

# LONSDALE DISTRICT HEATING

## Connecting North Vancouver, one step at a time

*The award-winning Lonsdale Energy Corporation (LEC) has emerged as a North American leader in the use of district energy mini-plants to deliver energy efficiently, conserve land, and promote integrated planning and high-performance building design. At the same time, the City of North Vancouver is using district energy as part of its strategy for waterfront revitalization and sustainable energy conservation. The LEC is a successful example of a self-sustaining utility operated through an alternative financing and procurement model. The system demonstrates the ability of district energy systems to accommodate a range of thermal needs of a diverse customer base.*

### Overview

The Lonsdale Energy Corporation (LEC) district heating system is made up of a series of mini-plants, each of which contains several high-efficiency, gas-fired condensing boilers providing 800-900 kW of energy. Three mini-plants are currently operating, with capacity for 15 boilers. Each mini-plant has the capacity to serve about 10 buildings. When fully built out, the system should provide up to 15 MW of hot water - enough to serve over 3 million ft<sup>2</sup> of building area. Hot water is distributed through underground pipes to customers. When the thermal heat energy has been used in the building's heating system, cooler water is returned to the mini-plants where it is reheated and recirculated.



#### Ownership

- public ownership

#### Sectors served

- ☒ Residential
- ☒ Commercial
- ☐ Institutional
- ☐ Industrial

#### Network capacity

- 6 MW heating



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## Context

In the early 1990s, the City of North Vancouver launched a planning initiative to redevelop the City's waterfront and urban core areas. In approving this initiative, City Council required that planners address energy considerations along with land use. This requirement was unusual, since energy planning in British Columbia is normally left to provincial-scale organizations, such as BC Hydro for electricity and Terasen Gas for natural gas.

Local Councillors were invited by the Federation of Canadian Municipalities (FCM) to join an "energy mission" to Europe to visit up-to-date energy installations. The study tour of centralized district energy systems in Europe led the City to retain consultants to explore the potential for a district heating utility.

The pre-feasibility study found that land for a central, stand-alone plant was scarce in the area. The study also noted that a central plant would require significant up-front capital to develop and that in creating a central plant, the City would have to forgo funds from some other potential revenue-producing redevelopment on municipal land. Further, a central plant would result in high operating costs for 24-hour on-site staffing to monitor system operations.

The alternative was interconnected mini-plants. The decision to pursue this option led to the establishment of the Lonsdale Energy Corporation (LEC). LEC is a public utility governed and regulated by the City of North Vancouver. The City entered into an agreement with Corix Utility, formerly Terasen Utility Services, which handles the development, maintenance, monitoring, servicing and the day-to-day operation of the Lower Lonsdale service area mini-plants. Initial planning for start-up capital of \$8 million for the system included \$2 million from the City of North Vancouver, \$2 million from Corix Utility, and a \$2 million loan as well as a \$2 million grant from the FCM Green Municipal Investment Fund.

## Timeline

- 1998** - City of North Vancouver funds feasibility study on district heating for Lower Lonsdale, Versatile Pacific site, and the Central Lonsdale area.
- 2001** - Federation of Canadian Municipalities provides \$20,000 to City of North Vancouver for study of the potential for "mini-plants" in the Lower Lonsdale and Versatile Pacific areas.
- 2003** - Federation of Canadian Municipalities, Green Municipal Investment Fund, provides \$4 million in project funding.
- 2004** - Agreement signed with Corix Utilities, formerly Terasen Utility Services to provide design, construction installation, maintenance, and operations of boiler plants, as well as operating services, customer care, and billings in the Lower Lonsdale service area; system begins operation.
- 2007** - Creation of the Central Lonsdale service area

## Benefits

### General

- LEC offers heating security. If one plant fails, other plants continue to provide customers with hot water.
- Mini-plants suit urban environments where land is scarce; they fit into residential and commercial parking lots. The average plant size is 1,200 to 1,400 ft<sup>2</sup>.
- The system is designed for flexibility and fuel optimization. The boilers have the potential to be adapted to use a variety of fuels.

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## Benefits cont...

### Environmental

- Improved air quality through reductions of nitrous oxide emissions by 64 percent and carbon dioxide emissions by 21 percent relative to conventional heating practices.
- High-efficiency energy boilers provide a 95 percent rate of capture on heat energy.
- Water-based energy delivery system can be adapted to alternative fuel sources,.

### Economic

- Competitive energy costs
- Rates include a capacity, meter and commodity charge which takes into consideration the specifics of each customer
- Total system capital cost (2003 estimate) \$8,133,800.

## Structure

The City of North Vancouver owns and regulates the Lonsdale Energy Corporation (LEC). City Council oversees the LEC, including defining the service area and setting rates for operating the district energy system. Corix Utilities is under contract to the LEC for building and operating the boilers in the Lower Lonsdale service area. The related infrastructure required for the delivery of hot water is contracted by LEC to the City of North Vancouver. Corix Utilities also provides customer service, such as metering and maintenance in the Lower Lonsdale service area.

## Basic Information

**Building type served:** residential and commercial

**Building area served:** 600,000 ft<sup>2</sup>

**Location:** City of North Vancouver, British Columbia

**Service begins:** 2004

**Utility Company:** Lonsdale Energy Corporation

**Technology:** Seven Viessmann condensing high efficiency boilers

**Production capacity:** 6 MW

**Fuel type:** Natural gas

**Distribution system:** Hot water uses thin-walled steel pipe insulated with PUR insulation

## Performance

The LEC boiler systems are designed to capture up to 95 percent of the heat energy derived from burning natural gas to heat water. The efficiency of the system has led to a review of the proposal to install five mini-plants to serve 3 million ft<sup>2</sup> of commercial and residential customers. Given improvements in building design to better incorporate the high efficiency of the LEC district energy systems, fewer mini-plants and boilers are needed.

