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December 23, 2021

B.C. Sustainable Energy Association
c/o William J. Andrews, Barrister & Solicitor
70 Talbot Street
Guelph, ON
N1G 2E9

Attention: Mr. William J. Andrews

Dear Mr. Andrews:

Re: FortisBC Inc. (FBC)

**2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side
Management Plan (LT DSM Plan) (Application)**
**Response to the B.C. Sustainable Energy Association (BCSEA) Information
Request (IR) No. 1**

On August 4, 2021, FBC filed the Application referenced above. In accordance with the regulatory timetable established in British Columbia Utilities Commission Order G-314-21 for the review of the Application, FBC respectfully submits the attached response to BCSEA IR No. 1.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

FortisBC Inc. (FBC or the Company) 2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)	Submission Date: December 23, 2021
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1 **A. 2021 LTERP**

2 **1.0 Topic: CleanBC Roadmap to 2030**

3 **Reference: Exhibit B-1, page ES-1, pdf p.13**

4 FBC states that the LTERP is intended to meet the following objectives:

- 5 • “Ensure cost-effective, secure and reliable power for customers;
- 6 • Provide cost-effective demand side management and customer solutions that help
- 7 meet FBC’s and BC’s environmental goals, and
- 8 • Ensure consistency with provincial energy objectives (for example, the applicable
- 9 objectives in the CEA and the CleanBC Plan).” [page ES-1, pdf p.13, underlined
- 10 added]

11 In October 2021, the BC Government issued a CleanBC Roadmap to 2030:

12 [https://www2.gov.bc.ca/assets/gov/environment/climate-](https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_to_2030.pdf)

13 [change/action/cleanbc/cleanbc_roadmap_to_2030.pdf](https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_to_2030.pdf)

14 1.1 Has FBC reviewed the CleanBC Roadmap to 2030? Did FBC provide input to the

15 Government during the development of the Roadmap?

16

17 **Response:**

18 FBC confirms it has reviewed the CleanBC Roadmap to 2030 and did provide input to the

19 Government during the development of the Roadmap. FBC continues to engage with the

20 Provincial government on providing its perspective to inform the development of policies as

21 outlined in the Roadmap.

22

23

24

25 1.2 Does FBC consider that the CleanBC Roadmap to 2030 provides policy guidance

26 applicable to FBC and in particular FBC’s LTERP?

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28 **Response:**

29 FBC considers the policy guidance in the CleanBC Roadmap to 2030 to be applicable to FBC

30 and its LTERP. Please refer to the response to MoveUP IR1 1.1 for additional discussion.

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1.3 In FBC's view, does the CleanBC Roadmap to 2030 provide policy support for FBC's preference for "clean" electricity as a supply resource in the LTERP?

Response:

Please refer to the response to MoveUP IR1 1.3.

1.4 How will FBC be affected by the 100% Clean Electricity Standard in the CleanBC Roadmap to 2030?

Response:

Please refer to the response to MoveUP IR1 1.3.

1.5 In FBC's view, are there elements of the CleanBC Roadmap to 2030 that present a problem for elements of FBC's 2021 LTERP? If so, please explain.

Response:

FBC does not believe there are elements of the Roadmap that present a problem for elements of FBC's 2021 LTERP. The assumptions and results presented in the LTERP are generally aligned with the Roadmap. Please also refer to the response to MoveUP IR1 1.1.

1.6 Please file a copy of the BC Government's CleanBC Roadmap to 2030.

Response:

Please refer to Attachment 1.6 for a copy of the BC Government's CleanBC Roadmap to 2030.

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1 **2.0 Topic: No Supply-Side Resources Before 2030**

2 **Reference: Exhibit B-1, Executive Summary, page ES-1, pdf p.13**

3 FBC states that “The analysis in this LTERP shows that FBC does not require any new
4 supply-side resources until at least 2030, based on the Reference Case load forecast,
5 existing resources and contracts in place, continued access to reliable and cost-effective
6 market energy, and the proposed level of DSM.” [page ES-1, pdf p.13, underline added]

7 2.1 Please confirm, or otherwise explain, that FBC is not at this time seeking BCUC
8 approval of a new SCGT gas plant, regardless of whether such a plant would use
9 RNG or conventional natural gas.

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11 **Response:**

12 Confirmed.

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16 FBC also confirms that “Any requests for approval of specific resource needs that are
17 identified within this plan will be further evaluated and brought forward through a separate
18 application to the BCUC if warranted in the future.” [page ES-1, pdf p.13]

19 2.2 Please briefly describe the regulatory options that FBC could exercise if for some
20 reason it does require new supply-side resources before 2030.

21
22 **Response:**

23 As discussed in Section 13.2, new generation resources or power supply contracts may be
24 required sooner than is contemplated in the LTERP based on the Reference Case load forecast.
25 If FBC’s periodic assessment of the load-resource balance indicates the need for new resources
26 sooner than contemplated in this LTERP, or if FBC’s access to market energy changes such that
27 it is no longer reliable or cost effective, FBC would likely submit an LTERP or supplemental update
28 filing sooner than five years from the submission of this LTERP, and/or an application to the
29 BCUC, such as a CPCN, requesting approval for the new required resource(s). FBC will explore
30 the potential resource options and needs identified in the LTERP in more detail, likely starting in
31 2022, due to the long-lead time to develop resources.

32

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1 **3.0 Topic: Transition to clean market purchases**

2 **Reference:** **Exhibit B-1, page ES-14, pdf p.26; page 80, pdf p.110; page 170, pdf**
3 **p.200; page 182, pdf p.212; page 216, pdf p.246**

4 FBC has applied a clean market adder to the cost of its market purchases for the analysis
5 in the 2021 LTERP. Market energy purchases have an associated carbon footprint, and
6 the Mid-C market price forecast is based on current and expected supply in the Pacific
7 Northwest, which includes coal and gas resources. FBC has used a clean market adder,
8 based on a forecast from IHS Markit, to represent the cost of purchasing only clean market
9 power. [page 80, pdf p.110]

10 LTERP Action Item 8 is a “transition to clean market purchases.” FBC states:

11 “... FBC has assumed for the purposes of this LTERP that future market energy
12 purchases are sourced from clean or renewable generation and, as such, has
13 applied a clean market adder to the cost of its market purchases. FBC intends to
14 pursue this option with Powerex, its current market supplier per the CEPSCA
15 [Capacity and Energy Purchase and Sale Agreement between FBC and Powerex],
16 and plans to provide an update on its status in a future FBC Annual Electric
17 Contracting Plan filing.” [pdf p.246, underline added]

18 3.1 Is FBC confident that clean electricity will be available for FBC to purchase from
19 the market going forward?

20
21 **Response:**

22 FBC is confident that clean electricity will be available for FBC to purchase from the market going
23 forward. In developing the clean market adder proxy, FBC had discussions with Northwest Power
24 and Conservation Council (NPCC) and IHS Market (IHS), as well as reviewed other utilities’ IRPs,
25 and understood that as utilities in the Pacific Northwest build additional renewable generation,
26 there could be an oversupply of RECs (renewable energy credits) in the future (as discussed in
27 Section 2.5.7). Additionally, FBC has held exploratory talks with Powerex on purchasing clean
28 market electricity, which is further solidified through Powerex adopting their Clean Energy Trade
29 Standard as of January 1, 2021.

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33 3.2 When does FBC expect to begin to purchase clean electricity from the market?

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35 **Response:**

36 FBC expects that it can begin to purchase clean electricity from the market within a year. However,
37 the exact timing will depend on the length and outcome of the contract negotiation process with
38 the market supplier and it is possible that it could take longer.

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3.3 For FBC to implement clean market purchases is BCUC acceptance of the 2021 LTERP sufficient, or is additional approval required?

Response:

For FBC to implement clean market purchases, FBC considers that BCUC acceptance of this action item in its decision on the 2021 LTERP is sufficient for FBC to negotiate an agreement for clean market purchases that would then be subject to BCUC approval.

3.4 Will FBC report on the status of its transition to clean market purchases in its Annual Reviews under the Multiyear Rates Plan?

Response:

FBC intends to report on its clean market purchases, if approved, through an update of its Annual Electric Contracting Plan filing. However, FBC has no objection to also providing a summary update as part of its Annual Reviews or other process if so directed by the BCUC as a result of the current process.

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1 **4.0 Topic: Shifting EV Charging Load**

2 **Reference: Exhibit B-1, Executive Summary, page ES-1, pdf p.13; Table 2-1:**
3 **Strategies for mitigating EV peak demand impacts, page 42, pdf**
4 **p.72; Section 13 Action Plan, page 215, pdf p.245**

5 Both the 2021 LTERP and the 2021 Long-Term DSM Plan emphasize the importance of
6 shifting the timing of EV charging away from times of peak demand (often abbreviated to
7 “shifting EV charging”).

8 LTERP Action Item 4 is to implement a program to help shift home EV charging. [pdf
9 p.245] EV adoption is expected to continue within the FBC service area. Without
10 mitigation, EV charging could significantly increase peak demand on the system. This
11 would accelerate the need for additional capacity generation resources and/or
12 transmission and distribution infrastructure, which would increase rates for customers.

13 Throughout the 2021 LTERP, FBC has analysed potential initiatives to shift home EV
14 charging from peak demand periods. FBC says that such initiatives, depending on their
15 success, could delay the need for additional generation resources to meet peak capacity
16 beyond 2030.

17 As indicated in Table 2-1, FBC has examined rate-based, hardware-based, and software-
18 based approaches to mitigating EV peak demand impacts. FBC intends to pursue the
19 software-based approach. However, if a pilot program is unsuccessful, FBC says it may
20 consider the other options in Table 2-1 to meet the objective of shifting EV charging from
21 peak demand periods. [page 43, pdf p.73]

22 FBC’s 2021 Long-Term DSM Plan notes that FBC’s 2019-2022 DSM Expenditure Plan
23 includes funding to conduct Demand-Response (DR) pilot projects to test the opportunity,
24 and customer willingness, to undertake load shifting, including home EV charging, during
25 peak demand periods. FBC says “The results are expected to inform a business case for
26 an ongoing DSM program to scale up DR capacity over time, the benefits of which may
27 include deferral of T&D infrastructure upgrades and power supply operational flexibility.”
28 [Exhibit B-1, Volume 2, page 26, pdf p.780]

29 4.1 If the BCUC accepts the 2021 LTERP and the 2021 Long-Term DSM Plan, does
30 FBC require any additional approvals at this time to implement a program to help
31 shift home EV charging?

33 **Response:**

34 FBC confirms that, should it propose to implement a demand response program related to shifting
35 home EV charging, it would be required to seek approval from the BCUC for the program in the
36 next DSM Plan. FBC expects to submit its next DSM Plan in 2022 for the period 2023 to 2027.

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4.2 Is FBC's approved 2019-2022 DSM Expenditure Plan sufficient to support a full (as distinct from pilot) program to shift home EV charging? If not, what steps would FBC take?

Response:

FBC's approved 2019-2022 DSM Plan enables FBC to implement demand response pilots, but does not include funding for FBC to implement a full program. To implement a full program, FBC would conduct the following activities:

1. Develop a business case for the full program based on results from the demand response pilot;
2. Include the business case inputs and cost-effective results in the next DSM Plan;
3. Receive BCUC approval for the full program as part of the next DSM Plan;
4. Expand the demand response pilots into a full program. Expansion may include:
 - a. Broadening the geographical area of potential participants;
 - b. Expanding the number of measures included in the program;
 - c. Expanding the marketing approach to encourage program participation; and
 - d. Changing the incentive structure to support more sustained program participation.

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1 **5.0 Topic: Preferred Portfolio**

2 **Reference: Exhibit B-1, Executive Summary, page ES-16, pdf p.28; Section 11**
3 **Portfolio Analysis**

4 Portfolio C3 is FBC's preferred portfolio for new generation resources for 2030 and
5 beyond. FBC says "The preferred portfolio ... includes a mix of PPA, market energy,
6 battery storage, gas plants using RNG fuel, solar, wind and run of river generation. [page
7 ES-16, pdf p.28]

8 FBC states:

9 "Portfolio C3 is the preferred portfolio under current market conditions as it best
10 meets the LTERP objectives in terms of balancing cost-effectiveness, reliability,
11 inclusion of cost-effective DSM and consideration of BC's energy objectives. This
12 portfolio is also aligned with the energy priorities as indicated by stakeholders,
13 Indigenous communities and customers through FBC's LTERP engagement
14 processes." [page ES-16, pdf p.28]

15 FBC also provides the following caveat:

16 "It is important to note that the portfolio analysis presented in this section provides
17 a high-level indication of how load-resource balance gaps may be filled in the
18 future. It is likely that before specific resource options are required, load forecasts,
19 load-resource balances and resource options and costs will change. Based on the
20 portfolio analysis results presented in this section, and assuming the reference
21 case load forecast, proposed DSM level and continued market access, FBC will
22 not require any new generation resources until at least 2030. ..." [page 174, pdf
23 p.204]

24 5.1 Assuming that the BCUC was to accepted the 2021 LTERP, please discuss what
25 it means that Portfolio C3 is the "preferred portfolio."

26 **Response:**

27 If the BCUC accepts FBC's 2021 LTERP including its recommended preferred portfolio, FBC
28 would further plan to implement the resources in this portfolio to meet customers' load
29 requirements, assuming the Reference Case load forecast, proposed DSM level and resource
30 options costs, and energy and capacity profiles remain as presented in the LTERP. For clarity,
31 the BCUC's acceptance of the LTERP does not imply approval for FBC to implement the
32 recommended portfolio. However, as some or all of these components will change over time, it is
33 more likely that the preferred portfolio is rather an indication of the types of resources FBC may
34 need to implement in the future. Updated information may mean that FBC later determines that
35 other new resources may be required. FBC expects that, when the time comes to commit to
36 acquiring new resources or supply contracts, it would then submit an application, such as a
37 request for a CPCN, to the BCUC for approval.
38

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1 **6.0 Topic: Contingency Resources Assessment**

2 **Reference:** **Exhibit B-1, Section 2.2.1 Climate Change, page 18, pdf p.48; Section**
3 **13 Action Plan, Item 3 Contingency resource(s) assessment, page**
4 **215, pdf p.245; Section 11 Portfolio Analysis, page 174, pdf p.204**

5 In the 2016 LTERP, Action Item 3 was to “Continue to assess the potential requirements
6 and timing for new resource options within B.C.” as part of FBC’s ongoing resource
7 planning activities. [page 140, pdf p.161]

8 In the Portfolio Analysis section of the 2021 LTERP, FBC says additional resource
9 analysis would be conducted if conditions arise in the future such that incremental
10 generation resources are required sooner than expected.

11 However, in Action Item 3 of the 2021 LTERP FBC indicates that in light of uncertainties
12 including climate change it does intend to explore resource options in the next few years
13 and might apply for funding above the MRP to do so.

14 In Action Item 3, FBC states:

15 “As part of the contingency planning discussed in Section 11, new generation
16 resources or power supply contracts may be required sooner than is contemplated
17 in this LTERP based on the Reference Case load forecast. Recent events like the
18 extreme heat and record loads for FBC in June 2021 (discussed in Section 2.2.1)
19 highlight the need for FBC’s resource portfolio to be flexible and adaptable to
20 unexpected changes in loads.

21 As part of a prudent approach to manage future system loads, FBC intends to
22 explore its potential resource options identified in this LTERP in more detail in the
23 next few years so that FBC is ready, if required, to bring forward an application for
24 a new resource to the BCUC for approval prior to the development of the next
25 LTERP.”

26 As part of this assessment, FBC may require funding for any costs above approved
27 capital and O&M budgets. FBC expects to review its financial forecast in its Annual
28 Review of rates and if necessary, file an updated forecast of expenditures to
29 account for any material changes to the forecast and to either ask for approval of
30 the changes or indicate that a separate supplemental filing for this work will be
31 required. [page 215, pdf p. 245, underline added]

32 6.1 Does Action Item 3 reflect an escalation of uncertainty about future load resource
33 balances compared to the 2016 LTERP?

35 **Response:**

36 This action item does not reflect an escalation of uncertainty about future load-resource balances
37 compared to the 2016 LTERP. It is intended to help ensure that FBC is prudently prepared.

<p style="text-align: center;">FortisBC Inc. (FBC or the Company) 2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)</p>	<p style="text-align: center;">Submission Date: December 23, 2021</p>
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Five years have elapsed since the 2016 LTERP and FBC's capacity requirement for new resources is closer now than it was. Therefore, FBC must begin the process of preparing to acquire new resources now as it may take some time to fully define the available resources such that a request for a CPCN could be filed. Waiting for the next LTERP to confirm the need could make it difficult, if not impossible, to acquire new resources before they are needed. Given that small changes in load could advance FBC's needs by several years, it is now time to begin this work.

6.2 Does Action Item 3 reflect heightened uncertainty about the Base Case load forecast?

Response:

FBC assumes this question is referring to the Reference Case load forecast, as presented in Section 3.

This action item does not reflect heightened uncertainty about the Reference Case load forecast. Please also refer to the response to BCSEA IR1 6.1.

6.3 Does Action Item 3 mean that FBC's resource portfolio is not sufficiently flexible and adaptable to unexpected changes in loads?

Response:

This action item does not mean that FBC's current resource portfolio is not sufficiently flexible and adaptable to unexpected changes in loads. Planning and operations should not be confused. FBC has significant flexibility to deal with unplanned loads or unit outages on an operational basis as confirmed by the PRM calculations.

As discussed in Section 11.3.9.1, FBC has several options for managing higher loads as part of its contingency planning (other than acquiring new resources) including:

- Increase market energy and capacity purchases;
- Increase PPA energy and capacity (if not already at its maximum);
- Implement EV peak shifting options discussed in Section 2.3.2; and
- Ramp up DSM to higher incentive levels.

Contingency plans to manage lower loads include the following:

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- 1 • Decrease market energy purchases; and
- 2 • Decrease PPA energy and capacity (if not already at its minimum).
- 3

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1 **7.0 Topic: EV Charging**

2 **Reference: Exhibit B-1, Executive Summary, page ES-3, pdf p.15; Section 2.3.2**
3 **Electric Vehicles**

4 FBC says it “is preparing to meet the changing and future needs of customers as they
5 relate to EVs and expects continued involvement in supporting transportation
6 electrification to help meet provincial GHG emission reduction targets.”

7 FBC gives four examples, the first of which is FBC’s installation and operation of a network
8 of public EV fast-charging stations across the FBC service territory (30 Level 3 DCFC
9 stations at 19 sites). [page 40, pdf p.70]

10 In the BCUC proceeding regarding FBC’s revised application for approval of rates for its
11 public EV fast charging service, FBC said that does not expect to deploy additional fast
12 charging sites or stations beyond those identified in the revised application. [FBC Rate
13 Design and Rates for EV DCFC Service, Exhibit B-5, p.10; Exhibit B-9, FBC Response to
14 BCSEA-VEVA IR 1.1, available at
15 <https://www.bcuc.com/OurWork/ViewProceeding?ApplicationId=611>]

16 7.1 Is FBC willing to consider future expansion of its network of public EV fast charging
17 stations and sites if there is an unmet demand from customers?
18

19 **Response:**

20 As noted in the response to BCSEA-VEVA IR1 13.2 from the referenced proceeding, FBC has
21 considered that it may have to expand the number of sites or stations in the future, but has no
22 plans to do so at this time. This is based, in part, on the reasons provided in the response to
23 BCUC IR1 8.5 in the same proceeding, including the expectation that growth in excess of FBC’s
24 forecast will be addressed by other service providers. FBC will continually review the
25 performance and use of its public charging infrastructure to ensure adequacy, including the
26 assessment of whether additional stations or sites are required to meet customer demand.

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30 FBC says it is also “developing a rate for commercial customers who wish to install fleet
31 or employee charging infrastructure for light-duty fleet and workplace vehicles.” FBC says
32 it intends to apply to the BCUC for approval of this new rate in the near future.

33 7.2 When does FBC expect to file this application?
34

35 **Response:**

36 FBC no longer intends to file for approval of a rate for commercial customers related to fleet or
37 employee-charging infrastructure as was contemplated when the LTERP was drafted. Rather,

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- 1 FBC intends to develop a program under the electrification provisions of Greenhouse Gas
- 2 Reduction (Clean Energy) Regulation (GGRR) that will assist in the acquisition, installation or use
- 3 of charging infrastructure. FBC intends to file an application for deferral account treatment for
- 4 costs related to incentive funding for light-duty fleet charging infrastructure in early 2022.

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1 **8.0 Topic: Small-Scale Distributed Generation**

2 **Reference:** **Exhibit B-1, section 2.3.4 Small-Scale Distributed Generation;**
3 **section 6.5.1 Distributed Generation, pdf p.162; section 10.7**
4 **Distributed Generation, pdf p.201; section 11.2 Long Run Marginal**
5 **Cost, page 178, lines 24-27, pdf p.208; section 12.3 Direct Customer**
6 **Surveys, page 207, lines 7-17, pdf p.237; Table 13-1: 2016 LTERP**
7 **Action Plan Status, 2016 Action Item 2, page 213, pdf p.243; 2021**
8 **LTERP Action Item 2, page 214, pdf p.244**

9 Action Item 2 in both the 2016 and 2021 LTERPs is: “2. Monitor potential load drivers to
10 determine if a particular load scenario is emerging.” And, both of the LTERPs state that
11 “FBC will continue to monitor the various load drivers and, in particular, the drivers that
12 may have the most impact on FBC’s loads in the next few years...” followed by examples.
13 [underline added]

14 In the 2016 LTERP, “rooftop solar PV” is identified as one of the drivers that may have the
15 most impact on FBC’s loads in the next few years (the others being EVs and fuel
16 switching). However, in the 2021 LTERP, the two particular drivers identified are “EV
17 growth or the addition of new large loads,” and “rooftop solar PV” is not mentioned.

18 8.1 Compared to the 2016 LTERP, does the 2021 LTERP downgrade “rooftop solar”
19 as a particular driver that may have the most impact on FBC’s loads in the next
20 few years? Please explain why or why not.

22 **Response:**

23 The 2021 LTERP continues to include rooftop solar as an important load driver for the future. The
24 2021 LTERP has included both residential and commercial rooftop solar, whereas the 2016
25 LTERP included only residential rooftop solar. FBC continues to monitor rooftop solar PV for its
26 potential impacts on the distribution system. However, as discussed in the 2021 LTERP, on a
27 relative basis, FBC expects that EV adoption and emerging new large loads, such as cannabis
28 production and data centre facilities, may be more impactful load drivers with much greater
29 potential to impact utility operations.

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33 8.2 Under the 2021 LTERP (per Action Item 2 or otherwise), Does FBC intend to
34 monitor rooftop PV and small-scale distributed generation for developments, such
35 as the number of participants in the Net Metering Program, the impact on energy
36 and peak load, the impact on distribution and transmission, and the potential for
37 small-scale distributed generation to become a system resource option?
38

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1 **Response:**

2 As discussed in Section 2.3.4, at this time, FBC is continuing to monitor developments in
3 distributed generation (DG), including energy storage, and will consider the role of distributed
4 energy resources in optimizing system benefits for customers in its future planning. FBC expects
5 that this will include monitoring the number of participants in the Net Metering Program, the impact
6 on energy and peak load, the impact on distribution and transmission, and the potential for small-
7 scale distributed generation to become a system resource option.

8 FBC notes in Section 6.5.1 that if DG uptake increases significantly in the future, FBC's
9 transmission and distribution planners will need to have the tools and knowledge for planning and
10 modeling a high-penetration of solar PV, alone or paired with batteries, or other DG technology
11 into the system. Alternative engineering designs, technology solutions, and new and updated
12 planning and operations practices that have been implemented in other jurisdictions may be
13 needed for the FBC transmission and distribution system of the future.

14

15

16

17 8.3 Please confirm, or otherwise explain, that under the 2021 LTERP FBC will continue
18 to support customer-owned distributed generation through its net metering tariff.

19

20 **Response:**

21 The Net Metering program is part of FBC's BCUC-approved tariff, and FBC has no plans to
22 discontinue the program.

23

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1 **9.0 Topic: Load Scenarios, Load Building**

2 **Reference: Exhibit B-1, section 13 Action Plan, page 214, pdf p.244; section 4**
3 **Load Scenarios, pdf p.126, et seq.; section 2.3.5 New Emerging**
4 **Large Loads, page 47, pdf p.77**

5 Action Item 2 in the 2021 LTERP Action Plan is to: “Monitor potential load drivers to
6 determine if a particular load scenario is emerging.”

7 In section 2.3.5, after discussing new emerging loads and Guidehouse’s recommendation
8 to consider load-building incentives, FBC concludes:

9 “FBC will continue to work with new customers in order to attract new loads and
10 more fully optimize its system, providing benefits to all customers.” [page 48, pdf
11 p.78]

12 9.1 Is it correct that the 2021 LTERP does not contemplate FBC initiating a new load-
13 building program over and above FBC’s ongoing work with new customers?
14 Please explain why or why not.

15
16 **Response:**

17 FBC confirms that the 2021 LTERP does not contemplate a new load-building program over and
18 above FBC’s ongoing work with new customers. Although FBC seeks ways to better support
19 customers, both new and existing, this is not seen as a new load-building program, but rather an
20 ongoing effort and strategy to attract and retain customers.

21

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1 **10.0 Topic: Load Resource Balance After DSM**

2 **Reference:** **Exhibit B-1, Figure 9-1: Energy Load-Resource Balance after DSM,**
3 **page 154, pdf p.184; Section 13.2 2021 LTERP Action Plan, page 214,**
4 **pdf p.244**

5 In the 2021 LTERP Action Plan, FBC states:

6
7 “The LRB [Load Resource Balance] presented in Section 9 of this LTERP indicates
8 that new supply-side resources other than market energy purchases are not
9 required until at least 2030 based on existing resources and committed contracts,
10 the Reference Case load forecast, current market energy conditions and the
11 proposed level of DSM.” [page 214, pdf p.244, underline added]

12 However, the text accompanying Figure 9-1 says the figure shows that “energy gaps start
13 in 2023.” [underline added]

14 10.1 Is the difference due to Figure 9-1 not showing market energy purchases?

15
16 **Response:**

17 Confirmed.

18

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1 **11.0 Topic: SCGT**

2 **Reference:** **Exhibit B-1, section 10.2.3 Environmental Attributes, page 164, pdf**
3 **p.194; Table 10-2: Supply-Side Resource Options Unit Cost**
4 **Summary, page 166, pdf p.196; page 168, pdf p.198; section 11.3.9.1**
5 **Contingency Plans, page 196, pdf p.226**

6 FBC states: “An SCGT plant using RNG as fuel is considered a clean resource as
7 biogas and biomass are considered clean or renewable per the CEA definition. [page 164,
8 pdf p.194]

9 11.1 Please elaborate on why FBC has confidence in this interpretation.

10

11 **Response:**

12 When organic waste like food scraps, cow manure or sewage decomposes, biogas is created
13 through a biological process such as anaerobic digestion. That raw biogas can be captured and
14 purified to create renewable natural gas (RNG). Biogas is identified as a clean and renewable
15 resource under the CEA, consequently RNG derived from biogas is equally considered to be
16 carbon neutral (i.e., with no reportable scope 1 GHG emissions). Therefore electricity energy
17 generated using RNG as a fuel source is also considered a clean resource.

18

19

20

21 FBC states that “The unit capacity costs for an SCGT gas plant using conventional natural
22 gas or using RNG as fuel are the same.” [page 168, pdf p.198]

23 11.2 Is this because, as FBC says with reference to Portfolio C2, “the impact of higher
24 RNG fuel costs [over conventional natural gas] are not material given the minimal
25 anticipated usage of the SCGT plants using RNG”? [page 196, pdf p.226]

26

27 **Response:**

28 Not confirmed. Please refer to the response to BCUC IR1 28.5.

29

30

31

32 11.3 Given that the unit capacity costs for an SCGT gas plant are roughly the same
33 whether it uses RNG or conventional natural gas, and given that an SCGT gas
34 plant using RNG is clean whereas an SCGT gas plant using conventional natural
35 gas is not clean, did FBC consider excluding an SCGT gas plant using
36 conventional natural gas from the portfolio analysis?

37

Response:

FBC did not consider excluding SCGT gas plants using conventional natural gas from the portfolio analysis. A portfolio that permits the selection of a SCGT resource aligns with the portfolio objectives (as discussed in the response to BCUC IR1 31.1) and serves as a point of reference that can be used to compare against a portfolio that includes an RNG SCGT resource (as discussed in the response to BCUC IR1 31.4). FBC did not include any portfolios with SCGT plants using conventional natural gas as a fuel source in its set of preferred portfolios based on the feedback received during the June 2021 RPAG meeting, as discussed in Section 11.3.8.

