

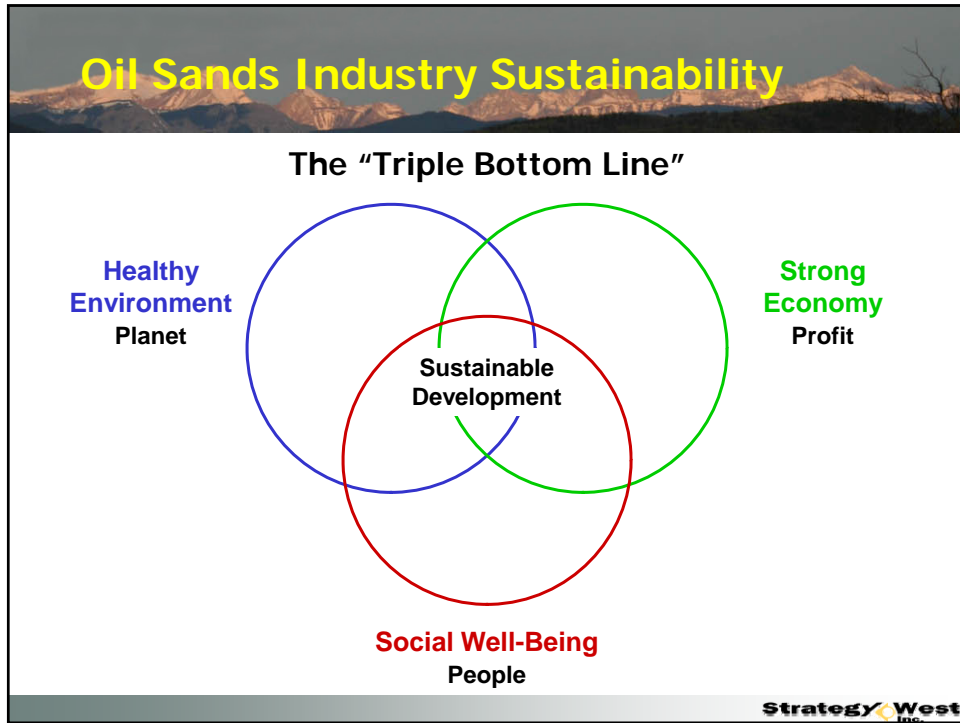


## Presentation Outline

- Oil Sands Industry Challenges
  - Overview
  - Greenhouse Gas Emissions
  - Tailings Disposal
- Oil Sands Industry Outlook
  - Bitumen Production
  - Synthetic Crude Oil and Non-upgraded Bitumen Supply
- Conclusions

2

Strategy West Inc.



- ## Oil Sands Industry Economic Challenges
- Economic Outlook
    - Oil Demand
    - Oil Prices and Oil Price Differentials
  - Capital Availability
  - Regulatory Uncertainties
    - Greenhouse Gas Emission Regulations
    - Regulatory Timelines
  - Project Capital Costs
  - Project Operating Costs
    - Non-Energy Operating Costs
    - Natural Gas Prices
- 4
- Strategy West Inc.**

## Oil Sands Industry Environmental Challenges

- Air Emissions
  - Greenhouse Gases
  - Criteria Air Contaminants (SO<sub>x</sub>, NO<sub>x</sub>, PM, VOCs, CO, NH<sub>3</sub>)
- Water Use
  - Consumption
  - Recycle
- Liquid Waste Disposal
- Solid Waste Disposal
  - Tailings
  - Other Solid Wastes
- Reclamation and Abandonment
- Cumulative Effects

5

Strategy West  
Inc.

