

**METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE**

REGULAR MEETING

Friday, September 18, 2020

1:00 p.m.

28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia

A G E N D A¹

1. ADOPTION OF THE AGENDA

1.1 September 18, 2020 Regular Meeting Agenda

That the Climate Action Committee adopt the agenda for its regular meeting scheduled for September 18, 2020 as circulated.

2. ADOPTION OF THE MINUTES

2.1 July 17, 2020 Regular Meeting Minutes

That the Climate Action Committee adopt the minutes of its regular meeting held July 17, 2020 as circulated.

3. DELEGATIONS

4. INVITED PRESENTATIONS

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Strata Energy Advisor Pilot Program Results

That the MVRD Board:

- a) receive for information the report dated August 14, 2020, titled “Strata Energy Advisor Pilot Program results”; and
- b) direct staff to report back with options for administration and delivery of a region-wide Strata Energy Advisor Program.

5.2 Managing Metro Vancouver’s Corporate Energy and Greenhouse Gas Emissions (2014 to 2018)

That the Climate Action Committee receive for information the report dated August 14, 2020 titled “Managing Metro Vancouver’s Corporate Energy and Greenhouse Gas Emissions (2014 to 2018)”.

¹ Note: Recommendation is shown under each item, where applicable.

5.3 Water Supply Outlook 2120

That the Climate Action Committee receive for information the report dated July 29, 2020, titled "Water Supply Outlook 2120".

5.4 2020 Update on Water Sustainability Innovation Fund Projects

That the Climate Action Committee receive for information the report dated July 29 2020, titled "2020 Update on Water Sustainability Innovation Fund Projects".

5.5 Partnering Agreements for Metro Vancouver's Wood Stove Exchange Program

That the MVRD Board:

- a) authorize the participation of wood burning appliance retailers in Metro Vancouver's wood stove exchange program;
- b) direct staff to publish Metro Vancouver's intention to work with wood burning appliance retailers listed in (c) below to carry out the program;
- c) authorize the Metro Vancouver Regional District to enter into a partnering agreement with each of the following retailers to establish the terms and conditions of the services provided to Metro Vancouver as part of the program:
 - i. A&B Technical Services, Surrey, BC
 - ii. Encore Fireplaces Ltd., Langley, BC
 - iii. Fastgo System (2011) Inc. (doing business as Fireplaces Unlimited), Surrey, BC
 - iv. GDS Green Home Mechanical Inc., Port Moody, BC
 - v. Good Guys Heating Cooling & Plumbing Ltd., Surrey, BC
 - vi. Hallmark Heating, Duct and Chimney Services, Surrey, BC
 - vii. Hilltop Plumbing and Heating (2016) Ltd., White Rock, BC
 - viii. Northwind Heating Ltd., Surrey, BC
 - ix. Real Lighting & Fireplaces Ltd., Surrey, BC
 - x. Solace Home Comfort Ltd., Burnaby, BC and Port Coquitlam, BC
 - xi. The LM Fireplace Warehouse Ltd., Richmond, BC
 - xii. Vancouver Gas Fireplaces Ltd., Vancouver, BC; and
- d) authorize the Chief Administrative Officer to execute the partnering agreements listed in (c) above.

5.6 Manager's Report

That the Climate Action Committee receive for information the report dated September 10, 2020, titled "Manager's Report".

6. INFORMATION ITEMS

- 6.1 Correspondence re GHG emissions and Ride-Hailing dated July 10, 2020 to Jerry Dobrovolsky, CAO and Commissioner, Metro Vancouver Regional District from Mike Buda, Executive Director, Mayors' Council on Regional Transportation.**

7. OTHER BUSINESS

8. BUSINESS ARISING FROM DELEGATIONS

9. RESOLUTION TO CLOSE MEETING

Note: The Committee must state by resolution the basis under section 90 of the Community Charter on which the meeting is being closed. If a member wishes to add an item, the basis must be included below.

10. ADJOURNMENT/CONCLUSION

That the Climate Action Committee adjourn/conclude its regular meeting of September 18, 2020.

Membership:

Carr, Adriane (C) - Vancouver
Dhaliwal, Sav (VC) - Burnaby
Arnason, Petrina - Langley Township
Baird, Ken - Tsawwassen First Nation
Dupont, Laura - Port Coquitlam

Hocking, David - Bowen Island
Kruger, Dylan - Delta
McCutcheon, Jen - Electoral Area A
McIlroy, Jessica - North Vancouver City
McLaughlin, Ron - Lions Bay

Patton, Allison - Surrey
Steves, Harold - Richmond
van den Broek, Val - Langley City
Yousef, Ahmed - Maple Ridge

**METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE**

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Climate Action Committee held at 1:02 p.m. on Friday, July 17, 2020 in the 28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia.

MEMBERS PRESENT:

Chair, Councillor Adriane Carr, Vancouver
 Vice Chair, Councillor Sav Dhaliwal, Burnaby*
 Councillor Petrina Arnason, Langley Township*
 Chief Ken Baird, Tsawwassen*
 Councillor Laura Dupont, Port Coquitlam
 Councillor David Hocking, Bowen Island
 Councillor Dylan Kruger, Delta* (arrived at 1:08 p.m.; departed at 2:59 p.m.)
 Director Jen McCutcheon, Electoral Area A*
 Councillor Jessica McIlroy, North Vancouver City*
 Mayor Ron McLaughlin, Lions Bay
 Councillor Allison Patton, Surrey*
 Councillor Harold Steves, Richmond*
 Mayor Val van den Broek, Langley City*
 Councillor Ahmed Yousef, Maple Ridge*

MEMBERS ABSENT:

None.

STAFF PRESENT:

Roger Quan, Director, Air Quality and Climate Change, Parks and Environment
 Genevieve Lanz, Legislative Services Coordinator, Board and Information Services

1. ADOPTION OF THE AGENDA

1.1 July 17, 2020 Regular Meeting Agenda

It was MOVED and SECONDED

That the Climate Action Committee adopt the agenda for its regular meeting scheduled for July 17, 2020 as circulated.

CARRIED

*denotes electronic meeting participation as authorized by Section 3.6.2 of the *Procedure Bylaw*

2. ADOPTION OF THE MINUTES

2.1 June 19, 2020 Regular Meeting Minutes

It was MOVED and SECONDED

That the Climate Action Committee adopt the minutes of its regular meeting held June 19, 2020 as circulated.

CARRIED

3. DELEGATIONS

No items presented.

4. INVITED PRESENTATIONS

4.1 Arjun Singh, Chair, UBCM Special Committee on Climate Action

Arjun Singh, Chair, Union of British Columbia Municipalities (UBCM) Special Committee on Climate Action, provided members with an update on the UBCM Special Committee on Climate Action, highlighting proposed recommendations for partnerships between senior levels of government regarding affordable housing, transportation, waste management and social mobilization, and upcoming engagement process.

1:08 p.m. Councillor Kruger arrived at the meeting.

Presentation material titled “UBCM Special Committee on Climate Action: Update” is retained with the July 17, 2020 Climate Action Committee agenda.

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Board Budget Workshop – Overview and Next Steps for Air Quality and Climate Change

Report dated July 6, 2020 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment and Dean Rear, General Manager, Financial Services/Chief Financial Officer, providing members with an overview of the 2021 budget process and next steps.

Members were provided with a presentation on the 2021 Board budget process, highlighting short-term action plan options to provide relief to households as a result of the novel coronavirus (COVID-19) pandemic, regulatory fee adjustments and revenue opportunities, and next steps.

Presentation material titled “Board Budget Workshop – Overview and Next Steps” is retained with the July 17, 2020 Climate Action Committee agenda.

It was MOVED and SECONDED

That the Climate Action Committee receive for information the report dated July 6, 2020, titled “Board Budget Workshop – Overview and Next Steps for Air Quality and Climate Change”.

CARRIED

5.2 Metro Vancouver’s Achievement of Carbon Neutrality in 2019

Report dated June 30, 2020 from Amy Thai, Environmental Technician II and Morgan Braglewicz, Senior Policy and Planning Analyst, Parks and Environment, providing members with the Provincial Climate Action Revenue Incentive Program submission and Metro Vancouver’s achievement of carbon neutrality in 2019.

Members were provided with a presentation on Metro Vancouver’s achievement of carbon neutrality in 2019, highlighting corporate greenhouse gas emissions and key carbon credit projects, energy and emissions reporting, and *Climate 2050 Roadmaps* next steps.

Presentation material titled “Metro Vancouver’s Achievement of Carbon Neutrality in 2019 – Climate Action Revenue Incentive Program (CARIP)” is retained with the July 17, 2020 Climate Action Committee agenda.

It was MOVED and SECONDED

That the MVRD Board receive for information the report titled “Metro Vancouver’s Achievement of Carbon Neutrality in 2019”, dated June 30, 2020.

CARRIED

5.3 Climate and Energy UBCM Resolutions Endorsed by Metro Vancouver Member Jurisdictions

Report dated June 22, 2020 from Morgan Braglewicz, Senior Policy and Planning Analyst and Erik Blair, Air Quality Planner, Parks and Environment, providing members with UBCM climate and energy resolutions endorsed by member jurisdictions.

It was MOVED and SECONDED

That the MVRD Board direct staff to forward the report dated June 22, 2020, titled “Climate and Energy UBCM Resolutions Endorsed by Metro Vancouver Member Jurisdictions” to member jurisdictions in preparation for the Union of British Columbia Municipalities convention on September 22–24, 2020.

CARRIED

5.4 Engagement on Amendments to Air Quality Permit and Regulatory Fees

Report dated July 8, 2020 from Ray Robb, Division Manager, Environmental Regulation and Enforcement, Derek Jennejohn, Lead Senior Engineer, Parks and Environment, seeking MVRD Board authorization to proceed with the Air Quality Permit and Regulatory Fees Amendments engagement process.

Members were provided with a presentation on Metro Vancouver's air quality regulatory services, highlighting permitting program and enforcement, principles for fee increases and cost recovery opportunities, and engagement process phases and engagement schedule.

Presentation material titled "Engagement on Amendments to Air Quality Fees – Metro Vancouver Permit and Regulatory Fees" is retained with the July 17, 2020 Climate Action Committee agenda.

It was MOVED and SECONDED

That the MVRD Board authorize staff to proceed with the engagement process as presented in the report dated July 8, 2020, titled "Engagement on Amendments to Air Quality Permit and Regulatory Fees".

CARRIED

5.5 Consultation on Expanding the Non-Road Diesel Engine Emission Regulation

Report dated July 3, 2020 from Ray Robb, Division Manager, Environmental Regulation and Enforcement and Cindy Onyejekwe, Senior Policy Analyst, Parks and Environment, seeking MVRD Board approval of the scope of proposed amendments to *GVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* and authorization to proceed with the engagement process.

2:59 p.m. Councillor Kruger departed the meeting.

Members were provided with a presentation on the Non-Road Diesel Engine Emissions program, highlighting the health impacts of diesel particulate matter, bylaw objectives and proposed changes, target emission engines and engine tiers, and consultation process and next steps.

Presentation material "Options for Future Direction of Metro Vancouver Non-Road Diesel Engine Emission Program" is retained with the July 17, 2020 Climate Action Committee agenda.

It was MOVED and SECONDED

That the MVRD Board:

- a) approve the scope of the proposed amendments to *GVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* and authorize staff to proceed with the engagement process as presented in the report dated July 3, 2020, titled "Consultation on Expanding the Non-Road Diesel Engine Regulation; and
- b) endorse the engagement plan attached to the report titled "Consultation on Expanding the Non-Road Diesel Engine Emission Regulation", dated July 3, 2020.

CARRIED

5.6 2020 Update on Regional District Sustainability Innovation Fund Projects

Report dated June 24, 2020 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment and Megan Gerryts, Corporate Policy Advisor, CAO Executive Offices, providing members with an update on the 2020 Regional District Sustainability Innovation Fund projects.

Members were provided with a presentation on the 2020 Regional District Sustainability Innovation Fund projects, highlighting the Strata Energy Advisor Program, DC Fast Charger at Metro Tower III, National Industrial Symbiosis Program, LumiAir: Lighting Your Path to Clean Air, Air Aware: Air Quality and Citizen Science, Climate Literacy Modules, Sustainable Infrastructure and Buildings Policy Design Guide and Transit Oriented Affordable Housing Implementation Calculator.

Presentation material titled “2020 Update on Sustainability Innovation Fund Projects – Regional District” is retained with the July 17, 2020 Climate Action Committee agenda.

It was MOVED and SECONDED

That the Climate Action Committee receive for information the report dated June 24, 2020, titled “2020 Update on Regional District Sustainability Innovation Fund Projects”.

CARRIED

5.7 Manager’s Report

Report dated June 22, 2020 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment, providing members with an update on the Climate Action Committee 2020 Work Plan, carbon neutral modelling scenarios project, building automation systems at the District of North Vancouver, and regional flood alerts and high water levels.

It was MOVED and SECONDED

That the Climate Action Committee receive for information the report dated June 22, 2020, titled “Manager’s Report”.

CARRIED

6. INFORMATION ITEMS

- 6.1 Correspondence re Alignment of Federal, Provincial, and Local Government Greenhouse Gas Targets dated June 9, 2020 to Mr. Sav Dhaliwal, Chair, Board of Directors from The Honourable Jonathan Wilkinson, Minister of Environment and Climate Change.**
- 6.2 Correspondence re Trans Mountain Expansion Project Reconsideration Process dated June 29, 2020 to Metro Vancouver Board of Directors from**

Ms. Meaghan Hoyle, Project Assessment Director, Environmental Assessment Office.

7. OTHER BUSINESS

No items presented.

8. BUSINESS ARISING FROM DELEGATIONS

No items presented.

9. RESOLUTION TO CLOSE MEETING

No items presented.

10. ADJOURNMENT/CONCLUSION

It was MOVED and SECONDED

That the Climate Action Committee conclude its regular meeting of July 17, 2020.

CARRIED

(Time: 4:07 p.m.)

Genevieve Lanz,
Legislative Services Coordinator

Adriane Carr, Chair

To: Climate Action Committee

From: Erik Blair, Air Quality Planner
Jason Emmert, Senior Planner
Parks and Environment Department

Date: August 14, 2020 Meeting Date: September 18, 2020

Subject: **Strata Energy Advisor Pilot Program Results**

RECOMMENDATION

That the MVRD Board:

- a) receive for information the report dated August 14, 2020, titled "Strata Energy Advisor Pilot Program results"; and
- b) direct staff to report back with options for administration and delivery of a region-wide Strata Energy Advisor Program.

EXECUTIVE SUMMARY

The Strata Energy Advisor Pilot Program is a multi-partner Sustainability Innovation Fund project that provided professional energy advisor services to strata-owned multi-unit residential buildings to support the implementation of energy and GHG reduction projects. The projects supported through the program resulted in 2,265 tonnes of GHG reductions, saving owners over \$320,000 per year in utility costs, and collecting valuable lessons about how to support this building sector. Staff are seeking direction from the Board on the ongoing delivery and scale up of the SEA program. The results from the Strata Energy Advisor Pilot Program will inform the development of actions for the *Climate 2050 Buildings Roadmap*. The pilot showed that significant GHG reductions are possible, and that an expanded program would support potential regulations to establish GHG limits for large buildings.

PURPOSE

To provide the Climate Action Committee and MVRD Board with the results from the Strata Energy Advisor Pilot Program, and to seek Board direction for staff to develop options for an ongoing program that can support the *Climate 2050* GHG reduction targets through the acceleration of low-carbon retrofits in strata buildings.

BACKGROUND

On June 12, 2015, the MVRD Board approved funding from the Sustainability Innovation Fund for the Strata Energy Advisor (SEA) Pilot Program, in the amounts of \$50,000 in 2015, \$50,000 in 2016, and \$100,000 in 2017. Subsequently, on October 27, 2017, the Metro Vancouver Board passed the following resolution:

That the MVRD Board:

- a) *direct staff to proceed with the Strata Energy Advisor Program under a revised scope, as outlined in the report dated August 28, 2017, titled "Strata Energy Advisor Program - Additional Information Regarding Air Quality Reserve Request"; and*

- b) authorize a contribution from the Air Quality Reserve, in the amount of \$192,500, to support delivery of the revised Strata Energy Advisor Program in 2017-2019.*

Partnering municipalities contributed an additional \$366,500, which brought the overall pilot program budget to \$759,000. In June 2019 staff provided an update to the Climate Action Committee on the implementation of the SEA Pilot Program. This report responds to an action in the 2020 Climate Action Committee work plan to provide a report on the results and recommendations of the SEA Pilot Program.

STRATA ENERGY ADVISOR PILOT PROGRAM

Large buildings are a major source of greenhouse gas (GHG) emissions in the region, and will be a key focus in the forthcoming *Climate 2050 Buildings Roadmap*. There are more than 7,200 strata buildings (over 300,000 households), representing approximately 700,000 tonnes of CO₂e per year, or 40% of all GHG emissions from large residential buildings in our region (not including single family residential). Like commercial and institutional buildings, these emissions are caused by burning natural gas for space and hot water heating. However, unlike commercial or institutional buildings, management decisions in strata buildings are made by volunteer owners elected to strata councils, who often have limited experience managing building systems or assets. It is estimated that every year 4%-11% of stratas undertake a major project that impacts energy use and GHG emissions.

The SEA Pilot Program sought to determine the potential for energy efficiency measures to be implemented in strata-owned multi-unit residential buildings by providing professional energy advisor services to strata councils and property managers, in particular when they are undertaking major building renewal and building maintenance projects. The program design was informed by a 2016 study by Metro Vancouver and its partners, which provided information on energy and GHG reduction opportunities from strata buildings, barriers to implementing reduction projects, and key considerations to ensure program uptake by participants. More information on these barriers can be found in the Attachment. The SEA Program was jointly funded through contributions from Metro Vancouver's Sustainability Innovation Fund and the program funding partners, including several member jurisdictions. A Steering Committee was established, with staff from the funding partners as well as the Condominium Homeowners Association (CHOA), BC Hydro, FortisBC, and BC Housing to provide strategic advice and direction for the pilot program.

The SEA Program, which ran from May, 2018 to November 31, 2019, was designed with two stages: "Intake through Approval" and "Implementation through Completion". Strata Energy Advisors were available to conduct free walk-through energy assessments and developed business case reports with recommended projects. In the second stage, strata councils (in qualifying municipalities) that approved projects had access to matching grants (up to \$1500) to support in-depth feasibility studies and to undertake smart building upgrades (controls) or building tune-ups (maintenance). Finally, the Strata Energy Advisors provided recommendations and support during project implementation, and subsequently confirmed project measures that were completed.

PROGRAM IMPACTS

In total the program delivered 82 walk-through energy assessments and business case reports resulting in 38 buildings that completed or were in the final steps of implementing energy efficiency

upgrades at the end of the pilot. As shown in the graph in the Attachment (page 3), targets were set in three categories of projects: Building Tune-ups/Retrocommissioning, Major Mechanical, and Building Envelope. Although the Pilot Program targets were not reached in these categories, projects were completed in all program streams, providing valuable information about energy/GHG impacts.

The SEA Program estimates that the lifetime GHG reduction from completed projects will be 2,265 tonnes. These reductions are attributable almost entirely to the 3,758 GJ of natural gas saved. There was also a considerable amount of electricity savings as a result of projects. Although these electricity savings do not translate into large GHG reductions due to our low-carbon electricity grid, electricity conservation frees up capacity that will be needed as large buildings electrify (e.g., for heating and EV charging). Overall, these energy savings translate into utility savings of over \$320,000 per year, or an average of \$88 per household. The cost of the SEA Program translates to a range of \$148 (not including program design costs) to \$243 (including design costs) per tonne of GHG reduced. The lower cost per tonne better represents the cost of an ongoing program as program design would not be a recurring expenditure. The Attachment contains further detailed analysis of the pilot program results, as well as illustrative case studies from three participating stratas that completed projects.

FUTURE PROGRAM COSTS AND REDUCTION POTENTIAL

The SEA Pilot Program has achieved measurable success in reducing GHGs in the buildings sector, and has the potential to be scaled to a level that meets the ambition of our regional climate targets in the buildings sector. The SEA Pilot Program reached approximately one percent of strata buildings undergoing an end-of-life renewal project. If the program was scaled to influence ten percent of this group of strata buildings, lifetime GHG reductions could conservatively increase to 15,000 tonnes.

Pairing a scaled-up version of the SEA Pilot Program with a regulatory requirement for GHG performance for existing buildings would likely be a cost effective approach to achieving the substantial GHG reductions needed in the building sector. Once a regulatory path for building owners and industry is set, programs like the SEA Pilot Program would coexist in order to support building owners to understand their options to meet any future requirements. Several valuable lessons were learned throughout the SEA Pilot Program in areas of program design, recruitment and screening, financing and support. The Final Report (Attachment) highlights key recommendations that can streamline the delivery of an ongoing SEA Program and potentially increase the level of GHG emissions reductions by focusing on specific project opportunities.

OPTIONS FOR ONGOING PROGRAM DELIVERY

Based on the findings of the SEA Pilot Program, the Steering Committee have recommended that options be explored for delivery of an ongoing program in our region. Ultimately, a regional program would benefit from a single administrator supported by funders and advisors from a broader stakeholder group. This is the model that Metro Vancouver employed for the SEA Pilot Program, which significantly lowered the level of effort required by member municipalities.

Metro Vancouver is currently limited in its ability to provide ongoing service programs like the SEA Program without a service establishment bylaw. Based on direction provided by the MVRD Board, staff could continue to work with member jurisdictions, the SEA Pilot Program Steering Committee and any other stakeholders, to explore how Metro Vancouver can continue to resource and support

an ongoing program on behalf of its member jurisdictions. Other options for program administration may include a program led by the Province or a third party organization. As such, staff are currently in preliminary discussions with the Province to determine how the SEA Program can align with existing and future buildings policy and programming to support the provincial *CleanBC* strategy.

ALTERNATIVES

1. That the MVRD Board:
 - a) receive for information the report dated August 14, 2020, titled “Strata Energy Advisor Pilot Program results”; and
 - b) direct staff to report back with options for administration and delivery of a region-wide Strata Energy Advisor Program.
2. That the MVRD Board receive for information the report dated August 14, 2020, titled “Strata Energy Advisor Pilot Program Results”, and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

The overall budget for the Strata Energy Advisor pilot program was \$759,000, including \$100,000 for a background study, the Program Design and Delivery budget at \$549,500, and the grant allocation budget of \$109,500. Metro Vancouver contributions included \$392,500 from the Sustainability Innovation Fund and Air Quality Reserves, as approved by the Board. Contributions from project partners within the respective municipalities totaled \$366,500. The funding partners’ contributions supported both the program design and delivery as well as grants that were made available to strata participants in their jurisdictions. Metro Vancouver and partner contributions for Program Design and Delivery were fully expended. \$27,243 in grant funding was dispensed, leaving \$82,027 municipal partner funding remaining. Staff are currently working with the Steering Committee to evaluate options for projects that would provide additional analysis of the data from the pilot program to support future program design and development in this sector. Any unused funding will be returned to each funding partner.

CONCLUSION

The SEA Pilot Program confirmed interest and demand for energy efficiency programming in strata buildings. The pilot has demonstrated that there is market demand and a significant opportunity to reduce energy use and GHG emissions in strata buildings. It is clear that an ongoing program must focus specifically on low-carbon retrofit projects. Regulatory requirements to limit GHG emissions from existing buildings will be needed to achieve the level of GHG reductions needed by 2030 and 2050 in the buildings sector, and programs like the SEA Program can serve as critical support for strata councils who are tasked with managing expensive and complex assets. The SEA pilot showed that significant reductions are possible in this sector. An expanded program will not achieve our targets on its own, but it can make a significant contribution. Staff are exploring options to continue the program in the future.

Attachment

“Strata Energy Advisor Pilot Program Final Report”, dated June 8, 2020 (40809754)

40817057

Strata Energy Advisor Pilot Program Final Report

Prepared By:
Darla Simpson, Manager of Sustainability Services
SES Consulting

Date:
June 8, 2020

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This report has been reviewed by representatives of Metro Vancouver, who commissioned the study, but the interpretation of the results of this study, as expressed in the report, is entirely the responsibility of the consultant authors and does not imply endorsement of specific points of view by Metro Vancouver. The findings and conclusions expressed in the report are the opinion of the authors of the study and may not necessarily be supported by Metro Vancouver. Any use by a third party of the information presented in this report, or any reliance on or decisions made based on such information, is solely the responsibility of such third party.

Executive Summary

At 25 per cent of emissions, buildings are the second largest source of greenhouse gas emissions in the Metro Vancouver region. Strata-owned multi-unit residential buildings represent approximately 40% of residences in the Metro region in an estimated 7,200 buildings. Commercial, industrial, and institutional components of the building sector have been actively working to reduce emissions, in part benefiting from government and utility energy efficiency programming. However, the Strata market has been largely untouched, lost in the gap between commercial-scale programs for building systems and residential programs.

Part of the reason stratas are under-represented in climate action and energy efficiency programming is because of their complex stakeholder and decision-making process. Collectively-owned and managed by an elected council, they are a difficult market sector to reach. They have a complex decision-making process requiring a majority of owners to vote to approve larger projects. Strata councils are commonly comprised of members with little or no building management experience yet they are tasked with managing multi-million-dollar building assets. Most stratas work with property management firms to assist with ongoing management, maintenance and renewal of buildings, but individual property managers have little incentive to champion energy efficiency except at the direction of their strata clients.

The Strata Energy Advisor pilot program was developed as part of Metro Vancouver's Sustainability Innovation Fund with support from sponsor partners including the City of New Westminster, City of North Vancouver, City of Richmond, City of Surrey, City of Vancouver, and University of British Columbia. In addition to sponsor partners, BC Hydro, FortisBC, BC Housing and the Condominium Home Owners Association formed a steering committee that informed the development of the pilot program.

The goal of the Strata Energy Advisor program was to inform the decision-making process of stratas by providing support through identifying, approving, and implementing energy conservation measures (ECM's). The foundation underlying the program design was that by establishing a relationship between the Strata Council Champion and the Strata Energy Advisor the program could help them to make smarter choices, save money over time, and improve their buildings. To do this the Strata Energy Advisors needed to be trustworthy third parties, knowledgeable about energy efficiency, and demonstrate genuine care and interest in supporting the Strata Council.

The program was designed in two stages: intake through approval and implementation through completion. In the first stage stratas registered for the program through the web site and were screened for opportunities to improve energy efficiency or to support renewal projects for building envelope or building-scale mechanical systems (heating, ventilation, air conditioning and hot water). Qualifying buildings were assigned a Strata Energy Advisor (SEA) as their primary contact throughout the program. These professional engineers provided free walk-through energy assessments and business case analysis of recommended ECM's. SEA's then worked with Strata's through each step from approvals through implementation of ECM's, clarifying next steps and providing unbiased information to address questions and concerns. Stratas in qualifying municipalities also had access to 50 per cent matching grants of up to \$1500 to implement building tune-up or smart building upgrades. For the renewal program stream, participating stratas could access up to \$1500 through a feasibility study grant to further details on proposed changes to their building systems.

In total the program delivered 82 walk-through energy assessments and business case reports resulting in 38 buildings that have completed or are in the final steps of implementing energy efficiency projects in one or more program streams: building tune-up (maintenance), smart building upgrades (controls), major mechanical, and building envelope.

Over 20 months, the pilot program was able to achieve:



Saved 640,605 kWh of electricity per year



Lifetime GHG savings of 2,265 tonnes



Saved 3,758 GJ of natural gas per year



Program cost of \$148 - \$243¹ / tonne of GHG savings (lifetime)

One of the foundational questions of the Strata Energy Advisor pilot program was if there is interest in energy efficiency programming for this market and what the scale of opportunity was. We believe the program has demonstrated there is a demand in this market and significant opportunity to influence carbon emission reductions through a targeted conservation program that supports the unique challenges of strata-owned residential buildings.

Program Impacts

The program was expanded from an original target of 70 site assessments to 88, of which 82 were completed. Those assessments led to 27 energy efficiency projects completed by November 30 2019, and a further 11 to be implemented in early 2020, for a total of 38 buildings completing the program. Participating stratas spent over \$500,000 in energy efficiency investments over the 20 months it was active. Investments ranged from \$50 for a notched belt replacement to over \$120,000 to replace 100 electric baseboard heaters with heat pumps. The average major mechanical renewal investment was \$45,000. Of note, the energy efficiency investments included here do not include unconfirmed costs for the 11 buildings implementing projects in early 2020. Investments excluded from this total include 2 condensing boiler upgrades and a window renewal project on a 15-storey high-rise. Even with these exclusions, the total energy efficiency investments were greater than the cost of the program outreach and support. The energy savings and improvements to buildings have reached over 3,500 residents in the lower mainland.



211 buildings registered for the program



99 buildings received a phone screening and 17 that screened out received “For Future Consideration” recommendations



82 walk-through energy assessments were completed and 82 business cases prepared



38 building completed energy efficiency projects, representing 3,642 residential units



Over \$508,250 in energy efficiency investments have been leveraged to date



\$321,466 in utility cost savings to buildings, as much as \$1,728 per residential unit per year

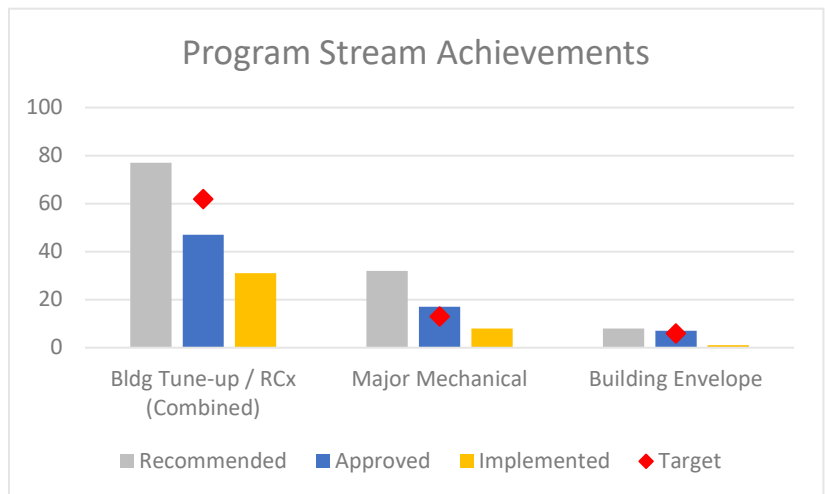
¹ \$148 per tonne reflect the cost of direct program delivery (services to the client), \$243 per tonne reflects the total cost of program development including early design and development activities.

Energy Conservation Projects Implemented

In total 38 buildings have completed one or more energy efficiency projects as a result of this program. A 46% completion rate, for buildings receiving a business case.

Of those 38 buildings, 11 will finish implementing projects in the first 6 months of 2020. Notably, 7 buildings indicated they did not complete projects because the pilot program was ending. With a longer implementation timeline, we likely would have seen more energy savings and emissions reductions.

While we did not reach the program targets, we were able to complete projects in all program streams.



