


District of Wells

Community Energy and Emissions Plan

DRAFT

March, 2015

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List of Acronyms

BAU	Business As Usual
CEEI	Community Energy and Emissions Inventory (inventories created by the Province for each local government)
CEEP	Community Energy and Emissions Plan
CO_2	Carbon Dioxide
DCC	Development Cost Charge
DSM	Demand Side Management (name for measures used to reduce energy consumption)
GHG	Greenhouse Gas (there are several different anthropogenic GHGs and they have different relative impacts. When tonnes of GHGs are stated in the document the standard practice of stating this in equivalent of tonnes of carbon dioxide is followed. Carbon dioxide is the most important anthropogenic GHG.)
GJ	Gigajoules (one of the standard measures of energy)
HDV	Heavy Duty Vehicles (i.e. commercial vehicles, like trucks)
ICSP	Integrated Community Sustainability Plan
kWh	kilowatt hours (standard measure of energy, typically used with electricity)
LAP	Local Area Plan
LDV	Light Duty Vehicles (i.e. the types of vehicles driven by ordinary people)
OCP	Official Community Plan
RGS	Regional Growth Strategy

Executive Summary

On March 18, 2015, a workshop was held with two Councillors and staff from the District of Wells, and was facilitated by the Community Energy Association. A follow up half-day workshop was held on March 27. The workshops and plan were funded by the BC Hydro PowerSmart Sustainable Communities Program.

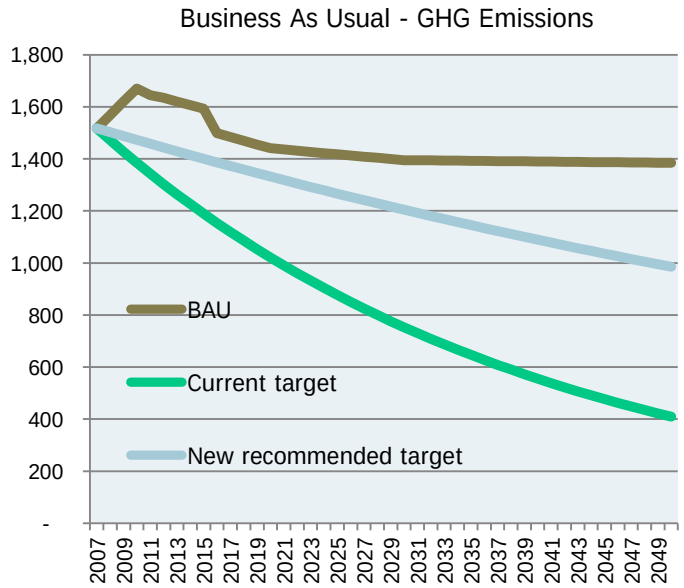
The workshop group looked at the energy, emissions, and energy expenditure data for the community as a whole and decided on an action plan.

Community energy and emissions – current status and business as usual

For the modelling process, the workshop group assumed that the community will not increase in population for the foreseeable future, and used the GHG reduction target from the District's OCP which is to reduce emissions 33% below 2007 levels by 2020, and 80% by 2050. Given the limited resources and levers available to the District, and the potential for nearby industrial development, this target may be difficult to achieve. As a result, and based on the expected plan results, the workshop group formulated a new recommended target of -12% by 2020 and -35% by 2050, which could be implemented when the OCP is next updated.

In 2010 total community annual energy expenditure was approximately $1 million, and GHG emissions were approximately 1,700 tonnes. Further detail on the energy and emissions for the community can be found in the 2010 Community Energy and Emissions Inventory (CEEI), produced by the Province.

With no action plan, but taking into account the GHG reducing impact of Provincial and Federal policies already in place, community emissions are predicted to change relative to the target trajectory according to the following chart:



Note that the bump in emissions from 2007 to 2010 is principally due to an increase in the number of commercial vehicles registered in Wells.

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Action Plan

The action plan developed by the workshop group is shown below:

Actions	Year 2015	2016	2017	2018
1 Buildings Basics				
1.1 Promote BC Hydro DSM programs	x			
1.4 District energy / renewable energy systems (M)			x	
2 Buildings High-Growth Measures				
2.1 Sustainability checklist for buildings (M)	x			
2.5 Revitalization tax exemption bylaw		x		
3 Residential Buildings				
3.3 Efficient wood stove program, & education on efficient wood stove operation		x		
NEW ACTION - Community forest selling waste wood for firewood (M)			x	
4 Commercial / Institutional Buildings and Transportation				
4.1 Promote BC Hydro's free energy assessments for businesses & organizations	x			
NEW ACTION - CARIP Fund for Municipal energy conservation projects - policy (M)			x	
6 LDV Transportation – Infrastructure & Collaboration				
6.2 Improve walking infrastructure (M)			x	
6.3 Cycling & alternative transportation infrastructure improvements (M)				x
6.4 Special event planning (M)		x		
NEW ACTION - More community gardens		x		
8 Enabling Actions				
8.1 Organizational structure for climate action	x			
NEW ACTION - Selling cheap parcels of land for eco houses, as per Craik, SK. "Green Rush"	x			
NEW ACTION - Horse manure collection from Barkerville for gardens	x			

The actions marked with an '(M)' were categorised as 'maybes' in the workshop.

The numbers of the actions listed above correspond to their numbers in the CEEP QuickStart Guide (see Appendix), which contains further detail about each of them. Some extra actions were also created which are not listed in the CEEP QuickStart Guide, which are marked with "new action".

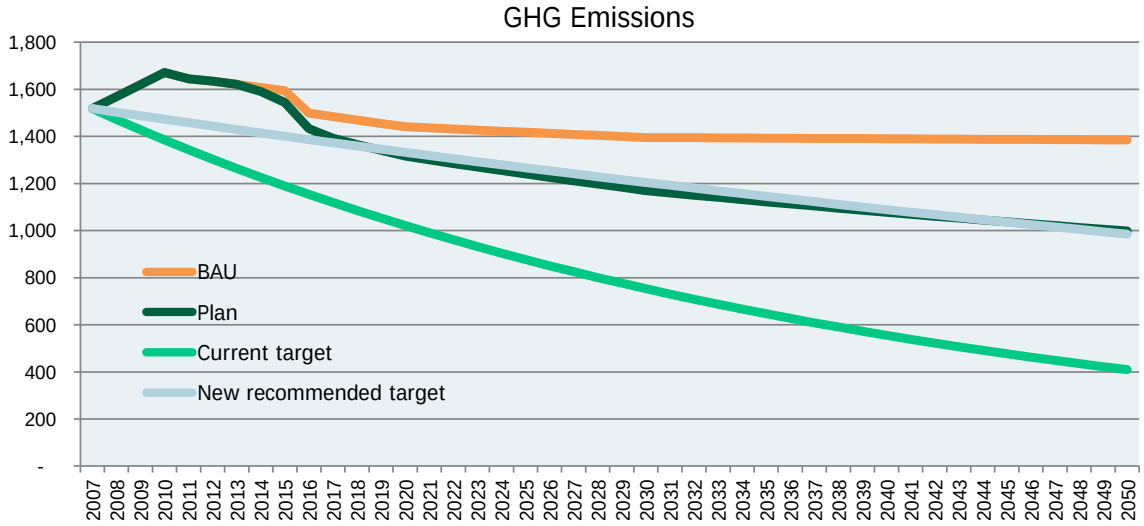
For further detail on BC Hydro DSM program incentives consult the BC Hydro Power Smart website, http://www.bchydro.com/powersmart.html.

The workshop included discussion of all the opportunities, and in-depth discussion of the following:

- 1.1 – Promote BC Hydro DSM Programs – especially BC Hydro's Low Income programs
- 1.4 – District energy / renewable energy systems – the biomass energy system being considered
- New action – selling cheap parcels of land for eco houses, as Craik in SK are doing. Action nicknamed "The Green Rush"

Results

The estimated impact of the plan on the community greenhouse gas emissions (in tonnes of GHGs per year) is shown below. Significant emissions reductions will be achieved beyond Business As Usual. The community is however unlikely to reach its current 2020 GHG target.



Based on the expected plan results, the workshop group formulated a new recommended GHG reduction target of -12% by 2020 and -35% by 2050 (below 2007 levels), which could be implemented when the OCP is next updated.

It should be noted that actions to reduce electricity consumption will also result in financial savings for the community, although they will not result in significant savings in emissions because BC electricity has a very low greenhouse gas intensity, and should be carbon neutral from 2016.

The major actions, listed by impacts in terms of annual GHG savings in the year 2020 are:

- 1.4 – District energy / renewable energy systems (i.e. biomass heating systems), 12 tonnes / yr
- 3.3 – Efficient wood stove program, & education on efficient wood stove operation, 11 tonnes / yr
- 1.1 – Promote BC Hydro DSM programs – 10 tonnes / yr (despite being BC Hydro programs they will still save emissions due to reducing consumption of heating oil, propane, and wood)

Next Steps

1. Report to Council on the BC Hydro Power Smart CEEP QuickStart (QS) workshop. Include CEEP-QS workshop description and participation, DRAFT results and report
2. Submit final Community Energy and Emissions Plan (CEEP) to Council
3. Begin plan implementation
4. Incorporate CEEP into OCP and Strategic Planning

Community Energy Savings

For the District of Wells, only a small percentage of the energy dollars spent within the community remain within the community. Therefore, a significant co-benefit of implementing this plan to reduce energy consumption and emissions is that reducing the energy dollars spent will help people, families, and businesses to reduce their expenses. In addition, using locally generated energy, if possible, will help to keep energy dollars local rather than exporting them.

The following chart shows the approximately $1 million of Wells community energy expenditures made in 2010, split by fuel type.

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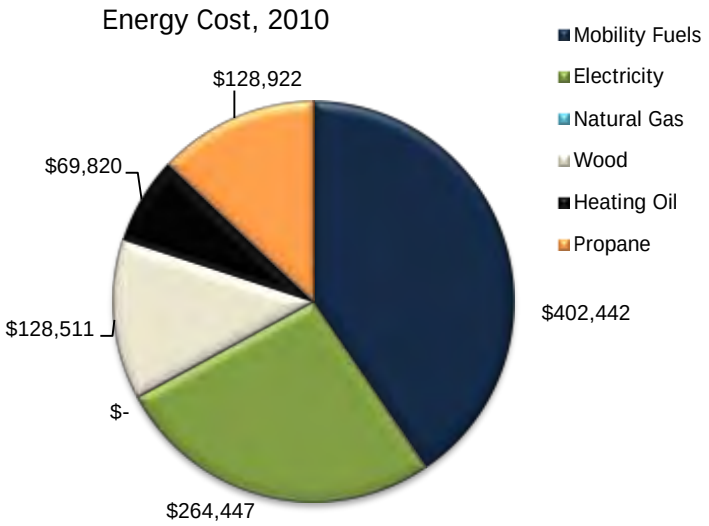
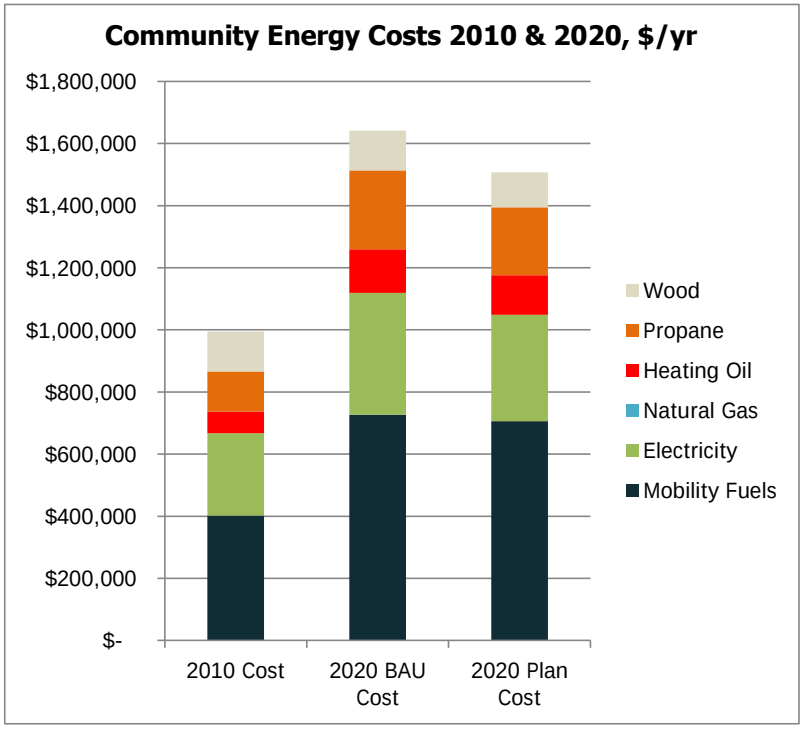


The impacts of the plan are shown in the following chart, comparing 2010 and 2020. Community energy costs are projected to be reduced by approximately 8% through plan implementation. The model assumes that energy prices will increase to 2020, and if this happens then this 8% reduction equates to about $130,000 per year or $480 per capita (or it would be about $80,000 or $290 per capita if energy prices stay the same). Note that although energy prices are very difficult to predict, there is confidence that the price of electricity will increase over the next few years due to BC Hydro's submissions on rates to the BC Utilities Commission.



Introduction

Through Bill 27, local governments in BC are required to make efforts towards reducing the greenhouse gas emissions of their communities. In addition, considering the energy and emissions from the community can give opportunities for increased efficiency and financial savings for this community of approximately 250 people. The figures in this report are based on 2010 energy and emissions inventory data from the Province, and recent energy costing data.

Bill 27 background

Through the Local Government (Green Communities) Statutes Amendment Act, also known as Bill 27, municipalities and regional districts are required to include targets, policies, and actions towards reducing greenhouse gas emissions from their communities in their Official Community Plans and Regional Growth Strategies.

