Global 4.5% Oil Production Decline Rate Means No Near-Term Peak

The missing link for understanding the future of world oil supply - a solidly based view of oil field decline rates - has now been filled by a new field-by-field analysis of production data by Cambridge Energy Research Associates (CERA) and IHS Inc.

The aggregate global decline rate is 4.5 percent, rather than the eight percent cited in many studies, based upon CERA's analysis of the production characteristics of 811 separate oil fields.

"Some of the more gloomy, pessimistic 'peak oil' views about the future of oil supplies that are current today result from an assumption of high decline rates," said CERA Oil Industry Activity Director Peter M. Jackson, author of the Finding the Critical Numbers report. "This new analysis provides the basis for more confidence about the future availability of oil.

"The absence of definitive, comprehensive analysis of production timelines and decline rates has led to widely differing estimates of the potential future availability of oil: an information vacuum that has contributed to the 'peak oil' theory of future liquids production capacity," he added. "We hope that this study will contribute to a more informed understanding of the issues, both below ground and above ground."

Jackson explained that this was a major research project: "To address this key question, we undertook a substantive analysis of the most extensive field production database in the world, developed and maintained by IHS, covering 811 separate fields that account for about two-thirds of current global production and half of the total proved and probable conventional oil reserve base," according to Jackson.

"The resulting analysis demonstrates that the aggregate global decline rate for fields currently in production is approximately 4.5 percent per year, and that annual field decline rates are not increasing with time.

"Getting this right, and understanding the underlying dynamics, are key because the amount of new oil supply that will come on stream to satisfy present and future oil demand depends to a large extent on a comprehensive understanding of annual decline rates of existing fields," he said.

"The analysis also concludes that decline rates are a function of reservoir physics and investment strategies, and that there is a general historical trend toward lower decline rates in recent years which may be due to better reservoir management practices and the impact of new technology.

In addition, because reservoir physics is only one of the key drivers, we would not expect to see a very rapid change in average decline rates in the future without a step change in technology or field development strategies," Jackson added.

"This analysis increases the quality and reliability of our projections of future oil supply. However, while our understanding and extrapolation of many belowground factors is improving, careful judgment is still required to accommodate the impact of aboveground factors, such as geopolitics, investment patterns, rising costs, government decision-making, and environmental issues, that will continue to have a major impact on the global forward production capacity profile."

Primary Findings

The primary conclusions drawn from CERA's analysis of 811 fields during the production build-up, plateau and decline stages in the oilfield life cycle include:

* Aggregate decline rate - The 4.5 percent per year aggregate global decline rate among fields in production (FIP) is much lower than the eight percent rate cited in many studies and projections. This pessimistic estimate may be a function of the generally more rapid decline rates observed in small fields - increasingly being developed in mature non-OPEC countries - and the rise of deepwater projects, which tend to flow at high rates as a requirement of commerciality, but which also decline rapidly.

* Fields in decline stage - Only 41 percent of production is from fields in the data base that are beyond the plateau stage and into the decline phase of their production lives.

* Low decline rate, longer lives - Annual field decline rates are not increasing but, as a result of increased investment, improved planning and technology, can be maintained at low decline rates in many fields for prolonged periods, and field life is very often longer than originally projected.

* Offshore vs. onshore fields - Individual offshore fields are declining at a 10 percent annual rate compared with six percent for onshore fields, and deepwater fields decline at 18 percent annually compared with 10 percent for shallow-water fields. Non-OPEC offshore fields decline five percent per

year compared with 12 percent for those in OPEC.

Large vs. Small Fields

The CERA analysis found significantly different production patterns in large fields vs. small fields. Typically, large fields build up over an average of six years, produce on plateau for seven years at 93 percent of their maximum annual production rate, and decline on average for more than 20 years. In contrast, small fields build up over an average of three years, produce on plateau for five years, and decline on average over more than 14 years.

Because large fields with more than 300 million barrels of originally present reserves represent over 95 percent of the reserves and 86 percent of the production in the study dataset, their lower decline rate and higher production level through extended decline periods is likely to make a major contribution to overall future liquids production capacity.

It is likely, according to CERA's analysis, that improved understanding of giant fields' complexities and reservoir models over the course of long life cycles has allowed late field expansion that has arrested decline and, in many cases, allowed production to increase significantly.

Decline Rates by Category

The CERA study also highlighted other factors, in addition to field size, that influence post-plateau (as distinct from the aggregate for all stages of all fields in production) decline rates, including reservoir characteristics, development location, regional setting and operational tactics.

OPEC fields generally decline at a slower rate than non-OPEC fields, possibly in relation to basic geological differences, the relative size of OPEC fields, their locations, and perhaps production constraints set by the organization. Limestone reservoirs (more prevalent in OPEC) tend to deplete more slowly than sandstone reservoirs. Offshore projects, prevalent in non-OPEC, decline more rapidly than onshore projects.

Future Profile

The major contribution of large fields to the total supply stream is clear from the CERA analysis. The 400 large fields studied (greater than 300mbo reserves) contributed an average production of 35 million barrels per day over the 2000-2005 period.

This data set excludes onshore North American large fields, but still represents 45 percent of world production over those six years. With expected overall moderate decline rates these large producing fields will continue to be a major source of global supply for many years to come.

As to the future production profile, almost two-thirds (63 percent) of remaining reserves are associated with fields that are still either in the buildup period or on plateau, and are producing 59 percent of current production.

In addition, CERA's database of new field developments expected to come on stream in the next four or five years includes some 350 projects (120 OPEC and 230 non-OPEC) with gross contributions of approximately three million barrels per day (MPD) annually from OPEC and 3.5 mbd from non-OPEC countries over the next few years.

World Capacity Conclusion

"The results of this new study reinforce CERA's existing bottom-up global liquids capacity model showing that liquids capacity of around 91 mbd in 2007 could climb to 112 mbd by 2017," according to Jackson.

"This outlook is supported by a key conclusion of this study: there is no evidence that oilfield decline rates will increase suddenly. It is important, though, to continue to research and understand evolving decline trends and further develop insight into the declines."

About the Author

Daniel Yergin, chairman of CERA, received the Pulitzer Prize for "The Prize: The Epic Quest for Oil, Money & Power" and the United States Energy Award for lifelong achievements in energy and the promotion of international understanding. Vist CERA.