

GENERATION ENERGY

The Conversation Continues



GENERATION ENERGY DIALOGUE SUMMARY



Étienne, 11 years/ans



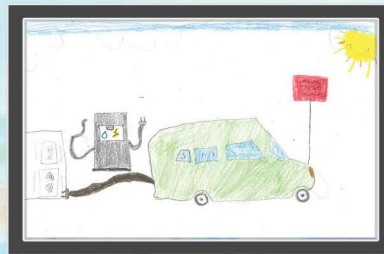
Mélodie, 7 years/ans



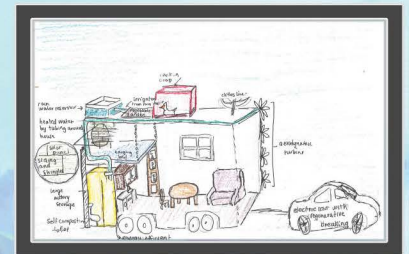
Élodie, 12 years/ans



Areyon, 9 years/ans



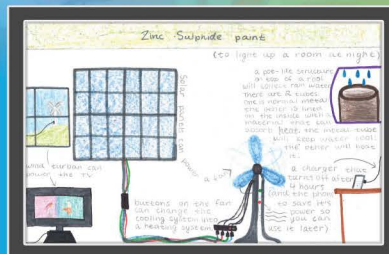
Alicia, 9 years/ans



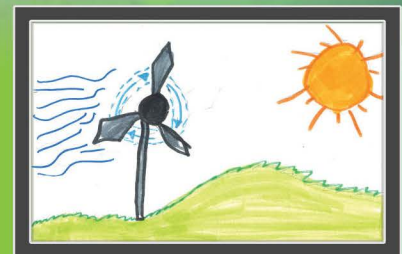
Hannah, 18 years/ans



Ana, 10 years/ans



Félicia, 11 years/ans



Akira, 9 years/ans



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DISCLAIMER

The Generation Energy dialogue brought together a variety of interests and perspectives to ensure that outcomes were representative of a national discussion. This report captures the wide range of opinions expressed from April to October, 2017. Input has not been adjusted outside of the requirement to categorize the range of thoughts and ideas. Statements made in this document are not consensus-based and should not be viewed as such.

The views represented in this document are not those of the Government of Canada.

ACKNOWLEDGEMENTS

Input included in this report was generated through over 60 engagement sessions, over 100 reports, close to 2000 online ideas and comments, and more than 335,000 polls and quizzes. This breadth of information could not have been gathered if not for the countless contributions of partner organizations and dedicated Canadians. We would like to thank these individuals and organizations for making the Generation Energy dialogue a success.

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WHAT WE HEARD Values and Principles

Throughout the Generation Energy process, the principal question asked was: What were the values and principles that Canadians cherished most and should guide their energy future? Their response was as follows:

LEADERSHIP

Demonstrating leadership at all levels of government and society will be integral to the energy transition. Canadians recognized the need for bold action and, at times, experimentation with new ideas and approaches, to reach long-term energy goals.

COLLABORATION

Canadians were unanimous in stressing the importance of collaboration between all Canadians, including governments, Indigenous communities, industry and civil society.

TRANSPARENCY

Improving transparency through ongoing consultations and engagement can promote positive discussion on what is required to support a low-carbon economy. Creating greater awareness of energy issues can help encourage citizens to become more informed and accountable.

CONSERVATION AND SUSTAINABILITY

Conservation and sustainability are critical principles to incorporate into future energy planning. Canadians were clear about the need to conserve resources, use more energy-efficient practices, mitigate climate change, and protect our air and water for the future.

LEVERAGE CANADA'S DIVERSITY

Canadians face very different realities when it comes to energy. The way in which energy is produced, transported and used varies greatly across provinces, territories and communities. Canadians were of the view that this diversity is a source of strength when working towards the future.

RESPECT FOR INDIGENOUS RIGHTS

Respecting the rights of Indigenous peoples and ensuring their engagement and participation in energy development and decision-making is critical for Canada's energy future.

INCLUSIVENESS AND FAIRNESS

Ensuring equal access to affordable energy and fair distribution of the costs of the energy transition will be important. Decisions on energy need to balance the need to transition to a low-carbon energy system with the potential impact of rising energy costs on consumers. Governance and decision-making should be inclusive processes, and Canadians should be empowered to be a part of the transition through equal employment opportunities.

SAFETY AND SECURITY

Canadians value a resilient energy system that is both safe and secure. Energy projects and infrastructure need to be developed with these principles in mind.



WHAT WE HEARD

Grids, Storage and Electricity

CANADIANS TOLD US THAT:

- The electricity system in 2050 will be resilient, reliable, affordable, 100-percent non-emitting, consumer-centric and clean, with more high-voltage direct-current transmission and distributed generation.
- Electrification of the economy is a key low-carbon pathway. Canada's electricity system must meet emerging demand for low-carbon electricity in the transportation, heating and industrial sectors.
- Canada's energy system is facing significant change due to grid modernization, distributed grids and integration of new smart grid technologies. The democratization of electricity production, supply and use can create both opportunities and challenges for citizens, companies and governments.
- Energy storage is helping to create a more efficient, smart and reliable electricity grid. Canadians see storage technologies fitting different regional needs. While one superior technology may exist in 2050, we still need to experiment with different solutions in the years ahead.
- Climate change will have a significant impact on Canada's electricity infrastructure. Appropriate plans need to be in place to ensure a resilient and secure electricity system for the future.

PRIORITY ISSUES

Emissions Reductions: Canada's electricity sector is over 80-percent greenhouse gas emissions-free. With ambitious economy-wide emissions reductions, the electricity sector will be pushed to completely decarbonize while at the same time expand to meet increased demand. A wide range of low-carbon energy technologies will be needed to build the electricity system of 2050. These technologies should also be seen as a source of job creation and as potential technologies for export.

Forecasting Electricity Demand: An understanding of how large the electricity system will become, in terms of future energy demand, is critical to ensure proper system planning, including preparing for required investments and building public support for future infrastructure development. A number of non-emitting energy sources exist in Canada to meet potential growth in electricity demand (hydro, nuclear, solar, wind and biomass). At the same time, Canadians told us that there are significant economic (cost, competitiveness, labour markets, energy exports), social (changing energy use), and environmental implications associated with electrification.

Regional Collaboration: Transitioning to a low- or zero-carbon electricity system will take time. Canadians want a flexible approach to electricity planning that leverages regional contexts and allows Canadian jurisdictions to adapt to changing conditions. Governments, the private sector, civil society and Indigenous communities will need to work together on a wide range of issues, including electricity infrastructure, technology development and regulatory change.

Reliability and Affordability: Addressing reliability and affordability issues is key to Canada's electricity future, to understanding the variable nature of many renewables, and to managing the increased costs of a larger electricity system. Smart grid and energy storage technology can stabilize electricity markets, integrate variable energy sources and facilitate the transition to a low-carbon future.

Democratization of Electricity: Canadians want more control over how energy is produced, moved and used. The emergence of small-scale renewable projects, combined with developments in smart grids, energy storage and information technology are making it possible for consumers to produce, store, use and sell energy. While this creates challenges based on existing utility models, there are also benefits from decentralization (e.g., revenues, cost savings, resilience and emissions reductions). Community ownership models are also popular based on the potential to create revenue, lower emissions and ensure energy investment decisions reflect local opinions.

OPPORTUNITIES FOR ACTION

Electrification of the economy is a key pathway to advance the low-carbon economy. A low-carbon electricity supply must be able to meet emerging demand in transportation, heating and industrial processes.

- ✓ **Demand for electricity will steadily increase** over the long term as we move towards decarbonization. Canadians said that a **national plan for electrification** in Canada that engages everyone would help address challenges related to expanding electricity infrastructure. In particular, regulatory barriers to clean energy projects need to be managed to allow projects to move forward in a timely fashion.
- ✓ Many Canadians see a mixture of technologies consisting of **nuclear, solar, wind, hydro, fossil fuels, tidal and geothermal** working together as giving us the best chance of meeting climate change goals while still supporting a competitive electricity sector.
- ✓ **East-West electricity connections** can connect provinces more reliant on fossil fuels with provinces with an abundance of renewable and non-emitting electricity capacity and potential. Government subsidies may be required to make East-West electricity interties commercially viable for utilities. New electricity infrastructure projects should use the newest and most efficient technology available to reduce energy losses.
- ✓ **Sector-by-sector electrification goals and pathways** for end-use sectors (transportation, buildings, industry, energy production, etc.) for the short, medium and long term can help identify synergies between sector needs. In addition, a targeted approach is required for electrification in remote, rural and Indigenous communities, which could also represent prototype solutions for a global challenge.

Canadians are concerned about how electrification may impact the cost of electricity.

Investment decisions in energy infrastructure need to be made with an understanding of long-term cost. Canadians want these costs communicated in an easily understandable manner.

- ✓ Governments need to **support the skills and standards required for an electrified economy**. They should also take a leading role through leveraging government procurement to accelerate demand for electric transportation and heating.

Canada's energy system is facing significant change due to **grid modernization, distributed grids and the integration of new smart grid technologies**. The democratization of electricity production, supply and use can create both opportunities and challenges for citizens, companies and governments.

- ✓ New technologies will bring about a paradigm shift in the use of small-scale generation and energy storage; a once-monolithic energy sector will incorporate many individuals and small organizations, which will make planning and coordination increasingly difficult. Canadians asked for **policies that will remove barriers to distributed energy systems** and support for financial models that will help an increasing number of Canadians and Canadian organizations become suppliers of energy.
- ✓ Technologies such as **blockchain, artificial intelligence and small-scale generation will be used to modernize and automate the grid**, moving towards a circular energy economy. Technology companies have a growing role in the energy system (e.g., Tesla, Google). Increased control over energy, from production to use, can be a source of revenue and an opportunity for increased savings for Canadians.
- ✓ **Decentralization can reduce long-range transmission and distribution costs** and maximize the use of local renewable generation. This is particularly important in the North, as the costs of building and maintaining electricity infrastructure in the North are prohibitively expensive. Governments should focus on community energy needs over those associated with industry.
- ✓ **By 2050, what it means to be a utility may be completely redefined**. Utilities may need to adapt to the growing number of opportunities for Canadians to get involved in energy production and use. Regulation of utilities will need to become more nimble and flexible to deal with potential market transformation. Utilities should think through the potential benefits of integrating a currently fragmented landscape – bringing natural gas, electricity and other energy services together. Canadians do not want to be taxed on local energy production or the transmission of electricity back onto the grid.
- ✓ Governments need to work with utilities and the private sector to **manage risks related to cyber security** and smart grid technology.
- ✓ **Smart meters should be deployed across all of Canada**, including in remote communities, to allow for the improved management of energy demand and integration of renewables. This technology will also help Canadians benefit from time-of-use pricing and compare their energy use to that of their neighbours.
- ✓ **Hybrid natural gas and electric heating solutions** can leverage natural gas resources to help reduce electricity demand during peak times, such as cold days.

Energy storage is helping to create a more efficient, smart and reliable electricity grid.

Canadians see large and small-scale storage technologies fitting different regional needs. While one superior technology may exist in 2050, we still need to experiment with different solutions in the years ahead.

- ✓ **Governments need to increase their support and “over-vector” on a wide range of energy storage technologies** (e.g., fuel cells, lithium-ion, hydrogen, pumped-hydro and compressed air). Inter-jurisdictional connections should be made between provinces capable of storing hydro power and those with strong intermittent renewable energy potential.
- ✓ Industry-driven efforts need to be supported by government and researchers, potentially through **research centres of excellence in energy storage**. Revenue models for commercial storage should be adjusted to ensure a fair return on investment and to incentivize funding.
- ✓ **Off-peak electricity can be leveraged to store energy for both heating and cooling**. Seasonal underground energy storage in a community-scale system can help communities meet 100 percent of heating needs using solar thermal. Electric thermal storage units can store heat for customers using off-peak electricity. Excess electricity can also create ice to cool buildings during the summer.
- ✓ The federal government should **test grid storage at military bases** across the country to save energy and money. Large-scale lithium-ion batteries can store electricity and serve as emergency energy back-ups.
- ✓ **Energy management systems are critically important** when looking to integrate energy storage. Jurisdictions should share best practices and information and, when feasible, pool resources to strengthen intelligent energy management.
- ✓ **Indigenous peoples should own and operate energy storage systems** in remote communities. This will help integrate variable renewables and ensure a reliable source of energy at all times.

Climate change will have significant impacts on Canada’s electricity infrastructure. The appropriate plans need to be in place to ensure a resilient and secure electricity system for the future.

- ✓ There is the potential for **increased vulnerability of electricity systems due to long-term climate change impacts** on temperature and weather events. While it is unclear whether severe weather events will increase in frequency, ice storms, high winds, heavy rains, snowfalls, tornadoes and flooding have the potential to cause significant damage.
- ✓ **Canadian utilities need to adapt their infrastructure and business plans to a changing climate** by studying how climate changes will affect their service areas. Canada needs resilient electricity infrastructure.
- ✓ Canada needs to **improve the availability of, and access to, regional climate data**. It is important that Canadian scientists in universities, think tanks and research consortia receive appropriate financial support to continue their research as part of ongoing efforts to advance scientific understanding. Utilities need to incorporate climate data into decision-making processes.
- ✓ The federal government needs to **work with provinces, territories, municipalities and international partners** to increase the resilience and security of electricity systems.



WHAT WE HEARD

Powering Transportation

CANADIANS TOLD US THAT:

- Canadians want the transportation system of the future to be clean, smart, shared, faster and cheaper.
- How we power transportation in Canada in the future will dramatically change as new technologies, systems and solutions come online. A range of energy sources used for transportation – from biofuels to electricity, hydrogen, natural gas and propane – will need to be given space to grow based on regional advantages and system needs.
- Potential transformative changes are coming to the transportation sector through the advancement of new technologies and ways of doing business (e.g., transportation as a service).
- Investing in low-carbon public and active transportation infrastructure, densification and mixed- space communities will help make our cities more livable, efficient and emissions-free.
- Being smart about how we regulate transportation and finance/fund innovation will be critical to decarbonizing the sector and taking advantage of new technologies and services.

