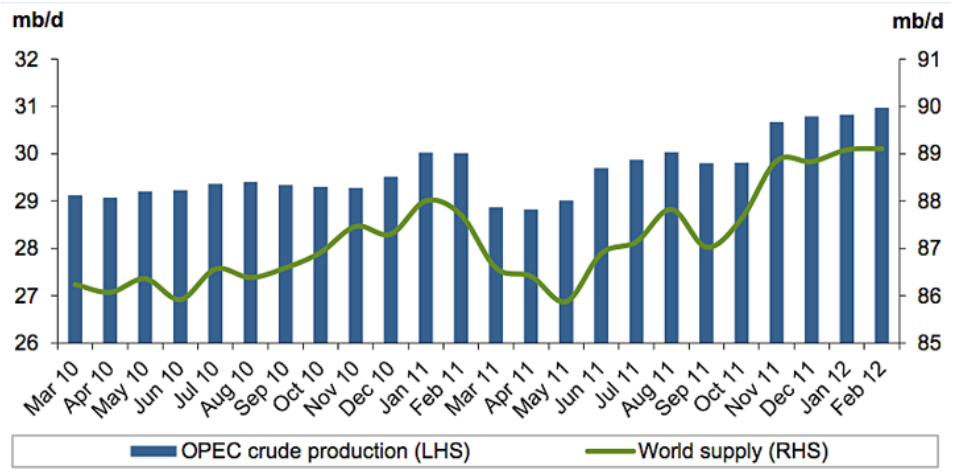
The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Tech Talk - Saudi Arabian Oil Production: Part 2

Posted by Heading Out on March 25, 2012 - 6:27am
Topic: Supply/Production
Tags: crude oil production, dammam, global demand, hoarding, iran sanctions, opec oil production, saudi arabia [list all tags]

There is some debate in the mainstream press about the relative causes and impacts of the rising gasoline price on the overall economy. (I paid $4.40 per gallon in Silicon Valley on Sunday, though only $3.67 in mid-Missouri today). As noted in my previous post, the Kingdom of Saudi Arabia is unique in its potential ability to increase oil production at relatively short notice, in order to deal with a shortfall in that overall supply. With the tightening of supplies from some of the nations that have seen the impact of the "Arab Spring", there is a concern that there may be such a disruption, as was seen during the recent turmoil in Libya. Fortunately the damage to that oil production infrastructure was minor, and the nation seems well on its way to returning to a "business as usual" situation. Unfortunately, there are still Yemen, Syria, Sudan and Iran to worry about, and so available additional supply provides some comfort to the market.

Yet in itself, some of that relief is misplaced. OPEC suggests in its March Monthly Oil Market Report (MOMR) that world oil demand is anticipated to grow by around 900 kbd this year, of which 600 kbd is expected to come from non-OPEC sources. In February, OPEC increased production by 140 kbd to average 30.97 mbd but expects that, over the year, demand for their crude will average 30 mbd. (Note that this does not include stock build-ups, and China has been building their SPR at a rate of up to 0.8 mbd). OPEC also suggests that OPEC NGL production will increase another 360 kbd over 2012. Their plot of global and OPEC oil production over the past two years is below.



The last two years of global (rhs) and OPEC oil production (lhs) (OPEC March MOMR)

In 2008, the KSA had stated that they would have an additional capacity beyond the 9.7 mbd they planned on producing in July of that year, through an available production increment of 900 kbd from Zuluf; 700 kbd from the oil fields at Safaniyah; 300 kbd from Berri; 300 kbd from

