Efficiency Canada

Canadian Provincial Energy Efficiency Scorecard

2019

Carleton UNIVERSITY

The 2019 Provincial Energy Efficiency Scorecard

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We wish to acknowledge the following individuals who acted as peer reviewers and subject matter experts, who include, in no particular order: Maryam Rezaei, Allan Crandlemire, Peter Love, Steve Nadel, Weston Berg, Andrew Pride, Susanne Ruhle, Liam O'Brien, Mathieu Côte, Rebecca Fiissel Schaefer, James Glave, Mike Parkes, Andrew Oding, Mike Singleton, Akua Schatz, Yasmin Abraham, Oana Spinu, Lindsay Wiginton, Matthew Klipperstein, Bob Bach, Richard Laszlo, Christine Gustafson, Shawna Henderson, and Corey Diamond. We also thank Mitchell Beer for providing copy-editing.

Efficiency Canada takes full responsibility for all final decisions regarding the Canadian Provincial Scorecard methodological design and accepts responsibility for any errors or omissions.

Executive Summary

This is Efficiency Canada's first provincial policy scorecard, marking the beginning of an annual process of tracking, benchmarking, and reporting on energy efficiency policies and performance. The scorecard is released in conjunction with a comprehensive database of provincial and territorial energy efficiency policies. This online resource, available at database.efficiencycanada.org, is searchable by jurisdiction and policy area. We produced the scorecard and database to raise the profile of energy efficiency in Canada and provide guidance for the development of policies that can contribute to a more energy-efficient economy. Together, we foresee the database and scorecard becoming indispensable tools for energy efficiency policy development in Canada.

Efficiency is the unsung hero of our energy system. Without improvements in energy intensity between 1990 and 2015, Canada would have spent $38.2 billion more on energy and emitted 94.8 more megatonnes (Mt) of greenhouse gas emissions.[1]

Canada's economy also includes a large number of energy efficiency workers. A 2019 study by ECO Canada estimated that 436,000 workers were directly employed in energy efficiency in 2018.[2] That is a larger work force than can be found in key sectors of our economy – such as oil and gas, or telecommunications – that receive considerably greater policy attention.[3]

However, much more can be done. In May 2018, a national efficiency potential study by the International Energy Agency and Natural Resources Canada found that economically and technically feasible energy efficiency measures in Canada could deliver average final energy savings of 1.9% per year between 2016 and 2050.[4] This scenario would see the energy we save accounting for more than 40% of Canada's energy needs by 2050. In June 2018, a report by the Generation Energy Council suggested an overarching milestone of bringing economy-wide energy efficiency improvements from 1% per year today, to 2% by 2025 and 3% by 2030.[5]

[1] Natural Resources Canada, "Energy Efficiency Trends in Canada: 1990-2015," Government of Canada, 2018, http://oee.nrcan.gc.ca/publications/statistics/trends/2015/index.cfm.
[2] Environmental Careers Organization of Canada (ECO Canada), "Energy Efficiency Employment in Canada" (Calgary, AB: Natural Resources Canada; Government of Canada, April 2019).
[3] 2018 employment in oil and gas extraction was 203,599, and 2018 employment in telecommunications was 123,448, according to CANSIM Table 281-0024, employment by industry.
[4] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050," Insight Series 2018 (Paris: International Energy Agency, 2018).
[5] The Generation Energy Council, "Canada's Energy Transition: Getting to Our Energy Future, Together" (Ottawa: Natural Resources Canada, June 2018).

Methodological Approach

This report provides a transparent, evidence-based, and comprehensive look at energy efficiency achievements and policies. Provinces receive a total score out of 100 across five policy areas: energy efficiency programs, enabling policies, buildings, transportation, and industry. The top scores in each policy area are based on best-in-class benchmarks and best practice policies.

The scorecard provides a snapshot in time, rather than an analysis of performance over several decades, and relies on empirical data which has a natural time lag associated with it. Thus, a province's score in some areas might be a lagging indicator that reflects previous policy initiatives, particularly when tracking quantitative metrics.

The analysis is also restricted to policies that were in place from January 2018 to June 2019. This period saw some important policy shifts, with new initiatives announced in provinces such as British Columbia and Nova Scotia, and backsliding in Ontario and Alberta. Scores in the latter provinces reflect both historic leadership and more recent policy shifts. Future scorecards will reflect new policy developments, especially as we track changes in scores over time and highlight provinces with significant improvements or regressions.

These methodological factors ensure that the scorecard follows the evidence rather than the latest headlines, and assesses the performance of an entire province rather than actors within that province – be they governments, utilities, regulators, or private sector firms.

Results

Table ES1 shows scores for each province by policy area, demonstrating how provinces show leadership in different areas. British Columbia leads in buildings, enabling strategies, and industry, Québec is the national leader in transportation efficiency, and Nova Scotia receives the top score in energy efficiency programs.

Table ES1. Summary of Provincial Scores

Rank	Province	Energy Efficiency Programs (35 pts.)	Enabling Policies (22 pts.)	Buildings (18 pts.)	Transportation (17 pts.)	Industry (8 pts.)	Total (100 pts.)
1	British Columbia	9	**14**	**14**	13	**6**	**56**
2	Québec	11	12	5	**14**	6	48
3	Ontario	15	12	9	7	5	47
4	Nova Scotia	**18**	11	6	5	6	45
5	Manitoba	13	6	6	2	5	32
6	Alberta	9	8	5	3	6	30
7	Prince Edward Island[6]	13	6	3	3	1	26
8	New Brunswick	6	7	1	7	4	24
9	Saskatchewan	2	6	4	1	5	18
10	Newfoundland and Labrador	4	6	2	2	1	15

Scores rounded to whole numbers. Figures might not sum due to rounding.
***Bold** indicates highest score in a category, which might be higher due to rounding.*
Provinces are highlighted in tiers of 10.

[6] Note that PEI's final score is renormalized from a total of 97 (rather than 100 points) because data was not available for the 3 points awarded for commute to work shares.

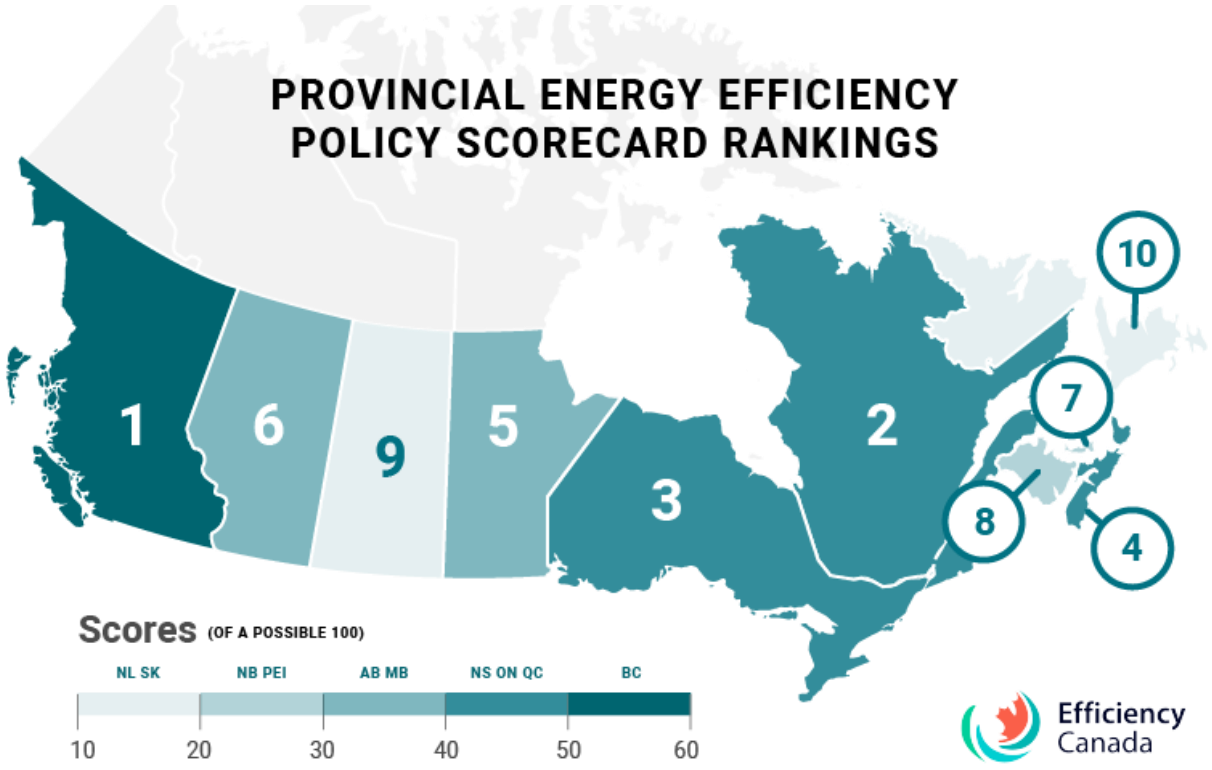

Figure ES1. Map of Canada with Ranks and Highlights by Tiers of 10

Figure ES1 shows provincial rankings, divided into five tiers for easy comparison. British Columbia receives the top score, followed by Québec, Ontario, and Nova Scotia in the second scoring tier.

British Columbia's Energy Step Code, which offers local governments a shared pathway to achieving net-zero energy-ready buildings, contributes to the province's strong lead in buildings. The province also receives high scores for supporting policies on carbon pricing, grid modernization, and vehicle electrification (including a commitment to ban sales of new internal combustion vehicles by 2040, and zero-emission vehicle-ready building codes). This robust policy framework is integrated with the province's long-standing energy efficiency programs.

Québec is the country's vehicle electrification leader, performing the best on metrics related to the number of electric vehicle registrations and charging stations. The provincial policy framework uses cap and trade income and other dedicated revenue sources to support energy efficiency across all fuels through Transition énergétique Québec (TEQ), working in conjunction with utilities and government departments. This policy framework achieves significant natural gas savings and supports an aggressive target to reduce oil use. The province is also a leader in energy efficiency research and development. It had the largest share of Natural Sciences and Engineering Research

Council (NSERC) grant funding for energy-related research going to energy efficiency projects, and supports efficiency-related research through organizations such as Hydro-Québec's Energy Technologies Laboratory, the Centre of Excellence in Energy Efficiency, and the Natural Gas Technologies Centre.

Ontario led Canada in electricity savings in 2017, and has developed building codes and appliance standards that are among the most energy-efficient in North America. It is the only province with a mandatory building energy reporting and benchmarking program, and has a high number of trained Certified Energy Managers compared to other provinces. The province lost points in this scorecard due to regressive policy changes, including cutbacks in electricity program budgets and cancellation of the Conservation First Framework, cancellation of electric vehicle charging policies, removal of a provision in the building code that would enable electric vehicle charging, and cancellation of a cap and trade system whose revenues bolstered energy efficiency. However, we also note recent policy statements that could see Ontario take a leadership position in natural gas energy efficiency, and the mobilization of private financing to support energy efficiency through the proposed Ontario Carbon Trust (now referred to as the Emission Reduction Fund).

Nova Scotia leads in energy efficiency programs, with relatively high electricity savings and a policy framework that makes considerable investments in non-electric energy efficiency, as well as programs targeting energy poverty. The province also leads in training and professionalization, with the highest number of energy managers and advisors relative to the number of buildings and industries. It has introduced important enabling policies, such as local improvement charges/Property Assessed Clean Energy (PACE), and has comprehensive industrial programs.

This scorecard identifies areas of strength, and potential areas for improvement, across all provinces. There is considerable room for every jurisdiction to improve energy savings performance and develop more robust efficiency policy frameworks.

Table ES2 summarizes provincial strengths and suggested areas for improvement, with further details available in the concluding chapter.

Table ES2. Provincial Strengths and Areas for Improvement		
Province	Strengths	Priority Areas for Improvement
British Columbia	BC Energy Step Code Appliance and Equipment Market Transformation Natural Gas Program Savings Targets Program Innovation and Coordination	Electricity Program Savings and Targets Building & Home Energy Ratings and Disclosure
Québec	Transportation Electrification Research and Development Natural Gas Savings GHG Reduction Funding	Building Codes Building & Home Energy Ratings and Disclosure Electricity Savings and Targets
Ontario	Building Energy Reporting and Benchmarking Grid Modernization Program Savings and Innovation Appliance and Equipment Standards	Policy Certainty and Transparency Natural Gas Savings Financing
Nova Scotia	Program Savings Training and Professionalization	Net-Zero Energy-Ready Buildings and Step Codes Building & Home Energy Ratings and Disclosure
Manitoba	Energy Efficiency Programs Long-Term Targets	Transportation Electrification Training and Professionalization
Alberta	Electricity Program Savings Financing	Energy Savings Targets and Policy Stability
Prince Edward Island	Energy Poverty Reduction Programs Energy Savings Targets	Building Codes and Energy Advisor Certifications Evaluation of Program Results
New Brunswick	Fast Charging Electric Vehicle Infrastructure Energy System Planning	Building Codes Regulatory Governance Stable Non-Electric Efficiency Funding
Saskatchewan	New Building Codes Industrial Programs	Energy Efficiency Programs
Newfoundland and Labrador	Electricity Programs Conservation Voltage Reduction	Energy Poverty Programs Building Electrification Transportation Electrification

Structure of Report

This report discusses each policy area and individual metric in turn. The introductory chapter outlines the methodology, scoring, and overall results, including a discussion of energy efficiency in the Canadian territories. The next chapters discuss energy efficiency programs, enabling policies, buildings, transportation, and industry in turn. Each policy area discussion includes an introduction, the methodological and scoring approach, results, and considerations for future scorecards. Some chapters include benchmarking and information that was not used for scoring but is provided for informational purposes. The concluding chapter goes into detail on strengths and priority areas for improvement in each province, and discusses considerations for future scorecards.

We will continue to refine our methodology and the issues we track. We look forward to making the Canadian provincial policy scorecard a tool for sharing best practices and raising the profile of one of Canada's most abundant clean energy resources – energy efficiency.

Introduction, Methodology, and Results

Purpose

This is Efficiency Canada's first provincial policy scorecard, marking the beginning of an annual process of tracking, benchmarking, and reporting on energy efficiency policies and performance.

The scorecard is released in conjunction with a comprehensive database of provincial and territorial energy efficiency policies. This online resource, available at database.efficiencycanada.org, is searchable by jurisdiction and topic, and provides information for scoring and benchmarking.

We have produced the scorecard and database to raise the profile of energy efficiency in Canada, and to provide guidance for the development of policies that can contribute to a more energy-efficient economy. The database tracks some topics that are not part of this scorecard report. For instance, you can find a description of provincial and territorial energy efficiency program administrative models, policy frameworks for appliance and equipment standards, and cost-effectiveness testing methods. We are asking for your help keeping this database accurate and up to date by notifying us of any policy changes by e-mailing database@efficiencycanada.org. The database will be updated annually as part of the scorecard process.

Efficiency is the unsung hero of our energy system. Without improvements in energy intensity between 1990 and 2015, Canada would have spent $38.2 billion more on energy and emitted 94.8 more megatonnes (Mt) of greenhouse gas emissions.[7] Canada's economy includes a large number of energy efficiency workers as well. A 2019 study by ECO Canada estimated that 436,000 workers were directly employed in energy efficiency in 2018.[8] That is more than can be found in other key sectors of our economy – such as oil and gas, or telecommunications – that receive considerably more policy attention.[9]

However, much more can be done. In May 2018, a national efficiency potential study by the International Energy Agency and Natural Resources Canada found that economically and technically feasible energy efficiency measures in Canada could deliver average final energy savings of 1.9% per year between 2016 and 2050.[10] This scenario would see the energy we save accounting for more than 40% of Canada's

[7] Natural Resources Canada, "Energy Use in Canada."
[8] Environmental Careers Organization of Canada (ECO Canada), "Energy Efficiency Employment in Canada."
[9] 2018 employment in oil and gas extraction was 203,599, and 2018 employment in telecommunications was 123,448, according to CANSIM Table 281-0024, employment by industry.
[10] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."

energy needs by 2050. In June 2018, a report by the Generation Energy Council suggests an overarching milestone of bringing economy-wide energy efficiency improvements from 1% per year today, to 2% by 2025, and 3% by 2030.[11]

The provinces and territories play a critical role in improving Canada's national energy efficiency performance because key policy areas such as public utility regulation, building codes, and municipal planning fall under provincial jurisdiction. This is why Efficiency Canada is placing a spotlight on provincial actions - to celebrate successes and share best practices, and to highlight areas where policymakers could make the biggest improvements.

Our first scorecard benefits from previous experience. First, we are learning from the example of the American Council for an Energy-Efficient Economy's (ACEEE) state policy scorecard, which has been published for 13 years.[12] As well, the Canadian Energy Efficiency Alliance (CEEA) published provincial report cards during the 2000s.

This report provides a transparent methodology to evaluate provincial energy efficiency policies. We know there will be future refinements and areas for improvement. The report also contains important benchmarking information. Many chapters include indicators that were not used for scoring but provide valuable information for us to understand the state of energy efficiency in Canada, and areas of provincial policy strength.

Methodology, Data Collection, and Review

Developing the first comprehensive Canadian scorecard relied upon extensive outreach and expert advice in the development of our methodology. Efficiency Canada contracted Dunsky Energy Consulting as well as the ACEEE to help develop the methodological approach. We consulted representatives from governments and utilities in every province and territory, starting in the summer of 2018, on the goals of the scorecard and its initial design. We also reached out to subject matter experts in areas such as building codes, transportation, and industrial efficiency.

We followed a three-stage process to collect data on provincial policies and performance. First, we worked with three graduate students at Carleton University who undertook desk research on provincial energy efficiency policies. We then identified policy areas where third-party data was available, and where information needed to be collected or verified through information requests. Second, in April 2019, we circulated an Excel-based information request to provincial government representatives, major utilities and energy efficiency program administrators, providing the draft findings from the desk research for respondents to correct or update based on policies that were in place, or would be, by June 2019. Finally, based on the responses, we asked follow-up

[11] The Generation Energy Council, "Canada's Energy Transition: Getting to Our Energy Future, Together." (Ottawa: Natural Resources Canada, June 2018).
[12] "The State Energy Efficiency Scorecard," American Council for an Energy-Efficient Economy (ACEEE), 2018, https://aceee.org/state-policy/scorecard.

questions and conducted additional desk research where necessary. A draft report with initial findings was circulated to respondents to provide a final check on the accuracy of information. We also relied on subject matter expert advisors to provide guidance and answer questions. These expert advisors were also given a confidential draft report to conduct a peer review.

Time Period Covered

The scorecard provides a snapshot of energy efficiency policies and performance over a specific timeline. The timelines covered in the report vary based on the availability of relevant information. Quantitative information for different provinces was available over different years. For instance, some provinces could only report energy savings data in 2018, while other provinces could only report for 2016. Thus we report some data over differing time frames and explain below how we compared provinces using the information available. In future years, we aim to work with provincial and territorial representatives to receive more recent data and create a more dynamic annual accounting of efficiency outcomes.

Where data was obtained from third parties, we used the latest information available or over a series of years that fit the context of the metric being tracked. For instance, some information came from the 2016 Census, while some research and development expenditure data covers the years 2014 to 2018. When tracking such activities as research and development expenditures, pilot projects, or building code compliance studies, we used a longer time frame that was consistent with the period over which such activities normally take place to ensure the analysis was relevant and up to date.

The report also tracks qualitative policy indicators, based on yes or no questions on whether each jurisdiction had implemented specific policies, such as a particular building code or a carbon price. We restricted our analysis to policies in place from January 2018 to June 2019, leading to a methodological issue regarding how to score when policy changes occurred over this time. If a policy was implemented by June 2019, a province received full points. In some instances, half points were awarded for jurisdictions that made demonstrable progress toward full implementation. When jurisdictions cancelled energy efficiency policies, we subtracted points for any policy changes up to June 2019. More points were subtracted if policy cancellations created significant disruption or occurred earlier in the 18-month time frame. These policy regressions were particularly evident in Ontario and Alberta, in areas such as energy efficiency programs and carbon pricing.

The provincial scores combine jurisdictions' past performance (based on historical data on quantitative outcomes) and the evolution of their policy frameworks and capabilities over time. The scorecard is grounded in evidence, which does not necessarily mean provincial scores track the very latest policy developments or news of the day. As provinces and territories implement new policies, future scorecards will increase or decrease their scoring, enabling us to track provinces with significantly higher or lower scores.

Scoring

We created a scorecard for provinces based on 100 points distributed across five policy area categories: energy efficiency programs, enabling policies, buildings, transportation, and industry, with specific scores for sub-categories or metrics within each policy area. Maximum scores represent “stretch” goals, reflecting best-in-class policies and performance that are consistent with the level of ambition needed to grapple with climate change, energy poverty, and productivity challenges while meeting national policy goals.

We assigned weights across the broad policy area categories based on estimated efficiency savings potential from a recent national study by the International Energy Agency and Natural Resources Canada.[13] This study broke down potential energy savings between 2016 and 2050 across sectors, finding that the largest proportion of potential savings came from buildings (28%), followed by transportation (25%). A further 12% of the potential savings were found in the industrial sector, not including oil and gas. The oil and gas sector alone accounted for 21% of potential savings, and the remaining 14% were found in “other” sectors, including energy supply and agriculture.

The relative weighting between buildings, transportation, and industry reflects the potential identified in the IEA/NRCan study. Potential savings in the industry sector may be higher in provinces with large oil and gas sectors, but this discrepancy should be mitigated through our weighting of provincial efforts in programs and enabling policies, which include topics related to oil and gas such as energy savings, carbon pricing, and research, development, and demonstration.

Energy efficiency programs and enabling policies are cross-cutting. Weights for these categories were based on the ACEEE scorecard, consultation with Dunsky Energy Consulting, and our own judgement. We recognize that programs are more likely to impact savings in buildings and industry than in transportation, though enabling policies should affect all three sectors.

The tracking combines “outcome” metrics which measure the performance of a jurisdiction, such as energy savings achieved or number of energy efficiency-related certifications, and “policy” metrics using a qualitative yes/no assessments. More weight was generally applied to outcome metrics.

We worked with our consultants and reached out to experts and stakeholders to determine a list of metrics and policy areas to track based on the following criteria:

[13] International Energy Agency and Natural Resources Canada, “Energy Efficiency Potential in Canada to 2050.”

1. **Measurable**: Could policy performance be objectively measured?
2. **Comparable**: Were the policy areas relevant and replicable across provinces?
3. **Actionable**: Could provinces take action to improve outcomes and/or add to the policy mix?
4. **Data availability**: Could either quantitative or qualitative data be accessed?
5. **Consensus**: Was there general agreement on the importance of this policy area?
6. **Capacity**: Did Efficiency Canada have the financial and human resources necessary to analyze information in sufficient time?

Table 1 presents the scoring by major category and specific policy area.

Further details of the scoring methodology for each policy area are provided in the chapters below.

We chose this scoring approach to present a transparent methodology that offers insight into areas of provincial policy strength. A caveat is that this scoring is a unique index. Overall provincial scores should not be compared to states' scores in the ACEEE scorecard. To draw useful comparisons between provinces and sub-national jurisdictions in other countries, it is best to consider specific topic areas. In future years, we envision adjusting the allocation of points to reflect emerging trends in energy efficiency, updates in the policy landscape, and refinements as we develop the capability to track policy areas more closely and learn from previous experience. The scorecard should thus be viewed as an evolving indicator and not a standardized index.

Table 1. Policy Areas and Metrics	Maximum Score
Energy Efficiency Programs	35
Annual incremental savings from electricity efficiency programs	10
Annual incremental savings from natural gas efficiency programs	7
Non-regulated fuels efficiency programs	3
Spending on efficiency programs	12
Energy poverty programs	3
Enabling Policies	22
Energy efficiency savings targets	6
Support for financing	3
RD&D and innovation	3
Training and professionalization	4
Grid modernization	3
Carbon pricing	3
Buildings	18
Building codes	8
Code compliance activities	3
Energy rating and disclosure	4
Appliance and equipment market transformation	3
Transportation	17
Zero-emission vehicle mandate	2
Electric vehicle public charging policies	2
High-efficiency vehicle consumer incentives	2
Support for EV/PHEVs in building codes	1
EV registrations	4
Number of public electric vehicle charging stations	3
Commute to work shares	3
Industry	8
Policies to encourage energy management systems	7
Cogeneration	1
Total	100

**We deduct points for policies or programs that were abruptly cancelled in 2018 and before June 2019.*

Area Beyond Scope, and Data Limitations

The scorecard focuses on public policies and their outcomes at the provincial level. Thus, we do not consider the role of federal policy, except where it might enable provincial action. For instance, many provincial programs were supported by the federal Low-Carbon Economy Fund.

The scoring excludes activity at the municipal level, except where provincial actions might enable or impede municipal efficiency initiatives (e.g. financing through local improvement charges/Property Assessed Clean Energy programs). Important municipal policies might be in place, especially if there is a void in provincial policy. For those interested in municipal information, we suggest consulting the QUEST Smart Energy Communities Benchmark, which considers energy efficiency policies and programs at the local level.[14] This initiative tracks policy areas such as local transportation and land use planning that are complementary to our provincial focus.

We have not included a scoring of territorial policies. The territories have unique energy contexts, and it is challenging to find publicly available information on energy efficiency initiatives. The following section highlights territorial activities, and we include territorial information in our online policy database.

The scorecard focuses on public sector policy. It thus provides a measure of policy best practices and performance, rather than a ranking of provinces' overall energy intensity. We also focus more on the role of governments and other public organizations (e.g. efficiency program administrators) than the private sector. However, public policy and the private sector are intertwined, and we report indicators where private sector actors contribute to public policy success, and/or where the private sector is influenced by policy. For instance, private sector actors are involved in electric vehicle charging, the decision to acquire training and certifications, and financing. In the future, we will work alongside organizations like the ACEEE to seek out reliable information on the private sector's contribution to energy savings.

The scorecard's transportation section focuses primarily on the integration of private transport with buildings and grids. Thus, we track progress in vehicle electrification and novel policy areas such as the development of EV-ready building codes. This focus on electrification and the efficiency of passenger cars is consistent with the largest efficiency potential identified in the IEA/NRCan national potential study noted above. A broader set of policies and indicators could include freight transport, public transit funding, and urban design. The QUEST Smart Cities Benchmark and the Pembina Institute's work on freight transport provide more information on these policy areas.[15]

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[14] "Smart Energy Communities Benchmark," QUEST, August 30, 2018, https://questcanada.org/project/smart-energy-communities-scorecard/.

[15] For example, see Lindsay Wiginton et al., "Fuel Savings and Emissions Reductions in Heavy-Duty Trucking: A Blueprint for Further Action in Canada" (Calgary, AB: Pembina Institute, April 2019), https://www.pembina.org/reports/freightclimateblueprints.pdf.

Several of the chapters below include discussion of future considerations for improved benchmarking, scoring, and information collection. Through the process of developing the scorecard, we encountered several data limitations that hindered the assessment of energy efficiency progress. We were also able to find unique datasets that helped illuminate the state of play in areas such as university-based R&D and building benchmarking. Sometimes these data were used for scoring or provided for illustrative purposes.

Overall Results

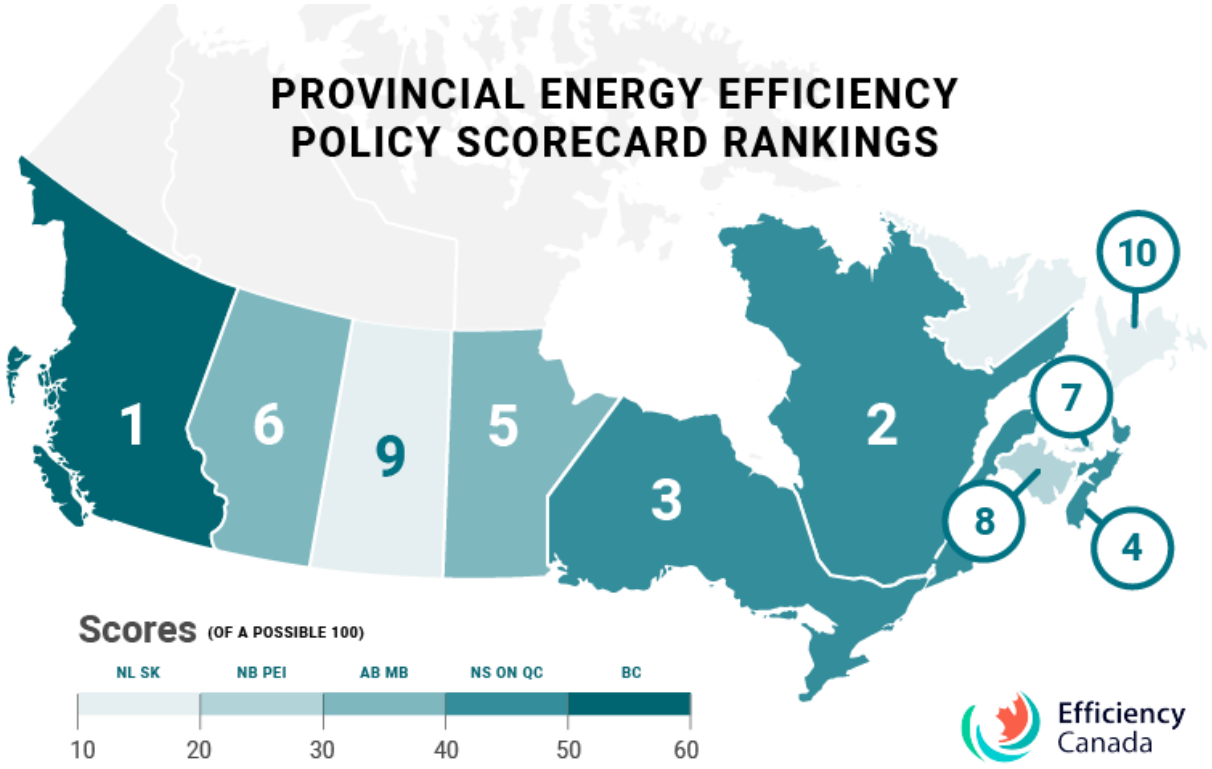

Figure 1. Map of Canada with Ranks and Highlights by Tiers of 10

This is the first comprehensive scoring of energy efficiency policy in the Canadian provinces. The overall results are presented in Table 2.

We list total provincial results in tiers of 10 (e.g. Ontario, Québec, and Nova Scotia all score in the 40s), and bold the highest score in each category.

Table 2. Summary of Provincial Scores

Rank	Province	Energy Efficiency Programs (35 pts.)	Enabling Policies (22 pts.)	Buildings (18 pts.)	Transportation (17 pts.)	Industry (8 pts.)	Total (100 pts.)
1	British Columbia	9	**14**	**14**	13	**6**	**56**
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Scores rounded to whole numbers. Figures might not sum due to rounding.
***Bold** indicates highest score in a category, which might be higher due to rounding.*
Provinces are highlighted in tiers of 10.

[16] Note that PEI's final score is renormalized from a total of 97 (rather than 100 points) because data was not available for the 3 points awarded for commute to work shares.

In 2019, **British Columbia** leads the nation in energy efficiency. The province ranks highest on buildings, enabling policies, and industry. The BC Energy Step Code, which offers local governments a shared regulatory pathway to achieving net-zero energy-ready buildings, gives the province a strong lead. The province's buildings policies are integrated within utility- and provincially-administered energy efficiency programs, and with its traditional leadership on appliance and equipment market transformation. British Columbia's long-standing carbon price, its grid modernization initiatives, and its support for industry capacity-building also contribute to a high score for policy leadership. The province has also demonstrated consistent support for vehicle electrification and sustainable transportation, including a commitment to ban sales of new internal combustion vehicles by 2040, and novel local government policies such as electric vehicle ready building codes.

The next tier of high scores includes Québec, Ontario, and Nova Scotia.

Québec is the country's vehicle electrification leader, performing the best in metrics related to the number of electric vehicle registrations and charging stations. The provincial policy framework uses cap and trade revenues and other dedicated revenue sources to support energy efficiency across all fuels through Transition énergétique Québec (TEQ), working in conjunction with utilities and government departments. This policy framework achieves big natural gas savings and produces the province's aggressive target to reduce oil use. The province is also a leader in energy efficiency research and development. It had the largest share of Natural Sciences and Engineering Research Council (NSERC) grant funding for energy-related research going to energy efficiency projects, and supports efficiency-related research through organizations such as Hydro-Québec's Energy Technologies Laboratory, the Centre of Excellence in Energy Efficiency, and the Natural Gas Technologies Centre.

Ontario scores well in all categories. It achieved the best results for electricity savings in 2017, and has developed building codes and appliance standards that are among the most energy-efficient in North America. Ontario is the only province with a mandatory building energy reporting and benchmarking program, and it has a high number of Certified Energy Managers. This demonstrates Ontario's recent leadership and its solid energy efficiency work force and policy infrastructure.

However, the province received lower scores in some policy areas because of regressive policy changes, including:

- Cancellation of the 2015-2020 Conservation First Framework and reduction of electricity program budgets by 50%[17]
- Elimination of the carbon cap and trade system that collected revenue to support energy efficiency programs;
- Cancellation of electric vehicle charging infrastructure programs;
- Cancellation of the Electric and Hydrogen Vehicle Incentive Program;
- Elimination of building code regulations that required residential buildings to include supporting infrastructure for electric vehicle charging.

Many of these initiatives were abruptly cancelled, which increases customer and market uncertainty. Ontario would also have scored better had it been able to supply data on program spending from cap and trade revenues.

While the scorecard tracks recent policy setbacks and the potential for lower scores in the future, we also note recent policy statements that would see Ontario take future leadership in natural gas savings, and in mobilizing private finance to support energy efficiency through the Ontario Carbon Trust (now referred to as the Emission Reduction Fund).

Nova Scotia leads in energy efficiency programs, with relatively high electricity savings and a policy framework that makes considerable investments in non-electric energy efficiency, as well as programs targeting energy poverty. The province also leads in training and professionalization, with the highest number of energy managers and advisors relative to the number of buildings and industries. It has introduced important enabling policies such as local improvement charges/Property Assessed Clean Energy, and has comprehensive industrial programs.

All provinces have opportunities to improve their energy efficiency policy frameworks. The conclusion of this report includes a more detailed discussion of provincial strengths and areas for improvement.

[17] Brendan Haley, “Ontario Government Breaks Election Promise to Support Electricity Conservation,” *Efficiency Canada* (blog), April 12, 2019, https://www.efficiencycanada.org/ontario-government-breaks-promise-to-support-electricity-conservation/.

All provinces also demonstrate areas of strength, creating many opportunities for learning and sharing of best practices across the country. A few illustrative examples include:

- The BC **Energy Step Code** presents a clear path toward net-zero energy-ready buildings and enables municipal leadership. As provinces consider how to reduce emissions and adopt new federal model energy codes, they can look to British Columbia's example.

- Manitoba has introduced clear, annual and multi-annual **minimum energy efficiency targets**. This reinforces the concept of energy efficiency as a resource and should drive the province's long-standing energy efficiency programs across all fuels toward bigger program savings, as well as improvements in building codes and support for appliance and equipment market transformation.

- Ontario has a **mandatory building energy and water reporting program** and leads the country in the number of buildings reporting energy savings for benchmarking. Many other provinces are experimenting with voluntary programs for homes and larger buildings, and would benefit from evolving toward a mandatory policy like Ontario's.

- Prince Edward Island, Nova Scotia, and Manitoba have dedicated investments toward low- to moderate-income households to **reduce energy poverty**. These provinces lead in investment levels per energy poor household using different policies, such as multi-fuel program approaches and dedicated funds.

- British Columbia, Québec, and New Brunswick have found different ways to support **electric vehicle charging** and provide vehicle consumer incentives. New Brunswick's network has the highest concentration of **fast chargers**. Examples from these provinces demonstrate the role to be played by utilities, governments, and non-governmental organizations.

We encourage our readers to use this report and the companion online database as tools for policy development. The discussion of particular policy areas provides relevant information on provincial policies and benchmarks. The overall scores should be interpreted as an indicator of the robustness of a jurisdiction's policy framework or "policy mix,"[18] and can help provinces fill gaps to reinforce their areas of existing policy strength.

[18] Jan Rosenow, Florian Kern, and Karoline Rogge, "The Need for Comprehensive and Well Targeted Instrument Mixes to Stimulate Energy Transitions: The Case of Energy Efficiency Policy," *Energy Research & Social Science* 33 (November 2017): 95–104, https://doi.org/10.1016/j.erss.2017.09.013.

The Territories

We did not include the territories in our overall scoring, largely due to challenges accessing information and some methodological challenges finding useful comparisons given the unique context of energy systems in the territories. In future years we aim to explore how to incorporate energy efficiency policies in the territories, and territorial policies are tracked in our policy database.

Below, we discuss the energy efficiency policy context in each of the territories and highlight areas of leadership. Energy efficiency improvements in Canada's north create significant benefits, given the importance of heating and the high cost of off-grid energy systems. As discussed below, the northern climate provides opportunities for research and testing to deliver insights about energy efficiency technologies, as well as novel program design strategies to serve local communities.

Yukon

Energy efficiency programs in Yukon are operated by the Government Energy Solutions Centre and the Yukon Housing Corporation, as well as utilities (Yukon Energy and Yukon Electrical Company) under the inCharge brand. Yukon pioneered the use of local improvement charges to help residents living in rural areas extend electrical grid and telephone services to their properties in 1984. This system was later used to fund on-site renewable energy systems, and could be used for energy efficiency upgrades.[19]

The City of Whitehorse, where three-quarters of Yukon's population lives, has developed its own green building standards for large and small buildings. New houses are required to meet thermal insulation values of R28 walls, R60 attics, and a maximum of 1.5 air changes per hour (at 50 Pa).[20] An EnerGuide label has been required on all new homes in Whitehorse since 2014, and the city also enforces the 2017 National Energy Code for Buildings.

