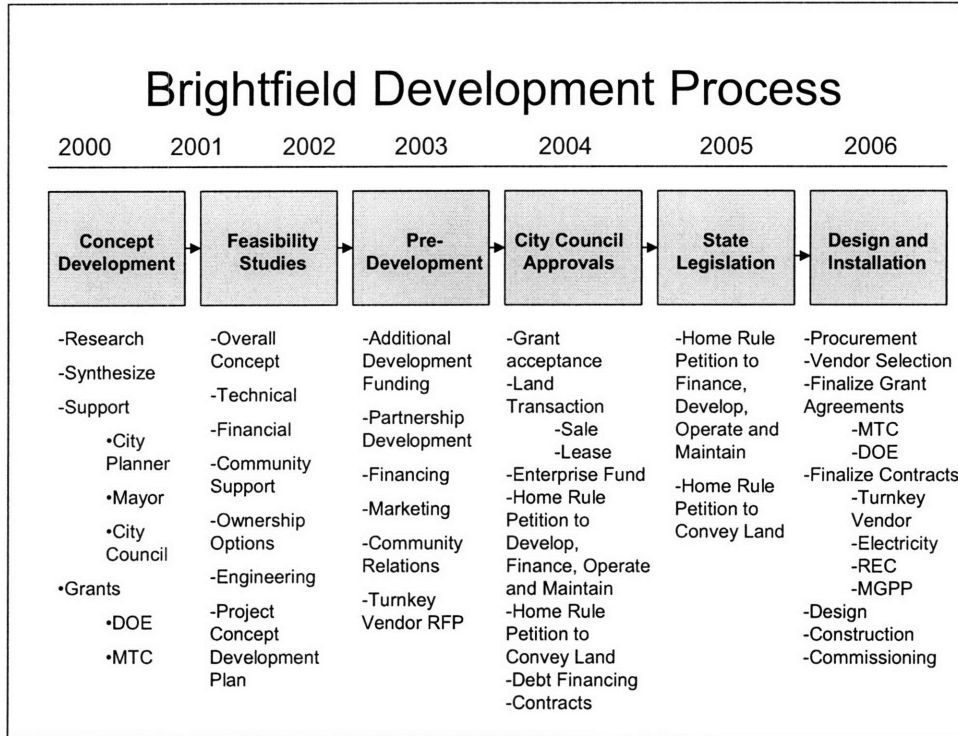
\*Owners of potential host sites for solar arrays.

Brockton’s Brightfield appeared well positioned to succeed. The City had performed detailed studies, they were thoroughly vetted, and the project enjoyed significant support at the local, state and Federal levels. Bay State Gas Company agreed to install the fencing and landscaping designed by Dufresne-Henry, valued at \$575,000, thus assuring community support. The City had secured the funds it thought were necessary to complete final predevelopment activities. The rest was simply implementation....

**Implementation Experience**

The completion of feasibility studies and beginning of predevelopment in 2003 was a landmark in the three-year journey, but unknown to project proponents; it was only about the halfway point in the process.

**Figure 14 - Brightfield Development Process**



Pre-Development Activity

Brockton had pre-development activities to complete in order to install the Brightfield. These included securing development funding, developing partnerships, completing its financing plan, ongoing community relations, and developing a turnkey vendor request for proposals (RFP).

*Securing Development Funding*

The project development budget required \$3.6 million to develop a 500 kW facility. There were two major challenges: securing \$1.5 million in grant funds when there were no existing grant programs providing large grants for solar technologies; and, convincing Bay State Gas Company to pay the City \$500,000 to purchase the same parcel of land it had donated to the city 30 years prior.

**Table 5 -- Brightfield Development Budget**

Proposed Sources of Funding	Amount
Grants	\$1,500,000
Revenue from sale of Lot 55 Grove St. to Bay State Gas Company	\$ 500,000
Municipal Bond (Debt)	\$1,600,000
Total	\$3,600,000

Securing \$1.5 million in grant funding was a significant challenge. The XENERGY report identified the most likely grant sources as the Massachusetts Renewable Energy Trust and the Massachusetts Community Development Action Grant (CDAG) program administered through the Department of Housing and Community Development. XENERGY also recommended that Brockton explore the possibility of securing a federal appropriation. There were no existing federal or state grant programs for which Brockton's Brightfield was a clear fit. The Federal Brightfields program had provided the feasibility funding, but solicitations were sporadic and there was no indication that significant capital funds would become available. The team knew it had to be creative, flexible and opportunistic to succeed.

Obtaining MTC's support was considered crucial to attracting other funding partners. The timing seemed appropriate in August 2003 when MTC's Director of the Renewable Energy Trust, Rob Pratt met with Mayor Jack Yunits and key members of the team. It resulted in Rob Pratt agreeing to work with the City to submit a \$1 million proposal to the MTC Board. Because the Brightfield request did not fit within existing program guidelines, Brockton would need to submit an unsolicited proposal. Pratt advised Brockton that in order to justify this expenditure, the proposal would need to highlight educational activities and economic development, and it would need to demonstrate that the facility would be a statewide asset. Brockton submitted a first draft in September 2003. That same month, Brockton also submitted a proposal for the "Massachusetts Green Power Partnership", (MGPP) a revenue guarantee program for RECs (see later detailed explanation). This "put option" was requested to provide a guaranteed revenue stream in the later years of the project (2012-2021) since the market for RECs was new and a revenue stream was imperative to secure bond financing. The City would only need it if the REC contract for which it had a letter of commitment, was in default.

Following a consultative visit from new MTC staff member Warren Leon, Brockton submitted a revision to its \$1 million proposal with greater focus on educational programming. One more series of revisions was prepared, with the goal of making the October board meeting. This final proposal highlighted the cost-effectiveness of Brockton's utility-scale project compared to the balance of MTC's solar grants, as well as the City's significant commitment of local funds. On average, grants from MTC's "Solar to Market Initiative" (up to \$500,000) were providing \$5.40 per watt subsidies for small installations (average 39 kW installation commitments) as compared to \$2.50 per watt for Brockton's single 500kW installation. A \$1 million grant would represent only 28% of the total project cost. ***Conclusion:** Brockton's project will increase by 71% the kW of installed PV supported by MTC at one third of the total grant support already approved. It will require a \$/installed watt grant level less than half of the past grants made by MTC.*"<sup>22</sup>

Pratt subsequently told Brockton its proposal would be better considered in the November board docket. This would give staff time more to prepare and be more effective advocates. Further, it would help for Mayor Yunits to meet with the MTC board member that chairs the RET subcommittee, Lawrence Reilly, Vice President and General Counsel for National Grid. The meeting was scheduled in October, and Mr. Reilly offered his support. In the meantime, MTC staff members requested numerous memos and analyses to bolster their arguments to the Board.

The proposal was pulled at the last minute from both the November and December dockets. It had become quite controversial. One very powerful board member was opposed to PV funding in general, and Brockton's project in particular. He felt that PV was not cost-effective as a

---

<sup>22</sup> "Brownfields to Brightfields: Revitalizing Brockton by Redeveloping a Brownfield into a Solar Energy Park". Proposal submitted by City of Brockton to Massachusetts Technology Collaborative, Renewable Energy Trust. November 7, 2003. Page A-1.

technology, and that investing \$1 million in one solar project was excessive relative to the energy generated. Rob Pratt believed that it was imperative for the Mayor to meet with this board member. The meeting was scheduled in February. It did not go well.

Mayor Yunits, the Chief Financial Officer, and Brownfields Coordinator presented the project, its benefits, and ways it supported the intent of the enabling legislation for the MRET. The Board member was vehement that “PV is not ready for prime time”, and that as a steward of state funds, he could not support non-net metered grid-connected PV as a matter of policy. He did not believe the environmental, economic development, or educational aspects of the legislation were relevant because there were other programs to support those types of initiatives, and he perceived the Trust solely as an energy fund. He said that unless someone could give him data that showed how it made sense from an energy policy perspective, he could not support the project.

The Mayor already had arranged a subsequent meeting with the Secretary of Commonwealth Development, Doug Foy, whom he believed would support the project and could convince the opposing Board member. One tense meeting, select State House lobbying by stakeholders including a local bank president, Bay State Gas Company’s president, and the local Chamber of Commerce, significant maneuvering by Pratt, and several memos and phone calls later got Brockton’s proposal to MTC’s February docket with an assurance it should succeed. Two days before the Board meeting, rumblings from the MTC Board led to a request to “bifurcate” the \$1 million grant decision from the MGPP decision. A flurry of subsequent letters, memos and phone calls got both proposals to the Board and an eventual favorable decision on February 26, 2004. The Mayor and Rob Pratt had expended significant political capital, with a great deal of behind-the-scenes assistance, to overcome the contentious resistance. This award was considered key to winning additional grant support for the remaining \$500,000 and making the project “real”.

The quest for additional funding went to multiple federal agencies: DOE, EPA, and EDA. Further, Brockton representatives (Mayor and Brownfields Coordinator) met with staff from the offices of Senators Kennedy and Kerry and Congressman Lynch. In one trip to Washington DC, the Mayor and Brownfields Coordinator met with the Assistant Secretary of Energy for EERE, David Garman. Garman said he would like to give the City a \$500,000 grant, but was not sure how to do it. The Solar Technologies Program funding approved by Congress could not be used for hardware; it was primarily for research and development. There was a small amount of funding for Million Solar Roofs, but that was for education and outreach, not deployment. He advised the City to work with his staff, and they believed funding would be more easily obtained if Brockton became a Million Solar Roofs Partnership. DOE headquarters staff advised Brockton to apply to the partnership. Brockton applied, as this would help the City realize its goals of installing the other systems it had studied. The DOE staff also made the unusual recommendation that Brockton apply for the typical \$50,000 Phase I partnership, and also add an extra request for an additional \$100,000. That special request was denied.

Brockton also applied for the Community Development Action Grant (CDAG) under the Massachusetts Department of Housing and Community Development, and wrote letters of inquiry for a number of private foundation grants.

The Brockton project team convened a meeting between MassDevelopment and MTC staff to discuss financing options, perhaps a low interest loan program. MassDevelopment said it would need to work within an existing program, and that it likely would not be more favorable than a municipal bond. But they would be willing to work with the City.



**Table 1 -- Grants Applied for in 2003-2004**

<b>Agency</b>	<b>Program</b>	<b>Amount Requested</b>	<b>Successful</b>
<b>FEDERAL</b> US DOE	Million Solar Roofs	\$50,000	Yes, but cannot be used for Brightfield, extra \$100,000 request denied
US DOE	State Energy Program, Renewable Energy on Brownfields	\$150,000	Yes, but only at \$59,400
US EDA	Public Works	\$750,000 in 2003 \$350,000 in 2004	No
Federal Appropriation	DOE EERE	\$1.2 million	No
US EPA	Supplemental Environmental Projects (project performed in lieu of, or in addition to, paying a penalty for a violation)	Not specified – dollar amount is based upon penalty	No
<b>STATE</b> MTC	Unsolicited proposals	\$1,000,000 capital \$40,000 education	Yes
MTC	MGPP	\$1,210,400 revenue guarantee	Yes
Department of Housing and Community Development	CDAG	\$404,650	No
Massachusetts Department of Environmental Protection (DEP)	Supplemental Environmental Projects	Not specified – dollar amount is based upon penalty	No
Massachusetts Executive Office of Environmental Affairs	Environmental Justice Initiative	Not specified – no funds were available, the EJI was seeking projects to have ready in the event funds could be made available	No
<b>PRIVATE FOUNDATIONS</b> StEPP Foundation	Strategic Environmental Project Pipeline	Up to \$500,000	No
Sheehan Family Foundation	Environment	\$25,000	Yes

There were a number of agencies approached and who told Brockton not to submit proposals because the project did not fall within their guidelines. The applications submitted are summarized below. Note, the applications that were not funded by EDA and CDAG were because job creation is one of the major programmatic goals, but the Brightfield does not create full time jobs, only installation jobs and an O&M contract that employs < .25 FTE (full time equivalents).

By the end of 2004, Brockton had secured \$1,084,000 in grants to construct the facility, a \$40,000 educational grant, and a revenue guarantee, which, if tapped, could provide up to \$1,210,400 in revenues over a 10-year time frame. The City was \$416,000 short of its goal for capital development, even after having expended significant time, resources, and political capital seeking grants from a diverse array of sources. **The lack of available funding programs proved a hurdle the city could not overcome to reach its capital development goal. DOE solar funds could not cover hardware and installation; economic development funds whose primary metric is job creation had other priorities; private foundations interested in renewable energy support education, outreach, advocacy and policy rather than local implementation projects.**

Another component of the financing plan was the sale of Lot 55 from the City of Brockton to Bay State Gas Company. This parcel had been unused for decades and was donated by the Gas Company to the City in 1972. It remained unused for the following three decades. Company officials had agreed that they would like to own the property for site control purposes. Because the chosen remedial remedy for site closure was a cap, Bay State Gas is responsible for maintaining the integrity of the cap in perpetuity. The idea of the transaction was supported, but the price had to be negotiated. The assessed value of the 14.7-acre property was listed as \$723,400.

Bay State Gas Company wanted to purchase only 8.174 acres of the total area, subdividing off the non-developable rear part of the property in the wetlands for the city to retain for protection of the Salisbury River and a potential greenway. The private appraisal for the 8.174 acres was \$392,638 so the company offered \$400,000. City officials felt strongly that they needed the full \$500,000 to finance their project. The company was concerned because all costs would be passed through to ratepayers and are subject to scrutiny by the Department of Telecommunications and Energy. Several more meetings, letters and telephone calls later, the City justified the costs and Bay State Gas Company agreed to the \$500,000 figure in January of 2004.

With the \$500,000 in place, Brockton had come close to its development goal: if the City obtained a \$1.6 million bond, it would have \$3,184,000, enough to install about a 450kW array.

After Brockton obtained the MTC grant award and negotiated the land transaction, the City turned to its bond counsel, the law firm Palmer & Dodge, LLP (currently Edwards Angell Palmer and Dodge, LLP) to initiate the process of securing a \$1.6 million municipal bond. The Chief Financial Officer scheduled a meeting at the Boston office of Palmer & Dodge on April 28, 2004, accompanied by the City Solicitor, Brownfields Coordinator, and consultant from KEMA-XENERGY. The attorneys advised Brockton that the City could not obtain a 20-year bond because Chapter 44 of the Massachusetts General Laws dictates the terms of debt municipalities can incur for various purposes. Chapter 44, Section 7 of Massachusetts General Laws has only one provision dictating the terms relevant for a renewable energy project.

CHAPTER 44, Section 7 Cities and towns; purposes for borrowing money within debt limit. "Cities and towns may incur debt, within the limit of indebtedness prescribed in section ten, for the purposes hereinafter set forth, and payable within the periods hereinafter specified: ... (3B) For energy conservation and alternative energy improvements to public buildings or facilities owned by the city or town, ten years."<sup>23</sup> They recommended the city could issue a 10-year bond. However, the financial model required the project to be revenue-neutral and paying the debt over ten years was not possible. This problem, they said, could be resolved through special state

---

<sup>23</sup> Massachusetts General Laws, Chapter 44, § 7.

legislation. Further, the attorneys added that the city lacked the legal authority to finance, develop, own and operate the facility because such authority was not explicitly granted in the Massachusetts General Laws. This problem similarly could be addressed through special state legislation, or a Home Rule Petition.

The project team was stunned. After completing detailed studies with the help of experts from a reputable energy services company and working in close contact with state and federal energy agencies, nobody had ever raised either of these issues. The special legislation would have to be written, approved by Brockton City Council, and then the State Legislature. In order to meet the state legislature's filing deadline of July 31, the City would need to act quickly. If the Home Rule Petition were filed to City Council in May, it would be read and referred to Finance Committee, and then need to go to a final vote. Beginning in June, Brockton City Council moves to a summer schedule and meets only once per month. The team had two weeks to develop the language and obtain the support of key City Councilors in order to meet the deadlines.

**The lack of legal authority to finance, develop, operate and own the facility, along with the limitations on borrowing term were the second major hurdle that threatened to derail the project. Its viability hinged on an act of the state legislature.**

While they were obtaining legal advice from bond counsel, the project team sought assistance on another vexing question. After hours of research and consultation with the Chief Procurement Officer, it was not clear which chapter of state procurement law would apply in seeking a vendor. Further, the construction procurement laws require that the design and build phases be separate. This would prove quite difficult as the design phase for utility-scale photovoltaic technology could result in a design that only one company's product could fulfill, which is prohibited. The attorneys said they would consult their in-house procurement experts, and also that issue could also be addressed within the Home Rule Petition. The project team asked that the Home Rule Petition specify Chapter 30B Uniform Procurement Act, which would allow the City to make its selection based on evaluation criteria rather than the "lowest qualified and responsible bidder" as dictated by the construction procurement regulations.

While the attorneys researched and drafted the Home Rule Petition, the project team began reaching out to key City Councilors and its state delegation to get the Home Rule Petition process started. Brockton is represented in the House by three Representatives (Canavan, Creedon and Kennedy) and in the Senate by Senator Robert Creedon.

The Home Rule Petition was read and accepted on May 24, 2004 and referred to the Committee on Finance. Finance Committee voted to recommend it favorably on June 14, and a final vote accepting the bill was passed on June 29, 2004. It was introduced in the House on July 1, 2004 (House No. 4955). Hearings were held by the Committee on Energy on August 2, 2004 and the Committee on Long-term Debt and Capital Expenditures on September 28, 2004. The Committee on Long-term Debt and Capital Expenditures made an amendment in the original language limiting borrowing to \$2 million (House No. 5098). That amendment had to go back to the Brockton City Council for acceptance. It was accepted and passed under suspension of the rules on October 25. The bill would subsequently need to pass through the Ways and Means Committee. The legislature was in informal session, and many representatives were busy campaigning for the fall elections, after which many were not in the House. The bill languished until December when it passed through Ways and Means and passed the House. On December 23, it was taken up by the Senate where Senator Creedon recommended the bill be amended by changing one clause by inserting after the word "bonds", the "or notes issued in anticipation of such bonds". The amendment was adopted. The bill was passed, and had to be sent back to the

House for concurrence on the amendment. The vote on the bill was delayed until the final day of the legislative session, January 3, 2005. Near the end of the session, the House voted to concur with the amendment. It was after 6 PM, however, and the Senate President had adjourned the Senate session. Before the House could vote to enact the Bill, the House Speaker adjourned the House session as well. The bill died literally in the last minutes of the 2004 session.

Project proponents were fearful the project itself was dead. Obtaining the \$1 million from MTC was highly controversial, and the MTC would not sign a grant agreement with the City until the Home Rule Petition was enacted into law. If the City did not act quickly and had to wait a full year to go through the legislative process once again, it risked losing its grant. The project was in great peril.

Representative Kennedy and Senator Creedon suggested the City seek to have the bill passed under suspension of the rules early in 2005. This required another vote from City Council accepting the House and Senate amendments, lobbying the Senate President, Speaker of the House, House Minority Leader and Governor Mitt Romney. Mayor Yunits, the Brownfields Coordinator, and the legislative delegation, with their staffs, worked frantically. The bill was resubmitted on January 31, 2005, passed both the House and Senate under suspension of the rules on February 10, 2005 and presented to the Governor, who signed it on February 17, 2005. The Brightfield had survived a near-fatal emergency, and it took an extraordinary act of the state legislature to resuscitate it. "Chapter 5 of the Acts of 2005: An Act authorizing the city of Brockton to install, finance and operate solar energy facilities" (House, No. 2007), approved by the Governor, February 17, 2005<sup>24</sup>, provided the required legal authority.

With this act, the City was now poised to be able to issue a bond. The type of bond was uncertain. Because Bay State Gas Company would own the property and lease it to the City, and because a private company would purchase the Renewable Energy Certificates, bond counsel advised the project would not be eligible for tax-exempt financing and would require a taxable bond. The City's ability to obtain low cost capital was diminished with this ruling. Nonetheless, the City had at this point won two major battles: obtaining the grant and the special legislation. The Mayor's office convened project stakeholders and initiated weekly meetings. It now seemed clear sailing to implement the Brightfield installation.

### *Partnership Development*

At the end of the feasibility study, Brockton sought to identify partners who might be able to help with different aspect of the project's development. The team believed that colleges and universities might serve as partners out of interest in research and development opportunities presented by a utility scale system, or perhaps an ownership interest. The project team sent letters and made follow-up phone calls. None of the universities including MIT, Harvard, Tufts, Boston University, and University of Massachusetts at Lowell and Amherst were interested.

The primary partner that was cultivated was private partner Bay State Gas Company. The company played several key roles. First, as the responsible party for the contamination, Bay State Gas wanted to own the property so a land transaction was required, per the negotiated term. Second, the City needed to negotiate a lease back for Lot 55 to develop Phase II of the Brightfield. Third, Bay State Gas had volunteered to install the attractive fencing and landscaping that was critical to winning community support. The fencing was installed in November-December 2002 and landscaping in the spring of 2003. Finally, Bay State Gas

---

<sup>24</sup> See attached Appendix 4.

encouraged the project team to apply to NiSource for an environmental grant that would support development of an educational display. From the project development perspective, working with Bay State Gas Company on the land transaction and lease were the most critical aspects of the partnership since the sale of the parcel provided critical project funds and the lease of both parcels would provide site control.

