

Alberta's oil sands are abundant, accessible, and affordable sources of crude oil. With the continuing decline of conventional North American crude oil reserves, the focus is turning towards oil sands exploration, development, and production. According to the Alberta Energy and Utilities Board (AEUB), production averaged 964 thousand barrels per day (bpd) of bitumen in 2003. Of this total, 644 thousand bpd was upgraded to produce 534 thousand bpd of synthetic crude oil and distillates, and 320 thousand bpd was sold as bitumen. Marketable oil sands production currently represents 35 per cent of Canada's total crude output. By 2005, marketable sales of synthetic crude oil and bitumen are expected to account for 50 percent of Canadian crude oil output and 10 percent of North America's output.

What are Oil Sands?

- Oil sands are crude deposits that are substantially heavier (more viscous) than other crude oils. Oil sands consist of sand, bitumen, mineral rich clays and water. Bitumen is a product of the oil sands that requires upgrading to synthetic crude oil or dilution with lighter hydrocarbons to make it transportable by pipelines and usable by refineries.

Oil Sands Reserves

- Alberta has huge deposits of oil sands that underlie 140,800 square kilometres (54,400 square miles) of the province. These deposits are separated into three regions: Peace River, Athabasca (Fort McMurray area), and Cold Lake (north of Lloydminster).



- These oil sands deposits contain approximately 1.6 trillion barrels of bitumen in-place, of which 174 billion barrels are proven reserves that can be recovered using current technology.

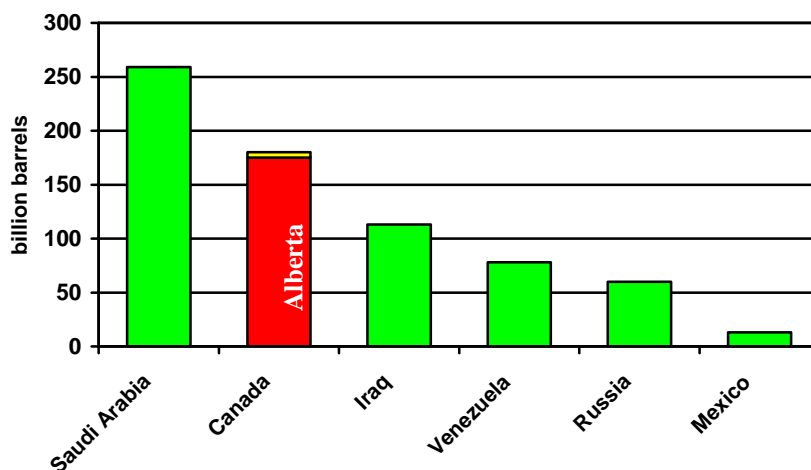
Alberta's Crude Oil Reserves – end of December 2003

Billion Barrels	Conventional Oil	Oil Sands
Initial Volume In-Place	62.0	1,629.0
Remaining Established	1.6	174.5
Remaining Ultimate Potential	4.7	310.5

Source: Alberta Energy & Utilities Board

- Currently, there are approximately 2,100 oil sands (mineral rights) agreements with the Province totalling approximately 34,500 square kilometres (13,300 square miles). Close to 75 percent of possible oil sands areas are still available for exploration and leasing.
- In December 2002, the *Oil & Gas Journal* reported that Canada ranks second largest in terms of global proven crude oil reserves (15 percent of world reserves), after Saudi Arabia. The majority of these reserves are found in Alberta's oil sands.

Proven World Reserves



Oil Sands Production -- Current & Projected

In 2003, oil sands bitumen production averaged 964 thousand bpd. Of this total, 644 thousand bpd was upgraded to 534 thousand bpd and sold as synthetic crude oil and distillates, while 320 thousand bpd was sold as clean bitumen. Projections based on announced projects indicate production of bitumen growing to 3 million bpd by 2020.

