

Backgrounder

EUB Issues Report on Alberta's Reserves and Supply Forecasts – May 30, 2002

Every year the Alberta Energy and Utilities Board (EUB) issues a report providing stakeholders with one of the most reliable sources of important information on the state of reserves and the supply and demand for Alberta's diverse energy resources and by-products – specifically crude oil, crude bitumen, natural gas, natural gas liquids, sulphur, and coal.

Providing high-quality information to support good decision-making is a key EUB service. Making energy resource data available to everyone involved – the EUB, landowners, communities, industry, government, and interested groups – makes for better decisions affecting the development of Alberta's resources. This backgrounder provides a brief summary of the EUB's report titled *Alberta's Reserves 2001 and Supply/Demand Outlook 2002-2011*.

Among this year's highlights is that Alberta's remaining established reserves for crude bitumen is estimated to be 27 768 million cubic metres, or 175 billion barrels. This represents one of the world's largest energy resources. In 2001, bitumen production surpassed conventional crude oil production for the first time. The EUB expects increases in annual volumes of bitumen production to occur in the future, allowing the province to offset the expected decline in conventional oil with bitumen production. The report also notes that natural gas production is expected to decline over the second half of the forecast period.

Resource supply, costs of development, energy demands, and conservation, as well as important social and environmental considerations, influence the economic factors that shape the development of Alberta's energy resources. Higher prices, record drilling activity, and planned investments in the oil sands area all contributed to the energy development picture in 2001, and help shape the forecast for the years to come.

Definitions of Reserves

At the outset, it is important to realize that all reserve estimates are just that, estimates. While we can never be absolutely certain of precisely how much oil, gas, or other products are actually in the ground and will ultimately be recovered, by using the best scientific assessment methods, the latest production information, and a rigorous compilation and review process, we can achieve a reasonable degree of accuracy that helps guide many critical resource management functions.

It is also important to understand that reserve estimates typically change or evolve over time due to things such as new discoveries, improvements in technologies, and updated production information. Further, in order to properly understand the information published in the reserves report, it is necessary first to ensure a correct understanding of what is meant by the different types of reserves.

Definitions of Reserves

Initial in-Place Reserves: The volume of oil/gas/product calculated or interpreted to exist in a reservoir before any volume has been produced.

Established Reserves: Those reserves recoverable under current technology and present and anticipated economic conditions specifically proved by drilling, testing, or production, plus the portion of reserves that are interpreted to exist from geological, geophysical, or similar information with reasonable certainty.

Initial Established Reserves: Initial established reserves prior to the deduction of any production.

Cumulative Production: The sum of production volumes from all prior years.

Remaining Established Reserves: Initial established reserves minus cumulative production.

Ultimate Potential Reserves: An estimate of initial established reserves that will have been developed in an area by the time all exploratory and development activity has ceased, having regard for the geological prospects of the area and anticipated technology and economic conditions.

Reserves Summary for 2001

The following table summarizes Alberta's energy reserves at the end of 2001:

2001 Reserves Summary

	Crude Bitumen		Crude Oil		Gas		Coal	
	million cubic metres	billion barrels	million cubic metres	billion barrels	billion cubic metres	trillion cubic feet	billion tonnes	billion tons
Initial in-Place	259 200	1 631	9 762	61.4	7 122	253	94	104
Initial Established	28 330	178	2 583	16.2	4 180	148	35	39
Cumulative Production	562	3.5	2 304	14.5	2 996	106	1.14	1.3
Remaining Established	27 768	175	278	1.7	1 184	42	34	38
Annual Production for 2001	43	0.271	42	0.264	143	5	0.033	0.036
Ultimate Potential	50 000	315	3 130	19.7	5 600	200	620	683

In this document both imperial and metric units of measurement are presented. Conversion factors are listed on the last page of this Backgrounder.

