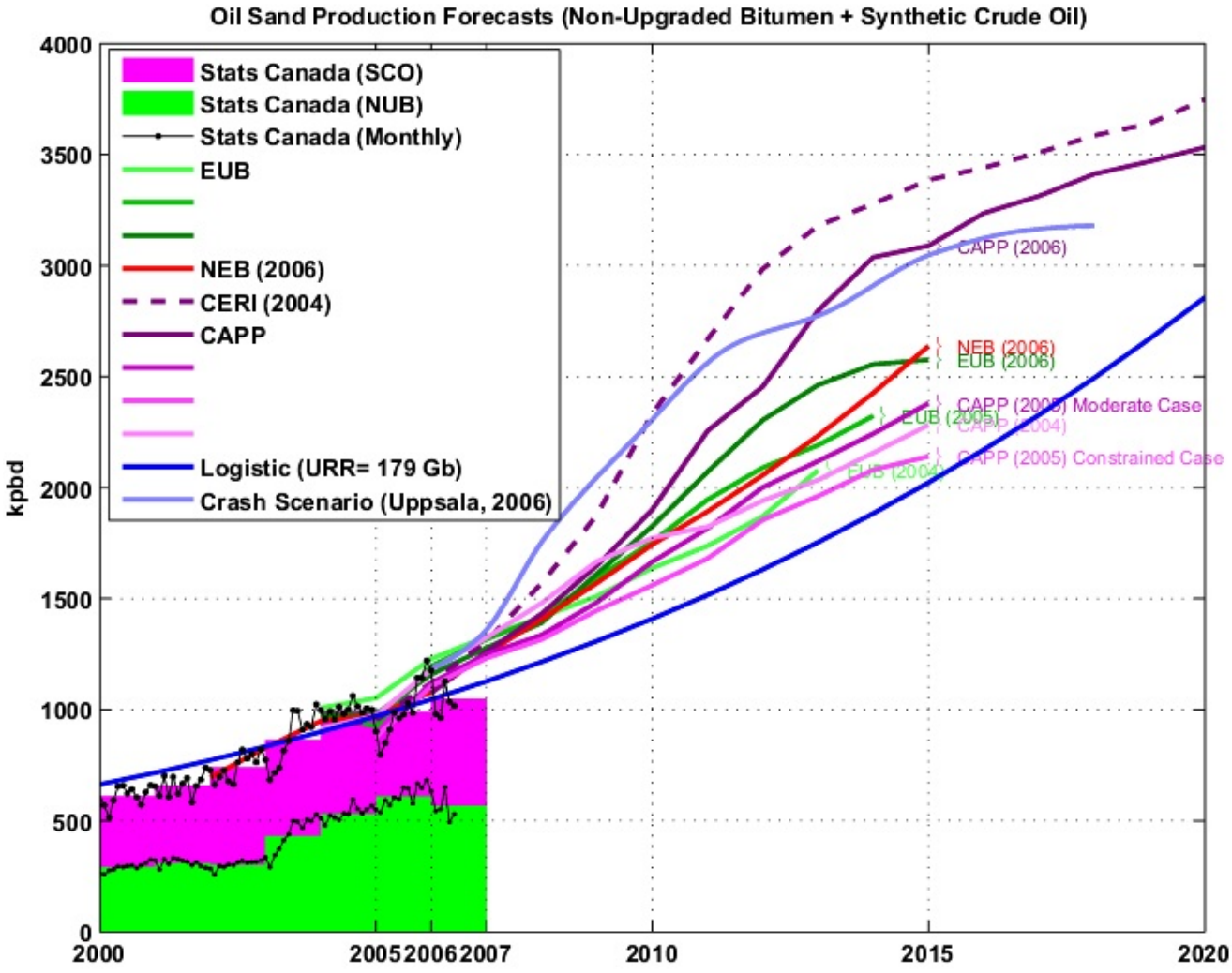
The Oil Drum: Canada
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Canadian Oil Sands Production Update

Posted by Sam Foucher on October 30, 2006 - 11:51am in The Oil Drum: Canada
Topic: Supply/Production
Tags: alberta, bitumen, canada, oil sands, synthetic crude oil [list all tags]

This is the first version of a monthly post about the last production numbers from Canadian oil sands (also called Tar sands).