## Oil Sands Industry Societal Challenges

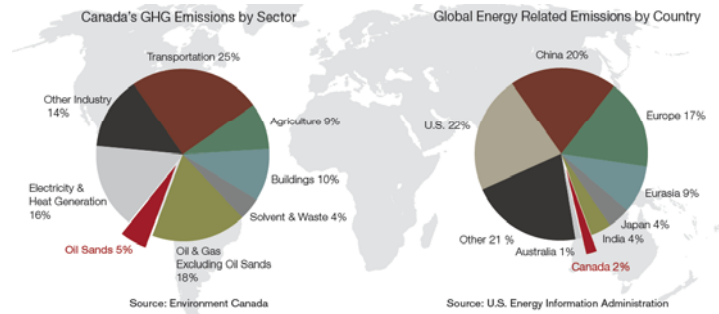
- Public Image
- Public Services
  - Health
  - Education
  - Other
- Public Infrastructure
  - Road
  - Water & Sewer
  - Rail
  - Other
- First Nations
- Employee Safety
- Regulatory Agencies
  - Staffing
  - Workload
  - Funding

6

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

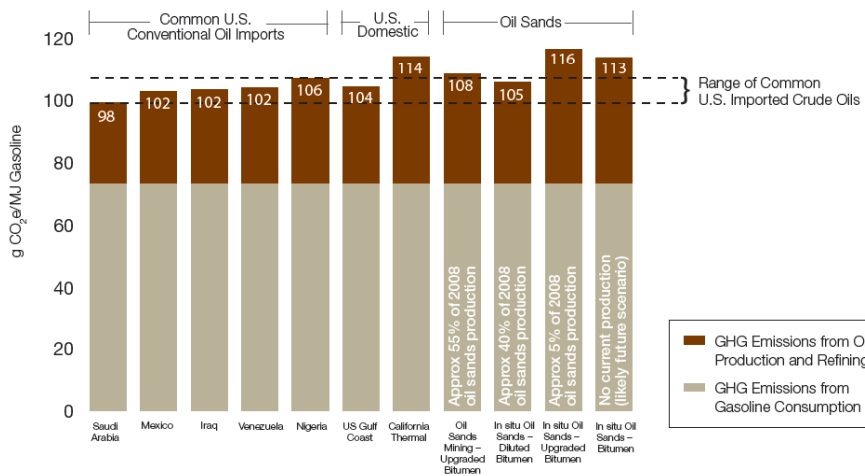


Source: Canadian Association of Petroleum Producers

Strategy West Inc.

## GHG Emissions – Wells to Wheels

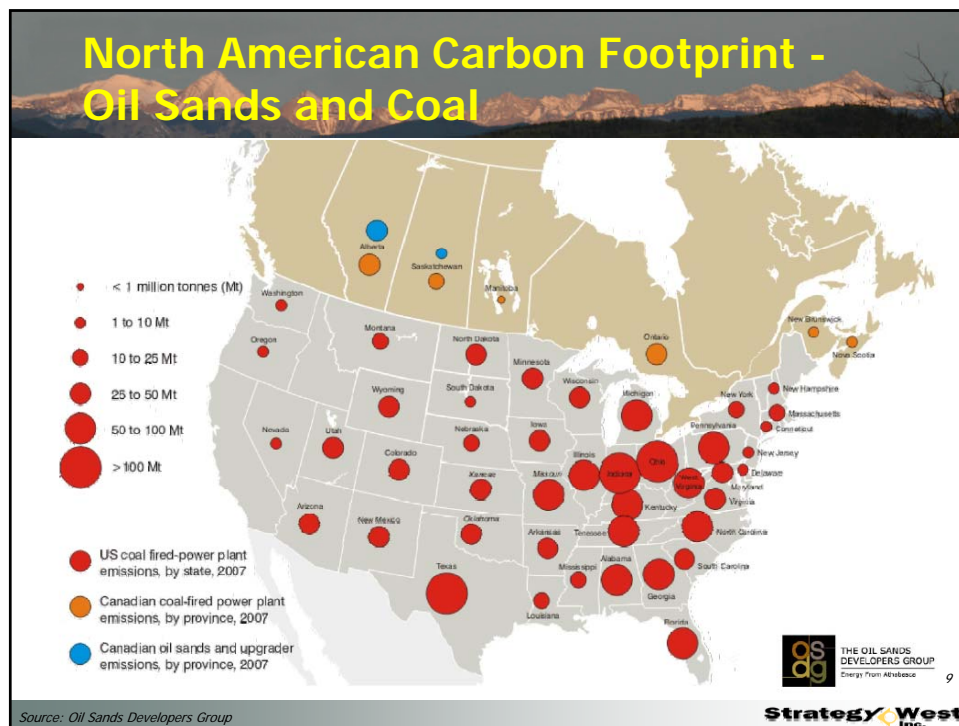
Life Cycle GHG Emissions of Various Crude Oils



