

FCM Sustainable Communities Mission

British Columbia, 2008



Case Study: Creating Sustainable Energy

OVERVIEW

Energy efficiency has significant economic and environmental benefits, and many communities in British Columbia are exploring opportunities for district energy and co-generation—combined generation of heat and power. In addition, raised standards and educational initiatives target energy conservation.

The B.C. Community Energy Association supports municipalities that address energy sustainability. Municipalities can address their energy needs in environmentally sustainable and economically viable ways through community energy plans, which involve mapping energy needs and untapped resources, sourcing renewable energy, using legislation to improve energy efficiency, and using education to improve energy conservation. By exploring local energy solutions, municipalities can demonstrate leadership and inspire and educate the community.

District energy is the distribution of thermal energy through a system of pipelines. Renewable district energy supports the environmental, social, and economic aspects of sustainability, and ensures security of supply, decreases reliance on fossil fuels, and lowers greenhouse gas (GHG) emissions. Because the economies of district energy are improved by dense, mixed-use neighbourhoods, sustainable neighbourhood developments often implement a district energy facility to provide revenue, generate jobs, and retain energy revenues for the community.

- Communities are looking to district energy systems and opportunities for the combined generation of heat and power to improve energy efficiency, to ensure sustainability of their energy supply, and to stimulate the local economy.
- Waste has become a resource: the heat given off by sewer mains can be captured and used to heat homes, and waste-to-energy facilities can turn garbage into heat and electricity.
- Energy efficiency is an economic necessity, and municipalities are reducing energy demand by encouraging density, creating incentives, and implementing legislation.



"Inside the Metro Vancouver waste-to-energy crane operator's area" l. to r.: Jean Tremblay (Saguenay, QC); Berry Vrbancovic (Kitchener, ON), Ken Lemke (Stony Plain, AB); Metro tour guide and crane operator



Building tomorrow, today.

FCM | Centre for Sustainable
Community Development



Many technologies are suitable for district energy; communities should explore what best meets their needs. Municipal energy mapping can identify untapped hot spots such as major sewer mains that could support future district energy facilities. Once this mapping is completed, municipalities can capitalize on construction maintenance opportunities to implement district energy.

Density is “the most powerful tool [for sustainability] that is under municipal control” said Brent Toderian, director of planning with the City of Vancouver. As energy prices rise and take an even greater proportion of gross domestic product (GDP), North American cities will need to increase densification to remain economically viable and competitive with dense European cities. However, legislation must be enacted to require specific energy efficiencies. High density buildings can be energy inefficient if they are not well designed.

On average, each resident of Vancouver produces five tonnes of carbon dioxide per year. Those living in the dense downtown peninsula produce only one and a half tonnes of carbon dioxide per year, below the level required for climate stabilization. Vancouver has implemented a number of measures for sustainability. By 2012, Vancouver city operations will be carbon neutral, and any new development on a site larger than two acres must test the feasibility of a district energy facility and install one if possible.

BC Hydro, B.C.’s electric utility, will attain self-sufficiency by 2016. BC Hydro’s Power Smart initiative will help to meet this goal by promoting energy conservation and educating consumers. BC Hydro is also exploring ways to involve local governments and enable sustainability and conservation through methods including district energy, combined heat and power, and community energy planning.

COMMUNITIES IN ACTION

Municipalities in B.C. are pioneering new approaches to energy. Bob Hawkesworth, an alderman from Calgary, commented, “fundamentally, what we’re trying to do is something that hasn’t been seriously undertaken before: to radically reduce energy consumption—

and in a culture where the profligate use of energy is just taken for granted. Success with these initial pioneer projects is very important. It gives you the confidence to move on, and it helps establish momentum.” Squamish, Revelstoke, Cheakamus, Chetwynd, and Kelowna have implemented innovative measures that address the energy efficiency needs of their particular communities.

