Brownfields to Green Energy: Redeveloping Contaminated Lands With Large-Scale Renewable Energy Facilities

by

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BA, International Studies
Earlham College, 2003

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

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2010

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Abstract: This thesis uses case studies of one unsuccessful, and three successful brownfield-to-renewable energy projects to identify common barriers such projects face and how those barriers can be overcome. The most significant barriers identified are those typical of brownfield development: cleanup costs, liability risks, uncertainty, technical and legal complexity, and the need to coordinate multiple stakeholders. These barriers can be overcome through strong partnerships characterized by full cooperation among developers, property owners, regulators, and local officials. Political and public support enables cooperation between public and private stakeholders. This support is driven by an expectation that brownfield-to-renewable energy projects will improve the city's image and stimulate development of the clean energy industry locally.

The three successful projects received substantial public support. This suggests that locating renewable energy facilities on contaminated lands is a possible solution to the siting controversies faced by new renewable energy facilities, and by wind farms especially. Renewable energy facilities offer a reuse option for brownfields that can coexist with ongoing remediation. Carving-out less polluted parcels from large properties for phased development is a strategy that has great potential to expand renewable energy development on brownfields and provide property owners revenue that can facilitate complete remediation.

The thesis concludes with recommendations for local, state, and federal actions to encourage and facilitate brownfields-to-renewable energy projects. Recommended local level actions include incorporating renewable energy into municipal comprehensive plans and brownfield redevelopment programs. Overall, recommendations emphasize facilitating the “carve-out” strategy (i.e. use the cleanest parts of brownfields for new energy projects) and modifying financial incentives to favor brownfield sites.

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

I am grateful to everyone who took time out of their busy schedules to speak with me about their involvement in the projects studied and about the potential for renewable energy development on brownfields:

Martin Doster, Robert Knoer, Andrew Riley, Chris Pawenski, Steve Walters, Paul Curran, Elizabeth Weir, David Flynn, Norman Polanksi, Jennifer Harvey, Ralph Miranda, Steve Hogen, Robert Cleary, Nils Bolgen, Paul Ellsberg, Chester Wilson, Christine Slattery, Robert Colangelo, Dave Reynolds, and Gregory Vanderlann

I give special thanks to Paul Werthman for granting me access to the former Bethlehem Steel site in Lackawanna, New York, and to John Deth for taking me on a tour of the site. I am very grateful to Dave Graham for arranging for me to meet the Solar City project team on short notice, for picking me up at the airport in Chicago, and generally ensuring that my visit was a success. Thanks to Tom Shepherd for finding time to give me his famous Toxics to Treasures Tour. Special thanks are also due to Lori Ribeiro for digging through her personal archives to share project documents with me that I probably would never have seen otherwise. I am also very grateful to Molly Ekerdt for her advice and for sharing her contacts in Chicago.

I am grateful to my thesis advisor Larry Susskind for encouraging me to pursue the topic, for always pushing me to do better, and for his dedication and responsiveness as an advisor. I thank Carl Seidman and Terry Szold for serving on my thesis committee and for their thoughtful and constructive comments.

I am deeply grateful to Blake Lipsett for her moral support, care, encouragement, and for believing in me whenever I doubted myself. Thanks to Marian Jensen, Ian Axilrod, Brad Fraley, Jacqueline Preston, and Joe Bolinger for their last minute copy-editing efforts. Any errors or omissions are my own. Finally, I thank my friends and family for all they have done for me.
# Table of Contents

List of Acronyms .................................................................................................................... 7

Chapter 1: Introduction .......................................................................................................... 11

  Presenting Case - Lake Calumet Cluster Site Energy Farm Proposal ..................................... 14
    Case Introduction .................................................................................................................. 14
  The Proposal: Drivers and Goals ............................................................................................ 17
  Proposal Feasibility Analysis – Assessing the Environmental Contamination ....................... 19
  Cluster Site Case Analysis and Overarching Themes ............................................................... 20
  Hypothesis ............................................................................................................................. 22
  Methodology and Research Design .......................................................................................... 23
  Summary of Findings ............................................................................................................. 24
  Relevance ............................................................................................................................... 25
  The Legal Landscape and Origins of “Brownfields” ............................................................... 28
  Challenges and Obstacles to Brownfield Development ............................................................ 33
  Local Brownfields Programs ................................................................................................. 36

Chapter 2: The Brockton Brightfield ....................................................................................... 45

  Introduction ............................................................................................................................ 45
  Site History and Environmental Remediation ......................................................................... 46
  Origins of the Brightfield Project and Early Concept Development ....................................... 48
  Feasibility Analysis and Securing Grants .............................................................................. 52
  Legal and Institutional Complications ................................................................................... 56
  Conclusion ............................................................................................................................. 59

Chapter 3: Steel Winds, Lackawanna, New York ................................................................. 63

  Introduction ............................................................................................................................ 63
  Site History and Summary of Environmental Enforcement Actions ....................................... 64
  Remediation and Wind Farm construction .............................................................................. 66
  Paving the Way for Wind Development in the Buffalo Area .................................................... 68
  Navigating the Regulatory Process and Project Financing ....................................................... 74
  Battling over PILOTs .............................................................................................................. 82
  “Looking Good”, Image Matters ............................................................................................ 85
  Conclusion ............................................................................................................................. 87
Chapter 4: Exelon City Solar, Chicago, Illinois ................................................................. 89
  Introduction .................................................................................................................. 89
  Site and Neighborhood History .................................................................................. 90
  Site Remediation and Solar Plant Construction .......................................................... 95
  Putting the Project Together ...................................................................................... 99
  Strong Political Support Enabled Full Cooperation .................................................. 103
  Conclusion ................................................................................................................... 107

Chapter 5: Cross-Case Comparative Analysis ................................................................. 109
  Introduction ................................................................................................................ 109
  Ownership Models ..................................................................................................... 109
  Overcoming Common Challenges to Brownfield Redevelopment ......................... 112
    Cleanup Costs ........................................................................................................ 112
    Liability and Risk Management ............................................................................. 113
  Stakeholder Cooperation is Essential for Success. ................................................. 114
  The Importance of Political Support ....................................................................... 115
  Lessons for Local Governments ............................................................................... 117
  Findings ..................................................................................................................... 118
  Recommendations ................................................................................................. 120
    Local Actions .......................................................................................................... 120
    State Actions .......................................................................................................... 121
    Federal Actions ....................................................................................................... 123
  Conclusion ................................................................................................................ 125
  References ............................................................................................................... 127
    List of Interviews ................................................................................................... 131
List of Acronyms

ACM  Asbestos containing material
ARAR  Applicable, Relevant, and Appropriate Requirements
ARRA  American Recovery and Reinvestment Act
BAA  Brownfield Action Age
BCP  New York State Brownfield Cleanup Program
BF  Brownfield
BAA  Brownfield Action Age
BTEX  Benzene, toluene, ethylbenzene, and xylenes
CBN  Canadian Brownfields Network
CCA  Carnow, Conibear and Associates
CEC  New England Clean Energy Council
CDOE  Chicago Department of Environment
CERCLA  Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS  Comprehensive Environmental Response, Compensation, and Liability Information System
CGRM  Coal gasification related materials
CREB  Clean Renewable Energy Bonds
CSA  Comprehensive Site Assessment
DOE  U.S. Department of Energy
DOER  Massachusetts Department of Energy Resources
DSIRE  Database of State Incentives for Renewables and Efficiency
EAF  Environmental Assessment Form
EAV  Equalized assessed valuation
EERE  U.S. DOE Office of Energy Efficiency and Renewable Energy
EIS  Environmental Impact Statement
EPA  U.S. Environmental Protection Agency
ETA  Economic Target Area
FIT  Feed-in tariff
FWPW  Former West Pullman Works
GEIS  Generic Environmental Impact Statement
GHG  Greenhouse gas
GTC  Gateway Trade Center, Inc.
GWh  Gigawatt hour
HDPE  high-density polyethylene
HHRA  Human Health Risk Assessment
HSWA  Federal Hazardous and Solid Waste Amendments
HUD  U.S. Department of Housing and Urban Development
ICC  Illinois Commerce Commission
IEPA  Illinois Environmental Protection Agency
IJRL  Illinois Jobs Recovery Law
IPCA  Industrial Park Conservation Area
IRM  Interim Remedial Measure
ITC  Investment Tax Credit
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>RPS</td>
<td>Renewable portfolio standard</td>
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<tr>
<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
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<tr>
<td>SEC</td>
<td>U.S. Securities and Exchange Commission</td>
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<tr>
<td>SEPA</td>
<td>Solar Electric Power Association</td>
</tr>
<tr>
<td>SEQR</td>
<td>State Environmental Quality Review</td>
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<td>SEQRA</td>
<td>New York State Environmental Quality Review Act</td>
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<td>SFA</td>
<td>Slag Fill Area</td>
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<td>SI</td>
<td>Site Investigation</td>
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<td>SRP</td>
<td>Illinois Site Remediation Program</td>
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<td>SWMU</td>
<td>Solid waste management unit</td>
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<tr>
<td>TACO</td>
<td>Tiered Approach to Corrective Action</td>
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<td>TIF</td>
<td>Tax increment financing</td>
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<tr>
<td>TPH</td>
<td>Total petroleum hydrocarbons</td>
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<tr>
<td>TRP</td>
<td>City of Chicago Tax Reactivation Program</td>
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<tr>
<td>TSCA</td>
<td>Toxic Substances Control Act</td>
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<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
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<tr>
<td>UST</td>
<td>Underground storage tank</td>
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<tr>
<td>VCP</td>
<td>Voluntary Cleanup Program</td>
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<tr>
<td>WECS</td>
<td>Wind energy conversion system</td>
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<tr>
<td>WIRA</td>
<td>West Pullman Industrial Redevelopment Area</td>
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Chapter 1: Introduction

The Small Business Liability Relief and Brownfields Revitalization Act of 2002 (Brownfields Act) defines a brownfield as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” These sites tend to be former industrial and commercial properties in urban areas. Within the last year there have been several events indicating increased interest and political pressure for combining brownfields redevelopment with renewable energy generation. In January 2009 the U.S. Environmental Protection Agency (EPA) launched its Re-Powering America’s Lands Initiative to encourage the use of brownfields, mine-scarred lands and other contaminated properties for siting renewable energy production. The EPA makes the following argument for this strategy:

The advantages to siting renewable energy on contaminated land and mine sites may include: critical infrastructure including transmission lines, roads and water onsite; appropriate zoning already in place; the availability of large sites with few site owners; reduced local opposition to renewable energy development; and the availability of many government programs that support cleanup and reuse. In addition, reusing these sites prevents the development of greenfield sites which serve as a critical carbon sink, protect watersheds and wetlands, provide habitat, and provide raw resources. Renewable energy is also an economically viable reuse for sites with significant cleanup costs or low real estate development demand, and can provide job opportunities in urban and rural communities, particularly where factories, mining and other manufacturing activities have ceased operations.

The EPA and National Renewable Energy Laboratory (NREL) collaborated to map the renewable energy potential of the nation’s brownfields, Superfund sites, Resource Conservation and Recovery Act (RCRA) sites, and abandoned mine sites.

The American Recovery and Reinvestment Act (ARRA) of 2009 provided $100 million for the EPA’s Brownfields Program, $6 billion for the U.S. Department of Energy’s (DOE) Loan

2 Brownfields are not uncommon in rural areas. Common types of rural brownfields include closed mines, landfills, and closed military bases. These can also be well suited to renewable energy facilities. There are examples of wind farms and solar farms on these types of sites. "Re-Powering America’s Lands: Renewable Energy on Contaminated Land and Mining Sites" http://www.epa.gov/renewableenergyland/docs/repower_contaminated_land_factsheet.pdf.
Guarantee Program, $16.8 billion for U.S. DOE Office of Energy Efficiency and Renewable Energy (EERE) and $1.6 billion for Clean Renewable Energy Bonds (CREBs). It also authorized the U.S. Department of Treasury to provide Renewable Energy Grants equal to 30% of the basis of the property for solar, fuel cells, and small wind turbines among other qualified facilities.4

In January, 2009, The Urban Land Institute released a report on the potential of Michigan’s brownfields for renewable energy production.5 The report estimated that the state’s brownfields had a wind capacity of 4,320 MW and that photovoltaic arrays placed on the remaining land could produce 1,535 MW of electricity and would result in substantial job creation. The Wilderness Society and the United States Conference of Mayors sent a letter to congress on April 8, 2009.6 Referring to the joint mapping effort between EPA NREL, they called on congress to include an incentive in the Renewable Electricity Standard legislation that prioritized brownfield sites for renewable electricity generation.

Interest is growing in other countries as well. In a letter to the Premier of Ontario dated June 18, 2009, The Canadian Brownfields Network (CBN) advocates the use of feed-in-tariffs (FIT) as a financial incentive for installing photovoltaics on brownfields.7 CBN proposes that municipalities could then lease brownfields to solar power developers while the site undergoes bio or phyto-remediation thus creating a revenue stream for the municipality from what would otherwise be a drain on the budget.

Brownfields have historically been difficult real estate transactions involving issues of liability and multiple layers of regulations. This bureaucratic aspect of brownfields developments has made their redevelopment a lengthy and risky process. Bureaucratic obstacles include agreeing on and meeting environmental standards, legal issues of ownership and liability, negotiating property transactions and establishing responsibility for maintaining site remediation systems and site controls. Meeting the requirements to fully assess environmental contamination and developing a remediation plan is often expensive and time consuming. Environmental laws

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6 http://wilderness.org/files/letter-to-Congress.pdf
governing the cleanup of polluted property create liability risks for owners, potential purchasers and lenders that must be addressed before a site is redeveloped. Determining property owners’ liability for past contamination and possible public health consequences is quite complicated particularly when there have been multiple owners over the life of the property.

Siting utility-scale renewable energy facilities has proven difficult as well. Utility-scale renewable energy projects may be desirable because they can create economies of scale lowering the cost per installed watt of capacity. Historically, public opposition has been a major obstacle to the development of new energy facilities, often delaying them for years if not causing the projects to be abandoned all together. Public opposition often stems from concern over safety, environmental impact, the effect on property values, and concerns over cost and cost sharing. Another source of friction is often a lack of agreement among stakeholders on the scope of technical review needed to make decisions. The absence of a forum for considering costs and benefits that includes genuine public participation and the failure to ensure timely and adequate public participation are common downfalls as well. Still another source of conflict is the uneven distribution of costs and benefits that means that some in a community may not receive benefits commensurate with the extra burdens or risks that they bear.

This thesis seeks to answer the following questions and pinpoint sources of resistance and political support. Does using brownfields increase or reduce the complexity of renewable energy development? Will community support for utility-scale wind farms and solar fields be easier to obtain when the site is a brownfield? Will the financing usually leveraged by utilities and others in developing energy facilities be available when the site is a brownfield? It examines one unsuccessful, and three successful brownfields-to-renewable energy projects in an effort to highlight common barriers to developing large-scale renewable energy plants on brownfields, illustrate how such barriers can be overcome, and develop policy recommendations to encourage such projects. The projects studied are located in New York, Massachusetts, and Illinois. Massachusetts is a leader in renewable energy policy and home to the Brockton Brightfield, which is one of the largest such projects on the East Coast. New York is a leader in renewable energy policy and home to the first urban wind farm on a brownfield. Illinois, and Chicago especially, is a leader in brownfields development. Chicago is also known for being at the forefront of urban sustainability programs. Chicago’s first attempt to create a large-scale
photovoltaic array on a brownfield site as part of the Chicago Brightfield project failed and serves as the presenting case of how barriers and challenges can derail a project.

The Lake Calumet Cluster Site Energy Farm Proposal discussed below serves as the presenting case and clearly illustrates the challenges of developing large-scale energy facilities on contaminated lands. It highlights overarching themes explored throughout the other case studies. Just as in the presenting case, stakeholders in each of these projects had to deal with the challenges of paying the cleanup and redevelopment costs, managing liability, accounting for uncertainty, and coordinating multiple parties to work constructively and cooperatively together. In addition to these challenges these projects had to successfully navigate the regulatory and permitting process necessary to build a utility-scale wind farm or solar farm. How project stakeholders in these three cases dealt with these challenges offers lessons for how others may complete similar projects. Following the description and analysis of the presenting case I describe the hypotheses tested by this thesis, and the methodology used to this. From there the introductory chapter discusses the evolving legal context that has produced the brownfields issue, the common barriers identified by the literature, and examples of local responses in the form of comprehensive brownfields redevelopment programs.

**Presenting Case - Lake Calumet Cluster Site Energy Farm Proposal**

**Case Introduction**

Electricity issues were front and center in Chicago in 1999. In March the City had reached a settlement over reliability issues with Commonwealth Edison (ComEd), the utility that serves the Chicago area. However, the utility’s record of poor reliability continued over the summer with several neighborhood blackouts and several close calls. In August the Illinois Commerce Commission (ICC) announced a thorough investigation of the utility’s operations and management. With pressure on the utility growing the City announced in early August that it would partner with ComEd and Chicago Solar, a subsidiary of Spire Corp, in the first project under a DOE’s Brownfield to Brightfield Initiative. At the same time, the City of Chicago, Illinois Environmental Protection Agency (IEPA), and EPA were intensifying plans for remediation and reuse of the Lake Calumet Cluster Site (Cluster Site), which is a “cluster” of
hazardous landfills and waste handling facilities in the heavily deindustrialized and polluted Lake Calumet area on Chicago’s South Side. William Abolt was commissioner of Chicago’s Department of Environment (CDOE) at the time. Dave Reynolds who worked under Abolt describes him as a man with “big ideas.” Abolt proposed the Cluster Site as a potential location for an energy farm with a 500 megawatt (MW) natural gas peaker plant, landfill gas operations, and 2.5 MW of photovoltaics. The proposal offered a sustainable reuse plan for the Cluster Site, a good use for a portion of settlement funds the City would obtain through its March 1999 negotiated agreement with ComEd, and a site for the new peaker plant that was needed.

Southeast Chicago used to be one of the greatest centers of industry in the nation, and still is a center of steel production. As of 2002, “Even with a 30 to 40 percent reduction in the amount of steel produced [since its heyday], the area of southeast Chicago and northwest Indiana remains the nation’s largest steel producing and processing region by a wide margin.”8 The Lake Calumet area was transformed from a wetland oasis for wildlife, birds especially, to an industrial powerhouse through the 1970s. It has largely been deindustrialized since then and in its current state is an unusual juxtaposition between vast brownfields, a few remaining industries, and the city’s most important wetlands. It is critical habitat for birds. Over 200 species, including herons and egrets, are known to visit the area annually. The Calumet area is also unique in the City for offering vast acres of open land for industrial development. In 2001 it had at least 13 sites totaling 1,000 acres available for industrial development.

Up until the mid 1800s the Lake Calumet area was dominated by marshy prairielands and was a prime spot for hunting and fishing. Beginning in 1876 the hydrology was altered significantly as the areas waterways were engineered for shipping. Portions of Lake Calumet and the surrounding rivers were dredged to make the waterways navigable for cargo ships and to meet international trade standards. The first rail lines were built over the lake in the 1850s, and “Today, so much rail has been laid that the Calumet area is North America’s largest center for intermodal freight shipping.”9 In fact, “Over 9 million containers a year are shipped in and out of the Calumet area—over twice that of any other U.S. metropolitan area.”10

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9 Ibid. Page 4
10 Ibid. Page 10
Beginning in the 1860s the area became a center for pig iron and steel production. The first steel plant was John Brown’s Iron and Steel Mill at 119th Street. It was followed by U.S. Steel in South Chicago in 1881 and Wisconsin Steel in South Deering. These towns were annexed into the city in 1986. These were company towns:

At the time when the towns were new, it was a given that a man working at U.S. Steel lived in South Chicago, and a man working at Wisconsin Steel lived in South Deering. The fortunes of mills and towns were inextricably linked. Throughout most of the 1900s, the steel industry was the dominant force that shaped both land use and culture in the Calumet area.11

Over the years other industries developed in the area included soap, paints, chemicals, and cement, but the dominant industry was steel until the 1970s. By 1982, the steel industry was collapsing. Southeast Side communities were devastated as mills closed taking supplier businesses down with them. With much less money in the community, and many people out of work, restaurants and shops closed too. The area has yet to recover.

Slag dumping began in Lake Calumet around 1900 and continued up until 1970. Beginning as far back as the 1940s, 87 acres of marshlands near Lake Calumet that had been strip-mined for sand needed for the nearby steel mills became a massive dumping ground for large amounts of industrial and municipal waste from the greater Chicago region. Thousands of chemical-filled drums, steel slag, and solvents were either illegally dumped in the strip mines, or improperly managed at the former Alburn incinerator there.12

The Cluster Site is in the city’s “dumping ground,” which for better or worse is also an area of tremendous ecological value. They are surrounded by several of the city’s major landfills, including Land and Lakes landfill to the west, Paxton II to the northwest, and Paxton I to the North, which have checkered environmental histories themselves. The name Cluster Site comes from a mid 1990s petition started by the Southeast Environmental Task Force asking U.S. EPA to provide Superfund monies to address this group of individual but adjacent sites. The petitioners’ idea was to “cluster” or bundle the sites in order to qualify for the National Priority List (NPL). Lake Calumet Cluster Site Workgroup formed around this petition and has been meeting ever since.13

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11 Ibid. Page 6
13 Ibid.
Album Incinerator. The Unnamed Parcel actually includes hundreds of parcels for which there are multiple owners. Nearby industries dumped industrial, chemical and municipal waste there from the 1940s to the 1960s. Dumping of industrial and municipal waste also dates back to the 1940s at U.S. Drum II, where a solvent recovery and waste transfer facility was operated during the 1970s. EPA removed and disposed of 6,000 drums and roughly 341,000 gallons of semi-solid waste/liquids. The Album Incinerator was likely used as landfill before it became a chemical incinerator from 1977 to 1983 when an explosion at the site led to investigations and the closing of the incinerator.

The Proposal: Drivers and Goals

The energy farm proposal for the Cluster Site sought to address several issues the city was confronting at the time. The City had recently reached a negotiated settlement with ComEd. In 1997 Mayor Daly brought a law suit against Commonwealth Edison. He charged the utility with violating its 1992 franchise agreement by lagging behind in system improvement investments committed to in that agreement. In 1999 the City and the utility reached a negotiated settlement which required ComEd to spend $1.25 billion to build substations and transmission lines and pay the City $100 million over four years. The $100 would be paid in allotments of $25 million per year to be used for investment in energy efficiency or renewable energy projects. Additionally, ComEd’s parent company, Exelon, had sold all coal-fired plants to Edison Mission Energy. As a result of that sale, Mission Energy was required to build another 500 MW power plant. The City wanted the new peaker plant to be built at the Cluster Site as part of the proposed energy farm. The Chicago Center for Green Technology had just been established with Chicago Solar as the principal tenant. The City had been interested in the Lake Calumet area for years because of its unique ecological value. The area contained the City’s largest wetlands and provided habitat to endangered species. The Cluster Site is located in the middle of this special ecological area. The energy farm proposal was seen as a way to bring revenue to Calumet for ecological restoration as the electricity sales would be used to pay for site remediation and ecological restoration.

15 David Reynolds. Telephone Interview by Author. April 1, 2010
ComEd was under pressure to serve its customers better. It struggled over the summer of 1999 as several blackouts occurred in Chicago and the surrounding suburbs and by mid August the Illinois Commerce Commission announced a thorough investigation into the company’s operations. A few weeks before on August 5th the City, ComEd, and Spire Solar Chicago announced they would partner in the first “Brightfield” project under the U.S. DOE’s new Brownfield to Brightfield Initiative, which promoted redeveloping brownfields with solar manufacturing, solar power installations, or both. Chicago Solar agreed to build a solar manufacturing factory at 445 N. Sacramento, the former site of Sacramento Crushing, a construction debris recycling facility that the City shut down in 1996 for violating environmental laws. The City committed to invest $2 million and ComEd would invest $6 million to place solar panels on schools, museums, and other public facilities. Spire would partner with the City to develop a 2.5 MW photovoltaic array at the Cluster Site that would begin as a 500 kW array and be expanded monthly until it covered 10 acres.

In June, 2000 Mayor Daly and Governor Ryan announced the Energy Farm Redevelopment Proposal for the Cluster Site. Based on a preliminary environmental assessment conducted in 1999 by Ecology and Environment it was believed that the Cluster Site was a contaminated brownfield with potential “hot spots.” The energy farm proposal was based on that assumption. Under this assumption the City’s believed it could rely on revenue generated by selling the electricity produced by the solar power plant and gas-fired power plant to fund cleanup and acquisition of the Cluster Site. CDOE was involved because of the environmental site assessment and remediation issues, the energy issues, and the responsibility for natural resource management and ecological restoration. The Department of Planning and Development manages the Tax Reactivation Program and the Calumet Open Space Plan. The Law Department was involved both to deal with the legal aspects of environmental law and real estate transactions. These three departments were to work together to implement the energy farm proposal in cooperation with EPA and IEPA. For years the EPA had been convening the Calumet Working Group, which was a citizen’s group focused on cleaning up the illegal landfills, increasing environmental scrutiny and improving the environment in the Calumet area.

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17 Lori A. Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts" (Massachusetts Institute of Technology, 2006).
South East Environmental Task Force and Southeast Chicago Development Commission were involved in Cluster Site Working Group.

**Proposal Feasibility Analysis – Assessing the Environmental Contamination**

In July 2000 EPA awarded a $100,000 Superfund grant to assess the Cluster Site and to refine the ambitious plan to convert 6,000 acres at Lake Calumet to industrial and environmental uses including the energy farm proposal. Commissioner Abolt told the Chicago Sun-Times that the money would help answer questions such as, "Where are the hot spots to dig up? Do any need to be capped? Which are the best wetlands to restore, and how?" The money was also to be used to evaluate the best place to site the 2.5 MW of photovoltaics (PV) which would be built in cooperation with Commonwealth Edison and was scheduled for completion in 2003.

Funded by the Superfund grant IEPA initiated an in-depth investigation of the Cluster Site, installing 134 test pits ranging in depth from 4 to 30 feet below ground. All but one of the test pits contained industrial, medical, and/or household waste. It and subsequent investigations have indicated that the Alburn and U.S. Drum sites, for example, still contain wastes at depths of more than 30 feet. The natural gas peaker plant was no longer feasible because the site was not structurally sound. In August 2001 Harza Engineering Company completed a Comprehensive Site Investigation that concluded that the site contained widespread soil and groundwater contamination. A November 2001 Ecological Risk Assessment found that the site posed an ecological risk to wildlife on the site. A Human Health Risk Assessment (HHRA) followed in February 2002. It concluded that there would be carcinogenic and non-carcinogenic health risks to unprotected site workers. A Remedial Options Report had been completed in September 2002 that proposed eleven remedial options ranging in cost from $18 million to $87 million. In November 2002 CDOE concluded that the potential liability associated with the site and the cost for remediation and abatement was much higher than originally anticipated. It was clear that the energy farm would not produce sufficient revenue to fund the abatement work. The City was also nervous about acquiring ownership and control of the site because of the liability and lack of funding for abatement.

