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Geothermal Exchange Organization

GEO Industry News

Scientific Research Shows That Geothermal Heat Pumps Outperform VRF Heating and Cooling

Dec. 15 – Definitive scientific research has shown that a geothermal heat pump (GHP) system offers far more efficiency in a large commercial building than a variable refrigerant flow (VRF)system.

In January 2013, the Geothermal Exchange Organization (GEO)—with financial assistance from Southern Company—contracted a research team from Oklahoma State University and Oak Ridge National Laboratory to evaluate the relative performance of GHP vs. VRF heating and cooling systems installed at the American Society of Heating Refrigeration and Air-conditioning Engineers (ASHRAE) International Headquarters Building in Atlanta, GA.*

When ASHRAE contracted a major renovation of their two-story, 31,000 sq. ft. building in 2008, they established a "living lab" to offer the chance to evaluate commercial building energy and sustainability performance. In addition to improvements to its envelope, floor plan and sustainability features such as lighting, the building uses three separate heating, ventilation and air-conditioning (HVAC) systems:

- A variable refrigerant flow system for spaces on the first floor;
- A geothermal heat pump system, primarily for spaces on the second floor; and,
- A dedicated outdoor air system (DOAS), which supplies fresh air to both floors.

The GEO research team studied the relative performance of the GHP and VRF systems, determining energy consumption of each, and heating and cooling required by the building. **"There's no question about it—GHPs trump VRF systems for efficiency and cost savings," said GEO President and CEO Doug Dougherty. "Our study of heating and cooling performance at the ASHRAE Building proves that over a two-year period—when all variables were accounted for—energy use by the geothermal system averaged 44% less than the VRF system."**

** ASHRAE provided data for this study, but the organization does not endorse, recommend or certify any equipment or service used at ASHRAE International Headquarters.*

The first-floor VRF system includes three dedicated split systems and two multi-zone inverter driven heat-recovery units. The multi-zone heat-recovery units are connected to a total of 22 fan coil units (FCUs). Cooling capacity of the heat-recovery units is 28 tons, while the three dedicated systems have an additional 10 tons of capacity. The second-floor GHP system includes 14 individual water-to-air heat pumps (two ¾-ton units, six 2-ton units and six 3-ton units) connected to a ground loop heat exchanger consisting of twelve 400-ft. deep vertical boreholes, for a total of 31.5 tons of cooling capacity.

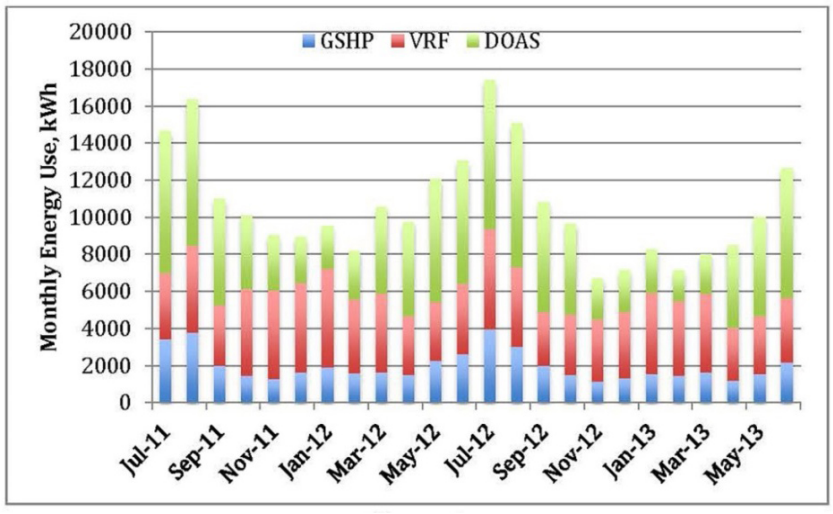
To facilitate efficiency studies like that performed by GEO, the ASHRAE Building renovation included an array of 1,600 sensors that monitor heating, ventilation and air-conditioning operations and conditions in each building zone.

Historical and current data from these sensors were available to the GEO research team, led by Dr. Jeff Spitler, Regents Professor of Mechanical Engineering at Oklahoma State University. His colleagues included Dr. Xiaobing Liu, Staff Scientist at Oak Ridge National Laboratory, and Laura Southard, Oklahoma State Mechanical Engineering graduate student. Southern Company provided the services of a power engineer to assist with onsite data measurements.