PRIORITY ISSUES

Technology and Systems Change: The transportation sector is one of the largest sources of greenhouse gas emissions in Canada. A number of different options to reduce emissions in this sector are vying for market share – including electric vehicles, natural gas-powered, hydrogen-powered and more efficient internal combustion engines, and biofuels. At the same time, new social and technology innovations, such as car sharing and autonomous driving, as well as active transport, increased mass transit and virtual work, are threatening to disrupt the structure of the transportation system. Freight transport will also face changes as the result of shifting energy markets, localized 3D printing, drone technology, autonomous vehicles and other changes (algae-based fuel, hydrogen, electric vehicles).

Infrastructure Renewal: Infrastructure needs for transportation in Canada will evolve over time. In order to target the right transportation infrastructure, Canada may need to overbuild and support some technologies that could end up failing. Different regional infrastructure solutions could be required to decarbonize transportation in Canada. Remote worksites, rural and Indigenous communities with unreliable electricity networks, urban environments and heavy transportation corridors all have different infrastructure needs. Planning for the future of transportation requires understanding these needs and managing change.

Unlocking Investment: Many actors in the transportation sector are currently resistant to change, facing high capital costs for new infrastructure investments in alternative transportation and

uncertain market conditions. To take advantage of new transportation technologies and innovations, both government and private-sector action may be required to implement new regulatory approaches, introduce new infrastructure financing and identify any additional strategic interventions that may be necessary (e.g., incentives, government procurement).

OPPORTUNITIES FOR ACTION

A range of energy sources may fuel personal and freight transportation as we decarbonize the sector – from biofuels to electricity, hydrogen, natural gas and synthetic fuel alternatives. Technologies will need to be given space to grow based on regional advantages and needs.

- ✓ **Many see electricity as the transportation fuel of the future.** We need to be ready to support a growing fleet of electric vehicles with adequate electricity supply and significant investments in fast charging stations, especially along transportation corridors. In order to encourage the purchase of electric vehicles, concerns surrounding cost, range and environmental impacts need to be mitigated through education, incentives, marketing, research and creating an emissions-free electricity system.
 - Some companies are leasing batteries to car owners rather than including the cost in the car purchase. This reduces up-front fees and alleviates concerns about battery degradation, as the battery is covered by warranty.
 - Another approach to support decarbonization is a mandated sales target for vehicle manufacturers for partial-emitting and zero-emitting vehicles. At the same time, some Canadians are concerned about the cost of large subsidies to incentivize electric vehicles.
 - Electric vehicle chargers should be universal and standardized, allowing all car models, as well as bikes and other transport options, to use electric infrastructure.
 - Until battery costs fall sufficiently, extended-life battery packs could be sold to enable long-distance travel with electric vehicles.
- ✓ **Hydrogen is an emerging source of low-carbon energy for transportation.** While there are currently challenges related to cost and supply, hydrogen produced through clean or renewable electricity may have an important role in the future, specifically in **supporting personal and heavy transportation** (e.g., freight, rail). Funding needs to go towards leveraging research and developing hydrogen infrastructure.
- ✓ **Biofuels can be integrated easily into existing fuel infrastructure** to help reduce emissions in the transportation sector. Ethanol and biodiesel are already blended into gasoline across Canada. Algae-based biofuels are a potential game-changer for the future of freight and aviation.
- ✓ **The largest opportunity for natural gas and propane-powered transport exists in the industrial sector** – specifically in freight transport (trucking, rail and marine) and public transit. More work is required to lower the emissions and costs of these fuels.
- ✓ **Improving the efficiency of internal-combustion engines** is delivering emissions reductions for new vehicles. At the same time, there is a growing desire to move away from fossil fuel transportation. Some Canadians think that the government should consider a ban on fossil fuel car sales, as seen in countries like France, UK and China.

Potential transformative changes in transportation are coming through the advancement of **new technologies and ways of doing business**, with major implications for energy use.

- ✓ **On-demand autonomous electric vehicles** owned by service-oriented companies have the potential to disrupt the transportation sector. This shift will be driven by cost factors (higher vehicle utilization, increased vehicle mileage, lower fuel and insurance costs) that allow transportation to be provided as a service at a much lower cost than owning a car. As these services gain momentum, the ownership of internal combustion engine vehicles may rapidly decline as costs increase, convenience decreases and quality of service diminishes.
- ✓ **A clear policy framework informed by engagement with all stakeholders will be required to manage the disruption of autonomous vehicles** and capitalize on potential benefits (e.g., reduced congestion, emissions reductions), as well as address challenges (impact on the use of mass transit).
- ✓ **Localized and more efficient distribution of goods and services** through 3D printing, drone technology and autonomous technology has the potential to reduce energy needs in Canada's freight system.
- ✓ **The less time cars spend idling, the more effectively we are using our resources.** We also need to be conscious of the possible environmental impacts of widely distributing batteries with heavy metals and integrate the recycling cost of these metals in battery fees. The sharing economy and new service providers may significantly increase vehicle utilization rates and reduce emerging demand for these items.

Investing in low-carbon public and active transportation infrastructure, in urban and rural settings, will help make our communities more livable, energy efficient and emissions-free.

- ✓ **Governments need to work together and with private-sector partners to support regional and national low-carbon transportation networks**, including emissions-free high-speed rail or hyperloops. These networks should be built between major population hubs. For rural Canada, the challenge will be finding opportunities to improve access between remote communities and major population centres, recognizing funding and resource challenges.
- ✓ For cities, governments should focus on funding better **low-carbon public transportation and active transportation infrastructure**. A focus should also be placed on commuter routes on the edges of cities or from satellite towns, on bike lanes, rail, and on culture-shifts to increase transit usage.
- ✓ One future challenge to public transit may come from the evolution of low-cost transportation-as-a-service businesses. Increased usage of these services may affect ridership of major public transit infrastructure, reducing the effectiveness of public transit and placing a burden on transit budgets.
- ✓ **Improving how transit agencies and other transportation players can access** financing may unlock transformative potential in how transit systems are developed (e.g., shared EV pods, fleets en-masse). Some Canadians see financial restrictions, for example on capital procurement, as holding back change.
- ✓ Avoiding travel for work through teleconferences, virtual workspaces and other tools can save emissions and money. The federal government should lead in implementing these practices.

Being smart about how we legislate and regulate transportation and fund innovation will be critical to decarbonizing the sector and taking advantage new technologies and services.

- ✓ **Regulation of transportation fuel** is emerging in places like Quebec and British Columbia. New regulation will need to be flexible enough not to “pick winners” when it comes to energy sources and technologies, but rather to allow different solutions the room to mature and capture market share.
- ✓ **Procurement is a powerful tool** to help decarbonize transportation. The private sector and governments can test new technologies and solutions across vehicle fleets to help commercialize new technology.
- ✓ **A carbon tax on freight transportation** that is recycled within the industry could drive innovation and promote ongoing emissions reductions.
- ✓ **Providing incentives (financial or non-financial) for the purchase of EVs** will drive ridership. The vast majority of all EVs sold in Canada in 2015 were purchased in three provinces that offer rebates.
- ✓ **Technical expertise to design, build, operate and maintain alternative fuel vehicle infrastructure** needs to be fostered within education systems.
- ✓ **Canada should focus on the capacity and expertise we already have** – in battery technology development, artificial intelligence and other areas. For example, we should not put all our efforts into building or subsidizing an electric vehicle plant in Canada but rather in licensing new technology to electric vehicle manufacturers.
- ✓ **Utilities are uniquely positioned to develop and implement new technologies to motivate change.** Allowing utilities to innovate in transportation could unleash new technologies and opportunities.
- ✓ **Regulation should target increased energy efficiency** across the entire transportation system.
- ✓ **Community-owned electric vehicle charging infrastructure** that allows communities to capture revenue from electricity sales could be a great tool to get citizens involved in the energy transition. Charging stations could also include solar panels, with energy fed into the charger or the grid. Customers would end up paying for the infrastructure, with additional revenue going to the community.
- ✓ Canadian companies, utilities and governments need to seize the opportunity to develop and **commercialize low-carbon transportation technologies and solutions on a global scale.** While some players are already leading on this front, more financing, support and innovation is necessary. In a world where electric vehicles require smaller manufacturing facilities and fewer people working in them, this could be an important source of economic revenue for Canadians.
- ✓ We need to redefine our definition of the “automotive sector.” It can no longer be seen simply as big auto manufacturers but should include mobility software, clean tech companies and even mining companies producing the raw materials for electric vehicles.
- ✓ Innovative approaches need to be identified to supply goods and services to the North while reducing costs and emissions and maintaining reliable supply.



WHAT WE HEARD

Energy Efficiency

CANADIANS TOLD US THAT:

- Energy efficiency is a critical tool in Canada's energy transition, serving as one of the lowest-cost options to meet and reduce energy demand in the generation ahead. Canada needs to use much less energy in the future, with the goal of decoupling economic growth from energy consumption.
- Efficiency should be a basic energy planning principle and should be accounted for before significant energy-related decisions and investments (e.g., building new supply, new construction and retrofits, policy and program development) are made. Each sector of the economy will require a tailored approach to improve energy efficiency.
- Incentives and regulations can help promote change. A mix of "push" (regulations) and "pull" (labelling, programs) actions are needed by governments to incentivize energy efficiency.
- New technologies and practices are continuing to revolutionize the way we use energy. Researching, commercializing and adopting these technologies and applying new social and business practices can help restructure the economy to be more energy efficient.
- Collaboration is crucial to creating transformative change in Canada's energy future. There is a need to build networks, provide information and tools and empower Canadians to champion efficiency. Every player in the energy system has a role and a responsibility to improve energy efficiency.

PRIORITY ISSUES

Economic Development: Energy efficiency provides the means to stimulate the economy, create jobs and increase productivity. By reducing energy needs in the face of population increases and energy demand growth, energy efficiency can serve as one of the key pathways to a low-carbon future. The payback from reduced energy costs often outweighs the upfront capital costs of efficiency improvements. Studies on the costs and benefits of energy efficiency show that for every \$1 spent on energy efficiency, between \$4 and \$8 of gross domestic product is gained. As we move forward, we need to recognize that Canadian jurisdictions have different regional contexts and therefore require tailored approaches to support efficiency.

Unlocking Efficiency: There are a series of challenges that we face to further improve energy efficiency in Canada. Utilities and energy providers sometimes displace their own sources of revenue by supporting efficiency. Low-income families can have a tough time accessing funding to pay for efficiency improvements, even though these improvements would benefit them greatly. Businesses can be risk adverse, choosing to maintain the status quo rather than invest in different solutions or technologies. Much of the technology already exists— the challenge is to proliferate

and mainstream these technologies. Efficiency is often ignored as a solution due to the perception that greater action is required to achieve transformative change.

Policy and Behavioural Change: Consistent reassessment of efficiency policies and approaches, by both the public and private sector, can help address changing markets, social conditions and technology innovation to help set and meet efficiency goals in the years ahead. Governments, businesses and society leaders need to encourage behavioural change across industrial, commercial, institutional and residential sectors to apply energy efficiency practices. This includes developing regulations, standards and codes. It also means leading investors towards the best available technology through information and financial support. Collecting data and providing up-to-date information on energy use can help individuals and companies measure their energy consumption and make informed investment decisions to improve efficiency.

OPPORTUNITIES FOR ACTION

Incentives and regulations can help promote change. A mix of “push” (regulations) and “pull” (labeling, programs) actions are needed by governments to incentivize energy efficiency.

- ✓ **Emerging ownership and financing models** for efficient end-use products (e.g., on-bill financing, crowd funding, community bonds) can improve the uptake of efficient products and behaviours. Governments need to look at ways to enable innovation and test new ways of financing efficiency.
- ✓ **Energy efficiency standards** such as ENERGY STAR for appliances or insulation requirements for buildings continue to reduce energy demand and foster technological innovation within industry.
- ✓ **Net-zero energy buildings** are paving the way for new carbon-neutral commercial and industrial infrastructure designs. Many Canadians want to support the ability to generate energy within a building or facility to offset the amount of energy it uses.
- ✓ **Energy efficiency retrofits** are crucial to reducing energy demand in existing building stock. For new builds, energy efficiency should be incorporated as a core principle. Codes and standards, energy audits, energy labels and communication resources are all important tools for governments to promote these actions. These tools need to be easy to use and affordable.
- ✓ **Innovative approaches to audit energy use**, including incentives and thermal heat mapping, can make it easier for Canadians to understand the benefits of efficiency retrofits.
- ✓ **Rental units require extra attention** as owners often pass on energy costs to tenants, who have little ability to retrofit or install energy efficient appliances. Bylaws and programming to support greater energy efficiency in these buildings could help significantly reduce energy use.

New technologies and practices are revolutionizing the way we use energy. Researching, commercializing and adopting these technologies and applying new social and business practices can help restructure the economy to be more energy efficient.

- ✓ **There should be a focus on research and development** of new technology to increase energy efficiency in all sectors, including agriculture and natural resources. Efficiency gains need to be made throughout the extraction, production, transport and transmission of all forms of energy in Canada. In addition, energy industries can use their own feedstock to reduce energy needs. For example, Canada's forest and pulp and paper sector has cut demand on fossil fuels by recycling biomass from its own processes. Meanwhile, Canada's petrochemical industry and refineries use natural gas as feedstock when most of the rest of the world uses oil.
- ✓ **Investments in smart grids** can help utilities expand time-of-use rates and other demand- side management programs to reduce peak electricity consumption.
- ✓ **Investments in efficient electricity transmission**, through high-voltage transmission lines as well as lower-voltage distribution lines, can reduce power losses between sources of electricity supply and demand.
- ✓ **Densification and distributed electricity generation** can help minimize the distance that energy, people and goods travel, reducing energy losses and associated costs and emissions. For example, industrial parks are heavy users of both electricity and heat, providing natural alignment with the development of localized combined heat and power generating stations. 3D printers also have the disruptive potential to localize manufacturing and minimize energy needs in transportation.
- ✓ **Automation of energy use** in the home, in industry and in institutional settings can increase awareness and control of energy. Sensors, smart shades and vents, programmable thermostats and other intelligent appliances and devices should be supported through incentives and marketing.
- ✓ **Capturing waste heat** can serve as a significant source of energy. Waste heat can be captured to feed industrial processes, supply commercial and residential heating needs, or even produce electricity. In one innovative example, new companies are commercializing technology to capture waste heat from water flowing down residential sinks and showers.
- ✓ **Ground-source and air-source heat pumps** utilize electricity in an efficient way to meet space heating, water heating and space cooling demand in buildings.
- ✓ **Investment in public transit** and other less energy-intensive forms of transportation (e.g., active transit, rail) can help reduce energy needs and lower emissions. Vehicles that are more efficient should be used in transit fleets, as well as for car sharing services.
- ✓ **Data centres** will be a growing source of energy demand in the future. Commercial and industrial buildings with these kinds of energy needs should be utilized as testing grounds for the best and most innovative energy efficient technologies and solutions.
- ✓ **Urban planners play a key role** in Canada's energy future by shaping the built environment in cities and communities across the country. Canada's cities of the future need to minimize energy use – through planting trees and growing roof-top gardens that shade houses and reduce heating needs, mixing commercial and residential space to lower commute times, developing district heating systems and applying other innovative solutions that bring people and technology together.

