




## Presentation Outline

- Industry Overview
- Resources, Reserves & Production
- Mining & Bitumen Extraction
- In Situ Bitumen Recovery
- Bitumen Upgrading
- GHG Emissions
- Industry Outlook
- Conclusions


2

Strategy West Inc.


## Oil Sands to Synthetic Crude Oil



**Oil Sands:**  
Deposits of sand, sandstone or other sedimentary rocks containing crude bitumen



**Crude Bitumen:**  
A highly viscous mixture, mainly of hydrocarbons heavier than pentanes



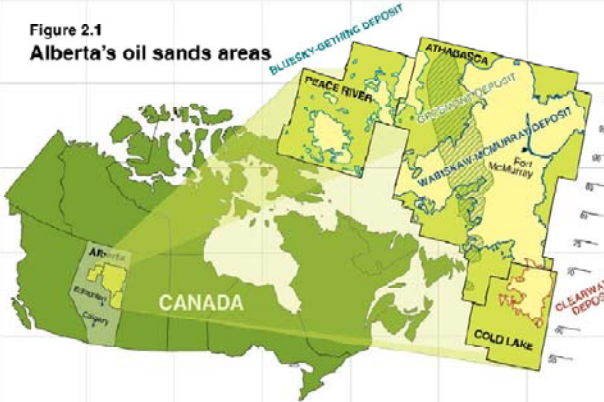
**Synthetic Crude Oil:**  
A mixture of hydrocarbons, similar to light crude oil, that is derived by upgrading crude bitumen or heavy oil

3

Illustrations: Syncrude Canada Ltd. Strategy West Inc.

## Resources and Reserves (ERCB)

**Figure 2.1**  
Alberta's oil sands areas



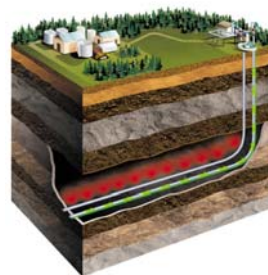
**3 Oil Sands Areas (OSAs) comprising 15 major Oil Sands Deposits (OSDs)**

- 142,000 square kilometres (54,000 square miles)
- Data at year-end 2009

- Initial volume in place (bitumen): 1,804 billion barrels
- Initial established reserves: 176.8 billion barrels
- Cumulative production: 6.9 billion barrels
- Remaining established reserves: 169.9 billion barrels
- Remaining established reserves under active development: 26.5 billion barrels

Source: ERCB ST98-20010; Alberta's Energy Reserves 2009 and Supply/Demand Outlook 2010-2019; June 2010 Strategy West Inc.

## Mineable and In Situ Resources and Reserves



### Mineable Resources/Reserves

- < 65m (~215 ft) to top of oil sands
- Athabasca Oil Sands Area only
- 7% of initial volume in place
- 22% of initial established reserves
- 65% of cumulative production to year-end 2009

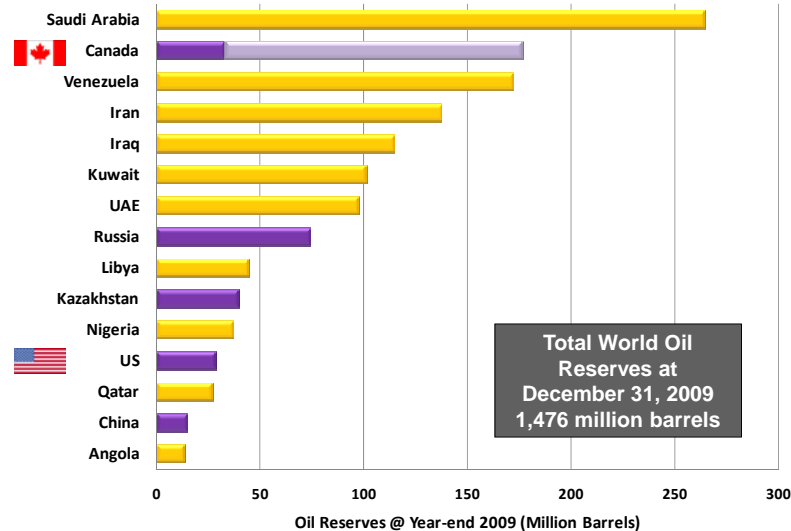
### In Situ Resources/Reserves

- > 65m (~215 ft) to top of oil sands
- Athabasca, Cold Lake and Peace River Oil Sands Areas
- 93% of initial volume in place
- 78% of initial established reserves
- 35% of cumulative production to year-end 2009