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.



## Canada's GHG Emission Reduction Commitments

- 1997 Kyoto Protocol
  - Protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at combating global warming
  - Initially adopted on December 11, 1997 in Kyoto, Japan and entered into force on February 16, 2005
  - As of November 2009, 187 states had ratified the Protocol
- Canada's Kyoto Commitments
  - Ratified by Canada on December 17, 2002 and committed to reduce GHG emissions to 6% below 1990 levels by 2008-2012
  - These commitments were not met
- 2009 Copenhagen Accord
  - In January 2010, Canada submitted conditional targets to reduce GHG emissions to 17% below 2005 levels by 2020
  - Detailed plans have not been released

10

Source: Environment Canada

Strategy West Inc.

## US Initiatives

- *American Clean Energy and Security Act* (Waxman-Markey Bill) was passed by the House of Representatives in June 2009
- Proposed *American Power Act* (Kerry-Lieberman Bill) will be tabled in the Senate summer 2010
- Both bills propose to:
  - Reduce GHG emissions from major sources by 17% by 2020 and 83% by 2050 relative to 2005 levels
  - Implement a national cap-and-trade scheme
- US Environmental Protection Agency (EPA) has developed rules to regulate GHG emissions if Congress does not act

Strategy West  
Inc.

## Industry Options

- Improve Existing Processes
  - Reduce energy use
  - Capture fugitive emissions
- Employ New Technologies
  - Gas-fired cogeneration
  - Hybrid steam-solvent in situ processes (i.e., SAP, LASER)
  - In situ combustion processes (i.e., THAI)
  - In situ electric heating (i.e., ET-DSP)
  - VAPEX, N-Solv
- Capture and Sequester CO<sub>2</sub> (CCS)

12

Strategy West  
Inc.

## Government Investments in Carbon Capture and Storage

- In 2008, Alberta announced a \$2B fund for investment in Carbon Capture and Storage
- Four projects were selected for possible provincial and federal funding:
  - **Shell/Chevron/Marathon - Quest Project**
    - Integrated carbon capture and storage project at the Scotford Upgrader in the Alberta Industrial Heartland
  - **Capital Power/Enbridge – Project Pioneer**
    - Integrated gasification combined-cycle carbon capture power generation facility at the Keephills 3 power plant, west of Edmonton
  - **Enhance/Northwest - The Alberta Carbon Trunk Line**
    - Gasification, CO<sub>2</sub> capture, transportation, enhanced oil recovery and storage in the Alberta Industrial Heartland and central Alberta
    - CO<sub>2</sub> capture from the Agrium fertilizer plant and the Northwest upgrader
  - **Swan Hills Synfuels - in-situ coal gasification (ISCG)**
- **Proposed funding for each project has been announced – final agreements are required**