In Table 10-3: Environmental, Socio-Economic and Lead Time Attributes Summary, FBC states that the ranking for GHG Emissions “assumes direct emissions except in the case SCGT using RNG, which includes indirect emissions created in the production of RNG.” [pdf p.199]

11.4 Does this mean that in ranking SCGTs for GHG Emissions FBC considers the upstream GHG emissions of RNG used as fuel but does consider the upstream GHG emissions of conventional natural gas used as fuel? If so, please explain why.

Response:

The table below outlines the key emission assumptions made regarding SCGT and RNG SCGT resources. FBC considered the upstream emissions for both RNG and conventional natural gas. For each MWh of energy dispatched, the following GHG emissions were accounted in the portfolio model:

Resource Type	Direct Emissions: Scope 1	Indirect Emissions: Scope 3
SCGT	0.47 tonnes CO ₂ e per MWh ¹	0.080 tonnes CO ₂ e per MWh ²
RNG SCGT	0.00 tonnes CO ₂ e per MWh ³	0.003 tonnes CO ₂ e per MWh ⁴

¹ 2018 B.C. Methodological Guidance for Quantifying Greenhouse Gas Emissions January, 2019 (DRAFT) Table 1: EMISSION FACTORS: Stationary Fuel Combustion (GJ) Page 13.

² 8.951 kg CO₂e/GJ based on 2019 upstream data as published by BC Oil and Gas Commission.

³ RNG has zero direct emissions for purposes of GHG Reporting.

⁴ Based on 2019 weighted average from the 4 existing RNG facilities that supply to the FEI system.

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12.0 Topic: Timing of Requirement for New Resources

Reference: Exhibit B-1, Table 13-1: 2016 LTERP Action Plan Status, page 213, pdf p.243

FBC states in Table 13-1:

“FBC’s 2019 forecast update indicated that load requirements had decreased compared to the 2016 LTERP forecast and DSM actuals were close to forecast and so the requirement for new resources was likely pushed further out in time than indicated in the 2016 LTERP. FBC has updated its load forecast and DSM load reduction in 2020 as part of this 2021 LTERP and LT DSM Plan and includes updated Load-Resource Balances in Section 7 and Section 9.” [page 213, pdf p.243, underline added]

12.1 Please describe the timing of the requirement for new resources that was indicated in the 2016 LTERP and the corresponding timing indicated by the 2021 LTERP.

Response:

The 2016 LTERP indicated the requirement for new resources, other than market energy and capacity purchases, starting in 2026. The 2016 LTERP assumed a self-sufficiency requirement (i.e., no reliance on market purchases) starting in 2025.

The 2021 LTERP indicates the requirement for new resources, other than market purchases, starts in 2030 (primarily for capacity purposes). The 2021 LTERP includes a capacity self-sufficiency requirement in 2030. However, this new resource requirement could be advanced depending on market conditions or changes to forecasts. Please also refer to the response to BCSEA IR1 6.1.

1 **13.0 Topic: IRP Comparisons**

2 **Reference:** **Exhibit B-1, 2021 LTERP Appendix D: PNW Electric Utilities Integrated Resource Plans Comparison Table,**
3 **page 1-4, pdf p.350-353; 2021 LTERP Appendix F: Long-Term Load Forecast, pdf p.368**

4 13.1 Please provide a version of the PNW Utilities IRP Comparison Table on pages 1-4 of Appendix D with an added column for
5 FBC.
6

7 **Response:**

8 The table below provides the Pacific Northwest Utilities IRP Comparison table with a column added to include FBC.

9 **Updated PNW Utilities IRP Comparison Table**

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
IRP Link	https://www.idahopower.com/energy-environment/energy-planning-and-electrical-projects/our-twenty-year-plan/	https://www.myavista.com/about-us/integrated-resource-planning	https://www.pacificorp.com/energy/integrated-resource-plan.html	https://pse-irp.participate.online/	https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning	http://www.seattle.gov/light/IRP/default.asp	https://www.fortisbc.com/about-us/corporate-information/regulatory-affairs/our-electricity-utility/electric-bcuc-submissions/resource-plans-for-electricity/2021-long-term-electric-resource-plan-and-long-term-demand-side-management-plan

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
Latest Plan	June 2019 IRP (2019-2038)	February 2020 IRP (2021-2045)	October 2019 IRP (2019-2038)	2019 IRP Progress Report (2018-2037)	March 2019 IRP (2020-2050)	2018 Progress Report (2018-2037)	2021 LTERP (2021-2040)
Service Area(s)	Idaho and Oregon	Eastern Washington and Northern Idaho	Pacific Power: Oregon, Washington and California Rocky Mountain Power: Utah, Wyoming and Idaho	Washington	Oregon	Washington (City of Seattle & outlying communities)	Southern Central Interior Region of British Columbia
Number of electric customers	557,645 ⁵	340,000 ⁶	1,900,000	1,100,000	887,000	780,000	182,000 ⁷
Current Energy/Capacity⁸ Requirement	Capacity: 3,392 MW ⁹ Energy: 1,810 aMW ¹⁰	Capacity: 1,726 MW ¹¹ Energy: 1,102 aMW	Capacity: 10,880 MW ¹² Energy: 60,555 GWh	Capacity: 5098 MW ¹³ Energy: 2,681 aMW	Capacity: 3,976 MW ¹⁴ Energy: 2,099 aMW	Capacity: 2,841 MW Energy: 10,068 GWh	Capacity ¹⁵ : Winter: 766 MW Summer: 638 MW Energy ¹⁶ : 3,720 GWh

⁵ <https://www.idahopower.com/about-us/company-information/company-facts/>

⁶ <https://www.myavista.com/about-us/our-company>

⁷ 2021 LTERP, Appendix F, Page 3 (Includes direct and indirect customers)

⁸ 8,760 hrs / year (non-leap year) * aMW - If leap year – 8,784 hrs / year.

⁹ Idaho Power Company 2019 IRP – Table 3.1 (Historical capacity, load and customer data).

¹⁰ Average Megawatt (aMW).

¹¹ Avista 2020 IRP – Table 3.6 Energy and Peak Forecasts (for year 2020).

¹² Net-Owned Generation Capacity https://www.brkenenergy.com/assets/pdf/facts_pacificorp.pdf

¹³ Puget Sound 2017 IRP – Figure 5-4, 5-6.

¹⁴ 2017 peak load - <https://portlandgeneral.com/about/info/quick-facts>

¹⁵ Based on 2021 forecast capacity requirements.

¹⁶ Based on 2021 forecast energy requirements.

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
Annual Load Growth Forecast¹⁷	Energy: 1.0 % Capacity: 1.2%	Energy: 0.3%	Energy: 0.87% Capacity: 0.83%	Energy: 1.3% Capacity: 1.4%	Energy: 1.0% Capacity: 1.2%	Energy: 0.4%	Energy: 1.1% ¹⁸
Current Energy Portfolio Mix	46% Hydro 17% Coal 8% Natural Gas 29% Purchased Power (20% PURPA ¹⁹ & PPA ²⁰ , 9% Market Purchases)	41% Natural Gas 26% Owned Hydro 9% Contracted Hydro 12% Coal 12% Biomass, Wind, Solar and Refuse ²¹	56% Coal 24% Natural Gas 10% Hydro 10% Renewable (Wind, Solar)	36% Coal 20% Natural Gas 32% Hydro Wind 10% Nuclear 1% Biomass, Other 1% (²²)	15% Coal 28% Natural Gas 15% Hydro 9% wind 33% Market Purchases (mix of renewables, hydro and thermal resources)	86% Hydro 7% Wind 5% Nuclear 1% Biogas 1% Unspecified ²³	41% Owned Hydro 25% Long-term contracts (Hydro) 26% Purchased Power (PPA – hydro-based) 8% Market Purchases ²⁴ >1% IPP()
Planning Reserve Margin	15%	Summer: 7% Winter : 16%	13%	17.8% After 2026 : 18.3% ²⁵	Summer: 10% Winter : 12%	Only provide WECC Target Margins: Summer: 17.5% Winter 19.2%	Summer : 14% ²⁶ Winter : 23% ²⁷

¹⁷ Compound annual growth rate, after DSM.

¹⁸ Based on forecast years of 2021 to 2040.

¹⁹ Public Utility Regulatory Policies Act (PURPA).

²⁰ Power Purchase Agreement (PPA).

²¹ Refuse is a fuel produced from various types of waste, such as municipal solid waste.

²² <https://www.pse.com/pages/energy-supply/electric-supply>

²³ <http://www.seattle.gov/light/FuelMix/>

²⁴ Fixed price contracted market purchases for 2021.

²⁵ Includes operating reserves. After 2026 Planning Margin increases to 18.3% after Colstrip Units 3 and 4 are removed from energy supply.

²⁶ Summer seasonal peak for 2021 using forecasted values including operating reserves (excluding market capacity).

²⁷ Winter seasonal peak for 2021 using forecasted values including operating reserves (excluding market capacity).

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
DSM	Energy efficiency reduces annual energy demand by 234 aMW and peak demand by 367 MW by 2038	Energy efficiency achievable potential of 235.4 aMW by 2040	Energy Efficiency and direct load control equal to 700 MW for the planning period (2019-2038)	Energy efficiency 374 MW by 2023 and 714 MW by 2037. ²⁸	Energy efficiency resource supply of 547.6 aMW by 2037	New conservation reaching 128 aMW by 2025 and 205 aMW by 2035	Total energy savings of 435 GWh and total capacity savings of 64 MW from 2021 to 2040 (per Base DSM scenario).
Owned Supply Resources	17 hydroelectric projects, 3 natural gas-fired plants, 1 diesel-powered plant, share ownership in 3 coal-fired facilities	8 hydroelectric developments, 1 coal-fired unit, 5 natural gas-fired projects, and a biomass plant.	10 coal facilities, 6 natural gas facilities, 1 geothermal and other, 41 hydro systems, 13 wind facilities, 2 coal mines	Shared ownership in 4 coal-fired generation units, 6 CCCT ²⁹ , 4 SCCTs ³⁰ , 3 hydro plants, 3 wind farms	7 hydroelectric plants, 5 natural gas plants, 2 coal-fired plants, 2 wind facility, 1 solar	4 major hydroelectric projects, 3 small hydroelectric projects, Landfill gas plant, BPA Hydro PPA (40%)	4 hydroelectric plants with CPA entitlements
Load-Resource Balance	Energy deficit: 2026 Capacity deficit: 2029	Energy deficit: 2026 Capacity ³¹ deficit: 2026	Energy Deficit: 2026 Capacity Deficit: Winter 2024 Summer 2028	Energy deficit: 2025 Capacity deficit: 2025	Energy deficit: 2021 Capacity deficit Winter: 2021 Summer: 2026	Energy deficit: 2028 Capacity deficit: 2028	Energy deficit: 2023 Capacity deficit Winter: 2031 Summer: 2030 ³² June: 2021 ³³

²⁸ 2017 PSE IRP.

²⁹ Combined-cycle combustion turbine (CCCT).

³⁰ Simple-cycle combustion turbine (SCCT).

³¹ Net of energy efficiency.

³² LTERP Table 9-1.

³³ All deficits are after DSM.

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
Preferred Resource Strategy	220 MW of Solar PV capacity by 2022-23 and 125 MW from 2034-2038. Exit 3 coal units by 2022 and 2 other coal units by 2026 ³⁴ . B2H transmission line project on-line in 2026. Natural Gas generation of 222 MW from 2028-2030 and additional 300 MW in 2035 and 2038.	Adequate resources before 2022, 500 MW of new wind, thermal upgrades in 2026 and 2027. Additional long duration pumped hydro storage and demand response.	DSM (700 MW of energy efficiency and new direct control resources), incremental transmission investment, 3,000 MW solar and 3,500 MW wind by 2023, 600 MW of battery storage capacity.	Energy efficiency and demand-response push natural-gas-fueled peaking plant to 2025. Additional 265 MW of solar by 2023, followed by another 377 MW by 2027. Removal of all coal generation by 2025.	Energy Efficiency (157 MWa ³⁵ by 2025), renewable actions including wind resources of 227 MWa by 2025 and energy storage (batteries and pumped storage)	Acquisition of energy efficiency, renewable resources, and improvements in hydro generation efficiency. Major resource required earliest by 2028	Base DSM scenario and PPA and market energy purchases for 2021 to 2040. Market capacity purchases for June only to 2030. After 2030, battery storage, RNG SCGT plants and solar and wind resources. ³⁶
Clean Energy and GHG Reduction Targets and Initiatives	Reduce average CO2 of energy sources from 2010-2020 to 15-20% lower than 2005. Ending participation in 2 coal plants. Reduce average CO2 emissions from energy	Shift to clean energy reduces GHG emissions from 2018 levels by 71% in 2030 and 79% in 2045 100% carbon neutral energy by 2027 (Renewable resources and REC ³⁷) and 100% clean energy by	Energy Vision 2020 Plan: 1,150 MW of new wind and 999 MW of upgraded wind resources to come on-line by 2020. California: Planning target of 100% renewable and carbon-free by 2045.	Washington State Energy Independence Act calls for utilities to invest in renewable generation to meet 15% of demand by 2020 and the Clean Energy Transformation	Reduction in GHG emissions of more than 80% by 2050. On track to serve 50% of customers with clean energy. Expanding and accelerating their “Electric Avenue” charging stations. Currently have 5	Washington State Energy Independence Act calls for utilities to invest in renewable generation to meet 15% of demand by 2020 and the Clean Energy Transformation Act requires at	Provincial government's emissions targets require GHG in BC to be 16% below 2007 levels by 2025, 40% by 2030, 60% by 2040 and 80% by 2050. CleanBC's sectoral targets include reductions of 27-

³⁴ There are seven coal units are within the 3 Coal-fired facilities owned (shared) by Idaho Power Company.

³⁵ Megawatt Average (MWa).

³⁶ Portfolio C3 in LTERP Table 11-2.

³⁷ Renewable Energy Credit (REC).

	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
	sources from 2010 to 2020 is 15-20% lower than 2005 levels. 100% Clean Energy by 2045.	2045 (phase out all carbon producing generation). Developing new programs for 2020 and beyond in Transportation Electrification Plan.	Oregon: 50% Renewable by 2040. Washington: 100% carbon neutral by 2030 and planning target of 100% renewable by 2045. Utah: goal of 20% by 2025 (must be cost effective). Investing \$26 million to support EV fast chargers, develop workplace charging programs, implement smart mobility.	Act requires at least 80% of delivered load be met by renewable resources by 2030 and 100% by 2045. Reduce Puget Sound Energy's carbon footprint by 50% by 2040. Carbon Balance program allows customers to purchase verified carbon offsets from local projects that work to reduce GHG. emissions. Green Direct Program allows customers the ability to purchase 100% of their energy from dedicated, local, renewable energy sources.	locations, 2 more by 2020. Distributed Flexibility to reduce 200 MW of conventional generation.	least 80% of delivered load be met by renewable resources by 2030 and 100% by 2045. City of Seattle has target of 30% EV adoption and fossil-fuel-free municipal fleet by 2030. Invest in EV charging infrastructure with emphasis on universal access and expanding coverage. Develop new rates for Transportation Market. ³⁸	32% for transportation, 38-43% for industry, 33-38% for oil and gas sector, and 59-64% for buildings and communities. Transportation includes heavy emphasis on Zero Emission Vehicles (ZEV Act), with targets of 10% of new light-duty vehicles sold in 2025 be zero-emissions, rising to 30% in 2030 and 100% by 2040. Building Targets include new buildings be 80% more energy efficient by 2032 (compared to 2018 levels). ³⁹ FortisBC 30BY30 target represents a goal to reduce the GHG

³⁸ Transportation Electrification Strategy: <https://rmi.org/wp-content/uploads/2019/06/rmi-seattle-city-lights.pdf>

³⁹ LTERP Section 2.2.3.5.



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	Idaho Power Company	Avista Utilities	PacifiCorp	Puget Sound Energy	Portland General Electric	Seattle City Light	FBC
				Moving away from coal generation ahead of schedule with sale of Colstrip Unit 4 and closure of Units 1 & 2 in 2020.			emissions associated with its customers' energy use by 30 percent by the year 2030. ⁴⁰

1
2

⁴⁰ LTERP Section 2.2.6.

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Regarding the 2021 LTERP long-term energy forecast, FBC states in summary:

“FBC is forecasting long-term Reference Case energy net load growth to average about 1.6 percent per year.” [page 26, pdf p.396, underline added]

Regarding the 2021 LTERP long-term capacity forecast (excluding Planning Reserve Margin), FBC states in summary:

“The winter and summer peaks for the Reference Case forecast grow at an average annual rate of 1.7 percent and 1.9 percent, respectively, over the next 20 years. Both the winter and summer peaks for the BAU forecast [excluding EV charging] grow at an average annual rate of 0.9 percent over the planning horizon.” [page 17, pdf p.387, underline added]

13.2 Please confirm, or otherwise explain, that FBC annual load growth forecast for both energy and (Base Case) capacity is higher than the other electric utilities shown in the PNW Utilities IRP Comparison Table on pdf p.350. If so, what are the likely reasons for this difference?

Response:

FBC confirms that BC EV adoption mandates are the likely reason for the differences in energy and capacity load requirements when comparing the Reference Case load forecast to other electric utilities' load forecasts shown in the PNW Utilities IRP Comparison Table. The ZEV Act was passed on May 19, 2019, and was used to create the EV energy and capacity load forecast in the Reference Case. All six IRP comparison forecasts are from 2018 to 2020, and most states that were included in the table did not have EV mandates until 2021, and therefore, were likely not included in the forecasts.

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1 **14.0 Topic: Planning Reserve Margin**

2 **Reference:** **Exhibit B-1, Appendix M. Planning Reserve Margin Report, pdf p.653,**
3 **et seq.;**

4 BCSEA seeks to obtain a better understanding of how the Planning Reserve Margin
5 (PRM) Report informs the 2021 LTERP.

6 FBC describes Planning Reserve Margin as “the dependable capacity above the expected
7 peak demand required to maintain a targeted level of system resource adequacy.”

8 Upon examining different methods to determine PRM for resource adequacy
9 requirements, “FBC has adopted LOLE [Loss of Load Expectation] as the reliability metric
10 for the assessment of PRM adequacy and targets a 1 day in 10 years or 0.1 day per year
11 threshold, which is commonly used by other utilities.”

12 The starting point is that: “FBC’s base resources to meet load consists of the Company’s
13 own generation, contracted capacity resources such as entitlements from Waneta
14 Expansion (WAX), 200 MW from BC Hydro under the Power Purchase Agreement (PPA)
15 as well as 370 MW of market access.” [underline added]

16 In preparing the 2021 LTERP, each of the relevant resource portfolios was reviewed and
17 additional capacity resources were added where necessary to ensure that the PRM
18 requirements were met.

19 The “portfolio optimization routine frequently selects SCGT and battery resources as the
20 most cost-effective way to fill a large portion of the forecasted capacity gaps within the
21 various portfolio scenarios.” However, for portfolios that intentionally exclude SCGT
22 resources, the optimization routine selects “multiple intermittent resources that collectively
23 meet the capacity gaps on the planning basis.” [underline added]

24 All of the portfolios meet the PRM requirements. However, portfolios that exclude SCGTs
25 (and therefore have multiple intermittent resources) are “more dependent on market
26 access as a contingency resource to meet reliability requirements.”

27 14.1 Please correct or supplement the description above.

28

29 **Response:**

30 In order to be capacity self-sufficient without the use of a dispatchable resource such as a RNG
31 SCGT, a portfolio of seasonally complementary intermittent resources is required, as
32 demonstrated with portfolio C4. For example, wind is more likely to produce energy during the
33 winter peak hours and solar is more likely to produce energy during the summer peak hours. To
34 meet the monthly capacity requirements, the utility requires confidence that the average monthly
35 energy generated by an intermittent resource is reasonably able to be delivered in the peak hours.

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1 In the event that the output of the resource varied significantly from what was forecasted such
2 that FBC was short supply and unable to meet the hourly load obligations, FBC would be required
3 to purchase the deficit from the market as the contingent resource. Therefore, portfolios that rely
4 on multiple intermittent resources are more dependent on market access as a contingency
5 resource to meet reliability requirements.

6 In contrast, if FBC were to build a RNG SCGT, it is likely to have less variability in the actual
7 amount of capacity that is delivered when the resource is scheduled to meet peak demand, and
8 therefore, less dependent on market access as a contingency resource to meet reliability
9 requirements.

10
11
12
13 14.2 Please explain the base resource of “370 MW of market access.”
14

15 **Response:**

16 The 370 MW of market access for the purposes of responding to unexpected conditions was
17 determined by the full capabilities and import rights of 71 Line (71L) in combination with the
18 CEPSA agreement. Although 370 MW was assumed as the base resource, in the Monte Carlo
19 (MC) simulation this was the maximum amount available. FBC’s ability to use 71L is contingent
20 on Teck Metals Ltd. (Teck) not using the line to support their business. Therefore, the available
21 market access to FBC in any one iteration of the MC simulation is based on how much and how
22 likely Teck is to be using 71L, which would reduce the amount of market access available to FBC.

23
24
25
26 14.3 For portfolios that exclude SCGTs and are more dependent on market access, is
27 market access in addition to the base resource of “370 MW of market access”?
28

29 **Response:**

30 In the resource planning portfolio, 0 MW of market access is assumed for capacity purposes, with
31 the exception of June. In the PRM model, 370 MW represents the maximum available market
32 access on 71 Line. No additional market access beyond 370 MW is assumed in any portfolio
33 scenario.
34

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1 **B. Long-Term DSM Plan**

2 **15.0 Topic: Long-Term DSM Plan**

3 **Reference:** **Exhibit B-1, Volume 2, Section 1 Overview, page 1, pdf p.755;**
4 **Section 1.1 The UCA and DSM Regulation, page 3, pdf p.758; Table**
5 **3-1 Key DSM Scenario Data, pp.14-15, pdf pp.768-769; Table 1-4:**
6 **Order G-117-18 BCUC Directives Applicable to LT DSM Plan, page 5,**
7 **pdf p.759; 2021 LTERP, pages 152-153, pdf pp.182-183**

8 FBC states:

9 “The Company’s objective for DSM activities is to offer customers in its service
10 territory a range of programs within a cost-effective portfolio of measures that
11 address the majority of end uses for each major customer sector.

12 The key objective for the LT DSM Plan is to determine the appropriate level of cost-
13 effective DSM resource acquisition to support the Company’s resource needs over
14 the LTERP’s planning horizon (2021 to 2040). The proposed DSM Scenario target
15 is to acquire 435 GWh of cost effective savings over the 20 year period.” [pdf p.755]

16 Regarding the avoided cost for DSM analysis purposes, FBC states:

17 “Accordingly, the Company has developed a long-run marginal cost (LRMC) for
18 DSM purposes, based on BC clean and renewable resources, of \$90 per MWh,
19 which reflects the cost of firm energy i.e. inclusive of generation capacity.
20 Additionally, FBC is using a Deferred Capital Expenditure (DCE) value of \$51.22
21 per kW-yr as its avoided capacity cost of deferred infrastructure, consistent with
22 the methodology presented in Appendix C of FBC’s 2017 DSM Expenditure Plan
23 Application, accepted by the BCUC in its Decision and Order G-9-17.” [pdf p.758]

24 FBC proposes the “Base DSM” scenario:

25 “Based on the avoided costs outlined above, and the Company’s proposed Base DSM
26 Scenario level, the CPR model estimates the portfolio TRC test to be 2.0. In conclusion,
27 the Company believes the LT DSM Plan meets the applicable requirements of the DSM
28 Regulation, as amended March 24, 2017.” [pdf p.758]

29 The Medium, High and Max DSM scenarios were not chosen, for the following reasons:

- 30
- 31 • “They are less cost-effective than other resource options. FBC would be paying an
32 increased incremental incentive proportion of measure costs, especially in
33 comparison to the relatively low cost of power supply options, such as market
34 electricity purchases. The Incremental cost compared to base case (\$/MWh) row
35 in Table 3-1 highlights the resource cost of the additional savings; and

- They present higher risks of insufficient customer participation. DSM participation is voluntary and FBC cannot have assurance that customer participation will be sufficient to meet the higher scenarios. The fact that FBC had below-target energy savings in recent program results indicates that it may not be readily feasible to achieve higher levels of DSM.” [pages 152-153, pdf pp.182-183]

Table 3-1 is reproduced for convenience:

Table 3-1: Key DSM Scenario Data

Category	DSM Scenario				
	Low	Base	Med	High	Max
Energy Savings, GWh					
Average per annum ('21 - '40)	21.0	21.8	22.4	23.4	25.2
Average per annum ('21 - '29)	26.8	28.0	29.4	31.4	34.5
Total (2021 to 2040)	421	435	449	468	503
Capacity Savings, MW					
Total (2021 to 2040)	61.6	64.0	65.6	68.1	72.7
Resource Cost, 2020 (\$000s)					
Average Cost (\$/MWh)	\$38	\$44	\$49	\$57	\$75
Incremental cost compared to base case (\$/MWh)	N/A	-	\$183	\$190	\$234

- 15.1 Please provide a table comparing the LRMC for DSM and the Deferred Capital Expenditure value for the 2021 Long-Term DSM Plan and the 2016 Long-Term DSM Plan. Please explain the differences.

Response:

When updating the DCE value for the 2021 LTERP, it was discovered that one formula was double counting transmission and distribution project costs. Although there has been growth in the coincident peak of the Reference Case load forecast and a corresponding increase in the costs of transmission and distribution projects on a net present value basis over the planning horizon, correcting this arithmetic error has contributed to the net decrease in the 2021 DCE value compared to the 2016 DCE value. The 2016 DCE value with the arithmetic error corrected would have been \$44.06 per kW-year.

The table below compares the LRMC and DCE values between the 2016 LTERP and 2021 LTERP, including the corrected 2016 DCE value. Values in the 2016 LTERP are stated in real 2015\$ and values in the 2021 LTERP are stated in real 2020\$.

<p style="text-align: center;">FortisBC Inc. (FBC or the Company)</p> <p style="text-align: center;">2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)</p>	<p style="text-align: center;">Submission Date: December 23, 2021</p>
<p>Response to BC Sustainable Energy Association (BCSEA) Information Request (IR) No. 1</p>	<p style="text-align: center;">Page 33</p>

	LRMC (\$/MWh)	DCE (\$/kW-year)
2016	100 ⁴¹	79.85 ⁴²
2016 (Corrected)	100	44.06
2021	90 ⁴³	51.22 ⁴⁴

The decrease in the LRMC is primarily associated with decreases in the cost of clean and renewable resources.

15.2 Please explain “Incremental cost compared to base case \$/MWh” in the bottom row of Table 3-1. Is this the cost in \$/MWh of the difference between Total (2021 to 2040) Energy Savings for the Medium, High and Max scenarios and the Total (2021 to 2040) Energy Savings for the Base scenario?

Response:

Please refer to the response to CEC IR1 40.1.

15.3 Is the “Incremental cost compared to base case \$/MWh” metric consistent with the direction in Order G-117-18 to “Use average cost approach outlined in the DSM Regulation as the basis for its comparative analysis of DSM portfolios”?

Response:

The “Average Cost (\$/MWh)” metric in Table 3-1 was the primary metric used to compare DSM Scenarios, and is consistent with the direction in Order G-117-18.

The “Incremental cost compared to base case \$/MWh” metric is a separate, additional metric used to illustrate the cost associated with additional energy savings compared to the Base scenario.

⁴¹ FBC 2016 LTERP, Figure 9-1, Portfolio B1, Page 119.

⁴² FBC 2016 Long-Term DSM Plan, Page 3.

⁴³ FBC 2021 LTERP. Figure 11-1, Portfolio A2. Page 180.

⁴⁴ FBC. 2021 Long-Term DSM Plan, Page 4.

15.4 Please provide copies of FBC's DSM annual reports showing the "recent program results."

Response:

Past FBC DSM Annual Reports which show program results can be found at the following link:
<https://www.fortisbc.com/about-us/corporate-information/regulatory-affairs/our-gas-utility/gas-bcuc-submissions/fortisbc-energy-inc.-gas-submissions/C-EM/annual-dsm-reports>

15.5 Please explain how "below-target energy savings in recent program results" jibes with the statement in Table 13-1 [page 213, pdf p.243] that FBC's 2019 forecast update indicated that DSM actuals were close to 2016 LTERP forecast.

