Community Commitments to Renewable Energy in BC

Submitted to the Province of BC

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Community Energy Association

BRITISH COLUMBIA

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Purpose of Report

The purpose of this report is to provide a snapshot of local government commitments to renewable energy projects in BC as of early 2015.

Specifically, for the Province, this report will:

- Provide both a reasonable base of renewable energy and district energy (RE/DE) initiatives undertaken across the Province over the past five years - Gas Tax, GMF, Canada Builds, and Climate Action Revenue Inventive Program (CARIP) Report listings (evidenced implementation) - as well as a 'heads up' on what to expect from local governments around the Province.
- Enable the Province time to 'tool up' in proactive support of anticipated local government efforts. With observations and recommendations from the successful proponents report, the Province can:
    - Consider innovative policies (e.g., model bylaws) to fill support gaps or eliminate barriers;
    - Better understand the relative importance of present funding vehicles (GMF, Gas Tax, Canada Builds) or consider new dedicated program funding; and
    - Further explore the potential for government's Climate Investment Branch (CIB) to provide carbon finance through offset purchases.
- Provide other agencies (e.g., federal government, academia) with insights into future local government needs for policy, technology or funding support.

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Executive Summary

Local governments across BC are actively interested in community renewable energy as evidenced by the grants, actions reported through the climate action revenue incentive program (CARIP), and by renewable energy appearing in **100% of the community energy and emissions plans (CEEPs) in BC.**

Three areas of analysis:

- **Planned Actions** as represented through Community Energy and Emissions Plans (CEEPs)
- **Reported Actions** as represented through Climate Action and Revenue Incentive Program (CARIP)
- **Funded Actions** as represented through a collection of local government-directed grants

Key Findings

1 There is **strong momentum** in communities of all sizes across all of BC on Community Renewable Energy. Over 50% of BC communities have plans to pursue renewable energy and 1/3 already have reported or funded renewable energy actions.

2 There is a **gap between plans and implementation** in all regions. Further, there is no correlation between having renewable energy in a plan and reporting renewable energy in CARIP or receiving funding. Only 16 communities have renewable energy in all 3 analysis areas (planned, reported, funded).

3 Over **$170 million** was invested across 91 projects with $86 million through a selection of grant programs from 2007 to 2014. On average, **grants comprised 64% of project costs**. This does NOT include the substantial investments in renewable energy not supported by these particular grants.

4 The **technologies with most momentum** include

District Heating

Building-scale Heating

- Local Biomass
- Geo-Exchange
- Waste Heat Recovery
- Solar Hot Water

Electricity

- Solar Photovoltaics

5 There are r**egional differences**. The South Coast, representing two thirds of the population, is the most active in district heating and solar hot water. The North has large value projects per capita and potential for rapid growth with continued liquefied natural gas and mining projects. The Okanagan region has the least number of communities receiving funding for renewable energy actions but received the most amount of funding overall.

6 **Offset investments may be possible by aggregating district heating and solar hot water** for the displacement of natural gas.

7 **BC communities have renewable energy resources and interest. Investment can be increased and GHG's reduced by reviewing the experience of other provinces and adopting best practices**.

8 Canada-wide, over **200 policies, programs and incentives to accelerate community renewable energy** have been implemented by Canadian provinces and territories.

The map below shows the percentage of communities in regions across BC with at least 1 planned, reported, or funded action as well as total regional population below the region name.

The tables below provide a summary of total actions and grants.

Figure 1 : Percent of Communities with Renewable Energy in Provincial Region by Area of Analysis

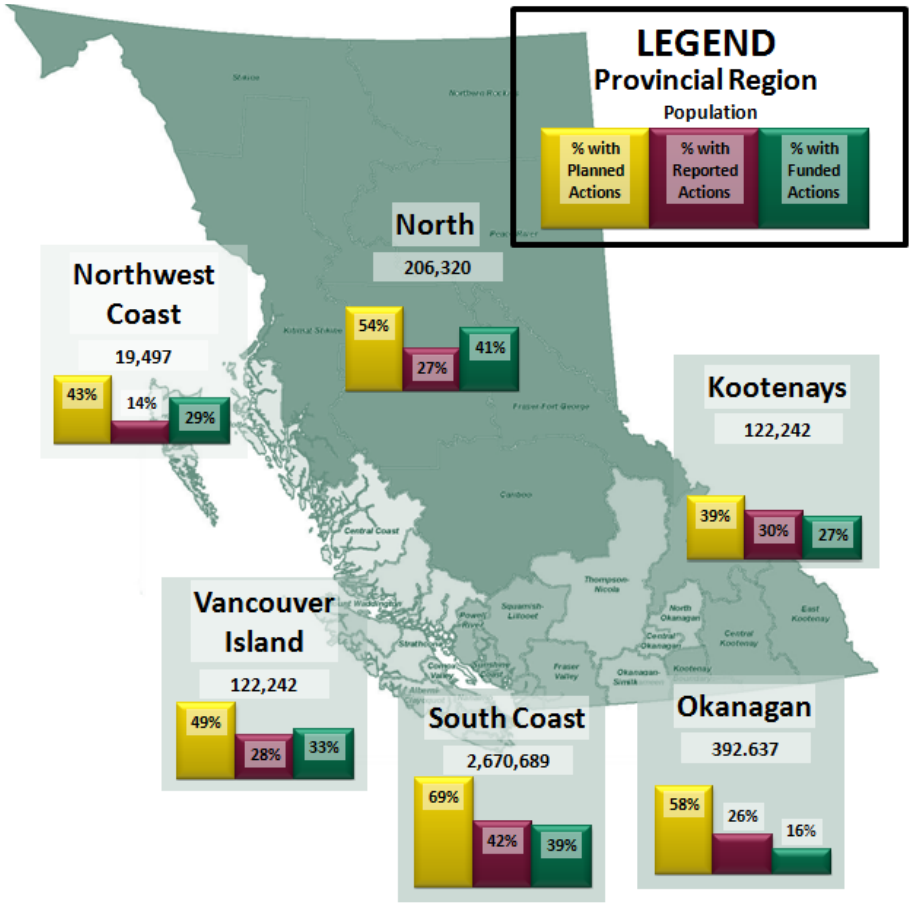


Table 1 : Summary of Renewable Energy Action Findings

	Planned	Reported	Funded
Total Number of Local Governments with Actions	101	56	61
Percentage of All Local Governments with Actions (188)	54%	30%	32%
Total Actions from All Communities	-	283	97

Table 2 : Summary of Funding for Renewable Energy Actions

Total Costs of All Projects	$168,834,341
Total Grants for All Projects	$86,520,755
Average Grant as % of Total	64%
Average Total Project Cost	$1,264,265

Introduction

Research Approach

Approach

The research analyzed data from:

- Commitments to study or implement local renewable energy systems were reviewed in approximately 100 community energy and emissions plans (CEEPs) for BC local governments (municipalities and regional districts) ranging from 1996 to 2014.
- Renewable energy actions reported through the Climate Action Revenue Incentive Program (CARIP) for 2010, 2011, 2012, 2013.
- Renewable energy funding from several provincial and federal grant programs including Green Municipal Fund, Building Canada Fund, Infrastructure Planning Grant, Gas Tax Fund, and Towns for Tomorrow grant program awarded from 2006 to 2014.
- Community Energy and Emissions Inventory information for commercial and residential buildings to provide a gross estimate of renewable energy carbon emissions reduction potential.
- BC Stats population information from 2010.

Data was analyzed to identify trends and correlations in activities by region, renewable energy sector, community size, and various other categories. Funding levels were analyzed by region and renewable energy type.

