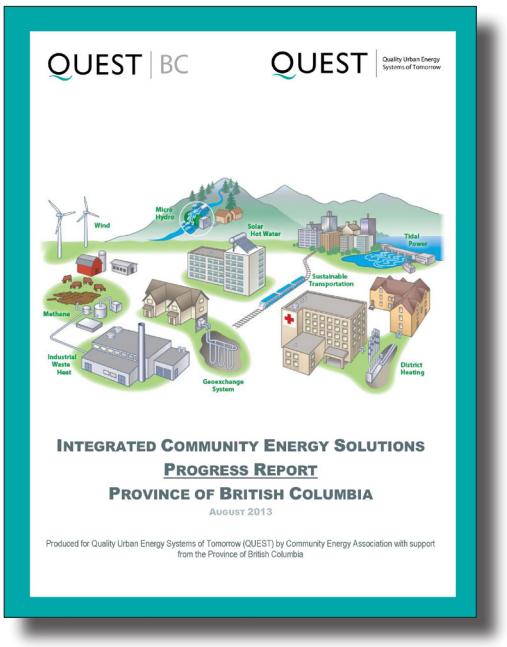
Integrated Community Energy Solutions Progress Report for the Province of British Columbia

Prepared by:
Community Energy Association, July 2013



Submitted to QUEST Exchange by:
QUEST BC Caucus, August 2013

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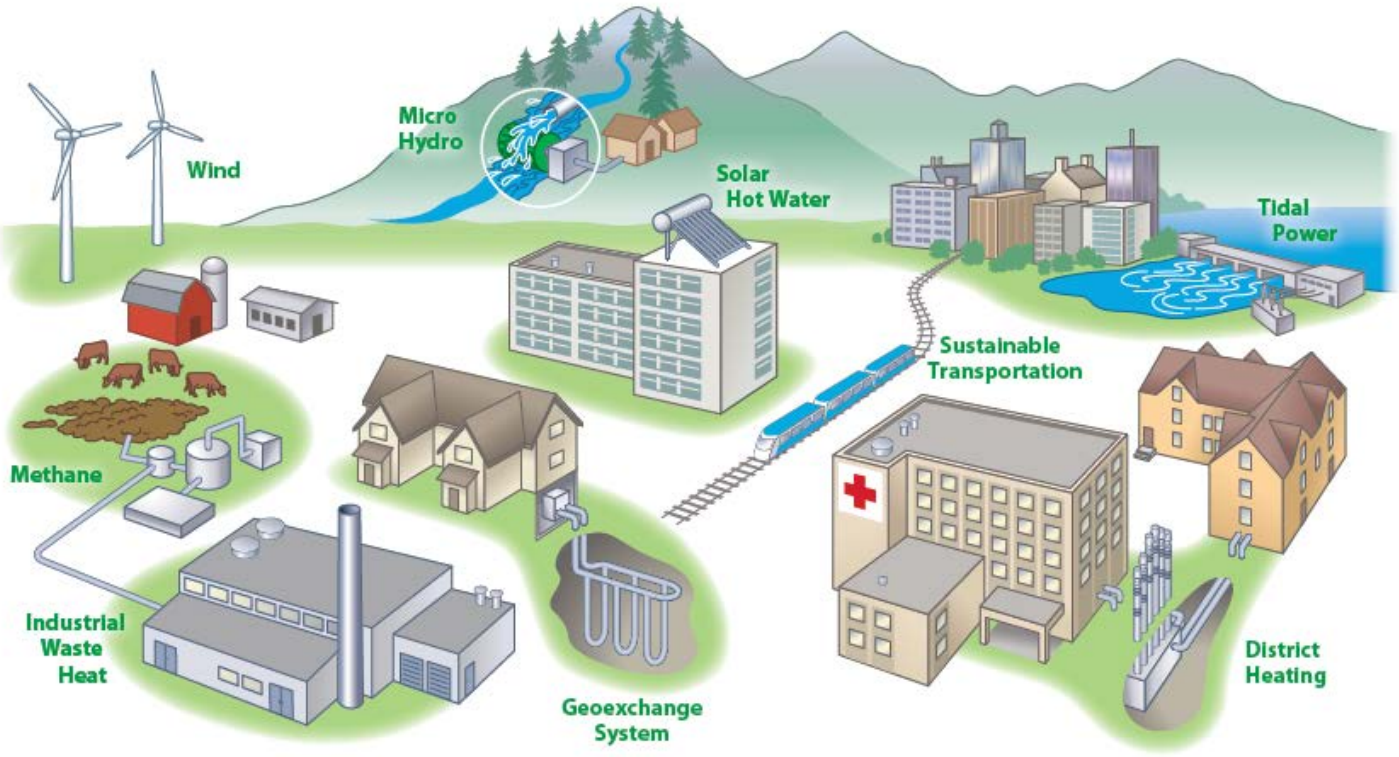


INTEGRATED COMMUNITY ENERGY SOLUTIONS

PROGRESS REPORT

PROVINCE OF BRITISH COLUMBIA

AUGUST 2013

Produced for Quality Urban Energy Systems of Tomorrow (QUEST) by Community Energy Association with support from the Province of British Columbia

Executive summary

This report provides a brief overview of the significant momentum across British Columbia related to energy at the community level and taking an integrated approach across the silos of Land Use and Community; Housing and Buildings; Local Community Services, Transportation, Energy Supply and Distribution, and Industry. This is often referred to Integrated Community Energy Solutions (ICES).

Uptake of ICES is progressing rapidly across BC, driven largely by the energy and climate action commitments of the Province and communities, with support from utilities, non-profits, academics, and the private sector. Partners have brought supportive legislation, policies, tools, resourcefulness and international best practices to the task.

BC has transformed from undertaking independent one-off integrative initiatives, to widespread, diverse, innovative and coordinated activity in small and large communities across the province.

In 2009, the Council of Energy Ministers released "Integrated Community Energy Solutions - A Roadmap for Action" (Roadmap). The Roadmap includes a three-phased approach for facilitating the transition to a new business-as-usual environment where, by 2050, this integrated approach is the norm. The table below provides a summary of BC's progress to-date in each of these phases and opportunities for further action.

