

# Introduction

In August 2008 the School District went on line with a 32 panel solar hot water system for our Aquatic Center and domestic hot water at our Middle School. With the potential energy savings realized by this project the School Board decided to have a District Facilities Renewable Energy Study done. In this report we included Geothermal, Solar and Wind energy. With this report the School Board will look at which projects best work for the district and develop a priority list for future projects.

## GeoSense Financing Worksheet

<b>Project:</b>		<b>High School</b>		<b>Date:</b> 03/16/09		
<b>Average Energy Inflation Rate:</b>		2.50%		<b>Average Energy Inflation Rate:</b> 4.00%		
<b>Annual Percent Interest Rate:</b>				<b>Annual Percent Interest Rate:</b>		
<b>Length of Loan in Years:</b>				<b>Length of Loan in Years:</b>		
<b>GeoSource Heat Pump System</b>				<b>Alternative Heating &amp; A/C</b>		
<b>Total System Installation Cost:</b>		<b>\$810,655.00</b>		Total System Installation Cost:		
Less Rebate and/or Utility Incentive:				Less Rebate and/or Utility Incentive:		
Total System Cost:		\$810,655.00		Total System Cost:		
Less System Down Payment:				Less System Down Payment:		
Total Amount Financed:		\$810,655.00		Total Amount Financed:		
				<b>\$0.00</b>		
<b>GeoSource Heat Pump System</b>				<b>Current Heating &amp; A/C</b>		
Number of Units installed:		1		Number of Furnaces installed:		
Estimated Annual Maintenance Cost:		\$35.00		Estimated Annual Maintenance Cost:		
<b>Estimated Annual Energy Cost:</b>		<b>\$56,390.00</b>		<b>Estimated Annual Energy Cost:</b>		
Total Annual Operating Cost:		\$56,425.00		Total Annual Operating Cost:		
<b>Monthly Operating Cost:</b>		<b>\$4,702.08</b>		<b>Monthly Operating Cost:</b>		
Amount of Monthly Loan Payment:				Amount of Monthly Loan Payment:		
<b>Total Monthly Cost:</b>		<b>\$4,705.00</b>		<b>Total Monthly Cost:</b>		
				<b>\$8,267.67</b>		
<b>GeoSource Heat Pump System</b>				<b>Alternative Heating &amp; A/C</b>		
<b>Year</b>	<b>Savings To Date</b>	<b>Avg. Cum. R.O.I.</b>	<b>Operating Cost</b>	<b>Cost To Date</b>	<b>Operating Cost</b>	<b>Cost To Date</b>
0	0.00			\$0.00		\$0.00
1	\$42,787.00	5.28%	\$56,425.00	\$56,425.00	\$99,212.00	\$99,212.00
2	\$88,131.86	5.44%	\$57,835.63	\$114,260.63	\$103,180.48	\$202,392.48
3	\$136,158.04	5.60%	\$59,281.52	\$173,542.14	\$107,307.70	\$309,700.18
4	\$186,994.49	5.77%	\$60,763.55	\$234,305.69	\$111,600.01	\$421,300.19
5	\$240,775.86	5.94%	\$62,282.64	\$296,588.34	\$116,064.01	\$537,364.19
6	\$297,642.72	6.12%	\$63,839.71	\$360,428.04	\$120,706.57	\$658,070.76
7	\$357,741.85	6.30%	\$65,435.70	\$425,863.75	\$125,534.83	\$783,605.59
8	\$421,226.48	6.50%	\$67,071.59	\$492,935.34	\$130,556.22	\$914,161.82
9	\$488,256.57	6.69%	\$68,748.38	\$561,683.72	\$135,778.47	\$1,049,940.29
10	\$558,999.08	6.90%	\$70,467.09	\$632,150.82	\$141,209.61	\$1,191,149.90
11	\$633,628.31	7.11%	\$72,228.77	\$704,379.59	\$146,858.00	\$1,338,007.90
12	\$712,326.14	7.32%	\$74,034.49	\$778,414.08	\$152,732.32	\$1,490,740.21
13	<b>\$795,282.39</b>	<b>7.55%</b>	<b>\$75,885.35</b>	<b>\$854,299.43</b>	<b>\$158,841.61</b>	<b>\$1,649,581.82</b>
14	\$882,695.18	7.78%	\$77,782.49	\$932,081.91	\$165,195.27	\$1,814,777.09
15	\$974,771.21	8.02%	\$79,727.05	\$1,011,808.96	\$171,803.08	\$1,986,580.18
16	\$1,071,726.20	8.26%	\$81,720.22	\$1,093,529.19	\$178,675.21	\$2,165,255.38
17	\$1,173,785.18	8.52%	\$83,763.23	\$1,177,292.42	\$185,822.22	\$2,351,077.60
18	\$1,281,182.98	8.78%	\$85,857.31	\$1,263,149.73	\$193,255.10	\$2,544,332.70
19	\$1,394,164.54	9.05%	\$88,003.74	\$1,351,153.47	\$200,985.31	\$2,745,318.01
20	\$1,512,985.43	9.33%	\$90,203.84	\$1,441,357.31	\$209,024.72	\$2,954,342.73

