



Canadian
GeoExchange
Coalition

Coalition
canadienne
de l'énergie
géothermique

3rd National GeoExchange Business & Policy Forum

**November 17-18, 2008
Fairmont Royal York
Toronto, Ontario**

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The following conference abstracts were written by Doug Martin (Seneca College) and Martin Stewart (University of Waterloo). The goal was to capture key messages from each presentation that in our opinion would help non-attendees decide if they wished to learn more by accessing the presentation or the presenters. The complete presentations are available for download from the CGC web site http://www.geo-exchange.ca/en/national_conference.php

Please email any comments or corrections to these conference abstracts to doug.martin@senecac.on.ca and stewartgeoscience@gmail.com and copy to sophie.martin@geo-exchange.ca

Conference Attendance

The Conference registration lists 210 individuals, representing 132 organizations. These organizations included eight college or universities and ten government (Federal or Municipal) organizations, in addition to equipment and product suppliers, designers, installers, trainers, software vendors and consultants.

The attending organizations geographically originated from Ontario (55), Quebec (22), British Columbia (8), Alberta (9), Manitoba (3), Nova Scotia (2) and Saskatchewan (1). International attendees were from United States (11), Sweden, Korea, Palestine and the Czech Republic.

Monday, November 17 – DAY 1

Proceedings by Doug Martin, Seneca College

Welcoming Remarks

Ted Kantowitz opened the National GeoExchange Conference. Mr. Kantowitz described the CGC accomplishments, highlighting the educational programs that have trained 2500 industry practitioners.

Mr. Allan Clarke of NRCAN reviewed the Federal Government objectives and funding envelopes from the Federal Government of Canada, ear-marking 500K\$ for infrastructure and training programs in geexchange industry.

9h30 – 10h00

Marc Rosen, UOIT **The Canadian Strategic Research Network on GSHPs**

Marc Rosen reviewed the design parameters of the UOIT (Ontario's newest university) campus heat pump system:

- 387 boreholes of 200 meters
- 40% reduction of heating costs, 16% reduction for cooling
- 3-5 years payback for HVAC system.

Mr. Rosen outlined the six key research and technology objectives of his proposal. He presented an unfunded 5-year, 6 million dollar research proposal for a national network of 28 lead researchers from 17 universities, focusing on Ground Source Heat Pump technologies and the associated tools, skills, policies, standards, enterprises and collaborators.

FULL PRESENTATION:http://www.geo-exchange.ca/en/UserAttachments/flex562_Marc%20Rosen%20-%20The%20Case%20for%20a%20Canadian%20Strategic%20Research%20Network%20on%20Ground-Source%20Heat%20Pumps.pdf

10h30 – 12h00 Building on the Past & Forging the Future

Bill Humber and Tim Lucas, Seneca College **The challenge of integrating geexchange training into colleges curriculum**

Bill Humber introduced the Seneca degree programs in sustainable buildings, which represent the “demand side” for energy systems and solutions. He introduced his current focus on concepts of *revitalization*, which advocates enhancing and extending building and other assets as an important aspect of *sustainability*.

Tim Lucas described two distance-learning courses (GET100 on “Basic Principles of Geothermal Energy Systems”, and GET200) from Seneca’s adult-education programs, which are suitable for entrepreneurs, do-it-yourselfers and new hires into HVAC businesses.

FULL PRESENTATION: N/A

Denis Tanguay, Canadian GeoExchange Coalition National Marketing Campaign

Denis Tanguay summarized the key CGC results to date:

- Over 2600 trained individuals
- 600 accredited practitioners
- 200 qualified companies
- 3000 CSA compliance reports in 2007/2008

Mr. Tanguay announced CGC National Marketing Campaign initiatives:

- A national TV Weather Channel/MétéoMédia advertising program – an affordable TV advertising program for regional advertising, customizable by individual CGC members.
In Phase one, advertisements introducing and branding CGC & geoexchange technology will run for two weeks during the Christmas season.
In Phase two, CGC members can add their 20 second customized messages which will then broadcast in their market regions, typically 36 times per week, over four months.
- Residential and Commercial Information Guides
- Website updates and revision
- Financing channels arranged for CGC members and clients