Response:

"Below-target energy savings in recent program results" refers to the recent actual program results for energy savings in 2019, 2020, and 2021 (2021 is still a forecast) that were below the target put forward in the 2019-2022 DSM Plan. A comparison between the 2016 LTERP, 2019-2022 DSM Plan and 2019-2022 DSM Actuals is presented in the table below:

Forecast/Actuals	Energy Savings (GWh)			
	2019	2020	2021	2022
2016 LTERP	26.4	26.4	28.4	30.4
2019-2022 DSM Plan	32.6	32.1	32.4	33.1
2019-2022 DSM Actuals	25.8	26.2	29.8*	Forecast not yet created

*Forecast values as of October 2021

The table shows that 2019-2022 DSM Actuals were below the 2019-2022 DSM Plan savings target and closer to the 2016 LTERP forecast.

FortisBC Inc. (FBC or the Company) 2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)	Submission Date: December 23, 2021
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1 **16.0 Topic: Long-Term DSM Plan,**

2 **Reference: Exhibit B-1, Volume 2, Section 3 DSM Scenario Development, page**
3 **13, pdf p.767**

4 FBC states:

5 “The DSM program scenarios FBC considered are based on incenting ever larger
6 proportions of the DSM measures’ incremental costs. The same DSM measures
7 were included in all scenarios, and the uptake was based on the market potential.
8 This approach supplants the prior metric of expressing DSM savings targets as a
9 percent of load growth offset. That metric, which originated in the 2007 BC Energy
10 Plan, included targets only to the end of 2020. New load growth forecasts are
11 significantly impacted by electric vehicle growth, which DSM has no energy
12 savings measures thus the existing approach was abandoned in favour of one that
13 aligns with incremental costing, similar to other utility conservation potential
14 reviews, including FEI. [pdf p. 767, underlined added]

15 16.1 Please explain in more detail how the current method of DSM scenario
16 development differs from the prior metric of expressing DSM savings targets as a
17 percent of load growth offset.

18
19 **Response:**

20 Please refer to the response to BCUC IR1 25.1.

21

FortisBC Inc. (FBC or the Company) 2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)	Submission Date: December 23, 2021
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1 **17.0 Topic: Long-Term DSM Plan**

2 **Reference: Exhibit B-1, Volume 2, Figure 3-2: Annual Energy Savings (Plan,**
3 **Actual, DSM Scenarios), page 16, pdf p.770**

4 17.1 What is the difference between the “the 2016 LTERP savings target trajectory (blue
5 dotted line) to 2021” and the “expenditure plan saving targets (yellow dotted line)”?

6
7 **Response:**

8 The “2016 LTERP” savings estimate (blue dotted line) represents the 2016 Long-Term DSM Plan
9 forecast savings presented in Table 3-2 of the 2016 Long-Term DSM Plan.

10 The “2016-21 Expenditure Plan” savings estimate (yellow dotted line) represents the DSM Plans’
11 forecast savings presented in:

- 12 1. 2016: Table 4-1 of the 2015-16 FBC DSM Plan, Appendix A
13 2. 2017: Table A-1 of the 2017 FBC DSM Plan, Appendix A
14 3. 2018: Table 1 of the 2018 FBC DSM Plan
15 4. 2019-2021: Table 5-1 of the 2019-2022 FBC DSM Plan

16 The 2016 Long-Term DSM Plan was used to inform the savings targets in the 2019-2022 DSM
17 Plan. The 2019-2022 DSM Plan increased the savings target by 22 percent to reflect increased
18 customer participation experienced in FBC’s DSM programs between the completion of the 2016
19 Long-Term DSM Plan and the completion of the 2019-2022 DSM Plan.

20

FortisBC Inc. (FBC or the Company) 2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application)	Submission Date: December 23, 2021
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1 **C. Orders Requested**

2 **18.0 Topic: Orders Requested**

3 **Reference: Exhibit B-1, Appendix P-2, Draft Final Order, pdf p.749.**

4 In Exhibit B-1, FBC provides the following language for the order it requests from the
5 BCUC in this proceeding:

6 “NOW THEREFORE pursuant to section 44.1(6) of the UCA, the BCUC orders as
7 follows: The BCUC accepts the FortisBC Inc. 2021 Long Term Electric Resource
8 Plan, including the 2021 Long Term Demand-Side Management Plan as being in
9 the public interest.”

10 18.1 Is this the order that FBC currently requests? Are there any modifications?
11

12 **Response:**

13 FBC confirms the citation above is the requested order and that there are no modifications.
14

Attachment 1.6

cleanBC

our nature. our power.
our future.





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MESSAGE FROM THE PREMIER



There's nothing more important than taking care of the place we call home.

No matter where you live, no matter your age or background, you want a good life and a secure future in the community you've chosen to live and work in. For today, and for your kids and grandkids tomorrow.

That's why we are bringing forward our CleanBC plan.

It's a plan about climate and science, actions and targets. But ultimately, CleanBC is about putting our province on the path to a cleaner, better future – with a low-carbon economy that creates opportunities for all while protecting our clean air, land and water.

The roots and inspiration for this plan are many. It acknowledges the accomplishments of Premier Gordon Campbell's government a decade ago in making B.C. a leader in reducing greenhouse gas emissions. It reflects the global commitment established three years ago in Paris to save our planet's future by acting on climate change now. But ultimately, CleanBC is inspired by the aspirations of the people of British Columbia, who work hard every day to help build our province and who ask for nothing more than a secure, sustainable future.

CleanBC directly addresses the challenges before us.

It holds that by working together, we can meet the increasing demand for an economy that is productive and forward-looking, while reducing pollution and protecting our climate. With the right path forward, business, industry, Indigenous peoples, workers and communities can come together to unlock B.C.'s full economic potential in a world that's beginning to embrace urgent climate action and eager for low-carbon products, services, and energy inputs.

It argues that transitioning to a low-polluting economy will deliver more and higher-value jobs for British Columbians in resource industries, the service economy, and in emerging and growing sectors. By positioning B.C. as a low-carbon leader, we will attract increased and new investment from around the globe – opening the door to more opportunities for people and companies, large and small, throughout our province.

Finally, CleanBC embraces all that makes British Columbia special – the nature, the people, the spirit of community – and demands we do more to protect it from the dangers posed by climate change. The unprecedented droughts, wildfires and floods we've seen in recent years must serve as notice. Our obligation to this province must be to improve how we live, work and commute – moving forward on a path that makes clean, renewable energy and pollution reduction the norm.

CleanBC is an outcome of the contribution of many, in particular the Climate Solutions and Clean Growth Advisory Council, convened by Minister George Heyman to provide strategic advice to government on climate action and low-carbon economic growth. I'm proud also that we have developed this plan in concert with our partners in the B.C. Green Caucus, who work tirelessly to bring forward the voices of so many British Columbians who care deeply about our province's future.

This plan is now public. Let the dialogue and solutions begin. And let's work together to build a better B.C. for everyone.

Honourable John Horgan
Premier of British Columbia



Climate change will challenge our economy, environment, and communities. Yet, in every challenge lies opportunity. CleanBC offers a pathway that will enable our province to seize opportunities for innovation and growth.

By coming together to enact this plan, we are charting a path that will advance a high quality of life for British Columbians well into the future. The work is just beginning, but for the first time in many years it is looking promising.

Dr. Andrew Weaver

Leader, B.C. Green Caucus; MLA – Oak Bay-Gordon Head



The CleanBC plan sets our province on a cleaner path over the next decade and beyond, reducing climate pollution and making cleaner solutions more convenient, available and affordable for British Columbians.

Within a global commitment to address climate change, B.C. must do its part by changing how we power our province, manage our waste, and protect our air, land and water. The change we need to make is already underway, as we move towards a cleaner, healthier and more sustainable future for ourselves and our children.

Honourable George Heyman

Minister of Environment and Climate Change Strategy



B.C. is a leader in generating clean, renewable energy. With CleanBC, we will use our abundant carbon-free electricity to power our province's future.

Working together, we can create a future defined by cleaner energy, reduced pollution, and new opportunities and jobs for all British Columbians.

Honourable Michelle Mungall

Minister of Energy, Mines and Petroleum Resources



British Columbia will be a leading global destination for industry planning to drive low-carbon economic growth and opportunities.

Putting British Columbia on the world stage as a leader in clean energy, products and services will open doors to new investment in established companies and start-ups alike: delivering more good-paying jobs for British Columbians.

Honourable Bruce Ralston

Minister of Jobs, Trade and Technology



EXECUTIVE SUMMARY

CleanBC is a pathway to a more prosperous, balanced, and sustainable future. Over the next decade and beyond, we must grow the use of clean and renewable energy in how we get around, heat our homes, and fuel our industry – making things better and more affordable for people. Our work is already underway, and we are making the most of it to benefit people and communities everywhere – from rural and remote B.C. to Indigenous communities and our growing urban centres.

Along with our actions to reduce greenhouse gas (GHG) emissions, CleanBC provides an effective blueprint to build our economy. Rising to meet the global challenge of climate change is an opportunity for British Columbia to mobilize our skilled workers, natural resources, and booming technology sector to reduce climate pollution and create good jobs and economic opportunities across B.C. The same innovations that reduce our emissions and improve our quality of life can drive economic growth and help businesses succeed in the global market for clean energy, technologies, products and expertise.

CleanBC describes how, together, we can make things more efficient, use less energy and waste less, while making sure that the energy we use is the cleanest possible and to the greatest extent possible made-in-B.C.

Our strategy reduces GHG emissions by shifting away from fossil fuels and towards clean and renewable energy. We first focus on some of the sectors that most affect our daily lives:

- For transportation – with cleaner fuels, cleaner vehicles and more support for measures that get people out of their cars
- For the buildings where we live and work – raising our standards for new construction and encouraging energy-saving improvements in existing homes and workplaces
- By reducing emissions from organic waste and diverting it from landfills
- By reducing emissions from industry with targeted incentives
- By working with employers, Indigenous communities, labour groups and others to make sure people throughout B.C. can get the skills they need for the jobs of the future

Making these changes cannot leave anyone behind. Switching to cleaner energy needs to be affordable for people across B.C. That's why we are helping with the upfront costs that come with home improvements, using cleaner energy, and zero-emission vehicles – giving people more affordable choices to save energy over the long run.

The full scope of actions envisioned in CleanBC – on the part of citizens, industry and business, and local and provincial government – will accomplish our 2030 GHG reduction goals. This plan describes specific reductions from the first set of actions totaling more than 75 per cent. Over the next 18 to 24 months

we will identify additional reductions across more sectors of our economy with the strong potential to exceed the remaining 25 per cent of our 2030 goals. These include:

- cleaner public transportation,
- cleaner and more efficient technology,
- the introduction of new clean energy options,
- reducing and making better use of waste,
- significantly increasing industrial electrification,
- reducing emissions from forestry, land use and agriculture, and
- improving community design and services.

As each new initiative is developed we will put it into action, so we are not waiting to get good ideas underway. We want to hear from the public and will be seeking input in the next year on initiatives that get us to our climate goals. Together, in collaboration with Indigenous peoples, we will work to build more resilient communities, where everyone benefits from a cleaner future.



What's in this plan:

- Our goal is to make every new building constructed in B.C. “net-zero energy ready” by 2032. Along the way we’re requiring new buildings to be more efficient, and ramping up funding for renovations and energy retrofits to our existing homes and offices, including \$400 million to support retrofits and upgrades for B.C.’s stock of publicly funded housing.
- We’re speeding up the switch to cleaner fuels at the gas pump – with further reductions to the carbon intensity of our transportation fuels.
- Just over 20 years from now, every new car sold in B.C. will be a zero-emission vehicle. We are helping people to afford cleaner cars and save money on fuel with incentive programs, and making it easier to charge or fuel them.
- We’re giving people the skills they need, making sure that British Columbians can lead the clean transition.
- We’re reducing residential and industrial organic waste and turning it into a clean resource.
- We’re helping industry lower their emissions and reduce their pollution.

These initiatives won’t just protect our environment and clean our air – they will help create new economic opportunities for people and spur innovation to grow our world-leading technology and clean energy sectors.

Together, we can rise to the challenge of global climate change and build a better life for people in this province.



KEY ACTIONS

Cleaner Transportation

Bring down the price of clean vehicles	Just over 20 years from now, every new car will be a zero-emission vehicle (ZEV) with phased-in increases to the ZEV standard	1.3
	Help people to afford cleaner cars and save money on gasoline bills with ZEV incentives	0.3
	Make it easier to charge or fuel a ZEV	
Speed up the switch to cleaner fuels	Make our fuel cleaner by increasing the low carbon fuel standard to 20% by 2030 and increasing the production of renewable transportation fuels	4.0
	Make vehicles run cleaner by increasing tailpipe emissions standards for vehicles sold after 2025	0.4
GHG Mt reduced by 2030		6.0

Improve where we live and work

Better buildings	Make every building more efficient by improving the Building Code and increasing efficiency standards	
Support for better buildings	Incentives to make homes more energy-efficient and heat pumps more affordable	0.5
	Upgrade public housing to make it more comfortable and energy-efficient	
	Make residential natural gas consumption cleaner by putting in place a minimum requirement of 15% to come from renewable gas	1.5
Support for communities	Help remote communities reduce dependence on diesel and support public infrastructure efficiency upgrades and fuel switching to biofuels with the CleanBC communities fund	
GHG Mt reduced by 2030		2.0



Cleaner Industry

Ramp up the CleanBC program for industry	Direct a portion of B.C.'s carbon tax paid by industry into incentives for cleaner operations	2.5
Improve air quality by cutting air pollution	Clean up air pollution in the lower mainland with a pilot project to test options to switch 1,700 freight trucks to cleaner or zero-emission fuel	
Reduce methane emissions from natural gas development	Reduce methane emissions from upstream oil and gas operations by 45%	0.9
Industrial electrification	Provide clean electricity to planned natural gas production in the Peace region	2.2
	Increase access to clean electricity for large operations with new transmission lines and interconnectivity to existing lines	1.3
Carbon capture and storage	Ensure a regulatory framework for safe and effective underground CO ₂ storage and direct air capture	0.6
Cleaner fuels for industry	Make industrial natural gas consumption cleaner with a minimum 15% to come from renewable gas	0.9
GHG Mt reduced by 2030		8.4

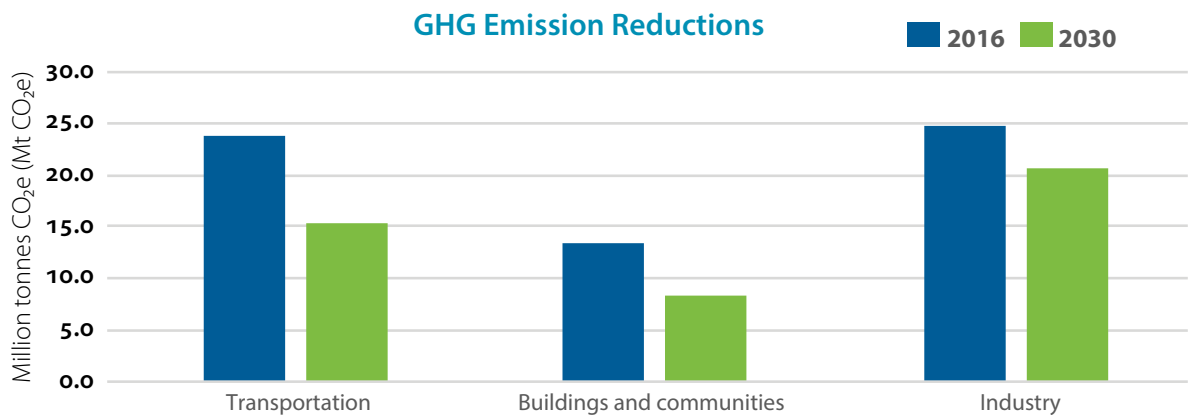
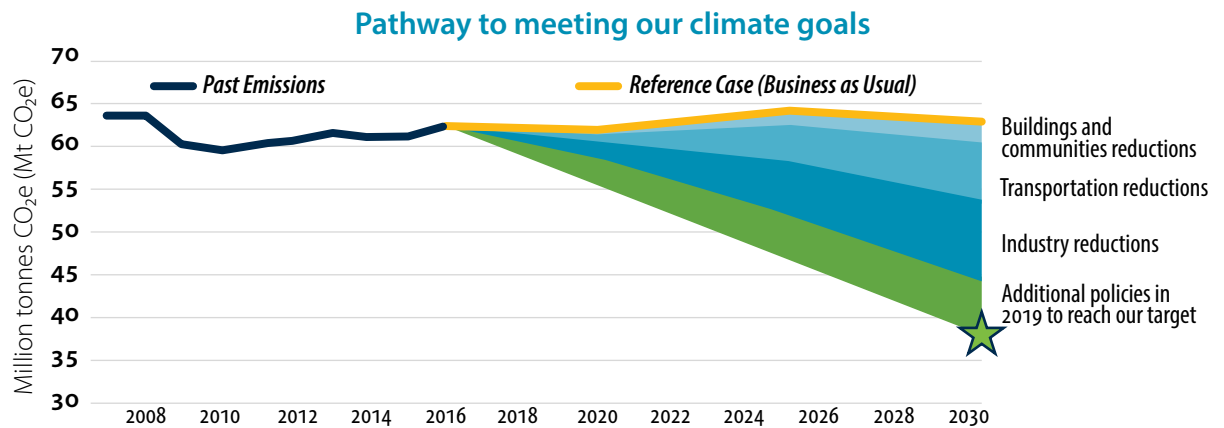
Reduce emissions from waste

Reduce waste and turn it into a clean resource	Help communities to achieve 95% organic waste diversion for agricultural, industrial, and municipal waste – including systems in place to capture 75% of landfill gas	0.7
	Waste less and make better use of it across all sectors of our economy, like forestry, agriculture, and residential areas, including renewing the B.C. Bioenergy Strategy and building out the bioenergy and biofuels cluster	
GHG Mt reduced by 2030		0.7
Continue the successful carbon pricing framework, with rebates for low and middle income British Columbians and support for clean investments		1.8

TOTAL GHG Mt reduced by 2030 18.9

The legislated target for 2030 is a reduction of 25.4 Mt GHG from a 2007 baseline

** Policy line items represent individual reduction potential estimates. Subtotals and totals are derived from combined modeling and may be lower than the sum of policies because of policy interactions (two policies contribute to the same reduction)*



ELECTRIFICATION: BY THE NUMBERS

We need to use more clean B.C. energy to meet our climate targets. This means reducing fossil-fuel consumption, increasing new biofuel consumption, and shifting to using more clean B.C. electricity. Specifically, by 2030, the policies in this strategy will require an additional 4,000 gigawatt-hours of electricity over and above currently projected demand growth to electrify key segments of our economy. This is equivalent to increasing BC Hydro's current system-wide capacity by about 8 per cent, or about the demand of the City of Vancouver. We can meet this increased electricity use with existing and planned projects that harness B.C.'s vast wealth of clean, renewable power. Meeting our targets beyond 2030 will require substantial additional volumes of new clean electricity to further electrify transportation, industry, and buildings. In 2019, BC Hydro will undertake a transformational review that addresses changing energy markets, new utility models and emerging technologies to deliver on CleanBC's longer-term electrification goals.



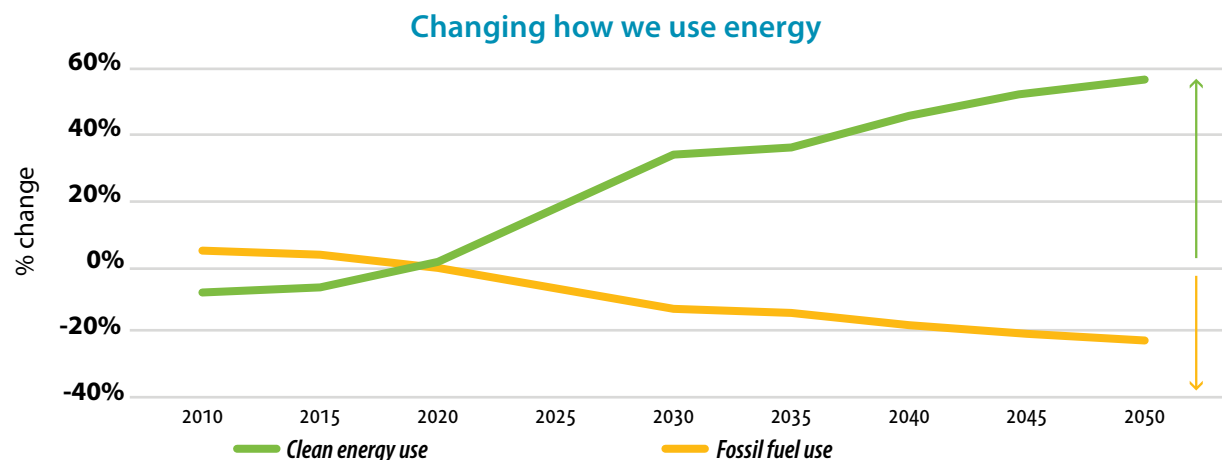
1 INTRODUCTION: POWERING OUR FUTURE

Our CleanBC plan protects what we care about and invests in steps that will make life more affordable, healthier and more comfortable, while creating a stronger economy and good jobs for the people of this province.

From fossil fuels to clean energy

Our lives and our economy are growing more and more reliant on energy. Thanks largely to the legacy of BC Hydro, we are already a clean-energy powerhouse. Almost all the electricity we produce is from clean and renewable resources. But when it comes to the energy we consume in our buildings, cars and industrial operations – nearly three quarters of the energy used across our economy still comes from fossil fuels.

To meet our goals we must increase our use of cleaner energy, especially electricity, in our lives and in key sectors of our economy – shifting away from our reliance on fossil fuels for transportation, industry, and housing. Together, we can make these sectors more efficient, so we use less energy and waste less, and make sure the energy we do use is the cleanest possible. People will benefit with more comfortable buildings, cleaner air, and more transportation options.



We're working towards a future where clean energy powers our homes, businesses and vehicles; where we use energy more efficiently; where more and more people have the skills and jobs of the future; where our natural resource industries have the smallest possible environmental footprint; where we work in full partnership with Indigenous peoples; where we use our position as a clean energy leader to grow our innovative technology sector; where we export our expertise and products to make a difference in the lives of hundreds of millions; and where we all enjoy cleaner air and a healthier natural environment.

Focusing on affordability

The move to more clean energy must be fair and affordable. We are focused on lowering energy use and making it easier to heat and power our buildings – and helping with those upfront costs. As we bring more and more zero-emission vehicles onto the market, we will expand incentives to make them more



CLEANBC: RENEWING OUR COMMITMENT TO CLIMATE ACTION

- 2008:** B.C. gets a head start on climate action, introducing North America's first comprehensive price on carbon along with a wide-ranging climate action plan supported by legislated GHG reduction targets; the Province, UBCM, and local governments sign the BC Climate Action Charter that commits them to take action on climate change.
- 2009:** B.C. introduces Renewable and Low Carbon Fuel Requirements to spur the supply of cleaner fuels.
- 2010:** The *B.C. Clean Energy Act* requires at least 93 per cent of our electricity to be generated from clean or renewable sources (BC Hydro has since achieved 98 per cent); all B.C. public-sector organizations achieve carbon neutrality.
- 2011:** The Province launches the Clean Energy Vehicle (CEV) program; the First Nations Clean Energy Business Fund is also launched.
- 2012:** B.C. meets its first interim target, reducing province-wide GHG emissions to six per cent below 2007 levels (though emissions began to rise again in later years).
- 2015:** B.C. has seen decoupling of GHG emissions from economic and population growth. Between 2007 and 2015, our net greenhouse gas emissions declined by 4.7 per cent; at the same time, our GDP grew by 16 per cent – proving that climate solutions and clean growth can go hand in hand.
- 2016:** B.C. and its partners in the Pacific Coast Collaborative – Washington, Oregon and California – sign the Pacific Coast Climate Leadership Action Plan.
- 2017:** The BC Energy Step Code is introduced, providing a voluntary path to achieving net-zero energy ready buildings; the BC Indigenous Clean Energy Initiative is launched.
- 2018:** B.C.'s price on carbon is increased for the first time since 2012 to \$35 per tonne, and set to increase by \$5 per tonne per year until it reaches \$50 per tonne in 2021; new revenues from B.C.'s carbon tax are dedicated to supporting measures that drive down GHG emissions and make life more affordable for British Columbians; new climate targets are legislated under the *Climate Change Accountability Act*; the Climate Solutions and Clean Growth Advisory Council is established to provide strategy advice on climate action and clean economic growth; the Province works with people to develop CleanBC, a long term strategy to meet our climate targets while building a stronger, more sustainable economy.

British Columbia has more than a decade of experience in driving down greenhouse gas emissions. During that time, we've seen our economy grow even as emissions have declined. We've expanded the climate action tax credit for low-income British Columbians. We've spurred the growth of a cutting-edge technology sector, renewed commitment from business and industry to building a cleaner B.C. brand, and further developed our clean B.C. energy resources, from electricity to biofuels to hydrogen fuel cells. These are strengths we can build on.

affordable while also expanding public transit. These should be accessible to people across this province. Our targeted incentives will be in place to help people make the switch to cleaner choices until these options become more common and more affordable.

Growing the economy as we build a cleaner future

Doing our part to address climate change means finding cleaner, more efficient solutions that will help us build and broaden our economy. We are well positioned to seize the opportunities emerging as people look for new solutions to the challenges of climate change, which in turn will provide good jobs for the people of B.C. The global market for clean energy, technologies, products and services is valued in the trillions of dollars and we have a head start on meeting that demand.

Reaching our targets and building resilient communities

There's more to do, especially when it comes to community development and infrastructure, public transportation, industrial waste, generating yet more clean energy, and working with B.C.'s Indigenous communities. Further action in these key areas over the next eighteen to twenty-four months will get us closer to our climate goals – while providing an unprecedented economic opportunity for our people, innovators and businesses. We will analyze these opportunities to determine where the strongest job growth is likely to be, and work with employers, labour groups, post-secondary institutions and Indigenous communities to identify the skills and training needed to meet this demand.

We also must prepare for, and adapt to, the unavoidable effects of climate change already impacting our province. Across B.C., average temperatures are increasing and extreme weather is becoming more frequent, with communities devastated by floods and forest fires. Managing these risks – and recognizing that they will have a range of impacts on British Columbians and the communities we live in – is essential to protecting our health and well-being and ensuring our communities and economy continue to thrive.

Working towards reconciliation

We will work in collaboration with Indigenous peoples to seize new clean economy opportunities and help communities adapt to the impacts of climate change. This will include collaboration on a climate change adaptation strategy to be developed for 2020. This collaboration and partnership will be based on reconciliation, respect and the shared goal of a better future for everyone in B.C. CleanBC initiatives must reflect government's commitment and obligation to support the implementation of the United Nations Declaration on the Rights of Indigenous Peoples and the Calls to Action of the Truth and Reconciliation Commission.

Public engagement

We heard from British Columbians in 2018 (<https://engage.gov.bc.ca/cleangrowthfuture/>) and we'll continue to listen as we explore solutions. A new round of engagement will begin in 2019 to inform the next steps of CleanBC, including collaboration with Indigenous peoples. This approach will allow us to update and expand the strategy.