Collaboration is crucial to creating transformative change in Canada's energy future. We need to be building networks, providing information and tools and empowering Canadians to champion efficiency.

- ✓ **Hosting “one-stop” online information hubs** with up-to-date information on energy efficiency programs, products and practices that are easily accessible via Google search can help people make informed energy decisions. This could be expanded to look at the economics of solar panels, batteries and electric vehicles. One challenge is that consumers need to access information in separate places, as utilities, provinces and the federal government all have different websites and information.
- ✓ **Giving businesses the tools and information** to identify energy costs and apply efficiency measures can help spur action and make companies more competitive.
- ✓ **Community-oriented approaches** to energy efficiency should include targeted incentives, the use of accessible online information portals and databases, innovative tools such as competitions and thermal heat mapping, and incentives to support efficiency upgrades.
- ✓ **Mobilizing grassroots and industry-driven initiatives** through in-kind support, the provision of knowledge, and grants and contributions can build networks that champion innovative approaches to energy efficiency.
- ✓ **Empowering youth** with training and leadership opportunities can help them act as difference makers and co-creators of energy efficient practices at home and in the private sector.
- ✓ **Identifying international best practices** and entering into agreements with other countries to standardize energy efficiency in products and services will promote efficiency on a global scale.
- ✓ **The movement to reduce consumption**, through vegetarian diets, buy-local campaigns, and tiny homes are growing trends that can help reduce energy needs in the future.
- ✓ **Gamifying reductions in energy consumption** through rewards, competitions with neighbours and businesses, and visual displays is a great way to reduce energy demand and engage younger generations in the discussion.



WHAT WE HEARD Renewable Energy

CANADIANS TOLD US THAT:

- Canadians see renewable energy as the foundation of Canada's energy future and key to meeting emissions reduction commitments. In fact, many expect renewables to double in capacity by 2050 and produce half of Canada's total energy supply. As a result, renewables are viewed as source of future jobs and energy exports.
- The role of renewables is changing and expanding due to technology shifts. New technologies, such as high-efficiency solar panels, could provide new options for energy planning in the future.
- Standards and regulations are required to give credibility to renewable energy technologies and ensure that markets are structured to support their integration.
- It is critical that the development of clean renewable energy does not come at the expense of healthy ecosystems and communities.

PRIORITY ISSUES

Balancing Power Sources: The differing forms of renewable energy make the integration of new power generation into the grid an important issue. Loading variable solar and wind power into the transmission grid requires careful balancing to ensure system needs are met. One solution is to use intermittent power locally and combine it with other flexible power sources, while another is to build long-distance interties with other jurisdictions to trade intermittent power to smooth out differences in supply and demand. Incorporating storage into grids could also absorb excess power and ensure sufficient supplies are available when necessary. However, as the system is expanded and backup systems and storage are added, Canadians are concerned that costs may rise.

New Ownership Models: Price trends and advances in renewable technologies, particularly solar panels and small-scale storage, could make it affordable to develop small-scale renewables to provide alternative options to large-scale utilities. The challenges of obtaining social licence for large projects make some Canadians see renewables being implemented primarily on the community or individual scale. These potential ownership models could drive change in the grid itself. Community or personal power generation may mean that many buildings could support activities for a portion of the day through solar or wind power. While it is unclear if such communities or households would become grid independent, the transmission grid would need to be modernized to enable "prosumers" to feed power into the grid or draw power from it, depending on their needs. Canadians desire a better understanding of what the scale of this grid would be, the degree of backup needed, and the overall cost and benefits of distributed ownership and generation compared to centralized ownership and distribution model currently used by utilities.

Capital Requirements and Affordability Concerns: Investment in new clean-generating capacity to support decarbonized electrification can have high capital costs. Investments in large hydropower generation capacity, for example, requires significant capital, yet hydro projects are a safe long-term investment because of long asset life and low operation costs. Providing incentives for investment in other renewables or de-risking new renewable technologies through funding research and innovation can potentially also have high costs. As a result, the costs of the energy transition could be difficult to manage, as customers, businesses and governments need to adopt a fair approach that does not overburden any one party. Some Canadians highlighted how they were worried about the cost of renewables, in particular for heating, as a transportation fuel and in remote communities.

Innovation and De-Risking New Technologies: There may be a need to de-risk new renewable technologies by funding research and innovation. This could help Canadian companies gain market share domestically and compete abroad. Certain areas should be prioritized, such as storage, northern climate solutions and renewable feedstocks. As technologies are de-risked, they may also need to be supported through regulation and incentives to ensure they can be commercialized. Biomass, for instance, is the only source of renewable energy that can be used within the existing fossil-fuel infrastructure, including coal-fired power plants, oil sands operations, and transportation fuel distribution systems. Many Canadians point to a series of technical and financial challenges that are holding back the successful commercialization of biomass.

Social Licence: Renewable energy projects must obtain social license to be developed. The potential environmental impacts of renewable energy projects and the associated concerns from communities and project stakeholders could negatively impact the low-carbon transition. This is particularly true for large-scale hydroelectric projects, but can also be a concern for wind, solar, biomass, marine and geothermal projects. Some citizens are concerned about environmental effects, such as bird strikes from wind turbines, flooding from dams, and impacts on wildlife habitats from large solar projects. This means there is a continued need to engage with communities, Indigenous peoples and stakeholders to determine the appropriate places and scales of renewable energy generation. The potential for environmental impacts means that new renewable projects must be designed to minimize environmental impacts and be planned with the participation of local communities.

OPPORTUNITIES FOR ACTION

Hydroelectricity has the potential to provide Canada's electricity baseload supply of the future and facilitate the development of a 100-percent clean electricity system by 2050.

- ✓ **Canada's untapped hydropower potential** – more than double the country's current capacity – can help meet demand while reducing emissions. All regions of Canada have hydropower resources available for development, making it a truly national resource.
- ✓ **Hydroelectricity offers a clear competitive advantage** for Canada's economy because it provides a reliable source of cost effective, low-emission energy to most provinces and many markets in the United States. To meet this potential, hydro projects must benefit their host communities and respect the rights and interests of Indigenous peoples.
- ✓ There is **disagreement about whether hydropower should be further developed**, specifically in remote and environmentally sensitive regions. Some Canadians cited concerns about environmental disturbance and the cost of large projects. Some Canadians say that hydropower must not threaten sensitive watersheds or negatively impact free-flowing river systems.

- ✓ **New innovative hydro technologies** such as in-stream kinetic turbines and ocean wave and tidal designs are being studied and tested. There are technologies that can improve the efficiency, flexibility and environmental performance of conventional hydroelectric generation, such as fish-friendly ladders, intake gates and turbines.
- ✓ Canada should **build and expand hydro reservoirs** to help store energy and enable the integration of other variable renewable energy sources, such as solar and wind.

Bioenergy and biomass could play a significant role in Canada's energy future as they can be economically utilized in Canada's existing carbon-based infrastructure and scaled to meet Canadians' energy needs.

- ✓ Biomass is the only renewable option that that can be **utilized in existing fossil fuel infrastructure** (e.g., heavy-duty trucking and aviation). This allows it to act as an efficient and cost-effective means of space heating and as a low-carbon transportation fuel. It is also the only renewable option that excels at providing industrial process heat, which is a large source of energy demand in natural resource recovery, extraction and processing.
- ✓ Canada has a competitive advantage in the bio-economy, as it has more biomass per capita than any other country and is a world leader in sustainable forest management. Opportunities exist to **deploy bioenergy on a large scale** in Canada and continue to make use of the current energy infrastructure.
- ✓ Bioenergy could be a good **option for facilities and modes of transportation that cannot rely on electricity alone** (e.g. steel plants, shipping). A second major opportunity is modern wood heating, which is seen as one of the lowest-cost renewable options for heating large buildings.
- ✓ **Indigenous communities can play a significant role in the development and management of bioenergy** and biomass projects as providers of traditional knowledge, suppliers of biomass, operators of facilities, exporters of biomass and consumers of bioenergy.
- ✓ Policies for bioenergy need to focus on both **technology development and market adoption**.

Solar energy has the potential to play a key role in the transition to a low-carbon economy and to drive the development of clean energy generation, including local generation in communities across the country.

- ✓ **Funding for community solar programs** has the potential to help reduce the overhead and soft costs of installing solar (marketing, administration, permitting) to a minimum while also creating jobs in the local economy through the deployment of solar panels, design of systems and supply of components.
- ✓ **Costs related to the development and integration of solar continue to decline**. Canadians noted the need to recognize the value of supporting distributed solar as the grid is modernized.
- ✓ To **make solar panels affordable and accessible**, a program for homeowners to receive a tax credit if they install and use solar panels on their home could be created. Support could also be provided to non-profit organizations for the installation of solar panels as a source of revenue generation and cost savings. Some Canadians want governments to remove barriers to solar installation (e.g., unfair regulation, fees, and taxes).

- ✓ **Some Canadians think that building codes should be updated** to require the installation of solar panels and community development plans to include a power-generating component as part of the community plan.
- ✓ While it is an ambitious goal, some Canadians think that **every home in Canada should have roof-top solar panels**.
- ✓ Many Canadians want to **develop innovative approaches to installing solar panels**. For example, public and private support can help develop floating solar panels that can be placed on lakes and other water bodies, solar-charged greenhouses, solar installations in remote communities and solar-powered electric vehicle charging stations.

Wind energy is the fastest growing form of renewable energy in Canada and can play a key role in the transition to a low-carbon economy.

- ✓ Canada must **reduce barriers and create incentives to add more wind power** onto the grid. Wind is emission-free and does not pollute the air or water. Furthermore, it is one of the lowest-cost options for new electricity supply.
- ✓ While wind power experiences issues related to intermittency, this problem can be overcome by **trading electricity with neighbouring jurisdictions** to help moderate generation fluctuations, **connecting with reliable back-up power sources**, or **leveraging energy storage technologies**, such as hydrogen or hydro.
- ✓ Canada needs to support the entire wind turbine industry, including **manufacturing, construction, operations and maintenance, and other spin-off businesses and occupations**.
- ✓ Canada should identify new approaches to capturing wind power, including **offshore wind turbines, wind turbines in northern climates, small-scale wind turbines and high-altitude wind turbines**.
- ✓ When siting wind turbines, project proponents must take into consideration **noise and visual disturbance, impacts on birds and bats, and land-use concerns**.

Geothermal energy has huge untapped energy source potential that has significant value both as a source of energy and as a technology export.

- ✓ **Geothermal is an underutilized energy resource** in Canada, given Canada's significant geothermal potential and the ability to **leverage the skills and resources from existing industries, such as oil and gas**.
- ✓ The **upfront risk associated with project development emerged as a critical barrier to investment** that many other renewables do not face. Policies to mitigate these risks have been essential in countries with developed geothermal industries, such as the United States, Iceland and New Zealand.
- ✓ While geothermal heat and power systems are already proven commercially, there are a number of **emerging geothermal technologies with significant transformative potential**. These include Enhanced Geothermal Systems, thermal piles, large-scale energy storage and "in situ" geothermal.

Marine renewables, including tidal energy, have huge and previously untapped potential to provide clean energy.

- ✓ **Tidal and wave power are key untapped renewable resources for coastal regions** in Canada.
- ✓ Although marine renewable technology is still emerging, additional research and support can help it become cost competitive with other renewable energy sources. Canada should be deploying more pilot projects to **test marine renewables in real-world situations.**



WHAT WE HEARD

Nuclear Energy

CANADIANS TOLD US

THAT:

- Many Canadians view the role of nuclear as fundamental to achieving and sustaining Canada's climate change goals and see the technology as a long-term source of baseload electricity supply.
- Small modular reactors (SMRs) will be key to the sustainable development of Canada's energy and natural resources, such as the oil sands, and can help reduce reliance on diesel generators for remote communities and the North.
- Canadians also view nuclear as a high-cost energy option and are concerned about nuclear waste management. As a result, they called for the selection and promotion of sustainable and low-cost energy solutions.

PRIORITY ISSUES

Social Acceptance for Nuclear Energy: Many Canadians agreed that there is a need to build and maintain public confidence for nuclear technology, with industry and government playing a role. There was consensus that governments have a role in providing certainty (policy, regulatory and funding) to improve investor confidence and deepen relationships with partner governments. Nuclear energy is viewed by many as an important part of Canada's energy mix now and into the future to help achieve our climate change goals.

Canadians identified the need for scalable electricity generation solutions that provide employment, use existing Canadian skill sets, are sustainable and safe, take advantage of existing infrastructure and help us mitigate and adapt to a changing climate. Accordingly, building public confidence for nuclear energy requires public education to inform Canadians about the role of nuclear energy as part of the mix.

Canadians expressed the concern that education alone is not enough and focused on the need to engage with communities, Indigenous peoples and other partners to determine social acceptance and support for additional nuclear development. There is a need for meaningful and not just obligatory public consultation, and it is important that local communities be engaged in decision-making processes to build public confidence.

Nuclear Waste Management: Many Canadians voiced concern with nuclear energy due to the perceived hazard associated with radioactive waste management and the perceived threat of nuclear disasters. There are concerns among Canadians about the management of Canada's used nuclear fuel, particularly if the use of nuclear energy increases and more nuclear fuel waste needs to be transported and stored safely. Some Canadians view uranium refining technologies as inefficient due to the creation of large amounts of waste. However, others point out that uranium mining and refining does not have a significantly higher environmental impact than other forms of

mining. Discussions also alluded to a potential shift to thorium as a primary fuel source, as many consider it to be more abundant and it produces less waste than uranium. In addition, the shift to different fuel sources could be complemented with a switch to newer nuclear technologies that some consider to be more efficient and cost-effective for Canadian taxpayers.

