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# Oil Sands Supply Outlook

*Potential Supply and Costs of Crude Bitumen and  
Synthetic Crude Oil in Canada, 2013-2017*

## CERI Media Briefing

March 3, 2004

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### **Slide 1 (Cover Slide)**

- Thank you for your introduction Wilf and for allowing us to use your facilities.
- I would also like to thank the media representatives for joining us this morning – both those who are with us in Calgary and those who have joined our teleconference and webcast
- I will be making a 20-25 minute presentation and will then be available to take your questions. I'll first take questions from those who are with us in Calgary and will then take questions from those who have joined us through CNW. I understand that we may have some representatives of Canada's francophone media with us as well. I'll be joined during the Q&A by Mr. Michel Scott, a Canadian Energy Research Institute (CERI) Board Member, who will assist me with any questions that might be raised in French.
- The information that I will be presenting is available on CNW. Additionally, CNW has a link to the CERI website with further information on our study.
- We are very pleased to be releasing our Oil Sands Supply Outlook this morning. Our study is a comprehensive examination of the future supply of oil from Canada's Oil Sands Deposits. The study concludes that Canada's oil sands industry has a very bright future, given reasonable oil price expectations. I'll be providing further details as we proceed.

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## CERI Oil Sands Supply Outlook

- CERI Study No. 108
  - Bitumen and SCO Supply Projections
    - 2004 - 2017
    - 5 Cases
  - Supply Costs
    - In situ technologies
    - Mining and extraction
    - Upgrading
  - Issues - including energy requirements, sources and costs
  - Breakfast presentation, Calgary Petroleum Club, March 10, 2004
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### Slide 2

- Our study contains our outlook for both bitumen and synthetic crude oil from the oil sands for the period 2004 – 2017. We provide supply projections for 5 separate outlooks: 2 unconstrained cases and 3 constrained cases under different business environments.
- For those not familiar with the oil sands, bitumen is the tar-like semi-solid material that saturates the reservoir sand. In fact the oil sands are often referred to as tar sands. SCO is a synthetic light-sweet crude oil that is produced by the industry by processing the crude bitumen in upgraders. Both SCO and unprocessed crude bitumen are sold to downstream refineries in Canada and the US. These refineries further process these feedstocks to produce RPPs like gasoline, diesel, jet fuel, and fuel oils.
- In our study we examine the costs being faced by the oil sands industry for the various technologies that are being employed. I'll describe these technologies later in my presentation.
- Our study also examines the various issues being faced by the industry – environmental issues, availability of skilled labour, high project capital costs, energy consumption and supply, infrastructure constraints, market constraints – to name a few.
- We will make a detailed presentation of study results at a breakfast meeting at the Calgary Petroleum Club one week from today, on Wednesday, March 10.

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## Conclusions

- **The industry has a robust future but faces many challenges including:**
  - High costs
  - Environmental impact
  - Labour availability and productivity
  - Energy requirements, sources and costs
  - Water requirements and supply
  - Market constraints
- **Many projects will proceed, others will not**

