



China's liquid fuels future

Posted by [Rembrandt](#) on February 19, 2007 - 12:00pm in [The Oil Drum: Europe](#)

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How are the 1.3 billion Chinese going to cope with their growing needs for energy?

Can the increase in Chinese liquid fuel consumption be maintained? Even in the face of a nearby world oil production peak? Or will China have to cope with a liquid fuel crisis in the near term future? This post focuses on whether China will or will not be able to meet their increasing demand for liquid fuels until 2015.

The underestimation of exponential growth

The increase in Chinese oil consumption in the past years is mostly seen as a recent development, supposedly driven by the industrial development of China. In reality, the growth in Chinese oil consumption has been the same in the past two decades. Between 1990 and 1999 annual oil consumption growth in China was 6% on average. Between 2000 and 2006 the average annual oil consumption growth in China was 7%. Also the 2004 anomaly of 13% growth in a single year is nothing new. In 1993 Chinese oil consumption growth happened to be 10%.

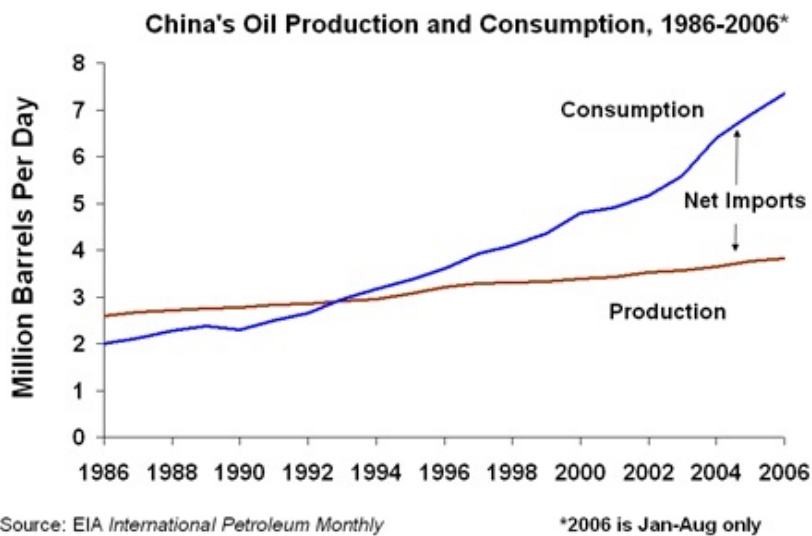


Figure 1 - Chinese oil consumption and production, source: [EIA](#)

This misconception of Chinese oil consumption growth is a typical example of underestimating the power of exponential growth. Between 1990 and 1999, absolute growth was around 2 million barrels per day (mb/d), from 2.3 mb/d in 1990 to 4.4 mb/d in 1999. In the past seven years, absolute growth has been 3 mb/d per day according to preliminary figures, from 4.4 mb/d in 1999 to 7.36mb/d in 2006.

If this present trend continues, the demand for oil (and other liquid fuels) in China will grow to 9.2 mb/d in 2010 and 12.4 mb/d in 2015.

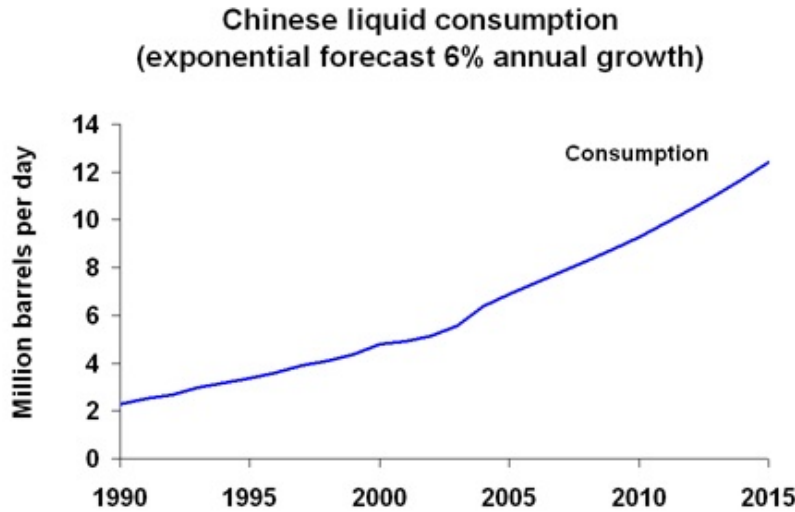


Figure 2 - Exponential growth trend in Chinese oil consumption

The influence of the Chinese Peak in oil Production

Currently China produces around half of their own oil needs domestically while the rest is imported. This situation will not last for very long. China is a very mature oil producer, most of the largest Chinese oil fields have peaked. This means that peak oil for China is not very far away. Colin Campbell, one of the main geologists of ASPO international, expects the Chinese peak to happen in the coming years. Professor Pang Xiongqi of ASPO China holds a slightly more optimistic view, foreseeing the peak in China in 2012 as shown in figure 3 below.

