



Community-based Renewable Energy in BC: A Snapshot

May 9, 2014

Community Energy Association

Acknowledgements

This report was completed by Patricia Bell, Peter Robinson and Dale Littlejohn of Community Energy Association for BC's Climate Action Secretariat.

This work would not have been possible without support of:

- Ted Sheldon, BC Climate Action Secretariat
- Stacey Bernier, Corix Infrastructure
- Jeff Carmichael, Metro Vancouver
- Heather Davies, BC Ministry of Energy and Mines
- David Eggles, HES PV
- Ed Knaggs, HES PV
- Janice Larson
- Chris Midgley, Regional District of Nanaimo
- Gordon Murray, Wood Pellet Association of Canada
- Genevieve Tokgoz, Metro Vancouver
- Lindsay Wood, BC Ministry of Aboriginal Relations and Reconciliation.

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Executive Summary

Since 1995, BC's provincial government has created new legislation, developed supportive policies and programs and provided funding opportunities to accelerate the adoption of renewable energy and energy efficiency in communities across the province. There is substantial uptake and continued growth of renewable energy across BC, driven largely by the energy and climate action commitments of the Province and communities, with technical and other support from utilities, non-profits, academics, and the private sector.

Federal partners have brought supportive legislation and policies, tools, resourcefulness and international best practices to the task. Renewable energy activity in communities across BC is shifting from a relatively small number of independent one-off initiatives to become a standard commitment in community energy and emissions plans and being applied as part of a more diverse, innovative and integrative approach to reducing community-wide greenhouse gas emissions in both small and large communities across the province.

The purpose of this report is to provide a snapshot of community-based renewable energy projects in BC at the end of 2013, to comment on how BC's legislative and policy framework and various dedicated programs across the province and over the years have supported the development of these projects, and to suggest a strategy for moving forward. As one might expect, compiling a repository or 'state of' community-based renewable energy across BC is a challenging proposition. These systems draw on a variety of natural and other sources, can be applied at a small scale (e.g., residential level) and may require no external support (hence no record keeping).

The following tables highlight different sources of renewable energy in BC, their end use, supportive policies and incentives, barriers and status. A repository or 'state of' community-based renewable energy activity (i.e., less than 50kW) across BC is a challenging proposition. These systems draw on a variety of natural and other sources, can be applied at a small scale (e.g., residential level) and may require no external support (hence no record keeping).

Table 1: Local Renewable Electricity[1]					
		Residential	**Commercial**	**PSO&LG**	**District**
Micro hydro	**Support**	Net meter, RCI	Net meter, RCI	Net meter, GMF, RCI	Not applicable
	Pol/Reg	Utility net meter and Standing Offer policies, Ministry of Energy and Mines & Clean Energy Act			Not applicable
	Barriers	Resource location, cost, payback, fish habitat			Not applicable
	Snapshot	3 FortisBC electric net-metering customers	Limited, if any	Kimberley, West Vancouver and other municipal water supply generators	Not applicable
Solar PV	**Support**	Net meter, RCI			Not applicable
	Pol/Reg	Utility net meter policy, local government & Clean Energy Act			Not applicable
	Barriers	Resource location, cost, payback, right to light, local government bylaws on appearance			Not applicable
	Snapshot	>300 grid-tied systems	>5 grid-tied systems	>30 grid-tied systems	Not applicable
Small-scale wind	**Support**	Net meter, RCI			Not applicable
	Pol/Reg	Utility net meter policy, local government & Clean Energy Act			Not applicable
	Barriers	Resource location, cost, payback, local height and guy-wire restrictions			Not applicable
	Snapshot	Some off-grid installations	Minimal	Some experimental systems (e.g. Port McNeill emergency ops center)	Not applicable

Table 2: Local Renewable Heat					
		Residential	**Commercial**	**PSO&LG**	**District**
Waste heat	**Support**	-	-	Carbon neutral, RCI	Funds: ICE, GMF, RCI
	Pol/Reg	Bldg code	Bldg code	Bldg code	BCUC
	Barriers	Small load & proximity	Proximity, costs, long-term certainty of supply	Proximity, costs, long-term certainty of supply	Pipe cost & permanence
	Snapshot	Some cases of drain water heat recovery	Some cases of waste heat recovery. E.g. Telus Garden	Some heat sharing between pools and rinks; hospitals	E.g. South East False Creek, Cheakamus Crossing, Okanagan College
Geoexchange	**Support**	-	-	Carbon neutral	
	Pol/Reg	Bldg code	Bldg code	Bldg code	BCUC
	Barriers	Payback, costs	Payback, costs	Payback, costs	Payback, pipe cost
	Snapshot	Strong in southern interior for new build	Several examples	Momentum for new civic bldgs	Gibsons

[1] AQ = Air quality plans/policies; BCBN = BC Bioenergy Network; Bldg Code = BC Building Code; BCUC = BC Utilities Commission; Carbon Neutral = Climate Action Charter commitments; GMF = Federation of Canadian Municipalities' Green Municipal Fund; ICE = Innovative Clean Energy Fund; RCI = Remote Community Implementation Program; WW2RH = Wood Waste 2 Rural Heat initiative.

Table 2: Local Renewable Heat (cont'd)					
Waste wood chip	**Support**	BCBN, RCI	WW2RH & BCBN, RCI	WW2RH & BCBN, carbon neutral, RCI	WW2RH & BCBN, RCI
	Pol/Reg	Bldg code & AQ	Bldg code & AQ	Bldg code & AQ	BCUC & AQ
	Barriers	Ease of use, systems designed for larger loads	Knowledge, supply security, retro cost	Awareness, contracts, costs	Cost of pipe in the ground, cost, density requirements, AQ concerns
	Snapshot	Very limited individual building systems. Some homes connected to district systems	Several examples of individual building systems, plus some businesses connected to district systems	5-15 civic buildings	6 systems (Revelstoke, PG, Enderby, UBC, UNBC, Telkwa)
Wood pellets	**Support**	BCBN, RCI	BCBN, RCI	BCBN, Carbon neutral, RCI	RCI
	Pol/Reg	Bldg code	Bldg code	Bldg code	BCUC
	Barriers	Awareness, capital, insurance	Cost to retrofit existing systems, handling, awareness	Cost to retrofit existing systems, handling, awareness	cost > chip
	Snapshot	Regional pockets of interest where no natural gas or higher prices. Up to 14,400 tonnes annually of pellets	Limited	5-15 civic buildings	Baldy Hughes Therapeutic Community district energy system
Solar hot water	**Support**	RCI	RCI	Carbon neutral, RCI	-
	Pol/Reg	Solar-ready, plumbing inspectors	-	-	BCUC
	Barriers	Payback, knowledge, few installers	Payback, knowledge, few installers	Payback	Cost & resource availability opposite of demand
	Snapshot	>550 systems	>10 systems	>150 systems	Feed in to LEC

The foundational legislation, policies and programs implemented in BC to date have successfully stimulated development of renewable energy at the community level as well as across BC's technology and educational sectors. Even so, there is tremendous growth potential available for communities pending additional support from a number of prospective partners and development programs. The next step is to achieve greater market penetration of renewable energy systems by scaling up (increasing output from existing systems) and out (increasing the number of renewable energy systems in place).

To achieve this, while acknowledging various barriers to a more aggressive application of renewable energy, the following actions are recommended as next steps:

1 Evaluate market transformation/acceleration initiatives in BC, including:

- SolarBC
- Wood Waste 2 Rural Heat Initiative/Green Heat Initiative
- BC Bioenergy Network
- Plug-in BC
- Energy Diet Community-based Social Marketing
- Remote Communities Initiative (RCI)
- Fraser Basin Council biodiesel
- LED Street Lights across BC
- Community Energy & Emissions Inventory
- Community Action on Energy & Emissions

Outputs to address: Initial goals, dedicated monitoring towards intended results, outcomes, costs, challenges/barriers, successes and lessons learned.

2 Profile dedicated local government or regional district programs deemed to be successful in accelerating / promoting renewable energy. The portability of success (lessons learned) should not be underestimated.

3 Based on 1&2 above, compile an up-to-date and comprehensive best-practices guide for BC local governments on accelerating local renewable energy. Consider modularizing (i.e., packaging) the available documentation (e.g., research, case studies, business cases, and available supports) for each of the renewable energy sources for subsequent local government deliberations.

4 Prioritize renewable energy technologies and segments based on potential to achieve goals – including cost-effective reduction of GHG's, local economic development (and many other) co-benefits and leveraging of regional resource availability.

5 Based on the results of 3&4, consider either a comprehensive local renewable energy market transformation suite of discrete programs targeted to specific sectors and technologies specifically leveraging provincial and local support. Consider:

a. working directly with a small number of local governments (e.g., two rural, one urban, one regional district) on one or more of the above modules to action the relevant best practices in support of their needs.

b. developing a simplified, executive-level decision-tree (as well as guidance and training) on renewable heat options based on building size/type, existing heating ventilation and air conditioning (HVAC) systems and climactic regions for the commercial, institutional and industrial (ICI) sector. The decision framework would not be based upon a detailed technical analysis (such as that delivered by RETScreen[2]) but would be a high level, user-friendly process that identifies viable renewable energy options quickly.

An effective approach to moving through these steps would be to convene a working group that, by using this report as a basis, can assess progress made, identify ways to overcome barriers and suggest the best way to move forward. Initially, the working group (which should include industry representatives) should focus on initiatives supporting renewable heat – with a goal to achieve transformational change.

[2] More information about RETscreen can be found at: http://www.retscreen.net/ang/home.php

1. Defining Community-based Renewable Energy

Since 1995, BC's provincial government has created new legislation, amended existing legislation, developed supportive policies and programs, and provided funding opportunities to accelerate the adoption of renewable energy and energy efficiency. This document focuses on the results of initiatives that have encouraged community-based renewable energy projects.

The purpose of this brief report is to provide a snapshot of community-based renewable energy projects in BC at the end of 2013, comment on how BC's legislative and policy framework has supported the development of these projects, and suggest a strategy for accelerating renewable energy at the local level as we move forward. This includes identifying what information is required to determine next steps.

For the purposes of this report, community-based renewable energy is defined as energy that:

- comes from resources which are naturally replenished on a human timescale,
- is created within the community or nearby region, and
- is used primarily (not necessarily fully) within the community.

