

THE ECONOMIC CONTRIBUTION OF THE UK DOWNSTREAM OIL SECTOR

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FOREWORD



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The UK's downstream oil sector is going through a transformation.

The long-term trends—shifting product demand, misalignment of supply and demand, and ensuring the UK remains an attractive place to do business—continue to challenge the UK Petroleum Industry Association (UKPIA) and our membership.

But there is change ahead for all elements of the sector, as the government rightly pursues its ambitions to reduce carbon emissions and those of other pollutants. We are firmly behind these goals, which benefit the communities in which we want to continue to work and prosper.

This is precisely why the sector is seeking the opportunities from among these challenges: playing its part now, adapting in the medium term, and planning for continued participation in a vibrant lower-carbon economy in the long term. Ours is a sector that adds considerable value and energy security to the wider economy today. We see this important role continuing in future, though we will change the *how* and *what* we deliver to provide new benefits to society.

For the first time, this analysis by Oxford Economics brings together a compelling account of the importance of the economic

contribution of the downstream oil sector right across the UK, including through activity we enable elsewhere in the economy. While the sector contributed £8.6 billion directly to UK GDP in 2016 and provided more than 120,000 jobs, we also enabled all other key sectors of the economy (from chemicals and other manufacturing to almost all transport-related business) to grow. Given this importance for the whole of the UK, this study also looks at the role the sector must play in the transition to a low-carbon future.

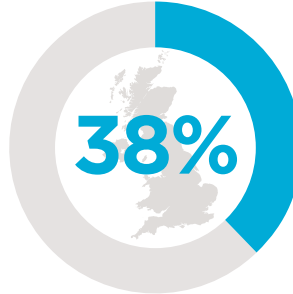
This is the first of a series of analyses that are being delivered as part of UKPIA's Future Vision programme, which will be published during 2019. It shows a positive future for the downstream oil sector, with the sector playing a key part in the solution to environmental challenges faced by the UK, and the wider world.

Through greater investment, development of transformative technologies, new business models, and collaboration across the whole business landscape, we believe the UK's downstream oil sector—as a technologically advanced, responsive sector, skilled in the cost-effective manufacture of a wide variety of energy and other useful products—can be a central part of a cleaner UK economy. We will work hard to reach this goal.

This document summarises the main findings of The Economic Contribution of the UK Downstream Oil Sector, a study by Oxford Economics commissioned by UKPIA. The full report is available at <http://www.ukpia.com/publications.aspx>. It provides full details of the methodologies and sources upon which the findings in this summary are based.

WHAT IS THE UK DOWNSTREAM OIL SECTOR ...

- This sector encompasses a wide range of companies involved in the production, import, distribution and sale of refined oil products, from petrol and aviation fuel to heating oil and lubricants
- A combination of domestic production and global import networks enables the sector to provide the UK with a secure supply of fuels

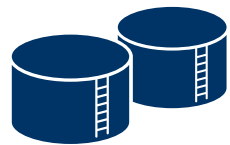


Share of UK energy consumption met by petroleum products



6 major refineries

- refine crude oil and blend biomass into petroleum products



41 coastal and 20 inland terminals

- used to import, export, and store refined fuel
- receive fuel from UK refineries via pipeline, rail and sea



3,000 miles of pipeline

- transports a range of fuels around the country
- pipes jet fuel direct to some of UK's main airports



8,500 filling stations

- supplied from terminals by a fleet of road tankers

Main products supplied



- petrol
- diesel to fuel cars, HGVs, buses & trains
- aviation fuel
- marine fuel
- heating oil
- liquefied petroleum gas (LPG)
- bitumen & lubricants
- chemical feedstocks

... AND HOW ARE ITS PRODUCTS USED?

1. TRANSPORT

More than three-quarters of petroleum products consumed in the UK are used to fuel the transportation of people and goods (figures shown are for 2016).