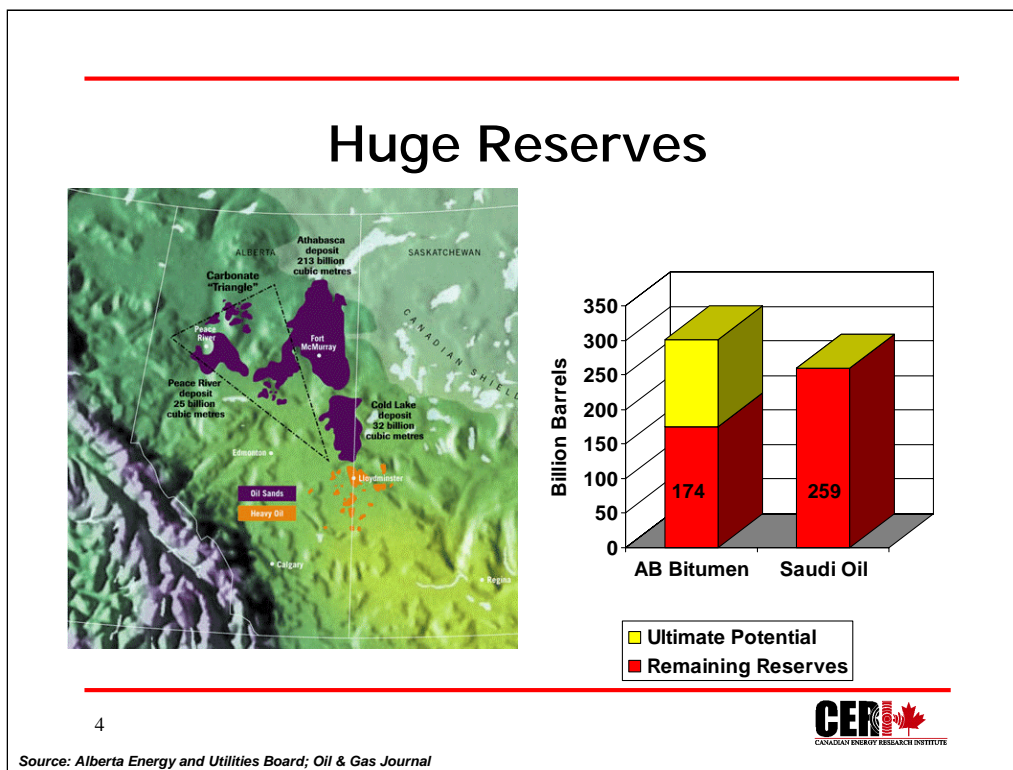
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### Slide 3

- The study concludes that Alberta's oil sands industry has a very robust future, given a reasonable outlook for crude oil prices.
- However, industry supply costs are higher than those that have been published previously and many other challenges face the industry.
- Several new oil sands projects will indeed proceed, while others will require innovative commercial and technological solutions to mitigate downside risks including those brought about by the vagaries of crude oil prices.
- Some projects will be deferred – we are already seeing that – others will not proceed at all.
- Before providing more detail, I'll present a brief overview of this very dynamic and growing industry.



### Slide 4

- Alberta's Oil Sands are among of the world's largest hydrocarbon deposits, with remaining established reserves of 174 billion barrels of crude bitumen. The Oil & Gas Journal recognized these reserves for the first time at year-end 2002, placing Canada second to only Saudi Arabia in total oil reserves.
- The oil sands are located in three distinct areas in Northern Alberta: the largest is Athabasca, the second largest Cold Lake, and the next Peace River.
- The petroleum constituent in the oil sands deposits, crude bitumen, is very viscous and does not flow at normal room temperatures. The oil sands layers can be up to 60m, or 200 ft, thick.
- The Athabasca area is the only one that contains shallow oil sands deposits that are amenable to recovery using surface mining techniques. Surface mineable deposits are located North on Fort McMurray, Alberta.
- However, the majority of the Athabasca resources and the resources in the Cold Lake and Peace River areas are too deep for surface mining – deeper than 75m or 250 ft – and must be recovered using special in situ recovery techniques. With in situ recovery, wells are drilled into the oil sands zone and special recovery techniques are applied to separate the bitumen from the sand in place and produce the bitumen to the surface through wells.

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## Substantial Production

### Oil Sands provided 35% of Canada's "crude oil" production in 2003

	<u>Mb/d</u>	<u>%</u>
Conventional Light	918	36.8
Condensate	163	6.5
Conventional Heavy	543	21.7
<b>Unprocessed Crude Bitumen</b>	<b>347</b>	<b>13.9</b>
<b>Synthetic Crude Oil</b>	<b>527</b>	<b>21.1</b>
<b>Total</b>	<b>2,498</b>	<b>100.0</b>

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Source: National Energy Board (Preliminary Data)

### Slide 5

- Not only are reserves very large, but the industry is already well established.
- The industry produced 874 thousand barrels per day of synthetic crude oil and unprocessed crude bitumen in 2003, representing 35% of Canada's total oil production. New projects that have recently come on stream have increased current productive capacity to over 1.0 million barrels per day. Projects under construction will add a further 160 thousand barrels per day of capacity once completed. Much of the oil produced in Western Canada, including SCO and unprocessed crude bitumen, is exported to the US – mainly to the Midwest states. In fact, Canada was the largest foreign supplier of crude oil and petroleum products to the US in 2003.
- Canada's oil sands industry is obviously already an important source of oil supply for the hungry US market (total imports of about 12 MMb/d).