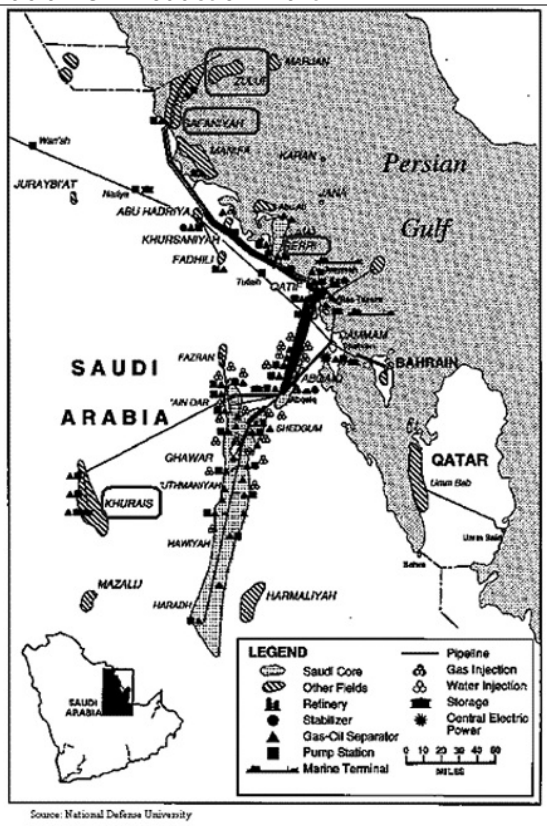
Khurais; and 250 kbd from Shaybah. Future projects planned at that time were:

Aramco Upstream Petroleum Projects (through 2011)

Field	Current Capacity (thousand bbl/d)	Increase (million bbl/d)	Online	Type	Estimated Cost (USD)	Notes
Haradh	300,000	0.3	Apr-06	Light	$1.5 billion	
Khurais (including Abu Jifan and Mazalij)	0	1.2	Jun-09	Light	$11 billion including gas	
Khursaniyah (including Abu Hadriyah and Al-Fadhili	50,000	0.5	Jun-07	Light	$4 billion	-Project is a half-year ahead of schedule
Manifa (offshore)	0	0.9	2011	Heavy	$7-9 billion	-Could rise to 1.5 million bbl/d -Two years ahead of schedule. -Largest offshore development undertaken by Aramco.
Neutral Zone*	NA	0.15	2010	Medium	$400 million (estimate)	
Nuayyim	0	0.1	2008	Extra Light	$350 million	
Shaybah I	555,000	0.25	Apr-08	Extra Light	$3 billion	-Associated cogeneration -Project is nearly a year ahead of schedule
Shaybah II, III*	NA	0.2	2010	Extra Light	$800 million (estimate)	
Total New Capacity		3.6				

Planned expansion of Aramco production from 2008 through 2011. (Next Big Future)

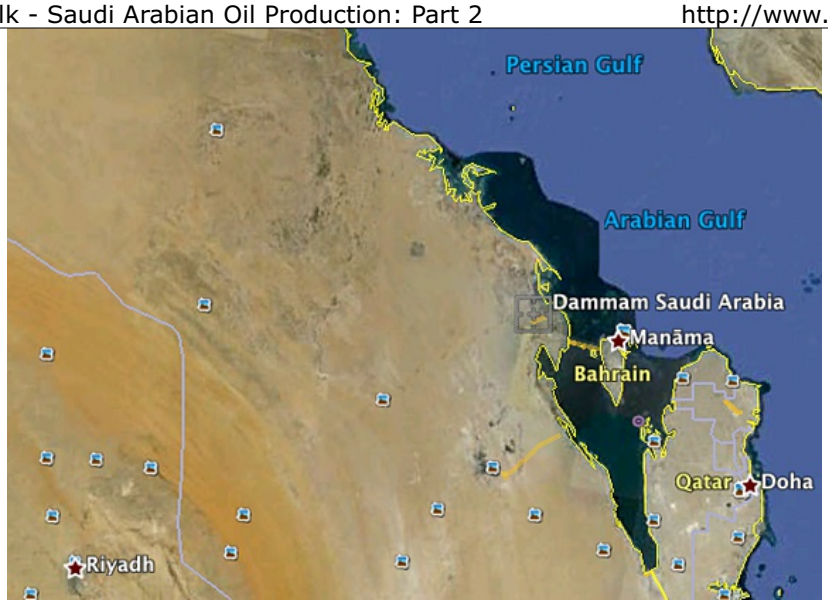
By the time that 2009 arrived with additional improved oilfield production from Khurais (to 1.2 mbd), then the addition of Shaybah (250 kbd) and production from a newly started field at Nuayyim (100 kbd), the KSA was considered to have a spare capacity of 4 mbd. This was an increase of 1.55 mbd over the previous reserve, but must be set against a production decline to 8.2 mbd to give a total of 12.2 mbd available.



