

Integrated Resource Recovery Case Study: Dockside Green Mixed Use Development



Project Summary: District energy; on-site sewage treatment plant; biomass gasification facility

Location: Victoria, British Columbia

Status: In operation since 2009

Environmental Benefits: Greenhouse gas emissions reduced by 3,400 tonnes/year; reduced water consumption; and reduced wood waste

Business Model: Micro-utility established; strata-managed treatment plant

Introduction

Dockside Green is an innovative residential and commercial development in central Victoria, British Columbia. When completed, the development will be home to more than 2,500 people. The development features on-site wastewater treatment and a biomass gasification facility which provides heat to a district heating system. This infrastructure is helping Dockside Green to attain a LEED Platinum rating. Dockside Green provides an innovative example of Integrated Resource Recovery (IRR) in an urban setting.

On-site Wastewater Treatment

A \$4 million on-site wastewater treatment plant is integrated into the center of Dockside Green. As pictured above, the plant sits beneath some of the residential buildings.



Effluent from the treatment plant

The reclaimed water (effluent) from the treatment plant exceeds the quality standards for potable water. Dockside Green re-uses this water for flushing toilets, irrigation, and to supply a waterway which provides both aesthetic appeal and habitat for wildlife. Reuse of the treated water saves approximately 113 million litres of drinking water per year. Dockside Green also includes low-flow plumbing fixtures and appliances. In total, water consumption is 65% lower than in traditional developments.

After water is reclaimed from sewage, biosolids remain. Approximately one garbage bag of biosolids is produced each day at the Dockside Green sewage treatment plant. A press specialized press compacts the biosolids into bricks, reducing both size and moisture content. Currently these bricks are used as compost for landscaping. The potential to use them in the biomass gasification plant is also being explored.

Heat is a natural by-product of the sewage treatment process. Currently the biomass gasification plant provides more than enough heat for the development. In the future, if off-site energy sales were increased, the treatment plant could be modified to capture heat for sale to the district energy grid. This would allow the recovery of yet another valuable resource, further offsetting GHG emissions and providing revenue to Dockside Green residents.



Dockside Gasification Plant – construction phase

Biomass Gasification Plant

Through the biomass gasification process, organic wastes (such as wood) can be converted into natural gas. The product, called synthetic gas or “syngas”, is greenhouse gas neutral. When the gas is combusted, it can be used in any application that natural gas could be used for - the generation of heat, electricity, or both (cogeneration).

Estimated Emissions Reductions from Gasification Plant

Site of reductions	Estimated reductions (Tonnes Co2 e/year)
Dockside Green	537
Excess heat to Delta Hotel and City Lands	1,824
Heat available for future off-site sales	1,131
Total	3,492

Source: Dockside Green Sustainability Report, 2008

At the Dockside Green biomass gasification plant, the syngas will be used as the primary energy source for the district heating system. The gasification plant uses locally sourced wood waste from construction demolition and tree trimmings. It is expected that 3,000 tonnes of wood waste will be used each year to fuel the plant. That volume of wood, which would fill two semi-trucks every week, will provide more heat than is required by Dockside Green. Plans are in place to sell excess heat to a nearby hotel. Over time, more heat will be sold off-site, resulting in further emission offsets and increased revenue.

As shown in the table “Estimated Emissions Reductions from Gasification Plant,” greenhouse gas reductions are expected to reach 3,400 tonnes annually. That is the equivalent to taking 870 cars off the road. The William J. Clinton Foundation has recognized Dockside Green as the first “greenhouse gas positive” community in North America.

Finance and Management

Project funding included a grant from The Federation of Canadian Municipalities for \$350,000. The grant funds were used to offset regulatory costs, including amendments to the *BC Waste Management Act*, as well as careful documentation and processing of the novel aspects of the project. The biomass gasification plant received \$1.5 million from Technology Early Action Measures (TEAM), a Federal grant program which supports new technologies which reduce greenhouse gas emissions.

Dockside Green Energy owns and operates the space and water heating service of Dockside Green. This “micro energy utility” is owned by four private-sector partners: the developer, a credit union, and two utilities. These partners maintain ownership and take responsibility for maintenance of the system, as well as receive the revenues from the project.

The on-site sewage treatment plant is currently managed by the developer. At full build-out of the development, the plant will be owned and operated by the strata council. It will be in the interests of the strata to maintain the plant for economic reasons. Firstly, the value of the water alone will save over \$81,000 annually for the development. Secondly, residents pay less for sewage fees than other Victoria residents. Thirdly, the reclaimed water is a vital component of the stream and helps to maintain property value. Finally, the treatment plant can be easily retrofitted to capture heat which can then be added to the district heating system. This would reduce demand for wood-waste and increase the available heat for potential sale off-site.



