COMBINED HEAT AND POWER ON BROWNFIELD SITES
Final Report

Prepared for

THE NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

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Abstract

Remediated brownfield sites offer an attractive and underutilized opportunity for siting clean distributed generation (DG) and combined heat and power (CHP), either in newly constructed buildings on a brownfield site or in renovated buildings on a brownfield site. Parties who remediate a contaminated site can be eligible for significant financial incentives from the existing New York State Brownfield Cleanup Program (BCP) tax credits, coupled with New York State incentives through NYSERDA, and federal tax credits. However, brownfield developers, municipalities, and community-based organizations affiliated with Brownfield Opportunity Areas (BOAs) (hereinafter BOA participants) are largely unaware of the benefits and potential opportunities of CHP on sites they are remediating through the BCP and BOA programs.

This project began an educational outreach effort in the brownfield developer and BOA communities on the benefits of installing CHP as part of a brownfield project and cost offsets that can be achieved by bundling the various incentive programs together to the extent still available. The team received positive feedback from these groups once they understood the commercially available CHP technologies on the market, and CHP systems are being effectively implemented as part of actual brownfield projects. However, the fluctuating incentive programs, which have even changed during the course of this contract, pose a real barrier to adoption of CHP on brownfield sites. The feedback received during the educational outreach effort, which included a review of in-the-field case studies, and a developer invitation-only tour of an actual CHP facility, indicated a willingness on the part of developers and BOA participants to consider CHP as an element of their brownfield redevelopment projects, provided: (1) such installations are consistent with an expected rate of return on investment; and (2) the available financial incentives are clear and certain. If New York's incentive programs for CHP and brownfields can become reliable and consistent, continued education related to CHP technology would very likely result in increased use of CHP technology as part of large scale brownfield redevelopment projects.

The study found multiple successful models for the mutually beneficial deployment of CHP in brownfields redevelopment, and each of these models is tied in to a particular set of public policy objectives.

- CHP matches up well with dense mixed use redevelopment projects that also benefit smart growth, community revitalization, and lowered greenhouse gases;

- CHP-served industrial parks generate jobs, support community economic development, and encourage a revival of manufacturing by virtue of energy savings and efficiencies;
- A new generation of CHP-based eco-industrial parks promises a higher success rate than eco-parks of the past, generating not only jobs and economic development, but also waste minimization;
- CHP can also anchor sustainable controlled-environment agriculture projects that offer the benefits of locally grown produce, while generating jobs and energy for the community.

The energy-efficiency and greenhouse gas-lowering benefits of CHP, when combined with the corresponding community benefits of these redevelopment projects, creates a compelling case that one might think would be reflected in favorable public policies. However, CHP is often a lower priority or in a grey area for energy-related incentives. Land-intensive renewables such as solar and wind tend to garner greater attention, even though they do not match up well with community redevelopment objectives. This analysis illuminates an area of research and public policy that has been largely ignored - the opportunities and benefits presented when redevelopment projects are aided by the energy efficiencies of CHP.

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Introduction

The redevelopment of Brownfield sites provides developers, community officials and the future tenants of the project a unique opportunity to consider new and innovative means for producing, distributing and utilizing energy at this location. When a site is developed there may be a desire to co-locate a variety of different types of uses: commercial enterprises; multi-family; and so on. These mixed types of business activities and residential uses might have energy consumption patterns that would be quite favorable for the utilization of combined heat and power (CHP) systems. Such a system might serve the electric power and thermal energy needs of a portion, or all of the enterprises within the new development. When electric power and thermal energy are generated onsite and distributed over an entire campus or development, we refer to these facilities as District Energy Systems with CHP (CHP/DES).

A well designed, high efficiency, low emissions CHP or CHP/DES can dramatically improve productivity, lower facilities' operational costs, provide more reliable power and make brownfield sites more competitive in an increasingly challenging economic environment. Utilizing onsite power at brownfield sites is not a new concept. This approach was piloted with renewable energy, primarily solar PV, beginning more than a decade ago.[1]

CHP and CHP/DES at brownfield sites offers a set of attributes that are distinct from prior approaches that focused on renewable energy. Solar PV systems, for example, offer the benefit of releasing no emissions of criteria pollutants or greenhouse gases. However, these systems remain quite costly, have a large land requirement per MW of power generated, operate at much lower efficiencies than CHP/DES, and provide a power source that is intermittent – subject to the availability of the local solar resource.

CHP and CHP/DES can deliver high total system efficiency by capturing and productively using the waste heat from power generation. In some applications such as the award winning district system at University of Texas – Austin, the efficiency of conversion reaches 90%. The power density of CHP and CHP/DES systems is far greater than that of solar PV; CHP/DES systems produce much more power and thermal energy on a comparatively smaller footprint. In addition,

[1] See for example "Energy Department Announces National Initiative to Redevelop Brownfields with Renewable Energy" at http://epa.gov/brownfields/partners/brightfd.htm, which refers to a 1999 announcement by then US DOE Secretary Bill Richardson.

the total efficiency of CHP/DES systems can approach 90%, while conversion efficiencies for PV are less than 20% in many applications.

The scale and the heterogeneity of industrial park and brownfields developments can make them particularly attractive opportunities for CHP and CHP/DES as larger projects generally present the prospect of more favorable economics. Furthermore, with the added feature of complimentary electric and thermal loads in close proximity, there is an opportunity to provide heating, cooling and power energy services to client sites operating within a development at a very competitive cost.

Certain types of businesses that require high levels of power quality and reliability are likely to be more attracted to sites that have onsite CHP systems, backed up with utility power. Data centers, financial institutions, research facilities, many types of industrial processes with sensitive computer controlled applications, are all strong potential candidates for high reliability onsite power generation. These types of customers demand enhanced levels of power reliability and quality that appropriately designed and configured CHP/DES systems can offer. Furthermore, the types of customers that require higher levels of power reliability and quality oftentimes are the types of high wage, high value added businesses that municipal leaders and economic development agencies find most attractive to recruit and retain.

Report Framework

The first two sections of this report organize the federal and New York State energy incentives available for CHP and explore federal policy issues surrounding CHP, district energy, and brownfields. Taken together, these sections provide a snapshot of the existing suite of incentives that can support clean energy development at remediated brownfield sites.

The report then discusses a number of in-depth case studies prepared for this project, including financing, technology, impacts, and how CHP fit into the overall redevelopment project. This section is followed by an analysis of the case studies.

The final section of this report describes the outreach directed towards developers and Brownfield Opportunity Areas (BOAs) under the scope of this project.

Additional information regarding state and federal incentives and complete case study write-ups are contained in the Appendices.

1. FEDERAL AND NEW YORK STATE ENERGY INCENTIVES APPLICABLE TO CHP

1.1 Federal Energy Incentives

Of the federal incentives listed below, those that have the greatest impact and are most universally available to CHP technology are the two federal tax incentives – the Business Energy Investment Tax Credit (ITC), and the accelerated depreciation provisions under the Modified Accelerated Cost-Recovery System (MACRS).

CHP technologies are also presumed to be broadly eligible for the US Department of Energy's (DOE's) Loan Guarantee Program if the project advances a new or improved technology.

A number of other tax credit, loan, and loan guarantee programs geared to renewables and CHP are only eligible if the feedstock or technology is classified as renewable and eligible for that program. That is, a CHP system that uses qualifying biomass as the feedstock, for example, would be eligible for most of these funding sources. CHP applications within fuel cell and solar technologies would also, presumably, be eligible.[2]

1.1.1 Capital Investment Tax Incentives – CHP Eligible

Business Energy Investment Tax Credit (ITC)[3] The Business Energy Investment Tax Credit (ITC) creates a 10 to 30 percent tax credit (ITC) for eligible capital costs. The applicable tax credit for CHP is 10 percent of the first 15 megawatts (MW). To qualify for the tax credit, the CHP system must

- produce at least 20 percent of its useful energy as electricity and 20 percent in the form of useful thermal energy
- be smaller than 50 MW
- be constructed by the taxpayer or have the original use of the equipment begin with the taxpayer
- be placed in service after October 3, 2008, and before January 1, 2017, and

[2] Additional information regarding federal energy incentives is available in Appendix A; information regarding New York State incentives is available in Appendix B.
[3] Websites: http://www.epa.gov/chp/incentives/index.html and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=0&ee=1

- be 60 percent efficient on a lower heating value basis.

Treasury - Renewable Energy Grants[4] The Treasury Department's Renewable Energy Grants, which convert the value of the ITC credit into an upfront grant, are authorized through the American Recovery and Reinvestment Act of 2009 (ARRA) and will expire after 2011. CHP projects that are eligible for the ITC are also eligible for the grants. Many of the project planners interviewed for this study are using this program. One, the Baltimore Energy Answers Fairfield project, has gained a commitment of $200 million.

Accelerated Depreciation - Modified Accelerated Cost-Recovery System (MACRS)[5] Under the federal Modified Accelerated Cost-Recovery System (MACRS), businesses may accelerate depreciation of certain energy production facilities. CHP is listed as eligible for a five-year schedule, the same as solar-electric, solar-thermal, fuel cells, microturbines, geothermal, and small wind. The five year schedule allows a 50% depreciation in the first year and the remainder in years two through five. The EPA CHP Partnership website indicates the following relative to the current authority for the program: "In December 2010 the provision for bonus depreciation was amended and extended by *The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (H.R. 4853)*. Under these amendments, eligible property placed in service after September 8, 2010 and before January 1, 2012 qualifies for 100 percent first-year bonus depreciation. For 2012, bonus depreciation is still available, but the allowable deduction reverts from 100 percent to 50 percent of the eligible basis."[6]

1.1.2 Production Tax Incentives – CHP Eligible if Feedstock/Technology is Renewable

Renewable Electricity Production Tax Credit (PTC)[7] The Renewable Electricity Production Tax Credit (PTC) grants a federal tax credit based on a per kWh rate for electricity that is produced from renewable sources. The corporate tax credit is highest (2.1 cents per kWh) for wind, closed-loop biomass, and geothermal. A lower (1.0 cents per kWh) is available for landfill gas, open-loop biomass, municipal solid waste resources, qualified hydropower, and marine resources. CHP projects are not specifically referenced so the operative assumption is that CHP is only

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[4] Website: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US53F&re=0&ee=1
[5] Websites: http://www.epa.gov/chp/incentives/index.html and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US06F&re=0&ee=1
[6] http://epa.gov/chp/incentives/index.html
[7] Websites: http://www.epa.gov/chp/incentives/index.html and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US13F&re=0&ee=1

eligible if the feedstock is "renewable" (biomass, municipal solid waste) and listed as eligible. According to the EPA CHP Partnership website, the status of the authority for the program is as follows: "The Energy Improvement and Extension Act of 2008 (EIEA) extended the PTC for biomass, geothermal, hydropower, landfill gas, waste-to-energy, and marine facilities and other forms of renewable energy through 2010, and ARRA further extended the tax credit through 2013."[8]

Facilities eligible for the PTC may opt for the ITC, but may not claim both. Project planners interviewed for this study have not mentioned PTC as an incentive that has been used.

1.1.3 Capital Loan Guarantee for New/Improved Technologies – CHP Eligible

Department of Energy Loan Guarantee[9] The US DOE issues loan guarantees to projects that "avoid, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." The projects need to employ new or significantly improved technologies when compared to technologies in service in the United States at the time the guarantee is issued. Because the focus of this program encompasses energy efficiencies and reducing greenhouse gases (rather than focusing only on renewables), CHP technologies can be assumed to be potentially eligible if a project meets the "new/improved" technology criteria. Listed eligible projects include fuel cells and "efficient electrical generation, transmission, and distribution technologies," as well as renewables. The program has historically been designed to support larger scale renewable energy and biofuel projects.

The legal authority for the program is Section 1703 of the Energy Policy Act of 2005 (Innovative Energy Efficiency, Renewable Energy, and Advanced Transmission & Distribution Loan Guarantees). ARRA expanded the loan guarantee program under section 1705 with $6 billion for renewable energy systems, biofuel, and electric power transmission projects. The 2009 funds are limited to projects that commenced construction by September 30, 2011.

Those interviewed for this study indicated a high level of frustration with this program and its applicability to CHP. Three interviewees had very similar experiences in that DOE was unable to give them good guidance with respect to eligibility and other program details.

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[8] http://epa.gov/chp/incentives/index.html
[9] Websites: http://www.lgprogram.energy.gov/ and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US48F&re=0&ee=1

1.1.4 Capital Loans and Loan Guarantees – CHP Eligible if Feedstock/Technology is Renewable

Clean Renewable Energy Bonds (CREB)[10] Two bond programs exist that are designed to produce low or no interest loans for energy conservation – Clean Renewable Energy Bonds (CREB's) and Qualified Energy Conservation Bonds (QECB's). The CREB Program produces very low or no interest loans through a bond program that is linked to a federal tax credit. However, the program does not have a current federal appropriation so the program is dormant. Additionally only public agencies and energy cooperatives are eligible, so it has limited applicability to CHP.

Qualified Energy Conservation Bonds (QECB)[11] The QECB program is similar to CREB's in that it makes available low or no interest loans by virtue of the link to a federal tax credit. The available tax credit authority is distributed to the states and 29.9 percent of the state's allocations can be used for "private activity bonds." CHP systems that use municipal solid waste or biomass as feedstock appear to be eligible because QECB's can be used for projects eligible for the PTC under Section 45.[12] Fuel cells and microturbines are listed technologies that are supported. However, QECB's can be used for a variety of purposes, including community energy conservation programs such as PACE; CHP systems may have difficulty competing for limited funding (authorization level $800 million).

Department of Agriculture Renewable Energy for America Program (REAP)[13] There are two Department of Agriculture loan and grant programs for renewable energy under the Renewable Energy for America Program (REAP); however CHP systems would only be eligible if the feedstock is renewable (e.g. biomass). The program is also limited to serving public agencies and electricity cooperatives.

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[10] Websites: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US45F&re=0&ee=1 and http://www.epa.gov/chp/incentives/index.html

[11] Websites: http://www.epa.gov/chp/incentives/index.html and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US51F&re=0&ee=1

[12] http://www.dsireusa.org/documents/Incentives/US13F.htm

[13] Website: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US46F&re=0&ee=1

1.1.5 Renewable Production Subsidy – CHP Eligible if Feedstock/Technology is Renewable

Renewable Energy Production Incentive (REPI)[14] The Renewable Energy Production Incentive (REPI) Program complements the Renewable Energy Production Tax Credit, listed above, by supplementing the sale price of renewable energy that is sold to the grid. Facilities are eligible for annual incentive payments of approximately 2.0 cents/kWh for landfill gas, solar, wind, geothermal, biomass, livestock methane, ocean, or fuel cells using hydrogen derived from eligible biomass facilities. CHP is not a named technology, but is presumed to be eligible if the feedstock/technology is recognized as renewable. The legal authority is the Energy Policy Act of 1992, reauthorized (and extended through 2026) by the Energy Policy Act of 2005. To be eligible, qualified renewable energy facilities must be operational before October 1, 2016. Funding is subject to annual appropriation, and the program has historically been under-funded.

1.2 New York State Energy Incentives/Programs

1.2.1 State Incentive Programs (Funded through the System Benefit Charge)

NYSERDA CHP Acceleration Program (To begin in 2012; some details still unknown) This program, a market development incentive, aims to accelerate the installation of CHP systems at New York State facilities in order to produce electricity and useful thermal energy. The maximum award per project is still unknown, but the total program budget is $25 million over five years (to run through 2016). This program will replace NYSERDA's Demonstration Program, with some differences. The Acceleration Program has a smaller budget and only considers pre-engineered, pre-packaged systems. Modules must be between 50 kW and 1MW; no more than 2 MW can be behind any one customer's meter.

1.2.2 Utility Rebate Program

Net Metering[15] This is an electricity policy in effect in many states, including New York (where it is managed by the state's Public Service Commission). Residential and non-residential customers of the state's major investor-owned utilities can measure the renewable energy they produce on-site against the energy they purchase at retail rates. In NY State, residential

[14] Website: http://www.epa.gov/chp/incentives/index.html#three and http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US33F&re=0&ee=1

[15] Website: https://www.nationalgridus.com/niagaramohawk/business/energyeff/4_net-mtrg.asp

producers can use micro-CHP (up to 10kW in capacity) to generate electricity and off-set the electricity they consume. If they generate more energy than they use, the net excess generation (NEG) can be credited by the utility provider at the distribution utility's avoided cost rate, *not* the full retail rate, or carried over indefinitely. The aggregate limit on net-metered CHP is 1% of a utility's 2005 demand. Recent laws allow remote net metering and micro hydro generation.

1.2.3 Other Programs

Empire State Development Corporation – Manufacturing Assistance Program (MAP) This program helps NY State manufacturers to invest in capital projects that "significantly improve production, productivity and competitiveness."[16] State manufacturers must use funds for capital investments in machinery and equipment. Projects that incorporate "industrial effectiveness" consulting and worker skills training are also eligible for funding. Interested NY State manufacturers must employ between 50 and 1,000 workers and at least 30 percent of their production must be exported beyond the immediate region or to a prime manufacturer that exports beyond the region. The maximum assistance is $1 million, determined by "magnitude of the improvements and their overall benefit to the company; the amount of private investment leveraged; and the economic impact of the manufacturer within its regional economy."

Empire State Development Corporation – Linked Deposit Program (LDP) The Linked Deposit Program aims to make borrowing less expensive for eligible NY State firms that want to "improve their competitiveness, market access and product development; modernize their equipment and/or expand their facilities for productivity growth or to introduce new technologies; to facilitate ownership transition; and to promote job creation retention."[17] Structured as a public-private partnership, businesses can obtain subsidized loans (subsidized by state deposits) with a 2 to 3 percent interest rate reduction. The maximum loan amount is $500,000 over four years, although as of 2011 legislation, borrowers can apply for a four-year extension/renewal. The maximum lifetime assistance, which includes prior deposits and extensions/renewals, is $2 million.

Dormitory Authority State of New York (DASNY) – Tax Exempt Equipment Leasing Program (TELP) [18] TELP is a technology and equipment financing program available to any DASNY

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[16] Website: http://esd.ny.gov/businessprograms/map.html
[17] Website: http://www.esd.ny.gov/BusinessPrograms/LinkedDeposit.html
[18] Websit: http://www.dasny.org/telp/index.php

qualified non-profit client that leases technical equipment, including energy management assets for the production of CHP. This program changes the traditional two-party taxable lease structure to include a financing organization as a third party. Client lease payments made to DASNY are automatically reassigned to this third party funder, which under this structure does not pay any taxes on interest income received from the nonprofit. Due to this elimination of taxes on the interest income portion of the taxable lease transaction, the average client saves about 10 percent on each $1,000,000 leased.

The Brownfield Redevelopment Tax Credit (BRTC) New York State has established a suite of incentives under the Brownfield Cleanup Program. One such incentive is a 10% - 24% Brownfield Redevelopment Tax Credit (BRTC) for property investments on remediated brownfields. These tax credits, under the Tangible property credit component, can be applied to CHP investments, and are capped at the lesser of $35 million or three times total cleanup costs for non-manufacturing properties. For manufacturing sector projects the cap is the lesser of $45 million or six times total cleanup costs. The tax credit is refundable, which means that the credit may be paid in cash if the taxpayer's tax liability is less than the amount of the credit.

1.2.4 State Standards

Renewable Portfolio Standard (managed by NYSERDA)[19] The goal of New York's renewable portfolio standard (RPS) is to expand the use of renewable energy in the state. As adopted in 2004 and revised in 2010, the RPS aims to use renewable sources for 30% of the State's electricity consumption by 2015. NYSERDA manages solicitations/ projects that are categorized as part of the Main Tier or the Customer-Sited Tier. CHP systems are eligible for either tier, depending on the size of generation. RPS incentives are available for anaerobic digester gas-fueled CHP and fuel cell CHP behind the customer's meter, large-scale biomass CHP, and pipeline directed biogas in the lower Hudson valley and in New York City.

1.2.5 Market-Based Incentives

Emission Reduction Credits (ERCs)[20] When a facility closes or reduces certain emissions below federally-required levels of control, it can sell credits to other facilities within a limited geographic area that need to offset new or increased emissions that exceed this cap. CHP projects

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[19] Website: http://www.nyserda.ny.gov/en/Programs/Energy-and-Environmental-Markets/Renewable-Portfolio-Standard.aspx
[20] Website: http://www.dec.ny.gov/chemical/8564.html

that generate fewer emissions than other combustion sources are eligible for ERCs. In NY State, NO_X, VOC, fine particulate matter (PM-2.5 and PM-10), and SO_2 ERCs can be marketed to nonattainment areas – those areas "where air pollution levels exceed the national ambient air quality standards."[21] Each ERC represents an emissions reduction of one ton per year. All available credits in NY State are listed in a registry[22], which is updated by the New York State Division of Air's Bureau of Stationary Sources. The ERC process can be a lengthy and expensive one and is not worthwhile unless the project creates "a significant emission reduction in an area where a high demand for ERCs creates a favorable price." [23]

Regional Greenhouse Gas Initiative[24] The Regional Greenhouse Gas Initiative (RGGI) took effect in 2009 and aims to complement other emissions or energy use reduction/clean energy programs. The Initiative establishes a carbon cap and trade market in ten Northeast and Mid-Atlantic states, including New York. The states have agreed to collectively cap and reduce total annual CO_2 emissions (from electric power generators larger than 25 MW) by ten percent by 2018. Individual states' caps vary; NY State will cap its emissions at roughly 64 million tons through 2014. NYSERDA coordinates the auctioning of CO_2. Some biomass-fed system CHP projects may be eligible for CO_2 offset allowances, including those associated with landfill methane capture and destruction, and with avoided methane emissions from agricultural manure management operations.

Property Assessed Clean Energy Bonds (PACE)[25] (Most local PACE programs have been suspended until further clarification in the wake of a 2010 Federal Housing Financing Agency statement, which expressed concern about the seniority of PACE liens.) New York is one of 17 states that adopted PACE enabling legislation in recent years, thereby authorizing its municipalities to finance loans from a variety of revenue sources. Current NY State law limits PACE programs to those funded via federal support. PACE allows homeowners and businesses to finance renewable energy and energy efficiency projects; such projects would include those deemed eligible by NYSERDA. To qualify, a contractor certified by NYSERDA, or to equally stringent standards, must conduct an energy audit or renewable energy feasibility study. Property owners repay loans through a 20-year annual assessment on property taxes; the assessment is attached to the property as a lien and is passed on to the new owner if sold. The maximum loan

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[21] Website: http://www.epa.gov/chp/documents/ers_program_details.pdf
[22] Website: http://www.dec.ny.gov/chemical/8948.html
[23] Website: http://www.epa.gov/chp/documents/ers_program_details.pdf
[24] Website: www.rggi.org
[25] Website: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY68F&re=1&ee=1

amount is 10 percent of the appraised real property value or 10 percent of the cost of qualified improvements.

2. FEDERAL POLICY ISSUES – CHP, DISTRICT ENERGY, AND BROWNFIELDS

A number of federal policy issues arose from the project team's extensive contacts with CHP project planners. The project team additionally surveyed congressional proposals that relate to CHP and district energy. The team was not tasked with preparing policy "recommendations;" therefore the following is offered to stimulate discussion.

