



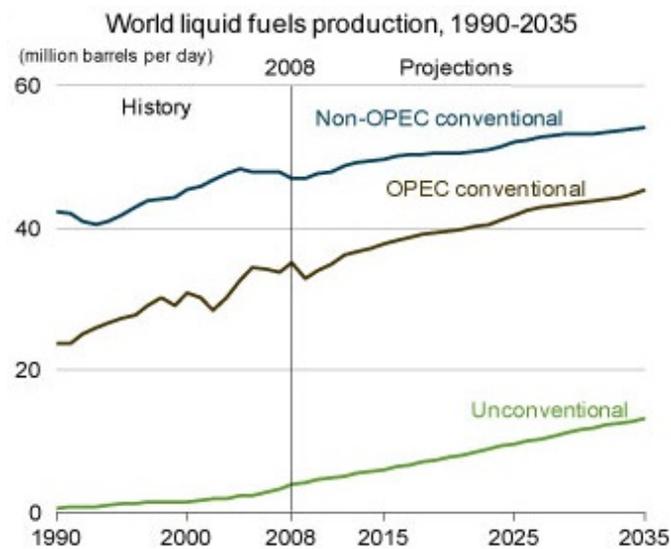
Tech Talk - The Future Production from Canadian Oil Sand

Posted by [Heading Out](#) on October 16, 2011 - 1:58am

Topic: [Supply/Production](#)

Tags: [alberta](#), [crude oil production](#), [oil mining](#), [oil sands](#), [sagd](#), [thai](#) [[list all tags](#)]

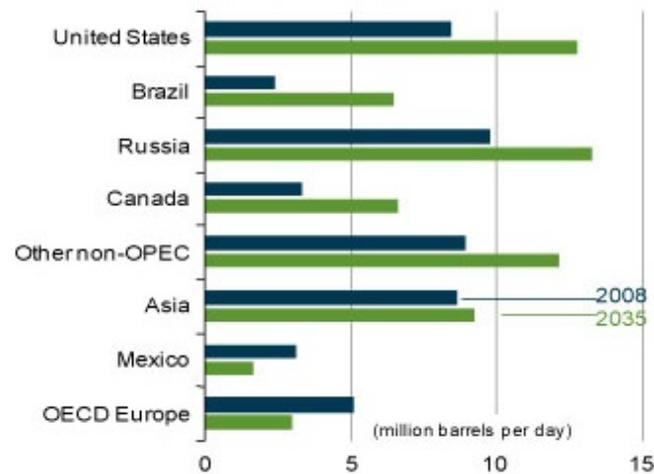
If one examines the forecast future supply of liquid fuels that the EIA projects in their most recent [International Energy Outlook](#), the agency projects a considerable growth in unconventional supplies of liquid fuels for 2011.



EIA projections of future growth in liquid fuel supplies ([EIA](#))

For North America, the projections foresee considerable growth both in production within the United States (rising from 8.5 to 12.8 mbdoe) and from Canada (rising from 3.4 mbdoe in 2008 to 6.6 mbdoe in 2035).

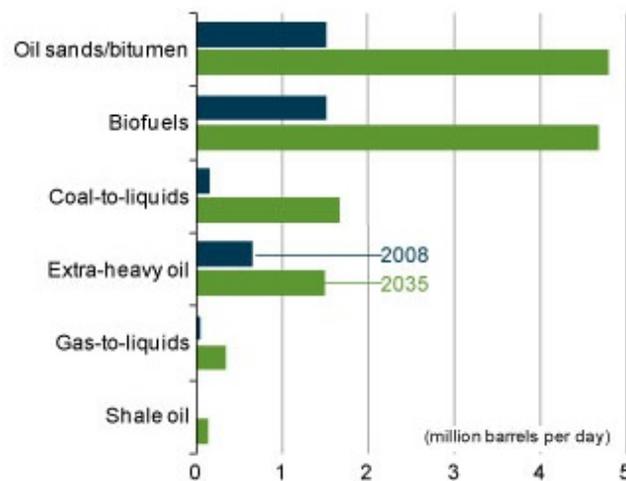
Non-OPEC liquids production by region, 2008 and 2035



Regional growth in liquid fuels generation 2008 to 2035 (EIA)

The growth in unconventional fuels is most critically anticipated as coming from oil sands, with biofuels (a topic for another day) close behind.

