



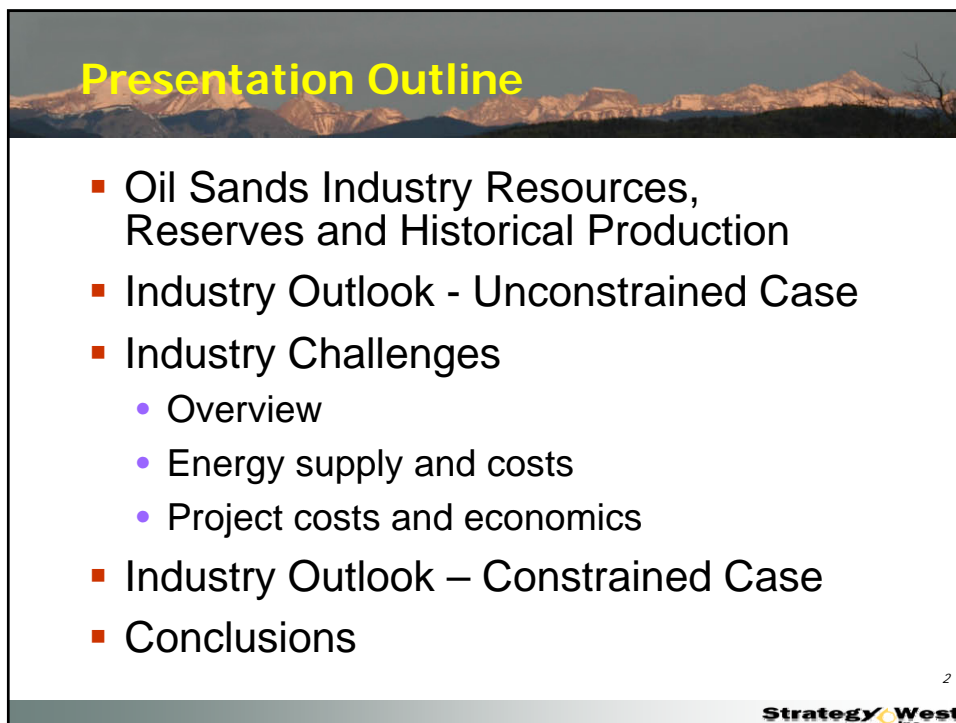
Oil Sands Outlook: How will the Challenges Facing the Industry affect Growth?

**4th Annual Canadian Oil Sands Summit
Insight Information**

Calgary, Alberta
January 16-17, 2007

**Bob Dunbar, P.Eng.
Strategy West Inc.**

Photo Courtesy Suncor Energy Inc.



Presentation Outline

- Oil Sands Industry Resources, Reserves and Historical Production
- Industry Outlook - Unconstrained Case
- Industry Challenges
 - Overview
 - Energy supply and costs
 - Project costs and economics
- Industry Outlook – Constrained Case
- Conclusions

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Resources and Reserves

Figure 2.1
Alberta's oil sands areas



- 3 Oil Sands Areas (OSAs) comprising 15 Oil Sands Deposits (OSDs)
- 140,000 square kilometres (54,000 square miles)
- Data at year-end 2005

- Initial volume in place (bitumen): 1,694 billion barrels
- Initial established reserves: 178.7 billion barrels
- Cumulative production: 5.0 billion barrels
- Remaining established reserves: 173.7 billion barrels
- Remaining established reserves under active development: 10.2 billion barrels

Source: EUB ST98-2006; Alberta's Energy Reserves 2005 and Supply/Demand Outlook 2006-2015; June 2006

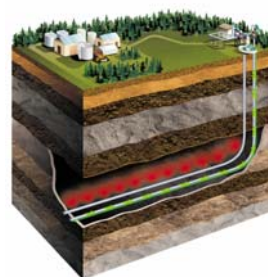
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Mineable and In Situ Resources and Reserves



Mineable Resources/Reserves

- < 75m (250 ft) to top of oil sands
- Athabasca Oil Sands Area only
- 6% of initial volume in place
- 20% of initial established reserves
- 68% of cumulative production to year-end 2005

