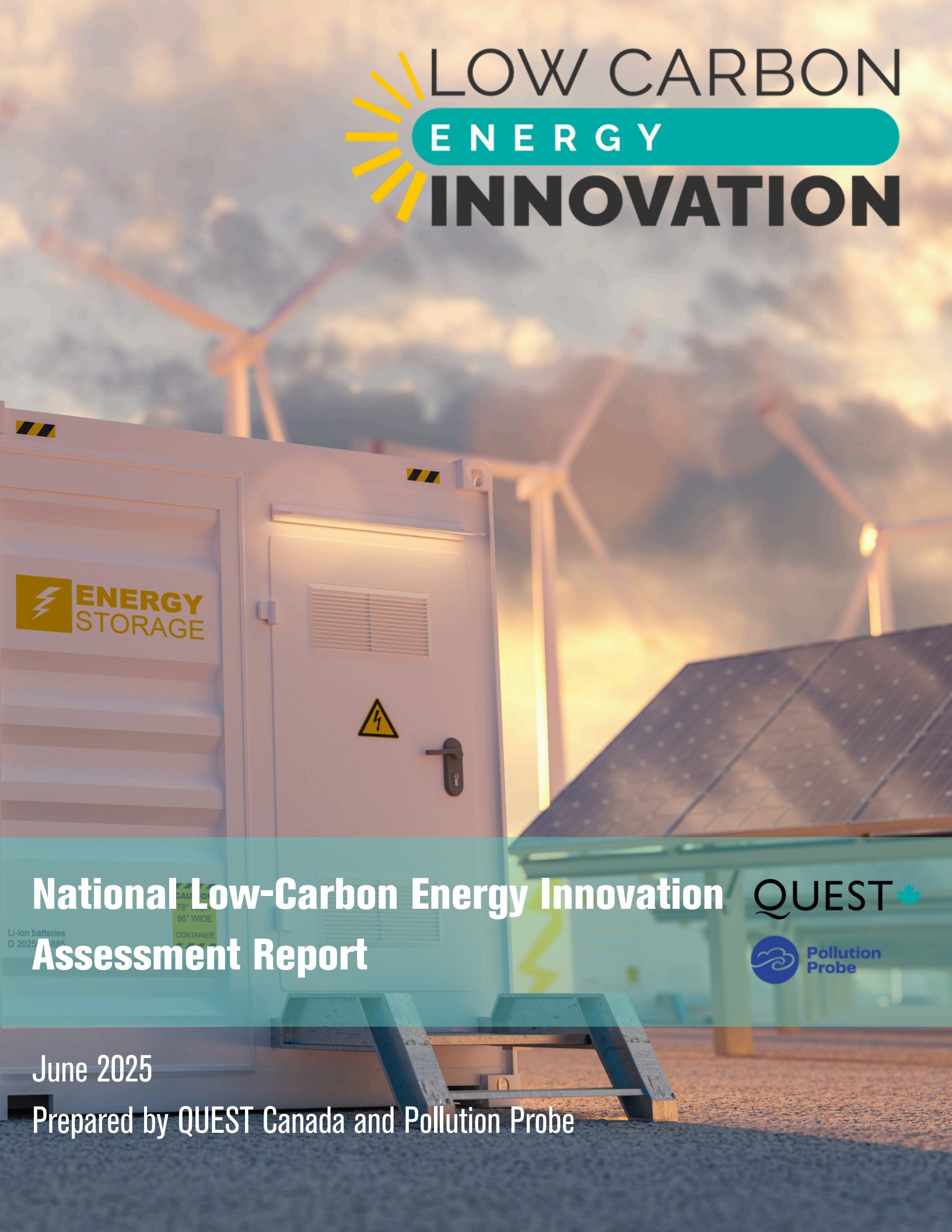
LOW CARBON ENERGY INNOVATION



National Low-Carbon Energy Innovation Assessment Report

QUEST

Pollution Probe

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Prepared by QUEST Canada and Pollution Probe

ACKNOWLEDGEMENTS

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Co-Authors

Richard Carlson, Pollution Probe

Ruth Kiro, Pollution Probe

Heldagardis Renyaan, QUEST Canada

Project Team

Richard Carlson, Pollution Probe

Ruth Kiro, Pollution Probe

Eddie Oldfield, QUEST Canada

Heldagardis Renyaan, QUEST Canada

Norma Panetta, QUEST Canada

Tonja Leach, QUEST Canada

Olumide Fatoki, QUEST Canada

Donald Wiedman, QUEST Canada

Melissa Schweyer, QUEST Canada

Andrei Nikiforuk, QUEST Canada

Kathryn Hoffart, ekho design

QUEST Canada is a registered Canadian charity that supports communities on their pathway to net zero. Since 2007, we've been facilitating connections, empowering community champions and advising decision-makers to implement energy use and emissions reduction solutions that best meet community needs and maximize local opportunities. We develop tools and resources, convene stakeholders and rights holders, and advise decision-makers – all with the goal of encouraging, assisting, and enabling communities to contribute to Canada's net-zero goals. Visit us at questcanada.org.

Pollution Probe is Canada's longest-standing environmental organization, pursuing environmental gains by working productively with governments, industry, and the public, with a steadfast commitment to Clean Air, Clean Water, and a Healthy Planet. Visit pollutionprobe.org.

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DEFINITIONS

TERM	DESCRIPTION
Low-carbon innovation	Low-carbon innovation refers to policies, regulatory frameworks and factors that enable research, development, deployment, new practices, new business models, and new products or services that reduce GHG emissions in the energy sector, aligning with Canada's net-zero targets. These strategies can be led by the provincial government, utilities, industries, technology providers, third-party organizations, new entrants or well-established players in the energy markets that promote innovation within the province/territory.
Policy area	A high-level category that directly and indirectly affects energy innovation.
Metric	Measures within a topic that may include several sub-metrics to evaluate policies or factors. A measurable element under each topic, representing a key factor for assessing progress or success.
Sub-metric	A binary or partial measure (Yes/No/Partly) used to evaluate detailed components of a metric.
Cost-of-service regulation (CoS)	A regulatory model where utilities recover costs along with a set rate of return, often less incentivizing for innovation.
Distributed energy resources (DER)	Decentralized technologies connected on the distribution system that provide electricity or reduce demand on the grid.
Enquiry services (Sandbox)	Support offered by regulators to innovators seeking to understand how existing rules apply to new technologies or business models.
Integrated resource planning (IRP)	A broad planning approach, usually conducted by an energy utility, where the future demand and supply for an energy service is developed. Electric and natural gas utilities, for example, conduct IRP at set intervals and focuses on long-term forecasting of energy supply and demand, infrastructure investment planning, and alignment of policies to support system-wide energy and climate goals.
Integrated energy systems planning (IESP)	An operational, implementation-oriented process that coordinates multiple, interconnected energy systems across fuels, infrastructure, emissions, land use, and community growth. Often referred to in this assessment as holistic energy systems planning, IESP supports cross-sectoral planning and integration, such as aligning electricity and thermal utilities, potential future demand changes (such as through electrification or fuel switching),

	community energy and emissions plans, land use development, and decarbonization pathways. It is spatially grounded and designed to support practical, place-based solutions for sustainable energy transitions.
Performance-based regulation (PBR)	A regulatory approach where utility revenues are tied to performance outcomes, rather than traditional cost-recovery. Also referred to as Incentive Rate Making.
Technology readiness levels (TRLs)	A scale (1-9) that measures the maturity of a particular technology, from conceptual research (TRL 1) to full-scale deployment (TRL 9). TRLs 1-6 are considered early-stage research in the laboratory, while TRLs 7-9 are progressing towards full deployment.

ABBREVIATIONS

ACRONYM	TERM
AMI	Advanced metering infrastructure
CoP	Community of Practice
CoS	Cost of service
DER	Distributed energy resources
DSM	Demand side management
IEA	International Energy Agency
IESP	Integrated energy system planning
IPP	Independent power producer
IRP	Integrated resource planning
LCEI	Low-carbon energy innovation
GHG	Greenhouse gas
PBR	Performance-based regulations
RNG	Renewable natural gas
TRL	Technology Readiness Level

EXECUTIVE SUMMARY

This National Low-Carbon Energy Innovation Assessment Report is part of the three-year Low-Carbon Energy Innovation (LCEI) Initiative led by QUEST Canada and Pollution Probe. Building upon the foundation laid by the Innovation Sandboxes Initiative[1] to identify the regulatory, policy, and market conditions needed to scale energy innovation that drives emissions reductions and positions Canada for long-term competitiveness.

WHY INNOVATION MATTERS

Reaching Canada's climate commitments and securing a low-emissions economy demands innovation at every level — not just technology, but across regulation, policy, governance, and business models. Low-carbon energy innovation reduces emissions and also delivers lower energy costs, stronger grid performance, more resilient communities, and new opportunities for investment and job creation.

For Canada to lead, governments must transition from simply setting targets toward implementation in real-world settings. That means eliminating regulatory obstacles, supporting pilots to commercial transitions, and developing a workforce equipped for the scale of the energy transition. Innovation is not optional, it is the engine of cost-effective, future ready net-zero energy systems.

This assessment evaluates every province and territory across four key policy areas using a structured methodology, which allows for a national assessment, highlighting both best practices and areas for improvement.[2] It equips policymakers and energy and community stakeholders with the insights necessary to accelerate innovation and drive meaningful progress toward a low-emissions economy.

FASTER, MORE EQUITABLE, MORE AFFORDABLE

Canada is a diverse country and every province and territory is at its own place in the energy transition journey. Despite this diversity, drawing on insights from the assessment, and the identification of best practices, there are six conclusions that highlight areas where Canada must improve if it wants to fully capture the value of becoming a low-emissions economy:

1. Align climate policy and market signals

Low-carbon innovation thrives in competitive energy markets, but only when backed by stable, credible policy. Investors and innovators need consistent, long-term climate policy to make confident decisions. Uncertainty is holding back progress.

[1] See Innovation Sandboxes and Pollution Probe

[2] The Northwest Territory and Nunavut are not assessed due to their unique energy requirements.

2. Modernize energy regulation to enable innovation

Outdated regulatory frameworks hinder innovation. Canada's provinces and territories need smarter regulatory frameworks that balance customer protection with flexibility, including advanced rate systems and performance-based models that reward results, not just compliance.

3. Plan energy systems holistically

Effective energy planning must look beyond silos. Integrated, cross-sectoral plans are key to identifying where emissions reductions can have the greatest impact and where innovation can unlock cost savings. Sectoral climate leadership starts with a systems view.

4. Prioritize thermal energy innovation

Canada's decarbonization efforts often over-focus on electricity, while overlooking heating, which accounts for the major share of energy use. Innovation in clean thermal energy is essential for a full transition to a low-emissions economy.

5. Put Indigenous inclusion in the center

Innovation must be inclusive. Indigenous communities, in particular, are key partners in Canada's energy future, as energy projects impact their lands and economies. Early, meaningful engagement builds trust, enables social acceptance, and long-term partnerships that drive shared success.

6. Build the skilled workforce the transition requires

Canada needs a skilled workforce ready to build, install, maintain, and manage a new energy system, and fast. This means not just training for today's needs, but anticipating tomorrow's skills. Investment in education and re-skilling must match the ambition of the transition.

Canada has the potential to secure a stronger, more resilient economy. This report is a blueprint for action. The path to a low-emissions economy is clear — scale innovation, remove barriers, and invest in people and systems that are ready for what's next.

1. INTRODUCTION: ACCELERATING LOW-CARBON ENERGY INNOVATION IN CANADA

Low-carbon energy innovation is critical to to Canada's economic and environmental development

Innovation will be essential to moving to net-zero and sustainable energy systems. According to the International Energy Agency (IEA), 2030 targets can be mostly achieved with existing technologies, with accelerated deployment and new business models.[3] However, reaching net zero by 2050 will require significant contributions from emerging technologies, many of which are currently in the prototype or demonstration stages.[4]

Promoting low-carbon energy innovation will not only reduce emissions. By fostering innovation, Canada can reduce long-term energy system costs, enhance grid efficiency, and unlock new economic opportunities. Clean energy innovation attracts investment, creates high-quality jobs, and can help local communities benefit from the transition.

Canada will need to both scale deployment of market-ready solutions and foster the development and commercialization of next-generation innovations. Accelerating both deployment and development will require not just technology improvements but also supportive policies, revised regulations, and new business strategies to foster clean energy. However, existing regulatory and market structures often present barriers that slow progress and limit the full economic potential of clean energy innovation.[5]

A sustainable and modern energy system requires comprehensive action from all levels of governance. Provinces and territories significantly influence energy markets and establish regulatory frameworks and climate change strategies.[6]

This low-carbon innovation assessment offers a clear picture of where each jurisdiction stands and highlights the diverse paths forward – recognizing that while there is no one-size-fits-all solution, every region has a role to play in driving progress.

[3] Miremadi, I., Saboohi, Y., & Jacobsson, S. (2018). Assessing the performance of energy innovation systems: Towards an established set of indicators. https://www.sciencedirect.com/science/article/abs/pii/S2214629618300033

[4] Bouckaert, S., Fernandez Pales, A., McGlade, C., Remme, U., Wanner, B., Varro, L., D'Ambrosio, D., & Spencer, T. (2021). Net zero by 2050: A roadmap for the global energy sector. International Energy Agency. https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

[5] International Energy Agency. (2022). The future of heat pumps and electrification. Retrieved from https://www.iea.org/reports/the-future-of-heat-pumps

[6] Canada Energy Regulator. (2022). Market snapshot: Canadian energy transition trends. Retrieved from https://www.cer-rec.gc.ca/en/

About the Low-Carbon Energy Innovation Initiative

QUEST Canada and Pollution Probe created the Low-Carbon Energy Innovation (LCEI) Initiative to analyze challenges and identify the enabling conditions that support innovation in Canada's energy sector. This initiative builds off of a previous initiative that examined the use of Innovation Sandboxes to drive innovation in regulated sectors.

This initiative looks at more than just regulatory factors hindering innovation, and is more holistic. It draws on years of jurisdictional research, multiple engagements with each province and territory, and ongoing collaboration with policy, regulatory, and industry stakeholders across the country. This initiative created a national Low-Carbon Energy Innovation Community of Practice (CoP) that met every two months over the course of the project, engaging approximately 173 unique stakeholders across Canada. During these sessions, feedback on the barriers for innovation were discussed, and speakers, both nationally and internationally, discussed best practices.

As part of this initiative, a national assessment of policies and factors promoting low-carbon innovation was carried out – providing a structured, evidence-based assessment of the current landscape and highlighting where progress is being made and where additional support is needed. This involved both developing a database of low-carbon energy innovation policies and an assessment methodology. Both were informed through the CoP meetings. In addition, three engagements with every jurisdiction across Canada, totalling 212 participants, were conducted over two years to validate findings and to refine the methodology. The findings and the assessment methodology are solely those of the Pollution Probe and QUEST Canada, and may not necessarily reflect the ideas or opinions of CoP members or any stakeholder who contributed.

2. METHODOLOGY

This National Low-Carbon Energy Innovation Assessment aims to evaluate the policies and factors that promote low-carbon innovation in Canada's energy sector. Development of the assessment criteria was the result of creating a database of all relevant policies and multiple rounds of engagement to iteratively develop an assessment framework. The multiple rounds of engagement provided insights and improvements to the assessment criteria. The end result is an assessment criteria that has been informed through input from policymakers, regulators, system operators, utilities, energy companies, and private sector participants.

Following this process, we developed four policy areas, which were then broken down into 12 topics, 26 metrics, and 52 sub-metrics to evaluate the policies and factors driving energy innovation directly and indirectly within each jurisdiction.[7]

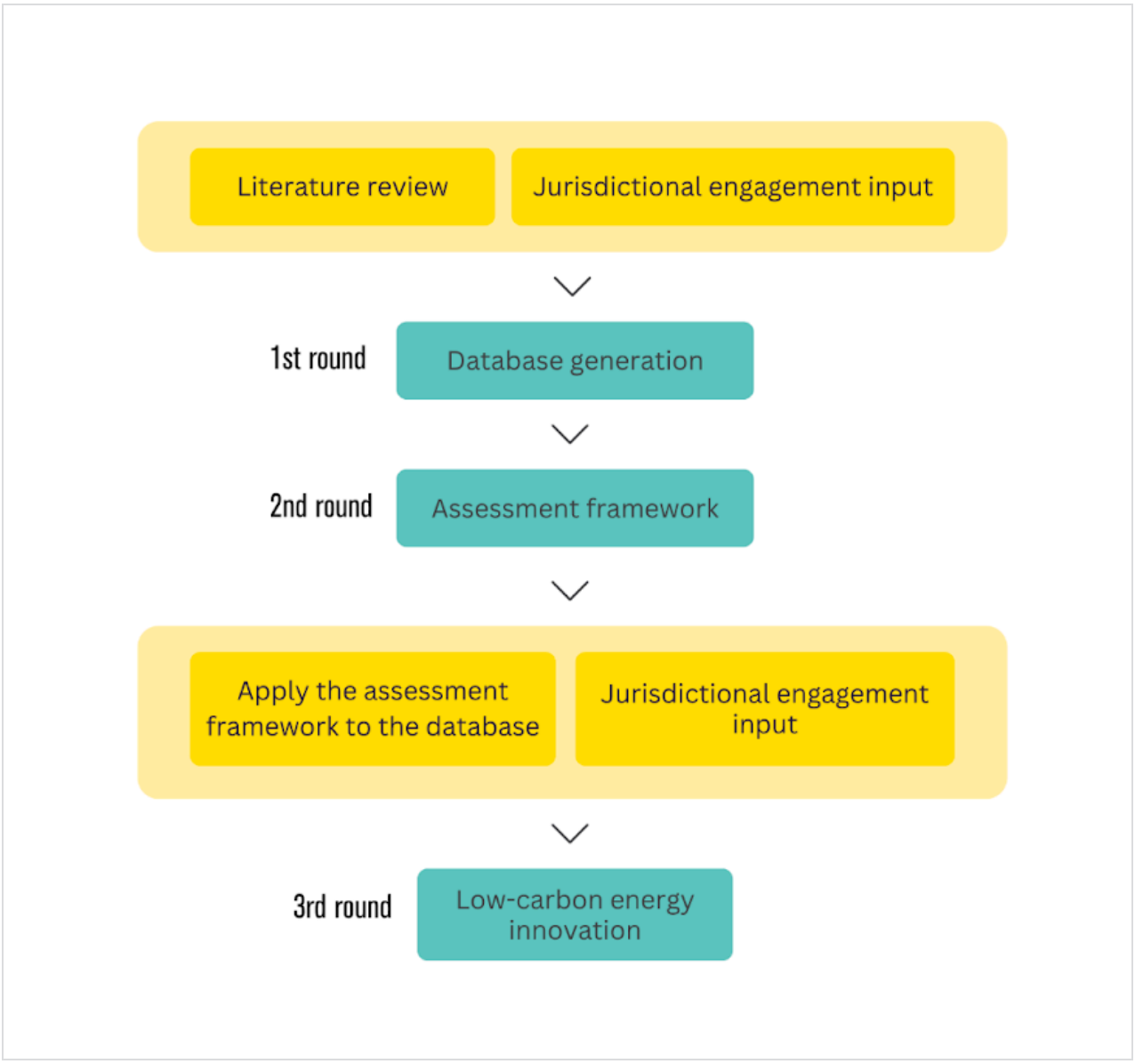
To create the assessment framework, there were a number of steps:

- Developing framework indicators
- Compiling a database of policies and factors influencing low-carbon energy innovation both directly and indirectly
- Developing an assessment system
- Applying this system to evaluate policies and factors in each jurisdiction, resulting in a low-carbon innovation assessment.

The methodology is based on various sources, including publicly available data from official websites, three rounds of engagement with each jurisdiction, and several one-on-one discussions with key stakeholders (see Figure 2.1).

[7] For details on the Methodology, view Annex 1.

Figure 2.1: Overview of the methodological process



Following the research and engagement, four key policy areas were identified to capture the essential elements that enable low-carbon energy innovation. Each policy area is further broken down into several topics, providing a more detailed understanding of the policy areas, as outlined in Table 2.1

Table 2.1: Overview of policy areas and topics

POLICY AREA	DESCRIPTION	TOPICS
1. Enabling net-zero energy policies	Policy area 1 highlights climate change and energy leadership within the jurisdiction. It evaluates policies and accountability mechanisms for 2030 and 2050 net-zero goals and industrial carbon pricing. Clear climate policies direct innovators to pursue low-carbon innovation.	1.1 Climate leadership
		1.2 Sectoral climate leadership
		1.3 Industrial carbon pricing revenues for net-zero goals
2. Enabling conditions for energy innovation	Policy area 2 focuses on the conditions that strengthen a jurisdiction's capacity for innovation, including competitive energy market structure, policies, and factors supporting the energy transition. These elements can facilitate the implementation of energy innovation in this field. While not necessarily preconditions for low-carbon energy innovation, these factors can enable greater innovation.	2.1 Energy market structure
		2.2 Supporting policies for the energy transition
3. Enabling energy innovation R&D, deployment and implementation	Policy area 3 focuses on enabling low-carbon innovation through effective innovation policies, regulations, and a supportive ecosystem.	3.1 Enabling innovation: Policies (data collection[8])
		3.2 Enabling innovation: Regulatory
		3.3 Enabling innovation: Ecosystem

[8] Data collection means that this topic was not assessed but data was collected.