OPPORTUNITIES FOR ACTION

Nuclear energy can serve as a reliable baseload supply of electricity and can help Canada reduce its greenhouse gas emissions and meet climate goals.

- ✓ **Canada's nuclear energy sector can provide reliable, affordable and clean baseload power** to help Canada achieve and sustain its climate change goals. It is viewed as a core part of Canada's efforts to decarbonize the energy system and to meet the government's Paris Accord commitments.
- ✓ With increasing global demand for electricity, **large and small nuclear power plants provide a viable option to support the achievement of emissions reduction objectives, reduce air pollution and limit land-use concerns** related to other energy sources.
- ✓ Some Canadians think that nuclear can contribute to the **expansion of Canada's electricity supply, a goal required for decarbonization**. It also supports the integration of renewables and storage technology into the energy portfolio.
- ✓ In order to tackle climate change and accommodate **new nuclear technologies, policy and programming support is needed** from federal and provincial governments to position nuclear as an essential part of Canada's domestic clean energy mix.
- ✓ Canada's **nuclear industry is a strategic asset** and its long-term success relies equally on business and governments, making continued dialogue between all stakeholders an important priority.

Small Modular Reactors (SMRs) can serve to meet demand for affordable and clean energy, specifically in Canadian industry and in Canada's remote and northern communities.

- ✓ **SMRs and Variable SMRs provide tailored on- and off-grid electricity** and co-generation solutions to remote communities, industrial parks and other large energy users. Small modular reactors can also help deliver clean, affordable energy to Canada's 300-plus remote communities. Some Canadians see SMRs improving the quality of life of residents inhabiting remote communities, as well as helping governments reduce the use of diesel in the North, improving energy access and security and supporting economic development opportunities through the export of technologies to global markets.
- ✓ **Government and industry engagement** on the nuclear file can support export opportunities and build investor confidence.

Due to the **importance of science and innovation** in providing long-term prosperity for Canada and the potential for small modular reactors to address priorities for clean energy in the North, there is a need for investment by industry and governments in nuclear innovation.

Nuclear technology has a broad range of applications beyond power generation.

- ✓ The nuclear industry supports more than power generation, as it creates benefits across a **wide range of industries** (health, security, agriculture, etc.). Additional benefits can be gained by establishing lasting partnerships amongst various players and across sectors (including large companies, utilities, small and medium enterprises, governments, laboratories and academia).
- ✓ **Ongoing development of Canada's expertise in nuclear** can spur innovation, jobs, exports and growth in nuclear science and technology in areas such as health, energy, safety and security and the environment , as well as maintain Canada's role in international political security and energy dialogues.



WHAT WE HEARD

Natural Gas

CANADIANS TOLD US THAT:

- There is a need for national direction and clarity on the long-term role of natural gas that takes into account issues concerning environmental impacts, affordability and reliability.
- Natural gas can play a critical role as a lower carbon fuel and can help move Canada and international counterparts toward a low-carbon future. Infrastructure is an important enabler in this regard.
- Technology and innovation, in particular solutions that reduce emissions and costs, will be significant factors in determining the role for natural gas in Canada's energy future.
- Building public confidence and creating a positive brand for Canadian natural gas could help improve public perception of the resource and industry.
- Renewable natural gas, propane and other synthetic alternatives have a potential role to play in Canada's future, as do the alternative uses for natural gas beyond combustion.
- Changes to the energy delivery industry and to Canada's energy policy approach could have significant impacts for the future of natural gas, including its competitiveness.

PRIORITY ISSUES

Future Role of Natural Gas: Two different narratives exist among Canadians on the role of natural gas in Canada's energy future: 1) that it will continue to be an important source of baseload electricity and heat and that increased effort should be placed on decarbonizing supply (e.g., through synthetic or renewable fuel and electrification), and 2) that it is a short-term energy option as the costs of renewables decrease and new clean energy storage solutions become available. Canadians have said that the future role of natural gas in our energy mix will be shaped by a number of factors, including adherence to emission targets, comparative costs, innovation, inter-regional equity and political will. Many Canadians have voiced the need for national direction and clarity on the role of natural gas, followed by regional conversations about common ground, goals, feasibility, timelines and long-term actions.

Environmental Impacts: One of the biggest concerns for Canadians and a key factor affecting the lack of clarity on the long-term role for natural gas in Canada is its impact on the environment. Some Canadians said they were not against the development and use of natural gas, but they were opposed to fracking as a means to extract oil and gas from the ground, as they felt it was too polluting. Canadians said that we have to put practices in place now that take care of not just the next generation but future generations to come. We need to think about the impacts of

development on things like air and water quality. Some Canadians voiced that it is not beneficial to continue with natural gas as an option for the future if it will maintain the same carbon intensity it has today. Canadians also voiced concerns over stranded assets and project lifecycles – raising the question of whether natural gas will be replaced by renewable energy in the decades ahead.

Reliability and Affordability: Canadians are concerned about the environmental impacts of energy, but they also care about affordability and reliability. While there are differences in opinion about the scale of opportunities and limitations for natural gas in Canada, there is a consensus among many Canadians that the reliability and affordability of natural gas will help it across three areas – as a fuel source for power generation, as a heating fuel in the buildings and industrial sectors and as a source of fuel for transportation. For energy to remain reliable and affordable, Canadians said we must continue to leverage existing infrastructure and, using a combination of policy, regulations and market forces, innovate in the areas that can most effectively help improve our economic and environmental performance.

Collaboration across Sectors: Many Canadians have said that collaboration across all relevant sectors is needed to move forward on clean natural gas development. Canadians also said it is important for Canada's energy industry not to put all its eggs in one basket – there is a need for collaboration and innovation both to reduce carbon in fossil fuel production and to develop renewable energy technologies.

OPPORTUNITIES FOR ACTION

Natural gas can play a critical role as a lower carbon fuel and can help move Canada and international counterparts towards a low-carbon future.

- ✓ **Canada has a world-class resource available** in the form of liquefied and compressed natural gas.
- ✓ Natural gas is currently a popular option to **enable the accelerated retirement of higher-emitting fossil fuels in the near-term** and is expected to play a critical role in the transition to a low-carbon future, particularly in transitioning power generation away from coal.
- ✓ Natural gas is the largest growing fuel source, and the abundance and versatility of this resource is helping the world shift to **less carbon-intensive electricity generation and heating** while at the same time providing an emerging option as a fuel for certain types of transportation.
- ✓ By powering more of the world with large domestic supplies of natural gas, Canada can do its part internationally to **help developing countries get off high-carbon fuels faster**.

Infrastructure is needed to support the use of natural gas in the energy transition. This includes leveraging existing critical infrastructure and creating new infrastructure where needed.

- ✓ **Canada's existing natural gas infrastructure network could be leveraged** to help achieve low-carbon objectives by fuel switching to renewable natural gas or hydrogen and expanding distribution networks into diesel and coal-reliant communities. This includes **collaboration between upstream and downstream fossil fuel sectors and promoting sharing of critical infrastructure**.

- ✓ Some Canadians said that while they are opposed to the use of oil and coal, they are not resistant to the use of natural gas.
- ✓ Supporting natural gas as a long-term energy resource includes **facilitating the infrastructure needed for its use (e.g., pipelines and LNG facilities)**.

Technology and innovation will be a significant factor in determining the long-term role for natural gas in Canada's energy future, particularly related to reducing costs and greenhouse gas emissions.

- ✓ To position natural gas as a viable option in a low-carbon future, **lowering carbon intensity through investments in innovation will be necessary**. This can be achieved through developing renewable and synthetic fuels, targeting emissions-free production, reducing fugitive emissions during transmission and improving the efficiency of fuel use.
- ✓ Canada should strive to be the hydrocarbon producer of choice in the transition to a low-carbon global economy. This means **pursuing innovation to dramatically reduce emissions (and costs) in production** and capturing and utilizing carbon dioxide for various materials and products.
- ✓ Policy levers that could be considered to **lower the chances of stranding assets are increased public commitment to research and development spending** to find technologies and processes to lower the break-even costs of new projects and long-term programs to increase markets for Canadian natural gas.
- ✓ Some Canadians said there is a **view from industry that technology and innovation will help Canada tackle the challenge of lowering emissions in the energy sector** – but this has not happened as fast as industry says, not for lack of effort.

Building public confidence and creating a positive brand for Canadian natural gas could help improve public perception of this resource and industry.

- ✓ There is an opportunity for Canada to **brand itself as a low-cost, low-carbon energy supplier** to meet world energy demand and to help replace more carbon-intensive fossil fuels like coal.
- ✓ **One of the biggest challenges for the oil and gas industry is public confidence** – Canadians said that industry needs to work in partnership with governments and Indigenous communities to build trust and foster benefits for Canadians.
- ✓ **Innovation, communication and a focus on sustainable practices** are all needed to create a positive brand and to attract the talent needed to the gas sector.
- ✓ Some Canadians said that the oil and gas sectors would benefit from increased ownership over product value-chains (from production to end use). This would help to improve confidence in the industry, support emissions reductions across the sector and allow industry to respond to and support other energy priorities.

Changes to Canada's energy policy approach, including to policies that govern the energy delivery industry, could have significant impacts on the future of natural gas, including its competitiveness.

- ✓ **In 2050 Canada's energy delivery industry could be integrated** into energy service provision, combining natural gas, electricity and transportation. Delivery systems could consolidate existing players, with more entities playing in a range of domestic and international markets.
- ✓ With respect to **managing the role of natural gas in the future**, Canadians said government must stick to its emissions reductions targets, provide long-term certainty to markets, consumers and producers, and define the transition period.
- ✓ **The long-term role for natural gas in electricity generation** will need to be defined to ensure that policy and market signals provide the information investors require to take decisions that will ensure that any greenhouse gas emissions from natural gas generation are consistent with Canada's climate change objectives.
- ✓ **Long-term support to incentivize the reduction of carbon intensity** in natural gas and improve the efficiency of its use for both heating and electricity may improve Canadian industrial competitiveness.

Renewable natural gas has a large potential role in Canada's future as a low-carbon fuel. To realize its potential, some Canadians voiced the need to overcome challenges faced by the fuel, specifically those related to cost and availability.

- ✓ **A wide range of approaches will be required to expand the supply of renewable natural gas** – including setting long-term targets, providing government subsidies, financing new renewable natural gas plants, expanding the use of anaerobic digesters and linking investments to other policy priorities (e.g., reducing landfill emissions and waste, finding alternatives to diesel in remote communities). These efforts would create the added benefit of long-term market certainty for renewable natural gas suppliers.
- ✓ **To support greater use of renewable natural gas**, regulations could help foster demand and incent the development of dedicated markets. One key focus is to reduce costs and, where required, support transparent cost sharing. The impact of a carbon price on other carbon-intensive fuels may improve the cost equation for renewable natural gas.

Propane could be used more widely as part of Canada's energy future, as an abundantly available, lower- emission, Canadian-produced energy source.

- ✓ **Propane can be used as an alternative option** in various energy applications, including in commercial and residential buildings, freight transport and in Indigenous and remote communities. Canada has a significant supply of propane available that is ready to be leveraged.

Finding alternative uses for hydrocarbons beyond combustion could play a big role for natural gas in Canada's energy future.

- ✓ One opportunity could be an increased focus on **non-combustion markets for Canadian hydrocarbons, for example in petrochemicals development.**
- ✓ **Natural gas and its associated liquids are the raw natural resources the chemical sector craves.** These resources can be exported, consumed, converted or sequestered into a multitude of finished goods that enhance the quality of life for Canadians and others in global markets.
- ✓ Some Canadians said natural gas liquids are the lowest-carbon approach to making chemicals, but we are not using them in Canada for this purpose. **Value-added manufacturing should be made a priority and is a solid option to support improved sustainability in hydrocarbon development.**



WHAT WE HEARD

Petroleum

CANADIANS TOLD US THAT:

- There is a need for clearer direction on the role of petroleum in Canada's energy future. Canadians are concerned about the environmental impact of development as well as the decline in competitiveness and jobs in the sector.
- Canada needs to find innovative approaches to support competitiveness while reducing emissions and meeting environmental objectives. The oil and gas sector needs to be part of the solution.
- Canada can expand its export markets and play a major role globally as a responsible energy supplier. Technology development and innovation is a critical factor in decarbonizing petroleum production.
- Creating a positive brand and building public confidence for Canadian petroleum through responsible development could help improve public perception of the resource and industry.
- Petroleum resources can be used for a variety of other non-combustion purposes, creating value added products that can support long-term economic growth.
- Domestic actions, specifically with respect to infrastructure and climate change, can help define the role of the petroleum industry in the energy transition and Canada's energy future.

PRIORITY ISSUES

Future Role of Petroleum: Canada currently has a hydrocarbon-based economy. Many Canadians have said that Canada needs to be united as a country on whether we use this commodity or not. They have called for clearer direction from governments on what the role of petroleum should be in Canada's energy future and in the energy transition. With fossil fuels making up a significant percentage of the energy mix in Canada, the oil and gas sector needs to be part of the solution in the transition to a low-carbon economy.

Competitiveness and Jobs: Canada's petroleum industry is a leader in energy innovation, is a source of economic growth, and is an important source of jobs and revenue. Many Canadians said that Canada needs to find innovative approaches to support the competitiveness of this industry while also reducing emissions and meeting environmental objectives. Key to this is the decarbonization of oil and gas production. Canadians said that many communities across Canada are dependent on traditional energy, both economically and socially.

Environmental Impacts and Climate Change Objectives: The environmental impacts of petroleum development and meeting Canada's climate change objectives are some of the biggest concerns for Canadians. While oil and gas industries are providing leadership to reduce emissions, many

Canadians said efforts need to be strengthened to meet Canada's greenhouse gas emission reduction targets. Reducing emissions in heavy industry, including fossil fuel production, could support a competitive advantage for Canada. Many other Canadians said they felt oil and gas were too polluting to maintain as significant contributors to Canada's energy mix and voiced the need for greater economic diversification and a focus on renewable energy resources. Canada needs to decide whether it is a leader or not in climate action. Some Canadians highlighted that hydrocarbon resources should be subject to a carbon price that is based on international norms.

Collaboration across Sectors: Many Canadians have called for increased collaboration across sectors and governments to create a path forward on the future of the petroleum industry in Canada. Collaboration could accelerate change by reducing emissions, creating new low-carbon fossil fuel by-products, and improving the safety and environmental sustainability of fossil fuel production and transportation.