*Site Control: Land Transaction and Lease*

Negotiating and implementing the land transaction and lease were managed by the City Law Department with implementation assistance and appearances at City Council by the Brownfields Coordinator. The Assistant City Solicitor, Benjamin Albanese, who handled all legal aspects of acquiring and disposing of City-owned properties, was charged with completing the land disposition and negotiating a lease agreement with Bay State Gas Company. Both transactions would require City Council approval, with the sale to flow through Real Estate Committee and the lease through Finance Committee. Further, proceeds from land transactions typically go to a city's General Fund, per Massachusetts General Laws. Channeling the funds to the project would require the City to establish an enterprise fund account, transfer the property as an asset of the fund, and obtain authorization to direct the funds to the Enterprise account.

Municipal disposition of land is typically performed through Chapter 30B, the Uniform Procurement Act, as are leases. The Assistant City Solicitor determined that because the property was a hazardous waste site, that status exempted the land from Chapter 30B as a special circumstance, so all that was required was City Council authorization. He wrote orders that were submitted in draft form to the Ward 4 City Councilor Linda Balzotti in August 2003, and the language was negotiated. Following the completed negotiations with Bay State Gas Company regarding price, the order was filed with the Council in January 2004, and referred to the appropriate committees. In Council, the primary concern was what Bay State Gas Company would do with the land if the Brightfield did not come to fruition. However, the Councilors were so impressed with the new appearance of the site after the fencing and landscaping was installed, the dramatic change was one of the most frequently cited reasons for the Councilors who spoke before voting in support. All three orders were unanimously supported – land sale, lease, and Enterprise fund.

Bay State Gas Company was eager to close on the property transaction because their DEP-mandated closure date for the site remediation was August 25, 2004. The site would require an Activity and Use Limitation, which is a deed restriction. The Company could apply it more readily if it owned the property. Otherwise, both the City and the gas company would need to engage in an additional series of legal transactions. Also, Bay State Gas Company had to file plans to subdivide the property and obtain Planning Board Approval, which it received in March 2004.

The Law Department was not concerned with Bay State Gas Company's regulatory requirements and did not act to close the transaction for several months. In August 2004, the City Solicitor over-ruled the Assistant City Solicitor and said that the parcel was not exempt from Chapter 30B, and that it would be necessary to issue a request for proposals (RFP) for the disposition of real property. Finally, in November 2004, the Law Department prepared a draft Request for Proposals, circulated it for comments, and issued it in December 2004. The RFP specified that the site be used for solar energy, the minimum price was \$500,000, and required a leaseback arrangement.

A pre-bid conference was planned on December 28, 2004. Bay State Gas Company submitted its questions and comments in advance, as there were several significant issues raised by the RFP that they sought to negotiate. Most importantly, the company was interested in purchasing only the 8.174 acres that had been subdivided previously, but the entire 15 acres had been included in the RFP (the Law Department ignored comments from the Brownfields Coordinator and DPW Commissioner, which raised this issue). Further, the lease agreement attached to the RFP had terms unacceptable to the company and at odds with terms the Mayor and Bay State Gas Company President Steven Bryant had negotiated. The Chief Procurement Officer determined that reducing the parcel size from the 14.7 acre Plot 55 to the smaller 8.174-acre parcel constituted a “significant change”. If the company would not purchase the entirety of Plot 55, nor accept the terms of the attached lease agreement, the RFP would need to be withdrawn, as those terms could not simply be negotiated. Bay State Gas Company said it could not accept the terms of the RFP. The Chief Procurement Officer initially extended the deadline, and then terminated the procurement on February 2, 2005.

On February 16, 2005 the City re-issued the RFP incorporating the changes to the parcel being offered and lease terms that were unacceptable. The Chief Procurement Officer sent a notice to Bay State Gas Company. However, no proposal was submitted on the second proposal deadline of March 18. The notice of the RFP had escaped the company’s attention. Yet a third RFP was finally issued in April with a May 6, 2005 deadline. The proposal from Bay State Gas Company was complete, with one exception. The City, using standard state forms, required that Bay State Gas Company list all officers of the corporation and include a sealed corporate vote allowing an officer to act on this transaction. The officers did not meet routinely, and were located in various divisions of the parent company NiSource; many were in other states including Indiana and Virginia. The Corporate officers would need to call a special meeting just for the purpose of completing the proposal. The signed documents were finally submitted at the end of May, allowing the City to act on the proposal.

By this time, the City Solicitor said the 2004 authorization was not valid in a new fiscal year, so the orders would need to be re-submitted and the transaction accepted by City Council in FY2005. Near-identical language was submitted. By this time, Mark Gildea, General Counsel to the City Council objected. He argued that money from a land transaction had to go to the General Fund, not an Enterprise account. The City’s attorneys from Edwards Angell Palmer & Dodge informed the City Solicitor that while that is typically the case, the Home Rule Petition as written provided the city legal authority to direct the funds into the Enterprise account. The Ward 4 City Councilor said that Gildea, who was not a fan of the project, had told a number of Councilors that they ought to require the money to go to the General Fund and use it for a different purpose than the Brightfield. There had been numerous municipal budget cuts and the \$500,000 could fund other important projects. Although the City Solicitor, Mayor, and CFO agreed that Palmer & Dodge was correct on the law, they did not believe their opinion would sway councilors who were being advised otherwise from their own Counsel. Palmer & Dodge contended that the funds, per the terms of the RFP and the home rule petition, needed to be used for the project. The CFO advised the team not to fight the amendment in the language. The net result would simply be one more appropriation, after the check was received, to allocate the money from the general fund to the Enterprise account. The project team did not fight the amended language and in June

2005, City Council passed the new ordinance authorizing the land transaction, lease and Enterprise account.

Bay State Gas Company continued to push for a closing date, and in September 2005 the Assistant City Solicitor finally began to work with the company and its attorneys to schedule a date and time. At that point, he first examined the deed to the property and discovered that it had been conveyed in 1972 from Bay State Gas Company to the city with a restriction: “the parcels are conveyed subject to a restriction that the property shall be used for park, recreational or conservation purposes only.” This provision triggers Article 97 of the Massachusetts Constitution, which says that land taken or acquired for conservation and other natural resource purposes cannot be used for another purpose except by a vote of two thirds of each branch of the state legislature. The gas company’s attorneys at Foley Hoag said the company could not, by law, close on the property. Attorney Albanese argued to the attorneys for Bay State Gas Company that since the land was a hazardous waste site and never used for park or recreation purposes, Article 97 did not apply. Foley Hoag found an Opinion of the Attorney General from 1973, which clarified interpretation of Article 97. In a letter dated October 11, 2005, Jacob Polatin of Foley Hoag wrote, “Bay State Gas does want to purchase the Grove Street property and lease it back to the City. However, Bay State cannot buy, and I am sure the City does not want to sell, the land in violation of a constitutional prohibition”.<sup>25</sup>

Another potentially fatal crisis had emerged. The land transaction and lease were required both to provide a vital \$500,000 infusion of cash to the project and to give the city site control to develop the Brightfield. A two-thirds vote of the State Legislature was required, and it had to be done by November 16 when the formal session ended because a two-thirds vote could not be obtained in an informal session. Delaying the vote until some time in 2006 seemed likely to result in a withdrawal of the MTC grant. The agreement had not been signed as MTC awaited proof the City could meet its matching funds commitment. The eleventh hour discovery of the deed restriction was a significant embarrassment.

A Home Rule Petition was filed with the Brockton City Council and passed under suspension of the rules on October 24, 2005. On October 28, 2005, Representative Thomas Kennedy wrote to Speaker of the House Salvatore Dimes requesting immediate action on House Docket 4850 “An Act Authorizing the City of Brockton to Convey Certain Park Land”. He requested swift action before the legislature adjourned on November 16<sup>th</sup>. On October 31, the bill was referred to the Joint Committee on Municipal and Regional Government. It was stalled – as it turns out, because the land was a gift to the City, the Attorney General would need to approve the transaction. Mayor Yunits had to go to the State House in early November to secure that approval. The public hearing for the Joint Committee on Municipal and Regional Government was held on November 14, 2005. It was moved with a favorable report to the House Steering, Policy, and Scheduling. On November 16, both houses of the state legislature unanimously voted in favor of Chapter 151 of the Acts of 2005: An Act authorizing the city of Brockton to convey certain park land (House, No. 4470). After passage by the legislature, the bill was sent to the Governor’s desk. The Executive Office of Environmental Affairs (EOEA) would need to approve the transaction for the Governor

---

<sup>25</sup> Letter to Benjamin Albanese, Esq. From Jacob Polatin, Re: Grove Street Conveyance – City of Brockton to Bay State Gas Company. October 11, 2005.

to sign. Senator Creedon's staff had to make the case for the project. With EOE's approval, Governor Mitt Romney signed the Act on November 22, 2005.

The Brightfield had survived yet another near-fatal challenge. There were yet other details gone awry, but the transaction finally closed in December 2005, nearly two years after the City and Bay State Gas Company had negotiated the sales price and the basic terms of the lease. This step was necessary both for financing the project and for establishing site control so as to develop the facility.

**Article 97 of the Massachusetts Constitution is a challenge for municipalities seeking to develop utility-scale renewable energy projects. Because city-owned land is often in scarce supply, and much of the land base falls under the broad brush of the Attorney General's interpretation of Article 97, even land that has not been developed as a park or conservation area could be considered affected by Article 97. The City Law Department's oversight in examining the deed early in the transaction nearly killed the project. The Attorney General's ruling concluded that "it would be seen prudent to classify lands and easements taken or acquired for a special purpose not found verbatim in Article 97 as nevertheless subject to Article 97 if reasonable doubt exists concerning their actual status." The Attorney General concluded that "natural resources" includes "land, soil and soil resources."<sup>26</sup> In effect, any parcel of undeveloped municipal land could potentially be construed to be subject to Article 97 restrictions.**

**Delays in project steps required duplication of effort and heroic measures to rectify. Two series of nearly identical orders to City Council were required to complete the land transaction, lease, and Enterprise fund because the transactions crossed over from one fiscal year to the next. Lengthy delays increase the number of transactions and associated costs. City officials and state representatives needed to expend significant political capital to obtain a vote of two thirds of the Massachusetts Legislature in less than three weeks.**

### *Financing*

The next step in developing the capital budget was obtaining City Council approval to issue a municipal bond for \$1.6 million. In prior presentations to City Council, the project had been portrayed as revenue neutral. Over the course of 2005, there were three changes that cast doubt on that scenario. When the Mayor sent his request to City Council, the CFO certification letter stated that, "I do not believe it is likely that this project will be truly revenue neutral, but I think it is probable that the annual incremental cost impact on the city, net of on-going project revenues, will be less than \$100,000. This is not a significant sum compared to the city's annual budget."<sup>27</sup> The project team had to explain what had happened, estimate the risk of the worse case actually transpiring, and convince the Council that even with the risk of the negative cash flow, the project was still worth supporting. The Brownfields Coordinator was charged with sending explanatory materials to the Council and making the presentation.

The initial challenge was explaining what had happened to change the finances. First, the City had failed to meet its fundraising goal of \$1.5 million in grants. As a result of not obtaining the CDAG grant, the Sheehan Family Foundation's board withdrew its pledge.

---

<sup>26</sup> Ibid.

<sup>27</sup> Letter from Chief Financial Officer John A. Condo to Mayor John T. Yunits, Jr. and the Brockton City Council. July 18, 2005.



The \$1 million MTC grant had been approved with the condition that the grant not exceed 28% of the total budget. The grant agreement subsequently was reduced to \$840,600. As a result, the City's budget was reduced to from \$3,600,000 to \$3,012,223 allowing construction of a facility no greater than 425 kW rather than 500 kW.

Second, the contracts for electricity and Renewable Energy Certificates had changed (see section below). The REC agreement that was actually executed was at a slightly lower rate of \$180 per MWh as compared to the prior \$185 per MWh projection and the contract was for the first ten years of the project with a revenue guarantee for the next seven years and uncertain revenue the final three years.

Third, the City learned in November 2005 that it had finally succeeded in obtaining a Federal appropriation. However, the initial \$1.2 million request for expanding to Phase II resulted in only \$800,000. With the project over \$500,000 behind in fundraising, the City needed to work with the Federal delegation and the DOE to determine whether the money could be used for this Phase I. While funds were available, their applicability and timing were uncertain. And it would take several months to receive the official award letters; but without the award letters, the MTC would not re-institute the full \$1 million grant.

As a result, the financial scenarios presented to City Council showed a worse case \$46,844 annual loss for the first ten years and \$10,482 for the second ten years. The best case, in contrast, showed a \$13,924 average annual positive cash flow for years 1-10 and \$33,661 for years 11-20.<sup>28</sup>

The Brownfields Coordinator presented the explanation about what had occurred, the best and worse case financial scenarios and their projected impact on the City's annual budget, and then made the case for why the Council should continue its record of unanimous support based on numerous benefits, some of which cannot be monetized. The project had returned a property to the tax base, which would contribute \$13,900 to the general fund based on 2006 tax rates. The sale of the parcel to Bay State Gas Company eliminated the City's liability for the hazardous waste site (which accrues to the municipal balance sheet). The project installation (see below) would create work for two local companies. The community supported the sustainable redevelopment. Blight was converted to a community asset, raising local property values. The site would provide educational opportunities for local children. Finally, the project would enhance the City's image<sup>29</sup>. The City Council unanimously approved the \$1.6 million in borrowing.

Brockton submitted an application to the US Treasury for "Community Renewable Energy Bonds" (CREBS) in April 2006. The Energy Policy Act of 2005 created this new financial instrument. The CREB is a tax credit bond that offers municipalities, electric cooperatives, and other public power systems to obtain the equivalent of an interest free loan while the bondholder receives a tax credit. The IRS did not commit to any decision dates, so in the interim the City issued a Bond Anticipation Note. If the city does not obtain the CREBs, it will need to issue a taxable bond, meaning a difference of up to 6% in interest and significant total difference in project financing costs.

---

<sup>28</sup> Memorandum to City Council Finance Committee from Lori Colombo, Brownfields Coordinator. November 30, 2006.

<sup>29</sup> Ibid.

**Over the course of five years of authorizing transactions, including heroic measures to secure home rule petitions, City Councilors had become heavily invested in making the Brightfield project succeed. This long-term support helped win approval for a project that might have negative cash flow, despite repeated warnings that it would have to be revenue neutral.**

### *Marketing the Facility Output to Generate Project Revenues*

During the project feasibility study, KEMA-XENERGY devised revenue targets of \$65 per MWh for the electricity generated by the Brightfield and \$200 per MWh for the Renewable Energy Certificates (RECs)<sup>30</sup>. The \$200 per MWh figure was quite aggressive, but preliminary results from the feasibility study suggested it might be achievable. Brockton had been awarded a \$10,000 grant from US EPA for an “Innovations” Grant to experiment with an innovative model for marketing the RECs from the Brightfield. The model was designed to encourage long-term contracts and a premium price at a time when most green power marketers favored short-term contracts and the average price for solar RECs was much lower.

The proposed approach for marketing the RECs from the Brightfield is similar to selling stock in a company with the promise that dividends will increase over time. Basically, purchasers would pay a premium in the early years in return for a greater quantity of lower priced RECs in later years. In Brockton’s model, a customer would enter into a contract to purchase a fixed percentage of the Brightfield’s REC production at a premium price for a fixed annual cost in a long-term contract. This initial premium price (as measured on a per megawatt-hour basis) would generate surplus annual cash flow that would be set-aside in a fund dedicated for capacity expansions. About every five years, the project would be expanded in increments of 100-150 kW.<sup>31</sup>

After each capacity expansion, assuming a customer is still under contract or opts to renew its contract, they would be entitled to the same fixed percentage of RECs produced by the now larger Brightfield (e.g. 600 kW instead of 500 kW). Thus the customer would be paying approximately the same price for a greater number of RECs.

This approach would: 1) reduce the \$/MWh price to customers of RECs over time, 2) allow for customers to support the ongoing development of renewable energy and meet growing retail demand, and 3) help encourage customers to enter into long-term contracts from the beginning or to renew existing contracts down the road (customers that did not renew their contracts would lose future rights to a fixed percentage of the additional capacity). The City of Brockton, in turn, would benefit from the increased electricity production. Moreover, the expansion concept is well suited for self-funded brownfield redevelopment (e.g. a 500 kW project can grow into a 1 MW project with the exclusive use of internal cash flow).

---

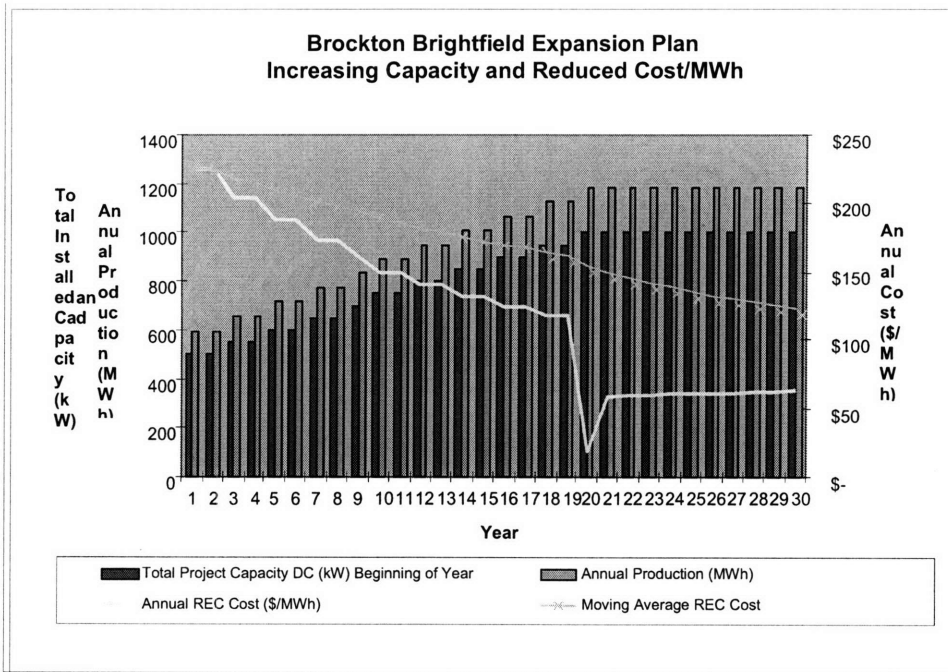
<sup>30</sup> “Brockton Brightfield Energy and Attribute Marketing Study”. Prepared by XENERGY, October 2002.

<sup>31</sup> This section on “Marketing the Facility Output” is excerpted from “Case Study: Brockton Brownfields to Brightfields Renewable Energy Certificate Innovative Marketing Concept”. Prepared for US Environmental Protection Agency by Lori Ribeiro, Brownfields Coordinator. July 2006.

**Table 8: Capacity Expansion Stopping at 1000 kW**

	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25	Year 30
Total Capacity (kW)	500	600	750	850	1000	1000	1000
Estimated Generation (MWh)	594	713	891	1,010	1,188	1,188	1,188
REC Annual Cost (\$/MWh)	\$ 225	\$ 188	\$ 150	\$ 132	\$ 19	\$ 60	\$ 63
REC Moving Average Cost (\$/MWh)	\$ 225	\$ 209	\$ 189	\$ 172	\$ 155	\$ 136	\$ 123

**Figure 15: Capacity Expansion Stopping at 1000 kW**



There are four elements of innovation featured in the REC marketing approach Brockton proposed. First, the length of the contract was much longer. Typically REC contracts are short-term in duration (1 – 3 years, no more than 5 years) and Brockton sought a 20-year contract that would last the term of its debt service.

Second, the fixed annual price was

different. Solar REC contracts typically estimate the quantity of RECs, and price per REC resulting in an estimated total annual cash flow to the project (since solar is an intermittent resource, REC output varies annually). Brockton sought a fixed annual cash flow with the understanding that there would be surplus cash flow in early years and that money would be reinvested in the project resulting in more RECs for the same annual payment in future years.

Third, the contracts were at an initial premium price. The \$225 per MWh initial price was higher than the market price for solar RECs at the time. The higher price was justified based on the multiple benefits of the project, reduced transactional costs for large-scale REC buyers, the promise of an increasing number of RECs over time that would decrease the cost on a per MWh basis. Further, some participants in the private green power market offered “blended” products in which solar comprises only 1-3% of the blend and less expensive technologies such as landfill gas, wind and hydro comprised the majority of the green power product.

Finally, the expansion scenario was unique. The fixed price was set at an initial premium such that the excess revenues would allow facility expansion. The underlying theory is

that REC purchasers in the private green power market seek to support the development of new renewable energy resources. Because they are doing so voluntarily, they may be willing to pay a premium for the benefit of expanding a project such as Brockton's that offers numerous environmental and community benefits.

As indicated in Table 1 and Graph 1, once an installed capacity of 1000 kW is achieved, positive cash flow is refunded to customers in the form of a REC buy down. The buy down significantly reduces the cost of RECs from years 20 to 30. In this scenario, the average price for the 30-year period is \$123/MWh, and 500 kW of new capacity is supported beyond the initial 500 kW.

Based on the preliminary assumptions, the following table illustrates the estimated quantity and cost of RECs available to customers that purchase 10%, 25%, 33%, and 50% of the Brightfield REC production.