Relative locations of fields in KSA and pipeline connections (Next Big Future)

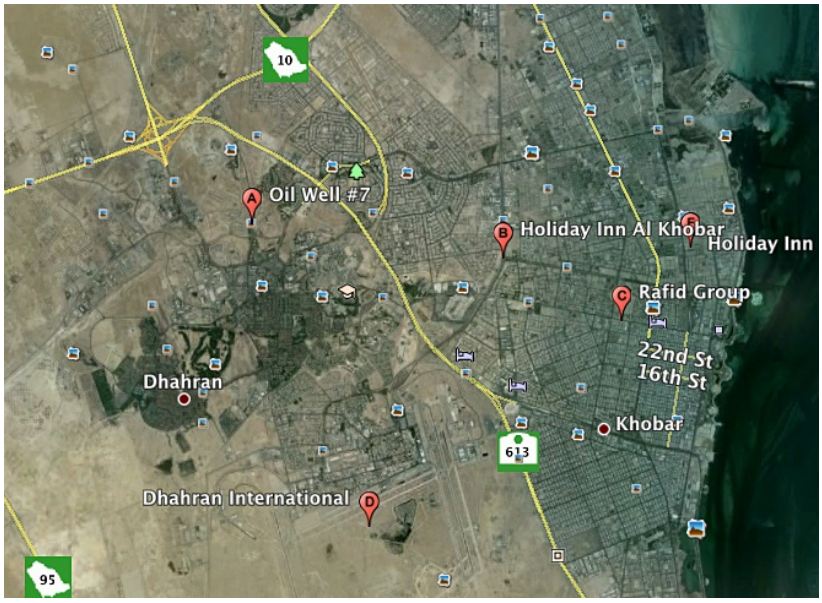
Although there have been additional changes in the mix since then, Aramco does not feel the need for further expansion in capabilities. The CEO of Saudi Aramco, Khalid al-Falih, stated in November 2011 that they would stop efforts to increase capacity, and hold production at the then achievable upper bound of 12 mbd. Future development efforts will switch towards natural gas production. Yet, just this week the kingdom has promised to pump some 9.9 mbd during March and April in order to "assure consuming nations that oil supplies will be adequate." (Ed. note: This does not necessarily mean that they will be able to immediately sell all of this production, though some nations have begun hoarding in concern over anticipated problems of supply later in the year.)

Interestingly, in order to sustain that 12 mbd target, Aramco is planning on re-opening the Dammam field, which has lain dormant for the past 30 years, and which will now be targeted to produce 100 kbd of heavy crude.



Location of the Dammam oil field (Google Earth)

Dammam was where the first wildcat wells were drilled in Saudi Arabia back in 1935, and even though the region had been surveyed since 1933, the first half-dozen wells weren't that much to write home about. The dome that forms the major geological feature and attracted the first effort, lies under Dhahran and has been resurveyed using 3-D seismic in order to find the best places to build the new wells.



Location of the oil field relative to the city (Google Earth) (I am indebted to Joules Burn and Jonathan Callahan for the right location)

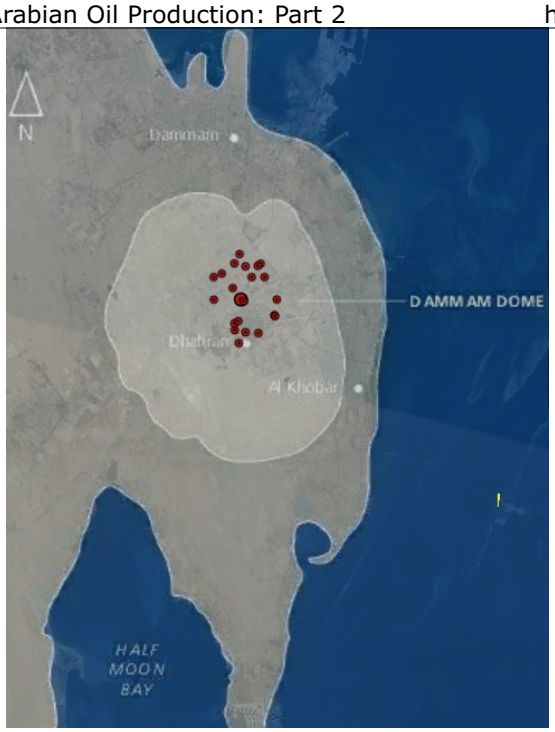
Of course, there is the question as to whether the re-opening of these older fields, such as Dammam, is in order to make even more oil available if needed, or whether the KSA will really need that production just to sustain existing targets. As I hope to explain in the next few posts (building on the previous analysis of TOD contributors and editors), it is much more likely to be the latter than the former.