Road


46 billion litres of oil products consumed



324 billion miles travelled on UK roads



1.9 billion tonnes of freight transported



Aviation

14 billion litres of oil products consumed



134 million passengers departed from UK airports




1.1 million tonnes of freight flown from UK airports

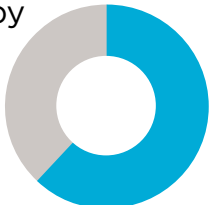


Rail and maritime


1.7 billion litres of oil products consumed



62% of rail energy needs met by petroleum products







103 million tonnes of domestic freight transported by water



2. PETROCHEMICALS


7.2 billion litres of oil products were used to manufacture petrochemicals. These are, in turn, used to produce a huge range of goods including:

-  building components
-  consumer electronics
-  clothing
-  cosmetics

-  paints/fertilisers
-  plastics/packaging
-  pharmaceuticals
-  vehicle components

3. HOME HEATING

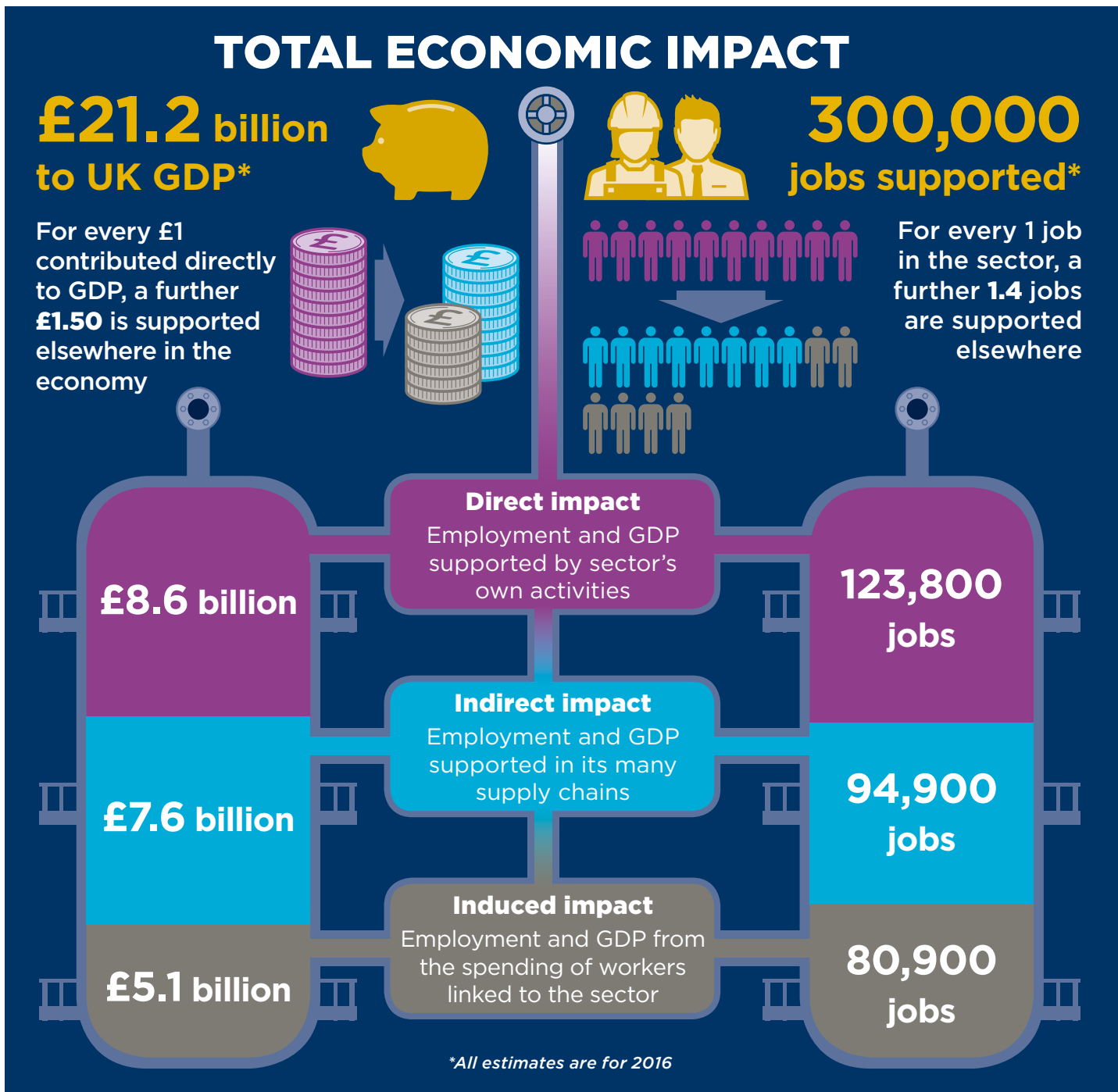
2.6 billion litres of oil products were used for domestic heating in 2016