Source: ERCB ST98-20010; Alberta's Energy Reserves 2009 and Supply/Demand Outlook 2010-2019; June 2010

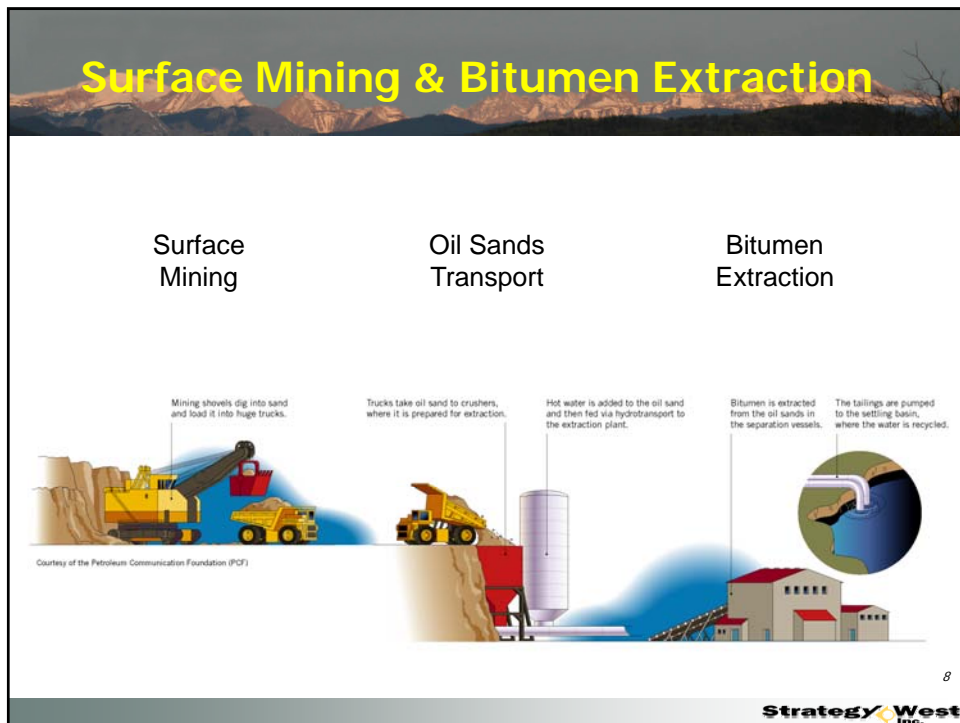
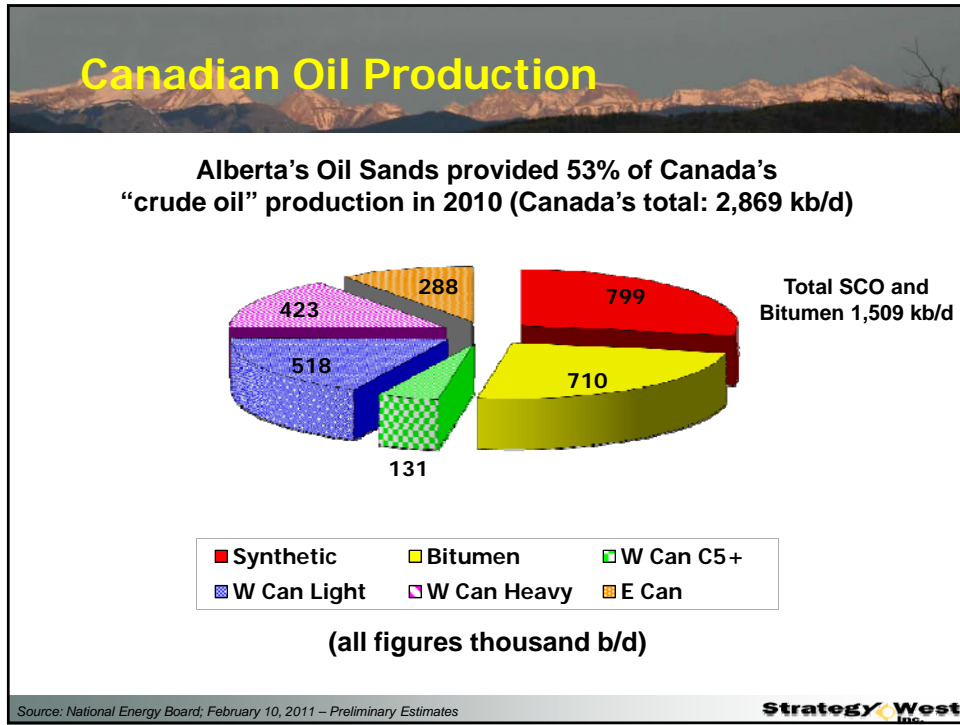
Strategy West Inc.