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19 "Work Moves Forward on Lake Calumet Cluster Sites/Paxton I.I. Landfill Repair Maintenance." Page 7
20 "Lake Calumet Cluster Site Status Summary (Draft)," (Chicago: Chicago Department of Environment, 2002).
21 Ibid.
With the energy farm proposal no longer feasible the City decided to work with EPA to get the site added to the National Priorities List. Such a listing would provide access to Federal Superfund monies for cleanup and create a pathway for the city to obtain liability protection if it gained control of the site in the future. The Cluster Site was proposed for listing on the NPL in 2005 and added to the NPL on March 4, 2010.22

At the time of the Chicago World’s Fair in 1893 the Lake Calumet area was subdivided for residential development. Speculators successfully sold lots to visitors to the World’s Fair, who only after purchase discovered that they had been swindled and sold swamp land. As a consequence most of the properties in the area had become tax delinquent and abandoned. Consequently, sorting out ownership and associated responsibility in the area is extremely complicated if not impossible.23 Because the Cluster Site were tax delinquent it was possible for the City to acquire ownership through its Tax Reactivation Program. The City had a history of acquiring tax delinquent properties and successfully redeveloping them through its Brownfields Program when it had a viable end use established beforehand. In this case the City could not justify acquiring a landfill that was not structurally sound for redevelopment. The Cluster Site was much dirtier and more dangerous than originally thought and carried with it significant liability the City was not prepared to accept. Ownership was extremely complicated. According to David Reynolds, “Ownership is a big issue, without clear control of the Cluster Site no one is going to build.”

Cluster Site Case Analysis and Overarching Themes

The story of the Energy Farm Redevelopment Proposal for the lake Calumet Cluster Site is illustrative of the major challenges facing brownfields redevelopment. These challenges are the same whether the potential end use is renewable energy production or anything else. Clean-up costs and fear of legal liability may be the two most critical issues in brownfields redevelopment. Because of the technical and legal complexity of these sites their redevelopment also involves lengthy and complicated administrative processes that are seen by many developers as a disincentive to development.

23 David Reynolds. Phone Interview by Author. April 1, 2010
Contaminated properties have to be cleaned up to standards deemed adequate to protect public health, safety, and the environment. Depending on the type and extent of contamination clean up can be extremely expensive. In most cases, particularly when a private developer is driving remediation and redevelopment, a project’s viability depends on whether the end use will generate revenues greater than the cost of cleanup. In the case of the Cluster Site cleanup costs turned out to be much higher than originally thought. Closing this economic gap is essential to make development possible on challenging sites. One possibility for accomplishing this is through increased government funding, tax credits, or other policy incentives. Developers can also strategically take advantage of existing incentives. In the Steel Winds case a moderately polluted brownfield is carved out of a larger more hazardous Resource Conservation and Recovery (RCRA) property to take advantage of New York State’s Brownfield Program benefits. The modular nature of solar and wind power technologies are particularly well suited to this strategy.

There are several issues related to legal liability. First there is the question of who is responsible for the contamination and therefore liable for it. There is also a question of whether the liability can be managed effectively. In the last twenty years a variety of programs and legal tools have been developed to manage liability and facilitate redevelopment. State Volunteer Cleanup Programs (VCPs), risk-based cleanup standards, innovations in environmental insurance, deed restrictions and other contractual real estate covenants have made it possible to manage liability risks effectively in many cases. However, many potential developers are still scared away from brownfields sites by potential liability issues. Liability issues were complicated greatly in the case of the Cluster Site because the extent and hazardousness of contamination on the site, and the complicated and murky chains of title associated with multiple owners and long abandoned sites. This potential liability was greater than the City could accept.

In addition to the cleanup costs and liability brownfields present uncertainty that may be greater than a developer is willing to assume. No one knows with absolutely certainty what is on the site or beneath it until they dig there. Even when environmental assessments have been done

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26 Robert Colangelo. Telephone Interview. March 31, 2010
there is the potential that a hazard will be discovered during construction or redevelopment preparation that could greatly increase the cost of cleanup. In order to succeed developers have to have contingencies that enable them to deal with the unexpected. The Exelon City Solar project offers a clear example of how such uncertainty manifests and how it can be managed effectively.

The Cluster Site also exemplifies how site conditions can limit redevelopment options. The area slated for the natural gas plant was discovered to be a structurally unsound landfill making the site unsuitable for a peaker plant. More generally, the construction of engineered barriers with clay, concrete, asphalt, high-density polyethylene (HDPE) or other materials is a commonly used remedial measure that may limit what can be built on the site in the future.

Brownfield sites are also complicated because of the number of parties that need to be involved to remediate them. This can be seen in the Cluster Site case. The City of Chicago was one party, although it required significant involvement from at least three city departments: Environment, Law, and Planning and Development. The IEPA and EPA were additional parties directly involved in site assessment and potential cleanup. Support was needed from the following parties as well: Exelon/ComEd, Spire Solar Chicago, Mission Energy, U.S. DOE, the Southeast Chicago Development Commission, Southeast Environmental Task Force, and the local alderman’s office. Beyond these eleven (or thirteen if you count each city department separately) the list could go on. It could include the potentially responsible parties (PRPs), of which there were hundreds in this case,27 as well as other community groups, government officials, etc.

**Hypothesis**

I expected several factors to be necessary ingredients for overcoming the barriers contaminated lands present for renewable energy development. Successfully completing renewable energy development on brownfields depends on strong public support in the local community and the active support of state, local, and even federal officials throughout the life of a project. Success also requires close partnership between project stakeholders including developers, property and environmental liability owners (these are not necessarily the same

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27 USEPA identified about 400 potentially responsible parties that had sent waste to the area. "Work Moves Forward on Lake Calumet Cluster Sites/Paxton I.I. Landfill Repair Maintenance."
entities in the case of brownfields properties) and public officials. To overcome the complexity, uncertainty, and risks of working on brownfield properties, project partners need to have good working relationship that involves close cooperation, clear communication of expectations, and free sharing of information. Also, the maturation of the renewable energy development market is also important. This includes the maturation and expansion of state renewable portfolio standard (RPS) policies and associated markets for renewable energy certificates\(^{28}\) (RECs), increasing willingness to invest in these projects among investors, and the establishment of a pool of solar and wind power developers experienced in assembling corporate financing, marketing RECs and developing power-purchase agreements in diverse settings.

**Methodology and Research Design**

This thesis uses a case study methodology to test the above hypotheses. Four in-depth case studies, one of an unsuccessful project, and three of successful projects, highlight the obstacles and risks that brownfields-to-renewable energy projects face and how they were overcome. The presenting case highlights how risks, obstacles and barriers to siting utility-scale renewable energy plants on brownfields can cause such projects to fail. The other three case studies will illustrate how these barriers can be overcome. An extensive internet search revealed relatively few (perhaps a dozen) examples of completed large-scale renewable energy production projects on brownfields in the United States. My case studies are selected from among this group. They involve relatively large scale projects, represent common types of contaminated land sites, and illustrate different partnership models. Using cases that are quite different from one another will yield a more comprehensive understanding of the common challenges these projects must overcome. In addition to a literature review, I conducted archival research of newspaper and journal articles, project related reports, presentations, websites and other materials. Approximately 20 stakeholders from the various projects were interviewed. Interviews were also conducted with environmental and brownfield regulatory staff, brownfields

\(^{28}\) A RPS requires utilities in the subject jurisdiction, usual a state, to supply a certain percentage of their energy through renewable sources. RPS policies define what is qualifies as a renewable resource and establishes compliance guidelines. A common characteristic of a RPS polices is that utilities demonstrate compliance through the ownership of RECs, which they either produce themselves or purchase from another power producer. A REC represents the attributes of one megawatt-hour of renewable electricity. For a comprehensive overview of the treatment of RECs in RPS policies in the U.S. see Edward A. Holt and Ryan H. Wiser, "The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards," (Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory, 2007).
redevelopment and renewable energy professionals and advocates, and consultants and attorneys who have worked with companies/developers to get a renewable energy project built on brownfield sites. In many cases interview subjects fell into more than one of these categories. In addition to the “nuts and bolts” of each individual project, interviews focused on which regulations, processes, policies and other factors create challenges and facilitate development, and what policy changes or additions may be beneficial.

Summary of Findings

I do not intend to suggest that these challenges can always be overcome. Indeed, in some cases, like that of the Cluster Site, they may be insurmountable given the available resources. However, the three case study projects presented in this thesis demonstrate that developing large-scale renewable energy projects on complex contaminated brownfields can not only be viable business projects but can also provide multiple community benefits. One important benefit is an improvement in community image through improved aesthetics and the introduction of non-polluting industry in communities that have historically had a concentration of dirty industries. The projects produce revenue for local governments through property taxes, payments in lieu of taxes (PILOTs), or lease payments. Other public benefits include educational opportunities, tourism opportunities, and increased development interest in the surrounding area.

The cases also demonstrate that the arguments for siting renewable energy facilities on brownfields have practical validity. The existing infrastructure on these sites, particularly electricity transmission infrastructure, is valuable and facilitates renewable energy development. Renewable energy technologies are aesthetically compatible with industrial sites and more easily accommodated by industrial zoning. In all three cases studies the project received overwhelming support from the community suggesting that brownfields may offer one solution to the siting difficulties faced by new energy production facilities, particularly the difficulty of siting large-scale wind turbines.

Renewable energy projects are similar other to development projects in many ways. However, passive renewable energy projects like wind farms and solar farms differ from other commercial development in at least one important aspect. They provide an option for a revenue producing operation that can coexist with continuing remediation activities. They are a viable use for sites with significant development constraints resulting from engineered or institutional
controls. The modular nature of solar photovoltaics and wind turbines is well suited to brownfield development in several ways. It may allow for flexible configurations and project phasing such that these technologies can first be deployed on less polluted areas of the site while remediation continues on other portions, or on areas with less potential for other commercial or industrial development. As illustrated by the Steel Winds project, this allows for a novel approach to reducing cleanup costs by dividing smaller less polluted properties out of larger more severely polluted ones. Depending on state and local policies, this can allow a developer to access brownfields tax credits and liability protection. Lease payments in this scenario provide the owner of the larger more severely contaminated site revenue that can support remediation of the entire site.

Relevance

For at least a decade there has been a federal agency promoting the use of brownfields and other contaminated lands for renewable energy production, yet relatively few projects have been completed in urban areas. DOE launched its Brownfield into Brightfield Initiative in 1999, and the EPA officially began the RE-Powering America’s Lands Initiative at the beginning of 2009. The DOE program met with limited success. Of the six pilot projects funded, the only large scale facility completed was the 425 kW Brockton Brightfield.

There are still relatively few completed urban brownfields-to-energy facility projects, but many are in the works. These include the ambitious Destiny mixed use development in Syracuse New York which plans to meet all of its energy needs on site through a 16 MW municipal solid waste plant and a 3.2 MW photovoltaic system on an adjacent structure; the Georgetown development in Redding Connecticut which is reusing a small scale hydro-electric dam to power one of its commercial buildings; the Kin-Buc Superfund landfill in New Jersey, which plans to install a 2.6 MW solar array to generate revenue for the onsite land use management plan (OSLMP), Stafford Park mixed use development in New Jersey that plans to meet its energy needs by onsite renewable energy technologies including wind turbines, and a ground mounted photovoltaic array, as well as building mounted solar panels. A 1.5 MW solar power plant is being built on a former seven acre landfill in The Navy Yard in Philadelphia. Clear Skies Solar is building a 2.1 MW solar farm on a former landing strip in Badger California. The solar park will be built on an existing 30-acre Brownfield that once served as an airplane landing strip. The
property has a substation that is capable of handling the 2.1 MW of new electrical capacity. The landing strip is well suited for a solar power plant because of it receives high radiation levels and faces limited air pollution.  

Additionally, two utilities have announced plans to deploy significant amounts of photovoltaics on brownfields and other sites. National Grid plans to deploy 5 MW of solar power in Massachusetts:

National Grid said it plans to construct facilities in Dorchester (1.3 MW), Revere (0.7 MW), Everett (0.6 MW) and Haverhill, Mass. (1 MW), on company-owned property. With its filing, National Grid announced plans to add a fifth site at its New England Distribution Center, located on the Sutton-Northbridge, Mass., border (1.2 MW). Four of the five sites are former brownfield locations and were selected because they have enough space to provide a nearby source of electricity to help reduce demand on the distribution networks in those areas, the company said.

In the Spring of 2009, Public Service Electric and Gas (PSE&G) announced “Solar 4 All”, a $773 million solar installation program:

According to the Solar Electric Power Association (SEPA), PSE&G's Solar 4 All program includes a four-pronged approach: adding PV panels on up to 200,000 utility poles; installing small rooftop PV systems on government facilities; installing large-scale solar power plants on utility property, brownfields and underutilized real estate; and installing systems on affordable housing developments.

On February 26, 2009, Ralph Izzo, CEO of PSE&G’s parent company, Public Service Enterprise Group (PSEG), mentioned this plan when he testified before congress in support of national renewable portfolio standard (RPS). A RPS requires utilities in the subject jurisdiction to supply a certain percentage of their energy through renewable sources. The percentage typically increases over time. Twenty-nine states and the District of Columbia have RPS policies.  

These projects suggest increasing interest among developers in incorporating large-scale renewable energy production into brownfields redevelopment. The limited number of successful projects to date combined with the growing interest in such projects highlights the need for

research focused on determining the barriers to renewable energy developments on brownfields and outlining policy changes to address these barriers.

The issue of contaminated idle sites is not going to go away. EPA estimates that there are 450,000 brownfields nationwide, but the true number could be much greater. Today’s industrial and commercial sites may be tomorrow’s brownfields. The dynamic global economy continues to shift the focus of capital, causing massive economic decline in some communities and leaving swaths of brownfields in its wake. The current economic crisis has already caused many industrial sites to shut down, creating new potential brownfields. Brownfields typically exist in urban areas where energy demand is the greatest. Brownfields are also well connected to transportation routes, and have existing transmission lines and other infrastructure. They are also often zoned appropriately for energy plants. They exist all over the country including the areas with the best solar and wind resources and areas well suited to biomass plants. Furthermore in the land-scarce cities of the northeast, the only available sites for locating renewable energy facilities often are brownfields.

This research is timely given the recent launching of the EPA RE-Powering America’s Lands initiative and the increasing number of projects underway. Furthermore, the need for increasing low- and zero-carbon renewable energy production is critical and ongoing. The EPA reports:

Climate change is a serious global challenge... Furthermore, the U.S. Environmental Protection Agency (EPA) has proposed that climate change is primarily the result of GHG emissions, its effects will worsen over time in the absence of regulatory action and the overall rate and magnitude of human induced climate change will likely increase, such that risks to public health and welfare will likewise grow over time so that future generations will be especially vulnerable; their vulnerability will include potentially catastrophic harms.34

Increasing renewable energy production is now an important item on the national agenda. In order to address the climate crisis, reduce the nation’s reliance on fossil fuel imports, and create a green economy, President Obama’s has set a goal of doubling the nation’s renewable energy

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capacity in three years, which would create enough power from renewable energy to meet the needs of six million homes.  

The Legal Landscape and Origins of “Brownfields”

The following section describes the origins of the brownfields issue in U.S. environmental policy. The relevant federal legislation is summarized and the evolution of brownfield policies in response to the experience of states and cities in implementing those policies is discussed. The next section enumerates the challenges and obstacles facing brownfields redevelopment. The introduction ends with a discussion of the role city governments play in brownfield redevelopment and how promoting large-scale renewable energy projects might be incorporated into local brownfield programs.

The brownfields issue stems from the way in which major environmental issues of the 1960s and 1970s were addressed through regulation. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was enacted in December 1980. It has been nicknamed Superfund because one of its functions was creation of the Superfund Trust Fund capitalized by a new tax on chemical production. The tax expired in 1995 but the Obama Administration has proposed reinstating it. The legislation was in part a response to growing anger over the presence of hazardous pollution in communities, which was heightened by notorious environmental disasters such as Love Canal in New York and Times Beach in Missouri in the late 1970s. Liability under CERCLA is strict, joint, several, and retroactive. Strict liability means that a potential responsible party (PRP) can be held liable even if they are not at fault or did not act negligently. Ignorance is not an excuse, nor is following standard industry practices of the time. Joint and several liability means that every PRP for the site can be held responsible for the entire cleanup, and retroactive liability means that parties can be held liable for actions taken before the enactment of CERCLA in 1980.

In addition to the Superfund Trust Fund, CERCLA also created the National Contingency Plan (EPA protocol for response to hazardous substance releases) and the National Priorities List.

36 Molly H. Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In" (Master in City Planning, Massachusetts Institute of Technology, 2009).
37 Ibid.
(NPL), which is a list of severely contaminated sites demanding federal attention, legal action, and resources for clean-up. The EPA’s computerized inventory system for brownfields is called the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). Sites on this list are under Superfund jurisdiction. Those that exceed a designated hazardous ranking are assigned to the National Priorities List, the rest are assigned to state inventories.\(^3^8\)

In 1986 the Superfund Amendments and Reauthorization Act (SARA) added research and remediation activities to the EPA’s mandate. It also charged the EPA with increasing state involvement in negotiating with responsible parties. Within the CERCLA framework states must enact and implement their own contaminated site legislation. State regulations must be consistent with CERCLA and other Applicable, Relevant, and Appropriate Requirements (ARARs) under federal laws, such as soil, air and water quality standards.

The Resource Conservation and Recovery Act (RCRA) of 1976 governs the management of nonhazardous (solid) waste, hazardous waste, and underground storage tanks. The act gives EPA authority to control hazardous waste from “cradle-to-grave.” This cradle-to-grave authority covers generation, transportation, treatment, storage and disposal. RCRA regulates solid waste management units (SWMU), which are defined as:

any discernible waste management unit at a RCRA facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste. The SWMU definition includes containers, tanks, surface impoundments, waste piles, land treatment units, landfills, incinerators and underground injection wells, including those units defined as "regulated units" under RCRA. It includes recycling units, wastewater treatment units and other units, which EPA has generally exempted from standards applicable to hazardous waste management units. Finally, it includes areas contaminated by routine, systematic and deliberate discharges from process areas.\(^3^9\)

The Federal Hazardous and Solid Waste Amendments (HSWA) are 1984 amendments to RCRA. HSWA focused on waste minimization, phasing out land disposal of hazardous waste, and on corrective action for releases. This law increased enforcement authority for EPA, created stricter hazardous waste management standards, and established a comprehensive UST program. RCRA


was amended in 1986 to give EPA authority to address problems resulting from underground storage tanks (USTs) containing petroleum or other hazardous materials.\textsuperscript{40}

An unintended consequence of CERCLA was that the aggressive liability rules discouraged clean-up, remediation, and redevelopment of moderately contaminated sites with economic potential. In implementing CERCLA EPA targeted not just past and present property owners, but transporters, parties that shipped waste to the landfill, lenders with ties to the polluting companies, and government entities that had acquired contaminated property. Molly Ekerdt describes the problems as follows:

CERCLA alarmed a lot of people over the next ten years [after enactment] as a storm of litigation ensued, even the most lucrative projects were stalled, banks wouldn't lend to projects where land might be contaminated, and companies had even more incentive to mothball properties. These conditions held no matter the level of contamination at the site, which in many cases was minimal or undetermined.\textsuperscript{41}

Fear around potential contaminated sites and increasing difficulty redeveloping industrial property lead to the realization among some regulators and policymakers that there was a need for a regulatory process to separate the moderately contaminated sites from the severely hazardous ones and to facilitate their redevelopment. Over the years CERCLA has been amended to reduce liability for recyclers and lenders that had made loans to PRPs. Financial incentives for brownfields projects have been added as well.

The EPA launched the Brownfield Action Agenda (BAA) in 1995. The BAA consisted of four main parts “(i) it provided funds for pilot programs to test redevelopment models and facilitate stakeholder cooperation; (ii) it clarified the liability of prospective purchasers, lenders, property owners, and others regarding their association to the site; (iii) it fostered partnerships among the different levels of government and community representatives aimed at developing strategies for promoting public participation and community involvement in brownfields decision making; and (iv) it incorporated job development and training opportunities into brownfields efforts.”\textsuperscript{42} By the end of 2000 all 50 states had participated in the EPA’s brownfields program and 45 states had established voluntary cleanup programs. Voluntary cleanup programs (VCPs) offer more flexible cleanup options than the prescriptive structure of

\textsuperscript{41} Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In". Page 15
\textsuperscript{42} DeSousa, \textit{Brownfields Redevelopment and the Quest for Sustainability}. Page 11
federal and state Superfund program and provide technical assistance, financial support and liability protection. The EPA negotiates the content of VCPs with state governments and signs Memoranda of Agreement (MOA) or Memoranda of Understanding (MOU) with states endorsing these programs.

Illinois Site Remediation Program (SRP) was created in 1995 and offers an example of the flexible cleanup approach of VCPs. Through this program developers receive technical assistance and guidance from the Illinois Environmental Protection Agency (IEPA) for site assessment and no further remediation (NFR) rulings to facilitate cleanup. SRP uses a Tiered Approach to Corrective Action (TACO), which is a risk based approach in which property is remediated according to intended reuse. Participants in the SRP must comply with state regulations, allow their site to be evaluated by IEPA, and develop a remedial action program that meets the Program's approval. Once a satisfactory Remedial Action Plan (RAP) is submitted and accepted IEPA issues a NFR letter certifying that the property does not pose a threat to human health or the environment. The NFR Letter is used to assist in a property transfer by informing an individual buying or selling property of the environmental site conditions. The value of the NRF letter is that it "signifies a release from further responsibilities under the Illinois Environmental Protection Act," but "The SRP is not an enforcement shield or an alternative to regulatory compliance." The SRP also offers the following financial programs: Illinois Municipal Brownfields Redevelopment Grant Program, the Illinois Brownfield Redevelopment Loan Program, the Brownfields Cleanup and Revolving Loan Fund, the Underground Storage Tank Fund, and the Environmental Remediation Tax Credit.

The Small Business Liability Relief and Brownfields Revitalization Act (Brownfields Act) became law in January 2002. It authorized $250 million annually in brownfields grants. However, between FY2003 and FY2007, Congress appropriated two thirds or less of this amount. According to DeSousa, "The review process for non-Superfund brownfields is under the jurisdiction of state governments and an important element of the Brownfields Act was the

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45 "Site Remediation Program Frequently Asked Questions."
47 Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In".
creation of the federal enforcement bar, which ensures that when a site goes through a state review program, the state becomes the primary regulator and the federal government cannot use Superfund enforcement authority over that site."48 As a result, most state agencies take a more active role in technical assistance and review activities than EPA. It is typical for the state agency to review and approve work plans and remedial objectives proposed by the responsible party at the beginning of the remediation process and then reviewing the remedial work to certify that remedial objectives have been met.49

In 1995, when the EPA launched its Brownfields Action Agenda (BAA) it defined brownfields as “abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived contamination.”50 The Small Business Liability Relief and Brownfields Revitalization Act of 2002 changed the definition to “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.”51 The brownfield term is intended to avoid the negative connotation of contaminated land. It also invokes brownfields counterpart, greenfields, which refers to open space or agricultural land on the urban periphery. Greenfields may also be called “unimproved” or “undeveloped” land.

The Brownfields Federal Partnership Action Agenda is a “compilation of commitments, new initiatives, events and activities that the participating federal agencies committed to undertake in partnership to help communities deal with brownfields and associated problems.”52 It was announced in November 2002 and contained over 100 commitments from 23 federal agencies. EPA’s Brownfields Program provides direct funding for brownfields assessment, cleanup, revolving loans, and environmental job training. “The EPA estimates that since its inception in 1995, investment in the Brownfields Program has leveraged more than US$6.5 billion in brownfields cleanup and redevelopment funding from the private and public sectors and created approximately 25,000 new jobs.”53

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48 DeSousa, Brownfields Redevelopment and the Quest for Sustainability. Page 13
49 Ibid.
50 Ibid., 2
51 Ibid., 2
52 DeSousa, Brownfields Redevelopment and the Quest for Sustainability., 12
53 Ibid., 14
Challenges and Obstacles to Brownfield Development

The two most critical challenges to redeveloping brownfields are high redevelopment costs and potential liability. According to DeSousa the primary obstacles discussed in North American and European literature are “the character and application of regulations, a lack of standardized and practical cleanup criteria, uncertainties regarding liability ensuing from environmental remediation, and funding resources available for remediation and redevelopment.”54 Brownfields face a basic economic challenge because they present high assessment and cleanup costs and tend to produce lower returns in terms of market or rental value. Idle or abandoned sites are a burden to local governments because they generate little to no property tax revenue for the municipality. The onsite infrastructure is often in poor condition further discouraging redevelopment. These sites are often viewed as “environmentally impaired areas where ecological renewal is futile.”55 A study conducted by DeSousa in the late 1990s in Canada found that private developers saw liability, which added to costs and risks through increased legal costs and decreased land values, as the most severe obstacle. Time delays are another source of uncertainty. Because they lengthen the development process, regulatory mechanisms continue to be serious barriers to redevelopment. Table 1 shows the results of DeSousa’s study in which developers in Ontario, Canada, were asked to rank potential obstacles on a scale from 1 (not an obstacle) to 5 (severe obstacle).

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<tr>
<th>Avg. Scaling</th>
<th>Potential Obstacle</th>
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<tr>
<td></td>
<td><strong>Moderate-severe</strong></td>
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<td>4.3</td>
<td>Liability concerns</td>
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<td>3.7</td>
<td>High Remediation Costs</td>
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<td>3.7</td>
<td>Slow Regulatory Process</td>
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<td>3.6</td>
<td>Complex Municipal Land Use Policies</td>
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<td></td>
<td><strong>Moderate Obstacles</strong></td>
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<td>3.4</td>
<td>Stringent Remediation Requirements</td>
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<tr>
<td>3.4</td>
<td>Uncertainty related to site-specific risk assessment</td>
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<td>3.2</td>
<td>Lack of government incentives</td>
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<td>3.1</td>
<td>Obtaining project financing</td>
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<tr>
<td>3.0</td>
<td>Lack of knowledge/negative attitude on the part of the public</td>
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<tr>
<td>3.0</td>
<td>Lack of knowledge/negative attitude on the part of stakeholders</td>
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54 Ibid., 8
55 Ibid., 31
56 Ibid. Page 31
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<th>Low-moderate obstacles</th>
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<tr>
<td>2.4 More Contamination than expected</td>
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<td>2.3 Potential impacts to adjacent properties</td>
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<td>2.2 High cost of insurance</td>
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<td>2.1 Lack of information on history of sites</td>
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<tr>
<td>1.3 Lack of remediation or disposal options</td>
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A 2006 study by the U.S. conference of Mayors found the most often identified obstacles to brownfields development from the public sector perspective was a lack of cleanup funds (156 cities/87%). The need for environmental assessments was second (101 cities/61%) followed by liability issues (97 cities/54%). Landowners may be concerned that if contamination is found, the owner will be responsible for cleanup costs, land value will decline because of contamination or perceived contamination (stigma hurts value), and adjacent landowners might blame their contamination problem on their neighbor. One result is that landowners landbank waiting for values to increase. Similar to landbanking, property owners may “mothball” their properties: Corporate owners find it cheaper to pay taxes, keep up fences, and pay a guard [than to clean up the site]. Many policymakers find these to be the most high-impact and frustrating properties to deal with.

