E3 Analytics

Analytical Brief

The Rise and Fall of Oil

Analytical Brief Volume 3, Issue 2.

Over a century and a half since its first commercial extraction, oil now accounts for approximately 40% of global energy use and over 90% of the world's transportation needs.

However, changes are afoot that could significantly change oil's future, and gradually undermine its privileged position in the energy world order. Despite these changes, conventional energy forecasts continue to predict that oil demand will continue to grow indefinitely, and retain its central position for decades to come.

This Analytical Brief examines the growing array of substitutes for oil, ranging from electric vehicles and biofuels, to natural gas vehicles and energy efficiency and finds that conventional energy forecasts are almost certainly wrong.

Oil Demand

According to the International Energy Agency (IEA), global oil demand has returned to pre-crisis levels surpassing 88 million barrels per day. And despite considerable economic uncertainty in the Eurozone, current oil prices have remained high, with the leading North American benchmark, West Texas Intermediate (WTI), trading at around $100,

Oil prices, 2010-11

Figure 1: Source: The Economist, June 16 2011

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and the leading global benchmark Brent oil in the $110-120 per barrel range, where they have more or less hovered since June of this year.

On July 11th 2008, WTI traded at its all-time nominal peak of $147.27 per barrel; shortly afterwards, prices plummeted back to $32 per barrel, a spectacular movement triggered in large part by the global financial crisis, and fears that global oil demand would decline.

While both prices and demand have recovered, data over the last fifteen years indicate that oil demand in many countries has reached a plateau; in fact, in the last five it has decreased by over 5 million barrels per day in the leading industrialized countries that make up the OECD.

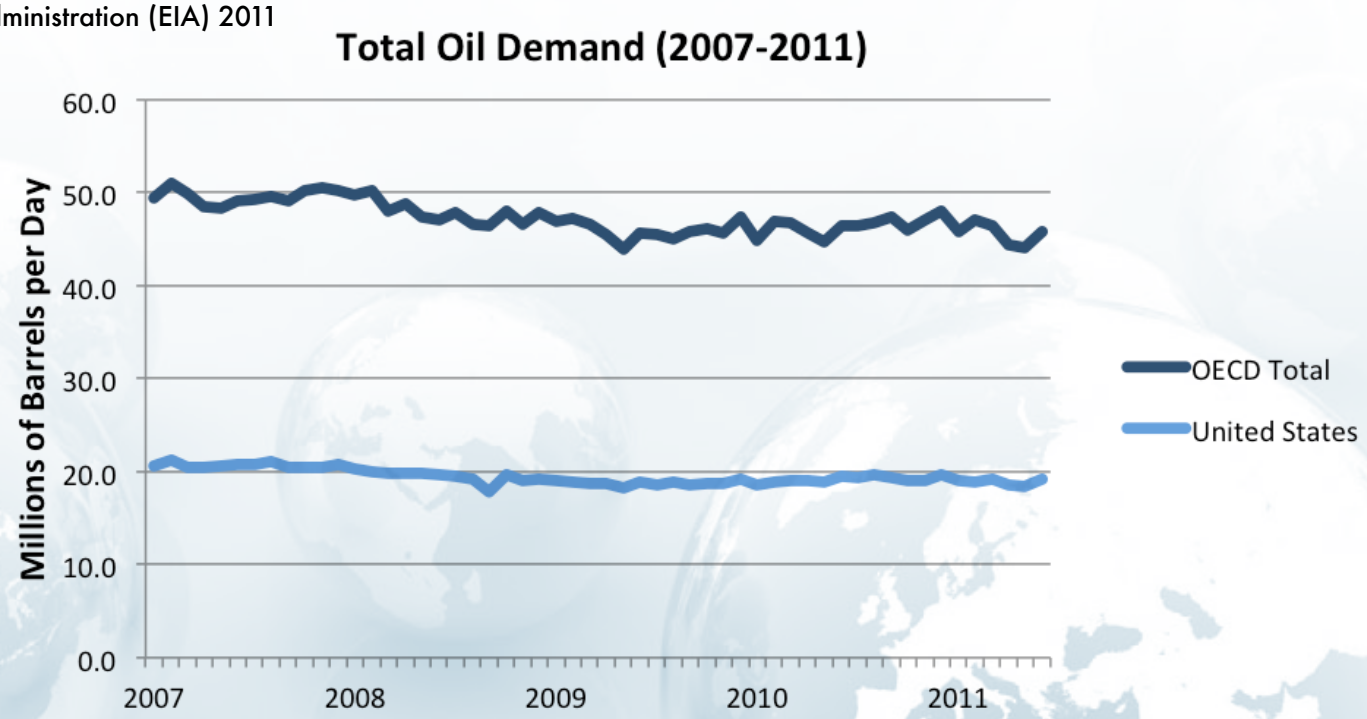
Conventional Thinking

Conventional energy forecasts generally assume that as GDP grows, so too will oil demand.

