

# The Energy Transition in Canada

How the “Power of Five” is transforming  
climate intention into climate action

Position paper developed by Schneider Electric, April 2023

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## Executive Summary

Over the past decade, the United Nations has developed a transformative plan that involves **17 critical Sustainable Development Goals (SDGs) to accelerate climate action and lead change on a global scale**. Canada's energy transition is guided by the SDGs and ladders up to global priorities. While each SDG is imperative to sustainable development, this paper focuses on **five SDGs**, coined the “power of five” – and outlines subsequent federal and provincial policies that are advancing Canada's climate action.

Foremost of these policies is Canada's Federal Sustainable Development Strategy 2022 to 2026<sup>1</sup>, which details the nation's decarbonization journey and paves a path to climate action. This is critical for Canada's energy transition and to scale up its global leadership. Canada currently ranks #7 among G7 nations<sup>2</sup>... in other words, last. The silver lining is that Canada is well positioned to take advantage of its strengths and to turn strategies and actions into measurable change.

This position paper examines Canada's energy transition and focuses on key efforts that are spurring innovation and defining pathways to progress and measurable change:

- **Chapter 1** introduces the urgency for Canada to turn intentions into actions to curb climate change.
- **Chapter 2** presents Canada's current climate profile and shares federal strategies, which cascade from the SDGs. Emphasis is placed on five SDGs (the “power of five”), which are shown to synergize with policies in three provinces: British Columbia, Ontario, and Quebec.
- **Chapter 3** shares an overview of the “cascade effect” – how directives across British Columbia, Ontario and Quebec align with the “power of five” (core federal directives).
- **Chapter 4** covers technological opportunities and trends to speed up the energy transition in three sectors that are crucial to the economies of British Columbia, Ontario, and Quebec: Buildings, Manufacturing and Transportation.

The goal of this paper is to present Canada's federal and provincial directives as they align to drive the nation's transition to a new world of energy. **Canada's future is sustainable, digital, and electrified and will shape how Canadians live, work, and create using advanced technologies that are readily available and set to make measurable impacts in this new energy landscape.**

### Chapter 1: A turning point for Canada and Climate Change

Over the past decade, Canada has implemented promising federal policies to affect climate action change. Some of the notable efforts include establishing the Climate and Clean Air Coalition (CCAC) in 2012, ratifying the Paris Agreement in 2016 (with the goal of reducing GHG emissions by 30% below 2005 levels by 2030), and legislating the Canadian Net Zero Emissions Accountability Act in 2021 to facilitate the achievement of net-zero emissions by 2050 by providing an accountability framework.

Canada is also taking bold bets on curbing climate change through the acceleration of sustainable, smart housing construction, hydrogen production, the adoption of more sustainable approaches to strategic minerals, and the deployment of innovative carbon capture, utilization, and storage (CCUS) technology. Canada's evolving choice of energy sources is also advancing the country's energy transition; for instance, the wind, solar and energy storage sector grew by 10.5% in 2022.<sup>3</sup>

Although Canada's decarbonization journey is paving pathways to climate action, these initiatives require acceleration to turn commitments into measurable change. According to the Climate Change Performance Index showcased at COP27, Canada's performance placed 58 out of 63 evaluated countries.<sup>4</sup>

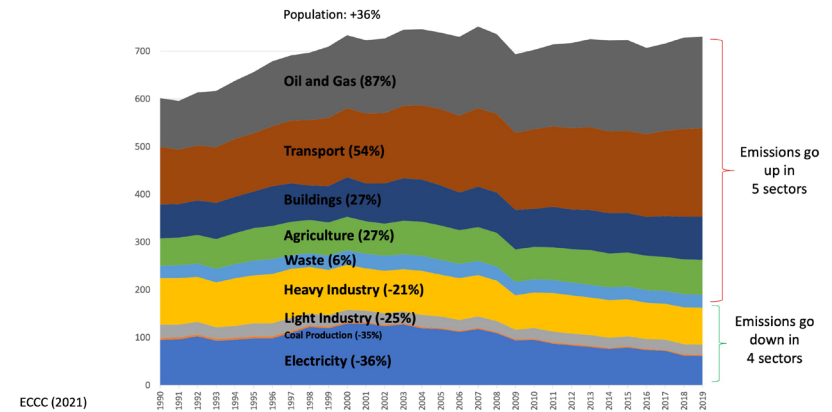
### Why is Canada lagging?

Canada is warming twice as fast as the global rate and in addition to contributions from electro-intensive sectors, rapid demographic shifts are resulting in higher energy consumption and increased rates of energy per person.

### Carbon-intensive sectors:

While select sectors are showing a decrease in greenhouse gas (GHG) emissions, five sectors are recording increased emission levels: oil & gas, transport, buildings, agriculture and waste (*Figure 1*).

Figure 1: Canada's GHG emissions (and growth) by sector, 1990-2019 (Mt)



<sup>3</sup> Environment Journal, February 1, 2023. Available at <https://environmentjournal.ca/canadas-wind-solar-and-energy-storage-sector-grew-by-10-5-in-2022/>

<sup>4</sup> Climate Change Performance Index 2023. Available at <https://ccpi.org/ranking/>

**Chapter 1:  
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Although heavy industry shows a decrease in emissions, there is more work to be done to meet aggressive emission reduction goals at large. A land of precious metals and minerals, Canada upholds its status as a trading nation that inherently depends on high energy required for the extraction of precious metals and minerals.<sup>5</sup>

GHG reduction requires actions targeted to specific provinces. **Three provinces have measurable opportunity for meeting the nation's commitments: British Columbia, Ontario and Quebec account for nearly 80% of Canada's GDP and a little more than half (52.6%) of the country's total end-use energy demand.** As well, most of Canada's northern communities use non-renewable fuels such as diesel to obtain power to drive their livelihood year-round, resulting in emissions on a continuous basis. For Canada's energy transition to be successful, initiatives must include the provincial perspective, with additional attention on the unique needs of remote, indigenous communities, in order to achieve immediate gains and long-term success.

### Demographic shifts & the residential market

Among the G7 nations, Canada is experiencing the highest population growth.<sup>6</sup> As well, record immigration levels and the rapid rise of the millennial cohort poised for home buying, are taxing energy demand and infrastructure. With annual housing construction at ~200k units/year, Canada's residential construction industry will need to build twice as many homes over a decade to catch up — signaling additional energy demand. Indeed, the Canadian economy is heavily reliant on residential investment (more than twice that of the United States: 10.1% of 2021 GDP in Canada vs 4.7% in U.S.) and must plan accordingly through the crucial lens of climate change.<sup>7</sup>



<sup>5</sup> Government of Canada, Information Bulletin. September 2022. Available at <https://natural-resources.canada.ca/maps-tools-and-publications/publications/minerals-mining-publications/mineral-trade/19310>  
<sup>6</sup> Statistics Canada, February 9, 2022. Available at <https://www150.statcan.gc.ca/n1/daily-quotidien/220209/cq-a001-eng.htm>  
<sup>7</sup> Lundy, Matt. The Globe and Mail, "Canada bet big on real estate. Now, it's an economic drag," September 6, 2021. Available at <https://www.theglobeandmail.com/business/article-canada-bet-big-on-real-estate-now-its-an-economic-drag/>

# A turning point for Canada and climate change

### Chapter 1: A turning point for Canada and Climate Change

#### Canada's climate snapshot:

At the federal level, Canada has enacted several meritorious policies and directives that indicate its prioritization of climate action — not simply climate intention. Foremost of these policies is Canada's Federal Sustainable Development Strategy 2022 to 2026 (addressed in Chapter 2).

