

# *Will Geo Work For Me?*

## *Geographically and Building Type?*

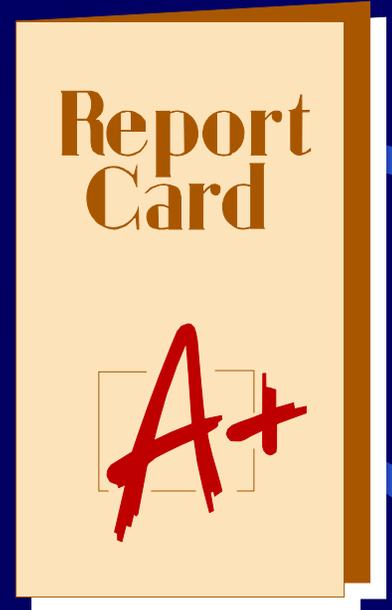
- | Successful Installations in 23 countries
- | 1 Degree Off Equator
- | 117 Miles North of Arctic Circle
- | List of 88 + Types of Applications
- | Project Size: 1/2 Ton to ~ 18,000 Tons

# *Systems Tailored For*

- | Hotel/Motel
- | Restaurants
- | Health Care
- | Educational Facilities
- | Government Buildings
- | Office Buildings
- | Yachts/Boats
- | New Construction or Retrofit

# *The Perfect HVAC System:*

- Reliable
- Easy To Install
- Applicable To Most Building Types
- Simple To Maintain
- Isolated From Extreme Environments
- Energy Efficient
- Utilize Energy in Building (Diversity)
- Long System Life
- Environmentally Sound



# *WSHP Features and Benefits*

- | High EER
- | High COP
- | Emission Free
- | 25 + years Service Life
- | Reduced Use of Refrigerants
- | Refrigerants: Phasing in R410A
- | Quiet Operation
- | Many sizes and configurations available

