DEVELOPMENTS IN THE INTERNATIONAL DOWNSTREAM OIL MARKETS AND THEIR DRIVERS: IMPLICATIONS FOR THE UK REFINING SECTOR

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DEPARTMENT OF ENERGY AND CLIMATE CHANGE

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GLOSSARY AND ABBREVIATIONS

API	American Petroleum Institute
ARA	Amsterdam-Rotterdam-Antwerp
B/D	Barrels per day
Barrel	42 US Gallons, 35 Imperial gallons, 159 litres
Biodiesel	Diesel fuel produced from agricultural products rather than mineral oil
Biogasoline	Gasoline containinig ethanol or ETBE derived from agricultural products
CAFE	Corporate Average Fuel Efficiency: a standard measure of fuel economy in the U.S.
CDU	Crude Distillation Unit
CIF	Cost, insurance and freight
CIF Price	Price of product delivered to named location. Includes product cost, insurance cost and freight cost to that location.
CIS	Commonwealth of Independent States, consisting of eleven former Soviet Republics: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine, and Uzbekistan
CNG	Compressed Natural Gas
CRF/ICRF	Capital recovery factor / Incremental capital recovery factor
CTL	Coal to liquids
ECA	Emissions Control Area
EFTA	European Free Trade Association
EPA	Environment Protection Agency: a U.S. Government body
ETBE	Ethyl tertiary butyl ether, a gasoline blend component
EU	European Union
FCC	Fluid Catalytic Cracker
FCC Equivalent	Residue conversion processing capacity expressed as an equivalent to an FCC unit
FOB	Free on board
FOB Price	Price of a product at named load port delivered free on board to ship. Insurance and freight costs to another location are separate and have to be paid by the buyer.
GTL	Gas to liquids
HDS	Hydrodesulfurisation. Catalytic process to remove sulphur from oil products
HSD	High speed diesel
IEA	International Energy Agency
IOC	International Oil Company
LLS	Louisiana Light Sweet
LPG	Liquified petroleum gas
LSD	Low-sulfur diesel
MTA	Million Tonnes per Annum
MTBE	Methyl tertiary butyl ether - a gasoline blend component
NGL	Natural gas liquids
NOC	National Oil Company
NWE	North West Europe
^{o}API	Degree API. Measure of density, usually for crude oils and condensates
OECD	Organisation for Economic Co-operation and Development
OPEC	Organisation of Petroleum Exporting Countries
pa	Per annum
RBOB	Reformulated Blendstock for Oxygenate Blending. An unfinished gasoline prepared for ethanol blending
RFCC	Residue Fluid Catalytic Cracker
RFG	Reformulated gasoline - clean gasoline required in some U.S. regions
RME	Rapeseed Methyl Ester - a biodiesel component
SECA	Sulfur Emission Control Area
SUV	Sports Ultility Vehicle
TAN	Total Acid Number. A measure of the acidity of crude oil, expressed as milligrams of potassium hydroxide per gram of crude (mgKOH/g).
Tonne	1 metric ton. 1,000 kilograms
tpy	tonnes per year
UAE	United Arab Emirates. Comprises the Emirates of Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Quwain,
ULSD	Ultra Low Sulphur Diesel usually 10 or 15 parts per million wt Sulphur
Urals	Russian export blend crude oil
USGC	U.S. Gulf Coast
VLCC	Very Large Crude Carrier
VGO	Vacuum gasoil
WTI	West Texas Intermediate

REFINERY PROCESS UNIT DESCRIPTION AND PRODUCTS

Unit	Main Function
Crude Distillation	Provides feed to all downstream units
Vacuum Distillation	Provides feed to cracking/coking units and produces fuel oil or bitumen
Thermal Cracking	Cracks heavy feedstocks to lighter products using high temperature
Visbreaking	Mild cracking of vacuum residues to reduce viscosity for fuel oil blending
Solvent Deasphalting	Extracts higher quality cracker feedstock from heavy residues and also produces very viscous fuel oil or bitumen product
Residue HDS	De-sulphurises heavy residues to improve their quality as feedstock to cracking units
Residue Hydrocracking	Cracks heavy residue at high temperature and pressure in presence of catalyst and hydrogen to produce mainly low sulphur middle distillate
Fluid Coker	Heats heavy straight run and cracked residues to produce light products and fuel gas
Delayed Coker	Heats heavy straight run and cracked residues to produce light products and solid coke
VGO HDS	De-sulphurises vacuum gasoils to improve their quality as feedstock to cracking units
Fluid Catalytic Cracking	Cracks vacuum gasoil feed at high temperature in presence of a fluidised bed of catalyst to produce primarily gasoline and some lower quality diesel product
Resid Catalytic Cracking	Cracks residue feeds at high temperature in presence of a fluidised bed of catalyst to produce primarily gasoline and some lower quality diesel product
Alkylation	Produces high quality gasoline component from LPG
Polymerization	Produces high octane gasoline component from LPG
MTBE Unit	Produces Methyl Tertiary Butyl Ether high octane gasoline component
TAME Unit	Produces Tertiary Amyl Methyl Ether high octane gasoline blend component
Isomerization	Isomerises normal alkanes to their isomers, e.g. hexane to methylpentane. Used to boost octane of naphtha for gasoline blending
Hydrocracker	Cracks vacuum gasoil feed at high temperature in presence of catalyst and hydrogen to produce primarily low sulphur middle distillates
Reformer - Semi-Regenerative	Produces high octane gasoline component called reformate from naphtha using fixed bed reactor
Reformer - Continuous	Produces high octane gasoline component called reformate from naphtha using moving bed reactors. Produces higher octane product than sem-regenerative reformer
BTX Extraction	Extracts pure Benzene/Toluene/Xylene from mixed hydrocarbon feed (usually heavy reformate)
Naphtha Hydrotreating	Desulphurises naphtha to feed to reformer, or for gasoline blending
Gasoline Desulfurization	Desulphurises mainly cracked gasolines typically produced by catalytic cracking to allow blending of low and ultra-low sulphur gasoline
Distillate Hydrotreating	Desulphurises diesel/gasoil/kerosene fractions to allow production of low and ultra-low sulphur diesel and heating gasoil
Asphalt	Produces asphalt/bitumen
Sulfur Plant	Extracts elemental sulphur from refinery gases produced by the various desulphurisation processes
Hydrogen Plant	Produces hydrogen as feedstock for hydrocrackers and hydrotreaters

I. INTRODUCTION

The UK demand for refined products has changed substantially over the last 15 years. Total demand for refined products, including bunkers but excluding refinery fuels, has fallen modestly from 78 million tonnes in the late 1990s to a provisional 70 million tonnes in 2010, but there has been a significant change in the mix of products consumed. Growth in the economy combined with increasing numbers of diesel cars has resulted in a strong increase in demand for road diesel. The associated reduction in numbers of gasoline fuelled cars combined with efficiency improvements has led to a drop in gasoline consumption. Strong growth in the aviation sector driven by expansion of low-cost airlines has resulted in an increase in jet fuel demand. However demand for heavy fuel oil has declined sharply as a result of switching to cleaner fuels in both industrial and power generation applications.

UK refineries have not been able to keep pace with this changing demand pattern. Most are configured to match a profile of higher gasoline and fuel oil demand together with lower jet and diesel (middle distillate) demand. To reconfigure their processes to produce more middle distillates and less fuel oil and gasoline requires substantial investment in new conversion units. With the current poor underlying economic climate and predicted low refining margin environment and with numerous refineries in the UK currently for sale, these investments are unlikely to be forthcoming in the near future.

Consequently the UK refined product balances show a surplus of gasoline and fuel oil and a deficit of diesel and jet. Demand for gasoline and for fuel oil are predicted to continue to fall, while demand for diesel and jet are predicted to continue to rise. As a result these imbalances are expected to grow. The UK will therefore become more dependent on imports of middle distillates, and this dependency would grow in the event of further UK refinery rationalization.

In future the products that the UK will require may come from a small number of countries or regions, in particular the Middle East and Asia. This is owing to financial and competitive pressures on the UK and European refining industry that means that capacity expansion in Europe is unlikely to keep up with changing European refined product demand patterns. This report looks at UK, European and Global refined product balances in detail and provides a prediction of the likely future sources of imported refined products to Europe and the UK.

Previous work undertaken for DECC concluded that the position of UK refiners relative to their European competitors was poor. This report seeks to investigate this further, looking again at UK refineries competitiveness, and whether there is a risk that competition from supply of products into the UK from overseas refineries is likely to further erode this.

Some further consolidation of the downstream oil market in the UK and Europe seems inevitable, with refinery ownership changes in the UK already underway. The proportion of UK refining capacity held by International Oil Companies (IOCs) has declined following recent changes in ownership and a number of IOCs have announced the intention to review their portfolios and sell assets. This report investigates the changing profile of ownership of companies involved in the refining industry globally and specifically in the UK and what these changes might mean for the longer term future of the UK refining industry.

In this report, the historical data source for refinery product output, demand and trade flows is the International Energy Agency (IEA); all forecasts are by Purvin & Gertz. Historical GDP and population data are from Eurostat and the International Monetary Fund (IMF). GDP forecasts are by Purvin & Gertz, but are based on IMF forecasts, and are included in the Appendix. All refinery capacity data are from Purvin & Gertz' databases.

II. EXECUTIVE SUMMARY

UK REFINED PRODUCT DEMAND: TRENDS AND OUTLOOK

Refined product demand, supply and the net trade balance for the United Kingdom has evolved considerably over the past ten years, and is forecast to change further to 2030. The most significant changes to product demand have been, and are expected to be:

- **A notable fall in the share of gasoline demand.** In 2000, gasoline accounted for 26% of total UK refined product demand. Although gasoline demand had peaked, in absolute terms, at 24 million tonnes in 1990, demand had remained broadly constant over the 1990-2000 decade, such that by 2000 it was still 22 million tonnes. From 2000 to 2010, however, demand fell considerably, to 14 million tonnes, primarily as a result of the increasing popularity of diesel-powered private vehicles and better fuel economy from newer gasoline cars. By 2030 gasoline demand is projected to fall further, to 8.0 million tonnes – a share of only 10% of total UK demand.

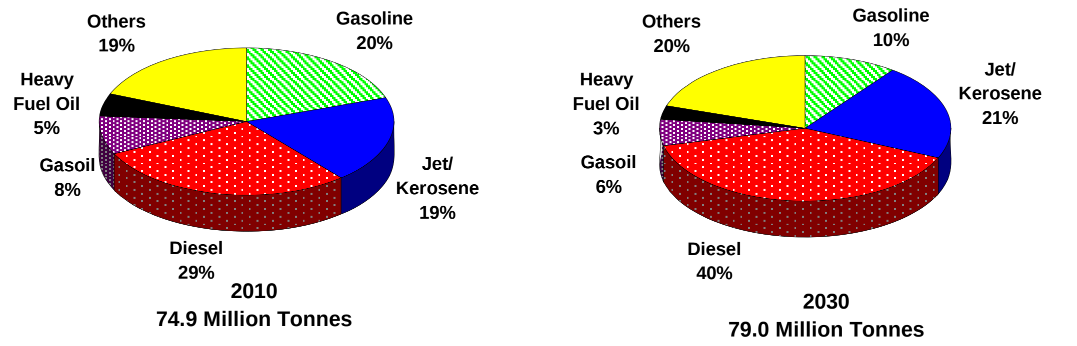
- **A corresponding increase in diesel demand.** The share of automotive diesel, including off-road and low- / ultra low-sulphur grades of 350/50/10ppm, has risen from only 19% of demand in 2000 to 29% in 2010, and is forecast to increase further to reach 40% in 2030. In addition to the switch to diesel cars this increase is also a result of economic growth and increased freight traffic, as well as a switch to ultra low-sulphur fuels for off-road use. Non-automotive gasoil demand will increase in 2015 by an estimated 1.2 million tonnes as a result of forthcoming changes in marine fuel specifications.

- **A steady increase in jet/kerosene consumption.** With the two major London airports at Heathrow and Gatwick the United Kingdom is the largest jet fuel market in Europe. Demand has been growing strongly since the 1990s, interrupted only by the decline in air traffic in 2002 following the events of 11th September 2001 and the loss of the Buncefield terminal in 2005. Future growth is likely to be underpinned by increasing air traffic volumes, although these will be offset partially by increasing aircraft efficiency.

- **Continuing declines in gasoil and heavy fuel oil demand.** The main trend is an expected loss of over 300,000 tonnes of heavy fuel oil demand in the electricity generation sector by 2013. A further impact will be the introduction of a maximum 0.1%S marine bunker fuel specifications for shipping in the North Sea and English Channel Emission Control Areas (ECAs) that are due to come into effect from 1st January 2015.

Figure II-1 illustrates the changing profile of UK refined product demand over the 20-year period from 2010 to 2030.

FIGURE II-1
UK PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes

Similar to most European countries the United Kingdom is increasingly reliant on trade flows to balance national refined product supply to product demand, as the industry adapts to changing demand trends. In this context, it is important to stress that the United Kingdom refined product market and balances can not be dissociated from the North European region. Projected future trade flows and balances have to be regarded in conjunction with the outlook for the North European and European trade and balances.

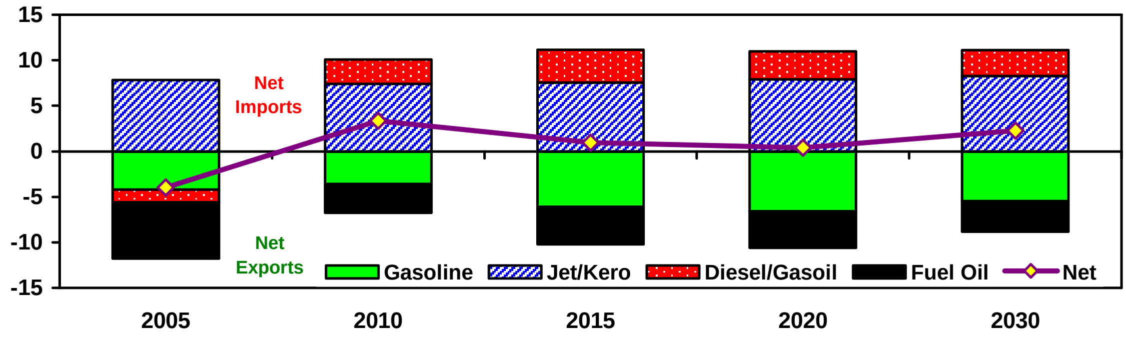
UK REFINING CAPACITY AND PRODUCT TRADE FLOWS

Historical and projected balances for refined products in the UK together with UK historical refined product trade flows are shown in Tables II-1 to II-6.

The total current UK refining capacity is 87 million tonnes, or 1.8 million B/D, divided among eight fuels refineries and two bitumen plants. As current product demand is 75 million tonnes (including refinery fuels) this is equivalent to about 86% of current operational capacity – a figure which indicates that the United Kingdom is not suffering from excess refining distillation capacity *per se.* However, an analysis of demand trends and recent trade flows indicates that it is the current configuration of UK refineries that represents the bigger issue. Following closure of the Teesside refinery the UK refining industry has a generally complex configuration although orientated to the production of gasoline. As the demand shifts away from gasoline this will present a growing challenge to the industry.

Figure II-2 shows the current UK product trade balance, of which the major trends are of gasoline and heavy fuel oil exports and imports of middle distillates. As there are few prospects of a major shift in the supply-demand balance in the period of the study the primary issues are those of securing suitable markets for gasoline exports and of sourcing suitable quantities of middle distillate imports. With long-term diesel and jet demand projected to grow slowly and no new confirmed refining capacity expected in the near term, net imports of middle distillates are set to continue to increase further. Over the forecast period to 2030 diesel/gasoil demand in the UK is expected to increase by eight million tonnes. In order to maintain an approximate balance as shown in Figure II-2, at least three major refinery investments projects costing in the order of $1 billion each would be required.

FIGURE II-2
UK PRODUCT TRADE BALANCE, 2005 - 2030
(Million Tonnes per Year)



Historical data source: IEA

The outlook for trade flows is discussed below, together with key conclusions.

Gasoline: UK net exports were 4.8 million tonnes in 2009 (the last year for complete data), or 6.0 million tonnes if imports from other parts of Europe are excluded. Of this, 90%, or 5.4 million tonnes, were exported to North America, illustrating the importance of that particular market. The remainder is mainly exported to West Africa.

Although the continuing decline in UK gasoline demand may be expected to result in increasing exports, the primary constraint remains the availability of export markets. Demand in the main export market, the United States, is likely to decline in the long term, and the increasing use of ethanol in the US will have the effect of reducing further the potential market for refinery-based gasoline. It is likely that exports to West Africa will continue, but are not expected to significantly increase because of the relatively modest increases in African domestic demand.

- Ultimately, exporters may have to look further afield to markets such as Latin America or the Middle East, or UK gasoline production will need to decline, implying some rationalisation of gasoline production capability. This would need to be achieved by re-configuring existing refineries rather than closing current capacity as that would result in a further increase in middle distillate imports as production would be lost through closure.

Jet/kerosene: net imports in 2009 were 7.0 million tonnes, of which the main suppliers were the Middle East (2.4 million tonnes) and Asia excluding China and India (essentially the Singapore region), of 2.0 million tonnes.

Imports of jet/kerosene are expected to remain the highest of the major products, both in terms of volume and share of domestic demand. Although the Middle East is likely to remain the predominant supplier increasing regional demand may curtail future Middle East export capabilities in the medium term, and as a result imports from India and the rest of Asia are likely to remain high.

- In the longer term, the Middle East, India and the rest of Asia will be significant providers of UK jet/kerosene supplies. Volumes will depend ultimately on regional demand growth and export-based capacity in the supplier locations.

Diesel/Gasoil: net imports in 2009 were only 0.6 million tonnes, although the recent peak was 2.2 million tonnes in 2006. The majority of diesel/gasoil trade is within Europe, with UK importing and exporting 4.4-5.3 million tonnes with other parts of Europe. Excluding this, the main trading partner is Russia and the CIS region, which accounted for 1.0 million tonnes of imports in 2009, with an additional 0.8 million tonnes from North America.

Imports are expected to continue to come primarily from the CIS region, with additional volumes from North America. However, as US diesel demand is projected to increase it is possible that imports from North America may start to decline, and that imports from India and the rest of Asia – for which imports of jet/kerosene have already been seen – will increase.

- The United Kingdom, and northern Europe, remain heavily reliant on Russia and the CIS for supplies of diesel/gasoil. It is almost certain that imports from the Middle East, India and Asia will be required in the long term unless there is investment in UK refinery configuration at levels not yet seen, which in turn will require a favourable business environment for refiners. A more immediate issue not only for the United Kingdom but also for all of northern Europe is the need for an additional 10 million tonnes (for northern Europe) of gasoil/diesel in 2015 as a result of the changes to marine bunker fuel regulations.

Heavy Fuel Oil: the UK is a large net exporter, of 4.3 million tonnes in 2009 and, similar to the situation for diesel/gasoil, the majority of trade is within Europe. Much of this is for the Rotterdam bunker market, and reflecting the slowdown in world trade in 2009 net exports fell by 1.8 million tonnes from 2008 levels.

Heavy fuel oil exports are likely to recover from 2010 and increase slowly as inland fuel oil demand declines. A major impact is to be seen in 2015, with an export increase of about 1.0 million tonnes as marine bunker fuel demand switches to gasoil-based marine fuels.

- Export volumes are currently relatively small and are not regarded as being a significant issue. The main export flows are expected to continue to be short-haul shipments to the Rotterdam bunker market.

The implications of the continuing imbalance of refined products and heavy reliance on trade flows is that import sources and export destinations are likely to be increasingly reliant on relatively few partners – which may, out of necessity, also require certain geopolitical considerations. This is a feature of refined products trade, as supplies will only be available from those countries that have sufficient excess refining capacity, which are relatively few.

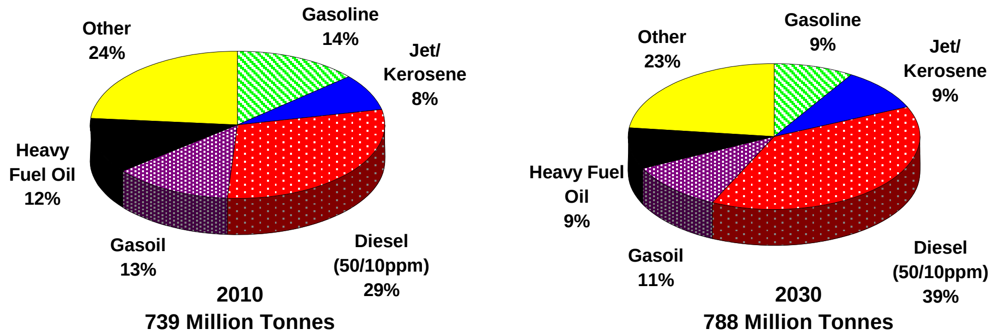
From the point of view of security of supply, refineries located in the UK provide for greater security of supply. This is because the refineries process crude oil that can be sourced from many different countries and regions whereas refined product imports are sourced from relatively few locations.

EUROPEAN REFINED PRODUCT DEMAND

As with the UK the European refined product market has become increasingly out of balance with changing domestic demand trends, making the region ever more reliant on trade flows to balance demand with supply. The most notable changes have been a growing surplus of gasoline and an increasing shortfall of gasoil/diesel, a result of the increasing popularity of diesel-powered private vehicles and growth in commercial diesel. The rapid growth in aviation, which carried on from the trend seen in the late 1990s, has also seen an increase in net jet/kerosene imports as demand has outstripped regional supply.

Figure II-3 illustrates the expected changes to European refined product demand from 2010 to 2030

FIGURE II-3
TOTAL EUROPEAN PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes

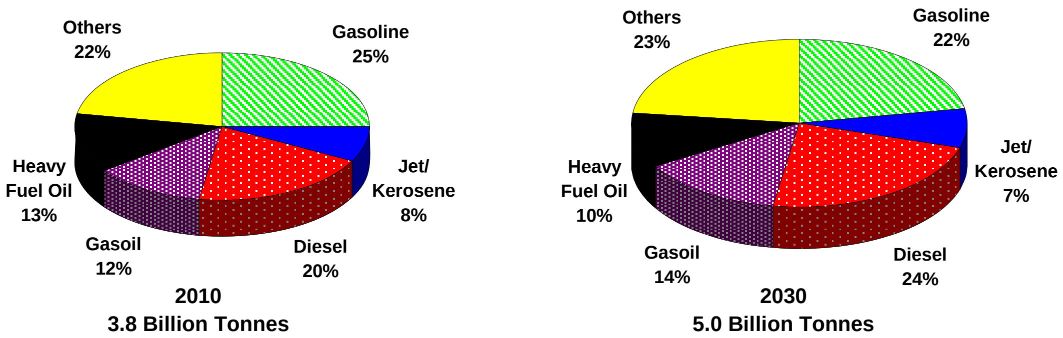
Including refinery fuels, middle distillates demand – jet/kerosene and gasoil/diesel – is forecast to increase from an estimated 50% of total product demand in 2010 to 59% by 2030, while the share of gasoline demand over the same period is projected to fall from 14% to 9%. This change is primarily a result of improving fuel efficiency and the switch from gasoline-powered private cars to diesel powered cars and in the longer term to cars powered by alternative fuels. Heavy fuel oil demand, including bunkers, is expected to decline slightly in absolute terms, such that its share of total refined product demand in 2030 is projected to fall from the current level of 12% to 9%.

GLOBAL REFINED PRODUCT DEMAND

In comparison with the relatively mature state of UK and European markets, that have minimal scope for overall refined product demand growth out to 2030, global refined product demand is forecast to increase much more strongly. By 2030, we expect world demand to have increased by 1.1 billion tonnes from 2010 levels, representing an annual average growth rate of about 1.2%. The majority of refined product demand growth out to 2030 will take place in the less developed, non-OECD countries.

In Europe and the UK it was noted how there has been a general shift in demand from gasoline to diesel, a trend that is expected to continue. Worldwide, this trend may be less evident, as gasoline demand is still growing and is expected to continue to grow in the developing markets. However it is demand for gasoil/diesel that is projected to increase the most, as seen in Figure II-4.

FIGURE II-4
WORLD PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

The share of middle distillates (jet/kerosene and gasoil/diesel combined) of global demand is projected to increase from 40% in 2010 to 44% in 2030. Gasoline demand share falls from 25% to 22% although total gasoline demand increases.

Given that the lead time for construction of new refinery plant is around five years, in the short to medium term there is a risk that middle distillate supply would be needed from less economically effective plant, such as hydroskimming refineries. Under such a scenario, higher prices for middle distillates relative to other oil products are likely. This would be a global issue, impacting the global economy, but would be most keenly felt in Europe (and therefore the UK) where middle distillate imports are most required to meet total product demand.

CHANGING UK REFINERY OWNERSHIP PROFILE

The United Kingdom has had an open economy for many years, and following the sale of the last of the government stake in BP in 1987 government has not had a direct involvement in the management of the oil industry. As a result, the UK refining industry has not included any presence of a national oil company, a situation which contrasts with many European and other countries where a national oil company has a dominant position in the market.

Until recently, the refineries and most of the marketing was under the control of international oil companies (IOCs). However, over recent years the international companies have increasingly focussed on the upstream, where they perceive they have a competitive advantage through technical capability and financial muscle, and which provides the potential for greater financial returns. But, as exploration and production has become more expensive and oil companies have been seeking to increase their capital reserves, IOCs have been shedding less profitable but capital-intensive activities, such as the downstream, where they hold little competitive advantage. By virtue of the United Kingdom's higher than normal exposure to the IOCs, it is almost uniquely exposed to this trend, such that the current sales of UK refineries are less to do with the domestic market situation but more related to a commonly-followed business strategy.

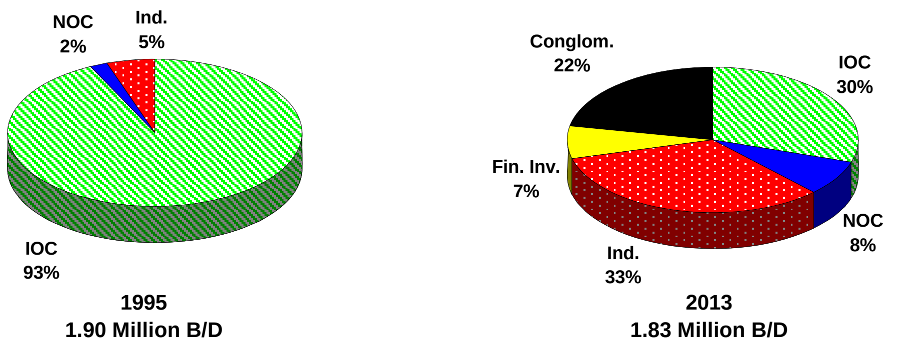
There are several categories of potential refinery owners defined in this report:

- **International Oil Companies (IOCs):** generally they are integrated companies with crude oil production, refining and marketing of refined products in several countries. Comprised predominantly of the old major oil companies, or "the majors", most are rationalising their downstream portfolios in Europe and elsewhere.

- **National Oil Companies (NOCs):** also are generally integrated companies, but tend to be focussed on one "home" market, as a result of being either state-owned or recently divested from state ownership. They can be predominantly a crude oil producer, such as Saudi Aramco, or downstream-oriented company, such as MOL.
- **Independent Refiners,** who focus on refining as their core business. Generally these are low-cost and aggressive operators, and may or may not participate in retail and commercial marketing downstream of the refinery. They are companies built on acquisition of assets from IOCs, generally at low prices, examples of which are Valero and Petroplus.
- **Financial Investors,** which includes a large spectrum covering private equity and hedge funds. They tend to have a range of business models that may include and will vary from long-term participation to a "buy-low, sell-high" approach. They are unlikely to make major investments because of their lack of expertise and the typically long payback periods required.
- **Conglomerates** is a category that includes companies that own refining and, possibly, marketing as part of a portfolio of industrial assets. Some are petrochemical companies that have acquired or built refining capacity as part of a petrochemical business, such as Ineos, while others are pure conglomerates such as Essar, of India, and Chaebols, of South Korea. Generally they are long-term investors.

A comparison of the changes in the share of UK refinery ownership since 1995 by company type, including the most recently-announced transaction of Chevron's Pembroke refinery to Valero and an assumed purchase of Milford Haven by Financial Investors and Lindsey by an Independent is shown in Figure II-5 below. Most striking is the much-reduced presence of the IOCs from UK refining, which is limited to the ConocoPhillips refinery in South Killingholme and the Exxon refinery in Fawley only.

FIGURE II-5
UK REFINERY OWNERSHIP PROFILE: 1995 AND 2013*



**Assumes Lindsey sold to Independent and Milford Haven sold to Financial Investors*

When considering the sale of UK assets an interesting mix of buyers has emerged, and one that includes examples of three of the five groups above: Essar is a Conglomerate, PetroChina is a NOC and Valero is an Independent Refiner. As of yet no Financial Investor has appeared, but as there are two refineries still for sale it is possible for one to enter the UK market.

The following matrix seeks to define key strategic criteria for the various ownership types. In some cases this represents a subjective generalisation and specific companies will have a different approach.

	IOC	NOC	Independent	Conglomerate	Financial
Strategy	Divestment and consolidation	Maintain or expand refining. Downstream investment where resource driven imperative	Expand based on attractive opportunities	Expansion and selective investment. Some linkage to other business opportunities	Aim to take advantage of the business cycle
Longevity	Long term for advantaged assets	Long term	Long term	Long term	Short term
Willingness to invest	Limited and would apply a high hurdle rate	Willing	Willing	Willing	No
Ability to withstand economic downturn	Good	Good	Reasonable	Good	Limited
Technical Ability	High	High	Good	Limited	Low

The Financial Investor group is the one that could potentially present the greatest risk to long-term operations, although it is stressed that not all financial investors may have a short-term attitude. However, all classes would react adversely and rapidly to any externally imposed increase in the costs of doing business.

IMPLICATIONS FOR SECURITY OF SUPPLY

UK demand trends will continue to diverge from the current UK refinery supply base. If the domestic refining industry is to reconfigure its plants and change its yields from being gasoline-predominant to diesel-predominant, then significant investment will be required. IOCs and larger NOCs are usually able to make such investments from their own cash reserves, but less well funded owners will have to raise capital from the financial markets. As a result, they will incur a higher cost of borrowing, which may render them being unable to finance large projects economically. In the case of Conglomerates, competition for capital will not only be the same issue that the IOCs currently have, but will extend to other businesses within the company portfolio.

Without investment particularly in middle distillate production the UK refineries would become gradually less competitive and therefore potentially more liable to closure in the longer term.

Another issue related to the sale of refineries is the disintegration of the supply chain resulting from the separation of refining from the associated marketing business. A presence in retail and commercial markets gives refiners some advantage as a secure outlet exists for product and the transfer-sale price of the product will be beneficial to both refiners (who would otherwise have to sell product at a lower, export-based price) and marketers. In fact, this trend will tend to reinforce itself, as the loss of a marketing arm also results inevitably in some inland sales being lost, such that additional quantities of products will have to be sold through the refinery gate, thus putting increased downward pressure on refinery-gate prices.

Effectively, this results in the refinery moving from being part of an integrated supply chain to being a merchant refiner exposed to the lowest market price. Whilst this situation is superficially attractive in periods of abundant supply as consumer prices may be reduced, loss of the refining capacity has the potential be a real problem if or when the supply situation changes, with the consequence that consumer prices will increase disproportionally as additional, marginal supplies are sought.

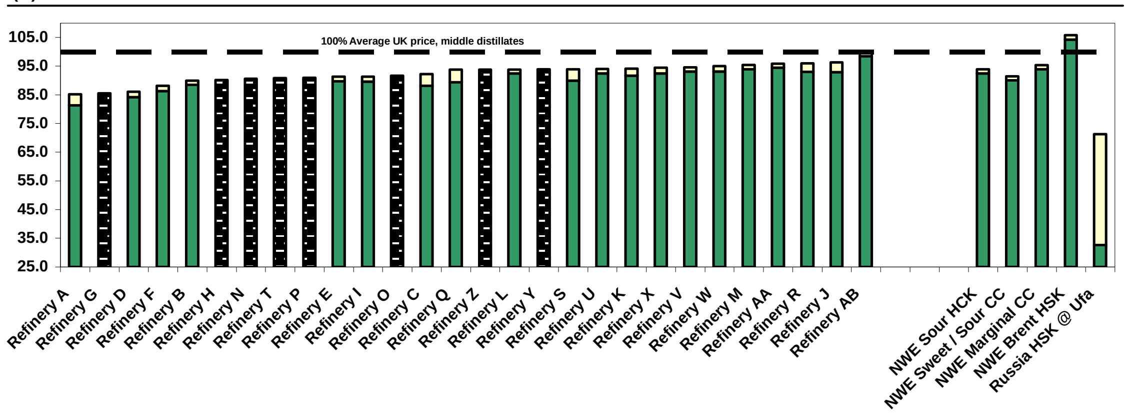
UK REFINERY COMPETITIVENESS

Our analysis of UK refinery performance shows that the average margin performance of the UK refineries is reasonable when compared to other peer refineries in North West Europe. This peer group of refineries is larger and more complex than the European average and therefore represents a challenging group of competitors.

Importantly, the UK refineries are even more competitive in the supply of products into the UK market compared to both European counterparts, and complex export refineries located in more distant regions such as the Middle-East or India. This is because the overseas refineries have to move the product from their location to the UK and in doing so incur a freight cost. This can be seen in Figure II-6 below.

FIGURE II-6
COMPARISON OF DISTILLATE SUPPLY COST INDEX, DELIVERED TO UK, 2010
(%)

Freight to UK
UK Refineries
Non-UK Refineries



It should also be recognized that for refineries located in North West Europe, sales of product into their own local market (which will have similar pricing to the UK market) will give a better return to the refinery than export to the UK (or any other location). Therefore even though some of the refineries in the analysis could in theory export to the UK and effectively compete with the UK refineries, most would not do this when they can more profitably serve their own local markets.

The more distant export refineries are not able to out-compete the UK refineries in the UK market. These export refineries do however provide the marginal supply of products into the UK, i.e. the products required by the UK market that the UK refineries do not themselves have the capacity to produce.

UK REFINING AND PRODUCT SUPPLY: GOVERNMENT POLICY

There is little that the UK government can do policy-wise that would impact the global oil markets and market positions. Total UK oil consumption in 2010 was around 74.9 million tonnes compared to the global consumption of 3.8 billion tonnes. UK consumption therefore represents around 2% of global oil demand. Any action undertaken by the UK alone can only have very limited impact on the global oil demand balance.

PGI have indentified areas of government policy that can or could have an impact on the competitiveness of the UK refining industry and on the security of product supply to the UK. We have divided these into policies or policy areas that have a direct influence on the downstream industry, and areas where the influence is more general or indirect.

The UK has an open free-market economy. We have not considered any policies that would involve direct intervention by the government in the downstream refined products market or industry in the UK.

POLICY AREAS THAT HAVE DIRECT INFLUENCE ON UK REFINERIES

Legislation relating to oil refining

The UK Government should not seek to apply more stringent legislation to UK refineries than that which is already applied by the European Union. This would ensure a level playing field for UK refiners when competing with their EU counterparts.

More specifically on the issue of “Carbon Tax” the UK government should not seek to increase the carbon tax applied to UK refineries to a higher level than that imposed by the EU. This would disadvantage UK refiners in comparison to their EU competitors as well as to non-EU competitors. An example of such a policy would be the unilateral introduction of a minimum floor price for carbon credits that is higher than the European market price applied to the refining industry. Such a situation would clearly disadvantage UK refiners (and other major energy consuming industries) compared to their EU counterparts. It also would defeat the object of the carbon credit market which is to encourage the most cost-effective reduction in greenhouse gas emissions to take place first.

It has been recognised that the refining industry is subject to carbon leakage. The proposed mechanism that provides for free allowances for the 10% most efficient refineries with other refiners purchasing credits for the difference is designed to mitigate this. Nevertheless the system still disadvantages EU refineries compared to their non-EU competitors, particularly when those refineries are close to the EU borders, such as in North Africa or in CIS countries on the EU Eastern borders.

In the absence of a global agreement on the application of carbon taxes, a potential solution that would level the playing field would be to apply an import carbon tax on oil products imported to the EU from regions that do not have an equivalent greenhouse gas reduction regime. The tax should be set at a level equal to the average carbon credit cost to EU refiners per barrel of product produced.

In general the government should lobby the EU to reduce the level of legislative pressure on EU refining.

Soft loan or loan guarantees

The ownership of UK refineries is moving away from the traditional International Oil Companies (IOCs) to a mixture of IOCs, Independent refiners, Conglomerates, and even Financial Investors. The UK refining industry in the longer term needs to make investments in middle distillate production. The IOCs are usually able to make such investments from their own cash, but less well funded owners will have to raise capital from the financial markets. This may result in some refinery owners being unable to finance large projects economically.

The government could encourage investment in the UK refining industry by either providing soft loans, or loan guarantees to refinery owners to assist in the financing of long term investments that address the imbalance between middle distillate and gasoline production and UK product demand.

Favourable tax treatment for strategic investments

Aligned with providing loans or loan guarantees above, allowing favourable tax treatment for strategic investments could also be an option, for example by allowing rapid tax depreciation of the new assets thus reducing the tax burden in the early years of project operation. Such allowances improve the economics of the investment project, and if as a result the project goes ahead, this then results in increased tax revenue in the longer term.

Guarantee full carbon credit allowance for new strategic refining investments

New investment in process plant on a refinery is likely to result in an increase in refinery energy consumption. In particular the types of plant that produce additional middle distillate products, such as hydrocrackers and cokers are energy intensive processes. As shown in this report the UK and EU needs to source additional middle distillates and therefore investment in such plants should not be discouraged by the policies that are seeking greenhouse gas emissions reduction. New plant directed at reducing the UK and EU deficit in middle distillate products should be given full carbon credit allowances under the scheme.

RELATED POLICY AREAS

Energy efficiency measures

Government should seek to encourage energy efficiency in all areas of UK energy consumption. This is a win-win situation as energy efficiency results in reduced costs and improved security of supply.

Improvements in the efficiency of trucks, buses and other vehicles would naturally have a downward impact on the level of fuel consumption, particularly diesel consumption. This in turn should increase security of supply as the UK would be less reliant on net diesel imports. High fuel prices already create a strong driver for improved efficiency, but targets on efficiency levels for new vehicles could also accelerate efficiency gains.

Encourage alternatives to kerosene for domestic heating fuel

UK consumption of jet/kerosene is currently around 14.5 million tonnes per annum of which around 3.3 million tonnes is burning kerosene. Production from UK refineries is around 8.4 million tonnes with net imports around 6 million tonnes. The kerosene used in domestic heating adds to the country net import position that is created by the presence of large hub airports in London. A reduction in heating kerosene demand would therefore reduce the UK net import position.

Encouraging the roll-out of the national gas grid to more remote areas would allow for substitution of kerosene with natural gas. This would have environmental benefits, with reduction in CO_2 and sulphur emissions, as well as reducing burning kerosene demand. Where pipeline gas is unlikely to become available, substitution by LPG (propane) could be an option. Households could be encouraged to switch to LPG with some government assistance in the form of grant, or scheme whereby the LPG supplier recovers costs of the LPG tankage through fuel supply over time.

Finally replacement of old inefficient boilers with modern efficient boilers would be likely to have the greatest impact. A renewal of the government boiler scrappage scheme possibly particularly targeted at oil (kerosene) fired heating schemes could be applied. Again apart from benefits in reducing kerosene demand such a scheme would also reduce greenhouse gas emissions.

Instigate measures to reduce traffic congestion

Slow moving traffic and traffic congestion result in increased fuel consumption. Measures to reduce traffic congestion therefore translate to a reduction in overall fuel demand. Such measures could be relatively simple, such as increased use of intelligent traffic control systems (e.g. intelligent traffic lights) and turning off traffic lights in urban areas late at night when they are not really needed. More complex measures could include co-ordination of utility works when this involves road-works, and incentives on all companies that are undertaking road-works to complete these in a timely manner.

Encourage the transfer of freight from road to railways.

Movement of freight by rail is more fuel efficient than by truck, and lower cost overall over longer distances. It is however less flexible than moving freight by truck.

In the longer term rail should be powered by electricity that is generated from a variety of low-carbon or carbon-neutral sources, rather than from diesel. Therefore movement of freight away from road to rail has the impact of diversifying energy demand, away from oil based hydrocarbons.

TABLE II-1
REFINED PRODUCT BALANCE
UNITED KINGDOM
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	23	23	20	20	20	20	20	19	19	19	18	16	15
	Imports	2	2	3	3	4	4	4	4	4	4	4	4	4
	Exports	(5)	(7)	(7)	(8)	(9)	(9)	(10)	(10)	(11)	(11)	(12)	(11)	(10)
	Biogasoline supply	-	0	0	0	0	0	0	0	1	1	1	1	1
	Supply Adjustments	0	0	0	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	22	19	17	16	15	14	13	12	12	11	9	8	8
Jet/Kerosene	Production	10	8	10	9	8	9	9	9	9	9	10	10	10
	Imports	5	9	8	9	8	8	9	9	9	9	9	9	9
	Exports	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	Supply Adjustments	1	0	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	15	16	16	15	14	15	15	15	16	16	16	17	17
Gasoil/Diesel	Production	28	29	27	25	25	25	25	26	26	27	29	29	30
	Imports	4	5	7	7	9	9	9	9	9	10	10	11	11
	Exports	(6)	(6)	(7)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)
	Int'l Bunkers	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
	Biodiesel supply	-	0	1	1	1	1	1	2	2	2	2	2	2
	CTL/GTL diesel supply	-	-	-	-	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(0)	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	24	26	27	26	27	27	28	28	29	29	31	33	34
	of which: Diesel	16	19	21	21	22	24	25	25	26	26	29	30	31
Heavy Fuel Oil	Production	12	12	11	8	7	7	7	7	7	7	7	7	7
	Imports	1	2	1	1	1	1	1	1	1	1	1	1	1
	Exports	(5)	(8)	(7)	(6)	(5)	(5)	(5)	(5)	(5)	(6)	(6)	(6)	(5)
	Int'l Bunkers	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
	Supply Adjustments	1	0	0	0	0	0	0	0	0	0	0	0	0
	Consumption	7	4	3	2	2	2	2	2	2	2	2	2	2
Other Products	Production	13	14	12	12	11	12	13	13	13	13	13	13	14
	Imports	2	3	3	3	2	3	3	3	3	3	3	3	3
	Exports	(3)	(5)	(4)	(4)	(4)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	2	3	3	3	4	3	3	3	3	3	3	3	3
	Consumption	14	15	13	13	14	15	15	16	16	16	16	16	16
Total	Production	86	86	80	75	72	73	74	74	74	75	76	75	75
	Imports	14	22	23	22	24	25	25	25	25	26	26	27	27
	Exports	(20)	(28)	(28)	(25)	(25)	(25)	(25)	(26)	(26)	(28)	(29)	(28)	(27)
	Int'l Bunkers	(2)	(2)	(3)	(2)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Biofuels/CTL/GTL supply	-	0	1	1	2	2	2	2	2	2	3	3	3
	Supply Adjustments	3	4	3	2	2	1	1	1	1	1	1	1	1
	Consumption	81	81	77	73	72	73	74	74	74	74	75	75	76

TABLE II-2
UNITED KINGDOM: GASOLINE TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	23,470	21,556	22,972	22,653	24,620	22,652	21,468	21,313	20,319	20,404
Imports										
Rest of Europe	2,354	1,818	672	666	2,158	2,288	3,805	3,283	3,324	3,017
Africa	26	13	-	-	-	60	-	-	-	-
Middle East	-	-	-	-	-	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	8	-	-	-	-	-	-	-	-	-
North America	-	7	10	6	36	-	-	3	-	2
Latin America	-	-	-	26	-	41	-	-	-	-
CIS	71	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	1,780	1,634	1,336	-	-	-	-	-	-
Total	2,459	3,618	2,316	2,034	2,194	2,389	3,805	3,286	3,324	3,019
Exports										
Rest of Europe	2,447	2,433	2,511	1,814	1,917	1,471	1,523	1,967	2,371	1,768
Africa	67	23	130	203	374	114	118	436	305	379
Middle East	138	-	-	79	57	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	37	-	61	117	39
North America	2,028	1,898	2,690	2,600	4,851	4,813	5,216	4,844	4,217	5,398
Latin America	13	98	205	129	108	154	144	30	9	119
CIS	15	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	40	35	-	-	-	-	17
Non-Specified / Other	-	1	2	743	-	-	-	-	-	91
Total	4,708	4,453	5,538	5,608	7,342	6,589	7,001	7,338	7,019	7,811
Net Imports / (Exports)	(2,249)	(835)	(3,222)	(3,574)	(5,148)	(4,200)	(3,196)	(4,052)	(3,695)	(4,792)

Note: Comprises Aviation Gasoline and Motor Gasoline

Historical data source: IEA

TABLE II-3
UNITED KINGDOM: JET/KEROSENE TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	9,562	8,998	8,871	8,798	9,228	8,492	9,635	9,144	9,641	8,852
Imports										
Rest of Europe	1,392	916	925	550	1,188	1,936	2,433	1,870	1,012	1,746
Africa	686	817	523	553	409	132	182	88	142	174
Middle East	2,252	3,759	2,062	2,670	5,331	4,667	4,284	4,832	2,835	2,391
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	129	465	581	500	911	233
Rest of Asia	29	-	235	-	-	207	88	39	1,897	1,953
North America	72	38	334	35	539	1,150	43	121	285	624
Latin America	274	154	433	198	126	785	895	375	1,008	985
CIS	37	-	16	32	296	148	147	334	399	405
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	19	636	2,471	3,635	-	-	-	-	-	153
Total	4,761	6,320	6,999	7,673	8,018	9,490	8,653	8,159	8,489	8,664
Exports										
Rest of Europe	686	623	988	983	1,362	1,622	1,309	1,501	2,093	1,616
Africa	-	-	1	-	-	-	-	-	28	15
Middle East	-	-	-	-	-	56	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	-	-	-	-	-
North America	-	-	-	-	34	-	-	-	-	5
Latin America	-	-	-	-	-	-	-	-	-	41
CIS	-	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	-	1	160	-	-	-	-	-	-
Total	686	623	990	1,143	1,396	1,678	1,309	1,501	2,121	1,677
Net Imports / (Exports)	4,075	5,697	6,009	6,530	6,622	7,812	7,344	6,658	6,368	6,987

Note: Comprises Jet fuel and other Kerosene

Historical data source: IEA

TABLE II-4
UNITED KINGDOM: GASOIL/DIESEL TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	28,298	26,796	28,393	27,579	28,839	28,691	26,080	26,397	26,971	25,393
Imports										
Rest of Europe	3,285	2,560	1,715	2,231	2,197	3,993	7,488	6,721	5,365	4,390
Africa	-	11	17	19	-	87	-	-	86	-
Middle East	80	-	-	-	378	-	25	-	156	276
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	67
Rest of Asia	-	30	-	-	1	99	141	376	-	-
North America	28	40	-	84	142	-	-	277	800	786
Latin America	-	-	-	-	21	-	-	-	-	73
CIS	422	498	556	172	1,477	743	409	876	1,061	1,037
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	959	931	997	-	-	-	-	-	-
Total	3,815	4,098	3,219	3,503	4,216	4,922	8,063	8,250	7,468	6,629
Exports										
Rest of Europe	6,025	5,103	5,794	4,620	5,882	5,445	5,553	5,101	6,057	5,281
Africa	82	-	69	302	431	727	183	1,228	1,159	645
Middle East	38	-	-	11	24	-	51	35	-	36
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	17	-	-	-	-	-
Rest of Asia	-	-	-	-	225	-	-	-	11	-
North America	172	151	433	268	35	143	32	169	50	31
Latin America	35	32	-	-	5	-	-	-	-	-
CIS	5	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	4	-	-	-	-	-
Non-Specified / Other	59	1	56	327	-	-	-	-	-	40
Total	6,416	5,287	6,352	5,528	6,623	6,315	5,819	6,533	7,277	6,033
Net Imports / (Exports)	(2,601)	(1,189)	(3,133)	(2,025)	(2,407)	(1,393)	2,244	1,717	191	596

Historical data source: IEA

TABLE II-5
UNITED KINGDOM: HEAVY FUEL OIL TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	11,621	11,912	10,551	11,517	12,988	11,728	12,277	11,809	11,349	8,413
Imports										
Rest of Europe	455	506	200	106	481	1,139	1,298	1,066	1,198	1,180
Africa	-	-	-	-	43	136	-	64	-	-
Middle East	-	-	-	-	-	24	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	-	-	-	-	-
North America	38	-	-	-	14	74	-	-	-	-
Latin America	-	-	-	-	-	-	-	-	-	-
CIS	103	-	-	-	74	37	34	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	474	358	288	-	117	-	-	-	60
Total	596	980	558	394	612	1,527	1,332	1,130	1,198	1,240
Exports										
Rest of Europe	3,862	3,890	4,306	3,971	6,370	5,440	7,486	6,631	6,057	4,876
Africa	35	36	67	132	511	343	59	183	96	-
Middle East	44	246	110	-	10	-	60	61	63	-
China	-	-	-	-	1	-	-	-	-	-
India	-	-	-	-	-	-	-	-	116	-
Rest of Asia	87	-	-	5	327	74	272	63	47	360
North America	1,069	1,191	554	972	1,404	2,595	491	801	909	304
Latin America	99	40	-	47	279	-	-	-	-	7
CIS	-	-	-	-	34	-	-	-	16	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	164	38	743	1,258	-	-	-	-	-	-
Total	5,360	5,441	5,780	6,385	8,936	8,452	8,368	7,739	7,304	5,547
Net Imports / (Exports)	(4,764)	(4,461)	(5,222)	(5,991)	(8,324)	(6,925)	(7,036)	(6,609)	(6,106)	(4,307)

Historical data source: IEA

TABLE II-6
UNITED KINGDOM: TOTAL PRODUCTS TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	86,341	82,092	83,998	84,529	89,826	85,763	82,841	81,210	80,436	74,762
Imports										
Rest of Europe	9,201	6,710	3,999	4,463	8,137	12,903	19,123	15,251	13,036	12,449
Africa	770	901	556	919	647	568	198	152	263	192
Middle East	2,332	3,759	2,062	2,691	5,715	4,691	4,339	4,846	3,877	2,882
China	-	3	-	-	2	-	-	7	-	6
India	-	-	-	-	129	465	581	500	911	300
Rest of Asia	40	30	295	34	2	306	229	419	1,897	1,963
North America	841	94	350	137	1,254	1,263	43	643	1,111	1,475
Latin America	284	164	466	242	565	827	895	565	1,307	1,058
CIS	717	498	572	384	2,026	1,191	1,216	1,454	1,515	1,645
Oceania	-	-	-	4	-	-	-	-	-	-
Non-Specified / Other	27	4,788	6,600	7,599	66	159	200	-	-	1,078
Total	14,212	16,947	14,900	16,473	18,543	22,373	26,824	23,837	23,917	23,048
Exports										
Rest of Europe	15,920	14,944	17,601	14,867	20,682	20,069	22,120	21,124	21,396	17,937
Africa	388	125	413	759	1,586	1,273	430	2,087	1,725	1,120
Middle East	232	272	151	110	116	71	111	96	64	36
China	13	43	2	11	27	16	23	25	1	24
India	32	25	-	-	100	66	56	59	204	47
Rest of Asia	91	1	43	94	559	111	272	142	187	402
North America	3,334	3,336	3,717	4,105	6,788	7,821	5,834	5,892	5,204	5,846
Latin America	188	268	370	481	545	233	161	62	14	187
CIS	20	1	-	7	51	-	-	4	16	1
Oceania	-	-	-	40	40	-	-	-	-	17
Non-Specified / Other	459	73	1,147	2,842	-	63	-	-	-	137
Total	20,677	19,088	23,444	23,316	30,494	29,723	29,007	29,491	28,811	25,754
Net Imports / (Exports)	(6,465)	(2,141)	(8,544)	(6,843)	(11,951)	(7,350)	(2,183)	(5,654)	(4,894)	(2,706)

III. UNITED KINGDOM REFINED PRODUCT DEMAND, SUPPLY AND TRADE BALANCE

In this section we will analyse the outlook for the UK economy, refined product demand and trade flows of products. Historic flows of products into and from the United Kingdom are discussed, together with an outlook for future UK trade flows by product and a discussion on expected trading partners, including likely import suppliers and export destinations. As future UK trade flows are an integral part of the northern European trading bloc – for example, the United Kingdom will be competing with other northern European countries for imports and exports – greater detail on trade patterns by source/destination are discussed in the European context in Section IV.