These and other energy pressures have resulted in the following climate snapshot of Canada:

- Canada has the **fourth highest** energy consumption per capita (person) – compared to the United States at 10<sup>th</sup> and the European Union at 45<sup>th</sup>.<sup>8</sup> If unchecked, this rate of consumption will prove to be even more detrimental in the long run. Using energy wisely and effectively, today, is required for future sustainability.
- Canada needs to **double** its energy production by 2050 to meet energy demand, so turning to clean energy is imperative.<sup>9</sup>
- Canada's carbon tax has **more than doubled in two years** and continues to increase from \$20/tonne in 2019, \$50/tonne in 2022, \$65/tonne in 2023 — to a planned CA\$170/tonne in 2030.<sup>10</sup>

- The country needs to invest over **\$100B per year** to reach a net-zero economy by 2050 (this spend is 5X more than the current investment of \$15-25B).<sup>11</sup>

Moreover, evidence of climate change abounds across the country, province by province:

- In 2021, a notorious “heat dome” “scorched” parts of British Columbia and ushered in one of the province's worst wildfire seasons.<sup>12</sup>
- In Quebec, flood disasters have dominated the headlines for over a decade, causing direct damage at a cost to the Quebec government of nearly \$70 million per year from 1991–2013.<sup>13</sup>
- Climate impacts in Ontario are forecasted to cost \$1.5 billion more each year.<sup>14</sup>

It is against this dire backdrop that Jerry DeMarco, Canada's Commissioner of the Environment and Sustainable Development, proclaimed:

“We cannot afford a fourth decade of failure on climate action.”<sup>15</sup>

<sup>8</sup> Canada Energy Regulator, “Market Snapshot: Why Canada is one of the world's largest electricity consumers,” August 31, 2022. Available at <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2022/market-snapshot-why-canada-is-one-of-the-worlds-largest-electricity-consumers.html>

<sup>9</sup> Clean Energy Canada, “A Renewable Powerhouse,” February 2023. Available at <https://cleanenergycanada.org/report/a-renewables-powerhouse/>

<sup>10</sup> “The federal carbon pollution pricing benchmark”, Government of Canada [accessed March 2023]: <https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/carbon-pollution-pricing-federal-benchmark-information.html>

<sup>11</sup> “A plan to grow our economy and make life more affordable”, April 2022. Government of Canada Budget 2022, page 105: <https://www.budget.canada.ca/2022/home-accueil-en.html>

<sup>12</sup> Williams, Nia, “Canada's ‘infernal summer’ puts climate change at forefront of election,” Reuters, September 1, 2021. Available at <https://www.reuters.com/business/environment/canadas-infernal-summer-puts-climate-change-forefront-election-2021-09-01/>

<sup>13</sup> Bush, E. and Lemmen, D.S., editors (2019): Canada's Changing Climate Report; Government of Canada, Ottawa, ON. p. 444. Available at <https://changingclimate.ca/regional-perspectives/chapter/2-0/>

<sup>14</sup> The Canadian Press, “Climate change could cost Ontario extra \$1.5B per year just to maintain transportation infrastructure.” September 22, 2022. <https://www.cbc.ca/news/canada/toronto/ontario-climate-change-fao-1.6591561>

<sup>15</sup> 2022 news conference: Commissioner of the Environment and Sustainable Development's Opening Statement [https://www.oag-bvg.gc.ca/internet/English/osm\\_20220426\\_e\\_44052.html](https://www.oag-bvg.gc.ca/internet/English/osm_20220426_e_44052.html)

Chapter 1:  
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# A turning point for Canada and climate change

## Turning Canada's strengths into sustainability opportunities

### *How can Canada better position itself?*

By taking advantage of the convergence of digitization and electrification. This intersection offers Canada a sustainable way forward:

- The most rapid gains will be made with **digital efficiency**, both in buildings (including residential housing) and manufacturing, to allow for real-time energy monitoring and adjustments to optimize energy efficiency at all times.
- Widespread **electrification** will accelerate the energy transition from dependence on fossil fuels to the implementation of clean energy options, including distributed energy resources such as solar and wind, microgrids and energy storage — this is especially important for sectors such as transportation, building, industry and infrastructure.
- In addition to retrofitting buildings, industrial facilities and infrastructure, Canada can commit to building homes, facilities and infrastructure sustainably — from ideation to operations and maintenance, by using **digital tools and services**.
- There is an emerging need to account for the bi-directional transaction of energy to enable flexibility and decentralize energy to serve local communities and support the electrical grid. The flow of bi-directional energy offers opportunities for innovation-at-the-edge solutions.

*Accelerating this journey requires an understanding of the roadmap. Specifically, how far along is Canada in its transition to a new world of energy? The next chapter explores Canada's climate change policies and cascades the commitments to actionable steps that energy consumers can take to drive a sizable impact on carbon reduction.*

*The time is now for all public and private entities to harmonize, accelerate, and deploy climate action from coast to coast.*

*If not now, then when? If not us, then who?*

# The current state of Canada's energy transition

Chapter 2:  
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### How is Canada prioritizing its decarbonization efforts and how are the efforts recognized globally?

The International Energy Agency (IEA) has taken notice of Canada's efforts to curb climate change in alignment with the UN's 2030 Agenda for Sustainable Development:<sup>16</sup>

"Canada has embarked on an ambitious transformation of its energy system and clear policy signals will be important to expand energy sector investments in clean and sustainable energy sources."

"Canada has made a series of international and domestic climate change commitments, notably setting a target to cut greenhouse gas emissions by 40-45% from 2005 levels by 2030 and a commitment to reach net zero emissions by 2050."

Indeed, Canada's Federal Sustainable Development Strategy 2022 to 2026 covers all 17 SDGs that drive the global agenda and guide Canada's clean energy policy. While all the SDGs are imperative to sustainable development, for the purpose of this position paper we have outlined **five** key goals ("the power of five") to demonstrate Canada's stance in the energy transition.

*(see next page for an overview)*






<sup>16</sup> International Energy Agency. "Canada's bold policies and support for innovation can underpin a successful energy transition, new IEA policy review says," January 13, 2022. Available at: <https://www.iea.org/news/canada-s-bold-policies-and-support-for-innovation-can-underpin-a-successful-energy-transition-new-iea-policy-review-says>



# The current state of Canada's energy transition

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### The Power of Five: Core goals shaping Canada's energy transition

Five SDGs (areas of focus)	Federal strategies	Examples of federal directives to drive strategies
 <p><b>7</b> AFFORDABLE AND CLEAN ENERGY</p>	Increase access to clean energy for Canadians	Smart Renewables & Electrification Program Pan-Canadian Grid Council
 <p><b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>	Foster innovation and green infrastructure in Canada	Low-carbon Economy Projects Industrial Energy Management System Program
 <p><b>11</b> SUSTAINABLE CITIES AND COMMUNITIES</p>	Improve access to affordable housing, clean air, transportation, parks, green spaces & cultural heritage in Canada	Zero-emission Vehicle Infrastructure Program
 <p><b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION</p>	Reduce waste and transition to zero-emission vehicles	Innovative Construction Materials/ R&D/Building Standards
 <p><b>13</b> CLIMATE ACTION</p>	Take action on climate change and its impacts	Pan-Canadian Framework on Clean Growth & Climate Change

# The current state of Canada's energy transition

The federal strategies shared on the previous page are contingent on several factors, including how provinces prioritize these efforts and how Canada operates within certain economic sectors.

### Provincial lens:

Three provinces appear to be in close step with Canada's Federal Sustainable Development Strategy – driving climate-action synergy that cascades from the SDGs to federal directives to provincial policies:



### Clean BC

The British Columbia government's plan is to reduce emissions, build a cleaner economy, and prepare for the impacts of climate change through its [CleanBC Roadmap to 2030](#) and the [Climate Preparedness and Adaptation Strategy](#)



### Ontario's Plan to Build

This plan is part of the [2022 Ontario Budget](#) and supports job creation and a stronger economy through investments in critical infrastructure development and critical minerals for innovation in high-growth sectors such as batteries, electric vehicles, and cleantech



### Quebec's 2030 Plan for a Green Economy

This [plan](#) is Quebec's first electrification and climate change policy framework that includes initiatives and GHG emission reduction targets for the transportation and building sectors

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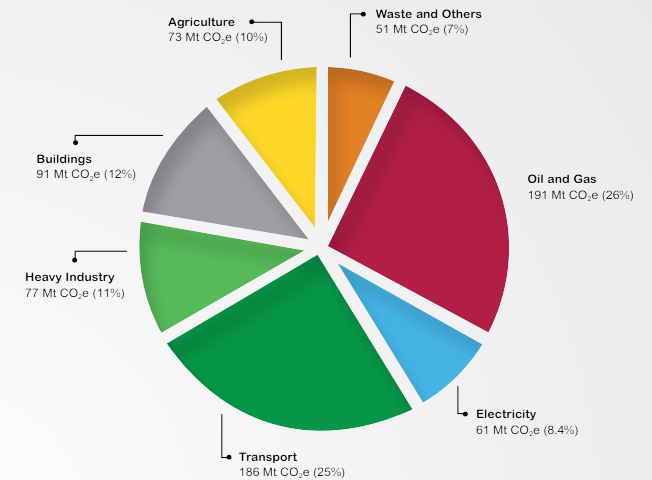
# The current state of Canada's energy transition

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While the directives for each province are distinct, there are commonalities among them that ladder up to the SDGs and federal priorities. Simply put, there is strong synergy toward climate action within these key provinces, thereby quickly building the momentum Canada needs for a more impactful energy transition.

