Municipality of North Cowichan
Environmental Advisory Committee
AGENDA

Tuesday, April 20, 2021, 1:30 p.m.
Electronically

Pages

1. CALL TO ORDER

This meeting, though electronic, is open to the public and all representations to the Environmental Advisory Committee form part of the public record. At this time, due to the COVID-19 Pandemic, public access to meeting rooms at North Cowichan Municipal Hall is not permitted, however, this meeting may be viewed on the District's live stream webcast at www.northcowichan.ca/meetings.

2. APPROVAL OF AGENDA

Recommendation:
That the Committee approve the agenda as circulated [or as amended].

3. ADOPTION OF MINUTES 2 - 3

Recommendation:
That the Committee adopt the minutes of the meeting held March 16, 2021.

4. BUSINESS

4.1. Introduction from Dr. Gordon McIntosh, BPI Ice Breaker 4 - 7

Prior to the Meeting: Please complete the attached "Behavioral Patterns Inventory" exercise (no need to submit to anyone in advance of the session) and bring your results to the meeting.

4.2. CAEP Actions - Sorting, Prioritization and Responsibility Process 8 - 34

Purpose: To review the draft policies and actions derived from the updated CAEP model as provided by the Consultant SSG and recommend a prioritized implementation action program to Council that maximizes the community's contribution to GHG reduction (& co-benefits) consistent with District and community capacity. Facilitated by Dr. Gordon McIntosh.

5. NEW BUSINESS

6. ADJOURNMENT

Municipality of North Cowichan
Environmental Advisory Committee
MINUTES

March 16, 2021, 1:30 p.m.
Electronically

Members Present	Councillor Kate Marsh, Chair Neil Anderson Cam Campbell Bruce Coates Per Dahlstrom Dr. Jana Kotaska Sandra McPherson Ashley Muckle Dr. Jesse Patterson
Members Absent	David Coulson Dr. Geoffrey Strong Dr. Shannon Waters
Staff Present	David Conway, Director, Engineering Projects Shaun Chadburn, Environmental Programs Coordinator Dave Preikshot, Senior Environmental Specialist Tricia Mayea, Deputy Corporate Officer

1. CALL TO ORDER

There being a quorum present, the Chair called the meeting to order at 1:33 p.m.

2. APPROVAL OF AGENDA

The following item was added as a late item to the agenda under New Business:

- Motion regarding circulating items and articles of interest to the Committee members

IT WAS MOVED AND SECONDED:
That the Committee approve the agenda as amended. CARRIED

3. ADOPTION OF MINUTES

IT WAS MOVED AND SECONDED:
That the Committee adopt the minutes of the meeting held March 2, 2021. CARRIED

4. BUSINESS

4.1 Presentation from Dr. Dave Preikshot providing an Overview of Emissions inventories and modelling used in 2013 and 2021

The Senior Environmental Specialist, Dave Preikshot provided a presentation with further background information on the 2021 CAEP Update projects approach on modelling and

GHG inventory in relation to the 2013 plan in order to allow staff and consultants to move onto developing an implementation framework for the committees future consideration. A copy of the presentation was included in the agenda package.

Jesse Patterson left the meeting at 3:30 p.m.

4.2 Discussion on Future Multi-Criteria Analysis Workshop on Climate Actions

The Committee discussed the desired parameters to be used for the multi-criteria analysis workshop.

IT WAS MOVED AND SECONDED:
That Sandy McPherson Chair the meeting. CARRIED

Chair Marsh left the meeting at 4:16 p.m. and Sandy McPherson assumed the Chair. Chair Marsh returned to the meeting at 4:24 p.m. and resumed the Chair.

5. NEW BUSINESS

5.1 Motion regarding circulating items and articles of interest to the Committee members

The Committee had questions about how to circulate items and articles of interest amongst themselves without breaking the open meeting rule [subsection 89(1) of the *Community Charter*.

The staff liaison will look into the matter and report back to the Committee.

6. ADJOURNMENT

The meeting ended at 4:38 p.m.

Certified by Recording Secretary

Signed by Chair

THE BEHAVIOURAL PATTERNS INVENTORY

INSTRUCTIONS:

1. For each group of four words, select the word which best describes you and score 1 in the box to the left under Step #1.
Select the word which next best describes you, score it 2 and enter in the box to the left under Step #1, and so on scoring 4 for the word which least describes you.

2. Transfer the scores in the boxes on the left to the white squares on the right.

3. Add up the scores in each column and enter the totals on the bottom of the page. They should cross total to 80

4. Transfer the totals to boxes A-O-C-S on the next page

Step #1		Step #2			
	TALKATIVE				
	SUPPORTIVE				
	OBJECTIVE				
	SOFT SPOKEN				
	DETERMINED				
	SOCIABLE				
	CONFIDENT				
	PATIENT				
	DEPENDABLE				
	SELF-CONTROLLED				
	CARING				
	FORCEFUL				
	FRIENDLY				
	CONVINCING				
	CAREFUL				
	SELF-SUFFICIENT				
	OPTIMISTIC				
	SINCERE				
	DISCIPLINED				
	OUTGOING				
	COOPERATIVE				
	LOYAL				
	ANALYTICAL				
	DARING				
	AGGRESSIVE				
	ACCURATE				
	AGREEABLE				
	WARM				
	RESPONSIVE				
	STRONG-WILLED				
	COMPETITIVE				
	THOUGHTFUL				
STEP# 3 TOTALS 80 =		**A**	**O**	**C**	**S**

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STEP #4

INSTRUCTIONS (continued)

5. Circle the number in each column which corresponds to the total you have entered above.

6. Join the circles A-O-C-S.

7. Tiebreaker: If you have two circles at exactly the same level - less than 20 on the chart; please complete the tiebreaker (#7) at the bottom of the page to determine your highest dimension.

TOTALS	**A**	**O**	**C**	**S**
HIGH DIMENSION	08	08	08	08
	09	09	09	09
	10	10	10	10
	11	11	11	11
	12	12	12	12
	13	13	13	13
	14	14	14	14
	15	15	15	15
	16	16	16	16
	17	17	17	17
	18	18	18	18
	19	19	19	19
STEP# 5	20	20	20	20
	21	21	21	21
STEP# 6	22	22	22	22
	23	23	23	23
	24	24	24	24
	25	25	25	25
	26	26	26	26
	27	27	27	27
	28	28	28	28
	29	29	29	29
	30	30	30	30
	31	31	31	31
LOW DIMENSION	32	32	32	32
HIGHEST DIMENSION (Lowest Score)				
TOTALS				
STEP #7 TIE BREAKER				
SYMPATHETIC				
ASSERTIVE				
CAUTIOUS				
ENTHUSIASTIC				

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THE BPI CHARACTERISTICS

A ***ASSERTIVE & ACTION-ORIENTED***	**O** ***OUTGOING & SOCIABLE***
Independent	Dependent
Confident (Self-Assured)	Caring
Optimistic	Supportive
Competitive	Cooperative
Goal-Oriented	Outgoing and Responsive
Assertive	Gets Along Well with Others
Time Perspective-Impatient	Warm and Sociable
High Need to Achieve	High Need to Affiliate
May Overstate and Exaggerate	Time Perspective-Future
Fast-Paced	May Act Impulsively
Direct Look, Few Smiles	Emotional (Show Feelings)
More Aware of Self Than Others	More Aware of Others
Makes Own Decisions	Rely on Opinions of Others
Talkative	Seeks Recognition From Other
Risk Taker	Yes, When Should Say No
May Dominate	Animated Gestures
May Be Ambitious	Need to Be Needed
Control Important	Trust People Implicitly

C ***CONTROLLED & DISCIPLINED***	**S** ***STABLE & STEADY***
Objective	Soft-Spoken
Determined	Patient and Reliable
Self-Controlled	Careful and Cautious
Self-Sufficient	Sincere
Disciplined	Loyal
Analytical	Agreeable
Accurate	Thoughtful
Strong Willed	Respectful
Reserved Socially	Supportive and Quiet
Independent	Dependent
Withdrawn At Times	Good Listener
Rely on Own Strengths	Wait for Others to Initiate
Need Space Don't Push	Want to Be Included
Strong Control of Feelings	Few Hand Gestures
Cautious and Exacting	Warm and Smiling
Industrious and Strong Willed	Gets All the Facts
Evaluates Carefully	Needs Reassurances
Calm and Self-Controlled	Accepting of Others
Objective and Cool Rationale	Good Natured

BPI CHARACTERISTICS

ACTION

	Need - recognition **Save - effort** **O** **OUTGOING & SOCIABLE** **Avg. 10%**	**Need - control/results** **Save - time** **A** **ASSERTIVE & ACTION-ORIENTED** **Avg. 10%**	***INDEPENDENT***
DEPENDENT			
RELATIONAL	**Need - stability** **Save - relationship** **S** **STABLE & STEADY** **Avg. 40%**	**Need - accuracy** **Save - face** **C** **CONTROLLED & DISCIPLINED** **Avg. 40%**	***TASK***

THINKING

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Hello EAC members,

In preparation for a productive meeting on April 20th, our facilitator (Dr. Gordon McIntosh) has developed the attached "CAEP ACTIONS" overview for the session (Attachment 1)

For the first session (April 20th), Dr. McIntosh is asking that members review the actions list at the end of the overview (same actions as the list I sent late last week) and come prepared to discuss what you feel the "Significance" of each action is by assigning a "High, Medium or Low" significance rating to each. If you have difficulty in doing this, I would suggest referring to the comments from Sustainability Solutions Group in the "Notes and Assumptions" column in the "CAEP Update Draft Climate Actions" list I sent out last week (Attachment 2), as well as referring to the marginal abatement cost curve for the relative significance of the emissions reduction and costs, found on the last page of the "CAEP Economic and Emissions Modelling Overview" (Attachment 3)

At the first session we will categorize the actions into different "baskets" by using the committee's rating of "Significance" of each action/initiative. The second session (May 4th) will unpack each of the "More Significant" actions in more detail (using criteria provided by the EAC at the last meeting) and then assign a "Now, Next, and Later" priority to each of them. This information can be passed along to SSG for consideration when preparing a draft implementation plan as well as being provided to Council.