## World's Largest Oil Reserves



Source: BP Statistical Review of World Energy; June 2010

Strategy West Inc.



## Tailings Disposal

- Tailings are an aqueous waste product of the bitumen extraction process
- Tailings contain:
  - Unrecovered bitumen
  - Sand, silts and clays
  - Residual solvents and chemicals from bitumen extraction
- Fluid fine tailings are difficult to consolidate
- Alberta's inventory of fluid fine tailings that require long term containment is now 840  $10^6$  m<sup>3</sup>
- Tailings ponds today are approximately 170 km<sup>2</sup>



Source: Pembina Institute/ Alberta Energy Resources Conservation Board

Strategy West Inc.

## Reclamation

- Disturbed Lands are to be returned to a state that is as biologically productive as the state that existed before operations commenced
- Syncrude received the first oil sands reclamation certificate in March 2008

Gateway Hill Reclaimed Land

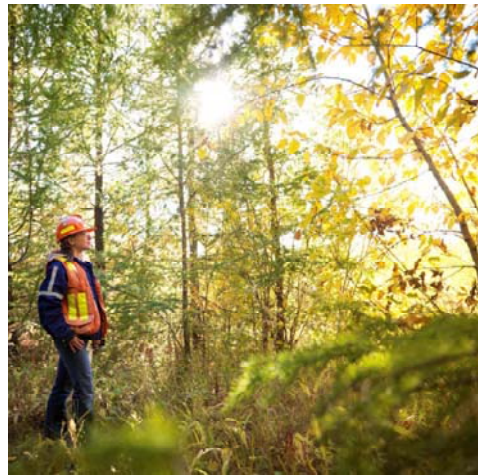


Image Source: Canadian Oil Sands Trust.

Strategy West Inc.

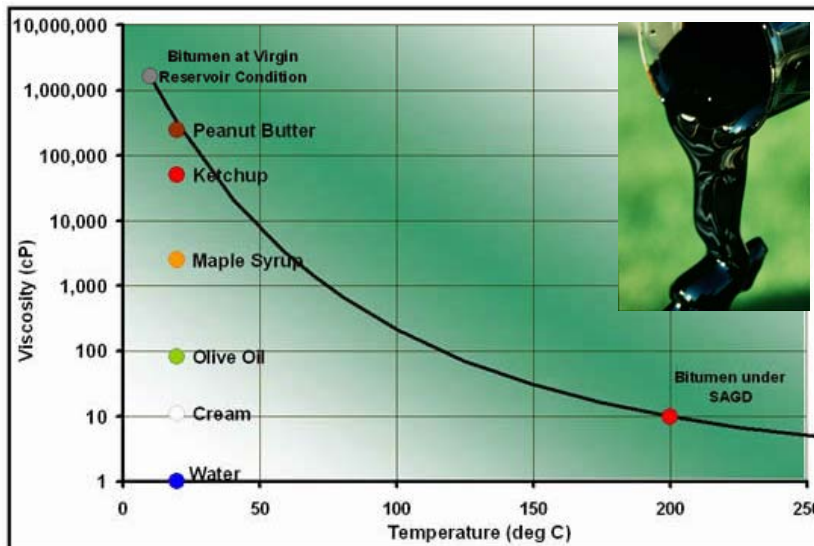
## Surface Disturbance and Reclamation – Oil Sands Mining

- Surface Disturbance
  - Oil sands are located below the surface of 140,200 km<sup>2</sup> of land, 4.5% of Canada's total boreal forest
  - Mineable oil sands only exist under 4,802 km<sup>2</sup>, 0.1% of Canada's total boreal forest
  - While disturbance is occurring daily, in more than 40 years oil sands mining has disturbed about 0.019% of Canada's boreal forest – some 602 km<sup>2</sup>
- Reclamation
  - Reclamation work is ongoing and continuous in the oil sands – to date, some 67 km<sup>2</sup> of land has been reclaimed