POLICY AREA	DESCRIPTION	TOPICS
4. Building the comprehensive needs of innovation: Workforce, collaboration, reconciliation, and equity (data collection[9])	Policy area 4 outlines the broader conditions essential for a successful net-zero transition, focusing on current and future workforce needs, along with policies and programs that promote collaboration, reconciliation, and equity.	4.1 Workforce needs policies
		4.2 Community engagement strategies
		4.3 Reconciliation policies
		4.4 Low-income policies

Following the development of the framework, 52 sub-metrics were developed to enable a detailed assessment of the policies and factors within each policy area (see Figure 2.2).

Given that different policies, acts and regulations were included, and varied across timelines, the following conditions were considered when assessing:

- Policies: Active policies from 2015 onward, assuming their flexibility and potential to change.
- Acts and Regulations: No time limit, assuming they are more stable and legally binding.
- Current conditions and factors: Reflect the state of each jurisdiction at the time the assessment.

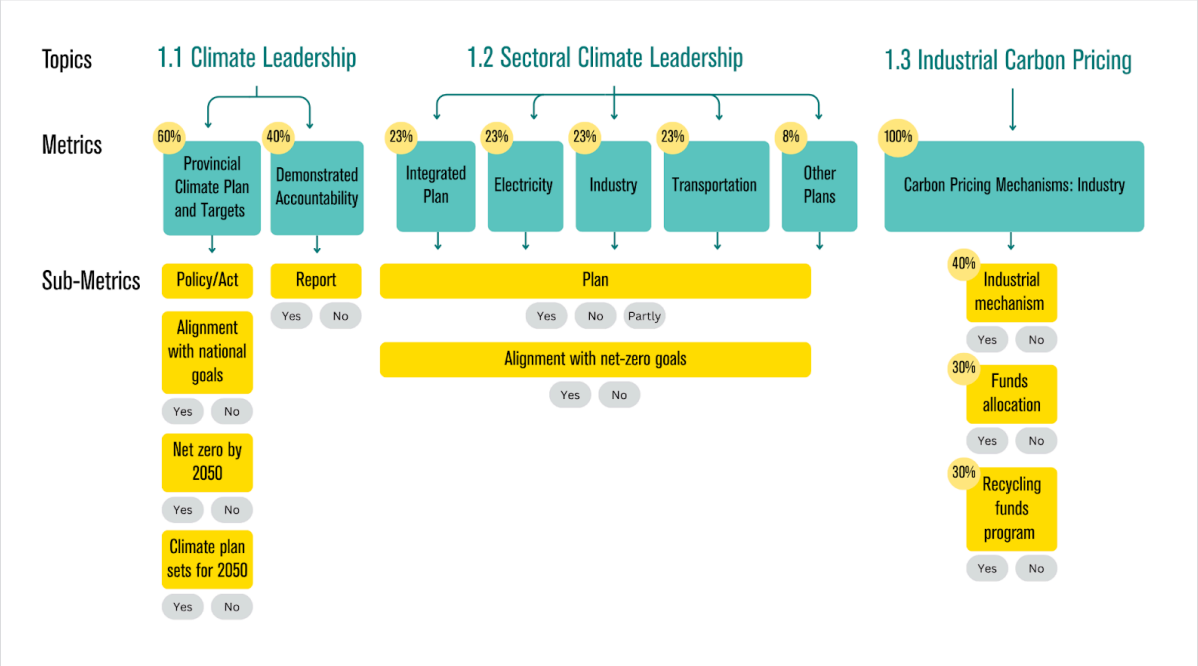
The cut-off date for data collection was the end of February 2025. Anything published after this date was not considered.

Each topics' weighting is distributed evenly across the related metrics for each topic, adding up to 100%. However, based on participants' feedback during multiple engagement sessions (see Annex 1), some of the weightings were adjusted (see Figure 2.2).

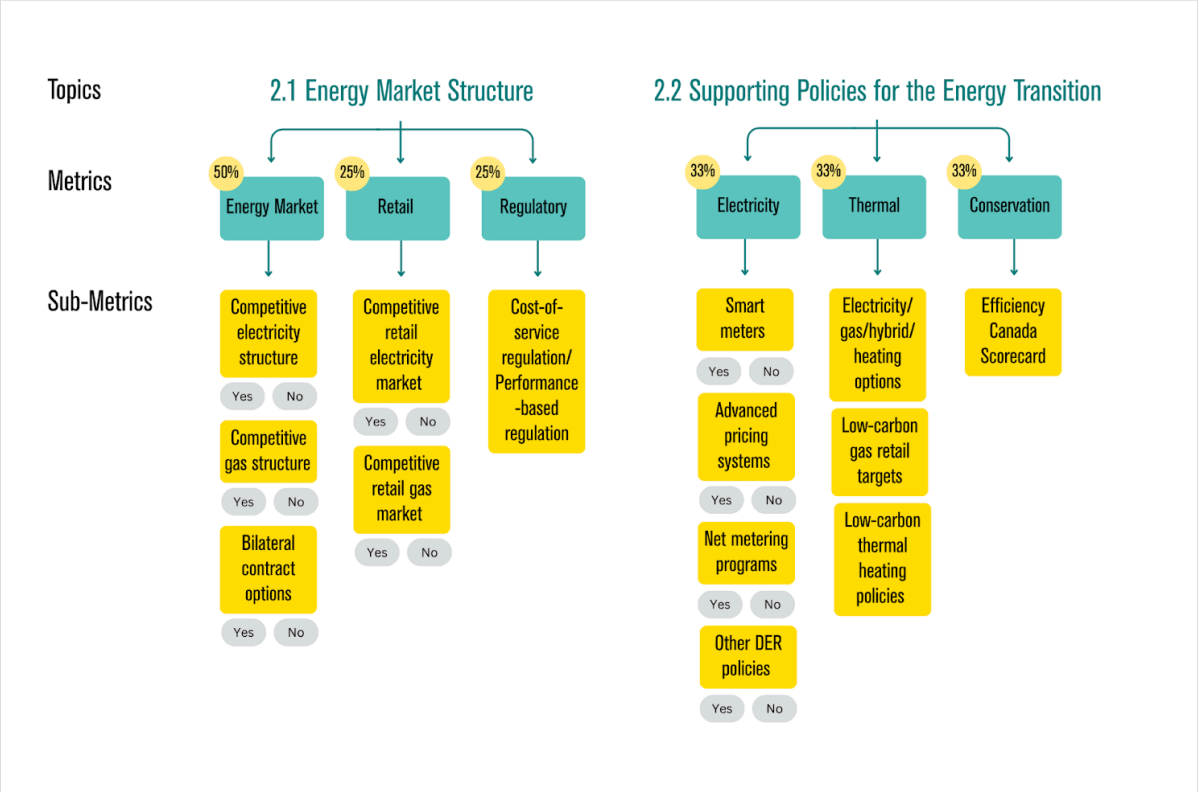
[9] Data collection means that this topic was not assessed but data was collected.

Figure 2.2: Overview of policy areas 1-4

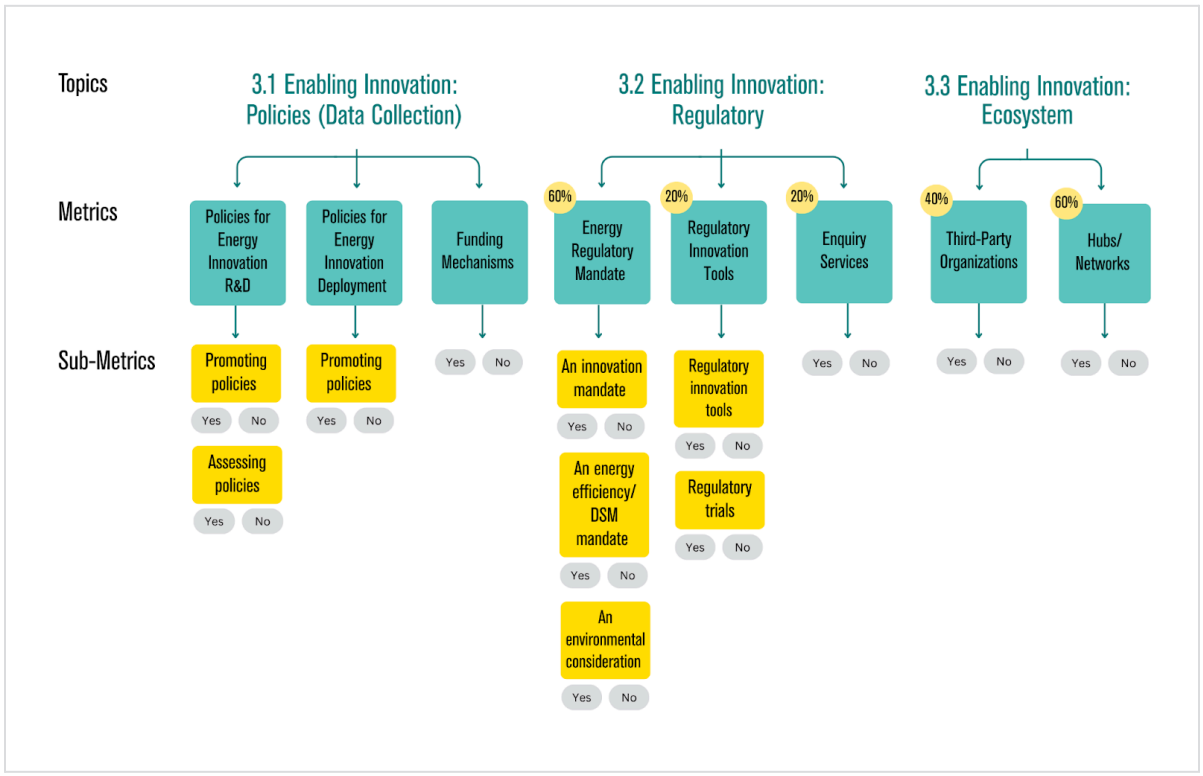
1. ENABLING NET ZERO ENERGY POLICIES



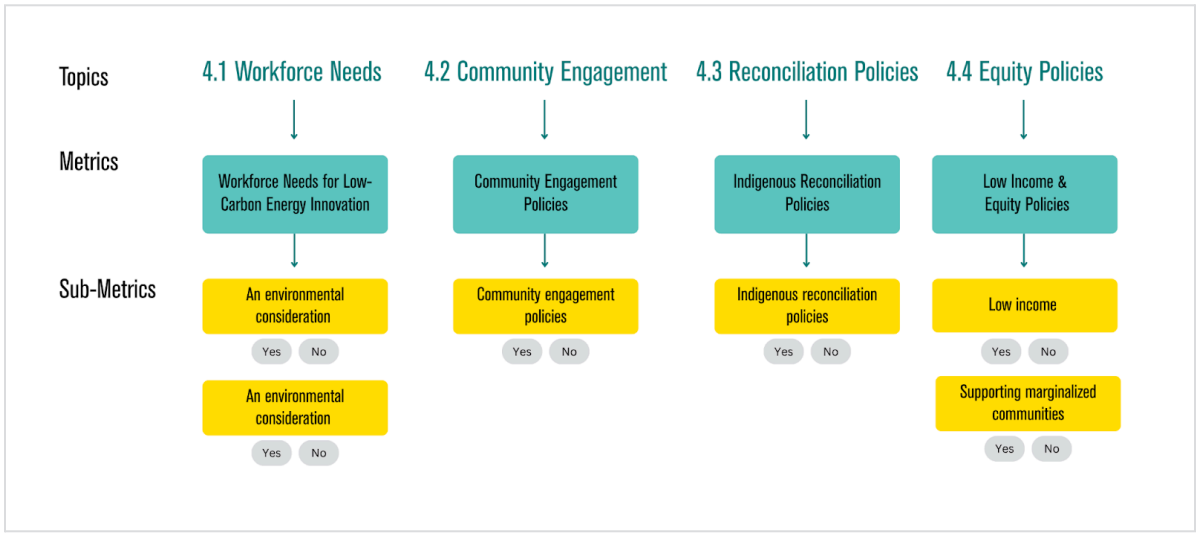
2. ENABLING CONDITIONS FOR ENERGY INNOVATION



3. ENABLING ENERGY INNOVATION R&D, DEPLOYMENT AND IMPLEMENTATION



4. BUILDING THE COMPREHENSIVE NEEDS OF INNOVATION: WORKFORCE, COLLABORATION, RECONCILIATION, AND EQUITY



Despite the best efforts to capture all policies related to the assessment criteria, there were some limitations:

- Challenges in gathering information: Some data (e.g., innovation funding, academic involvement) were not consistently available across all jurisdictions, leading to their removal from the database.

- Policy effectiveness: The assessment may not fully capture the depth or effectiveness of each measure.

- Policies overlap: Policies can overlap, making it challenging to attribute outcomes to a specific policy.

3. FINDINGS

The National Low-Carbon Energy Innovation Assessment evaluates the policies, regulations and practices in every Canadian jurisdiction[10] in terms of how well they create the conditions for greater and successful low-carbon energy innovation. The initiative identifies strengths and gaps in each jurisdiction, and highlights successful pathways and best practices.

Innovation is shaped by many factors, requiring a holistic approach when evaluating the conditions that could promote low-carbon innovation.

Clear government climate goals and policies are needed to provide direction for innovators. Yet these targets must be complemented by other policies that encourage energy innovation, provide a supportive regulatory framework, ensure sufficient funding, and promote the development of a supportive ecosystem to advance energy innovation towards future net-zero energy systems.

Increasing energy innovation will allow for a faster, more equitable, and more affordable transition to sustainable, net-zero energy systems, while also increasing economic development by fostering new industries and new companies.

At the same time, it is important that all segments of the population can benefit from low-carbon energy innovation.

Table 3.1 displays the high-level results for each jurisdiction assessed.

[10] See below for how the Northwest Territories and Nunavut are assessed separately.

The Northwest Territories and Nunavut

The **Northwest Territories** and **Nunavut** were evaluated separately from the others and were not assessed. Due to their unique circumstances, such as climate and geographical challenges, limited financial resources, and specific energy needs, what works in other parts of Canada may not be appropriate for these jurisdictions. For example, due to a small tax base, there may be insufficient capital for infrastructure development, and other funding sources may be required. Other differences could be that municipal policies are in place, and since these can represent large portions of the territory, but they are not considered in the assessment.

Therefore, these territories require tailored funding and customized approaches to support low-carbon energy innovation. They also face higher risks, including a limited number of available companies and elevated costs, which must be addressed through unique strategies. Many recommendations from the broader assessment do not apply to the territories. As a result, data was collected, but the policies were assessed, as outlined in Tables 3.2-3.5

Table 3.1: High–level results

Legend

Strong	Enabling Conditions, developed and integrated
Moderate	Key Conditions in Place, with room to grow
Emerging	Some Foundational Elements, early stage conditions
Limited	Few Enabling Conditions, opportunity for action

	AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT
1. Enabling net-zero energy policies													
1.1 Climate leadership													
1.2 Sectoral climate leadership													
1.3 Industrial carbon pricing													
2. Enabling conditions for energy innovation													
2.1 Energy market structure													
2.2 Supporting policies for the energy transition													
3. Enabling energy innovation R&D, deployment and implementation													
3.1 Enabling innovation: Policies (Data collection*)													
3.2 Enabling innovation: Regulatory													
3.3 Enabling innovation: Ecosystem													
4. Building the comprehensive needs of innovation: Workforce, collaboration, reconciliation, and equity													
4.1 Workforce needs policies	Data collection*												
4.2 Community engagement strategies													
4.3 Reconciliation initiatives													
4.4 Equity policies													

* Data collection means that this topic was not assessed but data was collected.

3.1 Framework metrics

Many direct and indirect factors influence innovation. Literature review and feedback from multiple rounds of consultations highlighted many considerations and identified many factors that can play a role. For this assessment, we selected the factors that were both measurable, available, and critical for innovation. The engagements also indicated that focusing on a few critical factors was more important than including all potential factors (see Annex 2).

The assessment framework was created to highlight essential low-carbon energy innovation policies and factors across Canadian jurisdictions. Four key policy areas were identified to guide this assessment. Each policy area includes topics, which are further divided into metrics and sub-metrics to evaluate the impact of these policies. The sub-metrics were designed to be yes/partly/no questions.

3.2 Overview of policy areas

3.2.1 Policy Area 1: Enabling net-zero policies

This policy area focuses on macro policies regarding climate change and the net-zero transition. Certainty on climate policies is essential for driving low-carbon innovation by guiding innovators towards investing in low-carbon targets and for assuring them their potential innovation will have a long-term market. Long-term policy frameworks also enable governments and stakeholders to plan and implement a smooth energy transition. These policies stimulate investment, drive research and development, enable innovative business models, and accelerate the adoption of low-carbon technologies, all while building trust among investors, industries, and the public.

This policy area measures the following:

- 2030 and 2050 climate change targets and plans, including their alignment with net-zero targets
- Accountability in climate change targets
- Sectoral climate plans and their alignment with net-zero goals
- Allocation of industrial carbon pricing revenues towards achieving net-zero goals

3.2.2 Policy Area 2: Enabling conditions for energy innovation

This policy area includes the framework and conditions essential to promote energy innovation along the energy transition pathway. Enabling policies and measures drive innovators to pursue low-carbon energy solutions and provide the means for new services or technologies to enter the system. A competitive energy market could further support this innovation by fostering a more dynamic and conducive environment for innovative low-carbon energy innovations to more easily enter the market.

This policy area measures the following:

- Competitive gas and electricity markets in supply and retail
- Advanced regulatory systems that could incentivize innovation among regulated utilities
- Enabling energy transition measures and policies (e.g., smart meters installation, advanced pricing systems, energy efficiency measures, etc)

3.2.3 Policy Area 3: Enabling energy innovation R&D, deployment, and implementation

This policy area includes policies and strategies directly related to promoting low-carbon innovation, including enabling R&D and deployment innovation policies and funding, the regulatory environment, and the innovation ecosystem.

Policies tailored to promoting energy innovation indicate the jurisdiction's priorities and provide clear direction for all market participants. A supportive regulatory framework and strong ecosystems further facilitate the process and create additional opportunities for innovation.

This policy area measures the following:

- Policies and funding to support energy innovation through R&D and deployment
- Mandates for innovation, energy efficiency, DSM, and environmental considerations in energy regulation
- Regulatory tools and sandbox components
- Innovation ecosystem

3.2.4 Policy Area 4: Building the comprehensive needs of innovation -- Workforce, collaboration, reconciliation, and equity

This policy area includes the complementary conditions and policies enabling low-carbon energy innovation, including developing the current and future workforce, community engagement, reconciliation, and low-income and equity initiatives. A large-scale, low-carbon energy transition must be people-centred and inclusive, considering its social and economic impacts on communities, jobs, and daily life. For this area, only data is gathered and discussed and policies are not assessed.

This policy area measures the following:

- Workforce policies for developing the skills needed in a net-zero economy
- Community engagement
- Indigenous reconciliation initiatives
- Climate-focused policies supporting low-income and marginalized communities in the net-zero transition

3.3 Results

3.3.1 Policy Area 1: Enabling net-zero energy policies

Table 3.2 illustrates the results of policy area 1, which focuses on climate change and energy leadership within the jurisdiction.

Key findings:

Strong on climate ambition:

While many jurisdictions have adopted 2030 GHG targets and established climate mitigation plans and accountability processes, to date, PEI is the only jurisdiction that has established a long-term mitigation strategy.

Sectoral planning remains siloed:

Energy plans in many jurisdictions have sectoral plans but lack integrated approaches across electricity, thermal, transportation, and industrial sectors. Ontario and Québec stand out because they have indicated they will develop holistic system planning approaches that integrate all energy uses. British Columbia highlights the need and intent to create holistic planning in the energy sector, and Manitoba has already integrated some energy planning, but only for gas and electricity sectors.

Carbon pricing revenue lacks net-zero alignment:

While industrial carbon pricing systems exist across all jurisdictions, only Québec shows the use of revenues for a climate mitigation program.

Best Practices: Policy Area 1

Climate leadership:

- **Prince Edward Island** has set a clear climate plan that aligns with the long-term net-zero target. The 2040 Net-Zero Framework was developed to clarify the commitments outlined in the Net-Zero Carbon Act and serves as a roadmap to achieve PEI's 2040 net-zero targets.
- **Québec**'s accountability process is supported by the 2023-2028 implementation plan. This plan outlines concrete climate actions for the next five years to achieve the government's targets and objectives. It includes tracking progress on climate targets, allocating funding, and adjusting funding to meet these goals, with a review process before a new implementation plan is developed for the subsequent five years.

Sectoral climate leadership:

- **Ontario**'s proposal for an Integrated Energy Resource Plan could create a holistic energy systems plan that sets out the actions and policy steps the government would take to achieve its vision of an affordable, reliable, clean energy system.

