The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Further Evidence of Saudi Arabia's Oil Production Decline

Posted by Sam Foucher on April 10, 2007 - 11:30am
Topic: Supply/Production
Tags: saudi arabia [list all tags]

This a guest post by ace.

Summary

My post is related to Stuart's and Euan's stories as my post discusses the declining Saudi Arabia's future production rates. The discussion about Euan's and Stuart's stories further validates Saudi Arabia's forecast decline.

My forecast decline for Saudi Arabia is in disagreement with Euan's previous statement: "According to my view, Saudi Arabia, together with other OPEC countries will raise production to meet this demand challenge". This demand challenge is stated by Euan to be that "The IEA are forecasting demand to rise strongly by around 3 million bpd between the second and fourth quarters." My assumption in my forecast in that Saudi Arabia does not have any long term ability to raise their production. This assumption is confirmed by Riyadh Bank's recent forecast of 8.44 mb/d average production for Saudi Arabia in 2007.

Stuart stated in his story "Saudi Arabian oil declines 8% in 2006". that "I'll bet $1000 with the first person who cares to take me up on it that the international oil agencies will never report sustained Saudi production of crude+condensate of 10.7 million barrels or more." My analysis gives further support to Stuart's prognosis that Saudi oil production is in decline, while showing a temporary increase back to 9 mb/d in 2011. However, the 900 kb/d total increase in capacity from Manifais the last of Saudi's known megaprojects. Consequently, Saudi oil production will begin steady irreversible decline, starting at the end of 2011.

Further evidence is presented from Hans Jud's article which uses field by field HL to forecast a decline in Saudi Arabia production. A hypothesis of URR=205 Gb is tested and proven to be false using a two cycle HL chart. Consequently, Saudi Arabia URR is showing a strong trend towards 165 Gb, of which about 110 Gb has already been produced. It's also worth noting that in BP's statistical review, Saudi Arabia reported reserves of 169.6 Gb in 1987, which is close to the URR of 165 Gb, and 255 Gb in 1988. How could this be when the last giant Saudi field of Lawnah (1.17 Gb) was discovered in 1975.

Finally, the future decline of Saudi production implies that peak total liquids is forecast to occur in mid 2009. This means that coordinated conservation plans need to start now.

Further evidence supporting Saudi Arabia's production decline continues to emerge. The evidence is not only technical and economic, but also behavioural. The analysis of the further evidence, described below, shows that Saudi Arabia is highly unlikely to produce over 8.5 million barrels/day of crude oil and lease condensate, on an annualised basis.

Saudi Arabia is in decline now. This means that the world's production is in decline now. Future supply will be unable to meet forecast demands. Governments, corporations and individuals need to start making coordinated plans to prepare for the decline in world production.

Recent Statements

Two recent statements provide further evidence of decreased Saudi oil production and the continuing struggle to convert resources to production.

Riyadh Bank predicts that Saudi oil production is expected to fall to 8.44 million bpd in 2007.

Andrew Gould, Schlumberger chief executive says *"The age of easy oil is over"* and *"rapid decline in existing fields were slowing the growth of energy capacity worldwide"*.

Saudi Arabia Production Forecast to December 2011

My current forecast shows Saudi oil production to be 8.43 million bpd in 2007. This is similar to the 2007 production forecast by the Riyadh Bank.

