Note on the Delay in the Peak of Supply of Liquid Fuel for Transportation Applications Derived from Conventional Oil by Greater Allocation to this Sector

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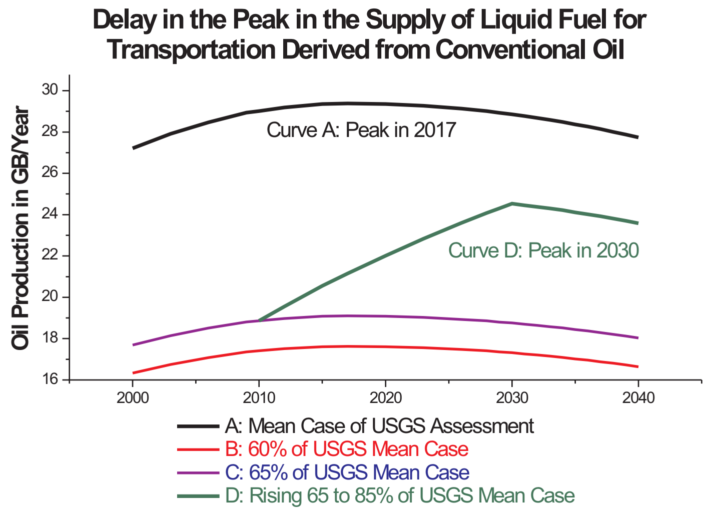
The peak in the world production of oil from conventional sources is expected within the next few decades and probably about 2020.[1] By applying a parabolic projection technique devised by this author[2] to the Mean Case of a major assessment of the world's remaining conventional resources published by the U. S. Geological Survey in 2000[3], it was found that this watershed in the world's energy system would occur in 2017. In Case 1 of the previous paper, the *Reserves Addition* defined in the U.S.G.S. study contributes to production only after the peak is past. This interpretation of the Year 2000 Assessment serves as the basis of this note.

It is somewhat uncertain as to how much of the present production of conventional oil is devoted to its intrinsic market as a supply of liquid fuel for mobile applications in the transportation field. A. Birky et al[4] infer that 68% of oil demand in the U.S. arises from the transportation sector. On a world basis, the corresponding allocation is given as 40% which seems low but this value depends upon the definitions employed. As an example of the difficulties involved in making this calculation, there is the question as to whether oil (or other energy) consumed in stationary facilities in the process of producing liquid products of a quality needed for mobile applications should be included in this value. Such questions are important because the provision of liquid fuel to the transportation sector will be a major issue in the energy system after the peak in the production of conventional oil has passed.

The need to limit the emissions of carbon dioxide to the atmosphere from the fossil fuels will also become critical in the same period as the peak in world conventional oil production is approached. If sustainability is defined as achieving a constant concentration of this gas in the atmosphere, the total emissions from these carbon-bearing fuels should be limited to the 2.7-2.9 gigatonnes carbon per year range which is a little less than one half the emissions of 6.4 GT C/year in 2000. It will be difficult to achieve this objective given the strong opposition to compliance with the much more modest reductions specified in the Kyoto Protocol. Nevertheless, the quantity of this greenhouse gas emitted from all mobile sources is a little less than 2.0 GT C/year at present and this value will likely only increase slowly over the years. Though the automotive age is spreading around the world to the developing countries leading to growing emissions from the transportation sector, this trend is offset to some degree by the rising efficiency with which these liquid fuels are consumed. Any comprehensive strategy for dealing with the approach of the peak in world oil production would include measures to encourage the allocation of as much of the oil available from conventional sources as possible to transportation requirements. The technical cost of production of conventional oil is low and its energy-dense liquid products (gasoline and diesel fuel) are well suited to this market. The replacements for these fuels derived either from nonconventional oil sources or from the newer options, such as methanol or hydrogen, are generally more costly. Such a strategy requires that oil be gradually withdrawn from present stationary applications, but this substitution is generally less expensive than the replacement of oil in mobile applications.

The projection of world oil production based upon the Mean Case of the U.S. Geological Survey is shown as Curve A in the Figure. Curves B and C illustrate the present situation assuming 60% and 65% respectively of this value is consumed in mobile applications in the transportation sector. These two latter curves peak at the same time as the underlying total supply of crude. However, if it is assumed that the proportion of crude oil directed to mobile applications could be increased by a modest one percent per year, the peak is delayed as illustrated in Curve D. This greater allocation might occur automatically from the influence of the higher relative prices for oil expected at that time or from policy measures introduced especially to achieve this end. Curve D is plotted with the following assumptions: the proportion of crude oil directed to mobile applications rises from 65% of the total con-



ventional production in 2010 at one percent per year until 85% is reached in 2020 and remains constant at this value thereafter. A limiting allocation of 85% is taken as the maximum feasible without the introduction of extraordinary and more costly processes. Under these particular assumptions, the peak in the supply of liquid fuel for transportation applications obtained from conventional oil production is delayed 13 years.

There are many reasons for increasing the allocation of conventional crude oil to transportation applications. Such measures would allow the use of more of the cheapest oil in applications for which it is well suited. This result would lead to an extension of the life span of the existing industrial structure of the major car manufacturing and fuel distribution facilities. The slow withdrawal of oil from stationary applications would offer more opportunities for natural gas and renewable sources of energy. Coal may find greater application with the advent of processes for the capture and sequestering of carbon dioxide. Nuclear energy might regain favour.

It is the conclusion of this note that there is a further advantage to the greater direction of conventional oil to the transportation sector. The peak in the availability of liquid products for mobile applications derived from conventional oil may be delayed by at least a decade with only a modest rate of reallocation of the available supply. This shift in timing arises because the production of conventional oil declines only slowly after the peak as modeled by the parabolic function. The resulting delay offers valuable time for the further development of the replacement options whether on the supply side in non-conventional oil production or on the vehicle side with the deployment of hybrid- and fuel cell-powered vehicles assuming an active program can be devised for replacing much of the oil now consumed in stationary applications.

References

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