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Reserve Appreciation And Incremental Flows

Posted by Dave Cohen on November 14, 2005 - 8:37pm
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Alternatively, I could have called this story "Back to Basics, What I Learned at ASPO USA, Part I".

To convince us all that peak oil is not just on the horizon, the IEA speaks of huge proven or potential reserve numbers or, even worse, undiscovered resources that will soon become producible reserves. In his ASPO USA talk, Matt Simmons (ppt) called this *reserve appreciation* and sarcastically referred to these as "conceptual reserves". As Chris Skrebowski (ppt) pointed out (Slide 8), what is relevant to peak oil is not reserves but diminishing incremental flows. The history of Kuwaiti reserve numbers and the recent revelation that the Greater Burgan field, the world's second largest in terms of reserves, is now "exhausted", make these distinctions clear.

In an analysis of Kuwait's Reserves (from the ASPO Newsletter 57, September 2005), we learn

> There is something decidedly fishy about Kuwait's reported reserves. It will be remembered that the country announced a massive increase in 1985 from 64 to 90 Gb although nothing particular had changed in the oilfields. Cumulative production through 1984 amounted to 22 Gb, giving the total discovered to that point of 86 Gb, which is only slightly below the new reported number of 90 Gb. This suggests that the country started reporting total found (termed Original Reserves) not Remaining Reserves. But an alternative interpretation is that the earlier number reflected a conservative recovery factor of say 30%, giving an oil-in-place value of 286 Gb. Increasing recovery to 40% would yield reserves of 92 Gb (286 x 0.4-22), close to the new estimate reported in 1985.
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> Kuwait's main field, Burgan, was found as long ago as 1938, suggesting that by now it must be heavily depleted....
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> Kuwait's genuine reserves are here taken to be about 55 Gb (far below the currently claimed 99 Gb) but this still delivers a very low depletion rate of only 1.3%, suggesting that even this low estimate may not be low enough. **Why would they be going to the trouble of drilling highly deviated wells across their border and trying to develop their own smaller northern fields if raising production was just a matter of opening valves in the Burgan Field**?

Why indeed? Reserve estimates have never decreased but now we learn that Greater Burgan has peaked and

> To be sure, the plateau in supply if achieved would be higher than a projection from the

> IEA. This week the Paris-based group said output from the Greater Burgan area will increase from 1.35 million barrels a day in 2004 to 1.64 million a day in 2020, before falling to 1.53 million a day in 2030. The field now pumps between 1.3 million and 1.7 million barrels a day, al-Zanki said.

Which is it? 1.3/mbd or 1.7/mbd? Whatever the actual daily production is and despite greater reserves numbers over the years, incremental flows at Burgan have peaked, may plateau for awhile and can only go down from there. Generally speaking, oil reservoirs go through primary, secondary and tertiary production. In his ASPO USA talk, Jeremy Gilbert (ppt) noted that typically, a reservoir might achieve a 40 to 45% recovery rate (from primary and secondary recovery) but using EOR in tertiary production might push that into the 50 to 55% range. In secondary production, methods are applied to re-pressurize the reservoir to maintain flows. Thus we read this from a report (big pdf warning) from Oxford Energy.

> If the share of oil output from the Neutral Zone is shared equally with Saudi Arabia, Kuwait was the sixth largest oil producer within OPEC in 2003 as well as the ninth largest exporter of crude oil in the world. Crude oil production averaged 2.2 million b/d but according to Nader Sultan, (then) Deputy Chairman and CEO of KPC, Kuwait planned to increase capacity to 3 million b/d by 2005 and to 3.5 million b/d by 2010. **These targets were widely viewed as being too ambitious, especially as the Burgan field, which generates over 80 per cent of the country's oil, is now suffering from a deep water cut problem**. As a result of these concerns the country has recently revised its expansion target with the focus now being on reaching 4 million b/d by 2020

Obviously, water cut results from water injection, an important secondary recovery technique. It seems apparent that in a mature, depleted field like Burgan, it is no longer possible to increase the incremental flows and probably what is "exhausted" there is the ability to apply secondary recovery methods to keep the reservoir at pressure.

As Simmons pointed out in his ASPO USA talk (slide 17), *reserve appreciation might be real, but [is] irrelevant* because if the appreciation is real, it only "extends the [tertiary production] tail" (slide 8) of the reservoir in question. For Greater Burgen, it is certainly reasonable to assume that tertiary production is right around the corner and incremental flows will decrease just as they did at Prudhoe Bay (slide 18).

So when we learn that Kuwait has 99 Gb in proven reserves and that

> **Most of Kuwait's oil reserves are located in the 70-billion barrel Greater Burgan area**, which comprises the Burgan, Magwa and Ahmadi structures. Greater Burgan is widely considered the world's second largest oil field, surpassed only by Saudi Arabia's Ghawar field, and has been producing oil since 1938.

we see that these enormous reserves numbers simply don't matter. Even if these numbers are not "conceptual" and actually reflect reality, this will only extend the tail end production. And we can now see that IEA statements like "Greater Burgan's output is expected to increase steadily to 1.6 mbd in 2015, and then decline slightly to around 1.5 mbd by 2030" as quoted by HO in Burgan and the other fields in Kuwait are simply nonsense. As Skrebowsky pointed out, what matters in peaking is the incremental flow rates, not the the impressive reserve numbers. What is

truly surprising is not the declines in Kuwaiti fields but rather that they admitted it, thus confirming Matt Simmons' and our worst fears.