The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Our Energy Supply: Some Basics

Posted by Gail the Actuary on March 13, 2010 - 10:45am
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If a person were to listen to Energy Secretary Steven Chu or National Geographic's Aftermath: World Without Oil, one might think that our energy problems are fairly minor and distant. We can easily add sufficiently renewable energy to substitute for fossil fuels in a fairly short time frame. All we need to do is put our minds (and pocketbooks) to it.

But if one looks at the situation more closely, one discovers that the situation is quite different. Our energy problems are close at hand, and solutions using what are optimistically called "renewables" are distant and may very well sink the country further into recession.

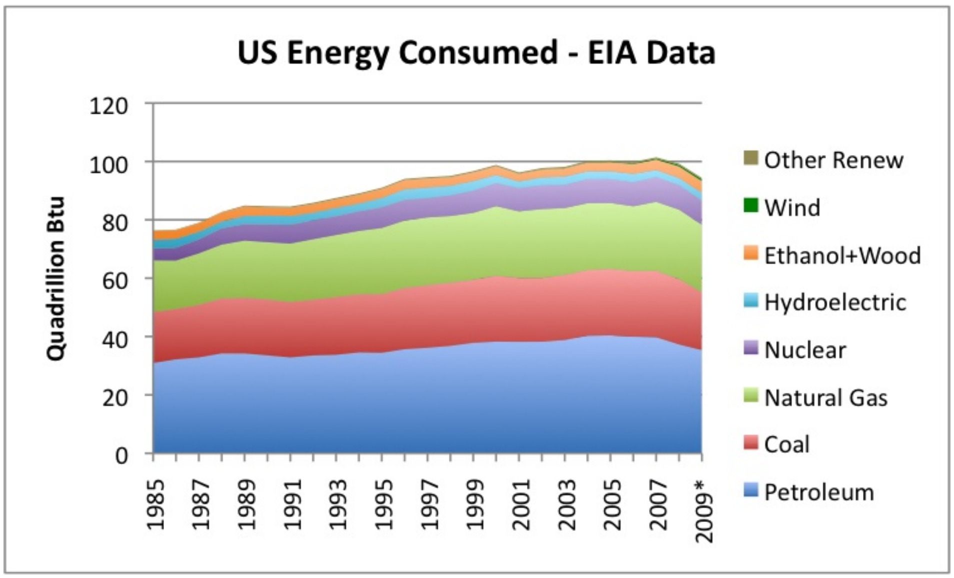

Figure 1- US energy consumption by source, based Energy Information Administration (EIA) Monthly Energy Review Table 1.3.
**Year 2009 estimated based on data through November.*

US energy consumption is already down quite a bit--some might say due to recession, but it seems even more likely that the result is the other way around--high energy prices squeezed the financial system. This in turn caused credit availability to drop and demand for oil, gas, and coal to drop. We have put a huge amount of effort and subsidies into wind and solar, but they hardly show up on the chart. Ethanol isn't shown separately in the chart this data was taken from--instead it is combined with wood and with other biofuels in a category called "biomass" in the EIA data. The biomass line has thickened a bit, but it is still pretty insignificant.

The following are a few observations about our current situation:

1. Even though wind, solar photovoltaic (PV), geothermal, and ethanol are called "renewables", they cannot be produced without fossil fuels, and need fossil fuels for maintenance.

In many ways, these energy sources should be called "fossil fuel extenders" rather than renewables, because they are very dependent on our current system. For example, growing corn for ethanol depends on tractors run by diesel for growing the corn, and natural gas or coal to power the ethanol plant. Corn is fertilized using fertilizers which are often imported, and sprayed with oil-based insecticides. Wind turbines require regular maintenance, and need to be part of an operating electrical system with fossil fuel back-ups. Solar PV will continue to make electricity once they have been made, but will not produce round-the-clock electricity unless they are part of an electrical system (which requires fossil fuels) or have battery backups which are replaced every few years (also requiring fossil fuels).

2. World oil production appears to have peaked. If it has not reached its maximum level, its maximum level is likely only a few years away.

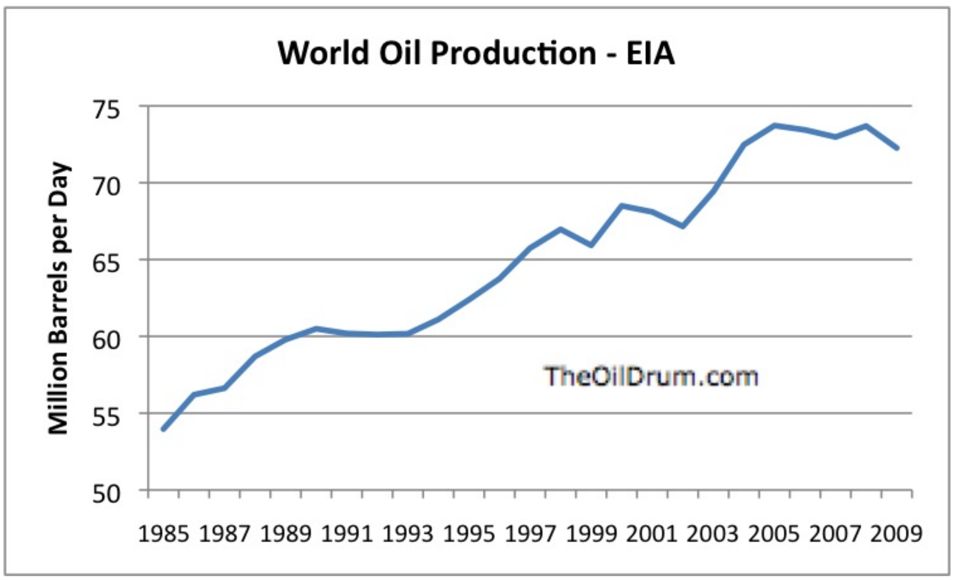

Figure 2. World oil production ("Crude and Condensate) from EIA Table 4.1d from [International Petroleum Monthly](#).