2.1 CHP and District Energy Statutory Issues

Continuation of the 1603 Treasury Department Renewable Energy Grants – The Treasury Department's section 1603 Renewable Energy Grants, which convert the value of the Business Energy Investment Tax Credit (ITC) into an upfront grant, are ARRA-authorized and will expire after 2011. As noted in the case study section, eight of the projects inventoried for this study are using the 1603 grants, and conversely, many of the projects cited would not have been undertaken absent the Treasury grants. If Congress continues the program, these kinds of projects would be replicated, accelerating the dual benefits of energy efficiency and sustainable economic development.

ITC Tax Credit Capacity Limitations – HB 2720 raises the capacity allowance for the Business Energy Investment Tax Credit (ITC) from 15 MW to 25 MW for CHP projects; it also makes industrial heat recovery projects (heat recovery from manufacturing processes) eligible for the ITC.

High Performance CHP Incentives – HB 2784 creates a new category of "Highly Efficient CHP projects," defined as those meeting a 70 percent efficiency. CHP projects that meet the 70 percent efficiency standard would be universally eligible for the 30 percent ITC credit. Currently, CHP projects are only eligible for the 30 percent tax credit if the feedstock is renewable.

District Energy Incentives – HR 5805 of the 111th Congress, Thermal Renewable Energy and Efficiency Act of 2010, does the following:

- Amends the Internal Revenue Code to extend the tax credit for the production of electricity from renewable resources to the production of thermal energy.

- Modifies the definition of "local heating and cooling facilities" for purposes of tax-exempt facility bonds to include equipment for producing thermal energy in the form of hot water, chilled water, or steam, distributing that thermal energy in pipelines.
- Amends the Energy Policy and Conservation Act, with respect to the energy sustainability and efficiency grant and loan program for institutions, to include a not-for-profit district energy system as an institutional entity for purposes of such grant program.

Clean Air Act – New Source Review – CHP project planners express concern that the permitting process for new CHP facilities is unduly difficult because the CHP plant's emissions are viewed like any other "New Source."[26] They maintain that there should be an established way for the forestalled emissions (the emissions from alternative dirtier or less efficient sources) to be taken into account in the permitting process.

Municipal Solid Waste as "Renewable" – The Environment and Energy Study Institute (EESI) produced a white paper that recommends that municipal solid waste (MSW, the feedstock for some CHP plants) should be classified as "renewable," making it eligible for various federal renewable energy incentives.[27]

Accelerated Depreciation for District Energy Assets – The International District Energy Association supports a reduction in depreciation schedules under the Modified Accelerated Cost Recovery System (MACRES) from the current 20 years to five years.[28]

2.2 CHP and District Energy Funding Issue

Full funding for EISA Sec. 471 – Section 471 authorizes the Energy Sustainability and Efficiency Grants and Loans for Institutions, which provides local government with cost-shared funding for sustainable energy projects, such as district energy systems, renewable energy, combined heat and power, waste heat recycling and natural sources of thermal energy such as deep water cooling. The program was authorized at $3.75 billion over FY 2009-2013.[29]

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[26] Arthur Venables, "Overcoming Regulatory Hurdles," http://cogeneration.org/ and US Clean Heat and Power Association, letter to US EPA, September 30, 2010, comment on the Clean Air Transport Rule.
[27] Environmental and Energy Study Institute, Issue Brief, "Reconsidering Municipal Solid Waste as a Renewable Energy Feedstock," July, 2009. http://www.seas.columbia.edu/earth/wtert/sofos/eesi_msw_issuebrief_072109.pdf
[28] Mark Spurr, International District Energy Association, Legislative Agenda for District Energy and CHP, Briefing sponsored by Environmental and Energy Study Institute and International District Energy Association, April 21, 2009
[29] ibid

2.3 CHP and District Energy Administrative Issues

DOE Loan Guarantee Program – Three of our case study projects had almost identical experiences with the DOE Loan Guarantee Program: that DOE was unable to provide them with useful guidance; that CHP seemed to be in a gray area relative to eligibility and departmental priorities; and that a great deal of time, effort, and expense was wasted on unsuccessful applications.

EPA Re-Powering America Initiative – The EPA Re-Powering America's Land Initiative promotes renewable energy reuse of contaminated sites. Because the primary renewable sources – solar and wind – are land intensive, the Re-Powering program is primarily oriented to larger more rural sites and landfills, i.e. sites where alternative productive uses are fairly unlikely. CHP and district energy are often times not classified as "renewable" because the feedstock may be carbon-based. However, there is vast potential for CHP and district energy to work in concert with brownfields redevelopment, while also producing energy efficiencies equivalent to solar and wind. EPA may want to explore this potential.

2.4 Brownfields Statutory Issues

Cleanfields – S 3374 from 111th Congress authorizes a new EPA brownfields program for renewable energy on brownfields. The proposal uses the existing EPA brownfields authority to fund site assessments and cleanup but targets funding for the new program to sites where renewable energy will be the end use.

3. CASE STUDIES FOR DEPLOYING CHP TO SUPPORT BROWNFIELDS, INDUSTRIAL PARKS, AND CONTROLLED-ENVIRONMENT AGRICULTURE PROJECTS

The case studies are divided into:

- Mixed use and high density projects
- Industrial park projects
- Eco-industrial park projects
- Sustainable and controlled-environment agriculture projects

There were twelve in-depth case studies that were carried out for this project. For these in-depth cases the team attempted to gain and report all principal attributes, including financing, technology, impacts, and the relationship between CHP and the redevelopment project. Interviews were conducted for each of the in-depth case studies. The complete record for each in-depth case is included in Appendix C. The Appendix includes website references that were used as information sources, in addition to project interviews.

There is a second group of projects that were researched but were not examined in-depth, i.e. there was no interview, and there is not an expanded write-up in the appendix.

In each section the in-depth case studies are described first, the more cursory cases are added in under an "Other Projects…" heading.

Another explanatory note: not all of the projects listed are "brownfields projects." Some would be classified more generally as "redevelopment projects." The team wanted to err on the side of including information about projects where there were synergies between redevelopment and CHP, potentially (if not actually) applicable to brownfields.

Analysis of the case study findings is contained in the following chapter (4).

3.1 Mixed Use and High Density Brownfield Redevelopment Projects

3.1.1 Austin Energy - Mueller Airport Redevelopment Area, Austin, Texas

Redevelopment Project – Mueller redevelopment area is a 700 acre former airport, and is planned to accommodate 4.7 million sq. ft of commercial space and 4,500 residences. Most of the site was classified as a brownfield because of airport-related contamination (spilled fuel) and a former landfill. The 470,000 sq ft Dell Children's Hospital (pictured at left) is an anchor and the primary customer for the CHP plant.

On-Site Energy – Austin Energy's tri-generation system, as follows: electricity - generation of 4.3 MW (1.2MW to the hospital, 3.1MW for plant equipment and the grid); Heat Recovery Steam Generator 22,000 lb/hr; three packaged centrifugal chillers: 2 @ 2500 tons and 1 @ 1500 tons; one absorption chiller (700 tons).

Energy-Redevelopment Synergies – CHP plant serves the 470,000 sq ft Dell Children's Hospital with electricity and chilled water. The district energy is also available along a loop road, and the following are linked in: Ronald McDonald House, Strictly Pediatrics Medical Office Complex, Southwest Educational Development Lab, and the headquarters of the Seton Family of Hospitals. Note several other businesses along the loop road did not link in, either because they were too small or because of the cookie-cutter designs of certain retailers.

Key Financing – Private financing through a revenue bond was the primary vehicle; also benefited from a DOE Demonstration Grant.

3.1.2 St. Paul Energy Park – District Energy System Enhances Urban Redevelopment District

Redevelopment Project – A district energy system was developed in 1986 to supply inexpensive and reliable energy to a 218-acre industrial redevelopment area about two miles from downtown. The community was designed as a mixed use, live-work-play community, a model of what would later be known as sustainable development. Energy Park now includes 25 buildings with 2.6 million sq ft of space, 92 companies and 4.200 jobs. The businesses are about ¾ office and ¼ industrial.

On-Site Energy – Evergreen Energy operates the district energy plant, which generates steam @49 MMBQ's per hour; the feedstock is natural gas. Expansion to include electricity generation, making the system a full CHP provider, is being considered.

Energy-Redevelopment Synergies – redevelopment has benefited from lower capital costs in initial construction and operating cost energy savings. The largest employer is U.S. Bancorp, a back office operation with heavy energy demands, occupying 361,000 sq ft, operating around the clock, and employing over 2,000 people. Other significant businesses benefitting include: Power Motion, Quality Tool, GLF Companies, Merrill Corp, and a hotel. GLF and Merrill are printers.

Key Financing – The original financing was a combination of federal UDAG loans and grants, supplemented by Port Authority funds loaned to the project based on the projected revenue stream from user contracts. Current plans/proposals would be financed through revenue bonds and the federal Production Tax Credit.

3.1.3 Atlantic Station - District Energy and Mixed Use/Brownfields Redevelopment

Redevelopment Project - Atlantic Station is a $2 billion, 13 million sq ft mixed use redevelopment of the former Atlantic Steel mill near downtown Atlanta. The project, which is about 50 percent built-out, involved a $50 million cleanup of the former Atlantic Steel property. Atlantic Station is often cited as a model for sustainability, with numerous green buildings, TOD, ride-sharing, and other elements. CB Richard Ellis is owner and master developer.

On-Site Energy - Atlantic Station is served by a district energy chilled water system that was designed and built simultaneously with the Atlantic Station redevelopment project. There are over 2 miles of piping, with up to 36" piping size. The first phase, which has been operating for five years, consists of three 2,500 ton centrifugal chillers, roughly corresponding to the first 2 million square feet of space. The phase I system is approximately at capacity and phase 2 (another 7,500 – 9,000 tons) will need to be built to accommodate more development. Veolia Energy Atlantic Station, LLC is the owner and operator. Plans call for an 8 MW fuel cell CHP plant.

Energy-Redevelopment Synergies - The district energy system is a competitively-priced reliable source of energy and all significant buildings are enrolled. The district system also helps meet sustainability goals and contributes to high LEED ratings of many of the buildings within the redevelop area. The density of the redevelopment project helped make the district chilled water system work, partly because most of Atlantic Station is built on top of parking garages and the pipes could be channeled through the parking garages rather than more expensive underground construction.

Key Financing - $24 million Fulton County revenue bond.

3.1.4 Dockside Green – Victoria's Model Sustainable Community Served by District Energy (current) and CHP (planned)

Redevelopment Project – Dockside Green is a new urbanist mixed use harbor front brownfields project in Victoria, British Columbia. Total build-out is 26 buildings, 1.3 million sq ft, including 1,300 DU's; five buildings are complete. The 18-acre site was previously a copper mine.

On-Site Energy – The capacity of the district energy system is 8 million BTUs per hour; however, slower build-out has meant that the system is operating at only 20 percent of capacity. A full CHP system was announced in 2009 but remains on the drawing boards due to the real estate market slow-down and financing hurdles. The capacity is in the range of 1 to 2 MW. The feedstock is renewable biomass. Corix Utilities Ltd and FortisBC own the district energy system.

Energy- Redevelopment Synergies – New development at Dockside Green enjoys three advantages: capital cost savings in energy infrastructure; operating cost/energy usage savings of up to 30 percent; and marketing advantages relative to sustainability (LEED Platinum). Dockside Green has received more than 20 awards for energy efficiency, carbon reduction, and sustainability, and is generally regarded as being among the greenest communities in the world.

Key Financing - Financing was primarily private with additional governmental support from BC Hydro, the provincial government and the City of Victoria. British Columbia's carbon reduction mandates (33 percent by 2020) and carbon tax factor into the incentives for the full CHP system.

3.1.5 Other Mixed Use and High Density Projects (researched but not interviewed for this study)

There are a number of high-rise, dense redevelopment projects (not necessarily brownfields) in New York City that are using CHP.

- ***Clinton Hill Apartments -*** An example that has been cited as a previous NYSERDA success story (as well as fairly extensive media and trade overage) is the Clinton Hill Apartments in Brooklyn. The 600 KW CHP system serves 1200 units in twelve buildings through natural gas-fired microturbines at each building. The system saves energy use and costs by 40 percent.[30] NYSERDA funds ($785,000) were instrumental in the capital financing ($1.9 million total).
- ***One River Place, Manhattan, New York City*** - One River Place is a 40 story/921 rental unit building located on the west side of Midtown Manhattan. It is currently located in what ConEdison identifies as a "severe load pocket". In 2008, the property installed a 150 kW combined heat and power project (CHP). This installation not only helps to provide the much needed load relief to the area, but it also provides the facility with 150 kW of base-load power and approximately 1,000,000 BTU/h of usable heat. The project was assisted by $113,000 from NYSERDA's Peak Load Reduction Program.[31]
- ***SeaPark East Apartments, Brooklyn*** - 150 kW CHP System retrofitted to 332 unit 1950's era affordable housing complex in Brooklyn. NYSERDA's Performance-Based CHP Incentive Program is projected to provide 413,000 of the $1,079,000 total cost. The Federal Investment Tax Credit of 10% and the Five year Modified Accelerated Cost Recovery System (MACRS) depreciation were also used in the financing scheme. The system is has achieved a 26% reduction in energy consumption and an overall efficiency rating of 68 percent. The dual unit system generates electricity and domestic hot water and saves $69,388/year in utility costs. The payback period is 6.4 years with incentives.[32]
- ***1350 Avenue of the Americas*** - Twelve microturbines power the offices and supply 35% (720 kW) of the electrical load for 35 floors and 547,000 feet of office space.[33]

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[30] See: http://www.cleanaircommunities.org/projects/clintonhill.html
[31] See: http://www.silversteinproperties.com/properties/one-river-place; and http://norgenconsulting.com/index_files/projectmanagament.htm
[32] Shaw, Linda, Future Energy Development, presentation: "Combined Heat and Power - *Saving Money, Energy and the Environment,"* June, 2011.
[33] Distributed Energy, "CHP Thrives in New York City," see http://www.distributedenergy.com/may-june-2009/chp-thrives-nyc.aspx

- ***Other New York State projects*** that have successfully employed CHP are may be found online.[34] Note that almost all of the residential, office, and hotel facilities listed are in New York City or Brooklyn. Facilities located outside of the New York City area are almost all institutional. Office buildings and skyscrapers located in other states that have successfully employed CHP may also be found online.[35]

Below are examples of CHP/District energy tie-ins to redevelopment plans in other states:

- ***Montpelier, Vermont Downtown CHP/District Energy Plant Planned*** – In Montpelier a planned 41 MBTU bio-mass CHP plant/district energy system will heat a complex of downtown, school, and state buildings, including the state capitol. The full build design will heat 1.8 million square feet of building space, which includes a number of planned redevelopment projects. The CHP plant will also produce 1.8 million kilowatt-hours of electricity annually. The project received $8 Million from the US Department of Energy Community Energy Deployment Program. [36]
- ***Portland Pearl District/District Energy Expansion to CHP*** – There is an existing district energy system for the "Brewery Blocks," which is part of the Pearl District, a former dilapidated warehouse district including some brownfield sites. The 4,000 ton chilled water system serves eight buildings. A feasibility study has been completed, scoping out expansion alternatives for the district energy system. The study recommended consideration of a full CHP system and a geographically-expanded district energy system.[37] A district energy system is also under consideration for the Lloyd Center, a near-downtown redevelopment area.[38]
- ***Portland South Waterfront*** – Portland South Waterfront is a massive new urbanist redevelopment of a brownfields site on the Willamette River. While the whole redevelopment plan is designed as green and energy-efficient, one building—the OHSU Center for Health and Healing—also incorporates energy production through an on-site gas-fired CHP system, as well as solar sunshades, with a result that the building achieves

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[34] See http://www.eea-inc.com/chpdata/States/NY.html
[35] See http://www1.eere.energy.gov/industry/distributedenergy/projects_sector.html#buildings
[36] See: http://www1.eere.energy.gov/deployment/communityre/montpelier.html
[37] Compass Resource Management, "Business Analysis for a Neighborhood Energy Utility in the North Pearl District,"for the City of Portland, March 2009.
[38] Oregon Solutions, "Draft Lloyd Green District Vision, Principles, Goals,Baseline and Metrics," 2009

a 60 percent reduction in energy use.[39] A district energy system for the larger redevelopment area is also under consideration.[40]

- ***Austin Energy, The Domain –*** The Domain is a mixed use redevelopment of a former IBM campus in Austin, Texas, several miles from downtown. Although originally planned as a technology park, the primary reuse is a 1.3 million sq ft mall, 390 high end apartments, and 75,000 sq ft of office space. An existing district energy system was overhauled and a 4.6-MW CHP system was created, designed to provide electricity to the grid and provide cooling to the Domain. The modular CHP system's pairing of a Solar turbine and Broad exhaust-fired absorption chiller was a pilot for an unproven technology. The projected efficiencies were not achieved, and, after several overhaul attempts, the system was abandoned. A $3 million Department of Energy grant helped finance the CHP pilot. With 20-20 hindsight, according to Wayne McKinzey at Austin Energy, the project would have likely succeeded if they had simply upgraded the existing district energy plant instead of attempting the new technology.
- ***North Vancouver District Energy (not CHP) Linked to Brownfield Area Development –*** North Vancouver, in order to promote sustainable reuse of their riverfront brownfields redevelopment area, developed a district energy system and required new or retrofitted buildings greater than 10,000 square feet be connected. Lonsdale Energy Corporation's system relies on high-efficiency gas mini-boilers to heat hot water, which is then piped underground to provide a heat source to residential towers, commercial space and a community center in the local service. The district energy system serves the Lower Lonsdale and Shipyard precincts.[41]
- ***Toronto – Regent Park District Energy (planned CHP) –*** A current district energy system, serving 5,000 residents of affordable housing units, will be expanded and modified to incorporate CHP, parallel to the neighborhood expansion to 12,000 residents.[42]

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[39] See: http://www.ohsu.edu/ohsuedu/newspub/releases/022207_leedaward.cfm
[40] See: http://djcoregon.com/news/2010/04/21/ohsu-plans-ahead-for-south-waterfront-district-energy/
[41] Websites**:** http://www.toolkit.bc.ca/success-stories/district-heating-north-vancouver; and http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/fichier.php/codectec/En/2009-10-01%20-%20Lonsdale%20Energy%20Corporation%20-%20North%20Vancouver,%20BC/DE+17+Lonsdale+energy+corp+%28ENG%29.pdf
[42] See: http://www.torontohousing.ca/media_centre/media_advisory/innovative_partnership_will_power_green_future_regent_park

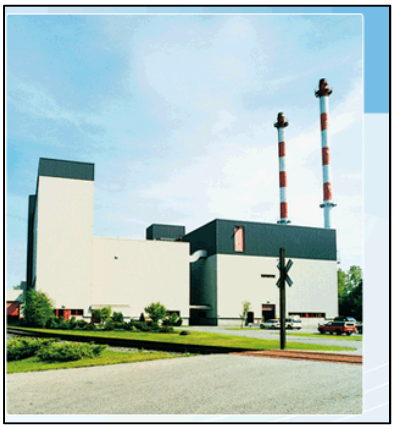
3.2 Industrial Parks

3.2.1 GUSC Energy Inc. a subsidiary of Griffiss Utility Services Corp, Griffiss Business and Technology Park, Rome, NY

Redevelopment Project - – Griffiss Business and Technology Park in Rome, NY is an industrial park redevelopment of the former Griffiss Air Force base (a former Superfund site). The Griffiss Utility Services Corp (GUSC) is a non-profit organization created by the Griffiss Local Development Corporation to manage the energy system for the Griffiss Park. The 3,500 acre park has successfully attracted over 80 businesses with a total of 5,800 employees.

On-Site Energy - The Park features a district energy system, which was inherited from the Air Force. Four 90,000-lb/hr boilers pump steam through a 26-mile distribution system. A full CHP plant, with a combined production capacity of 18 MW and fueled by bio-mass, is beginning to go under construction.

Energy-Redevelopment Synergies – The current district energy system produces steam to approximately 70 percent of the space in the industrial park (or 6 million sq. ft.) About half of the businesses in the park are steam users, including the Air Force Research Lab, Premier Aviation, Oneida County International Airport, Northeast Air Defense, ITT Advanced Engineering, Logoplaste (plastic packaging), Mascoma Biofuels, MGS Manufacturing (wire, cable, and fiber). Note the park has tripled in size (as measured by employment) since the time that GUSC began offering steam energy. The CHP plant will further improve efficiencies, expand capacity in producing steam, and will provide 10 to 15 percent of the Park's electricity needs.



Key Financing – For the CHP project, $6.2 million Treasury grant linked to ITC (30% credit due to biomass' classification as renewable).

3.2.2 Eastman Business Park, Rochester - Former Kodak Industrial Park Uses CHP to Attract Energy-Intensive Industrial Uses

Redevelopment Project – Eastman Business Park is 1,200 acres, 900 retained by Kodak and 300 acres available for redevelopment with new industrial uses. There are 3,000 associated with 35 tenants in the Eastman Business Park, and 3,000 jobs still in Kodak operations. The park has recently attracted four new clean technology companies, which, in addition to benefiting from CHP energy utilities, are also taking advantage of on-site bio-refineries, analytical services, thin film development, coating technology and logistics support.

On-Site Energy – Tri-generation system with the following: electricity production capacity of 130,000 kilowatts (all to business park occupants); steam capacity of 1,500,000 pounds per hour; chilled water capacity of 60,000 tons. The feedstock is coal with natural gas back-up. In addition, there is industrial water capacity of 50 million gallons per day, along with wastewater treatment capacity of 40 million gallons per day.

Energy-Redevelopment Synergies – Virtually all the businesses in the park use CHP-generated electricity, chilled water, and steam. In addition to Kodak, there are seven large manufacturers in the business park. Businesses save in operating costs, on the order of 20–30 percent, and energy savings are a significant factor in the success of the Park. A typical business is also saving substantial capital costs (not building their own boilers and HVAC systems).

Key Financing – System upgrades are privately financed.

3.2.3 Other Industrial Park Projects (researched but not interviewed for this study)

The most frequent application of CHP, generally, is deployment in tandem with an energy-intensive industrial use such as a paper mill, refinery, ethanol plant, or large-scale manufacturing operation. While most such CHP plants serve a single large user, some are located in industrial parks where the steam/thermal energy is available to more than one user.