Energy and GHG Savings

There were no energy or greenhouse gas reduction targets for the program as one of the main objectives of the pilot was to understand the opportunity for GHG reductions in the strata-owned MURB sector. As of the program close date on November 30, 2019 the program was on track to save 2,265 tonnes of emissions over the lifetime of the energy conservation measures. Again, we believe this does not reflect the full potential impact of the program if the implementation timeline were longer.

<i>Impacts by Program Stream</i>	Buildings Completing 1 or more ECM	Annual Electricity Savings (kWh)	Annual Natural Gas Savings (GJ)	Annual GHG Savings (T)	Lifetime GHG Savings (T)
<i>Building Tune Up AND/OR Smart Building Upgrades</i>	29	561,268	2,185	135	677
<i>Major Mechanical</i>	8	79337	1281.5	65	1298
<i>Building Envelope</i>	1	-	291	15	290
Total		640,605	3,758	215	2265

For comparison the electricity savings from this program would power 25 electric vehicles for 1 year and GHG savings are equivalent to removing 75 gas powered vehicles from our roads each year.

Recommendations

Throughout the pilot program we have developed a better understanding of the unique challenges and opportunities in the strata market. While many small learnings were adopted through different phases of the program, the following recommendations represent substantive opportunities to modify the program design to achieve stronger outcomes.

Program Design

1 | ONGOING SERVICE DELIVERY | Given major building systems have a renewal period of 20-30 years, to reach a significant portion of MURBs it would be advisable to have an ongoing program that could provide timely support when Strata's need it. At a minimum, a 2-3 year program would allow time to implement larger end of life renewal projects including building envelope upgrades. To ensure a sense of urgency to implement there could be a time limit placed on SEA support depending on average timeline to implement recommendations. Strata's typically have their AGM's in the Fall (Sept – Nov) or in Winter (Jan – Mar), so two annual program intakes or promotional pushes in May and September would align with annual strata AGM cycles.

2 | PROGRAM STREAMING | Streaming program participants into building envelope, major mechanical, or general energy efficiency earlier could allow for more targeted site assessments and remove the need for feasibility studies. For example, buildings planning for envelope renewal would be directed through a modified building envelope condition assessment (BECA) rather than a detailed review of their mechanical systems. This would remove a step for end of life renewal projects and provide greater value to participating buildings at approximately the same if not lower cost.

3 | GRANTS | The Building Tune-up and Smart Building Upgrade grant should be refined to streamline the claim process. This may include removing the pre-approval to hold grant funds, greater clarity on what is eligible for funding, and a requirement to submit all receipts under a single claim. For example, lighting automation was eligible but LED lighting retrofits were not eligible, so where LED lighting upgrades included automation there was some confusion. We would caution against removing grants all together as it was a strong driver of program registration.

4 | MULTIPLE CONTACTS | The program should require at least two contacts for each building, ideally a strata council champion and the property manager. This would help to reduce communication barriers as well as mitigating program attrition from council or property manager turnover. It also helps to ensure that there is more than one person familiar with the program and improves institutional memory. Property management firms may be valuable promotional channel partners where the SEA can provide additional support during end of life renewal projects in particular.

5 | SEA AND EXPERT | Due to the cost of having an engineer complete all the Strata Energy Advisor duties, it may be more cost effective to assign a pair of contacts to each building. A coordinator responsible for communications and support and an engineer to provide technical advice and analysis. While we do not have data on the breakdown of hours between these two tasks, SEA's reported spending significant time trying to reach and get updates from contacts. Engineering staff would likely be able to manage more buildings at a time if someone was assisting with the communications and coordinating meetings.

6 | COMMERCIAL STRATA UNITS | There may be an opportunity to include commercial strata units in the business case analysis. Particularly for smaller commercial units that would not be eligible for commercial level incentives. This recommendation should not be adopted without further investigation to understand how much additional work would be required to include additional systems and meters in the analysis.

Program Screening

7 | DATABASE PLATFORM | Explore using a new database platform that allows for multiple users to be assigned to a single account and for users to save and update their building profile. Ideally this same platform could be used to manage information and documents provided to program participants to create better continuity. This would reduce errors and double entry requirements when confirming data in the phone screening stage. It could also help to track and manage communications with participating buildings, create a more streamlined communication trail, automate prompts for upcoming milestones and reduce the administrative hours required for the program.

8 | SCREENING | The building data collected for screening should be streamlined to what is most relevant to the program. Again, a different platform would allow for if/then database design to remove questions not relevant to a given building. It should also be revamped to require participants to rank priority areas and assist in early program streaming. This could be revised during the phone screening, but would help to prioritize buildings that are prepared to take action. For example, if you selected building envelope as your top priority, follow up questions would ask if a BECA has been completed, if the strata council had identified this is a priority action and on what timeline.

9 | UTILITY DATA INTEGRATION | Accessing utility data was a barrier for participating buildings and significantly time consuming for SEA's. Creating an integration that permits the program to access BC Hydro and FortisBC accounts, ideally with building-level data and consolidated unit data would provide more accurate energy intensity analysis. It would also help to correct for screening errors when using dollar / unit utility intensity analysis which does not allow for comparison between electrically heating buildings (paid at the suite level) compared with central gas or steam heated buildings (paid at the building level). Adding a utility data integration could also allow buildings to opt in to participating in [Energy Star Portfolio Manager](#) and/or the [Building Benchmark BC](#) initiative.

It is worth noting that a number of virtual energy audit tools are emerging in the market that provide energy analysis and utility data integration. These tools are generally designed for commercial applications and would need to be carefully assessed and customized for strata-owned MURB's. The data provided by these tools should not be seen as a replacement for the relationship with a Strata Energy Advisor.

Program Financing

10 | AUDIT REBATE | We propose implementing a small cost to the audit in the range of \$500 that can be rebated back when energy efficiency measures are implemented. This will improve the completion rate and discourage free-riders. Cost should be marginal to ensure the "free" audit is still a driver. There may be an opportunity to tie the return of the audit rebate to completing an exit survey to improve program feedback.

11 | FINANCING | It is outside the scope of this program, however if there were an opportunity to partner with a Property Assessed Clean Energy (PACE) program that would allow strata buildings to finance a portion of energy efficiency renewal projects that would help to remove the split incentive of current and future owners to implement more expensive energy efficiency projects. Only 4 of 41 buildings that received a business case cited financial barriers as a reason for withdrawing, but we suspect this may be underreported as a contributing factor for rejection by council (4) and deferral to a future date (4).

12 | INCOME QUALIFYING INCENTIVES | Older buildings facing multiple end-of-life renewal projects may deferred or not completed due to hardships that would place on current owners. Creating some income qualifying incentives may help older buildings that may have been poorly maintained implement significant energy efficiency improvements with the added benefit of assisting the housing affordability challenges in the region.

Program Support

13 | RANKING RECOMMENDATIONS | The pilot program design favored unbiased information over recommendations that favored GHG reduction objectives. This led to some perverse outcomes where GHG emissions actually increased. For example, one building needed to replace their make-up air unit (MAU) and wanted the new unit to provide conditioned (heated) air, unlike their current MAU. The SEA provided a comparison of replacement MAU units with electric and natural gas options. The strata council chose to proceed with the natural gas option as it was most cost effective, but it increased the buildings GHG emissions. To address this, we recommend providing unbiased information for comparison, but also including SEA recommendations on the best option to pursue and why.

14 | CUSTOMER RELATIONSHIP MANAGEMENT | Different strata contacts had different preferences for frequency contact and updates. Including a CRM component in an updated program database platform would allow SEA's to schedule follow up reminders and more consistently document communications with clients.

15 | EDUCATION | Many participants reflected on the educational value of the program in helping them better understand their buildings and the energy efficiency opportunities. Revising the program to include more educational opportunities that would expand the audience for this information would improve institutional memory and program outcomes. For example, building in to the program presentation of business case findings directly to strata councils, providing a “hand-off” update when there are changes to the strata council members mid-program, and providing information sessions for all owners in advance of AGM / SGM votes to review the recommendations and allow for clarifying questions.

16 | CONTRACTOR SELECTION | Allowing SEA’s to help soliciting quotes and contractor selection was the number one requested revision to the program design. While there are liability concerns, these may be mitigated with strict guidelines. SEA’s interacting directly with contractors would have the added benefit of better understanding their approach to projects and supporting the development of a more informed contractor market.

17 | CONTRACTOR ADVISORY COMMITTEE | Creating a Contractor Advisory Committee to the program would help to refine the information in the energy conservation measures database and allow for more accurate financial analysis in the business cases. It could also help to create support for emerging best practices by identifying buildings that have effectively implemented measures and creating advocates in the strata contractor market.

Program Overview

There are over 7,200 existing residential strata buildings throughout Metro Vancouver, which are occupied by more than 300,000 households (more than 3 units). Strata buildings directly emit more than 700,000 tonnes of GHG emissions annually and use more than 8,000 GWh of energy (natural gas and electricity) per year.

As a significant and growing sector of the residential market, there is little known about energy efficiency opportunities in strata buildings. The objective of the Strata Energy Advisor pilot was to determine what opportunity there was to influence strata-owned multi-unit residential buildings to implement energy efficient measures in their buildings.

Strata buildings are an underserved sector in terms of energy efficiency programming as they bridge commercial and residential sectors. Strata buildings can range from townhome complexes, equivalent to small footprint single-family homes, to several hundred-unit high-rises. This program ranged in participants from 14-unit low-rise building to a 456 unit 23-story high-rise and from a utility cost intensity of just \$98 per year per unit to \$1496 per year per unit². Building management decisions in strata buildings are made by volunteer owners elected to strata councils. Most often members have limited experience managing building systems or assets of this size and 85% of applicants to this program indicated they hire property management firms to assist them. The uniqueness of this sector to a number of challenges that this program was designed to address:

1. **AMBIGUITY EFFECT:** this is the tendency to avoid options where an information gap makes the benefits uncertain, and instead go with what is familiar. To address this, each participating building was provided with a strata energy advisor to answer questions and provide unbiased information on the costs and benefits of various energy efficiency opportunities which were laid out in a business case developed for each building.
2. **CHOICE PARALYSIS:** often the best path forward isn’t clear. The breadth of choices actually prevents a decision from being made. In each business case energy efficiency opportunities were presented in a simple table with a business as usual option 1 and an energy efficient option 2. The benefits were described in simple language without jargon.

² Utility costs were for the strata corporation only and did not include utilities paid by individual owners. These were self-reported numbers from the strata budget documents.

		Estimated Project Costs		Benefits of Option 2		
#	Name	Option 1 - Less Efficient	Option 2 - Energy Efficient	Annual Cost Savings	Estimated Incentive Amount	Recovery Time of Extra Costs
1	Notched Belts	\$70	\$100	\$10	-	2.7 Years
2	Piping Insulation for Boiler Room	Do Nothing	\$3,500	\$270	\$1,500	7.5 Years

3. **ASYMMETRIC INFORMATION:** contractors are often more knowledgeable about building systems than strata councils and have their own drivers when preparing quotes and recommendations for work. This can leave strata owners at a disadvantage when interpreting recommendations or evaluating proposals. With an SEA acting as their trusted advisor, strata councils were coached to ask clarifying questions to ensure they had the right information to make a good decision.
4. **DIFFUSE OWNERSHIP / TRAGEDY OF THE COMMONS:** strata buildings are managed by all the residential owners, but there is little incentive to take on additional cost or effort to manage for the common good when they may not receive the full benefit over time. To overcome this limitation, SEA's created a clear business cases illustrating the direct benefits to live-in owners, rental owners, tenants, and investment owners. For tune-up and smart building upgrades, the program focused on a 5-year or less payback. For larger, end of life replacement projects, we focused on the marginal costs of an energy efficient alternative compared with a like-for-like replacement.
5. **MONEY:** getting owners to invest in building maintenance is a difficult. Levies and other mechanisms available to strata councils can place significant burdens on owners and renters. To address this, the program offered a building tune-up / smart building upgrade grant of 50% of the cost of the measures up to \$1500 in qualifying municipalities, with the balance commonly paid out of an annual operations maintenance budget. This removed the requirement (in most cases), to request budget funds from owners, which requires a majority vote to pass. The program also offered a feasibility study grant of \$1500 to buildings in qualifying municipalities to complete a building envelope condition assessment (BECA) or a more detailed study of the feasibility of a mechanical upgrade. Financing for larger end of life replacement projects require a 3/4 vote at the SGM or AGM to access Contingency Funds or approve a loan or levy for the balance.
6. **TIME:** volunteer strata council's often meet monthly, and in our experience, most strata's take a year or more to work through all of the steps of actually implementing a retrofit project. Given the pilot was 20 months long from launch to completion, this was a significant challenge. To address this, we prioritized end of life projects and mapped out key milestones for each building, including AGM dates, to work to known timelines.
7. **VISIBLE AND INVISIBLE:** some of the most impactful energy efficiency measures are not visible. This makes it hard for owners to see the results of their investment. The SEA program helped to make energy efficiency visible by presenting and comparing energy conversation measures versus "business as usual" options in the business case. This helped strata councils to see how a range of energy efficiency opportunities could reduce utility costs and GHG emissions while improving comfort and in some cases aesthetics.

Program Design: Opportunities and Challenges

The SEA pilot program was broken into two phases: Intake through Approval and Implementation through Completion. Phase 1 typically took 13 weeks from assigning an SEA through completion of the business case including revisions.



In **INTAKE**, the applicant registers online for the program and is screened to confirm they are located in the Metro Vancouver region and own a unit in a townhome strata complex or multi-unit residential building. They were then prompted by email to provide basic building data. This included information about their building, annual utility costs, why they joined the program, and what conservation projects they were interested in.

Buildings with a utility cost intensity of greater than \$400 per unit per year were eligible for the program.

If they qualified, buildings were assigned an SEA for the duration of the program. This helped to build a strong relationship and trust between the contact and the SEA. SEA's were professional engineers specializing in HVAC and controls. The SEA then coordinated a 30-minute phone screening interview to review any missing building data, confirm the program had been discussed with their strata council and what kind of projects the owners were interested in. Applicants interested only in lighting upgrades were screened out as that upgrade has a short payback and there are free site assessments provided by commercial operators. If the applicant demonstrated a readiness to proceed, they were asked to provide their utility data to create a building baseline for energy consumption and arrange a site visit with their SEA. Readiness to proceed included indicators such as having previously discussed energy efficiency opportunities or renewal projects at a strata council meeting with the council broadly supportive of proceeding, having completed a feasibility study or other early investigations into the opportunity, and/or measures to increase their contingency fund in anticipation of upcoming renewal projects.

Challenges and Opportunities

WEBSITE DATABASE PLATFORM & BUILDING DATA | The database management platform had significant limitations that created barriers for participants. For example, building information had to be entered in one sitting and could not be saved. Many applicants did not have all the information required to fully populate the building information so SEA's spent considerable time populating missing information in phone screening. In future, simplifying the building information screening and using a platform with a save function and allowed multiple "users" to be assigned to a single building would be advantageous in many aspects of the program design.

UTILITY COST INTENSITY AND UTILITY DATA | Initial screening using common area utility cost intensity had mixed results. The data used did not include aggregated in suite electricity use as it was not available at the time. This led to misleading results where central gas and steam heated buildings had very high utility cost per unit as opposed to electrically heated buildings where the cost of heating is paid by individual unit owners. Accessing utility data to create building baselines was time intensive for SEA's as they had to coach many participants through setting up online accounts and then downloading data. Fifteen per cent of contacts assigned an SEA withdrew at this stage. There may be an opportunity to program an integration that could automate this process and allow access to common area and consolidated residential unit data. This would provide more accurate baseline data for analysis, simplify the screening and investigation process, and have the added benefit of potential integration with [Energy Star Portfolio Manager](#) and/or the [Building Benchmark BC](#) initiative.

The **INVESTIGATION** stage began with a 4-hour assessment of each building reviewing energy efficiency opportunities and focusing on those the building owners were interested in pursuing. Each SEA was accompanied by at least one building contact, an owner representing the strata council or a property manager. This allowed SEA's to access mechanical rooms, roof, and at least one suite and to ask clarifying questions. At the completion of the site assessment, the SEA would present preliminary findings and confirm which measures should be analyzed further. Based on input from early participants, the SEA would also walk building contacts through the next stages of the program and what to expect. With building system and utility data, SEA's prepared simplified business cases outlining recommendations and a cost and GHG comparison between the business as usual and energy efficiency option for each proposed measure. The choice was made in the design phase to present all options without bias.

Once complete the business case was presented to the building contact by phone to commence the **APPROVALS** stage. Contacts were given the option of having an SEA present the business case to their strata council or to present it themselves. As part of a regular monthly meeting, strata councils would discuss and to vote to proceed with one or more of the recommendations.

Challenges and Opportunities

EARLY STREAMING & FREE-RIDER REDUCTION | While contacts were asked to indicate "future plans" there was not a strong correlation between stated interest and implemented projects. Twenty-one per cent of buildings that received a site assessment and business case decided not to proceed. Improving early screening for priority projects may reduce this free-rider issue. One approach to improve program outcomes would be to stream end of life or "imminent" projects into major mechanical or building envelope streams with site assessments focused primarily on that project. This may remove the need for feasibility studies all together by focusing resources earlier in the program. It would not exclude recommending more general energy efficiency measures, but would provide greater certainty around complex renewal projects. Participants interested in more general energy efficiency could be provided a simplified business case, or a building tune-up checklist which they could review with their maintenance provider. In addition, creating a rebate incentive, where participants would pay a

nominal fee for the site assessment and report, but would receive that nominal fee back if they implemented any measures, would significantly reduce free-riders.

Strata Story

An early participant in the pilot indicated they were *“interested in Solar, needs insulation and has roof replacement coming”*. In the business case they also asked for a boiler upgrade to be analyzed as it was nearing end of life. They chose to withdraw after receiving the business case indicating they would defer any recommendations for 5-7 years.

PRIORITIZED RECOMMENDATIONS VERSUS TRUST | Early in the program design the decision was made to have SEA’s present all the information in an unbiased way and not advocate for a particular energy efficiency technology or solution. Many program participants cited this as the most helpful part of the SEA program. From an exit survey: *“It was great to get a non-biased opinion of where we could improve our energy efficiency, especially as it relates to the mechanical systems in our building which nobody on Council is really qualified to assess.”*

In some instances, this led to stratas considering renewals that would increase GHG emissions and in a few building’s they opted for “like for like” rather than more energy efficient options. In one example, a building opted to add gas-fired heating to a make-up air unit that previously used unconditioned outside air and actually increased their GHG emissions. For the purposes of building trust, we would still recommend presenting all the information in the business case, however we suggest including an “SEA Recommends” commentary. This would allow the SEA to make a more fulsome case for a particular energy efficiency measure that may offset a strict cost comparison or payback analysis.

QUOTE QUALITY AND RECOMMENDATIONS | The original database created to identify and cost potential energy efficiency measures was based on projects implemented in commercial buildings. In some instances, this resulted in higher estimated costs than quotes received by strata councils. We also observed measures that would be standard practice in commercial buildings saw significant push back or were not seen as feasible in strata buildings of a similar scale. For example, using temperature or carbon dioxide sensors to control hallway and common area ventilation were not seen as feasible or cost effective. There may be an opportunity to collaborate with progressive contractors in the strata market to both improve the accuracy of the financial analysis in the business case as well as identify and develop resources to promote energy efficiency recommendations that may not be common, but are effective in reducing energy and GHG emissions in strata buildings. We have recommended the development of a contractor advisory committee that could help to refine the information in the energy conservation measures database and allow for more accurate financial analysis and support broader market transformation by identifying and promoting successful low-carbon renewal projects.

Strata Story

In one instance the SEA recommended the strata implement a variable speed drive (VSD) on their make up air unit (MUA). New energy efficiency MUA’s often have VSD’s as this allows the building to adjust ventilation, and heating demand, for common areas like hallways based on demand or scheduled occupancy. In our analysis this would have resulted in significant natural gas savings for the building.

The strata council approved the measure and was proceeding with soliciting a quote when their contractor convinced them it was a poor idea. While this is emerging best practice and common in new construction, we have yet to implement a retrofit of this nature in a strata-owned building.

The second stage for the SEA program was restricted by the program close date of November 20, 2019, but typically took 22 weeks from presentation of the business case to completed implementation.



FEASIBILITY STUDIES were recommended under two conditions. In the case of building envelope improvements, a building envelope condition assessment (BECA) was recommended to identify considerations that could not be observed by visual inspection. In the case of major mechanical upgrades, a feasibility study was recommended when there was a significant proposed change to a building system, such as moving from a standard boiler to a condensing boiler which requires additional venting. Buildings in partnering municipalities could apply for a program grant of up to \$1500 to cover the cost of the study and SEA's would assist in this application.

Challenges and Opportunities

BUILDING CONDITION ASSESSMENTS | Only 3 of the 7 feasibility studies supported as part of this program directly resulted in energy efficiency projects; although all 7 buildings implemented one or more energy efficiency measures. Three BECA studies were conducted to assess projects that may be implemented in future. A BECA assessment can include an occupant survey, visual condition assessment as well as a range of testing of air leakage, temperature, moisture, and humidity readings, thermal camera imaging and sampling of materials for laboratory testing. A BECA can look at the full building enclosure (roof, cladding, glazing) or targeted assessment of a known problem area. A walk-through energy assessment and report in the pilot cost an average of \$3,250 per building, a BECA assessment ranges from \$2500 to \$4500 depending on the provider and level of detail. As the type of assessment completed to identify mechanical system opportunities is significantly different from building envelope opportunities, it may be more cost effective to offer a specialized BECA assessment stream for those buildings. This would benefit buildings that are managing multiple end-of-life replacement projects over a longer timeline, including more customized support for implementation.

MECHANICAL STUDY CONSULTANTS | Many stratas that were interested in mechanical feasibility studies reported difficulty finding consultants or soliciting 3 competitive bids. Several defaulted to contractor assessments, which tended to de-prioritize energy efficiency considerations. As with the BECA studies, a more detailed analysis for

buildings considering significant changes to mechanical systems may be more effective at reaching program objectives than feasibility study grants. Alternately, as recommended under contractor selection and award, working with community partners to build capacity and connect consultants with stratas may help to address this market gap.

FINANCING of recommendations was arranged by strata councils with minimal support from SEA's. For small cost items such as building tune-up or smart building upgrades, most strata councils were able to finance through annual maintenance budget or in some cases through contingency funds. Buildings in partnering municipalities could apply for a program grant of up to \$1500 for 50% of the costs of the improvements, again SEA's would assist in this application. In projects requiring greater investments that triggered ownership votes, SEA's would offer to attend the AGM/SGM to provide information to owners in advance of the vote or they would prepare a summary document outlining the recommendation as well as costs and benefits as outlined in the business case.

Challenges and Opportunities

READY FUNDS | Of buildings that intended to proceed with energy efficiency measures, 15 per cent withdrew for financial reasons. A further 4 per cent deferred acting on recommendations to a future date. Through the program it was identified that buildings with significant contingency funds were much more likely to proceed to implementation of recommendations. Anecdotally, many older buildings with significant energy efficiency opportunities were unable to implement more robust (and costly) energy efficiency measures, instead opting for strategies to mitigate the issue. As an example, deferring a single-pane window upgrade in favor of weatherproofing improvements. There may be an opportunity to create an income-qualifying incentive program to support strata owners in undertaking end of life building system improvements with significant energy efficiency opportunities that helps to address GHG reductions, supports housing affordability objectives, and recognizes the value of embedded carbon in existing buildings supporting retrofits over replacement. Alternately working with partners to develop a property assessed clean energy (PACE) funding model or similar that aligns the cost of investment in significant energy efficiency upgrades with the strata owners that will benefit from those upgrades.

Strata Story

One participating Strata was an 8-unit building constructed in 1956. The building had undergone minimal maintenance and renewal work in its 64 years and they were very interested in improving the building comfort and performance. In the end, despite many opportunities identified and an eager strata council, they withdrew from the program due to financial limitations as an urgent re-piping project prevented them from considering other projects.

TUNE-UP GRANTS | Accessing grants was reported by many participants as a driver for joining the program, as were the free assessments. SEA's reported that the grant for building tune-up and smart building upgrades was particularly helpful in incenting stratas to implement measures and that having a grant deadline created an incentive to implement on a timeline. We recommend keeping this component of the program and looking at an annual or bi-annual deadline for grant claims.

GRANT PRE-APPLICATION | The grant pre-approval and then rebate claim process was overly onerous according to several contacts. Streamlining the grant process by removing the pre-approval to hold grant funds and to require all expenses be processed at one time would simplify claims. There is also a need to communicate with greater clarity what is and is not included in grant funds either through a prescriptive list or clarifying what would be excluded. For example, LED lighting upgrades were not eligible, but controls installed as part of LED lighting upgrades were. On the administration side, including a workflow in the database management to track and process grants would be advisable.

SEA's played an advisory role in supporting contacts to prepare for **CONTRACTOR SELECTION AND AWARD**. Contacts were provided with scope of work checklists to assist them in preparing RFQ or RFP documents. SEA's assisted in clarifying scope of work requirements and by directing contacts to relevant publicly available contractor lists; primarily BC Hydro, FortisBC and CHOA resources. In reviewing quotes, when requested by the contact, SEA's would provide guidance on clarifying questions to ask to ensure strata councils had full information to make an informed decision. SEA's did not recommend specific contractors or assist in contractor selection directly.

Challenges and Opportunities

CONTRACTOR SELECTION | The request *"to provide help with getting cost quotations"* was often cited as one thing that could be done to improve the program. Support with identifying and selecting contractors was requested by almost all buildings proceeding to implementation. Contractors working in the strata market tend to be smaller and more specialized providers rather than larger commercial contractors. Many stratas reported challenges finding contractors to bid work or that were knowledgeable about energy efficiency opportunities. Others preferred to work with those recommended by property managers or members of the strata council, or those they had prior relationships with as they were trusted and it was quicker than a more formal process.

Finding a means to address this barrier may significantly improve successful implementation for some clients and certainly speed up the process. There are liability concerns around recommending or vetting contractors that would need to be addressed. Increasing the scope for SEA's to coach strata councils through reviewing and comparing quotes would help to address this gap. There may be an opportunity to support this sector of the market with additional training and/or a "green seal" for professionals with training in specific areas, but this would be beyond the scope of the SEA program and best done in collaboration with other partners.

CONTRACTOR COLLABORATION | Some of the energy efficiency opportunities identified by SEA's that would be practical in a standard commercial building were not appropriate to the strata context. Similarly, many quotes for work in strata buildings came in much lower than in the commercial sector. Having an advisory committee of knowledgeable contractors involved in vetting the proposed energy conservation measures and helping to provide cost ranges would improve the accuracy of the business cases and quality of recommendations.

Strata Story

In one example, a boiler replacement quote came in quite low. Upon investigation it was discovered the contractor had proposed a smaller capacity boiler system, replacing 2 large boilers with 5 high-efficiency boilers. While the proposed design met energy efficiency best practices, the SEA advised the client to follow up with the contractor to confirm they had calculated the demand requirements and ensure there would be no issues providing heat and hot water with a smaller capacity system. We asked for the calculations to be forwarded to the SEA to verify as FortisBC incentives are available for reducing capacity, or "right-sizing" boilers, where warranted. The calculations were not provided to the SEA by the end of the program so it is unclear if the incentive was applied for, but the project was installed with no reports of issues.

Strata councils or their property management agents oversaw award and implementation of the recommendations. SEA's could be called in for advice if scope of work clarification was required. Upon **COMPLETION**, SEA's conducted an exit interview with contacts to confirm details of the measures implemented and to solicit input on the program.

Challenges and Opportunities

APPROPRIATE LEVELS OF SUPPORT | SEA's were instructed to have regular contact with clients until they formally withdrew or completed projects. Some contacts shared in the evaluation they appreciated SEA *"reminders"* while other found them too onerous and wanted *"less check ins [as they are] too time consuming for people who*

are just volunteers”. Including a simple client relationship management tool connected to the client database where an SEA could schedule a manual or automated prompt to a client based on a known timeline would allow for better, more customized communications. For example, 2-months in advance of the AGM, reach out to the strata contact to confirm if they would like support to host an information session for residents to understand the rationale of a proposed energy efficiency recommendation.

LOW RESPONSE RATES | Only 23 per cent of buildings that actively participated in stage 2 of the program completed a withdrawal or exit survey. Collecting high quality feedback at the end of a program after services have been rendered is a known challenge and there is unfortunately limited data on participant experience in later stages of the program due to low exit interview rates. We recommend exploring an incentive to provide feedback when exiting the program would provide more insight into the value proposition and reasons for attrition. This may also be a good opportunity for a third party to assess overall program experience.

The **OVERALL PROGRAM** was well received by the majority of participants. There were a few program design considerations that were identified throughout the program and in particular during the exit surveys.

Challenges and Opportunities

TIMELINES | Many program participants reflected on the challenges of timelines for the project. Specifically understanding how long it can take to move a strata building to approve and implement a project and recognizing that in the program timelines. There was also feedback about timing site assessments and business case presentations to align with annual general meetings. One contact reflected the *“report was received too late for any projects to be included in the budget that was approved by residents at the AGM”*. In future iterations of the program we would recommend a multi-year timeline with semi-annual or ongoing intake and outreach materials that help stratas to engage in the program at the right time in their decision-making. This would likely improve program outcomes and reduce the requirement for SEA’s to be checking in with contacts awaiting next steps.

STRATA COUNCIL TURNOVER | There were numerous instances over the 20 months of the program where a change in strata council leadership or property manager contact stopped or delayed progress. Many contacts also reported they strongly valued the educational aspects of the program with one indicating *“the engagement was very informative and the strata council now has a good idea as to what are the most effective ways of reducing energy consumption and carbon footprint of our building”*. Unfortunately, that information is lost as new strata councils are elected each year. To help to create greater institutional memory of the project there are a number of approaches that could be tested. For example:

- Ensuring both a property manager and strata council member are present for the site assessment
- Request all strata council members be present for the site assessment debrief at the end of the visit
- Creating a video recording of the site assessment as an educational tool for new strata council members
- Inviting all owners to learn about their building or the proposed recommendations by presenting at an AGM / SGM or “Lobby Party” where interested residents could drop in and learn more.

This may have additional benefits in preparing strata owners for the proposed BC Retrofit Code. At a minimum the SEA should be in contact with at least one strata council contact as well as the property manager. Wherever possible having the SEA interact directly with the strata council is advisable for building greater understanding and organizational memory.

COMMERCIAL AND RESIDENTIAL BUILDINGS | Some strata contacts reported *“since it was for strata’s, but the advice was only on strata common property, it wasn’t much use for us”* and found it was limiting to exclude commercial strata owners and in-suite energy efficiency opportunities. While there may be value in exploring inclusion of commercial owners in the larger building systems analysis as this has low additional cost in terms of creating the

business case, we would caution against inclusion of in-suite measures without designing program supports specifically for individual owner or resident adoption of recommendations.

ENHANCED SEA SUPPORT | As the pilot program evolved SEA's received requests to support strata's in ways we hadn't anticipated during the approvals and financing steps. These included:

- **Comparison tables:** side by side description and cost comparison to simplify decision-making for larger projects.
- **Info sheet:** distributed in advance of an AGM / SGM vote, a 1-page summary of the renewal project and why it was a priority for the strata, the decision they are recommending and why (including financial and non-financial drivers), and what they did to arrive at that decision.
- **Info meetings:** SEA attending either strata council meetings to answer clarification questions in advance of a vote, or attending a whole building information meeting to answer questions in advance of an AGM/SGM vote.