This definition includes the types of projects outlined in Table 3.

Table 3: List of Included Community-based Renewable Energy Projects/Types

Renewable heat	Renewable electricity	Emerging renewable energy	Renewable/ fuels for local sustainable transportation[3]
• waste heat recovery • passive solar, solar walls, solar hot water • local biomass/wood pellets/waste wood • geo-exchange heating • air source heat pumps[4]	• building-scale net-metering • Micro-hydro[5] • wind • solar photovoltaic • tidal	• bio-gas • bio-char	• bio-diesel • ethanol • bio-methane

The definition of community-based renewable energy used in this report does **NOT** include industrial self-generation (where significant energy use is at the plant with some sales back into the grid) or large, distributed generation and cogeneration (e.g. industrial processes such as Alcan & Teck Coal) & hydro-electric dams that generate extra electricity that is sold to the grid (BC Hydro dams, FortisBC bio-gas

[3] Initiatives are included in this report if implemented as part of an overall local sustainable transportation strategy.
[4] While there are a few examples of air source heat pumps supporting BC municipal operations, the scope of this report did not include detailed research on these examples.
[5] For this report, this includes only those that are below the threshold for BC Hydro's Standing Offer Program.

generation, pellet manufacturing plants, etc.) where energy is primarily generated for use outside the community or within the industry gate.

2. BC Enabling Policy, Legislation & Funding

The development of community-based renewable energy systems has progressed rapidly across British Columbia, driven largely by the climate action commitments of the Province and BC local governments and First Nations, along with strategic support from the utilities sector and federal government.

Tables 4-6 list some of the significant policies and actions that the Province of BC has implemented to support community-based renewable energy systems.

Table 4: Direct Support for Renewable Energy Development

Foundational Policies, Strategies and Legislation	Impact on Renewable Energy Development
2007 The BC Energy Plan: A Vision for Clean Energy Leadership	Led to creation of the Bioenergy Strategy and the Innovative Clean Energy (ICE) Fund.
2007 Local Government Climate Action Charter	Signed by 182 of 190 BC local governments, the Charter has provided an incentive for implementing renewable energy at the operational level. (See pg. 10 for more information.)
2008 Local Government (Green Communities) Statutes Amendment Act (Bill 27)	Required local and regional GHG emission targets, which encouraged local government renewable energy initiatives. (See pg. 10 for more information.)
2008 Greenhouse Gas Reductions Targets Act	Set Provincial targets for GHG emission reductions of 33% by 2020 & 80% by 2050[6] and provided authority for the Emission Offsets Regulation (2008) and the Carbon Neutral Government Regulation (2008).
2008 BC Climate Action Plan	The Climate Action Plan outlines strategies and initiatives to take B.C. approximately 73% towards meeting the goal of reducing greenhouse gas emissions by 33% by 2020.
2008 Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act	Promotes use of renewable fuel in transportation fuel blends, calls for reducing carbon in transportation fuels and provides authority for the Renewable and Low Carbon Fuel Requirements Regulation (enacted in December 2009).
2008 Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act	Focuses on reducing GHG emissions from certain industrial operations, while increasing opportunities in the bioenergy sector. Provides authority for the Landfill Gas Management Regulation and enables regulation of zero and net zero GHG emissions for electricity generation.

[6] Relative to 2007 levels.

2008 Utilities Commission Amendment Act	Encourages public utilities to reduce greenhouse gas emissions, take demand-side measures and produce, generate and acquire electricity from clean or renewable sources. It provided authority for the Demand-Side Measures Regulation (2008) which sets out rules that the BC Utilities Commission must use when assessing proposed utility demand-side measures.
2010 Clean Energy Act	Advances 16 specific energy objectives that include expediting clean energy investments and promoting regional job creation and First Nations' involvement in clean electricity development opportunities. It sets a clean and renewable energy target of 93%.
2011 Clean Energy Act Amendments	Compelled BC's utilities (BC Hydro and FortisBC) to provide on bill financing for homeowners to support energy efficiency, space heating and water heating improvements.
2008 BC Bioenergy Strategy	The basis for $25 million in funding for the provincial Bioenergy Network, funding intended to advance provincial biodiesel production with up to $10 million over three years and a two-part Bioenergy Call for Power focusing on existing biomass inventory in the forest industry.
2008 BC Energy Efficient Buildings Strategy: More Action, Less Energy	Strategy to reduce energy demand for all BC communities, focusing mainly on conservation. Provided funding to LiveSmart BC.

Table 5: Indirect Support for Renewable Energy Development

Foundational Policies, Strategies and Legislation	**Impact on Renewable Energy Implementation**
1995 Growth Strategies Statutes Amendment Act	By permitting establishment of urban growth boundaries, the Act encourages urban densities sufficient to support district energy.
2008 Greenhouse Gas Reduction (Cap and Trade) Act	Provides the statutory basis for setting up a market-based cap and trade framework to reduce greenhouse gas emissions from large emitters operating in the province.
2008 BC Green Building Code	By allowing builders the option of meeting a performance target of EnerGuide 77 (in addition to prescriptive options), the new code encouraged consideration of renewable energy as one way to meet the target.
2011 Clean Energy Vehicle Program	Created a point of sale incentive program for purchase of eligible clean energy vehicles, including electric vehicles, hydrogen fuel cell vehicles and new dedicated OEM compressed natural gas vehicles.

Table 6: Implementation via Renewable Energy Supportive Funding, Programs and Organizations

Capacity Building	
1995 Ministries of Environment, Community & Energy and UBCM formed Energy Aware Committee (now Community Energy Association)	Detailed 'how-to' guides on renewable and district energy, externally funded direct assistance to BC local governments, and recognition of achievement (awards).

2006 Community Energy and Emissions Inventory (CEEI) Program	Established a consistent process for measuring and reporting on GHG emissions throughout the province and target setting; particularly essential to smaller communities with more limited capacity. (See pg. 12 for more information.)
2007 Climate Action Secretariat established	Provides key project coordinating and relationship building function as well as capacity building via research and initiatives supporting and recognizing renewable energy initiatives for PSOs and local governments.
BC Climate Action Toolkit	The Toolkit provides guidance and resources dedicated to support local governments to help communities reduce greenhouse gas emissions and implement Climate Action Charter commitments. Content is developed in collaboration by the Joint-UBCM-Provincial Green Communities Committee (GCC) and Smart Planning for Communities, a program of the Fraser Basin Council. Ideas and contributions for Toolkit content is provided by a wide range of partners including BC local governments, provincial ministries and agencies, selected NGO's as well as the Toolkit partners.
Funding	
2005 Community Action on Energy and Emissions (CAEE)	A funding program supporting local governments and First Nations in a variety of renewable energy capacity building, planning and implementation projects. (See pg. 12 for more information.)
Infrastructure Planning Grants	Support district energy systems and integrated resource recovery.
2007 Public Sector Energy Conservation Agreements (PSECA)	A partnership between BC Hydro and provincial government. $75 M provided over three years to help public sector organizations reduce GHG emissions and achieve carbon neutrality. E.g. In 2010, 24 schools, 9 colleges and universities, and 5 hospitals installed solar panels to reduce natural gas or electricity consumption.
2008 Remote Communities Implementation Program	Has provided significant, ongoing financial support to remote communities in BC. (See pg. 13 for more information.)
BC Bioenergy Network created ($25 million) & Bioenergy Call for Power	Phase 1 of BC Hydro's Bioenergy Call for Power: Canfor Pulp Ltd. Partnership's project and PG Interior Waste to Energy Ltd.'s project in Prince George, Domtar Pulp and Paper Products Inc.'s project in Kamloops, and Zellstoff Celgar Ltd. Partnership's project in Castlegar. Together, these projects will generate 579 gigawatt hours of electricity annually; enough to power more than 52,000 homes.
2008 $25 M Innovative Clean Energy (ICE) Fund	Supports large renewable energy infrastructure projects (See pg. 12-13 for more information.)
2009 LiveSmart BC: Energy Efficiency Incentive Program	Initial phases of LiveSmart provided grants to residents and business implementing renewable energy such as air source or geoexchange heat pumps, solar hot water and solar photo voltaic panels.[7]

[7] http://www.livesmartbc.ca/attachments/LiveSmart-Home-Incentives(2012).pdf

2011 First Nations Clean Energy Business Fund	Through this fund, the provincial government has invested more than $5.1 million to support clean-energy opportunities in over 95 Aboriginal communities across BC, including wind energy, biomass and run-of-river hydroelectric power. (See pg. 14 for more information.)
2012 Pay as you Save Financing Pilots	The FortisBC program in Okanagan-Similkameen Regional District provided loans for space and water heating, including air source heat pumps. In addition to NRCan's dedicated Solar Colwood funding for solar hot water heaters, BC Hydro has provided low cost loans to City of Colwood residents to install ductless heat pumps. Through a regulation, the Province is expanding these on bill financing pilots to Vancouver Island and Kelowna, beginning in January 2014.
Ongoing Demand Management Programs from FortisBC and BC Hydro	Both utilities have provided a number of demand management programs over the years, including building assessments and funding (rebate) and technical support for renewable energy technology. BC Hydro's Sustainable Communities funding support for community energy managers, community energy and emissions planning, and district energy feasibility studies has had a strong positive impact on implementation at the local government level.
Financial/Market Mechanisms	
2008 Pacific Carbon Trust	Funds from offset purchases have supported 16 fuel switching projects (primarily biomass projects for large industry) across BC.[8]
2008 Climate Action Revenue Incentive Program	Has provided the equivalent of carbon tax payments back to local governments to further encourage operational and community-wide energy and GHG reductions. (See pg. 12 for more information.)
2008 Carbon Tax Act	Putting a price on carbon makes renewable energy alternatives more attractive.
Regulations	
2009 Landfill Gas Management Regulation	Landfill operators emitting above 1,000 tonnes of methane per year, must capture and destroy the gas, or use it as a source of heat. Related GHG reduction projects can use engines, boilers, pipelines, vehicles, or fuel cells to destroy (or use) the gas.[9]
2011 Solar Hot Water Ready Regulation	48 BC communities now require new single family homes to be solar hot water ready.
Programs	
2008 SolarBC established in partnership with federal government	An effective three year program resulting in numerous local government solar hot water installations. (See pg. 11 for more information.)
2008 $94.5 M endowment to create the Pacific Institute for Climate Solutions	Has led to a significant amount of BC-related research around renewable energy. (See Appendix A.)