ICES Roadmap Phase	BC Progress	Opportunities
I: Quick Starts for Early Impacts (2010–2015) Demo & pilot projects and plans that have a specific focus on ICES.	✓ A • Community momentum: o 47% of BC local governments presently have a plan to reduce energy and emissions in their community. o 181 local governments have implemented over 3,600 actions to save energy and emissions in their operations (2,442) and across their communities (1,193) in the two years of 2010 and 2011. • Increasing numbers of communities are integrating land use, transportation and building planning through greater integration of engineering and planning departments. • Discrete ICES elements are being deployed including >30 district energy systems and >500 electric vehicle charging stations • Partnerships – all partners are active including the Province, NGOs, co-ops, utilities, the private sector, and academia. • Community Energy and Emissions Inventories (CEEI) and Climate Action Revenue Incentive Program (CARIP) assure ongoing monitoring and reporting of progress for all BC local governments.	• Enhance existing information (CEEI, CARIP, PSO, industry energy use) • Implement distance-based auto insurance • Small community ICES screening tool
II: Acceleration (2010–2020) Programs, policies and regulations supporting ICES; R&D on ICES benefits and business case; R&D to validate / improve existing technologies and ICES decision making tools.	✓ B • Over the last 5 years, significant provincial legislation and policies have been established that are supportive of ICES. • Hindrances continue to exist, such as concurrent authority in building code, which limits what local governments can do to require efficient buildings; and decisions/recommendations by utility regulating authorities that do not enable transformation of the energy market to one more aligned with ICES objectives. • Tools and technologies are being experimented with and lessons learned from market failures and successes are being identified.	• Continue to support market transformation • ICES-ready voluntary building code provisions • Carbon tax changes to support ICES
III: Large-Scale Adoption (2020–2050) Develop ICES next generation of programs and technologies.	✓ B • BC is setting the stage for large-scale adoption but will need to evolve legislation, policies, programs and technologies to realize this. • Pacific Institute for Climate Solutions research streams will inform further policy and action.	• Identify emerging barriers and chart solution strategies.

BC Communities continue to demonstrate momentum on ICES. Many supportive policies and legislation are in place provincially. The next step is scaling up and out.

Background

Purpose of Report

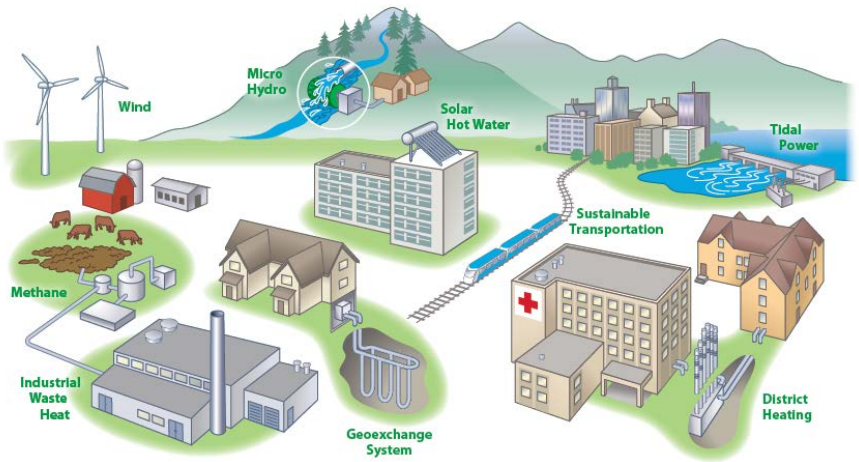
The purpose of this report is to highlight the progress related to the adoption of Integrated Community Energy Solutions (ICES) in the Province of British Columbia. This document provides a snapshot of ICES activity between 2007 and 2012, inclusive.

Acknowledgement

This report was completed by Dale Littlejohn and Patricia Bell of Community Energy Association for the Province of BC, Ministry of Energy Mines and Natural Gas with funding support from BC Hydro. This work would not have been possible without the volunteer support of Matthew Klippenstein in compiling information. The following Steering Committee members provided invaluable information and guidance in developing this progress report: Province of BC: Alan Barber, Jodi Dong, Ted Sheldon; BC Hydro: Victoria Smith, Travis Streb; FortisBC: John Turner; Natural Resources Canada: Renee Lazarowich. Several QUEST documents were referred to in order to ensure consistency with QUEST perspectives.

Definition

In its simplest form, ICES is about meeting energy needs at the community level by taking an integrated approach across the historical silos of Land Use and Community; Housing and Buildings; Local Community Services, Transportation, Energy Supply and Distribution, and Industry.



Community Energy

ICES Roadmap

The federal, provincial and territorial governments have demonstrated support for collaboration on ICES through a number of their recent documents. In September 2009, the Council of Energy Ministers released "**Integrated Community Energy Solutions: A Roadmap for Action**", which captures the potential of fully-integrated community solutions and recognizes the essential role of municipalities, developers, energy utilities and providers, non-government support agencies, industry, citizens and other stakeholders in developing ICES solutions. This document builds on the Council's 2007 document, "**Moving Forward on Energy Efficiency in Canada: A Foundation for Action**," which highlighted the value of reducing energy waste, while recognizing the vital role that governments can play in advancing energy efficiency as investors in programs and as policy-makers and regulators who help shape the marketplace by reducing barriers to action. The Energy and Mines Ministers' Conference 2012 document "**Moving Forward on Energy Efficiency in Canada: Achieving Results to 2020 and Beyond**" reiterated support for ICES, identifying the work involved with ICES as an example of the positive impact of a collaborative approach to energy that achieves savings beyond those possible by approaching each sector independently.

This report summarizes progress on ICES in BC starting before the 2009 release of the ICES Roadmap through to the end of 2012.

Potential

A recent QUEST – Quality Urban Energy Solutions of Tomorrow - study *The Potential Energy Savings and Environmental Benefits of Integrated Community Energy Solutions (Jaccard, 2010)* on the potential for ICES across Canada was conducted.

The study found that Integrated Community Energy Solutions have the potential to yield dramatic results:

- Greenhouse Gas Emissions: 5-12% annual reduction by 2050
- GDP above business-as-usual: 0.3 - 0.9% by 2050
- Employment above business-as-usual: Up to 0.4% per year by 2050
- Cost cutting: Reduce community capital, labour, and energy bills by $29 billion.

According to QUEST, the following Policy Principles can be applied from the local to the national level of governance in order to ensure successful outcomes.

1. Match land use needs and mobility options – understand the energy implications of land use, infrastructure for water and wastewater, waste management, personal mobility, goods movement, and building design decisions.
2. Match energy options to local context – local climate, building on land use choices, industrial structure, availability of local sources of waste and renewables.
3. Send clear and accurate price signals – consumers should see and pay full real costs, including external costs.
4. Manage risks and be flexible – maintain technological and fuel diversity; pursue cost-effective opportunities first and incorporate learnings. Assume the need to adapt quickly to market and technological surprises.
5. Emphasize performance and outcomes in policy and regulations – avoid prescribing fuels and technologies.
6. Pursue policy and program stability – maintain a consistent and predictable decision-making environment to sustain investor confidence.