Industrial carbon pricing:

- **Saskatchewan**'s Output-Based Performance Standards revenue will help fund industrial sector decarbonization.
- **Québec** allocates carbon market revenues into the Electrification and Climate Change Fund, which finances the measures outlined in the 2030 Plan for a Green Economy and ongoing commitments made under the 2013-2020 Climate Change Action Plan.

Table 3.2: Assessment of Policy Area 1: Enabling net-zero energy policies

Legend

Strong	Enabling Conditions, developed and integrated
Moderate	Key Conditions in Place, with room to grow
Emerging	Some Foundational Elements, early stage conditions
Limited	Few Enabling Conditions, opportunity for action

✓	Yes
✗	No
—	Partly
n/a	Not assessed

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	1. Climate leadership						n/a		n/a						100%
Metric	1. Jurisdictional net-zero policies and targets														60%
Sub Metrics	A jurisdictional climate change mitigation policy has been in place since at least 2015, or an act is in effect	Act	Act	Act	Policy	Policy	Policy	Act	✗	Policy	Act	Act	Policy	Act	
	The 2030 climate target is the same or more ambitious than the national target	✗	✓	✗	✓	✗	✗	✓	✗	✗	✓	✗	✗	✓	
	The climate plan aligns with the 2030 GHG target	✗	✓	✓	✓	—	✓	✓	✗	—	✓	—	✗	✓	
	A jurisdiction net-zero climate signal set for 2050	✓	✓	✗	✓	✗	✓	✓	✗	✗	✓	✓	✗	✓	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
	A clear climate plan that aligns with the 2050 net-zero target	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	
Metric	2. Demonstrated accountability on climate plan														40%
Sub Metric	There is an accountability report for the climate plan	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	

Topic	1.2 Sectoral climate leadership						n/a		n/a						100%
Metric	1. Integrated energy planning														23%
Sub Metric	A process for holistic energy system planning	✗	—	—	✗	✗	✗	—	✗	—	✗	—	✗	✗	
Metric	2. Electricity plan														23%
Sub Metrics	A jurisdictional electricity mitigation policy or act is in place	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	
	The electricity plan aligns with net-zero targets	—	✓	—	✓	—	✓	✓	✗	—	—	✓	—	—	
	The jurisdiction sets a clear decarbonization path for electric utilities	✗	—	—	—	✗	✓	✗	✗	—	✗	—	—	—	
Metric	3. Transportation plan														23%
Sub Metrics	A jurisdictional electricity mitigation policy or act is in place	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	—	✓	
	The transportation plan aligns with net-zero targets	—	✓	—	—	—	✓	—	✗	—	—	—	—	✓	
Metric	4. Industry plan														23%
Sub Metrics	A jurisdictional Industry mitigation policy is in place	✓	✓	✗	✓	✗	✓	—	✗	✓	✓	✓	✗	—	
	The Industry plan aligns with net-zero targets	—	—	✗	—	✗	—	✗	✗	—	—	✓	✗	✗	
Metric	5. Hydrogen plan														8%

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Sub Metrics	A jurisdictional low-carbon hydrogen policy is in place	✓	✓	X	✓	✓	X	✓	X	✓	X	✓	X	X	
	The hydrogen plan aligns with net-zero targets	—	—	X	✓	—	X	—	X	—	X	—	X	X	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	1.3 Industrial carbon pricing						n/a		n/a						100%
Metric	1. Carbon pricing mechanisms: industry														100%
Sub Metrics	The jurisdiction has an industrial carbon pricing mechanism: An output-based carbon pricing system	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	The industrial carbon pricing revenue is used to reduce GHG emissions	✓	✓	X	✓	✓	✓	✓	X	✓	X	✓	✓	X	
	There is a clear plan for the industrial carbon pricing revenues to achieve net-zero goals	X	X	X	X	X	X	X	X	X	X	—	X	X	

3.3.2 Policy Area 2: Enabling conditions for energy innovation

Table 3.3 illustrates the results of policy area 2, which focuses on factors that enhance a jurisdiction's energy framework in such a way that increased innovation could be more easily developed and deployed. These factors include potential for competitive services, and identifying policies that could support innovation, such as advanced metering infrastructure (AMI), policies to promote low-carbon thermal energy, and performance-based regulation (PBR).

Key findings:

Market structures help in shaping innovation potential:

Alberta and Ontario support innovation through market competition which encourages innovation, and through having advanced regulatory systems in which utility revenues could be tied to innovation-performance outcomes, rather than a traditional cost-system where utilities recover costs plus a set rate of return, often less incentivizing for innovation. While other provinces such as British Columbia and Québec rely on policy-driven monopoly systems to promote innovation.

Energy transition policies are in progress and may drive innovation:

All jurisdictions have net-metering programs, and most jurisdictions have installed or have pilots for smart meters, as well as efficiency measures at certain levels. A few jurisdictions offer heating options through electricity or hybrid systems, and fewer jurisdictions have low-carbon thermal policies.

Best Practices: Policy Area 2

Energy market structure:

- **Alberta**'s competitive energy market for gas and electricity enables greater innovation through more competitive supply and retail options.
- **Ontario**'s performance-based regulation (PBR): The Ontario Energy Board has had performance-based regulation since 2000, and recently held a consultation to advance its performance-based approach to rate regulation (2024-2025). This initiative aims to develop ways to strengthen the link between what electricity distributors earn and the achievement of outcomes consumers value, such as cost-effectiveness, reliability, and customer service.

Supporting policies for the energy transition:

- **British Columbia**'s low-carbon gas target: The CleanBC aims to achieve 15% renewable gas content in the natural gas system by 2030. This is supported by the Greenhouse Gas Reduction Regulation (GGRR), which has been amended to promote the production and use of renewable gas.
- **Québec**'s green heating options: The Chauffez vert program supports homeowners who want to replace their oil or propane heating system with a system that runs on electricity (or another renewable energy source).
- **Québec**'s government is bringing together Québec's two main energy distributors, Hydro-Québec and Énergir, around a shared goal: reducing GHG emissions from building heating by 50% by 2030.
- **Ontario**'s new electricity DSM plan: A Minister's Directive requires Ontario's Independent Electricity System Operator (IESO) to implement a 12-year electricity conservation and DSM framework starting January 1, 2025, with a budget of up to $10.9 billion for delivering a portfolio of energy efficiency programs.
- **Newfoundland and Labrador**'s electrification as a decarbonization strategy: With a grid that is approximately 99% decarbonized, has prioritized electrification over traditional energy efficiency as its core decarbonization strategy. The province has committed $90M to help households switch from oil heating to electric heat pumps. This approach maximizes the value of surplus clean electricity and reduces emissions by shifting consumers off fossil fuels entirely.

Table 3.3 Assessment of Policy Area 2: Enabling conditions for energy innovation

Legend

Strong	Enabling Conditions, developed and integrated
Moderate	Key Conditions in Place, with room to grow
Emerging	Some Foundational Elements, early stage conditions
Limited	Few Enabling Conditions, opportunity for action

✓	Yes
X	No
—	Partly
n/a	Not assessed

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	2.1 Energy market structure						n/a		n/a						100%
Metric	1. Energy market: Supply														50%
Sub Metrics	The jurisdiction has a competitive electricity generation	✓	X	X	X	—	X	—	X	—	—	X	X	—	
	The jurisdiction has bilateral contract options for electricity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	The jurisdiction has a competitive gas structure	—	X	X	X	n/a	X	X	n/a	X	n/a	—	X	n/a	
Metric	2. Energy market: Retail														25%
Sub Metrics	Retail: Customers may choose retailers for electricity	✓	X	X	—	X	X	—	X	✓	—	X	X	X	
	Retail: Customers may choose retailers for gas	✓	✓	✓	✓	n/a	X	X	n/a	✓	n/a	X	✓	n/a	
Metric	3. Energy market: Regulatory														25%
Sub Metric	Advanced rate regulatory systems	PBR	CoS	CoS	CoS	CoS	CoS	CoS	CoS	PBR	CoS	CoS	CoS	CoS	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	2.2 Supporting policies for the energy transition						n/a		n/a						100%
Metric	1. Supporting policies for the energy transition: electricity														33%
Sub Metrics	A smart meters installation	✓	✓	✗	✓	✗	pilot	✓	pilot	✓	pilot	✓	pilot	✓	
	Advanced pricing systems	pilot	✓	✗	✗	—	✗	pilot	✗	✓	✗	✓	✓	✗	
	Net metering programs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Other DER policies	✓	—	✓	✓	✗	✓	pilot	✓	✓	✗	✓	✗	✓	
	Net-Zero resources for DER	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Metric	2. Supporting policies for the energy transition: thermal														33%
Sub Metrics	The jurisdiction offers heating options through electricity or a hybrid gas and electricity system	✓	✓	✓	✓	✓	✗	✓	pilot	✓	✓	✓	✗	✓	
	The jurisdiction has low carbon gas retail targets	✗	✓	✗	✗	n/a	✗	✗	n/a	✗	n/a	✓	✗	n/a	
	The jurisdiction has policies for low-carbon thermal heating	✗	—	—	✗	✗	✗	✗	✗	✗	✗	—	✗	✗	
Metric	3. Supporting policies for the energy transition: electricity: conservation														25%
Sub Metric	Efficiency Canada's overall energy efficiency score (maximum 100 points, 2024)	8%	54%	30%	43%	14%	n/a	40%	n/a	33%	45%	45%	16%	32%	

3.3.3 Policy Area 3: Enabling energy innovation R&D, deployment, and Implementation

Table 3.4 illustrates the results of policy area 3, which focuses on enabling low-carbon innovation through effective innovation policies, regulations, and a supportive ecosystem.

Key findings:

Low-carbon innovation policies remain incomplete:

Several jurisdictions have some policies that support early-stage R&D (TRL 1-6) and deployment (TRL 7-9), but still, most jurisdictions still require clear plans. While most jurisdictions do not have a technology assessment policy that assesses which technology is more suitable for a net-zero future, the Northwest Territories and Nunavut have these policies.

Regulatory support is limited:

Only Ontario has a well developed regulatory system including sandbox tools and mandate for innovation. Other jurisdictions have made some progress in that area but still require regulatory modernization.

Innovation ecosystems are present in many jurisdictions:

Innovation ecosystems and involvement from third-party organizations are active in most jurisdictions.

Best Practices: Policy Area 3

Enabling innovation: Regulatory

- **Ontario** Energy Board's Innovation Sandbox supports pilot projects testing new activities, services and business models in Ontario's electricity and natural gas sectors.
- **Nova Scotia**'s Innovation Justification Criteria, part of the Capital Expenditure Justification Criteria, outlines the approval process for innovative projects that lower costs, improve reliability, support policies, and enhance consumer experience using proven technologies.
- **Manitoba**'s Efficiency Act encourages innovation within its mandate. It establishes Efficiency Manitoba as a corporation tasked with implementing demand-side management initiatives, achieving energy and cost savings, reducing GHG emissions, and more.

Enabling innovation: Ecosystem

- **Québec**'s innovation zones gathered stakeholders from several sectors to collaborate and leverage sustainable competitive advantages in innovative issues, including the Energy Transition Valley, which focuses on the battery industry, transport, green hydrogen, and industrial and port decarbonization.
- **Alberta**'s Energy Future Lab is an Alberta-based coalition of diverse innovators and leading organizations working to accelerate the transition to the energy system.
- **Yukon**'s First Nations Climate Action Fellowship is a 20-month program to support youth reconnecting with their culture and identity while exploring climate action.

Table 3.4: Assessment of Policy Area 3: Enabling energy innovation R&D, deployment and implementation

Legend

Strong	Enabling Conditions, developed and integrated
Moderate	Key Conditions in Place, with room to grow
Emerging	Some Foundational Elements, early stage conditions
Limited	Few Enabling Conditions, opportunity for action

✓	Yes
X	No
—	Partly
n/a	Not assessed

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	3.1 Enabling innovation: policies (Data collection)														
Metric	1. Policies for promoting energy innovation: R&D (TRL 1-6)														
Sub Metrics	The jurisdiction has policies that promote energy innovation through R&D (TRL 1-6)	—	—	X	—	—	—	—	X	X	—	—	—	—	
Sub Metrics	The jurisdiction has established policies for assessing the energy innovation technology needs	—	—	X	X	X	✓	✓	✓	X	X	X	X	X	
Metric	2. Policies for promoting energy innovation: deployment (TRL 7-9)														
Sub Metrics	The jurisdiction offers heating options through electricity or a hybrid gas and electricity system	—	✓	—	—	—	—	X	X	—	X	—	X	X	
Metric	3. Types of funding mechanisms for net-zero energy innovation														
Sub Metric	There are different types of funding mechanisms for energy innovation	✓	✓	—	✓	✓	X	✓	—	✓	—	✓	✓	—	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	3.2 Enabling innovation: regulatory						n/a		n/a						
Metric	1. Energy regulatory mandate (law)														60%
Sub Metrics	The act respecting energy regulation (e.g., the Electricity Act) includes a mandate for innovation	✗	—	—	✗	✗	✗	✗	✗	✓	✗	—	✗	✗	
	The act respecting energy regulation includes an energy efficiency or DSM mandate	✗	✓	✓	✓	—	✗	✓	✗	✓	—	—	✗	✓	
	The act respecting energy regulation includes environmental considerations for decision making	✗	✓	✗	—	—	✗	✓	✗	✓	✗	—	✗	✗	
Metric	2. Regulatory innovation tools														20%
Sub Metrics	Different regulatory tools that promote innovation	—	—	✗	—	✗	✗	✓	✗	✓	—	—	✗	—	
	Regulatory trials (part of the Sandbox)	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	
Metric	3. Enquiry Services (part of the Sandbox)														20%
Sub Metric	The jurisdiction provides enquiry services, enabling the innovator to receive assistance from the regulator	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	3.3 Enabling innovation: ecosystem						n/a		n/a						100%
Metric	1. Third-party organizations for energy innovation														40%
Sub Metrics	Third-party organizations involved in energy innovation	—	—	—	—	✓	—	✓	✗	—	—	✓	✓	—	
Metric	2. A wide ecosystem of innovation (hubs/labs/centers: (part of the Sandbox))														60%
Sub Metrics	Different regulatory tools that promote innovation	✓	✓	—	✓	✓	✓	✓	—	—	✓	✓	—	✓	

3.3.4 Policy Area 4: Building the comprehensive needs of innovation: workforce, collaboration, reconciliation, and equity

Table 3.5 illustrates the results of policy area 4, which focuses on the broader conditions essential for a low-carbon energy innovation to successfully support the net-zero transition. It focuses on current and future workforce needs and policies and programs promoting collaboration, Indigenous reconciliation, and equity. This policy area is not assessed, and we just collected information to identify best practices and potential gaps.

Key findings:

Workforce policies for future needs are still limited:

While many jurisdictions have policies addressing current workforce needs, additional efforts are required to develop policies for long-term workforce needs.

Low-income energy policies:

Such exist in all provinces, but policies that help marginalized communities are still limited.

Best Practices: Policy Area 4

Current and future workforce needs policies

- **British Columbia**'s workforce policies focus on training individuals for the clean energy economy in areas such as electric vehicle technology, heat pump installation, zero-energy buildings, and hydrogen.
- **British Columbia**'s StrongerBC Future Ready Action Plan connects people to the training they need for more than 250 in-demand careers in clean energy and housing areas.
- **Newfoundland and Labrador**'s training course by econext supports skill-building for success in the green economy.

Community engagement policies

- **New Brunswick**'s Environmental Trust Fund supports NGOs and local communities for projects aimed at environmental protection..
- **New Brunswick**'s Net-Zero Communities Accelerator (NCA) program uses proven tools and services to help communities develop and implement their Community Energy and Emissions Plans (CEEPs).
- **Nova Scotia**'s community solar program enables community groups to install up to 75kW of solar and sell it to the utility.

Indigenous reconciliation policies

- **Manitoba**'s Community-Driven Outcomes Contract (CDOC), an innovative pay-for-success social finance tool, uses private capital to help First Nation communities' energy transition.
- **Manitoba** plans 600-MW wind procurement with majority Indigenous ownership.
- **Saskatchewan**'s First Nations furnace replacement rebate helps improve home heating efficiency through SaskEnergy's work with Indigenous communities.
- **Yukon**'s IPP policies require at least 50% of projects to have a Yukon First Nation ownership component.

Equity policies

- **Newfoundland and Labrador**'s framework for IPPs enables isolated communities to finance renewable projects, reduce fuel consumption, and maintain affordable customer rates in Newfoundland and Labrador.
- **Prince Edward Island**'s free net-zero programs offer free heat pumps and electric water heaters to households earning $100,000 or less.

Table 3.5: Assessment of Policy Area 4: Building the comprehensive needs of innovation -- Workforce, collaboration, reconciliation, and equity (Data collection[11])

Legend

✓	Yes
X	No
—	Partly

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	4.1 Workforce needs														
Metric	1. Workforce needs policies for achieving a net-zero energy future														
Sub Metrics	The jurisdiction has policies that direct the workforce to current needs to achieve a net-zero energy future	✓	✓	✓	—	✓	—	✓	✓	—	✓	—	✓	—	
	The jurisdiction has policies that direct the workforce to future needs to achieve a net-zero energy future	—	✓	—	X	—	X	X	—	X	X	X	—	X	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	4.2 Community engagement														
Metric	1. Community engagement policies for achieving a net-zero energy future														
Sub Metric	The jurisdiction has policies for engagement to achieve a net-zero future	—	—	—	✓	—	✓	✓	✓	✓	—	—	—	✓	

[11]Data collection means that these topics were not assessed, but data was collected.

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	4.3 Reconciliation														
Metric	1. Reconciliation policies for achieving a net-zero energy future														
Sub Metric	The jurisdiction has energy-related Indigenous reconciliation policies to achieve a net-zero future	—	✓	✓	✓	—	—	—	—	—	—	—	✓	✓	

		AB	BC	MB	NB	NL	NT	NS	NU	ON	PE	QC	SK	YT	%
Topic	4.4 Equity														
Metric	1. Equity policies for achieving a net-zero energy future														
Sub Metrics	The jurisdiction has low-income energy policies to achieve a net-zero future	—	—	—	—	—	✓	✓	X	✓	—	—	—	✓	
	The jurisdiction has climate-related policies to help marginalized communities move towards a net-zero future	X	—	X	—	—	—	✓	X	X	X	—	X	—	

Best practices: Northwest Territories and Nunavut

Assessing the energy innovation technology needs (part of policy area 3)

- **Nunavut**'s Qikiqtani Region Marine Renewable Energy Resource Assessment for the Qikiqtani Region involves a review of publicly available information and two years of data collection to evaluate the region's potential for marine renewable energy of Qikiqtani communities.

Workforce needs (part of policy area 4)

- **Nunavut**'s Inuit Employment Plan (IEP) is a comprehensive strategy designed to enhance Inuit employment within the Qulliq Energy Corporation. Through the IEP, some employment programs are designed to assist our Inuit employees with achieving their career goals. Some of the current programs include the Inuit leadership development program, Inuit career development plans, an apprenticeship program, and a summer student program.

Community engagement (part of policy area 4)

- **Northwest Territories** communities are engaged by the Arctic Energy Alliance (AEA) through six office locations. Each office is involved in every program and project the AEA undertakes, and AEA staff attend trade shows, events, and other community engagement activities in every community in the Northwest Territories.
- **Nunavut**'s Business Model Project explores how communities can participate in and benefit from renewable energy (and other) developments, aligning with their priorities, capacity, and risk tolerance. It aims to develop a base understanding of benefit-sharing mechanisms, ensuring fair and equitable returns to communities from regional development projects.

3.3.5 Jurisdictional Assessment

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

4. JURISDICTIONAL ASSESSMENT

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

The following is QUEST Canada and Pollution Probe Foundation's Low-Carbon Energy Innovation Assessment of Yukon Territory, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.

The authors of this Assessment would like to acknowledge the diverse contributions from policymakers, regulators, industry leaders, municipal representatives, and non-governmental organizations, not-for-profits, consultants, utilities, and technology sector experts, and insights shared during LCEI Community of Practice (CoP) meetings and jurisdictional engagements.

