

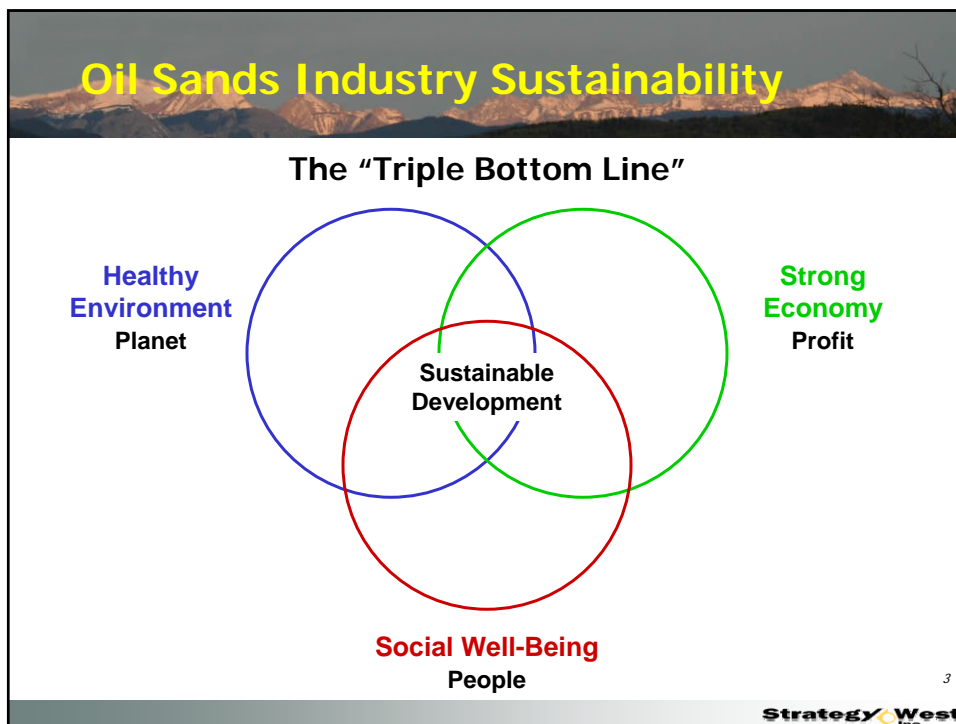


## Presentation Outline

- Oil Sands Industry Challenges and Sustainability
  - Overview
  - Energy Requirements
  - Greenhouse Gas Emissions
- Oil Sands Industry Production Outlook
  - Unadjusted Case
  - Adjusted Case
- Conclusions

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- ## Oil Sands Industry Economic Challenges
- **Capital Costs**
    - Labour Availability and Productivity
    - Services and Materials
    - Project Execution
  - **Operating Costs**
    - Purchased External Energy
    - Non-Energy Operating Costs
  - **Energy and Hydrogen Supply Options**
  - **Fiscal and Regulatory Uncertainties**
    - Provincial Royalties
    - Corporate Income Taxes
    - Greenhouse Gas Emissions
  - **Markets**
    - Integration/Final Product (Bitumen, SCO, RPPs, or Petrochemicals)?
    - Market Access
  - **Product Prices**
    - Light Sweet Crude (WTI/MSW)
    - Heavy-Light Differentials
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## 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

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## Oil Sands Industry Societal Challenges

- Public Services
  - Health
  - Education
  - Other
- Public Infrastructure
  - Road
  - Water & Sewer
  - Rail
  - Other
- Pace of Development
- First Nations
- Regulatory Agencies
  - Staffing & Expertise
  - Workload
  - Funding
- Project Legacies

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## Oil Sands Energy and Hydrogen Requirements

### Energy

- In situ steam and process heat
- Mining/extraction process heat
- Upgrading process heat
- Electricity

### Hydrogen

- Hydro-conversion processes (upgrading)

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## Current Sources of Thermal Energy, Hydrogen and Electricity

### Thermal Energy

- Purchased natural gas
- Produced gases (in situ projects)
- Process gases (upgraders)
- Liquid hydrocarbon fuels
- Crude bitumen
- Coke and other bitumen residues (upgraders)

