

freewatt®

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Single-Family Application of freewatt® Micro-CHP – A Case Study

Presented by:
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freewatt® - The Future of Home Energy

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Site Characteristics



- Located in suburb of Buffalo, NY
- Built 1964
- 2,900 square feet
- 2 Adults, 1 Child, during test period
- Design Heating Load 67,000 BTU's per hour
- 6,795 Heating Degree Days
 - (65°F base, TMY2 30 year average)
- Replaced 83% efficient gas furnace
- Commissioned September, 2007



National Fuel Demo Site
Warm Air *freewatt* System





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Electrical Usage 10/1/07 – 3/4/09

Read Date	Dates	Days	MCHP		Electrical Usage (kWh)			
			MCHP Run Time (hours)	MCHP Electric Generation (kWh)	Power Purchased from Grid (kWh)	Excess Power Sent to Grid (kWh)	Total Household Power Consumption for Period (kWh)	Net Power Consumption from Grid (kWh)
3/4/2009	1/30/09 - 3/4/09	33	361	433	670	137	967	533
1/30/2009	12/31/08 - 1/30/09	30	677	812	328	189	951	139
12/31/2008	12/2/08 - 12/31/08	29	643	771	240	193	818	47
12/2/2008	10/29/08 - 12/2/08	34	693	832	144	318	658	-174
10/29/2008	9/29/08 - 10/29/08	30	231	277	263	144	396	119
9/29/2008	9/2/08 - 9/29/08	27	0	0	489	0	489	489
9/2/2008	7/31/08 - 9/2/08	33	0	0	947	0	947	947
7/31/2008	6/30/08 - 7/31/08	31	0	0	1,249	0	1249	1249
6/30/2008	5/30/08 - 6/30/08*	31	37	44	1,148	2	1190	1146
5/30/2008	4/30/08 - 5/30/08	30	262	314	531	113	732	418
4/30/2008	4/1/08 - 4/30/08	29	280	336	334	132	538	202
4/1/2008	3/3/08 - 4/1/08	29	636	764	188	232	719	-44
3/3/2008	2/1/08 - 3/3/08	31	600	720	399	176	942	223
2/1/2008	1/3/08 - 2/1/08	29	646	775	239	202	812	37
1/3/2008	12/3/07 - 1/3/08	31	734	881	242	200	923	42
12/3/2007	10/31/07 - 12/3/07	33	476	571	449	142	878	307
10/31/2007	10/1/07 - 10/31/07	30	210	252	376	55	573	321
Totals		520	6485	7782	8236	2237	13782	6000

* Service Quality Assurance Program Credit
(included in bill) = \$8.76

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Electric Bill Comparison 10/1/07 – 3/4/09

			Electric Bill Comparison	
Read Date	Dates	Days	No freewatt - All Power Purchased from Grid	Net Metered - Exported Power Credited at Full Retail
3/4/2009	1/30/09 - 3/4/09	33	\$ 136.04	\$ 82.81
1/30/2009	12/31/08 - 1/30/09	30	\$ 140.10	\$ 35.24
12/31/2008	12/2/08 - 12/31/08	29	\$ 118.44	\$ 23.16
12/2/2008	10/29/08 - 12/2/08	34	\$ 98.26	\$ (3.55)
10/29/2008	9/29/08 - 10/29/08	30	\$ 63.15	\$ 31.39
9/29/2008	9/2/08 - 9/29/08	27	\$ 77.91	\$ 77.91
9/2/2008	7/31/08 - 9/2/08	33	\$ 138.83	\$ 138.83
7/31/2008	6/30/08 - 7/31/08	31	\$ 197.30	\$ 197.30
6/30/2008	5/30/08 - 6/30/08*	31	\$ 167.30	\$ 161.39
5/30/2008	4/30/08 - 5/30/08	30	\$ 115.23	\$ 73.19
4/30/2008	4/1/08 - 4/30/08	29	\$ 89.94	\$ 44.64
4/1/2008	3/3/08 - 4/1/08	29	\$ 111.71	\$ 11.74
3/3/2008	2/1/08 - 3/3/08	31	\$ 134.04	\$ 44.89
2/1/2008	1/3/08 - 2/1/08	29	\$ 121.54	\$ 22.02
1/3/2008	12/3/07 - 1/3/08	31	\$ 136.00	\$ 22.72
12/3/2007	10/31/07 - 12/3/07	33	\$ 126.58	\$ 55.54
10/31/2007	10/1/07 - 10/31/07	30	\$ 87.08	\$ 56.36
Totals		520	\$ 2,059.43	\$ 1,075.57