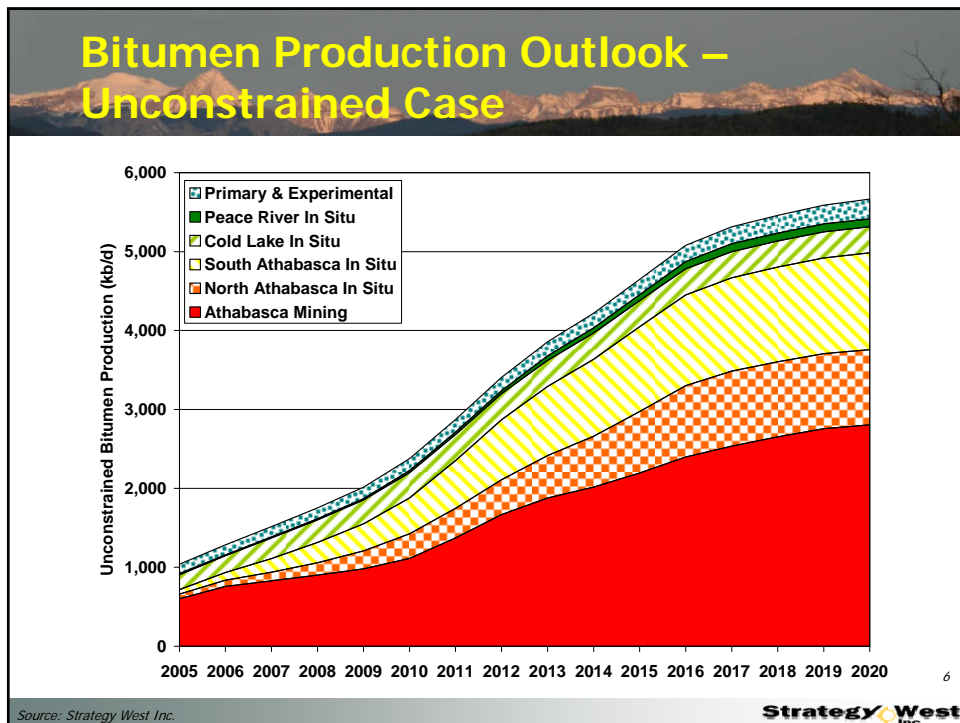
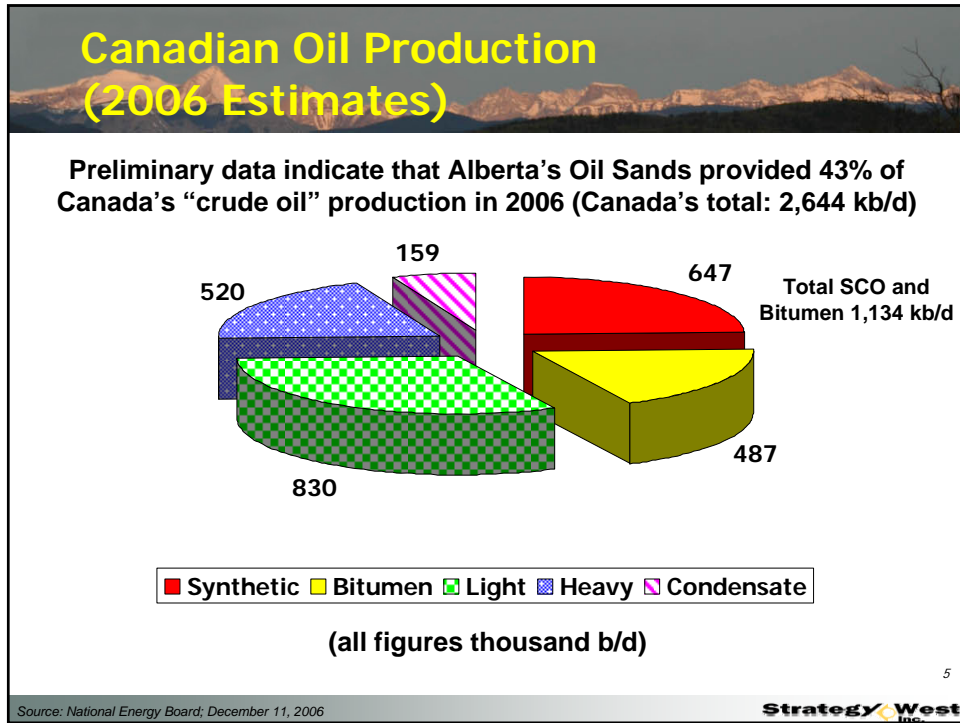


In Situ Resources/Reserves

- > 75m (250 ft) to top of oil sands
- Athabasca, Cold Lake and Peace River Oil Sands Areas
- 94% of initial volume in place
- 80% of initial established reserves
- 32% of cumulative production to year-end 2005

Source: EUB ST98-2006; Alberta's Energy Reserves 2005 and Supply/Demand Outlook 2006-2015; June 2006

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CAPEX – Unconstrained Case

	Incremental Bitumen 2005-2020 (million b/d)	Initial CAPEX (\$ per b/d)	Average Annual Initial CAPEX 2005-2020 (\$ billions)
Mining & Extraction	2.2	\$35,000 (Bitumen)	\$5.2
In Situ	2.4	\$25,000 (Bitumen)	\$3.9
Incremental Production	4.6		\$9.1
Upgrading	2.8	\$50,000 (SCO)	\$9.2
Total CAPEX			\$18.3

