Brownfield Tax Credits: An Incentive for Siting CHP

A Report by the Pace Energy and Climate Center
prepared for NYSERDA
Project # 9154

June 25, 2009

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ACKNOWLEDGEMENTS

The Pace Energy and Climate Center received support from many individuals and organizations in the preparation of this report. Our understanding of the operation of the various brownfield programs and resources, state tax incentives and the functioning of markets for brownfield development was considerably enhanced by the generous offer of time and expertise from several experts in the brownfield policy and development area. The Project Team appreciates the contributions of the following individuals who gave substantial time to answering our questions and to furthering our understanding of brownfield development matters:

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This acknowledgement is in no way meant to imply that these individuals endorse any or all of the content or the conclusions in this report. The individuals named above have not seen the final report and have not given their consent to be associated with the content or conclusions. Any factual errors, omissions or other mis-understandings of the applications of the programs described herein are solely the responsibility of the Project Team: Pace Energy & Climate Center and Capital Energy Solutions (Wilson Rickerson)

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INTRODUCTION

Brownfield redevelopment presents an under-explored opportunity for combined heat and power (CHP) development in New York State. The objective of this project is to encourage a closer relationship between the community of public and private entities interested in the redevelopment of brownfield sites, with their counterparts interested in promoting clean, high efficiency CHP development in the state. Recently enacted state legislation provides a significant suite of state tax credits aimed at brownfield redevelopment. Although these incentives were modified in June 2008, sites remain eligible for tax credits of three to as much as six times the investment in cleanup costs. These refundable credits are directly applicable to any capital investment at an eligible site. As will be discussed in greater detail below, some of these credits are transferable to subsequent owners of the site.

Brownfield redevelopment tax credits coupled with other financial incentives can encourage the use of CHP where such use is suitable for brownfield redevelopment. Using cost-effective CHP at a brownfield site to better manage energy costs could improve project economics for the brownfield developer, the end use property owner and tenants at the site.

Importance of Developing Brownfield Sites

Brownfields are typically abandoned or underused industrial and commercial property, where redevelopment or expansion may be complicated by real or perceived environmental contamination.[1] A brownfield site is defined in the law 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." [2] The New York State Department of Environmental Conservation (DEC) lists some examples of potential brownfield sites to include abandoned gas stations, old factory and mill complexes and foundries.[3]

The risk associated with the undetermined presence of contamination and the associated liability and cost is historically a significant deterrent to redevelopment at these sites. Vacant and abandoned sites can negatively affect entire blocks, neighborhoods and communities. A site falling into disrepair can quickly create negative externality effects, lowering values of adjacent properties, encouraging outmigration, reducing the area tax base, and creating a downward cycle that can affect whole blocks and neighborhoods

On the other hand, productive re-use of vacant, abandoned or under-utilized properties can have significant positive effects on neighborhoods and generate positive externalities for the community, region, and state. Productive re-use of sites may generate inward urban migration, create job opportunities in underserved neighborhoods, reduce environmental impacts, and lower total

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[1] New York State Department of Environmental Conservation, *Brownfield Redevelopment Toolbox: A Guide to Assist Communities in Redeveloping New York State's Brownfield*, p.3, http://www.dec.ny.gov/docs/remediation_hudson_pdf/bftoolbox.pdf.

[2] Brownfield Cleanup Program, New York State Environmental Conservation Law, McKinney's ECL § 27-1405; Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. §9601(39). See also *Small Business Liability Relief and Brownfields Revitalization Act*, Public Law 107-118, 115 Stat. 2356 (2002).

[3] NYS DEC, *Brownfield Redevelopment Toolbox*, p.3.

regional transportation and infrastructure costs by replacing "greenfield" [4] developments. For these and other reasons New York State and the federal government have established a suite of programs that provide education, outreach, training and monetary incentives to overcome the barriers and capture the benefits of brownfield site redevelopment.

Importance of Developing Clean Onsite CHP Projects

CHP, also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source, such as natural gas, biomass, biogas, coal, waste heat, or oil. CHP is not a single technology, but an integrated energy system that can be modified depending upon the needs of the energy end user.

Two-thirds of all the fuel used to make electricity in the U.S. is generally wasted by venting unused thermal energy (heat) from power generation equipment into the air or discharged into rivers. While there have been impressive energy efficiency gains in other sectors of the economy since the oil price shocks of the 1970s, the average efficiency of power generation within the U.S. has remained stagnant at around 33% since 1960.[5]

In many circumstances waste heat that is a byproduct of electric power generation can be put to a productive use. In commercial or institutional settings, it can provide domestic hot water and/or space heating and cooling for office buildings, hospitals, nursing homes, apartment buildings, hotels and retail space. In industrial applications, recycled waste heat can provide thermal energy for process uses, such as drying, sterilization and a host of other applications. By harnessing this wasted heat, businesses and institutions can capture significant energy savings.

The installation of clean, high efficiency onsite CHP can result in measurable gains in energy efficiency, lower energy bills and reduced emissions. CHP takes the place of "separately generated" heat and power, or the provision of power remotely from an electric generating station, with boilers and chillers onsite. In the separately generated power case, a site typically uses 100 units of input energy and gets just 49 units of useful heat and power. With CHP, the same 100 units of input energy can provide a business with 70, 75 or even in some cases 80 or more units of useful energy. This represents a gain of 40%, 50%, and as much or more than 60% in efficiency over conventional methods.

By using energy more efficiently, CHP lowers business costs, improves productivity and enhances local economic development. As a result, businesses are more competitive. Moreover, studies have shown that using otherwise wasted energy in a productive manner can lower the demand for natural gas, which puts downward pressure on gas prices.

Clean, high-efficiency CHP can markedly reduce emissions of criteria (regulated) pollutants as well as greenhouse gases (GHG) that contribute to global warming. A 2002 study for New York State Energy Research and Development Authority (NYSERDA) found that the following benefits would

[4] A piece of usually semirural property that is undeveloped except for agricultural use, especially one considered as a site for expanding urban development. *The Free Dictionary by Farlex*, s.v. "Greenfield", http://www.thefreedictionary.com/greenfield (accessed December 8, 2008).

[5] Casten, Thomas R., *Profitably Reducing Greenhouse Gas Emissions*, Recycled Energy Development, August 2008, p.1, http://www.recycled-energy.com/_documents/media-kit/RED-ReducingBroch.pdf (accessed August 31, 2008).

accrue to business in New York from acceleration of the penetration rate of clean CHP as compared with "business as usual."

New York State projections for energy and environmental benefits from CHP (2003 – 2013)

Total dollar savings	$1,825 billion
Total energy savings	316 trillion British thermal units (tBtu) (75 tBtu's in 2012)
Emissions Reductions	10,282 tons per year (tpy) of NOx 27,766 tpy of SO2 3,854,000 tpy of CO2

Energy Nexus Group and Pace Energy Project. "Combined Heat and Power Market Potential for New York State," prepared for New York State Energy Research and Development Administration, May 2002.

Brownfield Redevelopment and Clean Onsite CHP are Priority Interests of New York

The Governor, state legislature and local officials across New York have made clear that significant improvements in the energy efficiency of buildings, homes and industry in the state are a top policy priority. Likewise, state and local officials have expressed a strong commitment to encouraging the productive reuse of brownfield sites. This project seeks to join together these interests in ways that further both objectives.

It is vitally important to increase the awareness within the brownfield development community about the potential for using CHP where it is economically viable and environmentally preferred. Likewise, CHP developers should be informed about the potential for siting CHP on remediated brownfield sites and the associated incentives available to improve project economics and rate of return on CHP systems.

The Team has created a brochure for brownfield developers that provides answers to the following questions. The brochure is attached to this Report as Appendix A.

1. What is CHP?
2. What are the available systems and technologies?
3. In what types of businesses are CHP systems likely to be economically viable?
4. What are the benefits to the developer and to prospective tenants when installing a CHP system?
5. How does the developer assess a site as a good candidate for CHP?
6. What are the incentives available to assist in CHP project development?
7. Examples of successful systems in New York and elsewhere.
8. Resources for more information.

By targeting both brownfield and CHP developers, as well as identifying a set of "high value" target sites within the state, the project takes both a bottom-up and top-down approach to meet stated objectives. These approaches involve the following series of steps executed by the Team.

STEP 1: Bottom-up approach – targeting developers. Step 1 involves education and outreach programs to bring together brownfield project developers and CHP developers who are actively engaged in projects in New York State. The content of these programs will present and explain economically viable CHP opportunities to brownfield developers, and simultaneously present brownfield sites as an opportunity for CHP engineering and project developers. In these outreach programs, the Team will focus on identifying the suite of incentives available from both state and federal sources that significantly improves project economics for all parties.