Yukon has engaged in energy efficiency research in cold climates. A 2011-2017 study in partnership with the University of Victoria and the Yukon Government demonstrated the thermal performance and durability of vacuum-insulated panels in building envelopes in cold climate construction.[21] The government is also supporting a cold climate heat pump monitoring project.[22]

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[19] Roger Peters, Matt Horne, and Nicholas Ian Heap, "Using Local Improvement Charges to Finance Building Energy Efficiency Improvements: A Concept Report" (Calgary, AB: Pembina Institute, May 2004).
[20] Department of Land and Building Services, "Green Building Standards," City of Whitehorse, 2019, https://www.whitehorse.ca/departments/planning-building-services/building-inspections/new-green-building-standards.
[21] Doug MacLean et al., "Design Details and Long-Term Performance of VIPs in Canada's North," *Energy Procedia* 111 (March 2017): 481–89, https://doi.org/10.1016/j.egypro.2017.03.210.
[22] "Renewable Energy and Energy Efficiency Update: January 2016- June 2018" (Whitehorse, YK: Government of Yukon, 2018), https://online.engageyukon.ca/sites/default/files/emr-energy-strategy-update-2016-2018.pdf.

Yukon is developing a Climate Change, Energy and Green Economy Strategy, which is expected to include new policies to improve energy efficiency.

Northwest Territories

The Arctic Energy Alliance (AEA) is a not-for-profit organization that has existed for 22 years. It currently administers energy efficiency and renewable energy programs in NWT communities and has offices throughout the territory. Other energy efficiency initiatives are supported by the territorial government. The AEA recently received a boost in funding from the Low Carbon Economy Leadership Fund and the territorial and federal governments.[23] The number of home energy evaluations increased 58% from last year for new homes, and 23% from last year in existing homes.[24]

The AEA serves grid-tied and off-grid systems, and often works with local communities. Its programs support biomass district heating, and its community wood stoves project forms two-year partnerships with local communities to install EPA-certified stoves and increase local capacity around wood harvesting. Over the years, the AEA has also tested different technologies, such as solar heating and an electric vehicle.

Nunavut

The Nunavut energy system consists of isolated grids serving the territory's 25 communities, largely using diesel generators. Mining operations generate their own energy.

The Nunavut Climate Change Secretariat and the Nunavut Housing Corporation are involved in energy efficiency policies and programs. A Home Renovation Program provides forgivable loans for efficiency improvements. The Nunavut Housing Corporation is also undertaking retrofits and installing district heating systems in the communities of Sanikiluaq and Taloyoak. This is a $12-million investment, drawing on the $31 million allocated to Nunavut under the federal Low Carbon Economy Leadership Fund.[25] Other programs include the Nunavut Energy Management Program operated by the Department of Community and Government Services (CGS), which takes a regional approach to implementing efficiency measures.

[23] Arctic Energy Alliance, "2018/19 Annual Report" (Northwest Territories: Arctic Energy Alliance, July 2018), http://aea.nt.ca/files/download/22226a0178e8c6e.
[24] Arctic Energy Alliance, 6.
[25] Environment and Climate Change Canada, "The Governments of Canada and Nunavut Announce Investments in Energy Efficiency Upgrades That Help Residents Save Energy and Money," Government of Canada, September 10, 2018, https://www.canada.ca/en/environment-climate-change/news/2018/09/the-governments-of-canada-and-nunavut-announce-investments-in-energy-efficiency-upgrades-that-help-residents-save-energy-and-money.html.

Energy Efficiency Programs

Introduction

Energy efficiency programs secure energy savings through various strategies such as audits, retrofits, training for building tradespeople, "people-centred"[26] or behavioural efficiency strategies, and customized industrial programs. Many programs are administered by natural gas and electric utilities under a regulatory framework that recognizes energy efficiency as a resource—offering the same services as power plants, wind turbines, and transmission lines. The efficiency resource often provides energy services at much lower cost than new sources of supply, while also producing numerous co-benefits such as improved comfort, more income in the local economy, and reductions in energy poverty. In Canada, governments and third parties have also played a role as program administrators—for instance, through the Efficiency Nova Scotia efficiency utility, Energy Efficiency Alberta, Transition énergétique Québec (TEQ), and the short-lived Green Ontario Fund, funded through carbon pricing revenues.[27]

In this scorecard, we collected relevant information to make comparisons regardless of the administrative model in each jurisdiction. The different administrative structures, as well as provincial contexts, nevertheless created some challenges with data availability, which we discuss in this chapter.

[26] Karen Ehrhardt-Martinez and John A. Laitner, "Rebound, Technology and People: Mitigating the Rebound Effect with Energy-Resource Management and People-Centered Initiatives," in *ACEEE Summer Study on Energy Efficiency in Buildings*, 2010, 7–76.
[27] For a discussion of this evolution in program administration see Brendan Haley et al., "From Utility Demand Side Management to Low-Carbon Transitions: Opportunities and Challenges for Energy Efficiency Governance in a New Era," *Energy Research & Social Science* 59 (January 2020).

We collected information and allocated scores for the following policy areas or metrics:

- Annual incremental savings from electricity efficiency programs as a percentage of domestic sales, and third-party evaluation of results (**10 points**);
- Annual incremental savings from natural gas efficiency programs as a percentage of domestic sales, and third-party evaluation of results (**7 points**);
- Non-regulated fuels programs and policies, including spending per gigajoule, evaluation of savings, and dedicated funding sources (**3 points**);
- Spending on efficiency programs per capita (**6 points**) and per gigajoule of end use demand (**6 points**);
- Efficiency programs to reduce energy poverty (**3 points**).

This weighting for programs within the overall scorecard is roughly congruent with the state scorecard produced by the American Council for an Energy-Efficient Economy (ACEEE), although the natural gas savings and non-regulated fuel categories are weighted more heavily. Our inclusion of low-income or energy poverty reduction programs recognizes the importance of pulling program administrators toward harder-to-reach customer segments.

We collected spending and savings information from 2016 to 2018. This allows us to establish a relevant baseline for the first Canadian scorecard and compare provinces that were only able to report information for some years. We present figures on utility program spending as a percentage of revenues and per customer (natural gas) for illustrative purposes, as data limitations did not allow for scoring based on these metrics.

Based on the spending data we collected, we estimate that energy efficiency program spending across the country totalled almost $1 billion in 2016 and $1.2 billion in 2017. The figure may be even higher, as we were not able to collect complete spending information on efficiency programs in Ontario funded through cap and trade revenues, or on program spending in the territories. Total electricity savings from programs across Canada amounted to 2.9 terawatt-hours (TWh) in 2016 and 3.7 TWh in 2017. Canadian natural gas program savings totalled 170 million cubic metres, or 6.3 petajoules, in 2016.

Table 3 lists overall scores by province.

Table 3. Energy Efficiency Program Scoring Results

Province	Electricity Efficiency Program Savings (10 pts)	Natural Gas Efficiency Program Savings (7 pts)	Non-Regulated Fuels Programs and Policies (3 pts)	Efficiency Program Spending (12 pts)	Energy Poverty Reduction Programs (3 pts)	Totals* (35 pts)
Nova Scotia	5.50	N/A	4.50	6.50	1.25	18
Ontario	6.00	2.50	0.25	4.50	1.25	15
Manitoba	4.00	1.00	1.00	5.50	1.75	13
Prince Edward Island	0.50	N/A	5.00	6.00	1.75	13
Québec	2.00	4.50	2.25	2.50	0.00	11
British Columbia	3.50	1.50	0.00	3.00	1.25	9
Alberta	3.50	1.50	1.75	1.50	0.25	9
New Brunswick	3.00	N/A	0.50	2.00	0.25	6
Newfoundland and Labrador	2.50	N/A	0.00	1.50	0.25	4
Saskatchewan	1.00	0.00	0.00	0.50	0.00	2

**Totals rounded to whole numbers*

Program Savings

Electricity Savings

Electricity savings deliver multiple benefits. Saving electricity can avoid more expensive electricity generation options, increase reliability, and reduce risks. For customers, electricity savings can help improve the health and comfort of the home environment, create more durable houses, and reduce energy bills. There are also significant societal benefits, including reduction of GHG emissions, avoidance of other environmental impacts, and stimulating the local economy. Though some Canadian provinces have relatively low-carbon electricity systems because of the availability of hydroelectricity and other non-emitting sources, energy savings create additional benefits, such as avoiding environmental damages and higher costs associated with hydroelectric development and ensuring that existing hydroelectric resources are used for high-quality purposes—such as electricity exports to other jurisdictions, or electrification of transportation. In hydro-dominated jurisdictions, energy savings can create the

opportunity to generate revenue from electricity sales that reduce GHG emissions in other jurisdictions or domestic sectors that still use fossil fuels.

We assessed electricity savings by looking at net annual incremental savings from programs as a percentage of domestic sales. Thus, we excluded export sales and sales of other electricity services. Incremental savings refer to kilowatt-hour savings in the year the program was run, and do not include cumulative savings from efficiency measures undertaken or installed in previous years. We excluded savings attained through codes and standards, unless the program administrator could demonstrate that a portion of the savings was directly attributable to program activity.[28] We also excluded savings from distributed generation or renewable electricity programs, though we noted the growing importance of integrating these programs with energy efficiency portfolios (for instance, Manitoba, Ontario, Alberta, Saskatchewan, and Nova Scotia have offered load displacement and solar energy programs). Nor did we track capacity savings, which are important to reduce peak demand and promote flexible demand. Since demand response and other capacity-saving programs can produce both energy and capacity savings, we asked respondents to include any energy savings from these programs.

We asked respondents to report savings at the meter level if possible, to provide a consistent comparison. Meter-level savings do not consider the additional electricity savings derived at the point of generation by avoiding transmission losses. Where meter-level savings were not available, we asked respondents to provide an average percentage line loss factor and used this to convert reported generator savings to the meter level.

"Net" savings refers to energy reductions directly attributable to program activities. They should thus exclude savings attained through "free riders" or due to weather, but include the "spillovers" that can occur when program activities promote greater participation.[29] Finally, we tracked whether savings were evaluated and verified, and asked for a description of the evaluation protocols followed, which is recorded in our policy database.

The scorecard focused on the major program administrators in each jurisdiction. If a jurisdiction had multiple program administrators and the savings were comparable, we summed total electricity savings for that jurisdiction. A list of all utilities and program administrators reporting savings and/or sales data can be found in the notes below Table 5.

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[28] For a discussion on claiming savings from codes and savings promotion, see Glenn Reed, Toben Galvin, and Blair Hamilton, "Savings without Rebates: Moving toward Claiming Savings from Market Transformation" (ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, 2006).

[29] "Free riders" are energy efficiency program participants who would have taken energy saving actions on their own without inducement from the program. "Spillover" refers to additional energy savings that occur because a program participant implements additional measures beyond those targeted by the program, or due to non-participants engaging in energy savings activities because of the program's influence.

Some jurisdictions reported savings on a calendar year, while others based on a fiscal year. We tracked energy savings from the previous three years and linked calendar year 2018 to fiscal year 2018/19, and so on. Some jurisdictions were not able to report savings in all years, either because programs only began recently or due to lag times associated with publishing evaluated results. There was no single year when all jurisdictions were able to report electricity savings. Thus, we recorded the previous three years and, for initial benchmarking purposes, based our scoring on the maximum level of savings as a percentage of domestic sales over the time span. We chose the maximum to reward savings performance for those jurisdictions that reported savings over multiple years. In future years, we will likely move toward comparing results from the most recent year for which data is available, to create a more dynamic annual review.

We scored savings on a nine-point scale (Table 4), with annual incremental savings above 2.5% as the top level. An economic impact study produced for Efficiency Canada showed significant economic benefits of Canadian jurisdictions reaching this level of savings.[30] The American states of Massachusetts, Vermont, and Rhode Island have achieved annual savings higher than this level in previous years, and discussions of aggressive electricity savings suggest a target of 3% a year.[31] We also awarded one point if energy savings were evaluated by a third party.

[30] Dunsky Energy Consulting, “The Economic Impact of Improved Energy Efficiency in Canada: Employment and Other Economic Outcomes from the Pan-Canadian Framework’s Energy Efficiency Measures” (Vancouver, BC: Clean Energy Canada and Efficiency Canada, April 3, 2018).
[31] C Neme and J Grevatt, “The Next Quantum Leap in Efficiency: 30 Percent Electric Savings in Ten Years” (Montpelier, VT: Regulatory Assistance Project, 2016).

Table 4. Electricity Savings Scoring Methodology			
Savings as % of Domestic Sales		Score	Evaluated by a Third Party
2.50%	or greater	9.0	
2.36%	2.49%	8.5	
2.22%	2.35%	8.0	
2.08%	2.21%	7.5	
1.94%	2.07%	7.0	
1.81%	1.93%	6.5	
1.67%	1.80%	6.0	
1.53%	1.66%	5.5	
1.39%	1.52%	5.0	
1.25%	1.38%	4.5	**+1.0**
1.11%	1.24%	4.0	
0.97%	1.10%	3.5	
0.83%	0.96%	3.0	
0.69%	0.82%	2.5	
0.56%	0.68%	2.0	
0.42%	0.55%	1.5	
0.28%	0.41%	1.0	
0.14%	0.27%	0.5	
0.00%	0.13%	0.0	

The results are shown in Table 5, and the gigawatt-hour (GWh) savings used as a basis for the calculations can be found in Appendix C.

Table 5. Electricity Savings Scoring Results						
Province	Annual Incremental Savings as % of Domestic Sales			Maximum Savings (2016-2018)	Score (9 pts.)	Evaluated by a Third Party (+1 pt.)
	2016	2017	2018			
Ontario	1.06%	1.41%	-	1.41%	5.0	1.0
Nova Scotia	1.25%	1.18%	1.32%	1.32%	4.5	1.0
Manitoba	0.81%	0.92%	0.68%	0.92%	3.0	1.0
British Columbia	0.80%	0.64%	-	0.80%	2.5	1.0
Alberta	-	0.77%	0.26%	0.77%	2.5	1.0
New Brunswick	0.27%	0.38%	0.57%	0.57%	2.0	1.0
Newfoundland and Labrador	0.24%	0.41%	0.47%	0.47%	1.5	1.0
Québec	0.35%	0.35%	0.29%	0.35%	1.0	1.0
Saskatchewan	0.31%	0.21%	0.21%	0.31%	1.0	0
Prince Edward Island	-	-	0.20%	0.20%	0.5	0

Savings and sales data derived from information request to utilities and program administrators, supplemented or verified with reference to sources such as annual reports or utility regulatory documents. All respondents reported net savings. We focused on major program administrators in each province, and used sales data reported by each utility rather than province-wide figures that might include sales from smaller utilities. These figures might not include smaller utilities (e.g. municipal co-ops) or program administrators that do not report savings information, as well as some programs that do not currently have a significant impact on provincial electricity savings (including Clean BC and TEQ programs). The program administrators/utilities reporting savings and sales information for each province are: British Columbia (BC Hydro and FortisBC), Alberta (Energy Efficiency Alberta), Saskatchewan (SaskPower), Manitoba (Manitoba Hydro), Ontario (Independent Electricity System Operator and local distribution companies), Québec (Hydro-Québec), New Brunswick (New Brunswick Power), PEI (Efficiency PEI), Nova Scotia (Efficiency Nova Scotia and Nova Scotia Power), and Newfoundland and Labrador (Newfoundland and Labrador Hydro & Newfoundland Power).

Ontario and Nova Scotia receive the top scores for electricity savings. Both jurisdictions have consistently hit savings levels above 1% of annual incremental sales, ranking in the middle of our scoring scale. It is thus important to note that even these high savers might have significantly more electricity efficiency potential. For instance, modeling studies in Nova Scotia have demonstrated that annual savings above 2% are cost-effective.[32]

[32] Brendan Haley, "Nova Scotia Must Increase Energy Efficiency to Avoid a Costly Power Plant in 5 Years," *The Chronicle Herald*, May 15, 2018.

Natural Gas Savings

We tracked net annual incremental natural gas savings from programs in a similar manner to the electricity programs described above. Savings figures exclude codes and standards and should be net of free-rider effects. If respondents only provided gross savings, we applied a 0.8 net-to-gross ratio.[33]

We divided annual incremental savings by domestic natural gas sales using utility-specific sales figures in jurisdictions with utility program administrators, or aggregate figures where utility commissions could provide them. In jurisdictions where a non-utility program administrator was responsible for the entire province (e.g. Québec), we used Statistics Canada data on monthly natural gas distribution deliveries.[34]

Not all jurisdictions in Canada use a significant amount of natural gas, and thus we excluded some provinces from this metric and reallocated scores toward non-regulated fuels (see below). To identify the provinces where natural gas savings were not relevant, we looked at natural gas as a percentage of total end-use demand in the residential and commercial-institutional sectors.[35] The Atlantic provinces (Nova Scotia, New Brunswick, Newfoundland and Labrador, and Prince Edward Island) all had natural gas use below 10% and are thus excluded from this category.

Scoring for this category is based on a six-point scale with the highest annual incremental savings level equal to 1.75% of sales or greater. This is the level of savings modeled in an aggressive efficiency scenario for a recent Canadian economic impact study produced for Efficiency Canada.[36] Notably, the states of Illinois and Minnesota have introduced legislated targets of 1.5% annual savings.

We award another point if energy savings were evaluated by a third party.

[33] We selected this net-to-gross ratio after a review of Canadian jurisdictions that provided both net and gross savings in our information request, the ratio used in the ACEEE state scorecard, and after consultation with experts.
[34] Statistics Canada, “Table 25-10-0059-01: Canadian Monthly Natural Gas Distribution, Canada and Provinces,” Government of Canada, 2019, 25-10-0059–01, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2510005901.
[35] Using historical data from National Energy Board, “Canada’s Energy Future 2018: An Energy Market Assessment - Data Appendices, End-Use Demand” (Ottawa, ON: Government of Canada, 2018), http://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2018/2018nrgftr-eng.pdf.
[36] Dunsky Energy Consulting, “The Economic Impact of Improved Energy Efficiency in Canada: Employment and Other Economic Outcomes from the Pan-Canadian Framework’s Energy Efficiency Measures.”

Table 6. Natural Gas Savings Scoring Methodology			
Savings as % of Domestic Sales		Score	Evaluated by a Third Party
1.75%	or greater	6.0	
1.60%	1.74%	5.5	
1.46%	1.59%	5.0	
1.31%	1.45%	4.5	
1.17%	1.30%	4.0	
1.02%	1.16%	3.5	
0.88%	1.01%	3.0	**+ 1.0**
0.73%	0.87%	2.5	
0.58%	0.72%	2.0	
0.44%	0.57%	1.5	
0.29%	0.43%	1.0	
0.15%	0.28%	0.5	
0.00%	0.14%	0.0	

Similar to electricity savings, we list natural gas savings as a percentage of sales across the previous three years, taking the maximum annual savings for scoring purposes. We also awarded an extra point if programs were evaluated by a third party. The results are in Table 7.

Table 7. Natural Gas Savings Scoring Results						
Province	Annual Incremental Savings as % of Domestic Sales			Max Savings (2016-2018)	Score (6 pts)	Evaluated by a Third Party (+1 pt.)
	2016	2017	2018			
Québec*[37]	0.81%	0.91%	1.28%	1.28%	4.0	0.5
Ontario	0.44%	-	-	0.44%	1.5	1
British Columbia	0.20%	0.23%	0.23%	0.23%	0.5	1
Alberta	-	0.22%	0.17%	0.22%	0.5	1
Manitoba	0.11%	0.13%	0.13%*	0.13%	0.0	1
Saskatchewan	0.04%	0.04%	0.04%	0.04%	0.0	0

** Some savings reported as gross.*

Savings and sales data derived from information request to utilities and program administrators, supplemented or verified with reference to sources such as annual reports or utility dockets. We focused on major program administrators in each province, and used sales data reported by each utility rather than province-wide figures that might include sales from smaller utilities. These figures do not include smaller utilities or program administrators that do not report savings information (e.g. Pacific Northern Gas in BC), programs that do not have a significant impact on provincial energy savings, or programs where data was not publicly available (including Green Ontario Fund programs). The program administrators/utilities reporting savings and sales information for each province are: British Columbia (FortisBC), Alberta (Energy Efficiency Alberta), Saskatchewan (SaskEnergy), Manitoba (Manitoba Hydro), Ontario (Enbridge Gas Distribution and Union Gas), and Québec (Énergir and TEQ).

The top level of savings achieved in Québec is attributable to both utility (Énergir) and government (TEQ) programs. Énergir achieves high annual savings of about 0.7% of sales, even if TEQ savings are excluded.[38] A half-point was awarded to Québec because Énergir programs are independently evaluated.[39] TEQ programs report gross savings, so a 0.8 net-to-gross ratio was applied.

[37] TEQ savings only include measures installed in the year reported, and not measures "committed" as is sometimes reported by the organization. Some double-counting might exist between Énergir and TEQ gas savings. Information on the magnitude of any double-counting is not currently available. The program administrators advise that they coordinate to provide complementary program offerings and incentives.
[38] Énergir's annual incremental savings as a % of its sales were 0.71% in 2016, 0.67% in 2017, and 0.65% in 2018.
[39] The last major evaluation of Québec government operated programs occurred in 2013, and programs related to electric vehicles and fuel to electricity conversation have been evaluated more recently. These evaluations have been conducted internally or by an external firm. A review of evaluation reports available on the TEQ website did not show recent evaluations of major natural gas energy saving programs. We understand that an external firm will be conducting a comprehensive evaluation of all TEQ programs, including Écoperformance and residential programs. Thus, we expect Québec to receive full points for third party evaluation in future years.

Box 1: Québec Leads in Natural Gas Savings Because of Context and Policy

Québec's natural gas savings are on par with leading North American jurisdictions. An annual savings level of 1.28% of domestic sales is almost as high as to the top American state (Minnesota), which achieved savings of 1.35% of commercial and residential retail sales in 2017.

This high level of savings relative to spending is partly explained by the large share of natural gas demand attributable to commercial and industrial users, with the residential sector comprising only 11% of the total. Most residential properties in Québec are heated with electricity.

This level of natural gas savings is also a result of policy and program performance. Énergir, the major natural gas utility, maintains a close relationship with its industrial and commercial customers to provide turnkey programs with high levels of technical support. Énergir programs have received an 89% satisfaction rate from customers.*

Québec also prioritizes natural gas savings to reduce greenhouse gas emissions. Transition énergétique Québec (TEQ) is partly financed through the "quote part" levy on all energy distributors, as well as by carbon pricing revenues. This funding supports programs such as Écoperformance, which works with businesses, institutions, and municipalities with the principal objective of reducing GHG emissions from fossil fuels.

** Personal communication with Energir*

In future years, to the scorecard will likely move toward a fuel savings figure that enables us to compare natural gas and non-regulated fuel savings on a similar metric, to permit a more meaningful comparison across provinces with different fuel mixes. The next section discusses the related challenges that arose with this year's scorecard.

Program Spending

The scorecard tracks program spending as well as savings to account for efficiency programs that do not directly result in measurable energy savings but support other policy areas, such as codes and standards, market transformation, and innovation. Tracking spending also allows us to control for differences that might exist in provincial energy savings evaluation protocols, and in savings levels that occur because of distinct market structures.

This section includes spending information and a description of policy frameworks governing efficiency programs targeting "non-regulated fuels" such as heating oil,

propane, and wood. Future scorecards will track program savings for non-regulated fuels, but data limitations prevented us from doing so this year.

After a discussion of non-regulated fuels, we outline our scoring methodology based on total spending per capita and per unit of energy demand. The report then provides illustrative data on electricity and natural gas spending and discusses some of the challenges associated with data collection and benchmarking.

Non-Regulated Fuels Program Spending and Policy Frameworks

Non-regulated fuels refer to sources such as heating oil, propane, and wood. These are important heating sources in Atlantic Canada, and in many rural areas throughout the country. Every province has some petroleum product demand in the residential and commercial-institutional sectors, yet programs targeting these fuel sources are more difficult to track and are often neglected because they do not fall under the regulatory processes that govern electricity or natural gas distribution.

Many provinces operate efficiency programs that address these fuel sources, but not all provinces were able to report fuel-specific energy savings. Few of the programs targeting these fuels were evaluated by third parties.

To explore non-regulated fuel efficiency programs, we tracked total annual spending that could be clearly attributed to these fuel sources.[40] The programs are relevant to all provincial jurisdictions because every province makes some use of these fuels. For Atlantic provinces without significant natural gas demand, we tracked programs that could save natural gas as well as non-regulated fuels.

To compare across the provinces, we divided the available figures for total annual spending by the total annual final demand for natural gas liquids and refined petroleum products in the residential, agriculture, public administration, and commercial and institutional sectors excluding industry and transportation, using data from Statistics Canada.[41] This denominator is a proxy for building demand for non-regulated fuels (excluding wood, which is not tracked by Statistics Canada). Since the Atlantic provinces were excluded from the scoring for natural gas savings, natural gas demand was included along with non-regulated fuels, in these provinces.

We benchmarked spending per gigajoule on non-regulated fuel building demand based on a six-point scale for the Atlantic provinces, and on a one-point scale for all other provinces (Table 8).

[40] This includes programs that promote fuel switching as a conservation measure.
[41] Statistics Canada, “Table 25-10-0029-01: Supply and Demand of Primary and Secondary Energy in Terajoules, Annual,” Government of Canada, 2018, 25-10-0029–01, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2510002901.

Table 8. Non-Regulated Fuels Spending Scoring			
Spending Per GJ of Non-Regulated Fuel Demand from Buildings		Score (Atlantic Provinces)	Score (Natural Gas-Dominated Provinces)
$1.40	or higher	6.0	1.0
$1.28	$1.39	5.5	1.0
$1.17	$1.27	5.0	1.0
$1.05	$1.16	4.5	0.75
$0.93	$1.04	4.0	0.75
$0.82	$0.92	3.5	0.75
$0.70	$0.81	3.0	0.5
$0.58	$0.69	2.5	0.5
$0.47	$0.57	2.0	0.5
$0.35	$0.46	1.5	0.25
$0.23	$0.34	1.0	0.25
$0.12	$0.22	0.5	0.25
$0.00	$0.11	0.0	0.0

We only listed provinces that could present clear spending data for non-regulated fuels outside the transportation sector, and took the maximum number over the past three years.

Unfortunately, not all provinces were able to report non-regulated fuel spending, even though some programs might have covered these fuels. Given the lack of available spending and saving data, we also track and score on the policy framework that supports non-regulated fuel conservation programs in each jurisdiction. The results are below.

Table 9. Spending Per GJ of Non-Regulated Fuels Energy Demand in Buildings					
Province	2016	2017	2018	Max (2016-2018)	Score (6 pts Atlantic provinces, 1 pt other provinces)
Prince Edward Island	-	-	$1.236	$1.236	5.0
Nova Scotia	$0.444	$0.460	$0.596	$0.596	2.5
Québec	$0.209	$0.136	$0.132	$0.209	0.25
New Brunswick	-	-	$0.175	$0.175	0.5
Alberta[42]	-	-	$0.124	$0.124	0.25
British Columbia	$0.023	$0.023	$0.024	$0.024	0
Manitoba	$0.001	$0.002	$0.001	$0.002	0

Prince Edward Island scores the highest, with a significant portion of Efficiency PEI's budget spent on non-electric energy savings. Nova Scotia has consistently supported non-electric energy efficiency programs alongside demand-side management for electricity. New Brunswick Power operates fuel-agnostic programs targeted to low-income households, funded by the provincial government and through the Low Carbon Economy Leadership Fund. Québec supports non-regulated fuel programs through its Green Fund and "quote part" contribution from energy distributors (see below). The programs counted here include "chauffez vert", which converts oil and propane heating systems to more efficient electric systems, and a program that supports conversion from fossil fuels to residual forest biomass in the business, institutional, and municipal sectors. British Columbia has operated programs to switch from oil to heat pumps and promote efficient wood heating, and Manitoba Hydro offers efficiency services to homes heated by oil and propane. Outside of the Atlantic provinces, spending on these programs is lower, relative to provincial demand.

[42] Alberta is unique in achieving most of its non-regulated fuel savings from industrial programs, primarily a custom program that achieves relevant propane fuel savings. Even though these are industrial programs we continued to use a mainly residential/commercial denominator to be consistent.

Non-Regulated Fuel Policy Frameworks

Given the policy gaps with respect to non-regulated fuels, and the difficulties obtaining spending and savings data on non-regulated fuels in particular, we awarded scores for policy frameworks that enable non-regulated fuel efficiency savings. Jurisdictions received one point if a third party evaluated the energy savings from non-regulated fuels programs. Such evaluation enables future comparison of energy savings, improves program performance, and increases the legitimacy of non-regulated fuel efficiency. A total of two points were awarded for third-party evaluation in the Atlantic provinces, given the importance of non-regulated fuels in these jurisdictions and to recalibrate the scores with provinces receiving scores for natural gas.

We awarded another point if a jurisdiction had a dedicated funding source that enabled non-regulated fuel efficiency. Efficiency programs for non-regulated fuels are often neglected, in comparison to electricity and natural gas, because they are not encompassed within utility regulatory planning and a regulator does not oversee rate-setting in a manner that enables funding through rates or system benefit charges.[43] A dedicated funding source can enable sustainable support for these efficiency initiatives. These areas were scored out of two points for the Atlantic provinces, given the importance of these fuel sources in their energy systems, and to true up scores with provinces receiving natural gas scores.

Table 10. Third-Party Evaluation of Non-Regulated Fuel Programs

Province	Evaluation of Non-Regulated Fuel Programs by a Third Party?	Score
Nova Scotia	**Yes:** Non-electric energy efficiency programs are evaluated by a third party, using similar methods as electric demand side management.	2
Alberta	**Yes:** All programs are evaluated, including some propane-related efficiency measures.	1
Québec	**Yes:** TEQ recently conducted evaluations of its programs, focused on converting oil-heated homes to electricity.	1

[43] System benefit charges are non-bypassable charges imposed on all investor-owned electricity utilities. They were instituted in several American states during electricity deregulation to continue support for energy efficiency and renewable energy. In Canada, similar policies might be referred to as efficiency charges, energy efficiency line items, or energy efficiency might be supported by ratepayer funds like all other energy resources without a specific charge or line item.

Table 11. Dedicated Funding Sources for Non-Regulated Fuel Programs		
Province	Non-Regulated Fuel Dedicated Funding Source	Score
Manitoba	**Yes:** The Affordable Energy Fund was created under the Energy Savings Act and continued under the Efficiency Manitoba Act. It requires electricity and natural gas utilities to contribute to the fund to support programs for low-income households, seniors, and northern communities. A portion of this fund is allocated to assist customers who heat with oil, propane, or wood.	1
Québec	**Yes:** The "quote part" is funded by an annual contribution from all energy distributors and approved by the Régie de l'énergie. Cap and trade auction funds are also allocated from the provincial green fund. Both funding sources support multi-fuel programs.	1
Alberta	**Yes:** Programs in Alberta have been primarily supported by a carbon levy, which enables a fuel-neutral program approach. However, the carbon levy was cancelled in May 2019, creating significant uncertainty regarding future funding of efficiency programs. Thus, we awarded half-points.	0.5
Ontario	**Yes:** Multi-fuel programs were supported by cap and trade auction funds from the Greenhouse Gas Reduction Account, and through a Green Investment Fund. However, these funding sources were cancelled in 2018, leading to the abrupt cancellation of fuel-neutral programs. We awarded a quarter-point, since a dedicated funding source existed in early 2018.	0.25
British Columbia	**No**	0
Saskatchewan	**No**	0
New Brunswick	**No:** Support for non-electric programs from provincial government funds.	0
Prince Edward Island	**No**	0
Nova Scotia	**No:** Support for non-electric programs from provincial government funds.	0
Newfoundland and Labrador	**No**	0

Nova Scotia, Alberta, and Québec were the only provinces to subject non-regulated fuel programs to third-party evaluation. Manitoba and Québec have had long-standing policies that require energy distributors to contribute to all fuel efficiency initiatives. Carbon pricing initiatives in Québec, Ontario, and Alberta provided dedicated support for multi-fuel efficiency initiatives, but were cancelled in Ontario and Alberta during the period evaluated by this scorecard. Thus, we awarded half-points for those jurisdictions. While Prince Edward Island and Nova Scotia both spend a significant amount on non-regulated fuel efficiency initiatives, neither province currently has a dedicated source of program funding.

For next year's scorecard, we plan to collect information on energy savings from non-regulated fuels. This will allow us to provide a more insightful comparison of the performance of different provinces in reducing demand.

Total Program Spending Per Capita and Per Unit of Energy Demand

We scored based on provincial program spending across all fuels. We divided total spending by two denominators, population and a component of end-use energy demand, using tables from Statistics Canada.[44] We opted to score on these criteria rather than fuel-specific metrics because not all program administrators in Canada differentiate their budgets by fuel type. This method also enabled the use of a consistent denominator to normalize across provinces.

We scored based on both spending by energy demand and spending per capita because each indicator has its advantages and disadvantages, and produced different rankings across the provinces.

- Greater energy end use is likely to correspond with more efficiency potential. Thus, an indicator based on spending relative to energy demand controls for provinces that might have small populations relative to energy use. End use energy demand will be relatively higher in jurisdictions with larger industrial demands and larger heating or cooling loads, however these additional energy demands are also likely to create greater potential to save energy.

- The per capita spending indicator is intuitive, and controls for differences among provinces based on climatic conditions and/or non-residential energy demands that could be less amenable to annual energy savings.

We used both indicators to eliminate the biases that might result from using one but not the other.

[44] End-use demand figures from Statistics Canada, "Table 25-10-0029-01: Supply and Demand of Primary and Secondary Energy in Terajoules, Annual," 25-10-0029–01. Population figures from Statistics Canada, "Table 17-10-0009-01: Population Estimates, Quarterly," Government of Canada, 2019, 17-10-0009–01, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901.

The total end use energy demand denominator excluded transportation, as well as mining and oil and gas.[45] Few jurisdictions reported significant spending on transportation efficiency programs, and the major transportation programs that do exist in Canada are considered in the transportation section of the scorecard. We removed mining and oil and gas out of a concern that the sector could bias results against Alberta, Saskatchewan, and Newfoundland and Labrador, all of which have energy-intensive oil and gas industries. However, the IEA/NRCan potential study estimated that 21% of the country' efficiency potential is found in oil and gas.[46]

We scored on a six-point scale on both metrics. Per capita spending is easily compared to the American states through the ACEEE Scorecard, where the top per capita spender in 2018 was Vermont at $102, followed by Massachusetts at $90.[47] Scoring on both metrics was based on the maximum result over the past three years.

[45] We divided 2018 spending figures by 2017 end use demand because this was the most recent data available.
[46] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."
[47] Berg et al., "The 2018 State Energy Efficiency Scorecard."

Table 12. Program Spending Scoring Methodology (End Use Demand)		
Spending Per GJ of End Use Demand		Score
1.10	or greater	6.0
1.01	1.09	5.5
0.92	1.00	5.0
0.83	0.91	4.5
0.73	0.82	4.0
0.64	0.72	3.5
0.55	0.63	3.0
0.46	0.54	2.5
0.37	0.45	2.0
0.28	0.36	1.5
0.18	0.27	1.0
0.09	0.17	0.5
0.00	0.08	0.0

Table 13. Program Spending Scoring Methodology (Per Capita)		
Spending Per Capita		Score
100.00	or greater	6.0
91.67	99.99	5.5
83.33	91.66	5.0
75.00	83.32	4.5
66.67	74.99	4.0
58.33	66.66	3.5
50.00	58.32	3.0
41.67	49.99	2.5
33.33	41.66	2.0
25.00	33.32	1.5
16.67	24.99	1.0
8.33	16.66	0.5
0.00	8.32	0.0

The results are as follows:

Table 14. Spending Per Gigajoule of End-Use Demand (Excluding Transport, Mining and Oil and Gas)

Province	2016	2017	2018	Max (2016-2018)	Score (6 pts)
Nova Scotia	$0.58	$0.55	$0.65	$0.65	3.5
Prince Edward Island	-	-	$0.55	$0.55	3.0
Manitoba	$0.33	$0.41	$0.38	$0.41	2.0
Ontario	$0.30	$0.38	-	$0.38	2.0
British Columbia[48]	$0.31	$0.27	-	$0.31	1.5
Québec	$0.22	$0.20	$0.23	$0.23	1.0
New Brunswick	$0.19	$0.17	$0.22	$0.22	1.0
Newfoundland and Labrador	$0.16	$0.16	$0.15	$0.16	0.5
Alberta	$0.00	$0.12	$0.11	$0.12	0.5
Saskatchewan	$0.06	$0.04	$0.04	$0.06	0.0

Table 15. Spending Per Capita Scoring Results

Province	2016	2017	2018	Max (2016-2018)	Score (6 pts)
Manitoba	$47.04	$58.56	$54.14	$58.56	3.5
Nova Scotia	$46.24	$45.15	$52.38	$52.38	3.0
Prince Edward Island	-	-	$51.96	$51.96	3.0
Ontario	$33.87	$43.10	-	$43.10	2.5
British Columbia	$28.53	$25.65	-	$28.53	1.5
Québec	$26.56	$23.56	$27.33	$27.33	1.5
New Brunswick	$21.30	$17.79	$23.03	$23.03	1.0
Alberta	$0.00	$21.23	$18.71	$21.23	1.0
Newfoundland and Labrador	$17.59	$17.81	$16.76	$17.81	1.0
Saskatchewan	$12.01	$9.36	$8.25	$12.01	0.5

[48] Total spending in British Columbia includes spending by major utilities (BC Hydro, FortisBC), government programs through Clean BC, as well as natural gas program spending by Pacific Northern Gas (PNG). We do not report PNG savings above or spending as a percentage of revenue or per customer below because the necessary information was not available.

The two metrics present similar distributions across the provinces. Nova Scotia, Manitoba, and Prince Edward Island have achieved high levels of spending relative to their populations and energy demand in the past three years.

A major shortcoming of this comparison is the lack of publicly available spending data on energy efficiency programs from Ontario cap and trade revenues. The spending figures above include some funds from Ontario's Green Investment Fund and the Greenhouse Gas Reduction Account (GGRA) for programs delivered by natural gas utilities. There was substantial spending on energy efficiency programs by the Green Ontario Fund launched in August 2017, as well as other government ministries and partners, from 2016-2018. However, no spending figures were publicly available, and the province provided no information in response to our information request. The Ontario Environmental Commissioner reported in 2018 that the GGRA distributed $1.9 billion from November 2015 to July 2018, 85% of it targeted toward the building and transportation sectors.[49] In July 2018, the government tabled legislation to cancel cap and trade and wind down the programs those revenues supported. Including Ontario's cap and trade spending over this period would place the province higher on the spending benchmarks above.