Refined product demand, supply and the net trade balance for the United Kingdom has evolved considerably over the past ten years. Similar to most European countries the United Kingdom is increasingly reliant on trade flows to balance national refined product supply to product demand, as the industry adapts to changing demand trends.

ECONOMY

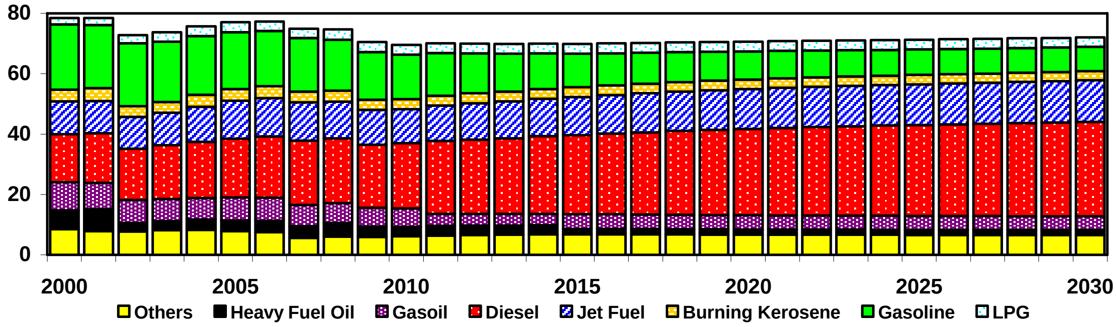
Prior to the 2008-2009 recession, the United Kingdom enjoyed relatively strong and consistent economic growth for a number of years. However, much of that growth was fuelled by high consumer borrowing and spending, and the onset of the serious financial crisis in 2008 resulted in a significant drop in both consumer and corporate credit, severely impacting the economy. GDP, which declined by 4.9% in 2009, is estimated to have recovered modestly in 2010 and to have grown by 0.9%, compared with a growth of 2.6% in 2007 and 0.5% in 2008. Looking ahead, the economy is expected to recover further in 2011-2012, returning to the average long-term trend growth rate of 2.0-2.5% per year thereafter, although growth prospects remain uncertain currently.

REFINED PRODUCT DEMAND

The share of petroleum in UK total primary energy supply has remained relatively unchanged since 2000, at 32-33%, and currently stands at 70 million tonnes per year – a fall of about four million tonnes from 2008-2009. Total petroleum demand is expected to drop slightly into 2010, thence to remain flat until 2015 before continuing to grow very slowly, as increasing transportation fuel demand offsets declining use in the residential/commercial and industrial sectors marginally. A summary of UK historical and forecast demand for refined products is presented in Table III-1.

Although long-term overall demand growth is projected to be relatively modest, there are several distinct trends in the forecast that should be noted. These include continuing growth in middle distillate demand for transportation that will continue to offset declining gasoline demand, a function of changing private vehicle registrations. Over the forecast period, total refined product growth is expected to average only about 0.2% per year (Figure III-1).

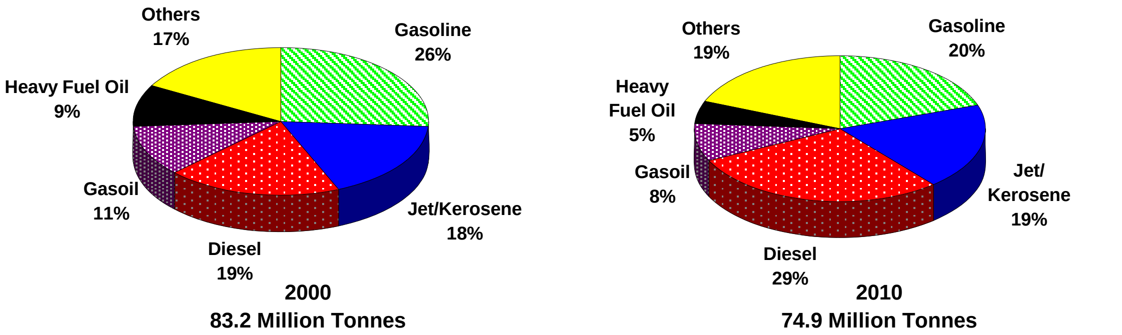
FIGURE III-1
UK REFINED PRODUCT DEMAND
(Million Tonnes per Year)



Note: Excludes Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

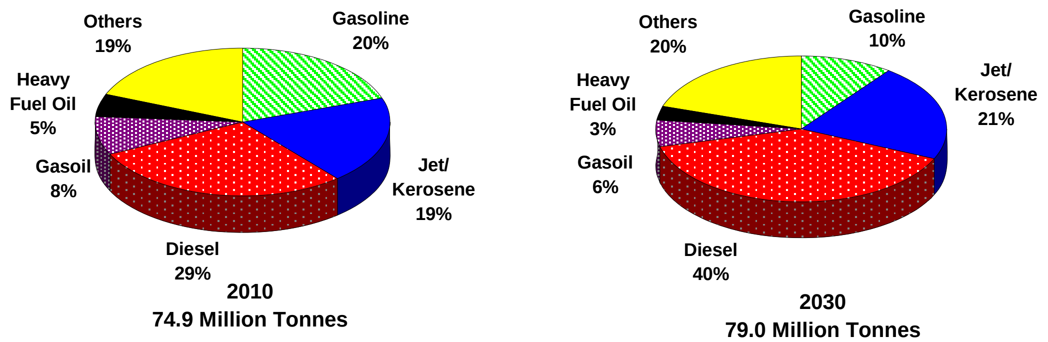
Figures III-2A and III-2B illustrate the nature of the changes to UK demand over the 10-year period from 2000 to 2010, and then from 2010 to 2030. The most significant changes are the fall of the share of gasoline demand, from 26% in 2000 to 20% in 2010, and then to 10% in 2030, while that for diesel (including off-road, 50/10ppm diesel) increases substantially, from only 19% of demand in 2000 29% in 2010 and rising to almost 40% in 2030. These changes are a result of the increasing popularity of diesel-powered passenger cars, as discussed below. The share of jet fuel demand increases slightly, while that for heavy fuel oil falls to only 3% of total demand (including refinery fuels), primarily a result of the changing bunker fuel specifications that are due to come into effect for the Emission Control Areas (ECAs) from 1st January 2015.

FIGURE III-2A
UK PRODUCT DEMAND AND PRODUCT SHARES: 2000 AND 2010



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

FIGURE III-2B
UK PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



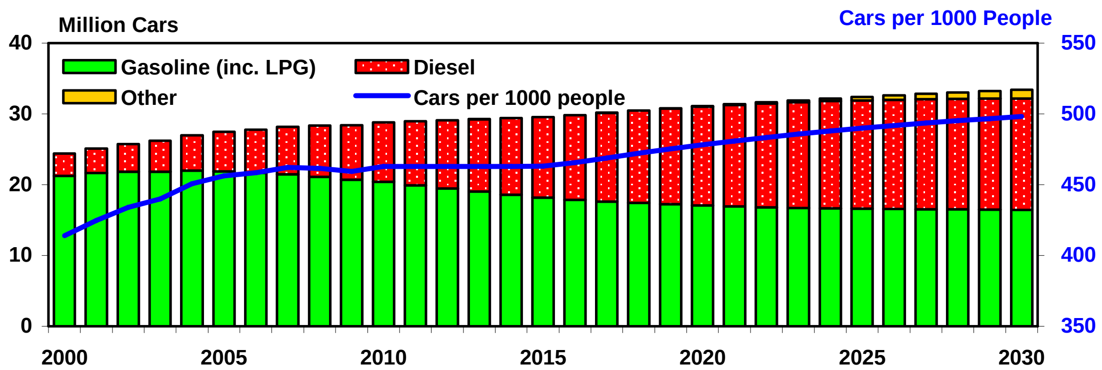
Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

Demand trends for each of the major refined products are discussed below. Definitions and product classifications are shown in the Notes to the Report.

GASOLINE

The primary driver of gasoline demand in the United Kingdom is the car population and the trend of new registrations and scrappage. The total number of cars in the United Kingdom is currently about 28.8 million, an average of 463 per thousand people (Figure III-3), with growth since 2007 having declined after a period of steady increases of 2.0% per year on average since 2000. New car registrations were down 11.3% in 2008 compared with 2007, and fell further in 2009 by 6.4%, despite the government incentive scheme providing £2,000 towards the purchase of a new car in exchange for scrapping a car more than 10 years old. Further long-term growth is likely to be moderate as car ownership in the UK is already relatively high.

FIGURE III-3
UK PASSENGER VEHICLE OUTLOOK



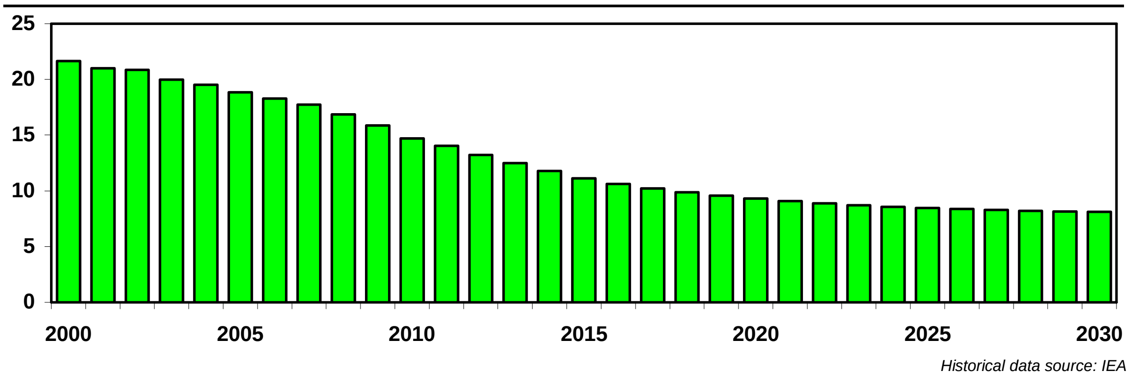
Historical data source: ACEA

The level of diesel cars in new car registrations has continued to grow strongly since 2000, following the introduction of a tax regime for company cars that favours low CO_2 emissions, and therefore which favours diesel cars, together with changing personal preferences among the general population towards the more economical diesel cars even though the United Kingdom, unlike many other European countries, has equal levels of duty for petrol and diesel. Higher fuel prices have also increased the attractiveness of fuel-efficient diesels. The share of diesels in new registrations reached 44% in 2008, compared with 33% in

2004 and only 14% in 2000; however, a combination of high retail diesel prices in 2008, the recession and the incentives of the car replacement scheme which tended to favour the purchase of small, gasoline-engined cars temporarily reversed this trend, such that the share of diesel cars in new registrations decreased to 42% in 2009. In 2010 this level recovered and in June 2010 the number of diesel cars newly registered exceeded the number of gasoline cars for the first time. In the medium term, some recovery in gasoline-car registrations is expected as more efficient engines are able to compete effectively with diesels on fuel cost, but only to the extent that in the longer term we expect new car registrations to average 50:50 for gasolines and diesels. As a result, taking into account annual fleet turnover we expect the diesel car population to continue to grow from the current level of around 27% towards 45% of the total car population by 2020.

Reflecting the increasing share in total car population of diesel cars and the improving efficiency of gasoline cars, gasoline demand has been in steady decline over the past few years (Figure III-4). Demand fell to about 15.9 million tonnes in 2009, and because of both continuing diesel car penetration and the introduction of more efficient gasoline-fuelled cars, demand is projected to decline steadily to around 8.1 million tonnes by 2030.

FIGURE III-4
UK GASOLINE PRODUCT DEMAND
(Million Tonnes per Year)

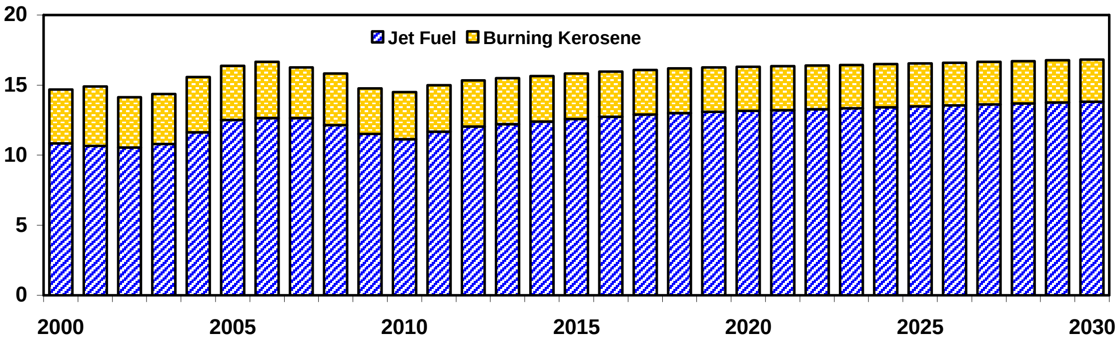


KEROSENE/JET FUEL

Burning kerosene represents around 22% of total kerosene/jet fuel demand in the United Kingdom, reflecting its use as heating oil in the domestic residential sector as opposed to gasoil. Base demand for burning kerosene has changed little over the past few years, excepting changes in annual temperatures, averaging approximately 3.3 million tonnes per year, although as would be expected it is very seasonal, with the majority of demand being in the winter months. The exceptionally cold weather in the beginning of 2010 and the early start to the 2010-2011 winter will have boosted demand in 2010, but improving home insulation standards will result in a long-term slow structural decline.

Jet fuel demand grew very strongly up to 2006, buoyed by the rapid growth of low-cost airlines in the previous five years and as a result of London’s role as a major transit hub. However, growth stopped in 2006-2007, partly as result of the loss of the Buncefield terminal, north of London, in December 2005, which eliminated a significant part of the infrastructure that supplied jet fuel to Heathrow airport and resulted in some severe rationing, as well as a general easing in the rate of aviation growth. A decline of 3.9% was recorded in 2008 just before the onset of the recession, with a further decline of 5.2% in 2009, to around 11.5 million tonnes, and in 2010 a combination of flight stoppages because of the Eyjafjallajökull volcano eruption and strike action by British Airways cabin crews is expected to have resulted in a further decline of 3.4%. As these losses are likely to have been one-off events we expect a rapid recovery in demand in 2011; thereafter future growth is likely to be slower than previous trend rates owing to more efficient aircraft, lower growth from the budget airlines as their market share matures and the impact of increased taxation on flying. Long-term demand is projected to grow by 0.5-1.0% per year (Figure III-5).

FIGURE III-5
UK JET/KEROSENE PRODUCT DEMAND
(Million Tonnes per Year)



Historical data source: IEA

In addition to expansion of capacity at Heathrow, growth in regional airports will contribute towards continuing growth in air traffic. Although the jet fuel supply infrastructure to London Heathrow has improved since the Buncefield incident capacity supply is still limited, this would need to be resolved before significant expansion of traffic at Heathrow is possible. There are proposals to rebuild the Buncefield terminal, subject to planning permission, but any rebuild programme would take at least two years.

GASOIL/DIESEL

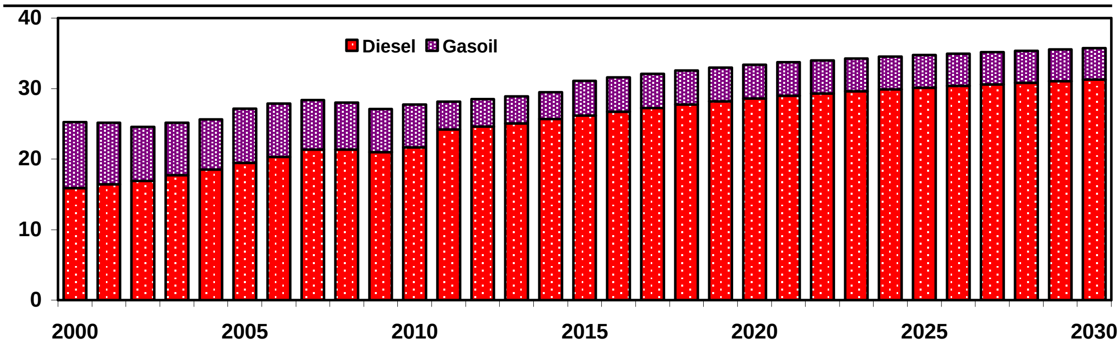
The transportation sector accounts for about 77% of total gasoil/diesel demand. Diesel demand growth for commercial vehicles is strongly linked to GDP, and demand for both commercial and passenger vehicles has been growing strongly, averaging over 4% per year from 2000 to 2007. However, as previously discussed a combination of high prices and the onset of recession resulted in a decline in combined diesel/gasoil demand declined in 2008 of 1.3%, with a further decline of 3.1% in 2009.

As the economy recovers we expect diesel demand growth to resume over the next few years. An additional component of diesel demand growth that will have taken place by 2012 is the result of the EU-wide switch in both off-road diesel and domestic marine gasoil from high-sulphur gasoil quality to road-diesel quality from 1st January 2009 and 1st January 2011 respectively. In the long term, diesel demand growth is expected to slow from 2.0%-2.5% per year to less than 1.0% per year, as the percentage of diesels in the car population nears a plateau, and both commercial and passenger vehicle efficiencies improve further.

Gasoil demand in the industrial sector has declined slightly from 2005 levels, although use in this sector is small compared with other fuels. Demand in the residential/commercial sector has been declining, although again this sector is quite small as the main home heating market for liquid fuels, unlike most of continental Europe, is burning kerosene rather than gasoil. The scope for further substitution by natural gas is becoming limited as the gas grid in the UK is already extensive. The switch to diesel for off-road vehicles on 1st January 2009 reduced gasoil use in the agriculture sector significantly, and a further reduction in gasoil demand will come with the change in 2011 for domestic marine gasoil to diesel.

In 2009 gasoil/diesel demand was around 27.1 million tonnes, with about 21.0 million tonnes being 10ppm sulphur road-diesel quality and the remaining 6.1 million tonnes being 0.1 wt% sulphur gasoil quality, the latter including 0.7 million tonnes used for international marine bunkers. As the UK borders the North Sea ECA zone, gasoil bunker demand is expected to increase significantly in 2015, when all marine fuel burnt within ECA zones will have to meet a maximum of 0.1% wt. sulphur specification, to 1.9 million tonnes. Continued growth in diesel demand, albeit offset partially by a small decline in gasoil demand, results in our forecast of total diesel/gasoil demand reaching 35.8 million tonnes by 2030 (Figure III-6).

FIGURE III-6
UK GASOIL/DIESEL PRODUCT DEMAND
(Million Tonnes per Year)



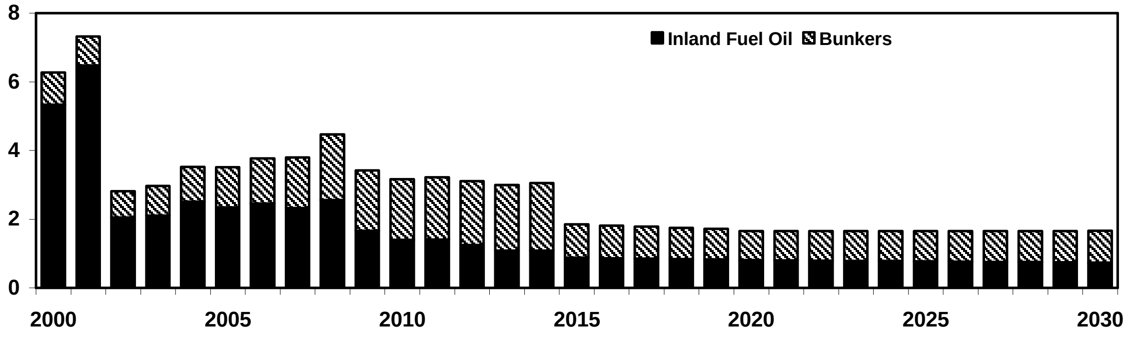
Historical data source: IEA

HEAVY FUEL OIL

Inland heavy fuel oil demand is declining. Most of the historical decline in demand has occurred in the power generation sector and in industry, as new combined-cycle gas turbine facilities have come on line at a rapid rate. Demand in 2009 fell to around 1.7 million tonnes – a drop of 35% – and two out of the three remaining fuel oil-fired power stations are due to close by 2014 as a result of the Large Combustion Plant directive. Scope for further fuel oil substitution thereafter is minimal, such that we expect little substantial change in inland fuel oil demand in the longer term.

Demand for international marine bunkers has been growing steadily since 2002 and accounted for about 1.8 million tonnes in 2009. This was a decline of just over 0.1 million tonnes, or 7.9%, from the 2008 level and may be attributable to the recession. However, this change compares favourably with the north European average decline of 13.1%, such that bunker demand was still greater in 2009 than it was in 2007. A likely explanation is that the majority of UK bunker fuel is produced at less than 1.5 wt% sulphur, and that the UK may be preferentially supplying bunkers into the North Sea and Baltic ECAs, which had to meet a maximum sulphur specification of 1.0 wt% as from 1st July 2010. As the world economy recovers we are expecting some long-term steady underlying growth in marine fuel oil demand, but significant reductions in heavy fuel oil bunkers demand are likely in 2015 and, to a lesser extent, in 2020 when IMO regulation changes result in a large shift towards lower-sulphur, gasoil-based bunkers (Figure III-7).

FIGURE III-7
UK HEAVY FUEL OIL PRODUCT DEMAND
(Million Tonnes per Year)



Historical data source: IEA

REFINING INDUSTRY

A summary of the UK refining capacity is shown in the table below. There are currently eight operational main-fuels refineries in the UK and two bitumen refineries, with a total capacity of about 87 million tonnes per year (1.8 million B/D).

SUMMARY UK REFINING CAPACITY 2010

Refinery	Owner	Primary Distillation Capacity (MTA)	(KB/D)	Nelson Complexity Factor
Fawley	ExxonMobil	15.9	326	9.1
Stanlow	Shell	14.4	296	7.4
South Killingholme	Conoco	10.8	221	11.3
Lindsey	Total	10.8	221	5.9
Pembroke	Chevron	10.2	210	8.6
Grangemouth	Ineos	10.0	205	7.9
Coryton	Petroplus	8.4	172	8.3
Milford Haven	Murphy	5.2	106	8.0
Eastham *	Shell/Nynas	1.3	27	3.5
Dundee *	Nynas	0.6	12	3.5
Total		**87**	**1796**	

* Note: Bitumen refinery, no main fuels production

Three UK refineries have changed hands in recent years. BP sold Grangemouth to Ineos in 2005 and Coryton to Petroplus in 2007. Total sold their share of Milford Haven to co-owner Murphy who then became sole owners in 2007.

Currently an unprecedented number of UK refineries are for sale. In 2009, three companies announced their intention to divest their refining assets in the UK. In early 2009, Petroplus announced that they would close the Teesside Port Clarence refinery – which had been mothballed since March 2009 – and convert the facility to an import terminal. In August 2009, Shell announced that the Stanlow refinery was for sale, a process that has now been completed with the announcement that Essar, of India, have purchased the facility. Elsewhere, Petrochina have announced a part-purchase and joint venture with Ineos regarding the refinery at Grangemouth, in March 2010 Chevron announced that it was seeking buyers for the

Pembroke refinery, in April 2010 Total confirmed that it was seeking to sell the Lindsey refinery and in July 2010 Murphy announced it was seeking buyers for the Milford Haven refinery.

There are no significant refinery capacity projects currently announced for the United Kingdom, the only major upgrading addition being a new 1.0-million tonne per year (21,000 B/D) gasoil desulfurization unit at the Total Lindsey refinery, which came on-stream in late 2010.

REFINED PRODUCT TRADE FLOWS

Historical trade analysis for the United Kingdom for each of the major products and for the total of all products is provided in Tables III-2 to III-6. These data provide a detailed breakdown of import source and export destination by product. A summary for the main products is shown in the Table below.

UNITED KINGDOM HISTORICAL TRADE FLOWS
(Million Tonnes)

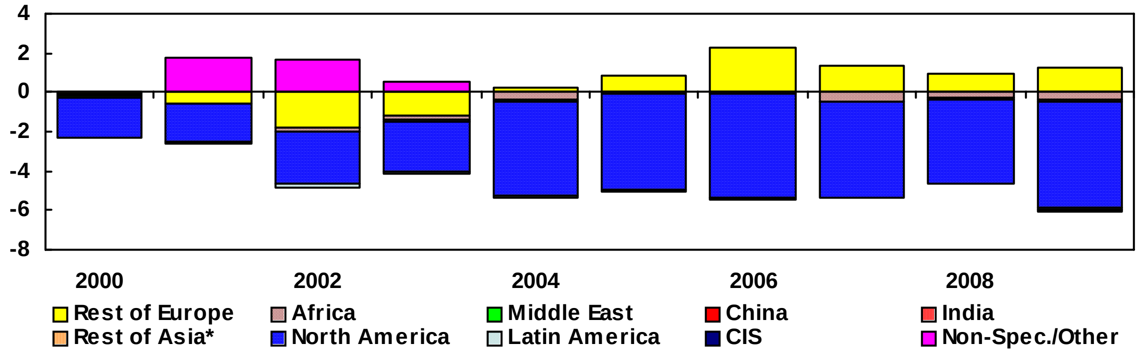
		1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gasoline	Imports	1.50	2.46	3.62	2.32	2.03	2.19	2.39	3.81	3.29	3.32	3.02
	Exports	(7.00)	(4.71)	(4.45)	(5.54)	(5.61)	(7.34)	(6.59)	(7.00)	(7.34)	(7.02)	(7.81)
	Net Import/(Export)	(5.50)	(2.25)	(0.84)	(3.22)	(3.57)	(5.15)	(4.20)	(3.20)	(4.05)	(3.70)	(4.79)
Diesel/Gasoil	Imports	1.34	3.82	4.10	3.22	3.50	4.22	4.92	8.06	8.25	7.47	6.63
	Exports	(5.86)	(6.42)	(5.29)	(6.35)	(5.53)	(6.62)	(6.32)	(5.82)	(6.53)	(7.28)	(6.03)
	Net Import/(Export)	(4.52)	(2.60)	(1.19)	(3.13)	(2.03)	(2.41)	(1.39)	2.24	1.72	0.19	0.60
Jet/Kerosene	Imports	0.90	4.76	6.32	7.00	7.67	8.02	9.49	8.65	8.16	8.49	8.69
	Exports	(1.08)	(0.69)	(0.62)	(0.99)	(1.14)	(1.40)	(1.68)	(1.31)	(1.50)	(2.12)	(1.68)
	Net Import/(Export)	(0.18)	4.08	5.70	6.01	6.53	6.62	7.81	7.34	6.66	6.37	7.01
Fuel Oil	Imports	2.40	0.60	0.98	0.56	0.39	0.61	1.53	1.33	1.13	1.20	1.24
	Exports	(4.42)	(5.36)	(5.44)	(5.78)	(6.39)	(8.94)	(8.45)	(8.37)	(7.74)	(7.30)	(5.55)
	Net Import/(Export)	(2.02)	(4.76)	(4.46)	(5.22)	(5.99)	(8.32)	(6.93)	(7.04)	(6.61)	(6.11)	(4.31)

Forecasts of future trade flows are discussed below for each product, on a net import or net export basis. It is important to stress that the United Kingdom is an integral part of a northern European trade hub, and that as the United Kingdom will be competing with other regional countries for trade flows forecasts of trade must be regarded in a regional context. The main UK markets are discussed below, with detailed north European product import and export forecasts by region presented in the following section.

HISTORICAL BALANCES

The United Kingdom is a major exporter of gasoline (Figure III-8). Net exports peaked in 1997 at 7.2 million tonnes before decreasing, partly due to the closure of the Shell Haven refinery in 1999, reaching a low point of 0.8 million tonnes in 2001. However exports increased strongly again over the previous decade as UK gasoline demand declined, with the major export market being the United States. Gasoline imports are typically from Scandinavia and the Rotterdam area, mostly for local blending. The UK will continue to be a large net gasoline exporter throughout the forecast period.

FIGURE III-8
NET UK GASOLINE TRADE, 2000-2009
(Million Tonnes: -ve = Exports)

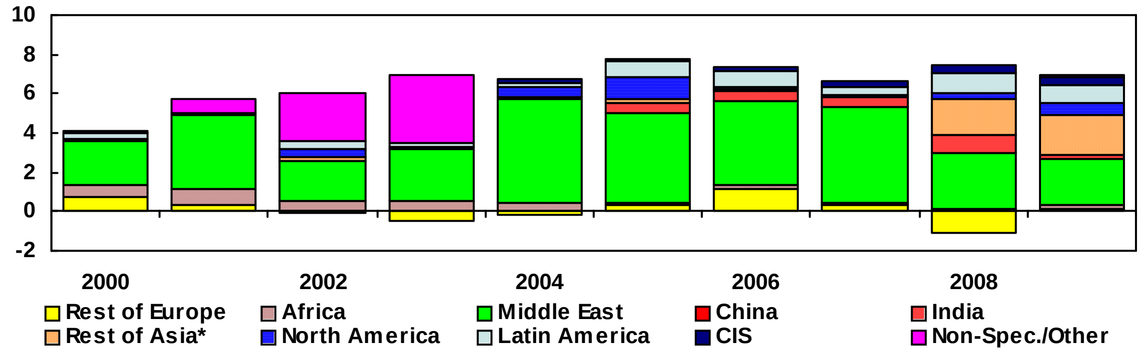


**Includes Oceania* *Historical data source: IEA*

Net imports of jet/kerosene are considerable, averaging 7.1 million tonnes in 2009, which is only slightly lower than the peak of 7.8 million tonnes in 2005 (Figure III-9). This is a result of the huge demand for jet fuel in the London area owing to the presence of Heathrow, Gatwick and Stansted airports, illustrated by the fact that since 2005 net jet/kerosene imports have been broadly similar to total UK refinery production, indicating that UK demand is roughly double domestic production. There is a small structural export market, of both jet fuel and burning kerosene to Ireland, as the United Kingdom is the main source of supply to the Irish market.

Although the Middle East is the primary source of imports, most noteworthy is the increase in volumes from India and the Rest of Asia (excluding China) starting in 2005 and gathering pace since 2008, a route made economical with the greater use of ships of over 100,000 dwt. These trends are significant, as they indicate an increasing diversity of supply and less reliance on one particular region.

FIGURE III-9
NET UK JET/KEROSENE TRADE, 2000-2009
(Million Tonnes: -ve = Exports)

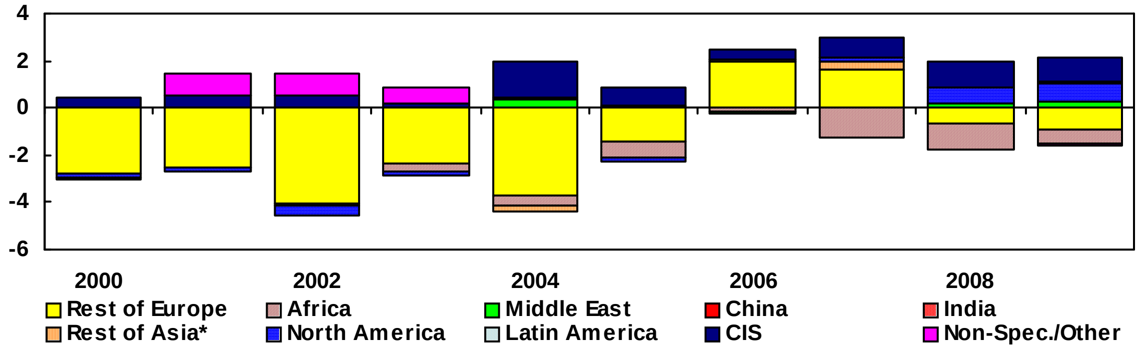


**Includes Oceania* *Historical data source: IEA*

The United Kingdom has been a large trader of gasoil/diesel over the past decade; however, during that time the country moved from a position of being a net exporter to a net importer, with increasing diesel demand resulting in net imports peaking at 2.2 million tonnes in 2006, before easing in 2007 and 2008 (Figure III-10). Significant quantities of unfinished gasoils are imported for upgrading, from other parts of Europe and the CIS region, as well as quantities of 10ppm sulphur road diesel, while the United Kingdom exports 0.1%S heating-oil grade gasoil, with northern France and Germany (via the Netherlands) being the significant markets. The United Kingdom is also a major supplier to the Irish market.

Although slowing diesel demand growth resulted in a reduction in net imports in 2008, net imports rose again in 2009 primarily as a result of reduced refinery production. The country is expected to remain a net importer over the longer term.

FIGURE III-10
NET UK GASOIL/DIESEL TRADE, 2000-2009
(Million Tonnes: -ve = Exports)

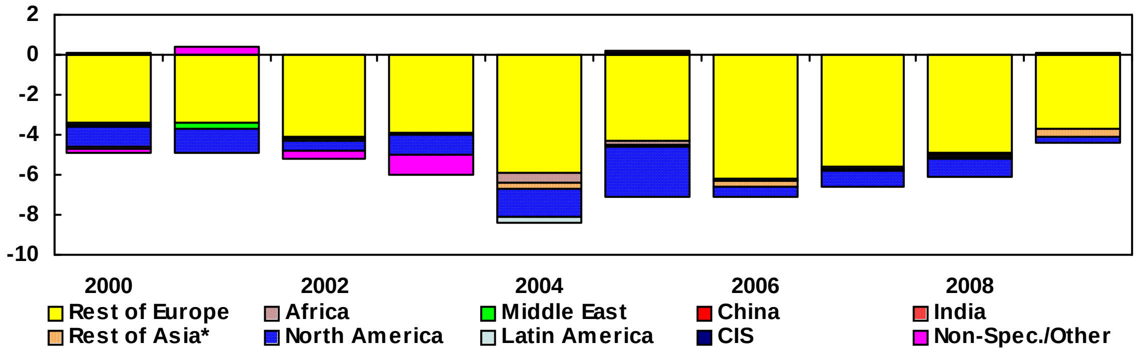


*Includes Oceania

Historical data source: IEA

The United Kingdom is a large net exporter of heavy fuel oil. Throughout much of the past decade net exports averaged 6.0-8.0 million tonnes, but a large drop in UK refining production in 2009 resulted in exports falling to 3.3 million tonnes. As discussed above, UK refineries are able to make low-sulphur bunker fuels, such that the majority of UK exports are to neighbouring European markets. Additional exports have also been seen to the United States, primarily for utilities. Very few cargoes are exported directly to the Middle East or Asia; shipping economics dictate that for these distances cargoes are usually sent to Rotterdam for bulk-building into VLCCs for onwards transportation.

FIGURE III-11
NET UK HEAVY FUEL OIL TRADE, 2000-2009
(Million Tonnes: -ve = Exports)



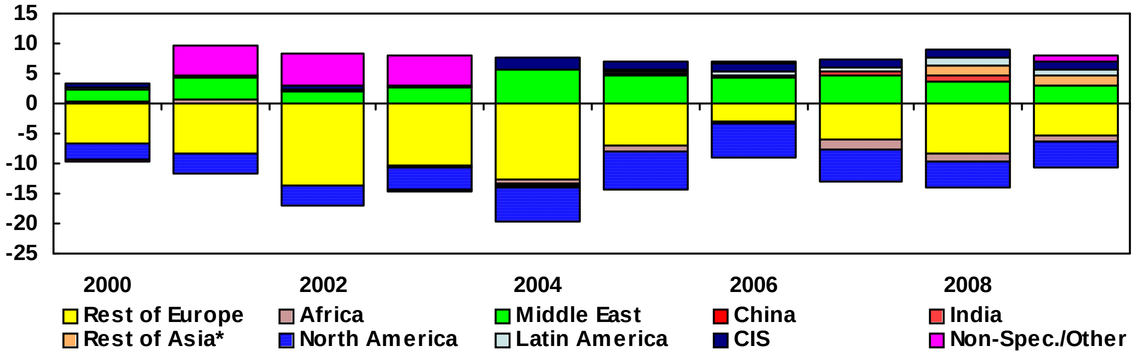
*Includes Oceania

Historical data source: IEA

There are some regional differences to the national net trade picture. The south east of England is constrained by infrastructure issues, especially following the 2005 Buncefield terminal fire. As a result there are a number of terminals located on the Thames estuary that import large volumes of gasoline and diesel in order to meet the local market demand. Significant import volumes of jet fuel also take place on the Thames estuary, as well as via Southampton and Humber estuary, with jet fuel being moved to Heathrow and other London airports primarily by pipeline. Elsewhere in the country, regional jet/kerosene supply and demand is more balanced. The UK west coast refineries export significant volume of jet/kerosene and gasoil/diesel to Ireland.

Figure III-12 shows the net UK balance for all refined products for the 2000-2009 period and the major import/export markets. These show a general east-west trading pattern; the Middle East, CIS and parts of Asia are the main suppliers, primarily of middle distillates, while the United States and Africa are the principal export destinations, mostly of gasoline but also of some fuel oil and, in the case of Africa, gasoil/diesel.

FIGURE III-12
NET UK TOTAL PRODUCTS TRADE, 2000-2009
(Million Tonnes: -ve = Exports)



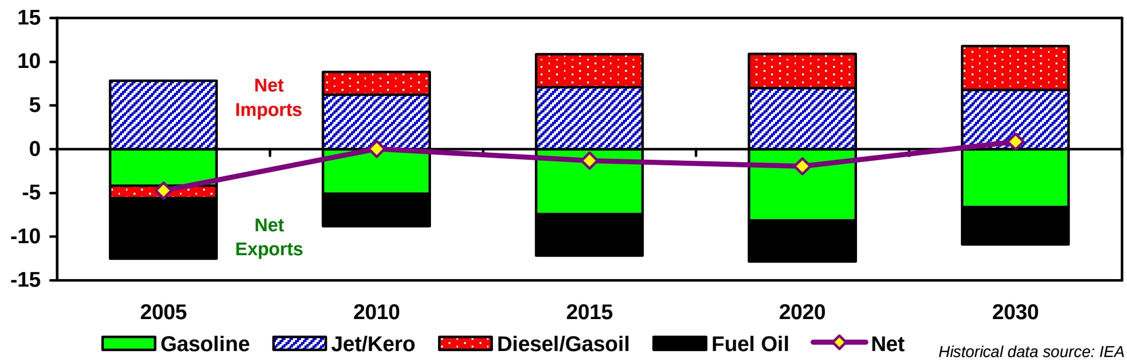
**Includes Oceania*

Historical data source: IEA

FUTURE TRADE FLOWS

As mentioned at the top of this section, future UK trade balances for each of the main products is shown in Table III-1, and are illustrated in Figure III-13 below.

FIGURE III-13
UK PRODUCT TRADE BALANCE, 2005 - 2030
(Million Tonnes per Year)



Historical data source: IEA

With long-term diesel and jet demand projected to grow slowly and no new confirmed refining capacity expected in the near term, net imports of middle distillates are set to continue to increase further (Figure III-13). For the longer-term outlook, the forecast assumes some investment in additional middle distillate production capacity in the United Kingdom; however, were this not to take place then imports of diesel would be expected to increase further, by approximately eight million tonnes by 2030. Beyond the immediate European area, imports of gasoil/diesel are expected to come primarily from the CIS region, with additional volumes from

North America. However, as US diesel demand is expected to increase it is possible that imports from North America may start to decline, and that trade flows from India and parts of Asia, already being seen for jet/kerosene, will increase.

A continuing decline in UK gasoline demand may be expected to result in increasing gasoline exports; however, the primary constraint remains the availability of export markets. As is discussed in Section V not only is US gasoline demand likely to decline in the long term, but the increasing use of ethanol in the US market will have the effect of reducing further the potential market for refinery-based gasoline. Although it is likely that exports to West Africa will continue we are not expecting significant increases in trade volumes, owing to relatively modest increases in domestic demand.

Net imports of jet/kerosene imports are expected to remain the highest, both in terms of volume and share of domestic demand. Although the Middle East is likely to remain the predominant supplier increasing regional demand may curtail future export capabilities in the medium term, and as a result imports from India and the rest of Asia are likely to remain high. In the longer term, both of these regions will be highly significant for UK jet/kerosene supplies.

After the reduction in volumes in 2009 heavy fuel oil exports are likely to recover from 2010 and increase slowly as inland fuel oil demand declines. A major trend is to be seen in 2015, with an increase of about 1.0 million tonnes as bunker fuel demand switches to gasoil-based marine fuels. Although occasional, opportunistic flows to US East Coast utilities are likely to continue the main export market is expected to be short-haul shipments to Rotterdam for bulk-building into VLCCs and onwards to East-of-Suez destinations.

