Corporate Report

NO: R247

COUNCIL DATE: NOVEMBER 19, 2007

REGULAR COUNCIL

TO:	**Mayor & Council**	DATE:	**November 14, 2007**
FROM:	**General Manager, Planning and Development**	FILE:	**5200-11**
SUBJECT:	**Energy Efficiency Studies and Grant Applications**		

RECOMMENDATION

It is recommended that Council:

1. Receive this report as information; and

2. Direct staff to consider the findings of the City Centre Community Energy Plan, the City of Surrey Energy Efficiency and Developer Workshop, and the Grandview Heights GeoExchange Technical Feasibility Study and Governance Study in relation to the development of Neighbourhood Concept Plans, the City Centre Plan Update, and the completion of the Sustainability Charter.

INTENT

The purpose of this report is to:

- advise Council of the results and findings associated with the grant applications and the subsequent energy studies related to energy efficiency and community development; and

- outline the next steps to incorporate the findings of the energy studies into City Policy and the Sustainability Charter with the aim of encouraging more energy efficient development and construction in the City of Surrey.

POLICY CONSIDERATIONS

The City of Surrey, through the Official Community Plan (the "OCP") and other City initiatives, has a wide array of policies and guidelines intended to promote sustainability and protect the environment. A key direction in the OCP is the creation of complete,

compact, and energy efficient communities that are supported by a range of transportation alternatives, developed using sustainable design and construction practices.

While many of these policies are high level and include references to both sustainability and environmental policies, there are relatively limited guidelines and targets associated with these policies. Four recent studies identify specific opportunities and areas where economic, social, and environmental factors are all incorporated into City practices and projects.

The executive summaries of these studies are attached as Appendices I – IV of this report.

BACKGROUND

In November 2006, Council received Corporate Report No. R240 - City Initiatives for Energy Planning. This report outlined the City's energy planning initiatives, specifically requesting that Council endorse the City of Surrey's participation in the Community Action on Energy Efficiency (CAEE) Program through the Province, to undertake two studies, including:

1. **Surrey City Centre Community Energy Plan (Appendix I)**

   The Sheltair Group and West Coast Environmental Law were selected by the City to undertake a study to develop a Community Energy Plan in association with the Surrey City Centre Plan Update process. The study identified a number of best practices and anticipated reductions in greenhouse gas emissions with the implementation of best practices in community design, offered suggestions for better energy efficient building standards, and reinforced an emphasis on Transit Oriented Design.

   The City received a grant for $20,000 and provided additional in kind support valued at $5,000. This parallel study to the City Centre Plan Update will support the development of a sustainability 'layer' in the Plan.

2. **Surrey Developer Energy Efficiency Workshop (Appendix II)**

   The Sheltair Group was also retained to undertake a workshop to provide information to City staff and members of the Surrey development community, including developers, builders and consultants, about opportunities for better, more environmentally and energy efficient buildings. This workshop was held in May 2007 and was attended by approximately 20 staff and 60 representatives of Surrey's building industry.

   The $25,000 grant was used to undertake, organize, facilitate, and coordinate speakers to attend the workshops. The Sheltair Group prepared a report outlining the findings and results from the workshop. The workshops reinforced that there is a need for a significant increase in homebuyer education and awareness by all levels of government, utilities and the development community.

3. **Grandview Heights GeoExchange Technical Feasibility Study (Appendix III)**

The Grandview Heights GeoExchange Technical Feasibility Study was a grant application made to GeoExchange BC, a group that represents and supports the development of geoexchange projects in British Columbia. Geoexchange energy, also known as "heat pumps" or "ground source heating and cooling", uses heat exchanger technology similar to that used in refrigerators to either extract heat from the earth for heating buildings or injecting heat from homes into the earth for cooling purposes. This grant was also supported by the Community Energy Association (CEA) and Corix Utilities Services.