Some CEEPs were created under community leaders that are no longer involved with the community and could represent planned actions that are no longer relevant. Funding was granted before reporting projects through CARIP so there is a possibility that funded actions will not appear as reported.

This analysis was then synthesized and summarized in this document.

Related Research

Over the past two years, modest exercises have been undertaken to begin to better understand the role that renewables and district energy should play in British Columbia in order for local governments to achieve their stated short or longer-term GHG emissions reduction targets (e.g., '*Transformational Change: Local Government Pathways to 2050*' - SSG; *'Getting to Implementation' – CEA+QUEST Canada-wide, in progress*) as well as develop a sense of the extent to which renewable energy is already playing a role in communities across the province (e.g., *'Community-based Renewable Energy in BC: A Snapshot' - CEA; 'Meeting the Climate Change Challenge (MC3)' - PICS; 'Illustrated Guide to Community Energy' and 'Community Energy Explorer' web resource - UBC CALP and Metro Vancouver*).

Renewable and district energy-related activities are being showcased through a variety of communication vehicles in BC and across Canada – including Climate Action Toolkit 'Success Stories'; Federation of Canadian Municipalities or other (e.g., QUEST) 'Case Studies' and, increasingly through the Climate Action Revenue Incentive Programs (CARIP) annual report submissions by BC local governments (under 'Energy Generation').

Documents that are highly recommended to read in conjunction with this report include:

- Community Renewable Energy Snapshot (2013)
- Investment Guide for Clean Energy Projects and Utilities
- BC ICES Progress Report (2013)
- Community Energy Planning – Getting to Implementation in Canada project (2014-2015)

Background and Context

In 2008, the Province of BC revised the *Local Government Act* requiring that community-wide greenhouse gas emission reduction targets, policies and actions be identified by all BC local governments. The BC Climate Action Charter was initiated in 2008 as a tool for BC local governments to voluntarily sign onto commitments in pursuit of greenhouse gas mitigation efforts. As of 2014, 181 of the 190 local governments have voluntarily signed onto the Charter. Of the 190 BC local governments, over 108 have Community Energy and Emissions Plans (CEEPs) in place.

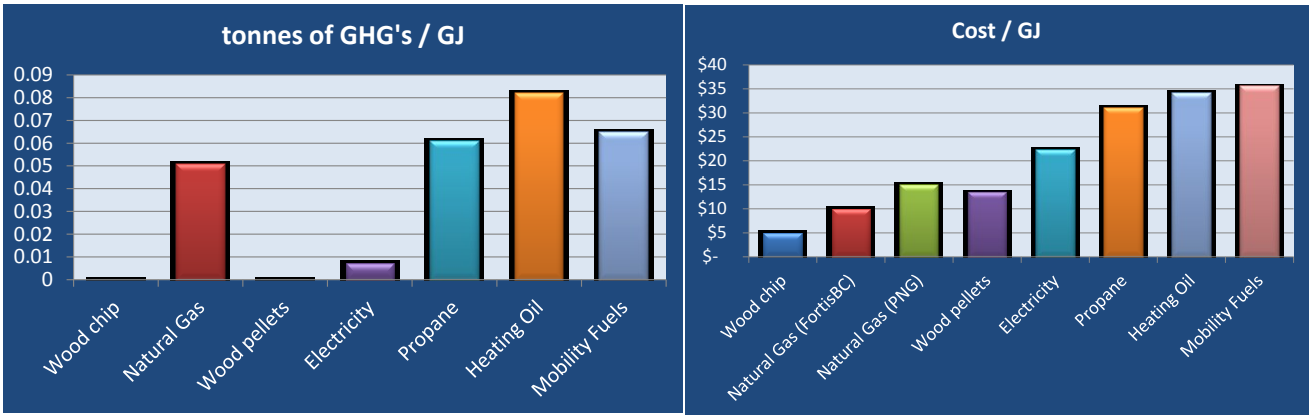
Although independent of, though certainly within communities across BC, public sector organizations are beginning to pursue renewable and district energy initiatives as part of the Carbon Neutral Government program (with funding through the Province's Carbon Neutral Capital Program, CNCP, available to three agencies – education, advanced education, health authorities). Overtime, it is anticipated that public sector organizations (PSOs) and their 'host' municipalities will increasingly look for joint partnerships in renewable and district energy initiatives.

Part of the Province's Climate Action Secretariat, the Climate Investment Branch (CIB) invests in emissions reductions projects that support government objectives on behalf of British Columbians, accelerate commercialization of technology in B.C. and demonstrate leadership in supporting the growth of B.C.'s green technology sector. CIB procurements target the purchase of more lower-cost offsets annually to make the most efficient use of resources, as well as projects in key sectors such as clean community infrastructure, new industrial projects and clean technology.

Energy Overview

Forms of energy are not created equally, particularly with respect to price and carbon in BC. The charts below provide a comparative overview of the most common fuel types used in BC in both buildings and transportation.

Figure 2 : Emissions and Cost per Unit of Energy



Provincial Actions Overview

The following table lists some of the significant policies and actions that the Province of BC has taken to address climate change, which are also highly relevant for community renewable energy.

Table 3 : Policies and Actions to Address Climate Change in BC

Before 2008	2008	2009-2013

• 1995 Provincial Ministries (Env, Comm, Energy) and UBCM formed Energy Aware Committee (now Community Energy Association)
• SolarBC established in partnership with federal government
• 2005 BC Bioenergy Strategy
• 2006 Community Energy and Emissions Inventory (CEEI) Program
• 2007 Public Sector Energy Conservation Agreements (PSECA)
• 2007 Climate Action Secretariat established
• 2007 Energy Plan
	• **Communities**
	  • 2008 Local Government (Green Communities) Statutes Amendment Act (Bill 27)
	  • 2008 Local Government Climate Action Charter
	  • 2008 Climate Action Revenue Incentive program
	  • 2008 Remote Communities Implementation Program
	• **Funding**
	  • 2008 $25 million Innovative Clean Energy (ICE) Fund
	  • 2008 $25 million Bioenergy Network
	  • 2008 $94.5 million endowment to create the Pacific Institute for Climate Solutions
	• **GHG Reduction**
	  • 2008 BC Climate Action Plan
	  • 2008 Carbon tax
	  • 2008 Greenhouse Gas Reductions Targets Act & Carbon Neutral Provincial Operations
	  • 2008 Greenhouse Gas Reduction (Cap and Trade) Act
	  • 2008 Greenhouse Gas Reduction (renewable fand low carbon fuel requirements) act
	  • 2008 Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act
	• **Miscellaneous**
	  • 2008 BC Energy Efficient Buildings Strategy: More Action, Less Energy
	  • 2008 BC Green Building Code
	  • 2008 Pacific Carbon Trust and partnerships with other jurisdictions
	  • 2008 Utilities Commission Amendment Act
		• 2009 LiveSmart BC: Energy Efficiency Incentive Program
		• 2010 Clean Energy Act
		• 2011 Signed agreements on limiting carbon emissions from government operations and promoting awareness of the impacts of sea level rise on coastal areas
		• 2011 Clean Energy Vehicle Program
		• 2011 Clean Energy Act Amendments for Pay-as-You-Save retrofit financing
		• 2011 Solar Hot Water Ready Regulation
		• 2012 Green Energy as a Rural Economic Development Tool Project
		• 2012 Greenhouse Gas Reduction (Clean Energy) Regulation
		• 2012 Clean Energy Vehicle Program
		• Ongoing: ICES and climate relevant initiatives like District Energy Systems and Integrated Resource Recovery are rewarded in infrastructure and related grants (Infrastructure Planning Grants)

Clean Tech Potential

According to Ottawa-based consultants Analytica Advisors, clean technology, or clean-tech, is the country's fastest-growing industry. The firm's "2014 Canadian Clean Technology Report", found direct employment by clean-tech companies rose six per cent from 2011 to 2012, from 38,800 people to 41,000, with revenues increasing nine per cent to $11.3-billion.