Electric Utility Efficiency Program Spending

Below we present electricity efficiency program spending as a percentage of utility revenues from domestic sales and system costs. We did not develop scores based on this indicator because of difficulties finding comparable benchmarks across the provinces. We present these figures for informational purposes because this indicator is commonly used to measure the level of energy efficiency effort in utility commission proceedings and public policy processes. It was not possible to present complete figures for all provinces because not all program administrators differentiate spending by electric and non-electric efficiency measures, nor was it possible to find comparable revenue figures for all provinces.

This indicator is reported in the ACEEE scorecard, based on statewide electricity revenues drawn from a mandatory Energy Information Administration survey to all electricity retailers. Finding comparable figures in the Canadian context is complicated by provinces with retail competition, where retailer revenues are not publicly available. These provinces might also have costs associated with transmission, as well as system and market operations, that would be reflected in a vertically integrated utility, but not in distributor revenues. The revenue figures used to make these calculations are based on our information request to utilities for total revenues from domestic sales. We also verified the figures, where possible, based on annual reports.

Alberta figures are excluded because Energy Efficiency Alberta does not divide spending by fuel source, and due to a lack of comprehensive utility revenue figures. In Ontario, electricity system experts suggested that electricity program spending relative

[49] Environmental Commissioner of Ontario, "Climate Action in Ontario: What's next? 2018 Greenhouse Gas Progress Report" (Toronto: Government of Ontario, September 2018).

to total cost of electricity service was the most relevant indicator, however this might not be strictly comparable with other provinces.

The other interesting aspect of the Canadian context that might influence these figures is the existence of provinces with very low electricity rates, and thus low domestic revenues, largely due to the prevalence of low-cost legacy hydroelectric resources. These figures might also be influenced by lower annual revenues due to the deferral of electricity system costs.

Table 16. Electricity Program Spending as a Percentage of Domestic Sales Revenues/Cost of Electricity Service

Province	2016	2017	2018
Manitoba	3.3%	4.3%	3.5%
Nova Scotia	2.3%	2.3%	2.4%
Ontario[50]	1.7%	2.1%	-
British Columbia	1.9%	1.5%	-
Newfoundland and Labrador	1.2%	1.3%	1.2%
New Brunswick	1.2%	1.0%	-
Prince Edward Island	-	-	0.9%
Québec	0.6%	0.5%	0.5%
Saskatchewan	0.6%	0.4%	0.3%

All figures drawn from information request and based on utility-specific revenues/costs. The participating utilities and program administrators for each jurisdiction were: British Columbia (BC Hydro and FortisBC), Saskatchewan (SaskPower), Manitoba (Manitoba Hydro), Ontario (Independent Electricity System Operator and local distribution companies), Québec (Hydro-Québec), New Brunswick (New Brunswick Power), PEI (Efficiency PEI, with revenue estimates from Maritime Electric and Summerside Electric from 2018-2021 hearing), Nova Scotia (Efficiency Nova Scotia and revenue information from Nova Scotia Power), Newfoundland and Labrador (Newfoundland and Labrador Hydro and Newfoundland Power).

[50] Denominator based on IESO “total cost of electricity service” rather than measure of utility revenues.

Natural Gas Utility Efficiency Program Spending

Below we present natural gas efficiency program spending as a percentage of utility revenues, and per customer. As with electricity, we did not score on this metric because of challenges with finding fuel-specific spending information and comparable revenue figures for each province.

Table 17 presents efficiency program spending as a percentage of utility revenues. These figures are calculated from total natural gas program spending divided by revenues from domestic sales, as reported by utilities responding to our information request. Where possible, figures were verified against annual reports and Statistics Canada data on distribution revenues.[51] We used the utility-specific information because we did not have spending or revenue information for some smaller natural gas utilities. Some discrepancies might exist because of the different ways in which utilities count revenues from business areas such as transmission and storage. Future scorecards will further verify the comparability of utility revenue figures.

We do not list Alberta due to a lack of fuel-specific spending information. We only report Énergir utility spending for Québec, divided by utility-specific revenues, because TEQ does not separate spending by fuel source. See Box 1 for an explanation of Énergir's relatively high level of savings relative to spending.

Table 17. Utility Natural Gas Spending as a Percentage of Revenues

Province	2016	2017	2018
Manitoba	3.8%	3.9%	3.5%
British Columbia	2.7%	2.8%	3.0%
Ontario	2.4%	2.4%	-
Québec	1.3%	1.2%	1.2%
Saskatchewan[52]	0.2%	0.3%	0.2%

All figures from information request and based on utility-specific revenues and costs. Participating utilities and program administrators for each jurisdiction were: British Columbia (FortisBC), Saskatchewan (SaskEnergy), Manitoba (Manitoba Hydro), Ontario (Union Gas and Enbridge Gas Distribution), Québec (Énergir).

Table 18 presents total natural gas efficiency program spending per residential customer. This parallels the ACEEE scorecard benchmark for natural gas efficiency

[51] Statistics Canada, "Table 25-10-0059-01: Canadian Monthly Natural Gas Distribution, Canada and Provinces."
[52] SaskEnergy revenues are for distribution utility only. It excludes gas commodity revenues spread among multiple gas retailers, as well as revenue from the transmission pipeline company.

spending, thus we present it for comparative purposes. The ranking based on spending per residential customer closely resembles the one above based on spending as a percentage of revenue for all utilities and jurisdictions – except for Québec's natural gas utility, Énergir. This is due to the small number of residential customers in Énergir's market. Thus, a measure of spending per residential customer provides little insight into the Québec market. For comparative purposes, the leading American states spent $144 (Massachusetts) and $112 (Rhode Island) per residential customer on efficiency programs in 2017,[53] and both residential markets are dominated by natural gas consumption.

Table 18. Utility Natural Gas Spending Per Residential Customer

Province	2016	2017	2018
Québec	$135.83	$127.65	$128.87
Manitoba	$52.06	$52.68	$49.89
British Columbia	$36.04	$37.62	$38.46
Ontario	$31.13	$36.10	-
Saskatchewan	$1.59	$2.00	$1.53

All figures from information request. See spending as a percentage of revenues table for a list of participating utilities.

Low-Income and Energy Poverty Programs

Improving energy affordability for low-income households is an important benefit of energy efficiency programs. Low-income households are the most adversely affected by high energy bills, so lowering energy bills through efficiency improvements can deliver significant benefits, including improvements in physical and mental health,[54] housing security, general reductions in poverty, and utility savings from reduced credit and collection costs.

However, program administrators can face several challenges reaching low-income populations, including the split incentive between landlords and tenants, participants' inability to co-pay for up-front costs of efficiency upgrades, and lack of trust in government or utility programs. Overcoming these challenges can require more effort

[53] Berg et al., "The 2018 State Energy Efficiency Scorecard."
[54] Christine Liddell and Chris Morris, "Fuel Poverty and Human Health: A Review of Recent Evidence," *Energy Policy*, The Role of Trust in Managing Uncertainties in the Transition to a Sustainable Energy Economy, Special Section with Regular Papers, 38, no. 6 (June 1, 2010): 2987–97, https://doi.org/10.1016/j.enpol.2010.01.037.

and costs, which is why specific policy goals and programs are necessary to ensure that low-income populations benefit from energy efficiency.

Energy poverty has emerged as a concept to explain a situation where high energy bills lead to inadequate energy services and social exclusion, preventing some households from gaining access to other necessities of life.[55] The level of energy poverty can be assessed by defining an acceptable or sustainable "energy burden" as a percentage of income spent on energy costs. In Canada, energy poverty researcher Dr. Maryam Rezaei suggests a 6% threshold, roughly twice the national median energy burden.[56] This logic, based on a relative measure of poverty, is similar to the rationale for the 10% threshold established in the United Kingdom. A 6% threshold is also justified if we accept that households should spend no more than 30% of their income on all housing costs, and no more than 20% of total housing costs on energy bills.[57]

The number of households in energy poverty can differ from the number of households considered to be low-income. Indeed, Rezaei's doctoral thesis on energy poverty in Canada found that 13% of the Canadian households struggling with energy poverty were still above the low-income cut-off (LICO), and that 11% of Canadians facing income poverty were not experiencing energy poverty.[58]

Between the two metrics, the number of households experiencing energy poverty is the most relevant for energy efficiency policy because it helps target those households where efficiency upgrades could have the greatest impact.

Statistics on energy poverty are not routinely published. However, Rezaei produced a custom tabulation from the 2016 census, working with the Canadian Urban Sustainability Practitioners (CUSP) network. Figure 19 shows the number of households that spent more than 6% of their after-tax income on home energy costs, including heat and electricity but not transportation.

[55] B. Boardman, *Fuel Poverty: From Cold Homes to Affordable Warmth* (London: Bellhaven Press, 1991), https://www.energypoverty.eu/publication/fuel-poverty-cold-homes-affordable-warmth.
[56] Maryam Rezaei, "Power to the People : Thinking (and Rethinking) Energy Poverty in British Columbia, Canada" (University of British Columbia, 2017), https://doi.org/10.14288/1.0351974.
[57] Roger D. Colton, *Direct Testimony and Exhibits before the Nova Scotia Utility and Review Board in the Matter of Affordable Energy Coalition et al vs. Nova Scotia Power Inc. et Al*, 2007; Roger D. Colton, "A Ratepayer Funded Home Energy Affordability Program for Low-Income Households: A Universal Service Program for Ontario's Energy Utilities" (prepared for Low-Income Energy Network, 2006).
[58] Rezaei, "Power to the People."

Table 19. Households by Province Spending More Than 6% of After-Tax Income on Home Energy Costs*		
Province	% of All Households	Number of households
Prince Edward Island	41%	23,640
Newfoundland and Labrador	38%	83,245
Nova Scotia	37%	147,085
New Brunswick	37%	114,790
Ontario	22%	1,138,065
Saskatchewan	21%	81,390
Canada	20%	2,810,905
Québec	18%	630,185
Manitoba	16%	74,435
Alberta	16%	237,425
British Columbia	15%	272,200

** 2016 Census, custom tabulation from Statistics Canada for Canadian Urban Sustainability Practitioners (CUSP) network, available at http://energypoverty.ca/backgrounder.pdf*

The scoring for this section is based on two indicators. We awarded a maximum of two points for low-income energy efficiency program spending per household in energy poverty, after asking information request respondents to list total energy efficiency program spending on low-income populations in the most recent year for which data was available, excluding other energy poverty reduction strategies. We did not specify an income cut-off, recognizing that the definition of low-income can differ by geographic area and that programs to alleviate energy poverty might target populations above standard poverty lines. Where respondents provided figures for the percentage of program spending serving low-income populations from programs with more general participation criteria, we multiplied total program budgets by these percentages. We divided the total spending figures by the number of households in energy poverty to compare program spending to reduce energy poverty across the provinces.

Scores were awarded on the following scale:

Table 20. Energy Poverty Reduction Program Scoring Methodology		
Energy Efficiency Program Spending Per Household in Energy Poverty		Score
$125	or higher	2.00
$109	$124	1.75
$94	$108	1.50
$78	$93	1.25
$63	$77	1.00
$47	$62	0.75
$31	$46	0.50
$16	$30	0.25
$0	$15	0.00

We developed a second indicator to track protocols and policies that encourage low-income energy efficiency efforts. Enabling policy frameworks that create long-term, durable support for low-income energy efficiency programs are important because vulnerable populations can be neglected. For instance, annual government budgets might shift resources toward the "median voter",[59] or ratepayer-funded initiatives with cost-effectiveness objectives may neglect low-income programs provided at no cost to participants, in the absence of performance indicators to promote equity and participation by hard-to-reach customer segments.

[59] For a classic article on the political sustainability challenges of low-income support programs, see Watler Korpi and Joachim Palme, "The Paradox of Redistribution and Strategies of Equality: Welfare State Institutions, Inequality, and Poverty in Western Countries," *American Sociological Review* 63 (1998): 661–87.

Our scoring awarded a maximum of one point if a jurisdiction had at least two of the following:

- A legislated or regulatory requirement with specific minimum savings or spending levels on low-income energy efficiency programs (**0.5 point**);
- Specific provisions within utility cost-effectiveness tests that considered low-income non-energy benefits, or exemptions from standard cost-effectiveness thresholds to encourage low-income efficiency (**0.5 point**);
- A specific, long-term fund dedicated to supporting low- to modest-income energy efficiency and/or energy poverty reduction programs (**0.5 point**).

Full points were awarded for at least two of these enabling policies. The minimum savings or spending levels were focused on ratepayer-funded programs to recognize that cost-effectiveness objectives might pull program administrators away from serving hard-to-reach populations. Points for programs funded through government expenditure or other voluntary contributions are reflected in the spending indicators discussed above.

Points for a specific fund were awarded if the dollars fell outside annual government budgetary processes, since annual government spending is captured in the spending per household indicator above. These specific funds can provide dedicated support to alleviate energy poverty. However, without sufficient resources, programs could also cap budgets at unreasonably low levels. We therefore considered these policies in conjunction with minimum budget and/or cost-effectiveness policies that provided incentives to increase efforts to alleviate energy poverty. The results on low-income program spending per household are provided in Table 21.

Prince Edward Island achieved the top score. Efficiency PEI dedicated a significant percentage of its budget to low-income populations. The focus is warranted given that census data shows Prince Edward Island has the highest rate of energy poverty. Manitoba and Nova Scotia received the next-highest points by spending $85 to $87 per household with an unsustainable energy burden. Nova Scotia's budget was almost twice as high as Manitoba's, as was the number of Nova Scotian households in energy poverty. In Nova Scotia, low-income program efforts are guided by a commitment in the 2014 Electricity Efficiency and Conservation Plan to retrofit all low-income homes over 10 years.[60]

[60] Government of Nova Scotia, "Using Less Energy: Nova Scotia's Electricity Efficiency and Conservation Plan," April 2014.

Table 21. Low-Income Program Spending Per Household in Energy Poverty			
Province	Spending Per Household in Energy Poverty	Spending on Low-Income Programs ($M) (2018)[61]	Score (2 pts)
Prince Edward Island	$116.90	$2.8	1.75
Manitoba	$87.96	$6.5	1.25
Nova Scotia	$85.73	$12.6	1.25
Ontario[62]	$25.42	$28.9	0.25
British Columbia	$24.85	$6.8	0.25
Newfoundland and Labrador	$24.03	$2.0	0.25
Alberta	$23.60	$5.6	0.25
New Brunswick	$17.42	$2.0	0.25
Québec	$8.82	$5.6	0
Saskatchewan	$1.35	$0.1	0

For energy poverty policies and programs, our information request and desk research found only three provinces (Ontario, British Columbia, Manitoba) with specific provisions to encourage low-income programs. Both British Columbia and Ontario require demand-side management plans to include low-income programs, and have made modifications to cost-effectiveness tests to accommodate this. Ontario and Manitoba have created specific funds to serve low-income populations and reduce energy poverty. The Ontario Affordability Fund is novel in its objective to capture households with high energy burdens that would not be considered to be experiencing income poverty.

[61] Spending is from the 2018 calendar year or 2018/19 fiscal year. Where data from these years was not available, we used the most recent year's information. This includes information from 2017/18 fiscal year from BC Hydro and Manitoba Hydro, and 2016 information from the Enbridge and Union natural gas utilities in Ontario.

[62] Spending figures for the Affordability Fund or other government operated energy efficiency programs (e.g. the Green Ontario Fund) were not available. These figures include spending by electricity and natural gas utilities. Note that Ontario received points for the Affordability Fund in scoring on supportive policy frameworks.

Table 22. Energy Poverty Policies and Programs Scoring Results					
Province	Energy Poverty Policies Description	Min. Require-ments (0.5 pt)	Cost-Effective-ness Screening (0.5 pt)	Special Fund (0.5 pt)	Score (1 pt. max)
Ontario	The 2015-2020 DSM framework for natural gas utilities includes a separate low-income scorecard that tracks energy savings and project applications to participate in a program for new affordable housing. Low-income programs are screened using a 0.70 benefit-cost threshold, using the TRC test, with a 15% non-energy benefit adder. The Ontario Energy Board further states that low-income programs not passing this threshold can be proposed and approved on merit. The Conservation First Framework, operating from 2015-2019, required a portfolio of programs to specific customer segments, including low-income. The IESO later centrally delivered a low-income program called the Home Assistance Program, which continues under the 2019-2020 interim framework. Low-income and Indigenous programs are not required to pass cost-effectiveness tests. In 2017, as part of the Ontario Fair Hydro Plan, the government launched the Affordability Fund with $100 million from the tax base. The program is overseen by an independent trust and is designed to provide energy efficiency measures to households that are struggling to pay their electricity bills and do not qualify for low-income conservation programs.	•	•	•	1
British Columbia	The Demand Side Measures Regulation (BC Reg 117/2017) to the Utilities Commission Act requires a public utility's portfolio to include programs for low-income households and rental accommodations in order to be considered adequate (Section 3). The regulation requires regulators to consider participant and non-energy benefits, and increase the benefits of particular programs (including low-income) by 40%. (Section 4(2)).	•	•		1
Manitoba	The Manitoba Affordable Energy Fund was established under the Energy Savings Act. Manitoba Hydro is to contribute a proportion of its gross revenue from electricity exports to the fund to ensure people with low incomes, seniors, and people living in rural and northern Manitoba have access to programs. In July 2007, the Public Utilities Board Order 99/07 required Central Gas Manitoba Inc. to contribute to the fund to support high-efficiency furnaces for low-income households and fixed-income seniors. This fund continues under the Efficiency Manitoba Act.			•	0.5

Enabling Policies

Introduction

Enabling policies refer to policies, regulations, and other activities that build supportive infrastructure and policy frameworks to advance energy efficiency in a province. They might cross several sectors and reinforce program strategies and other policy areas discussed in this scorecard. Many of these policies are important for energy savings to reach much larger scales. They are also important to ensure the "energy efficiency resource" has the capacity to continuously renew itself and produce new energy savings opportunities as older strategies and technologies (e.g. lighting) reach maturity.

For this topic, we sought novel quantitative indicators to provide relevant snapshots of energy efficiency activity in the provinces. Other policy areas are qualitative, and policy-based. In some areas, the scorecard presents initial research in areas that deserve more consideration, and we present data to illuminate the policy area discussed.

We collected information and allocated scores for the following policy areas or metrics:

- Energy efficiency savings targets (**6 points**);
- Support for financing (**3 points**);
- Research, Development and Demonstration and Program Innovation (**3 points**);
- Training and Professionalization (**4 points**);
- Grid modernization (**3 points**);
- Carbon pricing (**3 points**).

This chapter explains the methodologies and scores for each policy area or metric, and Table 23 lists scores by province.

Table 23. Enabling Policies Scoring Results

Province	Energy Efficiency Savings Targets (6 pts)	Support for Financing (3 pts)	RD&D and Program Innovation (3 pts)	Training and Professionalization (4 pts)	Grid Modernization (3 pts)	Carbon Pricing (3 pts)	Total (22 pts)
British Columbia	1.75	1.50	2.50	2.50	3.00	2.50	14
Québec	2.25	0.50	2.75	0.50	3.00	3.00	12
Ontario	1.00	1.50	2.50	2.50	2.5	2.00	12
Nova Scotia	1.75	1.00	2.50	4.00	0.75	1.00	11
Alberta	0.00	2.00	1.75	0.75	1.00	2.00	8
New Brunswick	0.75	0.00	2.50	2.25	0.75	1.00	7
Saskatchewan	0.50	1.00	1.75	1.00	1.00	1.00	6
Manitoba	1.50	1.00	1.50	0.75	0.25	1.00	6
Prince Edward Island	1.00	1.00	2.00	0.50	0.25	1.00	6
Newfoundland and Labrador	0.25	1.00	1.25	0.25	1.5	1.50	6

Totals rounded to whole numbers

Energy Efficiency Targets

Energy efficiency targets are enabling policies because they give clear direction to program administrators and energy system managers who can avoid supply side costs through energy efficiency. They reinforce the concept of efficiency as a quantifiable energy resource. Evidence from the US shows that Energy Efficiency Resource Standard (EERS) policies more than triple spending and savings levels.[63] It is also important to track future targets when benchmarking jurisdictions, so relevant comparisons can be made based on where jurisdictions are going and not only where they have been. Targets drive efficiency performance when they push energy efficiency administrators to achieve higher savings than they otherwise would.

To score on targets, we examined policy statements and legislative targets, as well as quantitative targets in future years. First, we scored on the existence of mandatory, long-term, energy efficiency targets that aimed to achieve a province's full energy efficiency potential. We provided a quarter-point for any jurisdiction that had outlined a long-term energy efficiency target in an energy or climate plan. We awarded these points regardless of whether the target existed for only one fuel source or the economy as a whole, and regardless of the aggressiveness of the target. To be considered long-term, the target had to cover at least a three-year period. Scoring increased to a half-point if the target was made mandatory through legislation or government regulation.

Table 24. Energy Savings Targets Policy Scoring Methodology

	Score (1 pt max)	Score (1 pt)
Long-term energy efficiency target as a policy statement (any fuel)	0.25	-
Mandatory long-term energy efficiency target through legislation or regulation (any fuel)	0.50	-
All cost-effective mandate or evidence of target based on maximum achievable potential (all fuels)	1.00	-
Policy includes transportation fuel savings target	-	1.00

To acknowledge targets that increased energy savings beyond business as usual, we awarded a full point to jurisdictions that required program administrators and regulators to achieve *all* cost-effective energy efficiency before investing in supply resources, or if a province's targets were clearly based on maximizing an aggressive definition of

[63] Maggie Molina and Marty Kushler, "Policies Matter: Creating a Foundation for an Energy-Efficient Utility of the Future" (Washington, DC: American Council for an Energy-Efficient Economy (ACEEE), June 9, 2015), https://aceee.org/policies-matter-creating-foundation-energy.

achievable energy efficiency potential. We awarded an additional point if a province had a target related primarily to transportation fuels.

We also tracked quantitative energy efficiency targets by fuel source in each province. This helped ascertain whether jurisdictions were actually moving toward targets outlined in policy statements, including targets established through energy efficiency plans, public utility regulation, or by utilities in energy planning processes. In most cases, these targets were approved by a utility regulator. In some cases, targets were not part of a formally approved plan, but based on recent assumptions used in utility resource planning. We calculated the approximate average annual incremental savings as a percentage of projected energy demand for each fuel source, for any year for which future targets were available, between 2019 and 2030. Consult Appendix E for further information on the years covered by each jurisdiction and the source information used.

We awarded a maximum of 2.5 points for electricity targets, and 1.5 points for natural gas or non-regulated fuel targets. The Atlantic provinces, with no significant natural gas usage, were scored based on non-electricity savings. If a province had a published target, we divided the annual incremental savings by end-use demand for petroleum products, natural gas liquids, and natural gas within the residential, commercial-institutional, agricultural, public administration, and industrial sectors, using Statistics Canada data.[64]

Comparing targets across provinces is complicated by some jurisdictions basing targets solely on program savings, while others include codes and standards. To arrive at an accurate comparison, we removed codes and standards from the savings target scoring. However, program administrators are incentivized to promote codes and standards when they are part of overall targets. Thus, we awarded an extra 0.25 points for jurisdictions that included codes and standards within targets approved by legislation or regulation.

[64] Statistics Canada, “Table 25-10-0029-01: Supply and Demand of Primary and Secondary Energy in Terajoules, Annual.”. Using 2017 figures, as this was the most recent year data was available.

Table 25. Electricity Savings Targets Scoring Methodology			
Annual Incremental Electricity Savings as % of Sales		Score	Bonus for Target Including Codes and Standards
2.50%	or greater	2.50	
2.25%	2.49%	2.25	
2.00%	2.24%	2.00	
1.75%	1.99%	1.75	
1.50%	1.74%	1.50	
1.25%	1.49%	1.25	**+0.25**
1.00%	1.24%	1.00	
0.75%	0.99%	0.75	
0.50%	0.74%	0.50	
0.25%	0.49%	0.25	
0.00%	0.24%	0.00	

Table 26. Natural Gas and Non-Regulated Fuels Savings Targets Scoring Methodology			
Annual Incremental Natural Gas/NRF Savings as % of Sales/Demand		Score	Bonus for Target Including Codes and Standards
1.50%	or greater	1.50	
1.25%	1.49%	1.25	
1.00%	1.24%	1.00	
0.75%	0.99%	0.75	**+0.25**
0.50%	0.74%	0.50	
0.25%	0.49%	0.25	
0.00%	0.24%	0.00	

The results are shown in the following table.

Table 27. Energy Efficiency Savings Target Policies

Province	Description	Long-Term Policy Target (0.25 pt.)	Legislative or Regulated target (0.5 pt)	Targeting All cost-effective (1 pt)	Includes Transport Fuel Target (+1 pt)	Score (2.5 pts)
Québec	Government directive 537-2017 requires Transition énergétique Québec to create a 2018-2023 master plan that improves energy efficiency at least 1% per year, on average. The Province's 2030 Energy Plan calls for a 2030 objective to improve energy efficiency 15% from a 2013 base year. The directive also creates a target to reduce the total consumption of petroleum products by at least 5% from a 2013 base year. The TEQ 2018-2023 Master Plan aims to improve energy efficiency by 1.2% per year, on average. This is an economy-wide target, including indirect changes from technological improvements and structural changes, as well as the impact of initiatives outside Québec. TEQ states that the initiatives within the plan are expected to improve efficiency by 0.6% per year (9.9 petajoules), higher than the 0.4% or 7.3 petajoules achieved from 2012 to 2017. The plan aims to reduce petroleum use by 12% in 2023 compared to 2013 levels. This is more than the government's directive to reduce consumption by 5% by 2023 as a first step toward the 2030 Energy Plan's target of a 40% reduction in 2030.	•	•		•	1.5

Manitoba	The Efficiency Manitoba Act, enacted in January 2018, mandates long-term energy efficiency savings targets over 15 years. The targets are: • Minimum net annual electricity savings of at least 1.5% of electricity consumption in the immediately preceding year; • Minimum net annual natural gas savings of 0.75% of natural gas consumption in the immediately preceding year. Any shortfalls and surpluses can be carried forward over the 15-year period to reach cumulative annual percentage savings equal to 22.5% for electricity and 11.25% for natural gas.		•			0.5
British Columbia	The Clean Energy Act established an objective "to take demand-side measures and to conserve energy, including the objective of the authority reducing its expected increase in demand for electricity by the year 2020 by at least 66%" (Part 1, Section 2(b)). This target relates solely to BC Hydro. Section 44.1(2)(f) of the Utilities Commission Act requires utilities other than BC Hydro to submit resource plans that explain any instances when demand for energy is not serviced through demand-side measures.		•			0.5
Prince Edward Island	The 2016/17 provincial energy strategy calls for ramping up to annual electricity savings of 2% of sales per year by 2020, or just under 30 GWh/year under a static load assumption. Savings would start at 0.4% of load in 2017 and accelerate from there. The strategy also calls for a ramp-up to annual energy savings of 2% of sales per year for non-electric fuels by 2020.	•				0.25
Saskatchewan	April 2019 Climate Resilience Saskatchewan report includes a measure to save 87 GWh in 2030 from energy efficiency and conservation programs.	•				0.25

Ontario	Ontario is currently developing a post-2020 framework for natural gas and electricity conservation. Long-term targets (i.e. three years in advance) are therefore currently unknown. Ontario's Conservation First Framework from 2015-2020 targeted 7 TWh of cumulative annual electricity savings from programs operated by local distribution companies and 1.7 TWh of cumulative annual savings from large industrial transmission-connected customers. The Conservation First Framework was terminated on March 21, 2019. On April 1, 2019, the IESO began delivering energy efficiency programs across the province under the Interim Framework, which is expected to run through December 31, 2020. The Interim Framework has a target of 1.4 TWh in energy savings and 189 MW in demand savings. For natural gas, the 2015-2020 framework establishes annual targets based on a formula that considers the previous year's program costs and savings results. The province's Environment Plan estimated savings of 3.2 Mt of CO2e emissions from natural gas conservation programs, incremental to the current framework. Thus, we include a policy target point for Ontario natural gas programs.	•				0.25
Alberta	No formal energy savings targets. Energy Efficiency Alberta's 2018/19 Business Plan states that performance targets will be included in the 2019/2020 business plan, informed by an efficiency potential study.					0.0
New Brunswick	No targets currently exist. New targets will be informed after the completion of an efficiency potential study, expected in 2019/20.					0.0
Nova Scotia	Electricity savings targets are determined by the Nova Scotia Utility and Review Board without an all cost-effective mandate. Non-electric performance metrics are negotiated with the provincial government.					0.0
Newfoundland and Labrador	No targets in policy or legislation.					0.0

Table 28. Electricity Savings Targets Scoring Results					
Province	Approximate Average Annual Electric Savings Target (2019-2030)	Score (2.5 pts)	Target Including Codes and Standards	Score (0.25 pts)	Total Score (2.5 pts + 0.25 bonus)
Nova Scotia	1.1%	1.00	-	-	1.00
New Brunswick	0.8%	0.75	-	-	0.75
Prince Edward Island	0.7%	0.75	-	-	0.75
British Columbia	0.5%	0.50	1.4%	0.25	0.75
Manitoba	0.5%	0.50	1.5%	0.25	0.75
Ontario	0.6%	0.50	-	-	0.50
Newfoundland and Labrador	0.3%	0.25	-	-	0.25
Saskatchewan	0.3%	0.25	-	-	0.25
Québec	0.3%	0.25	-	-	0.25
Alberta	-	0.00	-	-	0.00

Table 29. Natural Gas Savings Targets Scoring Results					
Province	Approximate Average Annual Natural Gas Savings Target (2019-2030)	Score (1.5 pts)	Target Including Codes and Standards	Score (0.25 pts)	Total Score (1.5 pts + 0.25 bonus)
Québec	0.7%	0.5	-	-	0.5
British Columbia	0.5%	0.5	-	-	0.5
Ontario	0.4%	0.25	-	-	0.25
Manitoba	0.2%	0.0	0.75%	0.25	0.25
Saskatchewan	0.0%	0.0	-	-	0.0
Alberta	-	0.0	-	-	0.0

Table 30. Non-Regulated Fuels Savings Targets Results[65]		
Province	Approximate Average Annual Fuel Savings Target (2019-2030)	Score (1.5 pts)
Nova Scotia	0.9%	0.75
Prince Edward Island	-	0
New Brunswick	-	0
Newfoundland and Labrador	-	0

No jurisdiction in Canada has a clear "all cost-effective" mandate. The rules for resource planning in the BC Utilities Commission Act requires utilities to explain why they are using energy generation or purchases rather than demand-side measures. However, this excludes BC Hydro and does not require "all" cost-effective efficiency to meet demand. These rules have spurred a more than doubling of FortisBC's spending on natural gas demand-side management in its 2019-2022 plan. In Ontario, a March 2014 Ministerial Directive instructed the Ontario Energy Board to develop a natural gas DSM framework to "enable the achievement of all cost-effective DSM … as far as is appropriate and reasonable".[66] However, the Ontario Energy Board placed a budget cap on maximum achievable energy savings based on a principle of achieving "all cost-effective DSM that results in a reasonable rate impact".[67] While these rules in BC and Ontario fall short of a clear and functional *all* cost-effective mandate, they have contributed to increased natural gas efficiency, in particular. The higher savings targets are reflected in our scoring in Table 29.[68]

Québec is the only jurisdiction with a transportation-related energy savings target. It is quite aggressive, equivalent to saving 3% of petroleum fuel per year by 2030. The figures above only count natural gas savings targets from the Énergir distributor for Québec because TEQ does not have specific natural gas savings targets. Québec is awarded points for its economy-wide target in the scoring on target policies.

Ontario's electricity savings target is based on the revised goals for 2019-2020, and an estimate of 2019 and 2020 savings targets for natural gas, explained in Appendix E. We awarded a quarter-point for a natural gas policy target in the government's fall 2018 Environment Plan. Further information from the Environmental Commissioner's Office

[65] No targets listed include codes and standards.
[66] This directive is not changed by the March 21, 2019 Ministerial Directive that instructed a wind down of the Conservation First Framework for electricity.
[67] 1 - EB-2014-0134, Report of the Board Demand Side Management Framework for Natural Gas Distributors (2015-2020), p.7. For discussion see Jack Gibbons, "Conservation First: In Theory and Practice," *Energy Regulation Quarterly*, June 14, 2015.
[68] Note that Québec's higher savings target is influenced by the relative lack of residential customers, while Ontario and BC demand side management efforts include larger residential markets.

stated that this target was based on the difference between the "constrained" and "unconstrained" estimates from a 2016 achievable potential study.[69] A calculation based on that study's cumulative energy savings results between 2020 and 2030 suggests the GHG target is consistent with 1.1% annual incremental savings.[70] However, post-2020 natural gas targets are still unclear, and an updated achievable potential study for natural gas and electricity conservation is currently under way in Ontario.

A further note of clarification concerns the discrepancy between Prince Edward Island's electricity savings target of 0.7% and the policy target to ramp up toward 2% annual incremental savings. These figures are based on a recently-approved 2018-2021 DSM Plan, which includes a consistent increase toward higher savings over the three years. If Prince Edward Island continued on a similar schedule, it would achieve 2% savings in 2025. The province was also awarded points for including a non-electric fuel target in its energy strategy, but no specific annual energy savings figures were provided in response to our information request, and we could not find any published data on the target.

Financing

Utility and government energy efficiency programs are often designed to leverage private investment in energy efficiency improvements, in large part by providing financial incentives to help reduce the up-front cost of new or more efficient technologies. Yet up-front costs are only one obstacle to realizing the full potential of energy efficiency. Other relevant barriers include uncertainty about the risks, benefits, and potential return on investments in efficiency on the part of potential financiers (e.g. banks, credit unions), and a lack of ability or willingness of potential program participants to obtain financing to cover the remaining up-front costs of deeper energy efficiency improvements.[71] Fortunately, there are a number of financing tools governments and other actors can use to address these barriers, tools which can be roughly categorized into repayment mechanisms and credit enhancements.[72]

Repayment mechanisms address some specific challenges associated with energy efficiency investment by homeowners or building operators, such as the need for long-term lending, simplified purchase and repayment, and transferability of repayment obligations to the party who benefits from the initial investment. Some prominent

[69] Environmental Commissioner of Ontario, "A Healthy, Happy, Prosperous Ontario: Why We Need More Energy Conservation," 2019 Energy Conservation Progress Report (Toronto, ON: Government of Ontario, March 2019).
[70] Estimating annual incremental from cumulative savings from 2020 to 2030 implicitly assumes 100% persistence of savings, suggesting 1.1% annual savings could be an underestimate.
[71] Energy and Mines Ministers' Conference, "Financing Energy Efficient Retrofits in the Built Environment" (Winnipeg, MB: Energy and Mines Ministers' Conference, August 2016), http://epe.lac-bac.gc.ca/100/201/301/weekly_acquisitions_list-ef/2016/16-41/publications.gc.ca/collections/collection_2016/rncan-nrcan/M4-122-2016-eng.pdf.
[72] Much of this discussion draws directly from a recent report by TAF and Dunsky Energy Consulting. See The Atmospheric Fund (TAF) and Dunsky Energy Consulting, "Energy Efficiency Financing Tools for the Canadian Context," TAF Technical Guidance Note (Toronto, ON, March 2017).

examples include local improvement charges (LICs) or Property Assessed Clean Energy (PACE) financing, where loans are repaid through property taxes; on-bill financing, which ties repayment to utility service; or the provision of “soft” loans (often by governments or utilities themselves) with preferential terms. In this scorecard, we award up to one point to provinces that have taken necessary steps to enable such support for financing, including regulations for LICs or pilot or demonstration programs, or where such mechanisms are currently in place.

Credit enhancements are tools that help de-risk energy efficiency investments to leverage more participation by private finance. Loan guarantees, creation of reserve funds to partially cover borrower defaults, and interest rate buy-downs (subsidizing interest rates on private loans) are examples of credit enhancements that governments can put in place to address barriers to private investment. In this scorecard, we awarded up to one point to provinces with active or pilot credit enhancement programs, expressly designed to encourage private sector financing.

While both repayment mechanisms and credit enhancements are tools that use public policies to leverage private investment, there are also steps governments can take to mobilize private capital to support the programs themselves. For example, governments might raise private capital from bond markets by issuing green bonds to capitalize a loan program, a public energy efficiency project, or a municipal LIC program. Revolving funds and/or trusts may be established to provide a continuous source of capital, provided by government or private sources, to support projects and programs. A specialized institution like a Green Bank may be created to provide a number of financing functions, from aggregating projects and issuing securities, to centralizing program coordination, offering soft loans, or providing credit enhancements. We awarded up to one point to provinces that have taken steps to mobilize capital through such initiatives.

Table 31. Financing Scoring Results				
Province	Repayment Mechanisms (1 point)	Credit Enhancements (1 point)	Capital Mobilization (1 point)	Total (3 pts)
Alberta	●	●	-	2.0
British Columbia	●	-	◑	1.5
Ontario	●	-	◑	1.5
Manitoba	●	-	-	1.0
Newfoundland and Labrador	●	-	-	1.0
Nova Scotia	●	-	-	1.0
Prince Edward Island	●	-	-	1.0
Saskatchewan	●	-	-	1.0
Québec	-	-	◑	0.5
New Brunswick	-	-	-	0.0

Repayment Mechanisms

Our research indicates that most financing support initiatives across Canada have focused on repayment mechanisms, rather than credit enhancements or other forms of private capital mobilization. Soft loans appear to be the most common repayment mechanism (often in conjunction with on-bill financing), with at least one loan program in place in each of British Columbia, Manitoba, Newfoundland and Labrador, Prince Edward Island, and Saskatchewan. Loans are typically provided by utility companies, though the terms and applicable technologies vary significantly.

Box 2: Manitoba Hydro's PAYS Financing Program

Manitoba Hydro's PAYS Financing Program is unique in Canada. It is the only support program for homeowners that bases repayment on the estimated annual energy savings from efficiency improvements, rather than being structured as a simple loan.

The program works by estimating the annual energy savings of the supported improvement, averaging them out on a monthly basis, and calculating the maximum eligible financing and term to ensure a monthly payment that is lower than monthly savings.

Of these provinces, Manitoba has the widest range of loan programs, including the Pay-as-You-Save (PAYS) program detailed in the sidebar, an Energy Finance Plan targeting a wide range of electrical and natural gas upgrades, a Residential Earth Power Loan for heat pumps, solar water heaters, and solar photovoltaic systems, an income-based Affordable Energy Program for renters and landlords, and a Home Energy Efficiency program that supports building envelope upgrades, space and water heating, and electric vehicle chargers—all administered by Manitoba Hydro, and all except the Affordable Energy Program using on-bill financing.[73]

In British Columbia, FortisBC currently operates a loan program for heat pumps, available only to customers with electric furnace or baseboard heaters, and municipal utilities in Nelson and Penticton run their own loan programs with on-bill financing.[74] While both FortisBC and BC Hydro conducted on-bill financing pilot programs (at the province's direction) in select locations in 2012, the regulation guiding utility financing is no longer in force due to low uptake.

