

# The Oil Sands: What is Needed to Realize the Potential?

**National Buyer/Seller Forum**

**March 25-27, 2008  
Edmonton, Alberta**

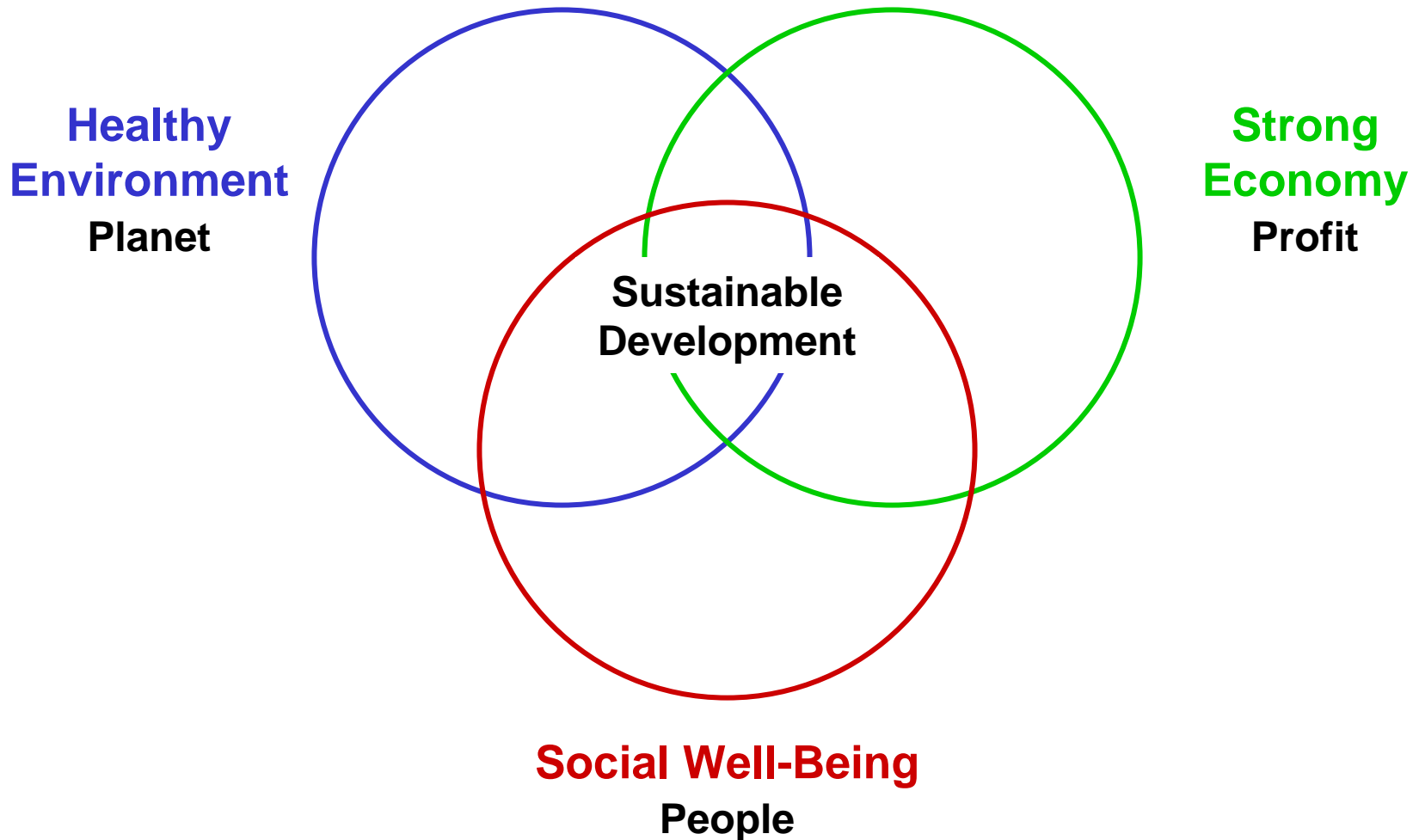
**Bob Dunbar  
Strategy West Inc.**

# Presentation Outline

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

# Oil Sands Industry Sustainability

## The "Triple Bottom Line"



# 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

# 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

# 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

# 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)

# 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)

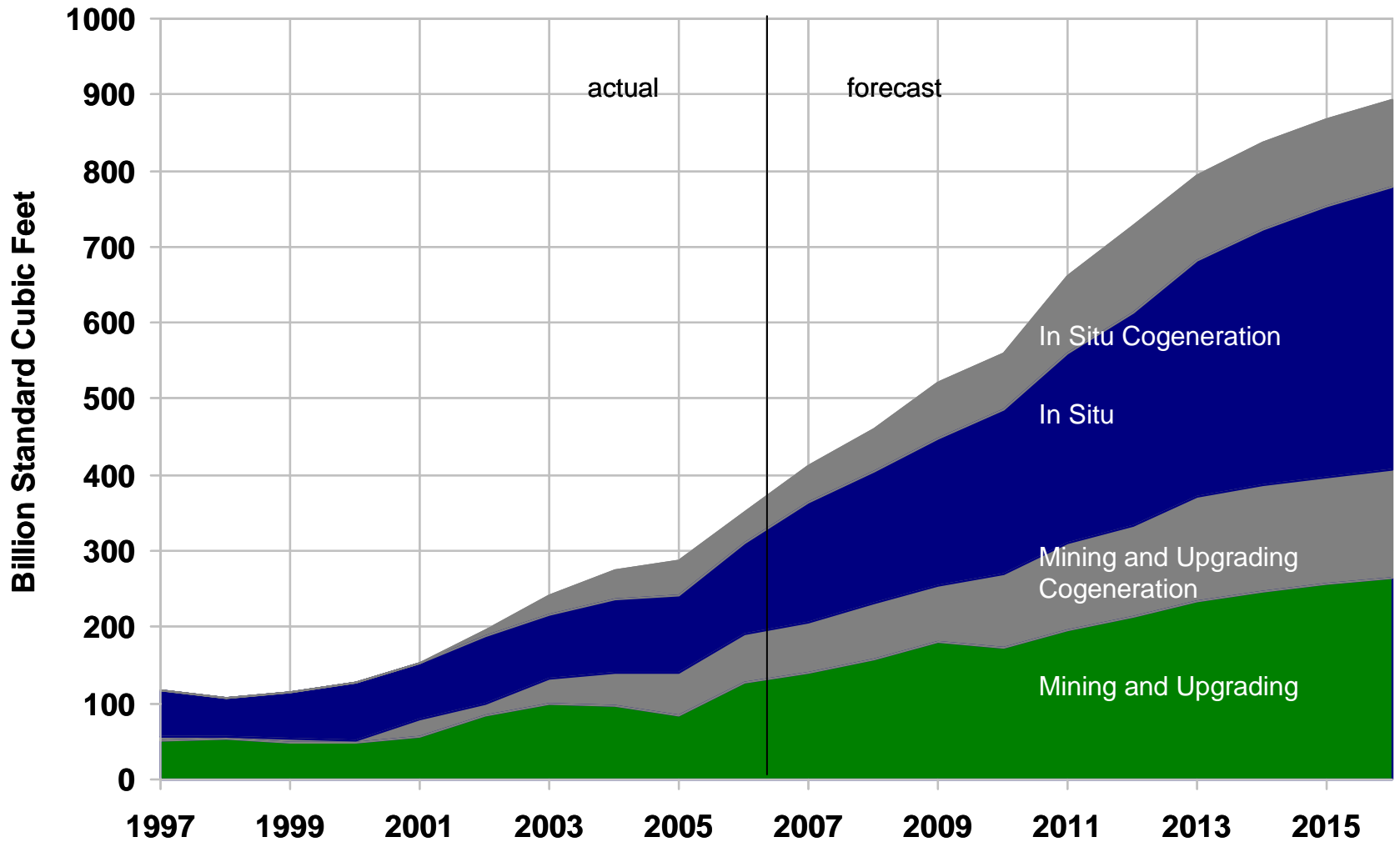
## Hydrogen

- Steam Methane Reforming (natural gas)