- ***Baytown Industrial Park, Texas –*** A completed 130 MW CHP serves four Bayer divisions and five other users. The CHP plant enabled electricity production with 90% fewer NO_X emissions and 45 percent fewer CO_2 emissions than an average fossil fuel generation facility in Texas. The historical use of the property would likely qualify it as a brownfield site. [43]

- ***Russell Industrial Park, Russell, Kansas, CHP Plant Linked to Ethanol Plant*** – A natural gas burning CHP plant provides 12 MW of electricity for the town and 3 MW to the ethanol plant, in addition to steam for the ethanol plant. The ethanol plant, operated by US Energy Partners, was lured to the industrial park because of the energy supply and pricing advantages. The project was initiated by the City in response to an explosion and fire at a previous power plant that left much of the city without power. The industrial park is not a known "brownfield."[44]

- ***Spiritwood Station, Jamestown, ND*** – A lignite-fired 76 MW CHP plant, under construction near Jamestown, ND, will produce electricity (to the grid) and 200,000 pounds of steam per hour, the latter to be used by Cargill Malt and, potentially, other industrial users in a nearby industrial park. Great River Energy will own and operate the plant.[45]

[43] See: http://files.harc.edu/Sites/GulfCoastCHP/CaseStudies/ChambersCountyTXBayer.pdf
[44] See: http://files.harc.edu/Sites/GulfCoastCHP/CaseStudies/RussellKSUSEnergyPartners.pdf
[45] See: http://www.greatriverenergy.com/makingelectricity/newprojects/spiritwoodstation.html

3.3 Eco-Industrial Parks

3.3.1 Catawba County, NC Ecocomplex - Planned CHP Project Links Greenhouse and Eco-Industrial Uses

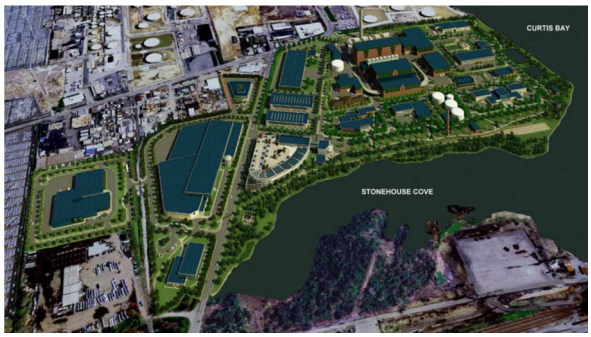
Redevelopment Project – The Catawba EcoComplex is an already-successful eco-industrial park and reuse of a county landfill. The CHP system will move the eco-park toward the dual goals of zero waste and carbon neutrality, as well as enhance marketing to businesses that can take advantage of the energy resources.

On-Site Energy – There is a current LFG recovery plant that produces 3 MW for sale to the grid. The biomass CHP plant (in design) will produce 3 MW of clean, cost-effective electricity for sale to a local utility, as well as thermal energy to existing and planned businesses. It is scheduled to go under construction in 2012.

Energy-Redevelopment Synergies - The steam heat will be used by: Gregory Wood Products and Pallet One for drying kilns; the County for a proposed new sludge maintenance facility; the Appalachian State biodiesel research facility; and the planned greenhouse. Current employment in the EcoComplex totals 250 jobs. They are also negotiating with a 250-job industrial user.

Chief Financing Mechanism – GO or revenue bonds. The County is considering other governmental incentives in order to enhance the economic viability of the project.

3.3.2 Energy Answers, Baltimore - CHP Plant to Anchor Eco-Industrial Park

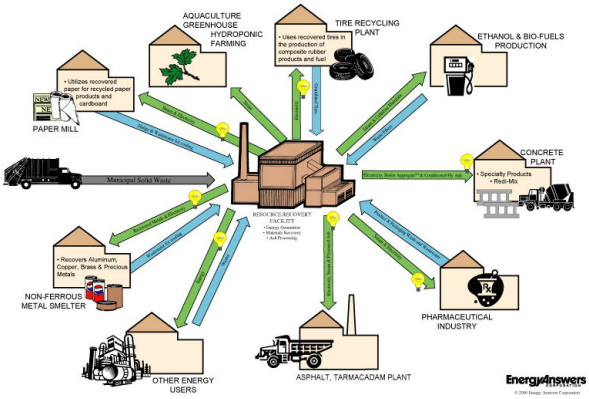


Redevelopment Project – A waste-to-energy CHP plant will be the centerpiece of a 90-acre eco-industrial park re-use of the former FMC fertilizer plant, a brownfields site in the Fairfield industrial area. It will also feature resource recovery of metals separated from the municipal solid waste. The site work is underway.

On-Site Energy – The plant is planned to produce 150 megawatts electricity and generate steam to power industries that co-locate with the CHP facility.

Energy-Redevelopment Synergies –About 75 of the 90 acres will be available for industrial redevelopment with complementary industries. Complementary industries could include: 1) energy intensive/steam heat users; 2) concrete block manufacturers using the ash residue; 3) businesses that use the recovered metals.

Resource Recovery Based Eco-Industrial Park



Key Financing – This is a $1 billion project with the following incentives: $200 million Treasury Renewable Energy Grant converting the value of the ITC credit; Maryland General Assembly re-classification of the project to "tier 1 renewable," which enables Energy Answers to negotiate a better rate from the utility; Baltimore also re-classified the site as a Focus Area under the State Enterprise Zone Program. They applied for the DOE Loan Guarantee, but were not successful.

3.3.3 Pure Energy/Saline Green – CHP to power bio-fuels and related manufacturing in Marshall, Mo.

Redevelopment Project – Saline Green, under development in Marshall, Mo., is essentially an eco-industrial park, except that the related businesses will all be owned by one company. The 15 MW CHP plant will generate thermal energy (steam) and electricity to: 1) power a cellulosic ethanol plant; 2) produce 12 MW renewable electricity, sold to the grid; and 3) produce Furfural Chemicals, a bi-product of processing the bio-mass materials. Of the 200-acre site, 60 acres are part of a now-closed landfill.

On-Site Energy – CHP plant will produce: 15 MW electricity (3 MW used internally and 12 MW sold to the grid); and steam to power:

- A cellulosic ethanol plant, which will produce 10 million gal/year output of ethanol).
- Furfural chemicals manufacturing facility.

The feedstock is woody bio-mass (including switchgrass grown on-site) and LFG.

Energy-Redevelopment Synergies – The CHP plant is the key to ethanol and furfural chemicals production facilities. Furfural is a bi-product of processing the bio-mass materials. Furfural is used in artificial limbs, rubber tires, plastics, and composite materials. The Furfural plant will produce 18,000 metric tons of product. (Note revenues from the Furfural plant are key to project feasibility).

Key Financing – $87 million, primarily private through Hedge fund investment grade bond. Ethanol subsidies are an important factor. The ITC will also be used. They applied to the DOE Loan Guarantee program but were not successful.

3.3.4 Other Eco-Industrial Park Projects

(The following project was written up following an interview, but there is no expanded case study write-up in the appendices, because the project was not successful.)

Londonderry Eco-Industrial Park, Londonderry, NH[46] - One project that illustrates some of the pitfalls is Londonderry Eco-Park, which was planned in the year 2000 to be a privately-financed CHP-based industrial park, promoting waste exchange and energy efficiency.

AES completed a $320-million, 720-Megawatt gas-fired cogeneration plant in 2001, and they continue to sell electricity to the grid. The steam/hot water generation part of the plan never materialized due to: 1) a distributor (the city) would have to be designated as a licensed public utility and city was not willing to do that; 2) insufficient users that need steam. There was a nearby yogurt factory that needed stream but the economics did not work. They have 30 employees.

One interesting eco plan factor was implemented – municipal waste water is diverted to the plant for cooling. AES pre-treats the waste water before and after cooling and sends back to WWTP.

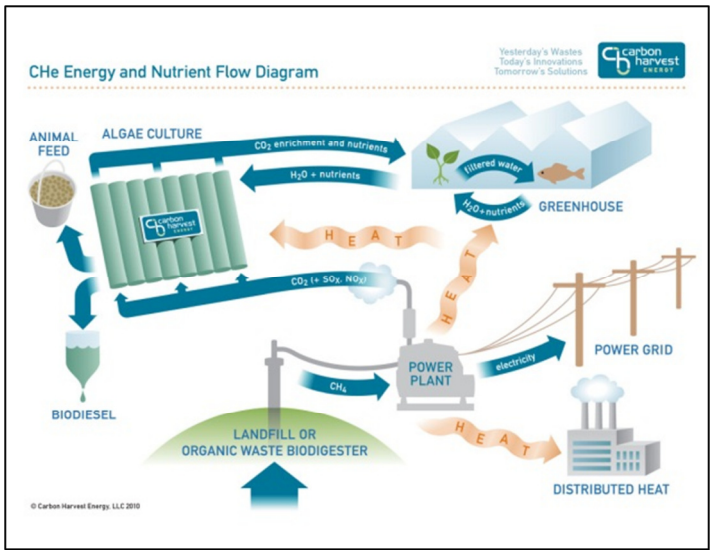
AES plant is now in receivership due to the following factors:

- Natural gas prices went up;
- The plant was overdesigned;
- The recession led to lower than expected demand.

[46] Sources: interview with Andre L. Garron, Community Development Director, Londonderry, NH, March 7, 2011; http://www.thriveinlondonderry.com/londonderry-advantage/eco-park.aspx; and http://www.highbeam.com/doc/1G1-88183523.html?key=01-42160D517E101C681B09071D052256213F4A374C1820234C3E0E0A60641A617F127119731B7B1D27

3.4 Sustainable and Controlled Environment Agriculture Projects

3.4.1 Carbon Harvest - LFG Recovery, CHP, and Controlled Environment Agriculture Projects



Redevelopment Project - Carbon Harvest is a triple bottom line business, specializing in projects that involve LFG recovery, CHP energy generation, and steam recovery for "Controlled Environment Agriculture." They have four projects that involve these elements: Brattleboro, VT; Keene, NH; Lebanon, NH; and Sullivan County (Monticello), NY. All of the projects involve steam generation linked to a greenhouse, aquaculture facility, and algae production facility, all in a closed loop system with nutrient and water re-cycling.

On-Site Energy - The 1.6 MW Lebanon plant and the 250 KW Brattleboro plant are operating. The Keene and Sullivan projects are planned to generate 600 KW and 1.6 MW, respectively.

Energy-Redevelopment Synergies - Aside from the greenhouse-aquaculture facilities, three of the projects also involve producing steam or electricity for nearby industrial users or industrial parks, as follows: Lebanon serves adjacent asphalt and concrete plants; Keene is planned to serve the Black Brook Industrial Park; and Sullivan is planned to connect to a new industrial park being developed on County owned land.

Key Financing Mechanisms – All of the facilities will use the Energy ITC; one received $500,000 from EPA Climate Communities; REC's are sold to Dartmouth College through a unique partnership. The Brattleboro project has received $1.1 million in Vermont state loans and grants.

3.4.2 H2Grow/Innovative Energy – Model City, NY Greenhouse-CHP-LFG Project

Redevelopment Project – H2Grow is a greenhouse hydroponic vegetable grower; Innovative Energy developed the greenhouse in order to make use of the waste heat from their 12 MW LFG recovery plant. The twelve-acre facility in Model City (Niagara County), New York, produces 6 million pounds of tomatoes annually.

On-Site Energy – Innovative Energy uses landfill gases (LFG) as the feedstock for a CHP system that generates 12 MW to the grid; waste heat recovery (61 million BTU's per hour) heats 250,000 gallons of water that re-circulates through the greenhouse, thus enabling year-round growing.

Energy-Redevelopment Synergies – The greenhouse saves $800,000 annually in fuel costs due to the CHP plant; H2Grow employs 40 people. Note that Innovative Energy has built and now operates several other LFG recovery plants, but the greenhouse component was deemed financial infeasible due to a precipitous drop in the price of tomatoes.

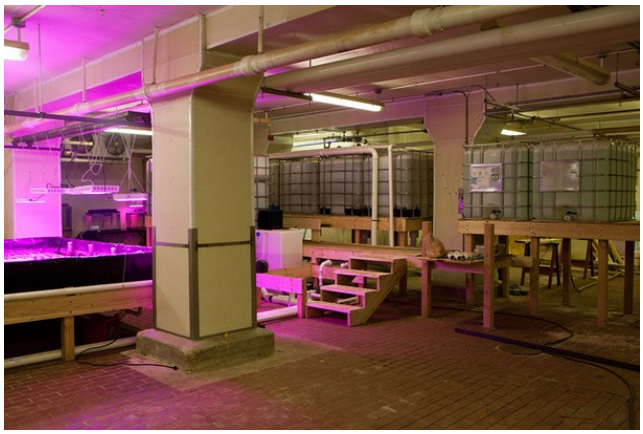
Key Financing – Cost was $10.5 million for the power plant, and $14 million for the greenhouse (including $1.5 million for the waste heat recovery system). The financing was private except for $500,000 from NYSERDA.

3.4.3 The Plant, Chicago, Vertical Farm and Food Business Incubator[47]

Redevelopment Project - A 93,500 sq ft former meatpacking plant has been brought back to life as a food production incubator, including aquaponics, a rooftop greenhouse, brewery, bakery and space for other food production businesses. A shared kitchen area serves multiple businesses.

On-Site Energy – The CHP plant will produce 420 KW to the buildings tenants, and the building's energy use will be net-zero, or no net energy used from the grid. The steam/thermal energy will produce 2.1 million BTU's per hour. The feedstock is methane from anaerobic digester converting food waste from: on-site and nearby breweries; a fat rendering plant next door; other on-site and nearby food production businesses.

Energy-Redevelopment Synergies – The building's tenants will be able to purchase electricity and steam/thermal from the onsite renewable energy system at rates that are only about a third of typical utility/grid prices. On-site businesses also gain in that food wastes are disposed of on-site as feedstock for the CHP system (converted to methane through the anaerobic digester). The steam will be used by the brewery and the rooftop greenhouse.



Key Financing – Incentives included two state grants - $838,000 came from the Food Scrap Composting Revitalization and Advancement Program and $720,000 in ARRA funds channeled through the state. Federal assistance may come from the Treasury 1603 grants that convert the value of the Energy Investment Tax Credit.

[47] See: http://www.plantchicago.com/; http://www.theatlanticcities.com/jobs-and-economy/2011/10/growing-industry-its-own-ashes/314/

3.4.4 Other Controlled Environment Agriculture Projects (researched but not interviewed for this study)

- ***Silver Bay Eco-Park, Silver Bay, Wisconsin*** – A planned eco-park is aiming to replicate much of the Carbon Harvest model, outlined above. A wood-pellet CHP plant would provide thermal heat for a greenhouse, algae facility, and fish farm; the fish farm would provide nutrients to the greenhouse; the algae will produce feedstock for a planned bio-diesel facility; and the greenhouse produces both vegetables and vegetation for the bio-diesel plant.[48]
- ***The Plant Vertical Farm/Food Production Incubator, Chicago*** –The anaerobic digester and combined heat and power system will convert 18 tons of biomass per day to approximately 300 kWh of electricity and sufficient heat to operate the entire facility and rooftop greenhouses while providing process heat for brewing.
- ***Farmers' Ethanol, Cadiz, Ohio*** —Under construction in Cadiz, Ohio, an industrial agriculture project is taking shape using three primary intertwined elements: a major confined animal feeding facility (MCAFF); a 7.5 MW CHP plant; and a bio-refinery to produce ethanol. The MCAFF will produce animal waste, which will be put through an anaerobic system and produce methane as the feedstock for the CHP plant. The CHP plant will produce steam to power for an ethanol plant. The site is a brownfield site.[49]

[48] See: http://www.twoharborsmn.com/event/article/id/21883/group/News/ and http://www.silverbay.com/EcoParkInfoBrochure.pdf

[49] See: http://friendsoffarmersethanol.com/ and http://www.greencarcongress.com/2009/05/farmers-ethanol-20090527.html

4. ANALYSIS OF CASE STUDIES

This section is organized into the following subsections:

- Economics, Density, and Economies of Scale
- Key Incentives
- Financing CHP or District Energy for Planned or Speculative Development
- District Energy Expanding to CHP
- Degree of Energy/GHG/cost savings
- Eco-Parks Revisited
- Zero Waste Sustainable Agriculture

4.1 Economics, Density, and Economies of Scale

Ninety percent of CHP projects are connected to industrial/manufacturing facilities[50] and most of the remainder serve hospitals, universities, and downtown areas – all energy-intensive uses that would be proximate to the CHP plant.

The current analysis explores an area that could be a new opportunity area for CHP, that non-downtown redevelopment areas and industrial parks may sometimes have sufficient energy-intensity and be compact enough to justify the investment in the thermal energy/waste heat component and therefore make CHP work.

If selling electricity to the grid, the successful application of the electricity generation aspect of CHP seems to be a fairly simple formula, with the primary variables being the cost of the feedstock, the price of electricity in the region, the price negotiated for purchase of electricity (as influenced by Renewable Energy Portfolio Standards), and the cost of borrowing, as influenced by any applicable incentives. The use of the thermal energy/waste heat is a different and more variable formula, including the above factors, but also including the energy-intensity and geographic distance to the proposed steam user(s).

Some of the indications that we observed related to density and economies of scale are:

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[50] http://cogeneration.net/combined-heat-and-power/, Published by The Renewable Energy Institute www.RenewableEnergyInstitute.org.

- ***Single Buildings*** - CHP works well for single buildings that are on the extreme high end for density, such as high rise/Manhattan settings. The project took note of a number of dense residential and commercial buildings of over 500,000 sq ft where CHP was successfully deployed. However, it is a rare occurrence for CHP to be deployed to serve single buildings of more modest sizes. This could change with more widespread use of microturbines, which hold the promise of bringing the benefits of CHP to smaller individual buildings.[51]
- ***Multiple Buildings*** - The economic returns for extending piping/service to multiple buildings are highly correlated with density.
    - For the Mueller/Austin Energy project, for example, the CHP project serves the hospital and a loop road, but the remainder of the 700 acre redevelopment area was not dense enough to justify the extension of pipes.
    - The Griffiss/Rome NY project found that, even with the piping in place at the street, it was not economical to connect up buildings that were less than 30,000 sq ft.
    - Atlantic Station saved capital costs on the piping for their district chilled water system because the density of Atlantic Station meant that the occupied space was built on top of garages, and the pipes were run through the garages, rather than the more expensive underground construction.
- ***CHP and Smart Growth*** - One analysis concluded that CHP/district energy for residential areas generally requires density of at least 25 dwelling units per acre, which is more than five times suburban sprawl densities.[52] To state the obvious, programs that advance CHP (and district energy) also contribute to smart growth, because the energy efficiencies gained can only be realized (in fact are only feasible) with dense, compact development.

Economies of scale also factor into the electricity production side of CHP. Note that, of the four Carbon Harvest projects, the smallest (Brattleboro @ 250 KW) required more subsidy than the other three projects.

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[51] http://www.epa.gov/chp/documents/microturbine_tech.pdf

[52] Environmental Building News, "In the Pipeline: District Energy and Green Building," March 1, 2007. see http://www.buildinggreen.com/auth/article.cfm/2007/3/6/In-the-Pipeline-District-Energy-and-Green-Building/?&printable=yes

4.2 Key Incentives

The study team attempted to collect comprehensive financing data for 14 projects. All but one of the projects reviewed involved some form of public subsidy. The following sources were used:

Investment Tax Credit and Section 1603 Treasury Grants - Of the federal incentives, the most frequently used incentives are the Business Energy Investment Tax Credit (ITC) and the Section 1603 Treasury Renewable Energy Grants that convert the value of the ITC. The ITC was being used by seven projects and the Section 1603 Treasury Grants were being used by four projects. Two planned projects were also planning to use the ITC. Several interviewees indicated that the Treasury Grants were critical to their projects, and they were working diligently to comply with the federal requirements for getting underway before the program expires at the end of 2011.

Production Tax Credit - One project was planning to use the Production Tax Credit (PTC). Generally, the ITC is more lucrative than the PTC, and, because the federal rules prohibit taking both, most projects are using the ITC.

DOE Loan Guarantee - There were three projects that pursued the DOE Loan Guarantee Program, and all three were turned down. All three also reflected considerable frustration with the program – these issues were described in greater detail in the previous Policy Issues section.

MACRS (accelerated depreciation) – Only one interviewee mentioned MACRS; however, it may be that project managers are not always aware of the tax incentives that are used by their accounting teams.

Other Federal - One project gained an EPA Climate Communities Grant. One made use of the DOE Community Energy Deployment Program.

No projects used the Clean Renewable Energy Bonds (CREB), Qualified Energy Conservation Bonds (QECB), Department of Agriculture Renewable Energy for America Program (REAP), or the Renewable Energy Production Incentive (REPI).

State Renewable Portfolio Standards - State Renewable Energy Portfolio Standard (RPS) standards factored into at least eight projects. The sale of Renewable Energy Credits (REC's) factored into five projects, but was usually not a principal source. Possibly more important than sale of REC's was that the RPS influenced the rate that the CHP project could negotiate with the local utility relative to selling the electricity to the grid, as nine projects were negotiating

favorable rates based on RPS requirements. Both of these factors are highly dependent on state variations in the RPS and on whether the feedstock is classified as renewable. The Energy Answers/Baltimore project benefited from a 2011 act of the Maryland General Assembly that established Municipal Solid Waste (the Energy Answer's feedstock) as "Tier 1 renewable" under Maryland's RPS.

State - Among state funding sources, four New York State projects were assisted by NYSERDA through either the Performance-Based CHP Incentive Program or the Peak-Load Reduction Program. Three projects in other states cited state sources as critical financing pieces.

Local - Four projects also used local GO or revenue bond funding.

Table __ CHP or District Energy Project Financing - Funding Sources

Key:

definite	
plan/possible	
apply/turned dwn	

	federal								state			Local	
	ITC	Section 1603 Treasury Grant	PTC	MACRS (accelerated depreciat'n)	EPA Climate Communit-ies	DOE Community Energy Deployment	DOE Loan Guarantee	other federal incentives	state financing	REC's under state RPS standards	Rate negotiation under State RPS	Local bond financing	other local
Atlantic Station													
Carbon Harvest													
Lebanon													
Brattleborough													
Keene													
Sullivan													
Catawba County													
Dockside Green													
Eastman Business Park													
Energy Answers													
Griffiss Park													
H2Grow													
Mueller Austin								*					
Saline Green								**					
St Paul Energy Park								***					
The Plant													

"Other" federal funding sources:

* Mueller - DOE Demonstration Grant

**Saline Green - federal ethanol production subsidies

*** St Paul Energy Park - HUD UDAG

4.3 Financing CHP or District Energy for Planned or Speculative Development

In an ideal world, CHP (or district energy) would be a built in part of major redevelopment projects. However, several of our case studies found lenders unwilling to consider potential revenues from the steam that would serve planned or speculative development. Lenders wanted to see signed contracts from *existing* energy users. Therefore, trying to advance a CHP system as part of a redevelopment project has a built-in problem as it pertains to private financing – the electricity generation aspect of the project (not the steam generation component) has to carry the financials. Otherwise, the project must obtain a very significant part of its financing from governmental sources that take a different view of the risk that the redevelopment project may not build out as planned.

This is one of the many reasons that CHP requires governmental involvement in financing. (See discussion of incentives, above.)

Another important consideration in planning a CHP (or district energy) system for a redevelopment project is the need to stage the CHP project with the stages of the redevelopment project. One of the case study projects, Dockside Green in Victoria, BC, is a case in point. The CHP system was designed to meet the needs of a large-scale redevelopment project that was stalled in 2009, and the resulting overcapacity caused financial difficulties and financing had to be reworked.