TABLE III-1
REFINED PRODUCT BALANCE
UNITED KINGDOM
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	23	23	20	20	20	20	20	19	19	19	18	16	15
	Imports	2	2	3	3	4	4	4	4	4	4	4	4	4
	Exports	(5)	(7)	(7)	(8)	(9)	(9)	(10)	(10)	(11)	(11)	(12)	(11)	(10)
	Biogasoline supply	-	0	0	0	0	0	0	0	1	1	1	1	1
	Supply Adjustments	0	0	0	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	22	19	17	16	15	14	13	12	12	11	9	8	8
Jet/Kerosene	Production	10	8	10	9	8	9	9	9	9	9	10	10	10
	Imports	5	9	8	9	8	8	9	9	9	9	9	9	9
	Exports	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	Supply Adjustments	1	0	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	15	16	16	15	14	15	15	15	16	16	16	17	17
Gasoil/Diesel	Production	28	29	27	25	25	25	25	26	26	27	29	29	30
	Imports	4	5	7	7	9	9	9	9	9	10	10	11	11
	Exports	(6)	(6)	(7)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)
	Int'l Bunkers	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
	Biodiesel supply	-	0	1	1	1	1	1	2	2	2	2	2	2
	CTL/GTL diesel supply	-	-	-	-	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(0)	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	24	26	27	26	27	27	28	28	29	29	31	33	34
	of which: Diesel	16	19	21	21	22	24	25	25	26	26	29	30	31
Heavy Fuel Oil	Production	12	12	11	8	7	7	7	7	7	7	7	7	7
	Imports	1	2	1	1	1	1	1	1	1	1	1	1	1
	Exports	(5)	(8)	(7)	(6)	(5)	(5)	(5)	(5)	(5)	(6)	(6)	(6)	(5)
	Int'l Bunkers	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
	Supply Adjustments	1	0	0	0	0	0	0	0	0	0	0	0	0
	Consumption	7	4	3	2	2	2	2	2	2	2	2	2	2
Other Products	Production	13	14	12	12	11	12	13	13	13	13	13	13	14
	Imports	2	3	3	3	2	3	3	3	3	3	3	3	3
	Exports	(3)	(5)	(4)	(4)	(4)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	2	3	3	3	4	3	3	3	3	3	3	3	3
	Consumption	14	15	13	13	14	15	15	16	16	16	16	16	16
Total	Production	86	86	80	75	72	73	74	74	74	75	76	75	75
	Imports	14	22	23	22	24	25	25	25	25	26	26	27	27
	Exports	(20)	(28)	(28)	(25)	(25)	(25)	(25)	(26)	(26)	(28)	(29)	(28)	(27)
	Int'l Bunkers	(2)	(2)	(3)	(2)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Biofuels/CTL/GTL supply	-	0	1	1	2	2	2	2	2	2	3	3	3
	Supply Adjustments	3	4	3	2	2	1	1	1	1	1	1	1	1
	Consumption	81	81	77	73	72	73	74	74	74	74	75	75	76

Historical data source: IEA

TABLE III-2
UNITED KINGDOM: GASOLINE TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	23,470	21,556	22,972	22,653	24,620	22,652	21,468	21,313	20,319	20,404
Imports										
Rest of Europe	2,354	1,818	672	666	2,158	2,288	3,805	3,283	3,324	3,017
Africa	26	13	-	-	-	60	-	-	-	-
Middle East	-	-	-	-	-	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	8	-	-	-	-	-	-	-	-	-
North America	-	7	10	6	36	-	-	3	-	2
Latin America	-	-	-	26	-	41	-	-	-	-
CIS	71	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	1,780	1,634	1,336	-	-	-	-	-	-
Total	2,459	3,618	2,316	2,034	2,194	2,389	3,805	3,286	3,324	3,019
Exports										
Rest of Europe	2,447	2,433	2,511	1,814	1,917	1,471	1,523	1,967	2,371	1,768
Africa	67	23	130	203	374	114	118	436	305	379
Middle East	138	-	-	79	57	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	37	-	61	117	39
North America	2,028	1,898	2,690	2,600	4,851	4,813	5,216	4,844	4,217	5,398
Latin America	13	98	205	129	108	154	144	30	9	119
CIS	15	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	40	35	-	-	-	-	17
Non-Specified / Other	-	1	2	743	-	-	-	-	-	91
Total	4,708	4,453	5,538	5,608	7,342	6,589	7,001	7,338	7,019	7,811
Net Imports / (Exports)	(2,249)	(835)	(3,222)	(3,574)	(5,148)	(4,200)	(3,196)	(4,052)	(3,695)	(4,792)

Note: Comprises Aviation Gasoline and Motor Gasoline

Historical data source: IEA

TABLE III-3
UNITED KINGDOM: JET/KEROSENE TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	9,562	8,998	8,871	8,798	9,228	8,492	9,635	9,144	9,641	8,852
Imports										
Rest of Europe	1,392	916	925	550	1,188	1,936	2,433	1,870	1,012	1,746
Africa	686	817	523	553	409	132	182	88	142	174
Middle East	2,252	3,759	2,062	2,670	5,331	4,667	4,284	4,832	2,835	2,391
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	129	465	581	500	911	233
Rest of Asia	29	-	235	-	-	207	88	39	1,897	1,953
North America	72	38	334	35	539	1,150	43	121	285	624
Latin America	274	154	433	198	126	785	895	375	1,008	985
CIS	37	-	16	32	296	148	147	334	399	405
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	19	636	2,471	3,635	-	-	-	-	-	153
Total	4,761	6,320	6,999	7,673	8,018	9,490	8,653	8,159	8,489	8,664
Exports										
Rest of Europe	686	623	988	983	1,362	1,622	1,309	1,501	2,093	1,616
Africa	-	-	1	-	-	-	-	-	28	15
Middle East	-	-	-	-	-	56	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	-	-	-	-	-
North America	-	-	-	-	34	-	-	-	-	5
Latin America	-	-	-	-	-	-	-	-	-	41
CIS	-	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	-	1	160	-	-	-	-	-	-
Total	686	623	990	1,143	1,396	1,678	1,309	1,501	2,121	1,677
Net Imports / (Exports)	4,075	5,697	6,009	6,530	6,622	7,812	7,344	6,658	6,368	6,987

Note: Comprises Jet fuel and other Kerosene

Historical data source: IEA

TABLE III-4
UNITED KINGDOM: GASOIL/DIESEL TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	28,298	26,796	28,393	27,579	28,839	28,691	26,080	26,397	26,971	25,393
Imports										
Rest of Europe	3,285	2,560	1,715	2,231	2,197	3,993	7,488	6,721	5,365	4,390
Africa	-	11	17	19	-	87	-	-	86	-
Middle East	80	-	-	-	378	-	25	-	156	276
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	67
Rest of Asia	-	30	-	-	1	99	141	376	-	-
North America	28	40	-	84	142	-	-	277	800	786
Latin America	-	-	-	-	21	-	-	-	-	73
CIS	422	498	556	172	1,477	743	409	876	1,061	1,037
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	959	931	997	-	-	-	-	-	-
Total	3,815	4,098	3,219	3,503	4,216	4,922	8,063	8,250	7,468	6,629
Exports										
Rest of Europe	6,025	5,103	5,794	4,620	5,882	5,445	5,553	5,101	6,057	5,281
Africa	82	-	69	302	431	727	183	1,228	1,159	645
Middle East	38	-	-	11	24	-	51	35	-	36
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	17	-	-	-	-	-
Rest of Asia	-	-	-	-	225	-	-	-	11	-
North America	172	151	433	268	35	143	32	169	50	31
Latin America	35	32	-	-	5	-	-	-	-	-
CIS	5	-	-	-	-	-	-	-	-	-
Oceania	-	-	-	-	4	-	-	-	-	-
Non-Specified / Other	59	1	56	327	-	-	-	-	-	40
Total	6,416	5,287	6,352	5,528	6,623	6,315	5,819	6,533	7,277	6,033
Net Imports / (Exports)	(2,601)	(1,189)	(3,133)	(2,025)	(2,407)	(1,393)	2,244	1,717	191	596

Historical data source: IEA

TABLE III-5
UNITED KINGDOM: HEAVY FUEL OIL TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	11,621	11,912	10,551	11,517	12,988	11,728	12,277	11,809	11,349	8,413
Imports										
Rest of Europe	455	506	200	106	481	1,139	1,298	1,066	1,198	1,180
Africa	-	-	-	-	43	136	-	64	-	-
Middle East	-	-	-	-	-	24	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
India	-	-	-	-	-	-	-	-	-	-
Rest of Asia	-	-	-	-	-	-	-	-	-	-
North America	38	-	-	-	14	74	-	-	-	-
Latin America	-	-	-	-	-	-	-	-	-	-
CIS	103	-	-	-	74	37	34	-	-	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	474	358	288	-	117	-	-	-	60
Total	596	980	558	394	612	1,527	1,332	1,130	1,198	1,240
Exports										
Rest of Europe	3,862	3,890	4,306	3,971	6,370	5,440	7,486	6,631	6,057	4,876
Africa	35	36	67	132	511	343	59	183	96	-
Middle East	44	246	110	-	10	-	60	61	63	-
China	-	-	-	-	1	-	-	-	-	-
India	-	-	-	-	-	-	-	-	116	-
Rest of Asia	87	-	-	5	327	74	272	63	47	360
North America	1,069	1,191	554	972	1,404	2,595	491	801	909	304
Latin America	99	40	-	47	279	-	-	-	-	7
CIS	-	-	-	-	34	-	-	-	16	-
Oceania	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	164	38	743	1,258	-	-	-	-	-	-
Total	5,360	5,441	5,780	6,385	8,936	8,452	8,368	7,739	7,304	5,547
Net Imports / (Exports)	(4,764)	(4,461)	(5,222)	(5,991)	(8,324)	(6,925)	(7,036)	(6,609)	(6,106)	(4,307)

Historical data source: IEA

TABLE III-6
UNITED KINGDOM: TOTAL PRODUCTS TRADE FLOWS
(Thousand Tonnes per Year)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Refinery Production	86,341	82,092	83,998	84,529	89,826	85,763	82,841	81,210	80,436	74,762
Imports										
Rest of Europe	9,201	6,710	3,999	4,463	8,137	12,903	19,123	15,251	13,036	12,449
Africa	770	901	556	919	647	568	198	152	263	192
Middle East	2,332	3,759	2,062	2,691	5,715	4,691	4,339	4,846	3,877	2,882
China	-	3	-	-	2	-	-	7	-	6
India	-	-	-	-	129	465	581	500	911	300
Rest of Asia	40	30	295	34	2	306	229	419	1,897	1,963
North America	841	94	350	137	1,254	1,263	43	643	1,111	1,475
Latin America	284	164	466	242	565	827	895	565	1,307	1,058
CIS	717	498	572	384	2,026	1,191	1,216	1,454	1,515	1,645
Oceania	-	-	-	4	-	-	-	-	-	-
Non-Specified / Other	27	4,788	6,600	7,599	66	159	200	-	-	1,078
Total	14,212	16,947	14,900	16,473	18,543	22,373	26,824	23,837	23,917	23,048
Exports										
Rest of Europe	15,920	14,944	17,601	14,867	20,682	20,069	22,120	21,124	21,396	17,937
Africa	388	125	413	759	1,586	1,273	430	2,087	1,725	1,120
Middle East	232	272	151	110	116	71	111	96	64	36
China	13	43	2	11	27	16	23	25	1	24
India	32	25	-	-	100	66	56	59	204	47
Rest of Asia	91	1	43	94	559	111	272	142	187	402
North America	3,334	3,336	3,717	4,105	6,788	7,821	5,834	5,892	5,204	5,846
Latin America	188	268	370	481	545	233	161	62	14	187
CIS	20	1	-	7	51	-	-	4	16	1
Oceania	-	-	-	40	40	-	-	-	-	17
Non-Specified / Other	459	73	1,147	2,842	-	63	-	-	-	137
Total	20,677	19,088	23,444	23,316	30,494	29,723	29,007	29,491	28,811	25,754
Net Imports / (Exports)	(6,465)	(2,141)	(8,544)	(6,843)	(11,951)	(7,350)	(2,183)	(5,654)	(4,894)	(2,706)

Historical data source: IEA

IV. EUROPEAN REFINED PRODUCT SUPPLY DEMAND AND TRADE BALANCE

This section looks at the general European refined product demand outlook and the implications for the regional supply-demand balance and product trade flows out to 2030. It also addresses the specific outlook for products trade into the northern European market, and the implications for the United Kingdom, by discussing and analysing likely future product imports and exports by source / destination.

Since 2000, the European refining industry has become increasingly out of balance with changing domestic demand trends, making the region ever more reliant on trade flows to balance demand with supply. The most notable changes have been a growing surplus of gasoline and an increasing shortfall of gasoil/diesel, a result of the increasing popularity of diesel-powered private vehicles and growth in commercial diesel. The rapid growth in aviation, which carried on from the trend seen in the late 1990s, has also seen an increase in net jet/kerosene imports as demand has outstripped regional supply.

Although Europe's principal trading patterns have not broadly changed in this timeframe, Asia has recently emerged as a trading partner. Strong economic growth and the expansion of its refining industry has seen Asia emerge as a source of imports of middle distillates and a destination for exports of heavy fuel oil. It is not, however, likely to be a destination for exports of gasoline, as future Asian demand is expected to be met primarily by regional supply. European gasoline exports, therefore, are expected to remain primarily within the Atlantic Basin.

A summary of European product supply, demand and trade balances is shown in Table IV-1, with subdivisions into Northern, Central and Southern Europe in Tables IV-2 to IV-4. The definition of the three regions is shown in the table below.

EUROPEAN SUB-REGIONS

North	Central	South
Belgium	Austria	Albania
Denmark	Czech Republic	Bosnia-Herzegovina
Estonia	Germany	Bulgaria
Finland	Hungary	Croatia
North France	Poland	Cyprus
Iceland	Slovak Republic	Gibraltar
Ireland	Switzerland	Greece
Latvia		Italy
Lithuania		FYR Macedonia
Luxembourg		Malta
Netherlands		Portugal
Norway		Romania
Sweden		Serbia + Montenegro
United Kingdom		Slovenia
		South France
		Spain
		Turkey

PRINCIPAL DEMAND TRENDS

Following the general world economic slowdown in 2001 and 2002 and before the financial crisis of 2008, European economic growth had been consistent and quite strong. The average rate for the region was in the order of 2.3% per year, with the strongest growth being seen in countries such as Ireland, the Baltic States and other former Eastern European countries such as the Czech Republic, Hungary, Poland and Slovakia.

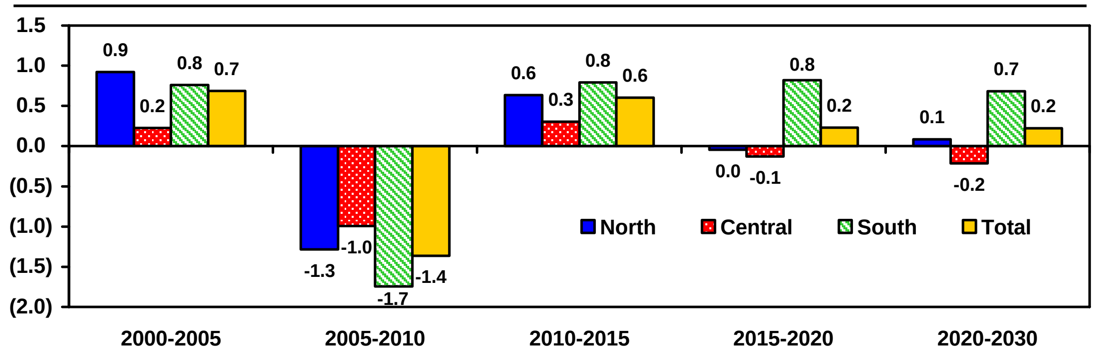
However, the effects of the recession have been considerable. GDP growth in most countries fell dramatically in 2009, by 4.1% on average and with the sharpest declines in the first quarter of the year. The greatest contraction was in Finland, by 8.0%, although the more notable contractions were in Iceland and Ireland, by 6.8% and 7.6% respectively, both of which suffered from a banking collapse. Even so, the four largest economies also fell considerably, from 2.5% for France to 4.9% for Germany and the United Kingdom, and to 5.0% for Italy. The recovery from the recession is currently quite tentative, with several countries exposed by high levels of debt.

Average European GDP is estimated to have recovered in 2010, by about 1.8%, helped by several government incentives and programmes. However, it is the one-off nature of these programmes that is behind our expectations of a slower increase in GDP in 2011, by only 1.5%, before economies in general recover more strongly, with average GDP growth peaking at 2.7% in 2014 before reverting to trend growth rates of 2.2%-2.4%. Overall, central and eastern European countries are expected to grow the strongest, with those that have recently acceded to the European Union benefitting most from inwards investment.

The forecast for oil demand is developed on a basis consistent with the overall energy requirements. In the transport sector, where oil faces only minimal competition from other energy forms, the forecasts were made using transportation fuel models. These models incorporate assumed changes to the vehicle parc in terms of both numbers and type of vehicle, miles driven and the changes to vehicle technology which are expected to be introduced and which will significantly impact future demand. For other sectors, such as residential/commercial, industry and power generation, oil demand projections take into account competition from alternative energy sources such as natural gas, solid fuels, nuclear energy and renewables.

Regional demand growth projections are presented for the three major regions of Europe. Figure IV-1 shows the regional demand projections for North, Central and South Europe for total refined products demand from 2000 to 2030.

FIGURE IV-1
EUROPEAN PRODUCT DEMAND GROWTH (2000 - 2030)
(Percent per Year)



Historical data source: IEA

The most significant change is for the 2005-2010 time period, with total European demand projected to have fallen by an average of 1.3% per year. There are two main causes of this downwards trend.

- **The recession and economic downturn of 2009** is estimated to have resulted in total European demand falling by about 38 million tonnes, or 4.9%, from 2008 levels. Demand fell across nearly all sectors, with demand for naphtha, jet/kerosene and heavy fuel oil falling by the greatest proportions.

- **Rising consumer oil prices and the mild winter of 2007** caused heating oil demand to contract significantly, as consumers ran down stocks and delayed purchases, such that non-automotive gasoil demand fell by 13% year-on-year. Heavy fuel oil demand also fell in power generation, which in many countries is a swing or peak fuel (i.e. only used when other generation such as gas or hydroelectricity is at full capacity), and as a result, total oil demand in 2007 fell by 13 million tonnes, or 1.6%, from 2006 levels.

Total demand is estimated to have remained broadly unchanged in 2010, growing by about 0.4%, but to recover by 1.2% in 2011. This is expected to be helped by recovering road diesel and jet/kerosene demand, the latter affected by the closure of northern European airspace in the second quarter of 2010 by the eruption of the Eyjafjallajökull volcano in Iceland. Over the long term, demand growth is expected to be highest in southern Europe as this region has the greatest number of growing economies and potentially the highest economic growth rate of the three regions. Oil demand in Central Europe is dominated by the German market and, therefore, that country's projected trends of declining gasoline and heating oil demand in the residential/commercial sector, the latter a result of substitution by renewables and increasing energy efficiency.

AUTOMOTIVE FUEL DEMAND

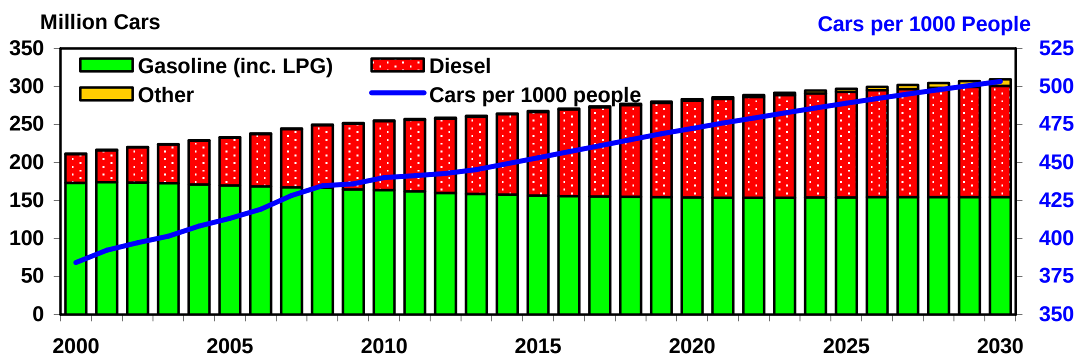
The main trend in product demand in Europe is that of declining gasoline demand while diesel fuel usage is expected to increase. The main driver of this structural shift is the change in private car ownership patterns that have been seen across Europe and which are expected to continue, and growth in commercial diesel demand for road transportation.

The transport sector (including aviation and domestic marine, but excluding international bunkers) currently accounts for about 55% of oil demand in Europe. The main uses in the transport sector are in private cars and commercial vehicles, including buses, and over the forecast period this proportion is projected to rise slightly, to 58%, by 2030. The development of regulations and technology affecting private cars in particular have had and will continue to have a significant influence on future demand for, and the qualities of, transport fuels.

The growth in new car registrations came to an abrupt halt in 2008 such that new car sales for the EU-27 plus EFTA countries of Iceland, Norway and Switzerland[1] were 7.9% lower than in 2007. New registrations in 2009 fell by a further 1.7%, although this would have been even lower were it not for the car-scrappage schemes introduced in Germany and the United Kingdom. These resulted in an increase in registrations in Germany of over 23% in 2009 compared with 2008, and in the United Kingdom registrations for September to December 2009 rose by nearly 27% over the same period in 2008. For 2010, new-car registrations for the same area fell by a further 4.9% over 2009, with one of the largest declines being in Germany, which fell by 23.4% after the one-off increase in 2009. Of the four largest markets, that in Italy suffered the most, falling by 9.2%.

Total vehicle ownership in Europe is currently about 444 per 1,000 people, and is projected to increase to just over 500 per 1,000 people by 2030 (Figure IV-2). Within this total, diesel vehicles in Europe are forecast to increase from around 84 million to 132 million by 2030, with most of the increase reflecting changes already in progress.

FIGURE IV-2
EUROPE PASSENGER VEHICLE OUTLOOK



Historical data source: ACEA

Regarding projections of long-term automotive fuel demand, we have assumed that average emissions of new car registrations will continue to move towards the current 2020 target of 95g CO_2/km, although our view is that this target will not be met on an average basis across the whole of Europe. Analyzing gasoline and diesel demand and current registration trends across the region it can be seen that different countries are at different stages towards this target, such that by 2020 it is expected that average emissions, based on current fuel consumption trends, will be closer to about 110g CO_2/km.

Allowing for additional savings made possible through more efficient air-conditioning systems, improvements in low rolling-resistance tyres, etc, claimed emissions are likely to be

[1] Excluding Cyprus and Malta, for which data is unavailable

near the 100g CO_2/km level, and for the majority of manufacturers, diesel cars are expected to continue to be encouraged as one of the strategies to help meet these lower CO_2 emission targets.

The production and uptake of common rail diesel systems has occurred rapidly, such that all of the diesels registered from 2002 are assumed to be direct injection. The development of gasoline direct injection (GDI), however, has been slower, but progress is being made, and uptake of GDI is projected to progress further. Some models are starting to appear in showrooms, although considering current economic conditions sales are expected to be sluggish at best before 2012.

A small number of new car registrations already are gasoline hybrid-powered, most of which are used in city centres. The share of registrations is forecast to rise modestly through to 2030. However, although the rate of introduction could be speeded up significantly if traffic restrictions are introduced for inner cities that require low- or zero-emission vehicles, there remain long-term questions over the viability of these drive trains, such that a move to full electric vehicles for inner cities is regarded as quite possible. Furthermore, the advantage of hybrid-powered vehicles in terms of fuel economy and CO_2 emissions is being eroded considerably by new technologies in conventional gasoline and diesel engines.

The rate of introduction of non-conventionally fuelled vehicles (mainly fuel cell vehicles) is assumed to remain very slow. Research activity has continued but there is still much to be achieved to reduce the cost of the vehicles, develop fuels and their distribution infrastructure and win customer acceptance. Our forecasts have assumed minimal uptake of fuel cells over the forecast period; however, if technology moves faster than anticipated, or if legislation makes conventional-engined vehicles more expensive or unable to be used in city centres, fuel cell-powered vehicles may enter the parc more quickly.

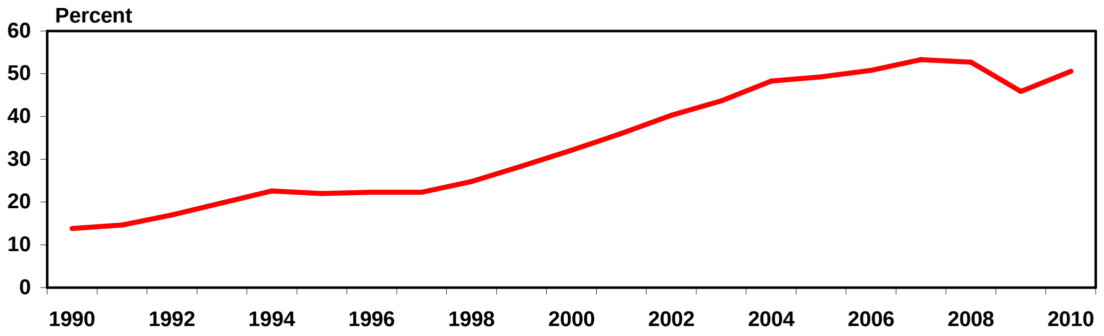
The rate of uptake of LPG-or natural gas (CNG)-powered vehicles in each country depends on national taxation policies and the existence or development of a fuel distribution infrastructure. As vehicle engines have become more complex, the cost of conversion to LPG or CNG has risen, increasing the annual distance that has to be driven before the conversion cost is recovered by fuel cost savings. However, the significant improvements in the fuel economy of gasoline and diesel engine cars that have been seen and are expected over the coming years reduces considerably the incentive to use gaseous fuels. Consequently, in those countries where they are already established, the proportion of these vehicles in the car parc is expected to decline in the longer term.

Diesel Vehicles

The penetration of diesel-engined cars varies considerably from country to country. The highest penetration is in Belgium, where 75% of new vehicles registered in 2009 and 2010 had diesel engines, which contrasts with the Netherlands at about 17% for the first eight months of 2010. It should be noted that the share of diesels in Greece is only 3%, but this may be regarded as an exception because diesel cars are effectively banned from the main Athens market. The level of uptake of diesels in any country depends on many factors, including the relative prices of gasoline and diesel at the pump, the relative cost and resale value of equivalent diesel- and gasoline-powered vehicles, the relative levels of duty and other annual vehicle taxes and the extent to which diesel cars are promoted by car manufacturers.

Up until 2007, the average share of diesels in new vehicle registrations increased steadily from 1990, before levelling off in 2007, as shown in Figure IV-3. The average share across Europe remained at about 53% in 2007 and 2008, although the past few years have hidden some diverging trends. Registrations in Austria, at one time the market leader with the largest share of diesels in 2003, declined from over 71% in 2003 to only 46% in 2009, although this recovered slightly in 2010 to almost 50%, as improving gasoline technology caused some consumers to switch back to gasoline-powered cars. Countries such as Norway and Sweden, on the other hand, have seen a sharp increase in the share of diesels, owing to changes in vehicle taxation policies. The plateau between 1994 and 1998 represents the period that followed the initial uptake of diesels by a relatively small sector of the population, but which preceded the large-scale introduction of high-pressure direct injection turbodiesels.

FIGURE IV-3
SHARE OF DIESELS IN EUROPEAN NEW CAR REGISTRATIONS



Note: Data for 2010 is for January -August only *Data source: ACEA*

In 2009, the share of diesel registrations fell significantly, to an average of 46%. We believe there to be two factors behind this trend, and which also explain the recovery shown for the first eight months of 2010:

- The economic downturn resulted not only in a fall in new car registrations, but also a trend to smaller average engine sizes – which tend to favour gasoline technology. In 2008, the average engine size of new registrations was 1.71 litres; in 2009, this fell to 1.63 litres – the lowest since 1991

- The car scrappage/replacement scheme introduced in Germany and the United Kingdom worked on the basis of a fixed cash rebate. This is likely to have favoured the purchase of smaller cars – and hence a greater proportion of gasoline-engined vehicles – than larger cars, as the cash amount represents a greater proportion of the initial purchase price for a small car than for a more expensive, larger car

As a result, we believe the dip in 2009 was more of a one-off occurrence than the signal of a terminal decline in the share of diesels in new registrations. Looking ahead, there are several factors that are likely to continue to stand in their favour, especially in those countries where registration levels remain relatively low:

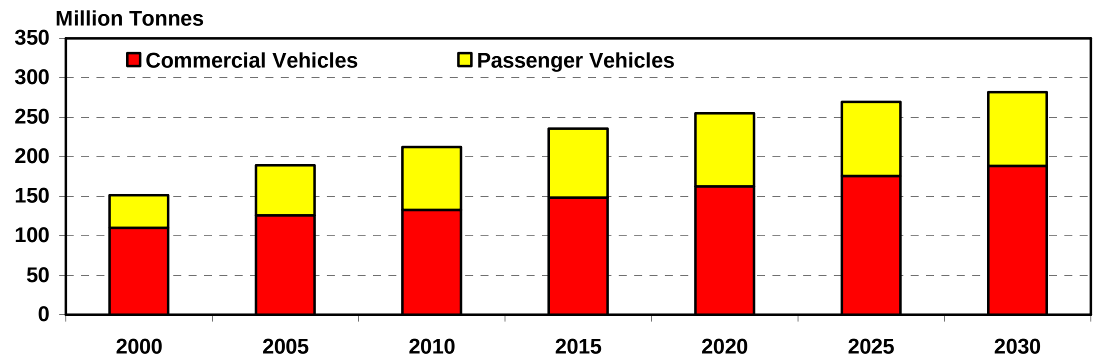
- The greater efficiency and fuel economy of diesels compared with gasoline engines reduces CO_2 emissions per mile/kilometre travelled, which help manufacturers meet their agreed emissions targets

- Diesel engines have considerably greater torque than the equivalent petrol engines, allowing for excellent mid-range acceleration and easier overtaking (although increasing use of gasoline engine turbo charging and supercharging are closing this difference considerably)

- As fuel prices rise, diesels continue to become more economically attractive, primarily owing to their greater fuel economy – provided that they do not command a significantly higher initial price tag.

The forecast of diesel registrations has been made on a country-by-country basis, recognising local factors such as taxation regimes, etc. However, it should be noted that despite the increase in the number of diesel-engined cars, passenger car diesel remains a relatively small proportion of road diesel consumption (Figure IV-4).

FIGURE IV-4
EUROPE DIESEL CONSUMPTION PROFILE



Historical data source: ACEA

In 2010, 63% of road diesel is estimated as use by commercial vehicles. Despite the forecast increase in the diesel car population, the proportion of diesel used in commercial vehicles is projected to remain broadly unchanged, at 64% by 2030, a result chiefly of vehicle efficiency improvement.

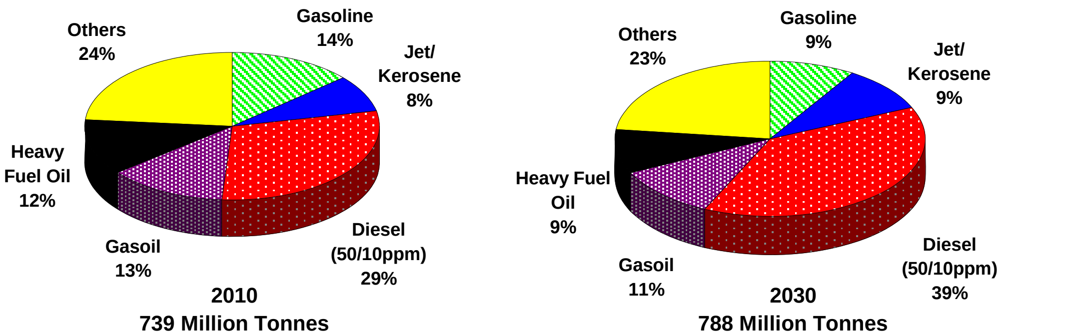
PRODUCT DEMAND

In 2010, refined product demand in Europe, including refinery fuels and about 57 million tonnes of bunker demand, is estimated to have been 739 million tonnes (see Table IV-1). Demand in the period 2000-2010 fell by 0.3% per year on average, with an average decline of 1.8% per year since 2006, primarily a result of the two factors noted above. Heavy fuel oil consumption for inland markets fell by almost 56% over the 2000-2010 period, although this decline was partially offset by strong growth in bunker demand up to 2007. Gasoline consumption has declined every year since 1997, with the annual rate of decrease since 2000 averaging 3.1%. Road diesel has grown by the highest rate since 2000, increasing by about 3.5% per year, despite a 1.8% fall in 2009, while average jet/kerosene demand growth of 1.3% p.a. was adversely affected by the recession in 2001 and general decline in air travel in 2002 after the events of 11th September 2001, and the sharp, recession-related fall of 5.9% in 2009.

Demand is projected to recover slightly in 2011, by 1.2%. All major refined products are expected to undergo some recovery in demand, except for gasoline which remains in structural decline. Heavy fuel oil demand is projected to grow a little, by 0.3%, assuming a continuation in recovery in bunker demand following two years of decline in 2008 and 2009. In 2012, demand is forecast to grow at a slightly slower rate, by 0.7%, with further recoveries in jet/kerosene and road diesel demand as the economic recovery is assumed to continue but at a more modest pace.

Figure IV-5 illustrates the changing pattern of demand in Europe for the long term. Including refinery fuels, middle distillates demand – jet/kerosene and gasoil/diesel – is forecast to increase from an estimated 50% of total product demand in 2010 to 59% by 2030, while the share of gasoline demand over the same period is projected to fall from 14% to 9%. Excluding refinery fuels, for which the greatest is refinery gas, equivalent shares of middle distillates are 53% in 2010 to 62% in 2030, and 14% in 2010 to 9% in 2030 for gasoline. This change is primarily a result of the above-mentioned switch from gasoline-powered private cars to diesel power. Heavy fuel oil demand, including bunkers, is expected to decline slightly in absolute terms, such that its share of total refined product demand in 2030 is projected to fall from the current level of 12% to 9%.

FIGURE IV-5
TOTAL EUROPEAN PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

GASOLINE

Gasoline demand in Europe peaked in 1997 at 145 million tonnes but has declined to 101 million tonnes as more diesel is used in the private automotive fleet. As discussed above, the share of diesels in new registrations has generally been increasing in nearly all European countries, such that even allowing for the one-off decline in 2009, their share of the total car parc is also increasing while that of gasoline-powered cars declines. With car manufacturers expected to continue promoting sales of diesel-powered cars to comply with legislation to reduce average CO_2 emissions from the new car fleet, and gasoline-powered engines themselves becoming considerably more fuel efficient, our projection is that gasoline demand will continue to decline over the forecast period, by an estimated 2.5-3.0% annually on average towards 2015, before slowing to an annual rate of decline towards 2.0%.

JET/KEROSENE

Jet/kerosene demand grew very strongly and consistently from the mid-1990s to 2007, supported by the liberalisation of the aviation industry and the arrival of many low-cost carriers, with the trend interrupted only by the decline in air travel in 2001 and 2002. However, the recession in 2009 resulted in a drop in jet fuel demand of 6.1%, to 54 million tonnes, as business travel, tourism and cargo traffic fell from 2008 levels, and demand fell further in 2010, by 1.1%, not only because of the weak recovery, but also because of the disruption to European air traffic caused by the eruption of the Eyjafjallajökull volcano in Iceland.

Following this one-off disruption a respectable improvement, of just under 3.0%, is expected in 2011, but from 2012 onwards demand growth is expected to ease slightly. Considering current congestion at many major airports and the move towards more fuel-efficient airliners in absolute terms and passenger-mile terms, the previous high growth rates of over 5% per year are unlikely to be repeated, such that long-term growth of nearer 1.5%-2.0% per year is regarded as more probable.

There is still a limited market in Europe for burning kerosene, primarily in Ireland and the United Kingdom, of about 5.6 million tonnes. This market is expected to decrease very slightly, with further expansion of renewable energy sources a factor constraining demand.

GASOIL/DIESEL

Gasoil/diesel is used primarily in the residential/commercial sector as a heating fuel in continental Europe and in the transport sector for road, rail and domestic marine use. There are also sizeable industrial and agricultural markets, but minimal use for power generation. Total consumption in 2010 is estimated to have been about 314 million tonnes, including about 7.6 million tonnes of bunker fuel demand.

Our outlook includes a step-change increase in marine bunker demand in 2015 of around 12 million tonnes. The October 2008 adoption of the Amendment to Annex VI of the MARPOL 73/78 convention calls for the sulphur content of marine fuel used in Emissions Control Areas (ECAs), which currently applies to the Baltic Sea, North Sea and English Channel, to be a maximum of 0.1%wt S from 2015. With further changes to global marine fuel content to 0.5%wt S currently scheduled for the 2020-2025 timeframe, and taking into account that some of this may be met by the use of sulphur scrubbers on board ship, we are also expecting a further switch of about two million tonnes of fuel from heavy fuel oil to marine diesel (gasoil) in 2020.

The use of heating gasoil has been in general decline for many years, with annual variations being driven by weather patterns – this was especially a major factor in 2007, because of the very mild first quarter – and end-user prices. As an example of the change in demand patterns, heating oil demand in the key German market fell by an average of 36% on a year-on-year basis each month from December 2006 to November 2007 as oil prices rose; conversely, from July 2008 to March 2009 demand grew by rates of over 45% on average for nine months continuously, peaking at over 76%, as consumers took advantage of declining oil prices and looked to replenish relatively low stock levels (tank capacities in Germany are capable of holding approximately 18 months of average demand, such that inventories can be managed to a greater degree than those in the United Kingdom). By the second half of 2009, however, the rate of change of demand slowed considerably as residential stocks recovered and, compared with the strong demand in 2008, was sharply negative. Similarly, demand towards the end of 2010 registered strong positive growth rates compared with the declines in the same period in 2009.

A continuing reduction in heating oil use is expected in our projections, a result mainly of continuing substitution by renewable energy sources, such as biomass, and improving efficiency by existing users as old systems are replaced. In some markets, however, housing developments outside city and town centres that are beyond current gas distribution systems are likely to result in additional heating oil demand, although once such developments reach a certain size it is probable that the gas network would be expanded to accommodate them, resulting in a decline.

Limited quantities of gasoil are used in power generation, as standby fuel for gas turbines and for small-scale island power plants. Limited growth is expected in this market. Gasoil use in industry has shown a very moderate rate of increase for the last seven years, and the forecast assumes that total consumption continues roughly at current levels.

The use of gasoil/diesel in the agriculture sector is split between use as a vehicle fuel and use for heating and crop drying. The limited data available indicates an approximately equal split, although this varies considerably between countries, with drying likely to be a higher share in northern countries. Despite downward pressure on the agriculture sector through surplus production, some growth in the use of gasoil/diesel in this sector is forecast particularly in former eastern European countries, as farmers increase automation.

Some considerable changes in gasoil usage are due to take place over the next five years, due to legislation in the Fuels Quality Directive. Some of the industrial sector had already switched to ultra-low sulphur fuel (10 ppm) in January 2010, as had part of the agriculture sector, and all gasoil used in non-road mobile machinery including use in inland waterway transportation must have switched to the 10 ppm grade by 1st January 2011. The effects of these changes are an estimated increase of 16.6 million tonnes of 10-ppm gasoil demand to take place in 2011.

Following a decline in 2009, transport diesel is expected to resume growing quite strongly, owing to steadily increasing use of commercial diesel and the expected increase in the number of diesel cars in the car parc, as discussed above. Overall, total European gasoil/diesel demand is projected to reach about 388 million tonnes by 2030, of which 303 million tonnes will be 10-ppm road/off road diesel.

HEAVY FUEL OIL

Overall fuel oil use has declined steadily for many years, with the largest falls in electricity generation and the industrial sectors, although growth in bunker fuel use has partially offset that decline, driven by the increase in global trade from the beginning of the previous decade in line with the rapid rise in manufacturing in the Far East. However, demand in this sector fell too in 2008 and 2009 as the slowdown in world economies took effect, but a recovery of about 5.3% is estimated to have taken place in 2010. Overall, heavy fuel oil demand is expected to continue to decline in all sectors except for bunkers over the longer term, although the rate of decline is expected to ease as the potential for further substitution has reduced considerably.

Bunker fuel oil demand is forecast to recover in 2011, by about 2.0% from 2010 levels, as worldwide trade continues to pick up. Demand is projected to increase further out to and including 2014 but, as discussed previously, demand is expected to fall sharply in 2015, by about 11 million tonnes, as a result of the October 2008 adoption of the Amendment to Annex VI of the MARPOL 73/78 convention, with an estimated further loss of three million tonnes by 2020. After this time and out towards 2030, few further major changes are expected; an assumed continuation of increasing world trade is likely to result in a small increase in bunker demand, although demand itself may prove to be limited by the general availability of fuel oil, such that refinery supplies will probably be the limiting factor for bunker demand.

REFINED PRODUCT TRADE FLOWS

Trade flows for refined products are discussed in two subsections below. The first is a summary of trends and trade flows, including forecasts, for Europe as a whole; the second provides a more detailed product-by-product analysis and discussion for North Europe, and the associated implications for the United Kingdom.

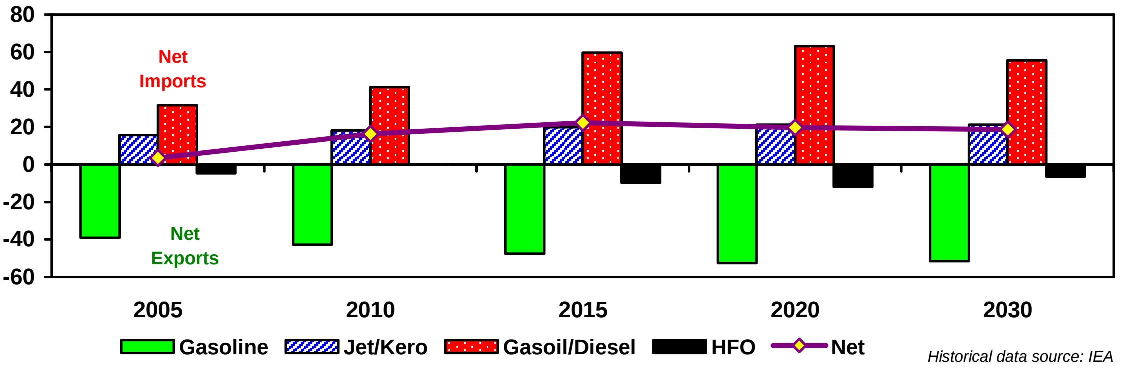
EUROPEAN SUMMARY

The European refining industry has become increasingly out of balance with domestic demand, with the result that the region is increasingly reliant on trade flows to balance demand with supply. As a result of the decline in gasoline demand and increase in diesel and jet fuel demand, Europe is structurally long on gasoline and structurally short on both jet/kerosene and gasoil/diesel. It is in approximate balance for heavy fuel oil.

Although overall crude runs in Europe are expected to decline gradually in the long term, some countries with higher-than-average demand growth are likely to add distillation capacity along with conversion projects. Offsetting this, we expect capacity will probably be closed in other locations, where economics become unfavourable; such changes are consistent with the long-term rationalisation of the refining industry, which results in the concentration of capacity into larger, more efficient refining sites. The main new distillation projects are in Spain and Poland, which are both growing markets in the long term.

The future trade flows for the main products for Europe are shown in Figure IV-6, followed by specific details on flows for each of the major products for Northern Europe.

FIGURE IV-6
EUROPEAN PRODUCT TRADE BALANCE, 2005 - 2030
(Million Tonnes)



The decline in gasoline demand is likely to have a significant impact on several European refiners, resulting in the rationalization of some gasoline-making facilities, especially in inland markets with few export opportunities. The closure of one FCC unit at the Bayernoël facility in southern Germany was completed in 2009; other refineries will continue to rely on exports to balance their production, but additional export opportunities, especially to traditional markets such as the United States, are likely to remain extremely limited. Owing to a lack of significant additional export markets, net exports are expected to remain broadly constant at about 45-50 million tonnes.

Despite the projected increases in hydrocracking capacity, the continued rise in European demand for middle distillates is forecast to result in increasing volumes of net imports for both jet/kerosene and diesel/gasoil to 2020. Net European jet/kerosene imports are projected to increase from an estimated 18 million tonnes in 2010 to 21 million tonnes in 2030; the Middle East is expected to remain the principal source, but increasing volumes are also projected to be required from Asia.

Europe is already a large net importer of diesel/gasoil, of about 41 million tonnes. France and Germany are the largest markets and import to meet both seasonal heating requirements and increasing diesel demand. The United Kingdom is also a net importer. Belgium and the Netherlands, with their large refining bases compared with the sizes of their domestic markets, are both net exporters, as is Italy; however the surplus in all of these markets is diminishing as domestic consumption increases. Combined gasoil/diesel net imports are projected to rise further, to 63 million tonnes by 2020, before easing slightly to 56 million tonnes by 2030 – assuming European production continues to increase. Of these import sources, the CIS region is expected to remain the most significant source, such that although additional sources such as the Middle East and Asia may be available, European markets are projected to remain heavily reliant on gasoil imports from this region. However, the fact that additional imports are required from the Middle East and Asia is an important factor of product pricing, as it is trade from this region that acts as the price-setter in Europe.

There is considerable trade of fuel oil in Europe, both as cracked or finished product and as unfinished refinery feedstocks. Similar to gasoil trade flows, the CIS Region is the primary supplier of fuel oil to Europe; however Libya is also a large supplier as it produces a good quality low-sulphur residue for upgrading. Net European fuel oil trade is in approximate balance and is expected to change only little over the forecast period, with net exports increasing slightly.

NORTHERN EUROPEAN PRODUCT BALANCES AND TRADE FLOWS

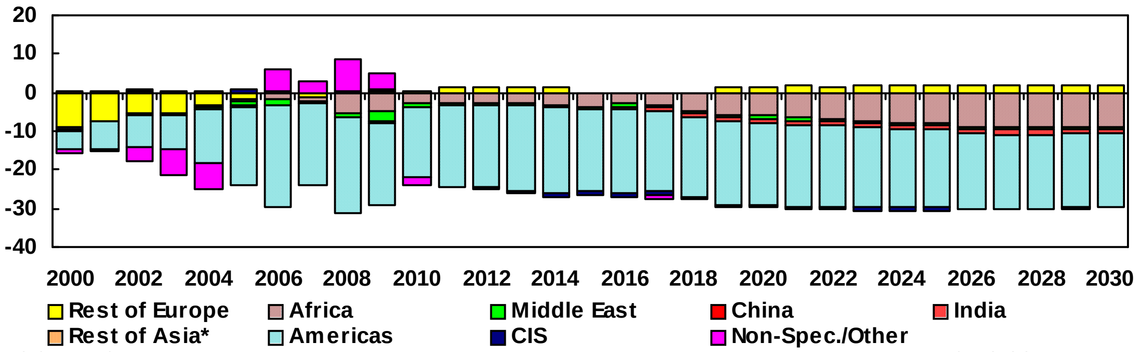
Specific historical and product trade flows for North Europe are provided in Tables IV-5 to IV-10.

Gasoline

As with the whole European region, Northern Europe has consistently been a net exporter of gasoline for many years, but the surplus has grown significantly in the last ten years to a level where, in 2010, Northern European refineries exported net 41% of total gasoline production, compared with 21% in 2000. The largest market for gasoline exports is North and South America, reaching an estimated 18 million tonnes in 2010, of which 15 million tonnes was to North America. This total is, however, down from the peak of 26 million tonnes for both markets recorded in 2006, with increasing ethanol use in the United States as well as declining consumer demand accounting for the decline. The size of these markets relative to total net exports is shown in Figure IV-7 below. The remainder of exports are into Africa and Middle Eastern markets, although the greater share of European exports to the Middle East and North Africa are from Southern Europe.

Looking ahead, the combined Americas will remain the most significant market for northern European refiners. Overall market dynamics are expected to change towards 2030, with US demand remaining relatively static but with demand in Latin America continuing to grow. As a result, the need for imports is expected to shift towards Latin America, but geographic considerations are such that northern European gasoline exports could well remain destined for the United States, but that Caribbean and northern Latin American production currently exported to the US market are diverted southwards towards Latin America. Exports are projected to continue into Africa, increasing towards nine million tonnes by 2030, such that total net exports are expected to increase very slightly in the long term, reaching a maximum of 27 million tonnes by the end of the forecast period. Some balancing flows from Central and Southern Europe account for the small net imports shown.