The technical study was to examine, in detail, the opportunities and constraints associated with developing and supporting the introduction of geoexchange heating and cooling systems in the development of Grandview Heights, and specifically in Grandview Heights Neighbourhood Concept Plan # 2.

4. **Grandview Heights GeoExchange Governance Study (Appendix IV)**

Related to the GeoExchange Technical Feasibility Study, a study was undertaken to determine the opportunities and strategies available to the City to govern, encourage, and support the implementation of utility services and geoexchange systems. The study also provided examples and opportunities for considering alternative forms of governance of any future energy utilities.

The following table summarizes the grants that the City was successful in obtaining in order to undertake this work.

Table 1: GeoExchange Studies Funding Chart of Contributions and Distributions

Contributions	Monetary Amount
GeoExchange BC Contribution	$22,500.00
Corix Utility Services	$10,000.00
Community Energy Association	$5,000.00
City of Surrey	$2,500.00
City (in-kind)	$5,000.00
Total:	**$45,000.00**
Distributions	
Project Management (City In-Kind)	$5,000.00
Technical Feasibility Study	$25,000.00
Governance Study	$15,000.00
Total	**$45,000.00**

DISCUSSION

During the course of these four studies and through the associated research of options regarding energy efficiency, several key issues were identified as being particularly important in terms of overall sustainability, community design, and the creation of more energy efficient buildings and communities. These key issues, identified through the studies include:

- Recognition that one important and effective means of reducing energy use is the design, layout and planning of communities. This includes the development of Transit Oriented Communities, increased density around and along major transportation corridors, and opportunities for innovative uses and forms of infrastructure.

- All developers should be subject to the same requirements and have the same obligations with respect to developing energy efficient buildings (i.e., there needs to be a "level playing field" so that developers incur the same incremental costs).

- The City, in cooperation with senior levels of government, the utilities, the development community and NGO groups such as the Green Building Council and BuiltGreen, should work towards promoting consumer awareness, regarding the benefits of using alternative energy sources and improved energy efficiency. This will assist the development community in investing in and developing buildings that meet the desires of the consumer.

- The City should identify potential roles related to the promotion of sustainable development, green infrastructure, alternative energy sources such as geoexchange heating and cooling systems, community energy systems and higher building standards.

- There is a need for additional knowledge in the local building industry to support the implementation of sustainable building features in green development projects .

- The benefit to cost ratio of introducing and building green developments is steadily improving with increasingly short payback periods for investment. There are also increased marketing opportunities for developments constructed with green features, including geoexchange and community heating systems.

- As the technology associated with green buildings and sustainable development matures and is more widely utilized, significant long term benefits will include:

    - Long range energy security;
    - Reduced building operating costs; and
    - Overall reduction in greenhouse gas emissions.

Next Steps

These four studies have identified options for the City to move towards a more energy efficient community. Opportunities to incorporate energy sustainability exist for corporate operations, such as new and upgraded facilities, Neighbourhood Concept Plans ("NCPs"), the City Centre Plan Update, the Sustainability Charter and future updates to the OCP.

Some of these next steps include:

- Further research and reporting regarding governance and what role the City could take in promoting alternative energy and energy efficiency;

- The integration of energy efficiency and energy planning, including community energy plans, into Neighbourhood Concept Plans;

- Communication with the building and development industries, the utilities and other governments to establish support systems to promote energy efficiency initiatives;

- Creation and distribution of information targeted at developers and home buyers outlining the benefits of green and sustainable development. Opportunities to showcase green developments in Surrey include:

    - The GVRD Waste Transfer Station (LEED Silver);
    - The Mountain Equipment Coop Distribution Centre (LEED Gold);
    - Semiahmoo Library and RCMP Station (LEED Silver); and
    - South Surrey Recreation Centre (Geoexchange System).
    - Leading by example through future City developments, including recreation centres, works yards, and other civic facilities, as well as encouraging other institutional and private buildings to adapt similar green development standards.