# Earth - Heat Sink and Heat Source

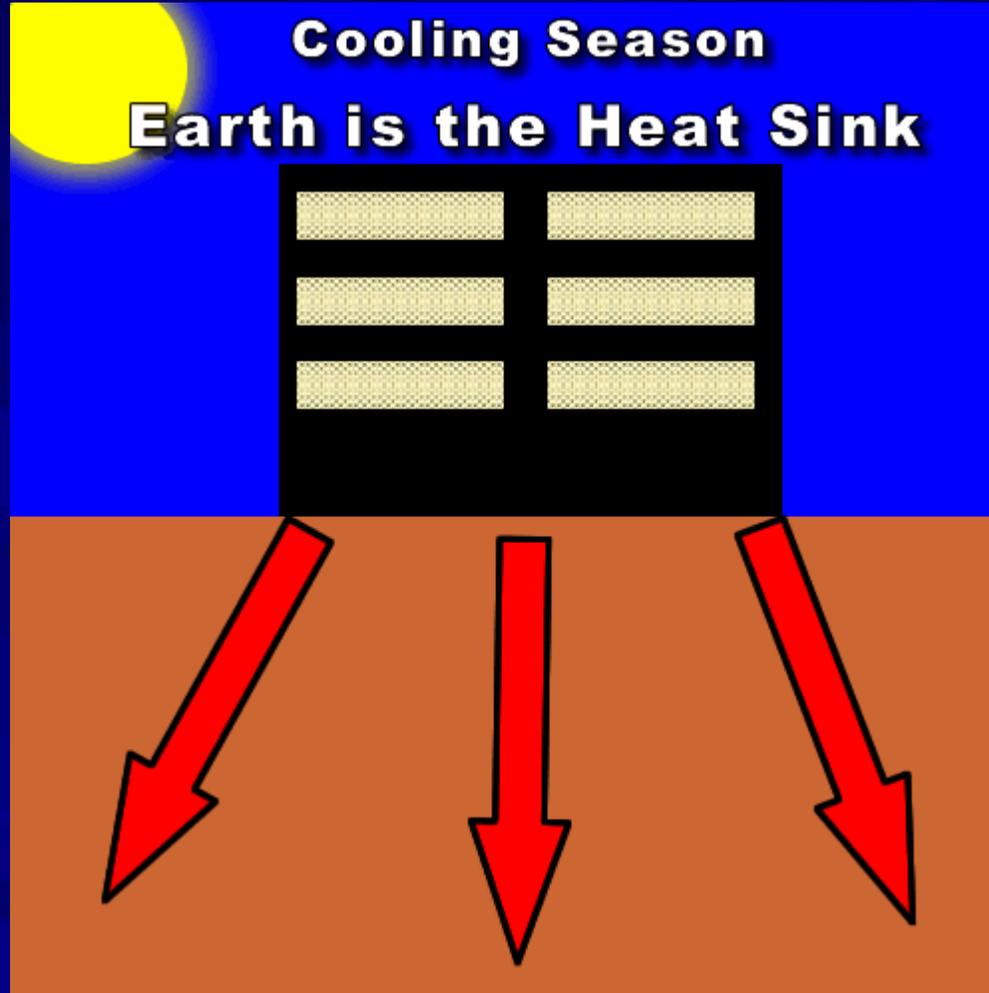
## Heat Sink - Summer

- Geothermal systems use the ground as a heat sink in the summer – excess energy is rejected into the ground via a water loop

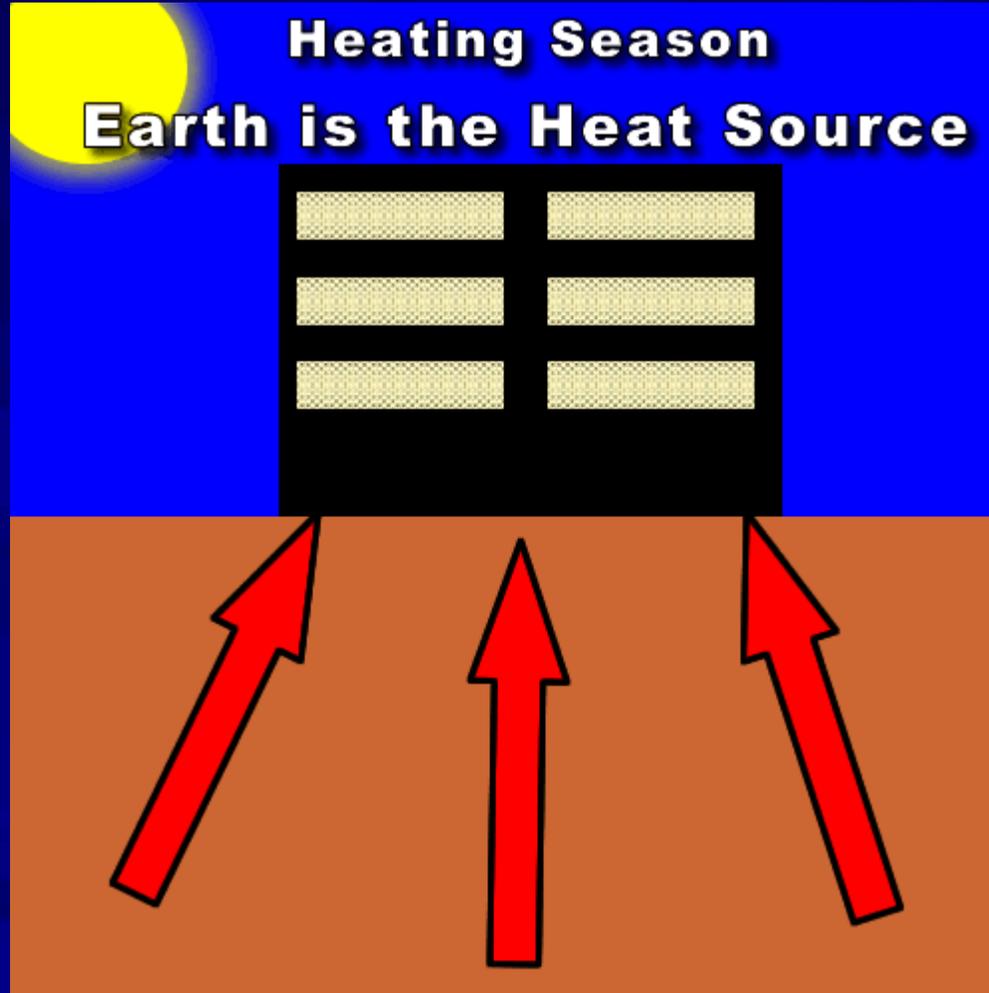
## Heat Source - Winter

- Geothermal systems use the ground as a heat source in the winter– energy is added to the building via a water loop

# Ground is Heat Sink



# Ground is Heat Source



# What is a Heat Pump?

A heat pump is a traditional compressor driven air conditioner with a refrigerant reversing valve. When engaged the reversing valve reverses the flow of the refrigerant through the liquid line changing the evaporator into the condenser and vice versa.



