



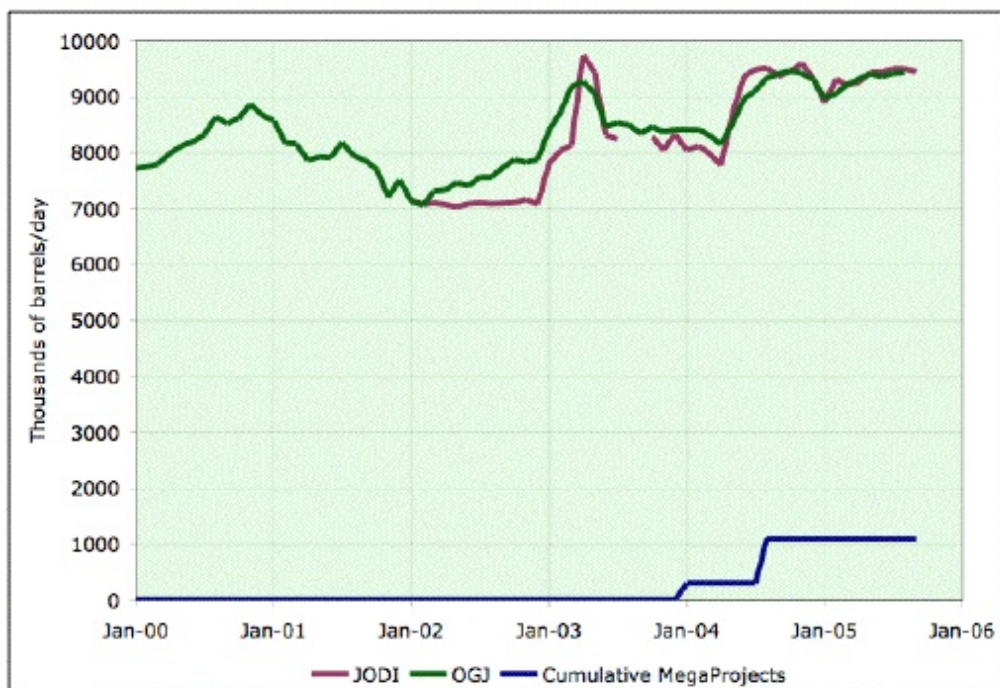
## Saudi Arabia from the Bottom Up

Posted by [Stuart Staniford](#) on November 22, 2005 - 4:48am

Topic: [Supply/Production](#)

Tags: [gas prices](#), [hubbert peak](#), [oil prices](#), [peak oil](#) [[list all tags](#)]

It seems such a simple idea: tabulate all upcoming oil development projects, figure out a decline rate for fields in production, and then you'll know what upcoming capacity will be. It seemed to [roughly work for Exxon](#). However, applying this idea to Saudi Arabia for the last five years leads to some significant puzzles.