CONCLUSION

The studies undertaken as part of the Provincial Program for Community Action on Energy Efficiency (CAEE), and the technical and governance studies associated with the possible introduction of geoexchange systems in Grandview Heights, have provided the City with information about opportunities for sustainable and green development in Surrey.

The findings from these studies provide information that can be considered for incorporation into new and existing neighbourhood and development plans.

The information, next steps, and relevant conclusions reached as part of these grant applications and subsequent studies, will also be considered and incorporated into the Sustainability Charter which is underway and expected to be completed in the next few weeks.

Jean Lamontagne
General Manager,
Planning and Development

GM/kms/saw

Attachments:

Appendix I	City Centre Community Energy Plan Executive Summary
Appendix II	City of Surrey Energy Efficiency and Developer Workshop Executive Summary
Appendix III	Grandview Heights GeoExchange Technical Feasibility Study Executive Summary
Appendix IV	Grandview Heights GeoExchange Governance Study Executive Summary

Appendix I

City Centre Community Energy Plan Executive Summary

The City of Surrey retained the Sheltair Group to prepare a Community Energy Plan (CEP) in support of the Surrey City Centre Plan Update process. It is intended that the City Centre Plan will incorporate sustainability principles as an integral part of the plan.

Surrey City Centre has a number of inherent features that support energy efficiency. It focuses on transit oriented development that will increase overall densities, provide a mix of housing options, services and employment opportunities, provide alternative options to car use and promote walking, cycling and transit use.

The CEP indicates that through the application of a number of best practices, including urban form, transportation systems, infrastructure and building practices, significant energy and greenhouse gas emission reductions can be realized. With the population of the City Centre expected to triple over the next 20 years, these reductions could have a significant impact on the province's efforts to reduce energy consumption and greenhouse gas production.

Best Practices

Best practices represent opportunities for reducing the environmental impact and enhancing the liveability of the Surrey City Centre. Best practices are summarised below and organised into four issue areas set out below:

1. **Community Design Best Practices**
    - Encourage, dense mixed use redevelopment ;
    - Cluster mix of uses and services around transportation nodes – SkyTrain stations;
    - Defined city-centre with decreasing densities radiating outwards;
    - Encourage infill redevelopment;
    - Development of performance criteria and indicators

2. **Infrastructure Best Practices**
    - District heating opportunities
    - LED conversion programs for buildings and street/traffic lights;
    - Community recycling and composting;
    - Investigate options for financial tools to support green buildings and infrastructure;
    - Track performance of infrastructure and maintenance needs and budget for upkeep and replacement;
    - Density bonus for community amenities – as per above, establish priorities that are needed to enhance viability of community;
    - Explore opportunities for biomass and/or installation of central plant(s)

3. **Building Standards Best Practices**
    - Green building policy – civic buildings;
    - Encourage LEED or equivalent in private development
    - Encourage the design and construction of buildings that are "solar ready" and "hydronic heat ready";

- Encourage retrofit of existing buildings– e.g. more energy efficient lights in large retail stores;
- Develop "Sustainability Checklists" for new development;
- Plan for solar orientation of buildings;
- Promote Geo-exchange contribution to building heating/cooling; and
- Assess building structure, e.g., shared walls, amount of glass allowed, N/S variation.

4. Transportation System Best Practices

- Design for alternate transportation modes;
- Encourage car-sharing, car co-ops, car pooling;
- Initiate an Anti-idling bylaw and training of city personnel;
- Promote an interconnected, closely spaced street grid;
- Convert civic vehicle fleet to hybrid or Ultra Low Emission Vehicle (ULEV); train civic staff to save gas;
- Support Transit Oriented Development;
- Consider "Cash in Lieu" of parking and other parking reduction strategies to encourage alternate transport;
- Explore U-Pass and/or Community Pass system with TransLink;
- ITS, e.g., congestion alerts, signal coordination.