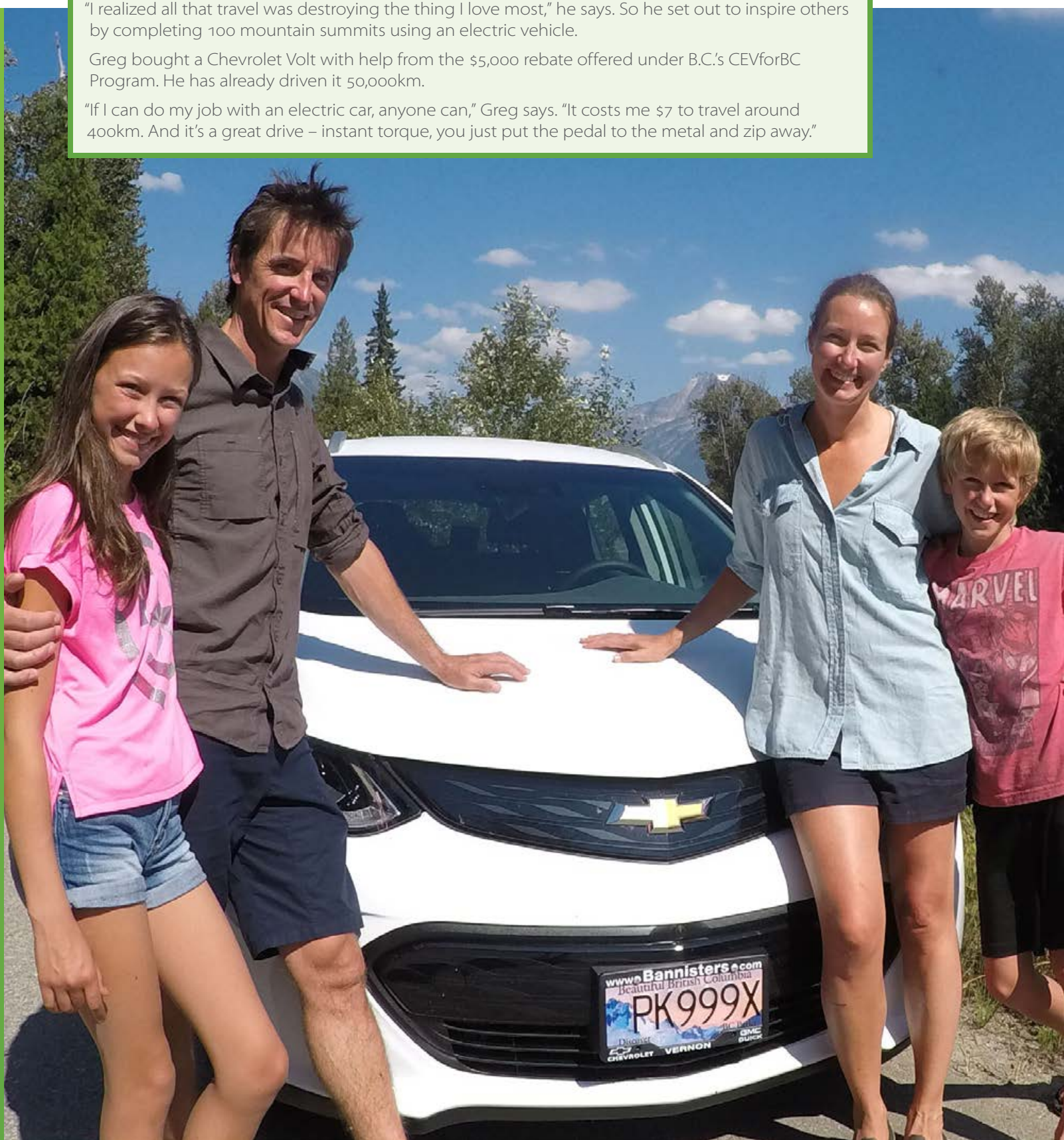
Working together, we can make these changes and reap huge benefits for people across this province. We will continue to collaborate with the federal government. We will build stronger relationships with Indigenous communities. We will work with local governments, businesses, and British Columbians from a range of backgrounds. And we will continue to receive advice from the Climate Solutions and Clean Growth Advisory Council.

MOUNTAIN ADVENTURER GOES ELECTRIC

As one of Canada's leading ski mountaineers, Revelstoke's Greg Hill has travelled the globe. "I realized all that travel was destroying the thing I love most," he says. So he set out to inspire others by completing 100 mountain summits using an electric vehicle.

Greg bought a Chevrolet Volt with help from the \$5,000 rebate offered under B.C.'s CEVforBC Program. He has already driven it 50,000km.

"If I can do my job with an electric car, anyone can," Greg says. "It costs me \$7 to travel around 400km. And it's a great drive – instant torque, you just put the pedal to the metal and zip away."



2 A CLEAR PATH TO A CLEANER B.C.

This document you're reading now is a pathway to a cleaner future for B.C. It sets out the first part of a long-term strategy for key sectors of our economy – from transportation to industrial processes to our built environment – to use less carbon-intensive energy. The Province has committed to fully funding initiatives that get us to our 2030 climate goals, recognizing that the strategy will be continually updated and expanded as new opportunities arise.

Our work is guided by three goals:

- Protect B.C.'s unique environment to guarantee clean air, land and water for future generations
- Leverage our actions on behalf of the environment to build a stronger, more diverse and more sustainable economy in every part of the province
- Provide the supports people need to make sure that everyone can benefit as we move to a cleaner, healthier B.C.

We're laying out a clear path to meeting our climate action targets by 2030. We're moving forward with a range of new and ambitious actions focusing on transportation, buildings and the CleanBC program for industry. These were developed through public consultations with the people of British Columbia and are targeted to deliver the greatest GHG reductions at the lowest cost while generating jobs and opportunities.

Together, the actions outlined in this document will get us 75 per cent of the way to our 2030 GHG target. Further actions will deliver a plan for the remaining 25 per cent of reductions. Additional engagement will begin in 2019 to ensure that future actions reflect the diverse needs and priorities of British Columbians.

Indigenous peoples will play a significant role in this next chapter. In the past, programs that support sustainable communities and more efficient choices haven't always been available to Indigenous communities – that won't be the case with CleanBC. We recognize the value of Indigenous knowledge. Through the actions we take together in our strategy we will ensure that the values and aspirations of Indigenous peoples are included in the future we are building together.

Going forward, we will continue to engage and collaborate with our partners and consult with the public on how we address our climate goals beyond 2030, to meet our targets for 2040 and 2050.

What this could look like in 2030

Here are some of the things that could be different because of the actions we're taking.



Cleaner transportation and better air quality

- Almost 500,000 new light duty zero-emission vehicles (ZEVs) and 140,000 plug-in hybrids on the road.
- 15% of the passenger vehicles could be all-electric, 4% plug-in hybrid, and 33% hybrids. That means less than half (48%) would be conventional gas-powered vehicles.
- Over 40% of diesel and 10% of gasoline comes from biofuels.



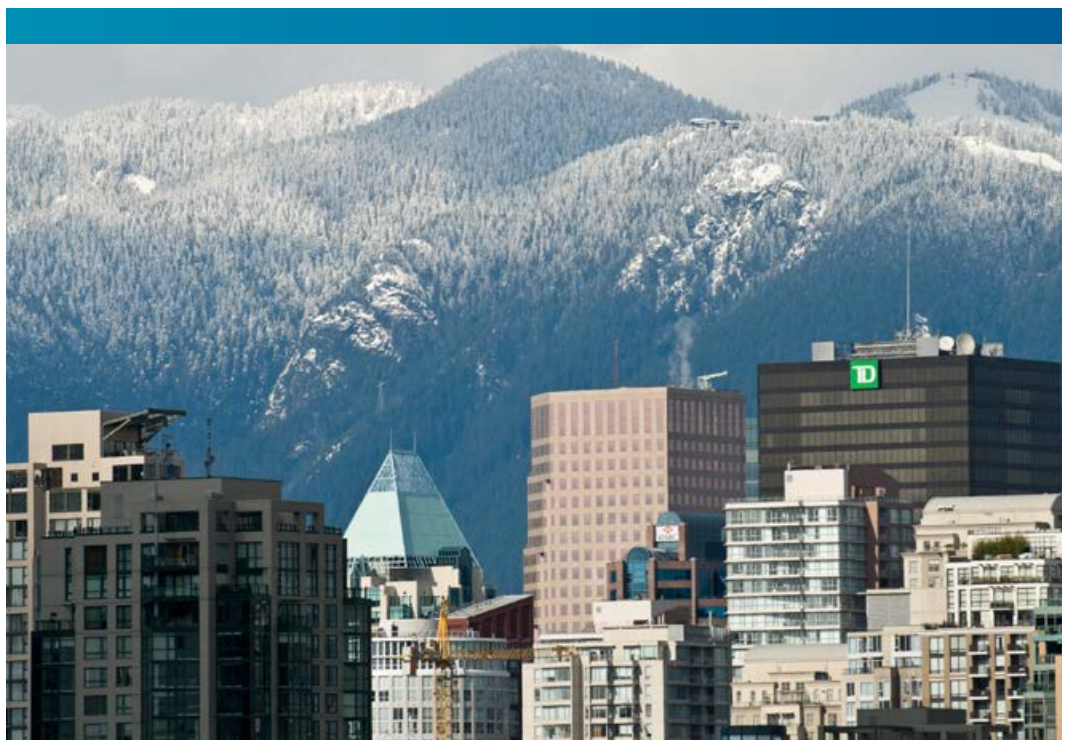
Healthier, more energy-efficient buildings

- 160,000 new residential heat pumps for space heating instead of natural gas furnaces – a 60% increase covering 600,000 m² or more floor space each year from 2019 -2030.
- 53 million m² of commercial floor space heated by heat pumps, that's fifteen times as much as today.
- For heating water - 150,000 new residential heat pumps in place of natural gas appliances.



Cleaner industry that cuts pollution

- 60 large industrial operations using heat pumps instead of natural gas.
- Over 55% of natural gas compressors in the oil and gas sector are electric.
- Emissions from 580,000 tonnes of CO₂e are prevented because of innovative technology like carbon capture and storage.



2.1 Getting Around

Whether it's getting the kids to school or getting goods to market, transportation is part of daily life. In B.C. we've done a lot to make it cleaner, from investing in transit and regulating cleaner fuels to providing incentives for zero-emission vehicles.

People are making cleaner choices, and those choices are making a difference: between 2007 and 2016, we lowered our per-person fossil fuel consumption by 10 per cent. That's progress we can build on.

To meet our targets, we must decouple the effects of population and economic growth from emissions growth, while delivering real emission reductions relative to our 2007 base year. Between 2007 and 2016, our economy grew by 19 per cent and our population by 11 per cent. As a result, emissions from the transportation sector rose, with the largest increase – 14.6 per cent – in emissions from regular passenger vehicles. Heavy-duty transport emissions rose by 7.7 per cent. We need to accelerate our move to less polluting and lower-carbon transportation.

With this strategy, we're moving to a future where new vehicles produce no emissions at all – starting with the following actions. Lowering our fuel consumption means lowering fuel costs, which is good for families and businesses. Along the way, the build out of new cleaner transportation technology and infrastructure will stimulate new economic opportunities and development in communities throughout B.C.

2.1.1 More Zero-Emission Vehicles (ZEVs) on the way

ZEV standard

Ensuring an ever-greater portion of our personal and commercial vehicle fleet is powered by clean B.C. electricity, hydrogen and renewable fuels is one of the most important steps we can take to reduce our carbon footprint.

Just over 20 years from now, all new light-duty cars and trucks sold in British Columbia will run on clean electricity from batteries or hydrogen fuel cells. Between now and then many of us will be driving plug-in electric hybrids with internal combustion engines as a back-up to ensure we can get where we're going in remote areas. By 2030 or earlier, we expect the price of ZEVs to be about the same as for conventional vehicles – and we can drive the price even lower by drawing more supply to our province.

CleanBC puts B.C. on a path for all new light-duty car and truck sales to be Zero-Emission Vehicles (ZEVs) by the year 2040.

By 2020, we will put in place a ZEV standard to make sure British Columbians have access to the numbers and types of zero-emission vehicles they want. The standard will require automakers to meet an escalating annual percentage of new light-duty ZEV sales, reaching:

- 10 per cent in 2025
- 30 per cent in 2030 and
- 100 per cent by 2040.

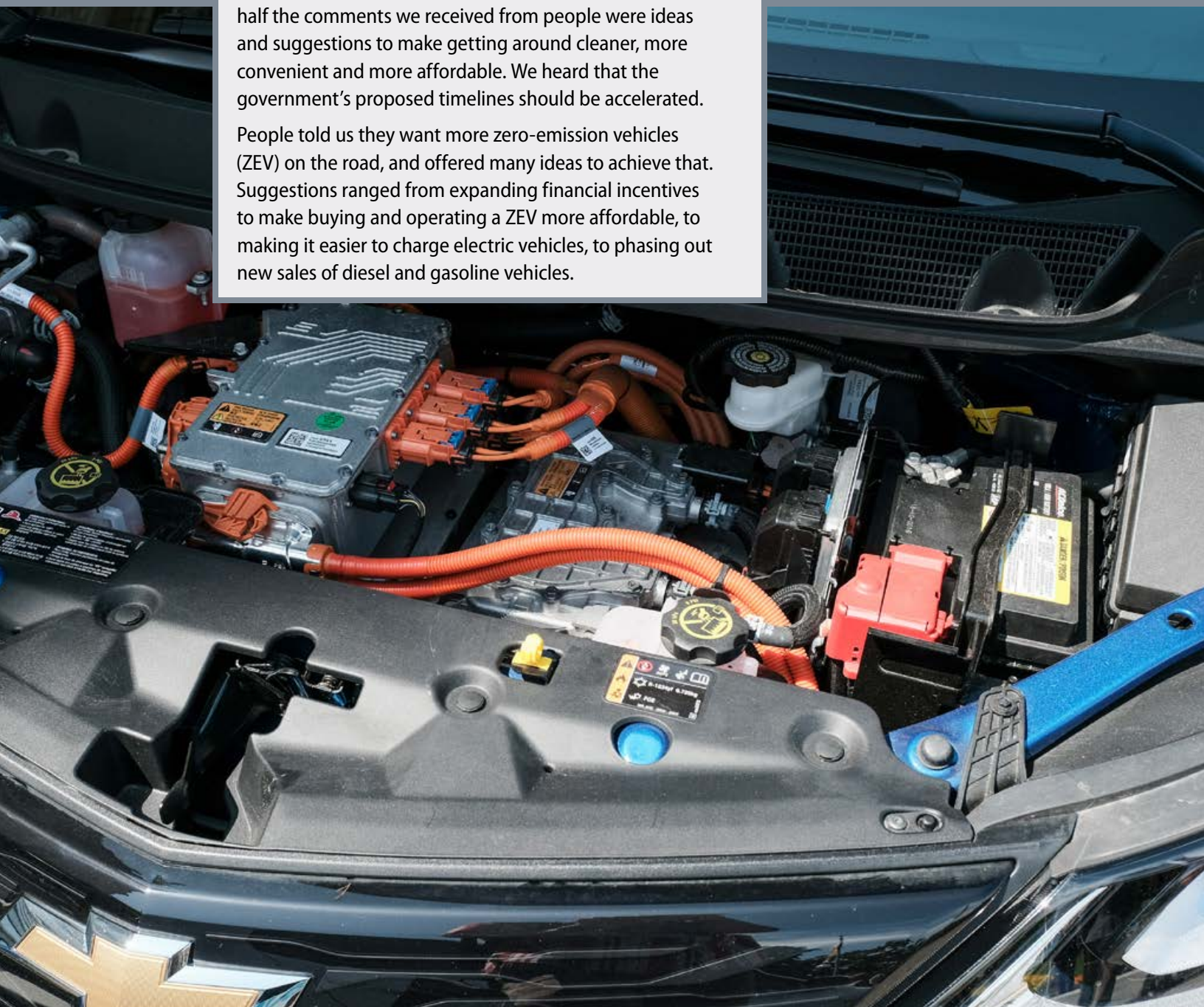
Bringing in the standard over time will allow automakers to offer a greater diversity of models and vehicle types that can meet the needs of drivers throughout B.C.

This ZEV standard is a market transformation tool, helping to ensure that cleaner vehicles are as widely available and competitively priced as possible. It will also support the growth of B.C.'s broader clean energy vehicle (CEV) sector, which includes 198 companies and 3,850 employees. This number will continue to rise as we expand the clean energy vehicle automotive curriculum across the province, as well as support electricians to upgrade their skills to support ZEV infrastructure. The CEV sector contributes approximately \$700 million a year in direct economic activity to the province.

WHAT WE HEARD ABOUT CLEAN TRANSPORTATION

No other topic in our public engagement grabbed people's attention like clean transportation. Well over half the comments we received from people were ideas and suggestions to make getting around cleaner, more convenient and more affordable. We heard that the government's proposed timelines should be accelerated.

People told us they want more zero-emission vehicles (ZEV) on the road, and offered many ideas to achieve that. Suggestions ranged from expanding financial incentives to make buying and operating a ZEV more affordable, to making it easier to charge electric vehicles, to phasing out new sales of diesel and gasoline vehicles.



Expanding clean vehicle infrastructure

As part of the move to ZEVs, we're making new investments in home and workplace charging, public charging stations and hydrogen fueling stations, so that British Columbians can charge-up in the convenience of their own home or workplace, and anyone can travel throughout the province in their ZEV. The private sector has a big role to play in this new clean energy infrastructure development, and the Province will be addressing barriers to investment in commercial charging, and hydrogen fueling, further expanding consumer choice and confidence for drivers.

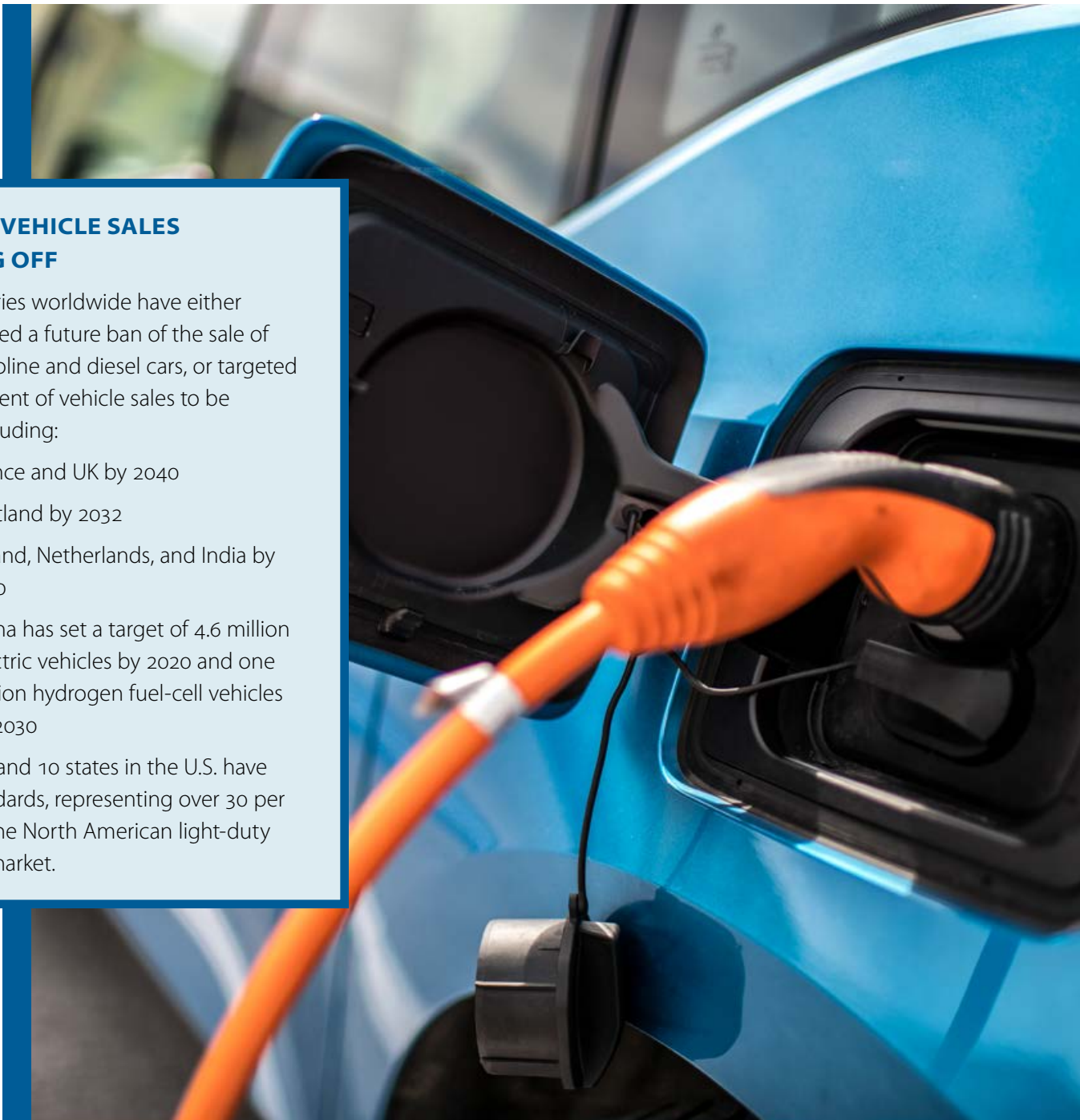
We're also exploring ways to help make sure that people in multi-unit housing can charge their cars at home. This will be explored further as we implement CleanBC.

CLEAN VEHICLE SALES TAKING OFF

16 countries worldwide have either announced a future ban of the sale of new gasoline and diesel cars, or targeted 100 per cent of vehicle sales to be ZEVs, including:

- France and UK by 2040
- Scotland by 2032
- Ireland, Netherlands, and India by 2030
- China has set a target of 4.6 million electric vehicles by 2020 and one million hydrogen fuel-cell vehicles by 2030

Quebec and 10 states in the U.S. have ZEV standards, representing over 30 per cent of the North American light-duty vehicle market.



Making the transition towards ZEVs more affordable

Zero-emission vehicles use cleaner energy, improve air quality, and cost dramatically less over time to fuel and operate. But they come with an upfront cost that can be out of reach for many families. Over time,

as more makes and models come onto the market, there will be greater choice for consumers and costs will come down. In the meantime, we are committed to helping families make the switch.

ZEV owners save on fuel costs – saving approximately \$1,500 every year for the average B.C. driver. And because electric vehicles have fewer moving parts, they typically require less maintenance.

Since 2011 the Province has provided incentives to encourage clean vehicle deployment and technology innovation within British Columbia. Under the CEVforBC program, qualifying British Columbians can get up to \$6,000 off the cost of a new clean energy vehicle. Since its inception, the program has helped about 12,000 B.C. residents and businesses.

CleanBC will keep the momentum going by expanding and redesigning the program to offer a new range of incentives for:

- vehicles,
- infrastructure, such as charging stations,
- commercial fleets, and
- public education.

Expanding the program will support the growth of B.C.'s ZEV infrastructure and the broader CEV sector, creating jobs and economic opportunities for companies and organizations involved in all aspects of the supply chain – from raw materials to final consumer products – related to vehicles or vehicle components, fuel and charging infrastructure and transferable technologies and services.

EXTENDING THE RANGE OF LONG-HAUL TRUCKS

A B.C. company is developing solutions for long-haul trucks with demanding road operations, towing up to 80,000 pounds of freight throughout the San Diego and Los Angeles regions. Loop Energy's fuel cell technology is part of a range of technological advancements used in the hybrid-configured trucks to extend their operating range beyond 200 miles (322 km) – without the need for refueling or recharging. Based in Burnaby, Loop develops and supplies this innovative technology and other zero-emission products for vehicle manufacturers.

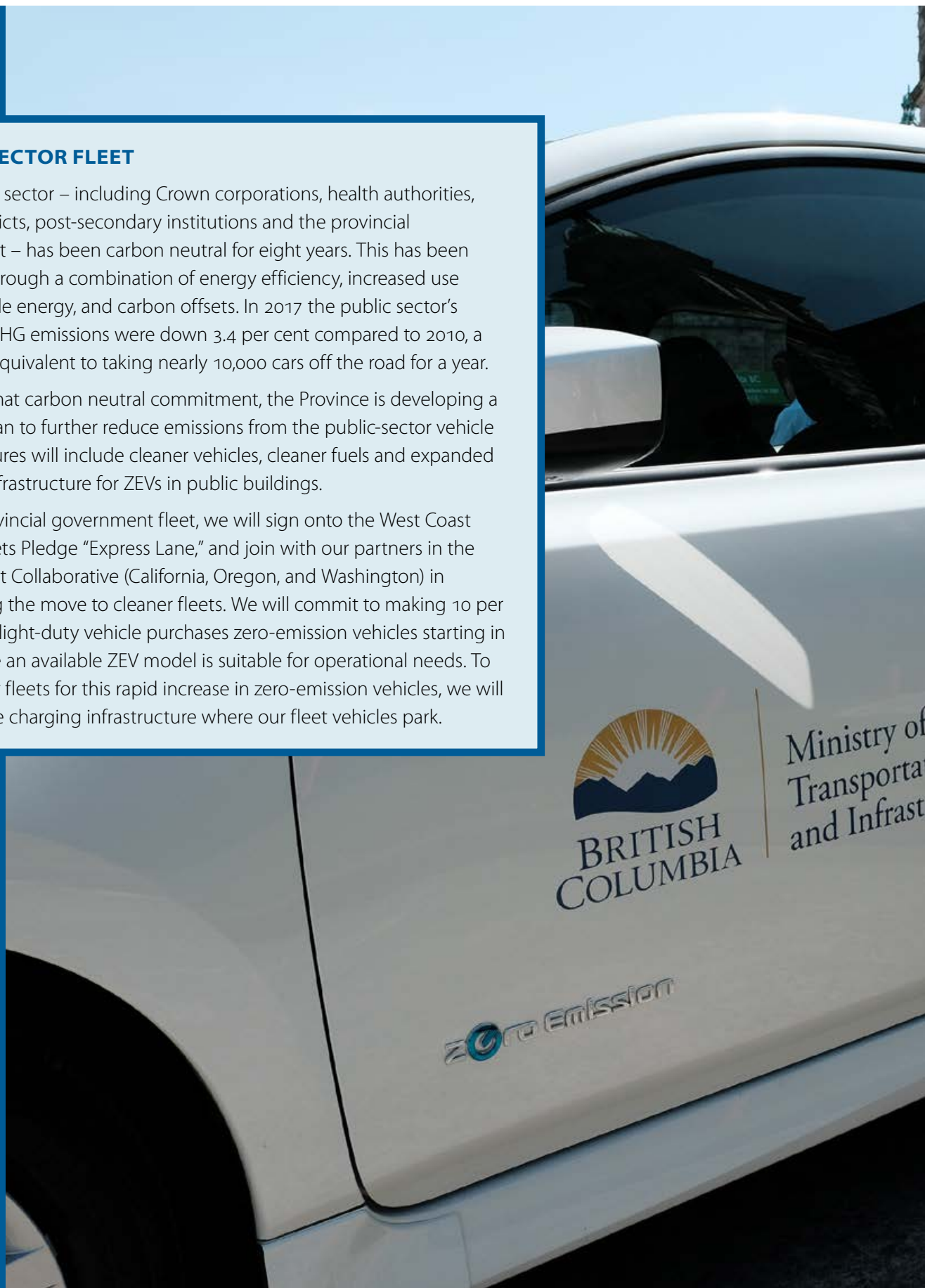


PUBLIC SECTOR FLEET

B.C.'s public sector – including Crown corporations, health authorities, school districts, post-secondary institutions and the provincial government – has been carbon neutral for eight years. This has been achieved through a combination of energy efficiency, increased use of renewable energy, and carbon offsets. In 2017 the public sector's collective GHG emissions were down 3.4 per cent compared to 2010, a reduction equivalent to taking nearly 10,000 cars off the road for a year.

As part of that carbon neutral commitment, the Province is developing a five-year plan to further reduce emissions from the public-sector vehicle fleet. Measures will include cleaner vehicles, cleaner fuels and expanded charging infrastructure for ZEVs in public buildings.

For the provincial government fleet, we will sign onto the West Coast Electric Fleets Pledge "Express Lane," and join with our partners in the Pacific Coast Collaborative (California, Oregon, and Washington) in accelerating the move to cleaner fleets. We will commit to making 10 per cent of our light-duty vehicle purchases zero-emission vehicles starting in 2020, where an available ZEV model is suitable for operational needs. To prepare our fleets for this rapid increase in zero-emission vehicles, we will improve the charging infrastructure where our fleet vehicles park.



CLEANER FERRIES

BC Ferries is joining the move to cleaner fuels and cleaner vessels, with three new intermediate-class “dual fuel” ships, capable of operating on liquified natural gas (LNG) or marine diesel. It’s also converting the second of its two largest Spirit Class vessels to dual fuel, with a return to service planned by summer 2019.

For our inland ferry fleet, the future is electric. The Province is taking incremental steps in that direction as available technology increasingly supports ongoing safe, reliable and efficient service. We aim to achieve full electrification of the inland ferry fleet by 2040.

BUILDING ON OUR LEGACY OF MARINE TRANSPORTATION

Richmond’s Corvus Energy has become a world leader in energy storage systems, including batteries for marine vessels. These systems cut carbon pollution, improve safety, and protect our clean air – while saving on fuel costs.

Corvus is growing rapidly. Their revenue has increased tenfold since 2016. To keep up, Corvus has quadrupled their production capacity, creating new jobs in B.C. Now, Seaspans Ferries is using this homegrown clean technology in two of their vessels, with plans for electricity to power future vessels. BC Ferries is also including it in their fleet upgrade.



2.1.2 *Speeding up the switch to cleaner fuels*

Zero-emission vehicles will do a lot to clear the air and bring down B.C.'s GHG emissions. But that transition will take time, and there will still be cases where liquid transportation fuels are needed. So we are also taking steps to reduce emissions from conventional vehicles so that they burn cleaner fuel.