Crude Bitumen Reserves - Alberta's Oil Sands Resource

Oil Sands defined: Oil Sands are naturally occurring mixtures of bitumen, water, sand and clay that are found in three areas of Alberta – Athabasca, Peace River, and Cold Lake. **Bitumen** is a thick, sticky form of crude oil. At room temperature, bitumen is like cold molasses. It must be heated or diluted before it will flow into a well or through a pipeline. If the oil sands deposits are close to the surface, bitumen can be recovered from the oil sands by open-pit **mining** and hot-water processing methods. Deeper deposits require **in situ** methods such as steam injection through vertical or horizontal wells.

Crude Bitumen Reserves

Alberta has the largest oil sands (crude bitumen) resource in the world. The total in situ and mineable remaining established reserves are 27.7 billion m³ (175 billion barrels), down slightly from 2000 due to production. To date, only 2% of the initial established crude bitumen reserve has been produced.

Crude Bitumen Production

In 2001, Alberta produced 25 million m³ (157 million barrels) from the mineable area and 18 million m³ (113 million barrels) from the in situ area, totalling 43 million m³ (271 million barrels). Bitumen produced from mining was upgraded, yielding 20 million m³ (126 million barrels) of synthetic crude oil (SCO). In situ production was marketed as crude bitumen.

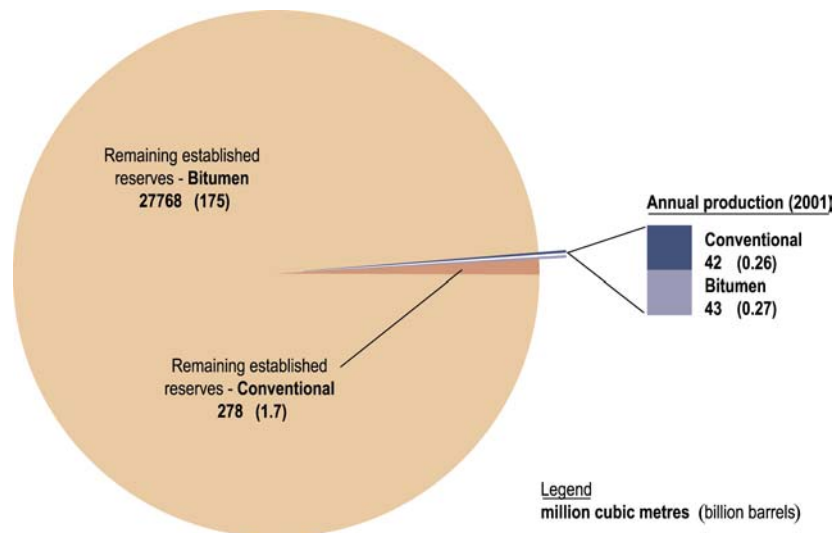
In 2001, total raw bitumen production exceeded total conventional crude oil production for the first time. The first commercial Steam Assisted Gravity Drainage production occurred in 2001.

Crude Oil Reserves

Alberta's remaining established reserves of conventional crude oil was estimated at 278 million m³ (1.7 billion barrels)—a 4.6 % reduction from 2000. Of the 28.6 million m³ (180 million barrels) added to initial established reserves, exploratory and development drilling, along with new enhanced recovery schemes, added reserves of 23.5 million m³ (148 million barrels). This replaced 56 per cent of 2001 production. Re-evaluation accounted for the remaining 5.1 million m³ (32 million barrels) addition.

Based on its 1988 study, the EUB estimates the ultimate potential recoverable reserves of crude oil at 3130 million m³ (19.7 billion barrels). The EUB believes that this estimate of ultimate potential is still reasonable.

The following figure shows annual production and remaining established reserves for crude bitumen and crude oil.



Alberta's oil reserves

Crude Oil Production and Drilling

Alberta's production of conventional crude oil totalled 42 million m³ (264 million barrels). Despite declining production over the past two decades, Alberta still produces 114 000 m³/day (717 000 barrels/day) of conventional crude oil.

