

Geothermal Heat Pumps and Solar PV's
Performance Contracting
Don Penn, PE, CGD

BENEFITS OF BUNDLED GEOEXCHANGE / SOLAR ENERGY PROJECTS

- **Projects reduce greenhouse gas emissions (by lowering demand for power from utility plants or reducing direct combustion of carbon-based fuels)**
- **Projects reduce energy spending, improve facilities and create jobs for the local community**
- **Comprehensive energy projects (onsite power generation and energy efficiency/avoidance) **promote growth of renewable and “clean” energy technologies****
- **Projects address “new energy equation ”challenges (demand growth > supply growth)**

Promote economic energy sources

Add diversity/avoidance component to energy sources

WHAT IS AN ENERGY PERFORMANCE CONTRACT

- ❖ Immediate capital intensive energy improvements
- ❖ Minimal up front \$'s needed
- ❖ Looks like a lease-purchase
- ❖ Self funding from savings
- ❖ Savings can/could be guaranteed = lower risk

What are the Costs

Average for U.S. Grid Electricity is 11.4 ¢/kWh

Average for Solar Electricity is 14-30¢/kWh

Average for Wind Electricity is 8.5 ¢/kWh

Average for Geothermal Steam Electricity is 6.5 ¢/kWh

Average for Residential GHP is 5 ¢/kWh (2.7 ¢/kWh w/ incentives)

Average for Commercial GHP is negative 4.1 ¢/kWh (negative 4.6 ¢/kWh w/ incentives)

HOW DO GEOTHERMAL HEAT PUMPS EFFECT ENERGY COSTS

FRISCO ISD ENERGY CONSUMPTION

ROGERS ELEMENTARY SCHOOL

sq.ft. 64586

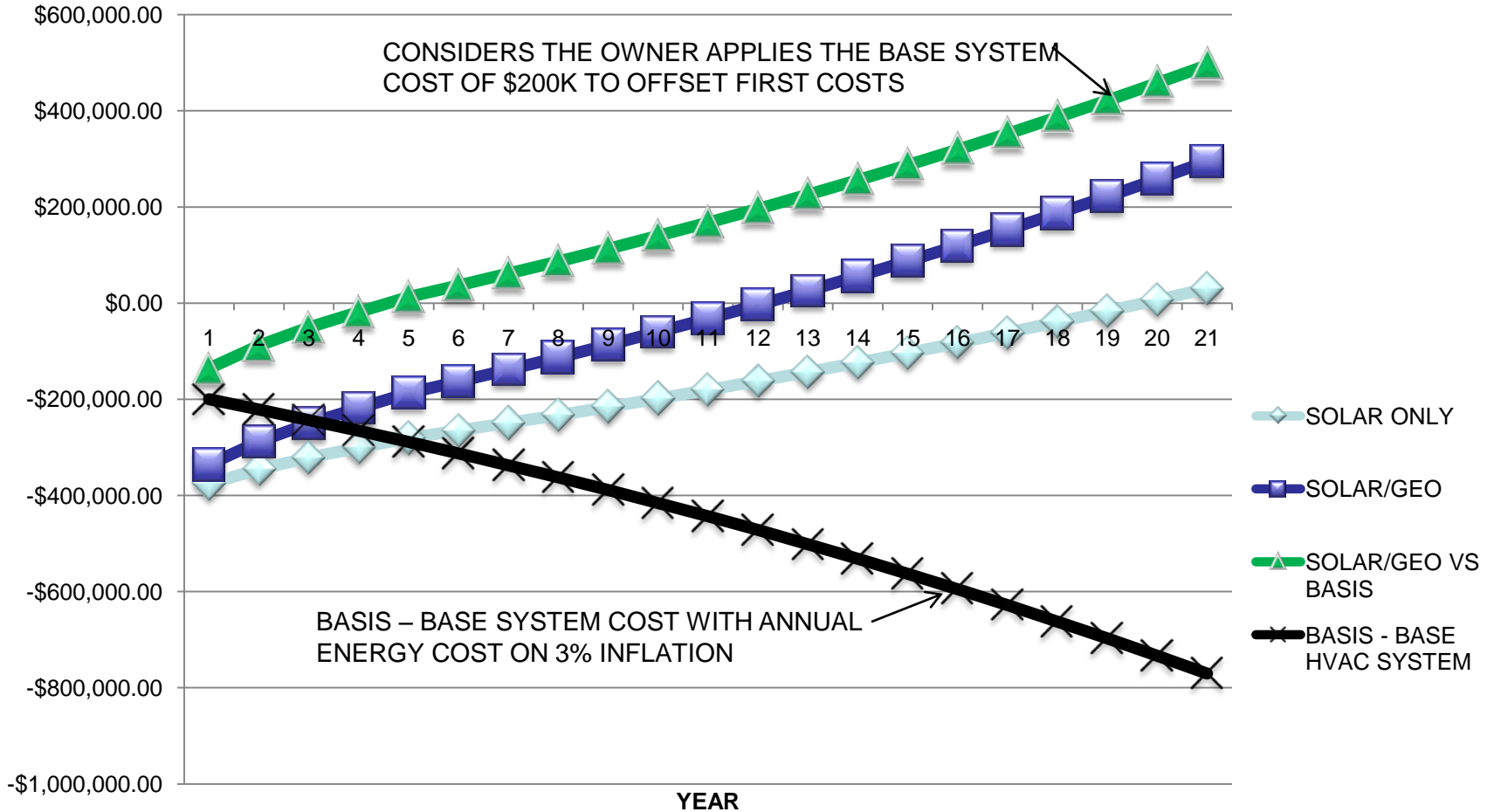
Type of HVAC System	Year	KBTU Used *	KBTU/Sq.Ft.
Chilled Water/Boiler	2005	3995362.841	61.86113
Chilled Water/Boiler	2006	4310334.391	66.73791
Geothermal Heat Pump	2007	2630772.55	40.73286
Geothermal Heat Pump	2008	2378297.175	36.82373