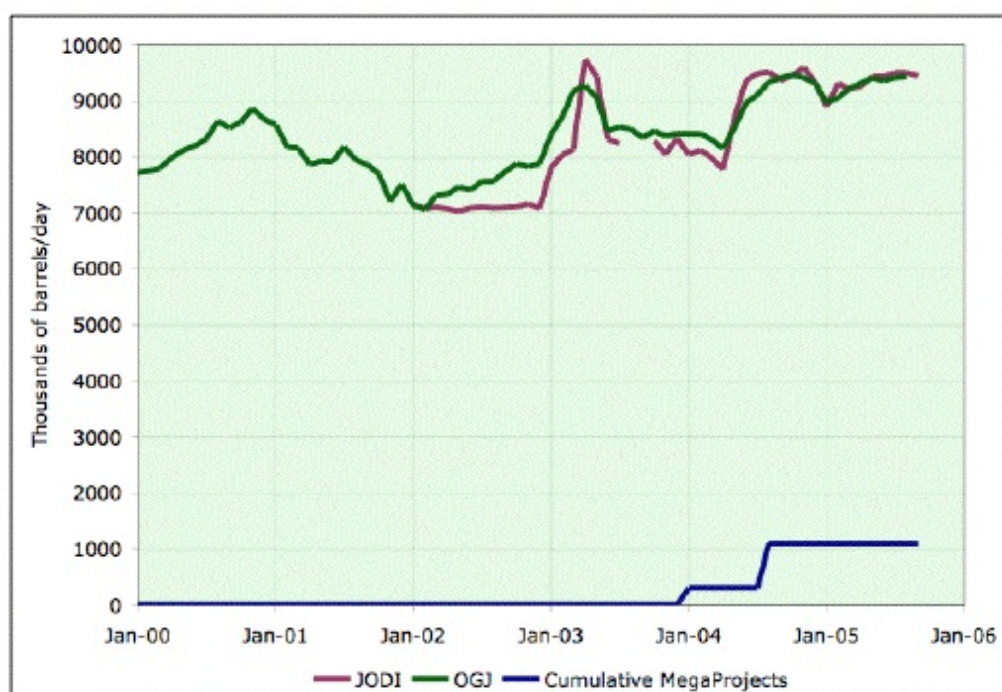
*Saudi monthly crude oil production in kbpd (excluding NGL), since January 2000, as estimated by both the [Oil and Gas Journal](#), and the new [Joint Oil Data Initiative](#). Also shown is the cumulative capacity increase from documented megaprojects to date.*

Firstly, a word on the data for production. I plotted data from two sources. The first was the brand new shiny data from the [JODI](#). I also coughed up \$50 to buy the old rusty data from the [Oil & Gas Journal](#). Both series are defined to exclude natural gas liquids, but include all grades of crude oil. As you can see, they agree roughly, but only roughly. Take your pick (and you'd probably be justified in being pretty sceptical about both of them).

At any rate, neither production series is at all well explained by the Saudi megaprojects so far. I went back through all [Saudi Aramco's](#) press releases, and also looked at the EIA's [country analysis brief](#), combined with some Google background checks to come up with this list of MegaProjects.

Project	On Stream	Increase (kbpd)
Haradh II	Jan 04	300
Qatif-Abu Sa'fah	Aug 04	800
Haradh III	2006	300
Abu Hadriyah/Fadhili/Khursaniyah	2007	800
Shaybah	2008	300
Nuayyim	2009	100
Khurais	2009	1200

This list ignores Hawiyah, which will produce around 310kbpd of NGL, since our production statistics do not include NGL. The first projects (Haradh II and Qatif/Al Sa'fah) have already happened, and their cumulative capacity increases are shown along with the production:



*Saudi monthly crude oil production in kbpd (excluding NGL), since January 2000, as estimated by both the [Oil and Gas Journal](#), and the new [Joint Oil Data Initiative](#). Also shown is the cumulative capacity increase from documented megaprojects to date.*

Pretty clearly, these projects do not explain very much about Saudi production history recently. I don't think one could even begin to compute a decline rate this way. The decline in production through 2001-2002, I am inclined to explain as due to Saudi Arabia's role as swing producer as the world economy slowed down following the tech-crash of 2000. They just cranked down production a little.

However, it's harder to make that kind of explanation for the production decline after the peak in early 2003. That was happening as prices were going up and demand was starting to increase in the very bullish way we saw over the last few years. So that might be interpreted as some kind of production problem. However, if so, the fix for it -- a 1200-1500kbpd increase which comes in late spring of 2004 -- is much too large to be accounted for by Haradh (300kbpd), and it occurs

before Qatif/Al Sa'fah was supposed to have come on line (unless the Saudis misreported that timeframe - they announced it in December, but said then that it came online in August).

Indeed, there is no noticeable production increase coming from the completion of the Qatif/Al-Sa'fah project. We must assume that they brought it on line but then just used it to rest some equivalent amount of production elsewhere.