FIGURE IV-7
NET NORTHERN EUROPE GASOLINE TRADE, 2000-2030
(Million Tonnes: -ve = Exports)



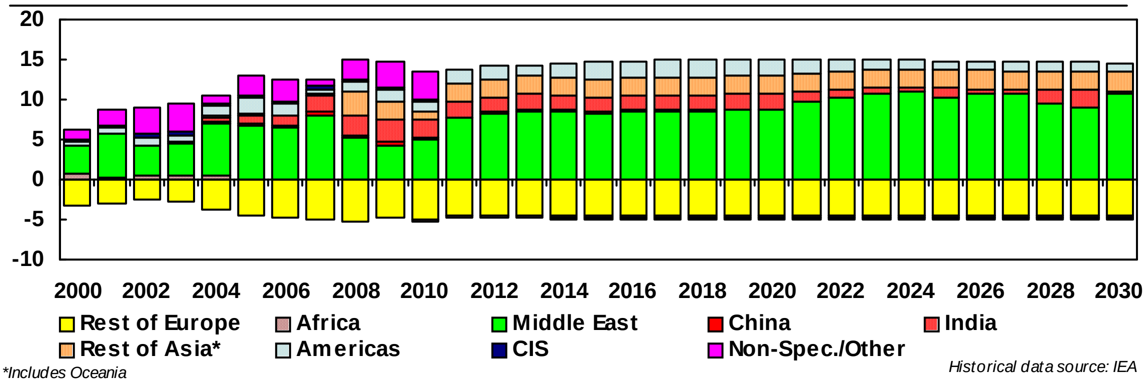
**Includes Oceania* *Historical data source: IEA*

JET/KEROSENE

Northern European jet/kerosene trade has changed significantly over the past 15 years. The region was essentially self-sufficient in jet/kerosene in the early 1990s, but the second part of that decade was notable for significant liberalisation of European air travel, resulting in the rapid growth of budget and "low-cost" airlines and a boom in leisure travel, with a resulting rapid increase in jet fuel demand. This continued into 2000, added to which was that changes to EU diesel specifications required a lower-density fuel, in turn necessitating more jet/kerosene to be blended into the diesel pool.

This resulted in demand for jet fuel increasing at rates of over 5% per year – far higher than the European refining industry could meet. As a result, net imports increased rapidly, rising from 3.0 million tonnes in 2000 to about 8.7 million tonnes in 2005, and increasing further to 10.0 million tonnes in 2009 before declining slightly to an estimated 9.3 million tonnes in 2010 as demand declined (see Figure IV-8).

FIGURE IV-8
NET NORTHERN EUROPE JET/KEROSENE TRADE, 2000-2030
(Million Tonnes: -ve = Exports)



**Includes Oceania* *Historical data source: IEA*

Up to about 2004, the chief source of these imports has been the Middle East, especially countries such as Kuwait, Saudi Arabia and the UAE. Since then, however, most noteworthy is the increase in imports from India and the rest of Asia, which have increased from under 1.0 million tonnes in 2004 to 5.5 million tonnes in 2008. Imports from North America and Latin America have also increased, reaching 1.8 million tonnes. The European exports shown above refer to jet fuel imported by the Netherlands and Belgium but subsequently exported to Germany.

As highlighted in the previous chapter, the largest European market for importing jet/kerosene is the United Kingdom, which imports approximately seven million tonnes net annually. This compares with Germany and France, which report net imports of about four million tonnes and two million tonnes respectively.

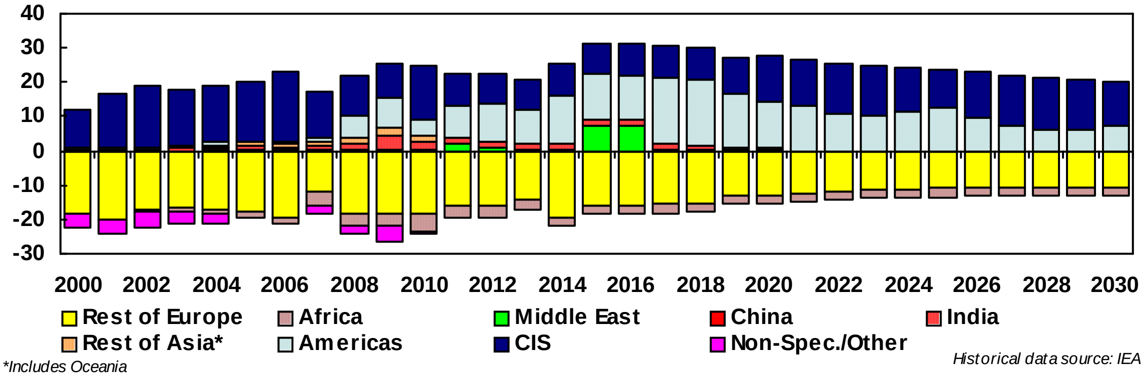
Taking into account the projected increases in hydrocracking capacity future northern European jet/kerosene imports are projected to remain broadly constant, at about ten million tonnes. The Middle East is expected to remain the principal source, but volumes are also projected to be required from India and Asia. These trends have significant implications for the United Kingdom, as it is these sources that will be key to future UK jet/kerosene imports and will therefore be the price-setters for jet/kerosene into Europe and the United Kingdom.

GASOIL/DIESEL

The increasing levels of private diesel car ownership and higher road haulage volumes have resulted in diesel fuel demand in Northern Europe alone increasing by annual average rates of approximately 4% since 2000. Some of this increase has been offset by declining demand for heating gasoil over this period, primarily in France (Germany is included in Central Europe); however, the size of the transportation market is such that despite this decline the combined gasoil/diesel market has been increasing by an average of 1.1% a year from 2000 to 2008, and after the 2009 recession is expected to bounce back to rates of 2.5% and 2.6% in 2011 and 2012 before easing off to an annual increase of about 1.0-1.2% up to 2015.

Although there were some refinery investments in Europe in the first part of last decade to increase diesel yields through residue destruction, most of the increase in diesel demand was met through increasing imports. At times of relatively poor refinery margins, the preferred strategy of most refiners was to invest in hydrotreating and other desulphurisation processes and import high-sulphur gasoil streams for upgrading into diesel. As shown in Figure IV-9, the principal source of Northern European gasoil imports has been the CIS region, with additional imports of diesel from the United States increasing notably from 2007 to 2009, reaching almost 10.0 million tonnes.

FIGURE IV-9
NET NORTHERN EUROPE GASOIL/DIESEL TRADE, 2000-2030
(Million Tonnes: -ve = Exports)

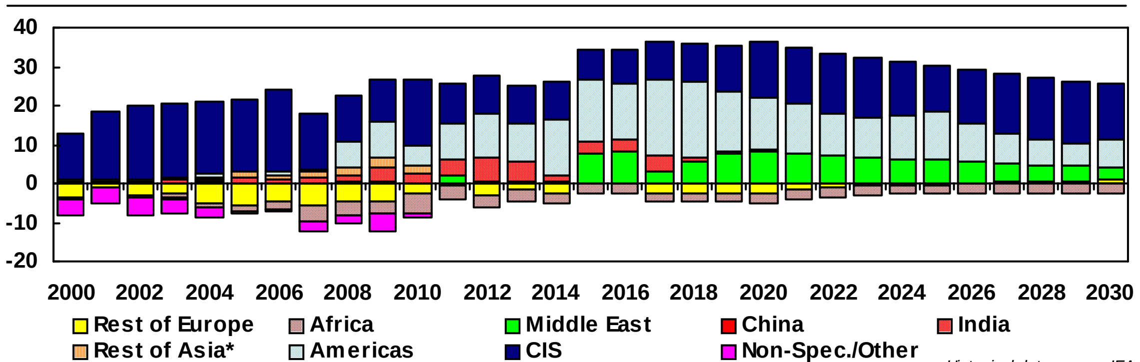


*Includes Oceania
Historical data source: IEA

As Russian gasoil is straight-run material from distillation units it is very suitable for desulphurisation into diesel compared with cracked gasoils, as it has a high cetane number and contains very low levels of aromatics. CIS gasoil import levels have varied recently, from 11 million tonnes in 2008 to 9.5 million tonnes in 2009, climbing to an estimated 16 million tonnes in 2010. They have, however, declined from a peak of 20 million tonnes in 2006, coinciding with an increase in imports from the United States and, importantly, from India and the Rest of Asia, which together reached 6.1 million tonnes in 2009.

A major point of note in the above chart is the level of exports to other parts of Europe, which are in the order of 20 million tonnes, and can imply that Northern Europe is in approximate balance regarding its gasoil/diesel requirements. These represent the significant levels of trade flows from Belgium and the Netherlands into Germany and, to a much lesser degree, Switzerland. If the two markets of North and Central Europe are combined, the level of import dependency of the combined region is far more evident. This is shown in Table IV-8 and Figure IV-10 below.

FIGURE IV-10
NET NORTHERN AND CENTRAL EUROPE GASOIL/DIESEL TRADE, 2000-2030
(Million Tonnes: -ve = Exports)



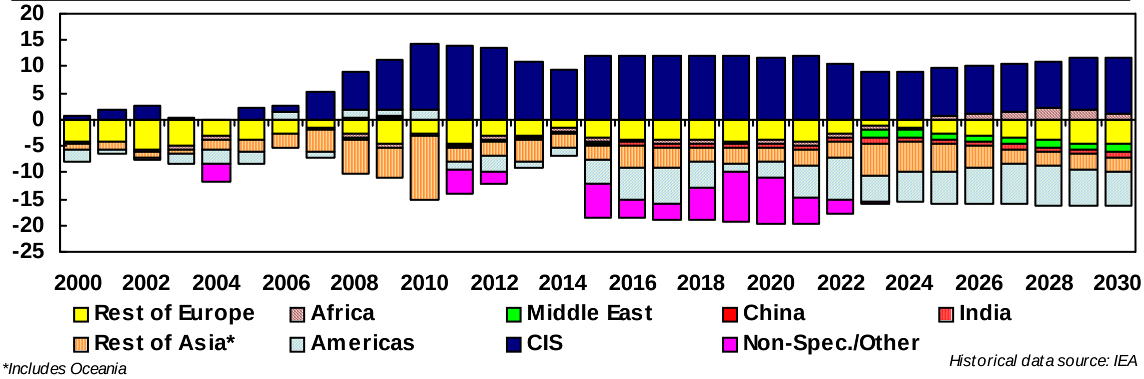
*Includes Oceania
Historical data source: IEA

The step-change in import requirements shown in 2015 illustrates the effects that the expected 12-million tonne increase in gasoil-based marine diesel bunker fuel demand will have on the Northern European trade balance. Current expectations are that the additional imports may be sourced from the Middle East.

HEAVY FUEL OIL

The largest supplier of heavy fuel oil to Northern Europe by far is Russia in the CIS region (Figure IV-11), with imports from this source estimated to have reached 13 million tonnes in 2010. Most of the Russian supply is straight-run fuel oil, which is used both as refinery feedstock and for blending into bunker fuel, although it is almost impossible to disaggregate the quantities used as feedstock owing to the lack of statistical data.

FIGURE IV-11
NET NORTHERN EUROPE HEAVY FUEL OIL TRADE, 2000-2030
(Million Tonnes: -ve = Exports)



*Includes Oceania

Historical data source: IEA

There is a considerable amount of trade of heavy fuel oil within Europe, as Northern Europe is a notable exporter as well. The main trade flows, and those which have been increasing substantially of late, are large-scale shipments to Singapore and Far East markets. Growing demand in East-of-Suez markets has resulted in heavy fuel oil being transported to Rotterdam for bulk-building into large carriers, including VLCCs (Very Large Crude Carriers), for long-haul shipment to Singapore. This market has grown from under 3.0 million tonnes in 2006 to an estimated 12 million tonnes in 2010, although these are expected to decline as additional East-of-Suez refining capacity comes on line. Intra-European flows include exports to Southern Europe, which in turn is a major supplier to the Middle East market.

In the past, US East Coast utilities imported low-sulphur fuel on a seasonal basis, and US refiners also purchase straight-run fuel oil as a refinery feedstock – this was especially notable in 2004 and 2005, when high natural gas prices resulted in utilities increasing their fuel oil use. Since then, however, the subsequent fall in gas prices has seen much less of this trade, and indeed at times there have been reverse flows, from the United States to Northern Europe.

The indicative increase in fuel oil exports in 2015 represents the sharp decline in European fuel oil use as a result of the switch to gasoil-based bunker fuels. The removal of about nine million tonnes from Northern European demand (out of a total of 11 million tonnes for all of Europe, thus highlighting the impact of the northern European ECAs) will move the region much closer to a net overall balance. Lastly, as discussed above, the large trade of fuel oil both as a finished product and as an unfinished refinery feedstock can result in some classification issues regarding countries of origin. This is reflected in the IEA category of 'Non-specified/Other'.

TABLE IV-1
REFINED PRODUCT BALANCE
TOTAL EUROPE
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	157	163	148	146	138	137	135	133	132	131	126	121	116
	Imports	39	34	30	29	29	29	29	29	29	29	28	27	27
	Exports	(53)	(73)	(75)	(73)	(72)	(72)	(73)	(73)	(75)	(76)	(80)	(80)	(78)
	Biogasoline supply	-	1	3	3	4	4	4	4	5	5	6	6	5
	Supply Adjustments	(6)	(4)	3	(0)	2	1	1	1	1	1	1	1	1
	Consumption	138	121	109	105	101	99	96	94	91	89	80	74	70
Jet/Kerosene	Production	48	48	50	45	45	46	47	49	49	50	53	56	59
	Imports	19	30	34	35	33	34	35	34	35	35	36	37	36
	Exports	(11)	(14)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
	Supply Adjustments	(1)	(5)	(6)	(7)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
	Consumption	54	59	63	59	59	60	62	63	64	65	69	72	74
Gasoil/Diesel	Production	270	288	291	278	274	275	275	282	284	287	300	314	328
	Imports	80	115	121	125	129	134	137	134	136	140	145	144	140
	Exports	(68)	(83)	(88)	(87)	(88)	(89)	(87)	(88)	(88)	(80)	(82)	(83)	(85)
	Int'l Bunkers	(9)	(8)	(7)	(7)	(8)	(8)	(8)	(8)	(9)	(21)	(24)	(24)	(25)
	Biodiesel supply	-	3	9	11	12	13	14	14	15	15	17	17	17
	CTL/GTL diesel supply	-	-	-	-	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(1)	(7)	(8)	(16)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(12)
	Consumption	272	307	318	304	307	313	317	321	325	328	344	354	363
	of which: Diesel	152	189	211	211	217	239	243	247	252	257	277	291	303
Heavy Fuel Oil	Production	132	126	112	95	91	91	90	87	87	86	84	82	79
	Imports	52	61	67	65	66	65	65	66	66	61	60	61	62
	Exports	(48)	(66)	(67)	(62)	(66)	(66)	(66)	(64)	(64)	(71)	(72)	(71)	(69)
	Int'l Bunkers	(38)	(50)	(53)	(47)	(50)	(51)	(51)	(52)	(52)	(41)	(38)	(39)	(40)
	Supply Adjustments	(8)	(3)	(6)	(4)	0	2	2	2	2	2	1	1	1
	Consumption	90	69	52	48	41	40	39	39	38	37	35	34	33
Other Products	Production	158	167	154	149	150	150	149	153	153	154	155	156	157
	Imports	56	67	64	64	65	68	70	68	68	68	68	67	66
	Exports	(40)	(45)	(48)	(48)	(49)	(48)	(46)	(46)	(46)	(46)	(46)	(46)	(47)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(9)	(11)	5	4	8	7	7	7	7	7	6	5	5
	Consumption	165	178	174	169	174	177	179	181	182	182	182	182	181
Total	Production	766	792	755	713	698	699	696	703	705	707	718	728	738
	Imports	245	307	316	318	323	330	335	331	333	333	337	335	332
	Exports	(221)	(281)	(293)	(284)	(290)	(290)	(287)	(287)	(288)	(289)	(295)	(295)	(294)
	Int'l Bunkers	(48)	(58)	(61)	(55)	(58)	(59)	(59)	(60)	(61)	(62)	(62)	(63)	(66)
	Biofuels/CTL/GTL supply	-	4	12	14	16	17	18	18	19	20	22	23	22
	Supply Adjustments	(25)	(30)	(12)	(23)	(7)	(9)	(8)	(8)	(8)	(8)	(10)	(11)	(11)
	Consumption	718	733	716	684	682	690	694	697	700	701	710	716	722

Historical data source: IEA

TABLE IV-2
REFINED PRODUCT BALANCE
NORTH EUROPE
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	70	70	59	59	57	55	55	54	54	53	51	49	47
	Imports	19	20	20	19	19	19	19	19	19	19	18	18	18
	Exports	(34)	(43)	(42)	(43)	(42)	(42)	(43)	(43)	(44)	(45)	(47)	(47)	(46)
	Biogasoline supply	-	0	1	1	2	2	2	2	2	2	2	2	2
	Supply Adjustments	(1)	1	6	5	5	5	5	5	4	4	4	4	4
	Consumption	54	48	43	42	40	39	37	36	35	34	29	27	25
Jet/Kerosene	Production	26	24	25	23	23	23	23	24	24	24	25	26	27
	Imports	11	19	22	22	20	21	21	21	21	22	22	21	21
	Exports	(8)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(11)	(11)	(11)
	Supply Adjustments	2	1	0	(0)	1	1	1	1	1	1	1	1	1
	Consumption	31	34	35	33	32	33	34	34	35	35	36	37	37
Gasoil/Diesel	Production	111	109	111	107	104	104	104	105	106	107	112	118	123
	Imports	35	50	52	54	59	62	62	62	63	64	64	63	61
	Exports	(46)	(50)	(54)	(56)	(58)	(59)	(59)	(59)	(59)	(51)	(52)	(53)	(53)
	Int'l Bunkers	(6)	(5)	(4)	(3)	(4)	(4)	(4)	(4)	(4)	(14)	(14)	(15)	(15)
	Biodiesel supply	-	0	3	3	4	4	5	5	5	5	6	7	7
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	14	14	14	11	14	15	15	15	15	15	15	15	15
	Consumption	108	119	122	116	119	122	124	125	126	127	132	134	136
	of which: Diesel	65	76	85	85	88	97	99	100	102	104	110	113	116
Heavy Fuel Oil	Production	51	53	48	41	40	39	38	38	38	38	36	35	34
	Imports	24	38	44	44	47	47	47	47	48	45	44	44	45
	Exports	(31)	(44)	(45)	(43)	(48)	(47)	(46)	(46)	(45)	(51)	(52)	(51)	(49)
	Int'l Bunkers	(23)	(30)	(32)	(28)	(30)	(31)	(32)	(32)	(33)	(24)	(21)	(22)	(22)
	Supply Adjustments	(0)	(0)	(2)	(1)	1	2	2	2	2	2	2	2	2
	Consumption	21	16	13	12	11	11	10	10	10	9	9	9	9
Other Products	Production	70	76	61	59	56	57	57	57	57	57	58	58	58
	Imports	26	34	32	33	35	35	36	36	36	36	36	36	36
	Exports	(26)	(28)	(29)	(28)	(29)	(27)	(27)	(27)	(27)	(27)	(27)	(27)	(28)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(4)	(11)	6	3	6	5	5	5	5	5	5	5	5
	Consumption	66	71	69	66	68	69	70	71	72	72	72	71	71
Total	Production	329	332	304	288	281	278	277	278	279	279	282	285	288
	Imports	116	162	169	172	180	183	185	186	186	185	184	183	180
	Exports	(146)	(176)	(183)	(182)	(189)	(187)	(186)	(186)	(186)	(186)	(189)	(189)	(187)
	Int'l Bunkers	(29)	(35)	(36)	(31)	(34)	(35)	(35)	(36)	(37)	(37)	(36)	(37)	(38)
	Biofuels/CTL/GTL supply	-	1	4	5	6	6	7	7	7	8	9	9	9
	Supply Adjustments	11	5	24	17	26	28	28	28	28	28	28	27	27
	Consumption	281	288	283	268	269	274	275	276	277	277	278	278	279

Historical data source: IEA

TABLE IV-3
REFINED PRODUCT BALANCE
CENTRAL EUROPE
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	38	39	36	36	33	33	32	32	31	31	29	27	24
	Imports	14	9	6	6	6	7	7	7	7	6	6	5	5
	Exports	(6)	(9)	(8)	(8)	(7)	(8)	(8)	(8)	(8)	(9)	(10)	(10)	(10)
	Biogasoline supply	-	0	1	1	2	1	1	1	1	2	2	2	2
	Supply Adjustments	(2)	(2)	(0)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	44	37	34	34	33	32	32	31	30	29	25	22	20
Jet/Kerosene	Production	6	6	7	6	6	6	7	7	7	7	7	8	8
	Imports	4	6	7	7	6	6	7	7	7	7	7	7	7
	Exports	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Supply Adjustments	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	10	11	12	12	12	12	12	12	12	13	13	14	14
Gasoil/Diesel	Production	66	75	74	74	72	73	74	76	76	77	80	84	87
	Imports	24	29	30	29	29	30	29	29	29	30	30	29	27
	Exports	(9)	(15)	(15)	(13)	(12)	(12)	(12)	(11)	(11)	(11)	(11)	(11)	(11)
	Int'l Bunkers	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
	Biodiesel supply	-	2	4	4	5	5	5	5	5	5	5	5	5
	CTL/GTL diesel supply	-	-	-	-	0	0	0	0	0	0	0	0	0
	Supply Adjustments	1	(2)	(2)	(7)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(7)	(7)
	Consumption	82	88	90	87	86	88	89	90	91	92	95	97	99
	of which: Diesel	38	46	52	53	55	59	60	62	63	64	70	74	77
Heavy Fuel Oil	Production	21	19	17	15	13	13	13	12	12	12	11	11	10
	Imports	4	4	3	4	3	3	3	4	4	3	3	3	4
	Exports	(7)	(7)	(7)	(5)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
	Int'l Bunkers	(2)	(2)	(3)	(2)	(3)	(3)	(3)	(2)	(2)	(1)	(1)	(1)	(1)
	Supply Adjustments	(2)	(1)	(1)	(0)	(0)	0	0	0	0	0	0	0	0
	Consumption	14	12	11	10	10	10	10	10	10	10	10	9	9
Other Products	Production	37	40	42	40	40	40	40	40	40	40	39	39	38
	Imports	12	12	11	10	11	11	11	11	11	11	10	9	9
	Exports	(4)	(6)	(8)	(7)	(7)	(8)	(8)	(8)	(8)	(7)	(7)	(7)	(7)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(1)	2	2	2	2	3	3	3	2	2	2	2	2
	Consumption	44	48	47	45	46	47	47	47	46	46	45	43	42
Total	Production	168	178	176	171	165	165	166	167	167	167	167	168	168
	Imports	59	59	57	55	56	57	58	57	58	58	57	54	51
	Exports	(27)	(38)	(39)	(34)	(31)	(32)	(32)	(32)	(32)	(32)	(33)	(33)	(32)
	Int'l Bunkers	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Biofuels/CTL/GTL supply	-	2	5	6	6	6	6	6	6	6	7	7	7
	Supply Adjustments	(3)	(3)	(2)	(7)	(7)	(6)	(6)	(6)	(6)	(6)	(6)	(7)	(7)
	Consumption	194	196	195	187	187	188	189	189	190	190	188	186	184

Historical data source: IEA

TABLE IV-4
REFINED PRODUCT BALANCE
SOUTHERN EUROPE
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	49	55	53	50	48	49	48	47	47	46	46	45	44
	Imports	5	5	4	4	3	3	3	4	4	4	4	4	4
	Exports	(12)	(21)	(24)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(23)	(23)	(23)
	Biogasoline supply	-	0	0	1	1	1	1	1	1	1	1	1	1
	Supply Adjustments	(3)	(4)	(2)	(4)	(1)	(3)	(3)	(3)	(3)	(3)	(2)	(2)	(2)
	Consumption	40	35	31	30	29	28	27	27	26	26	25	25	25
Jet/Kerosene	Production	15	18	18	16	16	16	17	18	18	19	20	22	24
	Imports	3	4	6	7	6	7	7	6	7	7	8	8	8
	Exports	(2)	(2)	(3)	(2)	(2)	(2)	(2)	(3)	(3)	(3)	(3)	(3)	(3)
	Supply Adjustments	(3)	(5)	(6)	(6)	(5)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)
	Consumption	13	14	16	15	15	15	16	16	17	17	19	21	23
Gasoil/Diesel	Production	93	104	105	98	97	98	97	101	102	103	108	113	118
	Imports	21	36	39	41	41	43	45	43	44	45	50	52	53
	Exports	(14)	(18)	(18)	(17)	(18)	(19)	(17)	(17)	(18)	(18)	(18)	(19)	(20)
	Int'l Bunkers	(3)	(3)	(3)	(3)	(3)	(4)	(4)	(4)	(4)	(5)	(7)	(7)	(8)
	Biodiesel supply	-	0	2	3	4	4	4	4	5	5	5	5	5
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(16)	(19)	(20)	(21)	(19)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(19)
	Consumption	82	100	106	101	101	103	105	106	108	109	117	123	128
	of which: Diesel	49	67	74	73	74	83	84	85	87	89	97	104	110
Heavy Fuel Oil	Production	60	55	47	40	38	39	39	37	37	37	36	36	35
	Imports	24	19	20	18	16	15	14	14	14	13	13	13	14
	Exports	(10)	(14)	(16)	(13)	(15)	(15)	(16)	(15)	(16)	(16)	(16)	(16)	(16)
	Int'l Bunkers	(13)	(17)	(19)	(17)	(17)	(17)	(17)	(17)	(17)	(16)	(16)	(16)	(17)
	Supply Adjustments	(6)	(2)	(4)	(3)	(1)	(1)	(0)	(0)	(0)	(0)	(1)	(1)	(1)
	Consumption	55	40	29	26	21	20	20	19	18	17	16	16	16
Other Products	Production	51	51	51	50	53	53	52	55	56	56	58	60	61
	Imports	17	21	21	21	20	21	22	20	21	21	21	22	22
	Exports	(10)	(11)	(11)	(13)	(13)	(13)	(12)	(12)	(12)	(12)	(12)	(12)	(13)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(4)	(2)	(3)	(0)	0	(1)	(0)	(1)	(1)	(1)	(1)	(2)	(2)
	Consumption	54	60	58	58	60	61	62	63	64	65	66	67	68
Total	Production	269	282	275	254	252	255	252	258	259	261	268	275	282
	Imports	70	85	90	91	87	90	92	88	89	90	96	99	100
	Exports	(48)	(67)	(72)	(67)	(70)	(71)	(69)	(68)	(70)	(70)	(72)	(74)	(74)
	Int'l Bunkers	(16)	(20)	(22)	(20)	(21)	(21)	(21)	(21)	(21)	(22)	(23)	(24)	(25)
	Biofuels/CTL/GTL supply	-	1	2	4	5	5	5	5	6	6	6	6	6
	Supply Adjustments	(32)	(32)	(34)	(33)	(26)	(30)	(29)	(29)	(30)	(30)	(31)	(31)	(31)
	Consumption	243	250	239	229	226	228	230	232	233	234	244	252	260

Historical data source: IEA

TABLE IV-5
NORTHERN EUROPE: GASOLINE TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	70.2	69.6	59.3	59.2	56.7	55.5	54.5	54.1	53.7	53.3	51.2	49.0	46.8
Imports													
Rest of Europe	2.5	2.5	1.8	2.4	3.2	2.9	3.0	3.0	3.0	1.3	2.6	3.0	3.0
Africa	0.2	0.9	0.2	0.5	0.1	-	-	-	-	-	-	-	-
Middle East	0.1	0.2	0.1	0.0	0.0	-	-	-	-	-	-	-	-
China	0.1	0.0	-	0.0	-	-	-	-	-	-	-	-	-
India	0.0	0.0	0.0	0.2	-	-	-	-	-	-	-	-	-
Rest of Asia	0.0	-	0.0	0.0	0.1	-	-	-	-	-	-	-	-
North America	0.0	0.0	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Latin America	0.1	0.1	0.2	0.4	0.1	-	-	-	-	-	-	-	-
CIS	0.5	1.0	0.2	0.3	0.2	-	-	-	-	-	-	-	-
Non-Specified / Other	-	-	8.3	5.1	-	-	-	-	-	-	-	-	-
Total	3.5	4.7	11.0	8.9	3.9	2.9	3.0	3.0	3.0	1.3	2.6	3.0	3.0
Exports													
Rest of Europe	11.4	4.1	1.8	2.0	2.6	1.7	1.7	1.6	1.6	1.5	1.3	1.1	0.9
Africa	0.7	1.6	5.6	5.5	3.0	2.6	2.6	2.6	3.1	3.4	6.1	7.7	8.8
Middle East	0.4	1.3	1.0	2.4	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.5	0.4
China	-	0.0	0.1	-	-	-	-	-	-	-	-	-	-
India	-	0.0	0.0	0.0	-	-	-	-	-	-	1.0	1.2	1.3
Rest of Asia	0.1	0.3	0.2	0.4	0.1	-	-	-	-	-	-	-	-
North America	4.7	19.6	21.3	18.3	15.2	16.0	16.9	17.3	17.3	17.3	16.9	13.0	10.8
Latin America	0.2	0.8	3.8	3.3	3.1	4.9	4.1	4.6	5.0	4.0	4.5	7.1	8.3
CIS	0.0	0.0	-	-	0.2	0.2	0.6	0.6	0.6	0.6	0.6	1.0	0.2
Non-Specified / Other	1.2	0.1	0.1	1.0	2.1	-	-	-	-	-	-	-	-
Total	18.7	27.8	33.7	33.0	27.3	26.3	26.7	27.6	28.5	27.7	31.1	31.5	30.7
Net Imports / (Exports)	(15.2)	(23.1)	(22.7)	(24.0)	(23.4)	(23.4)	(23.7)	(24.6)	(25.5)	(26.3)	(28.4)	(28.6)	(27.8)

Note: Comprises Aviation Gasoline and Motor Gasoline

Historical data source: IEA

TABLE IV-6
NORTHERN EUROPE: JET/KEROSENE TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	26.2	24.3	25.2	23.2	23.4	23.2	23.4	23.6	23.8	23.9	24.8	25.6	26.5
Imports													
Rest of Europe	0.9	0.9	0.6	1.2	0.2	-	-	-	-	-	-	-	-
Africa	0.7	0.1	0.2	0.2	0.0	-	-	-	-	-	-	-	-
Middle East	3.5	6.7	5.2	4.3	5.0	7.6	8.2	8.6	8.4	8.2	8.9	10.3	10.7
China	0.1	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	-	-	-
India	-	1.1	2.5	2.9	2.2	1.8	1.8	1.8	1.8	1.8	1.8	1.1	0.5
Rest of Asia	0.1	0.3	3.0	2.2	1.1	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
North America	0.0	0.9	0.4	0.5	0.4	0.7	0.5	0.4	0.7	1.2	1.0	-	-
Latin America	0.5	1.5	1.1	1.3	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
CIS	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Non-Specified / Other	1.2	2.5	2.3	3.3	3.6	-	-	-	-	-	-	-	-
Total	7.1	14.4	16.0	16.5	14.0	14.1	14.5	14.7	14.9	15.1	15.3	15.1	14.8
Exports													
Rest of Europe	4.1	5.2	6.0	6.0	5.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Africa	0.0	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Middle East	-	0.1	-	-	0.0	-	-	-	-	-	-	-	-
China	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-
India	-	0.0	-	-	-	-	-	-	-	-	-	-	-
Rest of Asia	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
North America	0.0	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-
Latin America	0.0	0.0	0.2	0.2	0.1	-	-	-	-	-	-	-	-
CIS	-	-	-	-	0.0	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6
Non-Specified / Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4.1	5.7	6.5	6.5	5.7	5.2	5.2	5.2	5.2	5.2	5.3	5.2	5.3
Net Imports / (Exports)	3.0	8.7	9.5	10.0	8.3	8.9	9.3	9.5	9.7	9.8	10.0	9.8	9.5

Historical data source: IEA

TABLE IV-7
NORTHERN EUROPE: GASOIL/DIESEL TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	111.0	109.4	111.1	106.6	104.3	103.7	104.2	105.2	106.2	107.2	112.3	117.5	122.8
Imports													
Rest of Europe	2.8	5.4	4.0	3.3	2.6	2.8	2.8	4.1	2.4	2.4	3.0	3.6	4.1
Africa	0.4	0.1	0.1	0.0	0.0	-	-	-	-	-	-	-	-
Middle East	0.3	0.2	0.4	0.5	0.5	2.3	0.9	0.4	0.4	7.5	0.4	-	-
China	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-
India	-	1.3	1.9	3.8	2.7	2.0	2.0	2.0	2.0	1.5	0.5	-	-
Rest of Asia	0.1	1.4	1.7	2.3	1.8	-	-	-	-	-	-	-	-
North America	1.1	0.7	6.6	9.8	6.0	9.7	10.9	9.5	13.9	13.0	8.1	7.0	6.7
Latin America	0.1	0.5	0.3	0.4	0.3	0.5	0.5	0.5	0.5	0.5	5.3	5.6	0.5
CIS	10.8	17.2	11.4	9.5	16.2	9.8	9.8	9.8	9.8	9.8	13.6	10.9	13.2
Non-Specified / Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	15.5	26.7	26.4	29.7	30.2	27.0	26.8	26.3	29.0	34.7	30.9	27.2	24.5
Exports													
Rest of Europe	20.9	23.0	22.1	21.9	20.8	18.6	18.6	18.6	21.8	18.6	16.1	14.7	14.7
Africa	0.8	1.7	4.1	3.4	5.2	3.9	3.4	2.9	2.4	2.4	2.4	2.4	2.4
Middle East	0.0	0.1	0.1	0.1	0.5	0.2	0.2	0.2	0.2	0.1	-	-	-
China	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
India	-	0.0	0.0	-	0.0	-	-	-	-	-	-	-	-
Rest of Asia	0.0	0.0	0.0	0.0	0.1	-	-	-	-	-	-	-	-
North America	0.5	1.6	0.2	0.5	0.5	-	-	-	-	-	-	-	-
Latin America	0.1	0.1	0.2	0.4	1.4	0.7	0.5	0.4	0.2	0.1	-	-	-
CIS	0.0	0.0	-	-	0.4	0.6	0.6	0.6	0.6	0.6	-	-	-
Non-Specified / Other	4.1	0.1	2.1	4.7	0.8	-	-	-	-	-	-	-	-
Total	26.4	26.5	28.8	31.1	29.6	24.1	23.3	22.7	25.3	21.8	18.6	17.1	17.1
Net Imports / (Exports)	(10.8)	0.2	(2.4)	(1.3)	0.6	3.0	3.5	3.5	3.7	12.9	12.3	10.0	7.3

Historical data source: IEA

TABLE IV-8
NORTHERN AND CENTRAL EUROPE: GASOIL/DIESEL TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	176.9	184.1	185.4	180.5	176.6	176.7	178.4	180.9	182.6	184.3	192.7	201.2	209.8
Imports													
Rest of Europe	1.9	3.2	2.4	2.6	2.7	4.5	2.1	3.3	2.4	4.9	2.3	2.9	3.5
Africa	0.4	0.1	0.1	0.0	0.0	-	-	-	-	-	-	-	-
Middle East	0.3	0.2	0.4	0.5	0.6	2.3	0.9	0.6	0.5	7.8	8.1	5.9	3.2
China	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-
India	-	1.3	1.9	3.9	2.7	4.0	6.2	5.4	2.0	3.3	0.5	-	-
Rest of Asia	0.1	1.5	1.7	2.4	1.9	-	-	-	-	-	-	-	-
North America	1.1	0.8	6.9	10.0	6.8	9.7	10.9	9.5	13.9	13.0	8.1	7.0	6.7
Latin America	0.1	0.5	0.3	0.4	0.3	0.5	0.5	0.5	0.5	0.5	5.3	5.6	0.5
CIS	12.1	18.7	12.1	10.6	17.4	10.5	10.5	10.5	10.5	10.5	14.6	11.9	14.1
Non-Specified / Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	16.0	26.3	25.8	30.4	32.3	31.5	31.1	29.9	29.8	40.0	38.8	33.3	28.1
Exports													
Rest of Europe	5.4	8.9	6.9	7.0	5.3	4.9	4.9	4.9	4.9	4.9	4.9	3.2	2.7
Africa	0.8	1.7	4.1	3.4	5.2	3.9	3.4	2.9	2.4	2.4	2.4	2.4	2.4
Middle East	0.0	0.1	0.1	0.1	0.5	0.2	0.2	0.2	0.2	0.1	-	-	-
China	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
India	-	0.0	0.0	-	0.0	-	-	-	-	-	-	-	-
Rest of Asia	0.1	0.0	0.0	0.0	0.1	-	-	-	-	-	-	-	-
North America	0.6	1.6	0.3	0.5	0.5	-	-	-	-	-	-	-	-
Latin America	0.1	0.1	0.2	0.4	1.4	0.7	0.5	0.4	0.2	0.1	-	-	-
CIS	0.0	0.0	0.0	-	0.4	0.6	0.6	0.6	0.6	0.6	-	-	-
Non-Specified / Other	4.1	0.1	2.1	4.7	0.8	-	-	-	-	-	-	-	-
Total	11.1	12.4	13.6	16.1	14.2	10.4	9.6	9.0	8.4	8.1	7.3	5.6	5.1
Net Imports / (Exports)	4.9	13.9	12.2	14.2	18.2	21.1	21.5	20.8	21.4	31.9	31.5	27.7	22.9

Historical data source: IEA

TABLE IV-9
NORTHERN EUROPE: HEAVY FUEL OIL TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	51.2	52.5	47.5	40.5	40.2	39.4	38.3	38.1	37.8	37.6	36.3	34.9	33.6
Imports													
Rest of Europe	2.6	2.4	4.1	2.8	3.4	2.7	3.6	4.1	5.2	2.7	2.7	4.6	2.7
Africa	0.3	0.6	0.2	0.3	0.6	0.3	0.3	0.3	0.3	0.3	0.3	1.6	1.8
Middle East	0.0	0.1	0.1	0.3	0.0	-	-	-	-	-	-	-	-
China	0.0	0.0	0.4	0.3	0.2	-	-	-	-	-	-	-	-
India	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-
Rest of Asia	0.0	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-
North America	0.3	0.3	2.0	2.2	1.9	0.5	0.5	2.8	3.4	0.5	-	-	-
Latin America	0.6	0.3	1.6	0.8	0.9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CIS	0.7	2.3	7.3	9.3	12.6	14.0	13.5	11.1	9.5	11.9	11.7	8.9	10.9
Non-Specified / Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4.4	6.1	15.7	16.0	19.8	18.1	18.5	18.7	18.9	16.1	15.3	15.6	16.0
Exports													
Rest of Europe	6.8	6.3	6.7	7.3	6.2	7.2	6.8	7.0	6.8	6.3	6.7	7.2	7.4
Africa	0.4	0.6	1.0	1.1	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Middle East	0.3	0.1	0.5	0.0	0.0	-	-	-	-	0.2	-	1.1	1.5
China	0.1	0.0	-	-	0.1	-	-	-	-	-	-	-	-
India	-	-	0.1	-	-	0.2	0.3	0.4	0.5	0.6	0.9	0.9	0.9
Rest of Asia	1.2	2.1	6.3	5.8	12.1	2.7	2.7	4.3	2.7	2.7	2.7	5.2	2.7
North America	3.0	2.7	1.3	0.9	1.0	1.6	1.6	1.6	2.1	1.6	1.6	2.1	2.1
Latin America	0.1	0.4	0.8	0.8	0.1	1.1	2.7	2.6	3.0	3.6	1.9	4.5	4.8
CIS	-	-	0.0	-	-	-	-	-	-	-	-	-	-
Non-Specified / Other	-	-	-	-	-	4.5	2.2	-	-	6.5	8.6	-	-
Total	11.9	12.2	16.7	15.7	20.5	18.3	17.3	16.7	16.1	22.6	23.3	21.8	20.3
Net Imports / (Exports)	(7.4)	(6.1)	(1.1)	0.2	(0.7)	(0.1)	1.3	1.9	2.9	(6.6)	(8.0)	(6.2)	(4.3)

Historical data source: IEA

TABLE IV-10
NORTHERN EUROPE: TOTAL PRODUCTS TRADE FLOWS
(Million Tonnes per Year)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	328.7	331.7	304.1	288.2	280.9	278.5	277.4	278.1	278.8	279.4	282.2	285.0	287.7
Imports													
Rest of Europe	11.9	15.2	14.3	13.0	12.2	11.1	11.9	13.5	12.8	9.0	11.0	13.5	12.4
Africa	2.8	2.8	3.2	3.5	4.0	1.6	2.0	3.3	2.9	1.9	1.2	4.8	4.8
Middle East	5.1	7.8	6.4	5.3	5.9	10.0	9.2	9.2	9.0	15.6	9.5	10.5	10.9
China	0.1	0.3	0.7	0.6	0.5	0.2	0.2	0.2	0.2	0.2	-	-	-
India	0.1	2.4	4.5	6.8	4.8	3.8	3.8	3.8	3.8	3.3	2.4	1.1	0.5
Rest of Asia	0.3	1.6	4.7	4.6	3.0	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
North America	1.3	2.0	8.5	11.9	8.0	10.5	11.6	11.9	17.0	14.2	8.8	6.7	6.4
Latin America	1.4	2.5	3.1	2.9	2.4	3.0	3.9	2.7	3.3	4.1	9.1	7.0	2.1
CIS	12.8	24.5	22.2	22.9	32.0	27.0	26.1	24.0	22.5	24.6	27.3	21.2	24.1
Non-Specified / Other	3.4	2.7	14.0	11.0	6.4	-	-	-	-	-	-	-	-
Total	39.2	61.7	81.6	82.3	79.1	69.5	71.0	70.9	73.9	75.2	71.5	67.1	63.5
Exports													
Rest of Europe	50.1	44.3	41.1	41.0	39.7	35.6	35.1	35.0	37.8	34.1	31.2	29.3	28.7
Africa	1.8	4.0	11.1	10.4	9.3	7.4	7.0	6.5	6.6	6.9	9.9	11.7	12.9
Middle East	0.7	1.6	1.6	2.9	1.7	1.2	1.2	1.1	1.1	1.1	0.7	1.5	1.8
China	0.1	0.0	0.1	0.1	0.3	-	-	-	-	-	-	-	-
India	0.0	0.0	0.1	0.1	0.0	0.2	0.3	0.4	0.5	0.6	1.8	2.0	2.2
Rest of Asia	1.2	2.2	6.5	6.3	11.3	3.1	3.1	4.4	3.1	3.1	3.1	5.2	3.1
North America	8.7	26.5	25.0	21.7	18.4	19.1	20.1	20.5	20.9	20.5	20.1	16.0	13.7
Latin America	0.4	1.3	5.5	5.0	5.1	7.1	7.3	7.7	8.3	7.6	6.6	11.6	13.2
CIS	0.0	0.0	0.0	-	0.7	1.2	1.7	1.7	1.7	1.7	1.2	1.7	0.9
Non-Specified / Other	7.2	0.6	9.0	10.7	6.1	3.9	1.9	-	-	5.6	7.4	-	-
Total	70.3	80.7	100.0	98.1	92.6	78.7	77.4	77.3	80.0	81.3	82.0	79.2	76.4
Net Imports / (Exports)	(31.1)	(19.0)	(18.4)	(15.8)	(13.4)	(9.1)	(6.5)	(6.4)	(6.1)	(6.1)	(10.5)	(12.0)	(13.0)

Historical data source: IEA

V. GLOBAL REFINED PRODUCT DEMAND AND TRADE BALANCES

Compared with the relatively mature state of UK and European markets, with minimal scope for overall refined product demand growth out to 2030, world refined product demand is forecast to increase much strongly. By 2030, we expect world demand to have increased by 1.1 billion tonnes from 2010 levels, representing an annual average growth rate of about 1.2%.

In this section we will address world refined product demand by region, summarizing overall regional trends in demand for each product, as well as world refined product demand by product, which looks at the changing dynamics for each of the major refined products. Finally, we shall discuss current and future trends in global trade flows.

REFINED PRODUCT DEMAND

The majority of refined product demand growth out to 2030 will take place in the less developed, non-OECD countries. Over the forecast period, world demand may be broken down into three groups:

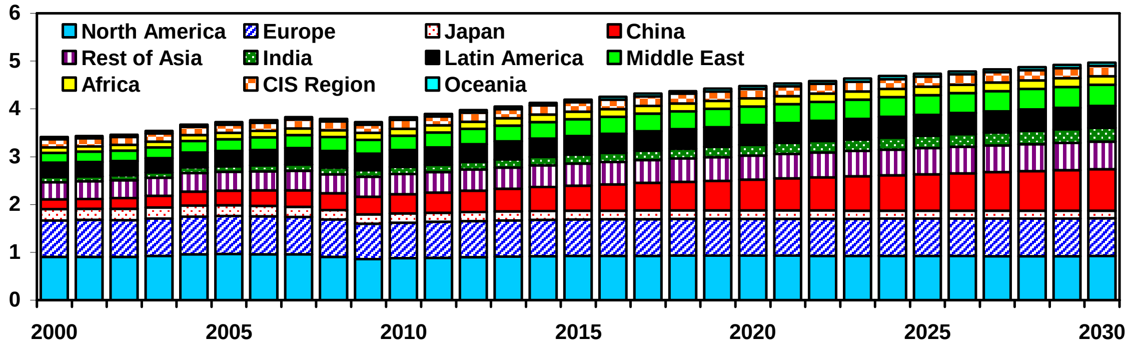
- **Large and mature.** Primarily, these comprise the markets of North America and OECD Europe, as well as OECD Asia

- **Small and growing.** These are regions such as Latin America, Africa, the CIS region and the Middle East, where although regional demand is expected to grow relatively strongly, and faster than in the mature markets, the overall market size is relatively small

- **Large and growing.** This group is the Asian market, including China and India.

The breakdown and expected growth trends of these markets is shown below, in Figure V-1

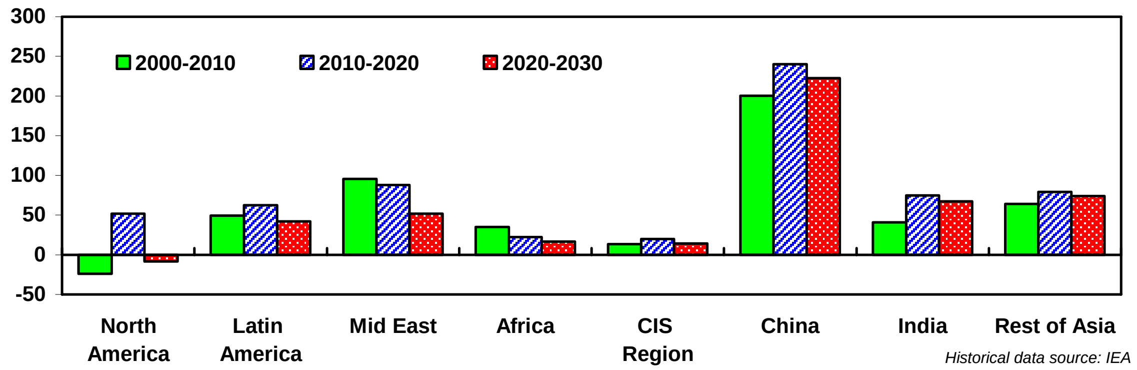
FIGURE V-1
WORLD REFINED PRODUCT DEMAND GROWTH, BY REGION
(Billion Tonnes)



Note: Includes Bunker Demand and Refinery Fuels. *Historical data source: IEA*

Looking back to the 1990s, even with the Asian Financial Crisis product demand growth in that region eclipsed growth in the rest of the world. Over the 1995-2006 period, China accounted for about half of total growth in Asia; however, future growth in Asia will be much more a result of that in China, as the decline in Japan is offsetting much of the growth in the rest of the region. These trends can be seen in Figure V-2, below.