The strata's that requested these supports seemed to get great benefit from them, and given the low cost and likelihood of increasing positive outcomes, we would suggest they be formally adopted in any future programs.

Strata Story

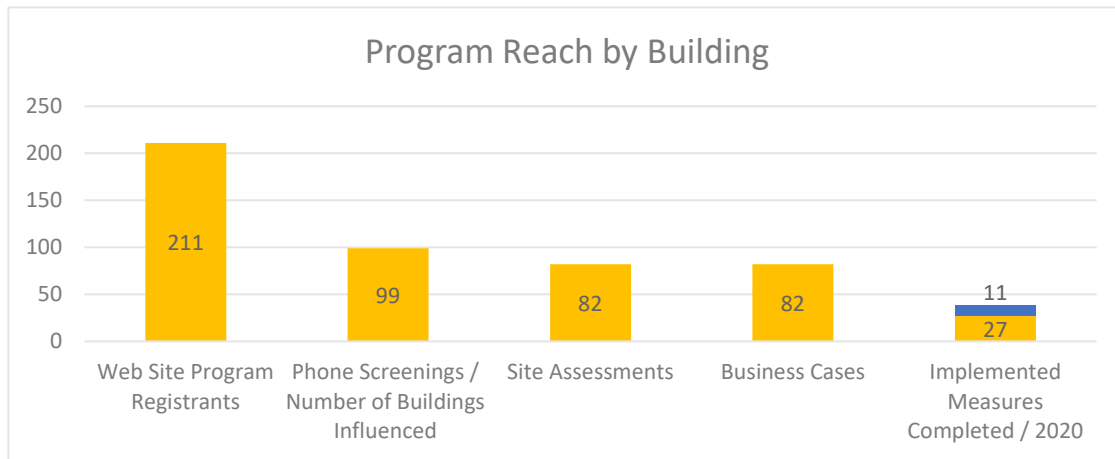
One building was facing two major end of life renewal projects: a domestic hot water boiler upgrade and a window replacement project. The strata council requested the SEA attend an information meeting to discuss the program recommendations and help the 35-unit building come to a shared understanding in advance of their AGM budget vote. There was a sense of urgency around the boiler replacement in particular as there had been multiple breakdowns in the recent past.

Approximately half of the owners attended the information session, which lasted just over one hour. During that time the SEA presented the recommendations and fielded questions from the owners. The SEA emphasized the value to the owners in terms of reducing their natural gas bill and improving comfort. The residents asked questions about the SEA program and why certain measures were recommended.

At the AGM that followed, the strata voted to proceed with the domestic hot water boiler upgrade and a building envelope condition assessment (BECA) for the window renewal at a cost of just over \$24,000. This project took just 8 months from an SEA being assigned to completing implementation of the boiler upgrade and at the completion of the program the BECA study had been completed and they were proceeding to solicit quotes. For comparison, most stratas will go through three voting cycles before a major renewal project is approved.

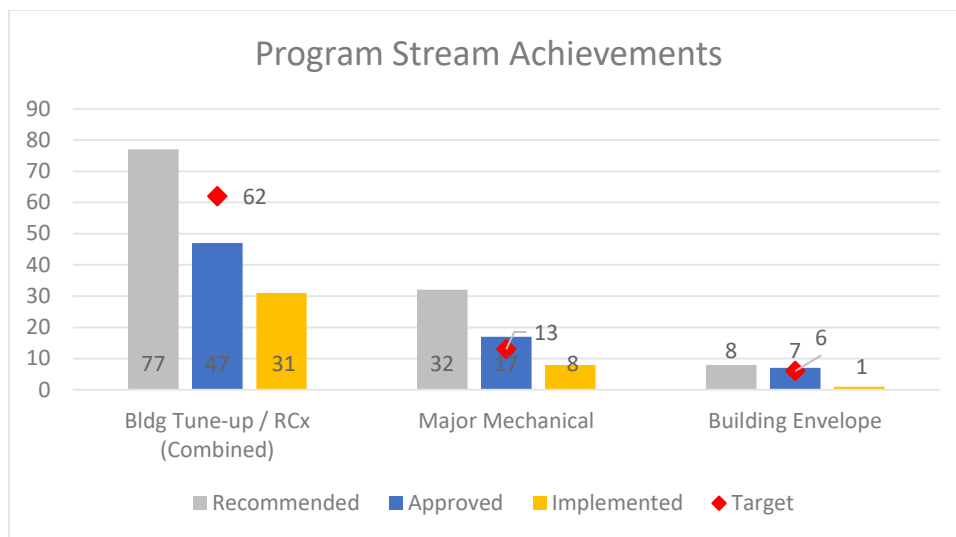
Program Analysis

The program targets were to register 200-300 buildings for the program and complete 88 energy assessments and subsequent business cases. In the end only 82 site assessments were completed as registration was lower than anticipated in some communities with quota's for participation. A total of 27 buildings implemented one or more energy efficiency measures as recommended by Strata Energy Advisors and the remaining 11 buildings are in the process of implementing measures that will be completed in 2020.



Program Impacts

While we did not reach the program targets, we were able to complete projects in all program streams and generate a great deal of interest in Strata Energy Advisor services and awareness of GHG and energy saving opportunities through the pilot. The target conversion rate was 70% of buildings implementing one or more measure while the program achieved 46% percent implementation rate of buildings receiving business case recommendations.



The program impacted 3,642 residential units across the 38 buildings that implemented energy saving measures and leveraged just over \$503,000³ in energy efficiency investments at an average of \$6,198 per building. Of note, the table below includes energy impacts from 11 projects that will be completed in 2020, but not dollars invested as this was not available at the close of the program.

<i>Impacts by Program Stream</i>	<i>Dollars Invested in Measures</i>	<i>Annual Electricity Savings (kWh)</i>	<i>Annual Natural Gas Savings (GJ)</i>	<i>Annual Utility Savings</i>	<i>Annual GHG Savings (Tonnes)</i>	<i>Lifetime GHG Savings (Tonnes)</i>
<i>Building Tune Up AND/OR Smart Building Upgrades</i>	\$ 132,811	561,268	2,185	\$ 131,708	135	677
<i>Major Mechanical</i>	\$ 361,659	79337	1281.5	\$ 187,458	65	1298
<i>Building Envelope</i>	\$ 8,930	-	291	\$ 2,300	15	290
Total	\$ 503,400	640,605	3,758	\$ 321,466	215	2265

The program saved 215 tonnes of GHG emissions in the region in 2020, and 2,265 tonnes over the lifetime of the measures. This assumes a persistence of 5 years for building tune-up and 20 years for major mechanical and building envelope. That represents 622 kg of GHG emissions per resident. In 2017 GHG emissions per resident in the Metro Vancouver region were calculated at 5.77 tonnes, so this program represents an 11 per cent reduction in emissions per resident reached.

Program Costs

The total investment for the pilot program was \$549,450 with \$335,100 spent working directly with strata buildings. This is the equivalent of \$92 - \$151 per residential unit impacted or \$148 - \$243⁴ per tonne of lifetime GHG savings.

	<i>Phone Screening</i>	<i>Site Assessment</i>	<i>Business Case</i>	<i>Simple Implementation Support</i>	<i>Advanced Implementation Support</i>
<i>Cost per building completed⁵</i>	\$ 415	\$ 699	\$ 2,010	\$ 1,546	\$ 2,987
<i>Hours per building completed</i>	3	6	16	12	24

The table above represents the cost per building that participated in that component of the program. For example, 82 site assessments were completed for an average cost of \$699 per assessment. This reflects actual hours used, not program budgets. Advanced implementation support includes all coaching and support to implement major mechanical or building envelope measures. Simple implementation support was for building tune-up or smart building upgrades.

³ Energy efficiency investments are higher than dollars invested in implementation as this includes feasibility studies completed that did not lead to implementation projects.

⁴ These ranges reflect the differences in direct program delivery costs versus the total cost of program development and delivery.

⁵ Includes free-riders: those that participated in the program but did not implement energy conservation measures.

Grant Funding

Grant funds were available for feasibility studies and to implement building tune up or smart building upgrades. In total, \$27,473 in grants funds were disbursed between April and November 2019, 25 per cent of the total funding available.

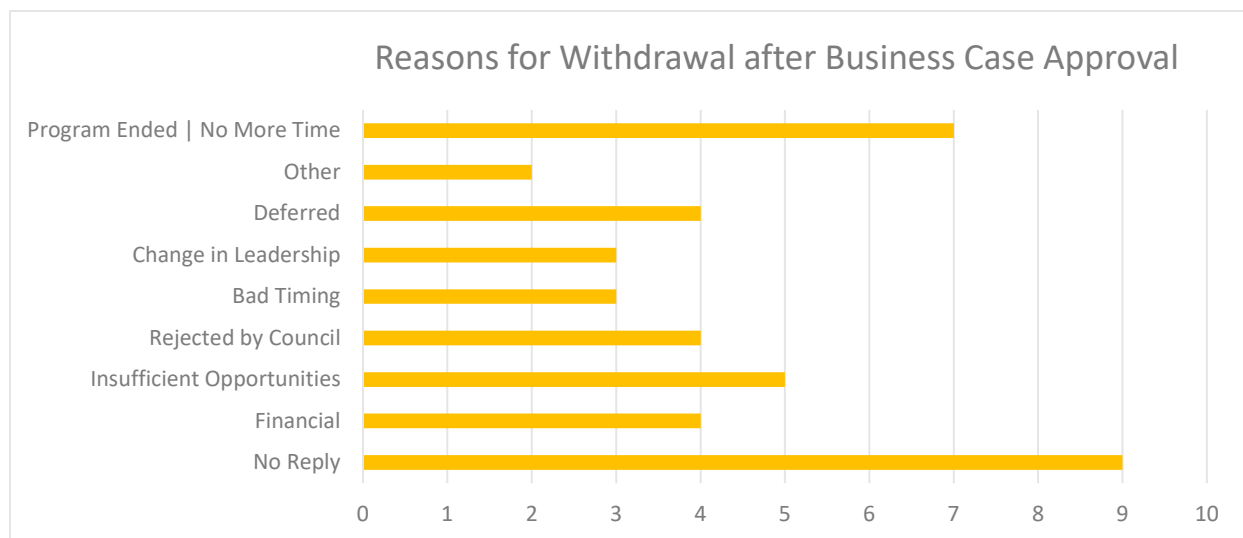
	Feasibility Studies	Building Tune-up / Smart Building Upgrades
Number of Grants Awarded	7	20
Average Amount of Grants	\$ 1,413	\$ 879
Average GHG Savings (T/ year)	30	5

Only 3 of the 7 feasibility study grants claimed led directly to implemented ECM's. Three buildings used the funds for a building envelope condition assessment studies, which were identified as opportunities for imminent end of life energy efficiency improvements, but did not result in project implemented in the program timeframe. The seventh feasibility study identified conditions that prevented the implementation of the recommended measure.

Program Attrition

In the first stage of the program, 70% of the buildings that were withdrawn were due to "No Reply". That is, they were contacted by email once per week for three weeks and once by phone in the fourth and final week and failed to respond. While we do not have confirmation, we attribute this to individuals signing up for the program and then later changing their minds. Just 13 per cent of buildings (14 total) screened out due to insufficient opportunities. This included buildings that were only interested in LED lighting upgrades and were therefore not eligible for the program.

Of the 41 buildings that withdrew after receiving a business case analysis 27 per cent withdrew with the intention of completing at some point in the future (program ended and deferred). Just 10 percent withdrew citing financial barriers, although anecdotally this was a factor in rejection by council and deferral. We can also assume this was a factor in the "no reply" withdrawals, who did not respond to SEA's after 4 or more attempts to contact.



Program Experience

Feedback on program experience was solicited from participants at two points in the pilot program timeline. One anonymous interim survey after the majority of buildings had received their business cases to evaluate phase 1 and then the option of an exit survey or interview at completion or withdrawal in phase 2.

The program had very low response rates with less than 30 per cent of buildings participating in program evaluation. While this is not surprising, it does leave us with little information to infer participants overall experience with the program.

Effectiveness of Program Elements

In the program exit survey's and interviews conducted in phase two of the program, contacts were asked "Overall, what did you find most helpful about your experience with the SEA program?". We have ranked the "most helpful" resources by mentions in the program exit survey's and interviews:

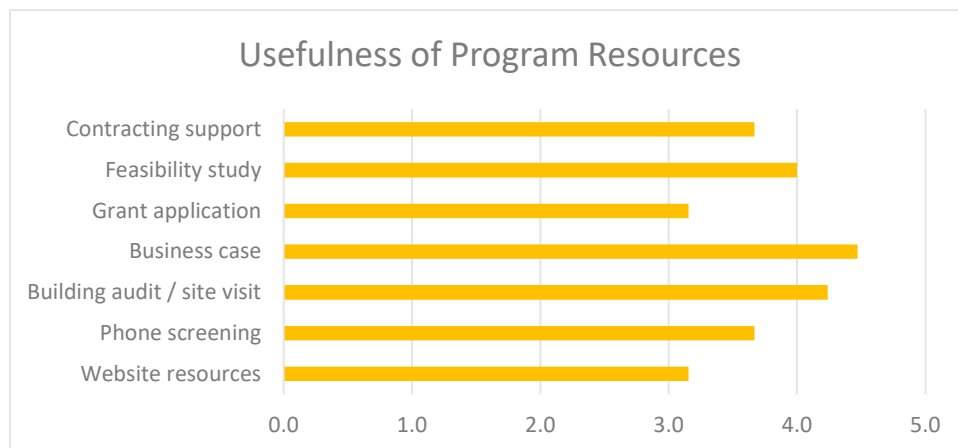
1. SEA Advice
2. Business Case Report
3. Grants
4. Maintenance Scope of Work Checklist

Not mentioned:

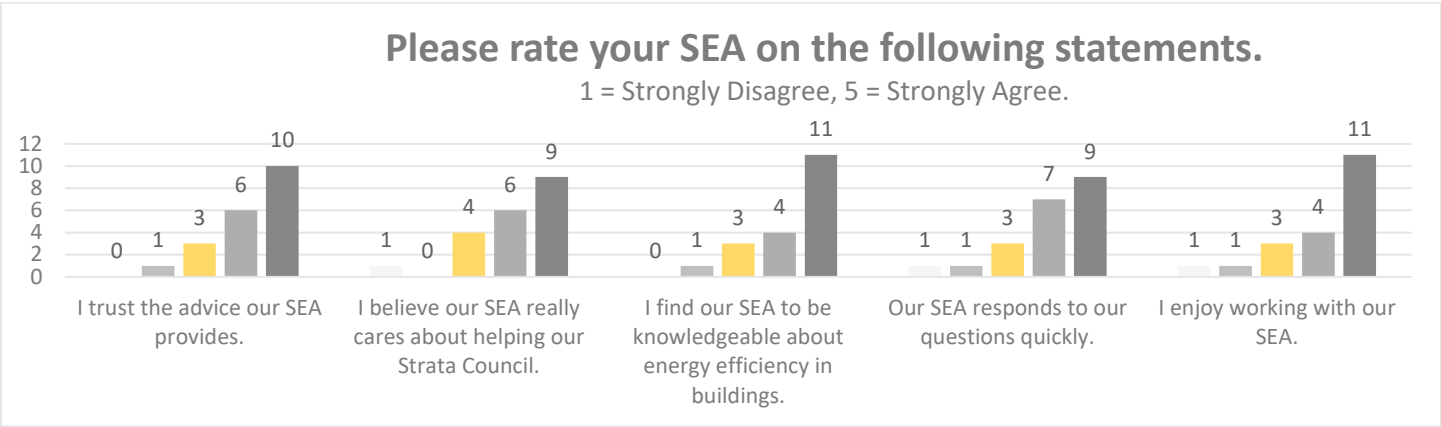
- Web Site
- Scope of Work Checklists (Building Envelope, Major Mechanical, Feasibility Study)
- Information Pages (summary of recommendations in preparation for AGM / SGM)

One respondent indicated "*The engagement was very informative and the strata council now has a good idea as to what are the most effective ways of reducing energy consumption and carbon footprint of our building.*" Several contacts referenced the educational value of the program, helping them to better understand how their buildings operated and plan for maintenance and renewal.

Resource usefulness was also ranked in the anonymous interim program survey where the value of the business case and site visit were identified as the most useful components.



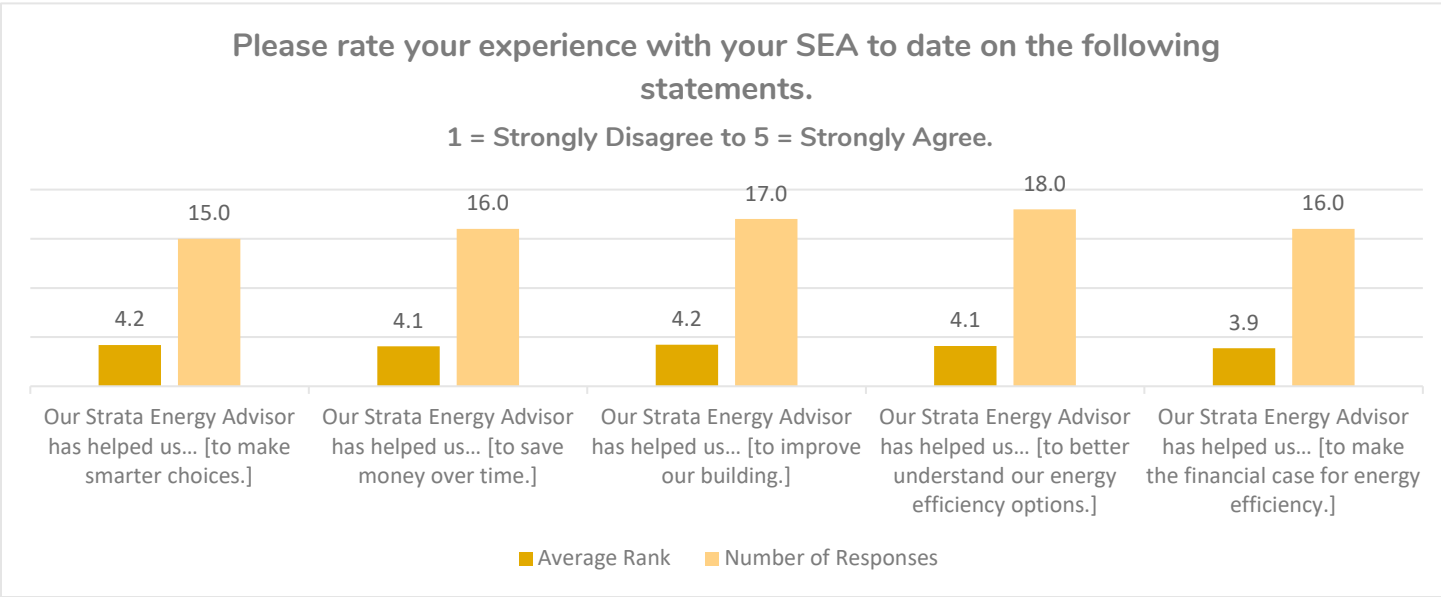
The interim survey also asked participants to evaluate SEA support. Specifically, around the program brand promise to be trustworthy, caring, and smart.



The large majority of the responded indicated they “agreed” or “strongly agreed”. The importance of the trustworthiness was echoed in several exit interview and survey comments. As reflected in the statement of one participant that they “*really appreciated having [an] unbiased third-party opinion of areas where we could be more efficient.*”

The Strata Energy Advisor value proposition was to support strata’s to:

- 1. Make smarter choices
- 2. Save money over time
- 3. Improve their building



Again, it was difficult to infer from the exit interviews and survey’s how effective the program was in meeting these objectives, though comments seemed to correlate with interim survey analysis that the program delivered strongest on making smarter choices with some room for improvement on making the financial case. Experience with the SEA and the value proposition of the program to participants would best be assessed by a third-party evaluation of the program now that it has been completed.

Future Projections

There are more than 7,200 strata-owned buildings in the lower mainland and an estimated 4 to 11 per cent of strata corporations undertake a major maintenance project each year.⁶ The pilot program reached just over 1 per cent of those buildings to achieve a lifetime GHG reduction of 2,265 Tonnes each year and energy efficiency investments of over \$500,000 in the region.

Extrapolating from data in the RDH Program Recommendations Report, we can get a sense of the potential of a scaled-up Strata Energy Advisor Program. This table shows the potential program reach based on the number of buildings that complete end-of-life renewal projects each year.

<i>Participation rate</i>	10%	25%	50%	75%
<i>Mechanical (# of buildings)</i>	40	101	202	303
<i>Envelope (# of buildings)</i>	30	74	148	221
<i>Total (# of buildings)</i>	70	175	349	524
<i>Annual cost based on \$6000 per building cost</i>	\$ 419,259	\$ 1,048,148	\$ 2,096,296	\$ 3,144,443

Based on results from the pilot, the average GHG impacts from each stream of the program were:

<i>Program Stream</i>	<i>Average Tonnes of Lifetime Savings per Building</i>
<i>Building Tune-up / Smart Building Upgrades</i>	23
<i>Major Mechanical End-of-Life Renewal</i>	162
<i>Building Envelope End-of-Life Renewal</i>	290

Looking only at end-of-life renewal projects, if the Strata Energy Advisor program influenced just 10 per cent of buildings annually, they could reduce GHG emissions by 15,000 tonnes per year or 2 per cent of regional emissions from this building sector. This estimate is still quite conservative as it is based on the performance of the pilot. We are confident that adopting the program recommendations will improve the completion success rates and decrease free-riders significantly, improving the cost-benefit ratio. Moving forward, if the SEA program objective is to help achieve Metro Vancouver's Climate 2050 target of carbon neutrality, program investments would need to scale to influence most of the annual renewal projects in strata buildings that use natural gas for heating and hot water, and leverage other incentive or regulatory mechanisms to ensure these are deep carbon retrofits.

⁶ RDH Program Recommendations Report, Metro Vancouver Strata Energy Advisor Program, 2016, Page 8

Appendix A: Municipal Analysis

Program Impacts	City of Vancouver	City of Richmond	City of Surrey	City of New West	City of North Van.	UBC	Other	Total
Completed Building Tune-Up	15	1	2	5	1	1	4	29
Completed Smart Building Upgrades	10	0	0	4	2	1	1	18
	3	2	1	1	0	0	1	8
Completed Building Envelope Project	1	0	0	0	0	0	0	1
Annual GHG Savings (Tonnes)	171.7	10.0	7.2	13.8	0.3	2.8	9.0	214.8
Residential Units Impacted	2173	80	479	686	48	145	227	3838

Program Participation	City of Vancouver	City of Richmond	City of Surrey	City of New West	City of North Van.	UBC	Other	Total
Received a Screening Call	50	6	5	15	8	4	11	99
Received a Site Visit	47	5	5	13	6	4	7	87
Received a Business Case	45	5	5	12	5	4	6	82
Received a 1 or More Grants	13	1	1	5	0	1	0	21
Completed OR Completed Future	20	2	3	7	1	1	4	38

Business Cases	City of Vancouver	City of Richmond	City of Surrey	City of New West	City of North Van.	UBC	Other	Total
Received a Business Case	45	5	5	12	5	4	6	82
Business Case Approved	35	4	5	10	3	3	5	65
Business Case Rejected	10	1	0	2	2	1	1	17
Completed OR Completed Future	20	2	3	7	1	1	4	38

Grants	City of Vancouver	City of Richmond	City of Surrey	City of New West	City of North Van.	UBC	Other	Total
Grant "Holds"	30	4	4	11	3	1	1	54
Feasibility Studies Completed	5	1	0	0	0	1	0	7
Building Tune-ups Completed	11	1	1	5	0	0	0	18
Grants Claimed	16	2	1	5	0	1	0	25
Grant Funds Issued	\$ 15,670	\$ 3,000	\$ 158	\$ 7,145	\$ -	\$ 1,500	\$ -	\$ 27,473

Argyle House Case Study

The HIGHLIGHTS | BUILDING TUNE-UP

Argyle House installed weather stripping in common areas and all units with an inspection by a professional installer using the SEA Building Tune-up Grant. In total this one project and common area light bulb replacements achieved:

ANNUAL	Electricity Savings	402 kWh
	Gas Savings	81 GJ
	Cost Savings	\$ 717
	GHG Savings	2.6 Tonnes
Reduction in GHG Intensity		1.6%
Lifetime GHG Savings		26 Tonnes



The BUILDING

Built in 1974, Argyle House is a 10-storey concrete strata building in New Westminster. All 41 residential units are heated by a central hot water (hydronic) boiler. Hallways are ventilated by a make up air unit on the roof that also uses central hot water for heating. A separate natural gas boiler provides domestic hot water for the building. Amenities include a pool, sauna, gym, games room and workshop for residents. The suites are generously sized and include in-suite laundry.

The CHALLENGE

At 45 years old, many of the original buildings systems were in need of repair or replacement. Jennifer had been on council for four years and was looking for ways to reduce the cost of the work that needed to be done. The building was already in the middle of a major parkade and pool area renovation and had a number of other projects on the radar. Jennifer was interested in energy efficiency, but for the strata council it was low priority given all the other concerns.

The annual strata utility budget was \$36,000, mostly natural gas for the two boilers. The utility cost per unit was \$878 a year, just moderately higher than the average of \$797 for comparable sized buildings, but significantly higher than the average of \$594 for all reporting buildings in the program.

The PLAN

After speaking with Jennifer and completing a walk-through assessment, their Strata Energy Advisor Selina focused on low-cost, short payback options: weather stripping, notched belts for the make up air unit and hot water piping insulation. They had already investigated an LED upgrade, but had decided to change from CFL to LED as bulbs burned out. Ideally Argyle House could upgrade the windows, boiler, and make-up air unit, but with all the other urgent priorities this wasn't an option for the strata council. In the end, the strata council was interested in the building tune-up options.

The PROCESS

The first step in the process was to get quotes for the work. During this time, the building had a boiler leak and changed property management companies. Throughout Jennifer and Selina worked together to navigate and adjust the plan. Selina also helped provide a bit of advice and support on a hot water storage tank replacement which helped gain the trust of council.

That trust was key when the weatherstripping and lighting upgrade quotes came back with huge cost ranges. As Jennifer said: "it [was] hard to trust the contractor's quotes", and they "appreciated that the SEA program was unbiased". After sorting through the quotes, council decided to proceed only with weatherstripping, as it would use up the entire building tune-up grant covering 50% of the cost. The balance was covered under their annual repair and maintenance fund. Notched belts would be done as part of planned regular maintenance and the others would have to be considered after other urgent problems were resolved.

Once the decision was made, the next challenge was coordinating access to all 41 suites in the building. Some residents were resistant to having people in their suites, but they were able to negotiate access times and dates. In the end, it took just 3 days to complete all suites and common areas. Residents reported there was an immediate comfort improvement. Windows were far less drafty and didn't howl in windstorms like they used to.

The SECRET TO SUCCESS

For Jennifer, one of the secrets of the SEA programs success was having access to an advisor. Someone to provide unbiased information gave the strata council the "confidence and peace of mind for a professional to come in and help prioritize the measures".

The other secret was access to the grant funding. Given all the other priorities, the weatherstripping installation "would not have not taken place without the SEA grant".

Landmark Regency Case Study

The HIGHLIGHTS | BUILDING TUNE-UP & SMART BUILDING UPGRADES

Landmark Regency replaced weather stripping in common areas and installed boiler room pipe insulation. Have also installed a parkade carbon monoxide sensor to control the exhaust fan.

ANNUAL	Electricity Savings	429 kWh
	Gas Savings	80 GJ
	Cost Savings	\$ 800
	GHG Savings	0.4 Tonnes
Reduction in GHG Intensity		1%
Lifetime GHG Savings		8 Tonnes



The BUILDING

The Landmark Regency was built in 1974. A 3-story strata in Vancouver with just 14 residential units, underground parking, storage, and shared laundry facilities. The building has one central boiler that provides hydronic (hot water) heating to units and domestic hot water. The boiler was original to the building, with multiple components replaced over time. A depreciation report prepared in 2014 gave it an “effective age” of 18 years. Hallways are ventilated with a single roof-top fan and there is an exhaust fan in the parkade. When they registered for the program, they were undergoing wall membrane updates and had completed two-sides of the building and were beginning on a third. Of the 14, only 5 units chose to upgrade windows during the membrane project.

The CHALLENGE

Kim had been on the strata council for 20 years at the Landmark Regency and was recently elected chair for the first time. The strata council recognized there was additional maintenance work to be done on the building but didn't have a specific project in mind. Council was interested in energy efficiency upgrades but weren't sure where to start.

The Landmark Regency had an annual strata utility budget of \$12,500 for natural gas and electricity. The utility cost per unit was \$893 a year, slightly higher than the average of \$772 for comparable sized buildings, and significantly higher than the average of \$594 for all reporting buildings in the program.

The PLAN

After speaking with their strata council representatives and completing a walk-through assessment, their Strata Energy Advisor Khaled looked at three potential areas of impact:

Tune-up and Smart Building Upgrades: low-cost short payback options like weather striping, piping insulation in the boiler room and a parkade carbon monoxide sensor.

LED Lighting Upgrade: while LED upgrades alone were outside the program scope, they were analyzed in conjunction with other measures and would achieve an 18 per cent reduction in electricity consumption and payback the cost in just 4 years.

Condensing Boiler Upgrade: the domestic hot water boiler was nearing end of life and at 70 per cent efficiency there was an opportunity to reduce their natural gas use by 9 per cent per year.

The strata council decided to proceed with the tune-up and smart building upgrades. They also wanted to complete a feasibility study to confirm if any changes to the system might be required to upgrade to a high efficiency condensing boiler. A full lighting upgrade wasn't approved, but they decided to trial replacing old bulbs with LED bulbs as they burnt out.

The PROCESS

The first challenge was finding a consultant to do the boiler upgrade feasibility study. The SEA directed Kim to Fortis BC's "Find a Contractor" web site and she started reaching out to them one by one. The majority of the companies she contacted would not give her a quote as the job was "too small". She stuck with it and eventually secured three quotes. To pay for the study, they used the SEA grant and funds from their annual maintenance budget, but they still had to call a special general meeting for the balance. In the end, even with the \$1500 feasibility study grant, the owners voted to defer the study and the proposed boiler upgrade until it reached end of life in 2021.

Kim also ran into challenges trying to find a contractor to install a carbon monoxide (CO) sensor to control the parkade exhaust fan. While she could find electricians, they didn't have experience with CO sensors. In the end Kim contacted a gas company to purchase the sensor and had an electrician install it. The electrician did a great job and also cleaned up old wiring to improve safety and future maintenance.

The LED upgrade had its own challenges. Rather than replacing the fixture, the strata chose to replace the bulbs only. The bulbs were purchased online at low cost. When they tested the bulbs, they started to flicker after just a few months. The issue was likely a combination of incompatible fixtures and a lower quality LED driver in the new bulb. The strata will vote to replace the fixtures in a future annual general meeting.