To explore this question a little further, I looked into the history of rig counts in Saudi Arabia (available from [Baker-Hughes](#)). This next plot shows that history just for oil rigs (ie not NG) over the last five years. Interesting! If the megaprojects required any additional rigs, it wasn't very many:

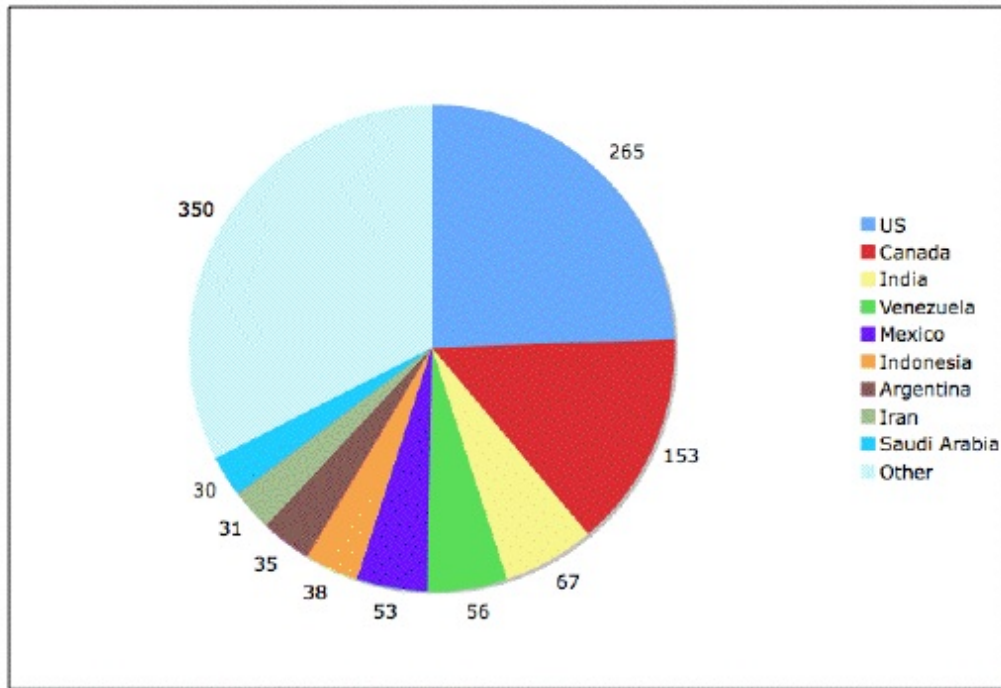


*Oil rigs working in Saudi Arabia according to [Baker-Hughes](#).*

Rig count has been pretty much flat, suggesting that the rigs for the new projects were just re-used from ones that had hitherto been doing development redrilling of Ghawar, etc. Only in this year is there a sudden marked increase in rigs. This suggests, that at least in the past, the megaprojects are by no means most of the story in Saudi capacity maintenance/increases. Of course, we could perfectly well argue that the future won't be like the past because in the past the Saudi's had significant spare capacity, and going forward they won't have very much, so now the megaproject capacity increases will become determining of what they produce. It's a nice story, but a rather speculative one.

You might wonder - is this a lot of rigs? The answer is very clear: no. Baker Hughes stats (which exclude the former Soviet Union countries) show Saudi Arabia ninth in the world for oil rigs, with only a little more than 10% of the oil rigs working in the United States (which is itself far down from the levels of past decades). Interesting that the world's biggest oil-supplier is such a pygmy in rig-count. (Again, all numbers are oil rigs; NG rigs are excluded).