Appendix II

City of Surrey Energy Efficiency and Developer Workshop Executive Summary

Executive Summary

This report summarizes the background study, presentation material, handouts, comments, and evaluations for two workshops on residential energy efficiency conducted by the City of Surrey and funded by the Community Action on Energy Efficiency program (CAEE) through the Ministry of Energy Mines and Petroleum Resources (MEMPR) and administered by the Fraser Basin Council. The audience for these workshops was the residential development sector, defined as single family, townhouse and four storey apartment housing types.

The objectives of the workshops were to provide information on energy efficiency to developers and to identify measures or actions the City could undertake to support improved energy efficiency in the sector.

The City of Surrey conducted the first workshop for approximately 20 City staff on January 24, 2007. A second workshop was held on March 19, 2007 with participation of approximately 60 members of the residential development sector. Workshop presentation materials included information on energy efficiency standards, programs and technology, tools for financing energy performance features, and a panel discussion on the business case for residential energy efficiency.

Key findings from the two workshops:

- In 2005 the provincial government, in *Energy Efficient Buildings: A Plan for BC* recommended higher minimum energy performance standards for new buildings. The standards relevant to residential buildings include: for single family and townhouses - Energuide 80 for Houses (EGH 80); for apartments - 25% less energy than the Model National Energy Code of Canada for Buildings (MNECB). Participants in the CAEE program were encouraged to promote these goals.

- There are currently a number of energy performance, design assistance, and incentive programs that builders and developers can access to assist in improving the energy performance in residential projects.

- Built Green is an energy performance rating system administered by the Canadian Home Builders Association (CHBA-BC). It is applicable to single family and townhouse projects and is widely supported by builders. Built Green Gold is equivalent to EGH 77.

- The environmental benefits of adopting increased energy performance standards for new residential construction were estimated as part of this study and are potentially significant. Adoption of the provincial government's targets for new residential construction would result in annual energy savings of 1.55 GWH of electricity, 67,000 GJ of natural gas, and a reduction of 4,060 tonnes of GHG, or 0.84 tonnes/dwelling unit/year (based on 2006 statistics for building permit approvals - 4,861 dwelling units).

- Many Surrey builders and developers who attended this workshop understand the value of energy efficiency, but many are reluctant to assume the extra cost because they are not sure consumers will pay more for the inclusion of energy efficiency features.

- More education is required for builders and consumers regarding the lower life cycle cost and other benefits (e.g., health, environmental) of improved energy performance.

- Support for improving energy efficiency is consistent with a wide variety of sustainable development objectives set out in the City of Surrey OCP. The City is committed to continuing to work with the development industry to find ways to improve energy efficiency and promote sustainable development.

On the basis of workshop input:

- A follow up presentation was made by Planning staff to the Development Advisory Committee (DAC) on March 21, 2007. A DAC representative to the Sustainability Charter process has been appointed.

- The Canadian Home Builders Association - BC (CHBA-BC) has requested that Council endorse the Built Green program and consider measures to support its adoption such as reduced permit fees or expedited approval of development applications. The Environmental Advisory Committee (EAC) has been asked to review the CHBA-BC request.

Conclusions:

- While the Surrey Sustainability Charter is being prepared, it is recommended that City staff provide an information package and advise applicants of contact information for energy performance programs such as Built Green (CHBC-BC), the Sustainable Building Centre (SBC) and the High Performance Building Program (BC Hydro) and encourage voluntary participation by developers and builders.

- The provincial government has indicated that the BC Building Code or alternative building regulations will be revised by 2010 to adopt the proposed energy performance standards. It is recommended the City encourage the development industry to take advantage of all support currently available to move toward or exceed these standards and modify their design and construction practices in the years prior to implementation of the new standard.

- Planning and development staff should maintain contact with provincial government representatives and energy efficiency program sponsors regarding energy performance policy and programs and update handout information as required.