QUEST BC Caucus

Quality Urban Energy Solutions for Tomorrow (QUEST) is a national non-profit organization advocating for Integrated Community Energy Solutions (ICES). QUEST has provincial caucuses made up of interested participants who see alignment between ICES and their day to day work. BC Caucus members include:

- **QUEST**: Brent Gilmour, Michael Harcourt
- **BC Hydro**: Victoria Smith (Caucus Chair), Travis Streb
- **APEG BC**: James Grant
- **FortisBC**: John Turner
- **Corix:** Stacey Bernier
- **Union of BC Municipalities**: Marylyn Chiang
- **Province of BC**: Brian Bedford, Christina Ianniciello, Darby Cameron, Jodi Dong, Mary Storzer, Ted Sheldon, Heather Davies
- **Community Energy Association**: Dale Littlejohn, Patricia Bell
- **Rural Communities**: Johan Stroman
- **Sustainable Cities International**: Jane McRae, Pat Gordon
- **Royal Roads University**: Nancy Wilkin
- **Fraser Basin Council**: Peter Ostergaard
- **Natural Resources Canada: Renée Lazarowich,** Jessica Webster

There is a robust and diverse QUEST caucus in BC actively working to realize the substantial potential that ICES has to reduce emissions and stimulate the local economy.

ICES Approach in BC

Integrated Community Energy Solutions (ICES) are progressing rapidly across British Columbia (BC) driven largely by the climate action commitments of the Province and communities, along with support from the Government of Canada and utilities sector. The following table lists some of the significant policies and actions that the Province of BC has taken to address climate change, which are also highly relevant for ICES implementation.

Before 2008	2008	2009-2013

• 1995 Provincial Ministries (Env, Comm, Energy) and UBCM formed Energy Aware Committee (now Community Energy Association)
• SolarBC established in partnership with federal government
• 2005 BC Bioenergy Strategy
• 2007 Public Sector Energy Conservation Agreements (PSECA)
• 2007 Climate Action Secretariat established
• 2007 Energy Plan
	• **Communities**
	  • 2008 Local Government (Green Communities) Statutes Amendment Act (Bill 27)
	  • 2008 Local Government Climate Action Charter
	  • 2008 Climate Action Revenue Incentive program
	  • 2008 Remote Communities Implementation Program
	• **Funding**
	  • 2008 $25 million Innovative Clean Energy (ICE) Fund
	  • 2008 $25 million Bioenergy Network
	  • 2008 $94.5 million endowment to create the Pacific Institute for Climate Solutions
	• **GHG Reduction**
	  • 2008 BC Climate Action Plan
	  • 2008 Carbon tax
	  • 2008 Greenhouse Gas Reductions Targets Act & Carbon Neutral Provincial Operations
	  • 2008 Greenhouse Gas Reduction (Cap and Trade) Act
	  • 2008 Greenhouse Gas Reduction (renewable fand low carbon fuel requirements) act
	  • 2008 Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act
	• **Miscellaneous**
	  • 2008 BC Energy Efficient Buildings Strategy: More Action, Less Energy
	  • 2008 BC Green Building Code
	  • 2008 Pacific Carbon Trust and partnerships with other jurisdictions
	  • 2008 Utilities Commission Amendment Act
		• 2009 Community Energy and Emissions Inventory (CEEI) Program
		• 2009 LiveSmart BC: Energy Efficiency Incentive Program
		• 2010 Clean Energy Act
		• 2011 Signed agreements on limiting carbon emissions from government operations and promoting awareness of the impacts of sea level rise on coastal areas
		• 2011 Clean Energy Vehicle Program
		• 2011 Clean Energy Act Amendments for Pay-as-You-Save retrofit financing
		• 2011 Solar Hot Water Ready Regulation
		• 2012 Green Energy as a Rural Economic Development Tool Project
		• 2012 Greenhouse Gas Reduction (Clean Energy) Regulation
		• 2012 Clean Energy Vehicle Program
		• 2013 APEGBC Sustainability Guidelines being updated and approved.
		• Ongoing: ICES and climate relevant initiatives like District Energy Systems and Integrated Resource Recovery are rewarded in infrastructure and related grants (Infrastructure Planning Grants)

National Support

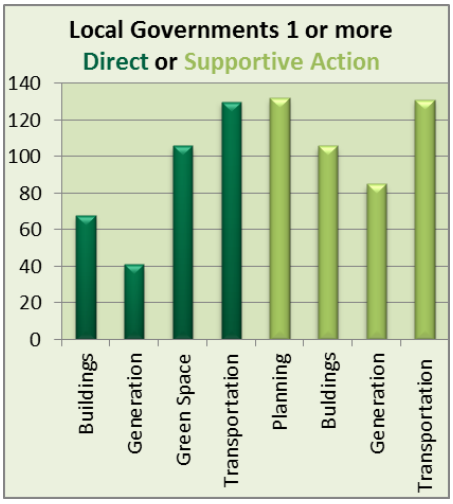
National supported initiatives in BC include the Equilibrium for Communities initiative (e.g., Ty-Hystanis), the Clean Energy Fund (e.g., Solar Colwood) and the ecoENERGY Innovation Initiative. CanmetENERGY's integrated community energy modelling and mapping research has directly assisted the Province to improve its Community Energy and Emissions Inventory reports to all communities (i.e., Tract and Neighbourhood Data Modelling initiative). Also, the Federation of Canadian Municipalities' (FCM) Partners in Climate Protection (PCP) Program has been collaborating with the Province of BC to improve coordination of their two programs to mutual BC local government members. In the residential sector, NRCan has been supporting a handful of pilots of innovative financial mechanisms for existing housing, with its EnerGuide Rating System, financial support, and technical expertise and information sharing. Many ICES plans and projects in BC have benefited from funding from FCM Green Municipal Fund, Gas Tax, and Natural Resources Canada programs.

The Province of BC has extensive legislation to support climate action and ICES, much of which has been in place for several years and may be of interest to other jurisdictions.

Local Action on ICES Planning and Deployment

Community Actions

BC's 190 local governments are demonstrating remarkable momentum on ICES as are many First Nations. The Roadmap organizes actions into the categories of Land Use and Community; Housing and Buildings; Local Community Services, Transportation, Energy Supply and Distribution, and Industry. The Province collects information annually from local governments in similar categories as part of the Climate Action Revenue Incentive Program (CARIP).

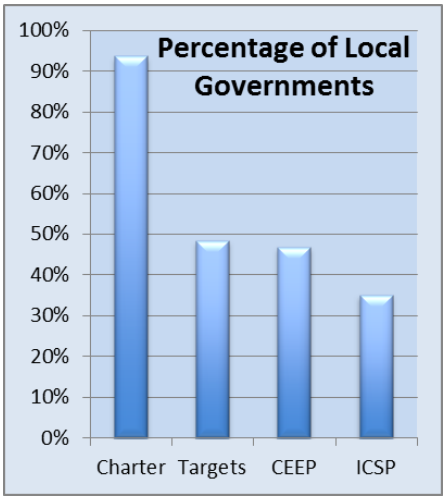


The charts at the side are generated from 2010 and 2011 CARIP reporting. There is significant action in all categories with exceptional activity in both transportation and broad planning.