## New Production Capacity

<ul style="list-style-type: none"> <li>■ <b>Mining/Extraction</b> <ul style="list-style-type: none"> <li>■ Syncrude – Stage 3</li> <li>■ CNRL – Horizon</li> <li>■ AOSP – Jackpine</li> <li>■ True North – Fort Hills</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ <b>In Situ</b> <ul style="list-style-type: none"> <li>■ Suncor – Firebag</li> <li>■ ConocoPhillips – Surmont</li> <li>■ Nexen/OPTI – Long Lake</li> <li>■ CNRL - Primrose Wolf Lake Expansion</li> <li>■ Petro-Canada - Meadow Creek</li> </ul> </li> </ul>
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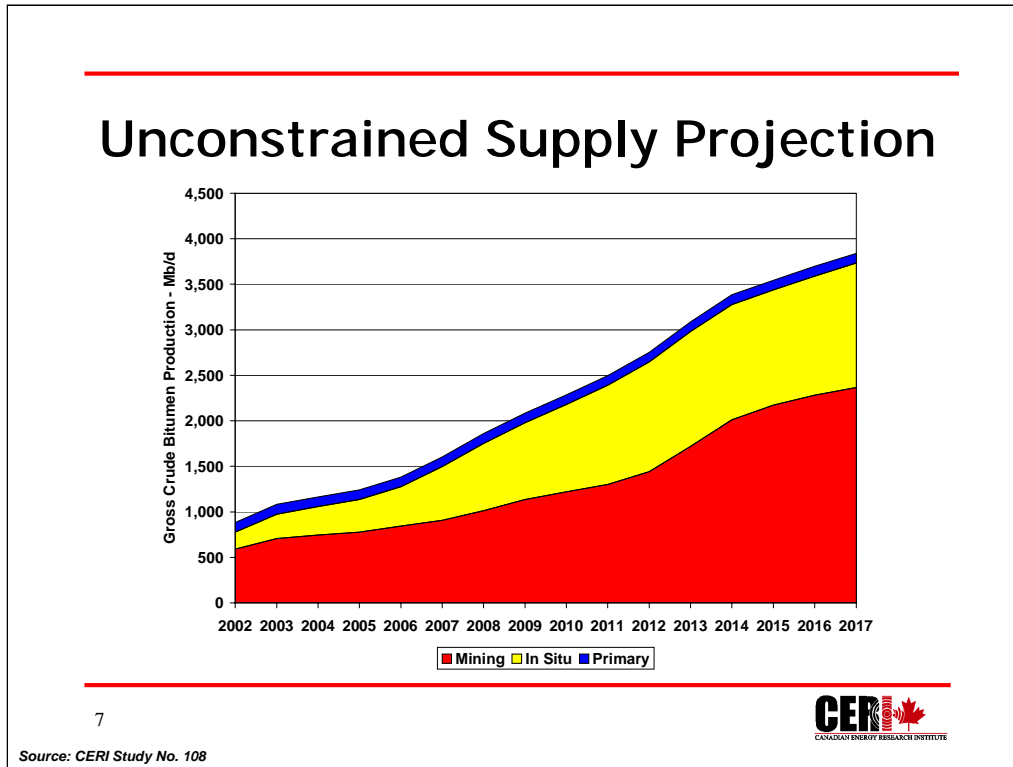
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**CERI** CANADIAN ENERGY RESEARCH INSTITUTE

Note: Projects that are either under construction or approved. Many others are at various stages in the regulatory process.

