



Utilities & Financing

A module of the

Renewable Energy Guide for Local Governments in British Columbia

February 2008

The 'first stop' for local government leaders addressing energy sustainability and climate change

Community Energy Association | Infrastructure Canada | British Columbia | Vancity | The Real Estate Foundation of British Columbia

About the Community Energy Association

The Community Energy Association is a charitable organization that assists local governments throughout British Columbia to promote energy efficiency and alternative energy through community energy planning and project implementation. For information and many more local government resources, please visit: **www.communityenergy.bc.ca**

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Citing this Document
Please cite this document as: Community Energy Association (2008) – *Utilities and Financing: Renewable Energy Guide for Local Governments in British Columbia.* Vancouver.

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Library and Archives Canada Cataloguing in Publication
Utilities & financing : a module of the renewable energy guide for local governments in British Columbia. February 2008.
Includes bibliographical references and index.
ISBN 978-0-9784411-1-1
1. Renewable energy sources – British Columbia – Finance.
2. Renewable energy sources – British Columbia.
3. Electric utilities – British Columbia – Finance.
4. Electric utilities – British Columbia.
5. Municipal government – British Columbia.
I. Community Energy Association (B.C.) II. Title: Utilities and financing. III. Title: Renewable energy guide. IV. Title: Renewable energy guide for local governments in British Columbia.
TJ807.9.C3U85 2008 333.79'6209711 C2008-901252-6

Cover photo credits (left to right): City of Dawson Creek; Revelstoke Chamber of Commerce; Revelstoke Community Energy Corporation; City of North Vancouver; Nelson Hydro, City of Nelson

Printed on 100% post-consumer recycled paper

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Acknowledgements
Production of this Guide has been made possible through financial contributions from Infrastructure Canada, the British Columbia Ministries of Environment and Community Services, Vancity and the Real Estate Foundation of British Columbia. The Cities of Coquitlam, Dawson Creek, Quesnel and Surrey were additional project partners.

The Community Energy Association would like to acknowledge, in addition, valuable contributions of the many people and organizations that provided advice and assistance in shaping this document:

Mark Allison, City of Surrey
Richard Ashe, City of Ottawa
Chris Baber, City of Vancouver
Brian Barnett, Resort Municipality of Whistler
Patricia Bell, City of Coquitlam
Steve Berna, Municipal Finance Authority
Rod Carle, City of New Westminster
Steve Davis, Independent Power Producers Association of BC
Kim Fowler, City of Port Coquitlam
Raymond Fung, District of West Vancouver
Valerie Gilson, Peace Energy Co-operative
Wade Grant, BC Assembly of First Nations
Helen Iosfin, BC Hydro
David Johnson, Revelstoke Community Energy Corporation
Erik Kaye, Ministry of Energy, Mines and Petroleum Resources
Emanuel Machado, City of Dawson Creek
Tatiana Robertson, Ministry of Community Services
Trudy Rotgans, Office of Housing and Construction Standards
Susan Rutherford, West Coast Environmental Law
Jim Savage, Quesnel Community and Economic Development Corporation
Sarah Smith, Terasen Gas
Glenn Stainton, Lonsdale Energy Corporation
Tara Tompkins, Ministry of Community Services

Finally, the Community Energy Association acknowledges the support of the many companies, organizations and governments which granted permission for use of their photos and illustrations in the publication.

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Table of Contents

Acronyms used in this guide

BC ..... British Columbia
CEA ..... Community Energy Association
FCM ..... Federation of Canadian Municipalities
IPP ..... Independent Power Producer
kW ..... kilowatt
LEC ..... Lonsdale Energy Corporation
LIC ..... Local Improvement Charge
MFA ..... Municipal Finance Authority
MW ..... megawatt
NRCan .... Natural Resources Canada
PV ..... photovoltaic
UBCM .... Union of British Columbia Municipalities

Utilities & Financing

Renewable Energy Guide For Local Governments in British Columbia

Executive Summary

Local governments around the world have been leaders in tackling climate change by promoting renewable energy at the community level, with innovative policies and programs that have made national-level impacts on energy policy and greenhouse gas emissions. Local governments are ideally placed to champion renewable energy in British Columbia.

Local government energy utilities

Establishing an energy utility can allow local governments to take advantage of the economic, social and environmental benefits presented by renewable energy. There are different types of local government utilities, which provide different opportunities and benefits.

1. District heating utilities

- Heat is distributed to buildings in the community
- Achieves high efficiencies
- Works with biomass, biogas, solar, ground-source heat pumps and heat recovery technologies
- Requires high density development or a major heat consumer

2. Decentralized heating and power utilities

- Utility installs individual or decentralized renewable energy systems in buildings throughout the community, and charges for their use
- Works at low and high density
- Successful model in the private sector, particularly for ground-source heat and solar hot-water heating

The City of Revelstoke implemented the first renewably-based district heating system in British Columbia.
Source: Revelstoke Chamber of Commerce

3. District electricity or 'micro-grid' utilities

- Generation and distribution of electricity within a neighbourhood or development
- Only likely to be viable in new development
- Can be operated independently of the main grid, and provide power during main grid power outages

4. Independent power production

- Utility generates power, and sells it to BC Hydro or FortisBC
- Usually requires involvement of private partners
- Works best where local government owns the resource, as with landfill gas

In addition to the four utility models above, there are six municipal electricity distribution utilities in BC. While these are common in the US and in Ontario, it is unlikely that any other British Columbia municipalities would be able to develop this kind of utility.

Case Studies : Sudbury District, City of Revelstoke and Toronto

Sudbury District Energy Corporation Sudbury District Energy Corporation runs a district heating and electricity utility in Sudbury, Ontario. The Corporation is jointly owned by the City of Greater Sudbury and Toromont Energy. The Corporation owns and operates two co-generation systems, and distributes heat and cooling to a number of buildings, including the local government headquarters, Sudbury Arena and the Sudbury Regional Hospital. Electricity produced by the co-generation units is sold to the provincial power grid.

City of Revelstoke Renewable District Heating The City of Revelstoke launched its district heating system in 2005, to provide hot water space heating to local buildings in the downtown core. The system burns woodwaste from the Downie Timber sawmill and in addition to providing hot water heating to the community, supplies low pressure steam for Downie's drying kilns. The system provides lower energy costs and price stability to customers, improves air quality by reducing woodwaste burned in the silo burner, and provides a financial return to the municipality. The City of Revelstoke established the Revelstoke Community Energy Corporation, a wholly-owned subsidiary, to operate the utility.

Toronto Atmospheric Fund The Toronto Atmospheric Fund, a revolving energy fund, was established in 1991, with a $25m endowment from the sale of City-owned property. It now provides over $1m in annual grants, and up to $8m in loans for energy projects. Projects paid for with the fund create $2.7m in annual savings. Examples of projects provided with loans include Toronto's waterfront wind turbine, and Canada's first municipally-owned 'tri-generation' system, which produces heat, cooling and electricity for an exhibition and convention centre.

There are different options for ownership and operation of energy utilities

- Full ownership and operation directly within local government operations
- Establishment of a wholly-owned subsidiary to own and operate the utility
- Local government ownership, private sector partner operation
- Partial local government ownership – either ownership of part of the system (such as distribution assets) or through a joint-equity project.

Each model has its advantages and disadvantages.

Financing and funding renewable energy projects

Whether local governments establish a utility to serve the community, or install renewable energy within municipal buildings, there is a range of financing and funding options available.

A range of options for innovative financing:

- Community bonds, providing an opportunity for residents to invest in projects that benefit the community
- Lease-purchase, providing flexibility and potentially lower costs
- Revolving energy funds, enabling the reinvestment of savings and revenues from energy projects into further projects
- Joint-equity partnerships, bringing private sector expertise into projects, and reducing local government risk exposure.

Flexible options for recouping the capital investment:

- Energy bills are likely the most straightforward option, with utility customers charged for their energy use
- Local Improvement Charges can be used to pay for renewable energy installations on buildings
- Offset credits enable utilities to 'monetize' the carbon benefit of projects, which can extend the reach of projects into areas that would otherwise not be economic
- Grants and low-interest loans are available from other levels of government.

1. Introduction

Utilities and Financing is a module of the Community Energy Association's *Renewable Energy Guide for Local Governments in British Columbia.* Other modules of this guide include:

- *Governance* (how local governments can encourage and mandate use of renewable energy in the community)
- *Heating Our Communities,* and
- *Powering Our Communities.*

Examples of the renewable energy systems that are feasible for local governments in British Columbia are profiled in *Heating Our Communities* and *Powering Our Communities.*

Utilities and Financing has been written for local government elected officials and staff interested in developing renewable energy projects and utilities in their communities.

Local governments around the world have been leaders in tackling climate change by promoting renewable energy at the community level, with innovative policies and programs that have made national-level impacts on energy policy. Local governments are ideally placed to champion renewable energy.

Opportunities outlined in this guide include:

- Local government ownership and operation of heating utilities, providing district or decentralized heating to buildings in the community
- Use of small-scale renewable energy technologies to heat and power municipal buildings
- Local government ownership and operation of power projects.

Local governments can bring substantial benefits to their communities by encouraging and supporting the development of renewable energy. Primary benefits include:

- significant greenhouse gas reductions, particularly for heat technologies where these reduce the use of natural gas and oil
- air quality benefits
- local economic development through renewable energy job creation, infrastructure development and keeping energy dollars circulating locally
- increased local energy security.

Local governments have traditionally played a central role in providing many essential services for their residents, such as water and sewage. Energy, however, has historically been provided by large, centralized energy utilities. This model is now starting to change, as opportunities provided by new technologies, and the pressures of climate change, prompt local governments and others to explore new ways to provide energy. In particular, the emergence of small-scale renewable energy technologies creates alternatives to traditional models of energy services provision.