In many categories over 100 local governments are pursuing one or more actions. In total over 1,500 actions have been reported on community-wide energy and emissions at the local level.

Broad planning can take many forms, including:

- Signing on to the Climate Action Charter, a voluntary commitment to carbon neutral operations by 2012; measuring community-wide emissions; and building compact, energy efficient communities;
- Establishing GHG reduction targets in official community plans (OCP), or regional growth strategies;
- Developing Community Energy and Emissions Plans (CEEP) to use local government authority and leadership to reduce energy and emissions community-wide;
- Creating Integrated Community Sustainability Plans (ICSP) to address sustainability more broadly across the community.



The adoption of these actions is depicted in the blue graph at the side. Of note, almost half of B.C.'s communities have CEEPs and almost all communities have signed the Climate Action Charter.

A sampling of the considerable progress in ICES related projects completed by BC First Nations is outlined below.

First Nation	Project
Gitga'at' First Nation	Hartley Bay Hydroelectric Project
Dzawada'enuxw First Nation	Ukwanalis Village Solar Hot Water Demonstration Project
Taku River Tlingit First Nation	Atlin Hydroelectric Power Project
Dease River First Nation	Good Hope Lake Hydroelectric Power Project
T'Souke First Nation	Sooke Community Solar Hot Water and Solar PV Installation
Xeni-Gwet'in First Nations Government	Nemaia Valley Solar Hot Water for Community Houses (pilot project)
Kwadacha First Nation	Fort Ware Biomass Community Heat and Power Project
Osoyoos Indian Band	Senkulman Business Park (Oliver) Geo Exchange System
Kitasoo Band Council	Klemtu Micro-Hydro Power System Upgrade

Momentum in communities all across BC. The communities with Targets and CEEPs represent over 70% of the local government influenced GHG emissions (buildings, transportation, waste) in BC.

Utilities Actions

The Province's main utilities - BC Hydro and FortisBC - are taking an increasingly integrated approach to communities and energy.

Since 2009, BC Hydro's Sustainable Communities Program has provided financial support and technical guidance to local governments to encourage the use of their unique levers (e.g. land use controls, bylaws, building permits, code compliance tools, property taxes, etc.) in order to embed energy conservation and efficiency into planning and development and influence the long term energy footprint of communities. Through BC Hydro's support:

- Over 45 Community Energy and Emissions Plans have been completed in large and small communities across BC;
- Community Energy Managers are placed within local governments to help build energy literacy and leadership capacity and drive energy conservation and efficiency policies and actions forward;
- Community planning and neighbourhood design processes are encouraged to consider energy implications of future development and re-development;
- Tangible, high impact projects receive implementation support to advance community-wide electrical savings and greenhouse gas emissions reductions.

BC Hydro also:

- Previously offered a District Energy Program that made available both capital incentives and funding for pre-feasibility and feasibility studies in urban areas across BC.
- Advances community scale energy efficiency policies with local governments through its Policy, Codes and Standards team and the Sustainable Communities Program.
- Supports small-scale, renewable energy generation through its Standing Offer Program.
- Has undertaken electric vehicle research and supports the deployment of electric vehicle charging infrastructure across BC through its internal Office of the Chief Technology Officer.

FortisBC has been active in driving ICES initiatives through several activities: FortisBC Powersense, and Energy Efficiency and Conservation programs apply a "Community Based Social Marketing" approach like the highly successful Rossland Energy Diet, and actively pursue energy conservation efforts through residential, commercial and industrial energy audits in communities throughout the province. The provincial Greenhouse Gas Reduction Regulation provided incentives from natural gas utilities for the conversion of equipment, building infrastructure, and training required over a five year period to help establish the market for heavy duty natural gas vehicles. In addition, biogas is being provided to the grid through anaerobic digestion and landfill gas. Fortis Alternative Energy Services has developed and operates a number of district energy systems and geo-exchange/integrated energy projects in BC.

Non Government / Utility Actors

BC is home to some of the leading community and energy planning academics globally, many of whom are conducting ICES-relevant research funded by the Pacific Institute for Climate Solutions (PICS) which is an excellent source for an overview of current research in BC.

Non-profits are active in supporting the planning and implementation of ICES across BC. A sampling of which include Community Energy Association, Fraser Basin Council, Pembina Institute, Association of Professional Engineers and Geoscientists of BC, Wood Waste 2 Rural Heat, Cascadia Green Building Council, Sustainable Cities International and Globe Foundation.

Some of these non-profits also consult to communities and are part of a Community Energy and Emissions Modeling (CEEM) community of practice (CoP) initiated by the Province of BC and Natural Resources Canada to support the development and application of energy and emissions models for

future scenario forecasting at the community scale. Also included in this group are academics and private sector consultants.

There is a robust consulting community in BC actively integrating across silos. A sample of consultants includes Golder, Stantec the MMM Group, Sustainability Solutions Group, FVB, Compass Resource Management, Kerr Wood Leidal, Jaccard and Associates, Navius Research, Enerficiency, Sinclair Environmental Solutions, and Prism Engineering.

Cooperatives and the private sector are also active in ICES activities in BC.

In addition to individual organizations, there are collections of like-minded organizations collaborating through formal and informal networks such as the QUEST BC Caucus, Plug-in BC working group, BC Bioenergy Network, Community Energy Association, Remote Communities Energy Network, Green Communities Committee, BC Mayors Climate Leadership Council and others.

Technology Deployment

ICES supportive plans were reviewed in the previous 'Community Actions' section. Highlights of physical technology related to ICES deployments that were identified in publicly available documentation reviewed in this report across BC include:

Number	Type	Description
> 30	District Energy	District (multiple customers) and discrete (campus) heating systems are operational across BC.
> 10	District Energy	District and discrete systems are in advanced planning, design or approval with many more being at the vision or pre-feasibility stage.
7	Combined Heat & Power	Systems or initiatives are providing **both** heat and electricity
2	BioGas	Systems are using renewable or waste resources to produce biogas. Several more are in the approval stage
> 16	Elec	Systems are in operation related to electricity from local distribution utilities to community electricity generation and participation in independent power projects
530 in 69	EV Charging	530 level 2 (240v) electric vehicle charging stations are being deployed in 69 communities across BC with the support of the Community Charging Infrastructure Fund of the Province.
13	EV Charging	Level 3 (DC Fast Charging) electric vehicle charging stations are being deployed by BC Hydro with the support of the Province across BC to allow electric vehicles to get up to an 80% charge in under 30 minutes.
68,681	Various	68,681 households have completed energy efficiency upgrades and received incentives through the LiveSmart BC: Efficiency Incentive Program
10,000 plus	Various	Over 10,000 small businesses have completed energy efficiency upgrades and received incentives through the LiveSmart BC: Small Business Program
32 and 35	Solar	32 local governments that have signed on to the SolarBC 'Solar Community' program with over 35 solar hot water systems installed on local government buildings.
36	Solar	Communities signed on to the solar-ready bylaw

All sectors are active in ICES in BC and this effort is shown in the results achieved.