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex565_Denis%20Tanguay%20-%20CGC%20National%20Marketing%20Campaign.pdf

13h30 – 15h00 Municipal leadership & Policy Initiatives

Gary Wilde, The Regional Municipality of Peel Heating and Cooling with Municipal Potable and Non-potable Water

Mr. Wilde presented the challenges and opportunities of using constant-temperature water supply which is pumped from Lake Ontario, for the heating and cooling of civic buildings in one of Canada's largest municipalities. Most importantly, such heat exchanger designs must comply with all safety and regulator standards for public potable water systems, including bacterial or other contamination, chlorine changes and environmental impacts on Lake Ontario. An alternative approach is to use non-potable, flushing water flows.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex567_Gary%20Wilde%20-%20Heating%20and%20Cooling%20w%20Municipal%20Potable%20and%20Non-Potable%20Waters.pdf

Eleanor McAteer, City of Toronto Outlook of geoexchange and community energy planning

Eleanor McAteer described the scale of the Greater Toronto Area:

- 2.6 million people (by 2030, increasing 500,000)

- 1.3 million employees
- 116 million square feet of office
- 1.0 million residences
- 5000 MW peak electrical demand, currently limited by transmission capacity (with a 2012 civic goal of reducing this demand by 500 MW)

Ms McAteer described several funds, subsidies, projects, community group initiatives, building standards, etc., that are planned or in process that will deliver cost-reduction and other benefits. Ms. McAteer described the City's relationship and preliminary intentions around geoexchange.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex576_Eleanor%20Mcateer%20-%20GeoExchange%20and%20Toronto%20Community%20Energy%20Planning.pdf

Thomas Melymuk, City of Pickering
Outlook of geoexchange and municipal sustainable planning

Thomas Melymuk described the Ontario city of Pickering:

- 95,000 people
- 30,000 employees (30% working in energy and environment areas)
- home of the Pickering nuclear plants of Ontario Hydro

Mr. Melymuk outlined the processes intended for designing and developing the Seaton Community sustainable zone within Pickering, and the role and potential of geoexchange.

FULL PRESENTATION: Available by contacting Sophie Martin at sophie.martin@geo-exchange.ca

15h30 – 17h00 District Energy & Sustainability

Jan Buijk, WADE Canada
The use of reciprocating engines in conjunction with thermal energy storage systems

Jan Buijk explained how gas-fueled reciprocating engines can generate electrical power and achieve thermal efficiencies approaching 100%, using cogeneration, energy storage sub-systems, community space-heating systems (such as are used for 95% of Copenhagen buildings and for 60% of all Denmark buildings) and by building systemic community infrastructures integrating transport, energy (wind, solar, other systems) and water/sewage systems. Integrated community systems must be encouraged by national strategies, policies, financial incentives and publicity programs.

Mr. Buijk presented the following implemented examples of such integrated systems:

- Sobey's distribution buildings in Vaughan, Ontario. (Natural gas fuel, 2.4 MW, 42% thermal efficiency.)
- Villa Colombo retirement home emergency generator. (335 KW, 1.4 MBtu thermal, 83% thermal efficiency.)

- Ontario Police College. (Tri-generation system, 848 KW, 87% thermal efficiency using thermal storage tanks.)
- Greenhouse, using waste CO₂ GHG for fertilization. (12 MW thermal, water heat storage of 48.2 MBtu , 93% efficiency.)

Mr. Buijk noted that about 15 Ontario greenhouses are reverting to using coal for their space heating at this moment due to cost issues.

FULL PRESENTATION: Available by contacting Sophie Martin at sophie.martin@geo-exchange.ca

Louis Marmen, Canadian Gas Association
Urban Integrated Energy Systems: Addressing the 2050 Energy and Environmental Challenge

Louis Marmen described the strategic goals of QUEST (Quality Urban Energy Systems of Tomorrow), a non-government collaborative organization which focuses on how Canadian communities can systematically improve their sustainability in energy, green house gases (GHG) and other aspects. (QUEST developed these goals from workshops and a process using engaged individuals and enterprises. Further workshops are scheduled.)

