

The future of energy: ExxonMobil's view



Mr Sakari Toivola, Lead Country Manager of ExxonMobil Finland.

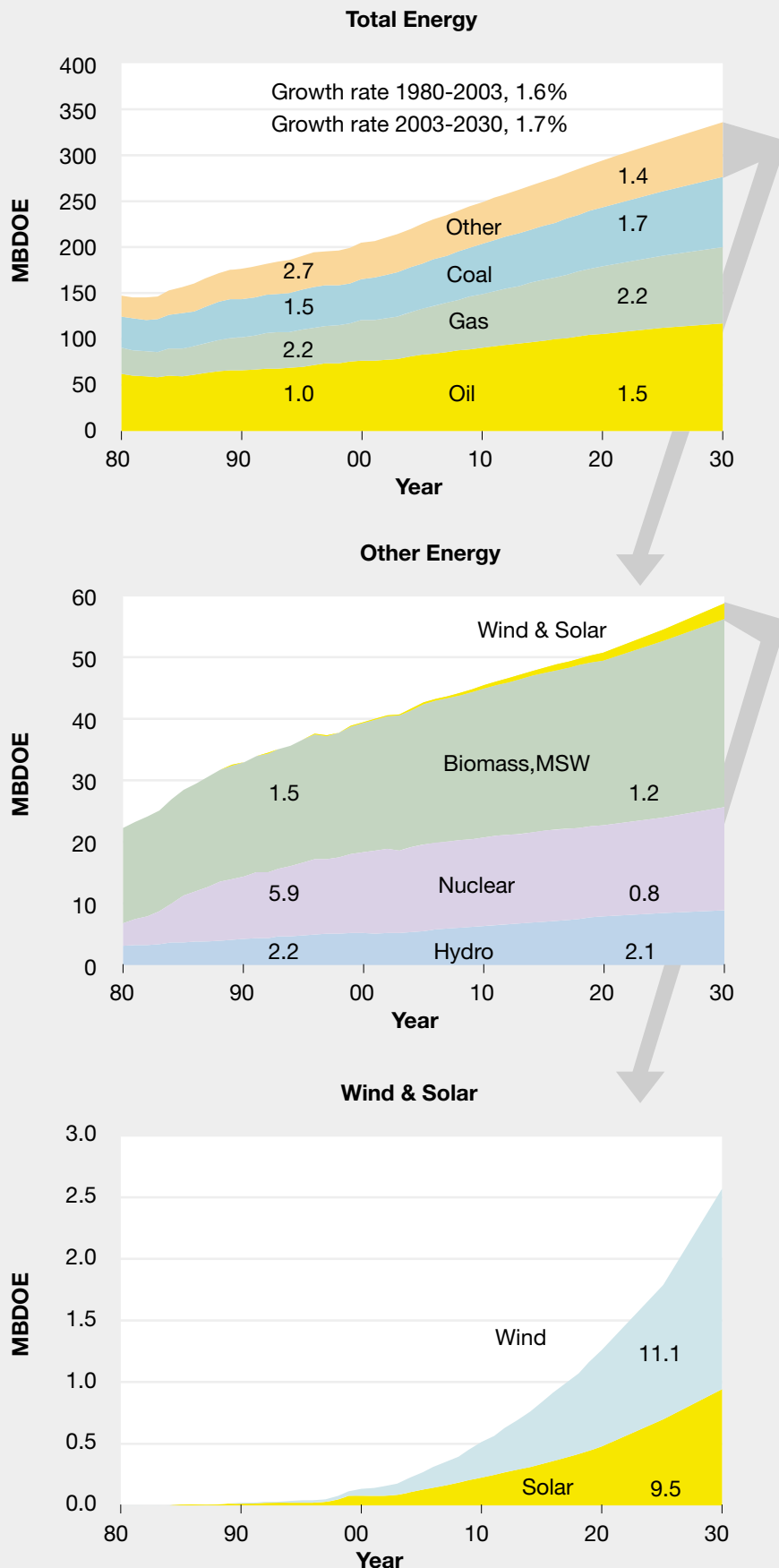


Fig. 1 – The world's estimated total energy sources.

When will fossil fuels run out? Will renewables, or wind and solar power, replace oil and gas in time? How high can the price of oil still go? Will we be driving hydrogen-powered vehicles by the end of the decade? Marine News talked recently to Sakari Toivola, Lead Country Manager of ExxonMobil Finland, for an energy expert's answer to these and other key questions concerning the future of the energy market.