Utilities and Financing provides an introduction to the ways in which local governments can promote and finance the use of renewable energy in their communities. The focus of this module is to:

- Outline why local governments are considering becoming involved in the provision of energy services, heating, cooling and electricity
- Briefly introduce the policy and legislative contexts that enable and limit local government action to foster renewable energy
- Outline opportunities for the use of renewable energy within corporate operations
- Describe how local governments can actively deliver renewable energy themselves, through the formation of a local government utility or energy services company
- Outline different business models of ownership, operation and financing renewable energy projects.

2. Policy context for renewable energy in BC

Renewable energy is a rapidly growing global industry,[1] and one in which British Columbia is well placed to take a leading role. This section introduces the role of local governments in promoting renewable energy in British Columbia, and outlines policy programs established by the provincial government.

2.1. Local governments and renewable energy projects

Local governments are ideally placed to champion renewable energy. Opportunities include:

- Installation of renewable energy to heat and power municipal buildings
- Ownership and operation of a district heating energy utility, providing heat to buildings in the community
- Ownership and operation of power projects
- Encouraging and/or mandating the use of renewable energy in the community.

Solar panels on Dawson Creek City Hall, for domestic hot water.

Source: City of Dawson Creek

In other parts of the world, local governments have played a major role in the establishment of renewable energy projects and utilities. Local government ownership and operation of energy systems has had significant impacts on local energy industries and on national-level energy policy.

2.2. Provincial policy context: Local governments and renewable energy

Climate change is a priority for the Government of British Columbia. The Province is committed to cutting greenhouse gas emissions by 33% by 2020, from 2007 levels. This target, along with an 80% reduction in greenhouse gas emissions by 2050, has been passed into law. The Province has also committed to becoming 'carbon neutral' by 2010, and is encouraging local governments to follow this example by becoming carbon neutral by 2012 through signing and implementing the British Columbia Climate Action Charter.[4]

These climate change goals are being pursued through a number of policy initiatives. The most relevant of these for local government involvement in renewable energy are sustainable community planning and energy policy.

2.2.1. Sustainable community planning

British Columbia local governments will be required to set greenhouse gas targets in their Official Community Plan and Regional Growth Strategy. Supporting this objective are a number of provincial initiatives on sustainable community planning.

Smart Planning for Communities is a collaborative province-wide initiative providing resources and tools to local and First Nation governments for planning socially, culturally, economically and environmentally sustainable communities. The Community Action on Energy and Emissions (CAEE) program is under the umbrella of Smart Planning for Communities. CAEE provides financial and research support to British Columbia local governments to advance energy efficiency through local government policy instruments and building upgrade incentives.

Did you know? European local government leaders in renewable energy

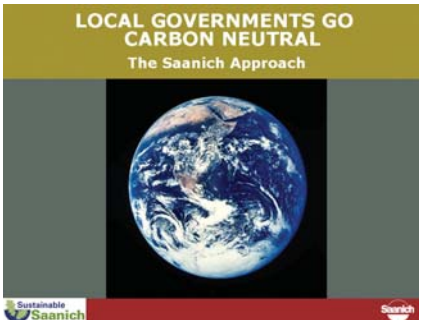
In Denmark, local governments were the first entities to develop district heating systems, many fuelled with municipal waste. Local governments now own the majority of Denmark's district heating systems, which supply more than 60% of the Danish population with heat.[2]

Since the launch of its energy strategy in 1986, the City of Freiburg, Germany, has installed hundreds of solar photovoltaic panels and solar hot water systems. The City has now become a European centre of the solar energy industry, hosting companies and research institutes.[3]

The City of Dawson Creek, winner of the 2006 Energy Aware Award and 2007 Green City Award, is providing leadership on energy sustainability planning.
Source: Community Energy Association

In addition to these programs, the Province will introduce new tools to enable local governments to encourage and implement renewable energy in their communities. These tools are the focus of the *Governance* module of this *Renewable Energy Guide*.

The British Columbia Climate Action Charter, signed by the Province, Union of BC Municipalities (UBCM) and signatory local governments, is an expression of intent to work towards shared climate change goals. Specifically, the Charter includes a commitment from signatory local governments to become carbon neutral in their own operations by 2012.



A carbon neutral leader in Canada, the District of Saanich established by bylaw in 2007, its own Carbon Neutral Reserve Fund.
Source: District of Saanich

2.2.2. Energy Policy

The 2007 BC Energy Plan[5] lays out a range of energy policy objectives and measures, many relevant to renewable energy. Important objectives include:

- "Greening" the BC Building Code, to integrate the highest energy efficiency standards in Canada and other sustainability provisions into the existing code
- 10 community energy projects that convert biomass to energy by 2020, as part of a provincial bioenergy strategy
- Development of alternative energy economic opportunities, though establishment of an Innovative Clean Energy Fund supporting development of clean power and energy efficiency technologies
- Energy efficiency and conservation, targeting 50% of BC Hydro's incremental resource needs to be met through conservation by 2020
- Electricity self-sufficiency by 2016 (BC Hydro imports and exports electricity, and in recent years BC has become a net importer).
- Promotion of small-scale and distributed electricity generation through the Standing Offer and Net Metering programs, which provide small generators with the opportunity to sell power to the grid.

The Province is expected to implement a number of measures to further enable local government action on renewable energy. These will form the basis of Community Energy Association's *Governance* module.

Case Study : District of Saanich

A low carbon leader in Canada, the District of Saanich established by bylaw in 2007, a Carbon Neutral Reserve Fund to help fund GHG-reducing projects within municipal boundaries. The District pays $15 into the fund for every GHG tonne emitted through municipal operations. Through this innovative fund, the District has found a way to both significantly reduce its carbon footprint and keep the money in the local economy. The District resolved to offset its GHG emissions in the 2008 budget year, and aims to reduce GHGs from operations by 10% by 2010.

3. Renewable energy in local government operations

Local governments in British Columbia are pursuing renewable energy in municipal buildings for a number of reasons. These include:

- Long-term cost savings for many technologies, particularly heat recovery, ground-source heating and solar air and water heating
- Greenhouse gas reductions and other environmental objectives
- Demonstrating environmental leadership to the community
- Educating local developers, engineering firms and the public about opportunities for renewable energy.

South Cariboo Recreation Centre ice rink. The use of ground-source heat pumps saves $48,000 every year in energy costs.

Source: Al Richmond, South Cariboo Arena Society

New buildings and major renovations are the best opportunities for renewable energy. Building-integrated renewable energy technologies are most cost-effective when incorporated into new buildings, or when capital equipment such as boilers or roofs need replacement. Ideally, renewable energy should be part of a green purchasing policy or green building policy for local government operations, ensuring that renewable energy is considered during all new building developments, retrofits and renovations. *Heating Our Communities,* produced by the Community Energy Association, outlines many opportunities and costs for use of specific renewable energy technologies for heating in municipal buildings.[6]

Where a local government is installing renewable electricity generating technologies, there may be opportunities to sell excess power to BC Hydro, either through the Net Metering program (if the renewable energy system is at a scale of less than or equal to 50kW) or through the Standing Offer Program (if the system is between 50kW and 10MW). These programs are discussed further in Section 4.2.5.

The Houston Leisure Centre uses ground-source heating for water and space heating.

Source: District of Houston

Did you know? RETScreen: a free tool for assessing renewable energy projects

The costs and benefits of renewable energy installations should be assessed carefully, including an assessment of resulting greenhouse gas reductions. Natural Resources Canada provides a free software tool, RETScreen, for assessing projects at a pre-feasibility or scoping study stage. The RETScreen database includes regional climate data (such as sunlight and wind speeds), product data (manufacturer and product specifications) and typical costs associated with project development. The tool also enables financial analysis, calculating not only simple paybacks, but also return on investment, net present value and other indicators of cost-effectiveness.

RETScreen is available from the NRCan website, and NRCan offers periodic free training courses across Canada as well as online learning tools. **www.retscreen.net.**

Examples of Renewable Energy Installations in Local Government Operations

Oliver, BC[7]
Installation: The curling club replaced an aging conventional ice-making and heating system with a ground-source system.
Capital cost: The ground-source system cost $25,500 more than a conventional system
Savings: $18,000 annually in energy and operating costs.

100 Mile House, BC[8]
Installation: South Cariboo Recreation Centre – ground-source heating system
Capital cost: Incremental cost of the renewable energy system was around $119,000.
Savings: Annual energy savings of $48,000.

Port Coquitlam, BC[9]
Installation: Hyde Creek recreation centre – heat recovery technology and solar water heating, as well as installation of high efficiency boiler
Capital cost: The total cost of the energy retrofit, including the solar hot water, was $349,000.
Savings: Total annual savings of over $40,000, of which solar hot water panels save $4000 annually; saves 96t CO2/year.

Okotoks, Alberta[10]
Installation: Solar water heaters for municipal swimming pool
Capital cost: $200,000
Savings: Annual savings of $20,000 and 43 tonnes of greenhouse gases.

Miami, Manitoba[11]
Installation: Hockey arena using ground-source heat pump system for ice-making, heating and air conditioning
Capital cost: The ground-source system cost around $32,000 more than the conventional equivalent.
Savings: Payback was within 2 years, annual operating and energy savings of $30,000.

Fort Smith, NWT[12]
Installation: a solar air heating system on the recreation centre
Capital cost: $53,000
Savings: The solar heating displaces 75% of heating load, leading to a 5-7 year payback.

The Community Energy Association provides many more resources for local government operations including the Green Buildings BC program for local governments and information on carbon neutral operations.

4. Local government energy utilities

Until recently, local government involvement in the ownership or operation of energy utilities has been unusual in British Columbia. Typically, generation, transmission and servicing systems have been owned and operated by large public utility companies such as BC Hydro, FortisBC, BC Transmission Corporation, Terasen Gas and Pacific Northern Gas, and by a number of smaller independent power producers (IPPs). These companies and corporations have designed, built and operated most of British Columbia's energy infrastructure.

Local governments are increasingly taking a role in the provision of both heat and power, through the formation of local government energy utilities. This chapter will help local governments explore the potential benefits of such utilities, and will describe the different types of energy utility.