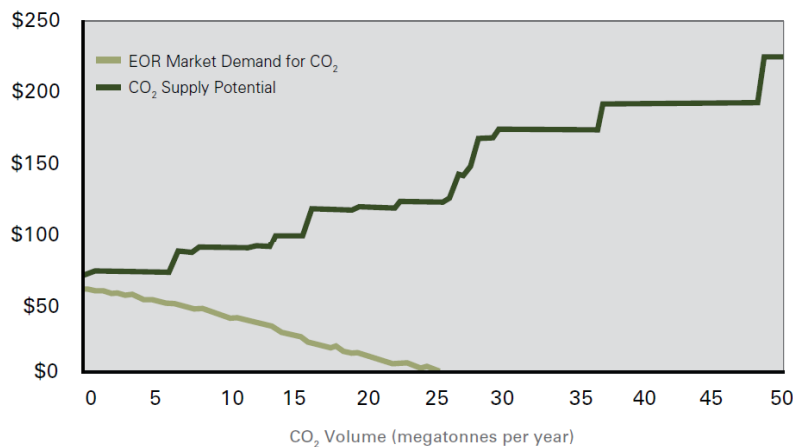
13

Source: Alberta Energy

Strategy West Inc.

## CO<sub>2</sub> Supply & EOR Demand Potential

CO<sub>2</sub> Supply & EOR Demand Potential circa 2020 / 2025 with \$75 Oil Price (WTI)  
(Supply cost includes capture and transport costs)



14

Source: ICO2N, October 2009

Strategy West Inc.

## CCS Summary

- CCS has potential to reduce the carbon footprint of the oil sands industry
- CCS is very costly
  - Gasification of bitumen residues provides the best opportunity for CO<sub>2</sub> capture in the oil sands
  - CO<sub>2</sub> capture from new and retrofitted SMRs may also be feasible
  - CO<sub>2</sub> capture from flue gases is very expensive
- EOR requires low-cost CO<sub>2</sub>
- The funding gap must be closed to achieve meaningful capture volumes
  - Government action would be required

15

Strategy West Inc.

## Tailings Disposal at Oil Sands Mining & Extraction Operations

- 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<sup>6</sup> m<sup>3</sup>
- Tailings ponds today are approximately 170 km<sup>2</sup>



16

Source: Pembina Institute; Alberta Energy Resources Conservation Board

Strategy West Inc.



## ERCB Directive 074

- Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes, was released February 3, 2009
- Directive 074 requires operators to:
  - Prepare tailings plans and report on tailings ponds annually
  - Reduce the accumulation of tailings by capturing fine particles, that would otherwise remain suspended in tailings ponds ,and placing them in a deposit that is “trafficable”
  - Specify dates for construction, use and closure of tailings ponds and file these dates with the ERCB by September 30, 2009.
- Operators’ compliance plans are available on the ERCB website. Supplemental Information Requests will also be available when they are completed.

17

Source: Alberta Energy Resources Conservation Board

Strategy West  
Inc.

## Compliance with Directive 074

- On April 22, 2010, the ERCB issued conditional approvals for Suncor’s Fort Hills and Syncrude’s Mildred Lake and Aurora North Mines
- Suncor Fort Hills
  - Thin-lift drying of fluid fine tailings in Dedicated Disposal Areas (DDAs)
  - Pilot testing required
  - Zero inventory of Mature Fine Tailings (MFT) at end of mine life
- Syncrude Mildred Lake and Aurora North
  - Mature Fine Tailings (MFT) centrifugation
  - Commercial demonstration plant to be in operation by August 2011 with start up of a full-scale supplemental tailings plant by June 2015
  - Untreated MFT to end-pit lake at end of mine life
- Plans submitted by others still under review