**Table 9. Cost and RECs to Customers: Capacity Expansion Stopping at 1000 kW**

Purchase 10% of Project							
	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25	Year 30
Estimated RECs (MWh)	59	71	89	101	119	119	119
REC Annual Cost (\$/MWh)	\$ 225	\$ 188	\$ 150	\$ 132	\$ 19	\$ 60	\$ 63
REC Moving Average Cost (\$/MWh)	\$ 225	\$ 209	\$ 189	\$ 172	\$ 155	\$ 136	\$ 123
<b>Annual Total Cost</b>	<b>\$ 13,361</b>	<b>\$ 13,361</b>	<b>\$ 13,361</b>	<b>\$ 13,361</b>	<b>\$ 2,236</b>	<b>\$ 7,169</b>	<b>\$ 7,490</b>
Purchase 25% of Project							
	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25	Year 30
Estimated RECs (MWh)	148	178	223	252	297	297	297
REC Annual Cost (\$/MWh)	\$ 225	\$ 188	\$ 150	\$ 132	\$ 19	\$ 60	\$ 63
REC Moving Average Cost (\$/MWh)	\$ 225	\$ 209	\$ 189	\$ 172	\$ 155	\$ 136	\$ 123
<b>Annual Total Cost</b>	<b>\$ 33,403</b>	<b>\$ 33,403</b>	<b>\$ 33,403</b>	<b>\$ 33,403</b>	<b>\$ 5,590</b>	<b>\$ 17,924</b>	<b>\$ 18,725</b>
Purchase 33% of Project							
	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25	Year 30
Estimated RECs (MWh)	196	235	294	333	392	392	392
REC Annual Cost (\$/MWh)	\$ 225	\$ 188	\$ 150	\$ 132	\$ 19	\$ 60	\$ 63
REC Moving Average Cost (\$/MWh)	\$ 225	\$ 209	\$ 189	\$ 172	\$ 155	\$ 136	\$ 123
<b>Annual Total Cost</b>	<b>\$ 44,092</b>	<b>\$ 44,092</b>	<b>\$ 44,092</b>	<b>\$ 44,092</b>	<b>\$ 7,379</b>	<b>\$ 23,659</b>	<b>\$ 24,717</b>
Purchase 50% of Project							
	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25	Year 30
Estimated RECs (MWh)	297	366	445	505	594	594	594
REC Annual Cost (\$/MWh)	\$ 225	\$ 188	\$ 150	\$ 132	\$ 19	\$ 60	\$ 63
REC Moving Average Cost (\$/MWh)	\$ 225	\$ 209	\$ 189	\$ 172	\$ 155	\$ 136	\$ 123
<b>Annual Total Cost</b>	<b>\$ 66,806</b>	<b>\$ 66,806</b>	<b>\$ 66,806</b>	<b>\$ 66,806</b>	<b>\$ 11,180</b>	<b>\$ 35,847</b>	<b>\$ 37,451</b>

The results of the program showed that of the 21 entities contacted, there were only two that were seriously interested in pursuing the relationship. Constellation New Energy was the leading potential purchaser because 1) it has a pre-existing electricity supply relationship with the City and strong track record of customer service; 2) it is a Fortune 200 company that manages large transactions – the economies of scale for one large PV purchase are attractive as compared to numerous small transactions; 3) it offered a blended green power product; 4) it had customers seeking solar RECs, and 5) its long term financial strength. Green Mountain Energy was willing to provide a letter of interest, but at a lower cost and shorter term than Constellation New Energy.

As a result, Brockton entered into negotiations with Constellation New Energy to develop a letter of intent for a 20 year contract. As mentioned previously, Brockton had decided to apply to the Massachusetts Renewable Energy Trust for the Massachusetts Green

Power Partnership (MGPP), a REC revenue guarantee program. Brockton sought the MGPP as an “insurance measure” since the market for RECs is nascent, and the City’s Chief Financial Officer and Bond Counsel felt it would help secure long term financing if Brockton were not so dependent on the single REC revenue stream. The City and Constellation New Energy awaited the decision on the MGPP and grant awards.

After the awards were made, the contract completion also had to await the results of Brockton’s quest for two pieces of special state legislation in 2005. After the first Home Rule Petition was enacted in February 2005, Brockton began to move forward with its Letter of Intent with Constellation New Energy. Negotiations commenced and new financial models were developed with updated data. Constellation New Energy offered to purchase 100% of the project output provided the City renewed its electricity supply contract which was due to expire in January 2007. There was a challenge, however, because the differential between the City’s existing contract (4.8 cents per kWh) and new prices (6.5 cents per kWh) was about 33%. City officials felt uneasy with a sole source contract that included such a significant price increase, even though state procurement laws allowed them to execute a sole source contract. The City decided that since its electricity bill far eclipsed the annual Brightfield revenues, it would need to conduct a competitive procurement. A consultant was brought in to manage the procurement in April 2005. The procurement was to seek a contract for municipal electricity supply as well as sale of the Brightfield’s output.

The firm performing electricity supply procurement used a multi-step process that requested price proposals by August 4, a time when electricity prices are traditionally high. The prices were all above 8 cents per kWh, so the consultant recommended trying again in early September when prices, historically, decrease from peak summer levels. Unfortunately, Hurricanes Rita and Katrina wreaked havoc with energy markets. Two more bids were sought. The City accepted one at the consultant’s recommendation that locked in the City’s electricity supply price at a higher rate (9.122 cents per kWh), and also changed the contract term for the Brightfield RECs. The price was to be on a lower per kWh basis; the expansion model had been dropped; and the term was reduced to 10 years.

Brockton subsequently entered into negotiations with Constellation New Energy that made the terms agreeable to both parties. By using its MGPP “REC Put Option” agreement, Brockton and Constellation New Energy were able to work out a 20-year contract that met the City’s requirement for a guaranteed (even if variable) revenue stream. It also met Constellation New Energy’s needs to have some pricing flexibility given the uncertainties of the long-term REC market. The REC terms agreed upon are 18 cents per kWh for years 1-5; 18 cents per kWh (with Brockton assigning the MGPP Put Option Agreement to Constellation New Energy) for years 6-15; and “market value” for years 16-20, with Constellation New Energy to reasonably determine market value prior to each year.

Constellation New Energy will also purchase the electricity generated by the facility for 7 cents per kWh for 10 years, and at market value to be determined for each the final 10 years of the contract.

Although the exact revenues per kWh are uncertain beyond year fifteen, the existence of a long-term contract provides a revenue stream that minimizes revenue risk such that long term debt financing is possible. The Chief Financial Officer characterizes it as a

“risk management decision” with a tolerable level of risk, as compared to having no contract past year five or ten.

**Once again, the lengthy delays for special legislation and intervention of additional stakeholders with different senses of commitment and urgency impacted the project outcome. The project is no longer revenue neutral. The expansion scenario was voided, leaving the City ill suited to install Phase II that will bring the Brightfield to its full 1 MW potential.**

#### *Preparing a Turnkey Vendor Request for Proposals*

The city retained Palmer & Dodge to assist in developing a request for proposals for a turnkey vendor to design, install, operate and maintain the solar Brightfield. KEMA-XENERGY and the Brownfields Coordinator wrote the initial draft with technical requirements in April 2005. Palmer & Dodge used the draft to develop a lengthy and complex RFP that was released on July 25, 2005. A pre-proposal meeting was scheduled for August 11, and the proposal deadline was August 30, 2005. Because there was considerable uncertainty in the final capital budget, the City requested proposals for two system sizes, 300 kW and 425 kW.

Eighteen potential bidders attended the pre-proposal meeting, and due to the complexity of the RFP response, they requested an extension in the proposal deadline. Potential bidders were concerned largely about RFP requirements that fall outside the bounds of typical utility-scale PV installations. The City’s insurance requirements, site security requirements, environmental considerations on a brownfield, all contributed to companies wondering whether they could meet these numerous specifications within the overall budget. The City extended the deadline to September 13 at 4:30 PM to give potential bidders more time to prepare their responses. On September 13, only one proposal was submitted by the appointed time. About 20 minutes later, a second proposal arrived. Because the RFP stated any proposal received after the deadline “shall be returned unopened”, the Chief Procurement Officer was uncertain what to do. He accepted the proposal and consulted the Law Department. The Law Department told him he would need to return it, unopened, to the bidders. This set off a frantic series of phone calls and letters from four companies that partnered in the bid (including the lead, Spire Corporation) seeking reconsideration, which ultimately failed.

The late bidders argued that it was in the City’s best interest to have more than one proposal to choose from and argued for re-opening the bidding process. The City consulted outside counsel and ultimately decided to review the timely proposal. It was rated as advantageous by a review panel that included the head of the National Renewable Energy Laboratory’s Center for Photovoltaics. The price proposal was within budget.

The City invited the team led by Global Solar Energy of Tucson, Arizona for an interview in November. At that time, the second home rule petition was pending and the company was advised that the act of the Legislature was required to move the project forward. The project team included Global Solar (system integrator and lead contractor), RWE Schott Solar (PV module supplier), Landerholm Electric (Brockton-based electrical contractor for installation, operations and maintenance), J. Derenzo and Company (Brockton-based civil contractor for site preparation), Coler and Colantonio (civil engineering), Fat Spaniel Technologies (data acquisition system), and SatCon

Technology (power conversion). Upon passage of the Home Rule Petition, Brockton needed the City Council approval of the \$1.6 million borrowing from City Council to have sufficient funds to execute a contract. In the meantime, the project proponents negotiated project terms.

The City Solicitor accepted the contract in January 2006. The contract required City Council approval. It was filed in February and accepted on March 13. On March 17, 2006 the city executed its contract with Global Solar Energy for a 425 kW facility.

### Project Development

Once all the approvals were obtained for legal authority, the City Council had voted to approve the \$1.6 million bond measure, and the contract was signed with Global Solar, the balance of the implementation was relatively easy. It consisted of negotiating final grant agreements and contracts including:

- Two Massachusetts Renewable Energy Trust Grants for Brightfield Development and Educational Programming.
- Massachusetts Renewable Energy Trust REC Put Option Agreement (Massachusetts Green Power Partnership, or MGPP)
- US Department of Energy: Two Appropriations made through different offices (one for \$700,000 through the Golden Field Office and one for \$100,000 through the Chicago Field Office)
- US Department of Energy Solar SEP (this 2004 grant had to be amended to remove some matching funds to be used for a match with the appropriations above)
- Power Purchase Agreement and REC Purchase Agreement with Constellation New Energy.

While each of these transactions was complicated and entailed lengthy negotiations, Brockton had charged Edwards Angell Palmer & Dodge as the lead negotiator for all but the DOE grant negotiations, which were handled by the Brownfields Coordinator. They were cumbersome and required input and action from numerous stakeholders, but did not require heroic acts. The contracts with Constellation New Energy and MGPP Put Option Agreement also required Brockton City Council approval. While grants typically require City Council approval, in the order seeking \$1.6 million in borrowing authorization, the bill included language authorizing the Mayor to seek and accept any and all grants supporting the facility's development.

### *Installing the Photovoltaic Array*

Global Solar Energy is the lead contractor responsible for installation, which began with design completion in April. The facility's installation is expected to be complete in August 2006. Performing the site preparation work was challenging since the project

**Figure 16 - Brockton Solar Brightfield**



team had not previously worked on a brownfield site. Complications included the initial engineering design and adding a sufficient layer of fill so as not to penetrate the cap.

*Interconnection and Commissioning*

Global Solar Energy and the City of Brockton have cooperated to submit

applications to National Grid for interconnection study and interconnection. The interconnection also involves numerous steps including an impact study, an interconnection agreement (with an insurance requirement), and an easement application. The MTC has agreed to retain a consultant to commission the facility. Both steps are planned to be complete by September 15, 2006.

*Project Administration*

The project is administered through the Department of Public Works with support of the Brownfields Coordinator. DPW requires Global Solar to submit weekly progress reports, and also works with the Building Inspector to approve the plans to issue a Notice to Proceed. The Building Inspector must review filings for the building and electrical permits.

Grant reports are required for five separate grants, some quarterly, and final reports for each. Grant administration is complex as different aspects of the project are funded, in part, through multiple grants. State and federal grants have different systems for reimbursement and reporting.

Other filings were also necessary including registering with the New England Power Pool and submitting the Massachusetts Division of Energy Resources Renewable Portfolio Standard Qualifications Statement.

The City will need to submit final reports and requests for reimbursement for its five different grants. Once the system is operational, revenues and expenses through the Enterprise Fund will need to be tracked and accounted for in order to ensure accuracy and that the project is auditable.

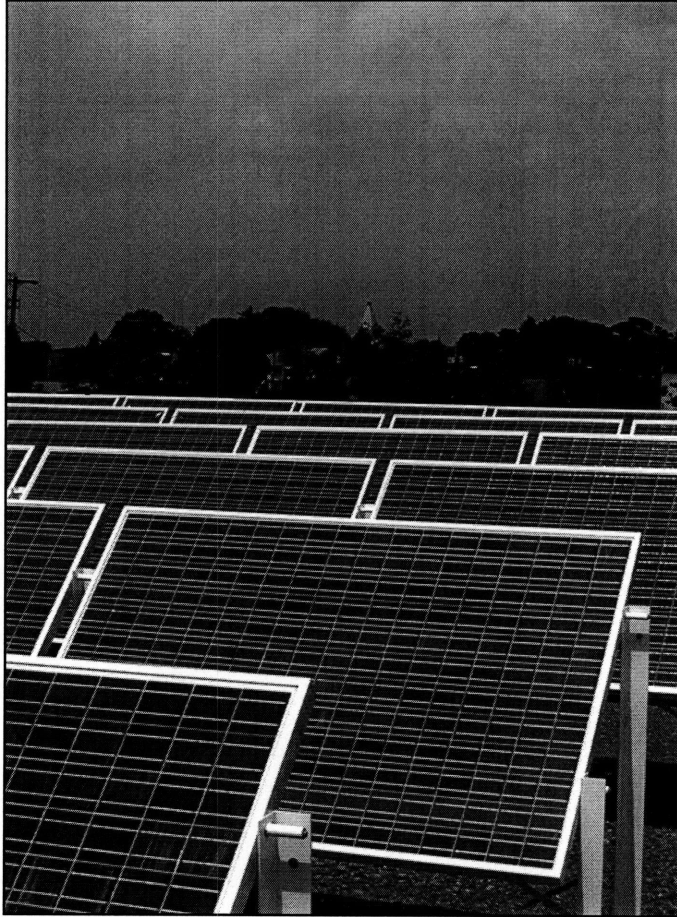
**Conclusions**

The implementation of a utility-scale solar Brightfield is a challenging, lengthy, and complicated process that likely was not envisioned by the program's proponents at DOE. Outside industry observers and city stakeholders have often stated it is a miracle this project made it to the installation phase. The necessity of heroic measures to implement the Brightfield concept is unfortunate because utility scale solar results in a lower installed cost per kW. PV is a popular for perceived environmental superiority, it can be sited



almost anywhere (unlike wind), can render otherwise useless properties productive, but is most frequently criticized precisely for the cost issue.

**Figure 17 - Brockton Brightfield with City Hall in Background**



The next chapter will analyze the key barriers that Brockton faced in implementing its Brightfield and policy changes that might serve to eliminate several of these barriers in the future.

## Chapter Four

### **Does It Have to be So Complicated? Analysis of Process, Key Decision Points and Policy Barriers for Developing Brockton's Brightfield**

Brockton's feasibility studies were completed in October 2002 and recommended that the city develop and own a 1 megawatt solar Brightfield in two 500 kW Phases. The facility design called for a park-like setting with educational displays to garner community support, and to enable the ratepayers statewide to take advantage of the publicly funded asset. The 500 kW project would produce nearly 600 MWh per year of electricity. The Phase I capital budget was \$3.6 million, and was to be paid through a combination of grants, proceeds from a land transaction, and a municipal bond. The Chief Financial Officer and City Council stated that the project's revenues would need to cover its expenses so that it would be revenue neutral; the marketing study showed a positive cash flow was feasible. The recommendations were straightforward, but the implementation was an entirely different story.

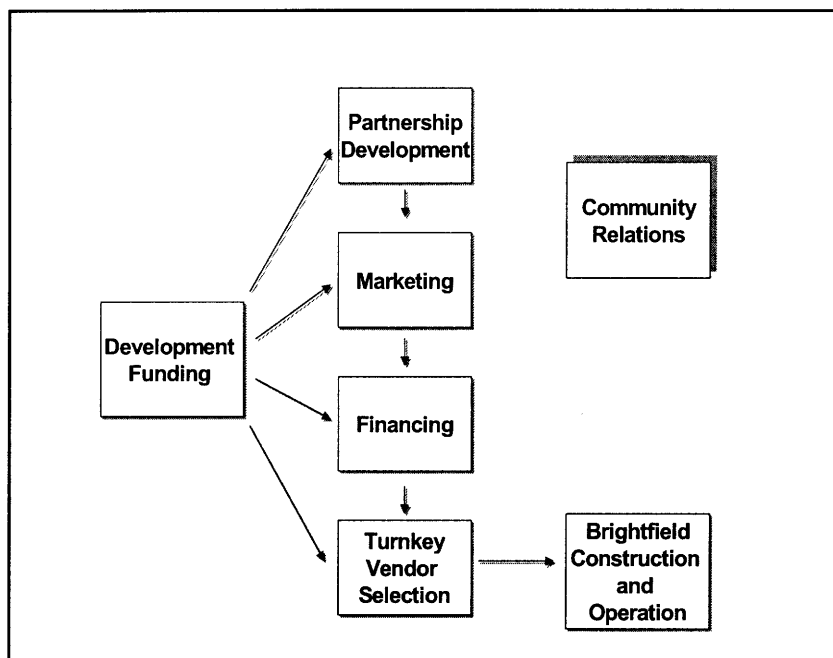
This Chapter analyzes the Brockton Brightfield implementation issues, describes the key success factors that enabled Brockton to overcome the issues, and then maps out for four key tasks the process and timeline, key decision points and how their increasing number decreases the likelihood of project success. It also identifies the regulatory and policy barriers that need to be overcome in order to reduce the number of process steps and, thereby, increase the probability of implementation success for future renewable energy projects. Where relevant, I also draw examples from the survey data of other municipalities confronting similar barriers.

#### ***Brightfield Project Implementation Issues***

In implementing the Brightfield project, there were far too many steps required to complete each link in the "causal chain" without difficulty. In part, this was because the project was new, so there was no predetermined path to follow. It was in part because of standard municipal constraints including a need for City Council approval for certain transactions. However, the number of steps was also too high due to policy barriers at the state and Federal levels. The analysis will show the decreasing probability of project success as the number of decision clearances increases. This analysis is focused on the following key steps that moved the project from the feasibility study to development beginning in 2002: securing grant funds, completing the land transaction and lease with Bay State Gas Company, obtaining bond financing, and marketing the electricity and Renewable Energy Certificates.

The Project Concept Development Plan visualized the project development process as a series of multiple, parallel steps that would begin in the 4<sup>th</sup> quarter of 2002 and end with the Brightfield commissioning in the third quarter of 2004.

Figure 18 – Planned Steps in Brightfield Project Development<sup>1</sup>



In reality, the project began in the third quarter of 2003 and installation is scheduled to be complete in the third quarter of 2006, two years later than originally envisioned. The two years of delays coincide with four of the policy and regulatory barriers identified in Chapter Three:

- Lack of existing grant programs to enable Brockton to secure financing in an expeditious manner.
- Restrictions created by Massachusetts General Laws including ten-year limitation on borrowing combined with a lack of clear legal authority to finance, develop, own and operate a solar power plant.
- Article 97 surprisingly applicable on a brownfield site, which had been deeded thirty years prior as conservation land.
- A series of project delays, combined with City Solicitor’s change in direction on sale of electricity and RECs, leads to decrease in contract terms, meaning project no longer meets revenue-neutral hurdle.

The project team operated in crisis mode during one or more of the key development phases for two solid years as a variety of barriers threatened to derail it, as shown in the following table. By “crisis mode” I refer to points in the project when, from the advocate’s point of view, the project’s viability was threatened. A negative outcome would terminate the project. From a public policy point of view, these may be considered times when the project and its value are undergoing review, or perhaps clearing through decision points of cost-benefit analysis to ensure the benefits outweigh the costs. The quarters described as “crisis mode”, then, are periods of time in which significant barriers emerged that had the potential to kill the Brightfield project, and which required extraordinary effort to overcome.

<sup>1</sup> “Brockton Brightfield Conceptual Development Plan”. October 2002. Prepared for City of Brockton and Massachusetts Renewable Energy Trust by Lori Colombo, XENERGY, and SPIRE Corporation.

Figure 19 – Operating State of Brockton Brightfield Project

Project Step	2003		2004				2005				2006		
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Secure Development Funding <sup>a</sup>		■	■										
Obtain Bond Financing <sup>b</sup>				■	■	■	■						
Complete Land Transaction and Lease <sup>c</sup>									■	■			
Market Electricity and RECs <sup>d</sup>								■	■	■			

<sup>a</sup> Struggle for \$1 million MRET capital grant

<sup>b</sup> First Home Rule Petition required for legal authority and debt term

<sup>c</sup> Second Home Rule Petition required for Article 97 conservation land issue

<sup>d</sup> Change in direction for electricity and REC marketing, contract price and term cuts due to spike in energy prices

**Key:**

*Routine Operation*



*Crisis Mode*

Because of the multiple, parallel steps, those charged with implementing the project were required to respond rapidly to emergency conditions at the expense of consistent action across project tasks. This led to a cycle of rush-delay, causing frustration on the part of some stakeholders that some items were not acted upon for months, but then suddenly required urgent attention. Since many steps required approval from City Council, certain tasks needed to be completed within a week or two because the process of City Council approval could require two months. Some measures (the amendment to the first Home Rule Petition, passing it again after it died in the House, and enacting the second Home Rule Petition) had to be passed under suspension of the rules in both Brockton City Council and the State Legislature. Numerous stakeholders had to expend significant political capital in order to secure such urgent action in balance with other competing priorities.