Thanks for your time

Shaun Chadburn BSc. Env
Environmental Programs Coordinator
Development and Engineering Services | Engineering

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CAEP ACTIONS
Sorting, Prioritization & Responsibility Process

PURPOSE

To review the draft policies and actions derived from the updated CAEP model as provided by the Consultant SSG and recommend a prioritized implementation action program to Council that maximizes the community's contribution to GHG reduction (& co-benefits) consistent with District and community capacity

PROCESS

April 20 – SORTING

1. **Working Together**
2. **Overview of process**
3. **Review proposed SORTING criteria**
4. **Assess significance of EACH action**

May 4 – PRIORITIZING

1. **Review April 20 Outcomes**
2. **Review proposed PRIORITIZING criteria**
3. **Assess priority each HIGH significance action**
4. **Identify potential leadership role(s)**
5. **Confirm recommendations to Council**

PRODUCT

- **Report to council –** process & rationale for recommendations with a NOW implementation program

PEOPLE

- **Committee –** reflect community interests using agreed upon criteria
- **Staff** – provide technical information and implementation implications
- **Facilitator & Chair** – achieve aims while hearing all views

CAEP ACTIONS
Sorting, Prioritization & Responsibility Criteria

DRAFT for Committee Discussion & Confirmation

SORTING - Significance – High, Medium & Low	
1. GHG Reduction	
2. Urgency	*Current threat or unique opportunity*
3. Environmental Co-benefits	*Habitat protection, air/water/soil quality*
4. Community Co-Benefits	*Livability, aesthetics, active lifestyles, smart growth*
5. Organizational Co-benefits	*Cost savings, efficiency, leadership*
6. Cost/Benefit	*Low cost/high impact*
7. OCP	Land Use, Transportation…….
PRIORITZING – NOW, Next & Later for High Significance Actions first	
1. Available Funding	*Exists, possible & difficult – District/Other Source*
2. Staff Work Program	*Doable, requires change & difficult - Time/Expertise*
3. Legislative Authority	*Within Mandate to requires senior government authority*
4. Technological Capacity	*Exists, early stages & unknown*
5. Community Support	*Invisible/readiness to major behaviour change required*
6. Partner Readiness	*Exists, potential to unknown - Government, NPO & Business*
LEADERSHIP/RESPSONBILITY	
1. District	*Direct, Enabling Others or Advocacy*
2. Other Government	*First Nation, Regional District, Province or Federal*
3. Non-Profit Sector	*Community Group, Provincial or National Association*
4. Business Sector	*Chamber of Commerce to specific sectors*

CAEP ACTIONS
Sorting, Prioritization & Responsibility Chart

SIGN = Significance; PRIO = priority; RESP = Responsibility; & REC = Recommendation to Council

	ACTION from CAEP	SIG	PRI	RES	REC
1	Land Use: Encourage and mandate infill development and multi-family homes, mixed-use developments. (Infill policy, density bonusing, zoning.) Establish 'climate lens' for use in proposed development assessments and approvals processes.				
2	Land Use: Infrastructure plans are subject to approval through a climate lens framework.				
3	Land Use: Create a policy requiring all new development applications to include an energy plan demonstrating the energy use of the development, energy use intensity targets, thermal energy demand intensity targets, and energy efficiency characteristics.				
4	Land Use: Develop tree canopy cover targets and annual tree planting program to achieve them.				
5	Buildings – General: Develop, adopt, and apply a standard for net-zero and climate resilient new construction. This may be done through the rezoning application process and Energy Conservation DPAs. Require that combustion energy supply and combustion-based appliances are disallowed in new buildings (certain exceptions may apply for commercial and industrial applications) via bylaw.				
6	Buildings – General: Implement a PACE program to finance/deliver building retrofits for different sectors/building type retrofits including heat pumps and solar PV.				
7	Housing: Develop a retrofit program to enable and fast-track deep energy and climate resilience retrofits in residential buildings (including heat pump installations).				
8	ICI and Municipal Buildings: Develop a retrofit program to enable and fast-track deep energy and climate resilience retrofits in non-residential buildings (including heat pump installations).				
9	ICI and Municipal Buildings: Develop a by-law requiring green roofs on new large buildings.				
10	ICI and Municipal Buildings: Develop an industrial coalition and support program for improving industrial process efficiency.				
11	ICI and Municipal Buildings: Create a retrofit policy and timeline on municipal building retrofit schedule.				
12	Transportation: EV bulk purchase and incentive programs.				
13	Transportation: Coordinate with the province on EV purchase and incentive programs.				
14	Transportation: EV charging equipment bulk purchase/installation and incentive programs.				

15	Transportation: BC Transit target: 100% electric by 2030.				
16	Transportation: All municipal vehicles are required to be zero emissions by 2030. Implement through facilities management plan.				
17	Transportation: Require all new developments to provide 100% of parking stalls with fast EV charging equipment (zoning bylaw update). Install fee-based EV charging stations at civic locations. Partner with businesses in providing EV charging stations.				
18	Transportation: Increase transit mode share through mode share - As per other transit actions.				
19	Transportation: Increase active transportation mode share: As per other transit actions. Include: revise street standard bylaws to complete streets standards that accommodate walking and cycling infrastructure (e.g. pathways and bike racks).				
20	Energy Production: Require all new buildings to have solar PV installations that supply 50% of the buildings' electric load. Use Energy Conservation DPA.				
21	Energy Production: Require 80% of existing buildings to have solar PV installations that supply 50% of the buildings' electric load.				
22	Energy Production: Require that all buildings using natural gas applications use renewable gas if they are unable to use electric systems. Heat pumps are the preferred space/water heating system.				
23	Energy Production: Require all new buildings built from 2022 onward to be energy storage ready. Install zero-emissions back-up power in critical infrastructure.				
24	Energy Production: Partner with a regional renewable energy cooperative capable of deploying renewable energy systems to buildings.				
25	Energy Production: Determine the best approach to supplying thermal energy to high heat demand buildings through a DE system.				
26	Energy Production: Follow the Province’s lead on hydrogen adoption to supplant natural gas use, preferring its use in natural gas lines when it becomes available and encouraging it for use in industrial processes.				
27	Solid Waste and Wastewater: Require end-of-life replacement of potable water system pump equipment with models that are 50% more energy efficient.				
28	Solid Waste and Wastewater: Implement water fixture efficiency specifications in building codes for new construction. Implement education and incentive programs for water fixture replacement and decreased water use.				
29	Solid Waste and Wastewater: Improve solid waste diversion collection services. Impose maximums on the number of garbage bags per household and volumes/tonnages for ICI buildings.				

	Implement a program to collect organic waste from multi-family, commercial, industrial, and institutional buildings. Work with businesses and incent zero waste options for local shopping.				
30	Solid Waste and Wastewater: Install anaerobic digestion facilities for wastewater treatment and biogas capture for use as renewable natural gas.				
31	Carbon Sequestration: Establish annual tree planting targets to substantially increase tree count. Update the MFR management strategy with carbon sequestration annual targets and best practices.				
32	Municipal Operations: Use the City's fair share carbon budget as a guide for decision-making, aiming to make all community operations carbon neutral by 2030.				
33	Municipal Operations: Integrate climate into financial decision-making by incorporating climate-related financial disclosure; a cost of carbon and a social cost of carbon; a municipal carbon budget; and a climate lens to capital and business planning and asset management.				
32	Municipal Operations: Develop and implement an energy and emissions inventory tracking tool. Use the tool in annual inventory updating and reporting.				
33	Municipal Operations: Monitor provincial, national, and international climate change scientific publications and agreements in order to update emissions reduction target (and associated energy and emissions inventories and models) every 5 years or less.				
34	Municipal Operations: Explore and establish new mechanisms for financing climate action (e.g. update the revolving loan fund).				

North Cowichan CAEP Update Draft Climate Actions

OCP Sector	Climate Change Goal	Climate Action	Potential Policy Approach	Notes and Assumptions
Land-use	Reduce emissions resultant from land-use arrangements.	Encourage and mandate infill development and multi-family homes, mixed-use developments. Establish 'climate lens' for use in proposed development assessments and approvals processes.	Infill policy, density bonusing, zoning.	Has synergistic effects with transportation/active transportation. Results in fewer new single family homes and encourages replacement of existing SFHs with multi-family. Results in typically smaller homes with shared walls/floors/ceilings = reduced energy use & emissions. New development is restricted to town centres. Decrease average dwelling size by 20% by 2050. Decrease the share of new buildings that are single family homes to 10% by 2050.
	Reduce emissions from infrastructure development.	Climate lens decision-making.	Infrastructure plans are subject to approval through a climate lens framework.	A climate lens decision-making framework can be developed (or borrowed) and applied to all new infrastructure proposals to ensure compliance with climate goals. Ideally, the framework is used at the outset of infrastructure planning, and not as a reactive measure to plans that are already developed.
	Reduce potential emissions in new developments.	Energy planning.	Create a policy requiring all new development applications to include an energy plan demonstrating the energy use of the development, energy use intensity targets, thermal energy demand intensity targets, and energy efficiency characteristics.	Coordinate with processes resultant from Step Code adoption.
	Reduce emissions from building cooling demand and sequester carbon.	Tree planting.	Develop tree canopy cover targets and annual tree planting program to achieve them.	Urban tree planting won't have a substantial sequestration potential, but will regulate microclimates to reduce cooling demands. (see related MFR action below).
Buildings - general	Reduce new buildings' potential emissions.	New building energy efficiency standards (energy use intensity and thermal energy demand intensity requirements).	Develop, adopt, and apply a standard for net-zero and climate resilient new construction. This may be done through the rezoning application process and Energy Conservation DPAs. Require that combustion energy supply and combustion-based appliances are disallowed in new buildings (certain exceptions may apply for commercial and industrial applications) via bylaw.	Aim to exceed the BC Step Code by requiring all new buildings are net-zero emissions starting in 2032 (i.e. not only "net-zero ready"), 2030 stretch goal. Excluding fossil fuel systems in homes is typically achieved by implementing an emissions/m2 maximum bylaw. Fossil fuel systems cannot meet the threshold.
	Reduce existing and new buildings' emissions.	Create financing for renewable energy projects.	Implement a PACE program to finance/deliver building retrofits for different sectors/building type retrofits including heat pumps and solar PV.	Use templates from other jurisdictions to set up PACE program. Use new provincial PACE program support.

Housing	Reduce existing buildings' potential emissions.	Retrofit existing housing stock.	Develop a retrofit program to enable and fast-track deep energy and climate resilience retrofits in residential buildings (including heat pump installations).	Achieve 50% thermal savings and 50% electrical savings in 80% of all existing dwellings by 2040. 100% of all homes' space heating and cooling and water heating needs are met by electrical sources by 2050. Pilot a bulk retrofits program to retrofit multiple homes of similar type or by neighbourhood. Establish PACE program for funding.
ICI and Municipal Buildings	Decrease emissions in existing buildings.	Retrofit existing ICI stock.	Develop a retrofit program to enable and fast-track deep energy and climate resilience retrofits in non-residential buildings (including heat pump installations).	Achieve 50% thermal savings and 50% electrical savings in 80% of all existing commercial buildings by 2040. 100% of all ICI buildings' space heating and cooling and water heating needs are met by electrical sources by 2050. Establish PACE program for funding.
	Decrease potential emissions in new buildings.	Green roofs.	Develop a by-law requiring green roofs on new large buildings.	Green roofs and solar panels can coexist.
	Decrease emissions in existing buildings.	Retrofit existing industrial buildings and operations.	Develop an industrial coalition and support program for improving industrial process efficiency.	Reduce industrial process emissions 50% by 2050.
	Decrease emissions in existing buildings.	Retrofit municipal buildings.	Create a retrofit policy and timeline on municipal building retrofit schedule.	100% of existing municipal buildings are retrofit to net zero emissions by 2030. Efforts will need to be coordinated with CVRD on its buildings within DNC.
Transportation	Decrease transportation emissions.	Zero emissions personal vehicles	EV bulk purchase and incentive programs.	Coordinated by City and partners. 100% of all new car sales are electric models by 2030. Coordinate a municipal-resident bulk purchasing program? Coordinate with provincial and federal incentive programs.
		Zero emissions commercial vehicles	Coordinate with the province on EV purchase and incentive programs.	100% of all new sales by 2040.
			EV charging equipment bulk purchase/installation and incentive programs.	Coordinated by City and partners
		Zero emissions transit	BC Transit target: 100% electric by 2030.	
		Zero emissions municipal fleet	All municipal vehicles are required to be zero emissions by 2030. Implement through facilities management plan.	Timelines for heavy equipment may be longer.