[8] Source: Pacific Carbon Trust web page accessed April 2014: http://www.pacificcarbontrust.com/our-projects/offset-showcase/#Size=&ProjectType=Fuel+Switching&Region=&Sector=&start=12

[9] Source: Province of BC website accessed April 2014: http://www.env.gov.bc.ca/epd/codes/landfill_gas/index.htm

2012 Green Energy as a Rural Economic Development Tool Project	As well as creating a variety of green energy information resources, the project includes assistance to a number of small rural interior communities and First Nations in the mountain pine beetle epidemic zone to assist with proposed green energy development projects and concepts.

Legislative and Policy Drivers

The following measures are discussed in more detail below because they have been particularly supportive of establishing community-based renewable energy systems in BC.

Climate Action Charter

As of 2014, 182 of 190 local governments have signed the Charter, committing to being carbon neutral in corporate operations, to reporting on community-wide GHG emissions and to creating complete, compact and more energy efficient rural and urban communities. Across the province local governments have implemented renewable energy projects in corporate operations, established financing programs to support further community-wide renewable energy work and established partnerships with public sector organizations. See Section 3 for examples.

Local Government (Green Communities) Statutes Amendment Act: Requiring GHG emission reduction targets in official community plans (by 2010) and regional growth strategies (by 2011) set the stage for ongoing action at the community level. The amendment also allowed development cost charges (DCCs) to be waived or reduced for development with lower environmental impact and for the creation of development permit area (DPA) designations to reduce GHG emissions and conserve energy. There was a lag between the development of targets and innovative use of existing and new planning tools as local governments contemplated how best to proceed. Recent examples of the use of planning tools to reduce GHG emissions include:

Table 7: Local Government Planning Tools Supporting Renewable Energy

Tool	Examples:
Development Cost Charges (DCCs)	• City of Penticton created a DCC bylaw that allows developments to receive a 50% or 100% DCC reduction based upon a sustainability checklist which includes solar hot water, photovoltaics, geoexchange and wind options.
Development Permit Areas (DPAs)	• The District of North Vancouver has an energy conservation and greenhouse gas emission reduction DPA which asks developers to install district energy compatible mechanical systems for future district energy systems. • The City of Fort St. John has a DPA that requires solar hot water systems for new single family dwellings.
Rezoning Policy	• District of North Vancouver requires large developments that need rezoning to conduct alternative energy assessments.

Tool	Examples:
Service Area Bylaws for District Energy	• The City of North Vancouver established a hydronic heat energy service bylaw to create a district heating service area for Lower Lonsdale within which new buildings are required to hook up to; the district energy system now includes solar and geoexchange sources. • City of Surrey adopted a service area bylaw for the Surrey City Centre geoexchange district energy system in 2012. Financial assistance is provided to developers for the first three years after bylaw adoption. • Town of Gibsons uses a service area bylaw to ensure connection to their geoexchange district energy system.
Development Agreements	• District of North Vancouver used a development agreement to ensure that district energy is included within the Seylynn Village development. • City of Victoria's Dockside Green development began with a master development agreement between the developer and the City of Victoria, requiring the project to generate its own electricity and to provide a district energy system. • The City of Coquitlam used a development agreement to require a district energy feasibility study for the Fraser Mills redevelopment proposal.
Site Level Targets	• The City of Vancouver asked developers in Southeast False Creek (SEFC) to meet or exceed specific targets and provided a list of strategies to do so, including connecting to the SEFC neighbourhood heat system, which uses heat from waste water.

BC Solar Hot Water Ready Regulation: The Province of BC developed this regulation in partnership with SolarBC and in consultation with the development industry to support the province's Greenhouse Gas reduction target of 33% by the year 2020. BC local governments are able to "opt-in" to the Solar Hot Water Ready Regulation under the BC Building Code. More information on the results of this program can be found in Section 3.

Capacity Building Programs/Organizations

SolarBC: The SolarBC program (funded by the Province of British Columbia and Natural Resources Canada) was the most successful of 14 similar projects across Canada. The program included support of designated solar communities, encouragement of solar hot water installations on local government and First Nation buildings and funding support for communities who adopted the Province's Solar Hot Water Ready Regulation. More information on the results of this program can be found in Section 3.

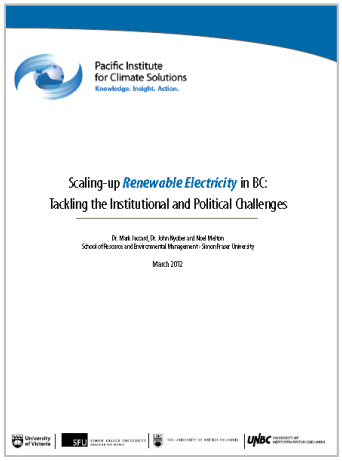

Figure 1: PICS Report

Pacific Institute for Climate Solutions (PICS): Created with a major endowment from the BC Ministry of the Environment, PICS is hosted and led by the University of Victoria in collaboration with BC's three other research-intensive universities: Simon Fraser University, the

University of British Columbia and the University of Northern British Columbia. Since 2008, PICS has funded research to support community-based renewable energy projects ranging from market development for bio char, the use of forest biomass for district heat, regulation of district energy systems, scaling up renewable electricity, and wind power. A list of relevant publications in included in Appendix A.

Community Energy Emissions Inventory (CEEI): This program, initiated by the Province in 2006, established a consistent process for measuring and reporting on GHG emissions throughout the province and target setting. The program issues local government specific emissions inventories that are particularly essential to smaller communities. Future CEEI reports are anticipated to be produced every two years (i.e. 2012, 2014, 2016) with updates to the base year (2007) inventories.

Funding Programs

Community Action on Energy and Emissions (CAEE) (2005-2010): Over five years, 54 BC local governments and First Nations participated in the CAEE program. Eleven of these projects involved renewable and/or district energy. A summary of all projects completed is in Appendix B. The Remote Community Implementation Program aspect of CAEE is ongoing.

The Climate Action Revenue Incentive Program (CARIP): This is a conditional grant program that provides funding to BC Climate Action Charter signatories equal to carbon taxes paid. This funding supports local governments in their efforts to reduce greenhouse gas emissions and move towards carbon neutrality. Local government CARIP projects are summarized in Section 3.

LiveSmart BC: Established via funding under the *BC Energy Efficient Buildings Strategy: More Action, Less Energy,* the LiveSmart BC program established momentum for community energy retrofits. Table 8 highlights impact of the program between 2009 and 2011. [10]

Table 8: Evaluation of the LiveSmart BC Efficiency Incentive Program

	---------- LiveSmart Participants ----------		Non -- Participants --		
	Total Installing Retrofits with Rebates	Estimated Total Installing Retrofits without Rebates	Estimated Total Installing Retrofits[1]	Estimated Total Market[2]	LiveSmart Estimated Share of B.C.'s Total Retrofit Market
Air-Source Heat Pump	9,579	1,000	35,000	46,000	21%
Furnace	12,830	6,700	137,000	157,000	8%
Windows	14,759	5,700	192,000	212,000	7%
Air sealing / draft proofing	13,835	10,400	207,000	231,000	6%
Insulation	9,639	8,000	141,000	159,000	6%
Doors	5,905	6,000	151,000	163,000	4%
Boiler	734	700	32,000	33,000	2%
Hot water heater	2,180	10,000	287,000	299,000	1%
Net count of households	33,431		582,000	615,000	5%

Innovative Clean Energy (ICE) Fund: The ICE fund encourages the development of new sources of clean energy and technologies to help support local economies in communities across BC. Since 2008, over

[10] From *Evaluation of the LiveSmart BC Efficiency Incentive Program* F2009 - F2011, November 2013, prepared by: BC Hydro Power Smart Evaluation

$77 million has been approved for 62 projects throughout B.C. that showcase a variety of clean energy technologies including solar, wind, tidal, geothermal, ocean wave and bioenergy. Feasibility assessments with potential local community benefits include:

- **Nexterra/UBC biomass heat and power system (funded in 2010, completed in 2013):** The ICE Fund provided $4.5 million to the University of British Columbia and GE Energy, which partnered to install and demonstrate a unique combined heat and power system, fuelled by biomass, at UBC's Vancouver campus.
- **Tsay Keh Dene First Nation, Williston Lake – $81,000 (funded 2011, completed 2011):** The first solar powered LED lighting system at an airfield in BC, which will reduce greenhouse gas emissions by replacing diesel-power.

Figure 2: UBC Biomass Heat and Power System

- **Earth Renu Energy Corp., Delta – $1 million (funded 2012, processing in operation 2013):** This facility processes up to 66,000 tonnes/year of urban organic waste to produce natural gas (bio methane). Carbon dioxide, a by-product of the process, will eventually be supplied to local greenhouses for crop production, and carbon neutral biofuel pellets and fuel from refuse will be used in cement kilns.
- **T'Sou-ke First Nation, Sooke – $1 million (funded 2012, construction underway):** This project will demonstrate new green MicroAir heating and cooling technology for an industrial greenhouse. The system will enhance crop production and clean water recovery, while reducing particulate emissions and dependency on fossil fuels.
- **Tsay Keh Dene First Nation – $1 million (funded 2011; feasibility study completed 2013):** This project takes wood waste from the shores of Williston Lake to produce heat and electricity for this diesel-reliant community. This wood waste has about as much energy as 30 million litres of diesel.

Remote Community Implementation Program: The RCI program assists BC's remote communities in reducing their dependence on diesel generation by funding capital costs of implementation or construction of clean energy systems, such as hydro, wind and solar energy. It is designed to complement other funding programs that are available to assist communities in clean energy planning and research. Feasibility or research studies are ineligible for RCI funding. The RCI program also coordinates a community-to-community mentorship program, including mentorships on solar energy. The Fraser Basin Council (FBC) has administered the RCI since it was introduced in 2009 as an independent initiative under the Community Action on Energy and Emissions (CAEE) program. An example of an RCI supported project is:

- **Dzawada'enuxw First Nation** (DFN) conducted an energy baseline survey in 2004, and later canvassed energy efficiency options with help from FBC's Smart Planning for Communities. Targeted energy savings included consideration of recommissioning a micro-hydro system. In 2011, DFN began a solar hot water demonstration project in four homes, with help from mentor George Colgate of Xeni

Gwet'in First Nation, and funding from the RCI program, Solar BC and DFN. The pilot homes gained an alternative, clean source of energy that proved reliable even on cloudy days, and achieved cost savings.