Whether the intent is mothballing or landbanking, these practices can stall neighborhood-wide renewal efforts.

Outdated infrastructure is another reason developers may avoid brownfield sites. Howland (2004) found that “In spite of the widespread view that one advantage of an inner-city site is its ready access to infrastructure, a common grievance among property owners is that water, sewer, and telecommunications facilities are outdated and inadequate.” This last point refers to the fact that high-speed internet was not available in most of the sites in Howland’s study area, the Carroll Camden neighborhood in Baltimore. Urban form can also be outdated such that it is no longer suitable to industry. Howland also found that sites that are “small and oddly shaped; with inadequate road access for modern trucks; … and with incompatible surrounding land uses are the most likely to remain unsold after 2 years.”

DeSousa found that developers in Milwaukee and Chicago identified the high cost (or amount) of cleanup as the biggest barrier to brownfield development. Other barriers mentioned

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57 Ibid., 32
58 Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In". Page 26
59 Marie Howland, “The Role of Contamination in Central City Industrial Decline,” *Economic Development Quarterly* 18, no. 3 (2004), 217
60 Ibid.
by Milwaukee developers included liability risks, longer project duration, and unknown or surprise costs. Some Chicago developers emphasized city and state regulations that delayed development, unknown costs, trouble obtaining financing. Liability risk was not mentioned by developers in the Chicago sample.61

Lending costs are typically higher for brownfield sites than for greenfield sites. Banks may require lower loan-to-value ratios because they do not want to own a stigmatized and costly property. This raises the needed equity beyond what many developers can handle.62 One way to encourage investment is to rezone to a higher value use. However, if risk based standards are used to govern cleanup the value added by more intensive use (residential) may be cancelled by increased cleanup costs. The findings of DeSousa 2002 study of brownfields development in Toronto support the argument that industrial reuse of brownfields provides greater public benefits for cities than residential reuse.

Experience with brownfields development tends to lessen the level of fear developers have of developing other contaminated properties. DeSousa reports:

While developing on brownfields is indeed perceived as slightly more costly and risky than greenfields, such views are strongly tied to the experience of developers in managing them. The more experienced developers consider brownfields management as just another aspect of development, while those with less tend to react more cautiously, but are willing to ‘do it again.’ Projects, therefore, are occurring at an increasing rate driven by a small group of ‘veteran’ urban developers, many of whom now concentrate on larger-scale mega-projects, and a cadre of new developers trying out the brownfields market typically on smaller properties... the vast majority of developers [in Chicago and Milwaukee] feel that greater financial assistance is the key to increasing residential redevelopment. However, many are still willing to go about profitable projects on their own, particularly if it helps avoid bureaucratic entanglement and delays.63

The author also found experience to be an important factor in how obstacles are perceived by those involved in brownfield development projects. Interview subjects who had made a career of brownfield redevelopment frequently viewed the risk and liability as manageable. One remarked that VCPs have largely addressed the liability issue.64 Conversely, a lawyer who is involved with her first brownfield project was extremely concerned about the liability issues. The

61 DeSousa, Brownfields Redevelopment and the Quest for Sustainability.,112
62 Ibid.,59
63 Ibid., 114
64 Robert Colangelo. Telephone Interview. March 31, 2010
experienced brownfields professional interviewed for this thesis agreed that greater financial assistance is essential for increasing the amount of brownfield redevelopment.

Because surrounding residents are directly impacted by brownfields, either by past pollution or the ongoing affects of blight, they tend to have greater involvement in brownfields redevelopment than conventional development. Developers and community members may disagree on the highest and best use of the property. From the developers’ perspective the highest and best use means the most profitable, whereas the community is likely to want the future use to meet community needs. These interests can overlap, but often do not, as blighted communities have needs for open space, public services, community centers, senior centers, etc.

Understanding brownfields redevelopment from a profit-based perspective is useful for policy makers. Understanding brownfields from a real estate market perspective allows planners to identify sites that will be attractive to developers and to develop realistic visions for future use. DeSousa argues that knowledge of the real estate market can be used to target brownfield policies and maximize public benefits:

Knowledge of an area’s market will help government determine what level of support is required to get a project moving and, on the flip-side, help government figure out how much public benefit it can squeeze from a project that has stronger market viability. The planning department of Vancouver, for instance, has an extremely detailed knowledge of the viability and profit potential of its real estate market, which they have used strategically to secure extensive public services and amenities from developers who wish to build on them.65

A pro-forma analysis assists in understanding the sources and extent of costs and risk factors for developers. This is essential for developing policies that effectively address those barriers to private-led brownfields development.

Local Brownfields Programs

The first level of action for local government is often creating and maintaining an inventory of brownfields. Some municipalities maintain inventories as property development portfolios to supply potential developers with relevant real estate information.66 Cities can use their land use planning powers to facilitate development. Such powers include zoning, powers of land acquisition through tax foreclosure or eminent domain, and the power to establish land

65 DeSousa, Brownfields Redevelopment and the Quest for Sustainability. Page 270
66 Ibid.
trusts. Municipalities can use their ability to acquire and assemble land to make properties more attractive to developers. This may be particularly useful in older cities where parcels are smaller and more oddly shaped. Cities may also incorporate demolition and remediation as part of these assembly efforts.

Local government contributes more funding to brownfield remediation and redevelopment than either states or federal government. Local governments provide subsidies though tax increment financing (TIF), bonds or tax abatements. TIF uses incremental real property tax revenue to fund designated development activities. Tax increment revenue is the portion of property tax that results from the increase in the current equalized assessed valuation (EAV) of each property over its certified initial EAV.

The EPA only makes assessment grants to cities giving city planning a central role in brownfield policy. The planning role can include engaging stakeholders to garner support, establishing and maintaining data on the city’s brownfield properties, creating marketing strategies to attract private developers or industries, ensuring equity and creating environmental justice. Classifying and prioritizing sites can be an important part of a marketing and redevelopment strategy. Cities also use EPA brownfield grants to create job training programs that prepare people for work in environmental cleanup.

Local ordinances can be powerful tools for facilitating cleanup and development. Chicago’s 1997 groundwater ordinance, which prohibits drilling wells and the consumption of groundwater within city limits, has been credited by some as being more effective at inducing cleanup than any other financial or regulatory incentive. By eliminating groundwater consumption the ordinance eliminated a major pathway for ingestion of contaminants. By eliminating the need to remediate groundwater, this ordinance has made cleanup generally much less expensive. According to Dave Reynolds, this ordinance is the reason only one site in Chicago has made the Superfund NPL. That site is the Lake Calumet Cluster Site, which was added to the NPL because it posed ecological risk to a special natural habitat, not because it was a threat to public health and safety, which is the reason sites usually make the NPL.

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67 Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In". Page 28
69 Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In".
70 Dave Reynolds. Telephone Interview. April 1, 2010.
Brownfield policy has focused on city ownership and clean-up of properties under the assumption that local governments were less exposed to legal action and would be able to access lower cost capital, and do not need to achieve as high a rates of return as private developers. On the other hand public ownership brings with it project requirements including bidding and labor use rules, time delays and a loss of control that may deter private developers. Furthermore, cities are not protected from liability. Chicago has avoided acquisition of properties because the Department of Justice does pursue cities as PRPs in Superfund cases.

The EPA divides the brownfield development process into four phases: Pre-development, Securing the Deal, Clean-up and Development, and Property Management. Pre-development typically involves refinement of the development concept (property use and type), conducting due diligence to assess the contamination on the property, securing access to the property, and indentifying sources of funding. The EPA notes that “Identifying the presence and extent of contamination is essential to evaluating risk, limiting liability, and determining an appropriate reuse.” A phase 1 environmental site assessment involves researching the background and history of the site to determine possible sources of contamination and to get an idea of what types of contaminants are likely to be found on the site. Phase I also involves a preliminary visual inspection of the site. Phase II involves conducting soil and groundwater tests in the areas that appeared to be contaminated during the Phase I. Determining clean-up and redevelopment options and estimating cleanup costs are also part of a Phase II. Additional phases may be required depending on the extent of contamination. The EPA also breaks development down into three common scenarios: private led, private-public partnership, or public led.

It is informative to examine real examples of comprehensive city-run brownfield programs. Milwaukee’s brownfield program carried out through a partnership of four agencies: Department of City Development, the Health Department, City Redevelopment Authority, Milwaukee Redevelopment Corporation. The program is part of the city’s Land Reuse Strategy. It focuses on attracting private investment, creating jobs, and restoring the environment. The City created various staff positions and established multiple TIF Districts for cleanup. It has also created an environmental testing fund for tax delinquent properties. City staff took part in a task

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71 Ekerdt, "Where Have All the Brownfields Gone? Lessons for Chicago 15 Years In".
73 Ibid.
force encouraging flexible closure, clarifying liability, streamlining regulatory processes, and facilitating groundwater negotiated agreements. Milwaukee has also taken steps to centralize administrative functions related to brownfields in order to make the development permitting process simpler and faster. 74

Chicago’s Brownfields Initiative is managed by an interdepartmental team of project managers from the Department of Environment, the Mayor’s Office, the Department of Community Development, the Department of Buildings and the Department of Law. It aims at making brownfields development as attractive as conventional development. Chicago’s first effort used $2 million in General Obligation Bonds to redevelop five brownfield properties. The pilot was so successful the city subsequently secured $74 million of Section 108 Loan Guarantees from the U.S. Dept. of Housing and Urban Development (HUD) and was designated a Showcase Community by the EPA. Under the program the City evaluates brownfields for their industrial, commercial, or residential development potential. If a property is attractive and has been tax delinquent for two years or more, the city can acquire it through negotiated purchase, lien foreclosure, or tax reactivation. The City performs a risk assessment to develop cleanup strategies and cost estimates. The City enrolls the majority of its brownfields properties in the SRP. 75 If a developer of a brownfield site is receiving City funds, the redevelopment must meet “Chicago Standards,” which are additional environmental criteria such as green roofs or onsite storm water management. One reason Chicago’s Brownfield Program may be so well regarded is its emphasis on creating open space and housing. 76

The West Pullman Industrial Park Conservation Area (IPCA) Tax Increment Financing (TIF) district is an example of a comprehensive municipal brownfields redevelopment project. The Illinois Industrial Jobs Recovery Law (IJRL) was ratified in 1992 with the intent to address the unique redevelopment challenges of underutilized and/or abandoned industrial areas, particularly environmentally contaminated areas. 77 The law allows communities to create three types of industrial redevelopment planning areas: Environmentally Contaminated Areas, Industrial Park Conservation Areas (IPCA), and Vacant Industrial Buildings Areas. The West

74 DeSousa, Brownfields Redevelopment and the Quest for Sustainability.
75 Ibid.
Pullman IPCA-TIF was created in 1998 with lifespan not to exceed 23 years. It consists of 210 acres zoned for industrial use. In order to qualify as a TIF under the IJRL the area had to meet certain conditions including being a “labor surplus municipality,”78 being well serviced by multi-modal transportation, accounting for less than 2% of the city’s equalized asset value (EAV) in the most recent valuation, and that redevelopment by private investment “in accordance with public goals” could not be reasonably expected “without the adoption of the plan.”79

This last point highlights an important stipulation of TIF law in Illinois, and other states, commonly referred to as a “but for” clause. The purpose of this clause is to ensure that TIF is only used where necessary, that is where “but for” the TIF, development could not reasonably be expected, that is in blighted areas with weak markets and poor infrastructure. One concern raised about TIF is that municipalities use it to compete with one another to attract businesses and consequently cannibalize their tax base. The “but for” clause is a safeguard that attempts to prevent TIF being used in areas that would likely experience development anyway.

The West Pullman IPCA-TIF intends to foster the area’s revitalization through site assembly efforts, soil remediation projects, and numerous infrastructure improvements, specifically the reconstruction of 119th, 120th and Morgan streets, and portions of Loomis and Racine avenues. The West Pullman IPCA is part of a larger comprehensive planning effort to revitalize the West Pullman/Maple Heights community and is an important component of the City's economic and industrial development strategy.80

Under the plan the City catalogued, environmentally assessed, and appraised vacant and underutilized properties to establish fair market values. The City then sought to acquire those properties through direct purchase, the Tax Reactivation Program, donation, leasing, or eminent domain. Environmental remediation performed by the City on properties it acquired included the major components of Phase 2 Environmental Studies and Remediation Plans with particular attention to separating aspects of remediation that must be completed before sites can be marketed (Advance Remediation) and those that should be undertaken at the time of

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78 Illinois TIF law defines a labor surplus municipality as “one in which the unemployment rate was more than 6 percent, and 100 percent or more of the national average unemployment rate at any time during the preceding six months.” “What Is T.I.F.,” S.B. Friedman & Company, http://www.friedmanco.com/What%20is%20TIF%20Updated%20TAB.pdf.
79 _______, "West Pullman Industrial Park Conservation Area Industrial Jobs Recovery Law Tax Incremental Financing Eligibility Study and Redevelopment Planning and Project Plan." Page 21
80 Ibid. Page 15
redevelopment (Concurrent Remediation). The intent was to create a regulatory streamlining program to achieve agreement on required remediation actions in advance so that building construction could occur concurrently with remediation. Under the plan the City evaluated and remediated environmental contamination throughout the West Pullman IPCA. Redevelopment agreements may provide resources and technical expertise for additional site specific environmental remediation activities.

Several area-wide infrastructure improvements were made to improve circulation within the West Pullman IPCA and improve accessibility to the area. These circulation improvements included entryway lighting, signage, landscaping, and street widening to various streets. Improvements were also made to water and sewer systems, and to the landscape perimeter and buffer landscaping to distinguish and screen the industrial park from the surrounding residential area, and creation of internal pedestrian circulation network. Additionally the neighborhood was hardwired for modern telecommunication.

After properties have been assessed and acquired the City performs market analysis to determine how best to market the properties. It then engages in targeted marketing to firms whose needs match the site and developers experienced in developing business and industrial parks, especially those with experience in brownfield redevelopment. Financial incentives are offered to existing property owners and redevelopers on a project by project basis to support redevelopment within the West Pullman IPCA. Costs eligible for such “development assistance“ included interest costs incurred by developers, rehabilitation costs of existing private structures, land cost write-down, and specific site preparation costs.

Redevelopment Project Costs are expenditures that can be funded by tax increment revenues under the IJRL. The IJRL defines these Redevelopment Project Costs “as the sum total of all reasonable or necessary costs incurred or estimated to be incurred by the municipality, and any of those costs incidental to a redevelopment plan and a redevelopment project.”81 There is a wide range of eligible costs including those incurred for environmental studies and remediation, land assembly, site preparation and infrastructure improvements, and financing. In addition to TIF revenues, other sources of funds which may be used to pay for Redevelopment Project Costs and associated obligations include: “land disposition proceeds, state and federal grants and loans, investment income, private investor and financial institution funds, reimbursement of

81 Ibid. Page 36
environmental clean-up costs by those legally responsible for such costs, and other sources of funds and revenues as the municipality may from time to time deem appropriate such as municipal sales tax revenues, municipal amusement taxes, and other sources." 82 Other sources of funds that could be applied to sites in the IPCA to finance redevelopment activities and offset predevelopment costs included new market tax credits, property tax abatement EPA grants, and EPA revolving loan funds. The city also pursued previous owners and operators who were responsible for polluting the sites to finance cleanup. There also may be the possibility of collecting on historic insurance policies including general and liability insurance policies and Federal Recovery through the Department of Defense. 83

Vancouver, Canada offers another example of comprehensive brownfields development program. John Punter has written extensively on Vancouver’s cooperative planning process, which he calls the Vancouver Model. According to Punter, this model:

is characterized by a clear demarcation between political decision making, which sets the overall parameters of the projects, and the technical resolution of development forms and designs that is delegated to city officials. The emphasis is on joint working by teams comprised of developer and city staff to prepare masterplans and convert them into official development plans and guidelines on their own. The developer pays for the creation of a dedicated team to work full time on the project’s preparation, while the city works corporately, linking the planning function as necessary... The approach is complemented by sustained public participation at all stages of development. 84

In the late 1970s the provincial government of British Columbia acquired 71 hectares of Falls Creek North in Vancouver. In 1980 the Premier announced the construction of a new sports stadium, BC Place, and planned to hold the World Transportation Fair (Expo 86) there to celebrate the centennials of Vancouver and Canadian Pacific, which operated major railroad yards on the site. Ten thousand residential units and 700,000 m² of office space were to be built after the Expo. The provincial government thus took on the role of performing much of the brownfields cleanup in Falls Creek North. The area was the city’s industrial center for much of its history and included two coal gasification plants, a dozen saw mills and wood preserving operations, metal shops, and the aforementioned rail yards. A range of metal and organic contaminants were present. The province created a comprehensive approach to managing

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82 Ibid. Page 39
contamination that used cost-effective site-specific and risk based tactics. After the expo the province sold the site to a property tycoon from Hong Kong, Li-Ka-Shing for CDN$320 million generating much controversy as critics argued the land true value was actually closer to CDN$1 billion.\textsuperscript{85}

A defining characteristic of Vancouver’s approach is extensive public-private cooperation. For example, the developer of Falls Creek North paid for the city’s planning and regulatory work funding a dedicated team of city officials including planners, engineers, park board members, housing officers, and social and cultural planners. Through public meetings and workshops seven principles emerged to guide the development. The development would integrate with the city, build on the setting, maintain the sense of a substantial water basin, use streets as an organizing device, create lively places having strong “imageability”, create neighborhoods, and plan for all age groups.\textsuperscript{86}

In 1991 Vancouver decided to develop South East Falls Creek as a sustainable residential community. The areas consisted of 80 acres of brownfields including: former sawmills, foundries, shipbuilding, metalworking, salt distribution, an incinerator, an asphalt paving plant, PCB transformer storage, explosives storages, underground fuel storage, steel fabrication and other industrial activities. The city owned approximately 50 acres with the remaining 30 in private hands. Heavy metals, hydrocarbons, and PCB wastes required remediation. The Official Development Plan for SEFC released in 2006 is a comprehensive design guide that includes 12 design principles and 14 sustainability principles. Among the environmental sustainability considerations is energy efficiency. The goal is to create a greenhouse gas neutral neighborhood based on renewable resources and energy efficient buildings. Energy source strategies include horizontal ground-source geothermal heatpumps, district heating, sanitary sewer and hot water waste heat recovery, solar water heating, and passive solar gain. After Vancouver was selected as the site of the 2010 Winter Olympics, the SEFC project site was chosen for the Olympic Village.

\textsuperscript{85} DeSousa, \textit{Brownfields Redevelopment and the Quest for Sustainability}.  
\textsuperscript{86} Ibid. Page 143
Chapter 2: The Brockton Brightfield

Introduction

The Brockton Brightfield is a 425 kW solar energy farm built on a former manufactured gas plant in the city’s blighted economic corridor. It is by far the largest and arguably the most successful brightfield project to result from the DOE’s Brownfields to Brighfields Initiative.\textsuperscript{87} The project was quite complex. It took six years, twelve grants, 101 local, state and federal approvals, and two pieces of special state legislation to complete.\textsuperscript{88} It involved at least 25 stakeholders and stakeholder groups with different interests and varying levels of commitment.\textsuperscript{89} Because of the diligence of highly committed project champions, detailed predevelopment work and significant local investment, the project team was able to overcome multiple legal and institutional barriers including the city’s lack of legal authority to own and operate a power plant and restrictions on its bonding authority. The difficulties created by the site’s status as a brownfield were less critical than the legal, institutional, and financial barriers enumerated in this case study. The Brockton Brightfield was a pioneering project, and thus a learning experience that highlighted state policies that would challenge any city interested in developing a brightfield. The project manager, Lori Ribeiro, went on to join the Policy Committee of the New England Clean Energy Council, an organization that helped shape the Green Communities Act which removed many of the barriers encountered by the Brockton Brightfield.

Similarly to the other two successful projects highlighted in this thesis, the Brockton Brightfield enjoyed significant community support and was successful because of a cooperative partnership approach. The cooperation of the Bay State Gas Company (Bay State), the party that owns the site liability, was particularly important. The project could not have been completed without critical support from the Massachusetts Renewable Energy Trust and state legislature. Construction costs for the Brockton Brightfield totaled $3.037 million. This was funded by a

\textsuperscript{87} The DOE’s Brownfield to Brightfield Initiative’s purpose was to encourage the incorporation of solar energy into brownfields redevelopment by installing solar power technology on brownfields, establishing solar power related manufacturing on redeveloped brownfields, or both. Of the six projects that received Brownfields to Brightfields grants from the DOE, the Brockton is the largest in terms of installed capacity. Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Pages 32-33

\textsuperscript{88} Lori A. Ribeiro, "Waste to Watts: A 'Brightfield' Installation Has the Potential to Bring Renewed Life to a Brownfield Site " \textit{Refocus} 8, no. 2 (2007). Page 49

\textsuperscript{89} Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Page 77
$1.6 million city bond, $789,000 grant from the U.S. Department of Energy, and more than $1 million in grants from the Massachusetts Technology Collaborative’s Renewable Energy Trust. The difficulties created by the site’s status as a brownfield were less critical than the legal, institutional, and financial barriers that would have confronted any municipality attempting to build a utility-scale renewable energy plant in Massachusetts. The brownfield specific challenges included site constraints in the need to allow the Bay State to perform ongoing maintenance and environmental monitoring, design specifications to protect the high density polyethylene (HDPE) cap, and complications in the land transaction and lease between Bay State Gas Company and the City of Brockton.

First a summary of the site’s history and past environmental enforcement actions provides a sense of the context in which the project took place. Next, I situate the Brockton Brightfield project in the city’s sustainable redevelopment strategy and describe the project’s early concept development. The third section details the feasibility analysis and project fundraising activities. The fourth section describes the unexpected legal barriers the project encountered and how they were overcome by the project team. The chapter concludes with an argument that the legal and institutional barriers created by state law were more critical challenges than any created by the site’s status as a brownfield. I argue that this was a pioneering project that generated valuable public policy lessons and contributed to the passage of the Green Communities Act.

**Site History and Environmental Remediation**

Brockton was once the “Shoe Manufacturing Capital” of the U.S., with more shoe companies collectively producing more shoes than any other U.S. City. The city also hosted a large number of other industries including gas production and cabinet-making. The Former Brockton Gas Plant operated from 1898 to 1963 was sold to LeBaron Foundary Inc. in 1983. The plant’s operations included a retort house, purifier house, coke storage area, above and below ground oil tanks, tar wells and gas holders. Byproducts of the operation included tars, spent purifier wastes, coal ash, coal fines, clinkers and cinders, collectively referred to as coal

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90 http://www.masstech.org/rebate/press/pr_10_26_06_brockton.html
gasification related materials (CGRM). In general, the CGRM consist of volatile organic compounds benzene, toluene, ethylbenzene, styrene, and xylenes and semi-volatile organic compounds that are classified as polycyclic aromatic hydrocarbons (PAH). Water gas and oil gas were also manufactured at the plant. The plant, buildings, and other structures were demolished in 1964. During the operation of the manufactured gas plant Gas Works II (Lot 55) was used for storage and disposal in manufacturing materials and wastes. The Salisbury Plain River, a perennial stream, is located approximately one-quarter mile east of Lot 19 and east of Lot 55. The Vinegard Swamp Storm Drain runs underneath both lots and empties into the river.

The EPA began investigating Gas Works I (Lot 19) in 1984. In 1989 Citizens Against Waste Sites petitioned the Department of Environmental Quality Engineering, MassDEP's predecessor, for a Public Involvement Plan (PIP) for Brockton Gas Works I and II. The CERCLA Removal Action at Brockton Gas Works I occurred in 1992. Actions included removal of 2,420 gallons of coal tar, the installation of a 15 foot wide by 75 foot long high-density polyethylene (HDPE) soil-vapor barrier to prevent migration of organic vapors to residences, the consolidation of 2,424 cubic yards of impacted soils under a 3.35 acre impermeable HDPE geo-membrane, and a separate 1.63 acre cap of clean fill. Bay State Gas also connected two residences to the municipal water supply and implemented an operation and maintenance plan that included a groundwater monitoring program. The CERCLA Removal Action for Brockton Gas Works II took place in 1990. Much of the site was fenced off and two residences were purchased and incorporated into the property. A permeable cap was installed over 1.66 acres. A 1.85 acre HDPE cap was installed over 957.5 cubic yards of potentially impacted soil that had been consolidated. Site grading was performed to improve drainage and prevent erosion and possible contact with contaminated soil. In 1993 EPA issued "No Further Remedial Action Planned" decisions for both sites indicating that they would not be added to the National Priorities List.

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93 Ibid., "Human Health Risk Characterization Scope of Work Former Brockton Gas Works Site, Rtn No. 4-0045," (West Bororouagh, MA: Bay State Gas Company, 2000).
94 Mark Wood, "Draft Memorandum: Former Brocton Gas Works, Brockton Ma, 4-00045," (Massachusetts Department of Environmental Protection, 2007).
95 Ibid.
In May 1994 Massachusetts Department of Environmental Protection (MassDEP) took control of oversight of the Gas Works remediation, notifying the responsible party that the site now must meet the requirements of the 1993 Massachusetts Contingency Plan (MCP). Bay State attempted to argue that compliance with previous EPA administrative orders was the “functional equivalent of completion of applicable MCP processes and had resulted in a condition of No Significant Risk as defined by the MCP.” In January 1997, MassDEP sent Bay State Gas Company letters indicating that Brockton Gas Works I and II would be classified as Tier I disposal sites for Failure to Take Action. A draft memo from Mark Wood at the MassDEP Southeast Regional Office illustrates that the site’s transition from CERCLA to the MCP was contentious. In 1997 MassDEP communicated numerous concerns regarding the extent of contamination, the identification of contaminants of concern, dose-response assessment, soil and groundwater categorization, identifying foreseeable uses, estimating exposure point concentrations, risk of harm to welfare, upper concentration limits, and stage I environmental screening. By 1999 remedial actions were continuing with removal of 21.5 cubic yards of soil containing hardened tar-like material.