### Hydrogen

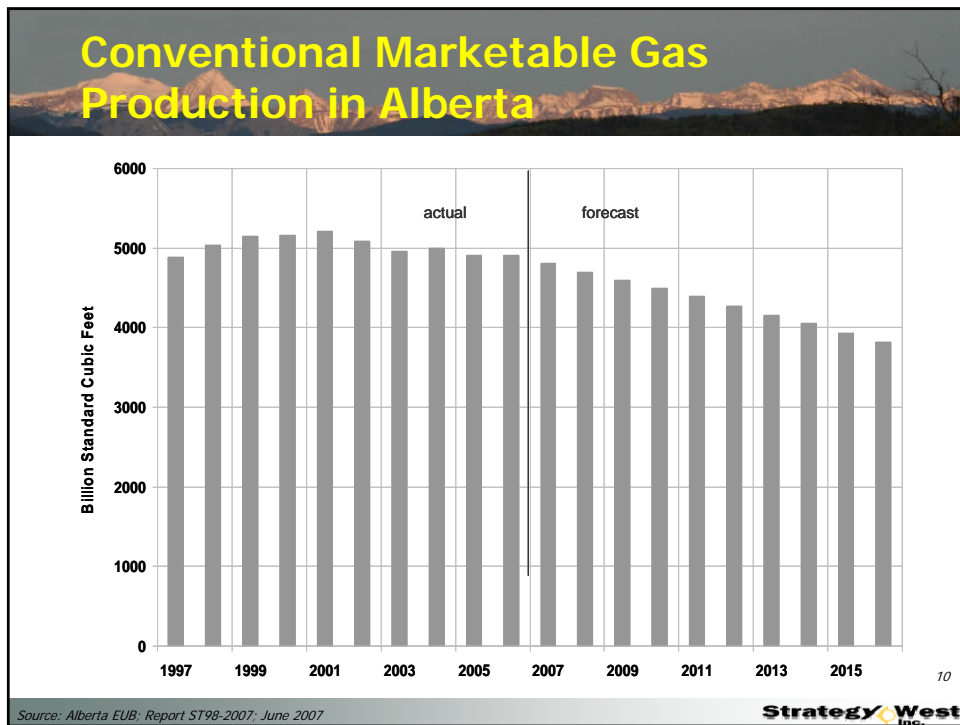
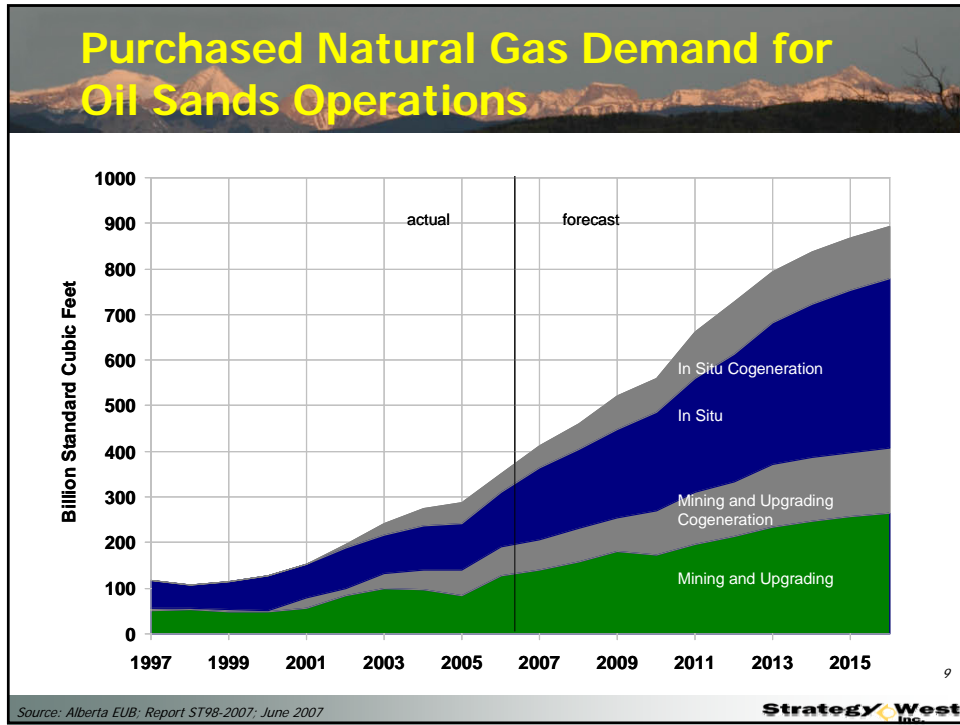
- Steam Methane Reforming (natural gas)

### Electricity

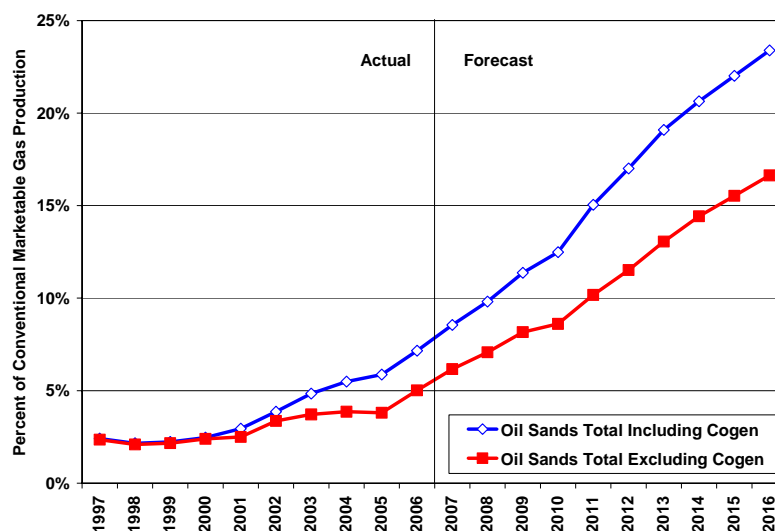
- On-site generation
- Purchased electricity