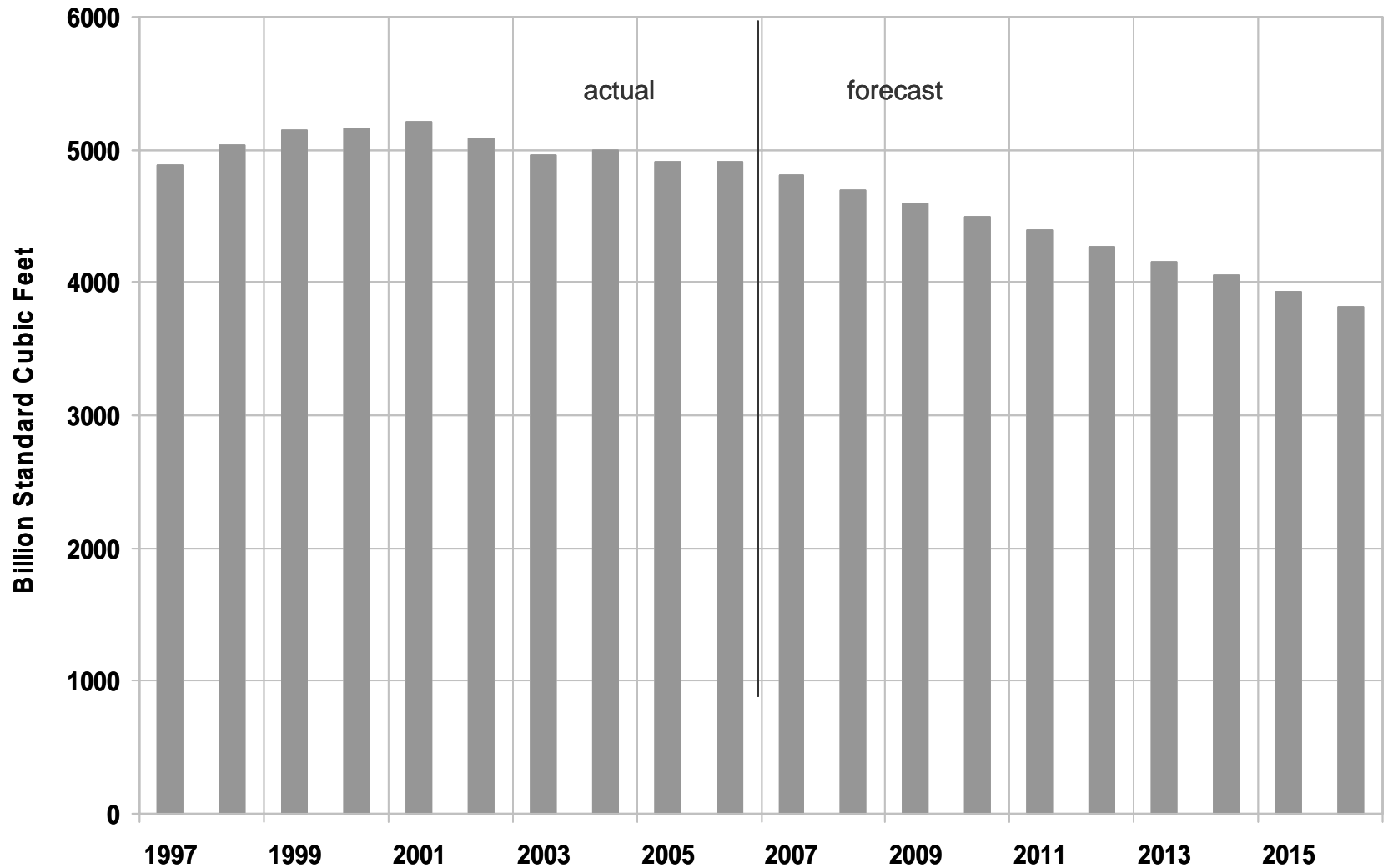
## Electricity

- On-site generation
- Purchased electricity

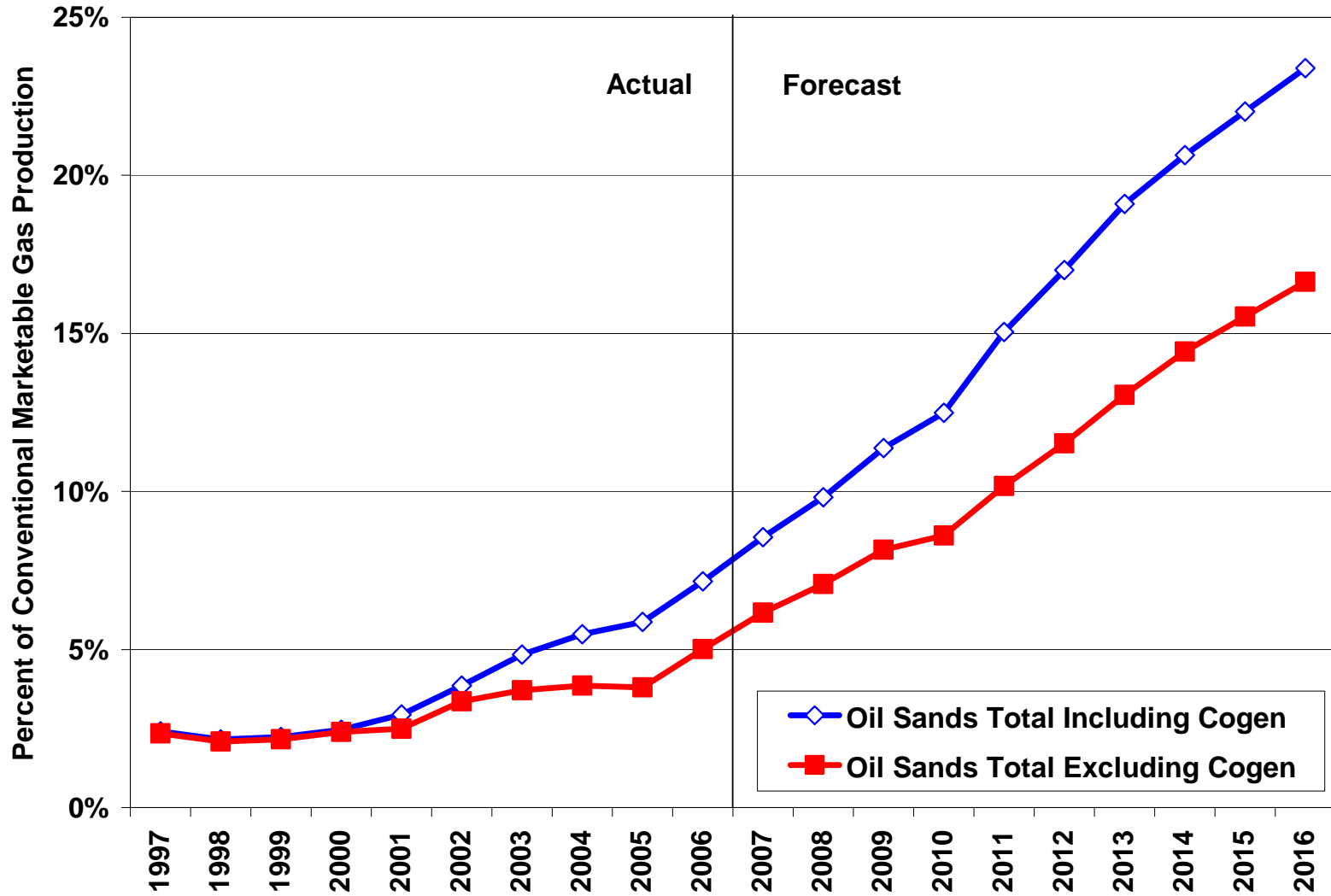
# Purchased Natural Gas Demand for Oil Sands Operations