Community Energy and Emissions Planning

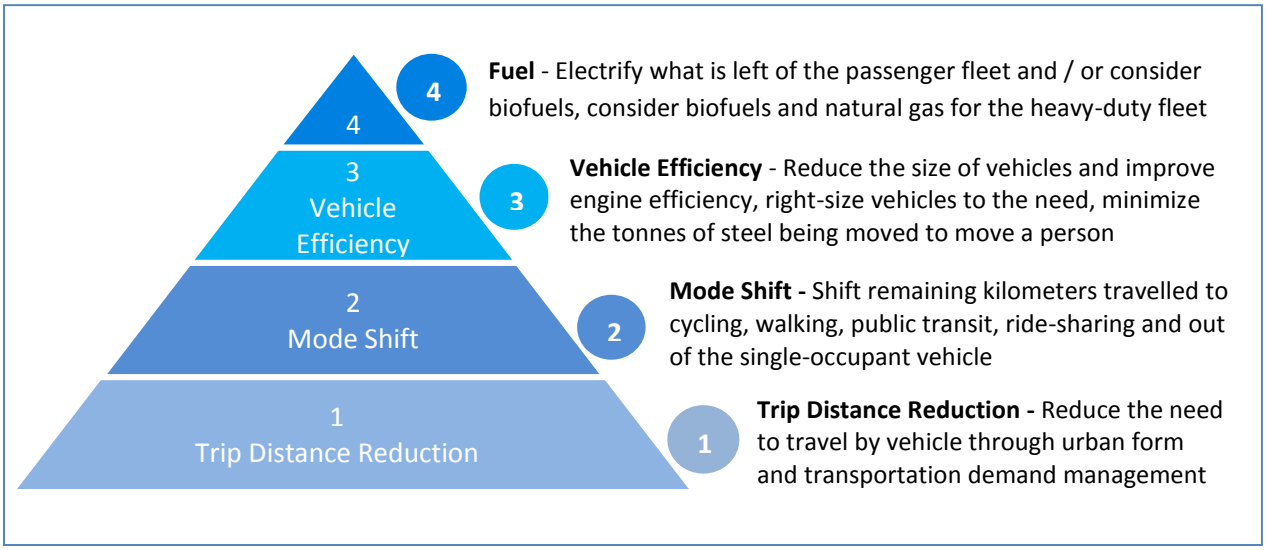
A community energy and emissions plan (CEEP) evaluates a community's existing energy use and greenhouse gas (GHG) emissions with a view to improving efficiency, cutting emissions, enhancing community resilience, managing future risks, and driving economic development. A CEEP usually encompasses building and site planning, renewable energy supply, land use and transportation planning, and infrastructure (including solid and liquid waste management). It provides guidance to a local government in long-term decision making processes.

Most GHG emissions within a local government's jurisdiction result from energy consumption and the burning of fossil fuels. With this relationship it makes sense to combine GHG and energy planning into one integrated plan. While some communities have completed stand-alone energy or GHG action plans, the close linkages between energy and GHG emissions suggest that a combined plan is preferable. In this guide the term community energy and emissions plan (and the acronym CEEP) is intended to incorporate both energy and GHG emissions, but not other emissions such as particulates or criteria air contaminants.

Energy Planning Hierarchy

Not all opportunities to influence energy and emissions across a community are created equally. It makes sense to reduce demand as much as possible first, since usually the best business cases are found through improving efficiency.

A similar hierarchy can be applied to the transportation sector. The image below is similar to the steps towards energy planning. In the transportation sector, the easiest step to take is to reduce vehicular trip distances through appropriate urban form (planning) and transportation demand management.



CEEP QuickStart Overview

The Community Energy and Emissions Planning (CEEP) QuickStart program is designed to provide a cost-effective way for small to mid-sized local governments to rapidly develop a practical CEEP including an implementation timeline. The CEEP process is depicted in the graphic below:

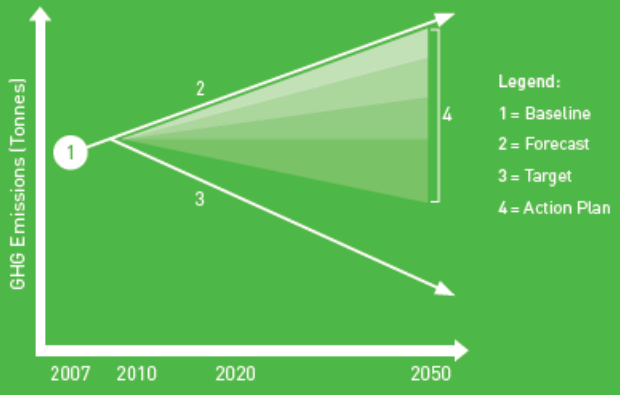
The graphic below explores the 'planning' step in the CEEP process as well as the benefits of developing a CEEP, ultimately leading to an action plan.

WHAT IS A CEEP?

A Community Energy and Emissions Plan is a comprehensive, long-term plan to improve energy efficiency, reduce GHG emissions, and foster local green energy solutions in your community.

There are 4 elements to a CEEP:

1. **Baseline:** 2007 Energy and Emissions from CEEI (Province of BC)
2. **Forecast:** Population forecast (BC Stats and local government)
3. **Target:** From Official Community Plan (legal requirement for GHG reduction target)
4. **Action Plan:** List of actions and approaches, developed by quarter, spanning several years, to estimate impacts and locally specific opportunities



BENEFITS OF DEVELOPING A CEEP:

- Reduce GHG emissions: Energy planning helps local government effectively manage GHG emissions. This contributes to mitigating climate change, and helps manage costs associated with carbon taxes and offsetting
- Reduction of energy costs: Energy planning improves budgeting and save money
- Creation of jobs and stimulation of the local economy: a CEEP can highlight opportunities for community development
- An opportunity to demonstrate leadership: Your CEEP contributes to a smart community plan, more efficient infrastructure, more livable neighbourhoods, and protection of the environment, showing leadership on multiple fronts

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Action Plan

On March 18, 2015, a workshop was held with two Councillors and staff from the District of Wells, and was facilitated by the Community Energy Association. A follow up half-day workshop was held on March 27. The workshops and plan were funded by the BC Hydro PowerSmart Sustainable Communities Program.

The workshop group looked at the energy and emissions data for their community as a whole and decided on an action plan for the community.

To assist with pre-workshop preparation, a short preparatory webinar was held to give participants background information on how energy planning initiatives can influence carbon emissions while also providing opportunities for financial savings within the community.

At the workshop a brief presentation was held and a GHG reduction assessment tool was introduced. The tool has been provided to staff for use in further analysis, and is populated with data derived from calculations developed to assess the impact that various actions and strategies may have on GHG emissions into the future. The tool shows the final results in user friendly charts and graphs.

Then the workshop group was provided with a collection of actions, and each action was discussed within the group and placed in one of four categories: “yes”, “no”, “maybe”, and “already done”.

The actions were placed on a chart in order to create a plan that covered the years from 2015-2019. The entire workshop group was invited to look at the plan and provide input as to the timing and sequencing of the actions.

Following this, some of the key actions were “unpacked”, meaning that they were discussed in detail, with appropriate steps highlighted, likely impacts, and other considerations.

Current Emissions and 'Business As Usual' Projections

The Province of BC has calculated the total energy use and greenhouse gas emissions from the community for 2010 through the Community Energy and Emissions Inventory (CEEI). In 2010 total community annual energy expenditure was approximately $1 million, and GHG emissions were approximately 1,700 tonnes. Further detail on the energy and emissions for the community can be found in the 2010 CEEI.

For the modelling process, the workshop group assumed that the community will not increase in population for the foreseeable future, and used the GHG reduction target from the District's OCP which is to reduce emissions 33% below 2007 levels by 2020, and 80% by 2050. Given the limited resources and levers available to the District, and the potential for nearby industrial development, this target may be difficult to achieve. As a result, and based on the expected plan results, the workshop group formulated a new recommended target of -12% by 2020 and -35% by 2050, which could be implemented when the OCP is next updated.

With no action plan, but taking into account the GHG reducing impact of Provincial and Federal policies already in place, community emissions are predicted to change relative to the target trajectory according to the following chart:

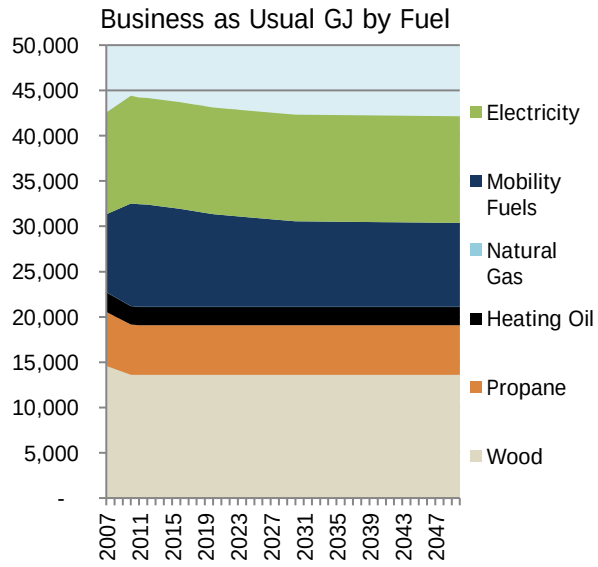
"Business As Usual" Projections & Target Overview	
Community	Wells District Municipality
Annual % target change in ghg	-3.00%
Population growth	0.0%
Default population growth	0.75%
2007 Population	244
Start-year for actions	2014

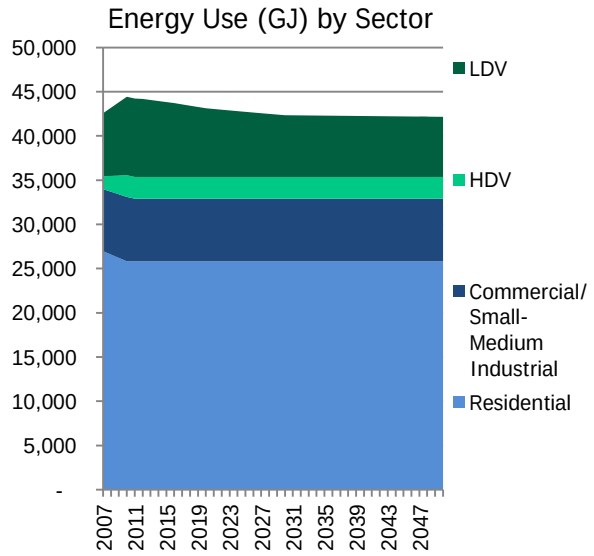
Emissions Summary		
2007 Emissions		1,518
2010 Emissions		1,671
Total Energy Expenditure	$	994,141
Per-capita energy cost	$	3,576
2010 Per-capita emissions		**6.01**

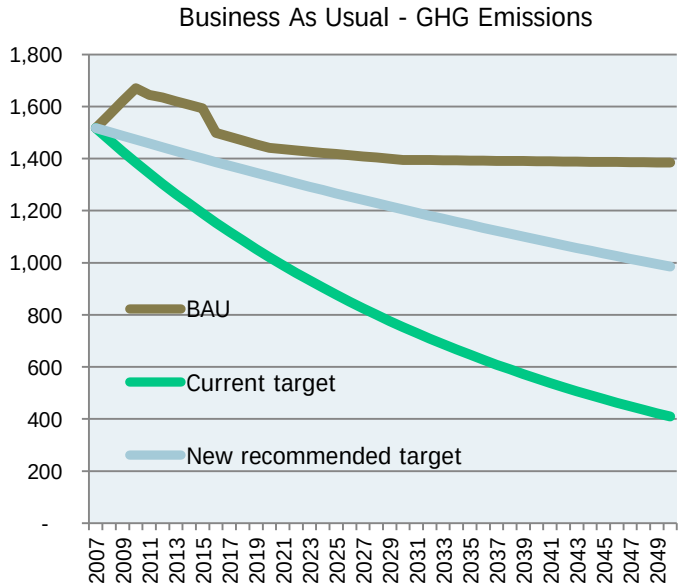
Old Targets Summary	2016	2020	2030	2050
Total reduction	-24%	-33%	-50%	**-73%**
Per-capita reduction	-33%	-41%	-56%	-76%
Total GHG	1,154	1,021	753	410
Per-Capita GHG	4.2	3.7	2.7	**1.5**

Proposed New Targets Summary	2016	2020	2030	2050
Total reduction	-9%	-12%	-21%	**-35%**
Per-capita reduction	-20%	-23%	-30%	-43%
Total GHG	1,386	1,332	1,204	985
Per-Capita GHG	5.0	4.8	4.3	**3.5**

Business as Usual (BAU) Summary	2016	2020	2030	2050
GHG's	1,499	1,441	1,395	1,385
GHG growth	-1%	-5%	-8%	-9%
Population	278	278	278	278
Pop growth	34	34	34	34
Pop Grow %	14%	14%	14%	14%
Per capita emissions	5.39	5.18	5.02	4.98







Note that the bump in emissions from 2007 to 2010 is principally due to an increase in the number of commercial vehicles registered in Wells.

Action Plan

The action plan developed by the workshop group is shown below. Actions that are in the CEEP QuickStart Guide but were considered to be inapplicable are not included below, as were several actions that are already being implemented by the community. The actions in the plan were categorised according to what year it was believed that they will be implemented.

Actions	Year 2015	2016	2017	2018
1 Buildings Basics				
1.1 Promote BC Hydro DSM programs	x			
1.4 District energy / renewable energy systems (M)			x	
2 Buildings High-Growth Measures				
2.1 Sustainability checklist for buildings (M)	x			
2.5 Revitalization tax exemption bylaw		x		
3 Residential Buildings				
3.3 Efficient wood stove program, & education on efficient wood stove operation		x		
NEW ACTION - Community forest selling waste wood for firewood (M)			x	
4 Commercial / Institutional Buildings and Transportation				
4.1 Promote BC Hydro's free energy assessments for businesses & organizations	x			
NEW ACTION - CARIP Fund for Municipal energy conservation projects - policy (M)			x	
6 LDV Transportation – Infrastructure & Collaboration				
6.2 Improve walking infrastructure (M)			x	
6.3 Cycling & alternative transportation infrastructure improvements (M)				x
6.4 Special event planning (M)		x		
NEW ACTION - More community gardens		x		
8 Enabling Actions				
8.1 Organizational structure for climate action	x			
NEW ACTION - Selling cheap parcels of land for eco houses, as per Craik, SK. "Green Rush"	x			
NEW ACTION - Horse manure collection from Barkerville for gardens	x			

The actions marked with an '(M)' were categorised as 'maybes' in the workshop.

The numbers of the actions listed above correspond to their numbers in the CEEP QuickStart Guide (see Appendix), which contains further detail about each of them. Some extra actions were also created which are not listed in the CEEP QuickStart Guide, which are marked with "new action".