The synergy between provinces also drives best practices. **Lessons learned in one province can help steer programs in another province** by establishing a standard practice to help drive the quality and economics of procurement as well as the deployment of proven technology solutions.

**Figure 2: Canada's GHG emissions by economic sector (2019)** Source: Government of Canada



### Sector carbon emissions:

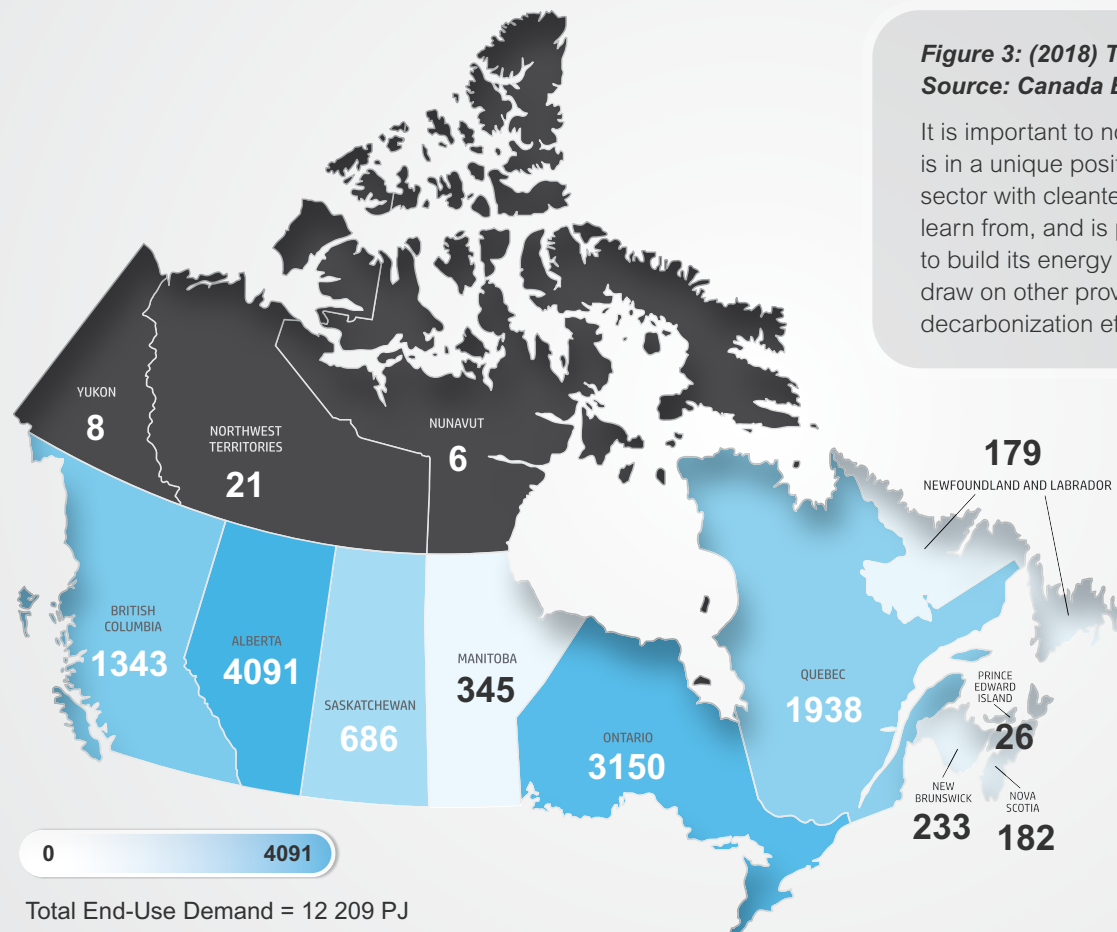
Figure 2 shows that oil and gas, transportation, buildings and heavy industry are among the top contributors of Canada's GHG output, several of which continue to have high emissions. There is tremendous opportunity to lower carbon-emissions in these sectors by shifting to clean energy sources. The good news is there are technologies available in the market to make this shift, now. In Chapter 4, sector-specific trends and technologies are outlined to guide the energy transition in several core sectors.



# The current state of Canada's energy transition

Chapter 2:  
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While all provinces have a responsibility to decarbonize and are committed to driving climate action in these sectors, this paper focuses on the three aforementioned provinces (**British Columbia, Ontario and Quebec**) because of the synergistic approach to their climate action policies as well as their combined GDP contribution, vast population, high end-use energy demand (*see Figure 3*) and sectoral diversity. This representation offers a balanced sample of sectors and provinces that can benefit from proven digitization and electrification solutions.



**Figure 3: (2018) Total end-use energy demand**  
Source: Canada Energy Regulator


It is important to note that the province of Alberta is in a unique position to transform the oil and gas sector with cleantech, which other provinces can learn from, and is planning innovative approaches to build its energy transition.<sup>17</sup> Future studies will draw on other provinces and sectors to spotlight decarbonization efforts and climate actions.

<sup>17</sup> <https://perspectives.se.com/oil-gas>



# The cascade effect: tying together SDGs and federal directives with provincial actions

**Chapter 3:**  
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SDG	Federal Directive	High-level Anchors & Timelines	Commercial Approaches	Near-Team Opportunities
 <p><b>7</b> AFFORDABLE AND CLEAN ENERGY</p>	<p><i>Increase access to green energy for Canadians</i></p>	<p><b>Renewable Energy</b> By 2030, <b>90%</b> of Canada's energy will be from renewable sources</p> <p><b>Energy Efficiency</b> By 2030, <b>600</b> petajoules of total energy savings will be achieved through the adoption of codes, standards and practices</p> <p><b>Clean Fuels</b> <b>By 2030</b>, the production and use of clean fuels will grow, and the lifecycle of carbon-intensive sources will reduce</p>	<p>Support renewable energy deployment &amp; form clean energy partnerships</p> <p>Develop and implement energy efficiency codes and regulations</p> <p>Support deployment of energy efficiency technologies and practices</p> <p>Work with stakeholders to advance Canada's hydrogen strategy</p>	<ul style="list-style-type: none"> <li>• Deploy next-gen smart grids and demonstrate efficiencies and savings</li> <li>• Install renewable energy in Indigenous and northern communities</li> <li>• Provide access to efficient sources of electricity</li> <li>• Support smart renewables</li> </ul>

For a lens on provincial efforts, see the next page

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## The cascade effect: tying together SDGs and federal directives with provincial actions