# Conventional Marketable Gas Production in Alberta



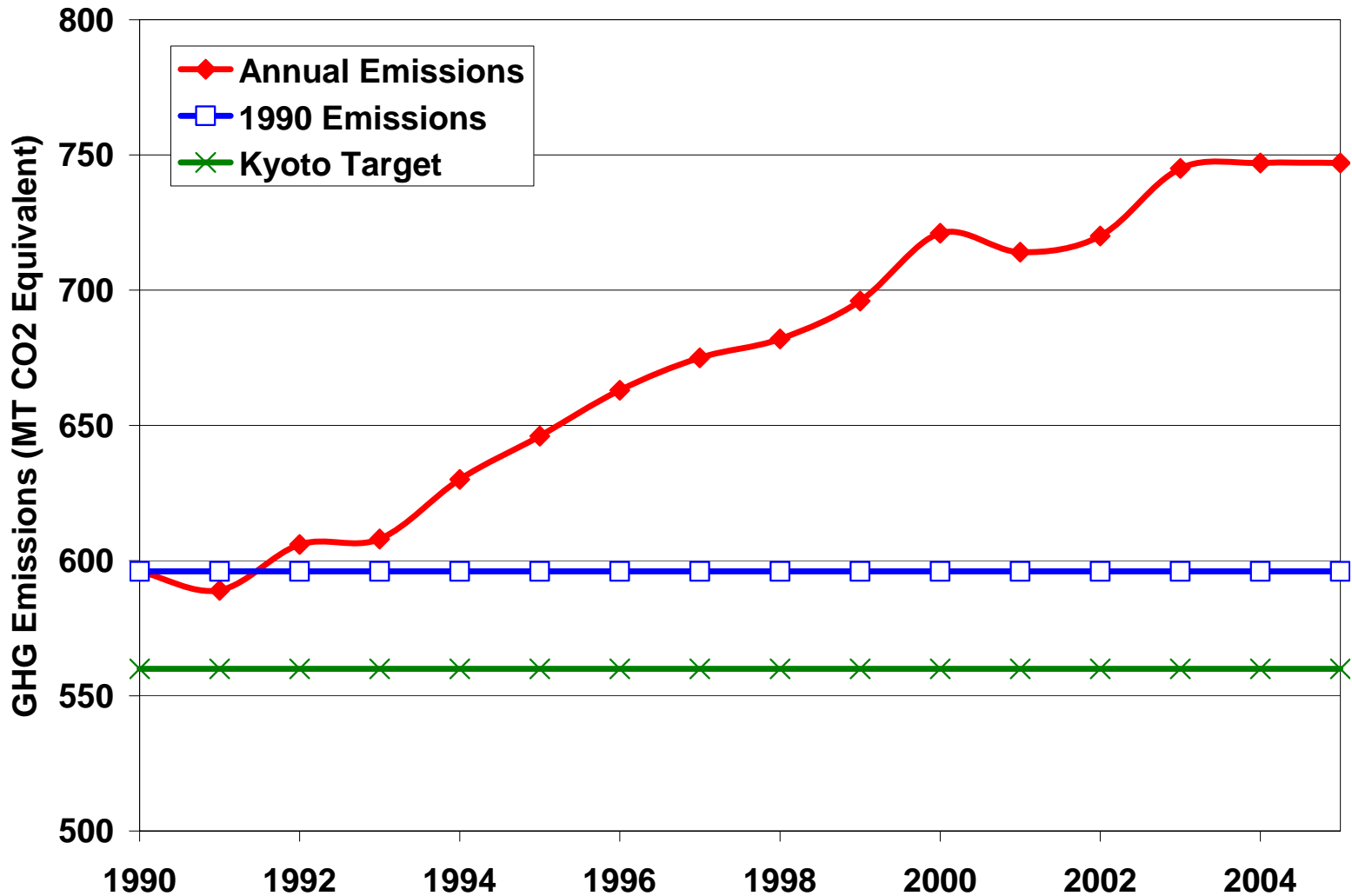
# Purchased Natural Gas as a Percentage of Conventional Marketable Gas



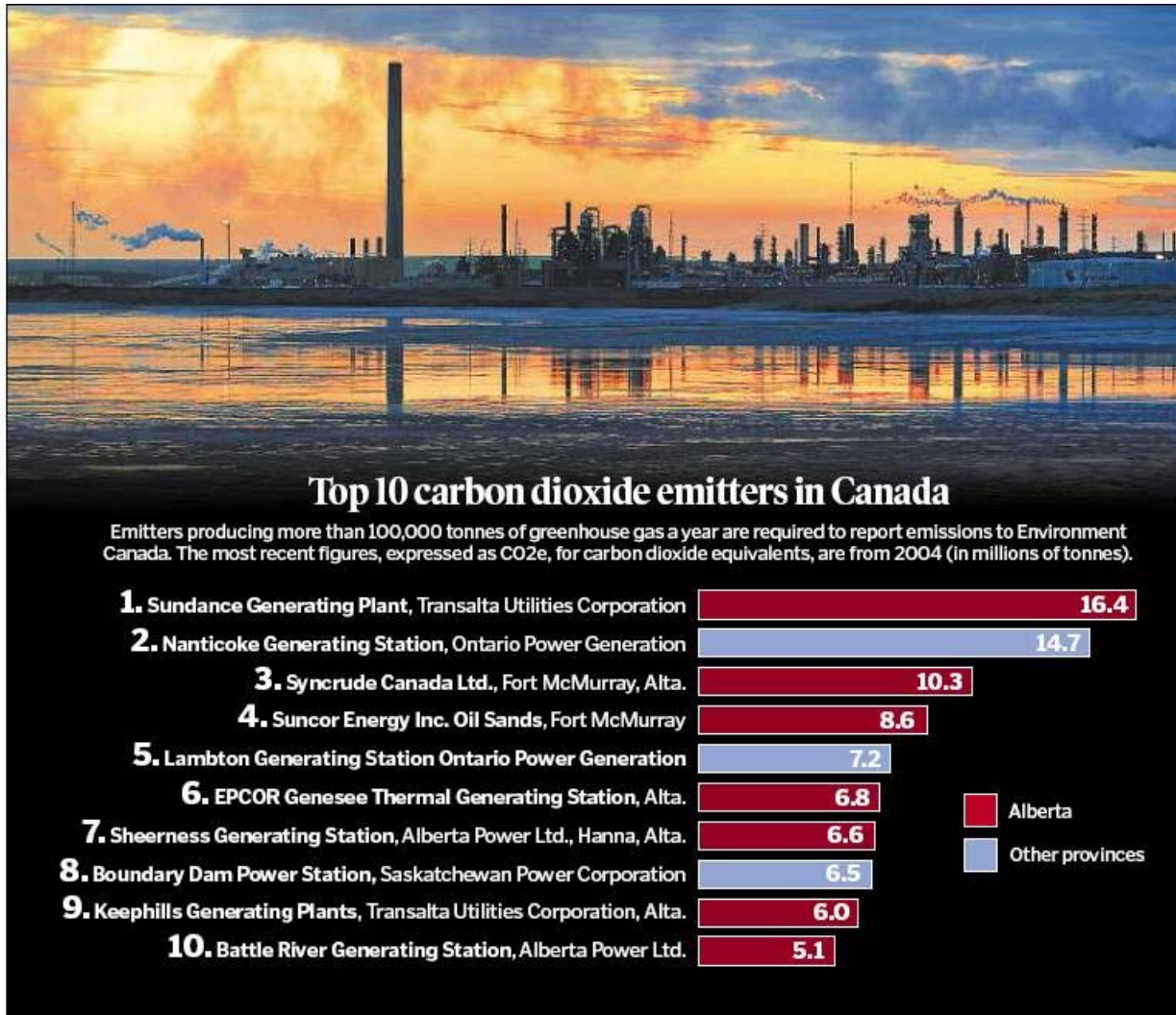
# Industry Options to Reduce Purchased Gas Requirements

- 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

# Canada's GHG Emissions



# Canada's Top GHG Emitters



Chris Schwarz, CanWest News Service

Syncrude's Mildred Lake plant north of Fort McMurray is the largest oilsands crude-oil production facility in the world.