At the current growth rate, Analytica estimates Canada's clean-tech industry will be worth $28 billion by 2022. But with the global market expected to triple to $2.5 trillion over the next six years, Canada hasn't come close to reaching its potential. It's our choice to seize the opportunity. With just two per cent of the global market (matching our share of population), we could have a $50 billion clean-tech industry by 2020 — double the size of today's aerospace industry….but only if there's a local market to kick-start the sector. CEEP implementation provides this market.

According to Clean Energy Canada, *Tracking the Energy Revolution* paints a vivid picture of the efforts underway to that end:

- 144 countries now have renewable-energy targets
- Last year, investors directed $207 billion into clean energy projects worldwide

- 60 percent of Fortune 100 firms have goals for boosting renewable energy use
- Last year was the first time China invested more money in new clean-energy capacity than it did in new coal plants.
- Worldwide, 6.5 million people now work in the renewable energy industry.

Local Government Actions Overview

Highlights of renewable energy technology deployments identified in publicly available documentation reviewed across[1] BC are summarized in the following table.

Table 4 : Renewable Energy Technlogy Deployments

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

Local Renewable Energy Definition

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.

[1] *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.

This definition includes the types of projects outlined in the following table:

Table 5 : Renewable Energy Actions

Renewable heat	Renewable electricity	Emerging renewable energy	Renewable/ fuels for local sustainable transportation[2]
• waste heat recovery • passive solar, solar walls, solar hot water • local biomass • geo-exchange heating • air source heat pumps[3]	• building-scale net-metering • micro-hydro[4] • wind • solar photovoltaic • tidal	• bio-gas • bio-char	• bio-diesel • ethanol • biomethane

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

Provincial Region Definition

To show variance across the province, the province was divided into six provincial regions.

Table 6 : Provincial Regions

North	Kootenays	Okanagan	South Coast	Northwest Coast	Vancouver Island
Kitimat-Stikine	Central Kootenay	Central Okanagan	Fraser Valley	Central Coast	Alberni-Clayoquot
Northern Rockies	Columbia-Shuswap	North Okanagan	Metro Vancouver	Skeena-Queen Charlotte	Capital
Peace River	East Kootenay	Okanagan-Similkameen	Squamish-Lillooet		Comox Valley
Bulkley-Nechako	Kootenay Boundary	Thompson-Nicola	Powell River		Cowichan Valley
Cariboo					Nanaimo
Fraser-Fort George					Mount Waddington
					Strathcona

[2] Initiatives are included in this report if implemented as part of an overall local sustainable transportation strategy.

[3] 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.

[4] For this report, this includes only those that are below the threshold for BC Hydro's Standing Offer Program.

Renewable Energy Findings

There are 16 communities, which represent 16% of communities with planned actions or 9% of communities in all of BC, that have renewable energy actions identified in all three areas of analysis – planning, reporting, funding. These communities ranged in population from 486 in Alert Bay to 642,843 in Metro Vancouver and included two Regional Districts.

Figure 3 : Communities with Actions in All Three Areas of Analysis

Provincial Region	Regional District	Community
North	Bulkley-Nechako	Burns Lake - Village
	Peace River	Dawson Creek - City
	Peace River	Fort St. John - City
	Sunshine Coast	Gibsons - Town
	Sunshine Coast	Sunshine Coast - Regional District
Northwest Coast	Skeena-Queen Charlotte	Queen Charlotte - Village
Okanagan	Okanagan-Similkameen	Penticton - City
	Okanagan-Similkameen	Summerland - District
South Coast	Fraser Valley	Chilliwack - City
	Fraser Valley	Mission - District
	Metro Vancouver	Metro Vancouver - Regional District
	Metro Vancouver	North Vancouver - City
	Metro Vancouver	Surrey - City
	Metro Vancouver	Vancouver - City
Vancouver Island	Mount Waddington	Alert Bay - Village
	Strathcona	Campbell River - City

Renewable Energy Sectors

Actions were collected by technology, analysis area (planned, reported, funded) and by both number of actions and number of local governments reporting at least one action. The difference in the numbers means that one community could be doing more than one action under that category, for instance installing waste heat recovery in multiple buildings would be reported as multiple actions.

The most popular renewable energies:

- Building-scale heating
  - Local Biomass
  - Geo-exchange
  - Waste heat recover
- District Heating
- Electricity
  - Solar PV

The table below provides a summary of this actions inventory:

Table 7 : Summary of Action Inventory

No. of Local Governments*					Total Actions	
Planned	Reported	Funded			Reported	Funded
33	19	23	Renewable Heat	waste heat recovery	29	23
15	0	2		passive solar, solar walls	0	2
72	43	15		solar hot water	94	11
37	17	2		local biomass/wood pellets/waste wood	24	2
46	15	12		geo-exchange heating	21	10
8	3	4		air source heat pumps	3	3
76	21	17		district heating	41	20
8	0	0		other	0	0
2	1	0	Renewable electricity	building-scale net-metering	1	0
18	9	4		micro-hydro	10	4
24	8	2		wind	8	1
20	14	5		solar photovoltaic	21	4
4	1	2		tidal	1	2
11	5	2		bio-mass (co-gen)	6	3
9	10	0		other	15	1
3	4	1	Emerging renewable energy	bio-gas	5	1
1	0	0		bio-char	0	0
0	0	0	Renewable/ fuels for local sustainable transportation	bio-diesel	0	0
0	0	0		ethanol	0	0
5	0	4		bio-methane	0	4
9	2	0		EV infrastructure	2	0
2	2	0		other	2	0
101	56	61	Total Local Governments with Actions	Total Actions of All Local Governments	283	97
54%	30%	32%	Percentage of All Local Governments (188)			

*Number of local governments with at least one action

The most popular renewable energy actions are solar hot water and district heating with each being referenced in approximately 80% of all communities with planned actions which represents approximately 40% of all BC local governments. The other renewable energy actions with identified as having the most momentum are usually consistent across planning, reporting, and funding. Local communities were least likely to receive funding for local biomass projects though it had a larger number of planned and reported actions. There are significantly more communities with planned actions than has been reported or funded. The higher number of communities with funded than

reported actions could be attributed to the 2006 to 2009 time period where grants were awarded but CARIP was not in place to report the action.

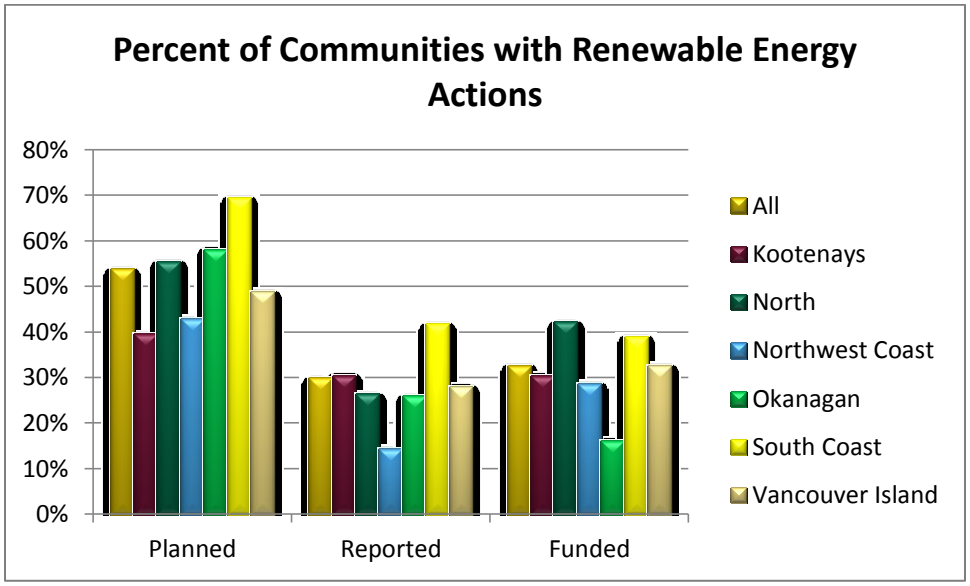
Commitments & Actions across BC

Communities in all regions of BC are including renewable energy in their plans and all regions are represented in renewable energy reporting and funding. The South Coast has the strongest showing in both planning and reporting, possibly due to the larger communities having greater resources.