OPPORTUNITIES FOR ACTION

Canada can expand its export markets and play a major role internationally as a supplier of responsibly developed petroleum resources.

- ✓ Canada needs to focus on positioning itself as a **competitive and responsible supplier of petroleum and a leader in low- to zero-carbon innovation**.
- ✓ Canada has an abundant oil resource, a very skilled workforce, and stringent environmental regulations but would **need investment and innovation to compete globally on cost and emissions reductions**.
- ✓ **Pipelines deliver energy safely, reliably and efficiently to Canadian end-users, connect North American markets and transport energy to ports for sale overseas.** Increases in crude oil supply in western Canada, primarily from the oil sands, have led to the incremental expansion of export-oriented pipelines as producers seek new markets. Pipeline project approvals are needed to meet this demand.
- ✓ **Lowering the cost of production would be vital to local Canadian firms** who have acquired oil and natural gas reserves and increased their exposure to stranded asset risk.
- ✓ **Many Canadians suggested that we cannot look at Canada in isolation in terms of addressing competitiveness and climate change** – if global demand falls, this will create risk, and decarbonizing petroleum production in Canada does not help with end-use of these products in other countries.

Technology development and innovation is a critical factor in decarbonizing petroleum production and creating advances that would help determine a role for this industry in Canada's energy future.

- ✓ **Next generation technology and energy innovation** will move from incremental to transformational change at a pace and scale that has not been seen before.
- ✓ **New technological advancements are needed to separate the idea of eliminating "carbon" from eliminating "oil and gas"** and to create end-use fossil fuel products with low carbon intensity. Canadians suggested that policies need to facilitate, not impede, these technological innovations.

- ✓ Many Canadians said that governments need to set a clear definition of “clean technology” so that the oil and gas sector can be included in the conversation and supported in this area.
- ✓ **Canada can use the scale of the oil and gas sector and its leadership experience to foster technology development and innovation** to address environmental issues and other energy priorities. Innovation in the petroleum industry led to addressing reliability issues through the development of the oil sands.
- ✓ **Energy producers need to work with end-users and innovate together** – different perspectives can help to promote innovations and solutions.
- ✓ **More emphasis should be placed on carbon utilization rather than capture and storage.** Finding ways to utilize carbon (e.g., in concrete, mining) will improve the viability of the technology and act as a source of demand for carbon in the long term. The Carbon XPRIZE is a good example of how we can spur innovation to capture carbon to be used for higher-value products.
- ✓ **Some Canadians said it is important to monitor the health of the innovation ecosystem for oil and gas** in terms of emission reductions. It may be equally important to focus on reducing emissions from other industries, such as steel and cement.

Creating a positive brand and building public confidence for Canadian petroleum through responsible development could help improve public perception of the resource and industry.

- ✓ Many Canadians said that **to build public trust, the oil and gas industry needs to communicate what they are doing well and what they are working to accomplish** and clearly outline how everyone in Canada benefits from a Canadian hydrocarbon industry.
- ✓ Some Canadians think that **the domestic oil and gas industry has a more positive image globally versus how it is seen in Canada** (recognized globally for responsible development and environmental standards). Within Canada, increased literacy is needed to create a better understanding of the industry.
- ✓ Some Canadians do not see the oil and gas industry as “honest brokers” – to fix this and create a more positive image, Canadians said that **industry can meet government climate change commitments and take action to support Indigenous engagement in the sector.**

Petroleum resources can be used for a variety of non-combustion purposes, creating value-added products that can support long-term economic growth.

- ✓ **Oil is a resource that Canadians use for a wide range of valuable purposes in their day-to-day lives (e.g., plastics, materials, medicines, lubricants).** This feedstock needs to be preserved and used for purposes beyond combustion.
- ✓ While oil remains the world’s primary energy source, **future demand will also be driven by the use of oil and gas as a feedstock for chemicals manufacturers and other industries.** Research should focus on emerging and new applications for fossil fuels in non-combustion areas.

Other domestic actions could help define the role of the petroleum industry in the energy transition and in Canada's energy future.

- ✓ **Canada could create a self-sufficient carbon economy** through the development of pipeline projects to reduce the need for oil imports and increase Canada's control over its carbon future and emissions, as well as increase revenues kept in Canada to maintain and improve the standard of living.
- ✓ The Paris Agreement implies that Canada eventually needs to get to zero emissions – some Canadians said that Canada should only build **new fossil fuel units that support this transition and enable improved integration of renewable energy sources.**
- ✓ The boom and bust nature of the oil and gas sector creates instability for workers and the economy. Some Canadians said that domestic oil and gas industries need to use their platforms and intellectual capital to advance an energy transition plan, in collaboration with other sectors. The focus should be on transitioning local labour markets and promoting regional economic growth in a sustainable manner.



WHAT WE HEARD Canadian Cities

CANADIANS TOLD US THAT:

- Cities, which make up the fastest growing regions of Canada, are home to over 80 percent of Canadians. Building a future for communities that includes integrated and efficient energy systems, opportunities for local energy production and trading, and low-carbon modes of transportation is fundamental to a low-carbon society.
- The role of communities is significant in the energy transition due to their connection to citizens and their impact on the use of energy. Canadians felt that communities and their inhabitants should have the opportunity to participate at national, regional and local government levels to help inform future energy policy and planning.
- Governments can act as enablers, convenors, co-regulators and funders to drive the development of smart and energy efficient cities.
- Regional and community diversity means that different approaches to the transition are needed in different locations.
- Urban design and transportation are key to building prosperous, livable and energy efficient cities. Federal, provincial and municipal governments should support new approaches to urban design, such as densification and active transportation.

PRIORITY ISSUES

Community Empowerment, Awareness and Collaboration: Cities and communities are positioned to be leaders in energy innovation to help find long-term solutions to challenges brought on by the transition. A strong entrepreneurial culture exists within Canadian cities. However, effective collaboration and partnerships across federal, provincial and municipal governments and with the private sector is required to release this potential.

High Capital Costs: The implementation of urban energy efficiency measures and community-scale energy projects is often made difficult by high upfront costs. To be attractive to private financing, such projects need to have clear revenue models, use proven technology and have experienced management teams. Canadians look to governments and the private sector to enable communities to work with a common financial intermediary to design similar clean energy projects that can be bundled into attractive, scalable investment opportunities for institutional investors.

Information Barriers: Coordination and information sharing between cities and across jurisdictions is a key challenge to acting on a pan-Canadian level to make cities and communities more energy efficient. Establishing a nationally recognized approach for the collection of data and creating standards of measuring and reporting energy at the municipal level could allow for the comparison and evaluation of municipalities and could provide the evidence necessary to guide Canada's transition to a low-carbon society.

OPPORTUNITIES FOR ACTION

Smart cities and smart regions enabled by the “Internet of things” have the potential to generate new business opportunities in both the market economy and the “platform economy,” to increase productivity, and employment and to enable the low-carbon transition.

- ✓ Buildings must be considered as part of a larger city organism – not just as users of energy but also as energy producers.
- ✓ The creation of **integrated energy systems in urban areas and rural communities** could reduce the marginal cost of energy while also reducing emissions. It would rely on five factors:
 1. Make buildings more efficient and enable installation of small-scale solar and wind;
 2. Set targets to replace hydrocarbons with renewables;
 3. Embed storage technologies across the grid;
 4. Support the development of smart grid and distributed grid infrastructure; and
 5. Invest in infrastructure to support the mass adoption of low-carbon transport.

Energy efficiency creates co-benefits for communities that advance social equity, support improved health and reduce the vulnerability of certain groups.

- ✓ Applying more **energy efficient practices in communities** improves indoor air quality, provides quieter and more functional spaces and saves homeowners’ money over the long-term.
- ✓ Cities and communities can take creative approaches to **engage the imagination of Canadians in the energy transition**. This means involving artists and cultural communities to inspire and engage Canadians on the possibilities offered by an energy transition.
- ✓ **Energy literacy campaigns** should be developed by municipalities, with a focus on linking the social, environmental and economic impacts of energy usage.

Actions are underway at the community level that have the potential to support **climate change mitigation, energy security and economic development**.

- ✓ **Energy and emissions plans developed by Canadian communities** in recent years contain visions that broadly articulate objectives of climate change mitigation, energy security, economic development and improved quality of life.
- ✓ **Integrated community energy mapping** is an emerging approach that leverages existing and new information and modelling software to provide scalable spatial information to support energy and emissions planning, policy, and program development and implementation.
- ✓ Policy choices in cities can accelerate market pressures in favour of renewables. Ambitious renewable energy targets can **help cities build strong “green” brands**, which are widely valued by private-sector partners and can help attract investment in local clean technology firms.



WHAT WE HEARD

Remote Communities

CANADIANS TOLD US THAT:

- By 2050, Canada's remote communities may be powered predominantly through local energy projects that are either individually or community owned.
- The high cost of diesel and an unreliable grid can act as strong motivators for remote communities to seek opportunities for energy systems change. Biomass heat and power plants should be considered an option where possible, specifically in northern remote communities where sustainable biomass is available to support such development. Propane and natural gas projects can also be developed and deployed as cleaner alternatives to diesel.
- The following essential elements are needed to catalyze diesel reduction projects and energy infrastructure development in remote off-grid communities across Canada:
 - Community-driven processes with citizen participation;
 - Recognition and acceptance that every community has different values and therefore may require different solutions;
 - Support for communities, rather than forcing decisions from outside;
 - Trust between industry, government and the community; and
 - Education and awareness for the entire community, not just governing bodies.

PRIORITY ISSUES

Diesel Dependence: As of 2016, Canada's remote communities, of which the majority are predominantly Indigenous, are facing a number of long-term challenges related to energy security and the continuing consequences of using expensive imported diesel fuel for heating, electricity and transportation. Many of these diesel systems are aging and, in a number of communities, the existing infrastructure limits electricity use, creates significant environmental risks and hinders community economic development.

Switching to lower, non-emission sources: Canadians described that ideally, by 2050, Canada's remote communities would be powered through individually and community-owned energy projects. To reduce diesel dependence, Canadians stated that a varied energy portfolio (e.g., predominantly renewables) will need to be designed and implemented. Indigenous participants cited the need to make their communities into renewables energy hubs, where they are given the skills and expertise to generate their own electricity and are not reliant on the grid but rather benefit from it. This approach ties into many First Nation, Métis and Inuit peoples' communal values. For communities to diversify their energy sources and become shareholders in projects, a number of difficult challenges will need to be overcome.

Financial Burden: Canadians voiced that the upfront cost of energy projects and updating and connecting to the grid are all extremely expensive. As remote communities are not big draws for large private companies there are few options available for absorbing the high capital cost of

renewable projects. Canadians from remote communities emphasized that they all have a small rate base, which means that the financial burden of installing connections to the grid will be heavily felt, as there are fewer consumers to pass the cost onto.

Without a grid connection or storage option, there is an inability to take advantage of surplus power produced. Canadians from remote communities often feel that they are unable to move past this stage without additional support.

Social and Educational Issues: Remote communities often face a wide range of pressing issues, including access to clean water, inadequate housing and unemployment. It is difficult to prioritize energy over these issues. Canadians were concerned that these communities can be very sensitive to the effects of energy development and market fluctuations, yet homes in these communities are often directly impacted by energy and other natural resource development. For example, a lack of clear rules can mean that the responsibility for dealing with environmental damage from decommissioned and orphaned projects can fall on local Indigenous communities. A lack of resources, skills and training capacity were also raised as barriers preventing communities from joining the transition and investing in renewable energy projects.

Policy and Regulation: Canadians emphasized that energy project implementation currently takes too long and involves too much red tape for communities to navigate through. Canadians were concerned that four-year government leadership terms (or shorter) often lead to short-sighted visions and unstable program development. Canadians expressed the difficulties in pursuing and developing energy projects, as the regulatory environment heavily impacts the development and implementation of energy projects.

OPPORTUNITIES FOR ACTION

The high cost of diesel and unreliable grids can be strong motivators for remote communities to seek opportunities for change.

- ✓ **The high cost of importing diesel makes renewable sources more competitive.**
- ✓ Unreliable remote grids can serve to motivate individuals and companies in remote locations into becoming **independent power producers**.
- ✓ The high cost associated with grid connections can be a strong motivator to look towards **building energy storage**.

Biomass heat and power plants should be considered an option where possible, specifically in northern remote communities where sustainable biomass is available to support such development.

- ✓ **Locally sourced biomass**, especially in Indigenous communities, can result in long-term sustainable businesses that benefit from traditional knowledge of forest ecosystems. Bioenergy can generate economic opportunities within communities and improve environmental sustainability.

Propane projects can be developed and deployed as sustainable alternatives to diesel.

- ✓ **Propane can be considered a ready-to-go solution**, widely available everywhere in Canada, with a low infrastructure cost to replace diesel. Propane has similar greenhouse gas emissions to natural gas but does not have the same fugitive emissions risk as natural gas (methane).

Canadians emphasized the importance of the following essential elements to catalyze diesel reduction projects and energy infrastructure development in remote off-grid communities across Canada.

- ✓ **A community-driven process with citizen participation** is needed to resolve energy issues in remote communities. Community values should be the focus of any future long-term energy plan. This means that every citizen will play a larger role in his or her own power generation. Local ownership helps to ensure that profits are circulated within local communities.
- ✓ **Governments need to recognize and accept that every community is different**, requiring different solutions. As there are significant regional differences between communities, energy programs and policies should be flexible and easy to navigate.
- ✓ **Governments should not be directing communities** but should instead support communities charting their own paths forward. The federal government has an important role in supporting the adoption of clean energy technologies in remote communities. Canadians recommended support through coverage of capital costs for projects.
- ✓ **Partnership and trust between industry, government and the community** will be required as they look to replace diesel with non- or lower-emitting alternative sources. For remote Indigenous communities, all future energy projects should work towards advancing reconciliation with Indigenous peoples. Respectful partnerships can help ensure that the most appropriate technologies are implemented. Canadians felt strongly that it was important to host in-person dialogues in these communities to hear individual perspectives and understand specific contexts.
- ✓ Improving education will require more than updating a website. Ideally, it should involve a personalized team and include live demonstrations of energy projects. Canadians suggested that the federal government and others, who are providing engagement and awareness sessions in remote communities, should do so for the entire community and not just the band or town council.