***Key Success Factors for Overcoming Obstacles***

Despite the many challenges posed by the project, it ultimately was developed. There are a number of factors that contributed to its success. These factors are identified below and their role in project success will be highlighted in the analysis of specific implementation barriers.

***1. A Charismatic Leader***

Mayor Jack Yunits enjoyed tremendous popularity and support in Brockton, with the local business community, and at the State and Federal levels. He had a solid reputation for his vision, hard work, and ability to accomplish difficult tasks. As an attorney by profession, Mayor Yunits is a skilled negotiator. He took office in 1996 and served for ten years, winning by a landslide each time until he decided to forego running for re-election in 2005. Because of his charismatic personality, commitment to the project, and well-established connections with key decision-makers in the State House, Mayor Yunits was able to garner support that others in a similar situation would not have enjoyed. Mayor Yunits was especially interested in environmental issues and had served on several state committees through high-level appointments, including serving on Governor Mitt Romney’s transition team for the environment and on the statewide Brownfields Advisory Group, as an appointee of Senate President Thomas Birmingham. Department heads and city employees viewed the Brightfields project as “the Mayor’s project”, ensuring it would obtain attention, even if not immediate action.

## 2. Project “Champions”

Like many complex long-term projects, the Brockton Brightfield required a motivated and committed project champion to bring the project to fruition. The Brownfields Coordinator played that role, largely motivated by environmental justice and community development concerns. As Brockton’s CFO described the role, “Sometimes a true believer’s unrelenting persistence can carry the day despite the obstacles presented by the nature of government and even resistance by bureaucrats.”<sup>2</sup> Within the MTC, the most significant supporting agency, director Rob Pratt served as a champion on Brockton’s behalf.

## 3. Positive Community Relations

The project team held its first public meeting within a few short months of beginning the feasibility study, even when several key project decisions had not been made. In this way, the team obtained early community input on the concept to determine what factors would lead to community acceptance. After the feasibility study was completed, a second public meeting was held. The landscaping was such an important issue that several smaller meetings and visits were held with residential abutters to the Grove Street property. The project team maintained positive media relations with local reporters to ensure the public was kept abreast of project developments.

Brockton also maintained media relations with the renewable energy and environmental trade publications. The various funding agencies were eager to obtain publicity for their roles in the project.

Throughout the project, the Brownfields Coordinator maintained communications with Ward 4 City Councilor Linda Balzotti. Further, Bay State Gas Company was very responsive to the resident’s concerns, and made several updates to the landscaping in response to resident requests. The site’s improved appearance was a key success factor in winning City Council approvals for other elements of the project as the community development benefits of the project became more visible.

## 4. Locally-driven Project

The project was initiated by the City of Brockton with visible, demonstrated support from the local community. This local support helped the City to obtain much-needed grant funds and political support for the numerous approvals it required.

## 5. Detailed Feasibility Study

The Brightfield project was technical and complicated to implement. The feasibility study served as the basis for defining, understanding, defending, and selling various aspects of the project. Certain elements – particularly the facility size and layout, financial model, ownership model, electricity and REC marketing strategies – required detailed study by experts. Participants with varying perspectives frequently challenged the project. The feasibility studies enabled project proponents to respond cogently.

Perhaps the most frustrating aspect of the feasibility study was the financial analysis. The grant fund amounts, project revenues, and debt scenarios were constantly moving targets. KEMA-XENERGY ran endless analyses to address these changes and to present the data in ways that served the needs of various stakeholders. The consultants at KEMA-XENERGY were also strong project supporters who continued working even during times when grant funds had been used up.

---

<sup>2</sup> E-mail communication from Brockton Chief Financial Officer John Condon, December 6, 2005.

Because there were so many unexpected divergences from the project's intended path, much of the work had not been budgeted.

#### 6. Strong Political Support

The Brightfield project was conceptually appealing and easy to support. However, the financing aspects were controversial. Strong local support, rapid response to the various information requests, and Mayor Yunits' strong political connections were required to carry it through the controversial MTC grant decision, the urgent rush to secure two Home Rule Petitions in one year, and obtaining a Federal appropriation in a time of budget cuts. The State Senator and Representatives also had to push hard to win the Home Rule Petition legislation.

Further, by winning City Council approvals consistently throughout the times when the project appeared revenue neutral, Councilors were so invested in making the project succeed, they agreed to the debt financing even with a CFO certification letter indicating it could impact the annual municipal budget by up to \$100,000 annually.

#### 7. Partnership Approach

Because the project involved so many decisions requiring dozens of stakeholders to provide support, the partnership approach helped to obtain critical approvals. When it came time to win support in the State House, there was an array of partners voicing their support with key decision makers.

Further, because there was no existing grant program to provide the necessary funding level. By drawing relatively small amounts of support from an array of sources, the project team was able to cobble together the necessary funds to finance the project.

#### 8. Significant Local Investment

The City of Brockton had developed a model in which the City contributed nearly 60% of the capital costs of the project, and sought 20% each from the state and Federal governments. Brockton ultimately sought 28% financing from MRET, which was in stark contrast to the 50% and above the Trust typically covered for solar installations. This local investment was considered even more significant in light of the City's status as an economically distressed area.

#### 9. Cost-effectiveness

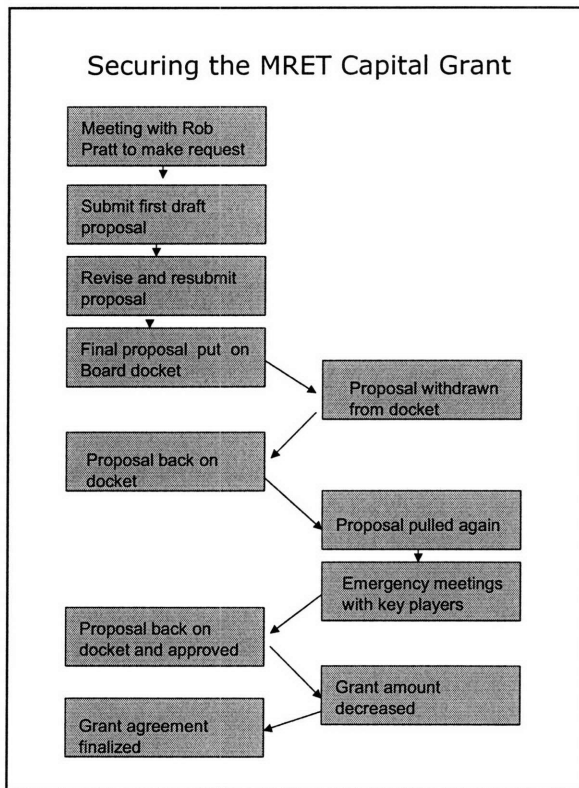
PV installations typically cost \$10-12 per watt, and Brockton's was budgeted at \$7 per watt. The large scale combined with significant local investment provided funders with a project that is far more cost-effective than small-scale projects. Further, the fact that the PV is ground-mounted offers additional advantages. Most PV is roof mounted, so public agencies providing funding do not have visible signs of their investment. MTC supported the project in part because it has great potential to educate the general public about renewable energy in a way other projects simply cannot manage. The educational benefits leverage their capital investment.

#### ***Implementation Pitfalls: Four Barriers and How they were Overcome***

The processes involved in completing the four key tasks identified above are shown through basic flow charts where divergences in the expected path are demonstrated. These tasks include securing development funding, obtaining bond financing, land transaction and lease, and marketing the electricity and RECs.

In the first case, we look at the process of securing the \$1 million capital grant from the MRET. In the initial meeting between Mayor Yunits and Rob Pratt in August 2003, Pratt indicated that the City had done a good job with the project and was ready to submit a request through an unsolicited proposal. He was impressed with the local commitment and with the innovative REC marketing plan that would provide significant revenues to cover project expenses. Pratt knew that a pure PV project would not be acceptable to the Board, so he advised the City to include a significant educational component and to highlight economic development aspects of the project. MTC was eager for success stories of project installations to overcome criticism about the results it had achieved relative to the size of the fund. Pratt believed, “Brockton will be to solar as Hull is to wind. It will be the poster child for solar energy in Massachusetts”. Building the Brightfield in 2004 would help the Trust achieve key goals; time was of the essence. The City developed a draft proposal and submitted it in early September 2003 in the hopes of obtaining a decision in the late September Board meeting. As the flow chart shows, the process did not work out as planned. The boxes on the right side of the flow charts are steps that diverged from the project plans.

**Figure 20 – Process for Obtaining MRET Capital Grant**



The initial estimate of one month from proposal to award decision elapsed into six months as a final decision was not made until the end of February 2004, and only after several high stakes meetings and behind-the-scenes lobbying efforts. MTC’s Board action included language specifying that it would provide a maximum of 28% of the project capital costs. This led to a subsequent reduction in Brockton’s grant when it did not receive the CDAG grant.

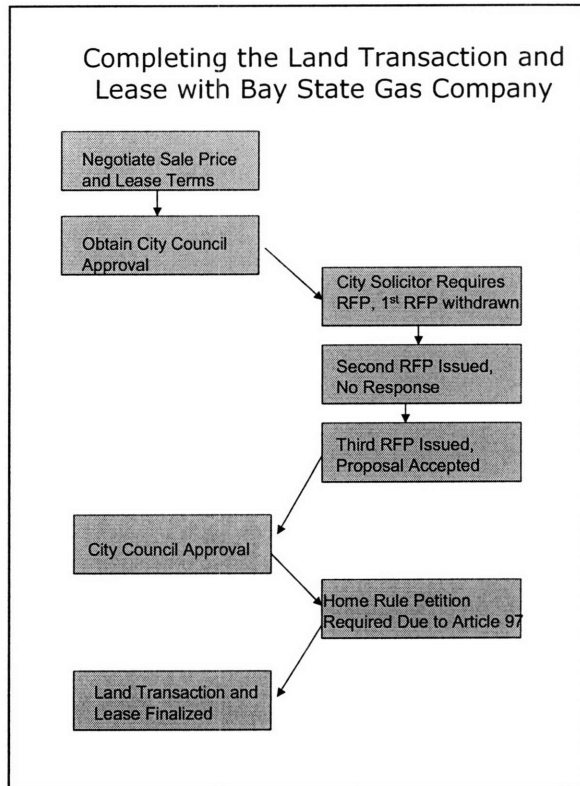
A significant part of the challenge with the MTC grant was that Brockton was attempting to secure a large grant through an unsolicited proposal. The decision was at the MTC Board’s discretion in an undefined process. It became a political decision. This was the step in the Brightfield project process that faced the most significant amount of opposition and required every resource available to succeed. The probability of success is impossible to know with any degree of accuracy. As one high level person close to the process wrote, “very, very few people could have done what you and the Mayor have, and that’s saying

a lot.” In this case, the key success factors that overcame the barrier were the leadership of Mayor Jack Yunits with his connections in the State House, the persistent background maneuvering on the part of the project champions, strong political support, intervention by well-placed partners, and positive community relations. The feasibility study, local investment and cost-effectiveness got the project to the point of being submitted to the MTC board, but it was the political maneuvering and project visibility that got it over the finish line.

The next critical and circuitous task was to complete the land transaction and lease with Bay State Gas Company. Because the city would obtain \$500,000 for a contaminated property that had been donated

from Bay State Gas Company three decades prior, and most brownfields sold for less than \$25,000, the parties believed the transaction would move quickly. However, a series of missteps and delays ensued.

**Figure 21 – Process for Completing the Land Transaction and Lease with Bay State Gas Company**



In this case, the process began in December 2003 and continued until December 2005. Again, it was completed only through extraordinary measures. The key success factors, again, included the strong pushing by Mayor Yunits and the project champions, strong political support at the State House, a meaningful partnership with Bay State Gas Company<sup>3</sup>, intervention by other partners (e.g., a lobbyist for the Solar Energy Business Association of New England, Government Affairs Director for the Massachusetts Renewable Energy Trust), and positive community relations. This was not a case of opposition, it was a case of moving a bill through the Brockton City Council, Attorney General’s Office, both houses of the State Legislature, the Executive Office of Environmental Affairs, and the Governor’s office, and getting all that done in five weeks when everyone had other competing priorities.

In April of 2004, after having received the \$1 million from MRET and negotiating a \$500,000 agreement with Bay State Gas Company, the City had believed it was ready to initiate the process of inquiring about

obtaining bond financing. The CFO, City Solicitor, Brownfields Coordinator and KEMA went to meet with bond counsel at Palmer & Dodge. This meeting would set off a chain of unanticipated emergency steps for the first Home Rule Petition.

As described in Chapter 4, the first Home Rule Petition died on the final day of the legislative session and had to be passed again by Brockton City Council, then re-introduced in the State Legislature and passed under suspension of the rules. This process was not completed until February 2005. Like the other Home Rule Petition, Chapter Five of the Acts of 2005 did not face any opposition. It was initially stymied by routine delays and a last minute amendment in the Senate that forced it back to the House for another vote without sufficient time remaining to act. It was the challenge of getting the Brockton City Council and State Legislature to pass the bill in early 2005 under suspension of the rules that was more of a challenge. Mayor Yunits had to call the Senate President, Speaker of the House and the Governor. The state delegation had to muster all of its muscle. The political support was crucial.

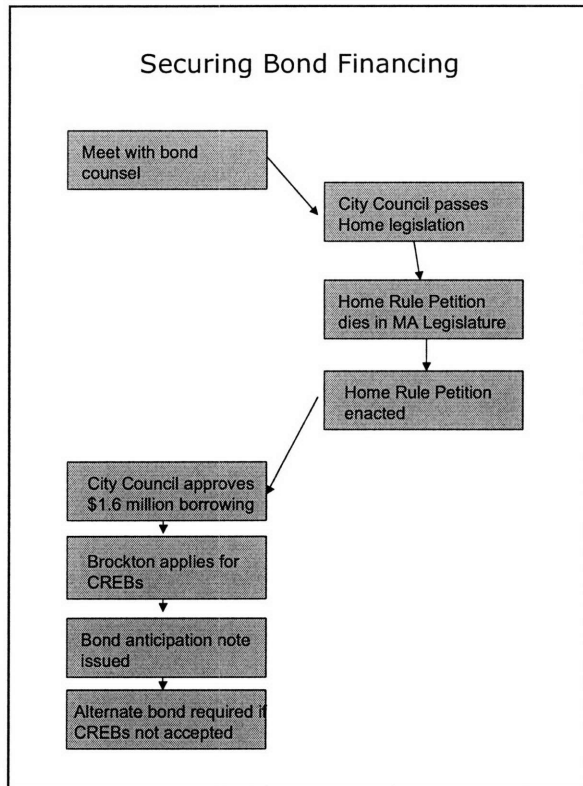
The bond financing required authorization by the Brockton City Council, which was approved in December 2005. This approval was challenging to secure with the change in revenue projections eliminated the guarantee of the project’s revenue neutral status. The positive community relations and political support were critical. City Councilors had voted unanimously on every measure to that point,

<sup>3</sup> From an email communication from Bay State Gas Company on November 27, 2005 regarding the closing of the real estate transaction: “I discussed the matter with [Bay State Gas Company President] Steve Bryant on Friday. Although he was not planning on being in the office on Monday, he told me that ‘he would drive across the State to help Jack Yunits.’”



including the emergency Home Rule Petitions. They knew that after requiring the State delegation to fight so hard for the project, it was nearly impossible to vote against it at this stage. The early “wins” in community relations, largely achieved through dramatic site improvements, led to strong community support for the project.

**Figure 22 -- Process for Securing Bond Financing**



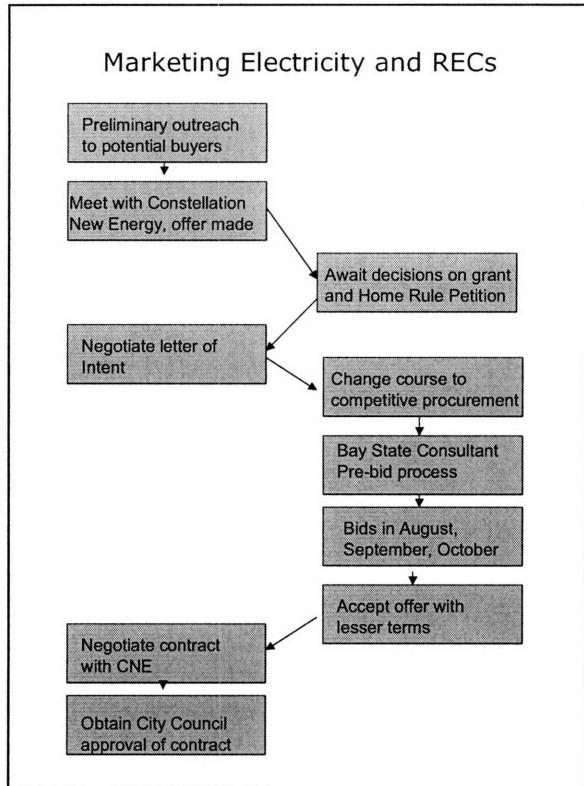
However, the bond still was not issued as of this writing in August 2006. The City applied for the new Community Renewable Energy Bonds and has not yet obtained a decision. In the meantime, a bond anticipation note was issued and this process may take several more months to be completed.

The fourth major task that experienced a series of delays was marketing the electricity and Renewable Energy Certificates produced by the Brightfield. As with the land transaction, the project consultants were convinced they were bringing an extraordinary deal to the City. Provided the City agreed to extend its electricity contract (at a rate which had saved the city millions of dollars over default service) for an additional three years, Constellation New Energy offered to purchase 100% of the RECs at an initial price of \$225 per MWh for 20-30 years. This was in contrast to the \$50 per MWh value in the compliance market and \$100 per MWh solar RECs were commanding at the time.

The City did not move to close the deal for almost two years, at which point the price of electricity had increased from 4.8 to 6.5 cents per kWh. Constellation New Energy was willing to give the city a “Market Watch Agreement” which enables a customer to lock in a percentage of its load at one price while waiting out the market for potential decreases. Massachusetts General Laws do allow municipalities to procure electricity without a formal RFP process. Just when the parties thought they had an agreement, the City Solicitor declared, “The tail is wagging the dog”. He ruled that the city would need to perform a competitive procurement. By the time he brought in his preferred consultant, and the consultant initiated his process, hurricanes Katrina and Rita had hit, prices were above 9 cents, and the REC contract terms were decreased to \$180 per MWh over 10 years. The project team would no longer be able to tell City Council that the project would be revenue neutral. Further negotiations enhanced the length of the contract by tapping the MGPP, but the City lost literally millions of dollars as a direct result of delay.

In addition, the project suffered through the complexity of multi-party action, with many of the project steps dependent on completion of other elements of the causal chain involving a complex array of actors, each with different perspectives and varying senses of urgency with regard to acting. The Brockton Law Department was slow to act on a number of Brightfield-related measures. The attorneys felt the project created too much additional work and required levels of expertise they did not have in-house. The project was a very low priority and ultimately was acted upon only because it was “the Mayor’s project”.

**Figure 23 -- Process for Marketing the Electricity and RECs**



The marketing of the electricity and RECs succeeded in part due to the initial feasibility study work, as well as the extra \$10,000 grant from US EPA to develop an innovative model. In the end, the contract worked through positive community relations and partnership with Constellation New Energy and MTC. By having the MGPP REC Put Option Agreement with MTC, Brockton was able to extend its contract with Constellation. There were many detailed negotiations involved in enhancing the deal back up to twenty years from the ten years Constellation had committed to in its letter of intent. Having outside counsel from Edwards Angell Palmer and Dodge to assist with negotiations was essential.

“We will show that what seemed to be a simple program turned out to be a very complex one, involving numerous participants, a host of differing perspectives, and a long and tortuous path of decision points that had to be cleared. Given these characteristics, the chances of completing the program with the haste its designers had hoped for – and even the chances of completing it at all – were sharply

reduced.”<sup>4</sup> Pressman and Wildavsky wrote this about EDA in Oakland, but it similarly applies to Brightfields in Brockton. Using their analytic framework, I will show the participants and perspectives, key decision points, and decreasing probability of success.

The following Figure 24 – Participants and Perspectives in the Brockton Brightfield Project identifies the numerous players that were involved in the project implementation. It also describes their connection to the project, perspective and major objectives, and sense of urgency. Because there were so many decision points, the relative sense of urgency is critical. Even people who do not oppose a measure likely require at least a week to make their decisions. Those with a low sense of urgency may take far longer.

<sup>4</sup> Pressman and Wildavsky, Implementation, page 94.

