

# Brockton Brightfield, Brockton, Massachusetts: A Sustainable Brownfield Revitalization Best Practice<sup>1</sup>

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## SITE HISTORY

*Brockton Gas Works (Carl Landerholm 2009)*

The Brockton Brightfield is owned by the City of Brockton, Massachusetts. Located about 20 miles south of Boston, the city has an ethnically diverse population of approximately 95,000. It is home to heavyweight champion Rocky Marciano and the world's first centrally powered electrical station, constructed by Thomas Edison in 1883 – giving Brockton the nicknames 'City of Champions' and 'City of Firsts'. It is thus fitting that one of the nation's first brightfields was constructed here and that the Brockton Brightfield is New England's largest photovoltaic (PV) facility.

The term brightfield, coined by the Clinton administration in the late 1990s, is defined as:

"the conversion of contaminated sites into usable land by bringing pollution-free solar energy and high-tech solar manufacturing jobs to these sites, including the placement of photovoltaic (PV) arrays that can reduce cleanup costs, building integrated solar energy systems as part of redevelopment, and solar manufacturing plants on brownfields." <sup>2</sup>



*Brockton (Source: Google Earth, 2012)*

<sup>1</sup> Methodological note: Information for this case study was obtained from available project reports, site visits, and structured interviews with key stakeholders, including developers, planners, consultants and community representatives. For any questions, please contact Christopher De Sousa, Associate Professor, Director, School of Urban and Regional Planning, [chris.desousa@ryerson.ca](mailto:chris.desousa@ryerson.ca). Research assistance provided by Jason Tilidetzke, Laura Lynn Roedl, Elizabeth Durkin, and Kevin Duffy from the University of Wisconsin-Milwaukee and Thierry Spiess from Ryerson University.

<sup>2</sup> U.S. Environmental Protection Agency, <http://epa.gov/brownfields/partners/brightfd.htm>

The 3.7-acre brightfield is installed on a 27-acre parcel of land abutting an industrial area near the downtown core and is the site of the former Brockton Gas Works manufactured gas plant, operated from 1898 until 1963<sup>3</sup>. In 1989, following investigative work by the Massachusetts Department of Environmental Quality Engineering, the U.S. Environmental Protection Agency began sampling and found that the soil was contaminated with an array of volatile organic compounds (VOCs), such as benzene, toluene, and xylene, as well as semi-volatile organic compounds like aromatic hydrocarbons. The remediation was completed in 2004, and involved the capping of the property 18 inches below the surface, which limited other reuse options; a few years after, the idea of a brightfield materialized.

Given that 97% of the city is built up, redeveloping a brownfield is vital to the economic development of Brockton. The Bay State Gas Company is the property owner (on a 30 year lease) and one of several responsible parties. The 1,512 SCHOTT solar modules, with a generating capacity of 465 kilowatts (kW), produce enough energy to power 77 homes.<sup>4</sup>



*Brockton Brightfield (2009)*



*Le Baron Foundry, just west (2009)*

## PROJECT VISION

The community surrounding the current brightfield has a median annual household income below 65% of the statewide median, and a large portion of the local population is foreign-born or minority<sup>5</sup>. The community is also affected by substandard housing, abandoned buildings, crime, and high unemployment rates. In 2000, the neighborhood, whose residents were already burdened by a demolition debris transfer station, a wastewater treatment plant and a foundry, was declared a state Environmental Justice Area. A proposal to construct a tire-recycling plant provoked heavy opposition in the community, and it was clear that a different path had to be taken to shake the city's emerging image of being the "Commonwealth's dumping ground". According to Lori Ribeiro, who served as project director and has written a thesis on the development, the City of Brockton had already taken steps to address this negative image by developing an application for the U.S. EPA's Sustainable Development Challenge

<sup>3</sup> Ribeiro, 2007

<sup>4</sup> [www.us.schott.com](http://www.us.schott.com)

<sup>5</sup> Ribeiro, 2007

Grant program a year earlier, proposing a virtual eco-industrial park with a placed-based approach emphasizing its energy history.