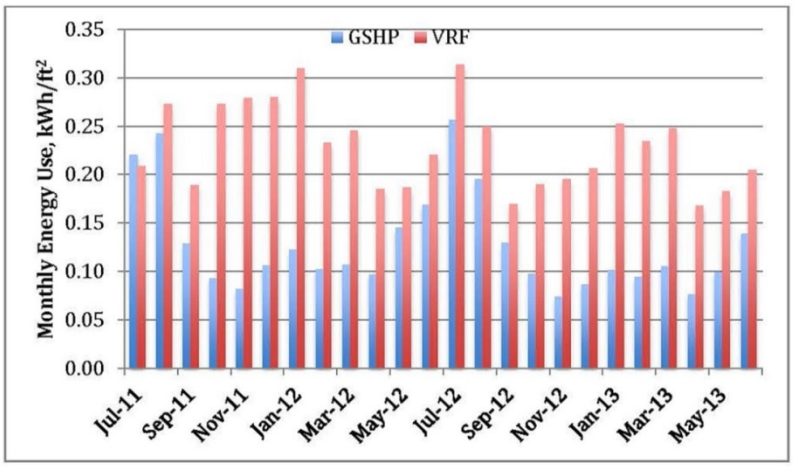
The researchers concentrated on determining actual heating and cooling provided by the GHP and VRF systems; data analysis; and computation of measured and experimental metrics. They collected two years of operational data (July 1, 2011 – June 30, 2013) for the HVAC systems. Data points included operating mode (off/heat/cool), zone temperature, and discharge air temperature for each individual FCU or heat pump. The researchers gathered data on ground-loop water supply, return temperatures and flow rates for the geothermal system.

The team also collected data for metered energy used by each system. For the GHP system, that included power for all 14 heat pumps, as well as the ground loop water circulation pumps. For the VRF system, power is metered and recorded only for the two heat-recovery units and the 22 FCUs connected to them. Power for the three dedicated split systems is metered through a different panel that also includes power used for computer servers and other equipment. All such differences were taken into account for comparison.

"Though the energy consumed by each system is affected by several factors—including floor space; heating and cooling loads; control strategies; and operating conditions/efficiencies—the efficiency implications of each system are clear," said Spitler. **"Raw data show that the VRF system used twice as much energy as the geothermal system during the two-year study period."** The areas served by the GHP and VRF systems have different heating and cooling loads, so the research team estimated heating and cooling loads for each as a combination of measured heat gains from lighting, plug loads, the DOAS , estimated occupant loads, and simulation-computed envelope loads.



Total monthly energy use by each HVAC system



Normalized monthly energy use per square foot

The graph at left shows that when differences in floor space were normalized, energy use (kWh/sq. ft.) by the GHP system was an average 44% less than the VRF system. "During the two-year study period, the GHP system used 29% less energy in the summer and 63% less energy in the winter/shoulder seasons than the VRF system, while maintaining similar zone temperatures," said Spitler.

"The underlying difference between the geothermal system and the air-source VRF system lays in the heat sink and source—ground vs. ambient air," Spitler explained. "Though the control strategy for the VRF system resulted in longer runtimes compared to the geothermal system, it is clear that ground loop water supply temperatures were more favorable than ambient air temperatures for heat pump operation. This allows the geothermal equipment to operate at higher efficiencies."

"Final Report, Performance of the HVAC Systems at the ASHRAE Headquarters Building" is available at the GEO website, here. Two peer-reviewed articles by Spitler et al. describing the project and its results were published this year in the *ASHRAE Journal* (September and December2014 issues). The articles can be accessed online at the ASHRAE website, here, and here. GEO will offer a free webinar about the research in early February 2015. (GEO)

Tax Extenders Bill Sent to Obama

Dec. 16 – At the last moment of their lame-duck session, the U.S. Senate passed a "tax extenders" bill and sent the measure to President Obama for signature. The legislation extends several business tax breaks through the end of this year (2014).

For the past several months, the Geothermal Exchange Organization (GEO) has actively urged passage of federal tax extenders bills, to reinstate and extend several incentives that expired on Dec. 31, 2013, but are important to the geothermal heat pump (GHP) industry. Mid-term elections pushed Senate action on the bills until the end of this year, and political wrangling over immigration and tax reform killed hopes for a 2-year extension already passed last summer by the House of Representatives.

A last ditch, single-year tax extender bill drafted by the House (HR 5771) passed by a 378-46 vote on Dec. 3. The Senate voted/concurred on the House bill with a vote of 76-16 on Dec. 16. The Obama Administration raised no objections to the legislation, so it is widely assumed he will sign it. For the time being, the measure retroactively extends (among other things) the following direct benefits to the GHP industry for the current year through Dec. 31, 2014:

Bonus Depreciation Taxpayers are allowed an additional (bonus) first-year depreciation deduction of 50% of commercial GHP system equipment that is placed into service after Dec. 31, 2013 but before Jan. 1, 2015.