Expanding B.C.'s low-carbon fuel standard

First, we're expanding the Province's Renewable and Low Carbon Fuel Standard. Low carbon fuels are created by blending in fuels from renewable sources such as vegetable oils, waste cooking oil, and forest and municipal organic waste. We currently require a 10 per cent reduction in the carbon intensity of fuels by 2020.

Moving forward, the standard will require suppliers to reduce the carbon intensity of diesel and gasoline by 20 per cent by 2030. Carbon intensity is measured on a lifecycle basis, taking into account all emissions including those from fuel production.

**CleanBC increases
the low-carbon fuel
standard to 20% by 2030.**

By further decreasing the carbon intensity over time, we can reduce carbon pollution even more. This one step achieves significant reductions in B.C.'s impact on the environment and the climate.

Increasing the supply of renewable fuels

To meet the increased demand for cleaner fuels, we will work with renewable fuel providers to ramp up new production of 650 million litres of renewable fuels by 2030. That's about eight per cent of our total annual fuel use.

The good thing is that there are plenty of sources for bio-fuels that are underused – including forest and municipal organic waste. We are also working with our two B.C. refineries in Burnaby and Prince George to develop the ability to refine both fossil crude and green crude made from a variety of waste and renewable sources.

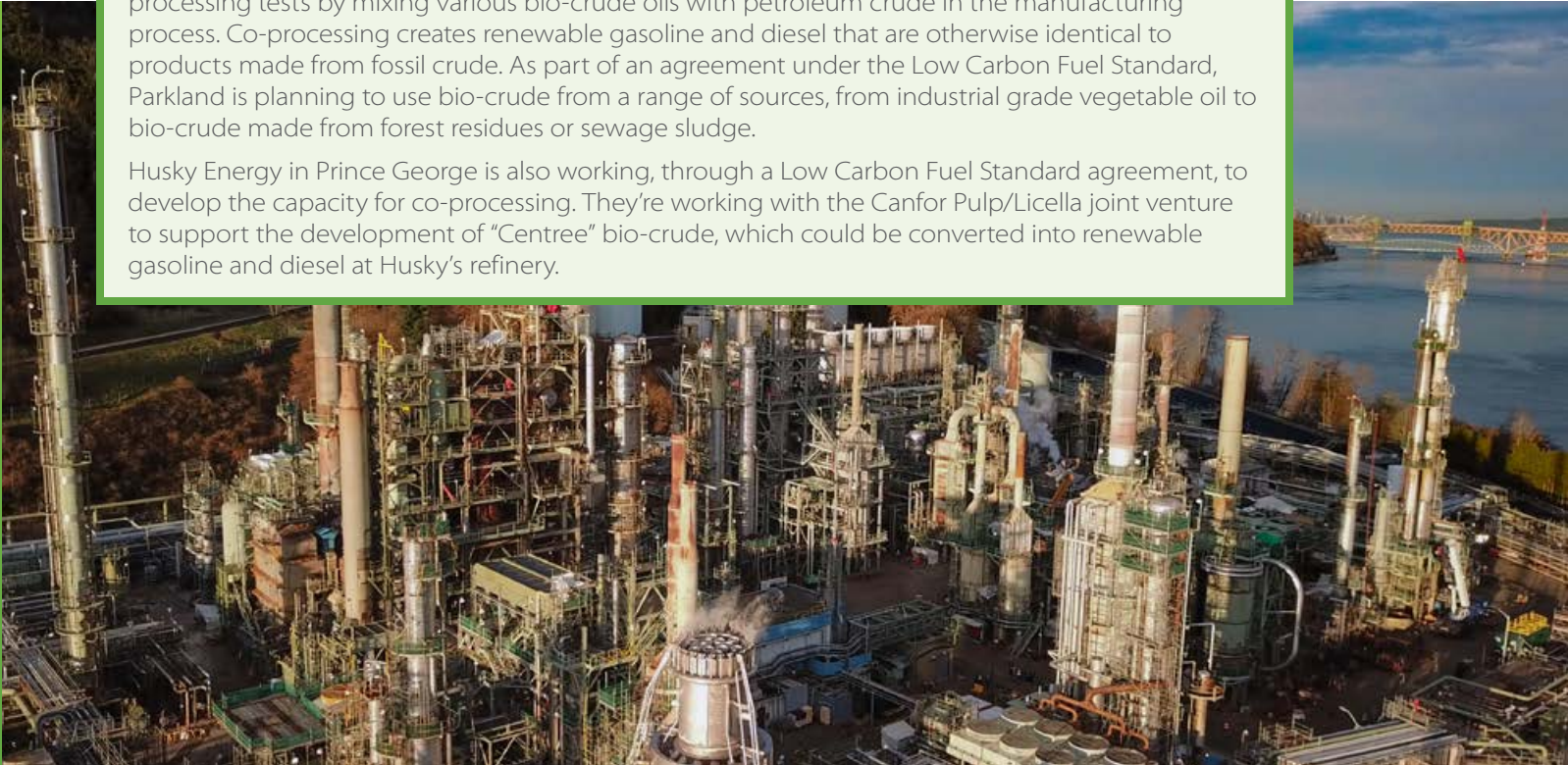
Together these two initiatives will deliver major improvements by cutting emissions and air pollution province-wide. They will also have a significant economic impact. Refining our own renewable fuels, with B.C. materials and B.C. workers, will lead to job growth and reduce the need to import fossil fuels and feedstock from other jurisdictions.



REFINING RENEWABLE FUELS

Over the last two years, Parkland Refining in Burnaby has been running commercial scale co-processing tests by mixing various bio-crude oils with petroleum crude in the manufacturing process. Co-processing creates renewable gasoline and diesel that are otherwise identical to products made from fossil crude. As part of an agreement under the Low Carbon Fuel Standard, Parkland is planning to use bio-crude from a range of sources, from industrial grade vegetable oil to bio-crude made from forest residues or sewage sludge.

Husky Energy in Prince George is also working, through a Low Carbon Fuel Standard agreement, to develop the capacity for co-processing. They're working with the Canfor Pulp/Licella joint venture to support the development of "Centree" bio-crude, which could be converted into renewable gasoline and diesel at Husky's refinery.



HESQUIAHT FIRST NATION CREATES CLEAN ELECTRICITY

The Hesquiaht First Nation is building a small hydropower plant to take advantage of their abundant hydro resources and create clean electricity. This energy will replace 70 per cent of the Hot Springs Cove community's diesel use, supporting local employment while cutting carbon pollution.

By reducing their reliance on diesel, the community will also save money, eliminate the noise from generators, and remove associated environmental and health concerns. The Hesquiaht First Nation is demonstrating how we can protect our natural environment, while seizing the opportunity of clean economic growth.



Showing the value of clean energy

B.C.'s carbon tax is designed to apply to all fossil fuels used in the province. In the transportation sector, carbon tax rates on gasoline and diesel were reduced to align with the introduction of the renewable fuel standard in 2010, which mandated renewable content in fuels sold in B.C.

As the portion of renewable fuels grows and a variety of fuel blends become available across the province, we'll examine ways to make the carbon price on fuels easy to identify and easy to understand. We will also look at ways to enhance the value of low carbon choices for consumers and for industry.

2.1.3 *Less time in gridlock*

It's not an option for everyone, but driving less can help reduce costs, stress and the risk of accidents, not to mention cutting back on greenhouse gas emissions and air pollution. In 2019, the Province will establish an active transportation strategy with measures to support new infrastructure, education and incentive programs, and safety improvements for people walking, cycling and using other kinds of active transportation. The Province will also offer incentives to local governments and public-sector organizations to reduce the need for commuting – so people can spend less time in their cars.

CleanBC will build on the comprehensive range of initiatives already well underway in the province to cut congestion, pollution and GHG emissions. For example, in the next 10 years, B.C., the federal government and local governments will invest more than \$8 billion under the Public Transit Infrastructure Fund and the Investing in Canada Infrastructure Program to expand and improve public transit in B.C. with new rapid transit lines, new SkyTrain cars in Metro Vancouver, and new buses across the rest of the province. Other investments will include system and facility upgrades, better communications technology, and new transit exchanges, park and rides, and bus shelters.

We are committed to making transit more accessible and efficient. We're also making it cleaner. BC Transit is continually monitoring the market for ways to improve fuel efficiency and reduce emissions on older buses. Meanwhile TransLink is on its way to phasing out the purchase of diesel buses altogether. More than a quarter of its overall fleet already runs on electricity.

As we expand our transportation infrastructure, we're making sure that major projects like new bridges and interchanges are designed to make walking, cycling and transit use as safe and convenient as possible. Since 2014, we've also provided more than \$30 million in grants to communities through BikeBC to support cycling infrastructure and cycling tourism.

In 2019, we will be engaging British Columbians on more ways to reduce traffic, congestion and transportation costs including community design and lifestyle choices.

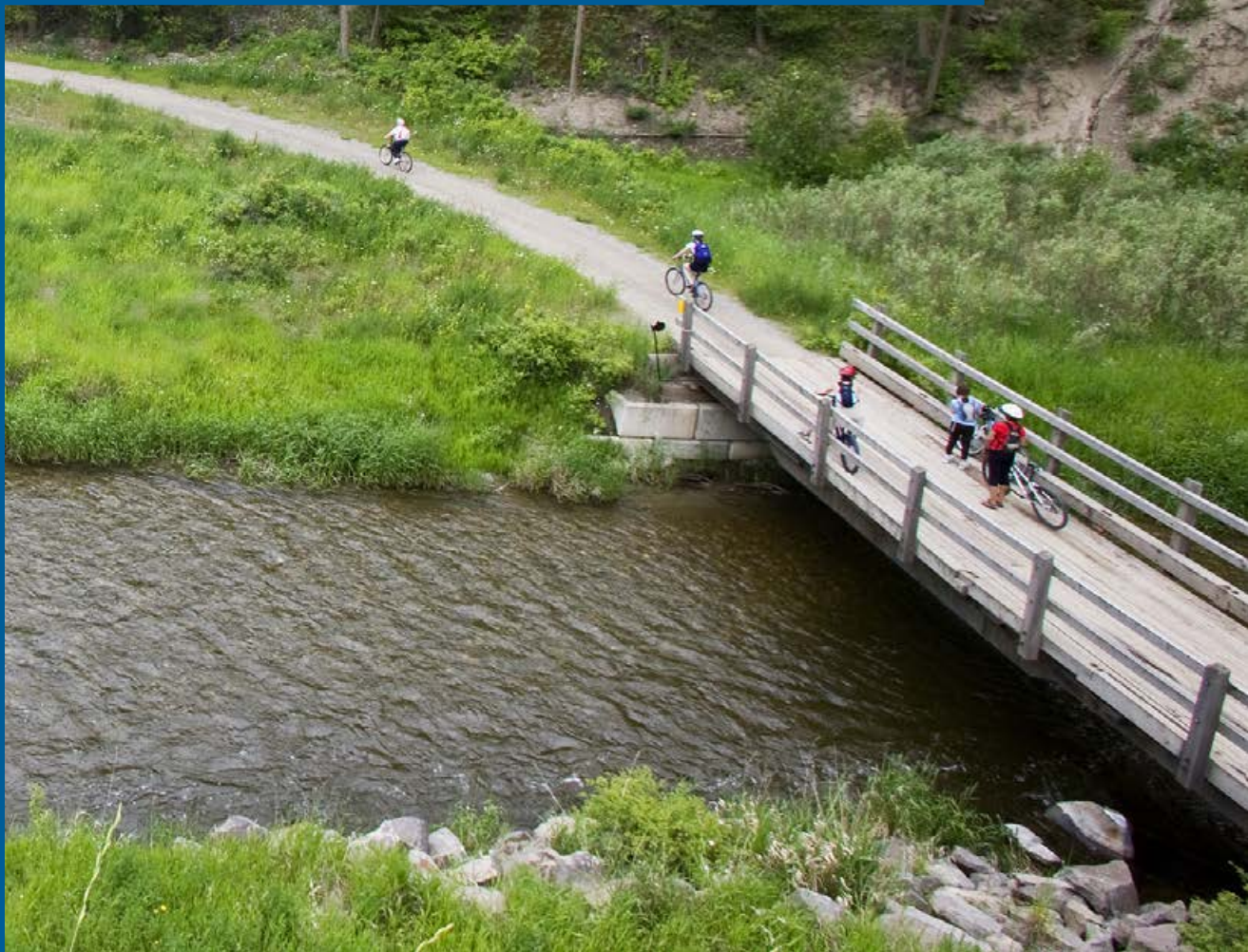


ACTIVE TRANSPORTATION

Active transportation, whether it's walking, cycling or scootering, is good for our health as well as the environment, and B.C. is working on a strategy to make it easier, safer and more attractive. We currently spend about \$1.50 a year per person on active transportation, including things like bike lanes, walking paths and well-planned connections to transit.

Cycling currently accounts for 2.5 per cent of personal transport in B.C. That's better than Quebec's share of 1.5 per cent and Ontario's 1.2 per cent - but both those provinces have ambitious plans to get more people on bikes. Those plans include significantly higher levels of investment than we currently have in B.C.

Among global leaders in active transportation, annual per-person investments are growing. The Netherlands spends \$48 per person per year on active transportation programs; Denmark invests \$34 per person, and New Zealand recently announced an investment of \$24 per person on infrastructure, education, promotion and safety. Lessons learned in these leading jurisdictions will help to inform the new B.C. strategy.



2.2 Improving Where We Live and Work

Our homes, schools, workplaces and other buildings play a big role in a cleaner province and a stronger economy.

For example, the green building industry now employs approximately 32,000 British Columbians in jobs ranging from architecture to manufacturing to installation. These are jobs in communities across B.C. Every dollar we invest in energy efficiency generates up to four times its value in economic growth. Then there are the benefits of living and working in a greener building, like greater comfort, lower energy use, and better air quality – both indoors and in your neighbourhood.

Every dollar we invest in energy efficiency generates up to four times its value in economic growth.

We've been moving in this direction for a while and our actions are making a difference. Between 2007 and 2016, greenhouse gas emissions from residential buildings shrank by more than 11 per cent, while emissions from commercial buildings were down 6 per cent.

When we build better buildings, we are putting new skills and newly skilled workers to work, and the building or home owner is going to save money in the long run.

Building technologies are a place where the B.C. technology sector excels. We have been a proving ground for building energy management systems and low carbon building materials, and now we will build on that foundation of innovation. CleanBC will help us move forward to a future where buildings produce no emissions at all – starting with the following actions.

2.2.1 Better Buildings: every building is more energy efficient

By 2032, all new buildings constructed in B.C. will be “net-zero energy ready.” Net-zero energy ready buildings are designed to be so efficient that they could meet all or most of their own energy consumption requirements with onsite renewable energy technologies. The change will be enacted step by step through the BC Building Code, which applies to all new construction in the province. Compared to the current base BC Building Code, new homes will be:

- 20 per cent more energy efficient by 2022,
- 40 per cent more energy efficient by 2027, and
- 80 per cent more energy efficient by 2032 – the net-zero energy ready standard.

New standards for building upgrades will be developed by 2024, guided by the model National Energy Code. Under this new code, upgrades to existing buildings will bring them up to modern standards for efficiency and comfort. This approach is designed to make the benefits of upgrading affordable and accessible, regardless of whether you own or rent.

Between 2022 and 2025, new energy efficiency standards will be set for space heaters, water heaters and residential windows. These will build on improvements introduced in 2018, which set new standards for lighting, air source heat pumps and gas fireplaces.

B.C. is also exploring an energy rating requirement for homes and buildings across the province at the point of sale or lease, similar to what we've seen on vehicles and appliances for many years. The process for generating ratings will be developed in consultation with stakeholders, with the goal of making it as simple and inexpensive as possible. The rating system would make it easier for buyers and renters to factor energy costs into their decisions while giving owners another incentive to make their buildings more efficient.

ENERGY EFFICIENCY UPGRADES IMPROVE LIFE FOR SENIORS

Creston's Erickson Golden Manor houses a vibrant community of seniors. They received a grant for energy efficiency upgrades, including replacing their "window shaker" air conditioners with heat pumps that both warm and cool.

"The quality of life of the tenants has improved 100 per cent," says Irene Walker, Chair of the Erickson Golden Agers Association. "We are reducing our energy consumption and saving money. It doesn't get any better than that."

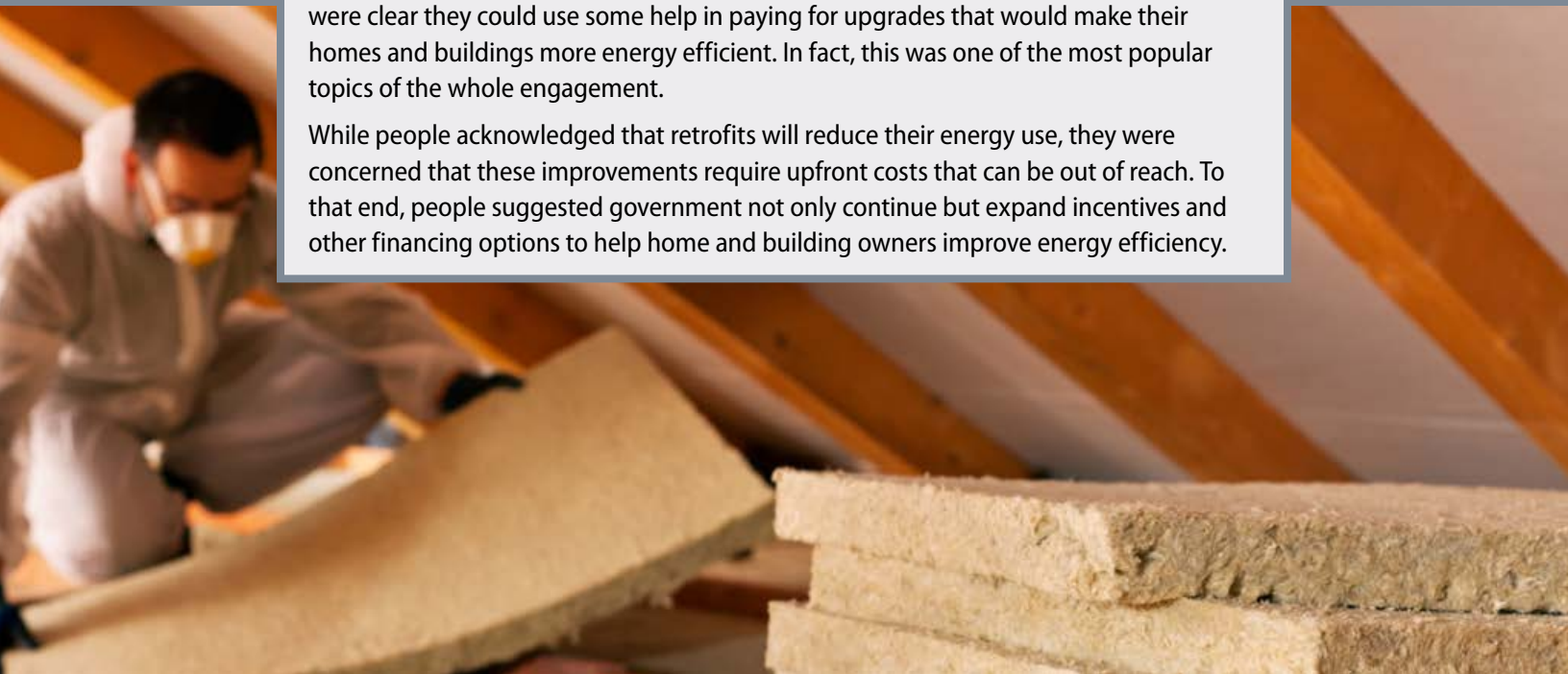
The Columbia Basin Trust's Energy Retrofit Program improved the energy efficiency of 46 buildings in 16 communities, representing over 930 affordable housing units.



WHAT WE HEARD ABOUT HOME AND BUILDING RETROFIT SUPPORT

During our 2018 online engagement about Clean, Efficient Buildings, British Columbians were clear they could use some help in paying for upgrades that would make their homes and buildings more energy efficient. In fact, this was one of the most popular topics of the whole engagement.

While people acknowledged that retrofits will reduce their energy use, they were concerned that these improvements require upfront costs that can be out of reach. To that end, people suggested government not only continue but expand incentives and other financing options to help home and building owners improve energy efficiency.



2.2.2 Supporting Better Buildings now

Changing codes and standards will make our buildings more efficient in the years to come. In the meantime, there's a lot we can do to improve the buildings we already have. For example, replacing an old natural gas furnace with an energy efficient heat pump can cut a building's space heating energy needs by 50 per cent or more, helping to make life more affordable over the long term. High efficiency windows and doors not only keep you comfortable but also shut out noise and UV rays. On a smaller scale, smart thermostats can help home and business owners reduce energy costs by up to 15 per cent, recouping their investment within months.

The Province has created the EfficiencyBC program to help people conserve energy and make their buildings healthier and more comfortable.

Launched in September 2018 with matching federal funds, EfficiencyBC offers:

- Rebates for homeowners to lower the cost of heat pumps and windows; these are integrated with incentives from utilities for insulation and other energy-saving upgrades
- Financial incentives for commercial and multi-unit residential buildings to do energy-saving studies and upgrades
- A single application for EfficiencyBC, BC Hydro, FortisBC, and local government incentives
- Free energy coaching services for homes and businesses, including a phone and email hotline staffed by energy coaching specialists
- A one-stop-shop website with an incentive search tool and useful information on options for energy efficiency upgrades
- Rebates and direct installations of energy efficiency improvements for lower-income households, starting in 2019.

These measures are helping but we need to do more to make energy-saving improvements accessible and affordable for all British Columbians. In the next three years, EfficiencyBC will expand significantly to reach more homes and businesses. It will also offer:

- targeted low-interest financing – allowing people to make improvements and pay for them over time with savings from their energy bills,
- specialized support for small businesses, and rental housing,
- specialized support for Indigenous and non-Indigenous communities, and
- high-efficiency equipment incentives for new construction.

HIGH-EFFICIENCY HEAT PUMPS

Heat pumps work by extracting heat from the air or ground outside and pushing it inside to heat your home – or pushing it out in the warmer months to keep your home cool. Because they move heat directly, rather than converting fuel into heat, they're more efficient than baseboard heaters or furnaces. When properly installed they use a third to a half as much energy. And heat pumps can be enhanced with filters that keep out pollution, dust and pollen.

As more people consider heat pumps, the Province is helping to make them more affordable. Through EfficiencyBC you can now access:

- Up to \$1,200 for replacing your electric heating system with a heat pump
- \$2,000 for replacing your oil, propane, or natural gas heating system with a heat pump

Some local governments offer up to an additional \$2,000 for converting from natural gas, oil, or propane to an electric air-source heat pump

For more on heat pumps, including help to decide which type is right for you, go to EfficiencyBC.ca/heatpumps. For more on incentives, go to EfficiencyBC.ca/incentives.



Renewing public housing

Energy performance is a key part of B.C.'s work to improve public housing. The Province has launched a \$1.1 billion, 10-year Capital Renewal Fund to support the improvement and preservation of existing, aging public housing stock in B.C. Of this, \$400 million is targeted to energy performance improvements that will lead to greenhouse gas emission reductions.

Cleaner public-sector buildings

New schools, hospitals and other facilities continue to be built in B.C. to achieve high levels of environmental performance, meeting Leadership in Energy and Environmental Design (LEED) Gold certification or equivalent. On average, these facilities have been designed to perform 40 per cent better than LEED's reference energy standard.

With this strategy we're also taking steps to make our existing stock of buildings cleaner, smarter and more energy efficient by taking advantage of the latest proven technologies. Early analysis of net-zero construction shows that savings more than make up for any added costs. As we retrofit older public buildings in communities throughout B.C. we'll create opportunities for local businesses, Indigenous peoples, professions and trades to develop the new energy step code skills and expertise to retrofit other buildings in their communities. For every one per cent improvement in its energy efficiency, including buildings and vehicles, B.C.'s public sector reduces its energy costs by an estimated \$4 million a year.

BIG ENERGY SAVINGS FOR UVIC STUDENT HOUSING

A new student housing project at the University of Victoria will accommodate 782 students – it'll be built to the Passive House standard, the world's leading standard for energy-efficient construction and equivalent to the highest step of the BC Energy Step Code. The building will use 75% less energy for heating, and at least 50% less overall energy than a typical construction design. The project replaces three aging buildings, helping the university to save on energy costs and provide more comfortable housing for students. During their construction, the new buildings will provide apprenticeships, project work and supply opportunities for local people and businesses.



Low Carbon Buildings Innovation Program

Starting in 2019, the Province will offer new incentives for builders, developers and manufacturers to stimulate the development and demonstration of innovative, low-carbon building solutions. The Low Carbon Buildings Innovation Program will accelerate the availability, acceptance and affordability of high performance solutions such as advanced building designs, advanced construction methods and ultra-efficient building components.

Funding will be available for projects in three categories, through bi-annual competitive calls:

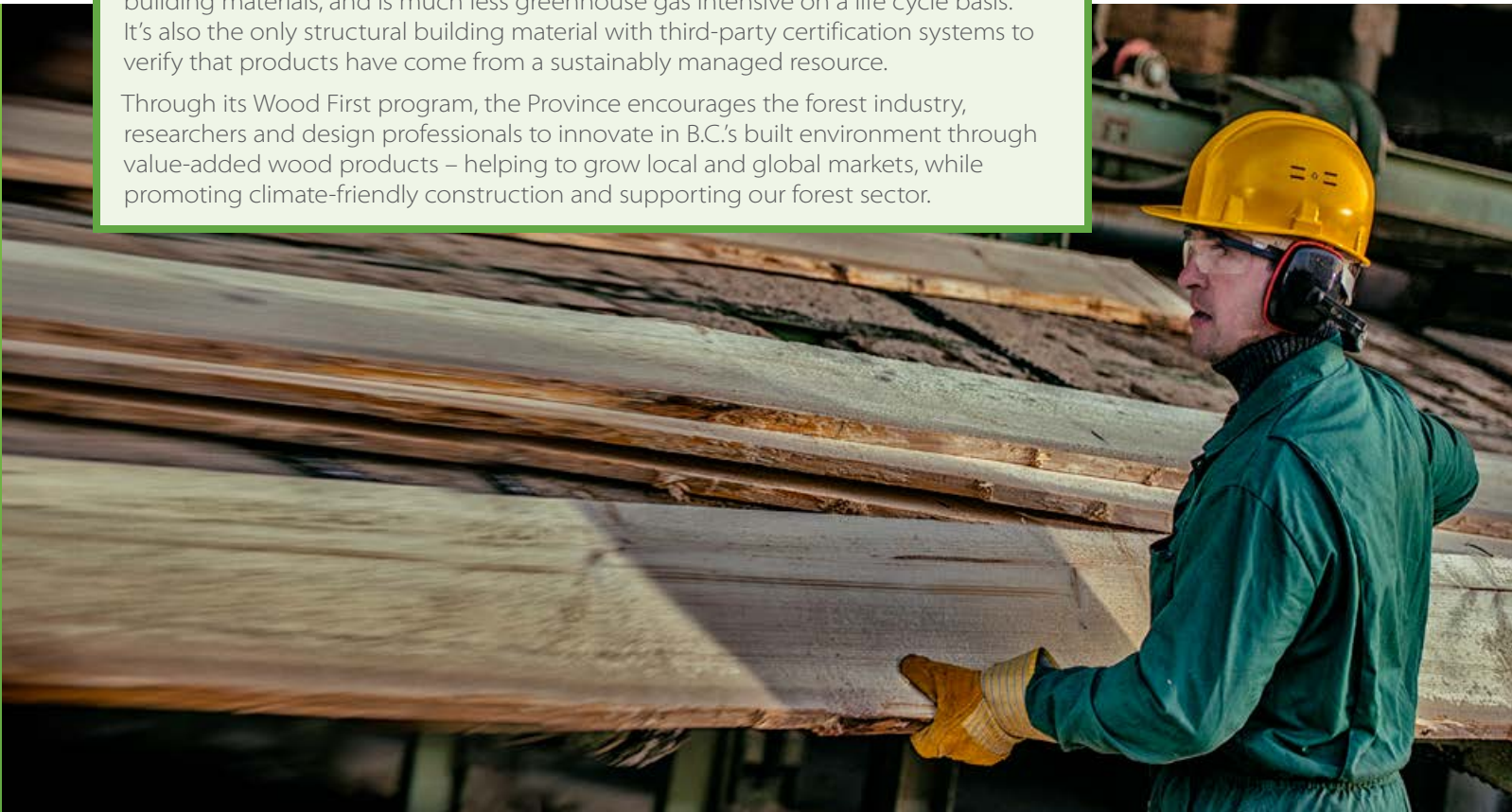
- Research – building solutions that show promise but may require further innovation before being commercialized (e.g. vacuum insulated wall panels and windows, natural gas heat pumps);
- Commercialization – building solutions that have been tested and are ready to be scaled up for wider application (e.g. high-performance prefabricated external insulation systems); and
- Demonstration – building solutions currently available in the marketplace that require demonstration to build industry capacity and public acceptance (e.g. such as net-zero energy ready construction).