STEP 2: Top-down approach – identifying "high value target sites." This approach uses a Geographic Information Systems (GIS) tool to process information on a database of brownfield sites in New York. The parameters include existing or proposed economic activity that could support CHP, power costs, access to gas supplies, location in congested electric power distribution areas, and other criteria important for CHP project viability. These critical factors will be used in a scoring process with the objective of identifying "high value target sites."

STEP 3: Marketing campaign. The Team will conduct a small group targeted marketing campaign to those who may be developing these high value sites. This marketing campaign will involve brochures, fact sheets and seminars.

STEP 4: "Special Case" Opportunities. (described in greater detail in section 3.2)
Large Scale Opportunities. This involves the identification of a subset of brownfield sites that are also industrial parks. The redevelopment of such sites may be suitable for large scale, highly efficient CHP projects including district systems and microgrids.

Implementation of Controlled Environment Agriculture (CEA) techniques at brownfield sites, both rural and urban. CEA integrates horticultural and engineering techniques to better optimize and diversify local food production. CEA requires both heat and power, which makes it ideally suited for CHP applications.

1 EXISTING BROWNFIELDS REDEVELOPMENT PROGRAMS

1.1 New York State Department of Environmental Conservation Brownfield Redevelopment Programs

This section provides a brief introduction to New York DEC programs designed to encourage redevelopment of brownfield sites. The programs include the Brownfield Cleanup Program (BCP), Brownfield Opportunity Areas; Brownfield Cleanup Grants, and the Environmental Restoration Program.

NY DEC Online Resources:
The New York DEC operates numerous programs that provide technical assistance, guidance and financial incentives designed to encourage economic development at remediated brownfield sites. Two invaluable documents were compiled by the DEC in this effort:

1. Detailed information about a range of state and federal incentives is provided in the Brownfield Financial Resources Manual.

- The DEC commissioned the preparation of the financial manual to provide assistance to municipalities and the private sector in the redevelopment of brownfield sites. This manual provides details on state, federal and private funding and financial incentives. In addition, it offers information on technical assistance resources and liability protection available for the cleanup and redevelopment.
- The manual also provides case studies that demonstrate how various funding sources, including grants and no- or low-interest loans, have been used to redevelop sites in New York State. These case studies identify state, federal and private sector entities involved in providing financial resources.

2. The agency also commissioned the DEC Brownfield Redevelopment Toolbox: A Guide to Assist Communities in Redeveloping New York State's Brownfields.

The Toolbox was designed to explain the cleanup and redevelopment of brownfields in straightforward terms and provide a systematic, start-to-finish guide to cleanup and redevelopment. It identifies four steps in the renewal process, provides a summary of each step, presents a series of key concepts, and lists and summarizes available tools and incentives local governments may use in pursuing redevelopment of contaminated sites.

We strongly encourage interested readers to take full advantage of both the Financial Resources Manual and the Brownfield Redevelopment Toolbox, as well as the whole suite of guidance materials available at the DEC Brownfields web pages at:
http://www.dec.ny.gov/chemical/brownfields.html.

1.1.1 Brownfield Cleanup Program

New York's Brownfield Cleanup Program (BCP),[6] first enacted in 2003, provides "Brownfield Cleanup Tax Credits" that are likely to be of great interest to those who are considering siting a clean CHP system at a remediated site. The BCP tax credits address environmental, legal liability and financial hurdles that impede the remediation and revitalization of brownfield sites. The BCP was amended in June of 2008 to place an upper cap on the amount of the credit, described below. The DEC website provides comprehensive information about the BCP at: http://www.dec.ny.gov/chemical/45734.html.

The New York Brownfield Cleanup Tax Credits provides investment incentives for state tax payers, including business and personal tax credits for remediation and development, real property taxes and environmental insurance tax credits.

There are two key tax credit provisions of the BCP: the Tangible Property Credit (aka Brownfield Redevelopment Tax Credit) and the Brownfield Real Property Tax Credit. The BCP authorizes these tax credits upon the securing of a Certificate of Completion (COC).[7] The COC is issued upon a determination that remediation requirements have been achieved under an approved Work Plan. The COC generally is not issued until DEC is satisfied that the active components of remedial action have been completed and all that is left is long-term maintenance and monitoring (including, where appropriate, implementation of a site management plan to make sure that residual contamination is not improperly disturbed and the filing of an Environmental Easement, and releases. This determination releases the applicant from liability to the state for hazardous waste or petroleum contamination at or emanating from the site.

Tangible Property Credit (Brownfield Redevelopment Tax Credit (BRTC)).

The BRTC is similar to an investment tax credit (ITC) for site preparation costs (including remediation, demolition, excavation, etc.), qualified tangible property costs (including buildings, structural components and improvements placed into service within 10 years after the COC is issued), and onsite groundwater remediation costs (those related to the remediation work plan). CHP equipment would fall under the tangible property costs.

The BRTC is a one-time credit equal to at least 12% (for a corporate taxpayer) or 10% (for an individual taxpayer) of the costs of buildings and improvements that are placed into service within 10 years after the COC is issued.

The credit is increased by 8% if the site is located in an "environmental zone" and increased by an additional 2% if the remediation is done to the highest environmental standard, for a total of up to 22%. If the property is located in a Brownfield Opportunity Area (BOA), the tangible property credit is further increased by 2 percent, thereby bringing the potential total credit up to a level of 24%.

It should be noted that legislation passed in June 2008 caps the amount of the tangible property tax credit to the lesser of $35 million or three times the cost of the cleanup and other site preparation

[6] Brownfield Cleanup Program, NYS Environmental Conservation Law, Mckinney's ECL, §27-1401.
[7] Also referred to as a "remediation certificate" under New York State Tax Law. Environmental remediation insurance credit, NYS Tax Law, McKinney's §23.

costs (in the case of non-manufacturing properties) or, in the case of manufacturing projects, to the lesser of $45 million or six times the cost of the cleanup and other site preparation costs.

Brownfield Real Property Tax Credit

The Brownfield Real Property Tax Credit (BRPTC) is an annual credit, which may be claimed for up to 10 years after the COC is issued. It is based on the number of jobs created, and includes credits for eligible real property taxes. The tax is limited to owners of a contaminated property who obtained a COC that is transferable to subsequent purchasers of the site who take title within seven years of the COC. A cap is imposed on the annual credit equal to $10,000, multiplied by the average number of full-time employees.

Additional elements of the Brownfield Cleanup Program:

Site Preparation Credit and On-site Groundwater Remediation Credits: The BCP legislation more than doubles the current tax incentives for site preparation and on-site groundwater cleanup.

- Site preparation and on-site groundwater costs cover remediation, demolition, excavation, fencing, security, and other capital account costs to make the site usable for redevelopment, excluding site acquisition costs.
- Eligible costs may be claimed for up to five years after the issuance of the COC. Projects accepted into the BCP after June 23, 2008 may qualify for credits ranging from 22-50%.[8]

For a more detailed explanation of these provisions go to
http://www.dec.ny.gov/chemical/45734.html

Double Dipping: Taxpayers are not allowed to receive the tax credit for the same tangible property more than once, and if an owner transfers eligibility for BCP tangible property credits to future owners, the new owner must exclude any acquisition cost of property that has already been claimed for a BCP tax credit.

1.1.2 Environmental Restoration Program

In 1996, New York State voters approved a $200 million Environmental Restoration fund, as part of the Clean Water / Clean Air Bond Act of 2006. The Environmental Restoration Program (ERP) was designed to encourage the cleanup and redevelopment of brownfield sites across the state. Although the participating entity is defined as a "municipality," this term is broadly construed to include counties, cities, towns, villages, school districts, supervisory and improvement districts, local public authorities and public benefit corporations, as well as community organizations that have formally partnered with a municipality. The municipality must own the property in order to participate.

The 1996 Bond Act identifies four criteria to be used in evaluating remediation projects:

1. Benefit to the environment;

[8] NYS DEC, *2008 Brownsfield Legislation Summary*, http://www.dec.ny.gov/chemical/45734.html (accessed on June 15, 2009).

2. Economic benefit to the state;
3. Potential for public or recreational use of the cleaned up property; and
4. Availability of other funding sources to pay for the project.

Two general types of ERP grants are available: Investigation grants and remediation grants. Investigation grants are applied to the process of determining the nature and extent of the contamination. The investigation process requires public input and the development of a record of determination. The investigation phase proposes particular remedies that are subsequently the subject of public comment. Applications for investigation grant support are handled on a first come, first served basis.

Remediation grants are available to finance the design and construction of a detailed cleanup scheme as specified in the Record of Decision that is an outcome of the Investigation phase. Remediation grants are awarded based upon a review process that includes ranking and scoring applications with respect to the key criteria set forth in the 1996 Bond Act.

