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Canada

CANADA'S CLEANTECH INDUSTRY: BRINGING INNOVATIVE CLEAN-FUEL TECHNOLOGIES TO THE OIL AND GAS SECTOR



Canada possesses the key ingredients to be a pioneer in production of cleaner fuels and clean fuel technologies. The country's significant seed-oil production and

residues from its substantial agriculture and forestry sectors are potential sources of feedstock. It also has petroleum expertise and the right policy environment.

Canadian refineries have the opportunity to lead the way in introducing new refinery feedstocks to create the next-generation fuels needed to meet climate-change policy goals.

The upcoming *Clean Fuel Standard* and related provincial policies will drive continued innovation in this sector. Canada's clean liquid fuels sector targets growth in production capacity from today's 3 million litres per year to 8.5 billion litres by 2030.

CANADA'S CLEAN FUEL STANDARD TO DRIVE INNOVATION AND ADOPTION OF CLEAN TECHNOLOGIES

The Clean Fuel Standard aims to reduce Canada's greenhouse gas emissions by 30 million tonnes per year by 2030, making it an important contribution to the achievement of the country's target of reducing national emissions by 30% below 2005 levels by 2030. The standard complements other Canadian climate policies and investments under the Pan-Canadian Framework on Clean Growth and Climate Change, including carbon-pollution pricing. These policies work in concert to reduce emissions across the economy and to create incentives for innovation and clean growth.

CANADIAN FEDERAL AND PROVINCIAL GOVERNMENT SUPPORT FOR CLEAN FUELS

The federal government has a number of clean-fuel fiscal programs to assist with the development, commercialization and use of clean fuels and clean-fuel technologies. These programs are driving new, world-leading examples of low-carbon and renewable-energy solutions. Federal funding examples include the \$1.2-billion Strategic Innovation Fund and the \$965-million Sustainable Development Technology Canada Tech Fund. The sector also has strong provincial support, with British Columbia's \$40-million Innovative Clean Energy Fund, Alberta's Bioenergy Producer Program and Quebec's refundable tax credit for biofuel production.

NOTEWORTHY CANADIAN CLEANTECH OIL AND GAS COMPANIES

> Carbon Engineering

Direct-air-capture and air-to-fuels technologies

> Cielo Waste Solutions Corp.

Produces renewable diesel using alternative waste feedstocks

> Forge Hydrocarbons

Research, management and commercial development of biofuels projects

> SeeO2 Energy

Converts greenhouse gas emissions into high-value fuels and chemicals

> Canfor Pulp / Licella

Converts pulp mill waste into stable "biocrude"

> NULIFE GreenTech

Transforms landfill-destined waste into biocarbon and biocrude oil

> Field Upgrading

Develops and commercializes sulphur removal and upgrades technology

> Iogen Corporation

Generates renewable biofuels from agricultural residues

> Ensyn Corporation

Manufactures renewable liquid fuels and chemical products



CLEAN-FUEL TECHNOLOGIES FOR THE OIL AND GAS SECTOR

CANADIAN COMPANIES WORKING GLOBALLY



NORTH WEST REDWATER PARTNERSHIP > nwrsturgeonrefinery.com

Alberta's **North West Redwater Partnership** has developed a bitumen-processing solution that maximizes the value of this raw material by producing ultra-low-sulphur fuels while incorporating a carbon dioxide (CO²) solution with integrated carbon capture and storage.

The captured CO² is safely sequestered by injecting it into depleted geological formations deep beneath the earth's surface. This strategy also turns what is essentially a waste product into a valuable commodity while responsibly and safely sequestering emissions. This occurs through a proven process, enhanced oil recovery, which a separate company performs.



PARKLAND > parklandcap.ca

Parkland Refining's Burnaby Refinery in British Columbia has been piloting canola oil and other bio-oils since 2017 and is actively investigating the blending of other next-generation feedstocks, like wood and agricultural waste and municipal sewage sludge.

In a process known as co-processing, a portion of the crude oil feedstock is substituted with a renewable source of feedstock to produce lower-carbon-intensity fuel. The process can make use of existing infrastructure, like refineries (with some modifications), pipelines and storage facilities, and current vehicles can use the resulting product without being modified.



ENERKEM > enerkem.com

Enerkem is the first company in the world to produce, at full commercial scale, renewable methanol and ethanol from non-recyclable, non-compostable municipal solid waste. **Enerkem's** solution replaces fossil-fuel sources, like petroleum and natural gas, to produce sustainable transportation fuels and chemicals used in a broad range of everyday products.

Enerkem offers an innovative, sustainable solution for waste management, energy diversification and the implementation of a circular economy. The company's facilities are built as prefabricated systems based on the company's modular manufacturing infrastructure and can be deployed globally.



STEEPER ENERGY > steeperenergy.com

Steeper Energy is a world leader in the development of advanced biofuels from a wide range of low-value biomass, such as residues and wastes from the agriculture and forest industries.

The company uses a hydrothermal liquefaction technology that produces a synthetic biocrude oil. Onsite upgrading or refinery co-processing of the oil can produce low-sulphur diesel, jet and marine biofuel. The company offers customers access to a wide range of test and analytical facilities, in various scales, to test their feedstocks and validate their business cases.

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