World oil production was increasing quite rapidly through 2004 (except for slowing down during recessions). In 2005, the rate of increase dropped, and production has been on a bumpy plateau since--although 2009 appears to be possibly headed downward--or at most on a continuing plateau for a while, before heading downward. There is no longer oil to be found which can be produced inexpensively--most of it was found long ago, and has already been pumped.

Newer sources of oil tend to be more expensive. If economies could really afford $200 or $300 or $400 barrel oil, and had unlimited capital, perhaps production could increase some more. But at some point, we run short of capital for more and more expensive new production, and the high price of oil tips the economy into recession and dampens demand.

Many analyses are reaching the same conclusion about world oil production. Just this week, a new study from Kuwait predicted oil production may reach a peak and decline in 2014. The International Energy Agency has also been talking about the possibility of a peak before 2020.

3. Whether the peak in production is from Peak Supply or Peak Demand, the result for the consumer is equally bad--recession, reduced job availability, and increasing loan defaults.

It does not really matter whether one puts the label "supply constraint" or "demand constraint" on the resulting drop in production--the effect is the same. Prices are still high relative to historical prices, even through the world is struggling to emerge from recession, as shown in Figure 3 below.

Figure 3. Spot oil prices for benchmark West Texas Intermediate. Graph by EIA.

Oil is essential for food production and transportation. Consumers tend to cut back on discretionary purchases (causing recession) or to default on their loans, if their budgets are squeezed by high prices oil prices. James Hamilton was one economist showing a link between high oil prices and recession.

4. Scaling up renewables to replace fossil fuels in current quantities does not look like it has much of a chance of succeeding, even in the long term.

One issue is the point made previously--it takes fossil fuels to produce renewables like wind and solar PV. Also, Figure 1 shows our success in scaling up so far has been quite limited. Scaling up ethanol further would require taking a huge share of our corn crop. Cellulosic ethanol isn't working out to date, and may never work out. Wood and other biomass is limited in supply, limiting production if it could be perfected.

There may be some particular applications of renewables which may turn out to work out well--for example, natural gas from waste, or biofuel from waste grease. But these tend to be limited in quantity.

Even if we were to, say, discover a way of producing biofuel from algae economically, it would years to work out the details of scaling production up, and a huge amount of investment (and fossil fuels to make tanks and other apparatus) to actually produce the biofuel in quantity. One would probably be looking at more than 30 years before the process could be scaled up sufficiently to start replacing a significant share of our oil production.

5. Natural gas will not solve all of our problems.

There has been considerable publicity about the US having "100 years of natural gas" available at current usage levels. There are several issues, however:

a. Natural gas will not run in our current vehicles. Fixing vehicles to run on natural gas, and adding infrastructure to deliver the gas, is likely to be expensive and take quite a few years.

b. If we were to use natural gas for transportation, supply would run out very quickly--perhaps 20 years or use, or even less. Look at natural gas use, compared to oil use on Figure 1.

c. It is not clear that the "100 years of natural gas" is available at prices consumers can afford. If the price is high, we may very well have the same "peak demand" issue we have for oil--people will not be able to afford huge electric bills and huge home heating bills--say double today's level.

d. Scaling up natural gas faces huge challenges. Our infrastructure is only built for the current usage of natural gas. Adding more pipes, storage, and end usage is very expensive and time consuming. If the timing of the new infrastructure is slower than the increase in gas production, gas prices are likely to plunge or stay too low for profitability.

e. There are concerns regarding "fracking" near major water supplies, such as that of New York City. Expansion of natural gas may not occur to the extent that many are hoping will take place in the 100 year supply numbers.

6. If increased drilling is done in the US and offshore, is likely to have modest beneficial impact on oil supply, but it is highly unlikely that it will solve our problems.

Gary Luquette, President of Chevron North America Exploration and Production recently wrote:

> The good news: the OCS [Outer Continental Shelf] has significant potential. Over time, it could add 1 million more barrels of oil and natural gas equivalent a day--potentially representing a fifth of the current total U.S. oil production. Advances in technology could increase that amount dramatically.

One million barrels of oil and natural gas equivalent is great--certainly more than what we are getting from biofuels or from wind or solar. If one adds additional onshore production, it could be more than this, perhaps another 1 or even 2 million barrels of oil and natural gas equivalent a day.

But remember, this isn't even all oil--part of this is natural gas, the problems of which were described in Item 5, above. Compared to the world's oil supply, an additional one million barrels of oil a day about 1% of world oil production. Compared to US oil usage, an additional one million barrels of oil a day is about 5%. So the additional oil supply would be helpful, (as would the additional jobs, and reduction in needed imports), but it wouldn't solve all of our problems.

Also, if the price of the new oil supplies turns out to be too expensive (because, for example, the cost of drilling in deep water is too expensive), we may find that the new supplies are really more expensive than the economy can afford. Oil prices may remain below the cost of production, bringing a fairly quick end to new production--oil companies will soon quit production, if deep sea (or other new production) is clearly a money loser.

7. Renewables tend to be high priced. If our big problem with oil is high price, renewables will not solve our problems.

Subsidies only hide high price--the cost to the economy is high, with or without a subsidy.

If we can find ***cheap*** renewables, it would be in our interested to expand them as much as possible. But expanding expensive renewables should be done with great caution, in my opinion. We have no guarantee regarding how long the renewables will last--wind is likely only to last as long as fossil fuels supplies are available. Just because an analysis is done assuming that wind (or another energy source) will have a 40 year lifetime doesn't mean it will actually last that long.