Along with stimulating the development of new ideas, the program will prove to the market that existing technologies work and deliver their intended benefits. This will increase the capacity of B.C.-based industries, generate consumer confidence, and help to lower the costs of new technologies and building approaches over time.

WOOD FIRST

B.C. wood is a natural choice for low carbon building. Wood is the only building material grown by sunlight, with a lighter carbon footprint than other common building materials, and is much less greenhouse gas intensive on a life cycle basis. It's also the only structural building material with third-party certification systems to verify that products have come from a sustainably managed resource.

Through its Wood First program, the Province encourages the forest industry, researchers and design professionals to innovate in B.C.'s built environment through value-added wood products – helping to grow local and global markets, while promoting climate-friendly construction and supporting our forest sector.



2.2.3 *Help for communities*

Support for remote communities

Most people in B.C. have no trouble plugging into clean electricity. It's a different story in remote and off-grid communities – many of which are Indigenous communities – where power has to be generated locally, typically with diesel-fired generators.

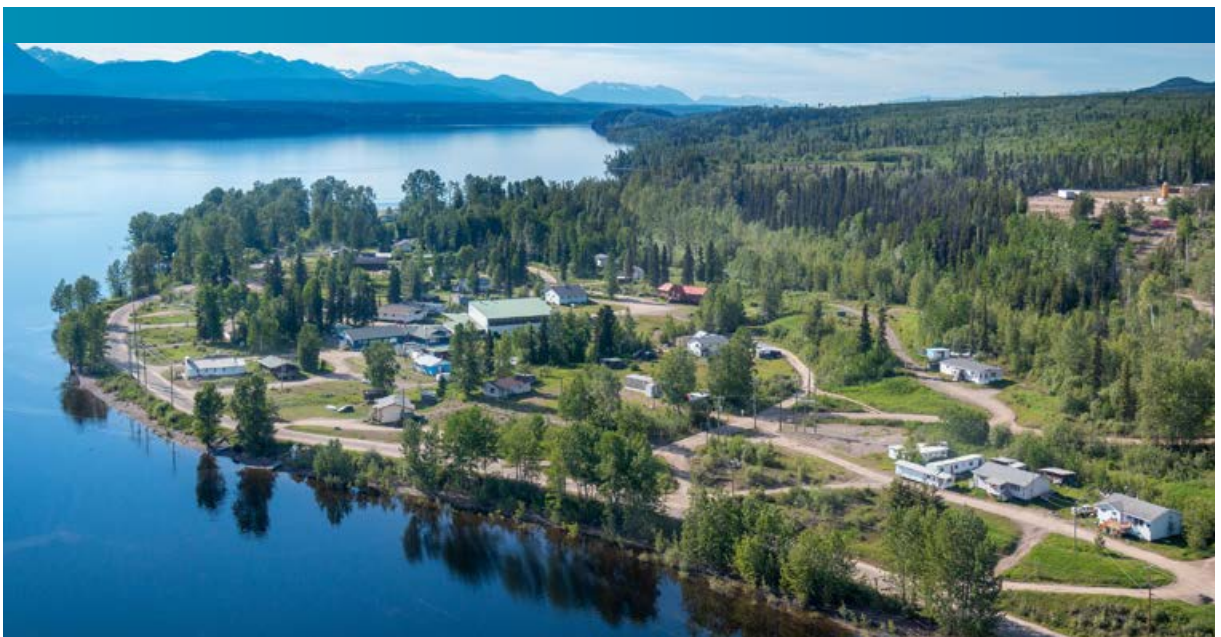
Apart from causing harmful air pollution and greenhouse gas emissions, burning diesel is the most expensive way to generate electricity. It also limits communities' potential growth and development opportunities.

As part of CleanBC, we're investing to help remote communities reduce or eliminate diesel generation and replace it with energy from cleaner sources. The funding will support a new Remote Community Clean Energy Strategy in partnership with utilities and the federal government. The four pillars of action under the Strategy are:

- support communities to develop expertise and experience in energy efficiency and clean generation;
- retrofit existing homes and buildings to make them highly energy efficient;
- develop renewable heating systems, including heat pump technology and district energy systems; and
- implement renewable energy projects to offset all or most remaining diesel generation, including rooftop solar photovoltaic and community-scale renewable systems.

By 2030, the Strategy targets the implementation of all four pillars in the remote communities served by the 22 largest diesel-powered electricity generation stations in B.C. (12 BC Hydro stations and 10 Indigenous Services Canada stations). The Strategy aims to reduce province-wide diesel consumption for generating electricity in remote communities by 80 per cent by 2030.

Additional support will be directed to the BC Indigenous Clean Energy Initiative, with matching funding from the federal government. The money will support project planning, feasibility and design in on-grid and off-grid Indigenous communities who are working to advance energy efficiency and clean energy projects.



KWADACHA FIRST NATION TURNS WOOD WASTE INTO ELECTRICITY

The Kwadacha First Nation is a community only accessible by logging roads or air. In the past, this meant relying on diesel power. Today, the Kwadacha have built a biomass plant that generates electricity and heat, cutting carbon emissions by approximately 20%.

This is the first known remote, off-grid application of biomass gasification-to-electricity in North America, and probably the world. The plant generates heat and power using wood chips from the abundant supply of trees killed by the pine beetle. The heat is used by a nearby school and greenhouses.

"We ran off diesel for too long, and this project brings some much-needed infrastructure to our very remote community," said Kwadacha Nation Chief Donny Van Somer. "Thank you to all those who helped along the way – this has created a few much-needed jobs and is a step closer to our vision of self-sustainability."

CleanBC Communities Fund

With this strategy, we're also investing – in partnership with the federal government – \$63 million to help local governments and Indigenous communities develop energy efficiency and clean energy projects. The CleanBC Communities Fund (CCF) will encourage investments in small-scale, community-owned energy generation from sources such as biomass, biogas, geothermal heat, hydro, solar, ocean or wind power to offset community energy use. The fund will start accepting applications this year with \$63 million of combined federal and provincial funding available for the first wave of capital funding. Projects will have to achieve at least one of the following outcomes:

- Increase the community's capacity to manage renewable energy,
- Increase access to clean energy transportation,
- Increase the energy efficiency of buildings, or
- Increase generation of clean energy.

Encouraging investments in small-scale, Indigenous and non-Indigenous community-owned projects will help all British Columbians make the transition away from fossil fuels. It will also generate new economic activity, new jobs, and advance B.C.'s clean energy sector.



**By 2030, these initiatives
are projected to achieve **2.0 Mt** of GHG reductions**



2.3 Reducing Waste And Turning It Into A Resource

Waste is an issue of great concern for British Columbians and can be expensive and difficult to manage for many communities. Organic waste now makes up 40 per cent of municipal landfills. Industrial and agricultural organic waste is also increasing, generating methane – a powerful greenhouse gas. This plan includes targeted measures to reduce the amount of organic waste we produce and to make better use of it. Preventing waste in the first place remains key to emission reductions, while in some cases organic waste can be used to generate cleaner sources of energy for use in homes and transportation.

Addressing organic waste is a component of a larger approach to a “circular economy” that we will address in coming initiatives. A circular economy approach values waste as a resource and moves away from the throw-away model we are used to. Growing our economy doesn’t have to mean using more

COFFEE ROASTER GOES GREEN AND GROWS BUSINESS

In 2009, B.C.’s Oughtred Coffee began a journey to measure and reduce their carbon footprint. They started with waste management, where they were able to divert over 90 per cent of their waste to recycling, while also helping start a social enterprise that turns burlap coffee sacs into reusable totes and backpacks.

They reduced both emissions and costs by investing in energy and water efficiency, as well as upgrading to a new roaster. Now, the company has cut emissions by 50 per cent and been carbon neutral for a decade, all while growing the volume of coffee they roast.



SURREY TURNS ORGANIC WASTE INTO RENEWABLE FUEL

As organic landfill waste breaks down, it creates biogas, a significant source of emissions. At the new Surrey Biofuel Facility, this waste is turned into clean products – biogas is used to make renewable natural gas, while the solid remains become compost for farms and gardens.

Surrey is putting this renewable fuel to good use, using it in garbage trucks and service vehicles, and in the future, to power a District Energy System for their City Centre. Surrey is showing communities across B.C. how they can close the loop on waste.



energy and resources. By designing waste out of the system, we will gradually transition to re-using more materials and creating more renewable energy sources that support our climate and economic goals.

Using our waste to increase our supply of renewable fuels

Not only is methane a powerful greenhouse gas, it's a source of energy we can't afford to waste. While we are producing natural gas for use in B.C. and for export, millions of cubic metres of methane are escaping into the atmosphere from our landfills, agricultural operations and sewage treatment plants.

CleanBC will put in place a minimum requirement for 15 per cent renewable content in natural gas by 2030.

This is the same methane as the natural gas in pipelines, and we can use it to meet the same cooking and heating needs. When we capture methane from organic sources such as farms and landfills it reduces carbon emissions and becomes a renewable source of energy.

As part of CleanBC, we will work with natural gas providers to put in place a minimum requirement for 15 per cent renewable content in natural gas by 2030. That means the gas we use in our furnaces, water heaters, dryers, stoves and other gas appliances will have less impact on the environment, and the

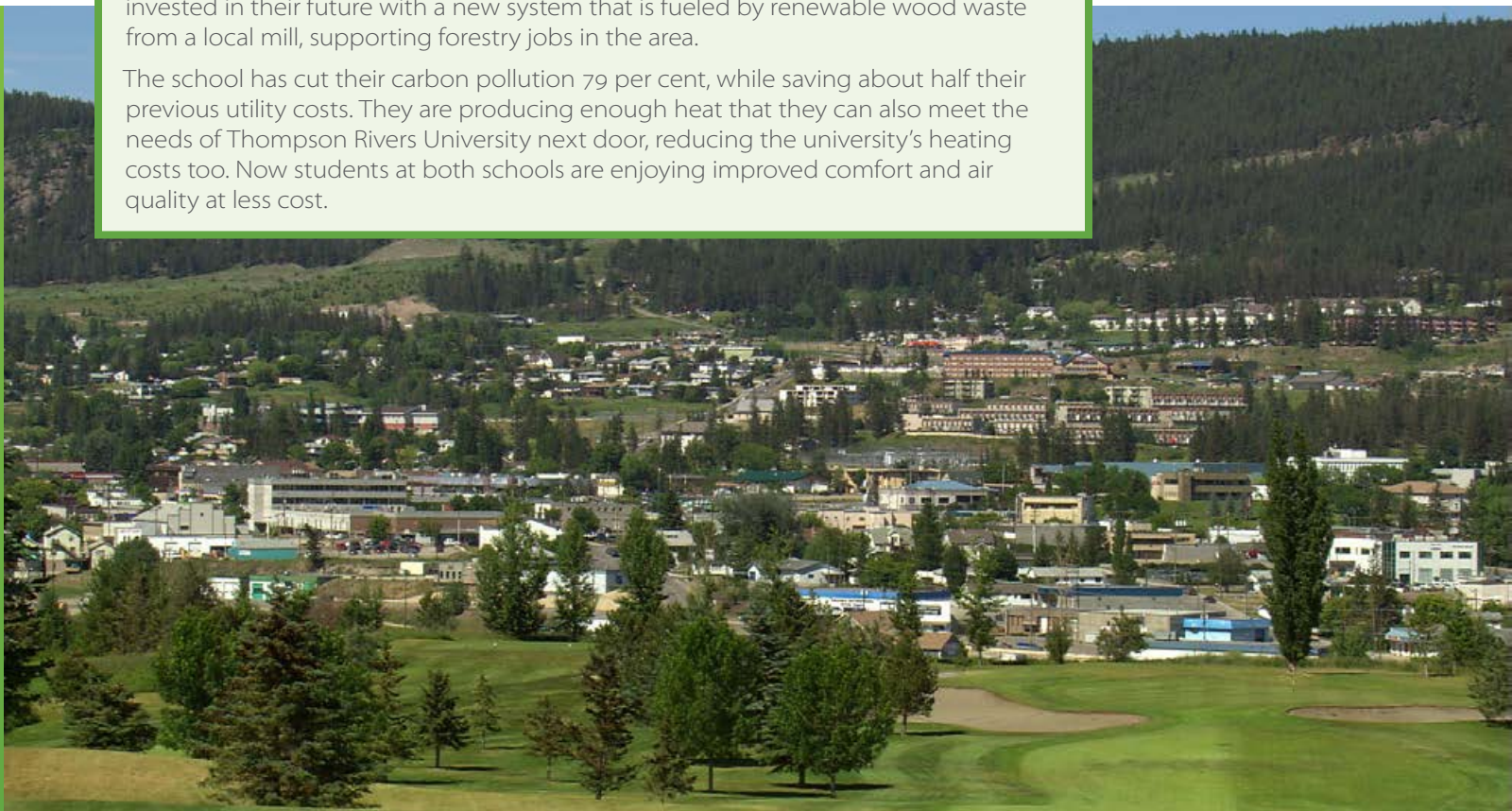
methane that is wasted from agriculture, sewage and landfills will be significantly reduced. Waste hydrogen can also be mixed with the natural gas we use in our homes and will provide additional renewable natural gas for our needs.

We will work with communities and support them to achieve 95 per cent organic waste diversion from municipal, industrial, and agricultural sources by 2030 – some of which will supply the new standard for renewable content – and maintain our commitment to capture 75 per cent of landfill gas.

WOOD WASTE KEEPS WILLIAMS LAKE STUDENTS WARM

Cataline Elementary School's outdated heating system needed replacement. So, they invested in their future with a new system that is fueled by renewable wood waste from a local mill, supporting forestry jobs in the area.

The school has cut their carbon pollution 79 per cent, while saving about half their previous utility costs. They are producing enough heat that they can also meet the needs of Thompson Rivers University next door, reducing the university's heating costs too. Now students at both schools are enjoying improved comfort and air quality at less cost.



GROWING DEMAND FOR RENEWABLE NATURAL GAS

Across B.C., farms, landfills and other facilities are turning waste into Renewable Natural Gas (RNG), allowing them to cut carbon emissions and find new revenue streams.

B.C. is one of the first jurisdictions in North America with a utility program for RNG - and customers are lining up. Through FortisBC, residents can choose to use RNG to heat their homes and hot water, and businesses can reduce their carbon footprint.

Now growing demand is encouraging more Renewable Natural Gas projects to come online, including opportunities for carbon-neutral hydrogen.

Renewing our bioenergy strategy

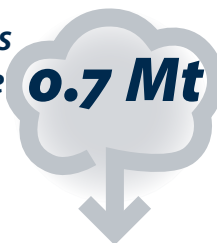
With growing requirements for renewable energy and fuel sources, B.C. will renew its bioenergy strategy, creating opportunities to turn organic waste into products and energy in areas such as agriculture, forestry and municipal organics. Key components of the strategy will include:

- investing in new biocrude refining capacity to meet our production target of 650 million litres
- helping communities develop and deploy clean technologies
- investing in bioenergy technologies and companies
- expanding production of renewable natural gas
- establishing a Centre of Excellence for Biofuels that leverages the work of the BC Bioenergy Network
- identifying and developing viable sources of hydrogen
- working with the forest sector, Indigenous and non-Indigenous communities, and the technology sector to advance the use of forest residuals for advanced building materials, commercial products and renewable fuels

Engagement, collaboration, and consultations on the strategy will begin in Spring 2019.



*By 2030, these initiatives
are projected to achieve* **0.7 Mt** *of GHG reductions*



2.4 Cleaner Industry

An economic opportunity for all British Columbians

Along with our actions to reduce GHG emissions, CleanBC provides an effective blueprint to grow our economy. Working to create the cleanest industries in the world, B.C. companies can be first movers and capture a significant share of the growing clean energy and low-carbon products market.

A strong economy means thriving industry, a well-educated and diverse workforce, good jobs and sustainable growth. For the past decade and beyond, B.C. industry have worked to reduce their carbon footprint, and have become models internationally for how to lower emissions. There is still work to do. As industry grows, so too do their emissions, making the actions in this plan all the more important. As industry continues to work with the clean tech sector to develop innovative solutions to reducing emissions, we can market our products, services, and technology to a world that is more and more interested in clean solutions.

The global market for clean tech solutions is projected to be worth \$3 trillion by 2020. B.C. already has a global brand that's recognized for quality. CleanBC provides another opportunity to build that brand and increase global market penetration while stable, efficient companies and industries will ensure a continuing supply of good jobs for British Columbians across the province.

Towards a low-carbon industrial strategy

As part of CleanBC, the Province has signed a Memorandum of Understanding with the Business Council of British Columbia, setting out a framework for a joint approach to unlocking B.C.'s full economic potential. Together, we will develop a low-carbon industrial strategy that builds on our competitive advantages and leverages further advancements to position and market B.C. companies to the world.

The strategy will focus on:

- Positioning B.C. as a destination for new investment and industry looking to meet the growing global demand for low-carbon products, services, and pollution-reducing technologies
- Enhancing British Columbia's competitive advantages while reducing our own GHG emissions intensity and helping avoid carbon leakage
- Advancing innovation that's focused on lowering emissions and reducing climate pollution
- Supporting economic opportunities for Indigenous peoples and communities, and
- Enhancing and marketing a clean B.C. brand internationally.

The MOU acknowledges that energy-intensive, trade-exposed industries may face unequal pressure from jurisdictions without carbon taxes, and commits both parties to keeping our industries competitive.

B.C. is already home to many world leaders in innovative technology and clean energy innovations. We account for nearly 35 per cent of Canada's clean tech firms. These 270 plus companies generate \$1.8 billion in revenues and employ more than 8,500 people across the province.

By supporting the good work that's already happening, and providing support and incentives for all sectors to lower their environmental impact, we will create a larger customer base and new markets across B.C., enabling our clean tech companies to test their products, scale-up, employ more people

and expand their sales to a global marketplace. All of this helps us grow and diversify our already world-leading clean tech sector.

For example, initiatives related to low carbon transportation and energy efficient home and business retrofitting will rapidly expand demand for products and services in communities across B.C. New businesses will be needed to meet this demand and they will provide good, sustainable jobs for British Columbians.

To further assist in these efforts, the Province will continue to align our innovation and entrepreneurship investments so that we can provide essential supports for the development and commercialization of the clean energy products and technologies industry needs. This approach will allow us to build on the global achievements of successful B.C. technology companies and support new and existing small and medium-sized enterprises as they capture new opportunities.

Markets for clean technology are expected to grow as millennials have indicated an even higher willingness to reduce GHG emissions. As we move forward with CleanBC, we will be reaching out to younger British Columbians to engage them directly in building our cleaner future.

CLEAN TECH COMPANIES LEADING THE WAY

Led by Ballard Power Systems, a global innovator in fuel cell technology, B.C. companies are developing new clean energy solutions for everything from portable electronics to transit bus applications. Ballard has designed and shipped over 400 megawatts of fuel cell technology to date. That's roughly equal to the annual energy needs of 80,000 homes.

In Vancouver, Corinex Communications develops and manufactures solutions for smart metering and smart grid infrastructure projects. To help homeowners reduce energy costs, Neurio delivers intelligent home energy management hardware, software and analytics.

Ostara helps cities, industries, and farms around the world protect water and food resources with game-changing technology that recovers valuable nutrients from wastewater streams and transforms them into a premium fertilizer that reduces agricultural runoff. And D-Wave is the only company in the world to sell commercial computers which use quantum mechanics to dramatically reduce the amount of time and energy required to solve complex computational problems.

In the Kootenays, Metal Tech Alley brings together partners from Trail, Rossland, Fruitvale, Montrose and Warfield to make new advances in digital fabrication and advanced materials, industrial recycling and the circular economy, which is designed to eliminate waste.

All of these advances are fueling our economy while helping us reduce greenhouse gas emissions.



2.4.1 CleanBC program for industry

The CleanBC program for industry announced in Budget 2018 directs a portion of B.C.'s carbon tax paid by industry into incentives for cleaner operations. The program is designed for regulated large industrial operations, such as pulp and paper mills, natural gas operations and refineries, and large mines.

In 2018, B.C.'s \$30 carbon tax rate was raised to \$35 per tonne, and it is set to increase by \$5 every year until 2021. As the price of carbon rises, the CleanBC program will offer incentives to further reduce emissions, funded by the carbon tax industries pay above \$30 a tonne.

The program includes:

- an Industrial Incentive that reduces carbon-tax costs for operations meeting world leading emissions benchmarks, and
- a Clean Industry Fund that invests some industrial carbon tax revenue directly into emission reduction projects, helping to make our traditional industries cleaner and stronger.

The fund and incentive work together: the fund supports projects to reduce emissions, and industrial operations with lower emissions pay less carbon tax and receive larger incentives. Initially, the fund will support the implementation of readily available technology. It will also be designed to leverage additional investments from facilities, partners, and other levels of government.

The incentive program and the fund will begin operating in 2019. Through collaboration with each industrial sector in B.C., greenhouse gas benchmarks will be identified for key products and services. The benchmarks will be based on all emission sources from a facility, including combustion, venting, flaring, fugitives, and industrial process emissions needed to compare performance across similar facilities.

Greenhouse gas emissions information is audited and reported annually for all large industry in B.C., and the CleanBC program will be based on that foundation of data. Benchmarks will be reviewed and updated regularly to ensure we keep pace with global technology development.

Requirements to apply for the fund will include:

- A detailed project plan that outlines the technologies or improved processes the facility wants to implement and the amount of emissions they expect to reduce; and,
- A business case for the project with financial details, outlining the need for funding support and justifying the request for funding.

The program will help our industries and workers thrive, create a clean industry brand for B.C., and help our traditional industries compete in a global market where consumers are demanding cleaner solutions. It will include an eligibility threshold to ensure the poorest performers have an incentive to invest in cleaner operations.

The CleanBC program for industry provides incentives for emitters to find innovative solutions to reduce GHG emissions. This will provide opportunities for a new generation of entrepreneurs who can focus their efforts on solving the problems industry has identified. This type of clarity will make it easier for B.C. companies to raise funds from investors who in turn will face less risk knowing there are willing customers.

It will also provide new opportunities and a larger market for B.C.'s innovative technology companies, supporting their development and demonstrating clean tech advantages to the world.

2.4.2 Making industrial transportation cleaner

Heavy duty transport is essential to our economy, and heavy trucks are becoming a testing ground for devices and strategies that reduce GHG emissions. Increased fuel efficiency means fewer emissions, and the industry has been developing and adopting efficiency measures for years. Every drop of fuel saved is money in the pocket, and that can mean a lot to an independent operator who measures every investment and closely manages the return on every trip.

Most highway truck tractors are shaped to make them aerodynamic and, over the past decade, we've seen new improvements such as trailer side skirts, boat tails and wide-base single tires. Truck manufacturers are also working on electric and hybrid zero-emission Class 8 tractors, known as the highway workhorse.

To further support and accelerate this clean transition, the Province is:

- Creating a new heavy-duty vehicle incentive program. This program will provide funding to promote the purchase of energy efficient equipment for large transport trucks.
- Expanding the Clean Energy Vehicle Medium/Heavy-Duty program to offer more incentives to support a transition to zero-emission vehicles and fuels in trucking, buses, port and airport ground equipment, and marine vessels. It will also support electric and hydrogen charging infrastructure for these vehicles at ports, service yards and truck stops.
- Supporting new training for heavy-duty vehicle drivers to help them make the most of new approaches and technologies.
- Partnering with the Vancouver Fraser Port Authority on a Clean Trucking pilot project to reduce emissions from drayage – the short-distance hauling of goods between terminals and other facilities such as distribution centres. The intent of the pilot is to make the latest in clean trucks and fuels available for drivers to start test driving in 2019. The lessons learned from the pilot project can be applied to other freight vehicles that operate in similar stop and go traffic environments in B.C.

Cleaner trade corridors and ports

B.C.'s transportation trade corridors and ports connect local businesses to global markets, facilitate trade and underpin both provincial and national economic growth. With trade volumes forecast to continue increasing over the next decade, key transportation sector stakeholders have formed the B.C. Clean Transportation Trade Corridors Advisory Council to address the following issues:

- Reducing absolute emissions while balancing economic growth along the corridors
- Promoting the use of clean fuel sources in transportation trade corridors and ports
- Improving efficiency of each mode of transportation involved
- Capitalizing on innovation and technology to advance clean transportation and support economic growth

The advisory council will collaborate with government and business to ensure B.C. has globally competitive, clean and efficient trade corridors.

HEALTH BENEFITS FROM REDUCING EMISSIONS FROM CONVENTIONAL DIESEL

Diesel is more efficient than gasoline but generates much more hazardous pollution. Along with its characteristic odour, diesel exhaust contains:

- **Particulate matter** that can cause or aggravate cardiovascular and lung diseases, heart attacks and arrhythmias. It can also cause cancer and may lead to atherosclerosis (hardening of the arteries), adverse birth outcomes and childhood respiratory disease.
- **Ground level ozone**, which can decrease lung function and aggravate asthma and other lung diseases.
- **Nitrogen oxides**, associated with increased deaths from heart and lung disease, and respiratory illness.
- **Polyaromatic hydrocarbons**, which have been linked to cancer.

The actions in this strategy will reduce the use of conventional diesel across B.C. and across our economy, targeting reductions in both transportation and energy-generation.

Renewable diesel – blended with fuels from renewable sources – is less carbon intensive. So are vehicles powered by natural gas. Both are important transitional fuels that can provide emission reductions while cleaner heavy-duty vehicles are being developed.

REDUCING EMISSIONS AT VANCOUVER INTERNATIONAL AIRPORT

With a record 24.2 million passengers in 2017, YVR is one of the fastest-growing airports in Canada – and it's taking action to ensure that growth is energy efficient and sustainable. For example:

- fully-electric buses, which create zero emissions, are used to move passengers between the airfield and the terminal building
- gates are provided with pre-conditioned air and ground power, which allows aircraft to use electricity instead of jet fuel
- 37 per cent of the ground handling fleet and 51 per cent of baggage support equipment now runs on electricity, and
- by 2022, a new GeoExchange system will use the earth's renewable energy to heat and cool the terminal building.

Overall, YVR has set an ambitious goal to reduce its greenhouse gas emissions by 33 per cent by 2020.



2.4.3 *Making B.C. industries the cleanest in the world – industrial and upstream electrification*

Electrification of industry is critical to meeting our climate commitments and reducing air pollution. Our goal is to make B.C. industries the cleanest in the world by using our clean energy to power our industrial economy.

Industrial processes often require large amounts of energy, with complex demands for delivery, infrastructure, and timing. To make it easier for large operations to access clean energy, BC Hydro will add new transmission lines and interconnect existing lines.

For areas like the Peace Region, this means electrifying industrial operations which up until now have depended on carbon-intensive fuels. In the South Peace, demand for electricity is growing faster than in any other part of British Columbia, largely due to natural gas exploration and development in the nearby Montney region. The Dawson Creek/Chetwynd Area Transmission Project has doubled electricity capacity in the area, allowing natural gas activities to be powered by clean electricity and avoid millions of tonnes of new greenhouse gas emissions.

In the meantime the Peace Region Electricity Supply (PRES) project will make it easier to replace natural gas combustion with electricity. Switching to clean electricity will make B.C.'s natural gas the cleanest in the world.

CUTTING EMISSIONS WITH UPSTREAM ELECTRIFICATION

In 2010, ARC Resources committed to building their Dawson Creek natural gas processing plant to produce fewer GHG emissions than was standard at the time. Electric-driven compressors were installed instead of gas-powered models and in 2018, ARC connected two more natural gas plants to B.C.'s clean electricity, significantly reducing emissions at those facilities. To reduce methane emissions, ARC is also developing a program to replace equipment with lower-emission or zero-emission pneumatics where possible.

These projects, supported by B.C.'s offset and infrastructure royalty programs, are helping drive the innovation needed to cut carbon during production.