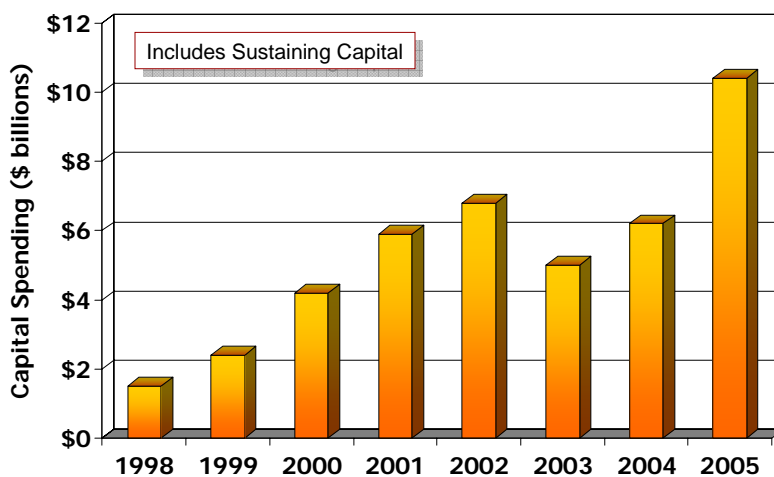
Note: does not include sustaining capital

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Source: Strategy West Inc.

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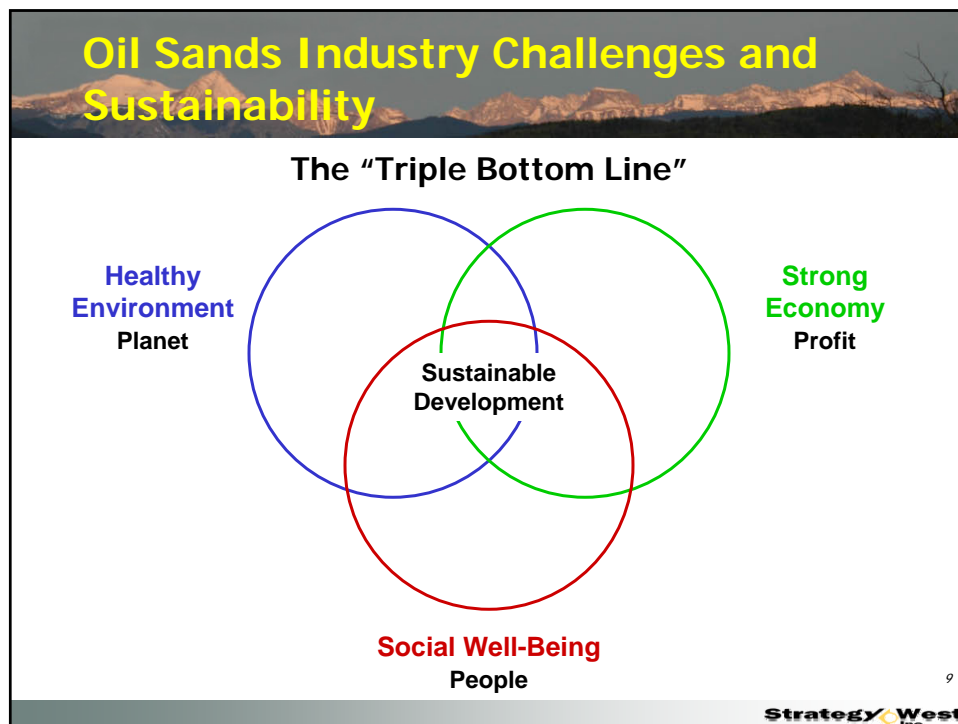
Oil Sands Historical CAPEX



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Source: Canadian Association of Petroleum Producers (CAPP)

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- ## Oil Sands Industry Environmental Challenges
- Air Emissions
 - Greenhouse Gases
 - Criteria Air Contaminants (SO_x, NO_x, PM, VOCs, CO, NH₃)
 - Water Use
 - Consumption
 - Recycle
 - Waste Disposal
 - Tailings
 - Other Solid and Liquid Wastes
 - Reclamation and Abandonment
 - Cumulative Effects
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Oil Sands Industry Economic Challenges

- Labour Availability and Productivity
- Capital Costs
 - Services and Materials
 - Project Management
- Energy Consumption, Supply and Costs
 - Internal Energy Use
 - External Energy Options
- Non-Energy Operating Costs
- Product Prices
 - Light Sweet Crude (WTI/MSW)
 - Heavy-Light Differentials
- Markets
 - Final Product (Bitumen, SCO, RPPs or Petrochemicals)?
 - Integration?
- Market Access
 - Pipeline Infrastructure
- Gas-over-Bitumen