The city initiated its Brownfield to Brightfield project to develop a PV array as a "Solar Energy Park" in 2000, with the following goals and objectives:<sup>6</sup>

- - *Redevelop brownfields in an environmentally friendly manner*
  - *Develop a new local and clean energy source for City use*
  - *Expand the City tax base*
  - *Enhance Brockton's image*
  - *Develop "Brockton Solar Champions" concept, built on "City of Champions" logo, by making Brockton first in the state in installed PV*
  - *Attract PV manufacturers to Brockton*

Inspired by a meeting with the stakeholders of the Chicago Brightfield<sup>7</sup> at the Brownfields 2000 national conference, the city initiated a feasibility study and a community outreach program to explore the possibility of constructing a brightfield in Brockton. In February 2001, the city submitted a proposal requesting \$30,000 from the U.S. Department of Energy to perform a feasibility study. True to its nickname, Brockton was the first (together with Hanford, WA and Atlantic City, NJ) to be selected nationwide to receive a DOE Brightfield Funds Award. The feasibility study executed by XENERGY (now KEMA) concluded that out of the 27 acres, only 10 acres were developable due to slope and wetland concerns, and that a 1 MW PV array would be technically feasible. It was recommended, however, that a 500kW PV installation be constructed to produce 600 MWh/year at an estimated cost of \$3,600,000. Upon further analysis, it was decided that a mounting structure that would not penetrate the 18-inch cap put into place as part of the site's remediation process would be optimal. In addition, it was determined that city ownership of the facility would be more economically feasible than private ownership, as the latter would yield a negative net present value. XENERGY also made it clear that site aesthetics were essential for garnering community support.

The first public meeting regarding the project was held at the end of 2001; the city presented the site plans to local residents, emphasizing that the project would be unobtrusive, non-polluting, and noise free. The community was primarily concerned with the aesthetic components of



*Project design, Brockton Brightfields. Source: Ribeiro, Brownfields to Brightfields.*

<sup>6</sup> Ribeiro, 2007

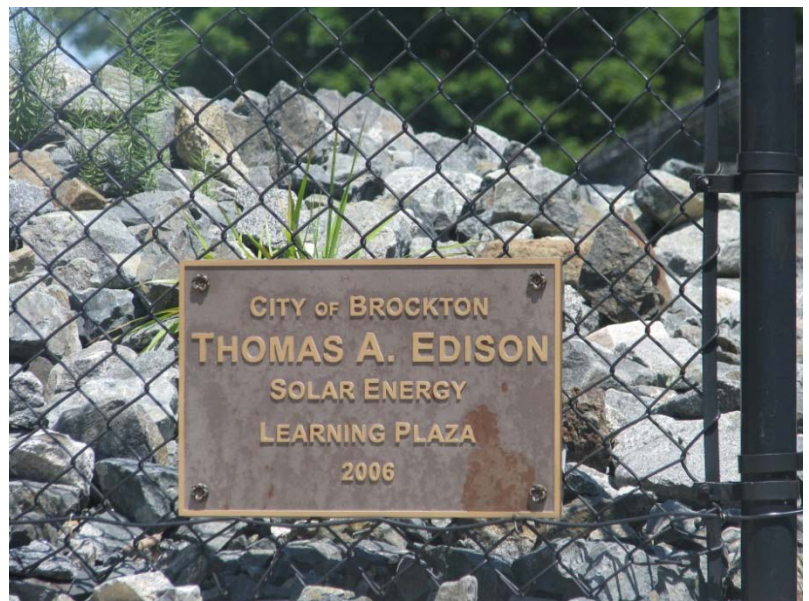
<sup>7</sup> The City of Chicago and Commonwealth Edison. Note that this initiative also led to the development of the Chicago Center for Green Technology; see case study.

the solar array, including the possibility of glare from the panels, the height of the installation, and security issues. These were addressed at a second public meeting, held in September 2002, where a more detailed landscape plan of the project was presented, with information on project size and characteristics, such as vegetation and fencing designs.