WHAT WE HEARD

Science and Innovation

CANADIANS TOLD US THAT:

- The transition to a low-carbon economy cannot happen without innovation. It drives change across the energy sector and provides new and potentially transformative options to support the transition to a low-carbon future. To succeed, Canadians have said that we must build a durable system that supports innovation in the energy sector in the long-term and benefits Canada's diverse regions.
- Research and innovation to drive the clean energy transition requires sustained funding from both the public and private sector.
- Building networks, fostering engagement and leveraging connections can help stimulate and accelerate new low-carbon discoveries and ways of doing business.
- Government policy can provide leadership, set research direction and drive energy innovation.
- There are a wide range of clean energy opportunities that require focused research and innovation. Clustering research around specific energy challenges could attract more researchers and support to multidisciplinary projects.

PRIORITY ISSUES

Disruptive Change: Breakthrough technologies and new ways of doing business have the potential to disrupt and change the way we make, move and use energy from coast to coast to coast. Emerging technologies, software and different energy sources will expand to play a large role in Canada's energy system of the future. Innovation is necessary to help create new business opportunities, jobs and environmental solutions for the next generation of Canadians.

Failure and Experimentation: Mistakes will be made over time. Support for new companies, technologies and business models that end up not working out the way they were intended may be classified as failure. However, lessons learned and new opportunities can still come from missteps, including through spin-off companies, unforeseen technology applications and improved awareness and education. Canadians felt that governments should increase risk tolerance related to the research, development, demonstration and commercialization of low-carbon energy technology.

Long-Term Goals: Research and technology innovation is a key enabler of long-term energy goals, including emissions reductions, cost savings, access to energy and economic growth and trade. Canada should focus on research and leverage innovation in strategic niche areas that hold the potential to support competitive advantages, such as energy innovation in remote communities and carbon capture and storage. Some Canadians want governments to fund research, incentivize the use of new technologies in energy and discourage the use of out of date high-carbon technologies.

Storytelling and Curiosity: Storytelling is an important tool for the research community that can improve public knowledge and understanding of energy research. Reframing energy as a basic need and an enabling service as well as including energy as part of the narrative surrounding climate change are examples of storytelling. Scientists should also be encouraged to be curious about the broader societal impacts of their research and to collaborate with social science experts. “Payback” on investments in discovery research should be expanded beyond economic classifications.

OPPORTUNITIES FOR ACTION

Research and innovation to drive the clean energy transition requires sustained funding from both the public and private sector.

- ✓ Governments need to improve **support for multidisciplinary research** projects that might “fall through the cracks” of current research mandates and prioritize long term, flexible funding for discovery research that covers research, collaboration and dissemination.
- ✓ Some Canadians want increased **incentives for high-risk research** in areas such as metamaterial modelling, quantum thermodynamics, bioenergetics and nuclear physics, including consistent financial support for long-term projects.
- ✓ **Public procurement** should be leveraged to support innovative low-carbon products and solutions. A good place to start would be support for energy efficient solutions in low-income housing projects.
- ✓ Funding provided to research energy technology should also include the **costs of protecting new ideas** to facilitate dissemination (and countering researchers' fears of others "stealing" their ideas) and the **cost of demonstrating projects** to showcase technology benefits.
- ✓ **Gamification and funding competitions** can help incentivize radical, transformative breakthroughs.
- ✓ **Carbon taxes are a potential source of funding** for energy-directed research. In addition, taxation policy (e.g., deductions, credits) can be used to incentivize research activities and test new energy innovations.

Building networks, fostering engagement and leveraging connections can help stimulate and accelerate new low-carbon discoveries and ways of doing business.

- ✓ Governments, the private sector, and academic institutions need to partner to fund and support research and innovation. Efforts should be made to build **formal organizational and institutional partnerships with specific technology focuses**. Solutions should then be brought to businesses and consumers to address government priorities and objectives.
- ✓ Some Canadians feel that a **Canadian centre for low-carbon materials could promote research, innovation and commercialization** in the area. This centre would help Canada restructure resource development to support a low-carbon economy. This could include exploiting resources in a different way and promoting carbon neutral materials across different sectors of the economy (e.g., construction).

- ✓ Canadians want more **pilot projects in industry and research and development in universities** for the development of low-carbon technology, with the goal of achieving significant capital cost reductions and economies of scale.
- ✓ It is important to **co-develop energy research and energy projects with Indigenous communities**. A lack of diversity, including a lack of Indigenous perspectives, is seen as an impediment to discovery. Embracing non-Western world views allows for new perspectives to stimulate and accelerate discovery research.
- ✓ **“Working within silos” is a barrier to stimulating and accelerating discoveries**. Concerted efforts within policy, academia and industry will be required to address this challenge.
- ✓ Effort should be directed toward **building educational networks** that promote and develop the engineering and technical skills required in the clean technology sector.

Government policy can provide leadership, set research direction and drive energy innovation.

- ✓ While governments should **avoid picking winners**, Canadians think that government intervention is still necessary to achieve a low-carbon future. Breakthrough innovation will require predictable funding and support over the long term to encourage research, development and demonstration of energy innovations.
- ✓ A forward-looking, cohesive energy strategy will attract Canadian researchers from many disciplines to the energy space. A high-level position statement on the energy transition from the Government of Canada would bring attention to the energy field as a research area open for new ideas and researchers.
- ✓ Significant benefits can come from **engaging the scientific community in policy decisions**.
- ✓ Government **policy needs to clarify the overriding long-term objective of research**. With the goal of emissions reductions, a carbon tax and additional mitigation measures (regulations, funding) can incentivize the uptake of emerging technologies and solutions.
- ✓ **Policy should foster transition experiments** that test new ideas to support the low-carbon transition. There are three critical advantages to transition experiments:
 - They can **enable learning** about change (what does and does not work) and help to improve and scale up possible responses by developing best practices.
 - They **promote capacity building** and context-specific solutions across Canada’s diverse regions.
 - They have enormous **educational potential** as an outreach and engagement tool.

There are a wide range of clean energy opportunities that require focused research and innovation. **Clustering public and private research funding around specific energy challenges** could attract more researchers and support to multidisciplinary projects.

- ✓ Managing energy through **artificial intelligence** and developing energy technology connected through the **Internet of things** are research areas ripe for discovery.

- ✓ Pioneer innovative, high-value uses for **carbon and carbon dioxide** beyond combustion. This means placing a strong focus in our innovation system on developing and commercializing ways to use carbon as a material in various applications.
- ✓ Global efforts to develop economical **solar fuels, high-efficiency inorganic solar cells and performant organic solar cells** are helping to make solar energy transferable, affordable and sustainable.
- ✓ Several **renewable technologies**, including tidal, offshore, geothermal and biomass, have minimal market penetration in Canada's power sector but have made significant breakthroughs in other countries. Additional research and innovative approaches to adoption can potentially help expand these technologies in Canada.
- ✓ Emissions reductions in the **oil and natural gas** industries is a priority area for research and innovation.
- ✓ In order for heavy industry to approach net-zero emissions, **breakthrough new processes, technologies and the widespread adoption of combustion innovations such as post-process carbon capture use and sequestration become necessary**. However, more work is required as most of these technologies today use more energy than conventional best available technologies.
- ✓ **Nuclear tools and technologies** are being used to produce innovations for other clean technologies and to solve important challenges. Materials research using neutron beams in Canada is a primary example.
- ✓ Some Canadians think that new technologies, such as carbon capture and storage, enable the **continued use of coal power plants**, which they see as an affordable source of power, while moving towards long-term climate objectives.
- ✓ Research to unlock **durable low-cost and high-density electrochemical energy storage** will help revolutionize how Canadians use and store energy.



WHAT WE HEARD

Governance and Cooperation

CANADIANS TOLD US THAT:

- Collaboration between all levels of government, Indigenous peoples and the private sector is critical to help develop a vision of Canada's energy future. Governments should support an open and realistic public discussion on energy. This discussion should confront our physical, economic, social, institutional and political realities at the same time as addressing Canada's climate change emissions targets.
- Canada should pioneer transparent policy development processes and decision-making tools that reflect long-term thinking and integrated approaches. This means modelling and sharing collaborative approaches to energy decision-making based on intergenerational, holistic and systems-based perspectives, including alignment with all levels of government through a long-term energy plan.
- Canadians must be more open to experimentation and recognize the fundamental role of the private sector and market-based change in the energy transition.

PRIORITY ISSUES

Collaboration: Canadians emphasized the importance of understanding that future challenges in Canada's energy sector are not just technical and economic but also social and political. They stated that we need to build on recent cooperation across governments through policy initiatives like the Canadian Energy Strategy and the Pan-Canadian Framework on Clean Growth and Climate Change to identify a national vision of Canada's future based on collaboration and respect. From there, participants believed that we could develop concrete objectives and goals that leverage Canadians' diverse regional strengths.

Federal Leadership: Coherent and collaborative action requires national leadership and a pan-Canadian vision. The federal government can play a leading role by setting a vision for energy in Canada with sector-specific goals, based on consultation with provinces, territories, Indigenous peoples, industry and civil society. This vision would need to be supported by a flexible policy and regulatory approach, and matched by efforts to enable provinces, territories and communities to meet these goals through funding and programs tailored to meet different regional and local needs.

Regional Diversity: Regional context is fundamental to future energy planning. Provinces, territories and communities will follow different approaches to a low-carbon energy future based on pre-existing infrastructure, resource endowments and energy sources. For some, this may mean looking to hydro, while others may draw on nuclear, solar, wind, tidal, renewable natural gas, geothermal or zero-carbon fuels.

Experimentation: It is important to recognize that no one knows what the physical energy economy will look like in 2050. This means that it is imperative that experimentation be encouraged and mistakes accepted as learning experiences. We will have to move slowly in order to test ideas and technologies before scaling up commercially proven solutions at the regional and

national level. Measuring progress on goals and objectives on a consistent basis can help improve outcomes over time. Clear communication of results and adjustments to policy will also be required along the way. As a result, future policy must be flexible and able to incorporate learning while also sending clear market signals to drive innovation and enable private sector investment.

Regulatory Certainty: Clear and effective regulation will be key to the energy transition. Fractured federal and provincial policy actions and regulatory approaches send contradictory signals to companies, creating uncertainty about the long-term direction of Canada's energy sector. Canadians believe that regulations make the transition to low carbon possible by driving innovation and implementing new technologies and by providing firms with clear signals about what investments should be made and how the energy industries are likely to change.

OPPORTUNITIES FOR ACTION

A Canadian vision of the energy future is fundamental to coherent national action and should form the foundation of a long-term energy transition plan.

- ✓ A broader **Canadian vision for energy** should be based on regional and bilateral agreements between governments and Indigenous peoples.
- ✓ Governments need to have the **political courage to make tough decisions** based on the results of engagement and evidence-based data.

Experimentation with both policy and technology has the potential to foster “made in Canada” solutions to global energy challenges and to drive innovation at every level of the energy sector.

- ✓ **Experimentation may help improve collaboration among governments.** Long-term planning should incorporate communities of practice, sector-based working groups, and networks between governments, industry and civil society that embrace experimentation and failure.
- ✓ As policy makers develop mechanisms to meet the goals enacted in the 2015 Paris climate agreement, the **research and development efforts** of the world's scientists, engineers and entrepreneurs will promote not only new energy supply options and greater energy efficiency but also emerging opportunities for technologies like carbon capture, storage and sequestration.

Regulation is a critical tool to help achieve long-term climate goals and to transition successfully to a low-carbon economy.

- ✓ **Adaptive regulation should be designed to enable iterative collaboration with stakeholders.** Collaboration rather than just cooperation enables governments, stakeholders and citizens to work together and encourages a system-wide approach rather than a focus on individual sectors.
- ✓ Investment in tomorrow's energy system will require a **high degree of certainty** and clear requirements and time horizons. Regulatory uncertainty may restrict long-term capital investment in energy.
- ✓ **Engagement with Indigenous communities** can be embedded within regulatory and policy processes. Placing Indigenous communities at the centre of the process enables meaningful collaboration and reconciliation through the transition to a low-carbon economy.



WHAT WE HEARD Indigenous Priorities

CANADIANS TOLD US THAT:

- By 2050, Indigenous communities should be powered by affordable and reliable clean energy, be active in decision-making and economic opportunities and have better access to energy programs and information. While there are many potential hurdles, Canadians believe that challenges can be overcome by collective action from governments, Indigenous peoples and the private sector.
- Indigenous engagement needs to be “started off in the right way,” which includes recognition and respect for each community and what they value.
- Indigenous rights should not be perceived as obstacles but as opportunities for inclusiveness in project development (e.g., harnessing and leveraging traditional wisdom to solve future energy problems).
- Indigenous communities should be defining their own energy pathways rather than having them defined by external processes.
- Information and processes regarding project development need to be more streamlined, easily accessible and understandable, and most importantly, they should foster collaboration and partnerships.
- Education needs to include all Indigenous community members and the public in preparation for a successful transition to a low-carbon future.

PRIORITY ISSUES

Lack of Capacity and Resources: Indigenous communities lack equal opportunities for negotiating with governments and the private sector to sustainably develop their resources, to benefit financially from such developments and to ensure economic development for their communities. Lack of resources, skills and training capacity were brought up numerous times as barriers for participation. In addition, Canadians mentioned that current government programs for energy projects are forcing communities to compete against each other to secure the necessary funding and resources.

People over Profit: Canadians stressed that economic benefit over community values seems to be the current approach for Indigenous renewable energy development. Some Canadians said that Indigenous communities are often in “sacrifice zones” for energy and economic development. For example, decommissioned and orphaned projects and other environmental damage from energy development can disproportionately impact local Indigenous communities.

Right to Education: Indigenous communities identified various issues that are often more pressing than decisions regarding energy sources (e.g., clean water, mental health, housing issues, etc.). When Indigenous communities face such important challenges, Canadians felt that it was difficult

to justify dedicating the time to understand and act on energy issues. At the same time, Canadians were concerned that these communities are not getting the same depth of public education as urban communities in regard to new energy alternatives and how far they have advanced (e.g., cost of solar, distance of electric vehicles).

OPPORTUNITIES FOR ACTION

Indigenous engagement needs to be “started off in the right way,” which includes recognition and respect for community needs and values.

- ✓ **A holistic approach is required** when working with Indigenous communities on energy issues to ensure that local and regional contexts are fully understood and accounted for. Canadians stressed that the importance of humility, respect and honouring the earth requires agency, and that Indigenous peoples are the stewards of that agency. Some Canadians said that these principles need to be embedded in every project consultation.
- ✓ **Partnership and trust** is essential for Indigenous engagement. Respect for Indigenous rights and building understanding through engagement should serve as the basis for any future government energy policy.

