The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

World Oil Forecasts Including Saudi Arabia - Update Aug 2007

Posted by ace on August 22, 2007 - 10:00am
Topic: Supply/Production
Tags: aramco, demand, ghawar, oil, peak oil, production, saudi arabia, supply [list all tags]

PLEASE NOTE: click on the link below for the most recent oil forecast update http://www.theoildrum.com/node/3623 which includes forecasts for Kuwait and the UAE.

Executive Summary

1. World total liquids production (Fig 1) remains on a peak plateau since 2006 and is forecast to fall off this peak plateau in 2009. According to the IEA, the current peak production of 86.13 mbd occurred on July 2006 and only one year later, June 2007 total liquids production fell to an unexpectedly low 84.28 mbd. As long as demand continues increasing then prices will also continue increasing.

2. Forecast world crude oil and lease condensate (C&C) production retains its 2005 peak (Fig 2). The forecast to 2100 shows declining C&C production, using a bottom up forecast to 2012 (Fig 3). The forecast to 2012 shows a 1%/yr decline rate to 2009, followed by a 4%/yr decline rate to 2012.

3. World oil discovery rates peaked in 1965 (Fig 4) and production has exceeded discovery for every year since the mid 1980s. Discoverable reserves in giant fields also peaked during the mid 1960s (Fig 5). The time lag between world peak discovery in 1965 and world peak production in 2005 of 40 years is similar to the time lag of 42 years for the USA Lower 48 (Fig 6).

4. World C&C year on year production changes to April 2007 and May 2007 (Figs 7,8) show significant declines for Mexico, North Sea and Saudi Arabia and significant increases for Russia, Azerbaijan and Angola. As Russia is likely to be on a production plateau and Saudi Arabia has probably passed peak production, the world C&C production will continue to decline slowly.

5. Key producer Saudi Arabia retains its 2005 C&C peak (Fig 10), which is the same as the peak year for world C&C (Fig 2). Saudi Arabia C&C production has now dropped to 8.6 mbd which is 1 mbd less than its peak in 2005. It is now almost a certainty that Saudi Arabia passed peak C&C production of 9.6 mbd in 2005 (Figs 9,10).

6. World natural gas plant liquids is forecast to increase due to new OPEC projects (Fig 11). World ethanol and XTL production is forecast to double by 2012 (Fig 12). World processing gains are forecast to decline slowly to 2012 (Fig 13).

---

1. World Total Liquids Supply & Demand

Although crude oil & lease condensate (C&C) production is forecast to continue declining, the total liquids supply remains on a plateau until 2009 (Fig 1), due to offsetting production increases from natural gas plant liquids (NGPLs), ethanol and XTL (BTL - biomass to liquids, CTL - coal to liquids and GTL - gas to liquids).

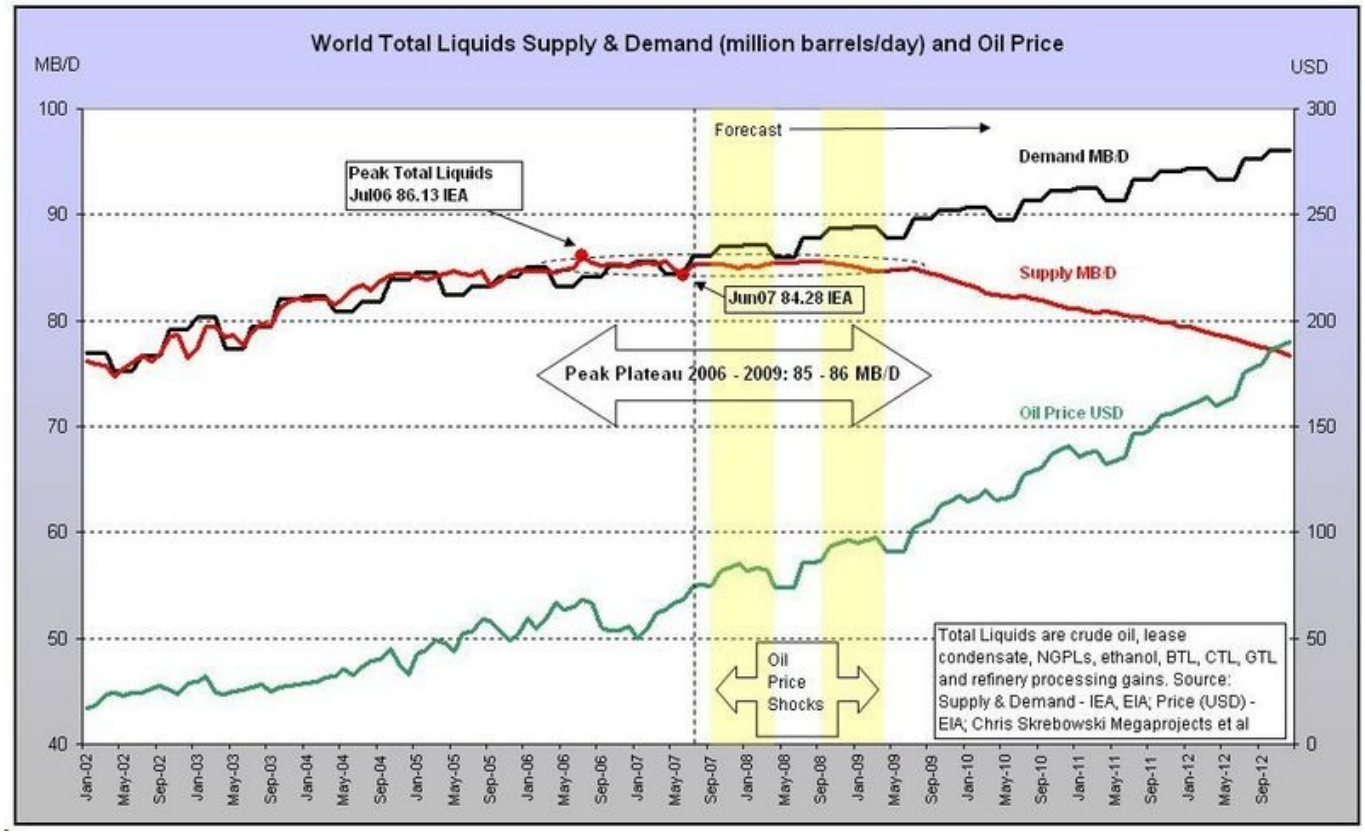

Fig 1 - Total Liquids Supply & Demand to 2012 (bottom up forecast) *- click to enlarge*

According to the 11 October 2006 IEA Oil Market Report Table 3, the current peak production of 86.13 mbd occurred on July 2006. On June 2007, total liquids production fell to an unexpected 84.28 mbd, from the 13 July 2007 IEA Oil Market Report Table 3, which represents a drop of 1.85 mbd, or just over 2%, in only one year.

This 1.85 mbd drop is due to falls in both OPEC and non OPEC total liquids. Unfortunately, OPEC natural gas liquids showed only a small production increase. OPEC-12 crude oil production fell by 1.60 mbd from July 2006 to June 2007. Although Angola crude oil increased by 0.14 mbd, the following significant decreases occurred: Saudi Arabia, 0.76 mbd; Iran, 0.30 mbd; Iraq, 0.12 mbd;

Kuwait, 0.12 mbd; Nigeria, 0.18 mbd; and Venezuela, 0.10 mbd. Non OPEC significant total liquids increases were 0.46 mbd from the former USSR (Russia, Azerbaijan, Kazakhstan and others) and 0.25 mbd of biofuels from outside of Brazil and USA. Non OPEC significant total liquids decreases were from Mexico, 0.12 mbd; Canada, 0.19 mbd; and Norway, a big decrease of 0.71 mbd.

Is future total liquids production likely to exceed the current peak of 86.13 mbd on July 2006? It might be possible but it appears unlikely. Maintenance in the North Sea would be mainly responsible for the big drop in Norway's production. After the maintenance is finished, North Sea production should increase in the next few months but then North Sea production should resume its decline. Mexico's production is in decline now. Former USSR production might increase by a small amount. Canada's production should increase slowly but the oil sands are experiencing production constraints and despite claimed reserves of up to 315 Gb (billion barrels), the oil sands will probably produce, at best, a maximum of only 2.5 mbd (million barrels/day). Biofuels production should also continue increasing. Non OPEC total liquids production might increase slowly, assuming that no unexpected disruptions occur.

In order for world total liquids production to exceed the current peak, OPEC total liquids production must also increase. OPEC meets next in September to potentially discuss production levels. However, OPEC will increase production if its members agree to increase production and if the many old OPEC oil fields are physically capable of increasing production. However, OPEC member Iran does not expect that production rates will be on the agenda. OPEC may have some capability to increase production but their remaining oil reserves could have a higher monetary value by holding production at current levels and selling remaining oil at higher prices later.

The challenges of increasing world production are highlighted by the former Saudi Aramco exploration and production head, Sadad Al-Husseini, who made this recent statement regarding the new sentiment of oil producers:

> There has been a paradigm shift in the energy world whereby oil producers are no longer inclined to rapidly exhaust their resource for the sake of accelerating the misuse of a precious and finite commodity. This sentiment prevails inside and outside of OPEC countries but has yet to be appreciated among the major energy consuming countries of the world.

