Jack DiEnna
Executive Director
The Geothermal National & International Initiative
Geothermal Heat Pump Technology

“More than a NICHE !!

There has been more interest shown in Geothermal Heat Pumps in 2014 than in any of the 40 years previously. It is continuing in 2015, because developers and investors are beginning to see the value in the ground loop.
What do we call it… Geothermal, Ground Source, GeoExchange.

The feds call it *geothermal heat pumps (GHP)*.

They are ground loops, boreholes not *WELLS* (unless you are doing an open system)
Why Geothermal Heat Pumps?

The US Department of Energy states, 36% of the primary energy used in the US is from energy use in buildings. This is more than the energy used by the transportation industry.

AND

40% of the total energy used in a building is for space conditioning and water heating.
Environmental Stability.

The US Environmental Protection Agency states that GHPs reduce Greenhouse Gas Emissions (the leading contributor to Climate Change) by up to 40% over convention HVAC systems.
Geothermal Heat Pumps

Use the earth’s **thermal properties** (ground source energy), in conjunction with electricity, to provide **space conditioning** (heating and cooling) and **water heating** to institutional, commercial and residential facilities both nationally & Internationally.

A report by Navigant Research predicts that the geothermal heat pump (GHP) market will nearly **triple** to **$17.2 billion** by 2020.

Remember, **NOTHING** is more **POWERFUL** than an idea whose time has **COME**!!!
Geothermal—
The Energy Under Our Feet
Geothermal Resource Estimates for the United States

Bruce Green and Gerry Nix,
National Renewable Energy Laboratory
The Nation’s geothermal resources represent a huge and viable energy resource, providing the U.S. with various ways to use them and enhance national security, and economic and environmental health.
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The States of MD and NH have approved Bills, which effectively makes GHPs an accepted technology available for Renewable Energy Credits (RECs) under the state’s Renewable Portfolio Standard (RPS), recognizing GHPs as a renewable energy source.
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The New York State Energy Research Development Authority (NYSERDA) as part of it’s $5 billion Clean Energy Fund has determined that GHPs are a renewable thermal solution along with solar thermal & Biomass. In a recent development, NYSERDA announced that they have appointed a Director to head the Renewable Thermal Initiative and lead the effort to develop markets that support clean, high efficiency, renewable thermal systems.

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The Road to 30%!
PEAK LOAD / DEMAND REDUCTION

In a report by the National Renewable Energy Laboratory (NREL) they determined that every installed ton of GHP capacity reduced peak load by \(0.55 - 0.88\) kW so GHPs can provide a cost effective, environmentally responsible solution to a utility’s “peak load” energy problem.

Western Farmer’s Cooperative based in OK & NM, in a program that they have been running since 2013, has captured metrics that support that finding. Participating homes in their program saw the peak demand for their HVAC system drop by 38% or a reduction of \(0.55\) kW per ton of installed capacity.
Peak Load Reduction---Utilities

The Western Farmer’s program also pointed to the fact that every kW saved equals $2,000 of energy generation resources that does not have to be built and that if 20% of their customer base changed to GHPs, one half billion dollars of generation infrastructure would not be needed.

This would allow for a major reduction in the planned new generation that must be built in the coming years.
WATER SAVINGS:

In a comparison study done on a 300 ton cooling system GHPs vs Water Cooled Chiller the results were dramatic...

Annual Savings:

Potable Water Savings (gals.) – 4,730,400
Bleed Savings (gals) - 1,892,160
Water Cost Savings - $32,106.72
Sewer Cost Savings - $12,866.69

(based on 96 gal per Rm per day, double occupancy)
WATER SAVINGS CONT.

Comparing two identical High School buildings in the Frisco, TX School District (a suburb of Dallas) Centennial HS using a hydronic system with a Cooling Tower and Wakefield using a Geothermal Heat Pump system, the water savings alone (negating the chemical or maintenance costs) were dramatic.

In the 2013-2014 school year Wakefield used over 2,500 gallons less water than Centennial.
RECENT DEVELOPMENTS!

- US EPA issues its Clean Power Plan (CPP) which requires States to collectively **reduce carbon emissions** from the electricity sector by **32% below 2005** levels in the next 15 years.

- On **August 25th 2015**, President Obama announced a Clean Energy Incentive Program (CEIP) to complement the CPP. In it he proposes to “unlock” the residential **Property-Assessed Clean Energy (PACE)** financing for single family housing which will make it easier for homeowners to invest in clean energy technologies such as GHPs.