**Figure 24 – Participants and Perspectives in the Brockton Brightfield Project**

<b>Participant</b>	<b>Connection with the Project</b>	<b>Perspective and Major Objectives</b>	<b>Sense of Urgency</b>
City of Brockton – Mayor’s Office and Office of the City Planner	Lead partners – Mayor plays key role in fundraising, securing special legislation; City Planner serves as Project Director for feasibility and predevelopment phases	Wanted to sustainably redevelop an otherwise unusable brownfield site, stimulate economic development through renewable energy, enhance city’s image	High
City of Brockton – Brownfields Coordinator (consultant contract)	Initiated the idea locally, “project champion”	Concerned with environmental justice in redeveloping brownfields, interested in bringing a growing high technology industry to Brockton, desire to make city’s image “cleaner and greener”	Very high
City of Brockton – Law Department	Custodian of city-owned property, responsible for contracts and legal matters, also responsible for procuring city electricity contract, writes Mayor’s orders filed with City Council	Project involves too much work for understaffed office lacking specialized expertise, unwilling participants	Low
City of Brockton – Finance Department	Chief Financial Officer has expanded powers granted by state legislature when City was nearly in receivership, must certify all transactions submitted to City Council that will have a financial impact, involved in electricity supply procurement	Initially skeptical, becomes solid supporter after fundraising hurdles are met and first Home Rule Petition is passed	Medium
City of Brockton – Department of Public Works	Brightfield is a utility, responsibility for project implementation moves to DPW when project moves from predevelopment to development (installation, management of Enterprise Fund)	DPW Commissioner is new; Brightfield is “one more thing they didn’t tell me about in the job interview”	Medium
City of Brockton – Building Department, Auditing, Treasurer Collector, Assessor, Clerk	Supporting roles on individual tasks involving their departments	This is the Mayor’s project, will do what they have to do	Low
Brockton City Council	Authority to approve budget and appropriations, approve borrowing, accept grants, pass special legislation, authorize Mayor to take certain actions, approve land transaction, lease and contracts	Unanimously passed every measure brought to Council	Medium
Ward 4 Brockton City Councilor Linda Balzotti	Represents Grove Street neighborhood	“This is the only project in my ten years on City Council that the neighbors actually ask for”	Very high
At-large City Councilor Thomas Brophy	In addition to serving on Brockton City Council (a part-time commitment), is legislative aide to state Senator Robert Creedon	Heavily involved in moving special legislation through the State House	High to medium

<b>Participant</b>	<b>Connection with the Project</b>	<b>Perspective and Major Objectives</b>	<b>Sense of Urgency</b>
US Department of Energy – Office of Energy Efficiency and Renewable Energy	Initiates the program, provides seed funding and technical assistance	Brightfields program coordinator and Assistant Secretary for EERE are supportive, rest of staff apathetic, especially after Bush takes office	Medium to low
US Department of Energy – Boston Regional Office	Provides direct technical assistance and grants management	Very committed to helping project succeed (Bush administration closes regional offices in 2006, support ends)	Medium to high
Massachusetts Technology Collaborative, Renewable Energy Trust (MRET)	Provides funds for feasibility study, predevelopment, installation, education, and REC revenue guarantee (total value exceeds \$2.5 million)	Director Rob Pratt and key staff very supportive; project is divisive with Board where there is strong resistance from one particularly powerful member; chair of MTC's RET subcommittee provides needed support	Medium to high
US Environmental Protection Agency, New England Region	Helps Brockton secure \$10,000 Innovations grant through competitive national program, provides technical and political support	EPA Administrator Robert Varney provides public support for project, project supports EPA goals for brownfields, clean energy and air quality	Medium
Bay State Gas Company	Responsible party for the brownfield, pays initial consulting fee for grant writing to initiate the project, buys back both parcels where facility will be developed, retains landscape architect, installs landscaping and fencing, provides oversight for site preparation for facility installation; President provides political support with key players in the State House, retains its attorneys at Foley Hoag to write second Home Rule Petition, parent company NiSource provides \$5,000 educational grant	Bay State Gas Company is responsible in perpetuity for site environmental conditions, this is ideal way to redevelop property and maintain integrity of the cap; also good for community relations	High
KEMA-XENERGY, an international consulting firm specializing in renewable energy and distributed generation	Plays key role throughout the project in feasibility study, predevelopment, facility development. Provides numerous hours of pro bono services when grant funds dwindle due to unanticipated delays; key consultants provide moral support when situation is grim	This is an important flagship project that deserves support, will be good experience for KEMA, a community service for economically distressed city	High
SPIRE Corporation	Spire was the solar PV company that performed the first Brightfield project in Chicago, served on consulting basis performing technical feasibility study and conceptual engineering design for Brockton's Brightfield, was lead partner in proposal rejected for missing the deadline	Spire's main line of business is the equipment used to manufacture PV modules, interested in promoting scattered sites and growing business in module assembly, wants to help Brockton succeed in hopes of business opportunity	Medium

<b>Participant</b>	<b>Connection with the Project</b>	<b>Perspective and Major Objectives</b>	<b>Sense of Urgency</b>
Constellation New Energy	A Fortune 200 energy services company with growing green power business in New England, connections to Brockton's project through existing power supply agreement and also through KEMA and Brownfields Coordinator (these consultants had both worked for National Energy Choice, purchased by New Energy, later Constellation New Energy)	RPS requires Constellation New Energy to purchase a percentage of its electricity supply from renewable energy resources	Medium to high
State Delegation (Representatives Thomas Kennedy, Geraldine Creedon and Christine Canavan, Senator Robert Creedon)	Sponsored and secured Home Rule Petitions in the Legislature, provided support letters for grants	Represent Brockton districts, legislative aide to Representative Kennedy is Mayor Yunits' son Conor	Low to medium, high in crisis
Massachusetts Division of Energy Resources (MA DOER)	Administers State Energy Program, provides RPS Qualifications Statement	Depends on the individual in the office, administrative contacts low interest, program contacts high interest in project success	Low to medium
Federal delegation (Congressman Stephen Lynch, Senators Kennedy and Kerry)	Secured \$800,000 appropriation in 2005	Represent Brockton, support Mayor Yunits	Medium
Global Solar Energy	Wins contract to design, install, operate and maintain along with partners at RWE Schott Solar, Landerholm Electric, Sat Con Technologies, Fat Spaniel Technology, J. Derenzo, Coler & Colantonio	This will be a marquis project in the northeast	High
National Grid/Massachusetts Electric Company	Provides political support for MRET grant awards, provides interconnection to the grid, serves as a partner in Brockton's Million Solar Roofs Partnership	MassElectric has large regional headquarters in Brockton where Vice President enjoys solid relationship with Mayor Yunits, desire to help the city for community relations	Low to medium
Solar Energy Business Association of New England	Provides political support for the project in the State House	Large PV installations are good for member businesses, some concern about size of Brockton's project diverting resources from other PV activities	High during critical time
MetroSouth Chamber of Commerce	Provides political support for the project for grant awards and Home Rule Petitions, serves as a partner in Brockton's Million Solar Roofs Partnership, serves as fiscal agent for NiSource grant	Brightfield initiative good for community and economic development, will help the City's image	Medium

This "simplified" table shows the complexity of 25 different stakeholders with varying roles, perspectives and senses of urgency to perform project tasks and make decisions. The need to move this many stakeholders to act resulted in numerous delays, not necessarily because people opposed the project, but because they had other competing priorities.

As a result of delays, some agreements that had been made among parties at one point in time lost validity after long periods of elapsed time. Transactional costs had skyrocketed through unanticipated and unbudgeted delays, and having to re-work agreements that fell through or changed over the course of time. The Brownfields Coordinator and KEMA-XENERGY experienced expired contracts, followed by several months with no pay and a significant commitment of pro bono services. After the initial MTC award had been made, they felt like they had won the major battle and were too invested to turn back, or to let down those who believed in the project and worked hard to help it succeed. What was initially a project became a cause.

***Key Decision Points and Probability of Success: 101 Decisions***

Another framework used by Pressman and Wildavsky is the number of decision points, participants involved, and cumulative number of decisions. Using this model in the case of Brockton’s Brightfield shows in a quantitative way just how unlikely it was for the project to succeed.

**Figure 25 – Decision Points and Clearances Necessary for Completion of Brockton Brightfields Project**

<b>Decision Points</b>	<b>Participants Involved</b>	<b>Cumulative Total of Agreements</b>
Decision to pursue Brightfield program	Mayor, City Planner, Brownfields Coordinator	2
Proposal of Brightfield concept to Responsible Party	City of Brockton, Bay State Gas Company	3
Obtaining US DOE for Planning Grant through State Energy Program and acceptance by City Council	City of Brockton, US DOE RO MA DOER US DOE HQ	6
Obtaining MRET Green Power Predevelopment Grant and acceptance by City Council	City of Brockton, MRET	9
Obtaining Community Support, including Ward Councilor	City of Brockton, Ward 4 Councilor Linda Balzotti	11
Securing Mayor and CFO approval to accept feasibility study recommendations	Mayor, CFO, Brownfields Coordinator, KEMA-XENERGY, Spire Corporation	14
Obtaining US EPA Innovations Grant for Green Power Marketing and acceptance by City Council	Brownfields Coordinator, City Planner, KEMA-XENERGY, US EPA New England US EPA HQ	17
Obtaining MRET Predevelopment Funding and acceptance by City Council	Brownfields Coordinator, KEMA-XENERGY, Mayor, MRET	21
Securing MRET \$1 million grant and MGPP REC Put Option Agreement	Mayor, Brownfields Coordinator, KEMA-XENERGY, MRET Director Rob Pratt, MRET Board, Secretary of Administration and Finance, Secretary of Commonwealth Development, National Grid/MassElectric, Bay State Gas Company	28
US DOE Acceptance of Brockton as Million Solar Roofs Partnership	Mayor, Brownfields Coordinator, KEMA-XENERGY, US DOE RO, US DOE HQ (plus 7 local partners)	30

<b>Decision Points</b>	<b>Participants Involved</b>	<b>Cumulative Total of Agreements</b>
Obtain US DOE Solar Technology on Brownfields Grant through State Energy Program and acceptance by City Council	Mayor, Brownfields Coordinator, KEMA-XENERGY, KEMA-XENERGY, US DOE RO, MA DOER, US DOE HQ	36
Secure Special Legislation through Home Rule Petition, dies in first session, passed under suspension of the rules in subsequent House session	Mayor, Brownfields Coordinator, City Council, Councilors Balzotti and Brophy, State Delegation, Speaker of the House Senate President, House Minority Whip, Governor	46
Obtain City Council approval on to allow Mayor to sell the land and enter into a lease in new fiscal year	Mayor, Law Department, CFO, Brownfields Coordinator, Councilor Linda Balzotti, City Council, Bay State Gas Company	48
Obtain City Council approval for consulting budget to complete predevelopment	Mayor, DPW, CFO, Brownfields Coordinator, Councilor Linda Balzotti, City Council	52
Preliminary negotiations of electricity and REC contract, decision to use competitive bidding rather than sole source	Brownfields Coordinator, Law Department, CFO, KEMA-XENERGY, Edwards Angell Palmer & Dodge, Constellation New Energy	54
Competitive bidding for electricity and REC contracts (four rounds of bidding)	Mayor, Brownfields Coordinator, Law Department, CFO, KEMA-XENERGY, Edwards Angell Palmer & Dodge, Bay State Consultants, Constellation New Energy	58
Procurement process for land transaction (issue RFP three times) and City Council acceptance	Brownfields Coordinator, Law Department, Chief Procurement Officer, DPW, Bay State Gas Company, Brockton City Council	66
MRET reduces grant commitment due to City's failure to obtain sufficient matching funds	MRET	67
Procure turnkey vendor	Brownfields Coordinator, Chief Procurement Officer, Edwards Angell Palmer & Dodge, KEMA-XENERGY, DPW, CFO	69
Land transaction falters because of Article 97 issues, second Home Rule Petition required	Brownfields Coordinator, Law Department, DPW, Bay State Gas Company, Brockton City Council, State Delegation, Attorney General, Executive Office of Environmental Affairs, Governor	79
Bids received for turnkey contract, one has to be rejected and potential appeal is threatened, Global Solar chosen	Brownfields Coordinator, Chief Procurement Officer, Law Department, DPW, Edwards Angell Palmer & Dodge, Spire Corporation, Global Solar	83
Negotiation of contract with Global Solar and City Council approval	Brownfields Coordinator, KEMA-XENERGY, Edwards Angell Palmer & Dodge, Global Solar Energy, City Solicitor, CFO	86
Negotiation of final grant agreement with MRET	Brownfields Coordinator, KEMA-XENERGY, Edwards Angell Palmer & Dodge, City Solicitor	88

Decision Points	Participants Involved	Cumulative Total of Agreements
Negotiation of MGPP with MRET and acceptance by City Council	Brownfields Coordinator, KEMA-XENERGY, Edwards Angell Palmer & Dodge, City Solicitor, CFO	93
Negotiation of electricity and REC contracts and acceptance by City Council	Brownfields Coordinator, KEMA-XENERGY, Edwards Angell Palmer & Dodge, Bay State Consultants, Constellation New Energy, City Solicitor, CFO	96
Obtaining City Council authorization to borrow \$1.6 million (requires three readings in Council)	Mayor, CFO, Brownfields Coordinator, Edwards Angell Palmer & Dodge, KEMA-XENERGY, and City Council	99
Obtain DOE approval to use appropriation for Phase I rather than Phase II expansion	US DOE, Brownfields Coordinator, DPW	101

The implementation of the Brightfield project required at least 101 different decision points, ignoring small tactical decisions and counting only those that played a significant role in moving the project forward. The level of these decisions ranged from offices in Brockton City Hall to the State Legislature, Massachusetts Governor, and even the US Congress.

Considering that the project generally enjoyed goodwill and broad support, there were very few places where the decisions were controversial. If we examine the probability of the program succeeding, again using the Pressman and Wildavsky model, we can see why people consider the project's success a near miracle. Like Pressman and Wildavsky<sup>5</sup>, we will look at the probability of favorable decision using the probability at four different levels: 80%, 90%, 95% and 99% likelihood of a favorable decision.

Probability of Agreement on Each Clearance Point (in percent)	Probability of Success After 101 Clearances	No. of Agreements that Reduce Probability Below 50%
80	.00000000163	4
90	.0000239	7
95	.00562	14
99	.362	68

As the table above shows, even if there is a 99% chance of a favorable outcome at each of 101 decision points, there is still only a 36 in 100 chance of the project succeeding through this number of decisions, even if it is not actively opposed. At 95% probability, there is only a 5 in 1000 chance of success. Clearly, this is an oversimplification as there is a different probability associated with each decision. For example, obtaining the MTC grant award of \$1 million was a long shot, likely with far less than 50% chance of success. However, what it demonstrates is that the number of agreements or clearances each project must win must be significantly reduced in order to increase the likelihood of program success. "Until one passes beyond 95 percent probability of agreement on each issue, only fourteen separate clearances are required to reduce the probability of completion below equality."<sup>6</sup>

<sup>5</sup> Pressman and Wildavsky, page 107.

<sup>6</sup> Ibid, p. 108.



## ***Regulatory and Policy Barriers***

There are four key barriers that emerged in Brockton's experience, and that other municipalities will face. Some of these barriers are specific to Brightfields and solar, though the majority of them are not.

1. Lack of existing grant and financing programs. The barriers begin with DOE's Brightfields program, which encouraged cities to devise ambitious goals, but provided few resources. The Brightfields program had only one staff person, and drew upon expertise of geographically distributed staff in Washington, DC headquarters, five regional offices, and the National Renewable Energy Laboratory. Importantly, it lacked grant funds beyond very small, sporadic solicitations. US DOE's Solar Energy Technologies Program is primarily a research and development program, there was no Congressionally authorized source of funds for deploying hardware. The need for grant funds was clearly anticipated: the market for PV is driven by incentives, even in the private sector. As Pressman and Wildavsky point out, "the essential constituents of any policy are objectives and resources."<sup>7</sup>

The Economic Development Administration Reauthorization Act of 2003 (enacted in October 2004) included \$25 million for Brightfields demonstration projects. Congress voted to authorize up to \$5 million in annual spending for Brightfields project development from 2004 through 2008. However, the funds were never appropriated. EDA was an unlikely home for Brightfields. In 2004, David A. Sampson, Assistant Secretary of Commerce for Economic Development testified before the Senate Committee on Environment and Public Works, "EDA is not opposed to pursuing the right Brightfields project provided it is consistent with our goals to create as many jobs and attract as much private sector support as possible." However, a Brightfield does not create jobs locally; it creates jobs indirectly through increasing demand for photovoltaics. Brockton was interested in supporting Massachusetts PV manufacturers, but was unable to specify PV manufactured in Massachusetts due to the federal interstate commerce clause, which prohibits such purchasing preferences. Brockton's two attempts at securing EDA funds through its regional EDA contact were rejected because job creation is EDA's primary criteria for evaluating public works funds, and Brightfields create jobs only indirectly and without a guarantee where they would be.

As a result of the lack of federal funds, and the difficulty securing state funds, Brockton initially fell short of its capital grant goal. This was not for lack of effort, but because the program did not fall within guidelines of existing programs.

While MTC eventually did provide the funding, it was a challenging road. The Trust's grant programs supporting solar have evolved over time, and are inconsistently available. This makes it difficult to plan. The process of submitting an unsolicited proposal resulted in high transactional costs in an environment of highly politicized funding decisions. In the end, Brockton obtained eleven grants from MTC, DOE, EPA, and NiSource to plan and develop the Brightfield.

Further, in the survey among Massachusetts municipalities, funding was mentioned repeatedly as being critical to making municipal clean energy projects succeed. Grants are necessary to make the electricity cost-competitive. MTC is the primary resource available to municipalities as most of the Federal incentives are tax credits that do not accrue to municipalities. One municipal contact called during the survey follow up said MTC "jerks people around so much" when they

---

<sup>7</sup> Pressman and Wildavsky, p. 168.

seek funding, she would not bother applying. The perception of the challenges creates barriers, even though some programmatic changes have simplified the application process. MTC will need to address this image to address these perceptions and encourage municipalities to apply.

Future policies encouraging development of renewable energy need to consider the availability of adequate financing and the transactional cost involved in securing such funds. “To him that hath the ability to fill out the forms shall be given.”<sup>8</sup> The MTC Small Renewables Initiative has been streamlined, and is now more accessible. However for utility-scale projects, smaller and poorer communities that cannot complete numerous, complex applications are unlikely to succeed, as will those who lack charismatic leaders and persistent project champions.

2. Lack of legal authority to finance, develop, own, and operate renewable energy facilities. At the state level, the Electricity Deregulation Act of 1997 left significant ambiguity. Most critically, while it appeared to contemplate the idea of municipalities as alternative energy producers, it did not give municipalities explicit legal authority. This limitation is not specific to solar or Brightfields; it applies to all “alternative energy” producers in towns without municipal light plants. This ambiguity frustrates attempts to define the boundaries of the issue, in terms of facility size or other criteria. In Brockton’s case, bond counsel raised the issue and required a Home Rule Petition to approve the bond. Anecdotal evidence from discussions with other attorneys and MTC staff indicate that other attorneys advising municipal clients on bond issues share Palmer & Dodge’s interpretation. Bond attorneys are notoriously conservative because they don’t wish to proceed with financing a project that may not legally be developed.

The boundary lines appear to be for a freestanding facility, not associated with a specific public building, and greater than 60 kW. The threshold for net metering as provided by the DTE Regulations (220 CMR 11.04) allows for net metering for up to 60 kW of installed capacity. MTC discourages projects greater than 60 kW for that reason, so Brockton will be the first in the state to exceed it. If the facility is freestanding, as in a solar Brightfield or a utility scale wind turbine, there is more likely to be a wholesale sale of electricity involved. Two of the survey respondents involved with Community Wind projects on Cape Cod reported a need for special legislation to be able to use one wind turbine to service two separate loads. The rules currently do not allow the distribution of electricity across a public way.

As described in Chapter three, definitions for “alternative energy producer” and “small power production facility” are provided. Municipalities are contemplated as alternative energy producers, but no explicit legal authority is granted. Municipalities seeking to develop alternative energy at a scale greater than 60 kW and/or not associated with a public building are confronted with significant uncertainty.

3. Municipal borrowing. Municipal authority and terms to borrow for alternative energy projects are derived from Chapter 44, Section 7, 3(b) which allows only 10 years to borrow for alternative energy projects. Financing for most photovoltaic and wind projects is typically calculated on a fifteen to twenty-year horizon. This makes economic sense as the life of the equipment is typically greater than 20 years, and warranties typically cover major equipment for 20 years.
4. Article 97 prevents the use or disposal of lands taken or deeded for conservation, open space or recreation purposes for other purposes. Since many municipalities lack significant land resources, this is likely to be an issue. Because Article 97 is within the Massachusetts Constitution, it is unlikely to be addressed through a legislative change. However, it is a

---

<sup>8</sup> Pressman and Wildavsky, p. 28.

restriction that municipalities need to take into consideration in site selection. Further, municipalities need to consider the broad interpretation of Article 97, which can construe land as conservation or natural resource land, even if it is a brownfield or other apparently unlikely candidate for Article 97.

### *Conclusions*

Due to the numerous special circumstances associated with the Brockton Brightfield, it is not considered to be broadly replicable. The Brightfields concept provides numerous public benefits, but is too complicated to implement without significant policy changes.

Many of the barriers described in this section are specific to Massachusetts. The financing available to a municipality will largely be dependent upon whether the state offers funding through a SBC fund, as well as the way the fund operates. In California, for example, there are numerous photovoltaic installations that cross beyond the 60 kW barrier, including numerous utility scale photovoltaic arrays. These rebates are set in known quantities and for long time horizons. There is the California Energy Commission's Emerging Renewable Technology Buy Down (providing rebates for solar PV, small wind, solar thermal, and fuel cells) and the California Public Utilities Commission Self-Generation Incentive Program<sup>9</sup>. In each case, the governing body sets the rates. The California programs provide a nearly automatic incentive program, provided proper procedures and eligibility criteria are met. The decisions are not political battles. California also offers an array of low interest and tax-exempt financing programs for local governments.