The ERP program has proven to be very popular with local governments. It provides up to 90% of the on-site investigation and remediation costs and may pay up to 100% of the eligible costs for off-site investigation and remediation activities.

The ERP program has been so popular that even though there is no funding at this time, the DEC still is taking applications. These applications are being put on hold until more funds are allocated to the program. Funds that were previously encumbered are being used to finance cleanup at sites that were previously accepted into the ERP. A site that has received remediation funding under the ERP would not be eligible for brownfield tax credits.

1.1.3 Brownfield Cleanup Grants

Cleanup grants provide funding for a grant recipient to carry out cleanup activities at brownfield sites. Eligible entities may apply for up to $200,000 per site, subject to the limitation that no entity can obtain funding for cleanup activities at more than five sites. This program is administered by the United States Environmental Protection Agency ("EPA"). Key terms and conditions with respect to cleanup grants include the following:

- These funds may be used to address sites contaminated by petroleum and hazardous substances, pollutants, or contaminants.

- There are about 100 approved Brownfield Opportunity Area (BOA) projects throughout the state. The BOA program is a New York State program, administered by DEC and the Department of State. These area-wide projects contain multiple potential brownfield sites. Sites that are located within BOAs may be eligible for EPA cleanup grants. The BOA program is described in more detail in Section 2.1.4, below.

- Cleanup grants require a 20 percent cost share, which may be in the form of a contribution of money, labor, material, or services, and must be for eligible and allowable costs (the match must equal 20 percent of the amount of funding provided by EPA).

- A cleanup grant applicant may request a waiver of the 20 percent cost share requirement based on hardship.

- An applicant must own the site for which it is requesting funding at time of application or demonstrate the ability to acquire title. The performance period for these grants is two years.

For more information go to http://www.epa.gov/brownfields/cleanup_grants.htm.

1.1.4 Brownfield Opportunity Areas

The BOA program provides municipalities and community-based organizations with financial and technical assistance to complete area-wide revitalization plans for discrete geographic areas or neighborhoods affected by multiple brownfield sites. This program blends together the New York Department of State's expertise in community-based planning projects combined with the DEC's expertise in assessing and cleaning brownfield sites.

Applicants that are eligible to apply for the incentives are: New York State municipalities (including villages, cities, town, local public authorities), local public benefit corporations, school districts, improvement districts, and Indian tribes.

> *There are about 100 approved BOA projects throughout the state. These area-wide projects contain multiple potential brownfield sites. BOA projects accepted into the program may qualify for an additional 2% tax credit for the tangible property component.*

It should be noted that Community-Based Organizations are defined as not-for-profit corporations that: are incorporated under Section 501(c)(3) of the Internal Revenue Code whose stated mission is to promote community revitalization within the geographic area in which the community-based organization is located; has 25 percent or more of its Board of Directors residing in the community in such area; and represents a community with a demonstrated financial need as indicated by high unemployment, low resident incomes, depressed property values, and/or high commercial vacancy rates.[9] It should also be noted that Municipalities and Community Based Organizations may act in cooperation**.**

Grant applications are available at the Department of State's web site at: http://www.nyswaterfronts.com/BOA_package.asp

For questions about this grant program, the application, and guidance for applicants, interested parties may call New York State Department of State at 518-474-6000.

[9] NYS DEC, *Brownsfield Opportunity Areas Program Fact Sheet*, http://www.dec.ny.gov/chemical/8650.html (accessed on June 15, 2009).

1.2 Federal Brownfield Redevelopment Programs

Federal Brownfield Tax Incentive under Section 198 of the Internal Revenue Code

The Emergency Economic Stabilization Act of 2008 (H.R. 1424), signed into law by President George W. Bush on October 3, 2008, included the $700 billion Troubled Asset Relief Program (TARP). Included in the TARP was an extension of expired or expiring tax provisions relating to brownfield remediation expensing under Section 198 of the Internal Revenue Code. The Section 198 tax incentive was extended through December 31, 2009, and is effective for expenditures paid or incurred after December 31, 2007. Section 198 allows taxpayers to receive a current federal income tax deduction for certain qualifying remediation costs that would otherwise be subject to capitalization. It is the only federal incentive targeted to private site owners (typically new property purchasers), and it allows property owners to amend tax returns to include deductions for past cleanups. Any corporation that is considering filing an amended return to take advantage of the retroactive tax deduction must do so within three years after the date it filed its original return.

2 CLEAN ONSITE CHP ON REDEVELOPED BROWNFIELD SITES

Clean, reliable, high efficiency onsite CHP can add significant value at a redeveloped brownfield site. It is important for developers to recognize the characteristics that may provide a good fit for a CHP project.

Where can CHP be Economically Attractive?	
Commercial Buildings	Hotels
Colleges and Universities	Nursing Homes
Hospitals	Schools (with pools and/or cooling)
Food Processing	Plastics Manufacturing
Chemical Plants / Pharmaceuticals	Pulp & Paper Industry
Data Centers	Fabricated Metals
Refrigerated Warehouses	Waste Water Treatment Plants
Greenhouses	Ice Arenas
Ethanol / Biofuels Processing Plants	Livestock Farms
Multifamily Buildings / high density residential	Supermarkets
Retail Stores	Restaurants

2.1 Critical Factors Determining Economically Viable CHP Projects

There are several critical factors to consider when assessing the potential viability of CHP at a site. These factors are:

- Coincidence of the thermal and electric load
- Significant uses for waste heat, preferably year-round use
- Spark spread (cost of making versus buying electricity)
- Expected hours of operation of the facility

2.1.1 Correlation Between (coincidence of) Thermal and Electric loads

The questions to be studied and evaluated are:

- Does the facility need heat at the same time that it needs electricity
- How much heat (Btu/hr) does a site need at the same time it needs electricity (kWh)
- Are there year-round uses for the waste heat
- Are there internal systems that should be considered for getting the best match of thermal and electric demand throughout the day and for each season

2.1.2 Significant Uses for Waste Heat

A key requirement is the existence of a simultaneous, consistent and reasonably large demand for thermal and electric energy. The more hours per day that the site can generate electric power and at the same time use the byproduct thermal energy to displace purchased fuels (natural gas, fuel oil), the more economic the CHP project will become.

2.1.3 Cost Differential Between Buying and Producing Electricity (Spark Spread)

A brownfield developer will be motivated to install a CHP system to the extent that producing power onsite is less expensive than is buying it from the distribution utility. The difference between the cost of buying versus the running costs of self generating power is referred to as the spark spread. The "running cost" of self-generation is the fuel costs incurred. Operation and maintenance costs, capital costs and costs other than the cost of fuel are generally not considered in a simple spark spread calculation. The larger is the difference of (Purchased Electricity – Running Cost of Self Generation) the more attractive is the CHP system.

The most common fuel utilized in CHP plants today is natural gas. For that reason, the following example for calculating spark spread is done assuming natural gas is the fuel of choice for the CHP system. However, if other fuels or combination of fuels are used for the CHP system, a similar approach would be used comparing the MMBtu cost of electricity to the MMBtu cost of the applicable CHP fuel.

Sophisticated modeling tools exist for determining CHP viability. However, a quick screening tool, prepared by the University of Chicago, Illinois and reprinted belos as Table 1. can be used for a quick assessment of CHP at a site.

Table 1. Estimating "Spark Spread"[10]

1.	**Determine the Average Annual Electric Cost** ($/MMBtu):			
a.	**Sum** the total cost for electricity from the last 12 months of bills (including demand charge): **Total Cost**	$		
b.	**Sum** the number of kWh utilized over the last 12 months of bills: **Total kWh**			kWh
c.	**Divide** the Total Cost by the Total kWh: **Average Annual Electric Cost**	$		/kWh
d.	**Multiply** the **Average Annual Electric Cost** ($/kWh) by 293 to convert to $/MMBtu: **Average Annual Electric Cost**	**$**		**/MMBTU**
2.	**Determine the Average Gas Cost** ($/MMBtu):			
a.	**Sum** the total cost for gas from the last 12 months of bills: **Total Cost**	$		
b.	**Sum** the number of Therms utilized over the last 12 months of bills: **Total Therms**	$		Therms
c.	**Divide** the Total Cost by the Total Therms: **Average Annual Gas Cost**	$		/Therm
d.	**Multiply** the **Average Annual Gas Cost** ($/Therms) by 10 (for NG) to convert to $/MMBTU: **Average Annual Gas Cost**	**$**		**/MMBTU**
3.	**Determine** the **"Spark Spread"**:			
a.	Average Annual Electric Cost (1.d.)	$		/MMBTU
b.	**Minus** Average Annual Gas Cost (2.d)	$		/MMBTU
	"Spark Spread"	**$**		
4.	**Is** the **"Spark Spread" >$12/MMBtu?**		**Yes / No**	
	If **Yes,** than CHP has the potential for favorable payback.			
	If **No,** than CHP may not have the potential for a favorable payback unless there are other benefits such as increased electric reliability or a need for backup power, a desire to increase energy efficiency, governmental support or incentives, etc. that can be considered to make CHP attractive.			

