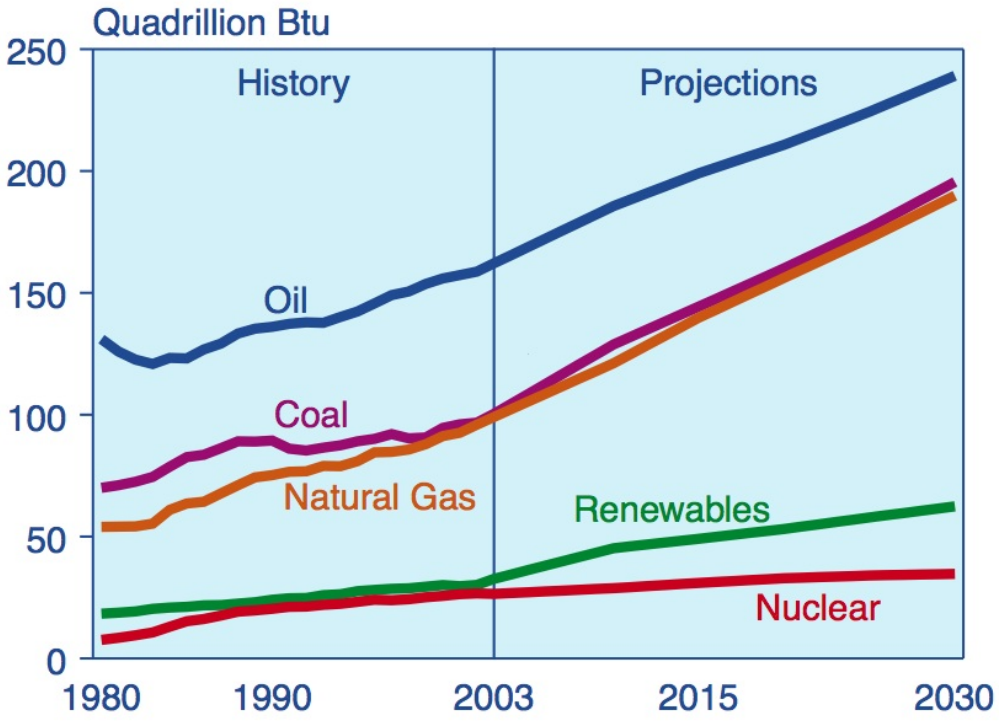
The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

A Critique of the 2006 EIA International Energy Outlook

Posted by Stuart Staniford on June 21, 2006 - 10:38am
Topic: Supply/Production
Tags: china, eia, opec, peak oil, united states [list all tags]

[editor's note, by Prof. Goose] Hey folks, see these buttons to the left? Note that they include reddit and digg. If you recommend TOD articles at these sites (account required, but they take seconds to set up, and once setup and logged in, all you have to do is click!), this actually helps! We can get more traffic driven over here! Please **hit the up arrow** for every article you think is worthy.

Freddy Hutter kindly emailed me to point out that the US EIA released the 2006 International Energy Outlook (IEO) yesterday morning. This is an annual exercise they have been doing since 1985 to project energy supply/demand out into the future - currently to 2030.



World energy production/consumption of various fuels 1980-2030 according to US EIA. This is Figure 3 of the 2006 International Energy Outlook.

As you can see - the future is bright to the EIA, unless perhaps you own beachfront or stormbelt property, in which case expect lots of wind and water. It will perhaps come as no surprise that I don't agree with their projections. Below are some critiques (mainly confining myself to the oil supply issues - others may want to take on the other fuels).