## Lessons learned

**Hybrid utility service models are a viable option for the delivery of distributed energy services.** In North Vancouver, energy services were traditionally the responsibility of provincial agents, such as BC Hydro or Terasen Gas. Establishing a municipal utility service meant rethinking the best way to deliver competitive energy services to city residents.

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## Lessons learned, cont....

An open/expandable model allows for innovation, mitigates development and operational risk, and optimizes expertise, ingenuity, and rigour in the delivery of a particular community service.

**Hybrid utility service models may be subject to requirements that do not apply to traditional utilities.** As a net importer of natural gas, LEC had to pay provincial sales tax (PST) on the purchase of fuel from suppliers. LEC was also required to charge PST to customers benefiting from the thermal services provided by the LEC. Under provincial regulations, however, utilities such as BC Hydro and Terasen Gas do not have to charge PST to residential customers. The tax requirement placed the LEC at a competitive disadvantage. LEC and the City of North Vancouver have been successful at partly resolving the issue. Following an amendment of BC's Social Service Tax Act and Regulations, PST is no longer charged on the invoices to residential customers. However, PST is still required to be paid on natural gas purchases and LEC is continuing its work to have this requirement removed.

**Municipalities can encourage uptake of district energy through planning practices.** For the City of North Vancouver, the process of undertaking an energy plan led to identifying sites within the municipality that would have a high demand for heating, as well as a mix of building types. The process contributed to the City acknowledging a need for contractual obligations with builders purchasing City-owned land to connect to district energy. As part of the rezoning process for development on City-owned lands, connection to the LEC is required and is treated like other municipal infrastructure requests, such as provisions for sidewalks, roads, sewer connections, and stormwater management. Before any development proceeds, every builder must sign a heat service contract. Because of this agreement, every customer pays the same rate for heating.

**High-performing district energy systems demand a new approach to engineering and building design.** As interest in district energy systems has grown, so has the awareness of the need to accurately model the efficiency of a district energy system. For the LEC, engineering design teams at first over-estimated heating demand for residential buildings, resulting in the over-sizing of

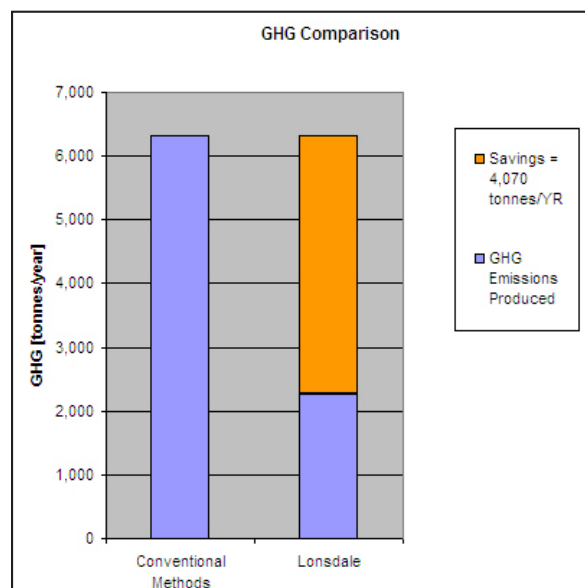
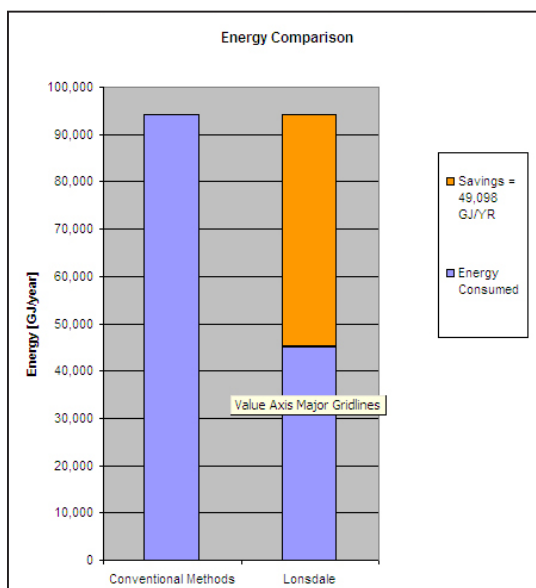
the mini-plants. Local developers' engineering design teams were also unfamiliar with the controls needed to ensure optimal operation of the mini-plant boilers. Management and operational staff of the LEC have since introduced detailed guidelines for developers' design teams to help implement the infrastructure, design, and controls needed to connect to the district energy system. LEC also works closely with owners' or developers' design engineers to streamline the preparation of designs.

### How the Lonsdale system works:



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## Energy / Greenhouse Gas Savings:



## Future

As of 2007, six buildings, totalling more than half a million ft<sup>2</sup> of commercial and residential space, are connected to the LEC system. In the next few years, service delivery is expected to double as new buildings are completed on the waterfront, including a commercial office building, two high-rise residential buildings and one mixed-use residential/retail building. In total, over 15 new buildings on the waterfront, including a hotel and conference facility, will contribute to the expected 2 to 3 million ft<sup>2</sup> of building area to be connected to the system within 10 years. Currently the LEC is expanding the district energy system within the high density growth corridors of the City of North Vancouver.

This expansion has led to the development of two distinct distribution grids. The most recent grid is located in the Central Lonsdale area and is expected to incorporate the use of solar energy collectors.

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<http://www.terasen.com/UtilityServices/Experience/NorthVanLowerLonsdale.htm>



Lonsdale District Heating Community  
is a member of the CDEA

*The opinions expressed in this document do not necessarily represent those of the plant operators or the project sponsors.*