



PowerTherm Environmental Impact and Site Economic Report

Project Name Government Office Building Sample

Section I - Site Details and Economic Performance

The installation of a PowerTherm Energy Solution is an energy efficiency measure with a commercially viable return on investment. Every government mandated energy efficiency study since the 1970's has recommended wide use of onsite thermally base-loaded plants that produce electricity. PowerTherm, with its superior and reliable technology, is the most realistic option for widespread implementation, in following these federal recommendations for dense, energy intensive locations and markets.

Table 1: Facility Carbon Generating Equipment

Type	Make	Model	Fuel Input (MMBTU)	Heat Output (MMBTU or tons)	Efficiency or COP	Quantity	Fuel Type	Year Installed
Boiler	Bryan	LM1050	10.20	8.40	82.4%	2	Nat Gas	1989
Boiler								
Boiler								
Elec Chiller	Carrier	19XRV69...		650	4.00	2	Electric	2002
Elec Chiller Absorption Chiller								

Table 2: Site Operating Detail and Energy Rates

Boiler or Steam Utility Output (MMBTU/hr)	Age Adjusted Heating Efficiency	Average Firing Hours (annual)	Average Boiler Fuel Cost (\$/MMBTU)	Chiller Output (tons)	Electric Chiller Hours (annual)	Efficiency (COP) of Displaced Chiller	Cost of Displaced Chiller Fuel (\$/MMBTU)
16.8	70%	1000	\$ 12.61	1300	2200	4.00	\$ 59.79

Absorption Chiller Output (tons)	Absorber Hours (annual)	Average Electric Load (kW)	Peak Electric Load (kW)	Average Cost of Electricity (\$/kWh)	Equipment Lifecycle	Square Footage
0	0	1100	2000	\$ 0.20	20	500,000

Table 3: Site Economic and Environmental "Carbon Footprint" - Annual Estimates

Note: Barrel of Oil Equivalent = BOE

Total heat produced on site	16,800	MMBTU		
Total fuel used on site	24,000	MMBTU	or	4,138 BOE
Total electricity used on site				9,636 MWh
Fossil fuel energy needed to generate utility electricity				19,687 BOE
Total fossil fuel energy needed to operate facility				23,825 BOE
Total Carbon (CO2) Emissions				6,645 Tons CO2
Rainforest Acreage needed to absorb emissions				1,983 Acres
Number of automobiles; equivalent emissions				1,096 Automobiles
Energy Intensity				113,756 BTU/sqft
Yearly Utility Costs (without PowerTherm)				\$ 2,268,384



PowerTherm Environmental Impact and Site Economic Report

Table 4: Proposed PowerTherm Equipment List and Operating Profile

Model DirectFire 1001

Component	Model	Quantity	Type of Heat Recovery	Total Net Heat Output (MMBTU/hr)	Total Chilled Water Output (tons)	Electric Output (kW)	Annual Operating Hours
MicroTurbine	C65GCE	3	External	1.22		192.8	8700
Boiler	N/A	0					
Chiller	N/A	0					
Pump 1	N/A	0					
Pump 2	N/A	0					
Gas Compressor	N/A	0					

Table 5: PowerTherm Energy Reduction Impact (positive numbers indicate reductions)

Total heat produced by PowerTherm						10,649	MMBTU
MicroTurbine fuel use						(21,648)	MMBTU
PowerTherm boiler fuel use						-	
Site heating fuel decrease						15,213	MMBTU
Net site fuel differential				(6,435)	MMBTU	or	(1,110) BOE
Electricity produced by PowerTherm						1,677	MWh
Electricity saved due to DirectChill chilling						-	MWh
Total electricity produced and saved						1,677	MWh
Fossil fuel energy saved due to electricity savings						3,427	BOE
Total fossil fuel energy saved due to the PowerTherm installation						2,317	BOE
Total energy reduction after installation of PowerTherm, <u>per year</u>						9.7%	
Yearly Utility Savings						\$ 261,021	

Table 6: PowerTherm Project Costs

PowerTherm Kit	\$	432,833	Federal MicroTurbine Tax Rebate	\$	-
Est. Installation Services	\$	300,000	Federal CHP Tax Rebate	\$	-
Avoided Equipment Costs	\$	-	State Rebate	\$	-
Avoided Installation Costs	\$	-	Utility Rebate	\$	-
Other	\$	-	Other		
Estimated Project Cost				\$	732,833