2.1.4 Operating Hours

One common operating strategy is to run generate electricity when it can be produced at a lower cost than would be paid if the electricity were purchased from the utility grid, taking into consideration both electric energy (kWh) and electric demand charges (kW).

[10] Midwest CHP Application Center et al., *Combined Heat and Power Resource Guide,* September 2003, http://www.chpcentermw.org/pdfs/chp_resource_guide_2003sep.pdf.

Often times, the facility managers will operate the CHP system only during the peak electric rate periods of the day, which might be 12 to 14 hours per day. If the system is operated 12 hours per day, 5 days per week, the CHP annual operating hours will be approximately 3,000 hours per year. Operating the CHP system fewer than 3,000 hours/year will normally not generate enough energy cost savings to justify the investment unless other factors are optimized.

The energy efficiency benefits of CHP arise from the ability to productively use the waste heat. Whenever there is a coincident need for heat and power the otherwise wasted heat can be used to displace fuels that otherwise would be used for space, hot water or process heating or to displace the need for running electric chillers for cooling.

2.2 New York State and Federal Incentives for On-Site Power Generation

There are several state and federal sources of incentives currently available to assist in the development of a clean onsite power facility in New York State. Section 2 of this report covered the programs and incentives available for brownfield development projects. This section reviews the state and federal incentives that may make a CHP investment at a remediated brownfield site a very attractive investment due to its high rate of return.

2.2.1 NYSERDA Technical Assistance Program

The New York State Energy Research and Development Authority (NYSERDA) will contribute a portion of the costs ("cost share") up to $500,000 on CHP selected studies over five years. For electrical customers of Consolidated Edison Company of New York, Inc. (Con Edison), NYSERDA will cost share up to $1,000,000 over five years. A customer may choose to use one of NYSERDA's prequalified FlexTech consultants as its Service Provider, or an independent Service Provider, which includes, but is not limited to energy service companies ESCOs, energy consultants and utility companies.[11]

2.2.2 NYSERDA Program Opportunity Notices: Distributed Generation as Combined Heat and Power

For the last several years, NYSERDA has offered capital grants for selected CHP projects through its Distributed Generation as Combined Heat and Power (DG-CHP) Program Opportunity Notices (PON). On an annual basis, and at times at more frequent intervals, NYSERDA invites proposals to support:

- Demonstration of DG-CHP systems at facilities in New York State
- Re-commissioning Studies to revisit qualifying, existing, NYSERDA-funded DG-CHP installations
- Technology Transfer Studies to broaden the market penetration of DG-CHP systems in New York State[12]

The most recent funding opportunity was NYSERDA PON 1241. Applications for the final round three were due on April 16, 2009. There were two categories of program opportunities – one category was for a single project and the second category for a "fleet." The maximum award per

[11] New York State Energy Research and Development Authority, *Technical Assistance Program*, http://www.nyserda.org/programs/Technical_Assistance/default.asp (accessed June 15, 2009).
[12] NYSERDA, *Distributed Generation as Combined Heat and Power (DG-CHP), Program Opportunity Notice (PON) 1241*, www.nyserda.org/funding/1241summary.pdf (accessed June 16, 2009).

project was $2,000,000 for a demonstration project and $4,000,000 for multiple projects that were part of a "fleet" as defined by the program requirements. In general the NYSERDA grant covered 30% of the CHP system costs, with certain critical factors permitting awardees a payment up to as much as 50% of total CHP system costs.

Category	NYSERDA Cost Share	Maximum NYSERDA Award per project
A: Demonstration Projects	30% to 50%	$2,000,000
A-1: Fleet Demonstration Projects	30% to 50%	$4,000,000

[13]

Though PON 1241 expired, interested parties are encouraged to visit the NYSERDA website that lists current and future funding opportunities. Visit the NYSERDA "Future Funding Opportunities" site for complete details on upcoming programs at http://www.nyserda.org/funding/funding.asp?i=1.

2.2.3 NYSERDA's CHP Existing Facility Incentives

NYSERDA offers incentives to promote the installation of clean, efficient, and commercially available CHP systems that provide summer on-peak demand reduction. Incentives are performance-based and correspond to the summer-peak demand reduction (kW), energy generation (kWh), and fuel conversion efficiency (FCE) achieved by the CHP system on an annual basis over a two-year measurement and verification (M&V) period.

Incentive[14]

	Upstate	Con Edison
Combined Heat and Power	$0.10/kWh + $600/kW	$0.10/kWh + $750/kW

Incentives are capped at $2,000,000 per CHP project.

Eligibility

A CHP System must:

- Consist of commercially available reciprocating engine or gas turbine-based CHP systems that result in electrical peak demand reduction during the summer capability period
- Have a 60% annual fuel conversion efficiency based on a higher heating value (HHV) including parasitic losses
- Use at least 75% of the generated electricity on-site
- Have a NOx emission rate < 1.6 lbs./MWh

NYSERDA has developed a detailed program manual for the CHP portion of the Existing Facilities program. Currently, this document can be located at the following site:

[13] NYSERDA, *Program Opportunity Notice 1241, Distributed Generation as Combined Heat and Power (DG-CHP),* http://www.nyserda.org/funding/1241pon.asp (accessed June 15, 2009).
[14] NYSERDA, *Existing Facilities Program, Combined Heat and Power (CHP) Incentives,* http://www.nyserda.org/programs/Existing_facilities/chp.html (accessed June 15, 2009).

http://www.nyserda.org/programs/Existing_facilities/chp.html

2.2.4 NYSERDA CHP and Renewable Generation Technical Assistance

Renewable Generation CHP Systems may be eligible for technical assistance concerning implementation of CHP using renewable fuels. NYSERDA offers funding for qualified CHP under the NYSERDA Customer Sited Tier Renewable Portfolio Standard (CST-RPS) program. Certain biomass-based CHP systems may also benefit from the federal production tax credit (PTC) program, the Clean Renewable Energy Bonds (CREBS) program, or other programs under the 2007 Farm Act.

Qualifying biomass-based CHP applications will be eligible for a richer suite of incentives than natural gas-powered CHP systems.

2.2.5 Federal On-Site Energy Incentives

Micro-turbine and Fuel Cell Tax Credits

Section 1336 of the Energy Policy Act of 2005 provided for investment tax credits (ITC) for the purchase of micro-turbines and fuel cells.[15] These tax credits were set to expire on December 31, 2008, but the Energy Improvement and Extension Act of 2008 extended the existing tax credits another 8 years with a new end date of December 31, 2016.

A taxpayer investing in micro-turbines may claim a credit for 10 percent of expenses incurred on eligible property up to a maximum of $200 per kW of capacity, available for systems up to 2 MW in size, with electric only operating efficiencies of 26% or greater.

Fuel cells with a minimum capacity of 0.5 kW and electric only efficiencies of 30% or higher are eligible for a 30% ITC for qualifying systems. The recent renewal of the fuel cell ITC provisions increased the level of the credit from a cap of $1,000 per kW to the current $3,000 per kW for qualifying systems. This nonrefundable credit applies to qualified equipment placed in service after 2005.

CHP Tax Credits

The Energy Improvement and Extension Act of 2008 included a new 10% investment tax credit (ITC) for all CHP facilities up to 50 MW in size.[16] The new CHP credit applies to CHP property as qualified under Section 48 of the Internal Revenue Code. The credit applies to the first 15 MW of qualified CHP property. There is a phase out of the ITC for qualified CHP property between 15 MW and 50 MW of capacity.

In order to qualify, a CHP system must meet the following criteria:

- Achieve an efficiency level of 60% or greater on a lower heating value basis
- Produce at least 20% of its useful energy as electricity and at least 20% of its useful energy as productively used thermal energy

[15] *Energy Policy Act of 2005*, 42 U.S.C. §15801 et seq (2008); Sections 48(c)(1) and 48(c)(2) of the Internal Revenue Code, 26 U.S.C. §48(c)(1) and 48(c)(2) (2008).
[16] EPA, *Combined Heat and Power Partnership: Funding*, http://www.epa.gov/chp/funding/fundinguschpinvestmenttaxcredit.html (accessed June 18, 2009).

- Have a nameplate capacity of less than 50 MW
- Have beneficial ownership by the taxpayer – being constructed by the taxpayer or having original use by the taxpayer, and
- Be placed in service on or after October 3, 2008 and before January 1, 2017

Modified Accelerated Cost Recovery

The Energy Improvement and Extension Act of 2008 also contained language defining CHP as "energy property" which appears to make such systems eligible for the 5 year, Modified Accelerated Cost Recovery (MACR) provisions of Section 168 of the Internal Revenue Code. The ability to take advantage of these accelerated depreciation provisions are another valuable economic incentive for CHP systems.

