



Oil Sands: Canada`s Energy Advantage

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The Need For Energy

World Population

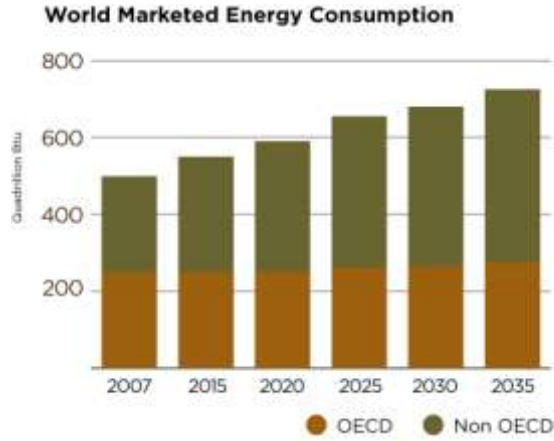


- Continued population growth - a key driver for energy demand
- Lifestyle expectations also continue to grow

Source: Shell Energy Scenarios to 2050



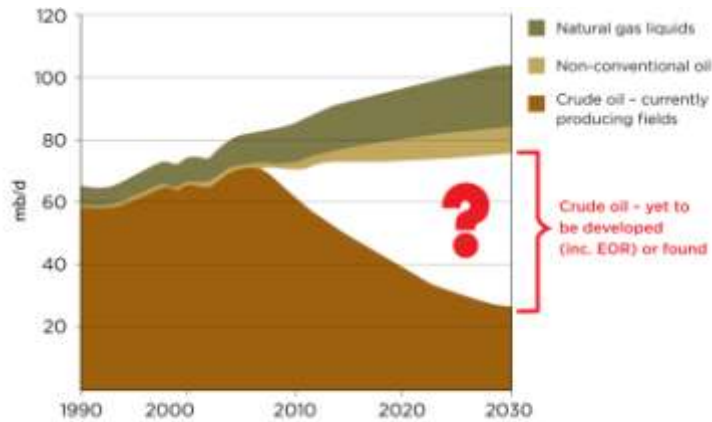
Energy Demand Continues To Grow



Source: <http://www.eia.gov/oiaf/ieo/highlights.html>



64 Million Barrels Of New Capacity Required By 2030

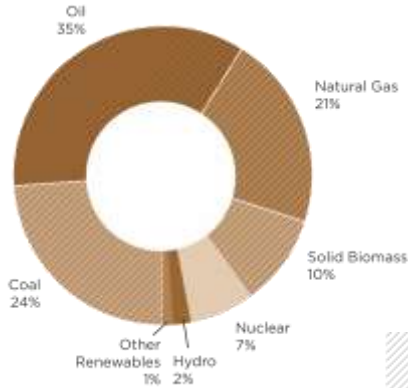


Source: International Energy Agency World Energy Outlook 2008

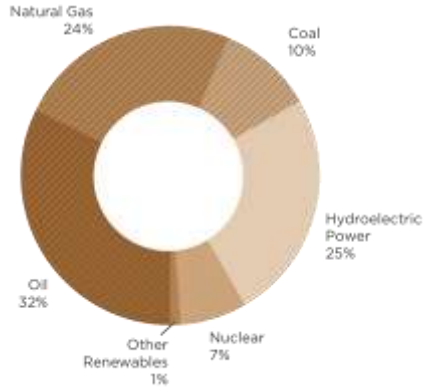


The Global vs. Canadian Energy Mix

Global Energy Mix: 90% carbon-based



Canadian Energy Mix: 66% carbon-based



Carbon-based resources

World Resources Institute: earthtrends.wri.org/images/EnergyFig1.jpg



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The Overall Canadian Energy System Must Balance...