### Provincial Efforts

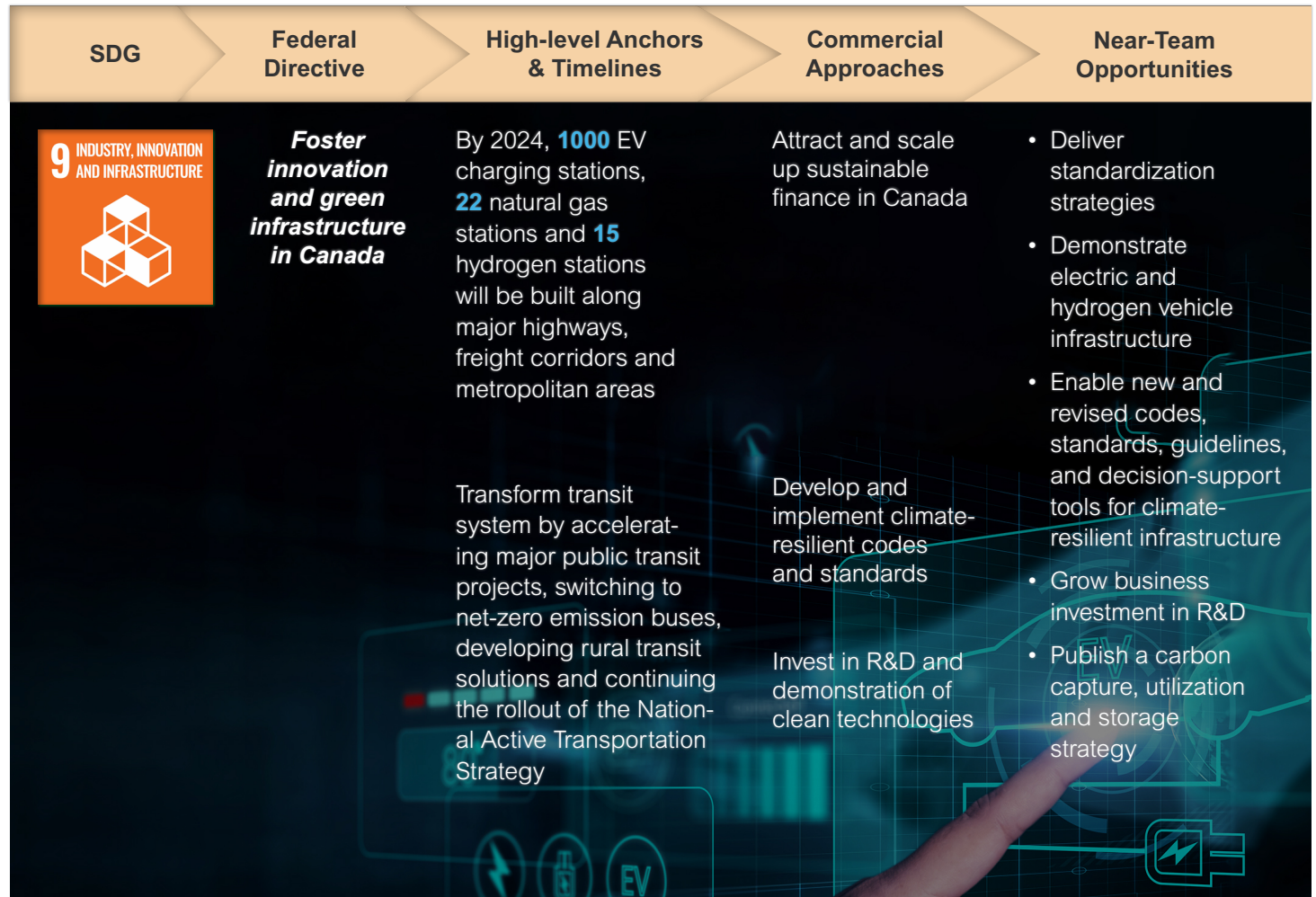


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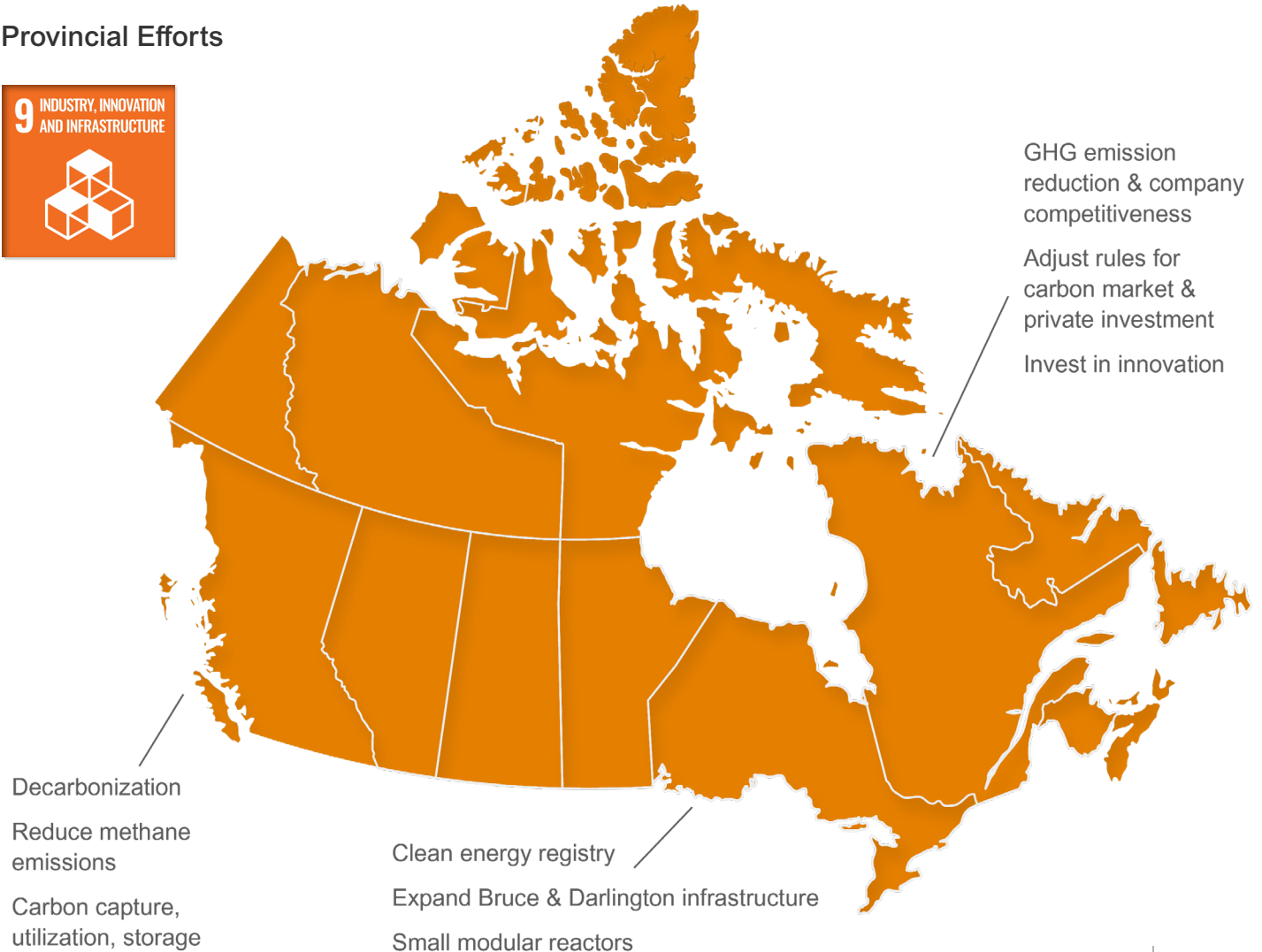