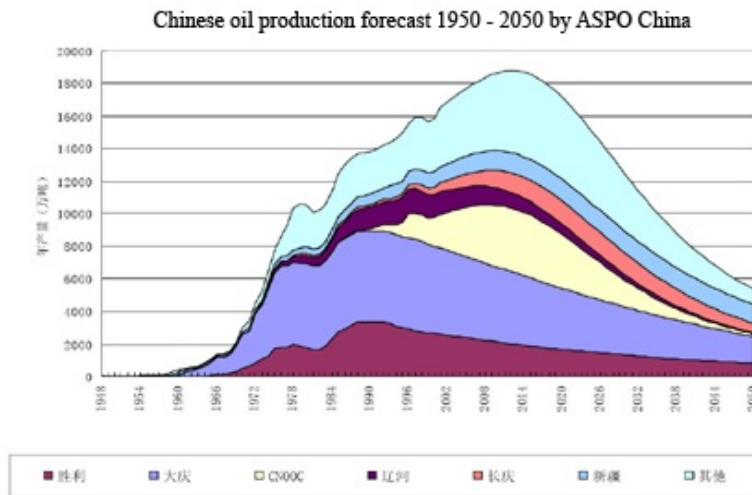


Figure 3 - Chinese oil production forecast in million tonnes, Source: ASPO China

As a reaction to the lack of domestic energy resources in relation to growing energy demand, the Chinese government has embarked on a very aggressive oil exploration program. In the first years of the 21st century this has led to a substantial increase in discoveries. That now seems to have halted. In 2005 proven reserves did not increase and in 2006 they declined with 12% to 16 billion barrels. Such a sharp drop in reserves is not a good sign with respect to Chinese oil production. Making it more likely that production will peak sooner than later.

This is bound to aggravate the already tight situation in China. To meet the needs of the many, China will have to obtain other fuel sources besides crude oil at a massive scale, and soon.

A short summary of alternatives

If we assume that Chinese oil production will peak in the coming years, around 9 mb/d of liquid fuels or alternatives need to be supplied from other sources than domestic oil production by 2015, such as oil imports, bio-fuels, coal-to-liquids, gas-to-liquids, energy savings, electric transport and so forth.

The largest source of these will in the short term remain to be oil imports, which currently amount to 3.5 mb/d. With sufficient aggressive foreign policy, China could very well be in the position of increasing that rate significantly, to maybe 6 mb/d by 2015. However, if the world production of oil peaks by 2010 or 2012, it is more likely that imports will not increase significantly and remain at the present level.

The second best option would be to shave off as much of the increasing fuel usage as possible by implementing efficient technology in all sectors that use oil. It is not impossible to obtain an annual reduction in present oil usage of 1% on top of which demand growth occurs. By doing so, the increase in oil consumption would be reduced with 800.000 b/d by 2015.

The third best option that China has in the short run is to continue with massive development of coal-to-liquid technologies. The research program in this field is focused on direct liquefaction without the creation of syngas, as is done with the Fischer-Tropsch process. Direct liquefaction is possible by pulverizing and blending the coal with synthetic oil, then treating it with hydrogen while heating the coal to 450°C in the presence of an iron catalyst. In doing so, shorter chains of hydrocarbon are obtained which are suitable for refinement into liquid fuels.

By the end of this year, [the Chinese company Shenhua hopes to have a factory that will produce 20.000 barrels per day of synthetic fuel](#) by using the process described above. However, there are many doubts that the process will work, since it has not been tested at such a large scale. If it does work, China has a technology that can produce synthetic fuels from coal in a very efficient manner at a cost between 30 to 45 dollars per barrel. The Chinese synthetic fuel program has the potential to produce about 1 million barrels of synthetic fuels per day by 2015.

The fourth best option that China is aggressively pursuing is the development of bio-fuels. The focus in this field has shifted from the domestic production of bio-ethanol to bio-diesel as the fuel of choice. [Recently, the Chinese government announced that it intends to plant an area the size of England, 13 million hectares, with Jatropha curcas trees of which the nut can be turned into a fuel.](#) The new governmental five year plan foresees a production of 120.000 barrels per day from bio-fuels by 2010 of which 60% from bio-ethanol and 40% from bio-diesel. Next to that, additional bio-fuels might be imported, but the amount is very uncertain. More interesting than imports would be ethanol production from cellulose. This technology is on the brink of commercial application in various factories in Japan, Spain and the United States. By 2015 domestic production of bio-fuels could very well be doubled to 240.000 barrels per day or maybe even tripled.

