

Charts

As mentioned in Issue-1, it is the intention that each issue of this journal will include a small number of charts - often from already-published sources - chosen as being particularly informative.

In this issue we focus on the production of *conventional* oil, and ask specifically: What has happened to global production of this category of oil in recent years, and what is forecast?

In the two issues of *The Oil Age* to-date, we have presented four forecasts: two top-down forecasts, respectively by Campbell and Laherrère; and two by-field bottom-up forecasts, respectively by Globalshift and Miller. Both of the top-down forecasts predict that the global production of conventional oil (and indeed of 'all-liquids') will go into decline in the near term; whereas by contrast both the bottom-up by-field forecasts see the production of conventional oil as being able to increase (assuming 'above-ground' constraints allow) out to perhaps 2025 or so, before then declining (and 'all-liquids' production also).

Note that the scope for increased conventional oil production in these two bottom-up forecasts is partly based on recent finds, but is largely from the few remaining 'swing' producers, whose production could potentially go quite a bit higher, were they to decide to do this; plus oil currently in 'fallow' fields (though see Miller's caution on this oil in this issue); and also from the increased application of enhanced oil recovery (EOR).

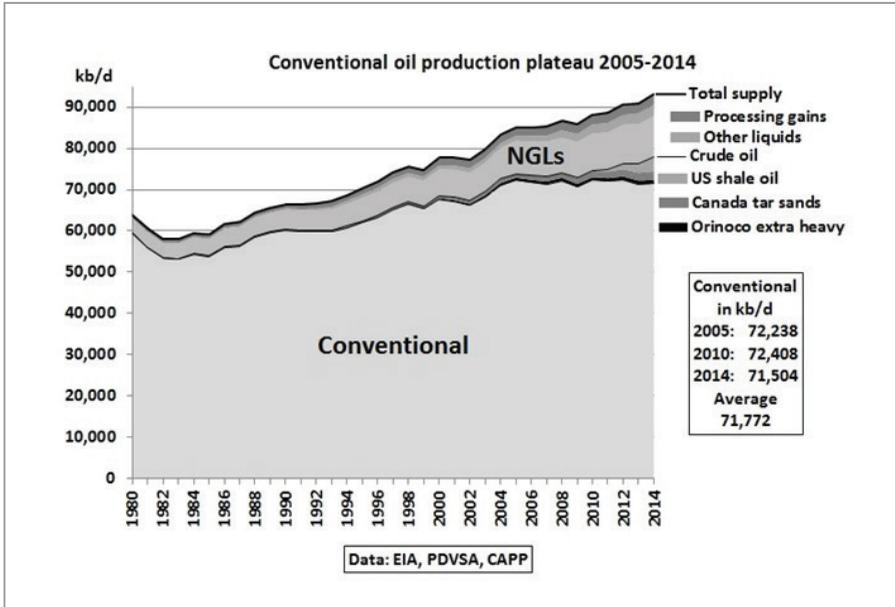
The charts presented below examine two things:

- Global production of conventional oil (taken here as primarily oil in *fields*) from 1980 to the present day, including its components; and also the production costs of some of these to see the impact on the maximum production cost of oil in recent years.
- Three recent ‘mainstream’ ‘all-liquids’ forecasts, from the IEA, BP and Exxon. The latter all show global conventional oil production as remaining more-or-less on plateau out to the end of their forecast horizons.

Specifically, the charts presented are:

- Mushalik: Global oil production 1980 to 2014 by oil category. This shows that global production of conventional oil has been on-plateau since 2005.
- Mushalik: A production-cost table from the consultancy: Energy Aspects.
- Mushalik: The resulting global production data categorised by production cost.
- IEA: A 2011 forecast of global ‘all-liquids’ production to 2035.
- BP: A 2015 forecast of global ‘all-liquids’ production to 2035.
- Exxon: A 2015 forecast of global ‘all-liquids’ production to 2040.

Chart 1. Global 'All-liquids' Production by Category of Liquids, 1980 – 2014.