		EV charging network	Require all new developments to provide 100% of parking stalls with fast EV charging equipment (zoning bylaw update). Install fee-based EV charging stations at civic locations. Partner with businesses in providing EV charging stations.	Although perhaps not extensively used, a network of EV charging stations provides confidence to would-be EV users.
		Increase transit mode share through mode shifting.	As per other transit actions.	Increase transit mode share to 25% by 2050.
		Increase active transportation mode share through mode shifting.	As per other transit actions. Include: revise street standard bylaws to complete streets standards that accommodate walking and cycling infrastructure (e.g. pathways and bike racks).	35% of trips are walking and cycling by 2050, targeting trips of less than 2km for walking and less than 5km for cycling. E-bike and e-scooter efforts can be made alongside active transportation and EV efforts. Parking and charging facilities can be installed at civic buildings, businesses, institutions, and parks. Bike lane infrastructure can accommodate e-bike and e-scooter use.
Energy Production	Decrease fossil fuel energy production and use.	Increase production and use of zero-emissions energy in new buildings.	Require all new buildings to have solar PV installations that supply 50% of the buildings' electric load. Use Energy Conservation DPA.	
		Increase production and use of zero-emissions energy in existing buildings. (Coupled with building retrofit actions)	Require 80% of existing buildings to have solar PV installations that supply 50% of the buildings' electric load.	20% of buildings are assumed to be in conditions and/or locations unsuitable to PV installations. Priority on retrofits first to reduce overall energy demand so it can be more easily met by solar PV systems. (This action is debatable, as the current electricity grid supply is very low emitting and adding solar PV does little to reduce electricity emissions. Plus, there would be a substantial cost to retrofitting homes with PV. It remains an option, but is less necessary than other actions).
		Fuel switch from natural gas to electric systems or renewable natural gas.	Require that all buildings using natural gas applications use renewable gas if they are unable to use electric systems. Heat pumps are the preferred space/water heating system.	Policy in place by 2030. Assumes adequate availability of required RNG volumes.
		Energy storage.	Require all new buildings built from 2022 onward to be energy storage ready. Install zero-emissions back-up power in critical infrastructure.	Assumes availability of affordable energy storage technology options.
		Renewable energy infrastructure installation.	Partner with a regional renewable energy cooperative capable of deploying renewable energy systems to buildings.	
		University Village/Civic Arena area district energy system installation.	Determine the best approach to supplying thermal energy to high heat demand buildings through a DE system.	DE should be a secondary concern, following energy efficiency optimization of buildings. Once demand is reduced, the appropriate energy system can be designed. The DE system should now use fossil fuels, and ideally does not use any form of combustion. Despite

				typically being considered net-zero, biomass combustion concentrates biomass emissions in the short-term instead of allowing natural decomposition over the long-term.
		Hydrogen use instead of natural gas.	Follow the Province's lead on hydrogen adoption to supplant natural gas use, preferring its use in natural gas lines when it becomes available and encouraging it for use in industrial processes.	Hydrogen production needs to be done via renewable methods in order to be an improvement on natural gas use. Industrial processes should be prioritized for hydrogen use as they are often the most challenging to convert from fossil fuel use do to either the nature of the process or the high temperature heat required.
Solid Waste & Wastewater	Decrease emissions from City potable water operations.	Increase energy efficiency of potable water operations.	Require end-of-life replacement of potable water system pump equipment with models that are 50% more energy efficient.	Decrease energy used in pumping by 2%/year to 2050. This may be a business-as-usual action if pumps are replaced at end-of-life, or they could be proactively replaced sooner.
	Decrease emissions resultant from water use.	Decrease potable water use.	Implement water fixture efficiency specifications in building codes for new construction. Implement education and incentive programs for water fixture replacement and decreased water use.	Decrease water volume use by 2%/year to 2050. Coordinate with BC Hydro programs.
	Decrease emissions resultant from solid waste.	Decrease solid waste and divert waste from landfills.	Improve solid waste diversion collection services. Impose maximums on the number of garbage bags per household and volumes/tonnages for ICI buildings. Implement a program to collect organic waste from multi-family, commercial, industrial, and institutional buildings. Work with businesses and incent zero waste options for local shopping.	90% of residential and ICI waste diverted by 2050. 95% of organic waste diverted by 2030.
	Decrease emissions resultant from wastewater.	Improve wastewater treatment.	Install anaerobic digestion facilities for wastewater treatment and biogas capture for use as renewable natural gas.	100% of wastewater is treated by anaerobic digesters. Organic solid waste can also be treated at these facilities.
Carbon Sequestration	Remove greenhouse gases from the atmosphere.	Increase carbon sequestration capacity.	Establish annual tree planting targets to substantially increase tree count. Update the MFR management strategy with carbon sequestration annual targets and best practices.	MFR management could have a substantial sequestration impact, as shown in other assessments.
Municipal Operations	Decrease emissions through municipal decision-making.	Carbon budget.	Use the City's fair share carbon budget as a guide for decision-making, aiming to make all community operations carbon neutral by	Need to calculate carbon budget and determine how it could be used.

			2030.	Perhaps through a Climate Lens decision-making framework.
		Financial decision-making.	Integrate climate into financial decision-making by incorporating climate-related financial disclosure; a cost of carbon and a social cost of carbon; a municipal carbon budget; and a climate lens to capital and business planning and asset management.	
		Energy and emissions inventory tracking.	Develop and implement an energy and emissions inventory tracking tool. Use the tool in annual inventory updating and reporting.	SSG can provide a tracking tool.
		Emissions reduction target updating.	Monitor provincial, national, and international climate change scientific publications and agreements in order to update emissions reduction target (and associated energy and emissions inventories and models) every 5 years or less.	
		Funding climate action implementation	Explore and establish new mechanisms for financing climate action (e.g. update the revolving loan fund).	

North Cowichan Low Carbon Scenario (LCS) Engagement Materials

Energy Modelling from Sustainability Solutions Group

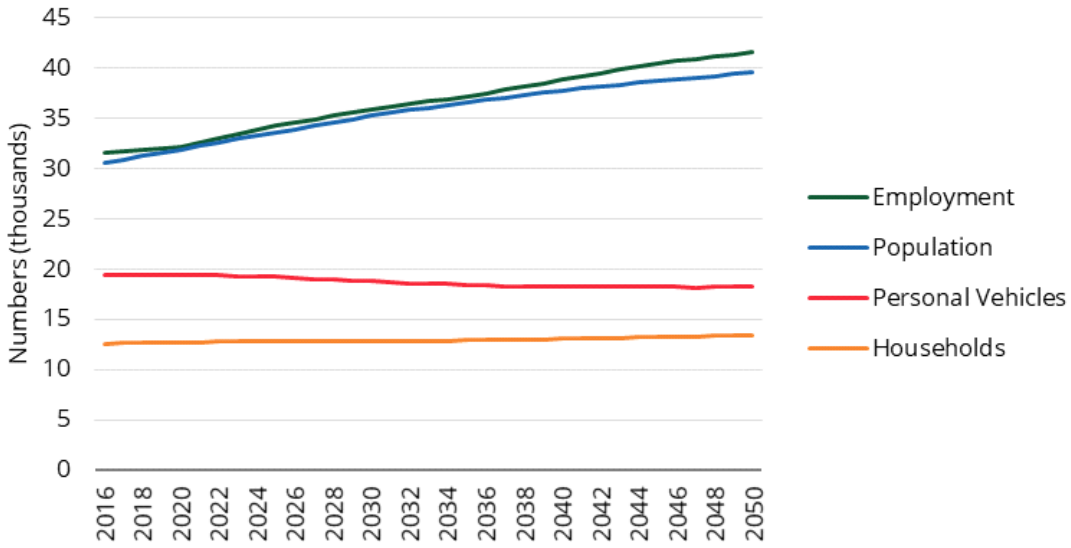

Figure 1: Population, Employment, Vehicles, and Households

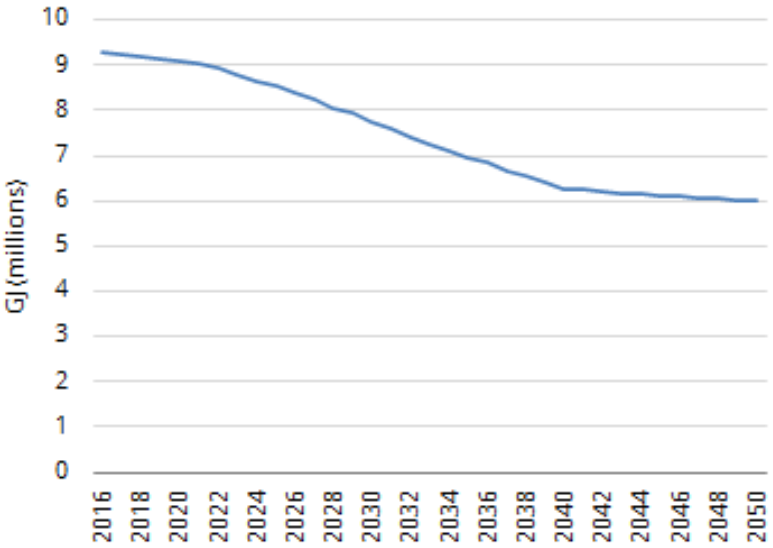

Figure 2: Total Energy - Total energy use decreases 35% between 2016 and 2050 as the Municipality implements actions, opportunities and measures in the Low Carbon Scenarios.