18

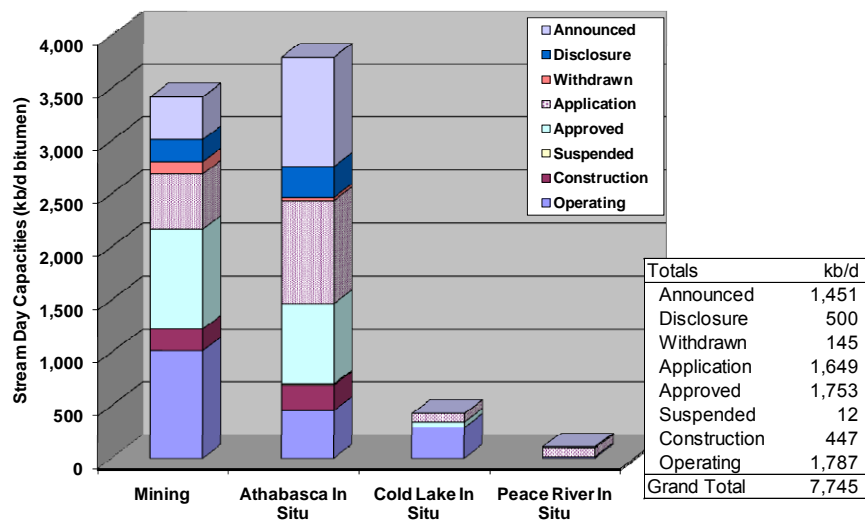
Strategy West  
Inc.

## Strategy West's Oil Sands Industry Outlooks

- Comprehensive Project Database
- Industry Outlooks
  - Project-by-project timing adjustments
  - Project-by-project probabilities
  - Aggregation of results
- Project listing may be downloaded at [www.strategywest.com](http://www.strategywest.com)

Strategy West Inc.

## Oil Sands Project Wish List



Sources: Operator Applications and Announcements; Strategy West Inc.; May 2010

Strategy West Inc.

## Commercial Projects under Construction

### Integrated Mining

- AOSP Expansion (2010/2011)
  - Jackpine Mine Phase 1A
  - Scotford 1 Upgrader Expansion

### Mining

- Imperial/ExxonMobil Kearl Lake Phase 1 (2012)

### In Situ

- StatoilHydro Leismer Demonstration (2010)
- Laricina Saleski Pilot (2010)
- Cenovus Christina Lake Phase 1C (2011)
- Devon Jackfish Phase 2 (2011)
- Suncor Firebag Phase 3 (2011)
- ConocoPhillips Surmont Phase 2 (2014-2016)

Sources: Operator Applications and Announcements: Strategy West Inc.; May 2010

Strategy West Inc.

## Most Likely Capacity Additions by 2020\*

### Upgraders

- None (BRIK?)

### Mining

- AOSP Muskeg River Expansion and Debottlenecking
- CNRL Horizon Phases 2 & 3
- Imperial/ExxonMobil Kearl Lake Phase 2
- Suncor North Steepbank Extension
- Syncrude Aurora South Phase 1