**Origins of the Brightfield Project and Early Concept Development**

During the course of the project’s development and implementation Brockton was the sixth largest city in the state, with a population of over 94,000. With 97% of its land developed, Brockton is a dense city that must focus on brownfields redevelopment if it wants to achieve further economic development. Ranking fourteenth highest in poverty in the state, it was designated an Economic Target Area (ETA) with several TIF-districts and several state designated Environmental Justice Populations. An ETA as defined by the Massachusetts Economic Develop Incentive Program, “is three, or more contiguous census tracts, in one or more municipalities, meeting one of eleven statutory criteria for economic need.” Companies in these areas may qualify for certain state tax incentives. The state defines an Environmental Justice Population as “neighborhoods (U.S. census Bureau census block groups) that meet one or

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96 Ibid.
97 City of Brockton, "Brownfields to Brightfields Project Final Report."
more of the following criteria: the median annual household income is at or below 65 percent of
the statewide median income for Massachusetts; or 25 percent of the residents are minority; or
25 percent of the residents are foreign born, or 25 percent of the residents are lacking English
language proficiency.\textsuperscript{99} Many of these neighborhoods are located in and around the state’s
oldest industrial sites and either host, or are located near to, many of the state’s brownfields. The
state prioritizes these neighborhoods for hazardous waste site clean-up funds, environmental
inspections and enforcement actions, and increased scrutiny of industrial facilities and sources of air
emissions. The state’s Environmental Justice Policy also encourages the creation of open space
within the designated neighborhoods and creates greater opportunities for community participation in
environmental decision making.\textsuperscript{100}

The city had one of the highest concentrations of trash related businesses in the state, and
the Brighfield project fit with the community’s desire to change the city’s image as the
“Commonwealth’s dumping ground.”\textsuperscript{101} Residents also wanted to ensure that brownfield
redevelopment did not create traffic problems or add pollution. Brockton’s Brownfields to
Brightfields project was part of a larger sustainable development strategy.\textsuperscript{102} The development
of a photovoltaic array as a "Solar Energy Park" had the following goals: “redevelop brownfields
in an environmentally friendly manner; develop a new local clean energy source for City use;
expand the city’s 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.”\textsuperscript{103}

In 1998 the City convened a meeting of stakeholders to develop a proposal for an EPA
Sustainable Development Challenge Grant. The grant application failed, but the idea that
emerged gained strong and lasting support among a group called the Mayor’s Economic
Advisors, which included the city planner and the leaders of the local economic development
agency, chamber of commerce, transit authority, redevelopment authority, and housing authority.
The idea they rallied behind was to capitalize on the city’s history as the home of Thomas

\textsuperscript{99} Bob Durand, "Environmental Justice Policy of the Executive Office of Environmental Affairs," ed. Executive
Office of Environmental Affairs (Boston: State of Massachusetts, 2002). Page 5
\textsuperscript{100} Public Law Research Institute, "Environmental Justice for All: A Fifty State Survey of Legislation, Policies, and
\textsuperscript{101} Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Page 35
\textsuperscript{102} City of Brockton, "Brownfields to Brightfields Project Final Report."
\textsuperscript{103} Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Page 36
Edison's first successful three wire electric plant by creating an eco-industrial park that included a solar panel manufacturer.

The idea remerged in April, 2000, when Tire Recyclers Inc.'s effort to open a tire recycling plant on a Brockton Superfund site called the Bargaineer Center ignited fierce community opposition and served to catalyze the city's pursuit of environmentally sustainable brownfield redevelopment. Soon after the backlash against Tire Recyclers, the city's Brownfields Coordinator, Lori Colombo (now Lori Ribeiro) learned about the DOE's Brownfield to Brightfield program through a press release. The idea of photovoltaic array was appealing because it would not produce emissions or increase traffic, which were major concerns residents had regarding the proposed tire recycling plant. The City began communication with DOE in May, 2000. Ribeiro developed a concept paper that presented the Brightfield concept as part of sustainable development strategy to attract renewable energy producers and clean industries to Brockton. The City Planner and Ribeiro obtained approval for the project from Mayor Yunits in September 2000 and were directed to explore five potential sites in the Brockton area.

At the request of Ribeiro, Spire Solar Executive Rodger LaFavre met Mayor Yunits to tour the Bargaineer Center site in November 2000. LaFavre described the ideal site for a utility-scale Brightfield as a property where soil contamination prohibits excavation, makes excavation overly expensive, or where soil disturbance is otherwise greatly restricted. For example, if a HDPE membrane is used to cap contaminants on a brownfield, then future use of the site must not break the seal of the cap, which significantly limits the site's development options. The former Brockton Gas Works sites fit this description as the remedial method being implemented was an HDPE membrane capping contaminants 18 inches below the surface, and the membrane could not be penetrated by reuse. Other factors making the site desirable for the Brightfield project included its large size of 27-acres and location in Brockton's industrially zoned Economic Corridor. The area along the corridor was characterized by substandard housing, abandoned buildings, high crime rates, high unemployment rates, and idle brownfields. Furthermore, the gas site had historical significance related to Edison's legacy on which city officials were trying to build.

104 Ibid.
105 Ibid.
In 2000, Bay State owned the liability for the former Brockton Gas Works and was responsible for its remediation, although it no longer owned either parcel as it had donated Lot 55 to the city in the 1970s and sold Lot 19 to LaBaron Foundry. Remediation and closure of the Brockton Gas Works was a long and arduous process for Bay State, which at that point had been involved in state or federal site clean-up programs for 16 years. The company was in the process of completing A Phase II Comprehensive Site Assessment (CSA) Report. Having dragged on for many years, the remedial activities no doubt had a significant impact on the neighborhood. Four houses had needed to be connected to municipal water and two houses had been purchased with the residents being permanently relocated.

Bay State had taken steps to maintain positive community relations. From 1987 to 1993 the company assigned a full time Public Affairs Representative, Vincent Pizzano, to handle day to day community relations during EPA removal actions. Mr. Pizzano spent many afternoons at the site meeting with residents at their homes to discuss their concerns. According to the company’s Public Involvement Plan submitted in 1997 as a requirement of the MCP the company had a record of being responsive to residents’ concerns, halting early morning truck traffic in response to complaints about noise, contracting a street sweeper for daily service in response to concerns about construction debris in the street, and responding to health concerns by testing nearby residential wells and connecting residents to public water supply when levels of site-related contaminants exceeded federal drinking water standards.\textsuperscript{106} The company also conducted a variety of outreach activities to keep the community informed.\textsuperscript{107} These outreach activities were continued under the 1997 Public Involvement Plan filed for the MCP.\textsuperscript{108}

Despite these efforts neither the community nor MassDEP were satisfied with Bay State’s actions or future plans. Bay State was under pressure to redevelop the land in a way that was beneficial to the community. An internal MassDEP memo dated May 14, 1997 raised a number of concerns about the risk assessment in support the Closure Report:

\textsuperscript{106} Ron Moreira, "Public Involvement Plan, Release Tracking Numbers 4-0045, 4-0241, and 4-11971, Brockton Gas Works I, I.I., and East Union Street Sites, Brockton Massachusetts," (Westborough, MA: Bay State Gas Company, 1997).
\textsuperscript{107} The company’s outreach activities included maintaining a mailing list of interested parties, sending notification letter to residents, communicating with the Brockton’s newspaper The Enterprise and the regional newspaper the Quincy Patriot Ledger, and meeting with public officials and residents to keep them informed about activities at the site. Public reports related site investigation and remediation were distrusted to interested parties and public repository was created at the Brockton Library.
\textsuperscript{108} Moreira, "Public Involvement Plan, Release Tracking Numbers 4-0045, 4-0241, and 4-11971, Brockton Gas Works I, I.I., and East Union Street Sites, Brockton Massachusetts."
The risk assessment report’s premise is that foreseeable use of both properties is vacant, inaccessible, capped land, based on the assumption that Bay State will acquire control of both properties, and that the PRP can determine the foreseeable use. *Loss of beneficial land use to the community and to the neighborhood does not appear to have been addressed* [my emphasis]...The determination of reasonable foreseeable use is a BWSC decision, not a risk assessment decision. If the landfills are to be left in place, however, and the parcels remain essentially unused to protect against exposure, the risk of harm to welfare should be evaluated more extensively.\(^{109}\)

In October 2000 both sites were still surrounded by an 8 foot chain-link fence topped with barbed wire.\(^{110}\) Bay State’s relations with the community and MassDEP would benefit from a reuse plan that improved the site’s appearance and created a beneficial use for the community.

Consequently when Bay State was contacted by the City of Brockton about the Brightfield proposal they embraced the solar project concept and agreed to work with the City to test its feasibility. Bay State’s cooperation and contribution were considerable. The company agreed to pay for landscaping. The company’s commitment to buy back the parcel from the city was essential for the city’s ability to finance the construction of the photovoltaic array. They contracted a landscape architecture firm to provide renderings for community meetings and would eventually agree to install fencing and provide landscaping worth $575,000, which assured community support.\(^{111}\) The gas company dedicated its environmental consulting firm ENSR to the project and the firm worked with Spire Corp. to perform the technical feasibility analysis.

**Feasibility Analysis and Securing Grants**

In February 2001 a $30,000 grant application for a feasibility study was submitted to the DOE through the Massachusetts Department of Energy Resources (DOER). The proposal was to study the feasibility of the large photovoltaic array on Grove Street, five rooftop installations, and a PV manufacturing facility. The Director of the Massachusetts Renewable Energy Trust (MRET) encouraged the City to apply for the Massachusetts Technology Collaborative’s (MTC) first "Green Power Predevelopment Program" for a grant to perform a detailed technical and financial feasibility study for the Grove Street parcel. In June 2001 Brockton received $128,415

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\(^{110}\) ENSR Corporation, "Human Health Risk Characterization Scope of Work Former Brockton Gas Works Site, Rtn No. 4-0045."

\(^{111}\) Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts".
grant from MTC and the $30,000 grant from the DOE. These awards enabled Brockton to hire consultants to perform the technical feasibility and financing studies.

The public nature of the project made phasing more complex. For example, Brockton needed state legislation to grant it the authority to borrow in order to obtain the funds to execute a contract with Global Solar Energy, the lead contractor for the construction of solar installation. Also, state law required the Brockton City Council to accept grant funds before they were expended. The time lapse between the award announcement and actual dispersal of funds to the city could delay the project. To advance the project more quickly Brockton committed to a $30,000 cash match for the DOE grant to cover certain consulting services allowing the project to move forward. In the case of the MTC grant the match came in the form of pro-bono services provided by project partners, so city appropriation was not 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.”

Spire Corp worked with Bay State Gas Company’s environmental consultant ENSR to perform the technical feasibility study of the former Brockton Gas Works. The study began in October 2001 and the first community meeting about the proposed brightfield was held on November 29, 2001. About 50 people attended the meeting. The original proposal included linking the brightfield to the Salisbury greenway with a pedestrian corridor. Residents objected strongly to the greenway link because they thought it would bring unwanted foot traffic. Once the proposal for the pedestrian path was dropped and residents’ concerns about safety and noise

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112 Ibid.
were addressed the community supported the solar power plant pending the aesthetics of the final design.\textsuperscript{114}

While Spire had originally thought that Grove Street site could support between 5 and 10 MW of photovoltaics, the final technical feasibility study concluded that based on technical, financial and aesthetic constraints, the two parcels were suitable for up to 1 MW of photovoltaics, with half to be installed on each parcel. Only 10 of the 27 total acres were immediately suitable for deploying photovoltaic modules because of unfavorable surface contours and the presence of 61 mature trees, and a downhill slope on the eastern side of lot 55. Spire recommended that the first installation take place on Lot 19 because it required minimal preparation for PV deployment. They argued completing phase I before beginning work on phase II would giving neighbors a chance to get used to solar modules and create an opportunity to recommend changes in the design of phase II if need be.\textsuperscript{115} This would require Bay State Gas to buy lot 19 back from LaBaron Foundary and lease it to the City.

Brockton’s Brightfield proposal included installing PV at additional locations to create demand to attract a PV manufacture. Solar Design Associates performed technical feasibility analysis for rooftop PV installations at 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. They concluded that a total of about 557 kW of peak PV capacity could be deployed at the five locations.\textsuperscript{116}

XENERGY (now KEMA) conducted the financial feasibility analysis. Based on the technical parameters, XENERGY concluded that the 1 MW array would cost $3.6 million to develop. XENERGY’s analysis showed that the project would have a negative net-present value (NPV) for a private developer, but a small positive NPV under a non-profit model. Consequently they recommended that the City own the project. XENERGY recommended “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 [lot 55] on Grove Street to Bay State Gas Company, and issue a

\textsuperscript{114} Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts".
\textsuperscript{116} City of Brockton, "Brownfields to Brightfields Project Final Report."
XENERGY also recommended that the city pursue the Contractor/Leaser Build and Operate ownership and partnership model to "leverage the expertise of for-profit developers while allowing the city to maximize its ability to secure low-cost capital." In July 2002 the Mayor embraced the idea of City ownership with the caveat that it had to be revenue neutral and would require the establishment of an enterprise account like those used for the water, sewer and municipal solid waste services. This would allow project revenues and expenses to be separated from the general fund. The revenues from selling electricity and renewable energy certificates would need to cover for debt service, operations and maintenance.

The community was presented with modified site plans and renderings at the second public meeting on September 18, 2002. Residents supported the Brightfield concept but still had deep concerns about the aesthetics, especially the fence, landscaping and height of the solar panels. According to the Enterprise, "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." City officials decided the Brightfield should be designed as a "Solar Energy Park" to address aesthetic concerns.

In March 2003 the MTC was so impressed with the projects progress that they amended the original grant with an additional $79,500 for the completion of predevelopment activities.

The project was progressing well:

117 Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Page 42
118 Ibid. Page 43
119 Ibid. Page 43
120 City of Brockton, "Brownfields to Brightfields Project Final Report."
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 $247,965.12

However, many challenges lay ahead. The project required $3.6 million to develop a 500 kW solar-plant. Obtaining $1.5 million in grant funds would be quite difficult because there were no existing grant programs providing large grants for solar technologies. Over the next year the project team worked tirelessly to secure the necessary grant funds. With the help of the Director of the MTC’s Renewable Energy Trust and other MTC staff, and lobbying of State representatives by the President of Bay State Gas and other stakeholders the project team eventually earned approval from the MTC Board for $1 million unsolicited grant proposal and a $1,210,400 revenue guarantee under the Massachusetts Green Power Partnership. In order to win support for the unsolicited proposal the project team had to convince the MTC Board that the Brockton Brightfield would benefit the state as a whole. They made the case by emphasizing its cost effectiveness over the typical MTC solar grants and the educational value of the solar energy park. By the end of 2004 Brockton was still $416,000 short of the $1.5 million capital development goal largely because the needs of the Brightfield project did not fit well with the goals and purposes of existing programs: “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.”

Legal and Institutional Complications

The experience of the project team illustrates a steep learning curve associated with carrying out a completely new type project. At multiple points the team was stunned by legal barriers uncovered by their lawyers. After three years of feasibility studies, grant applications, and cooperation with multiple state and federal agencies, the project team was stunned in 2004 when it learned from special council that the City of Brockton did not have legal authority to finance, develop, own or operate an energy plant. Brockton needed a Home Rule petition approved by the State Legislature to grant it such authority. Furthermore, because Massachusetts

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122 Ribeiro, "Does It Have to Be So Complicated? Municipal Renewable Energy Projects in Massachusetts". Page 44
123 Ibid. Page 50

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General Laws limited municipal bonds for energy improvements to public facilities to 10 years, the City also needed the state legislature to grant it authority to issue a bond with the 20 year life required by the financing plan.\textsuperscript{124}

Another challenge resulted from a lack of clarity on which of the state procurement laws applied to the project. The construction procurement law required that design and construction be bid separately. This was problematic because solar power developers typically work on a design-build basis. In order to allow the project to be awarded to the company that would submit the winning design, “The project team asked that the Home Rule Petition [authorizing the City to finance, develop, own, and operate the Brightfield] 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.”\textsuperscript{125} After many delays and complications and the expenditure of significant political capital “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)” passed the House and Senate under suspension of the rules on February 10, and was signed by the governor on February 17, 2005. The timing of the legislation was critical because the MTC grant hinged on its passage.

Bay State Gas, a willing and crucial partner in the brightfield project, wanted to buy Lot 55 back from the city for site control purposes because the company was required under state brownfield regulations to maintain the remedial cap for the foreseeable future. Of the 14.7 acres, the company only wanted to purchase the 8.174 developable acres and leave the city the wetlands portion as a buffer for the Salisbury River. The City eventually convinced Bay State Gas to pay $500,000, approximately $100,000 more than the appraised value, for the 8 acre property.\textsuperscript{126} However, closing the deal would take nearly two years and involve several major setbacks. The Assistant City Solicitor determined in August 2003 that the land transaction was exempt from Chapter 30B of the state procurement law because it was a hazardous waste site. On the verge of closing the deal with all of the city council and zoning approvals in place, this decision was overturned by the City Solicitor in August 2004 meaning that a bidding process would have to take place. A messy process followed with two unsuccessful RFPs. After Bay State Gas won the third RFP City Council finally approved the land sale and lease-back in June

\textsuperscript{124} Ibid.
\textsuperscript{125} Ibid. Page 52
\textsuperscript{126} Ibid.
2005. In September 2005 the Assistant City Solicitor examined the deed for the first time and
discovered that the property had been conveyed to the city to be used as park land triggering
Article 97 of the Massachusetts Constitution. The land was originally donated to the city in 1972
with a restriction that “the property shall be used for park, recreational or conservation purposes
only.”\textsuperscript{127} The land transaction was prohibited without another special act of the State Legislature.
Furthermore, because the land had originally been a gift to the city, the Home Rule petition
needed the approval of the state’s Attorney General before legislature would ratify it. The
special legislation allowing Brockton to sell Lot 55 to Bay State Gas was approved by the
legislature on November 16 and ratified by the governor on November 22, 2005.

A critical component of the project financing was an innovative marketing strategy for
the brightfield’s future RECs that was devised under an EPA Innovation Working Group grant.
The model was similar to selling stock in a company at a premium price in the early years in
exchange for greater returns when the company grows later on. Under the model a customer
would purchase a fixed percentage of the Brightfield’s REC production at a premium price for a
fixed annual cost in a long-term contract. The surplus annual cash flow created by the premium
would be set-aside in a fund dedicated for capacity expansions. The project would be expanded
in increments of 100-150 kW every 5 years or so. After each capacity expansion a customer
under contract would be entitled to the same fixed percentage of RECs produced by the now
larger Brightfield, thus paying roughly the same price for a greater number of RECs. The long
term contract (20 years instead of 1 to 3 typical for RECs at the time), the fixed annual price, the
initial price premium, and the capacity expansion scenario were all innovations.\textsuperscript{128} Ribeiro
argues that furthermore:

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

\textsuperscript{127} Ibid. Page 55
\textsuperscript{128} ———, "Case Study: Brockton "Brownfields to Brightfields" Renewable Energy Certificate Innovative
Marketing Strategy."
redevelopment (e.g. a 500 kW project can grow into a 1 MW project with the exclusive use of internal cash flow).\textsuperscript{129}

The proposal appealed to large firms that were attracted to the economy of scale the project provided and had customers interested in solar RECs.

A 20-year contract was negotiated with Constellation New Energy, which had an electricity supply contract with the City of Brockton nearing expiration. The contract balanced the City's need for a revenue guarantee with the company's need for some pricing flexibility. Constellation New Energy agreed to the following REC terms, "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."\textsuperscript{130} Additionally, the company will also purchase the brightfield's electricity for 7 cents per kWh for the first 10 years, and at annually determined market value for the second 10 years of the contract. This arrangement provided enough certainty of revenue to facilitate long-term financing. The city executed a contract with Global Solar for the 425 kW brightfield on March 17, 2006.

![Gas Works site before Brightfield project.](image1.png) ![Brockton Brightfield under construction 2006](image2.png)

**Figure 2.3**

**Conclusion**

The majority of the barriers the Brockton Brightfield project encountered resulted from state laws defining municipal authority or governing the manner in which public entities conduct business. The brownfield remediation was largely complete when Ribeiro first contacted Bay

\textsuperscript{129} Ibid. Page 58

\textsuperscript{130} Ibid. Page 61

\textsuperscript{131} Source of images, ---, "Case Study: Brockton "Brownfields to Brightfields" Renewable Energy Certificate Innovative Marketing Strategy."
State to discuss the brightfield concept. Thus the brightfield project team did not have to deal with the common brownfield challenges of cleanup costs, determining cleanup liability, or the technical challenges of determining appropriate cleanup standards and remediation measures. There were technical challenges in designing the solar array in a way that maintained the integrity of engineered barriers and would not interfere with site maintenance and future remedial measures. These challenges pale in comparison to passing two Home Rule Petitions through the state legislature or securing millions of dollars in grants.

The Brockton Brightfield was the first of its kind in Massachusetts, and as such produced valuable public policy lessons. Guided by her experience managing the Brockton Brightfield project, Lori Ribeiro joined the Policy Committee of the New England Clean Energy Council (CEC) where she helped shape the Green Communities Act which removed many of the barriers encountered by the Brockton Brightfield. The Act authorizes all Massachusetts municipalities (not just those with municipally owned utilities as before) to own and operate renewable energy generation facilities and to sell the resulting electricity and RECs. It allows municipalities to issue 15-year bonds or other notes of financing for renewable power generation and raises the net-metering limit from 60kW to 2MW for electricity generated by wind and solar technology. When the City of Brockton was developing its financing plan for its Brightfield, Massachusetts did not explicitly authorize local government to engage in net-metering under a third party power purchase or energy services agreement. This barrier was removed by Chapter 169 of the Acts of 2008, An Act Relative to Green (commonly called the Green Communities Act), which authorized government entities to enter into energy services contracts, including third party power purchase agreements for solar and wind power. Municipalities seeking a third party power purchase agreement are now exempt from chapter 30B procurement requirements. While this change does not benefit a scenario in which the city would own the power plant as Brockton owns the Brightfield, it provides a tool local governments can use to increase renewable energy production.

Ribeiro and the CEC were among multiple voices advocating for the final contents of the Green Communities Act. I do not want to overstate their influence on the legislation, but it is

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132 Lori Ribeiro. Personal Interview. March 11, 2010
noteworthy that the legislation removed the most significant barriers residing in state law.\textsuperscript{134} As
the largest solar power plant in the state and a pioneering brownfield redevelopment project, the
Brockton Brightfield was a major accomplishment not just for Brockton, but for the state of
Massachusetts. It succeeded because of substantial support in state government and by the
state’s federal delegation. Therefore it is reasonable to conclude that lessons learned by the
Brightfield project team were not lost on state policymakers as they drafted the Green
Communities Act, particularly when they were presented with draft language co-written by
Ribeiro.\textsuperscript{135}

\textsuperscript{134} Because Article 97 is part of the state constitution it could not be affected by regular legislation like the Green
Communities Act. Rather it would require a process of amending the state constitution. While Article 97 may
constrain renewable energy development in general, it is unlikely to constrain renewable energy development on
brownfields. The Brockton Brightfield scenario in which the site is both a brownfield and conveyed as park land is
unusual. Lori Ribeiro. Telephone Interview. March 11, 2010

\textsuperscript{135} Lori Ribeiro. Telephone Interview. March 11, 2010
Chapter 3: Steel Winds, Lackawanna, New York

Introduction

The Steel Winds project points to conditions that allow the redevelopment of brownfields with commercial-scale renewable energy to proceed smoothly. First, key players laid the groundwork for wind development before soliciting a developer. Paul Curran, the founder of BQ Energy began assembling the stakeholders in 2003. Prompted by local advocates for sustainable development, Erie County spent three years evaluating the potential for wind development in the Buffalo area that not only highlighted the Bethlehem Steel Company (BSC) Lackawanna Works site as the site with the greatest wind resources, but laid out the steps local governments could take to facilitate wind energy development. Cooperation between all stakeholders from the onset moved the project forward quickly. State policy offered powerful incentives for brownfield redevelopment and renewable energy that made the project economically viable. The former BSC Lackawanna Works site was extremely well suited for a commercial scale wind farm because it had tremendous wind resources, outstanding transportation and electrical infrastructure, and few competing uses. Steel Winds is an excellent example of the benefit that existing infrastructure on brownfields may provide for installing commercial-scale renewable energy facilities. Finally Steel Winds demonstrates this type of project can improve a city’s image and spur redevelopment interest.

The former Lackawanna Works site is subject to a RCRA corrective action. The site is owned by Tecumseh Redevelopment Inc., which is a subsidiary of Arcelor Mittal. BQ Energy (now Apex Wind Energy) was able to work with Tecumseh Redevelopment Inc. to carve a moderately polluted 29 acre brownfield parcel out of this larger more contaminated property. By doing this BQ Energy accessed highly valuable brownfield tax credits and liability protection through the New York State Brownfield Cleanup Program (BCP). The success of Steel Winds I is a testament to the BCP’s effectiveness at facilitating redevelopment through providing critical funding and liability protection. The tax credits afforded by the BCP made Steel Winds I possible. Future phases of Steel Winds will take advantage of the infrastructure improvements made during Steel Winds I, particularly modifications to an on-site substation and transmission

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136 Steel Winds I refers to the first 8 wind turbines erected at the BSC Lackawanna Works site.
lines. Future phases of Steel Winds will not be eligible for Brownfield’s Tax Credits but will take advantage of the infrastructure improvements for which previous tax credits helped pay.

The chapter’s first section summarizes the site’s history and its impact on the City of Lackawanna. A brief overview of environmental enforcement actions is also given. Next the remediation specific to the Steel Winds parcel and the construction of the wind farm is explained. The third section describes the origin of the concept of siting a wind farm at the former Lackawanna Works site and how those actions paved the way for the Steel Winds project. The fourth section describes the “nuts and bolts” of developing, permitting, and financing the project. The experience of Steel Winds in navigating the necessary regulatory processes is described. Of particular interest is the project team’s success at carving a moderately polluted brownfield out of the larger RCRA jurisdiction and the relative speed with which the project was moved through the state’s environmental review process. Exploring the project’s financing highlights the significance of brownfield tax credits in the financing strategy and the sophistication with which major wind energy developers finance projects. Payments in Lieu of Taxes play a significant role in wind energy development in New York, and the pros and cons of this system are discussed in the section five. The next section highlights the image value produced by the project. The chapter concludes by summarizing the lessons revealed by the case.

Site History and Summary of Environmental Enforcement Actions

The BSC Lackawanna Works site is complex. The 1,100 acre property spans two municipal jurisdictions with the majority of the site in Lackawanna and a small southern portion in the Town of Hamburg. The overall property is still subject to an RCRA consent order dating back to 1990 and Tecumseh is continuing the remediation process under supervision of the New York State Department of Environmental Conservation (NYSDEC). The site includes active rail lines, ongoing slag mining activities and lumber distribution operated by other companies under short-term contracts. An active port cuts through a portion of the site. The port is operated by Gateway Trade Center (GTC), Inc, which owns the adjacent property. Light manufacturing, warehouse, distribution and transportation facilities operate on GTC’s land.

The City of Lackawanna was established in 1909. It essentially began as a company town that resulted from the Lackawanna Iron and Steel Company relocation from Scranton,
Pennsylvania, to the shore of Lake Erie on the southern edge of Buffalo. The factory was made into a fully integrated steel plant after Bethlehem Steel purchased it in 1922. It eventually became the fourth largest plant in the nation, capable of producing 7 million tons of steel annually. Coke, coke by-products, structured steel, steel coal, steel bars, and specialty products were produced at the plant.  