Oil Sands Production Methods

- There are two types of oil sands production methods: mining and in-situ.
- Oil sands mining is an open pit mine operation. Oil sands are moved by trucks and shovels to a cleaning facility where the material is mixed with warm water to remove the bitumen from the sand. Today, all operating oil sands mines are linked with upgraders that convert the bitumen to synthetic crude oil.
- For oil sands reservoirs too deep to support economic surface mining operations, some form of an in-situ or “in place” recovery is required to produce bitumen. In-situ oil sands production is similar to that of conventional oil production where oil is recovered through wells. The AEUB estimates that 80 percent of the total bitumen ultimately recoverable will be with in-situ techniques. In general, the heavy, viscous nature of the bitumen means that it will not flow under normal conditions. Numerous in-situ technologies have been developed that apply thermal energy to heat the bitumen and allow it to flow to the well bore. These include thermal (steam) injection through vertical or horizontal wells such as cyclic steam stimulation (CSS), pressure cyclic steam drive (PCSD) and steam assisted gravity drainage (SAGD). Other technologies are emerging such as pulse technology, vapour recovery extraction (VAPEX) and toe-to-heel air injection (THAI).
- There are reservoirs in the oil sands where primary or "cold" production is possible. The bitumen in these areas will flow to the well bore when co-produced with sand through the use of progressive cavity pumps, the same technology that is used in conventional heavy oil production. This type of production technology is commonly called cold heavy oil production with sand (CHOPS). While this bitumen is lighter than the bitumen found in mineable and other in-situ reserves, it is heavier than conventional heavy oil. A significant difference between primary bitumen and conventional heavy oil production is the amount of sand that is co-produced. Sand production in primary bitumen wells may be two to three times greater than sand production in conventional heavy oil wells.
- In general, oil sands mines are found in central Athabasca deposits (around Fort McMurray). In-situ production is used in the Cold Lake, south Athabasca and Peace River deposits.

Government Framework

- The oil sands mineral rights in approximately 97 percent of Alberta’s 140 thousand square kilometers (54 thousand square miles) of oil sands area are owned by the provincial Crown and managed by the Alberta Department of Energy. The remaining 3 percent of the oil sands mineral rights in the province are held by the federal Crown within Indian reserves, by successors in title to the Hudson’s Bay Company, by the national railway companies and by the descendants of original homesteaders through rights granted by the federal Crown before 1887. These rights are referred to as “freehold rights”.
- The Departments of Environment and Sustainable Resource Development administer complementary environmental policies. The AEUB regulates oil and gas activities in the province.
- The Alberta Department of Energy is responsible for administering the legislation that governs the ownership, royalty and administration of Alberta’s oil, gas, oil sands, coal, metallic and other mineral resources. The Department’s main objective is to manage these non-renewable resources to ensure their efficient development for the greatest possible benefit to the province and its people.

Oil Sands Royalty

- In 1996, Alberta announced a new generic royalty regime for oil sands based on recommendations from a joint industry/government national task force. This regime is defined in the Mines and Minerals Act and the Oil Sands Royalty Regulation 1997, as amended (OSRR 97). Royalty is calculated using a revenue-less-cost calculation.
- In early project years before capital investment and other costs are recovered, the royalty rate is lower than the rate that is applied after costs are recovered. This helps project cash flows in early years. Once costs are recovered, the Province shares in project profits. Details are provided below.
 - In the pre-payout period (before the project has recovered all of its costs), projects pay royalty tied to 1 percent of gross revenue; and
 - In the post-payout period (after the project has recovered all of its costs), projects pay royalty tied to the greater of 1 percent of gross revenue or 25 percent of net revenue.
- Since 1990, oil sands royalties have totalled over \$3 billion.

Announced Investment

- Since 1996, when the generic royalty regime was introduced, \$30 billion (\$C) of investment in the oil sands has occurred.
- Looking forward, it is expected that new capital investment could range between \$3 billion and \$5 billion per year.
- Not all announced projects or project expansions are expected to proceed.

Oil Sands Projects

- The following table, titled *2003 Oil Sands Projects Bitumen Production*, provides an overview of the companies with ownership in oil sands projects (as defined under the OSRR 97). The table details 2003 average daily bitumen production from each project and announced future production target levels. Pipelines, utility plants (cogeneration), and as yet to be disclosed projects are not included.
 - As of December 31, 2003, there were 32 companies representing 59 projects approved under the OSRR 97.
 - Combined, these projects produced 938 thousand bpd of bitumen.
 - Another 26 thousand bpd of bitumen was produced under other royalty regimes such as the conventional oil royalty regime, freehold, or experimental royalty.
- Oil sands (OSRR 97 projects) production in 2003 by recovery method was as follows:

– Mining	614,562 bpd
– Thermal (CSS, PSCD, SAGD)	218,235 bpd
– Primary (Cold, CHOPS)	<u>104,839 bpd</u>
	937,636 bpd
- Oil sands (OSRR 97 projects) production in 2003 by region was as follows:

– Athabasca	698,645 bpd
– Cold Lake	226,665 bpd
– Peace River	<u>12,326 bpd</u>
	937,636 bpd