2.4.4 Reducing methane emissions from natural gas production

Methane, which has a much higher GHG impact than carbon dioxide, is generated in many processes, from landfills to agriculture. The Province has been working in collaboration with the natural gas sector, environmental organizations and the federal government to establish new rules to reduce methane emissions in the upstream production of natural gas by 45 per cent by 2025. Using new and upgraded technologies and leak detection and repair programs, methane emissions can be reduced while keeping natural gas production economic for companies. Provincial regulations are being developed by the BC Oil and Gas Commission and are expected to be passed by 2019. The Province will pursue an equivalency agreement with the federal government to ensure our regulations and oversight remain in force for the B.C. natural gas sector.

British Columbia and the federal government are also improving our understanding of how much methane may be escaping from the natural gas sector. Through field work in 2018 we are developing an updated assessment of fugitive methane releases, equipment counts and potential leaks. We will be further investigating leading technology and evolving best practices – including detection and repair of leaks in the natural gas sector – and will assess these with a view to adapting and applying those new best technologies to B.C.'s resources beginning in 2023. With this new information we will be able to calibrate our response to ensure we capture the most methane for the least cost, keeping the sector economic while reducing carbon pollution from major emitters.

ADDRESSING EMISSIONS FROM LIQUIFIED NATURAL GAS (LNG) DEVELOPMENT

One of the conditions for LNG development in B.C. is that it fits within the Province's climate commitments. While LNG Canada is working to make its Kitimat facility the world's cleanest in terms of greenhouse gas (GHG) emissions intensity, the project could add up to 3.45 megatonnes of carbon emissions to the province's total.

Recognizing that natural gas can be a transitional fuel on the path to less carbon-intensive options, the CleanBC program for industry will encourage the use of the greenest technology available in the sector to reduce emissions and encourage economic and job growth. More reductions from LNG's climate impact will be achieved through investments in electrification of upstream oil and gas production so extraction and processing are powered by electricity, instead of burning fossil fuels.



2.4.5 Technological innovation including carbon capture, utilization and storage

Carbon capture utilization and storage is a GHG emissions-mitigation measure that integrates with B.C.'s energy systems to recycle carbon into other forms of energy or to store it permanently deep underground.

Natural gas processing plants in northern B.C. have been doing this for decades, capturing carbon dioxide and sulphur dioxide from raw natural gas and pumping it back underground. As the technology to capture and reinject carbon dioxide becomes more economic and the geologic storage is better understood, the Province is taking action to ensure it can continue to be implemented safely and securely. We will develop a safe, effective regulatory framework for underground carbon dioxide storage, not just for the natural gas sector, but also for direct air capture.

This is a growing opportunity for British Columbia. Organizations like the Carbon Capture and Conversion Institute, a collaborative venture between CMC Research Institutes and BC Research Inc, are providing the test bed for the greenhouse gas reduction technologies of the future. The alliance of research and commercialization organizations creates a unique ecosystem of experts and equipment that is unparalleled in Canada.

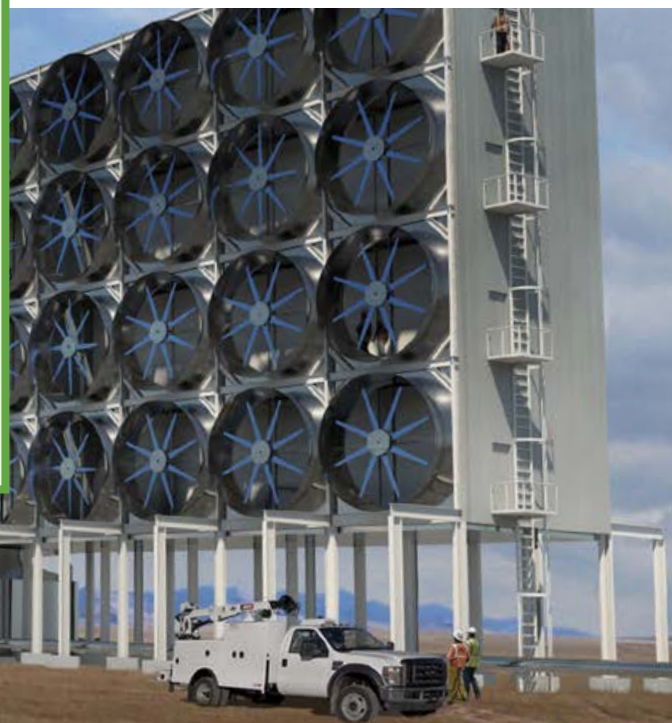
The Institute's mission is to accelerate the development, piloting, scale-up, and validation of new carbon capture and conversion technologies. They offer clients access to a comprehensive set of facilities for pilot project design, fabrication, testing and refinement. At the University of British Columbia, technology developers can work with faculty on early-stage, bench-scale technologies while the pilot project facility has infrastructure and utilities allowing for long-term trials.

This commitment to advancing technology is already paying off. For example, Squamish-based Carbon Engineering takes CO₂ out of the atmosphere and converts it into ultra-low emission transportation fuel. The company is a world leader in large-scale negative emissions technology.

B.C. COMPANY PULLS CARBON OUT OF THE AIR

Squamish's Carbon Engineering Ltd. (CE) is a clean tech company that is getting global attention. With support from B.C.'s Innovative Clean Energy Fund, they developed technology that pulls carbon emissions out of the air. They can then safely store it underground or turn it into a carbon-neutral fuel that works in any engine. By reusing existing carbon little or no additional emissions are created when this fuel is burned.

CE is now in early discussions to build commercial facilities. CE's game-changing Direct Air Capture facilities could enable the large-scale capture of carbon needed to offset emissions that may not be able to be addressed directly. Their facilities also have the potential to create 400 construction jobs and 100 permanent jobs each. Carbon Engineering is another example of B.C.'s growing clean technology.



2.4.6 Hydrogen economy

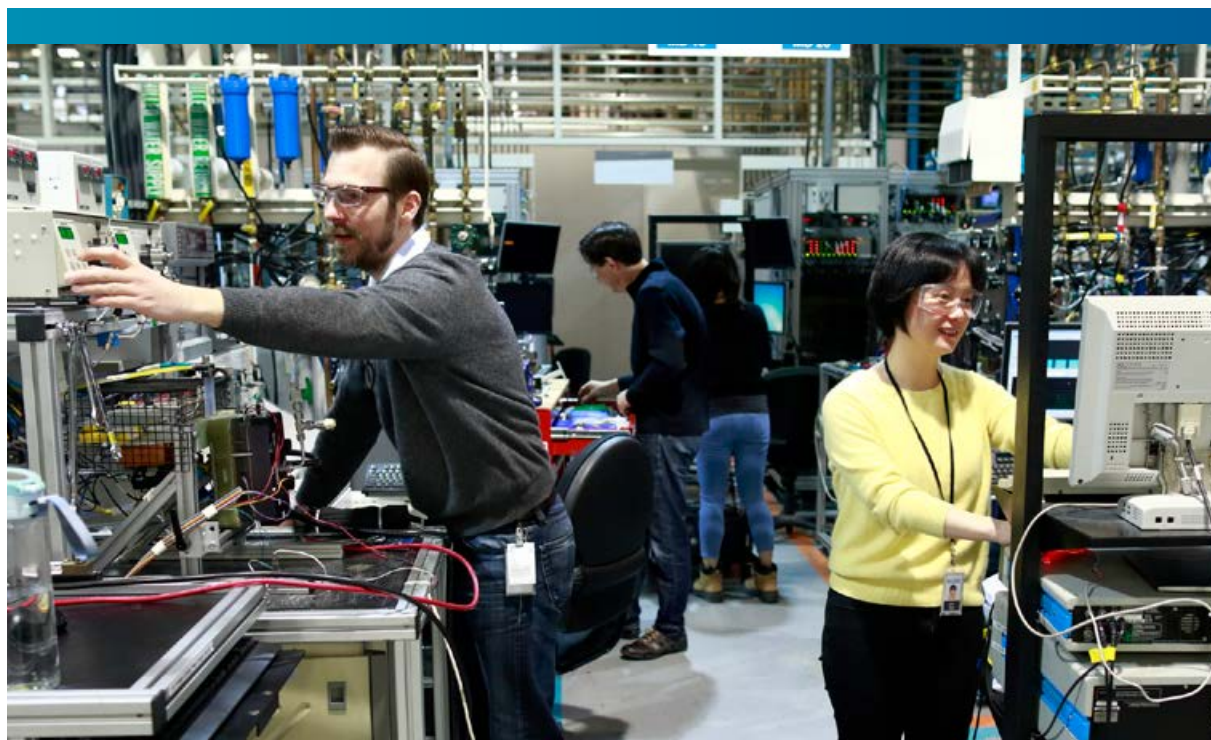
Hydrogen can play a major role in B.C.'s low-carbon energy systems. It's versatile, safe and clean when produced from B.C. electricity or renewable natural gas. It produces zero-emissions when it's used and can be stored and transported as a liquid or a gas.

Blending hydrogen with natural gas can significantly reduce emissions and provide an even cleaner transitional option where liquid fuels are needed. Clean hydrogen generated in B.C. would be among the least carbon-intensive energy products available in the world and could be used to lower the GHG intensity of LNG production.

As part of CleanBC, we will accelerate development of B.C.'s hydrogen economy with:

- financial supports for the deployment of fuel cell electric vehicles and infrastructure;
- support for centralized hydrogen production; and
- injection of sustainable hydrogen into the natural gas grid.

A B.C. Hydrogen Roadmap will be released in 2019 to grow the new low-carbon economy and identify economic opportunities throughout B.C. For example, off-grid Indigenous and non-Indigenous communities could host hydrogen fuel cell pilot projects. These new approaches could leverage our leadership in fuel-cell development to create more jobs in technology and innovation while reducing emissions across our economy.



3 HELPING PEOPLE GET THE SKILLS THEY NEED

Whether it's generating clean energy, retrofitting buildings or designing new technologies, making B.C. cleaner will create good jobs that support families and sustain our communities. We need new skilled workers, and new skills to equip those already at work across the province.

As new jobs and professions emerge, post-secondary education and training need to keep pace. So the Province is working with employers, Indigenous communities, labour groups and post-secondary institutions to analyze the labour market and identify:

- where the strongest job growth is likely to be,
- what skills are needed to meet the demand,
- what specific training we need to develop and deliver in our communities, and
- what support students and apprentices need to excel in these programs

As a first step, we are investing in two key sectors where we already know demand is strong and growing – cleaner buildings and cleaner transportation. This includes:

- **Training and certification for Energy Step Code professionals.** Since 2017, local governments have had the option of adopting the voluntary BC Energy Step Code (ESC). The ESC sets energy performance targets for new buildings, provides a technical roadmap for users and supports continuous improvements to the BC Building Code. The highest step of the ESC for any building type is “net-zero energy ready,” which is up to 80 per cent more efficient than the current base BC Building Code. The technologies and techniques needed to design and build these new buildings will be developed right here in B.C., and with the right training for our building professionals, it will mean new opportunities across the province.

GREEN SKILLS TRAINING CREATES NEW BUSINESS

Vancouver's Small Planet Supply brings builders, contractors, tradespeople and architects together to learn about improving air tightness – a key part of the requirements in BC's Energy Step Code.

This straightforward, hands-on training builds on existing skills, opening up new business opportunities for participants. They can then help clients save on energy use and costs, while greatly improving comfort and air quality.

“People find learning new skills exciting,” says CEO Albert Rooks. “It means they can deliver higher quality services.”



Now, with support from the Province, they have taken a mobile version of the course across B.C.

- **More training for ZEV-related work.** Expansion of the clean energy vehicle automotive curriculum across the province and support for electricians to upgrade their skills with the Electric Vehicle Infrastructure Training Program.

Clean vehicles present a significant economic opportunity for the province. B.C. has a highly skilled workforce and research, development activities and expertise in niche sectors that are critical to the deployment of clean vehicles and related infrastructure. This, combined with key deposits of minerals used in manufacturing of clean vehicle technologies, means B.C. is well positioned to capitalize on a global market for ZEVs and their related technologies.

Having the skilled mechanics available to keep a new clean fleet performing, and the skilled electricians to help build out supporting infrastructure, will be critical to the successful deployment of millions of vehicles across the province by 2040. Our training and apprenticeship programs will be designed to deliver the technical skills and certifications needed by this new segment of the transportation system.

SKILLED JOBS ON THE RISE

With a growing focus on clean energy, new types of jobs are opening up and demand is growing for skilled professionals in jobs such as:

- **Smart Grid Technician**, who helps to define, plan, install and manage software, firmware and smart grid systems for residential, commercial, and industrial utility customers.
- **Methane Gas Capture/Renewable Natural Gas Supply Technician**, focusing on the efficient collection, storage and utilization of methane from various sources including wastewater treatment facilities, landfill gas capture facilities or farms using anaerobic digesters.

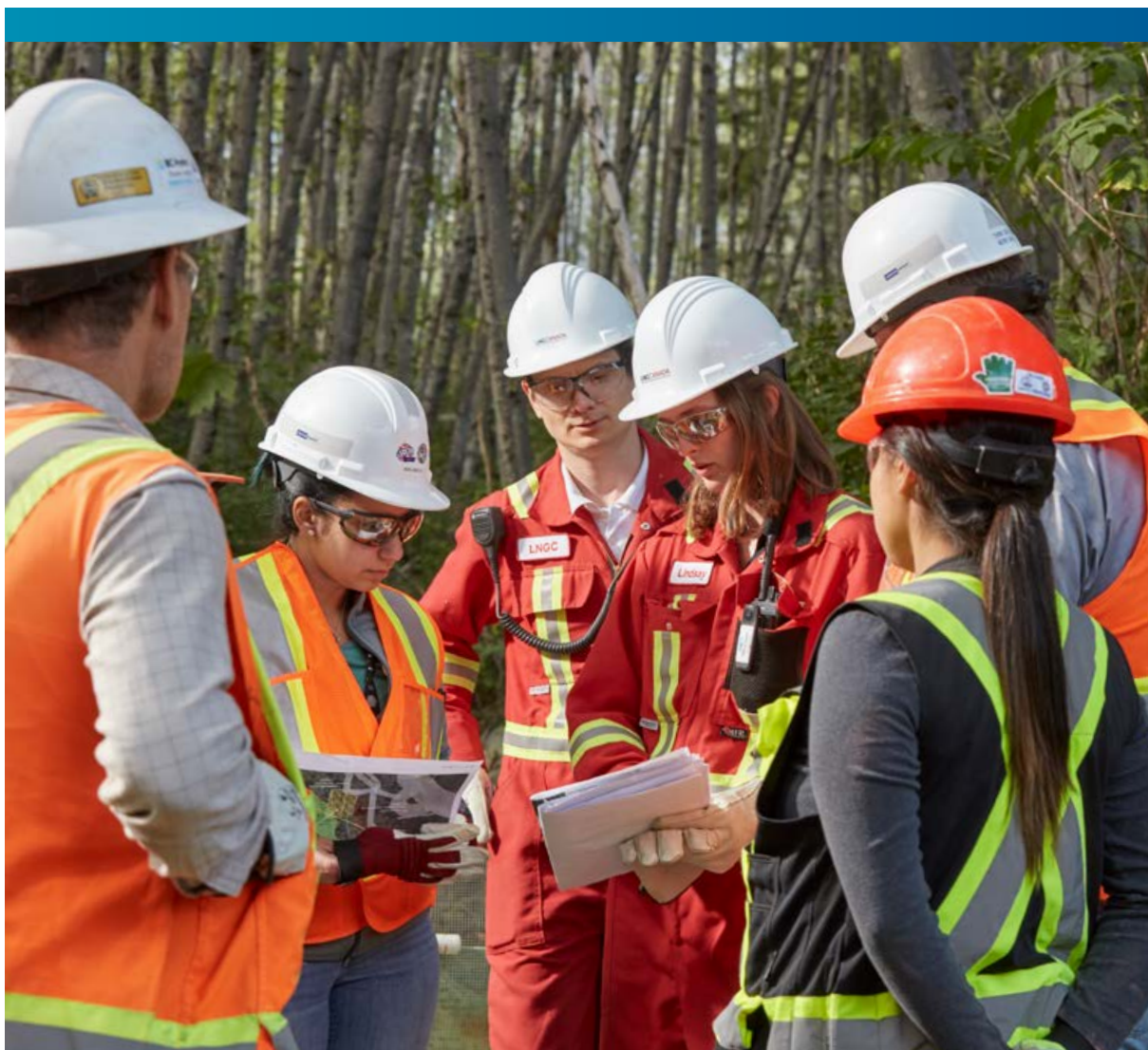


As part of this strategy, the Province is developing a CleanBC Labour Readiness Plan to address the labour and workplace opportunities that will emerge through the implementation of CleanBC. The plan will identify future occupational and skills profiles relevant to the transition to a low carbon economy, including where jobs may be located, and opportunities for mid-career workers to develop new skills.

Public engagement in 2019, including an online portal, will be used to gather public and professional input from a range of backgrounds to inform the plan's development. In addition, collaboration with Indigenous peoples on the plan will include community and regional meetings across the province.

The plan will incorporate public input, detailed assessments of labour market conditions and economic trends, address the participation of women and other under-represented communities in these roles, and respond to issues that could affect people's opportunities to participate. It will provide a framework for sector specific actions to equip British Columbians with the skills and experience they need to power our future.

The CleanBC Labour Readiness Plan will identify where additional support may be needed for lower income students, and tailored to meet the needs of Indigenous peoples, rural communities and workers. We will work with post-secondary institutions to implement the plan, developing new, skilled workers, and providing training opportunities for today's workers.





4 MEASURING OUR PROGRESS

Since 2008, B.C. has been tracking its GHG emissions and setting long-term targets for reductions. Measuring our progress towards those targets helps make sure we stay on track by adjusting and refining our approaches over time.

In May 2018 – recognizing the impacts of our growing economy and population – the Province set new targets for GHG emissions. Compared to 2007 levels, we are now committed to reductions of:

- 40 per cent by 2030,
- 60 per cent by 2040, and
- 80 per cent by 2050.

These new targets reflect the fact that early progress to meet our commitments has stalled in recent years – we are not on track to meet our goals if we don't change the way we use energy across key sectors. Compared to 2007, total net GHG emissions were down 3.7 per cent in 2016 according to our latest assessment (<https://www2.gov.bc.ca/gov/content?id=50B908BE85E0446EB6D3C434B4C8C106>).

Emissions have risen in several areas, driven by economic and population growth and a slowdown of reduction measures since 2011.

CHANGES IN EMISSIONS BY SECTOR 2007 – 2016			
HIGHER		LOWER	
Passenger vehicles	↑ 14.6%	Metal and mineral process emissions	↓ 22.3%
Oil, gas and mining	↑ 10.9%	Commercial buildings	↓ 6.5%
Heavy duty trucks	↑ 7.7 %	Residential buildings	↓ 11.1%
		Off-road transportation	↓ 14.5%
		Waste	↓ 14.3%

While the slow rate of emissions decline is troubling, we also see signs that our actions are paying off, thanks in large part to the choices made by British Columbians. For example, since 2007, emission intensities have fallen significantly in some sectors:

- GHG emissions per person have fallen by 12 per cent
- Fossil-fuel use per person is down by 10 per cent
- Overall, the carbon intensity of our economy – measured by the relationship between greenhouse gas emissions and economic growth – has decreased by 19 per cent
- In the oil and gas sector, carbon intensity has dropped by half in the last 10 years

CleanBC protects our communities and sets us on a path to a stronger, more sustainable future. The measures announced in this plan include ambitious goals for transforming the buildings we work and live in, how we get around, and how we power our economy and use cleaner energy.

Goal snapshot

Where we live and work

By 2030, emissions from buildings dropped by 40%.

- By 2032, new buildings will be 80% more efficient than a home built today (highest tier of B.C. energy step code)
- By 2030, 70,000 homes and 10 million m² of commercial buildings will be retrofitted to use clean electricity in space heating
- 60% of homes and 40% of commercial buildings will be heated with clean electricity
- Public buildings will lead the way, reducing emissions by 50% by 2030
- Overall, emissions from buildings will drop by 40%

Getting around

By 2030, fossil fuel use for transportation has dropped 20%

- By 2030, 30% of all sales of new light-duty cars and trucks will be zero-emission vehicles, rising to 100% by 2040
- To help meet increased demand for lower-carbon fuels, B.C. will support the production of 650 million litres of renewable fuels per year
- The Province will reduce GHG emissions from government vehicles by 40%
- Overall, fossil fuel use for transportation will drop by 20%

Cleaner Industry

- The CleanBC program for industry will reduce industrial emissions by 2.5 Mt per year
- By 2025, methane emissions from the natural gas sector will drop by 45%

Reduce waste and turn it into a resource

- By 2030, 95% of organic waste (including municipal, industrial, and agricultural) will be diverted from landfills and turned into other products
- By 2030, 75% of landfill methane will be captured

Adaptation

- By 2020, the Province will develop an Adaptation Strategy based on a province-wide climate risk assessment
-

Transparent, forward-looking and independent public reporting

Under the *Climate Change Accountability Act*, B.C. reports on its GHG emissions every year. However, it takes two years to gather the necessary data. That's why our latest *Progress to Targets report* is for 2016.

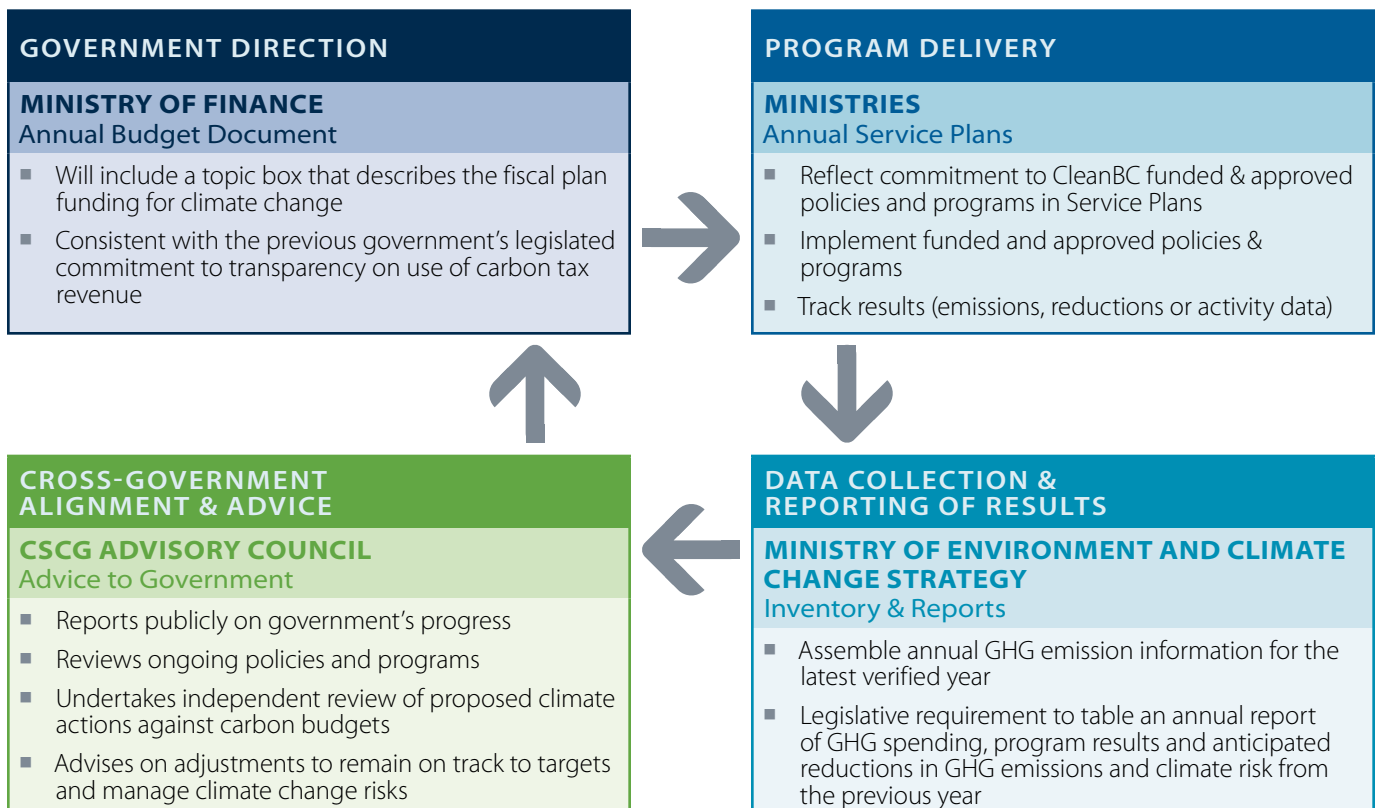
As part of CleanBC, we're committed to doing better. We're developing a new accountability framework to make sure people have access to the latest, most relevant information as soon as possible. We will continue to provide comprehensive reports on our progress under the *Climate Change Accountability Act*. We will also:

- table in the Legislature an annual report of spending, program results and anticipated reductions from the previous year,
- forecast emissions for three years in the future, based on strategic initiatives and modelling, and
- publish emissions results as we get the information.

Having more information sooner will allow our partners across all sectors to see how well their efforts are paying off, and to make early adjustments where needed.

The independent Climate Solutions and Clean Growth (CSCG) Advisory Council will provide a review of government's progress in reducing emissions as well as advice on future actions. Their first report will be available in 2019. The council includes members from Indigenous communities, environmental organizations, industry, academia, labour and local government.

Climate Change Accountability Process





5 WORKING TOGETHER

We will need to work together to protect what we care about and move towards a cleaner future. As part of this strategy we will build new – and strengthen existing – relationships with partners, including:

- **Indigenous peoples.** Working together for a cleaner future is an opportunity to advance lasting reconciliation with, and self-determination for, Indigenous peoples. Accordingly, and consistent with our commitments and obligations, we will work together with Indigenous peoples to develop a collaborative approach to engagement on the concepts and initiatives in this strategy. Collaboration with Indigenous peoples will include initiatives to build resilient communities, participate in new clean economy opportunities, recognize traditional knowledge, and help communities adapt to the impacts of climate change. This will include collaboration on a climate change adaptation strategy to be developed for 2020 and the CleanBC Labour Readiness Plan.
- **Business adaptation and industry.** B.C.'s business sector is serious about establishing the province as a world leader in supplying low carbon goods and services. And B.C. industries want to press their comparative advantages and build a clean B.C. brand. As new markets develop, business and industry leaders continue to work collaboratively with government and communities to protect jobs and ensure industries remain competitive.

By focusing on coordinated action in the near term, we can maintain and enhance our competitive advantages while building a cleaner future. For example, a newly-signed Memorandum of Understanding commits the Province and the Business Council of British Columbia to working jointly on a low-carbon industrial strategy to help our industries compete and win in the global marketplace.

- **Technology and innovation.** With hundreds of companies and thousands of employees, clean tech is one of our fastest-growing industries. Along with providing good jobs and business opportunities, the sector produces technologies that contribute to a cleaner, more sustainable world. Demand for these technologies is expected to rise significantly in the years ahead.
- **Educators and workers.** This includes working with labour groups, employers and post-secondary institutions to identify, and provide training for, new job opportunities for both new workers and mid-career workers of all backgrounds. This is consistent with the government's commitment to a fair and just transition to a cleaner economy.
- **The federal government and other jurisdictions.** Since 2016, federal, provincial and territorial governments have been guided by the Pan-Canadian Framework on Clean Growth and Climate Change, which sets out a national plan to reduce greenhouse gas emissions, grow the economy and build resilience to a changing climate.

The framework includes measures such as performance standards and regulations to encourage energy efficiency. It also includes commitments to reduce reliance on diesel fuel in northern and remote communities and fund smart grid deployment across the country. The Province and Ottawa are partners in a Forest Carbon Initiative, which invests in projects that sequester forest carbon and reduce carbon emissions – promoting the improved use of forest fibre for biofuels and longer-lived wood products.

Climate change is a global issue and no jurisdiction can tackle it alone. B.C. is also working closely with western U.S. states through the Pacific Coast Collaborative and with governments worldwide through initiatives such as the Paris Agreement. Joining forces allows us to increase our impacts and learn from one another's experiences.

- **Local governments.** From land-use planning to citizen engagement, local governments are often best positioned to make a difference in our daily lives. As we continue down the path to a cleaner future, they will play a critical role in areas such as developing new clean energy sources, supporting active and cleaner transportation options and helping B.C. transition to zero waste. Their ongoing efforts to make communities more compact, complete and energy-efficient are essential to this strategy's success.

B.C. local governments are leaders on climate action, managing their corporate and community wide GHG emissions and creating clean, compact, more energy efficient communities. CleanBC will leverage partnerships with B.C. local governments. Both urban and rural communities have a role to play as part of CleanBC and will be further engaged to help inform the next initiatives in the plan.