During the time integrated steel making operations were taking place at the site, 440 acres of man-made land consisting of steel slag were placed into Lake Erie (Figure 1). This area is referred to as the Slag Fill Area (SFA) by Tecumseh. This land filling took place in an area of the lake that included two Federal Dumping Grounds used for dredge spoils and other materials by the U.S. Army Corps of Engineers (USACE). As far back as 1938, “the SFA was also used for the management of waste materials, including sludge from wastewater treatment plants; sludge, dusts, and liquids from iron-making, steel-making, steel-forming, steel-finishing, and coke-making operations; and dredge materials from Smokes Creek.”

Between 1971 and 1977 Bethlehem Steel cut the workforce at the Lackawanna plant from 18,500 to just 5,000, with massive layoffs occurring in 1971 and 1977. In December 1982 the company announced that it would lay off another 3,900 employees shutting down most of the

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140 Ibid. Page 2
BSC closed its coke oven operation in September 2001, leaving a galvanized products mill as the only remaining steel manufacturing related activity at the Lackawanna Works site. The galvanizing operations were acquired by International Steel Group Lackawanna, Inc. as part of the asset purchase agreement that was approved by the Bankruptcy Court on April 23, 2003.\textsuperscript{142}

In 2005 Tecumseh signed a Memorandum of Understanding (MOU) with Erie County and the City of Lackawanna committing to promote redevelopment on the site after cleanup. The City of Lackawanna Planning Board, the lead agency for the Steel Winds Project under the State Environmental Quality Review Act (SEQRA), issued a Negative Declaration to BQ Energy for the Steel Winds project on September 7, 2005. A Negative Declaration means that the project will not have significant negative environmental impacts, and therefore does not have to file a full Environmental Impact Statement (EIS). This ruling gave initial approval to the project. Construction of Steel Winds I began in September 2006 and the eight turbines began full commercial operation on June 5, 2007.\textsuperscript{143}

\textbf{Remediation and Wind Farm construction}

The Steel Winds I parcel is a 30 acre strip of the former BSC Lackawanna Works located within the SFA along the Lake Erie shoreline. Other vulnerable aquatic habitats bordered by the site include Smokes Creek and Blasdell Creek. Several State wetlands and two state beaches are also located within two miles of the site, while two marinas lie within one mile north of the site.\textsuperscript{144} The north end of the BSC Site is a nesting ground for thousands of birds.\textsuperscript{145} Fishing and boating are common near the site offshore in Lake Erie. Prior to grading the SFA had a variable topography due to the slag/fill deposition patterns. Wastes at the BSC Site are a result of three primary operations: coal to coke production, iron ore to steel production, and support operations.

\textsuperscript{141} Jonathan S. Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape" (Massachusetts Institute of Technology, 2008).
\textsuperscript{142} Tecumseh Redevelopment Inc., "Final R.C.R.A. Facility Investigation Report." Page 2
\textsuperscript{144} \textit{---}, "Final R.C.R.A. Facility Investigation Report." Page 5
\textsuperscript{145} Dr. Ernest Sternberg and et al, "Wind Energy Initiatives for Greater Buffalo," (Buffalo: University at Buffalo, the State University of New York, 2001).
Waste materials include coal tar, sodium phenolate, ammonium sulfate, naphthalene, light oil, sulfur, slag and dozens more.\textsuperscript{146}

The only discernible features of the Steel Winds I site prior to construction of the wind farm were access roads and slag/fill piles. To access and erect the wind turbines, the area within 200 feet of each turbine was graded relatively flat with compacted slag fill. The eight windmills have a 3-blade design with each blade measuring 153 feet long. The blades rotate atop 240-foot monolithic tubular steel towers. Each tower is “anchored to massive octagon-shaped subsurface reinforced concrete foundations measuring approximately 65 feet across by 8 feet deep.”\textsuperscript{147}

The Remedial Actions implemented on the Steel Winds site included clearing the site of existing vegetation, covering the entire site with one foot of clean soil (totaling approximately 38,000 cubic yards), and seeding to promote vegetative growth. According to the Site Investigation/Remedial Alternatives Report/Interim Remedial Measures Report (SI/RAR/IRM) for the site:

The estimated capital cost for this alternative is approximately $1.2 million. Annual OM&M costs for groundwater monitoring, cover maintenance, and annual certifications are estimated to be $13,500, resulting in an estimated 30-year present worth cost of $1.4 million.\textsuperscript{148}

Enhanced aerobic bioremediation was implemented to mitigate groundwater contamination. Oxygen Release Compound (ORC®) \textit{Advanced}\textsuperscript{TM} filter socks placed in monitoring wells release oxygen over an extended period raising oxygen levels in the groundwater: “In the presence of this long-lasting oxygen source, aerobic microbes flourish accelerating natural attenuation of gasoline and fuel additives (BTEX and MTBE), diesel, kerosene, jet fuel, gas condensates, fuel oils, lubricants, bunker oil, PAHs, certain metals (arsenic), certain pesticides/herbicides and certain industrial solvents (alcohols and ketones).”\textsuperscript{149} Filter socks were placed in three upgradient, off-site monitoring wells, and two upgradient on-site groundwater monitoring wells. This groundwater treatment system had an estimated 30-year present worth cost of $102,000.

\textsuperscript{146} Ibid.
\textsuperscript{148} Ibid. Page 48
\textsuperscript{149} Ibid. Page 47
NYSDEC approved these Remedial Actions as sufficient to meet the Remedial Action Objectives (RAOs) for the site. RAOs “are site-specific statements that convey the goals for minimizing or eliminating substantial risks to public health and the environment.”\textsuperscript{150} The chosen Remedial Actions were sufficient to “Remove or cover impacted slag/fill to levels protective of human health” and “Mitigate loadings to groundwater from impacted slag/fill at levels that could be expected to result in exceedance of groundwater quality standards.”

Foundation excavation activities began on September 13, 2006 and were completed on October 18, 2006. When the excavation team encountered visual or olfactory impacts in the soil/fill, the material was segregated and staged on plastic sheeting north of the excavation. Because the material was unsuitable for foundation backfill, and because space was limited for turbine construction within the site, the staged material was later moved to the adjacent Tecumseh property pending Turnkey (the environmental consulting firm contracted by Tecumseh) and NYSDEC determination on soil handling requirements. The scrap metal removed from the site was consolidated for off-site recycling by Tecumseh's licensed scrap recovery firm, Iron City Recovery, and the tires were disposed off-site as part of Interim Remedial Measures (IRM) activities associated with placement of a soil cover.

\textbf{Paving the Way for Wind Development in the Buffalo Area}

The Buffalo Green Gold Development Corporation, urban planning graduate students at the University of Buffalo, and others were strong advocates for wind development in the Buffalo area years before BQ Energy and UPC Wind (now First Wind) decided to develop a wind farm in Lackawanna. These early advocates assessed wind resources and pushed local officials to encourage wind development. They argued for the development of wind energy on brownfields and offshore in Lake Erie and encouraged the county to take actions to attract wind developers as part of a sustainable development plan. Waterfront brownfields redevelopment was one of their goals, and the former Lackawanna Works site ranked high on the list of possible sites from the beginning. These advocates encouraged county and city officials to conduct more in depth assessment of wind resources and form a wind action group to determine how to make wind energy development a reality. They were successful at gaining widespread support:

\begin{flushright}
\textsuperscript{150} Ibid. Page 42
\end{flushright}
Despite initial skepticism about the effectiveness of an urban wind farm along Lake Erie, the Steel Winds project was eventually supported and championed vigorously by a wide range of local actors—politicians, public servants, renewable energy advocates, businesses, the site’s property owner, and the Buffalo media. The former Bethlehem Steel site was technically ideal, had few competing uses, and had an image of industry and contamination that fit well with the prospect of large-scale renewable energy.\textsuperscript{151}

The advocates consistently argued that one of the major benefits wind energy would bring would be a great boost to the area’s image. Many of their ideas have been implemented. Steel Winds has succeeded in attracting positive attention to the area. However, aside from expansion of Steel Winds, future wind energy development will most likely occur offshore in Lake Erie where it will not use land that has greater economic development potential and where the visual and auditory impacts will not deter residential and commercial development. BQ Energy received 50% support from New York State Energy Research and Development Authority (NYSERDA) to perform a preliminary feasibility study for wind turbines off the shore of the BSC site in Lake Erie. On December 1, 2009 the New York Power Authority issued a request for proposals (RFP) for a 120-500 MW offshore wind project in state waters of Lake Erie or Lake Ontario.\textsuperscript{152}

Buffalo’s Green Gold Development Corporation (Green Gold) was an early advocate for sustainable brownfields redevelopment in the Buffalo area. Green Gold was established in 1998 by a coalition of businesses, environmental organizations, and local governments. It was created to “recast the image and the reality of the local economy” and create the “Silicon Valley of Green Business” in Western New York.\textsuperscript{153} According to the group’s website, “The \textit{Green Gold Strategy} offers Buffalo the opportunity for economic and environmental revitalization by favoring sustainable approaches to brownfield redevelopment, building design and industry.”\textsuperscript{154} By 2001 the group decided that a wind power demonstration project could be the catalyst to begin turning their vision into reality.\textsuperscript{155}

Also in 2001 urban planning graduate students at the University of Buffalo conducted a study of six potential sites for wind energy development in the Buffalo area.\textsuperscript{156} One of the three sites the study recommended was the former BSC Lackawanna Works. The study also

\textsuperscript{151} Cherry, “The Windy City: Harnessing Power in the Neighborhood Landscape”. Page 81
\textsuperscript{155} Cherry, “The Windy City: Harnessing Power in the Neighborhood Landscape”. Page 82
\textsuperscript{156} Sternberg and al, "Wind Energy Initiatives for Greater Buffalo."
recommended the formation of an action group to focus on making wind development a reality by overseeing “all of the developments of future wind energy initiatives.”\textsuperscript{157} This led Green Gold to form the Wind Action Group, which has met monthly ever since. The group’s original members included local businesses, wind advocates, and Erie County. Eventually several private wind energy developers, including Paul Curran, started attending meetings.\textsuperscript{158}

Paul Curran was a project manager for Texaco before helping to start BQ Energy. At Texaco he created a business model of developing renewable energy projects at brownfield sites building a wind farm in 2002 at the Nerefco oil refinery near Rotterdam in the Netherlands. Having worked in the oil industry, he felt comfortable with the environmental and legal complexity of brownfield sites and anticipated that there would not be as much community opposition to wind projects at those sites compared to undeveloped sites. This was the case with Steel Winds where the community overwhelmingly supported the project.\textsuperscript{159} In 2003 he began working in Lackawanna to “put together the necessary pieces to make the project a reality.” According to Curran, we [BQ Energy] put together all the stakeholders, it took about three years to get everybody to think it was a great idea.”\textsuperscript{160} He noted that when he first approached the county about developing a wind farm on the Lackawanna Works site the county was already measuring the wind there for the Erie County Shoreline Wind Study reviewed below.

The University of Buffalo study focused on wind development as catalyst for redeveloping derelict industrial sites on the Lake Erie waterfront. Referring to the former BSC site, the authors suggest:

A wind farm could make a large impact towards the redevelopment of the property. The property could be divided so that areas not contaminated could be developed. The county could create a municipal utility and distribute power to the newly created parcels. If this utility can show that it produces energy, it would be eligible for low cost energy from the New York Power Authority. The municipal utility would then be able to offer low cost energy to companies that would develop on the Bethlehem Steel property. The legal implications of this strategy still need to be studied. This development creates real opportunity for the Bethlehem Steel site.\textsuperscript{161}

Note the suggestion to locate wind turbines on uncontaminated sites that have been divided out from larger brownfields. BQ energy and Tecumseh proved the effectiveness of this novel approach.

\textsuperscript{157} Ibid. Page VII
\textsuperscript{158} Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape".
\textsuperscript{159} Ibid.
\textsuperscript{160} Paul Curran. Personal Interview. April 2, 2010.
\textsuperscript{161} Sternberg and al, "Wind Energy Initiatives for Greater Buffalo." Page viii
approach at the BSC site. The study noted the following advantages of the BSC site: the area was relatively secluded and devoid of public activity, and its existing electrical infrastructure would allow for easy interconnection to the grid.

The University of Buffalo Study recommended placing 12 one MW turbines in the southern area of the Bethlehem Steel site, where most of the slag had been cleared by a mining company which sold the slag for highway construction. It also recommended that 19 two MW turbines be placed offshore of the Bethlehem Steel Site. Based on the American Wind Energy Association’s estimate that on average every 100 MW of wind generates $1,000,000 in local property taxes annually, The University of Buffalo study estimated that the City of Lackawanna had the potential to earn approximately $850,000 in tax revenues by developing 85 MW of wind power.\(^\text{162}\) The study proposed new recreational space, a “green” business park, and a “Windway Trail” bike path running by the proposed wind farms along the shore from the lighthouse at the mouth of the Buffalo River in Buffalo nine miles south to Woodlawn Beach in Hamburg.

The University of Buffalo study recommended actions local government could take to encourage wind development. It suggested the cities of Buffalo and Lackawanna, and the Town of Hamburg augment their zoning ordinances along four categories to ensure the rights and safety of residents. The primary categories were setbacks, environmental, safety, and design. The legislation that created the Bethlehem Redevelopment Area included zoning for industrial, civic, and open space; and allows for accessory developments including picnic, transit, parking, fence, and solar collection facility construction.\(^\text{163}\)

Mark Mitskovski was the Director of Environment and Planning for Erie County from 2000-2005. In that role he would receive frequent calls from Laird Robertson at Ecology and Environment—a multinational environmental consulting firm—pushing him to look at wind development. In 2002 he collaborated with Robertson to win matching funds from NYSERDA to perform a preliminary review of the Buffalo area’s wind resources. The editorial staff of The Buffalo News responded to the news of the new study with a skeptical editorial that ran on July 27:

> There is nothing intrinsically wrong with a new effort to study wind power on the Buffalo waterfront... [but] Nobody seems inclined to mention, though, that we’ve been here before. Erie County used $1.6 million in federal funds to build a 120-foot-tall windmill

\(^{162}\) Ibid. Page 57
\(^{163}\) Ibid.
on the shore near the South Towns sewer plant in Hamburg 18 years ago, and it produced
only chuckles before it was torn down four years later.

OK, maybe technology has improved..., but before anyone starts decorating a
redevelopment-targeted [Buffalo] waterfront with dozens of 220-foot towers, with blades
reaching up to 330 feet, we ought to consider aesthetics as well as location. And as far as
location goes -- has anybody considered the inside of City Hall.164

However, The Buffalo News would become a strong supporter of the Steel Wind project. The
resulting report, *The Erie County Shoreline Wind Study* (Shoreline Wind Study) was released in
2005 and identified the BSC Lackawanna Works site as the best location of the five studied.165
In addition to having the best wind resources, the study saw the brownfield redevelopment
potential as a positive attribute highlighting that the site offered easy access for turbine
installation and the existing electrical infrastructure. The authors also argued that “A series of
wind turbines would not visually detract from the current viewsheds on this industrial site and
could markedly improve the site’s image.”166 Wind resource is the most important factor in
determining the potential for commercial wind energy development, and the study attracted the
attention of wind energy developers.

The study identified economic incentives for Steel Winds including the federal
Production Tax Credit (PTC), potential long-term power purchase agreements, and the state’s
RPS. The PTC provides a tax credit for equity owners of wind-energy development and can
enable wind energy to be financially competitive with conventional forms of energy production.
The study concluded that the PTC is critical to development of the wind-energy industry.167 The
study also argued that not only are long term power purchase agreements (PPAs) important to
ensure the financial viability of a permitted wind energy project, “without a long-term PPA, there
is considerable risk: projects are more difficult to finance, the price of power will increase, and

165 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape".
State Energy Research and Development Authority (NYSERDA), 2005). Page 7-2
167 At the time, the PTC was in place for projects installed through 2005. In 2009 the American Recovery and
Reinvestment Act (ARRA) extended the PTC for wind through 2012. Introduced as part of the Energy Policy Act
of 1992, the PCT was allowed to expire three times between 1999 and 2004. Due in part to vigorous lobbying by
environmental groups and renewable energy industry advocates, the PTC has remained in place since 2004.
However, the ongoing uncertainty of its future can deter potential wind developers "Production Tax Credit for
Renewable Energy ", Union of Concerned Scientists,

72
reliance on fossil fuels will continue.” Other factors that can encourage renewable energy development include “Low-cost interconnection opportunities, local permitting requirements, wholesale electric prices in the area, and opportunities for ‘green’ market sales.”

The Shoreline Wind Study pointed to actions local officials in Erie County could take to prepare for wind energy development. At the top of the list was reforming zoning codes to explicitly allow wind turbines. The authors reported that:

Currently, none of the municipalities along the Erie County shoreline have specific provisions for wind-powered structures in their local zoning laws, and thus there is no clear path to applying for and obtaining special use permits for constructing and siting wind turbines. Developers and project applicants would benefit from consistent, specific criteria for permit applications and schedules and construction requirements, turning this perceived barrier to development into a navigable and streamlined process.

However, local municipalities did not rush to pass new zoning ordinances that allowed for wind. In a 2005 Memorandum of Understanding (MOU) with Erie County and Tecumseh, the City of Lackawanna tentatively endorsed wind development on a portion of the BSC site. The Town of Hamburg did not pass a wind ordinance until 2007 after being approached by BQ Energy regarding Steel Winds II.

Erie County first approached Lackawanna about developing wind on the BSC site in 2000. After 5 years of negotiation, a MOU for cleanup of the site was signed between the landowner, Erie County, and the City of Lackawanna in April 2005. The agreement tentatively endorsed a master plan for the site that included wind energy generation and public recreational access to the waterfront as part of a 10-year mixed-use redevelopment effort. The 2005 MOU states “The County of Erie will seek to provide a minimum of $10 million of public funds for infrastructure development (roads, water, sewers, lighting, public access and recreational facilities), which public funds are key to successful implementation of the Master Plan.”

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168 Hersey and Neumaier, "Erie County Shoreline Wind Study: Final Report." Page S-3
169 Ibid. Page S-2
170 Ibid. Page S-3
171 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape".
Navigating the Regulatory Process and Project Financing

Both Steel Winds I and II required site plan approvals and special use permits. A use allowed under special use permit means that it is allowed on a case-by-case basis. In New York, site plans, special use permits, and a number of other municipal land use decisions must be referred to the county’s department of planning and environment (or equivalent) for input. The county does not have planning authority but can make recommendations and is supposed to provide a regional planning perspective. Under the New York State Environmental Quality Review Act (SEQRA) certain projects require a State Environmental Quality Review.

The SEQR process is triggered if a project may have significant environmental impacts; when state permits must be obtained prior to construction; or when the state must fund or approve the proposed project. Key issues typically relevant to wind projects are avian impacts, cultural resources, visual impacts, biological considerations, and noise. Local governmental agencies and the public largely determine the level of analysis required under SEQR. A developer can minimize risk and potentially reduce the likelihood of preparing an environmental impact statement (EIS) by fostering community acceptance;

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*Figure 3.2* Tecumseh’s Redevelopment Master Plan for the Steel Works site as agreed to in the 2005 MOU.

173 Chris Pawenski. Personal Email. March 19, 2009
siting turbines on properties having no or few environmental issues; and being knowledgeable about science, state policy, and local permitting issue.174 This is similar to the National Environmental Policy Act (NEPA) or Massachusetts Environmental Policy Act (MEPA). The City of Lackawanna was the lead agency for the SEQR for Steel Winds I and II. The City issued a negative declaration to BQ Energy for Steel Winds I in September 2005.175 A Negative Declaration means that the project will not have significant negative environmental impacts, and therefore does not have to file a full Environmental Impact Statement (EIS).

As the lead agency the City was responsible for officially filing the Environmental Assessment Form (EIF) and supporting documentation with NYSDEC. The lead agency is also responsible for coordinating with the other affected jurisdictions and “involved and interested agencies.”176 This Coordinated Review process requires the lead agency to notify the other parties after completion of each segment of the environmental assessment, such as intent to act as lead agency, scope of work, and draft environmental impact statement. The various jurisdictions and agencies are then allowed to comment on the lead agency’s findings. The lead agency has power to make a negative or positive declaration but is also responsible for coordinating with the “involved and interested agencies,” and for being responsive to their concerns.177 For Steel Winds I the only other jurisdiction was Erie County. Completing the EIF involves performing focused and limited assessments of the possible impacts on birds and bats, and of visual and noise impacts. Because the site was environmentally impaired, an “eyesore” and a significant distance from residences, the potential for negative impacts were minimized and a more limited assessment was adequate. The review and permitting process was completed in less than 90 days, which is unusually fast.178

The more difficult challenge was getting the site into the BCP because it was part of a Superfund Site with an historic RCRA jurisdiction. A condition of the BCP is that a property cannot be subject to any other environmental enforcement actions. A significant component of the financing came from Brownfield Tax credits, roughly 18% of total cleanup and development

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174 Hersey and Neumaier, "Erie County Shoreline Wind Study: Final Report." Page S-3
176 Andrew Reilly, Principle, Wendell Companies. Interview. April 22, 2010
177 Andrew Reilly, Principle, Wendell Companies. Interview. April 22, 2010
178 David Flynn. Telephone Interview. April 16, 2010
costs for Steel Winds I. Therefore completing the Brownfield Cleanup Program was essential to the projects viability. BQ Energy created a new Limited Liability Corporation (LLC), Steel Winds LLC, to own and operate the project. Because this LLC was new, it had zero tax liability. The Brownfield Tax Credits are refundable tax credits, so Steel Winds LLC received a tax refund payment after construction of the first eight turbines (Steel Winds I). Unfortunately, the BCP has been changed since the completion of Steel Winds I so that tax credits are now capped.

| Table 4.1 - Brownfield Tax Credits for Steel Winds I |  |
|---|---|---|---|---|---|---|
| Calendar Year | Site Preparation Component | Tangible Property Component | On-site Groundwater Remediation Component | Total |
| | Cost | Credit | Cost | Credit | Cost | Credit | Cost | Credit |
| 2008 | $1,243,656 | $223,858 | $36,201,838 | $6,516,330 | $77,989 | $14,038 | $37,523,483 | $6,754,227 |
| 2009 | $88,947 | $16,010 | - | - | - | - | $88,947 | $16,010 |

David Flynn is an attorney for Phillips Lytle LLP and was one of the attorneys representing BQ Energy during the SEQR and permitting process. He described the experience of the Steel Winds project as somewhat unusual:

From a legal and regulatory perspective I think the biggest challenges were different from what you would expect from a greenfield wind farm...[The challenges] were not related to the land use and the environmental review of the wind project – those went spectacularly well in an almost unprecedented process in terms of duration. What became an issue and complicated the development process were... a number of gatekeeping issues for entry into the states brownfield program. On paper, at first brush, it looked like we couldn’t get the property we wanted into the program because of these historic regulatory issues. So we had to work with [NYS]DEC and U.S. EPA to carve-out from those historic jurisdictional issues the strip of land that we were interested in for our project, which then allowed it to be accepted into the brownfield program.\(^{180}\)

Turnkey Environmental Restoration, LLC (Turnkey) and Benchmark Environmental Engineering & Science, PLLC (Benchmark) are employee owned consulting firms, both founded by Paul Werthman in 1989.\(^{181}\) These two companies represent Tecumseh as its environmental consultants. In the case of Steel Winds, Turnkey and Benchmark were involved in all property related aspects, including land leases and sales. They worked on behalf of Tecumseh to negotiate the 35 year land lease with BQ Energy and they applied to NYSDEC on behalf of BQ.

\(^{179}\) New York State Department of Taxation and Finance, "Brownfield Credit Reports," http://www.tax.state.ny.us/statistics/special_interest_reports/brownfield_credit/brownfield_credit_reports.htm.

\(^{180}\) David Flynn. Telephone Interview. April 16, 2010

\(^{181}\) While legally separate firms, they essentially function as one with Benchmark performing engineering services and Turnkey handling environmental services that do not require a professional engineer. Paul Werthman. Telephone Interview. March 12, 2010
to get the property into the BCP. This required selecting a site that was “clean” enough to be
removed from the RCRA Consent Order, but “dirty” enough to qualify for the BCP. Thus
Benchmark and Turnkey worked with BQ to get approval from the EPA to remove the site from
the RCRA order. Benchmark and Turnkey also worked closely with BQ Energy to perform the
environmental site assessment and remediation on a design/build basis, which allowed the
process to be completed quickly. Additionally they assisted BQ in determining alignments for
the interconnection into the substation that was owned by Tecumseh, and assisted in the physical
layout of wind turbines and utility lines.

On August 23, 2006, the Buffalo News reported that the EPA had completed
investigation of the 1600 acre former BSC site handing oversight over to NYSDEC and allowing
the Steel Winds parcel to enter the state’s Brownfield’s program. Steel Winds had support from
its federal delegation. Congressman Brian Higgins had urged the EPA to proceed quickly with
this decision. Senator Charles Schumer called the project a “great chance for us to bring jobs
here by establishing a real niche for the region.”182 The first turbine was completed in February
2007 after the project broke ground in September 2006. Steel Winds I began full commercial
operation on June 5, 2007.183

According to the EPA, the Steel Winds I project cost $40 million.184 BQ Energy was able
to reduce its construction costs significantly through the Brownfields Tax Credits as illustrated in
table 4.1 above. According to Paul Curran, the project’s lead developer, they decided on 20 MW
for the Steel Winds I because the interconnection approval process in New York is much simpler
for projects 20 MW and under than for larger projects. The modular nature of wind energy is
advantageous in that the turbines comprise the majority of capital costs. Because there is not a
high fixed cost for associated infrastructure a project can be effectively sized according to what
the site allows. This is particularly true on a brownfield site where the project can take
advantage of existing transmission lines. Curran created a business model around developing
wind farms on brownfield sites. He explains:

183 "Steel Winds Project Achieves Full Commercial Operations; Wind Farm Represents a Significant Achievement
in the Use of New Clipper Wind Turbine Technology and the Revitalization of Former Bethlehem Steel Brownfield
Site."
184 "Bethlehem Steel Winds Project, New York," U.S. Environmental Protection Agency,
http://www.epa.gov/renewableenergyland/successstories.htm#bethlehem.
Brownfields always dictate how many turbines you can place. That is, you have to avoid areas of significant pollution; you have to avoid areas where someone is going to want to do something in the future for cleanup purposes.\textsuperscript{185}

Another factor that contributes to determining where to place the turbines when developing a large site like the Bethlehem Steel Site are the planned uses for other parts of the site. Steel Winds is built on one edge of the site along the shore, which is a significant distance from the portions of the site targeted for development as a business park. As illustrated in Figure 3.3 the wind turbines are located a significant distance from remaining steel plant structures, and even further from the nearest residences, which are on the far side of the factory ruins and not visible in the photograph.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.3}
\caption{Former Lackawanna Steel Workers site viewed from Steel Winds I.}
\end{figure}

First Wind financed its purchase of Steel Winds I from BQ Energy with 100\% equity.