Potential areas for attention:

- The North West Coast shows only 14% of communities reporting renewable energy. This could be an opportunity for a focus on getting from plans to implementation as the region experiences rapid growth.
- The Okanagan is showing a small percentage of communities receiving funding for renewable energy. There may be an opportunity for focused outreach to Okanagan local governments regarding relevant grant programs.

Figure 4 : Percent of Communities within Provincial Regions with Renewable Energy Actions by Area of Analysis



The South Coast, representing two-thirds of the population of BC is the most active in the most common actions – district heating and solar hot water. Given that these are both heating technologies potentially displacing natural gas, there may be an opportunity to investigate regional aggregation of district heating and solar hot water projects for the purposes of offset investment.

At the other end of the population spectrum, the Northwest Coast has less than 1% of BC's population but is poised to grow rapidly with new LNG and mining plays. This rapid growth may present an opportunity to increase the penetration of district heating and solar hot water in this strategic region.

Table 8 : Percentage of Communities with Renewable Energy Action from Provincial District

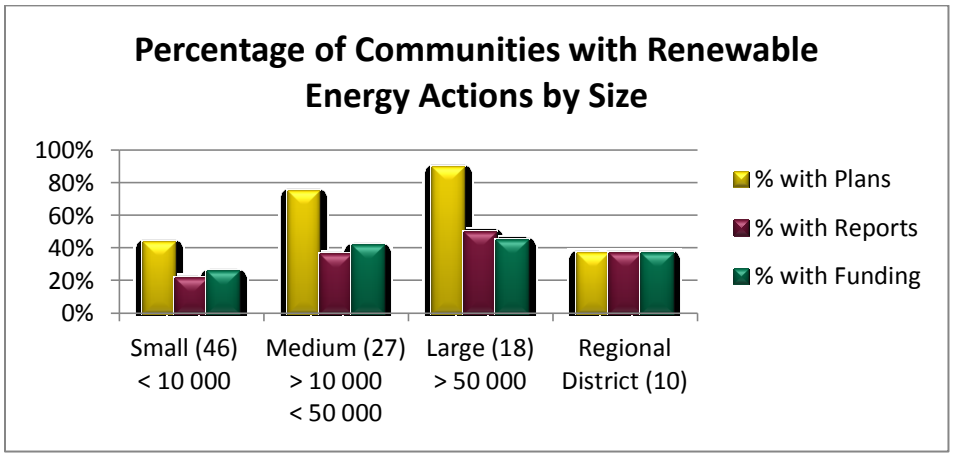
Provincial District	District Heating			Solar Hot Water			Population
	Planned	Reported	Funded	Planned	Reported	Funded	
Kootenays	14%	10%	18%	18%	16%	21%	3.1%
North	20%	14%	18%	18%	14%	21%	5.1%
Northwest Coast	3%	0%	0%	0%	2%	7%	0.4%
Okanagan	17%	14%	12%	16%	16%	0%	9.8%
South Coast	28%	48%	29%	22%	28%	29%	66.5%
Vancouver Island	18%	14%	24%	25%	23%	21%	15.1%

Community Sizes – Commitments & Actions

Communities of all sizes are planning for renewable energy. Larger communities are more likely to have renewable energy actions planned, reported, and funded than smaller communities with almost all large communities and nearly half of the small communities including renewable energy in their CEEPs. There is an opportunity to assist small communities in all areas of analysis. Size of community does not correlate to any greater rate of reported or funded action compared to planned actions. Ten percent of regional districts have an action reported in one of the areas of analysis, but it is not the same regional districts for each area.

A further analysis with the size of communities broken down into provincial district can be found in the Appendix.

Figure 5 : Percentage of Communities with Renewable Energy Actions by Size



Reviewing the communities by size and their interest in the six renewable energy actions with the most momentum as identified earlier, local biomass has the most interest from small communities. Medium and large communities have the most interest in solar hot water and district heating. Regional Districts have the most plans for waste heat recovery, solar photovoltaics, and geo-exchange heating. There is an opportunity to specify assistance based on size of community, with regional districts assisting in organizing economies of scale for small communities in technologies that do not need large areas for implementation such as solar hot water and local biomass. Large communities have the greatest spread of actions, with at least half of communities planning four of six of the discussed actions. Small and medium sized communities only have two actions with more than 50% of the communities showing planned implementation.

Table 9 : Percent of Communites with Actions in Each Area of Analysis by Size

	Small			Medium			Large			Regional District		
	Planned	Reported	Funded	Planned	Reported	Funded	Planned	Reported	Funded	Planned	Reported	Funded
waste heat recovery	20%	17%	37%	33%	38%	33%	50%	50%	11%	60%	50%	60%
solar hot water	70%	74%	26%	78%	69%	13%	78%	90%	22%	50%	80%	30%
local biomass/wood pellets/waste wood	46%	39%	7%	30%	23%	0%	22%	20%	0%	40%	30%	0%
geo-exchange heating	30%	17%	19%	48%	38%	20%	72%	40%	22%	60%	20%	10%
district heating	72%	22%	22%	78%	62%	33%	94%	70%	67%	50%	10%	0%
solar photovoltaic	13%	30%	11%	26%	31%	7%	22%	0%	0%	30%	30%	0%

Table 9 shows the percentage of communities that have actions within that area of analysis. For example, of all the small communities that planned actions through CEEPs, 20% had waste heat recovery as a renewable energy action.

Small communities have the greatest inconsistency with the actions they have planned, reported and received funding for. Though they have a significant interest in planning district heating systems, they have not reported many installations. Solar hot water was another action that was regularly planned and also reported, though it also did not receive as much funding. Waste hot water projects received funding most often even though it is one of the least planned and reported action type. Local biomass was a strongly planned and reported action but received the least amount of funding. This shows a large opportunity for district heating in small communities, where there is significant interest but not a lot of completed projects.

Medium sized communities were more consistent with district heating and solar hot water being the most planned and reported actions. Again, despite waste heat recovery being one of the least planned and reported action of the top six, it along with district heating were most frequently granted funding. Local biomass and photovoltaics had very few funded projects though they had a fairly high number of planned and reported actions.

Large communities have the most momentum in district heating with it being strong in all three areas of analysis. There was less solar hot water projects funded, though they were frequency planned and reported. Waste heat recovery, unlike the other community sizes, did not have many grants allocated to large communities.

Regional Districts are the only ones who had a high interest in waste heat recovery with good follow through on reporting and funding received after planning for it. Solar hot water has the most number of reported projects, and similar to the other communities sizes, did not receive as many grants for projects.