# GeoSense Financing Worksheet

**Project:** School District of Osceola

**Date:** 03/16/09

**GeoSource Heat Pump System**

**Current Heating / AC System**

	<b>Savings</b>	<b>Avg. Cum.</b>	<b>Operating</b>	<b>Cost</b>	<b>Operating</b>	<b>Cost</b>
<b>Year</b>	<b>To Date</b>	<b>R.O.I.</b>	<b>Cost</b>	<b>To Date</b>	<b>Cost</b>	<b>To Date</b>
<b>21</b>	\$1,637,912.20	9.62%	\$92,458.93	\$1,533,816.24	\$217,385.71	\$3,171,728.44
<b>22</b>	\$1,769,222.93	9.92%	\$94,770.41	\$1,628,586.64	\$226,081.14	\$3,397,809.58
<b>23</b>	\$1,907,207.65	10.23%	\$97,139.67	\$1,725,726.31	\$235,124.38	\$3,632,933.96
<b>24</b>	\$2,052,168.85	10.55%	\$99,568.16	\$1,825,294.47	\$244,529.36	\$3,877,463.32
<b>25</b>	\$2,204,422.02	10.88%	\$102,057.36	\$1,927,351.83	\$254,310.53	\$4,131,773.85
<b>26</b>	\$2,364,296.18	11.22%	\$104,608.80	\$2,031,960.63	\$264,482.95	\$4,396,256.81
<b>27</b>	\$2,532,134.44	11.57%	\$107,224.02	\$2,139,184.64	\$275,062.27	\$4,671,319.08
<b>28</b>	\$2,708,294.59	11.93%	\$109,904.62	\$2,249,089.26	\$286,064.76	\$4,957,383.84
<b>29</b>	\$2,893,149.71	12.31%	\$112,652.23	\$2,361,741.49	\$297,507.35	\$5,254,891.20
<b>30</b>	\$3,087,088.82	12.69%	\$115,468.54	\$2,477,210.03	\$309,407.65	\$5,564,298.84

## IV. Solar Domestic Water Heating - Renewable Energy Opportunities (REO - SHW)

The general methodology and technological principals for solar domestic water heating systems are outlined in the Appendix.

The following table summarizes the estimated hot water water usage, suggested system size, therms of natural gas offset, carbon reduction and installed cost. The Retscreen modeling analysis for each school is found in the Appendix.

School	Daily Usage (Gallons)	Suggested System (Sq. Ft)	Natural Gas Offset (Therms @ 80% plant Eff.)	Carbon Mitigation (Tons)	Cost x1000 (\$)	Focus On Energy (\$/x1000)	Final System Cost (\$/1000)
Bus Garage	150	120	160	0.9	\$18	\$4.0	\$14.0
Elementary	150	120	160	0.9	\$18	\$4.0	\$14.0
Intermediate	850	720	934	5.4	\$94	\$14.0	\$80.0
Middle	1,100	1120	1452	8.4	\$146	\$21.8	\$124.2
High School Kitchen/PE	1,000	1120	1357	7.9	\$146	\$20.3	\$125.7
High School Class Rooms	400	480	560	3.2	\$65	\$8.4	\$56.6

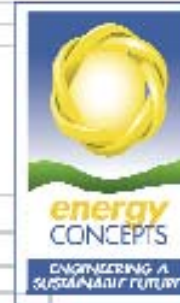
Five day week operation except for middle and high schools each with six day operation.