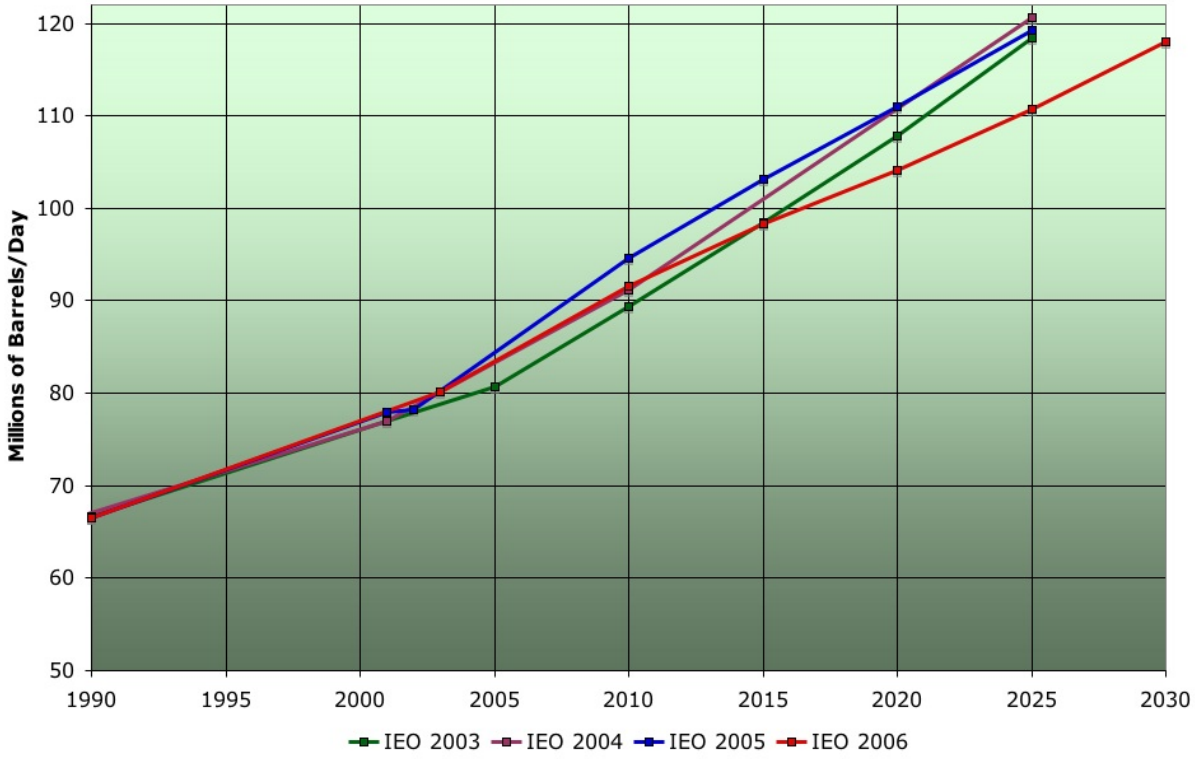
First off, I highly recommend a read of Appendix H, which gives a pretty objective seeming history of past performance of EIA forecasts, and gives their general caveats. I would summarize the past history discussion as follows:

- In the 1980s, they underestimated how fast market economy energy use would increase (ie they were slow to recognize the recognize the resumption in growth that would follow the retrenchment in the late 1970s and early 1980s after the big oil shocks).
- In the early and mid 1990s, they overestimated FSU energy use, and underestimated Chinese energy use. (Ie. they didn't foresee the severity of the collapse of the Soviet Union, and didn't recognize the strength of the transformation of China following the reforms of Deng Xiaoping).
- In the late 1990s, they overestimated energy use growth, as they didn't foresee the effects of the ruble devaluation and the Asian flu.

In short, the EIA generally operates by projecting recent history into the future, and doesn't typically recognize turning points until some time after they have been turned. In fairness, it is generally very hard to predict turning points in complex systems, and especially hard to call the timing of them well. As they themselves put the matter:

> The comparison of IEO projections and historical data in the context of political and social events underscores the importance of those events in shaping the world's energy markets. Such comparisons also point out how important a model's assumptions are to the derivation of accurate forecasts. The political and social upheaval in the EE/FSU dramatically affected the accuracy of the projections for the region. On the other hand, if higher economic growth rates had been assumed for China, more accurate forecasts for that region might have been achieved. It is important for users of the IEO or any other projection series to realize the limitations of the forecasts. Failing an ability to predict future volatility in social, political, or economic events, the projections should be viewed as a plausible path or trend for the future and not as a precise prediction of future events.

With that in mind, let's have a look at how their forecasts for oil have been evolving. Here is projected total oil supply from the last four annual editions of the IEO.