Appendix III

Grandview Heights GeoExchange Technical Feasibility Study Executive Summary

GEOEXCHANGE TECHNICAL FEASIBILITY STUDY
GRANDVIEW HEIGHTS NEIGHBOURHOOD, SURREY BC

Prepared by:
HEMMERA

Report Objective

The objective of this study was to evaluate the suitability of applying geoexchange technology in the Grandview Heights Community. The objectives of the study were:

- Complete a geoexchange resource evaluation examining site-specific conditions
- Identify potential opportunities, challenges, and limitations of using the technology
- Short list or preferably rank geoexchange options and configurations
- Identify and describe mechanisms to promote early adoption, in the context of established land use plans
- Complete an economic analysis of using geoexchange relative to conventional technologies
- Provide relevant case studies of similar applications in BC

Geoexchange Options

Geoexchange systems rely on a thermal coupling with the earth. The coupling is known as a ground heat exchanger (GHX). Many types of GHX are possible, including:

- ***Vertical closed-loop borehole GHX*** in which heat exchange piping is installed in vertical boreholes.

- ***Groundwater open loop GHX*** in which groundwater is pumped from one water well, heat is extracted from (or rejected to) the groundwater by the heat pump system, and the groundwater is then returned to the aquifer in another injection well.

- ***Horizontal closed-loop GHX*** in which heat exchange piping is installed in horizontal trenches.

- ***Surface water open or closed-loop GHX*** in which heat is exchanged with a surface water body.

- ***Other innovative GHX options*** utilizing other unique site-specific and / or application-specific resources.

Study Approach

The study followed the approach listed below:

- Collection and interpretation of general information about ground conditions in the subject area
- Evaluation of different options for geoexchange ground heat exchangers (GHX) relative to geological conditions and other site setting considerations
- Examine the existing General Land Use Plan to estimate building sizes, lot sizes, and number of units of various proposed land use designations
- Estimate the potential energy intensity / loads of the various land use designations
- Complete conceptual designs of potential geoexchange system types
- Estimate capital and operating costs of potential geoexchange system types
- Present the overall technical and economic feasibility of potential geoexchange system types, preferentially ranking and/or short listing the most appropriate configurations
- Identify and discuss potential regulatory and/or environmental concerns, as appropriate
- Identify mechanisms the City may employ to encourage early adoption of GeoExchange
- Provide recommended next steps for the evaluation

Study Results

Site Planning

In order to determine the feasibility of diverse geoexchange options, it was necessary to identify the siting requirements and maximum square footage of the principal dwelling units associated with each land use designation, as contained within Surrey's Zoning Bylaw. This information was combined with that in the Surrey NCP #2 Draft Preferred Land Use Concept and the Surrey Official Community Plan (OCP).

The population of Grandview Heights Neighbourhood Concept Plan #2 is approximately 600 residents, and it is expected that the population of this community will range between 7,200 and 11,200 residents when the neighbourhood is built-out over the next 10-15 years. A summary of the number of residential units and associated land areas can be found in the full document (Table 2 - Land Use Designations by Zone).

Geology and Hydrogeology

A conceptualized cross section in **Figure 5,** gives the likely stratigraphic units encountered in the South Surrey region. Conditions will vary and this log should simply be considered as a graphical representation of the stratigraphic units likely to be encountered.

Depth to bedrock in the Surrey region is typically more than 200 m (650 ft), and would not be encountered if drilling for typical geoexchange boreholes / groundwater wells.

Average anticipated ground thermal properties were estimated based on past experience in the area and published values.

Based on the regional geology/hydrostratigraphy, groundwater generally flows within three main water bearing hydrogeologic units within the area;

1. **Vashon Drift Perched Aquifer/Aquitard;**
   Due to the low permeability of this unit, and near surface influence on groundwater quality and flow, sufficient yields would likely not be attainable from this unit to meet the requirements of the proposed open loop geoexchange systems.

2. **Quadra Sands Aquifer; and**
   Given the uncertainty with respect to the presence of the aquifer, a more detailed evaluation of available geologic/hydrogeologic data (multiple available well logs, pump test data, etc.) would be required to assess feasibility of future utilization of this aquifer.