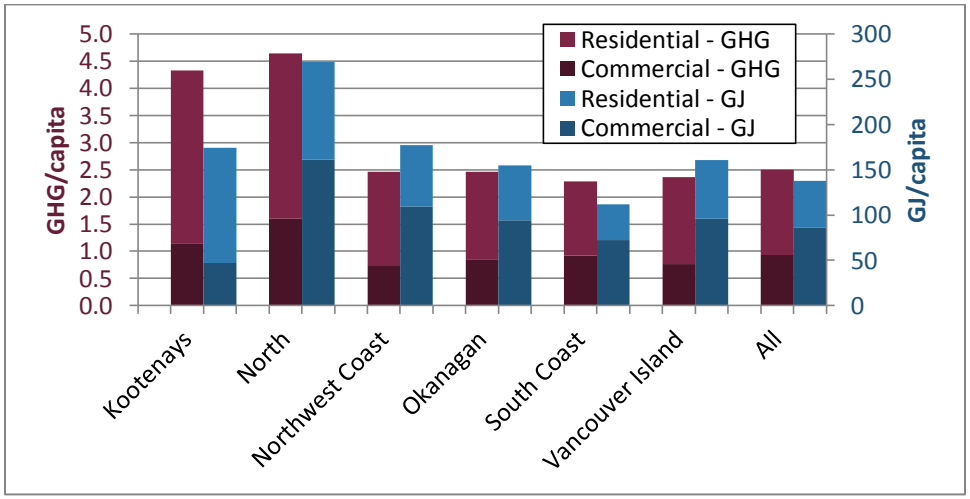
Some important points:

- Waste heat recovery projects are frequently receiving funding but not planned or reported, especially for small and medium sized communities. More education of these type of projects, and the funding that they have been receiving, could increase the number of plans or reports for this action.
- Solar hot water and district heating are consistently the most popular planned actions across all community sizes. Though they are more reported in medium and large communities, small communities could use assistance in development, with regional district oversight to promote both having more reported actions. There are more grants for district heating projects than solar hot water possibly meaning that solar hot water has better economics and can move forward more often without grant support, or grants are not as inclusive of that action.
- Though local bio-mass is in the top six due to planned interest, and there are a similar number of reported actions, it rarely receives funding. Similar to solar hot water this can mean good economics or lack of grants available.

GHG Savings Potential

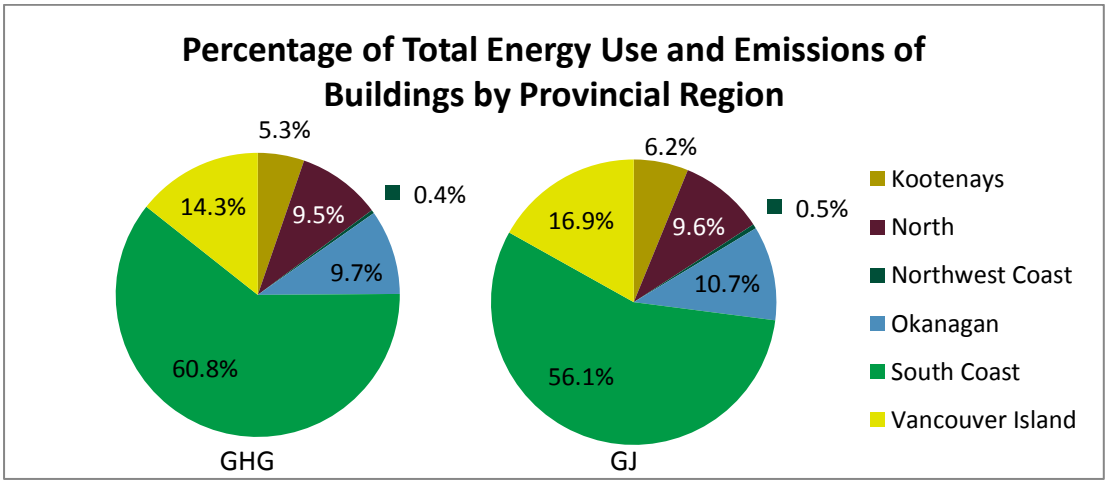
On a per capita basis, the North and Kootenays have significantly greater GHG emissions than the rest of the province, though the latter does have a more efficient energy usage. The South Coast and the Okanagan have the best emissions and energy use rate due their population size. The residential building emissions are greater than the commercial buildings but they have less energy use per capita.

Figure 6 : Cumulative Emissions and Energy Use of Buildings per Capita by Provincial Region



Though the South Coast has the best intensities, it also accounts for most of the emissions and energy use of the province, whereas the North accounts for very little. The high density nature of the South Coast means installations of any renewable energy on a district level will have a greater impact.

Figure 7 : Percentage of Total Emissions and Energy Use Emissions of Buildings by Provincial Region



The South Coast has 36 reported district heating actions from 22 communities. The size of the project can determine the energy produced with each project, but using BC Hydro's Resource Options Report (2013), taking the potential biomass options (biogas, municipal solid waste, and wood waste) as that is the usual district heating fuel source, there is a potential for 329 GWh/yr/project. If every community in South Coast that reported a district heating action installed one system, it could account for 2.7 times the current energy usage for the provincial region.

The implementation of the Carbon Tax in BC has been a motivator for communities to invest in clean energy projects. [5] As energy prices go up the population will be encouraging governments to reduce their carbon footprint. Installation of heating projects such as solar hot water and district heating would be able to benefit from this push for lower emission options.

Funding and Investment

Overview

60 communities have received funding for renewable energy projects. The projects ranged in price from $5000 to nearly $39 million. Grants were offered in the range of $5000 to $11 million between 2006 and 2014, or the equivalent of $19 per BC resident. The average amount of funding received for a project is 64%. The grants reviewed are only a representation of funding that has been provided and is not an exhaustive list. Specifically the SolarBC incentives are not included in this report.

Sectors

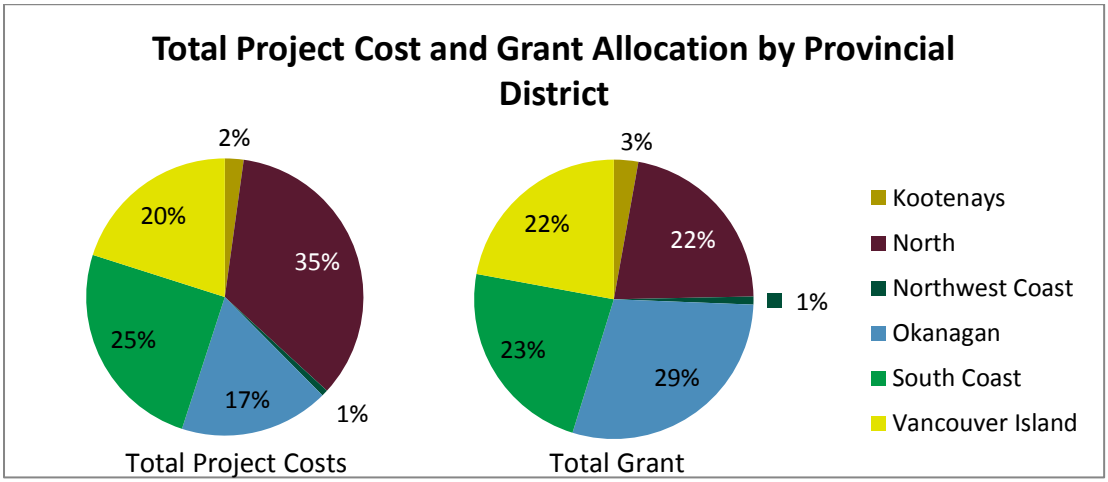
The North, South Coast, and Vancouver Island regions have the most amounts of projects that received funding. Okanagan, identified earlier as having the least amount of communities that have received funding for actions, has received the most amount of funding overall, meaning they have received funding for a small amount of projects but with greater worthwhile also receiving a greater percent of grant funding compared to total gross project cost. The Kootenays consistently received the least amount of funding, though this is mostly due to only smaller projects applying for the various programs.