Various forecasts for Synthetic Oil Crude (SCO) and Non-Upgraded Bitumen (NUB) derived from oil sands.

Oil Sands Production in a Nutshell

I won't go into too much detail about oil sands. I invite people to read the excellent stories previously posted on TOD by Dave and Heading Out:

Oh, Canada -- Natural Gas and the Future of Tar Sands Production

Mining Canadian Oil Sands into the future

The raw material of the oil sands industry is crude **bitumen**:

> Crude bitumen means a naturally occurring viscous mixture, mainly of hydrocarbons heavier than pentane, that may contain sulphur compounds and that, in its naturally occurring viscous state, will not flow to a well.

The raw crude bitumen is recovered either by surface mining or by In-Situ technologies for deeper deposits (THAI, SAGD, etc.). The crude bitumen is not the final product and has to go through **Upgrading:**

> Bitumen is deficient in hydrogen, compared with typical crude oils, which contain approximately 14 percent hydrogen. To make it an acceptable feedstock for conventional refineries, it must be upgraded into higher quality synthetic crude oil (SCO), through the addition of hydrogen or the rejection of carbon, or both. (National Energy Board, 2000) Upgrading bitumen utilizes natural gas as a source of heat and steam for processing, and also as a source of hydrogen for hydroprocessing.

In the following I will only consider two crude oil categories:

- Non Upgraded Bitumen (NUB).
- Upgraded Bitumen or Synthetic Crude Oil (SCO).

The main reason for this choice is that more data is available for these two categories, which is not the case if you consider the total raw bitumen production usually split into In-Situ and Mining productions. There is also a loss factor when upgrading Bitumen to SCO of about 30%, hence one has to be careful when comparing total production figures of bitumen and SCO+NUB. According to the Canadian Energy Research Institute, the average ratio of SCO to bitumen input for upgrading has varied between 0.69 to 0.75 between 2000-2004. From the same report, I derived a correction factor of 0.8835 to account for both the partial upgrading of the crude bitumen production and the losses during upgrading.

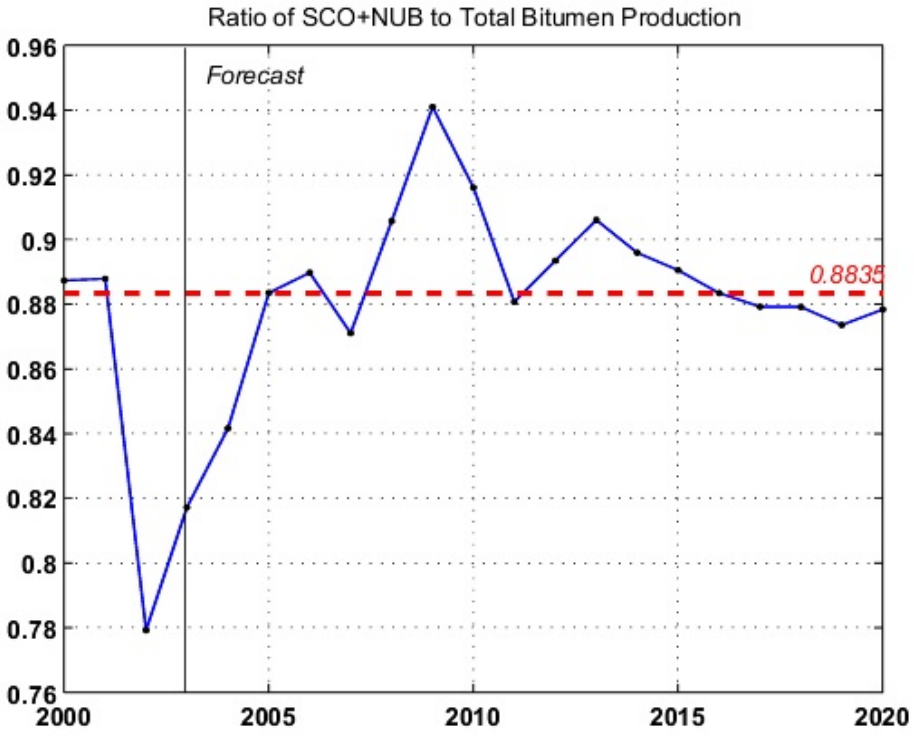


Fig. 1- Observed and predicted ratio of SCO+NUB production to the total Bitumen production (derived from CERI document). Click to enlarge.