According to their Securities and Exchange Commission (SEC) Registration Statement:

\begin{quote}
We undertook [Steel Winds I] primarily as a means of testing and gaining operating experience with the Clipper wind turbines. The project's relatively small size allowed us to initially finance the project with 100\% equity, which provided more flexibility as we
\end{quote}

\textsuperscript{185} Paul Curran. Interview. April 2, 2010
\textsuperscript{186} Photo by author. April 22, 2010.
worked with Clipper to understand the technology and deal with start-up issues that can be common in new turbine designs.\textsuperscript{187}

It is notable that First Wind saw Steel Winds as a chance to experiment with Clipper’s new Liberty turbine model. This model suffered from three types of defects that caused periods of prolonged downtime for turbines at Steel Winds I during 2007 and 2008.

Steel Winds I benefits from PTCs and MACRS depreciation and produces revenue through cash payments for the electricity and RECs it generates. In January 2008, First Wind executed an agreement with Lehman Brothers for $208 million of tax equity financing for its New York projects (Steel Winds I, Cohocton I, and Pratsburg I). In August 2008, $19.7 million of this was received for Steel Winds I. Lehman Brothers filed for bankruptcy on September 16, 2009. Consequently “First Wind repurchased the tax equity investor's interest in Steel Winds I for $4.5 million and terminated the agreement and such tax equity investor's remaining funding obligations.”\textsuperscript{188} The company sells the electricity at floating prices within New York Independent System Operator (NYISO) Zone A. It hedges against price volatility through financial swaps, and entered into a swap through 2016 for 95% of Steel Winds I expected output with an affiliate of Morgan Stanley.\textsuperscript{189} In January 2010, First Wind entered into a five-year PPA with Commerce Energy, Inc. that includes a fixed-price contact for all RECs generated by Steel Winds I.\textsuperscript{190}

The Town of Hamburg controls the southern portion of the Bethlehem Steel site. When the town was approached by BQ Energy in 2006 they responded cautiously. Steven Walters is the Town Supervisor for the Town of Hamburg. He described the Buffalo area’s first experience with commercial wind energy as “a debacle, a complete disaster.”\textsuperscript{191} In 1984 Erie County committed $1.6 million in federal funds to build a wind turbine near the South Towns Sewerage Treatment plant in Hamburg. The turbine did not work well from the beginning and was torn-down four years later.\textsuperscript{192}

\textsuperscript{188} Ibid.
\textsuperscript{189} Ibid.
\textsuperscript{190} Ibid.
\textsuperscript{191} Ibid.
\textsuperscript{192} "It Seems to Us."
Some resident groups pushed back against BQ's proposal and the Town put BQ's expansion of Steel Winds on hold while it finished revising its 1987 zoning code, which did not allow wind turbines and had a structural height limit well below that of the turbines proposed by BQ Energy. At one point a moratorium on wind development was considered, but strong support from residents led instead to the passage of a Commercial Wind Energy Conversion Systems (WECS) ordinance in June, 2007. City officials took their time and carefully surveyed WECS ordinances from around the country before crafting their own comprehensive wind ordinance. Mark Mistkovski, BQ's project manager for Steel Winds at the time, heralded the ordinance as "probably the best wind ordinance within the state." Positive aspects for BQ included that the ordinance allowed the planning board to waive the 1500 foot setback between wind towers and residences. The ordinance changed the noise allowance for waterfront development from hard limits of 45 and 50 decibels to the average noise level along the waterfront. It allowed new commercial wind proposals to be studied on a case by case basis with input from residents and required the developer to post a bond to pay for demolition should the turbines cease operation. This last component safeguards against a repeat of the Town's previous experience at the sewage treatment plant and prevents a defunct wind turbine from remaining in the viewshed.

Immediately after completion of Steel Winds I, BQ began to move ahead with plans to add 16 turbines to Steel Winds II in June 2007. This expansion project uses First Winds existing infrastructure, including interconnection equipment and site personnel. On June 20, 2007, BQ submitted a Letter of Intent to the City of Lackawanna requesting site plan approval and area variances for the eleven turbines proposed for the portion of the site in Lackawanna. A comprehensive environmental impact report including a Bird and Bat Risk Assessment, a Visual

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195 Ibid.
Impact Assessment and A noise Impact Assessment, was also submitted. The City of Lackawanna then sent a notice of intent to act as lead agency along with the comprehensive report to the Town of Hamburg and other involved and interested agencies. The Town of Hamburg initially objected to the City of Lackawanna acting as lead agency for the portion of the site located in the Town of Hamburg, and shortly thereafter Erie County objected because Hamburg had objected. The Town of Hamburg withdrew its objection after meeting with City of Lackawanna officials in early August.

The project site in Hamburg included portions of three different properties owned by Tecumseh Redevelopment, Inc., Buffalo Crushed Stone, Inc and South Buffalo Railway Company. It was complicated slightly by the Town of Hamburg’s Local Waterfront Revitalization Plan “which calls for a mix of public recreation, marinas, waterfront access office and residential development on the Buffalo Crushed Stone site.” All of the issues were worked out and BQ received approval of the site plan and special use permit in March 2008. In 2009 BQ Energy was acquired by Greenlight Energy Inc, which consists of Apex Wind and Axio Power. The other project developer, UPC Wind, had changed its name to First Wind in 2008. The Steel Winds project was structured so that First Wind would acquire it once constructed and become the owner operator. By 2009 First Wind had assumed control over future expansion of Steel Winds. Steel Winds II was being delayed by negotiations of the Payment in Lieu of Taxes (PILOT), which will be discussed in detail in the next section. In 2009 First Wind requested modification to the site plan for Hamburg which required re-approval of the site plan and special use permit. In addition First Wind requested and was granted a variance for one of the wind turbines that was sited too close to a property line.

Another factor that may have slowed the progress of Steel Winds II is that the property the turbine will be built on is not eligible for the BCP because environmental site assessments have not discovered contamination in the area on which the turbines will be built. Nevertheless some of the parties are concerned about liability issues because of the proximity to the RCRA property, and because the expansion will use infrastructure on that property. However, since the parcel will not complete the BCP no release from liability to the state will be granted. The fact that there is no liability release, even though there are no environmental issues, has complicated

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196 Adam S. Walters, September 18 2007.
the deal. Without recourse to the BCP liability protection the parties have had to address the liability issues through language in the lease agreement. 197

By early 2010, First Wind, the Town of Hamburg, and the City of Lackawanna reached an agreement on Steel Winds II. The project has been scaled back from 16 turbines to 6, which will result in an additional 15 megawatts of capacity bringing the project’s total size to 35 MW. However, First Wind was still in the process of securing the necessary rights to develop and operate the project. It had completed the project's System Reliability Impact Study and Facilities Study and was working towards an interconnection agreement with the New York Independent System Operator (NYISO) and National Grid. The company estimates the total installed development and construction costs for Steel Winds II will be approximately $40 million, including approximately $5 million of financing-related costs and excluding prepaid turbine maintenance and warranty costs. It intends to sell the electricity directly to the market through NYSO Zone A and hedge against fluctuating electricity prices through a financial swap. 198

**Battling over PILOTS**

Under New York State law wind power and solar power facilities are exempt from property taxes unless the municipality “opts out” of that exemption. This tax exemption is an important driver of renewable energy projects in New York, but it is not without its drawbacks. Because local governments can opt out of the exemption they can compel developers to negotiate a Payment in Lieu of Taxes (PILOT). Typically the town or city will negotiate the total PILOT amount with the developer and negotiate with the other taxing authorities (county, school district) on how to share the PILOT.”199 These negotiations are often contentious and protracted, which has been the case with Steel Winds. This policy is beneficial to developers for two reasons. First, the PILOT is always less than would be paid in property taxes. Second, a PILOT reduces uncertainty in the developer’s pro forma. This is because the PILOT is a fixed and does not vary over time as property taxes do. Conversely the system creates uncertainty for developers because they have to negotiate a PILOT for each project and because the negotiation

197 Paul Werthman, Telephone Interview. March 12, 2010
198 First Wind Holdings Inc., "Amendment No. 5 to Form S-1 Registration Statement under the Securities Act of 1933."
199 Steven Walters. Interview. April 23, 2010
can be prolonged indefinitely. From a public policy perspective the law is beneficial because it encourages renewable energy development by reducing costs for an industry that has narrow profit margins and it generates some revenue for local governments, but the process can create animosity between taxing authorities.

BQ Energy and UPC Wind did not have to pay property taxes on Steel Winds I. 200 The City of Lackawanna and the developers agreed to an annual payment of $12,500 per turbine ($5,000 MW), a sum both parties agreed was generous in 2005. This is just half of the annual property tax revenue per MW estimated by the University of Buffalo study. The Lackawanna School District was upset when they learned that under the agreement the City would keep all of the money. Mayor Polanski sees his role as negotiating on behalf of the City, not the School District, so he does not think he acted in bad faith. 201 Regardless, the agreement set the City up for a fight with the School District over Steel Winds II. Paul Hashem was the Superintendent of the Lackawanna School District at the time. According to an article in The Buffalo News printed after the announcement of the PILOT, “Hashem, who supports the wind farm and even has a photo mock-up of the completed Steel Winds in his office, said he believes that the laws surrounding the tax exemptions were so complicated that the schools were inadvertently left out.” 202

The success of Steel Winds I raised the City’s expectations. Steel Winds I increased development interest in Lackawanna creating potentially competing interests for the BSC site. This led the city of Lackawanna to try to negotiate higher payments for the second phase of Steel Winds. As negotiations over expansion proceeded the City has put pressure on First Wind to squeeze the turbines into a smaller area of the site. 203 City officials do not want expanded wind power to deter more traditional forms of development. People are more inclined to support offshore installations, particularly if it is a substantial distance offshore, because there will be reduced potential for visual and audio affects to deter development. Wind turbines have a very large footprint. Most developments have a fall zone that precludes constructing buildings within a distance from the turbine that is one and a half times the height of the turbine. 204 Thus wind

201 Norman Polanski. Interview. April 23, 2010
202 Becker, "Powering up 'Steel Winds'; First of 8 Giant Turbines Completed at Old Bethlehem Site."
203 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape".
204 Chris Pawekinski. Interview. March 16, 2010

83
turbines take away the potential for conventional development on significant amounts of land beyond the land need for the operation of the turbine itself.

In 2008, then project manager Mark Mitskovkski felt the ongoing contract negotiations were interfering with the planning and zoning review and the environmental review processes: “This stack of paper is $700,000 worth of work submitted to Lackawanna and Hamburg...stalled by economic payment issues that have nothing to do with [the environmental review]”. In early 2010 First Wind, the Town of Hamburg, and the City of Lackawanna finally reached agreement on Steel Winds II. The second phase has been scaled back to six turbines – four in Hamburg and two in Lackawanna. First Wind had decided not to pursue the second row of turbines in Lackawanna because additional testing suggested that the first row of turbines would diminish the wind resource for the second row. Under the negotiated PILOT First Wind will pay $10,000 per installed megawatt. Frontier Central School District and the Town of Hamburg have agreed to split the PILOT net of the county’s share 51.5% for the Hamburg and 48.5% for the School District. Hamburg Town Supervisor Steven Walters expects the County’s share to be in the range of 5 to 10 percent. Hamburg and Erie Country are still finalizing the PILOT sharing agreement. Next door in Lackawanna the situation is still up in the air. According to Mayor Polanski the Lackawanna School District is still pushing for a higher share of the PILOT, which could stall construction because First Wind wants to reach an agreement with all of the parties before proceeding.

Mayor Polanski thinks that the way PILOTs are negotiated impedes wind power development. The development is held up as the taxing authorities argue over their share of the PILOT. He thinks it would be much better if the state set a statewide standard to take the uncertainty and contentiousness out of the process. The standard could go as far as establishing a set sum per megawatt and requiring that it be divided among the taxing authorities in the same proportion as property taxes. Another option would be to set the share schedule but still allow the local government to negotiate the sum with the developer.

205 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape". Page 94
206 Norman Polanski. Interview. April 23, 2010
208 Steven Walters. Personal Interview. April 23, 2010
209 Mayor Norman Polanski. Personal Interview. April 23, 2010
210 Mayor Norman Polanski. Personal Interview. April 23, 2010
“Looking Good”, Image Matters

Improving the image of the Buffalo area has been a goal of local wind energy advocates since the 1990's. Promoters of wind energy wanted to create the image of Buffalo as a center of clean industry including renewable energy in order attract associated businesses. The Steel Winds project has undoubtedly had a positive effect on the region’s image and earned widespread support. These image benefits are highly valued by stakeholders. The number of Wind Farm projects in Western New York is growing, but so far has not lead to the transformation of greater Buffalo’s economy that proponents seek.

The University of Buffalo study, the Erie County and NYSEARDA report, and the Wind Action Group have emphasized wind energy development as part of a new vision for the Buffalo area. The students from the University of Buffalo argued:

One hundred years ago, greater Buffalo was the country’s hub of electrical power. Wind power can be the first step in reclaiming and reinventing Buffalo and Lackawanna as post-industrial, sustainable cities. Greater Buffalo has the opportunity to dramatically recast its image and lead the nation by example.

Erie County and NYSERDA highlighted the general redevelopment potential of the Bethlehem Steel Site suggesting that a wind farm could be structured in a way to attract development.

The property is an ideal location for many new industries because of its efficient transportation network, logistical infrastructure, and regional access to a highly educated and trained workforce. As the cost of energy is important to any new industrial plant, this site could be well-suited for future development. A wind farm would occupy only a small fraction of the [BSC] property, allowing the remaining land to be developed in such a way as to attract more industry and jobs to Erie County and Western New York.

Bill Nowak has been a passionate advocate for wind energy and sustainable development since founding Green Gold. In an opinion piece printed in the Buffalo News Nowak wrote:

Steel Winds is the largest urban wind farm in North America. The eight turbines on the old Bethlehem Steel site provide monumental advertising both for our wind resource and for the potential that exists for renewal on our urban waterfront brownfields. Any manufacturer looking to make a clear, progressive statement to markets far and wide recognizes the benefit of being associated with this project. As a pre-eminent example of brownfield reuse, this project has been written up in publications from Reader's Digest to the New York Times. For the time being, thanks to progressive political leadership from

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211 Sternberg and al, "Wind Energy Initiatives for Greater Buffalo."
212 Hersey and Neumaier, "Erie County Shoreline Wind Study: Final Report." Page 6-10
the City of Lackawanna, Steel Winds gives Western New York a huge leg up in the race to establish our regional identity as a hotbed of green activity.\textsuperscript{213}

Highlighting the cost of transporting wind turbine components from Europe, Buffalo’s transportation assets, wind resources, and the presence of vast areas of brownfields along the waterfront with transmission lines and access to shipping, Nowak makes a strong case for Buffalo to become a center for wind energy development and wind manufacturing. He calls for efforts to attract a major European wind manufacturer:

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Jaws drop when development officials from other areas see the wide-open expanses on our waterfront. Soil–open land–is abundant and perfectly located for clean energy development right in the windiest part of our region where rail, shipping and trucking all come together. Incredible, underutilized infrastructure in the form of power lines and supporting small manufacturing shops create a perfect neighborhood for clean energy operations… In a larger sense, potential industrial sites in Buffalo offer a premier location for shipping. Buffalo sits within 500 miles of 60 percent of the Canadian population and 40 percent of the U.S. population.\textsuperscript{214}

Despite all of these assets the green development boom has not yet materialized in Buffalo. Stakeholders see the positive image effects of Steel Winds as highly valuable. The University of Buffalo study concluded that “The most significant reason for greater Buffalo to adopt wind energy is the opportunity to radically change the image of the region.”\textsuperscript{215} After Steel Winds I was operational, many stakeholders would agree. Bill Eagan was Director of Economic Development for Lackawanna at the time Steel Winds I was built. In his view the image-changing effects and the development interest they can attract outweighed the PILOT revenue:

Eagan agrees that the “real direct benefit” of the project to the City is not the payments from the developer, but the image-changing effects of the wind turbines and the new development that this attention can attract. Eagan claims the Steel Winds project has already spurred the arrival of a new gas station, a coffee shop, a Tim Horton’s, a law enforcement weapon facility, and the city’s first hotel since the Lackawanna Hotel closed in the late 1970s.\textsuperscript{216}

Mayor Polanski told the Buffalo News: "its generated interest, and people know where the City of Lackawanna is...It projects our city in a positive light."\textsuperscript{217} Shortly after construction began a delegation from Cleveland visited Lackawanna to see the project. A coalition of business leaders, government

\textsuperscript{214} Ibid.
\textsuperscript{215} Sternberg and al, "Wind Energy Initiatives for Greater Buffalo." Page 10
\textsuperscript{216} Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape". Page 90
\textsuperscript{217} Becker, "Powering up 'Steel Winds'; First of 8 Giant Turbines Completed at Old Bethlehem Site."
officials, foundations, and environmental groups in Cleveland are now interested in offshore wind. ArcelorMittal is also exploring wind development at sites it owns in Cleveland.218

Each of the first eight wind turbines is emblazoned with the logo of one of the project partners. These include UPC Wind, BQ Energy, the City of Lackawanna, Erie County, NYSERDA, the Wind Action Group, NYSDEC, and ArcelorMittal. According to Mark Mitskovski:

We sent a photo [of the logo on the turbine] to Mittal Steel, and within 24 hours they had the photo up on their website. Within 48 hours, the chairman had phoned his US counterparts and said ‘I like this. I want more.’ This is a first for Mittal Steel.220

The community was happy to see the site reused for clean industry. Earlier proposals for site reuse included a tire burning facility in 1988, which community activists successfully prevented.221 Steel Winds has enjoyed overwhelming support in the greater Buffalo area. The residents of Woodlawn, the residential neighborhood closest to the site, are excited about the expansion.222

**Conclusion**

The experience of the Steel Winds project supports the common arguments for using brownfields for renewable energy facilities. The existing infrastructure was very valuable in that the project reused an onsite electrical substation as well as transmission lines, transportation infrastructure including an active port used for shipping turbines and equipment. It demonstrates that a wind farm is a viable reuse for a site with limited development potential – not much can be constructed on slag. It also demonstrates one of the distinctive aspects of renewable energy facilities as compared to other brownfield developments—they can coexist with ongoing remediation. The community viewed the project favorably because it helped to remediate and renew a blighted industrial area as opposed “spoiling” a scenic natural vista. Because the site was industrial and environmentally impaired, the environmental review process went

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218 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape".
219 Photo by Author, April 22, 2010
220 Cherry, "The Windy City: Harnessing Power in the Neighborhood Landscape", Page 89
221 Ibid.
222 Steven Walters. Interview. April 23, 2010
exceptionally fast. This suggests the potential to simplify permitting and environmental review is an additional reason to locate renewable energy facilities on brownfields.

This case reveals the importance of building public support for wind energy development in advance of actual development proposals. Several actors were advocating for wind energy development on the Lake Erie waterfront before the Steel Winds project materialized. Thus the support was there when BQ Energy was ready to build Steel Winds. Facilitated by the groundwork laid by NYSERDA, Erie County, the City of Lackawanna, and Tecumseh Redevelopment, the project moved forward smoothly. An important motivation behind the political support was an expectation that a wind farm would improve the area’s image and stimulate sustainable development. The wind farm provided an image boost to the community that was highly valued by local officials and has attracted positive attention.

Steel Winds reveals a novel strategy for minimizing cleanup costs and facilitating faster redevelopment. This strategy is to “carve-out” moderately polluted brownfields from larger sites with areas of severe contamination to take advantage of the benefits of state voluntary cleanup programs. The developers effectively worked with the property owner to separate a moderately polluted brownfield site from a highly contaminated Superfund property, and thus access valuable tax credits and liability protection through New York’s BCP. Phased-redevelopment in which renewable energy facilities are developed first can generate revenue for property owners to support ongoing site remediation of the large site, can provide revenue to the local government, and create an image of progress and attract development interest.
Chapter 4: Exelon City Solar, Chicago, Illinois

Introduction

Brownfields-to-brightfield projects are not hard to accomplish if they are economically viable; the parties work cooperatively together and the legal authority is clear. In contrast to the Brockton Brightfield, which took 5 years to complete, the 10 MW City Solar power plant was completed in approximately one year. As a "stimulus project," it needed to be partially operational by the end of 2009 in order to take advantage of bonus depreciation under the American Recovery and Reinvestment Act (ARRA). If the Brockton Brightfield epitomizes the struggle of a small, cash strapped city to build, own, and operate a solar power plant when it lacks the proper legal authority, City Solar demonstrates how quickly a Brightfield project can be built when the project has federal impetus, and the owner is one of the nation’s largest electric companies partnered with the world’s largest solar power developer and a major city led by one of the nation’s most powerful mayors. City Solar shows that the physical complexities presented by brownfield sites, such as the presence of engineered barriers, old infrastructure, underground storage tanks and foundations, and contaminated soil, can be managed efficiently if the construction team is well prepared and has the full cooperation of all the project partners.

Figure 4.1

A portion of the City Solar power plant with homes in the background.

City Solar, like the Brockton Brightfield and Steel Winds, illustrates that improving the neighborhoods image is an important benefit of locating solar farms and wind farms on brownfields. In all three cases the communities overwhelmingly supported the project. This suggests that choosing brownfields is an effective way to address the "siting puzzle" for renewable energy power plants. The project has produced tangible benefits

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223 Photo by Author. March 24, 2010
224 See Lawrence E. Susskind, "The Siting Puzzle: Balancing Economic and Environmental Gains and Losses," *Environmental Impact Assessment Review* 5, no. 2 (1985). In this article Susskind focuses on regionally necessary but potentially noxious facilities such as hazardous waste treatment facilities. Conflicts around siting utility-scale
for the city and the community. Through the land lease and real estate taxes, City Solar and will generate revenue for the city on properties that had been vacant for decades. The project converted a blighted and dangerous property into one with a productive power plant that is also an educational opportunity and something in which the community can take pride. City Solar will be a tourist destination and will be used for educational programs for k-12 students and by nearby colleges.

This chapter begins with a summary of the history of the site and surrounding neighborhood. The City’s early efforts at promoting redevelopment in WIRA are discussed. The next section describes the site remediation and solar plant construction. This section highlights the complexity of the site and the importance of preparation, planning, and cooperation between stakeholders in overcoming the technical complexity and uncertainty of constructing on brownfield sites. The third section describes the projects partnership structure, the importance of the ARRA in making the project possible, and how the project was moved through the planning process. The following section focuses on the importance of political support in motivating the cooperation necessary to move the project forward in the short time frame afforded by the ARRA. The chapter concludes by summarizing the lessons revealed by the case.

Site and Neighborhood History

The parcels comprising the City Solar project are three separate contiguous brownfield properties totaling 41 acres located in the Pullman neighborhood on the South Side of Chicago. The properties lie in the West Pullman Industrial Redevelopment Area (WIRA) Planned Management District. It is designated as an Industrial Park Conservation Area (IPCA)-TIF district and an Illinois Enterprise Zone. The area was at the heart of Chicago’s manufacturing from the 1880s until the 1980s. Over the years major manufactures like Pullman Car Works, Dutch Boy Paint, AM Forge, and Ingersoll have located facilities there. As these businesses came and went they left behind a complex industrial fabric comprised of a variety of industrial renewable energy facilities share similar characteristics. A region’s residents may agree that the facilities are needed but object to locating them in their vicinity, and the benefits may be diffuse while the impacts on the landscape are experienced locally.
buildings, underground and above ground storage tanks, transformers and other infrastructure. They also left behind a variety of contamination ranging in severity from minor to severe.

The parcels that make up City Solar consist of the former Chicago Building Structures/Chicago Malleable Castings site (also referred to Areas 10 and 11 by the city) and the former International Harvester site (Area 12). The city had acquired ownership of these sites over approximately the last 15 years. All sites were enrolled in the Illinois Environmental Protection Agency’s (IEPA’s) Site Remediation Program (SRP), which is the state’s voluntary cleanup program (VCP). Areas 10 and 11 are jointly enrolled in the SRP. The city spent approximately $800,000 on site investigation and remediation including removal of asbestos containing material (ACM), soil and demolition materials. Roughly $200,000 more was required for remediation concurrent with development of the solar power plant. This will be paid for by the first two years of rent payments to the city.225

From roughly 1911 to 1975 Area 10 was a foundry operated by Chicago Malleable Castings. After that Chicago Building Structures used the site primarily for warehousing building materials until 2002. The city acquired the site through its Tax Reactivation Program (TRP) and demolished the last building in 2008. A 1998 Phase II evaluation found polycyclic aromatic hydrocarbons (PAHs), elevated metal contamination, and asbestos. Area 11 was once the location of the International Harvester stock sheds and railroad spurs prior to 1911. International Harvester operated a manufacturing facility on Area 12 that produced parts for tractors, refrigerators, freezers, and industrial power equipment until 1983. Navistar is the successor to International Harvester and stepped forward in 1996 to enroll Area 12 in the SRP. In 1998 the city acquired the property though its tax reactivation program, and in 1999 the city and Navistar entered into a cost sharing agreement in which Navistar pays 100% of the administrative costs of completing the SRP. The City and Navistar share the cost of the final remedy. Contaminants addressed on this site included light non-aqueous phase liquid (LNAPL), PCBs, PNAs, total petroleum hydrocarbons (TPH), high concentrations of various metals, and hazardous waste.226 As of 2007, the USEPA had funded approximately $950,000 of cleanup on

the International Harvester site through a Supplemental Environmental Project established in 1998.227

First settled in the 1830s, rapid growth did not occur in the West Pullman area until after the opening of the Illinois Central and Michigan Central Railroad station and the development of the Pullman Palace Car Works in the 1850s. Significant transportation improvements and marketing efforts by the West Pullman Land Association attracted many industries to the area beginning in 1880s. By 1919 the residential population had reached 23,019 people, partly as a result of an influx of Eastern European Immigrants. The population continued to grow rapidly in the post World War I period and reached about 30,000 in 1930. Major manufactures locating in the neighborhood over the years included International Harvester, Pullman Car Works, Dutch Boy Paint, AM Forge, and Ingersoll companies. Products manufactured in the area included locomotive brake shoes, farm implements, railcars, various metallic working and forging operations, and lead-based paint production.228

The population peaked in 1980 at 45,000. Beginning in the 1960s, Chicago’s African-American population began relocating to the West Pullman area in large numbers. By 1990, 94% of the West Pullman community was African American. Suburban style tract housing proliferated in the community in the post war era. Consequently, West Pullman developed one of the City's highest rates of single-family home ownership.229 In 1990, 72% of the homes in the area were owner-occupied and the 1990 median housing value was $59,270. As of 2000, the population was 36,649, 92% African American, with a median family income of $42,914. The unemployment rate was 17.6 percent in 1990 and 10.5 percent in 2000.230

When WIRA was created as an IPCA-TIF in 1998 a majority of the area was vacant and environmental contamination was ubiquitous. The former International Harvester West Pullman Works site (now home to Exelon City Solar), the former West Pullman Iron Metal, and the Dutch Boy site were already listed in the Comprehensive Environmental Response, Compensation, and Liability Index System List (CERCLIS) indicating that they posed serious threats to the environment and human health. The city’s environmental consultant reported,

228 Graham and Brandt, "Stamp: Industry Revival in a Classic Chicago Neighborhood."
"The entire study area has railroad right-of-ways that are devoid of vegetation and could have been contaminated by chemical spills and herbicide applications; [and] the study area also exhibits many other potentially harmful conditions which are distributed throughout the sites and include above ground and underground storage tanks, asbestos containing material, PCBs, and lead-containing materials." The main east-west route through the area, 112th Street was in very poor condition and was completely vacant on its south side where the former Dutch Boy Paints and International Harvester sites are located.

