Energy Tomorrow: Why the World Needs More Canadian Energy

THE GROWING WORLD WILL REQUIRE MORE ENERGY, IN ALL FORMS. RENEWABLES AND NEW ALTERNATIVE SOURCES WILL INCREASINGLY SUPPLY A LARGER PART OF THAT ENERGY MIX. BUT THE WORLD IS ALSO GOING TO NEED OIL AND NATURAL GAS FOR A LONG TIME.

HOWEVER, THOSE RESOURCES MUST BE PRODUCED IN A NEW, BOLD WAY THAT RELIES ON TECHNOLOGY, INNOVATION, AND HIGH ENVIRONMENTAL PERFORMANCE STANDARDS.

A GLOBAL VISION FOR ENERGY

A wave of global energy demand is coming, as billions of people – especially in developing economies – turn to oil or natural gas for home and industrial uses, as transportation fuels, and as feedstock to make products from cell phones to medical equipment, paint to plastics, clothing, and more. In fact, the world will need about 11 million more barrels of oil a day by 2040 – 10 million barrels in India and China alone.

Canada has the third most oil in the world, and produces the fifth most natural gas. This gives us the opportunity to share our incredible resource wealth. But do we have a clear vision? Bold leadership? Are we innovating enough to turn our imagination into action?

Yes, yes, and yes.

TECHNOLOGY AND INNOVATION

Some of the strongest voices against petroleum development are concerned about greenhouse gases. But Canada’s upstream petroleum industry is working to break the link between energy growth and emissions growth.

For example, through Canada’s Oil Sands Innovation Alliance (COSIA), oil sands companies are inventing and using leading-edge technology. This unique, world-class partnership is dedicated to reducing impacts on air, land, and water. To date, they’ve developed and shared more than 900 distinct technologies worth more than $1.3 billion.

Other examples: the Petroleum Technology Alliance Canada (PTAC) facilitates innovation, collaborative research and technology development, demonstration, and deployment for a responsible Canadian hydrocarbon industry, helping Canada become a technology leader. And the Clean Resource Innovation Network (CRIN) is a newly formed network that unites industry, academia, government, innovators, investors, researchers and businesses to accelerate
innovation and commercialization of ground-breaking technologies. CRIN is helping make Canada’s oil and natural gas sector a global leader and centre of expertise in developing clean hydrocarbon-based energy.

ENGAGEMENT AND REGULATION
Canada’s petroleum industry supports the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and has developed guiding principles that govern respectful relationships, unique cultures and traditions, respect for the environment, and sustainable benefits for Indigenous communities.

Canada also has among the world’s highest standards for environmental protection. A 2014 study by Worley Parsons selected 10 producing areas (the U.K., Norway, the U.S. Gulf Coast, Australia (Queensland), North Dakota, Ghana, Brazil, Oman, Malaysia, and Alberta) and compared environmental laws and government processes with respect to stringency. The study revealed that Alberta, Canada is a consistent leader in environmental policies, laws and regulatory systems.

ENERGY TOMORROW
Unlike many petroleum producing countries, Canada has very high environmental standards, a commitment to Indigenous engagement, and thriving innovation and collaboration. Canada is a safe, reliable and technologically savvy energy partner.

Canada is poised to be a global energy supplier of choice. That’s why Canada can – and should – play a larger role in the world’s energy of tomorrow. Canada can balance the world’s energy needs with our planet’s environmental imperatives.

In Canada, we have everything to help get the world’s energy future right. Resources. People. Passion. Ideas. Collaboration. Innovation.

I invite you to learn more about the commitment of Canada’s upstream petroleum industry to protecting air, land, and water, engaging in a meaningful way with Indigenous Peoples, and collaborating to develop innovative technology that will help the world transition to a lower-carbon future.

Sincerely,

Tim McMillan, President and CEO
Canadian Association of Petroleum Producers

To understand the extent of Canada’s opportunity and the potential reception of Canadian energy products in the global market, in 2017 the Canadian Association of Petroleum Producers (CAPP) commissioned a report titled Global Energy Pulse. Researchers surveyed 22,000 people in 32 countries about their views on energy in general and on Canada as a supplier of choice in particular.