Source: Oil Sands Developers Group

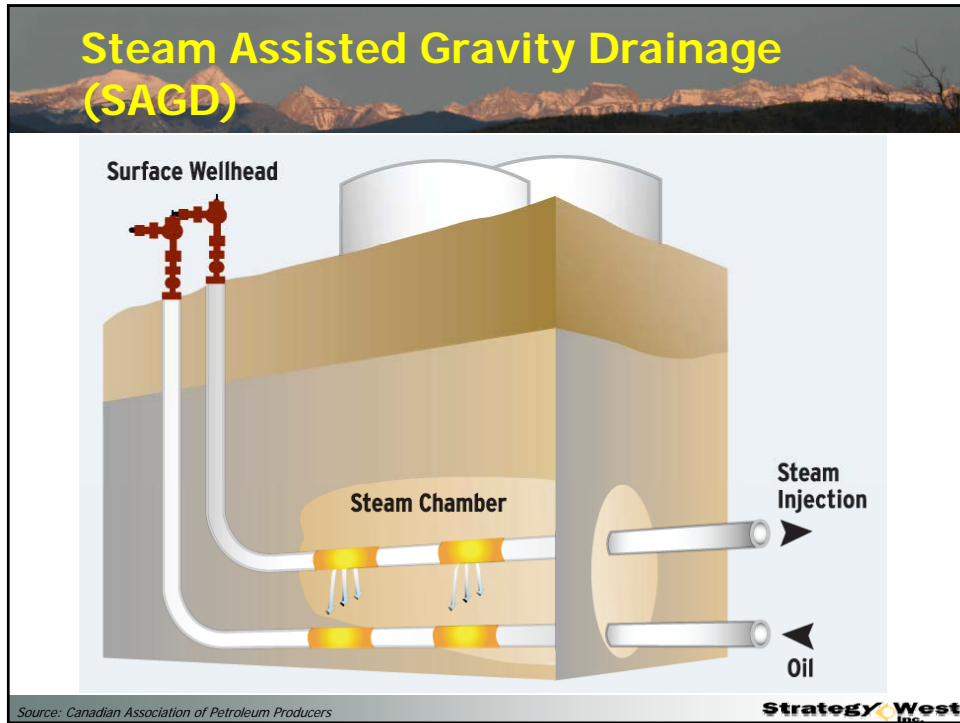
Strategy West Inc.

## In Situ Recovery: Dealing with Viscosity



Sources: Enerplus; Syncrude Canada Limited

Strategy West Inc.



## Upgrading Overview

If the upgrading process includes coking, the coke is removed from the bitumen and used for industrial applications. Another upgrading process will add hydrogen to the bitumen and break up the large hydrocarbon molecules – a process called hydrogen-addition or hydrogen-conversion.

Hydrocarbons are stabilized by adding hydrogen in the presence of catalysts. After stabilization, they are separated into naphtha, kerosene and gas oil.

The utilities plant provides steam, water and electric power to the rest of the plant.

Sulphur can be recovered to be used in fertilizer and other products.

A range of products including light sweet and sour crude oils and diesel products are blended and shipped to markets.

Courtesy of the Petroleum Communication Foundation (PCF)

▪ **Purpose:**

- Produce higher value liquid hydrocarbon products
- Produce valuable byproducts

▪ **Mechanisms:**

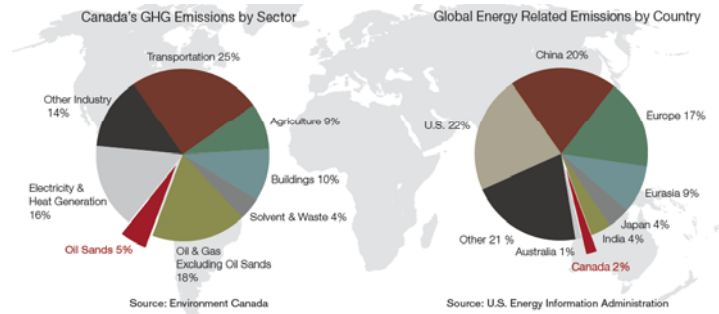
- Remove or breakdown bitumen residues
- Remove contaminants

14

Strategy West Inc.