## PROJECT CHARACTERISTICS AND DEVELOPMENT

Once the idea received the support of the public, it was time to consider the financing and legal implications of implementing a brightfield. To that end, the project was designed in a revenue-neutral way, meaning that project revenues would need to cover the debt service on city bonds issued to finance the project, as well as any operations and maintenance costs, which were projected to total \$3,600,000. The City Council issued municipal bonds (debt) worth \$1,600,000, and sought to raise the remainder from state and federal grants. The lack of funding programs was one of many hurdles that the city had to overcome during the five-year-long process of seeking financing. Available grants and funding (i.e., DOE Solar and Brightfield Fund) emphasized education, planning, and community engagement, but did not offer funding for construction and installation.

After lengthy negotiations and the implementation of an educational component into the project, Brockton was able to secure \$1,000,000 from the Massachusetts Technology Collaborative (MTC) via an unsolicited proposal, with the aid of Mayor Jack Yunits, MTC Director of the Renewable Energy Trust, and partners in Washington D.C., including Senators Kerry and Kennedy. The \$1 million MTC grant was approved, however, under the condition that the amount not exceed 28% of the total project budget. Subsequently, the grant was reduced to \$840,600 and the available budget went from \$3.6million to \$3,048,678, which would only allow the installation of a 425 kW PV system. Fortunately, third party Bay State Gas Co. agreed to buy back for \$500,000 the parcel of land that it had donated 30 years ago (effectively eliminating the city's site liability) and volunteered to provide the fencing and landscaping necessary to secure community support.<sup>8</sup>



*Brockton (Source: Google Earth, 2012)*

The U.S. EPA's Office of Solid Waste and Emergency Response (OSWER) notes that "a number of green power aggregators and marketers expressed interest in purchasing RECs from the solar Brightfield at a significant premium above and beyond what could be offered by the local market in return for compliance with the state's renewable energy target"<sup>9</sup>. Normally, renewable energy certificates/credits (RECs) are issued on short-term (1-5 years) contracts only, but the project team wanted a contract that would last the term of the brightfield's debt service of 20 years. The city of Brockton entered into a 20-year agreement with Constellation New Energy to sell RECs at variable rates of \$180 per MWh for years 1-5 and \$180 per MWh for years 6-15, with the city assigning the Massachusetts

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<sup>8</sup> Hersh, 2008

<sup>9</sup> OSWER Innovation Pilot Results Fact Sheet — January 2011, Brockton Brightfields: Innovative Green Power

Green Power Partnership ‘put option’ agreement to Constellation New Energy, and market value for the remainder of the contract.<sup>10</sup> The Green Power Partnership is an innovative program designed to support the construction of new renewable energy facilities, and is the largest of its kind in Massachusetts<sup>11</sup>. Under the Partnership, the Massachusetts Renewable Energy Trust has agreed to purchase energy certificates from renewable generators and sell them to both residential and commercial electricity consumers to ensure long-term financing.

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## BENEFITS, BARRIERS, AND LESSONS LEARNED

The Brockton Brightfield produces 580MWh annually, and the 460 kW system reduces annual emissions by approximately 677,000 lbs. of carbon dioxide, 1,200 lbs. of sulfur oxide, and 315 lbs. of nitrogen oxide.<sup>12</sup> Furthermore, the Brockton Brightfield emits no noise or odor, and creates no additional traffic.

Since the 1,512 RWE Schott (the name of the manufacturer) solar modules were manufactured locally in Billerica, MA, the brightfield project also added to the state economy. Wider community benefits also include the enhancement of local property values, educational opportunities for children and the public and, perhaps most important, a shift in the city’s image away from a “dumping ground”, back to an innovative “City of Firsts”. Since education was a vital component in the procurement of capital, the city decided to create a Solar Energy Park featuring an educational display, which highlights the technology used as well as the project’s economic development and other benefits for Brockton. The city also organizes scheduled tours of the site, community days, and school trips.