### Unit Fan

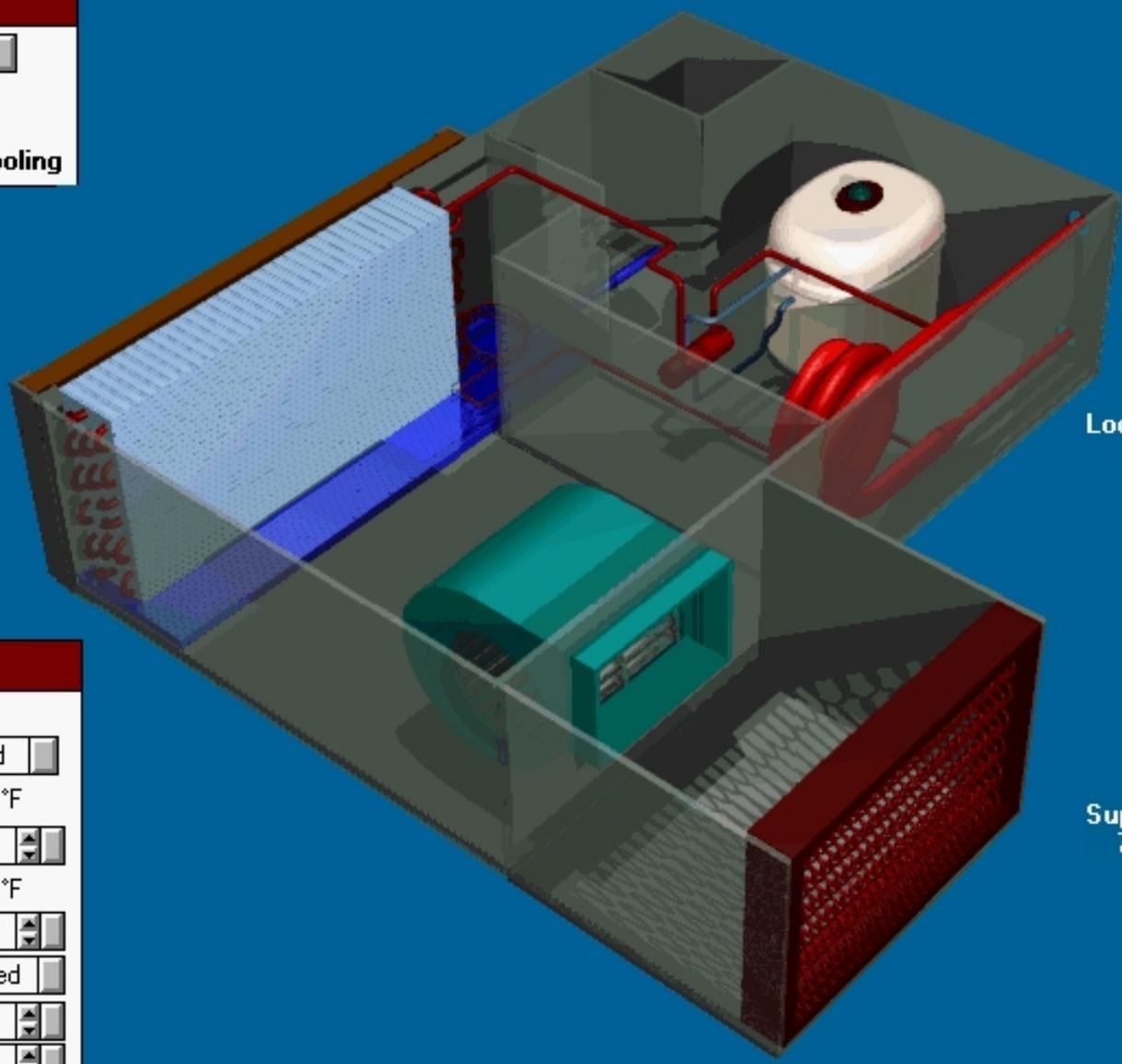
Operating Mode

- 1 -- Continuous
- 2 -- Cycle Heating Only
- 3 -- Cycle Heating and Cooling

OSA Temp.  
72.0 °F

Loop Water Temp.  
72.0 °F

Supply Temp.  
75.0 °F



### Zone Control

Disable Unit

Command Mode

Space Temperature 65.5 °F

Occupied Setpoint

Current Microtouch Bias 0.0 °F

Microtouch Bias Limit

Microset OFF Button

Heating Offset

Cooling Offset

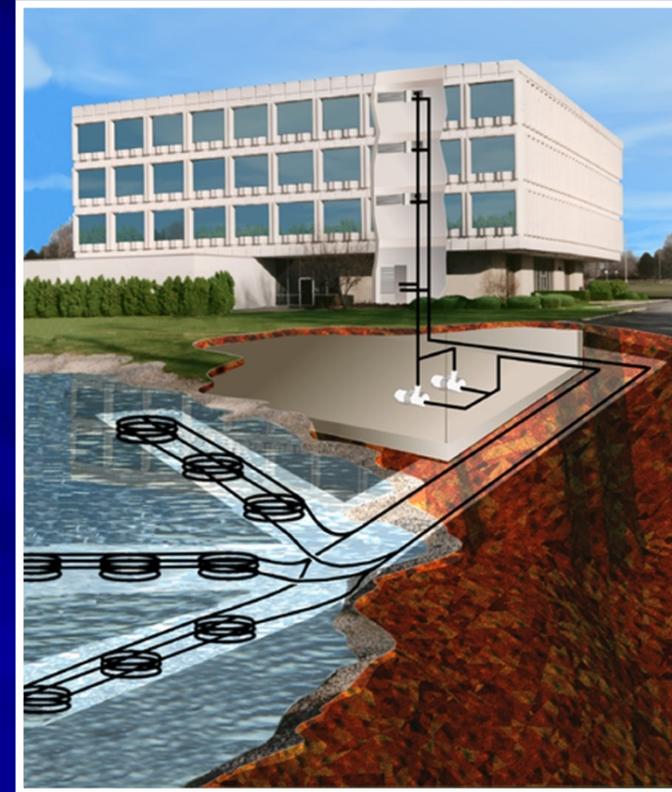