## Oil Sands GHG Emissions

- In 2007, Canada's oil sands industry emitted 38 Mt of GHGs accounting for:
  - Less than 5% of Canadian GHG emissions
  - Less than 0.1% of global GHG emissions

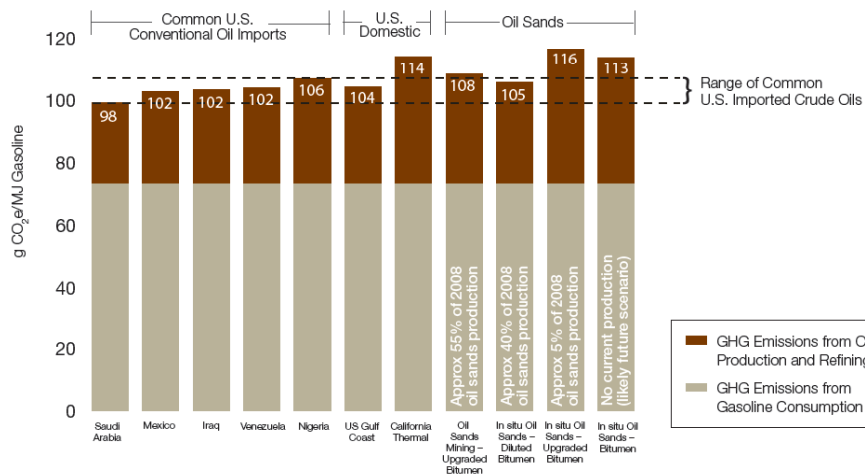


Source: Canadian Association of Petroleum Producers

Strategy West Inc.

## GHG Emissions – Wells to Wheels

Life Cycle GHG Emissions of Various Crude Oils

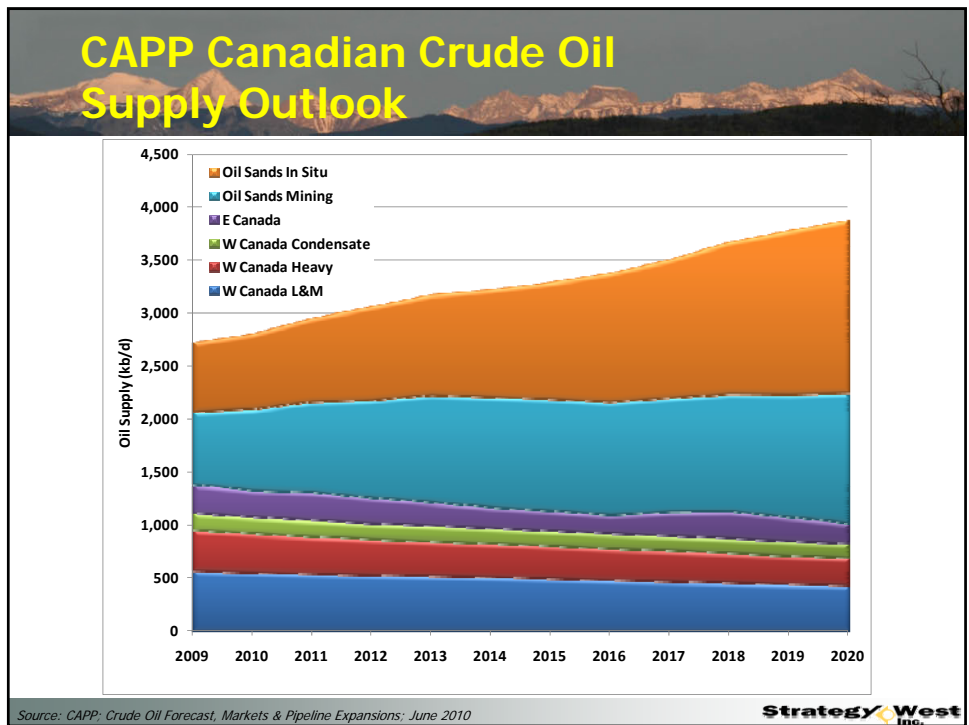
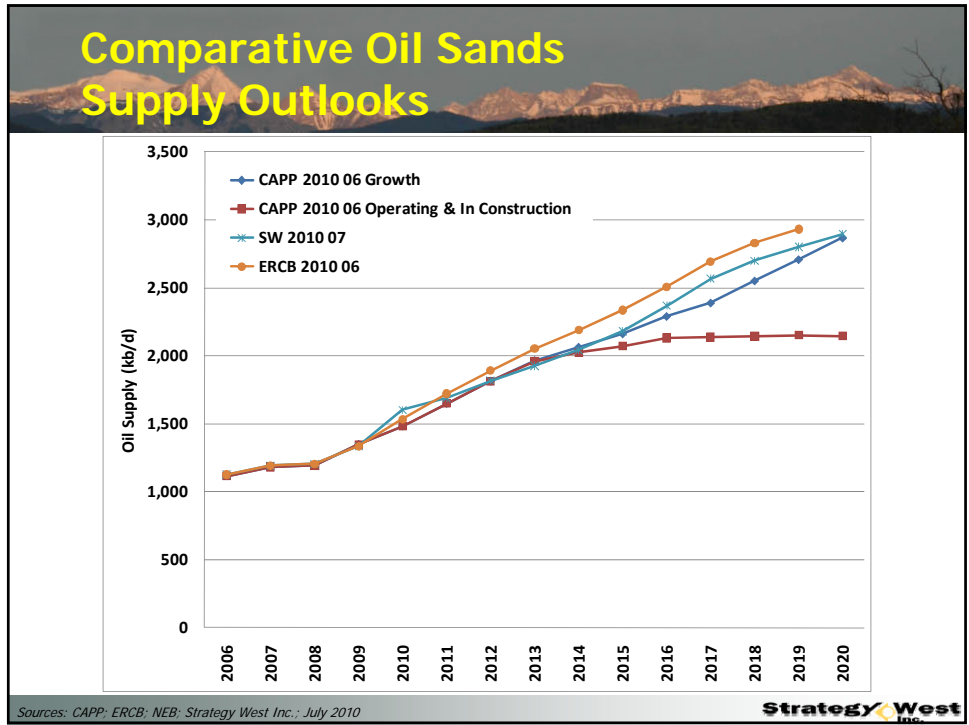


