The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Modeling Oil Depletion Using EIA Data - The Tiger Chasing its Tail?

Posted by nate hagens on June 13, 2006 - 10:22am

There are many potential definitions of Peak Oil: peak conventional, peak non-opec, date of maximum production, date of 50% Qt, peak liquids etc. We care about Peak Oil because we want to approximate the timing, cost, and estimated quantity of liquid fuel available to a globally connected society in order to initiate mitigation and planning. Typically, this site has used EIA data to puzzle out the 'cigar' posts with moving averages, new production records, etc. The March EIA Report came out recently and showed March daily production of 84,047,000 barrels per day, a decrease from the heretofore peak (Dec 2005) of 652,000 barrels per day.

On this site and others, we spend a lot of time dissecting the monthly and yearly production numbers looking for signs of a peak. But it appears that unless the EIA changes their definitions, what we are currently calling "Peak Oil" will be obfuscated (and delayed) by increasing amounts of alternative energies that are now being definitionally included as 'oil' in the headline number.

As long as we use EIA production numbers as the benchmark, Peak Oil will silently morph into Peak Liquids. This is relevant because the definitional layers we add on top of 'crude oil' are not equal in what they provide to society. It is also relevant in that the logistical heuristic used by M. King Hubbert was not intended to include corn and sugar cane derived ethanol, tar sands, or Natural Gas Liquids in its predictive theory of oil basin depletion. The concept of Peak Oil, already not widely believed, will start to be very confusing, and probably even more combative. In essence, we need to either a) adjust EIA data to exclude growing biofuel, NGL and coal liquid inputs or b) recognize that for practical 'peak oil societal impact' purposes, we really do primarily care about 'net liquid fuel' available and the costs of same, which would require categorical adjustments and handicapping for energy quality.

The EIA defines Oil Supply as the "production of crude oil (including lease condensate), natural gas plant liquids, and other liquids, and refinery processing gain (including gains from refining imported oil!)". This includes the tar sands production in Alberta but not the Orinoco sands in Venezuela.

Other Liquids are defined as "Ethanol, liquids produced from coal and oil shale, non-oil inputs to methyl tertiary butyl ether (MTBE), Orimulsion, and other hydrocarbons." And finally, other hydrocarbons are defined as "Materials received by a refinery and consumed as a raw material. Includes hydrogen, coal tar derivatives, gilsonite, and natural gas received by the refinery for reforming into hydrogen." Although currently a small number primarily in Europe, biodiesel feedstock presumably is a refinery 'raw material' (I am uncertain whether the 26 million tons of palm oil from Indonesia and Malaysia is included in the EIA data and have assumed that it is not)

Last year, the world produced over 12 billion gallons of ethanol. At 42 gallons per barrel, that equates to 290 million barrels. The world (specifically South Africa) also produced 160,000 bpd of Coal-to-liquids which was 58 million barrels for the year. So of the 30.66 billion barrels of 'oil' produced in 2005, about 350 million of them were ethanol and coal derived, or about 1.2%.

1.2% is not a big number (yet). But keep in mind that total oil production for 2004 was 30.3 billion so the 'record setting' 2005 was higher by about the amount of ethanol and CTL. Ethanol production is up 300% since 1997 and has doubled in just the last 4 years. Continued growth at a similar pace will begin to make a meaningful contribution to the EIA totals. If ethanol advocates and alternative energy proponents get their way, these numbers will increase dramatically, and certainly outpace increases in oil production on a percentage basis. Also, the Hirsch and Bezdek report (slide 84) assume five 100,000 bpd coal-to-liquid plants a year starting in year 4 of a mitigation scenario. One could argue we are in the early stages of this now as numerous corporations are exploring syncrude options from coal. CTL is a liquid fuel, but it is not oil.

This post has 2 main points:

1. Natural gas plant liquids (NGPL) counted as 1 for 1 in the headline crude oil production figure, only have 60% of the energy content of crude oil. Also, irrespective of ethanols energy input/output balance, ethanol only has less than 70% of the BTU per gallon as gasoline. It also requires liquid fuels (in addition to natural gas for fertilizer and nat gas or coal to steam) to harvest, transport and distribute. So the 290 million barrels of ethanol made in 2005 actually used quite a bit of oil to produce. Was the EIA correct to increase crude oil production from 30.37 GB to 30.66 GB for 2005 because of ethanol? If we are tracking "Peak Oil", or the maximum amount of oil available to a growing, demanding planet, we should care about the net (I'll save the net energy/EROI argument for a subsequent post - here I just mean net liquid fuels).

   Clearly, real businesses and individuals used some of the 30.37 GB of non-ethanol oil to produce the ethanol. So the greater the % of 'indirect oil' in the EIA totals, the more we scale up both the assets and liabilities of the planets energy balance sheet. (an extreme example would be an EROI of 1:1 for ethanol (with all energy inputs being liquids), then we might produce 50 mbpd of crude oil and 50 mbpd of ethanol for a total of 100 mbpd of EIA 'oil'. In this example however, every single drop of crude oil would be needed to produce the ethanol, so society would only have 50 mbpd of production (ethanol) at a 70% BTU rating. Obviously non-sensical. This is an extreme example, but at what point from it and our current situation (1.2%) does it become important...? (*In this example, notice that the reported production would be 100mbpd but only 50mbpd of ethanol would be available to society - at that moment we couldn't just instantaneously choose the *better* crude oil and abandon the ethanol because infrastructure would already be in place - there is a large societal time lag for Product A to Product B transformation decisions)

   Energy is the ability to do work. Our society is highly dependent on liquid fuels to do work. To trade one form of liquid fuel for another and include them both in production doesn't make sense.

2. Though it hasnt mattered a whole lot until now, using EIA data for any predictive heuristics based on geological regions may be inappropriate, as it increasingly includes biofuels, NGL and CTL (as well as orimulsion). The EIA can do whatever they want- they don't care if their reporting of liquid fuels conforms to bloggers doing depletion analysis, but should those of us who study and care about energy descent really include corn ethanol, soy diesel and Fischer-tropsch CTL in future 'oil' analyses?

Arguments about the tempest that is Peak Oil will become even thornier as more lower quality/costlier alternatives are defined 'as oil'. Once maximum oil production is validated globally, all we WILL care about is net liquid fuels available to society and at what costs in both dollar and natural resource terms, not whether Hubbert or anyone else was right. Said differently, if the EIA took ethanol out of their oil production numbers, I wouldn't have had to make this post.

SOME RIGHTS RESERVED This work is licensed under a Creative Commons Attribution-Share Alike 3.0 United States License.