* Includes Electrical and Natural Gas

Project Basis: 15,000 sq ft Building with Conventional Rooftop Units

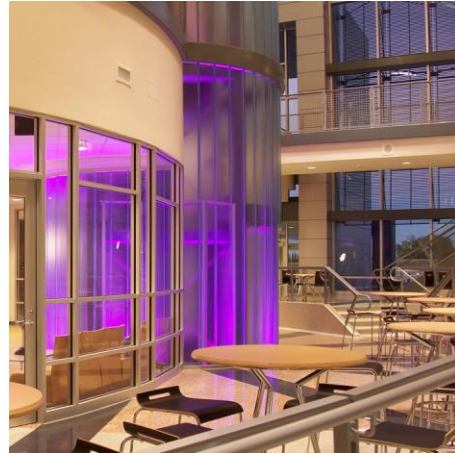
Geothermal HVAC Cost:				\$300,000.00
Conventional HVAC Costs:				\$200,000.00
Additional HVAC Costs:				\$100,000.00
Solar Installation for 60% Electrical Avoidance from Base Bldg				\$335,000.00
Solar Installation for 60% Electrical Avoidance with GHP's				\$225,000.00
Income Tax Rate			35.00%	
Tax Credit for Geo			10.00%	
Tax Credit for Solar			30.00%	
Annual Energy Costs Savings/Avoidance without Geo/Solar				\$13,300.00
Annual Energy Costs Savings/Avoidance with Geo/Solar				\$20,000.00
Energy Inflation				3.00%

CUMMULATIVE CASH FLOW COMPARISONS



How do GHPs Impact Carbon Emissions?

Main Heating Fuel Type		Geothermal		Baseline	Heat Pump		Natural Gas		
State	City	MWh	CO _{2e}	CO _{2e}	MWh	CO _{2e}	MWh	Mcf	CO _{2e}
IL	Chicago	13.5	8.6	17.0	33.2	21.3	4.3	180.2	15.1
OR	Portland	10.6	2.3	10.0	18.2	4.0	2.4	143.5	10.4
AZ	Phoenix	10.8	8.2	15.2	20.1	15.3	12.5	70.1	14.3
TX	Dallas	10.1	9.1	15.8	19.6	17.7	9.3	86.3	14.3
MA	Boston	12.3	8.4	15.4	26.1	17.8	3.8	160.5	13.6



THANK YOU

Geothermal Heat Pump - Business Tax Incentives

- **Federal Income Tax Credit:**
 - **10% of total GHP system cost**
 - **Credit is not limited**
 - **Can be used to offset AMT tax**
 - **Can be used in combination with subsidized financing**
 - **Can be used in more than one year**
- **Accelerated Depreciation:**
 - **5 year MACR depreciation for entire GHP system**
 - **Eligible for bonus depreciation in 2009 (50% write-off in first year)**
- **Eligibility:**
 - **Building located in the U.S.**
 - **Original use begins with taxpayer**
 - **Placed in service between 10/3/2008 and 12/31/2016**
 - **Can be used by regulated utilities**
 - **Must be claimed by the owner of the property (effects non-taxable)**

Richland Middle School - Birdville ISD