According to this logic, the only factor that can lead to a sustained reduction in global oil demand is slower global growth. This not only neglects the existence of an abundance of cost-competitive substitutes, it also ignores the fact that dozens of countries worldwide have already decoupled oil demand growth from growth in GDP, not least some of the largest economies in the world. The two graphs below demonstrate this trend in Germany, and in Japan.

"...dozens of countries worldwide have already decoupled oil demand growth from growth in GDP..."

Figure 2:
Source: US Energy Information Administration (EIA) 2011



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As these two last charts show, countries like Germany and Japan have effectively decoupled changes in GDP from oil consumption: little correlation between the two can be seen. In fact, the US reached its peak oil demand in 2005, France in 2001, while Italy's demand peaked in 1998.

However, so far, this reduction in oil demand from major industrialized countries has been more than offset by oil demand growth in emerging economies, in particular in China and India. The end result is that net demand growth has been positive as many emerging economies continue to grow at a rapid pace, and overall levels of affluence increase.

If this trend continues, oil demand will continue to climb, and prices will likely remain high enough to sustain new production and exploration investments. The consensus price forecasts from both the IEA and the US EIA are currently in the range of $85-100/bbl for the 2011-2016 period. This price range is now considered by many in the industry as a "sweet spot": sufficient to keep oil producing countries' budgets balanced, and high enough to continue justifying new exploration and production investments.

Based on these assumptions (among others), the IEA expects oil demand to climb by 1.2 million b/d every year until 2016, bringing global oil