The area's infrastructure was deemed inadequate to meet the needs of modern industrial uses. The building stock was deteriorated with many vacant buildings exhibiting broken windows and sagging roof lines. Most of the existing manufacturing buildings were relatively small and built between the mid 1950s and late 1960s. The majority of the major employers had been gone for years. In 1997 two businesses, Ingersoll Products at 11900 S. Morgan Street and U.S. Gear at 1030 W. 119th Street, occupied the largest active industrial facilities in the area and employed the majority of workers. A neighborhood that was once a thriving center of industry famous for manufacturing luxury railroad cars was now heavily blighted and in serious need of new investment.

WIRA was established as an IPCA-TIF in 1998. The lifespan of a TIF in Illinois is 23 years. In order to qualify as a TIF under the Illinois Jobs Recovery Law (IJRL) the area had to meet certain conditions including being a "labor surplus municipality," being well serviced by multi-modal transportation, accounting for less than 2% of the city’s equalized asset value (EAV) in the most recent valuation, and that redevelopment by private investment "in accordance with public goals" could not be reasonably expected "without the adoption of the plan."

The IPCA-TIF intends to foster the area’s revitalization through site assembly efforts, soil remediation projects, and numerous infrastructure improvements. It is part of a larger comprehensive planning effort which seeks to revitalize the West Pullman/Maple Heights

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232 Ibid.
233 Illinois TIF law defines a labor surplus municipality as "one in which the unemployment rate was more than 6 percent, and 100 percent or more of the national average unemployment rate at any time during the preceding six months." "What Is T.I.F."
234 ________, "West Pullman Industrial Park Conservation Area Industrial Jobs Recovery Law Tax Incremental Financing Eligibility Study and Redevelopment Planning and Project Plan." Page 21
community and is an important component of the city's economic and industrial development strategy. Under the plan the city catalogued, environmentally assessed, and appraised vacant and underutilized properties in order to establish fair market values. The city then sought to acquire those properties through direct purchase, the Tax Reactivation Program in which the city attains tax delinquent properties for the cost of the delinquent taxes, donation, leasing, and eminent domain. Several area-wide infrastructure improvements were made to improve circulation and accessibility within WIRA. These circulation improvements included entryway lighting, signage, landscaping, and street widening to various streets. Improvements were also made to water and sewer systems.

In making the case for establishment of the ICPA-TIF, the Eligibility Study described the challenges facing the neighborhood:

The environmental contamination, obsolete industrial structures, area abandonment, and dated infrastructure have made the area unattractive for new investment. Without substantial attention, the West Pullman IPCA will continue to be an underutilized and uncompetitive industrial area, aggravating existing conditions and exerting negative influences on the surrounding neighborhood.

However, the ICPA Eligibility Report also highlighted the community’s assets. The area has the locational advantages of an industrial history, diverse transportation systems, and an accessible industrial workforce. Exelon recognized the benefits of these assets. In presenting the city Solar proposal to City Council it noted:

The existing site has accessible electric power interconnection infrastructure – a Commonwealth Edison (ComEd) distribution line runs along the north side of the project site, facilitating access to the electricity grid, thereby requiring less excavation and soil disturbance in order to put the project into service. Road access to the site is excellent, and since the project site is not immediately adjacent to any residential neighborhoods, construction and operation of the facility will result in minimal disruption to surrounding areas.

While not “immediately adjacent” to residential properties, the area is surrounded by residential neighborhoods that are predominantly occupied by working class families, are well maintained and well organized around block clubs. The project hired construction workers from these surrounding neighborhoods.

235 Ibid. Page 15
236 Ibid. Page 14
Site Remediation and Solar Plant Construction

Navistar began site remediation activities on the Former West Pullman Works (FWPW) site in 1996. The city acquired the property in 1998. That year the City of Chicago contracted with Rust Environment and Infrastructure (Rust) to oversee the removal of over 2,600 tons of construction debris containing ACM. During 1999 and 2000 Navistar performed a number of remedial actions on the site including clearing the site of trees to allow for surface cleaning; removing oily liquids from vaults and sewers, removal of USTs, removal of miscellaneous debris, removal of approximately 2,930 tons of ACM, and removal and disposal of PCB-impacted materials. In-situ treatment of groundwater contaminated with hexavalent and trivalent chromium was completed successfully in early 2007.\textsuperscript{238} EPA approved a PCB remedial objective (RO) of 1 mg/kg, or 1 part per million (ppm). During the summer of 2009 soils with PCB concentrations exceeding 50 ppm were taken from the site and disposed of in Toxic Substances Control Act (TSCA) permitted landfills. Soils with PCB concentrations between 1ppm and 50ppm were disposed of off-site as non-hazardous special waste at a landfill.\textsuperscript{239} Soils containing hazardous lead as defined by RCRA were transported to an appropriate disposal facility in Illinois. Non-Hazardous Special Waste consisting of TPH, PNA, and soils and concrete with PCB concentrations below 50 ppm were disposed of in two local landfills. Approximately 20 new engineered barriers were installed throughout the site, which already contained numerous concrete and asphalt engineered barriers. The barriers, including their geographic coordinates will be recorded on the property deed after Navistar receives the NFR letter for the site. As an institutional control, some of the engineered barriers are marked by construction worker caution signs.

Prior to the solar plant construction, asbestos containing materials (ACM) left behind by previous demolition activities covered roughly 50% of Areas 10 and 11. This ACM debris had been weathered and degraded by exposure to the elements. In preparation for the solar plant, the CDOE retained Tetra Tech and Carnow, Conibear and Associates (CCA) to assess the contamination and create a materials management plan. Tetra Tech and CCA simulated worst case dust generation conditions at three locations on the site in order to evaluate potential

\textsuperscript{238} ARCADIS U.S. Inc., "Former West Pullman Works Remedial Action Completion Report."
\textsuperscript{239} Ibid.
exposure to asbestos fibers. This involved a “rake test” in which the soil is agitated with constant raking during dry conditions to simulate the dust created by construction activities. Air samples taken during raking were analyzed in according to International Standard Organization Method 10312. The tests concluded that areas containing one type of ACM, Transite debris, posed a potential risk of asbestos exposure for construction workers. Based on discussion of the proposed construction activities between Tetra Tech and SunPower representatives, a construction worker exposure frequency of 30 days was calculated based on six five-day work weeks of construction activities.  

Figure 4.1

The City Solar site viewed from the northeast in September 2010 before construction began.

Construction involved clearing and grubbing, installing support columns, installing solar panels, excavating soil in order to construct a retention basin, trenching, and installing utility lines in paved and unpaved areas of the site. In order to avoid redistribution of ACM, areas with ACM were not to be graded, scraped, or bulldozed. ACM soil and debris containing ACM were either taken off site and disposed of or consolidated in areas that already contained ACM to

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241 Dave Graham. Personal Communication. March 24, 2010
prevent the contamination of other areas of the site. In the event of dusty conditions a water truck was brought on site to wet the soil and debris in order to limit the creation of ACM containing dust. A critical concern for IEPA was that contaminants not be moved from contaminated areas to non-contaminated areas. 242

CDOE strives to “keep as much material onsite as possible to minimize disposal costs, reduce road traffic and conserve landfill space.” Remediation costs were minimized by remediating the site to industrial standards using risk assessment, engineered barriers and deed restrictions. The city enacted a groundwater ordinance in 1997 prohibiting the installation of potable water wells in the city. The Illinois’ VCP requires complete evaluation of groundwater but allows the remedial applicant to rely on this groundwater ordinance to prevent human consumption. The result is that most brownfield sites within Chicago do not require groundwater remediation.

Figure 4.2 243

Removal of drums from Building 9 basement four potential recognized environmental conditions. These included three drums in the basement of Building 9, unidentified insulation-like material in the south central portion of the former International Harvester site, stained soil and hydrocarbon orders in one section, and a sump pit. Two underground storage tanks (USTs) were discovered as well. The three drums were determined to contain non hazardous solid waste and were transported to an appropriate disposal facility. The insulation-like material was determined not to contain asbestos and was buried where it had been found. The sump was removed without discovering additional contamination.

Navistar as the party responsible for the cleanup provided Exelon and SunPower with all of the relevant environmental documentation and site plans. On September 15, 2009, ARCADIS submitted the Remedial Action Completion Report for Area 12 to IEPA. SunPower and Turner Construction (Turner) began redevelopment on Area 12 in October 2009. During subsurface construction from October through November Exelon observed

Removal of both USTs resulted in the CDOE declaring a release for each when the excavation activities turned up stained soil smelling of hydrocarbons. The stained soils were placed back into the excavation areas and buried. Excavation of the second UST revealed a subsurface foundation wall that extended to a depth of more than 14 feet.

Upon request a representative of IEPA Leaking Underground Storage Tank division confirmed ARCADIS' could proceed with the SRP under the 20 day certification period, as opposed to the 45 day certification period. On December 8, 2009, ARCADIS conducted a site inspection of the FWPW site to evaluate impacts of solar plant construction on engineered barriers at the site. A number of barriers installed by Navistar had been penetrated or otherwise

![Figure 4.2](image)

Site plan showing location of engineered barriers, former USTs, and excavations. Upon completion of solar plant construction Exelon repaired and or reconstructed the barriers. On behalf of the City of Chicago and Navistar, ARCADIS conducted an inspection to verify and document that all barriers are intact or repaired.

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The engineered barriers exist to hold contaminated soil in place and prevent people from inhaling or ingesting contaminated soil. Therefore when Todd Gross, IPEA’s Project Manager for the FWPW site, learned of the disruption and reconstruction of the engineered barriers he became quite concerned that contaminated soil had been spread from one part of the site to another. This would result in recontamination of the site and a change in site conditions so that they no longer matched the ESAs and RACR. On March 24, 2010, Todd Gross met with representatives from Navistar, ARCADIS, CDOE, Exelon, SunPower, and Turner Construction for a briefing on the impact of construction on the engineered barriers and remedies implemented by the construction team. I was fortunate to be allowed to join the meeting. ARCADIS had provided Exelon, SunPower, and Turner with detailed site plans showing the location of all of the engineered barriers. The construction team overlaid their engineering drawings for the solar plant with the site plan showing the location of the engineered barriers. The combined site plan that resulted had a detailed identification grid so that Exelon’s project manager could show Gross which barriers had been ruptured and where the USTs had been removed. Any soil excavated during construction of the solar plant was put back in place and the barrier above it was repaired.

After the briefing Gross’ concerns had been largely addressed. He no longer feared that the site had been recontaminated but stressed that IEPA had to be able to verify the remedies in place during future inspections. After the briefing and related discussion the group inspected all of the engineered barriers that had been affected. The site contains approximately 40 engineered barriers, 9 of which were determined to need further repairs after touring the site with IEPA. Additional modifications to some engineered barriers will be necessary, but Gross characterized the issues as “minor.” The extensive and careful documentation by ARCADIS and the construction team allowed the project to proceed smoothly despite a very complex site with numerous engineered barriers. It demonstrates that the site complexities presented by brownfields can be managed efficiently with appropriate planning and information sharing.

**Putting the Project Together**

According to Dave Graham, City Solar is a case of “the stars aligning.” Graham is an Environmental Engineer for the CDOE and has been working on remediating and redeveloping

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brownfields in WIRA for ten years. One morning in February 2009 he was told to go to a meeting. Inside the conference room sat representatives from Exelon Corp. and SunPower. Exelon and SunPower wanted to build a large scale solar power plant in the Chicago area, maybe on the Lake Michigan waterfront, at one of the airports, or some other location where the project would be highly visible. Thus, the Exelon City Solar project is what a real estate developer might call a case of a “use looking for a site.” The Department of Environment and the Department of Community Development convinced Exelon and Sunpower to build the plant in West Pullman on Areas 10, 11, and 12. Such a large vacant industrial area in a dense urban setting is rare. The site offered beneficial infrastructure including an adjacent high voltage distribution line owned by ComEd, the electric utility serving the area and had excellent road access. Development interest was limited in the area and the City argued the project would be a big boost to the West Pullman community.

City Solar was a stimulus (ARRA) project from the beginning and it included close collaboration between the City and the Obama Administration to make the project a reality. Exelon Generation Company LLC (ExGen) is the subsidiary of Exelon that developed City Solar with SunPower. When the project was presented to City Council in May 2009, ExGen highlighted how the project would contribute to the goals of the federal stimulus bill, stating, “This project meets the overall objective of the American Recovery and Reinvestment Act of 2009 because it is a commercially feasible renewable energy project that is ‘Shovel Ready’ and can be rapidly deployed in 2009, helping to stimulate economic recovery.” The project depended on a Federal Loan Guarantee from DOE to be economically viable. ExGen and SunPower’s project timeline was structured around this loan:

Given the approval date for the loan guarantee from the U. S. Department of Energy Loan Guarantee Project Office is unknown, the project will be executed in two phases. The second Phase will follow loan approval. The first phase involves completing the design, ordering material, establishing security, clearing the property, and installing 3,900 posts in “areas 10 & 11”, the western 20 acres of the site that does not require soils remediation. In the end, they decided to go ahead with the second phase before receiving the guarantee. The DOE Loan Guarantee Project Office had become backlogged from the increase in applications

247 Dave Graham. Phone Interview. April 1, 2010
249 Ibid. Page 6
that resulted from the additional loan guarantee funds made available by ARRA. ARRA also included bonus depreciation under the Modified Accelerated Cost Recovery System (MACRS). Most types of solar, geothermal, and wind energy technologies have a depreciable life of five years, as do several other renewable energy technologies. ARRA included bonus depreciation such that “the owner is entitled to deduct 50% of the adjusted basis of the property in 2008 and 2009,” with the remaining 50% of the adjusted basis to be depreciated over the regular depreciation schedule. ExGen wanted to take advantage of this bonus depreciation, which meant that the project had to be at least partially operational by December 31, 2009. Therefore they decide to proceed to Phase II confident that the loan guarantee would eventually be approved.

**Figure 4.5**

Graph showing the levelized cost of electricity per megawatt and the contribution of federal subsidies in covering the costs.

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http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US06F.

Table 4.1
City Solar
Sources and Uses of Funds (In Millions)²⁵²

<table>
<thead>
<tr>
<th>Sources</th>
<th>Uses</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE Loan</td>
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<tr>
<td>Exelon</td>
<td>Owner's Construction Costs</td>
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</tr>
<tr>
<td><strong>Total Project Funding</strong></td>
<td>Construction Contingency</td>
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<tr>
<td></td>
<td>Construction Subtotal</td>
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</tr>
<tr>
<td></td>
<td>Capitalized Interest</td>
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</tr>
<tr>
<td></td>
<td>Financing Fees</td>
<td>$0.65</td>
</tr>
<tr>
<td><strong>Total Source of Funds</strong></td>
<td>Total Uses of Funds</td>
<td>$63.49</td>
</tr>
</tbody>
</table>

Dollar amounts are in nominal (2009) dollars

ExGen and SunPower Corporation entered into an Engineering, Procurement and Construction contract in which SunPower was responsible for design, engineering, procurement, and construction of the facility. According to Exelon, “SunPower was chosen for the following reasons: (1) it is vertically integrated as both a manufacturer of solar panels and as a system installation company; (2) its solar cell conversion efficiency is the highest in the industry, allowing for the most energy output possible on a given site; (3) it has deep experience in design and installation; and (4) its officials immediately and enthusiastically endorsed the concept – the utilization of City-owned land in order to build a 10 MW project on a brownfield site.”²⁵³

SunPower forms joint ventures to develop and sell solar power plants to partners such as developers, independent power producers, utilities and financiers. These partners buy power plants developed by SunPower and enter into long term operating and maintenance service agreements with the company’s Service division. ExGen owns and controls approximately 33 GW of capacity, which is among the largest generation portfolios in the country. It is also the largest wholesale marketer of wind energy east of the Mississippi River.²⁵⁴

²⁵³ Exelon Generation Company LLC., "City Solar, Chicago I.L.: Presentation Material for C.D.C. And City Council ”.
²⁵⁴ Ibid.
SunPower will be responsible for operations and maintenance and will staff the facility during business hours. The company will continuously monitor the facility and its performance. Exelon is installing security cameras and providing security guards. Exelon Solar Chicago LLC was created as wholly owned subsidiary of ExGen to own the facility and sell the electricity and associated RECs produced by the facility to ExGen.

The passive nature of photovoltaics is a selling point for gaining community support. Exelon called this passive nature “a key virtue of solar energy.” It argued before City Council that, “Once commissioned and operating, the facility will passively track the path of the sun throughout the course of the day, making no noise and emitting no products.” The Department of Zoning and Land Use Planning agreed, deeming the solar plant a Minor Utility and Service, which is an as-of-right use in WIRA. According to Exelon, this determination was made because of “the passive nature of the proposed use, the absence of any significant adverse impacts on surrounding areas, and the potential environmental benefits gained by reducing Chicago’s dependence on fossil fuels.” Because the project did not require a Special Use permit, no Zoning Board of Appeals action was required and the project moved through the normal building permit process.

SunPower’s designers and engineers worked with the Chicago-based engineering design firm Environmental Design International Inc. to design the system in accordance with local codes. After the building permit application was submitted, the Chicago Department of Zoning and Land Use Planning examined the full set of plans for zoning and landscape review. After Zoning and Land Use Planning approval, the plans were referred back to the Chicago Building Department for a full review. This included structural, fire, electrical, storm water, streets and rights of way, and contaminated soils removal review.

**Strong Political Support Enabled Full Cooperation**

The City Solar project enjoyed strong political support from the time Exelon and SunPower first approached the City onward, and this support motivated the level of cooperation necessary to move the project forward quickly. There were several reasons the project received such a high level of political support. It brought non-polluting development to a blighted

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256 Ibid. Page 5
neighborhood that had experienced minimal development in several decades. Because it is the largest urban solar power plant in the nation and a brownfield redevelopment, City Solar is an unprecedented project that will improve the neighborhood’s image. The fact that it was a stimulus project that supported the President’s clean energy agenda added to its appeal. Along with solar energy training programs it brings hope that it will lead to further development of the clean energy economy in Chicago. The City of Chicago sees the project as an important step towards its goals of reducing power plant emissions by 20% and developing a green industry workforce in Chicago.\textsuperscript{257}

City Solar is a breakthrough demonstration project. The project is remarkable because it is the largest urban solar power plant in the U.S. and is located in a region not known for deploying solar power. Exelon highlighted these aspects and linked the project to the Obama Administration clean energy goals:

To our knowledge, City Solar would be the largest ground-based PV system installed in a major urban setting in the United States and, we believe, the world. In addition, City Solar will be built in the Midwest, where only a few small rooftop projects have been attempted. We believe that the breakthrough application of large-scale solar power in non-traditional regions as introduced by City Solar may spur similar installations, thus expanding the overall contribution of renewable solar power to the country’s generation portfolio, a key Obama Administration platform. The 39-acre site will be visible from the air as travelers fly into and out of Midway Airport. It will serve as a landmark and source of pride for the West Pullman and greater Chicago communities.\textsuperscript{258}

Although not mentioned in the previous quote, the fact that it is a brownfield redevelopment project is also extraordinary. The significance of the project was recognized immediately by public officials. Everyone in city government was supportive from the beginning, including the Mayor, Alderman Carrie Austin of the 34\textsuperscript{th} War, the Departments of Environment, Community Development, and Zoning and Land Use Planning.

Alderman Austin gave her support to the project in February 2009. She supported the plan for cleanup and for the city to lease the land to Exelon, and supported the Obama Administration’s clean energy agenda. The Alderman had to approve anything involving a city ordinance, whether it was removing an ally from the city’s street system, approving wrought iron fencing instead of chain-link fencing, or giving permission for Turner and SunPower to use City Owned property as a staging area.

\textsuperscript{257}———. "City Solar, Chicago I.L.: Presentation Material for C.D.C. And City Council ".
\textsuperscript{258}———. "City Solar, Chicago I.L.: Presentation Material for C.D.C. And City Council ". Page 8

104
The community’s main concern was cleanup. Community members want to see issuance of a No Further Remediation letter as proof that the site is clean. SunPower’s design will improve the site through perimeter landscaping and decorative fencing surrounding the facility. Low-growing shrubs that will not shade the solar modules will be planted throughout. As part of the storm water management plan the site is surrounded by a berm made from the materials collected when the site was cleared for grading. The berm will be planted with native grasses.

According to Chester Wilson, Chief of Staff for Alderman Austin, the site will be tourist attraction. A visitor center with indoor and outdoor observation areas will be built at the City Solar site. Solar technology training programs are another community benefit. According to Wilson, SunPower volunteered a training program before the Alderman even asked for it. The Alderman’s goal is to make sure the training programs benefit the community. SunPower asked for six locations, and the Alderman suggested two elementary schools, White Edward and Johnnie Coleman Academy, two high schools, Christian Fenger Academy High School and Julian High School, and two colleges, Chicago State and Olive Harvey.259

The completed project redevelopment a piece of contaminated property that would not have been developed otherwise because it presented numerous physical constraints. The city did not have money to remediate it to a point where it would be buildable for other uses. The site presented constraints in the form of deep trenches and numerous engineered barriers. Development potential was further limited because the building foundations that remained on the site were so deep and difficult to remove. The only reasonable way to develop on the property would be to backfill, grade, install slab, and build on top of the slab.

Alderman Austin is the Budget Chairman for the city. Thus, she wanted to spread the project’s economic benefits and make sure that qualified people from the surrounding area were hired for construction and other jobs. Workers were hired from the 9th, 34th, 21st and 19th Wards. However, one area for which the neighborhood could not supply workers was specialty welding. Many of the union welders in these four wards were not qualified to do the specialty welding required for the solar installation. The project also sourced from two local steel companies. This project created approximately 50 domestic offsite and 150 onsite jobs.

259 Chester Wilson. Interview. March 25, 2010
including engineering, electrical, and construction. Additionally, seven to eight full- and part-time workers will be hired to maintain the facility once it is operational.

Wilson believes that if there is a viable proposal for a site that involves solar or wind turbines then the Aldermen will be behind it, so there is not a need for as-of-right zoning for solar or wind energy conversion systems. Wilson remarked that “The building department jumped all over [City Solar] and was like, hey, whatever you need to happen, whatever we need to do to get it done, let’s get it done.” The biggest issue was landscaping—that is, what types of shrubbery and what types of trees? The city requires less landscaping inside of an industrial park than elsewhere. The applicable ordinance only covered what was outside of the fence. The Alderman was interested in landscaping inside the fence where it is protected and can protect the solar panels from vandalism. The community requested the berm, in part, for security reasons. During the project, a couple of the solar panels were vandalized with rocks.

A lot of pride was expressed by residents at the Victory Heights/Maple Park Advisory Council meeting on March 24, 2010. In the words of one long-time resident, the WIRA “used to look pitiful.” Prior to the completion of the project, some properties had burned-out buildings and cars. There were organized illegal operations to scavenge building materials from the abandoned buildings. The scavengers would cut-off the locks put on the entry gates by the city and replace them with their own locks. As an indication of how unsafe the area had become at one time, Dave Graham used to worry about finding a dead body on one of the sites in the

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Figure 4.6

3D rendering of an aerial view of City Solar from the northwest (proposed visitor center not shown).

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This project is turning a contaminated brownfield site that had been vacant for decades into one that will pay rent, payroll taxes, and property taxes to the City. Exelon agreed to pay $110,000 in annual rent to lease the land. SunPower plans to use the facility to develop training and apprentice programs to train technicians for future solar projects.

Conclusion

The City Solar project shows that the complexity and uncertainty of brownfield sites can be overcome by proper planning facilitated by close cooperation and information sharing between stakeholders. Arcadis and the construction team demonstrated a high level of professionalism in managing the remediation of the site concurrent with construction of the solar power plant handling new environmental issues as they arose. The solar plant installation led to the disruption of engineered barriers and that could have resulted in a serious conflict with IEPA. However, their experience, professionalism, and careful documentation enabled them to quickly address IEPA’s concerns quickly and keep the project moving forward.

Over the previous decade, the city had implemented a number of measures that created suitable conditions for the City Solar project. Under the city’s brownfield program the city acquired and assembled properties, and conducted building demolition and site remediation activities. Navistar also contributed by taking responsibility for the FWPW site and actively pursuing appropriate remediation. As part of the redevelopment plan for WIRA the city made a number of infrastructure improvements. As an industrial planned management district the area was maintained for industry and the zoning permitted a solar photovoltaic power plant as an as-of-right use. Thus, an exceptionally large area was available with suitable conditions when Exelon and SunPower approached the city in search of a site for their project.

The project converted a blighted and dangerous property into one with a productive power plant that is generating revenue for the city through the land lease and real estate taxes. The project generated construction jobs and will continue to produce community benefits through solar energy training programs and improved community image. Because it is also a clean energy demonstration project with support of the White House, the project received strong support.

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262 Dave Graham. Interview. March 24, 2010
political support from the time the concept was announced. This political support motivated the stakeholder cooperation necessary to meet the deadline for stimulus fund eligibility.

The project supports the arguments for locating renewable energy on brownfields. The solar power plant took advantage of onsite infrastructure and its construction was eased by excellent road access. It was built on a very complex site with limited development potential. The site is remarkable for being built in a heavily populated area in close proximity to a large residential neighborhood and elementary school. Ultimately, the community was highly supportive of developing renewable energy generation on this brownfield site.
Chapter 5: Cross-Case Comparative Analysis

Introduction

The Brockton Brightfield, Steel Winds, and City Solar projects differ in a variety of ways, including technology, project size, ownership structure, financing strategy, and state and local policy context. Each project faced unique challenges in addition to the common brownfield development challenges of cleanup costs, managing liability and uncertainty, navigating complex bureaucratic processes and coordinating multiple stakeholders. This chapter compares how each project overcame these common barriers. It also explores the unique challenges overcome by each project and draws lessons and policy implications from those experiences. This cross-case analysis reveals the importance of close cooperation among stakeholders and strong political support from state and local officials in completing these projects. Strategies for reducing cleanup costs, managing uncertainty, and properly phasing project development are suggested. These three cases illustrate different steps local governments can take to encourage renewable energy development on brownfields. The cases demonstrate the practical validity of arguments for siting solar and wind farms on contaminated lands. They benefited from existing onsite infrastructure and industrial zoning. Communities are supportive of renewable energy production on these sites, just as proponents of siting renewable energy facilities on contaminated lands argued they would be. The communities in which these projects were built believe that such projects improve the local image. This image boost is highly valued by local officials and residents.