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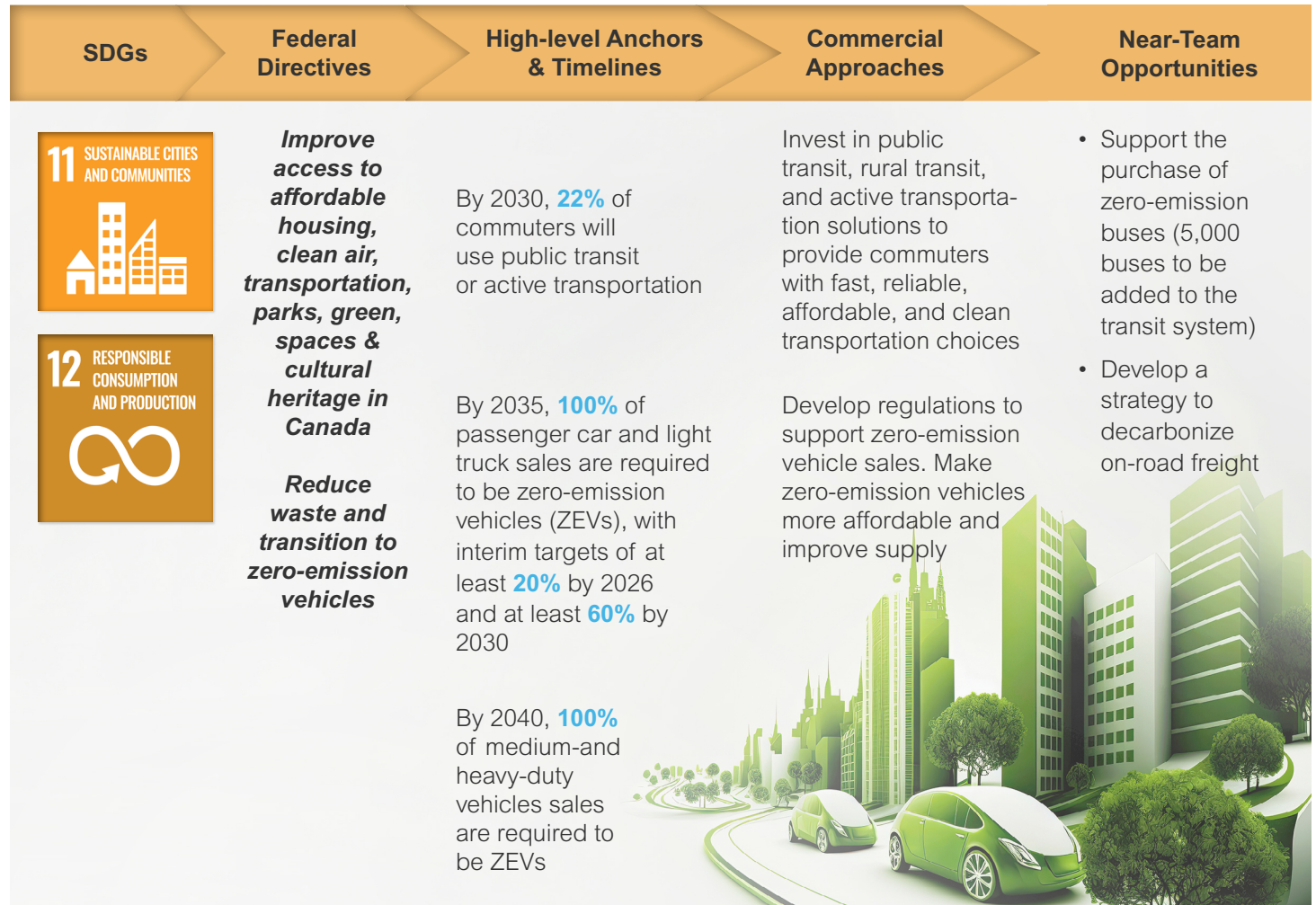
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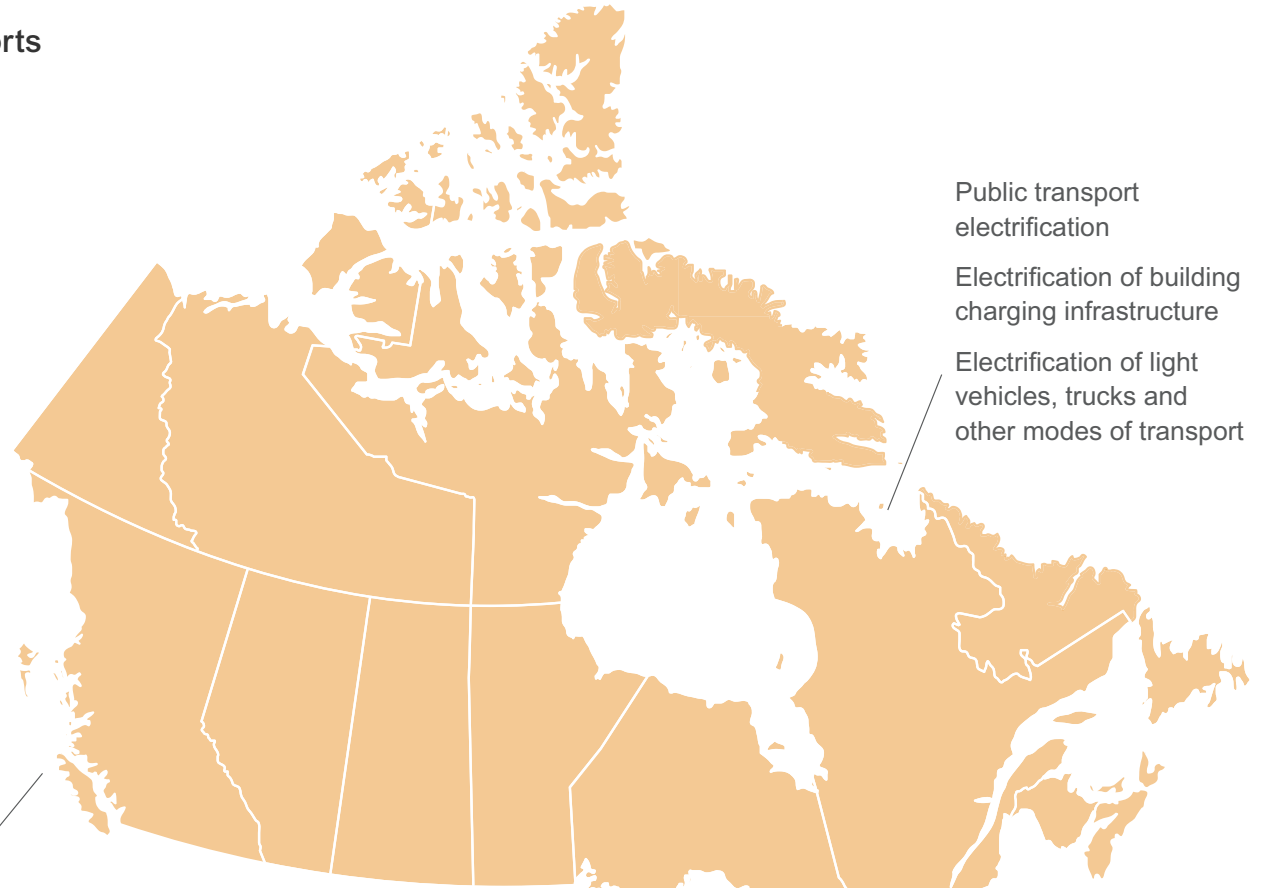


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### Provincial Efforts



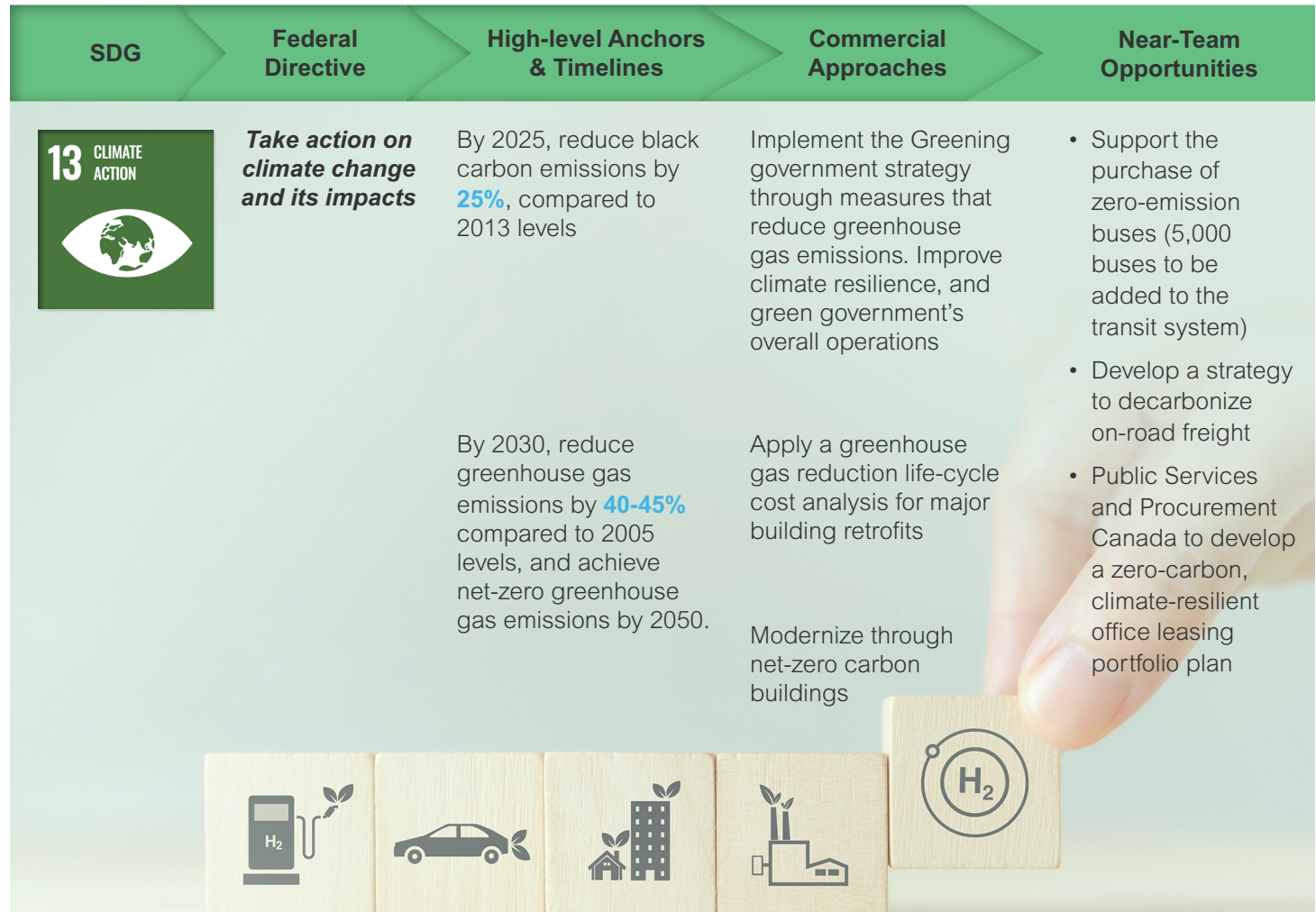
Public transport electrification  
Electrification of building charging infrastructure  
Electrification of light vehicles, trucks and other modes of transport