### In Situ

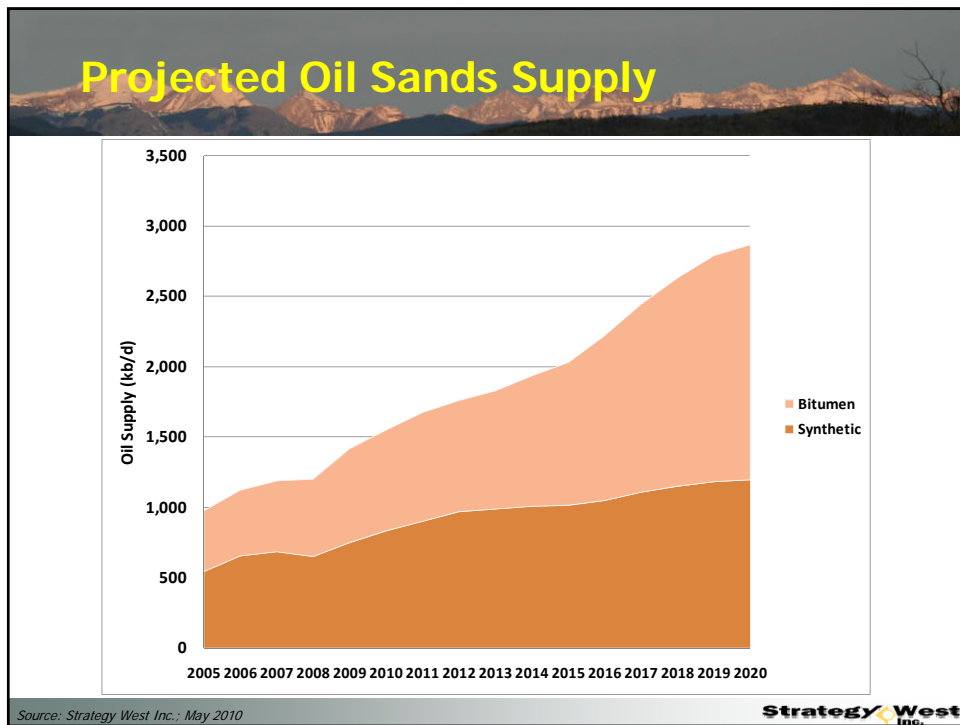
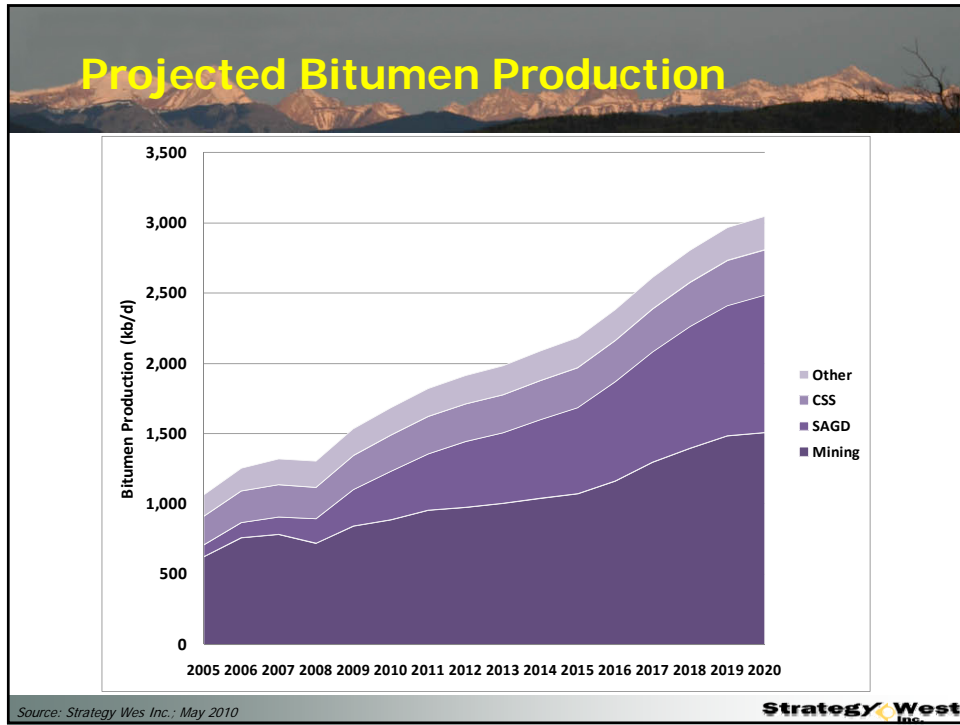
- Cenovus Christina Lake Phases 1D, 1E & 1F
- Cenovus Foster Creek Phase 1F
- Husky Sunrise Phases 1 & 2
- Imperial Cold Lake Phases 14-16
- Suncor Firebag Phases 4, 5 & 6
- Suncor MacKay River Expansion

\* The listed projects have been assigned probabilities of  $\geq 50\%$  and are judged most likely to be completed by 2020; however, none are certain - some may not be developed in this time frame. Other proposed projects not on this list have been assigned probabilities of  $< 50\%$  (i.e., regulatory approvals may not be in place, other factors) but some may still be developed by 2020.