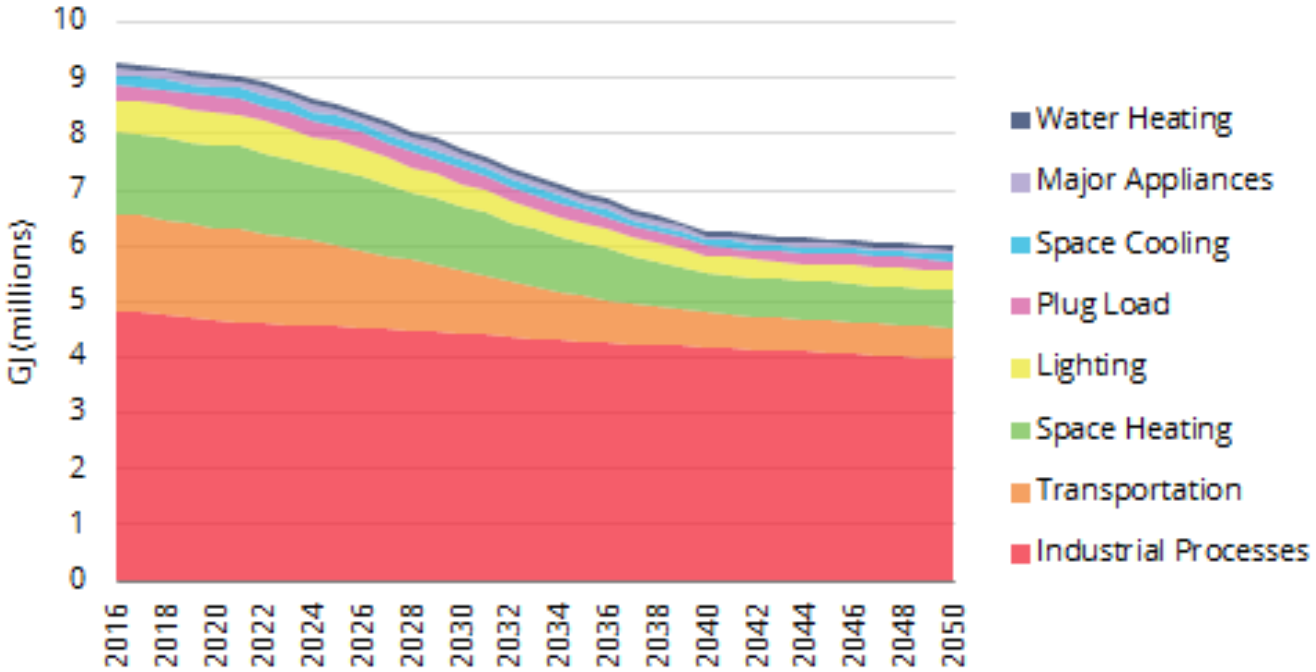

Figure 3 Total Energy by Sector

Industrial energy use from local small to medium industry account for half the energy used in the municipality (i.e. excludes the emissions from the Crofton mill as the federal government regulates and accounts for emissions of larger industrial emitters). Industrial energy use will decrease slightly with energy efficiency actions, even though industrial operations are expected to increase slightly over the next 30 years.

As electric vehicle ownership increases, total transportation energy use decreases because EVs are energy efficient in comparison to internal combustion engines.

Space and water heating energy demand decreases as electric heat pumps are installed, replacing natural gas heat and baseboard heaters. Heat pumps are at least 3 times more energy efficient than baseboard heaters.

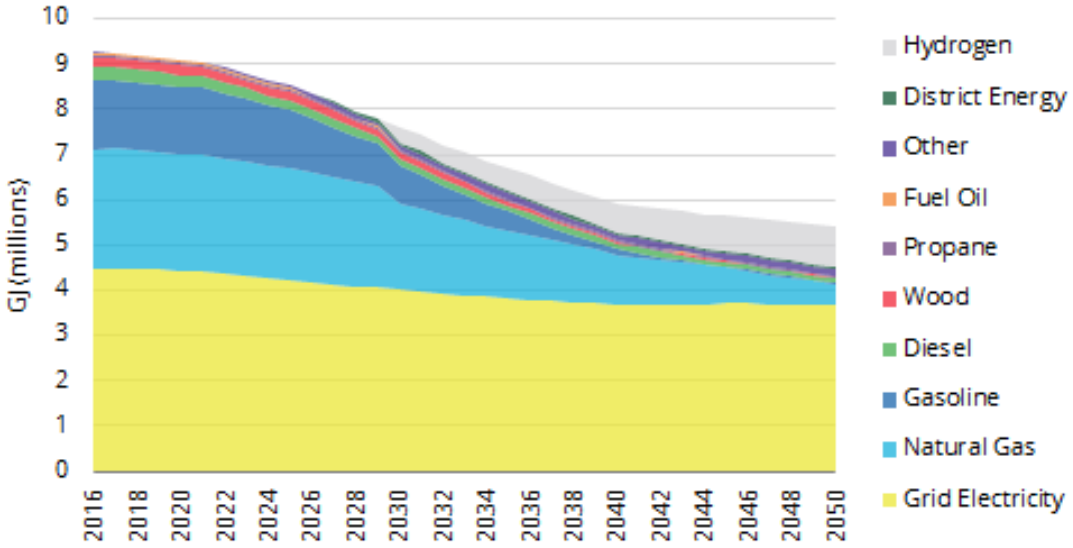

Figure 4: Total Energy by Fuel Type

Gasoline and diesel demand all but disappear by 2050 as vehicles electrify. Natural gas demand decreases significantly as heat pumps are installed in homes and businesses.

Hydrogen ("green" sourced) and renewable natural gas (RNG, gas captured from biological material and solid and liquid waste decomposition) replace some natural gas demand post-2030.

Overall, electricity decreases over time due to technological advancements in energy efficiency despite there being more homes with more space and water heating systems that utilize electricity.

Modelled Greenhouse Gas Emissions for the Municipality of North Cowichan

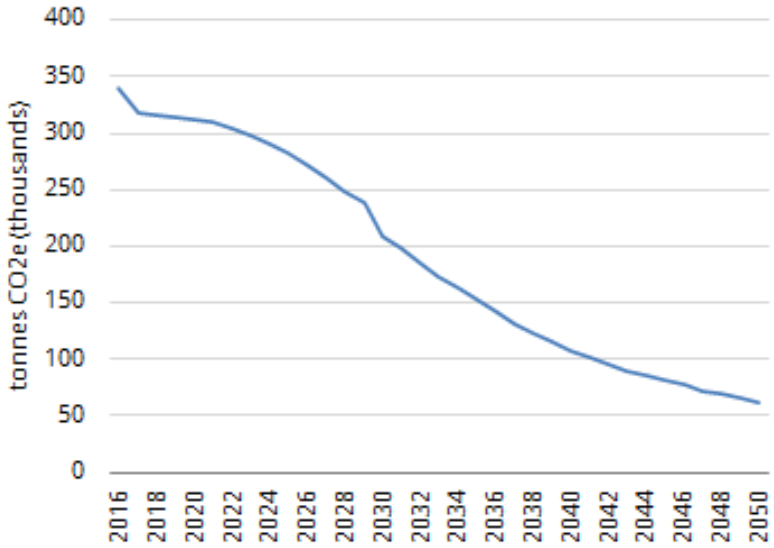

Figure 5: Total Emissions - Total emissions decrease 82% between 2016 and 2050 due to the implementation of actions, opportunities and measures in the proposed low-carbon scenario.

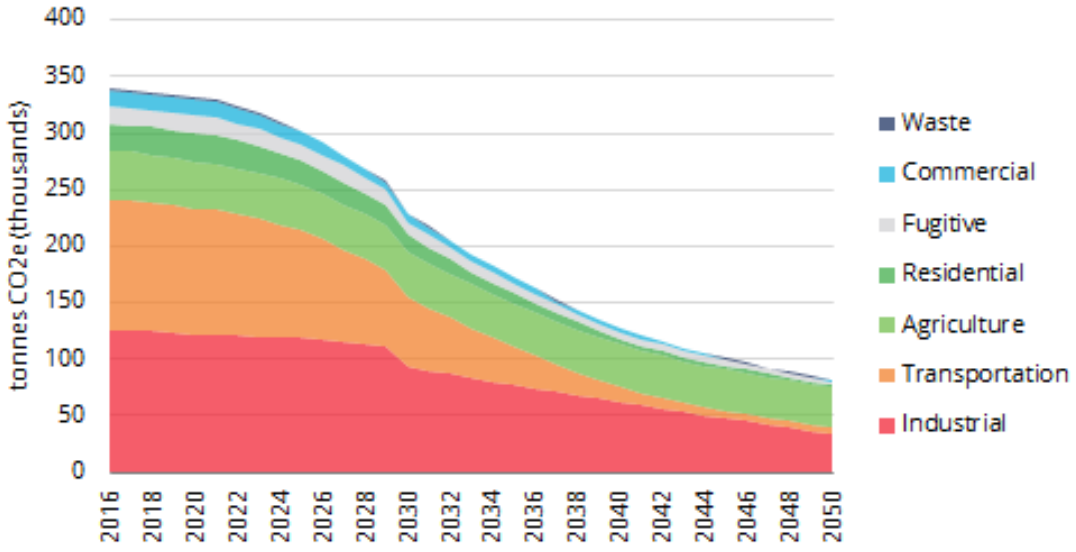

Figure 6: Total Emissions by Sector

Industrial emissions are decreased by half as energy efficiency measures are implemented and fossil fuel consuming processes are electrified. Transportation emissions all but disappear as vehicles electrify over time. Historic trends and forecasts for agricultural emissions suggest that no significant

increase or reduction is likely. Such forecasts may change given significant changes in farming technology and provincial guidelines to agricultural producers.

Commercial and residential buildings emissions all but disappear as the building stock is retrofitted for energy efficiency and transitions from fossil fuel energy to electricity. Fugitive emissions are the volumes of lost product during the distribution of natural gas, which is, itself, a powerful greenhouse gas.