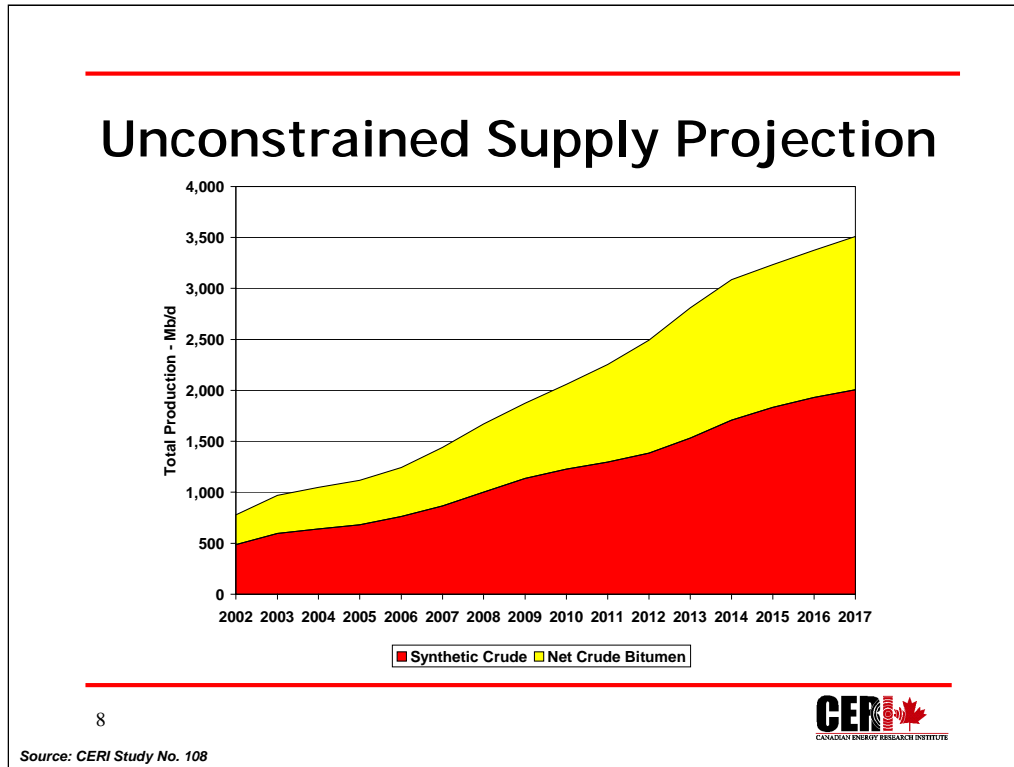
### Slide 6

- This slide lists new projects that have been approved by Alberta and federal regulatory agencies. They represent additional capacity of over 1.0 million barrels per day.
- Some of these projects are under construction:
  - Syncrude Stage 3, 110 Mb/d, C\$5.7B, 2005
  - Suncor Firebag, Phase 2, 35 Mb/d, C\$500MM
- Others have received corporate decisions to proceed but are yet to begin construction
  - ConocoPhillips Surmont
  - Nexen/OPTI Long Lake
- The remainder shown on this chart are either awaiting corporate decisions to proceed or are on hold. In addition to the projects shown here, many others are at various stages of the regulatory approval process.
- While production from mining projects represented about two-thirds of total bitumen production on 2002, the future of the industry rests with in situ technology, as most reserves are buried too deeply for surface mining.
  - Mineable: 7% of OBIP, 20% of initial established reserves
  - In Situ: 93% of IBIP, 80% of initial established reserves



### Slide 7

- As illustrated by this chart, if all proposed projects proceeded, we would see total crude bitumen production of 3.8 MMB/d by 2017.
- Much of this crude bitumen would be upgraded to more desirable synthetic crude oil.
- This is illustrated on the next chart.



### **Slide 8**

- After processing, total production would reach 3.5 million barrels per day by 2017: 2.0 million barrels per day of synthetic crude oil and 1.5 million barrels per day of unprocessed crude bitumen.
- Both products would then be sold to downstream refineries in Canada and the US for production of RPPs
- However, we don't expect these production levels to be achieved. While many new oil sands projects will proceed on schedule, others will likely be deferred.
- One important factor is that raw bitumen and synthetic crude oil supply costs are higher than those that have been published previously. These higher costs and seem to confirm why certain projects are proceeding while others are pending reviews.