Both Newfoundland and Labrador Hydro and Newfoundland Power have on-bill financing for select efficiency upgrades, and the provincial government, in conjunction with takeCharge, runs the Energy Efficiency Loan Program, offering low-interest loans of up to $10,000 that can also be financed on utility bills. In Prince Edward Island, an energy efficiency loan program was launched in November 2018, also providing loans of up to $10,000. In Saskatchewan, both SaskPower and SaskEnergy offered the Energy Star Loan Program, providing funding of up to $15,000 over five years, between July 1, 2018 and May 31, 2019. The program has since ended. Natural gas utilities in Ontario have been directed to offer on-bill repayment, allowing third-party companies to charge for services on utility bills, but do not themselves offer financing.[75]

Only three provinces have taken steps toward implementation of LIC programs: Alberta, Nova Scotia, and Ontario. In June 2018, the Legislative Assembly of Alberta passed an Act to Enable Clean Energy Improvements, which amends Alberta's Municipal Government Act to introduce a municipal clean energy improvement tax.[76] The

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[73] Manitoba Hydro, "PAYS Financing," Manitoba Hydro, 2019, https://www.hydro.mb.ca/your_home/pays/; Manitoba Hydro, "Energy Finance Plan," Manitoba Hydro, 2019, https://www.hydro.mb.ca/your_home/loans_financing/energy_finance_plan/; Manitoba Hydro, "Residential Earth Power Loan," Manitoba Hydro, 2019, https://www.hydro.mb.ca/your_home/earth_power_loan/; Manitoba Hydro, "Affordable Energy Program," Manitoba Hydro, 2019, https://www.hydro.mb.ca/your_home/affordable_energy/; Manitoba Hydro, "Home Energy Efficiency Loan," Manitoba Hydro, 2019, https://www.hydro.mb.ca/your_home/residential_loan/.

[74] CleanBC, "Financing - Better Homes BC," CleanBC - Better Homes, 2019, https://betterhomesbc.ca/financing/.

[75] Ontario Energy Board, "Mid-Term Review of the Demand Side Management (DSM) Framework for Natural Gas Distributors," Report of the Ontario Energy Board (Toronto, ON; Ontario Energy Board, November 29, 2018), https://www.oeb.ca/sites/default/files/Report-of-the-Board-DSM-Mid-Term-Review-20181129.pdf.

[76] Legislative Assembly of Alberta, "An Act to Enable Clean Energy Improvements," Pub. L. No. Bill 10 (2018),

legislation took effect on January 1, 2019. Energy Efficiency Alberta was planning to launch a pilot program with the City of Edmonton and was developing a program guide for municipalities in winter 2019. A regulation amending the Municipal Act was passed in 2012 in Ontario, specifying energy efficiency, renewable energy, and water conservation as eligible LIC measures.[77] The City of Toronto Act was also amended in 2012 to enable PACE financing,[78] and Toronto launched the Home Energy Loan Program in March 2014.[79]

Nova Scotia amended its Municipal Act to enable PACE loans in 2010. In 2013, Halifax launched the Solar City program to finance solar hot water installation, with funding support from the Federation of Canadian Municipalities' Green Municipal Fund', becoming the first city in Canada to use LIC funding on a large scale. Efficiency Nova Scotia currently offers the My Energy Improvement Plan PACE program,[80] and Clean Foundation provides PACE financing under its Clean Energy Financing program in five participating towns and municipalities.[81]

Credit Enhancement

We were only able to identify one credit enhancement program, the Green Loan Guarantee Program offered by Energy Efficiency Alberta, a $400-million initiative designed to support financial institutions and utilities that offer financing for energy efficiency, renewable energy, and clean technology projects.[82] The program is designed for the commercial and industrial sectors and consists of two tracks. The first, for individual projects, offers a guarantee for lenders to recover up to 50% of the principal and accrued interest on a loan that may go into default. The second, an institutional track, targets financial institutions, utilities, or other entities that are already providing financing for energy efficiency or clean energy projects. The maximum available guarantee ranges from $10 million to $50 million across three classes of participants, with offerings segmented by projects' GHG emission reduction potential, and with specific offerings for Indigenous communities.

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https://www.assembly.ab.ca/ISYS/LADDAR_files/docs/bills/bill/legislature_29/session_4/20180308_bill-010.pdf.

[77] Government of Ontario, "Local Improvement Charges - Priority Lien Status," Pub. L. No. O. Reg. 586/06 (2012), https://www.ontario.ca/laws/regulation/060586#BK62.

[78] Government of Ontario, "Local Improvement Charges - Priority Lien Status," Pub. L. No. O. Reg. 323/12 (2012), https://www.ontario.ca/laws/regulation/r12323.

[79] City of Toronto, "Home Energy Loan Program," City of Toronto, 2019, https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/home-energy-loan-program-help/.

[80] Efficiency Nova Scotia, "My Energy Improvement Plan PACE Program," Efficiency Nova Scotia, 2019, https://www.efficiencyns.ca/service/meip/.

[81] Clean Foundation, "Clean Energy Financing," Clean Foundation, 2019, https://clean.ns.ca/clean-energy-financing/.

[82] Energy Efficiency Alberta, "Green Loan Guarantee Program," Energy Efficiency Alberta, 2019, https://www.efficiencyalberta.ca/green-loan-guarantee-program/.

Capital Mobilization

Three provinces reported use of green bonds to fund energy efficiency measures: Ontario, Québec, and to a more limited extent, British Columbia. Ontario has issued green bonds five times between 2014 and 2019, producing $4 billion in proceeds for transit and energy efficiency projects. Québec has issued green bonds four times since February 2017 for projects focused primarily on public transportation. In British Columbia, the City of Vancouver issued one green bond in September 2018, totaling $85 million,[83] and the province has also used the instrument to support LEED-certified hospital infrastructure.[84]

The use of revolving funds, trusts, and Green Banks is somewhat more complicated. No province currently has a comprehensive green bank performing all of the functions described above. The Ontario government's November 2018 Environment Plan proposed the creation of an Ontario Carbon Trust (now referred to as the Emission Reduction Fund) that would use public funds to leverage private investment in clean technologies. The language in the Ontario Environment Plan suggests the proposed Trust could operate as Canada's first provincial Green Bank. However, no further plans or information on this initiative have been announced, and it is unclear exactly how this fund would operate—whether it would use the funding to help de-risk investment opportunities for private finance, or award it to project proponents as a more simple, direct financial incentive.

For capital mobilization, we award partial points to British Columbia, Ontario, and Québec for their green bond activities. A province with a comprehensive suite of capital mobilization functions, performed by an institution like a green bank, would receive full points.

Research & Development and Program Innovation

Continuing research, development and demonstration (RD&D) of novel energy efficiency technologies and experimenting with innovative program designs and delivery methods is essential to realizing the full energy savings potential of energy efficiency. For the purposes of this report, RD&D and innovation activities span the range from fundamental or early-stage scientific and technology research, to piloting and demonstration activities of proven technologies and/or program strategies that are novel to a jurisdiction.

According to the International Energy Agency, energy efficiency RD&D averaged 13.2% of all energy-related RD&D expenditures by federal, provincial, and territorial governments in Canada between 2010 and 2016. The figure increased to 22% in 2017

[83] City of Vancouver, "City Launches First Green Bond," City of Vancouver, September 12, 2018, https://vancouver.ca/news-calendar/city-launches-first-green-bond.aspx.
[84] Government of British Columbia, "North Island Hospitals Project Green Bond Issue a First," Government of British Columbia, July 2, 2014, https://news.gov.bc.ca/releases/2014FIN0023-000901.

and an estimated 25.6% in 2018, making energy efficiency second only to fossil fuels in share of total RD&D expenditures.[85] While this share varies considerably over a longer time period, in absolute terms spending on energy efficiency RD&D has increased relatively steadily since 1990 (see Figure 2). Between 2015 and 2018, total government spending on energy efficiency amounted to $709 million, from a total of $3.4 billion on all energy-related RD&D.

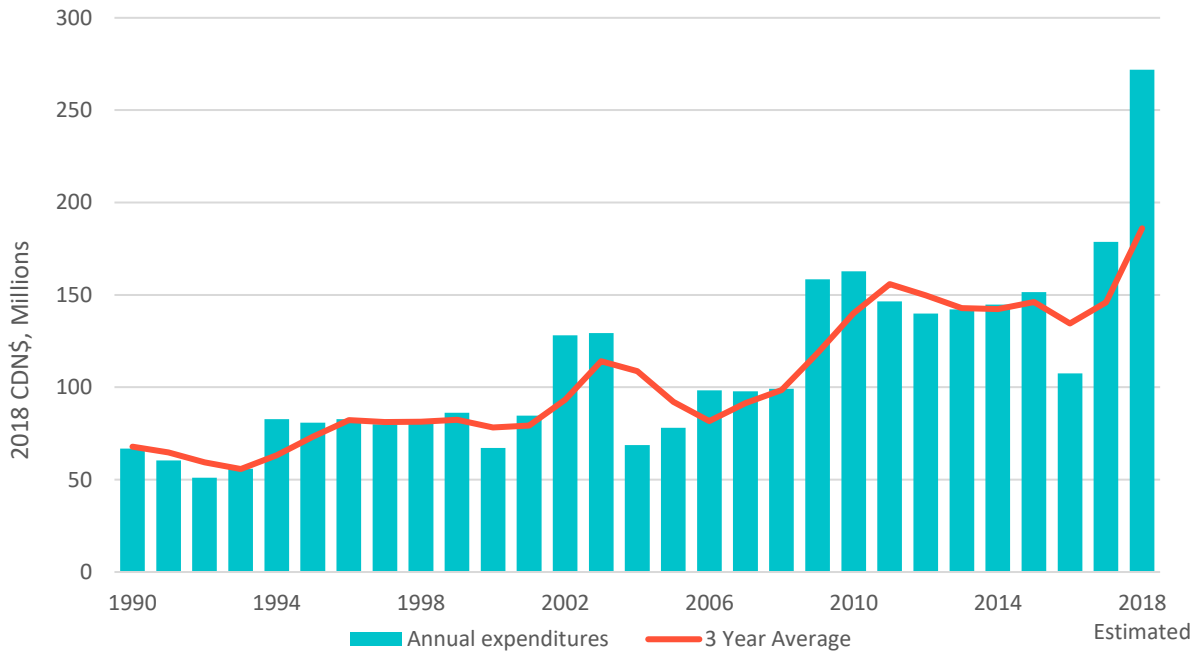

Figure 2. Federal, Provincial, and Territorial Government Expenditures on Energy Efficiency RD&D, 1990-2018 (2018 CDN$)

These expenditures can be further disaggregated into four categories: industry, buildings and appliances, transport, and other, a category that included communities, agriculture, heat pumps, and unallocated projects. Between 2010 and 2018, spending on transport efficiency RD&D accounted for an average 37% of expenditures, industry for 27.4%, buildings and appliances for 20.4%, and other spending for 15.2%. The dramatic jump in expenditures after 2016 came largely from growth in spending on transport and industrial efficiency RD&D. In the industrial sector, the bulk of spending is split between industrial techniques and processes, and industrial equipment and systems, the former averaging 69% of the overall category between 2015 and 2018, and the latter 28%. In the transport sector, roughly 92% of expenditures went to on-road vehicles over the same time frame.

[85] International Energy Agency, "Energy Technology RD&D Budgets," IEA Data Services, 2019, https://www.iea.org/statistics/rdd/.

According to Statistics Canada's Research and Development in Canadian Industry (RDCI) survey,[86] industry expenditures on all energy-related RD&D totaled $1.6 billion in 2016, and energy efficiency expenditures accounted for $290 million, or roughly 18%. Of that share, approximately 62% came from the manufacturing sector, 28.6% from the service sector, and 4% from utilities. Out of the national total for energy efficiency RD&D spending, $99 million was spent on energy efficiency in the industrial sector, largely by the manufacturing sector, at $57 million.

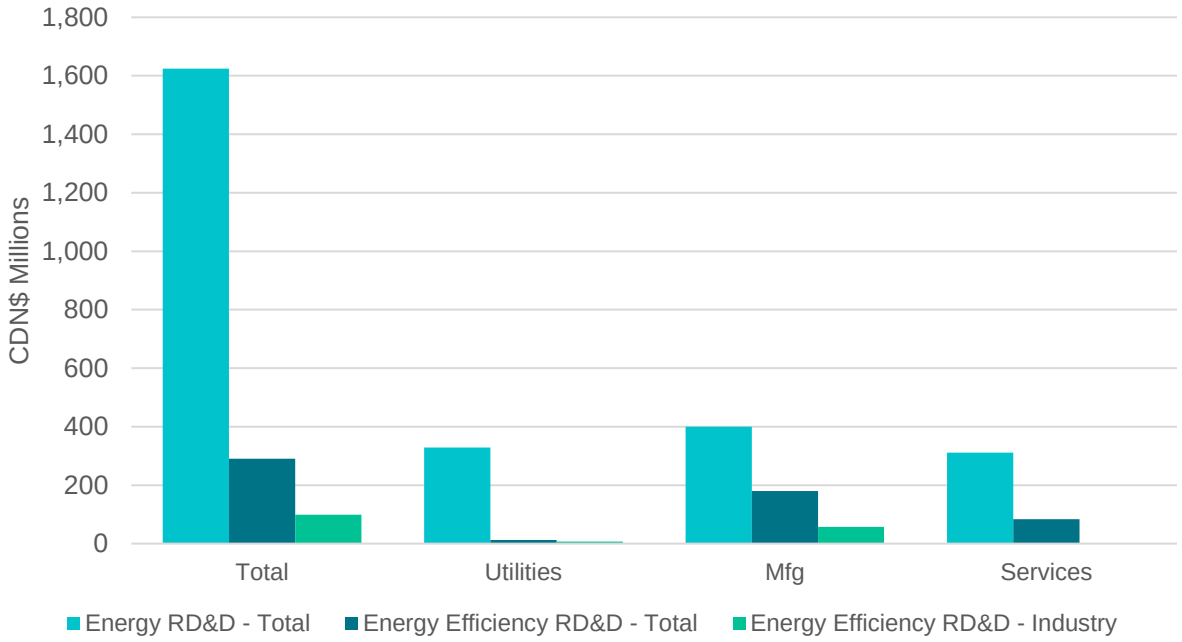

Figure 3. Energy and Energy Efficiency RD&D Expenditures by Industry Sector

Neither the IEA database nor the RDCI provided data on RD&D expenditures by province, so this information is provided for illustrative purposes and has not been used for scoring.

To score provinces on their energy efficiency-related RD&D and innovation activities, we looked at three different metrics: research funding for energy efficiency at universities and colleges; whether DSM program administrators had dedicated funds to support RD&D and program innovation; and, the existence of dedicated research

[86] Statistics Canada, "Annual Survey of Research and Development in Canadian Industry (RDCI)," Government of Canada, August 1, 2018, http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=4201; Statistics Canada, "Table 27-10-0341-01 Business Enterprise in-House Research and Development Characteristics, by Industry Group Based on the North American Industry Classification System (NAICS), Country of Control and Provinces and Territories," Government of Canada, December 27, 2017, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2710034101.

institutes, organizations, or provincially-supported research projects for energy efficiency. Table 32 provides a summary of the scoring for these metrics.

Table 32. RD&D and Program Innovation Scoring Results

Province	Research Funding (1 pt)	Program Innovation Funds (1 pt)	Institutes and Projects (1 pt)	Total (3 pts)
Québec	1	1	1	3
Ontario	0.5	1	1	2.5
Nova Scotia	0.5	1	1	2.5
New Brunswick	0.5	1	1	2.5
British Columbia	0.5	1	1	2.5
Prince Edward Island	0	1	1	2.0
Saskatchewan	0.25	0.5	1	1.75
Alberta	0.25	0.5	1	1.75
Manitoba	0.5	1	0	1.5
Newfoundland & Labrador	0.25	0	1	1.25

Research Funding

Research capacity varies widely across the provinces and can be expected to concentrate on issues that are particularly relevant to the provincial economy and society. Yet research institutions in all provinces conduct research on energy resources, and energy efficiency is relevant across all the sub-categories noted above. We thus consider the share energy efficiency RD&D funding comprises of funding for research on energy RD&D more broadly as a measure of the prioritization or intensity of energy efficiency in research institutions with substantial energy research capacities. This is the same approach the IEA takes in presenting energy efficiency RD&D expenditures.

The Natural Sciences and Engineering Research Council's (NSERC) is a federal government agency that funds academic research, primarily taking place at Canadian universities. NSERC maintains an online award database that can be filtered by area of application.[87] Energy efficiency is listed as a subset of a broader category of Energy Resources that includes electrical energy; energy resource production, exploration, processing, distribution and use; energy storage and conversion; nuclear energy; and oil, gas and coal. The database can supply a summary table of funding by year, area of application, and province.

Given the six sub-categories of energy resources in the NSERC database, we award a full point for research funding to provinces that exceed an energy efficiency RD&D intensity rate of 16.6% (100/6), 0.75 points for rates between 12% and 16.5%, 0.5 points for 8% to 11.9%, and 0.25 points for 4% to 7.9%. Provinces where the share of funding for energy efficiency RD&D falls below 4% of overall funding for energy resources receive no points. The results are shown below in Table 33.

It is important to note that NSERC funding does not represent all RD&D funding for energy efficiency in each province. There is no publicly available data source for province-wide energy efficiency RD&D expenditure, but the next two metrics are intended to capture a fuller picture.

Overall, NSERC funding for energy efficiency research totaled $31 million between 2014/15 and 2018/19, out of $318 million for energy resources as a whole. Unsurprisingly, the bulk of that funding went to provinces with more research institutions, and thus more projects overall—41.6% to Ontario and 31.2% to Québec. The next two provinces, Alberta and British Columbia, receive 9.9% and 9.2% of NSERC funding for energy efficiency projects, respectively.

We looked at funding for energy efficiency research as a proportion of funding for all energy resources research to benchmark across the provinces, relative to their internal research capabilities. As Table 33 indicates, the share of energy RD&D funding going to energy efficiency does not exceed a theoretically equal amount of 16.6% (since there are six energy resource subcategories) in any of the provinces. Québec leads the other provinces, being the only province to score in the second tier, while Manitoba, Ontario, Nova Scotia, British Columbia and New Brunswick all fall into the third tier. Prince Edward Island receives zero points on this metric, as the province was not awarded any NSERC funding for energy efficiency research in the years covered.

[87] Natural Sciences and Engineering Research Council of Canada, "NSERC's Awards Database," Government of Canada, 2018, http://www.nserc-crsng.gc.ca/ase-oro/index_eng.asp.

Table 33. NSERC Funding, All Energy Resources and Energy Efficiency 2014/15-2018/19				
Province	Energy Resources	Energy Efficiency	EE Research Intensity	Score (1 pt)
Québec	$63,324,487	$9,809,528	15.5%	0.75
Manitoba	$4,227,629	$500,500	11.8%	0.5
Ontario	$115,444,121	$13,109,272	11.4%	0.5
Nova Scotia	$10,590,296	$953,440	9.0%	0.5
British Columbia	$35,314,432	$2,897,740	8.2%	0.5
New Brunswick	$3,357,911	$269,000	8.0%	0.5
Saskatchewan	$7,041,584	$511,465	7.3%	0.25
Newfoundland and Labrador	$4,338,757	$309,000	7.1%	0.25
Alberta	$73,936,356	$3,123,442	4.2%	0.25
Prince Edward Island	$249,123	$0	0.0%	0

Funds for RD&D and Program Innovation

While RD&D for emerging technologies is important, so too is experimentation with new program delivery models or methods, and piloting technological improvements or processes that, while not necessarily unproven, are nonetheless new to provincial energy systems.

Rigorous evaluation, measurement, and verification is an essential element to ensure DSM investments from regulated entities are justifiable and cost-effective. But experimentation with new programs and processes can be difficult to justify under these frameworks, as there is a chance they could fail to produce the desired outcomes. Therefore, another aspect we considered in our evaluation of RD&D and innovation activities in Canada was whether efficiency program administrators had dedicated funding to support experimentation, program innovation, and pilot projects. Provinces were awarded 0.5 points for evidence of supported pilot projects and technological demonstration, or a full point for the existence of a dedicated fund or budget line to support experimentation with new program designs and technologies.

Table 34 summarizes provincial funding and programs for energy efficiency RD&D and program innovation.

Table 34. Program Innovation Funds Scoring Results		
Province	Innovation Fund	Score (1 pt)
British Columbia	The BC Demand-Side Measures Regulation requires a minimum of 1% of the DSM budget to be set aside for Codes and Standards, which includes technology RD&D and innovation activities. BC Hydro reported that it did not have a separate fund for RD&D and innovation, but provided a list of pilot and demonstration programs it had undertaken in the area of demand-side management. These initiatives are supported through budgeting for Codes and Standards in the utility's DSM plans. FortisBC has included funding for its Innovative Technologies program in its 2019-2022 DSM Plan, ranging from $2 million in 2019 to $3.1 million in 2022. The utility also manages its InnoTech program, funding for which totals $550,000 over the same period.	1
Manitoba	Manitoba Hydro includes an Innovation Fund in its DSM budget to support innovation and pilot projects, with $300,000 in total funding set aside for 2016/17-2018/19. The utility also includes a budget for emerging technology and future opportunities, totaling more than $7 million between 2016 and 2019, which was used primarily to support its pilot solar photovoltaic program. Manitoba Hydro's industrial energy efficiency Bioenergy Optimization Program also supports demonstration combined heat and power (CHP) projects (see the Industry chapter).	1
New Brunswick	NB Power's DSM plans include "enabling strategies" which can include demonstration projects, support mechanisms (e.g. financing and training), market transformation, and evaluation.	1
Nova Scotia	Efficiency Nova Scotia's DSM plan includes investments in enabling strategies to improve program and services and encourage market transformation.	1
Ontario	The Independent Electricity System Operator (IESO) managed the LDC Innovation Fund, which ended March 2019, and continues to manage the Grid Innovation Fund, which has supported more than 200 conservation, demand management, and energy storage projects since 2005. An example of how the latter fund contributed to program innovation is the IESO's Pay-for-Performance incentive program for commercial and institutional customers (detailed in the box below). Enbridge maintains a $6-million Collaboration and Innovation Fund ($1 million per year between 2015-2020), and Legacy Union Gas allocated an annual $500,000 toward a pilot and test fund.	1

Prince Edward Island	Efficiency PEI included an enabling strategies fund in its 2018-2021 DSM Plan, totaling approximately $815,000 over the three years.[88]	1
Québec	Hydro-Québec's DSM plan includes specific initiatives for R&D and pilot projects, particularly through its Laboratoire des technologies de l'énergie (LTE), part of its Institut de recherche d'Hydro-Québec (IREQ), as well as its Démonstration technologique et commerciale (DTEC) program. Budgets for these activities are in the range of $8 million per year for 2016-2018. Énergir also has a program which supports innovation in natural gas efficiency through the development and demonstration of new technologies, systems, and processes.[89]	1
Alberta	Energy Efficiency Alberta did not report having a dedicated innovation fund, but noted it is experimenting with new program approaches.	0.5
Saskatchewan	SaskPower reported it has no discrete fund, but that there are opportunities to utilize its DSM/EE program funds for pilot projects. SaskEnergy funds some demonstration projects for CHP, heat pumps, and other demonstration projects, though it is not clear whether they are supported by a dedicated innovation program.	0.5
Newfoundland and Labrador	No dedicated fund reported	0

[88] Prince Edward Island Energy Corporation, "2018-2021 Demand Side Management ('DSM') Plan," June 29, 2018, http://www.irac.pe.ca/infocentre/documents/Electric-UE41400-PEI_EEEC-Plan_FINAL-062918-for_filing.pdf.
[89] Énergir, "Innovations," Énergir, 2019, https://www.energir.com/en/major-industries/energy-efficiency-programs/programs/innovation/.

Box 3: Piloting a New Pay-for-Performance Approach in Ontario

Conventional efficiency incentive programs often consist of an up-front incentive payment to a program participant, determined by the estimated savings from the improvement being undertaken. This creates risk to the utility that the estimated savings will not materialize, and it doesn't provide much incentive for the program participant to continually work toward increased savings.

Beginning in 2012, the Ontario Power Authority (since merged into the IESO) began piloting a number of different pay-for-performance programs for commercial and institutional customers, funded by the Grid Innovation Fund. Program participants would commit to a specified energy savings target and receive incentive payments over time, based on the amount of actual savings realized. One such pilot program, involving 18 large grocery stores, achieved an average 10% savings at the portfolio level, compared with an average of 4% for conventional incentive programs.

Subsequently, the Ministry of Energy, Northern Development and Mines directed the IESO to develop and deliver the pay-for-performance model as a standing incentive program, resulting in an official program launch in December 2016.

Research Institutes and Projects

The final category we consider in our assessment of provincial RD&D and innovation activities is the existence of research institutes or provincially-supported research projects for energy efficiency technology. The intent of this metric is to capture specific RD&D initiatives for which energy efficiency is a core research theme, to begin building a better understanding of the energy efficiency innovation system in Canada.

We asked survey respondents to identify research institutes and provincially-supported research projects for energy efficiency, and to provide comments or clarification about activities in this area that we were able to identify through desk research. Where possible or applicable, we sought to verify that initiatives were indeed actively conducting or supporting RD&D or innovation activities for energy efficiency, or had supported projects in the past five years that were clearly related. For provinces that had one or more such institutes or projects, we awarded one point.

We attempted to restrict this list to institutes or projects with a clear connection to government or industry, thereby excluding research institutes or groups based at Canadian universities or colleges, innovation incubators or accelerator centres, venture capital or angel investor groups or businesses, federal government programs, or other national-level initiatives. We also excluded provincial government departments or programs with no clear evidence or identification of energy efficiency research support. In some cases, partial points were awarded if identified institutes or provincial projects

did not focus on energy efficiency specifically, but supported research on closely-related issues. The resulting list does not give a complete picture of energy efficiency innovation in Canada. We highlight a closer look at the energy efficiency research and innovation system as a fruitful area for further research.

Table 35. Research Institutes and Projects Scoring Results

Province	R&D Institutions/Projects	Score (1 pt)
Alberta	Emissions Reductions Alberta has funded RD&D to reduce GHG emissions through a number of funding streams, including the Industrial Efficiency Challenge, though this program is now closed. According to the funding stream website, the program awarded $69 million to 10 projects.[90]	1
British Columbia	The Province of British Columbia launched the $1.8-million CleanBC Building Innovation Fund in the spring of 2019 to support research, commercialization, and demonstration.[91] Since 2008, the BC government's Innovative Clean Energy fund has supported a number of RD&D projects, including high-performance window certification, field testing of heat pump water heaters and cold climate heat pumps, natural gas heat pump feasibility studies, and modeling of the EnerGuide rating system, and currently contributes funding to the BC-NRCan ISO 50001 initiative (detailed in the Industry chapter of this report).[92]	1
Newfoundland & Labrador	The Department of Tourism, Culture, Industry and Innovation has supported several efficiency-related projects in the past five years, including one for research and development of distributed smart thermostats.	1
Nova Scotia	The Government of Nova Scotia has supported several efficiency-related projects in the past five years, including studies of the efficiency sector supply chain, microlending for efficiency upgrades, and efficiency opportunities in old residential building stock.	1

[90] Emissions Reduction Alberta, "Industrial Efficiency Challenge," Emissions Reduction Alberta, 2018, https://www.eralberta.ca/apply-for-funding/era-industrial-efficiency-challenge/.
[91] Ministry of Energy and Mines, "CleanBC Building Innovation Fund - Province of British Columbia," Government of British Columbia, 2019, https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/energy-efficiency-conservation/programs/cleanbc-building-innovation-fund.
[92] Ministry of Energy and Mines, "Innovative Clean Energy (ICE) Fund," Government of British Columbia, 2018, https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/innovative-clean-energy-solutions/innovative-clean-energy-ice-fund.

Ontario	The Ontario Energy Board recently launched the OEB Innovation Sandbox to encourage utilities and other actors to get regulatory advice/relief for new ideas, products, and business models.[93]	1
Prince Edward Island	The Government of Prince Edward Island has supported several efficiency-related projects in the past five years, including one on cold climate air-source pumps, and another on thermal storage using heat pumps.	1
Québec	Hydro-Québec operates the L'Institut de recerche d'Hydro-Québec (IREQ) research centre, which conducts energy efficiency research at its Laboratoire des technologies de l'énergie (LTE), as noted above. The Centre d'excellence en efficacité énergétique provides funding support for energy efficiency RD&D in the transportation sector, and the Natural Gas Technologies Centre supports energy efficiency research in the natural gas sector.[94]	1
New Brunswick	The New Brunswick Innovation Foundation has invested in energy-related projects, though energy efficiency is not a core research area. The Smart Grid Innovation Network is a partnership between NB Power, the University of New Brunswick, and Siemens Canada that has supported RD&D in a number of smart grid related areas.	1
Saskatchewan	Innovation Saskatchewan manages the Saskatchewan Advantage Innovation Fund to support game-changing technological innovations in the province's core economic sectors.[95] Energy is listed as a core sector, though the program does not explicitly specify energy efficiency as an eligible project type.	0.5
Manitoba		0

Training and Professionalization

A highly qualified and professional workforce educated in energy efficiency is an important enabler of energy savings goals. Professional credentials encourage ongoing training, which will be important to rapidly evolve toward more efficient buildings and industries. A broader concept of capacity-building involves building a culture of conservation to encourage energy-efficient behaviours in workplaces and homes. We

[93] Ontario Energy Board, "OEB Innovation Sandbox," Ontario Energy Board, 2019, https://www.oeb.ca/_html/sandbox/index.php.
[94] "Centre d'excellence en efficacité énergétique," accessed July 31, 2019, https://c3e.ca/.
[95] "Saskatchewan Advantage Innovation Fund," Innovation Saskatchewan, accessed July 31, 2019, https://innovationsask.ca/research/saskatchewan-advantage-innovation-fund.

found that all provinces are engaged in some form of capacity-building, such as school education programs, general awareness and education efforts, and training initiatives.

To benchmark the provinces in training and professionalization we looked at data available on two types of certifications: residential energy advisors, and certified energy managers (CEM). Provincial-level data on these certifications was available from Natural Resources Canada, and the Association of Energy Engineers Certified Professionals Directory, respectively.

The two certifications cover broad areas of energy efficiency. Energy advisors primarily focus on new and existing residential homes, while CEMs primarily work in commercial, institutional, and industrial buildings and facilities. Our consultations with experts and review of provincial training programs confirmed that these are widely-used, nationally-recognized certifications that are frequently supported by federal and provincial policy. For instance, new model building codes (Part 9) and the Pan-Canadian Framework goals associated with home energy labeling will likely use Natural Resources Canada's EnerGuide rating system, which is supported by energy advisor certification.[96]

We are using these two certifications as barometers for a much wider system of training and skills development. We note the importance of integrating energy efficiency training within existing educational programs and professional skills development, as well as other energy efficiency certifications. We view these two certifications as good indicators because other professionals such as general contractors, electricians, plumbers, and home builders work in partnership with energy advisors and CEMs to identify the most beneficial improvements. Energy advisors and CEMs can also play a role in general education and motivation of energy-saving behaviours for homeowners and employees.

For the scorecard, we tracked energy advisors and managers with a business address located in a province. Some of these practitioners might provide services within their larger region, especially in smaller or geographically proximate jurisdictions (e.g. the Maritime or prairie provinces). We feel it is appropriate to provide extra credit to a province if its energy experts are also providing services to its larger region. However, it is important to recognize that province-specific figures may not fully reflect energy consumers' access to services from energy professionals.

For this topic, provinces could be awarded a total of four points: two for residential energy advisors, and two for Certified Energy Managers. We divided the residential energy advisors score into one point for existing houses and one for new construction. We counted the number of certifications, so one professional with two certifications would be counted twice.

[96] David Stonham, "Towards Net-Zero: A Building Code Meeting for the History Books," *Efficiency Canada* (blog), September 12, 2019, https://www.efficiencycanada.org/a-building-code-meeting-for-the-history-books-towards-a-net-zero-building-code/.

For existing houses, we included the number of certifications under the old EnerGuide rating system for new and existing houses, based on the 0-100 scale, as well as certifications under the new (version 15) system based on a gigajoule-per-year rating.[97] To normalize across the provinces, we divided total certifications over the number of single-detached and single-attached households.[98] This excluded apartments, mobile homes, and other moveable dwellings. Energy advisors have not been as active in these segments, and there is a need to train and certify advisors for multi-unit residential. We excluded apartments, in particular, because an energy advisor could serve many apartment units, and thus an advisor per building metric would not present a useful benchmark for provinces with a large number of multi-unit residential dwellings. Points were awarded on the following scale:

Table 36. Existing Home Energy Advisor Scoring Methodology

Existing Home Energy Advisors Per 10,000 Houses (Single Detached and Attached)		Score
3.5	Or greater	1.00
2.6	3.4	0.75
1.8	2.5	0.50
0.9	1.7	0.25
0.0	0.8	0.00

[97] Natural Resources Canada, Number of Active Energy Advisors per province – by program, as of 2019-03-25

[98] Natural Resources Canada, "Residential Sector, Total Households by Building Type and Energy Source," in *National Energy Use Database* (Ottawa, ON: Government of Canada, 2018), http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/databases.cfm.

Another point was awarded for new housing energy advisor certifications. We included certifications for new housing under the older EnerGuide rating system (0-100 scale) for new housing, the new (version 15) system based on a gigajoule-per-year rating which certifies for both new and existing housing, and the Energy Star and R-2000 certifications.[99] We divided the sum of these different certifications by total new construction building permits for single-dwelling residential structures in 2018.[100] We restricted our denominator to single dwellings for the reasons explained above: This is the market where energy advisors are traditionally more active, and we avoid biasing results against jurisdictions with significant multi-unit residential construction. Points were awarded on the following scale.

Table 37. New Home Energy Advisor Scoring Methodology

New Home Energy Advisors Per 1,000 Single Dwelling Residential New Construction Permits (2018)		Score
40	or greater	1.00
30	39	0.75
20	29	0.50
10	19	0.25
0	9	0.00

[99] Source Natural Resources Canada, Number of Active Energy Advisors per province – by program, as of 2019-03-25

[100] Statistics Canada, “Table 34-10-0066-01: Building Permits, by Type of Structure and Type of Work,” Government of Canada, 2019, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3410006601.

Finally, we awarded two points for Certified Energy Manager certifications per province, which could include CEM, CEM-International (I & II), and Energy Manager in Training (including International) certifications.[101] The total certifications listed in a province were divided by the number of businesses with greater than 100 employees.[102] CEMs typically work in the commercial and institutional sectors, and in industrial facilities. They are often hired by particular businesses. We chose larger businesses likely to hire one or more CEMs to provide a consistent comparison that avoids biasing results against provinces with more small and medium sized businesses. Of course a CEM can be highly valuable to smaller companies or a consortium of small companies.[103] We used a per business denominator because not all provinces had data to support a more relevant denominator based on the number of commercial-institutional buildings or total floor space in the sector. We awarded points on the following scale:

Table 38. Certified Energy Managers Scoring Methodology

Certified Energy Managers Per 100 Large Businesses (> 100 Employees)		Score
9.5	or greater	2.00
8.3	9.4	1.75
7.1	8.2	1.50
5.9	7.0	1.25
4.8	5.8	1.00
3.6	4.7	0.75
2.4	3.5	0.50
1.2	2.3	0.25
0.0	1.1	0.00

The results for all three metrics were as follows:

[101] "AEE Certified Professionals Directory," Association of Energy Engineers, 2019, https://portal.aeecenter.org/custom/cpdirectory/index.cfm.
[102] Statistics Canada, "Table 33-10-0092-01 Canadian Business Counts, with Employees, June 2018," Government of Canada, 2019, https://doi.org/10.25318/3310009201-eng.
[103] Seth Nowak, "Big Opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs" (Washington, DC: American Council for an Energy Efficiency Economy, 2016), aceee. org/researchreport/u1607.

Table 39. Existing Home Energy Advisory Certifications Scoring Results			
Province	Existing Home Energy Advisor Certifications (March 2019)	Existing Home Energy Advisor Certifications Per 10,000 Houses (Single Detached and Attached)	Score (1 pt)
Nova Scotia	113	3.8	1.00
Prince Edward Island	7	1.5	0.25
Ontario	569	1.5	0.25
New Brunswick	36	1.5	0.25
British Columbia	141	1.2	0.25
Québec	229	1.2	0.25
Alberta	72	0.6	0.00
Saskatchewan	13	0.4	0.00
Manitoba	2	0.1	0.00
Newfoundland and Labrador	2	0.1	0.00

Table 40. New Home Energy Advisor Certifications Scoring Results			
Province	New Home Energy Advisor Certifications (March 2019)	New Home Energy Advisors Per 1,000 Single Dwelling Residential New Construction Permits (2018)	Score (1pt)
Nova Scotia	105	57	1.00
New Brunswick	33	29	0.50
British Columbia	160	21	0.50
Ontario	392	16	0.25
Prince Edward Island	7	12	0.25
Newfoundland and Labrador	7	10	0.25
Saskatchewan	14	10	0.25
Alberta	86	8	0.00
Québec	19	2	0.00
Manitoba	2	1	0.00

Table 41. Certified Energy Manager Certifications Scoring Results			
Province	Total Certified Energy Manager (CEM) Certifications (April 2019)	Certified Energy Managers Per 100 Large Businesses (> 100 Employees)	Score (2 Pts)
Nova Scotia	63	10.0	2.00
Ontario	993	9.7	2.00
British Columbia	284	8.7	1.75
New Brunswick	37	7.3	1.50
Alberta	150	4.4	0.75
Saskatchewan	33	4.3	0.75
Manitoba	38	3.9	0.75
Québec	122	2.3	0.25
Prince Edward Island	1	1.0	0.00
Newfoundland and Labrador	2	0.5	0.00

Future scorecards could provide more robust tracking of energy training and professionalization. This could include other certifications, such as LEED and Passive House, and/or a more exhaustive tracking of how energy efficiency considerations are integrated in existing curricula and professional credentials. We also hope to track multi-unit residential energy advisor certifications in the future.