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## Purchased Natural Gas as a Percentage of Conventional Marketable Gas



Source: Alberta EUB, Report ST98-2007, June 2007

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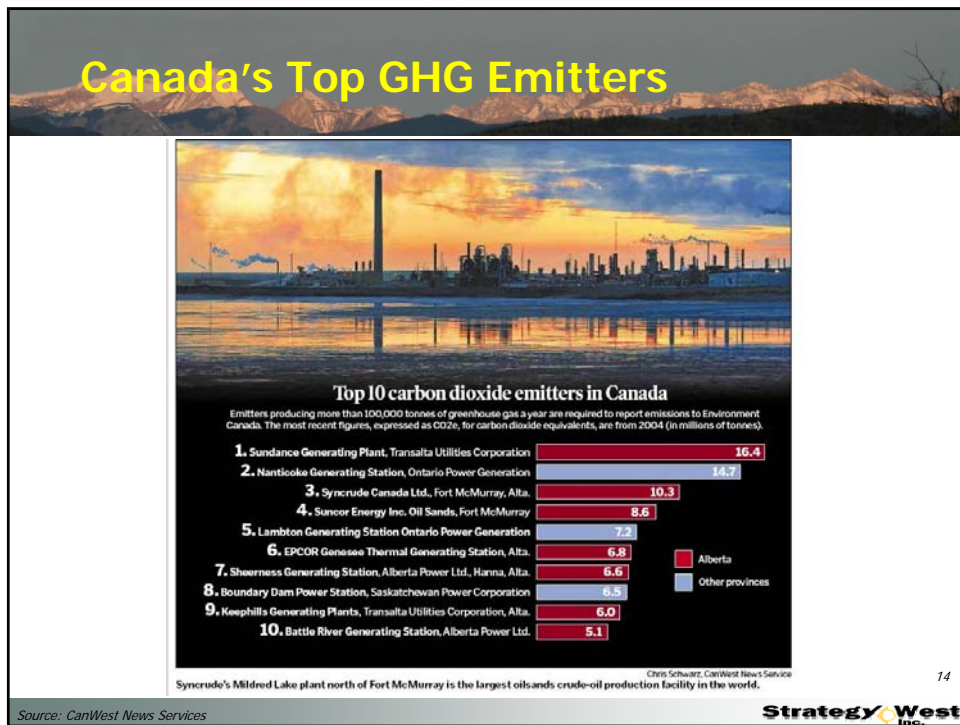
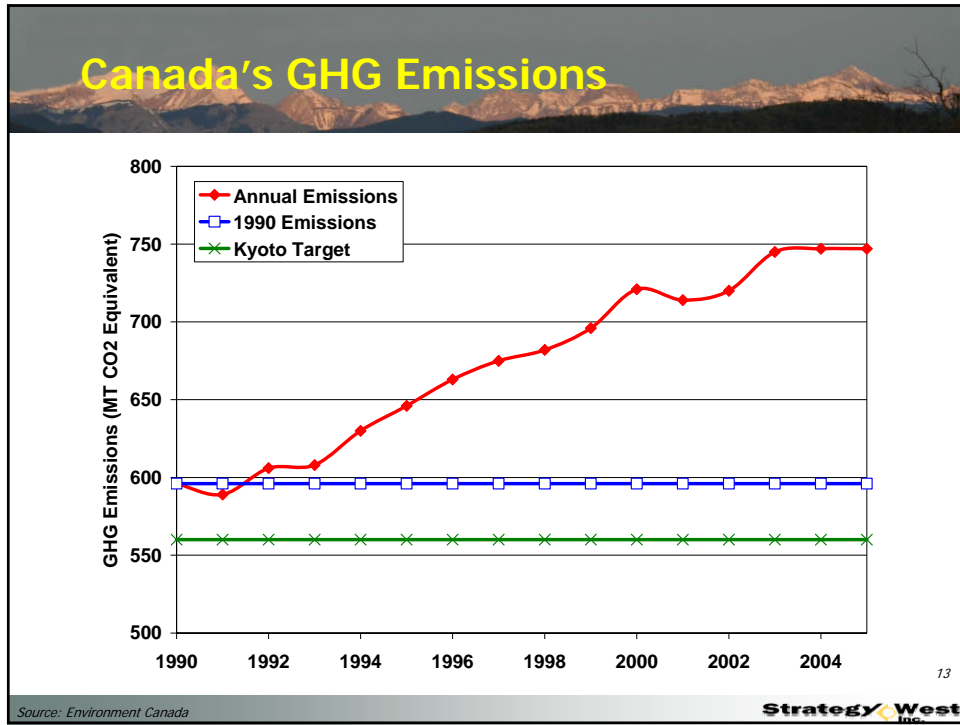
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## Industry Options to Reduce Purchased Gas Requirements