Notes:

- Chart by M. Mushalik of ASPO Australia, see: <http://crudeoilpeak.info>
- The data are:

For most categories of liquids, and total, from:

<http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>

For tar sands oil (in Canada):

<http://www.capp.ca/publications-and-statistics/publications/258990>

For Orinoco oil:

<http://www.menpet.gob.ve/secciones.php?option=view&idS=21>

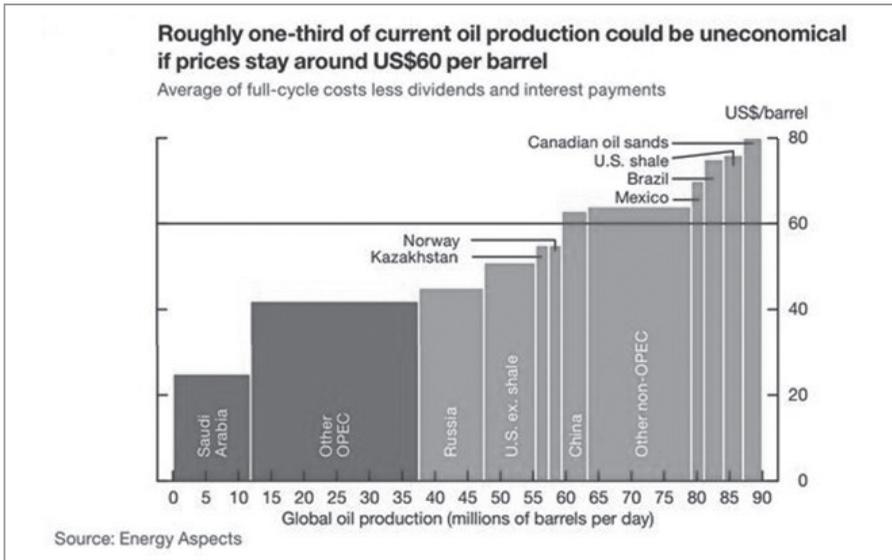
Note that here Mushalik notes: “I could not get Orinoco production for 2013 and 2014. I just took the 2012 production [for these dates]. If production were a bit different, it would not show up in the graph due to the scale.”

- Production of GTLs, CTLs and biofuels are in the ‘other liquids’ category.

Comments:

- The chart shows that global conventional oil production has been on plateau since 2005.
- Except for NGLs, the production so far of the non-conventional oils, and other liquids, has been quite modest; conventional oil has supplied the bulk of global oil for many years.
- What is the implication? Charts 2 and 3 below are provided by Matt Mushalik on his website (accessed 20 May 2015), and look at the implication in terms of the production costs of the other oils that have been produced to meet demand.

Chart 2. Production cost of oil by category



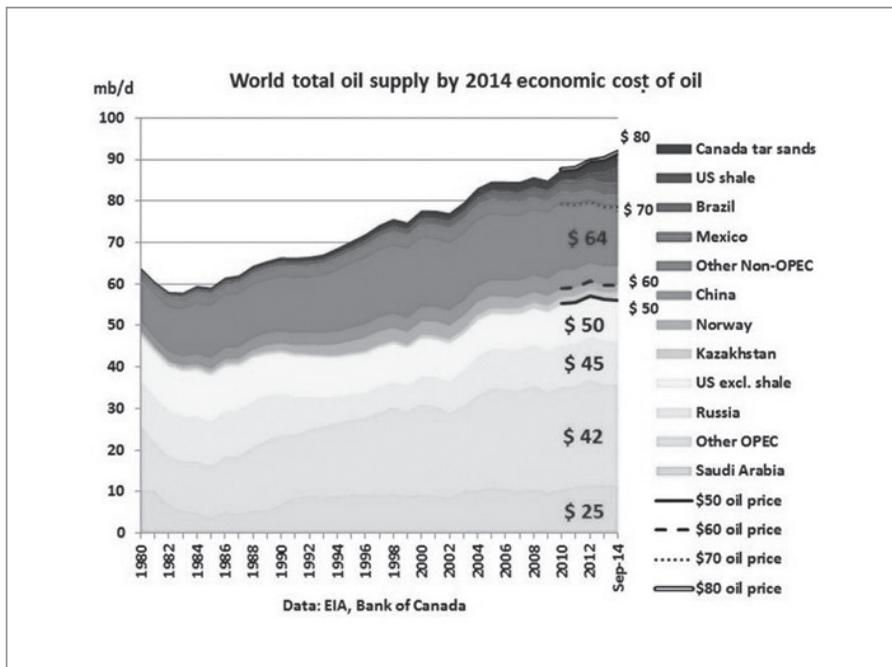
Notes:

- Chart by M. Mushalik, see: <http://crudeoilpeak.info>, accessed 20 May 2015.
- Data are from Energy Aspects, an independent research consultancy (but the chart is from a Bank of Canada report: <http://www.bankofcanada.ca/wp-content/uploads/2014/07/mpr-2015-01-21.pdf>).