Box 4: Nova Scotia: How a Small Province Boosted Energy Training and Professionalization

Nova Scotia was quick to recognize the importance of having a trained and certified energy efficiency work force. Provincial home upgrade incentive programs in operation since the mid 2000s measured energy savings through the National Resources Canada EnerGuide methodology. As energy savings efforts expanded after 2008, the demand for energy advisors increased. This created a network of NRCan-linked service organizations and trainers throughout the province. Companies specifically focused on training were established, such as ThermalWise (2009) and Blue House Energy (2013).

Other training is offered by national organizations, but it can be challenging for a small province to attract larger service providers to offer local sessions. And the independent contractors and small businesses that offer energy efficiency services lose money and work if they have to travel outside the province. So boosting training became one of the goals of Efficiency Nova Scotia's Efficiency Trade Network when it launched in 2016. With 50% of the cost of training covered, more local practitioners enrolled in courses, making it cost-effective for national organizations to offer local sessions. The recognition of the benefits of gaining professional credentials spread throughout the network.

Stimulating local demand for efficiency upgrades, linking programs to professional credentials, launching a trade ally network, and stimulating the local demand for training to reach a scale capable of competing with larger provinces all helped Nova Scotia assemble a comparatively large number of certified energy efficiency professionals.

Grid Modernization

Electricity grids, and the institutional structures that manage and govern them, evolved in the 20th century to deliver vast amounts of electricity from centralized generation plants to consumers spread out across a wide service area. A number of recent developments have challenged this model, particularly increased integration of variable renewable sources of electricity like wind and solar power, either at grid scale or in homes and businesses. Consumer preferences have changed as well, as some end users have sought more information and control over their electricity consumption. Natural gas networks are undergoing similar transformations, as utilities and regulators

explore peak shaving and “non-pipe” solutions to avoid more costly natural gas infrastructure.[104]

Recognition of the multiple benefits and cost-effectiveness of demand-side management, including both energy efficiency and demand response measures, has given rise to new practices and technologies to manage energy systems. There is growing recognition of the flexibility benefits of demand-side resources—the ability to rapidly change energy demands at certain times, or in particular locations, to make energy grids work more efficiently. For example, demand-side flexibility might be a readily available, and cost-effective way to increase the penetration of renewable energy.[105]

Grid modernization broadly describes the introduction of new technologies and practices to enhance the resiliency of energy grids. There are many different smart grid technologies and practices that can be implemented to modernize electricity as well as natural gas grids. In this section, we focus on efforts taken in provinces to facilitate two specific components that are particularly relevant to energy efficiency: advanced metering infrastructure, and rate designs to provide incentives for energy efficiency and demand savings. We also consider other grid modernization efforts that could directly or indirectly lead to greater energy efficiency, such as consideration of energy efficiency as a “non-wire” alternative in transmission or distribution grid planning, geo-targeting energy efficiency and demand response, and use of conservation voltage reduction (CVR) or volt-var optimization (VVO).

[104] Justin Gerdes, “Can Non-Pipeline Alternatives Curb New York’s Rising Natural Gas Demand?,” October 17, 2018, https://www.greentechmedia.com/articles/read/can-non-pipeline-alternatives-curb-new-yorks-rising-natural-gas-demand.

[105] Jennifer Potter, Elizabeth Stuart, and Peter Cappers, “Barriers and Opportunities to Broader Adoption of Integrated Demand Side Management at Electric Utilities: A Scoping Study” (Berkeley, CA: Electricity Markets and Policy Group, Berkeley Lab, February 2018); Cara Goldenberg, Mark Dyson, and Harry Masters, “Demand Flexibility: The Key to Enabling a Low-Cost, Low-Carbon Grid,” Insight Brief (Boulder, CO: Rocky Mountain Institute, February 2018).

Table 42. Grid Modernization Scoring Results*				
Province	Advanced Metering Infrastructure (1 Pt)	Rate Designs (1 pt)	Other Grid Modernization Initiatives (1 pt)	Score (3 pts)
British Columbia	●	●	●	3
Québec	●	●	●	3
Ontario	◑	●	●	2.5
Newfoundland & Labrador	◑	-	●	1.5
Alberta	◑	-	◑	1
Nova Scotia	○	-	◑	0.75
Saskatchewan	◑	◑	-	0.75
New Brunswick	○	-	◑	0.75
Manitoba	○	-	-	0.25
Prince Edward Island	○	-	-	0.25

* ● – 1 point; ◑ - 0.5 points; ○ – 0,25 points;

Advanced Metering Infrastructure

Electricity and natural gas consumption have traditionally been measured by simple meters at the customer's location, which record only total consumption and thus require periodic, manual meter readings. A core component of grid modernization is the replacement of traditional meters with smart meters, which record consumption more frequently (often hourly) and communicate that information directly to the utility via a wired or wireless network. Smart meters are part of a broader advanced metering infrastructure, alongside the communications networks and data management systems that enable two-way communication between utilities and customers.

According to the US Department of Energy, advanced metering infrastructure (AMI) provides several important functions associated with smart grids, including the ability to automatically and remotely record consumption, connect and disconnect service, detect tampering, identify and isolate outages, and monitor voltage. When combined with behind-the-meter technologies that provide information to the user and communicate with the meter, AMI also enables utilities to offer time-of-use-based rate programs and

other incentives for customers to reduce or shift their energy consumption,[106] leading to both cost and energy savings.

To score this component, we considered the extent to which provinces had taken early and comprehensive action in implementing advanced metering infrastructure, as well as current coverage in different end use market segments (residential, commercial, industrial) in both electricity and natural gas systems. A full point is awarded to provinces that took early action to build AMI and have achieved comprehensive coverage in one or more market segments in both electricity and natural gas (where applicable). We awarded a half-point for current initiatives to facilitate greater deployment of smart meters and/or AMI in provinces that have yet to achieve comprehensive coverage across market segments or energy sectors. We gave quarter points to provinces that had undertaken limited pilot or demonstration projects in one or two market segments, planned implementation programs that had not yet begun, or were studying advanced metering infrastructure potential.

British Columbia, Ontario, and Québec lead the pack for their early and comprehensive deployment of AMI. BC Hydro's smart meter program was launched in 2011, and as of December 2016, more than 99% of BC Hydro customers had smart meters installed.[107] FortisBC completed its AMI initiative in 2015, and FortisBC Energy Inc., the natural gas utility, has advanced metering for its largest commercial and industrial customers. Ontario's smart metering initiative was completed in 2012. As of December 2019, there were more than five million devices in place, serving residential and small business customers with demand under 50 kilowatts. On the natural gas side, however, Enbridge does not have an AMI plan in place and is following developments in other jurisdictions. In Québec, Hydro-Québec reported that over 3.9 million communicating meters had been installed in the province, or 98% of all meters requiring replacement.[108]

AMI initiatives in the rest of Canada are proceeding, but are not yet as far along as in the three leading provinces. Efforts in Alberta, Saskatchewan, and Newfoundland and Labrador appear to be the most developed, albeit targeted more at large commercial and industrial customers. SaskPower has conducted two smart meter pilot programs for these customer segments since 2015, with 8,500 smart meters installed and another 20,000 anticipated in 2019-2020. A future pilot program is planned for high-value residential customers. SaskEnergy reported that, as of March 2019, 390,000 advanced natural gas meters had been installed, reaching 98% of customers. SaskPower also has a number of projects under way that related to AMI, including development of an outage management system, a distributed supervisory control and data acquisition (SCADA) system which will enable the utility to remotely manage and control smart devices on

[106] Office of Electricity Delivery and Energy Reliability, "Advanced Metering Infrastructure and Customer Systems: Results from the Smart Grid Investment Grant Program" (U.S. Department of Energy, September 2016).
[107] BC Hydro, "Appendix P - Smart Metering and Infrastructure Program Completion and Evaluation Report," Fiscal 2017 to Fiscal 2019 Revenue Requirements Application (Vancouver, B.C.: BC Utilities Commission, December 21, 2016).
[108] Hydro-Quebec, "Meters and Meter-Reading," Hydro-Quebec, 2019, http://www.hydroquebec.com/residential/customer-space/account-and-billing/meter-reading.html.

the distribution network, and establishing a distribution control centre to manage reliability and power quality across the grid.

In Alberta, a market rule put in place after deregulation in the early 2000s requires sites with peak demand over two megawatts to have smart meters, and allows for distribution utilities to establish their own, lower thresholds if desired. In its 2011 final report, the Alberta Utilities Commission's Smart Grid Inquiry noted that industrial and commercial customers accounting for around 70% of consumption were equipped with smart meters, and that select municipalities and distribution utilities had undertaken measures to install smart meters for residential customers.[109] In Newfoundland and Labrador, approximately 58% of Newfoundland and Labrador Hydro's meters are automatic reading meters, and Newfoundland Power conducted a pilot program on direct control for hot water tanks which involved installing smart meters on a small scale.

Actions in the remaining provinces are at an earlier stage. Manitoba and Nova Scotia both have advanced metering initiatives set to begin in 2019. There have been smart meter pilot programs in Prince Edward Island, though widespread coverage does not yet appear to be in place or planned.

In 2017, New Brunswick's Energy and Utilities Board rejected an advanced metering infrastructure application from NB Power, part of the utility's Energy Smart NB initiative, detailed below. NB Power has since completed and filed a revised AMI business case which includes projected energy savings, and has deployed more than 600 smart meters as part of a conservation voltage reduction pilot.

Rate Designs

Whereas conventional rate design was based on a flat, per-kilowatt-hour rate for energy consumption, new rate designs typically incorporate some form of variable pricing, either through inclining (or declining) rates past a certain threshold of consumption, variable but predefined time-of-use rates, or higher peak prices that may vary with the severity of the event causing restricted conditions on the grid.[110]

A 2017 study by the American Council for an Energy-Efficient Economy found that time-of-use rates, critical peak pricing, and peak-time rebates for avoided consumption all produced net reductions in energy consumption. As well, tiered and time-of-use rates tended to reduce payback periods for efficiency upgrades compared to flat rates or relatively higher demand charges.[111]

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[109] "Alberta Smart Grid Inquiry" (Alberta Utilities Commission, January 31, 2011).
[110] Blake Houghton, Jackson Salovaara, and Humayun Tai, "Solving the Rate Puzzle: The Future of Electricity Rate Design," McKinsey & Company, March 2019, https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/solving-the-rate-puzzle-the-future-of-electricity-rate-design.
[111] Demand charges are based on the total capacity that needs to be in place to support demand requirements from different customer classes. They are more common in large consumer classes. Brendon Baatz, "Rate Design Matters: The Intersection of Residential Rate Design and Energy Efficiency"

The basic principle behind using rates as an incentive for energy conservation and/or efficiency is that price signals lead consumers to alter their behaviour to reduce their costs. Rate designs that offer declining block rates, or regulations that cap rates at a predefined level, should not be expected to lead to energy savings. Specialty rate designs have been in use for large consumer rate classes for some time, but their implementation in the smaller commercial and residential sectors is a relatively newer development.

In this scorecard, we therefore awarded one full point only to provinces that had implemented some form of inclining tiered rates and/or time-of-use rates across all consumer classes, with or without combined customer or demand charges. Provinces where such rate designs were partial or incomplete (e.g. demand charges or critical peak pricing without inclined or tiered rates) received a half-point.

Provinces' progress implementing rate design packages to drive energy savings largely mirrors progress on developing comprehensive AMI, with British Columbia, Ontario, and Québec all having inclined, tiered, or time-of-use rates in place for multiple end-use customer segments. Ontario's 2015 decision to end volumetric-based distribution charges for electricity is unlikely to incentivize efficiency savings, but the province still receives points for its widespread implementation of time-of-use pricing.[112]

None of the other provinces have widely implemented variable rates, though more limited plans are in place. For instance, Nova Scotia has interruptible rates available for large industrial customers and a time-of-use option for residential customers using electric thermal storage equipment. NB Power has demand charges and an interruptible energy product available for large industrial customers. Manitoba Hydro offers a curtailable rate program for large industrial customers, and SaskPower has demand charges and limited time-of-use rate options for larger customer classes. Time-of-use pricing is being studied or under development in Alberta, Manitoba, and Nova Scotia.

Manitoba, New Brunswick, Newfoundland & Labrador, Nova Scotia, and Prince Edward Island have declining tiered rates for general service or smaller industrial customers. Alberta's competitive retail market enables customers to choose among different retailers that may offer custom rate designs, though we were unable to identify any with time-of-use pricing. As well, an electricity price cap introduced in June 2017 limits energy charges for customers on the regulated rate option to $0.068/kWh.

(Washington D.C.: American Council for an Energy-Efficient Economy, March 2017), https://aceee.org/sites/default/files/publications/researchreports/u1703.pdf.

[112] For a discussion ,see Gibbons, "Conservation First."

Other Grid Modernization Efforts

There are many other grid modernization efforts that provinces could undertake that could directly or indirectly lead to greater energy efficiency, though they may not all be applicable to every provincial grid. Examples include:

- Enabling energy efficiency and demand response to serve as non-wire / non-pipe alternatives in geo-targeted transmission and distribution network planning;
- Delivering electricity at lower voltages (conservation voltage reduction (CVR));
- Managing reactive power and voltage levels (volt-var optimization, or VVR) to achieve energy savings.

We award up to one point for provinces that have taken action in one or more of these areas, depending on the extent of the initiative, its formalization, and the depth of experience gained through extensive testing and/or piloting of relevant technologies and planning practices.

Energy efficiency and demand response can avoid the need to build transmission in distribution infrastructure, especially when targeted in particular geographic areas and coupled with other strategies such as energy storage or distributed generation. There are regulatory and institutional barriers to incorporating these “non-wires” alternatives in grid planning processes, many of which come down to utilities’ and regulators’ limited familiarity with the practice.[113]

Our research shows that such practices are in their infancy in Canada. While the benefits of DSM programming for transmission and distribution grids can be incorporated in integrated system planning (through demand or load modeling) as is reportedly done in British Columbia and Québec, it is not clear that potential demand-side solutions are being explicitly identified as viable non-wires alternatives to localized or generalized grid constraints, or that such practices are formalized or guided by regulation. While less vertically-integrated systems such as Ontario and Alberta may have regulatory guidance or processes to encourage consideration of non-wires alternatives in grid planning, those systems have yet to fully include energy efficiency and/or demand response as eligible measures.

Nevertheless, several provinces have studies under way to test the use of energy efficiency in geo-targeted grid planning. BC Hydro is conducting pilot projects to test demand response and geo-targeted energy efficiency as a means to reduce peak load requirements and avoid potential substation upgrades, and Efficiency Nova Scotia was to begin a locational DSM pilot in the fall of 2019. Manitoba Hydro also reported that it

[113] IESO, “Barriers to Implementing Non-Wires Alternatives in Regional Planning,” (November 2018), http://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/rpr/rprag-20181101-barriers.pdf?la=en.

has started work on developing a location-specific DSM marginal value, to be used to identify system constraints and geo-target future DSM initiatives. Pilot studies are also under way in Ontario to test the ability of distributed energy resources, conservation, and demand response to defer other infrastructure upgrades.

Box 5: Integrating Grid Modernization and Demand-side Management – NB Power's Energy Smart NB Initiative

Energy Smart NB initiative is a core part of NB Power's 10-year plan, bringing together energy efficiency, demand response, and grid modernization efforts under one program. It evolved out of the utility's first DSM plan, Reduce and Shift Demand, when NB Power became responsible for the portfolio following the dissolution of Efficiency New Brunswick in 2014.

The initiative includes three interrelated components: Smart Grid (investing in grid modernization technology like AMI and integrated load management); Smart Habits (energy efficiency and demand response programs); and Smart Solutions (new products and services to leverage DSM programs and smart grid technology).

As NB Power describes them, the three elements are interdependent and intended as a foundational strategy to transform both the New Brunswick electricity grid and the way NB Power operates.

Experience with CVR/VVO appears most advanced in Québec, Newfoundland and Labrador, and British Columbia, and pilot projects are under way in Alberta, New Brunswick, and Ontario. BC Hydro includes VVO in the development of its load forecast, and Newfoundland Power uses CVR to manage winter peak load. Hydro-Québec conducted its CATVAR project between 2007 and 2016 to install and demonstrate equipment to manage distribution grid voltage and reactive power. The project was cancelled in 2016 due to anticipated energy surpluses and energy savings that were lower than expected, though the deployed equipment will be maintained on the network and continue to deliver some energy savings through the end of its operating life. Manitoba, Nova Scotia, Prince Edward Island, and Saskatchewan do not use CVR/VVO.

As noted above, these initiatives are often part of wider smart grid plans or programs that typically involve technologies and processes that may not be directly related to energy efficiency. Other grid modernization efforts may focus on microgrids, distributed energy resources, energy storage, or advanced communication systems. One notable

example is NB Power's Energy Smart NB initiative, which targets a range of smart grid technologies and services (see Box 5). NS Power is also testing distribution-scale and behind-the-meter storage as part of its Intelligent Feeder Project. Finally, examples of bringing stakeholders together to discuss and plan for increased grid modernization include Alberta's Smart Grid Consortium and Distribution System Inquiry, and the Energy Transformation Network of Ontario, formerly the Smart Grid Forum.

Carbon Pricing

Putting a price on carbon through a carbon tax or a cap and trade market increases the cost of products and services associated with the use of fossil fuel-based sources of energy, thereby creating an incentive for consumers to pick lower-carbon alternatives. Carbon pricing can help reduce market barriers to energy efficiency, partly by increasing the cost of fossil fuel-based energy and related products, which should improve the return on investment for many energy efficiency technologies and processes.[114]

Carbon pricing can also drive greater energy efficiency if revenues are invested in energy efficiency programs and demonstration projects.[115] For example, in 2016, 55% of the revenues received through the Regional Greenhouse Gas Initiative (RGGI) cap and trade market in the US northeast were invested in energy efficiency programming.[116] According to the Regional Energy Efficiency Database administered by the Northeast Energy Efficiency Partnerships (NEEP), the Lawrence Berkeley National Lab, and the US Department of Energy, RGGI's contribution to overall electricity efficiency program funding in 2017 ranged from just over 2% in Rhode Island to approximately 9% in New Hampshire, and approximately 15% for natural gas programming in Vermont.[117]

In October 2016, the Canadian federal government announced a pan-Canadian approach to pricing carbon pollution, with basic guidelines for implementing carbon pricing across the provinces and territories. The federal carbon pricing system went into effect on January 1, 2019.[118] The plan included a federal backstop price on carbon that would apply in provinces that did not meet the benchmark, with proceeds returned to the jurisdictions where they were collected via federal income tax rebates to individuals, and federal support to affected sectors (schools, hospitals, small and medium-sized

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[114] Lisa Ryan et al., "Energy Efficiency Policy and Carbon Pricing," Energy Efficiency Series (Paris: IEA/OECD, 2011).
[115] Steven Nadel, "More States and Provinces Adopt Carbon Pricing to Cut Emissions," American Council for an Energy-Efficient Economy (ACEEE), January 3, 2019, https://aceee.org/blog/2019/01/more-states-and-provinces-adopt.
[116] "The Investment of RGGI Proceeds in 2016" (The Regional Greenhouse Gas Initiative, September 2018), https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2016.pdf.
[117] Regional Evaluation Measurement & Verification Forum, "Regional Energy Efficiency Database," Northeast Energy Efficiency Partnerships, 2019, https://neep.org/initiatives/emv-forum/regional-energy-efficiency-database.
[118] Environment and Climate Change Canada, "Pan-Canadian Approach to Pricing Carbon Pollution," Government of Canada, October 3, 2016, https://www.canada.ca/en/environment-climate-change/news/2016/10/canadian-approach-pricing-carbon-pollution.html.

businesses, colleges and universities, municipalities, not-for-profit organizations, and Indigenous communities).

For this metric, provinces received one point for the existence of a carbon price system that meets the federal benchmark, up to one point if an explicit carbon price system was in place before the federal backstop took effect, and up to one point for the extent to which carbon pricing proceeds are used to fund energy efficiency improvements. On the last of those points, carbon pricing regimes received full points for a clear, formalized procedure to manage proceeds in a way that benefits energy efficiency. The scoring does not factor in the relative stringency of a province's carbon pricing system, nor the form or extent of coverage of the pricing regime. Organizations such as Canada's Ecofiscal Commission have assessed the various carbon pricing regimes for stringency, though that analysis does not yet reflect more recent policy developments.[119]

The results are shown in Table 43.

With the federal backstop in place, almost all provinces receive one full point for having a carbon price regime in place that meets the federal benchmark. When our analysis was conducted, New Brunswick, Ontario, and Saskatchewan had gone to court to challenge the federal authority to implement a national carbon price. Saskatchewan was the only province that had not signed the Pan-Canadian framework.[120]

Alberta is the only province that receives partial points for its carbon price. Though the province did have a carbon price in place for most of the time period under consideration, the provincial government repealed it in May 2019, and the federal backstop plan was not expected to take effect in Alberta until January 2020.

[119] Dale Beugin et al., "Comparing Stringency of Carbon Pricing Policies" (Canada's Ecofiscal Commission, July 2016), https://ecofiscal.ca/reports/comparing-stringency-carbon-pricing/. See as well Steven Nadel and Cassandra Kubes, "State and Provincial Efforts to Put a Price on Greenhouse Gas Emissions, with Implications for Energy Efficiency" (American Council for an Energy Efficiency Economy, January 2, 2019), https://aceee.org/white-paper/carbon-tax-010319.
[120] Kathryn Harrison, "The Fleeting Canadian Harmony on Carbon Pricing," Policy Options, July 8, 2019, https://policyoptions.irpp.org/magazines/july-2019/the-fleeting-canadian-harmony-on-carbon-pricing/.

Table 43. Carbon Pricing Scoring Results				
Province	Carbon Price (1pt)	Early Mover (1pt)	Funding Efficiency (1 pt)	Score (3 pts)
Québec	●	●	●	3.0
British Columbia	●	●	◑	2.5
Alberta	◑	◑	●	2.0
Ontario	●	◑	◑	2.0
Newfoundland and Labrador	●	-	◑	1.5
Manitoba	●	-	-	1.0
New Brunswick	●	-	-	1.0
Nova Scotia	●	-	-	1.0
Prince Edward Island	●	-	-	1.0
Saskatchewan	●	-	-	1.0

Nova Scotia and Newfoundland and Labrador both opted to establish their own, custom carbon pricing systems—a cap and trade regime in the former, and a hybrid performance/carbon tax system in the latter. New Brunswick intends to develop its own provincial system as well, and the proposed plan was open for public comment at time of writing. Saskatchewan implemented an output-based performance standard (OBPS) for large industrial emitters in January 2019, though this on its own did not meet the federal benchmark.

In the years prior to the implementation of the federal backstop, only four provinces had carbon price regimes in place that would have met the federal benchmark: Alberta, British Columbia, Ontario, and Québec. Of the four plans, British Columbia's carbon tax is the longest standing, having come into effect in 2008 at $10/tonne, rising to $30/tonne in 2012 and $40/tonne in 2019. The tax is broad-based, applying to the purchase or use of carbon-based fuels, whether or not they are combusted. Ontario and Québec had both joined a cap and trade market with California—Québec in 2014, Ontario in 2017—which initially covered only industry and electricity but expanded to include fossil fuel distributors in 2015. Ontario passed the Cap and Trade Cancellation Act in October 2018, providing for the wind-down of its cap and trade program and leading to the cancellation of many programs that supported energy efficiency improvements. Ontario therefore receives partial points on this metric. Alberta was also an early mover, introducing a $15/tonne carbon intensity performance levy on large emitters in 2007. As this program would not have met the specified federal benchmark, the Alberta

government expanded it in 2017, implementing a $30/tonne levy on transportation and heating fuels. The program was repealed in May 2019, so the province receives partial points on this metric.

On the use of proceeds to support energy efficiency, Québec's regime has the longest-standing formalized procedure for using carbon revenues to support energy efficiency. All proceeds from the cap and trade market go to the provincial Fond Verte, which is used to implement the 2013-2020 Climate Change Action Plan. Reducing fossil fuel consumption and improving energy efficiency in buildings is one of the core priorities of the plan.[121] Out of $1.46 billion in revenues collected between 2013 and 2017, TEQ reported $286.5 million invested in building energy efficiency programs and $967 million in transportation energy efficiency initiatives.[122]

Until it cancelled its carbon levy, Alberta directed a portion of the proceeds to Energy Efficiency Alberta, and to other initiatives that may benefit energy efficiency (for example, Emissions Reductions Alberta, which administers an industrial efficiency RD&D program). The province's carbon levy and its industrial emissions intensity charge brought in nearly $1.8 billion between 2016 and 2018, with approximately $169 million budgeted for Energy Efficiency Alberta.[123] As of June 2019, the cancellation of the carbon pricing policy in Alberta had not disrupted efficiency programs, so Alberta receives full points on this metric.

All proceeds from British Columbia's carbon tax were returned to consumers as tax cuts or rebates until mid-2019, when the province began using some of the funds to support the CleanBC Program for Industry.[124] The program includes a CleanBC Industrial Incentive program, which reduces carbon tax costs for operations meeting world-leading emissions benchmarks, and the CleanBC Industry Fund, which supports emission reduction projects in industry.[125] It is unclear whether either of those programs supports energy efficiency improvements, yet efficiency efforts are likely to be a component of emission reduction initiatives. Therefore, we awarded the province partial points on this metric.

Proceeds from Ontario's participation in the cap and trade market supported a variety of building and transportation efficiency programs, including the Green Ontario Fund

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[121] Environnement et Lutte contre les changements climateques, "2013-2020 Climate Change Action Plan/Green Fund," Government of Quebec, 2019, http://www.environnement.gouv.qc.ca/changementsclimatiques/plan-action-fonds-vert-en.asp.
[122] These figures should be seen as rough approximations. According to TEQ, the diversity and complexity of the programs supported by the Green Fund make it challenging to identify exactly how much supported energy efficiency specifically. "Bilan Mi-Parcours - 2017-2018" (Government of Quebec, 2018), http://www.environnement.gouv.qc.ca/changementsclimatiques/bilan/bilanPACC-mi-parcours.pdf.
[123] Rachel Maclean, "Alberta's Carbon Tax Brought in Billions. See Where It Went," CBC News, April 8, 2019, https://www.cbc.ca/news/canada/calgary/carbon-tax-alberta-election-climate-leadership-plan-revenue-generated-1.5050438.
[124] Only the share of proceeds received from industry above $30/tonne are directed to this program.
[125] Ministry of Environment, "British Columbia's Carbon Tax - Province of British Columbia," Government of British Columbia, 2019, https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax.

(GreenON), which provided a range of financial incentives for energy efficiency-related upgrades. All programs administered by GreenON, as well as other programs supported by cap and trade revenues, were cancelled by the end of 2018, so Ontario receives partial points on this metric.

Given that revenues from the federal backstop price on carbon are returned directly to individuals, and to select sectors through federal programming, provinces where the backstop has been implemented received no points for a formalized procedure to dedicate carbon price proceeds toward energy efficiency.

The remaining provinces without the federal backstop do not yet have clear, formalized processes for using carbon price revenues to support energy efficiency, and therefore receive no points on this measure. Newfoundland and Labrador receives partial points for specifying the portion of its carbon price proceeds that will be directed to energy efficiency programming, even though no funds have been directly earmarked.

Buildings

Introduction

The buildings sector is responsible for about 28% of end use demand in Canada and is the largest sector of potential energy savings (28%), according to the IEA/NRCan national level energy efficiency potential study.[126] Buildings are also where we spend a significant amount of our time in a cold-climate country like Canada. Buildings are a significant and often neglected component of Canada's infrastructure, and high-performance buildings are important for our quality of life, physical and mental health, and economic productivity.

Policies focused on the buildings sector are complex. There are many strategies that can influence the energy efficiency of our built environment, and many opportunities for provinces to demonstrate leadership.

We collected information and allocated scores for the following policy areas or metrics:

- Building codes for housing and small building and large buildings - including introduction of step codes and net-zero energy-ready commitments (**8 points**);
- Building code compliance activities (**3 points**);
- Building and home energy rating and disclosure (**4 points**);
- Appliance and equipment standards and market transformation (**3 points**).

Table 44 lists overall scores by province, and this chapter provides an explanation of methodologies and scores for each policy area or metric.

[126] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."

Table 44. Buildings Scoring Results					
Province	Building Codes (8 Pts)	Code Compliance Activities (3 Pts)	Energy Rating and Disclosure (4 pts)	Appliance and Equipment Standards and Market Transformation (3 pts)	Total (18 pts)
British Columbia	6.00	3.00	2.00	3.00	14
Ontario	4.00	0.25	2.00	3.00	9
Manitoba	1.50	0.50	1.00	3.00	6
Nova Scotia	2.00	0.00	1.00	3.00	6
Alberta	3.00	0.00	2.00	0.00	5
Québec	1.00	0.00	1.00	3.00	5
Saskatchewan	3.00	0.75	0.00	0.00	4
Prince Edward Island	0.75	0.00	0.00	2.00	3
Newfoundland and Labrador	1.00	0.50	0.00	0.00	2
New Brunswick	0.00	0.00	0.00	1.00	1

Totals rounded to whole numbers

Building Codes

Building codes set minimum standards for the design and construction of new buildings, including energy efficiency requirements. Buildings codes that require higher energy efficiency performance lock in significant energy savings and avoid the need for costlier, more difficult retrofits later on.

In Canada, the responsibility for adopting new building codes rests with the provinces and territories, which can further delegate that responsibility to municipalities. The federal government develops model codes that provinces can adopt and revise. The codes of relevance to energy efficiency include Section 9.36 of the National Building Code, which concerns energy efficiency performance for houses and small buildings.[127] The National Energy Code for Buildings (NECB) prescribes minimum performance levels for all types of buildings, and is the standard for commercial, institutional, and

[127] Canadian Commission on Building and Fire Codes, “Long-Term Strategy for Developing and Implementing More Ambitious Energy Codes: A Position Paper” (National Research Council Canada, 2016).

high-rise residential buildings (Part 3 of the National Building Code). Residential buildings are responsible for about three-fifths of total building energy use in Canada, and commercial and institutional buildings account for two-fifths.[128]

The federal government has established a long-term performance goal for provinces to adopt net-zero energy-ready (NZER) building codes by 2030.[129] This provides a performance-based goal for the federal government to define in model codes, and for the provinces to embrace. One important way to move toward the NZER or other high-performance housing standards is to develop stretch, stepped, or tiered codes.

Under this approach, a province would establish a long-term performance target, then define clear interim steps, higher than provincial minimums, to incrementally reach it. Local governments can set incentives or requirements for builders to meet a given step based on front-line experience, local policy goals, and the capacity of local industry to deliver on it.

Houses and Small Buildings

In the scorecard, we tracked minimum energy standards for houses and small buildings using the National Building Code as a reference. We also reviewed the development of provincial step or tiered codes, and provincial commitments to adopt net-zero energy-ready standards.

In this scorecard, provinces were awarded one point for adopting either the 2012 revision to the National Building Code, or the 2015 version of the Code. Similar points are awarded for both versions because they contain no significant differences with respect to energy efficiency.[130]

We awarded an extra point if we could find evidence that a province's standards exceeded these model codes for houses and small buildings, an extra point if a province had formally adopted a step or tiered code, and an extra point for a firm date for implementing a net-zero energy-ready standard, particularly for residential units or "homes and small buildings".

[128] Natural Resources Canada, "Canada's Secondary Energy Use (Final Demand) by Sector, End Use and Subsector," in *National Energy Use Database* (Ottawa, ON: Government of Canada, 2018), http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=HB&sector=aaa&juris=ca&rn=2&page=0.
[129] Environment and Climate Change Canada, "Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy." (Ottawa: Government of Canada, 2016), http://www.deslibris.ca/ID/10065393.
[130] Information request to National Research Council.

Table 45. Houses and Small Buildings Code Scoring Results					
Province	Adopted NBC 2012 Revision or 2015 (or Equivalent) (1 pt.)	Exceeds NBC 2015 (2 pts.)	Step or Tiered Code (1 pt.)	Net-zero Energy-Ready Commitment (1 pt.)	Score (4 pts)
British Columbia	●	-	●	●	3
Ontario	-	●	-	-	2
Alberta	●	-	-	-	1
Saskatchewan	●	-	-	-	1
Manitoba	●	-	-	-	1
Québec	●	-	-	-	1
Nova Scotia	●	-	-	-	1
Newfoundland and Labrador	●	-	-	-	1
Prince Edward Island	◑	-	-	-	0.5
New Brunswick	-	-	-	-	0

In May 2017, Prince Edward Island passed the Building Code Act, which enables province-wide building code regulations, and the PEI Energy Strategy includes plans to adopt the 2015 edition of the National Building Code. The adoption of code enforcement measures was awaiting enactment of regulations as of June 2019. We have therefore listed Prince Edward Island as "pending" and provided a half-point for demonstrated progress in adoption a building code with efficiency standards.

Ontario has building codes that are substantially different from the model code. The province states that the regulation known as Supplementary Standard SB-12, which relates to residential housing, achieves a 15% energy efficiency improvement over the previous version, which was intended to meet or exceed a level of 80 on the EnerGuide efficiency scale.[131] This exceeds the National Building Code energy efficiency standards, which slightly exceed 78 on the EnerGuide scale according to the National Research Council.[132]

[131] Note that this 0-100 EnerGuide rating scale was retired by Natural Resources Canada on December 31, 2018 and is replaced by a gigajoules per year consumption rating. Natural Resources Canada, "EnerGuide Rating System, Version 15," Government of Canada, April 20, 2016, https://www.nrcan.gc.ca/energy-efficiency/energuide-canada/energuide-rating-system-version-15/18392.
[132] National Research Council Canada, "Codes Canada - Frequently Asked Questions," Government of Canada, March 26, 2019, https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-frequently-asked-questions.

Québec also has a distinct construction code under its Buildings Act. Its energy efficiency provisions were last updated in 2012. The efficiency standards were largely based on the first version of the Novoclimat program for residential housing. In response to our information request, TEQ estimated these standards to be largely equivalent to section 9.36 of the model National Building Code.

There is no provincial building code in Newfoundland and Labrador, however the province's Municipalities Act and corresponding legislation for cities[133] require municipal councils to adopt "the National Building Code of Canada and supplements or amendments to that code". In response to our information request, the province indicated this means that, in practice, the province follows the 2015 Model National Building Code.

In 2017, British Columbia became the first North American jurisdiction to create a regulated pathway to net-zero energy-ready buildings when it introduced the BC Energy Step Code. The regulation, a series of amendments to the BC Building Code, gave local governments a "shared language" on energy efficiency and the authority to reference the new standard in their building bylaws. For houses and simple buildings, the standard offers five steps, each setting increasingly stringent energy use and airtightness requirements. The top step represents a net-zero energy-ready performance level. In its 2018 CleanBC plan, the province recommitted to requiring net-zero energy-ready new construction in the base code by 2032 and established interim targets in 2022 and 2027. Those targets align with the steps in the BC Energy Step Code.[134]

Commercial/Institutional and Multi-Unit Residential Buildings

Canada's first national standard for building energy performance was created through the Model National Energy Code for Buildings in 1997. The code was updated in 2011 and renamed the National Energy Code for Buildings (NECB). The 2011 NECB achieved a 25% performance improvement over its predecessor.[135] The 2015 NECB included changes such as new thermal requirements for semi-heated buildings, and maximum allowable lighting power densities harmonized with the ASHRAE 90.1-2013 standard. This version had an average annual energy savings of 2.5% over the 2011 NECB.[136] The 2017 version of the NECB is projected to achieve average annual savings of 7.8% to 11.9% above the 2015 version.

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[133] The municipalities of St. John's, Mount Pearl, and Corner Brook are bound by different legislation, and also follow the 2015 model National Building Code.
[134] See James Glave and Robyn Wark, "Lessons from the BC Energy Step Code," June 2019, https://energystepcode.ca/publications/.
[135] Natural Resources Canada, "Canada's National Energy Code," Government of Canada, March 6, 2018, https://www.nrcan.gc.ca/buildings/canadas-national-energy-code/20675.
[136] National Research Council information request. This is a broad average over several climate zones and building archetypes.

Box 6: A Clear Path Toward Net-Zero Energy-Ready Buildings in British Columbia

Traditionally, jurisdictions update building codes by making modest, incremental changes that are perceived to be cost-neutral to industry. The BC Step Code takes a different approach, by establishing a long-term goal and then a set of "steps"—representing steadily increasing levels of energy performance—to get there.

The standard evolved as a unified approach to what had become a patchwork of local government rules and requirements on energy efficiency. Builders and developers struggled to comply with the various requirements. After extensive collaboration with government, utility, and industry stakeholders, the province created the new standard as a unified approach. It provided local governments with a common language on building energy efficiency, and a technical performance pathway to reach the provincial goal of all net-zero energy-ready new buildings by 2032.

The BC Energy Step Code allows early adopter communities to advance up the steps sooner, thereby building industry capacity and allowing smaller, less experienced communities to learn from the leaders. A multi-stakeholder advisory body monitors implementation and troubleshoots issues as they come along.

To learn more about the history and lessons relevant to other jurisdictions, see Lessons from the BC Energy Step Code by James Glave and Robyn Wark, available from energystepcode.ca.

The ASHRAE 90.1 energy standard applies to all buildings except low-rise residential. Some provinces reference versions of this standard. Our consultations with experts suggested the NECB is likely to be more stringent in Canada's heating-dominated climate. The NECB is also a better measure of energy efficiency because it is based on energy use, while ASHRAE 90.1 is based on energy cost. In our review of provincial standards, we did not find evidence that the adoption of a version of ASHRAE 90.1 would change relative rankings.

The scorecard awards a half-point to provinces that adopt and enforce NECB 2011, one point for NECB 2015, and two points for NECB 2017, given the significant jump in efficiency performance it represents. We also looked for sufficient evidence that a province's building code was equivalent to one of these standards.

We awarded an extra point if a province had adopted a tiered or step code for commercial, institutional, and large residential buildings, and another extra point for committing to a net-zero energy-ready building code in the future.