- Conservation/Energy Efficiency Improvements
- New Bitumen Recovery Technologies
  - In Situ
  - Mining and Extraction
- Alternative Sources of Thermal Energy, Electricity and Hydrogen
  - Gasification of Bitumen Residues
  - Combustion of Bitumen/Bitumen Residues
  - Nuclear

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## Proposed Federal GHG Emission Strategy

- Introduced April 2007
- GHG emission intensity reductions
  - Existing facilities
    - 6% annual reduction every year until 2010 (18% reduction in intensity by 2010)
    - 2% annual improvement thereafter
  - New facilities
    - 3-year grace period - 2% annual improvement thereafter
    - Clean fuel standard
- Alternative compliance options
  - Climate Change Technology Fund
  - Various trading mechanisms
- Credit for early action
- The expectation is to achieve a total reduction in GHG emissions of 20% by 2020

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Source: Environment Canada Strategy West Inc.

## Proposed Federal Regulatory System

**Canada's regulatory system will apply to all industries and get tougher over time**

**TOUGH**

For existing facilities in all industrial sectors: mandatory reductions starting in 2010 and becoming tougher every year

**TOUGHER**

For new plants in key sectors coming on stream in 2004 and later: tougher emission targets to drive adoption of cleaner fuels and technologies

**TOUGHEST**

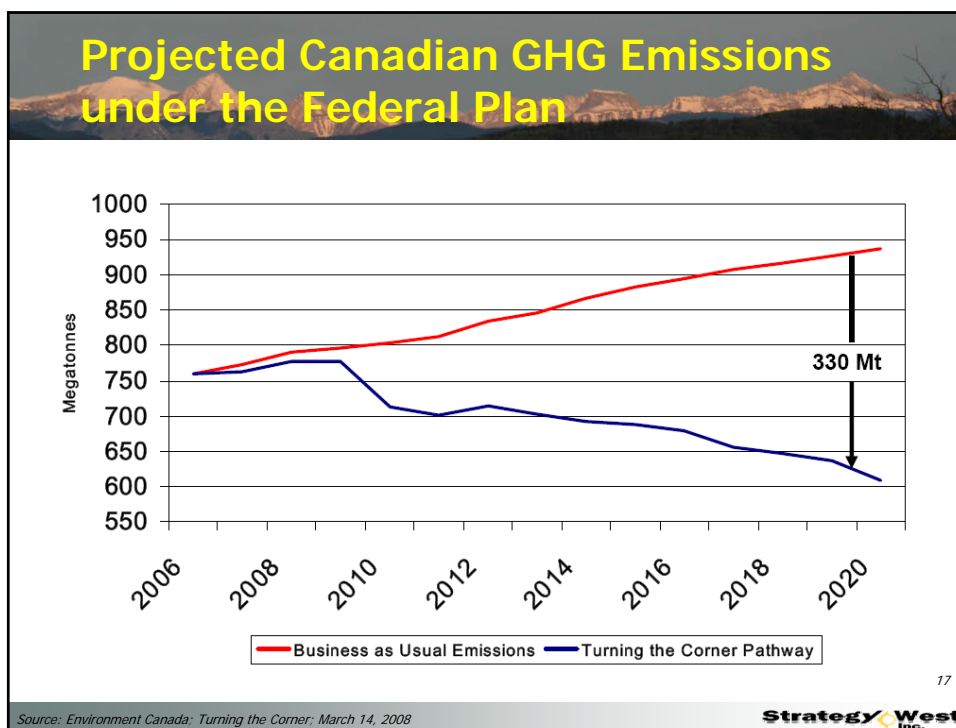
For oil sands and coal power plants coming on stream in 2012 and later:

- An end to new dirty coal plants
- Effectively requiring that oil sands use carbon capture and storage or other green technology to drastically cut greenhouse gas emissions

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Source: Environment Canada: Turning the Corner: March 14, 2008 Strategy West Inc.





- ### Next Steps – Federal Plan
- Draft regulations are expected to be published in *Canada Gazette, Part I* for public comment in fall 2008
  - Final regulations are expected to be approved and published in *Canada Gazette, Part II* in fall 2009
  - Greenhouse gas provisions of the regulations are to come into force, as planned, on January 1, 2010
  - Air pollutant elements will be added to the draft regulations once the regulatory framework for air pollutants has been finalized in spring 2008
- Source: Environment Canada; Turning the Corner; March 14, 2008
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## Alberta's 2008 Climate Change Strategy

