

PEI ENERGY SYSTEMS

Consolidation leads to economic benefits

Prince Edward Island is home to Canada's longest-running, privately operated, biomass-fired district heating system. Operating since the 1980s, the system has expanded to serve over 100 customers in the downtown core of Charlottetown and contributed to the establishment of a local waste-wood fuel-supply market. With valuable agricultural and revenue-producing land being consumed for landfill, minimizing waste was an important priority. In addition, limiting use of imported fuel sources was also important for ensuring long-term energy price stability. Charlottetown is an excellent example of how provincial energy concerns and municipal waste management issues can be addressed by district energy systems.

Overview

The Charlottetown district energy system serves over 125 buildings, comprising a mix of residential, commercial, and institutional customers, by distributing approximately 1 million litres of hot water through a 17-km distribution system, and high pressure steam through a 1 km distribution line to the Queen Elizabeth Hospital.

Within each customer's building is a heat transfer station with two heat exchangers: one for the building, which circulates water at 80°C, and another smaller one for domestic hot water that operates at 50°C.



Ownership

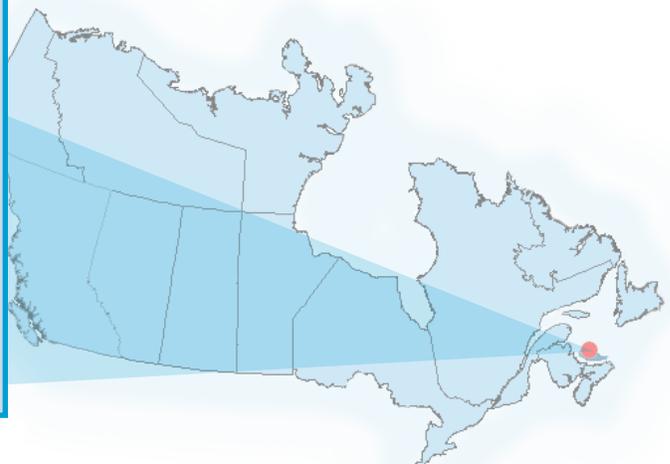
- private ownership

Plant capacity

- 33 MW heating
- 1.2 MW electricity

Sectors served

- Residential
- Commercial
- Institutional
- Industrial



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Overview, cont...

The system also provides steam for cooling at the Queen Elizabeth Hospital and hot water for cooling at the University of Prince Edward Island. Both facilities use absorption chillers to provide cooling. Power production for the system is decentralized from the provincial grid with the use of a 1.2-MW turbine generator that provides electricity for the main production facility.

Context

The Province of Prince Edward Island has long sought alternative local fuel supply options, since most of the province's oil and electricity must be imported. The search for local fuel sources and a proactive solution to the treatment of municipal waste led to the establishment of Canada's first biomass-fuelled hot water district heating system.

Between 1981 and 1989, three small district heating plants were constructed in the city by a crown corporation, the PEI Energy Corporation. The first plant was established for the Queen Elizabeth Hospital and used municipal solid waste to produce steam. The other two systems used wood waste from local sources to produce hot water and steam for provincial buildings, as well as the University of Prince Edward Island.

In 1995, Trigen Energy Canada Inc., then one of North America's largest owners and operators of district energy systems, purchased the district energy system from the Province. All three systems were connected to one large district energy system and the production was consolidated at one central district energy plant in the core of Charlottetown.

As part of the integration and upgrading process, a heat-recovery boiler and a highly efficient biomass plant to burn sawmill waste were added. In addition, power capacity was added to the plant

Timeline

- 1981-85** - Three district heating plants built in Charlottetown.
- 1995** - Province sells district energy system to Trigen Energy Canada.
- 1998** - Efficiency upgrades completed.
- 2004** - Addition of hot water storage and economisers.

with the installation of a 1.2-MW back pressure turbine to produce electricity for the plant and sell excess power to the local utility. In addition to the energy upgrades, a complete emissions control system was added, including dry lime. The efficiency upgrades were completed in 1997 at cost of nearly \$28 million.

Basic Information

- Building type served:** institutional, commercial and residential
- Building area served:** Over 4.5 million ft²
- Location:** Charlottetown, P.E.I.
- Completed:** 1997, upgraded in 2003
- Owner:** Fort Chicago Energy Partners L.P.
- Demand:** over 40 MWt
- Production capacity:** Base load 22 MW
Peaking and backup 51 MW
- Fuel type:** 41% municipal solid waste; 42% sawmill residue; 17% oil
- Distribution System:** 17 km hot water, thin-wall steel piping system
- Total cost of project:** \$25 to \$30 million for all system upgrades

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Benefits

General

- The Charlottetown district energy system burns about 66,000 tons of waste materials., including municipal waste and wood waste

Economic

- The provincial government estimates that for every dollar spent on biomass fuel, 70 cents stays in the local economy.
- Sawmill waste, which was a former liability, is now a profitable asset.