FIGURE V-2
REGIONAL REFINED PRODUCT DEMAND GROWTH, BY DECADE
(Million Tonnes)



REFINED PRODUCT DEMAND, BY REGION

Demand patterns are affected in each country and region by the same fundamentals – supply, demand and pricing. However, the timing and magnitude varies from country to country and region to region. For the purposes of this study, we have analysed the supply/demand balances in each country, forecast them and summarized them into regional balances, with the details shown in Tables V-1 to V-12.

From the analysis, a number of overall trends are apparent for each region.

North America

US product demand of approximately 790 million tonnes accounts for about 21% of total world demand. Demand trends have been mixed since 2000; there was minimal growth over the 2000-2002 period as a result of the recession, but demand picked up again in 2003 and continued to grow strongly to 2005, helped by the strong economy. Demand was hit again from 2007 to 2010 as high oil prices resulted in a drop in gasoline demand especially and a change in consumer driving patterns. In the longer term, demand is not expected to change significantly; gasoline demand is likely to decline as vehicle efficiency improves, but this trend is expected to be offset by a modest increase in diesel demand.

In Canada, annual demand increases are generally small, although demand did decline over the 2005-2009 period. Changes in oil prices affect different parts of the country differently, with rising prices benefitting Western Canada as its economy is heavily dependent on resource development. Eastern Canada, on the other hand, benefits from low prices. Total demand is currently about 89 million tonnes, and is projected to be relatively unchanged over the forecast period.

Latin America

Product demand is largely determined by the economies of and events in Brazil, Mexico and Venezuela, as together these three countries account for 50% of total Latin America demand. Demand at the beginning of the previous decade was affected by the recession across most of the region in 1998-1999, such that demand declined over the 1999-2003 period. Demand picked up strongly again, rising from 296 million tonnes in 2003 to 342 million tonnes in 2008, but since then has stagnated again owing to political and civil unrest in Bolivia, Colombia, Ecuador and Venezuela. Out to 2030, long-term economic growth, helped especially by that in Brazil, is expected to lift demand again, with regional demand surpassing 400 million tonnes by 2017.

Middle East

Overall refined product demand has increased by about 9.5 million tonnes per year on average since 2000, although changes are very sensitive to crude oil prices. Growth slowed in 2003 as a result of the war in Iraq, but bounced back in 2004. Demand growth was negatively impacted in 2003 by the war in Iraq. The largest increases in growth were in 2006 and 2008, helped by rising crude oil prices, while demand in 2009, at a time of falling prices, was broadly unchanged. Demand is currently about 300 million tonnes, and in the longer term we expect demand to increasing quite strongly, at rates equivalent to about 7.0 million tonnes per year.

Africa

There is very little year-to-year growth in demand, averaging only about four million tonnes per year. Reduced growth is usually associated with crude price increases which cause demand in the large importing countries to decline. Conversely, price increases stimulate demand in the large crude oil exporting countries. The net result is to moderate product demand growth. Total demand, including bunkers, is currently about 148 million tonnes, and is not expected to reach 180 million tonnes until 2029.

CIS Region

From 2000 to 2005, overall refined product demand including bunkers averaged about 170 million tonnes and changed little, although there were small increases in gasoline and diesel demand while that for heavy fuel oil declined. Demand picked up again in the second half of the previous decade, such that by 2010 it is estimated to have increased to 184 million tonnes, including bunkers. Future demand growth is expected to be reasonably strong, reaching roughly 220 million tonnes by 2030. Much of this growth is expected to be driven by demand for middle distillates, which may have consequences for continuing levels of gasoil exports to Europe.

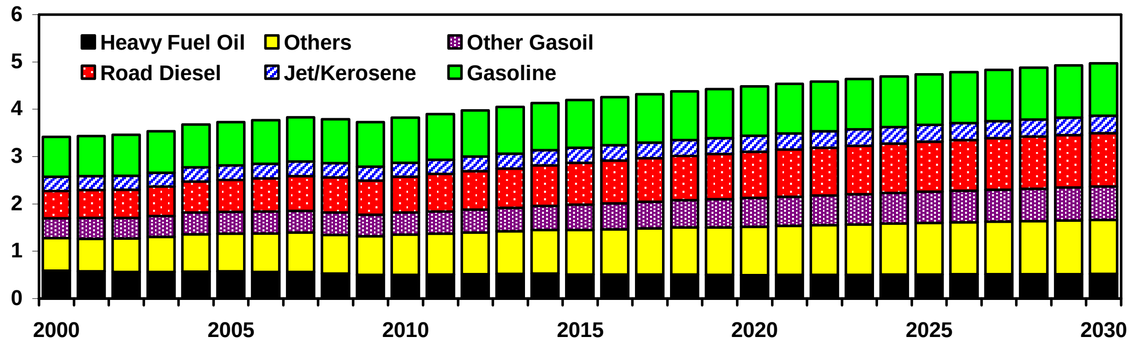
Asia

This region has historically been the fastest growing in the world. Over the 2000-2010 period demand in the region, including bunkers, grew by 263 million tonnes, with China alone accounting for 200 million tonnes of the increase. With demand in India growing by over 40 million tonnes the other most notable change is the decline in Japanese demand of 43 million tonnes over the same period. With China and India set to grow strongly, more than offsetting an expected further decline in demand in Japan, total product demand in Asia is forecast to reach 1.9 billion tonnes by 2030 – an increase of 62% from estimated 2010 levels.

REFINED PRODUCT DEMAND, BY PRODUCT

In Section IV, it was noted how there has been a general shift in demand from gasoline to diesel, a trend that is expected to continue. Worldwide, this trend may be less evident, as gasoline demand is still growing and is expected to continue to grow in the developing markets, but it is demand for gasoil/diesel that is projected to increase the most, as seen in Figure V-3.

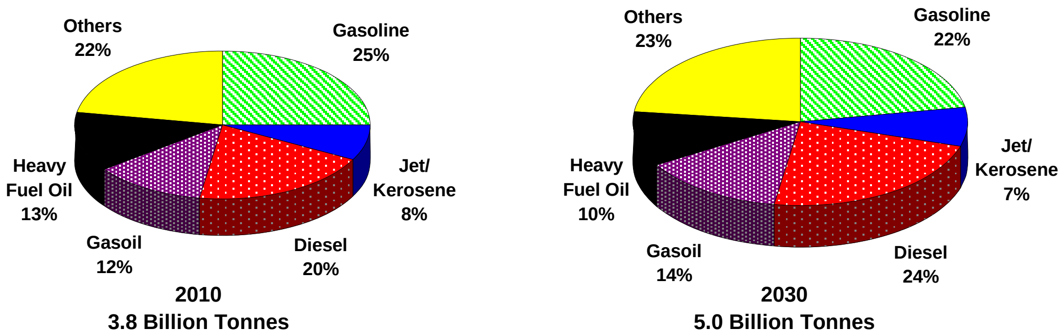
FIGURE V-3
WORLD REFINED PRODUCT DEMAND GROWTH, BY PRODUCT
(Billion Tonnes)



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

The rising share of diesel demand is can also be seen by comparing the share of products in 2010 and 2030 in Figure V-4, such that the share of all middle distillates (jet/kerosene and gasoil/diesel combined) is projected to increase to 44%.

FIGURE V-4
WORLD PRODUCT DEMAND AND PRODUCT SHARES: 2010 AND 2030



Note: Includes Bunker Demand and Refinery Fuels. "Others" includes Naphtha, LPG, Petcoke, Lubes, Bitumen, Waxes *Historical data source: IEA*

Demand trends for each of the major products are discussed below.

Gasoline

World consumption of gasoline grew at an average annual rate of about 1.2% per year over the 2000-09 period, even though consumption in Europe was declining over the entire period and the US demand dropped in 2008. Total world demand was 933 million tonnes in 2007, fell slightly in 2008 primarily due to the drop in demand in the United Stated, but recovered again in 2009, and is estimated to have averaged 953 million tonnes in 2010. Although demand is expected to continue increasing worldwide, reaching 1,100 million tonnes by 2030, the rate of growth will slow owing to both efficiency gains and as gasoline loses share to diesel in many countries.

The major trend in gasoline is that the quality is being improved worldwide. Lead has been eliminated in most of Europe, North America and much of Asia, and most remaining countries have lead phase-out plans in place. Sulphur and aromatics contents are being reduced in most developed countries, and the trends are also spreading to other regions. The use of oxygenates for both octane enhancement and environmental benefit is continuing to grow, even though MTBE use in the United States has been essentially eliminated due to voluntary state-level bans and federal action. Incentives for the use of ethanol are expected to expand for a variety of reasons; in North America ethanol consumption is viewed as a benefit to the agricultural sector as well as to reduce dependence on imports, while Brazil's program evolved primarily to reduce oil imports. In Europe and elsewhere, incentives for ethanol and other renewable fuels are being advanced as an avenue to help meet renewable energy targets.

Jet/Kerosene

Kerosene for jet fuel use was one of the most rapidly growing refined products prior to 2001, growing by about 3.6% per year. However, because of security concerns since the events of 11th September 2001, jet fuel consumption stagnated at 208 million tonnes over the 2001-2003 period. Growth resumed in 2004 and demand grew to 243 million tonnes by 2008 as security concerns lessened and business in Asia boomed. However, the global economic slowdown in 2008-2009 caused demand to fall again, although it recovered again in 2010 to average 2007 levels. Some further recovery is likely, with a resumption of steady growth.

Kerosene use for heating, lighting and cooking peaked just before 2000 but has steadily declined since then to 57 million tonnes, mainly because of increased use of LPG, natural gas and electricity in most regions. A slow decline is forecast to continue.

In most market regions jet fuel dominates the use of kerosene, but there are a few exceptions. There are a few countries in Asia and the Middle East that use more kerosene for lighting and cooking than jet fuel.

Gasoil/Diesel

World gasoil/diesel consumption, including bunker fuel use, exceeded gasoline consumption for the first time in 1996 and diesel demand continues to grow faster than that for gasoline. Demand increased at an overall rate of about 2.5% annually from 2000 to 2008, even though growth stagnated during the 2001-2002 period, and although it declined in 2009 as a result of the economic slowdown demand recovered again in 2010, to an estimated 1,224 million tonnes. Consumption of gasoil/diesel is much more widely distributed among world regions than gasoline, and the overall growth rate for gasoil/diesel over the forthcoming decade and indeed out to 2030 will remain higher than that for gasoline, as diesel captures market share from gasoline in many countries.

Diesel fuel use is growing rapidly in most countries, whereas heating gasoil growth is being negatively impacted by the shift toward increased use of natural gas, electricity and renewable fuels for heating. Regulations are requiring that the sulphur content be reduced, whether it is used for diesel or for burning, in most regions of the world, such that the United States, Europe, Japan, and other countries are going to even lower sulphur specifications.

The United States mandated a reduction to 15 ppm from 2006, whereas Europe and Japan have gone even lower, to 10 ppm.

Heavy Fuel Oil

Heavy fuel oil has been displaced significantly from stationary boilers by other fuels, mainly by natural gas, resulting in a slow worldwide decline through to an estimated 337 million tonnes in 2010. Demand is expected to continue to decline slowly over the long term as natural gas continues to compete with heavy fuel oil. Following steady growth of 5.0% per year on average from 2000 to 2007, bunker fuel demand declined in 2008 and 2009, although it too is estimated to have picked up in 2010, to 165 million tonnes, in line with the general economic recovery. In the longer term, especially in the 2015-2020 period, growth will be slowed by the partial switch to marine diesel. A significant amount of refinery conversion capacity is being added to balance supply and demand as the world’s crude slate is getting heavier.

About 35% of total residual fuel oil consumed in the world is used in Asia, where demand is expected to decline over time, such that the Middle East is the only region where strong growth in residual fuel is projected. The impact of the Sulphur in Liquid Fuels Directive, which began in 2003 on European residual fuel oil bunkers, has continued to result in increased displacement of high-sulphur grades from the Atlantic Basin to the Middle East and Asia. As environmental concerns are increasing, there is a definite shift towards cleaner-burning fuels, and in every region the sulphur content of residual fuel oil is being reduced.

REGIONAL REFINED PRODUCT TRADE

Trade in the major products has been increasing steadily since the 1980s, such that by 2000 exports of all refined products averaged about 22% of refinery production. These are expected to increase further in the medium term, averaging about 26% in 2015, and although towards 2030 the trade share of production is expected to decline slightly total volumes are still projected to increase, as shown in the table below.

MAJOR REFINED PRODUCTS: WORLD PRODUCTION AND TRADE

	2000			2015			2030		
	Production Million Tonnes	Shipments Million Tonnes	% of Production	Production Million Tonnes	Shipments Million Tonnes	% of Production	Production Million Tonnes	Shipments Million Tonnes	% of Production
Gasoline	820	114	13.8	948	170	18.0	1,035	158	15.3
Jet/Kerosene	309	61	19.8	335	87	26.0	378	91	24.1
Gasoil/Diesel	1,020	206	20.2	1,402	311	22.2	1,804	331	18.4
Heavy Fuel Oil	627	214	34.1	555	284	51.2	562	298	53.1

Tighter product specifications around the world will not significantly affect trade patterns over the long-term, as local refineries will invest to meet demand. For example, in the United States most traditional supply sources have been able to continue supplying low-sulphur diesel and reformulated/ethanol-ready gasoline. Others have continued to export but the product is imported as intermediates or feedstocks. The move in Europe to low-sulphur gasoline diesel has been met by local industry, as is the case throughout Asia.

The major change in international trade patterns has been between Asia and the Middle East. Prior to the drop in demand in 1998, demand in Asia was increasing by 30-40 million tonnes annually, and Asian refiners were scrambling to build enough refinery capacity to meet the rapidly growing demand, such that there was a significant trade route of products from the Middle East to Asia. As a result, about 4.2 million B/D of new refining capacity came onstream during the 1995-2000 period, whereas demand increased by only 3.3 million B/D. The resulting increase in refining capacity, combined with the reduced demand (particularly in 1998) caused Asian net imports to fall from 85 million tonnes in 1995 to only 30 million tonnes in 2009, negatively affecting Middle East suppliers. Towards 2030, however, net product imports are expected increase again, to 63 million tonnes, as demand growth is projected to outstrip additional refinery-builds in the region, particularly in China and India.

Tables V-13 to V-16 show the world trade patterns for gasoline, jet/kerosene, gasoil/diesel and heavy fuel oil between regions.

GASOLINE TRADE PATTERNS

World gasoline consumption is greatly influenced by events in the United States, as this country accounts for about 30% of total demand. Even though gasoline consumption is increasing rapidly in many developing countries, the base level is small and diesel dominates motor vehicle fuels in most regions other than North America.

Since gasoline is generally the highest value product, many countries attempt to be self-sufficient or have small surpluses. Even though total trade in gasoline is about 170 million tonnes, the North America, Africa and the Middle East are the only regions in which net imports of gasoline are at least approximately 10 million tonnes. US gasoline imports (including unfinished gasoline) have increased from around 20 million tonnes in 2000 to over 40 million tonnes in recent years, although these have fallen since 2008 and are likely to continue doing so. Because of its proximity, Latin America was historically the major supplier of gasoline to the United States, although imports from Europe increased significantly since 2000. Canadian exports to the US East Coast (most of which comes from the refiners in the Maritime Provinces) average about 5.5 million tonnes. Canada will likely continue to supply its surplus gasoline to the United States, but as discussed in the previous section imports from Europe are likely to have reached a peak.

Latin America has a very active gasoline trade with the region, historically being a net exporter but Latin America became a net importer in 2006. There are a large number of small countries that require small volumes of gasoline to meet local demand and Mexico has become a sizable importer, of about 14 million tonnes in 2008-2009, particularly along the US border. Exports to the U.S. peaked in 2000 at about 14 million tonnes but have dropped off to around 4.7 million tonnes as refinery operations in Latin America have slowed down. The Virgin Islands and Venezuela are the largest exporters to the United States.

Historically, the aggregated Asia region was a net importer of gasoline even though Singapore is a large net exporter. However, Asia became a net exporter of gasoline from the mid-1990s, and exports from China, Taiwan, South Korea and Thailand have increased significantly in recently years. A significant portion of the gasoline exports from the Asia countries, including China, are imported by Singapore to be reprocessed, upgraded and re-exported.

Prior to 2000, the Middle East was a small net exporter of gasoline, most of which was exported to Africa and Asia. However, even though production increased steadily demand has grown even faster, such that the region is a structural a net importer, currently of about 10 million tonnes. Even though a significant amount of new capacity is planned, the region is forecast to remain a net importer through to 2030.

Africa is a net importer of gasoline of about nine million tonnes. There is about three million tonnes of trade in gasoline between African countries, with Latin America and Europe being the major outside sources of supply. Net imports are expected to increase out to 2030 as rising demand outpaces increases in production.

Prior to the collapse of the political and economic system in the CIS Region and Eastern Europe, there was a large amount of trade in gasoline between the Republics and between the CIS Region and Eastern Europe. Trade dropped significantly in the early 1990s but exports increased in the early part of last decade up to 10.3 million tonnes in 2005. The region is a net exporter of about 2.2 million tonnes, most of which is shipped to the United States and the Middle East. Exports to the United States peaked at about 3.0 million tonnes in 2005, but as US demand has fallen so net exports have declined too, to about 1.3 million tonnes.

The gasoline imbalance that is reported as "other" exports is primarily the discrepancies in the trade statistics caused by some product being reported as gasoline exports by some countries and reported as naphtha imports by other countries. This frequently occurs with exports of low-octane gasoline. Also, in the trade statistics, all of the destinations of the exports are not explicitly identified. Alcohol blending in Brazil and gasoline produced from coal in South Africa cause imbalances between consumption and refinery production, as well. Overall, ethanol blending will increase in many countries.

JET/KEROSENE TRADE PATTERNS

The largest current net importer of jet/kerosene is currently Europe. As discussed in the previous section, this has been the result of rapid growth in airline travel, with the domestic refining system unable to meet the rising demand. Most of these imports come from the Middle East, with additional supplies from Latin America and Asia.

The Middle East is the largest net exporter, of about 20 million tonnes, and is also a primary supplier to parts of Africa, although northern African countries supply countries in the Eastern Mediterranean. The other major net exporter is Asia, totalling 16 million tonnes, and to a smaller degree Latin America, both of which supply the US market.

Similar to the statistics for gasoline, the kerosene/jet fuel imbalance that is reported as "other" imports is caused primarily by the discrepancies in the trade statistics caused by some product being reported as jet fuel exports when it is actually used as jet fuel bunkers for international flights, in addition to exports to unidentified markets.

GASOIL/DIESEL TRADE PATTERNS

As is the case for jet/kerosene, Europe is the largest net importing region of gasoil/diesel, with most of the deficit supplied from the CIS Region. As discussed in Section IV there is also a large volume of intra-Europe trade.

Up to 2005 Asia, including Japan, Singapore and China, was a net importer of gasoil/diesel, with the Middle East being the major supplier. However, as production in Asia increased so the gasoil/diesel balance has changed, such that by 2010 net exports reached an estimated 37 million tonnes. The region is expected to remain a net exporter, although by 2030 the net balance is forecast to fall slightly, to about 24 million tonnes. An assumption of increasing refinery production in China is such that in the long term it too will become a net exporter, despite the projected increase in demand. More significant, however, are the planned refinery expansions in India, which by 2020 could see the country remaining a net exporter of about 13 million tonnes despite the increase in demand.

The largest net exporter continues to be the CIS region, of 40-45 million tonnes, of which most is exported to Europe. Future volumes will depend much on the Russian government's policy regarding crude and product exports, as well as the extent of restructuring of the country's refining industry; however, future investment plans are expected to result in high levels of net exports out to 2030.

For much of the period from 2000 to 2007 the United States was a net importer of gasoil/diesel, very broadly in the region of ten million tonnes up to 2006. A change in refinery configuration to reduce gasoline yields as demand declined and an increase diesel production resulted in the country switching to become a net exporter in 2008, of 16 million tonnes, with European markets being a destination. By 2010 net US exports are estimated to have neared 22 million tonnes; however, after 2015 increasing national diesel demand is expected to result in a further change in US trade balances, such although it is likely to remain a net exporter volumes will decline towards 2030.

Latin America is more broadly in balance, although there is considerable intra-Latin American trade of about 8.5 million tonnes, and trade flows between Latin America and the United States is such that the US East Coast is Latin America's principal export market while US Gulf Coast refineries export excess gasoil/diesel to Latin America. This pattern is expected to continue, with Latin America continuing to export to the United States.

Africa has been a net importer since 1998, and currently imports about 20 million tonnes. Demand has been growing strongly, by over 50% from 2000 to 2010, outstripping production both in terms of volume and growth rates. Currently, the Middle East and Southern Europe are the main suppliers. Exports will increase as some of the new GTL plants come onstream, but these will have minimal impact on the overall balance. By 2030 net imports are projected to increase to 28 million tonnes.

The imbalance that is reported as "other" imports is caused primarily by the discrepancies in the trade statistics where some products are reported as distillate exports by some countries and reported as feedstock imports by others. Also, all of the destinations of the distillate exports are not explicitly identified in the trade statistics.

HEAVY FUEL OIL TRADE PATTERNS

Heavy fuel oil has three primary uses: (1) fuel for stationary boilers, (2) bunker fuel, and (3) feedstock for conversion units. Heavy fuel oil feedstock is utilised before blending to fuel oil specifications; however, some topped crude (crude oil that has undergone a very simple atmospheric distillation process) is counted as heavy fuel oil by the producing country but is classified as an unfinished oil by the importer. A considerable volume of heavy fuel oil is blended by traders/marketers, of which the origin and destination of the fuel oil can be confused. As a result, these factors account for the difference of about 50 million tonnes between production and consumption data on a global basis, as well as contributing to the large proportion of production being traded, at around 51% compared with 20%-28% for the other products.

The regions with lower-conversion refineries produce surplus fuel oil which is exported mostly to the OECD regions with high-conversion refineries that use it as a feedstock and minimise heavy fuel oil production. As discussed in Section IV, there is substantial trade within the European market, including imports from the CIS and exports to the Middle East and Asia. Rapidly increasing demand within the Middle East has resulted in the region moving from being a net exporter of about 27 million tonnes in 2000 to a position of being an small net importer in 2010, and future demand growth is such that net imports are projected to increase to 10 million tonnes by 2020 and 15 million tonnes by 2030. This is having a further knock-on effect on trade flows, as net import requirements by Asian markets, currently about 45 million tonnes, which had been supplied by the Middle East, are now being met by large-scale shipments in VLCCs from Europe. The Asia region, including China and India but dominated by the Singapore bunker market, is expected to remain a net importer, although increasing levels of refining capacity by 2030 are such that net import requirements are projected to fall from current levels of 56 million tonnes to 27 million tonnes by 2030.

From 2000 to 2008 the United States was a net fuel oil importing region, relying primarily on Latin America and Africa for its import requirements. There were also some trade flows from Europe to the US East Coast, primarily for utility use, although the recent sharp fall in US natural gas prices has decreased the attractiveness of fuel oil as a utility burning fuel. The United States is a marginal exporter, and about half of the trade is with Latin America.

Africa is a net exporter of about eight million tonnes of heavy fuel oil. Exports from Algeria and Libya are notable for being high-quality, low-sulphur streams, which are used primarily for blending and for use as a feedstock for refinery upgrading. About six million tonnes are exported to Latin America, with an additional amount to southern European countries. There is also some trade to the United States. Few major changes are expected in the long term.

The reported imbalance that appears as “other” imports results from the various reporting disparities referred to above. Many countries report exports of heavy fuel oil that is reported as an unfinished oil or a feedstock by the importing country. This is particularly true for the CIS Region.

TABLE V-1
REFINED PRODUCT BALANCE
NORTH AMERICA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	360	372	350	356	357	358	360	360	358	355	336	310	297
	Imports	29	51	51	44	42	42	41	40	39	38	32	26	23
	Exports	(11)	(14)	(14)	(15)	(20)	(17)	(17)	(17)	(17)	(17)	(16)	(15)	(15)
	Biogasoline supply	-	12	30	33	38	39	39	39	40	40	40	40	39
	Supply Adjustments	14	1	(1)	(1)	2	0	1	3	5	7	10	9	10
	Consumption	392	423	416	417	419	421	423	425	425	424	402	371	353
Jet/Kerosene	Production	81	79	73	69	70	71	73	74	75	76	79	81	84
	Imports	9	11	7	6	6	7	7	7	7	7	7	8	9
	Exports	(2)	(3)	(3)	(4)	(5)	(4)	(3)	(4)	(3)	(4)	(3)	(3)	(3)
	Supply Adjustments	(0)	(0)	0	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	88	86	77	70	72	74	76	77	78	79	83	87	90
Gasoil/Diesel	Production	203	224	240	227	234	236	241	246	248	251	256	267	276
	Imports	15	17	14	13	13	14	14	14	15	16	17	17	18
	Exports	(14)	(13)	(34)	(36)	(41)	(39)	(43)	(43)	(42)	(39)	(29)	(28)	(31)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)
	Biodiesel supply	-	0	1	1	2	3	4	4	4	4	4	4	4
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	2	(1)	(1)	(1)	2	0	2	2	2	2	5	6	7
	Consumption	206	227	220	202	211	213	218	222	226	233	252	265	273
Heavy Fuel Oil	Production	45	44	43	40	38	39	36	36	36	36	35	34	33
	Imports	22	32	21	19	22	20	19	19	19	17	16	17	18
	Exports	(9)	(17)	(24)	(26)	(25)	(22)	(20)	(19)	(19)	(21)	(20)	(18)	(17)
	Int'l Bunkers	(1)	(1)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(0)	(1)	(1)	(1)
	Supply Adjustments	(0)	1	1	(0)	0	(0)	0	0	0	0	(0)	(0)	(0)
	Consumption	57	58	40	32	35	35	35	35	35	31	30	32	33
Other Products	Production	165	170	164	155	161	162	167	170	173	176	183	188	191
	Imports	18	25	20	15	15	16	16	17	17	17	18	19	20
	Exports	(27)	(31)	(34)	(35)	(40)	(39)	(40)	(42)	(42)	(44)	(46)	(45)	(46)
	Int'l Bunkers	0	0	0	-	(0)	-	0	0	-	-	-	0	0
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	4	5	5	6	7	6	6	6	6	7	7	7	7
	Consumption	161	170	156	141	143	145	149	152	154	156	163	169	172
Total	Production	855	888	870	846	860	865	877	886	889	893	889	881	882
	Imports	93	137	113	98	99	98	97	97	97	95	91	88	87
	Exports	(63)	(78)	(109)	(117)	(131)	(122)	(123)	(125)	(123)	(124)	(113)	(110)	(112)
	Int'l Bunkers	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)
	Biofuels/CTL/GTL supply	-	12	31	34	40	42	43	43	43	44	44	44	43
	Supply Adjustments	19	6	4	3	12	6	9	11	13	16	22	22	24
	Consumption	903	965	909	862	879	889	901	911	918	923	930	923	922

Historical data source: IEA

TABLE V-2
REFINED PRODUCT BALANCE
LATIN AMERICA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	70	76	76	74	70	75	77	78	82	84	89	92	94
	Imports	14	19	23	24	27	25	24	25	25	25	27	28	30
	Exports	(20)	(22)	(20)	(15)	(12)	(13)	(14)	(14)	(16)	(18)	(19)	(18)	(17)
	Biogasoline supply	-	6	5	5	6	6	6	6	6	6	7	7	8
	Supply Adjustments	8	1	2	1	2	1	2	2	2	2	2	2	2
	Consumption	72	80	87	89	92	94	95	97	98	100	106	111	116
Jet/Kerosene	Production	21	20	19	18	16	18	19	19	20	21	23	24	25
	Imports	4	2	4	4	4	4	4	4	4	4	4	4	5
	Exports	(10)	(9)	(8)	(7)	(5)	(6)	(7)	(7)	(7)	(7)	(7)	(8)	(8)
	Supply Adjustments	(0)	(0)	(0)	(0)	(0)	0	0	0	0	0	0	0	0
	Consumption	15	14	15	15	16	16	16	17	17	18	19	20	22
Gasoil/Diesel	Production	91	103	106	104	96	104	106	108	117	128	148	156	165
	Imports	21	21	30	26	37	33	35	35	29	26	24	25	27
	Exports	(24)	(22)	(20)	(18)	(15)	(16)	(16)	(17)	(17)	(22)	(30)	(30)	(30)
	Int'l Bunkers	(3)	(4)	(3)	(3)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(5)	(5)
	Biodiesel supply	-	0	1	2	2	2	2	2	2	2	3	3	3
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	1	(2)	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	0	1	1
	Consumption	85	97	113	109	116	119	123	125	127	130	141	151	162
Heavy Fuel Oil	Production	87	80	81	75	71	73	74	75	77	74	69	66	63
	Imports	22	21	22	21	20	21	22	22	23	23	25	27	29
	Exports	(36)	(38)	(39)	(37)	(34)	(35)	(36)	(38)	(39)	(36)	(34)	(33)	(32)
	Int'l Bunkers	(8)	(10)	(13)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(17)	(19)
	Supply Adjustments	(1)	3	(0)	1	0	0	0	0	0	0	0	0	0
	Consumption	65	56	52	48	45	46	46	46	46	46	44	43	42
Other Products	Production	68	74	72	71	65	71	72	74	79	85	94	98	102
	Imports	9	12	14	13	19	18	18	18	16	14	12	12	12
	Exports	(17)	(22)	(18)	(16)	(13)	(16)	(16)	(16)	(17)	(19)	(20)	(20)	(20)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(3)	(3)	(1)	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(1)
	Consumption	57	61	67	67	69	72	74	75	78	80	86	89	93
Total	Production	337	352	355	341	318	342	348	354	374	392	422	436	449
	Imports	70	75	95	89	106	101	103	105	97	92	92	96	102
	Exports	(107)	(112)	(104)	(93)	(79)	(87)	(89)	(91)	(96)	(102)	(109)	(109)	(106)
	Int'l Bunkers	(11)	(13)	(16)	(16)	(15)	(17)	(17)	(18)	(18)	(19)	(20)	(22)	(24)
	Biofuels/CTL/GTL supply	-	6	7	7	8	8	8	9	9	9	10	10	11
	Supply Adjustments	4	0	(0)	(0)	0	0	1	1	1	1	2	3	3
	Consumption	293	309	335	328	338	347	354	360	367	373	396	414	434

Historical data source: IEA

TABLE V-3
REFINED PRODUCT BALANCE
MIDDLE EAST
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	34	41	45	49	49	51	54	57	61	63	71	73	76
	Imports	4	13	16	16	14	14	13	13	11	11	10	12	15
	Exports	(4)	(5)	(6)	(5)	(6)	(6)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
	Biogasoline supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	1	(0)	0	(5)	0	0	0	0	0	0	0	0	0
	Consumption	36	49	54	55	57	60	62	64	67	69	76	80	86
Jet/Kerosene	Production	35	38	37	38	40	42	42	42	43	44	48	49	50
	Imports	1	2	1	1	1	1	1	1	1	1	1	1	1
	Exports	(15)	(20)	(18)	(19)	(20)	(21)	(21)	(21)	(22)	(22)	(24)	(23)	(22)
	Supply Adjustments	(0)	(0)	(0)	0	0	0	1	1	1	1	1	1	1
	Consumption	20	20	21	21	21	22	22	23	24	24	27	28	30
Gasoil/Diesel	Production	87	94	99	102	100	104	107	106	111	119	143	152	162
	Imports	3	9	15	14	17	16	14	16	15	15	14	14	14
	Exports	(28)	(28)	(23)	(27)	(26)	(27)	(27)	(26)	(27)	(32)	(40)	(40)	(39)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(4)	(5)	(5)
	Biodiesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL diesel supply	-	-	1	1	1	2	3	3	4	4	4	4	4
	Supply Adjustments	(0)	0	(0)	0	1	2	3	4	4	4	4	4	4
	Consumption	61	75	90	89	92	95	97	100	102	105	116	126	138
Heavy Fuel Oil	Production	90	88	93	94	91	94	96	97	102	100	107	110	114
	Imports	13	15	21	21	22	22	23	23	24	25	26	28	30
	Exports	(41)	(28)	(22)	(23)	(20)	(20)	(19)	(18)	(18)	(15)	(15)	(15)	(14)
	Int'l Bunkers	(13)	(16)	(21)	(22)	(22)	(23)	(24)	(25)	(26)	(26)	(29)	(31)	(34)
	Supply Adjustments	3	1	(1)	(2)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)
	Consumption	53	60	70	69	69	72	75	77	82	83	89	91	94
Other Products	Production	40	51	53	53	56	58	59	60	62	65	76	79	82
	Imports	1	2	2	2	2	2	2	2	2	2	2	3	3
	Exports	(27)	(36)	(35)	(33)	(33)	(35)	(35)	(36)	(37)	(40)	(46)	(48)	(50)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	0	0	0	1	1	1	2	2	2	2	2
	Supply Adjustments	9	13	13	13	14	14	14	14	14	15	16	17	19
	Consumption	23	29	33	36	39	40	41	42	43	44	49	52	56
Total	Production	286	311	328	336	336	349	358	363	378	392	445	464	485
	Imports	23	41	54	55	56	55	54	56	54	54	53	58	63
	Exports	(115)	(117)	(105)	(107)	(104)	(108)	(108)	(106)	(108)	(114)	(129)	(130)	(130)
	Int'l Bunkers	(13)	(16)	(21)	(22)	(23)	(24)	(25)	(26)	(26)	(27)	(33)	(36)	(38)
	Biofuels/CTL/GTL supply	-	-	1	1	1	2	4	5	5	5	5	5	5
	Supply Adjustments	13	14	11	6	13	13	14	14	14	15	16	17	19
	Consumption	193	233	268	269	279	288	298	307	317	325	356	378	403

Historical data source: IEA

TABLE V-4
REFINED PRODUCT BALANCE
AFRICA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	18	20	20	18	18	18	18	19	19	19	21	22	24
	Imports	8	12	12	16	15	16	16	16	17	17	18	19	19
	Exports	(2)	(3)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(3)
	Biogasoline supply	-	-	-	-	-	-	0	0	0	0	0	0	0
	Supply Adjustments	0	(1)	2	(0)	0	0	0	0	0	0	0	0	0
	Consumption	24	28	32	32	31	32	32	33	34	34	37	39	41
Jet/Kerosene	Production	12	12	11	11	12	12	12	12	12	12	13	13	13
	Imports	5	5	5	7	7	7	7	7	7	7	8	8	9
	Exports	(4)	(4)	(4)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
	Supply Adjustments	(0)	(0)	0	(0)	0	0	0	0	0	0	0	0	0
	Consumption	12	12	13	13	14	14	14	15	15	15	16	16	17
Gasoil/Diesel	Production	27	33	32	30	33	34	36	36	37	37	40	44	47
	Imports	13	13	20	24	23	23	24	25	25	26	28	29	31
	Exports	(6)	(5)	(2)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Int'l Bunkers	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(3)
	Biodiesel supply	-	-	0	0	0	0	0	0	0	0	0	0	0
	CTL/GTL diesel supply	5	5	5	5	5	5	5	5	5	6	6	6	6
	Supply Adjustments	5	6	6	6	7	6	6	6	6	6	7	7	7
	Consumption	37	46	55	56	58	59	61	62	63	65	70	74	79
Heavy Fuel Oil	Production	37	39	35	31	32	32	33	32	32	32	32	31	31
	Imports	2	5	4	5	5	5	4	4	4	4	4	4	5
	Exports	(17)	(17)	(15)	(13)	(14)	(13)	(13)	(13)	(13)	(13)	(13)	(12)	(12)
	Int'l Bunkers	(7)	(7)	(5)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(6)
	Supply Adjustments	1	0	1	1	0	0	0	0	0	0	0	0	0
	Consumption	16	20	20	19	19	19	19	19	19	19	18	18	18
Other Products	Production	17	19	19	20	22	23	24	24	25	25	26	27	27
	Imports	2	3	3	3	3	3	3	3	3	3	4	4	4
	Exports	(9)	(9)	(8)	(10)	(12)	(12)	(13)	(13)	(13)	(13)	(14)	(14)	(14)
	Int'l Bunkers	-	(0)	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	2	2	2	2	2	2	2	2	2	2	2	2	2
	Supply Adjustments	1	0	0	1	1	0	1	0	1	1	1	1	1
	Consumption	12	16	15	15	16	16	17	17	17	17	18	19	20
Total	Production	110	124	118	110	117	119	123	124	125	127	132	137	142
	Imports	30	38	44	55	53	54	54	55	57	57	61	64	68
	Exports	(39)	(37)	(31)	(32)	(35)	(35)	(36)	(36)	(36)	(36)	(36)	(37)	(37)
	Int'l Bunkers	(8)	(9)	(6)	(6)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(8)	(9)
	Biofuels/CTL/GTL supply	7	7	7	6	7	7	7	7	7	7	8	8	8
	Supply Adjustments	1	0	4	2	2	2	2	2	2	2	2	2	2
	Consumption	101	123	135	136	138	140	143	145	147	150	159	166	174

Historical data source: IEA

TABLE V-5
REFINED PRODUCT BALANCE
CIS
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	36	46	49	49	48	51	50	50	50	50	51	52	54
	Imports	4	2	5	5	5	5	5	5	5	5	5	5	5
	Exports	(6)	(10)	(8)	(8)	(6)	(7)	(7)	(6)	(6)	(6)	(5)	(5)	(9)
	Biogasoline supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	0	0	0	(0)	0	0	0	0	0	0	0	0	0
	Consumption	34	38	46	46	48	48	49	49	49	50	51	51	51
Jet/Kerosene	Production	11	13	14	13	14	14	15	15	15	15	16	17	18
	Imports	0	1	1	1	1	1	1	1	1	1	1	1	1
	Exports	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Supply Adjustments	(0)	(0)	(0)	-	-	-	-	-	-	-	-	-	-
	Consumption	11	12	14	13	14	14	15	15	15	15	16	17	18
Gasoil/Diesel	Production	64	82	91	89	88	93	94	94	95	96	102	103	113
	Imports	4	2	6	5	6	6	6	6	6	6	6	5	5
	Exports	(30)	(44)	(48)	(50)	(47)	(52)	(51)	(52)	(52)	(52)	(55)	(52)	(59)
	Int'l Bunkers	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(4)	(5)
	Biodiesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	0	0	0	0	0	0	0	1	2	2	2	2	2
	Consumption	38	40	48	44	46	47	48	48	49	49	52	55	57
Heavy Fuel Oil	Production	70	85	86	85	87	91	89	88	86	87	84	83	87
	Imports	1	1	2	1	1	1	1	1	1	1	1	1	1
	Exports	(27)	(55)	(67)	(69)	(67)	(72)	(70)	(68)	(67)	(67)	(65)	(66)	(71)
	Int'l Bunkers	(3)	(3)	(4)	(3)	(3)	(4)	(4)	(4)	(4)	(4)	(4)	(5)	(6)
	Supply Adjustments	(1)	1	0	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	41	28	17	15	17	17	17	17	17	17	15	14	12
Other Products	Production	47	57	63	63	65	67	67	67	67	67	70	71	74
	Imports	1	1	2	2	2	2	2	2	2	2	2	2	2
	Exports	(3)	(8)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(9)	(8)	(6)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	0	(1)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(0)	(0)	0
	Consumption	45	49	53	53	54	56	56	57	57	58	62	65	70
Total	Production	228	282	302	299	302	316	315	314	313	315	322	326	346
	Imports	10	8	15	13	15	15	15	15	15	15	15	15	15
	Exports	(67)	(119)	(134)	(137)	(131)	(142)	(139)	(138)	(135)	(136)	(135)	(132)	(145)
	Int'l Bunkers	(3)	(3)	(4)	(4)	(4)	(5)	(5)	(5)	(5)	(6)	(7)	(9)	(10)
	Biofuels/CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	0	(0)	(1)	(1)	(2)	(2)	(2)	(0)	1	1	2	2	3
	Consumption	168	168	178	170	180	183	184	186	188	190	197	202	208

Historical data source: IEA

TABLE V-6
REFINED PRODUCT BALANCE
CHINA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	41	55	64	72	77	78	83	88	94	99	130	166	194
	Imports	-	-	2	0	0	0	0	0	0	0	0	0	0
	Exports	(5)	(6)	(2)	(5)	(6)	(3)	(4)	(4)	(4)	(4)	(5)	(3)	(1)
	Biogasoline supply	-	1	2	2	2	2	2	2	3	3	4	5	5
	Supply Adjustments	(2)	(1)	(4)	(2)	(1)	(1)	(1)	(1)	(1)	(2)	(1)	(0)	0
	Consumption	35	49	62	67	72	76	81	85	91	96	128	167	199
Jet/Kerosene	Production	9	10	12	15	17	18	19	20	21	21	25	29	31
	Imports	2	3	6	6	5	5	5	5	5	5	5	5	5
	Exports	(2)	(3)	(5)	(6)	(6)	(6)	(7)	(7)	(7)	(7)	(8)	(8)	(6)
	Supply Adjustments	(1)	0	0	-	-	-	-	-	-	-	-	-	-
	Consumption	9	11	13	15	16	16	17	18	19	19	22	26	29
Gasoil/Diesel	Production	71	111	134	141	158	165	174	184	195	205	248	294	327
	Imports	0	1	6	2	2	2	2	2	2	2	2	2	2
	Exports	(1)	(1)	(1)	(5)	(5)	(4)	(5)	(4)	(6)	(6)	(5)	(5)	(1)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(4)	(5)	(5)
	Biodiesel supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	CTL/GTL diesel supply	-	-	-	0	0	1	1	1	3	5	12	13	13
	Supply Adjustments	(3)	(0)	(4)	0	(0)	1	1	2	3	5	13	14	14
	Consumption	67	110	135	139	154	163	173	183	195	206	253	300	337
Heavy Fuel Oil	Production	21	18	17	19	20	23	25	26	27	29	28	31	33
	Imports	15	26	22	24	23	20	19	18	17	15	11	5	2
	Exports	(0)	(2)	(7)	(9)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Int'l Bunkers	(4)	(7)	(8)	(8)	(9)	(9)	(10)	(10)	(11)	(11)	(8)	(9)	(10)
	Supply Adjustments	2	1	1	1	0	1	1	1	1	1	1	1	1
	Consumption	33	35	25	27	25	25	24	24	24	23	20	17	15
Other Products	Production	56	90	102	108	117	125	132	139	147	154	183	216	239
	Imports	4	10	13	18	20	17	19	20	23	25	29	28	37
	Exports	(6)	(9)	(8)	(7)	(8)	(9)	(9)	(9)	(9)	(9)	(10)	(10)	(10)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	0	0	0	0	0	1	1	4	4	4
	Supply Adjustments	(0)	(0)	(0)	(1)	(1)	(1)	0	0	(0)	0	(0)	(0)	-
	Consumption	54	90	107	118	127	134	142	151	162	171	206	238	270
Total	Production	198	283	329	355	388	409	433	456	483	507	613	736	824
	Imports	21	40	50	50	50	44	45	45	47	47	47	40	46
	Exports	(13)	(22)	(24)	(31)	(35)	(33)	(34)	(33)	(36)	(37)	(38)	(36)	(29)
	Int'l Bunkers	(4)	(8)	(8)	(8)	(9)	(10)	(10)	(11)	(11)	(11)	(13)	(14)	(15)
	Biofuels/CTL/GTL supply	-	1	2	2	3	3	4	4	7	9	20	22	23
	Supply Adjustments	(3)	0	(7)	(2)	(2)	(1)	(0)	(0)	(0)	(0)	0	1	2
	Consumption	199	295	341	365	394	414	437	461	489	515	630	748	851

Historical data source: IEA

TABLE V-7
REFINED PRODUCT BALANCE
INDIA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	8	11	16	24	25	25	27	29	30	30	33	44	54
	Imports	0	0	0	0	1	1	1	1	1	1	1	1	1
	Exports	(1)	(3)	(5)	(12)	(11)	(11)	(12)	(12)	(12)	(10)	(5)	(6)	(4)
	Biogasoline supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(0)	0	0	0	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	7	9	11	13	14	15	16	18	19	21	29	39	51
Jet/Kerosene	Production	11	15	16	18	17	17	17	18	17	16	16	18	19
	Imports	2	1	1	1	1	1	1	1	1	2	3	1	1
	Exports	(0)	(3)	(4)	(5)	(4)	(4)	(4)	(4)	(4)	(3)	(3)	(4)	(5)
	Supply Adjustments	1	(0)	(0)	(0)	(1)	-	-	-	-	-	-	-	-
	Consumption	14	13	14	14	14	14	15	15	15	15	15	15	15
Gasoil/Diesel	Production	41	48	63	69	76	76	81	87	89	87	115	135	144
	Imports	-	1	3	3	2	2	2	2	2	2	2	2	2
	Exports	(2)	(8)	(14)	(17)	(19)	(15)	(16)	(17)	(15)	(8)	(16)	(18)	(12)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)
	Biodiesel supply	-	-	0	0	0	0	0	0	0	0	0	0	0
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	3	(0)	1	1	(1)	(0)	(0)	(0)	(0)	(0)	(0)	0	0
	Consumption	42	40	53	56	59	63	68	72	76	81	101	119	133
Heavy Fuel Oil	Production	17	22	27	26	25	25	26	28	28	27	23	30	36
	Imports	2	1	1	1	1	1	1	1	1	1	1	1	1
	Exports	(1)	(2)	(6)	(5)	(5)	(5)	(7)	(8)	(9)	(8)	(5)	(15)	(22)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Supply Adjustments	(1)	(1)	(0)	(0)	(0)	(0)	-	(0)	(0)	(0)	0	(0)	0
	Consumption	17	19	22	21	21	21	20	20	20	20	18	16	15
Other Products	Production	26	33	39	47	46	47	51	54	56	55	62	75	82
	Imports	3	4	9	6	5	5	5	4	4	4	4	4	4
	Exports	(5)	(6)	(8)	(10)	(12)	(12)	(13)	(14)	(14)	(11)	(9)	(12)	(13)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	2	1	(2)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	26	33	38	42	39	40	42	44	45	48	57	67	73
Total	Production	103	129	162	184	189	189	203	215	221	214	248	303	336
	Imports	7	7	15	10	11	11	11	10	10	11	12	10	10
	Exports	(8)	(21)	(37)	(50)	(51)	(47)	(52)	(55)	(53)	(40)	(38)	(55)	(57)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)
	Biofuels/CTL/GTL supply	-	0	0	0	0	0	0	0	0	0	0	1	1
	Supply Adjustments	4	(1)	(1)	0	(3)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	106	114	139	145	146	153	161	169	176	184	221	257	287