Marine News: What are the primary energy sources and possible major changes to come within 25 years?

At ExxonMobil we publish an annual Energy Outlook based on our own portfolio and research. This outlook is to a large extent consistent with the results of the International Energy Agency and other forecasters.

An affordable and reliable energy supply remains essential to the continued prosperity and wellbeing of the world's citizens. In the future, we expect that economic growth will continue to be the primary driver of energy demand, as it is today. The global economy has grown at an average rate of about three percent per year since 1970, and we think that on average it will continue at that pace over the next few decades.

Worldwide energy demand is expected to grow by more than 40% over the next twenty or so years despite expected gains in energy efficiency. The developing world will account for 80% of this growth. We will see higher consumption of motor fuels

Volumes contribution by opportunity

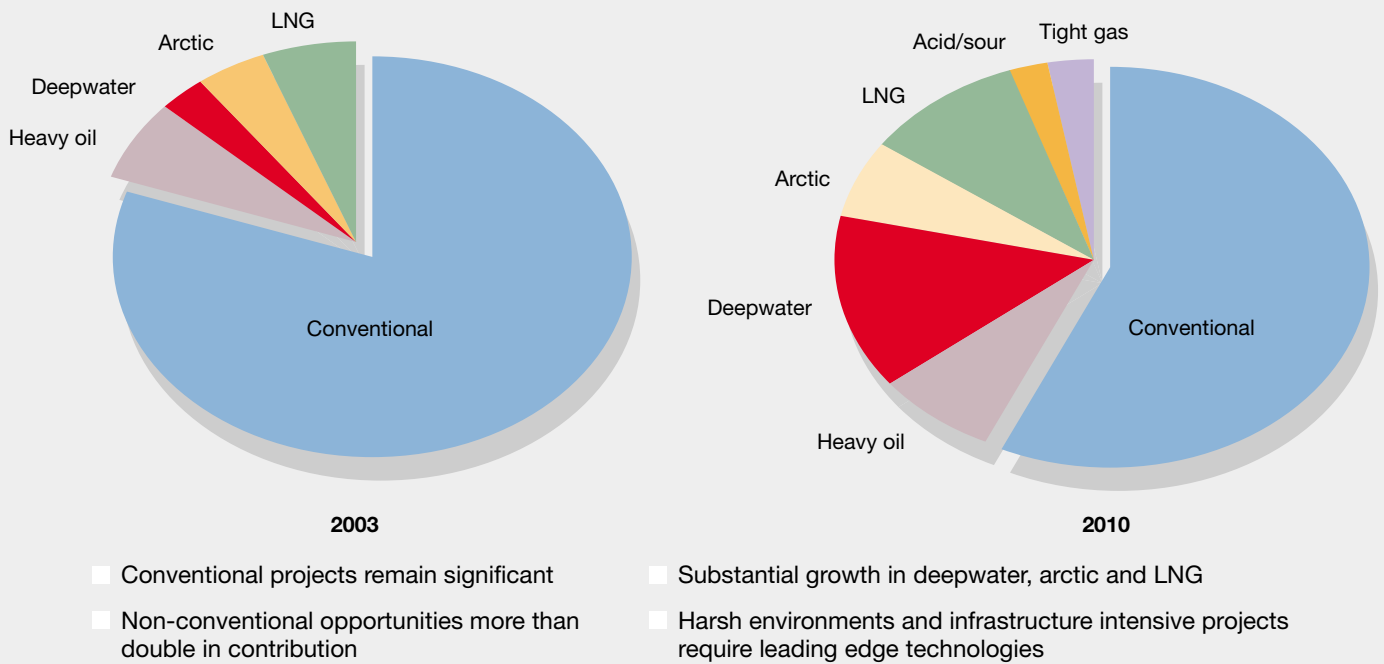


Fig. 2 – The vigorous development and application of new technologies will more than double the contribution of alternative energy sources in the decade ahead.

as the number of vehicles around the world increases. Demand for natural gas will continue to rise, driven by its increasing use in power generation.

We will need to develop new energy supplies both to meet new demand and to replace maturing resources. This requires access to discovered resources, as well as economic development of unconventional resources, continued technology advances and adequate financing.

Many types of energy will need to contribute to the 'energy mix' to satisfy future demand.