First Nations Clean Energy Business Fund (2011 – ongoing): Through this fund, the provincial government has invested more than $5.1 million to support clean-energy opportunities in over 95 Aboriginal communities across BC, including wind energy, biomass and run-of-river hydroelectric power. The First Nations Clean Energy Business Fund provides money for capacity-building in communities and investment in clean-energy infrastructure. The fund is also for revenue-sharing agreements with First Nations on whose traditional territory a clean-energy project is built. This funding has enabled First Nations to achieve a wide range of clean-energy related projects, among them:

- A feasibility study by **Lake Babine Nation** will look at bringing a district biomass heating system using wood chips online.
- **Okanagan Indian Band** will use their funds to develop a community energy plan assessing solar, wind, biomass and hydropower potential in their traditional territory, as well as energy-saving opportunities.
- **shishálh Nation** will invest in building the 33-megawatt Narrows Inlet Hydro Project, in partnership with private investors and another First Nation.
- A feasibility study toward a hybrid electricity solution for the Nemaiah Valley-based **Xeni Gwet'in First Nations.**
- **Uchucklesaht Tribe Government's** assessment, design and permitting of a hydropower project located in Barkley Sound on Vancouver Island.
- Evaluating potential run-of-river hydro power projects in the **Ts'elxweyeqw's** traditional territory in the Chilliwack River Valley.

Revenue sharing agreements under this program include:

- in 2012, $500,000 in equity funding to the **Tla-o-qui-aht First Nation** to finance construction of the revenue sharing Haa-ak-suuk Creek project; and
- the **Tahltan Nation** Forrest Kerr hydroelectric project, which is expected to generate approximately $2.5 million per year over the life of the project in revenue. A portion of water rentals and land rents charged for the project will be shared.

Figure 3: Haa-ak-suuk Creek Project

Remote Community Integrated Energy Project: Funding from Natural Resources Canada (ecoEnergy for Aboriginal and Northern Communities) will support projects being developed under the BC Remote Community Integrated Energy Project. Three community projects that will be funded under this agreement include:

- The **Gitga'at First Nation** small storage hydropower project that is integrated with a micro-smart-grid energy management system. The energy management system includes bi-directional load shedding and building DSM measures in a coastal community located on the central coast of British Columbia.
- The **Lasqueti Island** smart-grid integrated, combined heat and power system, which incorporates multiple home/building-scale solar PV, micro-hydro, and biomass inputs with community energy co-op management.
- The **Da'naxda'xw First Nation** hybrid containerized power system (small diesel generators, wind and/or solar generation, inverters, energy storage) and remote monitoring / control system.

3. Community-based Renewable Energy Implementation

As one might expect, compiling a repository or 'state of' community-based renewable energy across BC is a challenging proposition. These systems draw on a variety of natural and other sources, can be applied at a small scale (e.g., residential level) and may require no external support (hence no record keeping). The following two tables provide a glimpse into the level of community base renewable energy in BC.

Highlights of renewable energy technology deployments identified in publicly available documentation reviewed across[11] BC are summarized in Table 9.

Table 9: Renewable Energy Deployment in BC

Number	Type	Description
> 30	DES	Operational district (multiple customers) and discrete (campus) heating systems across BC.
> 10	DES	District and discrete systems in advanced planning, design or approval stages, with many more being at the vision or pre-feasibility stage.
7	CHP	Systems or initiatives providing both heat and electricity.
2	Biogas	Systems using renewable or waste resources to produce natural gas.
> 16	Electricity	Systems in operation related to electricity from local distribution utilities to local government electricity generation and participation in independent power projects.
4833	Wood	Old inefficient wood stoves replaced with high efficiency pellet, cordwood, electric and gas appliances.
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.
48	Solar	Communities signed on to the solar-ready bylaw.

According to Climate Action Revenue Incentive Program (CARIP) reports, a total of 73 direct energy generation community-based projects and 155 direct energy generation corporate projects were implemented by BC local governments throughout 2010, 2011 and 2012. At least 444 supportive energy

[11] *INTEGRATED COMMUNITY ENERGY SOLUTIONS PROGRESS REPORT PROVINCE OF BRITISH COLUMBIA AUGUST 2013*, prepared for Quality Urban Energy Systems of Tomorrow (QUEST) by Community Energy Association with support from the Province of British Columbia.

generation activities have also been identified, though some are continuations of local government activities across years.

Table 10: Summary of Energy Generation Projects according to CARIP Reports 2010-2012

	2010	2011	2012
Community-based **direct** generation	29	24	20
Corporate based **direct** generation	20	74	61
Community-based energy generation **supportive activities**	53	138	98
Corporate–based energy generation **supportive activities**	26	63	66

A more detailed analysis of local government entries into CARIP reports reveals some of the nature of the types of community and corporate direct generation projects that have been (see Table 11 below) **constructed or installed** in 2010 or 2011. (Note: The total number of projects in this table does not match totals in Table 10 above. Table 10 also counts records for continuation or expansion of existing projects, financing or organizational tasks and misclassified entries.)

Table 11: CARIP Report Detail for Direct Generation 2010-2012

	Air Source HP	Biomass	Biogas/Bio Fuels	Cogen	District Energy	Geoexhange	Micro Hydro	Solar PV or HW	Wind	Waste Heat	Total
Community				**1**	**1**	**4**		**4**		**1**	**22**
2010						2		1			3
2011				1	1	2		3		1	8
2012	1	1	1	1	1	2		1	1	2	11
Corporate	**3**	**4**	**1**			**13**	**3**	**64**	**2**	**29**	**158**
2010	2					10	3	34	1	14	64
2011	1	4	1			3		30	1	15	55
2012	2		4	1	2	4		15	1	10	39
Total	**3**	**4**	**1**	**1**	**1**	**17**	**3**	**68**	**2**	**30**	**180**

Types/Sources of Renewable Energy

This section provides brief snapshots of each of the various types of renewable energy activity across the province, with a sampling of initiatives being undertaken at the community level.

Waste Heat Recovery

Heat recovery is the practice of recovering and reusing the thermal energy we throw away, down our drains, through our exhaust systems and up our chimneys.[12] As an energy source, heat recovery is currently overlooked because of a lack of awareness of its benefits. Waste heat recovery can provide:

- a clean, renewable and cost effective source of heat for both residential and commercial users (emerging), in addition to industrial and institutional (established) applications
- an environmentally sound approach to reuse energy that would have otherwise gone to waste, and
- a reliable source of energy because technologies required to capture and use waste energy are proven, established and off-the-shelf.

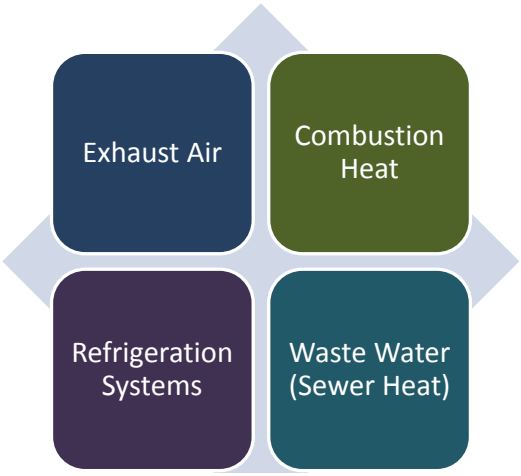

Figure 4: Sources of Waste Heat

Some examples of using waste heat in BC communities are outlined below:

Waste Heat Recovery

- Juan de Fuca Pool Recreation Centre, partnership of West Shore Parks & Recreation Society (Langford, Colwood, View Royal, Metchosin, Highlands, Capital Regional District Electoral Area), operational in 2000, recovers 700,000 BTUs per hour of waste heat from the ice arena and directs to the nearby pool.
- Okanagan College Kelowna KLO Road Campus – Okanagan – heat recovered from City of Kelowna's wastewater treatment plant effluent to heat the entire KLO Road Campus. Operational in 2004.
- Southeast False Creek Neighbourhood Energy Utility (NEU) – heat recovered from a wastewater lift station and used to heat the former Olympic Village. Designed to distribute heat to up to 16,000 residents on 32 hectares, with a peak load of 19.5 MW, and expected to supply 63,000 MWh/year of heat energy at full build-out. Operational in January 2010.
- District of Kitimat ice heat recovery system for the Sam Lindsay Aquatic Centre – installation of an ice heat recovery system at the Centre, as well as many other energy efficiency features, save the District $68,000 annually, with a project payback of 7.5 years, and CO2 emission reductions of 74%. The majority of savings are due to the ice heat recovery system.
- Strathcona Gardens Recreation Complex – waste heat recovered from the arena's compressors used to heat the aquatic facilities. $329,750 project, paid with $299,750 in Gas Tax funding, which will save $50-60,000 / year in energy costs. Operational in March 2014.

[12] Source: Ministry of Energy, Mines & Responsible for Core Review, web page accessed April 2014: http://www.empr.gov.bc.ca/RET/RENEWABLEENERGYTECHNOLOGIES/WER/Pages/default.aspx

Although Europe and Asia have been using untreated sewage heat as a source for district energy systems, the only known system currently in operation in North America is the neighbourhood energy utility in Southeast False Creek outlined above. Large metropolitan areas, like Metro Vancouver and Capital Regional District, as well as larger cities, such as Kelowna, are good candidates for sewer heat recovery because systems process significant volumes of effluent. The CRD undertook some earlier scoping studies. Metro Vancouver has passed an interim bylaw and is now actively looking at waste heat capacity through its sewer trunk system. Systems using treated effluent also have significant potential, and are becoming more commonplace.

Solar Thermal /Photovoltaics

Solar Thermal

Solar thermal systems heat air and water either passively or actively. A passive solar heating system is created through special building design or placement of appropriate building components to make use of solar energy. An active solar heating system involves a specific technology that collects solar energy and improves on the possibilities for storage or distribution of the energy.