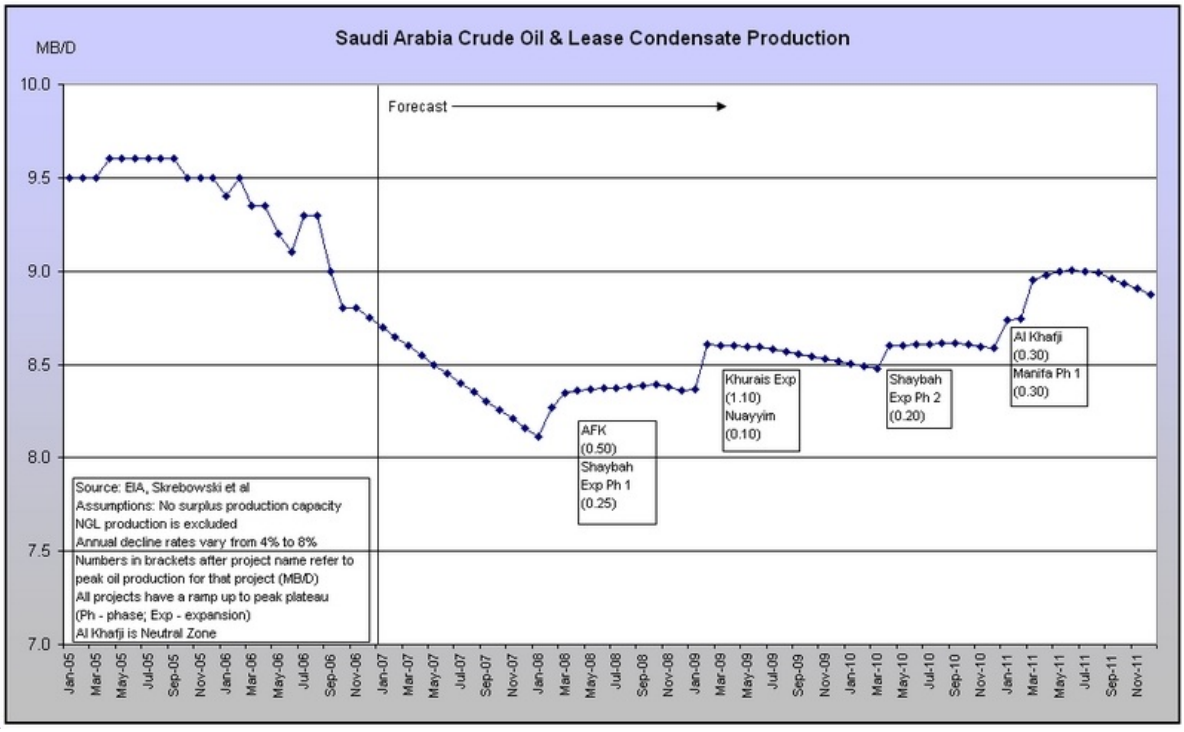

Fig 1. Saudi Arabia Production Forecast. Click to enlarge.

Saudi Arabia's Failed Attempt to Bring Forward Production from AFK

As it is becoming more likely that Saudi has no surplus capacity, the importance of the near term big projects of Shaybah and AFK (Khursaniyah) becomes critical.

This Nov 2006 CSIS presentation by Obaid makes the following statements:

> Khursaniyah (AFK) was *"originally scheduled for December 2007"* but in Nov 2006, Obaid says that it will be earlier: *"by June 2007 to reach 500,000 b/d"*.
>
> Shaybah expansion was *"originally scheduled for January 2009"* but again Obaid states an earlier date: *"by April/May 2008: 250,000 b/d will come on stream"*.

On Mar 4, 2007, Phil Hart said that *"Khursaniyah group of fields..is not expected on stream until the end of 2007."*

In Figure 1, I've assumed Khursaniyah (AFK) first oil is Feb 2008.

The desperation to deliver first oil earlier from AFK and Shaybah together with Riyadh Bank's downgraded oil forecast shows that Saudi Aramco is struggling to increase production rates. The forecast in Figure 1 from 2008 to 2011 may be too optimistic.

Saudi Arabia field-by-field analysis by Hans G. Jud: *"We are in decline NOW"*

Figures 2 to 6 are from the presentation by Hans Jud.