[5] http://www.corporateknights.com/channels/climate-and-carbon/b-c-carbon-tax/

The South Coast and Vancouver Island received larger grants for district heating than the other provincial regions.

There is no correlation between total project costs and the amount of funding granted.

Figure 8 : Total Project Cost and Grant Allocation by Provincial District



Renewable heat actions accounted for 77% of the funded projects. Waste heat recovery has the most of projects that received funding. Though there were a significant amount of district heating projects requesting funding, which would correlate to the interest identified earlier, they did not, on average, receive as much funding as a percentage of the total project cost as any other popular action and is the most expensive renewable energy action. Solar hot water has the best rate of receiving funding to cover project costs, as well as being one of the least expensive renewable energy action options on average. Other renewable energy actions that had multiple projects receive funding and large amounts of the costs covered are micro-hydro, photovoltaics, and bio-methane. Projects that received a less average grant amount is likely to be getting funding from other sources not analysed in this report including debt, or self-funding.

Table 10 : Funding and Total Costs for Renewable Energy Actions

		Projects	Total Costs of All Projects	Total Grants for all Projects	Average Grant as % of Total	Average Total Project Cost
Renewable heat	waste heat recovery	23	$36,757,814	$24,396,802	66%	$1,413,762
	solar hot water	11	$2,668,428	$2,238,453	84%	$177,895
	geo-exchange heating	10	$4,585,684	$2,340,137	51%	$382,140
	district heating	20	$60,940,555	$24,271,929	40%	$2,770,025
Renewable electricity	micro-hydro	4	$3,746,882	$3,441,882	92%	$936,721
	solar photovoltaic	4	$482,500	$458,500	95%	$96,500
Renewable/ fuels for local sustainable transportation	bio-methane	4	$2,088,952	$2,081,240	100%	$522,238
Total		91	$168,834,341	$86,520,755	64%	$1,264,265

Investment Potential

The actions receiving the most in grants are district heating and waste heat recovery. The Okanagan has received the most funding of all provincial regions, with the majority of that going to waste heat recovery. It has 12 communities with plans towards district heating and only two that have received grants towards that action. Using the average of all district heating projects, the ten remaining communities have a potential for $27.7 Million in project costs that could receive around 40% in grant allocation.

The North has received the least amount of funding for its projects. One of its largest projects is waste heat where it received a grant only worth 22% of the total project cost, much less than the 66% that was funded by grants for all waste heat projects.

Acceleration Opportunities

Offset Investment Potential

The table below provides initial analysis of the most popular community renewable energy technologies. Energy Efficiency in local government buildings may provide the greatest short-term opportunity with limited funding availability.

Table 11 : Analysis of Renewable Energy Technologies

Technology	Overall Appeal	Lead Time	Interest Level	Investment (low)	Investment (high)	# possible	GHG's	Energy potential
District Heating	Not many and often initially NG	3-7 years	Not suited for low density	0.5M	26M			
Solar Hot Water	Not sure of current momentum	1-3 years	SolarBC	0.3M	1M			
Biomass (Building)	Big opportunity in small communities & non-gas-grid	2-5 years	Municipal Waste	0.3M	0.5M			
Geo-exchange	Typically new-build, lots of small opportunities	1-2 years	Not as location specific	37k	4.5M			
Waste Heat Recovery	Fewer and some complexities (permanence,…)	2-5 years	Sporting Complexes	85k	11M			
Photovoltaics	Emerging opportunity, but does it advance objectives?	1-5 years	Easy installation	30k	3M			

Legend:

Good opportunity – short term returns	Average opportunity – Best medium term effects	Poor opportunity – Long term or least beneficial returns

The above table is based on readily available information in early 2015 and the experience of the author. It does not constitute a definitive study of all existing, planned, and potential projects. A myriad of factors will influence a specific project. This table provides an "order of magnitude" overview of the renewable energy space in BC.

There may be an opportunity to incent fuel-switching in communities not connected to the natural gas grid from heating oil and propane to pellet stoves and heat pumps.

Leveraging local governments to increase local renewable energy deployment

There may be an opportunity to incent local governments to enact policies to affect a GHG reduction in their community which could be claimed by CIB.

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. Recent examples of the use of planning tools to reduce GHG emissions include:

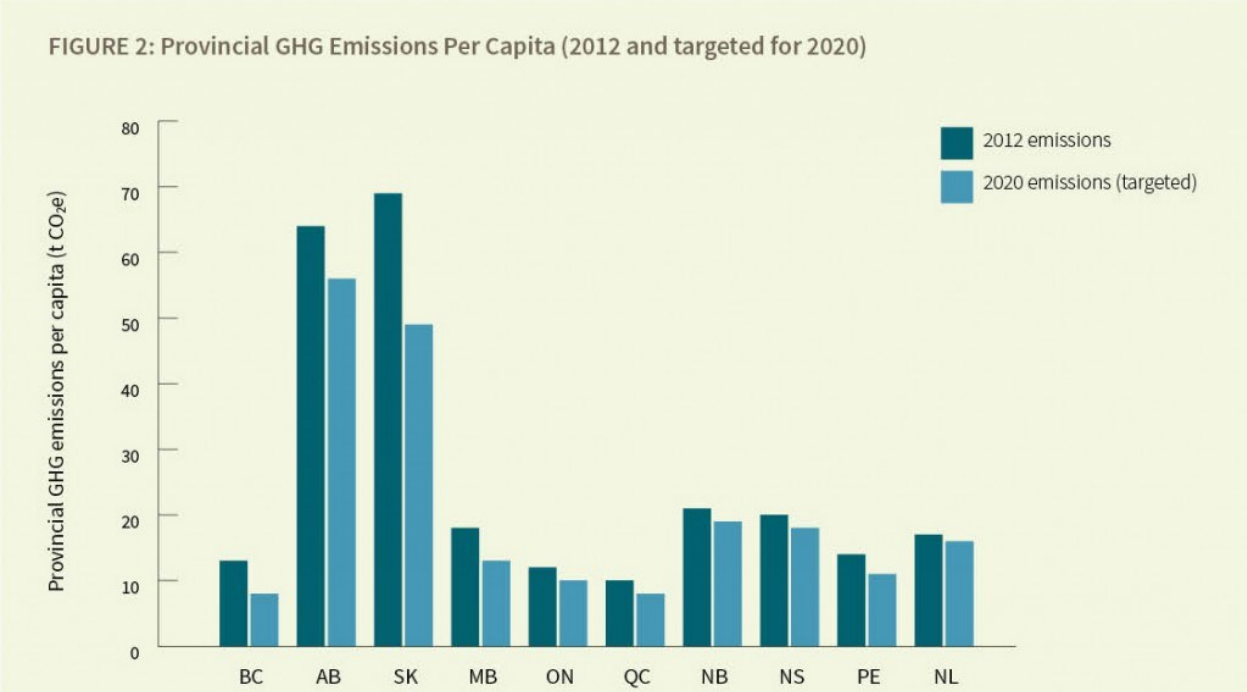
Table 12 : Local Government Planning Tools Supporting Renewable Energy

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.
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.