For further detail on BC Hydro DSM program incentives consult the BC Hydro Power Smart website, http://www.bchydro.com/powersmart.html.

Unpacking actions

The main workshop day on February 24 included discussion of all the opportunities, and in-depth discussion of the following:

- 1.1 – Promote BC Hydro DSM Programs – especially BC Hydro's Low Income programs
- 1.4 – District energy / renewable energy systems – the biomass energy system being considered
- New action – selling cheap parcels of land for eco houses, as Craik in SK are doing. "Green Rush"

During the full day and half day workshops, ways to proceed with the actions were discussed, and are outlined in the table on the next page.

Action	Yr	Effort	Comments
1.1 Promote BC Hydro DSM programs	1	Low	Communications initially, staff to connect with BC Hydro to obtain program information and leaflets to distribute. • Low Income Program promotion, Energy Saving Kits – the District could investigate being a holder of the Energy Saving Kits, and distributing them to residents in return for a small fee from BC Hydro, as other municipalities have done. A special day could be arranged when kits are distributed – this could be combined with when representatives from BC Hydro come to speak to the community. • Team PowerSmart program – people could be registered for this as the Energy Saving Kits are distributed. • Low Income Program promotion, Energy Conservation Assistance Program – leaflets on this program should be ordered, as this program may be able to help a number of people in the community. This could also be promoted to people when Energy Saving Kits are distributed. • Home Energy Rebate Offer program – leaflets could be distributed when people apply for permits for renovations. • New Home program – leaflets could be distributed when people apply for permits to build new residences. Articles on different programs could also be submitted to the monthly community newsletter. Likely that promotion could be conducted with relatively little staff effort. Action could be repeated in future years. Support from BC Hydro is available to help with this action.
1.4 District energy / renewable energy systems (M)	3	Medium to high	Action is a maybe. As there is no natural gas in the community and therefore high energy costs, there is a substantial opportunity to use bioenergy to reduce building heating costs. Automated bioenergy systems at this scale tend to use either woodchips or wood pellets. A pre-feasibility and business case study has been conducted by Wood Waste 2 Rural Heat, which looked at a district heating system for the community. In the workshop, there was discussion that wood pellets may be easier to deal with locally. In addition, there was consideration of the high capital costs of a district energy system, and how larger buildings in the community could be heated with individual wood pellet systems instead. Further investigation is required to determine the best options for the community. There was consideration that with institutional buildings leading the way and showing what savings can be made, then

			commercial buildings in the community may follow. Workshop discussion also considered that a Public Private Partnership could be a good option for the District, with provisions in the contract focussing on the successful operation of the systems. Next steps decided on at the workshop are: 1. Come to an understanding regarding what is happening to the school's geoexchange system 2. Have a presentation to Council by the biomass installation firm Ventek Limited support from BC Hydro may be available to help with this action.
2.1 Sustainability checklist for new buildings (M)	1	Low	Action is a maybe. A voluntary sustainability checklist for new buildings could be created. It could reference what is necessary for a building to become solar ready, and also the rebates available from BC Hydro that encourage new homes to be built to be more energy efficient than the BC Building Code. Support from BC Hydro is available to help with this action.
2.5 Revitalization tax exemption bylaw	2	Medium	The District is considering incentives to encourage new construction (and potentially renovations). Energy efficiency could be encouraged as part of this. Support from BC Hydro is available to help with this action.
NEW ACTION – Work with NDIT on revitalization program	1	Low to medium	Investigate the potential for a partnership with Northern Development Initiative Trust on a revitalization program. If there is potential, this could be conducted on an ongoing basis depending on what buildings the program would be suited for. Support from BC Hydro may be available to help with this action.
3.3 Efficient wood stove program, & education on efficient wood stove operation	2	Medium	It is to be investigated if and when the Province will release more funding for an efficient wood stove exchange program. Municipal involvement in the program could also be investigated. Note that consideration could also be given to education on how to operate and maintain a wood stove for clean burning, increased efficiency, and fire safety. District could consider putting information on this on its website. Could be done in conjunction with the Wells Volunteer Fire Brigade, and Barkerville.
NEW ACTION – Community forest selling waste wood for firewood (M)	3	Medium	Residents of Wells have difficulty in accessing waste wood from local forestry operations instead of it being burnt in slash piles. To help with this, it can be investigated as to whether waste wood produced by the new community forest could be sold or made available to residents seeking firewood. This may help to support the operations of the community forest.
4.1 Promote BC Hydro's free	1	Low	The BC Hydro funded Business Energy Advisor (BEA) program provides free energy efficiency assessments to small

energy assessments for businesses & organizations			and medium sized businesses and organizations, so long as they are willing to make energy efficiency improvements. The District to consider an energy assessment through this program for its own buildings (or to obtain the old report if an assessment has already been done). And also promote the program to all of the small and medium sized businesses and organizations in the community. Locally, the Bear's Paw Restaurant has participated in the program already, and installed LED lighting, generating savings.
NEW ACTION – CARIP Fund for Municipal energy conservation projects - policy (M)	3	Low to medium	Action is a maybe. The CARIP grant (aka carbon tax rebate) received could be allocated towards municipal energy efficiency projects – anything that will help the District to save more money. Many communities in BC have done this, and template policies are available from the free support available through BC Hydro.
6.2 Improve walking infrastructure (M)	3	Medium to high	Action is a maybe. The District would like to build a pedestrian footbridge in Willow River Park to increase pedestrian connectivity. Solar power pedestrian oriented lighting could also be investigated (note that District of Houston has done this).
6.3 Cycling & alternative transportation infrastructure improvements (M)	4	High	Action is a maybe. Could be accomplished through a partnership with Barkerville, and the Department of Transportation.
6.4 Special event planning (M)	2	Medium	Action is a maybe. This action consists of encouraging people to use transit by making transit free at certain times of the year. Could be tied with Barkerville and Quesnel, e.g. the bus from Quesnel to Barkerville in the summer. If Barkerville scheduled its events on a Thursday, then transit could be free to encourage people to take transit to the event.
NEW ACTION – More community gardens	2	Medium to high	Community gardens and the community greenhouse have already been successful in Wells. There may be an opportunity to have more community gardens, which, from an energy perspective, could marginally help to reduce the number of shopping trips people will need to take to Quesnel. But other benefits include reducing people's food expenditures, enhancing community food security, increasing walkability, and increasing community cohesiveness.
8.1 Organizational structure for community climate action	1	Low	Plan to be owned by staff at the District. The plan could sit under the remit of the Planning, Zoning, and Heritage committee.
NEW ACTION - Selling cheap parcels of land for eco houses, as per Craik, SK. "Green	1	Medium to high	The small rural community of Craik in Saskatchewan halted a population decline by obtaining some land from their equivalent of a Regional District, and selling parcels of it to prospective buyers for just $1 each, with the provision that all new construction must be sustainable. This has been successful for

Rush"			the community, and has led to a population increase. Workshop discussion centred on the Crown land lots available in the community. This opportunity strongly depends on the perspective of the Province. It will probably be difficult to realize this opportunity.
NEW ACTION - Horse manure collection from Barkerville for gardens	1	Low	Considerable horse manure available at Barkerville is currently being disposed of. This horse manure could be collected and distributed to residents of Wells, for use in their gardens.

Next Steps

Suggested next steps for the CEEP are:

1. Report to Council on the BC Hydro Power Smart CEEP QuickStart (QS) workshop. Include CEEP-QS workshop description and participation, DRAFT results and report
2. Submit final Community Energy and Emissions Plan (CEEP) to Council
3. Begin plan implementation
4. Incorporate CEEP into OCP and Strategic Planning

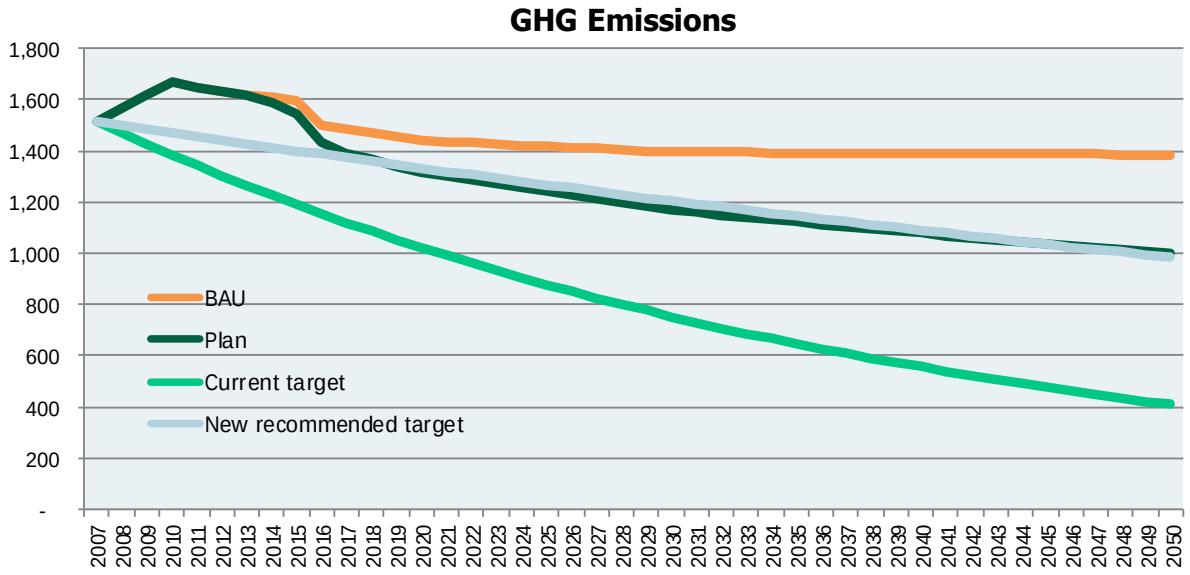
Results of Actions

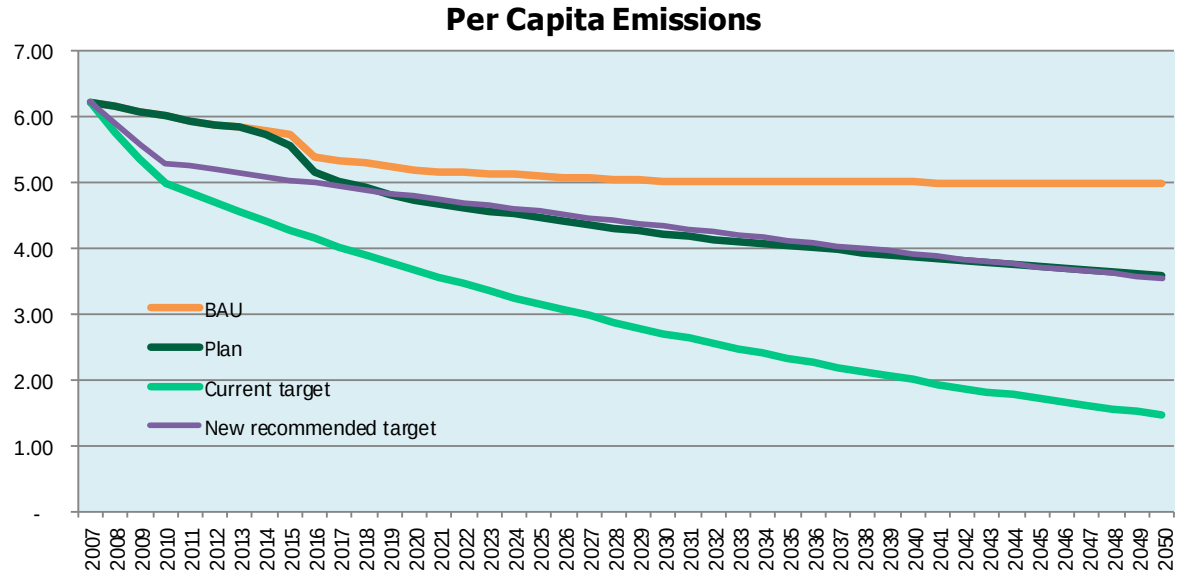
The anticipated results of the action plan, and the unpacked actions, are shown in the charts below. Significant greenhouse gas emission savings are feasible by implementing the actions.

Based on the expected plan results and the limited capacity and levers available to the District, the workshop group formulated a new recommended GHG reduction target of -12% by 2020 and -35% by 2050 (below 2007 levels), which could be implemented when the OCP is next updated.

It should be noted that actions to reduce electricity consumption will also result in financial savings for the community, although they will not result in significant savings in emissions because BC electricity has a very low greenhouse gas intensity and should be carbon neutral from 2016.