Business-Related Expensing A taxpayer can deduct up to $500,000 per year for GHP equipment and other property used in a trade or business during calendar year 2014.

Energy Efficient Homes Contractors can take a credit for each new energy-efficient home used as a residence in calendar year 2014. The credit is $1,000 for new homes that meet a 30% reduction in annual heating and cooling energy consumption, and $2,000 for new homes that meet a 50% annual reduction.

Energy Efficient Commercial Buildings Section 179D is extended for calendar year 2014. A deduction is allowed for equipment installed in 2014 as part of a plan to reduce total annual energy and power costs for interior lighting, heating, cooling, ventilation and hot water systems by at least 50% compared to a building that meets minimum ASHRAE requirements. The deduction is $1.80 per sq. ft. for which the expenditures were made. It's allowed in the year the property is placed into service. Tribes and non-profits can allocate the deduction to the person responsible for designing a property. (GEO)

Michigan Bill Includes GHPs as Renewable

Dec. 2 – State Rep. Aric Nesbitt (R-66th District) introduced Michigan House Bill No. 5980, which will amend the state's Renewable Energy Standard—Michigan 2008 PA 295, the "Clean, Renewable, and Efficient Energy Act."

Michigan enacted Public Act 295 in October 2008, requiring the state's investor-owned utilities, alternative retail suppliers, electric cooperatives and municipal electric utilities to generate 10% of their retail electricity sales from renewable energy resources by 2015. In addition to renewables, the standard allows utilities to use energy optimization (energy efficiency) and advanced cleaner energy systems to meet a limited portion of the requirement.

HB 5980 includes geothermal heat pumps (GHPs) as part of its expanded definition of "Renewable Energy," making them available for utility Renewable Energy Credits:

- An energy source, "that naturally replenishes over a human, not a geological, time frame and that is ultimately derived from solar power, water power, or wind power. Renewable energy resource does not include petroleum, nuclear, natural gas, or coal. A renewable energy resource comes from the sun or from thermal inertia of the earth and minimizes the output of toxic material in the conversion of the energy…." Among other sources such as biomass, solar and wind energy, the new definition of renewable energy includes: **"Thermal energy produced by a geothermal heat pump."**

The measure's definition of "Energy Efficiency" calls it a means to reduce customer energy use through "installation of measures" and "changes in energy usage behavior":

- "A decrease in customer consumption of electricity or natural gas achieved through measures or programs that target customer behavior, equipment, devices, or materials without reducing the quality of energy services."
- **"A decrease in the total amount of electricity or non-natural gas [e.g. propane and fuel oil – Editor] consumed for an end use or end uses achieved through measures such as geothermal, including ground source, reclaimed water, or groundwater."**

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Michigan Electric Cooperative Association Director of Energy Efficiency Programs Art Thayer was instrumental in promoting HB 5980 in the State House. "Art worked hard to make sure that legislative language offered by GEO that specifies GHPs got into the bill," said Geothermal Exchange Organization (GEO) President Doug Dougherty. "Introduction of HB 5980 is a big step toward gaining utility involvement in the promotion and installation of GHPs, and expanding our markets in Michigan." (GEO)

GEO Wins Changes to Illinois TRM for GHPs

Dec. 17 – Following its successful effort to legislate recognition of geothermal heat pumps (GHPs) into Illinois renewable and energy efficiency laws, the Geothermal Exchange Organization (GEO) has been directly involved in an eight-month process to win revisions to the state's *Technical Resource Manual* (TRM).

"There were lots of contentious issues that needed resolution to ensure that GHPs got a fair shake in efficiency evaluations against their competitors," said GEO President Doug Dougherty. "But in the end, we got everything that we proposed. We hope it becomes a template for other states." GEO changes to the TRM include:

1) Allowing GHPs to replace gas furnaces and realize their rightful heating efficiencies, as a result of changing the law and redefining energy efficiency as reducing total Btus for an end use.
2) Increasing the life expectancy of GHPs from 18 to 25 years.
3) Decreasing the cost of GHPs to $3,957/ton.
4) Increasing the average cost of air-source heat pumps (ASHPs) from $1,203/ton to $1,936/ton.
5) Requiring savings calculations to be done at the site—not site and source.
6) Recognizing hot water production with a GHP desuperheater.
7) Allowing for cooling savings if the home did not have cooling before a GHP retrofit.
8) Using partial load EER and COP for efficiency calculations, resulting in GHPs being 1.8x more efficient than a 15 SEER ASHP. (GEO)

LI-GEO
Long Island Geothermal Energy Organization

Suffolk County Announces First Uniform Geo Code in New York State

Nov. 13 - Upon its inception, the Long Island Geothermal Energy Organization (LI-GEO) recognized the critical need for standardization of geothermal system designs and installations. One of several committees established early on in the organization's history was for Standards and Codes.