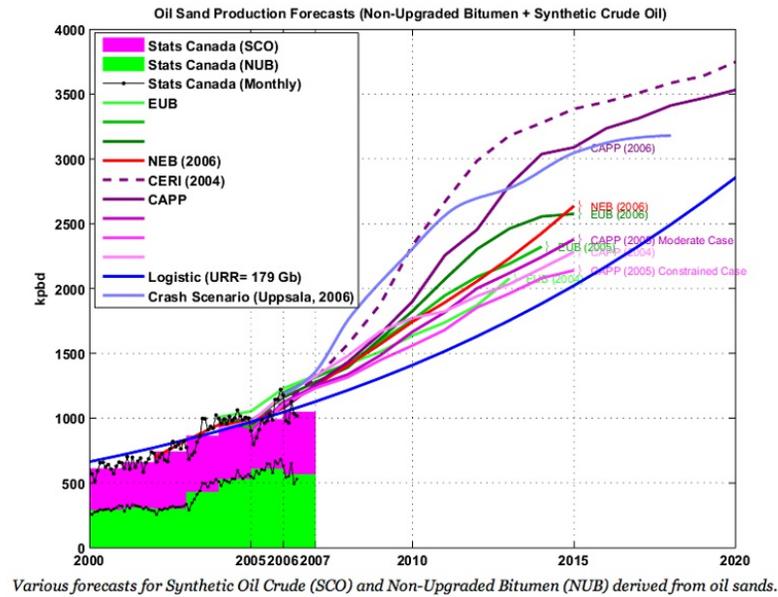
Unconventional liquids production by fuel type, 2008 and 2035



Future sources of unconventional liquid fuels (EIA)

In passing, it is worth noting (for folks such as Dr Yergin, perhaps) that the EIA does not see much of a significant role for oil from shales through 2035. But it highlights the criticality of the Athabasca oil sands for the future well-being of the North American fuel supply chain.

There have been a significant number of posts written both by myself and others over the years at [Bit Tooth](#) and at [The Oil Drum](#) about these reserves that play an increasing part in North American oil supply and that will likely grow to supply other nations as well, particularly China (a topic dating back to the [start of The Oil Drum](#)). In this particular post I will therefore discuss briefly an overview about the reservoirs and the technologies used to extract the fuel, in looking at the projected outlook for the future, – given that this has been reviewed and changed a number of times in the past. Some measure of that variation comes from the predictive curves that Sam Foucher posted [back in 2006](#).



Predictions of oil sand production from 5 years ago ([The Oil Drum](#))

Consider first the resource, the amount of oil that exists within the oil sands of Alberta, estimated as being between [1.7 and 2.5 trillion barrels](#). It is found in three major deposits the largest of which is the Athabasca, and then Cold Lake and Peace River.



Locations of the major oil sands in Canada ([CAPP](#))

There are several different ways in which the oil can be recovered, The one generating the most visibility is where the sands lie close enough to the surface [to be mined](#). Early use of single, large-scale bucket wheel excavators did not work out well, since production is tied to the well-being of a single machine. As a result, the sands are mined by perhaps 15 shovels within the mining pit, each scooping about 100 tons of sand at a time; and loading trucks, which then carry the material, 300 tons at a time to an in-mine crusher which breaks the rock into small fragments. These fragments (with waste rock largely removed) are then mixed with hot water and pumped to large tanks at the primary upgrader, where the sand, water, and bitumen are separated.

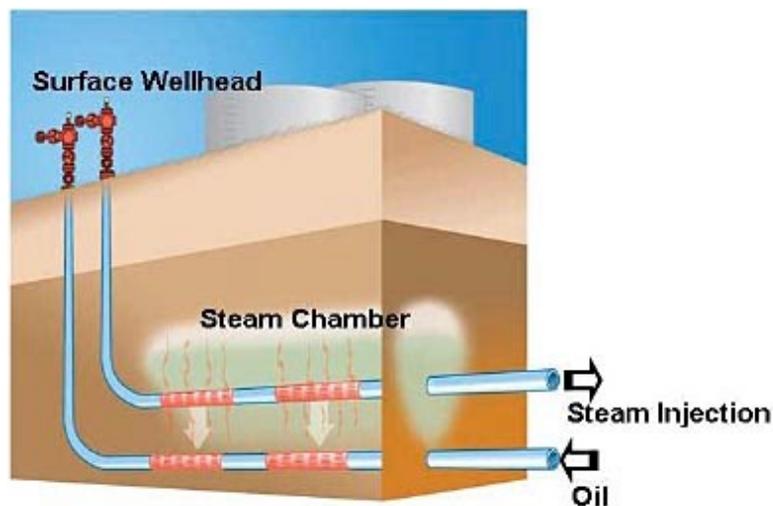


In loading a truck, it takes 2 to 4 shovel loads to fill the truck bed, depending on its size.

There is a [Youtube video of the process](#) available.

The sand also contains small particles of clay, which are difficult to settle out of the water, and the large tailings ponds used for this have been the focus of considerable controversy. This concern is recognized, and [considerable efforts are being made](#) to reduce the time that it takes for the settlement, and for site reclamation. That effort is continuing with [a collaborative effort](#) between the mining companies and four universities to improve the technology over that currently used.

