E2TECH
Geothermal Systems in Maine

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President - NEGPA

Geothermal with Confidence
In loving memory of
Dr. John Logan
Water Energy is a “value added” Distributor.

Our primary products are geothermal heat pump systems for commercial, industrial & residential applications.

We provide application design services for products which we distribute to engineering firms & design-build contractors.

Established 1978


Woman Owned Business

Offices
Geothermal heat pump manual for City of NY Architects & Engineers

Free copy www.northeastgeo.com

Geothermal Training & Design

WATER ENERGY
NORTHEASTGEO.COM

Industry credentials
- 3 Certified Geoexchange Designers – CGD
- Fourteen Accredited Installers – AI
- 35 years of Publications & Papers
- Charter members of “GEO”
- Cofounder of NEGPA
- NATE recognized Geothermal Training center

GEOTHERMAL IS ALL WE DO!
Air conditioners and air-source heat pumps transfer heat from inside houses to the air outside.

Refrigerators transfer heat from food into the kitchen.

Heat Pumps Are All Around Us...
What is a “ton”?

One ton of cooling

cooling is typically measured in tons
one ton of cooling is equivalent to
12,000 BTU/hour
(12,000 BTU’s is the amount of heat required to melt one ton of ice)
Stanford University's Global Climate & Energy Project

The amount of solar energy reaching the surface of the planet is so vast that in one year it is about twice as much as will ever be obtained from all of the Earth's non-renewable resources of coal, oil, natural gas, and mined uranium combined!
Delta “T” = temperature

Re: Heat Exchange
The further your travel between point “A”, and point “B”, the more energy you use!

Geothermal is a Solar Energy Management system

Geothermal in...

...Winter – Extracts heat from the earth

...Summer – Dispels heat to the earth...

...using a refrigerant circuit
**Performance**

What is COP and EER?

COP = Coefficient of Performance

High Efficiency boiler/furnace = **0.95** *(LESS than ONE)*

Electric Resistance = **COP of 1.0**

EER = Electrical Efficiency Ratio

Air-to-Air air conditioner has a “SEER” *(Seasonal Electrical Efficiency Ratio)* of up to 17

*Which declines as outdoor air temp declines!!!*

*Today’s geothermal – COP’s up to 5.9*

*Today’s geothermal - EER’s up to 52.0*

*With no efficiency decline due to outdoor air temp change!*
Geothermal (a.k.a. Groundsource) Heat Pumps are Solar Energy Management machines!

Building HEATING

1 unit of Electric Energy + 4 free units extracted FROM the Earth = 5 Units Heat Energy TO the BUILDING
"I heard geo isn’t as efficient as the ads claim!"

- Poor load analysis (under OR oversized)
- Poor earth installation
  - Oversized earth pumping and/or undersized capacity
- High duct static – Kills system efficiency and longevity, wastes fan energy
- Poor system install
- Undersized system relying on ELECTRIC DUCT HEATERS to make up the shortfall!
- Uniformed system operation (set back often brings on electric resistance)
- Intermediate devices that reduce system efficiency (e.g. Flat-plate exchangers, poorly sized circulators, etc.)
What you do on either side of the box will determine **SYSTEM** efficiency!

No such thing as “close enough” with geo!
LABORATORY SETTING
ISO - 13256
Testing method INCLUDES Pumping Penalty!

DELTAS of temperature and pressure MUST be respected or you will NOT approach/achieve published efficiencies
Overview of Geothermal Heat Pump Systems

elements include equipment and installation of...