The key metrics to be managed downwards over time are:

- GHG/Energy (the intensity ratio of Canada's green house gas emissions, divided by Canada's energy usage in joules, watt-hours or Btu's).
- Energy/GNP (the intensity ratio of Canada's energy consumption, divided by the Gross National Product in dollars).

Mr. Marmen presented some of the implementation methods available to achieve these metrics, including zero GHG energy production methods, systems to extract maximum output from all heat sources, particularly in urban applications and environments and geexchange.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex579_Louis%20Marmen%20-%20QUEST%20-%20A%20Collaborative%20to%20Accelerate%20Integration%20of%20Energy%20Systems%20in%20Canadian%20Communities.pdf

Ronald Gagnon, Concept-R Inc.
The source : a different approach.

Ronald Gagnon's dynamic pitch began with the observation that heat pump system design challenges are dominated by the capital costs of ground loop heat. Mr. Gagnon went on to describe his implemented solutions:

- Municipal Town Hall in St. Sauveur des Monts. (1440 square meters, 3 million dollars building, occupied September 2007, annual energy inputs of 0.524 GJ/square meter and lighting metrics of 13.1 W/meter.

The vertical double loops of the heat pump system were embedded in 36 building

piles of thermal concrete, to 27 meters. This novel approach concerned the concrete foundation trades, but posed no construction difficulties or costs.

- Town Hall in Bas Richelieu, Quebec, nearly complete. (35 ton HVAC GeoExchange system, using a storm drain access to the St. Lawrence river for a heat source, and geoplate heat exchangers installed on a marine dock.)

A “Canadian tunnel” (terminology originating from Europe) of a 62 meter tunnel buried 2 meters below grade to pre-heat or cool building air, with seasonal benefits of about 7 degrees Centigrade above/below ambient air temperature.

FULL PRESENTATION: Available by contacting Sophie Martin at sophie.martin@geo-exchange.ca

Tuesday, November 18 – DAY 2
Proceedings by Martin Stewart, University of Waterloo

8h00 – 9h00 Business Challenges

John Robinson, UBC

Designing of sustainable buildings: The centre for interactive research on sustainability (CIRS).

Dr. Robinson outlined plans for construction of the Centre for Interactive Research on Sustainability (CIRS) at UBC, with the vision to install the “most advanced high performance building in North America”. In order to achieve leadership in sustainable development Dr. Robinson is designing development and research around three interconnected fields:

1. Building design and operations
2. Visualization, simulation and community engagement
3. Partnerships and strategies for regional implementation

The building will be designed paperless, and will be built completely of wood and other sustainable materials. Environmental conditions within the building will be under the collective control of its users, while all energy usage and waste will be continuously monitored and recorded for study and optimization. “Plug and play” adaptability will be designed into the building to allow it to change with usage and occupancy with minimal long term consequences to sustainability.

They considered several possibilities for HVAC design of the structure. Geexchange was looked at initially to provide the primary source of heating and cooling load. It was discovered for much less capital cost waste heat could be captured from a neighbouring building, thus offsetting waste from one building to the gain of the CIRS centre. Overall they expect the building to provide a net negative contribution to carbon emissions on campus and may reduce the campus’ carbon footprint by as much as 45 t of CO₂ per year. Despite the significant technological advances and complexity of design, they expect the building could be constructed at or below the cost of an equivalent structure built by traditional design and materials, while providing an excellent laboratory for sustainability in the community.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex581_John%20Robinson%20-%20Designing%20Sustainable%20Buildings%20and%20Beyond.pdf

Jim Bererton, Stantec

Optimizing the balance between geothermal and solar in single residence applications

Using schematic hybrid solar-geothermal design and TRANSYS thermal modeling software, optimization studies were carried out to weigh the economic benefits of using solar, geothermal or conventional high efficiency heating of a home versus a hybrid of those systems. Overall, the findings point to the use of one of those end-members alone as the most

cost effective means of heating a house. Which end-member is best depends on the economic and capital cost conditions available to the user.