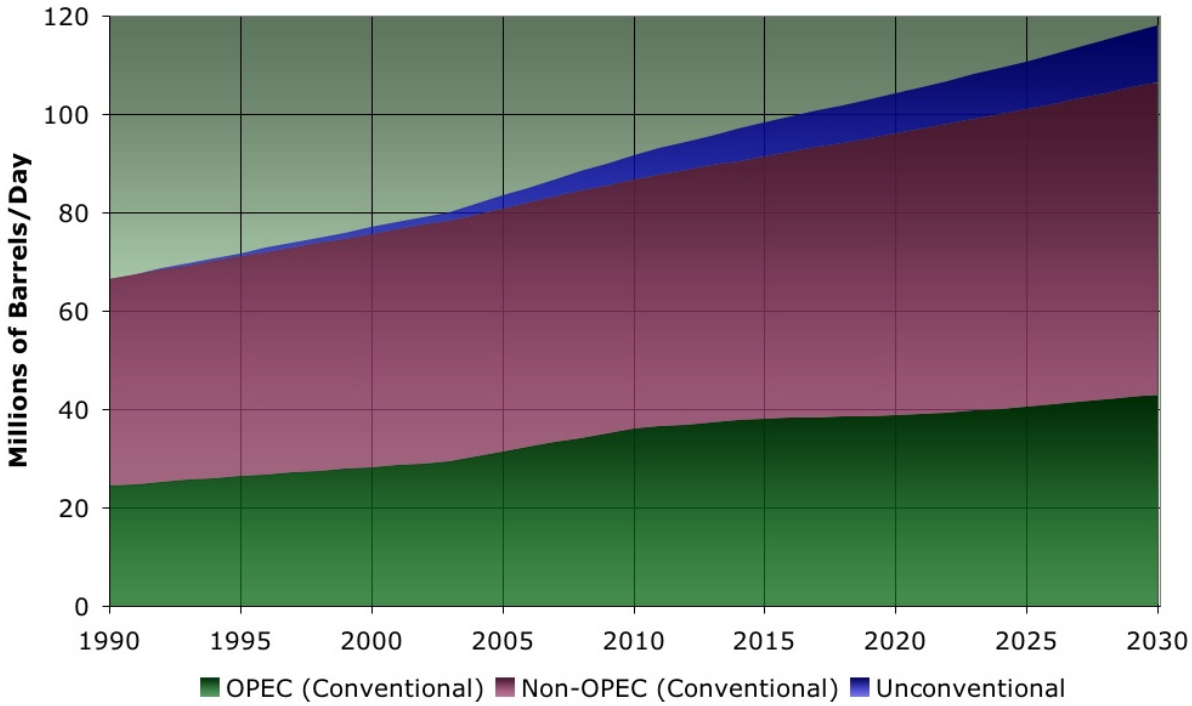
World production of oil 1990-2030 according to US EIA IEO reference scenarios from 2003 to 2006. Graph is not zero-scaled.

The changes are very small until this year, but they were anticipating slightly more oil in the mid-future. This year, higher prices have caused a reduction of demand a couple of decades off, but the difference only amounts to a few percent per decade. In short, they are only acknowledging very mild implications for the future growth of oil supply of current high prices and the associated production plateau.

In particular, peak oil is dismissed in a single sentence: the last one in this paragraph.

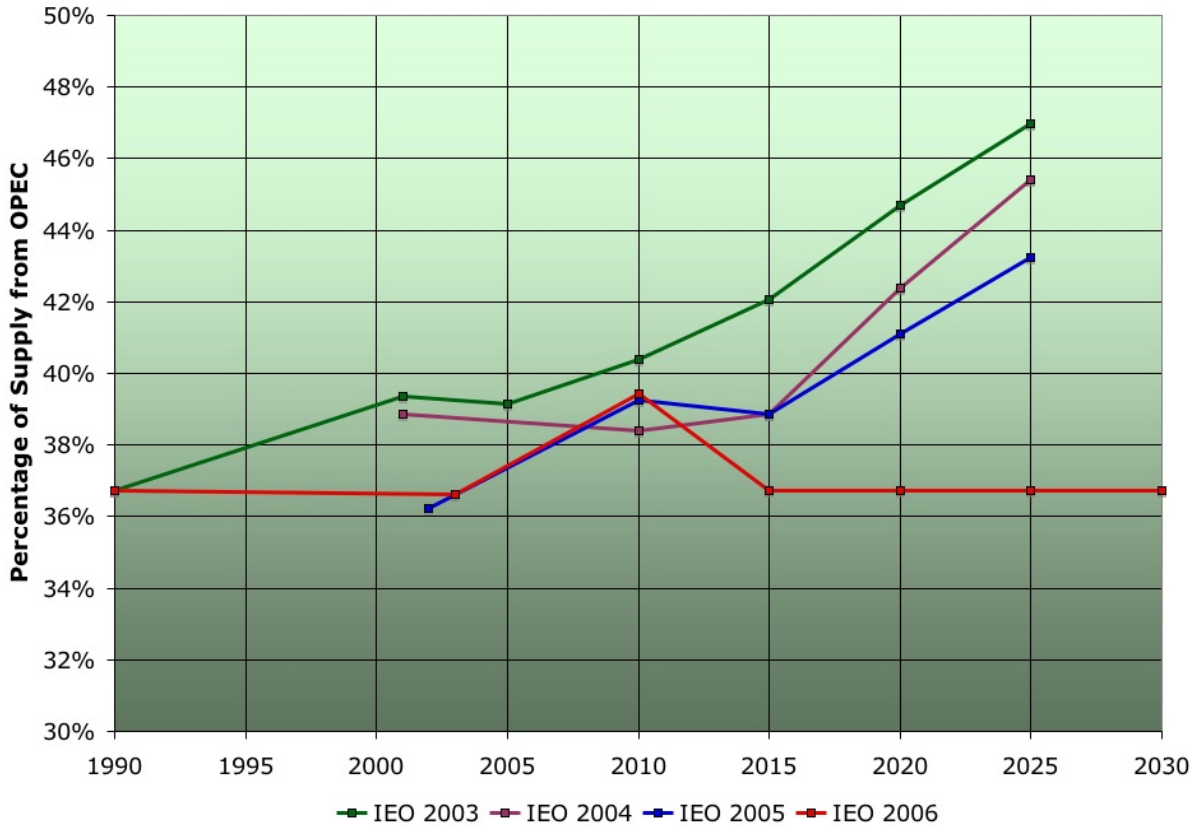
> It is important to note what this approach did and did not assume. A business-as-usual oil market environment was assumed. Disruptions in oil supply for any reason (war, terror, weather, geopolitics) were not assumed. It was assumed that all non-OPEC oil projects that show a favorable rate of return on investment would be funded. For the period out to 2030, there is sufficient oil to meet worldwide demand. Peaking of world oil production is not anticipated until after 2030.