The most significant push for solar thermal technology came through the SolarBC program, which supported the installation of a type of active solar thermal technology called solar hot water systems. The program was funded by the Province of British Columbia and Natural Resources Canada from 2008 to 2010. Over three years, the program provided incentives, assistance, training, and solar policy development support. A map showing all SolarBC installations up until 2011 can be found here: http://www.solarbc.ca/view-installations-across-bc. Notable accomplishments are shown in the following figure.[13]

SolarBC Accomplishments and Highlights from 2008 - 2011

SolarBC Project	Target	Expected
Solar Communities	5 communities	32 communities
Residential	546 systems	546 systems
Local Government	20 systems	39 systems
School	30 shw systems + 20KW PV power	42 shw systems + 33 kW PV power
Social Housing	18 systems	14 systems

Figure 5: Solar BC Accomplishments

The SolarBC program also:

- achieved 4,353 GJ, 94 tonnes of CO_2 equivalent reductions, and $4.2 million in annual savings due to the installations
- certified 54 professionals as Canadian Solar Industry Association (CanSIA) Solar Hot Water Installers
- involved four First Nations.

[13] Source: Solar BC web site, accessed April 2014

In addition, forty-eight local governments in BC have passed resolutions to sign on to the Solar Hot Water Ready Regulation, which requires all new single family homes to be built to accommodate future installation of a solar hot water system for water heating. Communities signed on as of June 14, 2011 are listed in Appendix C. In addition, since 2008 the City of Vancouver has implemented a Solar Homes Pilot and Green Homes Program.

Solar Photovoltaics

Solar photovoltaic (PV) panels generate electricity from solar energy. According to the National Survey Report of Photovoltaic Power in Canada (2012)[14], there is about 2.01MW of photovoltaic power production in BC. However, consulted experts[15] believe that production is probably closer to 1.6MW. Okanagan College's Penticton campus has a substantial installation of solar PV.

BC Hydro currently has 303 net metering customers with an installed capacity of 1.2 MW of energy. At least 277 of these customers use solar PV and 5 are wind/solar PV combined. Systems greater than 50 kW need to sell electricity to BC Hydro through the Standing Offer Program.

FortisBC Electric has 22 net metering customers (12 residential and 10 commercial). At least three are small hydro systems and the rest are solar net metering customers. Systems greater than 50 kW must sell electricity to FortisBC Electric through another means.

Examples of community-based solar projects in BC are outlined below:

Solar Hot Water/Photovoltaic and Passive Solar

- T'Sou-ke First Nation – 37 solar hot water systems on homes, and 75 kW of solar photovoltaics in four systems providing electricity for community buildings and homes. The systems were completed in 2009.
- Lonsdale Energy Corporation (LEC) solar hot water system – A 120 collector (303.6 m^2) solar hot water system on top of the City of North Vancouver library contributes heat to the LEC district energy system. The solar system was completed in 2009.
- Grand Forks Aquatic Centre – pool and hot tub heat provided by an 18 collector (45.3 m^2) solar hot water system, completed in 2009.
- Peace River North School District No. 60 solar walls – the school district has 3 passive solar walls in operation. Initial install 2002, full operation 2010.
- The Jim Pattison Centre of Excellence at Okanagan College's Penticton Campus – largest solar photovoltaic array in Western Canada on the roof at 258 kW, and solar chimneys passively draw warm air up and out of the building. These features contribute to making the building a "Living Building". The building was opened in 2011.

[14] Source: *National Survey Report of Photovoltaic Power in Canada* 2012 by CanSIA and Canmet
[15] Source: Email from E.Knaggs, HES PV, April 2014

Biomass Heating

Communities across BC have access to wood chips, pellets, shavings, sawdust, and other woody material, which can be collectively referred to as 'biomass', which provides the fuel for biomass heating systems. Biomass can play a key role in helping communities take control of their energy future while strengthening their local economy (because biomass is often sourced from the local area).

Biomass heating is a technology that is both familiar and unfamiliar to most communities in BC. Traditional approaches for biomass combustion are familiar and involve heating in open fireplaces, old stoves, outdoor boilers, and biomass disposal in large-scale polluting beehive burners. These approaches are inefficient and often result in the production of large amounts of particulate matter. Modern biomass heating takes the form of efficient, clean burning biomass systems. This approach is widespread in many European countries, for example Austria, where it supports the country's strict air quality standards with systems of high reliability and quality.

A number of bioenergy facilities operate in British Columbia today. Many of these are industrial plants that generate a lot of heat for a forest industry facility, and some of these also generate electricity which is used on site and/or sold to the grid. A study from Simon Fraser University estimates that 1,691,785 kW of energy are generated by biomass systems in BC.[16] G. Murray, [17] of the Wood Pellet Association of Canada estimates that 14,600 metric tonnes of wood pellets are used in BC each year. Examples of community-based biomass heating projects in BC are outlined below:

Biomass Heating

- Revelstoke Community Energy Corporation – this biomass district heating system uses 2.3 km of distribution piping to provide steam for the local mill's drying kilns, and hot water to ten buildings in the community. Heat is primarily provided by a 1.5 MW woodchip boiler, with biomass sourced from the local mill. Operation started in 2005.
- Fink Enderby Biomass District Heating System – Fink Machine built, owns, and operates a biomass district heating system in the Village of Enderby. With a 640 metre distribution network the system is currently connected to 8 customers including the Village's outdoor pool, industrial facilities, an Inn, and an Interior Health building. Heat is primarily provided by a 540 kW woodchip boiler, with biomass sourced from within the community or the surrounding area. Operation started in 2011.
- Village of Granisle Fire Hall bioenergy system – the Village installed a 30 kW woodchip system to heat its Fire Hall, severely reducing propane consumption. Estimated annual savings are $3,500. Biomass is currently sourced from neighbouring communities. Operation started in 2011.
- District of Lillooet Recreation Centre bioenergy system – the District installed a 400 kW wood pellet system to heat its Recreation Centre, severely reducing propane consumption. Estimated annual savings are $26,000. Biomass is sourced from BC wood pellets. Operation started in 2011.
- Telkwa Biomass District Heating System – municipal office, pub, school, and several houses are heated with the Village of Telkwa's biomass district heating system. Heat is primarily provided by a 300 kW woodchip boiler, with biomass sourced from within the community. Operation started in 2013.

[16] Source: *A Review of Renewable Energy in Canada, 2009*, Prepared for: Natural Resources Canada and Environment Canada Prepared by: John Nyboer and Kristin Lutes of the Canadian Industrial Energy End-use Data and Analysis Centre, Simon Fraser University, Burnaby, BC, March 2011

[17] Source: Email from Gordon Murray, RPF, CMA Executive Director Wood Pellet Association of Canada, April 2014

Geoexchange

Because the earth remains at a fairly stable temperature year-round, geoexchange systems can use the earth as a heat source and sink to provide heating and cooling. Geoexchange system heat pumps need electricity to run, and for each unit of electricity they consume, a well-designed geoexchange system can supply 3-4 units of heat. While geoexchange systems are sometimes colloquially referred to as geothermal systems, this terminology is best avoided. Geothermal systems are more commonly used to refer to systems that (without use of a heat pump) use heat from pockets of superheated water and steam deep underground, bring it to the surface and use it to generate electricity and/or supply heat.

BC saw a considerable level of geoexchange activity prior to 2009, due to a good business case for systems. However, GeoExchange BC believes that the level of activity in BC has softened considerably over 2009 to 2013 – largely due to reductions in the cost of natural gas and increases in the price of electricity over the period. There are pockets of stronger activity in BC, including certain segments of the institutional market, certain regions without access to natural gas, and the residential market in the southern interior. There is also some stronger uptake in higher-profile, utility-operated high-density or mixed-use applications, while uptake in the private commercial arena remains weak. According to Jeff Quibell, Chair of GeoExchange BC, there are signs (in 2014) suggesting an increase in natural gas prices – a trend that will help geoexchange uptake.[18]

According to a report prepared by Simon Fraser University, there are approximately 10,770 kW of geoexchange systems in BC.

Examples of community-based geoexchange systems in BC are highlighted below:

Geoexchange

- City of Castlegar City Hall – The City's new 12,000 ft^2 City Hall is heated and cooled with an 'open well' geoexchange system. In addition to other energy saving features, the building is designed to use half the energy of a conventionally building of the same size, saving 28,740 kg of CO_2 per year. The building opened in 2008.
- District of Houston geoexchange system – the District of Houston's arena and neighbouring aquatic facility use waste heat recovery and a geoexchange system to reduce emissions and save money.
- Ty-Histanis Geoexchange District Energy System – Ty-Histanis is a new, sustainable community development and expansion of the Esowista Reserve on Tla-o-qui-aht First Nation lands. The development will occur over several phases as buildings are constructed and occupied, with thermal energy needs provided by a geoexchange district energy system. The system will ultimately consist of up to 314 boreholes drilled to an average depth of 48 metres. Operation started in 2011.
- Sun Rivers Geoexchange Community – Sun Rivers Golf Resort Community is a major development on Tk'emlúps Indian Band land. At full build-out, all buildings will have vertical loop geoexchange systems. As of 2010, 550 homes (out of a projected development size of 2,000 homes) had been completed.
- SD 44 Education Service Centre/Arts for Kids geothermal and heat recovery system. The City of North Vancouver project is a partnership between Lonsdale Energy Corporation and School District 44, with approximate annual savings of 170 tons of CO_2 and 3,603 GJ of natural gas. Operation started in 2012.

[18] Source: Email from Jeff Quibell, P.Eng.Chair, GeoExchange BC, March 31, 2014

Micro Hydro

Micro hydro projects generate electricity without altering seasonal flow characteristics. Water is diverted from a natural watercourse through an intake channel and pipeline to a powerhouse where a turbine and generator convert the kinetic energy in the moving water to electrical energy. Some local governments have also used their water (or even wastewater) infrastructure to install micro hydro systems.

BC Hydro defines micro hydro as being a hydro project with a rated capacity of 2 MW or less. FortisBC Electric has at least three micro hydro systems being net metered (i.e. less than 50 kW), out of 22 net metering customers.