Ownership Models

The table on the next page summarizes the comparison of the three successful projects. Note that they are all structured under different ownership models: two variations of public private and one fully private. In the case of the Brockton Brightfield the solar power plant is publically owned by the City of Brockton but the land is leased from a private company, Bay State Gas. Steel Winds is privately owned and located on private land leased from Tecumseh Redevelopment Inc, while City Solar is privately owned by one company, operated by a second company, and on sited land leased from the City of Chicago.
<table>
<thead>
<tr>
<th>Table 5.1 Project Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Name</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>Capacity Size (Land Area)</strong></td>
</tr>
<tr>
<td><strong>Cost</strong></td>
</tr>
<tr>
<td><strong>Ownership</strong></td>
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<tr>
<td><strong>Year Completed</strong></td>
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<tr>
<td><strong>Time to Develop</strong></td>
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<tr>
<td><strong>Public benefits</strong></td>
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<tr>
<td><strong>Cleanup Paid By</strong></td>
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<tr>
<td><strong>Public Financial Support/Incentives</strong></td>
</tr>
<tr>
<td><strong>Unique Challenges</strong></td>
</tr>
</tbody>
</table>
These different models have pros and cons from a public benefits perspective. If the power plant is publically owned tax payers will capture a larger direct benefit from the energy production. The city can save money by producing its own electricity for use in public buildings and hedging against volatility in electricity markets. It can also generate revenue by marketing the associated RECs if state policy allows. In Brockton the long term contract with Constellation New Energy provided the City with a source of fixed price electricity. However, the project had very high transaction costs. It took six years to develop and an extraordinary commitment of time and energy by the mayor and project coordinator. It was only possible because of an exceptional fundraising campaign and substantial political support throughout state government. Many local governments are not able to dedicate the time and resources necessary to make such a project a reality.

Large-scale renewable energy facilities are complex development projects that require specialized knowledge and expertise, expertise that local governments typically lack. Private developers have greater financial flexibility and can take advantage of tax credits for renewable energy investments that local government cannot. In short, with the exception of publically owned utilities, local governments are ill suited to developing large-scale renewable energy projects.

The public land/private power plant developer is an appealing model. It offers government the opportunity to participate in and encourage renewable energy development within the bounds of typical governmental operations. Leasing publically owned land to a private developer produces revenue through lease payments and through property taxes, unless property taxes have been waved as an incentive. This model captures more revenue than a fully private development model with much less administrative burden for local government than the public ownership model.

When the land and power plant are privately owned, as with Steel Winds, the local government will receive revenue only through property taxes or PILOTs, but not as a direct result of electricity and REC sales.264 This model does not create any unusual administrative burdens for local officials. Rather it fits within the normal functions of municipal government in terms of approving site plans, providing zoning approval, granting building permits, etc.

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264 This does not have to be case. Minnesota’s offers an example of a production based PILOT system in which the revenue to the local government is a per kWh payment. This is discussed in more detail in the section on recommendations for state action.
Working with private property owners to attract private renewable energy development to brownfields may be an effective approach for local governments to take because it takes full advantage of the financial flexibility and specialized expertise of the private sector.

**Overcoming Common Challenges to Brownfield Redevelopment**

**Cleanup Costs**

The projects differed in the level of cleanup costs they faced and how these were overcome when they posed a challenge. Cleanup costs were not a challenge for the City of Brockton in developing the Brockton Brightfield. Bay State Gas had completed the majority of remediation before the city approached it in regards to developing a brightfield. The City of Chicago used several strategies for handling cleanup costs. One was to manage as much material on site as possible to minimize the expense of transportation and disposal. The Chicago groundwater ordinance reduces costs by eliminating the need for expensive groundwater remediation. Remediating the site to industrial standards using risk assessment, engineered barriers and deed restrictions minimized costs. Funding for cleanup came from several sources. The EPA funded approximately $950,000 of cleanup on the International Harvester site through a Supplemental Environmental Project established in 1998. The City and Navistar executed a cost sharing agreement for remediation of that site. Annual rent payments from Exelon to the City of Chicago will cover approximately $200,000 in additional remediation performed in preparation for power plant construction.

Of the three case studies, Steel Winds offers the most exciting strategy for minimizing costs on difficult sites, which is to develop less polluted sites first by carving such parcels out of the property. BQ Energy was able to minimize its costs in this way. BQ Energy worked with Tecumseh to separate a moderately polluted parcel from the rest of the property for purposes of taking advantage of the state’s BCP. This allowed BQ Energy to build on a site that required minimal remediation while gaining access to liability protection and to tax credits that composed a significant amount of project financing. Steel Winds is significant as a revenue producing operation that coexists with continuing site remediation. The property owner is receiving revenue through rent payments and has developed a productive use on part of the property with limited development potential for geotechnical reasons. It will be a number of years before
larger development takes place on the Lackawanna Works site. Steel Winds is a sign of progress that will endure during the long redevelopment process of the entire site. With property owner cooperation, renewable energy developers can use “carving-out” as a strategy to reduce cleanup costs for brownfield projects. This strategy facilitates phased development on difficult sites as less polluted sites are developed first creating operations that will produce revenue during ongoing remediation. Property owners may view them as interim uses during long-term remediation that can be replaced by more lucrative commercial or residential development should the real estate market strengthen in the future.

If a state VPC uses risk-based or tiered cleanup standards then choosing renewable energy as a reuse will reduce cleanup costs. Such uses lead to minimal human exposure as site access is restricted to construction and maintenance personnel. Photovoltaics can be built on top of a site with little or no disturbance of engineered barriers or contaminated soils. Eliminating the need for excavation reduces cleanup costs by avoiding the need to treat and dispose of contaminated soils.

**Liability and Risk Management**

All three projects completed the VCP in their respective state. These programs provide some measure of liability protection in the form of No Further Remediation or No Further Action (NFA) letters or Certificates of Completion. These documents release the responsible party from liability to the state. They assure the applicant that the state government will not attempt to force them to perform further site remediation in the future as long as the applicant adheres to the stipulations of the remedial action and site management plans including long term maintenance of site controls. The sale of Lot 55 from the City of Brockton back to Bay State Gas eliminated the City’s liability exposure and increased Bay State’s control of the site increasing the company’s ability to manage their liability.

The situation is more complex in the case of Solar City. The city has some liability exposure as the owner of Areas 10 and 11. While the City owns Area 12 Navistar remains the liable party and is pursuing a no NFR from IEPA through the SRP. Exelon will implement institutional controls to manage its liability. Upon completion of the solar power plant the site will be well controlled. The solar modules will be protected by a fence and security personnel. Site access will generally be restricted to operations and maintenance personnel with limited
access granted to students in SunPower’s training programs and other individuals Exelon or SunPower choose to allow on the site. The primary public access point will be the observation tower.

BQ Energy obtained a Certificate of Completion through the New York BCP which releases it from liability to the State for further remediation provided it adheres to the SMP. Certificates of Completion and NFR are transferred with property ownership or control. The ability to obtain the Certificate of Completion facilitated the development of Steel Winds I. The inability of Steel Winds II to receive a Certificate of Completion has complicated lease negotiations and hindered its progress. The parties have attempted to manage their liability through legal language in the lease agreement.

**Stakeholder Cooperation is Essential for Success.**

All three projects demonstrate an impressive level of cooperation among stakeholders. They all represent genuine partnership in which all parties are working together and committed to the project’s success. The Brockton Brightfield benefited from the full cooperation and support of Bay State Gas, which assigned its environmental consultant to work with Spire Corp to conduct the technical feasibility study. Bay State Gas also paid for landscaping improvements that were essential to gaining community support. Ribeiro and Mayor Yunits worked closely with staff at the MTC to craft a successful unsolicited grant proposal that was essential the projects financial viability. They also worked with other stakeholders to build substantial political support throughout state government.

In the case of Steel Winds, BQ Energy worked closely with Tecumseh’s environmental and engineering consultants, Benchmark and Turnkey, to meet the EPA’s requirements to release the Steel Winds site from the RCRA consent order on the BSC Lackawanna Works property. They also worked together to admit the site into the state’s BCP. The effort to release the site from the EPA’s jurisdiction benefited from the support of the Buffalo area’s federal representatives and the cooperation of EPA and NYSDEC. Benchmark worked with BQ Energy on the layout of the turbines and integration and modification of the electrical infrastructure. The development team, the City of Lackawanna, Erie County, the Town of Hamburg, and NYSDEC all cooperated to complete the SEQR process, which proceeded in record time.
The Solar City project offers an impressive example of how cooperation can help to manage the uncertainty of working on a brownfield site. It demonstrates that the efficient management of the site complexities presented by brownfields is possible with appropriate planning and information sharing. Navistar cooperated fully by directing its environmental consultant to share all relevant site plans and environmental documentation with the construction team of Exelon, SunPower, and Turner. The extensive and careful documentation by ARCADIS and the construction team allowed the project to proceed smoothly on a very complex site with approximately 40 engineered barriers. Armed with this information and working closely, ARCADIS and the construction team effectively worked through surprises they encountered during site preparation. For example the construction team worked with ARCADIS to perform additional remedial activities during site preparation and to remedy site disturbances that resulted from power plant installation. The Mayor’s Office, Alderman Austin, the Departments of Environment, Community Development, Buildings, and Zoning and Land Use Planning, all worked with Exelon and SunPower to move this project forward quickly.

**The Importance of Political Support**

All three projects benefited from overwhelming political support extending from the community up to level of federal government. The projects converted blighted properties into pollution free, revenue generating facilities. Perhaps more importantly they improve the image of communities associated with industrial decay and contamination. As highly visible symbols of progress, modernization, and a commitment to renewable energy, the communities hope the projects will spur development of a larger renewable energy industry with associated local manufacturing. For these reasons local officials were supportive and took seriously their responsibility to build broader public support. In all three cases they were able to do this. Political and public support made possible the cooperation between public and private stakeholders discussed in the previous section.

A driver of political support is the image benefits these projects are expected to bring. The Brockton Brighfield was part of a larger rebranding project of the city as “solar champions” seeking to market the city as committed to solar energy in order to attract a solar manufacture. As early as the late 1990s a wind demonstration project on the Buffalo waterfront was seen as a way to catalyze sustainable development and recast the area's image. Multiple stakeholders in
Steel Winds cited the value of image improvement provided by the project. Eagan said the positive impact on the areas image is worth more than the PILOT. Stakeholders there also hoped that it would attract a manufacture of wind turbine or photovoltaic components. A number of parties have since contacted Tecumseh with proposals for renewable and conventional energy projects. Mayor Polanski stated that the project put Lackawanna on the map. Value placed on image is further demonstrated by the logos on the wind turbines. Local officials expect City Solar to be a tourist attraction. It is a signature demonstration project that the city hopes will spur further solar development and growth in the local clean energy industry.

The City of Brockton built political support from the ground up. Solar energy development had political support before Ribeiro became aware of DOE’s Brightfield program. Ribeiro’s work was made possible because through the support of Mayor Yunits. With the Mayor’s support, she brought Spire Corp to Brockton and reached out to Bay State Gas. Early success at winning grants to develop the concept and earning support in the neighborhood earned the backing of the MTC’s Director, Bob Pratt. Pratt committed to work with the project team to convince the MTC Board to fund an unsolicited grant request. The Mayor expended significantly political capital building support among state agencies. He was assisted by the President of Bay State Gas, the local chamber of commerce, Bob Pratt and other stakeholders. Strong support in state government lead to the eventual passage of two acts of special legislation making the project possible. The project team was also assisted by Senators Kerry and Kennedy, and Congressman Stephens Lynch in lobbying for federal funds.

The case of City Solar is quite different. Exelon and SunPower had the support of the Obama Administration prior to approaching the City of Chicago. After gaining the support of the Mayor’s Office they met with Dave Graham in CDOE. Here political support expanded top down from the federal government, to the city government, which then garnered public support in the community. This support led to full cooperation from multiple departments of city government, which was necessary for the project to be completed in the short time required to remain eligible for federal stimulus funds.

In the case of Steel Winds there were a number of actors building support for wind energy before the project materialized. Thus the support was their when BQ Energy proposed Steel Winds. Before this the County and the State, through NYSERDA, were interested in wind energy development on the Lackawanna Works site. Green Gold Development and the Wind
Action Group had also been working to build public support for wind energy in the area since 2001. The developer began organizing the stakeholders in 2003, two years before announcing the project.

Steel Winds I is an urban wind farm that used the largest turbines on the market at the time. Yet, from the start it received overwhelming support from the residents of Lackawanna. This is quite remarkable for a utility-scale wind project. Public support came more slowly in Hamburg, most likely due to the residents’ earlier experience with the faulty wind turbine at the sewerage treatment plant. After several months of deliberation the Town came out in support enacting a progressive wind ordinance. These findings strongly suggest that political support for large-scale renewable energy projects, particularly wind, is easier to obtain when the site is a brownfield.

**Lessons for Local Governments**

Before Steel Winds was proposed Erie County joined with NYSERDA to perform a wind resource study. The study demonstrated that the Erie County Shoreline had significant wind resources serving to attract the attention of wind power developers. Mapping solar and wind resources at brownfield sites is a useful action local governments can take to promote related development. The quality of the renewable resource is one of the most important factors for determining whether a renewable energy project will be successful at a site.

The County, the City of Lackawanna, and Tecumseh Redevelopment signed a memorandum of understanding for redevelopment of the BSC Lackawanna Works site that included wind energy in the master plan. BQ Energy was already in negotiations with Tecumseh regarding the development of Steel Winds. Although tentative, the MOU was an important early endorsement of renewable energy development on the site.

Chicago acquired and assembled parcels, improved infrastructure and maintained the area, all to make the site more attractive to developers. They also pursued responsible parties to pay for the cleanup, began the remediation process, and entered sites in the state’s VCP. When Exelon and SunPower expressed interest in developing a project in the Chicago area the City had an appropriate site prepared for them. Had the developers approached the City a few years earlier the site would not have been ready for development. Alternatively, had redevelopment activities in WIRA been more successful the sites may have been developed for other uses.
Given the complexity of the site in terms of the number and variety of engineered barriers, the latter scenario was unlikely.

It is notable that the industrial zoning in WIRA allowed for solar power plants as-of-right. The Department of Planning and Zoning determined the solar power plant was a Minor Utility and Service. It is unclear how explicit the as-of-right status is in the ordinance. Did the department make this determination because of the political support for the project or are solar power plants or photovoltaic arrays explicitly listed in the ordinance as a Minor Utility and Service? For a municipality interested in attracting renewable energy development to brownfield sites it would be better to explicitly allow for renewable energy technologies in the zoning ordinance and providing detailed parameters of what is and is not permissible. Potential developers will be encouraged to invest if uncertainty is reduced by spelling out what is permitted.

As previously described, except for municipal utilities, local public agencies do not have the appropriate skill set for developing large-scale renewable energy projects. However, the experience of the Brockton Brightfield offers one critical lesson for City’s that want to pursue their own brownfield to renewable energy project. Before committing time and resources to developing a project proposal and performing technical and financial feasibility analysis, local officials should first conduct a legal analysis to make sure they have legal authority to own, operate, finance and develop a renewable power plant. They should also explore whether their bonding authority allows for the long-term financing needed for renewable energy to be cost effective. If local officials determine there are no obvious legal barriers they can proceed by locating a site with limited development potential (capped landfills for example) supporting electrical and transportation infrastructure, and high quality solar or wind resources. Once a site is located they can begin more detailed technical and financial feasibility studies and fundraising efforts.

**Findings**

Successfully completing renewable energy development on brownfields requires strong public support in the local community and the active support of state, local, and even federal officials throughout the life of a project. Political support is a necessary ingredient to sustain the level of cooperation required by these projects. Close cooperation, clear communication of
expectations, and free sharing of information is necessary to overcome the complexity, uncertainty, and risks of redeveloping brownfield properties. These projects require a true partnership between local officials, regulators, property owners, and developers.

Both brownfields redevelopment and renewable energy development are complex undertakings on their own. It is therefore reasonable to ask if using brownfields exacerbates the complexity of renewable energy development. The answer is yes and no. The installation of the wind towers or solar panels is likely to be complicated by the presence of engineered barriers or other brownfield site constraints. At the same time, its installation is facilitated by onsite infrastructure. For instance, the presence of electrical infrastructure allows for easy interconnection and avoids the complicated process of laying new transmission that rural sites may involve.

Judging by the experience of Steel Winds, the use of brownfield sites also simplifies the environmental review process. Renewable energy projects, particularly wind farms may require environmental impact statements. The use of industrial sites can reduce the scope of the environmental review and thus the speed of the permitting process as such sites typically have less wildlife and require the removal of less vegetation than undeveloped land more commonly targeted for wind farms. Industrial areas are also less likely to contain potential archeological sites.

Nothing in this study suggests that locating a project on a brownfield denies renewable energy developers financing sources they typically leverage. The Steel Winds case shows that environmental liability is a concern for financiers. However, it suggests that such concerns can be effectively addressed by the indemnification provided by a state VCP. According to Paul Curran, it was not difficult for BQ Energy to obtain a development loan for Steel Winds. The renewable energy industry is less vulnerable to the financing difficulties brownfields can create because tax equity typically comprises a significant portion of project financing. Brownfield status does not affect the eligibility for the tax credits that drive renewable energy development.

There is a growing pool of sophisticated wind and solar power companies that are willing to take on brownfields redevelopment. These developers are experienced in assembling corporate financing, marketing RECs and developing power-purchase agreements in diverse

[^265]: Paul Curran. Telephone Interview. April 2, 2010
settings. All levels of government should mobilize to implement policies that harness their expertise to remediate contaminated sites and expand renewable energy production.

Recommendations

Local Actions

In many ways renewable energy projects are similar to other development projects and thus could be served by traditional brownfield redevelopment programs such as the ones reviewed in Chapter 1. Local government interested in promoting large-scale renewable development should incorporate this interest into their comprehensive plan. The first step is to inventory sites and characterize their potential for renewable energy development. Sites that are suitable candidates are ones in weak real estate markets with few competing uses and that have high-power transmission lines and electric substations. My findings suggest that industrial sites that are considered “eyesores” are great candidates for wind turbines or photovoltaics because the visual impacts are likely to be perceived as positive rather than negative. Sites that have ongoing remediation needs or other site controls that limit development options should also be prioritized for renewable energy. The quality of the wind or solar resource is probably the most important factor in determining if a site is well suited to renewable energy production. Thus evaluating these resources should be incorporated into the larger inventory process. After identifying areas well suited to renewable energy development the comprehensive plan should be updated to indicate those areas targeted for renewable energy.

The municipality should also modify its zoning code to explicitly allow for wind turbines, photovoltaics, or other energy facilities. A well designed ordinance that sets clear parameters on what is allowed where and that establishes standard procedures, guidelines, and timelines for approving renewable energy facilities can be very helpful in attracting renewable energy developers. The permitting process can create uncertainty and time delays for developers, so the more a municipality can reduce these delays and uncertainty the more attractive it will be to developers. Another use of zoning power that would support renewable energy development would be the establishment of solar or wind access laws or easements restricting construction on adjacent parcels to guarantee access to the resource for the parcel targeted for energy development. The ability of local governments to do this will vary depending on state law.
Depending on state law, local governments may pursue a Generic Environment Impact Statement (GEIS) to streamline wind project permitting in the future. New York State allows local governments to do this. Municipalities pursuing wind energy development should prepare a GEIS for wind energy development as part of its comprehensive plan. The GEIS would identify mitigation measures to be implemented through zoning standards, thereby eliminating the need for state environmental quality review studies for individual proposed wind projects and streamlining the review process for future developers.266

Multiple properties with good wind or solar resources could be assembled and marketed for the development of a renewable energy farm. If well suited parcels are noncontiguous, the City could lease them all to a single developer to promote economies of scale (this may work better for solar than wind.) The energy needs of the surrounding properties, or other potential industries for the site should be evaluated to determine opportunities for behind the meter sales.

As part of the inventorying process the City should explore the possibility for phased-development. Large heavily contaminated sites may offer the potential to use a portion of the site for renewable energy. Thus the site inventory would include details about the location and extent of contamination on different parts of the site. The phased-development strategy would promote the option to develop renewable energy facilities on less polluted sites first by carving them out from the larger site. Depending on the state’s VCP, it may be possible to separate a less polluted brownfield site from a larger Superfund or RCRA site in order to qualify for the VCP and associated incentives. The Steel Winds project demonstrates how beneficial this can be.

State Actions

States should modify their VCPs, if necessary, to facilitate the division of potentially contaminated sites into smaller brownfield parcels so that less polluted properties can complete the VCP and be redeveloped more quickly. In general, New York’s BCP offers a good model for a VCP because it provides substantial tax credits that adequately compensate for the increased administrative burdens of participating in the program. The liability release provided by the program is also an effective driver for development.

States should amend their zoning enabling legislation where necessary to encourage brownfield-to-renewable energy projects. New Jersey offers an example of action that can be taken at the state level. In March 2009 New Jersey enacted state legislation (A.B. 2550) that amended the Municipal Land Use Law (P.L.1975, c.91) permitting facilities using solar energy technologies, photovoltaics, and wind energy systems for electricity production as permitted uses in an industrial-zoned parcel or parcels of 20 contiguous acres or more, provided the parcel or parcels are owned by the same person or entity. The law applies universally to all municipalities in the state.\(^{267}\)

Property tax exemptions for renewable energy projects can be effective incentives for such development. However, as seen in Steel Wind, when such policies encourage supplementing lost tax revenue with PILOTs they can cause conflicts and delay projects. States with policies similar to New York’s that allow local governments to opt-out of tax exemptions should standardize PILOT payments. The standard could go as far as establishing a set sum per megawatt and requiring that it be divided among the taxing authorities in the same proportion as property taxes. Another option would be to set the share schedule but still allow the local government to negotiate the sum with the developer, which would alleviate at least some of the contentiousness between taxing authorities. Minnesota provides an example of an alternative PILOT system. The state has a production based system with four tiers, large-scale, medium-scale, small and systems under 250 kW. Utility-scale projects, defined as those of 12 MW or greater pay .12 cents per kWh, systems between 2 and 12 MW pay .036 cents per kWh, systems between 250 kW and 2 MW pay .012 cents per kW, and those under 250 kW pay nothing.\(^{268}\) The drawback of a production system is revenue will vary annually as electricity production fluctuates. A fixed-sum system is preferable for budgeting purposes.

Twenty-nine states and the District of Columbia have Renewable Portfolio Standards. An increasing number of states have special carve-outs or credit multipliers for preferred technologies. Solar technology is the most common example.\(^{269}\) State RPS can likewise be


\(^{268}\)A.W.S. Truewind L.L.C., "Wind Energy Toolkit."

modified to either mandate renewable energy development on previously developed land, or provide a credit multiplier for such development.

Federal Actions

The EPA should develop a standard protocol for releasing portions of sites subject to EPA enforcement actions and consent orders from the larger property. The EPA has worked with many states to develop MOUs endorsing state VCPs. The EPA can work with state environmental agencies to modify, or develop new MOUs to facilitate the carve-out option.

The federal government provides critical tax subsidies to for solar and wind energy projects. The ITC is an important financial driver for solar projects, and the PTC is likewise critical to the viability of the wind energy industry. Offering a higher deduction under these current tax credit programs for projects on brownfield sites could provide a strong incentive. For example, the ITC provides a credit for 30% of project costs for solar projects. This could be raised to 35% if the site is completing a VCP or other remediation program. The PTC offers a 2.1 cent/kWh benefit—this could be slightly higher for brownfield projects.

Robert Colangelo, Executive Director of the National Brownfields Association says there really are not any incentives for developing on a brownfield. There are programs that try and level the playing field, but from the developer’s perspective it always easier and cheaper to develop a parcel of undeveloped land. Renewable energy is a great fit with brownfields because commercial RE projects require low-cost land to compensate for the expensive upfront capital investment needed to construct the plant. According to Colangelo, low-cost loans or loan guarantees for brownfields development would be very helpful. The DOE could prioritize Loan Guarantees for brownfield sites.

270 Robert Colangelo, Phone Interview by Author. March 31, 2010.
Conclusion

In many ways renewable energy projects are similar to other real estate developments. Parties pursuing renewable energy projects on brownfields confront the same challenges faced by anyone attempting to redevelop a brownfield. The two most significant challenges are clean-up costs and legal liability. There are other important barriers. Redevelopment of brownfields requires participation in lengthy and complicated administrative processes. As a result of being abandoned, poor record keeping on the part of previous owners, complicated chains of title, and other factors, brownfields present a greater level of uncertainty than other properties. However, passive solar and wind energy installation are unique in that they can co-exist with ongoing remediation.

The three projects studied here demonstrate that developing large-scale renewable energy projects on complex contaminated brownfields can not only be viable business projects but provide multiple community benefits. One important benefit is an improvement in community image. In all three cases the sites had been derelict for a decade or more and were associated with pollution and community decline. The projects not only improve the aesthetics of the site but bring a non-polluting industry to communities that have historically had a concentration of dirty industries. Other benefits include tax revenue or payments in lieu of taxes, educational opportunities, tourism opportunities, and increased development interest in the surrounding area.

Brownfields may offer one solution to the siting difficulties faced by energy production facilities, particularly large-scale wind turbines. In all three cases studies the project received overwhelming support from the community. This indicates that community acceptance for large scale renewable energy development, particularly solar and wind power, is greater on brownfield sites than greenfield sites. This seems reasonable for several reasons. People generally do not find derelict industrial sites attractive. Such sites are perceived as unsafe and polluted, which they often are. They also represent neighborhood decline. The establishment of clean productive facilities on these sites represents the possibility of neighborhood renewal. Furthermore, because the areas are already industrial the installation of solar panels or wind turbines does not spoil a “natural” area or ruin a scenic view. Landscaping improvements accompany two out of the three developments explored here and were important for gaining support.
The cases also demonstrate that the arguments for siting renewable energy facilities on brownfields have practical validity. The existing infrastructure on these sites, particularly electricity transmission infrastructure, is valuable and facilitates renewable energy development. In the case of Steel Winds, the developers were able to avoid constructing a new substation by purchasing one on site. Although modifications were necessary, the reuse of the substation still resulted in significant savings for the developer. Transportation infrastructure is also important. The presence of well serviced roads and multimodal transportation infrastructure, including rail and shipping, facilitates construction.

These projects do not realize the full potential of incorporating renewable energy facilities into brownfields redevelopment. There is potential to utilize the electricity produced by such installations to provide power to adjacent communities. Low-cost behind the meter power could also be used to attract businesses. There is potential to utilize brownfield for renewable energy development under a community-wide distributed generation strategy. It appears that this potential is not yet being realized.

While renewable energy projects face the same challenges as any brownfields redevelopment, they differ in at least one important aspect. Passive renewable energy projects like wind farms and solar farms differ provide an option for a revenue producing operation that can coexist with continuing remediation activities. Carving-out less polluted parcels from large properties for phased development is strategy that has great potential expand renewable energy development on brownfields and provide property owners revenue that can facilitate complete remediation.
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