Provincial Perspective

All provinces across Canada have expressed emissions targets. The action used to achieve those targets vary across the country including Carbon Tax (BC), Feed in Tariffs (ON, NS), and Cap and Trade programs (QC). Other programs such as the reduction of emitting sources (ON) are more specific ways to reduce the GHG emissions of a community. The method of comparing GHG emissions between provinces can vary. Figure 9 shows the difference between provinces with respect to capita. Because Alberta and Saskatchewan are high emitting provinces with relatively low populations, their rates are significantly higher than other provinces. Showing the emissions by GDP or by absolute value will show greater values particularly in Ontario, but also in British Columbia and Quebec, which all have greater populations but less valuable industries, and less in Saskatchewan, as its absolute level of GHG emissions is low.

Figure 9 : Provincial GHG Emissions per Capita

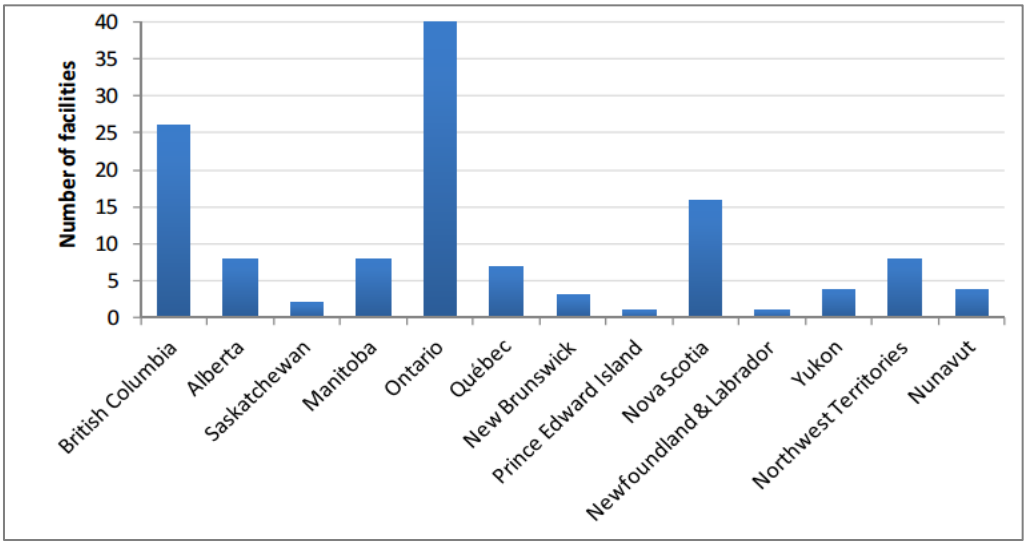


Provinces and territories across Canada are experimenting with ways to accelerate the development of community energy plans and their implementation, particularly with respect to renewable energy. In fact, approximately **500 policies, programs, and actions** were identified at the provincial / territorial level across Canada providing a rich seam to mine for those interested in further accelerating renewable energy.

Figure 10 : Provincial Review of Renewable Energy Acceleration Plans

The approach and results of some of these programs are explored in the following pages.

Figure 11 : Number of District Energy Facilities by Province and Territory



Source: (Canadian Industrial End-Use Data and Analysis Centre, 2015)

Ontario | Environmental Protection Act (Ontario Regulation 496/07)

In August 2007, the Ontario Government introduced the Environmental Protection Act: Ontario Regulation 496/07 Cessation of Coal Use. The regulation required that the Ontario Power Generation (OPG) phase out the use of coal to produce electricity after December 31, 2014. This regulation was fulfilled on April 8, 2014, when Ontario stopped burning coal at its Thunder Bay Generating Station. In August 2014, the OPG completed its conversion of the Atikokan Generating Station, which now burns wood pellets for peak load power production. The OPG is currently converting the Thunder Bay Generating Station to burn torrefied pellets, an advanced biomass fuel that exhibits coal like properties and has similar heat content to coal.[6]

Ontario's Feed-in Tariff (FIT) was launched in 2009 to encourage the development of renewable energy technology, attract investment and create new clean energy jobs in Ontario. The program is helping Ontario meet its goals for improving air quality and reducing its reliance on fossil fuels, including the phasing out of coal-fired generation in 2014.[7]

Manitoba

In 2011, Manitoba announced an emissions tax on coal in anticipation of a pending ban on coal heating, thereby giving many small coal users time to make the switch to alternatives. As of January 1, 2014, Manitoba's Conservation and Water Stewardship introduced North America's first petroleum coke and coal heating ban with a grace period up to July 1st, 2017 given approved conversion plans are filed by June 30th, 2014. Fines will be charged to those who do not comply or implement the submitted conversion plans. The ban is designed to reduce the GHG emissions associated with burning coal.[8]

[6] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)
[7] (Government of Ontario Ministry of Energy)
[8] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)

Outcomes

All revenues from Manitoba's 2012 emissions tax on coal ($500,000 in 2013) are being redirected to support the transition from coal to carbon-neutral biomass energy. The petroleum coke and coal heating ban have reduced emissions by between 50,000 – 100,000 tonnes.[9]

Manitoba | Geothermal Manitoba Funding Program

The Geothermal Manitoba funding program has provided $3 million in support for geothermal systems.

Outcomes

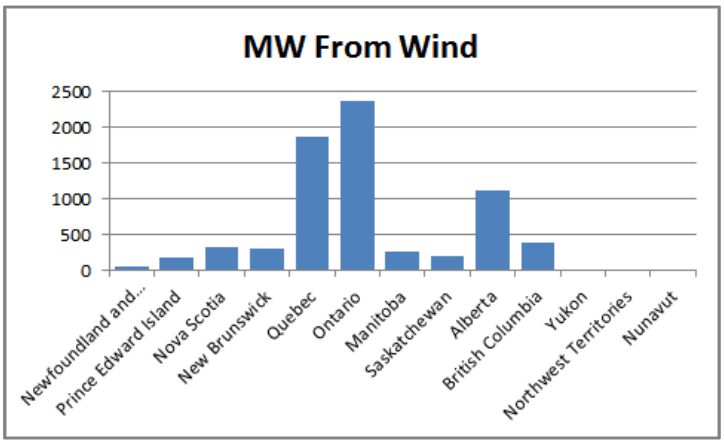
The program has assisted over 1,000 Manitobans install geoexchange systems in their homes and buildings. The program has also supported three community scale district geothermal systems, three residential complex systems and two office/retail complex systems.[10]

Ontario | Feed-in-Tariff Program

Ontario Feed-in-Tariff Program: Ontario's Green Energy and Green Economy Act (GEGEA), has supported growth in renewable energy sources such as wind, solar, hydroelectricity and bioenergy through the Feed-in Tariff (FIT) program. The FIT Program provides stable prices for generators of energy from renewable sources.

As per Figure 12, Ontario produces more wind-powered electricity than any other province in Canada.

Figure 12 : Megawatts Generated from Wind by Province and Territory



Source: (Canadian Wind Energy Association, 2014)

Ontario's Combined Heat and Power Standard Offer Program 2.0 (CHPSOP 2.0) supports the efficient use of gas-fired electricity generating facilities that use combined heat and power (CHP) technology. The objective of the CHPSOP2.0 program is to facilitate the increased development of CHP facilities up to a maximum capacity of 20 MW in size that provide thermal energy to operations in the target sectors, including district energy projects. This program has been instrumental in advancing projects in the City of Guelph.

Nova Scotia | Halifax Regional Municipality Solar City

The Province of Nova Scotia has passed an amendment to the Halifax Regional Municipality Charter that authorized Halifax Regional Municipality to install solar panels and other energy-efficiency equipment on private property with the consent of the owner and to pass a by-law respecting the recovery of the cost from the owner, enabling the successful implementation of the Solar City Project. The $8.3 million Solar City Program used an innovative financing and delivery mechanism allowing the municipality to provide turn-key installations for up to a 1,000 solar water heating systems to homeowners.