Al-Husseini also made this statement in 2005 about the physical ability of the world to increase production:

> "You look at the globe and ask, 'Where are the big increments?' and there's hardly anything but Saudi Arabia," he said. "The kingdom and Ghawar field are not the problem. That misses the whole point. The problem is that you go from 79 million barrels a day in 2002 to 82.5 in 2003 to 84.5 in 2004. You're leaping by two million to three million a year, and if you have to cover declines, that's another four to five million." In other words, if demand and depletion patterns continue, every year the world will need to open enough fields or wells to pump an additional six to eight million barrels a day — at least two million new barrels a day to meet the rising demand and at least four million to compensate for the declining production of existing fields. "That's like a whole new Saudi Arabia every couple of years," Husseini said. "It can't be done

> indefinitely. It's not sustainable."

It is possible, but unlikely that world total liquids production will exceed the current peak of 86.13 mbd because this would require simultaneous and significant production increases from both OPEC and non-OPEC countries.

As world total liquids production is forecast to decrease to 2012 (Fig 1), two important consequences are likely to occur. First, as demand is forecast to increase, prices are forecast to rise, using short and long run price elasticities, which will force demand downwards to equal supply. Second, the decreased available supply may invoke the IEA Response System for Oil Supply Emergencies. Unexpected supply reductions could trigger oil rationing among the 26 countries which are signatories to this IEA Response System, but unfortunately China, Russia, India and Brazil, which are not signatories, are highly unlikely to agree to the IEA's rationing method. The resulting tensions, from oil supply shortages, among the signatory and non-signatory countries could lead not only to continued competitive oil bidding, but also to continued conflicts and violence in order to secure vital oil supplies.

2. World Crude Oil & Lease Condensate Production

The largest component of world total liquids production is world C&C production. The first part, 2007 to 2012, of the forecast to 2100 (Fig 2), is created using a bottom up forecast based on over 300 continuously updated regions/projects from 2007 to 2012 (Fig 3). After 2012, two scenarios are shown. The first, the unlikely forecast scenario, shown by the green line, uses BP Annual Statistics Review 2006 proven reserves data which include grossly overstated OPEC reserves data. The second, the most likely forecast scenario, shown by the dark red line, is based partly on the BP reserves data, but large downward revisions are made to OPEC reserves and small upward revisions are made to the reserves of many countries to derive a more accurate estimate of proven and probable reserves. Yet to find C&C reserves are added to this estimate of proven and probable reserves to give world total ultimate recoverable reserves (URR) of 1.82 Tb (trillion barrels) including remaining URR of 0.78 Tb as at end 2006.

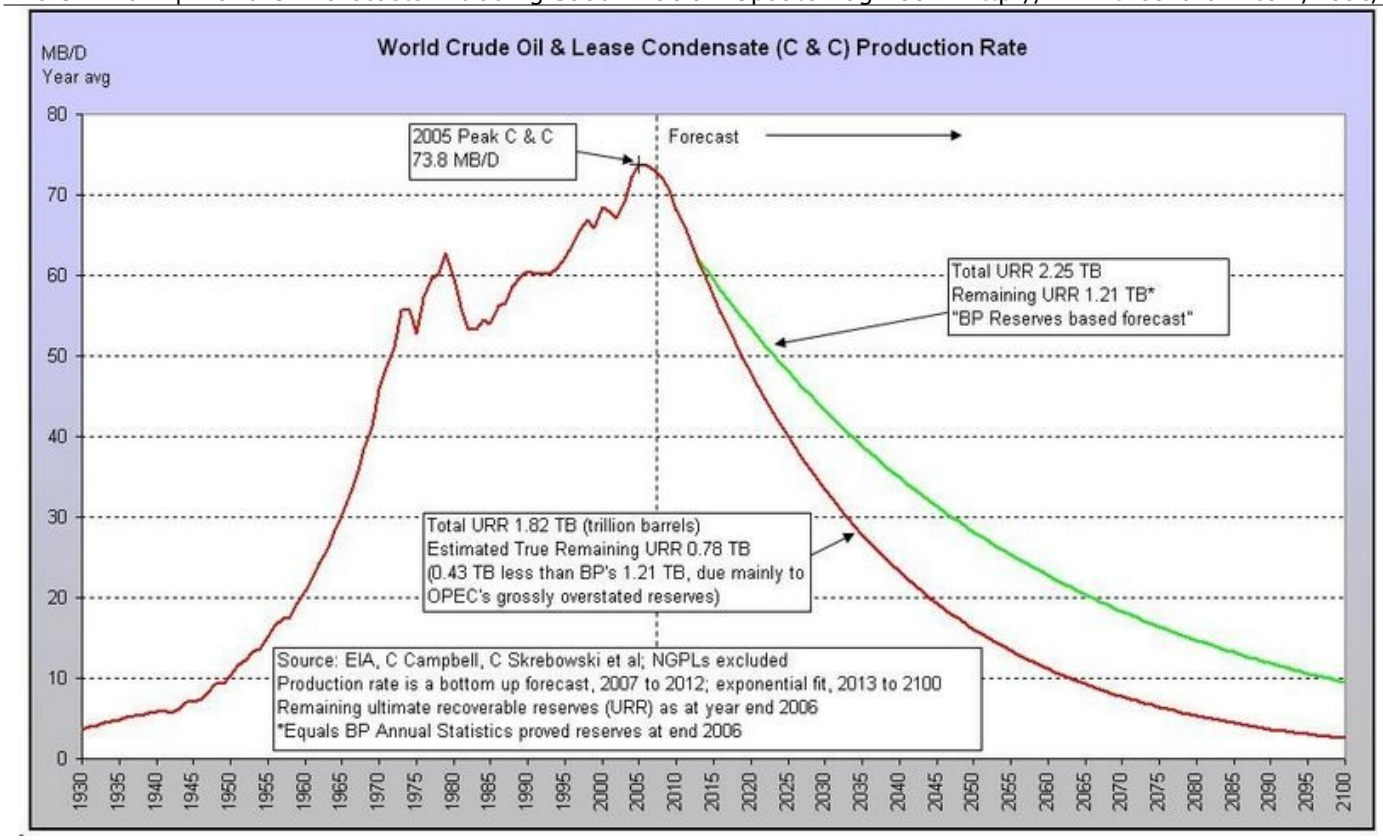

Fig 2 - World Crude Oil & Lease Condensate Production to 2100 *- click to enlarge*

World C&C production continues to retain its May 2005 peak and is forecast to decline by 1%/yr until 2009. The decline rate steepens to 4%/yr until 2012. The main reason for the end of the total liquids plateau in 2009 (Fig 1) is that the C&C production decline rate changes from 1%/yr to 4%/yr in 2009.

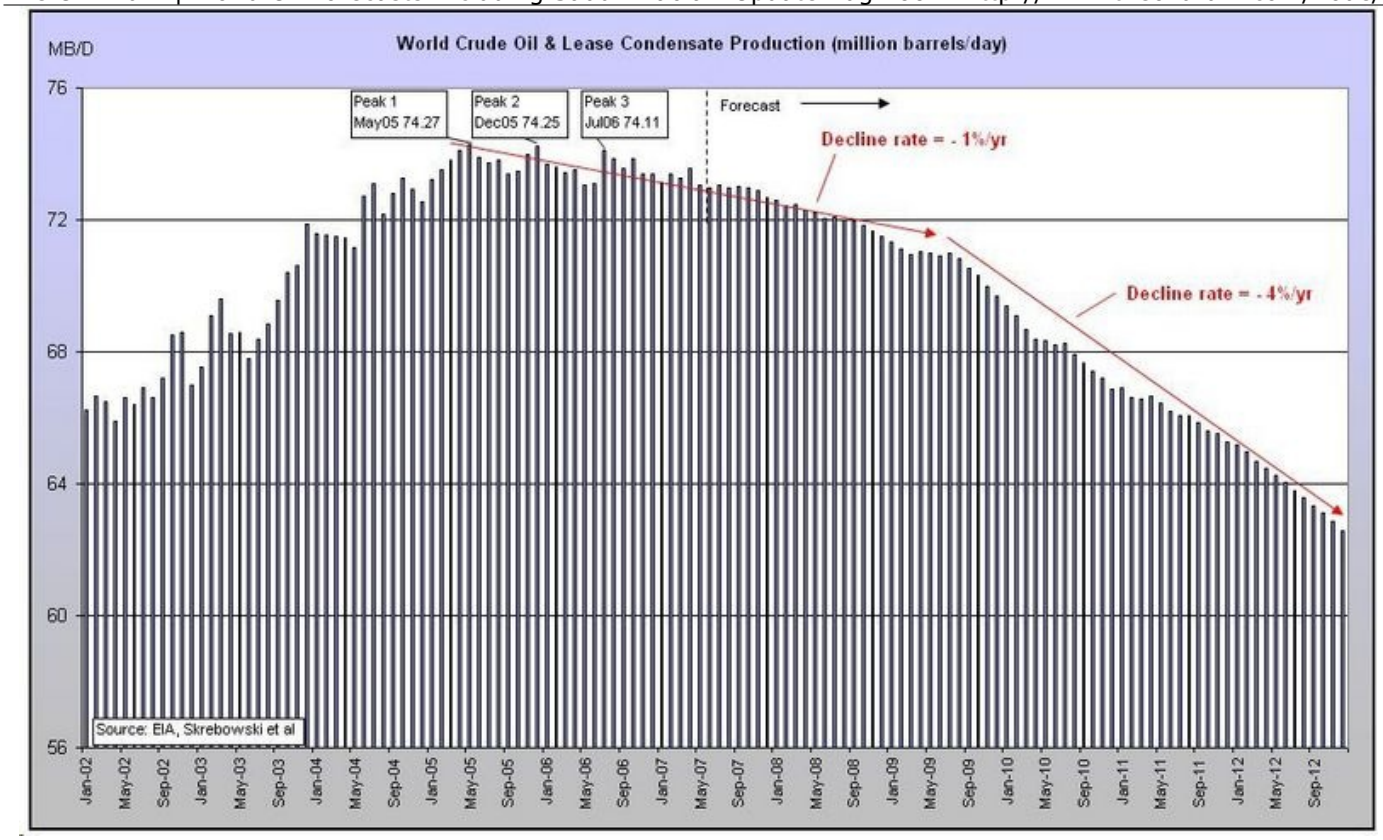

Fig 3 - World Crude Oil & Lease Condensate Production to 2012 (bottom up forecast) *- click to enlarge*