# Proposed Federal GHG Emission Strategy

- Introduced April 2007
- GHG emission intensity reductions
  - 6% annual reduction every year until 2010 (18% reduction in intensity by 2010)
  - 2% annual reduction every year after 2010 (the expectation is to achieve a total reduction in GHG emissions of 20% by 2020)
- Alternative compliance options
  - \$15/t contribution to technology fund (increasing after 3 years), or
  - Purchase GHG emission credits
- Credit for early action of 15Mt

# Canada's Proposed Regulatory System

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

Regulations start tough and get tougher

## TOUGH

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

## TOUGHER

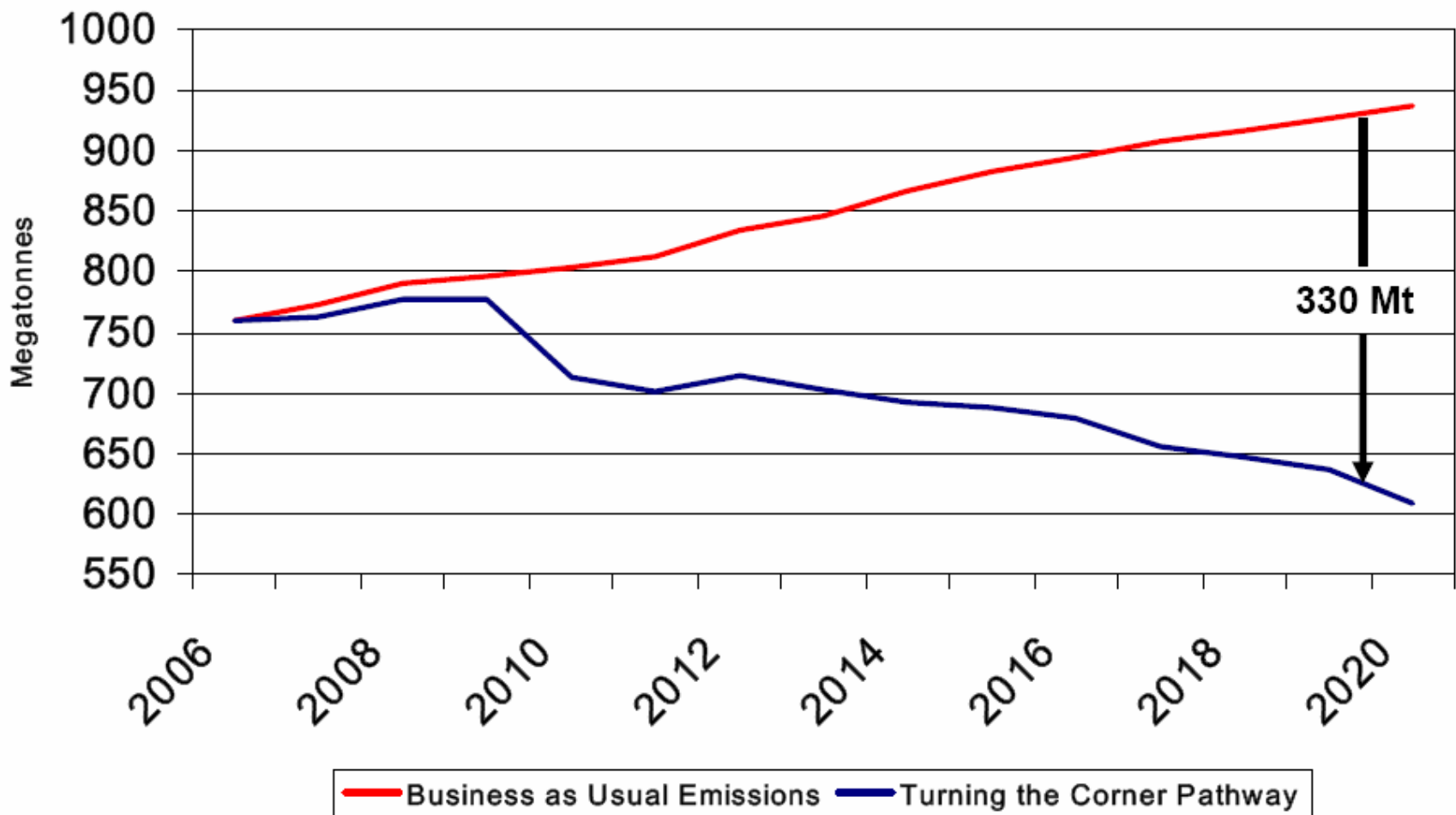
For new plants in key sectors coming on stream in 2004 and later: tougher emission targets to drive adoption of cleaner fuels and technologies