Fortunately, the weatherstripping upgrade was straight forward. Kim purchased the materials and it was installed by a resident who is also a contractor to minimize costs. The strata council did contract a plumber to install the pipe insulation with the SEA assisting to help interpret information when comparing quotes for the work.

The SECRET TO SUCCESS

According to Kim, none of these projects would have proceeded without the Strata Energy Advisor program. The building tune-up grant was the reason for signing up, but learning about their building was just as valuable. They knew they wanted to do something but weren't sure where to start, so the business case helped them understand and prioritize the energy efficiency opportunities. In addition to the work they've done so far, they have a plan to upgrade to LED lighting soon and a high efficiency boiler upgrade in the future saving 3.6 tonnes more greenhouse gas emissions each year.

Windsor Greene Case Study

The HIGHLIGHTS | MECHANICAL UP-GRADE

Windsor Green replaced a standard efficiency domestic hot water boiler with a high efficiency condensing boiler.

A N N U A L	Electricity Savings	11,217 kWh
	Gas Savings	150 GJ
	Cost Savings	\$ 2,700
	GHG Savings	7.6 Tonnes
Reduction in GHG Intensity		5.6%
Lifetime GHG Savings		152 Tonnes



The BUILDING

Windsor Greene is a 3-story residential building in Richmond. Built in 1989, it has 35 residential units with electric baseboards and gas fireplaces for heating. Hot water was provided by a central gas-fired boiler original to the building. A rooftop unit fan provided ventilation for corridors. There are both shared and in-suite laundry facilities.

The CHALLENGE

Emel was elected President of the strata council shortly before signing up for the Strata Energy Advisor pilot program. They were one of the last buildings accepted in to the program and they needed to act fast to benefit from the incentives and SEA support. They didn't have a specific project in mind, but were interested in improving their energy efficiency.

Windsor Greene had an annual strata utility budget of \$39,500 for natural gas and electricity. The utility cost per unit was \$1,129 a year, higher than the average of \$789 for comparable sized buildings.

The building had high electrical loads from older fluorescent lighting and electric space heating in common areas, but the main story was the natural gas consumption. The hot water boiler had been shutdown off an on creating irregularities in gas use. With that corrected for, they showed high consumption in winter from using gas fireplaces for heating to make up for drafty older windows and patio doors.

The PLAN

After the walk-through assessment, the focus became upgrading the domestic hot water boiler to a high efficiency condensing boiler. The strata council were also interested in finishing the LED upgrades, but decided with all the other investments they would stick with replacing fluorescent bulbs with LED bulbs as they burned out. Their SEA Khaled had proposed some building tune-up measures, but the strata council was more interested in replacing windows and sliding doors, so they decided to go ahead with a feasibility study. Khaled also identified replacing the rooftop unit fan and electric baseboard heaters with a heat pump as an energy efficiency opportunity, but that was deferred to a future discussion.

The PROCESS

To take full advantage of the program, Windsor Greene had to move fast. They applied for a feasibility study grant and found a consultant to complete a building envelope condition assessment (BECA) to evaluate replacing the windows, sliding doors, and stucco exterior. Even though they knew what they wanted done, because it was such a big investment, they wanted certainty around costs, benefits, and potential unknown issues before they opened up walls. The BECA was completed in October 2019 and the strata council is starting to plan for implementation.

The domestic hot water upgrade required a few more steps. Working closely with the property manager, the Strata Energy Advisor helped to identify the type of boiler they wanted and select a contractor to install it. The strata council called a special general meeting (SGM) to vote on accessing contingency funding to pay for the boiler replacement. Prior to the SGM, the strata council held an information meeting for residents to learn about the proposed upgrades. Khaled prepared an information sheet for the meeting, detailing why the boiler replacement was necessary, how they had come to this recommendation, and what the costs and benefits were to owners. Khaled also attended the information session to present the information and answer questions. The SGM vote was successful, the boiler was installed, and the strata council was just applying for the Fortis BC incentive at the close of the pilot program.

The SECRET TO SUCCESS

For Emel, the grant funding was the motivation for his strata council to get involved and the deadlines to claim the grants meant they made the decision faster than they would have otherwise. They spent almost \$20,000 upgrading their DHW boiler and were able to access incentives from Fortis BC, so the extra cost of the high efficiency boiler will be paid back in energy savings in less than 6 years.

Their Strata Energy Advisor was very helpful. He worked closely with their property manager, answering questions and setting up regular check-ins to keep things moving. Having Khaled at the info session for the AGM vote was also an important part of the success. It allowed the owners understand the pro's and con's of the options, and the credibility he had as an independent representative of a government program helped them feel more confident in their decision. Unfortunately, the pilot program ended before they were able to move on to the window and building enclosure upgrades, but Windsor Greene is keen to sign up again if the program returns.

To: Climate Action Committee

From: George Friedrich, Senior Project Engineer, Liquid Waste Services Department
Conor Reynolds, Division Manager, Air Quality and Climate Change Policy, Parks and Environment Department

Date: August 14, 2020 Meeting Date: September 18, 2020

Subject: **Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2014 to 2018)**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated August 14, 2020, titled "Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2014 to 2018)".

EXECUTIVE SUMMARY

Metro Vancouver uses energy to provide services to the region, which generates greenhouse gas emissions. Energy purchases cost approximately \$26 million per year, and unit rates for purchased energy are expected to continue to rise. Metro Vancouver facilities also produce energy for internal use and for sale to BC Hydro. To help manage operating costs and maintain Metro Vancouver's commitment to corporate carbon neutrality, staff are developing energy and GHG targets by service area, and pursuing actions to continuously improve energy efficiency and enhance renewable energy generation opportunities. This report provides an update on energy trends and actions to improve Metro Vancouver's progress on energy efficiency, support a transition to renewable energy, and achieve GHG emissions reductions, in the context of the Corporate Energy Management Policy, *Climate 2050*, and new regional GHG reduction targets. Systems have been developed to regularly report progress and will be updated as needed to ensure that all appropriate information is included.

PURPOSE

To inform the Climate Action Committee of trends in Metro Vancouver's corporate energy use, energy costs, and greenhouse gas (GHG) emissions for 2014 through 2018; to provide an update on energy management and GHG emissions management actions by service area; and to establish Metro Vancouver's commitment to setting energy and GHG emissions management targets by service area in 2020.

BACKGROUND

In 2014 the MVRD Board adopted the *Corporate Energy Management Policy*, which articulates Metro Vancouver's commitment to continuously improving the efficiency of energy use, production, generation, and recovery, and provides direction for staff to put processes in place to effectively manage energy, establish energy targets, and regularly monitor and report on progress toward reaching those targets.

At its meeting on October 11, 2018, Metro Vancouver's Utilities Committee received for information a report titled "Energy and Greenhouse Gas Emissions Management in Liquid Waste and Water

Utilities" detailing trends from 2013 through 2017. Subsequently, in July 2019, the Metro Vancouver Board adopted new *regional* targets to become a carbon neutral region by 2050, with an interim target of reducing GHG emissions by 45% from 2010 levels by 2030. This report expands upon the 2018 report to the Utilities Committee to include comprehensive energy and GHG information about all Metro Vancouver's service areas.

METRO VANCOUVER'S ENERGY AND EMISSIONS PROFILE

Metro Vancouver and its contractors purchase energy to power facilities, buildings, and fleets in providing vital services to the region. In addition to using purchased energy, Metro Vancouver also "self-generates" a substantial amount of energy. In most cases, this self-generated energy is used by Metro Vancouver; for example, biogas produced at wastewater treatment plants is used as a fuel to generate electricity and heat. Electricity that is self-generated at the Waste-to-Energy facility is sold to BC Hydro.

Metro Vancouver's purchased energy cost (primarily electricity, natural gas, diesel, and gasoline) exceeded \$26.4 million in 2018. Total corporate GHG emissions from all energy use resulted in over 21,000 tonnes carbon dioxide-equivalent (CO₂e) in 2018.

"Metro Vancouver Annual Corporate Energy and Greenhouse Gas Emissions Management Report 2014 to 2018" (Attachment) summarizes the five-year trend in energy and emissions for Metro Vancouver's operations. It provides details on trends in energy use, energy costs, and GHG emissions by service area. Costs for operating and maintaining self-generation energy systems are not yet included in this analysis. Key energy and GHG emissions performance indicators are also provided. The 2019 data is being finalized, and the 2015-2019 report will be presented at a future meeting.

Metro Vancouver's annual CARIP (Climate Action Revenue Incentive Program) report for 2019, which was presented to the Climate Action Committee at its July 17, 2020 meeting, reported emissions of 16,645 tonnes CO₂e associated with the delivery of "traditional local government services". The total of 22,500 tonnes reported here includes emissions from Metro Vancouver services which are not included in CARIP reporting, such as emissions associated with natural gas use in Metro Vancouver Housing services.

Managing Energy Use and Energy Costs

Metro Vancouver's established Corporate Energy Management Program aims to identify and implement energy savings opportunities in the operation and maintenance of existing facilities, and to ensure new facilities are designed with an energy-efficiency lens. Over 2014-2018, the energy conservation projects implemented by the program have resulted in cumulative energy savings of 48,000 GJ, resulting in cumulative operating cost savings of approximately \$1 million and ongoing savings of \$430,000 per year.

Despite these efforts, Metro Vancouver's total energy use has been trending upwards, increasing 6% between 2014 and 2018. A substantial proportion of the increased energy usage can be attributed to the commissioning and ongoing operation of major new facilities (such as the Capilano Raw Water Pump Station, commissioned in 2015).

Corporate GHG Emissions Trends

A suite of corporate policies that emphasize corporate Metro Vancouver GHG management have been adopted since 2014, including the Carbon Price Policy, the Fleet Planning and Acquisition Policy, the Liquid Waste Heat Recovery Policy, and the Sustainable Infrastructure and Buildings Policy. More detail is provided in the Attachment, and on the *Climate 2050* website.

Between 2014 and 2018, corporate energy-related GHG emissions increased by 13%, largely due to increased hauling of wastewater treatment residuals, increased natural gas use at the Waste-to-Energy Facility, and concurrent operation of both the old and new Head Office buildings. As detailed in the Attachment, staff are reviewing opportunities to manage emissions from existing energy use, and to identify new and enhanced emissions reductions projects, including: improved operating efficiencies; enhanced production and use of renewable fuels – such as renewable natural gas – that can replace fossil fuels; conversion of more fleet vehicles to low-carbon technologies as new models become available; and, incorporation of low-carbon technologies in major capital projects. To balance a portion of corporate energy-related emissions, a portfolio of non-energy-related emission-reduction projects has been pursued that aim to achieve real, measurable, and verifiable regional GHG emissions reductions, or avoid the release of GHGs altogether. These projects include several avoided forest conversion projects, the use of trenchless technology for sewer pipe installation, and the ecological restoration of Burns Bog. These emission reductions can be claimed by Metro Vancouver as GHG reduction credits under CARIP, and are described in Metro Vancouver's annual CARIP report for 2019, as presented to the Climate Action Committee at its July 17, 2020 meeting.

Renewable Energy and GHG Reduction Projects

Metro Vancouver produces, recovers, and uses substantial amounts of clean and renewable energy as part of its operations, which can affect the cost and emissions associated with purchased energy. Although energy recovery and production is not part of Metro Vancouver's core mandate, energy opportunities are examined where there is the potential for regional emissions reductions, renewable energy provision to the regional community, or significant revenue generation. As part of its *Climate 2050* strategy, Metro Vancouver is developing an Energy Roadmap that will include policies and actions to transition the regional energy supply to carbon neutral over the next 30 years; this Roadmap will include regionally significant corporate energy projects that support this goal.

As an example of the opportunity to produce renewable energy, Liquid Waste Services produces methane-rich biogas at four of its five wastewater treatment plants. Most of the biogas is used to directly fire boilers and generate heat and electricity in cogeneration engines. A number of opportunities are being explored to clean the biogas and supply it to Fortis' natural gas service grid as renewable natural gas. The Sustainability Innovation Fund has supported a number of projects in this area. A list of significant projects and opportunities that are expected to influence Metro Vancouver's ongoing corporate energy and GHG profile, and which are either underway or are being explored, is included in the Attachment.

Establishing Corporate Energy Efficiency and GHG Emissions Reduction Targets

In its 10-Year Plan (published in 2019) Housing has committed to reducing energy consumption by 25% (from 2015 National Energy Code for Buildings) for major rehabilitations and for new construction, and to reducing GHG emissions in the Housing portfolio by 45% by 2030 compared to 2010 levels. A target-setting process has been developed and is being tested by Liquid Waste Services and will be rolled out and replicated for other service areas in the Corporation.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

In 2018, Metro Vancouver spent over \$26.4 million on purchased energy. Energy unit rates are expected to increase over time. A robust Energy Management Program can help Metro Vancouver manage energy costs while supporting corporate GHG reductions. Estimated annual savings for Metro Vancouver's energy conservation projects completed from 2014 through 2018 are \$430,000.

BC Hydro and FortisBC contribute a total of up to \$150,000 per year toward the salaries of two energy management staff, who focus on electricity and natural gas conservation respectively. This funding is renewed annually and is contingent on meeting agreed-upon energy performance objectives. FortisBC funding up to \$180,000 is also being used in 2020 and 2021 for a temporary position developing the Climate 2050 Energy Roadmap. Since 2014, Metro Vancouver's Corporate Energy Management Program has accessed support funding of more than \$765,000 for salaries, and energy efficiency studies and projects.

CONCLUSION

Metro Vancouver aims to manage both energy and GHG emissions in a manner that balances service quality and reliability, fiscal responsibility, and environmental impact. Metro Vancouver has undertaken a range of regionally significant GHG reduction projects that have enabled it to achieve corporate carbon neutrality under the provincial CARIP program. However, energy use and costs continue to increase. As part of the implementation of its *Corporate Energy Management Policy* and *Climate 2050*, Metro Vancouver is showing corporate leadership by setting energy and GHG targets by service area, and will report on progress toward these targets at regular intervals.

Attachment

Metro Vancouver's Annual Corporate Energy and GHG Emissions Management Report: 2014 to 2018
(37098246)

39720037

**Metro Vancouver Annual Corporate Energy and
Greenhouse Gas Emissions Management Report
2014 to 2018**

August 14, 2020

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Appendix A: Supplemental Data

1. EXECUTIVE SUMMARY

Metro Vancouver spent more than \$26 million on energy use in 2018, which resulted in more than 21,000 tonnes of carbon dioxide equivalent (CO₂e) greenhouse gas (GHG) emissions. Liquid Waste Services was Metro Vancouver's largest energy user followed by Water Services, Solid Waste Services, Housing, Corporate Services, and Regional Parks. Figure 1, below, summarizes five-year trends in energy use, energy costs, and GHG emissions from energy use.

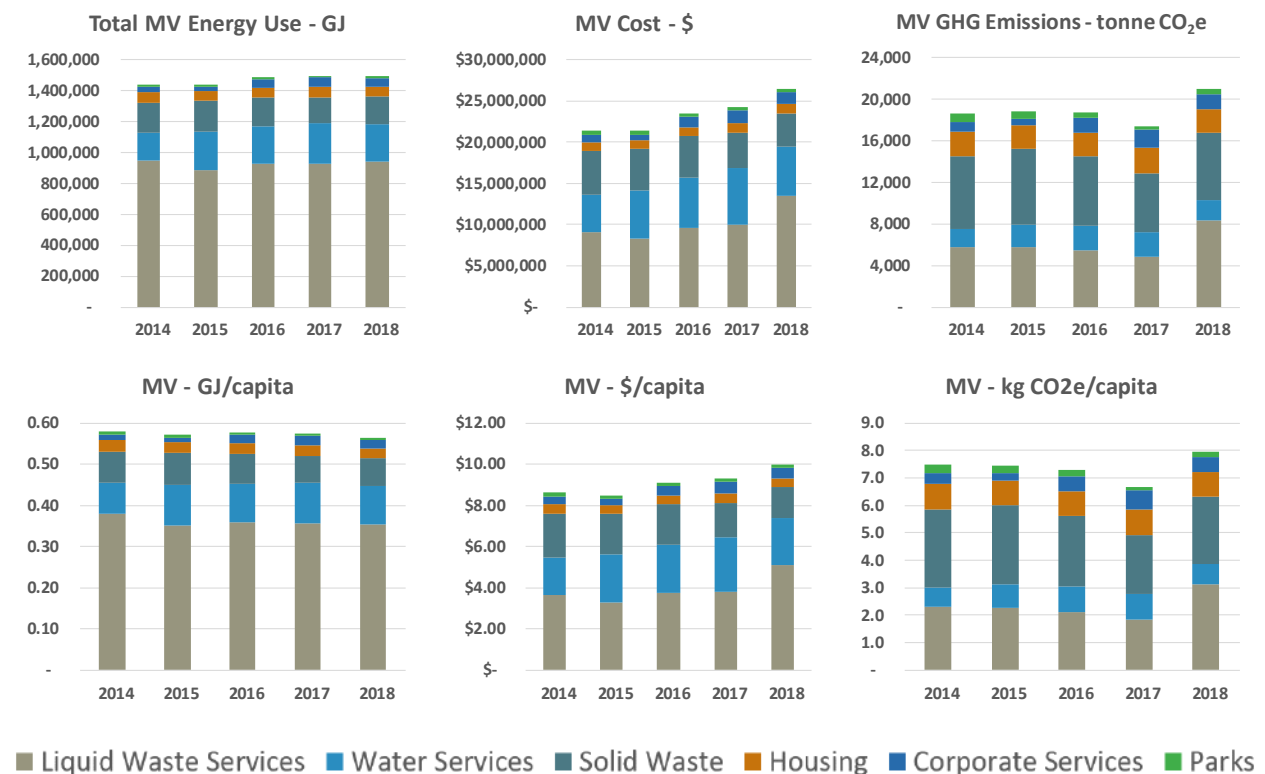


Figure 1: Five-Year Trends by Service Area

As shown in Figure 1, corporate energy use has increased by 4% since 2014, energy costs have increased by 23%, and GHG emissions associated with energy use have increased by 13%. Much of the cost increase seen from 2017 to 2018 was the result of increased electricity purchases required when the Annacis Island Wastewater Treatment Plant cogeneration engines were taken out of service in late 2017 to enable the cogeneration system upgrade that will be complete in 2020. Also shown in Figure 1, since 2014, per capita energy use has decreased by 3%, per capita energy cost has increased by 16% and per capita GHG emissions have increased by 6%.

Energy efficiency projects completed from 2014 through 2018 have contributed to savings of nearly 26,000 GJ per year. Cumulative cost savings from these projects over this period are estimated at \$1.2 million and cumulative GHG emissions reduction are 625 tonnes CO₂e.

Progress has been made toward implementing corporate policies related to energy use and GHG emissions including the *Corporate Energy Management Policy*, the *Sustainable Infrastructure and Buildings Policy*, the suite of *Asset Management* policies, and development of the *Climate 2050* Roadmaps.

All service areas have committed to setting energy and GHG emissions management targets in 2020 and establishing reporting systems to monitor progress toward meeting those targets. For its corporate emissions, Metro Vancouver has achieved carbon neutrality in 2015 and 2019. It commits to maintaining carbon neutral status from 2025 onwards.

Metro Vancouver is working to establish processes to monitor and manage the costs associated with energy self-generation.

2. INTRODUCTION

Energy plays a fundamental role in allowing Metro Vancouver to provide services to the region. Energy use represents one of Metro Vancouver's largest operating costs – totaling more than \$26 million in 2018 – and is Metro Vancouver's second-largest¹ source of corporate greenhouse gas (GHG) emissions. In 2018 Metro Vancouver used nearly 1,500,000 gigajoules (GJ) of energy including both purchased energy – such as electricity, natural gas, diesel, gasoline, propane, and steam – and energy that Metro Vancouver self-generated. In addition to the energy that Metro Vancouver uses, it also generates electricity at its Waste-to-Energy facility through combustion of municipal solid waste. This electricity is sold to BC Hydro.

Effective energy and GHG emissions management are therefore critical in demonstrating Metro Vancouver's corporate fiscal responsibility and commitment to climate change mitigation.

This report presents Metro Vancouver corporate trends in energy use, energy cost, and GHG emissions for each service area from 2014 through 2018. Service areas examined in this report comprise Liquid Waste Services, Water Services, Solid Waste Services, Metro Vancouver Housing Corporation (Housing), Regional Parks (Parks), and Corporate Services. The report also provides updates on progress that Metro Vancouver has made in implementing corporate policies related to energy and GHG emissions management and an update on the role that Metro Vancouver staff play in participating in various energy- and climate-related corporate initiatives.

3. ENERGY PRODUCTION/GENERATION, USE, COST AND GHG EMISSIONS TRENDS

With the objectives of managing corporate GHG emissions and energy-related operating costs, Metro Vancouver's *Corporate Energy Management Policy* commits the organization to continuously improving the efficiency with which it uses and produces energy. This section summarizes trends in corporate Metro Vancouver energy use, purchased energy costs, and GHG emissions related to energy use as well as trends in energy production/generation.

3.1 ENERGY UNIT COSTS

Energy costs play a significant role in the analyses and discussions that follow. Energy costs are driven by a combination of energy consumption – which Metro Vancouver can manage by establishing processes to design efficient systems and to operate and maintain those systems for peak efficiency – and energy unit rates over which Metro Vancouver has no control. Table 1 provides trends for aggregate energy unit rates (total cost divided by total energy use) for Metro Vancouver.

¹ GHG emissions from the combustion of municipal solid waste at the Metro Vancouver Waste-to-Energy Facility are Metro Vancouver's largest source of corporate GHG emissions.

Table 1: Aggregate Energy Unit Rates

Metro Vancouver Aggregate Energy Unit Rates (\$/GJ)									
	Year					Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Electricity	\$ 23.01	\$ 23.98	\$ 26.21	\$ 26.58	\$ 25.20	4%	14%	16%	10%
Stationary Fuels	\$ 12.39	\$ 11.55	\$ 12.04	\$ 9.04	\$ 11.04	-7%	-3%	-27%	-11%
Steam	\$ 20.43	\$ 18.73	\$ 17.93	\$ 19.91	\$ 20.88	-8%	-12%	-3%	2%
Mobile Energy	\$ 36.27	\$ 26.22	\$ 30.25	\$ 32.61	\$ 32.90	-28%	-17%	-10%	-9%

Notes:

Decrease (change less than zero)

Increase (change greater than zero)

Stationary Fuels, Steam, and Mobile Energy are all fossil fuels. From 2015 through 2018, fossil fuel unit rates have generally decreased compared to 2014. Natural gas is the dominant fuel used by Metro Vancouver in the Stationary Fuels category. Only one Metro Vancouver site (Housing's Regal Place) purchases steam, which is generated by Creative Energy using natural gas.

Electricity unit rates have increased significantly since 2014. The reduction in 2018 aggregate electricity rate is a result of increased electricity purchased by Annacis Island Wastewater Treatment Plant while the cogeneration engines are out of service to allow the installation of larger capacity engines/generators. As a very large energy consumer, that facility is billed by BC Hydro under a lower unit rate than the majority of all other Metro Vancouver facilities.

3.2 ENERGY USE, COST, AND GHG EMISSIONS TRENDS BY SERVICE AREA

2018 Energy Use, Cost, and GHG Emissions Distribution by Service Area

Figure 2 presents the distribution of 2018 energy use, energy costs², and GHG emissions from energy use amongst all Metro Vancouver service areas. GHG emissions from other sources are discussed in Section 4.

Metro Vancouver's total corporate GHG emissions presented in this report are not the same as the GHG emissions reported to the province under the Climate Action Revenue Incentive Program (CARIP). The reportable emissions under CARIP are limited to a defined set of "traditional services", which excludes GHG emissions from Housing, solid waste facilities such as the Metro Vancouver Waste-to-Energy Facility, and certain contracted emissions. This report includes both those GHG emissions reported under CARIP as well as the noted emissions excluded from CARIP.

² All energy costs presented in this report are actual for the year those costs were incurred.

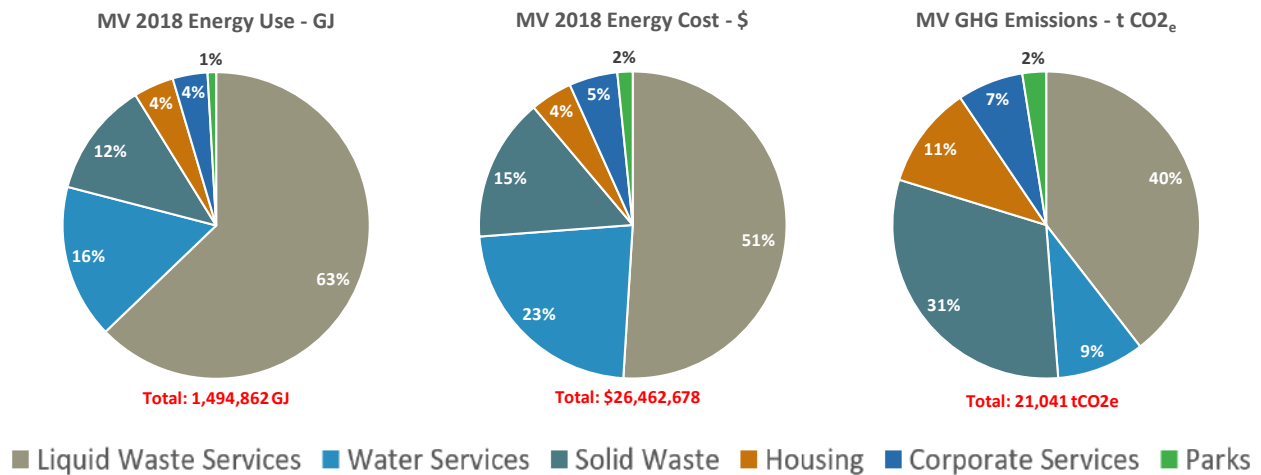


Figure 2: 2018 Energy Use, Cost, and GHG Emissions Distribution by Service Area

In 2018, Liquid Waste Services was the largest corporate energy user followed in order by Water Services, Solid Waste Services, Housing, Corporate Services, and Regional Parks. Energy costs in 2018 followed the same relative trends. GHG emissions intensities (mass of CO₂e emitted per unit of energy used) are greatest for fossil fuels such as natural gas, diesel, gasoline, and propane. In contrast, the majority of grid electricity in British Columbia is hydroelectrically generated and therefore considered a clean, renewable source of energy with very low GHG emissions intensity. These relative differences in GHG emissions intensities is the reason that the GHG pie chart shown in Figure 2 appears very different to the Energy Use and Energy Cost pie charts. Liquid Waste Services and Solid Waste Services use large amounts of fossil fuels to transport wastewater treatment residuals (biosolids, grit, and scum for Liquid Waste Services; filtration residuals for Water Services) and municipal solid waste, respectively; Solid Waste Services, Housing, and Corporate Services use significant quantities of natural gas. In contrast, although Water Services accounted for 16% of Metro Vancouver's 2018 corporate energy use, this energy was predominantly³ low-emissions electricity contributing to a smaller fraction of Metro Vancouver's corporate GHG emissions footprint.

The following sections present five-year trends in energy use, energy cost, and GHG emissions associated with energy use for Corporate Metro Vancouver and for each service area. In all cases, costs associated with energy production and self-generation are not included.

Metro Vancouver's Corporate Energy Management Policy commits the organization to continuous improvement in energy performance. Because energy use is often driven by variables outside Metro Vancouver's control, key performance indicators (KPIs) have been established for Corporate Metro Vancouver and for each service area to monitor progress toward meeting the continuous improvement

³ Water Services also uses fossil fuels to manage residuals generated through the water treatment process at Seymour Capilano Filtration Plant

objective. The following sections also present five-year KPI trends for the corporation and for each service area.

Corporate Metro Vancouver

This section discusses energy trends for Corporate Metro Vancouver, the aggregate of all services areas: Liquid Waste Services, Water Services, Solid Waste Services, Housing, Parks, and Corporate Services. Figure 3 presents Metro Vancouver corporate five-year trends by service area for energy use, energy cost (excluding energy production and self-generation), and GHG emissions from energy use both gross and KPI-normalized; these data are tabulated in Table 2.

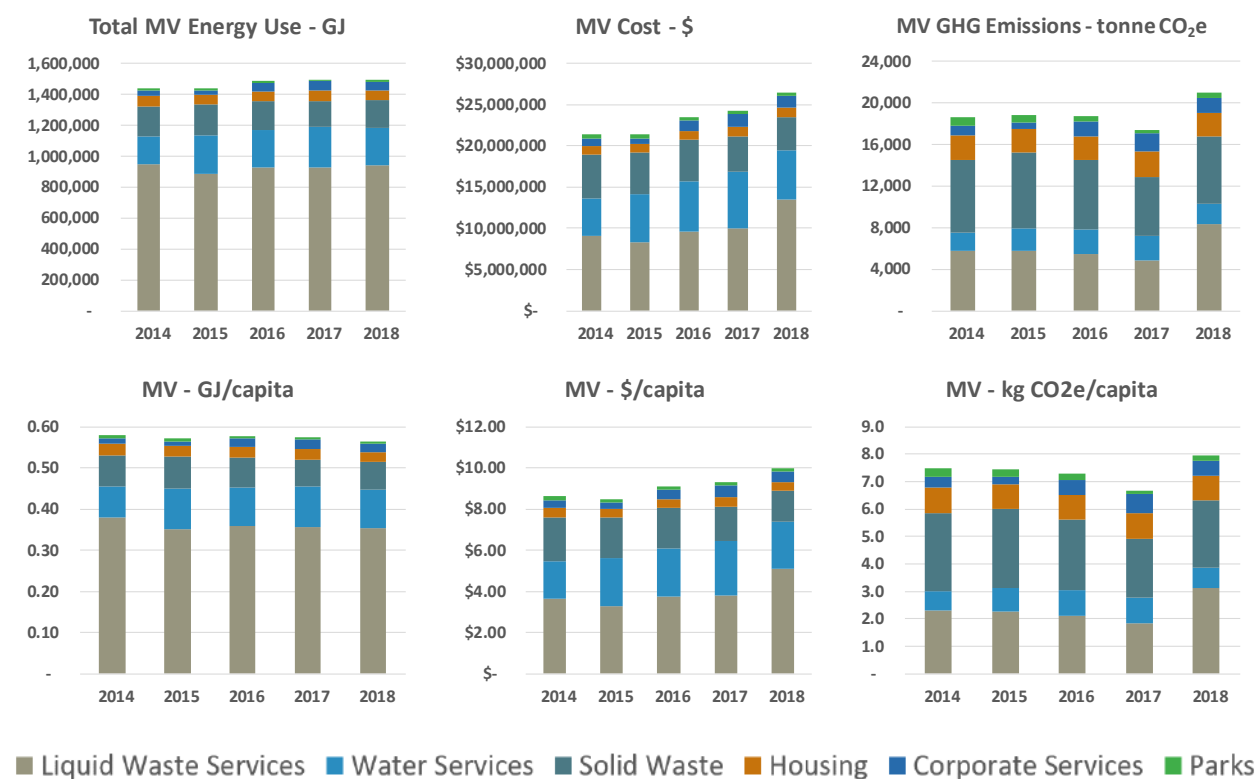


Figure 3: Five-Year Trends by Service Area

Table 2 also provides percent changes for each metric compared to 2014.