4.4 District Energy Expanding to CHP

Six of the projects noted in the case study section were district energy projects where a current plan or project included direct production of electricity to create a full CHP system. The factors that favorably influenced these expansions were as follows:

- ***Griffiss/Rome, NY*** – The ARRA Treasury grant based on the ITC tax credit made the project feasible;
- ***Dockside Green, Victoria, BC*** – CHP was part of the original plan, to be introduced as the redevelopment project matured; the motivation was sustainability; the financing is favorably influenced by British Columbia's carbon reduction mandates (33 percent by 2020) and carbon tax;

- ***Pearl District, Portland, OR*** – The motivation was partly driven by sustainability goals. A feasibility study outlined a reasonable payback period;
- ***Regent Park, Toronto*** - The motivation was partly driven by sustainability goals.
- ***St Paul, Energy Park*** – In early stages of evaluation; RPS factors into the financing.

Most municipal district energy systems are not CHP. There is an important opportunity such that, if several district energy-to-CHP projects go forward and demonstrate success, the replication factor could snowball as others follow suit.

4.5 Degree of Energy/GHG/Cost Savings

CHP is generally rated at 60 to 75 percent efficiency – about double the efficiency rating of centralized power plants. Greenhouse gas impacts also reflect these efficiencies, i.e. CHP emissions are about half those of conventional centralized power plants.

For steam and thermal users, there is an energy efficiency gain and a cost advantage that varies from marginal up to at least 30 percent, with a series of variables determining where a given project falls out on that spectrum. The cost advantage for steam/thermal users comes from two sources: obviously energy efficiency, but also from lower capital costs in the building's energy infrastructure:

- ***Capital Cost Savings***. The Griffiss Business Park, reported the potential advantage of their district energy system as including a savings of as much as $1million in capital cost savings to a manufacturer, just by the manufacturer NOT needing to provide its own boiler. Veolia Energy (the manager of the district chilled water system for Atlantic Station) advertised the advantages of their system as also including: space gained by not building separate boilers and chillers; avoided labor and maintenance expenditures related to boilers and chillers.
- ***Energy savings***. The Eastman Business Park reported that steam users were trimming energy costs by an average of about 20 percent, but the energy savings can be as high as 30 percent. Both Eastman and Griffiss reported that part of their cost advantage is their own internal structure – Eastman is organized as a cooperative and Griffiss is a non-profit. Other CHP/district energy systems may be only marginally more efficient than alternative sources.

4.6 Eco-Parks Revisited

Numerous eco-industrial parks were planned in the 1990s and most failed or evolved into something else. The conventional wisdom is that the waste exchange system envisioned for most of these projects was not a realistic objective. CHP brings a new and more achievable option for eco-parks. CHP can be an anchor and facilitator for sustainability objectives, as illustrated from the project case studies:

- ***The feedstock for the CHP plant can come from an on-site generator*** – The Catawba County project has two on-site wood-related businesses that provide waste wood as feedstock. The feedstock for "The Plant" project in Chicago includes waste from an on-site aquaponics farm and food waste from an on-site brewery and other food production businesses. The Pure Energy/Saline Green project will use switchgrass grown on-site as part of the feedstock.
- ***The steam generated can power on-site businesses*** – The Catawba County project will use the heat generated for drying kilns for on-site wood businesses. The Pure Energy/Saline Green project will generate steam to power a cellulosic ethanol plant. Three of the Carbon Harvest projects will power nearby industries and/or industrial parks.
- ***Bi-products of the CHP plant can be used by area businesses*** – The Pure Energy/Saline Green project will use the furfural (which results from burning bio-mass) in an on-site manufacturing operation. Energy Answers/Baltimore hopes to attract both: a concrete block manufacturer that will use the CHP ash; and one or more businesses that will use recovered metals that are separated from their municipal solid waste feedstock.

The possibilities and opportunities for advancing sustainability through CHP-based eco-parks appear to be vast. An interesting follow-up project would: 1). track these and other CHP-based eco-parks as they develop over time; 2) examine the financial aspects of the projects; and, 3) outline the conditions for success and potential replication.

4.7 Zero Waste Sustainable Agriculture

Seven projects cited as case studies in the "Controlled Environment Agriculture" section have an objective of zero or near zero waste: four Carbon Harvest projects, the Plant/Chicago; Silver Bay Eco-Park/Silver Bay, WI; and Farmers' Ethanol/Cadiz, OH. These sustainable agriculture projects exhibit the following interchanges.

- ***The feedstock for the CHP plant can come from an on-site generator*** – The CHP feedstock for "The Plant" project in Chicago includes waste from an on-site aquaponics farm and food waste from an on-site brewery and other food production businesses. For the Farmer's Ethanol/Cadiz. OH project, the CHP feedstock is animal waste from a confined animal feeding facility (MCAFF).
- ***The steam generated can power on-site businesses*** –All four of the Carbon Harvest projects, as well as H2Grow, Silver Bay, and The Plant, will use the thermal heat to warm year-round greenhouses. The Carbon Harvest projects also use the thermal heat for aquaculture and algae growing. The Farmer's Ethanol and the Silver Bay projects will use steam to power a bio-refinery and a bio-diesel plant, respectively.
- ***Other internal exchanges*** – In the Carbon Harvest model, as well as The Plant and the Silver Bay Wisconsin project, the waste from an aquaculture facility is fertilizer for the greenhouse. At Silver Bay, the algae facility is also feedstock for the bio-diesel plant.

Similar to the Eco-parks, above, a useful follow-up study would be tracking these sustainable agriculture projects over time and examining financial success and failure factors.

5. DEVELOPER AND BOA OUTREACH

Remediated brownfield sites offer an attractive and underutilized opportunity for siting clean distributed generation (DG) and combined heat and power (CHP). Parties who remediate a contaminated site and earn a certificate of completion (COC) from the New York State Department of Environmental Conservation (NYSDEC) through participation in the Brownfield Cleanup Program (BCP) are eligible for significant financial incentives from BCP tax credits until March 31, 2015 (when the tax credit program will either sunset or hopefully be extended), federal tax credits (see Federal and State Incentives section) and when available, New York State incentives through NYSERDA.

These financial incentives for redevelopment of brownfield sites, when packaged with one or more incentives for investments in clean CHP, could engender a very attractive rate of return for clean on-site power projects. However, from its extensive experience of working on brownfield projects with brownfield project developers, and New York BOA participants, Future Energy Development, LLC's (Future Energy) principal and staff have found that brownfield developers and BOA participants are largely unaware of the benefits and potential opportunities of CHP on sites they are remediating through the BCP. It is difficult enough becoming a brownfield expert. When green energy incentives and technologies are added to their plate the BOA participants seemed particularly overwhelmed. The brownfield developer construction managers seemed very impressed with the technology when they could see it operating in an actual building. The accompanying Power Point presentation did not have nearly the effect of the actual tour. Therefore, Future Energy's role in this study was to educate brownfield developers and BOA participants using simple, straightforward written materials on the incentives and benefits of installing CHP as part of a brownfield project, along with providing as much real life experience as possible, and also to get feedback from these groups on the barriers to adoption of CHP on brownfield sites.

5.1 Developer Outreach

Through Future Energy's deep understanding of the brownfield project development process and the regulations, barriers and opportunities for moving brownfield project development from design to completion, Future Energy reached out to individual developers, small developers groups, and conferences frequented by either brownfield developers and/or green building project

developers to educate these audiences on the benefits of installing CHP on brownfield sites. Future Energy developed a set of education and outreach materials in the form of brochures and Power Point presentations, and spoke at various large and small events related to brownfield and alternative energy development. These events provided opportunities to present simple, but still technical information regarding benefits and incentives for developing CHP on brownfield sites, and also for feedback on ways to encourage adoption of such systems. The results of these presentations and feedback received are discussed below.

5.1.1 Individual Developer Discussions

At the core of Future Energy's participation in the project were one-on-one conversations with individual active brownfield developers in the BCP to recommend that they consider CHP technology in their upcoming BCP redevelopment projects and an on-site tour of Silverstein Properties River Park Brownfield CHP Project on 42nd Street and 11th Avenue in Manhattan (see Small Group Developers section below). Such developers often do not have time in their schedules for attending conferences and appreciated the opportunity to learn more about CHP, without a large time commitment, in the setting of another developer's facility. To this end, Future Energy prepared a succinct PowerPoint presentation in order for these individual developers to begin to understand the technology, evaluate cost and savings, and then factor in the financial incentives to offset the cost and enhance the benefits. One of the outcomes of these conversations was that the first developer to submit an application for preliminary zoning approvals and a conceptual development plan in the Yonkers Alexander Street BOA agreed to evaluate CHP for a 20-acre development project. The use of CHP was included in the developers' written proposal for a special use permit to the City of Yonkers, which has been approved. When this project proceeds in 2013, this should be one of the largest new green neighborhoods in New York State.

Based on feedback from these one-on-one sessions, many developers are unknowledgeable about CHP, and work with large architectural and engineering firms who are hesitant to embrace CHP systems because of their lack of familiarity with CHP and unwillingness to stamp drawings with CHP units incorporated into the design. These developers are therefore skeptical and not encouraged to use the technology, or have "heard" it does not produce savings in light of the upfront costs. While feedback from NYSERDA has indicated that there are engineering firms familiar with CHP technology, developers tend to use engineering firms with whom they have had past success. An opportunity therefore exists for technology transfer of CHP to such

engineering firms to understand the roadblocks to incorporating CHP into their portfolio of client solutions for energy demands.

5.1.2 Small Group Developer Meetings

Possibly the most effective outreach program to brownfield project developers conducted by Future Energy for this project was a hands-on educational tour hosted by a large developer—Silverstein Properties—who has embraced CHP technology in the new World Trade Center buildings and in the ever growing River Place and adjacent Silver Towers Complex in Manhattan. Silverstein Properties hosted a tour and presentation of their existing CHP facility at its River Place property located on 42nd Street and 11th Avenue in New York City. This hands-on example to brownfield developers on the actual application of CHP technology was more compelling than the average presentation and resulted in all of the attendees interested in pursuing the technology for their planned new construction projects on brownfield sites and existing buildings. Unfortunately, after the presentation Future Energy learned that CHP was no longer an eligible technology for NYSERDA funding incentives for new construction projects. Three of the brownfield developers in attendance were interested in pursuing CHP for new buildings planned on brownfield sites should new NYSERDA incentives become available for new construction projects in 2012.

Fortunately, one of the developers had an existing building on a site in Yonkers that was built on a brownfield site, which could utilize the NYSERDA Exhibit Facilities Program for which CHP was still an eligible technology. As an outcome of the presentation, Pace arranged for the North East Energy Application Center, a NYSERDA CHP partner, to meet with the developer to initiate a feasibility study of the use of CHP at their existing facility in Yonkers. An improvement opportunity based on feedback from this developer was timelier follow up on such feasibility study inquiries. The developer was asked to provide copies of electrical bills and other information, but was eventually told their building was not a good candidate for CHP. Another improvement opportunity is to develop a list of building types that are good and not good for CHP applications since the pace of decision making by such businesspersons requires clear and timely information both of technical requirements and available incentives.

Based on the feedback from these developers, while they have become accustomed to the ever changing, but still certain, BCP tax credits, the uncertainty and lack of clarity regarding eligibility and potential incentives for CHP from NYSERDA's various building energy incentive programs did cause concern. For a developer to take the leap of faith on a new technology they are not

familiar with, they really do need to know the incentive they are relying on to incentivize them to attempt the technology will be there at the end of the day or they will simply stick to what they know. Brownfield developers are generally constructing new buildings, so excluding CHP as an eligible technology from the New Construction Program certainly discouraged several projects that could have used CHP on brownfield sites as a result of this project.

Clearly, there are good reasons to incorporate CHP into a new or existing building without or without government incentives. However, developers are not going to change the manner in which they know how to construct a building unless they can be clearly convinced the new technology will work, and the upfront costs will eventually provide a sufficient ROI. The educational effort that has occurred through this project provided a group of large scale developers with the preliminary tools they needed to explore CHP on their own, even without the incentive, but the incentive would likely have really pushed these parties into actual use of CHP. The elimination of the incentive effectually caused at least the temporary loss of this opportunity. Since it is our understanding that NYSERDA is revisiting its CHP program strategy in 2012, it is strongly encouraged that CHP incentives be made available to new construction or substantially renovated buildings, and possibly an enhanced program be developed for brownfields.

Additionally, the brownfield developers indicated that if NYSERDA is encouraging the use of CHP on brownfields, it needs to clearly communicate the incentives offered and streamline the project processes. A visit to the NYSERDA CHP web site does not provide clear, or up to date, information regarding CHP incentives. The "Funding Opportunities" links on the CHP page do not mention incentives for CHP. The linked "CHP Program Guide-Programs Overview" refers only to closed offerings, except for the feasibility studies mentioned above.

Further, even if these expired offerings were current, the only program where a developer could look at the program offering and have a good understanding of the available incentive is the Existing Facilities Program, which is not accepting any applications at this time. The remainder of the programs for non-development projects appear to have been competitive selections or for projects that are tenuously related to CHP systems (e.g. fuel cell systems, anaerobic digesters). In general, building or construction developers are not interested in applying for government RFP competitive selection processes in order to obtain an incentive because the application process is expensive, extremely uncertain, the time to ultimately enter into contracts with NYSERDSA is often lengthy, and there is obviously no ability to control the outcome. A recommendation is that the NYSERDA CHP web site be maintained to provide clear, up-to-date information about

NYSERDA support incentives for CHP and, if NYSERDSA is indeed targeting CHP on brownfields, that a program be structured in a manner similar to the Existing Facilities Program to include incentives for the installation of CHP with new building construction projects, which is simple and does not require competitive bidding, but does require an extensive application process and an agreement with commitments in the agreement document. Such a structure is more in keeping with the type of arrangements developers make during the everyday projects. Developers understand that if government is going to provide them with a financial incentive, they need to live up to their end of the bargain by installing and operating the technology and providing feedback after the installation. Therefore, an application/agreement process in exchange for an incentive works. This is akin to the process used to obtain the BCP tax credit incentive. However, developers are highly unlikely to competitively bid or engage in some other cumbersome process. Generally developers do not have large staffs do prepare forms or participate in complex government programs. However, if the goal is to save energy by getting more developers to install CHP in their buildings, simple, simple, simple is the key. Make the program and incentive simple, and developers, once knowledgeable about the program, should participate.

The same advice applies to BOA participants. While municipalities do generally have staff who know how to apply for RFPs and understand the need for competitive bidding processes, staff resources are at a premium these days and community based organizations have fewer and fewer resources. Therefore, keeping the process simple is also critically important for BOA participants in order to encourage use of CHP in large scale, area-wide BOA projects throughout New York. There are approximately 100 BOAs in the State. These large contiguous brownfield areas represent the best sites in the State for new sustainable green neighborhoods to be constructed, such as the planned BOA in Yonkers. Therefore, continuing to encourage use of CHP in BOAs is a key goal, but the incentive programs to encourage such use need to readily and simply complement the already complex series of brownfield redevelopment laws and regulations.

5.2 Conference Presentations

Future Energy prepared materials for and made presentations at a number of conferences during the course of this project to stakeholders in the clean energy technology, brownfield redevelopment and general industrial business communities. These events included:

- September 22, 2010 presentation to the Green Salon in New York City;

- October 21, 2010 presentation to the New York State Commercial Association of Realtors (NYSCAR) Education Session in Rochester, New York;
- November 18, 2010 presentation to the New York State Business Council (Business Council) at its annual Industry-Environment Conference in Saratoga Springs, New York; and
- March 29, 2011 presentation at the tenth Wall Street Green Summit in New York City.

Green Salon

There are many people in New York City who want to "go green," but simply do not know how to do it in a city that has roofs too small for solar panels and no space for wind turbines. However, CHP in large commercial buildings is a real green possibility. Future Energy Principal Linda Shaw, Esq. was the lead speaker at the Green Salon event in New York City on September 22, 2010, regarding the topic of CHP facilities on brownfield and NYC retrofit sites. The Green Salon is a part of the Global Change Foundation's environmental education series. See generally https://www.global-changefoundation.com/content/green-salon. The audience of about 21 people consisted of a mix of financial investors in the clean technology sector, policymakers, and other interested members or partners of The Global Change Foundation. It appeared no one in the audience was aware of the existence of CHP systems and these systems' practical application or pay back potential. Global Change Foundation director Peter Fusaro has expressed interest in follow up presentations and discussions and Future Energy will be a speaker at the Global Change Foundation's upcoming March 19-20, 2012 conference.

Association of Realtors

Even though realtors do not develop properties themselves, they certainly know many parties who do. As a result, when Future Energy was given the opportunity to give a brownfield update to this upstate realtor group, Future Energy's Associate Dwight Kanyuck presented the topic of "Energy Opportunities in Commercial Real Estate" at the New York State Commercial Association of Realtors Education Session held on October October 21, 2010. The audience included about 25 commercial realtors plus guests. The presentation included a focus on CHP, and resulted in a follow up inquiry from a large multi-family residential building owner interested in CHP as a potential solution for upgrading his existing HVAC systems to improve energy efficiency while complying with regulations regarding the use of ozone depleting refrigerants.

NYS Business Council Annual Environmental Conference

As a long term member of the New York State Business Council, Future Energy was given the opportunity to make a CHP presentation to a large audience, which mostly consists of representatives from industrial facilities throughout the state. Industrial properties represent an ideal location for CHP systems, particularly if the excess heat or steam can be used in an industrial process at the facility.

In a joint presentation, Future Energy's Linda Shaw and Dwight Kanyuck presented the topic of "The Green Economy: How New York is Losing Out" at the New York State Business Council's annual Industry-Environment Conference on November 18, 2010. The attendees of this conference included about 160 members of the Business Council ranging from not only industry representatives, but also utilities, policymakers, environmental attorneys and government officials. The presentation included an extended discussion of CHP on brownfield sites and at existing industrial facilities. Among the outcomes of this presentation was the recent formation of a Business Council Sub-Committee on green energy policy, to be chaired by Future Energy Principal Linda Shaw, to include, among other objectives, recommendations for encouraging the use of CHP on brownfield sites. There have been some staff changes at the Business Council, but Future Energy is optimistic about encouraging new management to continue interest in organizing this committee.

Wall Street Green Summit

Many investment bankers and firms are highly interested in green technology. While the financial sector has become extremely cautious about its investments, Future Energy believed this sector would be interested in being educated about the ready availability of CHP technology applications because CHP is an established rather than new technology.

Linda Shaw was invited and spoke at the tenth Wall Street Green Summit held on March 29, 2011. The Wall Street Green Summit focuses on the latest developments in Green Trading and Finance, and is attended by approximately 100 energy companies, investors, technology companies, and environmental project developers (see e.g. http://www.wsgts.com/attendees.php). Ms. Shaw' topic was Brownfields to Greenfields, and she specifically spoke on the use of the brownfield cleanup program and utilizing CHP during these projects.

The above conference presentations were well received, and elicited follow up discussions. If a CHP incentive still existed for new construction, Future Energy can confidently say some of the interested parties would be incorporating CHP into their project planning at this time.

It is interesting to note that the Business Council presentation even attracted the initial interest of New York State Department of Environmental Conservation energy counsel, who after hearing the presentation, provided insight on Department's greenhouse gas initiatives. NYSDEC counsel and Future Energy Principal Linda Shaw discussed how application of CHP could reduce a plant's carbon footprint. However, when asked if NYSDEC would help promote CHP to industrial companies it encounters in the permitting process, NYSDEC counsel did not appear to show any interest promoting this green technology to help a company achieve the Department's greenhouse gas initiatives or to even collaborate with NYSERDA. The disconnect and yet overlap between NYSDEC and NYSERDA's roles and goals could be an area where significant improvement is made. This even occurs within NYSDEC, since the agency does not view its role as promoting economic development, despite the fact that it is the sole agency in charge of the BCP, which is an economic development and environmental protection program based on these very words in the enabling statute. At a minimum, it should be feasible for high level staff at NYSERDA to meet with high level staff at NYSDEC in order to further educate appropriate parties in the permitting divisions about the benefits of CHP. If NYSDEC comes across an industry that could benefit from CHP technology, because the company needs steam or heat, that the NYSDEC permitting staff contact NYSERDA's main CHP contact at the time to alert them to a potential end user for this technology, particularly if the company needs a new boiler anyway to meet certain air regulations. An additional idea would be to provide NYSDEC with a small database of contacts to direct parties to the right NYSERDA contact if a party is interested in learning about new green CHP systems. Having worked with NYSDEC for many years, Future Energy's principals believe these simple two steps can be accomplished.

5.3 Brownfield Opportunity Areas

There are approximately 100 BOAs in municipalities throughout the State, which have been identified either by the municipalities themselves or by local community based organizations (CBOs) as containing a cluster of underutilized contaminated real estate in one location. The municipalities and CBOs participating in the BOA program ("BOA participant") receive grants to develop plans to redevelop these brownfield areas into a higher and better reuse.

Future Energy reached out to Western New York BOA participants as part of this project, and at the request of NYSERDA, to educate them on the benefits of CHP for the future planned projects in their BOA districts. FED arranged for and conducted a CHP workshop through the Lackawanna BOA project manager to present the benefits of CHP to key BOA stakeholders in Western and Central New York. The event was held on August 25, 2011 and, while originally planned as live event hosted at the SUNY Buffalo campus, because of feedback related to municipal constraints on travel budgets, the workshop was conducted as a conference call. The PowerPoint presentation was discussed at the workshop as well as local issues regarding brownfield eligibility and additional case studies discussed by the Northeast Midwest Institute.

The general reception about including CHP in future BOA projects in BOA districts was well received. Since BOA participants generally consist of municipal economic development staff, green energy saving measures may be too complex for them to fully understand. In general, focusing on the development community directly, which will actually construct the new structures in these BOA areas may make more sense than additional direct presentations to the BOA participants. Also educating the BOA staff at the Department of State (DOS) may make some sense. Such staff can then point BOA participants to NYSERDA contacts in the event a potential CHP project becomes closer to reality. Many BOA areas are not yet at the development stage. Therefore, NYSERDA can also work with DOS to determine which BOAs are closer to actual development than others to focus any continued outreach efforts.

5.4 Conclusions and Recommendations

Based on feedback received from brownfield developers and other stakeholders at the group meetings and presentations conducted by Future Energy, there is substantial interest on the part of brownfield redevelopers on the use of CHP as part of brownfield redevelopment projects. They recognized the energy efficiency benefits of capturing the synergy between power and thermal

demands. These benefits impact not only the bottom line, but can be a distinguishing marketing niche. Apartment dwellers are more and more interested in living in green buildings. Industrial and commercial building end users are looking for simple ways to reduce their bottom line.

Fundamentally, however, the financial return on investment on CHP systems needs to be consistent with return on investment expected for the overall project itself. Because of these expectations for return on investment, as well as the risks associated with redeveloping brownfields, it is likely that there will continue to be a need to provide financial support to encourage the use of CHP for such projects on the part of state and federal governments for some time until this technology becomes better known. For such incentives to be useful to brownfield project developers, the incentives need to be clear, predictable and sufficient to support the private investment through the project planning stage until construction or rehabilitation.

Federal incentives for CHP (see the incentives discussion in this report) are very clear and predictable, provide substantial financial support for the CHP project, and have minimal overhead cost associated with administering the incentive on the part of the developer and the government. A brownfield developer can count on a 10% federal tax credit on the CHP capital investment so long as it meets the criteria provide in the federal tax code. The documentation to support the tax credit is understood up front.