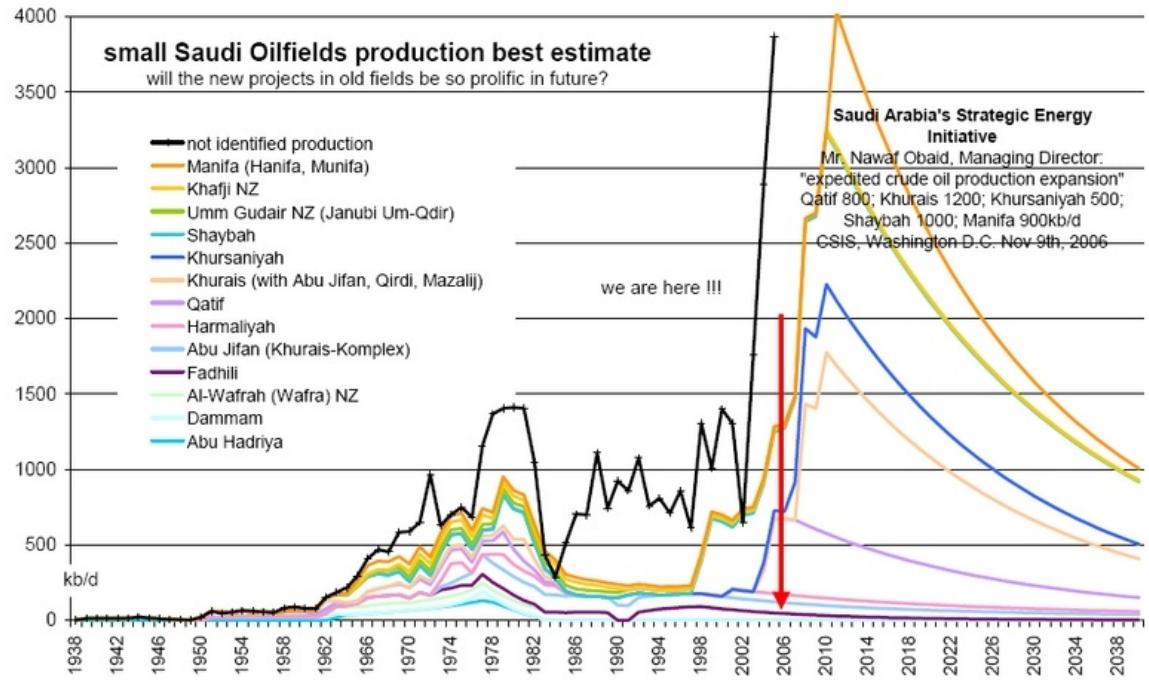

Figure 26: small fields "great future" — wow, what a jump ?!

Fig 2. Small Saudi Fields show "Great Future"?. Click to enlarge.

The figure above is partly based on information also from Obaid's CSIS presentation. The figure shows that there is justified scepticism over Aramco's promise to suddenly produce huge amounts of oil from old small fields. Look at Manifa and Khurais – huge production rate jumps!!

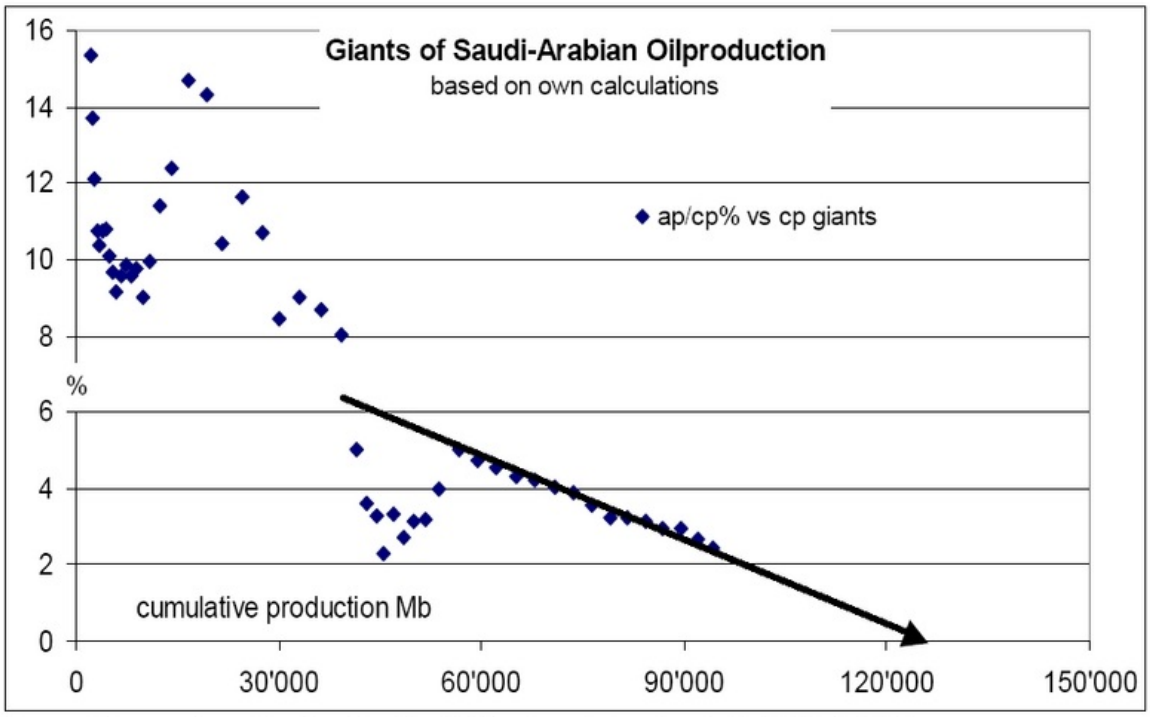

Figure 22: past production for the 6 Giants points clearly to EUR 125Gb

Fig 3. HL for Saudi Giant Fields. Click to enlarge.