Historical data source: IEA

TABLE V-8
REFINED PRODUCT BALANCE
JAPAN
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	42	43	42	42	43	43	43	42	42	41	41	40	39
	Imports	1	2	0	1	1	2	1	1	2	2	2	2	2
	Exports	(0)	(0)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	Biogasoline supply	-	-	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	0	(0)	0	0	1	0	0	0	0	0	0	0	0
	Consumption	43	44	42	42	43	43	43	42	42	42	41	40	39
Jet/Kerosene	Production	31	32	29	27	27	26	25	24	23	23	20	18	16
	Imports	5	3	1	1	1	1	1	1	1	1	1	1	1
	Exports	(1)	(1)	(3)	(2)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Supply Adjustments	(1)	(0)	(0)	(0)	0	-	-	-	-	-	-	-	-
	Consumption	34	34	27	25	26	26	25	24	24	23	21	18	16
Gasoil/Diesel	Production	60	58	55	50	50	48	46	45	43	43	44	45	46
	Imports	2	1	0	0	1	1	1	1	1	1	1	1	1
	Exports	(2)	(3)	(11)	(10)	(10)	(8)	(6)	(5)	(3)	(3)	(5)	(7)	(8)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)
	Biodiesel supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	0	0	0	1	0	0	0	0	0	0	0	0	0
	Consumption	60	55	44	41	41	41	40	40	40	40	39	38	37
Heavy Fuel Oil	Production	36	32	27	22	21	20	20	19	19	19	18	17	16
	Imports	1	4	4	2	2	2	2	2	2	2	2	2	2
	Exports	(1)	(3)	(3)	(3)	(3)	(3)	(2)	(2)	(2)	(2)	(3)	(4)	(4)
	Int'l Bunkers	(5)	(6)	(5)	(5)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
	Supply Adjustments	(0)	(0)	(0)	(0)	(0)	-	-	-	-	-	-	-	-
	Consumption	31	26	23	16	16	16	16	15	15	15	13	11	10
Other Products	Production	38	40	37	37	38	37	36	35	33	33	32	31	30
	Imports	27	25	22	24	28	26	25	27	27	27	26	26	26
	Exports	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(1)	(0)	(1)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Consumption	63	64	57	60	64	61	59	60	59	59	57	55	54
Total	Production	207	204	189	178	179	174	170	166	160	159	155	150	145
	Imports	36	35	28	28	32	31	30	32	33	33	32	32	32
	Exports	(4)	(9)	(19)	(17)	(17)	(14)	(12)	(10)	(8)	(8)	(10)	(13)	(16)
	Int'l Bunkers	(5)	(6)	(5)	(5)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
	Biofuels/CTL/GTL supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(2)	(1)	(0)	0	(0)	(1)	(1)	(1)	(1)	(1)	(0)	(0)	(0)
	Consumption	231	224	192	185	189	186	182	182	180	179	171	163	156

Historical data source: IEA

TABLE V-9
REFINED PRODUCT BALANCE
REST OF ASIA (Excluding China, India and Japan)
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	39	43	51	56	60	59	62	62	62	63	65	69	73
	Imports	13	21	26	28	32	33	34	35	35	36	38	37	36
	Exports	(11)	(21)	(28)	(30)	(32)	(32)	(33)	(33)	(33)	(32)	(28)	(26)	(25)
	Biogasoline supply	-	0	0	0	1	1	1	1	1	1	1	1	1
	Supply Adjustments	2	8	6	4	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	43	51	55	59	59	61	62	64	66	67	75	81	85
Jet/Kerosene	Production	46	48	51	50	51	51	51	52	52	52	54	57	58
	Imports	10	12	12	11	12	12	12	12	12	12	11	12	13
	Exports	(15)	(19)	(23)	(23)	(24)	(23)	(23)	(23)	(23)	(23)	(23)	(24)	(24)
	Supply Adjustments	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(0)	(0)	(0)	(0)
	Consumption	40	40	39	37	38	39	39	40	40	41	43	44	46
Gasoil/Diesel	Production	93	107	112	113	115	120	122	125	126	135	150	164	177
	Imports	33	39	42	49	49	50	50	50	51	50	50	53	56
	Exports	(30)	(37)	(51)	(59)	(57)	(62)	(61)	(61)	(59)	(64)	(53)	(57)	(63)
	Int'l Bunkers	(4)	(5)	(4)	(6)	(6)	(7)	(8)	(9)	(10)	(11)	(25)	(25)	(26)
	Biodiesel supply	-	0	1	1	1	1	1	1	1	1	1	1	2
	CTL/GTL diesel supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(0)	(1)	(1)	1	(1)	0	0	0	0	0	0	0	0
	Consumption	91	103	99	99	100	102	104	106	109	111	124	135	146
Heavy Fuel Oil	Production	90	81	65	59	60	65	68	70	71	65	65	68	69
	Imports	51	48	72	81	85	84	85	86	87	87	83	98	105
	Exports	(32)	(31)	(39)	(38)	(38)	(40)	(41)	(42)	(44)	(41)	(42)	(45)	(48)
	Int'l Bunkers	(32)	(41)	(47)	(53)	(58)	(60)	(62)	(64)	(67)	(64)	(62)	(79)	(87)
	Supply Adjustments	(3)	0	(3)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Consumption	73	57	49	46	47	47	46	46	46	45	42	39	37
Other Products	Production	65	79	79	78	78	82	84	85	86	87	92	98	104
	Imports	23	29	38	41	45	42	41	39	40	42	47	52	53
	Exports	(20)	(21)	(22)	(22)	(22)	(23)	(24)	(25)	(25)	(25)	(24)	(25)	(26)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	7	12	13	14	14	14	16	16	17	17	18	18	18
	Consumption	75	99	108	111	115	114	117	116	118	122	132	144	149
Total	Production	333	357	358	355	363	377	387	393	396	401	427	455	483
	Imports	129	150	191	211	223	221	221	221	226	227	230	253	263
	Exports	(108)	(130)	(163)	(172)	(173)	(181)	(183)	(184)	(182)	(184)	(170)	(177)	(186)
	Int'l Bunkers	(37)	(46)	(52)	(59)	(64)	(67)	(70)	(73)	(76)	(74)	(86)	(104)	(113)
	Biofuels/CTL/GTL supply	-	1	1	2	2	2	2	2	2	2	2	3	3
	Supply Adjustments	5	19	13	15	8	10	12	13	13	14	14	14	15
	Consumption	323	351	349	353	360	362	369	372	379	386	416	443	464

Historical data source: IEA

TABLE V-10
REFINED PRODUCT BALANCE
TOTAL ASIA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	131	152	173	194	205	206	215	222	228	233	268	318	360
	Imports	14	23	29	30	34	36	36	37	39	39	41	41	39
	Exports	(17)	(30)	(36)	(48)	(50)	(48)	(50)	(51)	(50)	(47)	(39)	(37)	(32)
	Biogasoline supply	-	1	2	2	3	3	3	3	4	4	5	6	6
	Supply Adjustments	0	7	3	3	(2)	(1)	(2)	(2)	(2)	(2)	(1)	(1)	(0)
	Consumption	128	153	170	181	188	195	202	210	218	226	274	327	373
Jet/Kerosene	Production	98	105	108	110	112	111	112	113	113	113	115	122	125
	Imports	19	20	21	19	19	19	19	19	20	20	20	19	20
	Exports	(18)	(25)	(35)	(37)	(36)	(35)	(35)	(35)	(34)	(33)	(34)	(37)	(37)
	Supply Adjustments	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(0)	(0)	(0)	(0)
	Consumption	97	98	92	91	94	95	96	97	98	99	101	103	107
Gasoil/Diesel	Production	265	324	365	373	398	408	425	440	453	470	557	637	694
	Imports	35	41	52	54	54	55	55	55	55	55	55	57	61
	Exports	(34)	(51)	(77)	(90)	(91)	(89)	(89)	(86)	(82)	(82)	(79)	(86)	(85)
	Int'l Bunkers	(5)	(5)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(31)	(32)	(33)
	Biodiesel supply	-	0	1	1	1	1	1	1	1	1	2	2	2
	CTL/GTL diesel supply	-	0	0	0	1	1	1	2	3	5	13	13	14
	Supply Adjustments	(0)	(1)	(4)	3	(2)	1	1	2	4	5	13	14	15
	Consumption	261	308	331	335	354	369	385	402	420	438	516	593	654
Heavy Fuel Oil	Production	163	152	137	125	127	134	139	142	145	139	133	146	154
	Imports	68	79	99	108	112	108	107	107	108	106	97	107	111
	Exports	(34)	(38)	(55)	(55)	(56)	(58)	(60)	(63)	(64)	(61)	(60)	(74)	(84)
	Int'l Bunkers	(41)	(55)	(60)	(65)	(71)	(74)	(77)	(79)	(82)	(79)	(75)	(92)	(102)
	Supply Adjustments	(2)	0	(2)	(3)	(3)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	Consumption	154	138	118	111	109	108	107	106	104	103	94	84	76
Other Products	Production	184	242	256	270	279	291	302	312	322	328	369	421	455
	Imports	57	69	82	89	98	90	90	90	94	99	107	110	120
	Exports	(31)	(38)	(39)	(40)	(43)	(45)	(47)	(48)	(48)	(45)	(44)	(47)	(50)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	-	-	-	0	0	0	0	0	1	1	4	4	4
	Supply Adjustments	8	13	10	12	11	12	15	15	16	16	17	17	17
	Consumption	218	285	310	330	345	348	360	370	385	399	452	504	547
Total	Production	840	974	1,038	1,072	1,120	1,149	1,193	1,229	1,260	1,282	1,443	1,644	1,788
	Imports	193	232	283	300	316	308	307	309	316	318	320	334	351
	Exports	(133)	(181)	(243)	(270)	(276)	(275)	(281)	(283)	(279)	(268)	(256)	(281)	(288)
	Int'l Bunkers	(46)	(60)	(65)	(72)	(77)	(81)	(85)	(89)	(93)	(91)	(105)	(124)	(135)
	Biofuels/CTL/GTL supply	-	2	3	4	5	5	6	7	9	12	23	25	26
	Supply Adjustments	4	18	5	13	2	8	11	11	11	12	13	14	15
	Consumption	859	983	1,022	1,048	1,089	1,114	1,149	1,184	1,225	1,265	1,438	1,611	1,758

Historical data source: IEA

TABLE V-11
REFINED PRODUCT BALANCE
OCEANIA
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	15	15	14	14	14	14	14	14	15	15	15	16	17
	Imports	2	4	4	5	3	3	3	2	2	2	2	2	2
	Exports	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Biogasoline supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	(0)	(1)	(1)	(2)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	16	18	17	17	17	17	17	17	17	17	17	18	18
Jet/Kerosene	Production	5	5	5	5	5	5	5	5	5	5	5	5	5
	Imports	1	2	3	3	2	2	2	3	3	3	3	4	4
	Exports	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Supply Adjustments	(0)	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	6	6	7	7	7	8	8	8	8	8	8	9	9
Gasoil/Diesel	Production	13	13	12	12	13	13	13	14	14	14	15	17	18
	Imports	3	6	9	9	9	8	9	9	9	9	10	10	10
	Exports	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)
	Biodiesel supply	-	-	0	0	0	0	0	0	0	0	0	0	0
	CTL/GTL diesel supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	(0)	0	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	15	18	20	20	20	21	21	21	22	22	23	25	26
Heavy Fuel Oil	Production	2	2	2	1	1	1	1	1	1	1	1	2	2
	Imports	1	2	3	3	2	2	2	2	2	2	2	2	2
	Exports	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Int'l Bunkers	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Supply Adjustments	0	(0)	(0)	(0)	(0)	-	-	-	-	-	-	-	-
	Consumption	2	2	2	2	2	2	2	2	2	2	2	2	2
Other Products	Production	6	5	4	4	4	4	4	4	4	4	4	4	5
	Imports	1	2	2	2	2	2	2	2	2	2	2	2	3
	Exports	(1)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Int'l Bunkers	-	-	-	-	-	-	-	-	-	-	-	-	-
	CTL/GTL supply	-	-	-	-	-	-	-	-	-	-	-	-	-
	Supply Adjustments	1	0	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	7	6	6	6	5	5	5	6	6	6	6	6	7
Total	Production	42	40	38	37	37	38	38	39	39	39	42	44	46
	Imports	9	16	20	21	20	17	18	18	18	19	19	19	20
	Exports	(4)	(3)	(2)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Int'l Bunkers	(1)	(1)	(2)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(3)	(3)
	Biofuels/CTL/GTL supply	-	0	0	0	0	0	0	0	0	0	0	0	0
	Supply Adjustments	1	(1)	(2)	(4)	(3)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	Consumption	46	51	52	52	52	52	53	53	54	55	57	60	62

Historical data source: IEA

TABLE V-12
REFINED PRODUCT BALANCE
WORLD
(Million Tonnes)

		2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Gasoline	Production	822	885	874	900	898	909	923	932	943	949	976	1,004	1,037
	Imports	114	158	170	169	169	168	168	167	167	166	163	160	159
	Exports	(114)	(157)	(161)	(166)	(168)	(165)	(169)	(168)	(171)	(170)	(167)	(163)	(159)
	Biogasoline supply	-	20	40	44	50	52	53	54	54	55	58	59	59
	Supply Adjustments	17	4	9	(4)	3	1	2	4	6	8	12	11	12
	Consumption	840	910	932	942	953	965	977	989	999	1,008	1,042	1,070	1,108
Jet/Kerosene	Production	311	320	318	311	315	320	324	330	333	337	352	367	379
	Imports	57	72	76	75	74	76	76	76	77	78	80	82	84
	Exports	(61)	(76)	(85)	(87)	(86)	(87)	(87)	(88)	(87)	(87)	(89)	(92)	(92)
	Supply Adjustments	(5)	(8)	(8)	(9)	(6)	(5)	(5)	(5)	(5)	(4)	(4)	(4)	(4)
	Consumption	301	308	302	289	297	303	309	314	318	323	339	353	368
Gasoil/Diesel	Production	1,020	1,160	1,236	1,215	1,236	1,269	1,297	1,326	1,358	1,402	1,561	1,690	1,804
	Imports	175	225	266	271	287	290	292	294	291	292	297	302	306
	Exports	(206)	(246)	(293)	(311)	(311)	(316)	(316)	(314)	(311)	(311)	(317)	(323)	(331)
	Int'l Bunkers	(20)	(20)	(18)	(20)	(21)	(23)	(25)	(27)	(29)	(43)	(70)	(73)	(77)
	Biodiesel supply	-	3	12	14	18	20	21	22	22	23	25	26	29
	CTL/GTL diesel supply	5	6	6	6	7	8	9	10	12	14	22	23	23
	Supply Adjustments	6	(4)	(9)	(11)	(7)	(4)	(1)	1	4	6	18	21	21
	Consumption	975	1,119	1,194	1,158	1,203	1,235	1,269	1,301	1,335	1,369	1,514	1,643	1,751
Heavy Fuel Oil	Production	627	614	590	546	538	554	558	560	566	555	545	554	562
	Imports	183	216	238	245	251	244	244	246	247	239	232	247	258
	Exports	(214)	(260)	(289)	(285)	(283)	(286)	(285)	(283)	(285)	(284)	(278)	(288)	(298)
	Int'l Bunkers	(110)	(141)	(157)	(155)	(165)	(171)	(176)	(180)	(185)	(172)	(169)	(192)	(208)
	Supply Adjustments	(8)	3	(9)	(7)	(4)	(1)	(1)	(1)	(1)	(1)	(2)	(3)	(3)
	Consumption	478	432	373	344	337	339	340	341	342	338	328	318	310
Other Products	Production	672	772	774	774	790	816	835	854	875	894	968	1,035	1,084
	Imports	136	173	181	182	197	192	194	193	196	199	206	211	222
	Exports	(149)	(183)	(188)	(187)	(194)	(200)	(203)	(207)	(209)	(212)	(219)	(224)	(228)
	Int'l Bunkers	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	CTL/GTL supply	2	2	2	2	2	2	3	4	4	5	7	7	7
	Supply Adjustments	27	32	44	45	51	50	54	55	56	58	58	59	61
	Consumption	687	796	814	816	846	861	882	899	922	943	1,019	1,087	1,146
Total	Production	3,452	3,751	3,792	3,746	3,778	3,868	3,937	4,002	4,075	4,138	4,402	4,649	4,866
	Imports	665	845	931	941	979	970	973	977	978	974	979	1,002	1,029
	Exports	(744)	(922)	(1,015)	(1,035)	(1,042)	(1,054)	(1,060)	(1,061)	(1,063)	(1,065)	(1,071)	(1,090)	(1,108)
	Int'l Bunkers	(131)	(162)	(176)	(176)	(186)	(194)	(201)	(208)	(214)	(215)	(239)	(266)	(285)
	Biofuels/CTL/GTL supply	7	31	60	67	77	82	87	89	93	97	112	115	119
	Supply Adjustments	32	21	21	8	30	32	40	45	48	52	59	61	64
	Consumption	3,281	3,564	3,614	3,550	3,636	3,703	3,776	3,843	3,916	3,981	4,242	4,471	4,684

Historical data source: IEA

TABLE V-13
WORLD GASOLINE TRADE
(Million Tonnes)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	820	883	873	899	897	908	921	931	941	948	974	1,002	1,035
Importers													
United States	28	48	47	40	38	37	36	35	34	33	28	22	19
Canada	1	4	4	4	4	5	5	5	5	5	5	4	4
Latin America	14	19	23	24	27	25	24	24	25	25	27	28	29
Middle East	4	13	16	16	14	14	13	13	11	11	10	12	15
Africa	8	11	12	16	15	16	16	16	16	17	18	18	19
Japan	1	2	0	1	1	2	1	1	2	2	2	2	2
China	-	-	2	0	0	0	0	0	0	0	0	0	0
India	-	0	0	0	1	1	1	1	1	1	1	1	1
Singapore	4	7	10	11	13	13	13	13	13	13	13	13	13
Rest of Asia	11	18	20	22	22	22	23	24	25	25	27	26	25
Europe	39	34	30	29	29	29	29	29	29	29	28	27	26
CIS	4	2	5	5	5	5	5	5	5	5	5	5	5
Others	-	-	-	-	-	-	1	1	4	4	4	4	0
Total	114	158	170	168	169	168	168	168	171	170	166	163	158
Exporters													
United States	7	7	8	9	14	11	10	10	10	10	9	8	8
Canada	4	7	6	6	7	7	7	7	7	7	7	7	7
Latin America	20	22	19	15	12	13	14	14	16	18	19	18	17
Middle East	4	5	6	5	6	6	5	5	5	5	5	5	5
Africa	2	3	2	2	2	2	2	2	2	2	2	2	3
Japan	0	0	1	1	2	2	2	2	2	2	2	2	2
China	5	6	2	5	6	3	4	4	4	4	5	3	1
India	1	3	5	12	11	11	12	12	12	10	5	6	4
Singapore	7	14	18	19	22	21	22	21	21	21	19	18	17
Rest of Asia	4	8	10	11	10	11	12	12	12	11	9	9	8
Europe	53	73	75	73	72	72	73	73	75	76	80	80	78
CIS	6	10	8	8	6	7	7	6	6	6	5	5	9
Others	0	0	8	2	1	2	-	-	-	-	-	-	-
Total	114	158	170	168	169	168	168	168	171	170	166	163	158
Exports as % of Production	13.8	17.9	19.4	18.7	18.8	18.5	18.3	18.1	18.1	18.0	17.1	16.3	15.3

Historical data source: IEA

TABLE V-14
WORLD JET/KEROSENE TRADE
(Million Tonnes)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	309	318	317	309	314	318	323	328	331	335	351	366	378
Importers													
United States	8	9	5	4	4	5	5	5	5	5	5	6	6
Canada	1	2	2	2	2	2	2	2	2	2	3	3	3
Latin America	4	2	4	4	4	4	4	4	4	4	4	4	5
Middle East	1	2	1	1	1	1	1	1	1	1	1	1	1
Africa	5	5	5	6	7	7	7	7	7	7	8	8	9
Japan	5	3	1	1	1	1	1	1	1	1	1	1	1
China	2	3	6	6	5	5	5	5	5	5	5	5	5
India	2	1	1	1	1	1	1	1	1	2	2	1	1
Singapore	1	2	3	3	3	3	3	3	3	3	3	3	3
Rest of Asia	10	12	11	11	12	11	11	11	12	12	12	13	14
Europe	18	29	34	35	33	34	35	34	35	35	36	36	36
CIS	0	1	1	1	1	1	1	1	1	1	1	1	1
Others	5	4	9	12	12	11	11	11	10	10	9	10	7
Total	61	76	84	87	86	86	87	87	87	87	89	91	91
Exporters													
United States	2	3	3	3	4	3	2	3	2	3	2	1	1
Canada	0	1	0	1	1	1	1	1	1	1	1	1	1
Latin America	10	9	8	7	5	6	7	7	7	7	7	8	8
Middle East	15	20	18	19	20	21	21	21	21	22	23	23	22
Africa	4	4	4	4	5	5	5	5	5	5	5	5	5
Japan	1	1	3	2	2	1	1	1	1	1	1	1	1
China	2	3	5	6	6	6	7	7	7	7	8	8	6
India	0	3	4	5	4	4	4	4	4	3	3	4	5
Singapore	6	8	8	7	7	7	7	7	7	7	7	7	8
Rest of Asia	10	11	15	16	16	17	16	16	16	15	16	16	17
Europe	11	14	15	15	15	15	15	15	15	15	15	15	15
CIS	1	1	1	1	1	1	1	1	1	1	1	1	1
Others	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	61	76	84	87	86	86	87	87	87	87	89	91	91
Exports as % of Production	19.8	23.9	26.6	28.0	27.3	27.2	26.9	26.6	26.2	26.0	25.2	25.0	24.1

Historical data source: IEA

TABLE V-15
WORLD GASOIL/DIESEL TRADE
(Million Tonnes)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	1,020	1,160	1,236	1,215	1,236	1,269	1,297	1,326	1,358	1,402	1,561	1,690	1,804
Importers													
United States	14	16	10	11	11	12	12	12	12	12	13	14	14
Canada	1	1	3	2	2	2	2	3	3	4	3	3	3
Latin America	21	21	30	26	37	33	35	35	29	26	24	25	27
Middle East	3	9	15	14	17	16	14	16	15	15	14	14	14
Africa	13	13	20	24	23	23	24	25	25	26	28	29	31
Japan	2	1	0	0	1	1	1	1	1	1	1	1	1
China	0	1	6	2	2	2	2	2	2	2	2	2	2
India	-	1	3	3	2	2	2	2	2	2	2	2	2
Singapore	4	4	9	15	15	15	15	15	15	15	15	15	15
Rest of Asia	32	41	42	44	43	43	43	44	45	44	45	47	51
Europe	80	115	121	125	129	134	137	134	136	140	145	144	140
CIS	4	2	6	5	6	6	6	6	6	6	6	5	5
Others	30	20	27	40	24	26	24	20	20	19	20	20	25
Total	206	246	293	311	311	316	316	314	311	311	317	323	331
Exporters													
United States	8	7	26	29	33	32	35	35	34	31	20	20	23
Canada	5	6	8	8	8	8	8	8	8	8	9	8	9
Latin America	24	22	20	18	15	16	16	17	17	22	30	30	30
Middle East	28	28	23	27	26	27	27	26	27	32	40	40	39
Africa	6	5	2	2	3	3	3	3	3	3	3	3	3
Japan	2	3	11	10	10	8	6	5	3	3	5	7	8
China	1	1	1	5	5	4	5	4	6	6	5	5	1
India	2	8	14	17	19	15	16	17	15	8	16	18	12
Singapore	11	15	20	24	23	26	27	27	27	31	21	23	24
Rest of Asia	20	23	32	35	34	36	35	34	32	33	32	35	39
Europe	68	83	88	87	88	89	87	88	88	80	82	83	85
CIS	30	44	48	50	47	52	51	52	52	52	55	52	59
Others	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	206	246	293	311	311	316	316	314	311	311	317	323	331
Exports as % of Production	20.2	21.2	23.7	25.6	25.1	24.9	24.4	23.7	22.9	22.2	20.3	19.1	18.4

Historical data source: IEA

TABLE V-16
WORLD HEAVY FUEL OIL TRADE
(Million Tonnes)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Refinery Production	627	614	590	546	538	554	558	560	566	555	545	554	562
Importers													
United States	19	29	19	18	21	18	18	18	18	16	15	16	17
Canada	3	3	2	1	1	1	1	1	1	1	1	1	1
Latin America	22	21	22	21	20	21	22	22	23	23	25	27	29
Middle East	13	15	21	21	22	22	23	23	24	25	26	28	30
Africa	2	5	4	5	5	5	4	4	4	4	4	4	5
Japan	1	4	4	2	2	2	2	2	2	2	2	2	2
China	15	26	22	24	23	20	19	18	17	15	11	5	2
India	2	1	1	1	1	1	1	1	1	1	1	1	1
Singapore	28	30	49	57	61	60	61	62	64	64	60	74	81
Rest of Asia	24	20	26	26	27	27	26	26	26	25	25	26	26
Europe	52	61	67	65	66	65	65	66	66	61	60	61	62
CIS	1	1	2	1	1	1	1	1	1	1	1	1	1
Others	31	44	51	40	32	43	41	38	38	45	46	41	41
Total	214	260	289	285	283	286	285	283	285	284	278	288	298
Exporters													
United States	8	14	19	23	22	19	16	16	16	18	18	16	14
Canada	1	3	4	3	3	3	3	3	3	3	3	2	2
Latin America	36	38	39	37	34	35	36	38	39	36	34	33	32
Middle East	41	28	22	23	20	20	19	18	18	15	15	15	14
Africa	17	17	15	13	14	13	13	13	13	13	13	12	12
Japan	1	3	3	3	3	3	2	2	2	2	3	4	4
China	0	2	7	9	10	10	10	10	10	10	10	10	10
India	1	2	6	5	5	5	7	8	9	8	5	15	22
Singapore	9	12	22	24	24	24	24	24	24	24	24	24	24
Rest of Asia	24	19	17	14	14	16	17	18	20	17	18	21	24
Europe	48	66	67	62	66	66	66	64	64	71	72	71	69
CIS	27	55	67	69	67	72	70	68	67	67	65	66	71
Others	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	214	260	289	285	283	286	285	283	285	284	278	288	298
Exports as % of Production	34.1	42.3	49.0	52.2	52.6	51.7	51.0	50.6	50.3	51.2	51.1	52.0	53.1

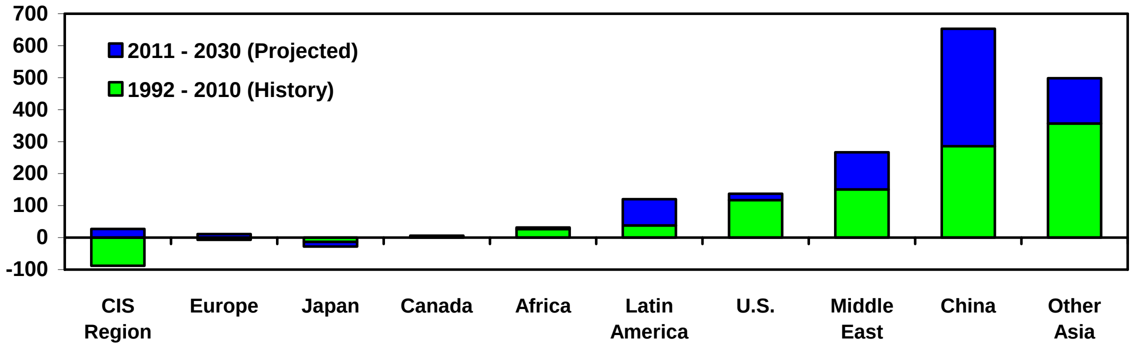
Historical data source: IEA

VI. GLOBAL REFINERY CAPACITY ANALYSIS

WORLD REFINERY CAPACITY REQUIREMENTS

World refining capacity is constantly changing as refiners strive to keep pace with changes in product demand, product specifications and crude production quality. Total global primary crude distillation capacity stood at around 4.62 billion tonnes per annum (93.7 million barrels per day) in 2010. Overall worldwide refining crude distillation capacity has increased by a total of about 840 million tonnes per annum (17.0 million B/D) from 1992 to 2009, averaging an increase of 49 million tonnes per annum (1.0 million B/D) per year, or growth of about 1.2% per year. This net overall increase occurred even as some regions, such as Japan and the CIS Region, effectively closed or idled some of their refining capacity while in others such as Europe and Canada net distillation capacity has remained static (Figure VI-1).

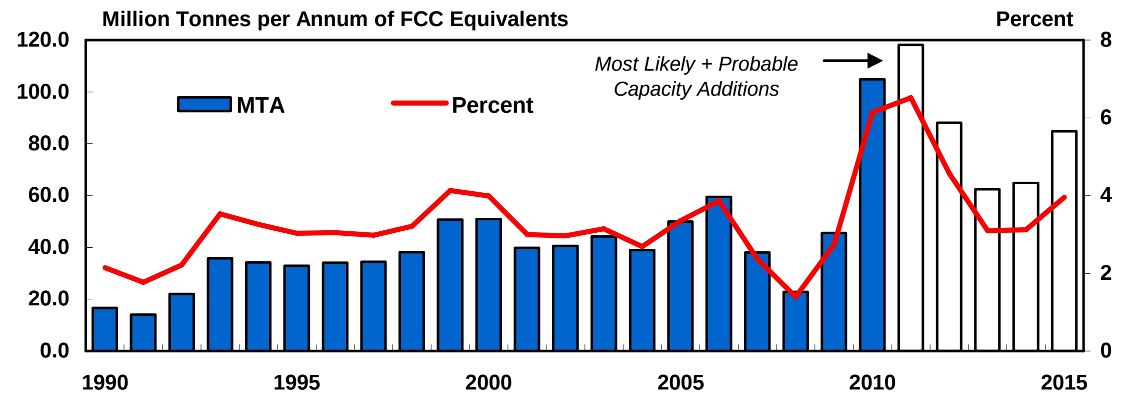
FIGURE VI-1
WORLD REFINERY CAPACITY CHANGES
(Million Tonnes per Annum)



Looking forward to 2030, we anticipate that the demand growth requirement for additional crude distillation capacity will slow to less than 1% per year on average. These projections would add another 740 million tonnes per annum (15 million B/D) of crude distillation capacity by 2030, or about 37 million tonnes per annum (0.76 million B/D) per year over the next 20 years, compared to the 49 million tonnes per annum that was added each year from 1992 - 2009. According to our analysis, China and Other Asia (excluding Japan) are the primary growth regions, together making up over 53% of the projected increases in refinery crude distillation capacity from now until 2030. The Middle East is expected to be another high growth region, contributing another 16% of the total projected additions.

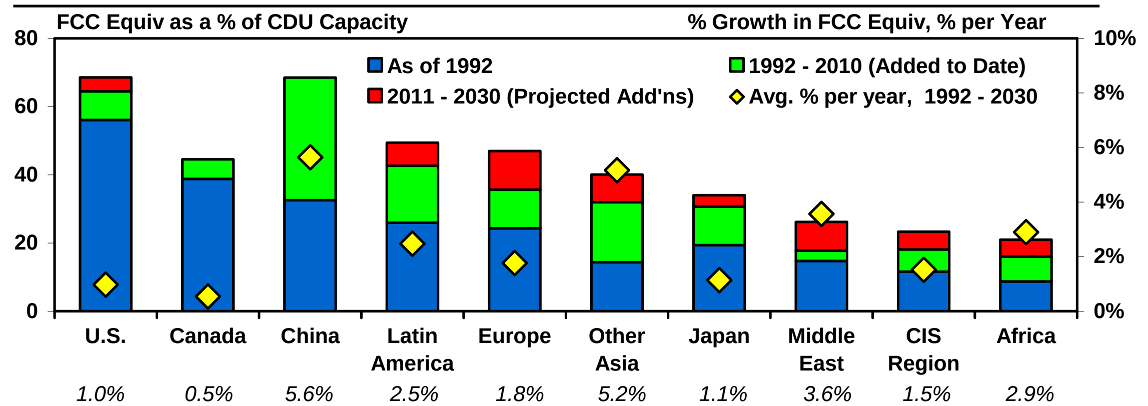
We have also projected the requirements for conversion capacity (i.e. the capacity for upgrading of heavy low-value fuel oil components to light higher-value products) by region. Historically, even when refinery closures were widespread, conversion capacity was being added. This increase in upgrading capability was necessary to keep pace with the trend toward higher demand for light products per barrel of crude oil run. This shift in product slate is quantified for each country/region. Changes in world conversion capacity are shown in Figure VI-2. Both heavy oil and vacuum gas oil conversion units are expressed in cat cracker equivalents. The capacities for future years reflect the announced projects that we believe are likely to be completed by 2015. We have analyzed the announced projects and categorized them as either: Speculative, Probable or Most Likely, in increasing order of our assessment of likelihood of completion. The Most Likely and Probable projects are included in the supply/demand balances and as available future capacity shown in Figure VI-2.

FIGURE VI-2
WORLD REFINING CONVERSION CAPACITY CHANGES



Worldwide, most regions will continue to add conversion capacity in response to changing crude slates, declining residual fuel oil demand and increasing light product demand (Figure VI-3). The more mature industries in the U.S. and Canada are expected to average 1.0 per year growth in FCC Equivalents, while China and growth in other parts of Asia (excluding Japan) could average rates exceeding 5.0% per year. The Middle East and Latin America are also adding a moderate amount of conversion capacity in the form of grassroots heavy oil refineries as well as refinery upgrade projects. Tables VI-2 through VI-16 provide listings of Most Likely and Probable refinery projects by region that have been included in our analysis of available future capacity.

FIGURE VI-3
WORLDWIDE REFINERY COMPLEXITY BY REGION



WORLD REFINERY COMPLEXITY

Purvin & Gertz maintains a database of processing unit capacities for each refinery in the world. This list is based on publicly available information from a number of sources such as the Oil & Gas Journal and other industry publications. Often, these traditional data sources contain errors and omissions that we seek to correct using other public information that is more scattered and difficult to obtain.

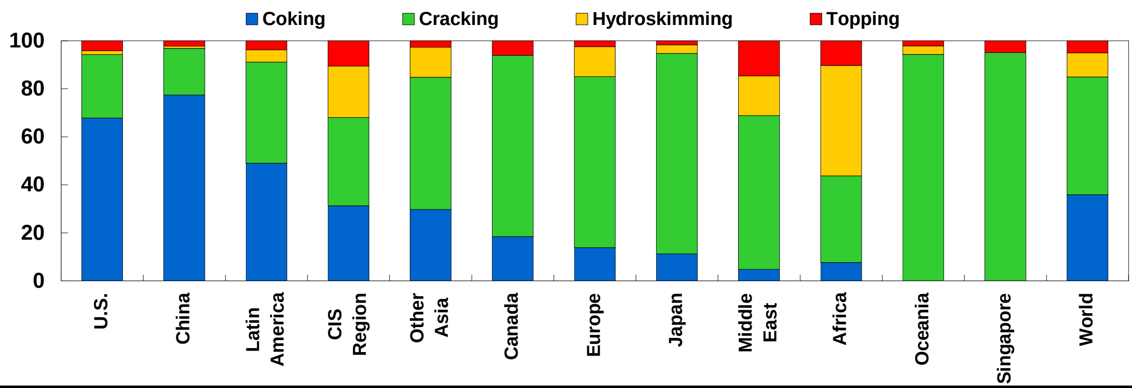
The Nelson Complexity Index, as well as a Conversion Capacity Index, is calculated for each refinery (see Section VII for definitions). The Conversion Capacity Index is determined by calculating the barrels of conversion capacity in catalytic cracking equivalents and dividing the result by the distillation capacity. The worldwide refineries are classified into five types based on Conversion Capacity Index.

REFINERY CLASSIFICATIONS

Type	Conversion Capacity Index (%)	Comments
Topping	-	Distillation Capacity Only
Hydroskimming	-	Distillation Plus Reforming
Simple Cracking	<20	Cracking Without Coking
Cracking	20+	Cracking Without Coking
Coking	20+	Coking With Cracking

Refinery complexity varies widely in each region, but when the refinery capacity is aggregated, a picture of the relative degree of conversion emerges (Figure VI-4).

FIGURE VI-4
WORLD REFINERY CONFIGURATION: January 2010
(Percent)



Light product demand largely determines the type of refinery capacity in a region, so it is not surprising that the U.S. has the most complex refineries overall. As the world requirement for products is shifting from heavy to light products, more conversion capacity is being added (Figures VI-2, VI-3). The U.S., China, Latin America, and the CIS region already have a significant portion of capacity represented by coking. In Africa, hydroskimming is prevalent and the general trend should be to add reformers to topping refineries to become hydroskimmers, and to add conversion to hydroskimmers and become simple cracking refineries. Europe, Asia (excluding China), the Middle East, and Oceania have their refineries in predominantly cracking configurations.

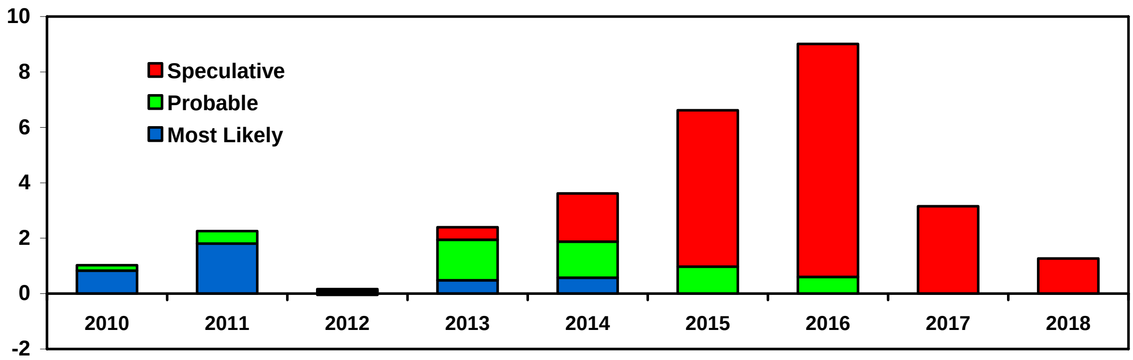
NEW REFINERY PROJECTS

Refinery project announcements increased markedly over 2005 to 2008. After the onset of the global economic downturn in 2008-2009, many of the announced projects were delayed, scaled back, or cancelled.

Purvin & Gertz monitors refinery project announcements for each refinery in the world and adds them to existing capacity based on projected completion dates to develop estimated future capacities. Our experience is that project announcements tend to be optimistic, that unrealistic completion dates often are listed, and many planned projects are delayed or abandoned. As a result of this experience, we screen the crude distillation project announcements using a series of criteria to help identify which projects are likely to be completed. These criteria included the financial strength of promoters, status of project approval by owners or board of directors, status of project development, history of building similar projects, political stability of country, access to crude oil supply, local demand for refined products, and other key factors. A summary of worldwide refinery capacity including announced project additions is shown in Table VI-1.

In our 2010 outlook, we considered 331 crude distillation project announcements. Of these we classified 83 as either "Most Likely" or "Probable" and included these in our analysis of required refinery capacity and the announced project tables for each region (Table VI-2 through Table VI-16). The remaining announced projects were considered to be "Speculative" and are listed in Table VI-17. As shown in Figure VI-5, the majority of announced projects after 2013 have been categorized as speculative in our analysis. While some of this capacity may eventually be built, these speculative projects have not yet progressed sufficiently to be included in our analysis of available future capacity.

FIGURE VI-5
WORLDWIDE POTENTIAL CRUDE DISTILLATION ADDITIONS
(Millions Barrels per Day)



Inevitably, some capacity additions are added that never appear on project lists. This capacity expansion is referred to as "capacity creep." This "creep" can occur as the result of projects completed by in-house maintenance groups, efficiency gains due to operating changes or catalyst improvement, etc. By comparing announced projects to actual capacity additions over the years, we have found that the creep is generally around 0.5 to 1.0% per year. Therefore, for projected refinery capacity over the next several years, we add this creep to announced projects in our analysis of refinery economics. There will undoubtedly be other project announcements over the forecast period as refiners respond to changing demand and economic requirements.

Announced distillation projects and creep capacity growth appear to be sufficient through 2020 for most regions. By 2030, China will need to increase crude distillation capacity by an additional 4.8 million B/D over 2020 to keep pace with demand growth. Although there is a potential for some of the projects in the Middle East to offset some of this pressure, China has demonstrated a willingness and capability to quickly build capacity when it is needed. Some additional crude distillation capacity may also be needed in the Indian Subcontinent, Other Asia and Latin America by 2030 but the announced crude distillation projects already planned in North America and Europe appear largely sufficient to meet the future demand requirements.

In most regions downstream conversion units and associated support facilities will be required to meet the future product demand slate as well as changing product specifications. When considering the world as a whole, demand for residual fuel oil is declining relative to demand for lighter products. This changing product slate combined with the changing crude slate will prompt investment in conversion capacity over the long term in addition to the projects already announced in the next few years. From 2010 to 2030, conversion capacity (in fluid catalytic cracking or FCC Equivalents) is expected to be added at an average rate of about 1.5% annually for the world as a whole. However, some regions will need to expand specific types of conversion capacity before 2020, as shown below.

There is the potential for overbuilding FCC capacity if some of the projects we have classified as speculative are built. Although most of these projects have not yet been designed, our analysis of press reports indicates that perhaps these projects could have more FCC capacity than is needed and too little hydrocracking capacity, i.e. too much capacity for production of gasoline, and too little capacity for production of middle distillate. Feasibility and configuration studies are likely to pick up on the emerging trends and refinery project plans revised accordingly. In any case, it appears that significant increases in hydrocracking capacity will be required by 2020 in the major consuming regions of Asia, Europe and North America and in the producing CIS region in order to keep up with expected increases in global middle distillate demand.

ANALYSIS OF REGIONAL REFINERY PROJECT ADDITIONS

Refinery capacity additions projected out to 2015 are reasonably well known since these projects are either at an advanced design stage or already under construction. Our analysis also shows additional required additions by 2020 and 2030. The locations and timing of these additions are not yet known, but they are required if the global refining industry is to meet the projected future demands for the different refined products.

Table VI-1 shows a summary of expected changes to global refinery capacity by different refinery plant types. The different plant types each contribute to production of different products. Please refer to the glossary provided at the front of this report for a simplified guide as to the impact a particular plant type has on a refinery production profile.

The impact of the projected additions of refined product production capability for the different world regions is discussed below. In this discussion we have simplified the addition of all the different plant types listed into a number of product related categories:-

Crude Distillation

Non Cat-Cracking gasoline units, i.e. any unit that produces gasoline products that is not a catalytic cracking unit

Cat-Cracking units, primarily focussed on gasoline production

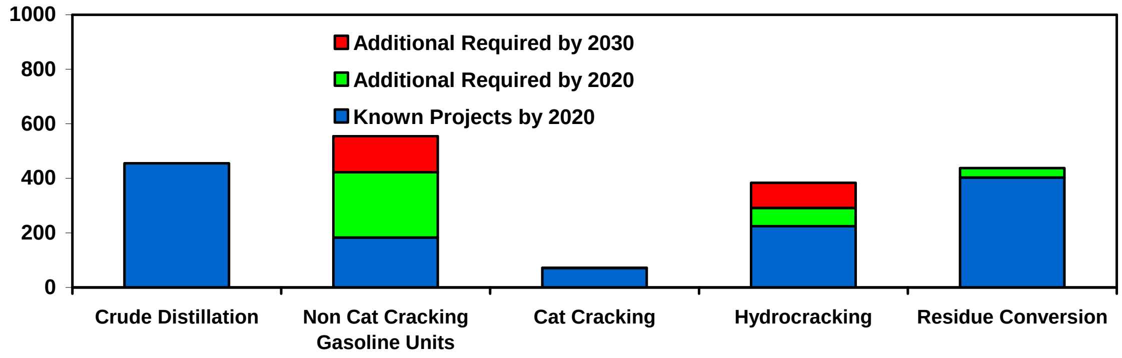
Hydrocracking units, primarily focussed on middle-distillate production

Residue conversion units, primarily focussed on middle distillate production.

NORTH AMERICA

Figure VI-6 below shows the expected and required capacity additions to US and Canadian refineries over 2010 to 2030.

FIGURE VI-6
NORTH AMERICA EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)



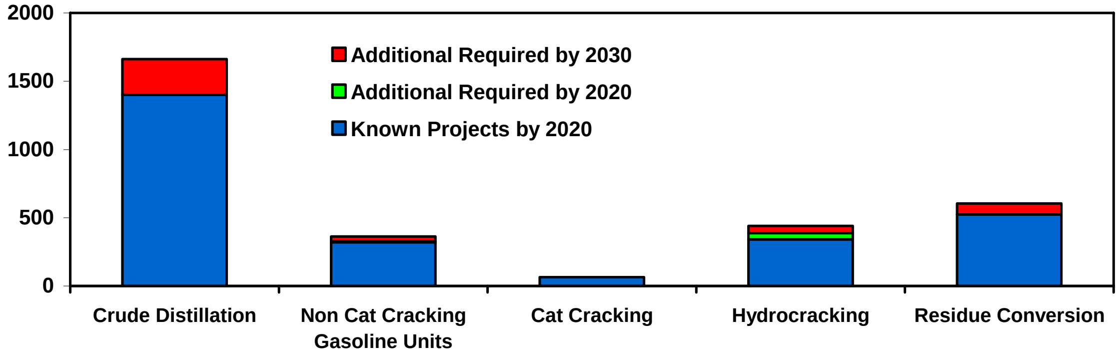
The additions show an increase in conversion capacity and these changes increase the potential for both gasoline and middle distillate production. Our analysis indicates that additional hydrocracking capacity above that already announced is likely to be required by 2020 and again by 2030 to further increase middle distillate production.

As shown in the regional balances in Section V (Table V-1) the increases in diesel and jet production are absorbed by similar increases in domestic consumption. These refinery investments in North America are therefore primarily required to supply the domestic market rather than for export to other regions.

LATIN AMERICA

Figure VI-7 shows the expected and required capacity additions to Latin American refineries over 2010 to 2030.