Saskatchewan and Alberta both adopted NECB 2017 in early 2019. Previously, NECB 2011 was in effect in Alberta, and Saskatchewan did not have an energy code. Ontario's Supplementary Standard SB-10 references NECB 2015 and ASHRAE 90.1-2013, but also includes higher performance standards and prescriptive requirements that reinforce and augment these standards, such as limitations on windows and doors as a percentage of envelope areas and penetrations that cause thermal bridging (e.g. balconies). The Ontario standard claims a 13% average improvement above the 2011 NECB,[137] suggesting performance equivalent to NECB 2017, which is estimated to represent a 10.3% to 14.4% efficiency improvement above NECB 2011.[138] While a direct comparison between Ontario's SB-12 and NECB 2017 is not available, we have given Ontario the same points as provinces that adopted NECB 2017.

We have listed Prince Edward Island as "pending" adoption and enforcement of the NECB 2015 Building Code and awarded a quarter-point. As noted above, the province has made demonstrated progress toward adopting a province-wide building code, and the 2016/2017 Energy Strategy calls for adoption of NECB 2015.[139]

The last update to an energy code in Québec occurred in 1983, and the current version is not considered to be equivalent in stringency to any of the national energy codes. The Transition énergétique Québec (TEQ) Master Plan includes adoption of NECB 2015 by 2019/20.[140]

British Columbia has a four-step code for "large and complex" (Part 3) buildings greater than four storeys or 600 square metres in footprint area. The province has also committed to implementing a net-zero energy-ready code for these buildings by 2032.

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[137] Environmental Commissioner of Ontario, "Conservation: Let's Get Serious," Annual Energy Conservation Report - 2015/2016 (Toronto, ON: Government of Canada, 2016), http://docs.assets.eco.on.ca/reports/energy/2015-2016/ECO_Conservation_Lets_Get_Serious.pdf.
[138] National Research Council Canada, "National Energy Code of Canada for Buildings 2017" (Ottawa, ON: Government of Canada, 2017), https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-energy-code-canada-buildings-2017.
[139] Dunsky Energy Consulting, "Provincial Energy Strategy, 2016/17" (Charlottetown, PE: Government of Prince Edward Island, August 2016), https://www.princeedwardisland.ca/sites/default/files/publications/pei_energystrategymarch_2017_web.pdf.
[140] Government of Quebec, "Joining Forces for a Sustainable Energy Future: 2018-2023 Energy Transition, Innovation and Efficiency Master Plan - Objectives and Roadmaps" (Government of Quebec, 2019), https://transitionenergetique.gouv.qc.ca/fileadmin/medias/pdf/plan-directeur/PAP_TEQ_PlanDirecteur_Web_ANG.pdf.

Table 46. Commercial/Institutional and Multi-Unit Residential Building Code Scoring Results*

Province	2011 NECB (0.5 pt.)	2015 NECB (1 pt.)	2017 NECB (2 pts.)	Stretch or Step Code (1 pt.)	Net-Zero Energy Ready Commitment (1 pt.)	Score (4 pts)
British Columbia	-	●	-	●	●	3
Alberta	-	-	●	-	-	2
Saskatchewan	-	-	●	-	-	2
Ontario[141]	-	-	●	-	-	2
Nova Scotia	-	●	-	-	-	1
Manitoba	●	-	-	-	-	0.5
Prince Edward Island	-	○	-	-	-	0.25
New Brunswick	-	-	-	-	-	0
Newfoundland and Labrador	-	-	-	-	-	0
Québec	-	-	-	-	-	0

* ● Full points ◑ - Half points; ○ – Quarter points;

Future scorecards could consider a quantitative score based on modeled energy intensity of buildings that would more accurately assess the difference in code energy performance. This would provide a more accurate comparison, as some provinces do not follow model national codes or make province-specific amendments. In future years, we also envision assessing provincial progress toward adopting an energy retrofit code. The Pan-Canadian Climate Framework includes development of a model code for existing buildings by 2022.

[141] Ontario specific code deemed to be roughly equivalent to NECB 2017 for scoring purposes.

Building Code Compliance Activities

Building energy codes only save energy if builders comply with them. Creating a robust policy framework for code compliance can also help build capacity for more stringent energy codes in the future. The energy efficiency provisions of building codes can be neglected, as compliance with fire and plumbing regulations present more immediate concerns. But failure to comply with efficiency standards means energy saving and GHG reduction goals will not be achieved, and homeowners can face significant long-term costs and lower-performing housing, leading to a lack of confidence in builders and policymakers.

Consistent with the methodology used by the American Council for an Energy-Efficient Economy, this scorecard awarded one point if a province had conducted a compliance study in the past five years. If a province conducted a study, we asked for the compliance rate, while recognizing that scoring provinces on their compliance rates might not provide an accurate picture of performance, since more stringent building codes are likely to have lower compliance rates. We awarded one point if a province could clearly demonstrate that specific resources were dedicated to compliance with energy efficiency standards.

We awarded up to one extra point for evidence of relevant activities, including code training and technical assistance for building officials and/or the design and building community; involvement of utilities in promoting compliance; creation of tools such as energy models to promote compliance; the presence of a stakeholder group or collaborative prioritizing code compliance; and/or a “gap analysis” to inform code compliance strategies. Activities in each of these areas were awarded a quarter-point.

Table 47. Compliance Activities Scoring Results

Province	Compliance Study in Last 5 Years (1 pt.)	Dedicated Resources (1 pt.)	Other Compliance Activities (1 pt. total, 0.25 pts. each)					Score (3 pts)
			Code Training and Technical Assistance	Utility Involvement	Compliance Tools	Stakeholder Group or Compliance Collaborative	Codes Gap Analysis	
British Columbia	●	●	●	●	●	●	●	3
Saskatchewan			●	●	●	-	-	0.75
Manitoba			-	●	●	-	-	0.50
Newfoundland and Labrador			●	-	●	-	-	0.50
Ontario			-	-	-	●	-	0.25
Alberta			-	-	-	-	-	0
New Brunswick			-	-	-	-	-	0
Nova Scotia			-	-	-	-	-	0
Prince Edward Island			-	-	-	-	-	0
Québec			-	-	-	-	-	0

British Columbia leads in this category. In a compliance study in 2015, the province and BC Hydro surveyed building officials and building professionals and estimated a 60% compliance rate, 79% among the buildings the respondents were engaged with.

British Columbia also provided evidence of dedicated resources for energy code compliance, estimating that 40% of a staff member's time was devoted to the task. Utilities are also required to spend a minimum of 1% of their budgets on codes and standards through the Demand Side Measures Regulation. BC Hydro estimated that approximately $400,000 of its $4.8-million budget for codes and standards relates to compliance activities.

British Columbia also reported activity in all compliance categories, largely related to the policy framework and engagement around the BC Energy Step Code. Relevant activities include:

Training and Technical Assistance

- Provincial energy coaches to support local government compliance efforts;
- In-person and online courses through Energy Foundations Program with Building Officials of British Columbia;
- Energy Step Code Handbook for Building Officials.

Utility Involvement

- Technical support for Energy Step Code Council subcommittee;
- BC Hydro co-funding of local government building officials with energy code compliance work plans.

Compliance Tools

- Building Energy Requirements Tool enables easier compliance review for permitting by Areas Having Jurisdiction (AHJ).

Stakeholder Group or Collaborative

- The Energy Step Code Council includes a Compliance and Energy Advisor Subcommittee.

Gap Analysis

- Competency framework and gap analysis developed through the Energy Foundations Program.

Other provinces identified relevant activities, often tied in with the adoption of new energy codes. Saskatchewan was the first province to adopt the 2017 National Energy Code for Buildings, and received points for developing a Guide to Implementation of NECB 2017 which includes tools such as a compliance checklist.[142] Saskatchewan also reported training sessions through the Saskatchewan Building Officials Association, the Building Standards and Licensing Branch of the Ministry of Government Relations, and the Canada Green Building Council, and SaskEnergy took part in a provincial committee on codes and code compliance.

Manitoba Hydro provided in-kind support and expertise to the Office of the Fire Commissioner and the City of Winnipeg and offered incentives and expertise to promote energy modeling, which improves the quality of code compliance submissions. We awarded a point for stakeholder collaboration in Ontario after our consultation with experts pointed to a number of activities that complement building code compliance, due to the stakeholder-based design of Ontario-specific building codes. Those activities included technical advisory committees, and participation by the Building and Development Branch, Ministry of Municipal Affairs and Housing in meetings with organizations that represent municipal building officials.

Newfoundland and Labrador received points for training on section 9.36 of the building code and compliance tools for developing two publicly available training guides: Guide to Building Energy Efficient Homes and Small Buildings – 2016, and Guide to Better Building Envelopes for Large Buildings – 2016.

Other provinces did not identify relevant code compliance activities in our information request, and we could not find further information through desk research and consultations with local experts. The overall results thus demonstrate a significant weakness in Canadian building energy code compliance. This is concerning from the perspective of achieving energy savings from existing codes, as well as the national capacity to adopt more stringent codes in the future. The American states appear to be more active in code compliance because the 2009 American Recovery and Reinvestment Act provided funding for states to implement more stringent building codes and achieve a 90% compliance rate for new residential and commercial buildings by 2017.[143]

The British Columbian experience demonstrates that compliance-related activities should increase with a plan to move toward net-zero energy-ready codes, as prioritized in the Pan-Canadian Framework on Clean Growth and Climate Change. British Columbia also demonstrates the role utilities can play in code compliance, if codes and standards are identified as a relevant program area.

[142] Government Relations, “Guide: Implementation of NECB 2017 in Saskatchewan,” Province of Saskatchewan, 2019, https://publications.saskatchewan.ca/#/products/100047.
[143] “Energy Codes and ARRA,” The Building Codes Assistance Project, 2018, http://bcapcodes.org/policy-action-toolkit/energy-codes-and-arra/.

In future editions of this report, Efficiency Canada intends to clarify code compliance benchmarks to inform provincial policy development. This could include tracking resources (based on budgets and/or full-time equivalent staff) dedicated to code compliance per province, and normalizing the metric over the number of building permits issued. It might also include a closer look at the methodologies used in code compliance studies, such as the use of a statistically significant sample and standardized protocols.

Energy Ratings and Disclosure

Energy ratings and disclosure make building energy performance visible and can help drive a market for efficiency upgrades and improved building operations. We refer to Home Energy Ratings and Disclosure (HERD) when discussing residential structures and Building Energy Rating and Disclosure (BERD) when discussing commercial, institutional, and multi-unit residential buildings. These different building types have distinct ratings systems, policies, and programs.

In its discussion of existing building retrofits, the Pan-Canadian Framework on Clean Growth and Climate Change committed to seeing federal, provincial, and territorial governments require "labeling of building energy use by as early as 2019."[144] The final report of the Expert Panel on Sustainable Finance also identified energy rating and disclosure policies as an important driver for a private building retrofit market. The Panel recommended a mandatory labeling and public disclosure program for building performance, and disclosure requirements on residential homes at the point of sale, lease, or transfer.[145]

In this scorecard category, provinces could receive a maximum of four points. Two points were awarded for implementation of mandatory policies requiring home energy rating and disclosure (HERD) at a specified point in time, such as during the sale of a house. One point was awarded if a province had a voluntary program to encourage disclosure of home energy ratings or labels. Many provinces offer new and existing housing programs that provide an EnerGuide or other rating label, but to receive points a province had to facilitate wider disclosure, via a website, a home listing service, or some other form of publication.

Two points were awarded to provinces with mandatory rating and disclosure of building energy use via BERD initiatives, and one point for voluntary programs. These initiatives are often referred to as benchmarking programs because they facilitate comparisons with similar building types, which can help make the business case for building upgrades and encourage the investigation of operating procedures that save energy.

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[144] Environment and Climate Change Canada, "Pan-Canadian Framework on Clean Growth and Climate Change," 17.

[145] Expert Panel on Sustainable Finance and Environment and Climate Change Canada, *Final Report of the Expert Panel on Sustainable Finance: Mobilizing Finance for Sustainable Growth.* (Ottawa, ON: Government of Canada, 2019), http://epe.lac-bac.gc.ca/100/201/301/weekly_acquisitions_list-ef/2019/19-24/publications.gc.ca/collections/collection_2019/eccc/En4-350-2-2019-eng.pdf.

The results are provided in Table 48, with the names and short descriptions of relevant voluntary programs listed in Table 49 and Table 50.

Table 48. Energy Rating and Disclosure Policies Scoring Results

Province	Home Energy Rating and Disclosure		Building Energy Rating and Disclosure		Score (4 pts)
	Mandatory Policy (2 pts.)	Voluntary Program (1 pt.)	Mandatory Policy (2 pts.)	Voluntary Program (1 pt.)	
Ontario	-	-	●	-	2
Alberta	-	●	-	●	2
British Columbia	-	●	-	●	2
Manitoba	-	-	-	●	1
Nova Scotia	-	●	-	-	1
Québec	-	-	-	●	1
New Brunswick	-	-	-	-	0
Newfoundland and Labrador	-	-	-	-	0
Prince Edward Island	-	-	-	-	0
Saskatchewan	-	-	-	-	0

Home Energy Ratings and Disclosure

There are no mandatory programs for home energy labels or ratings and disclosure currently in place in any Canadian province. Ontario previously enabled mandatory disclosure of energy information prior to the sale of a home under the Green Energy Act, by creating a right to receive the information. However, this provision was never proclaimed into force and the enabling legislation was cancelled with the repeal of the Green Energy Act in 2018.

Municipalities and efficiency program administrators currently operate voluntary programs in British Columbia, Alberta, and Nova Scotia. In Ontario, the Enbridge natural gas utility ran a voluntary program from 2012 to 2014. However, this program was not approved for continuation after 2014.

Table 49. Home Energy Ratings and Disclosure Voluntary Programs and Initiatives

Province	HERD Voluntary Program
British Columbia	Rateourhome.ca is a pilot project that allows residents of Metro Vancouver to voluntarily display EnerGuide ratings online on a home energy map.
Alberta	Through Change Homes for Climate, The City of Edmonton with Energy Efficiency Alberta provides incentives for a home energy audit if results are shared online. The program produces a map of home EnerGuide ratings.
Ontario	Know Your Energy Score was a home labeling program under the Enbridge Gas 2012-2014 DSM Plan. The program successfully solicited realtor commitments to home labeling, but did not meet targets for home listings with energy ratings. The Ontario Energy Board did not approve the continuation of the program in the 2015-2020 DSM Plan, calling instead for a program integrated across gas and electric energy sources.
Nova Scotia	A joint venture between Efficiency Nova Scotia, the provincial government, the Nova Scotia Association of Realtors, and the Viewpoint real estate listing website encourages home sellers to upload their EnerGuide labels onto Viewpoint.

Building Energy Ratings and Disclosure

We tracked rating and disclosure policies and programs for larger buildings separately. These programs usually target commercial, institutional, and multi-unit residential buildings. Disclosing their energy use data helps inform potential buyers or tenants, enables comparisons with similar buildings, and can improve the business case for building upgrades and improved building operations.

Ontario has a regulatory policy requiring large buildings (with some exceptions) to report their water and energy use every year. The reporting requirement is being phased in over time: commercial and industrial buildings 250,000 square feet or larger were required to report by July 1, 2018; commercial, industrial and residential buildings 100,000 square feet or larger were required to report by July 1, 2019.

Some municipalities in British Columbia have mandatory energy and GHG reporting for new buildings. For instance, the City of Vancouver and municipalities using the BC Energy Step Code require new buildings to upload basic building information and estimated energy and GHG emissions into Energy Star Portfolio Manager. The BC Step Code facilitates benchmarking through its requirements for energy modeling, and common energy use assumptions.

Table 50. Building Energy Rating and Disclosure Voluntary Programs and Initiatives

Province	BERD Voluntary Program
British Columbia	BC Hydro and FortisBC enable automatic data uploads and promote benchmarking through Energy Star Portfolio Manager. The City of Vancouver and local governments require new large buildings to set up an Energy Star Portfolio Manager account for energy and GHG benchmarking. The BC Step Code enables this through requirements for energy modeling.
Alberta	The City of Edmonton and Alberta's Municipal Climate Change Action Centre lead energy benchmarking programs.
Manitoba	Manitoba Hydro promotes Energy Star Portfolio Manager and enables automatic uploads of energy use data.
Ontario	Mandatory requirement has facilitated the delivery of services on how to report, from organizations such as the Canada Green Building Council.
Québec	The four-year Building Energy Challenge (Défi-Énergie en immobilier), launched in May 2018, is a program for commercial and institutional buildings to voluntarily disclose energy use data.[146] The program is coordinated by BOMA Québec and supported by the City of Montreal, Transition énergétique Québec, Énergir, and Hydro-Québec.

The voluntary and mandatory programs listed above use Energy Star Portfolio Manager for reporting. This tool was created by the US Environmental Protection Agency and adapted for Canadian use by Natural Resources Canada (NRCan). NRCan publishes data snapshots with the number of buildings and total floor space participating in benchmarking per province.

[146] BOMA Quebec, "Doing Better, One Building at a Time – Building Energy Challenge," Défi-Énergie en immobilier, September 25, 2018, https://buildingenergychallenge.ca/boma-quebec-lance-une-nouvelle-competition-conviviale-en-performance-energetique-destinee-aux-immeubles-commerciaux-du-quebec/.

To assess the level of participation, we compared total floor area benchmarked by December 2017 to the latest available data on total commercial and institutional floor space in each province or region, captured in the National Energy Use Database (NEUD) through the Survey of Commercial and Institutional Buildings (see Table 51). This provided an approximate comparison, since multi-unit residential buildings are reported into Energy Star Portfolio Manager, but our denominator only recorded commercial and institutional buildings. Unfortunately, the data do not enable a province-by-province comparison, since the total commercial and institutional floor area is aggregated for the Atlantic region and for British Columbia and the territories. Thus, the data were not used for scoring, and are presented for illustrative purposes only. Table 51 presents figures for participation rather than the energy intensity of buildings in each province.

Table 51. Participation in Energy Star Portfolio Manager

Province/Region	Floor Area Benchmarked with Energy Star Portfolio Manager, Million Square Metres, December 2017	Floor Area Benchmarked as % of Total Commercial and Institutional Floor Area
Ontario	108	37%
Alberta	36	32%
BC and Territories	31	29%
Manitoba	8	28%
Québec	25	17%
Atlantic	6	12%
Saskatchewan	2	7%

The figures indicate that the provinces with the most active programs are benchmarking more building area. Ontario is in the lead with a mandatory program, followed by Alberta and British Columbia with a history of municipal leadership. Manitoba also has a history of encouraging building energy benchmarking through Manitoba Hydro (see Box 7).

Box 7: Manitoba Hydro Offers Automatic Data Upload

Manitoba Hydro was the first utility in Canada to offer automatic uploads to Energy Star® Portfolio Manager in 2015. The utility assigned internal information technology staff to create the automatic upload functionality that sends new electricity and natural gas consumption information to the Portfolio Manager database, requiring no manual intervention by the customer once they have set up a building profile. Manitoba Hydro also uploads the past 10 years of a building's monthly energy consumption data, providing owners with information on the impacts of past energy efficiency projects and operational decisions.

We also tracked statements and commitments concerning building energy rating and disclosure. Table 52 shows that home labeling and building energy ratings are noted in several provincial strategies, using various strategies to smooth the way for mandatory policies. British Columbia's Climate Action Plan refers to making energy ratings "as simple and inexpensive as possible". Ontario plans to work with real estate associations, and Québec presents a clear timeline for home energy labels starting with a working group, followed by municipal pilot projects, leading toward mandatory ratings at the point of sale. Nova Scotia plans to launch a voluntary program in 2019. If provinces follow through with these plans, they will improve their standings in future scorecards.

Table 52. Provincial Policy Commitments to Energy Rating and Disclosure		
Province	Home Energy Rating and Disclosure	Building Energy Rating and Disclosure
British Columbia	**Clean BC Climate Action Plan**[147] Commits to exploring energy ratings "at the point of sale or lease" through stakeholder consultation, with the goal of making energy rating requirements "as simple and inexpensive as possible". This refers to both small homes and large buildings.	
Saskatchewan	**Prairie Resilience**[148] The December 2017 Climate Change Strategy states that the government will "explore options to label buildings for energy performance".	
Ontario	**Ontario Environment Plan**[149] The November 2018 plan states an intention to work with the Ontario Real Estate Association to encourage voluntary display of home energy efficiency information on real estate listings to better inform buyers and encourage energy efficiency measures.	Mandatory/regulated program in place.

[147] Government of British Columbia, "CleanBC: Our Nature, Our Power, Our Future" (Victoria, BC: Government of British Columbia, December 2018), 27, https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_2018-bc-climate-strategy.pdf.
[148] Government of Saskatchewan, "Prairie Resilience: A Made-in-Saskatchewan Climate Change Strategy" (Government of Saskatchewan, December 2017), 7, https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/a-made-in-saskatchewan-climate-change-strategy/prairie-resilience.
[149] Ontario Ministry of Environment Conservation and Parks, "Preserving and Protecting Our Environment for Future Generations: A Made-in-Ontario Environment Plan" (policy proposal posted to Environmental Registry of Ontario, November 28, 2018), 32, https://ero.ontario.ca/notice/013-4208.

Québec	**TEQ Master Plan**[150] The TEQ Master Plan includes a roadmap to eventually implement a compulsory energy efficiency rating system for new buildings, and upon the resale of single-family homes. The roadmap calls for the province to form a working group on mandatory energy ratings in 2018/19, launch a pilot project in at least one city in 2021/22, and enact mandatory ratings by 2023/28.	**TEQ Master Plan** The Transition énergétique Québec calls for making the disclosure of commercial and institutional building use data mandatory between 2023 and 2028.
New Brunswick	**The 2016 Climate Action Plan, Transitioning to a Low-Carbon Economy**[151] States that the government would "if viable, require energy labeling for all new building construction, both residential and commercial".	
Prince Edward Island	**Provincial Energy Strategy 2016/2017**[152] Includes an action item to "implement mandatory building labeling for the residential sector when homes are listed for sale", and to "examine the feasibility of a mandatory commercial/institutional building energy reporting system, or a voluntary one led by government buildings".	
Nova Scotia		In the fall of 2018, The Government of Nova Scotia, Efficiency Nova Scotia, and the Canada Green Building Council announced plans to design a voluntary building energy benchmarking program.

In future years, we will advocate for province-by-province data on floor area and numbers of buildings, to provide a quantitative indicator of benchmarking progress. We might also consider assessing the level of disclosure required in different policies and programs. Future policies might also move toward mandatory upgrading of buildings that fail to meet specified performance levels.

[150] Government of Quebec, "Joining Forces for a Sustainable Energy Future: 2018-2023 Energy Transition, Innovation and Efficiency Master Plan - Objectives and Roadmaps." See pp. 46-53 for HERD, and pp. 54-59 for BERD
[151] Province of New Brunswick, "Transitioning to a Low-Carbon Economy New Brunswick's Climate Change Action Plan," 2016, 7.
[152] Dunsky Energy Consulting, "Provincial Energy Strategy, 2016/17," 24.

Appliance and Equipment Market Transformation

Improved efficiency of appliances and equipment is a critical driver of energy efficiency. Recent federal regulatory amendments are expected to reduce GHG emissions by 1.07 megatonnes by 2030, with quantified benefits three times higher than technology and administrative costs.[153]

Appliance and equipment efficiencies are achieved through minimum standards and regulations, and by a process of market transformation that often precedes regulations and makes more efficient products the norm. Market transformation can be supported by activities such as product demonstrations, training and education of supply chain actors, and customer education through such devices as product labels.[154]

In Canada, federal standards apply to products that are imported or shipped between provinces, and provinces have jurisdiction over products sold within their borders. British Columbia, Manitoba, Ontario, Québec, New Brunswick, and Nova Scotia have their own efficiency regulations, including standards for energy use in many federally-regulated products. This policy context contrasts with the United States, where federal pre-emption overrides state standards for federally-regulated products.[155] Thus, provinces can contribute to appliance and equipment efficiency by setting standards for products not covered by federal regulations, and they can adopt more stringent standards than the federal government.

In 2018, a market transformation roadmap for three strategic technologies (space heating, water heating, and windows) was released at the annual Energy and Mines Ministers' Conference.[156] The roadmap aims to set a U-factor of 0.8 for all residential windows sold by 2030, and all space and water heating technologies for sale to meet an energy performance of more than 100% by 2035.[157] Interim goals enable provinces to prioritize activities based on their specific contexts, such as carbon intensity of electricity grids and local climates.[158]

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[153] Public Works and Government Services Canada, "Canada Gazette, Part 1, Volume 152, Number 49: Regulations Amending the Energy Efficiency Regulations, 2016," Government of Canada, December 8, 2018, http://gazette.gc.ca/rp-pr/p1/2018/2018-12-08/html/reg3-eng.html; Public Works and Government Services Canada, "Canada Gazette, Part II, Volume 153, Number 12: Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 15)," Government of Canada, June 3, 2019, http://www.gazette.gc.ca/rp-pr/p2/2019/2019-06-12/html/sor-dors164-eng.html.

[154] Carl Blumstein, Seymour Goldstone, and Loren Lutzenhiser, "A Theory-Based Approach to Market Transformation," *Energy Policy* 28, no. 2 (2000): 137–144.

[155] Yet states can apply for a waiver.

[156] Saskatchewan was not a signatory to the final communiqué due to concerns about life cycle costs to provincial consumers and GHG implications of electrification in the province's carbon-intensive grid.

[157] Energy and Mines Ministers' Conference, "Paving the Road to 2030 and Beyond: Market Transformation Road Map for Energy Efficient Equipment in the Building Sector" (Iqaluit, Nunavut, August 2018), https://www.nrcan.gc.ca/energy/regulations/21290.

[158] For instance, there is a 2030 goal for residential natural gas heat pump with a seasonal coefficient of performance greater than 1.2 to be manufactured and installed.

This year's scorecard assesses initial progress toward this market transformation roadmap. While every province can play a role in promoting market transformation, not all are involved in developing their own codes and standards, since only some of them manufacture these types of products. We asked provinces to record relevant activities in support of the roadmap, identify any regulated products not covered by federal regulations, and indicate whether they had adopted regulations that exceeded the federal standard.

Table 53 groups provincial initiatives in four broad categories:

- Research Development and Demonstration, including laboratory and field tests, product development, and demonstration activities;
- Information, awareness, and training;
- Utility involvement and upstream program strategies, including advocacy for more stringent codes and standards, or upstream market transformation programs to influence supply chains;
- Provincial codes and standards that exceed federal standards by covering new products or setting higher levels of stringency.

The scoring excludes customer incentives which are best categorized as "resource acquisition" initiatives. While customer-focused programs play an important role in stimulating local demand, that influence is captured in other scorecard categories, particularly program savings and spending.

Provinces received one point for activities in each category, for a maximum of three points. Future scorecards will move toward a more detailed, fine-grained assessment of provincial performance. This could involve a quantitative metric for the impact of provincial standard-setting, and more detailed monitoring of market transformation activities.

Table 53. Appliance and Equipment Market Transformation Activities					
Province	RD&D - Lab and Field Tests, Product Development and Demonstration Projects (1 pt)	Information, Awareness and Training (1 pt)	Upstream Program Strategies and Utility Involvement (1 pt)	Codes and Standards (1 pt)	Score (Max 3 pts)
British Columbia	**Space Heating** -cold climate heat pump field study -heat pump installation field study **Water Heating** -field study of heat pump water heaters	Clean BC programs support installer training and education	1% of utility energy efficiency budgets dedicated to codes and standards support **Windows** -High-performance windows certification program	BC Reg 14/2015 includes standards for windows/doors and gas boilers BC Reg 14/2015 more stringent than federal for vented gas fireplaces and gas furnaces	3
Manitoba	**Space Heating** -Manitoba Hydro monitoring air source heat pumps **Water Heating** -Manitoba Hydro heat pump water heater field test Biomass demonstration projects	**Windows** -Manitoba Hydro engagement of architects re: commercial retrofits	Manitoba Hydro engagement with SCOPEER[159], National Energy Code Building Envelope Task Group, Fenestration Manitoba		3

[159] Strategic Steering Committee on Performance, Energy Efficiency and Renewables

Ontario	Heat pump demonstration projects through IESO Grid Innovation Fund and Toronto and Region Conservation Authority Sustainable Tech Evaluation Program	Research and tools for customers and utilities developed through IESO programs (e.g. guide for measuring and verifying savings from heat pump retrofits)	Natural gas utility market transformation program works with builders and developers to exceed building code requirements at design stage.	Ontario Reg 509/18 includes standards for windows, residential and commercial gas-fired boilers, and water heaters Ontario has standards for many products that are outside federal regulations, such as gas and electric water heaters, space heating equipment such as commercial gas-fired boilers, residential windows, and thermostats Ontario has standards more stringent than federal government for products such as heat pumps and air conditioners	3
Québec	Énergir Innovation efficace program supports demonstration projects for efficient natural gas technologies	Énergir support for training and certification in high-efficiency natural gas equipment	Hydro Québec market transformation programs targeting wall-mounted electronic thermostats for baseboard heaters (2004-2013)	TEQ Master Plan announces initiatives to regulate products outside federal jurisdiction, including windows and doors Product standards for thermostats, which currently fall outside federal regulation Québec standards more stringent than federal include electric and gas water heaters	3

Nova Scotia	Field studies on cold climate heat pump and heat pump water heaters in partnership with Natural Resources Canada, Efficiency Nova Scotia, and Nova Scotia Power		Efficiency Nova Scotia Demand Side Management plans include investments in enabling strategies, such as advocacy and support for adoption of energy efficiency standards in provincial and federal regulations	Regulation of wood-burning appliances not covered by federal standards	3
Prince Edward Island	PEI utilities support energy storage heat pump pilot project[160]			PEI's Energy Strategy 2016/17 calls or monitoring appliance standards approved in the United States, and other provinces, to reduce the lag time associated with harmonization	2
New Brunswick	New Brunswick Innovation Fund support for energy storage heat pump pilot project in PEI				1
Alberta					0
Newfoundland and Labrador					0
Saskatchewan					0

[160] Terrence McEachern, "P.E.I. Electric Utilities Involved in Pilot Project for Heat Pumps That Store Energy," The Guardian, June 16, 2018, http://www.theguardian.pe.ca/news/local/pei-electric-utilities-involved-in-pilot-project-for-heat-pumps-that-store-energy-219009/.

Transportation

Transportation accounts for 29.8% of total energy consumption in Canada and stands to deliver 26% of the country's potential energy savings by 2050.[161] Achieving these savings would prevent 1.5 gigatons of CO2 emissions through 2050, or one-third of total potential emissions reductions.[162]

Almost half of Canada's transport energy demand currently comes from light-duty passenger vehicles. While a number of current and possible future policies and initiatives could improve passenger vehicle energy efficiency, electrification of personal transport will play a particularly important role. According to the US Department of Energy, electric vehicles convert 59% to 60% of electrical energy received from the grid to power at the wheels, while conventional gasoline vehicles convert only 17% to 21% of the energy in gasoline to power.[163] Electrification could lead to large total energy savings as well: under the IEA's Energy Efficiency scenario, two out of three light-duty passenger vehicles sold will be electric by 2050, cutting fuel consumption from this subsector in half.[164]

Scores for the transportation category reflect provincial policies and performance in energy efficiency, primarily in personal transportation, thereby targeting the integration of private transportation with buildings and electricity grids. We collected information on the following policy areas or metrics:

- The existence of a zero-emissions vehicle mandate (**2 points**);
- Policies to support public charging stations (**2 points**);
- High-efficiency vehicle consumer incentives (**2 points**);
- Support for electric (EV) and plug-in hybrid electric vehicles (PHEV) in building codes (**1 point**);
- EV/PHEV registrations per total vehicle registrations (**4 points**);
- Availability of public charging (including fast DC charging) stations (**3 points**);
- Commute-to-work shares (**3 points**).

[161] Natural Resources Canada, "Canada's Secondary Energy Use (Final Demand) by Sector, End Use and Subsector"; International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."
[162] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."
[163] Office of Energy Efficiency & Renewable Energy, "All-Electric Vehicles," U.S Department of Energy, 2019, http://www.fueleconomy.gov/feg/evtech.shtml.
[164] International Energy Agency and Natural Resources Canada, "Energy Efficiency Potential in Canada to 2050."

Table 54. Transportation Scoring Results								
Province	ZEV Mandate (2 pts)	Public Charging Policies (2 pts)	Consumer Incentives (2 pts)	EV-Ready Building Codes (1 pts)	ZEV Registra-tions (4 pts)	Public Charging Stations (3 pts)	Commute-to-Work Shares (3 pts)	Total (17pts)
Québec	2	2	2	1	3	2.5	1.75	14
British Columbia	2	2	2	1	2.5	1.5	1.75	13
Ontario	0	1*	1*	0.25*	1.75	0.75	1.75	7
New Brunswick	0	1.5	2	0	0.25	1.5	1.25	7
Nova Scotia	0	1.5	0	0	0.25	1.25	1.75	5
Alberta	0	1.5	0	0	0.25	0	1.25	3
Prince Edward Island	0	1.5	0	0	0.5	0.5	-	3
Newfoundland and Labrador	0	0.5**	0	0	0.25	0	1.25	2
Manitoba	0	0	0	0	0.25	0	1.75	2
Saskatchewan	0	0	0	0	0	0	1	1

** Reduced points due to program cancellations*
*** Programs not yet in operation*
Totals rounded to whole numbers

The scorecard does not include measures related to commercial and freight transportation, nor urban form issues that would make cities more amenable to energy-efficient personal transportation. The QUEST Smart Energy Communities Benchmark includes more information on personal transportation and urban design issues.[165] We included a score for commute-to-work shares to reflect the importance of personal transportation modes other than single-occupant automobiles (walking, biking, public transit, carpooling). For future scorecards, we will investigate ways to expand on our consideration of transportation efficiency.

Zero-Emission Vehicle Mandates

Governments can take action to promote energy efficiency in personal vehicle transportation by adopting regulations requiring that zero-emission vehicles (electric, plug-in electric, or fuel-cell) comprise a certain share of all vehicles offered for sale by manufacturers in a jurisdiction. An early model of this kind of regulation is California's Zero-Emission Vehicle Program, which since 2009 has set a gradually increasing percentage share target for ZEVs.[166] In April 2019, Canada announced a nation-wide ZEV target of 10% of light-duty vehicles by 2025, 30% by 2030, and 100% by 2040.[167] We awarded two points to provinces that had adopted zero-emission vehicle mandates that met, exceeded, or supplemented the national target prior to the federal announcement. This metric will be revisited in future scorecards.

Only two provinces had announced or legislated equivalent or higher mandates prior to the federal mandate: British Columbia and Québec. British Columbia announced its intention to pass a ZEV mandate by 2020 in its Fall 2018 CleanBC climate strategy.[168] The Zero-Emission Vehicles Act, passed in May 2019, implements a credit/debit system for auto manufacturers and sets the same ZEV sales and leasing targets—10% by 2025, 30% by 2030, and 100% by 2040—adopted by the federal government.[169]

Québec's Zero-Emission Vehicle Standard was adopted in October 2016 and came into force in January 2018. The standard also establishes a credit/debit system, requiring manufacturers to earn ZEV credits equivalent to 3.5% of light-duty vehicle sales and leases by 2018 and 16% by 2025.[170] No other province has implemented a ZEV

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[165] "Smart Energy Communities Benchmark."
[166] California Air Resources Board, "Zero-Emission Vehicle Program," California Environmental Protection Agency, 2019, https://ww2.arb.ca.gov/index.php/our-work/programs/zero-emission-vehicle-program/about.
[167] Transport Canada, "Government of Canada Invests in Zero-Emission Vehicles," Government of Canada, April 17, 2019, https://www.canada.ca/en/transport-canada/news/2019/04/government-of-canada-invests-in-zero-emission-vehicles.html.
[168] Government of British Columbia, "CleanBC: Our Nature, Our Power, Our Future."
[169] Minister of Energy, Mines & Petroleum Resources, "Zero-Emission Vehicles Act," Pub. L. No. Bill 28 (2019), https://www.leg.bc.ca/parliamentary-business/legislation-debates-proceedings/41st-parliament/4th-session/bills/first-reading/gov28-1.
[170] Government of Quebec, "ZEV Standard - Explanatory Leaflet," 2019, http://www.environnement.gouv.qc.ca/changementsclimatiques/vze/feuillet-vze-reglement-en.pdf.

mandate, so British Columbia and Québec are the only two that receive the full two points for this metric.

Electric Vehicle Registrations

Electric and plug-in hybrid vehicles registrations in each province relative to total vehicle registrations provide a quantitative indicator of personal transportation electrification. At an average of about 2.5 per thousand light-duty vehicles, EV/PHEV registrations across the 10 provinces are still a small percentage of Canada's passenger fleet.

We scored EV/PHEV registrations by summing annual registrations from 2010 to 2018, then dividing the total by all light-duty vehicle registrations in 2018 using data from Statistics Canada.[171] We awarded 0.25 points for every 0.625 EV/PHEV registrations per thousand registrations, up to a total of four points for provinces exceeding 10 EV/PHEVs per thousand.

Table 55. EV/PHEV registrations scoring summary

EV/PHEV Registrations / 1,000 Light Duty Vehicle Registrations	Provinces	Scoring (4 pts)
> 10	-	-
7.5 – 10	Québec	3
5 – 7.5	British Columbia	2.5
2.5 – 5	Ontario	1.75
1.25 – 2.5	Prince Edward Island	0.5
0.625 – 1.25	Alberta, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia	0.25
< 0.625	Saskatchewan	0

Québec and British Columbia were the leaders in the EV/PHEV share of light-duty vehicle registrations, followed by Ontario. The rest of the provinces all fell below the national average of ~2.5 ZEVs per thousand light-duty vehicles, excluding the territories.

[171] Statistics Canada, "Vehicle Registrations, by Type of Vehicle," Government of Canada, 2019, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701. Data on ZEV registrations is from IHS Automotive Polk 2018

Support for Public Charging

Governments and other actors in Canada can help reduce barriers to vehicle electrification by setting targets and/or providing support to increase the availability of public charging infrastructure for EV/PHEVs. Range anxiety is a well-documented barrier to potential buyers, second only to cost concerns.[172] Studies have shown that greater availability of public charging stations can reduce range anxiety, even though most owners prefer to charge their vehicles at home and that average daily driving habits suggest that range limitations are not an issue.[173] Therefore, policies and programs to support the installation of private and public charging infrastructure can reduce barriers to EV/PHEV uptake. Level 2 or Level 3 (Fast DC) chargers are particularly important on highways, to promote convenience and make EV/PHEVs competitive with energy-dense petroleum fuels. [174]

The federal government established the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative in its 2016 budget, with $96.4 million directed to support a coast-to-coast charging network for electric vehicles, natural gas stations along key freight corridors, and stations for hydrogen fuel cell vehicles in metropolitan centres. According to Natural Resources Canada, the initiative supported deployment of 102 electric vehicle charging stations in Phase 1, and has a target of 900 more for Phase 2. Phase 2 data on the NRCan website indicate program support for approximately 384 electric charging projects, many with multiple stations.[175] Approximately two-thirds of these projects were put forward by private actors, the rest by publicly-owned utilities or municipalities. Only Level 3 (fast DC) charging stations are eligible for support under the program.