LOW CARBON ENERGY INNOVATION

YUKON

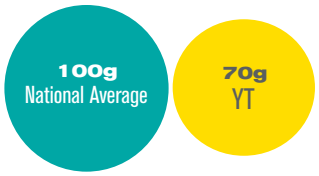
A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

POPULATION
46.3 K
IN 2024

13.8%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)



CO_2e/kWh

GHG TARGET BY 2030

45%
(below 2010 levels)

YUKON ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

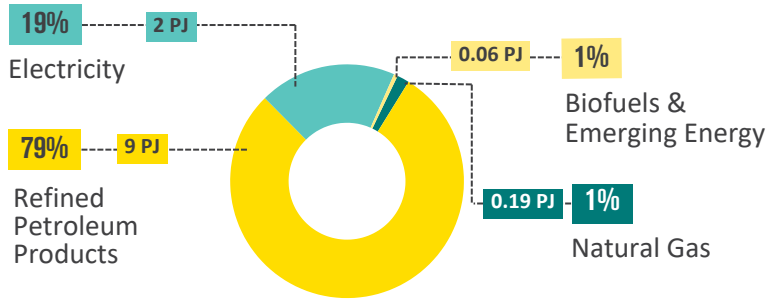
- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

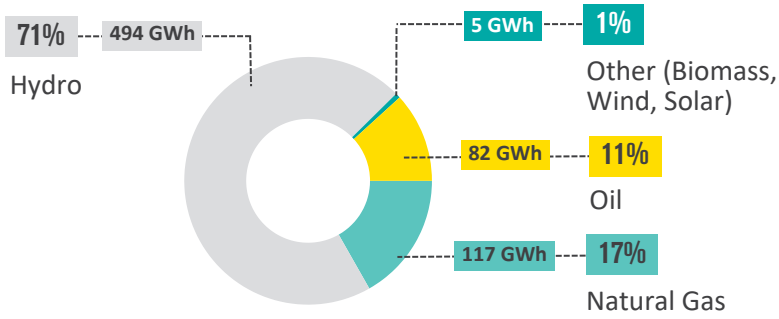
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

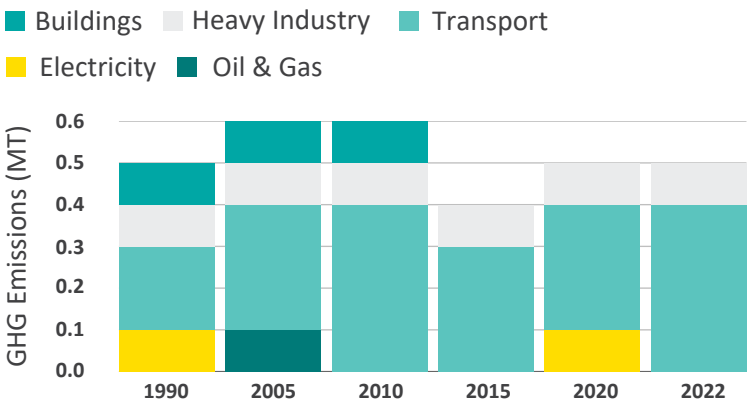
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

The Yukon's innovation ecosystem and community engagement process will support innovation. However, providing funding and developing tailored policies are necessary to advance energy innovation in Yukon. It is important to note that any policy will need to consider the territory's unique climate, geographical challenges, energy needs, and the constraints of the existing funding model.

STRENGTHS

The innovation ecosystem: Yukon's diverse energy ecosystem enables a supportive environment for energy innovation through several initiatives, including the Yukon Innovation Hub, IncubateNorth, the Yukon Communities Small Business Network, Wrap-Around Innovation Services, the Yukon Investment Challenge, Northlight Innovation, Yukon Innovation Week, and the Yukon First Nations Climate Action Fellowship. A third-party organization, Yukonstruct Society, also creates a supportive environment for energy innovation.

Community engagement: Yukon promotes community engagement for a net-zero future through various policies and initiatives, including the report on the Yukon Innovation Plan and feedback on the Carbon Rebate Program Design, the Youth Panel on Climate Change, the Yukon Climate Leadership Council, the Youth Panel on Climate Change Recommendations, and the Innovative and Renewable Energy Initiative, which has been expanded to support more community projects. These initiatives create supportive conditions for innovation in the energy sector.

PATHWAY FORWARD

Regulatory framework to promote innovation: Enhancing innovation by establishing a strong regulatory framework, incorporating mandates for innovation, and using tools such as regulatory trials and enquiry services would create a more supportive environment for low-carbon innovation to succeed.

Workforce needs: Develop a skilled workforce to address current and future needs, such as the Investment Readiness Training Program, which will help support innovation activities towards advancing low-carbon solutions and encouraging new participants.

QUEST

Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

BRITISH COLUMBIA

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

BRITISH COLUMBIA ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

POPULATION
5.6 million
IN 2024

11.9%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

100g National Average

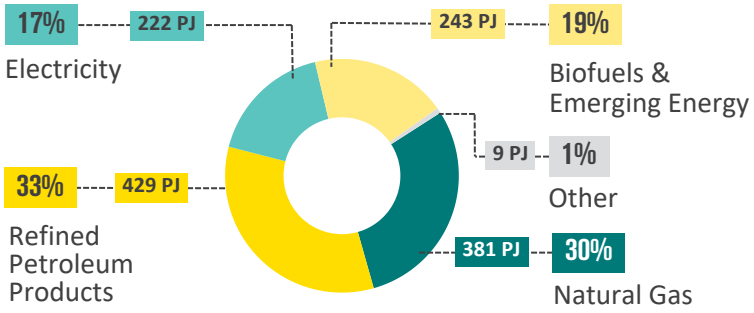
14g BC

CO_2e/kWh

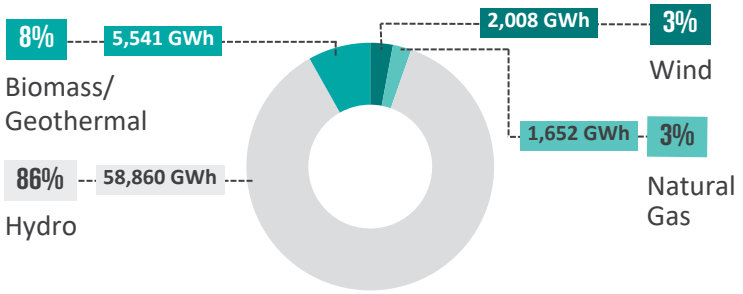
GHG TARGET BY 2023

40%
(compared to 2007 levels)

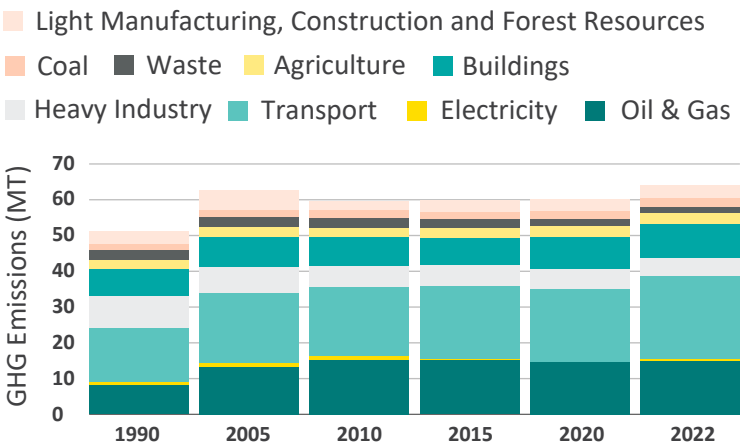
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

British Columbia's strong climate leadership and policies have the potential to drive innovation toward net-zero goals. However, a supportive regulatory and policy framework is necessary to enable low-carbon innovation further.

STRENGTHS

Climate leadership: British Columbia demonstrates strong climate leadership through the Climate Change Accountability Act, which establishes legally mandated GHG reduction targets, and the province's CleanBC strategy, along with accountability reports, strengthens its commitment to climate action and sets a clear signal to achieve net-zero emissions by 2050. These initiatives encourage innovators to pursue low-carbon targets.

Supporting policies for the energy transition: British Columbia demonstrates a strong energy framework that includes the installation of smart meters, advanced pricing systems, net metering programs, and plans for distributed energy resources (DER). The province also has set targets for renewable natural gas (RNG) and has an ambitious building code and energy efficiency measures, all setting conditions for innovation in these areas.

PATHWAY FORWARD

Supporting innovation through a regulatory framework: Developing a strong regulatory framework that mandates innovation and strengthens tools such as regulatory trials and enquiry services will provide an environment for testing and implementing innovative solutions, accelerating progress toward net-zero goals.

Enabling innovation through better energy market conditions: With limited competition in the energy market, British Columbia should create an environment that promotes innovation and enables innovators to develop and implement energy innovation effectively. This innovative environment could include funding options, public investments, competition with other energy markets, understanding the goals of innovators, identifying factors that influence innovation, and creating policies that promote low-carbon innovation.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

ALBERTA

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

ALBERTA ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

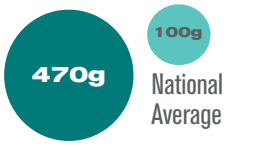
Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

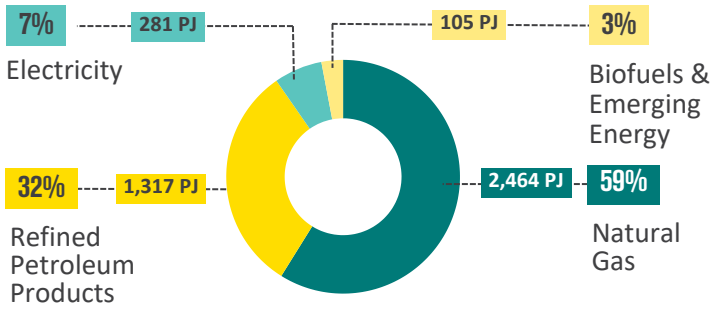
POPULATION
4.8 million
IN 2024
11.9%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

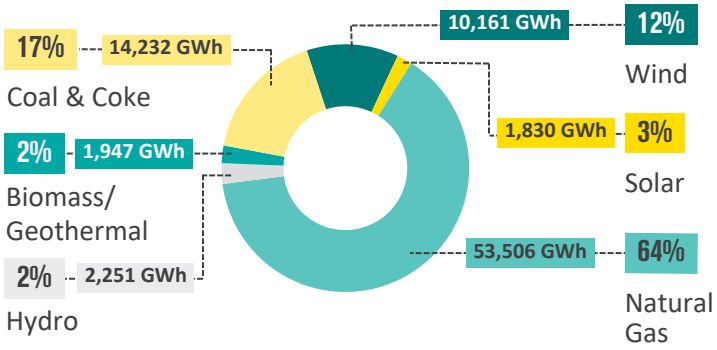


NO GHG TARGET

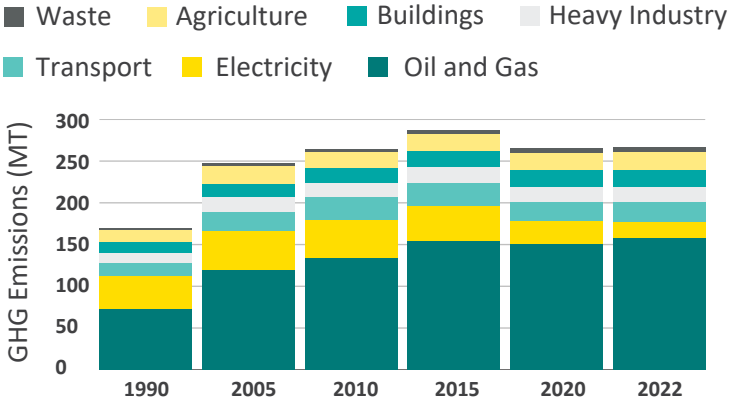
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Alberta's competitive energy market and innovation ecosystem provide a strong foundation for low-carbon energy innovation. However, strong leadership across all sectors is needed to leverage these measures to drive energy innovation towards a net-zero economy.

STRENGTHS

- Competitive conditions: Alberta's competitive energy markets, on both the supply and retail sides, enable an open and supportive environment for energy innovation.
- The innovation ecosystem: Alberta's diverse energy ecosystem includes initiatives, such as the Energy Futures Lab, and the Business Renewables Centre Canada, enable a supportive environment for energy innovation.

PATHWAY FORWARD

- Climate leadership: Developing a long-term climate strategy across all sectors, with clear GHG reduction targets and decarbonization pathways, will help direct innovation activities towards advancing low-carbon solutions and encouraging new participants.
- Regulatory framework to promote innovation: Enhancing innovation by establishing a strong regulatory framework, incorporating mandates for innovation, and using tools such as regulatory trials and enquiry services will create a supportive environment for low-carbon innovation to succeed.

FOR MORE INFORMATION, SEE THE FULL REPORT AT:

QUEST Canada &
Pollution Probe

QUEST

Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
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3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
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5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

SASKATCHEWAN

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

SASKATCHEWAN ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

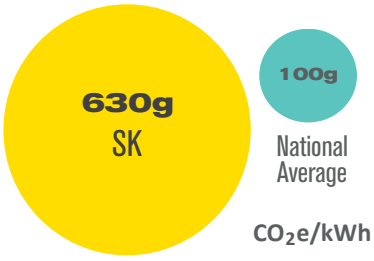
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

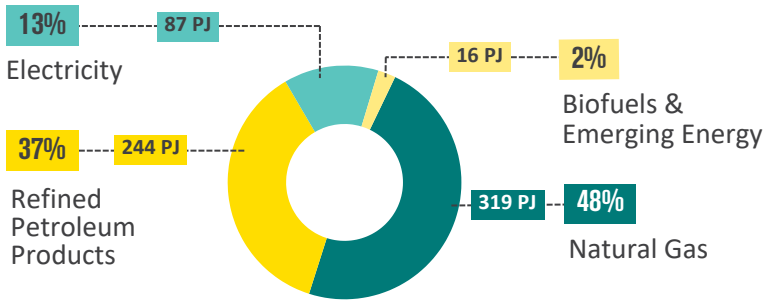
POPULATION
1.2 million
IN 2024

6.1%
since 2019

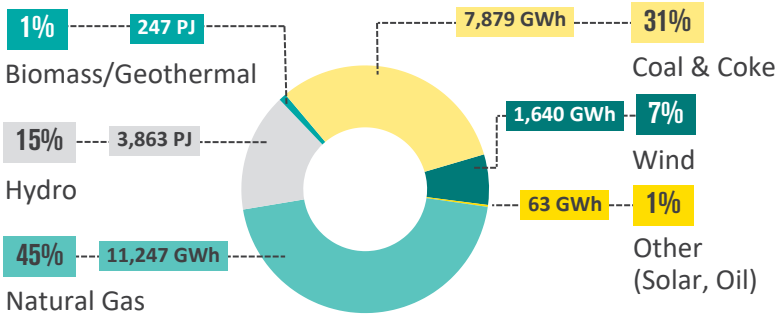
GHG INTENSITY OF THE ELECTRICITY GRID (2022)



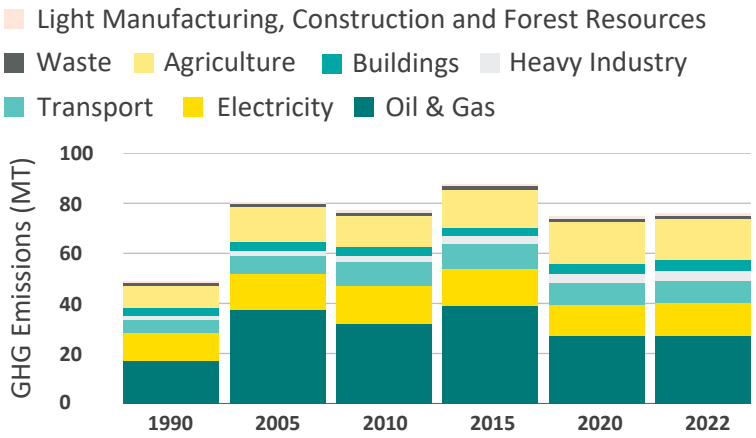
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Saskatchewan's policies on energy reconciliation and workforce needs can promote an innovative environment that benefits the province. However, expanding opportunities for innovation requires strong climate leadership across all sectors, supportive energy transition policies, and a regulatory framework that helps drive energy innovation toward a net-zero economy.

STRENGTHS

Indigenous energy initiatives:
Saskatchewan has implemented several reconciliation initiatives that support the transition to a net-zero economy and, thus, ease the conditions for more energy innovation. These include the First Nations Furnace Replacement Rebate, the Indigenous Allyship Award (Individual), the Indigenous Allyship Award (Organization), Métis Nation Saskatchewan, the Report on Provincial Engagement Sessions, and the Indigenous Business Gathering.

Workforce Needs:
Saskatchewan addresses current and future workforce needs in the energy sector. Programs such as Innovate to Learn, Training Courses and Information by MCAS, Educational Programs and Business Initiatives, and Building the Workforce for a Growing Economy promote the development of a skilled workforce capable of driving innovation in the energy sector.

PATHWAY FORWARD

Climate leadership: Developing a long-term climate strategy across all sectors, with clear GHG reduction targets and decarbonization pathways, will help direct innovation activities towards advancing low-carbon solutions and encouraging new participants.

Regulatory framework to promote innovation: Enhancing innovation by establishing a strong regulatory framework, incorporating mandates for innovation, and using tools such as regulatory trials and enquiry services will create a supportive environment for low-carbon innovation to succeed.

QUEST

Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
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LOW CARBON ENERGY INNOVATION

MANTIOBA

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

MANITOBA ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

POPULATION
1.4 million
IN 2024

9.2%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

100g National Average

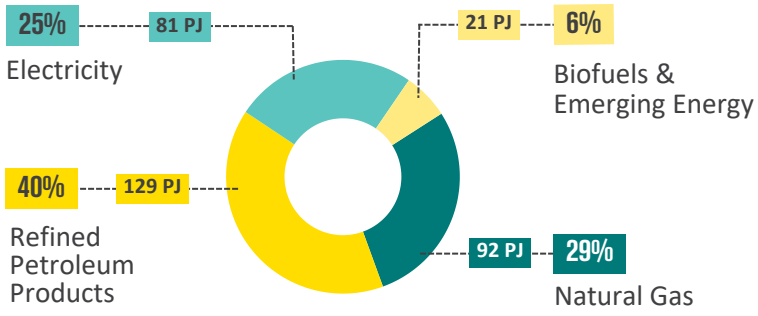
1.3g MB

CO_2e/kWh

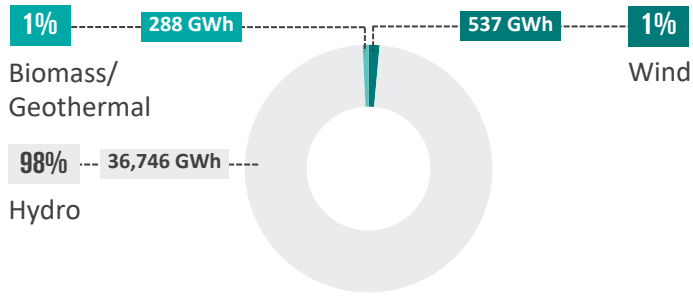
GHG TARGET FOR 2023-27

5.6
Mt of CO_2e

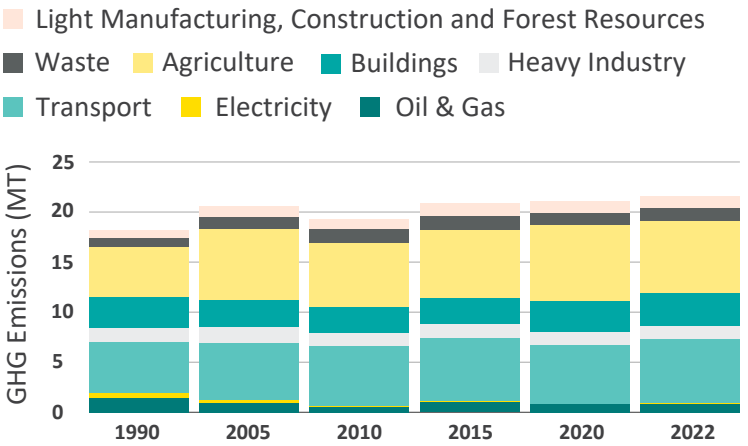
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

The Manitoba Affordable Energy Plan outlines the province's vision for its energy future, supporting wind energy partnerships and enabling more opportunities for innovation in the energy sector. The Efficiency Manitoba Act also complements this by establishing Efficiency Manitoba to implement demand-side management, reduce emissions, and defer significant investments. However, more integrated energy market planning, strengthened energy transition strategies, and a supportive regulatory framework are needed to drive low-carbon innovation toward a net-zero economy.

STRENGTHS

Indigenous energy initiatives: Manitoba has implemented several reconciliation initiatives that create the conditions to support low-carbon innovation and contribute to the transition to a net-zero economy. Key initiatives include a 600-MW wind power procurement with majority Indigenous ownership, a community-driven outcomes contract, funding for the First Nation Ground Source Heat Pump Training and Installation Program, the Indigenous Climate Hub, and the First Nation Energy Efficiency Program.

The Efficiency Manitoba Act: Manitoba enables innovation within its mandate. It establishes Efficiency Manitoba as a corporation tasked with implementing demand-side management initiatives, achieving energy and cost savings, reducing GHG emissions, and more to enable innovation in that area.

PATHWAY FORWARD

Developing an integrated energy strategy: Promoting an integrated energy strategy that sets sectoral strategies and guides participants in understanding their roles in energy decarbonization. This approach will create more opportunities for energy innovation across different sectors in the province.

Enabling innovation through better energy market conditions: With limited competition in the energy market, Manitoba should create an environment that promotes innovation and enables innovators to develop and implement energy innovation effectively. This innovative environment could include funding options, public investments, competition with other energy markets, understanding the goals of innovators, identifying factors that influence innovation, and creating policies that promote low-carbon innovation.