Independently, the Suffolk County Planning Commission (SCPC) decided to develop a fast-track permitting process for geothermal systems as it had previously implemented for solar and wind systems. Towards that end, SCPC contacted LI-GEO and together, the two organizations developed a draft model geothermal code framed around an initial code developed by the Town of Brookhaven, NY.

SCPC solicited input of key stakeholders on the draft model code, and LI-GEO incorporated the input received. The final code was adopted by SCPC on Oct. 1, and subsequently issued to various town and village municipal officials. During LI-GEO's annual conference convened on Nov. 13, SCPC Chairman David Calone and Suffolk County Executive Steve Bellone officially rolled out the model code.

The primary objective of the geothermal code is to help municipalities evaluate proposed geothermal systems in residential and commercial settings. It is designed to allow for a more streamlined application process, and thus more expeditious review and approval of permits to install geothermal systems that satisfy certain basic criteria—specifically system type and site conditions.

The model code applies to typical systems installed in "non-sensitive areas"—as defined in the code—which comprise the majority of situations in which geothermal systems are being installed on Long Island. It is important to note that the code does not exclude other types of geothermal systems or

installations at project sites that vary from the basic criteria. Situations not covered under the code will be addressed separately by the municipality. Access and review the model geothermal code here.

PSEG Long Island has committed to provide implementation assistance of $10,000 to each township and $5,000 to the first ten villages with a population greater than 5,000 in Suffolk and Nassau that adopt the model geothermal code by March 31, 2015. For more information on PSEG Long Island's implementation assistance, contact John Franceschina by email here, or by phone at: (516) 660-3049.

LI-GEO is planning a series of training and informational sessions on implementation of the code for municipal officials and others. Interested parties can contact John Rhyner by email here, or by phone at: (631) 406-9969. (LI-GEO)

Massachusetts Makes Renewable Heating Cheaper

Dec. 1 – A new law passed earlier this year in Massachusetts will make it cheaper to use renewable energy to heat a home, and better compete with fossil fuels used for heating and cooling. Senate Bill 2214's Alternative Energy Portfolio Standard requires meeting 5% of the state's electric load with "alternative energy" by 2020. It augments the state's Renewable Portfolio Standard.

The new law creates Alterative Energy Credits for production of thermal renewable energy used for heating and cooling. **This includes geothermal heat pumps**, solar panels, wood pellet stoves and boilers, and a range of technology that uses hot water, solar, biomass or other renewable energy forms to generate heat. The Massachusetts Department of Energy Resources will calculate the amount of energy generated over a 10-year period and award those credits upfront. The credits can then be sold to electricity suppliers. Money from the sale of the credits helps home or business owners to defray the cost of installing the heating and cooling technology.

The Massachusetts Forest Alliance was a major backer of the legislation because of its impact on the forest industry. With other thermal renewable interests, **the Geothermal Exchange Organization (GEO) was a major contributor to passage of the legislation.** Read the rest of the story here. (MassLive)

Massachusetts Offers Geo Incentives

Dec. 16 – As rulemaking for the state's new thermal renewable energy law proceeds (see previous article), the Massachusetts Clean Energy Center (MassCEC) recently added another round of incentives for homeowners interested in the efficiency and comfort afforded by geothermal heating and cooling.

MassCEC offers rebates of up to $12,500—based on system size—to eligible homeowners who install qualifying ground-source, or geothermal, heat pumps (GHPs). While GHPs require electricity to operate, efficient models use a quarter of the electricity compared to traditional electric heating.

Residents interested in ground-source heat pumps for their homes can learn more about the technology, then work with an eligible installer to determine if a system would work in their home. Installers will work with homeowners to determine eligibility for rebates, as well as navigate the application process. All applications must be submitted to and approved by MassCEC before the installation process begins to be eligible for a rebate.