Suggested Metrics for Future Reporting

The Roadmap outlined several sectors and goals. The Province of BC's Community Energy and Emissions Inventories (CEEI) for each jurisdiction provides a natural 'home' for the metrics suggested to measure ongoing progress toward these goals. This table suggests some indicators to consider.

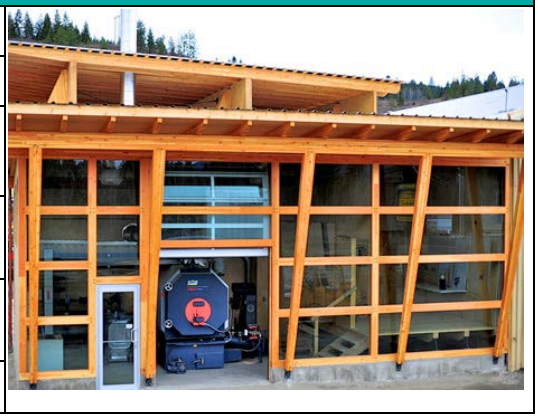
Suggested Metric	Sectors	Current Status	Recommendation
Energy and GHG emissions total and per-capita by sector (buildings, transportation and solid waste), by fuel by community	All sectors	Currently measured or estimated in bi-annual CEEI. Electricity and natural gas from utilities. Other buildings fuels estimated. Transportation based on registered vehicles (#, make, model) and efficiency by jurisdiction (VKTs estimated).	Improve measurement of non-utility building energy (propane, heating oil, wood) Improve measurement of transportation emissions, particularly vehicle kilometers traveled (may require a shift to distance-based insurance) Include per-capita in CEEI
Actions taken by sector by community	All Sectors	Currently reported by most local governments in annual CARIP application. Would require additional reporting for First Nations	Continue. Develop a template of common actions to enable coding and data analysis (and possibly ease report filing); actions within this framework can be assigned an energy/GHG influence potential based on research including the Partners for Climate Protection National Measures Report (and can be adjusted based on population growth)
Per-capita infrastructure cost	All Sectors	Not currently captured	Review asset management reporting and potential to link to population to identify opportunities to reduce sprawl and cost
Transportation mode-split by jurisdiction	Trans-portation	Census / Statistics Canada reports	To include mode-split estimates (and other readily available secondary indicators) from BC Transit and Translink into CEEI reports.
Number of clean energy vehicles by jurisdiction	Transport ation	Partly calculable from CEEI	Include CEV as % of light duty vehicle population in CEEI
Energy costs	All Sectors	Not tracked	Include in CEEI cost estimates of energy based on utility average rates by sector, annual average fuel prices by region of the province.
Economic Development	All Sectors	Not tracked and difficult to obtain	Include option in CARIP reporting to estimate economic development and co-benefits. Consider a bi-annual study specifically on this.
Aggregate Summary Reporting	All Sectors	Started with research contributing to the development of this document	Produce every 2 years, a summary report integrating CARIP, CEEI, and provincial economic and population information to produce a snapshot of aggregate actions and results province wide including level of activity by sector across local governments. First Nations would require parallel reporting
Neighborhood-level visual reporting	All Sectors	Tract and Neighbourhood Data Modelling (TaNDM) project is piloting this approach with respect to buildings.	Based on the CEEI data, develop an online, 'heat map' of energy use and GHG emissions by sector at the most granular level possible without compromising privacy or data quality.
Other	All Sectors	Metrics and actions as recommended by the community energy and emissions modeling working group	Continue Community Energy and Emissions Modelling working group activities currently underway.

CARIP and CEEI provide robust starting points and, with a few enhancements, can be improved to monitor progress toward ICES goals while providing policy-makers invaluable data.

Examples

The following case studies provide a more detailed description of the types of ICES initiatives that are currently taking place in B.C.

Fink Enderby District Energy Utility

The Basics	
Community: Enderby, **Population:** 2,900	
Owner: Fink Machine Inc. **Operator:** Fink Machine Inc.	
Year Started: December 24, 2011 **Connections:** 8 current customers (buildings)	
Generation Source: Viessmann KOB Pyrot 540 kW wood-fired boiler with back up provided by a 300 kW gas-fired boiler.	
Distribution System: Urecon Insulated Pex Line (3 inch main) for district loop of 640 metres.	
Energy Produced Heat √ Electricity x	

How it Started: Fink Machine Inc. received approval from the City of Enderby in May 2011 to install the privately financed, owned and operated Fink Enderby District Energy System. The first customer was the City of Enderby for their outdoor pool. The system provides space heating, domestic hot water and pool heating.

Fink Machine will eventually supply carbon neutral renewable energy from wood biomass to 12 individual customers. The present underground distribution system is 640 m in length. Biomass fuel is supplied by local sawmills, diverted wood waste from a landfill and various local businesses that produce clean wood biomass. The Fink Machine biomass district energy system is the first of its kind operating as a private utility under 1 MW in western Canada.

Linkages to ICES: The Enderby solution addresses a number of ICES principles including:

- Utilizing a local renewable resource to generate heat. Not that this particular resource may have been considered waste otherwise
- Using grid and other energy for peaking and backup
- Collaboration of a number of actors including the private sector and the local government

Financing: Private funds were used to evaluate feasibility for the system. Cost and consumption data, type of buildings and their heat loss and current energy costs were assessed. The district heating lines have been installed at a cost of $400/meter. The cost of a system like this is approximately $1.2 million. Payback is estimated around 10 years providing that all 12 anticipated customers come on-line.

Operation: Once fully operational, the system is expected to consume 800 tonnes of renewable wood fuel annually while helping to mitigate approximately 425 tonnes of greenhouse gases. Customers save 10-18% on their utility bills from improved heating efficiency, avoided payment of carbon taxes (reducing costs by 10-12%), and no longer need to purchase or repair their own heating systems.