QUEST

Pollution Probe

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5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

ONTARIO

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

ONTARIO ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

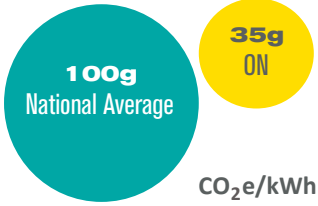
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

POPULATION
16 million
IN 2024

10.9%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

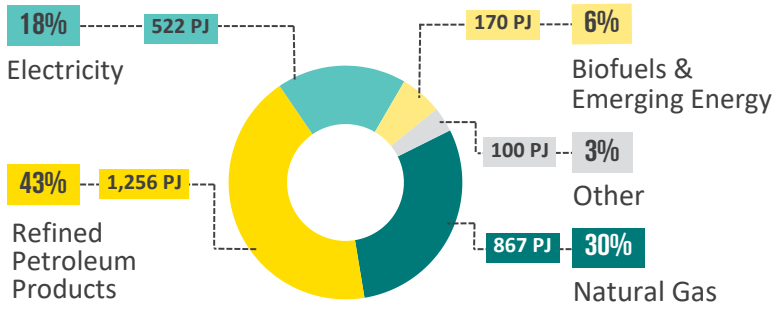


CO_2e/kWh

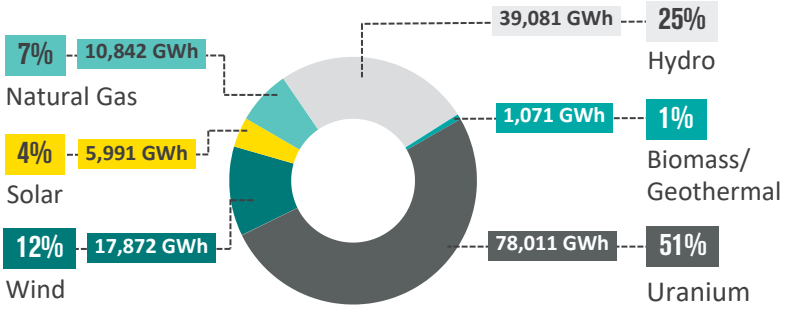
GHG TARGET BY 2030

30%
(below 2005 levels)

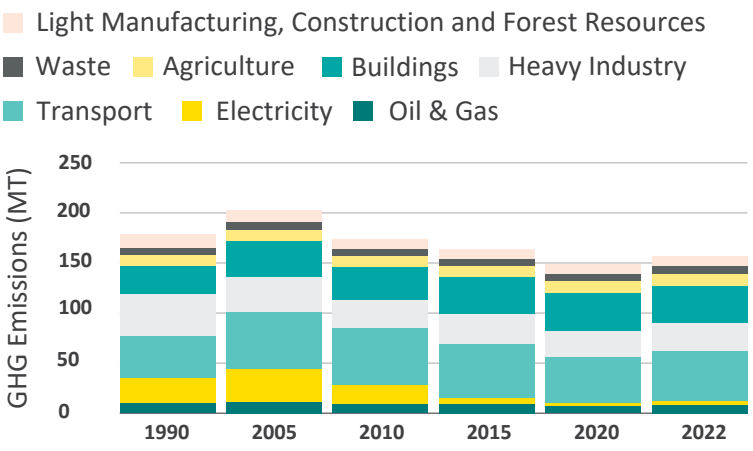
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Ontario's regulatory framework provides a strong foundation for low-carbon energy innovation. However, effective climate leadership across all sectors and a skilled workforce will also be essential to drive energy innovation towards a net-zero economy.

STRENGTHS

Regulatory framework to promote innovation: Ontario is a leader in establishing a regulatory framework that encourages innovation, including mandates for innovation, energy efficiency, demand management, and conservation under the Ontario Energy Board Act, the OEB Innovation Sandbox Challenge, Innovation Sandbox 2.0, and regulatory tools such as the Benefit-Cost Analysis (BCA) Framework and a new regulation under the Planning Act.

Spending on DSM: The new electricity DSM will be a 12-year conservation program with a budget of up to $10.9 billion. While announced after the assessment was completed, and hence not reflected in the results, the new plan can create more opportunities for energy innovation across the province.

PATHWAY FORWARD

Climate leadership: Developing a long-term climate strategy across all sectors, with clear GHG reduction targets and decarbonization pathways, will help direct innovation activities towards advancing low-carbon innovation and encouraging new participants.

Workforce needs: Develop the workforce to meet future needs for a skilled workforce qualified to drive innovation in the energy sector to achieve a net-zero energy future.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:

1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901

2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now

3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf

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LOW CARBON ENERGY INNOVATION

QUEBEC

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

QUEBEC ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

POPULATION
9 million
IN 2024

6.7%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

100g National Average

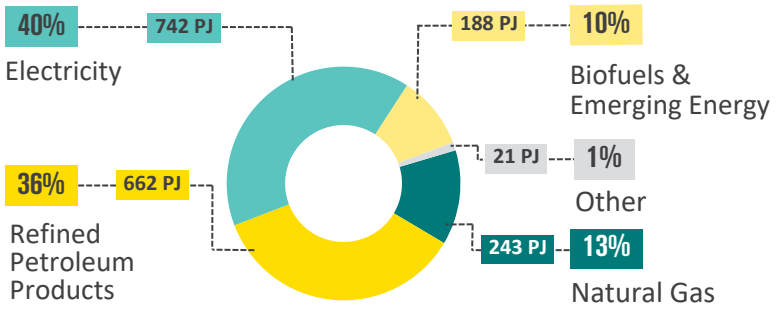
1.2g QC

CO_2e/kWh

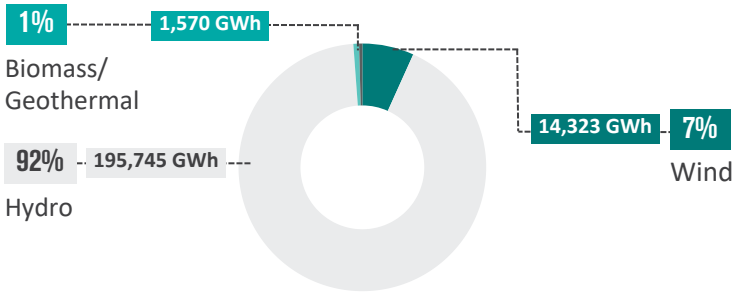
GHG TARGET BY 2030

37.5%
(below 1990 levels)

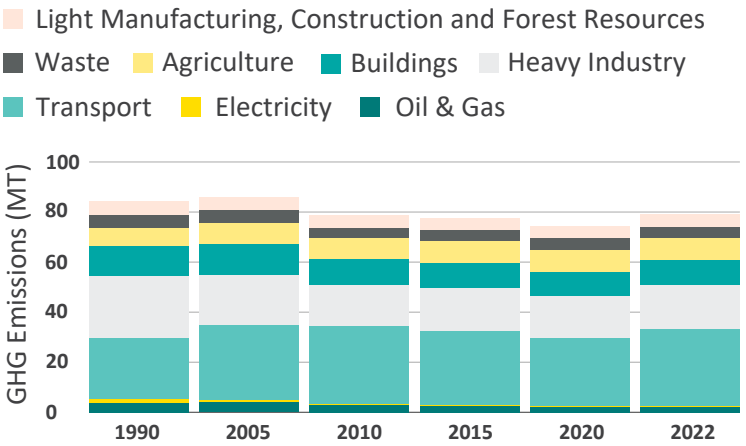
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Québec's strong innovation ecosystem, strategic allocation of carbon pricing revenues, and sectoral climate leadership create a strong foundation for low-carbon energy innovation. However, promoted enquiry services, regulatory trials, and a skilled workforce for current and future needs are essential to advancing energy innovation toward a net-zero economy.

STRENGTHS

The innovation ecosystem: Québec is a leader in developing a diverse and active energy innovation ecosystem, supported by a wide range of organizations and initiatives. The province's innovation framework includes research on the energy maturity of Québec SMEs, collaborative R&D hubs, the Institut de recherche en électricité du Québec (IREQ), the Hydro Lab, the Center of Excellence in Transportation Electrification and Energy Storage, Québec's Innovation Zones, the Center of Excellence in Energy Efficiency (C3E), the Mouvement des accélérateurs d'innovation du Québec, InnovHQ, and more. These elements form a comprehensive ecosystem that encourages innovation at every stage, from research and development to deployment, driving progress in energy innovation across the province.

Industrial Carbon Pricing: Québec allocates revenue from its cap-and-trade system to fund initiatives under the 2030 Plan for a Green Economy and commitments from the 2013-2020 Climate Change Action Plan, supporting climate goals and low-carbon innovation.

PATHWAY FORWARD

Enabling innovation through better energy market conditions: With limited competition in the energy market, Québec should create an environment that promotes innovation and enables innovators to develop and implement energy innovation effectively. This innovative environment could include funding options, public investments, competition with other energy markets, understanding the goals of innovators, identifying factors that influence innovation, and creating policies that promote low-carbon innovation.

Workforce needs: Develop a skilled workforce to meet current and future needs, such as through the Partnership Training Grants, which will support innovative activities to advance low-carbon innovation and enable new participants.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

NEW BRUNSWICK

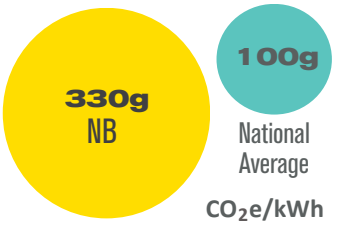
A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

POPULATION
849K
IN 2024

9.8%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)



CO_2e/kWh

GHG TARGET BY 2030

46%
(below 2005 levels)

NEW BRUNSWICK ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

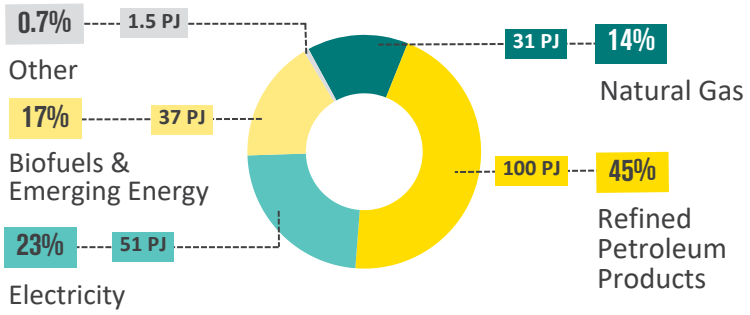
- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

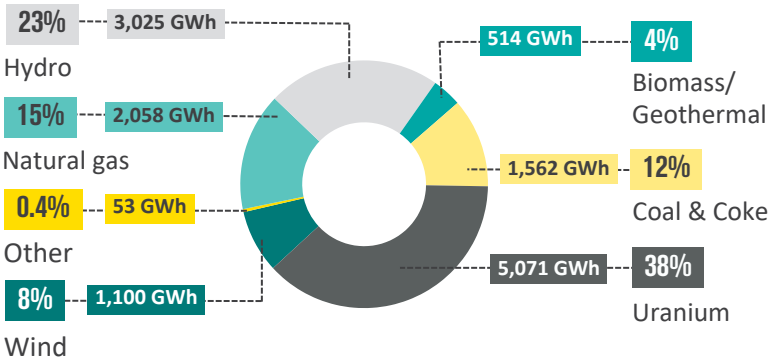
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)

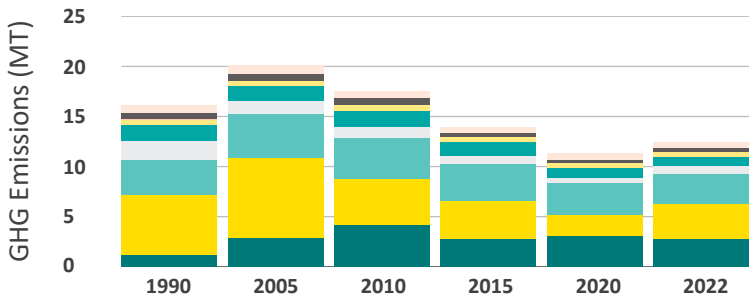


ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR

Light Manufacturing, Construction and Forest Resources
Waste · Agriculture · Buildings · Heavy Industry
Transport · Electricity · Oil & Gas



INSIGHTS FOR PROMOTING INNOVATION

New Brunswick's climate leadership, climate action accountability, and energy efficiency measures can potentially direct innovation toward net zero. However, a supporting regulatory and policy framework is needed to enable low-carbon innovation.

STRENGTHS

The innovation ecosystem:
New Brunswick's diverse energy ecosystem creates more energy innovation opportunities. Key contributors include the Smart Grid Research Lab, the Off-Site Construction Research Centre, the NSERC Energy Storage Technology Network, the Smart Grid Innovation Network, and the Green Energy Hub.

Indigenous energy initiatives:
New Brunswick has implemented several reconciliation initiatives that create the conditions to support low-carbon innovation and contribute to the transition to a net-zero economy. Key initiatives include the Energy Transition Working Group: First Nations and Key Stakeholders, the Locally Owned Renewable Energy Projects that are Small Scale, the Neweg Energy Project, and Community Renewable Energy.

PATHWAY FORWARD

Supporting policies for the energy transition: Developing more policies to support the energy transition. Initiatives like time-of-use pricing, green heating solutions, and developing an ambitious building code, similar to its recent initiatives on smart meters, net metering, and energy efficiency, will encourage greater innovation aimed at achieving net zero in the energy sector and create more opportunities in innovation in this area.

Supporting innovation through a regulatory framework: Developing a strong regulatory framework that mandates innovation and strengthens tools like regulatory trials and enquiry services. This framework will provide an environment for testing and implementing innovative solutions, accelerating progress toward net zero goals.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

NOVA SCOTIA

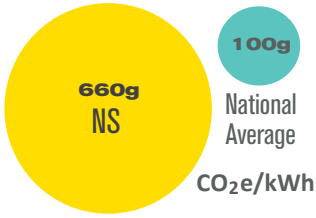
A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

POPULATION
1 MILLION
IN 2024

10.6%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)



GHG TARGET BY 2030

53%
(from 2005 levels)

NOVA SCOTIA ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

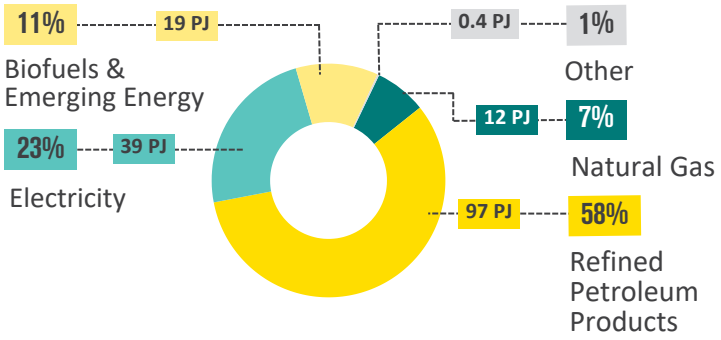
- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

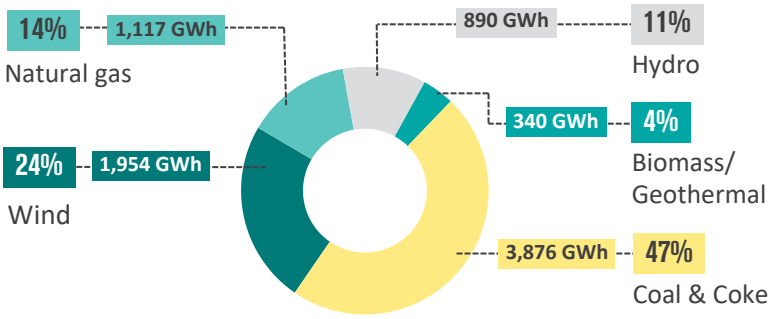
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

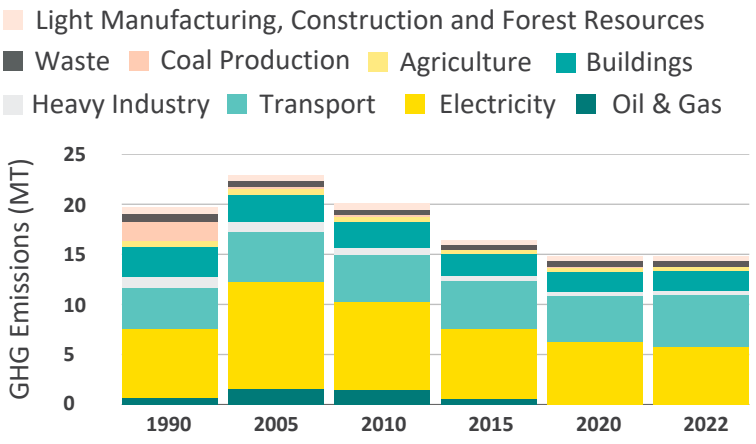
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Nova Scotia's strong climate leadership and innovation ecosystem provide a foundation for advancing low-carbon energy innovation. However, promoting energy innovation requires comprehensive energy system planning, a well-prepared skilled workforce for future needs, and an environment that supports innovators in developing and implementing energy innovations.

STRENGTHS

Climate Leadership:
Nova Scotia demonstrates strong climate leadership with a target to reduce GHG emissions by 53% by 2030 and achieve net-zero emissions by 2050, supported by a clear strategy and regular accountability reports. This leadership can encourage innovators to pursue low-carbon targets.

The innovation ecosystem:
Nova Scotia's diverse energy ecosystem and third-party organizations create opportunities for energy innovation. Key components include Volta Labs, incubation facilities, the green hydrogen research cluster, the Workplace Innovation and Productivity Skills Incentive, the Nova Scotia First Fund, FORCE, Invest Nova Scotia, and Efficiency Nova Scotia.

PATHWAY FORWARD

Enabling innovation through better energy market conditions: Given the limited competition in Nova Scotia's energy market, enabling an environment that supports and accelerates innovation is necessary. This could include introducing funding mechanisms, encouraging public investment, allowing competition with other energy markets, understanding innovators' goals, identifying key drivers of innovation, and implementing policies that promote low-carbon innovation.

Workforce needs: Develop the workforce to meet current and future needs for a skilled workforce qualified to drive innovation in the energy sector to achieve a net-zero energy future.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:
1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now
3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

PRINCE EDWARD ISLAND

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

PRINCE EDWARD ISLAND ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

POPULATION
177K
IN 2024

15.2%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

100g National Average

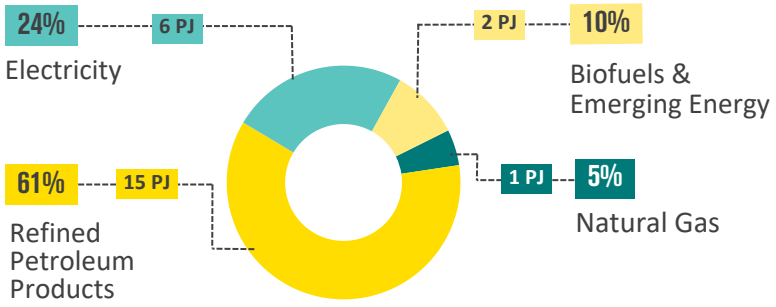
2g PEI

CO_2e/kWh

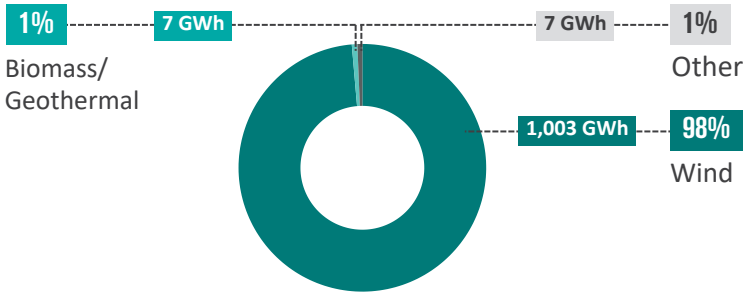
GHG TARGET BY 2030

40%
(below 2005 levels)

FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)

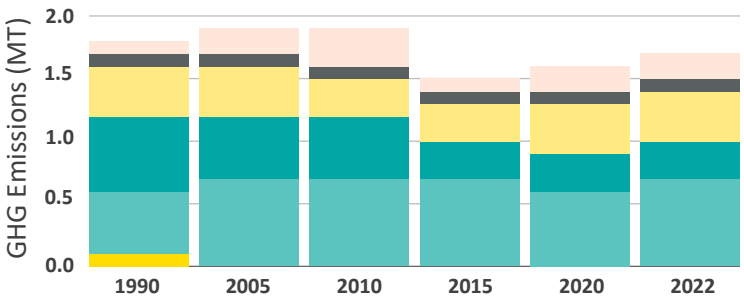


ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR

Light Manufacturing, Construction and Forest Resources
Waste
Agriculture
Buildings
Transport
Electricity



INSIGHTS FOR PROMOTING INNOVATION

Prince Edward Island is a leader in climate action and is on a path toward achieving a net-zero economy by 2040, creating opportunities for innovation in this direction. However, to further enhance progress and drive energy innovation toward a net-zero economy, the province can prioritize developing sector-specific pathways, allocating carbon pricing revenues to low-carbon energy innovation, establishing a regulatory framework for innovation, and implementing targeted policies that support research, development, and deployment innovation.

STRENGTHS

Climate leadership: Prince Edward Island demonstrates strong climate leadership with its pathway to achieve net-zero emissions by 2040, set net-zero targets in the net-zero Carbon Act and its 2040 net-zero Framework, and accountability about net-zero goals. These initiatives encourage innovators to pursue low-carbon targets actively.