FIGURE VI-7
LATIN AMERICA EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)

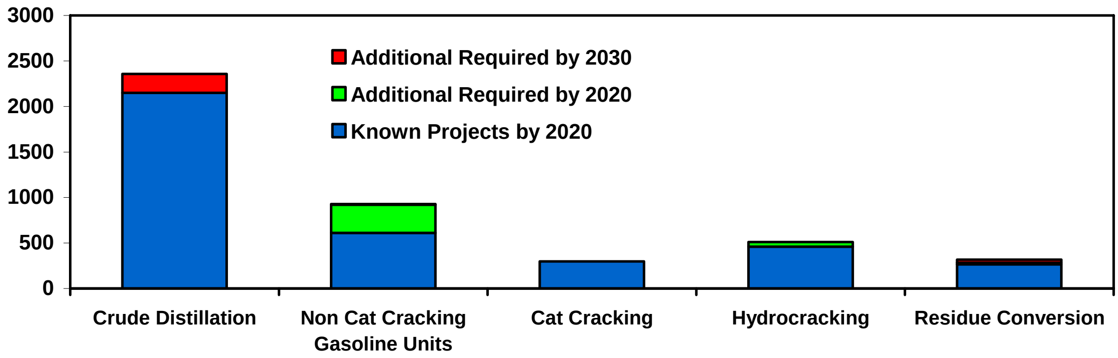


The expected capacity increases should result in an increase in production of both gasoline and middle distillates. However as shown in the regional balances in Section V (Table V-2) demand for these products in Latin America is also expected to increase at a similar rate thus absorbing the increases in production. Some slight increase in middle distillate exports may occur. Nevertheless the refinery investments in Latin America are required mainly to satisfy the domestic market rather than for production of exports to other regions.

MIDDLE EAST

Figure VI-8 shows the expected capacity additions to refineries in the Middle East over 2010 to 2030.

FIGURE VI-8
MIDDLE EAST EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)



There are very significant capacity expansions expected in both crude distillation and conversion units, with some further expansion required by 2030.

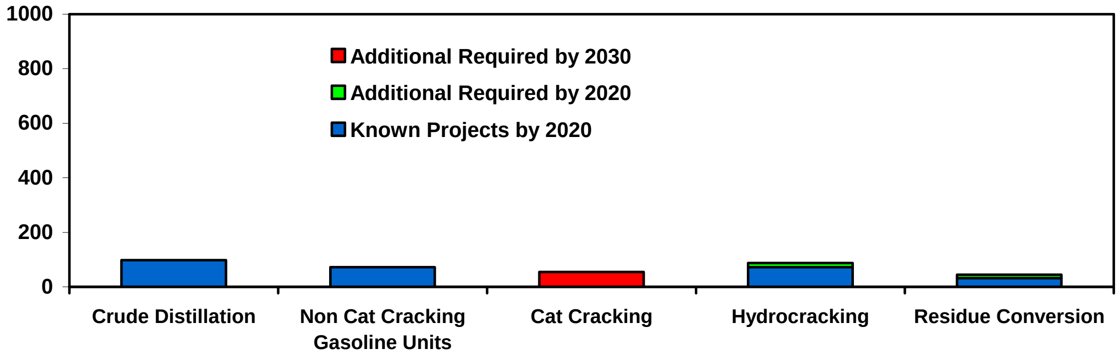
The expected capacity increases would result in an increase in production of all refined products which impacts the Middle East supply demand balance as shown in the regional balances in Section V (Table V-3). For gasoline, the increased production is matched by increase in domestic consumption. For jet, the increased production is offset by similar increase in local consumption. For diesel and gasoil, the increase in production is partially offset by an increase in consumption, but net exports also increase. For heavy fuel oil, the increase in production is wholly absorbed by a greater increase in consumption, with the region increasing fuel oil imports.

It can be seen that there is significant and rapid change in the supply demand balance expected in the Middle East. The refinery investments provide additional gasoline and fuel oil for local consumption, but also produce additional middle distillates that are consumed both locally and increase exports to other regions. The investments can therefore be considered to target both local and export markets.

AFRICA

Figure VI-9 shows the expected and required capacity additions to African refineries from 2010 to 2030.

FIGURE VI-9
AFRICA EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)

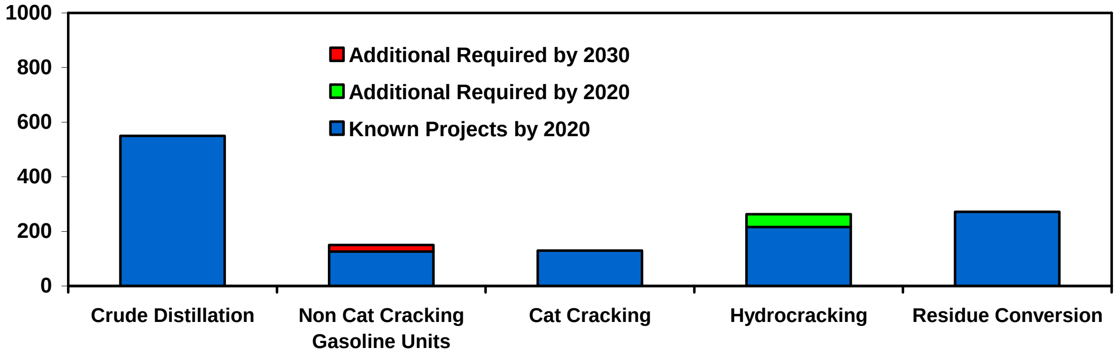


The expected capacity increases result in small increase in production of both gasoline and middle distillates. The balances are shown in Section V (Table V-4). In general the increased production does not keep pace with increased demand resulting in higher overall net imports. Some additional conversion capacity is required by 2030.The refinery investments in Africa are therefore required to help satisfy the domestic market demand rather than for production of exports to other regions.

COMMONWEALTH OF INDEPENDENT STATES (CIS)

Figure VI-10 shows the expected and required capacity additions to CIS region refineries from 2010 to 2030.

FIGURE VI-10
CIS EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)



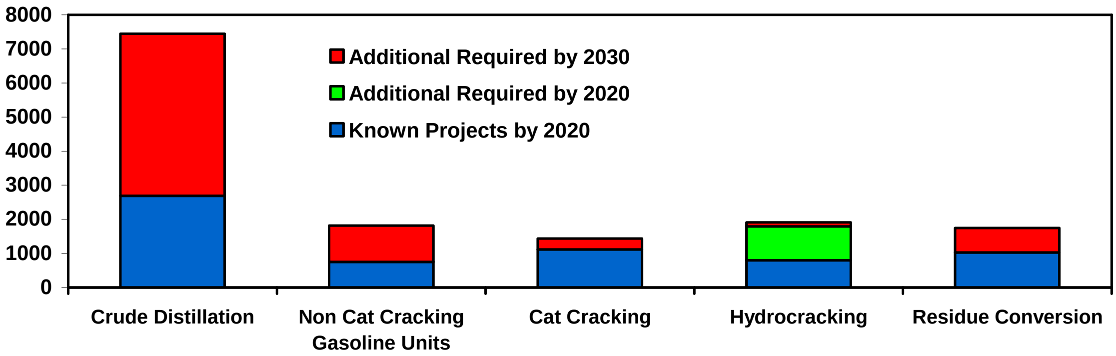
The expected capacity increases result in an increase in gasoline production and a substantial increase in middle distillate production, with little change in fuel oil production. The balances are shown in Section V (Table V-5). The CIS region is already a major exporter of refined products particularly into the European markets. Much of this is driven by the Russian oil export tax regime. The tax on refined products export is lower than the tax on crude oil exports, and this gives an incentive to refine crude in Russia and export products.

The additional production is not required to supply the CIS as the region is already long products. Investment that is specifically targeted at markets within the CIS region will result in the displacement of production from elsewhere in the CIS into export markets, or the closure of some older capacity. Apart from investments to improve fuel product quality in the local markets, much of the additional refining capacity expected in the CIS is either deliberately targeted towards export markets, or the resultant production increases reach export markets by knock-on effects.

CHINA

Figure VI-11 shows the expected and required capacity additions to Chinese refineries from 2010 to 2030. Very substantial capacity additions are both expected and required.

FIGURE VI-11
CHINA EXPECTED AND REQUIRED CAPACITY ADDITIONS TO 2030
(Thousand Barrels per Day)

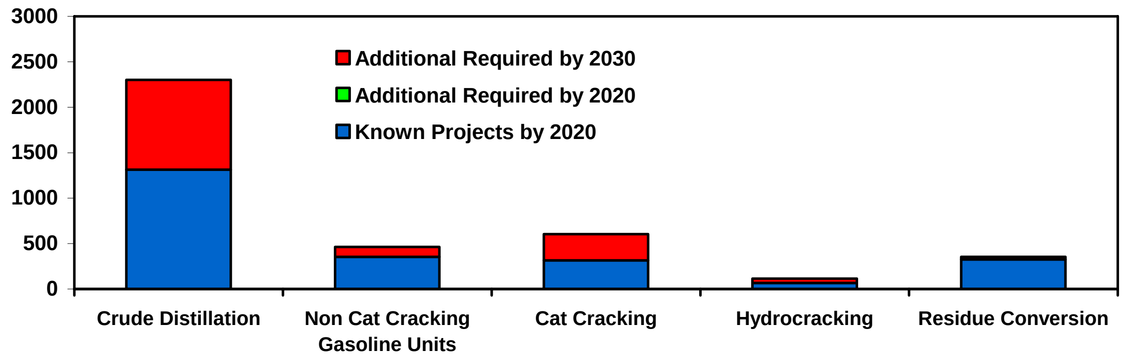


The expected capacity increases result in a substantial increase in both gasoline and middle distillate production with some increase in fuel oil production. The balances are shown in Section V (Table V-6). It can be seen that all the additional refined product production is expected to be absorbed by the rapidly increasing local demand. Substantial additional capacity increases from 2020 to 2030 of all unit types are required in order to keep pace with domestic demand.

INDIAN SUBCONTINENT

Figure VI-12 shows the expected and required capacity additions to refineries on the Indian sub-continent, comprising India, Pakistan, Bangladesh and Sri-Lanka. The 2010 combined distillation capacity was 4.1 million B/D (202 million tonnes per annum) of which 3.8 million B/D (93%) was in India.

FIGURE VI-12
INDIA EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)

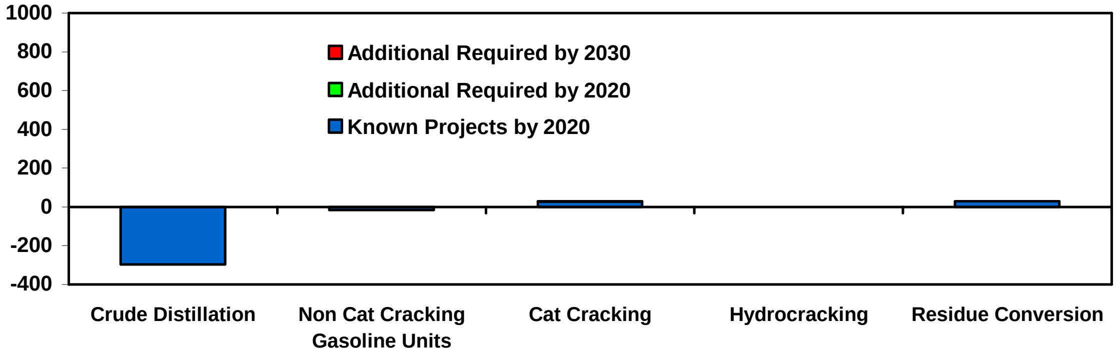


The expected capacity increases result in a substantial increase in both gasoline and middle distillate production with fuel oil production remaining almost constant. The resultant balances are shown in Section V (Table V-7). In 2010 India was already a net exporter of gasoline, middle distillates and fuel oil. By 2020 the expected increased production of gasoline, jet/kerosene and diesel/gasoil is matched by a similar or greater growth in domestic consumption for these products. As a result the net position of India as a fuels exporter in 2020 remains but export volumes are expected to be lower than in 2010. While some of the recent and future investments in Indian refining capacity have been targeted towards the export markets of Europe and North America, rapidly expanding domestic demand is expected to limit the volumes ultimately available for export. Further investment is likely by 2030 to allow for further growth in the domestic market, resulting in a potential continuation of exports at varying levels.

JAPAN

Figure VI-13 shows the expected capacity additions to Japanese refineries.

FIGURE VI-13
JAPAN EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)

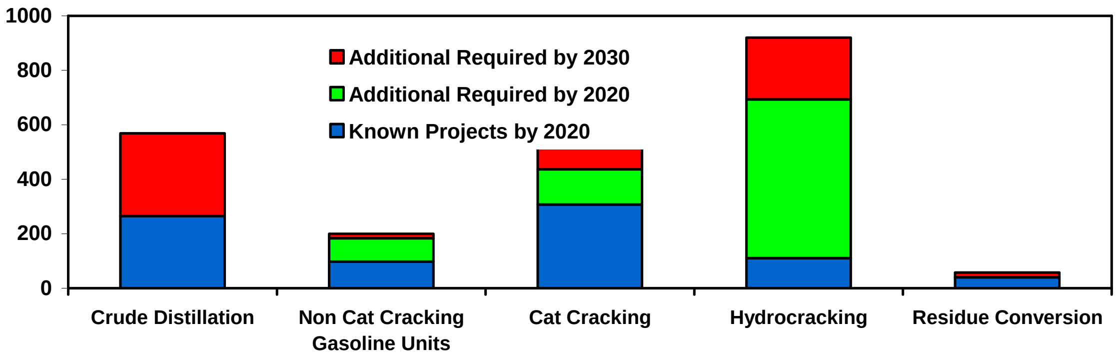


The expected capacity changes result in some small decrease in gasoline and middle distillate production. Japan is a very mature post-industrial economy with declining population and one of the lowest energy intensities in the world. There is a strong focus on energy conservation as there is very little indigenous production of fossil-fuel energy. Demand for all oil products has been reducing since 2000 and the oil industry has been undergoing a period of consolidation. Crude distillation capacity has fallen by 10% since the year 1998. In addition the logistics for the oil industry are built around an ability to import large cargoes of crude oil from distant overseas location to supply domestic demand, with limited capability for product exports. Consequently increases in product production are not expected, and some further consolidation of existing refinery capacity is expected. The expected refined product balances are shown in Section V (Table V-8). Japan is a net exporter of diesel with other products being close to balanced. The predicted balances show little change from 2010.

OTHER ASIA INCLUDING OCEANIA

The remaining Asian countries, including those in South Korea, Taiwan, Southeast Asia, and Oceania have been consolidated together as “Other Asia”. Figure VI-14 shows the expected capacity additions to refineries in Other Asia and Oceania.

FIGURE VI-14
OTHER ASIA AND OCEANIA EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)

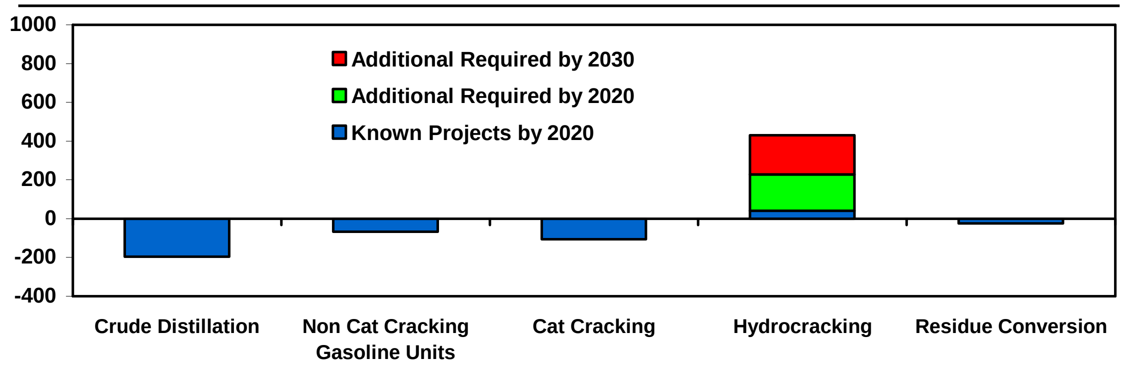


The expected capacity increases result in an increase in both gasoline and middle distillate production with fuel oil production remaining almost constant. The balances are shown in Section V (Table V-9). The increase in gasoline production is lower than the expected increase in demand and therefore imports of gasoline into the region are expected to increase. Production and demand for jet/kerosene both increase at a similar rate, with the region remaining a net exporter. The expected increases in diesel production are partly absorbed by increases in local and marine bunker demand with exports expected to increase slightly. In general it can be seen that the new investments allow the region to keep pace with local rising demand, while maintaining a similar level of middle distillate exports. The new investments can therefore be regarded as fulfilling increases in local demand, rather than being specifically targeted at export markets.

NORTH EUROPE

Figure VI-15 shows the expected and required capacity changes to refineries in North Europe. Note the small expected reduction in crude distillation capacity by 2020.

FIGURE VI-15
NORTH EUROPE EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)

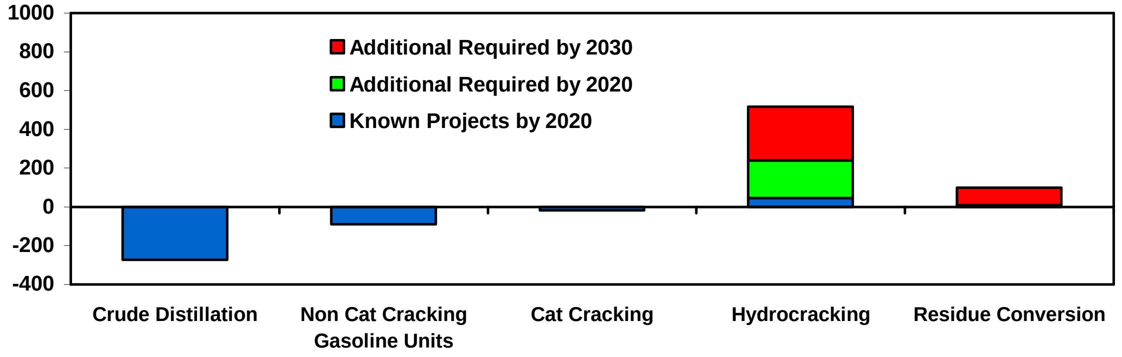


The expected capacity changes result in an increase in middle distillate production and a reduction in gasoline and fuel oil production. The balances are shown in Section IV (Table IV-2). With only three hydrocrackers under construction and distillation capacity being closed, the increase in middle distillate production lags behind expected increase in demand increasing the net import position of the North European market. By contrast the expected reduction in gasoline production is not as great as the expected drop in gasoline demand, resulting in a slight increase in the gasoline net export position. Fuel oil exports are expected to remain broadly constant. The refinery investments (and divestments) in North Europe are certainly for product supply into the North and Central European markets. In both the medium term to 2020 and longer term out to 2030 significant additional investment in middle distillate production capacity is required along with additional reduction in gasoline production with resulting closure or downsizing of gasoline producing units.

CENTRAL EUROPE

Figure VI-16 shows the expected and required capacity changes to refineries in Central Europe.

FIGURE VI-16
CENTRAL EUROPE EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)



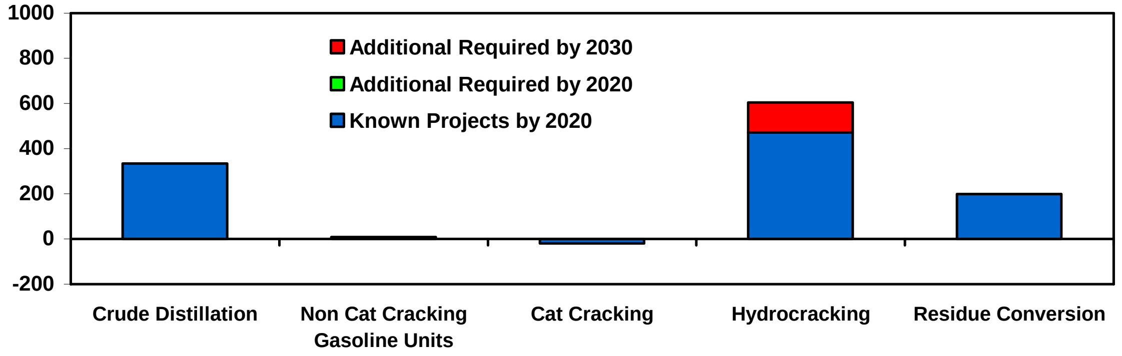
The expected capacity changes result in an increase in middle distillate production and reduction in gasoline and fuel oil production. The balances are shown in Section IV (Table IV-3). Central Europe is already a major importer of middle distillates and has a small net export of gasoline and fuel oil.

The expected increase in middle distillate production is expected to keep pace with the expected increase in demand therefore maintaining the net import position. The small expected reduction in gasoline production is slightly lower than the expected drop in gasoline demand, resulting in a slight increase in the gasoline net export position. The fuel oil position is expected to remain unchanged. The refinery investments in Central Europe can be regarded as servicing the local market. As with Northern Europe, in the medium and longer term further investment in middle distillate production capacity is required, and additional reduction in gasoline production with resultant closure of gasoline producing units is likely.

SOUTH EUROPE

Figure VI-17 shows the expected and required capacity changes to refineries in South Europe.

FIGURE VI-17
SOUTH EUROPE EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)



The majority of the expected capacity changes result in an increase in middle distillate production. The balances are shown in Section IV (Table IV-4). The expected increase in middle distillate production is slightly lower than the expected increase in demand therefore increasing the net import position. Gasoline production declines at the same rate as demand thus maintaining net exports at current levels. The fuel oil position is expected to remain unchanged. The investments can be regarded as servicing the local market. As with Northern and Central Europe, by 2030 further investment in middle distillate production capacity is required, along with the closure of gasoline producing units to rebalance supply and demand.

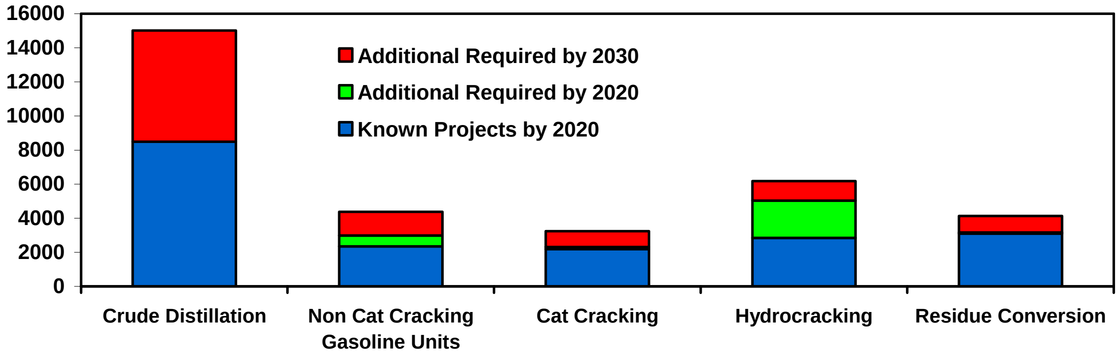
UK

There is very little major investment currently announced at UK refineries. Known projects are limited to additional diesel hydrotreating capacity at the ConocoPhillips refinery at South Killingholme and additional diesel hydrotreating capacity plus associated hydrogen production plant at the Total Lindsey refinery in North Killingholme. These capacity additions should allow for the processing of some higher sulphur crudes and some increase in diesel production. However these are mainly quality treating investments rather than investment in additional crude distillation or cracking capacity, and would not fundamentally increase the production of middle distillates overall. Details of these investments are listed in Table VI-16.

CONCLUSIONS

A summary of the total global expected and required refining investments are shown in Figure VI-18.

FIGURE VI-18
GLOBAL EXPECTED AND REQUIRED CAPACITY ADDITIONS 2015 TO 2025
(Thousand Barrels per Day)



It can be seen that to keep pace with growing global demand for refined products, additional investment in refining capacity are required. The expected growth in middle distillates results in a bias in the conversion investments towards those that will produce most distillates, although this is to an extent market specific. As overall demand for the lighter products exceeds that of heavy fuel oil, the increase in crude processing will need to be accompanied by some investment to convert the surplus fuel oil to light products.

It is concluded that for the North America, Latin America and African regions and the countries of China and Japan the additional production from expected investments is absorbed by expected demand increases in the respective local markets. For the rest of Asia (excluding India) investments keep pace with expanding demand with a small increase in middle distillate exports.

For India the recent and expected investments result in an increase in exports in the short term, but these are expected to be reduced in the longer term owing to rapidly expanding domestic demand. In the Middle East the expected investments reduce current levels of gasoline import and increase net diesel/gasoil exports. These investments therefore target both local and export markets.

The CIS region is already a major exporter of refined products and this is expected to continue. Production from new capacity therefore increases the net surplus resulting in an increase in exports, primarily of middle distillates to the European markets. Some reduction in fuel oil exports to European markets is expected as the CIS refining industry gradually increases its conversion capacity.

By 2020 there is substantial investment expected in Europe resulting in an increase in middle distillate production. However the level of expected investment still does not keep pace with the expected European demand increase for middle distillates, resulting in an increase in overall middle distillate imports. In section IV it is shown that to meet this demand imports are required to be sourced from the CIS, Middle East North America and Asia, i.e. from almost all other regions. Substantial further investment in European middle distillate production capacity is required by 2030.

One key message is that Europe (and indeed the UK) should not be overly concerned about the development of middle distillate export refineries in other regions, as the production from them is required to balance expected European demand. However as large new refineries are commissioned there will be a boost to product supply and downward pressure on refinery profitability as is being seen now. As the capacity is absorbed by market growth in the export location a better balance is achieved and profitability restored.

To improve security of supply Europe should increase its own production capacity of middle distillates, while reducing dependency on export gasoline markets. This does not translate into a requirement for an increase in crude distillation capacity, but for a substantial switch in upgrading capacity from catalytic cracking to hydrocracking and/or coking. This would boost middle distillate production and reduce gasoline production, thus going some way to correct the current European imbalances. However such changes would require very substantial capital investment.

Our analysis of expected global refinery investment above and resultant refined product balances shown in sections III, IV and V by definition come to a global balance of supply and demand for refined products. However within this analysis, the balance for middle distillates is much more stretched than the balances for gasoline and fuel oil. Units primarily producing middle distillates such as hydrocrackers and cokers are running at high utilisation rates – there is very little spare production capacity. The utilisation rates for gasoline and fuel oil producing units such as cat-crackers and crude distillers are lower, meaning that there is spare production capacity for these products.

Therefore an increase in middle distillate demand above that projected in our balances would require additional further refinery investment, whereas an increase in gasoline or fuel oil demand could be accommodated by increased utilisation of the existing global capacity.

Given that the lead time for construction of new refinery plant is between three to five years, in the short to medium term there is a significant risk of a shortage of middle distillate supply constraining demand. Under such a scenario, higher prices for middle distillates relative to other oil products are likely. This would be a global issue, impacting the global economy, but would be most keenly felt in Europe and the UK where middle distillate imports are most required to meet total product demand.

TABLE VI-1
TOTAL WORLD REFINERY CAPACITY
(Thousand Barrels per Day, Unless Noted)

	Existing plus Announced at End of Year											Required	Required vs. Announced	Total Add'ns, incl. Projects	Required	Required Additions
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Thru 2020	Thru 2020	2030	2020-2030
Crude Distillation	92,261	93,124	94,383	96,533	96,581	98,526	100,188	101,373	101,973	101,973	101,973	101,973	0	8,849	108,494	6,521
Vacuum Distillation	33,955	34,409	35,011	35,964	36,098	36,983	37,674	38,219	38,559	38,559	38,559	39,678	1,120	5,269	42,952	3,274
Thermal Cracking	796	801	801	801	801	801	801	859	859	859	859	859	0	58	859	0
Visbreaking	3,467	3,557	3,569	3,514	3,545	3,545	3,523	3,563	3,648	3,648	3,648	3,648	0	91	3,693	45
Solvent Deasphalting	800	818	818	843	843	843	843	873	873	873	873	873	0	55	879	6
Residue HDS	1,973	2,102	2,168	2,380	2,380	2,449	2,554	2,554	2,554	2,554	2,554	2,597	43	495	2,645	48
Residue Hydrocracking	549	609	609	613	636	679	679	679	679	679	679	734	55	125	799	65
Fluid Coker	272	319	319	339	339	339	339	369	369	369	369	369	0	50	369	0
Delayed Coker	5,253	5,991	6,463	6,870	7,016	7,366	7,708	7,835	7,915	7,915	7,915	7,982	66	1,991	8,896	915
VGO HDS	7,037	7,627	7,800	7,984	8,162	8,216	8,216	8,322	8,322	8,322	8,322	8,331	9	704	8,394	63
Fluid Catalytic Cracking	13,374	13,536	13,602	13,941	13,980	14,140	14,167	14,217	14,217	14,217	14,217	14,346	129	810	15,116	770
Resid Catalytic Cracking	3,524	4,133	4,290	4,472	4,472	4,670	4,887	4,887	4,887	4,887	4,887	4,887	0	754	5,045	158
Alkylation	2,234	2,259	2,299	2,328	2,340	2,340	2,344	2,356	2,356	2,356	2,356	2,441	85	183	2,614	173
Polymerization	204	204	204	204	204	204	208	208	208	208	208	209	0	4	219	10
MTBE Unit	257	309	310	320	320	320	320	320	320	320	320	325	4	16	348	24
TAME Unit	32	32	32	32	32	32	32	32	32	32	32	32	0	0	32	0
Isomerization	2,150	2,189	2,254	2,397	2,417	2,431	2,481	2,488	2,503	2,503	2,503	2,748	245	559	2,917	169
Hydrocracker	6,173	6,565	6,746	7,288	7,527	7,990	8,460	8,724	8,891	8,891	8,891	11,021	2,130	4,456	12,103	1,082
Reformer - Semi-Regenerative	7,854	7,925	7,872	7,841	7,832	7,832	7,853	7,853	7,853	7,853	7,854	7,854	0	-72	7,854	0
Reformer - Continuous	5,187	5,621	5,812	6,323	6,413	6,651	6,858	6,978	7,083	7,083	7,083	7,389	306	1,768	8,406	1,017
BTX Extraction	1,543	1,582	1,605	1,731	1,744	1,776	1,776	1,776	1,776	1,776	1,776	1,776	0	193	1,776	0
Naphtha Hydrotreating	15,641	15,852	16,038	16,660	16,724	16,980	17,333	17,491	17,611	17,611	17,611	18,175	564	2,324	19,526	1,351
Gasoline Desulfurization	4,342	5,147	5,524	5,720	5,886	5,959	6,021	6,021	6,021	6,021	6,021	6,441	420	1,294	7,219	777
Distillate Hydrotreating	23,520	25,327	26,051	27,297	27,735	28,322	29,045	29,472	29,610	29,610	29,610	29,925	315	4,598	33,463	3,537
Asphalt	2,514	2,547	2,557	2,554	2,555	2,555	2,555	2,555	2,555	2,555	2,555	2,555	0	8	2,555	0
Sulfur Plant, LTPD	92,431	96,694	99,619	101,996	102,958	105,108	106,357	108,637	109,027	109,027	109,027	113,994	4,966	17,299	131,358	17,365
Hydrogen Plant, MMSCFD	17,725	18,699	19,214	20,191	20,699	21,538	21,987	22,562	22,814	22,814	22,814	27,706	4,892	9,007	30,700	2,993
FCC Equivalents	35,259	38,038	39,304	41,155	41,722	43,254	44,633	45,273	45,610	45,610	45,610	47,406	1,796	9,368	51,138	3,732
FCC Equivalents as a % of Crude	38	41	42	43	43	44	45	45	45	45	45	46			47	

TABLE VI-2
UNITED STATES REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	State	PADD	2011	2012	2013	2014	2015	2016	2017	2018
Crude	WRB Refining (COP/Encana)	Wood River	IL	II	50	-	-	-	-	-	-	-
	Marathon	Detroit	MI	II	-	-	20	-	-	-	-	-
	BP/Husky	Toledo	OH	II	-	-	-	-	15	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	325	-	-	-	-	-	-
Crude Total					*50*	*325*	*20*	-	*15*	-	-	-
Vacuum	BP/Husky	Toledo	OH	II	-	-	-	-	30	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	160	-	-	-	-	-	-
	Total SA	Port Arthur	TX	III	55	-	-	-	-	-	-	-
Vacuum Total					*55*	*160*	-	-	*30*	-	-	-
Coker-Delayed	WRB Refining (COP/Encana)	Wood River	IL	II	65	-	-	-	-	-	-	-
	BP	Whiting	IN	II	-	-	63	-	-	-	-	-
	Marathon	Detroit	MI	II	-	-	28	-	-	-	-	-
	BP/Husky	Toledo	OH	II	-	-	-	-	30	-	-	-
	Flint Hills Resources	Corpus Christi	TX	III	2	-	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	95	-	-	-	-	-	-
	Total SA	Port Arthur	TX	III	50	-	-	-	-	-	-	-
Coker-Delayed Total					*117*	*95*	*91*	-	*30*	-	-	-
FCCU	WRB Refining (COP/Encana)	Wood River	IL	II	27	-	-	-	-	-	-	-
Hydrocracker-Resid	Chevron	Pascagoula	MS	III	-	4	-	-	-	-	-	-
Hydrocracker-Other	Valero Energy Corp.	St. Charles (Norco)	LA	III	-	-	50	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	75	-	-	-	-	-	-
	Valero Energy Corp.	Port Arthur	TX	III	-	50	-	-	-	-	-	-
Hydrocracker-Other Total					-	*125*	*50*	-	-	-	-	-
Hydrotreater-Naphtha	Marathon	Detroit	MI	II	-	-	12	-	-	-	-	-
	BP/Husky	Toledo	OH	II	-	42	-	-	-	-	-	-
	BP/Husky	Toledo	OH	II	-	(40)	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	85	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	28	-	-	-	-	-	-
Hydrotreater-Naphtha Total					-	*115*	*12*	-	-	-	-	-
Hydrotreater-Diesel	Marathon	Detroit	MI	II	-	-	33	-	-	-	-	-
	Tesoro Petroleum	Mandan	ND	II	2	-	-	-	-	-	-	-
	BP/Husky	Toledo	OH	II	-	-	-	-	40	-	-	-
	Holly	Tulsa	OK	II	13	-	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	60	-	-	-	-	-	-
	Valero Energy Corp.	Port Arthur	TX	III	-	15	-	-	-	-	-	-
	Petro Star, Inc.	Valdez	AK	V	14	-	-	-	-	-	-	-
	BP	Ferndale	WA	V	-	-	25	-	-	-	-	-
Hydrotreater-Diesel Total					*28*	*75*	*58*	-	*40*	-	-	-
Hydrotreater-VGO/HGO	BP	Whiting	IN	II	-	-	100	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	50	-	-	-	-	-	-
Hydrotreater-VGO/HGO Total					-	*50*	*100*	-	-	-	-	-
Hydrotreater-Gasoline	Coffeyville Resources LLC	Coffeyville	KS	II	60	-	-	-	-	-	-	-
Hydrogenation-Benzene	Holly	Tulsa	OK	II	6	-	-	-	-	-	-	-
	Holly Corp.	Woods Cross	UT	IV	-	4	-	-	-	-	-	-
Hydrogenation-Benzene Total					*6*	*4*	-	-	-	-	-	-
Reformer-CCR	BP/Husky	Toledo	OH	II	-	42	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	85	-	-	-	-	-	-
Reformer-CCR Total					-	*127*	-	-	-	-	-	-
Reformer-Cyclic	BP/Husky	Toledo	OH	II	-	(43)	-	-	-	-	-	-
Hydrogen-Steam Methane (MMSCFD)	BP	Whiting	IN	II	-	-	180	-	-	-	-	-
	Valero Energy Corp.	Memphis	TN	II	-	30	-	-	-	-	-	-
	Valero Energy Corp.	St. Charles (Norco)	LA	III	-	-	50	-	-	-	-	-
	Valero Energy Corp.	Sunray	TX	III	-	30	-	-	-	-	-	-
	Chevron	Richmond	CA	V	80	-	-	-	-	-	-	-
	Valero Energy Corp.	Benicia	CA	V	-	-	100	-	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)					*80*	*60*	*330*	-	-	-	-	-
Alkylation-SF	WRB Refining (COP/Encana)	Wood River	IL	II	6	-	-	-	-	-	-	-
Isomerization-C5/C6	WRB Refining (COP/Encana)	Wood River	IL	II	4	-	-	-	-	-	-	-
	Motiva Enterprises LLC	Port Arthur	TX	III	-	28	-	-	-	-	-	-
Isomerization-C5/C6 Total					*4*	*28*	-	-	-	-	-	-
Sulfur (LT/D)	Marathon	Detroit	MI	II	-	-	280	-	-	-	-	-
	Valero Energy Corp.	St. Charles (Norco)	LA	III	-	-	260	-	-	-	-	-
Sulfur Total (LT/D)					-	-	*540*	-	-	-	-	-

TABLE VI-3
CANADA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Province	2011	2012	2013	2014	2015	2016	2017	2018
Crude	North Atlantic Refining	Come By Chance	Newfoundland	15	-	-	-	-	-	-	-
	Consumers Cooperative Refineries Ltd.	Regina	Saskatchewan	-	30	-	-	-	-	-	-
Crude Total				*15*	*30*	-	-	-	-	-	-
FCCU	Consumers Cooperative Refineries Ltd.	Regina	Saskatchewan	-	15	-	-	-	-	-	-
Hydrocracker-Other	North Atlantic Refining	Come By Chance	Newfoundland	4	-	-	-	-	-	-	-

TABLE VI-4
LATIN AMERICA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	300	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	300	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	25	-	-	-	-	-	-	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	230	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	165	-	-	-	-
	Petrobras (Clara Camarao)	Alto do Rodrigues	Brazil	30	-	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	33	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	82	-	-	-
	Empresa Colombiana de Petr.	Barrancabermeja	Colombia	-	-	-	-	50	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	35	-	-	-
	PEMEX	Minatitlan	Mexico	150	-	-	-	-	-	-	-
Crude Total				*238*	-	-	*465*	*397*	-	*300*	-
Vacuum	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	180	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	180	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	75	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	47	-	-	-
	PEMEX	Minatitlan	Mexico	80	-	-	-	-	-	-	-
Vacuum Total				*80*	-	-	*255*	*47*	-	*180*	-
Coker-Delayed	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	80	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	80	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	31	-	-	-	-	-	-	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	70	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	30	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	36	-	-	-
	Empresa Colombiana de Petr.	Barrancabermeja	Colombia	-	-	-	-	50	-	-	-
	PEMEX	Minatitlan	Mexico	50	-	-	-	-	-	-	-
Coker-Delayed Total				*81*	-	-	*110*	*156*	-	*80*	-
FCCU	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	6	-	-	-
	PEMEX	Minatitlan	Mexico	38	-	-	-	-	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	9	-	-	-	-	-	-	-
FCCU Total				*47*	-	-	-	*6*	-	-	-
Visbreaker	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	(23)	-	-	-
Hydrocracker-Other	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	90	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	90	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	50	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	50	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	32	-	-	-
	Empresa Colombiana de Petr.	Barrancabermeja	Colombia	-	-	-	-	30	-	-	-
Hydrocracker-Other Total				-	-	-	*140*	*112*	-	*90*	-
Hydrotreater-Naphtha	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	60	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	60	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	18	-	-	-	-	-	-	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	40	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	20	-	-	-	-
	Petrobras (Clara Camarao)	Alto do Rodrigues	Brazil	8	-	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	15	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	23	-	-	-
	Empresa Colombiana de Petr.	Barrancabermeja	Colombia	-	-	-	-	20	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	10	-	-	-
	PEMEX	Minatitlan	Mexico	15	-	-	-	-	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	7	-	-	-	-	-	-	-
Hydrotreater-Naphtha Total				*63*	-	-	*80*	*93*	-	*60*	-
Hydrotreater-Diesel	Repsol-YPF	La Plata	Argentina	-	-	40	-	-	-	-	-
	Repsol-YPF	Lujan de Cuyo	Argentina	-	-	18	-	-	-	-	-
	Landulpho Alves (RLAM)	Mataripe	Brazil	53	-	-	-	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	82	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	82	-
	Gabriel Passos (REGAP)	Betim	Brazil	-	25	-	-	-	-	-	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	29	-	-	-	-	-	-	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	150	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	50	-	-	-	-
	Petrobras (Clara Camarao)	Alto do Rodrigues	Brazil	6	-	-	-	-	-	-	-
	Alberto Pasqualini (REFAP)	Canoas	Brazil	-	33	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	-	-	36	-	-	-	-	-
	President Bernardes (RPBC)	Cubatao	Brazil	-	-	50	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	63	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	15	-	-	-
	Pemex	Cadereyta	Mexico	30	-	-	-	-	-	-	-
	PEMEX	Minatitlan	Mexico	33	-	-	-	-	-	-	-
	Repsol	La Pampilla	Peru	25	-	-	-	-	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	-	40	-	-	-	-	-	-
	ANCAP	La Teja	Uruguay	18	-	-	-	-	-	-	-
Hydrotreater-Diesel Total				*195*	*98*	*144*	*132*	*228*	-	*82*	-

TABLE VI-4 (CONT'D)
LATIN AMERICA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-VGO/HGO	PEMEX	Minatitlan	Mexico	45	-	-	-	-	-	-	-
Hydrotreater-Gasoline	Repsol-YPF	Lujan de Cuyo	Argentina	-	30	-	-	-	-	-	-
	Manaus (REMAN)	Manaus	Brazil	-	5	-	-	-	-	-	-
	Landulpho Alves (RLAM)	Mataripe	Brazil	50	-	-	-	-	-	-	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	31	-	-	-	-	-	-	-
	Henrique Lage (REVAP)	Sao Jose dos Campos	Brazil	31	-	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	31	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	18	-	-	-
	Pemex	Salamanca	Mexico	-	50	-	-	-	-	-	-
	Pemex	Tula Hidalgo	Mexico	-	50	-	-	-	-	-	-
	Pemex	Cadereyta	Mexico	43	-	-	-	-	-	-	-
	Pemex	Salina Cruz	Mexico	-	-	25	-	-	-	-	-
	Pemex	Ciudad Madero	Mexico	40	-	-	-	-	-	-	-
	PEMEX	Minatitlan	Mexico	-	-	25	-	-	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	32	-	-	-	-	-	-	-
	ANCAP	La Teja	Uruguay	5	-	-	-	-	-	-	-
Hydrotreater-Gasoline Total				*263*	*135*	*50*	-	*18*	-	-	-
Hydrogenation-Benzene	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	5	-	-	-
Reformer-CCR	Repsol-YPF	La Plata	Argentina	-	-	20	-	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	60	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	60	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	7	-	-	-	-	-	-	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	40	-	-	-
	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	20	-	-	-	-
	Henrique Lage (REVAP)	Sao Jose dos Campos	Brazil	10	-	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	15	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	18	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	28	-	-	-	-	-	-	-
Reformer-CCR Total				*60*	-	*20*	*80*	*58*	-	*60*	-
Reformer-Semi Regen	Petrobras (Clara Camarao)	Alto do Rodrigues	Brazil	8	-	-	-	-	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	10	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	(18)	-	-	-	-	-	-	-
Reformer-Semi Regen Total				*(11)*	-	-	-	*10*	-	-	-
Hydrogen-Steam Methane (MMSCFD)	Repsol-YPF	Lujan de Cuyo	Argentina	-	30	-	-	-	-	-	-
	Landulpho Alves (RLAM)	Mataripe	Brazil	31	-	-	-	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	112	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	112	-
	Petrobras/PDVSA (RNE)	Abreu e Lima	Brazil	-	-	-	-	210	-	-	-
	Henrique Lage (REVAP)	Sao Jose dos Campos	Brazil	42	-	-	-	-	-	-	-
	Paulinia (REPLAN)	Paulinia	Brazil	30	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	97	-	-	-
	PEMEX	Minatitlan	Mexico	48	-	-	-	-	-	-	-
Hydrogen-Steam Methane Total (M				*151*	*30*	-	*112*	*307*	-	*112*	-
Hydrogen-Steam Naphtha (MMSCFD)	President Getulio Vargas (REPAR)	Araucaria	Brazil	24	-	-	-	-	-	-	-
Alkylation-SF	ENAP Refinerias SA	Aconcagua, Concon	Chile	-	-	6	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	4	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	8	-	-	-	-	-	-	-
Alkylation-SF Total				*8*	-	*6*	-	*4*	-	-	-
Alkylation-HF	PEMEX	Minatitlan	Mexico	12	-	-	-	-	-	-	-
Isomerization-C4	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	1	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	1	-	-	-
	PEMEX	Minatitlan	Mexico	4	-	-	-	-	-	-	-
Isomerization-C4 Total				*4*	-	-	-	*3*	-	-	-
Isomerization-C5/C6	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	7	-	-	-	-	-	-	-
Aromatics-BTX	Petrobras (Comperj I)	Rio de Janeiro (Comperj)	Brazil	-	-	-	14	-	-	-	-
Sulfur (LT/D)	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	190	-	-	-	-
	Petrobras (Premium I)	Sao Luis	Brazil	-	-	-	-	-	-	190	-
	President Getulio Vargas (REPAR)	Araucaria	Brazil	65	-	-	-	-	-	-	-
	Empresa Colombiana de Petr.	Cartagena	Colombia	-	-	-	-	216	-	-	-
	Refinadora Costarricense de Petroleo SA	Limon	Costa Rica	-	-	-	-	25	-	-	-
	PEMEX	Minatitlan	Mexico	540	-	-	-	-	-	-	-
	Petroleum Co. of Trinidad and Tobago	Pointe-a-Pierre	Trinidad	100	-	-	-	-	-	-	-
Sulfur Total (LT/D)				*705*	-	-	*190*	*241*	-	*190*	-

TABLE VI-5
MIDDLE EAST REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	417	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	120	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	231	-	-
	National Iranian Oil Co.	Lavan	Iran	-	-	-	20	-	-	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	80	-	-	-	-
	Kar	Arbil	Iraq	-	40	-	-	-	-	-	-
	Laffan Refinery Co.	Ras Laffan	Qatar	-	-	-	-	-	140	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	400	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	400	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	300	-
Crude Total				-	*160*	-	*500*	*417*	*771*	*300*	-
Vacuum	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	200	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	30	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	115	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	200	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	200	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	160	-
Vacuum Total				-	*30*	-	*200*	*200*	*315*	*160*	-
Coker-Delayed	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	80	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	100	-	-	-	-
Coker-Delayed Total				-	-	-	*100*	-	*80*	-	-
FCCU	National Iranian Oil Co.	Abadan	Iran	-	45	-	-	-	-	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	33	-	-	-	-
FCCU Total				-	*45*	-	*33*	-	-	-	-
Other CCU	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	127	-	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	94	-	-	-	-
Other CCU Total				-	-	-	*94*	*127*	-	-	-
Visbreaker	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	85	-
Hydrocracker-Other	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	41	-	-	-	-	-	-	-
	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	57	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	42	-	-
	Oil Refineries Ltd.	Haifa	Israel	-	25	-	-	-	-	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	100	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	118	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	77	-
Hydrocracker-Other Total				*41*	*25*	-	*118*	*57*	*142*	*77*	-
Hydrotreater-Naphtha	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	69	-	-	-
	National Iranian Oil Co.	Tabriz	Iran	-	34	-	-	-	-	-	-
	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	25	-	-	-	-	-
	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	16	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	45	-	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	33	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	34	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	28	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	43	-	-
	National Iranian Oil Co.	Abadan	Iran	-	22	-	-	-	-	-	-
	National Iranian Oil Co.	Lavan	Iran	-	-	-	5	-	-	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	33	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	18	-	-	-	-	-	-	-
	Kar	Arbil	Iraq	-	9	-	-	-	-	-	-
	Laffan Refinery Co.	Ras Laffan	Qatar	-	-	-	-	-	50	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	45	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	45	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	45	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	15	-
Hydrotreater-Naphtha Total				*18*	*205*	*41*	*83*	*69*	*138*	*60*	-
Hydrotreater-Kerosene	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	108	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	25	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	45	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	32	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	32	-	-	-	-	-	-	-
	Kar	Arbil	Iraq	-	3	-	-	-	-	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	20	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	30	-	-	-	-
Hydrotreater-Kerosene Total				*32*	*28*	-	*62*	*108*	*65*	-	-