4.1. Rationale for local government utilities

4.1.1. Regulation and local government utilities

In British Columbia, public utilities are regulated by the BC Utilities Commission (BCUC). The BCUC establishes, amongst other things, rates that can be charged to utility customers. The *BC Utilities Commission Act* defines an energy-related public utility as a person or organization who:

> *"owns or operates in British Columbia, equipment or facilities for the production, generation, storage, transmission, sale, delivery or provision of electricity, natural gas, steam or any other agent for the production of light, heat, cold or power to or for the public or a corporation for compensation,...but does not include a municipality or regional district in respect of services provided by the municipality or regional district within its own boundaries"*[13]

Services provided by a local government within its own boundaries are specifically excluded from the definition of public utility and are therefore outside the scope of the *Utilities Commission Act.* This means that if a local government provides alternative energy services to a neighbourhood within its municipal limits, it will not be regulated by the Act. This has important implications, since the BCUC regulates prices and the capital structure of utilities (that is, the debt/equity ratio and other finance concerns). Local government utilities are therefore free to determine their own rates, priorities and tolerance for risk.

4.1.2. Why consider a local government utility?

Local government ownership of a utility provides an opportunity to promote sustainability objectives, bolster local energy security, and potentially contribute to local economic development by keeping energy dollars circulating locally. Since local government utilities are not subject to regulation by the BCUC, the utility has significant flexibility in terms of planning and setting its own rates.

Local governments can have longer time horizons and lower discount rates than many private sector companies. By virtue of their public-service position, they have the flexibility to look beyond immediate, bottom-line considerations and balance investment return with customer rates, long-term energy security and environmental considerations.

There are also costs associated with acting as an energy utility. Depending on how the system is structured, these are likely to include the purchase and placement of infrastructure, operation and maintenance, administrative costs (including metering and billing), as well as regulatory and governance costs.

4.2. Types of energy utility

Local governments in British Columbia have a long history of utility provision in the areas of water, sewer and solid waste infrastructure. Only recently, however, have local governments ventured into the provision of energy services (with some notable exceptions, such as the Cities of New Westminster and Nelson). Local governments can and have become involved in several different sorts of utility company:

- District Heating Utilities
- District Electricity Utilities
- Electricity Distribution Utilities
- Decentralized Utilities
- Independent Power Production.

4.2.1. District heating utilities

District heating systems (sometimes called 'community energy systems') are likely to offer the best opportunities for many local governments to create sustainable energy utilities. District heating is a long-established technology, providing heat to the residents of many European cities. Many local governments in Canada already own and operate a district heating utility.

How it works

In a district heating system, heat is generated in one or more facilities and distributed to a number of buildings through hot water or steam pipes. Some types of district energy system can also be used for cooling, as well as heating.

Local governments can install a district heating system in a development or neighbourhood, and run it as a district heating utility. Regardless of how such a utility is owned and financed, it will usually either charge customers a flat 'access fee' or use meters to charge customers for heat used. Where possible, it is better to meter heat consumption rather than charge a flat fee, since this provides consumers with an incentive to use their heat efficiently. *Heating Our Communities,* another module of this Community Energy Association *Renewable Energy Guide* series, provides detailed information about district heating systems and the renewable energy sources that can be used to fuel them.

A few of the buildings connected to the district energy service provided by the Lonsdale Energy Corporation in the City of North Vancouver.

Source: City of North Vancouver

Opportunities and advantages

District heating systems are typically more efficient than individual heating systems, and provide opportunities to incorporate renewable energy sources. In addition, district heating systems provide:

- Flexibility and opportunities for growth (it is typically straightforward to expand the system and connect new customers or heat sources)
- Relatively simple operation and management
- A strong business case, since the greater efficiencies of district heating lead to better economic performance than individual heating systems.

District heating systems are most appropriate where:

- There is sufficient density of buildings and heating loads. Areas of single-family homes are generally unsuitable for district heating systems, since the long distances between heat customers reduce the efficiency of the system.
- There is a major heat consumer (e.g. a hospital, recreation centre or industrial facility) that could serve as a primary customer to anchor the project.
- There is an existing fuel source (e.g. a local waste biomass source) or opportunity from heat recovery.

While it is possible to install a district heating system in existing buildings, district heating systems are most cost-effective in new developments.

Local service area bylaw: requiring connection to a district energy system

An important feature of district heating systems is that local governments can require customers to connect to the system. District heating thus offers one of the few mechanisms through which local governments can require, rather than just encourage, the use of renewable energy.

The *Community Charter* allows a local government to deliver and charge for any local area service it deems beneficial to the community.[14] Once the service is in place, the local government can mandate connection to, and use of, the service. Heating or cooling via a district energy system qualifies as a service, and the City of North Vancouver has implemented a district heating system using a Local Area Service bylaw.[15] This requires buildings to connect to the heating system provided by the City-owned Lonsdale Energy Corporation. The precedent set by the City of North Vancouver Hydronic Heating Bylaw has not been tested in the courts, and formal legal advice *must* be sought

Case Study : Lonsdale Energy Corporation

The City of North Vancouver's award-winning district heating system entered service in 2004, under the management of a wholly-owned city subsidiary, the Lonsdale Energy Corporation. The system is fuelled with natural gas, rather than with a renewable energy source, and is operated in partnership with Corix Utilities (formerly Terasen Utility Services). In 2007 the City was awarded $204,000 from the BC-Canada Rural Municipal Infrastructure Fund to supplement the system with solar energy. The money will fund the installation of 120 solar hot-water panels, expected to generate 280MWh of energy every year. The City is also exploring opportunities to use ground-source heat pumps to supplement the heat requirements of the system, and reduce reliance on natural gas. The Lonsdale system is an example of the flexible way in which district heating systems can grow, and incorporate new renewable energy sources as they do so.

before pursuing this approach. (For more on the Lonsdale district heating system, see section 5.3.)

Examples and resources

There are several local government district heating utilities in operation or under construction in British Columbia, and others across Canada. Some of these are profiled in the table below. An excellent source of information about district heating systems in North America is the District Energy Community Resource Centre[16], a website run by the Canadian District Energy Association.

Laying district heating hot water pipes in the City of Revelstoke.
Source: Revelstoke Community Energy Corporation

Examples of Municipal District Heating Utilities in Canada

Lonsdale Energy Corporation; City of North Vancouver, BC
- Natural-gas-fuelled district heating system, now expanding to include solar heating
- Wholly owned by the City
- Operation contracted to Corix Utilities

http://www.cnv.org/server.aspx?C=2&I=98

Revelstoke Community Energy Corporation (RCEC); City of Revelstoke, BC
- Biomass-fuelled district heating system
- Wholly owned by the City
- Operated as a wholly-owned subsidiary, which contracts staff to operate and manage the utility

http://www.cityofrevelstoke.com/edc/energyproject-announcement.htm

Markham District Energy Inc; Town of Markham, ON
- District heat and electricity utility, powered by natural gas
- Wholly owned and operated by the Town

http://www.markhamdistrictenergy.com

Drake Landing Company, Okotoks, Alberta
- Solar hot water/geo-exchange hybrid system provides heating to the 52 homes of the Drake Landing community
- Drake Landing Company established as a partnership between the Town of Okotoks, a developer, home builder and the gas utility ATCO
- ATCO will take over operation of the system after the first four years

http://www.dlsc.ca/

Centre in the Park Community Energy System; Strathcona County, AB
- Natural-gas-fuelled district heating system
- Wholly owned and operated by the municipality

http://www.strathcona.ab.ca/Strathcona/Departments/Utilities/Community+energy/About+community+energy.htm

District Energy Windsor (DEW); City of Windsor, ON
- Natural-gas-fuelled district heating and cooling
- Project developed by the municipally-owned electric utility
- The utility owns only the heat distribution assets; it buys heat from a privately-owned central heat plant

http://www.wuc.on.ca/index.asp?scn=65000&sub=65100

Sudbury District Energy Corporation (SDEC); City of Greater Sudbury, ON
- Natural-gas-fuelled district heating and electricity
- Jointly owned by the City of Greater Sudbury and Toromont Energy

http://www.summitconnects.com/Articles_Columns/Summit_Articles/2001/special_focus/PPP/Sudbury_energy.htm

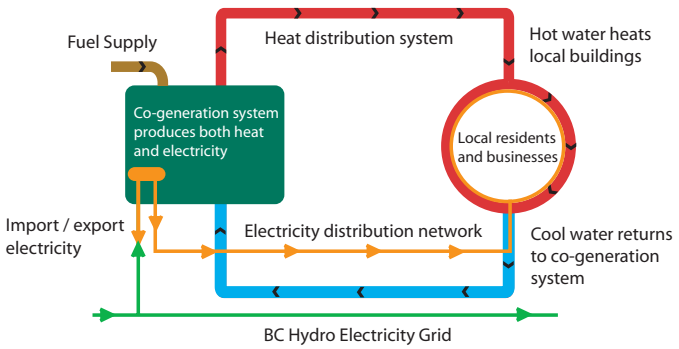
4.2.2. District electricity utility or "micro-grid"

How it works

It is possible for a local government to establish an electric utility that serves a new development or small neighbourhood. This would be analogous to a district heating utility: the local government would own the generation and distribution assets and provide customer services and billing. The system would include renewable energy generation (e.g. through a biomass co-generation system or solar photovoltaic panels), and would distribute electricity to customers connected to the system. Such a utility could be connected to the main grid. This would enable it to 'import' power from the grid in case of a power shortfall, and 'export' power to the grid to sell any surplus power (through BC Hydro's Standing Offer Program).

This kind of district electricity utility or micro-grid can also be developed to provide remote, off-grid communities with power. BC Hydro, through its remote communities electrification and non-integrated area programs, is actively promoting renewable energy in off-grid communities in British Columbia. Local government involvement in this sort of off-grid utility is likely best limited to involvement in a local IPP, supplying power to an off-grid system owned by BC Hydro (for information on local government IPPs, see Section 4.2.5).

