ENGINEERING A SUSTAINABLE FUTURE: ROLE OF ENGINEERS IN HELPING CANADA ACHIEVE NET-ZERO EMISSIONS BY 2050

THE ENGINEERING PROFESSION'S POSITION

- Engineers are essential in providing the technical expertise and solutions necessary for Canada to achieve its net-zero emissions targets by 2050. They are also committed to working with the federal government and other stakeholders to help meet net-zero emission targets, by providing the guidance and support necessary to plan, design, develop, and implement sustainable solutions and systems.
- Engineers Canada is committed to working with the federal government, industry partners, and other engineering organizations to address the challenges and opportunities related to achieving net-zero.
- The engineering profession recognizes the urgency of addressing climate change and the critical role that engineers and engineering solutions play in transitioning to a low-carbon economy while maintain a prosperous and resilient Canadian society.

The challenge(s)

The Government of Canada has committed to transition the Canadian economy and achieve net-zero greenhouse gas (GHG) emissions by 2050 through the federal *Canadian Net-Zero Emissions Accountability Act*[1]. This ambitious goal has the potential to effectively reduce Canada's impact on global warming and solidify Canada's position as a global leader in low-emission technologies and practices across all economic sectors. To support the path to net zero, the federal government is developing Emissions Reduction Plans in five-year increments from 2030-2045. The first of these plans—Canada's 2030 Emissions Reduction Plan[2] (released in March 2022)—provides a roadmap for how the country will reduce emissions by 40-45 per cent (from 2005 levels), by 2030. The federal plan uses a multi-faceted approach that commits all sectors of the Canadian economy to take climate change seriously and to do their part to reduce the nation's carbon emissions dramatically in less than 30 years.

While this monumental task presents a challenge for decision makers, the engineering profession has a crucial role in designing, developing, and implementing sustainable solutions and systems across economic sectors that will help the federal government achieve its net-zero targets while maintaining a productive Canadian economy. This involves designing energy-efficient buildings and infrastructure, improving the delivery systems of clean and renewable energy technologies (such as wind, solar, geothermal, hydro, and nuclear), and implementing systems that reduce emissions. Engineers are also involved in the research and development of new technologies that will help reduce GHG emissions by sequestering carbon from the atmosphere and mitigate the effects of climate change, all while carefully assessing and managing associated risks.

The societal acceptance of technology is a crucial factor in the transition to net zero. Although numerous solutions to mitigate climate change already exist, public perception and required lifestyle changes may hinder their widespread implementation[3]. Engineers can play a role in this process by promoting social engagement through education and communication, fostering support among stakeholders and the public, and facilitating the successful adoption of these technologies.

[1] Government of Canada (2023). "Net-Zero Emissions by 2050". Retrieved from: https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html

[2] Government of Canada (2023). "2030 Emissions Reduction Plan: Clean Air, Strong Economy". Retrieved from: 2030 Emissions Reduction Plan: Clean Air, Strong Economy - Canada.ca

[3] University of Colorado Boulder (2022). "As the Climate Changes, So Must the Role of Engineers". Retrieved from: https://www.colorado.edu/herbst/2022/06/09/climate-changes-so-must-role-engineers#:~:text=Scientists%20and%20engineers%20are%20innovating,the%20rate%20of%20climate%20change.

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Engineers are therefore essential in providing the technical expertise and solutions necessary to achieve the federal government's net-zero targets, as well as in identifying and addressing the barriers to implementation and in the design and operation of the infrastructure needed to support the transition.

How Engineers Canada has contributed

Engineers Canada actively engages with the federal government to ensure that professional engineers are involved in initiatives that impact their work. We have established open and strong working relationships with both parliamentarians and senior federal officials within the federal government.

In collaboration with the 12 provincial and territorial engineering regulators, Engineers Canada has offered unbiased expertise to enhance the safety and resiliency of communities across Canada, while contributing to efforts to mitigate climate change and its impacts. Initiatives include:

- Issuing National Position Statements that reflect the engineering profession's stance on critical issues related to public interest, including climate change mitigation and adaptation.
- Supporting federal initiatives by providing evidence-based recommendations.
- Creating national guidelines and papers that serve the needs of regulators, engineers, and applicants for licensure regarding the environment and sustainability.

Provincial and territorial engineering regulators are key to the federal government's net-zero goals, upholding high standards of competency and ethics among engineers. They set and enforce guidelines for sustainable engineering practices, including the design of energy-efficient buildings and infrastructure, and the development of renewable energy systems. Regulators also offer education and training opportunities to equip engineers with the necessary knowledge and skills for sustainable technology and system implementation.

Recommendations to the federal government

The engineering profession's collaboration with the federal government is essential to realizing Canada's net-zero emissions plan while maintaining a prosperous and resilient Canadian society. These emission targets can be met through a combination of measures, that can be supported by the engineers. They include:

- Evaluating and proposing solutions to address Canada's future energy requirements while balancing cost-effectiveness, reliability, and GHG reduction. This entails dramatically increasing renewable energy sources such as wind, solar, geothermal, hydro, and nuclear, thereby decreasing dependence on fossil fuels.
- Increasing the use of electricity and hydrogen in the transmission and end use of energy as well as associated energy storage technologies such as battery technology.
- Improving energy efficiency in domestic, commercial, and industrial sectors, including buildings, transportation, and industry to reduce energy consumption and emissions.
- Investing in the development and deployment of new technologies, such as carbon capture and storage, to reduce emissions from industrial processes and power generation.

The federal government should prioritize infrastructure investments for a net-zero future,

focusing on leveraging our current infrastructure and upgrading the transmission grid to overcome its limitations in capacity and interconnectivity. This is essential during emergency scenarios, such as prolonged power outages following natural disasters like Hurricane Fiona. The federal government should also prioritize infrastructure investments to support resource extraction and transportation for materials such as hydrogen, lithium, uranium, and other metals and minerals. Streamlining the approval process will increase market efficiency and access to these resources.

Engineers possess the skills and knowledge to respond and advise the federal government on current and future challenges and opportunities. The application of engineering principles and expertise spans across every federal department, from Environment and Climate Change Canada to the Department of Finance, and includes providing insight to strengthen Canada's innovative output, protecting structural integrity of physical infrastructure, protecting the natural environment, and finding solutions, across economic sectors, for a net-zero carbon economy. Moreover, to ensure proper consultation and collaboration in accordance with provincial and territorial engineering acts, the federal government should engage professional engineers when developing or amending legislation and regulations related to engineering work related to these issues.

How Engineers Canada will contribute

Engineers Canada will:

- Provide guidance and expertise on sustainable engineering practices and technologies to help the government develop and implement policies and programs that reduce GHG emissions.
- Continue to promote the adoption of sustainable engineering practices and technologies through the development and dissemination of national guidelines.
- Continue to provide input and feedback from engineers on federal initiatives, legislation, policies, and regulations to support the transition to a low-carbon economy.
- Though its national accreditation process for undergraduate engineering education, ensure awareness of society's needs regarding climate change mitigation, and associated engineering expertise is a part of the training of Canadian engineers at Canadian post-secondary institutions.

Other notable references and reports:

- Canadian Climate Institute (2023). The Big Switch. Powering Canada's Net Zero Future.
- Clean Energy Canada (2023). A Renewables Powerhouse.
- International Energy Agency (2023). Energy Technology Perspectives 2023
- Electricity Canada (2023). Net Zero by 2050.
- SNC Lavalin (2022). Engineering Net Zero. Is Canada on Track to Meet its 2023 Targets?