# Vertical Loops

Most common for large commercial projects



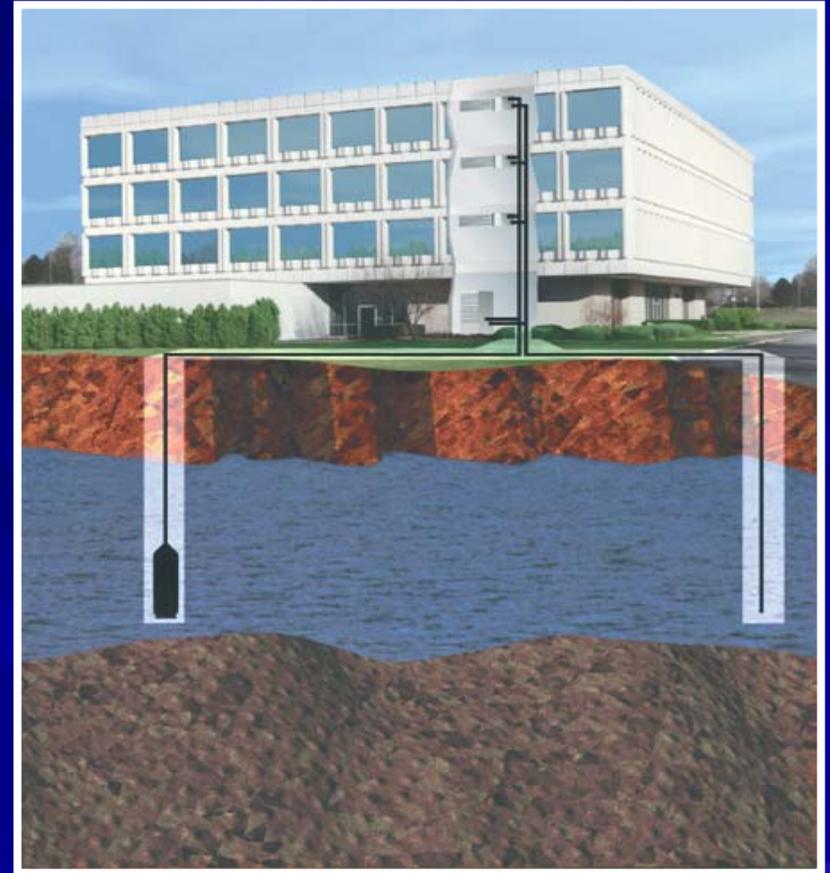
# Closed Pond/Lake

- **Ground Water**
- **Pond or Lake**
- **Man made or natural**
- **8 to 12 feet minimum**
- **10 to 50 tons per acre**
- **Average Water Temperature  
35 to 87**
- **Evaporative effect of water  
in summer**
- **Thermal conductivity of the  
earth in the winter**



# Closed to the Aquifer System

- Constant supply water temperature
- Lower first cost
- Intermediate heat exchanger