A key finding was that respondents prefer to obtain energy from their own country’s resources, but 31 per cent of respondents ranked Canada first among 11 producing nations as the preferred supplier of oil and natural gas.

Among worldwide respondents supportive of Canadian imports, India and China – forecast by the International Energy Agency (IEA) to see energy demand increase by 49 and 46 per cent, respectively, by 2040 – rated Canada’s oil and natural gas industry highly for our leading technologies to minimize environmental impacts.

Canada is uniquely positioned to become the world’s energy supplier of choice because of our political stability, stringent environmental regulations, and a commitment to responsible production, underpinned by the industry’s leading innovation and technology advances.

**ASIAN MARKET OPPORTUNITY**

**INDIA**

**CHINA**

Driven by population increases and a growing middle class, China and India will need by 2040 an additional 10 MILLION BARRELS/DAY OF OIL AND 54 BILLION CUBIC FEET/DAY OF NATURAL GAS compared to what they consume today (IEA, 2016).

WHERE WILL THAT ENERGY COME FROM?

**CANADIAN EXPORTS (2016)**

- Oil Reserves: 170 BILLION BARRELS
- Natural Gas Reserves: 1.230 TRILLION CUBIC FEET

**Sources:** IEA (2016), Oil and Gas Journal (2016), NEB

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**Canadian Geographic Energy IQ Program**

The Royal Canadian Geographical Society has created a witty, informative video about making and moving Canada’s energy, along with an energy-use survey and other educational tools. Take the survey and learn more at: [energyiq.canadiangeographic.ca](http://energyiq.canadiangeographic.ca)

**The World Is Open To More Canadian Energy**

Canada is the preferred choice for oil and natural gas imports out of 11 producing countries. See the full survey results at [globalenergypulse.com](http://globalenergypulse.com)
Engaging Indigenous Communities

**ENDORSING UNDRIP**

The Canadian oil and natural gas industry is proud to support the principles of the *United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)* as a framework for Indigenous reconciliation in Canada. We acknowledge the importance of reconciliation and recognize that natural resource development is linked to the broader reconciliation process. We further believe that implementing UNDRIP will create opportunities for progress that will benefit all Canadians, including Indigenous communities.

**CAPP GUIDING PRINCIPLES**

The Canadian Association of Petroleum Producers (CAPP) and its member companies developed *Guiding Principles for Engagement with Aboriginal Communities*. These principles reflect industry practices and are meant to be used by CAPP member companies to guide their engagement with Indigenous communities (First Nations, Métis and Inuit Peoples of Canada as defined in Canada’s *Constitution Act, 1982*).

1. **RESPECTFUL RELATIONSHIPS**

   We recognize and respect the existing Aboriginal and treaty rights of the Aboriginal Peoples of Canada and seek respectful and mutually beneficial relationships with Aboriginal communities.

2. **RESPECTING UNIQUE CULTURES AND TRADITIONS**

   We work collaboratively with Aboriginal communities to respect their unique cultures and traditional knowledge.

3. **RESPECT FOR THE ENVIRONMENT**

   Throughout the full life cycle of our projects we respect the environment and acknowledge the unique connection Aboriginal Peoples have to the land and the environment.

4. **SUSTAINABLE BENEFITS**

   We provide opportunities and benefits for Aboriginal communities in a sustainable manner that supports our mutual prosperity.
Innovating To Reduce Impacts

**AIR**

Canada, with less than one per cent of the world’s population, generates two per cent of global greenhouse gas (GHG) emissions. Of that, Canada’s upstream oil and natural gas industry - including the oil sands sector - emits 22 per cent of Canada’s total. Canada’s oil sands sector emits fewer GHGs than the buildings, electricity and agriculture sectors.

**GLOBAL AND CANADIAN GHG EMISSIONS COMPARISON**

**MANAGING EMISSIONS: REGULATION AND TECHNOLOGY**

There has been significant regulatory and government action in Canada to monitor and reduce GHG emissions from the oil and natural gas industry. Canadian governments are leading on emissions reduction, with policies in place since 1998.