Production Data

There are several data providers available:

- Statistics Canada has monthly time series for NUB and SCO production up to 1985 (not free, CA$3.42 per dataset, financing kindly provided by TOD).
- Monthly data from the National Energy Board (NEB) up to 1998
- The (EUB) also publishes monthly estimates up to 2001.

Most of the data are in Cubic Meters and the conversion factor I used to convert production figures in barrels is 1M3= 6.2929 barrels. The different datasets are shown on Fig. 2, we can observe that they all agree on the total production (SCO+NUB) but that there are some discrepancies on the SCO production levels (I don't have a definitive answer on why).

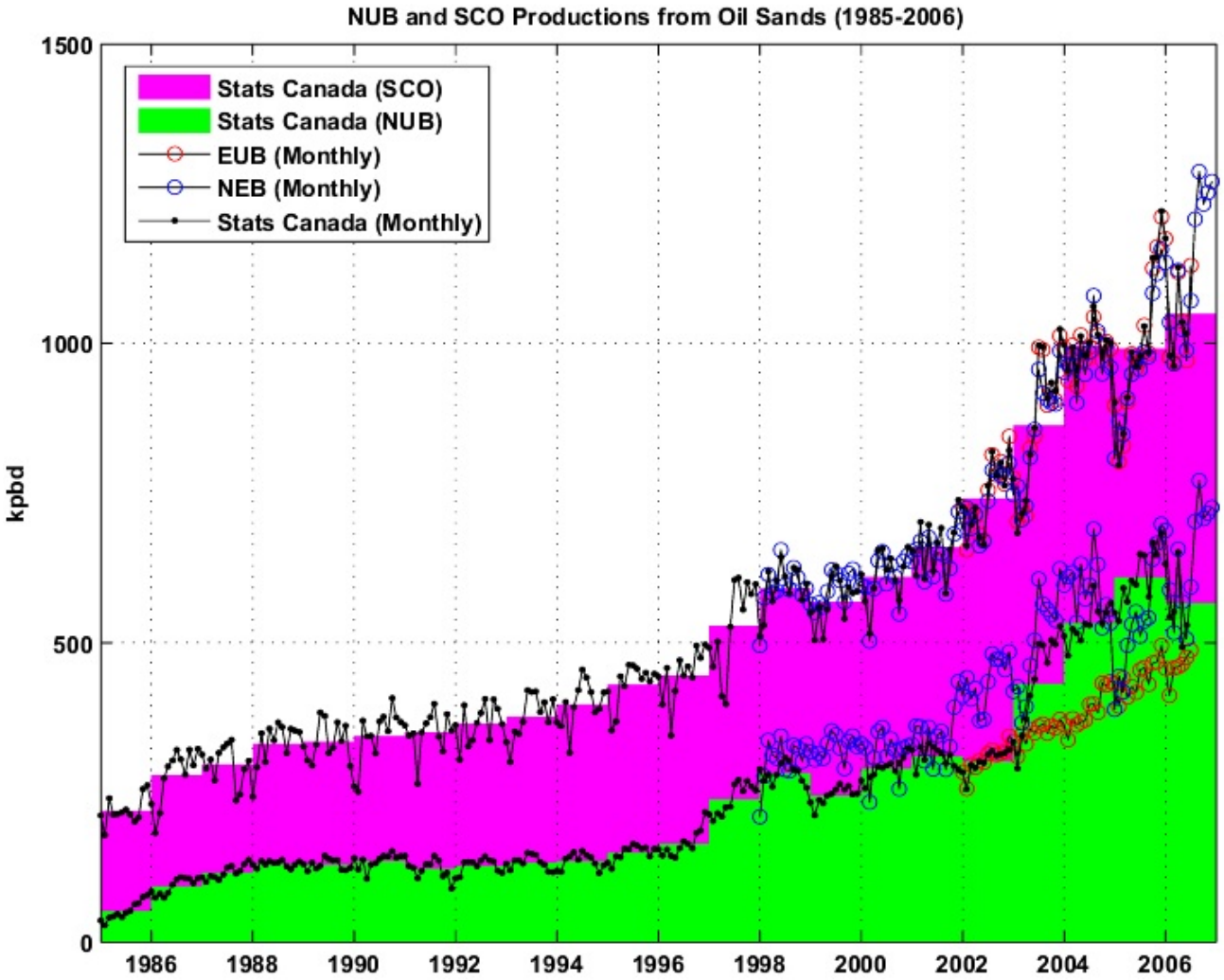


Fig. 2- Various monthly production estimates for Synthetic Crude Oil (SCO) and Non-Upgraded Bitumen (NUB). Click to enlarge.

Forecasts

There are a lot of forecasts out there on oil sands production, most of them being for the total bitumen production. For now, I considered only the following references:

- National Energy Board of Canada (NEB):

Canada's Oil Sands - Opportunities and Challenges to 2015 - 2006