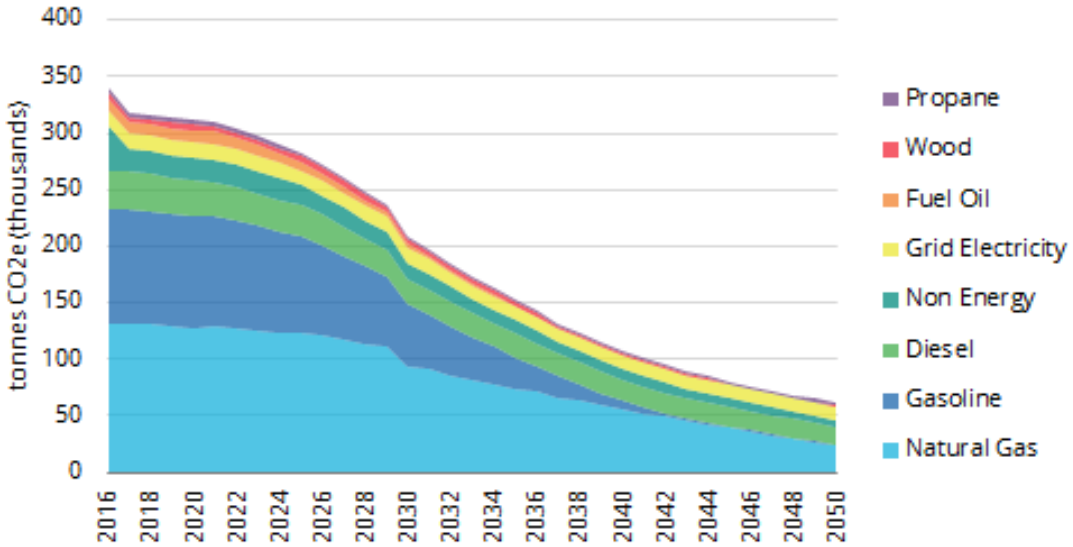

Figure 7: Total Emissions by Fuel Type

A portion of natural gas use remains in 2050 in the industrial sector and some diesel remains in 2050 as heavy-duty vehicles are the last to electrify. A small amount of emissions from the electricity grid remain in 2050 as some of the electricity imported into the province is generated from fossil fuel sources. “Non energy” emissions are those associated with agriculture (ex. crops, animals etc.).

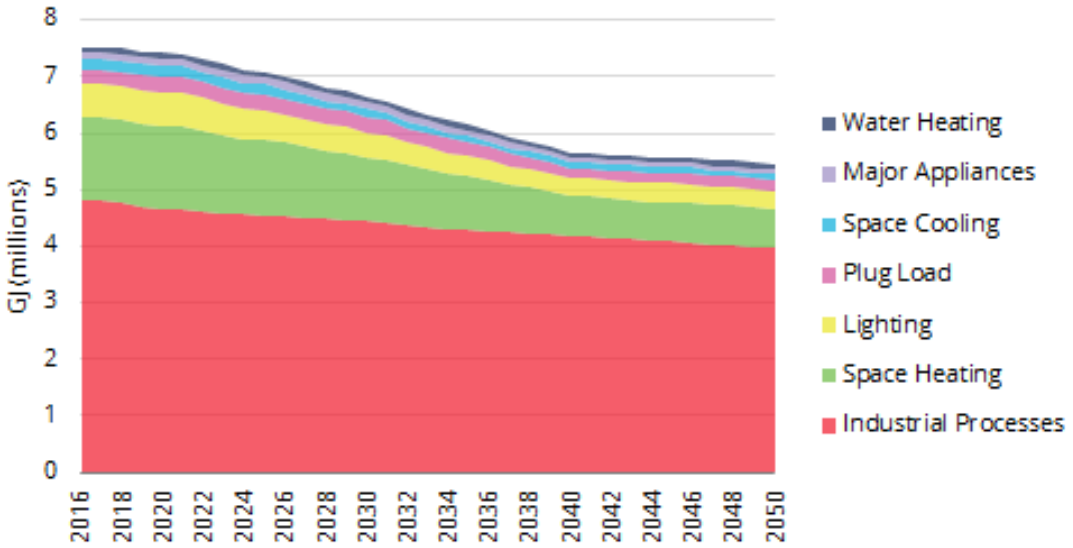

Figure 8: Energy in Buildings by Sector

Energy use in buildings decreases 28% by 2050 due to the implementation of proposed low-carbon scenario actions, opportunities and measures. Energy demand for space heating decreases significantly as homes are retrofit with energy efficient heat pumps.

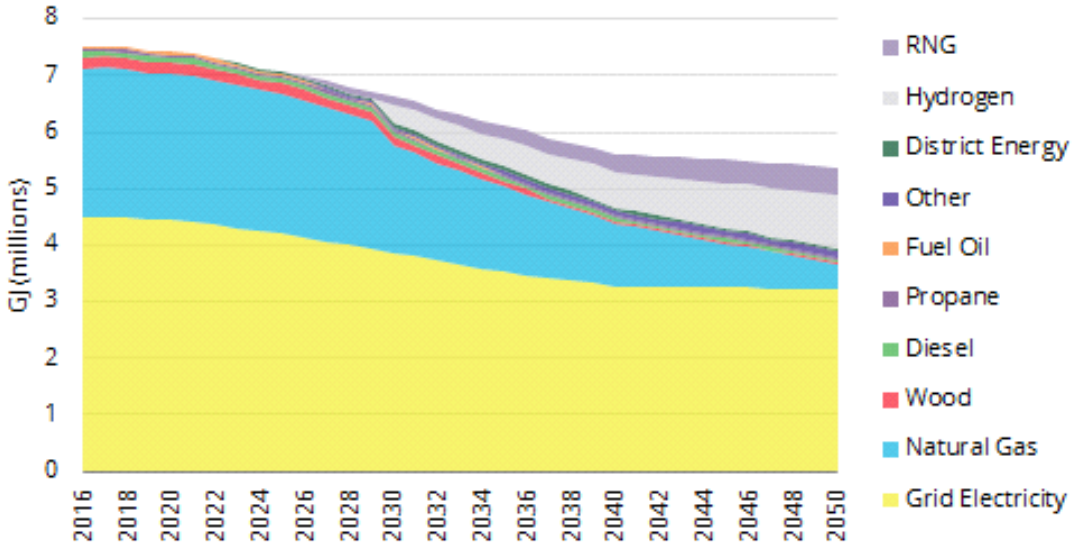

Figure 9: Energy Use in Buildings by Fuel Type

Electricity use in buildings decreases even though the number of buildings increases. This is due to the improved energy efficiency from insulation, window and door retrofits and switching heating systems to energy efficient heat pumps. Natural gas use in buildings is phased out and hydrogen and renewable natural gas are introduced in some buildings as a natural gas alternative.

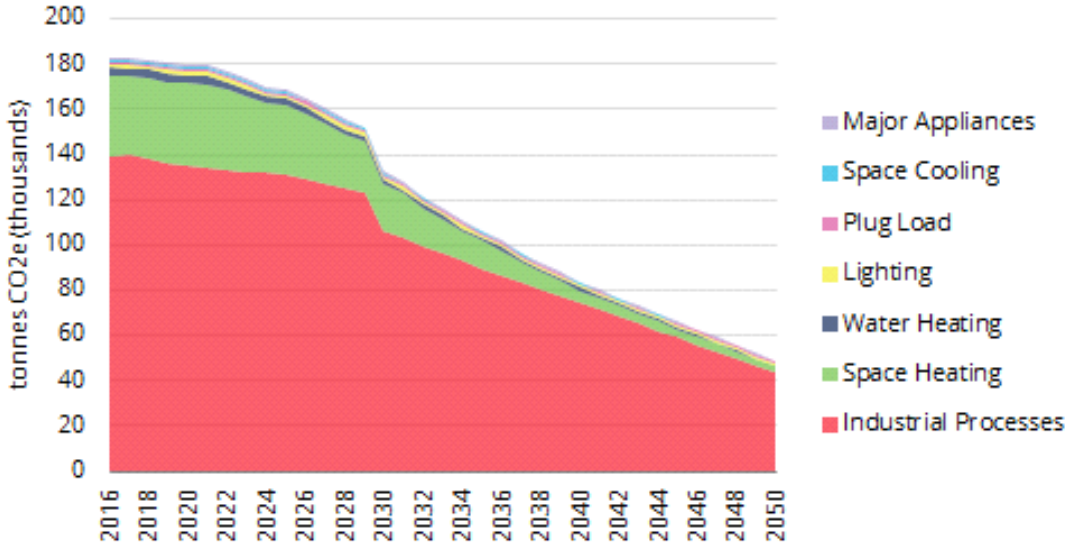

Figure 10: Emissions in Buildings by Sector

Emissions in buildings decrease 73% by 2050 due to the implementation of proposed low-carbon scenario actions, opportunities and measures. Industrial buildings account for 90% of emissions from the building stock in 2050.

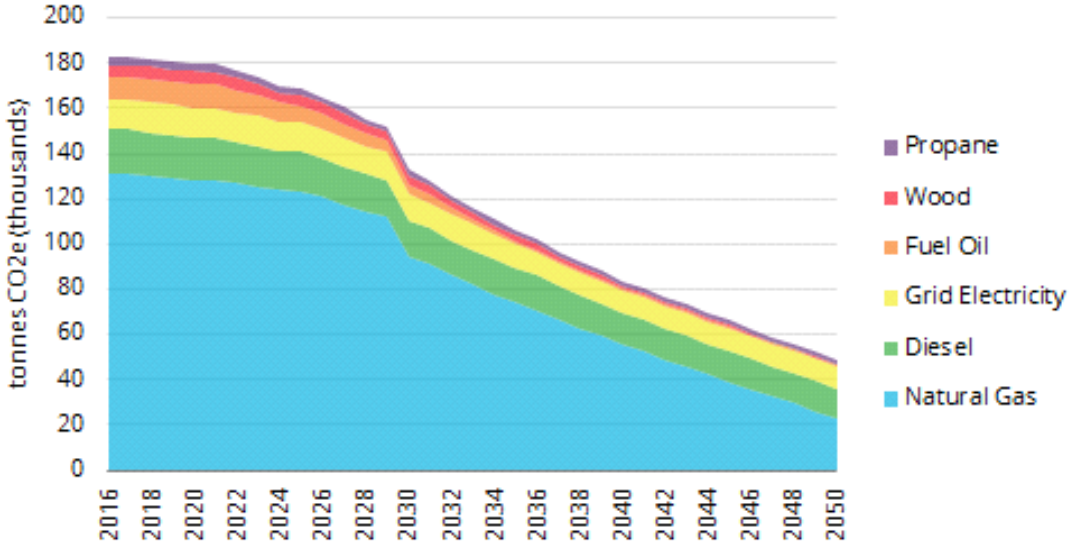

Figure 11: Emissions in Buildings by Fuel Type.

The majority of emissions from buildings in 2050 are from natural gas use in the industrial sector.