Gas-to-liquids does not seem to have much potential. Domestic gas in China is intended for electricity generation. Imports of liquids produced by gas are also unlikely in the given time period, since most of the gas-to-liquids plants under construction will not start up much earlier than 2010. The potential for electric transport replacing liquid demand in the short term is not very large, unless there is a large shift in governmental policy towards huge systems for public transport.

Scenario conclusion - soft or hard landing?

If the assumptions above are taken including the possibility that China will be able to keep increasing their imports of crude oil, the following scenario is the result:

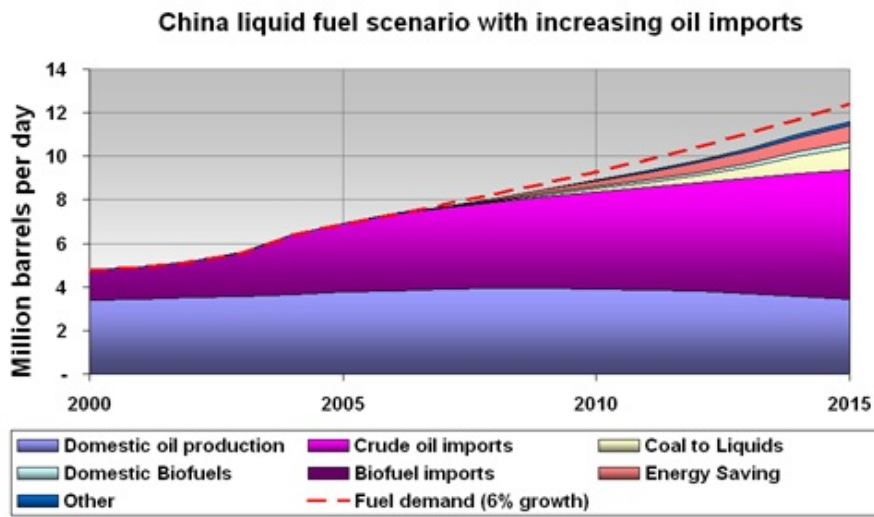


Figure 4 - Chinese liquid fuel scenario with increasing imports in case of later world oil production peak

In this case the resulting gap between sustained liquid demand and supply is quite small and will not result in any problems for China. Demand in this case will be dampened slightly by market factors without great economic loss. However, if oil production peaks around 2010, making it virtually impossible to increase the amount of imported oil, the situation would severely dampen economic growth. Supply in that case would fall short with 3 mb/d by 2015, and consumption can only increase with around 2% annually. While this would cause hardship for the industrialising of China and the end of "business as usual", it does entail the continuation of Chinese development at a far slower pace.

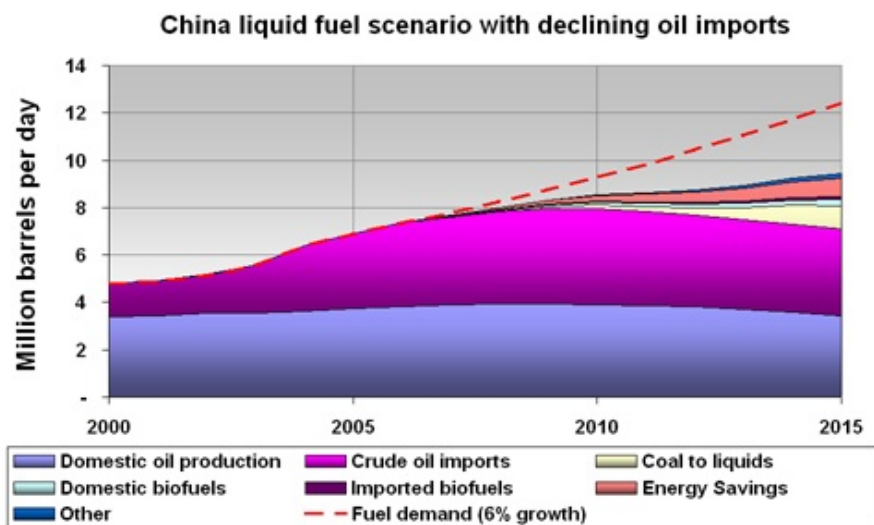


Figure 5 - Chinese liquid fuel scenario with restricted imports due to early world oil production peak

From the look of things, it seems that China is in pretty good shape thanks to their aggressive coal to liquids program and foreign policy which has led to an increasing supply of imported oil. While this will come with an environmental pricetag to future generations, the need for liquid fuels in

the short term is vastly higher than the environmental damage caused by the usage of fossil fuels.



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