

The investment challenge

UKPIA's Malcolm Watson and Nick Vandervell provide an overview of the key challenges facing today's UK refining sector.

The volatility seen in oil markets over the last year, while not matching the turmoil in financial markets, highlights the international mixture of the UK's oil and gas supply and some of the associated exposures. We are still fortunate in having access to North Sea oil, although production from the UK sector is declining. The oil industry also provides a secure source of refining oil products for the UK to keep the 'wheels turning'.

However, without future investment in UK refineries to meet changing product demand, the UK will become more reliant on imports and the processing of a wider range of crude oils – for example, diesel from Russia and jet fuel from the Middle East – and less able to export the surplus petrol and fuel oil it produces. With higher prices for these imported finished products, the impact on the UK's trade balance is also a consideration at a time when the country has an increased level of external debt to finance.

It is therefore important that oil companies see the UK as a good location for future investment.

Oil matters

It would be easy to dismiss these concerns on the basis that renewables and nuclear will replace conventional oil derived fuels. Whilst it is likely that a range of alternative fuels will evolve in the coming years, conventional fuels will continue to make up a large proportion of the transport fuel mix beyond 2030, the limit of international forecasts.

The International Energy Agency's (IEA) revised forecasts still indicate that oil demand will continue to grow from the current level of about 86mn b/d, perhaps by as much as 50% by 2030, driven by strong demand from the Far East and Middle East. A tighter oil demand/supply balance is envisaged post-2012. However,

at this stage, it is difficult to gauge the medium-term impact of the current global slow down on both demand and investment plans.

Over the last 15 years, oil companies have made significant investment to reduce the environmental impact of refineries and the fuels they produce. In the last decade, £5bn has been invested in oil refining and marketing in the UK – notable achievements include:

- The removal of lead and reduction of sulphur and aromatic compounds from road fuels.

- Reduced emissions from the distribution of petrol and reduced emissions of sulphur dioxide and nitrous oxides from refineries.

- Improved energy efficiency through a combination of actions, including construction of refinery combined heat and power (CHP).

Environmental improvements at refineries will continue, despite North Sea crude oil starting to be replaced by new sources of crude oil with higher sulphur contents, thanks to ongoing investment in UK refineries. These objectives will be at the forefront of future investment plans. For example, Total has started construction of a hydrodesulphurisation plant and associated hydrogen production unit at its Lindsey oil refinery. Scheduled for completion in 2009, it will enable the plant to process sourer crudes, containing higher sulphur levels, and increase diesel production.

Meanwhile, greater demand for air travel and the increased popularity of diesel cars in recent years has seen a rise in demand for diesel and jet fuel in the UK, with the proportion of new diesel car sales in the UK starting to approach the levels of some other European Union (EU) countries that have a lower duty rate on diesel than petrol. With increased fuel efficiency and the switch (see **Figure 1**) to diesel, petrol sales have been in decline in the UK since 1990, coupled with a collapse in fuel oil demand as users have switched to gas.

Oil products trade

'Mind the gap' could be the watchword here. UK refinery output doesn't match

UK demand and the gap is filled from the large global traded market in petroleum products. For example, the UK imports 6.4mn t/y of jet fuel (mainly from the Middle East) and 1.9mn t/y of diesel (mainly from Russia) to cover a deficit in these products, and exports 4.2mn t/y of surplus petrol (mainly to the US) and 6.6mn t/y of fuel oil. The EU generally is in a similar position on diesel and gas oil, with nearly 30mn tonnes imported annually, much of it from Russia.

A recent study of UK refining by Wood Mackenzie for the UK government suggested that the total demand for petroleum products will not change greatly in the foreseeable future, but that there will be a change in the demand balance between individual products. The likelihood is that there will continue to be increasing diesel penetration at the expense of petrol consumption, and jet fuel demand will mirror the growth in demand for air travel.

The rate of change is difficult to gauge as, for example, technical improvements in small petrol-engined vehicles could close some of the efficiency gap with diesel, but without the added complexity and cost of exhaust clean-up associated with the latter.

These changes are likely to be exacerbated by the impact of biofuels, especially in the US and the EU, and changes to the marine fuel market agreed by the International Maritime Organisation (IMO).

The current UK/EU petrol surplus is largely exported to the US and the EU. However, the 2007 US Energy Bill requires the addition of 136bn l/y (105mn t/y) of bioethanol into the road fuel supply system by 2022, and new fuel economy measures for cars and small trucks by 2020. These two measures will move the US from a position of petrol deficit to a petrol surplus, removing the major export market for UK refineries (see **Figure 2**).

This potential collapse of the petrol export market to the US could have major implications for UK refineries and poses a major challenge to the industry. Investment to change the fuel output from refineries is likely to be required, with closure of sites a real possibility in the medium term if such investment is not made.