3.7 million homes in Great Britain are not connected to the mains gas network. Many rely on heating oil and LPG as the main source of heating

TOTAL ECONOMIC IMPACT OF THE UK DOWNSTREAM OIL SECTOR

The sector makes a major contribution to the UK economy each year, in terms of the GDP it generates and the employment it supports



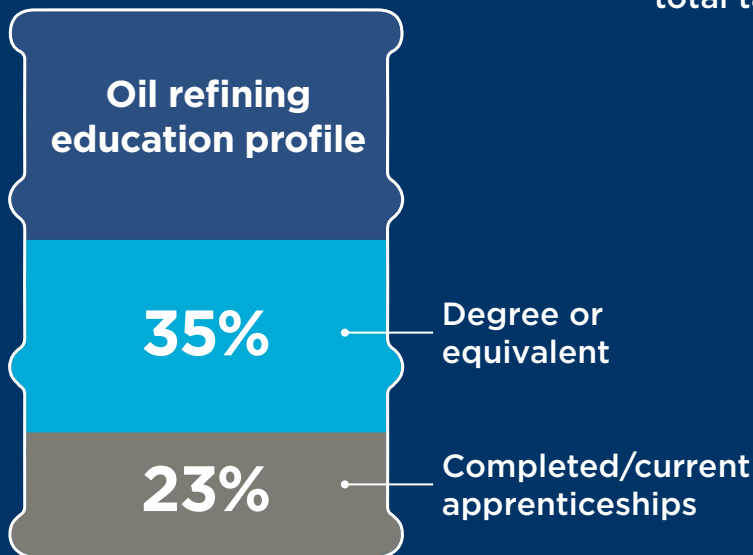


Skills and productivity



Productivity in the sector is **29%** above the national average

Oil refining offers a range of highly-skilled roles:



Reflecting these high skill levels, average pay in refining exceeds **£50,000 per year**, almost **90%** above the UK average

Tax revenues

The sector is an important collector of government revenues. In 2016/2017, it collected:

£28 billion in fuel duty

+ **£8 billion** in VAT from road fuels

= **5%** of UK's total tax receipts



The impact of filling stations

100,000 people were employed in UK filling stations in 2016

Each **100 workers** employed generated

£1.1 million for the wider economy, and supported

18 jobs through their spending

MAJOR DOWNSTREAM OIL INFRASTRUCTURE

For each 100 workers employed in the downstream sector (excluding filling stations), we estimate their spending contributes £4.7 million to the UK's annual GDP, and supports 76 jobs

Cheshire

Essar Stanlow

- Refinery employs more than 900 staff, plus 800 contractors.
- Essar invested more than £570 million between 2011 and 2018 to improve efficiency and throughput, reduce emissions, and enhance safety.

The Haven Waterway

Valero Pembroke

- More than 500 people are employed at the refinery, plus several hundred contractors.
- The refinery is situated within a cluster of other energy sector activity, which also includes major fuel storage facilities operated by Valero and Puma Energy.
- Crude oil, other oil products, and liquefied gas represented more than 95 percent of the total tonnage that passed through nearby Milford Haven port in 2016.

Key

- Refineries
- Pipelines
- Terminals
(Numbers denote multiple terminals in close proximity)

Fawley

Esso Fawley

- Largest refinery in UK, and only one in South of England.
- Closely integrated with adjoining chemical manufacturing plant.
- In 2016, 1,000 people were employed in refining sector within New Forest district.
- A further 800 people were employed in chemicals manufacturing in the area.

Valero Pembroke



Grangemouth

Petroineos Grangemouth

- Directly employs 550 people, plus contractors.
- Nearby chemicals plants, including the one owned by INEOS, use outputs from the refinery.
- Combined petroleum and chemicals cluster is major source of employment in wider Grangemouth and Falkirk area.

The Humber Energy Estuary

Phillips 66 Humber

- 1,100 onsite workers (including contractors).
- Has undertaken £1.5 billion of capital and maintenance expenditures since 2005.

Total Lindsey

- Employs a further 400 workers, plus contractors.
- £33 million of investment allocated to enhance efficiency, in addition to the £20 million that is invested every year to adapt to industry demands and remain competitive.
- More than one-third of Grimsby and Immingham ports' total tonnage related to crude oil, oil products, or liquefied gas in 2016.