For example, regulations in Western Canada’s petroleum producing provinces have helped reduce emissions:

- British Columbia eliminated routine flaring in 2016. Since 2006, industry has reduced annual flare volumes by 23 per cent.

  Source: BC Oil and Gas Commission

- Alberta’s regulations have reduced the amount of natural gas flared by 80 per cent from 1996 to 2010.

- Saskatchewan enforces regulations for reducing flaring, incinerating, or venting from oil and natural gas operations.

Canada’s approach to climate change ensures that Canada’s oil and natural gas continues to be developed responsibly with world-leading environmental performance.

Source: Environment and Climate Change Canada 2017 & World Resources Institute 2013
standards to strengthen our position compared to other jurisdictions. In this way, Canada’s oil and natural gas resources will be an important part of the lower carbon economy on a global basis.

MANAGING METHANE
Methane contributes to GHG emissions, so reducing methane emissions from all sources is an important way to tackle climate change. Methane is emitted from many sources both human-made and natural, including fuel combustion, oil and natural gas development, industrial processes, electricity generation, landfills, livestock and wildfires.

“Fugitive methane emissions” come from unintentional leaks from valves and other equipment used in drilling and production. “Venting” is a controlled release of gases as part of oil and natural gas processing. Regulations and industry best practices provide guidance to avoid venting when possible.

Canada’s oil and natural gas industry has committed to reduce methane emissions by 45 per cent by 2025. Through relationships with regulators, governments, and stakeholders, the industry can deliver action on climate change while realizing the economic benefits the sector brings to Canada’s economy.

Technology is critical to reducing methane emissions from oil and natural gas development. Advancing technology is co-ordinated through various organizations such as Natural Resources Canada, Emissions Reduction Alberta and universities, with the goal to develop a robust ground, aerial and satellite-based detection network.

CANADIAN SPACE TECHNOLOGY MEETS OIL SANDS INNOVATION
Oil sands mine operators are required to conduct annual measurements of carbon dioxide (CO₂) and methane emissions from tailings ponds and mine faces, stationary combustion and mobile sources, collectively known as fugitive emissions. All emissions are reported annually to the Alberta government.

The current measurement method involves using a large hood which is either floated on the surface of a pond or set on the mine face to capture emissions. Operators then measure the volume of captured emissions and use that to estimate total fugitive emissions over a period of time.

In a COSIA initiative launched in 2015, COSIA members are working with a global emissions monitoring company based in Quebec to investigate using satellite technology to provide more accurate and frequent measurements of fugitive emissions.
LAND
Canadian oil and natural gas exploration, production and reclamation are regulated by provincial and federal bodies to ensure safe, efficient and environmentally responsible resource development. Oil and natural gas operations occur in diverse landscapes representing many ecosystems that are home to a variety of plants and animals. Canada's oil and natural gas industry is working to reduce the size of its footprint in order to maintain the biodiversity of the operational regions and to support the function of natural ecosystems.

MULTI-WELL PADS
Advances in horizontal drilling and the use of multi-well drilling pads have greatly reduced the amount of land disturbed for drilling operations. Several horizontal wells drilled from a single pad can access a greater area of the reservoir from a smaller piece of land than vertical wells drilled from single-well pads.

A 20-well horizontal drilling pad disturbs about five per cent of the land that would be disturbed for an equivalent number of individual wells.

Canada's oil sands resources lie under 142,000 km² of land. About 97 per cent of that resource could be recovered by in situ technologies, which have a much smaller footprint than surface mining.

RECLAMATION
Reclamation is the act of returning disturbed land to a sustainable landscape. Reclamation planning starts at the beginning of an oil or natural gas development project and physical reclamation proceeds when resources have been depleted. From the start of any development, producers strive to reduce their impact by avoiding sensitive habitats, minimizing the area needed for well sites and working with other users to share roads and pipelines.