Comments:

- The message of the chart is clear; various classes of oil have different costs, with the non-conventional oils the most expensive.
- But also compare these data with the higher production costs estimated by the IEA in their 2013 Resources to Reserves report (where the x-axis is total volume of liquids considered recoverable by category, and where a range of other-liquids', in addition to oil, are given), that was reproduced as Chart 2 in The Oil Age, vol. 1, no. 1.
- And also compare to the higher production costs estimated (vs. Mb/d, as here) by IHS-CERA in Figure 16 of: Miller, R.G., Sorrell, S.R., 2014. The future of oil supply. Phil. Trans. R. Soc. Vol. 372: 20130179.
- Mushalik goes on to write: "Let's put these costs into an oil production graph". This is done in Chart 3, below.

Chart 3. Global oil supply split by 2014 estimated economic cost of oil by region of production



Notes:

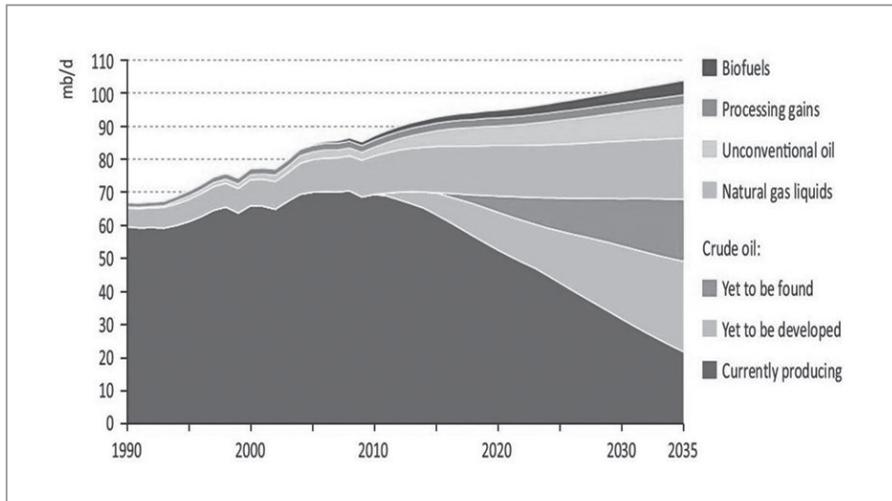
- Chart by M. Mushalik, see: <http://crudeoilpeak.info>, accessed 20 May 2015.
- Data combine US' EIA production data (see Chart 1, above) with Energy Aspects' data quoted by the Bank of Canada, Chart 2.

Comments:

- Mushalik writes: “Figure: Oil supply by country/area and economic cost of oil. [In this figure] oil supplies are stacked by 2014 economic cost of oil, starting with Saudi Arabia (\$25/barrel, green) and going up to Canadian tar sands (\$80/barrel, dark red). The colours have been extended over the whole period to 1980 so that the production history can be seen. Lines in various styles show 4 different cost levels, whereby their lengths are indicative only to show corresponding production levels for the last years. It seems that oil supplies up to

around \$75 have peaked (all countries up to Brazil). In other words, if the world is willing (or able) to pay only \$75 a barrel, corresponding oil production [has] declined since 2012 – at around 1.6% over 2 years. \$50 oil was up and down, but at only 56 Mb/d or 60% of current demand. What is important here is that affordable oil does not appear to increase in volume. That has serious implications for economic and transport planning. [In the figure] supply includes: crude oil, natural gas plant liquids, refinery processing gains and other liquids (including bio fuels). The EIA definitions are here: <http://www.eia.gov/cfapps/ipdbproject/docs/IPMNotes.html#p1>

Chart 4. IEA 2011 World Energy Outlook Forecast of Global 'All-liquids' Production to 2035