A series of setbacks was responsible for delaying the Brightfield project, which took six years from conception to completion. One of the primary ones has been a common theme through the case studies analyzed in this series, which is the barriers to innovation imposed by an inflexible regulatory framework, whether local, state, or federal. In this case, Hersh notes that first, project developers “learned that Brockton, or any city or town in the Commonwealth, could not obtain a 20-year bond because under the relevant sections of the state’s enabling legislation addressing renewable energy projects, a city was limited to issuing a 10-year bond”<sup>13</sup>. This meant that the revenue-neutral design was jeopardized for at least the first 10 years. Moreover, the city’s legal counsel declared that the city did not have the authority to own a PV facility under the current state legislation. Faced with these added hurdles, the city drafted a revision of the state legislation that would issue them the proper authority to develop, finance, and own a solar power-generating facility. The bill was approved by the State’s House and Senate and signed into law by then-Governor Mitt Romney in February of 2005.<sup>14</sup> The new law enabled the city to issue 20-year bonds and follow through with the original design of a revenue-neutral project.

The acquisition of funds, particularly for innovative projects whose outcomes fall outside of the neat jobs and development metrics preferred by most agencies, is another common barrier that affected the Brockton project. The project was financed in large part by the use of RECs and the so-called solar carve-out, which is a concept that requires utility companies to buy a certain proportion of their power from owners of qualified solar systems (e.g. Brightfields) via special solar renewable energy credits (SRECs).<sup>15</sup> “The solar carve-out supports distributed solar PV energy facilities including residential, commercial, public, and non-profit projects, and is designed to help the Commonwealth achieve the installation of 400 MW of solar PV across the state,” according to the Commonwealth website<sup>16</sup>. Hersh notes that “the credits have a price floor of \$300 per MWh, nearly 10 times the price of other

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10 Hersh, 2008

11 <http://energy.gov/>

12 Ribeiro

13 Hersh, 2008

14 Hersh, 2008

15 Hersh, p. 8

16 <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/>

renewable energy credits utilities must buy... If utilities are unable to comply with the requirements of the carve-out through SREC purchases, they are required to pay an alternative compliance payment (ACP) of \$600 per MWh... In other words, the ACP price serves as a price ceiling for the Massachusetts SREC market."<sup>17</sup> Early funding through the DOE seed funds was also essential to develop the more sustainable vision. Massachusetts' Renewable Energy Portfolio Standards began with an obligation of one percent in 2003, and then increased by one-half percent annually until it reached 4% in 2009<sup>18</sup>.

A third barrier that was suggested in the literature and by interviewees was the challenge associated with the decentralization of energy production in a system that is accustomed to building for centralized production and distribution. Decentralized or distributed energy generation produces energy in closer proximity to consumers, compared to conventional, larger power plants, thus reducing transmission loss/costs, and includes PV, solar, small wind turbines, fuel cells, etcetera. In addition to the obstacle of creating new legal structures that allow for local ownership and for access to tax incentives, smaller energy facilities historically experience greater challenges in securing enough capital.