EV infrastructure  
Hydrogen infrastructure  
Zero emission vehicles  
Commercial Vehicle Pilots

Hospital infrastructure  
Low-carbon hydrogen production projects  
Small modular reactors developed at scale for clean reliable electricity  
Energy storage and ancillary industry

# The cascade effect: tying together SDGs and federal directives with provincial actions

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### Provincial Efforts



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What this synergized approach reveals — through the lens of provincial economies and climate directives informed by the SDGs — is that actions specifically within the buildings, manufacturing, and transportation sectors can drive measurable change.

The next chapter highlights technological trends that can facilitate actions for decarbonization within each of the three sectors

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# Technologies and trends accelerating the energy transition across three sectors

The convergence of electrification and digitization have given rise to a new energy landscape that is changing how Canadians manage energy, design buildings, produce goods, and electrify transportation. The nation's measurable change depends on decarbonization and clean energy innovation, driven by electric and digital technologies.

This chapter shares a **sector-focused** approach to examine the trends and technologies which are leading the energy transition in Canada. As referenced in chapter 1, these sectors are among those that produce GHG emissions and are key contributors to GDP and economic growth:

- **Buildings**
- **Manufacturing (including the heavy-process industry for construction and building materials)**
- **Transportation**

These sectors have strong transformation potential and are well suited to utilize digitization and electrification technology to lower their carbon footprint in the following ways:

- **Upstream transformation:** maximizing renewables and/or non-emitting energy sources by “reducing, offsetting and using GHG emissions from core upstream operations and identifying emerging best practices in emissions management for companies and governments.” (S&P Global)<sup>18</sup>
- **Efficiency transformation:** achieving productivity and operational efficiency improvements through the digitalization and electrification of processes and systems (i.e. heat pumps, smart building controls, process optimization)
- **Downstream transformation:** Facilitating and optimizing smart consumption with bi-directional energy flow and innovative prosumer market solutions. Empowering prosumers

Chapter 4:  
Technologies and trends accelerating the energy transition

<sup>18</sup> <https://www.spglobal.com/commodityinsights/en/ci/products/upstream-transformation-service.html#:~:text=The%20Upstream%20Transformation%20service%20provides,managements%20for%20companies%20and%20governments>

# Technologies and trends accelerating the energy transition across three sectors

**As these transformations play out in the market, key trends are simultaneously accelerating the speed and scale of change:**

**1. Investment in demand-side energy flexibility sources:** provinces must build action plans that facilitate energy system flexibility, a converged digital and electrical system that enables demand-side control of energy usage from distributed energy resources (DERs). This flexibility is essential to resolving the challenges posed by the variability of renewables and to reducing the cost of decarbonization and electrification of crucial areas of British Columbia's, Ontario's and Quebec's economies.

The addition of solar and wind generation, combined with electrical loads on the demand side to manage the variability of renewables, creates a huge opportunity for greater resiliency and reduced GHGs through electrification. Demand-side optimization and its dynamic management reduces the burden on the electrical grid through digitization. This approach will further enable greater electrification at end-use, for example, through the deployment of smart, connected heat pumps and EV charging stations.

**2. Investing in decentralizing the energy system:** the decentralization of the energy system enables the integration of distributed energy resources (such as solar and wind, EV batteries and energy storage) that leverages two-way communication between the grid and the end-user — as enabled by the digitization of the grid.

Onsite energy infrastructure (i.e., microgrids) are needed to control and manage these DERs. A microgrid is a self-contained electrical network that enables end-users to generate their own electricity onsite and use it when it is most needed (e.g. during outages or during peak grid demand windows). Specifically, they can incorporate battery systems to store electricity and deploy it during outages or spikes on grid demand. Commercial and microgrids enable both electrical resilience and economic resiliency.

**3. The rise of the Prosumer:** individuals have a shared responsibility in the energy transition by co-creating a next-generation interconnected grid that uses transactive solutions to allow homeowners to consume and produce energy. This bidirectional flow of energy (decentralized energy flow versus the conventional one-way grid model) allows 'prosumers' to be actively involved in GHG emission reduction and in building more resilient grid support.

Chapter 4:  
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# Technologies and trends accelerating the energy transition across three sectors

How can sectors realize the most rapid gains from these technological advancements?

## Buildings

Drive energy efficiency in buildings with digital solutions

Given that the building sector is foundational to Canada's GDP, especially as manifested in provincial economies, it must be the bedrock of Canada's decarbonization efforts. Buildings currently represent more than 13% Canada's total sector emissions.<sup>19</sup>

In general, the most rapid gains for energy flexibility in this sector will be made with digital efficiency in buildings with monitoring and controls. For instance, the synergy of digitization with electrification can have a big impact on heat in buildings; specifically, connected heat pumps could electrify 90% of heat in buildings.<sup>20</sup> The remainder can provide niches for green hydrogen and biogas.

The most innovative and cost-effective way to boost energy efficiency in buildings is to equip them with connectable solutions such as monitoring tools, sensors, controls, and building management systems (BMS). Those enable building occupants and managers to optimize energy use based on real-time information.

The installation of BMS, or home controls, in commercial building applications requires a comparatively small upfront investment; estimated to be 1% of the total building construction cost. Moreover, when deployed correctly and maintained over time, these systems or controls can save 5% to 13% of total building energy consumption.

<sup>19</sup> <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environment-healthy-economy/annex-homes-buildings.html>

<sup>20</sup> "REPowerEU: Empowering energy consumers for a more sustainable and resilient Europe", May 19, 2022, Schneider Electric, page 8: <https://www.se.com/ww/en/insights/sustainability/sustainability-research-institute/empowering-energy-consumers-for-a-more-sustainable-and-resilient-europe.jsp>