3 SUCCESS STORIES AND SPECIAL OPPORTUNITIES

3.1 CHP Case Studies and Success Stories

CHP is not a new, untested application. In this section of the report, we describe several CHP projects in New York State which cover a variety of different end use business sectors. These projects demonstrate the successful application of CHP at brownfield sites, hospitals, supermarkets, universities, multi-family dwellings and industrial applications.

In New York there are over 250 existing CHP sites with about 5,500 MW of total generating capacity. NYSERDA has a nationally recognized program that attempts to demonstrate state-of-the art concepts in CHP designs and implementations.

> *Since 2001, NYSERDA has committed over $61 million to 96 CHP demonstration projects with a projected installed peak load reduction of 218 MW and a total cost of $374 million. As of today, 52 projects are operational with an installed capacity of 26 MW.*

3.1.1 Hospitals

CHP is often particularly well suited for the hospital sector. Hospitals have many of the attributes required for cost-effective CHP implementation, such as continuous operation, demand for hot water, space heating, cooling, considerable power demands, and critical requirements for reliable power and energy supply.

New York Presbyterian Hospital

The New York Presbyterian Hospital (NYPH) is one of New York's largest and most comprehensive hospitals, with over 16,000 employees and 676 rooms.[17] NYPH installed a CHP system in its existing boiler plant which came online in May 2009. This CHP system provides on-

[17] Hospitality Jobs Online, *Hotel Profile: New York Presbyterian Hospital*, http://profiles.hospitalityonline.com/218010/ (accessed June 15, 2009).

site electrical generation and uses the waste heat from the electric generation process to satisfy the hospital's process and space conditioning (including cooling) requirements.

The 7.5 MW CHP plant generates enough electricity to satisfy almost half of the hospital's electric power demand on an annualized basis.[18] The CHP plant will continue to operate in the event of a Con Edison power outage, thus increasing energy reliability for the hospital. The CHP system is expected to save the NYPH several million dollars in energy costs annually. The overall efficiency of the plant will be 89%, which is significantly higher than central station power plants and the hospital's existing boiler plant.[19]

Montefiore Hospital

Montefiore Medical Center in the Bronx is one the largest medical facilities in the Nation.[20] The facility meets its entire electric and thermal needs through a CHP system, which has a total electrical capacity of 10 MW and provides the base load power to the center. The system is supplemented by two standby engines that can provide 4 MW of additional capacity.[21] In addition, the Montefiore CHP system supplies electricity to other buildings in the area. "During the August 14, 2003 blackout, Montefiore was reportedly the only hospital in New York City that continued to admit patients, perform surgeries, and continue normal operations" [22]

South Oaks Hospital

In 1990, South Oaks Hospital installed a CHP system at its campus in Amytiville, NY. The system consists of two dual-fuel (natural gas and diesel) reciprocating engines and has a nameplate capacity of 1.3 MW. [23] As the Montefiore CHP system, the South Oaks system provides 100% of the electricity and heat used in the medical facility and is configured to provide baseload power to the hospital. [24] The facility remains connected to the electric grid allowing the hospital to buy electricity from a utility if fuel costs increase and/or the CHP system is under maintenance. In addition, South Oaks can sell back excess electricity to the utility. [25] "During the major northeast blackout in August 2003, South Oaks Hospital never lost power, while the area around the hospital lost power for 14 hours. Employees were not even aware of the blackout at first because they saw no

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[18] NYSERDA, *Research and Development Projects, Industry and Buildings*, http://www.nyserda.org/programs/Research_Development/R&D%20Top%20Projects%20REV%205-08.pdf (accessed June 19, 2009).

[19] New York-Presbyterian, *NYPgreen: Sustainability at New York-Presbyterian Hospital*, http://nyp.org/about/nyp-green.html (accessed June 15 2009).

[20] EPA, *EPA Agrees to Montefiore Medical Center Environmental Self Audit*, January 2, 2004, http://yosemite.epa.gov/opa/admpress.nsf/7144dd430c47561885257018004c77a3/1bcbcfa290abe82085257147007248fd!OpenDocument (accessed June 18, 2009).

[21] Berry, Jan, *Assessing the Benefits of On-Site Combined Heat and Power during the August 14, 2003 Blackout*, Energy Efficiency and Renewable Energy, Department of Energy, June 2004, p. 10, http://www.eere.energy.gov/de/pdfs/chp_blackout_081403.pdf (accessed June 17, 2009).

[22] *Ibid.*

[23] *Ibid.* at 17.

[24] Northeast CHP Application Center, *South Oaks Hospital, 1.3 MW CHP Application, Project Profile*, http://www.chpcentermw.org/rac_profiles/Northeast/South%2520Oaks%2520Hospital%2520profile.pdf (accessed June 15, 2009).

[25] Berry, Jan, *Assessment August 14, 2003 Blackout*, at 17.

interruption in their service. The hospital chose to stay off the grid for five days following the blackout because of concerns about instability in the grid."[26]

Hospitals in New York that installed CHP systems were able to continue operating through the blackout with little to no discernable problems.

3.1.2 Supermarkets

Waldbaum's on Long Island

Waldbaum's Supermarket in Long Island, New York is a 57,000-square-foot retail facility. The grocery store meets its entire electricity demand with a Capstone microturbine CHP system with a 60 kW capacity.[27] The system is integrated with "a 20,000-cfm Munters Drycool air-handling unit", which provides cooling, heating and dehumidification to the main sales areas of the store.[28] According to the Northeast CHP Application Center:

> An attractive feature of this site is the ability to use the rejected thermal energy from the generator on a year round basis. In the summer, dehumidification of the incoming air significantly reduces the energy consumption of the electric air conditioning system. In the winter, there is a significant space heating load. This system was extensively monitored for a period of 18 months. Net CHP system efficiency ranged from more than 60% based on higher heating value (HHV) on cold winter days to over 50% HHV on humid summer days. Extensive environmental testing showed that the micro-turbine exceeded its emissions specifications. The NO_x emissions from the micro-turbine were 3 to 5 ppmv (at 15% O2) at full load.[29]

A CHP system configuration like Waldbaum's yields approximately $19,000 in operating savings in Consolidated Edison territory.[30]

A&P Supermarket in Mount Kisco

A&P Supermarket in Mount Kisco, New York is a 57,000-square-foot facility. The entire retail store is powered by a PureComfort 240 unit manufactured by UTC Power. The PureComfort 240 unit consists of four 60 kW microturbines, from which waste heat is collected and used to produce chilled water to run through the air conditioning system.[31] According to the manufacturer, the PureComfort 240 unit has a system efficiency of approximately 80% and it "produces about 40% less CO_2 per megawatt-hour than the average fossil-fueled utility power plant and about 10,000 lbs per year less NO_x".[32]

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[26] Northeast CHP Application Center, *South Oaks Hospital, Project Profile.*
[27] *Ibid.*
[28] Northeast CHP Application Center, *Waldbaum's Supermarket, 60 kW CHP Application, Project Profile* http://www.chpcentermw.org/rac_profiles/Northeast/Waldbaums_CHPProjectProfile.pdf (accessed June 15, 2009).
[29] *Ibid.*
[30] *Ibid.*
[31] UTC Power, *A & P Fresh Market Opens for Business with Latest Energy Efficient Technology from UTC Power*, http://files.harc.edu/Sites/GulfCoastCHP/CaseStudies/APFreshMarketMountKiskoNY.pdf (accessed June 16, 2009).
[32] Oak Ridge National Laboratory, DOE, *Microturbines for Commercial Markets Poster*, http://www.ornl.gov/sci/de_materials/documents/posters/poster_02202_mfcm_white.pdf (accessed June 17, 2009).

3.1.3 Universities and Multifamily Buildings

10 West 66th Street - Multifamily Residential

10 West 66th Street is a multifamily residential cooperative building located in mid-town Manhattan with 256 units. The building has an on-site CHP system manufactured by Ingersoll-Rand, which offsets part of the facility's base electrical load[33] and provides heating and cooling.[34] The CHP system consists of a natural gas-fired microturbine with a 70 kW capacity. "Heat recovered from the turbine exhaust and lube oil cooling circuit is used to produce domestic hot water."[35] According to the EPA, the CHP system has an approximate 67% efficiency and reduces CO_2 emissions by approximately 100 tons per year.[36] In 2005, the 10 West 66th Street project received a CHP Certificate of Recognition from the EPA and the Department of Energy (DOE).