By contrast, NYSERDA's CHP program provides little to no incentive for development of CHP on brownfield sites at this time since brownfield sites generally construct new buildings, and there is currently no standing NYSERDA program that provides an incentive for CHP for new construction. NYSERDA's practice of issuing Program Opportunity Notices (PONs) for demonstration projects is of little value to brownfield developers because the timing of such offerings is unpredictable, the cost of putting together proposals for PONs is high (unless the developer was already planning and had engineered a CHP system), there is a relatively low likelihood for a return for the effort, and NYSERDA's post-award contracting cycle is likely to be too long to correspond with the pre-development schedule.

If it is a policy objective of New York State to encourage the widespread use of CHP in new residential, commercial, or industrial construction, it is recommended that either a simple state tax credit program be implemented in a manner similar to the federal tax credit or that NYSERDA design a program for new construction either by permitting CHP as an eligible technology in the New Construction Program or through a defined incentive approach for CHP similar to that provided for existing buildings in the Existing Facilities Program.

Once the incentives are in place, there is a large continuing education need for technology transfer of CHP to developers and architectural and engineering firms to encourage incorporating CHP into their portfolio of client solutions for energy demands.

Appendix A: Federal Energy Incentives Applicable to CHP

Business Energy Investment Tax Credit (ITC)	
Program Purpose	Encourage renewable energy and energy efficiency by providing a tax incentive f qualifying capital investment.
Eligible Sectors	Commercial, Industrial, Utility, Agricultural
Eligible Applicants	Taxpayers making qualified investments
Eligible Projects	Eligible projects by credit amount: • 30% for solar, fuel cells and small wind • 10% for geothermal, microturbines and CHP • Small wind turbines: 100 kW or less* • CHP systems must: o Produce at least 20 percent of its useful energy as electricity and 20 pe in the form of useful thermal energy. o Be smaller than 50 MW. o Be 60 percent efficient on a lower heating value basis. (there is an exc for bio-mass relative to efficiency ratings)
CHP Amount/ Incentive Rate	The applicable tax credit for CHP is generally 10 percent of the first 15 megawat (MW). Closed-loop biomass systems (including biomass CHP projects) qualify for a 30% credit through December 31, 2013
Max Incentive	No ceiling
Eligible System Size	• Fuel cells: 0.5 kW or greater • Microturbines: 2 MW or less • CHP: 50 MW or less
Program Budget	(entitlement tax credit)
Legal authority	26 USC § 48

Expiration	Units must be placed in service on or before December 31, 2016
Website	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=1
Contact	Public Information - IRS U.S. Internal Revenue Service 1111 Constitution Avenue, N.W. Washington, DC 20224 Phone: (800) 829-1040 Web Site: http://www.irs.gov

US Treasury Section 1603 Renewable Energy Grants	
Program Purpose	Expand upfront financing for renewable and energy-efficiency projects by conve the value of the ITC and PTC credits to an upfront grant. The program was autho under the ARRA economic stimulus and is being phased out.
Eligible Sectors	Commercial, Industrial, Utility, Agricultural
Eligible Applicants	Same as the ITC and PTC
Eligible Projects	Same as the ITC and PTC Note projects must be under construction on Dec 31, 2011
CHP Amount/ Incentive Rate	Grant generally corresponds to the amount of the credit under the ITC or PTC, fo example, most CHP projects are eligible for a 10 percent grant, but closed loop b CHP projects may be eligible for a 30 percent grant
Max Incentive	No ceiling
Eligible System Size	See the rules for the ITC and the PTC
Program Budget	(entitlement tax credit)
Legal authority	H.R. 4853, 2010 H.R. 1: Div. B, Sec. 1104 & 1603
Expiration	Units must be under construction on or before Dec 31, 2011 and placed in service according to a schedule available at: http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx The guidelines include a "safe harbor" provision that sets the beginning of constr at the point where the applicant has incurred or paid at least 5% of the total cost o property, excluding land and certain preliminary planning activities.
Website	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US53F&re=1 and http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx
Contact	Grant Information U.S. Department of Treasury E-Mail: 1603Questions@do.treas.gov

Renewable Electricity Production Tax Credit (PTC)	
Program Purpose	The renewable electricity production tax credit (PTC) encourages renewable energy production by providing a corporate tax credit based on a per-kilowatt-hour production of electricity from renewable sources. The PTC is normally a 10 year credit.
Eligible Sectors	Commercial, Industrial
Eligible Applicants	Taxpayers with qualifying renewable energy production
Eligible Projects	CHP is not directly included as eligible; however, CHP projects that use an identified renewable source as feedstock are presumed to be eligible. These include: Landfill Gas, Biomass, Municipal Solid Waste, and Anaerobic Digestion.
CHP Amount/ Incentive Rate	2.2¢/kWh for wind, geothermal, closed-loop biomass; 1.1¢/kWh for other eligibl technologies. Generally applies to first 10 years of operation.
Max Incentive	No ceiling
Program Budget	(entitlement tax credit)
Legal authority	26 USC § 45
Expiration	Varies based on the type of project
Website	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US13F&re=1&ee= http://www.irs.gov/pub/irs-pdf/f8835.pdf
Contact	Public Information - IRS U.S. Internal Revenue Service 1111 Constitution Avenue, N.W. Washington, DC 20224 Phone: (800) 829-1040

US Department of Energy Loan Guarantees	
Program Purpose	Financing support for energy production projects that ”avoid, reduce, or sequeste pollutants or anthropogenic emissions of greenhouse gases.” The projects need t employ new or significantly improved technologies when compared to technolog service in the United States at the time the guarantee is issued. Note no funds were appropriated for the program in FY 12.
Eligible Sectors	Commercial, Industrial, Nonprofit, Schools, Local Government, State Governme Agricultural, Institutional, Any non-federal entity, Manufacturing Facilities
Eligible Applicants	Private, nonprofit and public entities with qualifying projects.
Eligible Projects	**1703 Program:** • ***New or significantly improved technology:*** Proposed projects must fit wi the criteria for "New or Significantly Improved Technologies" as defined CFR 609. Project must NOT be a commercial technology that is already i general use. • ***CHP in a gray area:*** Because the focus of this program encompasses ene efficiencies and reducing greenhouse gases (rather than focusing only on renewables), CHP technologies can be assumed to be potentially eligible project meets the “new/improved” technology criteria. Listed eligible pro include fuel cells and “Efficient electrical generation, transmission, and distribution technologies,” as well as renewables. However, the program historically been designed to support larger scale renewable energy and bi projects. Note that three of the case studies featured in this report attempt Loan Guarantee applications and all three were either turned down or bec discouraged relative to the likelihood of success. **1705 Program** was an ARRA-authorized program and projects must have started construction Sept 30, 2011
CHP Amount/	No limitations

Incentive Rate	
Terms	Full repayment is required over a period not to exceed the lesser of 30 years or 90 the projected useful life of the physical asset to be financed. Borrowers must pay Energy Department's Credit Subsidy Cost (CSC, the expected long-term liability Federal Government in issuing the loan guarantee)
Program Budget	No appropriation for FY 12
Legal authority	42 USC § 16511 et seq. 10 CFR 609
Expiration	(depends on appropriations)
Websites	http://www.lgprogram.energy.gov http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US48F&re=0
Contact	Public Information - DOE U.S. Department of Energy 1000 Independence Avenue, SW Washington , DC 20585-0121 Phone: (202) 586-8336 E-Mail: LGProgram@hq.doe.gov

Clean Renewable Energy Bonds (CREB).	
Program Purpose	Encourage renewable energy through favorable financing. The CREB Program produces very low or no interest loans through a bond program that is linked to a federal tax credit. However, the program does not have a current federal appropri so the program is dormant.
Eligible Applicants	Local Government, State Government, Tribal Government, Municipal Utility, Rur Electric Cooperative. (Private entities are not eligible.)
Eligible Projects	CHP is presumed to be eligible if the feedstock is renewable, including: Biomass, Municipal Solid Waste, Landfill Gas, and Anaerobic Digestion. Solar Thermal Electric, Photovoltaics, Wind, Hydroelectric, Geothermal Electric, Hydrokinetic P Tidal Energy, Wave Energy, Ocean Thermal are also eligible.
CHP Amount/ Incentive Rate	No limitations
Terms	The objective is 0% interest rate financing. The borrower pays back only the prin of the bond, and the bondholder receives federal tax credits in lieu of the traditiona bond interest.
Program Budget	No appropriation for FY 12
Legal authority	26 USC § 54 (Old CREBs) 26 USC § 54A (New CREBs)
Expiration	(depends on appropriations)
Websites	http://www.irs.gov/pub/irs-tege/tc_and_stcb_q-a._09-07-10_1.5.pdf http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US45F&re=0&
Contact	Public Information - IRS U.S. Internal Revenue Service 1111 Constitution Avenue, N.W. Washington, DC 20224 Phone: (800) 829-1040

Qualified Energy Conservation Bonds (QECBs)	
Program Purpose	The QECB program makes available low or no interest loans by virtue of a link to a federal tax credit. The available tax credit authority is distributed to the states and 29.9 percent of the state's allocations can be used for "private activity bonds."
Eligible Applicants	Local Government, State Government, Tribal Government (29 percent of the bonds can be used for "private activity bonds").
Eligible Projects	A broad variety of projects are potentially eligible. CREB's are most frequently used as a favorable borrowing source for community energy conservation programs, such as PACE, energy efficiency capital expenditures in public buildings, and green community programs. CHP is presumed to be eligible if the feedstock is renewable, including: Biomass, Municipal Solid Waste, Landfill Gas, and Anaerobic Digestion. Solar Thermal Electric, Photovoltaics, Wind, Hydroelectric, Geothermal Electric, Hydrokinetic Power, Tidal Energy, Wave Energy, Ocean Thermal are also eligible.
CHP Amount/ Incentive Rate	No limitations, but the overall size of the program and the manner in which it is distributed to the states limit the availability of the funds relative to large-scale projects.
Terms	These are tax credit bonds, similar to CREB's, except that the states distribute bond allocations. The objective is 0% interest rate financing. The borrower pays back only the principal of the bond, and the bondholder receives federal tax credits in lieu of the traditional bond interest.
Program Budget	$800 Million
Legal authority	26 USC § 54A
Expiration	(depends on appropriations)
Website	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US51F&re=1&ee=1 http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/QECB.html
Contact	Contact: Timothy Jones or David White of the IRS Office of Associate Chief

Counsel at (202) 622-3980, or:

Public Information - IRS

U.S. Internal Revenue Service

1111 Constitution Avenue, N.W.

Washington, DC 20224

Phone: (800) 829-1040

USDA - Rural Energy for America Program (REAP) Grants and Loan Guarantees	
Program Purpose	REAP encourages energy efficiency and renewable energy in rural and small town areas by making available grants (to public agencies and cooperatives) and loan guarantees (additionally available to private entities) for projects that expand renew energy production and/or create energy efficiencies.
Eligible Applicants	• For grants: Commercial, Schools, Local Government, State Government, T Government, Rural Electric Cooperative, Agricultural, Public Power Entiti • For loan guarantees: same plus private commercial entities
Eligible Projects	CHP is eligible. May also fund projects that promote energy efficiency (from renewable and non-renewable sources). The full list of eligible technologies: Sola Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind, Biom Hydroelectric, Geothermal Electric, Geothermal Heat Pumps, CHP/Cogeneration, Hydrogen, Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy Ocean Thermal, Renewable Fuels, Fuel Cells using Renewable Fuels, Microturbin Geothermal Direct-Use.
CHP Amount/ Incentive Rate	Grants limited to 25% of project cost. Loan guarantees may not exceed $25 millio The combined amount of a grant and loan guarantee may not exceed 75% of the project's cost.
Program Budget	REAP Grants have generally been funded at $55 to $70 million annually. REAP loan guarantees have generally been funded at $23 million annually.
Legal authority	7 USC § 8106
Expiration	(depends on appropriations)
Website	http://www.rurdev.usda.gov/rbs/busp/bprogs.htm http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US46F&re=1& http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US05F&re=1&ee=1

Contact	Public Information - RBS U.S. Department of Agriculture Rural Business - Cooperative Service USDA/RBS, Room 5045-S, Mail Stop 3201 1400 Independence Avenue SW Washington, DC 20250-3201 Phone: (202) 690-4730

Appendix B: New York State Energy Incentives/Programs

NYSERDA CHP Acceleration Program (To Begin in 2012; More Details TBD)	
Program Purpose	A market development incentive program to accelerate the installation of CHP systems in New York State
Eligible Sectors	Commercial, Industrial, Nonprofit, Schools, Local Government, State Government, Installer/Contractor, Fed. Government, Agricultural, Institutional, Residential
Eligible Applicants	Located in NY State; electric customer of investor-owned utility company; must pay into System Benefits Charge
Eligible Projects	Pre-engineered, pre-packaged systems only
Eligible System Size	Modules between 50 kW and 1MW; no more than 2 MW behind any one customer's meter
Funding Source	System Benefits Charge
Program Budget	$25 million ($5 million/year for 5 years)
Expiration	TBD; Scheduled to run through 2016
Contact	Edward Kear; (518) 862-1090, ext. 3269; ebk@nyserda.org.

Net Metering	
Program Purpose	To provide an incentive for residential and non-residential customers who generate on-site renewable energy
Eligible Sectors	Residential and non-residential
Eligible Applicants	Customers of the state's major investor-owned utilities (Central Hudson, Con Edison, NYSEG, RGE, National Grid, Orange and Rockland)
Eligible Projects	Biomass, Fuel Cells, micro-CHP/Cogeneration, Anaerobic Digestion, Fuel Cells using Renewable Fuels
System Limit	10 kW for residential micro-CHP and fuel cells
Aggregate Limit	1% of utility's 2005 demand for residential micro-CHP and fuel cells
Max Incentive	Varies; net excess credited to customer's next bill at full cost of service rate for that service class, except for micro-CHP and fuel cells, which are credited at avoided-cost rate. Carries over indefinitely for non-residential. For other customers, including those using farm waste, excess credits are cashed out after 12 months at the avoided-cost rate.
Funding Source	Rate-payers from each utility
Capacity Limit/Time	First-come, first-served
Website	http://www.dps.state.ny.us/distgen.htm
Contact	Mike Worden (518) 486-2498; michael_worden@dps.state.ny.us
Application Process	Communicate with utility, file application, utility confirms applicant meets NY Standardized Interconnection Requirements (SIR), system installation, test in accordance with NY SIR, final acceptance

Empire State Manufacturing Assistance Program	
Program Purpose	To help NY State manufacturers improve productivity and competitiveness by investing in capital projects
Eligible Sectors	Industrial
Eligible Applicants	NYS manufacturers; must employ 50 to 1,000 workers and export at least 30% of production beyond immediate region, or supply at least 30% of production to a prime manufacturer that exports beyond the region
Eligible Projects	Capital investments in machinery and equipment that improve productivity and competitiveness; "Industrial Effectiveness" consulting and worker skills training
Max Assistance	$1 million
Funding Source	NY State
Minimum Requirements	$1 million capital investment; Quantified improvements over baseline operation of 20% or more
Deadline	Applications typically reviewed on ongoing basis, but may change in future; See website for details
Website	http://esd.ny.gov/businessprograms/map.html
Contact	Main Program Administrator, (518) 292-5340 or ESD Regional Office as listed at: http://www.empire.state.ny.us/contacts_and_About_Us/locations.asp
Expected Results	Substantial improvements to the output, productivity and competitiveness of the manufacturing facility; must be measurable and verifiable. Examples: increased production output; process efficiency; improvements in quality control; new product line; resource conservation; pollution prevention; cost-reduction or revenue-enhancement measures

Evaluation	Assistance amount determined by magnitude and overall benefits to company; amount of private investment leveraged; and economic impact on regional economy
Application Process	Contact ESD Regional Office; Submit proposals, to include: project description, quantified project results, milestone schedule, project budget and cash flow analysis

Empire State Linked Deposit Program	
Program Purpose	To provide financing at a reduced rate to help improve competitiveness of NYS firms in variety of ways
Eligible Sectors	Manufacturing; Some service sectors (retail, professional and personal services eligible ONLY if located in NYS, creating and/or retaining permanent jobs in economically disadvantaged area, and employ 100 or fewer full-time equivalent in NYS)
Eligible Applicants	NYS manufacturers and service firms; specific requirements for 2% vs. 3% interest rates available on website
Eligible Projects	Those that improve performance and competitiveness, market access and product development, including equipment modernization, expansion of facilities, or introduction of new technologies; Projects that facilitate ownership transition and/or promote job creation retention; Projects designed to increase export activities
Program Limits	2-3% interest rate reduction in loan of up to $500,000 for four years; borrowers can also apply for a 4-year extension on same project; total lifetime assistance (inc. renewals and prior deposits) cannot exceed $2 million; eligible business may have up to three LDP loans outstanding, totaling $1 million
Evaluation	Borrower/project eligibility must be met, company must project goals and demonstrate need for loan subsidy; If applying for renewal, must show original goals met, explain new goals, and demonstrate continued need for loan subsidy
Minimum Requirements	Principal place of business must be in NYS and company must show it has revenues and existing NYS-based employees (no out-of-state companies or new start-ups)
Expected Results	Improved business competitiveness, NYS jobs created/retained, opportunity for disadvantaged businesses, overall economic growth

Funding Source	NYS Office of the State Comptroller ($460 million) and NYS Department of Taxation & Finance ($100 million)
Program Budget	$560 million revolving fund
Expiration	None; permanent program
Website	http://www.esd.ny.gov/BusinessPrograms/LinkedDeposit.html
Contact	LDP office, (518) 292-5261 or Linkeddeposit@empire.state.ny.us
Application Process	Businesses apply at participating financial institution with which they do business, or the New York Business Development Corporation. Must complete application, available online: involves describing project and its ability to improve competitiveness and profitability, purpose of loan, operating company's business

Dormitory Authority State of New York Tax-Exempt Leasing Program	
Program Purpose	To reduce costs for NY State Dormitory Authority not-for-profit clients that lease technology equipment and energy projects
Eligible Applicants	Dormitory Authority not-for-profit clients, including any higher education institution, non-profit hospital, residential health care facility, diagnostic and treatment center, or other authorized non-profit client organization
Eligible Projects	Leasing of energy management equipment, performance contracting, and other energy conservation projects
Minimum Requirements	Approximately $1 million
Maximum Financial Savings	$100,000 per $1 million funded
Maximum Project Savings	Leveraged savings vary according to project; likely substantial
Not-for-Profit Funding Source	Banks, lending companies, vendors, other private sources of capital
Annual Program Limit	Subject to not-for-profit approving resolution, and that of the NY State Public Authorities Control Board approving resolution
Deadline	Generally last business day of each month on a rolling schedule: http://www.dasny.org/finance/telp/calendar.php
Expected Results	Enhance operations by lowering energy use and operating costs; Utilize savings as path to offset cost of financing, thereby seeking funding neutrality (i.e. investment pays for self over time)
Evaluation	Ongoing evaluation process typically required by organizational management and/or board of directors; client reports on performance savings and project activity

Website	http://www.dasny.org/telp/index.php
Contact	Art Ware 518-257-3373; aware@dsny.org
Application Process	Simplified two-part application, required Certificate of Need for the State Health Department (for health care leases only), required public notice of the lease, and approval by the Public Authorities Control Board; On average, process takes 6-8 weeks

The Brownfield Redevelopment Tax Credit (BRTC)	
Program Purpose	To encourage private-sector cleanup and development of brownfields throughout the State..
Eligible Applicants	Taxpayers who have entered into a Brownfield Cleanup Agreement (BCA) with NYS DEC.
Eligible Projects	Eligible projects must have received a notice of acceptance into the Brownfield Cleanup Program issued by the Department of Environmental Conservation on or after June 23, 2008, and executed a Brownfield Cleanup Agreement (BCA) under the Environmental Conservation Law (ECL) and have a Certificate of Completion (COC) issued by the Commissioner of Environmental Conservation; or the project has received the COC pursuant to the transfer or sale of a qualified site
Minimum Requirements	
Maximum Financial Savings	Capped at the lesser of 3 times cleanup costs (or $35 million) for non-manufacturing entities, or 6 times cleanup costs ($45 million) for manufacturing establishments
Maximum Project Savings	$45 million for manufacturing or $35 million non-manufacturing
Not-for-Profit Funding Source	Qualifying entities must be taxpayers
Annual Program Limit	Tax credit amounts exceeding $2 Million must be deferred to a future year. See Corporation Tax Credit Deferral
Deadline	Program ends 12/31/2012
Website	http://www.tax.ny.gov/pit/credits/brownfield_redevelopment.htm

Contact	
Application Process	File form CT-611.1 (for corporations) or file form IT-611.1 (for all others).