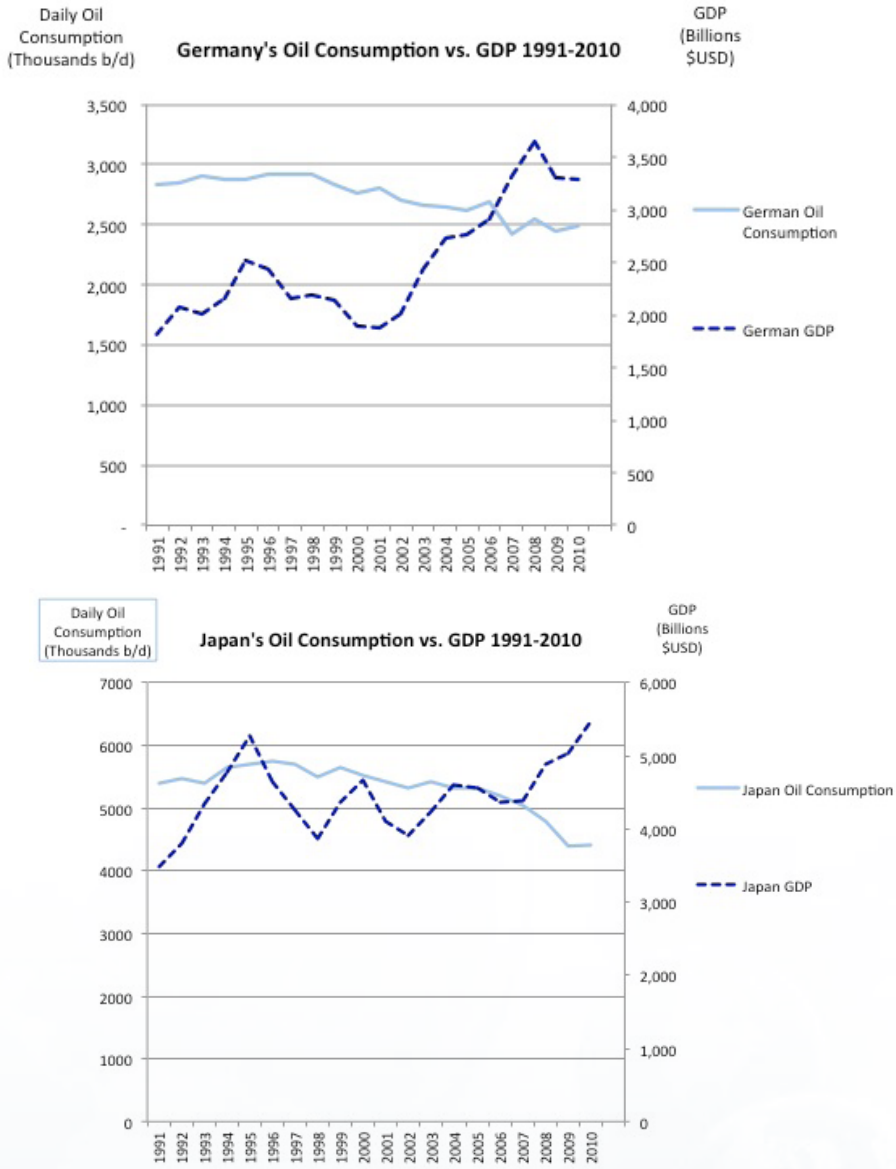

Figure 3 & 4: Source: US EIA, IMF

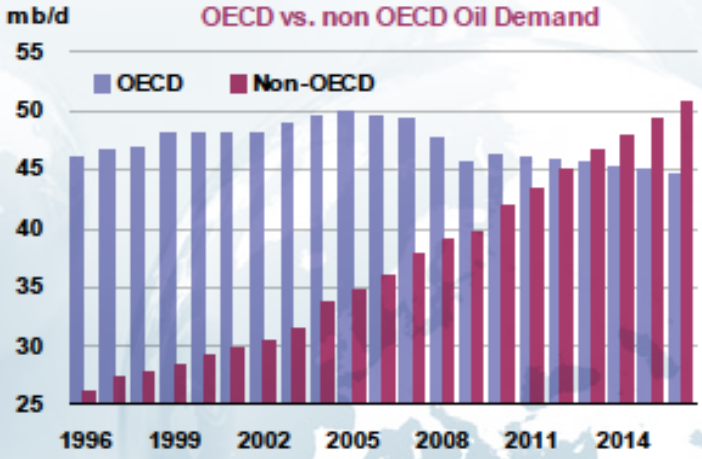

Figure 5: Source: International Energy Agency (IEA) 2011

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consumption to approximately 95 million barrels per day. Forecasts further out project that global oil demand will climb to over 100 million b/d by 2020, and to roughly 110 million b/p by 2035. The implicit assumption, as highlighted above, is that rising demand from China and India will outstrip any decrease in demand elsewhere.

And yet, as this Brief explores, the current view of the oil market ignores or downplays a host of factors that are actively working to counteract this trend.

Oil for one, and one for...?

In order to better understand what drives oil demand, it is helpful to distinguish between the causal factors that drive demand creation, and those that drive demand destruction.

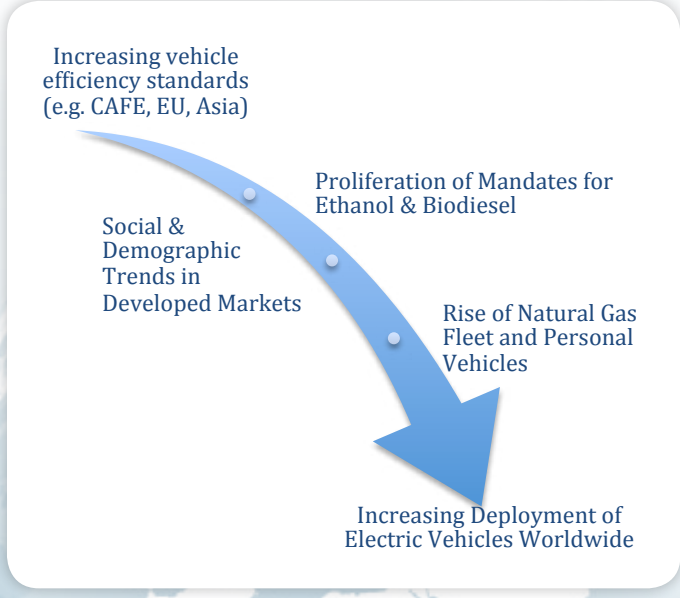
In the former category are factors like the continued demand for energy-intensive cars and trucks, the sustained growth in international shipping and aviation, the steady demand for petrochemicals, as well as the rapid growth from emerging markets. Underpinning these factors is continued global economic growth, which, in conventional forecasts, is generally correlated to rising oil demand.