But if we start to dig into where they think the supply is coming from, more interesting things emerge: things that might cause one to question the story-line. This next graph shows their decomposition of supply into OPEC, Non-OPEC conventional oil, and unconventional oil (tar sands, biofuels, GTL and CTL).



World production of oil by source 1990-2030 according to US EIA. This is redrawn from Figure 31 of the 2006 International Energy Outlook. The years 1990, 2003, 2010, 2015, 2020, 2025, and 2030 are from the EIA figure, and I have linearly interpolated between those points to give a clearer idea of the trends over time.

Clearly, unconventional sources are regarded as a small but rapidly growing player, and OPEC supply is expected to grow rather slower than the other components. Interesting. Even more interesting is to look at the changing assumptions about OPEC over the last few IEOS:



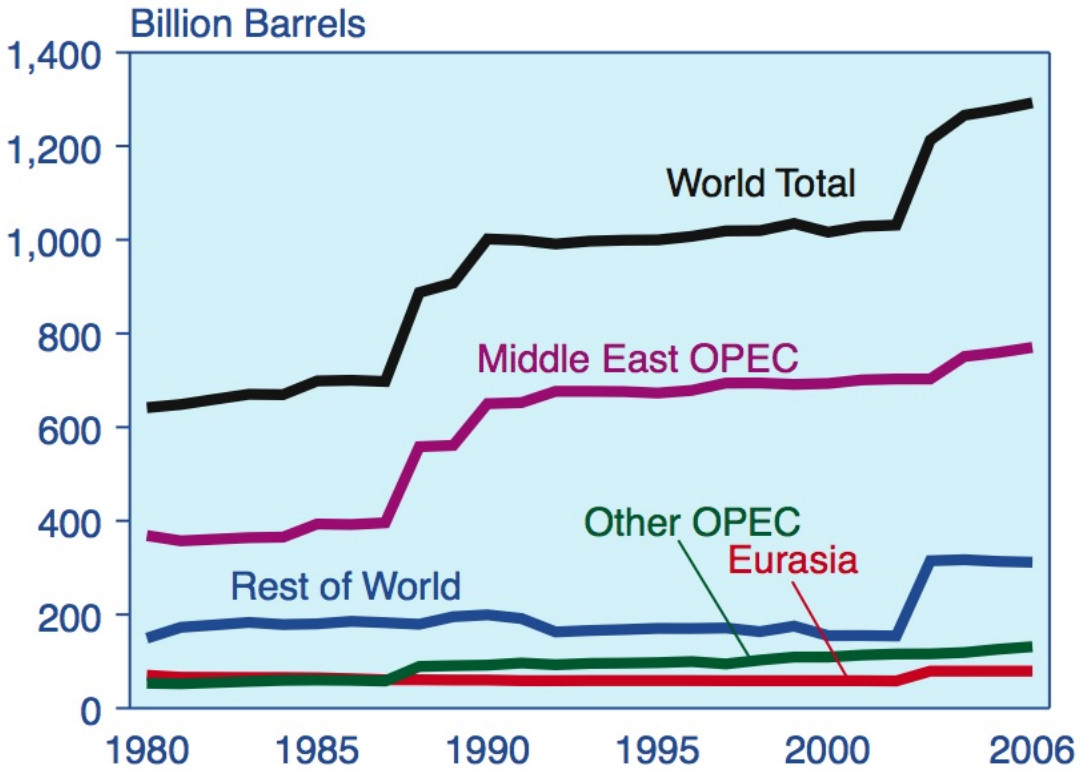
Percentage of world production of oil anticipated to be derived from OPEC from 1990-2030 according to US EIA IEOs from 2003 to 2006.