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## Supply Cost

- **Supply Cost is the constant dollar price needed to recover all capital expenditures, operating costs, royalties and taxes and earn a specified return on investment**
  - **For this study supply costs:**
    - **Are calculated in constant 2003 dollars**
    - **Assume a 10% ROI (real)**
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Source: CERl Study No. 108



### Slide 9

- Before showing you our supply cost results, I would like to explain what supply cost is.
- Supply Cost is the constant dollar price needed to recover all capital expenditures, operating costs, royalties and taxes and earn a specified return on investment. For this study supply costs:
  - Are calculated in constant 2003 dollars
  - Assume a 10% ROI (real)
- In other words, SC is the price the project owner would have to receive in \$/b to cover all costs and earn an adequate return on investment.

## Bitumen Supply Costs

	Plant Gate (C\$/b)	WTI @ Cushing (US\$/b)
<b>Cold Lake Primary</b>	<b>14.51</b>	<b>21.57</b>
<b>Cold Lake CSS</b>	<b>17.77</b>	<b>25.12</b>
<b>Athabasca SAGD</b>	<b>15.64</b>	<b>25.10</b>
<b>Athabasca Mining &amp; Extraction</b>	<b>15.48</b>	<b>24.97</b>

**CSS: Cyclic Steam Stimulation**

**SAGD: Steam Assisted Gravity Drainage**

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Source: CERl Study No. 108



### Slide 10

- This is a summary of our supply cost results for crude bitumen from Athabasca and Cold Lake. This bitumen has not been upgraded but can still be valued in the market as shown here.
- Our analysis indicates that the oil sands industry requires West Texas Intermediate (WTI) oil prices of about US\$25 per barrel at Cushing, Oklahoma to cover all costs and earn an adequate return on investment. While current oil prices are much higher, many project proponents are basing their plans on prices in the mid-twenties.
- The first three technologies shown are in situ recovery technologies – the last is for surface mining and extraction.
- It should be understood that these results are representative of typical projects. Some projects are located in very attractive oil sands deposits and will achieve lower costs. Additionally, the industry is working very hard to improve technologies and bring costs down.
- The difference between the plant gate price and the WTI price takes into account:
  - Transportation costs to market
  - The value of the bitumen in the market having regard for its high sulphur content and low API gravity.

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## SCO Supply Costs

	Plant Gate (C\$/b)	WTI @ Cushing (US\$/b)
Mining, Extraction & Upgrading	30.50	24.90
Standalone Upgrading	12.71	N/A

SCO: Synthetic Crude Oil

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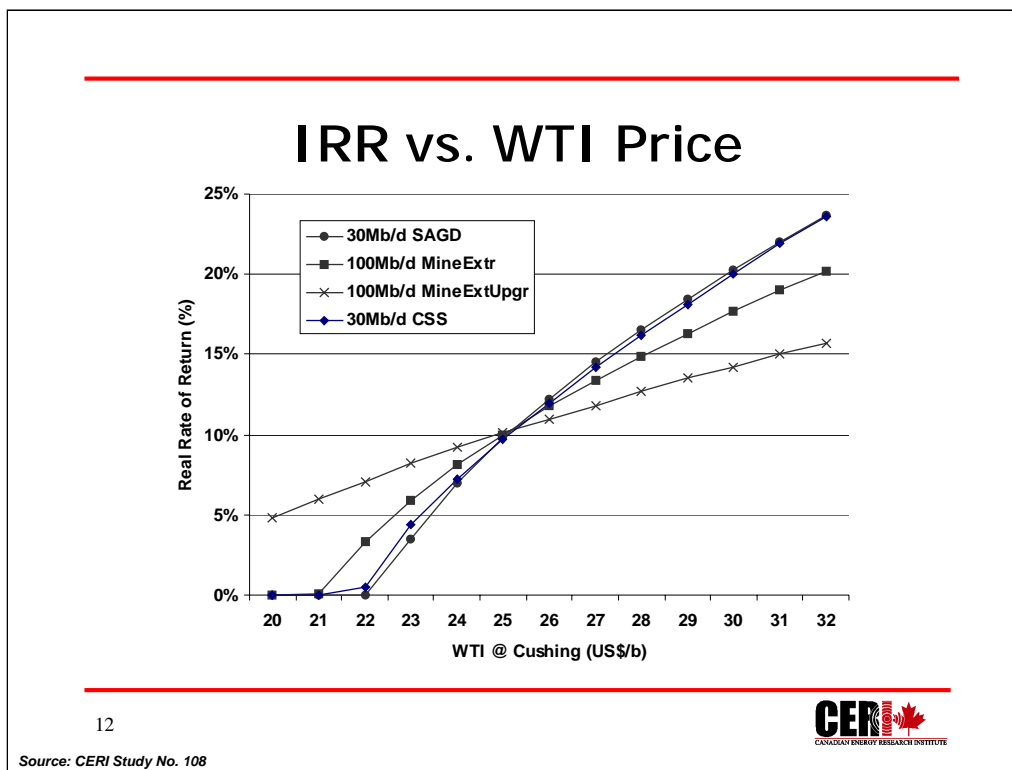
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Source: CERI Study No. 108