Overview GHG Emissions





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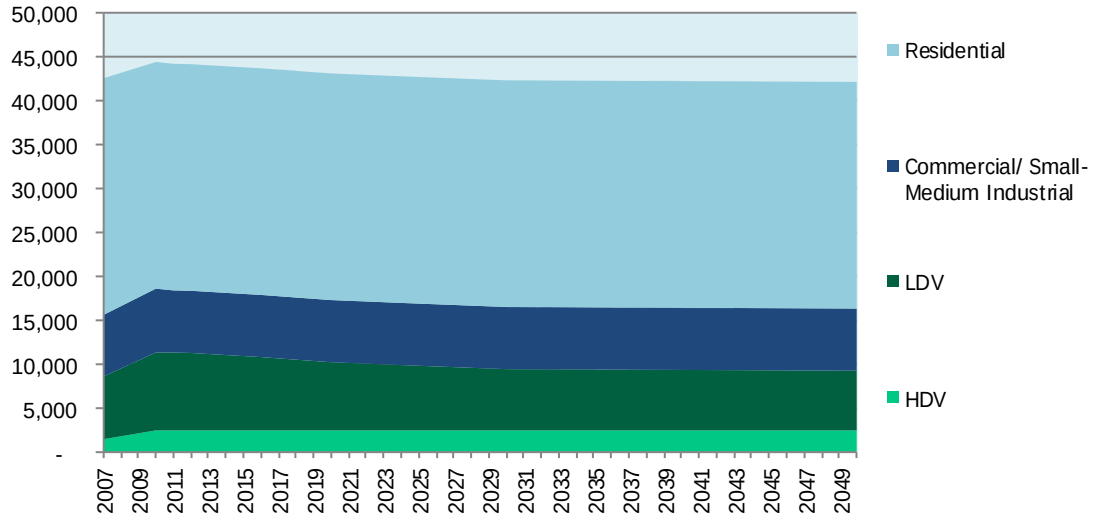
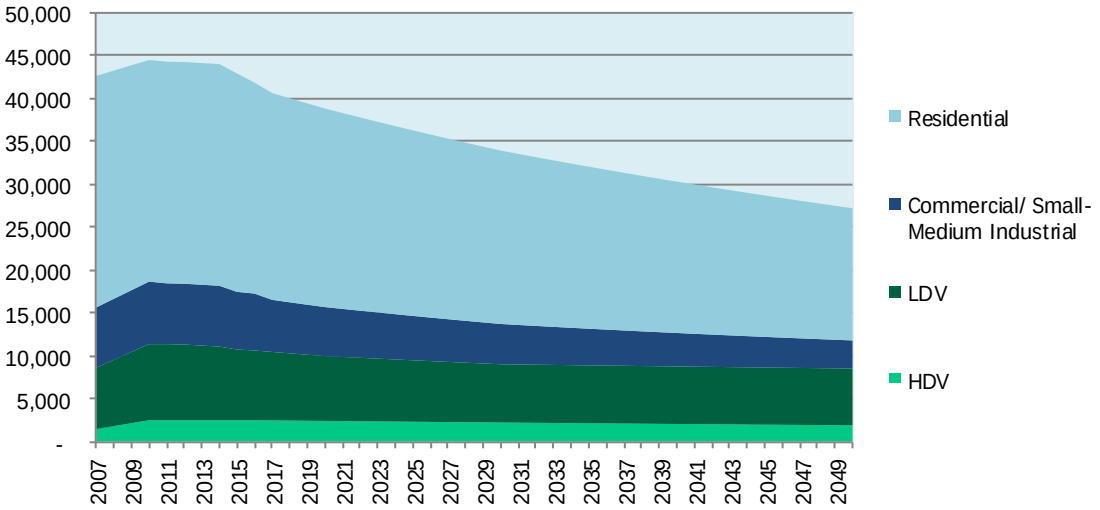
Energy Use by Sector