To participate, installers must submit a completed version of the primary installer agreement below, along with their International Ground Source Heat Pump Association (IGSHPA) accreditation or three references to MassCEC. Installers are responsible for accurately filling out the application on behalf of residents, and should carefully review the program manual below to ensure that homeowners and equipment are eligible for rebates under this program. Complete information about the program for both homeowners and installers can be found here. (GEO)

Oregon Allows Open-Loop Geo

The Oregon Department of Energy has filed permanent rules for the state's Residential Energy Tax Credit program. The rule amendments go into effect on Jan. 1, 2015. Among other things, the rules allow open-loop geothermal heat pump systems. The rules also modify the tax credit chart and consolidate eligible costs into one section for all devices. For more information about the rulemaking, visit the Oregon Department of Energy online here. (ODOE)

To All of Our Friends in the Geothermal Community,

Happy Holidays and Best Wishes for a Prosperous New Year

The Board of Directors and Staff of GEO,
The Geothermal Exchange Organization

2015 Winter Conference & Expo

Registration is open for ASHRAE's 2015 Winter Conference in Chicago where attendees have the chance to discuss and examine the latest topics in the building industry, network; participate in technical tours; attend ASHRAE Learning Institute courses; earn professional credits; and obtain ASHRAE certifications.

The ASHRAE Conference takes place Jan. 24-28, Palmer House Hilton, while the ASHRAE co-sponsored AHR Expo is held Jan. 26-28, McCormick Place. Complete Conference information and registration can be found at www.ashrae.org/chicago, and Expo information at www.ahrexpo.com.
In keeping with ASHRAE's goal of continuing education, the Conference offers over 200 Professional Development Hours, as well as Continuing Education Units, which can be applied toward a Professional Engineering license.

The Technical Program features more than 100 sessions and 300 speakers over eight tracks: Systems and Equipment; Fundamentals and Applications; Industrial Facilities (new); Large Buildings: Mission Critical Facilities and Applications (new); Energy Efficiency; Life Safety (new); Design of Energy and Water Efficient Systems (new); Hospital Design and Codes (new). Specifically, the program features sessions on cold climate design, tall buildings, hospital and clean room design and data centers.

The ASHRAE Learning Institute (ALI) offers 20 professional development seminars and short courses to stay current on HVAC&R trends. Among them is a new course on Standard 202, ***Commissioning Process for Buildings and Systems***, in addition to updates to Standard 90.1, ***Energy Standard for Buildings Except Low-Rise Residential Buildings,*** and 62.1, ***Ventilation for Acceptable Indoor Air Quality***. Training topics include commissioning, energy management, Standard 55, ***Thermal Environmental Conditions for Human Occupancy***, energy efficient data centers, healthcare facilities, building energy audits, the coming smart grid and ground source heat pumps. Register at www.ashrae.org/chicagocourses.

Additionally, ASHRAE offers a special administration of all six certifications on Jan. 28: Building Energy Assessment Professional (BEAP); Building Energy Modeling Professional (BEMP); Commissioning Process Management Professional (CPMP); High-Performance Building Design Professional (HBDP); Healthcare Facility Design Professional (HFDP); and Operations & Performance Management Professional (OPMP). Register at www.ashrae.org/certification. Also offered are technical tours, which include Walgreens net zero geothermally heated and cooled store, a brewery, and McCormick Place.

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its more than 50,000 members worldwide focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability. Through research, standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today. More information can be found at www.ashrae.org/news.

Geo Dominates ASHRAE Technology Awards

Dec. 12 – The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) has selected a number of First Place winners for outstanding achievements by ASHRAE members and building owners who have successfully applied innovative building design. Their designs incorporate ASHRAE standards for effective energy management and indoor air quality, and serve to communicate innovative systems design. Winning projects were selected from entries earning regional awards. First place awards will be presented at the ASHRAE 2015 Winter Conference, on Jan. 24-28 in Chicago, IL. Among nine projects selected by ASHRAE, the following eight projects utilize geothermal (and water source) heat pumps:

Federal Center South – Building 12021 (Seattle, WA) Federal Center South is a three-story, 209,000-sq. ft. facility with the U.S. Army Corps of Engineers Seattle District as the exclusive tenant. The project used an integrated design approach that focused on energy conservation measures vs. expensive onsite energy generation strategies. The project includes use of ground-loop heat exchange piping in almost 50% of the building's grout-filled steel pipe piles that provide needed structural support for the building. These 100 tons of "energy piles" efficiently reject waste heat and extract heat from the ground. In the summer, waste heat is rejected into the ground as a priority over an evaporative fluid cooler to save both energy and water. In the winter, heat is extracted from the ground and elevated to useful temperatures for heating the building through the use of the heat recovery chillers. The ground loop heat exchanger improves the building's energy use intensity substantially, reduces the building's carbon footprint and saves water.