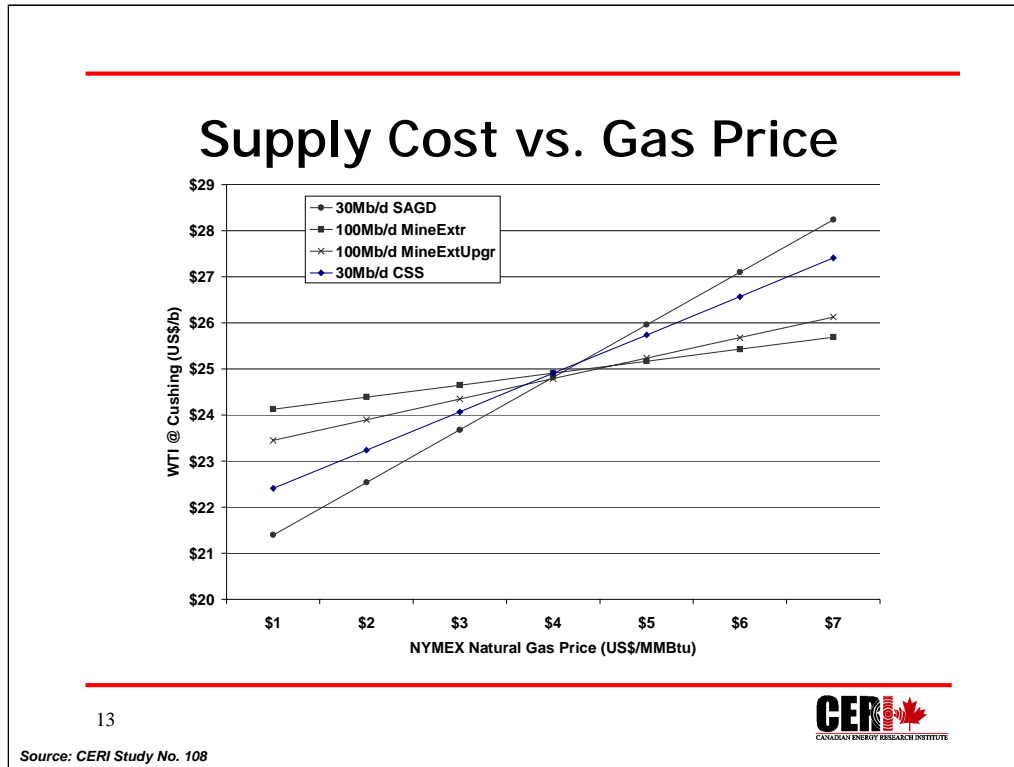
### Slide 11

- Most of the crude bitumen that is produced will be upgraded to synthetic crude oil. The SCO would be sold to downstream refineries.
- Our analysis of upgrading costs indicates that a mining project producing SCO in the Athabasca area would also need WTI prices of about US\$25/b to be economic.
- One of the key parameters for these analyses is the assumed natural gas prices, since these projects are very large natural gas consumers. For our analysis, we assumed:
  - NYMEX natural gas price of US\$4.25/MMBtu – this translates into a plant gate natural gas price of C\$4.74/GJ (March 2 closing prices were US\$5.565/MMBtu and C\$5.98/GJ respectively)
  - Canada US exchange rate of 0.75 US\$/C\$ (March 1 closing rate was 0.7448 US\$/C\$)
- The costs of upgrading crude bitumen is estimated to be C\$12.71/b