### Focus Rewards

# Osceola Schools, WI (Feasibility Study)

Sol-Com™ 720 db

## Solar Thermal Financial Analysis



934 Therms

0 Federal Tax Rate  
 0.00 Fed/State Tax Rate  
 \$1.06 Natural Gas Rate  
 1.09 Escalation Factor

Year #	First Cost \$	FoE Rebate \$	Rebate Income* \$	After Rebate \$	30% Tax Credit** \$	Annual Electrical \$	Depreciation Basis *** \$	MACRS 5 YR Depreciation 40% Tax	Cumulative \$
1	(94,000)	14,000	0	(80,000)	0	990	(94,000)	0	(79,010)
2						1,079		0	(77,931)
3						1,176		0	(76,755)
4						1,282		0	(75,472)
5						1,398		0	(74,075)
6						1,523		0	(72,552)
7						1,660			(70,891)
8						1,810			(69,081)
9						1,973			(67,108)
10						2,150			(65,108)
11						2,344			(62,764)
12						2,555			(60,209)
13						2,785			(57,425)
14						3,035			(54,389)
15						3,308			(51,081)
16						3,606			(47,475)
17						3,931			(43,544)
18						4,285			(39,259)
19						4,670			(34,589)
20						5,090			(29,499)
21						5,549			(23,950)
22						6,048			(17,902)
23						6,592			(11,310)
24						7,186			(4,124)
25						7,832			3,708

0 % Federal Tax Rate  
 0 % Combined State/Federal Tax Rate  
 \$1.06 \$/Therm Energy Charge  
 1.09 Energy Cost Escalation Factor

\* The Rebate qualifies as Income for Federal tax purposes and is considered positive cash flow for year one

## V. Solar Air Heating Collectors - Renewable Energy Opportunities (REO - SA)

The general methodology and technological principals for solar air collector heating systems are outlined in the Appendix. The Modeling for solar air collectors is not as well accepted as Solar Water Heating. If the District chooses to proceed with these projects, a more definitive review of the therms out put would need to be done with a more sophisticated modeling program.

The following table summarizes the suggested system size, therms of natural gas offset, carbon reduction and installed cost. The Retscreen modeling analysis for each school is found in the Appendix.

School	Room	Suggested System (Sq. Ft)	Natural Gas Offset (Therms @ 80% plant Eff.)	Carbon Mitigation (Tons)	Cost (\$)
Bus Garage	Cold Storage	640	45	3.6	\$51K
Elementary	Gymnasium	960	67	5.4	\$77K
Intermediate	Gymnasium	240	17	1.35	\$24K
Middle	Gymnasium	960	67	5.4	\$77K

# Osceola Schools, WI (Feasibility Study)

Sol-Aire™ 960

## Solar Air Collector Financial Analysis

670 Therms



0 Federal Tax Rate  
 0.00 Fed/State Tax Rate  
 \$1.06 Natural Gas Rate  
 1.09 Escalation Factor

Year	First Cost	FoE Rebate	Rebate Income*	After Rebate	30% Tax Credit**	Annual Energy Savings	Depreciation Basis ***	MACRS 5 YR 40% Tax	Cumulative
#	\$	\$	\$	\$	\$	\$	\$	\$	\$
1	(51,000)	0	0	(51,000)	0	710	(51,000)	0	(50,290)
2						774		0	(49,516)
3						844		0	(48,672)
4						920		0	(47,752)
5						1,003		0	(46,750)
6						1,093		0	(45,657)
7						1,191			(44,466)
8						1,298			(43,275)
9						1,415			(41,980)
10						1,542			(40,587)
11						1,681			(39,096)
12						1,833			(37,503)
13						1,998			(35,806)
14						2,177			(34,028)
15						2,373			(32,155)
16						2,587			(30,168)
17						2,820			(28,048)
18						3,073			(25,775)
19						3,350			(23,325)
20						3,652			(20,673)
21						3,980			(17,893)
22						4,338			(14,955)
23						4,729			(11,826)
24						5,155			(8,429)
25						5,618			(4,047)

0 % Federal Tax Rate  
 0 % Combined State/Federal Tax Rate  
 \$1.06 \$/Therm Energy Charge  
 1.09 Energy Cost Escalation Factor

\* The Rebate qualifies as income for Federal tax purposes and is considered positive cash flow for year one

\*\* When claiming the rebate as income the 30% tax credit can then be applied to the full system first cost.

\*\*\* Depreciable basis is system first cost less 50% of the tax credit

## VI. Solar Air Duct Heating - Renewable Energy Opportunities (REO - SADH)

The general methodology and technological principals for solar air duct ventilation pre-heating systems are outlined in the Appendix. The modeling programs are not as well defined for solar duct heaters as they are for solar water heating. If the District chooses to proceed with these projects, a more definitive review of the therms out put would need to be done with a more sophisticated modeling program.