- **Energy** – affordable, reliable and secure
- **Economic growth** – for all regions and segments of the Canadian economy and without impacting Canadian competitiveness
- **Environmental Protection**



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No Impact-Free Energy Source



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Coal

- **World's most abundant fossil fuel** – 24% of global energy needs... 39% of global electricity...indispensable for iron and steel production
- **Huge Canadian reserves**...4+B tonnes...10th place globally
- **73,000 families employed**...\$5B/yr into the Canadian economy...\$2B via exports to 21 countries
- **16,270 MW installed coal fired electricity** (10% of Canadian electricity)
- Significant recent investments in **“Clean Coal”**... SK and AB CCS projects (both Chilled Ammonia and Integrated Gasification Combined Cycle)
- **GHG and other emissions**... mining type disturbances and issues



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Hydro-Electric

- **Canada is one of the largest producers of hydro-electric power in the world...70,858MW at 475 facilities...60% of Canadian electricity...potential to double production**
- **Low emissions**
- **Huge land areas flooded... heavy metal mobilization... river system dynamics altered...impediments to fish movement**



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Wind Energy

- **Canadian installed capacity now more than 3,300 MW...ten-fold increase in the last 6 years...1% of Canada's electricity**
- **25,000 MW of wind projects** in various stages of development
- **Low wind energy density and low service factors** requires large numbers (i.e., 500 windmills on 40,000 acres = 1,000 MW)... electrons cannot be stored...traditional powered spinning reserve often required for grid stability
- **High costs**...required feed-in tariffs being rolled back in many jurisdictions
- **Concerns about birds, bats, required association transmission facilities, noise, aesthetics**



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Solar

- **Total Canadian installed capacity is very small** (32 MW) and mostly off the grid
- **Low emissions** but very **high cost** (approx. \$420/Bbl as oil equivalent energy)...replacement of U.S. coal fired electricity with solar estimated to require \$4.4 trillion for solar panels alone
- **Low energy density requires large collector area**
- **Electrons cannot be stored**...conventionally fired spinning reserves required



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Natural Gas

- **Generates 24% of energy in Canada**
- **Canada is the world's third-largest producer and exporter**
- Potential to be used as **transportation fuel**
- **Significant reserves**, particularly as shale gas but public concerns are increasing with shale gas operations and moratoria put in place in Quebec and Pennsylvania



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Biofuel

- **Canada is a world leader in Biofuels**...about 1% of Canadian energy supply... 140 M Litres/yr
- Ethanol production in BC, AB, SK, MB, ON and QC
- Iogen Corporation is the world's first cellulosic ethanol production
- Food to fuel concerns (100,000 Bbls requires the corn to feed 34 million people)...huge land use... 100+% of global arable land required to replace global crude oil demand...huge water, fertilizer, pesticide needs...full cycle GHG emissions



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Biomass

- Biomass **generates 6% of Canadian energy**...primarily by-products from pulp, paper and forestry operations (wood chips, sawdust, etc.)
- **1,380 MW of associated electrical production**



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Geothermal

- **30,000 geothermal energy installations in Canada...** primarily for internal or self-use



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Nuclear

- **Canada has the world's largest known high-grade uranium deposits** and is the **2nd largest producer**...significant growth potential
- **15% of Canadian electricity**... 14,700 MW capacity... 50% in ON...significant growth potential
- **Very low emissions, GHGs and cost**
- **Significant public concerns** regarding safety, waste disposal of reactors and uranium mining operations



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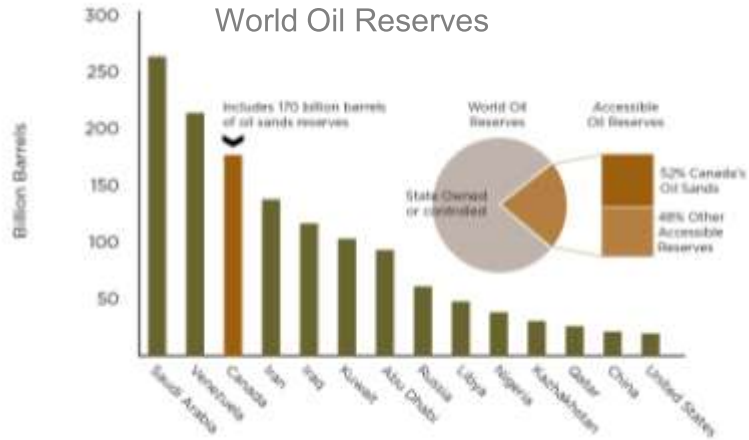
NIMBY-ism