It is possible that electricity supply might qualify as a service similar to heat supply, and that a local government district electricity utility may thus be able to mandate connection to the system (see Local Area Service Bylaw discussion in section 4.2.1 above). However, this model has never been tested, and legal advice must be sought before pursuing such an option.



Micro-grid diagram The distribution systems for both heat and electricity are owned and operated by the local government utility. The system can also export and import electricity to and from the BC Hydro grid.

Source: Adapted, with permission, from Woking Council

Opportunities and advantages

- Encourages development of local renewables to meet local power needs
- Best suited to new developments
- Micro-grids can usually be operated independently of the main electricity grid in "island mode", and therefore may be able to provide back-up power during a main-grid power outage
- Most likely to be economically viable with co-generation systems that provide heat as well as power
- Enables rate structures that provide incentives for energy efficiency.

Set against these advantages are costs of establishing and maintaining such a utility. Upfront capital investment, operation, maintenance and customer service could all

Case Study : Borough of Woking, UK

The Borough of Woking is a town in London's commuter belt, with a population of 90,000. In 1992, Woking realized it could save significant sums of money, and greatly improve environmental performance, by creating small district electric and heating utilities based on co-generation. Today, Woking owns nine natural-gas-powered co-generation systems (one of them using a fuel cell), and eleven photovoltaic solar power systems.

In each of these systems the Borough owns the generation and distribution infrastructure, piping for heat distribution and a 'private wire' system for the distribution of electricity. Over 10 years these systems, along with other energy efficiency measures undertaken in council-owned buildings, achieved carbon reductions of over 70%, and cost savings of nearly £4.9m (around CAD$10m). Woking's innovative energy projects have been financed from a revolving fund that started with a £250,000 (CAD$500,000) investment in 1991.

There are important differences between the Borough of Woking and local governments in British Columbia. First, Woking, like many UK local governments, owns and operates many more buildings than most local governments in British Columbia; the Borough Council owns around 10% of Woking's housing. Second, UK electricity rates are higher, and electricity is more carbon-intensive, providing greater opportunities to save money and emissions compared with British Columbia. However, most of Woking's projects have been retrofit into existing developments, incurring a significantly higher capital costs than would be the case for new developments. Woking is an example of what can be achieved by a Council that undertakes bold and innovative energy projects. **www.mefl.com.au/documents/woking-1.pdf**

represent significant costs. Given low electricity rates in BC, it is likely to be difficult to justify a micro-grid on financial grounds alone. Agreements with BC Hydro would also likely be necessary to ensure power quality and reliability for times when the micro-grid wanted to connect to the main grid.

Examples and resources

Neighbourhood or development-scale electric utilities have been established in several developments in Canada. The Direct Energy Centre, part of the Exhibition Place convention centre owned by the City of Toronto,[17] has a natural-gas-powered 'tri-generation' system, generating heating, cooling and electricity for the building.

4.2.3. Electricity distribution utilities

How it works

In most of British Columbia, electricity is distributed to customers by either BC Hydro or FortisBC. Six cities are exceptions; in Nelson, New Westminster, Kelowna, Summerland, Penticton and Grand Forks, municipal utilities distribute electricity and provide customer services and billing. This is for historical reasons, and the municipal distribution utilities have been in operation since before the establishment of BC Hydro in the 1960s. Most of these municipal utilities purchase power from other utility companies, rather than generate it themselves, and only Nelson Hydro owns and operates its own generation facilities.

Across Canada, the trend has been for local governments to sell their distribution utilities to larger utility companies. A recent example in British Columbia is the sale of Princeton Light and Power to FortisBC. However, in the US, several local governments have sought to buy the distribution network from the incumbent utility company, and establish their own municipal distribution utilities.[18]

Nelson Hydro generating station (right) operating since 1907 at Bonnington Falls; Fortis BC plant (left).
Source: Nelson Hydro, City of Nelson

A local government could, in principle, buy the local distribution network (or parts of it) from BC Hydro or FortisBC, and establish an electricity distribution utility. While this would be possible under current BCUC regulations,[19] it is unlikely that either BC Hydro or FortisBC would be interested in selling their distribution assets. Furthermore, it is not clear that the benefits of municipal ownership outweigh the considerable costs and complexity of establishing such a utility. As a result, opportunities created by ownership of a municipal electric distribution utility are likely restricted to those six British Columbia communities that already own their electric utility.

Opportunities and advantages

- Municipal electric utilities are well placed to generate their own power and integrate it directly into their own distribution systems.
- Municipal electric utilities are able to provide many more incentives for the adoption of renewable energy than local governments. For example, a municipal electric utility could offer a 'feed-in' tariff that would buy power from renewable electricity producers

Examples of District Electricity Utilities or "Micro-Grids"

Direct Energy Centre, Exhibition Place, Toronto

- Gas-fired co-generation system provides heat, cooling and electricity to the convention centre.

http://www.directenergycentre.com/org_environmental.htm
http://decrc.cdea.ca/connect/learn-links/supplemental-case-studies/toronto_cne.pdf

Borough of Woking, UK

- Nine co-generation systems provide heat and electricity to local residents and businesses
- Seven of these "private-wire grid" systems also include solar PV
- Jointly owned by local government and private partner

www.cfsd.org.uk/events/tspd12/WBC%20sustainable%20and%20renewable%20energy%20installations.pdf

Municipal Electricity Distribution Utilities in British Columbia

City of New Westminster

- Wholly owns and operates distribution system, provides customer services and billing
- Buys power from BC Hydro, does not generate any power itself
- Managed by a municipal Electric Utility Commission

http://www.city.newwestminster.bc.ca/cityhall/finance/electrical.htm

City of Penticton, City of Grand Forks and District of Summerland

- Each of these municipalities wholly owns and operates an electric distribution utility, and purchases power from FortisBC
- They do not produce any of their own power

http://www.penticton.ca/electrical/default.asp
http://www.city.grandforks.bc.ca/services/
http://www.dist.summerland.bc.ca/departments/power/

City of Kelowna

- Municipal distribution utility wholly owns distribution assets, and provides customer services
- Operation and maintenance are provided by FortisBC
- Buys power from FortisBC
- The Kelowna Landfill Gas project, within the service area, also produces power, which is either used by the landfill operations, or sold to FortisBC

http://www.city.kelowna.bc.ca/CM/Page391.aspx

City of Nelson

- Municipal utility wholly owned by the City of Nelson
- Provides service to the City of Nelson, and to some surrounding areas beyond city limits
- Produces over half of its own power, from the Bonnington Falls hydro station
- Buys remaining power from FortisBC

http://www.city.nelson.bc.ca/html/hydro.html

within the community at a favourable rate. Feed-in tariffs of this kind have been hugely successful in Spain and Germany.

- Ownership of a municipal electric utility empowers local governments to create rate structures that provide incentives for energy efficiency.

Examples and resources

The six British Columbia municipal electric distribution utilities are outlined in the table above. In addition, municipal electric distribution utilities are more common in Ontario, where they are represented by the Electricity Distributors Association (**http://www.eda-on.ca**; formerly the Municipal Electric Association). In the US, Austin Energy, the utility owned by the City of Austin, Texas, provides a range of energy programs, including a renewable energy credit scheme (which enable customers to buy only renewable energy), rebates for solar water heaters and free home energy audits. **http://www.austinenergy.com/**

4.2.4. Decentralized utilities

Utilities do not necessarily own and operate a single integrated system. There are models in which the utility owns and operates a portfolio of decentralized small energy systems. This can work with both heat and electricity technologies.

How it works

The local government utility can install renewable energy equipment such as solar water heaters or ground-source heat pumps in buildings throughout the community, and charge for their use. The local government utility would pay the upfront costs of installation, and would own the energy system. Customers would pay either a flat rate, or would pay an energy bill based on their energy use. Utilities of this kind are most successful when the customer experiences immediate savings over their previous energy system.

At Sun Rivers, Corix Utilities installs and manages the vertical ground-source heat loops as community infrastructure. Residents are billed a monthly ground loop access fee as part of their utilities, and save on monthly energy bills.

Source (image far left): Sun Rivers Golf Resort Community: www.sunrivers.com
Source (image left): Courtesy of WaterFurnace International: www.waterfurnace.com

One form of this decentralized utility model has become common in the private sector for ground-source heat pumps, and is known as the 'field rental' model. In this case, the utility company installs the ground loops (which collect heat energy from the ground), and then leases them to building owners. Recent examples of this model in British Columbia include the Sun Rivers Golf Resort Community[20] (a partnership with the Kamloops First Nation), and the Wilden development in Kelowna.[21]

The situation is a little more complicated for electricity technologies, because most renewable electricity technologies only provide power intermittently (when the sun is shining, or the wind blowing). With the establishment of a 'Net Metering' program in BC, there are opportunities to create a new type of electrical utility that manages a portfolio of 'micro-generators', rather than centralized generation and distribution systems. However, the low cost of electricity in BC means that decentralized utilities based on photovoltaics (PV) or small wind power, are unlikely to be economically viable business models.[22]

Opportunities and advantages

There are several advantages to local government operation of a decentralized utility based on renewable heat technologies:

- Unlike district heating systems, this model does not need high density development to be economically viable
- Can reduce energy bills for buildings supplied with renewable energy
- May create opportunities for local governments seeking to generate local 'offsets' to meet carbon neutrality commitments.

Examples and resources

While the decentralized utility model has become common in the private sector, there are currently few examples of local government involvement in such utilities. In Ontario, a local government-owned electric utility has partnered with a private company to create a decentralized ground-source heat pump utility called Lifetime Energy. Lifetime pays the full upfront cost of installation, and maintains ownership of the ground-source heat pump system. Charges for use of the ground-source heating system are then billed along with the regular electricity bill, and provide the homeowner with instant savings over their previous heating system.[23]

There are several private sector firms developing these kinds of services for renewable heat, particularly in the ground-source heat pump sector (the 'field rental' model, discussed above). In BC, Terasen Energy Services and Corix Utilities invest in sustainable energy systems, and provide operation and maintenance for the assets they own. In the solar heating sector, Mondial Energy in Toronto finances the installation of solar hot water systems using a decentralized utility model. Mondial obtains a performance guarantee from the solar hot water system installer, and an energy purchase agreement from the building occupier.[24] Mondial Energy retains ownership of the solar energy systems, and sells the energy to the building occupier.