In the later category are factors like increasing vehicle fuel efficiency (for instance, the recent boost to CAFE standards in the US and the more stringent fuel economy standards being adopted in the EU, and China), the proliferation of mandates to substitute ethanol and biodiesel into traditional gasoline and diesel supplies, vehicle saturation in many developed country markets, as well as the emergence of alternatives such as natural gas-powered vehicles (NGVs), and electric vehicles (EVs).

While the role of some of the factors depressing oil demand is beginning to flatten out, such as biofuels supply (see next chart), there are other factors that have been chipping away silently for decades (such as energy efficiency), and others that are just beginning to enter the market, and therefore just beginning to influence oil demand, such as EVs and NGVs.

Factors Driving an Increase in Global Oil Demand

Factors Driving a Decrease in Global Oil Demand



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Estimated Global Growth in Biofuels Supply (2010-2016) (million b/p)

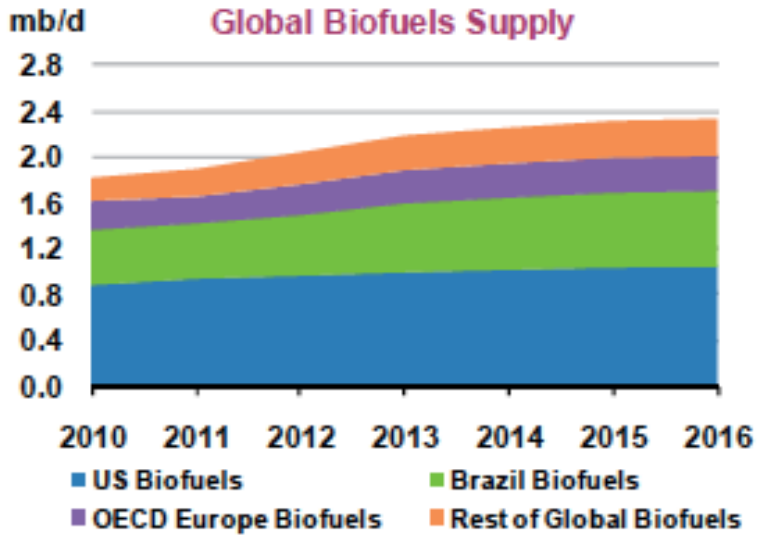
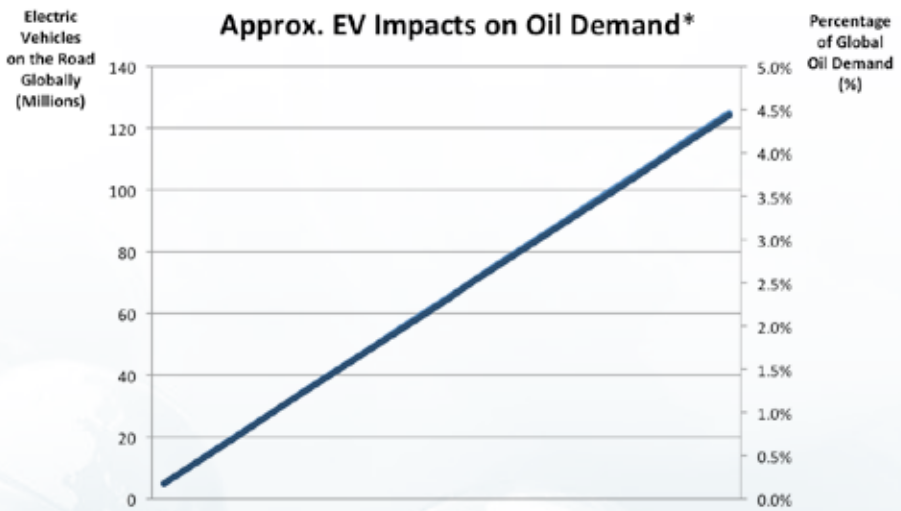


Figure 6: Source: IEA 2011



*This depiction assumes each displaced vehicle travels 25,000km per year, at 13.5km/L (32 mpg) fuel efficiency, and that the baseline oil demand is 90 million barrels per day.