Examples of community-based micro hydro systems in BC are highlighted below:

Micro Hydro

- West Vancouver Micro Hydro – the District of West Vancouver installed a micro hydro turbine in the drinking water system for water coming from Eagle Lake. The project cost $328,000 and is estimated to provide $700,000 in net revenue over 25 years for the District. 1.1 GWh per year is generated. The head is about 150 metres. Operation started in 2003.
- Kimberley Micro Hydro – the City of Kimberley installed a 25 kW turbine in its drinking water system, with a head of about 35 metres. Operation started in 2008.
- Lake Country Micro Hydro – the District of Lake Country installed a turbine with a 1.1 MW capacity in the drinking water system, generating 3.9 GWh or $225,000 (net) per year for the District, with an estimated payback of 5.4 years. The head is about 190 metres. Operation started in 2009.
- Nakusp Micro Hydro – the Village of Nakusp installed a 50 kW micro hydro plant during construction of its new water treatment plant. It is expected to generate $35,000 annually in revenue for the Village, by offsetting electricity consumption and through a net metering agreement with BC Hydro. The project and water treatment plant were funded through the Federal Gas Tax Innovations Fund. Operation started in January 2014.
- Fort St John Micro Hydro – In 2014, the City of Fort St John expects to install a micro hydro turbine to generate electricity from the effluent from their wastewater treatment plant, as it drops 250 metres before entering the Peace River. The turbine may have a rated capacity of approximately 100 kW, and generate 930 MWh annually with a value of approximately $100,000.

Biogas

Biogas is a gas comprised principally of methane and carbon dioxide produced by the anaerobic degradation of biomass. Biogas is commonly generated from organic waste products at sewage treatment plants, solid waste landfills, and in some agricultural operations. Biogas can be used to generate heat and/or electricity, and in some cases biogas has been supplied to natural gas companies.

According to a report by SFU[19], BC biogas projects have a present capacity of about 117,745 kW. BC Hydro has Standing Offer customers (e.g., CRD and Nanaimo below), and one biogas net metering customer (i.e. the customer has a rated capacity of less than 50 kW).

Examples of community-based biogas systems in BC are highlighted below:

Biogas

- City of Prince George wastewater treatment plant biogas – the City's Lansdowne Waste Water Treatment Centre treats 95% of the wastewater discharged into the City's sewer system. Biogas generated in the anaerobic digesters is piped to different areas of the Centre for use in turbines that generate electricity and heat.
- Metro Vancouver wastewater treatment plant biogas – at four of Metro Vancouver's five wastewater treatment plants, biogas generated from the plants is used for heat, and in some cases for electricity as well in the plants. The Annacis Island Plant for example meets 100% of its heat requirements and 50% of its electricity requirements through biogas, reducing GHG emissions by 660 tonnes per year.

Wind

British Columbia has abundant, widely distributed wind energy resources in three areas: the Peace region in the Northeast; Vancouver Island; and the North Coast. Wind is a clean and renewable source that does not produce air or water pollution, greenhouse gases, solid or toxic wastes.

BC Hydro has at least 5 net metering (i.e. less than 50 kW) customers that generate electricity from wind and solar PV combined, out of 303 net metering customers. Larger wind energy systems need to sell electricity to BC Hydro through the Standing Offer Program. Examples of community-based wind energy systems in BC are highlighted below:

Wind

- Village of McBride – in 2007, the Village installed a small horizontal axis wind turbine to provide electricity for the airport, with any surplus provided to the BC Hydro grid through a net metering arrangement. The wind turbine is a 2 kW Southwest Wind Power Skystream turbine, which generates about 1,500 kWh per year.
- Village of Alert Bay School – in 2009, Alert Bay Elementary School installed a 2 kW horizontal axis wind turbine for education and power production.
- Town of Port McNeill – in 2011, the Town installed a small-scale horizontal axis wind turbine outside its main office to generate electricity for the emergency operations centre, and provide any surplus to BC Hydro through a net metering arrangement.
- Lower Similkameen Indian Band – in 2011, the Band installed a 5 kW horizontal axis S-343 Endurance Wind Power wind turbine to generate electricity for the school, and act as a demonstration and educational tool. The turbine has been erected on a 120 foot mast. Excess electricity generated is sold to FortisBC Electricity.

[19] Source: *A Review of Renewable Energy in Canada, 2009*, Canadian Industrial Energy End-use Data and Analysis Centre, Simon Fraser University, Burnaby, BC, March 2011

Ocean Energy

Energy can be generated from ocean water from two main sources: waves and tidal currents. Various technologies to harvest energy from these sources and turn it into electricity are under development around the world, with some commercial systems in place.

Waves are created from the wind blowing over the ocean surface, while ocean tides are generated by the rotation of the earth within the gravitational fields of the moon and sun. Technologies can convert the energy from these sources into electricity.

According to figures from the Ministry of Energy and Mines, an estimated 6,000 MW from wave energy and 2,000 MW from tidal energy have been identified as available for capture in B.C.

An example of community-based ocean energy systems in BC is highlighted below:

Ocean Energy

- From 2006 to 2011, there was a small demonstration tidal energy project at Race Rocks, near Victoria. The Lester B. Pearson College of the Pacific, the provincial and federal governments and industry partnered to install and test the system. The turbine will be sent to the Museum of Science and Technology in Ottawa as the first ocean tidal generator built and deployed in Canada.

Biodiesel & Ethanol

Biofuels are produced through the transformation of biomass into a liquid fuel. For example, biodiesel can be produced from the conversion of organic oils and fats. Ethanol, which is the dominant biofuel in Canada, is a liquid alcohol produced from the fermentation of biomass. Biofuels are primarily used as transportation fuel.

An example of community-based biodiesel and ethanol systems in BC is outlined below:

Biodiesel & Ethanol

- Biofuel production and distribution facility at Bing's Creek – this project is a partnership between the Cowichan Bio-Diesel Co-op (CB-DC), the Cowichan Valley Regional District (CVRD), and Cowichan Energy Alternatives Society. This facility, along with co-op biofuel distribution locations and a growing list of community partnerships, is part of a growing Islands Biofuels Network initiative. A carbon footprint assessment carried out by Cowichan Energy Alternatives revealed that through the production and use of completely recycled biodiesel, CB-DC already has prevented over 520 tonnes of GHG emissions from entering the atmosphere.

4. Investment, Jobs & Education

British Columbia is considered a North American leader in clean energy. GLOBE Advisors state that "the transition toward a cleaner economy is about creating and retaining wealth and jobs, reducing the carbon footprint of societies, restoring the natural environmental balance of critical ecosystems, and implementing improvements in energy and industrial efficiency, all of which contribute to enhanced economic competitiveness."[20]

The Province's Clean Energy Act requires using clean or renewable resources to help achieve provincial GHG reduction targets, and encourages economic development and the creation and retention of jobs. In 2011, the Clean Energy Supply and Storage sector in B.C. was estimated to have generated some $4.9 billion in GDP ($3.9 billion direct; $1.0 billion indirect) and 25,100 full-time equivalent jobs (13,000 direct; 12,100 indirect).

Of direct jobs, clean energy generation in BC accounts for approximately 9,800 jobs (about 75% of all employment in the energy generation and storage sector), clean technology development and manufacturing account for 1,980 FTE jobs, and the smart grid and transmission segment accounts for some 1,220 jobs. The clean-energy technology industry is one of the fastest growing industries in BC, with more than 200 organizations, 68 per cent of which formed in the past decade.[21] Clean-energy technology is one of eight key sectors mentioned in the BC Jobs Plan.[22]

For clean energy heat supply to commercial, institutional and residential buildings in communities across BC, biomass-based energy projects serve as the source with an already established track record and tremendous growth potential. To meet customer demands across B.C., further growth is in the cards for clean energy. BC Hydro forecasts, before accounting for energy conservation and efficiency measures, that customer demand for electricity will increase by 40 percent over the next 20 years.[23]

Eight educational institutions and centres of excellence support green research and technology development in BC, bringing experts from the public, private, and academic sectors together to collaborate on applied research, development, and commercialization of new technologies.

[20] *Market Report: British Columbia's CLEAN ENERGY SUPPLY & STORAGE SECTOR*, September 2012, Globe Advisors, a division of the GLOBE Group, September 2012, page 10.
[21] Ibid, page 3.
[22] *B.C.'s Green Economy: Growing Green Jobs*, Update 2014
[23] *Integrated Resource Plan: Meeting B.C.'s Future Electricity Needs*, BC Hydro, August 2013, page 4."

Table 12: BC Educational Programs with a Focus on Renewable Energy

Adapted from: *Trade and Invest BC* at http://www.britishcolumbia.ca/invest/industry-sectors/technology/clean-technology.aspx

Centre of Excellence	Academic Institutions	Focus
Centre for Energy Systems Applications	British Columbia Institute of Technology	Renewable energy technologies (geo-exchange, photovoltaic, and high efficiency lighting) in an integrated systems approach
Centre for Interactive Research on Sustainability	University of British Columbia	Sustainable transportation, clean energy/technology
Collaborative for Advanced Landscape Planning	University of British Columbia	Uses modeling and visualization, and processes such as workshops, charrettes and extensive community planning exercises to investigate how citizens engage with sustainability challenges in their communities.
Energy House	Northern Lights College	Wind turbines, photovoltaic, solar thermal, biomass, geoexchange
Institute for Integrated Energy Systems	University of Victoria	Renewable energy systems, hydrogen fuel cell technology
Institute for Resources, Environment and Sustainability	University of British Columbia	Sustainable resource management and ecology
Pacific Institute for Climate Solutions	Universities of Victoria, British Columbia, Northern British Columbia & Simon Fraser Unversity.	Low-carbon economy, climate change, sustainable communities, resilient ecosystems
Jim Pattison Centre of Excellence in Sustainable Building Technologies and Renewable Energy Conservation	Okanagan College	Sustainable construction management technology, geothermal, electrical, carpentry, green building design and construction, onsite alternative energy sources, metering and monitoring of green buildings, building envelope construction, life cycle management& HVAC
National Research Council Institute for Fuel Cell Innovation	Located on UBC campus	Hydrogen and fuel cell systems

5. Barriers

Table 13 summarizes systemic barriers to increased renewable energy uptake.[24] Progress levels specified in the table represent Community Energy Association's assessment of BC's success in overcoming each of these barriers, based on the research gathered for this report. The numbered discussion points below explain why each 'progress' rating in Table 13 was selected.