The Federal government encourages installation of renewable energy largely through tax incentives and accelerated depreciation. While these are helpful for the private sector, they do not help municipalities. Production incentives are the primary form of accessible Federal support; however they are subject to annual appropriations and often under-funded. The new Community Renewable Energy Bonds program provides a new financing instrument. However; its funding is currently capped and no decisions have been announced regarding the 2006 solicitation. It will be difficult for other municipalities to plan for using that tax-exempt bond-financing program.

The legal authority issues are specific to Massachusetts. All of the decisions that required Brockton to obtain special legislation will also face other municipalities seeking to install utility scale systems, particularly if they want to obtain 20 year financing. The particulars of electricity regulation (or deregulation) vary by state.

Removal of policy barriers could decrease the process complexity, number of transactions and decision points, and elapsed time in developing municipal renewable energy projects of all types. Streamlining the implementation process would have significant impact. Even with a 95% likelihood of success at each clearance point, having to pass more than 14 decisions reduces the likelihood of project success below 50%.

If Brockton's story is shared with other municipalities, and they are aware of process barriers, it may help them perform better planning (e.g., not be blindsided by Article 97). However, only legislative and policy changes will serve to remove the most significant barriers municipalities confront.

---

<sup>9</sup> "Renewable Energy Assistance Packet: A Compendium of Resources for Local Governments". Third edition. 2003. Prepared by the Local Government Commission through funding from the California Energy Commission.

## Chapter Five

### Policy Implications and Recommendations

As an increasing number of municipalities plan for and begin to implement renewable energy projects beyond popular solar on schools installations, the early movers confront policy barriers that hinder and threaten to derail these important initiatives. These policy barriers are being encountered with greater frequency as cities and towns struggle to meet their energy needs in an era of dramatic price increases and increasing concern about the environmental impacts of electricity production.

The barriers are triggered by utility-scale projects in cities and towns that lack municipal light plants. Because net metering is capped at 60 kW in Massachusetts, many challenges begin at that threshold. Some of these problems are common to the cases of Brockton, Falmouth, and Truro. Others are unique but significant nonetheless as they reveal challenges certain to be faced in future projects. Brockton’s chosen remedy was a time consuming Home Rule Petition. Many municipalities would decline to pursue this option.

In this Chapter, I focus primarily on policy barriers that could be addressed through legislative or regulatory changes. I also discuss the lessons of implementing renewable energy technology innovation at the local level.

#### *State Policies Hindering Municipal Development of Renewable Energy*

There are many state policies that make it difficult for municipalities to finance, develop, operate and maintain renewable energy projects. This section is focused on municipalities that do not have municipal light plants. Municipalities without established municipal light plants face different hurdles than those with municipal light plants, which have explicit legal authority to develop electricity generation assets, as well as other implementation advantages. Of 351 Massachusetts municipalities, only 41 have municipal light plants. Most of the policy barriers cited below do not apply to municipal light towns. One hurdle municipal light plant towns face that non-municipal lighting plant towns do not is that they are typically ineligible for grants from the Massachusetts Renewable Energy Trust because their ratepayers do not contribute to the fund.

The table below identifies policy barriers, the source of the barrier, and proposed solutions that will be discussed in this chapter.

**Table 10 -- Policy Barriers, their Sources, and Proposed Solutions**

<b>Policy barrier...</b>	<b>Derived from...</b>	<b>Proposed solution</b>
Legal authority to develop, finance, operate and maintain	MGL Chapter 164 silent on the issue	Legislative change
Limitation on municipal borrowing for alternative energy	MGL CHAPTER 44. Section 7	Legislative change
Procurement	MGL Chapter 30B, MGL 30§ 39M, MGL Chapter 149, MGL Chapter 25A: Section 11C	Legislative change

<b>Policy barrier...</b>	<b>Derived from...</b>	<b>Proposed solution</b>
Land availability	Article 97	No change, address by other means
Behind the meter economic advantages balanced with technical considerations	Interconnection standards	Legislative change
Limited project scale	Net metering provisions	Legislative change
Third party contracting	Net metering provisions	Legislative change
Insurance requirements	Interconnection standards	Legislative change

### Legal Authority to Finance, Develop, Operate and Maintain

It is not clear under Massachusetts General Laws whether a municipality has the legal authority to finance, develop, operate or maintain a utility-scale renewable energy facility. There is no case law, and few written legal opinions are available.

When Brockton sought assistance from bond counsel in April 2004, the law firm Palmer & Dodge concluded that because state law was silent on the issue, municipalities lack legal authority to finance, develop, operate and maintain alternative energy facilities. The Brightfield project team sought alternate opinions. Only one written opinion was found.

In 2003, the Massachusetts Energy Consumers Alliance had asked the law firm Bernstein, Cushner & Kimmell, P.C., to investigate whether state law precludes municipalities from developing and owning wind projects. The legal opinion was sought for the purpose of understanding whether a wind farm could be developed by the City of Boston on the Boston Harbor Islands. The legal opinion uses the following logic to suggest such development is not precluded.<sup>1</sup>

Chapter 164, Section 34 of the Massachusetts General Laws gives cities and towns the authority to construct and operate a municipal light plant. A municipal light plant is regulated by the Department of Telecommunications and Energy (DTE).<sup>2</sup> Massachusetts General Laws separate by definition “alternative energy producer” from “electricity company” in that “electric company shall not mean an alternative energy producer”.<sup>3</sup>

An “alternative energy producer” is “any person, firm, partnership, association, public or private corporation, or any agency, department, board, commission or authority of the

<sup>1</sup> Memorandum dated April 7, 2003 from Bernstein, Cushner & Kimmell, P.C. to Larry Chretien, Massachusetts Energy Consumers Alliance.

<sup>2</sup> There are significant transactional costs and regulatory requirements associated with establishment of a municipal light plant, and it requires approval by City council or town meeting in two consecutive years. The hurdles are sufficiently high that no new municipal lighting plant has been established in Massachusetts in many years. Although a wind energy project, solar power plant, or landfill gas project could qualify, the costs of establishing a new municipal light plant would far outweigh the benefits.

<sup>3</sup> Massachusetts General Laws, Chapter 164, Section 1. <http://www.mass.gov/legis/laws/mgl/164-1.htm>

commonwealth or of a subdivision of the commonwealth, that owns or operates a cogeneration facility or small power production facility as defined in this section, and does not engage in the retail sale of electricity other than sales to customers that are within the confines of an industrial park, which park existed prior to March first, nineteen hundred and eighty-two, and in which park there existed as of said date electrical generating capacity of more than fifteen megawatts.”<sup>4</sup> A city or town is a subdivision of the commonwealth. A “small power production facility” is “a facility which is any electrical generating unit which produces electric energy solely by the use, as a primary energy source, of biomass, waste, wind, water, wood, geothermal, solar energy, or any combination thereof, or produces gas if it is produced from coal, biomass, solid waste or wood, and has a power production capacity which, together with any other facilities located at the same site is not greater than thirty megawatts.”<sup>5</sup>

Because the General Laws, Chapter 164, Section 76 state that municipalities may be alternative energy producers and that, based on other statements in this section, “it appears a town operating as an alternative energy producer need not comply with the provisions... regarding municipal light plants.” The opinion concludes by stating that “The provisions in G.L. c. 164 regarding alternative energy producers do not provide explicit statutory authority for municipal operation of a wind power project; however, they show that the legislature contemplated the likelihood of such activities, and exempted such projects from DTE review and control. Presumably, in order to enter into contracts as an alternative energy producer, the city or town will require such approval as is needed in the normal course of business, such as a vote by town meeting or approval by city council.”<sup>6</sup>

The City of Brockton shared this opinion with Palmer & Dodge in May 2004. Palmer & Dodge agreed that there is not explicit statutory authority to develop solar, wind or other alternative energy projects. They concluded that special legislation is required, however, rather than approvals “in the normal course of business” to establish legal authority. The Bernstein, Cushner & Kimmell opinion hinged, in part, on their legal analysis of general municipal authority to act under the Home Rule Act. This argument did not sway Palmer & Dodge. A staff member at the Massachusetts Renewable Energy Trust said he was aware that other attorneys had reviewed the opinion and similarly believed special legislation is required.

A legislative change providing explicit legal authority would resolve this issue.

### Land Availability and Use (Article 97)

When seeking an appropriate location for a utility-scale renewable energy project, municipalities typically begin by looking at properties already owned by the city or town. If that land was purchased or otherwise acquired for public natural resource purposes such as parks, open space, conservation or recreation, it is covered by Article 97, an amendment to the state constitution enacted by a ballot measure in 1972.

Article 97 states that, “Lands and easements taken or acquired for such purposes shall not be used for other purposes or otherwise disposed of except by laws enacted by a two thirds vote, taken by yeas and nays, of each branch of the general court.” As a result, if a densely populated municipality with a shortage of open space wishes to site an alternative energy

---

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

<sup>6</sup> Ibid.

project on such lands, it requires an act of the state legislature that must be performed when the General Court is in session, not during the informal session.

According to a staff member at the Massachusetts Technology Collaborative, Article 97 issues are among the primary barriers to siting wind projects in municipalities<sup>7</sup>. In the City of Brockton's case, a brownfield property that was donated to the city in 1973 and had been an idle brownfield for three decades was surprisingly considered Article 97 property because the deed from Bay State Gas to the City of Brockton stipulated, "the parcels are conveyed subject to a restriction that the property shall be used for park, recreational or conservation purposes only." Even though the property had never been used or considered for park and recreational purposes, and the Activity and Use Limitation eventually applied to the property would prohibit such a use, a ruling by the Attorney General in 1973 called for the broadest interpretation of the legislation. Brockton required special legislation for its sale-leaseback arrangement with Bay State Gas Company, which was critical for project financing and site control. Some communities, when confronted with this Article 97 challenge, opt to select alternate sites.

It appears unlikely that Article 97 issues would be resolved through a legislative change. According to John DeVillars, who formerly served as Secretary of Environmental Affairs for the Commonwealth of Massachusetts and Regional Administrator for EPA New England Region, "I don't think it's realistic to think you can get any generic entitlement or expedited process for renewables. It will have to be site-specific, using the Home Rule Petition process. Article 97 is a sacred cow that won't be led to the slaughter easily."<sup>8</sup>

### Siting Constraints and Economic Disadvantages

For wind projects in general, the two greatest factors leading to economic viability are the availability of wind resources and the ability to develop the project behind the meter so as to take advantage of avoided retail cost of electricity. Behind the meter advantages are also very significant for solar and other renewable energy resources. The challenge for municipalities is that often the best location for the resource is not co-located with their largest electric loads (frequently schools and water and wastewater treatment plants). If the electricity is not all used on site and must be distributed a public way, the electricity becomes subjected to a distribution charge. In these cases, the municipality faces a choice between an optimal technical solution for the location and an optimal solution for financing purposes, and then these factors must be weighed with other factors including community acceptance.

Some renewable energy projects are economically viable only if they can take advantage of both optimal resource and behind the meter advantage. These economic disadvantages are exacerbated by the 60 kW cap on net metering. It is important to note that net metering does not, in itself, prohibit projects >60 kW, it simply limits the economic advantages of net metering. It was difficult to identify where in the regulations these challenges with access across a public way and net metering were located. In an interview with Nils Bolgen, a project manager at the Massachusetts Renewable Energy Trust, I sought to clarify the specific provisions in the regulations that require distribution charges be imposed when crossing a public way. "It's not explicitly stated in the regulations.... You can't put your finger on it.

---

<sup>7</sup> Interview with Kristin Burke, Program Manager, Massachusetts Technology Collaborative, Renewable Energy Trust. February 2006.

<sup>8</sup> Interview with John DeVillars, August 2006.

It's squishy, like Jello.”<sup>9</sup> The regulations provide certain powers to the distribution companies, and they set the rules.

This conundrum could be resolved through two potential means. First, a legislative change could be enacted to provide municipalities the ability to use grid-connected power generated off-site at avoided retail cost. This is likely to be controversial with investor owned utilities, which would perceive such a requirement as forcing them to bear uncompensated distribution costs. Because of that, an alternate solution could be a change in the handling of crossing a public way. One idea would be to allow to contiguous meters to take advantage of net metering. Another might be to define an appropriate wheeling rate for municipalities as a compromise solution. Because there is public benefit to municipal adoption of renewable energy, this may be acceptable.

### Municipal Borrowing

Chapter 44 of the Massachusetts General Laws dictates the terms of debt municipalities can incur. The laws governing municipal borrowing apparently did not contemplate community-based renewable energy projects of a scale greater than modest improvements to public buildings. Chapter 44, Section 7 of Massachusetts General Laws poses a major hurdle:

CHAPTER 44. § 7 Cities and towns; purposes for borrowing money within debt limit.  
“Cities and towns may incur debt, within the limit of indebtedness prescribed in section ten, for the purposes hereinafter set forth, and payable within the periods hereinafter specified: ...  
(3B) For energy conservation and alternative energy improvements to public buildings or facilities owned by the city or town, ten years.”<sup>10</sup>

Photovoltaics and wind projects are typically financed for 20 years. In order to overcome this financing barrier, a community must secure special legislation or find a way to finance the project within a 10-year time frame. This holds true regardless of the source of the debt and if the particular bond or loan program allows 20 years.

Further, the language “improvements to public buildings or facilities owned by the city or town” posed a challenge to Brockton’s Brightfield, according to Palmer & Dodge. This was one other case where it appeared Brockton lacked legal authority because the project was not associated with a public building or facility, and which led the firm to conclude a Home Rule Petition was required.

A legislative change should be enacted to allow borrowing for up to 20 years and also eliminating the requirement that the alternative energy project be associated with a building. This is supported by the project life span, typical financing arrangements, and equipment warranties. Language from Chapter 44 § 7(9) could serve as model language “For the cost of equipment, 5 years or for such maximum term, not exceeding 15 years, based upon the maximum useful life of the equipment as determined by the board of selectmen or the mayor or city manager of the city or town,”<sup>11</sup> but substituting a span from 10 to 20 years.

---

<sup>9</sup> Interview with Nils Bolgen, August 2006.

<sup>10</sup> Massachusetts General Laws, Chapter 44, § 7. <http://www.mass.gov/legis/laws/mgl/44-7.htm>

<sup>11</sup> Ibid.



## Procurement

There are three different chapters of state procurement law that municipalities must follow for the purchase of goods and services; which chapter applies depends upon what product or service the city or town is procuring. Brockton's Chief Procurement Officer was stymied by the challenge of determining which chapter of state procurement law would apply to developing the Brightfield, which sounded like construction of public works, but was not analogous to a roadway due to its high technology requirements.

Chapter 30B applies to "every contract for the procurement of supplies, services or real property and for disposing of supplies or real property by a governmental body".<sup>12</sup> Excluded from Chapter 30B, among other items, is "energy contracts entered into by a city or town or group of cities or towns or political subdivisions of the commonwealth, for energy or energy related services; provided, however, that within 15 days of the signing of a contract for energy or energy related services by a city, town, political subdivision, or group of cities, towns or political subdivisions said city, town, political subdivision, or group of cities, towns or political subdivisions shall submit to the department of telecommunications and energy, the division of energy resources, and the office of the inspector general a copy of the contract and a report of the process used to execute the contract".

Chapter 30 Section 39M applies to "Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than ten thousand dollars, and every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, as defined by subsection one of section forty-four A of chapter one hundred and forty-nine, estimated to cost more than \$25,000 but not more than \$100,000."<sup>13</sup>

Chapter 149 applies to procurement for "every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency."<sup>14</sup>

Chapter 149 § 44M applies to "Energy system", any equipment that is employed to heat or cool a building, or to heat hot water used in a building, or to generate electricity for a building and that uses the sun, wind, water, biomass, oil, natural gas, or electricity as its power supply in whole or in part." In the case of the Brightfield, the project was not associated with a building.

Further, under the Division of Energy Resources, Chapter 25A: Section 11C. Contracts for procurement of energy management services provides for performance contracting for energy savings contracts.<sup>15</sup>

A review of these regulations does not provide clarity as to which is appropriate for utility-scale solar as there are elements of each that are not applicable. Bond counsel was not comfortable with a 30B exclusion for a system of this size. Further, separating design/build

---

<sup>12</sup> Massachusetts General Laws, Chapter 30(B) Uniform Procurement Act.  
<http://www.mass.gov/legis/laws/mgl/30b-1.htm>

<sup>13</sup> Massachusetts General Laws Chapter 30 § 39 M.. <http://www.mass.gov/legis/laws/mgl/30-39m.htm>

<sup>14</sup> Massachusetts General Laws Chapter 149 "Fair Competition for Bidders on Public Works"  
<http://www.mass.gov/legis/laws/mgl/149-44a.htm>

<sup>15</sup> Chapter 25A: Section 11C. Contracts for procurement of energy management services  
<http://www.mass.gov/legis/laws/mgl/25a-11c.htm>

posed additional challenges because a system design would likely specify or favor particular technologies, making a competitive procurement difficult. Palmer & Dodge attorneys felt that seeking an exclusion from competitive procurement in Brockton's Home Rule Petition would make it controversial and less likely to succeed. In the end, Palmer & Dodge recommended that Brockton's Home Rule Petition specify use of Chapter 30(B) and allowing a single procurement of design and build.

Other municipalities (i.e., Newton) followed the cumbersome Chapter 149 process. Again, for a freestanding project that is not part of a building, the applicable authority is unclear. A legislative measure should clarify which chapter, if any, applies to the development of alternative energy producers.

Some of the survey respondents had inquired as to whether the state could assist with purchasing. In 2004, MTC had investigated whether it could facilitate municipal purchasing and meet environmental goals by working through the Massachusetts Environmentally Preferred Purchasing Program. The Environmentally Preferred Products Procurement Program is run by the state Operational Services Division. It is designed to use the state's purchasing power to reduce its environmental and public health impacts and to encourage markets for environmentally preferred products. That option is constrained, however, by a \$10,000 maximum contract value. Any project with a value greater than \$10,000 will have to be competitively bid. A legislative remedy could be developed for renewable energy technologies exempting them from the \$10,000 cap and enabling the state to both simplify the process and reduce initial capital costs.

### Third Party Contracting

Some municipalities may seek to minimize the administrative and policy barriers through third party contracting. In this model, a private third party finances and installs the system and recovers its costs through a long term power purchase agreement with the end user. Because private parties can take advantage of tax incentives and accelerated depreciation, as well as reduce transactional costs, this option is often perceived as advantageous. However, in an interview exploring some of the other issues identified through my primary research, I discovered that third party net metering is not authorized<sup>16</sup>. To date, there have not been any known challenges. However, to include third party contracting as an option, a legislative change would provide explicit authority.

### Insurance Provisions

Per the above process, I also learned of an additional barrier that was not revealed through my primary research. Interconnection standards currently require interconnecting customers to procure insurance policies. These policies are driven by liability concerns. Because there is little precedent, it is unknown what impact these provisions will have on project finances. Brockton only recently began seeking insurance policies, and is awaiting cost information. Other states do not require it, so it remains to be seen whether it is absolutely necessary. The questions to be explored are whether it is necessary and, if so, whether the utilities could pool distributed generation customers so as to obtain an optimally priced product.<sup>17</sup>

---

<sup>16</sup> Interview with Fran Cummings, Policy Director, Massachusetts Technology Collaborative, Renewable Energy Trust.

<sup>17</sup> Ibid.

## Grants and Incentive Programs

State grants and incentives available for development of renewable energy are typically allocated through programs that are short-lived and awarded through a competitive application process. The programs funding the grants may be in effect for only one or two years, making planning for resources difficult. In some cases, the incentive amount is on a sliding scale based upon how many awards are made by the rather than a predictable time frames. The applications themselves can be lengthy and cumbersome; many municipalities simply lack the resources to complete the applications. In some cases, the grant award will expire if the project is not completed within one year. Given the numerous permissions and bureaucratic hurdles, some government agencies hesitate to apply.

For example, for cities seeking to install photovoltaics, the Massachusetts Renewable Energy Trust offered a “Cluster Grant” program in 2002 that awarded funds to only six awardees to create geographic “clusters” of solar. In 2003, an “Open PV” program provided grants to seven more entities that could use the awards for installations without geographic restriction. The program was subsequently changed in 2004 to the “Small Renewables Initiative” which is not limited to PV, but can support installation of any technology under 10 kW. The benefit of this program is a simpler application. However, This funding is available through a block structure program with steadily declining funds once a certain amount of funding is allocated. It also has uncertain renewal prospects.

For any technology installation over 10 kW, the Large Onsite Renewable Initiative (LORI) provides grants through a competitive solicitation held sporadically, perhaps twice annually. Recognizing the importance of long-term revenue streams for renewable energy projects, the MTC also created the “Massachusetts Green Power Partnership” REC revenue guarantee program. Applicants can specify one of four potential arrangements that include agreements or options for MTC to purchase the RECs during a certain applicant-specified period in the project life. This program is also available only through sporadic solicitation.

Applicants are precluded from obtaining both a LORI award and by the Massachusetts Green Power Partnership REC revenue guarantee program. As a result, if a municipality begins planning a project in 2006, it will not be able to plan with confidence for either incentive. Its success may have as much to do with the competitors within any single application cycle as it does with the quality of their project and application.

Experimental grant programs such as these are understandable in the early phase of a SBC fund. Now that the Trust has several years of experience, and the benefit of learning from other SBC funds, the Massachusetts Renewable Energy Trust can make municipal planning more reliable and facilitate industry growth by adopting consistent funding programs, such as the successful Small Renewables Initiative, with longer time horizons.