205 West End Avenue - Multifamily Residential

205 West End Avenue is a 540-unit multifamily residential cooperative building located in Manhattan. The high-rise building is powered by two 150 kW natural gas rich burn internal combustion engines manufactured by Waukesha. "The system operates 24/7 and is capable of annually producing approximately 2,336,000 kilowatt-hours of electricity, and is projected to save 205 West End Condominium $322,049 annually in energy costs."[37]

Utica College

Utica College and Faxton-St. Luke's Healthcare will install a CHP facility in Utica, New York. The CHP system will provide electric and thermal energy to several buildings, including a hospital and a nursing home owned by St. Luke's and a 78-unit dorm room used by Utica College.[38] The system is projected to have a nameplate capacity of 10 MW, consisting of six on-site natural gas fired generators with a combined capacity of 6 MW and two backup generators that will provide 4 MW of additional capacity.[39] Waste heat from the engines will be used to produce high pressure steam and hot and chilled water.[40] The new CHP facility will save an estimated $350,000 per year in energy costs.[41]

3.1.4 Industrial Sector Applications

Hexion Chemicals

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[33] NYSERDA, *10 West 66th Street CHP Site Fact Sheet*, link available at http://chp.nyserda.org/facilities/details.cfm?facility=32 (accessed June 17, 2009).
[34] HARC, *Guide to Site Visits-NYSERDA CHP Conference-June 2004*, http://files.harc.edu/Sites/GulfCoastCHP/CaseStudies/ManhattanNYApartments.pdf (accessed June 16, 2009).
[35] EPA, *Winners of Energy Star CHP Awards and CHP Certificates of Recognition*, p. 16, http://epa.gov/CHP/documents/past_award_winners.pdf (accessed June 17, 2009).
[36] *Ibid.*
[37] HARC, *Guide to Site Visits-NYSERDA CHP Conference-June 2004*, http://files.harc.edu/Sites/GulfCoastCHP/CaseStudies/ManhattanNYApartments.pdf (accessed June 16, 2009).
[38] NYSERDA, *St. Luke's Hospital NYSERDA CHP Details*, link available at http://chp.nyserda.org/facilities/fulldetails.cfm?Facility=104.
[39] *Ibid.*
[40] *Ibid.*
[41] Leogrande, Christine, *UC Joins Faxton-St. Luke's, Burrstone Energy for Co-Gen Plant*, Utica College, November 7, 2007, http://www.utica.edu/instadvance/marketingcomm/news/index.cfm?featureaction=detail&id=1832&archive=5 (accessed on June 16, 2009).

The Hexion Specialty Chemical plant in South Glens Falls, New York installed an innovative CHP system to provide power to its facilities. This CHP system consists of a steam turbine generator powered by wasted heat (turned into steam) collected from Hexion's formaldehyde manufacturing process. The system produces up to 451 kW of electricity. [42] It does not use fuel of any kind. Thus, Hexion's CHP system generates zero emissions and "reduces CO_2 emissions by an estimated 8,300 tons of per year." [43] The project received the 2005 Energy Star CHP Award from the EPA and the DOE. [44]

Harbec Plastics

In 2001, Harbec Plastics located in Ontario, New York installed a "hybrid wind/CHP system" to power its facility. The CHP system has a nameplate capacity of 750 kW, consisting of twenty-five 30 kW Capstone natural gas-fired microturbines that generate electricity for the manufacturing process. Waste heat from the microturbines is used to heat water, which in turn is used to heat the facility in the Winter and to chill water for the air conditioning system in the Summer. [45]

Harbec Plastics' "CHP system produces less than 10% of the CO_2 of traditional sources of energy like coal and oil for the same amount of energy. The heating and cooling are bi-products of this process bringing efficiency levels up to around 70% and 36% in net cost reductions. The payback time on the system is two and half years."[46]

Arrow Linen

Arrow Linen located in Brooklyn, New York operates a 56,000- square foot industrial laundry facility. The facility is powered by a natural gas fired internal combustion engine. Wasted heat from the combustion process is recovered to produce "hot water that is used by the laundry machines and to preheat boiler feed water."[47] The CHP system has a capacity of 300 kW of electricity and operates at an estimated efficiency of 80%.[48] In addition, it "requires an estimated 36% less fuel than typical onsite thermal generation and purchased electricity. Based on this comparison, the system reduces CO_2 emissions by an estimated 651 tons per year." [49]

3.2 Special Opportunities

3.2.1 Brownfield and Industrial Parks:

Sites that are both brownfield and industrial parks may present a special opportunity for CHP applications. If the site undertakes a remediation effort resulting in a COC, they are eligible for the incentives detailed in Section 3 above. Furthermore, within an industrial park, a project developer

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[42] NYSERDA, *Hexion Specialty Chemical: Back Pressured Turbine Fueled by Recovered Steam*, http://www.nyserda.org/programs/industry/CaseStudies/Hexion.pdf (accessed June 16, 2009).
[43] EPA, *Winners of Energy Star CHP Awards and CHP Certificates of Recognition* at 7.
[44] *Ibid.*
[45] Northeast CHP Application Center, Harbec Plastics 750kW CHP Application, Project Profile, http://www.chpcentermw.org/rac_profiles/Northeast/Harbec-CHPProjectProfile_final.pdf (accessed June 16, 2009).
[46] *Ibid.*
[47] EPA, *Winners of Energy Star CHP Awards and CHP Certificates of Recognition* at 8.
[48] NYSERDA DG/CHP Program, *Arrow Linen: Engines for Hot Water Process Loads Project Profile*, http://cdhnrgy1.user.openhosting.com/Fact%20Sheets/Arrow%20Linen%20CHP%20Site%20Fact%20Sheet.pdf (accessed June 16, 2009).
[49] EPA, *Winners of Energy Star CHP Awards and CHP Certificates of Recognition at* 8.

is able to construct a system that shares electric power and thermal energy across more than one site and available to unrelated business entities. This is not true under typical circumstances where the sale of power and thermal energy to several unrelated entities would likely breach the distribution utilities franchise service territory rights.

The advantage is that multiple users with complimentary demands for power and thermal energy can permit system designs that optimize the energy efficiency and cost savings. If there are sites with complimentary characteristics, but each site is constrained to designing an individual system, then the benefits of these complimentary demands are lost. For this reason, the Project Team has identified the possibility of CHP development at sites that are both brownfield and industrial parks as an interesting opportunity offering some potentially significant energy efficiency benefits for end users and for the State.

The DEC maintains the Environmental Site Remediation Database. This database contains records of the sites which have been remediated or are being managed under one of Division of Environmental Remediation's remedial programs (i.e., State Superfund, Brownfield Cleanup, etc.).[50] DEC reports that all sites listed on the "Registry of Inactive Hazardous Waste Disposal Sites in New York State" are included in this database.[51] The Registry of Inactive Hazardous Waste Disposal Sites only includes the State Superfund sites.

This database can be searched by Program. Sites classified as "C" are considered complete; sites classified as "A" are still active. The DEC also has maintains a list of sites that have secured a COC. At present, this information can be found at http://www.dec.ny.gov/chemical/30360.html.

The DEC has issued 56 Certificates of Completion for Brownfield Cleanup Program sites since Chapter 1 of the Laws of 2003 established the Brownfield Cleanup Program. Of those 56 sites, several were industrial parks including:

- Flushing Industrial Park (Eastern) Parcel 1
- Flushing Industrial Park (Western) Parcel 2
- Flushing Industrial Park (Western Waterfront) Parcel 3
- Midler City Industrial Park in Syracuse

Among sites accepted into the BCP at least two have proposed the development of onsite energy projects.

- Empire Generating Project (2008) in Rensselaer
- Steelwinds (2007) in Lackawanna

The Empire Generating Project and Steel Winds projects are discussed briefly below.

Empire Generating Project (Empire)

Empire is the owner and developer of a 635 net megawatt (MW) (including 107 MW of duct firing capacity) combined cycle, natural gas fired power plant in Rensselaer, New York. Company

[50] NYS DEC, *Environmental Remediation Site Database*, http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3 (accessed June 16, 2009).
[51] NYS DEC, *Inactive Hazardous Waste Disposal Site Program (Superfund)*, http://www.dec.ny.gov/chemical/8439.html (accessed June 16, 2009).

officials say the power plant will generate property tax revenue for the city of Rensselaer and result in a beneficial cleanup and productive use at the former BASF site.[52] The facility will utilize a steam turbine that will be powered by the waste heat from the gas turbines.[53] The site is expected to be completed by 2010.

The benefits of the Empire Generating project are estimated to total $290 million over a 20-year period. Some economic benefits of this project include creating over 500 jobs to construct the plant and permanently adding 20 full time positions at the plant once the power plant is completed.[54]

Steel Winds Projects

The Steel Winds Project is a 20 MW commercial wind farm, along the shores of Lake Erie, which revitalized a 30-acre portion of the former Bethlehem Steel Brownfield site. The $40 million wind project is the first urban wind project in the United States. Steel Winds will generate enough electricity to serve the needs of approximately 6,000 western New York homes. The energy produced by Steel Winds has no fuel cost, therefore serving as a natural hedge against volatile fuel prices, which affects electric bills.