Table 2: Five-Year Energy and GHG Emissions Trends – Corporate Metro Vancouver

	Metro Vancouver					Percent Change Relative to 2014			
	Year								
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Total Energy Use (GJ)	1,442,301	1,442,212	1,486,436	1,498,215	1,494,862	-0.01%	3%	4%	4%
Total Cost (\$)	\$ 21,437,482	\$ 21,411,027	\$ 23,428,066	\$ 24,235,895	\$ 26,462,678	0%	9%	13%	23%
Total GHG Emissions (t CO ₂ e)	18,623	18,810	18,742	17,439	21,041	1%	0.6%	-6%	13%
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493	1%	4%	5%	6%
GJ/capita	0.580	0.571	0.577	0.574	0.564	-1%	-0.4%	-1%	-3%
\$/capita	\$ 8.62	\$ 8.48	\$ 9.10	\$ 9.28	\$ 9.99	-2%	6%	8%	16%
kg CO ₂ e/capita	7.5	7.5	7.3	6.7	7.9	-0.5%	-3%	-11%	6%

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Since 2014, Metro Vancouver has experienced an increase of approximately 4% in energy use with costs increasing by 23% over the same period. Cost increases are largely driven by increases in electricity rates. Much of the cost increase seen from 2017 to 2018 was the result of increased electricity purchases required when the Annacis Island Wastewater Treatment Plant cogeneration engines were taken out of service in late 2017 to enable the cogeneration system upgrade that will be complete in 2020. In 2018, GHG emissions increased by 13% compared to 2014. This trend is due to significant increases in fossil fuel use by Liquid Waste Services (for residuals management), Solid Waste Services (Waste-to-Energy facility operation), and Corporate Services (for simultaneous operation of both new and old Head Office buildings).

Corporate Metro Vancouver KPIs for energy use, energy costs, and GHG emissions from energy use are calculated per capita total regional population as summarized in Table 2. Corporate energy use per capita has decreased by 3% since 2014. Reasons for increases in energy cost per capita and GHG emissions per capita are provided in the preceding paragraph.

Liquid Waste Services

Table 3 summarizes Liquid Waste Services gross energy and GHG emissions trends, as well as those trends normalized against the Liquid Waste Services KPI: per megalitre⁴ of wastewater collected and treated.

⁴ One megalitre equals one million litres

Table 3: Five-Year Energy and GHG Emissions Trends – Liquid Waste Services

	Liquid Waste Services					Percent Change Relative to 2014			
	Year								
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Total Energy Use (GJ)	947,374	885,533	927,861	929,560	938,832	-7%	-2%	-2%	-1%
Total Cost (\$)	\$ 9,075,054	\$ 8,264,923	\$ 9,638,522	\$ 9,986,935	\$ 13,490,288	-9%	6%	10%	49%
Total GHG Emissions (t CO ₂ e)	5,736	5,770	5,471	4,835	8,320	1%	-5%	-16%	45%
ML Collected & Treated	440,763	415,000	437,520	449,541	456,083	-6%	-1%	2%	3%
GJ/ML Collected & Treated	2.15	2.13	2.12	2.07	2.06	-1%	-1%	-4%	-4%
\$/ML	\$ 20.59	\$ 19.92	\$ 22.03	\$ 22.22	\$ 29.58	-3%	7%	8%	44%
kg CO ₂ e/ML	13.0	13.9	12.5	10.8	18.2	7%	-4%	-17%	40%

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

As Metro Vancouver's largest energy user, Liquid Waste Services trends influence overall Metro Vancouver trends to a large degree. Liquid Waste Services has experienced an upward trend in energy use since 2015 with marginally less energy used in 2018 compared to 2014. Significant Liquid Waste Services energy cost increases are predominantly the result of increasing purchased electricity use coupled with increasing electricity unit rates. Since the late 1990s, Annacis Island Wastewater Treatment Plant has used biogas produced in the wastewater treatment process to power engines that cogenerated electricity and heat for use in the plant. In December 2017, the cogeneration system was taken out of service to allow the installation of new engines and generators with significantly higher cogeneration capacity. The cogeneration system remained out of service for the duration of 2018. Since the cogeneration system was decommissioned, electricity that would have been generated on-site had to be purchased from BC Hydro. This was a significant contributor to the 10% and 49% cost increases seen in 2017 and 2018, respectively.

The 2018 increase in GHG emissions is primarily a result of increased use of fossil fuels for transportation of the historic stockpile of land-dried biosolids at Iona Island Wastewater Treatment Plant to beneficial use sites and landfill for non-conforming materials. This work will continue for several more years until the stockpile is removed in preparation for the secondary upgrade of the treatment plant.

Water Services

Table 4 summarizes Water Services gross energy and GHG emissions trends, as well as those trends normalized against the Water Services KPI: per megalitre of drinking water treated and delivered.

Table 4: Five-Year Energy and GHG Emissions Trends – Water Services

	Water Services									
	Year					Percent Change Relative to 2014				
	2014	2015	2016	2017	2018	2015	2016	2017	2018	
Total Energy Use (GJ)	182,367	250,479	238,541	258,465	242,946	37%	31%	42%	33%	
Total Cost (\$)	\$ 4,578,678	\$ 5,933,789	\$ 6,022,223	\$ 6,922,103	\$ 6,038,796	30%	32%	51%	32%	
Total GHG Emissions (t CO ₂ e)	1,784	2,168	2,394	2,400	1,939	22%	34%	35%	9%	
ML Treated & Delivered	381,261	385,093	383,774	389,177	399,736	1%	1%	2%	5%	
GJ/ML Treated & Delivered	0.48	0.65	0.62	0.66	0.61	36%	30%	39%	27%	
\$/ML	\$ 12.01	\$ 15.41	\$ 15.69	\$ 17.79	\$ 15.11	28%	31%	48%	26%	
kg CO ₂ e/ML	4.7	5.6	6.2	6.2	4.9	20%	33%	32%	4%	

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Water Services is Metro Vancouver's second-largest energy user. Water Services has experienced a significant increase in energy use and energy costs since 2015 largely attributed to the completion of the Twin Tunnels in early 2015. Prior to 2015, approximately 17% of water delivered to member jurisdictions originated from Capilano Lake and was treated by chemical disinfection but not filtration. Since the completion of the Twin Tunnels, all Capilano Lake water is pumped at the Capilano Raw Water Pump Station (CRWPS) to Seymour Capilano Filtration Plant (SCFP) where it is filtered and disinfected.

Water Services energy use KPI (GJ/ML) and energy cost KPI (\$/ML) have increased significantly with the operation of CRWPS and associated increased flows through SCFP. Since 2015, the energy and energy cost KPIs have varied in relation to the amount of water pumped by CRWPS. Improvements seen in the GHG emissions from energy use KPI (kg CO₂e/ML) in 2018 is attributed to the optimization of CRWPS operation and a decrease in fossil fuel use for SCFP residuals management.

Solid Waste Services

Solid Waste Services is Metro Vancouver's third largest energy user. Table 5 summarizes Solid Waste Services gross energy and GHG emissions trends, as well as those trends normalized against the Solid Waste Services KPI: per tonne of municipal solid waste disposed.

Table 5: Five-Year Energy and GHG Emissions Trends – Solid Waste Services

	Solid Waste Services									
	Year					Percent Change Relative to 2014				
	2014	2015	2016	2017	2018	2015	2016	2017	2018	
Total Energy Use (GJ)	192,026	197,721	189,144	169,980	181,379	3%	-2%	-11%	-6%	
Total Cost (\$)	\$ 5,246,106	\$ 5,035,676	\$ 5,058,848	\$ 4,294,082	\$ 3,988,835	-4%	-4%	-18%	-24%	
Total GHG Emissions (t CO ₂ e)	7,023	7,277	6,652	5,636	6,525	4%	-5%	-20%	-7%	
Mass Disposed (tonnes)	542,477	539,926	557,495	590,002	590,805	0%	3%	9%	9%	
GJ/tonne disposed	0.35	0.37	0.34	0.29	0.31	3%	-4%	-19%	-13%	
\$/tonne disposed	\$ 9.67	\$ 9.33	\$ 9.07	\$ 7.28	\$ 6.75	-4%	-6.17%	-25%	-30%	
kg CO ₂ e/tonne disposed	12.9	13.5	11.9	9.6	11.0	4%	-8%	-26%	-15%	

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Mass disposed data in Table 5 includes garbage and organics. Decreases in energy use and GHG emissions compared to 2014 are primarily a result of decreased fuel use related to transfer truck hauling of municipal solid waste from transfer stations.

Housing

Table 6 summarizes Housing gross energy and GHG emissions trends and those trends normalized against the Housing KPI: per million square metres of conditioned floorspace per heating degree day (HDD)⁵.

Table 6: Five-Year Energy and GHG Emissions Trends – Housing

	Housing									
	Year					Percent Change Relative to 2014				
	2014	2015	2016	2017	2018	2015	2016	2017	2018	
Total Energy Use (GJ)	66,969	63,376	63,517	67,531	63,404	-5%	-5%	0.8%	-5%	
Total Cost (\$)	\$ 1,133,904	\$ 1,038,603	\$ 1,055,580	\$ 1,182,707	\$ 1,170,949	-8%	-7%	4%	3.3%	
Total GHG Emissions (t CO ₂ e)	2,362	2,245	2,243	2,424	2,272	-5%	-5%	3%	-4%	
Million m ² *HDD	750	711	724	833	788	-5%	-3%	11%	5%	
kJ/(m ² *HDD)	89.28	89.13	87.71	81.07	80.47	-0.2%	-2%	-9%	-10%	
\$/ (million m ² *HDD)	\$ 1,511.71	\$ 1,460.63	\$ 1,457.65	\$ 1,419.91	\$ 1,486.06	-3%	-4%	-6%	-2%	
g CO ₂ e/(m ² *HDD)	3.15	3.16	3.10	2.91	2.88	0.3%	-2%	-8%	-8%	

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Since 2014, Housing has made significant investments in energy-efficient natural gas space heating and domestic hot water heating equipment, a building envelope upgrade at one site, targeted window replacements, lighting efficiency upgrades, and laundry appliance efficiency improvements. Additional natural gas savings have been realized through tenant energy awareness campaigns conducted at seven Housing sites. These investments have translated into the significant performance improvements noted in Table 6.

Corporate Services

The Corporate Services service area includes Corporate Safety, Human Resources, Fleet Management, and Corporate Facilities. Throughout this report, energy use, energy costs, and GHG emissions associated with energy use specific to fleet vehicles and equipment have been allocated to individual departments where specific vehicles and equipment are assigned to those departments. Energy data for vehicles and equipment that are not assigned to individual departments (pool vehicles and loaner vehicles, for example) are reported in Corporate Services. Table 7 summarizes Corporate Services gross energy and GHG emissions trends and those trends normalized against the Corporate Services KPI: per capita regional population.

⁵ A heating degree day (HDD) is the recognized energy management metric used to quantify the energy required to heat a building. It is the number of degrees that a day's average temperature is below 18 °Celsius. Annual HDD is the summation of daily HDDs over the course of a year.

Table 7: Five-Year Energy and GHG Emissions Trends – Corporate Services

	Corporate Services									
	Year					Percent Change Relative to 2014				
	2014	2015	2016	2017	2018	2015	2016	2017	2018	
Total Energy Use (GJ)	36,556	29,765	54,460	61,552	54,846	-19%	49%	68%	50%	
Total Cost (\$)	\$ 872,617	\$ 679,349	\$ 1,277,304	\$ 1,522,402	\$ 1,348,803	-22%	46%	74%	55%	
Total GHG Emissions (t CO ₂ e)	954	664	1,464	1,789	1,460	-30%	54%	88%	53%	
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493	1%	4%	5%	6%	
GJ/capita	0.01	0.01	0.02	0.02	0.02	-20%	44%	60%	41%	
\$/capita	\$ 0.35	\$ 0.27	\$ 0.50	\$ 0.58	\$ 0.51	-23%	41%	66%	45%	
kg CO ₂ e/capita	0.4	0.3	0.6	0.7	0.6	-31%	48%	79%	44%	

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

From the time that Metro Vancouver purchased Metrotower III as its new Head Office building in January 2016, until the former two Head Office buildings were sold in early 2019, Metro Vancouver operated all three buildings. This is the primary reason for the significant increases in all Table 7 indicators. With the sale of the former Head Office buildings in early 2019, energy and GHG emissions trends are expected to significantly improve in 2019.

Regional Parks

Table 8 summarizes Regional Parks gross energy and GHG emissions trends and those trends normalized against the Regional Parks KPI: per capita regional population.

Table 8: Five-Year Energy and GHG Emissions Trends – Regional Parks

	Parks									
	Year					Percent Change Relative to 2014				
	2014	2015	2016	2017	2018	2015	2016	2017	2018	
Total Energy Use (GJ)	17,008	15,338	12,912	11,127	13,454	-10%	-24%	-35%	-21%	
Total Cost (\$)	\$ 531,123	\$ 458,686	\$ 375,589	\$ 327,666	\$ 425,006	-14%	-29%	-38%	-20%	
Total GHG Emissions (t CO ₂ e)	766	686	517	355	525	-10%	-32%	-54%	-31%	
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493	1%	4%	5%	6%	
MJ/capita	6.84	6.08	5.01	4.26	5.08	-11%	-27%	-38%	-26%	
\$/capita	\$ 0.21	\$ 0.18	\$ 0.15	\$ 0.13	\$ 0.16	-15%	-32%	-41%	-25%	
kg CO ₂ e/capita	0.31	0.27	0.20	0.14	0.20	-12%	-35%	-56%	-36%	

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Savings shown for all indicators in Table 8 are primarily attributed to fuel reductions for the Parks fleet.

3.3 ENERGY PRODUCTION/GENERATION TRENDS BY SERVICE AREA

This section summarizes trends in Metro Vancouver corporate energy production/generation from 2014 through 2018 for the three Metro Vancouver service areas that self-generate energy: Liquid Waste Services, Water Services, and Solid Waste Services. In this report, *energy production* refers to the production of sources of energy (such as biogas produced at wastewater treatment plants) and *energy generation* refers to the conversion of energy sources into usable energy (electricity and heat).

Liquid Waste Services

Liquid Waste Services produces methane-rich biogas – a clean, renewable energy source – at four of its five wastewater treatment plants when volatile suspended solids in the wastewater are metabolized (destroyed) by micro-organisms in the primary and secondary treatment processes. Most of the biogas produced is used within the plants for beneficial purposes: to generate heat and/or electricity or to power pumps. Excess biogas is flared to the atmosphere. Table 9 summarizes biogas uses at the four wastewater treatment plants where biogas is produced. Biogas production in excess of what can be used by the plant is flared (wasted).

Table 9: Wastewater Treatment Plant Biogas Uses – Liquid Waste Services

Wastewater Treatment Plant	Biogas Uses
Annacis Island	<ul style="list-style-type: none"> Electricity and heat generation in cogeneration engines Heat generation in boilers
Iona Island	<ul style="list-style-type: none"> Electricity and heat generation in cogeneration engines
Lulu Island	<ul style="list-style-type: none"> Heat generation in boilers
Lions Gate	<ul style="list-style-type: none"> Heat generation in boilers Wastewater pumping pump engines
Northwest Langley	<ul style="list-style-type: none"> This facility does not produce biogas

Table 10 provides trends in total biogas production, percent of biogas used, and biogas production per tonne of volatile suspended solids removed from the wastewater. Most of the energy used by Liquid Waste Services is derived from clean, renewable sources: purchased electricity and energy derived from biogas. Non-renewable (fossil) energy is used primarily to transport wastewater treatment residuals to beneficial use sites and landfills for material that can't be beneficially used. Table 10 also provides trends in the percentage of energy used by Liquid Waste Services that is derived from renewable sources. Throughout this report, percent changes highlighted green indicate performance improvements or changes favourable to energy or GHG emissions management; percent changes highlighted red indicate a degradation in performance or changes unfavourable to energy or GHG emissions management.

Table 10: Biogas Production and Utilization Trends – Liquid Waste Services

LIQUID WASTE SERVICES - ENERGY & GHG EMISSIONS MANAGEMENT SCORECARD									
BIOGAS PRODUCED AND USED	2014	2015	2016	2017	2018	Percent Change Relative to 2014			
						2015	2016	2017	2018
Mass Volatile Solids Destroyed (tonne)	35,229	37,555	39,867	41,748	42,283	7%	13%	19%	20%
Volume Biogas Produced (m3)	33,586,289	32,800,605	33,706,654	33,889,059	35,707,557	-2%	0%	1%	6%
Volume Biogas Produced per Mass Volatile Solids Destroyed (m3/tonne)	953	873	845	812	844	-8%	-11%	-15%	-11%
% Biogas Used	69%	68%	71%	69%	50%	-1%	3%	0%	-27%
% Renewable Energy** Use	92%	92%	93%	94%	89%	-1%	1%	1%	-4%

Notes

Renewable Energy** = Electricity Purchased + Biogas-Derived Energy Used

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

Annual biogas production per mass of volatile solids destroyed has decreased since 2014. The dramatic decrease in percent biogas usage in 2018 was a result of the Annacis Island Wastewater Treatment Plant cogeneration engines being taken out of service in December 2017 for a system upgrade. Once commissioned in 2020, the new cogeneration system is expected to utilize significantly more biogas than the old cogeneration system and biogas percent utilization rates are expected to exceed historical levels. The decrease in percent renewable energy use seen in 2018 was primarily the result of increased fossil fuel used for hauling larger quantities of the historic biosolids stockpile in preparation for the upgrade of the Iona Island WWTP.

Table 11 provides trends for combined electricity production from biogas at Annacis Island and Iona Island Wastewater Treatment Plants.

Table 11: Electricity Generation from Biogas Trends – Liquid Waste Services

COGEN ELECTRICITY PRODUCED						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Biogas Used in Cogens (m3)	18,679,458	17,447,428	18,946,373	17,316,388	8,024,538	-7%	1%	-7%	-57%
Electricity Self-Generated (GJ)	149,610	140,734	148,112	132,972	61,035	-6%	-1%	-11%	-59%
Electricity Generated per Volume Biogas Burned (MJ/m3)	8.0	8.1	7.8	7.7	7.6	1%	-2%	-4%	-5%

Notes

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

Each year from 2015 through 2018, increasing volumes of biogas were used in the Iona Island Wastewater Treatment Plant cogeneration engines and more electricity and heat were produced by the engines compared to 2014. However, combined Annacis Island / Iona Island cogeneration performance (MJ electricity generated per cubic metre biogas burned) has decreased since 2015 primarily due to a degradation in the efficiency of the IWWTP engines.

Metro Vancouver is working to establish processes to monitor the total cost of producing and generating energy at wastewater treatment plants for comparison to the cost of purchasing this energy from the grid. These costs will include maintenance costs, operations project costs, and capital project costs and will be reported in the future.

Water Services

The elevations of the Seymour Capilano Filtration Plant and the Coquitlam Water Treatment Plant provide the water transmission system with a significant amount of “free” energy in the form of gravity-generated hydraulic pressure. Using gravity supply, the water utility is able to avoid pumping in much of the transmission system when regional water demands are low enough to allow this practice. Gravity transmission contributes to energy cost savings.

Water Services produces hydroelectricity as treated drinking water flows from Seymour Capilano Filtration Plant to Capilano Energy Recovery Facility where the water turns a turbine and generates electricity. This electricity is used to offset a portion of the purchased electricity required to operate pumps at the Capilano Raw Water Pump Station. Table 12 summarizes trends in Capilano Energy Recovery

Facility electricity generation since the facility was commissioned in February 2016. The table also includes percent changes relative to 2016.

Table 12: Capilano Energy Recovery Facility Electricity Generation Trends – Water Services

CERF ELECTRICITY GENERATION						Percent Change Relative to 2016			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Treated Water Tunnel Flow (ML)	-	-	146,750	144,478	156,323	-	-	-2%	7%
Electricity Generation (GJ)	-	-	14,482	10,658	31,217	-	-	-26%	116%
Flow Utilization (MJ/ML)	-	-	99	74	200	-	-	-25%	102%
Generation Capacity Utilization ⁺⁺⁺	-	-	27%	20%	58%	-	-	-7%	31%
% BC Hydro Generation Requirement	-	-	42%	31%	91%	-	-	-11%	49%

Notes

Generation Capacity Utilization⁺⁺⁺ - based on 1.7 MW generator operating continuously

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

The Capilano Energy Recovery Facility started generating electricity in early 2016. The facility experienced several operational issues that were resolved through much of 2016 and 2017, resulting in lower than expected electricity generation.

Water Services received approximately \$2.7 million incentive funding from BC Hydro for the construction of Capilano Energy Recovery Facility. The funding agreement requires Water Services generate 9.5 gigawatt hours of electricity per year (34,200 GJ/year) to avoid clawback payments to BC Hydro (pro-rated to the amount of the shortfall). The shortfall during the first year of operation (December 2015 through December 2016) required Water Services to repay BC Hydro \$45,498 in 2019.

Water Services is developing operational strategies to maximize the flow passing through the turbine and maintenance strategies to minimize turbine down-time. These strategies will optimize Capilano Energy Recovery Facility electricity generation.

Water Services recovers energy from water pressure at three additional facilities: turbines at Seymour Falls Dam and Cleveland Dam generate electricity; and water pressure at Cleveland Dam Pump House is used to drive water distribution pumps. Table 13 summarizes energy generation trends at these facilities from 2014 through 2018.

Table 13: Other Energy Generation Trends – Water Services

OTHER ENERGY GENERATION						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Cleveland Dam Pump House (GJ)*	2,574	2,567	2,857	2,619	2,805	0%	11%	2%	9%
Cleveland Dam Turbine (GJ) ⁺	2,475	2,466	2,439	2,424	2,518	0%	-1%	-2%	2%
SFD Turbine (GJ)	1,611	1,471	1,579	1,696	1,569	-9%	-2%	5%	-3%
Total	6,660	6,504	6,875	6,738	6,892	-2%	3%	1%	3%

Notes

* - Calculated pump house flows

⁺ - Calculated from the turbine generation curve for an average annual Capilano Lake level

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

Metro Vancouver is working to establish processes to monitor the total cost of generating energy within the water utility for comparison to the cost of purchasing this energy from the grid. These costs will include

maintenance costs, ongoing project costs, and BC Hydro clawback charges and will be reported in the future.

Solid Waste Services

Since 1988, Solid Waste Services has generated steam, and later electricity, through burning municipal solid waste at its Waste-to-Energy facility that manages roughly a quarter of the region's municipal solid waste. As the waste burns, the hot gases from the combustion process pass into a boiler area where they heat water-filled tubes. The water boils to become steam while the gas passes through an air pollution control process. The steam produced in the boiler area is used to power a turbine that converts the steam into electricity. The facility produces enough electricity to power 16,000 homes per year. The electricity is sold to BC Hydro generating more than \$6 million in revenue each year. Table 14 summarizes Waste-to-Energy Facility electricity generation trends from 2014 through 2018.

Table 14: Metro Vancouver Waste-to-Energy Facility Electricity Generation Trends – Solid Waste Services

WTEF ELECTRICITY GENERATION						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Inbound Tonnage (tonne)	275,266	256,402	254,256	259,747	253,123	-7%	-8%	-6%	-8%
Electricity Generation (GJ)	537,110	558,731	624,053	611,018	587,633	4%	16%	14%	9%
Electricity Generation per Tonne	1.95	2.18	2.45	2.35	2.32	12%	26%	21%	19%
Municipal Solid Waste Burned (GJ/tonne)									

Notes:

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

Tonnage managed by the Waste-to-Energy Facility has decreased compared to 2014 while electricity generation per tonne of municipal solid waste processed has increased compared to 2014. This increase in electricity generation capacity is attributed to the disposal ban on organic materials such as food scraps that Metro Vancouver put in place in January 2015. With organics removed from the Waste-to-Energy process stream, there has been a relative increase in proportion of municipal solid waste of higher heating value which provides more heat when burned. As the boilers are heat limited, this allows the facility to generate more electricity per tonne of municipal solid waste.

4. OTHER GHG EMISSIONS TRENDS

In addition to GHG emissions originating directly from energy use (discussed above), Metro Vancouver's total corporate GHG emissions also include emissions originating from non-energy sources.

Solid Waste Services' Waste-to-Energy Facility is Metro Vancouver's largest source of quantified non-energy GHG emissions.

The facility emits GHGs through the combustion of municipal solid waste and natural gas to fuel the process burners. Emissions from municipal solid waste are classified as biogenic (derived through the combustion of organic material) and anthropogenic (derived through the combustion of fossil-based

materials such as plastics and natural gas). Table 15 summarize the facility's trends in biogenic (organics-derived) and anthropogenic (fossil-derived) GHG emissions.

Table 15: GHG Emissions from Metro Vancouver Waste-to-Energy Facility – Solid Waste Services

GHG Emissions (t CO ₂ e) - Solid Waste Services Waste-to-Energy Facility									
	Year					Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Biogenic Emissions from MSW	158,383	157,540	141,842	168,676	154,497	-1%	-10%	6%	-2%
Anthropogenic Emissions from MSW	108,118	113,447	117,470	117,788	120,211	5%	9%	9%	11%
Anthropogenic Emissions from Natural Gas	563	982	802	1,014	1,990	74%	42%	80%	253%
Total GHG Emissions	267,064	271,969	260,114	287,478	276,698	2%	-3%	8%	4%

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Biogenic emissions from waste combustion have generally decreased since Metro Vancouver introduced the disposal ban on organic materials in 2015. This has led to a corresponding increase in anthropogenic emissions from waste combustion as the proportion of non-biogenic material managed at the facility has increased. The large increase in natural gas emissions at the Waste-to-Energy Facility is due to the installation of larger capacity gas burners, as required by the facility's Operational Certificate. These gas burners are used to maintain high furnace temperatures during start up and shut down events and any other time as necessary to maintain the secondary combustion zone temperature.

Liquid Waste Services has several potential sources of other GHG emissions. Of these emissions, those resulting from flared biogas are the only emissions that have thus far been quantified and tracked as summarized in Table 16.

Table 16: GHG Emissions from Wasted Biogas – Liquid Waste Services

LIQUID WASTE SERVICES - ENERGY & GHG EMISSIONS MANAGEMENT SCORECARD									
ENERGY WASTED						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018	2015	2016	2017	2018
Energy Wasted (GJ)	260,937	246,256	227,934	244,897	412,074	-6%	-13%	-6%	58%
GHG Emissions from Energy Wasted (t CO ₂ e)	76	71	66	71	120	-6%	-13%	-6%	58%

Notes

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

The amount of biogas flared and associated GHG emissions increased significantly in 2018 primarily due to the decommissioning of the Annacis Island Wastewater Treatment Plant cogeneration engines in December 2017 to make way for higher capacity units. Since that time and throughout 2018, biogas was used to directly fire the plant's boilers but, because boiler demand alone is less than cogeneration engine demand (which supplied both heat and electricity) more biogas was flared (wasted). These emissions are expected to decrease significantly when the upgraded Annacis cogeneration system is commissioned in 2020.

Other potential sources of non-energy-related Liquid Waste Services GHG emissions include fugitive emissions of biogas and nitrous oxide – both very potent GHGs – from the collections system, the

wastewater treatment process, lagoons, and stockpiles. Although studies were conducted several years ago to estimate GHG emissions from lagoons and stockpiles at the IWWTP, the results were inconclusive due to high levels of uncertainty in measurements and methods used. Similarly, 2019 investigations by UBC Sustainability Scholars regarding potential sources of fugitive methane and nitrous oxide emissions from Annacis Island Wastewater Treatment Plant demonstrated high uncertainties in estimating fugitive emissions. Liquid Waste Services has not yet quantified emissions associated with refrigerant use and the production, transportation, and use of priority chemicals and consumables.

Liquid Waste Services will continue to investigate these non-energy GHG emissions sources to determine if any are significant and will develop emissions management strategies for those deemed significant.

Similarly, the remaining service areas (Water Services, Solid Waste Services, Housing, Corporate Services, and Regional Parks) will also investigate other potential sources of GHG emissions and develop management strategies for those found to be significant.

5. CORPORATE POLICY IMPLEMENTATION AND INITIATIVE UPDATE

Since 2014, Metro Vancouver has developed a number of policies and initiatives aimed at managing energy costs and GHG emissions. This section provides an update on Metro Vancouver's progress toward implementing these policies and participating in these initiatives.

5.1 CORPORATE ENERGY MANAGEMENT POLICY

The *Corporate Energy Management Policy* was adopted by the Board in 2014. The policy articulates Metro Vancouver's commitment to continuously improving energy efficiency in its operations, and to continuously improving the efficiency of energy production, generation, and recovery. It also provides direction for staff to put processes in place to effectively manage energy following International Organization for Standardization (ISO) energy management practices. The following table provides a summary of progress Metro Vancouver has made in completing the directives defined in the *Corporate Energy Management Policy*.

Table 17: Corporate Energy Management Policy Implementation Status

Policy Directive	Status
<ul style="list-style-type: none"> Establish substantiated, realistic, and measurable targets that motivate continuous improvement and are consistent with other objectives. 	<ul style="list-style-type: none"> In 2018, Housing became the first department to set a GHG emissions reduction target which was published in its 2019 Work Plan. Both GHG emissions reduction targets and energy performance targets have been set in the Housing 10-Year Plan published in 2019.

Policy Directive	Status
	<ul style="list-style-type: none"> All service areas (Liquid Waste Services, Water Services, Solid Waste Services, Corporate Services, and Regional Parks) have committed to setting energy and GHG emissions management targets in 2020 and establishing reporting systems to monitor progress toward meeting those targets.
<ul style="list-style-type: none"> Develop a strategic energy management planning process for achieving these targets using triple bottom line analysis methods. 	<ul style="list-style-type: none"> Housing completes triple bottom line life-cycle cost analyses on all mechanical equipment upgrades. Housing is currently developing a strategic plan to meet the energy and GHG emissions targets set in its 10-Year Plan (2019). In early 2020, Metro Vancouver senior management re-iterated its commitment to increasing emphasis on strategic energy and GHG emissions management.
<ul style="list-style-type: none"> Regularly monitor and report on progress toward meeting these targets using a corporate energy and GHG tracking system. 	<ul style="list-style-type: none"> Metro Vancouver invested in software as service in 2013 to establish its corporate energy and GHG emissions database. The database will be used to report on progress toward meeting targets as they are established. Metro Vancouver annually reports energy and GHG emissions metrics on its publicly-accessible Performance Monitoring Dashboard. Annual reporting to the Climate Action Committee and Board will continue.
<ul style="list-style-type: none"> Establish processes that continuously improve Energy Performance in planning, design, procurement, construction, operation, and maintenance of Metro Vancouver assets and services. 	<ul style="list-style-type: none"> Housing included energy efficiency considerations in the 2018 update of its Unit Standards. Options analysis processes have been developed for Housing and are being carried out on all mechanical equipment upgrades to identify the most energy efficient and least GHG intensive solutions on a life cycle net present value basis. This process will be formalized once refined. Housing implements options that improve building energy performance through the guidance of industry standards, BC Energy Step Code, options analysis, energy studies and modelling. Energy efficiency and GHG emissions have been or are being considered for a number of large Liquid Waste Services and Solid Waste Services capital projects. Formal processes will be developed for capital projects and for operations and maintenance projects.