- **Utilities.** BC Hydro and FortisBC have a long history of partnering with people and communities to help conserve energy and switch to cleaner options. For example, FortisBC offers rebates on high-efficiency appliances, equipment and more. Meanwhile, BC Hydro has 900 customers on its net metering program, which allows them to generate their own electricity and sell what they don't use back to BC Hydro. As we move forward with CleanBC, utilities will continue to support, encourage and enable the transition to clean energy as we ensure their policies align with the Province's electrification goals and emission reduction targets.
- **Academics and non-governmental organizations.** B.C.'s post-secondary institutions are home to world-leading researchers and students that are exploring and advancing clean solutions, spanning technology and policy solutions. We are also home to active and engaged civil society organizations who have a long history working with British Columbians and all levels of government to address climate change. The input and advice of knowledgeable and engaged British Columbians has bolstered these initiatives and will continue to do so as we move forward.

We're also continuing to talk to British Columbians, as we begin to implement these activities and continue our work on remaining sectors.



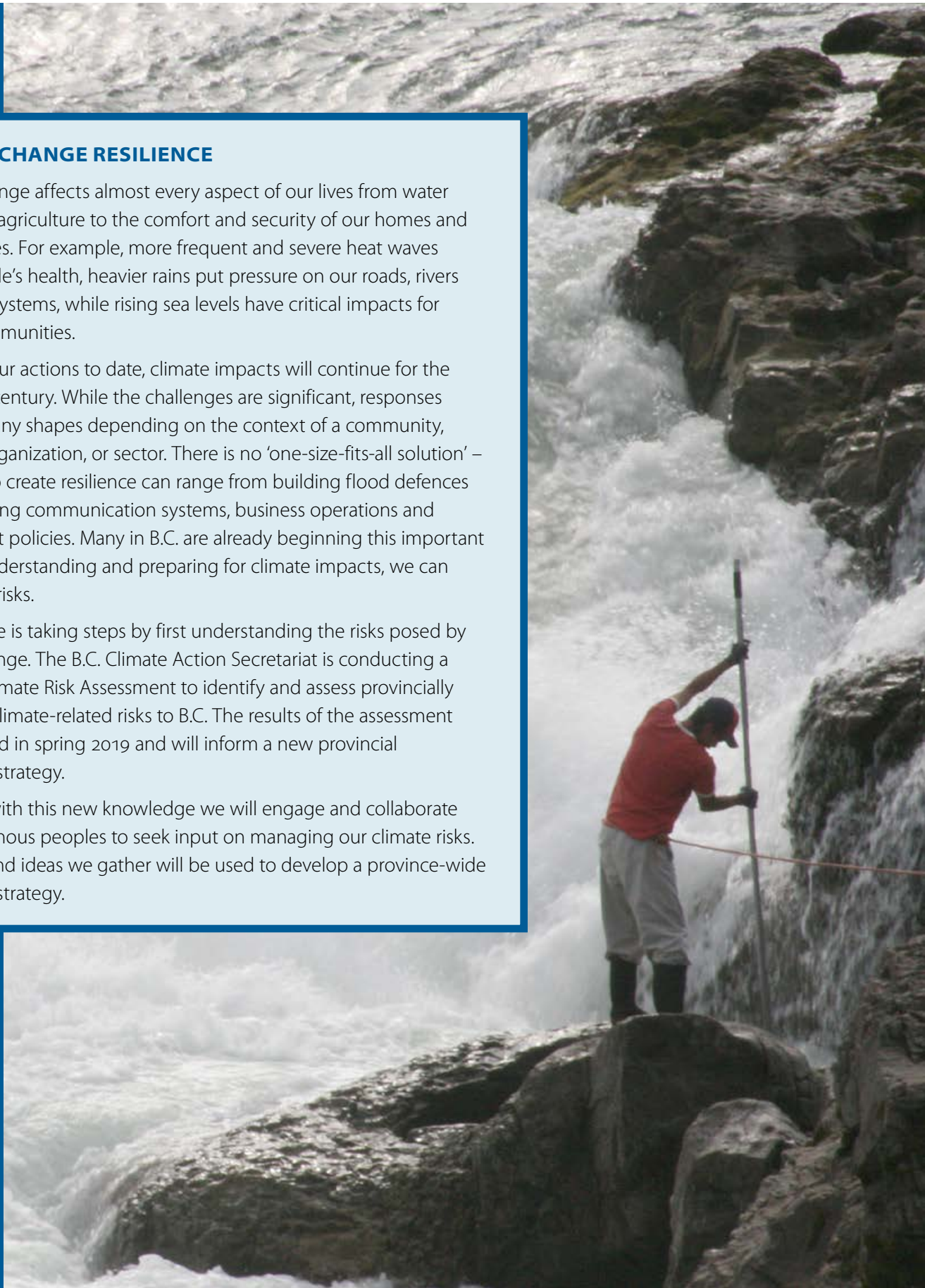
CLIMATE CHANGE RESILIENCE

Climate change affects almost every aspect of our lives from water supply and agriculture to the comfort and security of our homes and communities. For example, more frequent and severe heat waves affect people's health, heavier rains put pressure on our roads, rivers and sewer systems, while rising sea levels have critical impacts for coastal communities.

Even with our actions to date, climate impacts will continue for the rest of this century. While the challenges are significant, responses can take many shapes depending on the context of a community, business, organization, or sector. There is no 'one-size-fits-all solution' – measures to create resilience can range from building flood defences to redesigning communication systems, business operations and government policies. Many in B.C. are already beginning this important work. By understanding and preparing for climate impacts, we can reduce the risks.

The Province is taking steps by first understanding the risks posed by climate change. The B.C. Climate Action Secretariat is conducting a Strategic Climate Risk Assessment to identify and assess provincially significant climate-related risks to B.C. The results of the assessment are expected in spring 2019 and will inform a new provincial adaptation strategy.

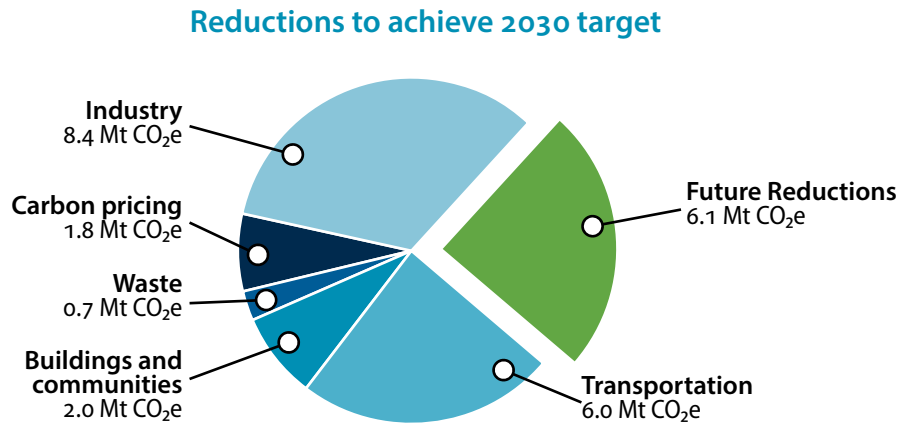
Equipped with this new knowledge we will engage and collaborate with Indigenous peoples to seek input on managing our climate risks. The input and ideas we gather will be used to develop a province-wide adaptation strategy.





6 REACHING OUR TARGETS

The industry, buildings and transportation initiatives laid out in this plan combine to reduce our emissions by 18.9 Mt, getting us 75% of the way to our 2030 climate targets.



The remaining 6.1Mt in reductions will be achieved through initiatives identified over the next 18-24 months, including:

- reducing and making better use of waste,
- improving community planning, active transportation, and transit
- cleaner heavy-duty vehicles and freight
- significantly increasing industrial electrification,
- meeting our demand for clean electricity,
- maintaining a resilient agricultural sector, and
- cleaner, more efficient technology.

Work to achieve additional emission reductions in these and other areas will continue throughout this period.

To make our 2040 and 2050 targets achievable we need additional reductions through innovation and investment. New technologies mean new jobs – good jobs that didn't exist before. They involve new equipment, new ways of doing things, and new products that save energy and money for families. As the strategy develops there will be many opportunities for new enterprise and community development.

Areas where there are still significant GHG emissions will be the focus of future actions. These remaining emissions come from fossil fuels or result from chemical or biological processes. They will not be easy to address, but we are committed to finding solutions.

We are committed to making sure that these actions achieve the emissions reductions we need. Not every step is likely to turn out as planned; some will achieve even greater results and others may need a new approach. As research and innovation deliver more solutions, we will review and update our plans.

In 2019, a renewed cross-government effort will begin to roll-out the initiatives that will get us the 6.1 million tonnes we need to reach our targets. We will continue working with British Columbians to identify and seize further opportunities in the months and years ahead, and we will take these steps in cooperation and collaboration with B.C.'s Indigenous peoples. In 2020, as part of our new accountability framework, the Minister of Environment and Climate Change Strategy will report on the new initiatives and how much closer they will bring us to our targets. Each year will have an update on what's working and what needs more attention.

Engagement, collaboration, and public consultations in 2019 will focus on topics including:

Reducing waste

Imagine living in a world without waste, where by-products of all kinds are reused, recycled and reconstituted as raw materials. Where no other option exists, they are used as a source of energy. That approach, known as a "circular economy" is what we are adopting in British Columbia, recognizing its potential for creating jobs, promoting innovation, and protecting the environment by harnessing the full value of resources.

Overall, waste is still a 1.5 million tonne problem for greenhouse gas emissions, and the negative effects of managing waste of all kinds continue to be an expensive part of our lives. Our strategy for waste will focus on prevention, which has the greatest potential for reducing GHG emissions, including those emissions that occur beyond our borders where many of the products we use are manufactured.

British Columbia's Extended Producer Responsibility program is an example of the way we will encourage manufacturers and retailers to prevent waste at the source, and we will look at new products and approaches for prevention. We'll also look at actions to increase reuse and recycling combined with key downstream mitigation measures, such as reducing methane emissions from landfills.

Other waste streams come from industry, like bark and other milling waste in the forestry sector, or manure and agricultural waste that can lead to environmental problems if we don't manage it well. We will explore solutions for these more difficult waste streams so they don't just pile up. Renewable natural gas, liquid biofuels and local bioenergy systems may be some of the solutions that also help reduce the use of higher carbon fuels.

Community planning, active transportation and transit

Community planning decisions can go a long way toward reducing our environmental impacts. For example, compact communities reduce the need to drive by having housing, shops, workplaces, schools, parks and civic facilities within easy walking distance of each other. Similarly, focusing development along existing transit routes can make daily travel easier, cleaner and more convenient. Generally, the urban planning and design choices that make communities livable also make them less energy and emissions intensive, benefiting everyone.

Future initiatives with CleanBC will include a plan for a clean communities and transportation system network, supporting industry and people of all ages and abilities to efficiently access the goods, services and markets they need. Our work in this area will focus on land-use; transportation network

infrastructure, including options for active transportation such as cycling and walking; and transportation demand management. We will address policies, programs, services and products that encourage people to use sustainable modes of transportation rather than driving alone, or to make fewer trips by car.

As part of this new plan, the Province will support local governments, the Nisga'a Lisims Government, and Treaty First Nations to use their policy tools and purchasing power to help reach our 2030 target while developing more compact communities and providing safe, convenient and affordable zero-emission transportation options.

Cleaner heavy-duty fleets and freight

Light-duty cars and trucks are only a part of our province's transportation story, and at present they are the most advanced in terms of options, affordability and near-term solutions. Lower carbon alternatives are still in development for commercial and heavy-duty vehicles, which contribute 8.1 million tonnes per year to our greenhouse gas emissions.

Next, we will be exploring new fuel and transportation alternatives for freight, including trucks and heavy equipment used in industrial operations like mining and logging. We will also be working with small business to find clean transportation options across B.C. We will build on our global transportation hubs to lower fuel costs and air pollution while making our ports attractive to global shipping fleets transitioning to LNG as a lower cost, lower GHG transition fuel.

Cleaner fuels like LNG and biofuels may be powering these fleets for some time, but we will also be attracting the leading heavy electric vehicle manufacturers to deploy their first fleets here and contribute to our climate goals.

Further industrial electrification

Just as the move to electric cars reduces emissions from transportation, switching from fossil fuels to clean electricity can make a big difference for industry and manufacturing. The industrial sector is forecast to contribute over 20.7 million tonnes of GHGs in 2030, but transitioning to electricity can be a challenge and each industry will face different technical and economic conditions.

The Province is committed to working with B.C. industries and manufacturers to identify the best pathway for each, recognizing that there are often lower carbon prices in competing jurisdictions. We will work with the Business Council of British Columbia and Indigenous businesses to find new ways to reduce emissions and develop a low carbon industrial strategy that supports a strong, sustainable economy.

We will also be working with our tech sector to find more ways to use our clean electricity to benefit B.C. and seek the advice of British Columbians on how best to support this fast-growing sector of our economy.

Electricity supply

With clean electricity as the foundation for the prosperous and sustainable future for this province, BC Hydro is taking steps to position us for enduring success in the rapidly changing global energy sector. We have begun a structural review with an eye towards reducing costs, increasing revenues and keeping rates affordable for British Columbians.

Results of this focused review will inform a broader review that identifies key B.C. and North American trends, like the falling cost of renewables and alternative visions for BC Hydro's long-term role. These include both generating and acquiring energy, maximizing B.C.'s capacity advantage, supporting clean economic development, and adapting to growth in distributed and district energy and new digital technology. This work will be carried out over the course of 2019.

Incorporating these findings and the strategic direction set by CleanBC, BC Hydro will prepare a new Integrated Resource Plan to incorporate new objectives and develop a new path forward for electricity in B.C.

Maintaining a resilient agricultural sector

The B.C. agricultural sector is already taking action to enhance agriculture's ability to adapt to climate change and contribute to reducing the province's emissions. The BC Agriculture and Food Climate Action Initiative has been working with local agricultural producers to understand the potential future impacts of a changing climate, including increasing temperatures, variable rainfall and extreme weather events. By developing Regional Adaptation Strategies, our farming communities will have the information and tools they need to maintain a resilient agricultural sector in B.C. Through the Canadian Agricultural Partnership, the Province and the federal government are investing in the agriculture, agri-food and agri-based sectors across the province and will continue to explore new opportunities to benefit from the growing demand for clean fuels and clean food.

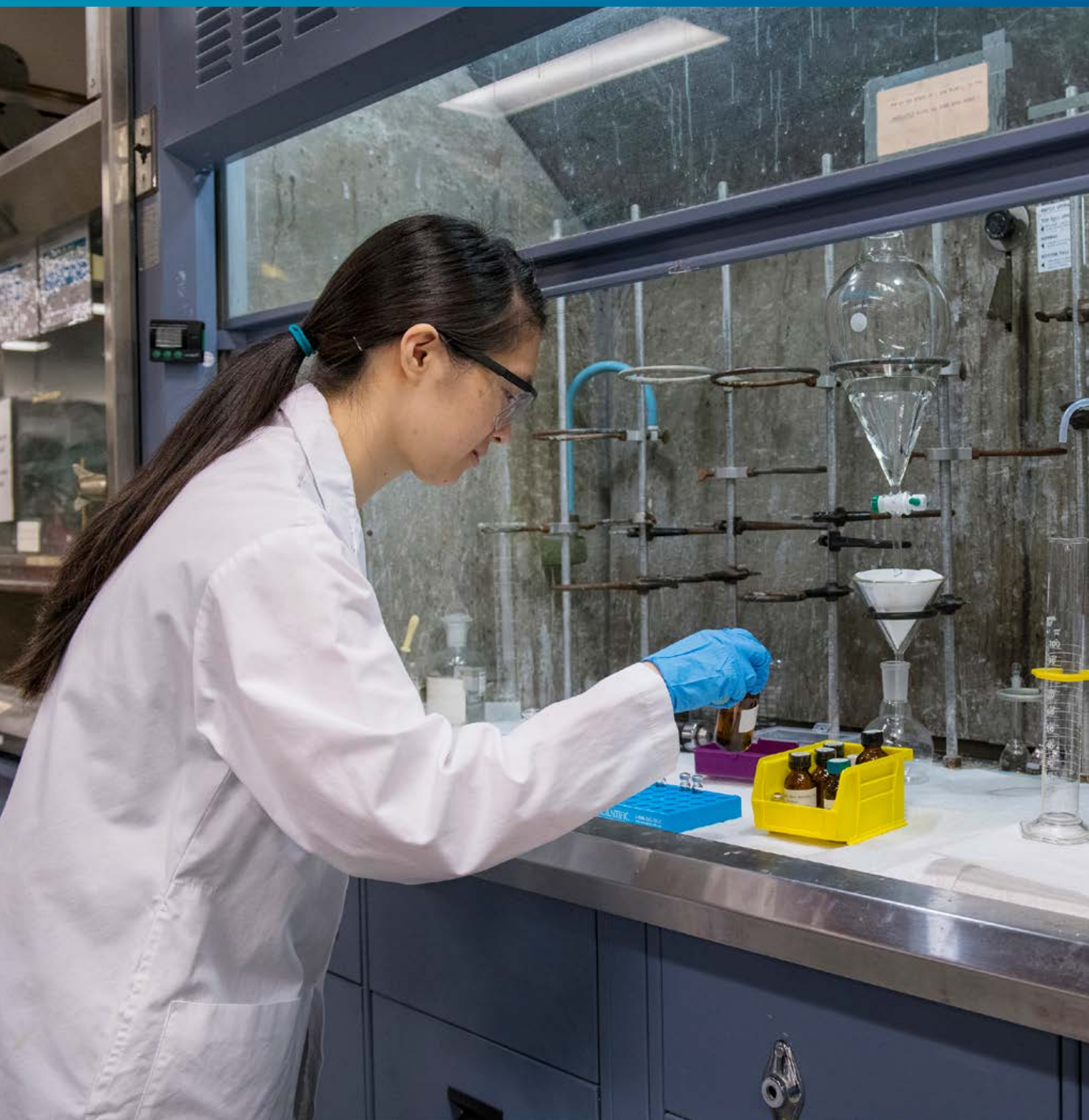
Cleaner, more efficient technology

As part of the move to cleaner industries, the Province will continue to explore technologies that have the potential to reduce emissions in sectors where there are few alternatives to fossil fuels. For example, carbon capture, utilization and storage contains carbon dioxide emissions from sources like natural gas production or manufacturing plants and either reuses it in low-carbon products, such as fuels or concrete, or stores it underground to keep it out of the atmosphere. This is just one example of the new technologies evolving to support cleaner, more sustainable industries to drive our future economy.

MineSense, a pioneer B.C. technology company, is creating digital mining solutions that provide real-time, sensor-based ore sorting for large-scale mines. They concentrate ore through superior ore-waste classification to increase revenue from higher recoveries and reduce costs spent on processing waste. MineSense was recently named to the Global Cleantech 100 and has offices and field personnel in South America, Australia and Africa and works with mining customers around the world.

Another innovative company, G4 Insights Inc., is developing and commercializing the conversion of forestry waste into pipeline grade renewable natural gas (RNG). Their process turns forestry residue such as slash piles and sawmill waste into methane, which can be used as a low carbon transportation fuel or for renewable power generation and space heating. The company is currently working on a pilot project with plans for a commercial product within three years.

APPENDIX



CleanBC initiatives by sector

INITIATIVE	DESCRIPTION	GHG Mt in 2030
CLEANER TRANSPORTATION		
Bring down the price of clean vehicles	Just over 20 years from now, every new car will be a zero-emission vehicle	
	<ul style="list-style-type: none"> Mandate 100% of new cars to be zero-emission vehicles (ZEVs) by 2040; 30% ZEV by 2030 and 10% ZEV by 2025. 	1.3
	Help people to afford cleaner cars and save money on gas bills with zero-emission vehicle (ZEV) incentives	
	<ul style="list-style-type: none"> Continue to provide rebates for light-duty vehicles Expand incentives for clean buses and heavy-duty vehicles 	0.3
	Make it easier to charge an electric car or fuel a hydrogen car	
	<ul style="list-style-type: none"> Expand the charging network with home, work and public fast-charging stations and additional hydrogen fueling stations Enable private investment in charging and hydrogen fueling infrastructure to get more stations faster 	
Speed up the switch to cleaner fuels	Phase in more renewable fuels for the gas we use	
	<ul style="list-style-type: none"> Make our fuel cleaner by increasing the low carbon fuel standard to 20% by 2030 Increase the supply of cleaner fuels by ramping up new production in B.C. of 650 million litres of renewable gasoline and diesel by 2030 	4.0
	<ul style="list-style-type: none"> Make vehicles run cleaner by increasing tailpipe emissions standards for vehicles sold after 2025 	0.4
Get to work on getting rid of gridlock	<ul style="list-style-type: none"> Help people get around with a long-term strategy to increase active transportation and look at better commuting solutions. 	
subtotal		6.0
IMPROVE WHERE WE LIVE AND WORK		
Better Buildings	Make every building more efficient	
	<ul style="list-style-type: none"> Improve the BC Building Code in phases leading up to “net-zero energy ready” by 2032 Adopt the model National Energy Code for existing buildings by 2024 Increase efficiency standards for heating equipment and windows Encourage the development of innovative and cost-effective low-carbon building solutions 	
Support for Better Buildings	Focused investments in public housing to use less energy at home	0.5
	<ul style="list-style-type: none"> \$1.1 B for Capital Renewal fund for public housing to improve living conditions, energy efficiency, and reduce emissions Incentives to make heat pumps affordable and make homes more comfortable through building envelope upgrades Retrofits for public buildings so they use less energy Improve building energy information available to buyers and renters 	
	<ul style="list-style-type: none"> Make residential natural gas consumption cleaner by putting in place a minimum requirement of 15% to come from renewable gas 	1.5
Support for Communities	<ul style="list-style-type: none"> Help remote communities reduce their dependence on diesel Support public infrastructure efficiency upgrades and fuel switching to biofuels with the CleanBC Communities Fund 	
subtotal		2.0

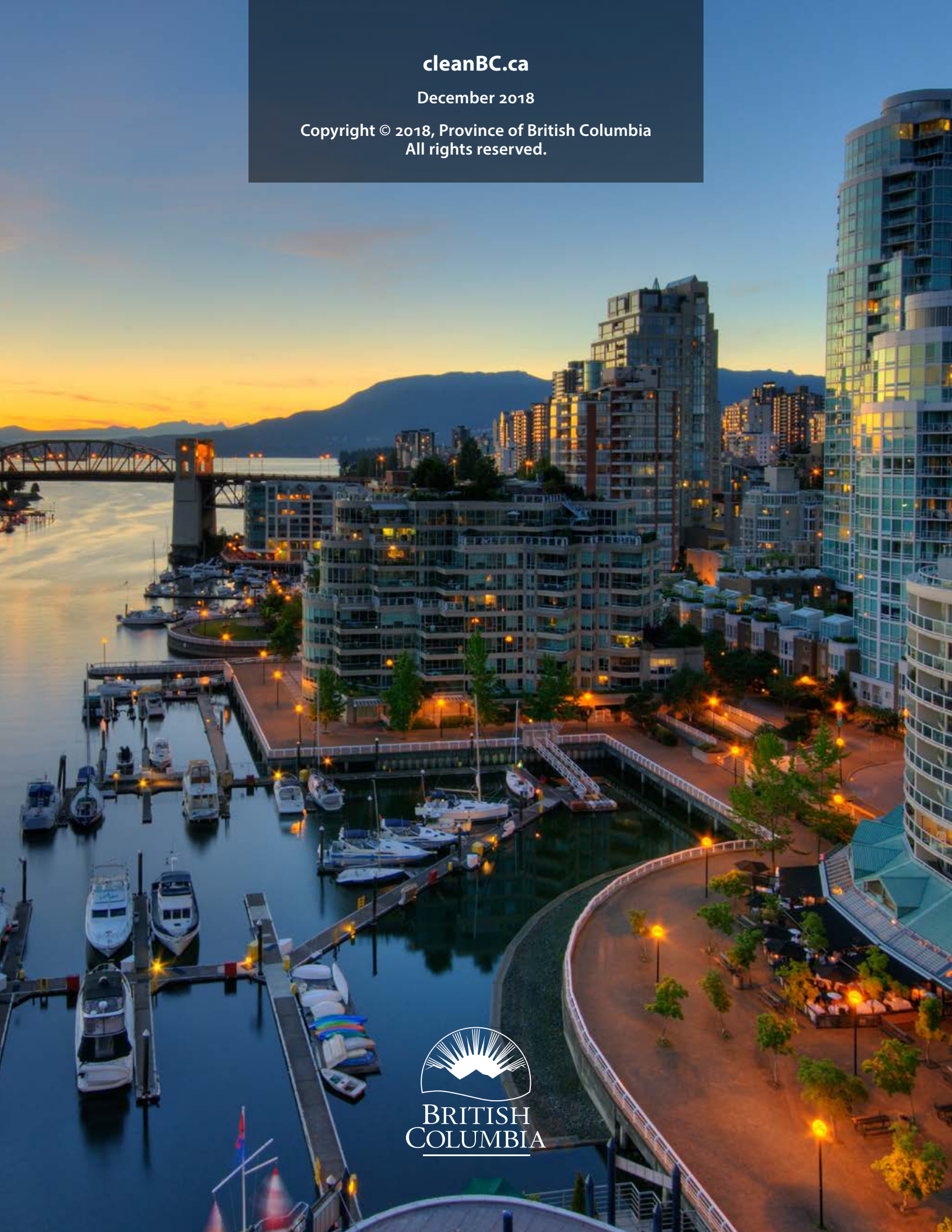
INITIATIVE	DESCRIPTION	GHG Mt in 2030
CLEANER INDUSTRY		
Ramp up the clean growth program for industry	<ul style="list-style-type: none"> Direct a portion of B.C.'s carbon tax paid by industry into incentives for cleaner operations 	2.5
Improve air quality by cutting air pollution	<ul style="list-style-type: none"> Clean up air pollution in the lower mainland with a pilot project to test options to switch 1,700 freight trucks to natural gas and low or zero-carbon fuel by 2030 Make heavy-duty vehicles more efficient with fuel efficiency improvements, education on best driving practices 	
Reduce emissions from methane	<ul style="list-style-type: none"> Reduce methane emissions from upstream oil and gas operations by 45% 	0.9
Industrial electrification	<ul style="list-style-type: none"> Provide clean electricity to planned natural gas production in the Peace region 	2.2
	<ul style="list-style-type: none"> Increase access to clean electricity for large operations with new transmission lines and interconnectivity to existing lines 	1.3
Carbon capture and storage	<ul style="list-style-type: none"> Ensure a regulatory framework for safe and effective underground CO₂ storage and direct air capture 	0.6
Cleaner fuels for industry	<ul style="list-style-type: none"> Make industrial natural gas consumption cleaner by putting in place a minimum requirement of 15% to come from renewable gas 	0.9
subtotal		8.4
REDUCE WASTE		
Reduce waste and turn it into a clean resource	<ul style="list-style-type: none"> Help communities to achieve 95% organic waste diversion for agricultural, industrial, and municipal waste – including systems in place to capture 75% of landfill gas Waste less and make better use of it across all sectors of our economy, like forestry, agriculture, and residential areas, including renewing the B.C. Bioenergy Strategy and building out the bioenergy and biofuels cluster 	0.7
subtotal		0.7
HELPING PEOPLE GET THE SKILLS THEY NEED		
Make sure British Columbians can lead the clean transition	<ul style="list-style-type: none"> Develop programs like Energy Step Code training and certification, and Certified Retrofit Professional accreditation Expand job training for electric and other zero-emission vehicles 	
MEASURING OUR PROGRESS		
Establish credible targets and a strategy to meet them	<ul style="list-style-type: none"> Roll-out associated programs and enabling legislation for CleanBC 	
Stay accountable	<ul style="list-style-type: none"> Coordinate implementation and reporting for CleanBC 	
Carbon pricing	<ul style="list-style-type: none"> Grow the carbon tax \$5.00 per year 2018 to 2021 to encourage lower emission alternatives, with rebates for low and middle income British Columbians and support for clean investments 	1.8
subtotal		1.8
2018 CleanBC TOTAL REDUCTIONS		18.9
<i>The legislated target for 2030 is a reduction of 25.4 Mt GHG from a 2007 baseline</i>		

* Policy line items represent individual reduction potential estimates. Subtotals and totals are derived from combined modeling and may be lower than the sum of policies because of policy interactions (two policies contribute to the same reduction)

cleanBC.ca

December 2018

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**BRITISH
COLUMBIA**