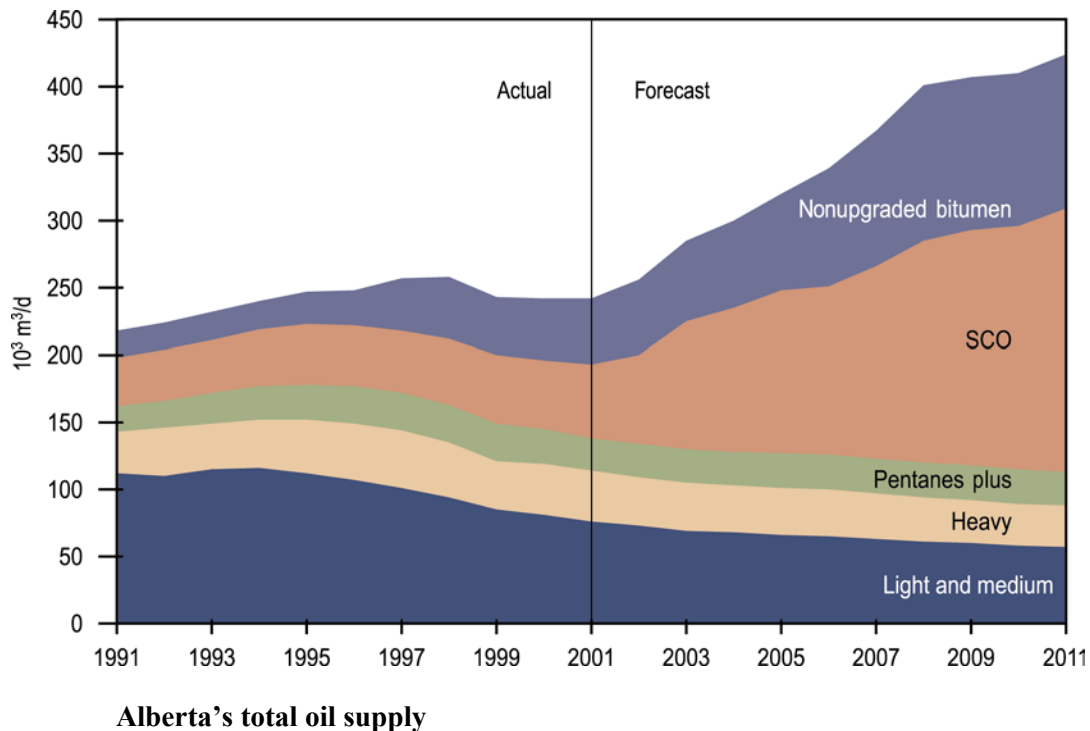
The number of successful oil wells decreased by 18 per cent, from 2700 in 2000 to 2220 in 2001. With the expectation that crude oil prices will remain strong, the EUB estimates that 1800 and 2100 successful oil wells will be drilled in 2002 and 2003 respectively, leveling at about 2400 wells per year over the remainder of the forecast.

Total Oil Supply and Demand

Alberta's 2001 production from conventional oil, oil sands sources, and pentanes plus was 243 000 m³/day (1.53 million barrels/day)—about the same as in 2000. Production is forecast to reach 424 000 m³/day (2.7 million barrels/day) by 2011.

A comparison of conventional oil production and bitumen production over the last 10 years clearly shows a trend towards a larger percentage being allocated to bitumen. This allows the province to offset the expected decline in conventional oil with bitumen production.

Although conventional oil production will continue to decline, as expected, the EUB estimates that production of bitumen will triple by 2011, accounting for as much as 75 per cent of Alberta's total oil supply.