3. **Pre-Semiahmoo Aquifer.**
   Based on the number of wells screened within the aquifer, and reported production well yields from individual wells, the aquifer appears suitable for considering an open loop design and should be further tested.

Geoexchange Technical Feasibility

Vertical closed-loop GHX

Vertical closed-loop GHX can be applied to the entire development. Two scenarios have been examined in the report – drilling boreholes to only 30m (100ft) deep due to the presence of a gravel bed at this depth which may limit drilling with some equipment or drilling to a more typical borehole depth of 90m (300ft).

For certain areas of the development, namely Medium Density Residential and Multiple Residential (15-25 upa) insufficient land space may be available for the 30m (100ft) borehole option. Therefore boreholes would need to be 90m (300ft) deep in these areas.

In some areas it may be necessary to place the boreholes under the building footprint. This is a relatively common situation however extra scrutiny is required on the design of the system to ensure operability is maintained and ground loop conditions do not adversely affect the building foundations.

The advantages of a vertical closed loop system are its predictability and robust design. It is also a good choice for where ground area is limited. A vertical closed loop system does however require the highest capital cost investment of all the types of geoexchange installation.

Groundwater Open Loop GHX

Groundwater Open Loop GHX systems could be applied throughout the development except for the lower South-East corner which is situated beyond the potential extent of the aquifer.

Given the NCP#2 plan density and the expected loads required for GHX, the available groundwater supply would likely only meet a lesser portion of the required load. It is proposed that Groundwater Open Loop systems be applied to a select portion of the development where the conditions for groundwater are particularly favourable or where site restrictions make the implementation of a closed loop system problematic.

A Groundwater Open Loop system has the advantage of being economic to install. Three or four supply wells and one return ('injection') well can provide the source for multiple buildings hence decreasing the capital cost per residential unit. Groundwater systems also typically operate at a constant slightly higher temperature than closed loops therefore increasing the overall efficiency of the system. To ensure the long term availability of the resource, thorough and comprehensive well testing and modelling of the aquifer is required. Future development of the aquifer may also have an impact on its long term viability as a geoexchange source.

Horizontal Closed Loop GHX

Horizontal closed loop GHX systems are suitable for residential lots with proportionally higher available land space such as Suburban Residential, Suburban Transitional, Low Density Residential and Low Medium Density Residential.

Horizontal Closed Loops systems have the advantage that they require low capital investment. There are also many contractors trained to install such systems as opposed to vertical systems which require more specialised skills and equipment. The main drawback to using horizontal systems is the large amount of land required for their installation.

Economic Analysis

Projected simple payback periods were calculated to be 4 - 8 years for horizontal closed-loop GHX and 3-24 years for Vertical Closed-Loop systems. The variability of payback depends on building energy use, equipment size and installation costs. The payback on the majority of the open-loop groundwater GHX systems is less than 1 year. A significant saving on capital equipment is made when using a geoexchange system. Heat pumps can provide heating and air conditioning within the same equipment. Open Loop Groundwater systems benefit from economies of scale where by one set of supply and injection wells can supply multiple buildings. A summary of the economic analysis can be seen in *Table 10: Summary of Capital Costs and Technical Feasibility.*

Greenhouse Gas Reductions

By implementing a geoexchange utility for the development the greenhouse gas reductions are estimated to be 16-25 tones equivalent CO2 per year (400-625 tones over a 25 year life cycle), equating to removing 1700-2600 cars per year from the roads.

Mechanisms to Promote Early Adoption

A number of mechanisms for promoting early implementation of geoexchange in the area have been identified, including:

- Supporting Development of a District Energy System,
- Financing Via Utility Company,
- Mitigating Risk Via Joint Venture or Ownership by Utility Company,
- Promoting Sustainable Public Buildings,
- Providing Information Kits,
- Empowering Staff with Policy Support,
- Community Amenity Contribution Financing,
- Development Cost Charge Financing,
- Focusing on a Probable First Phase Location,
- Exploiting Economies of Scale with Integrated District System, and
- Refining this study by conducting further investigations and analysis.