3. Peak Production and Peak Discovery Time Lags

Although the forecast production decline rate in Fig 2 appears high, it is a natural time lagged response to the peak year for discoveries as shown in this section. Fig 4 shows the peak discovery year in 1965, followed by a steady decline in the discovery rate. For every year since the mid 1980s, annual production has been greater than annual discoveries. This is not sustainable and it is inevitable that world annual production will start to decline. This timing of peak production and rate of decline is forecast by Fig 2.

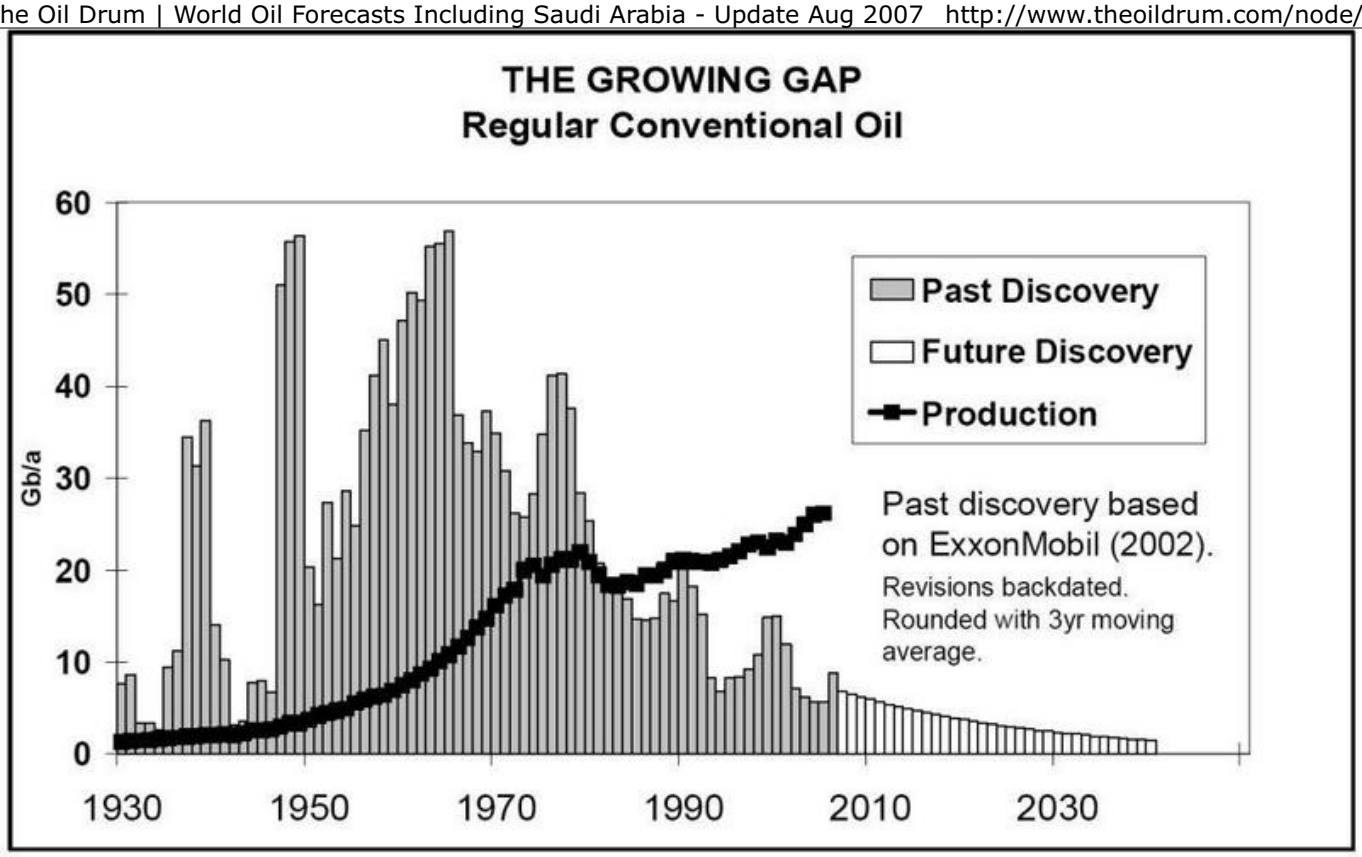

Fig 4 - World Discoveries (source [ASPO Ireland Newsletter No. 80, August 2007](#)) - *click to enlarge*

The figure below focuses on giant oil field discoveries and shows a similar shape to the figure above. The number of giant oil fields discovered peaked in the 1960-69 decade and both the number of giant fields and their respective recoverable reserves have declined steadily. The shape of the discovery decline curve below from 1960 to 2006 is similar to the production decline curve (Fig 2) from 2005 to 2100.

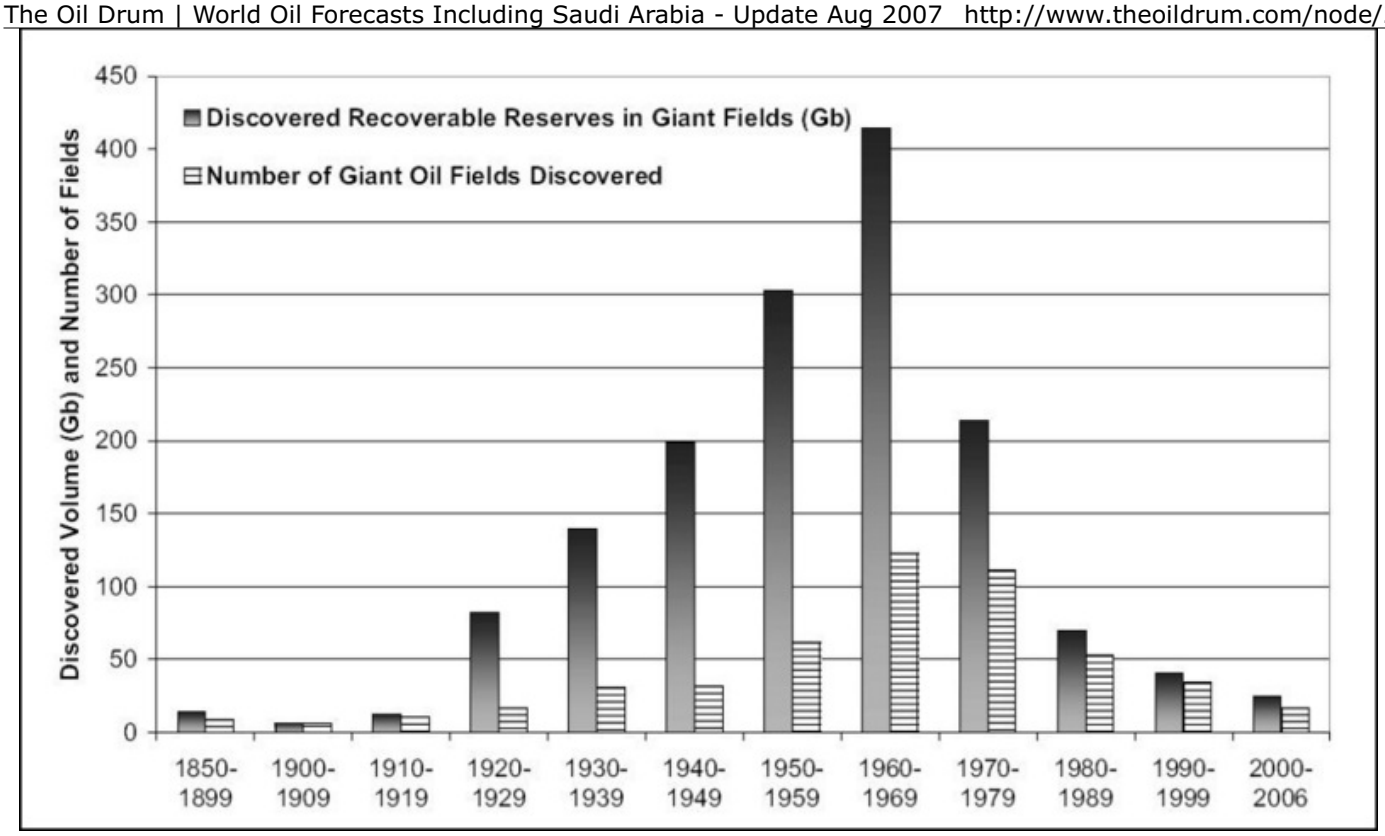

Fig 5 - World Discoveries, Giant Oil Fields (source Giant Oil Fields – The Highway to Oil, Fredrik Robelius, March 2007) *- click to enlarge*

A very good example of the time lag between peak discovery and peak production is the USA (Fig 6). Peak discovery was 1930 and peak production occurred 42 years later in 1972. Fig 4 shows peak discovery for the world occurred in 1965. Fig 3 predicts that peak production occurred in 2005, which is 40 years later than peak discovery, a similar time lag to the USA.