Table 13: Systemic Barriers and Estimated Progress in Overcoming these Barriers in BC

Barrier Category	Specific Challenge	Progress
1. Legislative/Policy Foundation	Establishing foundational legislation and policy support at the provincial level to encourage renewable energy activity	
2. Technical Support	Providing information on technology (costs/benefits/resources required)	
3. Financial /Market Transformation	Access to capital, especially small communities	
	Funding to help renewables compete with fossil fuels financially & overcome capacity and cost challenges around technology	
4. Institutional	Replacing patchwork policy frameworks and support with comprehensive and coordinated policies and programs at, and amongst, each level of government	
5. Community	Helping communities establish dedicated personnel with skills and budget (including community energy and sustainability managers).	
6. Governance	Helping to build institutional capacity to establish new organizational structures	

1. **Legislative/Policy Foundation:** Although often the primary barrier to enabling progress on renewable energy, BC has established a suite of legislation, policies and programs that have led to the development of GHG emission reduction targets for local governments at both the community and the corporate level. While establishing targets (i.e., changes to the BC *Local Government Act*) does not necessarily lead to action, research reviewed by this report certainly suggests that many target-inspired actions have taken place at both the community and corporate level. While some local governments have met their carbon neutrality targets, there is significant scope to increase the number and impact of actions at the community level by removing other barriers discussed below.

2. **Technical Support**: Over the past twenty years, the Province has provided funding for programs, guides and, in some cases, organizations that has helped to inform local governments and First Nations of renewable energy options available and the steps that can be taken to establish projects. The suite of guides available from the Community Energy Association as well as those produced by the Green Energy as a Rural Economic Development Tool project are good examples of supportive documents, while the beetle action coalitions, BC Bioenergy Network and Wood Waste 2 Rural Heat are examples of organizations that have provided technical support. While large local governments generally have

[24] Based in part on *Barriers to Renewable Energy Development in British Columbia's Remote Communities* by L. Inglis, University of Guelph, 2008

enough resources to take action based on information provided, research alone is often not enough to help small local governments move forward because of resource constraints.

3. **Financial Support/Market Transformation:** Local Government Infrastructure Grants and the Community Action on Energy and Emissions, Remote Community Implementation and Climate Action Revenue Incentive programs are examples of financial measures that have helped BC communities access capital for renewable energy projects, often providing funds for leveraging other (federal) programs. While a number of grant programs are still available, coordination of these programs and/or a dedicated renewable energy funding program could be beneficial. Small communities could benefit from support in applying for grants.

   BC's carbon tax has supported a degree of market transformation around energy. However, subsidies for the production of fossil fuels continue to be a considerable barrier to market transformation.

4. **Institutional:** Policies and programs supporting renewable heat are still specific to goals of originating ministries and, to some degree, tend to come and go. While there is some vertical alignment with local government policies (the Climate Action Charter and Solar Hot Water regulation), some provincial policies have incented local government to consider certain opportunities within a specific timeframe instead of creating aligned programs that will move everyone in the same direction. Coordination of a range of Provincial programs that meet Provincial objectives (e.g., green buildings, landfill gas, infrastructure planning grants) and local government/First Nation objectives at the same time would have greater impact. For example, a suite of complimentary programs that enable local governments to improve building energy performance or support district energy, modeled on the Solar Hot Water Regulation, would be very helpful.

5. **Community:** Knowledgeable staff to focus on energy issues is a significant barrier, particularly for smaller communities. BC Hydro's Sustainable Communities program, which provides two years of financial support for community energy manager positions at the local government level, has helped overcome this barrier for those communities that have received the funding.

6. **Governance:** While some initial work has been completed in this area – primarily, the Green Energy as a Rural Economic Development Tool Project (*Governance and Financing Guide*) and BC Hydro's community energy manager program – longer term and more direct 'hands on' programs (as opposed to guides) that help achieve implementation would be helpful.

In terms of **project specific barriers,** Inglis (2008) identified the following barriers to implementing renewable energy in small BC communities (the relevant systemic barrier above is identified in brackets): [25]

- Evaluating the long term potential of local renewable resources (systemic barriers: technical, financial)

[25] Based in part on *Barriers to Renewable Energy Development in British Columbia's Remote Communities* by L. Inglis, University of Guelph, 2008

- Building and maintaining productive stakeholder relationships (systemic barriers: governance, community)
- Achieving environmental approvals (systemic barriers: technical, governance)
- Staff and organizational capacity issues, specifically to negotiate and administer long term contracts (systemic barriers: community, governance)
- Complexity of grant application and management processes (systemic barriers: community)
- Time required to manage multiple funding sources (systemic barriers: community)
- Impact of construction delays (caused by winter weather) on ability to meet funding schedules (systemic barriers: financial)
- Interest in local economic and community development but lack of capacity to achieve those goals (systemic barriers: community, governance)

Project specific barriers to renewable energy (including waste heat-based) district heating systems include:

- **Pacing development of district energy with residential market demand.** Professionals involved in renewable district heat implementation are aware of the high cost of renewables and the need for a reliable and appropriately sized customer demand. In most cases, loads are relatively small and build out according to the residential market demand. This means that most systems start with natural gas coupled within a strategic and thoughtful plan to ensure that rates are smoothed out over time. If market conditions increase the speed of development this can allow the introduction of renewables as planned or sooner. A clear component of success is the leadership universities and municipalities have around mandatory connection to district energy. This has been an important tool, in part because information is readily shared, allowing others to reduce research time and move more quickly on new district energy initiatives.[26] (systemic barrier: market transformation)
- **Overcoming BC's low electricity rates and the default to baseboard heaters.** A second challenge continues to be overcoming the business-as-usual approach, typically installation of electric baseboards, by installing hydronic heating systems. Incentives offered to early adopting developers and utilities who will take over in-building systems under a utility structure would help. District energy providers have realized the need to meet and discuss the challenges in educating developers about district energy, and are presently developing a common platform and message for the developer community. (systemic barrier: market transformation)
- **Understanding the technical and governance issues associated with sewer heat extraction is limited.** Technical issues that need to be further explored include the capabilities and limitations of sewage heat recovery technologies, assessment of the seasonal variability of energy content of sewage, and impacts of multiple sewage heat extraction projects on wastewater treatment plant processes.[27] Governance-related issues include ownership and transfer of heat rights and the need for

[26] Source: Email from Stacey Bernier at Corix Infrastructure, April 2014
[27] Source: Report to Metro Vancouver's Utilities Committee July 11, 2012 by J. Carmichael, Division Manager, Utility Research & Innovation & email from G. Tokgoz, Project Engineer, Utility Research & Innovation

cooperative rules for coordinating requests for use of sewage for such projects. Four factors hinder increased use of waste sewer heat[28]:

- current low price of natural gas (systemic barrier: financial)
- lack of hard rules/requirements for developments to build DES compatible hydronic heating systems (systemic barrier: institutional)
- distance between large sources of waste heat and appropriate loads - there are few high-density developments right next to waste water treatment plants (systemic barrier: institutional)
- the pace of decision making in developer vs. municipal worlds can result in missed opportunities (systemic barrier: community).

6. Next Steps

Community Energy Association believes that market transformation is key to scaling renewable energy opportunities up (increasing output of existing systems) and out (increasing the number of systems in place). Transforming BC's energy market will help reduce other barriers to renewable energy by helping it to be as cost effective and easy to implement as traditional approaches. Figure 6 links the barriers discussed above to recommended next steps.

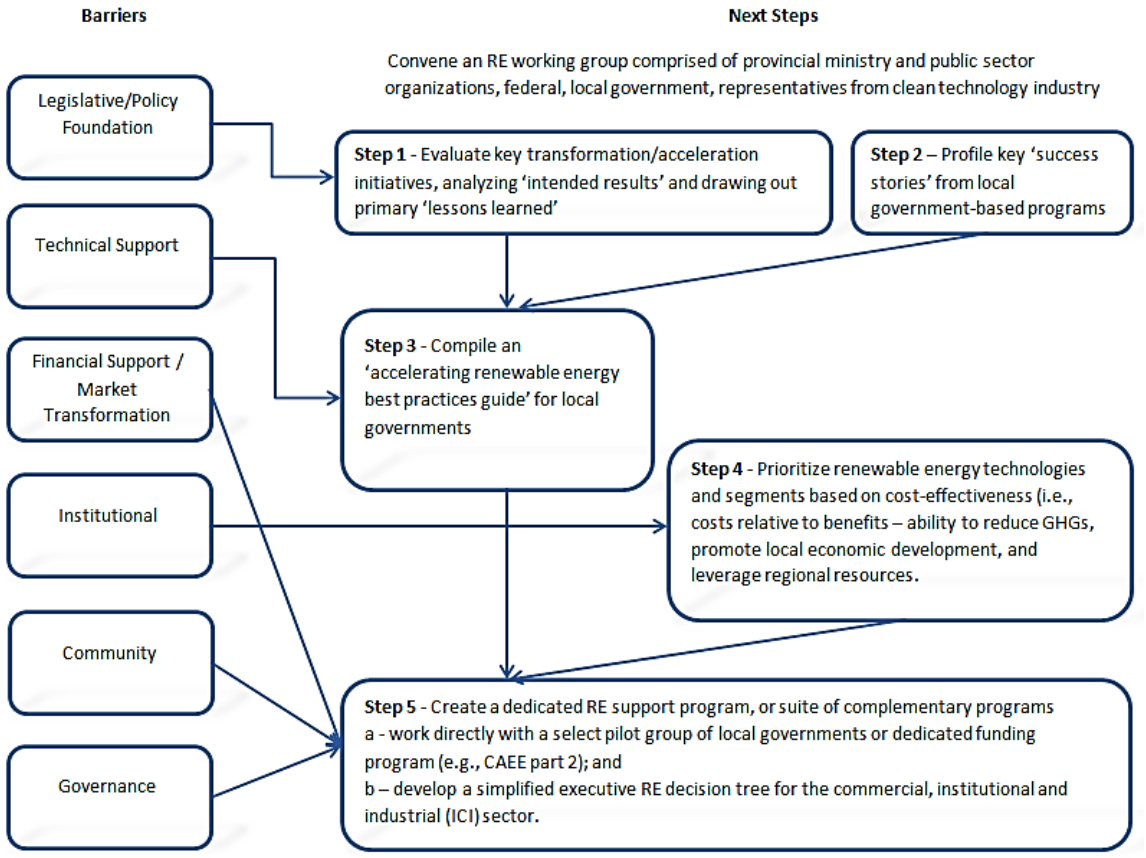

Figure 6: Overcoming Barriers: Recommended Next Steps

[28] Source: G. Tokgoz, Metro Vancouver, via email March 28

Over the last ten years, BC has effectively implemented a number of legislative and policy changes that have established a foundation for action, while at the same time providing funding support for sector specific programs, some of which has been ongoing and others that are no longer in place. This is a good time to evaluate which programs have been most successful and why.