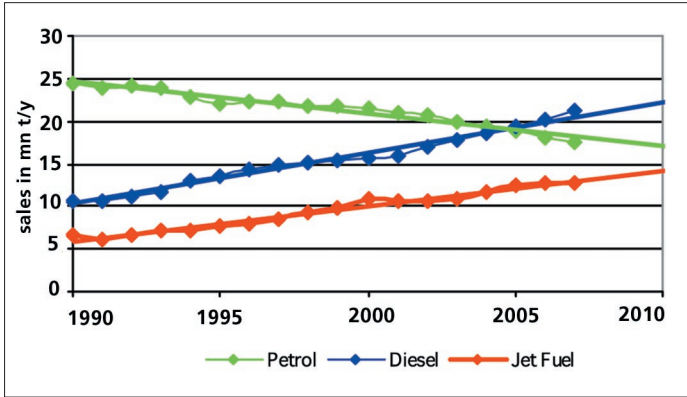


Figure 1: UK fuel trends Source: UK Dept for Energy and Climate Change

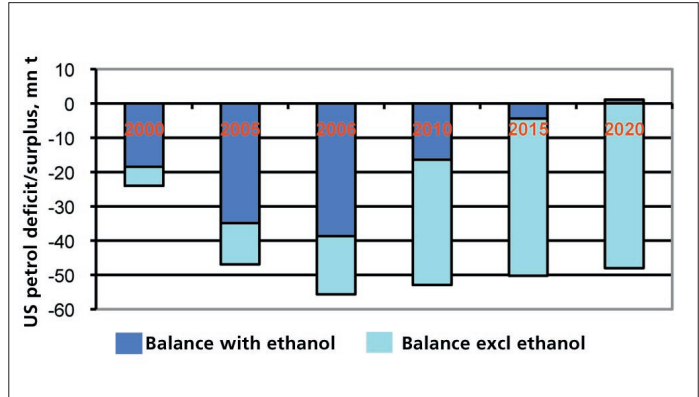


Figure 2: US petrol balance Source: Wood Mackenzie

Meanwhile, the IMO has decided to set a 0.5% sulphur global cap on marine fuels from 2020, which will be preceded by the move to 0.1% sulphur gas oil in the North Sea and English Channel in 2015. At present, marine fuels are largely derived from distillation residue streams. These changes will likely require ships currently using fuel oil to switch to gas oil, a product already in tight supply within the UK and most other EU countries.

Ships are major users of the fuel oil produced from UK refineries, which represents about 17% of refinery output. Although there are some options to treat and upgrade residual fuel oil, most of which require substantial investment, without this market there would be little economic use for fuel oil.

A world where all marine fuels are gas oil based rather than fuel oil based looks radically different to the current refining environment. Globally, an additional 600mn t/y of crude oil would be required to manufacture the additional fuel. This is more than the current annual production of Saudi Arabia. Within Europe, an additional 50mn t/y of gas oil would be required, an increase in 20% on current demand. The EU and the UK are currently net importers of diesel.

As the two examples above illustrate, the global fuels market is evolving rapidly and UK refineries will have to invest to meet the shifting demand.

Meeting the challenge

Refinery output can be re-aligned to produce more diesel and less petrol by investment in new processing/conversion units – for example replacing catalytic crackers with hydrocrackers. These are lengthy, complex projects which will take

around five years to complete. Because of limitations on the availability of engineering effort and specialist equipment, such as high pressure reactor vessels, only a few refineries worldwide could be converted within one year.

Investment in refineries must be justified against other projects by an oil company (both upstream and downstream). Oil companies can choose to invest in UK refineries to meet future challenges, or they can invest at refineries abroad, particularly in countries with rapidly growing demand, or they can import products in deficit.

If investment in UK refineries is not forthcoming in the future, the current security of supply of crucial oil products will be reduced as a greater proportion of products will be imported to satisfy UK demand, and the range of crude oils that UK refineries are able to process will be reduced. Globally, there are far more suppliers of crude oil than oil products, and refineries therefore provide enhanced flexibility. If UK refineries close, the country will be dependant on fewer suppliers of energy and oil products.

The last previous major market change encountered by UK refiners was the collapse of the market for fuel oil used in power generation in the 1970s. The number of refineries in the UK halved. Failure to invest in UK refining in the next few years could well have similar consequences.

The investment required will be large. For example, the costs of installing a fuel oil conversion unit to upgrade heavier fuel oil to transport fuels are estimated to be more than £1bn for a typical project and significantly increase CO₂ emissions. Companies cannot afford for these investments not to pay off over the long term, a situation not helped by greater market

volatility witnessed over the last year. They will only invest in UK refineries if the correct conditions are in place. The UK government must provide a stable climate for long-term investment – this requires consistent policy decisions and a level playing field with competitors from inside and outside the EU, particularly in the area of environmental legislation.

Emissions impact

Any newly constructed refinery units aimed at bringing UK refining output closer in line with market demand will also increase the amount of CO₂ produced per unit of throughput. If UK refineries were made to purchase all allowances required to cover their emissions under the EU Emissions Trading Scheme (EU ETS), the additional costs would take a significant part of the refinery margin and profit.

Whether or not refiners are able to recover any of these costs from consumers, the EU will become a less attractive destination for investment until other regions impose similar costs. Hence, it is essential that the EU ETS includes effective measures to prevent the migration of refinery investment out of the EU.

Such a situation would do nothing to reduce global emissions, merely displacing them to areas outside the influence of EU or UK policy.

A final word

There has been considerable investment in refining and distribution in the UK over the last decade. However, more investment is required if the current security of supply provided by UK refineries is to continue. This investment will be helped by clarity and confidence in the stability of energy and environment policy in the UK.