Indigenous rights should not be perceived as obstacles but as opportunities for inclusiveness in project development (e.g., harnessing and leveraging traditional wisdom to solve future energy problems).

- ✓ **Incorporating Indigenous knowledge** in policy development and regulatory processes will improve information and knowledge, which can be used to help inform future energy decisions.
- ✓ Canadians called for governments to **move beyond the “legal minimum” requirement to consult** and embed Indigenous perspectives throughout the policy development cycle. This means contributing to capacity development and community empowerment in a culturally and spiritually appropriate manner. For example, government should not just talk about Indigenous rights but also about Indigenous law and protocols for the management of the land.
- ✓ Canadians also raised the important role of women, due to their influence on children and the Earth, and of youth, as the future generation, in sharing traditional knowledge and promoting positive action.

Indigenous communities should be defining their own energy pathways rather than having them defined by external processes.

- ✓ **Indigenous choices and options for local ownership** should be the focus. Canada has an opportunity to increase support for initiatives where Indigenous peoples lead innovation in clean energy development.
- ✓ **Community-owned and operated projects** allow for greater community stability and autonomy. Canadians recommended that Indigenous renewable energy development be redefined as projects that are built and implemented by Indigenous groups and communities. Each successful energy project is an opportunity to help pave the path for a community’s financial independence.

Information and processes regarding project development need to be more streamlined, easily accessible, understandable and most importantly, foster collaboration and partnership.

- ✓ **Better access to clean energy funding, programming and information** is critical to help Indigenous peoples, businesses and communities develop solutions. This means providing support for Indigenous communities to participate in, and partner on, all stages of energy project development.
- ✓ **No community is left behind** – Canadians emphasized that future policies and programs should ensure that communities are not competing against each other for financial resources. Canadians believe that the end goal should be equal benefit and access to resources for all communities, to foster partnerships and collaboration among the various Indigenous communities.

Education on future energy opportunities and challenges needs to be a priority across Indigenous communities and with the general public in preparation for a successful transition to a low-carbon future.

- ✓ **Public education and awareness sessions** should be conducted for entire communities and not just town councils. Canadians recommended that every community member should have the option to go through comprehensive community planning. Canadians also suggested increasing public knowledge about Indigenous culture, treaties, reconciliation and land claims.
- ✓ **Training programs** that build the skills required for the clean energy economy in Indigenous communities are needed. Additionally, mentorship was brought up by Canadians as an essential element for Indigenous-led businesses to succeed.



WHAT WE HEARD

Energy Data and Information

CANADIANS TOLD US THAT:

- Having accurate and reliable data, including full life cycle energy data, is needed to take advantage of opportunities in Canada's energy future and support the energy transition. Access to quality energy data and information will improve market analysis, support smart energy policies and foster a healthy discussion of the costs and benefits of different forms of energy use. For example, proper data may help the private sector identify how to monetize new energy technologies.
- Transparent and accurate data and modelling provide the means to take into account uncertainty and make evidence-based decisions about Canada's energy future.
- Canadians feel that they are living in a world where people have their own opinions and, increasingly, their own facts. This makes accurate and transparent energy data and modeling more important than ever.
- Sharing information across industries, governments and other organizations, including best practices, can help promote learning and limit the same mistakes across jurisdictions or businesses.

PRIORITY ISSUES

Credible and Complete Data: There are gaps and inconsistencies in Canadian data collection, since energy data is collected by a variety of organizations for differing reasons. Future evidence-based policies must be developed with credible data that allows for the proper consideration of environmental, economic and social factors. If policy development is going to be proactive rather than reactive, adaptable at the national, provincial and municipal level, accurate, easily available, and trusted, then data is fundamental.

Robust Models: Canadian models require strengthening – some Canadians think that independent committees with access to a number of different models can help provide choices and pathways for the energy transition. The goal should be a robust community of modellers that continuously test, challenge and improve models. This will allow unbiased advice to help inform medium- and long-term government decisions.

Improving Knowledge and Decision Making: Communities across Canada often lack knowledge about energy use or have deeply held perceptions about energy and its role in the economy. These opinions and ideals differ across regions. We need to be aware of these existing perceptions, be open and transparent, and support greater availability and use of energy data. Making energy consumption data readily available and accessible would help educate users about their behaviors and help create new solutions and business models to foster more intelligent energy usage. Transparent public communication of the evidence that informs decision-making is also necessary in the energy transition. It can serve to reassure Canadians that sound facts are

informing the transition to a low-carbon economy and counter weaker sources of information in the public domain that polarize the debate.

Uncertainty: Significant challenges exist with predicting disruptive change and innovation over the medium to long-term. In terms of dealing with uncertainty in the future Canadians think we should 1) focus less on specific numbers from energy models and look for broad consistent trends across different models; 2) use various types of models and be aware of their strengths and weaknesses; and 3) use quantitative and qualitative scenario analysis to analyze potential energy futures.

OPPORTUNITIES FOR ACTION

Energy modelling can inform Canadians on how policy and market changes will impact the economy and the country's emissions profile and enable informed decision-making at every level of Canadian society.

- ✓ **Data and modelling should be accessible** to policy makers, corporate strategists and Canadian consumers to help inform decisions about energy use, investment and long-term planning.
- ✓ **Sharing information proactively** across public and private sectors would help ensure that energy users have the information they need to make informed decisions.
- ✓ Reform of the energy system requires excellent sources of reliable, accessible information.
Sound information systems underpin public confidence in energy decision-making.
- ✓ Canadians expressed concerns that they did not know enough about energy in general, and renewables in particular, to make informed decisions on either a personal or national level. They recommended that **government develop more public awareness and education regarding different types of energy.**

A data and modelling center that collects and shares accurate energy data and provides transparent modeling capability could both help educate Canadians about energy use and enable fact-based decision making across all sectors of Canada's economy and society.

- ✓ Canadians would benefit from an **independent source for energy information** that can support the broader discourse on costs and benefits of energy, which could take the form of a new national energy information organization.
- ✓ An **energy information organization** should be non-biased, with broad stakeholder support, a legislated mandate, stable long-term funding and transparent operations. Its functions could include data management, research and analysis, marketing and communications.

Canada should spur innovation by providing open data and accessible models to allow people and companies to participate in and propose solutions to long-term energy challenges.

- ✓ **Governments and companies have a strong need for energy data and modeling**, which creates opportunities for public and private sectors to benefit while improving Canada's capacity to analyze our shared energy future.
- ✓ **Analytical modelling and scenario development can be a relatively cheap way to test models and examine the impact of energy policies and project decisions.** This makes them valuable to any group preparing to invest large sums in new or emerging energy technologies or programs.



WHAT WE HEARD

Public Confidence

CANADIANS TOLD US THAT:

- Improving communication and transparency in energy decision-making will foster greater public confidence in Canada's energy future.
- Establishing mechanisms to improve cooperation and collaboration between federal, provincial, territorial, Indigenous and municipal governments can help advance shared energy priorities and improve long-term confidence in energy decision-making.
- Gaining and maintaining public confidence in energy development and decision-making is a nuanced challenge that requires sharing information, involving Canadians in decision-making processes and stimulating broad education efforts on energy issues.

PRIORITY ISSUES:

Information and Transparency: Tremendous opportunities exist in the energy sector, but they cannot be realized without building public trust in project approval processes and in how decisions are made. To support participation and engagement in energy decision-making, there is a clear need for fact-based policy and the sharing of data and knowledge among governments, utilities, industry and Canadians. More broadly, support for education can help Canadians understand energy choices and make informed contributions to energy conversations happening at the local, regional and national level during the transition. Transparent public communication of evidence that informs decision-making is a key element of confidence; it serves to reassure Canadians that sound facts are informing the transition to a low-carbon economy.

Energy Policy and Regulation: Building and maintaining public confidence in the energy sector is a key component of the transition. Canadians communicated the sense that the Generation Energy dialogue has created a space to engage in discussions around how to base energy policy on Canadians' values and perspectives; however, Canadians also expressed the need to reflect this thinking in a broader policy framework that guides the transition. This extends to the regulatory sphere that affects energy project decision-making on the national, provincial and local community level. Canadians emphasized that enhanced flexibility in regulatory processes will foster meaningful engagement with local and indigenous communities and governments on big projects. As such, engagement and participation in decision-making emerged as the main tenets of building public confidence. Consultations are only the first step – there is a need for clear policies, defined common outcomes and, most importantly, demonstrated results to ensure the public's confidence over the next generation.

OPPORTUNITIES FOR ACTION

Canadians advocate for collaboration not only between all levels of government but amongst energy stakeholders as well.

- ✓ **Establishing mechanisms to improve cooperation and collaboration between federal, provincial, territorial, Indigenous and municipal governments** can help ensure all partners have their voices heard and to improve public confidence over the long term.
- ✓ Encouraging **new business models** that enable communities, particularly Indigenous communities, to get involved in energy projects can help foster improved outcomes and co-benefits (revenues, jobs).
- ✓ Collaborative mechanisms such as **co-creation or co-management relationships** between governments and local communities can have a positive impact on achieving environmental and economic objectives.
- ✓ **Comprehensive planning at the community level** with many different stakeholders is a good avenue for collaboration that facilitates community engagement. Multistakeholder expert groups can provide communities with information and walk them through any long-term challenges and opportunities.

Energy information and energy literacy can help build transparency and support credibility in energy decision-making.

- ✓ In order to work towards public trust in energy development, **clear channels of communication** can assist in distributing information, particularly with regard to the results of modelling efforts and providing a vision of how energy systems are changing.
- ✓ Canadians agree that the public needs a **reliable and credible source of energy information** that can provide a coherent picture of the energy sector. To this end, the establishment of a Canadian energy information organization could help provide credibility and transparency.
- ✓ To depolarize the debate, there are opportunities for government to **develop mechanisms to communicate the full-cost equation and potential value of energy projects**. These may also allow for a better understanding of potential trade-offs in the low-carbon transition.
- ✓ Canadians recommended the establishment of **unbiased educational organizations** for Indigenous-related energy developments to help inform decision-making in different communities.

Engagement and participation in decision-making is critical to ensure that Canadians feel validated and included in decisions that impact their communities.

- ✓ There is a large role for governments to play in **empowering Canadians to participate in energy planning and decision-making**. To improve public confidence in energy decision-making, all levels of society need to be engaged in the decision-making processes.
- ✓ Public engagement is important to **develop a common vision for Canada's energy future** and to ensure that Canadians' values are reflected in future policy development.
- ✓ In particular, we must **consult with Indigenous peoples** on energy development and work with them on piloting new technologies that could support a low-carbon, sustainable economy.
- ✓ Establishing mechanisms that emphasize the **inclusion of local and Indigenous communities** in decision-making processes was a key recommendation by Canadians to foster trust (e.g., co-management – the sharing of power and responsibility between the government and local resource owners and users).
- ✓ While Generation Energy has provided Canadians from all walks of life with an opportunity to discuss Canada's energy future, the federal government and its provincial partners should continue to work closely with all Canadians to ensure that the **dialogue continues and that public trust is built and maintained**.



WHAT WE HEARD

Workforce and Labour Markets

CANADIANS TOLD US THAT:

- Canada's transition to a low-carbon future will have a significant impact on our economy, including regional labour markets. Advances in technology, social ingenuity, business innovation and market changes will affect how and where people work in the energy sector.
- Governments, industry and civil society need to collaborate to develop training programs and other mechanisms to support skill transfers between traditional and new energy industries. In particular, the focus should be on an energy workforce strategy for youth.
- If properly supported, the skills and technology required for the low-carbon economy can be a long-term competitive advantage and a source of export revenues for Canada.
- Governments should focus on the development of clean energy training programs in remote and Indigenous communities, leveraging partnerships with colleges and other educational institutions.

PRIORITY ISSUES

Potential Jobs Losses: The challenge that most concerns Canadians is the potential for job losses in coal generation, oil and gas, and related industries. Canadians are concerned not only about losing their occupations but also about not being able to transfer their skills to an equivalent application or opportunity. While the transition to low-carbon is generally seen as necessary and beneficial, ensuring that the transition is just and equitable for all Canadians emerged as a top priority.

Technological Change: Digitization and other potential changes in the energy sector intensify concerns around the sector's shift to low-carbon. While it is still unclear how exactly technology and social disruptions will impact the energy sector, future jobs in the sector could require more extensive knowledge of information technology. Programmers and data engineers, for instance, could play as important a role in finding and extracting hydrocarbons as geologists. In the electricity sector, new digital tools, such as blockchain, could enable distributed grids, requiring systems managers to be as comfortable with programming as installing solar panels. It is unclear how these new technologies will change the sector, but it is clear that the skills and knowledge required to work in the energy sector will be different in 2050 than they are in 2017.

Diversity and Demographics: The energy sector faces challenges related to gender diversity and a potentially shrinking workforce. Canadians emphasized that the energy sector needs to do more to encourage gender diversity. This is true of both the growing low-carbon energy sector and established sectors, such as oil and gas. Addressing this challenge may require a shift in workplace culture. At the same, energy companies must remain aware that Canada's population is aging and retirements are increasing. This makes hiring and training a new generation of employees fundamental to the sector's future.

OPPORTUNITIES FOR ACTION

The rise in global demand for low-carbon energy creates opportunities for Canadians to participate in the growing clean energy sector both at home and abroad.

- ✓ **Massive investments in low-carbon energy** will be required over the next 30 years to meet domestic and international demand for clean, low-carbon energy, which could lead to significant job growth. Employment growth is likely to be focused in hydro, intermittent renewables, electricity and clean transport but could also include biofuels and natural gas.
- ✓ **Growth of employment in clean energy** has the potential to offset job losses in other parts of the energy sector. Some skills are directly transferable, for example, the same skill set is applicable when developing geothermal wells and fracking for tight gas.

Effective retraining and skills development could allow Canadians to benefit from the transition and give Canadian energy companies a competitive edge globally.

- ✓ **A national labour market strategy** could help address market restructuring and unemployment as global and national markets move to low-carbon energy and as new technologies impact the way different energy sources are developed.
- ✓ **Retraining** will be required as employees shift to new positions in the sector and new technologies are adopted. The generational nature of the transition to low-carbon is likely to provide a timeframe that enables such retraining.
- ✓ **Canada's education system** is a competitive advantage. The existing base of highly skilled labour and expertise provides the country with a significant foundation for the transition to low-carbon energy.
- ✓ **Support for gender equality** will require greater awareness and information, targeted training, apprenticeships, employment placement, financial tools and social policies.