Companies conduct a myriad of research programs to improve the efficiency and effectiveness of their reclamation. Examples include testing new methods of soil salvage to retain the valuable characteristics of soil nutrients and structures, as well as seed and root stocks for revegetation, and collaborating with Indigenous communities to select the best native plant species for revegetation.
WATER
Canada’s oil and natural gas industry operates onshore and offshore, managing a myriad of water resources. Safety of people and protecting the environment are always top priorities.

HYDRAULIC FRACTURING: PROTECTING WATER
The Canadian oil and natural gas industry is highly regulated. While each province has its own regulations, all jurisdictions have laws to manage environmental impacts, protect fresh water, and ensure safe and responsible development.

For example, most reservoirs developed using hydraulic fracturing are found at depths exceeding 2,000 metres, while fresh water aquifers are usually found at depths less than 300 metres. When wells are drilled through shallow aquifers, multiple layers of steel casing are cemented in place to isolate the aquifer from the resource-bearing zone and all activity inside the wellbore. The protection of fresh water aquifers is strictly regulated by provincial governments.

Protecting water during hydraulic fracturing operations is a priority for the industry, which supports and abides by all regulations governing hydraulic fracturing operations, water use, and water protection. In addition, the industry is committed to following CAPP’s five guiding principles and seven supporting operating practices.

MARINE TRANSPORT: SAFETY FIRST
Oil tankers have moved regularly and safely along Canada’s West Coast since the 1930s. In 2016, more than one million tonnes of crude oil, or about 23,000 barrels of oil per day, was shipped from the Port of Vancouver.

Source: Port of Vancouver

While focused on preventing environmental incidents, companies also develop safety plans and comprehensive spill response plans in the event of an emergency. Before drilling can begin, companies must apply for authorizations from the relevant regulatory body in Atlantic Canada – the Canada-Newfoundland and Labrador Offshore Petroleum Board, or the Canada-Nova Scotia Offshore Petroleum Board.

The volume and frequency of oil spills has been decreasing globally since the 1970s. A report sponsored by the Clear Seas Centre for Responsible Marine Shipping, Commercial Marine Shipping Accidents: Understanding the Risks in Canada, identified that large oil spills, especially those from oil tankers, have been rare in Canadian waters.

PROTECTING OUR COASTLINES
Marine inspectors board oil tankers travelling in Canadian waters to make sure they have double hulls and are in safe operating condition.

• Local marine pilots with extensive regional knowledge are required to navigate oil tankers entering Canada’s harbours and commercial waterways.

• Tugboat escorts are used to guide loaded vessels through designated water areas - they can slow and stop or steer the vessel.

• Navigational aids in Canadian waters use visual, auditory and electronic signals to mark shipping routes and warn of obstructions.

Source: Clear Seas Centre for Responsible Marine Shipping, 2017
NRG/COSIA CARBON XPRIZE
In partnership with NRG Energy in the U.S., COSIA has launched a global competition offering $20 million to innovators best able to convert carbon dioxide emissions into usable products.

The competition is structured as a two-track prize, with one track focused on testing technologies at a natural gas facility, and the other focused on testing technologies at a coal power plant. A prize of $10 million is available to the winners of each track.

In March 2017, COSIA announced a partnership with the governments of Canada and Alberta to support construction of a test facility in Calgary, Alberta, Canada. The Alberta Carbon Conversion Technology Centre will be one of the few places in the world where carbon conversion technologies can be tested on a commercial scale, and NRG COSIA Carbon XPRIZE finalists will be the first tenants to test their solutions in the natural gas track of the Carbon XPRIZE.

Innovation and Technology: Improving Production, Decreasing Impacts
Collaboration and knowledge sharing are fundamental to innovation and technology development and deployment in Canada’s oil and natural gas sector.

COSIA: DELIVERING ENVIRONMENTAL PERFORMANCE
Canada’s Oil Sands Innovation Alliance (COSIA) is an alliance of oil sands producers focused on accelerating the pace of improvement in environmental performance in Canada’s oil sands through collaborative action and innovation. COSIA is scouring the world for innovations to tackle the industry’s toughest challenges.

