



THE CANADIAN PATH TO NET-ZERO:

Efficiency, Electrification, Energy Storage,
and Carbon Capture Innovation

Presented by SGIN

SGIN Energy Leadership Series

The SGIN Energy Leadership Series delivers accessible understandings concerning our continuing need to drive clean energy implementation and at and at scale. In this series our industry network of leaders share insights and understandings as to the major issues we face and break down the myths and noise that can be barriers to achieving clean beneficial energy for our subsequent generations.



EXECUTIVE SUMMARY

Canada's commitment to achieving net-zero emissions by 2050 requires a multifaceted approach leveraging key technologies and strategies. In 2023, Canada's greenhouse gas emissions were reported at 702 megatons of carbon dioxide equivalent.

This paper examines four critical pillars of Canada's path to net-zero: energy efficiency, electrification, energy storage, and carbon capture innovation. By improving energy efficiency across sectors, electrifying transportation and industry, developing advanced energy storage solutions, and pioneering carbon capture technologies, Canada can significantly reduce its greenhouse gas emissions while maintaining economic growth.

This paper explores current initiatives, future potential, and challenges in each area, concluding with policy recommendations to accelerate Canada's transition to a low-carbon economy. Coordinated efforts across these domains will be essential for meeting Canada's ambitious climate goals.



INTRODUCTION



Canada's commitment to net-zero emissions involves rethinking its energy systems and industries to reduce greenhouse gas emissions by 2050. The Canadian Net-Zero Emissions Accountability Act sets the framework for this transformation, which includes technology development, policy reforms, and significant investments.



The path to net-zero requires integrating energy efficiency, electrification, energy storage, and carbon capture.



Technological and policy changes must balance emission reductions with economic growth.



Collaboration between government, industry, and stakeholders is crucial.

ENERGY EFFICIENCY

Improving energy efficiency reduces emissions, saves costs, and enhances competitiveness. Programs for retrofitting buildings and adopting smart technologies are already underway.



The benefits of efficiency

Do more with less energy. Efficiency reduces energy waste and lowers greenhouse gas emissions.



Barriers to adoption

Upfront costs and incentive mismatches hinder progress. For example, landlords pay for upgrades, but tenants benefit from savings.



Driving change

Innovative financing and stricter building codes can help. Property tax-based financing and mandatory energy audits can accelerate adoption.

ELECTRIFICATION



Electrifying transportation, buildings, and industry will shift energy use from fossil fuels to clean electricity. Grid expansion and modernization are key enablers.



Transportation transformation

All new light-duty vehicles to be zero-emission by 2035. Electrification of transport will significantly reduce emissions.



Clean energy for homes

Transition to electric heat pumps and appliances. Electrification in buildings reduces reliance on natural gas and oil.



The grid challenge

Infrastructure upgrades are essential. A modernized grid will handle increased electricity demand and renewable integration.



ENERGY STORAGE

Energy storage is essential for managing renewable energy's variability and ensuring reliable power.



The storage role

Balances supply and demand for renewable energy. Storage enables wind and solar energy to meet grid demands efficiently.