Figure 3 shows a cumulative HL plot for the giant fields of Ghawar, Abqaiq, Berri, Safinaya, Zuluf and Marjan. The URR is 125 Gb. Jud also does HLs for each of these giant fields in his presentation. His analysis of Ghawar is further broken down into its subfields.

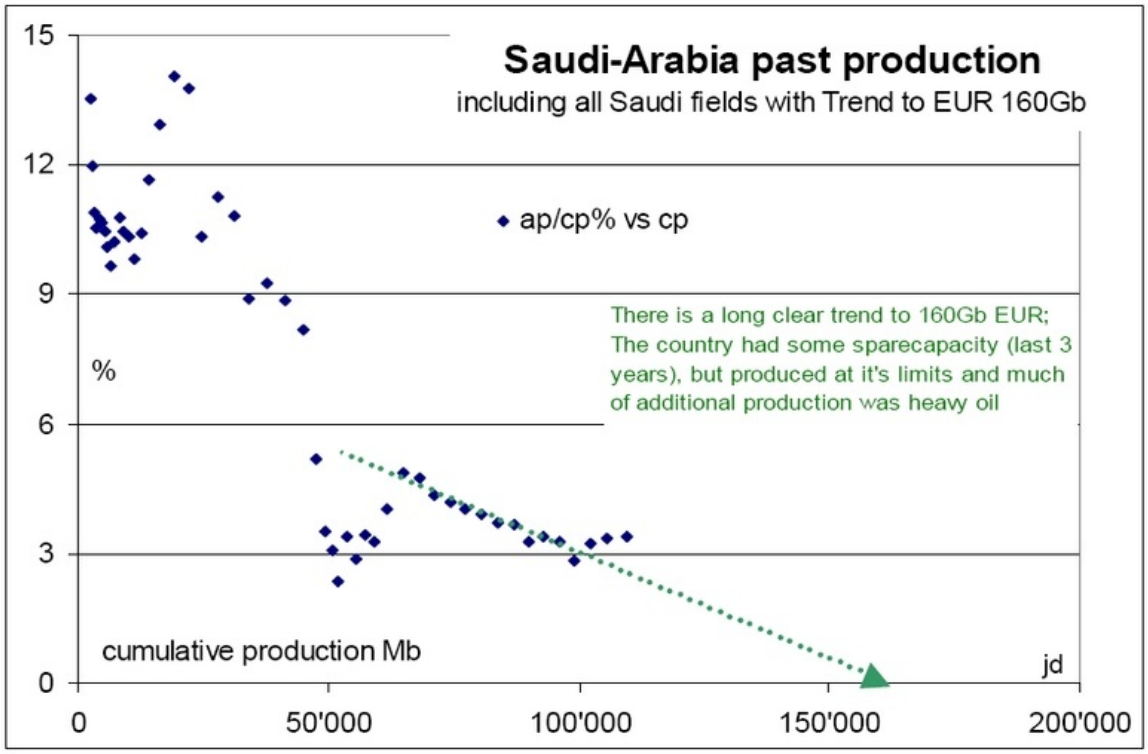

Figure 23: Saudi-production trend for all fields tends to a EUR of about 160Gb.

Fig 4. HL for Saudi Arabia – all fields. Click to enlarge.

Figure 4 above shows a URR of about 165 Gb.