Renewable Portfolio Standard	
Program Purpose	To expand the use of renewable energy in the state so that renewable sources account for 30% of the state's electricity consumption by 2015
Eligible Sectors	All
Eligible Applicants	Customers of NYS investor owned electric utilities that pay RPS fee
Eligible CHP Projects	Anaerobic digester gas-fueled CHP and fuel cell CHP behind the customer's meter, large-scale biomass CHP, pipeline directed biogas in the lower Hudson valley and in New York City
Eligible System Size	Varies by program
Minimum Requirements	To be eligible under the Main Tier, must have first commenced commercial operation on or after January 1, 2003 (unless a significant upgrade or repowering took place after this date and/or introduced or increased use of biomass)
Max Incentive	Varies by program
Program Budget	Customer Sited Fuel Cell program - $21M; Customer Sited ADG program - $57M; Customer Sited Regional program (direct use and pipeline directed in downstate region - also includes PV) - $150M; Main Tier (all sources over 1MW are eligible) - $2.4B (All through 2015)
Funding Source	RPS surcharge on each kilowatt-hour sold by the state's investor-owned utilities; separate from and in addition to the state system benefits charge
Evaluation	Open enrollment (first come, first served) for Fuel Cell and ADG programs; Competitive selection on price per kWh for Regional and Main Tier programs
Expiration	Open enrollment programs expire on December 31, 2015; Competitive selection programs typically have 2 due dates per year
Website	http://www.nyserda.ny.gov

Contact	NYSERDA, (866) 697-3732, info@nyserda.org OR PSC, (518) 474-7080, web_questions@dps.state.ny.us
Application Process	See individual program instruction

Emission Reduction Credits	
Program Purpose	To offset new air emissions in the designated Ozone, PM-10, PM-2.5
Eligible Applicants	NY-based facilities; Facilities subject to Part 201 Permit; non-permitted facilities through individual single source SIP revision
Eligible Projects	Those that reduce permitted emissions by accepting a federally-enforceable emission cap or surrender a permit; permitted emissions are: NOx, PM-2.5, PM-10, SO2 & VOC
Maximum Price	Varies depending on market
Evaluation	Reduction must be quantifiable, enforceable, permanent and surplus (baseline - 2 years); See website for more information in subpart 231-10 of ERC regulations
Deadline	Within Baseline Period: For past reduction, any 24 consecutive months within the 5 years immediately preceding the emission reduction date; for future reduction, any 24 consecutive months within the 5 years immediately preceding the date of receipt of an application which proposes to use for future reduction
Website	http://www.dec.ny.gov/chemical/8564.html
Contact	NYSDEC Division of Air Resources, ERC Program, 518-402-8403; DARWeb@gw.dec.state.ny.us
Application Process	First contact appropriate regional office; Once permit type is determined, submit permit application through regional office

Regional Greenhouse Gas Initiative	
Program Purpose	To reduce carbon dioxide emissions from power plants in 10 Northeast and Mid-Atlantic states through a market-based regulatory program
Eligible CHP Projects	Some biomass-fed system projects may be eligible for CO2 offset allowances, including those associated with landfill methane capture and destruction, and with avoided methane emissions from agricultural manure management operations
Maximum Price	Varies - $1.89 per allowance (1 allowance=1 short ton CO2) was floor price for 2011 auctions, until allowance prices rise there will be no viable offset market due to the economics. If prices do rise sufficiently, the "per ton value of CO2 offset by a project" would likely closely track allowance prices.
Expiration	Auctions are held quarterly through 2018; see website for details
Expected Results	States' collective reduction of total annual CO2 emissions (from electric power generators larger than 25 MW) by 10% by 2018 from the administratively set cap established in the MOU. The program will undergo a comprehensive review in 2012, which could result in significant changes, including adjusting the cap to better reflect actual 2009 emissions in the region.
Website	http://www.rggi.org/
Contact	rggi@nyserda.org
Evaluation	CO2-equivalent emissions reductions or carbon sequestration must be real, additional, verifiable, enforceable, and permanent; evaluated through a periodic Monitoring and Verification Report submitted to state regulatory agency
Application Process	1) Open general account in RGGI CO2 Allowance and Tracking System (COATS); 2) Register proposed offset project in RGGI COATS; 3) Submit Consistency Application to demonstrate that

	project meets relevant state regulations, include signed verification statement and verification report from state-accredited independent verifier

Property Assessed Clean Energy Bonds	
State of Program	Until uncertainty from FHFA is resolved via national legislation or shift in FHFA policies, PACE programs in NY and the nation are indefinitely frozen and their future highly uncertain; see http://pacenow.org/blog/ for status updates
Program Purpose	To provide an innovative financing mechanism that allows homeowners and businesses to finance renewable energy and energy efficiency projects and pay back those loans through an assessment on their property tax bill
Eligible Sectors	Any building paying property taxes is eligible
Eligible CHP Projects	To be determined; those deemed eligible by NYSERDA
Eligible System Size	Any (though the portion of the project funded via a PACE loan cannot exceed the lesser of 10% of the property value or 10% of overall project cost)
Minimum Requirements	NYSERDA would need to establish these for CHP; would need to demonstrate public benefit, such as through decreased demand for electricity, cleaner air, or similar effects
Max Loan Amount	The lesser of 10% of appraised real property value or 10% of the cost of qualified improvements.
Funding Source	PACE is the municipal level finance mechanism for loans from a variety of revenue sources, such as federal stimulus, state funds, regional RGGI funds, and municipal bonds. Current NY law limits PACE programs to those funded via federal support.
Evaluation	To qualify, must undergo energy audit or renewable energy feasibility study
Website	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY68F&re=1&ee=1
Contact	standards@nyserda.org

Application	
Process	To be determined

Appendix C: Complete Record of Case Studies

Mueller Airport Redevelopment Area, Austin, Texas

Austin Energy

1. Summary – The redevelopment of the 417-acre former Mueller airport was designed to meet the high sustainability standards of a new planned community. The Dell Children's Medical Center is one major anchor of the mixed use redevelopment. A 4.5 megawatt, gas-fired turbine generates 100 percent of the Medical Center's electrical power, as well as providing chilled water to five other business users.

2. Contact info

   Wayne McKinzey

   Austin Energy and Mueller Energy Center

   (512) 322-6559

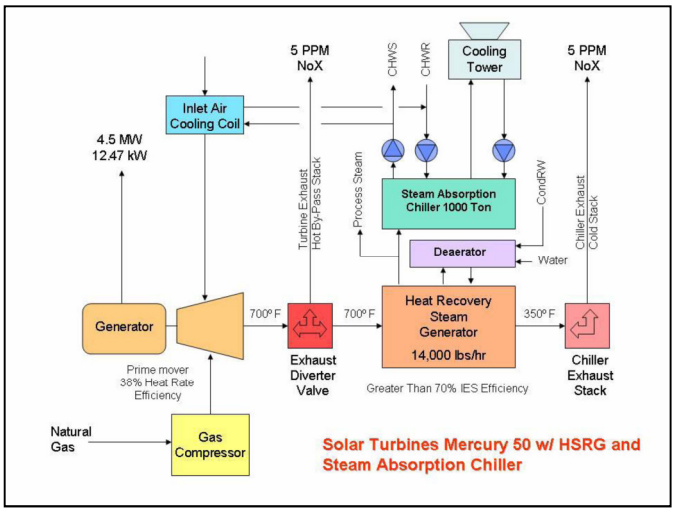
   Wayne.McKinzey@austinenergy.com

3. Basic project description

   - What was the original impetus? The Dell Children's Center Hospital was planned to reach very high environmental/sustainability standards and the district energy system was instrumental in their achieving LEED Platinum status.
   - Status (completed, designed, planned) – Complete, 2007
   - Location – Former Mueller airport
   - Developer: Austin Energy

     CHP engineer, builder, operator: Engineered Systems, HPAC Engineering, Mueller Energy Center

4. <u>CHP technology and feedstock</u> – gas-fired tri-generation, generates electricity, steam and chilled water):



   - CHP plant:
     - Mercury 50 – 4.3 MW, 38% efficiency, 5 ppm
     - HRSG w/burner
   - Heat Recovery Steam Generator 22,000 lb/hr (13,500 lb/hr Steam Heat Recovery)
     - Thermal Storage Tank – 8000 ton/hr
   - Packaged and absorption chiller plants There are:
     i. three packaged centrifugal chillers: 2 @ 2500 tons and 1 @ 1500 tons;
     ii. one absorption chiller (700 tons).
   - Packaged Emergency Generator – 1500 kW

5. <u>Relationship of CHP plant to the brownfields redevelopment</u> – Mueller redevelopment area is 700 acres and is planned to accommodate 4.7 million sq. ft of commercial space and 4,500 residences. Most the site was classified as brownfield because of airport-related contamination (spilled fuel) and a former landfill.

CHP plant serves 470,000 sq ft Dell Children's Hospital with electricity and chilled water. The following are also served by the chilled water/district energy system: Ronald McDonald House, Strictly Pediatrics Medical Office Complex, Southwest Educational Development Lab, and the headquarters of

the Seton Family of Hospitals.

The chilled water system includes underground piping along a loop road. Note not all businesses locating on the loop are tied in – several big box retail stores did not tie in partly because it would have made them alter their cookie-cutter store designs. Each new use on or near the loop is financially evaluated – there needs to be a high density load in order to be advantageous. While the chilled water system saves capital investment in each building's air conditioning system, on the other side of the ledger, each building that joins the system must invest in a heat exchanger and monitoring equipment to assure that the water that is returned is a certain temperature.

- Key brownfields hurdles overcome – Brownfields issues included spilled fuel, methane from a former landfill, multiple UST''s, and asbestos.
- Key brownfields financing – Tax increment financing
- What are the synergies between brownfields redevelopment and CHP? The district chilled water system aided redevelopment of the hospital and a series of associated uses by providing a lower cost reliable source of steam and chilled waters for air conditioning.

6. Energy Output –
   - Electricity - generation of 4.3 MW (1.2MW to the hospital, 3.1MW for plant equipment and the grid);
   - Steam output - 22,000 lb/hr Steam Heat Recovery

7. Financing – key incentives –
   - Revenue bond based on contract with the hospital
   - Federal incentives –
     a. DOE demonstration grant but was not the primary financing.
   - Renewable Energy Portfolio standard – No, there is no RPS in Texas.

8. GHG and air quality benefits –

   Compared to traditional centralized gas-fired power plant

   - 47% lower CO2
   - 50% lower sulfur dioxide
   - 93% lower NOX – less than 5 ppm

9. Economic impacts –

   Energy savings to the hospital and other users

10. Success factors –

    - Natural gas and grid interconnect and tariffs
    - Account for parasitic loads and metering
    - Permitting & zoning – emissions and noise
    - Involve the right people in solicitation evaluation and contract negotiation

11. Website and articles:

    HPAC Engineering - http://hpac.com/mag/meeting_todays_energy/#

    Austin Energy - http://www.austinenergy.com/Commercial/Other%20Services/On-Site%20Energy%20Systems/districtcooling.htm. Note Austin Energy has two district energy/CHP plants: downtown and Mueller. A third CHP project at "the Domain" (a mixed use redevelopment of the former IBM campus) piloted new technologies that did not reach their intended efficiencies, and the system was abandoned.

St. Paul Energy Park

1. Summary – A district energy system was developed in 1986 by the St. Paul Port Authority to supply inexpensive and reliable energy to a mixed use redevelopment of a 218-acre former industrial area, about two miles from downtown. System provides both hot water and chilled water through a two-pipe distribution system. Ever-Green Energy, which operates the system but was not the original developer, is currently examining adding an additional set of distribution pipes to convert to a 4-pipe system to provide year-round heating and cooling and could add electrical generating capacity in the future which would make it a complete CHP system.

2. Contact info

   Andrew Kasid (interviewed)

   Ever-Green Energy

   (651) 925-8152

   andrew.kasid@districtenergy.com

   Laurie Hansen (not interviewed)

   St. Paul Port Authority

   651-224-5686

3. Basic Project description.

   a. Status (completed, designed, planned) – Complete, but upgrades planned

   b. Location – industrial area about 2 miles from downtown

   c. Developer/owner – St Paul Port Authority

   d. CHP engineer, builder, operator – Current operator is Ever-Green Energy. A previous operator was NRG.

4. Background on the business and vision for the project – The district energy system was installed at the same time that the area was being redeveloped, and the inexpensive, reliable energy derived from the system was viewed as part of the marketing of the redevelopment project. The community was designed as a mixed use, live-work-play community, a model of what would later be known as sustainable development.

5. CHP type, feedstock, etc. – Natural gas with heat pumps. Originally, the chilled water came from "once-through" groundwater supplemented by chillers and heat pumps, but the State of MN required a change to install cooling towers in 2010.

6. Relationship of CHP plant to the brownfields redevelopment –

    a. Describe the redevelopment area – 218-acre industrial area redeveloped for mixed residential, commercial, and industrial uses, now includes 25 buildings with 2.6 million sq ft of space, 92 companies and 4,200 jobs. The businesses are about ¾ office and ¼ industrial. Retail was originally planned as part of the redevelopment project, but the retail failed and has been converted to office space. The largest employer is U.S. Bancor, occupying 361,000, operating around the clock, and employing over 2,000 people.

    b. Key brownfields hurdles overcome – The area was redeveloped before the term brownfields was coined, but it was a typical urban industrial area and the presumption is that there were typical environmental/cleanup issues. There was also a 4-acre Superfund site that was redeveloped and now houses Kemps Ice Cream and the national testing firm, Thomson Prometrics.

    c. Key brownfields/redevelopment financing – HUD UDAG

    d. What are the synergies between brownfields redevelopment and District Energy/CHP? Redeveloped properties were initially mandated to link to the District energy system. Energy efficiencies are believed to be a significant factor in attracting the U.S. Bancorp back office operation, a 24-hour high load energy user.

7. Energy Output -

    a. Electricity to grid – None currently but under consideration.

b. Electricity to area users – None currently but providing electricity to a nearby college is under consideration

c. Hot water capacity – 49 MMBQ's per hour

d. Identify steam users – US Bancorp, Power Motion, Quality Tool, GLF Companies, Merrill Corp, a hotel, other residential and commercial uses. GLF and Merrill are printers.

e. Identify the advantages to the hot water users - The district energy system provides reliable heating and cooling at competitive prices with long-term stable rates. The system also relieves the building owners of the capital costs for equipment, the space requirements for the equipment and on-going maintenance.

8. Financing – key incentives –

The original financing was a combination of federal UDAG loans and grants, supplemented by Port Authority funds loaned to the project based on the projected revenue stream from user contracts.

Currently under consideration are three projects.

1. Expanding the system from a two-pipe system to a 4-pipe system. The reason for this is that the current system is inflexible in relation to fluctuating temperatures in the spring and fall. The 4-pipe system allows easy change-over between heating and air conditioning.

2. Expanding to also produce electricity, which would make the system a full CHP project. This project may produce electricity for an adjacent college campus and/or electricity to the grid.

3. Switching to a renewable bio-fuel feedstock – a federal grant application was prepared but was turned down.

Projects 1) and 2) above are expected to be eligible for the federal Production Tax Credit

9. Regulatory issues:

a. Issues related to selling to the grid – They are analyzing the potential of producing electricity to sell to the grid. Minnesota has a REPS, which will presumably motivate the utility to enter into a long-term contract.

b. Is there a GHG trading system and did it factor in? No.

10. Benefits -

a. GHG savings – this has not been estimated.

b. Economic impacts – 4,200 jobs

11. Website and articles:

http://www.districtenergy.com/about/story.html

http://www.stpaul.gov/index.aspx?NID=503

http://www.sppa.com/developed-business-centers/energy-park/

Atlantic Station - District Energy and Brownfields

1. Summary – Atlantic Station is a $2 billion, 13 million sq ft mixed use redevelopment of the former Atlantic Steel mill near downtown Atlanta. The project, which is about 50 percent built-out, involved a $50 million cleanup of the former Atlantic Steel property. Atlantic Station is often cited as a model for sustainability, with numerous green buildings, TOD, ride-sharing, and other elements. CB Richard Ellis is owner and master developer.

Atlantic Station District Chilled Water System was designed and built simultaneously with the redevelopment project. There are over 2 miles of piping, with up to 36" piping size. All the major buildings in Atlantic Station are connected to the system and benefitting from the efficiencies and reliability of the district chilled water system.

2. Contact info

Michael Decker (interviewed)

Veolia Energy

Tel: 404.745.9445

mdecker@veoliaenergyna.com

Sean McIntosh, Manager (not interviewed)

Atlantic Station Master Owners Association,

c/o CB Richard Ellis, Inc.

404-898-2500

Sean.McIntosh@cbre.com

3. Basic Project description.

   a. Status (completed, designed, planned) – Phase I complete

   b. Location – Atlantic Station, Atlanta

c. Developer – CB Richard Ellis

d. District Energy engineer, builder, operator -

Operator - Veolia Energy Atlantic Station, LLC is the owner and operator.

Centrifugal Chillers – York YDXF

4. Background on the business and vision for the project – Atlantic Station was designed to be a model green/sustainable new urbanist redevelopment project. Many of the buildings are LEED Gold. District energy was part of that vision.

5. District Energy/CHP Specs. – There are 2 miles of piping, up to 36 inches . The first phase, which has been operating for five years, consists of three 2,500 ton centrifugal chillers, roughly corresponding to the first 2 million square feet of space. Capacity - 7500 Tons of cooling.

6. Relationship of CHP plant to the brownfields redevelopment –

a. Key brownfields hurdles overcome – There was a $50 million cleanup of the former Atlantic Steel site.

b. Key brownfields financing - $250 million in TIF financing was the primary gap closer.

c. What are the synergies between brownfields redevelopment and district energy? The district energy system is a competitively-priced reliable source of energy. The district system helped meet sustainability goals and contributed to high LEED ratings.

The density of the redevelopment project helped make the district chilled water system work, partly because most of Atlantic Station is built on top of parking garages and the pipes could be channeled through the parking garages rather than more expensive underground construction.

7. Energy Output -

a. Electricity to grid – NA

b. Electricity to area users - NA

c. Capacity – 7500 Tons of cooling

d. Identify steam users – most Atlantic Station buildings are on the district energy system.

e. Identify the advantages to the chilled water users –space gained by not building separate boilers and chillers; avoided labor and maintenance expenditures related to boilers and chillers.

8. Financing – key incentives –

a. *Total and summary of capital project* - $35 million total. Note that district energy projects like this one are generally not eligible for the federal energy incentives available to CHP. The project used:

i. $24 million Fulton County revenue bond

ii. Remainder - Private

9. Regulatory issues:

a. Issues related to selling to the grid – NA

b. Did the state's renewable energy portfolio standard factor in? - NA

c. Was the classification of the project as "renewable" an issue? - NA

d. Is there a GHG trading system and did it factor in? No

10. Benefits

a. GHG savings – GHG savings have not been calculated for the district energy system.

b. Economic impacts – The full build-out is designed to produce: 2,000 to 3,000 residential units, 4 to 6 million square feet of commercial office space, 1,000 to 1,200 hotel rooms, and 1 to 2 million square feet of retail, with a total employment of as many as 20,000 people.

c. Community benefits -

11. Key Success factors –

    a. Financial -

    b. Other -

12. Policy issues encountered -

13. Website and articles:

    http://www.veoliaenergyna.com/veolia-energy-north-america/locations/atlanta.htm

    http://www.shfcc.tv/projects.html

    http://www.atlanticstation.com/

Dockside Green, Victoria, British Columbia

District Energy (current), CHP planned

1. Summary – Dockside Green is a new urbanist mixed use harborfront brownfields project in Victoria, British Columbia. The district energy system, based on advanced biomass gasification technology, enables Dockside Green to self-generate clean, low-cost heat using locally sourced wood fuel to help achieve the developer's goal of carbon neutrality. A second phase of the project could involve a full CHP system.

2. Contact info

   Darsi Quinn, Manager, Marketing and Business Development

   Nexterra

   (604) 637-2501 - ext. 115

   dquinn@nexterra.ca

3. Basic Project description.

   a. Status (completed, designed, planned) – District energy system, complete; CHP planned. The redevelopment project – five buildings complete; total build-out is 26 buildings, 1.3 million sq ft.

   b. Location – Dockside Green, Victoria, British Columbia

   c. Developer – Windmill West

   d. CHP engineer, builder, operator –

      i. System engineering and building - Nexterra

      ii. Owner/Operator - Corix Utilities Ltd and FortisBC owns the district energy system.

4. Background on the business and vision for the project – The project was conceived by Joe Van Belleghem, the visionary behind Dockside and a partner with development company Windmill West.

5. District Energy/CHP technology. – Nexterra Energy Corp uses a fixed-bed, updraft gasification technology that converts wood residuals such as bark, sawdust and shavings into syngas. A full CHP system is in planning.

   The second stage of technology development involves conveying and directly firing the syngas into rotary kiln and boiler burners. The company has performed successful trials of this application at pilot scale and is currently working to commercialize this solution. The first installation will start-up later this year at the Kruger Products tissue mill in New Westminster, BC.

   The company is now embarked on the third generation of biomass gasification technology in collaboration with GE Energy and its gas engine division, GE Jenbacher. It is developing an advanced combined heat and power system, ranging from 2 to 10 MW, which involves direct-firing syngas into GE's Jenbacher internal combustion engines. Pilot testing of the technology is being conducted at the company's Product Development Centre, where a 250 kWe Jenbacher is being installed. This next-phase gasification system has also been proposed for installation at Dockside Green when it becomes commercially available.

6. Relationship of CHP plant to the brownfields redevelopment – Dockside Green's master plan encompasses 26 buildings totaling 1.3 million sq ft of mixed residential, office, retail and light industrial space on the 15-acre brownfields site. By 2015, the community will be home to approximately 2500 residents in three neighborhoods. Project construction began in early 2006.

   a. Key brownfields hurdles overcome – Site was a copper mine. Site remediation taking soil off the site, thermally treating it and mixing it with biosolids, then using it to reclaim an old copper mine; some of the soil was also capped. These remediation efforts were incorporated into the project's financials by designing the master plan around the areas where the soil could be capped.

   b. Key brownfields financing -

   c. What are the synergies between brownfields redevelopment and District energy/CHP?

i. *Economics.* The district energy system saves some capital costs in initial construction. Buildings still have to be equipped with heat exchanger, but that involves less capital investment than a full HVAC system.

From an operating cost point of view, it produces energy/heat at $4.00 - $5.00 per million BTU's. This is marginally lower than natural gas. In general, bio-mass competes affectively with natural gas in areas where natural gas is $10 per million/BTU or more.

The capacity of the district energy system is 8 million BTUs per hour, but, because the project has been slower to build out than anticipated, the system is operating to produce only 1 to 2 million BTU's. This has caused the financing plan to be re-worked.

ii. *Marketing.* The biomass plant also played a key role in helping Dockside Green achieve LEED Platinum status and garner nearly two dozen national and international honours, including a BC Green Cities Partnership Award from LiveSmart BC, a Ministry of Environment Arbor Vitae Award and an Excellence in Urban Sustainability Award from the Globe Foundation's Awards for Environmental Excellence. These rankings and awards help market the property to environmentally-aware businesses and residents.

7. Energy Output -

a. Electricity to grid – NA, currently. A plan to covert the pant to CHP may be modeled after a similar Nexterra system at University of South Carolina which produces 1.38 MW electricity to the grid.

b. Electricity to area users – NA, currently.

c. Steam capacity - The capacity of the district energy system 8 million BTUs per hour, but, because the project has been slower to build out than anticipated, the system is operating to produce only 1 to 2 million BTU's.

d. Identify steam users – Aside from the five completed buildings in Dockside Green, the district energy system also serves a nearby hotel.

e. Identify the advantages to the steam users – See 6-c-1, above.

8. Financing – key incentives –

Financing was primarily private with additional governmental support from BC Hydro, the provincial government and the city of Victoria.

9. Regulatory issues:

a. Issues related to selling to the grid – NA

b. Was the classification of the project as "renewable" an issue? NA

c. Renewable energy portfolio standard and GHG trading systems factor in? The project's renewable energy system seems tailor-made for British Columbia, where greenhouse gas emission reduction strategies and targets are required in all official community plans and regional growth strategies. The province has established legally binding greenhouse gas reduction targets of 33% from 2007 levels by 2020 and 80% by 2050. But the cornerstone of British Columbia's climate action plan is a revenue-neutral carbon tax starting at CA$10 ($9.20) per tonne in 2008 rising to CA$30 ($27.60) per tonne in 2012. It has also established Pacific Carbon Trust to sell carbon offsets at CA$25 ($23) per tonne.

10. Benefits

a. GHG savings – Dockside Green is claimed to be "on track to be carbon-neutral," primarily due to its renewable energy use. By generating surplus renewable energy in the form of heat that can be sold off-site, the development will be able to compensate for the greenhouse gases generated on-site through electricity and the delivery of the waste wood biomass to the plant. The community also began to earn carbon credits this fall when the biomass plant was connected to serve a nearby hotel.

b. Economic/community impacts – 15-acre brownfield cleaned up and redeveloped as sustainable mixed use community, generating jobs and local tax revenues.

11. Key Success factors – Primarily driven by the 1) developer's and the City's sustainability objectives; and 2) British Columbia's GHG reduction policies.