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Oil Sands Industry Societal Challenges

- Public Services
 - Health
 - Education
 - Other
- Public Infrastructure
 - Road
 - Water & Sewer
 - Rail
 - Other
- Regulatory Issues
 - Royalties and Taxes (Economic Rent)
 - Regulatory Agencies
 - Staffing
 - Workload
 - Funding
- Pace of Development

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Oil Sands Energy and Hydrogen Uses

<p>Thermal Energy</p> <ul style="list-style-type: none"> ▪ In situ steam and process heat ▪ Mining/extraction process heat ▪ Upgrading process heat 	<p>Hydrogen</p> <ul style="list-style-type: none"> ▪ Hydro-conversion processes (upgrading) <p>Electricity</p>
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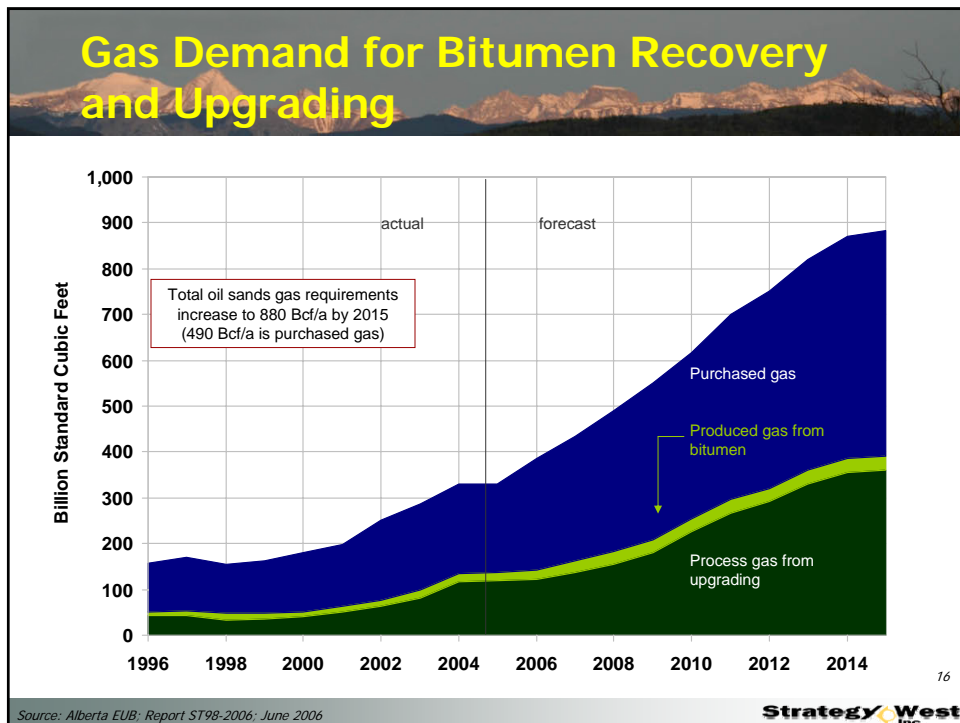
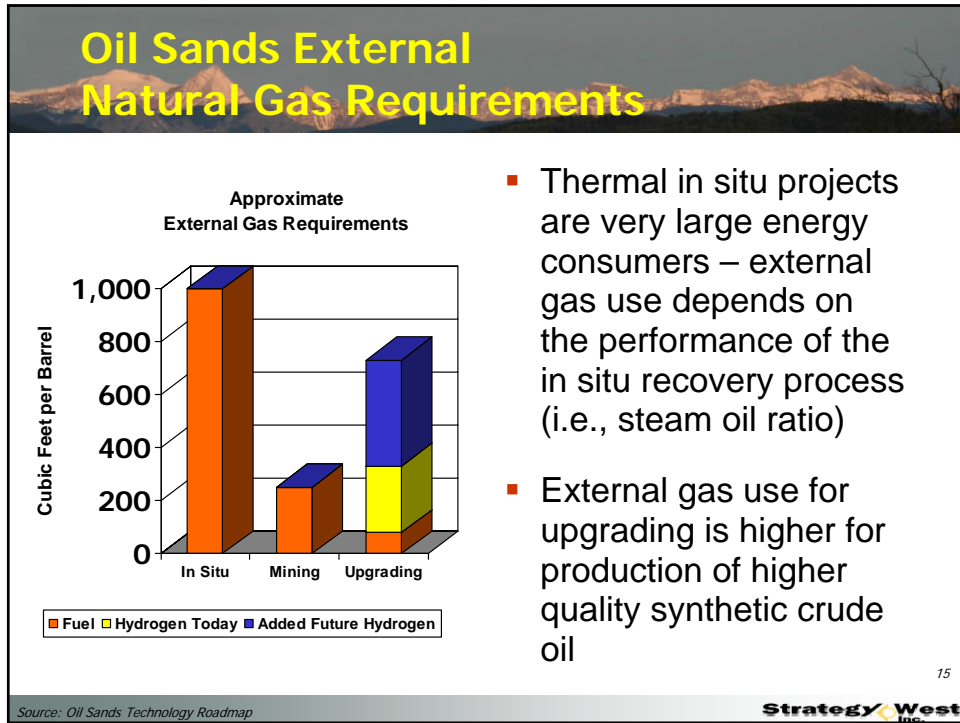
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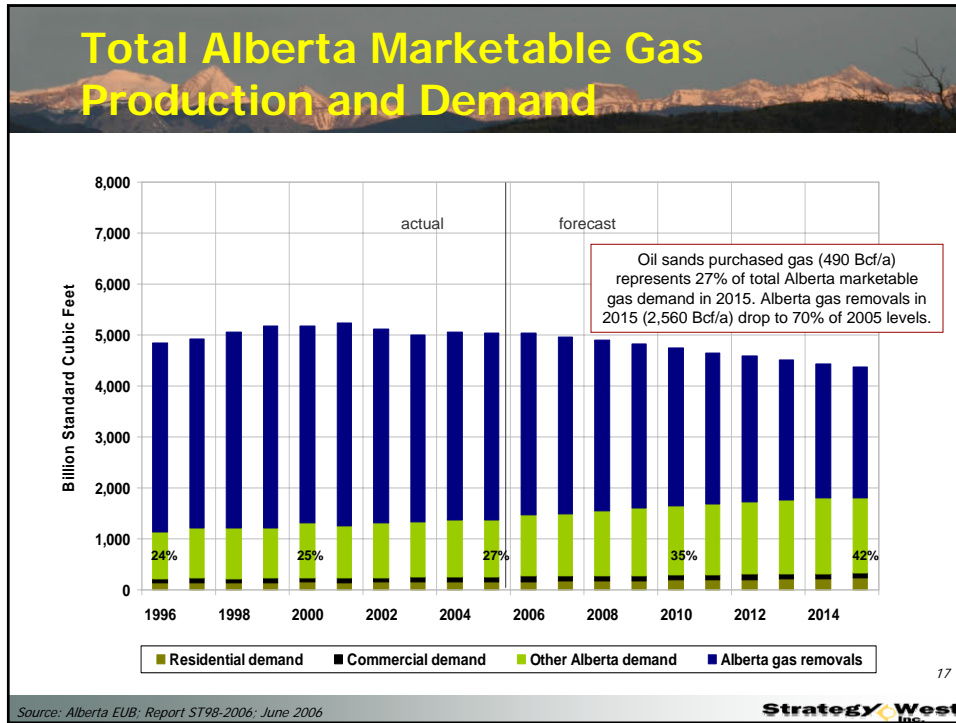
Current Sources of Thermal Energy, Hydrogen and Electricity