2003 Oil Sands Projects Bitumen Production*

Company Name	Project Name	Location	Recovery Method	Production (bpd)	Recent Company or Project Announced Target¹
Baytex	Reita Lake ²	Cold Lake	Primary	4,946	
Blackrock Ventures	Hilda Lake	Cold Lake	SAGD	-	
	Orion Project	Cold Lake	SAGD	-	Orion bitumen production to be 20,000 bpd by 2007
	Seal I, II	Peace River	Primary	<u>2,898</u>	Seal bitumen production to be 15,000 bpd by 2005
				2,898	
Bonavista Petroleum	Frog, Swimming, Irish, Elk Pt, Lindbergh Louis	Cold Lake	Primary	3,580	
Canadian Natural Resources	13 projects ³	Cold Lake	Primary	16,979	
	Lindbergh North	Cold Lake	Primary	4,457	
	Fishing Lake	Cold Lake	Primary	5,553	
	Moose Hills	Cold Lake	Primary	8,483	
	Beartrap	Cold Lake	Primary	3,875	
	Brintnell, Pelican Lake	Athabasca	Primary	7,265	
	Wabasca	Athabasca	Primary	16,820	
	Primrose	Cold Lake	CSS/SAGD	30,125	Primrose SCO production to be 120,000 bpd by 2012+
	Kirby Thermal Project	Athabasca	SAGD	-	
	Burnt Lake Crown Agreement	Cold Lake	SAGD	1,079	
	Wolf Lake Crown Agreement	Cold Lake	CSS/SAGD	4,805	
	Horizon	Athabasca	Mining/Upgrader	<u>-</u>	Horizon SCO production to be 232,000 bpd by 2012+
				99,443	
Canadian Oil Sands Trust	Syncrude ⁴ (36.7%)	Athabasca	Mining/Upgrader	94,023	Syncrude SCO production to be 550,000 bpd by 2016
Chevron Texaco	Athabasca Oil Sands Project ⁵ (20%)	Athabasca	Mining/Upgrader	17,107	AOSP bitumen production to be 525,000 bpd by 2010
Conoco Phillips	Surmont Project ⁶ (43.5%)	Athabasca	SAGD	-	Surmont bitumen production to be 110,000 bpd by 2010
	Syncrude ⁴ (9%)	Athabasca	Mining/Upgrader	<u>22,995</u>	Syncrude SCO production to be 550,000 bpd by 2016
				22,995	
Crispin Energy	Mann Lake, Mann North	Cold Lake	Primary	263	
Deer Creek	Jocelyn	Athabasca	SAGD	-	Jocelyn bitumen production to be 30,000 bpd by 2012
Delphi Energy	John Lake	Cold Lake	Primary	122	
Devon	Manatokan, Tulabi John Lake	Cold Lake	Primary	7,215	
	Dover	Athabasca	SAGD	1,538	
	Surmont Project ⁶ (13%)	Athabasca	SAGD	-	Surmont bitumen production to be 110,000 bpd by 2010
	Jackfish	Athabasca	SAGD	<u>-</u>	Jackfish bitumen production to be 35,000 bpd by 2008
				8,754	

Company Name	Project Name	Location	Recovery Method	Production (bpd)	Recent Company or Project Announced Target¹
Encana	Foster Creek	Athabasca	SAGD	22,238	
	Pelican Lake, Woodenhouse	Athabasca	Primary	16,134	
	Christina Lake	Athabasca	SAGD	3,866	
				42,238	
ExxonMobil	Kearl Mine	Athabasca	Mining	-	Kearl Mine bitumen production to be 100,000 bpd by 2012+ (future expansion to 200,000 bpd)
	Iron River	Cold Lake	Primary	2,291	
				2,291	
Husky Oil Limited	Tucker	Cold Lake	SAGD	-	Tucker bitumen production to be 30,000 bpd by 2007
	Sunrise ⁷	Athabasca	SAGD	-	Sunrise bitumen production to be 200,000 bpd
				-	
Imperial Oil	Cold Lake	Cold Lake	CSS	129,534	Cold Lake bitumen production to be 180,000 bpd by 2008
	Syncrude ⁴ (25%)	Athabasca	Mining/Upgrader	63,874	Syncrude SCO production to be 550,000 bpd by 2016
	Kearl Mine	Athabasca	Mining	-	Kearl Mine bitumen production to be 100,000 bpd by 2012+ (future expansion to 200,000 bpd)
				193,408	
Japan Canada Oilsands	Hangingstone	Athabasca	SAGD	4,851	JACOS bitumen production to be 60,000 bpd by 2012+
Koch Petroleum	North Wabasca	Athabasca	Primary	373	
	Peace River	Peace River	Primary	227	
				600	
Krang Energy	Lindbergh South	Cold Lake	Primary	614	
Mocal	Syncrude ⁴ (5%)	Athabasca	Mining/Upgrader	12,775	Syncrude SCO production to be 550,000 bpd by 2016
Murphy Oil Ltd.	Lindbergh	Cold Lake	Primary	265	
	Syncrude ⁴ (5%)	Athabasca	Mining/Upgrader	12,775	Syncrude SCO production to be 550,000 bpd by 2016
				13,040	
Nexen	Syncrude ⁴ (7.2%)	Athabasca	Mining/Upgrader	18,396	Syncrude SCO production to be 550,000 bpd by 2016
	Long Lake ⁸ (50%)	Athabasca	SAGD/Upgrader	124	Long Lake bitumen production to be 72,000 bpd by 2007
				18,520	
Opti	Long Lake ⁸ (50%)	Athabasca	SAGD/Upgrader	124	Long Lake bitumen production to be 72,000 bpd by 2007
Petro-Canada	MacKay River	Athabasca	SAGD	10,716	MacKay River bitumen production to be 27,000 bpd by 2007
	Meadow Creek	Athabasca	SAGD	-	Meadow Creek bitumen production to be 40,000 bpd by 2007
	Syncrude ⁴ (12%)	Athabasca	Mining/upgrader	30,660	Syncrude SCO production to be 550,000 bpd by 2016
				41,376	
Petrovera⁹	Elk Point/Frog Lake/ Lindbergh	Cold Lake	Primary	2,478	
Ricks Nova Scotia	Beaverdam	Cold Lake	Primary	-	