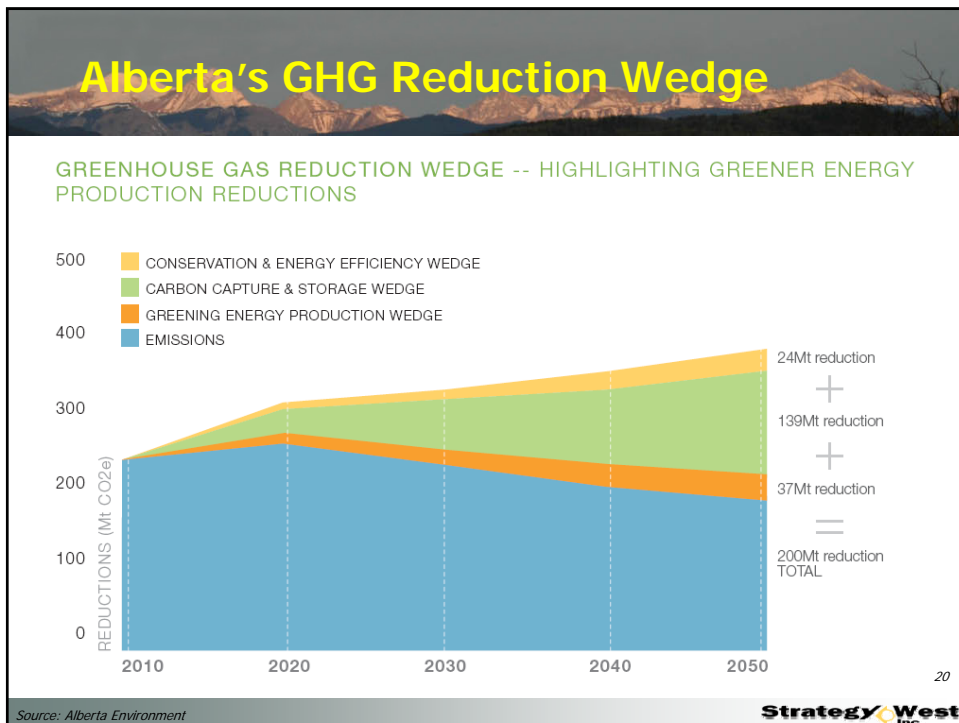
### Themes

- Conserving and using energy efficiently
- Implementing carbon capture and storage
- Greening energy production

### Targets & Results

- By 2010 - Reduce emissions by 20 Mt
  - Meet intensity target established in 2002 plan
- By 2020 - Reduce emissions by 50 Mt
  - Stabilize GHG emissions and begin reduction
- By 2050 - Reduce emissions by 200 Mt
  - 50% below BAU level
  - 14% below 2005 level

Source: Alberta Environment Strategy West Inc.

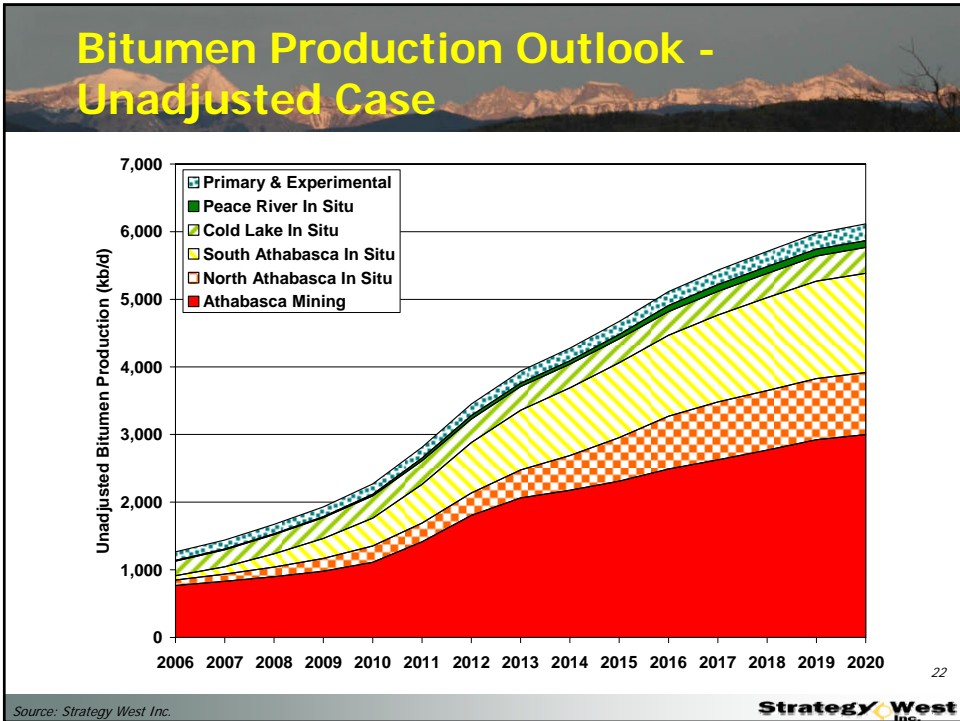


## Strategy West's Oil Sands Industry Outlooks

- Comprehensive Project Database
  - Used to develop aggregated industry outlooks
- Unadjusted Outlook
  - Assumes all existing and proposed projects are developed and meet their scheduled startup dates
- Adjusted Outlook
  - Project-by-project timing adjustments
  - Project-by-project probability assessment