Janesville Ice Arena Addition and Renovation (Janesville, WI) The project included renovation of the existing 26,000-sq. ft. arena with the addition of 2,000-sq. ft. that included new locker rooms, an ice resurfacing melt pit and resurfacing equipment storage area. The original ice refrigeration system, installed in 1964, was a direct refrigeration system that used R-22 refrigerant circulated in piping embedded in the floor. The new system incorporates a pond-loop geothermal system to handle the high refrigeration needs of the arena. The system uses a city owned pond as thermal storage to pull and reject heat to the ice refrigeration system, which is made up of three water source heat pumps. The use of a pond loop geothermal system as it relates to an ice sheet refrigeration system is unique as the system takes advantage of the pond's ability to maintain relatively constant temperatures. The water-source heat pumps use R-410A refrigerant, which does not contain bromine or chlorine and is considered a non-ozone depleting refrigerant. The geothermal system transfers energy to and from the pond without burning fossil fuels.

Peace Island Medical Center (San Juan Island, WA) The 40,000-sq. ft., high-performance, critical access hospital and clinic contains 10 inpatient beds, emergency and imaging areas, surgery depart-ments and an ambulatory outpatient clinic with a cancer care center. Island resources are limited, which made sustainable choices vital and simple design necessary. The mechanical system was designed to use only electricity. The project employs numerous energy efficiency measures, including passive design

strategies for load reduction and natural ventilation; more efficient envelope; and orientation for controlled passive solar heat. Other measures include operable windows, a ground source heat pump, a variable air volume system and heat recovery ventilators.

Tacoma Center for Urban Waters (Tacoma, WA) The 51,000-sq. ft. lab facility focuses on receiving and analyzing water samples from the waterways of Tacoma and surrounding areas. Design features include heat recovery; energy efficient lighting; daylighting; natural ventilation; radiant floors; low-e glass and exterior operable shading; variable air volume low flow fume hoods; low-flow plumbing fixtures; rainwater harvesting; "green" roof; and energy efficiency HVAC&R components. One of most innovative features is a geoexchange system that uses the relatively constant temperature of the earth as an ideal medium to either reject heat from the building in the cooling cycle, or draw energy from the earth for heating the building. The geoexchange ground loop will last the life of the building without requiring replacement.

Valley Middle School (Snohomish, WA) A directive from the school district was to make the building as energy efficient and maintenance-friendly as possible. A ground-source system sized for 100% of the central plant heating and cooling capacity was selected. A water-to-water heat pump allowed the design team to utilize displacement ventilation, which requires very tight discharge air temperature control to maintain occupant comfort. An energy management system (EMS)-based energy dashboard system with touch screen monitors at multiple locations allows staff and students to learn about the sustainable features of the building. The project saw a reduction in greenhouse gas emissions of 530 metric tonne carbon dioxide equivalent reduction based on Northwest region utility average emissions and 1,079 metric tonne carbon dioxide equivalent reduction based on national utility average emissions.

Wayne N. Aspinall Federal Building and U.S Courthouse (Grand Junction, CO) The project converted a 1918 landmark into one of the most energy efficient, sustainable historic buildings in the country. To meet aggressive performance goals—including energy independence and energy efficiency—design included a photovoltaic array; innovative insulation; solar film storm windows; a hybrid heating and cooling system tied to a 32-borehole geoexchange loop; and a dedicated outdoor air system with evaporative cooling and heat recovery.

Westhills Recreation Center (Langford, BC – Canada) The 75,000-sq. ft. recreation facility includes a National Hockey League-size indoor ice rink; an outdoor ice rink; a skating trail joining the two together; a bowling alley; offices and a restaurant. The mechanical system for the three ice surfaces are integrated into the building HVAC system to the extent that no fossil fuels are used for the facility other than in the kitchen. The outdoor rink offers an interesting energy balance opportunity in winter by providing additional rejected energy during the heating season. Even with the extensive use of energy, only 40% of the waste energy is required within the complex. The remaining 60% is pumped 400 yards to the growing Westhills housing development as an energy source for their household heat pumps. The project turned a typical arena subfloor heating system into an enhanced geothermal field. It's the first in North America to use new ultra high-efficient reciprocating compressors, and the first total integration between an ice facility and an entire community. The center also is the first in North America to utilize ammonia heat pumps to heat a housing community and is one of only a few ammonia based air conditioning systems. (ASHRAE)

Taurus Whisper Valley Net Zero Housing Project Relies on Geothermal

Taurus Development (Munich, Germany) has started construction on the nation's first net-zero energy, master planned community at Whisper Valley, in Austin, TX. The 2,224-acre project will offer 7,500 detached and apartment units and more than two-million-sq. ft. of retail and office space, with parks, swimming pools and schools. With attention to sustainability and minimal environmental impacts, a third of the project's land has been set aside for green spaces and waterscapes.

