Natural Gas To Replace Oil As Dominant Fuel By 2025

By Fereidoon Sioshansi*

Oil has been the dominant fuel of the past 50 years, feeding the world's industries as well as the increasingly important transportation sector. But like other dominant fuels that preceded it, namely wood and coal, the dominance of oil – many experts believe – may be on the wane.

The problem is not an imminent shortage of supplies. Rather, the growing demand will simply outrun our ability to find and pump enough out of the ground. In September 2004, PFC Energy, a Washington-based consultancy, shocked many by pointing out the inevitable result of world's ever increasing addiction to cheap petroleum. Looking at what is known to be underground and our ability to pump it out, PFC predicts that world oil production will probably peak around 100 million barrels per day, from the current 82. While that may sound like good news, it is not enough to meet the increasing demand, currently growing at 2.4% annually, if not faster. Moreover, "Even production of 100 million barrels a day can only be sustained for a few years," according to Roger Diwan, the PFC study's main analyst. The real bad news is that the world has essentially been living on borrowed time for some time, and most of us didn't even know it. Mr. Diwan says, "Every year since the 1970, we have been consuming much more oil than we have been discovering."

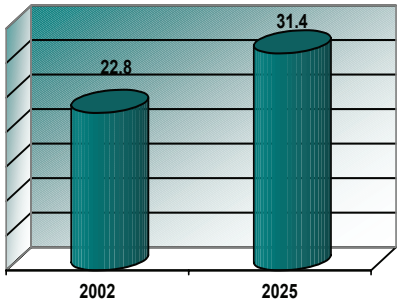
Although there are some dissenters to this view, the consensus appears to be that world oil production will peak some time in the next decade or two, followed by a gradual decline. reached the same conclusion. By 2050, according to an article by Roger Bentley and Michael Smith (see Third Quarter issue of the *IAEE newsletter*), world oil production would return to the 1960s levels, roughly half of the 2020 peak.

The question is "How are we going to wean our fossil-based economies from increased reliance on oil?" The answer depends on whom you ask. Renewable energy advocates would like to see a growing role for wind, solar, hydro and biomass. Nuclear proponents think nuclear energy can fill the void created by diminishing oil supplies and/or higher prices. Others believe that we have to use the next two decades to develop the basis for a more sustainable hydrogen-based economy, perhaps fueled by renewable energy resources on a grand scale or using clean-coal technologies.

Energy efficiency gurus believe that the ultimate answer is to use less energy, and use it wisely and sparingly. Scarcity and higher prices, they believe, will force us in that direction regardless of which path we choose.

While these alternatives are likely to compete for the support and inevitable subsidies of policy makers, the reality is that natural gas is the most likely candidate for carrying us through for another while – perhaps a few decades after oil has become too scarce and pricey to use in all but selective applications.

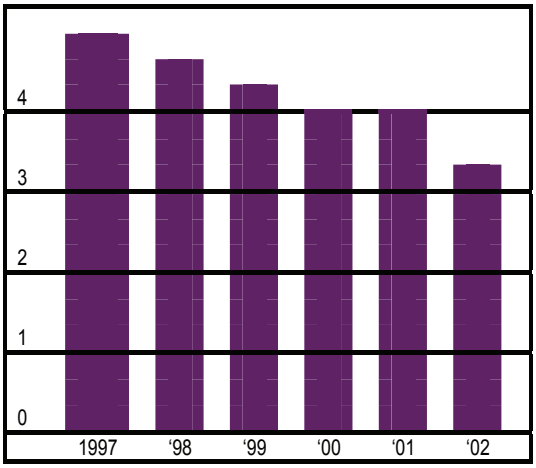
United States Consumption of Natural Gas
2002 and 2025 Projection
trillion cubic feet



Source: Annual Energy Outlook 2004, Energy Information Administration

The reasons are straightforward. Natural gas is plentiful and – with the appropriate level of investments in the transportation, storage and distribution infrastructure – is likely to replace oil in many applications. It is also cleaner, a significant bonus in combating global climate change. In the US alone, natural gas consumption is projected to grow at 1.4% per annum between 2002 and 2025. The electric power and the industrial sector account for over 70% of the projected growth in demand in the U.S. In many industrialized countries with no or few indigenous energy sources, the demand growth for natural gas will be considerably more robust.

Annual Production of Natural Gas from Fields in the Gulf of Mexico
trillion cubic feet



Source: US Department of the Interior

Up to now, however, natural gas has been playing the role of second fiddle to oil. As a gas, it is bulky and expensive to transport over long distances – putting it at a significant disadvantage to oil. By and large, it has been transported and distributed though pipelines from wellhead to major markets in Europe and North America. Major reserves, which are concentrated in the Middle East and Russia, are far from where the gas is in high demand. Despite the best efforts, domestic

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supplies in North America and Europe have not kept up with the rapidly growing demand.

This picture, however, is about to change. The advent of liquefied natural gas (LNG), now widely used to transport natural gas from distance fields to Japan and Korea, will spread over the next two decades just as supplies of oil dwindle – and its price continues to rise – relatively speaking. Why has LNG not taken off already? The answer is partly economic and partly has to do with so-called *economies of scale*:

- With oil at $50+ per barrel, relatively expensive LNG becomes cost-competitive; and
- As more investment goes to develop and expand LNG shipping and receiving facilities and specialized tankers, the per-unit costs will drop, making LNG an even better bargain.

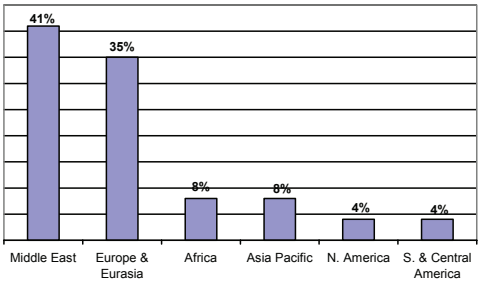
The case for LNG becomes even more compelling if it is agreed that oil will remain pricey – or become pricier over time. LNG makes sense once natural gas prices exceed $3.50 per million British Thermal Units (MMBTUs). With prices in the all-important U.S. market hovering above $5/MMBTUs and expected to remain high, the incentives to develop LNG facilities is enormous.

What is the hold-up? First, the scale of investments required is non-trivial, of the order of $5 billion or more for a single processing port and facilities. Worldwide, the amount of investment required over the next decade is expected to top $100 billion, and that may not be enough to meet the needs of giant new consuming countries like China. The second obstacle is to get the necessary environmental and siting permits – a daunting task in the post 9/11 era, especially in the U.S. where LNG terminals are sorely needed. Don't expect an overnight shift to LNG as developing the infrastructure on both ends will take years, perhaps a decade, from making a decision to finish.

Distribution of Proven Reserves of Natural Gas

percent, 2003

6,205 trillion cubic feet = 176 trillion cubic meters



Source: BP's Statistical Review of World Energy, June 2004

Where will the natural gas come from? There is no shortage of supplies if you are willing to go half way around the world. But once the gas is liquefied and the LNG transport and receiving system is developed, LNG will become a world-class commodity, just as oil or soybeans is today. The stuff can travel from the distant fields to the world markets.