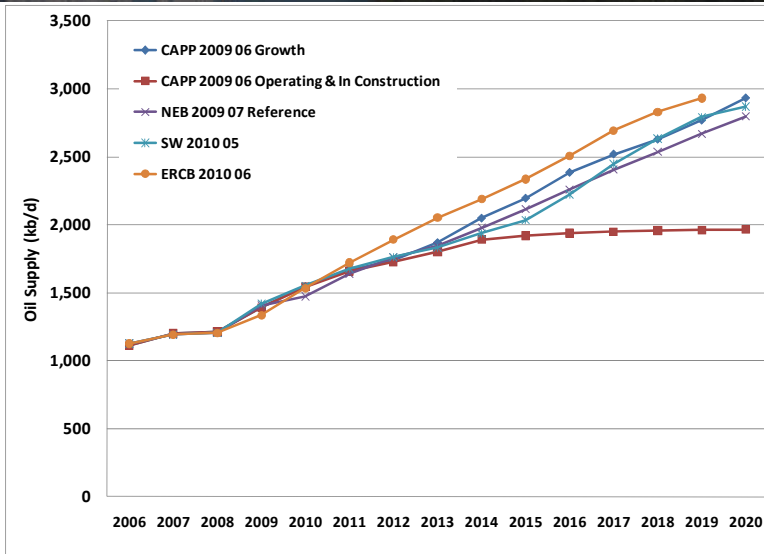
22

Sources: Strategy West Inc.; May 2010

Strategy West Inc.



## Comparative Oil Sands Supply Outlooks



Sources: CAPP; ERCB; NEB; Strategy West Inc.

Strategy West Inc.

## Conclusions

- The many challenges facing the oil sands industry will affect industry growth.
- The industry is GHG gas emission intensive. There are uncertainties about how these emissions will be regulated.
- Upgrading economics are not favourable due to high project costs and narrow light/heavy oil price differentials. No new upgrading capacity is expected by 2020 (BRIK?).
- Mining has generated large volumes of stored fluid fine tailings. Regulators will not allow continued accumulation and will require that existing tailings ponds be satisfactorily reclaimed.
- Bitumen production using mining/extraction and in situ technologies is economically attractive at current oil prices.
- Canadian bitumen production is expected to double by 2020, reaching about 3 million b/d; about 45% will be upgraded before delivery to market.

26

Strategy West Inc.



