


Thank you for the opportunity to explain to an international audience, Revelstoke's experience with its move into the field of green energy production and use.

## Overview

- Project description
- Why we did the project
- Financial aspects
- Operating experience
- Looking forward



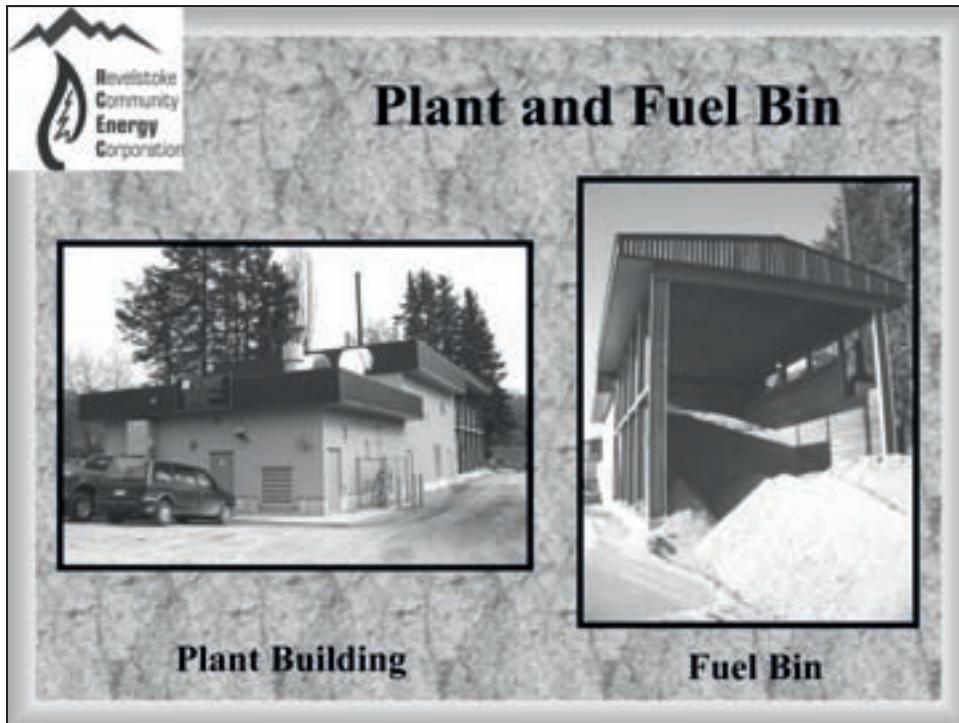
## Project Description

- Heat Only Project
- 1.5 Megawatt Biomass Boiler and 1.75 MW propane backup boiler
- Wood “waste” from Downie Sawmill
- Plant produces steam for sale to Downie’s dry kiln
- 2.3 km of District Heating Piping to major buildings in the City Core for Heating and Domestic Hot Water

It is designed to burn up to 7,000 green tonnes of waste wood residue per year; or 10% of the waste from the Downie Mill.

The word “waste” is in quotes because what was totally a waste product a few years ago now has a value, so in fact the contribution of the Downie Mill is much more significant than when the project was established.

Target is to provide about 85% of the steam for the dry kiln.



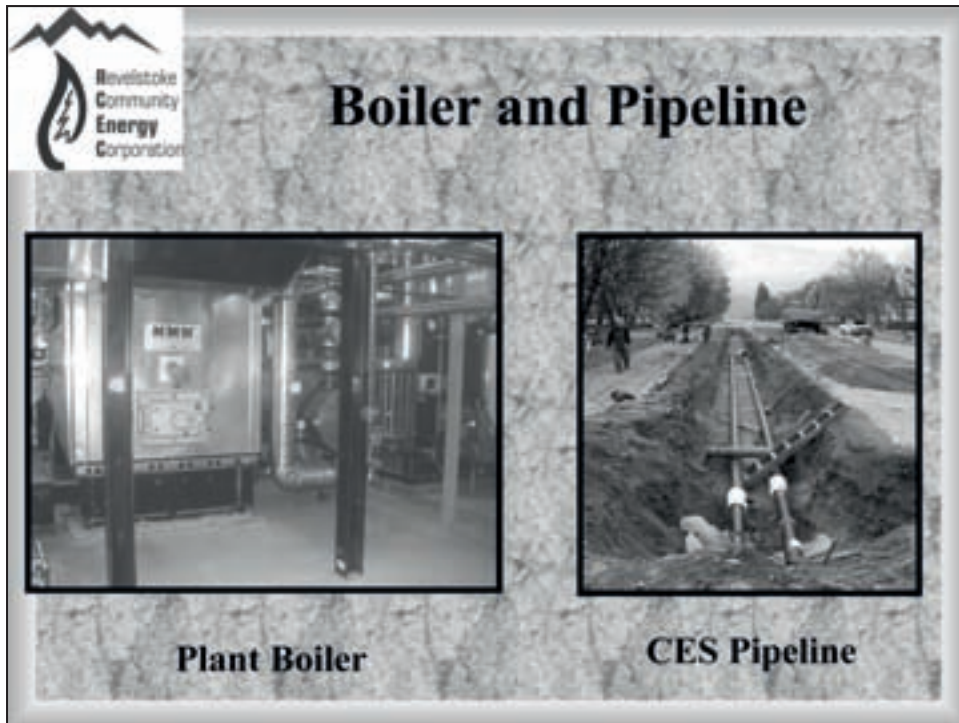
The Central Heating Plant is 300 sq metres, and contains the highly automated 1.5 MW (thermal) bio-mass burner