WaterFurnace®

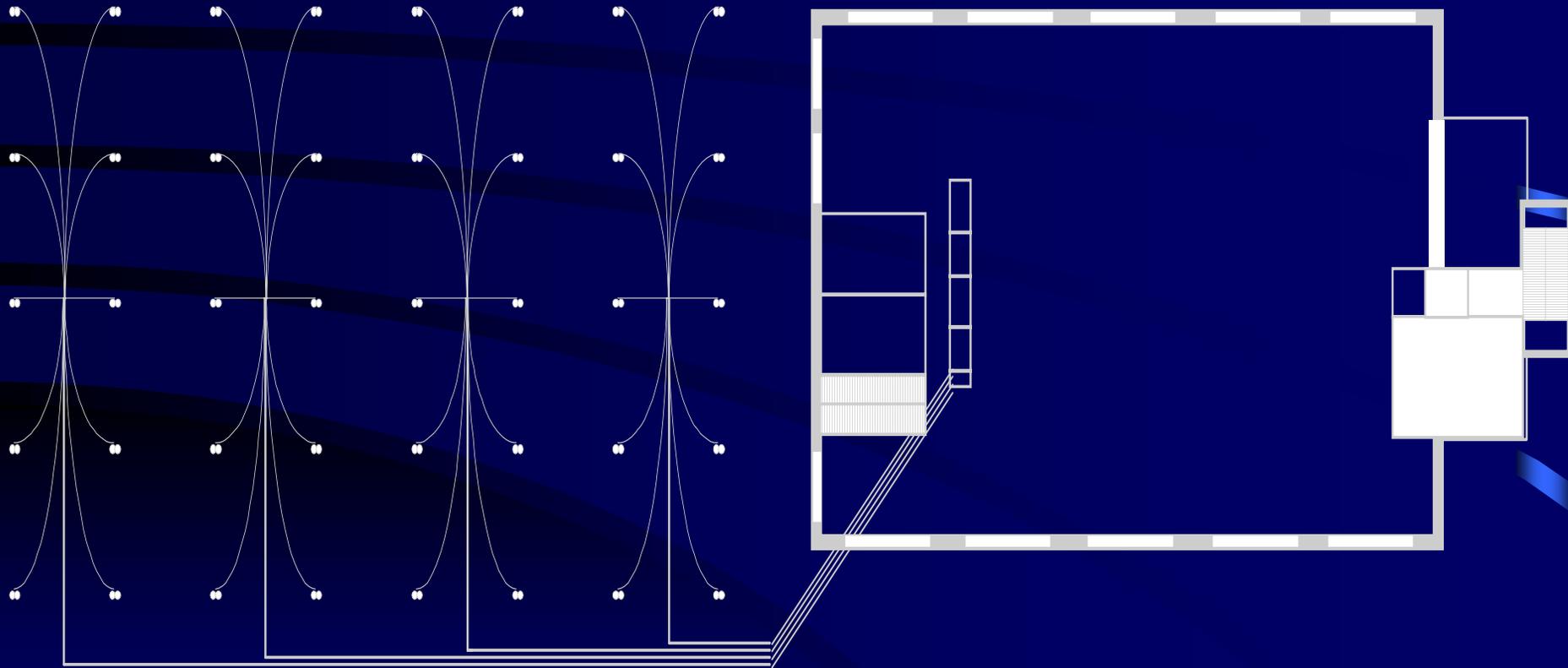
# • *Garrett Office Buildings*



# • *Loop Field Overview*



# GeoThermal Building Loop Field Site Plan