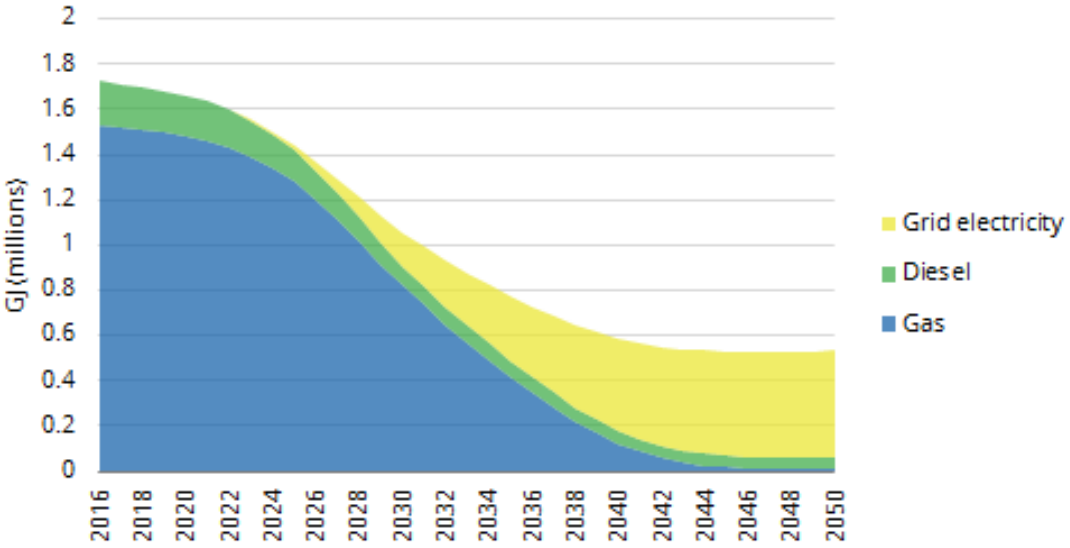

Figure 12: Energy in Transportation

Grid electricity use for vehicle charging increases substantially over the next 30 years and gasoline use is almost eliminated as vehicles electrify. Diesel use decreases as heavy-duty vehicles electrify over

time but heavy-duty vehicle models are projected to electrify at a slower rate than personal vehicles which leaves some diesel use remaining in 2050.

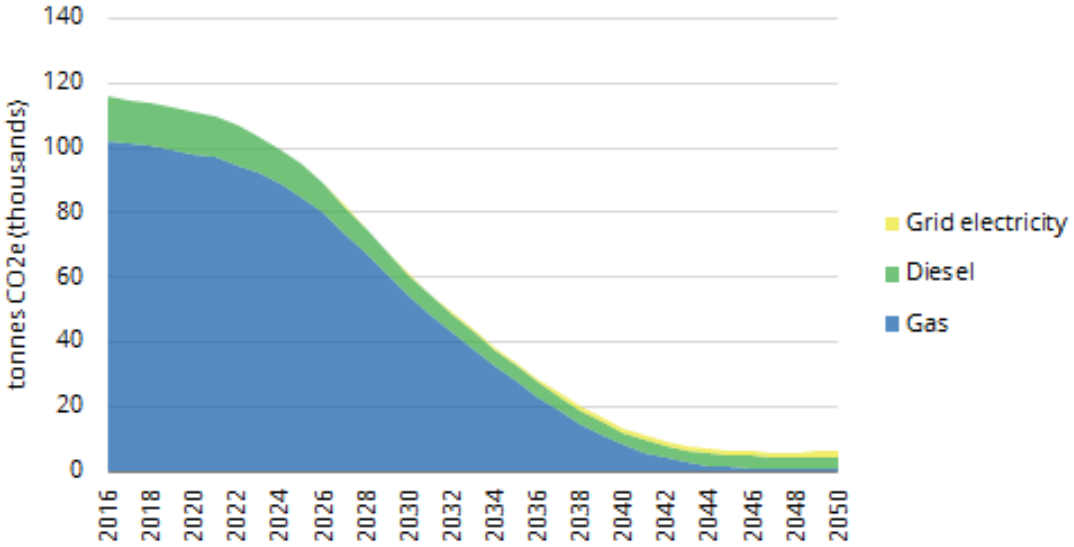

Figure 13: Emissions in Transportation

Gasoline based emissions disappear and emissions from diesel use are also reduced as heavy-duty vehicles electrify. Relative emissions from electricity use in vehicles increases due to the imported fossil fuel-generated electricity from out of Province.

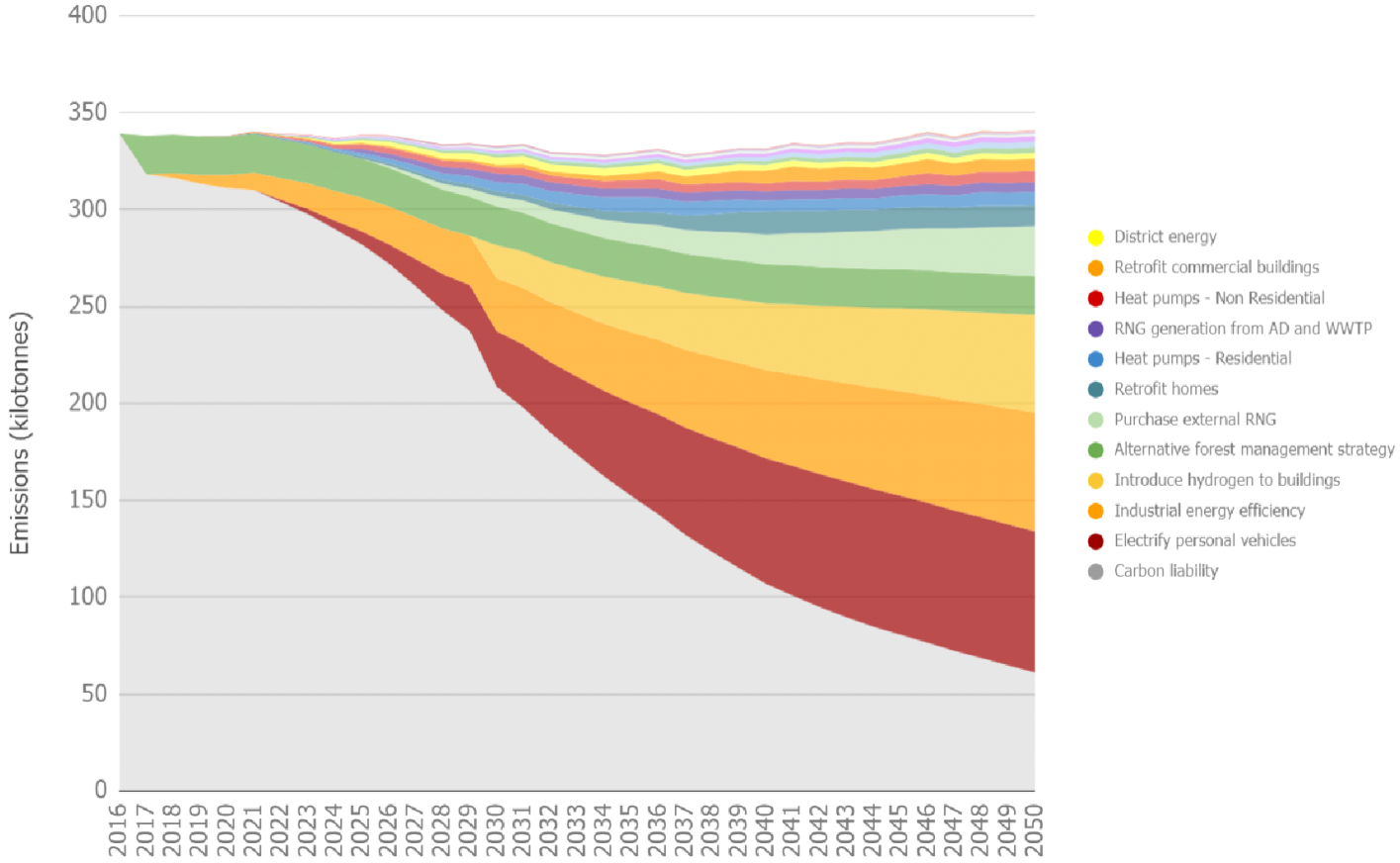

Figure 14: Emissions Reduction Wedges by Action

Seven actions are responsible for 90% of emissions reductions: Electric vehicle adoption, industrial sector energy efficiency and fuel switching, Hydrogen replacement of natural gas, Municipal forest management for carbon sequestration (These are preliminary estimates and also assume that carbon credits are not sold for profit), renewable natural gas purchasing to replace natural gas, home energy efficiency retrofits and switching home space and water heating to heat pumps.

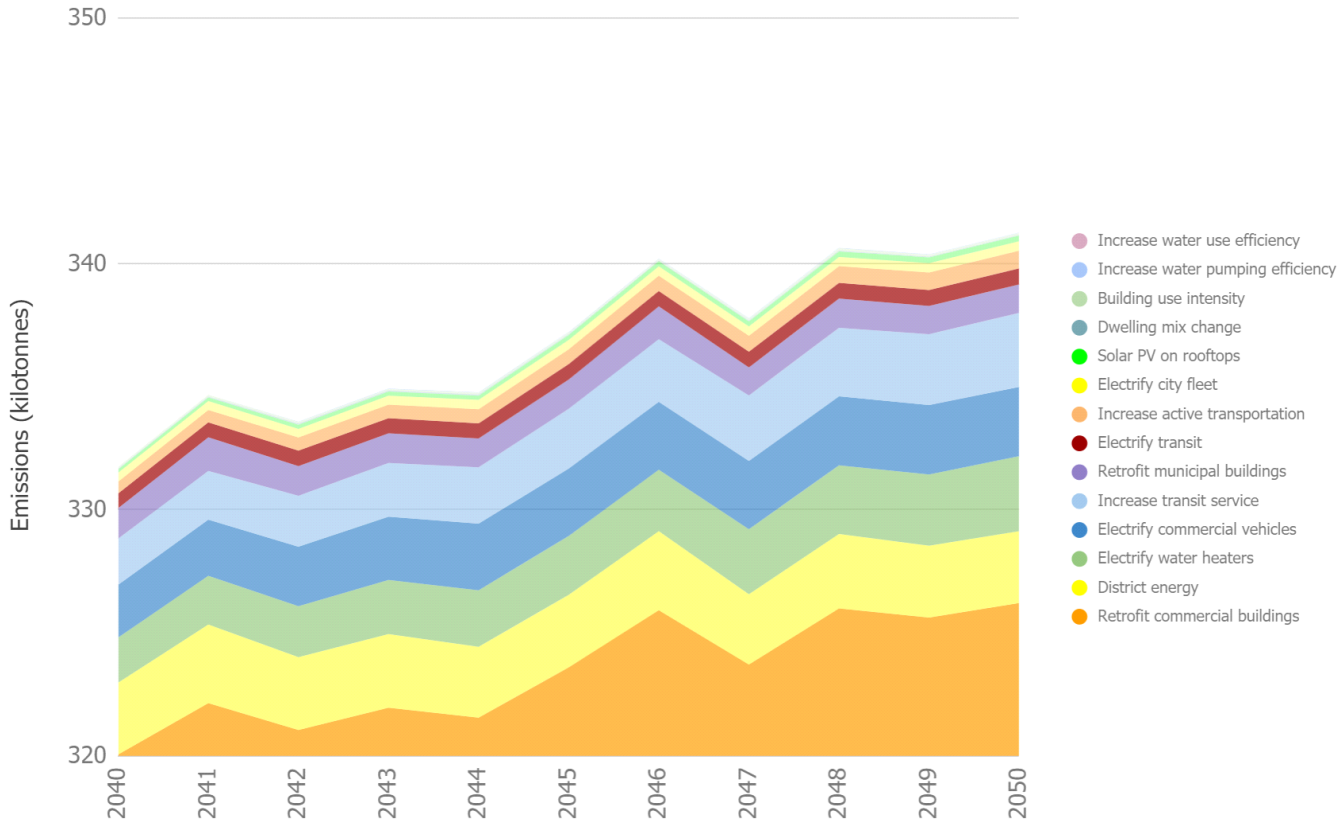

Figure 15: Emissions Reduction Wedges by Action (Continued)

Fifteen actions are responsible for the remaining 10% of total emissions reductions from actions not captured in Figure 14: Renewable natural gas generation from anaerobic digestion and waste water treatment processes, heat pumps (Non-Residential), retrofitting commercial buildings, implementation of district energy, electrifying water heaters, electrifying commercial vehicles, Increasing transit service use, retrofitting municipal buildings, electrifying transit, Increasing travel by active transportation, electrifying the Municipal fleet, installing solar photovoltaic systems on rooftops, changing the dwelling type mix (e.g. single family homes to multifamily buildings), reducing the energy intensity of buildings and increasing water pumping efficiency.