The water in this stream comes from Dockside’s Wastewater Treatment Plant and from rainfall. Adjacent units have increased in value from the amenity.

Triple Bottom Line (TBL) Planning Process

Decision-making is most commonly based solely on economic criteria. TBL, also called “full cost accounting”, expands the criteria by including ecological and social values. Dockside Green, including its waste recovery infrastructure, is the product of a commitment to Triple Bottom Line (TBL) by both the City and the developer. Equal weight was given to the economic, social, and environmental merits of the project. If the decision had been made with traditional cost-benefit criteria, the project would have had lower social and environmental value.

City of Victoria staff released a Development Concept for the Dockside Lands in 2004. The document envisioned a mixed-use sustainable development to be selected through a TBL process. City staff, with the approval of Council, set out a minimum acceptable economic return for the development (essentially cost recovery) and beyond this threshold sought to maximize the triple bottom line benefits. Because of this process, smaller, more progressive development companies could compete with larger ones. Although the developer actually bid the lowest dollar-value for the land, they offered the highest social and environmental benefits and won the competition.



Green walls on the development are irrigated with reclaimed water.

With support from federal, provincial and private sector partners, the City developed a sustainability performance measurement framework (the Dockside Green Performance Indicators). The indicators are used to periodically measure the social, economic and environmental impacts and outcomes of the development. Monitoring will be provided through an annual Sustainability Report. This will help the City and the community to better understand the impact of the development and to identify and consider adjustments to enhance its overall sustainability.

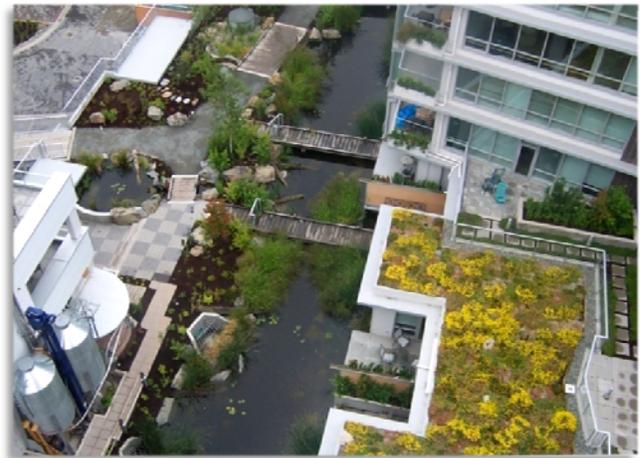
Overcoming Challenges

As an innovative development, Dockside Green faced numerous regulatory challenges. The ways in which these were addressed provide valuable lessons for future Integrated Resource Recovery projects in British Columbia.

Development Cost Charges (DCCs): In most cases, development requires new infrastructure or places increasing strain on old infrastructure, including roads, sewage, and other services. Development cost charges are fees collected by local governments from land developers to offset these increased infrastructure costs. During the early phases of the Dockside project, the developer faced significant barriers to receiving a DCC exemption for sewage. Recent changes to the *Local Government Act* allow local governments to waive DCC costs for such developments.

Sewage Billing: Victoria residents currently pay sewage fees to both the City of Victoria and the Capital Regional District (CRD). An agreement was reached between the developer and the City to exempt Dockside Green residents from municipal sewage fees.

In addition, Dockside Green residents will pay less for their CRD sewage bills. In early 2009, the CRD began a new sewage billing system based on water consumption. This practice promotes waste reduction and indirectly increases the value of reclaimed water. As Dockside Green uses less potable water than other developments, their CRD sewage fees will also be lower.



Aerial view of reclaimed water feature and a green roof at Dockside Green.

Taxes: A property tax exemption for the biomass gasification plant was negotiated between the developer and the City of Victoria. A Provincial Sales Tax exemption was also granted for the plant, lowering capital costs significantly.

Zoning and Floor Space Ratio: Zoning regulates the allowable density and use of parcels of land. The City of Victoria supported the gasification plant at Dockside Green by providing a zoning change, allowing the facility to be located on-site.

Floor space ratio (FSR) is a limitation imposed by local governments which limits the density of a development. Each square foot of above-ground floor area in a development counts towards its maximum FSR. At Dockside Green, the floor area of the sewage treatment plant is counted as part of the FSR. This left the developer with two feasible options: either to reduce the density of other parts of the development (such as the size or number of housing units) or to build part of the treatment plant underground. The latter option was selected, resulting in increased construction costs for the treatment plant. If the FSR of the treatment plant had been exempted from the development's total, the cost of the plant would have been significantly lowered.

For more information on the Dockside Green development, refer to the annual Dockside Green Sustainability Report at <http://docksidegreen.com/sustainability/overview/overview.html>, or email info@docksidegreen.com.