The innovation ecosystem: Prince Edward Island's diverse energy ecosystem and third-party organizations create more opportunities for energy innovation. Key contributors include the Wind Energy Institute, the Climate Registry, the Cleantech Learning and Innovation Centre, BioCommons Research Park, the Prince Edward Island BioAlliance, the BioAccelerator, Emergence, the Bioscience Incubator, PEI Cleantech Innovative Collaborations, Cleantech Park, and Summerside's Living Lab Program.

PATHWAY FORWARD

Supporting policies for the energy transition: Focus on creating additional policies to support the energy transition. Initiatives such as implementing smart meters, promoting green heating solutions, RNG targets, advanced pricing systems and enhancing energy efficiency measures can encourage innovation in these areas.

Regulatory framework to promote innovation: Enhancing innovation by establishing a strong regulatory framework, incorporating mandates for innovation, and using tools such as regulatory trials and enquiry services would create conditions for innovation.

QUEST

Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

Data used comes from:

1 Statistics Canada (2024) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901

2 The Pembina Institute (2024) www.pembina.org/pub/all-together-now

3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf

4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA

5 Government of Canada (2024) https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

LOW CARBON ENERGY INNOVATION

NEWFOUNDLAND & LABRADOR

A transformation in how energy is generated, distributed, and used, is necessary to achieve Canada's target of net-zero by 2050. However, current regulatory and market frameworks hinder the development and deployment of the low-carbon innovations needed.

To assess low-carbon energy innovation we developed a National Low-Carbon Energy Innovation Assessment that identifies strengths and gaps and highlights successful pathways forward in each jurisdiction.

POPULATION
543K
IN 2024

2.8%
since 2019

GHG INTENSITY OF THE ELECTRICITY GRID (2022)

100g National Average

17g NL

CO_2e/kWh

GHG TARGET BY 2030

30%
(below 2005 levels)

NEWFOUNDLAND & LABRADOR ASSESSMENT

Strong	Enabling conditions developed and integrated
Moderate	Key conditions in place, with room to grow
Emerging	Some foundational elements - early-stage
Limited	Few enabling conditions - opportunity for action
N/A	Not assessed

Policy Area 1: Enabling Net-Zero Energy Policies

- Climate Leadership
- Sectoral Climate Leadership
- Industrial Carbon Pricing

Policy Area 2: Enabling Conditions for Energy Innovation

- Energy Market Structure
- Supporting Policies for the Energy Transition

Policy Area 3: Enabling Energy Innovation

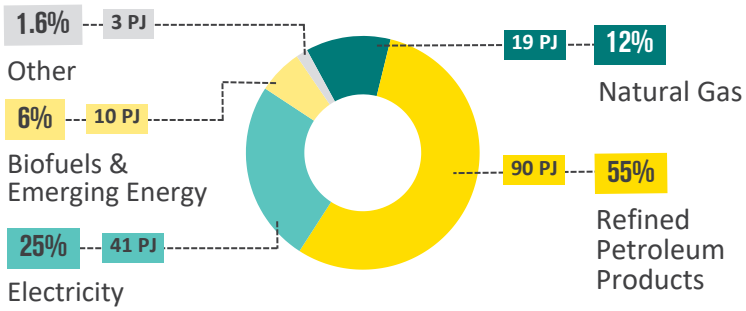
- Enabling Innovation: Policies
- Enabling Innovation: Regulatory
- Enabling Innovation: Ecosystem

Policy Area 4: Building the Comprehensive Needs of Innovation (Data Collection*)

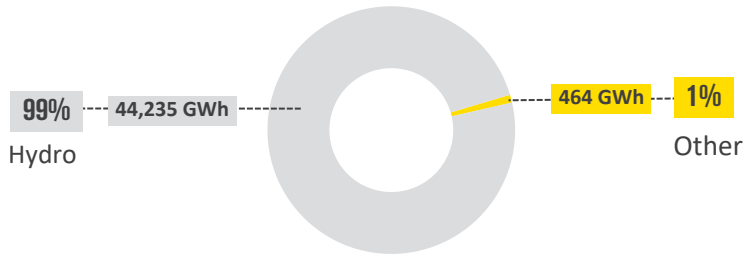
- Energy Workforce Needs
- Energy Community Engagement
- Energy Reconciliation
- Energy Equity

*Data collection means that this topic was not assessed, but data was collected.

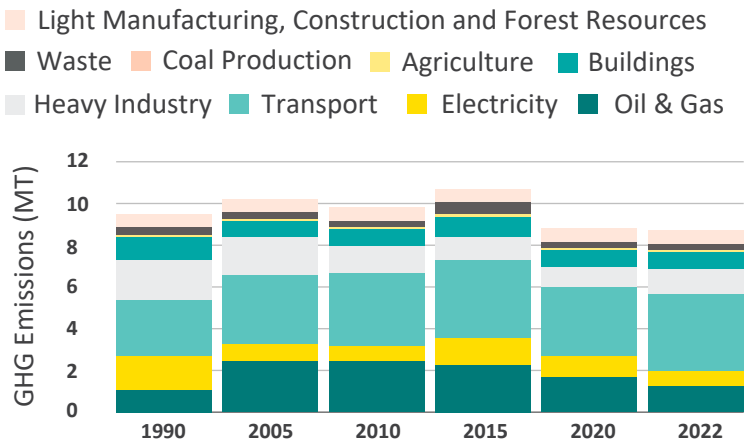
FINAL ENERGY CONSUMPTION IN PETAJOULES (2022)



ELECTRICITY GENERATION IN GWH (2022)



GHG EMISSIONS BY SECTOR



INSIGHTS FOR PROMOTING INNOVATION

Newfoundland and Labrador's innovation ecosystem and involvement from third-party organizations create the conditions to promote innovation. However, strong climate leadership across all sectors and a regulatory framework are needed to leverage the innovation ecosystem to drive energy innovation towards a net-zero economy.

STRENGTHS

The innovation ecosystem: Newfoundland and Labrador has a diverse innovation ecosystem that creates more opportunities for energy innovation to happen that includes various third-party organizations, such as TechNL, Econext, OceansAdvance, Energy NL, the Atlantic Canada Opportunities Agency, and Energy Research & Innovation. It also has innovation-focused centers, including the NL Ocean Technology R&D Facilities, the Innovation Centre, the Harsh Environment Research Facility, and the Marine Biomass Innovation project.

Workforce needs: Newfoundland and Labrador are working to address current workforce needs in the energy sector. Programs such as low-carbon technician courses and training and professional development opportunities promote the development of a skilled workforce qualified to drive innovation in the energy sector.

PATHWAY FORWARD

Supporting policies for the energy transition: Focusing on creating additional policies to support the energy transition. Initiatives such as implementing smart meters, promoting green heating solutions, expanding distributed energy resource programs like net metering, enhancing energy efficiency measures, establishing a more ambitious building code, and introducing green heating solutions similar to the TakeCHARGE: Oil to Electric Incentive Program can promote innovation in these areas.

Supporting innovation through a regulatory framework: Developing a strong regulatory framework that mandates innovation and strengthens tools like regulatory trials and enquiry services. This framework will provide an environment for testing and implementing innovative solutions, accelerating progress toward net zero goals.

QUEST Pollution Probe

FOR MORE INFORMATION, SEE THE FULL REPORT AT: QUEST Canada & Pollution Probe

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3 Government of Canada (2024) https://publications.gc.ca/collections/collection_2024/eccc/En81-4-2022-3-eng.pdf
4 Canada Energy Regulator (2023): https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA
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5. DISCUSSION AND PATHS FORWARD

Canada is a diverse country with diverse energy systems. Each jurisdiction is at different stages of their low-carbon energy journey, and will require different solutions. While all will require innovation in low-carbon energy, there are different barriers and opportunities in each.

Saying that, all of Canada is starting a journey to sustainable net-zero energy systems. And while they are starting from different places and with different constraints and opportunities, there is much that can be learned from each other. Some overarching conclusions and lessons learned include the following.

1. Align climate policy and market signals

Low-carbon energy innovation thrives in competitive energy markets, but only when backed by stable, credible policy. Investors and innovators need consistent, long-term climate policy to make confident decisions. Uncertainty is holding back progress.

Best practices:

Alberta's competitive energy markets, both in supply and retail, create a strong environment for innovation. Yet as there is not a clear policy signal in Alberta, innovation is not always directed towards reducing emissions and creating a low-carbon energy system. In comparison, in BC there is strong policy leadership, and they have worked to create competition in spaces they can, such as allowing competition in natural gas supply and for renewable electricity projects.

Ontario combines moderate competition with strong policy tools (e.g., its $10.9 billion DSM framework[12] and Innovation Sandbox[13]), which can enable better alignment between innovation and emissions reduction goals even without direct policy guidance.

2. Modernize energy regulation to enable innovation

Outdated regulatory frameworks hinder innovation. Canada's provinces and territories need smarter regulatory frameworks that balance customer protection with flexibility, including advanced rate systems and performance-based models that reward results, not just compliance.

Best practices:

Ontario is a leader in promoting innovation in the regulatory system. Initiatives such as the Innovation Sandbox, where the Ontario Energy Board facilitates pilot projects and provides regulatory guidance to drive energy innovation. Ontario further supports innovation by mandating the consideration of innovation, energy efficiency, demand management, and conservation under the Ontario Energy Board

[12] Independent Electricity System Operator. (2024). *2025–2027 DSM plan with beneficial electrification*. https://www.ieso.ca/-/media/Files/IESO/Document-Library/eDSM/2025-2027-DSM-Plan-with-Beneficial-Electrification.pdf

[13] Ontario Energy Board. (n.d.). OEB Innovation Sandbox. https://www.oeb.ca/_html/sandbox/index.php

Act, along with various regulatory tools designed to enable progress. Complementing these efforts, Ontario's use of performance-based regulation could incentivize innovation among regulated utilities with proper direction.

3. Plan energy systems holistically

Effective energy planning must look beyond silos. Integrated energy systems planning that holistically look at cross-sectors are key to identifying where emissions reductions can have the greatest impact and where innovation can unlock cost savings. Sectoral climate leadership starts with a systems view.

Best practices:

Several jurisdictions have begun taking steps towards holistic energy planning. Manitoba has an integrated resource plan for both gas and electricity. However, the broader energy ecosystem and the interactions between different sectors must be fully addressed. Other jurisdictions are planning to develop plans in the near future. Ontario has proposed an Integrated Energy Resource Plan to promote an affordable, reliable, clean energy system. In Québec, Bill 69 is being advanced to support the development of an integrated resource plan that facilitates the province's energy transition. British Columbia's *Powering Our Future: BC's Clean Energy Strategy* highlights the need for system-wide planning to build a resilient, clean energy future.

4. Prioritize thermal energy innovation

Canada's decarbonization efforts often over-focus on electricity, while overlooking heating, which accounts for the major share of energy use. Innovation in clean thermal energy is essential for a full transition to a low-emissions economy.

Best practices:

Some jurisdictions have introduced supportive measures for investing in heat pumps, either as stand-alone systems or as hybrid heating. For example, Manitoba offers rebates for heat pump upgrades, while Ontario and Québec have established programs for hybrid heating systems. However, there is still a gap in comprehensive policies to guide and accelerate the transition to a clean thermal future and to consider other thermal energy options, such as district heating. Québec is currently the most advanced in this area, as the Québec government is bringing together the province's two main energy distributors, Hydro-Québec and Énergir, with a shared goal of reducing GHG emissions from building heating by 50% by 2030.

5. Put Indigenous inclusion in the centre

Innovation must be inclusive. Indigenous communities, in particular, are key partners in Canada's energy future, as energy projects impact their lands and economies. Early, meaningful engagement builds trust, enables social acceptance, and long-term partnerships that drive shared success.

Best practices:

Some jurisdictions have taken steps, such as Saskatchewan, which has introduced initiatives such as the First Nations Furnace Replacement Rebate and the Indigenous Business Gathering. In Manitoba, the Community-Driven Outcomes Contract (CDOC)—an innovative pay-for-success social finance tool—uses private capital to support First Nations in their energy transition. In the Yukon, independent power producers (IPPs) require that at least 50% of projects include First Nation ownership.

6. Build the skilled workforce the transition requires

Canada needs a skilled workforce ready to build, install, maintain, and manage a new energy system, and fast. This means not just training for today's needs, but anticipating tomorrow's skills. Investment in education and re-skilling must match the ambition of the transition.

Best practices:

British Columbia has begun to address future skills gaps through its *Powering Our Future: BC's Clean Energy Strategy*, which offers training for roles such as EV technicians, heat pump installers, and hydrogen specialists. The StrongerBC Future Ready Action Plan supports training for over 250 in-demand careers, aiming to prepare 8,500 skilled workers. Looking for future needs, the Workforce Readiness for the Clean Economy Strategy identifies emerging labour needs under CleanBC and outlines actions to help individuals and businesses succeed in the evolving clean economy.

Jurisdictional comparisons

Every jurisdiction in Canada operates their energy system in a unique way. However, there are some commonalities, such by technology or by region, where common issues arise.

Large hydropower-dominated provinces: BC, Manitoba and Québec

- **BC**, **Manitoba**, and **Québec** are all large hydropower-dominated provinces. These jurisdictions also have the lowest cost of electricity in Canada. While they also include natural gas systems, greater electrification is being pursued by all three. There are thus opportunities for innovation that promotes electrification and fuel switching.

- In addition, all three are dominated by large monopoly Crown corporations. Competition is generally limited in these provinces, and in many cases not seen as a priority. To compensate, policy direction is very clear and strong, particularly in **BC** and **Québec**, and it is emerging in **Manitoba**.

- For these provinces, emphasis should be placed on developing competition where it is appropriate, and ensuring that the enabling conditions, such as smart meters and innovative tariffs, are available to allow for new services. Thermal energy is another area where additional development could occur. Developing regulatory tools to support innovation could also contribute to deploying innovation.

Prairie provinces: Alberta and Saskatchewan

- Both **Alberta** and **Saskatchewan** have large fossil fuel resources, both coal and natural gas, and limited hydropower resources. As such, their energy systems have historically relied on fossil fuels to meet their energy needs.

- In both provinces developments in renewable energy and nuclear are underway, but both provinces will likely continue to be reliant on fossil fuels for the near future.

- **Alberta** has some benefits due to the competitive nature of its energy systems. If coupled with strong policy there is a lot of opportunity for new, lower-emitting services to be developed, aiding in reducing emissions in the system.

- Regulatory reform and the development of regulatory tools promoting innovation would also benefit both. In addition, companies there experienced in developing large energy infrastructure and working with Indigenous communities can be coupled with the development of new technologies, such as nuclear reactors, renewable energy or geothermal. **Saskatchewan**, being smaller, has more limited resources, but is able to work with **Alberta** and other jurisdictions to develop new resources, such as nuclear.

Atlantic provinces: Limited market opportunities

- **New Brunswick**, **PEI**, **Nova Scotia**, and **Newfoundland and Labrador** are all interconnected and are developing strong frameworks for moving to a net-zero future and developing renewable energy. All four provinces, however, are relatively small and have limited market opportunities. Competition is likely to be more limited, and so public financing is likely to play a larger role.

- All four provinces also have strong policy direction, with **PEI** and **Nova Scotia** leading. Yet in all, regulatory modernization and the introduction of regulatory tools for innovation (such as Innovation Sandboxes) would be useful. **Nova Scotia** has taken early steps on modernizing its energy regulatory system, and more can be built off that.

Ontario: An outlier

- **Ontario** is a bit of an outlier and there are similarities with **Alberta** in that there is competition in the energy sector, although at a limited level. At the same time, government direction is greater than in those, yet less in the jurisdictions that rely more on monopoly integrated utilities.

- **Ontario** is also a leader in Canada on regulatory modernization and in regulatory tools to support innovation, with the first Innovation Sandbox being introduced.

6. CONCLUSIONS

This National Low-Carbon Energy Innovation Assessment is the first of its kind to provide a pan-Canadian analysis of the enabling conditions for low-carbon energy innovation. It was developed to identify the strategies and factors that promote low-carbon energy innovation across Canada, highlight what gaps exist, and provide suggestions on best practices to address them. It aims to guide jurisdictions in strengthening low-carbon energy innovation within their jurisdiction so that all of Canada can benefit.

The assessment was developed through an iterative process of multiple stakeholder engagements, literature reviews, and data collection. It incorporated insights to create and refine the assessment findings.

The findings reinforce that advancing low-carbon energy innovation require multiple, coordinated strategies:

1. Promote low-carbon innovation through creating enabling conditions

- Develop a clear vision for low-carbon energy innovation with supporting policies and funding opportunities while ensuring energy utilities can support innovation that benefits consumers.
- Create more competition in energy markets with a strong regulatory framework, amend energy regulation acts, and support innovators by offering regulatory assistance and enabling an ecosystem for progress.

2. Guide innovators toward a net-zero trajectory

- Establish a clear direction for low-carbon energy innovation by demonstrating strong climate leadership and holistic energy planning.
- Enhance energy transition strategies to promote innovation in areas such as smart meters, advanced pricing, net metering, and cleaner heating.

3. Need for regulatory modernization

- Establish more performance-based regulation, in jurisdictions where it is not present.
- Develop regulatory tools for innovation, such as Innovation Sandboxes.[14]

[14] For more information see Reports from the previous Innovation Sandboxes initiative at: https://www.pollutionprobe.org/innovation-sandboxes-project/ and https://questcanada.org/innovation-sandboxes-project/

4. Support inclusive low-carbon innovation

- Create favourable conditions for a successful energy transition by addressing workforce needs and promoting equity, reconciliation, and collaboration among regulators, industry, third-party organizations, the private sector, and academia to drive innovation and ensure inclusive participation.

Evaluating innovation is challenging because there is no single measure that definitively indicates success. Direct and indirect factors can influence innovation outcomes. Sometimes, key metrics have been difficult to track due to limited data availability.

Low-carbon energy innovation will be critical for Canada's future economic development, and to help reduce emissions. To ensure Canada can capture the value from this innovation, there is a need for continued work on low-carbon innovation assessment, building on the foundation established here.

7. ANNEXES

Annex 1: Methodology & Methodological Approach

Methodology overview:

The methodology aimed to assess the policies and factors that promote low-carbon innovation in Canada's energy sector. Multiple iterations of stakeholder engagement, literature reviews, and data collection were conducted to incorporate additional insights to create and refine the low-carbon innovation assessment , providing actionable guidance for policymakers to advance initiatives in their jurisdictions.

Methodology outcome:

4 policy areas, 12 topics, 26 metrics, and 52 sub-metrics were developed to evaluate the policies and factors driving energy innovation directly and indirectly within each jurisdiction.

1. Methodology process

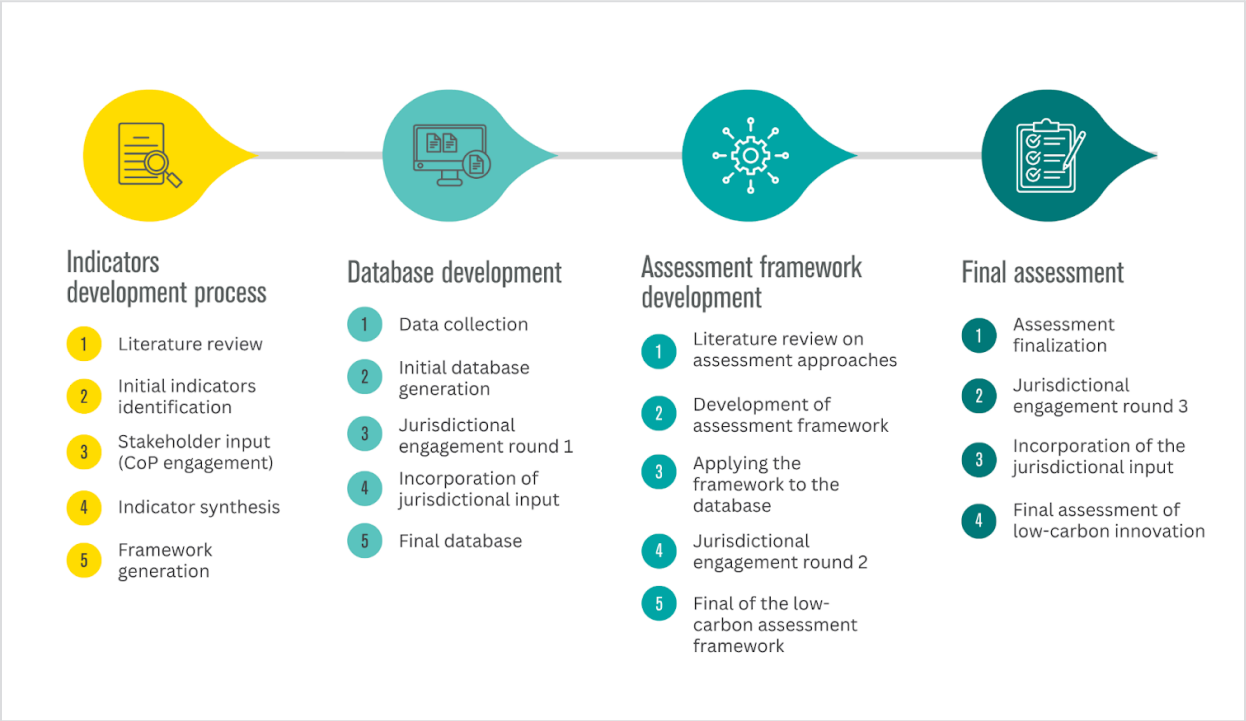
Overview:

The methodology includes several key steps: first, developing framework indicators; second, compiling a database of policies and factors influencing energy innovation both directly and indirectly; third, developing an assessment system; and finally, applying this system to evaluate policies and factors in each jurisdiction, resulting in a low-carbon innovation assessment.