The scorecard awards a half-point to provinces that support private charging stations in homes or workplaces, another half-point for efforts by governments or utilities to increase availability of public charging stations, and one point for initiatives that include

[172] Ona Egbue and Suzanna Long, “Barriers to Widespread Adoption of Electric Vehicles: An Analysis of Consumer Attitudes and Perceptions,” *Energy Policy*, Special Section: Frontiers of Sustainability, 48 (September 1, 2012): 717–29, https://doi.org/10.1016/j.enpol.2012.06.009.
[173] Jing Dong, Changzheng Liu, and Zhenhong Lin, “Charging Infrastructure Planning for Promoting Battery Electric Vehicles: An Activity-Based Approach Using Multiday Travel Data,” *Transportation Research Part C: Emerging Technologies* 38 (January 1, 2014): 44–55, https://doi.org/10.1016/j.trc.2013.11.001.
[174] Level 2 chargers have an output of 240 volts (AC) and can take up to 5 hours to charge enough for 200 km of range. Level 3 chargers output 400 volts (DC) and take ~30mins to reach 80% of 200km range.
[175] Natural Resources Canada, “Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative,” Government of Canada, April 4, 2016, https://www.nrcan.gc.ca/energy/alternative-fuels/fuel-facts/ecoenergy/18352.

or prioritize Level 3 charging stations. Partial points may have been awarded for policies or programs that were cancelled during the period under review. We did not award points for initiatives that sought only to remove regulatory barriers to private investment, with the expectation that the outcome-based metric on public charging availability should capture the impacts of all policy approaches.

Of all the provinces, only British Columbia had provincial government support programs for private and public charging infrastructure.[176] The province also supported a separate program aimed at fleet managers, administered by the Fraser Basin Council, which offered up to $2,000 per Level 2 charging station.[177] Ontario had three similar programs, including a one-time, $20-million initiative in 2016 for public charging infrastructure, but residential and workplace support programs were cancelled in July 2018 with the repeal of the province's carbon cap and trade program.[178]

Box 8: Supporting Charging Infrastructure

The Government of British Columbia administers two charging infrastructure support initiatives, the Fast DC Charger Program and the Charging Solutions and Incentives Program. Project proponents in B.C. who apply for and receive federal support are automatically eligible for additional provincial support, up to a total of 75% of estimated project costs, unless the proponent is a provincial or municipal government. As of 2017, these programs had supported 1,300 private and public charging stations, including 30 Level 3 stations.[176]

In its 2019 budget, Newfoundland and Labrador dedicated $2 million to pursue funding opportunities for charging infrastructure with the federal government and the private and not-for-profit sectors, but the program did not appear to be in operation as of June 2019.[179] Québec is the only other province with support for residential charging installation.[180]

[176] Government of British Columbia, "DC Fast Charger Program," 2018, https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program/charging-infrastructure/dcfc-program; Government of British Columbia, "Clean Energy Vehicle Program," 2017, https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program.
[177] "Fleet Infrastructure Incentive," Plug In BC, 2019, https://pluginbc.ca/incentives/fleet-infrastructure-incentive/.
[178] Ministry of Transportation, "Survey Results" (Toronto, ON; Government of Ontario, June 2019).
[179] Hon. Tom Osborne, Minister of Finance, "Budget 2019 – Working towards a Brighter Future," Government of Newfoundland and Labrador, April 16, 2019, https://www.releases.gov.nl.ca/releases/2019/fin/0416n07.aspx.
[180] Transition energetique Quebec, "Home Charging Station Rebate," Government of Quebec, 2019, https://vehiculeselectriques.gouv.qc.ca/english/rabais/domicile/programme-remboursement-borne-recharge-domicile.asp.

Utility-run initiatives under way in other provinces have received some provincial or municipal support. These generally pertain to the building and/or management of a provincial charging network with industry or municipal partners. Examples include ATCO's Peaks to Prairies program in Alberta,[181] NB Power's eCharge Network,[182] and Hydro-Québec's charging network, Le Circuit Electrique.[183] In Nova Scotia[184] and Prince Edward Island, utility or government construction of public electric charging stations has largely proceeded through support from the federal government, with case-by-case provincial funding.[185] In New Brunswick, the provincial government partnered with NB Power in 2018 to build 12 Level 2 charging stations at provincial parks.[186]

Neither Saskatchewan nor Manitoba has any standing government or utility-run program to support construction of private or public charging stations, and neither has sought support through the federal government program. Stations have been built in these provinces through federal government support, or by private actors like Suncor and Canadian Tire. Manitoba convened an electric vehicle advisory committee in 2012, which recommended subsidies for Level 2 charging infrastructure as well as a ZEV mandate and consumer incentives, but the province has not yet taken action in these areas.[187]

Public Charging Availability

In addition to the policy metric above, we scored provinces on the availability of public charging infrastructure by comparing the total number of stations with the extent of the provincial road network.[188] We awarded 0.25 points for every two stations per thousand kilometres of publicly-owned roads, up to a total of three points, plus one bonus point for

[181] "Peaks to Prairies Electric Vehicle Charging Station," accessed June 12, 2019, https://www.atco.com/en-ca/projects/peaks-to-prairies-electric-vehicle-charging-station.html.
[182] "Welcome - ECharge Network," NB Power, 2019, https://echargenetwork.com/.
[183] Hydro-Québec and AddÉnergie Inc., "Le Circuit Électrique," Le Circuit électrique, 2019, https://lecircuitelectrique.com/.
[184] CBC News, "NS Power Says $1M for Electric Vehicle Chargers a 'Benefit to Nova Scotians,'" CBC News, March 6, 2018, https://www.cbc.ca/news/canada/nova-scotia/ns-power-says-1m-for-electric-vehicle-chargers-a-benefit-to-nova-scotians-1.4564164.
[185] Government of Prince Edward Island, "Canada Invests in PEI's First Level 3 Electric Vehicle Fast Chargers," Government of Prince Edward Island, March 11, 2019, https://www.princeedwardisland.ca/en/news/canada-invests-peis-first-level-3-electric-vehicle-fast-chargers.
[186] NB Power and Tourism, Heritage and Culture, "Electric Vehicle Charging Stations to Be Added to Provincial Parks," Government of New Brunswick, May 22, 2018, https://www2.gnb.ca/content/gnb/en/news/news_release.2018.05.0598.html.
[187] Electric Vehicle Advisory Committee, "Realizing the Potential of Electric Vehicles in Manitoba" (Winnipeg: Government of Manitoba, February 21, 2012), https://www.gov.mb.ca/sd/environment_and_biodiversity/energy/pubs/ev_advisory_committee_final_report.pdf.
[188] Data on publicly owned roads includes highways, arterials, collectors and local road infrastructure. See Infrastructure Canada, "Inventory of Publicly Owned Road Assets," Government of Canada, 2019, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3410017601.

provinces where charging stations with DC fast-chargers exceeded 20% of all public charging capacity.

Data on public charging stations was obtained from Natural Resource Canada's Electric Charging and Alternative Fuelling Stations Locator online database, a free resource that lists all publicly accessible, currently available public charging stations across Canada and which is verified by an independent third-party.[189] This listing includes both networked charging stations (those part of one of ten different charging networks),[190] data for which is uploaded automatically through an API) and non-networked stations (data for which must be submitted manually to the database). Each station may have one or more Level 1, Level 2, or Fast DC charging ports or combinations thereof.

While the database is verified by an independent third party, it may not include all charging stations available in each province. Other charging station database services may have different numbers, though in some instances this may be due to their inclusion of unverified, self-reported, non-networked stations. We are nevertheless confident that the NRCan database provides a fair basis for comparison across the provinces.

We recognize that our choice to normalize across provinces by public road infrastructure may disadvantage more rural jurisdictions with larger road networks. However, this is still the most relevant metric to assess the extent to which the charging infrastructure in place is sufficient to counter range anxiety for potential rural and urban consumers. We chose to score on numbers of stations rather than ports to provide a fairer comparison across rural and urban jurisdictions, recognizing that densely-populated regions could in theory provide sufficient charging availability with fewer stations and more ports, while sparsely-populated regions would require more stations but fewer ports.

[189] Natural Resources Canada, "Electric Charging and Alternative Fuelling Stations Locator," Government of Canada, 2019, https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation-and-alternative-fuels/electric-charging-alternative-fuelling-stationslocator-map/20487#/analyze?country=CA&fuel=ELEC&ev_levels=1&ev_levels=2&ev_levels=dc_fast&status=E&status=P.

[190] These networks include the ChargePoint Network; Le Circuit Electrique; EV Connect; FLO; GE WattStation; Greenlots; SemaCharge Network; Tesla; and some SunCountry Highway stations. We note that data originally downloaded in June 2019 labelled stations part of FLO, Le Circuit Electrique, or eCharge networks as part of an 'AddEnergie Technologies' network. Data downloaded in September 2019 reclassified these as either FLO or Le Circuit Electrique, but dropped 37 stations in New Brunswick that are part of the province's eCharge network. For the purposes of scoring in this report, we have chosen to use the September 2019 data, with the dropped eCharge stations added back in, after ensuring there was no duplication of data.

Table 56. Electric Vehicle Charging Stations Per 1,000 Kilometres of Public-Owned Roads				
Province	Charging Stations	Road Kilometres	Stations / 1,000 Kilometres	Score (3 pts)
Québec	2071	103,174	20.1	2.5
British Columbia	867	65,547	13.2	1.5
Ontario	1195	180,958	6.6	0.75
New Brunswick	116	27,455	4.2	0.5
Prince Edward Island	25	5,575	4.5	0.5
Nova Scotia	77	27,112	2.8	0.25
Alberta	188	176,342	1.1	0
Newfoundland and Labrador	23	13,493	1.7	0
Saskatchewan	34	63,080	0.5	0
Manitoba	41	81,031	0.5	0

Table 57. Fast DC Charging Availability			
Province	Stations with Fast DC Charging	Share of All Stations	Score (1 Point)
New Brunswick	35	30%	1
Nova Scotia	17	22%	1
Ontario	230	19%	0
British Columbia	108	13%	0
Manitoba	5	12%	0
Alberta	20	11%	0
Québec	207	10%	0

At 20.1 and 13.2 stations per thousand kilometres of road, respectively, Québec and British Columbia ranked highest on this metric. Ontario (6.6), Prince Edward Island (4.5), New Brunswick (4.2), and Nova Scotia (2.8) followed. The rest of the provinces had fewer than two stations per thousand kilometres of road. The national average was 5.5.

Only New Brunswick and Nova Scotia exceeded the 20% threshold of charging stations with DC fast charging that earned them one bonus point.

Vehicle Consumer Incentives

Another form of policy support is consumer incentives for the purchase of more fuel-efficient vehicles. The up-front purchase cost of high-efficiency vehicles using new and advanced technologies can be a barrier to consumer uptake, despite having much lower operating costs than conventional vehicles.[191] Governments can reduce these barriers by offering financial incentives to consumers, such as tax credits, rebates and sales tax exemptions.

As of May 1, 2019, the federal government offers purchase incentives of $5,000 for EVs and long-range PHEVs, and $2,500 for shorter range PHEVs.[192] The scorecard awards two points to provinces with financial incentives that preceded and/or supplement the federal plan, with partial points for policies or programs that were cancelled during the period under review.

British Columbia, through its Clean Energy Vehicles Program, offers point-of-sale incentives of up to $5,000 for EV/PHEVs with a suggested retail price of less than $77,000.[193] The province also funds a Specialty-Use Vehicle Incentive, available to individuals and public or private fleets as an incentive for electric motorcycles and scooters, forklifts, and other commercial vehicles, and the non-profit BC SCRAP-IT Program Society offers financial incentives for new ($6,000) and used ($3,000) electric vehicles, but not PHEVs.[194] Québec's *Roulez vert* program, launched in January 2012, offers rebates of up to $8,000 for purchase of a new EV/PHEV with a retail price less than $75,000, and up to $3,000 for vehicles priced between $75,000 and $125,000. As well, a pilot project between April 2017 and March 2019 that offered rebates of up to

[191] See Natural Resources Canada, "2019 Fuel Consumption Guide" (Ottawa, ON: Government of Canada, 2019). for estimates of annual fuel costs for all passenger vehicles sold in Canada.
[192] Transport Canada, "Zero-Emission Vehicles," Government of Canada, April 11, 2019, http://www.tc.gc.ca/en/services/road/innovative-technologies/zero-emission-vehicles.html.
[193] Government of British Columbia, "Clean Energy Vehicle Program"; Government of British Columbia and New Car Dealers Association of BC, "Clean Energy Vehicles for British Columbia | New Car Dealers of BC," 2019, https://www.cevforbc.ca/.
[194] Province of British Columbia, "CEV Specialty-Use Vehicle Incentive," Province of British Columbia, 2019, https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program/suvi; "Program Policies," The BC SCRAP-IT Program, 2019, https://scrapit.ca/faqsinfo/programpolicies/.

$4,000 for the purchase of used EV/PHEVs is now an official part of the *Roulez vert* program.[195] Both provinces received full points for this metric.

Ontario and New Brunswick had consumer incentive programs that ended during the period under review. The New Brunswick Lung Association, supported by provincial and federal grants, offered rebates of $1,000 under the Drive Electric NB program between April 2018 and March 2019, when the program's funding was exhausted.[196] Ontario's Electric and Hydrogen Vehicle Incentives Program, which had offered incentives ranging from $5,000 to $14,000, was cancelled when the carbon cap and trade program that funded it was repealed.[197] We awarded only partial points to Ontario due to the abrupt cancellation of the program and the increased customer and market uncertainty that resulted.

None of the other provinces had consumer incentives for the purchase of EV/PHEVs, and consequently they received no points.

Support for EV/PHEVs in Building Codes

Governments can remove barriers to EV/PHEVs by implementing building code regulations that require supporting infrastructure in new home construction. This can be as simple as appropriate conduiting or 200-amp service. Such provisions can help reduce barriers to potential EV/PHEV buyers because the infrastructure to support installation of home charging will already be in place. It is also an example of how transportation is becoming more closely integrated with buildings, which is of particular interest to energy efficiency policy. Provinces that included support for EV/PHEVs in their building codes received one point, with partial points if a provision was removed during the period under review.

Provincial building codes regulations to support private EV/PHEV charging infrastructure are not widespread. Québec changed its electricity code in 2018 to include an obligation to install basic wiring for EV charging in certain dwellings. Ontario amended its building code in 2017 to require new single- and multi-family homes to include supporting infrastructure for EV/PHEV charging, effective January 1, 2018, but

[195] Transition energetique Quebec, "Government Rebates," Government of Quebec, 2019, https://vehiculeselectriques.gouv.qc.ca/english/rabais/ve-occasion/programme-rabais-vehicule-occasion.asp.
[196] Hannah Moore, "Happy Problem: Drive Electric NB's Rebate Program Was so Popular It Had to End Early," Conservation Council of New Brunswick, February 29, 2019, https://www.conservationcouncil.ca/en/happy-problem-drive-electric-nbs-rebate-program-was-so-popular-it-had-to-end-early/.
[197] Ministry of Transportation, "Ontario Ends the Electric and Hydrogen Vehicle Charging Incentive Programs," Government of Ontario, August 31, 2018, http://www.mto.gov.on.ca/english/vehicles/electric/electric-vehicle-incentive-program.shtml.

the requirement was revoked in another amendment passed May 2, 2019.[198] Consequently, Ontario received only partial points for this metric.

British Columbia revised its Building Code Act in 2016 to define EV chargers as "out of scope"[199] under the legislation. This action gave local governments greater flexibility to create rules for EV charging in new developments, enabling a number of municipal bylaws requiring EV charging in new builds and EV-ready stalls in multi-unit buildings. British Columbia received full points on this metric.[200]

Commute-to-Work Shares

We also looked at the share of commuters who regularly travelled to and from work using a transportation mode other than a single-occupancy vehicle (public transit, carpooling, walking, or cycling), based on "sustainable transport" data for census metropolitan areas (CMAs) in the 2016 Census.[201] Statistics Canada defines a CMA as an area consisting of one or more neighbouring municipalities situated around a core with a total population of 100,000 or more, at last half of whom live in the core. The census gathered information about commuting practices for employed persons across six different sizes of CMAs. All provinces have urban areas classified as CMAs, except Prince Edward Island. To compensate for the absence of data for PEI on this metric, we adjust the province's total score to reflect a percentage out of 97.

As each of the sustainable commuting options defined by Statistics Canada represents an energy efficiency gain over single-occupant, personal vehicle commuting (not taking into consideration vehicle fuel type), we considered the percentage of commuters regularly using alternative modes of transportation as a measure of commute-to-work energy efficiency in each province. We did not discriminate between transportation modes, other than single-occupant, personal vehicle trips. Thus carpooling, public transportation, and cycling all counted toward progress on this benchmark.

According to the Eurostat 2017 yearbook,[202] car use in leading European capital cities can be quite low—in 17 of 31 cities analyzed, fewer than half of survey respondents used cars as their principal means of commuting to work. In Stockholm, fewer than 25% reported using cars as their principal means of transport. Shares of commuters using public transport were also quite high in some cities, exceeding 60% in several major European cities (Paris, Madrid, Prague, Budapest, Warsaw, Stockholm, and others) and

[198] Government of Ontario, "O. Reg. 88/19: BUILDING CODE," Amending O. Reg. 332/12 BUILDING CODE ACT, 1992 § (2019), 88, https://www.ontario.ca/laws/regulation/R19088.
[199] 'Out of scope' is defined as "matters… local government can regulate… if they have authority to do so in other statutes"
[200] For details by municipality, see https://pluginbc.ca/policy/
[201] Statistics Canada, "Census in Brief: Commuters Using Sustainable Transportation in Census Metropolitan Areas," Government of Canada, November 29, 2017, https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016029/98-200-x2016029-eng.cfm.
[202] Statistical Office of the European Communities, *Eurostat Regional Yearbook: 2017 Edition.*, 2017, http://data.europa.eu/doi/10.2785/257716.

averaging 49% across 72 of the largest European cities. In Amsterdam and Copenhagen, bicycles were the primary means of transportation for more than 50% of respondents, while in Paris 50% reported walking as their principal means of transportation.

The European results are not directly comparable to Statistics Canada data, since modal shares in the former study cannot be aggregated to estimate total, non-car commute shares.[203] Nor did the European study consider carpooling as a separate means of transport, suggesting that the extent of sustainable transportation use could be even higher than suggested by the figures for average public transit use. Accordingly, we arrived at 60% of commuters regularly using modes of transportation other than single-occupancy vehicles as an aggressive but attainable goal, and the benchmark value that merited a full three points on this metric. This is also broadly consistent with the Generation Energy Council's goal of cutting single-passenger trips in medium and large cities in half by 2040.[204] For every 5% decrease in the sustainable commute-to-work share, we subtracted 0.25 points.

Data from the 2016 Census suggest Canadian cities have some way to go to reach the benchmark value noted above. All provinces fall considerably below shares for public transit use, bicycling, and walking established by European cities.

The data also show that provinces with different urban contexts use different forms of sustainable transportation. For example, while British Columbia leads the provinces in overall sustainable transport use, the only specific mode for which it places first is cycling. Atlantic provinces make much greater use of carpooling than the rest of Canada, while Québec places first for its use of public transport. Halifax places first for commuters who walk to work. These results suggest that differences in urban design, geographic area, and climate are not necessarily barriers to provinces finding strategies to minimize single-occupancy commuting while accommodating unique circumstances.

[203] Respondents were allowed to select more than one transport mode, so total commute shares can exceed 100%.
[204] The Generation Energy Council, "Canada's Energy Transition: Getting to Our Energy Future, Together."

Table 58. Commute to Work Shares By Sustainable Transportation Modes, from Statistics Canada, 'Census in Brief' (November 2017)

Province	CMAs	Total Commuters	Carpooling	Public Transit	Cycling	Walking	Total Sustainable Transport	Score (3 pts)
British Columbia	4	1,498,105	11%	17%	3%	7%	38%	1.75
Nova Scotia	1	194,805	16%	12%	1%	8%	37%	1.75
Ontario	16	5,050,320	12%	17%	1%	5%	36%	1.75
Manitoba	1	377,845	15%	14%	2%	5%	35%	1.75
Québec	6	2,665,435	9%	19%	2%	5%	35%	1.75
Alberta	3	1,392,780	11%	12%	1%	4%	29%	1.25
New Brunswick	2	124,250	17%	4%	0%	5%	27%	1.25
Newfoundland and Labrador	1	97,920	18%	3%	0%	5%	26%	1.25
Saskatchewan	2	265,385	14%	5%	2%	4%	24%	1
Prince Edward Island	0	-	-	-	-	-	-	-

Industry

Industry accounts for 39% of total energy end use in Canada, more than any other end-use sector. At the same time, it is the only end-use sector to have experienced less overall growth in energy consumption than the end-use sector as a whole since 1990.[205] While this sector (excluding oil and gas) has less energy-saving potential than buildings and transportation, there is still considerable opportunity to reduce energy intensity. According to the International Energy Agency, industrial energy intensity could decrease by 38% by 2050, with appropriate policies to realize efficiency potential.[206]

Included within the industrial sector are several sub-sectors, including:

- Energy-intensive heavy manufacturing industries like iron and steel, cement, aluminum, chemicals and petroleum refining, and pulp and paper;
- Less energy-intensive light manufacturing like textiles, automobiles, and electronics; and
- Non-manufacturing industries like mining,[207] forestry, construction.

Potential efficiency savings vary across these subsectors. The greatest potential is in less energy-intensive manufacturing industries as well as pulp and paper (together accounting for around two-thirds of cumulative savings by 2050), while the least is in cement, accounting for 2% of total savings.[208] These industries tend to be concentrated in different provinces, as well. For instance, nearly 80% of mining energy consumption is in Alberta, 82% of iron and steel energy consumption is in Ontario, and 80% of smelting and refining (i.e. aluminum production) energy consumption takes place in Québec.[209]

[205] Natural Resources Canada, “Canada’s Secondary Energy Use (Final Demand) by Sector, End Use and Subsector.”
[206] International Energy Agency and Natural Resources Canada, “Energy Efficiency Potential in Canada to 2050.”
[207] Includes oil and gas production
[208] International Energy Agency and Natural Resources Canada, “Energy Efficiency Potential in Canada to 2050.”
[209] Natural Resources Canada, “Comprehensive Energy Use Database,” Government of Canada, 2016, http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive_tables/list.cfm.

The consequence is that potential efficiency savings in the industrial sector vary significantly from province to province, as do the possible technologies and processes that can be adopted to achieve them. Accordingly, we have selected a set of industrial energy efficiency indicators that are most broadly applicable across industry subsectors and provinces. These fall under the general subheadings of energy management and cogeneration. The summary scoring for both categories is shown in Table 59.

Table 59. Industry Scoring Results

Province	Energy Management (7 pts)	Cogeneration/Combined Heat and Power (1 pt)	Total (8 pts)
British Columbia	5.75	0.25	6
Québec	5.25	0.5	5.75
Alberta	4.5	1	5.5
Nova Scotia	4.5	1	5.5
Manitoba	4	1	5
Ontario	4	1	5
Saskatchewan	4.75	0.25	5
New Brunswick	3	0.5	3.5
Newfoundland and Labrador	1	0	1
Prince Edward Island	0.5	0	0.5

Energy Management

Facility and/or organization energy management is an important energy efficiency initiative that all industrial sectors can take. Broadly speaking, energy management involves a number of separate but often closely-related components, including energy monitoring and/or benchmarking, assessment of energy consumption and potential efficiency improvements, expert management and/or oversight of energy use, development and implementation of energy efficiency plans, and capacity-building initiatives for managers and employees in the workplace. The combination of these components under a comprehensive energy management plan or strategy for the organization, with energy savings performance tracked and reported on, is referred to as an energy management system (EnMS).

Though many of these components are equally applicable to institutional or commercial building energy efficiency, we review them in this chapter because the Generation Energy Council flagged energy management as a critical step toward increasing efficiency in the industrial sector. The Council sets a target of having 75% of industrial energy use benefiting from energy management systems by 2030.[210]

Tracking and Monitoring

Often the first step toward comprehensive energy management is to put in place a means for tracking energy consumption and monitoring energy use patterns. Provinces that provided support for energy tracking, monitoring, and/or benchmarking receive a half-point in the scorecard.

An energy management information system (EMIS) is a more comprehensive, combined software/hardware solution for measuring and managing energy use in a facility, typically including data analysis tools, reporting tools, monitoring software, and optimization and decision support software.[211] Having an EMIS in place helps organizations plan, make decisions, and take effective actions to manage energy use and costs, and is therefore an integral support for facility energy management. However, an EMIS can be costly to install and technically complicated to operate, and expert auditing may be necessary to ensure the system is implemented and working properly.

Provinces with support programs but no financial incentives for EMIS adoption received a half point in the scorecard. Support programs that included financial incentives received an additional half point.

Assessment

The next step in improving energy efficiency in an industrial facility is to conduct some form of energy consumption assessment. An energy audit is a comprehensive assessment which helps determine where, when, why, and how energy is being used, gives information to improve efficiency and reduce costs, and is therefore important to verify savings achieved through the efficiency improvements that follow.[212] Provinces with support programs for energy audits received a half point in the scorecard.

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[210] The Generation Energy Council, “Canada’s Energy Transition: Getting to Our Energy Future, Together,” 26.

[211] Office of Energy Efficiency, “Energy Management Information Systems,” Natural Resources Canada, December 12, 2017, https://www.nrcan.gc.ca/energy/efficiency/energy-efficiency-industry/energy-management-industry/energy-management-information-systems/20403; James H. Hooke, David Hart, and Byron J. Landry, *Energy Management Information Systems: Achieving Improved Energy Efficiency: A Handbook for Managers, Engineers and Operational Staff* (Ottawa: Office of Energy Efficiency of Natural Resources Canada, 2004).

[212] Natural Resources Canada, “Conducting an Energy Audit,” Government of Canada, December 12, 2017, https://www.nrcan.gc.ca/energy/efficiency/energy-efficiency-industry/energy-management-industry/conducting-energy-audit/20401.

While an energy audit is typically conducted for an entire facility, an energy efficiency feasibility study is another form of assessment that is carried out for a single system within the facility. A feasibility study ascertains the costs and benefits of making efficiency improvements to that system, and helps inform investment decisions for the business.[213] Provinces with support programs for energy efficiency feasibility studies received a half point.

Management

An unfortunate barrier to energy efficiency in business and industry is that many organizations lack the expertise or resources to manage and oversee energy consumption and related energy efficiency initiatives. Having a dedicated, professional energy manager embedded in the organization is therefore an integral part of overall organizational energy management. Provinces with programs to support an embedded energy manager in industrial organizations received one point in the scorecard.

An alternative—though perhaps less comprehensive—strategy is to provide access to expert energy management consultants. Provinces with industrial efficiency programs that provide or support such access, but do not support an embedded energy manager, received a half point.

Capacity-Building

Having an embedded energy manager is one form of capacity-building that can help industrial organizations achieve their energy efficiency goals. Yet energy management can be further supported by putting in place training, education, or awareness-building programs for other managers and employees in the work force, to ensure they have the knowledge and resources to support management plans. Provinces with industrial efficiency programs that supported such training and education initiatives within an organization, whether or not they were tied to a larger energy management incentive program, received 0.5 point.

Industrial efficiency programming can also work to support formal training and accreditation for energy and building managers, auditors, and energy measurement and verification professionals. Certifications and courses particularly relevant in the institutional, commercial, and industrial end use sectors include the Certified Energy Manager (CEM) program, the Certified Measurement and Verification Professional (CMVP) program, and the Certified Energy Auditor (CEA) program.[214] Provinces with industrial efficiency programs to support formal training and accreditation received a half point.

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[213] BC Hydro, “Energy Efficiency Feasibility Study,” BC Hydro - Power Smart, 2019, https://www.bchydro.com/powersmart/business/programs/studies-audits/eefs.html.
[214] See Canadian Institute for Energy Training (CIET), “List of Training Programs,” CIET: Sustainable Energy Training, 2019, https://cietcanada.com/energy-efficiency-training-programs/.

Energy Management System (EnMS)

An energy management system (EnMS) combines assessment, management, measurement and verification, and capacity-building into a comprehensive plan or strategy for energy management, with specific efficiency goals or targets that are tracked and reported on over a period of years. An EnMS is therefore a comprehensive and crucial step toward improving energy efficiency in the industrial sector overall. According to the Clean Energy Ministerial (CEM) Energy Management Working Group, energy management systems have the potential to save up to 30% of total energy use in industry.[215] Provinces with a dedicated support program to facilitate development and implementation of an EnMS received one point in the scorecard.

Certification

Certification is a further step that can be taken to verify energy savings performance and/or the existence of a management system that follows recognized international standards. There are three such certifications in use in Canada.

Natural Resources Canada administers an Energy Star for Industry certification that is available to industry partners and based on energy performance indicators. To receive the certification, a participant must be a member of the Canadian Industry Partnership for Energy Conservation (CIPEC), satisfy a facility type description, and receive a rating of 75 or higher on the measurement of an energy performance indicator specific to their industry. They must also satisfy some environmental criteria, including no violations over 12 months of federal and/or provincial environmental and air quality regulations. Unlike the two certification standards described below, the Energy Star certification measures only performance, not the existence of EnMS policies or procedures in the organization.[216] Provinces with programs that provided support or incentives for participants to receive Energy Star certification received a half point.

The ISO-50001 standard informs the process and requirements for implementing a rigorous and effective EnMS, helping organizations develop policy, fix targets to meet that policy, gather data and measure results, review effectiveness, and (importantly) continually improve energy management.[217] For provinces with EnMS support programs that are informed by ISO-50001, but do not require or lead to ISO-50001 certification, we awarded a half point. Programs with an ISO-50001 certification requirement received an additional point.

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[215] Office of Energy Efficiency, “ISO 50001 Energy Management Systems Standard,” Natural Resources Canada, December 12, 2017, https://www.nrcan.gc.ca/energy/efficiency/energy-efficiency-industry/energy-management-industry/iso-50001-energy-management-systems-standard/20405.
[216] Office of Energy Efficiency, “ENERGY STAR for Industry Certification,” Natural Resources Canada, August 1, 2017, https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/energy-star-industry/19858.
[217] Office of Energy Efficiency, “ISO 50001 Energy Management Systems Standard,” 50001; “ISO 50001 - Energy Management Systems” (International Organization for Standardization (ISO), 2018), 50001, https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100400.pdf.

The US Department of Energy has developed a standard that is even higher, based on ISO-50001, called Superior Energy Performance 50001 (or SEP 50001), which combines third-party performance verification with ISO-50001 certification.[218] Under SEP 50001, there are three optional levels—Silver, Gold, and Platinum—that recognize elevated savings performance above the requirements of the ISO standard.[219] As certification under this program involves verification of both performance (like Energy Star) and process (requiring ISO-50001 certification), provinces that support certification of industrial EnMS under this program received the full two points for this category.

Results

To assess the extent to which these aspects of energy management in industry are supported by policy in each province, we conducted an extensive review of industrial and commercial energy efficiency programs in Canada, supplemented by information from government and utility stakeholders to confirm or clarify our characterization of their programs and incentives.

[218] US Department of Energy, "ISO 50001," Better Buildings Initiative, 2019, 50001, https://betterbuildingssolutioncenter.energy.gov/iso-50001.
[219] US Department of Energy, "SEP 50001 Silver, Gold & Platinum," Better Buildings Initiative, 2019, https://betterbuildingssolutioncenter.energy.gov/iso-50001/sep-50001/silver-gold-platinum.

Table 60. Energy Management Scoring Results							
Province	Tracking and Monitoring (1 pt)	Assessment (1 pt)	Experts (1 pt)	Capacity-building (1 pt)	EnMS (1 pt)	Certification (2 pts)	Total (7 pts)
British Columbia	1	1	1	1	1	0.75	5.75
Québec	1	1	1	0.5	1	0.75	5.25
Saskatchewan	1	1	1	0	1	0.75	4.75
Alberta	0	1	1	1	1	0.5	4.5
Nova Scotia	1	0.5	1	1	1	0	4.5
Manitoba	1	1	0.5	0.5	0.5	0.5	4
Ontario	1	1	1	1	0	0	4
New Brunswick	1	1	0.5	0.5	0	0	3
Newfoundland & Labrador	0	1	0	0	0	0	1
Prince Edward Island*	0	0.5	0	0	0	0	0.5

* *PEI's industrial programs are planned*

Box 9: Industrial Energy Management in Saskatchewan

SaskPower's Industrial Energy Optimization Program consists of two tracks, one for capital investment and the other for energy management. The energy management track supports projects leading to the implementation of an Energy Management Information System, as well as a comprehensive Energy Management System involving the planning and implementation of ISO 50001 certification.

Each track consists of three phases—identification, development, and implementation—with technical assistance provided along the way. At each phase, program participants are encouraged to continue to the next phase, with incentive payments divided equally between delivery of the required report or study and evidence of proceeding to the next phase. At the final phase of the energy management track, the second portion is disbursed following the delivery of mutually-agreed progress reports following implementation.

Encapsulating the numerous elements of energy management into a simplified, three-stage program may help to reduce the complication often associated with numerous piecemeal programs and encourage participants to complete all stages.

While most provinces offer programs to support one or more of the components of a comprehensive energy management system, only Alberta, British Columbia, Nova Scotia, Québec, and Saskatchewan have programs in which the expected outcome is the development of a full-fledged EnMS. Though most of these programs are designed in compliance with ISO-50001 and may specify it as a goal, none actually require certification as a condition for receiving the associated incentives. This is true even of the BC-NRCan ISO 50001 Implementation Initiative, a collaborative program between Natural Resources Canada and British Columbia to drive implementation of the standard. No program appears to target or support Energy Star for Industry or the SEP-50001 certification.

While no provincial program requires certification, several do provide additional support to program participants that wish to pursue certification. Most notable is the BC-NRCan initiative, which is explicitly oriented toward certification and includes consulting support from BC Hydro for clients wishing to pursue ISO certification. SaskPower's Industrial Energy Optimization Program's energy management track also explicitly supports ISO-50001 certification as an eligible project type. In Québec, the TEQ Master Plan sets out to make the ISO-50001 standard mandatory for all large enterprises that participate in incentive programs between 2023 and 2028, and to provide additional financial

incentives to program participants that have ISO-50001 certification. For these efforts, we awarded partial points on the certification indicator.

In some cases, it can be difficult to differentiate programs to support energy managers and programs to support the development of energy management systems. For instance, Manitoba Hydro's Energy Manager Initiative, a component of the utility's Performance Optimization Program, provides assistance to participants to conduct an energy management assessment that could be based on ISO-50001 requirements, though this appears to be largely an embedded manager program and does not lead to the development of a comprehensive EnMS. However, Manitoba Hydro has supported ISO-50001 certification at 3M-Morden, and the province received partial points on this metric as a result. In Ontario, the Save on Energy, Energy Manager program supports embedded energy managers and encourages program participants to adopt an EnMS, or at least some of the components thereof, but stops short of supporting an EnMS specifically (the Independent Electricity System Operator confirmed there are no EnMS programs currently in place in Ontario, though the province informally promotes the use of international standards for energy management). Recent cancellation of Ontario's monitoring and targeting program removed support for other aspects of an EnMS (such as an EMIS), though industry can still receive support to implement a building automation system (which can include an EMIS) under the Save On Energy retrofit program.

The needs of industrial program participants differ widely across provinces and industrial sectors, and diverse programs to support the different components of an energy management system add needed flexibility. However, there is also added value in designing programs to encourage participants to go further than they might otherwise. Notable examples of this approach are Energy Efficiency Alberta's strategic energy management programs, which grant participants full access to incentives from other programs, and SaskPower's Industrial Energy Optimization Program, detailed above.

Cogeneration/Combined Heat and Power

In any transformation of energy, some energy is lost in the form of heat. Capturing and using that heat in a cogeneration, or combined heat and power (CHP) system increases the efficiency of the overall system. The use of biomass or other renewable fuels in place of fossil fuels in such systems can further provide net reductions in greenhouse gases, energy cost savings, and local economic development.

While CHP may be useful at the grid level or in communities, it can be particularly significant in many industrial settings, such as pulp and paper, or in private, off-grid generation plants attached to large industrial facilities. CHP can be supported by demand-side management programs that provide industrial energy efficiency incentives, or through policies that facilitate operators' participation in ancillary services markets, streamlined interconnection standards, and inclusion as an eligible measure in a non-

wire or non-pipe solution program to address grid needs.[220] Provinces with policies or programs that support co-generation/CHP along these lines received 0.5 point in the scorecard.

It is important that CHP systems be designed appropriately for the size of each load (heat and power). Improperly sizing a CHP system can mean the return on investment takes longer than it might otherwise. Therefore, expert review and/or consultation, potentially through an energy audit or feasibility study, is important to ensure CHP systems are designed properly to meet estimated loads. Provinces can further support CHP deployment with programs to facilitate the use of renewable fuels in CHP systems. Provinces with such additional supportive policies or programs for CHP received an additional 0.5 point.

Our scoring in this policy area focused on whether provinces had created a framework for CHP to participate in energy systems. Different provincial contexts might call for more or less CHP, so we selected a metric based on policy rather than outcome. Information from the Canadian Energy and Emissions Data Centre cogeneration database showed that every province and territory had at least one cogeneration unit.[221] Provinces with relatively low-carbon electricity grids (Québec, British Columbia, Newfoundland and Labrador) still used CHP for industries such as pulp and paper.