Policy Directive	Status
	<ul style="list-style-type: none"> Energy efficiency and GHG emissions impacts will be considered in development of guidelines for the <i>Sustainable Infrastructure and Buildings Policy</i> (discussed in Section 5.4).
<ul style="list-style-type: none"> Provide access to energy information and training for staff. 	<ul style="list-style-type: none"> A corporate energy management communication strategy is under development. The reporting system described above will become an integral component of this strategy. A Corporate Energy Management Newsletter is published on a periodic basis. Energy management workshops were delivered for O&M staff at Lulu Island Wastewater Treatment Plant and Seymour-Capilano Filtration Plant. A formal process for identifying training needs will be initiated. Housing has included an energy efficiency section in its regular newsletters to tenants and creates energy conservation posters for those residences participating in natural gas conservation competitions. The Metro Vancouver Energy Management Group presents annual energy and GHG emissions performance updates to Housing management and field staff.
<ul style="list-style-type: none"> Empower staff to generate solutions that meet the objectives of this policy. 	<ul style="list-style-type: none"> Liquid Waste Services Management has endorsed its Innovation Incubator to encourage staff to bring forward ideas for innovation and efficiency that promote continuous improvement. Tenant energy awareness campaigns conducted at seven Housing sites.

5.2 CARBON PRICE POLICY

In June 2017, the MVRD Board approved Metro Vancouver's *Carbon Price Policy*. The policy is being incorporated into life cycle cost analyses during Metro Vancouver's capital planning processes, and in particular, into financial business casing tools used for options analyses that concern energy decisions.

Metro Vancouver's corporate carbon price of \$150 per tonne of CO₂e emissions was applied to the business case for Liquid Waste Services' effluent heat recovery at the new North Shore Wastewater Treatment Plant. Heat recovered from treated effluent will provide heating to Lonsdale Energy Corporation's district energy customers, displacing natural gas use and reducing regional GHG emissions. The \$17.9 million cost of investing in these GHG reductions, which equates to approximately \$120 per tonne on a life-cycle basis, is lower than the price of carbon established in the *Carbon Price Policy* and is therefore worth pursuing.

Housing completes options analyses on all lighting and mechanical equipment (boilers, water heaters, ventilation systems, etc.) replacement projects to identify the option with the lowest life cycle net present value cost while factoring in Metro Vancouver's corporate carbon price.

Currently-available electric heat pump technology could replace natural gas use and reduce Housing GHG emissions from building energy use by more than 90%. To date, the carbon price has strengthened the already-positive business case for high efficiency natural gas equipment but has not been successful in financially justifying investment in the lowest-carbon electric option. Housing experience suggests that, with existing external financial incentives, a carbon price of approximately \$220/tonne CO₂e would be required to justify this type of investment.

The corporate carbon price is also used in fleet procurement decisions discussed in Section 5.2 and sewer heat recovery business-casing discussed in Section 6.2.

5.3 FLEET PLANNING AND ACQUISITION POLICY

In September 2016, the Metro Vancouver Board adopted the *Fleet Planning and Acquisition Policy* aimed at:

- Reducing overall size of fleet
- Rightsizing vehicles (transitioning to smaller, more fuel-efficient vehicles)
- Reducing overall km traveled
- Transitioning to lower-carbon vehicles (reducing GHG emissions per km traveled)

Implementation of the policy is the responsibility of Metro Vancouver Fleet Services. Each year, Fleet Services evaluates market options for replacement of aging compact sedans and sport utility vehicles in the context of meeting the objectives of the Fleet Planning and Acquisition Policy. The evaluation involves life-cycle net present value costing (including the Corporate Carbon Price) for purchase and operation of each option. Preferred makes and models become those recommended in the Low Emissions Vehicle Standards – a hierarchy of most-preferred to least preferred technologies based on GHG emissions – for vehicle replacements made in the following year.

Global positioning systems (GPSs) have been installed in all fleet vehicles. In the future, these systems could be used to improve route planning and thereby reduce fuel use and GHG emissions.

Table 18 compares trends in Metro Vancouver fleet energy and GHG emissions performance indicators for 2016 (the year the policy was adopted) through 2018.

Table 18: Fleet Energy and GHG Emissions Reduction Performance Trends

Metro Vancouver				Percent Change Relative to 2016	
	2016	2017	2018	2017	2018
Fleet Size (no. vehicles)	420	424	452	1%	8%
Percent Fuelled Solely from Fossil Sources	87.4%	85.6%	84.5%	-2%	-3%
Fossil Fuel Use (GJ)	39,953	38,623	37,790	-3%	-5%
Fossil Fuel Cost	1,224,968	1,332,922	1,467,473	9%	20%
GHG Emissions from Fossil Fuel Use (t CO ₂ e)	2,722	2,628	2,571	-3%	-6%

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Since adoption of the Fleet Planning and Acquisition Policy in 2016, the size of the corporate fleet has increased by 8% while the percentage of vehicles fueled only by fossil fuels has decreased by 3%. Total emissions from the corporate fleet have decreased by 6% since 2016. Fleet Services is working to improve mileage data collection to allow the indicators shown in Table 18 to be normalized against distance traveled.

5.4 SUSTAINABLE INFRASTRUCTURE AND BUILDINGS POLICY

In October 2018 the Metro Vancouver Board adopted the *Sustainable Infrastructure and Buildings Policy*. This policy aims to ensure that the wide range of projects undertaken by Metro Vancouver are consistent in their approach to sustainable design and construction. The policy compels design teams to incorporate performance-based considerations for energy efficiency and GHG emissions, sustainable and efficient use of resources, and ecological health.

In 2019 work began to develop a Sustainable Infrastructure and Buildings Design Guide to facilitate and support the successful application of the policy to new infrastructure and building projects as well as significant retrofits to existing infrastructure and buildings. The Design Guide will provide technical guidelines to be used by the Corporation's staff and consulting teams to assist delivering high-performance, sustainable infrastructure and building projects. The policy targets Leadership in Energy and Environmental Design (LEED) Gold and BC Energy Step Code Level 3 as minimum standards for occupied buildings and Envision Gold for infrastructure. Development of the Design Guide is being led by staff in Air Quality and Climate Change with support from the CAO's office, complemented by a technical advisory group and steering committee comprising appointed staff from each service area.

5.5 ASSET MANAGEMENT POLICIES

Metro Vancouver delivers its services through an extensive and complex portfolio of assets. In 2018, the Board approved separate asset management policies for Liquid Waste Services, Water Services, Solid Waste Services, Housing, and Regional Parks. These policies will establish asset management principles and framework to balance asset performance, risk, and cost to deliver Metro Vancouver services. Staff are currently developing the methodology to manage these assets in a manner that minimizes asset failure risks and impact to customers and optimizes the lifecycle value of assets. Energy represents a major component of the life-cycle operating costs and GHG emissions and energy performance can be a measure

of asset condition and functionality. Energy will therefore be included in processes for monitoring annual asset performance and operation costs.

5.6 CLIMATE 2050

In 2018, Metro Vancouver's Board adopted the *Climate 2050⁶ Strategic Framework*, and amended it in 2019 to set more aggressive GHG reduction targets. *Climate 2050* aims to demonstrate bold leadership in responding to climate change by ensuring our infrastructure, ecosystems, and communities are resilient to the impacts of climate change, and by pursuing a carbon neutral region by 2050, with an interim target of reducing greenhouse gas emissions by 45% from 2010 levels by 2030. To implement this strategy, Metro Vancouver is currently developing a series of Roadmaps, which will include specific actions to reduce greenhouse gas emissions. Metro Vancouver can set the path towards carbon neutrality, but it will not be able to achieve the targets on its own without significant cooperation, collaboration, and commitment from member jurisdictions, other orders of government, partner organizations, stakeholders, and the public. With its regional partners, Metro Vancouver is developing the first iterations of the *Climate 2050* Roadmaps in 2019 and 2020.

For its corporate emissions, Metro Vancouver has achieved carbon neutrality in 2015 and 2019. It commits to maintaining carbon neutral status from 2025 onwards. Efforts are underway to support this commitment, including the establishment of a Liquid Waste Services department team to develop and implement projects for this purpose. The Liquid Waste Services department team is also developing corresponding plans for addressing and reducing the impacts of climate change on liquid waste infrastructure and operations, to continue to protect human health and the environment.

6. ENERGY- AND CLIMATE-RELATED PROJECTS

As a signatory to the B.C. Climate Action Charter, Metro Vancouver is committed to pursuing carbon neutrality. To help facilitate this goal, the *Corporate Climate Action Plan* was developed and presented to the GVRD Board in 2010. The objective of the Plan is to become a "carbon neutral corporation resilient to the impacts of climate change". This objective is to be achieved through three strategies:

- Reducing energy consumption through efficiencies;
- Transitioning to renewable energy; and
- Maximizing energy recovery.

Aligning with these strategies, this section provides an update regarding energy- and climate-related projects that have been completed by Metro Vancouver from 2014 through 2018.

⁶ *Climate 2050* Website: <http://www.metrovancouver.org/climate2050>

6.1 ENERGY EFFICIENCY

Table 19 summarizes estimated annual energy savings for energy efficiency projects completed by each department from 2014 through 2018. Annual savings realized in each year perpetuate in subsequent years, summing to the Cumulative Savings shown in Table 19.

Table 19: Energy Efficiency Project Activities by Service Area

Completed Energy Efficiency Projects - Estimated Annual Savings (GJ)								
Project Completion Year		Liquid Waste Services	Water Services	Solid Waste Services	Housing	Corporate Services	Parks	Metro Vancouver Total
2014		772	2,703	-	-	-	-	3,475
2015		-	190	-	-	-	-	190
2016		4,579	623	-	2,801	-	1,124	9,127
2017		3,152	818	-	1,338	-	10	5,318
2018		2,530	1,688	-	525	2,484	572	7,800
Total		11,032	6,023	-	4,664	2,484	1,707	25,911
Cumulative Savings*	Energy (GJ)	19,029	17,126	-	8,385	207	2,919	47,667
	Cost	\$ 558,087	\$ 490,762	\$ -	\$ 94,604	\$ 3,367	\$ 25,166	\$ 1,171,986
	GHG Emissions (t CO ₂ e)	56	50	-	367	7	145	625

* - cumulative savings for projects completed in 2014 through 2018

From 2014 through 2018, Metro Vancouver completed energy efficiency projects that save nearly 26,000 GJ per year. Cumulatively these projects have reduced energy use by over 47,000 GJ, energy costs by \$1.2 million, and GHG emissions by 625 tonnes CO₂e.

Liquid Waste Services

Liquid Waste Services energy efficiency and energy generation improvement projects account for approximately 43% of total Metro Vancouver annual savings for the period reported. These include both energy efficiency upgrades to capital equipment as well as process optimization projects. Total estimated savings for Liquid Waste Services energy efficiency project completions are 11,000 GJ/year; cumulative savings from 2014 through 2018 are estimated at 19,000 GJ, \$558,000, and 56 tonnes CO₂e. In addition to energy efficiency projects, Liquid Waste Services in partnership with BC Hydro completed a project in 2015 that has allowed additional electricity self-generation of approximately 12,600 GJ per year from the Iona Island Wastewater Treatment Plant cogeneration engines. This improvement reduces electricity purchases from BC Hydro and results in significantly less flaring of biogas.

Water Services

Water Services energy efficiency projects account for approximately 23% of total Metro Vancouver annual savings for the period reported. These projects include both energy efficiency upgrades to capital equipment as well as process optimization projects. Total estimated savings for energy efficiency project completions are 6,000 GJ/year; cumulative savings since 2014 are estimated at 17,000 GJ (\$490,000). In addition to these energy efficiency projects, Capilano Energy Recovery Facility began generating electricity in 2016. From 2016 through 2018, the facility generated over 56,000 GJ of electricity that was used by the

Capilano Raw Water Pump Station. The Capilano Energy Recovery Facility is expected to generate 34,200 GJ of electricity per year once operation is fully optimized.

Solid Waste Services

The new Coquitlam Transfer Station – expected to be complete in 2021 – includes energy-efficient features such as translucent panels to reduce the need for electrical lighting, LED lighting, air-source heat pumps for space heating, and variable speed ventilation control. Similar energy-efficient features have been included in the design of new Surrey Recycling and Waste Drop-Off Facility, which will be constructed under the guidance of the Metro Vancouver Sustainable Infrastructure and Buildings Policy. The construction of these facilities is expected to be complete in 2021-2022.

At the Waste-to-Energy Facility, Solid Waste Services completed its non-ferrous metals recovery project in 2018 which is expected to reduce global GHG emissions associated with production of these metals from ore. These emissions reductions have not yet been quantified.

Solid Waste Services' increased waste diversion efforts and disposal bans for recyclable materials have contributed to increased recycling rates and reduced GHG emissions.

Housing

Housing energy efficiency projects account for approximately 18% of total corporate Metro Vancouver annual savings for the period reported. Total estimated savings for Housing energy efficiency project completions exceed 4,600 GJ per year; cumulative savings since 2014 are estimated at 8,400 GJ (\$95,000). Housing has strategically invested in energy-efficient mechanical equipment (boilers and hot water heaters), laundry equipment, and lighting systems. Housing has also taken advantage of FortisBC incentives that installed equipment – free of charge – to reduce residential hot water use.

In its 10-Year Plan (published in 2019) Housing has committed to reducing energy consumption by 25% for major rehabilitations, such as comprehensive building envelope upgrades, and for new construction (from 2015 National Energy Code for Buildings). The 10-Year Plan also commits to reducing GHG emissions in the Housing portfolio by 45% over the next 10 years (compared to 2010 levels).

In 2019 a Sustainability Innovation Fund application was approved for Housing: *Energy Step Code Implementation Impacts for Building Envelope Rehabilitations of Existing Buildings*. The study will investigate the energy use, financial implications, and GHG emissions reduction impacts that the different levels of the BC Energy Step Code could have on rehabilitation of the existing Housing portfolio.

Corporate Services

Colliers International (Colliers) has managed Metro Vancouver's Head Office building, Metrotower III, since mid-2018. Since then, Colliers has completed several projects targeting energy efficiency improvements. These include adjustment of building systems (heating, ventilation, and lighting) controls, a parkade lighting upgrade, and improvement/repairs to building's the three boilers. Projects completed at the end of 2018 are expected to reduce building energy use by nearly 2,500 GJ per year, energy costs by \$37,000 per year, and GHG emissions by 80 tonnes CO₂e per year.

Regional Parks

In 2016, Regional Parks invested in a high-efficiency condensing boiler to heat water for the pool at Capilano River Park. In the autumn of 2018, Regional Parks began shutting down the pool annually from the end of September through to the beginning of March. Regional Parks also installed programmable thermostats to control electric baseboard heater at its Central Area Office. From 2016 through 2018, these improvements have saved over \$25,000 in energy costs and reduced GHG emissions by 145 tonnes CO₂e.

Fleet

Refer to Section 5.3 for a summary of activities related to energy efficiency improvements for the Metro Vancouver fleet.

6.2 ENERGY RECOVERY

Liquid Waste Services

Biogas Production and Utilization

Liquid Waste Services has produced biogas from treatment processes at four of its five wastewater treatment plants for decades and this is the utility's largest existing energy recovery endeavour. The majority of the biogas is used within the four treatment plants to produce heat, electricity, and/or mechanical energy thus offsetting the purchase of fossil natural gas and grid electricity. Pursuing efficiency improvements in biogas production would increase energy recovery rates and further reduce Liquid Waste Services fossil fuel dependence and grid electricity purchases as well as enhance opportunities for sale of renewable natural gas to mitigate regional GHG emissions.

In 2015, a multi-year project was completed by Liquid Waste Services and BC Hydro that allowed more biogas to be used by the Iona Island Wastewater Treatment Plant cogeneration engines than had been previously permitted. These improvements resulted in annual biogas utilization increasing from approximately 70% to approximately 84%. This has translated to an increase of 8% in annual electricity generation.

Late in 2017, the Annacis Island Wastewater Treatment Plant cogeneration system was taken out of service and the construction phase of upgrading the system with increased generation capacity began. The new cogeneration system is expected to significantly reduce the amount of biogas that needs to be flared (wasted) and is expected to increase electricity generation by approximately 20,000,000 kWh per year. Annacis Island Wastewater Treatment Plant will use all electricity generated to reduce electricity purchases from BC Hydro. Liquid Waste Services expects the new system to be operational in 2020.

Heat Recovery

The North Shore Wastewater Treatment Plant, currently under construction, will include a facility that will recover heat from the plant effluent for sale to Lonsdale Energy Corporation (LEC), which will significantly reduce the use of fossil natural gas in LEC's district energy system. The plant will also recover heat from effluent for use on-site to offset natural gas use. Metro Vancouver staff are currently evaluating the financial viability of recovering heat from the Lulu Island Wastewater Treatment Plant effluent for on-site use. This would reduce the amount of biogas required by the plant to meet its thermal demands thus liberating additional quantities of biogas for clean-up and sale to FortisBC as described in Section 6.3.

Sewer heat and effluent heat recovery within the Liquid Waste Services utility have the potential to contribute enough energy to heat approximately 700 high rise buildings in the region. The most promising opportunities to establish financially feasible sewer heat recovery facilities will often be new high-density development close to large sewer lines. In addition to the North Shore Wastewater Treatment Plant effluent heat recovery project described above, several municipalities, including Richmond, New Westminster, and Surrey, are currently planning large district energy systems. Initial assessments indicate that sewer heat is the most reliable and cost-effective energy source for such systems. Assuming that this

heat displaces heat that would have been generated by natural gas, these systems are capable of reducing greenhouse gas emissions by tens of thousands of tonnes per year by 2030, and potentially by hundreds of thousands of tonnes per year by 2050.

Renewable Natural Gas

Biogas produced at wastewater treatment plants can be cleaned up and sold as biomethane, a renewable source of energy. FortisBC buys biomethane and delivers it to a growing market, displacing fossil natural gas use and thus reducing greenhouse gas emissions. One project of this kind is under construction at the Lulu Island Wastewater Treatment Plant. This system will be operational by the end of 2020. It will sell excess biogas, which is not needed for use at the Lulu Island Wastewater Treatment Plant, to FortisBC. This concept could be applied to other new wastewater treatment plants in the region, and could generate revenue and reduce regional greenhouse gas emissions by tens of thousands of tonnes per year.

Research has shown that the methane content in biogas can be increased by promoting the right microbial communities within the anaerobic digesters that produce the biogas. Given the current and increasing capacity of Metro Vancouver's digesters, a team of innovators are developing a renewable natural gas (RNG) Optimizer for future trials at the Lulu Island Wastewater Treatment Plant. The RNG Optimizer could boost methane generation by 15% to 25%. This will help reduce gas cleaning requirements and substantially increase generation of GHG credits and revenues from RNG sales. The successful implementation of the RNG Optimizer at wastewater treatment facilities could motivate its application at other anaerobic digestion facilities processing agricultural or food wastes. Metro Vancouver anticipates that bench-scale testing could commence as early as 2021 and full-scale implementation between 2025 and 2030.

Biocrude

Metro Vancouver is leading the implementation of the world's first hydrothermal processing (HTP) demonstration system integrated with an operating wastewater treatment facility. HTP is an emerging technology that converts wastewater biomass into biocrude (a renewable and low carbon version of crude oil), which minimizes the production, transportation and disposal of residuals from the wastewater treatment process. A local refinery and project partner will use the biocrude for refinement into a low-carbon transportation fuel such as biodiesel or biojet fuel. The first barrels of biocrude from wastewater are scheduled for production in 2022. This circular economy demonstration could reduce GHG emissions by three-fold at equivalent or lower costs than current processes. If successful, HTP systems can be scaled to many metropolitan wastewater treatment facilities globally. Further, wet feedstocks from alternate industries such as the municipal solid waste, agricultural, and forestry could provide additional decarbonization opportunities.

Water Services

Water Services has opportunities to recover energy from water flowing in pipes. From its commissioning in 2016 to the end of 2018, Capilano Energy Recovery Facility generated over 56,000 GJ of electricity that was used to offset a portion of electricity purchases to operate the Capilano Raw Water Pump Station.

Staff have investigated additional opportunities to generate electricity from water flowing through pipes at two pump stations and where raw water arrives at Seymour Capilano Filtration Plant from Seymour Lake. The BC Hydro Standing Offer Program that would allow generation at the pump stations was suspended indefinitely in 2017, thus temporarily precluding pursuit of these generation opportunities. Further steps related to energy recovery at Seymour Capilano Filtration Plant are on hold until a decision to proceed with full twinning of Seymour Lake water main line is made, which is not anticipated for several years.

The Angus Drive Pressure Reducing Valve Chamber, constructed in 2016, was designed to accommodate the future addition of a turbine to generate electricity as water flows from Kersland Reservoir to the City of Richmond. The project is on the Long Range Plan potentially scheduled for 2028/2029, providing BC Hydro's Standing Offer Program is reinstated.

As part of the long-term Joint Water Use Plan planning process, Water Services is evaluating the viability of using a turbine to produce electricity from water leaving the Capilano Reservoir. The electricity generated could be used at existing water facilities such as Capilano Raw Water Pump Station or sold to BC Hydro if and when its Standing Offer Program is reinstated.

Solid Waste Services

District energy systems distribute low grade thermal energy to multiple buildings. These systems typically consist of a heating and cooling centres, and a thermal network of pipes connected to several buildings. In 2020 Solid Waste Services staff are initiating a district energy project that will recover heat from the Waste-to-Energy Facility and transfer the heat to residential and commercial developments in proximity to the facility. By doing so, users of the heat will reduce their use of fossil natural gas in their boilers. Solid Waste Services staff has engaged a consultant to complete the preliminary design and business case for district energy opportunities at developments in Burnaby and Vancouver. This project could result in greenhouse gas emission reductions ranging from 8,000 to 70,000 tonnes of CO₂e per year, depending on the size of the project. Phase 1 of the project is expected to be complete by 2026.

The new Coquitlam Transfer station has been designed to reduce heating energy requirements by recovering heat from ventilation air to pre-heat fresh air entering the ventilation system. These features have also been included in the design of the new Surrey Recycling and Waste Drop-Off Facility.

Housing, Corporate Services, and Regional Parks

Housing, Corporate Services, and Regional Parks did not undertake any energy recovery projects during the period reported. However, opportunities for heat recovery have been identified (e.g. recovering heat from ventilation systems) and will be evaluated as part of the capital improvement options analysis process.

6.3 TRANSITION TO RENEWABLE ENERGY

Liquid Waste Services

Liquid Waste Services' primary sources of stationary energy – electricity and biogas – are renewable. Opportunities nonetheless exist to transition from natural gas and mobile fossil fuels. For example, improving efficiencies of biogas production will reduce Liquid Waste Services dependence on fossil natural gas.

Except during the coldest days in winter, Lulu Island Wastewater Treatment Plant typically produces more biogas than it requires to meet the plant's thermal demands, with excess gas flared to the atmosphere. Construction began in 2019 to build a facility at Lulu Island Wastewater Treatment Plant that will purify the excess biogas to pipeline quality and sell the gas to FortisBC as renewable natural gas. As mentioned in Section 6.2 (Energy Recovery), the sale of this gas by FortisBC will allow others in the region to transition from fossil natural gas to renewable energy.

Contracted residuals hauling services are Liquid Waste Services' largest users of fossil fuels. Future opportunities might exist to encourage these contractors to transition their vehicles to lower-carbon fuel sources such as electricity and renewable natural gas.

With respect to transitioning fleet vehicles to lower-carbon fuel sources, the impacts of changes to the Liquid Waste Services fleet are discussed in Section 5.3.

Water Services

Currently, the primary source of stationary energy used by the water utility is purchased hydroelectricity which, in British Columbia, is considered a clean, renewable energy. Water Services fleet and residuals management use fossil fuels to operate vehicles. Transitioning these mobile fuels to less carbon-intensive energy sources may provide opportunities to reduce GHG emissions from these sources. Water Services is also responsible for the operation of a small number of facilities that use fossil natural gas for space heating. The technical and financial feasibility of meeting these space heating loads using electric air-source heat pumps will be investigated in the future. Beyond transitioning the Water Services fleet to less carbon-intensive fuel sources discussed in Section 5.3, no other Water Services projects are currently planned for transition to renewable energy.

As is the case with Liquid Waste Services, contracted residuals hauling services are also the largest users of fossil fuels for Water Services. Opportunities may exist to encourage these contractors to transition to lower-carbon fuel sources.

Solid Waste Services

Fuels used by solid waste transfer service trucks are one of Metro Vancouver's largest users of fossil fuels. Opportunities might exist to encourage these contractors to transition to lower-carbon fuel sources.

Electric vehicle charging stations have been included in the designs of the new Coquitlam Transfer Station and the new Surrey Recycling and Waste Drop-Off Facility. Natural gas will not be used at either of these facilities; all heating requirements will be met with electricity.

Housing

For the period reported, Housing was corporate Metro Vancouver's largest consumer of non-renewable natural gas, which is used for space heating and hot water heating. As mentioned earlier, electricity in British Columbia is considered a clean, renewable source of energy. Transitioning from natural gas space heating to electric space heating using high-efficiency heat pumps in Housing buildings is seen as one of the most promising opportunities for Housing to transition to renewable energy. Unfortunately, even when factoring in Metro Vancouver's internal carbon price of \$150 per tonne of carbon dioxide equivalent emissions, business cases completed to date have shown that it is not yet financially viable to invest in electric heat pump technology. Improved financial incentives from BC Hydro, the Provincial Government, and/or Federal Government could tip the business case to the positive in the future. In the meantime, Housing will continue to evaluate how heat pump technology could play a role in achieving the GHG emissions reduction targets set out in Housing's 10-Year Plan and in Climate 2050. Housing's focus over the next 10 years will be on new construction and major rehabilitation, and this presents a significant opportunity to shift towards electrification to meet its energy and climate objectives. Although transitioning from natural gas to electricity for facility thermal demands will significantly reduce GHG emissions related to these demands, electrification options tend to carry significantly higher capital, operations, and maintenance costs. Metro Vancouver staff are investigating means by which Housing will be able to fund these additional costs to make the transition away from natural gas financially sustainable while keeping rents affordable.

Two 2020 Housing applications to the Sustainability Innovation Fund and that pertain to renewable energy have been approved to proceed: *Building Resilience: Exploring the Potential of Renewable Energy Building Infrastructure* and *Net-Zero Feasibility Study for Welcher Affordable Housing Development*. The studies will investigate the opportunity and challenges of integrating renewable infrastructure, such as solar panels or geo-exchange energy, into new and existing housing complexes. Incorporating renewable energy infrastructure into housing retrofits and redevelopments could significantly reduce greenhouse gas emissions and provide energy resiliency. However, incorporating renewable energy infrastructure into existing developments may be challenged by space and financial constraints. If the studies demonstrate that these types of projects could be financially viable then opportunities to scale across the housing portfolio would be investigated.

Corporate Services

Before sale of its former Head Office building, Metro Vancouver evaluated the option to relocate the solar thermal collectors on that building to its new Head Office building, but costs to do so could not be justified and the project did not proceed.

Regional Parks

The works yard at Colony Farm Regional Park does not have access to grid electricity. In 2018, Regional Parks installed solar panels at the works yard to generate electricity that, until then, had to be generated by a gasoline-powered generator. The initiative was funded by Metro Vancouver's Sustainability Innovation Program and will reduce GHG emissions and noise pollution associated with generator operation. Staff are monitoring the effectiveness and efficiency of this pilot project to determine whether similar installations are feasible at other park or utility sites that currently rely on gas-powered generators.

Fleet

Refer to Section 5.3 for a summary of activities related to transitioning the Metro Vancouver fleet to less carbon-intensive fuel sources.

7. SUMMARY

Metro Vancouver spent more than \$26 million on energy use in 2018, which resulted in more than 21,000 tonnes of CO₂e GHG emissions. Corporate energy use has increased by 4% since 2014, energy costs have increased by 23%, and GHG emissions associated with energy use have increased by 13%. Per capita energy use has decreased by 3%, per capita energy cost has increased by 16% and per capita GHG emissions have increased by 6%.

Energy efficiency projects completed from 2014 through 2018 have contributed to savings of nearly 26,000 GJ per year. Cumulative cost savings from these projects over this period are estimated at \$1.2 million and cumulative GHG emissions reduction are 625 tonnes CO₂e

Progress has been made toward implementing corporate policies related to energy use and GHG emissions including the *Corporate Energy Management Policy*, the *Sustainable Infrastructure and Buildings Policy*, the suite of *Asset Management* policies, and development of the *Climate 2050* Roadmaps.

All service areas have committed to setting energy and GHG emissions management targets in 2020 and establishing reporting systems to monitor progress toward meeting those targets. For its corporate GHG emissions, Metro Vancouver has committed to achieving and maintaining carbon neutrality status by 2025 and onwards.

Metro Vancouver is working to establish processes to monitor and manage the costs associated with energy self-generation.