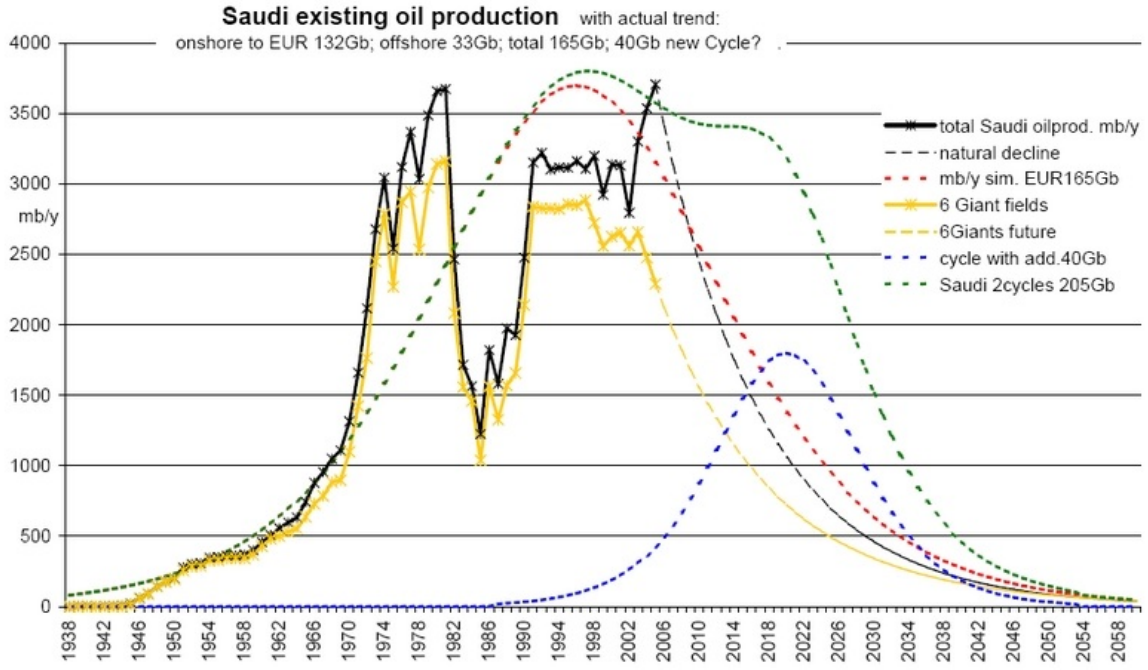

Figure 29: Saudi past production, "natural decline", Hubbert with 165Gb, "new cycle" with 40Gb and combined Hubbert 2 cycles

Fig 5. Two cycle HL. Click to enlarge.

For this chart, Jud optimistically assumes that Saudi Arabia has an additional 40 Gb of secret oil to produce. This gives the dashed blue line. This is added to the dashed red line (URR 165 Gb) to give the dashed green line as a forecast for Saudi production.

In the last few years, note also in the figure above the production drop in the 6 giant fields while total production is increasing. Are the MRC wells in the giant fields starting to show accelerated decline rates due to increased water cut?

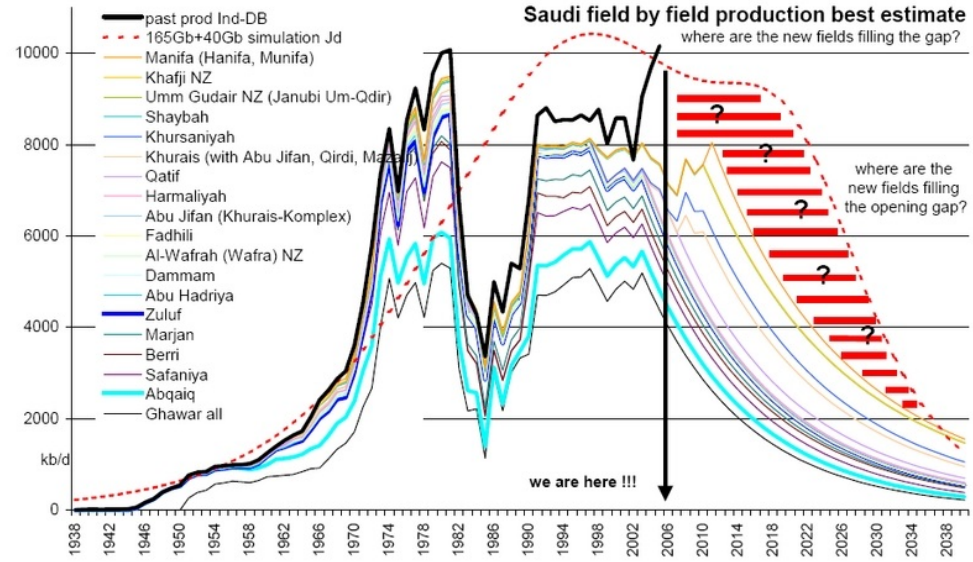

Figure 30: all known fields with "hypothetical natural decline" and opening gap

Fig 6. Where are the missing fields?. Click to enlarge.

This last figure shows that Jud's optimistic assumption of an additional 40 Gb is most likely false. This means that Saudi's URR is about 165Gb. Figure 5 shows the dashed red line for the URR 165 Gb which might be the best HL fit for Saudi. This could imply a sudden decline in Saudi production as shown by the natural decline as the dashed black line in Figure 5.