The data used came from various sources, including an analysis of publicly available data from official websites, research on innovation, three rounds of engagement with each jurisdiction, and several one-on-one discussions with key stakeholders.

2. Methodological approach

Figure - Annex 1.1: The methodological approach



The methodology consists of the following key steps:

Step 1: Indicator development process

1. Literature review:

A comprehensive review of methodologies from established frameworks, such as Efficiency Canada's Energy Efficiency Scorecard,[15] IEA Tracking Clean Energy Innovation a Framework for Using Indicators to Inform Policy,[16] Smart GRid Innovation Network's Smart Energy Benchmarking as well as other Canadian-specific scorecards (such as those from Pembina and Clean Energy Canada). The focus was on identifying strategies for evaluating policies and factors that support low-carbon energy innovation across Canada.

[15] Efficiency Canada, 2022 Canadian Energy Efficiency Scorecard: Provinces and Territories, 2022, https://www.efficiencycanada.org/scorecard-2022/

[16] IEA, Tracking clean energy innovation, A framework for using indicators to inform policy, November 2020, https://iea.blob.core.windows.net/assets/b742edc1-edbc-4e73-ab0a-91f803fc3176/Tracking_clean_energy_innovation.pdf

2. Initial indicators development:

Creating an initial set of indicators to assess low-carbon energy innovation policies. These indicators are categorized into policy areas, topics, metrics, and sub-metrics, enabling jurisdiction-specific assessment.

3. Stakeholder input:

Engagement with Community of Practice (CoP) participants to gather additional indicators and recommendations, ensuring diverse knowledge and perspectives are included.

4. Indicators synthesis:

The combination of indicators from the literature review and those proposed by stakeholders, resulting in a cohesive and comprehensive set of indicators.

5. Framework generation:

Development of a final framework of indicators, structured by policy areas, topics, metrics, and sub-metrics to support detailed evaluations across jurisdictions.

Step 2: Database development

1. Data collection:

Gathering data on low-carbon energy innovation policies aligned with the indicators framework from credible sources, including government and utility websites.

2. Initial database generation:

Populating the framework with collected data to create a preliminary database.

3. Jurisdictional engagement input:

Engagement sessions were conducted with each jurisdiction to review the database, incorporate feedback, and ensure comprehensive coverage. The database and its structure are updated as needed.

4. Database generation:

Refining the database based on input and data collection from various jurisdictions.

Step 3: Assessment framework development

1. Literature review on assessment approaches:

A comprehensive review of assessment methods (see step 1.1 for references).

2. Development of assessment framework:

The creation of an assessment system to evaluateCanada's low-carbon energy innovation landscape. This system enabled us to evaluate jurisdictions and highlight best practices and successful case studies.

3. Applying the assessment system to the database:

The assessment system was applied to data from the jurisdictional database.

4. Assessment development:

Producing an initial version of the low-carbon innovation assessment.

5. Jurisdictional engagement:

Each jurisdiction had an opportunity to review the database and the assessment system. Feedback led to a refinement of the database, assessment, and overall structure.

Step 4: Final assessment

1. Assessment finalization:

Generating the final version of the low-carbon innovation assessment.

2. Jurisdictional review:

Sharing the final assessment with all jurisdictions, presenting it during engagement sessions, incorporating their input, and making necessary adjustments.

Establishing the assessment system

Overview:

Four policy areas, 12 topics, 26 metrics, and 52 sub-metrics were developed to assess policies and factors driving energy innovation across Canadian jurisdictions. This framework highlights key low-carbon innovation drivers and provides actionable insights for achieving net-zero targets in each jurisdiction.

3.1 Timeframe considerations for jurisdictional indicators

Given that different policies, acts and regulations were included, and varied across timelines, the following conditions were considered when assessing:

- Policies: These are active policies from 2015 onward, assuming that policies can be long-term, but they are typically more flexible and subject to change. A ten-year timeframe captures long-term policies while ensuring they are relevant and currently applicable.
- Acts and regulations: These are included without a time limit, assuming that legislated instruments are more stable and legally binding than policies.
- Current conditions and factors: These represent the current conditions affecting the jurisdiction at the time the assessment was completed.

In addition, the data was included up to the end of February 2025. Policies published after this date were not included.

3.2 Scope and focus

Overview:

The Low-Carbon Energy Innovation Assessment evaluates energy innovation across Canadian jurisdictions, focusing on the provincial and territorial government level and suggesting actionable insights to support innovation to meet net-zero targets.

This study examines energy innovation across Canadian jurisdictions through a comprehensive framework comprising four policy areas, 12 topics, 26 metrics, and 52 sub-metrics. The framework evaluates key drivers of low-carbon innovation and provides actionable insights to support innovation to meet net-zero targets.

This assessment focuses on the role of provincial and territorial governments in creating conditions that promote net-zero innovation and placing their jurisdictions on a trajectory toward a net-zero future. It considers policies and factors at the provincial or territorial level, excluding municipal or federal initiatives, unless there is a collaboration between federal and jurisdictional levels, in which case such factors are included.

3.3 Assessment development

3.3.1 Assessment rational

The assessment system was designed to be measurable, transparent, clear, and practical while aligning with input from participants in each jurisdiction. By implementing policies and measures aligned with the four policy areas, jurisdictions can enable net-zero innovation that could contribute to reaching the 2050 net-zero targets.

The database on factors and policies may not reflect previously implemented actions to reduce GHG emissions, such as the percentage of clean energy in each jurisdiction's energy grid. This means that even if a province has already implemented a specific policy, the database will not consider it.

3.3.2 Development of policy areas and topics

The low-carbon innovation assessment was developed to highlight the essential policies and factors driving low-carbon energy innovation across Canadian jurisdictions. To this end, four key policy areas were developed to capture the essential elements to enable low-carbon innovation aligned with net-zero objectives. Each policy area is further broken down into several topics, providing a more detailed understanding of the policy areas, as outlined in Table 2.1.

3.3.3 The importance of policy areas in promoting innovation

Policy Area 1: Enabling net-zero energy policies

Why is it important for innovation?

Clear climate policies are essential for driving low-carbon innovation by guiding innovators toward achieving low-carbon targets. Policy can contribute to setting the direction of innovation and shaping its effects in the markets.[17] Long-term policy frameworks enable governments and stakeholders to plan and implement a smooth energy transition. These policies stimulate investment, drive research and development, enable innovative business models, and accelerate the adoption of low-carbon technologies, all while building trust among investors, industries, and the public.[18]

[17] OECD, Competition and Innovation: A Theoretical Perspective, May 2023, https://www.oecd.org/en/publications/competition-and-innovation-a-theoretical-perspective_4632227c-en.html

[18] IEA, Net Zero by 2050 A Roadmap for the Global Energy Sector, October 2021, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

Policy Area 2: Enabling conditions for energy innovation

Why is it essential for innovation?

A competitive energy market and energy transition policies are essential in enabling innovation. These conditions, policies and initiatives direct innovators to pursue low-carbon initiatives in the energy transition sector. The jurisdictional engagements highlighted that a competitive market and/or a supportive regulatory environment could facilitate innovation. A literature review supports this, showing that various factors, including competition, influence innovation potential. Harvard Business School also emphasizes that technological innovation is shaped by multiple factors, with healthy competition playing an essential role.[19,20] While these factors are not necessarily preconditions for low-carbon energy innovation, they can create a more conducive environment. Additional preconditions that could further promote innovation include:[21]

- Funding and available resources significantly influence a company's ability to engage in innovative activities
- Public investments
- Encouraging competition between economies could drive innovation in utilities operating within non-competitive energy markets, particularly if the innovation has value in other jurisdictions
- Understanding the objectives of an innovator, such as financial goals, market impact, or technological advancement
- Identifying factors influencing innovators, such as funding availability, potential returns, risk-adjusted rates of return on investment, and potential earnings from product sales
- Broader policies, such as a provincial RNG target, can promote innovation by encouraging the development of various types of RNG
- Jurisdictional provisions aimed at achieving broader policies (e.g., environmental or transportation goals) can be important sources of financing, enhancing companies' incentives and capacity to innovate
- Collaboration allows companies to work together to create new products and services, leveraging shared expertise and resources
- Public programs such as that allocate funding for innovative low-carbon solutions
- Public bodies that invest in innovation
- Workforce, assets and experience

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[19] Professor Michael E. Porter Harvard Business School, Competition and Antitrust: A Productivity-Based Approach, May 2002, https://www.hbs.edu/ris/Publication%20Files/053002antitrust_06eae678-b707-457c-b139-18c38e45e786.pdf

[20] Government of Canada, Growing the new economy: the integral relationship between competition and innovation, January 2018, https://www.canada.ca/en/competition-bureau/news/2018/01/growing_the_new_economytheintegralrelationshipbetweencompetition.html

[21] OECD, Competition and Innovation: A Theoretical Perspective, May 2023, https://www.oecd.org/en/publications/competition-and-innovation-a-theoretical-perspective_4632227c-en.html

- The magnitude and maturity of the firm
- The management decisions and size of the skilled workforce
- The business model and processes
- Other external factors, including political, social, organizational and economic systems
- Regulations, trade and customs, permits and licenses to operate in the markets
- A supportive business environment
- Effective human resource management enhances a firm's ability to leverage the creative ideas of its workforce
- A well-developed business plan is essential for effectively driving the innovation process
- The needed technology and market demand are essential factors to consider
- Network effects in innovation implementation are when consumers value a product not just for its features but also for its adoption by others.

Policy Area 3: Enabling energy innovation R&D, deployment and implementation

Why is it essential for innovation?

Policies tailored to energy innovation indicate the province's priorities and provide clear direction for its innovation path. A supportive regulatory framework and strong ecosystems further facilitate the process and create additional opportunities for innovation.

Policy Area 4: Building the comprehensive needs of innovation: workforce, collaboration, reconciliation, and equity

Why is it essential for innovation?

Policy area 4 outlines the broader conditions essential for a successful net-zero transition, focusing on current and future workforce needs and policies and programs promoting collaboration, reconciliation, and equity. As outlined by the IEA,[22] a transition of the scale and speed described by the net-zero pathway cannot be achieved without the support and participation of citizens. Energy transitions have to take account of the social and economic impacts on individuals and communities, and people must be treated as active participants. These changes will impact people's lives, including transportation, heating, cooking, urban planning, and jobs. Therefore, governments need to ensure that clean energy transitions are people-centred and inclusive. In the net-zero pathway, household energy expenditure as a share of disposable income rises modestly in emerging markets and developing economies as more people gain access to energy and demand for modern energy services increases rapidly. Ensuring energy affordability

[22] IEA, Net Zero by 2050 A Roadmap for the Global Energy Sector, October 2021, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

for households requires careful attention. Policy tools such as tax credits, loans, and targeted subsidies can be used to provide direct support to the most vulnerable populations.

Policies including a skilled workforce for the current and future energy sectors, promoting equity, fostering collaboration, encouraging community involvement, advancing reconciliation, and enhancing inclusivity in energy and climate initiatives establish a strong foundation for supporting and driving innovation success.

3.3.4 Metrics and sub-metrics development

Each policy area and the topics that fell under each were divided into metrics and sub-metrics, as detailed in Tables 3.2-3.5 and Figure 2.3, to assess the direct and indirect impacts of these policies and factors on promoting energy innovation in Canada. The sub-metrics were developed as binary yes/no questions, focusing on the presence of the following:

- Policies and reports
- Acts and regulations
- Current conditions and factors: targets, alignment with GHG targets and existing mechanisms or conditions.

After collecting the data, some metrics were challenging to assess or there was incomplete data to make an assessment possible. As a result, some specific metrics were used only for data collection, as indicated in Tables 3.2-3.5 and were not applied, meaning no assessment was carried out for those metrics. Therefore, 10 sub-metrics were used to collect the data, while 42 sub-metrics were assessed.

Factors contributing to promoting energy innovation are presented in Tables 3.2-3.5.

Additional effective indicators[23,24] not included in this assessment but found essential for driving innovation are:

- Government R&D spending
- The percentage of the budget allocated to innovation (R&D and deployment)
- Private investment leverage in R&D
- Capital mobilization for large-scale infrastructure projects
- Measures to reduce investor risk
- R&D expenditure (could be separate to more factors such as training, software development, Innovation management, acquisition of assets, engineering, acquisition of assets)/R&D intensity (a proportion of total revenues)
- Tax incentives
- Patent activity: the number of patents requested or granted
- Number of scientific papers published
- Software updates

[23] https://www.oecd.org/en/publications/competition-and-innovation-a-theoretical-perspective_4632227c-en.html

[24] https://iea.blob.core.windows.net/assets/b742edc1-edbc-4e73-ab0a-91f803fc3176/Tracking_clean_energy_innovation.pdf

- New products or productivity improvements
- Marketing
- Training
- After-sale services

3.3.5 Weighting structure

The default weighting structure assigned to each topic is 100%, with each submetric distributed evenly across the related metrics for each topic. However, based on participant feedback during multiple engagement sessions (see Stakeholder engagement rounds section above), some of the weightings were adjusted. Below are the detailed weightings for the modified non-default topics:

Topic 1.1: Climate Leadership

- Metric 1: Jurisdictional net-zero policies and targets [60%]
- Metric 2: Demonstrated accountability on climate plan [40%]

Topic 1.2: Sectoral Climate Leadership

- Metric 1: Integrated energy planning [23%]
- Metric 2: Electricity plan [23%]
- Metric 3: Transportation plan[23%]
- Metric 4: Industry plan[23%]
- Metric 5: Other plan [8%]

Topic 2.1: Energy Market Structure

- Metric 1: Energy market: Supply [40%]
- Metric 2: Energy market: Retail [30%]
- Metric 3: Energy market: Regulatory [30%]

Topic 3.2: Enabling Innovation – Regulatory

- Metric 1: Energy regulatory mandate (law) [60%]
- Metric 2: Regulatory innovation tools [20%]
- Metric 3: Enquiry services (part of the sandbox) [20%]

Topic 3.3: Enabling Innovation - Ecosystem

- Metric 1: Third-party organizations for energy innovation [40%]
- Metric 2: A wide ecosystem of innovation (hubs/labs/centres: (part of the Sandbox)) [60%]

Moreover, for the jurisdictions that do not include a gas sector, the relevant metrics were excluded and not considered.

3.3.6 Detailed overview of the policy areas, topics and sub-metrics

Figure 2.3 illustrates the overview of Policy Areas 1-4.

Table - Annex 2.1: Detailed Overview of Policy Area 1

Policy Area 1: Enabling net-zero energy policies			Topic contribution (%)
Topic 1	Climate leadership	This topic evaluates a jurisdiction's climate leadership by assessing efforts to reduce GHG emissions by 2030 and to achieve net-zero by 2050 through clear and ambitious policies. It considers legally mandated climate mitigation plans, ambitious 2030 targets aligned with national commitments, alignment of climate plans with 2030 GHG targets, net-zero signal for 2050, plans to support that, and accountability mechanisms to track progress and promote transparency.	100%
Metric 1	Jurisdictional net-zero policies and targets		
Sub-metric	**A jurisdictional climate change mitigation policy has been in place since at least 2015, or an act is in effect**	This sub-metric includes whether the province has established clear policies to mitigate climate change by 2030. “Yes” indicates the existence of an act that mandates a climate mitigation plan, while “partly” indicates a jurisdictional climate change mitigation policy in place since at least 2015. “No” means there is no policy in place.	12%
	The 2030 climate target is the same or more ambitious than the national target	This sub-metric evaluates whether the province's 2030 target is similar to or more ambitious than the national target, which is to reduce GHG emissions by 40-45% below the 2005 levels by 2030. “Yes” indicates that the GHG target is at least as ambitious as the national target of reducing emissions by 40-45% below 2005 levels by 2030. “No” indicates less ambitious targets.	12%
	The climate plan aligns with the 2030 GHG target	This sub-metric evaluates whether the jurisdiction's climate plan aligns with achieving its GHG reduction targets. ”Yes” indicates that the plan includes a list of specific actions to reduce GHG emissions and demonstrates that these actions collectively meet the	12%

		overall target. “Partly” indicates that policies consist of actions that may not fully meet the GHG targets. “No” means that the plan is not aligned with the target.	
	A jurisdiction net-zero climate signal set for 2050	This sub-metric evaluates whether the jurisdiction has set a signal for a net-zero GHG target by 2050. ”Yes” indicates that the jurisdiction plans to reach net-zero GHG emissions by 2050. “No” indicates otherwise.	12%
	A clear climate plan that aligns with the 2050 net-zero target	This sub-metric evaluates whether the jurisdiction has established a climate mitigation strategy for 2050 that aligns with the net-zero target. ”Yes” indicates that the climate mitigation strategy includes a list of specific actions to reduce GHG emissions by 2050. “No” means there is no policy in place.	12%
Metric 2	Demonstrated accountability on climate plan		
Sub-metric	**There is an accountability report for the climate plan**	This sub-metric assesses if the jurisdiction has an accountability process to meet its climate targets. “Yes” indicates that the jurisdiction has a policy of regularly and scheduled publishing accountability reports. “No” means there is no policy in place.	40%
Topic 1.2	Sectoral climate leadership	This topic evaluates a jurisdiction's plans to reduce GHG emissions in key sectors by 2030: electricity, transportation, hydrogen, and industry. It focuses on mitigation strategies that integrate these sectors into a decarbonization pathway aligned with net-zero objectives and provides clear guidance to utilities and other stakeholders in achieving these targets.	100%
Metric 1	Integrated energy planning		
Sub-metric	**A process for holistic energy system planning**	This sub-metric evaluates whether the jurisdiction has established integrated energy planning. “ Yes” indicates that the jurisdiction has an integrated energy policy. “Partly” means such a policy is in development. “No” means there is no policy in place.	23%
Metric 2	Electricity plan		
Sub-metric	**A jurisdictional electricity mitigation policy or act is in place**	This sub-metric evaluates whether the jurisdiction has established an electricity mitigation policy or act since 2015. “Yes” indicates that a standalone or integrated electricity mitigation policy or act has been implemented since 2015. “No” means there is no policy in place.	7.6%
	The electricity plan aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's electricity plan aligns with its GHG reduction targets. "Yes" indicates that the plan outlines specific actions	7.6%

		collectively achieving the electricity sector's GHG emission reduction target. "Partly" means that the plan includes actions, but they may not fully meet the GHG targets. "No" means the plan is not aligned with the target.	
	The jurisdiction sets a clear decarbonization path for electric utilities	This sub-metric assesses whether the jurisdiction has established a clear path for electric utilities to decarbonize the sector. “Yes” indicates that the provincial government has set a clear plan and target for electricity utilities, providing a defined course of action to decarbonize the sector. “Partly” means that utilities have set a target but lack a clear path, or have published a plan to reach net zero without specific government guidance. “No” means there is no clear path or target in place.	7.6%
Metric 3	Transportation plan		
Sub-metric	**A jurisdictional transportation mitigation policy is in place**	This sub-metric evaluates whether the jurisdiction has established a transportation mitigation policy or act since 2015. “Yes” indicates that a standalone or integrated transportation mitigation policy or act has been implemented since 2015. “No” means there is no such policy in place.	11.5%
	The transportation plan aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's transportation plan aligns with its GHG reduction targets. "Yes" indicates that the plan outlines specific actions collectively achieving the transportation sector's GHG emission reduction target. "Partly" means that the plan includes actions, but they may not fully meet the sectoral GHG targets. "No" means the plan is not aligned with the target.	11.5%
Metric 4	Industry plan		
Sub-metric	**A jurisdictional industry mitigation policy is in place**	This sub-metric evaluates whether the jurisdiction has established an industry mitigation policy since 2015. “Yes” indicates that a standalone or integrated industry mitigation policy has been implemented since 2015. “No” means there is no such policy in place.	11.5%
	The industry policy aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's industry plan aligns with its GHG reduction targets. "Yes" indicates that the plan outlines specific actions collectively achieving the industry sector's GHG emission reduction target. "Partly" means that the plan includes actions, but they may not fully meet the sectoral GHG targets. "No" means the plan is not aligned with the target.	11.5%