- Alberta Energy and Utilities Board (EUB):

Alberta's Reserves 2005 and Supply/Demand Outlook 2006-2015
Alberta's Reserves 2004 and Supply/Demand Outlook 2005-2014
Alberta's Reserves 2003 and Supply/Demand Outlook 2004-2013

- Canadian Association of Petroleum Producers (CAPP):

Canadian Crude Oil Production and Supply Forecast, 2006 - 2015
Canadian Crude Oil Production and Supply Forecast, 2005 - 2015
Canadian Crude Oil Production and Supply Forecast, 2004 - 2015

- Canadian Energy Research Institute (CERI):

Spreading the Wealth Around: The Economic Impact of Alberta's Oil Sands Industry - Marh 2006

- Uppsala University (Professor Kjell Aleklett, member of the ASPO):

Bengt Söderbergh, Canada's Oil Sands Resources and Its Future Impact on Global Oil Supply. Master Thesis, 2006.
Söderbergh et al., A Crash Program Scenario for the Canadian Oil Sands Industry, to appear in Energy Policy, 2006

- Purely for the fun of it, I fitted a Logistic curve on the young oil sands production history assuming prior knowledge of the URR at 179 Gb. Of course, it gives me an unrealistic production profile peaking in 2050 at more than 9.7 mbpd.