Solar heating panels owned by Mondial Energy Inc. on the roof of WoodGreen Community Services residential building in Toronto.

Source: Mondial Energy Inc.

Examples of Decentralized Utilities in Canada

Corix Utilities
- Works throughout BC to develop sustainable energy systems
- Owns and operates the Sun Rivers ground-source heat utility overlooking Kamloops, as well as other ground-source heat utilities in Vernon and Invermere, BC.

www.corix.com

Lifetime Energy
- Jointly owned by a municipal electric utility and a private company
- Operates only in Ontario
- Pays capital costs associated with installation of ground-source heat pumps
- Retains ownership of the system
- Bills customers for access to system

www.lifetimeenergy.ca

Mondial Energy
- Based in Toronto
- Pays capital costs associated with installation of solar water heating
- Retains ownership of the system
- Bills customers according to heat used

www.mondial-energy.com

Terasen Energy Services
- Works in partnership with customers to develop sustainable energy systems throughout BC
- Invests in energy assets ranging in size from large-scale ground-source heating systems for stand-alone developments to complete district energy systems for communities.
- Enters into long-term contracts with energy users to supply their heating and cooling requirements, and to provide complete maintenance and 24/7 support.

www.terasenenergyservices.com

TerraSource
- An alliance between Corix Utilities (formerly Terasen Utility Services) and Geotility, a BC ground-source heat pump company
- Pays capital cost of ground-source heat pump loops, charges access fee
- Customer pays for, and owns, in-house parts of the system

www.terrasource.ca

4.2.5. Independent power production

How it works

Local governments can act as Independent Power Producers (IPPs), and develop renewable electricity projects that sell power to BC Hydro. BC Hydro buys power in a number of ways, but the most relevant for local government IPP projects are the 'Call for Power' process and the 'Standing Offer Program'.

Calls for Power. BC Hydro issues periodic calls for power, in which it invites IPPs to propose power projects and selects those from which it will undertake to sign an Energy Purchase Agreement. Further details about BC Hydro's acquisition process are available at **http://www.bchydro.com/info/ipp/ipp956.html.**

Standing Offer Program. BC Hydro introduced the standing offer program in 2007, in order to encourage small, decentralized renewable energy projects. Renewable energy projects with an electricity generating capacity of between 50kW and 10MW are eligible for the program. Projects sign a minimum 20-year Energy Purchase Agreement with BC Hydro, at a guaranteed price. It is possible for a local government to generate energy for its own use and sell any excess power to BC Hydro under the Standing Offer Program. Further details about the process are available at: **www.bchydro.com/standingoffer.**

For most local governments, the IPP model will only be possible in partnership with a private sector partner, since few local governments have the expertise needed to develop an IPP project alone. The Independent Power Producer's Association of BC (IPPBC) may be able to help local governments to find partners or to learn more about the process: **www.ippbc.com.**

Opportunities and advantages

- Potentially good business case. However, local governments must balance the potential financial benefits with the substantial business and investment risks associated with IPP development.
- Likely to work best where local governments own the resource, as with landfill gas projects.

Examples and resources

Several local governments in British Columbia have become involved in the development and ownership of independent power projects, profiled in the table below; all of these sell power to BC Hydro. Feasibility studies are available for many of these projects, and these provide a useful resource for other local governments that might be considering costs and benefits of a particular project.

In addition to the examples below, the Village of Anmore is exploring an innovative approach to structuring an IPP along with a private sector partner, making use of existing heritage hydro infrastructure.

The District of West Vancouver, in partnership with Pacific Cascade Hydro, generates 1.1GWh of hydro-electricity annually from its Eagle Lake water supply.

Source: District of West Vancouver

Examples of Municipal/Regional Independent Power Producers in BC

Vancouver Landfill Gas Utilization Project; City of Vancouver and Corporation of the District of Delta

- Electricity from landfill gas combustion in a co-generation power plant
- Heat distributed to nearby greenhouses
- Partnership with Maxim Power

Community Energy Association Case Study[25]

Hartland Landfill Gas Utilization Project; Capital Regional District

- Electricity from landfill gas combustion
- Partnership with Maxim Power
- Also see section 5.4

Capital Regional District submission to UBCM community excellence award[26]

Eagle Lake Micro-hydro; District of West Vancouver

- Small turbine installed in drinking water reservoir outflow, replacing pressure-reducing valve
- Project was established as a partnership with Cascade Power, a local firm
- Financed directly by District of West Vancouver

BC Hydro IPP profile[27]

China Creek Micro-hydro; Hupacaseth First Nation and City of Port Alberni

- Micro-hydro project
- Led by Hupacaseth First Nation; City of Port Alberni support role
- Jointly owned by Hupacaseth First Nation, Ucluelet First Nation, Synex Energy and the City of Port Alberni

BC Hydro IPP profile[28]

Waste-To-Energy Facility; Metro Vancouver

- Combustion of municipal solid waste generates electricity, sold to BC Hydro, and heat, sold to an adjacent industrial facility
- Owned by Metro Vancouver, operated by Montenay, Inc.

Metro Vancouver waste-to-energy facility fact sheet[29]

4.3. Steps in establishing a municipal utility

The process for establishing a municipal utility will be unique in each jurisdiction and will be influenced by the way in which ownership and operation of the system is structured. Chapter 5 discusses options for the ownership and operation of a local government utility in greater detail. In every case, however, there are certain common steps that must be considered, irrespective of the ultimate form that the utility takes. These include:

1. Identify possible projects suitable for your area. The Community Energy Association's documents *Heating Our Communities* and *Powering Our Communities* can provide some direction. RETScreen,[30] a free software tool developed by NRCan (see box in Chapter 3 for further details) is a straightforward way of quickly evaluating potential projects.

2. Contact critical partners to determine if there is any interest in developing an energy system, and any support available. These will differ between types of energy project. A district heating utility will need to confirm that there is interest from potential customers; an independent power production project will need to contact BC Hydro, and likely will need to contact existing IPPs as potential partners.

3. Establish a working group to collaborate on the project. This group should include at least one elected official, municipal staff members and the key partners identified in the previous step.

4. Contact the relevant regulatory authorities (e.g. Ministry of Environment) and, if appropriate, involve them from the earliest stage possible.

5. Investigate sources of funding for the preliminary scoping study. Chapter 6 outlines appropriate funding and financing approaches, and CEA's guide *Funding Your Community Energy and Climate Change Initiatives*[31] provides an up-to-date reference.

6. Launch a scoping study (also referred to as a pre-feasibility study) to investigate the potential for an energy utility. Much work can be done in-house, such as determining availability of renewable sources of energy, willingness of community members to participate in and/or support the project, identification of likely customers and so on.

7. If the scoping study shows promise, undertake a full feasibility study, which should include a detailed investigation of technical and financial aspects of the project. Note that the cost of a feasibility study can vary widely depending on scope and complexity of the energy system being considered.

At this stage, it will be possible to move forward with securing project financing and proceeding with project development.

5. Ownership and operation of projects

Utilities and Financing explores only ownership and operations models in which local governments have some ownership role. Encouraging the establishment of renewable energy utilities within the private sector will be addressed in the *Governance* module of this *Renewable Energy Guide for Local Governments in British Columbia.*

There are a number of ways in which energy utility businesses can be structured, with varying opportunities for local government involvement. This section outlines four variations to illustrate the range of possibilities, and highlights potential advantages and disadvantages of each:

1. Total ownership and operation directly by a local government
2. Total ownership and operation by a local government through a wholly-owned subsidiary
3. Total ownership of the utility, with some or all operation contracted to a private company
4. Partnerships with private companies, involving less than total ownership by the local government.

The applicability of these models will vary according to the sort of energy service being offered, but in general they apply across the generation and distribution of both heat and electricity. They are applicable for renewable energy projects in municipal operations, and for any of the utility models outlined in Chapter 4.

5.1. Model 1: Local government direct utility ownership and operation

In this model, the local government would own all of the generation and distribution assets. All regulatory and operational control resides with the local government, which operates and maintains the system, sets rates and collects payment from users. This model does not involve the establishment of a separate legal corporation to manage the utility; rather, the local government simply absorbs utility operation into an existing department.

Map showing the extent of the Neighbourhood Energy Utility in Vancouver's South East False Creek.
Source: City of Vancouver

The main advantages of this model are:

- Local government control over the project. This includes the ability to set rates (without oversight of the BCUC), and to expand the system and make technology choice decisions.
- Lower cost and greater flexibility of capital. Local governments can access low-cost financing from the Municipal Finance Authority. Furthermore, a private utility would be subject to BCUC regulations concerning capital structure (which require significant equity financing, for example). In contrast, local governments have no such restrictions, and are better placed to access grant monies from senior levels of government.
- Flexibility and synergies with other local government operations. For example, overall staffing needs may be reduced, as staffing can be integrated across the utility and other operations.

However, in directly owning and operating the energy utility, the local government takes on all the risks, both financial and legal, associated with running an energy business. The local government must have, or be able to acquire, significant in-house expertise to commission (and perhaps design and build), operate and manage the system.

Most municipal electricity distribution utilities are run on this model, with day-to-day operation handled by a city department. In the City of New Westminster, where the electric utility is operated by the City's Electrical Department, a municipal Electrical Utility Commission has been established to oversee management of the utility.[32] The Commissioners have electric industry management expertise that would not otherwise have been available within a city department.

The City of Vancouver directly owns and operates the Neighbourhood Energy Utility (a district heating system), currently under construction at the South East False Creek Olympic Village site. In 2006 the City commissioned a study to examine different ownership and operation options for the utility. This report is available online, and provides a useful resource for a local government considering establishment of a utility.[33]

Case Study : False Creek Neighbourhood Energy Utility

In its comprehensive redevelopment of the South East False Creek area, the City of Vancouver is establishing a district heating utility, called the Neighbourhood Energy Utility or NEU, in order to reduce greenhouse gas emissions arising from the development. The project is guided by two major objectives: the need to reduce greenhouse gas emissions, and the need for the project (and operations model) to be financially viable in the long term.