# • *GeoThermal Building - Roof View*



# • *VAV Building - Roof View*



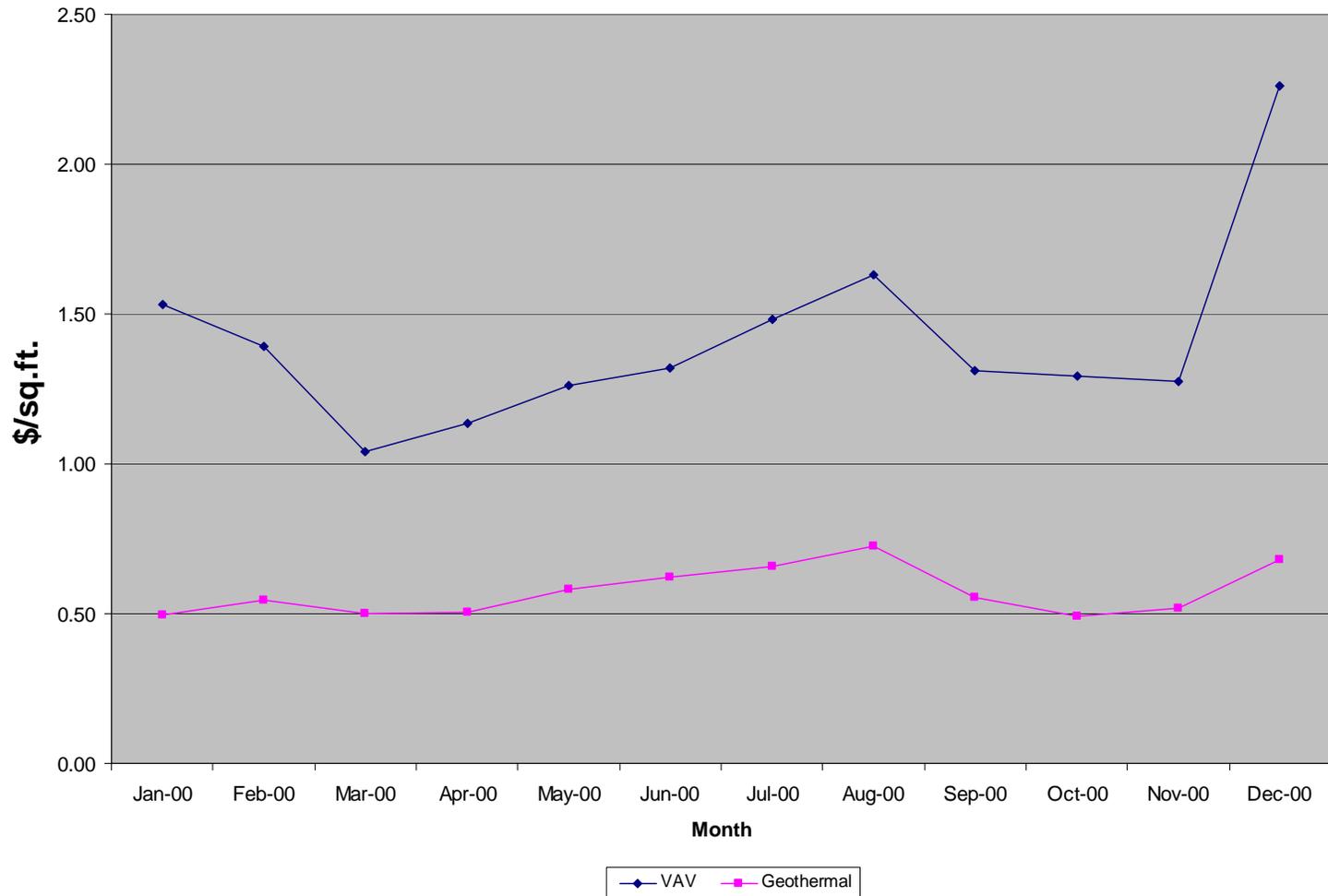
- *VAV Building*
- *Central Air Handler*