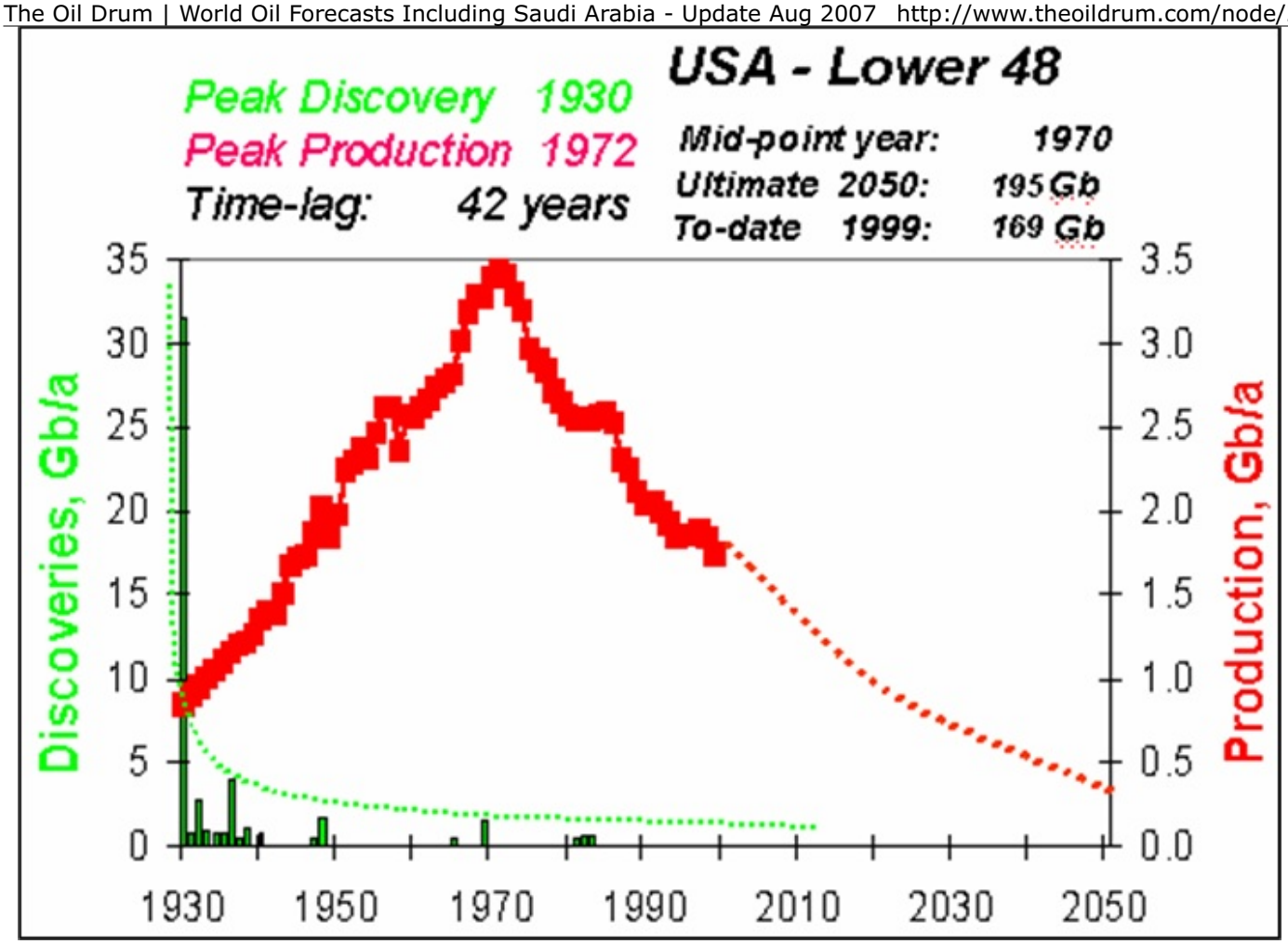

Fig 6 – USA Lower 48 Peak Discovery and Peak Production (source [Peak Oil: an Outlook on Crude Oil Depletion, Colin J.Campbell, February 2002]) *- click to enlarge*

4. World Crude Oil & Lease Condensate Production Changes

Year on year production changes, represented by the green bars in Figures 7 and 8 below, show the biggest declines for Mexico, North Sea and Saudi Arabia and the biggest increases for Russia, Azerbaijan and Angola. Angola has many projects which should increase its production capacity but actual production rates may be limited to OPEC quota targets of about 2 mbd which are likely to be "assigned this year or early 2008" according to the OPEC Secretary General. Russia's mature field production will probably limit Russia's future production growth.

Month on month changes from Mar 2007 to Apr 2007 (Fig 7), represented by the light blue bars, indicate that the reduction of militant action in Nigeria helped increase its production. Over the same time period, Russia showed a small decrease in production, assumed to be caused by seasonal maintenance, while Iraq, USA, Australia, China and the North Sea showed small increases.

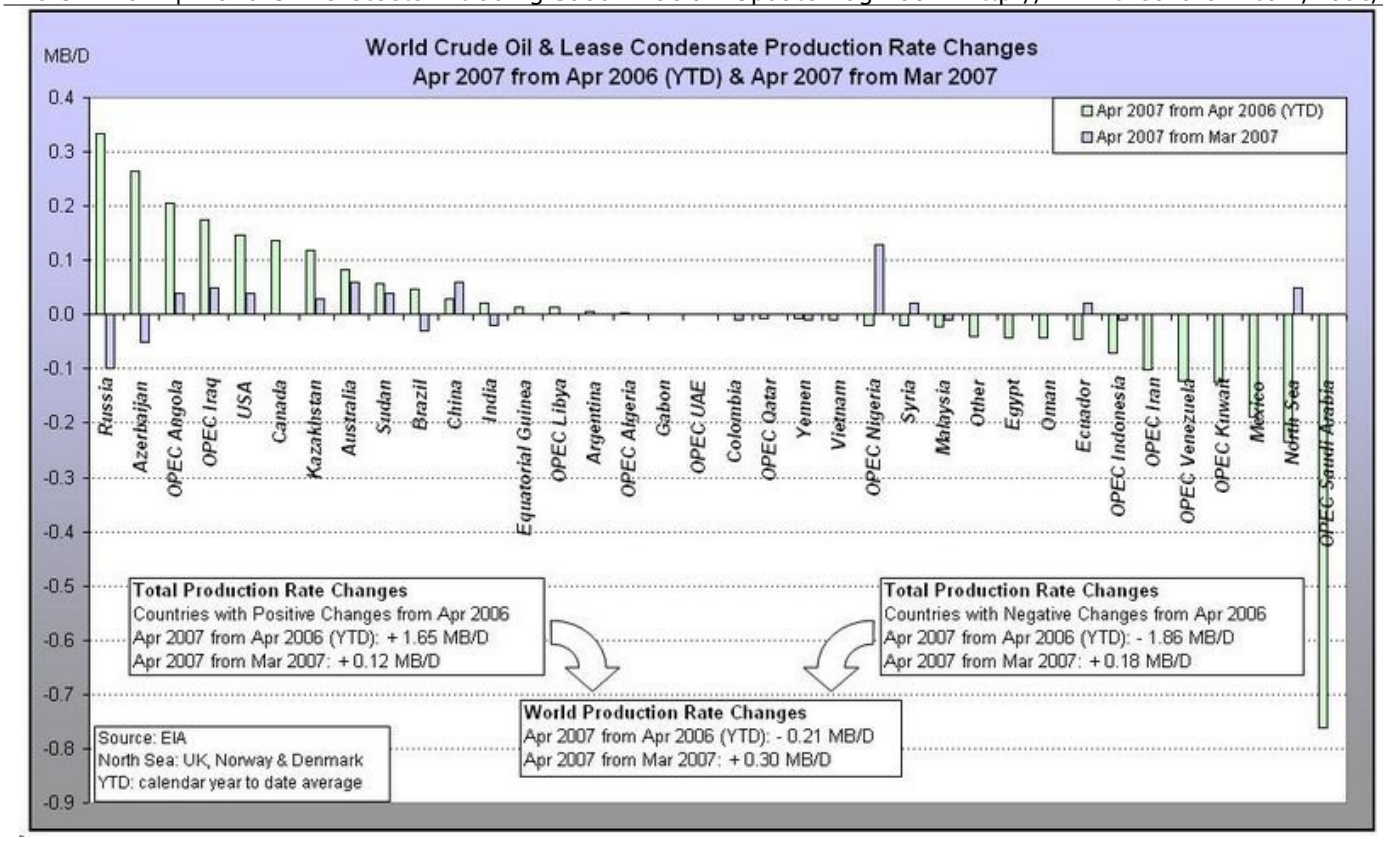

Fig 7 - World Crude Oil & Lease Condensate Production Changes to April 2007 - *click to enlarge*

Month on month changes from Apr 2007 to May 2007 (Fig 8) show an unfortunate fall in Nigeria's production due presumably to increased militant action. Production also fell for Canada, Kazakhstan and the North Sea, assumed to be due to seasonal maintenance. The production drop for Mexico is due mainly to continued geological decline as PEMEX announced that "oil reserves may run out in seven years". Also from Apr 2007 to May 2007, Canada decreased C&C production by almost 0.10 mbd, despite the optimism about oil sands. Russia showed a small increase in production of only 0.02 mbd. Could this mean that Russia's C&C production is on a plateau? The large total drop of 0.51 mbd in world C&C production from Apr 2007 to May 2007 should reverse in the coming months as maintenance activities are completed. Hopefully some easing of militant attacks will allow Nigeria's production to also increase.

