Closed Coffin: Ending the Debate on "The End of Cheap Oil" A commentary

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The past five years have seen a renewed debate on the issue of oil supply and the possibility of a near-term peak in production and the concomitant adverse economic consequences. A number of articles have stated that discoveries over the past thirty years have been only a fraction of consumption and that according to the Hubbert Curve method, world oil production is close to a peak. What few people realize is that these arguments are based entirely on a very particular technical argument, and recent evidence has highlighted its fallacy.

The greatest attention was achieved by the March 1998 Scientific American article "The End of Cheap Oil" by Jean Laherrere and Colin Campbell, largely due to the extreme nature of their warning -- production peaking within a few years -- and the alleged irrefutability of it. Subsequently, the authors have been very active publicizing their views, including testimony to the British House of Commons, speaking on BBC, and a number of other venues. A few articles in the general press have been at least skeptical, but most of the work refuting their arguments has been treated cautiously and quite a few lay observers have taken their arguments as truth rather than speculation. Critics of these arguments (like myself) have noted that these forecasts have repeatedly proven to be incorrect, including those by Colin Campbell in particular, who as early as 1989 predicted a peak in world oil production for that year. Their rejoinder has been to note correctly that -- past performance is not proof of future performance.

However, to the more explicit charge that their model is mis-specified, the authors have made a more substantive response. The primary flaw in this type of model is the assumption that recoverable petroleum resources are fixed, when the amount of oil which can be recovered depends on both the total amount of oil (a geological factor which is fixed), but also dynamic variables like price, infrastructure, and technology. If the amount of recoverable oil increases, as it has in the past, then the level predicted for peak production must increase and the date pushed further into the future. This has been observed many times from forecasters using this type of model and relying on estimates of ultimately recoverable resources (URR). But Campbell and Laherrere have asserted that their estimate of URR is both highly accurate and stable because of their calculation using field size estimates showing declining discovery size, moving towards an asymptote. Since they have relied heavily on a privately held database, which is unavailable to the general researcher, it has been difficult for critics to respond to this specifically.

The reliance on discovery trends to estimate URR has received similar criticism as the faulty URR estimates, namely that estimates of field size tend to increase over time with improved recovery methods, better examination of seismic data, infill drilling, and so forth. This means that the size of the recent fields is being underestimated compared to older fields, exaggerating the nearness of the asymptote and understating its size. An analogy would be to plant trees over twenty years and note that the size of the most recently planted trees was shrinking, and concluding that timber resources would become scarce. Campbell and Laherrere have argued in response that increases in recovery at existing fields are artifacts of accounting rules (which is only partly true) and that they have overcome this flaw by their reliance on a database whose reserve estimates do not suffer from this bias. Since the estimate of ultimately recoverable resources is based on their field size estimates, the question of field growth becomes central to the entire debate. And their primary line of defense has been that their critics lack access to this database.

Last year, the publication of the USGS's World Petroleum Assessment provided one particularly sharp

nail in the coffin of this argument, when (among other things) they examined the development of field size estimates over time using the same proprietary database which Campbell and Laherrere relied on, and concluded that reserve growth from existing fields, although uncertain, would be substantial. They published a mean estimate of 612 billion barrels (nearly 30 years of current consumption), significantly increasing their estimate of the world's URR.

But the final nails seem to be located in this summer's little-noticed announcement by IHS Energy -- the firm whose field database Campbell and Laherrere have utilized -- of estimated discoveries. According to the firm, discoveries in 2000 were 14.3 billion barrels in 2000, a 10% drop from 1999. This has two interesting implications: first, discoveries have risen sharply the past two years, refuting the statement that poor geology, rather than lack of access to the most prospective areas in OPEC, has kept discoveries low for the past three decades. But also, this implies that discoveries in the past two years have amounted to nearly 20% of the total undiscovered oil which Campbell and Laherrere argued remain! Undoubtedly they -- and others -- will argue that this is due to the firm's inclusion of deepwater reserves, which they are not considering, and that is a factor in the recent robustness of discoveries. However, the primary element behind the greater discovery rates has been the finding of two new supergiant fields in Kazakhstan and Iran. Again, this refutes the argument that discoveries have been relatively low in recent decades due to geological scarcity and supports the optimists' arguments that the lower discoveries are partly due to reduced drilling in the Middle East after the 1970s nationalizations.

And the most crucial fact is actually IHS Energy's reference to earlier discoveries. They have revised their estimates of remaining reserves at end -- 1991 to 1200 billion barrels, implying that oil discovered to that date was close to 1900 billion barrels (since about 675 billion barrels had been produced). This despite the Campbell/Laherrere argument that their data does not experience revisions due to their reliance on P50 (50% probability) estimates, compared to P90 (90% probability) used in the US and by many US oil companies. While there remain uncertainties about future field reserve growth versus historical growth, it becomes clear that it is still continuing and the arguments that they had corrected for the problem are fallacious at best.

Indeed, the sheer size of the revisions are themselves significant. Although I lack access to historical IHS Energy estimates, Campbell and Laherrere had placed "back-dated" reserves in the early 1990s at barely over 1000 billion barrels in their 1998 article. This implies (to be generous) an increase due to revisions of 150 billion barrels or more in a mere five years: 30% more than actual consumption! It means (as I have repeatedly argued) that their discovery trend curves are misleading, because the more recent numbers were understated, and in the future will likely be too low again. The method they use is flawed because of this definitional mistake.

Note also that the amount discovered to 1991 (which would include only minimal deepwater discoveries) is actually significantly greater than the two now estimate would ever be discovered. In fact, IHS Energy puts current reserves at 1100 billion barrels, which, with past production, yields almost 2000 billion barrels, about 10% or 200 billion barrels over the 1800 billion barrels which the duo have confidently predicted would be the ultimate total. Presumably we can expect them to make yet another upwards revision in their URR estimate. Indeed, despite fears of declining discoveries, estimated recoverable resources -- even by pessimists -- have grown faster than consumption. This can hardly be argued as a sign of resource scarcity.

There are many other arguments that have made up part of this debate, and I have tried to deal with each of them in the articles cited below, as well as further forthcoming work. But while we need be concerned about quite a number of issues related to petroleum supply -- depletion, change in reserve growth, concentration of production in politically stable areas -- a possible near-term peak in production (conventional or otherwise) is not one of them. It takes a lot of nails to close a coffin, but the size and quality of these will hopefully ensure that it remains closed.

1. "Forecasting Oil Supply: Theory and Practice," Quarterly Review of Economics and Finance, 2001, forthcoming.

2. "The Debate Over Oil Supply: Science or Religion?" Geopolitics of Energy, August 1999.
3. "Farce this Time: Renewed Pessimism About Oil Supply" Geopolitics of Energy, December 1998-January 1999.
4. "The Analysis and Forecasting of Petroleum Supply: Sources of Error and Bias," in Energy Watchers VII, ed. by Dorothea H. El Mallakh, International Research Center for Energy and Economic Development, 1996.