Question: what will the 2007 assumptions about future OPEC production look like?

Obviously, EIA has been getting steadily more pessimistic about OPEC with each year from 2003-2005, but then they really whacked into it this year. This is perhaps not surprising given the very public comments from senior OPEC figures that Western projections of OPEC production were unrealistic. However, the most recent curve looks highly suspicious. It jumps up from 36.63% in 2003 to 39.4% in 2010, and then falls back to a flat 36.74% in 2015-2030. That 36.74% figure is numerically identical to the value in 1990. In short, those OPEC production numbers didn't come from some complicated model of OPEC reserves and decision-making. Instead, they came from a fixed percentage of the top-line production.

I think this tends to support what many of us suspected about the EIA projections: they start with what they think will be a politically acceptable demand projection, and then tweak the supply assumptions to add up to that.

Speaking of made-up numbers, the elephant in the room now gets faintly outlined, though not actually honestly acknowledged and discussed. This graph is in the report for the first time (at least in recent years):



History of world oil reserves 1980-2006 according to US EIA. This is Figure 28 of the 2006 International Energy Outlook.

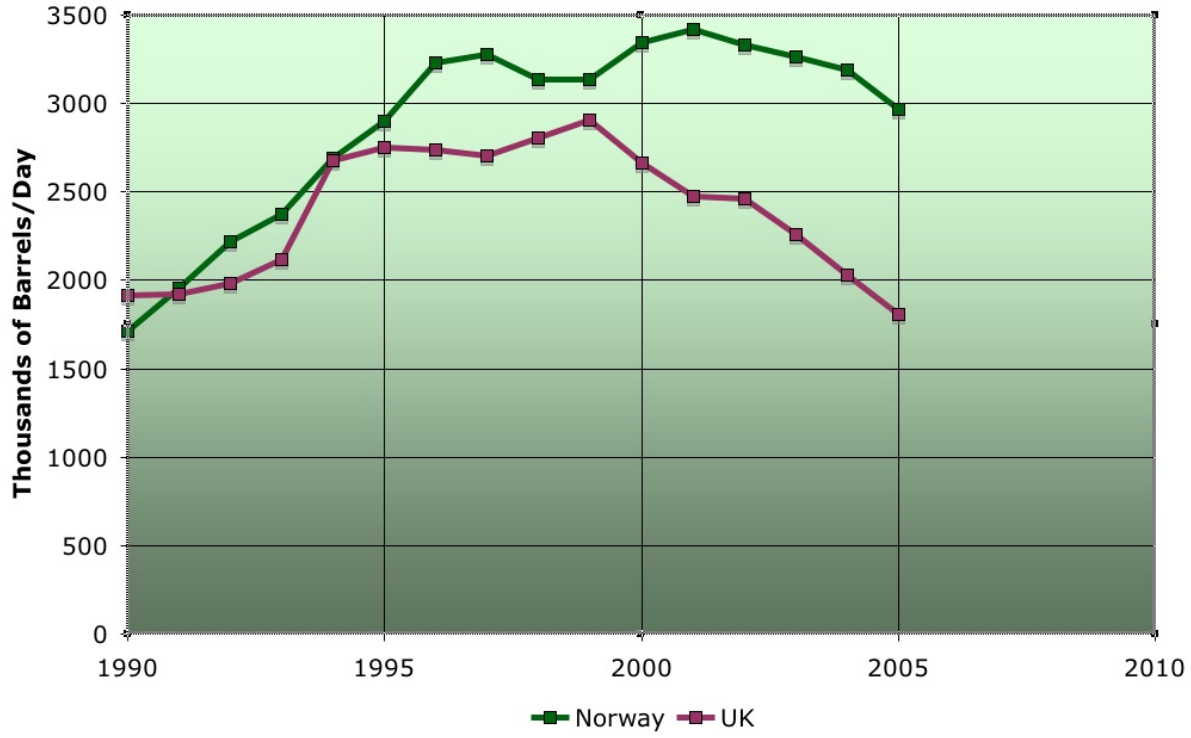
However, there is no discussion of whether or not those 1980s-era OPEC reserve revisions are credible or not. The diplomatic calculation seems to have been made that it just isn't nice to accuse a set of important suppliers of lying about the data, so instead of questioning whether that oil is really there or not, EIA and IEA couch it in terms of OPEC being unwilling to make the required level of investments to produce it. At least some distance to recognizing reality has been