APPENDIX A

SUPPLEMENTAL DATA

Table A1: Summary of Departmental Trends

	Metro Vancouver						Percent Change Relative to 2014			
	Year						2015 2016 2017 2018			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	1,442,301	1,442,212	1,486,436	1,498,215	1,494,862		-0.01%	3%	4%	4%
Total Cost (\$)	\$ 21,437,482	\$ 21,411,027	\$ 23,428,066	\$ 24,235,895	\$ 26,462,678		0%	9%	13%	23%
Total GHG Emissions (t CO2e)	18,623	18,810	18,742	17,439	21,041		1%	0.6%	-6%	13%
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493		1%	4%	5%	6%
GJ/capita	0.580	0.571	0.577	0.574	0.564		-1%	-0.4%	-1%	-3%
\$/capita	\$ 8.62	\$ 8.48	\$ 9.10	\$ 9.28	\$ 9.99		-2%	6%	8%	16%
kg CO2e/capita	7.5	7.5	7.3	6.7	7.9		-0.5%	-3%	-11%	6%
Liquid Waste Services										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	947,374	885,533	927,861	929,560	938,832		-7%	-2%	-2%	-1%
Total Cost (\$)	\$ 9,075,054	\$ 8,264,923	\$ 9,638,522	\$ 9,986,935	\$ 13,490,288		-9%	6%	10%	49%
Total GHG Emissions (t CO2e)	5,736	5,770	5,471	4,835	8,320		1%	-5%	-16%	45%
ML Collected & Treated	440,763	415,000	437,520	449,541	456,083		-6%	-1%	2%	3%
GJ/ML Collected & Treated	2.15	2.13	2.12	2.07	2.06		-1%	-1%	-4%	-4%
\$/ML	\$ 20.59	\$ 19.92	\$ 22.03	\$ 22.22	\$ 29.58		-3%	7%	8%	44%
kg CO2e/ML	13.0	13.9	12.5	10.8	18.2		7%	-4%	-17%	40%
Water Services										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	182,367	250,479	238,541	258,465	242,946		37%	31%	42%	33%
Total Cost (\$)	\$ 4,578,678	\$ 5,933,789	\$ 6,022,223	\$ 6,922,103	\$ 6,038,796		30%	32%	51%	32%
Total GHG Emissions (t CO2e)	1,784	2,168	2,394	2,400	1,939		22%	34%	35%	9%
ML Treated & Delivered	381,261	385,093	383,774	389,177	399,736		1%	1%	2%	5%
GJ/ML Treated & Delivered	0.48	0.65	0.62	0.66	0.61		36%	30%	39%	27%
\$/ML	\$ 12.01	\$ 15.41	\$ 15.69	\$ 17.79	\$ 15.11		28%	31%	48%	26%
kg CO2e/ML	4.7	5.6	6.2	6.2	4.9		20%	33%	32%	4%
Solid Waste Services										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	192,026	197,721	189,144	169,980	181,379		3%	-2%	-11%	-6%
Total Cost (\$)	\$ 5,246,106	\$ 5,035,676	\$ 5,058,848	\$ 4,294,082	\$ 3,988,835		-4%	-4%	-18%	-24%
Total GHG Emissions (t CO2e)	7,023	7,277	6,652	5,636	6,525		4%	-5%	-20%	-7%
Mass Disposed (tonnes)	1,303,191	1,220,842	1,256,261	1,291,169	1,282,752		-6%	-4%	-1%	-2%
GJ/tonne disposed	0.15	0.16	0.15	0.13	0.14		10%	2%	-11%	-4%
\$/tonne disposed	\$ 4.03	\$ 4.12	\$ 4.03	\$ 3.33	\$ 3.11		2%	0.03%	-17%	-23%
kg CO2e/tonne disposed	5.4	6.0	5.3	4.4	5.1		11%	-2%	-19%	-6%
Housing										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	66,969	63,376	63,517	67,531	63,404		-5%	-5%	0.8%	-5%
Total Cost (\$)	\$ 1,133,904	\$ 1,038,603	\$ 1,055,580	\$ 1,182,707	\$ 1,170,949		-8%	-7%	4%	3.3%
Total GHG Emissions (t CO2e)	2,362	2,245	2,243	2,424	2,272		-5%	-5%	3%	-4%
Million m ² *HDD	750	711	724	833	788		-5%	-3%	11%	5%
kJ/(m ² *HDD)	89.28	89.13	87.71	81.07	80.47		-0.2%	-2%	-9%	-10%
\$/million m ² *HDD	\$ 1,512	\$ 1,461	\$ 1,458	\$ 1,420	\$ 1,486		-3%	-4%	-6%	-2%
g CO2e/(m ² *HDD)	3.15	3.16	3.10	2.91	2.88		0.3%	-2%	-8%	-8%
Corporate Services										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	36,556	29,765	54,460	61,552	54,846		-19%	49%	68%	50%
Total Cost (\$)	\$ 872,617	\$ 679,349	\$ 1,277,304	\$ 1,522,402	\$ 1,348,803		-22%	46%	74%	55%
Total GHG Emissions (t CO2e)	954	664	1,464	1,789	1,460		-30%	54%	88%	53%
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493		1%	4%	5%	6%
GJ/capita	0.01	0.01	0.02	0.02	0.02		-20%	44%	60%	41%
\$/capita	\$ 0.35	\$ 0.27	\$ 0.50	\$ 0.58	\$ 0.51		-23%	41%	66%	45%
kg CO2e/capita	0.4	0.3	0.6	0.7	0.6		-31%	48%	79%	44%
Parks										
	Year						Percent Change Relative to 2014			
	2014	2015	2016	2017	2018		2015	2016	2017	2018
Total Energy Use (GJ)	17,008	15,338	12,912	11,127	13,454		-10%	-24%	-35%	-21%
Total Cost (\$)	\$ 531,123	\$ 458,686	\$ 375,589	\$ 327,666	\$ 425,006		-14%	-29%	-38%	-20%
Total GHG Emissions (t CO2e)	766	686	517	355	525		-10%	-32%	-54%	-31%
Population	2,487,879	2,524,714	2,575,540	2,610,929	2,648,493		1%	4%	5%	6%
MI/capita	6.84	6.08	5.01	4.26	5.08		-11%	-27%	-38%	-26%
\$/capita	\$ 0.21	\$ 0.18	\$ 0.15	\$ 0.13	\$ 0.16		-15%	-32%	-41%	-25%
kg CO2e/capita	0.31	0.27	0.20	0.14	0.20		-12%	-35%	-56%	-36%

Notes:

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

To: Climate Action Committee

From: Lucas Pitts, Director, Policy, Planning and Analysis (Acting)
Water Services Department

Date: July 29, 2020 Meeting Date: September 18, 2020

Subject: **Water Supply Outlook 2120**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated July 29, 2020, titled "Water Supply Outlook 2120".

EXECUTIVE SUMMARY

Over the past three years, a detailed technical study was completed to assess long-term water supply needs for the rapidly growing Metro Vancouver region. The study evaluated the implications of climate change, power resiliency, and seismicity and key findings have been consolidated into the referenced *Water Supply Outlook 2120* document.

Long-term modelling predicts declining snowpack due to warming temperatures and reduced summer rainfall. To manage the predicted supply shortfall, additional water supplies were reviewed, both within and outside the Metro Vancouver Region. This study confirms that Metro Vancouver is on the right track with plans to have Coquitlam Lake Water Supply Project in place to provide the additional water supply needed to meet the growing demand for water over the next 50 years. A number of projects have been identified that could provide the next longer-term increment, such as raising Seymour Falls Dam, but new sources of supply outside the existing watersheds will not be required for the foreseeable future (i.e. desalinating Fraser River water or expansion to Pitt Lake).

PURPOSE

To present the Climate Action Committee with an update on the options for expanding the region's water supply over the next 100 years.

BACKGROUND

Metro Vancouver's last major comprehensive regional water supply planning study was completed in the late 1990s, which established the Coquitlam Reservoir as the next increment of supply. The *Board Strategic Plan* includes an action to "ensure Metro Vancouver continues to supply high-quality drinking water to a growing region into the next century." The new study is also supported by the *Drinking Water Management Plan*, which recognizes that new water supply sources will need to be developed in the future and includes a goal to "ensure the efficient supply of water."

Over the past three years, a technical study was completed to examine the options for new water supply sources as part of the development of an update to the 1990's water supply plan. The current study also evaluated the implications of climate change, power resiliency, and seismicity.

REGIONAL WATER DEMAND

Per capita water demand has been generally declining over the past two decades, which can be attributed to plumbing efficiency improvements, outdoor watering restrictions, seasonal pricing, increased residential water metering, densification of urban areas, and public water conservation campaigns. Current trends show that even with this reduction in per capita consumption, the overall water use is starting to increase.

Key recent efforts, such as implementation of the Board-approved *Drinking Water Conservation Plan* (DWCP) and *Residential Water Metering in Metro Vancouver: Best Practices Guide for Local Governments*, will assist in limiting the impacts of population growth on water demand. Metro Vancouver continues to support local governments in their efforts to implement residential water metering in their jurisdiction. Nonetheless, additional long-term supply will be required in the coming years to meet the needs of a growing region and adapt to the predicted impacts of climate change.

SYSTEM VULNERABILITIES

No high-risk short-term vulnerabilities related to climate change were identified, but lower-risk long-term system risk considerations include:

- Reduced spring inflows as a consequence of reduced snowpack;
- Flood risk at low-lying facilities related to sea level rise;
- Debris flow risk in source supply watersheds related to extreme weather;
- Risk of power outages related to increased likelihood of extreme weather; and
- Earthquake risk.

In response to the risk of prolonged power outages, a prioritized ranking of projects to improve power resiliency was developed. The study also evaluated various risk scenarios associated with widespread power outages caused by extreme weather events.

The resiliency of existing treatment processes was reviewed against future climate change impacts and increased risk of turbidity in the source lakes. Updates are currently planned for the Seymour Capilano Filtration Plant to further improve treatment and operational resilience to problematic turbidity events. At the Coquitlam source, the study recommended that treatment processes include filtration for increased resiliency to factors that could be influenced by climate change (e.g. increasing extreme weather events in the watershed that could affect turbidity levels, or forest fires).

The existing program to seismically upgrade the key marine crossings in the region was re-evaluated to ensure that projects are correctly prioritized in the Long Range Capital Plan. The status of these upgrade projects are presented below in Table 1.

Table 1 – Marine Crossings – Seismic Upgrade Program

Location	Status
Port Mann Water Supply Tunnel	Complete
Annacis Water Supply Tunnel	Underway
Second Narrows Water Supply Tunnel	Underway
Cambie-Richmond Water Supply Tunnel	Preliminary Design
Haney Main #4 Water Supply Tunnel	Preliminary Design

WATER DEMAND AND SUPPLY FORECASTING

Multiple uncertainties exist over the next century that could impact the regional water system. Historical data was reviewed to identify statistically-significant influencing variables for water demand including:

- total population and density;
- temperature and precipitation;
- residential metering;
- water price and income;
- employment and industrial activities; and
- outdoor water demand.

Updated watershed models were developed for forecasting inflows over the next century, incorporating anticipated climate change and natural variability. The model results generally indicate:

- Declining fall/winter/spring snowpack due to warming temperatures;
- Lower spring/summer inflows due to reduced precipitation; and
- Increasing fall/winter inflows in the form of rainfall.

It is anticipated that future snowmelt will become less reliable in supplementing reservoir levels and refilling of source reservoirs will become more dependent on rainfall. Unlike other areas of North America, however, Metro Vancouver's reservoirs are anticipated to continue to reliably refill on an annual basis. Therefore, meeting future water demands through a phased enhancement of supply sources within existing watersheds, while continuing to focus on water conservation initiatives, is a reasonable approach.

The Coquitlam Reservoir was previously identified as the next increment of source supply and design of a second deeper intake and associated treatment facilities is underway with expected completion in the mid-2030s. Modeling of the forecasted water demand predicts that beyond expansion of the Coquitlam source, additional source development will be required by approximately 2070.

LONG-TERM WATER SUPPLY EXPANSION OPTIONS

Twenty-nine long-term water supply options were considered under the following three broad themes:

- Expansion of lake storage within existing watersheds;
- Development of new lake storage outside the region; and
- Considerations such as seawater desalination, groundwater and the Fraser River.

Potential lake storage options within the existing Capilano and Seymour watersheds include a new Upper Capilano Watershed Dam or Upper Seymour Watershed Dam, both located within the upper reaches of the respective watersheds, or a new Lower Seymour Watershed Dam located in the Lower Seymour Conservation Reserve. Consideration was also given to a Raised Seymour Falls Dam, which would require raising the existing dam or construction of a new higher dam located at or adjacent to the existing dam. This option would provide the largest amount of additional storage relative to other options within the existing watersheds.

Possible lake storage options outside the region include Pitt Lake, Allouette Lake, Stave Lake, Chehalis Lake, Chilliwack Lake and Harrison Lake. The GVWD does not currently hold any water licences on these potential sources, and the study identified that significant new infrastructure would be required to integrate these supply options with the existing transmission system.

Considerations related to the high cost of treatment precluded seawater desalination as a viable option. Groundwater development is also not considered practical given the need for land acquisition within urban areas and extensive pumping requirements. Although extraction of freshwater from the Fraser River upstream of the tidal influence was considered as a potential source of water, it was noted that this would be a very costly option given the system upgrades that would be required to integrate this supply option with the existing transmission system.

Seven options were short-listed for detailed analysis, of which the Raised Seymour Falls Dam was identified as a highly-ranked potential option for long-term water supply development. However, the other options within the existing watershed were also considered to be viable, attributed in part to their use of existing infrastructure and treatment processes.

ALTERNATIVES

This is an information report; no alternatives are presented.

FINANCIAL IMPLICATIONS

Planned upgrades at the Coquitlam Reservoir, currently in the project definition phase and included in Metro Vancouver's financial plan, are projected to meet the region's water supply needs well beyond mid-century, to about the 2070s.

A continued emphasis will remain on water conservation initiatives that help to reduce water demand to aid in the deferral of long-term storage upgrades and associated costs.

OTHER IMPLICATIONS

Development of long-term water supply expansion options will be of interest to a wide audience. Metro Vancouver is committed to engaging and drawing upon the knowledge and experience of its member jurisdictions, First Nations, other orders of government and the public as options continue to be assessed and refined.

CONCLUSION

Metro Vancouver is currently planning to meet the growing demand for water from the Coquitlam Reservoir and the design of a second deeper intake and associated treatment facilities is underway with expected completion in the mid-2030s. Additional storage capacity will subsequently be required, currently estimated by about the 2070s.

Longer term water supply options include expansion of lake storage within existing watersheds, development of new lake storage outside the region, and considerations such as seawater desalination, groundwater and the Fraser River. A higher dam at Seymour Falls is one of the highest-ranked options; however, further evaluation of this and other highly-ranked source expansion options will be needed in the future as additional information becomes available. There will also be a continued focus on water conservation initiatives to help defer costly future water supply expansion projects, where possible.

Reference

[Water Supply Outlook 2120, dated September 2019](#)

To: Climate Action Committee

From: Lucas Pitts, Director, Policy, Planning and Analysis (Acting)
Water Services Department

Date: July 29, 2020 Meeting Date: September 18, 2020

Subject: **2020 Update on Water Sustainability Innovation Fund Projects**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated July 29, 2020, titled “2020 Update on Water Sustainability Innovation Fund Projects”.

EXECUTIVE SUMMARY

Annually, the Climate Action Committee is provided with an update on all projects funded under the Sustainability Innovation Funds. This report provides an update on five projects that were approved for funding from 2017 to 2019 and are in various stages of completion.

PURPOSE

This report provides an update on projects funded under the Water Sustainability Innovation Fund.

BACKGROUND

The Water Sustainability Innovation Fund was created by the Board in 2004 to provide financial support to Regional District or utility projects that contribute to the region’s sustainability. The GVWD Board adopted the *Water Sustainability Innovation Fund Policy* on June 27, 2014, with further amendments in 2016, to guide the use and management of the Fund. The policy requires that the Climate Action Committee be updated on an annual basis on the deliverables, outcomes and measurable benefits of the projects receiving funding.

This report presents an update on projects that have not yet been reported as complete to the Climate Action Committee. The projects, outlined below, were approved for funding from 2017 to 2019. Projects that were approved for funding in 2020 have not been included in this report, but will be reported on in 2021, as per the policy.

STATUS OF SUSTAINABILITY INNOVATION PROJECTS (APPROVAL YEARS: 2017 – 2019)

Project	Approval Year	Amount Approved	Status
Earthquake Early Warning System	2017	\$100,000	Complete
Residential Indoor and Outdoor End Uses of Water	2018	\$380,000	Discontinued
Greywater Reuse and Rainwater Harvesting Demonstration	2018	\$350,000	In Progress
Next Generation Snowpack Monitoring	2019	\$160,000	In Progress
Treating Emerging Contaminants at the Seymour Capilano Filtration Plant	2019	\$300,000	In Progress

Updates on each of the five projects are provided in the appendix to this report.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The projects summarized in this report had funding approved by the GVWD Board from 2017-2019. The disbursements of funds were made following the applicable *Sustainability Innovation Fund Policy* that governs the use and management of the Funds.

The table below outlines the funding approved and the amount spent to date for each project. Any unspent funds for completed projects remain in the Sustainability Innovation Fund reserve.

Project	Total Amount of Funding Approved	Amount Spent (as of July 31, 2020)
2017 Approval Year		
Earthquake Early Warning System	\$100,000	\$94,976.38
2018 Approval Year		
Residential Indoor and Outdoor End Uses of Water	\$380,000	\$-
Greywater Reuse and Rainwater Harvesting Demonstration	\$350,000	\$119,000
2019 Approval Year		
Next Generation Snowpack Monitoring	\$160,000	\$85,000
Treating Emerging Contaminants at the Seymour Capilano Filtration Plant	\$300,000	\$0

CONCLUSION

This report has presented an update on five projects funded under the Water Sustainability Innovation Fund. The Sustainability Innovation Funds were created by the Board in 2004 to provide financial support to utility or Regional District projects that contribute to the region's sustainability.

Appendix: Update on Water Sustainability Innovation Fund Projects

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APPENDIX: UPDATE ON WATER SUSTAINABILITY INNOVATION FUND PROJECTS

Earthquake Early Warning System: Complete

Approved in 2017, Metro Vancouver's Earthquake Early Warning (EEW) System project assessed the opportunities for an earthquake early warning system that could reduce the potential for disruption to the provision of water to the region in the event of a major earthquake. A consultant's technical assessment report was completed in late 2018, followed by further definition of the proposed pilot design elements in 2019.

The assessment showed that the application of EEW is evolving, and identified potential opportunities to implement EEW through a network of integrated sensors placed at key facilities such as water treatment plants, reservoirs and dams. This will help safeguard workers, conserve water (in reservoirs) and exercise key automated functions to aid in the recovery process. The assessment noted that versions of EEW have been successfully implemented in many schools in the region, at the legislature buildings in Victoria, and elsewhere around the world; however, no comparative applications were found for water or liquid waste infrastructure.

Sensor placements were recommended at the Seymour Capilano Filtration Plant, various reservoirs and water main valves as part of the pilot phase assessment. Staff were engaged in the selection criteria and operational factors for the pilot test sites. A follow-on funding request for execution of the pilot program was brought forward and approved in February, 2020.

Key outcomes:

- EEW assessment completed
- Pilot design completed
- Follow-on pilot SIF funding secured (for pilot in 2020 – 2021)

Residential Indoor and Outdoor End Uses of Water: Discontinued

This project was approved in 2018 to measure and record both indoor and outdoor water use patterns of about 150 single-family homes over a two-month period in the summer months. The results from the study would provide a detailed understanding of how water is used indoors by each fixture and frequency and quantity of water applied to lawns and gardens.

The study would also evaluate water use patterns in the Metro Vancouver region in comparison to other North American jurisdictions as reported in the Water Research Foundation 2016 Residential End Uses of Water Study. The study would also allow communications materials to be research-based, incorporating water use and public attitudes research information specific to this region.

Project work began in 2018 with the project working group of local government representatives to identify a preliminary list of candidate properties for the study.

As a result of the current pandemic and the fact that this summer would not be representative of the average summer usage of water because residents are spending a greater period of time at home, the Residential Indoor and Outdoor End Uses of Water Study funded through the Water Sustainability

Innovation Fund will not be proceeding at this time. Further consideration will be given to proceeding with this project once summer water use stabilizes to previous or near previous levels.

Greywater Reuse and Rainwater Harvesting Demonstration: In Progress

Approved in 2018, the objective of this project is to reduce the use of potable water for non-potable purposes, by supporting the uptake of water reuse systems in the region. The reuse of greywater and rainwater presents a potential source of non-potable water that may reduce demands on drinking water and treatment/distribution infrastructure. The project draws on the experience of existing reuse installations in the region to share lessons learned in navigating regulatory, implementation and operational challenges. The objective is to support and encourage new developments that may be considering water reuse to successfully implement and maintain greywater or rainwater systems.

Project work began in late 2019, which includes completion of a background review and technology scan, to identify the current status and barriers to implementation of water reuse technology and systems within the region. A major component of the project is to monitor several buildings with on-site water reuse systems within the region over the period of one year, to gain hands-on experience with system performance and detail lessons learned. Closures and changes to building occupancy and operations due to COVID-19 have led to delays on confirming buildings that would be suitable as Case Studies. Development of an adjusted schedule and plan for identifying the Case Studies is in progress. Findings from this project will be compiled in a published Guidebook. The outline for the Guidebook has been created and reviewed by Metro Vancouver and will continue to be developed as other phases of the project progress.

Another main focus of the project is to host a series of workshops with stakeholders in the region to identify current barriers to water reuse and develop pathways to overcome barriers. The Roadmap process is anticipated to begin in Fall 2020.

Key outcomes:

- A Guidebook for onsite non-potable water reuse that acts as an industry go-to resource to improve education, simplify implementation, and support ongoing operation of these systems in the region.
- A Roadmap that outlines the roles and responsibilities of various agencies in this area, and charts a path forward for addressing key barriers to broader uptake of these systems will be developed.

Next Generation Snowpack Monitoring: In Progress

Approved in 2019, the objective of this project is to explore and assess new technologies for measuring and monitoring the snowpack within Metro Vancouver's water supply areas. Snowpack data is used to estimate how much water is available in the snowpack to replenish drinking water reservoirs and provide downstream environmental flows during the annual dry period in summer and early fall. Manual snow measurements have been the primary method for collecting snowpack information since the mid 1930's. This project has looked at various technologies that will give a better understanding of snow conditions over time and space.

Work began in April 2019. Light Detection and Ranging (LiDAR) was selected as a potential tool for measuring snow depth over large areas. Aerial LiDAR surveys are conducted once the ground surface is bare, and again when it is snow covered. The bare-earth and snow-covered elevations are compared to determine the depth of snow on the ground. The first LiDAR survey was completed in May 2019. In addition, various satellites and snow cover algorithms were explored.

In 2020, a satellite snow cover product was selected and used to assess snow cover extent over the watershed during clear-sky days. Four additional LiDAR surveys were also completed. Unfortunately, due to COVID-19, field validation was limited to only the first survey in early March. Additional work is required to determine the true accuracy of LiDAR snow measurements, and to help develop snow water equivalent and water volume models.

The combination of using satellites for assessing the total watershed area that is snow covered, and LiDAR for determined the snow depth have shown great promise for modernizing our snow survey program and improving our understanding of the watershed snowpack. Having a more complete understanding of snow conditions allows us to monitor for and adapt to climate change.

Traditional manual snow surveys were not completed for most of the 2020 season due to COVID-19. These new remote sensing technologies were put to the test and proved their value as a part of a comprehensive snow monitoring program.

Key outcomes:

- Freely available moderate-to-high resolution satellite imagery has been incorporated into monthly snowpack assessments and reports.
- A total of five aerial LiDAR surveys of the upper Seymour watershed were completed in 2019 and 2020. Additional work is required to validate the data collected, particularly in snow-covered areas under dense forest canopy.
- Additional in-situ snow depth measurements with automated sensors were incorporated into total snow water equivalent and water volume estimates.

Treating Emerging Contaminants at the Seymour Capilano Filtration Plant: In Progress

Approved in 2019, this project will evaluate the resiliency of the SCFP to changes in raw water quality caused by emerging contaminants of concern. These contaminants may be the result of climate change or anthropogenic activities and include, but are not limited to, ash and fire retardants from forest fires, ash from volcanic eruptions, cyanotoxins (blue-green algae), perfluoralkyl substances, perfluorinated chemicals, and airborne contaminants such as microplastics. The anticipated scope of work includes a Literature Survey, Treatment Assessment and Pilot Testing.

Key outcomes:

- Recommendation for operational improvements and best practices to effectively treat emerging contaminants.
- Develop a detailed understanding of future contaminants that may occur in source waters from climate change, or anthropogenic activities.

- Conduct pilot testing to confirm the effectiveness of the proposed operational or process modifications.
- Evaluate modifications to existing treatment process and/or new treatment methods, to address emerging contaminants.

To: Climate Action Committee

From: Derek Jennejohn, Lead Senior Engineer
Grace Cockle, Senior Permit and Enforcement Officer
Parks and Environment Department

Date: August 17, 2020 Meeting Date: September 18, 2020

Subject: **Partnering Agreements for Metro Vancouver's Wood Stove Exchange Program**

RECOMMENDATION

That the MVRD Board:

- a) authorize the participation of wood burning appliance retailers in Metro Vancouver's wood stove exchange program;
- b) direct staff to publish Metro Vancouver's intention to work with wood burning appliance retailers listed in (c) below to carry out the program;
- c) authorize the Metro Vancouver Regional District to enter into a partnering agreement with each of the following retailers to establish the terms and conditions of the services provided to Metro Vancouver as part of the program:
 - i. A&B Technical Services, Surrey, BC
 - ii. Encore Fireplaces Ltd., Langley, BC
 - iii. Fastgo System (2011) Inc. (doing business as Fireplaces Unlimited), Surrey, BC
 - iv. GDS Green Home Mechanical Inc., Port Moody, BC
 - v. Good Guys Heating Cooling & Plumbing Ltd., Surrey, BC
 - vi. Hallmark Heating, Duct and Chimney Services, Surrey, BC
 - vii. Hilltop Plumbing and Heating (2016) Ltd., White Rock, BC
 - viii. Northwind Heating Ltd., Surrey, BC
 - ix. Real Lighting & Fireplaces Ltd., Surrey, BC
 - x. Solace Home Comfort Ltd., Burnaby, BC and Port Coquitlam, BC
 - xi. The LM Fireplace Warehouse Ltd., Richmond, BC
 - xii. Vancouver Gas Fireplaces Ltd., Vancouver, BC; and
- d) authorize the Chief Administrative Officer to execute the partnering agreements listed in (c) above.

EXECUTIVE SUMMARY

Metro Vancouver has operated its Wood Stove Exchange Program since 2009 with funding from the provincial government. The exchange program reduces emissions from residential wood burning in the region by providing rebates to accelerate replacement of older, uncertified wood burning appliances with units that are more energy efficient and comply with more stringent emissions standards. Participating wood burning appliance retailers play an important role in the exchange program.

The exchange program provides limited assistance to participating retailers by advertising their names on promotional materials. Under the *Local Government Act*, Metro Vancouver Regional

District may only provide assistance to an industrial, commercial or business undertaking under a partnering agreement. In accordance with this requirement, staff seek authorization from the MVRD Board to enter into new agreements with retailers whose current agreements will expire and formalize participation of additional appliance retailers.

PURPOSE

To seek MVRD Board authorization to enter into new partnering agreements with wood burning appliance retailers for the Metro Vancouver Wood Stove Exchange Program. This requires agreements with four retailers whose existing agreements will expire at the end of 2020, and with eight new retailers that seek to participate in the exchange program.

BACKGROUND

To meet requirements of the *Local Government Act*, staff seek authorization from the MVRD Board to enter into new agreements with retailers whose agreements will expire December 31, 2020, and formalize participation of additional wood burning appliance retailers in the Metro Vancouver Wood Stove Exchange Program (Reference 1).

Residential wood burning appliances, such as wood stoves and fireplaces, contribute about 30% of fine particulate matter (PM_{2.5}) emissions in the region. Exposure to PM_{2.5} emissions is associated with health impacts, and programs to reduce PM_{2.5} are a priority in Metro Vancouver's air quality program.

Metro Vancouver Wood Stove Exchange Program

The Wood Stove Exchange Program has operated since 2009, with ongoing funding from the provincial government. The exchange program reduces emissions from residential wood burning in the region by providing rebates to accelerate replacement of older, uncertified wood burning appliances (e.g., wood stoves, fireplaces) with units that are more energy efficient and comply with more stringent emissions standards. New, certified wood stoves, if operated properly, can reduce PM_{2.5} emissions by as much as 80% compared to uncertified appliances, and natural gas appliances can reduce PM_{2.5} emissions by 99%.

The BC Wood Stove Exchange Program provides funding to local governments, non-profit organizations, and air quality management organizations to offer local wood stove exchange programs. Since 2009, Metro Vancouver has received approximately \$281,000 of funding from the provincial program and completed nearly 800 exchanges, resulting in ongoing PM_{2.5} reductions of more than 15 tonnes per year, and air quality improvements in neighbourhoods across the region.

Metro Vancouver offers a \$250 rebate for the exchange of an uncertified wood burning appliance for a certified wood burning appliance or electric insert. A rebate of \$400 is provided for exchanges to a natural gas or propane appliance, pellet stove or electric heat pump. The program also provides education and outreach materials on how to burn wood more cleanly, and workshops aimed at promoting proper wood burning practices.

These activities align with *Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020* which was adopted by the MVRD Board in March 2020. Bylaw 1303 will reduce emissions from residential indoor wood burning and introduces phased

measures that will ultimately require the use of cleaner wood-burning appliances such as the ones for which incentives are provided under the wood stove exchange program.

Requirements for Participating Retailers

Participating retailers play an important role in the program, by confirming eligibility of homeowners for rebates, ensuring removal from service of uncertified wood stoves, and distributing educational materials.

Two steps are required to formalize participation of wood burning appliance retailers in the Wood Stove Exchange Program:

1. Publish notification: under the *Local Government Act*, prior to provision of assistance, the Board must publish notification of its intent to provide certain kinds of assistance, including assistance under a partnering agreement.
2. Establish partnering agreement: the program will provide limited assistance to participating retailers by advertising their names on promotional materials. Under the *Local Government Act*, the MVRD Board may provide assistance to an industrial, commercial or business undertaking only under a partnering agreement.

As of August 2020, Metro Vancouver's Wood Stove Exchange Program involves 22 participating retailers. Of these, four retailers have agreements that will expire at the end of 2020. With increasing awareness of the program, there are also ongoing requests from retailers to be added to the program. Eight additional retailers have expressed interest in joining the program, which would bring the total number of retailers to 30. Staff seek authorization to enter into new partnering agreements with the retailers whose agreements are expiring and to include additional wood burning appliance retailers.

Expanding the number of participating retailers will provide additional choice to residents utilizing the wood stove exchange program.

ALTERNATIVES

1. That the MVRD Board:
 - a) authorize the participation of wood burning appliance retailers in Metro Vancouver's wood stove exchange program;
 - b) direct staff to publish Metro Vancouver's intention to work with wood burning appliance retailers listed in (c) below to carry out the program;
 - c) authorize the Metro Vancouver Regional District to enter into a partnering agreement with each of the following retailers to establish the terms and conditions of the services provided to Metro Vancouver as part of the program:
 - i. A&B Technical Services, Surrey, BC
 - ii. Encore Fireplaces Ltd., Langley, BC
 - iii. Fastgo System (2011) Inc. (doing business as Fireplaces Unlimited), Surrey, BC
 - iv. GDS Green Home Mechanical Inc., Port Moody, BC
 - v. Good Guys Heating Cooling & Plumbing Ltd., Surrey, BC
 - vi. Hallmark Heating, Duct and Chimney Services, Surrey, BC
 - vii. Hilltop Plumbing and Heating (2016) Ltd., White Rock, BC
 - viii. Northwind Heating Ltd., Surrey, BC

- ix. Real Lighting & Fireplaces Ltd., Surrey, BC
 - x. Solace Home Comfort Ltd., Burnaby, BC and Port Coquitlam, BC
 - xi. The LM Fireplace Warehouse Ltd., Richmond, BC
 - xii. Vancouver Gas Fireplaces Ltd., Vancouver, BC; and
- d) authorize the Chief Administrative Officer to execute the partnering agreements listed in (c) above.
2. That the MVRD Board receive for information the report dated August 17, 2020, titled "Partnering Agreements for Metro Vancouver's Wood Stove Exchange Program", and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Metro Vancouver applies for and receives funding from the Province to operate the regional wood stove exchange program. Since 2009, Metro Vancouver has received approximately \$281,000 in funding, including \$57,000 in November 2019. Funds are used to provide rebates for exchanges and deliver wood heat workshops. Administration of the program is accommodated within existing Metro Vancouver budgets and the program can be continued without additional financial implications.