## 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

# Projected Canadian GHG Emissions under the Federal Plan



# Alberta's 2008 Climate Change Strategy

## Themes

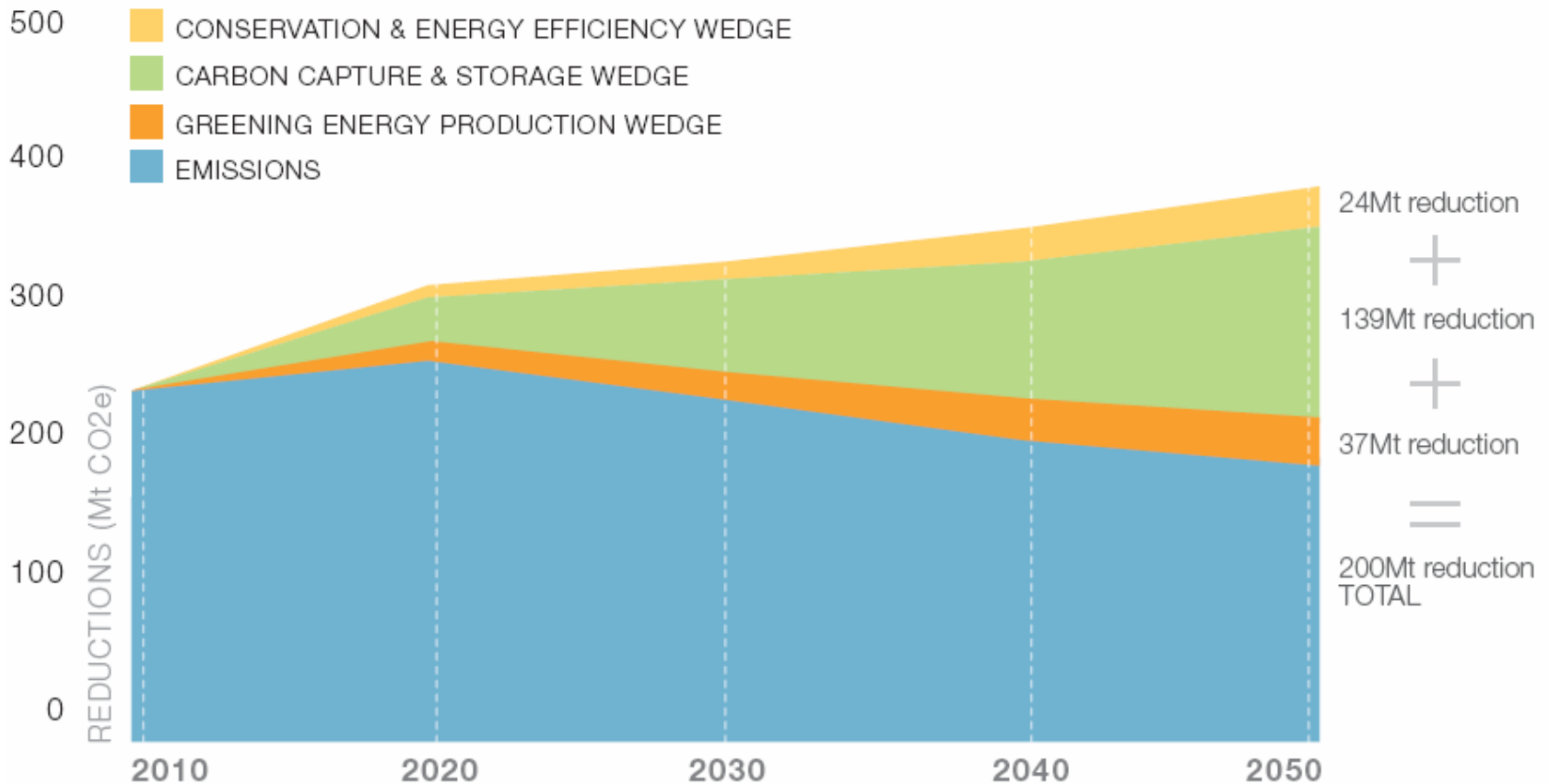
- Conserving and using energy efficiently
- Implementing carbon capture and storage
- Greening energy production

## 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

# Alberta's GHG Reduction Wedge

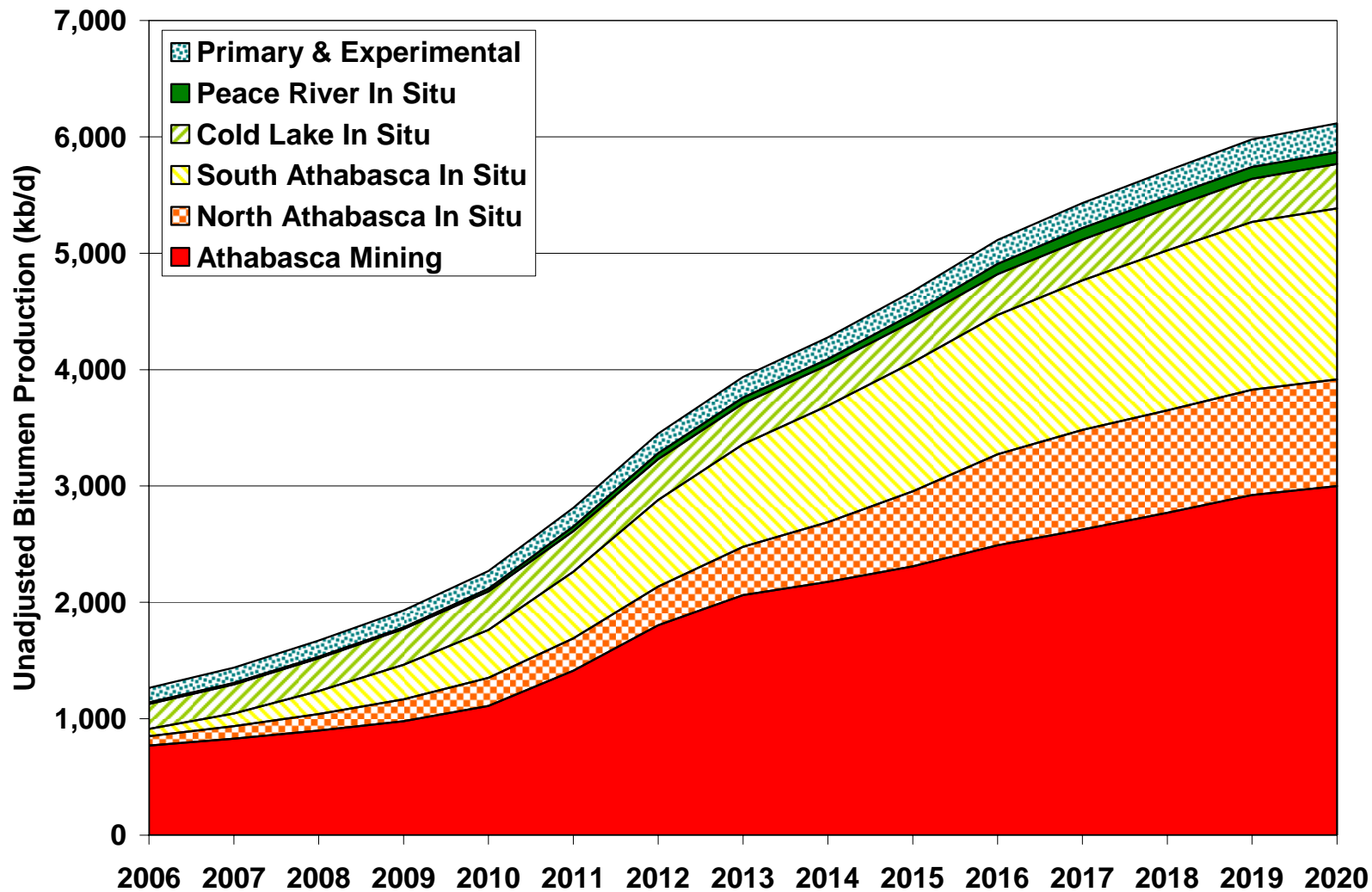
## GREENHOUSE GAS REDUCTION WEDGE -- HIGHLIGHTING GREENER ENERGY PRODUCTION REDUCTIONS