32 Years Ago...Oil Sands Were A Technical and Economic Curiosity



Today...Oil Sands Are A Globally Significant Resource



Source: Oil & Gas Journal Dec. 2010

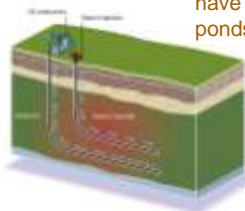


Oil Sands Production Technologies Have Significantly Evolved...

Mining – 20% of the oil sands resource is less than 200 feet deep



In-Situ – 80% of the oil sands resource is more than 200 feet deep
Steam Assisted Gravity Drainage (SAGD)



In-situ operations do not have mines or tailings ponds



Oil Sands – Poised For Growth...

1) Operating Projects: 2.03 M bbl/d

- Mining – 1.305 M bbl/d
- in-situ – 0.725 M bbl/d

2) Under Construction: 0.435 M bbl/d

- Mining – 0.100 M bbl/d
- in-situ – 0.335 M bbl/d

3) Projects with Regulatory Approval 1.590 M bbl/d

- Mining – 0.925 M bbl/d
- in-situ – 0.665 M bbl/d

4) Projects Under Regulatory Review: 4.465 M bbl/d

- Mining – 0.870 M bbl/d
- in-situ – 3.775 M bbl/d

Data source: OSDG, Nichols Applied Management 20

Oil Sands Expenditures Flow Across The Continent



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A Range Of Products Made In Canada



Coils of steel:
•Made in Quebec



Truck:
•Built in Ontario



Heat Exchanger:
•Made in British Columbia



Valve:
•Built in Ontario



Process equipment:
•Built in Alberta



Oil Sands Growth Also Depends Upon Labour



...as well as goods and services coming from across the continent

Economic And Employment Impacts Of Oil Sands Over 25 Years...

Location	\$ million GDP	Jobs
Total Canada	1,738,253	456,000
Alberta	1,574,530	352,600
BC	45,474	28,500
Ontario	54,850	32,000
Quebec	23,172	15,000
Saskatchewan	18,694	12,000
Manitoba	11,548	8,500
Maritimes	4,775	3,800
Northern Canada	1,591	800

...extend across Canada.

Source: Canadian Energy Research Institute, Economic Impacts of the Petroleum Industry in Canada. July, 2009



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Canada – U.S. Energy Trade...

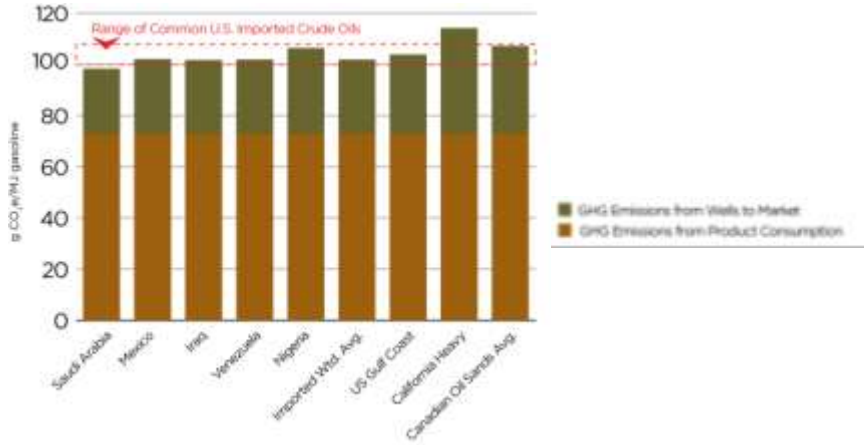
...a significant contributor to our economy