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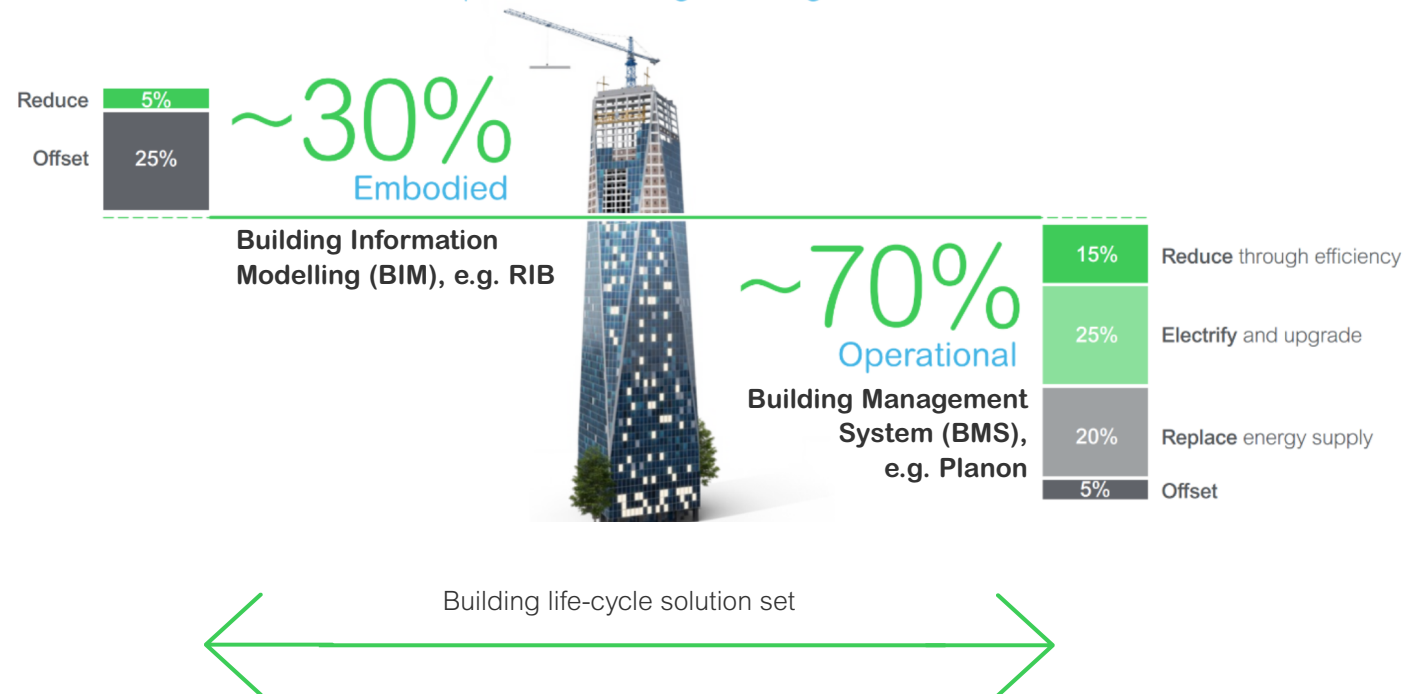


# Technologies and trends accelerating the energy transition across three sectors

## Buildings

Drive energy efficiency in buildings with digital solutions

Carbon emission reduction impact in existing buildings



Chapter 4:  
Technologies and trends accelerating the energy transition

# Technologies and trends accelerating the energy transition across three sectors

## Buildings

Drive energy efficiency in buildings with digital solutions

### Deploy renewables with rooftop solar and self-consumption

Directives to decarbonize buildings must include strong solar ambitions. Distributed solar-energy generation is a true game changer for the building stock and the supporting grid infrastructure, as it can offer a key alternative to slow and expensive grid upgrades, helping to accelerate the electrification of existing building stock while also greening new builds. Since leveraging solar is highly dependent on each province's ability to decentralize, harness, and store energy locally, the deployment of self-consumption capacities at the building level is paramount.

In many deployments, building owners would have the opportunity to become prosumers (i.e., both producers and consumers of energy from solar). Producing more energy than the building consumes over the course of a day (even after including storage provisions for optimized self-consumption) can help evolve the role and design of distribution grids into more like a platform for clean energy exchange. Such an evolution will result in more expansive decarbonization efforts.



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## Buildings: A Case Study



### Future Ready Tower:

Building modernization yields sustainable results in Edmonton

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Standing 18 storeys above a busy street in downtown Edmonton, is HSBC Place – a modern structure transformed to a premier office space for top-tier tenants. The mechanical and electrical equipment had reached the end of its useful life and was ready to be replaced. By implementing a smart, connected building management system, HSBC Place has enabled the operations team and tenants to have control of more than 600 areas — all controlled by one central system. The solution enables occupants to customize their air and lighting levels and allows the operations team to easily monitor and control power, HVAC, and automation systems. This modernization effort has facilitated HSBC Place’s designation as a LEED® Gold v4 facility.

# Technologies and trends accelerating the energy transition across three sectors

## Manufacturing

Digitalize energy efficiency in industrial processes with energy management systems

According to the IEA, 65% of energy used in industry is derived directly from fossil fuels (27% from gas).<sup>21</sup> Collecting, analyzing, and automatically acting in response to data combines decarbonization and cost-effectiveness. Industrial automation systems range from smart sensors and connected devices to advanced process controls with software analytics; these technologies are major enablers in reducing energy consumption and GHG emissions from industrial processes. Combined, this range of digital technologies and software applications can bring up to 30% energy savings, according to the IEA.<sup>22</sup> Most potential savings have payback periods of less than two years, with greater savings possible over longer periods.<sup>23</sup>

The benefits of digitization increase when combined with electrification. Electrification displaces fossil fuels, but it is also more measurable and more precise for greater energy optimization. Additionally, electricity is more cost-effective and available today, especially in light industry. While light industry has a lower energy footprint than its heavier counterpart, it also stands to benefit more from electrification.

A recent IEA study estimates that electrification has the capacity to provide 70% of total potential energy savings in the sector.<sup>24</sup>

<sup>21</sup> IEA report (2021): Energy efficiency, P77  
<https://www.iea.org/reports/energy-efficiency-2021>  
<sup>22</sup> Ibid.  
<sup>23</sup> Ibid.  
<sup>24</sup> Ibid.

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# Technologies and trends accelerating the energy transition across three sectors

## Manufacturing

Digitalize energy efficiency in industrial processes with energy management systems

### Electrify manufacturing with better industrial processes

McKinsey estimates that, using only technologies available today, almost 50% of all fuel used for energy by industrial companies could be replaced with electricity.<sup>25</sup> Electricity has intrinsic process-related capabilities that make it a superior solution. Thanks to the many electric heating techniques, for example, heat can be delivered at precise temperatures, focused at point of use, and better controlled and automated.<sup>26</sup>

Direct electrification enables greater digitization which, in turn, facilitates greater resilience through microgrids, and enhanced system efficiency through demand response services. According to a recent, comprehensive bottom-up analysis of energy use in 11 industrial sectors, 78% of energy demand is electrifiable with existing technologies. The chart below illustrates which sectors can be electrified with common technologies (“stage 1”), which with existing tailored technologies (“stage 2”) and which require technological maturation (“stage 3”).<sup>27</sup>

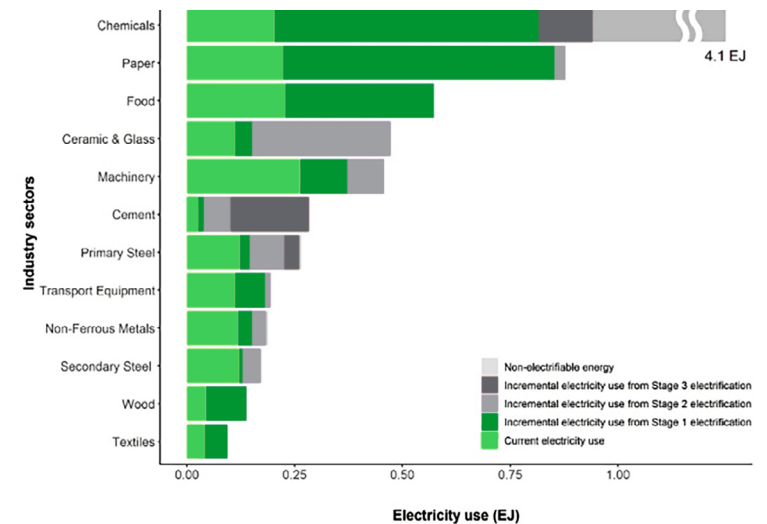
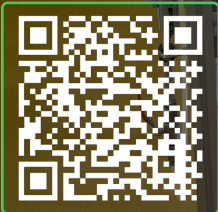


Figure 5: Electrification in Sectors  
Source: <https://iopscience.iop.org/article/10.1088/1748-9326/abbd02/pdf>

<sup>25</sup> Occo Roelofsen, Ken Somers, Eveline Speelman, and Maaike Witteveen. McKinsey. "Plugging in: What electrification can do for industry." May 28, 2020. Available at <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/plugging-in-what-electrification-can-do-for-industry>  
<sup>26</sup> Beyond Zero Emissions (2018): "Electrifying Industry", [https://bze.org.au/research\\_release/electrifying-industry/](https://bze.org.au/research_release/electrifying-industry/)  
<sup>27</sup> Silvia Madeddu et al 2020 Environ. Res. Lett. 15 124004. Available at <https://doi.org/10.1088/1748-9326/abbd02>

# Contents

## Manufacturing: A Case Study



### Achieving carbon-neutral status

In the Food & Beverage industry

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The internationally-renowned brand, Danone Evian, modernized its facility to deliver its mineral water more sustainably. The modernization project has enabled Danone Evian to visualize, monitor, manage and analyze its power quality and energy use in real-time via its local platform. With actionable insights from its data, the company has reduced energy consumption and improved power continuity. Danone Evian has saved an estimated 315 metric tonnes of CO2 equivalent and 372 m3 of water, allowing the facility to become certified carbon neutral by Carbon Trust. Today, the site operates 100% on renewable energy, and since 2008 the company has reduced its energy consumption by 34% per water litre.