Alberta, Manitoba, Nova Scotia, and Ontario provided the most comprehensive support for CHP deployment in industrial settings. Alberta's Custom Energy Solutions Program includes CHP as an eligible upgrade and funds up to 100% of the cost of scoping to ensure CHP systems are properly sized. Though there is no discrimination between fuels for CHP projects, incentives are based in part on a project's ability to reduce emissions. Manitoba Hydro's Bioenergy Optimization Program is geared specifically to CHP projects using biomass, with financial incentives to cover a portion of the cost of feasibility studies (up to $15,000) and capital investment (up to 50%, to a maximum of $1 million for electrical load reductions and $250,000 for natural gas).

[220] Natural Resources Canada, "Combined Heat & Power," Natural Resources Canada, 2019, https://www.nrcan.gc.ca/energy/energy-sources-distribution/renewables/bioenergy-systems/combined-heat-power/7409.
[221] Canadian Energy and Emissions Data Centre (CEEDC), "Cogeneration Database," Simon Fraser University, 2016, https://public.tableau.com/views/CEEDC_IEF_cogeneration/Dashboard?:showVizHome=no&:embed=true.

Table 61. Cogeneration Units by Province	
Province	Cogeneration Units
Alberta	48
British Columbia	30
Manitoba	3
New Brunswick	6
Newfoundland and Labrador	1
Nova Scotia	5
Ontario	124
Prince Edward Island	1
Québec	18
Saskatchewan	6

Table 62. CHP Programs and Supportive Policies Scoring Results			
Province	CHP Programs (0.5 pt)	Supportive Policies (0.5 pt)	Total (1 pt)
Alberta	●	●	1
Manitoba	●	●	1
Nova Scotia	●	●	1
Ontario	●	●	1
Québec	◑	◑	0.5
New Brunswick	◑	◑	0.5
British Columbia	◑	-	0.25
Saskatchewan	-	◑	0.25
Newfoundland & Labrador	-	-	0
Prince Edward Island	-	-	0

Efficiency Nova Scotia's Custom Program provides business program participants with technical and financial support for behind-the-meter CHP. Incentives are calculated on electricity load savings, project cost, and the participant's financial requirements, but not on non-electrical energy saved or reductions in peak electricity demand. Program incentives may be used for implementation, feasibility analysis, or technical assistance. Only CHP programs that reduce GHG emissions through fuel switching receive support.

In Ontario, the IESO's Save On Energy Process and System Upgrades Program supports CHP projects fueled by waste energy from the site. As of July 1, 2018, it no longer accepts applications for fossil fuel-based CHP projects. Applications are reviewed by a technical reviewer, and must be accompanied by a feasibility study before being approved. Union Gas (now merged into Enbridge) also supported CHP projects through its demand-side management programs.

None of the other provinces have dedicated support for CHP in industrial settings, though Québec, New Brunswick, British Columbia, and Saskatchewan have taken some steps toward supporting CHP more broadly. Québec directed Hydro-Québec to purchase electricity generated by biomass cogeneration in the pulp and paper industry, resulting in 21 contracts with peak capacity of 338 megawatts.[222] New Brunswick's Large Industrial Renewable Energy Purchase Program directs NB Power to purchase electricity from industrial biomass generation. Though British Columbia has no formal CHP policy, BC Hydro has a transmission service rate that could provide an incentive to install generation, though the current electricity supply surplus in British Columbia means BC Hydro would not be interested in purchasing it. SaskEnergy has funded CHP demonstration projects in commercial buildings and collaborated with building code officials and gas inspectors to identify installations. Both SaskEnergy and SaskPower have identified a lack of streamlined interconnection standards as a barrier to be addressed collaboratively. These provinces all received partial points on this metric.

Newfoundland and Labrador and Prince Edward Island had no formal or informal CHP policies in industrial settings.

[222] "Hydro-Québec Sustainability Report 2018," *Q U É B E C*, n.d., 96.

Conclusions

Provincial Strengths and Areas for Improvement

Efficiency Canada produced this scorecard primarily as a tool for policy development. The results highlight best practices that different provinces can learn from, areas of provincial strength that should be celebrated, and areas where provinces could direct more policy attention to drive further energy savings. The analysis of several different policy areas enables us to highlight areas of strength and potential priority areas for improvement for each province, which we present below. The areas for improvement are informed by the results of the scorecard and our understanding of provincial policy contexts.

Alberta

Strengths

- **Electricity Program Savings:** Alberta did not have any efficiency programs in the market in 2016, but achieved electricity savings equal to 0.8% of domestic sales the next year. These are impressive results in the first years of Energy Efficiency Alberta's existence.

- **Financing:** Alberta has developed comprehensive finance offerings through policy and programs, which hold promise of creating a robust market for energy efficiency upgrades. Alberta is one of three provinces that have enabled energy efficiency upgrades through local improvement charges, or Property Assessed Clean Energy (PACE). Energy Efficiency Alberta is working with the City of Edmonton to pilot this program and developing guidance for municipalities on the use of this tool. Energy Efficiency Alberta also offers the Green Loan Guarantee Program, which acts as a credit enhancement to attract financial institutions and utilities to the energy efficiency finance market.

Areas for Improvement

- **Energy Savings Targets and Policy Stability:** Alberta has not defined future energy efficiency targets, which is indicative of the general uncertainty regarding the future of energy efficiency in Alberta at the time of writing. This report makes note of the uncertainty that cancelling the province's carbon pricing framework creates for the future of Alberta's current multi-fuel program approach. Alberta is the only province that has not integrated energy efficiency into electricity and natural gas system planning. A new policy framework based on choosing energy efficiency as a priority energy resource would enable target-setting and consistent support for successful efficiency programs.

British Columbia

Strengths

- **BC Energy Step Code**: The BC Energy Step Code, a powerful market transformation tool, is the province's standout energy efficiency achievement. Local governments may use the regulation to incentivize or require builders to deliver above-code energy performance. The standard has also contributed to the province's leadership in other building areas, particularly in activities that promote building code compliance.

- **Appliance and Equipment Market Transformation**: British Columbia has a history of leadership in appliance and equipment standard-setting and has taken an early lead on the national agenda to promote market transformation in space heating, water heating, and windows. Through its CleanBC climate plan, the province is conducting field studies of various energy efficiency technologies and supports installer training and education. These initiatives will need to continue to ramp up if the province is to implement its CleanBC agenda, which includes a big push on heat pumps.

- **Natural Gas Program Savings Targets**: FortisBC is increasing its natural gas savings from historic levels equal to 0.2% of annual sales to 0.5%. This is the second-highest target in the country, behind only Québec's major natural gas distributor (Énergir), which achieves relatively high savings in its commercial- and industrial-dominated market. New programs from CleanBC, as well as leadership in building codes and standards, will lead to further natural gas savings. In addition, Pacific Northern Gas is developing a new demand-side management plan.

- **Program Innovation and Coordination**: The provincial government coordinates its work on building codes and appliance and equipment standards with utility efficiency programs. A minimum of 1% of utility energy efficiency budgets is dedicated to codes and standards support, and codes and standards are incorporated in utility targets. This enables utilities to undertake market transformation activities that might not otherwise be supported by utility objectives focused more narrowly on energy savings.

Areas for Improvement

- **Electricity Program Savings and Targets**: British Columbia has scaled back its electricity program savings and budgets in recent years. Annual targets are approximately 0.5% of sales (programs only), about half of leading Canadian provinces and well below leading American states with annual savings greater than 2.5% of sales. BC Hydro has followed a moderation approach to electricity

demand-side management while the utility has an electricity surplus.[223] The province has the ability to ramp up electricity savings, which will have significant value in the future in the context of the government's CleanBC Plan, which anticipates electrification of transportation, industry, and buildings, and the need for new, clean electricity.[224] Energy efficiency should be fully considered as an alternative to electricity generation, and as a way to promote more strategic use of the province's existing clean energy resources.

- **Building and Home Energy Ratings and Disclosure:** For BC to maintain and expand its leadership in building energy efficiency, it should consider moving toward mandatory energy ratings and disclosure for homes and buildings. Like the BC Energy Step Code, municipalities and utilities have paved the way for a provincial program. The BC Energy Step Code has already created much of the supporting infrastructure, such as tools for energy modeling and trained energy advisors. There are also opportunities for British Columbia to learn from Ontario's mandatory building benchmarking program.

Manitoba

Strengths

- **Energy Efficiency Programs:** Manitoba has supported energy efficiency programs for electricity and natural gas for many years, and is the Canadian leader in per capita program spending. Manitoba's approach enables a comprehensive suite of programs, covering all sectors and all fuel types, including non-regulated fuels such as propane. In addition, Manitoba has created a specific fund to support programs for low- to modest-income customers, which contributes to the second-highest investment in programming per household in energy poverty.

- **Long-Term Targets:** The Efficiency Manitoba Act creates clear, annual targets for electricity and natural gas savings, with flexibility to contribute to 15-year cumulative savings targets. The introduction of legislated targets has been supported by provincial governments led by different political parties.[225] Targets such as these can help create the policy stability required for programs to perform, and thus it is important for Manitoba to enable the efficiency program administrator to achieve, and surpass, these provincially-mandated targets.

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[223] BC Hydro, "BC Hydro F2020–F2021 Revenue Requirements, Exhibit B-1" (Vancouver, BC: BC Utilities Commission, 2019).
[224] Government of British Columbia, "CleanBC: Our Nature, Our Power, Our Future."
[225] A Progressive Conservative government passed the *Efficiency Manitoba Act*, and the previous NDP government supported a plan to create legislated targets for a new energy efficiency administrator in its December 2015 Climate Change and Green Economy Action Plan.

Areas for Improvement

- **Transportation Electrification:** Manitoba has the lowest proportion of electric vehicle charging stations per road kilometre of all the provinces, and has only one electric vehicle or plug-in hybrid electric vehicle (EV/PHEV) for every thousand light-duty vehicle registrations, compared with seven to eight in the other hydro-rich provinces of Québec and British Columbia.[226] Manitoba could learn from the leading policies in Québec, BC, and Ontario, and from initiatives in cold-climate provinces like Alberta to promote transportation electrification.

- **Training and Professionalization:** Manitoba lags other provinces in the two types of professional certifications tracked in this year's scorecard (new and existing home energy advisors, and Certified Energy Managers). Increasing the number of certifications will enable Manitoba to make progress in areas such as home energy labeling, and the adoption of new performance-based building codes.

New Brunswick

Strengths

- **Fast Charging Electric Vehicle Infrastructure:** At 30%, New Brunswick has the highest proportion of stations with fast charging capacity within its electric vehicle charging network. The province has run innovative charging programs by partnering with the utility to install stations in provincial parks.

- **Energy System Planning:** At time of writing, New Brunswick was conducting a new efficiency potential study and Integrated Resource Plan to inform long-term targets. The province has developed a demand-side management approach that takes an all fuels perspective. These activities are part of NB Power's comprehensive Energy Smart NB initiative, which includes activities to support a range of smart grid technologies and services.

[226] There might be concern that Manitoba's cold winters could negatively affect vehicle performance. Manitoba Hydro provides useful tips and information on vehicle performance at https://www.hydro.mb.ca/your_home/electric_vehicles/

Areas for Improvement

- **Building Codes:** New Brunswick has yet to adopt a model national building code. The neighbouring provinces of Québec and PEI are updating their codes, while Nova Scotia has adopted the 2015 National Energy Code for Buildings and is now proposing adopting the 2017 version.[227]

- **Regulatory Governance:** New Brunswick plans to release a new Integrated Resource Plan for electricity in 2020. The province can become an energy efficiency leader by using the results of this analysis to clearly direct regulators to invest in *all* energy efficiency that is less costly than new supply, and/or by adopting an energy efficiency resource standard.[228] Furthermore, energy efficiency program costs could be accounted for in a manner consistent with supply-side options[229], and public discussion in the province should emphasize how efficiency impacts customer bills, and not only electricity rates.

- **Stable Non-Electric Efficiency Funding:** The province's all fuels perspective in program design has significant potential. This policy framework can be reinforced by identifying the maximum potential for energy savings in non-electric fuels and providing long-term, sustainable funding.

Newfoundland and Labrador

Strengths

- **Electricity Programs:** The province's TakeCharge electricity conservation programs have demonstrated their ability to achieve energy savings. This performance is important to acknowledge, given the challenge of serving the province's decentralized population centres. These program delivery capabilities should be maintained and increased to help the province grapple with high energy costs and create jobs. A recent analysis for the Muskrat Falls rate mitigation hearings found that electricity energy efficiency is highly cost-effective on Newfoundland Island, and that expanded efficiency programs will reduce average bills. Efficiency programs will also reduce winter peak demand, which

[227] Communications Nova Scotia, "Nova Scotia Building Code Regulations: Public Consultation," Nova Scotia Building Code Regulations: Public Consultation, August 19, 2019, https://novascotia.ca/building-code-regulations-consultation/.
[228] Molina and Kushler, "Policies Matter."
[229] In July 2019, The New Brunswick Energy and Utilities Board rejected a proposal to capitalize demand-side management costs to enable a better alignment over time of ratepayer costs and benefits and to manage demand side resource costs in the same way as supply resources. Yet, a dissenting opinion was written by member John Patrick Herron. See John Patrick Herron, "Dissenting Opinion of Member Herron," in *IN THE MATTER OF an Application by New Brunswick Power Corporation Pursuant to Subsection 103(1) of the Electricity Act, S.N.B. 2013, c. 7, for Approval of the Schedules of Rates for the Fiscal Year Commencing April 1, 2019* (Fredericton, N.B.: New Brunswick Energy and Utilities Board, 2019), http://www.nbeub.ca/uploads/2019%2007%2016%20-%20Decision.pdf.

will rise with increased electrification (see below). This avoids locking Newfoundland and Labrador ratepayers into paying for new capacity and frees up exports during those times when other jurisdictions will pay the highest price.[230]

- **Conservation Voltage Reduction:** Newfoundland Power uses conservation voltage reduction to manage peak load in winter. This grid management strategy can help reduce power consumption at critical times.

Areas for Improvement

- **Energy Poverty Programs:** The Newfoundland and Labrador Housing Corporation's Home Energy Savings Program spends about $2 million per year on low-income housing upgrades. Yet the province has the second-highest rate of energy poverty in the country. This means Newfoundland and Labrador spends about $24 for every household in energy poverty, compared to $86 in Nova Scotia and $117 in PEI. As the province grapples with the cost of energy, a focus on reducing energy burdens (high bills relative to income) will be more strategic than simply considering energy prices or rates. An energy poverty reduction strategy might further involve the province's electricity utilities, as reducing energy burdens provides cost savings to utilities in credit and collections charges, and other benefits such as better customer relations.

- **Building Electrification:** Replacing oil-fired heating with efficient heat pumps in the institutional, residential, and commercial sectors provides a way to use the province's hydroelectric surplus in a manner that also reduces overall household and business energy costs, reduces GHG emissions, and provides revenues to pay for the fixed costs of the Muskrat Falls hydroelectric project.[231] Newfoundland and Labrador could demand that the federal government fully support the market transformation roadmap for space and water heating technologies discussed in this report, to make the province a leader in the diffusion of cold climate heat pumps and building electrification.

- **Transportation Electrification:** As Newfoundland and Labrador forecasts a surplus of hydroelectricity with the construction of the Muskrat Falls development, it can promote the electrification of transport as a way to reduce emissions, and use hydro resources to reduce fuel costs. Information in this report shows that the province has two electric vehicle charging stations for every thousand kilometres of road, while the hydro-rich provinces of Québec and British Columbia have 20 and 13, respectively. Newfoundland and Labrador also has considerably fewer electric vehicle registrations per thousand light-duty vehicles

[230] Synapse Energy Economics, "Phase 2 Report on Muskrat Falls Project Rate Mitigation" (Prepared for Board of Commissioners of Public Utilities, Province of Newfoundland and Labrador, September 25, 2019).
[231] Synapse Energy Economics.

than Québec. Newfoundland and Labrador has the opportunity to join these other hydro-rich provinces in transportation electrification leadership.

Vehicle electrification can be part of a broader sustainable transportation strategy. For example, given that St. John's is the national leader in carpooling as a way to commute to work, electrically-driven carpools could become a new mode of sustainable transport.

Nova Scotia

Strengths

- **Program Savings:** Nova Scotia is among the top Canadian provinces in program savings, spending, and targets, with a policy framework that enables savings in electricity as well as the non-regulated fuels that dominate the province's heating market. These program achievements are led by Efficiency Nova Scotia, Canada's first energy efficiency utility.

- **Training and Professionalization:** Nova Scotia leads other provinces in the number of new and existing home energy advisors and certified energy manager certifications, relative to the number of buildings and businesses. These results were achieved through program designs that created market demand for training and a strategy that sought to overcome some of the obstacles a small province can face attracting national training organizations. The province's policy framework has helped build a local sector for energy efficiency training and education that also serves the broader Atlantic region. This trained work force can be a key enabler of more energy savings and new energy efficiency policies.

Areas for Improvement

- **Net-Zero Energy-Ready Buildings and Step Codes:** Nova Scotia can reinforce and augment the program savings it has achieved by moving toward codes that require high-performance buildings. In August, the province announced consultations on upgrading the building code.[232] This is an opportunity to develop a net-zero energy-ready goal and learn from the BC experience with the Energy Step Code.

- **Building and Home Energy Rating and Disclosure:** Nova Scotia has encouraged home sellers to upload energy labels to a real estate website and plans to launch a voluntary building benchmarking program. The province's relatively large number of energy advisors and energy managers means it is likely the best prepared to encourage building labeling and benchmarking. With government leadership complementing the work of Efficiency Nova Scotia and

[232] Communications Nova Scotia, "Nova Scotia Building Code Regulations."

other efficiency organizations, the province could move to mandatory energy rating and disclosure policies.

Ontario

Strengths

- **Building Energy Reporting and Benchmarking:** Ontario has led other jurisdictions in the creation of a regulated building reporting and disclosure program. The first reporting date was July 1, 2018, with more types of buildings gradually included. Ontario also leads in the amount of floor area reporting to Energy Star Portfolio Manager relative to all commercial-institutional buildings.

- **Grid Modernization:** Ontario has comprehensively installed advanced meters in its electricity system and is undertaking pilot studies to geographically target energy efficiency as an alternative to transmission and distribution upgrades. The province has engaged multi-stakeholder processes through its Transformation Network of Ontario (formerly the Smart Grid Forum), and continues to be a leading jurisdiction in considering the role of efficiency and other technologies in a distributed energy future.

- **Program Savings and Innovation:** Ontario achieved the highest level of electricity savings in the country in 2017, with annual savings equal to 1.4% of sales. Provincial program administrators have also placed emphasis on ongoing program and market innovation. The LDC Innovation Fund (cancelled in March 2019) and the Grid Innovation Fund (which continues) have supported more than 200 projects related to conservation, demand management, and energy storage since 2005. The natural gas utilities maintain a Collaboration and Innovation Fund and Pilot and Test Fund. The Ontario Energy Board launched an Innovation Sandbox to encourage utilities and other market participants to get regulatory advice and flexibility to test new ideas, products, and business models.

- **Appliance and Equipment Standards**: Ontario has consistently updated its appliance and equipment efficiency standards to be among the highest in North America. The province regulates more than 80 products, more than any other province or the federal government.

Areas for Improvement

- **Policy Certainty and Transparency:** The Ontario government disrupted its existing 2015-2020 Conservation First Framework for electricity by cutting its budgets in half in 2019. This scorecard notes several other policy areas where policies or projects were abruptly cancelled, such as EV charging policies and incentives, and removal of a provision to support EV charging in building codes. Furthermore, no information is available on the level of spending or savings performance of programs funded by Ontario's cap and trade revenues. For programs and policies to perform well, it is important to have a stable policy framework,[233] as well as transparency to encourage evaluation and democratic discussion.

- **Natural Gas Savings:** Ontario's Environment Plan calls for a significant increase in natural gas conservation, moving toward annual savings of approximately 1.1% of sales.[234] Ontario has a good track record in achieving natural gas program savings. In the development of a post-2020 natural gas demand-side management framework the province should target all cost-effective savings potential, recognize energy efficiency as a "non-pipe alternative" to avoid new natural gas infrastructure, and recognize the multiple GHG reduction and other non-energy benefits of saving energy.

- **Financing:** Ontario's Environment Plan includes the idea of creating an Ontario Carbon Trust (now referred to as the Emission Reduction Fund). that would use public funds to leverage private investment in clean technologies. This holds promise to act as a green bank that could use a number of strategies to mobilize private sector capital. Such an initiative would complement Ontario's existing financing strategies, which include financing through local improvement charges and utility on-bill financing.

Prince Edward Island

Strengths

- **Energy Poverty Reduction Programs:** Prince Edward Island has dedicated a significant percentage of its program budget to non-electric fuels and programs to support low-income populations. Based on the most recent figures, PEI has the highest spending per household in household energy poverty. This is an important focus, given census data that suggests the island has a high rate of energy poverty.

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[233] For a discussion of policy principles that contribute to effective energy efficiency programs, see Richard Sedano, "Who Should Deliver Ratepayer-Funded Energy Efficiency? A 2011 Update" (Regulatory Assistance Project, 2011).
[234] Ontario Ministry of Environment Conservation and Parks, "Preserving and Protecting Our Environment for Future Generations: A Made-in-Ontario Environment Plan." See targets section of this report for discussion of 1.1% figure.

- **Energy Savings Targets:** The 2016/17 energy strategy calls for the province to ramp up annual incremental savings for both electric and non-electric fuels to 2% of annual sales. These are savings levels achieved by leading energy-saving jurisdictions in North America and could make the province a Canadian energy savings leader. A 2018-2021 demand-side management plan contains a significant ramp-up in energy savings targets, which could see electricity savings reaching 2% by 2025.

Areas for Improvement

- **Building Codes and Energy Advisor Certifications:** Prince Edward Island's May 2017 Building Code Act enables province-wide building code regulations, but codes must await regulation to be enforced. As Prince Edward Island experiences more new construction, a strong building code with proper enforcement and compliance will prevent lost energy efficiency opportunities.[235] The province could support new building energy efficiency by increasing the number of certified new home energy advisors in the province. The province has one new home energy advisor for every 100 residential construction permits, compared to six in Nova Scotia and three in New Brunswick.

- **Evaluation of Program Results:** The Prince Edward Island energy saving results in 2018 were not evaluated by a third party. Ensuring robust evaluation, measurement, and verification increases confidence in energy savings results, and helps improve program performance. Evaluating and verifying program results may be a challenge for PEI due to the relatively small scale of program activity and low number of participants. However, the 2018-2021 plan calls for independent evaluation, reported to the Island Regulatory and Appeals Commission, with a strategy for leveraging information from neighbouring provinces.

Québec

Strengths

- **Transportation Electrification:** Québec leads all other provinces in the number of electric vehicle and plug-in hybrid electric vehicle registrations relative to total vehicles, and availability of public charging stations on provincial roads. Québec is also the only province with an energy savings target for transportation fuels.

- **Research and Development:** Québec has research institutes such as Hydro-Québec's Energy Technologies Laboratory, the Centre of Excellence in Energy

[235] The Guardian, "Busiest Construction Season Ever Forecast for P.E.I. in 2019 | The Guardian," The Guardian, February 4, 2019, http://www.theguardian.pe.ca/news/local/busiest-construction-season-ever-forecast-for-pei-in-2019-281631/.

Efficiency, and the Natural Gas Technologies Centre that engage in energy efficiency research. In addition, Québec has the highest intensity of NSERC funding for energy efficiency research relative to total energy research.

- **Natural Gas Savings:** Québec leads the country in natural gas savings. This is partly due to a market context with few residential gas customers relative to commercial and industrial operations with larger savings potential, but is also supported by a policy context that emphasizes GHG reductions. Programs are supported by natural gas utilities, and by the government through Transition énergétique Québec (TEQ).

- **GHG Reduction Funding:** Québec has enabled fossil fuel savings through its use of carbon pricing revenues to support building efficiency and sustainable transportation. The funding from the provinces cap and trade system and the "quote part" contribution from energy distributors enables efficiency strategies across fuels led by Transition énergétique Québec (TEQ), in coordination with electricity and natural gas utilities. These diverse sources of funding give Québec the ability to integrate energy efficiency with GHG reduction strategies and create the conditions for flexible and innovative program designs.

Areas for Improvement

- **Building Codes:** The last update to Québec's building code for commercial-institutional and multi-unit residential buildings occurred in 1983. In the summer of 2019, Québec launched a consultation on updating the building code.[236] Updating this code can also be an opportunity to consider buildings efficiency strategies, such as adoption of a step code and promoting code compliance.

- **Building and Home Energy Rating and Disclosure:** The TEQ Master Plan calls a move to mandatory energy rating and disclosure for both homes and commercial-institutional buildings between 2023 and 2028. The province is off to a good start with its Building Energy Challenge for commercial and institutional buildings, and should aim to move from voluntary toward mandatory programs as soon as possible to catalyze a market for energy savings.

- **Electricity Savings**: A surplus of contracted electricity has meant that Québec has not placed significant emphasis on achieving electricity savings in recent years, though Hydro-Québec has a long history of efficiency program implementation. Québec has placed increased emphasis on electrification to use the province's large renewable energy resources to reduce emissions. A June 2019 analysis to inform the government's new agenda foresees the need for an

[236] "Projet de règlement modifiant le Code de construction," Régie du bâtiment du Québec, 2019, https://www.rbq.gouv.qc.ca/lois-reglements-et-codes/projets-de-reglement/en-consultation.html#c18859.

additional 125 to 185 TWh by 2050, above the 206 TWh produced in 2015.[237] If Québec is to meet its climate and economic goals associated with electrification, it can reduce electricity system costs and avoid controversies over energy generation projects by ramping up electric energy efficiency, especially in the industrial sector.

Saskatchewan

Strengths

- **New Building Codes:** Saskatchewan was the first province to adopt the 2017 National Energy Code for Buildings, which delivers substantial efficiency improvements over previous versions.

- **Industrial Programs:** SaskPower's industrial cohort program encapsulates multiple aspects of energy management into a simplified, three-stage program. The approach reduces complication and encourages participants to go further in the adoption of energy management systems than they might otherwise.

Areas for Improvement

- **Energy Efficiency Programs:** Saskatchewan lags other provinces in both savings and spending on energy efficiency programs, in natural gas and electricity. Saskatchewan's 2030 electricity savings target is equal to about 0.3% annual savings as a percentage of sales, while another coal-dependent province (Nova Scotia) plans to save 1.1% as a percentage of sales and American states are hitting 3% annual savings levels. Saskatchewan's electricity demand is growing, and the province is meeting part of the increase with renewable energy generation. It makes sense to also consider efficiency as a low-cost, clean energy resource. Saskatchewan can learn from provinces with fossil fuel-based electricity systems (Nova Scotia, New Brunswick), as well as neighbouring provinces with similar climates and industrial structures (Alberta, Manitoba).

[237] Dunsky Energy Consulting, "Trajectoires de Réduction d'émissions de GES Du Québec – Horizons 2030 et 2050" (Préparé pour le ministère de l'Environnement et de la Lutte contre les changements climatiques, June 2019), http://www.environnement.gouv.qc.ca/changementsclimatiques/plan-action-fonds-vert.asp.P. xv

Final Thoughts

The discussion of province-specific strengths and areas for improvement demonstrates numerous opportunities for provinces to learn from each other. All provinces are implementing policies to improve energy efficiency. However, every province also has opportunities to improve its energy efficiency policy mix. Our hope is that this scorecard will spur discussion and learning between the provinces, so Canada as a whole can build a more energy-efficient economy.

Data Limitations

Researching and writing this report gave us the opportunity to understand where we could access relevant data and where there were limitations. When comparing the Canadian scorecard to the American version, we came to realize that information supplied by the US Energy Information Administration is not available in Canada. Our understanding of energy efficiency policy in Canada would be enhanced by provincial breakdowns in areas such as commercial-institutional buildings, research and development expenditure, and utility revenues. In other cases, we do not have access to the data required to assess policy goals, such as the percentage of industrial energy users benefiting from energy management systems, or the number of single passenger trips taken using sustainable transportation modes. We also reiterate the limited information on energy efficiency spending and savings in some jurisdictions, such as Ontario's use of cap and trade funding.

We see significant value in the proposed Canadian Centre for Energy Information, and are significantly better placed to offer useful advice from the work on this report.

Future Scorecards

As noted above, our approach to future scorecards will evolve alongside emerging trends in energy efficiency policy, and our ability to track different policy areas. The scorecard will be an evolving indicator and tool for learning and sharing best practices, rather than a standardized index.

Based on current plans and understandings, we expect future scorecards could incorporate the adoption of existing housing or retrofit codes as Canada develops a model code for existing housing, and the tracking of non-regulated fuel savings as more provinces expand the provision and evaluation of energy savings programs.

We will monitor with interest the evolution of demand-side resources in electricity and natural gas systems. In this scorecard we tracked grid modernization, and we could consider the role of distributed renewables, storage, and flexible demand in future years.

The decision-making framework for future revisions or expansions of the scorecard will be similar to the one we followed for this first iteration—considering our capacity to analyze, as well as the comparability and availability of data, consensus on policy importance, and ability of provincial policymakers to take action.

We welcome advice on the development of future scorecards, and encourage the energy efficiency policy community to help us expand and continuously update and verify the information in our efficiency policy database.

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Appendix A: Respondents to Information Requests

Efficiency Canada circulated an information request to government and utility/program administrator representatives on April 15, 2019, in each province. Each representative was contacted beforehand to anticipate the request and to introduce the scorecard project. We received a response to all information requests sent in all cases, except for the government of Alberta.

We asked for numerical data as well as qualitative policy information. Below we identify the primary organizations that participated by responding to our information request. Efficiency Canada supplemented this information with desk research before and after the request and remains solely responsible for the content of this report.

Province	Government	Utility/Program Administrator
Alberta	*No response*	Energy Efficiency Alberta
British Columbia	BC Ministry of Energy, Mines and Petroleum Resources	FortisBC BC Hydro
Manitoba	Energy Division, Ministry of Growth, Enterprise and Trade	Manitoba Hydro in correspondence with Efficiency Manitoba
New Brunswick	Ministry of Energy and Resource Development	New Brunswick Power
Newfoundland and Labrador	Department of Municipal Affairs and Environment, Climate Change Branch	Newfoundland and Labrador Hydro Newfoundland Power
Nova Scotia	Energy Efficiency and Renewable Energy, Nova Scotia Department of Energy	Efficiency Nova Scotia
Ontario	Ministry of Energy, Northern Development and Mines Ministry of Environment, Conservation and Parks Ministry of Transportation Ontario Energy Board	Independent Electricity System Operator Enbridge Gas
Prince Edward Island	Efficiency PEI	
Québec	Transition énergétique Québec (TEQ)	Hydro-Québec Énergir
Saskatchewan	Climate Change Branch, Ministry of Environment	SaskPower SaskEnergy

Appendix B: Energy Efficiency Program Spending

Energy Efficiency Program Spending by Province and Fuel Source ($M)

Province	2016	2017	2018
British Columbia	**137.29**	**125.32**	
Electricity Spending	103.94	89.61	
Natural gas spending	32.71	35.07	35.92
Multi-fuel and non-regulated fuel spending	0.64	0.64	0.67
Alberta	**0.00**	**89.59**	**79.95**
Multi-fuel and non-regulated fuel spending	0.00	89.59	79.95
Saskatchewan	**13.55**	**10.70**	**9.54**
Electricity Spending	13.00	10.00	9.00
Natural gas spending	0.55	0.70	0.54
Manitoba	**61.27**	**77.56**	**72.78**
Electricity Spending	48.04	64.04	59.92
Natural gas spending	13.19	13.48	12.84
Multi-fuel and non-regulated fuel spending	0.03	0.04	0.02
Ontario	**466.51**	**602.15**	
Electricity Spending	356.12	435.86	
Natural gas spending	103.49	126.89	
Multi-fuel and non-regulated fuel spending[238]	6.90	39.40	50.40
Québec	**217.65**	**194.48**	**228.00**
Electricity Spending	66.90	58.30	58.70
Natural gas spending	19.05	18.08	18.40
Multi-fuel and non-regulated fuel spending[239]	131.70	118.10	150.90
New Brunswick	**16.20**	**13.60**	**17.69**
Electricity Spending	16.20	13.60	
Multi-fuel and non-regulated fuel spending			17.69
Prince Edward Island			**7.87**
Electricity Spending			1.94
Multi-fuel and non-regulated fuel spending			5.93
Nova Scotia	**43.41**	**42.71**	**50.00**
Electricity Spending	30.81	30.32	33.95
Multi-fuel and non-regulated fuel spending	12.60	12.39	16.06
Newfoundland and Labrador	**9.30**	**9.43**	**8.84**
Electricity Spending	9.30	9.43	8.84
Total	**965.18**	**1165.55**	

Blank spaces indicate data not available. Zero indicate no funding. No total is presented for 2018 due to incomplete data.
Spending data reported in 2016/17 fiscal year is recorded in 2016, and so on.

[238] No data available for cap and trade revenue funded programs in Ontario.
[239] These figures exclude TEQ transportation spending for “roulez vert.”

Appendix C: Electricity Savings

Energy efficiency program net annual incremental electricity savings (GWh, meter level)

	2016	2017	2018
British Columbia	492.9	390.6	
Alberta	0.0	404.3	141.5
Saskatchewan	67.9	50.0	49.1
Manitoba	180.0	207.9	155.9
Ontario	1,465.0	1,890.3	
Québec	534.0	524.0	454.7
New Brunswick	35.8	50.7	69.0
Prince Edward Island			2.8
Nova Scotia	126.4	120.7	139.8
Newfoundland and Labrador	18.2	31.3	35.5
Total	2,920.2	3,669.9	

Note adjustments to savings levels made to convert generator level savings to meter level by applying an average line loss factor, and to convert gross savings to net through an assumed net-to-gross ratio of 0.856. These are program savings only, not including savings from codes and standards. For these reasons, these energy savings might differ from those reported in documents such as annual reports and evaluation reports. See the electricity program savings chapter for further details and a list of reporting utilities and program administrators. Totals are only added when all jurisdictions reported. Spending data reported in 2016/17 fiscal year is recorded in 2016, and so on.

Appendix D: Natural Gas Savings

Energy efficiency program net annual incremental natural gas savings (Mm^3)

	2016	2017	2018
British Columbia*	11.8	14.3	14.1
Alberta	0.0	16.3	12.6
Saskatchewan	0.6	0.6	0.7
Manitoba	2.2	2.7	3.0
Ontario	106.5		
Québec	49.0	56.0	81.4
Total	170.2		

*Converted from savings originally reported in GJ using National Energy Board conversion tables.[240]

Energy efficiency program net annual incremental natural gas savings (GJ)

	2016	2017	2018
British Columbia	438,827	533,538	523,226
Alberta*	0	607,009	468,104
Saskatchewan*	23,218	23,220	25,581
Manitoba*	83,651	100,447	110,445
Ontario*	3,966,782	-	-
Québec*	1,824,750	2,083,938	3,029,457
Total	6,337,228		

*Converted from savings originally reported in Mm^3 using National Energy Board conversion tables.

Note adjustments to savings levels made to convert gross savings to net through an assumed net-to-gross ratio of 0.8. These are program savings only, not including savings from codes and standards. For these reasons, these energy savings might differ from those reported in documents such as annual reports and evaluation reports. See the natural gas program savings chapter for further details and a list of reporting utilities and program administrators. Totals are only added when all jurisdictions reported. Spending data reported in 2016/17 fiscal year is recorded in 2016, and so on.

[240] National Energy Board, Energy Conversion tables, available at https://apps.neb-one.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=en-CA

Appendix E: Energy Savings Target Sources

See below for further details on source information and years covered for calculation of energy savings targets found in tables 28-30.

Province	Electricity	Natural Gas or Non-Regulated Fuels
Alberta	-	-
British Columbia	Figures are amalgamation of BC Hydro & Fortis BC BC Hydro – 2019/2020 & 2020/2021 from Fiscal Year 2020 to 2021 Revenue Requirements Application Fortis BC – Savings from 2019-2022 DSM Plan, sales from Annual Review for 2019 Rates	Amalgamation of savings targets from FortisBC and CleanBC Fortis Energy 2019-2022 DSM plan, sales forecast for 2019 from Fortis Energy 2018 Review of 2019 Rates CleanBC targets provided by Province of British Columbia
Manitoba	Targets reported from Manitoba Hydro in information request, based on 2019 DSM Plan; Sales from Manitoba Hydro 2018 Electric Load Forecast	Targets from 2019-2023 reported by Manitoba Hydro Sales forecast from information request, based on 2018 Natural Gas Volume Forecast
	Forthcoming Efficiency Manitoba DSM plan was not available at time of writing, and may not correspond with targets used here	
New Brunswick	Savings – NB Power 2019-2021 DSM Plan Sales – NB Power 10-year plan for Fiscal Years 2020-2029	
Newfoundland & Labrador	Amalgamation of Newfoundland Power and Newfoundland and Labrador Hydro targets and load for years 2019 and 2020, from information request	
Nova Scotia	Savings - 2020-2022 Demand Side Management Resource Plan Sales – NS Power 10-Year System Outlook - 2018	Figure for 2019 only. Based on EfficiencyOne 2019 Business Plan non-electric fuels target.

Ontario	Savings – 2019-2020 only, from 2019-2020 Interim Framework Load forecast – IESO Technical Planning Conference, Sept. 13 2018	Annual natural gas targets are set by formula, considering resource acquisition, market transformation, low-income programs and large volume customers. Savings-related targets based on yield rate from previous year's performance, multiplied by approved budgets with productivity factor Approximate targets for 2019 and 2020 based on this formula, using calculated yield rates from savings/budgets in 2017, multiplied by 2019, 2020 budgets from 2015-2020 DSM plans, divided by 2018 sales Result is program targets similar to reported program achievements (annual incremental savings equal to 0.4%)
Prince Edward Island	Savings & Sales – PEI Energy Corporation 2018-2021 Demand Side Management Resource Plan, Response to Synapse IR-01 for regulatory docket UE41400	
Québec	Savings targets for 2019-2023 provided by information request from Hydro-Québec, sales data is for 2018	Savings targets for 2019-2023 from Plan global en efficacité énergétique d'Énergir Sales forecast from Plan d'appprovisionnement 2020-2023 d'Énegir
Saskatchewan	Targets from 2019-2021 SaskPower Annual Report 2017/18, Sales from 2018-19 sales. Long-term target from Climate Resilience Saskatchewan 2019 Report estimated to equal 0.3% of sales, based on assumed 1% annual load growth from 2018-9 baseline	Targets and sales forecast from 2019-2023 reported by SaskEnergy information request Note: targets are projections, not approved by regulatory body