### Slide 12

- Changes in oil price have a dramatic effect on economic returns as illustrated by this chart.
- For example, at today's oil prices (US\$36.58 on March 2) in situ recovery projects would yield returns on investment well in excess of 20% after tax.
- At WTI prices below US\$25/b, many projects would not be economic.
- As stated previously, while current oil prices are much higher than US\$25/b, many project proponents are basing their plans on prices in the mid-twenties.
- It is worth noting that a WTI price of about US\$25/b is about US\$2/b below the mid-point of the OPEC price band. Some speculate that OPEC in fact may now be targeting higher prices. The fact that OPEC cut quotas earlier this month, while world prices were well above its price band, would seem to lend weight to this argument.



### Slide 13

- Natural gas price is a very important component of supply cost, particularly for in situ recovery projects (CSS and SAGD) that are very large energy consumers. Small increases in gas prices result in large increases in supply costs.
- To reiterate, for our analysis, we assumed:
  - NYMEX natural gas price of US\$4.25/MMBtu – this translates into a plant gate natural gas price of C\$4.74/GJ (March 1 closing prices were US\$5.55/MMBtu and C\$5.98/GJ respectively)
  - Canada US exchange rate of 0.75 US\$/C\$ (March 1 closing rate was 0.7467 US\$/C\$)

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## Supply Outlook in 2017 (million barrels per day)

	SCO	Bitumen	Total
<b>Unconstrained</b>	<b>2.0</b>	<b>1.5</b>	<b>3.5</b>
<b>High (US\$32/b)</b>	<b>1.6</b>	<b>1.2</b>	<b>2.8</b>
<b>Reference (US\$25/b)</b>	<b>1.3</b>	<b>0.9</b>	<b>2.2</b>
<b>Low (US\$18/b)</b>	<b>0.8</b>	<b>0.3</b>	<b>1.1</b>

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### **Slide 14**

- This chart shows our supply projections
- Under a high growth scenario that assumes WTI prices of US\$32 per barrel at Cushing, Oklahoma, oil sands production would reach 2.8 million barrels per day by 2017: 1.6 million barrels per day of synthetic crude oil and 1.2 million barrels per day of unprocessed crude bitumen. Industry growth would not be constrained by the availability of the hydrocarbon resource or project opportunities, but by the availability of skilled labour to effectively execute projects while avoiding the capital cost overruns that have plagued the industry. In this scenario, industry capital spending would average C\$4.4 billion per year over the 2004 to 2017 period.
- Under a more moderate growth scenario that assumes WTI prices of US\$25 per barrel at Cushing, Oklahoma, oil sands production would reach 2.2 million barrels per day by 2017: 1.3 million barrels per day of synthetic crude oil and 0.9 million barrels per day of unprocessed crude bitumen. In this scenario, industry capital spending would average C\$3.1 billion per year over the 2004 to 2017 period.
- Under a low growth scenario that assumes WTI prices of US\$18 per barrel at Cushing, Oklahoma, industry expansion would stall. Operating projects would continue and those under construction would be completed. Industry production would peak at 1.16 million barrels per day in 2007: 0.80 million barrels per day of synthetic crude oil and 0.36 million barrels per day of unprocessed crude bitumen.

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## Capital Spending (C\$ billions per year)

	Total
<b>Unconstrained</b>	<b>6.2</b>
<b>High (US\$32/b)</b>	<b>4.4</b>
<b>Reference (US\$25/b)</b>	<b>3.1</b>
<b>Low (US\$18/b)</b>	<b>1.0</b>

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### **Slide 15**

- Average annual capital spending for these cases is summarized on this slide.
- During a past period of rapid industry expansion (1999-2002) average industry capital spending was C\$4.8 billion per year. Projects were difficult to manage, skilled labour was in very tight supply, and serious cost overruns occurred. We don't believe that this spending level is sustainable and have limited capital spending to a somewhat lower level in the high supply case.