# Technologies and trends accelerating the energy transition across three sectors

## Transportation

### Deploy electric vehicles and smart charging

Both EVs and smart charging are key to reducing reliance on fossil fuels. Some are concerned about the burden EV charging could place on grid infrastructure. The reality is that, if well managed, smart charging — by the nature of its optimization — can actually help to smooth grid demand.<sup>28</sup> More important, charging at a building level provides cost benefits compared to public charging. Smart EV charging can generate savings of up to 70% for consumers, when compared to public EV charging costs, especially if paired with time-of-use tariffs, demand charges, and the implementation of distributed power generation infrastructure (such as on-site solar).<sup>29</sup> This potential is magnified when combined with distributed generation resources and flexibility strategies within a building (flexible loads, local energy storage, both electric).<sup>30</sup>

In areas where the limitation of grid infrastructure is an issue, microgrids can support EV fleet deployments by providing onsite charging infrastructure.

Smart EV charging can generate savings of up to 70% for consumers, when compared to public EV charging costs.

<sup>28</sup> Schneider Electric Sustainability Research Institute (2021) "Electric Vehicle Smart Charging in Buildings", <https://www.se.com/ww/en/insights/sustainability/sustainability-research-institute/electric-vehicle-se-sustainable-research-institute.jsp>

<sup>29</sup> *Ibid.*

<sup>30</sup> IRENA (2019): "Electric-vehicle smart charging: Innovation landscape brief", [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA\\_EV\\_Smart\\_Charging\\_2019.pdf?rev=ce97a59bf5314e1dafce7bdcaa72fa88](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA_EV_Smart_Charging_2019.pdf?rev=ce97a59bf5314e1dafce7bdcaa72fa88)

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# Technologies and trends accelerating the energy transition across three sectors

## Transportation

Deploy electric vehicles and smart charging

### Adopt an integrated approach to transportation-related microgrids

For the transportation sector, the benefits of microgrids can go beyond EV fleets. There are many parallel infrastructure efforts that can complement fleet electrification and, accordingly, integrated into a more far-reaching microgrid project to accelerate the decarbonization of the transportation sector. Consider the Consumer-Packaged Goods (CPG) industry, for instance. A global CPG company typically comprises a large manufacturing facility, the fleet itself, warehousing and logistics, distribution and end-customer companies — that is, the retail companies that are now placing higher demands on the CPGs to green up their operations.

Adopting an integrated system approach allows stakeholders to address all energy issues — whether decarbonization, resilience, reliability, or even capacity — at the same time as they are electrifying the transportation infrastructure. Stakeholders can optimize electric fueling infrastructure to serve the fleet while also improving plant operations and availability and GHG emission reduction. This approach allows transportation stakeholders to tackle Scope 1 and Scope 3 emissions at the same time.

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## Transportation: A Case Study



### Sustainable transit: An EV bus fleet with smart charging infrastructure

Montgomery County, Maryland, in the United States, has deployed a microgrid to support smart charging infrastructure for its proposed fleet of 110 electric buses by the end of 2023, reducing lifetime emissions by more than 155,000 tonnes while delivering resilience to climate events and power outages.<sup>31</sup> The microgrid-powered Brookville Bus Depot will charge up to 70 buses, providing the infrastructure needed to deflect demand from the grid, while ensuring renewable solar energy as a clean source for powering the county's EV fleet. This is a win-win scenario, as this project will ensure the availability and uptime of electricity, in turn improving energy resilience.

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<sup>31</sup>AlphaStruxure, a joint venture of the Carlyle Group and Schneider Electric announces integrated fleet electrification infrastructure project to support Montgomery County, Maryland's growing electric bus fleet, "May 12, 2021. <https://www.businesswire.com/news/home/20210512005224/en/AlphaStruxure-a-joint-venture-of-The-Carlyle-Group-and-Schneider-Electric-Announces-Integrated-Fleet-Electrification-Infrastructure-Project-to-Support-Montgomery-County-Maryland%E2%80%99s-Growing-Electric-Bus-Fleet>

### Achieving net zero in Canada requires a bold plan

#### Taking advantage of the trends and technologies

Along with energy consumers and climate activists, Canada's federal and provincial directives are driving the transition to a new world of energy that is sustainable, digital, and electrified. This is a new world of energy, Electricity 4.0. Key technologies are significantly transforming the energy landscape. Visit [www.se.com/ca/en](http://www.se.com/ca/en) to learn about a wide range of technologies and solutions that support the buildings, manufacturing, transportation - and many other sectors.

The net-zero goal must cascade from global goals, guided by federal policies, implemented by provinces, and actioned by consumers, businesses, and other stakeholders. We must all lean in and adopt new policies and practices in order to build a more sustainable and scalable path to this nation's energy transition. The good news is that Canada's net-zero strategies, plans, and measures are in sync at federal and provincial levels. This paper has outlined the "power of five" SDGs and how each connects with federal directives and provincial initiatives. Advanced technologies are also readily available to lead sectors in their electrification and digitization journeys and adoption of energy efficient, decarbonized, and clean energy operations and infrastructure.

#### Canada is well positioned to take advantage of its strengths and to turn its bold bets into measurable change through these core actions:

- Integration of clean, renewable energy sources into the power mix;
- Sustainable, smart building modernization and construction based on demand-side energy flexibility;
- Energy-efficient approaches to industrial processes via energy management systems;
- The deployment of onsite energy infrastructure (microgrids);
- Cleaner transportation via the adoption of EV vehicles and smart-charging infrastructure; and
- Federal budget (March 2023) provides \$20B over six years in tax credits to promote investments in green technologies.



The time is now to usher in a new era of innovation that will evolve Canada's stance as a nation with climate intention to one that is driving climate action.

Conclusion

The landscape of climate change, sustainability and technological approaches continues to evolve. The following are key reference documents that offer further research and analysis.

## Federal

- Canada 2030 Emissions Reduction Plan: <https://publications.gc.ca/site/eng/9.909338/publication.html>
- Pan Canadian Framework on Clean Growth and Climate Change: <https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/climate-change-plan.html>
- Canada Energy Transition: <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/canadas-energy-transition/canadas-energy-transition-historical-future-changes-energy-systems-update-energy-market-assessment-future-pathways.html#:~:text=Canada's%20transitioning%20energy%20system%20may,electricity%20for%20powering%20end%2Duses>
- Clean Electricity Standard: <https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/achieving-net-zero-emissions-electricity-generation-discussion-paper.html>
- Federal Sustainable Development Strategy: <https://www.fsds-sfdd.ca/en>

## British Columbia

- Clean BC Roadmap: [https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc\\_roadmap\\_2030.pdf](https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf)
- 2022 BC Budget and Fiscal Plan: [https://www.bcbudget.gov.bc.ca/2022/pdf/2022\\_budget\\_and\\_fiscal\\_plan.pdf](https://www.bcbudget.gov.bc.ca/2022/pdf/2022_budget_and_fiscal_plan.pdf)

## Ontario

- Net Zero 2050: [https://energyontario.ca/Files/PDF%20files%20to%20share/OEA\\_Net\\_Zero\\_2050.pdf](https://energyontario.ca/Files/PDF%20files%20to%20share/OEA_Net_Zero_2050.pdf)
- Framework for Energy Innovation: <https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/framework-energy-innovation>
- 2022 Ontario Budget: <https://budget.ontario.ca/2022/contents.html>

## Quebec

- Strategy Quebec 2015 – 2020: <https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/environnement/publications-adm/developpement-durable/strategie-dd-2015-2020.pdf>
- Plan Economie-verte Quebec: <https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/environnement/publications-adm/plan-economie-verte/plan-economie-verte-2030.pdf>
- 2022-2023 Quebec Budget: [http://www.budget.finances.gouv.qc.ca/budget/2022-2023/index\\_en.asp](http://www.budget.finances.gouv.qc.ca/budget/2022-2023/index_en.asp)

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