CONCLUSION

Residential wood burning appliances are significant contributors to fine particulate matter emissions, representing about 30% of the region's PM_{2.5} emissions. Metro Vancouver has operated a Wood Stove Exchange Program since 2009, with ongoing funding from the provincial government, and has completed nearly 800 exchanges. This has reduced PM_{2.5} emissions in neighbourhoods throughout the region, ultimately improving local air quality and mitigating health impacts for residents. The program is aligned with the MVRD Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020, adopted by the Board in March 2020, which introduces phased measures that will ultimately require the use of cleaner wood-burning appliances such as those for which incentives are provided under this program.

Staff seek to enter into new partnering agreements with wood burning appliance retailers participating in the Wood Stove Exchange Program. Under Alternative 1, four retailers will continue to participate in the program and eight additional retailers will be added. Alternative 1 is recommended, whereby staff seek authorization from the Metro Vancouver Board to formalize the participation of these appliance retailers in the program.

Reference

1. [Metro Vancouver Wood Stove Exchange Program](#)

40479590

To: Climate Action Committee

From: Roger Quan, Director, Air Quality and Climate Change
Parks and Environment Department

Date: September 10, 2020 Meeting Date: September 18, 2020

Subject: **Manager's Report**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated September 10, 2020, titled "Manager's Report".

Climate Action Committee 2020 Work Plan

The attachment to this report sets out the Committee's Work Plan for 2020. The status of work program elements is indicated as pending, in progress, or complete. The listing is updated as needed to include new issues that arise, items requested by the Committee, and changes to the schedule.

CONSULTATION AND ENGAGEMENT UPDATES

Update on Consultation on Alternate Approach to Regulating Emissions from Open-Air Burning

In October 2019 the MVRD Board directed staff to proceed with the first phase of engagement and consultation on a proposed approach to regulating air emissions from open-air burning activities. The engagement activities described in the engagement plan had not been completed before the COVID-19 pandemic response required adjustments to the work plan for consultation and engagement.

A report to the Climate Action Committee on May 15, 2020, titled "Adapting Air Quality and Climate Change Engagement During COVID-19", presented a revised engagement plan to seek input from key stakeholders on proposals by July 31, 2020. That phase of engagement has now been completed and the feedback received is being analyzed. Staff anticipate reporting back to the Committee before the end of the year, with a summary of the feedback received during the first phase of engagement. At that time staff will also be seeking direction to proceed with a second phase of consultation, based on a bylaw development consultation paper that incorporates feedback received to date.

Clean Air Plan and Climate 2050 Engagement Update

Through summer 2020, staff have been actively seeking input on a series of discussion papers on the priority areas for climate action and air quality protection, to inform development of the *Climate 2050 Roadmaps* and the *Clean Air Plan*. The first three papers address the largest emission sources in the region: Buildings, Industry, and Transportation. More recent discussion papers include Agriculture, Nature & Ecosystems and Waste Management. The six published discussion papers were promoted via social media throughout July and August. Posts were viewed by over 18,000 residents on Facebook, and over 24,000 times on Twitter and LinkedIn. Social media promotions contributed to nearly 2,000 visits to the *Climate 2050* webpage where the papers are posted.

A series of online, accessible questionnaires have been promoted through social media, newsletters, outreach to associations, and on the [Clean Air Plan](#) and [Climate 2050](#) webpages. Member jurisdictions and other organizations are welcome to promote these feedback options. The feedback window for online input on Buildings, Transportation and Industry has been extended to September 30, and the questionnaires for Agriculture, Nature & Ecosystems and Waste will be open until the end of 2020.

Staff have attended the Maple Ridge Agriculture Advisory Committee and the Surrey Agriculture and Food Policy Advisory Committee to discuss the Agriculture Discussion Paper. Staff have also attended the Richmond Advisory Committee on the Environment, the District of North Vancouver City Council, and the City of North Vancouver Climate and Environment Advisory Task Force, to discuss all published discussion papers. Staff also presented to the Greater Vancouver Urban Freight Council on the Transportation Discussion Paper, as well as to the Regional Planning Advisory Committee and climate protection and liquid waste sub-committees of the Regional Engineers Advisory Committee.

In the fall, staff intend to host a public and stakeholder webinar series, and a workshop for other orders of government with a focus on Buildings, Industry and Transportation. Additional discussion papers under development include Energy, Infrastructure, and Land Use and Growth Management.

BUILDING ENERGY AND EMISSIONS

Electrification Options for Metro Vancouver's *Climate 2050 Buildings Roadmap*

Metro Vancouver staff are currently working on a project to ensure alignment between a province-wide zero carbon buildings plan called the *Building Electrification Roadmap*, and Metro Vancouver's *Climate 2050 Buildings Roadmap*. The *Building Electrification Roadmap* is funded by the Province of British Columbia, BC Hydro and the City of Vancouver, and guided by a Steering Committee of government and non-government members, including Metro Vancouver. The vision for the *Building Electrification Roadmap* focuses on transitioning to clean, low-carbon energy in buildings, very similar to that of the *Climate 2050 Buildings Roadmap*.

Through this work, the lead consultant for the *Building Electrification Roadmap*, Integral Group, has assessed the technical feasibility and key barriers to electrification for major building sectors. Metro Vancouver staff and the *Building Electrification Roadmap* Steering Committee have recognized that it will be advantageous for these two roadmaps to identify and align corresponding strategies, actions and key responsibilities where possible. To this end, Metro Vancouver has retained Integral Group to extrapolate the findings of the *Building Electrification Roadmap* into a scope and scale that can be directly applied to the *Climate 2050 Building Roadmap's* regional lens. Due to the concurrent development of the roadmaps, it is expected that this work will support further alignment of climate actions and strategies undertaken by a number of government and non-government organizations in the BC buildings sector. This project has an expected completion date of November 2020.

Building Energy and Emissions Benchmarking and Performance Requirements: Program Concept

Metro Vancouver and the City of Surrey are partnering on a project to advance energy and emissions benchmarking and performance requirements in the region. The project is being administered by Metro Vancouver and has funding support from Surrey and BC Hydro. The success of benchmarking programs in other jurisdictions made this a “Big Idea” in the *Climate 2050 Buildings Discussion Paper*.

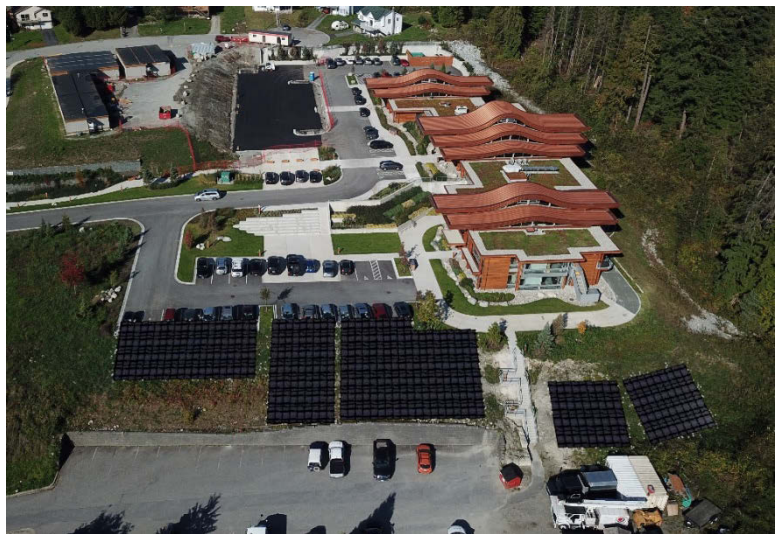
To support both Metro Vancouver and Surrey in the development of programs for new and existing buildings, this project has two main objectives:

- Develop a detailed concept for a regionally coordinated benchmarking performance requirement and program for existing buildings in the Metro Vancouver region.
- Design a program, materials and a resourcing estimate to benchmark new buildings in the City of Surrey that may serve as a model for other local governments.

This project was initiated in June 2020, recognizing the need to continue to undertake climate actions while developing the *Climate 2050 Buildings Roadmap*. Staff intend to bring the findings of this work to the Climate Action Committee early in 2021, outlining program elements that could form a regional energy benchmarking and emissions performance program for large buildings in the region.

Tsleil-Waututh Nation's Solar Power Initiative

The Tsleil-Waututh Nation (TWN) recognizes that climate change is a threat, and has developed a Climate Change Resiliency Plan as well as green energy initiatives that reduce community emissions and demonstrate TWN's values of environmental stewardship and economic sustainability. A new solar project is under construction that will power the TWN administration building in North Vancouver, helping it become a net-zero energy building. The TWN solar project builds on previous experience: in 2014, TWN completed its first solar project to power 90% of the community daycare. This will be the largest solar project to date on the North Shore, and is the largest ground-mounted solar project in the Lower Mainland. It will consist of 5 solar arrays on the south-facing slope beside the Administration building, and will be integrated into the surrounding environment with landscape materials and natural planting.



The total cost of the project is \$600,000 and is one-third funded by Northern Growth Foundation, Fraser Basin Council, and the New Relationship Trust (an Indigenous Capital Organization). The remaining two-thirds of the funding is provided by the TWN, and the project is estimated to yield approximately \$30,000 in community savings per year. This project was designed and built to serve seven generations and educate the future generation about the importance of reducing the Nation's carbon footprint.

AIR QUALITY UPDATES

Summer 2020 Air Quality Advisories

The summers of 2015, 2017 and 2018 have been eventful in terms of air quality advisories due to impacts from wildfires outside of the region. Staff have been working with partner agencies including health authorities to refine air quality advisory procedures and ensure the timely provision of air quality data to the public.

COVID-19 has been a further issue during the summer of 2020, with information from the BC Centre for Disease Control that degraded air quality can increase the susceptibility of the public to COVID-19, as well as the severity of the infection.

At time of writing of this report, the following air quality advisories have been issued in 2020:

- July 30: ground-level ozone advisory related to summer heat wave
 - Temperatures in the Fraser Valley reached the mid-30s, with persistent stable conditions over the previous week, leading to a build up of precursors to ground level-ozone formation. Ground level-ozone concentrations exceeded Metro Vancouver's 1-hour ozone objective (82 ppb) at three stations (Mission, Chilliwack and Abbotsford Airport) while the 8-hour threshold (62 ppb) was exceeded at Mission and Chilliwack. The advisory was cancelled on July 31 with a return to cooler temperatures.
- August 16: ground-level ozone advisory related to summer heat wave
 - The elevated ozone was attributed to precursor emissions and very hot and sunny weather, with temperatures again reaching the mid-30s. One station (Pitt Meadows) exceeded the 1-hour air quality objective for ozone, and one station (Coquitlam) exceeded the 8-hour objective. The advisory was cancelled on August 17 with a return to cooler temperatures.
- September 8: wildfire smoke advisory
 - A ridge of high pressure led to conditions that were very favourable for aggressive fire growth and new fire starts over the Labour Day long weekend. On September 7, eastern Washington State saw a significant number of new fires begin and grow, and during the evening, smoke began moving westward as outflow winds picked up. On September 8, Metro Vancouver was impacted by the accumulation of wildfire activity in Washington State, Oregon, and California, with smoke initially remaining aloft but beginning to impact at ground level by mid-day, resulting in the issuance of an advisory. Fine particulate (PM_{2.5}) concentrations exceeded Metro Vancouver's 24-hour objective at thirteen stations by September 9, with wildfire smoke having reached most areas throughout Metro Vancouver and the Fraser Valley. Ground-level ozone was added to the advisory on September 9 due to hot sunny weather and the expected increase in ozone production due to precursors in wildfire smoke. On September 10 ground-level ozone was removed from the advisory since slightly cooler temperatures were forecast and wildfire smoke had diminished in the region. At time of writing, the fine particulate matter advisory remains in effect with wildfire smoke models showing the potential for wildfire smoke to again impact the region at ground-level as well as being at higher elevations. Wildfires in Washington State, Oregon and California remain very active and satellite images show dense smoke located just south of the border and off the coast of Washington.

Air Quality Monitoring on Musqueam Reserve Lands in Vancouver

Metro Vancouver's mobile air monitoring unit (MAMU) is continuing to monitor air quality on Musqueam's Indian Reserve No. 2 lands in Vancouver. In cooperation with Musqueam's public works department, MAMU has been located at the Musqueam Cultural Pavilion, near the shore of the north arm of the Fraser River since March 17, 2020. Monitoring was interrupted for three days from July 27 to July 30 in order to move MAMU for a required commercial vehicle inspection and routine service. Monitoring by MAMU is scheduled to continue until the end of the year.

The monitoring provides information on air quality in the Musqueam community, and supports Metro Vancouver's Iona Island Wastewater Treatment Plant Biosolids Dewatering Facility project. In February 2020, Metro Vancouver began construction of the new Biosolids Dewatering Facility within the existing Iona Island Wastewater Plant in the City of Richmond, which will be used to dewater the ongoing production of biosolids. As part of a larger environmental monitoring program, data collected by MAMU will be used to track air quality during construction, determine a baseline for future impacts of the project, and compare air quality at Musqueam with nearby monitoring stations and other parts of the region.

Early in 2021 the collected data will go through a validation process to produce a final dataset and a data summary will be prepared to compare the measurements against Metro Vancouver's established ambient air quality objectives. A full report will also be prepared, which will include a comparison to other stations operated in the regional air quality monitoring network.

BC Lung Association *State of the Air 2020* Report

In July 2020, the BC Lung Association released the *State of the Air 2020* report for British Columbia (see Reference). The BC Lung Association report is similar in scope and complementary to Metro Vancouver's annual *Caring for the Air* report, which was received by the Climate Action Committee at its June meeting. While the *Caring for the Air* report focuses on the Lower Fraser Valley airshed, the BC Lung report provides information for the province as a whole. This year's edition focusses on a number of issues related to air quality and health, and includes articles on air quality data, air pollution and COVID-19, cannabis production and use, and highlights from this year's BC Lung Association Air Quality and Health Workshop, "Environmental Justice of Air Quality in the Era of Citizen Science", as well as updates from partner agencies on recent air quality and health actions underway in BC.

A data snapshot of BC's air quality levels in 2019 confirms that for Metro Vancouver, air quality at all Metro Vancouver stations was within BC air quality objectives for fine particulate matter, ozone, nitrogen dioxide, and sulphur dioxide, and that most air contaminant levels have been improving over the last decade.

Reference

British Columbia Lung Association, [State of the Air Report 2020](#) and [Technical Appendix](#)

Attachment

Climate Action Committee 2020 Work Plan

Climate Action Committee 2020 Work Plan

Report Date: September 10, 2020

Priorities

1 st Quarter	Status
Climate 2050 and Clean Air Plan Discussion Papers: Nature and Ecosystems, Agriculture, and Waste	Complete
Air Quality – proposed bylaw for residential wood burning	Complete
SIF (Sustainability Innovation Fund) – 2020 proposals	Complete
SIF – results of Air Aware citizen science air quality monitoring	In progress
SIF – results of electric vehicle fast charger demonstration at Metro Tower III	In progress
Ecological Health – invasive species – outreach materials	Complete
Participate in environmental assessment processes as required	Complete
2 nd Quarter	
Climate 2050 – electric vehicle programs review and recommendations	In progress
Climate 2050 - managing Metro Vancouver's corporate energy and GHG emissions	Complete
Air Quality – 9 th annual Caring for the Air report	Complete
Air Quality – second phase of consultation on proposals for managing cannabis production emissions	In progress
SIF – status report on previously approved liquid waste projects	Complete
SIF – results of the Strata Energy Advisor pilot program and proposals for moving forward	In progress
SIF – design for public display of air quality monitoring data and outreach strategy	In progress
Ecological Health Framework – annual report	Complete
Ecological Health – invasive species – best management practices	Complete
Participate in environmental assessment processes as required	Complete
3 rd Quarter	
Climate 2050 Annual report – Metro Vancouver's climate actions and carbon neutral progress	In progress
Climate 2050 and Clean Air Plan – Phase I engagement results	In progress
Climate 2050 and Clean Air Plan – modelling to support a carbon neutral region	In progress
Air Quality - monitoring network review and upgrades	In progress
Air Quality - initiate consultation on expansion of Non-Road Diesel Engine bylaw	Complete
Air Quality - initiate consultation on review of air quality regulatory fees	Complete
Air Quality - outreach on reducing residential wood-burning emissions	In progress
Air Quality – second phase of consultation on open-air burning bylaw	In progress
SIF – status report on previously approved regional district projects	Complete
SIF – status report on previously approved water projects	In progress
Participate in environmental assessment processes as required	In progress
4 th Quarter	
Climate 2050 Roadmaps – Buildings, Industry, and Transportation	In progress
Climate 2050 – regional building emissions benchmarking program	In progress
Metro Vancouver's Draft Clean Air Plan	Pending

Air Quality - initiate consultation on regulatory measures to meet ambient air quality objectives for nitrogen dioxide	Pending
SIF – Metro Vancouver’s Sustainable Infrastructure and Buildings Policy Design Guide	In progress
Annual budget and 5 year financial plan	In progress
Ecological Health – regional ecosystem connectivity	Pending
Participate in environmental assessment processes as required	Pending

July 10, 2020

Jerry Dobrovolny,
CAO and Commissioner
Metro Vancouver Regional District
2075 Kingsway
Vancouver, BC V5N 2T2

Sent via e-mail: Jerry.Dobrovolny@metrovancouver.org

Dear Mr. Dobrovolny,

On June 25, the Mayors' Council received a report titled "GHG emissions and Ride-Hailing" and endorsed the recommendations within that report.

One of those recommendations was that the Mayors' Council on Regional Transportation:
Forward a copy of this report to Metro Vancouver's Climate Action Committee for consideration of a parallel process through Metro Vancouver's Board of Directors.

The report is attached for consideration by the Climate Action Committee.

Please direct any questions regarding this report to Eve Hou, Manager Policy Development, at eve.hou@translink.ca.

Sincerely,



Mike Buda
Executive Director

c. Neal Carley, M.A.Sc., P.Eng, General Manager, Parks & Environment

Attached: Report to Mayors' Council, "GHG emissions and Ride-Hailing", June 25, 2020

Report to Mayors' Council, "GHG emissions and Ride-Hailing", June 25, 2020

TO: Mayors' Council on Regional Transportation

FROM: Geoff Cross, Vice President, Planning and Policy

DATE: June 18, 2020

SUBJECT: **ITEM 5.3 – Greenhouse Gas Requirements on Ride-Hailing Vehicles**

RECOMMENDATIONS:

That the Mayors' Council on Regional Transportation:

1. Write a letter to the BC Minister of Transportation and Infrastructure requesting that:
 - a. The regulations governing Transportation Network Services (TNS) be amended to establish greenhouse gas requirements on TNS operators and that these requirements include:
 - i. A future-year emissions reduction and/or zero-emissions target, with interim targets;
 - ii. A requirement that each TNS operator submit an emissions reduction plan outlining the measures to be taken to achieve the targets established;
 - iii. A requirement to report, at regular intervals, progress towards achieving the established targets.
 - b. Consideration be given for equivalent requirements for the taxi industry; and
 - c. A copy of the letter be sent to the BC Ministry of Energy and Mines in order to encourage creation of new funding programs specifically aimed at supporting shared-use vehicles and gig-economy commercial vehicles to transition to clean energy vehicles.
 2. Encourage all municipal councils to support Motion B9 "BC Clean Kilometre Act for Ride Hailing fleets" at the Union of B.C. Municipalities Convention in September.
 3. Forward a copy of this report to Metro Vancouver's Climate Action Committee for consideration of a parallel process through Metro Vancouver's Board of Directors.
 4. Receive this report.
-

PURPOSE:

To advise the Mayors' Council on Provincial regulations on ride-hailing with respect to greenhouse gas (GHG) emissions, to identify concerns with the provincial regulations, to highlight best practices from other jurisdictions and to seek endorsement on an approach to request the Province to establish GHG emissions requirements on ride-hailing operators.

BACKGROUND:

On July 8, the Province of BC announced new regulations that apply to Transportation Network Services (TNS). These regulations set out the operating requirements for TNS companies and drivers. On August 19, policies were established by the Passenger Transportation Board (PTB) to address boundaries, fares, vehicle caps and data requirements.

Absent from Provincial requirements or PTB policy on TNS companies was any consideration of greenhouse gas emissions reporting or reductions. The only related requirement is that the maximum age of vehicles operating on TNS platforms be 10 years + 1 month.

DISCUSSION:

Challenge

Ride-hailing has potential to contribute to an incremental increase in regional greenhouse gas emissions.

Provincial regulations have raised several concerns among local government, namely, potential for significant GHG emissions contribution from the TNS sector, lack of alignment with local, regional and provincial climate change objectives and inconsistency with vehicle requirements on the taxi industry.

Ride-hailing, by its very nature, creates vehicle-kilometers-travelled (VKT)¹. The ride-hailing industry argues that ride-hailing provides a new mode for trips which are difficult to satisfy without the use of a personal automobile, thus providing an option for making those trips while remaining a car-free household. The net effect, particularly in the long run, is difficult to ascertain; however, recent studies are pointing to a net increase in VKT and associated greenhouse gas emissions².

The scale of these effects in this region is unknown as TNS operations only launched at the beginning of 2020 and have since experienced a downturn due to the pandemic and associated lockdown. However, observations of ride-hailing activity in neighboring Seattle during pre-COVID-19 times may give an indication of potential impact of ride-hailing in this region. In 2018, ride-hailing in Seattle:

- Created 31 million trips
- Resulted in 260 million kilometres of driving
- Consumed 23.4 million litres of gasoline³
- Emitted 56,000 tonnes of GHGs per year, plus associated smog-forming pollutants

These total emissions only include vehicle emissions while in active service – deadheading (driving empty to get to the next fare) is not included in this estimate. A number of studies⁴ have found that TNS services in the U.S. put 2.8 new TNS vehicle miles on the road for each mile of personal driving

¹ Unlike carpooling or ride-sharing, where drivers pick-up passengers along a route they would have already taken, hence resulting in no net increase to VKT, ride-hailing works like a taxi service, where trips are made upon request.

² See https://www.sfcta.org/sites/default/files/2019-02/TNCs_Today_112917_0.pdf and San Francisco County Transportation Authority, TNCs Today: A Profile of San Francisco Transportation Network Company Activity (San Francisco County Transportation Authority, 2017).

³ This is calculated based on an average fuel economy of 9.2L/100 km.

⁴ Two recent studies that quantify deadheading include: <https://www.nber.org/papers/w22083.pdf> and <http://www.schallerconsult.com/rideservices/emptyseats.pdf>

removed, for an overall 180 percent increase in driving on city streets⁵. In other words, deadheading would almost triple the estimated GHG emissions from this sector.

Additionally, TNS vehicles drive significant more than privately-owned automobiles. One study found that a full-time TNS vehicle drove almost five times further on a daily basis, thereby emitting five times more GHG emissions, than privately owned vehicles⁶. The emissions impact of a highly emitting TNS vehicle is therefore compounded by this extensive driving.

Inconsistent regulations on taxi industry:

While TNS operators have no requirements in terms of their carbon footprint, taxis in this region have faced fuel economy requirements since 2007⁷. Specifically, any requested additional taxi licenses issued in the Metro Vancouver or Capital Regional District needed to meet eco-friendly taxi requirements. The definition of eco-friendly taxis was set by the Passenger Transportation Board in 2007, and required that vehicles meet a combined fuel consumption rating of:

- Max 6.9 litres/100 km; or
- Max 8 litres/100 km for special purpose vehicles (SUV) or full-size vehicles; or
Max 10.1 litres/100 km for van or minivan.

Inconsistent regulations between taxis and TNS sectors is a concern that has been repeatedly raised by municipalities in this region.

Regulatory Authority Over Ride-Hailing in BC:

In BC, ride-hailing regulations largely rest in Provincial hands. The Province is responsible for establishing TNS vehicle and driver requirements, such as the vehicle age limit and requirements for regular inspection.

Municipalities in BC retain the authority to regulate ride-hailing primarily through business licensing and street and traffic management, such as curb access bylaws. In the Metro Vancouver region, an inter-municipal business license (IMBL) is in place, which provides TNS operators with a single business license to access all participating municipalities within Metro Vancouver, Fraser Valley and Squamish-Lillooet Regional Districts. Municipalities are unable to prohibit or control the number of TNS vehicles in operation in their jurisdiction.

Although local governments could explore mandatory GHG requirements on TNS operators as a condition of a permanent IMBL in this region, concerns have been raised that this could be interpreted as a violation of Provincial regulations. The Province is best positioned to establish GHG requirements on TNS operators.

⁵ Schaller, Bruce, July 2018, "The New Automobility: Lyft, Uber and the Future of American Cities", <http://www.schallerconsult.com/rideservices/automobility.pdf>

⁶ Alan, Jenn, "Emissions Benefits of Electric Vehicles in Uber and Lyft Services", August 1, 2019, <https://escholarship.org/uc/item/15s1h1kn>

⁷ Accessible vehicles were excluded from this requirement.

Policy Basis for Action - Climate change is a priority to all levels of government in this region.

In July 2019, the Metro Vancouver Board adopted a target to reduce net GHG emissions across the region to zero by 2050. This aligns with the goals of many of the region's municipalities, including those who have declared climate emergencies⁸.

The Province of BC has also prioritized climate change by setting its own target of 80% below 2007 levels by 2050 and has actively been working to reduce emissions from all sectors, including transportation. Recently, the Province passed legislation that all new vehicles sold in BC beginning in 2040 shall be zero emissions.

In 2018, TransLink's Board of Directors and the Mayors' Council adopted climate targets to support local and regional goals:

- 1) Reducing TransLink's GHG emissions by 80 per cent by 2050,
- 2) Utilizing only renewable energy sources by 2050.

Significant efforts are currently being made in this region by local government and TransLink to undertake initiatives to achieve these climate targets. **The absence of a GHG emissions reduction framework in the Provincial regulations on TNS operations will work against these local and regional efforts.**

Options for Mitigating GHG Emissions from TNS Sector

With the goal of GHG reduction from the TNS sector, two broad option categories may be explored:

- A) **Incentives Only (Status Quo):** Provide incentives in the form of discounts for business licenses or curb access fees for zero emission vehicles (ZEV). This option is the current status quo. The Region 1 Inter-municipal Business License (IMBL) provides a significant discount for licensing zero emission vehicles (\$30 per vehicle per year, versus \$150 for conventional). City of Vancouver's street and traffic bylaws also provide incentives for ZEV TNS vehicles in terms of a 50% discounted pick-up and drop-off fee.
- B) **Regulatory Requirements:** Establish mandatory requirements related to reducing GHG emissions from TNS operators. There are several options which could be explored in a regulatory requirement, including:
 - a. Meeting a fleet fuel economy target;
 - b. Meeting a fleet ZEV proportion target⁹;

⁸ The cities of Vancouver, Richmond, New Westminster, Port Moody, West Vancouver, District of North Vancouver, Burnaby, and Township of Langley have all declared climate emergencies.

⁹ Recent pilot projects in Austin, Seattle and Atlanta are demonstrating that today's electric vehicles can meet ride-hailing drivers' operational needs, while providing better financial return and supporting local climate goals. These pilot projects involve renting TNS drivers Chevrolet Bolts (20 in Austin, 50 in each of Seattle and Atlanta) with unlimited kilometres and free charging. The pilots found that 90% of the time, the ZEV met daily driving needs and that compared with drivers who rented gasoline vehicles, the Bolt drivers leased their cars for twice as long (indicating that they liked the experience of these vehicles) and earned a higher net income.

- c. Meeting a GHG reduction target allowing for compliance flexibility (which can include technological options and reduced deadheading / increased use of shared modes); and
- d. Tracking, reporting and planning requirements.

Assessment of Options

Incentives have a number of advantages, but perhaps most key is that they are much easier for local government to implement within the regulatory framework of business licenses and street and traffic management fees. The key drawback of incentives, however, is a lack of guaranteed uptake and, hence, actual GHG reductions. Additionally, the impact of a discount is limited by size of the fee to begin with.

The key advantage of regulatory requirements is increased certainty of results, which is critical to meet regional and local climate targets. The key challenge associated with regulation for this industry is that ride-hailing operators do not own the vehicles operating on their platform and therefore have less ability to impact fleet composition. However, regulations designed with compliance flexibility and adequate compliance time can prompt industry to find creative solutions to meet targets, which will likely involve pilot projects, infrastructure deployment, and innovative measures to reduce deadheading and increase sharing. Such an approach has been adopted in California, which set precedent as the first jurisdiction in North America to adopt comprehensive regulatory requirements for GHG emissions reductions from the ride-hailing industry (see Appendix A).

Recommendation

Staff recommend that a holistic approach be taken in this region to ensure that ride-hailing supports local and regional climate goals. A holistic approach includes both voluntary measures (such as monetary incentives and pilot projects) and mandatory requirements (such as targets, plans, and reporting). The combination of approaches is most effective at ensuring climate goals while minimizing the impact on the ride-hailing industry. Currently, a mandatory requirement is lacking.

Conclusion

Based on trends from other parts of the world, ride-hailing is poised to have a steadily increasing impact on VKT and transportation emissions in this region, as the economy reopens in stages during and after the pandemic. In order to meet local, regional, and Provincial climate targets, a holistic approach should be taken to reduce GHG emissions from this sector, which includes both voluntary (incentive-based) and mandatory measures. Currently, no mandatory measures exist to require TNS operators to reduce their carbon footprint. The Province is best positioned to establish GHG requirements for this industry.

Management recommends that the Mayors' Council advocate to the Province to establish mandatory GHG requirements in support of local, regional, and Provincial climate targets including:

- sending a letter from the Chair of the Mayors' Council directly to the Minister of Transportation,
- encouraging each individual municipality within the region to support motion B9 at the Union of B.C. Municipalities Convention in September.

Motion B9, submitted by the City of Vancouver, advocates to the province to design and implement a BC Clean Kilometre Act for Ride Hailing fleets that supports the targets set in Clean BC and the Intergovernmental Panel on Climate Change (IPCC) report and requires ride hailing fleets to reduce their emissions accordingly, and that this be developed in consultation with industry and local government.

Management further recommends that this report be forwarded by the Mayors' Council to Metro Vancouver's Climate Action Committee for consideration of similar advocacy work through Metro Vancouver's Board of Directors.

APPENDIX A: California's Clean Miles Standard for Ride-Hailing

In September 2018, California passed Senate Bill 1014 which establishes a "Clean Miles Standard" for ride-hailing. It requires that:

- By January 1, 2020 the **California Air Resources Board (CARB) established a baseline** for GHG emissions from vehicles that drive on TNS platforms on a per-passenger-mile basis.
- By January 1, 2021 **CARB must adopt annual GHG reduction targets**. These targets must include annual goals for increasing the passenger-miles traveled using zero-emission vehicles.
- By January 1, 2022 and bi-annually thereafter, **each TNS develop a GHG emissions reduction plan** that includes increasing the proportion of drivers using ZEVs on their platform.

The California standards represents best practice in North America for regulating GHG emissions from TNS operators. The regulation will address vehicle fuel economy and fuel type, as well as vehicle occupancy (pooling) and deadhead driving. Additionally, by establishing objectives-based targets further into the future and allowing for flexibility in compliance, this regulation enables individual TNS operators to determine their own compliance pathway, while ensuring GHG reduction goals are met.