12. Policy issues encountered - NA

13. Website and articles:

    http://www.cospp.com/articles/print/volume-11/issue-4/project-profiles/biomass-gasification2.html

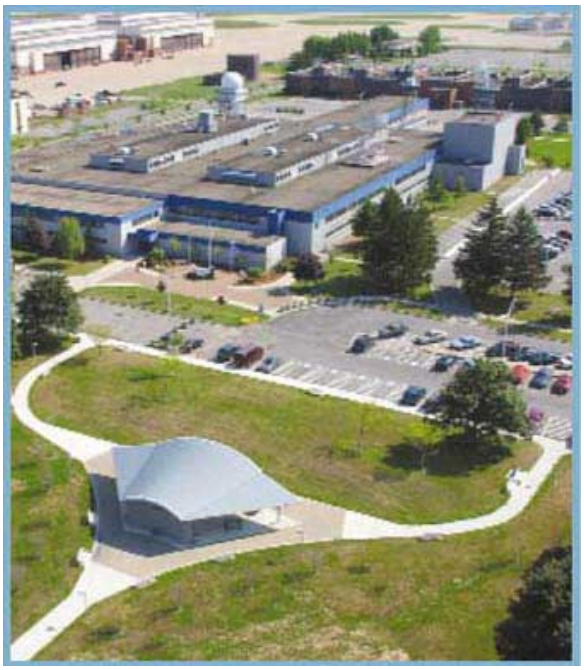
    Dockside Green

    Dockside Green celebrates being selected as a founding 'Climate Positive Development' by the Clinton Climate Initiative and opens their on-site Biomass Heat Generation Plant.

Griffiss Business and Technology Park, Rome, NY

GUSC Energy Inc. a subsidiary of Griffiss Utility Services Corp.

1. Summary – Griffiss Business and Technology Park in Rome, NY is an industrial park redevelopment of the former Griffiss Air Force base (a former Superfund site). The Griffiss Utility Services Corp (GUSC) is a non-profit organization created by the Griffiss Local Development Corporation to manage the energy system for the Griffiss Park. The 3,500 acre park has successfully attracted over 80 businesses with a total of 5,800 employees.



The park features a district energy system, which was inherited from the Air Force and produces steam to approximately 70 percent of the space in the industrial park (or 6 million sq. ft.) About half of the businesses in the park are steam users. A full CHP plant, with a combined production capacity of 22 MW, is under construction.

2. Contact info

Dan Maneen, President

Griffiss Utility Services Corporation

(315) 838-4872 x2253

dmaneen@gusc.net

3. Basic Project description.

- Status (completed, designed, planned) – district energy – existing; CHP – under construction.
- Location – Rome, New York
- Industrial Park Developer - Oneida County Industrial Development Corp

- CHP/district energy owner, builder, operator - GUSC Energy Inc. a subsidiary of Griffiss Utility Services Corp

4. Background on the business and vision for the project – The Air Force base closed in 1993 to 1995. The property was turned over to the County IDA. The district energy plant was built in the 1980's to meet the Air Force base' energy needs. GUSC took over ownership and management of the system in 2000. The CHP plant is being planned and developed by GUSC. From the GUSC website, its mission is to:

   Provide steam heat and distribute electricity to the tenants of Griffiss Business and Technology Park in Rome, New York. GUSC is a lightly regulated, non-profit utility that maximizes the use of the park's existing energy infrastructure and employs responsible environmental practices to provide economical and reliable utilities to tenants in an effort to encourage economic development of the Park and the region.

5. CHP/district energy feedstock.

   - District energy – gas fired w/ oil back-up
   - CHP plant – biomass w/ gas and oil backup.

6. Relationship of CHP plant to the brownfields redevelopment –

   - Key brownfields hurdles overcome – The Air Force cleaned up the site under Superfund and through a BRAC agreement, at a cost of $138 million. 2,900 acres have been de-listed from Superfund. EPA reviews all transfers of property, and 2,500 acres have transferred to the County EDC or to private businesses. Each new business in the park receives a 99-year indemnification from the Air Force for any newly discovered contamination. EPA and NY DEC are both signatories to the cleanup agreement.
   - Key cleanup financing – Air Force - $138 million.
   - What are the synergies between brownfields redevelopment and district energy/CHP system? The current district

energy system produces steam to approximately 70 percent of the space in the industrial park (or 6 million sq. ft.) Note the park has tripled in size (as measured by employment) since the time that GUSC began offering steam energy. The CHP plant will further improve efficiencies, expand capacity in producing steam, and will provide 10 to 15 percent of the Park's electricity needs.See 7-b and 7-e for the nature of the energy savings.

Note the park has tripled in size (as measured by employment) since the time that GUSC began offering steam energy. Mr. Maneen believes that the recent success of the Park is due in part to GUSC Energy services.

7. Energy Output

- Electricity to grid – None

- Electricity to area users – Currently GUSC distributes (but does not produce) electricity. GUSC negotiates rates on behalf of industrial park businesses and then distributes electricity provided by the local utility. GUSC has an Energy Cost Savings Benefit allocation of low-cost electric power from the New York Power Authority (NYPA). The negotiated rate is significantly below (by appr. 20-30 percent) the rate that individual businesses would pay.

  After the CHP plant is completed, the electricity produced will provide 10 – 15 percent of the electricity needs of the park's business tenants, with further savings to the businesses.

- Steam capacity

  Current – GUSC's existing steam plant consists of four 90,000-lb/hr boilers. GUSC owns and maintains a 26-mile steam distribution system, two substations. Historically, the utility has generated approximately 250 million pounds of steam per year and distributes over 70 million kilowatt-hours of electricity.

- Identify steam users – of the park's 70 businesses, about ½ are steam users, including the Air Force Research Lab, Premier Aviation, Oneida County International Airport, Northeast Air Defense, -, ITT Advanced Engineering, Logoplaste (plastic packaging), Mascoma Biofuels, MGS Manufacturing (wire, cable, and fiber). A total of 3.2 million sq ft, about 70 percent of the space in the park, is served by steam.

- Identify the advantages to the steam users - New businesses can save significant capital and operating costs. On the capital cost side, for example, a manufacturer might save $1 million by not building its own boiler. Operating cost savings come from: 1) the non-profit structure of GUSC; 2) the lower cost of steam relative to electricity; and 3) (for the CHP plant) the lower cost of bio-mass relative to natural gas (the current differential is about $6.50/dekatherm/gas vs. $2.50/dekatherm/bio-mass).

8. Financing – key incentives –

   - *Total and summary of capital project* - $20 million CHP plant
   - *Treasury section 1603 grants (to convert the value of ITC)* - $6.0 million
   - *Business Energy Investment Tax Credit (ITC)* - eligible for 30 percent credit because bio-mass is renewable. Other CHP plants only qualify for 10%
   - *DOE Loan Guarantee* –They applied but were not approved. They did not find DOE staff responsive, and they regard the program as too politicized.
   - *State incentives* – applied to NSERDA but they were not approved. See discussion of energy efficiency rating under 10-a. GUSC received a $1.5M grant through the Regional Economic Development Council through NY State.

9. Regulatory issues:

   - Issues related to selling to the grid – NA
   - Did the state's renewable energy portfolio standard factor in? REC's are a very minor part of financing of the CHP plant.
   - Was the classification of the project as "renewable" an issue? The switch from the gas-fired district energy system to the bio-mass feedstock for CHP was driven by the higher credit amount in the ITC for bio-mass as a renewable source.
   - Is there a GHG trading system and did it factor in? NA

10. Benefits

    - Energy/GHG savings – The CHP plant is projected to reduce GHG by 26,000 metric tons annually. Regulators rate the biomass CHP plant as 40 – 45% efficient. GUSC (and other

woody bio-mass energy producers) argue that the energy efficiency rating should be 60 – 65 percent. The difference comes from the starting point in the measurement process, with the regulators starting at the raw material, and GUSC arguing that the starting point should be after the raw material has been put in a useable form through gasification or other processes.

- Economic impacts – Almost 6,000 jobs in 70 businesses are located in the park; about ½ the businesses but 2/3 of the employment are served by the current district energy system, and the number will likely go up after the CHP plant is built. Note the park has tripled in size (as measured by employment) since the time that GUSC began offering steam energy. Mr. Maneen believes that the recent success of the Park is due in part to GUSC energy services.

  Manufacturers in the park include: Goodrich Power Transmission Systems, ITT Advanced Engineering, , Logoplaste (plastic packaging), Mascoma Biofuels, MGS Manufacturing (wire, cable, and fiber), and Sovena (edible oils).

- Other environmental benefits – The woody bio-mass feedstock comes primarily from the waste wood of area logging and paper mill operations.

11. Key Success factors –
    - Financial – The ARRA 1603 Treasury grant that converts the value of the ITC.
    - Other – Air Force commitments to the community.
12. Policy issues encountered -
13. Other notes: In evaluating whether it makes sense to connect new businesses to the steam system, the break-even point is about 25,000 sq ft.
14. Website and articles:

    http://www.gusc.net/

    http://www.griffissbusinesspark.com/

    http://www.epa.gov/region2/superfund/npl/griffiss/

http://yosemite.epa.gov/opa/admpress.nsf/0/3D37E0E95527F9928525758D005FED65

http://www.oneidacountyida.org/

Eastman Business Park, Rochester

Former Kodak Industrial Park Uses Combined Heat and Power to Attract

Energy-Intensive Industrial Uses

1. Summary – Eastman Business Park is 1,200 acres, 900 of which are retained by Kodak with 300 acres available for redevelopment and new industrial uses. Kodak operates a tri-generation plant to serve its internal purposes, and it has become a strong incentive for new businesses to locate at the Park, particularly for those with energy-intensive industrial needs. There are currently 35 tenants that reside on the Eastman Business Park campus, employing approximately 3,000 people. This includes four new clean-tech companies that have recently made the Park their home. In addition to benefiting from CHP energy utilities, they are also taking advantage of on-site bio-refineries, analytical services, thin film development, coating technology and logistics support. Kodak continues to employ over 3,500 within its operations at Eastman Business Park.

2. Contact info

   Mike Alt, Director

   Eastman Business Park

   585.477-1556

   Michael.alt@kodak.com

3. Basic Project description.

   a. Status (completed, designed, planned) – Complete (originally established before 1900); upgraded periodically

   b. Location – Rochester, NY

   c. Developer – Kodak/Eastman Business Park

   d. CHP engineer, builder, operator - Kodak/Eastman Business Park

4. Background on the business and vision for the project - Kodak operates a tri-generation plant to serve its internal purposes, and it has become a strong incentive for new businesses to locate at the Park, particularly for those with energy-intensive industrial needs.

5. CHP Technology, feedstock, etc. –

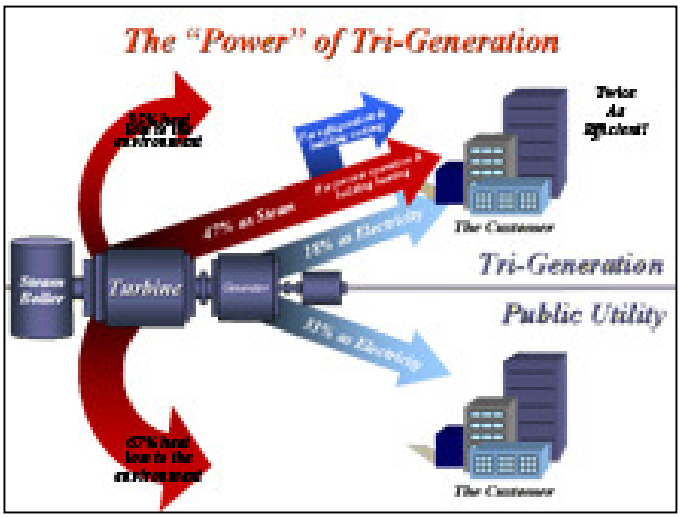
   Feedstock – primarily coal, some natural gas

   See "energy output," below.

6. Relationship of CHP plant to the brownfields or industrial park redevelopment –Kodak has an active site-wide groundwater management system in place and pumps all the perimeter groundwater back into the treatment plant on-site to treat groundwater before it leaves the site. However, some of the properties in Eastman Business Park have contamination issues and related regulatory oversight through RCRA. Kodak addresses those issues before selling or leasing the property.

   a. Key brownfields financing – Much of the site is not eligible for the NY BCP tax credits or other brownfields incentives due to the Superfund and RCRA regulation.

   b. Synergies between industrial park redevelopment and CHP- The CHP plant enables marketing to energy-intensive uses that can benefit from the electricity and/or steam/district energy availability. This energy efficiency has been a key factor in the Park attracting/retaining seven large manufacturers. The Park has also recently attracted four new clean technology companies that, in addition to benefiting from CHP energy utilities, are also taking advantage of on-site bio-refineries, analytical services, thin film development, coating technology and logistics support.



7. Energy Output – Tri-Generation system with 125 MW total output, as follows:

   a. Electricity to grid – usually sells 5-8 MW to the grid.

b. Electricity to area users – 130,000 kilowatts capacity of co-generation from steam reduction with backup inter-connections with the public utility. Electricity is generated at 13,800 volts and distributed throughout the Park on a small grid with underground redundant feeds to double-ended load centers/substations for highest reliability and quality of power. Double-ended load centers are designed to provide full load with either feeder out of service. Typical delivery to customers is 480 volt, three phase alternating current.

c. Steam capacity - 1,500,000 pounds per hour firm capacity from utility-grade boilers with emergency backup boilers. Steam is generated at 1400 psig/900°F and supplied to customers at different nominal pressure levels of 260 psig, 140 psig, 70 psig and 5 psig. Note that separate pipes carry differing pressure/temperature levels – the varying levels broaden the appeal to businesses with differing energy needs.

   Steam is used for multiple purposes: converted to electricity; direct heating; direct use in manufacturing; generating chilled water; and generating compressed air.

d. Chilled Water - 60,000 tons installed capacity of tri-generation utilizing steam driven turbines optimizing total system costs. Nominal supply temperature is 40°F.

e. Utilities users – virtually all the businesses in the Park use CHP-generated electricity, steam, and chilled water. In addition to Kodak, there are 35 businesses on site including seven large manufacturers. Businesses include: LiDestri Foods, Inc. (food production processor); Carestream Health; Cerion Energy; Acquest Development ITT Exelis; Champion Photo Chemistry; Natcore ;Ortho Clinical Diagnostics and Rochester Silver Works, LLC.

f. Business Advantages – A typical business on site at Eastman Business Park is saving substantial capital costs (not building their own boilers and HVAC systems). Operating costs are also substantially less than conventional utility costs (approximately 20 – 30 percent), in part because the CHP energy utilities are operated as a cooperative.

   An additional advantage is that there is industrial water capacity of 50 million gallons per day, along with wastewater treatment capacity of 40 million gallons per day.

8. Financing – key incentives – The CHP system has existed for almost 100 years and there has been no significant expansion in recent years. Maintenance and upgrades are privately financed from system revenues with minimal incentives.

9. Regulatory issues:

    a. Issues related to selling to the grid – No

    b. Did the state's renewable energy portfolio standard factor in? No

    c. Was the classification of the project as "renewable" an issue? No

    d. Is there a GHG trading system and did it factor in? No

10. Benefits

    a. GHG savings – GHG savings have not been calculated. Note Kodak/Eastman Business Park has been an active ENERGY STAR Industrial Partner since 2001, and since has received awards for: 2004 Leadership in Energy Management; 2005 Sustained Excellence; 2010 Kodak Office Site received the Energy Star "Label" as it received an 81% rating and uses 33% less energy than a typical office building in the US.

    b. Economic impacts – Tenants of Eastman Business Park currently employ approximately 3,000 people, in addition to the 3,500 Kodak jobs within the operations at the Park.

    c. Community benefits – jobs and taxes

11. Key Success factors –

    a. Financial - Capital costs are limited to maintenance and modernization based on the fact that the CHP system was in place before the redevelopment began.

    b. Other – Managing the CHP system as a cooperative makes a significant difference in operating costs.

12. Policy issues encountered – Eastman Business Park's Director commented that the CHP-related energy advantages are very substantial in terms of attracting businesses to the site; however, they have lost some prospects to states that offer aggressive incentive packages that New York State was unable to match.

13. Website and articles:

    http://eastmanbusinesspark.com/

    http://eastmanbusinesspark.com/utilities.php

Catawba County, NC EcoComplex Case Study

Planned Woody Biomass CHP Project Links Greenhouse and Industrial Uses

1. Summary – The Catawba EcoComplex is an already-successful eco-industrial park and reuse of a county landfill. The Woody Biomass CHP system will move the eco-park toward the dual goals of zero waste and carbon neutrality. This biomass CHP plant will produce 3 megawatts (MW) of clean, cost-effective electricity for sale to a local utility; 2.5 MW produced by a GE Jenbacher Type 6 Gas Engine Generator Set and 0.5 MW produced by micro steam turbines. The excess steam and heat will be used by the County to operate the Appalachian State University Biodiesel Research and Production Facility, dry wastewater sludge, drying kilns for Gregory Wood Products and Pallet One, and future greenhouses.

2. Contact info

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Darsi Quinn, Manager, Marketing and Business Development

Nexterra

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3. Basic Project description.

   a. Status (completed, designed, planned) –

      i. Eco-park – four existing businesses, and the Bio-diesel Research Center, totaling 250 jobs;

      ii. Existing LFG recovery system, consisting of three 1-Megawatt generators;

iii. Woody Biomass CHP system designed, scheduled to go under construction in 2012.

b. Location – Newton, NC

c. Developer – Catawba County

d. CHP engineer, builder, operator –

i. CHP Engineer/builder – Nexterra (in conjunction with GE)

ii. Building and infrastructure - CDM-Smith

iii. LFG recovery engineer-builder – Catawba County

iv. Owner/operator – Catawba County

4. Background on the business and vision for the project – Catawba County is developing the EcoComplex as a model of applied industrial ecology symbiosis and sustainable job-creating economic development. The eco-park has successfully promoted: 1) waste minimization through exchanges (applied industrial ecology) within and in proximity to the park; and, 2) carbon neutrality.

5. CHP feedstock, technology. –

a. Feedstock – Bio-mass from:

i. Wood waste from two wood products businesses in the EcoComplex: Gregory Wood Products and Pallet One;

ii. Bio-mass diverted from the landfill, (yard waste, land clearing);

iii. Waste from several area furniture manufacturers;

iv. Feedstock crops planted on unusable parts of the landfill.

b. CHP Technology

i. CHP plant - Nexterra Energy Corp (in conjunction with GE Power & Water's gas engine division) uses a fixed-bed, updraft gasification technology that converts wood residuals such as bark, sawdust and shavings into syngas.

ii. Existing LFG Recovery – Three 1 MW GE Jenbacher gas engines.

6. Relationship of CHP plant to the brownfields redevelopment –

a. Key brownfields hurdles overcome – Landfill reuse

b. Key brownfields financing - none

c. What are the synergies between brownfields redevelopment and CHP? The steam energy is used by: Gregory Wood Products, Pallet One, Bio-diesel production. They are negotiating with a 250-job industrial user.

7. Energy Output –

a. Electricity to grid –

i. Existing LFG recovery system – 3.0 MW to the grid 9 (an additional 1.0 MW of generation planned for 2014)

ii. Planned CHP – 3.0 MW sold to the grid (negotiations with Duke Energy are "getting close.")

b. Electricity to area users - NA

c. Steam capacity – There are several options still under consideration with differing steam outputs.

d. Identify steam/heat users –

i. Drying wood for Gregory Wood Products and Pallet One;

ii. Drying waste water sludge at nearby sewage treatment plant.

iii. Bio-diesel production of 100,000 gallons/annually by the just-completed Catawba County-Appalachian State University Biodiesel Research, Development and Production Facility.

iv. Currently negotiating with a major industrial user that would add 250 jobs and would be a steam/heat user.

v. Some of the low-pressure steam output may also be captured and converted to more electricity to the grid by virtue of micro-turbines (potential for 0.5 MW additional electricity).

e. Identify the advantages to the steam users – cost effective source of heat.

8. Financing – key incentives – The most likely financing will be primarily local government GO or revenue bonds. They are projecting an internal rate of return of 5-10 percent. The County is considering other governmental incentives in order to enhance the economic viability of the project. They are exploring various federal incentives (QECB, ITC, PTC, and DOE Loan Guarantee).

9. Regulatory issues:

a. Issues related to selling to the grid – (see below)

b. Did the state's renewable energy portfolio standard factor in? Yes – NC's RPS is 12.5% by 2021 and provides an incentive for the utility (Duke Energy) to negotiate a favorable rate for the electricity the plant will sell to the grid.

c. Was the classification of the project as "renewable" an issue? Bio-mass is classified as renewable and that classification was helpful relative to the state's RPS and potentially for federal incentives.

d. Is there a GHG trading system and did it factor in? NA

10. Benefits

a. GHG savings – The EcoComplex has an objective of carbon neutrality, which they believe they will achieve once the CHP plant is in place. Existing LFG recovery system generates enough electricity to power approximately 1,400 average size home. The CHP plant is rated for 65 percent efficiency in producing energy.

b. Economic impacts – 250 jobs, currently; negotiating with an industrial user that would double that number.

c. Community benefits – see above.

11. Key Success factors –

    a. Financial – TBD

    b. Other – The County's leadership in creating and implementing the plan.

12. Policy issues encountered - NA

13. Website and articles:

    http://www.catawbacountync.gov/depts/u&e/ecoAwards.asp

    http://www.catawbacountync.gov/depts/u&e/existing.asp

Pure Energy - Saline Green

CHP-Anchored Eco-Industrial Park Planned in Marshall, MO

1. Summary – Saline Green, under development in Marshall, Mo., is essentially an eco-industrial park, except that the related businesses will all be owned by one company. The 15 MW CHP plant uses wood waste/bio-mass and methane from a landfill to generate thermal energy (steam) and electricity to: 1) power a cellulosic ethanol plant; 2) produce 12 MW renewable electricity, sold to the grid; and 3) produce Furfural Chemicals, a bi-product of processing the bio-mass materials.

2. Contact info

   Irshed Ahmed, CEO, Pure Energy, 61 South Paramus Road, Paramus, NJ 07652

   201-843-8100

   ahmed@pureenergy.com

3. Basic Project description.

   a. Status (completed, designed, planned) – Site work is under construction; fully designed; financing is close, but not final

   b. Location – Marshall, Mo

      166 acre site

   c. Developer – Saline Green (Div of Pure Energy)

   d. CHP engineer, builder, operator - Burns & McDonnell - engineer, builder

4. Background on the business and vision for the project –

Pure Energy Corporation is a bio-based fuels and chemicals company focused on bridging the fossil energy and the renewable energy industries with environmentally friendlier and commercially viable systems.

The project has been a joint venture w/ TVA, which financed a $32 million demonstration plant in Mussel Shoals, Alabama, under a 1997 agreement with Pure Energy. The Marshall, Mo plant will be a full-scale version of the demonstration plant.

5. CHP type, feedstock, detail. –

Feedstock – primarily wood waste/bio-mass (wood chips, sawdust, corn cobs, sugar cane, and switchgrass, which they grow on their own site); also methane from a 60-ac on-site landfill. Capable of using Municipal Solid Waste, as well.

Uses gasification technology widely used in Europe

Produces the following (all three controlled by Saline Green):

   a. Steam (and electricity) to power a cellulosic ethanol plant, which will produce 10 million gal/year output of ethanol). Uses a Two-Stage Dilute Acid Hydrolysis technology to produce high quality ethanol

   b. 15 MW electricity: 3 used internally and 12 MW sold to the grid;

   c. Furfural chemicals manufacturing. Furfural is a bi-product of processing the bio-mass materials. Furfural is used in artificial limbs, rubber tires, plastics, and composite materials. The Furfural plant will produce 18,000 metric tons of product. (Note revenues from the Furfural plant are key to project feasibility).