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## CAPEX – Unadjusted Case

	Production Increase 2008-2020 (million b/d)	Initial CAPEX (2007 C\$ per b/d)	Average Annual Initial CAPEX 2008-2020 (2007 C\$ billions)
Mining & Extraction	2.2	\$40,000 (Bitumen)	\$6.7
In Situ	2.5	\$10,000-\$35,000 (Bitumen)	\$5.7
Incremental Production	4.7		\$12.4
Upgrading	2.8	\$50,000 (SCO)	\$10.9
<b>Total CAPEX</b>			<b>\$23.3</b>

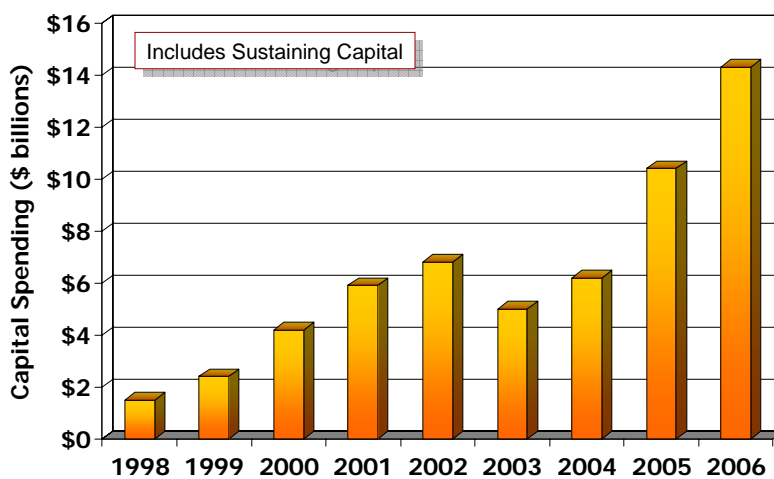
Note: does not include sustaining capital

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Source: Strategy West Inc.

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## Oil Sands Historical CAPEX



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Source: Canadian Association of Petroleum Producers

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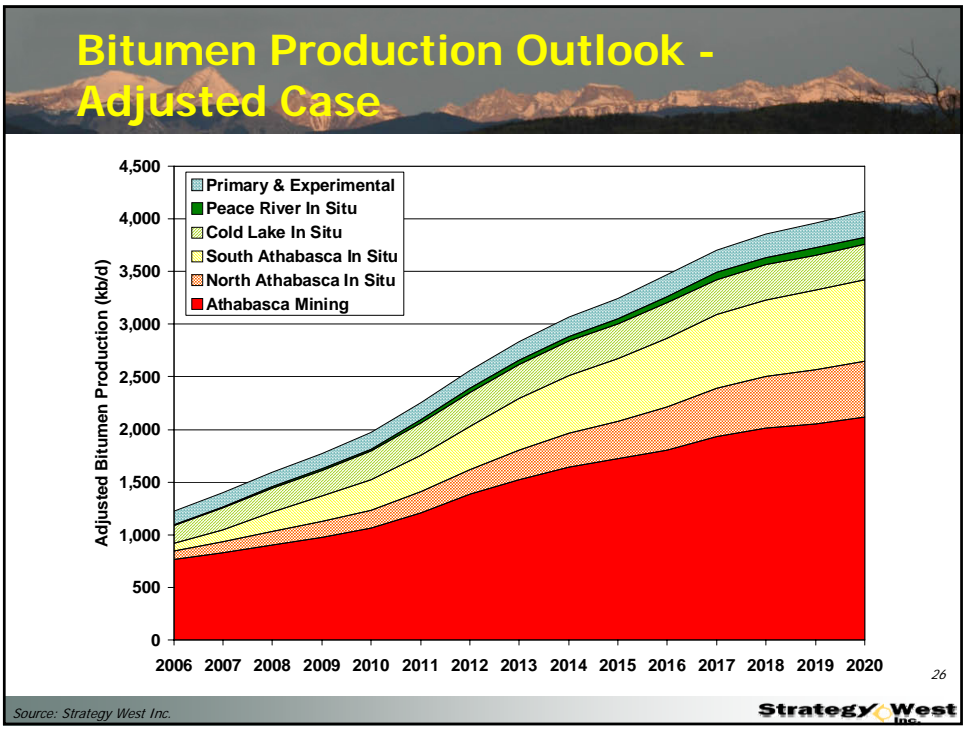
## Adjusted Industry Outlook - Project-by-Project Assessment