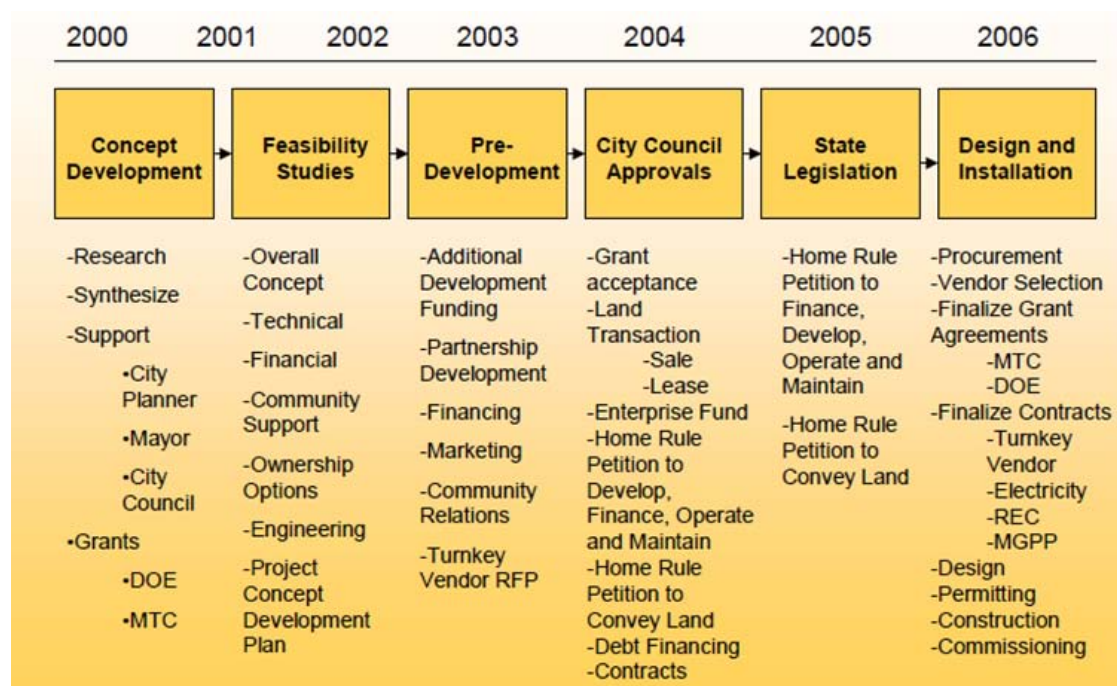
As with many sustainability projects, Brockton overcame these barriers through the sheer perseverance of project champions from government and the citizenry, as well as strong community pressure for change and progress. In all, the Brockton Brightfield has been able to generate nearly \$145,000 in annual revenue for the city, which goes towards paying off the cost to build and maintain the brightfield. It is estimated that the loan will be paid off in full by 2026, and the city will begin to directly profit from the sale of RECs and electricity. The brightfield has a module warranty of 20 years, and with an expected system life of 30-50 years, the city should see profits for 10 to 30 years.

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<sup>17</sup> Hersh, p. 8

<sup>18</sup> <http://www.mass.gov/eea/energy-utilities-clean-tech/>

## TIMELINE



*Project timeline, Brockton Brightfields. Source: Ribeiro (2006, p. 46)*

## REFERENCES

- Bolgen, N. (2009). *Interview*. Program Director, Clean Energy, MA Technology Park Corp. Brockton, Massachusetts
- Gurley, P. (2009). *Interview*. Brockton, City of Brockton
- Harrington, J. (2009). *Interview*. Brockton, Mayor, City of Brockton.
- Hersh, Robert, (2010). *Promoting Solar Power on Brownfields in Brockton, Massachusetts*. Mountain View, CA; Center for Public Environmental Oversight, <http://www.cpeo.org/pubs/Brockton.pdf>.
- Johnson, C. (2006) A bright idea for blighted property - City to take lead with solar energy, Boston Globe, May 11, 2006.
- Landerholm, C. (2009). *Interview*. Brockton. Landerholm Electric Company.
- Moskal, J. (2009). *Interview*. US Environmental Protection Agency, Region 1.
- OSWER Innovation Pilot Results Fact Sheet — January 2011, Brockton Brightfields: Innovative Green Power renewed life to a brownfield site. ReFocus 47, March/April. [www.re-focus.net](http://www.re-focus.net).
- Ribeiro, L. (2006) *Does it Have to be so Complicated? Municipal Renewable Energy Projects in Massachusetts*.
- Ribeiro, L., (2007). Waste to Watts, A "brightfield" installation has the potential to bring
- Ribeiro, L., (2009). *Interview*. Boston, Blue Wave Strategies.
- Ribeiro, L., Lynch, B., Brown, J., (n/a). Nation's Largest "Brightfield" Dedicated in U.S. Environmental Protection Agency, <http://epa.gov/brownfields/partners/brightfd.htm>, [www.us.schott.com](http://www.us.schott.com). Retrieved Dec. 1<sup>st</sup>, 2012.

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*The Sustainable Brownfields Consortium is an interdisciplinary group of researchers and technical advisors who are analyzing best practices for sustainable redevelopment of brownfields and the environmental, economic and public health benefits that can result. Funded by a grant from U.S. EPA, the project is a collaboration of the University of Illinois at Chicago (where it is based), University of Illinois at Urbana-Champaign, University of Wisconsin-Milwaukee, Ryerson University, Resources for the Future, Kandiyo, and Hellmuth + Bicknese Architects. The project website is at [www.brownfields.uic.edu](http://www.brownfields.uic.edu).*