- Canada provided energy exports to the U.S. valued at \$76.3B in 2009...Canada supplies some 9% of the U.S.'s total energy requirements
- 2.5 MBbl/d of crude oil and refined products
- Canada supplies 87% of all the U.S. natural gas imports
- Canada and the U.S. share an integrated electricity grid
- Canada supplies 33% of U.S. uranium requirements



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Wells-To-Wheels



Source: Jacobs Consultancy, Life Cycle Assessment Comparison for North America and Imported Crudes, June 2009



Oil Sands Emissions Have Fallen...

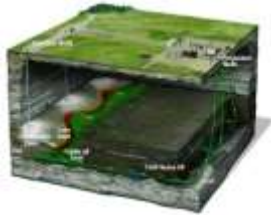


...by 39 per cent since 1990.



New Technologies

THAI™



Solvent Recovery

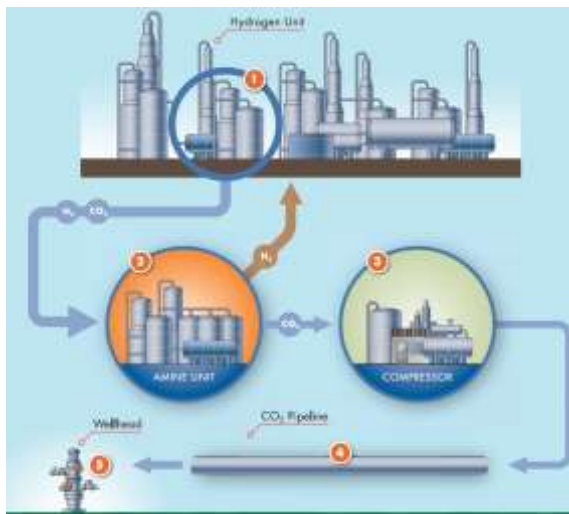


Electro Thermal Dynamic Stripping

Geothermal



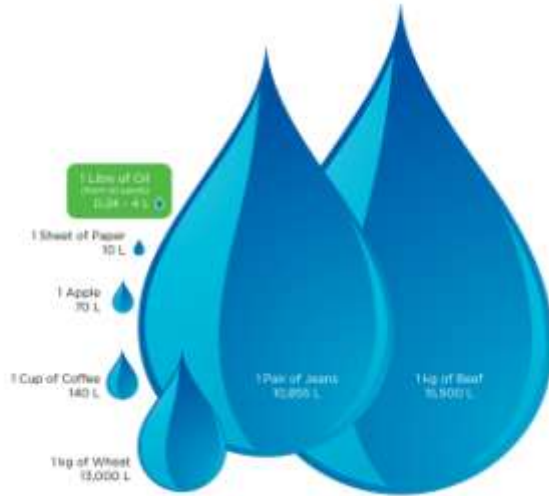
Quest CCS Project – At The Shell Scotford Oil Sands Upgrader



- Potential to capture over one million tonnes of CO₂ per year
- Equivalent of taking 175,000 vehicles off the road
- Part of Alberta's \$2 billion climate change commitment



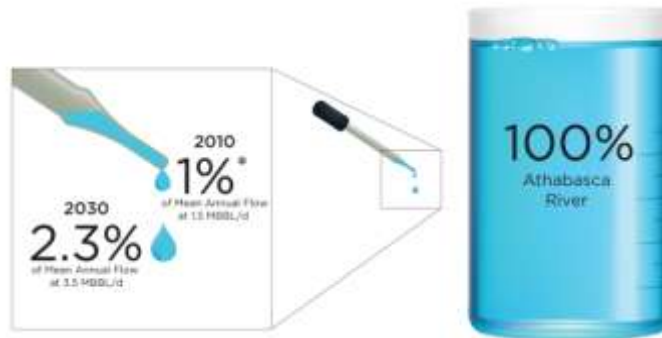
Oil Sands Water Footprint Is Efficient



Source: <http://www.waterfootprint.org>



Water Management Is A Priority



In Alberta ...