- EARTH COUPLING
- HEAT PUMPS
- DISTRIBUTION

...each element has to be thoughtfully consider to **minimize first cost** and **maximize** operating performance and system longevity
Types of Earth Coupling

Closed Loop
- Conductive

Standing Column
- Conductive & Advective
- Partial Bleed

Open to Recycle
- Advective
THERMAL EFFICIENCY

Properly designed Earth coupling

- CLOSED LOOPS - Good efficiency
  32 °F Winter  77 °F Summer
  COP’s up to 4.4

- STANDING COLUMN – Better efficiency
  45 °F Winter  65 °F Summer
  COP’s up to 5.4

- OPEN to RECYCLE - Best efficiency
  50 °F Winter  59 °F Summer
  COP’s up to 5.6

per ARI/ISO Standard - 13256
Dedicated Geo, and dual-use wells

What is this?

1. A well cap?
2. Your permanent fuel tank?
3. Both 1 and 2 above?

This could be both your water well and permanent fuel tank
Earth Coupling Installation Factors for GEOTHERMAL HEAT PUMPS

EACH METHOD MUST BE EVALUATED FOR THE APPLICATION & LOCATION

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1 = highest/best
“Real time” delivery – As energy is extracted it is immediately delivered to the zone

Average inside cost: $4,500 to $5,500/ton
Electric tank heaters as “second stage” are also EVIL!!!
AMPLIFY Alternative Energy w/ Geothermal Heat Pumps

Building HEATING

1 unit of purchased Electric Energy + 4 free units extracted FROM the Earth = 5 Units Heat Energy TO the BUILDING
Portland Area Monthly Heating Cost Comparison

Monthly Heating Cost in Dollars

Heating Months from September through May

- **Propane**
- **Oil**
- **Pellets**
- **Geo**
The partial resistance heat dilemma!

-ARI 210-
FULL LOAD
HEATING
HOURS for
New England
The partial resistance heat problem...

So 2,400 hours of high efficiency GEO heating at COP of 4 – GREAT!!!

...which leaves 600 hrs. at a COP of 1 (if resistance heat is used)

CUTS ANNUAL EFFICIENCY IN HALF!!! AND creates an electric power “peak” during coldest winter days!

Translation – Running a heat pack for a week is the same as running the geothermal for a month!

100% system = Annual of COP of 4
80% with resistance “back up” = Annual COP of 2 or less!!!

20% resistance heat DOUBLES LENGTH OF SIMPLE PAYBACK!
"geothermal provides the best ROI of ANY investment…"

Up to 39% in year one!!!
(Using closed loop method)

...and our new Saving Account Program will give you 0.5% per year!

Compare the potential of a high ROI to interest on your bank savings account... or your investment portfolio lately!
Geo costs and benefits

SAVING OPERATING COSTS
40%- 80%

MAINTENANCE SAVINGS
30% - 50%

✓ Home/building resale – ½ Utility bill and Green!
✓ Aesthetics – Nothing on the roof or outside!
✓ System life – MTBF = 46 years (small)
19 years (large) source DOE by PRC corp.
✓ Safety – No Carbon Monoxide danger
✓ Up to 19 DIRECT LEED points!
Geothermal Heat Pumps Make a Better Environment!

- Dirty bird! - One Gallon of Fuel Oil = emission of 21 pounds of Carbon Dioxide to the Environment!
- “The CLEANER blue flame” - One Gallon of propane or CCF of Natural Gas = Emission of about 10 pounds of Carbon Dioxide to the Environment

But wait, there’s more!!!

Typical geo system reduces overall carbon by over 50%

ADD 11.6 # of CO$_2$ per gallon/CCF for TRANSPORTATION of fossil fuels to the home or business!
The Daddy of all federal tax credits!

RESIDENTIAL

- “30% of the entire geothermal install”
- Most N.E. states have utility rebates too!

COMMERCIAL

- “10% tax credit and 5 year accel. depreciation”
- USDA Rural Development Grants
- DOER tax credits for private owners and municipal designer/project leaders
Our system philosophy...

1. Highest efficiency install
2. Lowest first cost

We are focused on the WHOLE system
Thanks!

Martin Orio, AI
V.P. Business Development

Martin Orio, AI
President

www.northeastgeo.com

www.negpa.org

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