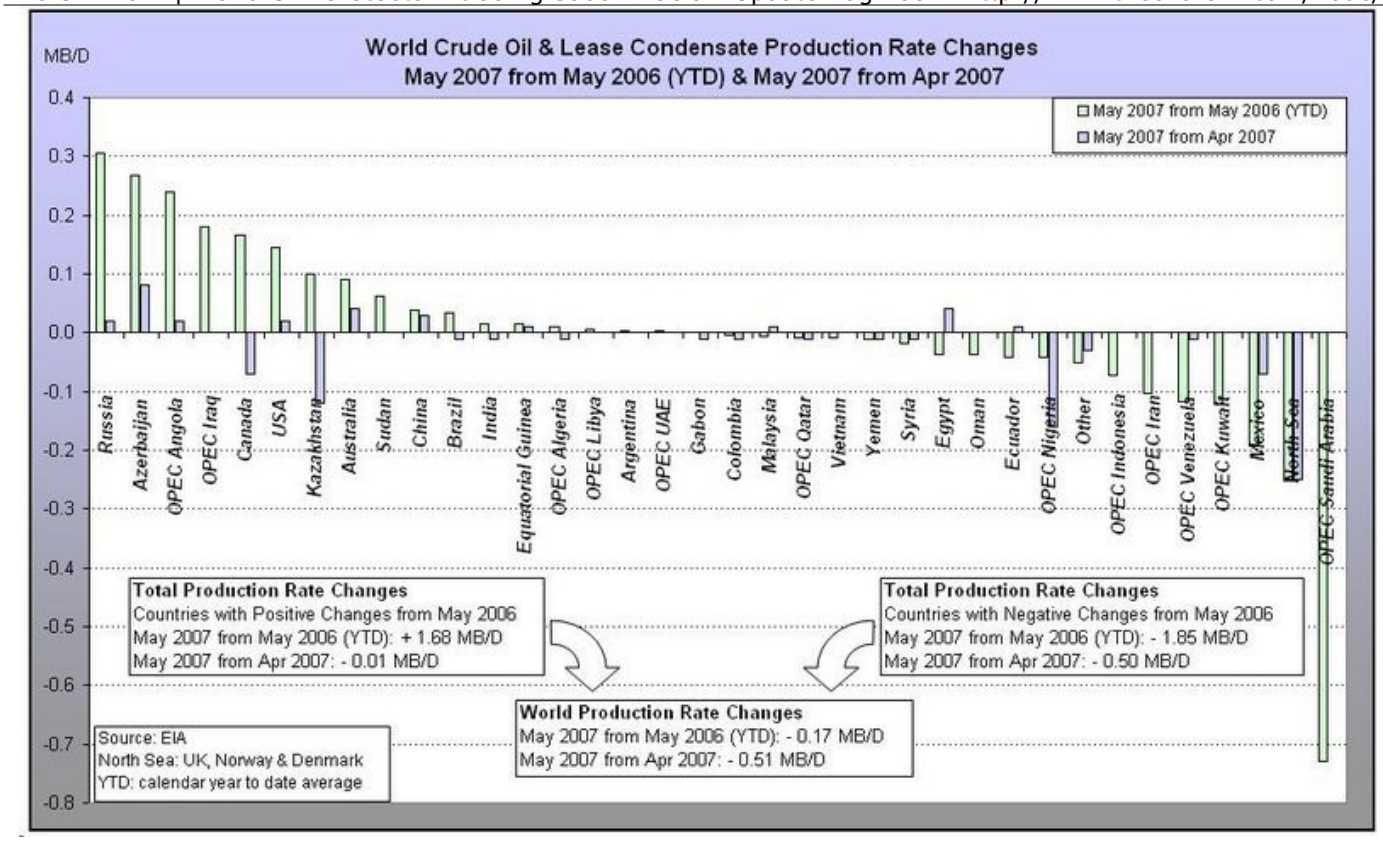

Fig 8 - World Crude Oil & Lease Condensate Production Changes to May 2007 - *click to enlarge*

World C&C production is dropping, on a year on year basis, by about 0.20 mbd (Figs 7 & 8). This is not a high decline rate but given that Russia is probably unable and unwilling to increase production and that Saudi Arabia, the North Sea and Mexico are unlikely to reverse their decline rates, the world C&C production rate will continue to decline (Fig 3).

5. Saudi Arabia Crude Oil & Lease Condensate Production

Saudi Arabia remains a key producer in the world and continually reminds the world of its enormous reserves and surplus production capacity. This paragraph on capacity in IEA's 12 June 2007 Oil Market Report, page 15, explains Saudi Arabia's current surplus capacity situation within an OPEC context.

> Notional spare capacity stands at 4.0 mb/d, while our measure of *effective spare capacity* (excluding Indonesia, Iraq, Nigeria and Venezuela) stands at 2.85 mb/d. Although these volumes are physically producible, even this lower figure likely overstates what OPEC could actually shift onto the market given current prices and shortages in refinery upgrading capacity. Heavy, sour Saudi Arabian and Kuwaiti crude accounts for 88% of the *effective spare capacity* figure. In the absence of substantial discounts, these volumes might struggle to find buyers while sizeable amounts of refinery upgrading capacity remain offline for scheduled and unscheduled maintenance. **Readily marketable spare crude capacity may therefore be much lower, and a more accurate reflection of current market tightness**.

In other words, this IEA paragraph says that the world has only 0.35 mb/d spare capacity of readily marketable light sweet crude because the spare capacities of 2.20 mb/d from Saudi Arabia and 0.30 mb/d from Kuwait are hard to sell heavy sour crudes. In August 2007, energy analyst Bill Herbert reaffirmed IEA's views when he said that "even if OPEC decides to open the spigot a bit more, it's hardly a guarantee prices would stay in check. Most of OPEC's spare capacity is in heavy sour crude oil, which must be processed in types of refineries that already are running at full capacity. There's very little ability on the part of the supply system to respond to more demand". Furthermore, the EIA Short Term Energy Outlook, 7 August 2007 stated that "The low level of surplus OPEC oil production capacity, which is primarily in heavy crude oil, remains a key reason for the continued tight market conditions ...Further, the apparent unwillingness by OPEC to use available surplus capacity in the face of rising crude oil prices reduces any downward price impact that additional surplus capacity might have." Given these statements by the IEA, Herbert and the EIA, the following forecast assumes no effective spare capacity of easily marketable Saudi Arabia crude.

It is also assumed that Saudi Arabia will produce their fields while maintaining the annual depletion rate, which is annual production as a percentage of ultimate recoverable remaining reserves, at less than about 5.3%/yr. This should ensure that reservoir damage does not occur due to overproduction from their fields. The figure of 5.3%/yr was selected because the annual depletion rate of remaining reserves reached a peak of 5.3%/yr in the third quarter of 2006 (Fig 9), based upon estimated ultimate recoverable reserves (URR) of 175 Gb for Saudi Arabia. This figure of 5.3%/yr could be too optimistic. Tariq Shafiq, a petroleum engineer who was Vice President and Executive Director of the Iraq National Oil Company (INOC), said that a depletion rate of 4-5% is well within good reservoir management for large fields. In addition, Colin Campbell stated on page 7 of his ASPO Ireland Newsletter No. 80, August 2007 that "a Depletion Rate of 4.2%...sounds quite reasonable for a mature country like Kuwait, compared for example with 6.5% in the United Kingdom or 4.5% in the US-48". If a lower forecast annual depletion rate is assumed then Saudi Arabia's production rate would drop faster than is forecast (Fig 9).

The estimated URR of 175 Gb is equal to 155 Gb of non heavy crude plus 20 Gb of heavy crude. Although the heavy sour crude fields of Safaniya and Manifa may ultimately produce much more than 20 Gb, only 20 Gb is assigned because this low quality crude is difficult to market and difficult to process by refineries. The non heavy crude URR of 155 Gb includes 85 Gb for Ghawar (light), 15 Gb for Abqaiq (extra light), 8 Gb for Berri (extra light) and the remaining URR is assigned to Aramco's other non heavy crude fields including Marjan, Qatif, Khurais, Zuluf, Shaybah, Abu Safah and Khursaniyah. The estimated URR is based mainly on the information sources about Saudi Arabia, located at the end of this article.