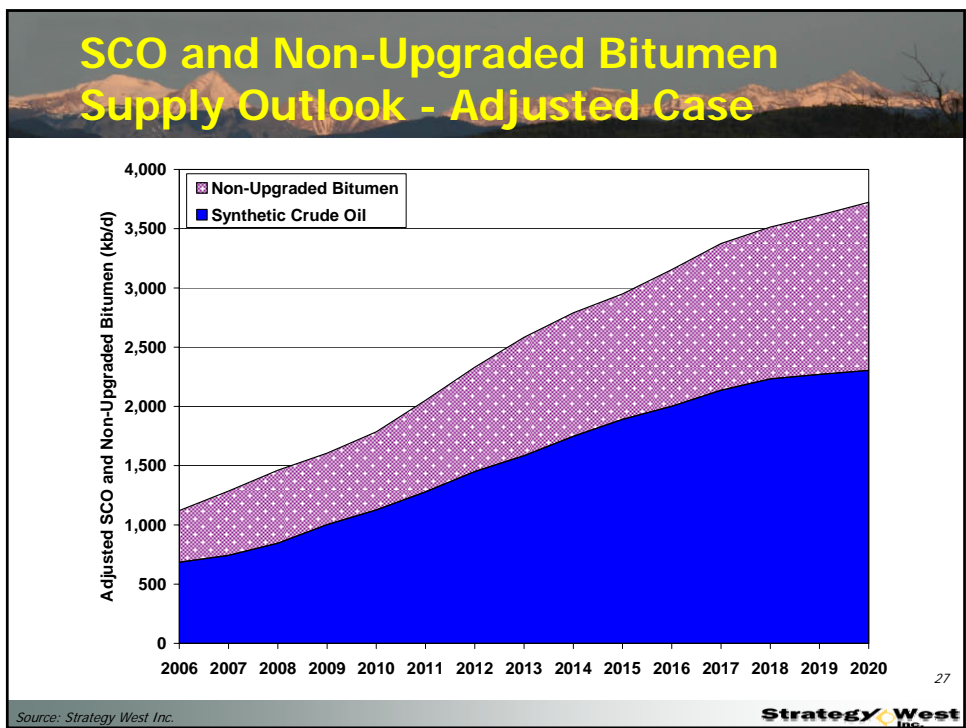
- Project Timing
  - Lease evaluation
  - Disclosure
  - Application preparation and EIA
  - Application review and approval
  - Detailed engineering
  - Internal approval
  - Construction
  - Phasing

- Project Probabilities
  - Project status
  - Owners
    - Operating experience
    - Financial capacity
    - Technical capability
    - Other factors
  - Technology
  - Existing operations
  - Integration
  - Timing

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Source: Strategy West Inc. **Strategy West Inc.**



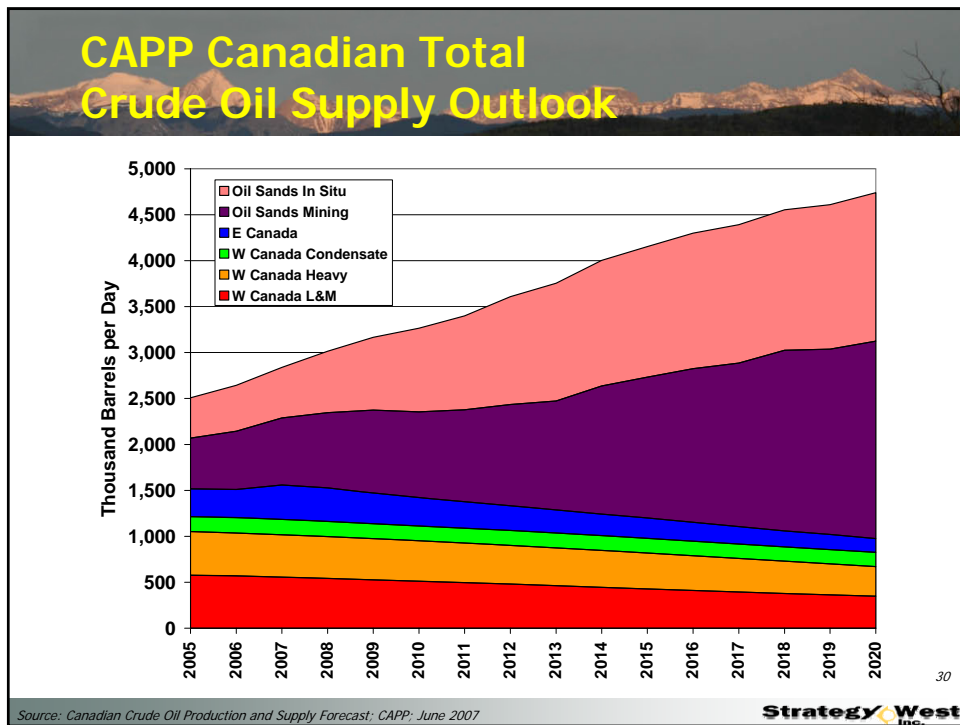
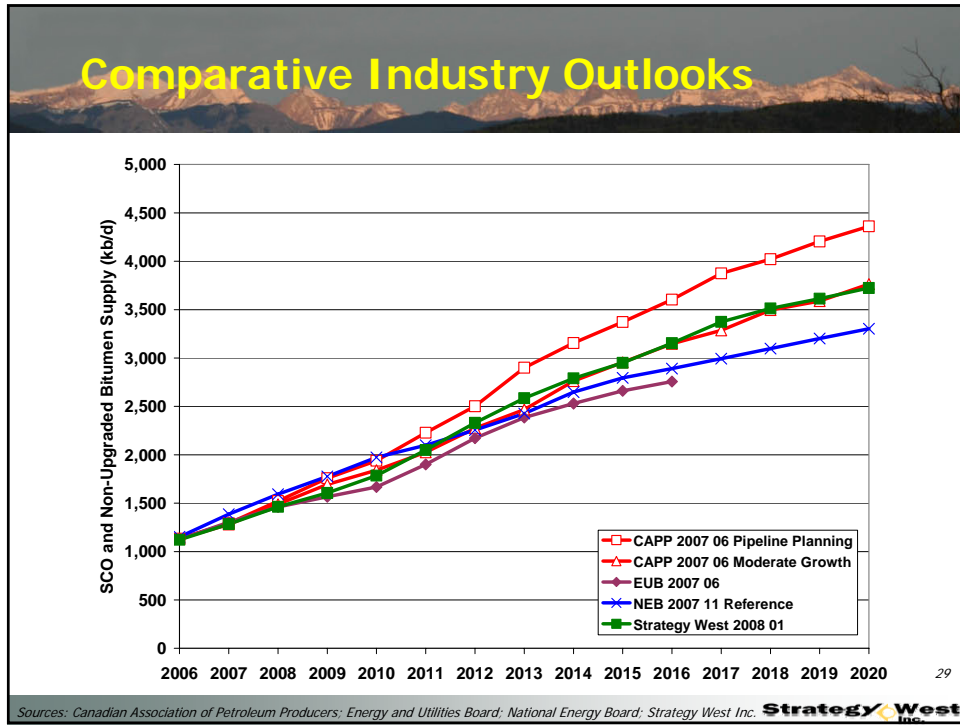