Along with other elements, this concept includes connection to a geothermal circulation system. In addition, every house will be fitted with geothermal heating and cooling systems, solar panels and energy-saving household equipment and water heating.

As the "greenest city in the United States," Austin has introduced stringent environmental regulations affecting new construction projects. Starting in 2016, all new builds in the city will have to meet a stringent new zero-energy standard. The Taurus Whisper Valley Project has been setting standards that meet the new legal requirements a full year ahead of their introduction.

According to a Taurus report, "The regulations for new builds introduced in Austin present both a challenge and an opportunity. On the one hand, project developers who lack 'green' expertise will be denied entry to the market. On the other hand, project developers who can make sustainable concepts affordable through technical solutions and innovative financing structures have a clear competitive advantage."

"Installing these modern building systems entails no additional installation costs for home-buyers," Taurus continues. "Buyers pay the extra costs in the form of a monthly payment of US$180 to $220, an amount that even includes the maintenance of the equipment. At the same time, thanks to their minimal energy usage, homeowners save from $150 to $250 per month. This means that the extra costs are more than offset by reduced energy bills. Taurus's new financing concept makes high initial investment for ecological housing a thing of the past, making 'green' housing with prices between $175,000 and $300,000 affordable for a broad segment of the population." More information about Taurus Development can be found here. (Taurus)

Notice of Public Review – Bi-National Standard

A 60-day public review of the Bi-National (U.S./Canada) C448 Standard for the design and installation of ground-source heat pumps for commercial and residential buildings began on Dec. 16. If you would like to comment, you can access the draft document here. You must register to view or comment on the draft. The Standard covers minimum requirements for equipment and material selection, site survey, system design, installation, testing and verification, documentation, and commissioning and decommissioning. It applies to:

- Direct expansion ground source heat pumps for systems using ground heat exchangers as a thermal source or sink for heating and/or cooling, with or without a supplementary heating source.
- Unitary single package or split system, liquid source and ground source heat pumps for all systems using groundwater, submerged heat exchangers, or ground heat exchangers as a thermal source or sink for heating and/or cooling, with or without a supplementary heating source.
- Standing column wells, thermal energy storage systems, and to both new and retrofit installations.

RFP for Geo Consulting and Monitoring in Massachusetts

The Massachusetts Clean Energy Center (MassCEC) and the Massachusetts Department of Energy Resources (DOER) seek consulting services in the following areas: ground-source heat pump (GSHP) engineering, design reviews and miscellaneous technical services; residential GSHP inspection and commissioning; and installation of performance monitoring equipment on select residential air-source heat pump (ASHP) systems, GSHP systems, and small pellet boiler (SPB) systems.

Since 2012, MassCEC and DOER have worked closely to develop and administer $6 million in pilot programs supporting woody biomass, high efficiency heat pump and district energy technologies at both the residential and commercial scale. Imperative goals of the programs include ensuring the installation of properly designed equipment and collecting accurate and relevant data on system performance.

Applicants may submit proposals to fulfill one or more of the following roles:

- **Design Review** Residential- and commercial-scale ground-source heat pump engineering and design review and miscellaneous technical services;
- **Inspections and Commissioning** Residential ground-source heat pump inspection and commissioning; and/or,
- **Metering and Monitoring** Installation of performance monitoring equipment on selected projects funded through the Residential Ground-Source Heat Pump Pilot Program, the Residential Air-Source Heat Pump Pilot Program, and the Small Pellet Boiler Program.

MassCEC encourages firms to apply for one or more of these roles. Multiple contractors may be selected for these roles. Through this *Request for Proposals*, MassCEC and DOER seek statements of qualifications, proposed work plans and budgets from individual companies or teams that can assist MassCEC in performing the roles identified above.

Program Documents

Heat Pump Consulting and Monitoring Services

Consulting Services RFP Posted Questions and Responses Updated 8-20

Questions? Email here. Website here.