The schematic system incorporated a main collection tank tied to flat plate and vacuum tube solar arrays as well as a ground source heat exchanger. Heat collected from the outside loop by heat exchanger first services the high temperature direct hot water tank, then a second medium temperature tank for space heating. Finally any residual heat was dumped to a solar thermal storage tank for future use. The study was carried out for climate conditions equivalent to Calgary, Alberta which resulted in solar heating being a heavily favoured system economically.

Given higher solar install costs and lower geothermal costs, the balance can shift to geothermal while a hybrid system does not appear optimal in any case. Results show that determining the optimal heating system or hybrid system depends strongly on site-specific cost and performance measures. An optimal solution could be any combination of the three, solar, geexchange, conventional or one of the three alone. Though not included in such modeling, capitalization and taxation strategies can have significant impact on the cost effectiveness over the lifetime of the chosen heating design.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex583_Jim%20Bererton%20-%20Optimizing%20the%20Balance%20Between%20Geo%20and%20Solar%20Systems.pdf

9h00 – 10h30 Case studies – Learning from experience

Brian Beatty, Geoenergy Solutions Inc. Innovative large-scale GX system in Ontario

One of the largest capital costs and hence highest risk aspects associated with installation of large-scale geoexchange systems is the design and installation of vertical boreholes and borehole fields. Brian Beatty took us through the risks associated with various stages of design and installation of large-scale GX systems in Ontario.

Design of any system begins first with the calculation of energy loads followed by site mapping and testing to determine how to facilitate the supply of those loads. To supply heating/cooling loads require analysis of ground conditions through compilation of geologic, groundwater and aquifer maps. Larger scale installations generally require test drilling and ground temperature and conductivity measurements to mitigate the risk of sufficient ground installations to meet the supply need.

Borehole thermal energy storage (BTES) systems require their own unique design considerations to allow heat and cold storage while minimizing loss to groundwater constraints. Key considerations for standing column wells include uniform bedrock geology and the presence of a single aquifer with good quality water. Limitations can include the presence of hydrocarbons (oil and/or gas) in the subsurface, poor quality groundwater and low thermal conductivity bedrock.

Significant risks associated with drilling during installation are difficult in unexpected ground conditions. Canada provides a diverse array of ground conditions that can affect the implementation of GX systems. A variety of options for rig mobilization, drilling speed and efficiency, borehole loop, backfill and header design are available to the installer today to best tackle the local ground conditions. Experience and local expertise are a requisite for efficient, safe and proper installation and completion of the ground loop. Drilling and installation of large-scale GX systems is in its infancy in Canada, while future demand is expected to exceed the supply of trained and experienced drill contractors.

FULL PRESENTATION: Available by contacting Sophie Martin at sophie.martin@geo-exchange.ca

Mike Millard, Southern Comfort Mechanical
The Albert's Lake subdivision: First residential geothermal installation by a First Nation's community in Canada

Mike Millard walked us through the installation of GX at the Albert's Lake subdivision in Cross Lake Manitoba, which has been recognized as the first residential geoexchange installation by a First Nations community in Canada. Working in such communities presents its own challenges and rewards to the installer and benefits the community not only in increased energy efficiency and sustainability, but can empower local community members through developing skills and trades in construction and installation.

Rowhouse construction was chosen for the community to cut down on construction costs while making better use of limited land, as the community tries to mitigate a severe housing shortage. Slab or grade construction allowed the use of embedded heat coils for radiant heating of the house while eliminating the need for a crawlspace and requisite sump pump. Heat recovery ventilation is added to increase efficiency and minimize heat loss. The ground loop comprises horizontal slinky construction laid flat on conductive granite bedrock in a trench backfilled with the local moist mulch overburden. Unique ground conditions required the use of some dynamite to assist in ground preparation.

Extreme winter conditions presented a unique challenge overcome by erecting temporary cover-all shelters which could be later reused for community needs. The installed floor loops were utilized using temporary boilers to heat the workspace during construction, minimizing construction heating costs and safety risks associated with the use of propane heating. The unique climate challenges and remote location were turned into opportunities to innovate in construction methods as well as spawn opportunities for the community. They anticipate collaborating on future developments through partnerships with other bands and acquisition of CGC accredited training and skills for maintenance and business development.