Further, MTC should explore additional financing alternatives. A zero interest loan program analogous to the SRF Revolving Fund offered by EPA for water infrastructure projects serves as a model. Over the course of twenty years, the difference between a zero interest bond and (likely) a taxable bond could reach into the hundreds of thousands of dollars.

Finally, MTC could play a significant role by providing technical assistance to municipalities that are required to apply for multiple sources of financing. The applications are lengthy and complicated, and often put project financing out of reach for resource-strapped municipalities. Consulting support similar to technical assistance provided through the

Community Wind initiative would enable more municipalities to access diverse funding streams.

### ***Federal Policy Barriers for Municipalities and Recommended Changes***

Most of the federal policy barriers relate to federal grant and incentive programs designed to encourage installation of renewable energy. Most of these financial instruments are designed for private beneficiaries, in the form of tax incentives and accelerated depreciation.

#### **Grant and loan programs**

There are few grant or loan programs to help municipalities study, perform predevelopment for, or install renewable energy projects. In the current fiscal climate, it is difficult to envision the creation of ambitious new programs. Therefore, the programs cited here are limited to existing programs that were relevant to the case study examined, including Brightfields and Solar Powering America (formerly Million Solar Roofs).

The Economic Development Administration Reauthorization Act of 2003 enacted in October 2004 included \$25 million for Brightfields demonstration projects. Congress voted to authorize up to \$5 million in annual spending for Brightfields project development from 2004 through 2008. However, the funds were never appropriated. A congressional appropriation should be made to provide authorized funding. Development of utility scale Brightfields provides numerous public benefits and is justified. If EDA's program is funded, it should be implemented in tandem with the DOE's Brightfields program. Regular solicitations, technical assistance, and a link to funding can make the difference between ambitious pronouncements and program success.

Further, the DOE has recently unveiled an ambitious "Solar America Initiative". The program seeks to increase technology acceptance by eliminating marketplace barriers and increase opportunities for market expansion. The proposed innovation as compared to the past Solar Energy Technologies program is a shift towards a partnership approach. DOE can work with municipalities to address financing and implementation barriers by working in partnership with its solid base of over 100 state and local Million Solar Roofs partners that have worked since 1997 to install over 350,000 PV systems nationwide. This significant resource base of partners includes several that responded to the "Notice of Public Input" process. The input has not yet been published, but is sure to include a variety of innovative and thoughtful recommendations. A Federal zero interest loan program similar to the one proposed above could provide a mechanism for DOE to foster increased deployment of photovoltaics without providing a costly grant or duplicative buy-down incentive program.

#### **Bonds: Availability and IRS Rules**

The recently Community Renewable Energy Bonds program authorized through the Energy Policy Act of 2005 provides another financial instrument available to municipalities in the form of an interest-free bond. The Federal government provides the bondholder a tax credit in the amount a bond issuer would otherwise pay in interest. It presents challenges common to renewable energy financing: its guidelines are unclear and its horizon of availability is uncertain. The first round of applications was due in April 2006. Following this experiment, the Treasury should determine a regular cycle of availability and funding amount for at least a five-year window.

The IRS could also foster more cost-effective implementation of renewable energy through revised regulations pertaining to municipal bonds. It is logical to expect that a municipality should be able to issue tax-exempt municipal bonds for renewable energy, there are other aspects

of project financing that require issuance of taxable bonds. Because more incentives accrue to private parties and they are less constrained by state regulations, municipalities are turning to private developers to assist them with implementation. These relationships serve to eliminate lower cost of capital advantages that should accrue to public projects. The sale of electricity and Renewable Energy Certificates to private parties and leasing property from a for-profit company can prohibit a municipality from issuing tax exempt bonds due to federal regulations concerning [*check with Jay Gonzalez at EAPD for correct terminology*]. The difference between a tax-exempt and taxable bond can be several percentage points, creating significant financial impact over 20 years.

### Production Incentives

The federal Renewable Energy Production Incentive provides financial incentive payments of 1.5 cents per kWh production incentive to qualifying projects for the first ten years of their operation. This program is typically under-funded and subject to annual appropriations by Congress. Longer-term, adequate financing should be provided.

### ***Conclusions***

Forward-thinking municipalities have begun to plan for and install renewable energy projects. These facilities offer numerous public benefits and should be encouraged. Policy changes at the state and federal level could be enacted to facilitate municipal adoption of renewable energy resources as one critical element in their electricity supply portfolio. Stakeholders concerned with energy, the environment, and municipal well-being should encourage state and federal policy changes that reduce the number and complexity of process steps and decisions required to enable implementation to succeed.

Brockton's Brightfield project implementation was challenged by the complexity of joint action, policy barriers that required legislative fixes, and theoretical defects in the Brightfield program concept. These barriers were overcome only through a confluence of multiple key success factors. The probability of Brockton succeeding were low. Success factors that helped Brockton overcome the barriers included a charismatic leader, strong project champions, positive community relations, strong political support, locally-driven and owned project, a detailed feasibility study, a partnership approach, significant local investment and cost-effectiveness.

The problems of financing and complexity of joint action are leading more municipalities towards third party contracting with private developers. This model allows a municipality to enter into a long-term power purchase agreement with a private developer, who bears the initial capital costs and development risks. While that appears to eliminate many policy and process barriers, it also has the downsides of eliminating key success factors and exposing municipalities to legal challenges. If a project is not locally owned, the public benefits diminish and crucial support may be lost. It also eliminates some of the price advantages of municipal asset ownership.

Implementing utility-scale renewable energy projects provides many public benefits. It should not be so complicated that it requires heroic effort, disproportionate transactional costs, and a unique confluence of multiple success factors to succeed. The policy recommendations provided here would eliminate numerous decision clearances that reduce probability of project success. Doing so would greatly enhance municipal adoption of renewable energy technologies, with all the attendant environmental, social and economic benefits such action provides.

Massachusetts has a long history of convening diverse stakeholders to address policy and legislative issues. Because there is currently little precedent for successful completion of municipal renewable

energy projects, it is likely there are additional barriers that have not yet been identified or fully explored. The Distributed Generation Collaborative has invested significant time and resources into discussing related issues that may or may not be specific to municipalities. Further, in the case of wind energy, policies have recently been adopted at the municipal level that may serve as additional barriers. It will be important, again, to convene diverse stakeholders to discuss the spectrum of barriers and to develop workable solutions that acknowledge the public benefits of local government adoption of renewable energy technologies, and then set ratemaking and other regulations in a way that is consistent with utility protections in the Deregulation Act. Enacting a comprehensive series of policy changes will better enable Massachusetts to reap the environmental, economic, and energy security benefits of renewable energy.

## References

- Beals, Gerald. "The Development of Early Power Plants Throughout the World". 1997. Excerpted on <http://www.thomasedison.com/brockton.htm>.
- Bernstein, Cushner & Kimmell, P.C. ,Memorandum Re: Legal Authority of a Municipality to Construct and Own a Wind Energy Project, to Larry Chretien, Massachusetts Energy Consumers Alliance, April 7, 2003.
- BP Paulsboro, New Jersey, BP website, <http://www.bpaulsboronj.com/redevelopment/solar.html>.
- Carroll, Walter F. Brockton: From Rural Parish to Urban Center. Windsor Publications, 1989.
- Code of Massachusetts Regulations, 225 CMR 14.00 Renewable Energy Portfolio Standard.
- Colombo, Lori R. "Brockton Brightfield Community Outreach Plan and Summary of Results", October 2002.
- Colombo, Lori, XENERGY, and SPIRE Corporation. "Brockton Brightfield Conceptual Development Plan", October 2002.
- Colombo, Lori , Memorandum to City Council Finance Committee, November 30, 2006.
- Condon, John A., Letter to Mayor John T. Yunits, Jr. and the Brockton City Council, July 18, 2005.
- Consortium for Energy Efficiency, "Fact Sheet: State and Local Purchasing Initiative", <http://www.cee1.org/resrc/facts/purch-fx.php3>.
- Environmental Defense, Fact Sheet: Air Quality. November 2002. [http://www.environmentaldefense.org/documents/1041\\_FactSheet\\_Electricity.pdf](http://www.environmentaldefense.org/documents/1041_FactSheet_Electricity.pdf).
- Flynn, Sean, "Brockton Residents Want Solar Panels Hidden." *Enterprise*, September 19, 2002.
- Massachusetts General Laws, available at <http://www.mass.gov/legis/>
- Local Government Commission , "Renewable Energy Assistance Packet: A Compendium of Resources for Local Governments". Third edition. 2003.
- Massachusetts Renewable Energy Trust website. <http://www.masstech.org>
- Polatin, Jacob Letter to Benjamin Albanese, Re: Grove Street Conveyance – City of Brockton to Bay State Gas Company, October 11, 2005.
- Ribeiro, Lori, "Case Study: Brockton Brownfields to Brightfields Renewable Energy Certificate Innovative Marketing Concept", July 2006.

Pressman, Jeffrey and Aaron Wildavsky. Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, this Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes. Los Angeles and Berkeley, California: University of California Press, 1984.

Singh, Virinder. "Clean Government: Options for Government to Buy Renewable Energy". Renewable Energy Policy Project, April 1999.

Solar Design Associates, "The Use of Solar Electricity at City of Brockton Facilities", March 2004.

Spears Bell, Rhonda and Elena Temple. "US Mayors Sound Alarm on Rising Fuel Costs and Energy Crisis", (May 10, 2006). US Conference of Mayors Home Page. Retrieved July 6, 2006 from <http://usmayors.org/uscm/home.asp>.

Spire Corporation, "Technical Feasibility Study for the Brockton Brightfield", Task 1 Report, February 2002

Sterzinger, George and Matt Svrczek, "Solar PV Development: Location of Manufacturing Activity." Renewable Energy Policy Project, Technical Report, January 2005.

Sterzinger, George and Matt Svrczek, "Wind Turbine Development: Location of Manufacturing Activity," Renewable Energy Policy Project, Technical Report, September 2004.

U.S. Department of Energy, Brightfields Program information, <http://www.eere.energy.gov/wip/pdfs/brightfields.pdf>

US Department of Energy, Rebuild America Program, [http://www.rebuild.gov/sectors/SectorPages/OverView\\_govt.asp?MktID=4](http://www.rebuild.gov/sectors/SectorPages/OverView_govt.asp?MktID=4)

U.S. Department of Energy, State Energy Program Projects, [http://www.eere.energy.gov/state\\_energy\\_program/projects\\_topic.cfm](http://www.eere.energy.gov/state_energy_program/projects_topic.cfm)

XENERGY, "Brockton Brightfield Energy and Attribute Marketing Study", October 2002.

XENERGY, "Brockton Brightfield Ownership and Partnership Options Study", July 2002

XENERGY, "Brockton Brightfield Pre-Tax Financial Feasibility Study", April 2002

#### Interviews

Nils Bolgen, Program Manager, Massachusetts Technology Collaborative, Renewable Energy Trust

Joseph Bourg, Principal, Millenium Energy



Kristin Burke, Program Manager, Massachusetts Technology Collaborative, Renewable Energy Trust

Fran Cummings, Policy Director, Massachusetts Technology Collaborative, Renewable Energy Trust

.John DeVillars, Managing Director, BlueWave Strategies, Inc.

Steven Hogan, Executive Vice President, Spire Corporation.

## Appendix 1 – Brightfield Project Chronology

Year	Process Step
2000-Spring	Project concept development
Summer	Presentation to and acceptance by City Planner
September	Presentation to and acceptance by Mayor
October	Participation in Brownfields 2000 national conference, meeting with stakeholders to first Brightfield in Chicago (Spire Corporation and DOE)
November	Inquiry made to "Responsible Party", Bay State Gas Company -- Project concept well-received
	Inquiries made to US DOE regarding support, discussions with contacts in Boston and DC HQ, meetings with Spire Corporation
	Mayor requests study of PV applications at Brockton High School, Wastewater Treatment Plant, Baseball Stadium, and Desalination Plant
December	DOE issues Brightfields solicitation for Brightfields; \$100,000 available nationwide for 1 or 2 projects -- competition expected to include at least 10 projects, including one from NYC "with all the bells and whistles"
2001-January	More stakeholder meetings and research
February	Proposal submitted for requesting \$30,000 DOE Brightfields Funds (through MA DOER since funds are through State Energy Program). Project is to perform feasibility analysis on Brightfield concept -- PV array, PV on four rooftops, attracting a PV manufacturing plant to Brockton.
	Ongoing research and meetings, communications from DOE that technical support will be limited
April	Brockton meets with Massachusetts Technology Collaborative (MTC), administrator of the Renewable Energy Trust, works with project partners to submit proposal for \$128,415 to perform a detailed technical and financial feasibility study for PV array on Grove Street.
June	Brockton receives notice of DOE Brightfields funding award-- one of three communities selected nationwide
	Brockton receives notice of MTC "Green Power Predevelopment" funding award-- one of seven communities selected statewide -- among the first facilities in the state to receive funding from the Trust.
	Brockton Mayor Jack Yunits provides comments on US DOE's National Energy Policy at public meeting held in Boston. He is the only elected official in the state to appear in one of seven regional meetings held nationwide regarding funding and performance of DOE's Office of Energy Efficiency and Renewable Energy.
July	DOE and MTC Project agreements negotiated
Fall	Projects commence
	Stakeholder outreach
November	First public meeting regarding project concept
December	Technical Feasibility Study for PV array completed <a href="http://www.ci.brockton.ma.us/Section_News/Bids.cfm?BidID=16">http://www.ci.brockton.ma.us/Section_News/Bids.cfm?BidID=16</a>
2002	Technical feasibility report revised, completed in February

## Appendix 1 – Brightfield Project Chronology

April	Pre-Tax Financial Feasibility Study completed <a href="http://www.ci.brockton.ma.us/Admin/File_Manager/stored/FinancialFeasibilityFinalReport%2Epdf">http://www.ci.brockton.ma.us/Admin/File_Manager/stored/FinancialFeasibilityFinalReport%2Epdf</a>
May	Brockton submits proposal to North American for Environmental Cooperation. Proposal was not funded.
July	Ownership and Partnership Options Study Completed
August	Preliminary Design and Engineering Report Completed <a href="http://www.ci.brockton.ma.us/Admin/File_Manager/stored/BrocktonTask5Final021106%2Epdf">http://www.ci.brockton.ma.us/Admin/File_Manager/stored/BrocktonTask5Final021106%2Epdf</a>
September	Second public meeting held -- Community supports the project provided aesthetic considerations are addressed.
October	Community Outreach Plan and Summary of Results completed
	Energy and Attribute Marketing Study completed
	Brightfield Financing Study completed, in consideration of final design
	Project team meets with Mayor and CFO, given approval to proceed to next step provided grant funds of \$1.5 million can be raised
	Conceptual Development Plan submitted to MTC.
	Dialogue with MTC for Final Pre-development Funding Initiated
November	Brockton submits proposal to US EPA for \$10,000 to "Innovations Working Group" financing to test Innovative Marketing Plan for Renewable Energy Certificates (RECs)
	Brockton initiates discussions with MTC for additional predevelopment funding to complete financing plan, marketing, and procurement documents for turnkey system installation
December	Brockton submits proposal to MTC for \$79,550 in additional development funding
2003-February	MTC awards Brockton \$79,550
Spring-Summer	Brockton conducts market research on innovative model for marketing RECs -- meets with potential brokers and end customers.
	Brockton seeks additional funding sources -- discussions and meetings with are held US EPA, US EDA, and DOE
June	Mayor Yunits meets with DOE Assistant Secretary of Energy Efficiency and Renewable Energy David Garman to request project financing
June	Brockton submits proposal to US Economic Development Administration seeking up to \$750,000
June	Brockton asks Federal Congressional delegation for assistance in securing \$1 million appropriate for Brightfield development
July	Brockton forms "Brockton Solar Champions Partnership" and applies to become a DOE Million Solar Roofs" partnership with a Phase I grant of \$50,000.
August	Brockton obtains verbal commitment for REC and electricity purchase from private company
September	Brockton appliest to MTC for "Green Power Partnership", a revenue guarantee program for Renewable Energy Certificates.

## Appendix 1 – Brightfield Project Chronology

	Brockton receives DOE Million Solar Roofs award
October	Brockton submits draft proposal to MTC seeking \$1 million in predevelopment financing. Discussions ensue, additional data is provided, and revisions are made.
November	Brockton submits final proposal to MTC seeking \$1 million in predevelopment financing.
December	Proposal to MTC is supposed to undergo Board vote. Project removed from the docket just before the meeting.
	Bay State Gas Company completes significant landscaping and fencing work surrounding the properties.
2004. January	Brockton project received Board resistance. Clarification is sought.
	Mayor writes to Secretary of Administration and Finance seeking support.
	Brockton project again removed from MTC docket.
February.	Mayor Yunits meets with key officials in State House to confront institutional resistance to \$1 million MTC grant.
	Mayor Yunits meets with Chairman of MTC Board's Renewable Energy Trust Chairman to provide project overview and merits.
	Brockton Brightfield project approved by MTC Board for development funding and MGPP.
	Brockton seeks and obtains City Council approval to sell parcel of land to Bay State Gas Company, lease the land for Brightfield development, and establish an Enterprise Fund for the project. Aesthetic improvements at the site key to winning support.
March	Official MTC award announcements and significant media coverage
	Brockton fields dozens of calls from PV manufacturers, installers, component manufacturers, other interested stakeholders.
	Brockton applies to US DOE for "Solar Technology on Brightfields", seeks \$150,000 of \$250,000 available nationwide for 2-3 grants.
April	Brockton Chief Financial Officer contacts bond counsel to discuss project financing. Bond counsel raises concerns and requests a meeting.
	Bond counsel at Palmer & Dodge raise three issues posed by the Brightfield that are not allowable under Massachusetts General Laws (MGL): legal authority to finance, develop and operate the facility, length of debt financing, uncertainty regarding procurement. Special legislation ("Home Rule Petition) is required to overcome these barriers.
May	Bond counsel drafts Home Rule Petition, it is filed to City Council
June	City Council approves Home Rule Petition
	Home Rule Petition filed at State House by Representative Tom Kennedy.
	Brockton meets with Federal delegation to seek appropriation for Brightfield.
August	House Energy Committee holds public hearing on Home Rule Petition. It is recommended favorably.
September	House Committee on Long-Term Debt and Public Expenditures holds public hearing on Home Rule Petition. It is recommended favorably with amendments.
	Brockton learns it will receive \$59,400 from US DOE for Brightfield development.

## Appendix 1 – Brightfield Project Chronology

October	Amended Home Rule Petition referred to Committee on Ways and Means.
December	House Counsel rules amended home rule must be approved by City Council. Measure passes under suspension of the rules. Bill is referred to the Senate. Senate passes home rule petition with an amendment, referred back to the House.
2005 January	House votes to concur with amendment, but does not vote to pass the legislation. The Bill is dead.
	City and State delegation initiate intensive lobbying effort to get measure passed under suspension of the rules. Must obtain approval from House Speaker, Senate President, and minority leaders in House and Senate.
February	Legislation passes under suspension of the rules. Legislation requires Governor's signature.
	Governor signs the legislation, Chapter 5 of the Acts of 2005. <a href="http://www.mass.gov/legis/laws/seslaw05/sl050005.htm">http://www.mass.gov/legis/laws/seslaw05/sl050005.htm</a>
	Brockton applies to Massachusetts Community Development Action Grant (CDAG) for \$400,000.
	Brockton obtains \$25,000 grant commitment from Sheehan Family Foundation as a match for CDAG.
	Brockton must renew City Council authorizations of land transaction and Enterprise Fund following passage of Home Rule petition.
	Brockton releases request for proposals for disposition of property on Grove Street
March	Brockton begins discussions with MTC regarding updating / renegotiating specific terms of grant contracts and MGPP
	Brockton enters into negotiations with Constellation New Energy (CNE) for 1) city to extend its electricity supply contract with CNE and for 2) CNE to purchase RECs generated by the Brightfield and 3) to manage the power purchase for Brightfield electricity for City Hall load.
	Bay State Gas Company seeks to close on the land transaction and lease agreement.
April	City Solicitor decides that Brockton should not sole source with CNE, decides the contracts must be put out to bid through another consultant
	City begins to draft Request for Proposals for Turnkey System Design, Installation, Operations and Maintenance
May	Brockton receives proposal from Bay State Gas Company for purchase of land
	Land transaction negotiations continue, require approval of City Council
	Bay State Consultants begins procurement process for electricity and RECs
	Brockton CDAG proposal is rejected.
June	City Council votes to authorize sale of property to Bay State Gas Company and lease agreement
	City Council approves \$26,000 appropriate to Enterprise Fund for consulting expenses
	BayState Consultants establishes contract terms for Electricity and REC bids, establishes uniform requirements with two for bids to be submitted on July 14
	MTC reduces grant commitment due to City's failure to meet entire match requirement
July	Electricity and REC bids submitted and rejected due to unfavorable terms

## Appendix 1 – Brightfield Project Chronology

	Request for Proposal documents finalized, advertised and released
August	Pre-bid meeting for Turnkey Brightfield installer
	Electricity and REC bids sought, submitted and rejected due to unfavorable terms
	Sheehan Family Foundation rescinds grant pledge of \$25,000.
September	Brightfields Proposals submitted -- only one proposal is submitted timely, the other is submitted 20 minutes past the timeline and must be rejected
	Electricity and REC bids sought, submitted and failed twice due to unfavorable terms -- hurricanes Katrina and Rita drove prices up
	Rejected vendor initiates potential protest
	Land transaction falters -- the land had been deeded as conservation, open space or recreation land and may not be able to be conveyed. Legal research required.
October	Electricity and REC bids sought and accepted, though terms are not favorable. Prices perceived to be only increasing. REC deal diminished in this round from 20 years to 10. Rather than being revenue-neutral, the project may have negative cash flow through 18 of 20 years.
	Land transaction discovered to be prohibited by Article 97 of the Massachusetts constitution. Issue can be resolved only through 2/3 vote of the state legislature. The legislature adjourns on November 16, if the legislation does not pass, it will not be considered until Spring 2006.
	Second Home Rule Petition drafted and filed to City Council. Passed under suspension of the rules.
	Home Rule Petition filed in the House.
November	Joint Committee on Municipalities and Regional Government holds public hearing on Home Rule Petition, recommends it favorably.
	Home Rule Petition passes the House and Senate at 4:20 PM on the final day of the legislative session , Chapter 151 of the Acts of 2005. <a href="http://www.mass.gov/legis/laws/seslaw05/sl050151.htm">http://www.mass.gov/legis/laws/seslaw05/sl050151.htm</a>
	Land transaction nearly closed -- the mylars for the property subdivision were signed by a firm other than the one cited in City Council and Home Rule Petition. Site survey documents must be redone.
	Land transaction closed.
	Project size renegotiated with MTC.
	Brockton obtains \$700,000 appropriate from US DOE
	Mayor seeks debt authorization of \$1.6 million from City Council
December	City Council approves \$1.6 million bond request
	Negotiation with turnkey system vendor underway
	Negotiation of REC and electricity contracts underway
	Negotiation of final grant terms with MTC underway
	Negotiation of grant terms with DOE scheduled for January 2006
2006 January	Negotiations commence with US Department of Energy on appropriations; there are two through two separate departments

## Appendix 1 – Brightfield Project Chronology

February	Contract negotiations with Global Solar completed, contract filed with City Council
March	Contract with Global Solar signed
April	Brightfield Groundbreaking ceremony
May	Power Purchase Agreement and REC Contract with Constellation New Energy completed and submitted to City Council
	Massachusetts Green Power Partnership REC Put Option Agreement finalized and submitted to City Council
June	Finance Committee of City Council takes up contracts, re-affirms debt financing measure



**ICLEI U.S.A., Inc.**  
 436 14th Street, Suite 1520  
 Oakland, California 94612, U.S.A.

Phone: +1-510/844-0699  
 Fax: +1-510/844-0698  
 E-mail: [iclei\\_usa@iclei.org](mailto:iclei_usa@iclei.org)  
 Website: [www.iclei.org/usa](http://www.iclei.org/usa)

June 22, 2006

Dear Colleague:

Energy issues are making headlines daily, and many local governments are responding with new approaches to meeting their energy needs. As a municipal leader with an interest in clean energy, we invite you to participate in an important survey on municipal clean energy projects in Massachusetts. ICLEI-Local Governments for Sustainability is working with the Massachusetts Technology Collaborative's Renewable Energy Trust and the Commonwealth of Massachusetts to quantify existing municipal clean energy projects and to determine barriers to new clean energy projects in the state.