BAU Energy Use by Sector, GJ/year

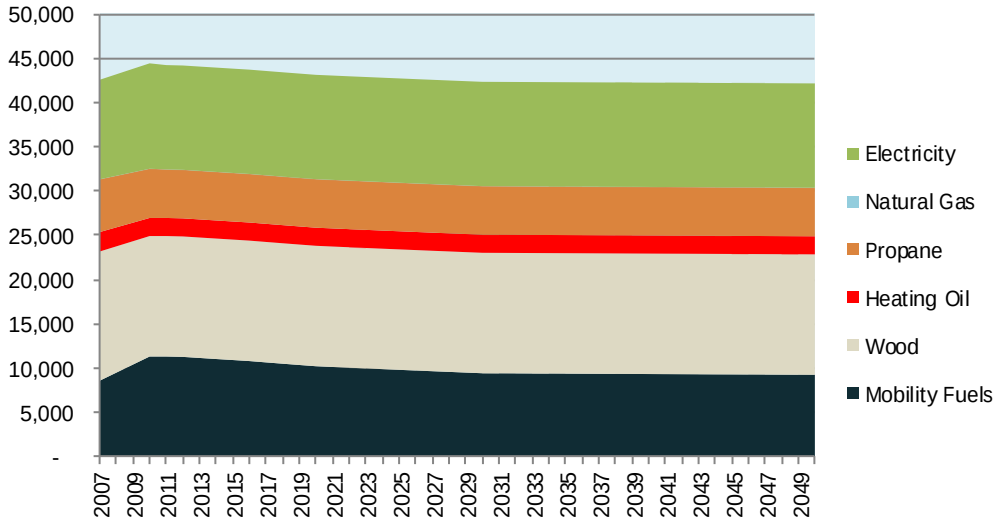


Planned Energy Use by Sector, GJ/year

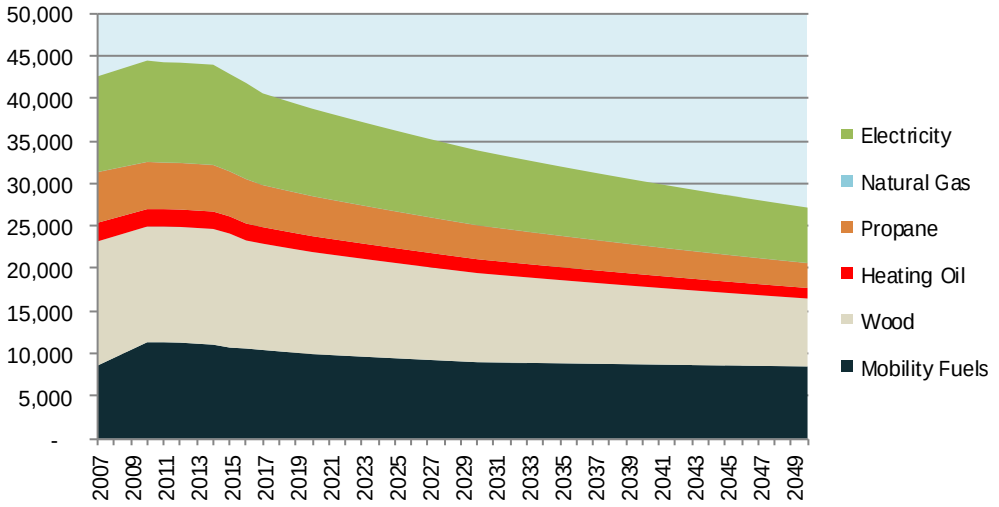


Energy Use by Fuel

BAU Energy Use by Fuel, GJ/year

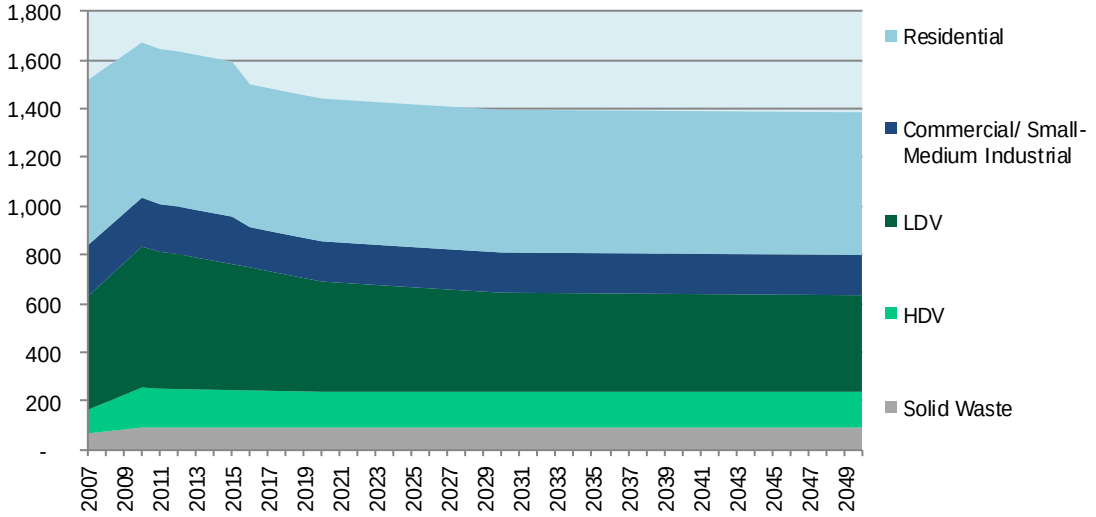


Planned Energy Use by Fuel, GJ/year

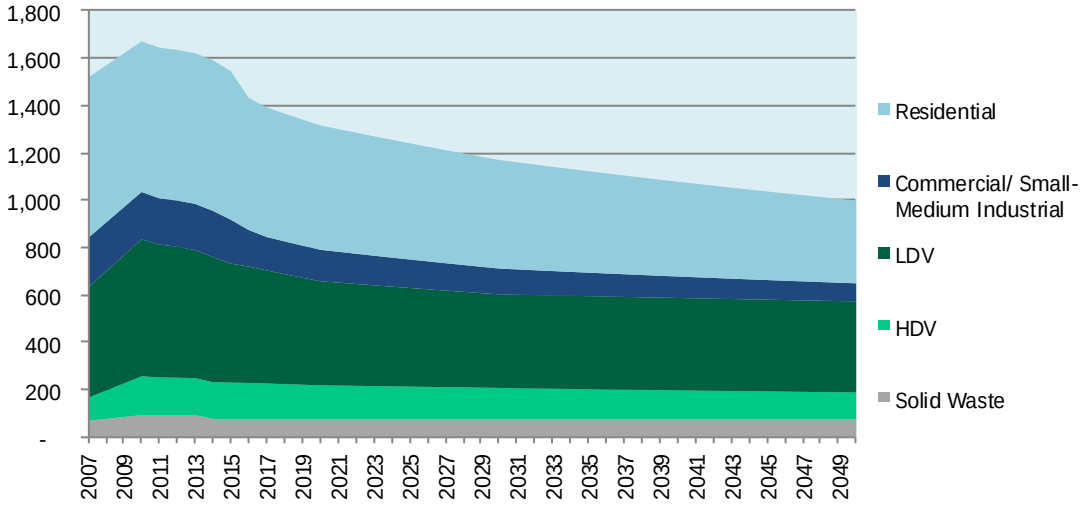


GHGs by Sector

BAU GHGs by Sector, tonnes/year

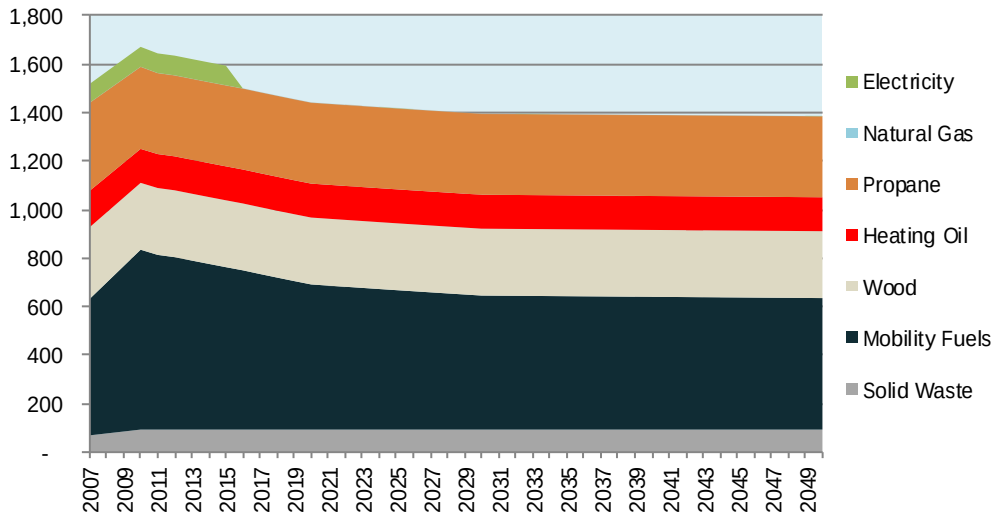


Planned GHGs by Sector, tonnes/year

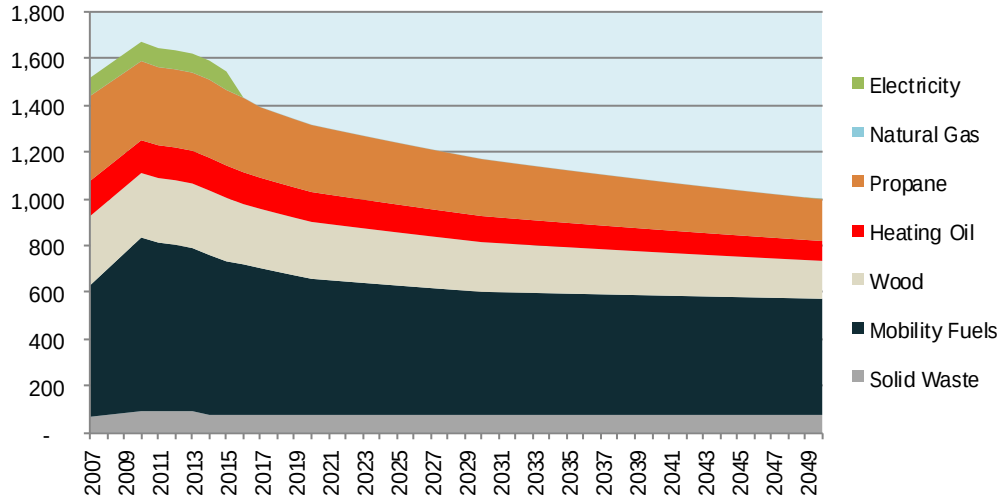


GHGs by Fuels & Waste

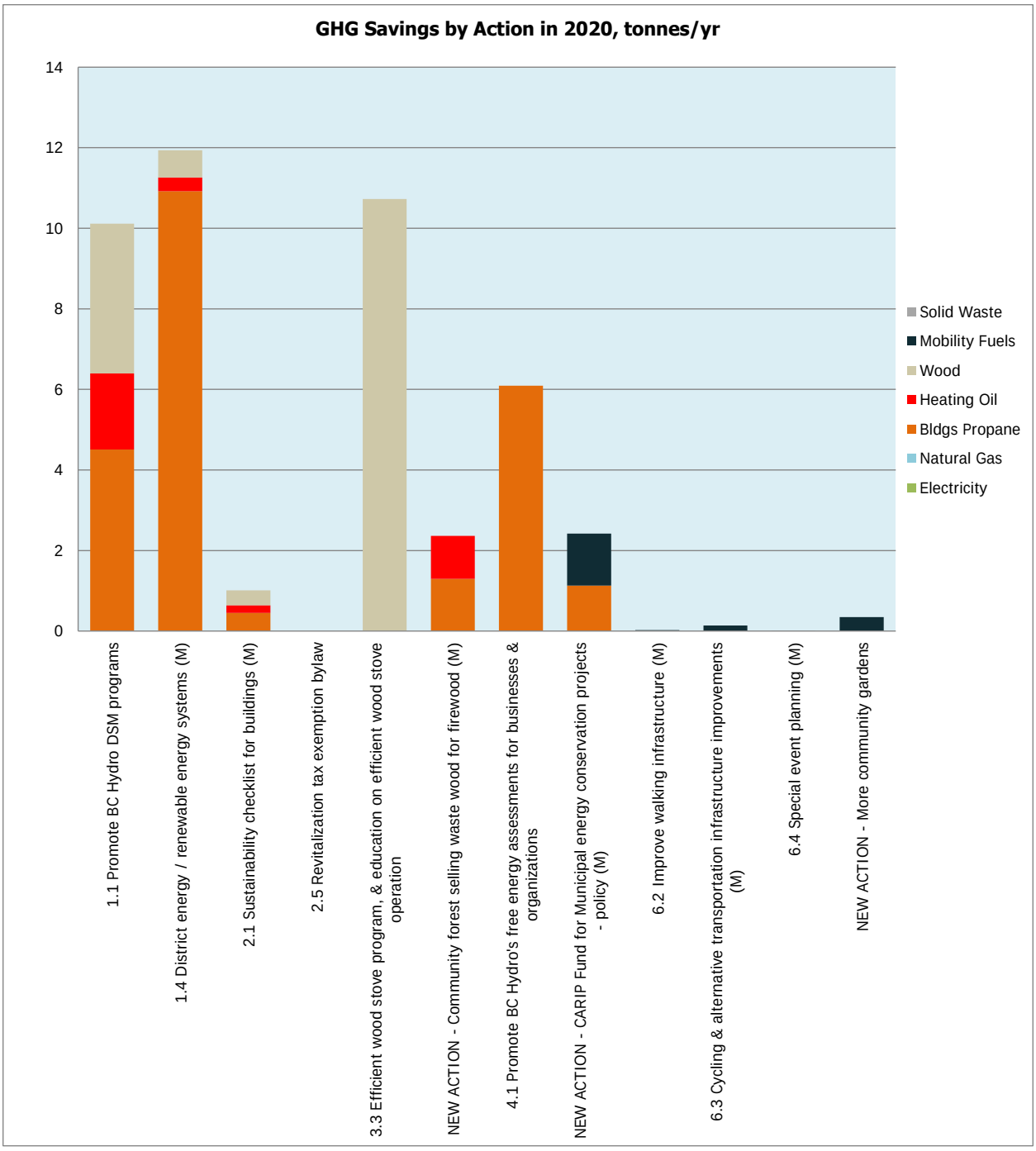
BAU GHGs by Fuels & Waste, tonnes/year

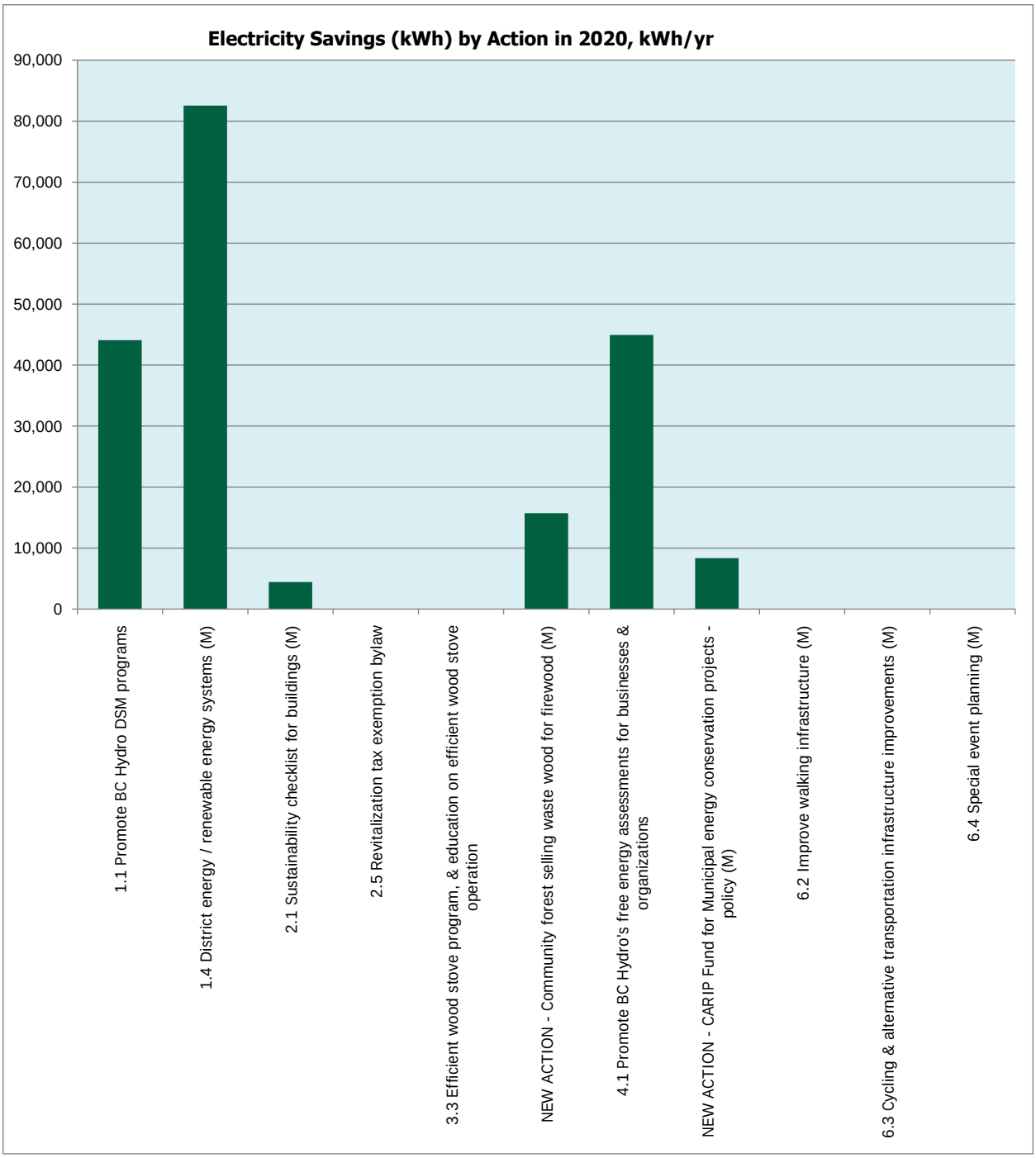


Planned GHGs by Fuels & Waste, tonnes/year



Note that the Province of BC has committed to a carbon-neutral electricity grid by 2016. In the model electricity emissions become zero from 2016 and remain there for the duration of the projected period.


GHG Savings by Action in 2020, tonnes/yr
14
12
10
8
6
4
2
0
Solid Waste
Mobility Fuels
Wood
Heating Oil
Bldgs Propane
Natural Gas
Electricity
1.1 Promote BC Hydro DSM programs
1.4 District energy / renewable energy systems (M)
2.1 Sustainability checklist for buildings (M)
2.5 Revitalization tax exemption bylaw
3.3 Efficient wood stove program, & education on efficient wood stove operation
NEW ACTION - Community forest selling waste wood for firewood (M)
4.1 Promote BC Hydro's free energy assessments for businesses & organizations
NEW ACTION - CARIP Fund for Municipal energy conservation projects - policy (M)
6.2 Improve walking infrastructure (M)
6.3 Cycling & alternative transportation infrastructure improvements (M)
6.4 Special event planning (M)
NEW ACTION - More community gardens


Electricity Savings (kWh) by Action in 2020, kWh/yr
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1.1 Promote BC Hydro DSM programs
1.4 District energy / renewable energy systems (M)
2.1 Sustainability checklist for buildings (M)
2.5 Revitalization tax exemption bylaw
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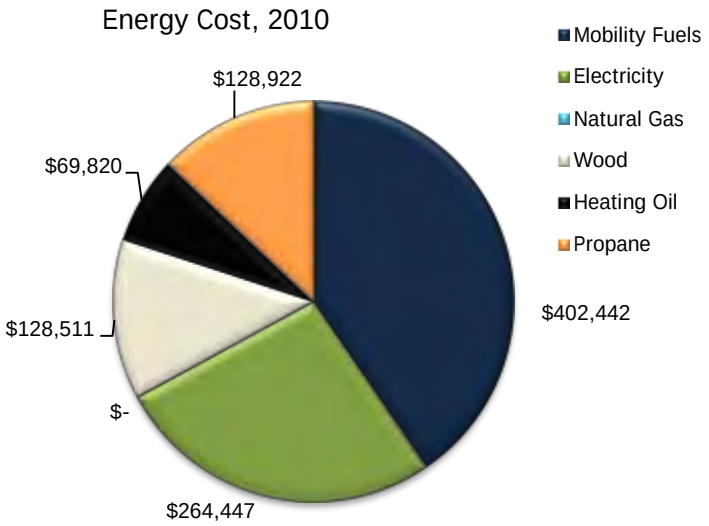
6.4 Special event planning (M)

Community Energy Savings

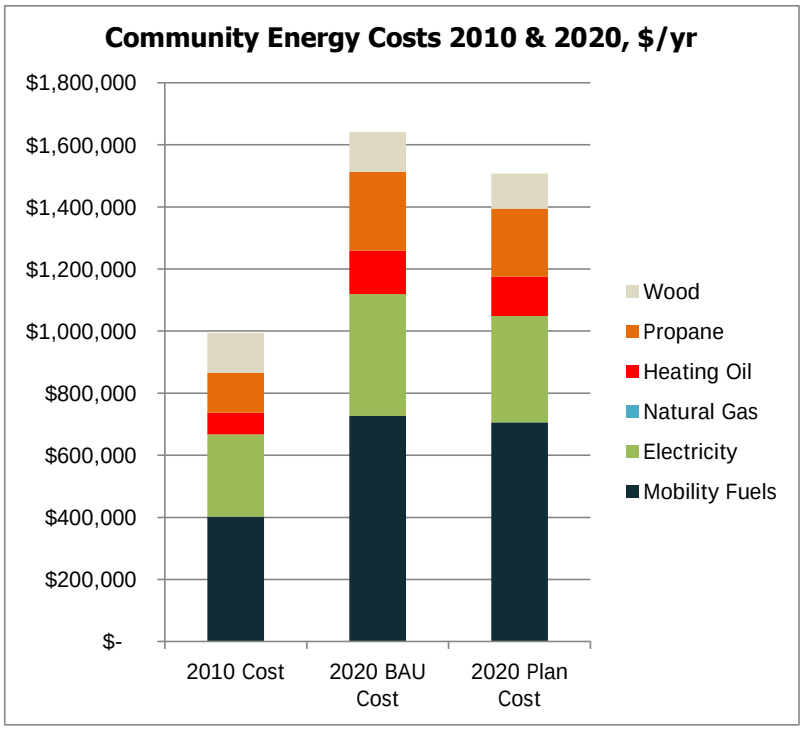
Community Energy Savings

For the District of Wells, only a small percentage of the energy dollars spent within the community remain within the community. Therefore, a significant co-benefit of implementing this plan to reduce energy consumption and emissions is that reducing the energy dollars spent will help people, families, and businesses to reduce their expenses. In addition, using locally generated energy will help to keep energy dollars local rather than exporting them.

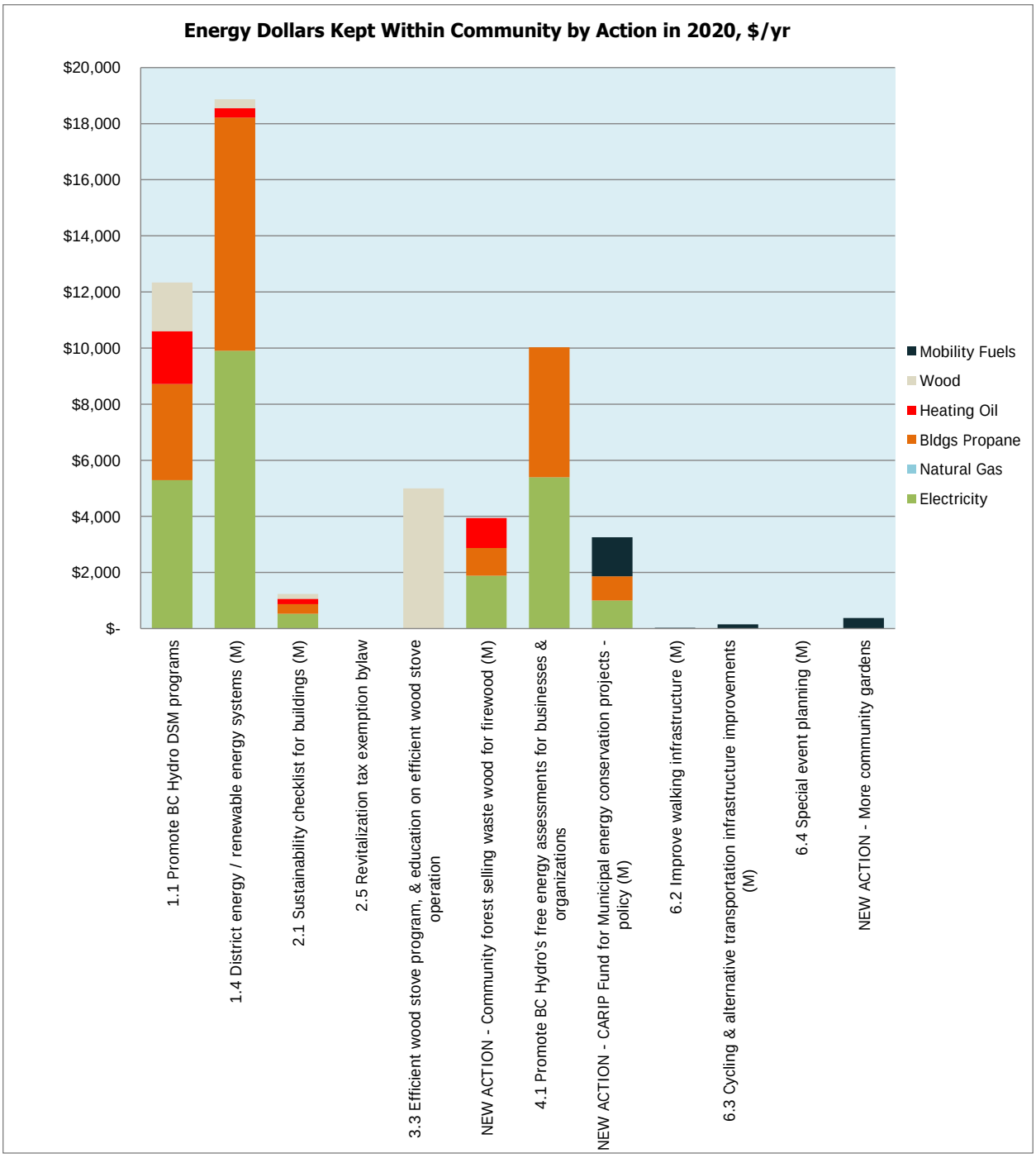
The following chart shows the approximately $1 million of Wells community energy expenditures made in 2010, split by fuel type.