It also includes a back up propane-fired boiler and electrical generation, so that we can guarantee the delivery of the heat to our customers even in the event of a plant failure and power outage.

The propane boiler also provides a peaking capacity for really cold days.

There is cyclonic and electrostatic ash/dust collection on the system, to ensure clean effluent gases.

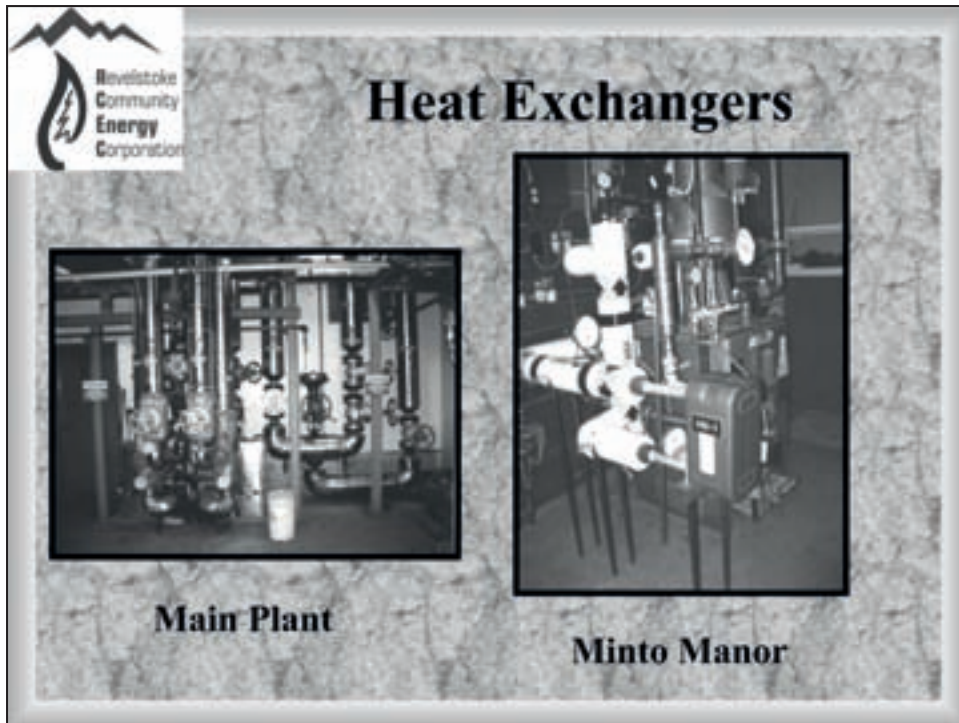
The fuel bin holds between a 2 and a 3 day supply of fuel.



The boiler heats oil, that transfers the heat to both the stem generator and the hot water CES. Thus the plant doesn't work with a high pressure steam boiler, and this has distinct advantages from a staffing point of view.


Pipe is welded, insulated, and contains a leak detection system so that we know if there is a leak, and where it is. Has been hit by a backhoe and survived.

Cost was about \$700 per trench metre when we did the project. Substantially more now...



The heat exchangers at the plant extract the heat from the oil into the circulating CES pipes.

The heat exchanger at the Manor, one of our smaller customers, measures 12" x 4" x 3.5", is in the blue box. This replaces the propane furnace behind it and provides all the heat required for space heating and domestic hot water.




## Why Revelstoke Did This Project

- Improved air quality
- Step toward silo burner elimination
- GHG displacement @ 3400 tonnes/yr.
- Propane import displacement
- Alternate energy source
- Non-taxable, non tax source of City revenue
- Value-added use of wood “waste”
- Local processing of local resources

Air quality was a major concern for the citizens of Revelstoke, due partially to the presence of the Oliveen burner for waste wood at the Downie Mill.

We are now at the point of seriously considering the expansion of the plant in response to rising demand for heat, and the possibility of adding co-generation capacity.



## **Advantages to Downie and CES Customers**

- Long term stable energy pricing
- No need for a boiler and maintenance of same, with space saving in building
- A “Win-Win” solution to wood “waste”

Contracts are for 20 years, and the cost of energy for our customers will not increase by more than the cost of living in BC each year. With our newer contracts, the price will be 85% dependent on CPI in British Columbia, and 15% on the CPI – Energy for BC. This provides some insulation against our propane prices rising sharply.