Company Name	Project Name	Location	Recovery Method	Production (bpd)	Recent Company or Project Announced Target¹
Shell Canada Limited	Peace River	Peace River	Pressure Pulse/SAGD	1,185	
	Peace River	Peace River	Pressure Pulse/SAGD	8,018	Peace River bitumen production to be 17,000 bpd by
	Athabasca Oil Sands Project ⁵ (60%)	Athabasca	Mining/Upgrader	<u>51,320</u>	AOSP bitumen production to be 525,000 bpd by 2010
				60,522	
Suncor	Steepbank & Millennium Mine	Athabasca	Mining/Upgrader	273,532	
	Firebag	Athabasca	SAGD	32	Suncor SCO production to be 550,000 bpd by 2010-2012
	Voyageur	Athabasca	Mining/SAGD	-	
				273,563	
Synenco	Northern Lights	Athabasca	Mining	-	Northern Lights bitumen production to be 100,000 bpd by 2009
TOTAL (TotalFinaElf)	Surmont Project ⁶ (43.5%)	Athabasca	SAGD	-	Surmont bitumen production to be 110,000 bpd by 2010
TrueNorth Energy	Fort Hills ¹⁰ (78%)	Athabasca	Mining	-	Fort Hills bitumen production to be 50,000 bpd by 2009 (future expansion to 200,000 bpd)
UTS Corporation	Fort Hills ¹⁰ (22%)	Athabasca	Mining	-	Fort Hills bitumen production to be 50,000 bpd by 2009 (future expansion to 200,000 bpd)
Western Oil Sands	Athabasca Oil Sands Project ⁵ (20%)	Athabasca	Mining/Upgrader	17,107	AOSP bitumen production to be 525,000 bpd by 2010
OIL SANDS PRODUCTION (OIL SANDS ROYALTY PROJECTS)				937,636	
OIL SANDS PRODUCTION (CONVENTIONAL, EXPERIMENTAL, & FREEHOLD PROJECTS)				26,444	
TOTAL OIL SANDS PRODUCTION				964,080	

* Sources: ADOE/AEUB

- (1) Publicly announced targets as of October 25, 2004.
- (2) Baytex's Reita Lake production is shared with CNRL.
- (3) CNRL's 13 combined projects include: Seibert Lake, Fort Kent, Frog Lake, Elk Pt, John Lake, Ashmont, Cold Lake, Marwayne, West Marwayne, Edwards Lake, Elizabeth, Lindbergh CA, Elk Pt CA.
- (4) Syncrude ownership on Dec 31, 2003: Canadian Oil Sands Trust (36.7%), Imperial Oil (25%), Petro Canada (12%), Conoco Philips (9%), Nexen (7%), Mocal (5%), Murphy Oil (5%). Syncrude average bitumen production in 2003 = 255,496 bpd.
- (5) Athabasca Oil Sands Project ownership on Dec 31/03: Shell Canada (60%), Chevron Canada (20%), Western Oil Sands (20%). AOSP average bitumen production in 2003 = 85,533 bpd.
- (6) Surmont project joint venture ownership on Dec 31/03: TOTAL (43.5%), Conoco Philips (43.5%), Devon (13%).
- (7) Project name change from Kearl Lake to Sunrise.
- (8) Opti-Nexen Long Lake project ownership as of June 2003: Opti (50%), Nexen (50%).
- (9) Petrovera purchased by Canadian Natural Resources - February 2004.
- (10) Fort Hills project ownership on Dec 31, 2003: TrueNorth Energy (78%), UTS Energy (22%). UTS announced the intent to purchase all TrueNorth shares in the Fort Hills project in July 2004.