Through COSIA, participating companies capture, develop and share the most innovative approaches and best thinking to improve environmental performance in the oil sands, focusing on four Environmental Priority Areas (EPAs) – greenhouse gases, land, water and tailings.

CRIN: SEEKING TRANSFORMATIONAL IMPACT
The Clean Resource Innovation Network (CRIN) is an industry-led network that leverages the oil and natural gas industry’s strengths in large-scale heavy industrial collaboration by aligning research and technology priorities, addressing gaps and incenting innovation.

CRIN will advance technology solutions mapped against priority areas across the oil and natural gas sector. Innovation areas will be selected for the highest transformational impact and environmental improvements while capturing domestic and international sales opportunities for small and medium enterprises. Proposed technology focus areas include: carbon reduction, water, methane emissions quantification and abatement, hydrocarbon extraction, digitization of operations, well abandonment and site remediation.
PTAC: CONVENTIONAL AND UNCONVENTIONAL INNOVATION

Petroleum Technology Alliance Canada (PTAC) is a facilitator of collaborative research and development initiatives and technology development, and operates in partnership with all industry stakeholders to transform challenges into opportunities.

By effectively leveraging financial resources and technical expertise, PTAC supports collaborative networks that advance innovative research and technology development projects that address pertinent industry challenges through activities which reduce costs, improve operational efficiencies, enhance environmental stewardship, and advance regulatory development.

IMPROVING METHANE EMISSIONS DETECTION

In August 2017, the Canadian federal government announced the launch of two new methane emissions reduction initiatives, funded in part by Natural Resources Canada and managed by Petroleum Technology Alliance Canada (PTAC). These initiatives will help to identify the most performance-effective technology options to achieve methane emissions reductions, accelerate technology development, and advance Canada’s competitiveness.

Focus areas include advanced methane detection, analytics and mitigation.

Advancing to a cleaner, lower-carbon economy that includes oil and natural gas offers Canada significant domestic and international opportunities. We have the chance to become a global leader in clean-tech for the development, production, extraction, and end-use of our hydrocarbon resources.
THE WORLD NEEDS MORE CANADA.

WE ARE COMMITTED TO REDUCING OUR ENVIRONMENTAL IMPACT THROUGH INNOVATIVE SOLUTIONS AND BECOMING THE GLOBAL ENERGY SUPPLIER OF CHOICE. LEARN MORE ABOUT OUR INDUSTRY WORK FROM THE FOLLOWING PARTNERS:

- Alberta Energy Regulator (AER) - www.aer.ca
- Alberta Environment and Parks - www.aep.alberta.ca
- BC Oil and Gas Commission - www.bcogc.ca
- Canada-Newfoundland and Labrador Offshore Petroleum Board - www.cnlopb.ca
- Canada-Nova Scotia Offshore Petroleum Board - www.cnsopb.ns.ca
- Canada’s Oil Sands Innovation Alliance - www.cosia.ca
- Canadian Industrial Energy End-use Data and Analysis Centre (CIEDAC) - www.sfu.ca/cieedac.html
- Canadian Association of Petroleum Producers (CAPP) - www.capp.ca
- Canadian Energy Research Institute (CERI) - www.ceri.ca
- Canadian Gas Association - www.cga.ca
- Canadian Society for Unconventional Resources (CSUR) - www.csur.com
- Clean Air Strategic Alliance (CASA) - www.casahome.org
- Environment and Climate Change Canada - www.ec.gc.ca
- Frac Focus Chemical Disclosure Registry - www.fracfocus.ca
- International Energy Agency - www.iea.org
- International Maritime Organization - www.imo.org
- National Energy Board (NEB) - www.neb-one.gc.ca
- Natural Resources Canada - www.nrcan.gc.ca
- New Brunswick Department of Natural Resources - https://www2.gnb.ca
- Petroleum Technology Alliance Canada - www.ptac.org
- Statistics Canada - www.statcan.gc.ca
- U.S. Energy Information Administration (EIA) - www.eia.gov