The Squamish Community Energy Action Plan will improve energy efficiency and decrease the use of fossil fuel energy sources throughout the community. A district energy system will be created—first to provide downtown buildings with hot water from natural gas boilers, and later to become a co-generation system powered primarily with biomass. The facility may be one central plant or a series of miniature utilities. The construction for the downtown waterfront development could offer an opportunity to capitalize on radiant heat from sewer mains.

Revelstoke received a grant from the FCM Green Municipal Fund for its Community Energy Project, a unique partnership between the city and a local sawmill to produce thermal energy from wood residue in a biomass boiler. The project will provide the sawmill with low-pressure steam, while providing buildings in downtown Revelstoke with hot water and reducing GHG emissions by 3,700 tonnes annually. It could be replicated by other forestry-dependent municipalities.

Whistler’s Cheakamus Crossing, which will be the Whistler Athlete’s Village during the 2010 Olympic Winter Games, will have a district energy system that capitalizes on the waste heat from the effluent generated by the municipal wastewater treatment plant. This is, essentially, a free source of renewable energy, and up to ninety per cent of the Cheakamus Crossing heating needs will be provided by the system. Water at an ambient temperature of 12°–15°C will be pumped around the village through a looped pipeline. Heat pumps within the individual units will capture the energy from the water and use it to heat the homes.

“One of the things I found most fascinating [during the FCM Mission tour] is the ability to capture wastewater energy,” said Al Kemmere, a reeve from Mountain View County, Alberta. “There is lots of potential in that.”

By 2009, Dokie Wind Energy Inc. will install 48 commercial-grade wind turbines near Chetwynd. The wind farm will generate enough renewable energy to power 34,000 homes per year, and the first eight turbines will be installed in fall 2008.



Since 2004, Chetwynd has used four 27-metre-high windmills to power 5,250 decorative LED lights, originally installed as part of its WinterLights Celebration Program. The wind power project sparked community interest and engagement.

Kelowna has installed a microturbine project at its Glenmore Landfill. Methane gas from the landfill is collected in a series of horizontal pipes and fed into a microturbine, where it is combusted to generate energy.

METRO VANCOUVER WASTE-TO-ENERGY

“Energy recovery projects are the key to getting to carbon neutral for Metro Vancouver,” said Roger Quan, Air Quality Planning Division Manager, Policy and Planning Department, Metro Vancouver. Metro Vancouver produces three million tonnes of garbage per year, fifty-two per cent of which is diverted through recycling programs. Within the next seven years, waste diversion will increase to seventy per cent. The revision of the 1995 waste management plan capitalizes on waste as a resource, with opportunities for material and energy recovery. The Metro Vancouver Waste-to-Energy Facility (WTEF), which has been in operation since 1988, reduces waste to ten per cent of its original volume.

The plant’s receiving bunker can hold 3,500 tonnes of waste—enough to operate the plant for four days. Currently, the plant combusts 850 tonnes a day, which is 130 tonnes above capacity. Waste is fed into the furnace at a steady rate by computer-controlled rams. Most materials combust, as the furnace burns at 1,150°C; bottom ash and non-combustibles fall through a grate at the bottom of the furnace. The bottom ash is collected for reuse at a landfill for cover and road construction. The flue gas emerges from the furnace at 230°C. This heat is used to boil water and generate steam, which drives a turbine and creates electricity. The flue gas is then filtered through a bag house with 480 fabric filters that remove the fly ash. The clean gas emerges from the stack at 135°C. Air quality is carefully monitored and the emissions meet strict environmental controls. The plant’s emissions have never been detected by airshed monitors.

Operated and maintained by Veolia Environmental Services, the facility has been upgraded nearly every two years, so it is more efficient and has better environmental performance than the original design. Steam that is extracted halfway through the process and sold to the nearby paper mill generates revenues of \$7 million per year. Energy sales account for revenues of \$6 million per year. Ferrous metal is removed from bottom ash and sold for \$1 million per year. The facility is exploring how to capitalize on its waste heat by providing

heat to a residential development four and a half kilometres away from the plant.