The possibility of a lower Saudi Arabia total URR exists. Based on this mathematical technique, this recent research "suggests that the Saudi Qt (or total URR) is only 150 Gb, which in turn suggests that Saudi Arabia is now over 70% depleted, with about 40 Gb in remaining recoverable reserves." A 2006 research paper, using the same method, estimated a total URR of 160 Gb, as shown in this plot. Another source of oil reserves, prior to nationalization of Saudi Aramco in 1980, is a report titled "Critical Factors Affecting Saudi Arabia's Oil Decisions", published by the US General Accounting Office in 1978. As referenced on page 72 of Twilight in the Desert, this report stated that the remaining proven reserves as at the end of 1976 was 110 Gb with 70 Gb in the four super giants of Ghawar, Safaniya, Abqaiq and Berri. Cumulative production from these four giant fields was 26 Gb and cumulative production for all Saudi Arabia was 29 Gb. Thus, total proven reserves (produced and remaining) at the end of 1976 was equal to 139 Gb (29 Gb plus

110 Gb), of which 96 Gb (26 Gb plus 70 Gb) was attributable to the four super giants and 43 Gb (3 Gb plus 40 Gb) was attributable to the rest of the fields. This figure of 139 Gb does not include probable reserves, unlike total URR, and is less than the total URR estimates of 150 Gb and 160 Gb from the two research sources above. Allowing for the inclusion of probable reserves and only small discoveries since the last giant field Shaybah was found in 1968, an appreciation from 139 Gb to the total URR of 175 Gb appears reasonable.

As of June 2007, Aramco's total cumulative C&C production is 112 Gb, being 64% of the URR 175 Gb. Over half of the 112 Gb has been produced from the super giant Ghawar. Abqaiq, Berri and Safaniya have also been significant producers. Aramco has produced over half of the estimated URR and the production curve is forecast to follow a typical post peak decline curve, shown by the red line in Fig 9. Unfortunately, the new production capacities from AFK, Shaybah expansion, Nuayyim and Khurais are not enough to offset decline from existing fields. Aramco has scheduled Manifa last because it will produce heavy oil which is less marketable than lighter grades.

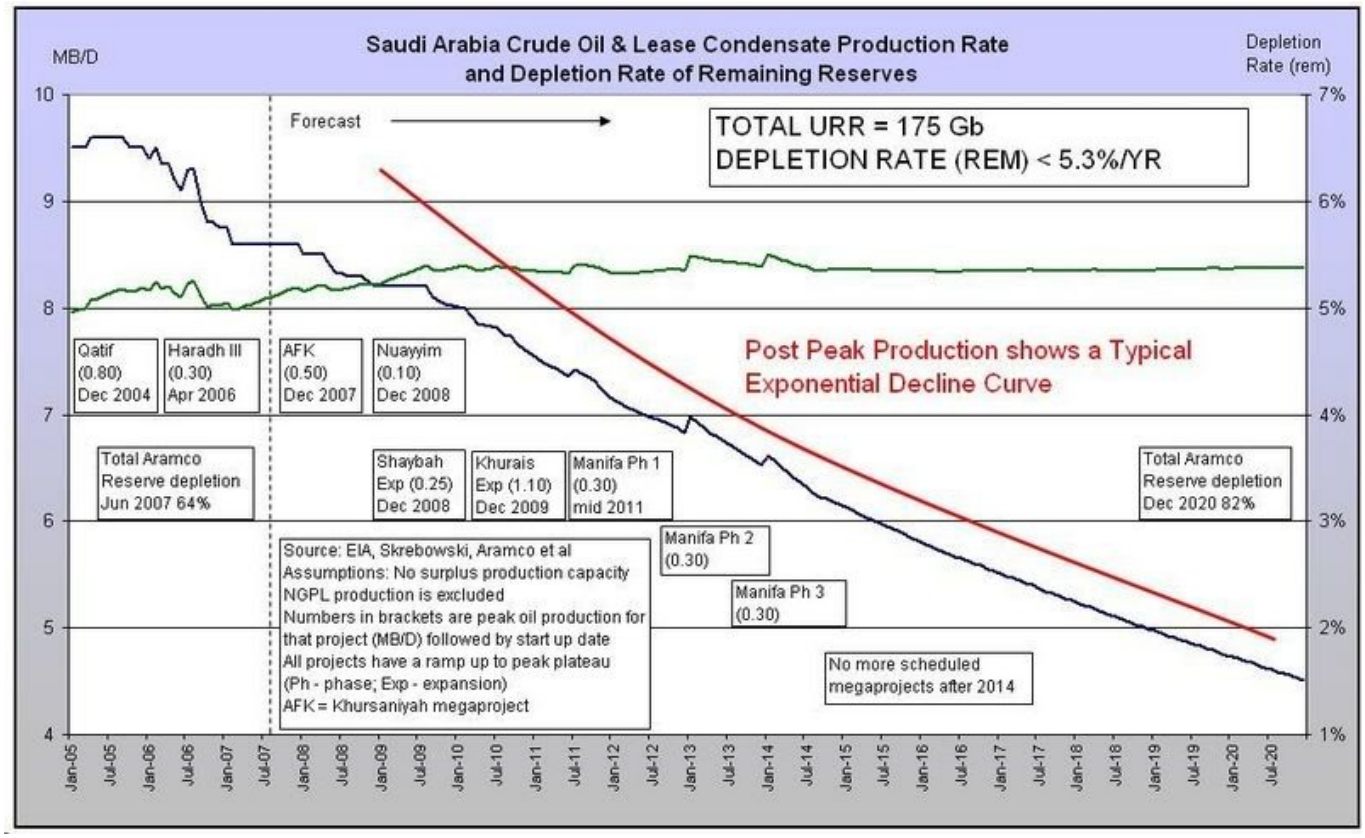

Fig 9 - Saudi Arabia Crude Oil & Lease Condensate Production to 2020 (bottom up forecast) *- click to enlarge*

Figs 9 and 10 have been updated for Aramco's most recent project schedule, released in June 2007, which no longer includes originally scheduled expansion from both Al Khafji (Neutral Zone, 0.30 mbd, 2011) and Shaybah phase 2 expansion (0.25 mbd, 2010). Furthermore, Aramco's recent project schedule showed Khurais start-up on June 2009, but now a recent press release dated 25 July 2007, on Saudi Aramco's website states that Khurais is "scheduled for the end of 2009", which is assumed to be December 2009 for Figs 9 and 10. Although Khurais is forecast to produce 1.1 mbd, Matt Simmons doubts that Khurais will produce 0.8 mbd. This report stated that the "Khurais field west of the giant Ghawar field could potentially increase Saudi production by a further 800,000 b/d" and another report made a similar statement "Another potential project, at the Khurais field, could increase Saudi production capacity by 800,000 bbl/d". These

statements indicate that the forecast production of 1.1 mbd from Khurais might be too high.

There are three forecast scenarios from 2007 to 2080, shown in Fig 10. The solid red line shows a "Do Nothing" forecast scenario. This represents a production decline rate of 8%/yr which is equivalent to ultimate recoverable reserves of 148 Gb (billion barrels). This scenario is highly unlikely but serves as a useful lower bound for the forecast production profile. The "New Peak?" dashed red line represents a scenario for which another peak is attained. However, the inset in the chart explains that another 1.75 mbd would be required from other projects and infill drilling. This is highly unlikely and predicts that a peak in 2005 has passed. **The "Bottom Up" dark blue line in Fig 10 represents the most likely scenario and includes the bottom up forecast to 2020 from Fig 9, followed by an annual production decline rate of 5%/yr.**