The impacts of the plan are shown in the following chart, comparing 2010 and 2020. Community energy costs are projected to be reduced by approximately 8% through plan implementation. The model assumes that energy prices will increase to 2020, and if this happens then this 8% reduction equates to about $130,000 per year or $480 per capita (or it would be about $80,000 or $290 per capita if energy prices stay the same). Note that although energy prices are very difficult to predict, there is confidence that the price of electricity will increase over the next few years due to BC Hydro's submissions on rates to the BC Utilities Commission.



The following chart can be considered against estimates for the level of effort and resources needed to implement each action, for a cost benefit consideration. Note that several actions can have additional benefits, including financial benefits, that are not included in the calculation of “community energy dollars saved” (e.g. implementing land use suite “lite” and “enhanced” can reduce municipal infrastructure capital and operating costs).


Energy Dollars Kept Within Community by Action in 2020, $/yr
$20,000
$18,000
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$-
Mobility Fuels
Wood
Heating Oil
Bldgs Propane
Natural Gas
Electricity
1.1 Promote BC Hydro DSM programs
1.4 District energy / renewable energy systems (M)
2.1 Sustainability checklist for buildings (M)
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3.3 Efficient wood stove program, & education on efficient wood stove operation
NEW ACTION - Community forest selling waste wood for firewood (M)
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6.2 Improve walking infrastructure (M)
6.3 Cycling & alternative transportation infrastructure improvements (M)
6.4 Special event planning (M)
NEW ACTION - More community gardens

Appendix – Actions Descriptions

The descriptions below are taken from the CEEP QuickStart Guide.

1. BUILDINGS - BASICS

These actions are recommended for all local governments unless there is a compelling reason that a particular measure should not be implemented. Energy-efficiency retrofits in buildings can yield 25%-50% savings in total energy use. Retrofits through the LiveSmart program averaged 31%.

ACTION	DESCRIPTION
1.1 PROMOTE BC HYDRO DEMAND SIDE MANAGEMENT PROGRAMS Type: Social	**Key Question:** This action is recommended unless there is a reason why it cannot be done. **Description:** BC Hydro offers many electricity conservation programs branded as PowerSmart (PS). Local governments can assist in promotion of these programs, increasing awareness and encouraging local participation in residential and commercial sectors (e.g. communicating about PowerSmart programs during building permit application processes), so residents and businesses can save electricity and money. **% Energy Savings Calculation:** Commercial = a*b*c, Residential = d*e*f a. % of commercial customers reached b. % of reached commercial that engage with PS c. average % improvement from engaging with PS d. % of residential customers reached e. % of those reached that engage with PS f. average % improvement from engaging with PS Example: (a*b*c) = (90% * 5% * 30%) = 1.4% (commercial buildings sector) (d*e*f) = (90% * 5% * 30%) = 1.4% (residential buildings sector)
1.2 PROMOTE NATURAL GAS DEMAND SIDE MANAGEMENT PROGRAMS Type: Social	**Key Question:** This action is recommended unless there is a reason why it cannot be done. **Description:** Natural gas providers offer natural gas conservation programs. Local governments can assist in promotion of these programs, increasing awareness and encouraging local participation in residential and commercial sectors (e.g. during building permit application processes), so local residents and businesses can save natural gas and money. **% Energy Savings Calculation:** Commercial = a*b*c, Residential = d*e*f a. % of commercial customers reached b. % of reached commercial that engage with programs c. average % improvement from engaging with programs d. % of residential customers reached e. % of those reached that engage with programs f. average % improvement from engaging with programs Example: (a*b*c) = (90% * 5% * 30%) = 1.4% (commercial buildings sector) (d*e*f) = (90% * 5% * 30%) = 1.4% (residential buildings sector)
1.3 PROMOTE PROVINCIAL / FEDERAL DEMAND SIDE MANAGEMENT PROGRAMS Type: Social	**Key Question:** This action is recommended unless there is a reason why it cannot be done. **Description:** Federal and Provincial governments offers many energy conservation programs. Local governments can assist in the promotion of these programs locally, increasing awareness and encouraging participation in residential and commercial sectors (e.g. including program information in regular communications and in building permit application processes), so local residents and businesses can conserve energy and save money. **% Energy Savings Calculation:** Commercial = a*b*c, Residential = d*e*f a. % of commercial customers reached b. % of reached commercial that engage with programs c. average % improvement by energy type (elec, gas, ...) from engaging with programs d. % of residential customers reached e. % of those reached that engage with programs f. average % improvement from engaging with programs energy use by type in residential Example: (a*b*c) = (90% * 5% * 30%) = 1.4% (commercial buildings sector) (d*e*f) = (90% * 5% * 30%) = 1.4% (residential buildings sector)

BC hydro powersmart

ACTION	DESCRIPTION
1.4 **DISTRICT ENERGY / RENEWABLE ENERGY SYSTEMS** Type: Infrastructure	**Key Question:** Is there a source of waste heat (rink, industry, sewer pipes, wastewater treatment plant, ...) near to heat demand (pool, hospital, ...) OR are several public-sector (municipality, regional district, provincial ministry, health authority, school district, ...) facilities located close to each other? **Description:** Development permit area (DPA) guidelines can be used to require renewable energy systems external to buildings, such as a renewable district energy system. DPA's can enable the maximization of passive solar opportunities. District energy (DE) example: Revelstoke Community Energy Corporation.
	Calculation: Existing Residential = a*b*c, New Residential = a*d*c, Existing Commercial = e*f*g, New Commercial = e*f*h a. % of energy used for heating & cooling for residential (77%) b. % of existing residential connected to DE c. % reduction of energy from DE for residential (66%, based on Coefficient of Performance of 3 (COP 3); i.e. energy output is 3 times energy input (3 times more efficient than electric baseboard) use 66% for electric baseboard displacement, higher for natural gas / heating oil displacement d. % of new residential connected to DE e. % of energy for heating and cooling in industrial/commercial/institutional (ICI) (63%) f. % reduction in heating / cooling from DE for ICI (66%, based on COP 3) g. % of existing ICI connected to DE h. % of new ICI connected to DE Example: Energy improvements in indicated sectors: (a*b*c) = (77% * 5% * 66%) = 0.3% (existing residential buildings sector) (a*d*c) = (77% * 5% * 66%) = 2.5% (new residential buildings sector) (e*f*g) = (63% * 66% * 1%) = 0.4% (existing commercial sector) (e*f*h) = (63% * 66% * 10%) = 4.2% (new commercial sector)
1.5 **IMPROVE BUILDING CODE ENFORCEMENT** Type: Operations	**Key Question:** Would buildings be more energy efficient with better building code enforcement and inspection? **Description:** Greening the Building Code is an ongoing provincial initiative. The current focus is on reducing buildings energy and water use, improving energy performance of new housing to the equivalent of EnerGuide 80, and including solar hot water ready homes (where practical). BC Building Code EnerGuide standard may not be reflected in some buildings due to lack of sufficient inspection and enforcement. Local governments can facilitate installation of high quality renewable energy systems by: • Ensuring that building inspectors are familiar with Council support for renewable energy, and know where to go for information about renewable energy. • Creating guidelines, and passing a resolution endorsing them, to provide clear interpretation of building code issues with respect to specific technologies. • Increasing the number and training of inspectors.
	% Energy Savings Calculation: New Residential = a*b, New Commercial = c*d a. % new residential buildings captured by improved enforcement b. % improvement in new commercial buildings by energy type through better enforcement c. % new commercial buildings captured by improved enforcement d. % improvement in new residential buildings by energy type through better enforcement Example: (a*b) = (80% * 15%) = 12% (new residential buildings) (c*d) = (80% * 5%) = 4% (new commercial buildings)

2. BUILDINGS - HIGH GROWTH MEASURES

These measures typically have the greatest applicability in communities that are growing rapidly or are land-constrained. Communities with a low/no growth rate may also find some measures useful.

ACTION	DESCRIPTION
2.1 SUSTAINABILITY CHECKLIST FOR BUILDINGS Type: Social	**Key Question:** Is the community expected to grow rapidly? **Description:** Developers can be required to complete a sustainability or smart growth checklist as part of development permit or rezoning application processes. The checklist might include, for example, questions about sustainable energy features incorporated into new developments. Checklist measures are not compulsory; the aim of the checklist is to highlight local government sustainability and clean energy objectives, and to educate developers about the potential for including energy efficiency measures or renewable energy technologies in new buildings.
	% Energy Savings Calculation: New Buildings = a*b*c, Existing Buildings = d*e*f a. % new buildings exposed to checklist b. % of those in (a) who improve performance c. Average % impact in new buildings by energy type d. % major renovations exposed to checklist e. % of existing buildings doing major renovations f. Average % impact by energy type for major renovations Example: (a*b*c) = (90%*20%*15%) = 2.7% new buildings (d*e*f) = (90%* 1%*15%) = 0.7% existing buildings
2.2 USE ZONING BYLAWS TO DEFINE DESIRED ENERGY PERFORMANCE Type: Regulatory	**Key Question:** Is the community expected to grow rapidly? **Description:** Council can adopt a rezoning policy that encourages developments that incorporate renewable energy. Any development that requires a rezoning must be approved by Council, which can consider benefits to the community as part of its decision. While the OCP lays out general expectations of the community, Council can also adopt a rezoning policy, which provides a clear statement of attributes that Council will seek in making rezoning decisions. It is important to note that a rezoning policy cannot set requirements for rezoning, because Councillors are required to approach rezoning hearings with an 'open mind.' However, if a development does not meet stated expectations of Council, it is unlikely to be recommended by staff or approved by Council. The rezoning policy must be designed carefully to be legal and effective. Example: Bowen Island Municipality.
	% Energy Savings Calculation: (a*b*c) a. % new buildings covered by policy b. % of those in (a) who improve performance c. Average % impact in new buildings by energy type Example: (a*b*c) = (30% * 90% * 30%) = 8% for new buildings
2.3 DENSITY BONUS FOR ENERGY PERFORMANCE Type: Financial	**Key Question:** Is the community expected to grow rapidly? **Description:** Density bonusing means that a developer may be allowed to build to a higher density than is normally permitted in the zone (in terms of floor space ratio, site coverage or buildings per parcel) in exchange for the provision of amenities. It is possible that this could be used to promote renewable energy, if GHG reduction, energy security, improved air quality and economic benefits from the use of renewable energy are considered community amenities. The BC Office of Housing and Construction Standards has produced some guidance on the use of density bonuses, and drafted a model bylaw, available at: http://www.toolkit.bc.ca/tool/density-bonusing
	% Energy Savings Calculation: (a*b*c) a. % new buildings covered by policy b. % of those in (a) that improve performance c. Average % impact in new buildings by energy type Example: (a*b*c) = (25% * 75% * 25%) = 4.7% for new buildings

ACTION	DESCRIPTION
2.4 EXPEDITING PERMIT APPROVALS, FEE REBATES, OTHER FINANCIAL INCENTIVES Type: Financial	**Key Question:** Is the community expected to grow rapidly? **Description:** Expedited approvals provide strong incentive for developers. Example: District of Saanich
	% Energy Savings Calculation: (a*b*c) a. % new buildings covered by policy b. % of those in (a) who improve performance c. Average % impact in new buildings by energy type Example: (a*b*c) = (25% * 75% * 25%) = 4.7% for new buildings
2.5 TAX EXEMPTION BYLAW Type: Financial	**Key Question:** Is the community expected to grow rapidly? **Description:** Tax exemptions provide significant financial incentive. A Revitalization Tax Exemption (RTE) program may be designed to encourage energy efficient development in a small area or throughout a jurisdiction. This tool could allow property owners to make energy improvements to their property and apply for a tax exemption. The benefit of a RTE is tied to the property. Example: District of Maple Ridge.
	% Energy Savings Calculation: (a*b*c) a. % new buildings covered by policy b. % of those in (a.) who improve performance c. Average % impact in new buildings by energy type Example: (a*b*c) = (25% * 75% * 25%) = 4.7% for new buildings
2.6 DCC REDUCTIONS OR WAIVERS, FOR GHG'S Type: Financial	**Key Question:** Is the community expected to grow rapidly? **Description:** A development cost charge (DCC) reduction or exemption provides financial incentive for developers, with costs directly borne by the local government.
	% Energy Savings Calculation: (a*b*c) a. % new buildings covered by policy b. % of those in (a) who improve performance c. Average % impact in new buildings by energy type Example: (a*b*c) = (15% * 90% * 25%) = 1.1% for new buildings

3. RESIDENTIAL BUILDINGS

The following actions may be applicable to residential buildings.