Recommended Future Steps

- A series of test boreholes across the Grandview Heights area would be required in order to confirm sub-surface conditions across the area, and to assess potential limitations of various drilling methods. These test holes will determine the extent of the gravel layer throughout the NCP #2 area and hence the most cost effective borehole depth. Logging the test holes will also ensure accurate information for pricing can be provided to drillers during any future tender process.

- In addition to test drilling FTC (Formation Thermal Conductivity) would be required at several sites across the NCP #2 area. This testing confirms the actual thermal conductivity and diffusivity of the ground formation. These site specific values will allow an accurate design to be carried out resulting in a more economic system.

- In order to quantify the number of production wells and injection wells that potentially could be completed within the NCP#2 development area would require the installation of a test production and likely a test injection well. In addition, a conceptual model detailing groundwater flow would also need to be constructed. Once completed, development of an analytical or numerical groundwater flow model would be required to assess potential drawdown interference effects, thermal interference effects, production well spacing, injection well/production well number and spacing, and more. This work would be required for performance of a more detailed feasibility assessment as well as preliminary and final system design / planning.

- Consider strategies for early implementation, including potential developer feedback.

- Explore potential integrated district energy options in higher density areas, and lower density areas surrounding public amenities (parks, schools, utility corridors).

- Explore potential unique geoexchange opportunities including:

  - integrated energy options in the proposed commercial-residential area in the north-east corner of the site. If a commercial use utilizes refrigeration (such as a convenience commercial use), then there may be opportunities to use the excess heat to heat the commercial and residential uses in the building.

  - Sewer heat exchange in the planned force main.

  - Heat exchange with the current and planned expansion of the GVRD water reservoir.

- Update the work completed to date to reflect refinements in the land use concept.

- Require a fully engineered solution for the geoexchange system and any utility designs, following recognized design standards and guidelines (e.g. CSA 448.2 as a minimum) and encourage the adoption of energy performance targets, verification, and monitoring.

- Evaluate and specify some measure of energy performance targets for new developments and retrofits, which will make GHX more cost effective, and more technically viable.

Appendix IV

Grandview Heights GeoExchange Governance Study Executive Summary

Executive Summary:
Encouraging & Implementing Ground-source Heating in Development Projects

A Community Energy Association report for the City of Surrey

The City of Surrey is undertaking an extensive planning process for the Grandview Heights area in South Surrey and is exploring ground-source heat pumps (GSHPs) as an option for meeting neighbourhood heating and cooling needs. This report, prepared by the Community Energy Association, introduces GSHP technology, suggests options for encouraging GSHPs in the community, and illustrates possibilities for City involvement in the ownership and operation of GSHP systems. The report does not address the financial cost effectiveness or technical considerations of installing ground-source heat pumps.

Ground-source heat pumps are an efficient and green technology
Ground-source heat pumps (GSHPs) use the energy in the ground for heating and cooling in buildings. They are much more efficient than conventional heating systems, leading to significantly lower operating costs and better environmental performance, particularly in terms of greenhouse gas emissions.

Most GSHP systems serve a single building. This report also describes the options for GSHPs in district heating systems, which are an integrated, large-scale, modular and flexible way to distribute heat to a number of buildings. Zones characterized by high-density development, such as commercial areas or multi-unit residential clusters, will lend themselves well to connection to a district GSHP system. District systems can be more efficient, benefiting from load aggregation and economies of scale.

The City of Surrey has many options for encouraging GSHPs
Surrey has laid the foundations for policies to encourage GSHPs through supportive language in its Official Community Plan. The report outlines a number of policy options. All of the measures suggested have been previously used by other local governments in BC to encourage energy efficiency and/or renewable energy.