covered this year, though I suspect there is further to go.

However, in order to make up the gap required now that OPEC cannot be the main solution to future growth in supply, severe strain is being put on the rest of the projection assumptions. For example, consider the assumptions about the North Sea:

> In the IEO2006 reference case, the decline in North Sea production is slowed slightly relative to past outlooks, based on the implementation of strategies for redeveloping mature fields. Production from Norway, OECD Europe's largest producer, is expected to peak at about 3.6 million barrels per day in 2006 and then decline gradually to about 2.5 million barrels per day in 2030 with the maturing of some of its larger and older fields. The United Kingdom sector is expected to produce about 2.2 million barrels per day in 2010, followed by a decline to 1.4 million barrels per day in 2030.

What planet are they living on?



North Sea Oil Production 1990-2005 Source: BP Statistical Review of World Energy, 2006.

UK production is already far below 2.2mbpd, and it's on track to decline to 1.4mbpd in the next year or two, never mind 2030. Likewise, it's hard to see Norway doing 3.6mbpd this year, and very hard to see production holding up above 2.2mbpd for the next 25 years. These assumptions seem ludicrous.

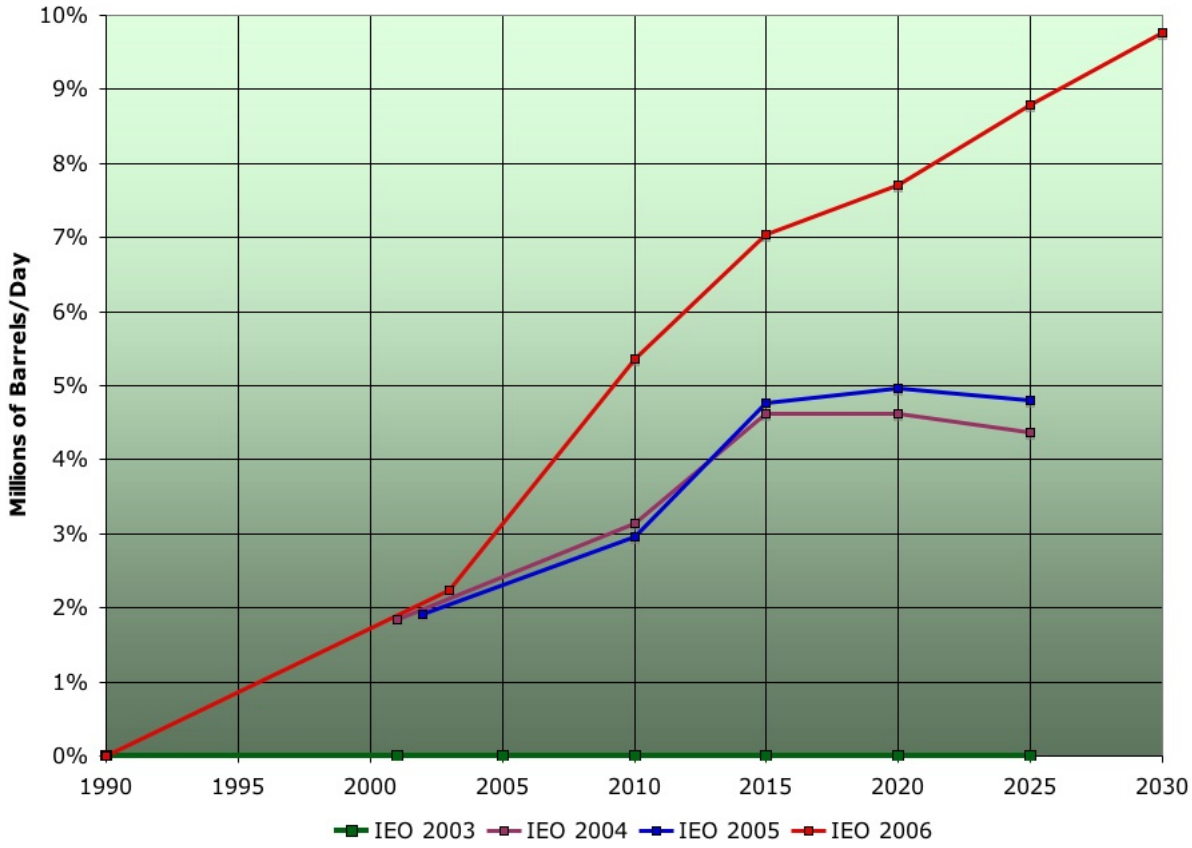
Also in the "what are they smoking?" category are these assumptions about Mexico:

> The IEO2006 reference case assumes in the sustained higher world oil price environment, Mexico's state oil company, Pemex will successfully lobby to use a larger portion of its profits to fund exploration and production investments and thereby increase production in the long-term. Production in Mexico exceeds 4.0 million barrels

> per day by the end of the decade and continues increasing to 5.0 million barrels per day by 2030, despite the anticipated decline in production of Mexico's largest oil field at Cantarell

And I hear that Dr Pangloss is soon to be appointed President of Mexico.

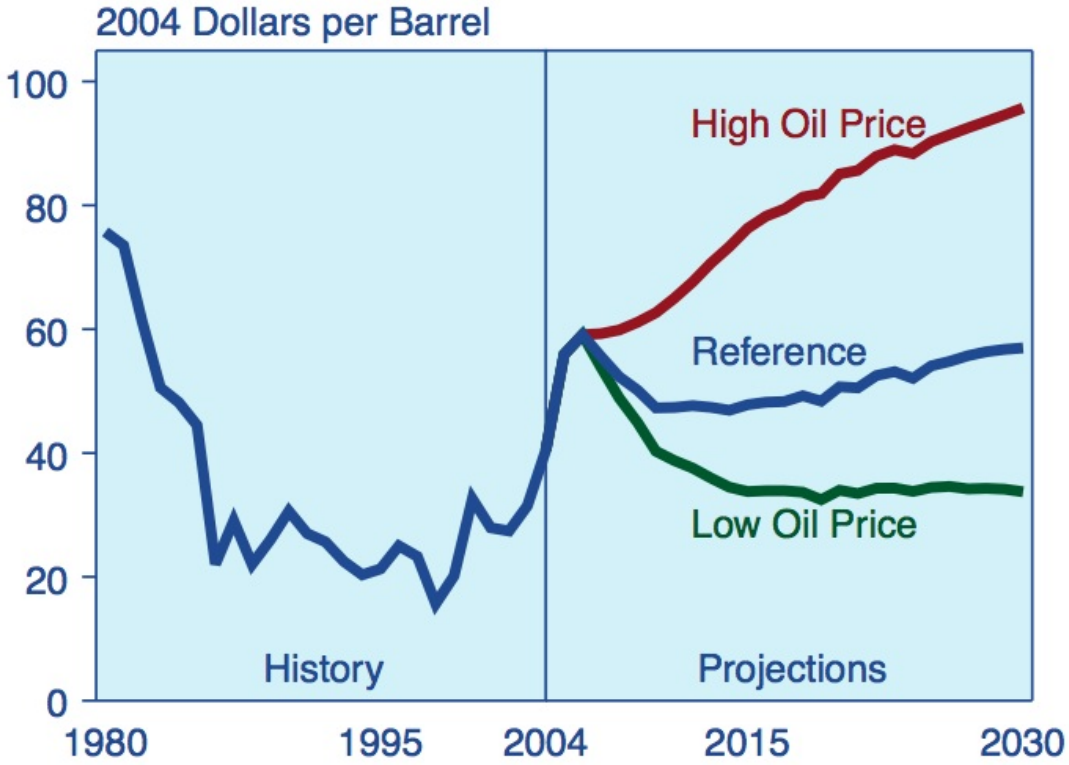
Here's the assumption about what proportion of oil supply is going to come from unconventional oil. This includes biofuels, coal-to-liquids, and tar sands.



Percentage of world production of oil anticipated to be derived from unconventional sources from 1990-2030 according to US EIA IEOs from 2003 to 2006. In 2003, unconventional sources were not detailed or discussed as important to future supply.