We encourage you to fill this survey out to the best of your ability or to pass it along to the most appropriate municipal staff member. Most importantly, we need information on clean energy installations in your community and your experience with barriers to implementation. The results of this survey will be used to develop a recommendations report to the Commonwealth highlighting the best way to support municipal clean energy projects. In addition, we will develop the framework for a municipal roundtable on climate change. All survey participants will receive a copy of the recommendations report at the end of the year.

You can complete this paper survey, or we encourage you to complete it online at <http://www.surveymk.com/s.asp?A=127452017E16546>. This survey will take about 5-10 minutes to complete, but you can begin the survey and go back at a later time to complete it. If you use this paper survey, please fax it back to Garrett Fitzgerald at 510-844-0698 or return it in the enclosed envelope.

Please complete the survey by July 14. *As a token of our appreciation, we will hold a drawing for a Phantom Gourmet restaurant gift card valued at \$75 that can be used at over 100 fine restaurants in MA and RI (<http://www.certificatesetc.com/restaurants.asp>).* Three winners will be drawn from all surveys received by July 14. We appreciate your participation in this important survey!

Sincerely,

Kim Lundgren  
 Director  
 Northeast Regional Capacity Center  
 ICLEI-USA

**ICLEI U.S.A. Northeast  
 Regional Capacity Center**  
 Boston City Hall, Room 805  
 One City Hall Plaza  
 Boston, MA 02201

Phone: +1-617/635-3853  
 Fax: +1-617/635-3435

**World Secretariat**  
 Toronto, Canada

**International Training Centre**  
 Freiburg, Germany

**Africa Secretariat**  
 Johannesburg, South Africa

**East Asia  
 Japan Office**  
 Tokyo, Japan

**Korea Office**  
 Seoul, Korea

**European Secretariat**  
 Freiburg, Germany

**Latin America and  
 Caribbean Secretariat**  
 Rio de Janeiro, Brazil

**North America  
 Canada Office**  
 Toronto, Canada

**U.S.A. Office**  
 Oakland, U.S.A.

**Oceania Secretariat**  
 Melbourne, Australia

**Southeast Asia Secretariat**  
 Manila, Philippines

**South Asia Secretariat**  
 New Delhi, India

**Project Offices**  
 China  
 Indonesia  
 Mexico





**Fax your reply to ICLEI, Attention: Garrett Fitzgerald  
510-844-0698 (fax), 510-844-0699 (phone)**

**Government Implemented Clean Energy Projects**

- 1) Has your municipality installed any clean energy technologies in your community?  
 Yes     No
  
- 2) Does your municipality have plans to install any clean energy technologies in your community?  
 Yes     No
  
- 3) Which clean energy technology is your municipality most interested in installing in your community?  
 Wind     Solar (PV)     Solar (hot water)     Other (specify) \_\_\_\_\_
  
- 4) The following questions related to any clean energy technologies planned or installed:  
 (If none, SKIP TO QUESTION 5)

	Clean Energy Technology Project 1	Clean Energy Technology Project 2	Clean Energy Technology Project 3
<b>Project Name/Host Facility (e.g., Smith Library, Jones School)</b>			
<b>Planned or installed?</b>	<input type="checkbox"/> Planned <input type="checkbox"/> Installed	<input type="checkbox"/> Planned <input type="checkbox"/> Installed	<input type="checkbox"/> Planned <input type="checkbox"/> Installed
<b>Project location</b>	<input type="checkbox"/> School <input type="checkbox"/> Library <input type="checkbox"/> City/Town Hall <input type="checkbox"/> Other (specify) _____	<input type="checkbox"/> School <input type="checkbox"/> Library <input type="checkbox"/> City/Town Hall <input type="checkbox"/> Other (specify) _____	<input type="checkbox"/> School <input type="checkbox"/> Library <input type="checkbox"/> City/Town Hall <input type="checkbox"/> Other (specify) _____
<b>Technology used</b>	<input type="checkbox"/> Solar photovoltaic <input type="checkbox"/> Solar hot water <input type="checkbox"/> Wind <input type="checkbox"/> Landfill gas <input type="checkbox"/> Hydro <input type="checkbox"/> Other biomass <input type="checkbox"/> Other (specify) _____	<input type="checkbox"/> Solar photovoltaic <input type="checkbox"/> Solar hot water <input type="checkbox"/> Wind <input type="checkbox"/> Landfill gas <input type="checkbox"/> Hydro <input type="checkbox"/> Other biomass <input type="checkbox"/> Other (specify) _____	<input type="checkbox"/> Solar photovoltaic <input type="checkbox"/> Solar hot water <input type="checkbox"/> Wind <input type="checkbox"/> Landfill gas <input type="checkbox"/> Hydro <input type="checkbox"/> Other biomass <input type="checkbox"/> Other (specify) _____
<b>Year installed or year installation planned</b>			
<b>Estimated installed capacity (e.g., 1.5 kW)</b>			
<b>Estimated annual energy generation (e.g., 3,000 kWh/year)</b>			

- 5) Please rate how important each of the following factors is in deciding to install or consider clean energy technologies.

← Not at all important - - - - - Very important →

Rising costs of traditional energy sources	1	2	3	4	5
Reduction of greenhouse gas emissions	1	2	3	4	5
Education/demonstration	1	2	3	4	5
Economic development	1	2	3	4	5
Energy security / independence	1	2	3	4	5
Other (specify) _____	1	2	3	4	5

**Clean Energy Policies**

6) Has your municipality developed or implemented any policies or ordinances that support clean energy installations in your community?

- Yes       No (SKIP TO QUESTION 8)

7) Which of the following policies or ordinances has your municipality adopted:

- Building codes
- Energy efficiency policy
- Green building plan
- Climate action plan
- Renewable energy commitment (e.g., 10% of City energy needs from renewables by 2010)
- Greenhouse gas emission reduction targets
- Wind turbine ordinance
- Other (specify) \_\_\_\_\_

8) Please rate each of the following barriers below in terms of how significant they are to implementation of clean energy projects in your community. Use a scale of 1 to 5 where 1 is an entirely insignificant barrier and 5 is a very significant barrier.

← Very Insignificant ----- Very Significant →

Initial clean energy project installation costs	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Internal rate of return or other cost criteria	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Lack of/divided support amongst political leaders for clean energy projects in your community	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Lack of/divided community support for clean energy projects in your community	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Limited knowledge on how to implement clean energy projects	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Complexity / number of steps involved in implementing clean energy projects	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Legal issues associated with installing energy technologies	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Land availability / siting limitations	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Other (specify)_____	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5

**Clean Energy Outreach**

9) Has your community participated in the Clean Energy Choice Program ([www.cleanenergychoice.org](http://www.cleanenergychoice.org))?

- Yes       No       Don't Know

a) If "Yes", in what way?

- General promotion
- Purchasing clean energy for the municipality
- Elected official and/or municipal staff purchases
- Other (specify) \_\_\_\_\_

10) Has your municipality accrued funds through the Clean Energy Choice Program?

- Yes       No       Don't Know

a) If “yes”, have funds already been slated or used for a particular project? Describe.

11) Would your municipality be interested in participating in a statewide effort to educate community members about clean energy?

Yes             No             Don't Know

**Lessons Learned and Recommendations**

12) What are the primary lessons you have learned in installing or planning to install clean energy technologies?

13) What kinds of technical assistance, state policy change, or other forms of support would most help your community to install clean energy technologies?

**Contact Information**

Local Government Agency \_\_\_\_\_

Contact Name \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Phone \_\_\_\_\_

Email Address \_\_\_\_\_

Is your municipality a member of ICLEI's Cities for Climate Protection® Campaign?

Yes             No

Is your municipality interested in learning more about ICLEI's Cities for Climate Protection Campaign?

Yes             No

### **Appendix 3 – Survey Mailing List**

#### **Municipality**

Town of Amesbury  
Town of Amherst  
Town of Arlington  
Town of Ashland  
City of Attleboro  
Barnstable County  
Town of Barnstable  
Cape Cod Commission  
Belmont Municipal Light  
City of Beverly  
City of Boston  
City of Brockton  
Town of Burlington  
Town of Canton  
Town of Chelmsford  
City of Chicopee  
Town of Dedham  
Town of Eastham  
City of Easthampton  
Town of Easton  
City of Everett  
Town of Fairhaven  
Town of Falmouth  
City of Gardner  
City of Gloucester  
Town of Great Barrington  
City of Greenfield  
Town of Harwich  
City of Haverhill  
Town of Barnstable  
Town of Lenox  
City of Leominster  
Town of Lexington  
Town of Longmeadow  
City of Lowell  
City of Lynn  
City of Malden  
City of Medford  
City of Melrose  
Town of Milford

### **Appendix 3 – Survey Mailing List**

Town of Milton  
Town of Monterey  
Town of Nahant  
Town of Nantucket  
City of New Bedford  
Newburyport Public Schools  
City of Newton  
Town of Norfolk  
City of North Adams  
City of Northampton  
City of Peabody  
Town of Pembroke  
Berkshire Regional Planning Commission  
City of Pittsfield  
Town of Plymouth  
City of Quincy  
Town of Reading  
City of Revere  
City of Salem  
Town of Shutesbury  
City of Somerville  
Town of Southborough  
City of Springfield  
Town of Swampscott  
Town of Truro  
Town of Montague  
City of Waltham  
City of Waltham  
Town of Warwick  
Town of Watertown  
Town of Watertown  
Town of Wayland  
Town of Wellesley  
City of Westfield  
Town of Weston  
Town of Williamstown  
City of Woburn  
City of Woburn  
City of Worcester  
Town of Wrentham

**AN ACT AUTHORIZING THE CITY OF BROCKTON TO INSTALL,  
FINANCE AND OPERATE SOLAR ENERGY FACILITIES.**

*Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:*

**SECTION 1.** Notwithstanding any general or special law to the contrary, the city of Brockton may design and install ground-mounted solar energy facilities at the 2 brownfields parcels owned or leased by the city of Brockton located on opposite sides of Grove street, aggregating approximately 15 acres and previously owned by the Brockton Gaslight Company, prepare and improve the sites, acquire all equipment necessary for the solar energy facilities, make improvements and extraordinary repairs to the facilities, and pay all other costs incidental and related thereto.

**SECTION 2.** The city of Brockton may issue bonds or notes up to but not exceeding the sum of \$2,000,000 in the aggregate in order to finance all or a portion of the costs of the solar energy facility projects authorized pursuant to section 1. Notwithstanding chapter 44 of the General Laws to the contrary, the maturities of any such bonds issued by the city of Brockton under this act either shall be arranged so that for each issue the annual combined payments of principal and interest payable in each year, commencing with the first year in which a principal payment is required, shall be as nearly equal as practicable in the opinion of the city treasurer, or shall be arranged in accordance with a schedule providing for a more rapid amortization of principal. The first payment of principal of each issue of bonds or of any temporary notes issued in anticipation of the bonds shall be not later than 5 years from the estimated date of commencement of regular operation of the solar energy facilities financed thereby, as determined by the city treasurer, and the last payment of principal of the bonds shall be not later than 25 years from the date of the bonds. Indebtedness incurred under this act shall not be included in determining the limit of indebtedness of the city under section 10 of said chapter 44, but, except as otherwise provided in this act, shall be subject to the provisions of said chapter 44.

**SECTION 3.** Notwithstanding any general or special law to the contrary, the city of Brockton may operate any solar energy facilities installed pursuant to section 1, sell any electricity generated from such facilities and sell any other marketable products resulting from its generation of solar energy at such facilities or from its generation of any type of renewable energy at any renewable energy facility which the city is authorized by law to operate, including electronic certificates created to represent the "generation attributes" as such term is defined under 225 CMR 14.02 of each megawatt hour of energy generated by the solar energy facilities or any such other renewable energy producing facilities. The mayor of the city of Brockton may enter into 1 or more contracts on behalf of the city of Brockton for the sale of electricity and other marketable products resulting from the generation of solar energy at the solar energy facilities with such parties and upon such terms and conditions as the mayor determines to be in the best interest of the city of Brockton, but any such contract shall be subject to the approval of the city council.

**SECTION 4.** The city of Brockton shall procure any services required for the design, installation, improvement, repair and operation of the solar energy facilities authorized pursuant to this act and the acquisition of any equipment necessary in connection therewith in accordance

## Appendix 4 – Chapter 5 of the Acts of 2005

with the procurement requirements of chapter 30B of the General Laws, and the city of Brockton may procure any such services and equipment together as one procurement or as separate procurements thereunder.

**SECTION 5.** The city of Brockton may establish an enterprise fund pursuant to section 53F 1/2 of chapter 44 of the General Laws for the receipt authorized pursuant to this act and from any other renewable energy producing facilities which the city is authorized by law to operate and all moneys received for the benefit of the solar energy facilities and any such other renewable energy facilities, other than the proceeds of bonds or notes issued therefor. Such receipts are to be used to pay costs of operation and maintenance of the solar energy facilities, to pay costs of future improvements and repairs thereto, and to pay the principal and interest on any bonds or notes issued therefor.

**SECTION 6.** This act shall take effect upon its passage.

Approved February 17, 2005.

## **Appendix 5**

### **Chapter 151 of the Acts of 2005**

#### **AN ACT AUTHORIZING THE CITY OF BROCKTON TO CONVEY CERTAIN PARK LAND.**

*Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:*

**SECTION 1.** The city of Brockton, acting by and through its mayor and city council, may convey a certain parcel of land acquired for park, recreational and conservation purposes to Bay State Gas Company. Consideration paid for said parcel shall be \$500,000. Said parcel is shown as Lot 1 on a plan of land entitled "Subdivision Plan of Land, Grove Street, Brockton, Mass." dated October 3, 2003 and prepared by Harry R. Feldman, Inc., which is on file in the office of the city clerk. The grantee shall assume the costs of all appraisals, studies, surveys and other expenses related to the conveyance.

**SECTION 2.** This act shall take effect upon its passage.

Approved November 22, 2005.



**Appendix 6 – Responses to Open Ended Questions:**

<b>Barriers to Implementation</b>
Brockton has experienced numerous municipal budget cuts over the past several years, so it is difficult to do new projects. Also, we are lean on staff, so we can only implement these projects if we can get grants to hire consultants to do the predevelopment and installation work.
I responded 'completely insignificant barrier' above to seven responses because that's the closest response to what I have in mind. The actual response to those seven inquiries is that the city hasn't considered 'clean energy projects'. The responses could very well be different if we did set a policy direction towards considering such projects' but the response for now must remain 'completely insignificant' because none of those issues have been contemplated. The greatest barrier accordingly is limited to no knowledge.
Not having an Energy Officer of Worcester staff. No money to hire someone to oversee task force and implementation.
Lack of knowledge is the largest barrier, followed costs and/or perception of costs
Net Metering is too low to make big installation possible. Utility fear of the unknown. We haven't run out of oil and natural gas (yet). Plenty of coal.
Lack of manpower in the heavily volunteer-based structure of the government of this vanishingly small town.
Getting the backing of the Board of Selectmen and Town Meeting. Board of Selectmen and Town Meeting have to feel that through implementation they are saving significant amount of money.
Cost, technical knowledge, supply constraints on PV
Building a cost savings position for projects. Most are for them but say we can't afford them.

**Appendix 6 – Responses to Open Ended Questions:**

<b>Primary lessons learned</b>
Patience it takes time to coordinate
Public outreach integral for installation especially for controversial projects like wind turbines
We need to see what neighboring communities have done first
Neighbors won't like it -especially wind towers
Public support and a long view are critical
Solar project very popular. Wind has concerns for abutters, mostly noise but also visual impact on landscape.
Accountability for project needs to be very clear. Things move slowly especially in municipalities
It's a great opportunity for the community, but very time consuming and expensive. You need to have a long time horizon and a lot of patience.
That it takes a long time to re-coup costs
Not Applicable
Start early bring everyone together, bring elected officials and staff on board, make the decision to install clean an easy one by giving all needed data and info.
The premium for clean energy technologies is coming down and becoming more affordable.
Many surprises possible with Roof and Building integrity, Codes. Paperwork can be cumbersome. Solar Electric installations now are for education of next generations and to drive solar industry costs down.
The capital cost is high! To the extent that the payback time is long.
1) It's harder to do than one would like it to be. 2) Design of the renewable energy system should be integrated with the building design. Given that the MTC funds became available after the design was completed, the PV system was designed after the fact.
Biggest obstacle - The general lack of awareness of the Program, its benefits and cost and resource commitments.

**Appendix 6 – Responses to Open Ended Questions:**

<b>Technical assistance, state policy change, or other forms of support that would be most helpful</b>
State renewable energy mandates for municipalities (or federal mandate)
Funding, technical assistance, more funding
More public education
More photos and videos of current installations
State bid contracts
Funding is really needed. Education at municipal and private level.
Enhance net metering--raising minimum. Reinstate regional US DOE office. Being able to use all power at retail in locations different from where power is generated.
More technical assistance for planning and predevelopment would help. Also, more consistent grant programs so you can do advance planning and know the funds will be there. Finally, for larger projects (which we might never do again), we discovered that municipalities need special legislation for borrowing and for legal authority. Omnibus legislation addressing these issues ought to be considered.
Examples of other communities' installations.
Identified priority of public officials and state government Financial support
At this time, I would have to respond by saying the dissemination of literature and educational charrettes would be most helpful (i.e., through the MMA). With the ever-increasing cost in fossil fuels, our electric costs, heating costs, vehicle fuel cost, etc. are growing. Alternatives certainly would be embraced for consideration. I think we would have to first learn about such technologies, how they could help us, learn about the long term financial benefits. Perhaps other departments in the city might already be cognizant of such technologies and might already be pursuing possible projects. However I am not aware of them, so the responses from this survey are predicated on my knowledge of the goings-on in our municipal government. My level of insight is also immersed in the fact that the Department of Planning and Development prepares the City's Capital Improvements Program annually in 5-year planning horizons. To date, no department has proposed a capital project that references clean energy technologies. I hope my responses are helpful and good luck with your study.
Money or group purchasing.
Funding, funding, funding. Support demonstrating that clean energy technologies actually improve the bottom line over time.
Exempt clean energy from Chapter 149 requirements similar to Performance Contracting. Increase net metering maximum somewhat. Require utilities to be champions.
I think that the MTC and its structure will be of great help. Our largest two loads are across the state Rte 6 from each other, precluding us from supplying them with one generator. We need a change in the State Law to permit this. I think Falmouth has a similar situation.
City is not eligible for tax incentives; so the payback is not quite as attractive as it is for businesses. Residential tax incentives could be stronger.