Save the Date! **BSU Geothermal Conference**

Ball State University (Muncie, IN) will convene *GEOCON III: The Challenges and Benefits of Geothermal Retrofits of Existing Buildings*, at the Assembly Hall, Ball State Alumni Center, on April 8, 2015, from 8:00 a.m. to 5:00 p.m. A preliminary agenda includes speakers Wendell Brase (University of California-Irvine), Sue Hall (Climate Neutral – Oregon), David Tulauskas (General Motors Director of Sustainability) and Mark Orlowski (Sustainable Endowments Institute – Boston). **Save the date, and look for updates in *Geothermal Industry News*.**

EPA Says OSU a Green Power Leader

Dec. 3 – The U.S. Environmental Protection Agency (EPA) selected Oklahoma State University (OSU) as one of only four organizations nationwide to receive its Green Power Leadership Award for use of green power practices and technologies. OSU is also the only educational organization recognized this year across all categories. The award honors the country's leading green power users for their commitment and contribution to helping advance the nation's voluntary green power market. EPA officials presented the award to OSU on Dec. 3 at the 2014 Renewable Energy Markets Conference in Sacramento, CA.

OSU's Stillwater campus has documented that 72% of its total electrical need was provided by wind-generated power in 2013, making it one of the most energy efficient universities in the nation. OSU also has saved more than $32 million since July 2007 through a behavior-based energy conservation program across all five of its campuses.

A leader in geothermal technology, OSU is home to the International Ground Source Heat Pump Association (IGSHPA), established in 1987 to promote geothermal technology worldwide, and to train accredited installers. Geothermal heat pumps currently provide heating and cooling in two OSU Stillwater buildings: the Campus Recreation Annex and the Mechanical Engineering Petroleum Lab. Two more buildings undergoing renovation and construction—the Veterinary Medicine Administration and a Civil Engineering Lab—will also incorporate geothermal systems. The four buildings will provide 80,600-sq. ft. of space on the Stillwater campus that is heated and cooled with geothermal technology. The Health Sciences Center at OSU-IT in Okmulgee and the Engineering Technology Building at OSU-OKC also utilize geothermal technology. Read the article here. (*Stillwater News Press*)

Village Bakery Goes "Greener" with Geo

Dec. 14 - With energy provided by solar, wood, and now geothermal, Village Bakery and the Della Zona Pizzeria may be the "greenest" place in Athens, OH. A geothermal heat pump system is the latest step toward environmental progress at the two adjacent buildings. The system was installed to handle heating and cooling needs.

Because of limited lot size, the bakery contractor drilled a deep vertical loop system, which requires less surface area than a horizontal system. Five heat exchangers were buried in 300-ft. boreholes under the parking lot behind the East State Street bakery. The heat exchangers are filled with water and antifreeze that is pumped through the closed-loop system, transporting heat energy between the ground outside and the heat pump unit inside.

So why is a geothermal, or ground-source, heat pump so energy efficient? Compared to a standard air-source heat pump, it takes significantly less energy to extract heat from the 55° (F) underground than, say, from 25° outside air. Similarly, it requires less energy to reject heat energy back into the moderate temperature ground than into 90° air for summertime cooling. These systems also can provide cheap water heating in the summer, using excess heat from the heat-exchange process.

The cost of the geothermal system was nearly $37,000, with a little over $9,000 from a Rural Energy for America Program grant. The outlay also will be softened with a federal energy tax credit that Village Bakery will be applying for this year. Read the rest of the story here. (*The Athens News*)

Seward, Alaska Looking at Geothermal for City Buildings

Dec. 12 - The Seward (AK) City Council took an important first step toward implementing renewable energy in Seward, authorizing $48,000 to develop an economic evaluation for heating the Seward Museum Library and City Annex (former Seward Library) buildings with geothermal energy. When constructed, the district heating loop project would replace the oil boiler systems in those buildings with a geothermal loop system leading from underground boreholes drilled on city land near the edge of the Seward waterfront.

City frontage along Resurrection Bay currently used for recreation and camping during the tourist season lie above water-saturated deep alluvial deposits that are believed to have strong potential for installing vertical ground loop fields. Vertical ground loops up to 300-ft. deep, can be warmed by ground and ocean heat from the bay without the challenges of directly pumping sea water. People using the waterfront would barely notice a physical difference. Seward's Alaska SeaLife Center already utilizes a unique seawater heat pump system that has replaced a costly, less efficient boiler heating system. Read the article here. (*Seward City News*)

HERO PACE Program in California

Nov. 17 - Forty-two cities and counties across California have officially launched the HERO Property Assessed Clean Energy (PACE) Program, which enables homeowners and commercial property owners to pay off energy- and water-efficiency improvements through their property tax bill. The HERO Program has now been adopted by more than 200 communities in the Golden State since launching in December 2011. HERO now serves 44 percent of households in California. It has helped fund more than 20,000 residential efficiency projects, totaling more than $375 million in financing. By funding projects, the program has also helped to create more than 3,000 local jobs. Learn more here. (PRNewswire)

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