FULL PRESENTATION: <http://www.southerncomfortmechanical.ca/geothermal.htm>

Click on Downloads & Media

Click on Cross Lake Band Presentation

Rob Andrushuk, Manitoba Hydro
Monitoring field performance of residential geothermal heat pumps

Rob Andrushuk presented results from a multiyear study monitoring the performance of installed geexchange systems in 10 different homes across Manitoba. This study was undertaken to support Manitoba Hydro's position that geexchange technology in the province is a viable and economic alternative to heating homes. He was clear to point out that they were not "looking for disasters", but merely sought to collect data on energy usage and cost savings associated with existing geexchange systems. Comprehensive monitoring of the whole house as well as the various components of the ground loop and exchange pumps and auxiliary components demonstrated varying levels of efficiency, but successfully supplied all but approximately 1% of the annual heating needs for the homes (the remainder taken up by auxiliary heaters).

As to be expected, the field monitored SCOP was generally lower than manufacturer's CSA COP ratings due to efficiency losses external to the pumps (air duct and ground loop resistance). Various loop configurations deviated very little from the average entering temperature of 36 degrees, except for the one open loop studied which benefited from temperatures up to 44.9 degrees. The geexchange systems studied provided an average 18% savings to hot water heating costs, 86% of which was attained while in heating mode. This contributed to an overall reduction in average energy use by 613 kWh.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex585_Rob%20Andrushuk%20-%20Monitoring%20Field%20Performance%20of%20Residential%20Geothermal%20Heat%20Pumps.pdf

11h00 – 12h30 Technology and Innovation

Erik Thorsteinen, Natural Resources Canada
Preliminary findings from a borefield thermal storage experiment

Results from an experimental borefield thermal storage site were outlined by Erik Thorsteinen from the CANMET Energy Technology Centre. Researchers from the centre believe that this technology may be compatible for storing heat energy from cogeneration, microcogeneration and ground source heat pumps. A dual zone borefield was installed to minimize heat loss by injecting and extracting high grade heat from the core of the borefield while lower grades can be accessed from the outer zone.

Although cold storage needs additional work, heat storage was demonstrated to provide direct heat at temperatures greater than the heat pump capacity, while the heat pumps could be operated with greater efficiency. They found that cogeneration must be run as much as possible to maximize efficiency by providing more waste heat to the borehole field and returning more payback by feeding electricity back into the grid.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex587_Erik%20Thorsteinson%20-%20BTES%20of%20CoGen%20Waste%20Heat.pdf

Carlos Jurado, Career Bridge
Effect of a GX system on ground water geochemistry.

Carlos Jurado provided a unique perspective on the environmental impact of heating groundwater from geexchange. The risk associated with geexchange systems and groundwater is that changes in temperature affect the chemical balance found within that water and the soil containing it. Carlos' study used chemical data from two well studied aquifers in Southwestern Ontario: the Mannheim aquifer in Kitchener-Waterloo and the Yonge street aquifer from Aurora-Newmarket.

Through the use of standard water chemistry software, he was able to show that changes in temperature had little effect on the acidity of the groundwater, but does effect the oxygen balance substantially. Carlos demonstrated that this imbalance from increasing groundwater temperatures in the vicinity of the geexchange loop can have two deleterious effects: one being the potential for scaling (precipitation of calcium, magnesite, dolomite depositing on and around the borehole), and the second being the potential to dissolve iron-bearing minerals (e.g. bernalite) within the soil. While dissolving pure phases of those minerals is not a significant problem, in some localities those iron minerals also carry toxic elements such as arsenic or antimony which would dissolve at the same time. While harmless left alone in the soil, once dissolved into groundwater, these elements can be carried to nearby drinking water wells where they become a health concern to the public.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex589_Carlos%20Jurado-%20Modelling%20TES%20in%20Closed%20Loop%20Potential%20Aquifer%20effects.pdf

Bill Wong, SAIC Canada
Market factors and potential applications of Aquifer Thermal Energy Storage (ATES)