References and Links:

Stephen Bearss, Renewable Energy Representative, Fink Machine Inc. www.finkmachine.com

Solar Colwood Community Energy Efficiency Program

The Basics	
Community: Colwood **Population:** 16,100	
Project proponent: City of Colwood **Project manager:** City of Colwood	
Year started: 2010 **Budget:** Approximately $12 million (cash and in kind)	
Project description: Solar Colwood is a demonstration of a whole community moving towards energy conservation and renewable low carbon power, predominantly focused around solar thermal, but also including emerging technologies such as ductless split heat pumps (DSHP), Smart Home/Smart Grid technologies, solar photovoltaic (PV), geo-exchange, district energy solutions, and electric vehicle (EV) charging infrastructure.	
Initial target: Energy saving actions by 1000 households and businesses (out of 6000 total).	
Project partners: NRCan, Province of BC, T'Sou-ke First Nation, Royal Roads University, Camoson College, BC Hydro, Fortis BC, Solar BC, Canadian Solar Cities Project, West Shore Chamber of Commerce, Horizon Technologies, League Assets, Vancity, New Car Dealers Association of BC.	

How it Started: The Solar Colwood program is one response to forecasted growth in energy use and GHG emissions in Colwood. It puts into action strategies identified in the City's 2010 Community Energy and Emissions Plan. Building retrofits were identified as a significant opportunity, as the City's housing stock consists mostly of single-family homes built before 1985. Retrofits were also seen as a source of emissions which the municipality could influence, as opposed to transit for example, a source over which they have less direct control. Project proponents and partners see the program as an opportunity to demonstrate municipal leadership and share findings.

Linkages to ICES: The scope of the Solar Colwood program recognizes the importance of taking an integrated approach to energy and emissions reductions and includes several aspects of ICES, including: housing and buildings, local community services, transportation, and energy supply. The Solar Colwood program is supported by municipal policies and strategies, such as adopting 'smart growth' zoning strategies; adopting the "solar ready" bylaw for new construction; providing electric vehicles charging stations; and electric vehicle use in the City's operations.

Financing: A significant portion ($3.9 million) of project financing comes from Natural Resources Canada, through its Clean Energy Fund, although other sources of funding were also accessed and leveraged. For example, Royal Roads University is funding its study of the uptake of the Solar Colwood program through a grant from the Pacific Institute for Climate Solutions (PICS), BC Hydro contributed to incentives for ductless split heat pumps, and the Province of BC is funding part of the electric vehicle charging infrastructure portion of the program. Individual households and businesses also contribute financially to the program through their participation.

Cost/Benefit: Grants to homeowners for SHW, DSHP, and EV charging infrastructure from the Solar Colwood program are enhanced by LiveSmart BC grants, reducing out-of-pocket costs by approximately 33 to 50%. Energy efficiency and displacement of fossil fuels by renewable energy will result in reduced energy costs and reduced GHG emissions in Colwood. Other benefits include local economic activity and skill development.

Operation: The responsibility for project management, program development, community outreach and marketing has primarily been taken by consultants hired and overseen by the City. Homeowners have a choice of certified energy advisors and registered installers, and are helped through the process by a Solar Colwood advisor. A multi-media campaign, along with other social marketing tactics serves to keep Solar Colwood in the news and help to share success stories.

Results to date: Uptake of Solar Hot Water systems has been slower than expected, however overall engagement with the Solar Colwood program by the community is seen as a success. To date, over 500 Colwood residents and businesses have taken some form of action through the program. The profile of Colwood, both regionally and nationally has increased significantly, and in 2011, the City of Colwood, Royal Roads University and BC Hydro won the Union of BC Municipalities Climate & Energy Action Award for Public Service Organization and Local Government Collaboration for their innovative Solar Colwood partnerships. Colwood was named as Canada's second official "Canadian Solar City" in February 2013, and was one of the three Canadian cities named as finalists in the international Earth Hour City Challenge.

Lessons Learned: There are many challenges involved in mobilizing a whole community towards a transformative change. Some of the challenges were within the control of the project team, such as delivering clear and consistent messaging; and coordinating between different partners. Others were not, for example uncertainty surrounding federal and provincial energy efficiency incentive programs. Personalized service and a smooth application process are both crucial for homeowners.

References and Links:

City of Colwood, Judith Cullington, City Councillor and Lead Project Proponent.

Solar Colwood, Chris Birchall, Program Manager.

Royal Roads University, Dr. Chris Ling, Associate Professor, School of Environment and Sustainability.

http://www.solarcolwood.ca

Opportunities to Accelerate ICES

While ICES progress is rapid, widespread and innovative in BC, there are several significant opportunities to further accelerate ICES. These are listed in the table below. The top priority opportunities are described further in this section and the remaining are described in the appendix.

Opportunity	Priority	Policy & Regulation	Technology & Tools	Information	Capacity Building	Leadership Opportunities	Market Transformation
ICES-Ready Voluntary Building Regulation	1	✓					
Distance Based Vehicle Insurance	1	✓					
Carbon Tax Changes to fund Actions and Plans Consistent with ICES	1						✓
Peer Mentoring and Collaboration and Community of Practice	2		✓		✓		
Expansion of current reporting (Community Energy and Emissions Inventory and CARIP)	2		✓	✓			
Continued Market Transformation	2						✓
Small Community ICES Screening Tool	3		✓				
Reporting Public Sector Energy Use by Community and Building	3			✓			
Growth of Community Energy and Emissions Modelling Community of Practice	3				✓	✓	
Awareness Campaign	3				✓		

BC is making strong progress on ICES. Several specific opportunities are available to significantly accelerate ICES scaling up and out.

ICES-Ready Voluntary Building Regulation suite

Concurrent authority in B.C.'s Building Code is recognized as a significant limitation for many local governments in their pursuit of GHG targets, policies and actions as well as ensuring long-term viability of long-lived building assets in their communities. Developing a comprehensive suite of energy performance enhancements that local governments could voluntarily sign on to would:

1. Provide local governments with direct access to the tools they need to meet their GHG targets related to new and existing buildings;
2. Provide developers with a view to likely future evolution of the base Building Code;
3. Reduce the need for local governments to resort to tools to bypass the limitations of the Building Code thereby encouraging a more consistent environment for developers across BC;
4. Maintain Building Code authority at the provincial level.

Examples of ICES-ready voluntary provisions include: Solar-ready (already in place) voluntary regulation, electric vehicle-ready voluntary regulation (City of Vancouver has a model that could be enhanced), district-energy-ready (work recently completed by CEA), building performance and performance labeling requirements, and a renewable energy requirement (drafted by Pembina Institute for BC communities). Given the existing work to build on, it is reasonable that, with committed effort, the Province of BC could draft code provisions, conduct stakeholder engagement, receive comments, implement the ICES-ready provisions and encourage local governments to sign on to these voluntary provisions within 2-3 years.