*Oil rigs working around the world in Oct/Nov 2005 according to [Baker-Hughes](#). Numbers exclude Former Soviet Union.*

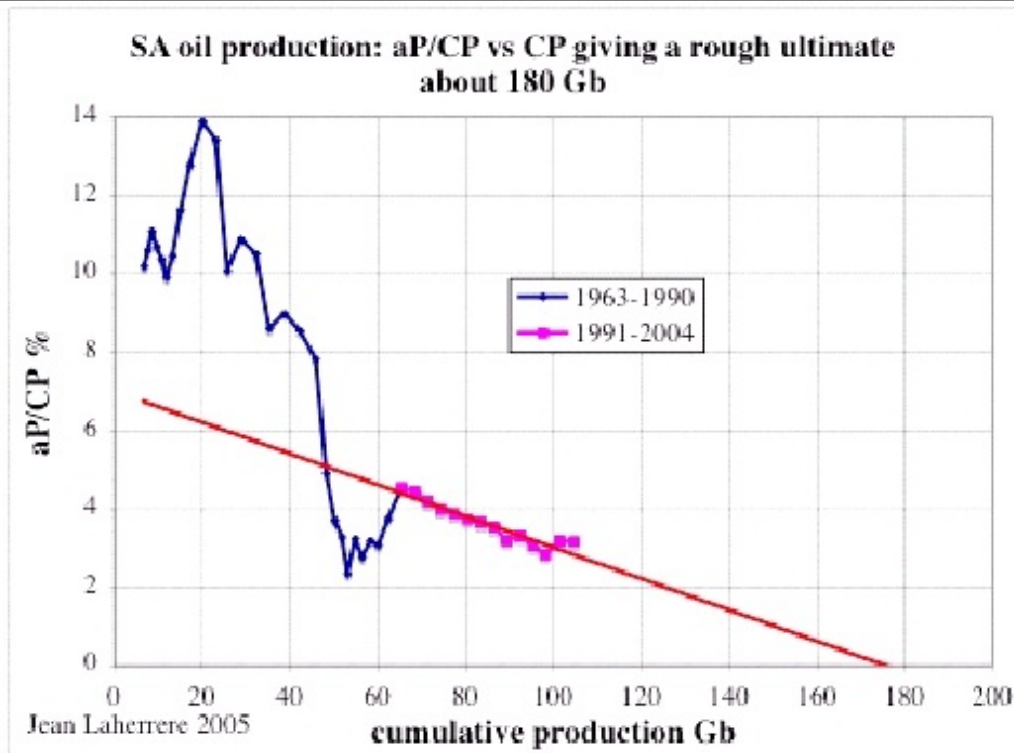
Considering that there are scores of oil fields that have never been developed in Saudi Arabia, it seems that Sadad Al-Husseini has to have at least something of a point when he [told Peter Maass](#),

For example, in the U.S. you have infrastructure — there must be tens of thousands of miles of pipelines. If we, in Saudi Arabia, evolve to that level of commercial maturity, we could probably produce a heck of a lot more oil. But to get there is a very tedious, slow process.

So if we can't find a decline rate by looking at past megaprojects and production, what are others saying? The [EIA quotes the Saudis](#) as saying their fields are declining at 5%-12% annually. HO mentioned that the IEA is estimating that the Saudi production base [now declines at 600kbpd/year](#), if they don't do additional drilling and projects. That is a shade over 6% of current production - towards the low end of the EIA-cited range.