# 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

# Bitumen Production Outlook - Unadjusted Case

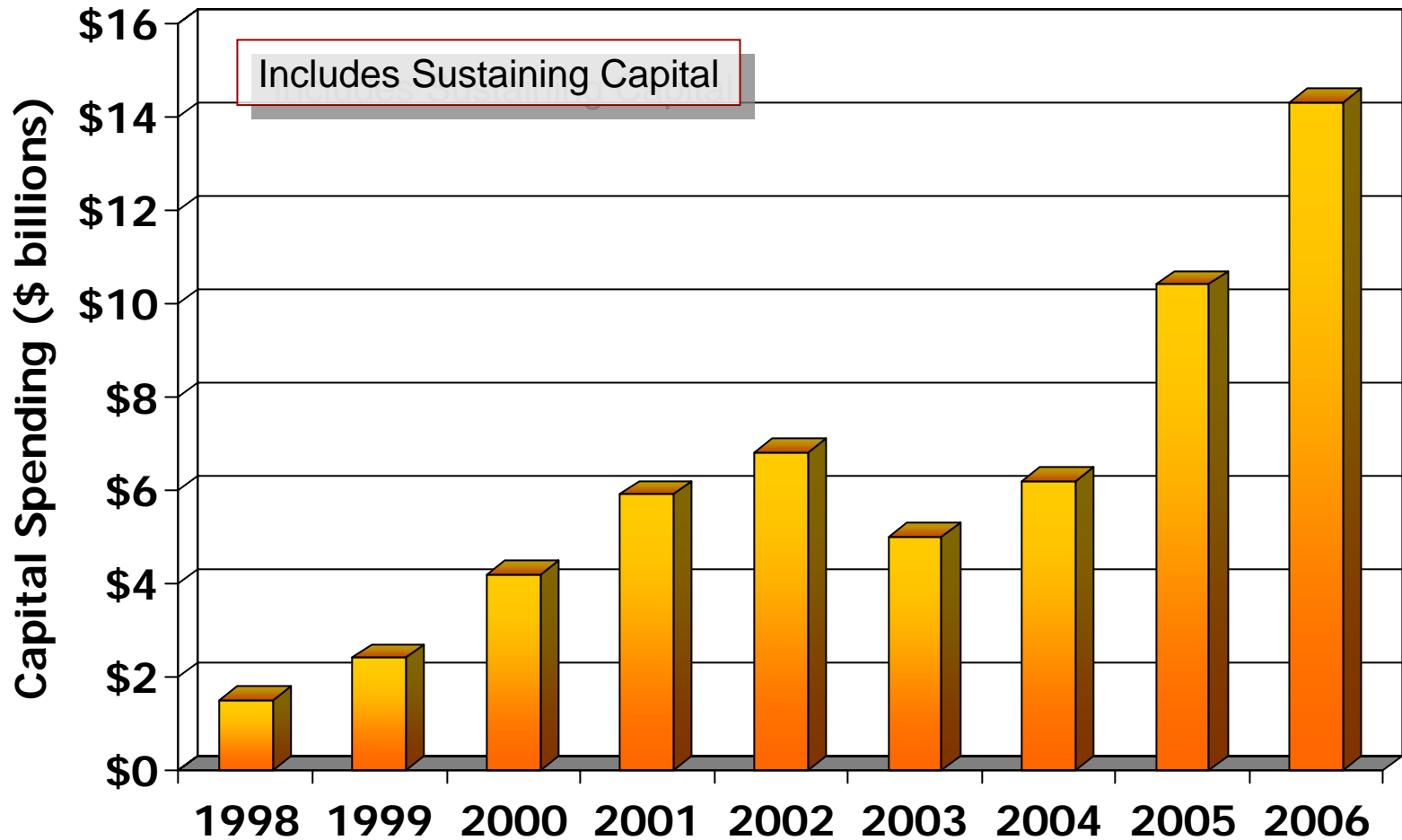


# CAPEX – Unadjusted Case

	<b>Production Increase 2008-2020 (million b/d)</b>	<b>Initial CAPEX (2007 C\$ per b/d)</b>	<b>Average Annual Initial CAPEX 2008-2020 (2007 C\$ billions)</b>
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