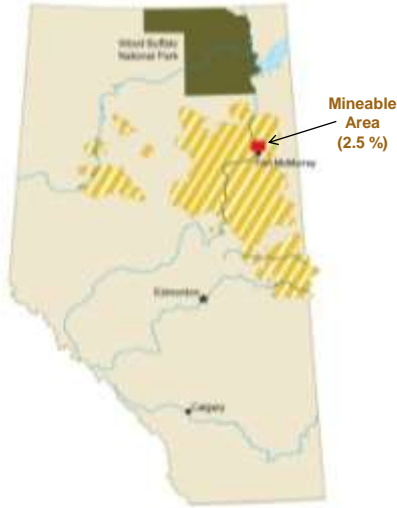
Water used for oil sands is about 88 million m³

Water used for agriculture is about 4,100 million m³

*During low-flow periods, withdrawal is capped at about 8 to 10 percent.



Boreal Forest Use



Mineable oil sands only exists under 0.1 per cent of Canada's total boreal forest

3,200,000 km² – Boreal Forest
 662 km² disturbed to date
 73 km² reclaimed to date



2.5 per cent of the surface area is mineable
 Contains 20 per cent of the resource

97.5 per cent will be developed through in-situ
 Contains 80 per cent of the resource



100 per cent of disturbed land will be reclaimed





More than 40% of NE Alberta is proposed to be protected...

Designated new conservation areas are interconnected to enhance biodiversity conservation



93,260 sq. km (Lower Athabasca Region) 70,280 sq km (Ireland)



The Road To The Future



Responsible Oil Sands Development

- Balancing Energy, the Economy and the Environment
- It's time to talk about the real facts
- Add your voice to the conversation



www.oilsandsdevelopers.ca



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APPENDIX



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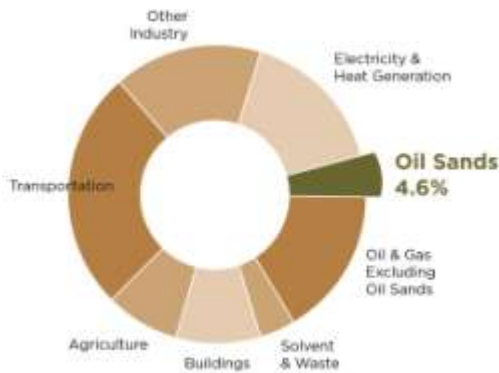
2011 Capital Spending Plans

Company	2011 Capital Budget (\$millions)
Suncor Energy Inc.	4,180
Canadian Natural Resources Limited	2,765
Conoco Energy Inc.	1,350
Canadian Oil Sands Limited (Mining and upgrading; Syncrude 36.74% interest)	927
MEG Energy Corp.	900
ConocoPhillips Canada Limited	790
Imperial Oil Limited (23% Syncrude interest only)	631
Nexen Inc.	600
BP PLC	416
Total E&P Canada Ltd.	345
Athabasca Oil Sands Corp.	302
Harvest Operations Corp.	280
SinoCanada Petroleum Corporation (9.03% Syncrude interest only)	235
CPTI Canada Inc.	150
Mocal Energy Limited (3% Syncrude share only)	126
Murphy Oil Company Ltd. (3% Syncrude share only)	126
Conocochee Oil and Gas Limited	72
Geirly Oil Sands ULC	70
Pengrowth Energy Corporation	50
BlackPearl Resources Inc.	22
Total	\$14,257



Source: Oilsands Review, March 2011

Oil Sands GHG Emissions



- Oil Sands account for 4.6 per cent of Canada's GHG emissions – Canada accounts for 5 per cent of global GHG emissions
- 1/1000th of the world's total emissions - approximately 70 per cent of Canada's crude oil requirements



Source: Environment Canada