Long-term energy policy requires balancing support for existing industries with the need to foster new market opportunities.

- ✓ **Continued collaboration** between governments, industry and civil society is required to understand the full implications of the low-carbon transition on labour markets through research and analysis and open communication with citizens. By identifying expected changes in labour markets, we can find ways to help Canadians participate and prosper in the energy economy of the future.



WHAT WE HEARD

Financing the Transition

CANADIANS TOLD US THAT:

- Canada's transition to a low-carbon future requires significant investment and creative financing solutions to support the development and expansion of clean technologies and energy systems.
- Governments and the private sector need to work together to support entrepreneurship and finance innovation and technology. There needs to be balanced responsibility across public and private sectors throughout the energy transition.
- Major investments will be required to support future energy infrastructure and to research and commercialize new technologies and fund programs to drive the transition. In addition, investments in infrastructure projects are needed to improve low-carbon energy trade and increase the integration of energy systems between regions.

PRIORITY ISSUES

Accounting for the full costs of the energy transition: Canadians noted that in financing the transition, it is important to take into account all the positive and negative impacts when selecting and financing energy options. This includes direct and indirect impacts. Additionally, the true cost of energy should account for the full social and environmental costs. As such, it is important to assess the policy instruments and levers in place to target carbon emissions. This allows for a more meaningful comparison of options and helps ensure that the decisions are both cost-effective and environmentally and socially acceptable.

Capital Investment and Start-up Costs: Start-up costs for clean energy technologies were identified by Canadians as a major barrier to development. There is a need to recognize and accommodate the high upfront capital cost and long-term investment cycles of industry, and on a smaller scale local community investment. With regard to large-scale investment, Canadians have noted that there is a significant role for the federal government in establishing various mechanisms to support and facilitate clean energy investment at the provincial and municipal levels. At the community level, there are financial barriers to clean energy adoption, such as upfront project costs, that need to be mitigated. Canadians want government programming to help ease early start-up costs for companies and communities.

Regulation and Policy: Canadians agree that we need a strong and stable policy framework and regulatory regime, with clarity for all parties, to support investment certainty. A favourable investment climate for small and medium-sized enterprises is required to support the shift to renewable energy. It is important that policies or programs in the future ensure that communities are not competing for resources, and that the distribution of benefits is equal across various communities to foster collaboration and partnerships.

OPPORTUNITIES FOR ACTION

Innovative financing solutions and partnerships with private industries create opportunities for Canadians to innovate and develop clean technologies for use domestically and abroad.

- ✓ Canadians called for the creation of grants and subsidies to cover the initial capital costs of clean energy projects across Canadian communities and to lower risks for local partners.
- ✓ Governments should **leverage private-sector funding and look at alternative financing models** prevalent in the sharing economy (e.g., blockchain, crowdsourcing) to accelerate low-carbon objectives.
- ✓ Canada should **take the lead from other countries** that have seen success in developing energy funds and financing energy development (e.g., the Norwegian Pension Fund). While some Canadians still support large-scale projects, others want to move towards smaller, more accessible projects and funding options.
- ✓ Canadians agree that **financial incentives are needed for oil companies investing in innovation**.
- ✓ Governments have a role to play in **promoting investment in green bonds and improving the standards for investments in green funds**, which increase the social acceptability and the use of renewable energy.
- ✓ Canadians noted subsidization for the oil and gas industry as a major contributor to environmental costs and call for the consideration of **alternative financing mechanisms to reduce emissions**.
- ✓ Innovative finance solutions that support low-carbon outcomes and encourage the participation of Canada's small and medium enterprises offer numerous benefits, such as:
 - **job creation** in the clean technology sector;
 - the accelerated **deployment of new technologies** into the marketplace; and
 - the **increased export potential** of clean technologies as demand increases.

Stable infrastructure investment and effective energy project development processes are critical to support the transition to a low-carbon economy due to the scope of change being discussed.

- ✓ Strategic investments are required to support the **development of inter-jurisdictional electricity markets** based on regional advantages (e.g., hydro, wind).
- ✓ More **mega projects** (e.g. large-scale hydro, natural gas) are needed to spur investment and innovation. In particular, consideration should be given to the possibility of development corridors.
- ✓ As jurisdictions transition to low-carbon energy, there is the potential that carbon-intensive infrastructure will be decommissioned or stranded. Where feasible, **stranded infrastructure should be leveraged** for new, clean purposes (e.g., renewable natural gas pipelines or coal-turned biogas power).

- ✓ Canadian jurisdictions should support **new ownership models** for energy-related technologies, for example through renting or leasing energy production technologies.

Canadians view cities as energy leaders and consistently call for financial support to give cities the tools needed to reduce emissions, innovate, create jobs and support citizen participation in the transition.

- ✓ From the built environment to transportation and electricity production, cities are active participants in Canada's energy economy. Canadians pointed to **cities as important sustainability laboratories** due to their close interaction with citizens and level of energy use.
- ✓ There is a consistent call for **collaboration and financial support to give cities the tools needed** to reduce emissions, innovate, create jobs and support citizen participation in Canada's energy transition.
- ✓ Municipalities and **local governments are well placed to direct support through policy** tools and instruments at the local level. Communities and companies should have access to grants or programs to encourage them to convert to clean energy.



WHAT WE HEARD

Connecting to the Global Transition

CANADIANS TOLD US THAT:

- The global low-carbon energy transition is underway, reshaping how we produce, transport and use energy. This global transition will have a significant impact on how Canada's energy system is shaped in the decades ahead.
- The low-carbon transition brings with it opportunities for economic growth. Canada must look to leverage its advantages to meet emerging global demand for clean energy products and services.
- Global markets for oil and gas are poised to continue growing in the decades ahead. Long-term oil and gas markets are less certain. Canada needs to leverage its core strengths and use fossil fuels to fund the transition to a low-carbon economy.
- Canada must have a flexible approach to the energy transition that adapts to future changes in global prices for fossil fuels and renewables. The goal is for Canada to produce clean and affordable energy that serves as a long-term competitive advantage for Canadian industries, in particular those that are energy intensive.

PRIORITY ISSUES

Low-Carbon Transition as a Global Phenomenon: The global low-carbon energy transition is underway, bringing with it dramatic changes to how we produce, consume, and understand energy. While overall energy demand continues to grow globally as more people gain access to energy, demand for low-carbon energy is starting to shift the global energy mix away from fossil fuels. These global energy trends have driven home the reality that Canada is explicitly tied to the international energy economy. A large part of Canada's energy future will be adapting to global trends.

Economic Opportunities: The energy industry is an important long-term source of economic opportunity – providing tax revenues, jobs, and critical services to local economies. The key is a balanced approach to the transition that leverages Canada's strengths by incentivizing the shift to clean energy, including the decarbonization of oil and gas extraction, while working to help industries and their employees continue to succeed in changing global energy markets. The oil and gas industry brings value to Canadians through government revenues that fund social programs, jobs and opportunities for small to large businesses.

Driving Emissions Reductions: Canada can reduce its own emissions through the introduction of renewable energy and other low-carbon solutions and at the same time apply its experience, technology and innovations to assist other countries in meeting their own targets. A good first step is to identify what we want to be good at and then cooperate and collaborate across government, academia and the private sector to get there.

OPPORTUNITIES FOR ACTION

The low-carbon transition is creating opportunities for economic development and growth. Canada must look to leverage domestic advantages to meet **emerging global demand for clean energy products and services**.

- ✓ The federal government needs to act as a champion for Canadian interests by establishing a **clear national energy vision that promotes various opportunities for clean energy exports**. Without government support, emerging technologies and businesses may move to other markets.
- ✓ Canada should **prioritize support for domestic clean energy technologies and services that can be exported to global markets** (e.g., cold-weather wind turbines, smart grid systems, biomass products, low-carbon transportation technologies). Governments should look to do more – potentially ramping up high-level diplomatic missions to improve trade relations with emerging markets for clean technology.
- ✓ The low-carbon economy is also not just about energy products – it is important to consider the future impacts and **potential benefits to the service sector and ancillary industries supporting clean technology**.
- ✓ **Canada should be smart about where to focus its efforts**. Competing against global suppliers of solar panels or wind turbines may not be economically feasible. Canada should look to leverage a clean power sector, a strong education system, a trained workforce and its resource industry to identify niche opportunities to develop clean products and services for diverse global markets. Technology that integrates into existing supply chains can take advantage of and build on industry that already exists. Potential examples include energy storage (supported by domestic mineral extraction), cold-weather technology, carbon sequestration, marine renewables, biomass and petrochemicals.
- ✓ **Electricity systems are evolving as smart grids, the Internet of things, energy storage and distributed renewables take hold**. Canada has the opportunity to lead in the development of technology system supply chains that build on these advances to meet growing global demand.
- ✓ **Canada's mining industry could play an essential role in the energy transition** by producing the metals and minerals required to manufacture clean technologies.
- ✓ For nuclear technology, significant **market opportunities exist in China and India where new nuclear programs are underway**. The government must find ways to ensure that Canadian nuclear products have access to these markets.
- ✓ **Tax policy should support the clean technology sector**, such as providing tax breaks for the mining of heavy metals used in batteries.
- ✓ **International cooperation on clean technology** should be a major priority for Canada – collaboration with other countries can help achieve domestic objectives while improving our reputation as a clean energy leader. Joining the International Renewable Energy Agency is a good start.
- ✓ Canada should require certain products to have a "**carbon label**" that indicates the amount of energy consumed and the amount of carbon generated during the life cycle of the product. This could help establish a Canadian low-carbon product brand.

- ✓ Clean **electricity exports** to the United States are an important source of revenue and can help reduce emissions in the United States. The federal government needs to support North-South electricity infrastructure.

Global markets for oil and gas are poised to continue growing in the decades ahead. Long-term oil and gas markets are less certain. **Canada needs to leverage its core strengths and use fossil fuels to fund the transition to a low-carbon economy.**

- ✓ **Canada can focus on sharing its resource wealth, extraction technology and knowledge as a way to improve the global energy landscape and establish a Canadian energy brand.** This would allow us to use revenues to invest in future energy resources (clean energy) and ensure we have a reliable and cost-effective alternative when it is required.
- ✓ Canada's oil and gas sector has a role to play in the global challenge to tackle climate change by **lowering the carbon intensity of production and removing carbon from the fuels produced. Canada should prioritize the development and export of technologies to decarbonize fossil fuel production** (e.g., biomethane, hydrogen steams).
- ✓ Some Canadians think that **energy production, refining and products should be performed and made in Canada for Canadians.** Importing oil from other countries creates emissions. Government policies should incentivize businesses to invest in Canadian resources, especially in provinces where the economy is heavily dependent on investments from other countries. Natural gas liquids and light tight oil resources can provide reliable and affordable energy based on responsible and inclusive development.
- ✓ As **demand for liquid fuels continues to grow in developing, non-OECD countries, Canada has a role to play in helping those countries meet their needs.** By powering more of the world with our abundant supplies of natural gas, we can do our part internationally to help developing countries get off high-carbon fuels faster. Canadian oil and gas is produced and supplied with high environmental standards, transparency and enforcement. Many other regions do not have similar regulations and standards.
- ✓ Some Canadians think that **Canada should not subsidize the fossil fuel industry.** Tax incentives should not support investments in carbon-intensive infrastructure. There will be long-term consequences from stranded assets, such as orphaned wells and tailings ponds. Governments should hold an inclusive discussion on fossil fuel tax policy with Indigenous communities, civil society and the private sector.
- ✓ Over the long term, **Canada's fossil fuel industry will face challenges related to declining global demand.** Canada should identify the short-term decisions to make this transition easier and reduce the potential for stranded assets. This could include supporting skills retraining, tax modernization and considering value-added alternatives (e.g., petrochemicals, polymers).
- ✓ **Canada needs access to international markets via pipelines** in order to export its oil and gas resources, including liquefied natural gas. These resources are currently sold at a discount to the United States market. Without pipelines, Canada will continue to be heavily dependent on demand from the United States.

- ✓ Some Canadians want to **apply a carbon levy on imports** where the carbon price applied by the exporting country does not meet or exceed Canada's domestic carbon price. This could prevent domestic production and consumption from being undercut by goods produced in jurisdictions with weaker climate policies.
- ✓ One line of thinking is that if you get policy right, and industry is innovating, then **governments should avoid being directly involved in markets** and let industry do what it needs to do.

Canada must have a flexible approach to the energy transition that adapts to future changes in global prices for fossil fuels and renewables. The goal is for Canada to produce **clean and affordable energy that serves as a long-term competitive advantage for Canadian industries**, in particular those that are energy intensive.

- ✓ In the long-term, a **lack of affordable clean energy may hurt industrial competitiveness** and impact domestic investment decisions. If we increase energy costs in Canada, when our competitors are not doing the same, it may put us at an economic disadvantage.
- ✓ **Environmental sustainability is critical to support economic growth in Canada.** Energy costs should properly account for environmental externalities. At the same time, costs should not overburden industry or create uncertainty in the market.
- ✓ Canada's electricity prices are relatively low compared to many other countries. For instance, consumers in Germany and Denmark pay more than twice as much as Canadians. However, consumers in those countries use less electricity per capita than in Canada. **Energy efficiency is therefore an important tool to shield against energy price fluctuations and support domestic competitiveness.**
- ✓ A modernized and clearly articulated **industrial energy policy** could play an important role in supporting long-term industrial competitiveness in Canada. This work would require federal, provincial and territorial government collaboration with industry to develop a roadmap that integrates private sector action with policies focused on reducing the carbon intensity of Canadian products, marketing "low-carbon Canadian products" internationally and reducing costs, specifically with regard to energy use.
- ✓ Canada needs a **common vision and plan of action to decarbonize heavy industry** based on regionally specific circumstances. This plan should manage issues related to energy costs, commercialization and labour force training.
- ✓ **Natural gas can play an important role** as a low-cost energy alternative in Canada's energy future.
- ✓ **Ignoring global shifts in energy markets runs the risk of limiting the long-term attractiveness of Canada's energy industry to investors.**
- ✓ **Increased control over energy, from production to use, can be a source of revenue and savings** for Canadian citizens and businesses.