

Canadian Energy Outlook: Essential keys to tackling the energy transition challenge

Montréal, October 6, 2021 – In response to the urgent need to ensure a truly effective energy transition across the country, the Institut de l'énergie Trottier at Polytechnique Montréal, in partnership with e3c Hub–HEC Montréal and the firm ESMIA, has published *Canadian Energy Outlook 2021: Horizon 2060*. The report, now in its second edition, forecasts trends in Canadian energy production and consumption along with greenhouse gas (GHG) emissions. To better gauge the impacts of reduction strategies, it compares transformation scenarios over the next 40 years, depending on whether Canada achieves carbon neutrality in 2045, 2050, or 2060. This energy modelling is based on the most comprehensive technology description of its kind in the country.

Canada has adopted stringent GHG reduction targets. Given that the energy sector alone is the source of more than 80% of emissions, it must be singled out as a priority sector for decarbonization. Knowing that this same sector accounts for 10.2% of GDP, and that Canadians are major consumers of energy—ranking second per capita among OECD countries—transforming the sector will be pivotal for the country's future.

To ensure the success of this unprecedented energy and technology transition, independent researchers have turned to modelling. Their evaluation of possible pathways to carbon neutrality in Canada includes assessments of their cost and impact at the national level as well as province by province, taking into account the considerable differences in their energy profiles.

"The goal is to illuminate a clear path and propose a way forward to meet our targets on time," explains Simon Langlois-Bertrand, a researcher specializing in energy issues and the report's lead author. "Our analyses, informed by hard evidence, can guide policy and investment. But for that to happen, policymakers must embrace these findings."

The zero-carbon objective changes everything

The report's most compelling conclusion is that committing to the zero-carbon objective has a profound impact on the nature of the transition. With technology solutions that will generate only a partial reduction in emissions now ruled out, so-called transitional energy sources such as natural gas are fundamentally incompatible with a net-zero objective and must therefore be abandoned immediately.

Likewise, given the sheer scale of the challenge, it is economically imperative that eliminating GHG emissions occurs wherever possible, only retaining solutions based on GHG capture and sequestration for sectors that cannot be decarbonized, such as farming and certain industrial processes.

It's still possible to meet climate targets

The report's authors state that, from a purely technical and economic standpoint, the transformation is achievable and economical. Although the overall ramifications of complete decarbonization are impossible to predict, the projected cost of the process to the Canadian economy is rapidly falling as technologies improve. Whereas the marginal cost to eliminate the last tonne of CO₂ needed to achieve 65% decarbonization of the Canadian economy by 2050 was estimated to be greater than \$1,100 in the 2018 edition of the report, the newest forecasts put the marginal cost of deeper decarbonisation - of 80% or 100% of the country's economy by 2050 - at \$400 and \$1,100 respectively.

With rapid technological advances and diligent application of the proper measures, achieving carbon neutrality may even prove profitable.

Leadership and the power to act rest with government

In recent years, governments in Canada have spent billions of dollars on energy transition with relatively few results to show for it. *Canadian Energy Outlook 2021* illustrates that these failures can be reversed if governments act strategically and boldly to compel far-reaching transformations, accepting the risks of failure, rather than playing at the margins of established approaches.

Priority sectors

From a cost optimization perspective, the main keys to achieving the current 2030 GHG reduction targets are: substantial reductions in electricity generation, industrial and commercial emissions, and oil and gas sector emissions. Governments will have to set targets and develop specific sector-based programs for each of the above-mentioned industries.

The report's conclusions on a sector-by-sector basis are available [here](#) (buildings, transportation, agriculture, carbon capture and storage, citizens' roles. **(LIEN HYPERTEXTE À VENIR)**.

The authors will present the results of the report at a webinar this Wednesday at 1:30 p.m. Interested participants can register [here](#). **(LIEN HYPERTEXTE À VENIR)**.

SUMMARY CONCLUSIONS BY SECTOR

Buildings

The building sector offers the greatest potential for transformation (potential GHG emissions reductions compared with 2016 levels of 32% by 2030, and of 97% by 2050). In the area of heating, significant gains can be made over the short term by converting fossil-fuel-based systems to electricity.

However, carbon pricing alone is not enough to ensure a significant shift away from business-as-usual. Regulations that mandate carbon neutrality in new buildings and encourage better insulation in existing buildings as well as a massive transition to electric heat pumps will be critical.

Transportation

Transportation will be the most difficult sector to decarbonize. Though crucial to the overall emissions reduction effort, the transformations required in this area are difficult and will take time to implement, given the higher costs, the need to develop significant infrastructure, and the technological challenges involved in freight transport. It will take decades for urban planning compatible with the net-zero objective to have an impact.

Industry

The modelling results show that decarbonization in industry demands a mix of technological solutions, including but not limited to carbon capture. Additional solutions are: technological innovation, switching fuels, changing products, emissions capture, and shifting a considerable share of energy production to bioenergy with carbon capture and storage (BECCS).

Agriculture

The best achievable overall GHG reduction for agriculture in the carbon-neutral scenarios is 31% by 2050. The pathways explored suggest that the sector will be responsible for one-third of all remaining emissions by 2050. Unless drastic changes are made to production methods and outputs, these emissions cannot be avoided and it will not be possible to capture them on site. This is thus an area where considerable research will be needed to investigate potential improvements in land-use management, dietary changes and alternative production methods.

Carbon capture and sequestration

Carbon capture and sequestration will be critical to achieving carbon neutrality. Even if significant emissions reductions are achieved where technology allows, there will still be a substantial quantity (between 155 and 167 MtCO₂e per year) of emissions that cannot be avoided, reduced or captured using current technologies. These are mainly emissions from agriculture and waste, plus most of the emissions from industrial processes.

Not to be overlooked are the current risks and unknowns of continuous large-scale storage. While technological improvements may mitigate some of these risks over time, it appears essential that at least as much effort be dedicated to innovation in emissions reductions as to capture-based solutions.

Roles played by the government and by citizens

It will be important for governments to focus their actions primarily on the industrial and commercial sectors.

The role of citizens' daily actions in achieving climate goals is, for now, limited to a few sectors. Less than 20%

of all GHG emissions can be directly attributed to the direct choices of the population, including residential heating (6%) and personal transportation (individual vehicle 11% and air travel 1%).

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About the Institut de l'énergie Trottier (IET)

The IET was created in 2013 thanks to a generous donation from the Trottier Family Foundation. Its mission is to support the search for sustainable solutions to help achieve the necessary energy transition, to disseminate knowledge, and to contribute to societal dialogue on energy issues.

Media inquiries:

Audrey Rondeau, Communications Advisor

Institut de l'énergie Trottier – Polytechnique Montréal

audrey.rondeau@polymtl.ca