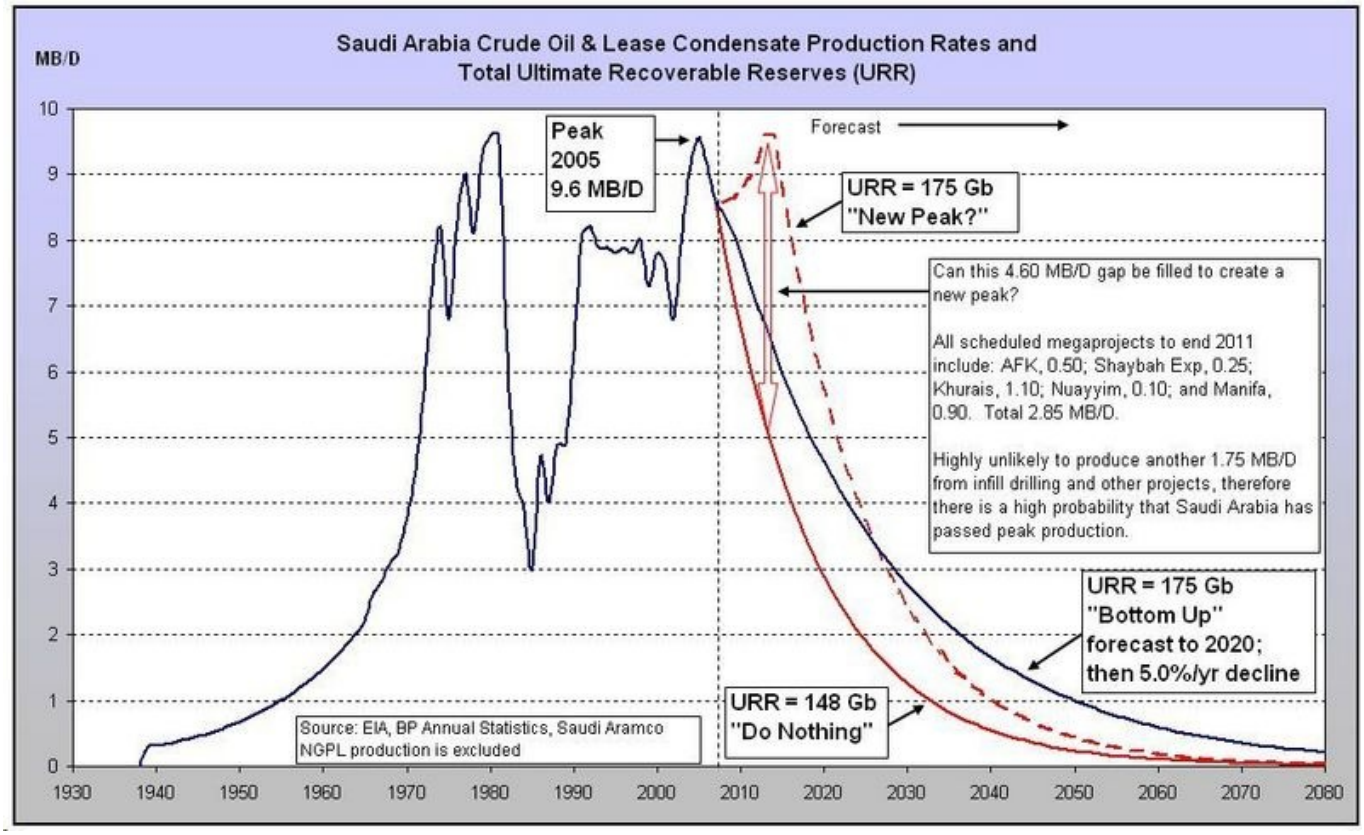

Fig 10 - Saudi Arabia Crude Oil & Lease Condensate Production to 2080 *- click to enlarge*

Saudi Arabia has never directly admitted that it has passed peak C&C production, but in August 2004 a former OPEC president, Purnomo Yusgiantoro, admitted that "oil prices were at crazy levels, but that OPEC was powerless to cool the market...There is no more supply". Thus, based on Yusgiantoro's statement, in August 2004, Saudi Arabia's C&C production was at maximum capacity of 9.5 mbd, up by a significant 1.1 mbd from April 2004 (EIA). Furthermore, on 11 April 2006, according to this source and requoted here, Platts quoted a Saudi Aramco spokesman saying that "Saudi Aramco's mature crude oil fields are expected to decline at a gross average rate of 8%/yr without additional maintenance and drilling" and that **"This maintain potential drilling in mature fields combined with a multitude of remedial actions and the development of new fields, with long plateau lives, lowers the composite decline rate of producing fields to around 2%."** Therefore, as of April 2006, **Aramco's crude oil production was forecast by this Aramco spokesman to decline at 2%/yr which**

means that Saudi Arabia has passed peak crude oil production.

These three sources provide additional information about Saudi Arabia's production decline rates. Aramco Senior Vice President Abdullah Saif admitted that "One challenge for the Saudis in achieving this objective is that their existing fields sustain 5 percent-12 percent annual "decline rates," (as reported in Petroleum Intelligence Weekly and the International Oil Daily) meaning that the country needs around 500,000-1 million bbl/d in new capacity each year just to compensate". The Schlumberger CEO said that "the industry is dealing with a phenomenon that is exaggerated by the lack of investment over the past 18 years. This phenomenon is the decline rate for the older reservoirs that form the backbone of the world's oil production, both in and out of OPEC. An accurate average decline rate is hard to estimate, but an overall figure of 8% is not an unreasonable assumption." The EIA also stated that a "challenge for the Saudis in achieving their strategic vision to add production capacity is that their existing fields sustain, on average, 6 to 8 percent annual "decline rates" (as reported by Platts Oilgram) in existing fields, meaning that the country needs around 700,000 bbl/d in additional capacity each year just to compensate for natural decline."

Saudi Arabia C&C production was 9.5 mbd in August 2004. According to the previous EIA statement, Saudi Arabia needs 0.7 mbd additional capacity each year just to compensate for natural decline. Therefore, three years later, by August 2007, additional capacity of 2.1 mbd (3*0.7 mbd) would have been required just to compensate for natural decline. Since August 2004 there was a total capacity addition of only 1.1 mbd from these two projects as stated by Saudi Aramco's Press Kit on their website. In late 2004, Qatif (including Abu Safah) began operations with production capacity of 0.8 mbd and in early 2006, 0.3 mbd capacity from Haradh III, 0.3 mbd (Fig 9), which leaves a shortfall of 1.0 mbd. This implies that Saudi production in August 2007 is 8.5 mbd, 1.0 mbd less than the 9.5 mbd production in August 2004, excluding capacity additions from infill drilling. Accordingly, this number of 8.5 mbd is slightly less than the number of 8.6 mbd for July 2007, from the EIA Short Term Energy Outlook, Table 3a, 7 August 2007. Based on the quotes and statements in this and the previous two paragraphs, **it is highly unlikely that capacity additions from new projects, including infill drilling, are sufficient to compensate for existing production decline, and consequently the "Bottom Up" scenario in Fig 10 remains the most likely scenario.**

6. Other Components of Total Liquids Production

Natural gas plant liquids show an increase in production due to OPEC projects from Saudi Arabia, Algeria, Iran and Qatar. Saudi Aramco's most recent project schedule, released in June 2007, shows two significant NGPL projects to be completed within a year: Hawiyah at 318,000 barrels/day and Khursaniyah at 290,000 barrels/day.

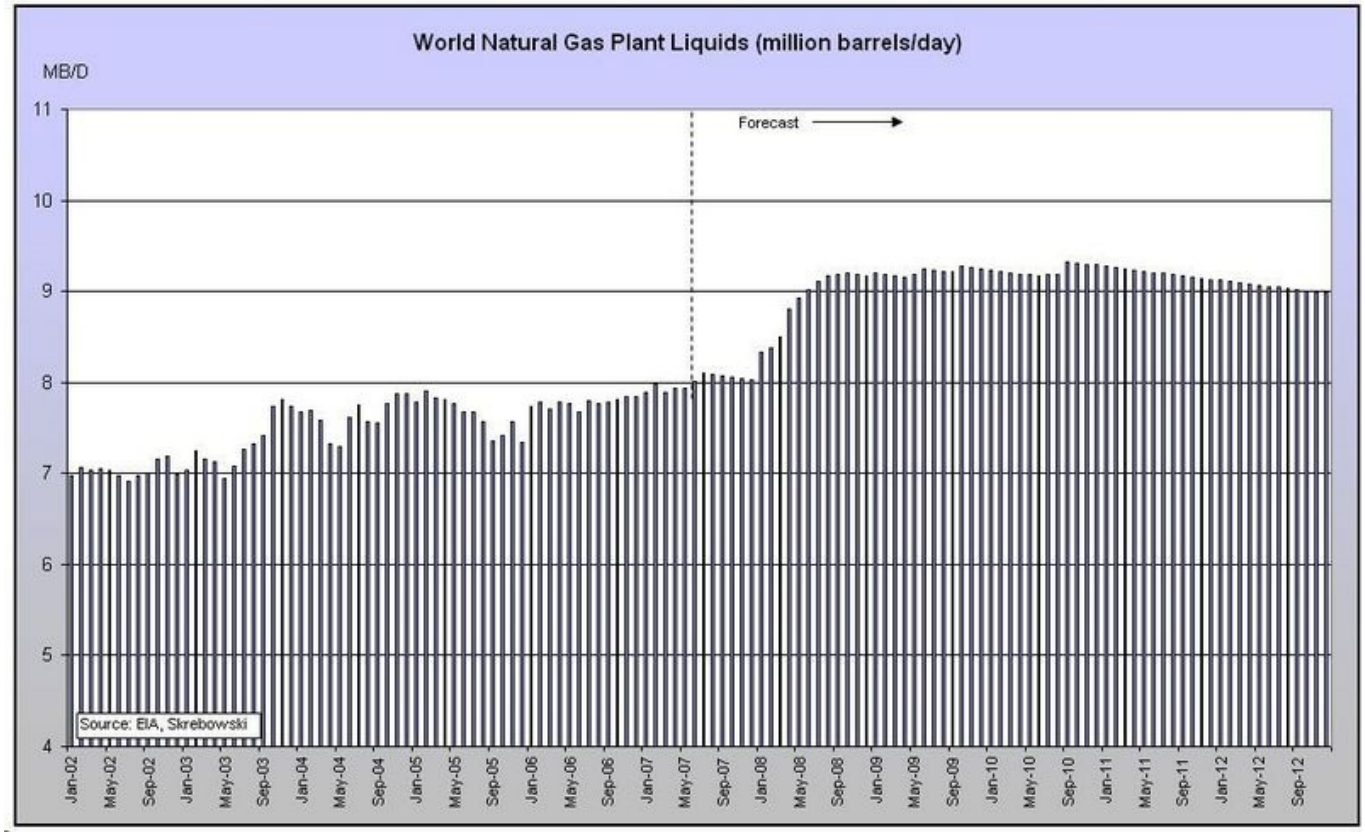

Fig 11 - World Natural Gas Plant Liquids Production to 2012 (bottom up forecast) *- click to enlarge*

Ethanol and XTL (BTL, CTL and GTL) production is forecast to double to 2012. Unfortunately, the increased production of government subsidised corn based ethanol in the USA is increasing the prices of many other food products.