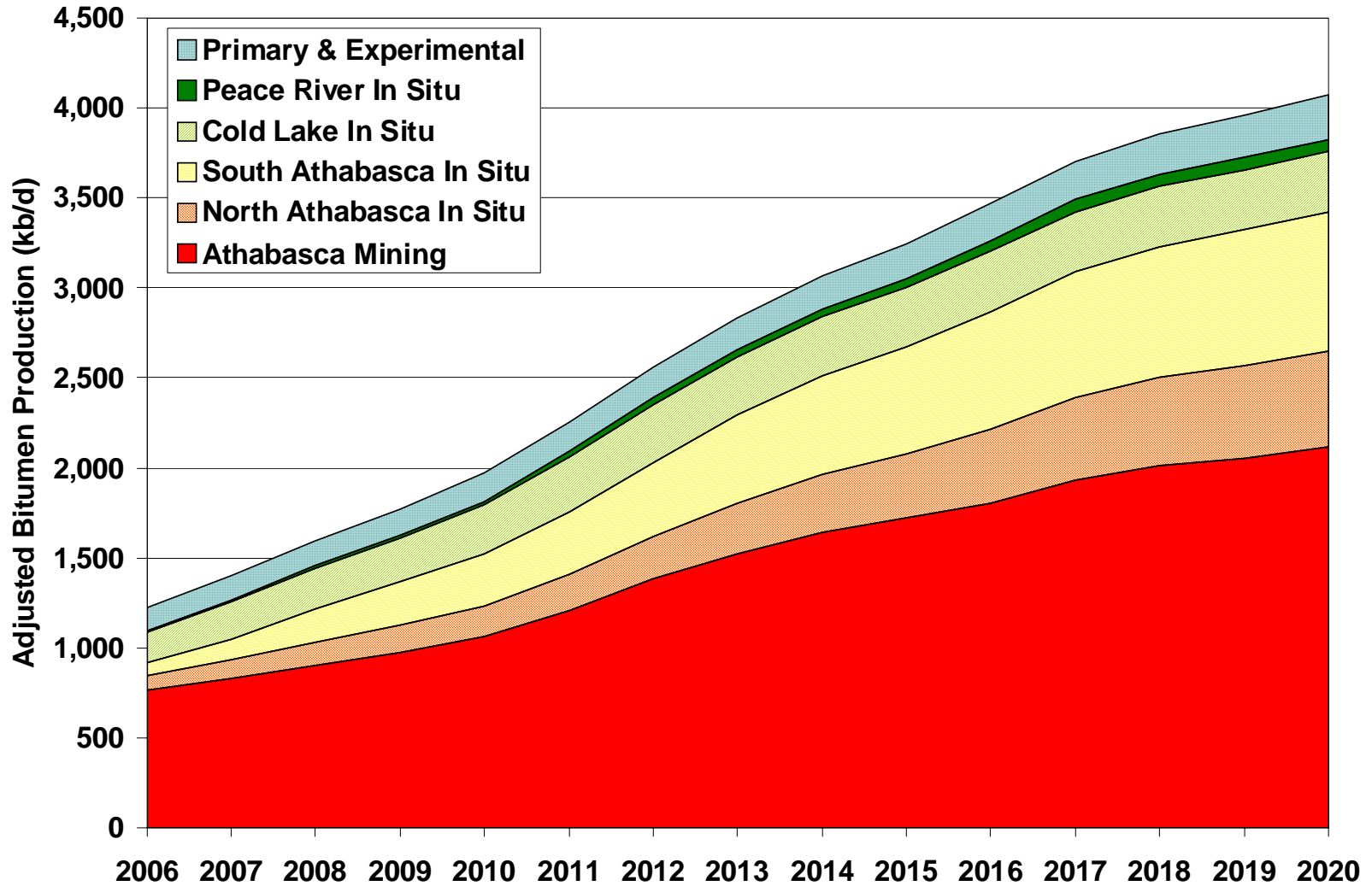
# Oil Sands Historical CAPEX



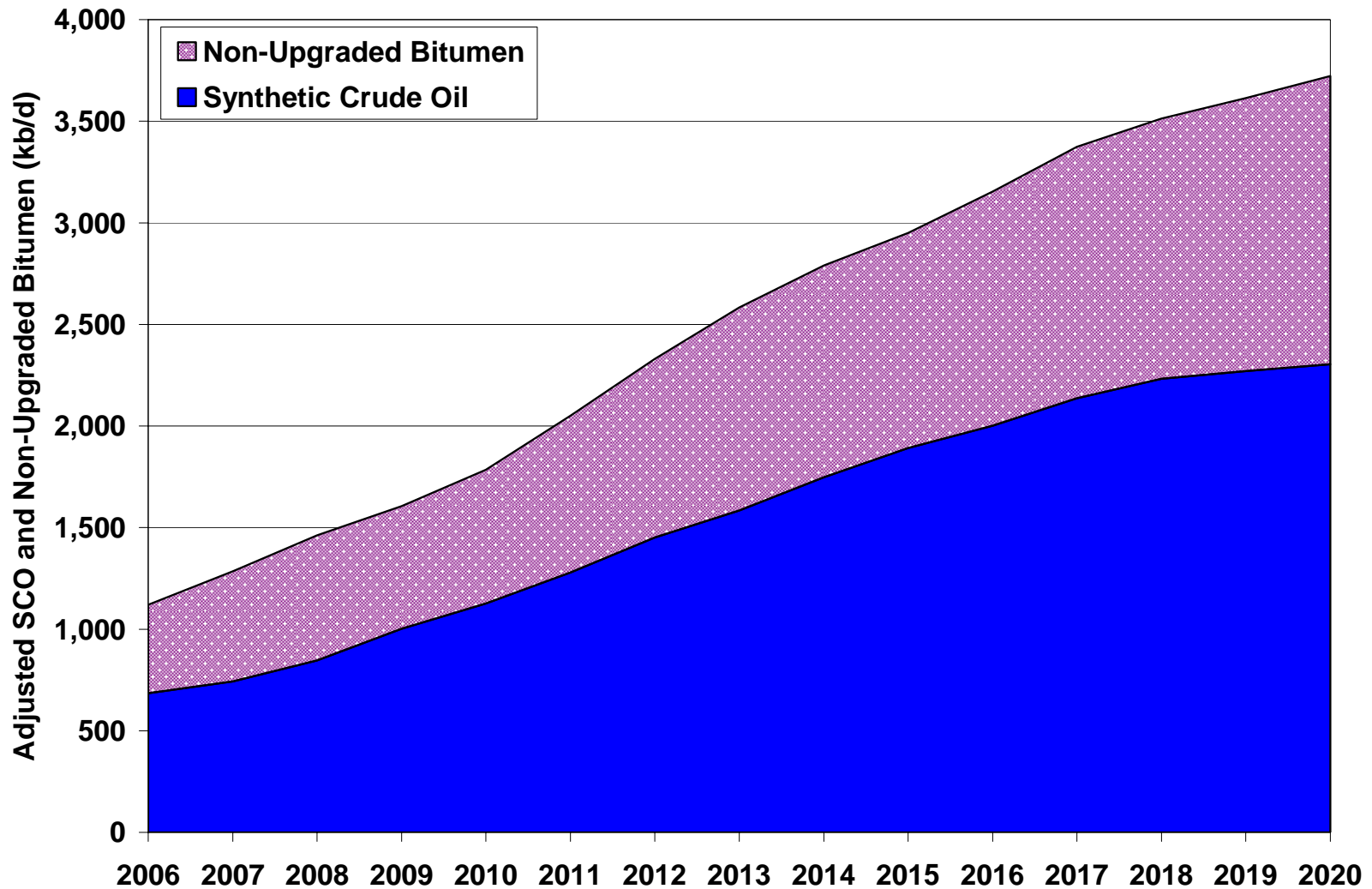
# Adjusted Industry Outlook - Project-by-Project Assessment