<p>Thermal Energy</p> <ul style="list-style-type: none"> ▪ Natural Gas ▪ Produced Gases (in situ projects) ▪ Process Gases (upgraders) ▪ Coke (upgraders) ▪ Liquid Hydrocarbon Fuels ▪ Crude Bitumen 	<p>Hydrogen</p> <ul style="list-style-type: none"> ▪ Steam Methane Reforming (natural gas) <p>Electricity</p> <ul style="list-style-type: none"> ▪ On-site Cogeneration ▪ Purchased Electricity
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Potential Future Sources of Thermal Energy, Hydrogen and Electricity

Technology	Thermal Energy	Electricity	Hydrogen
Bitumen Combustion	✓	✓	
Gasification	✓	✓	✓
Nuclear	✓	✓	✓

It is also expected that oil sands industry energy intensity will be reduced through efficiency improvements and application of new recovery technologies

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Oil Sands Gasification Projects

Project	Gasification Status
OPTI/Nexen Long Lake 1-4	Construction (Phase 1)
North West Upgrading 1 - 3	Application
Northern Lights 1 & 2	Application
Suncor Voyageur 2	Under Consideration
Petro-Canada Sturgeon 2	Under Consideration
CNRL Horizon 4 & 5	Under Consideration
CNRL Primrose 1 & 2	Under Consideration
NAOSC Kai Kos Dehseh 2	Under Consideration
Others?	