- In **July**, the MD PSC approved one of the most aggressive energy efficiency targets in the nation, requiring utilities to **cut retail sales by 2% each year.**
Other Interesting NY GHP Projects!

American Water Project- Long Island

American Water, one of the largest private water companies in the US, in a strategic partnership with FHP/Bosch has developed a state of the art geothermal pilot project in a Elementary school (circa 1957) using their water as the medium for the geothermal heat pumps. This system is delivering year round comfort and has enabled the school to use their facility throughout the summer. The GHP system has reduced their overall energy use by 30kBTUs per sq. ft.

St. Patrick’s Cathedral – 5th Ave, New York City.

GHPs are playing an important role in the renovation of this iconic New York City and national landmark.
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The answer is “third party ownership” of the ground loop, that could be:

Utility (Electric, Gas, Water),

Developer (Commonwealth Group) or a Loop Ownership Company (ORCA).
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-Renewed Interest by utilities of all kind, Electric (both IOUs & Cooperatives), Gas and most recently Water Utilities.

-Recognition by the Engineering Community (ASHRAE) on the value of GHP Technology.

-the growth of “net zero” developments, both Public and Private, that depend on GHPs, along with PV to achieve this rating.
GHP’s - as a Renewable Technology for Utilities.

1- They are a “demand reduction” technology which does not have to have “backup” generation. A equivalent megawatt of installed ghp capacity, reduces that amount from the grid.

2- They work 24/7, 365, never needing the sun to shine or the wind to blow.
GHP’s - as a Renewable Technology for Utilities.

3- It is a permanent (50 year) demand reduction, one that does not need any notification.

4- It can become a new business unit (Loop leasing or collection of REC benefits).

5- It is using “energy” already owned by the consumer but delivered by the Utility.

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Job Creation / Retention & Training

In an Industry study done in 2010 it was determined that a commercial project involves 22 different job classifications.

The International Ground Source Heat Pump Association has, in partnership with the Association of Energy Engineers, ASHRAE and NATE, developed the training and certifications needed to ensure a strong infrastructure to support the growth of geothermal heat pumps both nationally and internationally.

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Kensington Capa High School, Philadelphia, PA

90,000 Sq. Ft. Closed Loop GHP Project
Brownfield Site, LEED Platinum

96 Boreholes @ 500 Ft Deep =
48,000 Drilling Ft @ $20 /Ft = $960K

Simple payback (Yrs.) 7.60 (no grants)

20 year Life Cycle Cost (GHP vs Conventional)

Construction - +$1 M
Operating Cost /yr- -$180K
Maintenance Cost/yr- -$19,800

20 yr Life Cycle Cost- +$2,632,160.00

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Kensington Capa High School, Philadelphia, PA

RESULTS

School “Incidents” (crime & Violence) Dropped 66%

Truancy dropped 25%

Test Scores have Quadrupled

Graduation has gone from 30% to 67%

One Students quote: “I am poor now but I am no longer without hope.”
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50,000 sf Building w/ 1,000 sf Data Center
(in the suburbs of Phila.)

Building is LEED Platinum and completely geothermal.

64 Boreholes @ 500 Ft Deep – Closed Loop Vertical Bore.

260 Ton capacity – 60 Tons dedicated to the data center
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HVAC 20 Year Life Cycle Cost Analysis

Baseline HVAC System vs Geothermal HVAC System

Construction- $1,500,000 vs $2,000,000 = +33.3%

Operating Cost/yr. $201,000 vs $119,000 = -40.8%

Maintenance Cost/yr. $16,000 vs $5,000 = -68.8%

20Yr Lifecycle Cost* $6,440,00 vs $5,280,000 = -18.0%

*7% interest for 20 years

Simple Payback* (years) 8.62 yrs.

*This is without taking advantage of any rebates or grants!

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Timing is everything, Now is the Time to get involved.

Attend training, look for opportunities, we now have larger companies recognizing the value of this technology.

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Geothermal Heat Pump Technology

Uses the “ENERGY UNDER OUR FEET”, the energy we already OWN to deliver the Triple E benefits of:

- Energy independence & security.
- Environmental stability.
- Economic prosperity.

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We cannot solve our problems with the same thinking we used when we created them.”

- Albert Einstein

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If you have any questions or need further information please contact me at 610-659-4998 or e-mail me at jdienna@geonii.org