District heating systems can be run on a variety of different heat sources, and the City explored a number of options. The initial feasibility study concluded that either sewer heat recovery or biomass combustion technologies were capable of satisfying NEU's environmental and economic objectives. Although the biomass option had a lower cost, lower greenhouse gas emissions and lower technical risk, the City decided that an application to Metro Vancouver for an air emissions permit (and the necessary public consultation) would unacceptably delay the project. As a result, the Neighbourhood Energy Utility will be one of North America's first district heating systems using sewer heat recovery. However, the biomass option is still under consideration for possible future expansion of the NEU.

The City considered a number of options for ownership and operation of the utility:

1. Full ownership and operation by the City
2. Ownership through a wholly-owned subsidiary
3. Ownership with service contract
4. Private sector ownership and operation

After detailed analysis, the City opted to maintain full ownership and operation directly, without significant third party involvement or the creation of a subsidiary. This option allows the City greater assurance of meeting long-term GHG emission reduction targets and was identified as the lowest cost option for NEU customers.

Unlike other BC local governments, the City of Vancouver is able to issue debt directly, rather than through the Municipal Finance Authority. However, the Vancouver Charter did not authorize the City of borrow for the establishment of an energy utility. To overcome this problem, the City used interim financing of $14m from its internal Capital Financing Fund to cover start-up development costs. Since this time, the Province of BC has amended the Vancouver Charter and the City now has the authority to engage in utility-specific borrowing with a similar model to its water utility.

The utility will structure rates to ensure that energy costs:

- are acceptable to consumers,
- fully cover the costs of the NEU to the City, and
- provide price signals that encourage energy-efficient behaviour.

5.2. Model 2: Local government ownership through a wholly-owned subsidiary

It is possible for the local government to wholly-own an energy utility, and operate it separately from other local government operations through the formation of a subsidiary corporation. The subsidiary would be a legally separate body governed by the *Business Corporations Act*.

Major advantages of this model are:

- Some protection of the local government from liability, since the subsidiary corporation is a legal entity responsible for its own debts and liabilities. This protection may not be complete however. If a heating system operated by a local government utility fails, it is likely that residents would demand compensation from the local government should the subsidiary corporation become insolvent.
- Significant control retained by council. Managerial direction for this subsidiary corporation could come from a variety of sources, including local government council or a group of councillors specially tasked to direct it. The utility is less directly under the local government's control than the previous model, but significant council control can still be maintained.
- Avoids BCUC oversight.
- Relatively cheap capital, as above.

The Cities of Revelstoke and North Vancouver have both adopted this model for their district heating utilities, having formed the Revelstoke Community Energy Corporation and the Lonsdale Energy Corporation respectively.

Case Study : Revelstoke Community Energy Corporation

The City of Revelstoke launched its district heating system in 2005, to provide hot water heating to local buildings in the downtown core. The system burns woodwaste from the Downie Timber sawmill and in addition to heating water, supplies low pressure steam for Downie's drying kilns. The system provides lower energy costs and price stability to customers, improves air quality by reducing the amount of woodwaste burned in the silo burner, and provides a financial return to the municipality. Recent community consultation around Revelstoke's OCP shows public support for the system, and an interest in its expansion.

The City had previously established a successful wholly-owned corporation, the Revelstoke Community Forestry Corporation, to own and manage a community forest business. This experience led the City to follow a similar model in developing the energy system, through the formation of the Revelstoke Community Energy Corporation (RCEC).

RCEC works closely with Downie Sawmill, which donated land for the project, and which has provided a guarantee of 20 years of free fuel from sawmill waste. Downie Sawmill is also one of the RCEC's major customers, having signed a 20-year energy purchase agreement.

Financing was provided through a combination of loans, grants and City investment. Total project cost was around $5m, of which the FCM Green Municipal Funds provided $1.35m as a grant and $1.35m as a low-interest loan. The City itself invested $1.25m from its utility reserve fund, while the remaining $1m was borrowed from the local credit union. RCEC wholly owns the system and is responsible for its operation.

The biomass heat plant of Revelstoke's district heating system.
Source: Revelstoke Community Energy Corporation

5.3. Model 3: Local government ownership, private operation

A third way that an energy project may be structured is by vesting total ownership of the system and its assets in the local government, and contracting out the servicing and operation of the system to a third party. In this case, the utility can be owned either by the local government directly, or by a wholly-owned subsidiary.

Advantages of private operation:

- Council maintains some control, for example through setting rates through bylaws and operating policies, but less so than in the above models since Council would be constrained by contracts signed with the service provider
- Potential to benefit from private sector expertise in delivering energy services
- Avoids BCUC oversight
- Relatively cheap capital, as above.

An example of a municipally-owned system that has contracts with a service provider is the City of North Vancouver's district heating system. The Lonsdale Energy Corporation (LEC) was established in spring of 2003 and is a wholly-owned corporation of the City of North Vancouver.[34] The LEC manages the Lonsdale district energy system, which produces and distributes hot water at a series of natural-gas-fired mini-plants within Lower Lonsdale. All buildings to be constructed within the district energy catchment area, including City land and the pier development, are required to utilize hot water (or 'hydronic') heating so as to be compatible with a possible future connection to a district heating system.

The boilers that provide heat for North Vancouver's district heating system are serviced and maintained by Corix Utilities.
Source: Community Energy Association

LEC reports regularly to Council on its performance and Council approves utility tariffs; the utility is not regulated by BCUC. The local government has signed an agreement with Corix Utilities (formerly Terasen Utility Services) to provide operating services, customer care services and billing, as well as design, construction, installation, maintenance and operations of all boiler plants. (For more on the Lonsdale district heating system, see section 4.2.1.)

5.4. Model 4: Less than 100% public ownership

In British Columbia, local governments are empowered to form partnerships with the private sector to deliver services.[35] In a joint-equity partnership, the local government owns less than 100% of the system. While the requirement for BCUC oversight may still be avoided in many of these arrangements, a legal opinion should be requested by the private partner to confirm their exemption, on a case-by-case basis.[36]

Partial ownership can take many forms. In some cases, it is possible for the local government to own only some system assets, but to wholly own these. For example, a local government could own the distribution system in a district heating system, while a private partner might own the heat generators. This model has been used by the City of Windsor, Ontario, with the distribution assets of District Energy Windsor owned by the City, and the heat generation plants owned privately.[37]

Alternatively, partial ownership will mean that both local government and private investors hold equity in the project. This model will usually involve establishment of a subsidiary corporation.

The Hartland Landfill Gas Utilization Project, a partnership of the Capital Regional District and Maxim Power, produces 1.6 MW of green power and returns a royalty of $200,000 annually to the CRD.
Source: Capital Regional District

The principal advantages of this model are:

- Risks are shared with private-sector partners
- Enables the project to benefit from private sector expertise
- Capital costs are shared with private-sector partners.

The major disadvantages are a partial loss of control over, and revenue from, the project, and potential BCUC oversight.

This model has been common for local governments involved in independent power production, and examples include:

- Hartland Landfill Gas Utilization Project, a partnership of the Capital Regional District and Maxim Power (CRD share is 70%).
- Vancouver Landfill Gas Utilization Project, a partnership between the City of Vancouver, Corporation of the District of Delta and Maxim Power.

Case Study : Sudbury District Energy Corporation

The Sudbury District Energy Corporation runs a district heating and electricity utility in Sudbury, Ontario, jointly owned by the City of Greater Sudbury and Toromont Energy. The Corporation owns and operates two co-generation systems, and distributes heat and cooling to a number of buildings, including local government headquarters, Sudbury Arena and Sudbury Regional Hospital.[38] Electricity produced by the co-generation units is sold to the grid.

5.5. Summary: Models of ownership and operation of energy utilities

Energy Utility Models: Considerations and Examples

Model 1: Local government direct utility ownership and operation

Advantages

- Direct local government control
- Potentially lower cost of capital
- May be synergies with other City departments
- Avoids BCUC oversight

Disadvantages

- Risks and liability directly borne by City
- Requires the city to have expertise in energy system management

Examples

City of Vancouver Neighbourhood Energy Utility; most electricity distribution utilities

Model 2: Local government ownership through a wholly-owned subsidiary

Advantages

- Lower liability and risk
- Direct local government control
- Day-to-day operations delegated to board of directors
- Avoids BCUC oversight

Disadvantages

- Some risks still carried by City
- New bylaw required
- May be higher operating costs compared to direct City operation

Examples

City of North Vancouver Lonsdale Energy Corporation
City of Revelstoke Community Energy Corporation

Model 3: Local government ownership, private operation

Advantages

- Lower liability and risk than direct operation
- Expertise of private sector
- Potentially lower staffing costs
- Avoids BCUC oversight

Disadvantages

- Government control less direct
- Some risks still carried by City

Examples

City of North Vancouver Lonsdale Energy Corp.
City of Kelowna electric distribution utility

Model 4: Less than 100% public ownership

Advantages

- Expertise of private sector
- Some private sector capital
- Risks shared with private partner

Disadvantages

- Less government control
- Potential for BCUC oversight
- Revenues shared with private sector

Examples

Most municipal IPP projects

6. Financial tools for municipal delivery of energy

Developing a renewable energy project will require significant time and effort. It will also require money. This chapter briefly outlines options for financing and funding a renewable energy system, whether part of a utility, or simply an installation in a local government building. The chapter makes a distinction between financing and funding renewable energy projects. Financing refers to how the upfront capital is secured, while funding refers to the ultimate source of money for the project, that is, how the upfront capital costs are repaid or recovered.[39]

6.1. Financing

Relatively small projects can be financed on a 'pay-as-you-go' basis, directly from the local government capital or operating budgets. For larger projects other financing arrangements are likely to be more appropriate. This section provides an introduction to some of the more innovative approaches to financing local government renewable energy.