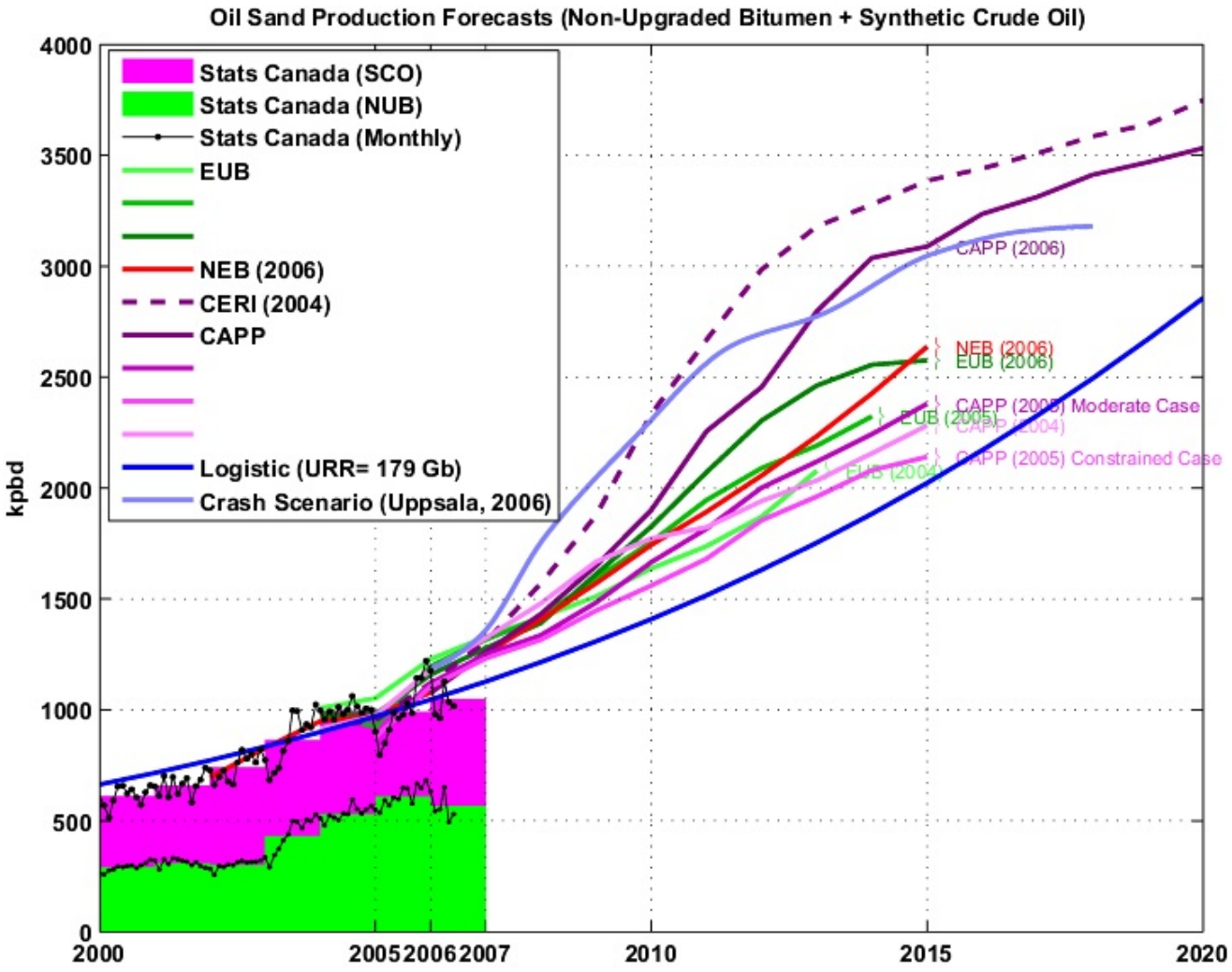


Fig. 3- Various forecasts for Synthetic Oil Crude (SCO) and Non-Upgraded Bitumen (NUB) derived from oil sands.

Forecast	2005	2006	2007	2010	2015	Peak Date	Peak Value
Observed (Statistic Canada)	991.28	1048.88	NA	NA	NA	2005-11	1220.77

CAPP* (2006)	NA	1074.30	1260.71	1900.34	3087.73	2020	3531.23
CAPP constrained* (2005)	877.29	1104.34	1230.67	1559.33	2139.76	2015	2139.76
CAPP moderate* (2005)	877.29	1119.36	1248.34	1664.46	2378.30	2015	2378.30
CAPP* (2004)	972.70	1178.55	1323.44	1772.24	2281.12	2015	2281.12
NEB* (2006)	974.60	1077.45	1252.58	1742.38	2636.36	2015	2636.36
CERI* (2004)	951.24	1120.68	1307.05	2333.33	3383.81	2020	3746.88
EUB (2006)	979.80	1157.89	1277.46	1824.94	2573.80	2015	2573.80
EUB (2005)	925.06	1195.65	1315.22	1755.72	NA	2014	2322.08
EUB (2004)	1050.91	1227.12	1327.80	1636.15	NA	2013	2076.66
Logistic (URR= 179Gb)	969.61	1045.51	1126.98	1408.21	2021.70	2050	9731.72
ASPO* (2006)	NA	1251.37	1534.73	2427.70	3082.43	2018-01	3178.40

Table I. Production estimates (in thousands of barrels per day (kbpd)) for SCO+NUB derived from different forecasts (indicates forecasts that were originally for total bitumen production and that have been corrected using the factor 0.88 explained earlier).*

In summary, we can see that most forecasts are in agreement with each other and are predicting a doubling of the current production within 6 years. However, we can observe than the older forecasts have a tendency to be a little bit over optimistic and have been revised downward afterward (see for instance EUB-2006 and EUB-2004).

This is a first draft and there is a lot of work to do. Many important aspects have not been addressed here, for instance: 1) How the decline in conventional oil production will affect the total Canadian production; 2) How domestic demand will evolve; 3) The dependence on Natural Gas. I will attempt to explore these different problems in my future posts.

The different datasets used in this post will be put together in a public spreadsheet, probably next month.