Economic Modelling for the Municipality of North Cowichan

**Assumptions used throughout the economic modelling utilize an interest rate of 3% and amortization period of 25 years. The assumptions also incorporate the Federal Government of Canada's December 2020 direction on carbon pricing (Changing to* $50 a tonne in 2022 then increasing $15 tonne each year to $170 a tonne by 2030.)

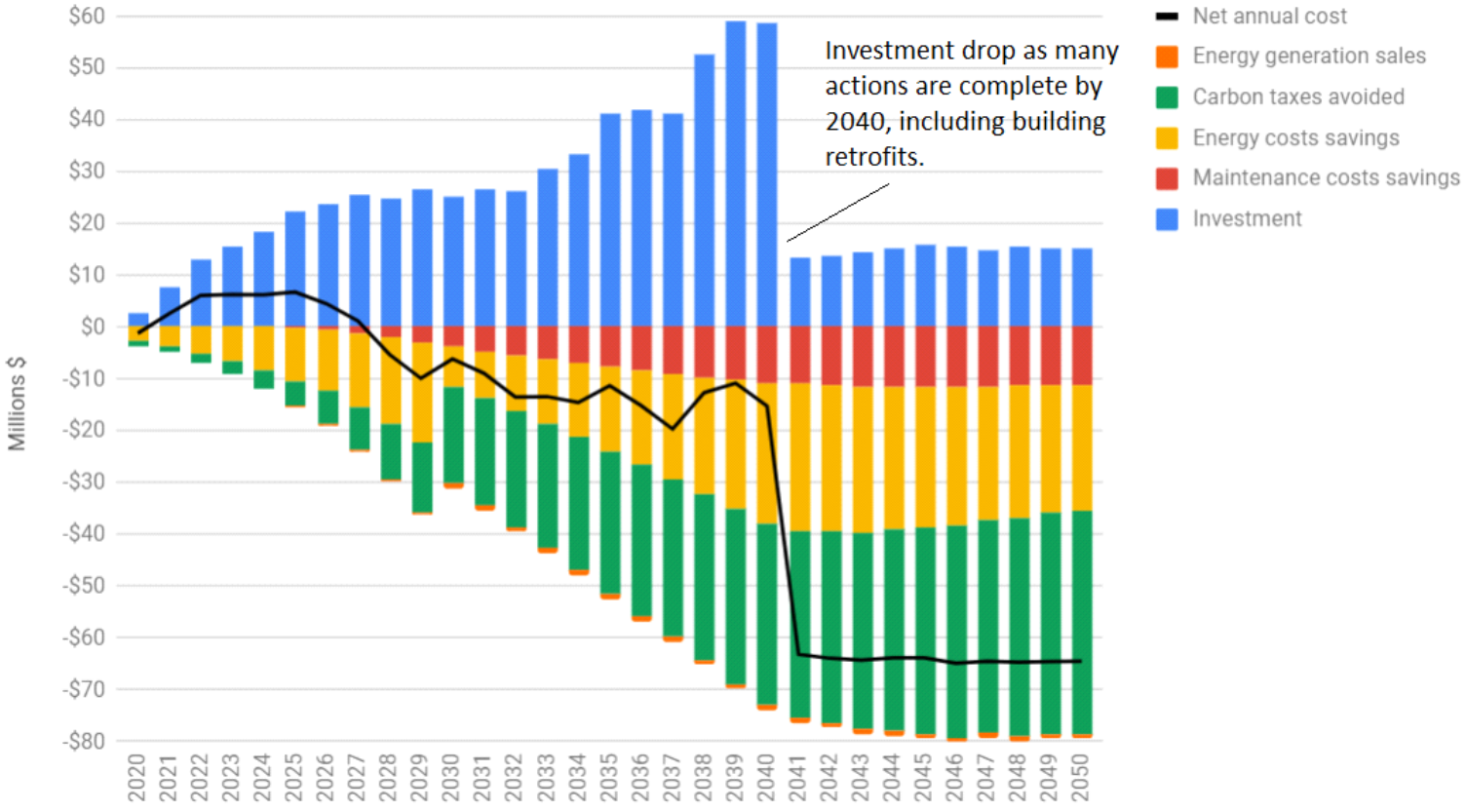

Figure 16: Low-Carbon Scenario Investments and Returns

Modelled investments and returns are compared to business as usual investments and returns. Figure 16 illustrates what investments and returns would be incurred beyond the BAU scenario. Total investments to implement LCS actions are above the horizontal axis. It's important to note that these investments are not borne solely via publicly funded taxes or the Municipality alone. Investment figures include those made by the Municipality, residents, businesses, etc.

"Revenues" shown above are from renewable energy generation sales. "Carbon" is the carbon taxes avoided due to fuel switching and energy efficiency actions. Energy is the energy costs that are avoided by implementation of Low carbon scenario actions. "Maintenance" is the operation and maintenance costs avoided due to buildings systems and electric vehicles that require less maintenance.

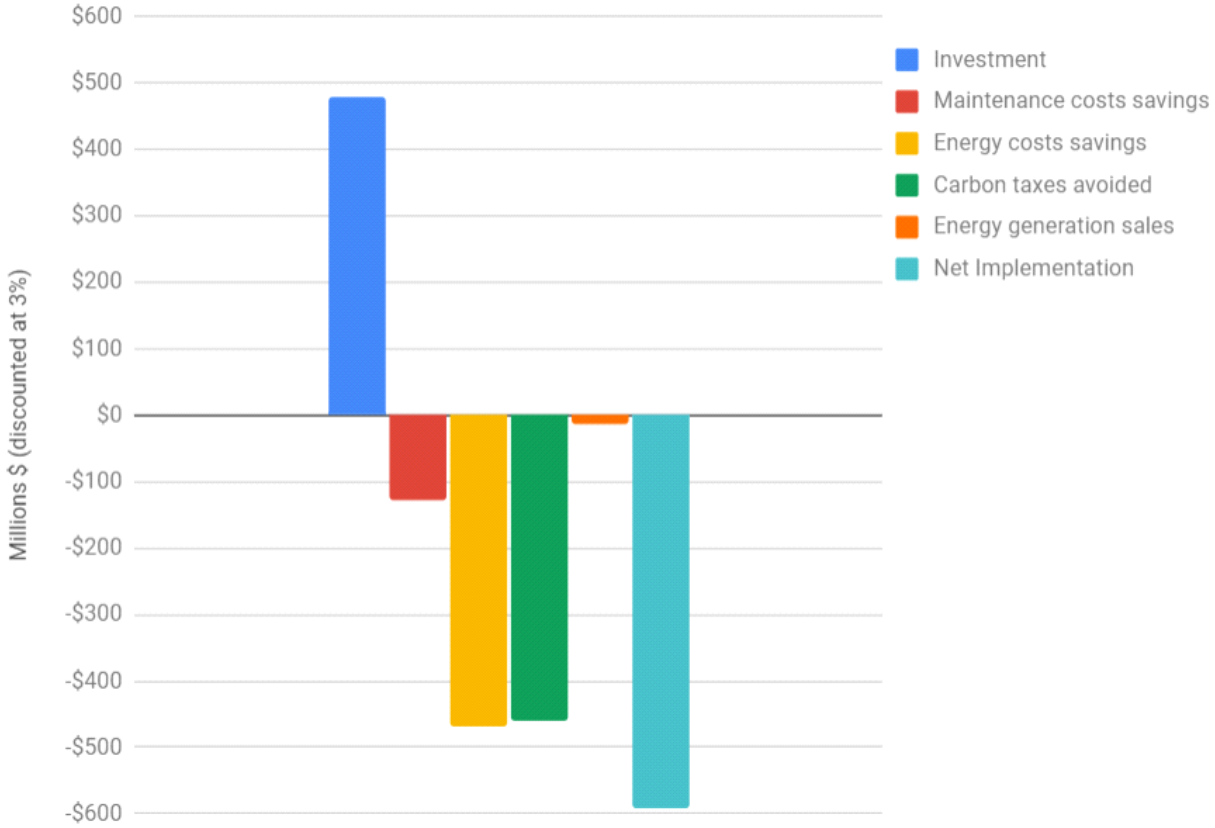

Figure 17: Cumulative Investments and Returns of Proposed Actions

Figure 17 shows the total investments and returns of the actions proposed under the low carbon scenarios. Investments total $500 million whereas maintenance, energy, carbon tax and revenue savings are $130 million, $485 million, $145 Million and $13 million, respectively (Totalling $773 Million). The net savings from these investments are $273 million dollars.