ACTION	DESCRIPTION
3.1 SIGN ON TO SOLAR-READY BUILDING CODE PROVISION **Type:** Regulatory	**Key Question:** This action is recommended unless there is a compelling reason not to implement. **Description:** The Province of BC has developed a model solar-ready bylaw (link below) **http://www.housing.gov.bc.ca/building/consultation/shwr/qanda.htm** that local governments can sign on to and implement in their jurisdictions. This bylaw reduces the cost of installing solar hot water (SHW) after construction at minimal cost at construction time. Domestic hot water is approximately 30% of residential energy use. Solar hot water can provide up to 50% - 60% of domestic hot water use. Applies to residential only. Further calculations available in "Option 1C: Project Profile Solar Thermal (Hot Water) Retrofits" at the 'how' tab of http://www.toolkit.bc.ca/carbon-neutral-government. The deadline has passed but a future opportunity is likely.
	% Energy Savings Calculation: (a*b*c) a. % of new residential that is single family b. % of new residential that installs SHW c. Average % reduction on total household fuel use by fuel type from SHW (typically 30% of household energy use is hot water; typical SHW installations cover 50% of domestic hot water) Example: (a*b*c) = (60% * 20% * (30% * 50%)) = 1.8% for new buildings
3.2 EDUCATION FOR DEVELOPERS **Type:** Social	**Key Question:** This action is recommended unless there is a compelling reason not to implement. **Description:** Developers make key decisions as projects are being developed, that affect the energy performance of buildings over their lifecycle. While some developers pursue high performance buildings and renewable heating/cooling systems, many lack awareness of these systems and view them as increasing cost and risk. Education and showcasing can build awareness that leads to action. Applies primarily to residential development.
	% Energy Savings Calculation: (a*b*c) a. % of development community reached b. % of those in (a) who integrate energy improvements into their developments c. Average % impact by energy type of improvements Example: (a*b*c) = (20% * 10% * 20%) = 0.4% for new buildings
3.3 EFFICIENT WOOD STOVE PROGRAM **Type:** Financial	**Key Question:** Do many residents use inefficient wood fireplaces / stoves? **Description:** The Provincial Wood Stove Exchange Program encourages residents to change out their older, smoky wood stoves for low-emission appliances — including new CSA-/EPA-certified clean-burning wood stoves. Offered at the community level, the program involves funding and incentives to promote the exchange and replacement of old wood stoves. It also delivers education to help people operate their wood-burning appliances efficiently. In the Skeena region, communities contributed between $7,000 and $15,000 to offer their residents extra incentives. In addition, permit fees for installation of new appliances were waived, and additional incentives were established in the form of bylaws requiring mandatory removal of old wood stoves. Note: assumes increased efficiency of burning, results in less wood being consumed, and has little impact on fossil fuels and GHGs (since wood-burning is considered GHG-neutral).
	% Energy Savings Calculation: (for wood fuel only) = (a*b) a. % of wood-stoves changed as a result of the program b. Average % improvement in efficiency per stove Example: (10%*40%)= 4% for wood fuel for existing buildings

ACTION	DESCRIPTION
3.4 BIOMASS HEATING **Type:** Social, Financial	**Key Question:** Is there a local or regional biomass supply that could be used for heating? Description: Communities heating primarily with propane, heating oil, or in some cases electricity may have a strong financial case for conversion to automated forms of bioenergy such as wood pellet and woodchip. Green Heat Initiative (http://www.greenheatinitiative.com/) is an unbiased non-profit resource that local governments can draw upon to further assess feasibility. The reasons that some homes may not have yet converted to wood pellet, despite the substantial cost savings in energy include: • Knowledge • Individual difficulties with handling of pellets – delivery & storage • Capital costs, particularly for those on fixed incomes The knowledge barrier could be covered quite easily, with an information campaign that describes the economic and environmental factors. The local government could help to coordinate bulk purchases of wood pellets for the community, which could help to further reduce the cost of wood pellets. Purchasing pellets in loose bulk is the cheapest option. To assist with the difficulties of handling pellets including for the elderly could involve automated systems such as hoppers that could be filled by an operator(?). Outdoor storage options that a pellet stove could suck or auger pellets from could also be filled by an operator(?). Alternatively, when the hopper needs refilling, the resident could use a small container to transfer the pellets from the bag into the hopper. Financing of pellet stove: It is estimated that the installation cost of a wood pellet stove might be approximately $5,000, although this cost might be reduced if several pellet stove installations were coordinated together as a bulk order. Cost savings compared to propane, heating oil and electric in small villages could result in a simple payback of the order of 5 years, with the estimated lifespan of a wood pellet stove (provided it is properly cleaned and maintained) to be at least greater than 10 years. Benefits to the project include reducing community energy expenditures, a substantial reduction in community greenhouse gas emissions, and some potential for local economic development. Similar benefits can be achieved in southwestern BC's temperate climates with the use of air-source heat pumps. Further calculations available in "Option 1B: Project Profile Energy Efficient Building Retrofits and Fuel Switching" at the "how" tab of http://www.toolkit.bc.ca/carbon-neutral-government
	% Emissions Savings Calculation = (a*b*c*d) a. % existing buildings exposed to program b. % of those exposed who convert c. % of building GHG's associated with space heating d. % of heat load that biomass covers Example: (a*b*c*d) = (100%*40%*70%*80%) = 22.4% existing residential buildings

4. COMMERCIAL / INSTITUTIONAL BUILDINGS AND TRANSPORTATION

The following measures apply to the commercial / institutional sector. Note that there are likely other specific opportunities to engage this sector in specific communities.

ACTION	DESCRIPTION
4.1 HOST CLIMATE-SMART PROGRAM DELIVERY **Type:** Social	**Key Question:** Are there small and mid-sized businesses that would engage in climate training if offered? **Description:** ClimateSmart provides training, tools, and technical assistance to small and mid-sized businesses. This includes three, four-hour training sessions. Each session is run by experts experienced in advising small and medium-sized enterprises on best practices of managing and reducing GHGs. Groups consist of 10-15 enterprises, with training sessions scheduled over a ten-week period. Local governments can sponsor ClimateSmart to come to their community.
	% Energy Savings Calculation: for commercial sector buildings = (a*b) and for commercial sector transportation= (c*d) a. % of commercial sector participating in climate smart b. % improvement in buildings as a result of participating in the program c. % of commercial sector participating in climate smart d. % improvement in buildings as a result of participating in the program Example: (a*b) = (2% * 15%) = 0.3% for existing commercial buildings Example: (c*d) = (2% * 10%) = .2% for commercial transportation
4.2 ECO-INDUSTRIAL NETWORKING ASSESSMENT **Type:** Social	**Key Question:** Are there industrial / commercial operations that may benefit from collaboration (shipping co-ordination, waste as input, sharing heat, ...) **Description:** Eco-industrial networking is a relationship-building process that aims to minimize waste and create efficiencies among industrial and other buildings. For example, an eco-industrial network might involve locating a building with a high waste-heat output, such as an ice rink, next to a major heat consumer, such as a swimming pool, thus capturing the value of what was previously wasted. Local governments are well placed to identify and promote opportunities for eco-industrial networking. Local governments can also specifically zone for eco-industrial uses and location of uses: for example, District of Ucluelet has established the Ucluelet Eco-Industrial Park zone, a comprehensive development zone.
	% Energy Savings Calculation: commercial sector buildings= (a*b) and for commercial sector transportation= (c*d) a. % of commercial sector included in eco-industrial networking b. % improvement as a result of participating in the program c. % of commercial sector included in eco-industrial networking d. % improvement as a result of participating in the program Example: (a*b) = (1% * 10%) = 0.1% for existing commercial buildings Example: (c*d) = (1% * 20%) = 0.2% for commercial transportation

ACTION	DESCRIPTION
4.3 **NATURAL GAS VEHICLE COLLABORATION** Type: Social, Financial	**Key Question:** Are there heavy-duty fleets that could refuel where local government fleets refuel? **Description:** Gasoline and diesel have approximately 140% of the emissions per unit of energy as natural gas. Natural gas refuelling stations need a critical mass of return-to-base heavy duty vehicles (often ten or more) to be viable. The local government may have some fleet vehicles that could be converted to natural gas from diesel to meet its carbon-neutral operations commitments. Collaborating with other local return-to-base fleets (such as BC Transit, school board, waste haulers, and commercial operators) could provide the critical mass to make a refuelling station viable. This can lower the emissions from all of the participating entities. Further calculations available in "Option 1A: Project Profile Low Emission Vehicles" at the 'how' tab of http://www.toolkit.bc.ca/carbon-neutral-government. **% Emissions Savings Calculation** = (a/b)*c , where: a. Number of heavy duty vehiclekilometers traveled from vehicles converting to natural gas b. Total number of heavy duty vehicle-kilometers traveled c. % difference in emissions from original configuration to natural gas configuration (efficiency and carbon intensity) Example: (a/b)*c = (10,000/100,000) * 30% = 3% of emissions from existing heavy duty commercial vehicles

5. LIGHT DUTY VEHICLE TRANSPORTATION – URBAN FORM

Urban form including smart growth and street design offer the greatest single opportunity for many communities to reduce emissions.

ACTION	DESCRIPTION
5.1 LAND USE SUITE LITE	**Key Question:** Recommended for communities wherever politically practical. **Description:** Designate growth areas and set minimum lot sizes outside growth area; apply mixed-use zoning for downtown. This can preserve the rural character outside of downtown while enabling more residents to live in proximity to services. This can reduce transportation needs while developing areas that are most economically maintained by the local government (rather than sprawling infrastructure). Specific zoning is required for primary and secondary growth areas as well as areas outside the designated growth areas. Conservation covenants (such as through land trusts) may also be considered for agricultural lands or natural habitats.
	% Energy Savings Calculation: for Light Duty Vehicle sector= (a*b*c) a. % of community in downtown b. Degree to which the area in (a) will exhibit the full implementation of supportive land use c. % reduction in transportation emissions (see Background section for guidance on emissions reduction potential) Example: (a*b*c) = (20% * 20% * 30%) = 1.2% for LDV sector
5.2 LAND USE SUITE ENHANCED	**Key Question:** Recommended for communities seeking significant GHG reductions **Description:** This measure extends 'Land use suite lite'. Beyond designating growth areas, urban containment boundaries could be established to further enforce where growth occurs. Also, the type of growth could be further defined through establishing zones for transit-oriented development or pedestrian-oriented development. An industrial/commercial land strategy may also be required to facilitate eco-industrial networking, transit provisioning and mobility.
	% Energy Savings Calculation: for LDV sector = (a*b*c) a. % of community covered by program b. Degree to which the area in (a) will exhibit the full implementation of supportive land use c. % reduction in transportation emissions (see Background section for guidance on emissions reduction potential) Example: (a*b*c) = (50% * 25% * 30%) = 3.8% for LDV sector
5.3 STREET DESIGN	**Key Question:** This action is recommended for all communities unless there is a reason why it should not be implemented. **Description:** Reconfigure streets to be 'living streets' / 'complete streets' - including formalizing hierarchy (pedestrian - bike - transit - truck - car). Typically this is a policy decision, followed by street reconfiguration as streets are regularly scheduled for resurfacing / reconstruction for pavement maintenance or installation of utilities. If new streets are required, design to support a grid pattern.
	% Energy Savings Calculation: for LDV sector = (a*b*c) a. % of community covered by program b. Degree to which the area in (a) will exhibit the full implementation of supportive land use c. % reduction in transportation emissions (see Background section for guidance on emissions reduction potential) Example: (a*b*c) = (5% * 25% * 30%) = 0.4% for LDV sector
5.4 FLOW RGS, OCP, AND LAP THROUGH TO ZONING	**Key Question:** Recommended for all communities. **Description:** It is important to flow climate and energy-related statements from the RGS or OCP through to local area / neighbourhood plans and zoning. Often good statements in the RGS/OCP just need to be implemented all the way through in a rigorous way.
	% Energy Savings Calculation: N/A – depends on OCP policies.

6. LIGHT DUTY VEHICLE TRANSPORTATION – INFRASTRUCTURE & COLLABORATION

ACTION	DESCRIPTION
6.1 ACTIVE TRANSPORTATION PLANNING	**Key Question:** This action is recommended for all communities considering transportation demand management. **Description:** Active transportation planning processes can lead to future policy and infrastructure changes. A number of communities have researched, developed and planned active transportation initiatives through funding grants offered by the Built Environment and Active Transportation (BEAT) initiative of the BC Recreation and Parks Association (BCRPA) and UBCM. Many of these communities are small yet have started ambitious active transportation plans. Such programs can kick-start a transportation demand management (TDM) program for small or mid-size communities, especially those with little or no public transit.
	Calculation: N/A – this is a planning process which will not produce direct results itself, but may lead to projects that will produce savings.
6.2 IMPROVE WALKING INFRASTRUCTURE	**Key Question:** Are there major trip destinations (commercial services, schools, hospital, employers, etc.) less than 3km from a significant number of residences? **Description:** Local governments can easily promote walking. Tips on promoting walking have been developed by the Central Okanagan Regional District: **www.kelowna.ca/CM/Page1056.aspx** Other communities could create a similar resource page on their website or as a printed handout. Walking is suitable for trips in small and mid-size communities where distances in town are short. Most people can walk a kilometre in 10 minutes and can walk for 30 minutes, or approximately 3 km, during good-weather months. It is reasonable to target distances of 3 km or less for the promotion of active transportation (if combined with strategies to change people's perception of the time and effort it takes to walk). One walking-infrastructure opportunity available in many communities is a walking school bus. A Walking School Bus or Bicycle Train consists of a group of children walking or cycling to school with one or more adults. It can be informally planned when two or three families take turns walking or cycling with their children to school, or more formally developed and organized with specific stops, designated participants and volunteer Walking School Bus or Bicycle Train leaders.
	% Energy Savings Calculation: for LDV sector= (a*b*c)/d a. Number of walking trips/year b. % of trips that would have been by car c. average walking trip length d. Total LDV vehicle kilometers travelled (VKT) (estimation can be derived from CEEI data) Example: (a*b*c)/d = (36,500 * 20% * 1.5) / 200,000,000 = 0.01% LDV emissions

ACTION	DESCRIPTION
6.3 CYCLING & ALTERNATIVE TRANSPORTATION INFRASTRUCTURE IMPROVEMENTS	**Key Question:** Are there trip destinations within 5-8km of a significant number of residences? **Description:** Cycling is perhaps the fastest way to make a trip of less than 5 km. It is reasonable to target distances of 5 to 8 km for cycling in an active transportation strategy. Cyclists travelling 8 km or more value shower facilities at their final destination, and all cyclists value safe, secure storage for their bikes. These facilities can be installed at various sites of employment in a community, such as public institutions, businesses and regional district or municipal offices. A major barrier to increasing the number of cycling trips to workplaces is lack of secure bike lock-ups and change-room facilities. Requiring these basic facilities can be made part of the development process through a community's planning bylaw. A US tool to estimate demand for bike routes is available at: **http://www.bicyclinginfo.org/bikecost/step1.cfm** . It is tailored for use in the US, but can be used by BC communities. Information required includes population density in the area surrounding the bike route, and the percentage of total trips in the area already made by bicycle. Where this is not known, use the BC average figure of 2%. More detailed guidance on methods for estimating the likely number of users is available from the governments of New Zealand, US, UK and Australia. However, these tend to be lengthy documents; guidance from New Zealand may be of most direct use. Other important parameters include percentage of cyclists using the bike route that would otherwise have driven, and average bike trip length. Where locally-specific data are not available, the following benchmarks may be used: • % of non-recreational cyclists who would have driven, if they were not cycling: 50%. • Average BC cycling commuter distance: 5km each way, 10km return trip
	% Energy Savings Calculation: for LDV sector = (a*b*c)/d a. Number of cycling trips/year b. % of trips that would have been by car c. average walking trip length d. Total LDV vehicle kilometers travelled Example: (a*b*c)/d = (36,500 * 30% * 5) / 200,000,000 = 0.03% LDV emissions This calculation methodology is only relevant where bicycle facilities are constructed on commuter routes, or to other major destinations to which people travel by car. Recreational bike paths will not lead to a reduction in emissions, and may even lead to an increase in emissions, since people may drive to them.
6.4 SPECIAL EVENT PLANNING	**Key Question:** Are large special events planned? **Description:** Local governments often promote transit for transportation to major community or sporting events in their area. There are direct benefits to having people try alternative modes of transportation during large events. Experience has shown that people will be more likely (at worst, less reluctant) to use transit after having a good experience at a special event. This was the case in Victoria in 1994 when a 12-day major sporting event saw record modal splits for transit (50% and up), which set the stage for an impressive five-year growth in ridership.
	% Energy Savings Calculation: for LDV sector = (a*b*c) a. % of LDV travel associated with travel to/from event b. % of travel population in (b) affected by action a. Average % reduction in vehicle kilometers travelled by population in (c) Example: (a*b*c) = (1% * 20% * 10%) = 0.002% LDV sector