Some form of debt will be necessary for many projects. This is perfectly appropriate – renewable energy is "marketable" infrastructure, which can be self-financing. In the case of a local government utility, the energy bills paid by customers will cover debt repayments. In the case of renewable energy projects within municipal operations, the savings on conventional energy bills will pay back the upfront investment.

The traditional form of debt for capital projects for most local governments is the Municipal Finance Authority's Capital Borrowing Program. Local governments are likely to be familiar with this approach, which entails some restrictions (such as the requirement for elector and provincial approval, and limits to the total liability local governments can take on).[40]

In addition to long-term borrowing through the MFA, many renewable energy projects undertaken by local government in British Columbia have also benefited from low-interest loans from the Federation of Canadian Municipalities Green Municipal Fund. These are both good options for long-term financing of energy projects. More innovative financing arrangements include:

- Community bonds
- Lease-purchase
- Revolving energy funds
- Financial partners in a joint-equity project.

The Local Government Finance Branch of the Ministry of Community Services can provide guidance on specific issues surrounding local government borrowing. You can find the Financial Analyst for your local government here: **http://www.cserv.gov.bc.ca/lgd/infra/index.htm.**

6.1.1. Community bonds

A community bond is a form of borrowing from within the local community. The local government, through the Municipal Finance Authority, issues bonds that offer local residents a secure investment that benefits the community. Interest rates are set by the local government, and are typically structured so that they provide residents with a better rate than a Canada Savings Bond, and provide the local government with cheaper capital than would be available in public capital markets. Advantages of community bonds include:

- generation of local interest and pride in the project
- local benefits of investment

Case Study : Whistler Athlete Village District Energy System

As part of the preparation for the 2010 Winter Olympics, the Resort Municipality of Whistler is working with Terasen Energy Services to develop a renewable district heating system for the Athlete Village development. The project examined a range of renewable heat sources for the district heating system (including ground-source heat and landfill gas combustion), and is progressing with wastewater heat recovery. A heat plant in the wastewater treatment system will warm water that is then distributed throughout the Village. Heat pumps in each building will then extract heat from the water. The system is expected to result in 60-70% lower greenhouse gas emissions than a typical heating system.

Capital financing for the project was unusual, in part because of Whistler's status as a host for the 2010 Olympics. Funding for the distribution pipes came from Olympic infrastructure funds for the Village, along with road, water and sewer infrastructure. The wastewater treatment plant was already due to be upgraded (at a cost of around $50m), and the heat recovery plant represents a relatively small additional cost (around $2.5m). Whistler also received a loan of $2.25m from FCM's Green Municipal Fund for the project.

- interest paid to local businesses and residents; unlike with most other forms of debt, the cost of interest is also kept within the community.

The local government issuing the community bond is responsible for advertising and selling the bond to businesses and individuals in the community. Typically this process involves a town hall meeting, in which the local government outlines the investment for which bonds are being issued, and the MFA provides assurance about security of the bonds (the bonds carry the same AAA credit rating as other MFA services). The process for public assent is the same as that for long-term capital borrowing.

There are several examples of local governments in British Columbia using community bonds to finance infrastructure projects such as road and sewer repairs. For example, the Village of New Denver used community bonds to raise $220,000 in 2005. The Municipal Finance Authority provides a brochure describing the process involved in issuing community bonds.[41]

6.1.2. Lease-purchase

In a lease-purchase model, ownership of the energy system rests with a third party until the final lease payments have been made. Once all payments have been made, the local government takes over ownership of the system. This is essentially a different way of structuring debt that provides more flexibility and can be cheaper than long-term debt.[42]

The Municipal Finance Authority runs a leasing program, with a floating interest rate set at 1% below prime. Note that leasing can only be used for equipment that is removable (a solar heating panel, for example, could be leased, while most energy efficiency measures such as insulation could not be). For a leasing term of less than five years, no public assent is necessary. Further details are available from the Municipal Finance Authority.[43]

6.1.3. Revolving Energy Funds

A revolving energy fund is a system of financing energy improvements. A fund is set up to lend money for energy efficiency and renewable energy projects. The savings and revenues from these projects go back into the fund, which is then able to fund further projects. A good example at the national level is FCM's Green Municipal Fund, which provides both grants and loans for infrastructure projects including renewable energy.

A revolving fund can be established in a number of different ways. Most commonly, a revolving fund is set up through an initial endowment or seed funding. How much of the revenue or savings stream is reinvested into the fund, and how much is used elsewhere, can be decided by council. However, revolving funds work best where 100% of revenues are reinvested into the fund.

Advantages of revolving funds include:

- long-term savings, by building on earlier savings to generate deeper savings
- a framework for long-term investment and action
- a management tool to ensure costs, revenues and savings are kept on track.

Toronto's Waterfront wind turbine, which received funding from the Toronto Atmospheric Fund.
Source: Toronto Atmospheric Fund

Examples of revolving energy funds in Canadian cities include Edmonton's Energy Management Revolving Fund,[44] and the Toronto Atmospheric Fund (see Case Study). The International Council for Local Environmental Initiatives (ICLEI) has published a short compilation of Australian local government experiences with this model.[45] It might also be possible to partner with other local governments to develop pooled revolving energy funds.

6.1.4. Financial partners in a joint equity project

A further option that a local government may wish to pursue is a partnership with another organization that will bring capital to the table. This partner provides investment in exchange for an ownership share of the project. Not all partnership arrangements will be able to access MFA financing, and a local government entering a joint equity partnership should contact the Municipal Finance Authority early in the process, as the MFA can provide guidance.

Advantages to this approach are:

- sharing of project risks
- private sector energy and finance expertise
- reduced local government capital requirement.

Case Study : Toronto Atmospheric Fund[46]

The Toronto Atmospheric Fund was established in 1991, with a $25m endowment from the sale of city-owned property. The fund now provides over $1m in annual grants, and up to $8m in loans for energy projects. Funded projects create $2.7m in annual savings. Projects provided with loans include Toronto's Waterfront Turbine, and Canada's first municipally-owned 'tri-generation' system, which produces heat, cooling and electricity for an exhibition and convention centre.

Balanced against these benefits is loss of some control of the project, and loss of some revenues to the private partner. It is also unlikely that the private partner would be able to access capital at rates as favourable as those provided by the MFA, so any capital brought in by the private partner may increase the overall cost of capital for the project.

6.2. Funding

Regardless of how projects are financed, they must ultimately be paid for. There are three general options:

- User fees (i.e. energy revenues)
- Taxation (and local improvement charges)
- Grants (usually from higher levels of government, i.e. through non-municipal taxation).

6.2.1. User fees

People are accustomed to paying for energy, and this is usually straightforward and uncontroversial. Some form of user fees is likely to be the best choice in funding most renewable energy projects. Where the local government has established a utility, user fees can be collected in a relatively straightforward manner, as a traditional energy bill. In the case of independent power projects, power will be sold to BC Hydro, rather than to customers directly.

A potential difficulty with user fees is the administrative burden they may place on the utility. Ideally, user fees should be tied to energy use, since this will provide customers with an incentive to use energy frugally. The City of Vancouver is planning to use a metering system for its Neighbourhood Energy Utility, in part to ensure that consumers are encouraged to adopt energy-efficient behaviours. Alternatively, energy consumers can be charged a periodic flat rate for use of an energy system, and the bill collected along with other utility rates (for sewer and water services, for example). The district energy system in Whistler is planning to use this approach.

The second potential difficulty with the user fee approach is that renewable energy projects may come at a higher cost than traditional BC energy costs. Consumers in British Columbia are used to paying extremely low prices for energy, and funding the full cost of a renewable energy system through user fees might lead to energy bills that consumers perceive to be unacceptably high.

A metering box for a district heating system.

Source: Community Energy Association

To some extent, higher user fees must be accompanied with the message that the higher costs are the necessary price of addressing society's rising emissions and the challenges of sustainability. One way to communicate this message would be to itemize the difference between conventional rates and the local government utility rates as a 'green premium' on the bill.

An alternative approach is to attempt to "monetize" the environmental attributes of renewable energy (as distinct from the energy itself) by selling emission credits or green energy credits.

6.2.2. Taxation and Local Improvement Charges

While renewable energy projects could be paid for with general taxation revenues, this is likely not the best option. Budget limitations aside, charging users directly is more likely to be perceived as fair.

An alternative type of taxation that can be used to fund renewable energy technologies integrated into buildings is the Local Improvement Charge (LIC). LICs are added as an item in the property tax bill, and are usually used to fund improvements that are highly specific to a local area, such as road paving or sidewalk construction. They are, in effect, similar to user fees, but unlike user fees, the charge is assessed as a tax on a building, rather than as a fee levied for the use of a service. This means that when homeowners

Did you know? Marketing the attributes of renewable energy: Carbon and green energy credits

There are many individuals and organizations willing to pay a premium either to buy green energy, or to meet carbon neutral objectives by buying carbon offsets. This enables an energy utility to 'monetize' the environmental attributes of green energy, by selling the environmental benefits in addition to the actual heat or power delivered. Selling the 'green premium' to carbon credit buyers is unlikely to generate significant revenue, but may make it easier to pass energy costs on to users at a rate that meets BC energy consumer expectations.

Markets for carbon reductions are still in their infancy, but are developing rapidly. As yet, there are few rules guiding the market, and local governments should seek advice if they wish to follow this approach. Note that it will not be possible to sell renewable energy credits arising from electricity projects that have signed Energy Purchase Agreements with BC Hydro as part of the Standing Offer or Net Metering programs, as BC Hydro demands that all green energy or carbon credits are transferred to BC Hydro.

move, the LIC is still assessed against the building until the capital investment has been paid off. The LIC can be structured so that the savings resulting from the renewable energy system are greater than the local improvement charges, so the building owner experiences modest savings as soon as the renewable energy system is operational.