- 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

# Bitumen Production Outlook - Adjusted Case



# SCO and Non-Upgraded Bitumen Supply Outlook - Adjusted Case

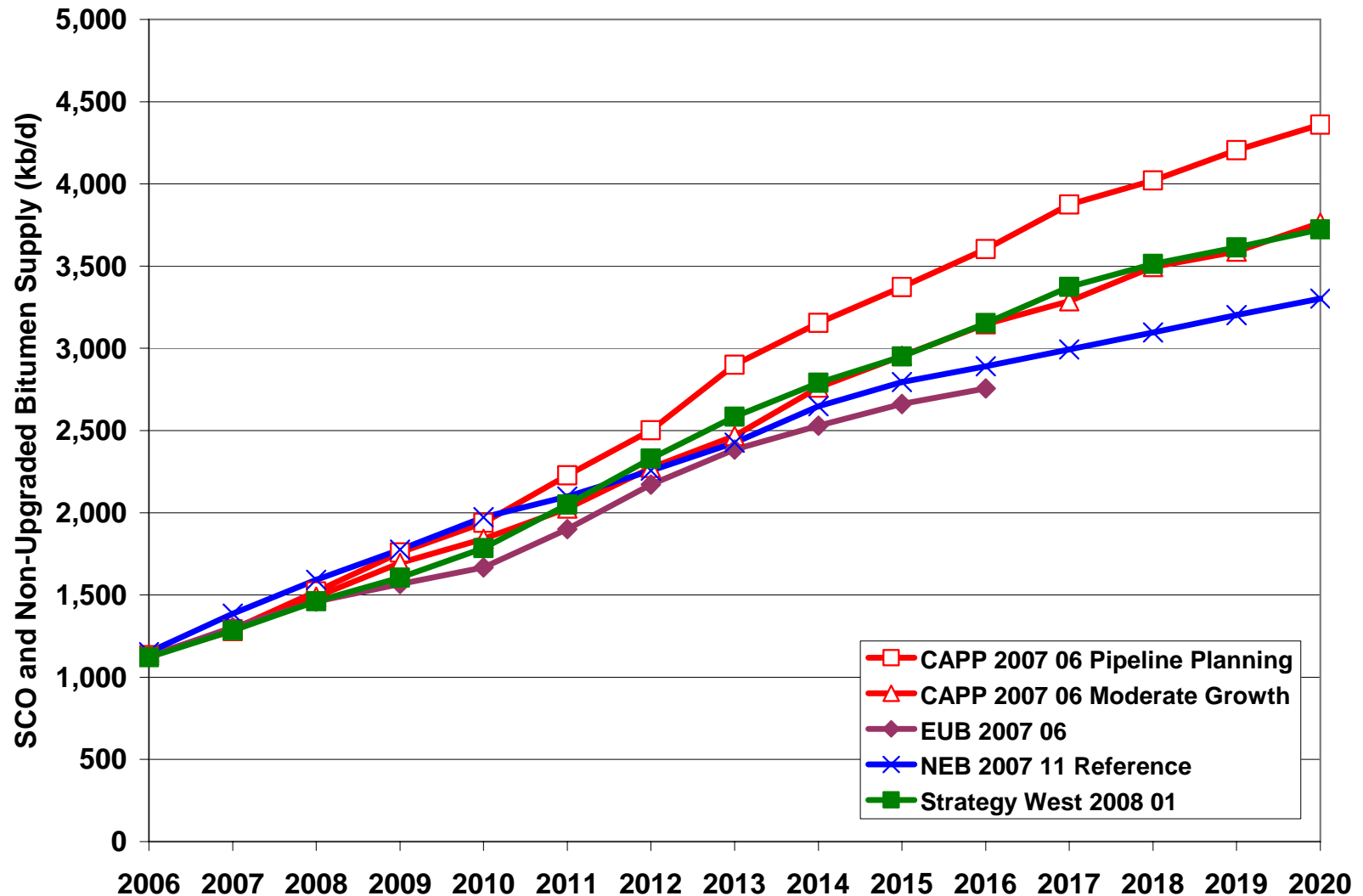


# CAPEX – Adjusted Case

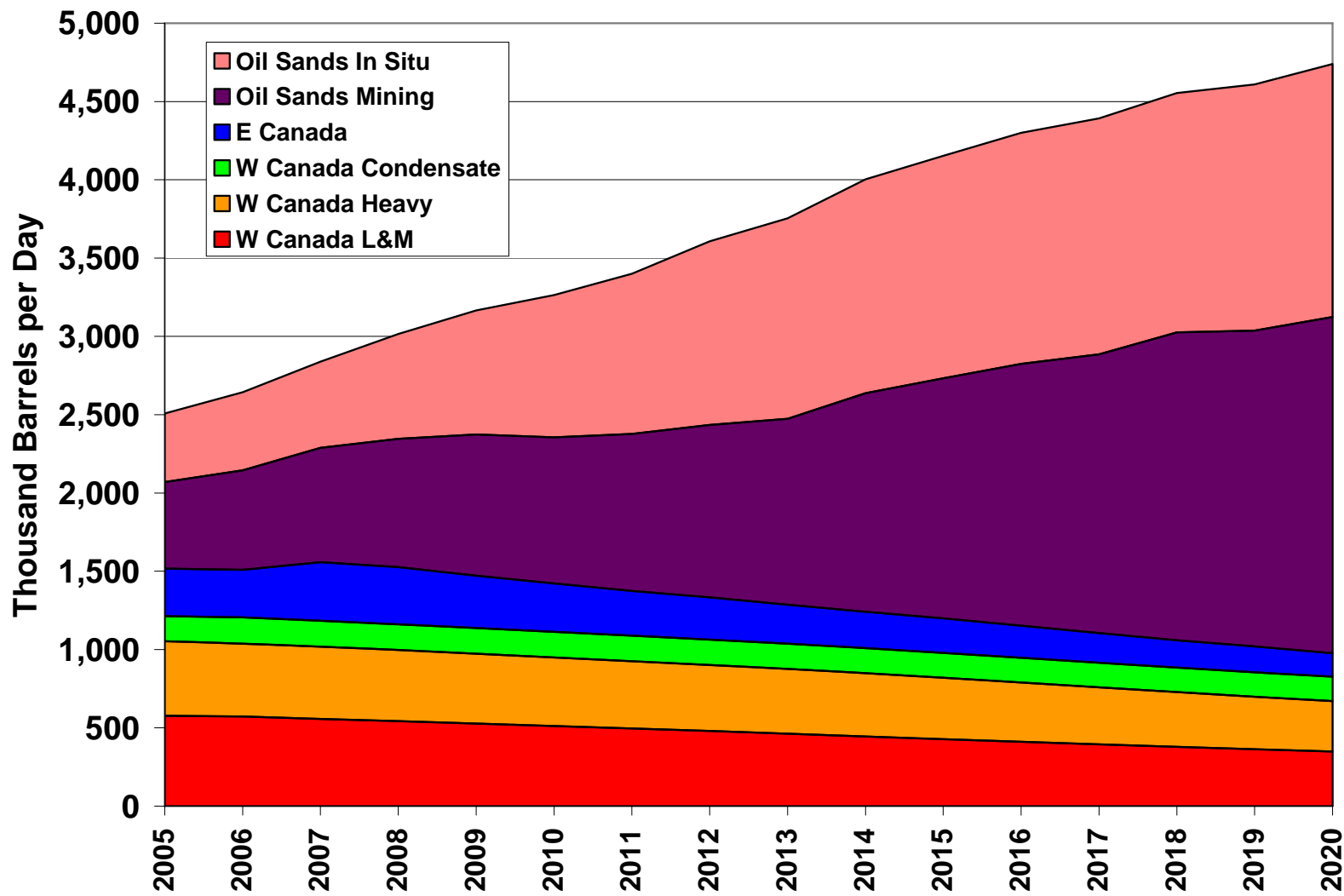
	<b>Production Increase 2008-2020 (million b/d)</b>	<b>Initial CAPEX (2007 C\$ per b/d)</b>	<b>Average Annual Initial CAPEX 2008-2020 (2007 C\$ billions)</b>
Mining & Extraction	1.3	\$40,000 (Bitumen)	\$4.0
In Situ	1.4	\$10,000-\$35,000 (Bitumen)	\$3.1
Incremental Production	2.7		\$7.1
Upgrading	1.6	\$50,000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

Note: does not include sustaining capital

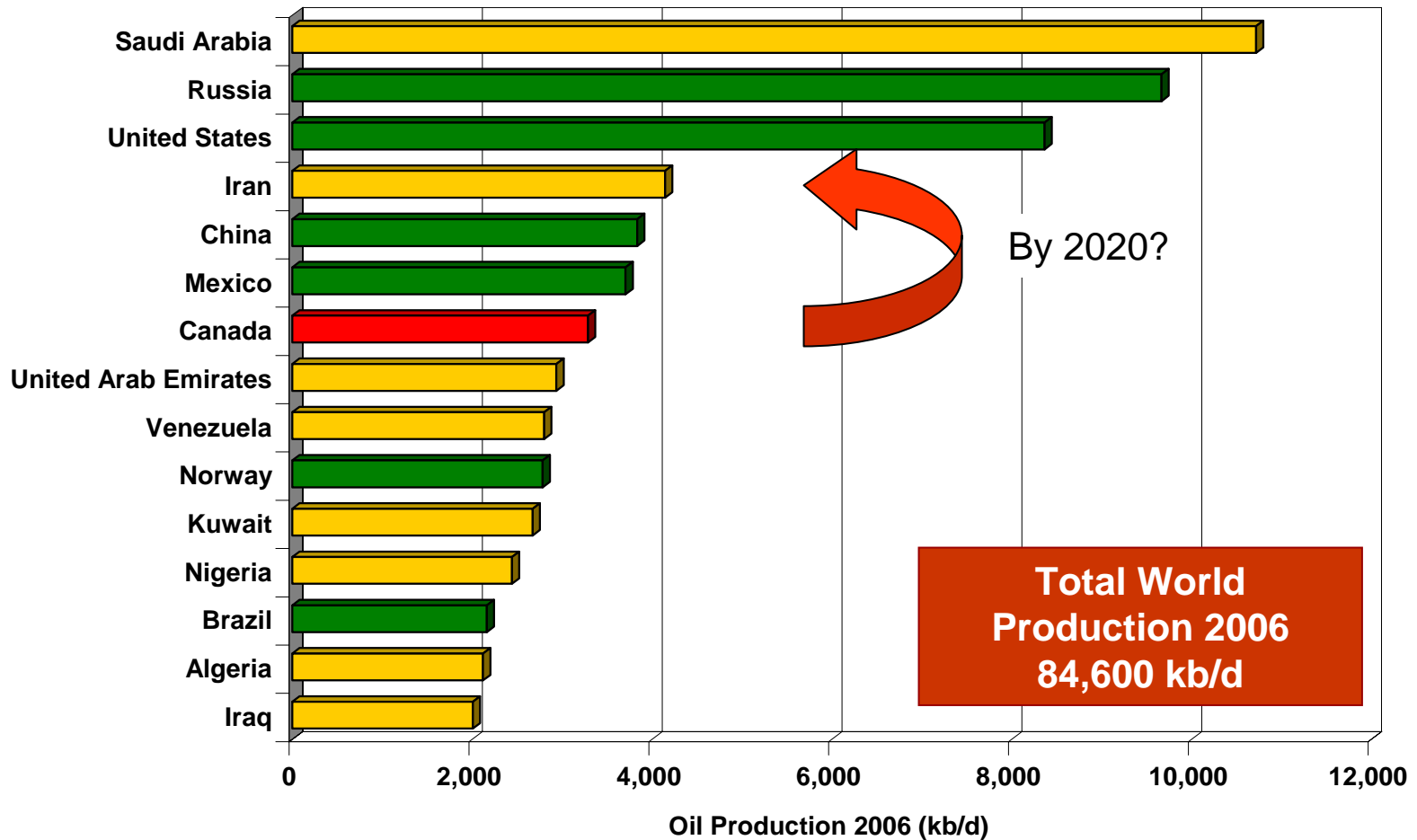
# Comparative Industry Outlooks



# CAPP Canadian Total Crude Oil Supply Outlook



# World's Largest Oil Producers



# 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.



# Thank You

# Questions?

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