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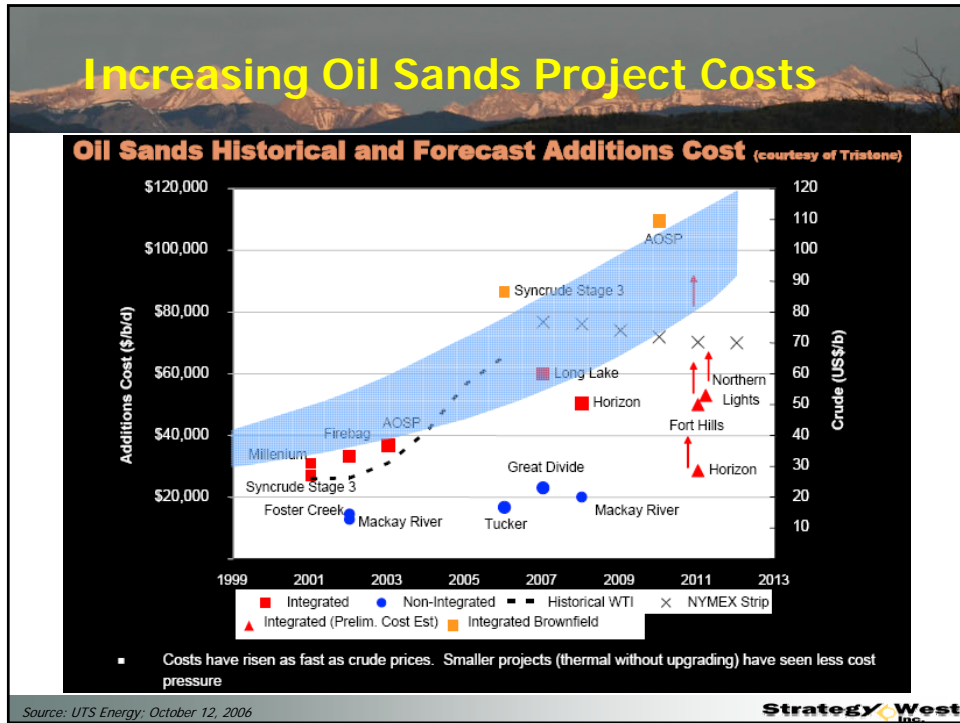
Source: Project Applications and Announcements Strategy West Inc.

Energy Reduction Initiatives for Bitumen Recovery and Extraction

<p>Process Improvements</p> <ul style="list-style-type: none"> • In Situ Recovery <ul style="list-style-type: none"> ▪ Secondary Recovery <ul style="list-style-type: none"> – Gas Cap Repressurization – Polymer Flooding ▪ Thermal Recovery <ul style="list-style-type: none"> – Electric Submersible Pumps (ESPs) – Low Pressure SAGD • Mining & Extraction <ul style="list-style-type: none"> ▪ Hydrotransport ▪ Low Energy Extraction ▪ High Temperature Froth Treatment 	<p>Developing Processes</p> <ul style="list-style-type: none"> • In Situ Recovery <ul style="list-style-type: none"> ▪ Solvents <ul style="list-style-type: none"> – VAPEX – Thermal Solvent ▪ Co-Injection <ul style="list-style-type: none"> – Steam, Solvents, Non-Condensing Gases ▪ Combustion <ul style="list-style-type: none"> – THAI • Mining & Extraction <ul style="list-style-type: none"> ▪ Mine Face Extraction ▪ Mine Face Hydrotransport ▪ BITMIN
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Initial CAPEX – Selected Non-Integrated Projects

Steam Assisted Gravity Drainage (SAGD)					
Operator	Project	CAPEX (\$ millions)	Capacity (b/d bitumen)	Unit CAPEX (\$ per b/d)	Startup
Suncor	Firebag 2	\$540	35,000	\$15,400	Q1 2006
Husky	Tucker	\$470	30,000	\$15,700	Q4 2006
Connacher	Great Divide	\$240	10,000	\$24,000	Q3 2007
Petro-Canada	Mackay River 2	\$800 - \$1,200	40,000	\$20,000 - \$30,000	2010
Mining and Extraction					
Operator	Project	CAPEX (\$ millions)	Capacity (b/d bitumen)	Unit CAPEX (\$ per b/d)	Startup
Synenco	Northern Lights	\$4,400 - \$5,600	114,500	\$38,400 - \$48,900	2011

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Source: Company Press Releases and Investor Presentations

Initial CAPEX – Selected Integrated Projects

Steam Assisted Gravity Drainage (SAGD) with Integrated Upgrading

Operator	Project	CAPEX (\$ millions)	Capacity (b/d SCO)	Unit CAPEX (\$ per b/d)	Startup
OPTI/Nexen	Long Lake 1	\$4,600	58,500	\$78,600	Q1/Q3 2007