* Service Quality Assurance Program Credit
(included in bill) = \$8.76


Net Savings \$ 983.86

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Gas Usage for Heating 9/07 – 2/09

	MCHP Run Time [hours]	Heat Produced by MCHP [mm Btu]	Furnace Run Time [hours]	Heat Produced by Furnace [mm Btu]	Total Heat Generation [mm Btu]	Total Gas Used [therms]
freewatt	6605.8	80.9	1640.6	122.1	203.0	2534.5
Old Furnace*	0	0	2445.3	203.0	203.0	2445.3

- MCHP provides 39.9% of heat demand
- Auxiliary furnace provides remaining 60.1% of heat demand
- *Old furnace is 100,000 Btu/Hr input at 83% efficiency
- Chart shows calculated run time and gas input that would be required to provide same amount of heat as freewatt provided
- Gas usage estimated to increase 3.6% with freewatt
 - $2534.5 - 2445.3 = 3.6\%$ increase
- If gas costs remain the same, the resulting estimated gas bill increase for the period would be \$119.50
 - $2534.5 - 2445.3 = 89.2$ additional therms
 - $89.2 * \$1.34/\text{therm} = \119.50 over 18 months (about \$80 for 12 months)
- *But gas costs don't remain the same, gas is less expensive* with a freewatt system... (* in New York State)* 

Residential Distributed Generation Service SC-24

- Higher minimum monthly delivery charge for first 4 CCF (\$30.54 versus \$15.54)
- Much lower delivery charge for subsequent CCF's (\$0.025 versus \$0.373 next 46 CCF and \$0.025 versus \$0.101 for over 50 CCF)
- Break even point is just under 35 CCF per month

Month	Usage (CCF)	SC-1 Res.	SC-24 DG	Savings
October	121	\$ 138.74	\$ 120.04	\$ 18.70
September	40	\$ 60.19	\$ 58.26	\$ 1.93
August	14	\$ 32.16	\$ 41.17	\$ (9.01)
July	47	\$ 75.58	\$ 70.85	\$ 4.73
June	36	\$ 56.68	\$ 54.46	\$ 2.22
May	45	\$ 69.79	\$ 66.69	\$ 3.10
April	97	\$ 118.87	\$ 102.40	\$ 16.47
March	161	\$ 209.24	\$ 178.42	\$ 30.82
February	208	\$ 272.45	\$ 232.04	\$ 40.41
January	311	\$ 431.09	\$ 373.22	\$ 57.87
December	321	\$ 439.32	\$ 376.96	\$ 62.36
November	182	\$ 242.31	\$ 209.11	\$ 33.20
Total	1583	\$ 2,146.42	\$ 1,883.62	\$ 262.80

Actual gas bill savings is \$262.80 for 12 months

Estimated savings for entire 18 month test period \$394.20

Effective Gas Cost

\$1.36 / ccf

\$1.19 / ccf

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Reduced CO₂ Emissions 9/07 – 2/09

**13,748
pounds**

Based on estimated average displaced CO₂ emissions for the Western NY electric grid (1.74 lbs/kWh)



Average Carbon Footprint:
Winter Electricity Use,
Conventional Heating System



Average Carbon Footprint:
Winter Electricity Use,
Freewatt Micro-CHP System

- Carbon Dioxide reduction could be 1 to 5 or more tons per year depending on average displaced emissions for local grid power
- A utility or third party aggregator could aggregate the emissions credits for thousands of installations

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Summary of Estimated Energy and Environmental Savings

	Energy Cost Savings [\$]	Electricity Generated [kWh]	Primary Fuel Savings [Therms]	CO₂ Reduction [Pounds]
2008	\$830.24	4,929	543.7	8,502
18 Month Test Period	\$1,378.06	7,782	880.4	13,748

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Thank You!