The following table summarizes the air handling unit, its design ventilation air, suggested system size, therms of natural gas offset, carbon reduction and installed cost. The Retscreen modeling analysis for each school is found in the Appendix.

School	Air Handling Unit	Ventilation Rate (cfm)/ Suggested System (# Collectors)	Natural Gas Offset (Therms @ 80% plant Eff.)	Carbon Mitigation (Tons)	Cost x1000 (\$)
Bus Garage	MUA-1	2200/18	790	3.8	\$29
Elementary	AHU-1	2200/18	870	5.2	\$29
	AHU-2	1800/15	680	5.1	\$25
	AHU-4	325/3	850	0.84	\$7
Intermediate	AHU-6	1200/10	570	3.4	\$15
	AHU-7	2400/20	1135	6.8	\$32
Middle	AHU-3	29000/24	1370	8.2	\$36
	RTU-1	1000/8	460	2.7	\$14
High School	AHU-1	4615/38	2160	12.9	\$55
	AHU-6	3000/25	1418	8.5	\$40
	AHU-7	6100/50	2450	17	\$75

The results are based upon a 5 day 12 hour weekday schedule and a 1 day 10 hr weekend schedule.



# Osceola Schools, WI (Feasibility Study)

Sol-DuctAire™ 432

## Solar Air Collector Financial Analysis

790 Therms



0 Federal Tax Rate  
 0.00 Fed/State Tax Rate  
 \$1.06 Natural Gas Rate  
 1.09 Escalation Factor

Year	First Cost	FoE Rebate	Rebate Income*	After Rebate	30% Tax Credit**	Annual Energy Savings	Depreciation Basis ***	MACRS 5 YR 40% Tax	Depreciation	Cumulative
#	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
1	(29,000)	0	0	(29,000)	0	837	(29,000)	0	0	(28,163)
2						913		0	0	(27,250)
3						995		0	0	(26,255)
4						1,084		0	0	(25,170)
5						1,182		0	0	(23,988)
6						1,288		0	0	(22,700)
7						1,404				(21,296)
8						1,531				(19,891)
9						1,669				(18,223)
10						1,819				(16,404)
11						1,982				(14,421)
12						2,161				(12,261)
13						2,355				(9,905)
14						2,567				(7,338)
16						2,798				(4,540)
18						3,050				(1,489)
17						3,325				1,835
18						3,624				5,459
19						3,950				9,409
20						4,306				13,715
21						4,693				18,408
22						5,116				23,524
23						5,576				29,100
24						6,078				35,177
25						6,625				41,802

0 % Federal Tax Rate  
 0 % Combined State/Federal Tax Rate  
 \$1.06 \$/Therm Energy Charge  
 1.09 Energy Cost Escalation Factor

\* The Rebate qualifies as income for Federal tax purposes and is considered positive cash flow for year one

\*\* When claiming the rebate as income the 30% tax credit can then be applied to the full system first cost.

\*\*\* Depreciable basis is system first cost less 50% of the tax credit

School	System Size (DC kW)	Annual Production PV Watts (kWh)	Carbon Mitigation (Tons)	Cost x1000 (\$)	Focus On Energy (\$/x1000)	Final System Cost (\$/1000)
Demo Tracker (CBR)	3.8	5,600	2.9	\$45	\$11.2	\$33.8
Best Value (CBR)	13	17,500	13.1	\$130	\$35	\$95
Bus Garage (IG)	20	26,400	13.2	\$190	\$39.6	\$150.4
Elementary (IG)	20	26,400	13.2	\$190	\$39.6	\$150.4
Intermediate (IG)	20	26,400	13.2	\$190	\$39.6	\$150.4
Middle (IG)	20	26,400	13.2	\$190	\$39.6	\$150.4
High School (IG)	20	26,400	13.2	\$190	\$39.6	\$150.4

Systems can receive Focus on Energy funding via the two programs below. It is noted that the best value in a system would be a 13 kW system producing 17,500 kWh/yr to receive the maximum \$35k cash back reward. This system represents the best % buy down from the FoE programs.