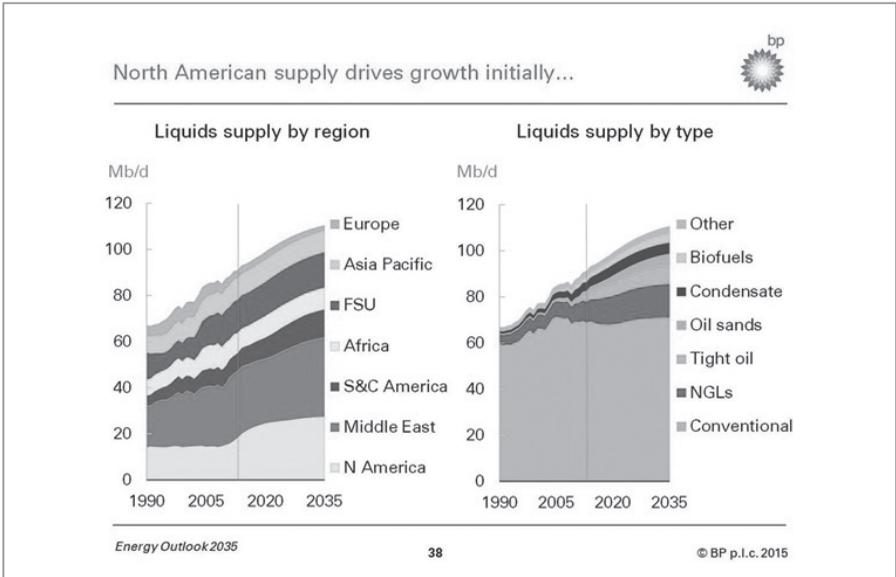
Notes:

- IEA WEO forecast, 2011.

Comment:

- Forecasts that global production of conventional oil (here classed as 'Crude oil') will stay flat to 2035; and all the increase needed to meet demand will be from NGLs, non-conventional oils, refinery gain and biofuels.

Chart 5. BP's 2015 *Energy Outlook 2035* Forecast of Global 'All-liquids' Production to 2035



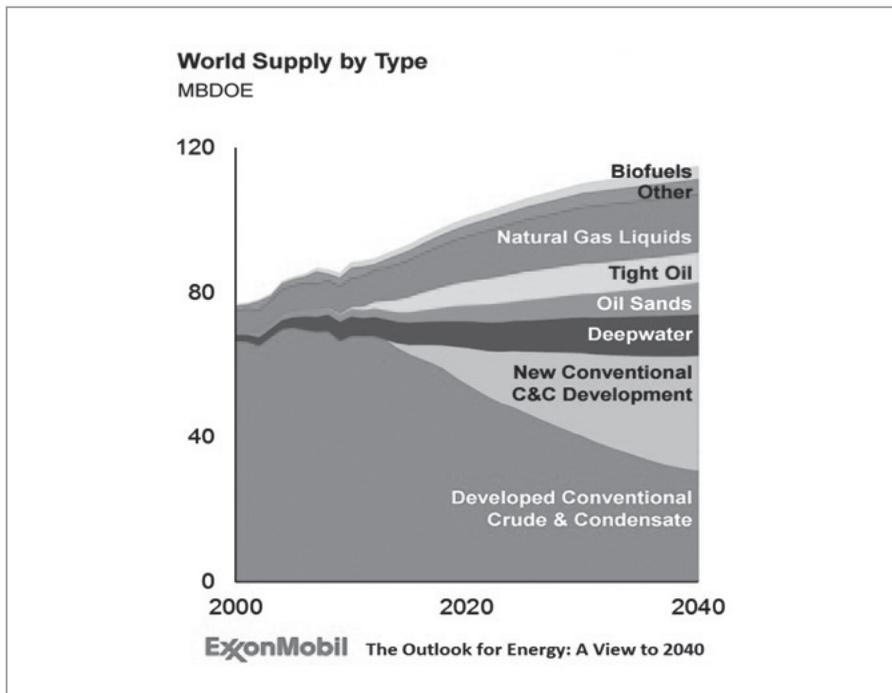
Notes:

- Data from BP website, accessed 20 May 2015, *Energy Outlook 2035*.

Comments:

- Very similar forecast to IEA, above; global conventional oil production remains flat.

Chart 6. ExxonMobil Forecast to 2040 of World Liquids supply, by type of liquid



Notes:

- Data from the ExxonMobil website [<http://cdn.exxonmobil.com/~media/global/reports/outlook-for-energy/2015/2015-energy-outlook-presentation.pdf> (accessed 20 May 2015)]

Comments:

- As with Charts 4 & 5, global production of conventional oil is forecast to remain flat to 2040.

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