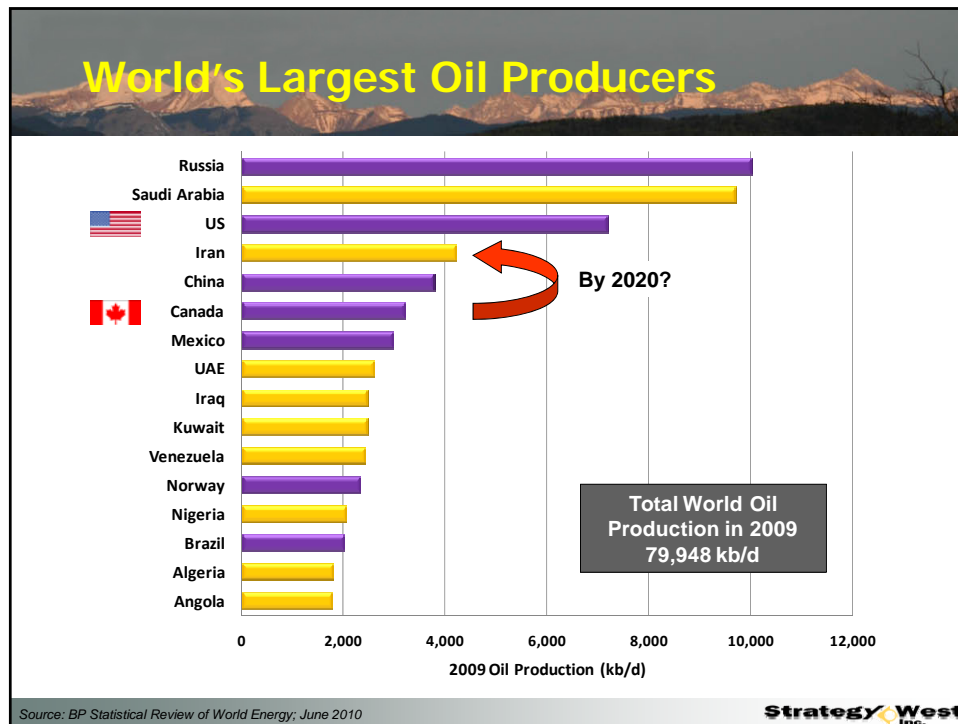
Source: Jacobs Consultancy, Life Cycle Assessment Comparison for North American and Imported Crudes, June 2009

Source: Alberta Energy Research Institute/Jacobs Consultancy: July 2009

Strategy West Inc.







### Conclusions

- Canada's oil sands deposits are among the world's largest hydrocarbon accumulations.
- The oil sands industry is well established and making a significant contribution to global oil supply.
- The 2008/2009 financial crisis caused project deferrals and cancellations.
- Industry growth has resumed; however, the growth rate will depend on oil prices and how industry and government address the many challenges the industry faces.

**Strategy West Inc.**



**Thank You**

**Questions?**

Please visit  
**[www.strategywest.com](http://www.strategywest.com)** for oil  
sands project lists and other  
detailed oil sands industry  
information

27

**Strategy West**  
Inc.