ACTION	DESCRIPTION
6.5 **COLLABORATE WITH MAJOR EMPLOYERS ON TRANSPORTATION**	**Key Question:** Is there major employer(s) in the community? **Description:** Collaboration with major employers such as industries, schools and hospitals can uncover opportunities to reduce commuting-related transportation emissions. UVic achieved a 27% reduction in campus parking during a 30% growth in student population and major new building activity in the past 16 years. Single-occupant vehicle traffic to campus plunged from 58% in 1992 to 37.5% in 2008, while parking rates soared from minimally priced to market-rate priced.
	% Energy Savings Calculation: for LDV sector = (a*b*c) b. % of LDV travel associated with travel to/from employer/institution c. % of travel population in (b) affected by action d. Average % reduction in vehicle kilometers travelled by population in (c) Example: (a*b*c) = (10% * 50% * 20%) = 1.0% LDV emissions
6.6 **TRANSIT SUITE**	**Key Question:** Are there major trip destinations beyond 8km that are not sufficiently served by transit? **Description:** There are 82 transit systems serving 50 communities in BC. Three types of transit service are operated through BC Transit: conventional transit, paratransit and custom transit. • Conventional transit serves the general population using mid-size, large or double-decker buses with fixed routes and fixed schedules. Most buses are fully wheelchair accessible, with door ramps that lower. • Paratransit offers small-town, rural and suburban areas flexible routing and schedules for passengers using minibuses, taxis and vans. Many paratransit systems offer trips beyond their immediate community one or more days a week. • Custom transit serves those who cannot use conventional transit because of a disability. It operates vans and minibuses for dial-a-ride, door-to-door handyDART service. Service is also offered through contracted Taxi Supplement and Taxi Saver (discounted coupon) programs. Many factors affect transit deployment, key ones being residential density and form.
	% Energy Savings Calculation: for LDV sector = (a*b) a. % of population affected by transit measures (within approx. 400 meters of stops) b. Average % reduction in vehicle kilometers traveled for population in (b) Example: = (20% * 5%) = 1% LDV emissions
6.7 **RIDE-SHARING AND GUARANTEED RIDE HOME PROGRAMS**	**Key Question:** Are there major trip destinations beyond 8km that are not sufficiently served by transit? **Description:** Carpooling is a simple way for local governments to begin TDM while saving money, reducing congestion and conserving energy along the way. Founders of the Nelson Carshare Co-op set up a ride-sharing system for longer-distance intercommunity travel where rides could be offered or sought for travel between communities. This ride-matching service is now run by the Kootenay Rideshare and is undergoing expansion; details can be found at **www.kootenayrideshare.com**. "With car sharing as a choice, Car Co-op members drive much less (1400 km/year) than the average driver (6,000-24,000 km/year) in the Lower Mainland." Source: Cooperative Auto Network. (75%-94% reduction but much of this cannot be directly attributed to a coop.)
	% Energy Savings Calculation: for LDV sector= (a*b) a. % of population affected by ride-share b. Average % reduction in vehicle kilometers traveled for population in (b) Example: = (10% * 10%) = 1% LDV emissions

ACTION	DESCRIPTION
6.8 INTERCOMMUNITY TRANSIT SERVICES	**Key Question:** Is there significant inter-community travel? **Description:** While trips between BC communities have typically relied on the private automobile, there are publicly funded transportation links between many communities, some covering distances of several hundred kilometres. These transportation links are usually established for a specific purpose and are not well known or publicized. The transit link between Vernon and UBC Okanagan in Kelowna is a key example, providing a long-distance transit link from one community to a post-secondary institution in another community. This practice is not common in small or mid-size communities and could be more widely implemented. Health Connections is a provincially funded program to address regional travel needs for rural residents who must travel long distances to access specialized nonemergency medical services. Regional health authorities have full discretion in how they seek to deliver this service. Service restrictions vary region to region, but many include intercommunity bus services. **http://www.bctransit.com/health_connections/?p=2.list** The Interior Health Authority provided an estimated 25,000 rides in 2008, with 35% of trips being medical in nature. Within the 200,000-square-kilometre Interior Health region, encompassing the East Kootenay, Kootenay-Boundary, Okanagan and Thompson Cariboo Shuswap areas, these trips are a largely untapped resource for the area's 700,000-plus residents. Few people know about this service because it is not well advertised outside of doctors' offices and the medical community. Promoting these services is an opportunity for local governments.
	% Energy Savings Calculation: for LDV sector = (a*b*c) a. % of population affected by inter-community transit b. % of VKT related to inter-community travel c. % of LDV trips avoided Example: = (60% * 10% * 10%) = 0.6% LDV emissions
6.9 LOW CARBON AND ELECTRIC VEHICLE SUITE **Type: Social, Financial**	**Key Question:** Can adequate resources be allocated to implement these recommended actions? **Description:** Low carbon and electric vehicles can play a significant role in reducing emissions from light duty (passenger) vehicles. Local governments can play an enabling role in this transition. Measurement may be difficult, but without this suite of support or a similar one, the local transition to low carbon and electric vehicles may be delayed by many years. Battery electric vehicles may be appropriate in some communities, with current models that travel on highways and can travel for over 100km. In other areas, plug-in-electric-hybrids (PHEV) may be a more practical option. With PHEVs, most travel within the community can be done on electricity and the gasoline engine can provide power to the batteries for extended highway driving. Some models have an option to heat the cabin up before unplugging. There are several specific actions all local governments can take to prepare for low carbon and electric vehicles. • Sign on to provincial 'EV-Ready' bylaw when it is available. Analysis indicates 80% of charging will be done at home. • Include EV charging infrastructure in sustainability guidelines • Ensure permitting processes (for renovations particularly) are set up to smoothly address electric vehicle charging infrastructure • Consider low carbon vehicles (see action 4.3) and electric vehicles for the local government fleet to demonstrate the viability of the technology • Set up a charging station at a highly visible location For higher growth communities, a requirement for alternative fuelling could be established for new gas stations. Surrey City Council passed an innovative new fuel initiative. All new service stations in Surrey will be required to provide at least one alternative fuel source, such as hydrogen, compressed natural gas, or electric vehicle recharging, in addition to conventional gasoline, diesel and propane energy.
	% Emissions Savings Calculation: N/A – unquantifiable at this time, however given national and international projections, with supportive measures as outlined above, electric vehicles (split between PHEV and battery electric vehicles) could comprise 1% of passenger vehicles on the road by 2016 and up to 2% by 2020.

7. WASTE

ACTION	DESCRIPTION
7.1 ORGANICS DIVERSION	**Key Question:** Is a significant amount of organics going to landfill that could be economically diverted? **Description:** GHG emissions from landfills are primarily from the decomposition of buried organics. Create a comprehensive composting program: • Encourage grass swapping and back-yard composting. • Create a public compost pick-up site and program. • Support existing and new capacity for reusable resources, including Free Swaps, Share Sheds, free-store for unwanted goods, and building materials depot. Organics make up approximately 43 percent of solid waste in Metro Vancouver according to the Recycling Council of BC, which also states that on average, each British Columbian generates over 600 kilograms of waste annually. By diverting organics, each of us has the opportunity to remove approximately 200 kilograms from the solid waste stream every year. Further calculations available in "Option 10: Project Profile Household Organic Waste Composting" at the "how" tab of http://www.toolkit.bc.ca/carbon-neutral-government.
	% Energy Savings Calculation for municipal solid waste sector = (a -c)*b a. % of landfill GHG's from organics b. % of organics diverted annually c. Average % of emissions over planning period (to 2050?) from organics currently in landfill under BAU scenario Example: (a -c)*b = (80% - 25%) * 10% = 35% waste emissions

8. ENABLING ACTIONS

ACTION	DESCRIPTION
8.1 ORGANIZATIONAL STRUCTURE FOR CLIMATE ACTION	**Key Question:** Are there questions about who is accountable within council / board as well as within staff for climate action? **Description:** Climate action crosses all departments and levels within a local government. Establishing decision-making, communication, accountability, and resourcing structures that are appropriate for the size and culture of the local government has repeatedly been proven to be critical to implementing actions in a cost-effective manner and achieving results. Taking time up-front to establish such structures is a worthwhile investment in setting implementation up for success. Key questions to answer include: • Who makes which decisions regarding climate action? • Who is expected to do what and how are they held accountable? • What new / different communication / planning is required to enable implementation of actions, some of which may be cross-departmental? • What organizational structure changes are required to operationalize this? Some examples include: Council climate committee, cross-departmental working group, updated job descriptions, resource allocation to include climate action and new positions. • How will capital, operating and human resource elements of the CEEP be funded?
	Calculation: This enabling action does not have direct impacts itself, however it may be critical to achieving results from other actions.
8.2 ESTABLISH A REGIONAL ENERGY COOPERATIVE	**Key Question:** Is there strong interest in clean energy in the community? **Description:** Energy co-operatives are companies owned by their members, rather than by shareholders, with each member having an equal vote. Community energy cooperatives have provided an important vehicle for development of local renewable energy in Denmark, the Netherlands and Germany. In Germany, 200,000 people own shares in local wind turbines. City of Dawson Creek played an important role in establishment of the Peace Energy Cooperative, providing advice and other forms of non-financial support.
	Calculation: Impacts from this enabling action will be dependent on actions and investments of the co-op. This can provide funding and a sense of community and buy-in to climate actions.
8.3 IDENTIFY GREEN ECONOMY OPPORTUNITIES	**Key Question:** This enabling action is recommended to all local governments who want to achieve economic development / diversification benefits from climate action. **Description:** British Columbians pay on average $4200 per person annually for energy in their communities (i.e. electricity, natural gas and transportation fuels), not including energy consumed by industry, airlines, ferries, etc. For most communities, 70-80% of money spent on energy leaves town, going to utilities, oil companies, and provincial and federal taxes. Local clean energy development and energy efficiency can be drivers of economic diversification in rural BC, presenting opportunities for communities to transition to a green economy, thereby generating long-term economic and community development benefits. A "green economy" is characterized by low carbon (with renewable energies replacing fossil fuels), low resource depletion and low environmental degradation. A guide to achieving economic development potential of climate action is *Clean Energy for a Green Economy* available at **http://www.communityenergy.bc.ca/node/692**
	Calculation: This enabling action will assist in moving other actions forward.

ACTION	DESCRIPTION
8.4 USE LOCAL GOVERNMENT ASSETS TO CREATE EXPERTISE AND COMMUNITY-WIDE CHANGE	**Key Question:** Are actions being taken in local government (LG) operations that could be leveraged to support community-wide action? **Description:** **LG ACTION** / **COMMUNITY OPPORTUNITIES** BUILDINGS: District energy systems; - Building energy efficiency retrofits; - New green buildings — **Awareness:** Increasing public awareness of clean energy and conservation, leading to a greater willingness to explore clean energy and conservation, particularly if corporate actions are deployed in a way to maximize public visibility. **Association:** Visible actions that others are implementing clean energy and conservation. **Action:** Local governments across BC are exploring district energy systems with their own buildings as the first buildings that provide critical mass for the system. Many local governments are also connecting public sector organizations in BC which all have carbon neutral commitments. These systems then extend to the surrounding community. FLEET: - Biofuels; - Hybrids / EV's — **Agency:** Improved access to fuels and mechanics who can service biofuel, hybrid, or electric vehicles. OTHER: - Carbon neutral actions — **Awareness and Association:** Provides local government leaders (staff and elected officials) an opportunity to gain knowledge of clean energy and conservation so they can more confidently demonstrate community leadership by implementing them where appropriate in their own business or residence. **Calculation:** Impacts of these enabling actions are highly dependent on specific actions planned for local government operations.
8.5 LONG-TERM, DEEP COMMUNITY ENGAGEMENT (CULTURE CHANGE)	**Key Question:** Do the other actions identified fall short of the desired change? **Description:** Overall, the purpose of social mobilization for British Columbia climate action is to: 1. Engage residents in developing and implementing climate solutions through collective, "bottom-up", informal, organizational and institutional initiatives. 2. Change collective behaviour to reduce carbon footprints. 3. Build public support for (and contributions to) low-carbon climate policies and actions focused on the green economy, ecological resilience and sustainable communities, in order to achieve GHG targets, short- and long-term, as well as other provincial climate change goals. 4. Build capacity and resilience to plan and respond to climate change adaptation and mitigation. Active mechanisms can be established to pilot, replicate and monitor successful social engagement techniques, such as the Columbia Basin Community Adaptation program, and the UK Rural Community Councils community-led planning, which writes: *People need ... information, a realistic assessment of the threat or diagnosis, a sense of personal control over their circumstances, a clear goal, an understanding of the strategies to reach that goal, a sense of support, and frequent feedback that allows them to see that they are moving in the right direction.* A recent study found that reasonably achievable emissions reductions are approximately 20% in the US household sector in 10 years, if "most effective non-regulatory interventions are used," such as incentives and social marking (Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., Vandenbergh, M. P.: Household actions can provide a behavioural wedge to rapidly reduce U.S. carbon emissions, in *Proceedings of the National Academy of Sciences*, 106: 44, 18452-18456, 2009). **Calculation:** Impacts can be substantial but are highly dependent on the specific program implemented.