Some 80% of the reserves lie too deep for mining to be an effective solution, and with the bitumen in natural form being too thick to easily flow to wells, ways had to be found to encourage that flow. The most common and that most often projected for future development, is based on the use of [Steam Assisted Gravity Drainage](#).



Artist's illustration of the SAGD process ([Devon Canada Corp](#))

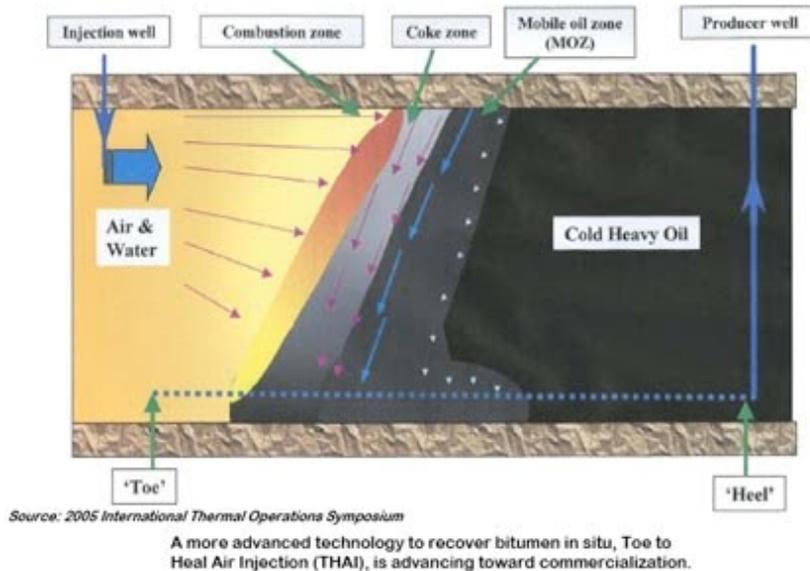
There is a [video of the SAGD process](#) on Youtube.

One of the problems with SAGD comes in the need to generate the steam that is fed into the

upper pipe, and which migrates up into the sand to heat and thin the oil. The typical method to provide the steam is with natural gas, and as [Dave Cohen noted](#) some years ago, the supply of that natural gas becomes more of an issue, as the size of the operation continues to grow.

One of the more innovative of the techniques suggested overcomes that problem through burning some of the oil in place, in a process known as [Toe to Heel Air Injection](#) (THAI). Igniting a section of the oil sand, and after using the heat to drive off the more volatile oil while continuing the burn with residual coke left behind, as the flame front progresses, has been shown to be viable.

THAI Bitumen-Recovery Process



It is an artist's impression of a side view of the site, with the blue dotted horizontal line representing the recovery well and air being fed in from a higher well into the formation.

The [video showing the THAI process](#) is also on Youtube.

However, at present it has only a limited planned future, though that may increase as information on the technique becomes more evident.

So what is the likelihood that, using these techniques, that production will rise to the levels which the EIA project? Well, in their October 3rd edition, the [Oil and Gas Journal](#) (OGJ) listed (registration required) those projects currently planned for Canada in the period through 2020 and beyond. The list contains 144 projects, many of which are defined as the separate stages of different developments. Taking just those that relate to oil sand production roughly 70% plan on using thermal methods to recover deeper oil (mainly SAGD, though there are small amounts of THAI, cyclic steam and [electrothermal](#)). 30%, roughly 2 mbdoe, of the increase in production is planned to come from surface mining.

It is unlikely that the total 6 mbdoe of increased production will all come to pass. However, given that these are all defined projects, many broken into separate phases that can be geared back or advanced, depending on market conditions and supply – particularly in the further out years – the projected increases that the EIA project would seem to be eminently reasonable to anticipate. (Caveats on water and natural gas availability are discounted at present).

I would be remiss in not thanking [HereinHalifax](#) who led me to the report on [Eastern Canadian supplies](#), which pointed out that the flow of crude in the pipeline from Sarnia to Montreal, about

which I wrote earlier, was originally Eastward, carrying western crude, but which was reversed as the market for the oil from Alberta developed in the United States, and Eastern Canadian refineries supply switched to tanker import.

The increasing plans to produce oil from Alberta depend, to a degree, on the ability of pipelines to carry the resulting product to market. Production is therefore likely to hinge on the success with which those advocating the various pipelines are able to achieve. And to a considerable extent these are political, rather than technical decisions.

Postscript: Emmanuel has pointed out that when I discussed the fields in Eastern Canada I did not mention the [Old Harry Field](#), which has been the [subject of much debate](#) between Quebec and the Federal Government and which may be twice as large as the Hibernia field. With apologies (and thanks to Kristin) here is the location:



Location of the Old Harry Field (Source [Evidentia](#))



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