Local improvement charges would be particularly appropriate where the use of renewable energy would provide immediate local environmental benefits. This might include areas that suffer poor air quality from the use of inefficient wood-burning fireplaces and stoves. A LIC-funded program to provide alternative sources of renewable heat (such as an efficient stove change-out program, or solar hot water heating program) would provide direct local air quality benefits, as well as reducing the community's energy use and greenhouse gas emissions.

While LIC funding could be used for a range of energy utility projects, it would be most appropriate for a decentralized utility. A successful LIC program would:

- Establish which technologies are eligible for the program
- Set performance standards, and identify eligible installers (for example, those accredited by relevant industry associations)
- Advertise the program widely in the community, and ensure it is not seen as a 'tax' on green energy, but as an opportunity for homeowners to access low-cost financing for renewable energy in their own home.

The District of Central Saanich, in partnership with the Pembina Institute, has explored options for using LICs to fund energy efficiency and renewable energy projects.[47] Although no local government in British Columbia has used LICs to fund renewable energy projects, a legal opinion obtained by the District of Central Saanich suggests that it would be feasible.[48]

6.2.3. Grants

In addition to user fees and/or taxes, it may be possible to use planning and capital grants to fund renewable energy projects. The Community Energy Association has produced a short guide to loans and grants available (see *Funding Your Community Energy and Climate Change Initiatives*[49]), including Gas Tax Agreement funds, FCM's Green Municipal Fund, ecoEnergy and a wide range of other funding sources. The Community Energy Association can provide advice about which of these may be relevant for a particular project.

Grant programs are often over-subscribed. To increase your chances of funding:

- Complete and include a feasibility study if applying for a capital grant program. This will demonstrate that various options have been reviewed and the best solution has been determined.
- Include a corporate and/or community energy plan to demonstrate how the capital project is working towards a long-term corporate/community energy target.
- Include updated and detailed cost estimates.

The Ministry of Community Services Local Government Infrastructure Planning grant program provides an opportunity to apply for feasibility and corporate/community energy planning funding to help support local government renewable projects. Further information is available here: **http://www.cserv.gov.bc.ca/lgd/infra/infrastructure_grants/index.htm.**

Overlooking Thunder Meadows, near Fernie, BC

7. Conclusion: A vision for a renewable BC

Renewable energy is a booming global industry, attracting 20-25% of global investment in the power sector.[50] As conventional energy prices rise, and as the world confronts the challenges of climate change, the growth of renewable energy will certainly continue. Cities around the world are seizing opportunities presented by the global shift towards renewable energy supplies, and this guide outlines the ways in which local governments in British Columbia can realize the economic and environmental benefits of renewable energy.

Looking forward ten years, we can imagine communities in which residents profit from their investments in a local energy system; communities whose energy bills pay for local jobs, not for imports; communities that take pride in their role as clean, green entrepreneurs.

Realizing this vision will take dedication and hard work. The Community Energy Association is committed to helping local governments become leaders in Canada's transition to a low-carbon economy. Contact us for support. We look forward to hearing how your community is developing renewable energy policies and projects, and we'll share your successes with other local governments, as we'll share theirs with you.

Endnotes

[1] Renewables Global Status Report 2006, published by the Renewable Energy Policy Network for the 21st Century: **www.ren21.org**

[2] For a history of the development of district heating in Denmark, visit the website of the Danish Board of District Heating, at **http://dbdh.dk/artikel.asp?id=479&mid=24**

[3] For a description of Freiburg's solar programs, visit http://www.solarregion.freiburg.de/solarregion/freiburg_solar_city.php

[4] BC Climate Action Charter: **http://ubcm.ihostez.com/content/pdfstorage/27805820A3714D389CFBE558FC06F7B9-ClimateActionCharter.pdf**

[5] 2007 BC Energy Plan **http://www.energyplan.gov.bc.ca/**

[6] Heating Our Communities, a Module of the Renewable Energy Guide for Local Governments in British Columbia. Community Energy Association 2007. **http://www.communityenergy.bc.ca/resources-introduction/heating-our-communities-renewable-energy-guide-for-local-governments-in-bc**

[7] Oliver, BC curling club case study, produced by NRCan **http://www.geo-exchange.ca/Pdf/OliverBCCurlingClub.pdf**

[8] South Cariboo Recreation Centre. **http://geoheat.oit.edu/bulletin/bull26-3/art6.pdf**

[9] **http://www.gvrd.bc.ca/sustainability/casestudies/HydeCreekRecreationCentre.htm**

[10] CanSIA case study of Okotoks, Alberta. **http://www.cansia.ca/downloads/bulletins/NB003s.pdf**

[11] Miami, Manitoba – CanREN case study **http://www.canren.gc.ca/renew_ene/index.asp?CaID=48&PgID=786**

[12] Fort Smith, NWT SolarWall installation **http://www.pwgsc.gc.ca/si/inac/content/programs_energy_heating-e.html#sec4**

[13] BC Utilities Commission Act, Section 1. **http://www.qp.gov.bc.ca/statreg/stat/U/96473_01.htm#section1**

[14] *Community Charter,* Section 216

[15] City of North Vancouver Hydronic Heating Bylaw: **http://www.cnv.org/bylaws/bylaws/7575.doc**

[16] District Heating Case Studies: **http://decrc.cdea.ca**

[17] Exhibition Place, Toronto **http://decrc.cdea.ca/connect/learn-links/supplemental-case-studies/toronto_cne.pdf**

[18] Six Iowa communities attempt to buy distribution network **http://www.newrules.org/de/archives/000128.html**

[19] BC Utilities Commission Act, Section 52.

[20] Sun Rivers Golf Resort Community in Kamloops, an example of a ground-source heat pump utility: **http://www.sunrivers.com/geothermal/golf-geothermal-heating.shtml**

[21] Wilden Development in Kelowna, an example of a ground-source heat pump utility: **http://www.wilden.ca/geothermal.php**

[22] There do not appear to be any successful North American examples of private sector firms developing a decentralized electric utility that manages a portfolio of small-scale renewable generators. Citizen:Re, a US company, is attempting to develop the model, offering free installation of solar PV panels and charging customers rates slightly lower than their initial electricity provider. However, the company has not yet started installing panels, and it has been accused of promising more than it can deliver.

[23] **http://www.lifetimeenergy.ca/FourEasySteps.php**

[24] **http://www.mondial-energy.com/howitworks.htm**

[25] Vancouver Landfill Gas Utilization Project case study: **http://www.communityenergy.bc.ca/news/2002-winner-delta-vancouver-for-landfill-gas**

[26] Capital Regional District case study of Hartland Landfill Gas Utilization Project **www.crd.bc.ca/waste/documents/fcm_landfillgas.pdf**

[27] BC Hydro profile of the District of West Vancouver's Eagle Lake project **http://www.bchydro.com/info/ipp/ipp8541.html**

[28] BC Hydro profile of the China Creek micro-hydro project **http://www.bchydro.com/info/ipp/ipp40394.html**

[29] Metro Vancouver waste-to-energy fact sheet **www.gvrd.bc.ca/recycling-and-garbage/pdfs/WasteEnergyFactsheet.pdf**

[30] RETScreen software is available from NRCan at **www.retscreen.net.**

[31] Funding Your Community Energy and Climate Change Initiatives is available from the Community Energy Association's website at **http://www.communityenergy.bc.ca/news/funding-your-community-energy-initiatives**

[32] City of New Westminster Electrical Utility Commission **http://www.newwestcity.ca/cityhall/electrical/index.htm**

[33] **www.city.vancouver.bc.ca/ctyclerk/cclerk/20061214/documents/csb3a.pdf**

[34] For more information about the Lonsdale Energy Corporation, visit their website: **http://www.cnv.org//server.aspx?c=2&i=98**

[35] Section 8(2) of the *Community Charter*

[36] The BC Utilities Commission has discretion to exempt a utility from direct regulation, if it is satisfied that the public interest is being protected.

[37] District Energy Windsor: **http://www.wuc.on.ca/dew/dew.cfm**

[38] Sudbury District Energy system **http://decrc.cdea.ca/connect/learn-links/supplemental-case-studies/sudbury.pdf**

[39] Casey Vander Ploeg, 2006. New tools for new times: a sourcebook for the financing, funding and delivery of urban infrastructure. Canada West Foundation. **http://www.cwf.ca/V2/files/NewTools.pdf**

[40] Information about the restrictions on long-term borrowing can be found at **http://www.cserv.gov.bc.ca/lgd/gov_structure/community_charter/finance/borrowing_leasing_changes.htm**

[41] Community Bond Brochure, Municipal Finance Authority. **http://www.mfa.bc.ca/pdfs/Community%20Bond%20Brochure.pdf**

[42] ICLEI Resource on financing renewable energy: **http://www.iclei.org/index.php?id=1669**

[43] Municipal Finance Authority leasing program **http://www.mfa.bc.ca/leasing.htm**

[44] **www.edmonton.ca/Environment/WasteManagement/OfficeofEnv/EnergyManRevolvingFund.pdf**

[45] **http://ccp.iclei.org/ruralvic/pdf/REF.pdf**

[46] Toronto Atmospheric Fund **http://www.toronto.ca/taf/**

[47] Peters et al 2004. Using local improvement charges to finance building energy efficiency improvements. Report for Climate Change Central and BC Hydro. Pembina Institute, Calgary **http://pubs.pembina.org/reports/LICProgramFinal%20ReportMay27042.pdf**

[48] Buholzer, B. 2007. Letter to Rosalyn Tanner of the District of Central Saanich containing legal advice on the use of Local Improvement Charges to finance solar panels. Lidstone, Young, Anderson: Barristors and Solicitors. January 3rd 2007. Vancouver, BC **http://www.communityenergy.bc.ca/sites/default/files/LIC%20Legal%20Opinion.pdf**

[49] Community Energy Association. Funding Your Community Energy and Climate Change Initiatives: A guide to funding and resources for British Columbia local governments. **http://www.communityenergy.bc.ca/resources/cea-publications-0**

[50] Renewable Energy Policy Network for the 21st Century. Global Renewables Status Report 2006. **www.ren21.org.**

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