#### Cash Back Reward - CBR (<20kW)

<b>SYSTEMS AT:</b>	<b>NEW COMPLETE SYSTEMS</b>	<b>COST SHARE</b>	<b>REWARD</b>
Non-profit* Government sites	\$2.00 per kWh/yr	35%	\$35,000

#### Implementation Grant - IG (20kW - 50 kW)

System owner:	Reward Factor	Maximum Cost Share	Maximum Reward
Non-profit* or Government sites	\$1.50	35%	\$50,000

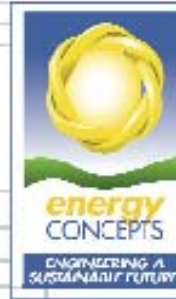
Should the District decide to consider a larger investment into PV beyond the above net metered projects, a more thorough evaluation would be required. Available budgets would need to be determined. Specific array spacing on roofs as well as structural engineering review would need to be evaluated. Main service interconnection considerations would need engineering review. Some economy of scale can be realized for larger than 20 kW systems. It may be possible to approach \$8/kW for these larger

# Osceola Schools, WI (Feasibility Study)

Sol-Lectric™ 20 kW

Solar Electric Financial Analysis

26,400 Annual kWh



0 Federal Tax Rate  
 0.00 Fed/State Tax Rate  
 0.1 electric Rate  
 1.07 Escalation Factor

Year #	First Cost \$	FoE Rebate \$	Rebate Income* \$	After Rebate \$	30% Tax Credit** \$	Annual Electrical \$	Depreciation Basis *** \$	MACRS 5 YR Depreciation 40% Tax	Cumulative \$
1	(190,000)	39,600	0	(150,400)	0	2,640	(190,000)	0	(147,760)
2						2,825		0	(144,935)
3						3,023		0	(141,913)
4						3,234		0	(138,679)
5						3,461		0	(135,218)
6						3,703		0	(131,515)
7						3,962			(127,553)
8						4,239			(123,314)
9						4,536			(118,778)
10						4,854			(114,022)
11						5,193			(109,009)
12						5,557			(103,452)
13						5,946			(97,506)
14						6,362			(91,144)
15						6,807			(84,337)
16						7,284			(77,053)
17						7,794			(69,259)
18						8,339			(60,920)
19						8,923			(51,997)
20						9,548			(42,449)
21						10,216			(32,233)
22						10,931			(21,302)
23						11,696			(9,606)
24						12,515			2,909
25						13,391			16,300

0 % Federal Tax Rate  
 0 % Combined State/Federal Tax Rate  
 0.1 \$/kWh Energy Charge  
 1.07 Energy Cost Escalation Factor

\* The Rebate qualifies as Income for Federal tax purposes and is considered positive cash flow for year one

# Osceola Schools, WI (Feasibility Study)

Proven 15 kW

Wind Financial Analysis

23,400 kWh/Yr



0 % Federal Tax Rate  
 0.00 Fed/State Tax Rate  
 \$0.10 Electric Rate  
  
 1.07 Escalation Factor

Year #	First Cost	FoE Rebate	Rebate Income*	After Rebate	30% Tax Credit**	Annual Energy Savings	Depreciation Basis ***	MACRS 5 YR 40% Tax	Depreciation	Cumulative
1	(112,500)	25,200	0	(87,300)	0	2,340	(112,500)	0	0	(84,960)
2						2,504		0	0	(82,456)
3						2,679		0	0	(79,777)
4						2,867		0	0	(76,911)
5						3,067		0	0	(73,843)
6						3,282		0	0	(70,561)
7						3,512		0	0	(67,050)
8						3,758		0	0	(63,292)
9						4,021		0	0	(59,271)
10						4,302		0	0	(55,215)
11						4,603		0	0	(50,612)
12						4,925		0	0	(45,687)
13						5,270		0	0	(40,417)
14						5,639		0	0	(34,778)
15						6,034		0	0	(28,744)
16						6,456		0	0	(22,288)
17						6,908		0	0	(15,380)
18						7,392		0	0	(7,988)
19						7,909		0	0	(79)
20						8,463		0	0	8,384
21						9,055		0	0	17,439
22						9,689		0	0	27,128
23						10,367		0	0	37,495
24						11,093		0	0	48,588
25						11,869		0	0	60,457

0 % Federal Tax Rate  
 0 % Combined State/Federal Tax Rate  
 \$0.10 \$/kWh Energy Charge  
 1.07 Energy Cost Escalation Factor

\* The Rebate qualifies as income for Federal tax purposes and is considered positive cash flow for year one  
 \*\* When claiming the rebate as income the 30% tax credit can then be applied to the full system first cost.  
 \*\*\* Depreciable basis is system first cost less 50% of the tax credit