Canada's Oil & Gas Innovation Ecosystem (2017)

A Brief History of Oil and Gas Innovation

INNOVATION CHALLENGES | INNOVATION MILESTONES

Canada

Canada's Oil & Gas Sector

Inputs

FEDERAL GOVERNMENT

Today's Innovation Challenge & Opportunities

Today's Innovation Solutions & Opportunities

Legend – Text & Flow

Specific to Oil & Gas

Specific to Cleantech (including Oil & Gas)

People

Money

Information

Materials

All values in $CAN unless otherwise noted

Global Advantage

CLEANTECH:

Cleantech is any product, process or service that improves operational performance, productivity, or efficiency while reducing consumption, waste, or environmental pollution. (Report NSCE, 2016)

Upstream | Midstream | Downstream | End-Use

Cleantech Technology Along Oil and Gas Supply Chain:

Oil & Gas Clean Tech Innovation Along Oil and Gas Supply Chain

Future Innovation Along Oil and Gas Supply Chain

Sources: NRCan Energy Factbook 2017; NRCan Clean Technology, Government of Canada Working Group on Clean Technology, Innovation, and Jobs Report 2016

Money: **$345 M** in 70 Programs Supporting Private Sector Innovation (2015)
$3,165 M SR&ED (2016)

People: **516 K** Grad/yr
Architecture, Engineering and Related Technologies (Uni 28,000 K, Colleges 34,000 K)

Money: **$1,023 M** for Contract Research from Firms
$30 M for Oil and Gas R&D (2016)

Money: **$3,064 M** for High-Ed. R&D (2016)
NSERC (2016) Grants in Heavy Oil and Oil Sands: **$14M**
CFREF (2016) Grants for Carbon & Energy Research: **$150M**
NSERC (2016) Grants in Regulated Fields: **$14M**
CFREF (2016) Grants in Water and Ocean Dev't: **$172 M**

HIGHER EDUCATION

PRIVATE SECTOR

Money: **$1,171 M** for High-Ed. R&D (2016)

PROVINCIAL/TERRITORIAL GOVERNMENTS

Money: **$1,076 M** for Provincial Economic Development (2017)

Information: Federal Technology, Business and Market Advice to Clients
(e.g. **Over 250 IRAP ITAs, GAC Trade Commissioners in 174 Global Offices**, etc.)

Money: **$42 B** Federal Corporate Income Taxes (2016)
$137 B in Federal Personal Income Taxes from Private Sector (2016)
$1.4 B in Federal Corporate Income Tax on Oil and Gas (2015)

Material: **$28.5 B** Federal Procurement (2014)
of Goods (**$4.5 B**) & Services (**$24 B**) per Year

Information: **2,662**
Active Licenses owned by High-Education

Money: **$311 M** to Support Private Sector Innovation Including Advice (2015)

Money: **$26 B** Provincial Corporate Income Taxes (2016)
$101B in Prov Personal Income Taxes from Private Sector (2016)
$1.06 B in Prov Personal Income Taxes from Oil and Gas (2015)
$4.15 B in Prov Royalties from Oil and Gas (2015)
$1.58 B in Prov Land Sales from Oil and Gas (2015)
$2 B from Federal Gas Tax for Municipal Infrastructure

Total Exports (2016): **$628 B**
Goods: **$521 B**
Services: **$107 B**
Crude Oil & Bitumen: **$52.3 B**
Natural Gas, NLGs, Products: **$10.1 B**
Refined Petroleum Products: **$6.7 B**
Cleantech: **$14.2 B**

GLOBAL MARKETS

Money: **$768 M** in Foreign Direct Investment (2015)

Information: **$12 B** IP Imports

Total Imports (2016): **$676 B**
Goods: **$647 B**
Services: **$29 B**
Crude Oil & Bitumen: **$15.6 B**
Natural Gas, NLGs, Products: **$4.6 B**
Refined Petroleum Products: **$9.4 B**

Venture Capital: **$3.2 B**
Cleantech VC: **$0.2 B**

Private Equity: **$13.7B**
Oil & Gas PE: **$4.4B**
Cleantech PE: **$1.7B**

Outcomes

1. ECONOMIC OUTCOMES

- Acceleration and commercialization of clean and efficient technologies
- $129.9 B contribution to Canada's GDP (chained 2007)
- $48 B in capital expenditures for oil and gas extraction in 2016 down from $76 B in 2014 (CAANSA, by NAICS)
- Oil and gas industry is the largest single private investor in Canada
- Over 3000 companies in Canada (outside of Alberta) provide goods and services to the oil sands
- $15B/year contribution to government revenues
- Expansion of sustainable resource development
- Development of Canadian technology companies and supply chains
- Increase of economic diversity through spin-off and exportable technologies
- Increase value-added
- Increase ownership of assets in Canada's oil and gas
- Improve Canada's profitability & international competitiveness
- Creates and maintains high-quality sustainable jobs (181,540 jobs in 2016)
- Increase taxes, royalties to support social programs

FEDERAL TARGETS:
- *Grow Canada's goods and services exports – from resources, advanced manufacturing and clean tech – by 30 per cent by 2025*
- *Double the number of high-growth companies in Canada, particularly in the digital, clean technology and health technology sectors, from 14,000 to 28,000 by 2025*
- *Increase the clean technology sector's contribution to Canada's gross domestic product (GDP)*

2. ENVIRONMENTAL OUTCOMES

- Improve environmental international best practices
- Improve overall environmental performance along the oil and gas value chain
- Lower the carbon and low cost oil and gas industry
- Expansion of sustainable resource development
- Acceleration and commercialization of clean and efficient technologies in Canada and across the globe
- Reduce GHGs to meet international targets

FEDERAL TARGETS:
- *Reduce Canada's GHG emissions from 726 MT currently to 525 MT in 2030, 30% below 2005 levels*
- *Reduce greenhouse gas emissions from oil sands operations by at least 40% below 2005 levels by 2030*
- *Increase renewable electricity production from energy research from 2 to 10 times by 2030*
- *Help limit global temperature increases to less than 2 degrees Celsius (Paris Agreement, COP21) by transitioning to a low carbon economy*
- *Implement the Pan-Canadian Framework on Clean Growth and Climate Change, including:*
  - *Create a $2 billion Low Carbon Economy Fund*
  - *Introduce a national carbon pricing floor*
  - *Phase out inefficient fossil fuel subsidies by 2025*
  - *Extend a new Canadian Centre for Climate Modelling and Analysis to improve climate science and regional climate adaptation planning*
  - *Phase out inefficient fossil fuel subsidies*
  - *Double the number of high-growth companies in Canada, particularly in the digital, clean technology and health technology sectors, from 14,000 to 28,000 by 2025*
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DISRUPTIVE CLEAN TECHNOLOGY INNOVATIONS IN OIL AND GAS

Leading Social Contributors of the Oil and Gas Sector

3. SOCIAL OUTCOMES

- Improve "brand Canada" and global social license
- $28/yr in clean infrastructure projects in communities and First Nations communities
- Reduce polluting externalities, secondary, and social impacts from industry production
- Corporate social responsibility provides relief, education, and health support to communities