Go Green...Go Geothermal...
What We’ll Cover Today

★ Market Status
  ▪ Current Status
  ▪ Growth
  ▪ Potential

★ System Advantages and Disadvantages
  ▪ Competing Technologies

★ Case Studies
  ▪ Lessons Learned

★ Feasibility of Geothermal Heat Pump Systems in Southern California
Geothermal HVAC Market Share

The Geothermal Market

ONE million geothermal heat pumps have been installed in the United States.
Potential Growth

Potential Growth

• Government Standards and Policy
  ✓ California AB 2339

  *AB 2339 requires the California Energy Commission to identify and address existing barriers to the deployment of geothermal heat pumps and geothermal ground loop technologies*

• Incentives
  ✓ Federal Tax Incentives
  ✓ Utility and State Financing Programs

• Delivered Energy Costs (Oil, Gas, Electricity)

• Hybrid Systems
System Advantages and Disadvantages

- High Energy Efficiencies
- Reduce Peak Electric Demand
- Lower Life Cycle Costs
- Reduction in GHGs
- Lower Maintenance Costs

- High equipment and installation costs
- Site Specific Nature of System
- Space requirements
- Longer installation duration
Competing Technologies

• Improved Higher Efficiency Equipment
• Natural Gas
  -Currently an Abundant Resource
  -Currently Inexpensive (Susceptible to Fluctuating Prices)
• Solar
  -Fastest Growing Industry in the US 2010
Average annual energy costs for building #2 (Geo) is $0.96/sf ft. ($0.10/sq. meter);

Average annual energy costs for building #1 (VAV) is $2.12/sq. ft. ($0.23/sq. meter.)
Project Energy Saving Examples

Dutchess Community College – NY
- Design-build project
- 120,000 sf dormitory
- 88 well closed loop geothermal system
- Estimated Annual Energy Cost Savings of 40%

Naval Surface Warfare Center – MD
- Design-build project
- Multi-building facility
- 90 well closed loop geothermal system
- Estimated Annual Energy Cost Savings of 35%
• Initial assessment by the architect determined that the geothermal option was logistically and cost prohibitive.

• Bowman Geothermal was brought in to provide a comprehensive feasibility and alternative design.

• This feasibility and design approach allowed the project to move forward with the geothermal system at a reduced cost.

*Thorough evaluation of the available resources determined the site suitable for open loop standing column wells, allowing for a reduced land requirement and reduced installation costs*
Veteran Affairs Clinic

- Preliminary Design Called for 80 wells at 400’ w/ utilization of current chillers
- Bowman was part of the team that won the bid. Reviewing the preliminary design, Bowman was able to determine the 80 well field would be under-utilized.
- A new design was implemented which calls for 36 wells at 400’
- While the Hybrid system is still planned to utilize the current chillers, there may now be opportunity to replace the current equipment with extended range chillers
Southern California presents a strong case to utilize a hybrid option

Conceptual Building (250,000 ft²)

✓ Cooling Dominated
  ✓ Peak Loads
  - 405 tons Cooling
  - 1710 kbh Heating
  - 154 kbh DHW
Simulation Building – Southern California

Average Monthly Cooling Load
Average Monthly Heating Load
Loads to Ground

kbtu/hr

Jan            Feb              Mar             Apr
May
Jun              Jul
Aug
Sep
Oct
Nov
Dec
Simulation Building – Southern California

100% GHP
• 200 bores at 500 ft depth
• Total kWh/year 180,918

Hybrid Option
• 80 bores at 500 ft depth
• Total kWh/year 217,670

Chilled and Hot Water Coils
Standard VAV w/ Reheat:
406,900 kWh/year
593 Mbtu/year
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