Saudi Arabia's Decline means that the World's Production will not supply the Forecast Demand

The forecast in Figure 1 assumes that old small fields such as Khursaniyah (AFK), Khurais and Manifa can deliver huge increases in production. Figure 5 shows these forecasts to be overoptimistic (Matt Simmons would probably agree).

It is highly unlikely that Saudi Arabia will ever produce more than 8.5 million bpd (Crude Oil and Lease Condensate). This means that if any supply disruption or sudden demand increase occurs, do not assume that Saudi Arabia can be "called" upon to supply extra oil. Assume that oil price shocks are likely to occur starting the middle of this year as shown below.

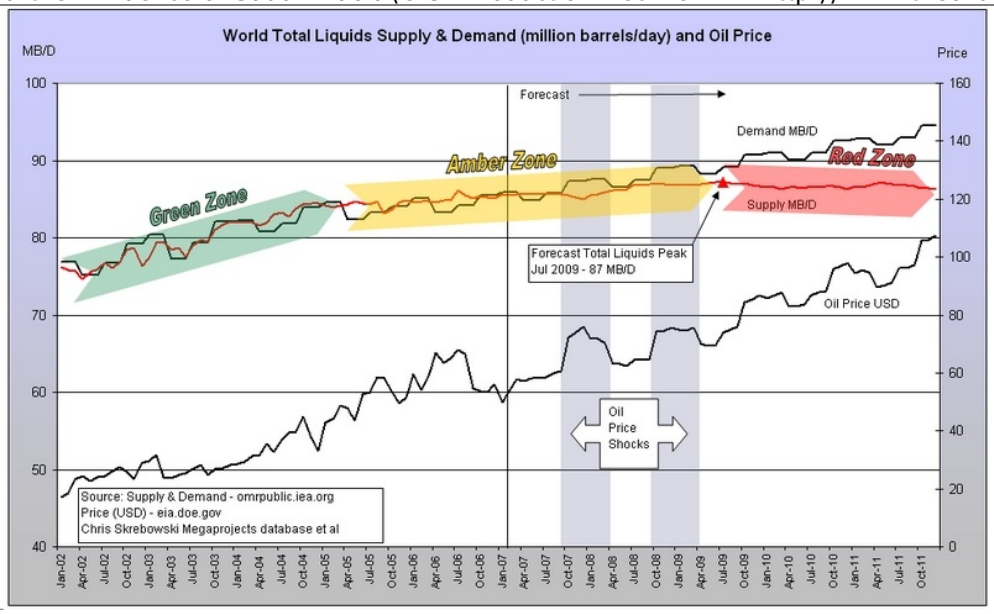

Fig 7. We are in the Amber Zone and approaching the Red Zone!. Click to enlarge.

Green Zone:
Supply was able to meet demand. Sufficient surplus capacity existed. Prices showed only moderate volatility. This zone ended on about May 2005 which coincidentally is the peak for crude oil & lease condensate production.
Amber Zone:
Saudi Arabia has become supply constrained. Prices show more volatility. Price shocks occur in 2007Q4 and 2008Q4. Surplus capacity is going to zero. Supply is struggling to meet demand. Increased production from natural gas liquids and ethanol delays the total liquids peak to July 2009, which is the end of this zone. The desperate attempt to use subsidised ethanol has doubled corn prices and is now indirectly increasing other food prices. Nationalisation of hydrocarbon reserves continues. Refineries need to be modified to accept the heavier and increasingly sour crude stream. Horizontal MRC wells have become common practice but have steeper decline rates. Old infrastructure needs replacing. A shortage of skilled people exists. CONSERVATION PLANS NEED TO START NOW.

Red Zone:
Starts just after the total liquids peak in mid 2009. There is no more surplus capacity. Supply falls far short of demand leading to drastic demand destruction. The name of the last basin is called “conservation” – world must use less oil. Saudi Arabia announces further “voluntary cuts” in production. Oil prices increase at a faster rate than during the amber zone. World economic growth rates become lower. The IEA emergency sharing system may be invoked and rationing occurs……

Further Reading on Saudi Arabia:

by Stuart Staniford

Water in the Gas Tank
Saudi Aramco's Astrologers
A Nosedive Toward the Desert
Saudi Arabian oil declines 8% in 2006

by Euan Mearns

Saudi production laid bare
Saudi Arabia and that $1000 bet