When the first wells were drilled, none of those dwellings in what is now the city of Dhahran existed; rather, the area was still a desert, and most of the local Bedouin were migratory and lived

in tents. At this time the world was in the midst of the Great Depression as the Saudi King was informed that the first well was about to be drilled.

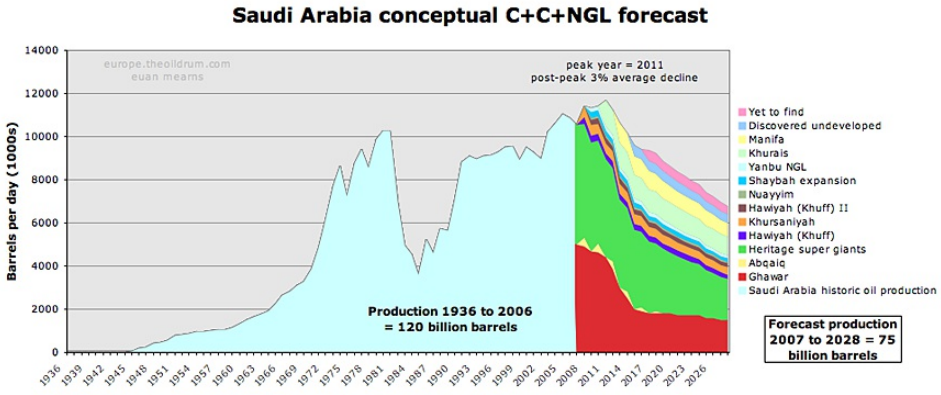
> The wildcatters had already started to arrive in the Dammam Dome area where the first well, in drilling lingo, was to be "spudded in." Tents were set up temporarily on a broad terrace near a group of limestone outcroppings. A pier was started down by the shore at al-Khobar, a fishing village. In January 1935, while the geologists were out on the desert reaches continuing their surface explorations, the construction crew was digging a cellar for the first drilling rig.
>
> Most of the pioneer group were experienced in the conditions of wildcatting far away from well-stocked oil field supply centers. They knew how to improvise. Lacking dynamite, they broke up the rock for the derrick cellar by heating the rock with a wood fire and then flooding it with cold water.
>
> By February 19, the cellar was completed, and by mid-April the derrick was up and being rigged. On April 30, the wildcatters spudded in Dammam No. 1, the first oil well in Saudi Arabia.
>
> The hole was first drilled by the cable tool method, a slow process being replaced by the modern rotary rig system at that time. Three crews worked around the clock to "make hole" as fast as possible.

The first well was initially drilled down to around 2,000 ft, but only produced at around 100 bd. In the next year of the effort, a second well initially produced some 3,840 bd and gave an incentive for further drilling, but then fell to a yield of only 225 bd in the same year. No. 3 came in at 100 bd, and number 4 was a dry hole, as was number 5 initially. While number 6 was still being drilled, a deeper well had been authorized as number 7, and this spudded on December 7th, 1936. On March 4, 1938, at a depth of 4,727 ft it began to flow at 1,585 bd, and within three days the flow had increased to 3,690 bd. The well had discovered the Arab D reservoir, and the Dammam well continued to flow for 44 years, producing 32.5 million barrels of oil (Matt Simmons – Twilight in the Desert). At the time, the Saudi king was presented with $50,000 in gold, as agreed.



The scope of the Dammam Dome (Joules Burn)

Saudi production took a number of years to develop, as Euan Mearns discussed in 2007, when he plotted the following graph based on Saudi plans known then:



History of Saudi Oil Production (Euan Mearns)

Euan's post dealt with the decline of the historic fields. Since we are now in the phase of Saudi production in which new oil and reserves are brought on board to match those declines, the topic will focus on this aspect as we consider individual fields of the Kingdom.