	Education and awareness	Incentives	Zoning-related policies
Benefits	Lack of awareness consistently cited as barrier. Greater knowledge among public, staff and developers enables uptake	High upfront costs a major existing barrier – incentives help developers make the case for investment	The zoning system can be a powerful lever to encourage particular kinds of development
Options	▪ Education campaigns ▪ Demonstration projects ▪ Development permit checklists	▪ Reduced permit fees ▪ Expedited approvals ▪ Tax exemptions in revitalization areas ▪ Density bonuses	▪ Planning rules that enable GSHP through density, setbacks etc. ▪ Rezoning policy ▪ Local Service Area for district heating system
Examples*	City of White Rock operations centre; City of New Westminster's development permit checklist	District of Saanich reduced permit fees and expedited approvals; District of Maple Ridge tax exemptions	City of North Vancouver's Service Area Bylaw for district heating; Bowen Island's rezoning policy

*Examples are of BC local governments using these measures to promote energy efficiency or renewables, not GSHPs specifically.

There are options for City involvement in owning or operating GSHP systems

In addition to encouraging developers and the private sector to install ground-source heat pumps, the City can take a more active role in the delivery of ground-source heating. The report outlines options for ownership and operation with different levels of involvement and commitment from the City.

Ownership model	Description	Examples
100% public ownership and operation	City owns and operates the system, possibly through a subsidiary or SPV	None for GSHPs, several for electric utilities, e.g. Nelson Hydro
100% public ownership with service contract	City owns system, contracts out operations to private third party	None for GSHPs. North Vancouver's Lonsdale Energy Corp. contracts Corix
Less than 100% public ownership	City could own an equity share in a utility, or could wholly own some assets (such as distribution system)	Sudbury District Energy; Enwave Corp. (Toronto); and the Village of Anmore (electric utility)
Field Rental model (public or private ownership)	Energy services company or municipal utility installs ground-source heat loops, and rents them out to building occupants	Kamloops Sun Rivers Golf Course Resort; Wilden in Kelowna; and Wakefield Beach on the Sunshine Coast
Strata ownership (no municipal ownership)	GSHP System owned by the strata council, capital paid off in strata fees (higher fees offset by lower energy bills)	Simon Fraser University's UniverCity development
Co-operative ownership (private and/or public)	Customers are members who jointly own the utility.	Delta-Montrose Electric Association, Colorado, installs GSHPs.

The City can form a municipal energy utility

The formation of a local government utility is one option for delivering ground-source heating and other sustainable energy systems. Municipal utilities can support sustainability objectives, bolster local energy security, and potentially contribute to local economic development by keeping energy dollars circulating locally. Energy services provided by a local government within its boundaries are not subject to regulation by the BC Utilities Commission, which means that the municipal utility has significant flexibility in terms of planning and setting its own rates. These benefits must be balanced against costs, which may include the installation of infrastructure, administrative costs (including additional metering and billing), as well as regulatory and governance costs.

Liability concerns should be minimized

There are a number of ways in which the City could find itself legally liable if GSHP systems fail:

- The building code requires adequate provision of heating. While a Professional Engineer certifies most buildings, and thus assumes responsibility, liability for building permits for single family homes rests with the City. If a GSHP is inadequate, the City may be liable. Ultimately, the City will need to either transfer the risk by requiring a professional engineer, or be satisfied that systems are designed appropriately through installation standards and training of municipal staff.

- In cases where the local government is recommending or requiring the use of ground-source heat pumps, it is possible that the local government could be open to liability if the system fails unless a qualified professional ensures that systems are installed to appropriate standards.

- Where the City has an ownership stake in an energy system, this also clearly implies legal liability, which can be limited through exercising due diligence and other appropriate legal means.

Conclusion

The City has a number of options for encouraging ground-source heat pump systems throughout the community. This report provides an overview of the mechanisms available, and provides the City with a basis to move forward with specific projects and policies.