As you can see, EIA is assuming that prices are going to stay high enough that unconventional sources are profitable to develop, and that we will need them in much larger quantities than was assumed a few years ago.

Here are the price assumptions:

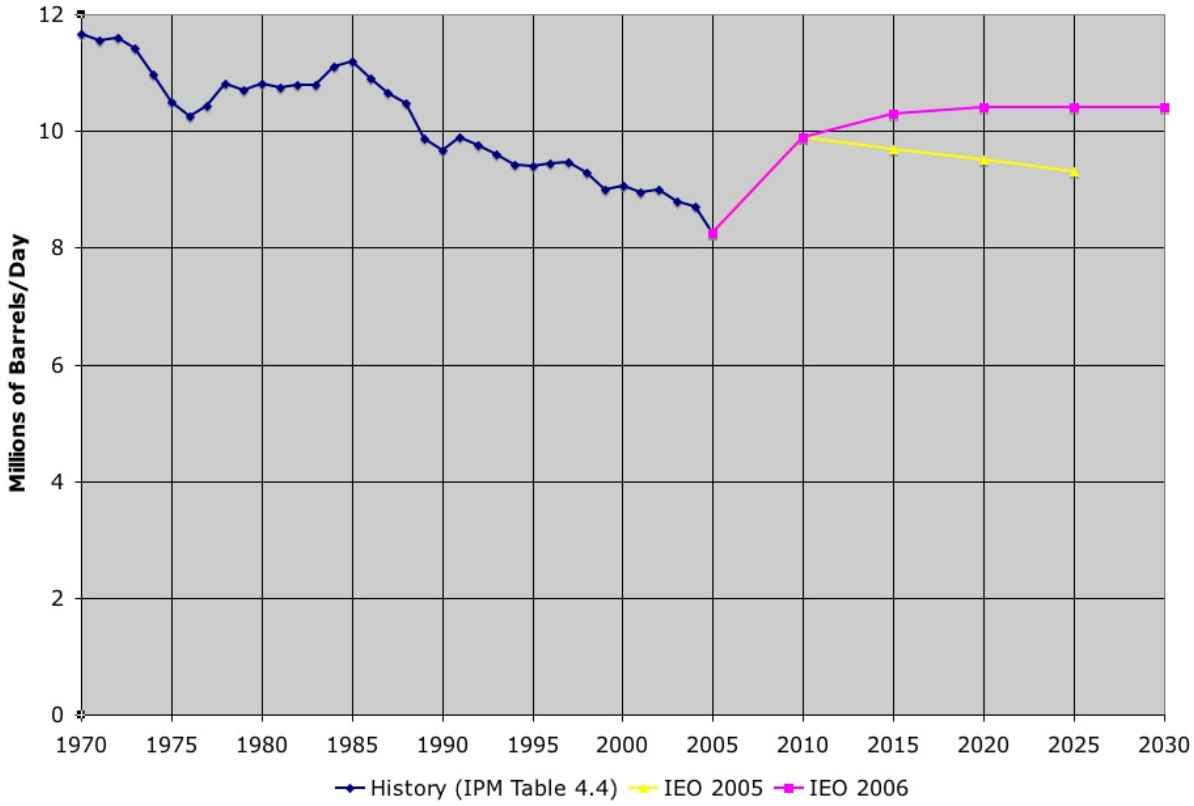


History of world oil reserves 1980-2006 according to US EIA. This is Figure 32 of the 2006 International Energy Outlook.

All my graphs above are for the reference scenarios, and in that scenario, prices drop in the near future, but stay in the $50-$60 band. Wouldn't want to deliver any bad news about near term gas prices to the political appointees, now, would we? The high case looks like a lower bound to me.

In summary, the EIA is now assuming less OPEC production and higher prices in the future, causing more use of unconventional oil. However, this is assumed to have very slight effects on overall supply, and no material impact on economic growth. Individual detailed elements of the projection are looking increasingly implausible, and I expect significant continued movement in the projection over the next few years as it slowly catches up with the unfolding reality.

Update [2006-6-21 18:52:53 by Stuart Staniford]: Here are the assumptions for future US production.



US total oil production. Historical data is from Table 4.4 of the most recent International Petroleum Monthly, and projections are from the 2006 International Energy Outlook, and it's companion in 2005. (The IEO historical data matches the Table 4.4 oil definition, but the latter is more complete).

Note the bump in historical US production from the late 1970s on is due to the startup of Alaskan production. Apparently, the EIA has found a domestic oil source significantly better than Alaska, and production from it will be starting soon.