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Don't Count on Revolution in Oil Supply

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This is a guest post by Sadad al-Huseini, now a petroleum consultant and formerly executive vice president of Saudi Aramco for exploration and production, and is a response to the recent article in PIW (Petroleum Intelligence Weekly) by Leonardo Maugeri on his new study Oil: the Next Revolution, challenging his optimism about future oil supplies (PIW Jul.2'12). This article originally appeared in the July 23, 2012 edition of PIW.

Leonardo Maugeri's recent paper *Oil: The Next Revolution* on the presumed future abundance of oil supplies rejects the pessimistic outlook of limited increases in oil capacity over the next decade. It suggests global oil capacity will exceed 110 million barrels per day by the end of the decade, putting an immediate end to concerns regarding constrained long-term oil supplies. This conclusion is based on an assessment of new projects with a reported capacity of 49 million b/d before a downward adjustment to 29 million b/d to allow for completion risks and reserves depletion. Maugeri holds two PhDs, one in Political Science and one in Economics, and has extensive executive experience with ENI in strategies and developments and in petrochemicals.

In putting forth this optimistic thesis, Maugeri apparently sets aside a variety of technical realities, including the difference between natural gas liquids (NGLs) and conventional oil, reserves depletion versus capacity declines, and proven reserves as opposed to speculative resources.

The report mixes NGLs, which feed petrochemicals and domestic or industrial fuel applications, with conventional oil, which is the main source for transportation fuels. When fractionated, NGLs yield propane, butane and light naphtha. These products cannot replace oil distillates such as gasoline, diesel or jet fuel.

For example, NGLs grew from 7 million b/d in 2003 to an estimated 12 million b/d in 2011 but provided no relief to the demand for transportation fuels, which was surging across those years. The growth in NGLs is now forecast by the IEA to reach an ambitious 20 million b/d by 2030. Impressive as this may be, NGLs will remain at best marginally relevant to transportation applications until widespread changes occur in the technology and infrastructure of the auto and trucking industries. Given cost and complexities, there is no evidence that this is likely to happen within this decade.

In regard to capacity declines, the report appears to confuse oil reserves depletion with capacity declines. In the world of petroleum engineering, depletion quantifies residual reserves in the ground, while declines define a reservoir's ability to sustain a given level of production over time. Incremental reserves in modern discoveries are added early in a discovery's life while production declines are a subsequent development related to reservoir factors including changing fluid compositions and diminishing reservoir energy. Maugeri's suggestion that incremental reserves may offset capacity declines mixes up speculative exploration variables with reservoir engineering realities.

The report takes exception to the IEA's 2008 estimate of an average 6.7% global oil capacity

decline and offers an equivalent estimate of less than 2% per year. This low estimate is apparently based on the observation of historical production rates from major oil producing countries. It is not clear how the author extracted the convoluted effects of offsetting market volatility, spare capacity utilization, natural production declines, and ongoing new capacity investments from such historical trends.

The IEA's 2008 study, on the other hand, applies well-established petroleum engineering principles to 800 post-peak fields that make up the majority of global oil supplies. The natural decline rates of these fields were reported to average 3.4% for 54 supergiant fields, 6.5% for scores of giant fields and the 10.4% decline rate for hundreds of large fields. At the IEA's 6.7% level of capacity declines, the current 74 million b/d of conventional oil supplies (which exclude NGLs, biofuels, nonconventionals and various other liquids) would require 5 million b/d of supplemental new capacity annually just to maintain a flat level of supply. Based on these assessments, Maugeri's 29 million b/d of "risked" new capacity would only replace declines through 2017. Even the full 49 million b/d of new projects would only extend current liquids production on a flat trajectory to 2021.

In regard to global oil reserves, the Maugeri report highlights the opportunity to convert trillions of barrels of unconventional oil resources into proven reserves. This is hardly a simple process, as he points out, given the realities of technical, environmental and economic challenges. Industry studies based on the IEA's published upstream oil and oil equivalent projects have shown that the capital cost of Canadian bitumen and Qatari GTL projects have averaged $97,000 per barrel of capacity. Had these prohibitive economics been otherwise, the resources alluded to in the Maugeri report would have entered into widespread development many years ago.

In regard to reserves growth and revisions to current estimates, the report needs updating. Leading oil producers only apply a low recovery factor of 20%-25% in those instances when this is in fact the limit to potential oil recoveries. On the other hand, major OPEC and non-OPEC producers frequently invoke 40%-50% recovery factors based on IOR and EOR technologies deployed within their operations or elsewhere in the world. In some advanced operations, reserves are actually estimated by complex reservoir modeling and simulation techniques which apply different production rules and investment strategies over time, not by average recovery factors.

Finally, the "explosion" in US oil shales and tight sands, which is assessed to grow to over 4.7 million b/d by 2020, is indeed a great technical and commercial success story. It is a welcome development given the constrained outlook for global oil supplies and the US' own consumption of 18.5 million b/d of oil and oil equivalent liquids.

Maugeri's report is right to emphasize the many risks that confront the energy industry today. Although national and international oil companies are doing the best they can to increase oil supplies, they are often operating in the shadow of profound technical challenges, adverse political restrictions and severe financial hurdles.

Not surprisingly, many oil executives have stated publicly that incremental oil supplies are now in a precarious balance with capacity declines and will remain so for years to come.

Much as all the stakeholders in the energy industry would like to be optimistic, it isn't an oil glut by 2020 that is keeping oil prices as high as they are. It is the reality that the oil sector has been pushed to the limit of its capabilities and that this difficult challenge will dominate energy markets for the rest of the decade.