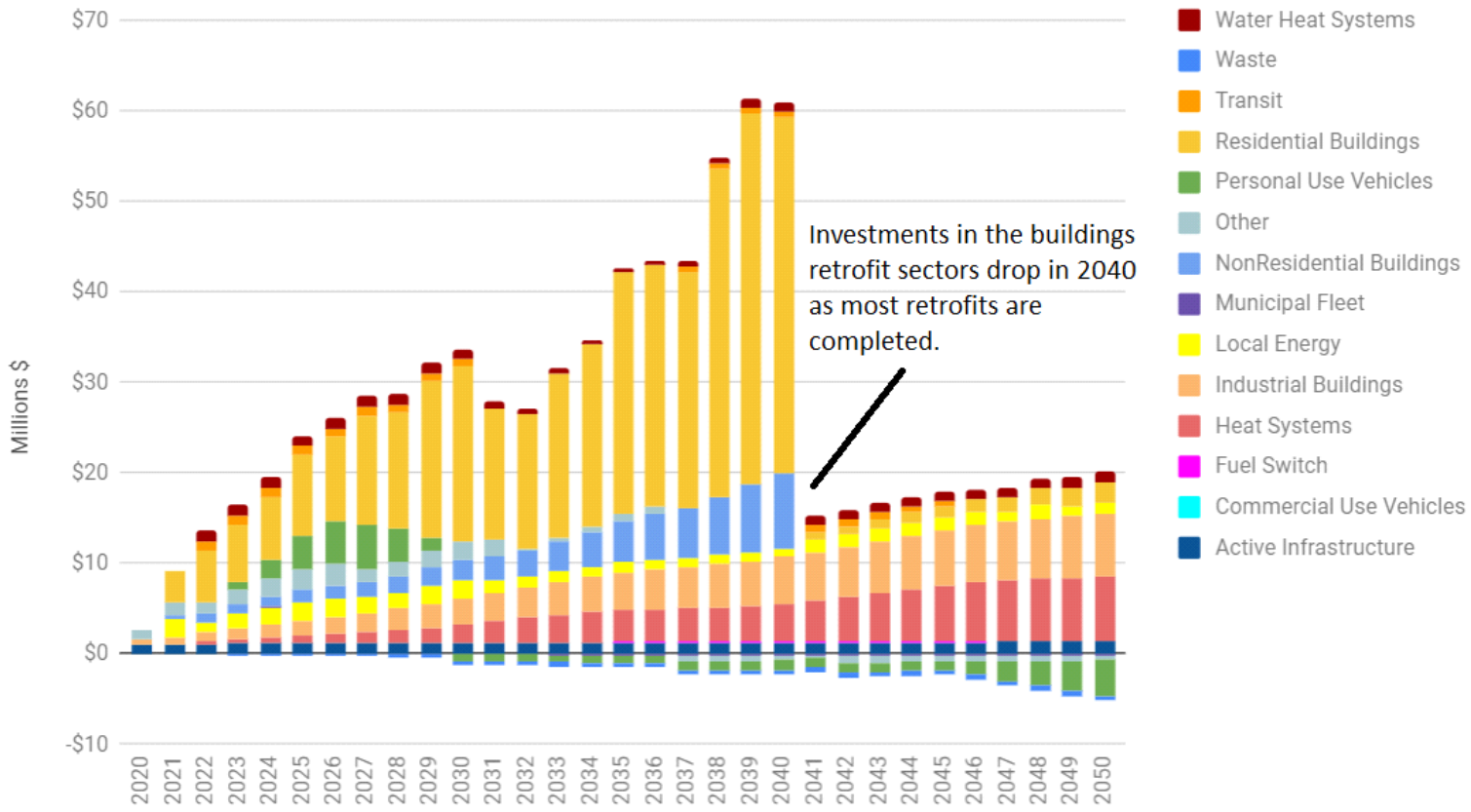

Figure 18: Investments by Sector

The largest investments are in residential building energy efficiency retrofits, EV purchases (although collectively these realize returns after 2030 when price parity with gasoline vehicles is assumed to be reached), non-residential building energy efficiency retrofits, heat pump systems as well as industrial building retrofits and fuel switching.

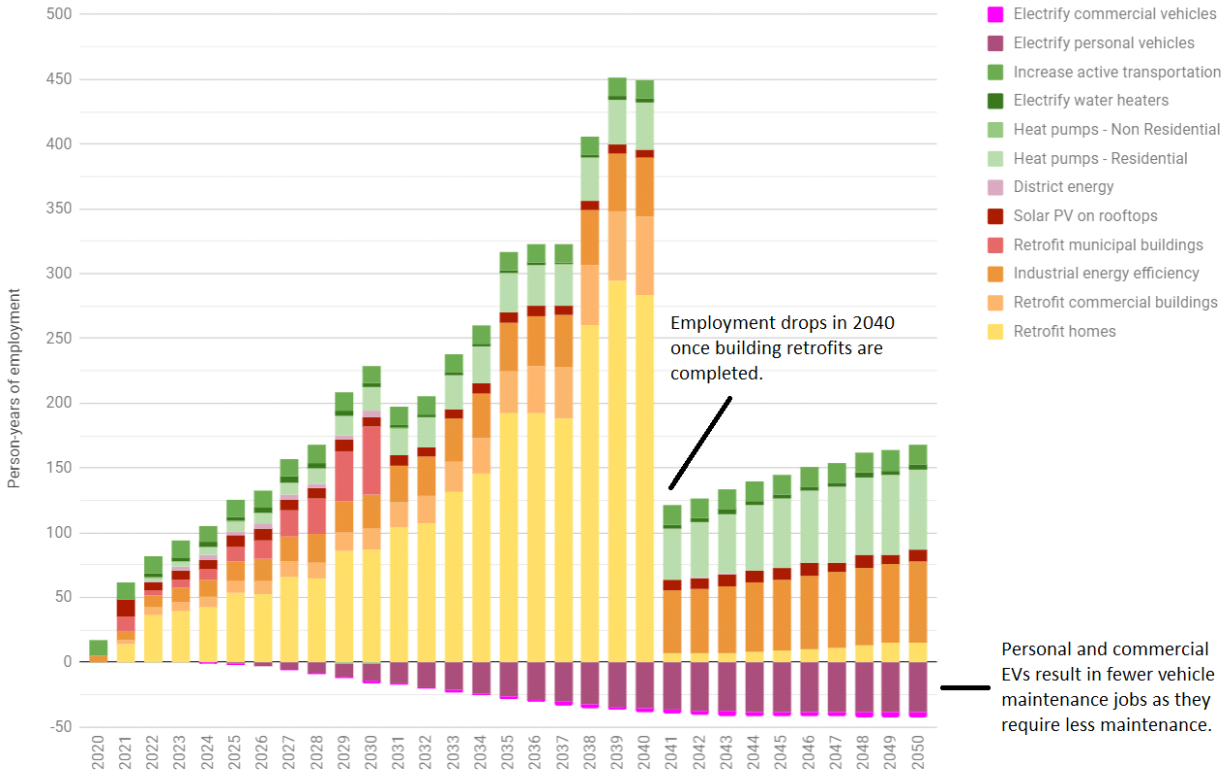

Figure 19:

Employment

As a result of the investments, local employment levels increase as actions are implemented. Employment is measured in person-years of employment created as the jobs created are not necessarily permanent, but in flux as the actions are implemented and eventually come to an end. Sectors with the largest employment gains are: Construction and trades for retrofitting homes, commercial, and industrial buildings, heat pump installers, active transportation infrastructure construction. Some maintenance jobs are lost in the personal and commercial vehicles sectors as EVs require less servicing.

In any year, the employment increase from low-carbon actions implementation is less than +2% of the projected labour force in that year.

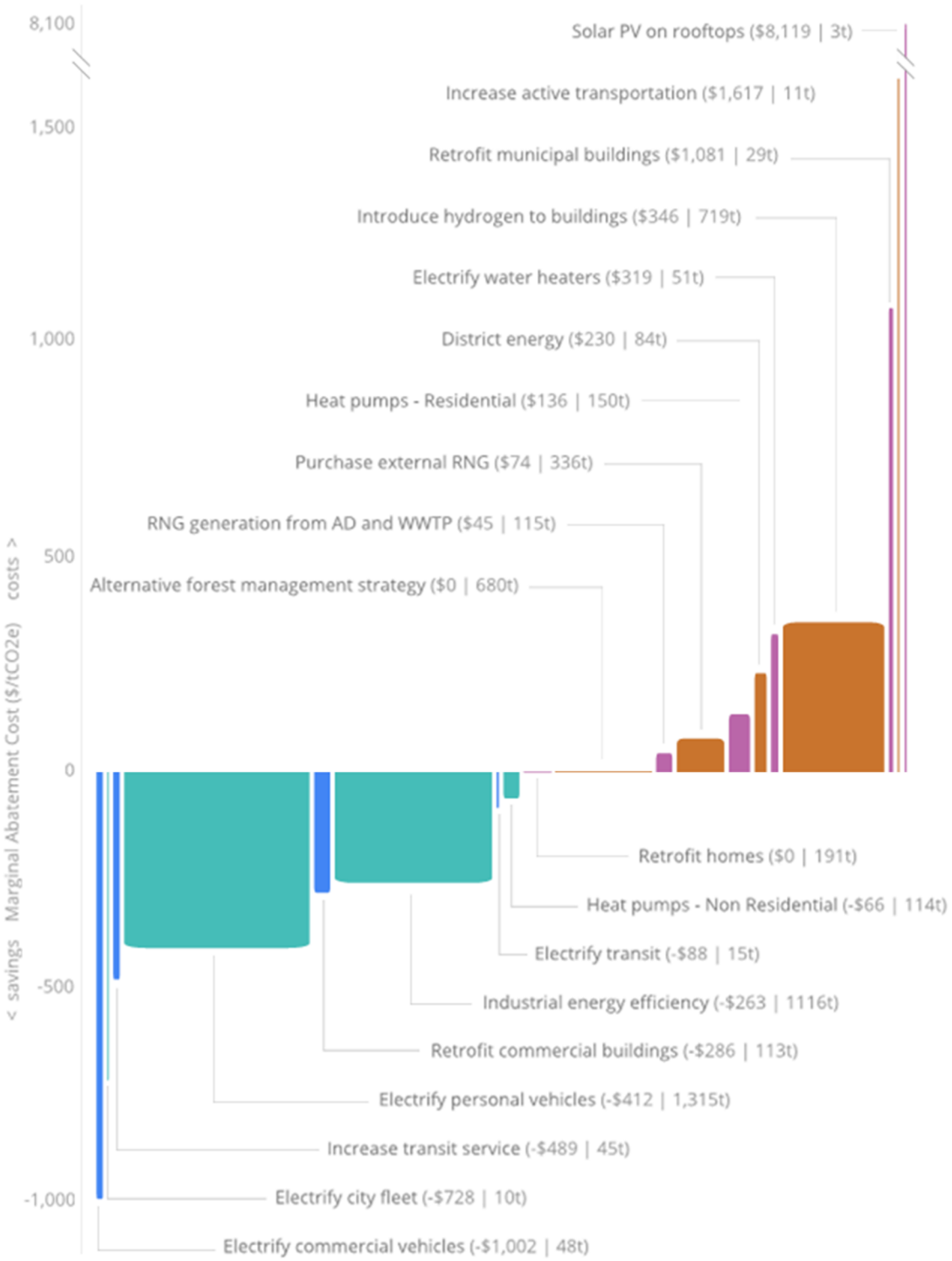

Figure 20: Marginal Abatement Cost Curve for Low Carbon Scenario Actions.

A marginal abatement cost curve (MACC) is a visual representation of the amount and cost per tonne of emissions reduction. X-Axis is proportion of carbon sequestration for a given action. Y-Axis is the cost of a given action per tonne of emissions reduced (Above the bar costs money, below the bar saves

money or avoids costs)*Note* Qualitative co-benefits not captured in graph but will be considered in future phases of the project.