PowerTherm Environmental Impact and Site Economic Report

Cash Flow Analysis							Discount Rate	4.0%
CO2 Value (\$/ton)		\$ -	Utility Fuel Discount		19.6%	Marginal Tax Rate		0.0%
Year	Capital Cost	Utility Savings	Service Contract Cost	Fuel Discount Savings	CO2 Offset Value	Tax Savings (5/1 MACRS)	Net Cash Flow	Omitted Savings
0	\$ (732,833)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (732,833)	Neutral
1	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
2	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
3	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
4	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
5	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
6	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
7	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
8	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
9	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
10	\$ -	\$ 261,021	\$ (30,000)	\$ 53,504	\$ -	\$ -	\$ 284,525	
11*	\$ (295,000)	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ (16,475)	
12	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
13	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
14	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
15	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
16	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
17	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
18	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
19	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	
20	\$ -	\$ 261,021	\$ (36,000)	\$ 53,504	\$ -	\$ -	\$ 278,525	

* After year 10 a capital expenditure is recommended to refurbish the MicroTurbines and other equipment to "like new" condition.

Table 8: Cumulative Savings

	<u>10 Year Total</u>		<u>20 Year Total</u>
Over 10 Years	\$ 2,845,248	Over 20 Years	\$ 5,630,496
Simple Payback (years)	2.6	Simple Payback (years)	2.7
IRR	37.2%	IRR	38.3%
NPV	\$ 1,514,344	NPV	\$ 2,797,547

Table 9: Costs to Generate Power with PowerTherm - 10 year average

Fuel Costs (\$/kWh)	\$ 0.131 kWh
Maintenance Costs (\$/kWh)	\$ 0.018 kWh
Capital Cost (\$/kWh)	\$ 0.044 kWh
Thermal Credit (\$/kWh)	\$ (0.114) kWh
Total Cost of Generation	\$ 0.078 kWh



PowerTherm Environmental Impact and Site Economic Report

Section II - PowerTherm Environmental Benefits and Energy Efficiency Information

The energy reductions that PowerTherm directly offers the end user are tangible and can be quantified by reviewing utility bills and monitoring the PowerTherm system output. In addition to those direct operational cost savings, PowerTherm installations greatly benefit American society and the entire planet in ways that are not immediately obvious. If you consider the figures presented in the table below, it becomes apparent that relatively small PowerTherm projects can have large positive environmental impact effects.

Table 10: PowerTherm Environmental Benefits - Annual Impacts

Fossil Fuel Savings due to PowerTherm		2,317 Barrels of Oil
This amount of energy could have flown 120 people	82,370	miles in a Boeing 737
Or driven a family of 4	2,292,232	miles in an average sized automobile
CO2 Savings - calculated according to DOE and EPA conversion data		745 tons of CO2
This CO2 savings is equivalent to removing	123	cars from the roads <u>permanently</u> .
Or planting	253	acres of forest <u>every year</u> .

Table 11: Federal Energy Management Program Guidance

Energy Independence and Security Act of 2007 (EISA 2007)

Agency energy use per square foot in baseline FY	2003	113,756 BTU/sqft
Facility energy use per square foot prior to PowerTherm installation	2009	113,756 BTU/sqft
Facility energy use per square foot after PowerTherm installation	2010	115,180 BTU/sqft
*EO 13123 Section 502(e) credit of 8438 BTU/kWh		28,306 BTU/sqft
Total		86,874 BTU/sqft
Annual Energy Intensity Reduction from 2003 Baseline		23.6%

EISA 2007 Energy Reduction Compliance Table	
Fiscal Year	Reduction
2009	12%
2010	15%
2011	18%
2012	21%
2013	24%
2014	27%
2015	30%

* EO 13123 Section 502(e) guidance is available online at:

http://www1.eere.energy.gov/femp/pdfs/energyreportingguidance_2009.pdf

Compliance data is available online through FEMP at:

<http://www1.eere.energy.gov/femp/regulations/eisa.html>

Guidance on Life Cycle Cost Analysis Required by Executive Order 13123

http://www1.eere.energy.gov/femp/pdfs/lcc_guide_05.pdf

PowerTherm Environmental Impact and Site Economic Report

Table 12: Utility Rate Data Explanation

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE MONTHLY COMMERCIAL BILLS INCLUDING STATE GRT MAJOR ELECTRIC COMPANIES JULY 1, 2005						
	SMALL 10 KW		MEDIUM 50 KW		LARGE 250 KW	
	20% L.F.	30% L.F.	25% L.F.	35% L.F.	30% L.F.	50% L.F.
	1,440 KWH	2,160 KWH	9,000 KWH	12,600 KWH	54,000 KWH	90,000 KWH
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.						
BASIC SERVICE CHARGE	\$ 13.32	\$ 13.32	-	-	-	-
DELIVERY CHARGE (KWH)	96.37	135.85	127.80	178.92	766.80	1,278.00
MONTHLY ADJUSTMENT (KWH)	(9.65)	(14.47)	(23.40)	(32.76)	(140.40)	(234.00)
DELIVERY CHARGE (KW)	-	-	667.00	\$667.00	\$3,335.00	\$3,335.00
MONTHLY ADJUSTMENT (KW)	-	-	(38.50)	(38.50)	(\$192.50)	(\$192.50)
SYSTEM BENEFIT CHARGE (KWH)	2.30	3.46	14.40	20.16	86.40	144.00
MONTHLY ADJUSTMENT CHARGE (KWH)	3.68	5.52	23.01	32.22	138.08	230.13
TAXES (NEW YORK CITY)	2.70	3.66	19.60	21.04	101.60	116.04
TOTAL ELECTRIC DELIVERY CHARGE*	\$ 108.73	\$ 147.33	\$ 789.91	\$ 848.08	\$ 4,094.98	\$ 4,676.67
ELECTRIC SUPPLY (KWH)	225.22	337.82	986.40	1,380.96	5,918.40	9,864.00
ELECTRIC SUPPLY (KW)	-	-	488.00	488.00	2,440.00	2,440.00
MARKET SUPPLY CHARGE (KWH)	(2.85)	(4.27)	(17.78)	(24.90)	(106.70)	(177.84)
TAXES (NEW YORK CITY)	5.73	8.60	37.51	47.55	212.66	349.05
TOTAL ELECTRIC SUPPLY CHARGE	\$ 228.10	\$ 342.15	\$ 1,494.13	\$ 1,891.61	\$ 8,464.36	\$ 12,439.21
TOTAL ELECTRIC CHARGE	\$ 336.83	\$ 489.49	\$ 2,284.04	\$ 2,739.69	\$ 12,559.34	\$ 17,115.88

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE MONTHLY BILLS OF COMMERCIAL AND INDUSTRIAL CUSTOMERS LARGE GAS COMPANIES July 1, 2005*			
	1,000 MCF OR 10,000 THERMS	10,000 MCF OR 100,000 THERMS	100,000 MCF OR 1,000,000 THERMS
	\$	\$	\$
KEYSPAN GAS EAST CORP. DBA BROOKLYN UNION OF LONG ISLAND S.C. NO. 2 - GENERAL (HTG.)			
DELIVERY SERVICE	3,505.87	33,106.87	329,106.07
GAS SUPPLY CHARGE	\$0.959481 PER THERM	8,584.81	85,848.10
SUBTOTAL	12,090.68	118,954.97	1,167,567.97
INCL TAX SURCHARGES	12,483.73	122,821.96	1,226,204.30
DELIVERY	3.2508%		
COMMODITY	3.2508%		

This customer's profile fits into this monthly electric usage profile

Electricity Rate = Bill Amount/Usage
 Electricity Rate = \$12559.34/54000 kWh
Rate = \$ 0.23 kWh

This is the "bottom line" amount paid for electricity

This customer's profile fits into this monthly fuel usage profile

This is the "bottom line" amount paid for fuel

Natural Gas Rate = Bill Amount/Usage
 Natural Gas Rate = \$12,483.73/1000 MMBTU
Gas Rate = \$ 12.48 MMBTU

Key Assumptions:

- 1 Boiler and HVAC equipment has a 20 year life, MicroTurbine recapitalization occurs at year 10
- 2 Energy Savings are based upon user input rates on page 2
- 3 No increases in energy rates are calculated during the analysis presented

Disclaimer: This document is for general illustrative and informational purposes only. The benefits and costs described in this document are estimates and are based on a number of equipment and operational assumptions. Actual fuel or energy savings, emission reductions and costs may be higher or lower and will depend on a variety of factors such as environmental conditions, proper equipment and system operation and maintenance, and energy and utility cost fluctuations. No particular result is guaranteed. Customer is responsible for determining whether the equipment, system and information in this document are appropriate for customer's use and for achieving customer's savings and benefits goals. The equipment and system are subject to the terms and conditions included with the purchase documents. **NO WARRANTIES ARE GIVEN. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE SPECIFICALLY EXCLUDED.**