[9] (Government of Manitoba, 2013)
[10] (Government of Manitoba)

Outcomes

By February 2014, 241 homes had participated in the Solar City program. By comparison, in 2012, just 52 homes in the Halifax region had solar systems installed. As of mid-January 2014, over 1,000 homes had a free solar assessment completed.[11]

British Columbia | Solar Hot Water Ready Regulation

The Province of British Columbia introduced a new Solar Hot Water Ready Regulation for single family homes allowing communities who opt in to the regulation to require new single family homes to be solar hot water ready (plumbing, electrical and roof structures are prepared to support solar hot water equipment). This is one way that BC communities can require the development community to build beyond the requirements of the building code.

Outcomes

Since it was first offered, 48 local governments (over 25%) of BC local governments have signed on to the regulation and implemented solar hot water ready requirements in their communities.

Investing in Bioenergy Capacity

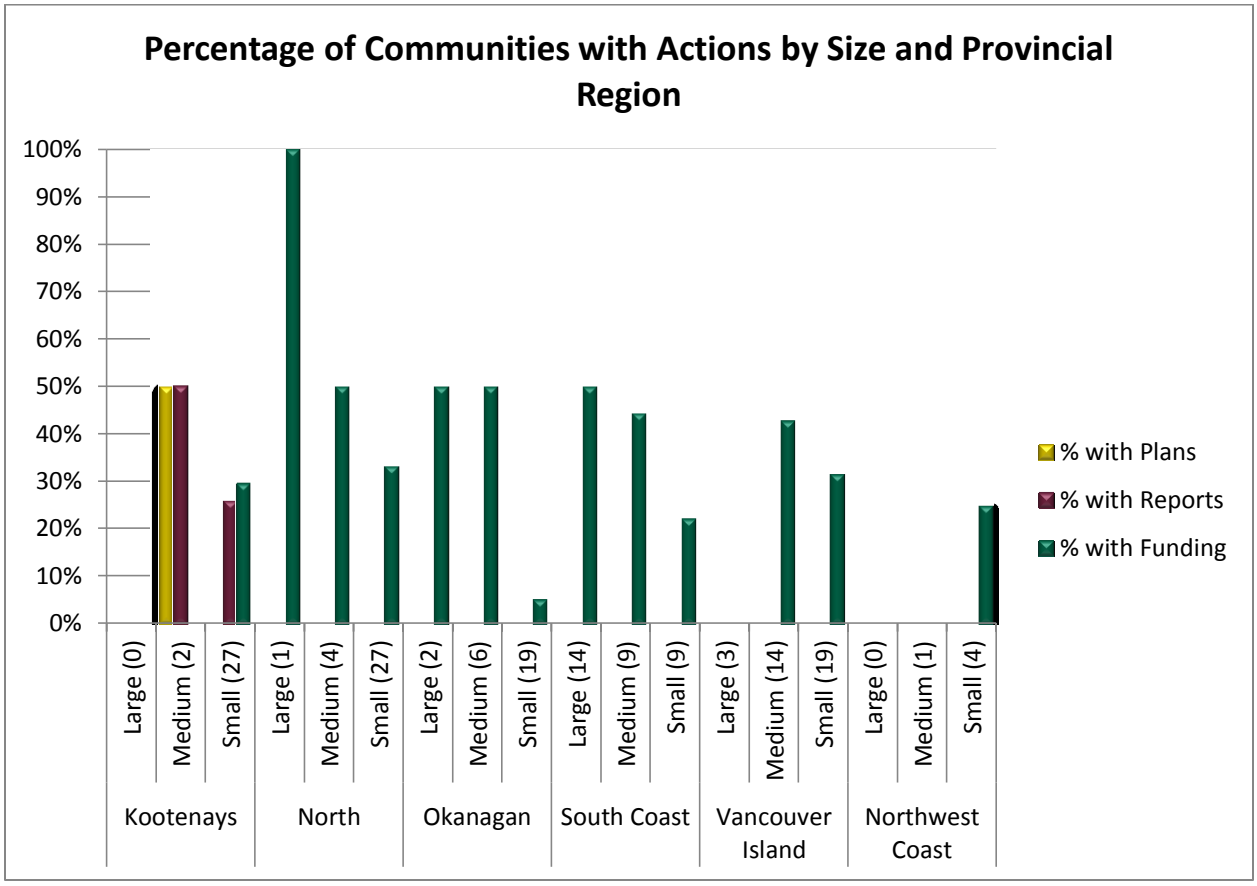
Many provinces have also undertaken measures to encourage investment in bioenergy capacity to reduce reliance on fossil fuels, support renewable energy standards where they exist and create value-added opportunities. Several provinces have mandated renewable fuel content and announced infrastructure grants. Key provincial initiatives are:

- **Manitoba** has introduced the $400,000 **Biomass Energy Support Program** to help users of coal and biomass processors make the transition from coal towards bio-based energy systems and supply chains. This program will help the development of a renewable industry, create jobs and use the three to five million tonnes of biomass available annually in Manitoba[12]
- In 2006, the **Alberta** government introduced the **Nine Point Bioenergy Plan** that included a variety of policy measures that encouraged the development of biofuels and bioenergy infrastructure; facilitated the establishment of bio-industrial networks; established micro-generation standards for bioenergy; improved taxation and investments instruments for the bioenergy sector; and established the renewable fuel standard,[13]
- In **British Columbia**, the BC Bioenergy Network was set up in 2008 to deploy near-term bioenergy technology capital for pilot and demonstration plants, and to support education and advocacy for the sector. By the end of 2013 it will have spent $16.1 million to advance bioenergy developments in BC.[14]
- The **Quebec** government took an approach unique and allowed regional economic development groups, or CRE's (Conseil régionale de l'environnmente) to examine local bioenergy proposals and allocate wood where it would best help communities. CREs are comprised of mayors, economic development organizations, and local stakeholders.
- In 2008, the **Quebec** government allocated $150 million to promote the conversion of municipal and institutional heavy oil heating to biomass through direct grants.[15]

[11] (Halifax Regional Council)
[12] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)
[13] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)
[14] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)
[15] (CANBIO, 2014 CANBIO Report on the Status of Bioenergy in Canada)

Appendix

Appendix 1: Percentage of Communities with Actions by Size and Provincial Region



Appendix 2 : Total projects funded by provincial region

		All	North	Kootenays	Okanagan	South Coast	Northwest Coast	Vancouver Island
Renewable Heat	waste heat recovery	23	6	4	2	2	0	12
	passive solar, solar walls	2	1	0	0	1	0	0
	solar hot water	11	3	3	0	4	1	4
	local biomass/wood pellets/waste wood	2	0	0	1	1	0	0
	geo-exchange heating	10	3	1	2	3	0	3
	air source heat pumps	3	1	1	0	1	0	1
	district heating	20	3	3	3	8	0	5
Renewable electricity	building-scale net-metering	0	0	0	0	0	0	0
	micro-hydro	4	1	0	1	0	1	1
	wind	1	0	0	0	0	0	2
	solar photovoltaic	4	1	2	1	0	0	1
	ocean (wave or tidal)	2	0	0	0	0	0	3
	biomass (co-gen)	3	1	0	0	1	0	1
	other	1	0	0	0	0	0	1
Emerging renewable energy	bio-gas	1	0	0	1	0	0	0
Renewable/ fuels for local sustainable transportation	bio-methane	4	2	1	0	0	0	1
Total		91	23	15	11	22	2	35
CEEPs funded		25	8	3	2	7	0	5
Average Grant Awarded vs Total Gross Project Cost		64%	65%	71%	78%	62%	76%	54%

Does not include renewable energy actions that received no funding