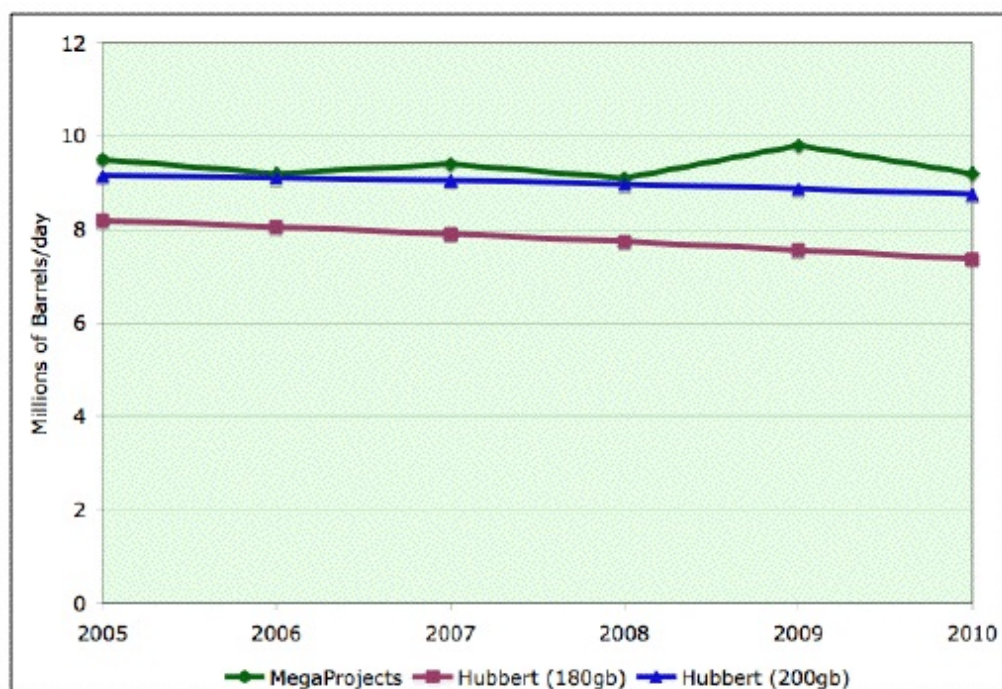
That kind of decline makes for a problem: by 2010, they'll have 3mbpd of declines under their belts, and there's only 2400kbpd of new projects coming on stream. Hard to see how production can get increased that way. However, bear in mind that the IEA number could be pretty uncertain either way. On the upside, there's no way to know how much drilling they might do outside the context of the Megaprojects. On the downside, decline rates after use of MRC horizontal wells etc have a nasty tendency to accelerate. So it wouldn't surprise me to find the Saudi's looking for excuses to keep production flat or declining while they still go ahead with their projects (as after Qatif/Al Sa'fah).

We can compare this bottom-up megaprojects analysis to the top-down Hubbert analysis. Remember this picture created by [Jean Laherrere](#), with a projection to a 180gb ultimately recovered reserves (URR), suggesting Saudi Arabia is already past peak (at least in the sense of the smooth fit midpoint which comes in 1998).



*Hubbert Linearization of Saudi Oil Production. Credit [Jean Laherrere](#).*

However, it's worth noting that the last couple of years have popped up above the line. If we suppose they are really more representative of the Hubbert curve, and the Saudi's were voluntarily restricting production in between, we'd get a curve that went out to about 200gb, with a midpoint in 2003. On the last graph, I plot the megaprojects plus 600kbpd annual declines and both of those Hubbert projections:



*Three Projections of Saudi Production. One (dark green) adds the tabulated megaprojects to the IEA 600kbpd decline in existing production estimate. The second (plum) is the Hubbert*

*production curve implied by Lahaherre's linearization fit with a 180gb ultimate recovery. The third (blue) takes a Hubbert curve with a 200gb ultimate recovery.*

If you believe Laharrere with his 180gb, then the Saudi's are now overproducing and the piper will probably have to be paid with a Matt Simmons-style production collapse before too long. If you buy the 200gb Hubbert story, then the top-down analysis agrees quite well with the megaprojects + 600kbpd annual decline bottom-up analysis.

However, I think the truth is it's very hard to tell from this data. A great deal is going to depend on the level of effort in terms of rig-count going forward, and what is really going to happen to Ghawar production (which probably nobody knows). If JODI ever manages to pry out field production data from the Saudi's, we'd be in better shape.

And finally, we must not forget Mr Al-Naimi, with his [460gb of reserves still to go](#) (implying an ultimate recovery of 570gb). If he's right, Saudi Arabia is an immature province, production could be increased enormously over where it is, and all a set of hard-drinking SUV drivers needs to do to keep the party going is persuade them to use a lot more rigs. Mine's a single malt, please.



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