Considering the 'state of play' with community based renewable energy across the province, the following are considerations to the Province and partners in their efforts to achieve much broader market transformation in order to foster a substantially greater share of renewable energy's contribution to meeting each BC community's GHG reduction targets.

To prioritize, ground truth and assist in operationalizing each of the following steps, Community Energy Association recommends convening a working group that, by using this report as a basis, can more fully assess progress made (by sector or renewable energy generally), identify ways to overcome barriers, and suggest the best approaches for moving forward. The working group would be comprised of the three provincial Ministries of Environment, Energy and Mines, and Community Services and Corporate Development, UBCM and local government representation (including BC Mayors' Climate Change Leadership Council), key public sector organizations, industry and Natural Resources Canada.

1

Evaluate market transformation/acceleration initiatives in BC, including:

- SolarBC
- Wood Waste 2 Rural Heat Initiative/Green Heat Initiative
- BC Bioenergy Network
- Plug-in BC
- Energy Diet Community-based Social Marketing
- Remote Communities Initiative (RCI)
- Fraser Basin Council biodiesel
- LED Street Lights across BC
- Community Energy & Emissions Inventory
- Community Action on Energy & Emissions

Outputs to address: Initial goals, dedicated monitoring towards intended results, outcomes, costs, challenges/barriers, successes and lessons learned.

2

Profile dedicated local government or regional district programs deemed to be successful in accelerating / promoting renewable energy. The portability of success (lessons learned) should not be underestimated.

3

Based on 1&2 above, compile an up-to-date and comprehensive best-practices guide for BC local governments on accelerating local renewable energy. Consider modularizing (i.e., packaging) the available documentation (e.g., research, case studies, business cases, and available supports) for each of the renewable energy sources for subsequent local government deliberations.

4

Prioritize renewable energy technologies and segments based on potential to achieve goals – including cost-effective reduction of GHG's, local economic development (and many other) co-benefits and leveraging of regional resource availability.

5 Based on the results of 3&4, consider either a comprehensive local renewable energy market transformation suite of discrete programs targeted to specific sectors and technologies specifically leveraging provincial and local support. Consider:

c. working directly with a small number of local governments (e.g., two rural, one urban, one regional district) on one or more of the above modules to action the relevant best practices in support of their needs.

d. developing a simplified, executive-level decision-tree (as well as guidance and training) on renewable heat options based on building size/type, existing heating ventilation and air conditioning (HVAC) systems and climactic regions for the commercial, institutional and industrial (ICI) sector. The decision framework would not be based upon a detailed technical analysis (such as that delivered by RETScreen[29]) but would be a high level, user-friendly process that identifies viable renewable energy options quickly.

[29] More information about RETscreen can be found at: http://www.retscreen.net/ang/home.php

Appendix A: Renewable Energy-related Studies Completed by Pacific Institute for Climate Solutions

- *Industrial and Market Development of Bio char in British Columbia* (February 2014) by Geoff de Ruiter, Steve Helle and Michael Rutherford. (Updated Feb. 25, 2014)
- *Fire in the woods or fire in the boiler? A new tool to help rural communities determine if forest biomass from wildfire abatement can sustainably fuel a district heating system* (August 2013) by Juan Blanco, Dave Flanders, Dale Littlejohn, David Dubois and Peter Robinson.
- *The Regulation of District Energy Systems* (May 2012) by Peter Ostergaard, Fraser Basin Council
- *Scaling-up Renewable Electricity in BC: Tackling the Institutional and Political Challenges* (Mar. 2012) by Mark Jaccard, John Nyober and Noel Melton, Simon Fraser University
- *Lessons from British Columbia's "Carbon Neutral Government" Mandate* (Mar. 2011) by Kim Lau and Hadi Dowlatabadi, University of British Columbia
- *Local Content Requirements in British Columbia's Wind Power Industry* (Dec. 2010) by May Hao, Matt Mackenzie, Alex Pomerant and Kate Strachran, University of Victoria
- *Electrifying the BC Vehicle Fleet* (Nov. 2009) by Liam Kelly, Trevor Williams, Brett Kerrigan and Curran Crawford, University of Victoria
- *Infrastructure and Communities: The Path to Sustainable Communities* (Nov. 2008) by John Robinson, Tom Berkhout, Sarah Burch, Emily Jane Davis, Nichole Dusyk and Alison Shaw, University of British Columbia
- *A Cap and Trade System for Reducing Greenhouse Gas Emissions in BC* (Nov. 2008) by Nancy Olewiler, Simon Fraser University
- *Alternative Energy Technologies for BC* (Nov. 2008) by R.L. Evans, University of British Columbia
- *An Integrated Approach to Transportation Policy in BC* (Nov. 2008) by Brian Gouge, Francis Ries, Conor Reynolds, Eric Mazzi, Clark Lim and Hadi Dowlatabadi, University of British Columbia
- *Buildings and Climate Solutions* (Nov. 2008) by Robert Woodbury, Lyn Bartram and Davis Marques, Simon Fraser University; Ray Cole and Dana Vanier, University of British Columbia; Rosamund Hyde, STANTEC; Douglas McLeod, OSTEC and Thomas Mueller, Canada Green Building Council

Appendix B: Projects Completed Under the Community Action on Energy and Emissions Incentive Program

BC Community	Phase	Community Energy/GHG/Air Quality Planning	Corporate Energy Efficiency, Audits, E3 Fleets	Policy Review, incl. OCP Policies	Green Building Policies, Checklists, Regulations	Information/Education/Outreach	District Energy, Renewable Energy	Sustainability Planning and/or Checklist	Bylaw and Regulation Review and Development	DPAs, Design Guidelines and Local Improvement Areas	Incentives and Financial Tools	Building Labeling	Sustainable Transportation
Adams Lake Indian Band	6	●											
Coldwater Indian Band	5		●	●									
Ktunaxa First Nation	5	●	●				●						
Musgamagw Tsawataineuk Tribal Council	6	●	●		●	●							
Seabird Island Band	6	●			●	●							
West Moberly First Nation	6	●	●				●						
City of Abbotsford	3			●									
City of Burnaby	2			●	●								
City of Campbell River	3		●	●				●					
City of Colwood	5		●					●	●	●	●		
City of Dawson Creek	2, 4						●		●				
City of Fernie	5	●											
City of Fort St John	2			●					●	●			
City of Kamloops	3	●											
City of Kelowna	3	●			●								
City of Kimberley	6	●											
City of Merritt	2			●					●	●		●	
City of Nelson	5	●											
City of New Westminster	3		●										
City of North Vancouver	2, 4	●					●		●	●			
City of Prince George	5		●	●	●	●		●					●
City of Prince Rupert	5	●											
City of Port Moody	3, 4	●						●					
City of Quesnel	1		●										
City of Surrey	3	●				●							
City of Vancouver	2, 4			●					●		●		
City of Victoria	2			●	●								
Corporation of Delta	5								●	●			
District of 100 Mile House	5	●		●	●			●					
District of Central Saanich	2, 4	●		●				●	●			●	
District of Elkford	6	●	●	●			●						
District of Houston	2			●			●		●				
District of North Vancouver	4			●	●								
District of Saanich	2 4				●	●				●		●	
District of Squamish	3, 4	●											●
District of Ucluelet	5				●	●	●	●	●				
District of Vanderhoof	3	●						●					
Municipality of Bowen Island	2, 3	●	●		●					●			
Capital Regional District	3	●											
Regional District of Central Kootenay	3		●										
Fraser Valley Regional District	6	●											
Regional District of Nanaimo	3, 4	●			●			●			●		
Resort Municipality of Whistler	5					●							●
Town of Atlin	1		●										
Town of Gibsons	6						●						
Town of Ladysmith	5	●											
Town of Oliver	2						●			●			
Town of Smithers	2, 3	●		●		●		●					
Village of Burns Lake	5	●											
Village of Kaslo	2		●			●							
Village of Queen Charlotte	5			●		●					●		
Islands Trust Salt Spring Island	2, 4		●	●		●		●		●		●	

Timing of Phases:

Phase 1 - 2004/05
Phase 2 - 2006/07 (Pilot)
Phase 3 - 2006/07
Phase 4 - 2007/08 (Gold Program)
Phase 5 - 2007/08
Phase 6 - 2008/09

Appendix C: Communities that Adopted BC's Solar Hot Water Regulation*

- Village of Ashcroft
- City of Campbell River
- Cariboo Regional District
- City of Chilliwack
- City of Colwood
- Cowichan Valley Regional District
- City of Cranbrook
- City of Dawson Creek
- Corporation of Delta
- City of Duncan
- Township of Esquimalt
- City of Fernie
- City of Fort St. John
- Greater Vancouver Regional District
- District of Invermere
- Village of Kaslo
- City of Kelowna
- Township of Langley
- District of Maple Ridge
- District of Metchosin
- Village of Midway
- City of New Westminster
- Municipality of North Cowichan
- City of North Vancouver
- District of North Vancouver
- District of Peachland
- City of Pitt Meadows
- City of Port Coquitlam
- City of Port Moody
- City of Richmond
- District of Sparwood
- Squamish Lillooet Regional District
- District of Tofino
- Town of View Royal
- District of West Vancouver
- Resort Municipality of Whistler

*Note – The present regulation recognizes 36 communities but as of 2014, 48 local governments have actually adopted BC's solar hot water regulation.

Appendix D: Sample of BC Integrated Community Energy Systems Projects

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source
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

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source
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	O	1	-	PV

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source
	Energy System				
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

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source
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 hydroelectricity.	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-	O	DE	-	CH4

Location	Project	D, C, O - Development, Construction, Operating	DE/E/1/CHP (District, Elect, 1 bldg , heat&elec)	Ownership	Energy Source
	East Vancouver, "River District")				
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