As you can see from the graph in Figure 1, we expect global energy demand to grow by 1.7% per year – rising from today's 215 million barrels per day oil equivalent to more than 300 million barrels a day by 2030.

Oil demand, shown in yellow, grows in line with total energy. Gas demand is the fastest growing fuel, increasing by about 2.4% per year and reaching a 24% share of total energy by 2030. You may be surprised, but coal is expected to grow by about 1.5% per year, driven by strong growth in China and India and continued growth in the USA.

In the very long term we expect the energy mix to become more diversified. But for the foreseeable future, fossil fuels are the only forms of energy with the scale and versatility to address the world's energy demand challenge.

Other energy, shown in beige, is further detailed in the middle panel, and is

expected to be slightly less important in 25 years than it is today.

Wind and solar power are depicted by the yellow sliver at the top and, again, is expanded in the panel below. We have assumed that technological advances and continued subsidies will support the high growth projection, but even so, their contribution to total energy will still be small at less than 0.5%.

So to summarize, a diversity of supply sources is important to meet overall energy needs but oil and gas, which represent 60% of energy supplies today, are expected to remain the dominant energy sources well into the middle of this century.

Marine News: Where are the largest oil resources and how do you see oil prices developing?

The future oil and gas resources can be segmented into two different areas: those available using conventional technology, and those associated with defined and specific technology requirements. The left-hand graph in Figure 2 shows that the conventional volumes remain significant but will shrink considerably by the end of the decade.

In contrast, volumes from emerging development technologies (right-hand piechart) will more than double in contribution by 2010. Our portfolio is not unlike that of several other international companies. So, for the industry in general, the challenges presented by harsh conditions, remote areas and requirements

for significant new infrastructure require the application of leading-edge technologies.

Typical growth areas for ExxonMobil include Africa, the Middle East, Russia and the Caspian. Together, these areas account for about 20% of our volumes today but are expected to contribute over 40% of our volumes in 2010. Supply from Europe will decline slightly but will still remain a significant contributor for many years to come.

The oil price is influenced by political developments, supply and demand and over the past year has risen to more than sixty dollars a barrel. Even so, it is still not as high today as it was in real terms in the 1980s. We would not like to venture any forecast of future developments, however.

Marine News: Growth in energy demand for transportation is a crucial element. Could you describe this in more detail?

Figure 3 shows oil demand trends to 2030 for developing countries on the left and developed countries on the right.

The beige segment represents demand for road transportation; the blue, demand for air, marine and rail. In the segment called 'transport related' is demand for lubes, asphalt, chemicals used in manufacturing vehicles, and the pro rata share of refining energy associated with meeting demand in these sectors. The grey area represents all non-transport uses of oil such as heating and cooking, industrial furnaces and power generation.