Bill Wong outlined to the audience why he believes that Aquifer Thermal Energy Storage (ATES) may have significant potential to supply renewable heat energy to the public and a new market for geexchange technology in Canada. Multiple factors supporting implementation of this technology include:

1. concern about the potential for global warming from conventional energy sources,
2. long-term increases in the price of fossil fuels,
3. emerging new utilities with non-traditional roles,
4. receptive regulatory environment,
5. technological advances and
6. improvements in energy efficiency

The use of ATES technology can help ease the stress on overstretched electrical infrastructure which is crippling our major urban centers. This technology is well suited for balancing

commercial heating and cooling loads as well as for high density residential infrastructure loads.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex591_Bill%20Wong%20-%20ATES%20and%20Market%20Factors.pdf

13h30 – 15h30 Market analysis: A global perspective

E.J. Lee, Korea Institute of Energy Research Survey of markets in Asia

Although only in its infancy, Dr. Lee describes the geexchange industry in Korea and East Asia as a growing technology that is being actively supported by government agencies as a source of renewable energy. To 2006, the industry was dominated by smaller installations focusing on residential applications, but has since become a focus for larger construction firms building high-rises and commercial buildings. The Korea institute of energy research has taken an active role in monitoring the industry and studying the technology to help it move into the future. Korea has a small but growing manufacturing base for heat pumps and related technology. With increased demand, major manufacturing firms such as Samsung, LG, etc., may move into the industry, bringing Korea into global competition with companies in North America and elsewhere.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex593_EJ%20Lee%20-%20Survey%20of%20Markets%20in%20Asia.pdf

Khaled Alsabawi, MENA Geothermal Ltd. Survey of markets in the Middle East

Khaled Al Sabawi's enlightening talk highlighted to the audience his efforts to bring geexchange technology to the Middle East and North Africa regions. Despite the low latitude location, these countries still have substantial heating needs in winter as well as cooling needs during the hot summers. Khaled is using the first geothermal system to be installed at UCI headquarters in Palestine as a model to market the systems throughout his business' area of interest. He feels that he is only beginning to tap into the potential of an area that is seeing some of the highest population growth rates in the world and the massive infrastructure developments that come with such growth. Culturally, economics provides the biggest draw for this type of technology equally in both resource poor and resource endowed countries. UAE is developing Masdar city, a planned urban center of 47,500 people which they hope to turn into the first zero-carbon, zero-waste city in the world. This is a major step forward in sustainable thinking and demonstrates the desire to move away from carbon-intensive infrastructure to renewable energy technologies which can include geexchange.

The Etihad subdivision development in Ramallah Al Bireh is part of a project building 62 semi-detached villas which will utilize MENA's geexchange system for both heating and cooling.

The system's specs include:

- 70m deep vertical loop
- 2 water to air pumps, with duct distribution
- Cooling COP 5.3
- Heating COP 4.4

They are expecting an annual reduction in use of 1,820 L of diesel fuel, 1,500 kWh electricity and significant reduction in carbon emissions, given twelve hours of operation per day. The estimated 70% reduction in operating cost should provide a payback period of 5 years.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex595_Khaled%20Al%20Sabawi%20-%20Geothermal%20Goes%20MENA.pdf

Martin Forsén, Swedish Heat Pump Association Survey of markets in Europe

Martin brought to our attention how much heat pump technology has swept across Europe in the wake of some of the highest energy prices in the developed world. In some countries nearly 90% of new housing developments use heat pump technology to supply their heating needs. In Scandinavian countries, air to air heat pumps are the technology of choice and are gaining even greater market share (55%), while ground source heat pumps are a significant second choice (25%). Single family houses present great mass market opportunities while multifamily dwellings and commercial buildings offer future potential to the market.

Adoption of these technologies has been driven in large part by policies to adopt more secure energy sources with reduced GHG emissions and greater energy and cost efficiency. More than 600,000 heat pumps of all types have been installed in Sweden since 2000. Since the energy crisis of the early 1980s, heating oil usage has dropped by 85% and, despite the shift away from oil, electricity demand has decreased with increasingly efficient technologies taking the place of oil and conventional electric heating.