Mining and Extraction with Integrated Upgrading

Operator	Project	CAPEX (\$ millions)	Capacity (b/d SCO)	Unit CAPEX (\$ per b/d)	Startup
CNRL	Horizon 1	\$6,800	114,500	\$59,600	Q3 2008
Petro-Canada	Fort Hills 1	\$12,600	140,000	\$90,000	2011
Petro-Canada	Fort Hills 2	\$8,000	100,000	\$80,000	2014
Shell	AOSP Expansion 1	\$10,000 - \$12,000	100,000	\$100,000 - \$120,000	2010

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Source: Company Press Releases and Investor Presentations: Fort Hills Figures from UTS Energy Oct 12, 2006

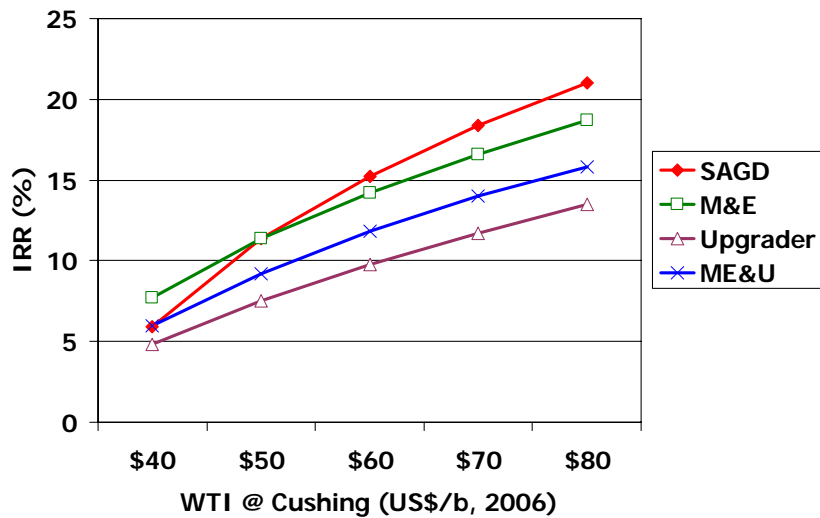
Hypothetical Oil Sands Projects – Cost Assumptions

	SAGD	Mining & Extraction	Upgrading (Coker)
Product	Dilbit	Dilbit	Synthetic Crude Oil
Initial CAPEX (Real 2006 C\$ per b/d)	\$25,000 (Bitumen)	\$35,000 (Bitumen)	\$50,000 (SCO)
Non-energy OPEX (Real 2006 C\$ /b)	\$4.00	\$8.00	\$4.00
Purchased Natural Gas (GJ/b)	1.10	0.20	0.50
Purchased Electricity (kWh/b)	9	-	-
SCO Yield	-	-	85%
GHG Emission Penalty (\$/t)	-	-	-

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Source: Strategy West Inc.

Hypothetical Oil Sands Projects - Illustrative Investment Returns



Source: Strategy West Inc.

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Economic Implications

- Escalating costs have raised the oil sands project investment threshold to US\$50-60/b (WTI at Cushing)
- Others have expressed similar views:
 - Charlie Fischer (Nexen): New projects will need crude prices of about US\$45/b to break even (October 2006)
 - Murray Edwards (CNRL): "These projects, long term, need prices higher than \$50 [US\$/b]"; (October 2006)

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Constrained Case Timing Adjustments and Probabilities

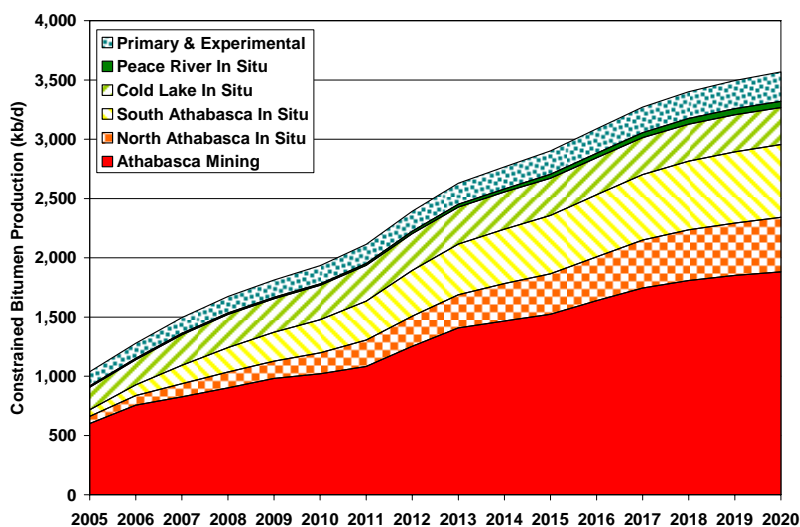
- Project Timing
 - Lease Evaluation
 - Disclosure
 - Application Preparation and EIA
 - Application Review and Approval
 - Detailed Engineering
 - Internal Approval
 - Construction
 - Phasing
- Project Probabilities
 - Project Status
 - Owners
 - Operating experience
 - Financial capacity
 - Technical capability
 - Other factors
 - Technology
 - Existing Operations
 - Integration
 - Timing

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Source: Strategy West Inc.