Metric 5	Other plan (hydrogen plan)		
Sub-metric	**A jurisdictional low-carbon hydrogen mitigation policy is in place**	This sub-metric evaluates whether the jurisdiction has established a hydrogen policy since 2015. “Yes” indicates that such a policy has been implemented since 2015. “No” means there is no such policy in place.	4%
	The hydrogen plan aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's hydrogen plan aligns with GHG reduction targets. "Yes" indicates that the plan outlines specific actions collectively achieving the hydrogen GHG emission target. "Partly" means that the plan includes actions, but they may not fully meet the sectoral GHG targets. "No" means the plan is not aligned with the target.	4%
Topic 1.3	Industrial carbon pricing	This topic evaluates whether a jurisdiction allocates revenue from industrial carbon pricing to support net-zero goals and has a clear plan for using these funds to achieve those targets.	100%
Metric 1	Carbon pricing mechanisms: industry		
Sub-metric	**The jurisdiction has an industrial carbon pricing mechanism: An output-based carbon pricing system.**	This sub-metric evaluates whether the jurisdiction has implemented industrial carbon pricing. "Yes" indicates that an industrial carbon pricing mechanism is in place at the provincial or federal level. "No" means that no such mechanism is in place.	40%
	The industrial carbon pricing revenue is used to reduce GHG emissions.	This sub-metric evaluates whether the jurisdiction allocates revenue from industrial carbon pricing to initiatives that reduce GHG emissions. “Yes” indicates that the jurisdiction uses funds from the industrial pricing mechanism to reduce GHG emissions. “No” means it does not.	40%
	There is a clear plan for the industrial carbon pricing revenues to achieve net-zero goals	This sub-metric evaluates whether the jurisdiction directs industrial carbon pricing revenue toward net-zero targets through a clear plan that outlines specific initiatives and allocated funding to achieve that goal. “Yes” indicates that the jurisdiction has a clear plan to invest revenue from the industrial pricing mechanism to meet its net-zero target. “No” means it does not.	30%

Table Annex 2.2: Detailed overview of Policy Area 2

Policy Area 2: Enabling conditions for energy innovation			Topic contribution (%)	
Topic 2.1	Energy market structure	This topic assesses the level of competitiveness in electricity and gas markets.	100%	
Metric 1	Energy market: supply		Topic contribution (%)	Topic contribution (%)[25](NL, NU, PE, YT)
Sub-metric	**The jurisdiction has a competitive electricity generation.**	This sub-metric evaluates whether the jurisdiction has a competitive electricity market. "Yes" indicates that electricity generation is fully competitive. "No" means it is not.	16.7%	25%
	The jurisdiction has bilateral contract options for electricity.	This sub-metric evaluates whether the jurisdiction offers bilateral contracts. "Yes" indicates that bilateral contracting options are available in the jurisdiction. "No" means that they are not.	16.7%	25%
	The jurisdiction has a competitive gas structure.	This sub-metric evaluates whether the jurisdiction has a competitive gas supply market. “Yes” indicates that there is competition among gas suppliers. “No” means there is no such competition.	16.7%	N/A
Metric 2	Energy market: retail			
Sub-metric	**Retail: Customers may choose retailers for electricity.**	This sub-metric evaluates whether consumers can choose their electricity provider. "Yes" indicates that consumers can choose from multiple electricity providers. "No" means they cannot.	12.5%	25%
	Retail: Customers may choose retailers for gas	This sub-metric evaluates whether consumers can choose their gas provider. "Yes" indicates that consumers can choose from multiple gas providers. "No" means they cannot.	12.5%	N/A

[25] Jurisdiction without a gas sector

Metric 3	Energy market: regulatory		Topic contribution (%)	
Sub-metric	**Advanced rate regulatory systems**	This sub-metric evaluates whether the jurisdiction has an advanced rate regulation system. "Yes" indicates the use of performance-based regulation (PBR), while "No" indicates the use of cost-of-service (CoS) regulation. CoS regulation enables utilities to invest while ensuring recovery of service costs and a reasonable return on equity. PBR is a regulatory approach designed to strengthen utility incentives to improve performance and align utility goals with customer interests and public policy. PBR is considered to encourage innovation among regulated utilities.	25%	
Metric 2	**Electricity plan**			
Sub-metric	**A jurisdictional electricity mitigation policy or act is in place**	This sub-metric evaluates whether the jurisdiction has established an electricity mitigation policy or act since 2015. “Yes” indicates that a standalone or integrated electricity mitigation policy or act has been implemented since 2015. “No” means there is no policy in place.	7.6%	
	The electricity plan aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's electricity plan aligns with its GHG reduction targets. "Yes" indicates that the plan outlines specific actions collectively achieving the electricity sector's GHG emission reduction target. "Partly" means that the plan includes actions, but they may not fully meet the GHG targets. "No" means the plan is not aligned with the target.	7.6%	
	The jurisdiction sets a clear decarbonization path for electric utilities	This sub-metric assesses whether the jurisdiction has established a clear path for electric utilities to decarbonize the sector. “Yes” indicates that the provincial government has set a clear plan and target for electricity utilities, providing a defined course of action to decarbonize the sector. “Partly” means that utilities have set a target but lack a clear path, or have published a plan to reach net zero	7.6%	

		without specific government guidance. “No” means there is no clear path or target in place.		
Metric 3	Transportation plan			
Sub-metric	**A jurisdictional transportation mitigation policy is in place**	This sub-metric evaluates whether the jurisdiction has established a transportation mitigation policy or act since 2015. “Yes” indicates that a standalone or integrated transportation mitigation policy or act has been implemented since 2015. “No” means there is no such policy in place.	11.5%	
	The transportation plan aligns with net-zero targets	This sub-metric evaluates whether the jurisdiction's transportation plan aligns with its GHG reduction targets. "Yes" indicates that the plan outlines specific actions collectively achieving the transportation sector's GHG emission reduction target. "Partly" means that the plan includes actions, but they may not fully meet the sectoral GHG targets. "No" means the plan is not aligned with the target.	11.5%	
Topic 2.2	Supporting policies for the energy transition	This topic evaluates energy transition policies, including electricity, thermal energy, and energy efficiency measures.	100%	
Metric 1	Regulatory framework: electricity			
Sub-metric	**A smart meters installation**	This sub-metric evaluates the implementation of smart meter installations within the jurisdiction. "Yes" indicates that the jurisdiction has deployed smart meters or established programs for their installation. "Partly" means a pilot program is in place. "No" means the jurisdiction has no smart meter installations or plans.	6.7%	
	Advanced pricing systems	This sub-metric evaluates whether the jurisdiction has implemented advanced pricing systems. "Yes" indicates that advanced pricing systems are in place or that programs for their implementation have been established. "Partly" means a pilot program is in place. "No" means the jurisdiction has not implemented or planned any advanced pricing systems.	6.7%	

	Net metering programs	This sub-metric evaluates whether the jurisdiction has net metering programs. "Yes" indicates that a net metering program is in place. "Partly" means a pilot program is in place. "No" means the jurisdiction has not implemented a net metering program.	6.7%	
	Other DER policies	This sub-metric assesses whether the jurisdiction has policies for distributed energy resources (DER). "Yes" indicates that there are DER policies. "Partly" means a pilot program is in place. "No" means there is no such policy.	6.7%	
	Net-zero resources for DER	This sub-metric indicates whether DER programs are sourced only from net-zero resources. "Yes" means the jurisdiction has DER programs focused on net-zero resources. "No" means it does not.	6.7%	
Metric 2	Regulatory framework: thermal		Topic contribution (%)	Topic contribution (%)[26](NL, NU, PE, YT)
Sub-metric	**The jurisdiction offers heating options through electricity or a hybrid gas and electricity system**	This sub-metric evaluates whether the jurisdiction offers heating options powered by electricity or hybrid systems (e.g., gas and electricity). "Yes" indicates such heating options are implemented. "Partly" means a pilot program or a plan for one is in place. "No" means no such options exist.	11%	17%
	The jurisdiction has low-carbon gas retail targets	This sub-metric evaluates whether the jurisdiction has a low-carbon gas retail target. "Yes" indicates the jurisdiction has low-carbon gas retail targets, such as renewable natural gas (RNG) targets. "No" means it does not have targets.	11%	N/A
	The jurisdiction has policies for low-carbon thermal heating	This sub-metric evaluates whether the jurisdiction has policies promoting thermal heating from cleaner sources. "Yes" indicates that such policies are established. "Partly" means there is a plan to implement them, or policies only exist for certain sectors."No" means there are no such policies.	11%	17%

[26] Jurisdiction without a gas sector

Metric 3	Regulatory framework: conservation		Topic contribution (%)
	Efficiency Canada's overall energy efficiency score (maximum 100 points, 2024)	The assessment reflects the points assigned by the 2024 Efficiency Canada Scorecard.[27]	33%

Table - Annex 2.3: Detailed overview of Policy Area 3

Policy Area 3: Enabling energy innovation R&D, deployment and implementation			
Topic 3.1	Enabling innovation: policies	This topic assesses whether a jurisdiction has policies promoting energy innovation, including support for R&D, technology deployment, net-zero technology assessment, and diverse funding mechanisms.	Data collection
Metric 1	Policies for promoting Energy Innovation: R&D (TRL 1-6)		
Sub-metric	**The jurisdiction has policies that promote energy innovation through R&D (TRL 1-6)**	This sub-metric includes policies that promote and support low-carbon innovation through research and development to achieve net-zero goals (Technology Readiness Levels (TRL) 1–6).	Data collection
Sub-metric	**The jurisdiction has established policies for assessing the energy innovation technology needs**	This sub-metric includes policies that assess which low-carbon energy innovation technologies are needed to achieve net-zero goals (Technology Readiness Levels (TRL) 1–6).	Data collection
Metric 2	Policies for promoting energy innovation: deployment (TRL 7-9)		

[27] Efficiency Canada, 2024 Canadian Energy Efficiency Scorecard: Provinces and Territories, 2024, https://www.scorecard.efficiencycanada.org/scorecard-download-2024/

Sub-metric	**The jurisdiction has policies that promote energy innovation through deployment (TRL 7-9)**	This sub-metric includes policies that promote and support low-carbon innovation through deployment to achieve net-zero goals (Technology Readiness Levels (TRL) 7–9).	Data collection
Metric 3	Types of funding mechanisms for net-zero energy innovation		
Sub-metric	**There are different types of funding mechanisms for energy innovation**	This sub-metric evaluates whether the jurisdiction has diverse funding mechanisms for low-carbon energy innovation that support research, development, and deployment towards net-zero goals.	Data collection
Topic 3.2	Enabling innovation: regulatory	This topic evaluates whether a jurisdiction's regulatory framework supports innovation. It assesses whether the framework includes mandates encouraging innovation, energy efficiency, and environmental considerations, provides diverse regulatory tools, allows for regulatory experimentation, and offers enquiry services.	100%
Metric 1	Energy regulatory mandate (law)		Topic contribution (%)
Sub-metric	**The act respecting energy regulation (e.g., the Electricity Act) includes a mandate for innovation**	This sub-metric evaluates whether the jurisdiction's act respecting energy regulation (e.g., the Electricity Act) includes a mandate to promote innovation. "Yes" indicates that the act encourages innovation. "Partly" means innovation is under consideration. "No" means the act does not include such a mandate.	20%
	The act respecting energy regulation (e.g., the Electricity Act) includes an energy efficiency or DSM mandate	This sub-metric evaluates whether the jurisdiction's act respecting energy regulation (e.g., the Electricity Act) includes a mandate to promote energy efficiency or demand-side management (DSM). "Yes" indicates that the act encourages energy efficiency or DSM. "Partly" means these areas are under consideration. "No" means the act does not include such a mandate.	20%

	The act respecting energy regulation (e.g., the Electricity Act) includes environmental considerations for decision-making	This sub-metric evaluates whether the jurisdiction's act respecting energy regulation (e.g., the Electricity Act) includes a mandate for environmental considerations. "Yes" indicates that environmental considerations are integrated into the legislation. "Partly" means environmental considerations are in development or reflected in decisions made by the regulator. "No" means the act does not include such a mandate.	20%
Metric 2	Regulatory innovation tools		
Sub-metric	**Different of regulatory tools that promote innovation**	This sub-metric evaluates whether the jurisdiction offers a variety of regulatory tools that encourage innovation. "Yes" indicates that large jurisdictions provide at least three different regulatory tools, while small jurisdictions provide at least one tool promoting innovation. "Partly" means the number of regulatory tools is below these thresholds. "No" means there are no such tools in place.	10%
	Regulatory trials (part of the sandbox)	This sub-metric evaluates whether the jurisdiction allows safe spaces for experimentation, such as time-limited exemptions or derogations from existing rules for specific trials. "Yes" indicates that such safe spaces are enabled. "No" means the jurisdiction does not allow them.	10%
Metric 3	Enquiry services (part of the sandbox)		
Sub-metric	**The jurisdiction provides enquiry services, enabling the innovator to receive assistance from the regulator**	This sub-metric evaluates whether the jurisdiction provides enquiry services to support innovators navigating the regulatory landscape. These services may include informal discussions with regulatory staff about how regulations apply to new ideas and project-specific support with tailored guidance for pilot projects. “Yes” indicates that such enquiry services are available. “No” means they are not available.	20%
Topic 3.3	Enabling innovation: ecosystem	This topic evaluates whether the jurisdiction has a supportive ecosystem for energy innovation, demonstrated by innovation hubs, partnerships, networks, and collaboration with third-party organizations.	100%

Metric 1	Third-party organizations for energy innovation		
Sub-metric	**Third-party organizations involved in energy innovation**	This sub-metric evaluates the presence of third-party organizations involved in energy innovation within a jurisdiction. "Yes" indicates at least five such organizations for large or three for small jurisdictions. "Partly" means the number falls below these thresholds. "No" means no such organizations are present.	40%
Metric 2	A wide ecosystem of innovation (Hubs/Labs/Centers: (part of the Sandbox))		
Sub-metric	**The jurisdiction has hubs/networks/ labs/centers that promote innovation**	This sub-metric evaluates whether the jurisdiction has hubs, networks, labs, or centers enabling collaboration and knowledge exchange to promote low-carbon innovation. "Yes" indicates the presence of at least five such entities in large jurisdictions or at least three in small jurisdictions. "Partly" means the number falls below these thresholds. "No" means there is no such ecosystem for innovation.	60%

Table - Annex 2.4: Detailed overview of Policy Area 4

Policy Area 4: Building the comprehensive needs of innovation: workforce, collaboration, reconciliation, and equity

Topic 4.1	Workforce needs	This topic assesses how a jurisdiction prepares its current and future workforce for the net-zero transition.	
Metric 1	Workforce needs policies for achieving a net-zero energy future		
Sub-metric	**The jurisdiction has policies that direct the workforce to current needs to achieve a net-zero energy future**	This sub-metric assesses if the jurisdiction has policies that support the current energy workforce in advancing a net-zero future.	Data collection
	The jurisdiction has policies that direct the workforce to future needs to achieve a net-zero energy future	This sub-metric assesses if the jurisdiction has policies supporting the future energy workforce achieving a net-zero future.	Data collection
Topic 4.2	Community engagement policies	This topic includes policies encouraging active participation from diverse stakeholders through public education, consultations, and community involvement in energy and climate programs.	
Metric 1	Community engagement policies for achieving a net-zero energy future		
Sub-metric	**The jurisdiction has policies for engagement to achieve a net-zero future**	This sub-metric indicates that the jurisdiction has policies encouraging active participation from diverse stakeholders, including public education, consultations, and community involvement in energy and climate programs.	Data collection
Topic 4.3	Reconciliation policies	This topic includes policies that support Indigenous participation in energy and climate initiatives.	

Metric 1	Reconciliation policies for achieving a net-zero energy future		
Sub-metric	**The jurisdiction has energy-related Indigenous reconciliation policies to achieve a net-zero future**	This sub-metric indicates that the jurisdiction has policies supporting Indigenous participation in energy and climate initiatives or policies leading to energy transitions and climate action benefits.	Data collection
Topic 4.4	Equity policies	This topic includes policies supporting low-income households and marginalized communities in energy and climate initiatives.	
Metric 1	Equity policies for achieving a net-zero energy future		
Sub-metric	**The jurisdiction has low-income energy policies to achieve a net-zero future**	This sub-metric indicates that the jurisdiction has policies that support low-income households in energy and climate initiatives.	Data collection
	The jurisdiction has climate-related policies to help marginalized communities move towards a net-zero future.	This sub-metric indicates that the jurisdiction has policies supporting marginalized communities' participation in energy and climate initiatives or policies leading to energy transitions and climate action benefits.	Data collection

Assessment limitations

Overview:

This low-carbon innovation assessment evaluates indicators affecting energy innovation, but due to the study's limitations, it may not fully capture all factors influencing net-zero innovation.

This work evaluates factors that affect energy innovation across Canadian jurisdictions through a comprehensive framework. While this approach ensures a structured assessment of policies and factors, it is limited by several factors including the following:

- Data availability: The data was gathered through desk research, along with additional insights provided by provinces and territories during three engagement rounds. However, some relevant information may be included within other non-energy or climate policies, which could result in gaps in capturing all policies and factors.
- Challenges in gathering information: During the study, we incorporated additional measures into our findings , including academia involvement, the percentage of funding allocated to innovation, pilot initiatives, and more. However, data for these metrics was not consistently available across all provinces, leading to their removal from the database.
- Partial representation: The metrics and sub-metrics track specific aspects of each policy area, which may result in outcomes that do not fully capture the efforts or achievements of certain jurisdictions in the policy area. This limitation arises from challenges in measuring some metrics and sub-metrics or gaps in data collection, such as detailed information on funding allocated by each jurisdiction for energy innovation.
- Policy effectiveness: The assessment may not fully capture the depth or effectiveness of each policy.
- Innovation implications:
    - Policy or measure does not necessarily indicate increased innovation within jurisdiction.
    - The assessment framework evaluates the listed metrics while recognizing that other indicators may influence innovation.
- Policies overlap: Policies can overlap, making attributing outcomes to a specific policy or measure challenging.

Annex 2: Summary of Engagements

1. Stakeholder engagement rounds

Overview:

Three rounds of stakeholder engagement were conducted to validate, refine, and improve the findings, database, methodology, assessment system, and the final low-carbon innovation assessment.

Three rounds of stakeholder engagement were conducted at key milestones to validate findings, refine methodologies and the assessment system, and share draft results for each jurisdiction.

The first round focused on validating research findings and gathering insights on factors driving energy innovation within each jurisdiction.

The second round reviewed the draft assessment framework and sought feedback on metrics and methodologies.

The third round presented draft results for each jurisdiction to provincial government representatives, validated findings, and refined results as needed.

In parallel, additional one-on-one engagements and four of the eleven CoP discussions were dedicated to presenting the indicators, the database, the assessment system and the draft results, in order to gather feedback and to update and refine the assessment system.

The details for the engagements and the relevant CoP sessions are indicated below.

1. Stakeholder engagement – 1st Round

- Québec - December 1st, 2023
- Alberta - January 15th, 2024
- British Columbia - January 15th, 2024
- Nova Scotia - January 17th, 2024
- Ontario - January 19th, 2024
- Prince Edward Island - January 22nd, 2024
- Saskatchewan - January 23rd, 2024
- New Brunswick - February 7th, 2024
- Newfoundland - February 8th, 2024
- Manitoba - February 12th, 2024
- Northwest Territories, Nunavut, and Yukon - March 27th, 2024

2. Stakeholder engagement – 2nd Round

- Québec- July 10th, 2024
- Ontario - July 24th, 2024
- British Columbia - August 14th, 2024
- Prairies (Alberta, Manitoba, Saskatchewan) - September 11th, 2024
- Atlantic (New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island) - September 18th, 2024
- Northwest Territories, Nunavut, and Yukon - September 25th,2024

3. Stakeholder engagement – 3rd Round

- Manitoba - February 7th, 2025
- Yukon - February 10th, 2025
- Newfoundland and Labrador - February 14th, 2025
- Québec - February 18th, 2025
- British Columbia - February 21st, 2025
- Prince Edward Island - February 24th, 2025
- Saskatchewan - March 10th, 2025
- Nova Scotia- March 20th, 2025

- Ontario - April 1st, 2025, with additional responses received via email from various divisions
- New Brunswick - April 11th, 2025
- Northwest Territories - April 11th, 2025 - Responses received by email
- Alberta - Response was not received
- Nunavut - Response was not received

4. Community of Practice (CoP) Sessions:

a. CoP Session 1 (February 9, 2023): Identified key barriers to innovation
b. CoP Session 2 (April 13, 2023): Highlighted systemic barriers; OEB shared Sandbox work; discussed policy solutions.
c. CoP Session 3 (June 15th, 2023): Feedback on indicators and suggestions for new ones.
d. CoP Session 4 (September 21, 2023): Research update; discussed smart grid pilots and electrification pathways.
e. CoP Session 5 (November 30, 2023)**:** Innovation policy scan; highlighted barriers in Alberta and Ontario case studies.
f. CoP Session 6 (February 1st, 2024): Feedback on the database and recommendations for additional policies and factors.
g. CoP Session 7 (March 28, 2024): Focused on gas innovation; utilities shared hydrogen and hybrid heating projects.
h. CoP Session 8 (June 27th, 2024): Input on the assessment framework and improvement suggestions.
i. CoP Session 9 (Oct 3, 2024): Indigenous-led innovation examples and regional clean energy projects.
j. CoP Session 10 (November 28th, 2024): Review and feedback on the draft results.
k. CoP Session 11 (Feb 19, 2025): Clean Energy Canada and Efficiency Canada shared assessment methodologies and insights.

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Pollution Probe