The Ship Power Supplier

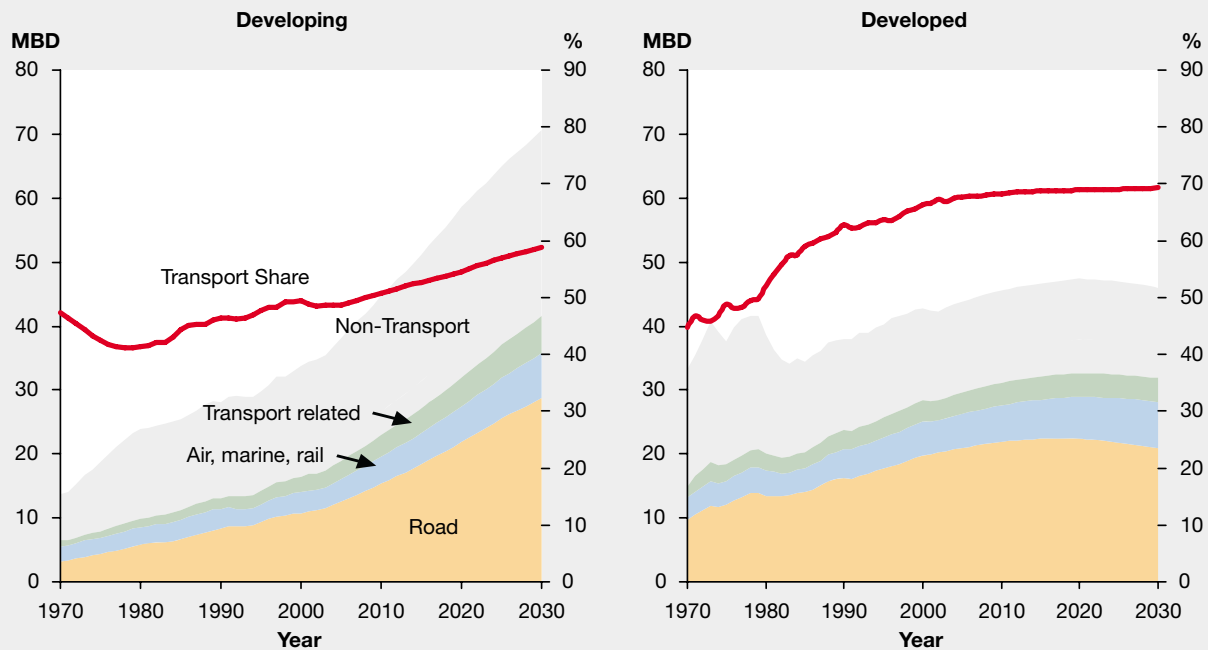


Fig. 3 – The breakdown of oil by use differs considerably when comparing developed with developing countries, a trend that will increase towards 2030.

Car ownership is a function of income and other factors. Once income reaches a certain threshold level, vehicle purchases accelerate and ultimately level off toward some saturation level. So predicting car ownership is obviously an important component when predicting future energy demand.

Our outlook to 2030 assumes the USA will level out to just under 900 cars per 1000 people, 40% higher than other key developed markets. Western Europe will be in the 'average' range from 470 (UK) to 630 (Germany) and Japan will exceed 600. Africa and India will probably have the lowest penetration at around 50 cars per 1000 people.

Over time we expect to see a greater portion of the oil barrel used in the transportation sector, and we will also see rapid growth in oil demand in developing nations, while in the developed countries this is expected to peak before 2030.

Marine News: What are the prime mover fuel alternatives for marine transportation in the long term?

The automotive industry predicts that the internal combustion engine will continue to power over 90% of all new vehicles sold to at least 2030. They will also continue to power the marine transport sector in the long term.

However, technologies are expected to improve future fuel efficiency. We, for example, are currently working on advanced engines that combine the

efficiency of a high-compression diesel engine with the lower emissions of a gasoline engine.

Marine News: How fast is the use of renewables and non-fossil fuels growing and what is their impact on the transportation sector?

Renewables will grow at a high rate, approximately 10% a year, supported by government subsidies, but they will contribute only a small fraction of energy supply, between 0.5-1% of total energy demand.

Marine News: Natural gas is projected to be the fastest growing primary energy source. How much new trade (LNG) is needed to meet the demand?

The traditional method of transporting natural gas has been via pipelines. However, technological advances have reduced the costs of cooling and liquefying natural gas. This makes transporting it by tanker both practicable and efficient.

As you know, LNG is natural gas which has been liquefied to a temperature of -160 °C because as a liquid it takes up only 1/600th the volume of natural gas. We expect LNG flows to grow by about 7.5% per year, or quadruple by 2020. They will then account for 13% of total world gas demand.

At present, LNG is primarily a source of supply to Asia-Pacific, specifically Japan and Korea. By 2010 the Atlantic basin, including the USA, Canada and Europe, will exceed Asia-Pacific imports.

That said, given the size and pace of this projected growth, the siting and permitting of LNG infrastructure (particularly receiving terminals) will need to progress in a timely manner to bring this predicted volume to market.

Marine News: What is the role of hydrogen?

There is much public discussion regarding hydrogen as a potential source of future energy. ExxonMobil is deeply involved in research to explore this possibility.

Hydrogen is appealing as it offers the potential for efficient, emissions-free vehicles. Although abundant, hydrogen must first be produced from water or hydrocarbons. This step requires the use of energy generated from primary sources like oil, gas, coal, nuclear or renewables.

It is therefore very important to understand the amount of additional primary energy that will be required and also the full supply chain costs and greenhouse gas emissions associated with hydrogen production, distribution and consumption.

We expect that continued improvements in the internal combustion engine will provide significant contributions to efficiency improvements for many more years. Although ExxonMobil and other companies are continuously pursuing research into hydrogen as an energy source, hydrogen vehicles are not expected to make a significant contribution over the next two decades. ■