**•Garrett Office Buildings**  
**•2000 Energy Consumption**

Month	VAV 15,000 ft <sup>2</sup>		Geothermal 20,000 ft <sup>2</sup>	
	Gas Mcf	Elec kWh	Gas Mcf	Elec kWh
Jan-00	36.2	12,400	0.0	9,920
Feb-00	21.0	14,720	0.0	10,880
Mar-00	6.9	13,600	0.0	9,960
Apr-00	4.3	15,760	0.0	10,120
May-00	3.5	17,920	0.0	11,600
Jun-00	4.2	18,560	0.0	12,400
Jul-00	3.2	21,280	0.0	13,120
Aug-00	3.2	23,520	0.0	14,480
Sep-00	3.2	18,720	0.0	11,120
Oct-00	11.2	16,080	0.0	9,840
Nov-00	21.9	12,720	0.0	10,360
Dec-00	69.4	13,600	0.0	13,600
<b>Total</b>	<b>188.2</b>	<b>198,880</b>	<b>0.0</b>	<b>137,400</b>
<b>\$ Cost</b>	<b>\$ 1,882</b>	<b>\$ 17,899</b>	<b>\$</b>	<b>\$ 10,992</b>
<b>\$/ft<sup>2</sup></b>	<b>1.32</b>		<b>0.55</b>	

- **Garrett Office Buildings**
- **2000 Energy Consumption Profile**



# *Trinity River Vision Authority Projects*

- *Tarrant County Community College*
- *New Downtown Campus*
- *Geothermal Cooling, Solar Energy, Wind Energy*
- *Trinity River Area Parks*
- *Solar Lighting for park trails & public areas*
- *Long Term*
- *Potential for a variety of new construction projects.*



*Renewable Energy Solutions*

# *Fort Polk Project - US Army Base*

- | 4003 Living Units
- | 1,000 to 2,700 sq/ft
- | 1296 buildings
- | Replaced: 80% a/c heat pump, 20% a/c with gas heat
- | Service Calls: 90/day reduced to 18/month
- | 32 Million kWh/year savings
- | 20,000 MMBtu gas savings
- | \$3.3 Million savings in operating costs annually

# *Oklahoma State Capitol Building*

- | 855 Nominal Tons
- | 1/2 Ton to 30 Ton Equipment
- | Horizontal, Vertical, Console, WWHP
- | Improved IAQ
- | Replaced 138 Different HVAC Units
- | Reduced HVAC Maintenance Staff (16 to 3)
- | Reclaimed 15,000 sq.ft. of Office Space
- | Operating Savings: \$ 1/4 Million/yr..

# *Western Heights School District*

## **High School:**

- 410,000 sq/ft
- Mechanical System:
  - RTU's
  - 4-Pipe Fan Coils
  - Air Cooled Chiller
  - Cooling Tower & Boiler
- Annual operating costs:  
\$689,640
- Operating Costs per sq/ft: \$1.68

## **Middle School:**

- 440,200 sq/ft
- Mechanical System:
  - GSHP's, WWHP's
  - ERV's
  - GHEX: Vertical loops under soccer field
  - BacNet BAS System
- Annual Operating Cost: \$242,110
- Operating Costs per sq/ft: \$0.58

# Hale Irwin Golf Course Community-Briar Creek

- Emissions saved over system life (20 yrs), 1100 units
- SO<sub>2</sub>            Sulfur Dioxide            680,000 pounds saved
- NO<sub>x</sub>            Nitrogen Oxide            246,200 pounds saved
- CO<sub>2</sub>            Carbon Dioxide            66,500,000 pounds saved
  
- The above savings in pollution is equivalent to:
- Planting 12840 acres of trees            or
- Removing 5860 cars from our roads
- By utilizing our system, approximately 232,000 tons of coal, need not be burned to generate energy.
- Equals 3220 railcars of coal

# *Comments on Good Renewable Stewardship*

- | Focus has been on utilizing PV/Solar and Wind in order to provide renewable energy – Great!
- | Due to cost – only about 25% of building energy can be provided with PV or Wind
- | When combined with GeoThermal – 50% to 60% of required energy to operate building can be provided with same amount of PV or Wind
- | We seem content with efficiently filling a leaking bucket but not fixing the leaks.

# Questions?

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