Natural Gas Reserves

At the end of 2001, Alberta's remaining established reserves of natural gas at the field plant gate stood at 1184 billion m³ (42 trillion cubic feet). While new drilling has not fully replaced gas production since 1982, last year's record drilling added new reserves, replacing 67 per cent of the production for 2001, compared to 90 per cent in 2000.

In 1992 the EUB estimated Alberta's ultimate marketable gas potential at approximately 5600 billion m³ (200 trillion cubic feet). To bring this estimate up to date, the EUB has undertaken an ultimate potential study targeted for completion in 2003.

Natural Gas Production and Drilling

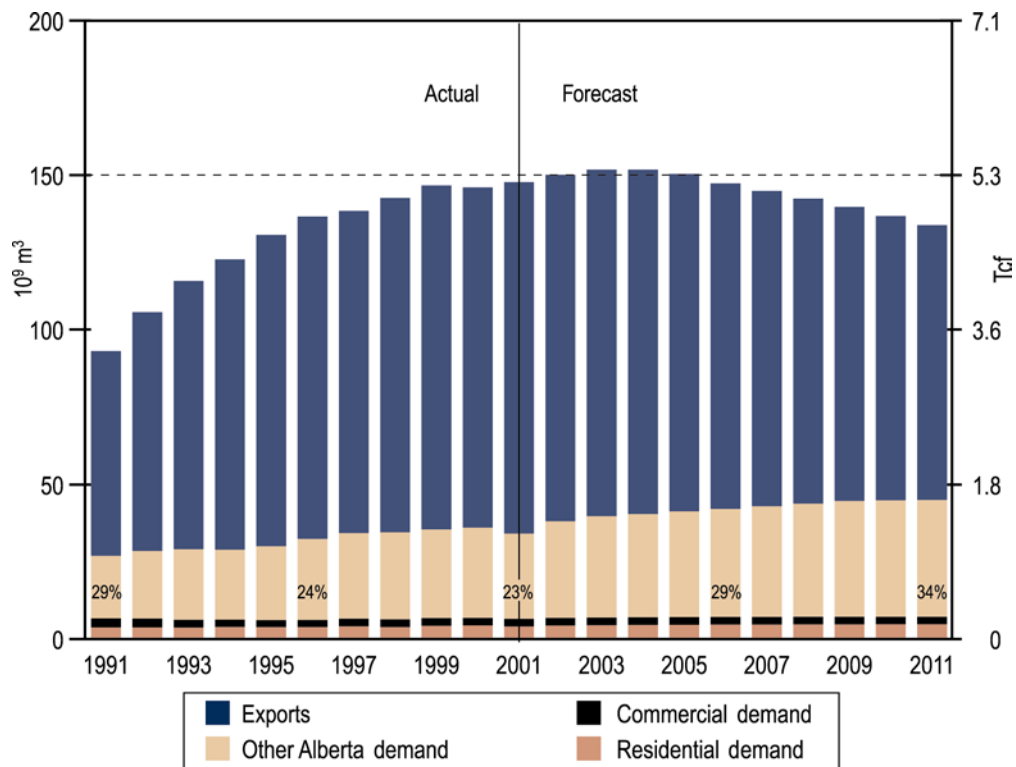
Several major factors have an impact on natural gas production, including natural gas prices, drilling activity, the location of Alberta's reserves, and the performance characteristics of wells. Alberta produced 143 billion m³ (5.1 trillion cubic feet) of marketable natural gas in 2001. The trend of upward annual production levels evident over the past several years began to show significant flattening in 1999. Production in 2001 shows a continuation of this flattening trend, despite record gas well drilling activity.

There were 9682 successful gas wells drilled in Alberta in 2001, a 17 % increase over the 8264 gas wells drilled in 2000. The EUB expects continued strong drilling, estimating 9500 to 11000 wells for the period 2002 to 2005 and some 10000 successful wells per year over the remainder of the forecast period.