Distance-based light-duty vehicle insurance

Communities recognize that light duty vehicle transportation is a significant part (frequently over 50%) of the community's emissions. Communities recognize that quality transportation emissions data is policy-relevant when developing, implementing, and monitoring targets, policies and actions related to transportation GHG's. Transportation emissions are calculated by "Vehicle Fuel Efficiency (per kilometer) X Vehicle Kilometers Travelled (VKT)". Currently CEEI has good data from ICBC on vehicle (by make, model, and year) by jurisdiction (notwithstanding boundary definition challenges in some areas) and vehicle energy efficiency (from NRCAN ratings) but must estimate VKT based on econometrics for most of BC extrapolated from AirCare odometer readings in the Lower Mainland. The Province of BC could require the Insurance Corporation of British Columbia to institute distance-based insurance. This would provide high quality data to monitor the effectiveness of local government targets, policies and actions while also providing an additional financial incentive to reduce VKT and emissions. An interim alternative would be for ICBC to require VKT recording for all car owners during annual registration coupled with incentives for reducing VKTs from year to year.

Carbon tax changes

Linked to ICES-aligned technology and capacity building: BC has a carbon tax on fossil fuels. This tax provides a long-term upward price signal to the market, encouraging reduction of fossil fuel use. The carbon tax has gone up in $5 increments annually since its introduction. No further increases are planned. If changes are contemplated, they could be structured to be outside the revenue-neutral commitment of the current carbon tax and could be used to stimulate ICES implementation and achieve the Province's GHG targets. This could mean allocating a portion of the new carbon tax revenues to urban areas (Metro Vancouver and CRD at a minimum) to support public transit and the remaining funds could be established as a grant program for communities outside those jurisdictions for ICES-relevant plans, studies, and implementation (similar to the administration of the Federal Gas Tax funds).

Appendix 1: Acceleration Opportunities

In addition to the top priority acceleration opportunities described in the main body of the document, the following could also be considered for further accelerating ICES specifically and climate action generally at the community level.

- **Expansion of Current Reporting**
    - **Community Energy and Emissions Inventory Reports to include secondary indicators and spatialization**: Local governments across BC rely on CEEI reports for planning and monitoring targets, policies, and actions related to reducing GHG's in their communities. Larger communities have multiple neighborhoods which are the size of smaller municipalities. Spatializing CEEI data to provide 'heat-map' style visual comparative analysis of neighborhoods would assist larger communities in focusing their efforts in areas where there is the most to gain. This can be coordinated with the BC Energy Map and BCMap initiatives. Secondary indicators are recognized as useful in measuring progress toward GHG reduction by measuring the elements that drive GHG emissions. Expanding on the set of secondary indicators in CEEI with input from the Community Energy and Emissions Modeling (CEEM) working group and local governments would improve monitoring and reporting for all B.C. local governments.
    - **Expansion of CARIP reports to include outcomes**: Currently climate action revenue incentive program grant applications provide a useful central database of actions taken by local governments to reduce GHG's in their operations and across their community. They do not include the modeled or measured results of these actions. This secondary data would be most policy-relevant for local governments in evaluating which policies are the most effective in producing the intended results.
- **Continued market transformation support** for ICES-relevant technologies include electric vehicles, highly energy efficient new homes, and biomass district energy. These technologies are currently in their infancy in BC and are likely to lead to significant GHG reductions if adopted widely. All are experiencing market or information failures – EV's and charging stations, biomass district energy and wood fuel supply quality control and aggregation, highly efficient home building and building/consumer/developer knowledge/experience/information. The Province of BC is in a position to support a market transformation in both buildings and transportation that can lead to energy and cost savings for the public, reduced GHG emissions, and in some cases local employment opportunities. With buildings, NRCan has been supporting a handful of pilots of Innovative Financial Mechanisms for existing housing. Financing EE improvements through utility on-bill and local improvement charges has not been explored beyond existing housing, but new EE housing or infrastructure (e.g. DE connection) could potentially use this mechanism. : In the residential sector, NRCan has been supporting a handful of pilots of Innovative Financial Mechanisms for existing housing, with its EnerGuide Rating System, (limited?) financial support, and technical expertise and information sharing
- **Support a mentorship program between similar communities**. This could be informed by experience with the Remote Community Mentorship program or some of existing communities of practice in related topic areas.
- **Development of a small-community ICES screening tool** which would leverage existing information sources: many small local governments and First Nations in BC have a strong interest in implementing ICES to reduce energy and emissions, but lack the simple, defensible tools to conduct screening-level analysis to support reports to council for approval for further study or for grant applications. A small community excel-based ICES screening tool could be developed. NRCAN's RETScreen has some elements of this but is more complex than many small community planners want to engage with. A screening tool or suite of tools could

accelerate ICES adoption in small communities. CEA recently released with UBC and Wood Waste 2 Rural Heat (formerly the Green Heat Initiative) a screening tool called FIRSTHeat for local governments and first nations to assess the potential of FireSmart treatments that would also provide local biomass for renewable district heating and building-scale heating. Tools like this, which address the unique circumstances of small communities in BC, are lacking in many areas. The province could provide modest funding which could likely be leveraged with funding from other sources to build out a tool/suite of tools for ICES-relevant technologies in small communities, given the unique BC environment. Providing implementation support to small communities to implement results would also assist in accelerating ICES action across BC.

- **Publication of PSO energy use** by building / campus postal code: As local governments plan ICES implementation, including but not limited to district energy systems, public sector (provincial, health authority, Crown Corporation, colleges, schools, and universities) buildings could play significant roles. Publication of energy use collected by the Province's SmartTool as part of Carbon Neutral Government reporting could be made publicly available to assist local governments in evaluating the potential of ICES solutions. This could help the Province to achieve its own carbon neutral goals.
- **Continued growth of the Community Energy and Emissions Modelling Community of Practice**, incorporating CALP/Decision Theatre efforts to enhance GIS/visualization capabilities across all modelling practitioners and their client local governments.
- **ICES awareness campaign**, possibly linked to asset management for communities. Communities are pursuing ICES - without knowing that they are pursuing ICES - according to recent CEA research funded by BC Hydro and NRCAN on ICES-alignment of community energy and emissions plans. Conducting a focused education and outreach campaign to community staff and elected officials on the definition, principles, and benefits of ICES could lead to further conscious acceleration of ICES. Outreach and education to this segment is likely best achieved through a combination of presentations at existing conferences across BC that these target groups attend as well as regional in-person workshops backed up by webinars.
    - **Climate Action Charter** - Enhance collective understanding of how ICES will be 'core' and/or 'central' to 'complete, compact, energy-efficient communities'. This 'information' will be fundamental to 'leadership opportunities and market stimulation' (below).