Waste-to-energy facilities are efficient at a minimum of 100,000 tonnes of waste per year, which would be generated by approximately 100,000 people. The WTEF will have a minimum lifespan of 50 years with no maintenance or upgrades. The capital cost to construct a similar facility today would be approximately \$250,000. More information is available on the Metro Vancouver website at www.metrovancouver.org/services/solidwaste/planning/Pages/default.aspx.

SOUTHEAST FALSE CREEK

Vancouver’s Southeast False Creek Neighbourhood Energy Utility will be located on the development site and provide heating and hot water to all buildings in the Southeast False Creek development. Its first phase will recover heat from the municipal sewer system, and capture heat from solar modules mounted on roofs in the Southeast False Creek neighbourhood.

Sewage waste heat will be captured and used to heat water, which will be delivered to individual buildings through a network of underground pipes. Natural gas can also be used to supplement captured sewage waste heat in case of extreme temperatures or simultaneous hot water demands. The facility will act as a showcase for sustainable technology, and will at a minimum meet LEED Gold standards.

The utility, which will be owned and operated by the City of Vancouver, will significantly reduce GHG emissions and can adopt new alternative heat sources as technology advances. “We’re off the grid for heating and for domestic hot water,” said Jody Andrews, project manager.

DOCKSIDE GREEN

The Dockside Green development in Victoria will produce more energy in its onsite power plant than it will consume in its buildings. The excess heat will be exported to a neighbouring hotel, making the community carbon positive in terms of building heating.

The waste wood biomass gasification plant uses a system manufactured by the B.C. company, Nexterra Energy Corp. “Focus on your local businesses to build your economy,” developer Joe Van Belleghem said. Construction waste wood can be used; because contaminants must be avoided, drywall or wood immersed in the ocean cannot. The plant uses natural gas boilers as a backup system.



CONTACTS

Brent Toderian
 Director of Planning
 City of Vancouver
 E-mail: brent.toderian@vancouver.ca
 Website: vancouver.ca/commsvcs/planning

Brent Leigh
 Managing Director
 Squamish Sustainability Corporation
 Tel.: 604-815-5087
 E-mail: bleigh@squamish.ca
 Website: www.businesssquamish.com

Cameron Chalmers
 Director of Planning
 District of Squamish
 Tel.: 604-815-5000
 E-mail: cchalmers@squamish.ca
 Website: www.squamishbusiness.com

Gary MacIsaac
 Executive Director
 Union of British Columbia Municipalities
 Tel.: 604-270-8226
 E-mail: info@civicnet.bc.ca
 Website: www.civicnet.bc.ca

Neil Godfrey
 Vice President
 Whistler 2020 Development Corporation
 Tel.: 604-935-3030
 E-mail: ngodfrey@whistler.ca
 Website: www.whistlerdevelopmentcorp.ca

Mike Vance
 General Manager
 Community Initiatives
 Resort Municipality of Whistler
 Tel.: 866-932-5535
 E-mail: mvance@whistler.ca
 Website: www.whistler.ca

Roger Quan
 Air Quality Planning Division Manager
 Policy and Planning Department
 Metro Vancouver
 Website: www.metrovancouver.org

Martin Elsasser
 Assistant Facility Manager
 Veolia Environmental Services
 Tel.: 604-521-1025
 Website: www.VeoliaES.com

Jody Andrews
 Deputy City Manager and Project Manager
 Southeast False Creek and Olympic Village
 E-mail: mailto:olympicvillage@vancouver.ca
 Website: <http://www.vancouver.ca/olympicvillage>

Joe Van Belleghem
 Co-developer
 Dockside Green
 E-mail: joe@docksidegreen.com
 Website: <http://www.docksidegreen.com>

ADDITIONAL RESOURCES

This case study highlights sites visited by delegates on the 2008 FCM Community Energy Planning Mission. For additional information on the Mission, including more Mission case studies, presentations and the 2008 Mission Report, visit the FCM Centre for Sustainable Community Development Website at www.sustainablecommunities.fcm.ca/Community_Energy_Mission.