While it is impossible to accurately predict the rate of uptake in electric vehicles (indeed, forecasts in this area may well be more speculative than oil forecasts), it should be clear that if electric vehicles begin to reach wider adoption, as firms such as McKinsey, Deutsche Bank, and many in the automotive industry expect, they could rapidly displace several additional millions of barrels per day of global oil consumption [Note: a subsequent Analytical Brief will examine electric vehicles in particular].

To visualize the impacts that EVs could have on oil demand, it is possible to model different levels of electric vehicle and natural gas vehicle penetration. The following chart provides a glimpse of the basic relationship (see Figure 6).

As this figure shows, the introduction of 25 million EVs displaces roughly 1% of global oil demand; 100 million EVs would displace almost 4%. Average estimates suggest that EV sales could readily exceed 20 million units per year by 2020 – this means that almost a full percentage of global oil demand would be knocked off annually, all else being equal.

Turning to natural gas vehicles (NGVs), a similar story is unfolding. According to the leading NGV industry body, the number of natural gas powered vehicles in 2010 was over 12.5 million, and is growing at double-digit rates worldwide. With natural gas prices projected to remain low at least for the next 7-10 years, uptake could be rapid, particularly in markets such as the US. Assuming a modest 10% year-over-year growth in the use of NGVs (growth rates from 2009-10 were roughly 12%, while the rate of growth since 2001 has averaged 24%), it is possible to project the possible future impact on oil demand.

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When the impacts of biofuels, electric vehicles and natural gas vehicles are combined, it becomes clear that significant changes are afoot: oil is facing its first genuine competition in the personal transportation sector in almost a century.

Moreover, it can be argued that the assumptions employed here for both electric and natural gas-powered vehicle uptake are modest: they could readily be surpassed under a host of scenarios, ranging from increased competition, rising oil prices, increased climate concerns, as well as continued technological innovation, most notably in the battery sector.

The Great Race

A race is emerging between the social, economic and technological factors that are driving oil demand creation, and those driving oil demand destruction.

"Oil is facing its first genuine competition in the personal transportation sector in almost a century."

While the balance remains currently in favor of demand creation, it remains an open question how long this trend will continue.

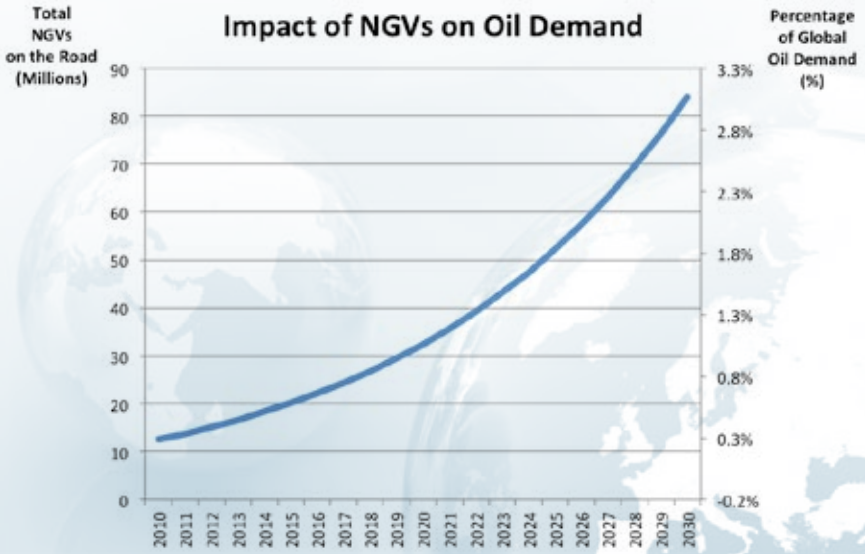
And while growth from markets like China and India will unquestionably put upward pressure on oil demand in the near term, it is far from clear that it will surpass demand destruction in the medium-to-long term.

How oil producers react to a future decrease in oil demand remains to be seen. However, given how deeply many oil-producing countries rely on oil revenues to balance their books, the transition is bound to have significant social, economic, and geopolitical implications.

A final note

Despite the emergence of a host of competitors, the decline of oil is likely to be gradual, more like phasing one instrument out of the symphony than disbanding the orchestra altogether – with any luck, this should provide governments, consumers, and businesses the time to adapt to a world producing and consuming less and less oil.

Perhaps more importantly, the emergence of substitutes should help ensure that the transition away from oil occurs under conditions of relative peace, rather than protracted war.



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