### CAPEX – Adjusted Case

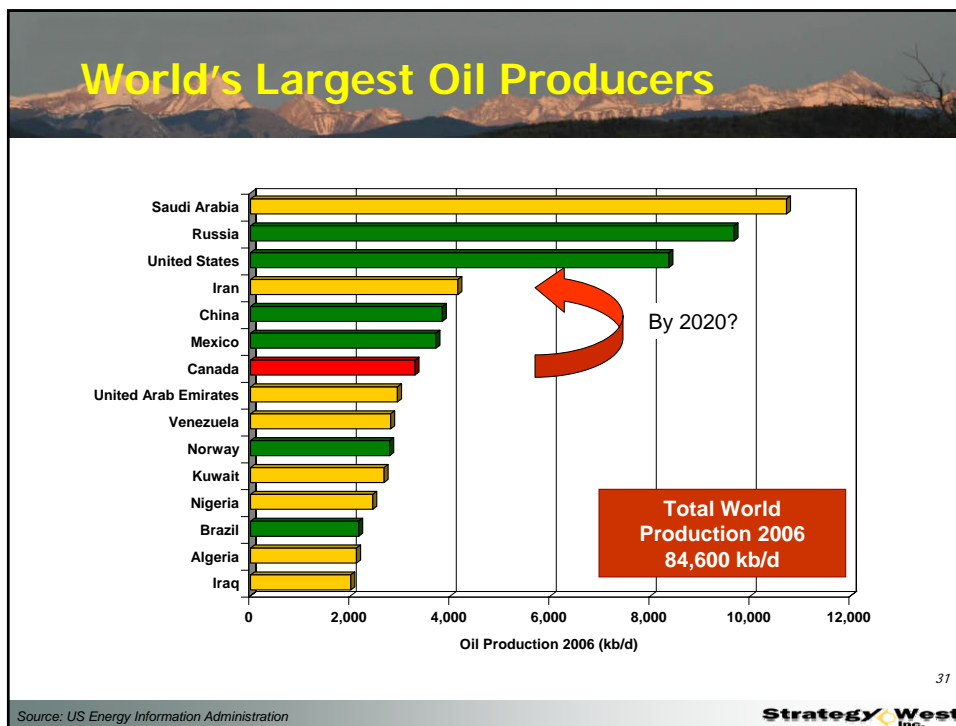
	Production Increase 2008-2020 (million b/d)	Initial CAPEX (2007 C\$ per b/d)	Average Annual Initial CAPEX 2008-2020 (2007 C\$ billions)
Mining & Extraction	1.3	\$40,000 (Bitumen)	\$4.0
In Situ	1.4	\$10,000-\$35,000 (Bitumen)	\$3.1
Incremental Production	2.7		\$7.1
Upgrading	1.6	\$50,000 (SCO)	\$6.0
<b>Total CAPEX</b>			<b>\$13.1</b>

Note: does not include sustaining capital

Source: Strategy West Inc. 28







## Conclusions

- Canada's oil sands deposits are among the world's largest hydrocarbon accumulations.
- The industry is well developed and making a substantial contribution to global oil supply.
- Oil sands projects are experiencing cost pressures but are economically attractive at oil prices of US\$60-70/b (WTI @ Cushing, OK).
- While the many challenges facing the industry will cause project delays and cancellations, these challenges are being addressed and the industry will continue to grow.

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**Thank You**

**Questions?**

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

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