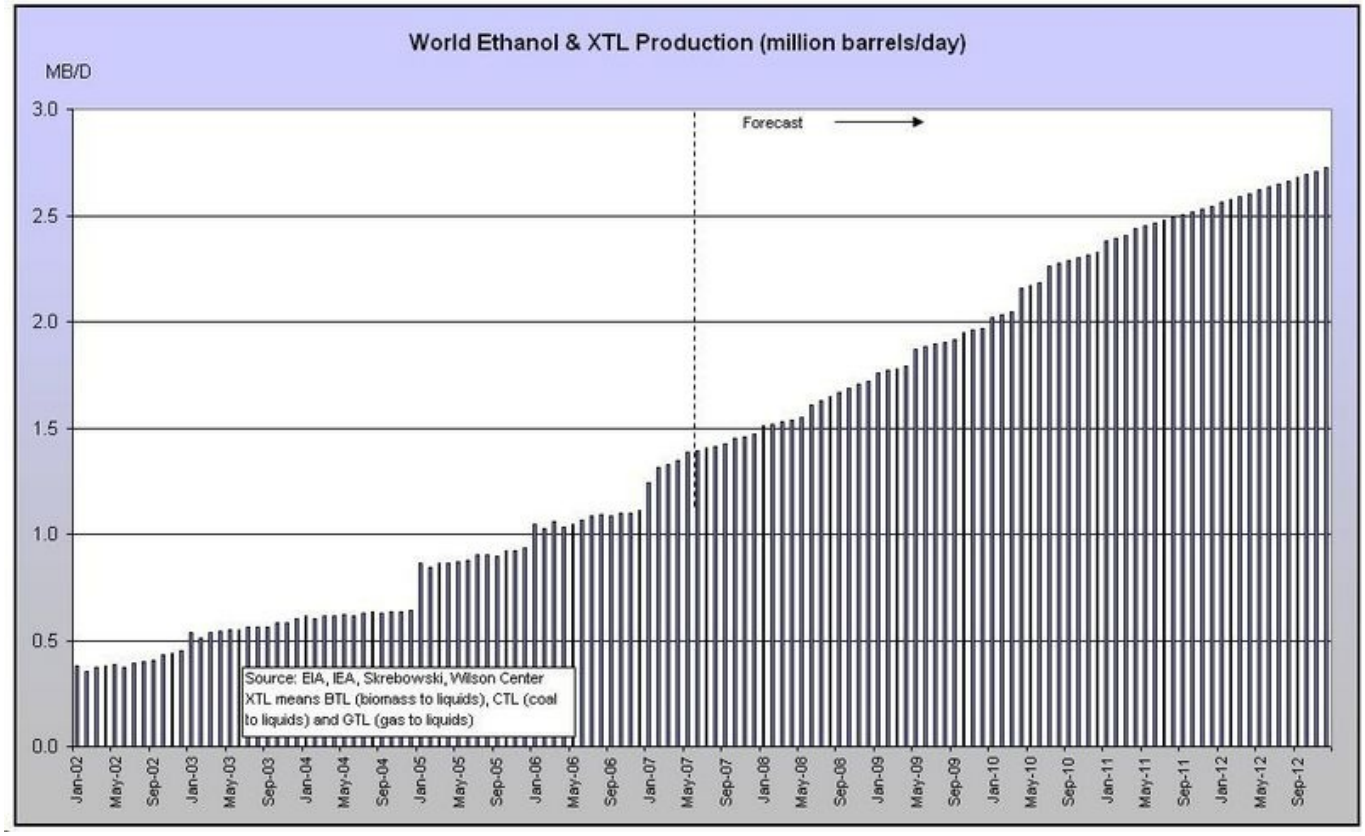

Fig 12 - World Ethanol & XTL Production to 2012 (bottom up forecast) *- click to enlarge*

Processing gains are defined by the EIA as "The volumetric amount by which total output is greater than input for a given period of time. This difference is due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed." These gains are forecast to decline slowly based on the decline in C&C (Fig 3).

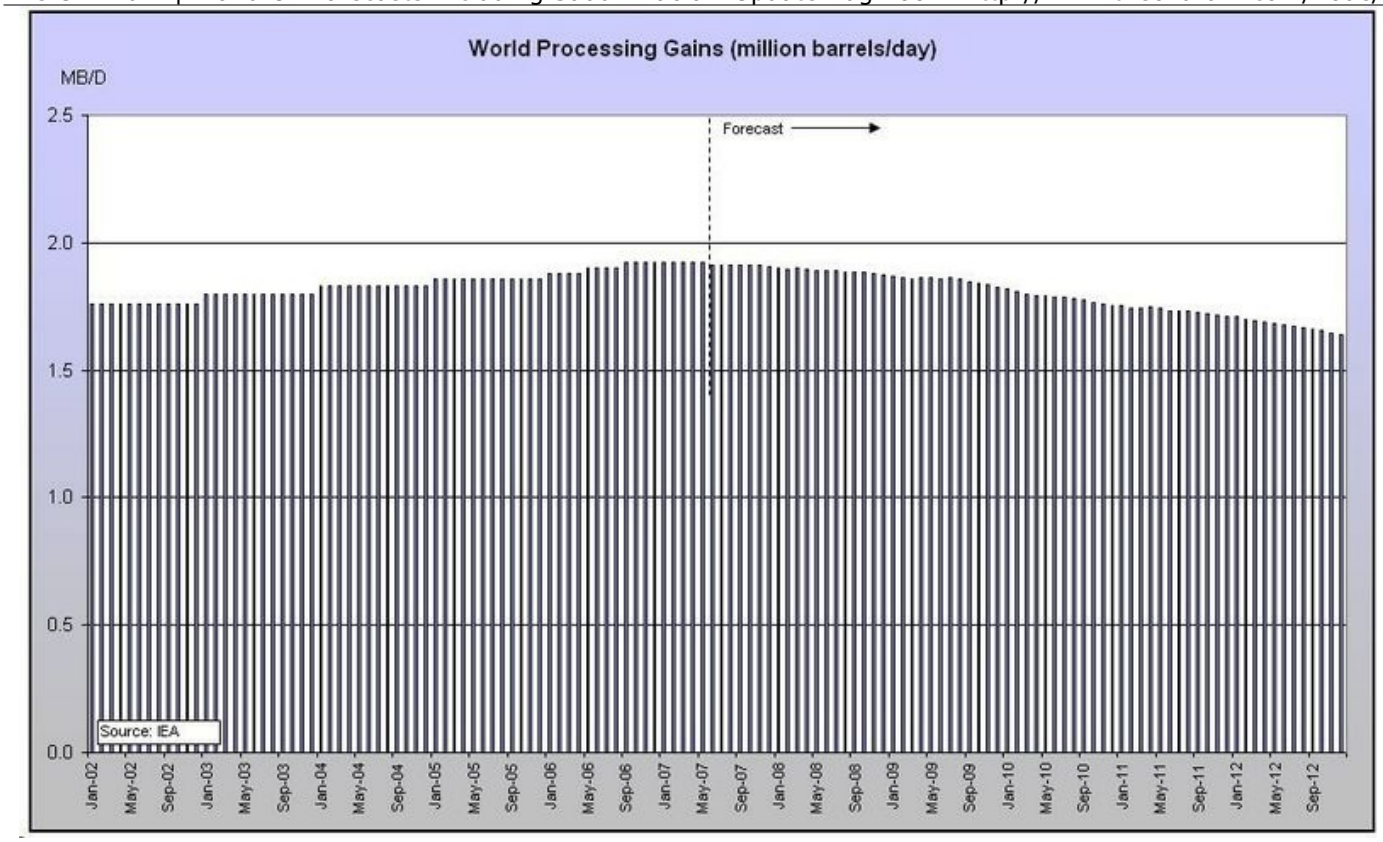

Fig 13 - World Processing Gains to 2012 (bottom up forecast) *- click to enlarge*

7. Additional Information Sources

For more forecasts please refer to this article by Khebab, Peak Oil Update - June 2007: Production Forecasts and EIA Oil Production Numbers and to Peak Oil Media Redux by Prof Goose, including this lecture by Dr. Albert Bartlett.

Further articles about Saudi Arabia:

by Stuart Staniford

- **Saudi Arabia and Gas Prices**
- **Depletion Levels in Ghawar**
- **The Status of North Ghawar**
- **Further Saudi Arabia Discussions**
- **Water in the Gas Tank**
- **A Nosedive Toward the Desert**
- **Saudi Arabian oil declines 8% in 2006**

by Euan Mearns

- Ghawar reserves update and revisions (1)
- GHAWAR: an estimate of remaining oil reserves and production decline (Part 2 - results)
- GHAWAR: an estimate of remaining oil reserves and production decline (Part 1 -

background and methodology)
- **Saudi production laid bare**
- **Saudi Arabia and that $1000 bet**

by Heading Out

- **Simple mathematics - The Saudi reserves, GOSPs and water injection**
- **Of Oil Supply trains and a thought on Ain Dar**

by Ace

- **Updated World Oil Forecasts, including Saudi Arabia**
- **Saudi Arabia's Reserve "Depletion Rates" provide Strong Evidence to Support Total Reserves of 175 Gb with only 65 Gb Remaining**
- **Further Evidence of Saudi Arabia's Oil Production Decline**