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## Oil Sands Natural Gas Use (thousand cubic feet per barrel)

	<u>Low Case</u>	<u>High Case</u>
<b>Thermal In Situ</b>	<b>0.90</b>	<b>1.20</b>
<b>Mining</b>	<b>0.20</b>	<b>0.30</b>
<b>Upgrading</b>	<b>0.30</b>	<b>0.70</b>

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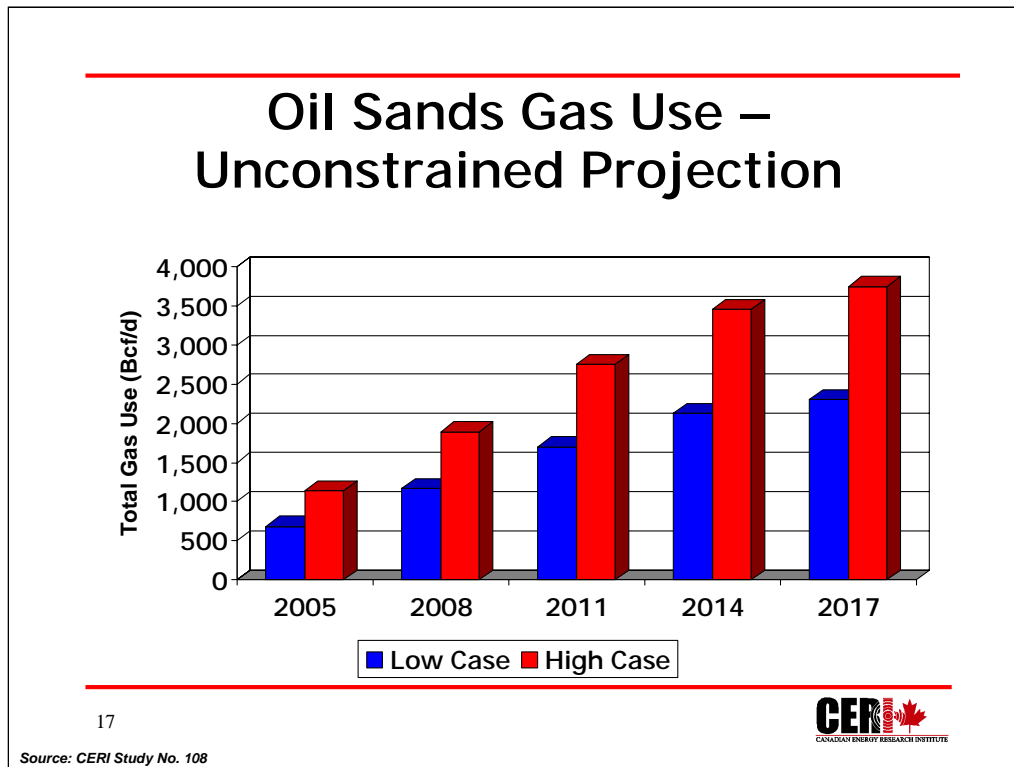
Source: CERl Study No. 108



### Slide 16

- A big issue facing the industry is its consumption of large quantities of natural gas to satisfy its energy needs and produce the hydrogen used in upgrading operations.
- Thermal in situ operations (CSS and SAGD) use natural gas that is burned to generate the steam that is injected into the subsurface reservoir. They are the largest energy consumers per barrel of bitumen produced. Mining operations use relatively small amounts of energy. Upgrading operations can be large natural gas consumers, depending on technology employed and the quality of the SCO produced.
- We have developed a projection of the natural gas that would be consumed by the industry under the unconstrained supply outlook as shown on the next chart.





#### **Slide 17**

- Gas consumption under this case could rise to as much as 3.7 Bcf/d by 2017. However, please recognize that this is a high-side outlook. A more reasonable outlook would see gas demand by 2017 in the range 1.5 to 2.5 Bcf/d. These are still very big numbers and represent more gas than is expected to be brought to Southern markets from Canada's McKenzie Delta/Beaufort Sea region.
- Demand for gas by the growing oil sands industry and by other users in North America is expected to maintain upward pressure on natural gas prices. High gas prices will provide incentives for:
  - Further industry efficiency improvements
  - Development of new recovery technologies
  - Fuel substitution
- The industry is working hard on all of these options.
- Thank you. That concludes my prepared remarks. I'll now take your questions – first from those in Calgary.