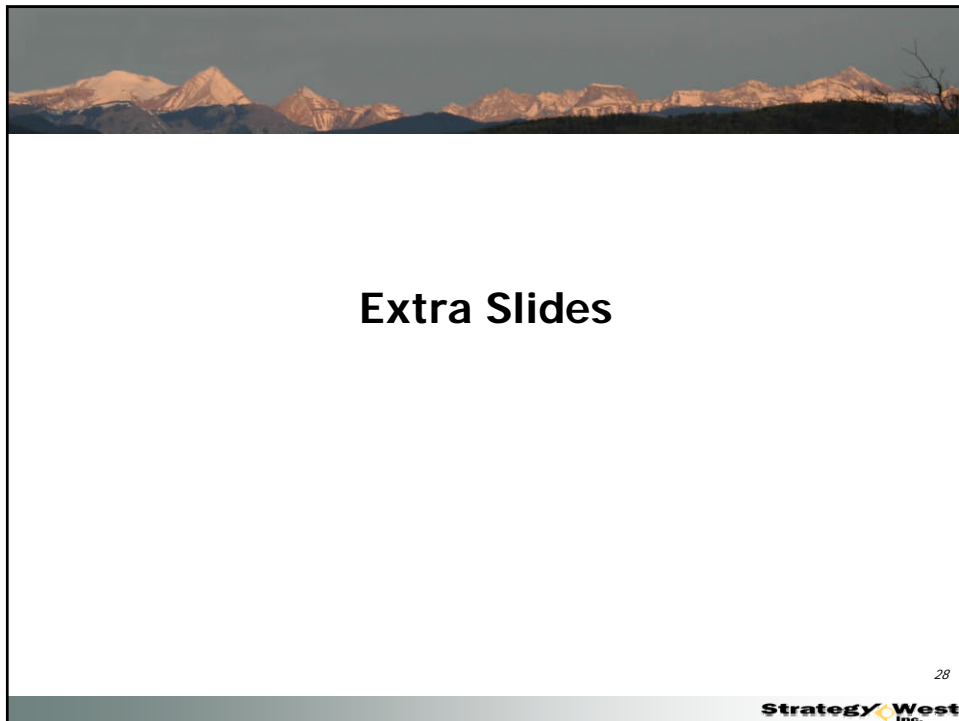
**Thank You**

**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.



**Extra Slides**

28

Strategy West Inc.

## Existing Upgraders

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)	Synthetic Capacity (kb/d)
Suncor	Tar Island (U1 & U2) Upgraders	1967	440	357
Syncrude	Mildred Lake Upgrader	1978	407	350
Shell (AOSP)	Scotford Upgrader	2003	155	158
CNRL	Horizon Upgrader	2008	135	114
Nexen	Long Lake Upgrader	2008	72	58.5
<b>Totals</b>			<b>1,209</b>	<b>1,037.5</b>

29

Sources: Operator Applications and Announcements: Strategy West Inc.

## Existing Mining & Extraction Projects

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)
Suncor	Base, Steepbank & Millennium Mines	1967	321
Syncrude	Base, North & North Aurora Mines	1978	407
Shell (AOSP)	Muskeg River (Albian) Mine	2002	155
CNRL	Horizon Mine	2008	135
<b>Total</b>			<b>1,018</b>

30

Sources: Operator Applications and Announcements: Strategy West Inc.

## Existing North Athabasca Commercial Thermal In Situ Projects

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)
Suncor	Mackay River SAGD Project Phase 1	2002	33
Suncor	Firebag SAGD Project Phases 1 & 2 Cogeneration & Expansion Project	2004	95
<b>Total</b>			<b>128</b>

37

Sources: Operator Applications and Announcements: Strategy West Inc.

Strategy West  
Inc.

## Existing South Athabasca Commercial Thermal In Situ Projects

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)
Cenovus	Foster Creek SAGD Project Phases 1A, 1B, 1C, 1D & 1E	2001	120
Cenovus	Christina Lake SAGD Project Phases 1A & 1B	2002	18.8
JACOS	Hangingstone SAGD Project Demonstration Project	2002	10
Conoco-Phillips	Surmont SAGD Project Phase 1	2006	27
Connacher	Great Divide SAGD Project Pod 1 & 2 (Algar)	2007	20
MEG Energy	Christina Lake SAGD Project Phase 1 Pilot & 2	2007	25
Nexen	Long Lake SAGD Project Phase 1	2007	72
Devon	Jackfish SAGD Project Phase 1	2008	35
<b>Total</b>			<b>327.8</b>

32

Sources: Operator Applications and Announcements: Strategy West Inc.

Strategy West  
Inc.



## Existing Cold Lake Commercial Thermal In Situ Projects

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)
Imperial Oil	Cold Lake CSS Project Phases 1-13	1985	140
CNRL	Primrose & Wolf Lake CSS Project	1985	120
Husky	Tucker SAGD Project Phase 1	2006	30
Shell	Orion SAGD Project Phase 1	2007	10
<b>Total</b>			<b>300</b>

33

Sources: Operator Applications and Announcements: Strategy West Inc.

Strategy West Inc.

## Existing Peace River Commercial Thermal In Situ Projects

Operator	Project	Initial Startup	Bitumen Capacity (kb/d)
Shell	Peace River HCSS Project Cadotte Lake	1986	12.5
North Peace	Red Earth CSS Pilot Project	2009	1
<b>Total</b>			<b>13.5</b>

34

Sources: Operator Applications and Announcements: Strategy West Inc.

Strategy West Inc.