Environmental

- Levels of carbon dioxide, sulphur dioxide and nitrogen emissions have been reduced relative to fossil fuel operating systems.
- Consumption of heating oils by individual building boiler systems was significantly reduced and now serves as a secondary fuel source for back-up.
- Improved air quality with the removal of uncontrolled stack emissions from multiple boiler plants in individual buildings and replacement with a single well-managed plant.

Performance

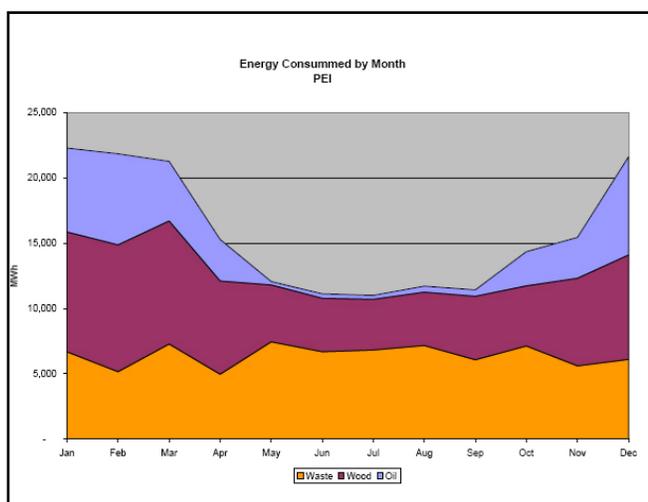
While financial viability is important and makes the Charlottetown district energy system a success, priority is placed on providing high-quality customer service and strengthening the local biomass fuel market. Customers are offered rates that are competitive with their alternative cost of energy, typically light oil. Customers are also protected from volatile market swings in the cost of oil through secured contracts for the delivery of heat at competitive rates.

Customers are generally satisfied with the reliability, consistency and convenience of the district heating services. The Harbourside Project, a large apartment building, saved nearly \$350,000 in capital upgrades by choosing not to upgrade their internal heating system and using the high-efficiency of the Charlottetown district energy system instead.

Lessons learned

Engaging local stakeholders and regulatory bodies from the outset can help establish a broad base of support and limit the impact of regulatory hurdles encountered. The challenges encountered by the developers when integrating the Charlottetown district energy system included securing access through municipal rights-of-way, specifically with regards to piping infrastructure and roads. Working closely with municipal agencies and departments at the pre-feasibility stage of a project can ensure timely decisions on the locations of infrastructure and can help avoid costly “work-arounds.”

Scanning for municipal fees and tax implications at the pre-feasibility stage makes it possible to identify alternative strategies and assess cost implications.



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Lessons learned, cont...

Capital and long-term operating costs of a project can incrementally escalate when levies or fees are applied to plant infrastructure located in municipal or private right-of-ways.

District energy systems in smaller communities can be integrated into existing urban environments and used as part of an economic retention and growth strategy.

In Charlottetown, expansion opportunities have focused on converting and retrofitting the existing building stock of the community to generate the appropriate thermal and customer demand. For many communities experiencing little or no growth, business and other commercial services are seeking competitive advantage in the cost of operations and district energy offers this advantage.

Optimizing existing infrastructure assets can contribute to the development of a viable and profitable district energy system.

For Charlottetown, a patchwork of plants across the City offered an existing distribution network on which to build a district energy system. Across Canada, many communities have housing cooperatives, campuses, and multi-unit buildings that use small-scale centralized boiler systems. These systems offer a point for evaluating district energy. Development risk and initial capital investment can be reduced by locating and assessing existing distribution infrastructure systems (culverts, channels, high-pressure pipes, boiler systems, etc.), determining opportunities for conversion, and examining forecasted growth in terms of population and employment plans for a municipality.

Structure

PEI Energy Systems is a privately run company, previously owned and operated by Countryside Power Income Fund. In August, 2007, Countryside Power Income Fund was acquired by Fort Chicago Energy Partners L.P., a Calgary-based income trust operating as a publicly traded limited partnership. Fort Chicago's portfolio includes a number of assets from energy and petrochemical industries across North America.

Future

Moderate growth is expected for the Charlottetown district energy system. Growth will depend largely on the development of new buildings.

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