Although the sales of heat pumps has flattened in Sweden and Switzerland due to maturation of the market, Germany, Austria, Finland and Norway are quickly playing catch-up with soaring demand for heat pumps, based on successes in Sweden and their implementation of heat pump subsidies.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex597_Martin%20Forsen%20-%20Survey%20of%20Markets%20in%20Europe.pdf

Denis Tanguay, CGC
Survey of markets in the Americas

Denis presented an overview of ground source heat pump (GSHP) deliveries in the US and estimates of market trends here in Canada in the GX industry. He notes that there is an unexpected disconnect throughout the US between shipments of GSHPs and building permits over the last 10 years. Current trends include:

	<i>Building permits</i>	<i>GSHP Shipments</i>
Northeast	decreasing since 2004	Flat
South	decreasing since 2005	Increasing
West	decreasing since 2005	Increasing
Midwest	decreasing since 2005	Increasing
Total	decreasing since 2005	Increasing

Overall from 1997 to 2003 there was a decreasing trend in shipments of GSHPs, but has since increased significantly since 2005, despite the obvious trend in decreasing building permits. The data clearly demonstrates this inverse correlation, but does not explain why. Either there is a lag between the trends or perhaps the current increase in GSHPs will prove to be a new paradigm for heating.

Canada's market is not so easy to analyze as data doesn't exist for GSHP shipments. CGC's best estimate is that there are between 5-6 thousand installations a year, and cumulatively there are 40,000 in service. Growth rates are estimated to be 25-50% over the last 2-3 years. Future factors which may affect the industry include falling housing starts, a strong retrofit market, skills shortages (e.g. drilling), energy price volatility and incentive programs. CGC membership has grown substantially since 2006 and training has been provided all across the country in all provinces. Public interest and awareness has grown substantially as measured by the growing number of visits to CGC's website and inquiries to CGC.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex605_Denis%20Tanguay%20-%20Survey%20of%20Markets%20in%20the%20Americas.pdf

16h00 – 17h00 Investment, Financing & Market Initiatives

Graham Banks, Maxium Financial Services Inc.
Financing geexchange installations in condominiums

Graham outlines the challenges and offers solutions to developers wanting to incorporate GX into the HVAC systems of condominiums. Despite the long term cost savings, comfort and saleable qualities of GX, condo developers may shy away from installing these systems due to concerns about up-front capital costs associated with their installation. To get around this concern, financing is available to amortize the cost of the installation so that the condo corporation pays out the cost of the installation over time rather than upfront. Annual cost

savings in many cases can more than make up for the added financing costs, and once the financing has matured (generally a low risk fixed rate loan with 8-10 year amortization) the corporation is left with significantly reduced overhead costs in comparison to condominiums heated and cooled by conventional HVAC systems. When arranging such financings, disclosure is key to success, as is understanding the condo corporation's rights and government condominium laws.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex601_Graham%20Banks%20-%20Financing%20GeoExchange%20in%20Condominiums.pdf

Tom Jewett, Natural Resources Canada How Class 43.2 applies to geoexchange system

Tom Jewett presented an overview of the federal Class 43.2 regulations which cover taxation measures regarding clean energy generation assets. These regulations provide for applying capital cost allowances for qualifying equipment which can be written off at 50% per year on a Declining Balance basis. Costs that can be written off include:

- purchase price of machinery and equipment,
- costs of design, engineering and commissioning
- legal accounting or other expenses
- costs other services required to make a system operational

Deductions can only be made once equipment is "available-for-use" and only half of the deduction can be made in the first year. Canadian Renewable Conservation Expenses (CRCE) may be deducted from the year they are incurred, carried forward indefinitely and may be returned to investors under flow-through share agreements. Although 43.2 regulations do not specify GSHP, 43.1 includes GSHP under the "active solar" category. Amendments are currently proposed to remove the restriction on GSHP that heat can be only used for an industrial process or in a greenhouse, allowing more flexibility to write off costs associated with the use of GSHP in a wider array of applications.

FULL PRESENTATION: http://www.geo-exchange.ca/en/UserAttachments/flex603_Tom%20Jewett-%20GeoExchange%20Technology%20and%20Class%2043%202.pdf