Developers of the project are paying the city of Lackawanna $100,000 a year for the next 15 years for the eight turbines that are in place because wind and solar energy projects are exempt from paying taxes. In addition, the developers stand to gain a state tax credit, up to 20 percent of the value of the development deal through the state Brownfield Cleanup Program (BCP).

The developers are also eligible to bid into the State's Renewable Portfolio Standard. If Steel Winds opts to bid into the portfolio, it could receive a little over $1 million a year for the length of the contract. Energy companies building new facilities can also write off all of their capital costs over five years.[55]

3.2.2 Controlled Environment Agriculture

Controlled Environment Agriculture (CEA) involves the use of science and technology to optimize the growth, quality and efficiency of plants. The plants environment is carefully controlled including the amount of temperature, light, and CO_2 it receives. CEA provides a viable solution to producing healthy plants on a continuous basis.

Key facts about the CEA industry include the following:[56]

- The principal CEA crops grown commercially are tomatoes, cucumbers, peppers, and lettuce. Strawberries, beans, squash, and herbs are also commonly grown.
- CEA is practiced on the largest scale in the Netherlands and Israel (pioneers), Spain, Mexico, Canada, the United States, Japan, Nicaragua, and Australia.

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[52] First Light Power Resources, *Empire Generating Co., LLC: Project Summary*, http://www.firstlightpower.com/generation/empire_generating_co_llc.asp (accessed on June 16, 2009).
[53] Rulison, Larry, *Power Plant in Full Swing*, Timesunion.com, June 2, 2009, http://www.timesunion.com/AspStories/story.asp?storyID=806008&category=BUSINESS.
[54] New York Real Estate Journal, *First Light Power Resources to Begin Construction of $700m Power Plant Project*, http://nyrej.com/21728 (accessed June 16, 2009).
[55] Steel Winds, http://www.steelwinds.com/steelwinds/ (accessed June 16, 2009).
[56] NY Sunworks Sustainable Engineering, *Controlled Environment Agriculture*, http://nysunworks.org/?page_id=47 (accessed on June 16, 2009).

- Today, there are over 3000 acres [~1200 hectares] of greenhouse hydroponic vegetables produced in the US, Canada, and Mexico (North America).
- Eurofresh (Arizona) sold 125 million pounds of tomatoes in 2005. They have 256 acres (~106 ha.) under glass and represent ~1/3 of the commercial hydroponic greenhouse area in the U.S.
- Village Farms (North America) grows more than 350 acres (~142 ha.) of hydroponic produce.
- Commercial greenhouses in Almeria, Spain cover a footprint of ~ 50,000 acres (~20,000 ha.)

CEA requires large heat sources which can be a very nice complement to a CHP system that requires a good thermal "host." CEA can be implemented in urban or rural areas. CEA makes greater economic sense in an environment when food transport costs are rising dramatically. There are other important factors that are generating greater interest in CEA, including concerns for food security, the diversification of food sources and greater consumer demand for local food sources.[57]

A good CHP project requires a "heat sink" at precisely the same times that electricity is being produced.[58] The more heat that can be used productively, the greater the efficiency. CEA is one among many possible thermal applications that could make for a highly efficient, and therefore cost-effective, CHP project. CEA simultaneously addresses two pressing public policy concerns: that of improving energy efficiency and improving the economic and energy usage characteristics of our current food supply system.

Opportunities

NYSERDA seeks to encourage innovative local food production systems, such as CEA, that can reduce dependence on carbon-based fuels. The production in New York State of fresh produce, fish and seafood products in controlled environments could experience explosive growth, based on rising energy and fertilizer costs, innovations in greenhouses and energy technologies, concern over energy security and food safety, and rising interest in locally grown food products.

Currently, NYSERDA is developing a Roadmap to show opportunities in the CEA industry in New York State. NYSERDA created CEA web pages and a listserv to help develop research priorities that will aid it in establishing future PONs. These PONs will offer funding to companies doing work in the CEA field.[59] For more information on CEA and how to join the listserv, please go to www.nyserda.org/programs/IABR/IndustryRD/Listserv.asp.

3.2.3 Microgrids

Microgrids are relatively small networks of CHP or other generation sources and loads that are optimized through an energy management system. Microgrid development creates a middle ground

[57] Bourgeois, Tom, *Combined Heat and Power (CHP) in the Northeast Region: An Introduction*, Northeast Combined Heat and Power Application Center, http://ceinfo.org/ugbn/Presentations/20COT08_Bourgeois_CHP-Intro-1.pdf (accessed June 16, 2009).
[58] This is true if no thermal storage is available. If a site has thermal energy storage then the demand for thermal energy can be de-linked from the demand for electric power
[59] NYSERDA, Controlled Environment Agriculture (CEA) Listserv, http://www.nyserda.org/programs/IABR/IndustryRD/Listserv.asp (accessed June 16, 2009).

between end use efficiency and efficient or renewable generation which can be used to improve the overall efficiency of CHP systems.

Several cities, notably London, are experimenting with Microgrids, and significant research and development (R&D) is underway in the U.S., including at Con Edison. However, there are no known projects that incorporate microgrids and brownfields together.

4 RESOURCES

4.1 Organizations

In this section we describe some resources for further information on CHP and brownfield redevelopment opportunities that may be relevant for our New York State audience.

4.1.1 New York State Energy Research and Development Authority (NYSERDA)

NYSERDA strives to facilitate change through the widespread development and use of innovative technologies to improve the State's energy, economic, and environmental wellbeing. NYSERDA's CHP program promotes cleaner and more-efficient electrical power generation, heating and cooling for buildings, and industrial processes. This program leads by providing technical assistance and incentives to energy users, gathering data and assessing trends to help formulate future energy policy. The contact person at NYSERDA is:

Dana Levy, Program Manager, Industrial Research
Phone: (518) 862-1090 ext. 3377
E-mail: DLL@nyserda.org
Website: http://www.nyserda.org/Programs/dgchp.asp

4.1.2 The New York Department of Environment Conservation (DEC)

The DEC works across New York State to pursue scientific assessment and vigorous action to protect and enhance New York's environment and natural resources. DEC cleanup programs promote environmental restoration and preservation, public health protection, economic development, job creation and community revitalization throughout the state. DEC has over 20 years of experience in cleaning up contaminated properties. While maintaining strict cleanup standards, DEC also provides appropriate liability relief and funding for investigation and remediation of contaminated sites. The contact person at DEC is:

Val Washington, Deputy Commissioner – Remediation and Materials Management
Phone: (518) 402-2794 one: (518) 402-9706
Website: http://www.dec.ny.gov/chemical/brownfields.html

4.1.3 Northeast CHP Application Center

The Northeast CHP Regional Application Center (NERAC) was established in October 2003 for the U.S. Department of Energy (DOE) at the University of Massachusetts Amherst (UMass) and Pace University (Pace). Its mission is to provide application assistance, technology information, and educational support in the seven Northeast states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The contact at NERAC is:

Tom Bourgeois, NERAC Co-Director for Education and Outreach
Phone: (914) 422-4013
E-mail: tbourgeois@law.pace.edu
Website: http://www.northeastchp.org/nac/index.cfm

4.1.4 Northeast Midwest Institute

The Northeast Midwest Institute (NEMW) is a private, non-profit, and non-partisan research organization dedicated to economic vitality, environmental quality, and regional equity for Northeast and Midwest states. It fulfills its mission by conducting research and analysis, developing and advancing innovative policy, providing evaluation of key federal programs, disseminating information, and highlighting sound economic and environmental technologies and practices. The Institute is unique has its ties to Congress through the Northeast-Midwest Congressional and Senate Coalitions, which is Co-chaired by Senators Susan Collins (R-ME) and Jack Reed (D-RI), and Reps. Steven LaTourette (R-OH) and Jim Oberstar (D-MN). Evans Paull is a senior policy analyst focusing on Brownfield redevelopment and ecosystem-restoration financing. The contact at NEMW is:

Evans Paull, Senior Policy Analyst
Phone: (202) 544-5200
Website: http://www.nemw.org

4.1.5 Environmental Protection Agency (EPA)

EPA's Brownfields Program provides direct funding for brownfields assessment, cleanup, revolving loans, and environmental job training. To facilitate the leveraging of public resources, EPA's Brownfields Program collaborates with other EPA programs (CHP), other federal partners, and state agencies to identify and make available resources that can be used for brownfields activities. In addition to direct brownfields funding, EPA also provides technical information on brownfields financing matters. The contact at EPA is:

Mr. Derrick Brown
Office of Brownfields and Land Revitalization (OBLR)
Phone: (202) 566-2772
Fax: (202) 566-1476
Email: brown.derrick@epa.gov
Website: http://www.epa.gov/brownfields/index.html

OR

CHP Partnership
U.S. Environmental Protection Agency
Phone: 703-373-8108
E-mail: chp@epa.gov
Website: http://www.epa.gov/CHP/index.html

4.1.6 National Brownfield Association

The National Brownfield Association (NBA) is a non-profit, member-based organization dedicated to promoting sustainable development and encouraging green building on Brownfield sites. The NBA is the premier association for government, businesses and individuals involved in the

redevelopment of Brownfields and the only group that represents the wide range of public and private sector Brownfield stakeholders. The NBA is the "go-to" organization for information on the Brownfield market, keeping its members up to date on market trends, redevelopment opportunities, and changes in policy and legislation. The contact at NBA is:

Jill Burgos, Northeast Chapter Coordinator
Phone: (773) 714-0407 ext 124
E-mail: jillb@brownfieldassociation.org
Website: http://www.brownfieldassociation.org/Home/tabid/36/Default.aspx

4.2 Applications

NYSERDA's CHP existing facilities application
http://www.nyserda.org/programs/Existing_facilities/pdfs/Existing%20Facilities%20application.pdf

NYSERDA's New Construction Program
http://www.nyserda.org/Funding/1222pon.asp

NYSERDA's Commercial Loan fund
http://www.nyserda.org/loanfund/appcommercialInfo.pdf

EPA Brownfields cleanup fact sheet
http://www.epa.gov/brownfields/facts/cleanup_factsheet.pdf

APPENDIX A. Brownfield Tax Credits Fact Sheet

Green Energy for Brownfields:
How to use Tax Credits to install Combined Heat and Power Systems at Redeveloped Brownfields in New York State

The Brownfield Redevelopment Opportunity
A brownfield is a property where redevelopment or reuse may be complicated by the presence of hazardous waste and/or petroleum. There are thousands of brownfields across New York State, representing an important share of the State's potentially developable property base. Brownfield redevelopment can provide significant benefits for the surrounding community and can reduce the need to use undeveloped land. The New York State Brownfield Cleanup Program (BCP) offers a suite of incentives to encourage brownfields redevelopment when a site is remediated and meets the requirements of the BCP. It should be noted that on June 23, 2008, some incentives were modified. One of the modifications involves the Brownfield Redevelopment Tax Credit (BRTC) which contains three incentive opportunities. First, there is a property tax credit of between 10% and 24% for capital investments made on cleaned-up brownfields. The BRTC is capped at $35 million for non-manufacturing properties and $45 million for manufacturing projects. Second, based upon the level of remediation, there is a tiered approach for the claimed credit and third there are onsite groundwater remediation credits available. Approved BCP projects before June 23 will be grandfathered in under the old rules which did not place a cap on the property tax credit and did not provide a benefit for being in a Brownfield Opportunity Area (BOA).

The Combined Heat and Power Opportunity
The BRTC creates a significant opportunity for investments in alternative energy technologies. One of the most compelling of these technologies is combined heat and power (CHP). CHP systems generate electricity through combustion and capture the waste heat from the combustion process for use in heating and/or cooling applications. The simultaneous generation of electricity and heat can be twice as efficient as generating heat and power separately. The increased efficiency of these systems decreases air pollution and greenhouse gas emissions in New York and results in increased energy bill savings for developers who install CHP on their property. Investments in CHP qualify for the Brownfield Redevelopment Tax Credit, and redevelopment projects are well-positioned to profit from CHP installations.

How does the Brownfield Redevelopment Tax Credit Work?
Focusing solely on the first component of the Brownfield Redevelopment Tax Credit (BRTC), the property tax credit is a refundable tax credit, which means that if an investor does not have sufficient qualifying tax liability to absorb the tax credit, the remainder of the credit is paid as cash. The BRTC is available to brownfield redevelopers that have signed a Brownfield Cleanup Agreement with the New York Department of Environmental Conservation (NYSDEC).

How is the value of the BRTC determined?
The tax credit value varies by the type of entity filing a tax return, the extent of the clean-up, and the location of the brownfield site. The base tax credit is 12% for corporate taxpayers and 10% for non-corporate taxpayers. If the site has been cleaned up to the point that it can meet the State's 6 NYCRR Part 375 regulation's requirements for unrestricted use (Track 1), then the value of the tax credit increases by 2%. If at least half of the brownfield site is located in an area designated by Empire State Development as an environmental zone (EnZone), then the value of the credit increases by 8%. EnZones are areas of the State with high poverty and unemployment rates. A map of EnZones in New York can be found at http://www.empire.state.ny.us/pdf/brownfields/All_Criteria.pdf. Finally, if the site is in a designated

Brownfield Opportunity Area (BOA), the credit increases by an additional 2%. Information about the BOA program can be found here: www.nyswaterfronts.com/grantopps_BOA.asp.
As shown below, the tax credit for CHP on BCP sites can be as high as 24%.

Calculating the Brownfield Redevelopment Tax Credit

Taxpayer	Base tax credit	Track 1	EnZone	BOA	Maximum tax credit
Non-Corporate	10%	+2%	+8%	+2%	22%
Corporate	12%	+2%	+8%	+2%	24%

How can a developer take advantage of the Tax Credit for CHP systems?
The Pace Law School Energy Project is working actively to connect brownfield redevelopers and CHP developers. If you are a brownfield redeveloper interested in learning more about CHP or exploring partnerships with CHP companies, Pace can assist you using its in-house expertise and extensive industry network. If you are a CHP developer interested in exploring opportunities on brownfield sites, the Pace team is developing a tool for identifying the most promising brownfield sites around New York State and is conducting ongoing outreach to brownfields redevelopers about the benefits of CHP. For more information about this program, please contact Tom Bourgeois at the Pace Energy and Climate Center at (914) 422-4013 or *TBourgeois@law.pace.edu*.

APPENDIX B. Issues of Uncertainty and Timeliness Related to the BCP Program

The Brownfield Cleanup Program and the associated tax credit incentives are designed to further the State's goal of enhancing private sector clean-up of brownfield sites. In the course of preparing this report, the authors received numerous comments from the development community regarding the effectiveness of the BCP in meeting the goal of fostering greater private sector interest in clean-up of brownfield sites.

We recognize that this report is not the appropriate venue for opening a debate about the factors that may make the BCP more effective in meeting its objectives, or even whether or not changes to the program are warranted. However, due to the frequency with which these issues arose in our interviews, the authors determined that the report would not be complete if these matters were omitted entirely.

Developers place a premium on timeliness and on the ability to manage risk. They state that developing a brownfield site is a time consuming process and one that is fraught with uncertainties. All other factors equal, it is much easier to manage timelines and project risk on non-brownfield sites. To encourage development at brownfield sites requires inducements that counter-balance these real increases in the cost of doing business. The State of New York clearly recognizes this and has addressed it with the passage of the Brownfields Cleanup Program and the full suite of programmatic tools and resources to stimulate development at brownfield sites.

Several parties with whom we spoke, entities involved in the brownfield development process, have expressed concerns related to timeliness and more so to risks, pertaining to the BCP program. The primary issue seems to be the risk that a proposed project will not be accepted into the BCP. The consensus among the small group of developers whom we interviewed was that there was too high a degree of uncertainty related to DEC's determination of the eligibility of individual projects for the program.

Those commenting on this issue felt that there should be a clearer path to program participation. Such a result would encourage those considering private redevelopment of brownfields to take on the additional business risks that are associated with such projects, if they felt that being admitted to the BCP was more predictable.

Another concern expressed by developers was that, once a project has been accepted into the BCP, there may be substantial uncertainty regarding the timing of DEC's review of required submissions, such as engineering work plans and reports. The BCP does not establish any deadlines for DEC's review and approval of submissions. Here again, developers have heightened concerns about timeliness and risk.

One suggestion related to clean energy development on brownfield sites was to create a special pathway to program participation. If a site met certain conditions related to clean energy project development, that site would have a greater assurance of being admitted into the program. A site qualifying for entry into the program on this "preferred basis" could also be placed on a fast track through the review and approval process.

Setting apart clean energy development projects for preferred treatment is not without precedent. States have experimented in the past with special tracks for firms that have displayed exemplary

performance on environmental matters in the past, or for projects that meet a pre-ordained set of criteria that distinguish them as “environmentally superior”.

The State of New York has identified improving the energy efficiency of industry, buildings and transport and the development of clean energy resources to be important public policy objectives. The State’s interest in the promotion of established energy efficiency and clean energy development goals provides a sound rationale for considering creation of a “preferred path” for projects that are deemed to be superior in this regard.