What other energy source gives that type of guarantee?




## Project Costs

- \$7.9M Project
- ~\$3.0M for Central Plant and Equipment\*
- ~\$2.7M for Phases 1, 2, & 3 of CES\*
- ~\$1.2M for Energy Transfer Stations\*
- ~\$1.0M for construction financing, developer's costs, etc.

\* Includes design and engineering

The system is now built out to the capacity of the biomass combustor.



## Sources of Financing


• RCFC Holding Co.	\$1.25M
• City Pref Share Purchase	\$1.20M
• FCM GMF Loan @ ~3.5%	\$1.35M
• Revelstoke Credit Union	\$1.00M
• FCM GMF Grant	\$1.81M
• Towns for Tomorrow grant	\$0.38M
• From operating funds	<u>\$0.91M</u>
• Total	\$7.90M

Briefly, 28% of the cost was covered by a grant  
 17% was covered as a low interest loan  
 13% was a loan at prime plus, and  
 31% came from the City of Revelstoke and its wholly owned  
 RCFC.



## Financial Summary

- Simple Payback – 13 years (10)
  - Return on Investment\* – 5.3% (6.5%)
  - Return on Equity\* – 8.8% (13.8%)
- \* Over 25 years - figures in brackets represent projections  
in feasibility study



## **Our Experience To Date – Start Up**

- Approximately 2% over budget at commissioning
- Learning curve on boiler operation - fuel feed modifications, adjustments for variations in fuel
- Failure to meet first 2 year's revenue projections & significant extra costs to rectify problems
- Customers have difficulty understanding seasonal boiler efficiency which causes difficulty in establishing Energy Supply Agreements.

Part of the reason the 1<sup>st</sup> year projections were not met is that build out occurred over 3 years, and it would be better to have all customers on line from the start.

## Experience - Operating

- Heat exchanger failures
- Water contamination of thermal oil
- Steam generator and combustor pipe corrosion despite prescribed water Rx
- Replacement of inferior quality refractory in year 4
- Fire - Hydraulics Room - Dec 2009

The original heat exchangers weren't robust enough, and were replaced. They are no longer on the market.

The contamination came from leaking tubes in the steam generator.

The fire certainly justified the existence of the propane backup boiler.


## Experience - Analysis

- Qualified backup staffing is a problem in small communities.
- Small plants lack economies of scale.
- Energy supply contracts with customers must provide means to recover unexpected costs.

The last point led to the modification of the price adjustment clause in our newest energy supply agreements.

## Experience - Analysis (cont'd)

- Awareness of DE lacking in key federal and provincial gov't departments.
- Outdated legislation and plant modification to avoid 24/7 manning of plant - hot oil loop - has been the source of the majority of our problems. This has also changed this year due to the changes introduced by BC Safety Authority.



## Future Considerations

- Costs of fuel after current fuel supply agreement expires and/or the mill goes down.
- Financing for expansion of plant and distribution system.
- Mill closure would be loss of major revenue source.
- Climate change will create a demand for cooling.
- What is minimum size of project to get good economies of scale?

The Downie Timber mill is the most efficient cedar mill in North America, even investing in upgrades during the current economic downturn to be well positioned as we come out of the recession.

Fuel in the long term is not a problem in the Revelstoke region. There are three mills with suitable feed stock.

The Revelstoke Community Forest Corporation has significant cuts of hemlock that could be chipped relatively inexpensively.

## Future Considerations (Cont'd)

- Cost effective hookups for individual residences
- Emerging technologies may identify more profitable energy creation from the same fuel base resulting in escalating biomass cost.
- Economics of DE and other alternate energy sources negatively impacted by current relatively low pricing of fossil fuels and electricity.



**Revelstoke  
Community  
Energy  
Corporation**

## Keys To Success

**“Necessity is the Mother of Invention”**

- A committed Council with a will to complete and a Community Energy and Emissions Plan underway to give future direction
- Availability of grants and financing
- Broad support from an informed, self-confidant community
- A project champion

City Council has experience with RCFC

Financing is likely easier now with the Green Funds, and the programs based on the Transfer of the Federal Gas Tax Revenue should help new projects.

Champion was Dr. Geoff Battersby, a retired physician, former mayor and founding member of the RCFC and the RCFdn.


## **Keys To Success (Cont'd)**

- **A committed corporate citizen - Downie Timber**
  - gave 1/3 acre of land for the plant site
  - provided 20 year agreement to supply fuel delivered free
  - signed 20 year contract to purchase steam energy
  - signed a staffing agreement at cost - a 50/50 share of an employee

Downie Street Sawmill is committed to being involved in the community; they benefit from the elimination of the Oliveen burner, and they get a source of steam for their kilns.



CEEP is under way; RCEC to benefit.



Thank you

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