6. Relationship of CHP plant to the brownfields redevelopment –

   a. Key brownfields hurdles overcome – Of the 200-acre site, 60 acres are part of a now-closed landfill.

   b. Key brownfields financing - none

   c. What are the synergies between brownfields redevelopment and CHP? Able to use landfill gas as part of the feedstock.

7. Energy Output -

a. Electricity to grid – 12 MW

b. Electricity to area users – 3 MW to the ethanol plant and the Furfural chemical plant

c. Ethanol Plant – 10 million gallons, annually

d. Identify steam users – On-site bio-diesel plant; exploring providing steam to other areas businesses and a nearby neighborhood

e. Identify the advantages to the steam users – lower cost and more reliable

8. Financing – key incentives –

a. *Total and summary of capital project* - $87 million, primarily private through Hedge fund investment grade bond

b. *Section 1603 Treasury grants (converts the value of ITC)* - no

c. *Business Energy Investment Tax Credit (ITC)* – yes, amount unclear.

d. *Renewable Electricity Production Tax Credit (PTC*). ("May come into play")

e. *DOE Loan Guarantee* – applied but found DOE unresponsive and could not resolve issues. (Note, similar experience of Energy Answers, see EA case study)

f. *State and local incentives* – (a $141 million State of Missouri tax exempt bond fell through when the bond market collapsed)

g. *Ethanol incentives –*

- Federal - $1.01/gal. subsidy for cellulosic ethanol vs $0.45/gal. for corn-based ethanol
- Missouri - $0.20/gal subsidies.

h. *Utility incentives* – Mo. has a 15% RPS. Power purchase agreement is being negotiated.

i. *Private* – Hedge fund investment grade bond

9. Regulatory issues:

a. Issues related to selling to the grid – no

b. Did the state's renewable energy portfolio standard factor in? – Mo. has a 15% RPS, adding an incentive for the utility to participate and negotiate

c. Is there a GHG trading system and did it factor in? No

10. Benefits

a. GHG savings – Not calculated

b. Economic impacts –

- 150 construction jobs;
- 72 permanent high paying jobs; and
- Over 50 indirect jobs

c. Community benefits -

11. Key Success factors –

a. Financial – Revenues from Furfural production are key to financing.

b. Other – TVA backing of pilot plant.

12. Policy issues encountered – DOE loan guarantee program did not work; staff was unresponsive.

13. Visuals – see PPT

14. Website and articles:

http://www.pure-energy.com/pureindex.html http://biofuelsdigest.com/blog2/2009/05/20/pure-energy-saline-gren-pick-missouri-city-for-cellulosic-ethanol-project/

http://www.marshallnews.com/story/1618723.html

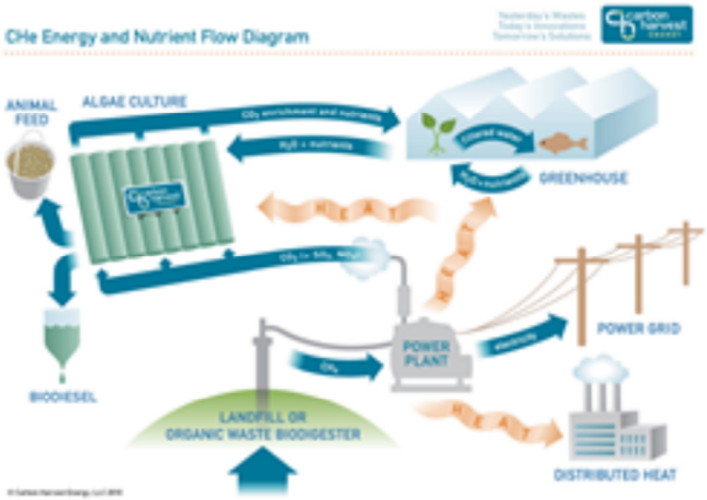
http://www.marshallnews.com/story/1541002.html

http://www.thecesite.com/PureEnergy.html

Carbon Harvest LFG Recovery-

CHP and Controlled Environment Agriculture Projects

1. Summary – Carbon Harvest is a triple bottom line business, specializing in projects that involve LFG recovery, CHP energy generation, and steam recovery for "Controlled Environment Agriculture." They have four projects that involve these elements: Brattleboro, VT; Keene, NH; Lebanon, NH; and Sullivan County (Monticello), NY. The 1.6 MW Lebanon plant and the 250 KW Brattleboro plant are operating. The other two projects are in planning or permitting. All of the projects will involve steam generation linked to a greenhouse, aquaculture facility, and algae production facility, all in a closed loop system with nutrient and water re-cycling. Three of the projects also involve producing steam or electricity for nearby industrial users or industrial parks.



2. Contact info

Don McCormick, CEO

Carbon Harvest

802-318-4970

don@carbonharvestenergy.com

3. Basic Project description.

   a. Location and status (completed, designed, planned) –

Lebanon, NH –	**Brattleboro, VT** –	**Keene, NH** –	**Sullivan Co, NY** –
▪ CHP plant complete. ▪ Greenhouse, aquaculture, and algae grow-out	▪ CHP plant is operating, but will be upgraded. ▪ Greenhouse –	▪ CHP – late stage planning ▪ Greenhouse, aquaculture, and algae	▪ CHP – planning ▪ Greenhouse, food distribution,

facility are planned/committed .	under construction. ▪ Algae facility underway. ▪ Training center for aquaculture complete	facility - in late-stage planning. ▪ Plans also call for extension of three-phase power lines to the adjacent Black Brook Industrial Park	aquaculture, and algae facility - planning.

b. Developer – Carbon Harvest

c. CHP engineer, builder, operator – Carbon Harvest

Greenhouse planned for Lebanon

4. Background on the business and vision for the project – Carbon Harvest is a triple bottom line business, specializing in capturing LFG, generating electricity to the grid and heat for Controlled Environment Agriculture. Their projects typically include a greenhouse (heated from steam heat recovery), aquaculture, and an "algae grow-out" facility, all in a closed loop system with nutrient and water re-cycling. The algae production can be used for: nutrients for the greenhouse; animal feed for fish and poultry; and/or biofuel production.

   See diagram below. The Lebanon plant is also planned to provide energy to a nearby asphalt plant and a concrete plant, taking both off the grid. The Sullivan project is also planned to serve a 60-acre business park being developed on nearby county land.

5. CHP feedstock, technology. – LFG recovery

6. Relationship of CHP plant to brownfields and industrial park redevelopment – The projects are being built on landfill sites. Clarify. Three of the projects are planned to also serve adjacent industrial parks/businesses with steam/heat or electricity.

Lebanon – planned to provide energy to a nearby asphalt plant and a concrete plant, taking both off the grid.	**Brattleboro** – NA	**Keene** – planned to also serve the Black Brook Industrial Park with electricity.	**Sullivan Co** - planned to serve a 60-acre business park being developed on nearby county land.

7. Energy Output -

	Lebanon	**Brattleboro**	**Keene**	**Sullivan Co**
Electricity to grid –	1.2 MW	250 KW	600 KW	1.6 MW
Electricity to area users	NA	NA	Planned to also serve the Black Brook Industrial Park with electricity.	Potential power purchasers: Catskill Regional Medical Center, County offices, and new development at the abandoned adjacent Apollo Mall.
Steam capacity	47,000 MMBTU's/hour			
Identify steam users	▪ Greenhouse – 21,000 sf ▪ Aquaculture – 30,000 gallons ▪ Algae growing- 3-5 ac ▪ Concrete plant	▪ Greenhouse – 20,000 sf ▪ Aquaculture – 30,000 gallons ▪ Algae growing	▪ Greenhouse – 20,000 sf ▪ Aquaculture – 30,000 gallons ▪ Algae growing	▪ Greenhouse, food storage, and distribution center – 25 acres ▪ Aquaculture – 250,000 gallons ▪ Algae growing

	▪ Asphalt plant			
Identify the advantages to the steam users	Cost and reliability	Cost and reliability	Cost and reliability	Cost and reliability

8.

9. Financing – key incentives –

Lebanon – $5 million total. All CH' projects include the ITC and REC's. The largest buyer of the REC's is Dartmouth College. ▪ $1.8 million Section 1603 Treasury grant converting the value of the ITC ▪ Carbon credits purchased by Dartmouth College @ appr $4 per metric ton CO2, applied to 60,000 metric tons LFG destroyed yields $240,000.	**Brattleboro** – $2 million total. All CH' projects include the ITC and REC's. The largest buyer of the REC's is Dartmouth College. ▪ $325,000 grant – Vermont Sustainable Jobs (originally DOE seed funds); ▪ $500,000 loan (2 percent) – VT Clean Energy (ARRA) ▪ $360,000 loan (2 percent) - VT Economic Development Authority	**Keene** – $2.1 million total. All CH' projects include the ITC and REC's. The largest buyer of the REC's is Dartmouth College. ▪ $500,000 EPA Climate Showcase Communities; ▪ $1.6 million private	**Sullivan Co** – All CH' projects include the ITC and REC's. The largest buyer of the REC's is Dartmouth College.

10. Regulatory issues:

    a. Issues related to selling to the grid –

    b. Did the state's renewable energy portfolio standard factor in? There are RPS requirements that factor into each project. REC's are sold, generally to Dartmouth College, which is a partner in the CH projects.

    c. Was the classification of the project as "renewable" an issue? No

    d. Is there a GHG trading system and did it factor in?

11. Benefits

    a. GHG savings – All Carbon Harvest facilities are zero fossil fuels coming in and zero waste going out. The Keene facility will remove approximately 20,000 metric tons of carbon.

    b. Economic impacts – jobs not calculated, but between, the direct jobs in CH operations (greenhouse, algae, aquaculture, and CHP) and the additional jobs served by steam serving area businesses, the jobs numbers for each site are estimated to start at 100 and go up from there.

    c. Community benefits – locally produced year-round agricultural products.

12. Key Success factors – The Carbon Harvest business model is unique, creative, and attracts public support because of the high standards for sustainability.

    a. Financial – ITC and REC's are important financing factors. The CH partnership with Dartmouth College includes purchase of REC's.

       The smaller size of the Brattleboro facility dictated that other public funding sources also be tapped.

    b. Other -

13. Policy issues encountered -

14. Website and articles

http://carbonharvestenergy.com/

H2Grow/Innovative Energy – Greenhouse-CHP-LFG project

Case Study

1. Summary – Innovative Energy uses landfill gases (LFG) as the feedstock for a CHP system that generates 12 MW of electricity to the grid, as well as steam to heat the H2Grow year-round greenhouse. H2Grow is a hydroponic vegetable grower; the greenhouse is a twelve-acre facility in Niagara County, New York.

2. Contact info

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Innovative Energy Systems

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3. Basic Project description.

   a. Status (completed, designed, planned) – LFG recovery system completed in 2001. Greenhouse completed in 2005.

   b. Location – Model City, Niagara Co, NY – Modern Landfill

   c. Developer – H2Grow and Model City Energy (subsidiary of Innovative Energy)

   d. CHP engineer, builder, operator - partners are listed as: Caterpillar (for engine generators) , Innovative Energy Systems, Modern Corporations

4. Background on the business and vision for the project – The original 2001 project was conceived as a typical LFG recovery system designed to produce electricity to the grid. The greenhouse was added in order to take advantage of the waste heat. Innovative Energy owns and operates both the CHP project and the greenhouse.

Note that Innovative Energy is involved in several other LFG recovery projects, but H2Grow is the only greenhouse/waste heat recovery project. The greenhouse/waste heat recovery option was considered for several other projects but a precipitous drop in the price of tomatoes (caused by foreign competition) led to significantly lower revenue projections.

5. CHP type/technology, feedstock.

   Feedstock – methane/landfill gas.

   The heat for the Greenhouse is produced using special heat recovery equipment surrounding 7 electrical generators at neighboring Innovative Energy. Recirculated water (2,500 gallons) is heated by a jacket heat exchanger, then an exhaust heat exchanger, reaching 220 degrees Fahrenheit and providing 31 million Btu of heat per hour. In addition, the engine-generator produces enough electricity to power the greenhouses, with excess power sold to the grid.

   Original 2001 project had seven Caterpillar G3516 engine-generator sets; expansion in 2006 added four Caterpillar 3520 engines.

6. Relationship of CHP plant to the brownfields redevelopment – The project involved LFG recovery, but the greenhouse was placed on adjacent agricultural land.

7. Energy Output -

   a. Electricity to grid – 12 MW

   b. Electricity to area users – CHP generated electricity also powers the greenhouse

   c. Heat capacity – 61 million BTU's per hour capacity

   d. Identify steam users – Greenhouse (the above heat capacity is used only in the peak winter months).

   e. Identify the advantages to the steam users – Saves $800,000 in fuel costs. (The greenhouse has a back-up oil heat system that is not used.)

8. Financing – key incentives – Cost was $10.5 million for the power plant, and $14 million for the greenhouse (including $1.5 million for the waste heat recovery system). The financing was private except for $500,000 from NYSERDA.

9. Regulatory issues: EPA air emissions' permitting has been problematic. Air emission regulators tend to look at the emissions from the LFG recovery power plant in isolation, not in comparison to alternative power generating sources.

    a. Issues related to selling to the grid – No.

    b. Did the state's renewable energy portfolio standard factor in? The plant was built before Renewable Energy Credits; so that was not part of the original financial plan, but they are selling REC's now.

    c. Was the classification of the project as "renewable" an issue? No

    d. Is there a GHG trading system and did it factor in? No

10. Benefits

    a. GHG savings – Estimated emissions reductions of 0.0150 million metric tons of carbon, which is equivalent to: carbon sequestered annually by 11,800 acres of pine or fir forests, annual greenhouse gas emissions from 10,500 passenger vehicles, or carbon dioxide emissions from 128,200 barrels of oil consumed. Annual energy savings equate to powering 7,100 homes.

    b. Economic impacts – 40 jobs; H2Grow saves $800,000 annually on fuel costs

    c. Community benefits – 6 million lbs of locally produced tomatoes annually.

11. Website and articles:

    http://www.ieslfge.com/

www.H2gro.net

http://www.nyserda.org/programs/industry/CaseStudies/Modern%20Landfill.pdf

http://niagara-gazette.com/communities/x681337674/H2GROW-Tomatoes-thrive-on-planet-saving-system-in-Youngstown

http://www.growingedge.com/upstate-new-york-sustainable-hydroponic-tomato-greenhouse-operation-on-discovery-channel

Appendix D: Federal and State Brownfield Incentive Brochures

Federal Policy Issues – CHP, District Energy, and Brownfields

A number of federal policy issues arose from the project team's extensive contacts with CHP project planners. The project team additionally surveyed congressional proposals that relate to CHP and district energy. The team was not tasked with preparing policy "recommendations;" therefore the following is offered to stimulate discussion.

CHP and District Energy Statutory Issues:

- ***Continuation of the 1603 Treasury Department Renewable Energy Grants*** – The Treasury Department's section 1603 Renewable Energy Grants, which convert the value of the Business Energy Investment Tax Credit (ITC) into an upfront grant, are ARRA-authorized and will expire after 2011. As noted in the case study section, eight of the projects inventoried for this study are using the 1603 grants, and, conversely, many of the projects cited would not have been undertaken absent the Treasury grants. If Congress continues the program, these kinds of projects would be replicated, accelerating the dual benefits of energy efficiency and sustainable economic development.
- ***ITC Tax Credit Capacity Limitations –*** HB 2720 raises the capacity allowance for the Business Energy Investment Tax Credit (ITC) from 15 MW to 25 MW for CHP projects; it also makes industrial heat recovery projects (heat recovery from manufacturing processes) eligible for the ITC.
- ***High Performance CHP Incentives –*** HB 2784 creates a new category of "Highly Efficient CHP projects," defined as those meeting a 70% efficiency. CHP projects that meet the 70 percent efficiency standard would be universally eligible for the 30 percent ITC credit. Currently, CHP projects are only eligible for the 30 percent tax credit if the feedstock is renewable.
- ***District Energy Incentives –*** HR 5805 of the 111th congress, Thermal Renewable Energy and Efficiency Act of 2010, does the following:
    - Amends the Internal Revenue Code to extend the tax credit for the production of electricity from renewable resources to the production of thermal energy.
    - Modifies the definition of: "local heating and cooling facilities" for purposes of tax-exempt facility bonds to include equipment for producing thermal energy in the form of hot water, chilled water, or steam, distributing that thermal energy in pipelines.

- Amends the Energy Policy and Conservation Act, with respect to the energy sustainability and efficiency grant and loan program for institutions, to include a not-for-profit district energy system as an institutional entity for purposes of such grant program.

- ***Clean Air Act – New Source Review.*** CHP project planners express concern that the permitting process for new CHP facilities is unduly difficult because the CHP plant's emissions are viewed like any other "New Source."[53] They maintain that there should be an established way for the forestalled emissions (the emissions from alternative dirtier or less efficient sources) to be taken into account in the permitting process.

- ***Municipal Solid Waste as "Renewable"*** – The Environment and Energy Study Institute (EESI) produced a white paper that recommends that municipal solid waste (MSW, the feedstock for some CHP plants) should be classified as "renewable," making it eligible for various federal renewable energy incentives.[54]

- ***Accelerated Depreciation for District Energy Assets*** – The International District Energy Association supports a reduction in depreciation schedules under the Modified Accelerated Cost Recovery System (MACRES) from the current 20 years to five years.[55]

CHP and District Energy Funding Issue

- ***Full funding for EISA Sec. 471*** – Section 471 authorizes the Energy Sustainability and Efficiency Grants and Loans for Institutions**,** which provides local government with cost-shared funding for sustainable energy projects, such as district energy systems, renewable energy, combined heat and power, waste heat recycling and natural sources of thermal energy such as deep water cooling. The program was authorized at $3.75 billion over FY 2009-2013.[56]

CHP and District Energy Administrative Issues:

- ***DOE Loan Guarantee Program*** – Three of our case study projects had almost identical experiences with the DOE Loan Guarantee Program – that DOE was unable to provide them with useful guidance; that CHP seemed to be in a gray area relative to eligibility and departmental

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[53] Arthur Venables, "Overcoming Regulatory Hurdles," http://cogeneration.org/ and US Clean Heat and Power Association, letter to US EPA, September 30, 2010, comment on the Clean Air Transport Rule.
[54] Environmental and Energy Study Institute, Issue Brief, "Reconsidering Municipal Solid Waste as a Renewable Energy Feedstock," July, 2009. http://www.seas.columbia.edu/earth/wtert/sofos/eesi_msw_issuebrief_072109.pdf
[55] Mark Spurr, International District Energy Association, Legislative Agenda for District Energy and CHP, Briefing sponsored by Environmental and Energy Study Institute and International District Energy Association, April 21, 2009
[56] ibid

priorities; and that a great deal of time, effort, and expense was wasted on unsuccessful applications.

- ***EPA Re-Powering America Initiative*** – The EPA Re-Powering America's Land Initiative promotes renewable energy reuse of contaminated sites. Because the primary renewable sources – solar and wind – are land intensive, the Re-Powering program is primarily oriented to larger more rural sites and landfills, i.e. sites where alternative productive uses are fairly unlikely. CHP and district energy are often times not classified as "renewable" because the feedstock may be carbon-based. However, there is vast potential for CHP and district energy to work in concert with brownfields redevelopment, while also producing energy efficiencies equivalent to solar and wind. EPA may want to explore this potential.

Brownfields Statutory Issues

- ***Cleanfields*** – S 3374 from 111th Congress authorizes a new EPA brownfields program for renewable energy on brownfields. The proposal uses the existing EPA brownfields authority to fund site assessments and cleanup but targets funding for the new program to sites where renewable energy will be the end use.

NEW YORK STATE'S BROWNFIELDS INCENTIVES

New York's brownfields incentives were, until recently, among the most generous of all state brownfields programs. However, the fiscal crisis has led to fairly drastic reductions, as follows:

Brownfields Cleanup Program (BCP)

BCP is an income tax credit program designed to encourage investment in brownfields. The State's fiscal distress has led the legislature to adopt a "deferral" of credits that exceed $2 million. Because there is no guarantee that the State will not extend the deferrals, this essentially means that the maximum credit that a developer can count on is $2 million. The following is a description of the Program that is on the books, and the reader should note that, absent the deferral policy, this is a very powerful incentive.

> Redevelopment Credits – Tax credits are 10% - 24% of total development costs up to $35 million or three times site prep costs, whichever is less. Manufacturing projects are up to $45 million in credits or 6 times cleanup costs, whichever is less. From the base 10-12 percent credit (available statewide), additional credits are available as follows:
>
> - Additional 8% credit if located in a distressed area (New York's ENZones)
> - Additional 2% credit if cleanup is to an unrestricted use
> - Additional 2% if in a Brownfields Opportunity Area
>
> Site prep credits – 22% to 50% of cleanup and site preparation costs depending on the extent of the cleanup and the type of reuse. Higher percentages are for unrestricted use cleanups with residential re-use.
>
> Environmental Insurance Credits - One-time credit of 50% (up to $30,000) of environmental insurance costs.

The credits are refundable, which means that the developer gains the full benefit of the credit even when the developer's income is insufficient to take advantage of the incentive.

Credits are automatic in the sense that there is no "needs test" and no statewide cap. Eligibility depends on having a "Brownfields Cleanup Agreement" with the regulatory side of BCP. The New York State Department of Environmental Conservation (DEC) imposes administrative standards for admission to the program. A number of the projects that have been turned down have filed lawsuits and the courts have overruled DEC on several occasions.

See: http://www.dec.ny.gov/chemical/45734.html

Brownfields Opportunities Areas (BOA)

The Brownfield Opportunity Areas Program, made possible by the Superfund/Brownfield law in October 2003, provides municipalities and community based organizations with assistance, up to 90 percent of the eligible project costs, to complete revitalization plans and implementation strategies for areas or communities affected by the presence of brownfield sites, and site assessments for strategic brownfield sites. Municipalities and non-profit/community-based organizations are eligible.

There are three stages/levels of funding: pre-nomination, nomination, and implantation strategy.

The BOA Program has been impacted by severe funding cutbacks, and the Governor's recent FY 12 budget "zeroed" the program, although it can continue for a period of time by virtue of prior appropriations.

See: http://www.dec.ny.gov/chemical/8447.html and http://nyswaterfronts.com/grantopps_BOA.asp.

Environmental Restoration Program (ERP)

Under the Environmental Restoration Program, the State provides grants to municipalities to reimburse up to 90 percent of on-site eligible costs and 100% of off-site eligible costs for site investigation and remediation activities. Sites must be owned by a public agency. There are strong liability protections for local government activities on ERP-funded sites.

Originally funded at $200 million as part of the $1.75 billion Clean Water/Clean Air Bond Act of 1996, funds have been reported to be 100% spent down and are unlikely to be replenished.

See: http://www.dec.ny.gov/chemical/8444.html

Brownfields Incentives and CHP

The BCP credit, even with the $2 million ceiling, could provide an impetus to CHP projects that qualify (i.e. projects that are admitted into the program by virtue of reaching a cleanup agreement with the Department of Environmental Conservation). It is our understanding that the BCP credit could work with the federal energy-related tax incentives outlined in section 1.1of the report.

The BOA Program may also represent an opportunity for CHP, in that CHP projects could be planned into the redevelopment areas.