Much of Alberta’s gas development has centred on shallow gas in southeastern Alberta with over half of the province’s producing wells but only 16 % of 2001 natural gas production. Over time, the EUB anticipates that the focus of exploration activity will shift to the western portion of the province and correspondingly higher-productivity wells.

Natural Gas Supply and Demand

The EUB expects gas production to decline by about 2 per cent per year over the final 5 years of the forecast period. New pools are smaller and new wells drilled today are exhibiting lower initial production rates and steeper decline rates. Factoring this in, the EUB believes that new wells drilled will not be able to sustain production levels over the latter half of the forecast period. Future supply is shown below.



Disposition of marketable gas production

Although natural gas supply from conventional sources is expected to start declining moderately in the latter half of the forecast period, sufficient supply exists to meet Alberta’s demand. If the EUB’s demand forecast is realized, Alberta’s natural gas requirement will be one-third of total Alberta production by the end of the forecast period.

As Alberta requirements increase and production declines over time, the volumes available for removal from the province will decline. The EUB’s mandate requires that the natural gas needs of Alberta’s core market (defined as residential, commercial, and institutional gas consumers) are

met over the long term, before any new gas removal permits are approved. Other potential sources, such as frontier gas and coalbed methane, may offer options for supplementing the supply of conventional gas in the future.

Ethane, Other Natural Gas Liquids, and Sulphur

Total remaining established reserves of ethane are about the same as the 252 million m³ (1.6 billion barrels) in 2000. Remaining established reserves of liquid ethane expected to be recovered from raw natural gas based on existing technology and market conditions, was estimated at 174 million m³ (1.1 billion barrels) in 2001.

The production of specification ethane was 12.7 million m³ (79.9 million barrels), about the same as the 12.8 million m³ (80.5 million barrels), in 2000. The majority of ethane was used as feedstock for Alberta's petrochemical industry. The supply of ethane is expected to meet demand over the forecast period.

The remaining established reserves of other natural gas liquids (NGLs)—propane, butanes, and pentanes plus—slightly decreased to 212 million m³ (1.3 billion barrels) in 2001. The supply of propane and butanes is expected to meet demand over the forecast period. However, a shortage of pentanes plus as a diluent for heavy oil and nonupgraded bitumen is expected by 2006. Alternative sources of diluent would be required.

The remaining established reserves of sulphur are 94 million tonnes from natural gas and upgrading of bitumen from mining areas under active development. Sulphur demand is not expected to increase significantly, and Alberta's sulphur inventory will continue to grow over the forecast period.

Coal

The current estimate for remaining established resources for all types of coal is about 34 billion tonnes. This massive resource continues to help meet the energy needs of Albertans, supplying fuel for about 75 per cent of the province's electricity generation. Alberta's coal reserves represent over a thousand years of supply at current production levels.

Alberta's total coal production in 2001 was 33 million tonnes of raw coal, down slightly from 2000 due to the closure of Smoky River coal mine. Recent increases in coal prices, due to high energy prices and high global steel production, improved prospects for Alberta's low-sulphur coal and created opportunities for extending coal production. Subbituminous coal production is expected to increase in the middle part of the forecast period to meet demand for additional electrical generating capacity.

MEASUREMENT: In this document both imperial and metric units of measurement are presented. Conversion factors are:

- 1 m³ of gas = 35.494 cubic feet of gas
- 1 m³ of oil = 6.293 barrels of oil (one barrel contains approximately 159 litres)
- 1 tonne = 0.9842 (U.K.) long tons (2240 pounds), or 1.1023 short tons (2000 pounds)

A **cubic metre** (m³) is the volume held by a cube 1 metre by 1 metre by 1 metre. To visualize this amount of volume, the space taken up by a typical kitchen oven range is almost 1 cubic metre (m³). In addition,

- 1 thousand cubic metres = the energy used by one water heater for a year.
- 1 million cubic metres = enough to heat 180 homes for one year.
- 1 billion cubic metres = enough to heat 180,000 homes for one year.