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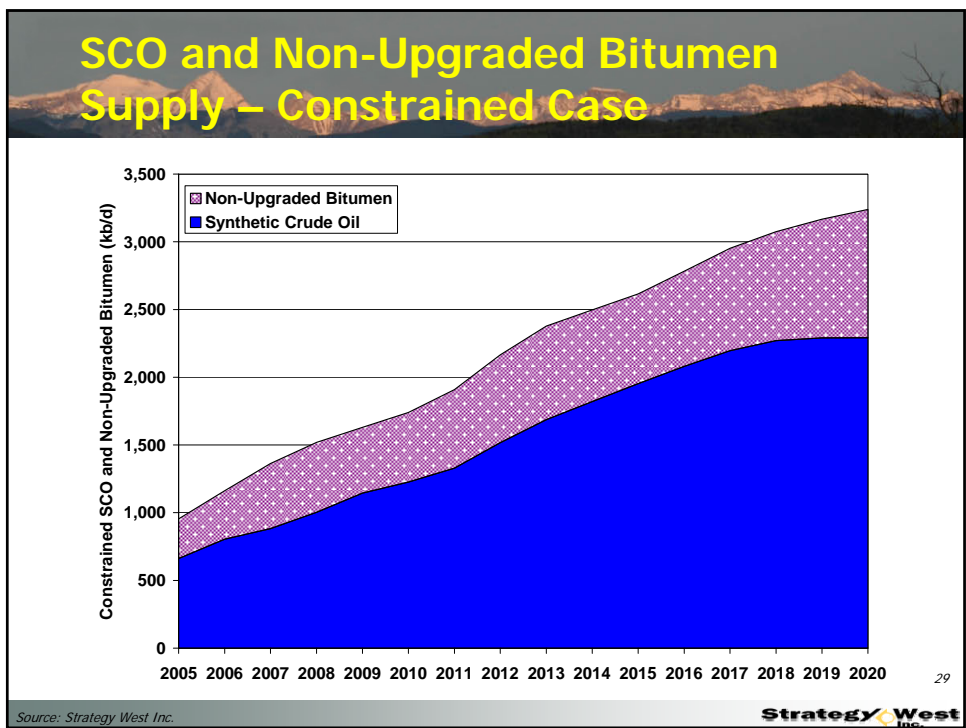
Bitumen Production Outlook – Constrained Case



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Source: Strategy West Inc.

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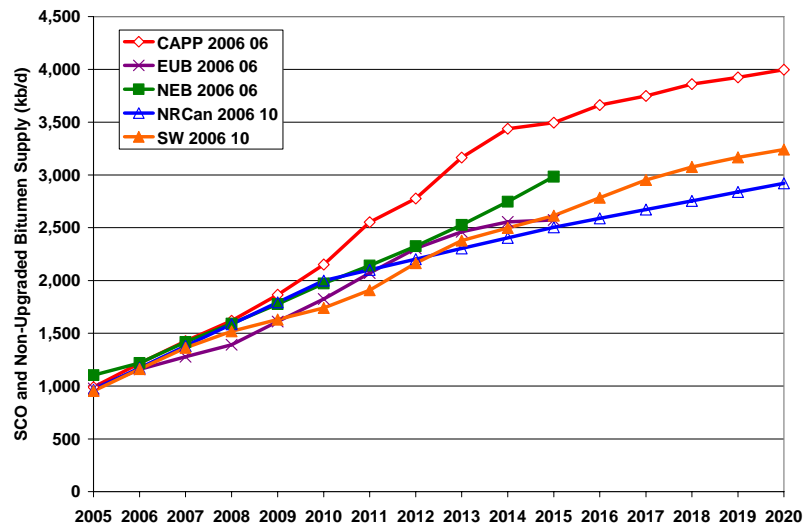
CAPEX – Constrained Case

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Mining & Extraction	1.3	\$35,000 (Bitumen)	\$3.0
In Situ	1.2	\$25,000 (Bitumen)	\$2.0
Incremental Production	2.5		\$5.0
Upgrading	1.6	\$50,000 (SCO)	\$5.4
Total CAPEX			\$10.4

Note: does not include sustaining capital

Source: Strategy West Inc. 30

Comparative Industry Outlooks



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Conclusions

- Canada's oil sands are one of the world's largest hydrocarbon accumulations
- The industry is well developed and making a significant contribution to North American oil supply
- Oil sands projects are experiencing cost pressures but are economically attractive at current high oil prices
- The industry faces many challenges but will overcome them and continue to grow

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Thank You

Questions?

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