Appendix 2: Sample BC ICES Projects

The following table outlines technology implementations that can be considered building blocks for ICES. This table is not exhaustive. It is based on information readily available in spring 2013.

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source, for sorting
Abbotsford	Catalyst Power Bio-methane Plant 110,000 gj /yr. Receives manure from 5 km radius.	O	GAS	PRIV	AgW
Burnaby	BCIT	O	DE	GOV	CH4 Bio PV SHW
Burnaby	Simon Fraser University / UniverCity	O	DE	PRIV	Bio
Burns Lake	Burns Lake Arena	O	1	LG	Bio
Cache Creek	Cache Creek Outdoor Pool SHW&ASHP	O	1	LG	SHW
Castlegar	Castlegar City Hall - Geothermal	O	1	LG	Geo
Colwood	Solar Colwood (solar, ductless heat pumps, EV's)	O	CHP	LG	-
Colwood	Juan de Fuca Pool, Arena and Curling Club	O	DE	LG	WH
Dzawada'enuxw First Nation	Solar Hot Water Demonstration Project	O	-	-	SHW
Elkford	Elkford Fire Hall - Geothermal	O	1	LG	Geo
Enderby	FinkMachines in Enderby - Biomass DE	O	DE	PRIV	Bio
Fort St. John	Fort St. John City Hall (solar hot water) and Public Works Shop (solar air heating)	O	1	LG	PV SAH
Gibsons	Geo-Exchange DEU for Upper Gibsons	O	DE	LG	Geo
Golden	Golden Amenity Hubs campground and bike share	O	E	LG	PV SHW Geo
Grand Forks	Grand Forks Electric Utility	O	E	LG	-
Houston	Houston Rink and Leisure Centre	O	1	LG	WH
Kamloops	Sun Rivers Community Development Corporation Initial partnership between Tk'emlúps FN, federal government and developer.	O	CHP	PRIV	Geo
Kamloops	Kamloops Turnkey Gasification System Pilot Study	O	E	LG	BIO
Kaslo	Kaslo City Hall - Geothermal	O	1	LG	Geo
Kelowna	Okanagan College District Heating from Sewage	O	DE	LG	Sew
Kelowna	UBC - Okanagan	O	DE	GOV	Sew
Kelowna	City of Kelowna landfill gas to electricty - microturbine pilot	O	E	LG	LandGas
Kelowna	Kelowna Electric Utility	O	E	LG	-
Kimberley	Kimberley micro hydro in water supply	O	E	LG	uH
Kitimat	Sam Lindsay Aquatic Center/ Tamitik Arena	O	DE	LG	WH
Lake Country	District of Lake Country Micro-Hydro Project (DLC), in drinking water supply system |Eldorado Reservoir Hydroelectric Generation Plant	O	E	LG	uH
Langford	Westhills Langford DE Sharing System	O	DE	PRIV	Geo
Langley, Surrey	Kwantlen Polytecnic University	O	DE	-	Geo
Lasqueti Island	Lasqueti Community Hall Renewable Energy System	O	1	-	PV
Lillooet	Wood Biomass at the Lillooet Recreation Centre	O	1	FN	Bio
Mackenzie	Mackenzie Green Energy Center	O	CHP	LG	-
Nakusp	Nakusp Arena - Geothermal	O	1	LG	Geo

Nakusp	Nakusp Energy Cabin	O	1	LG	-
Nanaimo	Cedar Road Landfill-Gas-to- Electricity Facility (Nanaimo)	O	E	JV	LandGas
Nelson	Nelson HydroElectric Utility	O	E	LG	-
New Westminster	New Westminster Electrical Utility	O	E	LG	-
North Vancouver	Lonsdale Energy Corporation Hydronic Service Bylaw	O	DE	LG	CH4 SHW
Port Alberni	Run-of-river: China Creek	O	E	JV	uH
Prince George	Baldy Hughes Theraputic Community (BHTC)	O	DE	GOV	Bio
Prince George	City of Prince George	O	DE	LG	-
Prince George	UNBC Turnkey Gasification Heating System	O	DE	GOV	-
Revelstoke	Revelstoke Community Energy System	O	DE	LG	Bio
Richmond	River Green (Olympic Oval) "waste heat and water recovery"	O	DE	PRIV	CH4 Sew
Richmond	Alexandra District Energy Utility	O	DE	PRIV	CH4 Geo
Saanich	Saanich Peninsula Thermal Energy Recovery System	O	CHP	LG	WH
Saanich	Hartland Landfill Gas Utilization Project (Saanich)	O	E	JV	LandGas
Salmon Arm	Landfill gas capture at Salmon Arm landfill	O	GAS	LG	-
Simpcw Nation	Bone Creek Run of River (Simpcw First Nation and TransAlta)	O	E	JV	uH
Surrey	Surrey Memorial Hospital	O	DE	GOV	CH4
Tla-o-qui-aht First Nation	Run-of-river: Canoe Creek	O	E	JV	uH
Tofino	Ty Histanis DE Energy Geoexchange (Tla-o-qui-aht First Nation). Only FN DES in Canada. Geothermal plant operates via hydro electricity.	O	DE	FN	Geo uH
Trail	RD of Kootenay Boundary rec/pool/rink: efficiency, Solar Hot Water, heat recovery	O	1	LG	SHW WH
T'souke Nation	T'souke First Nation Solar Hot Water and Photovoltaic	O	CHP	FN	PV SHW
Vancouver	Burns Bog Landfill Gas Collection	O	CHP	JV	LandGas
Vancouver	Southeast False Creek Neighbourhood Energy Utility (NEU)	O	DE	LG	CH4 Sew
Vancouver	Downtown Vancouver heating, a.k.a. "Central Heat Distribution"	O	DE	PRIV	CH4 Bio
Vancouver	UBC	O	DE	GOV	CH4 Bio
Vancouver	Pacific Health Services Authority's Min -District Energy System	O	DE	GOV	CH4 Bio
Vancouver	River District Energy (South-East Vancouver, "River District")	O	DE	-	CH4
Vancouver	Vancouver Convention Centre Sea Water Cooling Heat Pump System	O	1	LG	Geo
Victoria	University of Victoria	O	DE	GOV	CH4
Victoria	Dockside Green Community Energy System	O	DE	PRIV	CH4
Victoria	Dockside Green Wastewater Treatment Plant (WWTP) in Victoria	O	DE	LG	WH
West Vancouver	Eagle Lake Micro hydro project	O	E	JV	uH
Whistler	Whistler Athlete's Village District Energy Sharing System (WAVDESS)	O	DE	LG	CH4 WH
Whistler	Whistler Public Library	O	1	LG	-
Xeni-Gwet'in First Nations Government	Solar Hot Water for Community Houses (pilot project)	O	-	-	SHW