Thames Estuary

- Terminals and storage facilities that provide London and the South East with direct access to global fuel supply markets.
- More than 1.5 million cubic metres of bulk storage facilities for liquid fuels.
- Home to Shell Haven, BP Isle of Grain, Navigator Terminals and CLH Pipeline System.
- More than £100 million of investment undertaken or announced since 2014 for refurbishment and expansion.

HOW THE DOWNSTREAM OIL SECTOR IS HELPING THE UK'S ENERGY TRANSITION

The sector has a vital role to play in realising a low-carbon future, and is pioneering ways to contribute to the government's policy objectives

THE FUTURE OF OIL DEMAND



80% Reduction in greenhouse gas emissions sought by UK Climate Change Act by 2050, compared to 1990 levels.

20% IEA's forecast drop in European oil demand between 2016 and 2040, based on current policies.

56% IEA's forecast drop in European oil demand if governments introduce policies needed to meet international objectives.

Even under the most ambitious scenarios, there will be demand for oil products for the foreseeable future:

- **98.5%** of UK licensed cars were powered by petrol or diesel in 2017.
- **HGVs and aircraft** will continue to rely on oil-based fuels (for UK, this means continued reliance on import networks that ensure secure supply of these fuels).
- The **petrochemicals industry** will continue to rely on the downstream sector for inputs.

On a global basis, the IEA expects world oil demand to continue to increase in its baseline scenario, driven by rapid growth in other regions.



MAKING DOWNSTREAM OPERATIONS MORE EFFICIENT

UK oil refineries have increased their fuel efficiency throughout the last two decades: 5.7 percent of fuel was used to power refineries in 2017, compared to seven percent in 1995. The sector's latest initiatives include:

- Introducing "combined heat and power" (CHP) plants, which re-use waste heat and reduce reliance on the main electricity grid.
- Integrating with petrochemicals plants to share utilities and reduce transport costs.
- Developing more sophisticated control and monitoring systems.

In the filling station sector, a number of outlets have installed solar panels on their roofs.



REDUCING THE SECTOR'S ENVIRONMENTAL IMPACT

Between 2005 and 2016, UK refineries reduced their sulphur dioxide emissions by 65 percent, nitrogen oxide emissions by 43 percent, and emissions of non-methane organic compounds by 48 percent.

Now they are exploring ways of exporting recovered waste heat to surrounding homes and businesses in "district heating networks".

In the longer term, there are efforts to reduce the sector's environmental impact through carbon capture and storage technology. An extension of this technique is "carbon capture and utilisation", whereby captured carbon is re-used to make construction materials, for example.



DEVELOPING CLEANER FUELS FROM NEW SOURCES

The sector has already removed sulphur from UK road fuels in line with legislation, and some companies are now focussing on developing new types of fuel. For example, “gas-to-liquid” fuel, which can be used in existing diesel engines, was made available on the UK market in 2017. This could play an important role in reducing emissions from larger vehicles that cannot easily be switched to other power sources.

Some companies in the sector are also seeking to increase the share of biofuel content in their products. These include:

Biogas: LPG derived from biological feedstocks such as vegetable oil, animal fat, cellulosic biomass, sugar and starch crops. Available in the UK since 2018, biogas can be used in existing infrastructure and equipment without modification.

Biofuel from algae: still in early stages of development, this emits much lower levels of greenhouse gases than most existing transport fuels. Algae consumes carbon dioxide while growing, and can be grown in wastewater, purifying it in the process.

Jet fuel from waste: initiatives are exploring this in North America and India. The carbon footprint of this fuel would be substantially lower than that of the conventional equivalent.



DIVERSIFYING INTO OTHER NEW PRODUCTS AND SERVICES

As well as adapting existing products, some downstream firms are diversifying into new product areas. These include:

Graphite coke

When oil is refined, a heavy residue is left over which has traditionally been used as fuel for ships or power stations. One UK refinery instead processes this to produce petrol, petroleum coke, and graphite coke. The latter can be used in the lithium ion batteries used in smartphones and electric vehicles. The company is exploring potential for this to be used in the UK electric vehicle supply chain.

Powering alternative-fuel vehicles

To enable growth in the take-up of electric vehicles, the UK’s charging infrastructure must expand significantly. Major filling station owners are introducing fast and ultra-fast charging points around the country which can add up to 600 miles of range per hour of charging time.

Energy companies are also driving research into improvements in battery technology, while filling stations are starting to cater for motorists who are operating hydrogen fuel cell vehicles.





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