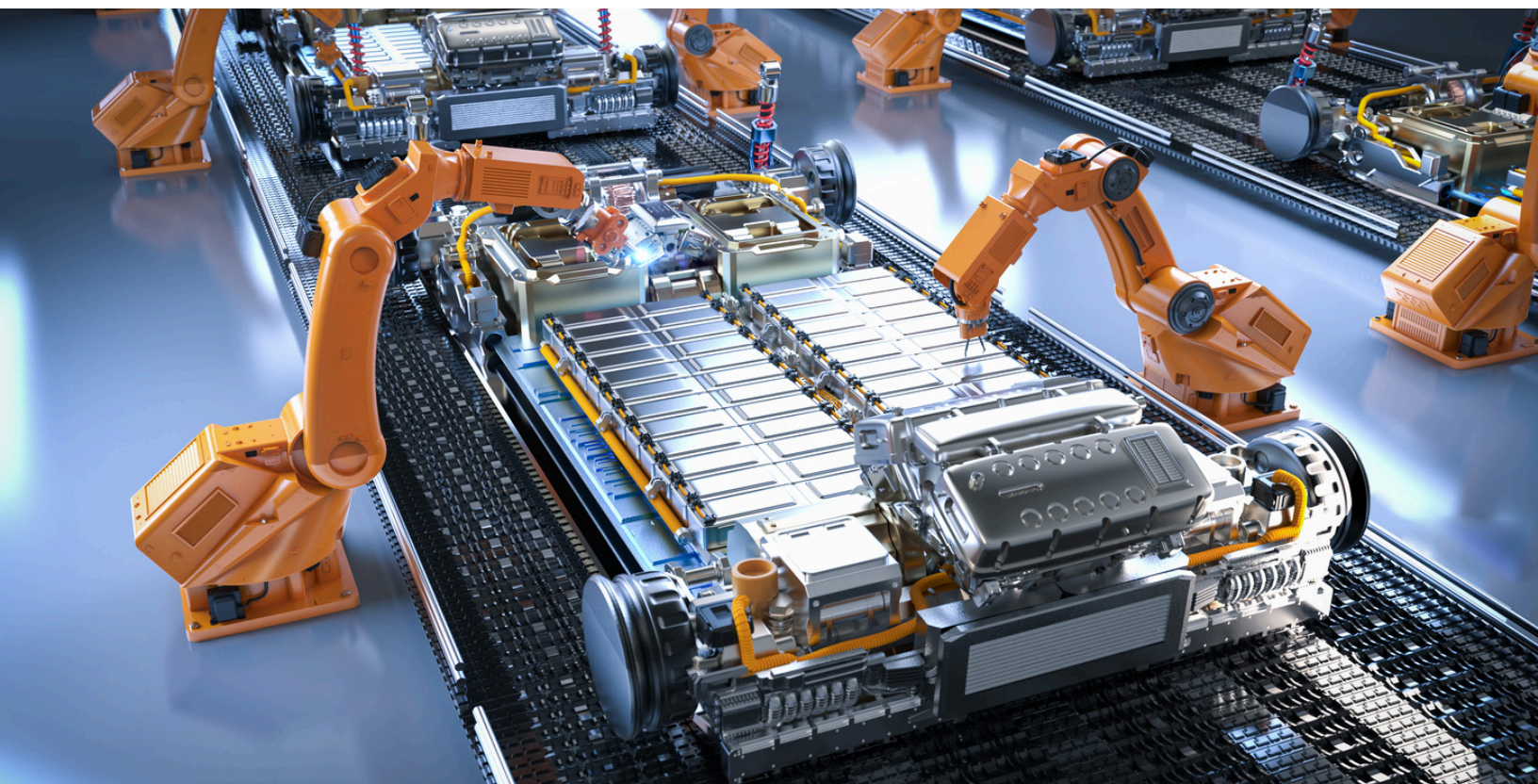
Technological opportunities

Batteries, pumped hydro, and emerging solutions. Innovations like hydrogen storage address seasonal energy needs.



Canada's advantage

Access to critical minerals for battery production. Resources like lithium and cobalt position Canada as a global leader in energy storage.



CARBON CAPTURE INNOVATION



Carbon capture reduces emissions from industries where decarbonization is challenging. Canada is a global leader in developing these technologies.



What is CCUS?

Captures and stores CO₂ emissions. These technologies are critical for industries like cement and steel.



Canada's leadership

Projects like Alberta's Quest lead the way. Quest has captured over 5 million tons of CO₂ since 2015.










Scaling challenges

High costs and infrastructure requirements. Incentives and partnerships will help expand adoption.



POLICY RECOMMENDATIONS

-  Implement a national energy efficiency strategy with increased funding for retrofit programs and stricter building codes.
-  Expand electric vehicle incentives and charging infrastructure investments to accelerate transportation electrification.
-  Develop a comprehensive energy storage strategy, including regulatory reforms to value storage services and increased R&D funding.
-  Enhance support for CCUS through expanded tax credits and public-private partnerships for infrastructure development.
-  Establish a green innovation fund to support cross-sector collaboration and commercialization of clean technologies.
-  Introduce a harmonized carbon pricing system across all provinces with steadily increasing rates to drive long-term investments in low-carbon solutions.
-  Strengthen interprovincial cooperation on clean electricity transmission to optimize renewable energy integration nationwide.



CONCLUSION

Canada's path to net-zero emissions by 2050 requires a coordinated approach leveraging energy efficiency, electrification, energy storage, and carbon capture innovation. By implementing robust policies and fostering technological advancements in these key areas, Canada can successfully transition to a low-carbon economy while maintaining its position as a global energy leader.



This paper is brought to you by the Smart Grid Innovation Network. We foster Canada's transition to clean energy, helping build stronger, more resilient communities and a sustainable economy. To learn more about us, please visit us at [SGIN.ca](https://www.sgin.ca).