TABLE VI-5 (CONT'D)
MIDDLE EAST REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-Diesel	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	22	-	-	-	-	-	-	-
	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	75	-	-	-
	National Iranian Oil Co.	Tabriz	Iran	-	80	-	-	-	-	-	-
	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	50	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	42	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	96	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	90	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	53	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	53	-	-	-	-	-	-	-
	Kar	Arbil	Iraq	-	4	-	-	-	-	-	-
	Laffan Refinery Co.	Ras Laffan	Qatar	-	-	-	-	-	28	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	50	-	-
	Saudi Aramco-Mobil	Yanbu	Saudi Arabia	-	-	40	-	-	-	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	50	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	56	-
Hydrotreater-Diesel Total				*75*	*222*	*90*	*103*	*75*	*168*	*56*	-
Hydrotreater-VGO/HGO	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	56	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	33	-	-	-	-
Hydrotreater-VGO/HGO Total				-	-	-	*33*	-	*56*	-	-
Hydrotreater-Resid	National Iranian Oil Co.	Arak	Iran	-	-	-	69	-	-	-	-
Hydrotreater-Gasoline	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	37	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	50	-	-	-	-	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	51	-	-	-	-
	Saudi Aramco-Mobil	Yanbu	Saudi Arabia	-	-	50	-	-	-	-	-
Hydrotreater-Gasoline Total				-	*50*	*50*	*51*	*37*	-	-	-
Reformer-CCR	National Iranian Oil Co.	Tabriz	Iran	-	20	-	-	-	-	-	-
	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	25	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	45	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	32	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	47	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	20	-	-	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	45	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	45	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	45	-
Reformer-CCR Total				-	*97*	*25*	*65*	-	*92*	*45*	-
Reformer-Semi Regen	Kar	Arbil	Iraq	-	6	-	-	-	-	-	-
Hydrogen-Steam Methane (MMSCFD)	National Iranian Oil Co.	Isfahan	Iran	-	202	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	75	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	135	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	42	-	-	-	-	-	-	-
	Saudi Aramco-Mobil	Yanbu	Saudi Arabia	-	-	70	-	-	-	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	200	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	140	-
Hydrogen-Steam Methane Total (MMSCFD)				*42*	*202*	*70*	*335*	-	*75*	*140*	-
Alkylation-SF	National Iranian Oil Co.	Abadan	Iran	-	16	-	-	-	-	-	-
Isomerization-C4	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	-	-	23	-	-	-
Isomerization-C5/C6	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	16	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	30	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	27	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	20	-	-	-	-	-	-
	National Iranian Oil Co.	Lavan	Iran	-	-	-	5	-	-	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	9	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	18	-	-	-	-	-	-	-
	Kar	Arbil	Iraq	-	3	-	-	-	-	-	-
	Ministry of Oil, Refinery Admin.	Baiji, North	Iraq	20	-	-	-	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	15	-
Isomerization-C5/C6 Total				*38*	*80*	*16*	*14*	-	-	*15*	-
Aromatics-BTX	National Iranian Oil Co.	Tabriz	Iran	-	6	-	-	-	-	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	18	-	-	-	-
Aromatics-BTX Total				-	*6*	-	*18*	-	-	-	-
Sulfur (LT/D)	National Iranian Oil Co.	Bandar Abbas	Iran	-	-	120	-	-	-	-	-
	Persian Gulf Star Oil Co.	Bandar Abbas	Iran	-	85	-	-	-	-	-	-
	National Iranian Oil Co.	Isfahan	Iran	-	600	-	-	-	-	-	-
	National Iranian Oil Co.	Abadan	Iran	-	-	-	-	-	460	-	-
	National Iranian Oil Co.	Arak	Iran	-	-	-	640	-	-	-	-
	National Iranian Oil Co.	Tehran	Iran	110	-	-	-	-	-	-	-
	Laffan Refinery Co.	Ras Laffan	Qatar	-	-	-	-	-	200	-	-
	Saudi Aramco	Yanbu	Saudi Arabia	-	-	-	-	-	1,180	-	-
	Saudi Aramco/TOTAL	Jubail	Saudi Arabia	-	-	-	800	-	-	-	-
	Saudi Aramco	Jizan	Saudi Arabia	-	-	-	-	-	-	200	-
Sulfur Total (LT/D)				*110*	*685*	*120*	*1,440*	-	*1,840*	*200*	-
Lubes	Abu Dhabi National Oil Co.	Ruwais	Abu Dhabi	-	-	12	-	-	-	-	-
	Bahrain Petroleum Co.	Sitra	Bahrain	-	8	-	-	-	-	-	-
Lubes Total				-	*8*	*12*	-	-	-	-	-

TABLE VI-6
AFRICA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	NAFTEC	Skikda	Algeria	-	37	-	-	-	-	-	-
	Samir	Mohammedia	Morocco	-	50	-	-	-	-	-	-
	Amakpe	Eket	Nigeria	6	-	-	-	-	-	-	-
	Amakpe	Eket	Nigeria	-	-	6	-	-	-	-	-
Crude Total				*6*	*87*	*6*	-	-	-	-	-
Vacuum	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	82	-	-	-
	Samir	Mohammedia	Morocco	-	35	-	-	-	-	-	-
Vacuum Total				-	*35*	-	-	*82*	-	-	-
Coker-Delayed	Middle East Oil Refinery (MIDOR)	Ameriya	Egypt	7	-	-	-	-	-	-	-
	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	25	-	-	-
Coker-Delayed Total				*7*	-	-	-	*25*	-	-	-
Hydrocracker-Other	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	40	-	-	-
Hydrotreater-Naphtha	NAFTEC	Skikda	Algeria	-	55	-	-	-	-	-	-
	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	18	-	-	-
	NOC	Tobruk	Libya	3	-	-	-	-	-	-	-
	Amakpe	Eket	Nigeria	4	-	-	-	-	-	-	-
Hydrotreater-Naphtha Total				*7*	*55*	-	-	*18*	-	-	-
Hydrotreater-Diesel	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	24	-	-	-
Reformer-CCR	NAFTEC	Skikda	Algeria	-	50	-	-	-	-	-	-
	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	13	-	-	-
	NOC	Tobruk	Libya	3	-	-	-	-	-	-	-
Reformer-CCR Total				*3*	*50*	-	-	*13*	-	-	-
Reformer-Semi Regen	Ghanian Italian Petroleum	Tema	Ghana	2	-	-	-	-	-	-	-
	Amakpe	Eket	Nigeria	4	-	-	-	-	-	-	-
Reformer-Semi Regen Total				*6*	-	-	-	-	-	-	-
Aromatics-BTX	NAFTEC	Skikda	Algeria	-	40	-	-	-	-	-	-
Sulfur (LT/D)	Egyptian Refining Co.	Mostorod	Egypt	-	-	-	-	250	-	-	-

TABLE VI-7
EUROPE REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Petroplus	Reichstett-Vendenheim	France	(80)	-	-	-	-	-	-	-
	Hellenic Petroleum	Thessaloniki	Greece	25	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(94)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(70)	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	110	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	214	-	-	-
Crude Total				*(109)*	-	-	-	*214*	-	-	-
Vacuum	Petroplus	Reichstett-Vendenheim	France	(31)	-	-	-	-	-	-	-
	Hellenic Petroleum	Elefsis	Greece	40	-	-	-	-	-	-	-
	Galp	Leca da Palmeira Porto	Portugal	20	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(38)	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	90	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	80	-	-	-
	Tupras	Izmit	Turkey	-	-	-	47	-	-	-	-
Vacuum Total				*82*	-	-	*47*	*80*	-	-	-
Coker-Delayed	OMV Petrom (Petrobrazi)	Ploiesti	Romania	-	-	-	7	-	-	-	-
	Repsol	Cartagena Murcia	Spain	60	-	-	-	-	-	-	-
	Repsol	Somorrostro Vizcaya	Spain	40	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	40	-	-	-
	Tupras	Izmit	Turkey	-	-	-	52	-	-	-	-
Coker-Delayed Total				*100*	-	-	*59*	*40*	-	-	-
Coker-Fluid/Flexi	Hellenic Petroleum	Elefsis	Greece	20	-	-	-	-	-	-	-
FCCU	Petroplus	Reichstett-Vendenheim	France	(13)	-	-	-	-	-	-	-
Other CCU	OMV Petrom (Arpechim)	Pitesti	Romania	(19)	-	-	-	-	-	-	-
Visbreaker	Petroplus	Reichstett-Vendenheim	France	(18)	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(36)	-	-	-	-	-	-	-
	Galp	Leca da Palmeira Porto	Portugal	10	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(11)	-	-	-	-	-	-	-
Visbreaker Total				*(55)*	-	-	-	-	-	-	-
Solvent Deasphalting	Lotos	Gdansk	Poland	25	-	-	-	-	-	-	-
Hydrocracker-Vacuum Gasoil	Total	Gonfreville L'Orcher	France	-	40	-	-	-	-	-	-
	Lukoil Neftochim	Bourgas	Bulgaria	-	-	35	-	-	-	-	-
	Hellenic Petroleum	Elefsis	Greece	40	-	-	-	-	-	-	-
	Galp	Sines	Portugal	43	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	50	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	66	-	-	-
	Tupras	Izmit	Turkey	-	-	-	50	-	-	-	-
Hydrocracker-Vacuum Gasoil Total				*133*	*40*	*35*	*50*	*66*	-	-	-
Hydrocracker-Resid	Lukoil Neftochim	Bourgas	Bulgaria	-	-	43	-	-	-	-	-
	Agip	Sannazzaro, Pavia	Italy	-	23	-	-	-	-	-	-
Hydrocracker-Resid Total				-	*23*	*43*	-	-	-	-	-
Hydrocracker-Other	Lotos	Gdansk	Poland	45	-	-	-	-	-	-	-
	INA	Rijeka	Croatia	33	-	-	-	-	-	-	-
	INA	Sisak	Croatia	-	-	-	-	16	-	-	-
	NIS	Pancevo	Serbia	-	-	-	30	-	-	-	-
Hydrocracker-Other Total				*78*	-	-	*30*	*16*	-	-	-
Hydrocracker-Lube	OMV Petrom (Arpechim)	Pitesti	Romania	(2)	-	-	-	-	-	-	-
Hydrotreater-Naphtha	Petroplus	Reichstett-Vendenheim	France	(19)	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(33)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(12)	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	10	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	20	-	-	-
Hydrotreater-Naphtha Total				*(53)*	-	-	-	*20*	-	-	-
Hydrotreater-Kerosene	Tamoil Italia SpA	Cremona	Italy	(8)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(19)	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	26	-	-	-
Hydrotreater-Kerosene Total				*(27)*	-	-	-	*26*	-	-	-

TABLE VI-7 (CONT'D)
EUROPE REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-Diesel	Lotos	Gdansk	Poland	50	-	-	-	-	-	-	-
	ExxonMobil	Antwerp	Belgium	40	-	-	-	-	-	-	-
	Petroplus	Reichstett-Vendenheim	France	(6)	-	-	-	-	-	-	-
	Shell	Pernis	Netherlands	40	-	-	-	-	-	-	-
	ConocoPhillips	South Killingholme	United Kingdom	60	-	-	-	-	-	-	-
	Total	North Killingholme	United Kingdom	20	-	-	-	-	-	-	-
	INA	Rijeka	Croatia	18	-	-	-	-	-	-	-
	INA	Sisak	Croatia	-	-	-	-	20	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(40)	-	-	-	-	-	-	-
	BP	Castellon de la Plana	Spain	30	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	25	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	68	-	-	-
	Tupras	Izmit	Turkey	-	-	-	28	-	-	-	-
Hydrotreater-Diesel Total				*238*	-	-	*28*	*88*	-	-	-
Hydrotreater-VGO/HGO	Petroplus	Reichstett-Vendenheim	France	(15)	-	-	-	-	-	-	-
Hydrotreater-Gasoline	Tamoil Italia SpA	Cremona	Italy	(3)	-	-	-	-	-	-	-
	Tupras	Izmit	Turkey	-	-	-	7	-	-	-	-
Hydrotreater-Gasoline Total				*(3)*	-	-	*7*	-	-	-	-
Hydrogenation-Benzene	Tamoil Italia SpA	Cremona	Italy	(3)	-	-	-	-	-	-	-
Hydrotreater-Other	Tamoil Italia SpA	Cremona	Italy	(7)	-	-	-	-	-	-	-
Reformer-CCR	Hellenic Petroleum	Thessaloniki	Greece	15	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(15)	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	28	-	-	-
Reformer-CCR Total				-	-	-	-	*28*	-	-	-
Reformer-Semi Regen	Petroplus	Reichstett-Vendenheim	France	(15)	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(9)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(12)	-	-	-	-	-	-	-
Reformer-Semi Regen Total				*(37)*	-	-	-	-	-	-	-
Hydrogen-Steam Methane (MMSCFD)	PKN Orlen	Plock	Poland	47	-	-	-	-	-	-	-
	Total	North Killingholme	United Kingdom	30	-	-	-	-	-	-	-
	Lukoil Neftochim	Bourgas	Bulgaria	-	-	142	-	-	-	-	-
	INA	Rijeka	Croatia	75	-	-	-	-	-	-	-
	INA	Sisak	Croatia	-	-	-	-	50	-	-	-
	Hellenic Petroleum	Elefsis	Greece	68	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(2)	-	-	-	-	-	-	-
	Rompetrol	Midia (Constanta)	Romania	40	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	150	-	-	-
	Tupras	Izmit	Turkey	-	-	-	100	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)				*259*	-	*142*	*100*	*200*	-	-	-
Hydrogen-Recovery (MMSCFD)	Tamoil Italia SpA	Cremona	Italy	(5)	-	-	-	-	-	-	-
Isomerization-C5/C6	INA	Sisak	Croatia	8	-	-	-	-	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(11)	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	5	-	-	-	-	-	-	-
Isomerization-C5/C6 Total				*2*	-	-	-	-	-	-	-
Aromatics-BTX	PKN Orlen	Plock	Poland	10	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(2)	-	-	-	-	-	-	-
Aromatics-BTX Total				*8*	-	-	-	-	-	-	-
Sulfur (LT/D)	OMV	Schwechat	Austria	60	-	-	-	-	-	-	-
	BP	Gelsenkirchen	Germany	140	-	-	-	-	-	-	-
	BP	Lingen	Germany	110	-	-	-	-	-	-	-
	Total	Leuna	Germany	500	-	-	-	-	-	-	-
	Petroplus	Antwerp	Belgium	30	-	-	-	-	-	-	-
	BP	Europoort	Netherlands	140	-	-	-	-	-	-	-
	INA	Rijeka	Croatia	190	-	-	-	-	-	-	-
	INA	Sisak	Croatia	-	-	-	-	65	-	-	-
	Tamoil Italia SpA	Cremona	Italy	(42)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(22)	-	-	-	-	-	-	-
	STRAS (Socar & Turkas)	Aliaga	Turkey	-	-	-	-	300	-	-	-
	Tupras	Izmit	Turkey	-	-	-	360	-	-	-	-
Sulfur Total (LT/D)				*1,106*	-	-	*360*	*365*	-	-	-
Lubes	OMV Petrom (Arpechim)	Pitesti	Romania	(1)	-	-	-	-	-	-	-
	Repsol	Cartagena Murcia	Spain	-	-	-	13	-	-	-	-
Lubes Total				*(1)*	-	-	*13*	-	-	-	-
Asphalt	Petroplus	Reichstett-Vendenheim	France	(7)	-	-	-	-	-	-	-
	OMV Petrom (Arpechim)	Pitesti	Romania	(3)	-	-	-	-	-	-	-
Asphalt Total				*(11)*	-	-	-	-	-	-	-

TABLE VI-8
CIS REGION REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	200	-	-
	Rosneft	Komsomolsk	Russia	-	-	16	-	-	-	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	140	-	-	-
	Mariisky NPZ	Mari El	Russia	54	-	-	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	140	-	-	-	-	-	-	-
Crude Total				*194*	-	*16*	-	*140*	*200*	-	-
Vacuum	TNK - BP	Nizhnevartovsk	Russia	17	-	-	-	-	-	-	-
	Rosneft	Achinsk	Russia	-	-	50	-	-	-	-	-
	Alliance Group	Khabarovsk	Russia	40	-	-	-	-	-	-	-
	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	80	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	70	-	-	-
	Surgutneftegaz	Kirishi	Russia	-	-	84	-	-	-	-	-
	Mariisky NPZ	Mari El	Russia	34	-	-	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	87	-	-	-	-	-	-	-
Vacuum Total				*178*	-	*134*	-	*70*	*80*	-	-
Coker-Delayed	Rosneft	Achinsk	Russia	-	-	25	-	-	-	-	-
	Rosneft	Komsomolsk	Russia	-	-	13	-	-	-	-	-
	Lukoil	Volgograd	Russia	17	-	-	-	-	-	-	-
Coker-Delayed Total				*17*	-	*38*	-	-	-	-	-
Coker-Fluid/Flexi	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	30	-	-
FCCU	Rosneft	Angarsk	Russia	-	18	-	-	-	-	-	-
	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	50	-	-
	Lukoil	Volgograd	Russia	-	-	-	22	-	-	-	-
FCCU Total				-	*18*	-	*22*	-	*50*	-	-
Visbreaker	Alliance Group	Khabarovsk	Russia	10	-	-	-	-	-	-	-
	Surgutneftegaz	Kirishi	Russia	-	-	32	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	40	-	-	-	-	-	-	-
Visbreaker Total				*50*	-	*32*	-	-	-	-	-
Thermal-Cracker	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	58	-	-
Solvent Deasphalting	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	30	-	-
Hydrocracker-Other	Alliance Group	Khabarovsk	Russia	-	10	-	-	-	-	-	-
	Rosneft	Komsomolsk	Russia	-	-	25	-	-	-	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	81	-	-	-
	Surgutneftegaz	Kirishi	Russia	-	-	60	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	-	-	-	40	-	-	-	-
Hydrocracker-Other Total				-	*10*	*85*	*40*	*81*	-	-	-
Hydrotreater-Naphtha	Rosneft	Tuapse	Russia	-	-	-	-	40	-	-	-
	Tatneft	Nizhnekamsk	Russia	17	-	-	-	-	-	-	-
Hydrotreater-Naphtha Total				*17*	-	-	-	*40*	-	-	-
Hydrotreater-Kerosene	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	15	-	-
	Tatneft	Nizhnekamsk	Russia	10	-	-	-	-	-	-	-
Hydrotreater-Kerosene Total				*10*	-	-	-	-	*15*	-	-
Hydrotreater-Diesel	Slavneft	Mozyr	Belarus	55	-	-	-	-	-	-	-
	P.O. Naftan Refinery	Novopolotsk	Belarus	18	-	-	-	-	-	-	-
	Alliance Group	Khabarovsk	Russia	-	24	-	-	-	-	-	-
	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	65	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	74	-	-	-
	Lukoil	Volgograd	Russia	35	-	-	-	-	-	-	-
	TNK - BP	Saratov (Kreking)	Russia	-	-	34	-	-	-	-	-
Hydrotreater-Diesel Total				*108*	*24*	*34*	-	*74*	*65*	-	-
Hydrotreater-VGO/HGO	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	50	-	-
	Lukoil	Volgograd	Russia	-	-	-	22	-	-	-	-
Hydrotreater-VGO/HGO Total				-	-	-	*22*	-	*50*	-	-
Reformer-CCR	Rosneft	Tuapse	Russia	-	-	-	-	31	-	-	-
	Tatneft	Nizhnekamsk	Russia	17	-	-	-	-	-	-	-
Reformer-CCR Total				*17*	-	-	-	*31*	-	-	-
Reformer-Semi Regen	Alliance Group	Khabarovsk	Russia	-	3	-	-	-	-	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	(11)	-	-	-
Reformer-Semi Regen Total				-	*3*	-	-	*(11)*	-	-	-

TABLE VI-8 (CONT'D)
CIS REGION REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrogen-Steam Methane (MMSCFD)	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	100	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	42	-	-	-
	Surgutneftegaz	Kirishi	Russia	-	-	100	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	-	-	-	100	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)				-	-	*100*	*100*	*42*	*100*	-	-
Hydrogen-Steam Naphtha (MMSCFD)	Alliance Group	Khabarovsk	Russia	-	27	-	-	-	-	-	-
Alkylation-SF	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	13	-	-
Alkylation-HF	Azerneftyanajag	Novo-Baku	Azerbaijan	8	-	-	-	-	-	-	-
Isomerization-C4	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	7	-	-
Isomerization-C5	P.O. Naftan Refinery	Novopolotsk	Belarus	7	-	-	-	-	-	-	-
Isomerization-C5/C6	Rosneft	Komsomolsk	Russia	-	-	2	-	-	-	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	17	-	-	-
	Rosneft	Syzran	Russia	6	-	-	-	-	-	-	-
	TNK - BP	Saratov (Kreking)	Russia	-	-	3	-	-	-	-	-
	Russneft	Orsk	Russia	7	-	-	-	-	-	-	-
Isomerization-C5/C6 Total				*13*	-	*5*	-	*17*	-	-	-
Aromatics-BTX	KazMunaiGaz	Atyrau (Guryev)	Kazakhstan	-	-	13	-	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	3	-	-	-	-	-	-	-
Aromatics-BTX Total				*3*	-	*13*	-	-	-	-	-
Oxy-MTBE	Azerneftyanajag	Novo-Baku	Azerbaijan	3	-	-	-	-	-	-	-
Sulfur (LT/D)	Alliance Group	Khabarovsk	Russia	-	35	-	-	-	-	-	-
	Rosneft	Cape of Vostok (Nakhodka)	Russia	-	-	-	-	-	140	-	-
	Rosneft	Komsomolsk	Russia	-	-	38	-	-	-	-	-
	Rosneft	Tuapse	Russia	-	-	-	-	340	-	-	-
	Surgutneftegaz	Kirishi	Russia	-	-	175	-	-	-	-	-
	Lukoil	Volgograd	Russia	-	-	-	120	-	-	-	-
	Tatneft	Nizhnekamsk	Russia	820	-	-	-	-	-	-	-
Sulfur Total (LT/D)				*820*	*35*	*213*	*120*	*340*	*140*	-	-
Asphalt	TNK - BP	Nizhnevartovsk	Russia	11	-	-	-	-	-	-	-
	Rosneft	Komsomolsk	Russia	-	-	1	-	-	-	-	-
	Yug Rusi	Novoshakhtinsk	Russia	-	6	-	-	-	-	-	-
Asphalt Total				*11*	*6*	*1*	-	-	-	-	-

TABLE VI-9
CHINA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Province	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Sinopec Anqing Petrochemical	Anqing	Anhui	-	50	-	-	-	-	-	-
	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	240	-	-	-	-	-	-
	CNPC Jieyang City (PDVSA)	Jieyang City	Guangdong	-	-	-	200	-	-	-	-
	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	130	-	-	-	-	-	-
	Sinopec Zhanjiang (Dongxing)	Zhanjiang	Guangdong	100	-	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	300	-	-	-	-
	CNPC Huabei Oilfield Petrochemical	Shijiazhuang	Hebei	-	-	60	-	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	60	-	-	-	-	-
	Sinopec Jingmen Oil Refining	Jingmen	Hubei	10	-	-	-	-	-	-	-
	Sinopec Wuhan Oil Refining	Wuhan	Hubei	-	40	-	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	67	-	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	60	-	-	-	-	-	-	-
	CNPC Liaoyang Chemical Fiber Corp.	Liaoyang	Liaoning	110	-	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	100	-	-	-	-	-	-
	China Local Refineries	Shandong	Shandong	100	-	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	100	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	200	-	-	-	-
	Huaxing Petrochemical (ChemChina)	Shandong	Shandong	140	-	-	-	-	-	-	-
	Sinopec Qingdao	Qingdao	Shandong	20	-	-	-	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	200	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	400	-	-	-
Crude Total				*540*	*827*	*120*	*800*	*400*	-	-	-
Vacuum	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	120	-	-	-	-	-	-
	CNPC Jieyang City (PDVSA)	Jieyang City	Guangdong	-	-	-	100	-	-	-	-
	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	107	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	155	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	30	-	-	-	-	-
	Sinopec Wuhan Oil Refining	Wuhan	Hubei	-	20	-	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	30	-	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	40	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	80	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	80	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	200	-	-	-
Vacuum Total				*30*	*327*	*30*	*375*	*200*	-	-	-
Coker-Delayed	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	26	-	-	-	-	-	-
	CNPC Jieyang City (PDVSA)	Jieyang City	Guangdong	-	-	-	50	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	30	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	17	-	-	-	-	-
	China Local Refineries	Shandong	Shandong	43	-	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	20	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	40	-	-	-	-
	Huaxing Petrochemical (ChemChina)	Shandong	Shandong	30	-	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	80	-	-	-
Coker-Delayed Total				*73*	*26*	*17*	*140*	*80*	-	-	-
FCCU	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	46	-	-	-	-	-	-
	CNPC Jieyang City (PDVSA)	Jieyang City	Guangdong	-	-	-	50	-	-	-	-
	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	38	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	55	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	35	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	28	-	-	-	-	-	-	-
FCCU Total				*28*	*84*	*35*	*105*	-	-	-	-
Other CCU	Sinopec Anqing Petrochemical	Anqing	Anhui	-	37	-	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	40	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	45	-	-	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	50	-	-	-	-	-	-
Other CCU Total				-	*172*	-	-	-	-	-	-
Hydrocracker-Distillate	CNPC Fushun Petrochemical	Fushun	Liaoning	40	-	-	-	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	22	-	-	-	-	-	-
Hydrocracker-Distillate Total				*40*	*22*	-	-	-	-	-	-
Hydrocracker-Other	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	50	-	-	-	-	-	-
	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	41	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	70	-	-	-	-
	CNPC Huabei Oilfield Petrochemical	Shijiazhuang	Hebei	-	-	64	-	-	-	-	-
	Sinopec Wuhan Oil Refining	Wuhan	Hubei	-	36	-	-	-	-	-	-
	CNPC Liaoyang Chemical Fiber Corp.	Liaoyang	Liaoning	20	-	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	20	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	40	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	22	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	100	-	-	-
Hydrocracker-Other Total				*20*	*149*	*64*	*130*	*100*	-	-	-

TABLE VI-9 (CONT'D)
CHINA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Province	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-Naphtha	Sinopec Anqing Petrochemical	Anqing	Anhui	-	24	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	33	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	29	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	20	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	19	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	20	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	40	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	80	-	-	-
Hydrotreater-Naphtha Total				-	*63*	*29*	*93*	*80*	-	-	-
Hydrotreater-Kerosene	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	28	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	10	-	-	-	-	-	-
Hydrotreater-Kerosene Total				-	*10*	-	*28*	-	-	-	-
Hydrotreater-Diesel	Sinopec Anqing Petrochemical	Anqing	Anhui	-	45	-	-	-	-	-	-
	Sinochem Quanzhou (KPC/Shell)	Quanzhou	Fujian	-	40	-	-	-	-	-	-
	CNPC Lanzhou Refining	Lanzhou	Gansu	-	-	62	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	90	-	-	-	-
	CNPC Huabei Oilfield Petrochemical	Shijiazhuang	Hebei	-	-	50	-	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	49	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	25	-	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	32	-	-	-	-	-	-	-
	CNPC Fushun Petrochemical	Fushun	Liaoning	36	-	-	-	-	-	-	-
	CNPC Liaoyang Chemical Fiber Corp.	Liaoyang	Liaoning	40	-	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	45	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	25	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	40	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	70	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	80	-	-	-
Hydrotreater-Diesel Total				*108*	*225*	*161*	*155*	*80*	-	-	-
Hydrotreater-VGO/HGO	CNPC Huabei Oilfield Petrochemical	Shijiazhuang	Hebei	-	-	60	-	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	58	-	-	-	-	-
Hydrotreater-VGO/HGO Total				-	-	*118*	-	-	-	-	-
Hydrotreater-Resid	Sinopec Anqing Petrochemical	Anqing	Anhui	-	37	-	-	-	-	-	-
	Sinopec Changling Petrochemical	Yueyang	Hunan	-	30	-	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	40	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	45	-	-	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	60	-	-	-	-	-	-
Hydrotreater-Resid Total				-	*212*	-	-	-	-	-	-
Hydrotreater Lube Polish	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	31	-	-	-	-	-	-
Hydrotreater-Gasoline	CNPC Lanzhou Refining	Lanzhou	Gansu	-	-	42	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	24	-	-	-	-	-	-	-
Hydrotreater-Gasoline Total				*24*	-	*42*	-	-	-	-	-
Reformer-CCR	Sinopec Anqing Petrochemical	Anqing	Anhui	-	24	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	33	-	-	-	-
	CNPC Huabei Oilfield Petrochemical	Shijiazhuang	Hebei	-	-	25	-	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	29	-	-	-	-	-
	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	20	-	-	-	-	-	-
	CNPC Liaoyang Chemical Fiber Corp.	Liaoyang	Liaoning	33	-	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	19	-	-	-	-	-	-
	CNOOC Haihua	Haihua	Shandong	-	-	-	20	-	-	-	-
	CNPC Weihai	Weihai	Shandong	-	-	-	40	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	40	-	-	-	-	-	-
	CNPC Taizhou (Shell/Qatar)	Taizhou	Zhejiang	-	-	-	-	80	-	-	-
Reformer-CCR Total				*33*	*103*	*54*	*93*	*80*	-	-	-
Hydrogen-Steam Methane (MMSCFD)	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	150	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	25	-	-	-	-	-
	CNPC Pengzhou	Pengzhou	Sichuan	-	30	-	-	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)				-	*30*	*25*	*150*	-	-	-	-
Alkylation-SF	CNPC Hohhot Petrochem. Branch	Hohhot	Inner Mongolia	-	3	-	-	-	-	-	-
Aromatics-BTX	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	7	-	-	-	-	-	-
	CNPC Yinchuan	Yinchuan	Ningxia	-	4	-	-	-	-	-	-
Aromatics-BTX Total				-	*11*	-	-	-	-	-	-
Sulfur (LT/D)	Sinopec Anqing Petrochemical	Anqing	Anhui	-	108	-	-	-	-	-	-
	Sinopec Maoming Petrochemical	Maoming	Guangdong	-	270	-	-	-	-	-	-
	Sinopec Zhanjiang (KPC)	Zhanjiang	Guangdong	-	-	-	400	-	-	-	-
	Sinopec Shijia Oil Refining	Shijiazhuang	Hebei	-	-	215	-	-	-	-	-
	Jilin Petrochemical Co.	Jilin	Jilin	40	-	-	-	-	-	-	-
	CNPC Liaoyang Chemical Fiber Corp.	Liaoyang	Liaoning	82	-	-	-	-	-	-	-
Sulfur Total (LT/D)				*122*	*378*	*215*	*400*	-	-	-	-

TABLE VI-10
JAPAN REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Fuji Oil CL	Sodegaura	(49)	-	-	-	-	-	-	-
	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(114)	-	-	-	-	-	-	-
	Japan Energy	Mizushima	(20)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(114)	-	-	-	-	-
Crude Total			*(183)*	-	*(114)*	-	-	-	-	-
Vacuum	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(29)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(52)	-	-	-	-	-
Vacuum Total			*(29)*	-	*(52)*	-	-	-	-	-
FCCU	Nippon Oil CL	Mizushima	3	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(25)	-	-	-	-	-
FCCU Total			*3*	-	*(25)*	-	-	-	-	-
Other CCU	Taiyo Oil CL	Ehime	25	-	-	-	-	-	-	-
	Kashima Oil CL	Kashima	-	25	-	-	-	-	-	-
Other CCU Total			*25*	*25*	-	-	-	-	-	-
Hydrotreater-Naphtha	Japan Energy	Kashima	30	-	-	-	-	-	-	-
	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(25)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(18)	-	-	-	-	-
Hydrotreater-Naphtha Total			*5*	-	*(18)*	-	-	-	-	-
Hydrotreater-Kerosene	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(19)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(32)	-	-	-	-	-
Hydrotreater-Kerosene Total			*(19)*	-	*(32)*	-	-	-	-	-
Hydrotreater-Diesel	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(25)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(18)	-	-	-	-	-
Hydrotreater-Diesel Total			*(25)*	-	*(18)*	-	-	-	-	-
Hydrotreater-VGO/HGO	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(14)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(41)	-	-	-	-	-
Hydrotreater-VGO/HGO Total			*(14)*	-	*(41)*	-	-	-	-	-
Hydrotreater-Gasoline	Taiyo Oil CL	Ehime	13	-	-	-	-	-	-	-
Reformer-CCR	Idemitsu Kosan CL	Tokuyama	-	-	(9)	-	-	-	-	-
Reformer-Semi Regen	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(12)	-	-	-	-	-	-	-
Reformer-Other	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(13)	-	-	-	-	-	-	-
	Idemitsu Kosan CL	Tokuyama	-	-	(9)	-	-	-	-	-
Reformer-Other Total			*(13)*	-	*(9)*	-	-	-	-	-
Hydrogen-Steam Naphtha (MMSCFD)	Idemitsu Kosan CL	Tokuyama	-	-	(17)	-	-	-	-	-
Alkylation-SF	Taiyo Oil CL	Ehime	6	-	-	-	-	-	-	-
Isomerization-C5/C6	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(6)	-	-	-	-	-	-	-
Aromatics-BTX	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(3)	-	-	-	-	-	-	-
Oxy-MTBE	Cosmo Oil CL	Sakai	(2)	-	-	-	-	-	-	-
Oxy-ETBE	Cosmo Oil CL	Sakai	2	-	-	-	-	-	-	-
Sulfur (LT/D)	Idemitsu Kosan CL	Tokuyama	-	-	(176)	-	-	-	-	-
Asphalt	Toa Oil CL	Kawasaki (Mizue/Ohmigachi)	(1)	-	-	-	-	-	-	-

TABLE VI-11
INDIAN SUBCONTINENT REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Hindustan Petroleum CL	Visakhapatnam	India	-	-	-	180	-	-	-	-
	Essar Oil	Vadinar	India	80	-	-	-	-	-	-	-
	Essar Oil	Vadinar	India	-	40	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	66	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	125	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	300	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	180	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	125	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	120	-	-	-	-	-	-
	Bosicor	Karachi	Pakistan	5	-	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	93	-	-	-
Crude Total				*210*	*831*	-	*180*	*93*	-	-	-
Vacuum	Hindustan Petroleum CL	Visakhapatnam	India	-	-	-	85	-	-	-	-
	Essar Oil	Vadinar	India	46	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	22	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	55	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	120	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	72	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	34	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	42	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	43	-	-	-
Vacuum Total				*101*	*290*	-	*85*	*43*	-	-	-
Coker-Delayed	Essar Oil	Vadinar	India	94	-	-	-	-	-	-	-
	Indian Oil CL	Koyali	India	61	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	40	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	22	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	80	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	45	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	20	-	-	-	-	-	-
Coker-Delayed Total				*177*	*185*	-	-	-	-	-	-
FCCU	Essar Oil	Vadinar	India	7	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	32	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	78	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	45	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	35	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	22	-	-	-
FCCU Total				*7*	*190*	-	-	*22*	-	-	-
Other CCU	Hindustan Petroleum CL	Visakhapatnam	India	-	-	-	54	-	-	-	-
Visbreaker	Essar Oil	Vadinar	India	(38)	-	-	-	-	-	-	-
Hydrocracker-Other	Bharat Oman Refineries Ltd	Bina	India	34	-	-	-	-	-	-	-
Hydrotreater-Naphtha	Essar Oil	Vadinar	India	40	-	-	-	-	-	-	-
	Indian Oil CL	Koyali	India	5	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	45	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	10	-	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	11	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	60	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	36	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	15	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	40	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	38	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	23	-	-	-
Hydrotreater-Naphtha Total				*66*	*234*	-	-	*23*	-	-	-
Hydrotreater-Kerosene	Essar Oil	Vadinar	India	19	-	-	-	-	-	-	-
Hydrotreater-Diesel	Hindustan Petroleum CL	Visakhapatnam	India	-	40	-	-	-	-	-	-
	Hindustan Petroleum CL	Visakhapatnam	India	-	-	-	50	-	-	-	-
	Essar Oil	Vadinar	India	70	-	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	30	-	-	-	-	-	-	-
	Hindustan Petroleum CL	Mahul Bombay	India	-	40	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	100	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	54	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	30	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	11	-	-	-	-	-	-
	Pak-Arab RFY (PARCO)	Mahmood	Pakistan	26	-	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	23	-	-	-
Hydrotreater-Diesel Total				*126*	*275*	-	*50*	*23*	-	-	-
Hydrotreater-VGO/HGO	Essar Oil	Vadinar	India	107	-	-	-	-	-	-	-
	Indian Oil CL	Koyali	India	36	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	104	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	45	-	-	-	-	-	-
Hydrotreater-VGO/HGO Total				*143*	*149*	-	-	-	-	-	-

TABLE VI-11 (CONT'D)
INDIAN SUBCONTINENT REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-Gasoline	Hindustan Petroleum CL	Visakhapatnam	India	-	-	-	23	-	-	-	-
	Mangalore Refining	Mangalore	India	-	13	-	-	-	-	-	-
Hydrotreater-Gasoline Total				-	*13*	-	*23*	-	-	-	-
Reformer-CCR	Essar Oil	Vadinar	India	23	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	45	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	10	-	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	53	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	36	-	-	-	-	-	-
Reformer-CCR Total				*33*	*134*	-	-	-	-	-	-
Reformer-Semi Regen	Nagarjuna Group/TIDCO	Cuddalore	India	-	15	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	24	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	23	-	-	-
Reformer-Semi Regen Total				-	*39*	-	-	*23*	-	-	-
Hydrogen-Steam Methane (MMSCFD)	Hindustan Petroleum CL	Visakhapatnam	India	-	41	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	70	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	70	-	-	-	-	-	-	-
	Hindustan Petroleum CL	Mahul Bombay	India	-	23	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	90	-	-	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)				*70*	*224*	-	-	-	-	-	-
Hydrogen-Steam Naphtha (MMSCFD)	HPCL/Mittal	Bhatinda	India	-	90	-	-	-	-	-	-
Alkylation-SF	Indian Oil CL	Paradip	India	-	10	-	-	-	-	-	-
Isomerization-C5/C6	Essar Oil	Vadinar	India	15	-	-	-	-	-	-	-
	Indian Oil CL	Koyali	India	5	-	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	6	-	-	-	-	-	-	-
	HPCL/Mittal	Bhatinda	India	-	15	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	5	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	13	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	8	-	-	-
Isomerization-C5/C6 Total				*26*	*33*	-	-	*8*	-	-	-
Polymerization	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	4	-	-	-
Aromatics-BTX	Mangalore Refining	Mangalore	India	-	20	-	-	-	-	-	-
	Indian Oil CL	Paradip	India	-	24	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	17	-	-	-	-	-	-
Aromatics-BTX Total				-	*61*	-	-	-	-	-	-
Oxy-MTBE	Nagarjuna Group/TIDCO	Cuddalore	India	-	10	-	-	-	-	-	-
Sulfur (LT/D)	Essar Oil	Vadinar	India	910	-	-	-	-	-	-	-
	Mangalore Refining	Mangalore	India	-	105	-	-	-	-	-	-
	Bharat Oman Refineries Ltd	Bina	India	360	-	-	-	-	-	-	-
	Nagarjuna Group/TIDCO	Cuddalore	India	-	190	-	-	-	-	-	-
	Bosicor	Balochistan	Pakistan	-	13	-	-	-	-	-	-
	Indus Refinery Ltd	Port Qasim	Pakistan	-	-	-	-	58	-	-	-
Sulfur Total (LT/D)				*1,270*	*308*	-	-	*58*	-	-	-
Lubes	Mangalore Refining	Mangalore	India	-	5	-	-	-	-	-	-
Asphalt	Nagarjuna Group/TIDCO	Cuddalore	India	-	2	-	-	-	-	-	-

TABLE VI-12
SOUTHEAST ASIA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Crude	Pertamina	Balongan	Indonesia	5	-	-	-	-	-	-	-
	PetroVietnam/Consortium	Nghi Son	Vietnam	-	-	-	-	200	-	-	-
Crude Total				*5*	-	-	-	*200*	-	-	-
Other CCU	Pertamina	Balikpapan	Indonesia	-	-	-	50	-	-	-	-
	Pertamina	Musi	Indonesia	-	3	-	-	-	-	-	-
	PetroVietnam/Consortium	Nghi Son	Vietnam	-	-	-	-	90	-	-	-
Other CCU Total				-	*3*	-	*50*	*90*	-	-	-
Hydrotreater-Naphtha	PetroVietnam/Consortium	Nghi Son	Vietnam	-	-	-	-	25	-	-	-
Hydrotreater-Diesel	Shell Refining Co. Berhad	Port Dickson	Malaysia	-	-	-	-	45	-	-	-
	ExxonMobil Corp.	Jurong Island	Singapore	-	-	-	57	-	-	-	-
	PTT Aromatics & RefiningPTT Aromatics & Refining	Map Ta Phut	Thailand	-	85	-	-	-	-	-	-
Hydrotreater-Diesel Total				-	*85*	-	*57*	*45*	-	-	-
Hydrotreater-Resid	PetroVietnam/Consortium	Nghi Son	Vietnam	-	-	-	-	105	-	-	-
Reformer-CCR	PetroVietnam/Consortium	Nghi Son	Vietnam	-	-	-	-	25	-	-	-

TABLE VI-13
SOUTH KOREA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	2011	2012	2013	2014	2015	2016	2017	2018
Crude	S-Oil	Onsan	60	-	-	-	-	-	-	-
Vacuum	SK Corp	Inchon	-	-	-	-	-	70	-	-
FCCU	GS-Caltex	Yosu	-	-	29	-	-	-	-	-
Other CCU	Hyundai Oil Ref Co.	Daesan	52	-	-	-	-	-	-	-
Visbreaker	SK Corp	Inchon	-	-	-	-	-	40	-	-
Hydrocracker-Other	SK Corp	Inchon	-	-	-	-	-	40	-	-
Hydrotreater-Naphtha	S-Oil	Onsan	45	-	-	-	-	-	-	-
Hydrotreater-Resid	Hyundai Oil Ref Co.	Daesan	66	-	-	-	-	-	-	-
Hydrotreater-Gasoline	GS-Caltex	Yosu	-	-	24	-	-	-	-	-
Reformer-CCR	S-Oil	Onsan	45	-	-	-	-	-	-	-
Alkylation-SF	GS-Caltex	Yosu	-	-	6	-	-	-	-	-
Aromatics-BTX	S-Oil	Onsan	23	-	-	-	-	-	-	-

TABLE VI-14
TAIWAN REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	2011	2012	2013	2014	2015	2016	2017	2018
Other CCU	Chinese Petroleum Corp.	Kaohsiung/Ta-Lin	80	-	-	-	-	-	-	-
Hydrotreater-Diesel	Chinese Petroleum Corp.	Kaohsiung/Ta-Lin	32	-	-	-	-	-	-	-
Hydrotreater-Gasoline	Chinese Petroleum Corp.	Kaohsiung/Ta-Lin	20	-	-	-	-	-	-	-
Sulfur (LT/D)	Chinese Petroleum Corp.	Kaohsiung/Ta-Lin	-	-	50	-	-	-	-	-

TABLE VI-15
OCEANIA REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Vacuum	LG Caltex	Kurnell	Australia	(7)	-	-	-	-	-	-	-
Hydrotreater Lube Polish	LG Caltex	Kurnell	Australia	(6)	-	-	-	-	-	-	-
Lubes	LG Caltex	Kurnell	Australia	(4)	-	-	-	-	-	-	-

TABLE VI-16
UK REFINERY PROJECTS
(Thousand Barrels per Day, Unless Otherwise Noted)

Project Type	Company	City	Country	2011	2012	2013	2014	2015	2016	2017	2018
Hydrotreater-Diesel	ConocoPhillips	South Killingholme	United Kingdom	60	-	-	-	-	-	-	-
	Total	North Killingholme	United Kingdom	20	-	-	-	-	-	-	-
Hydrotreater-Diesel Total				*80*	-	-	-	-	-	-	-
Hydrogen-Steam Methane (MMSCFD)	Total	North Killingholme	United Kingdom	30	-	-	-	-	-	-	-
Hydrogen-Steam Methane Total (MMSCFD)				*30*	-	-	-	-	-	-	-

TABLE VI-17
SPECULATIVE REFINERY PROJECTS
(Thousand Barrels per Day)

Region	Country	City	Company	Capacity: Distillation	Capacity: Coking	Capacity: FCC	Capacity: Hydro-Cracking	Potential Start-up
North America	United States	Borger, TX	WRB Refining (COP/Encana)	55	12			2019
		Catlettsburg, KY	Marathon		37			2019
		Deer Park, TX	Shell			15		2016
		Elk Point, SD	Hyperion Resources	400				2016
		Ferndale, WA	ConocoPhillips		25			2016
		Lima, OH	Husky Energy		60			2016
		Port Allen, LA	Placid Refining	25				2019
		Port Arthur, TX	Valero Energy Corp.	75				2017
		Robinson, IL	Marathon		37			2020
		Warren, PA	United Refining Co.		15			2020
		Wilmington, CA	Tesoro West Coast	5				2015
		Wilmington, CA	Tesoro West Coast	16	9			2020
		Wood River, IL	WRB Refining (COP/Encana)	95	50			2020
	Canada	Come By Chance, Newfoundland	North Atlantic Refining	60	30			2017
		TBD, Alberta	Alberta First Nations	100				2020
Latin America	Argentina	La Plata	Repsol-YPF		25			2015
		TBD	Tierra del Fuego Gov't	62				2020
		TBD (General Mosconi II)	Consortium	150				2020
	Bolivia	TBD	Yacimientos Petroliferos Fiscales Bolivianos	85				2020
	Brazil	Rio de Janeiro (Comperj)	Petrobras (Comperj II)	165	30		50	2017
	Chile	Aconcagua, Concon	ENAP Refinerias SA				25	2020
	Cuba	Cienfuegos	Cienfuegos/CNPC/PDVSA	85				2014
	Dominica	TBD	Govt/PDVSA	10				2017
	Dominican Republic	Haina	Refidomsa	16			15	2016
	Ecuador	Manta	Petroecuador/PDVSA (Refineria del Pacifico)	300	90		60	2017
	Jamaica	Kingston	Petrojam Ltd/PDVSA	20				2016
		Kingston	Petrojam Ltd/PDVSA		11			2017
	Mexico	Tula Hidalgo	Pemex	250	60	60	30	2016
	Peru	Iquitos Loreto	Petroleos del Peru	5		6		2020
		Talara	Petroleos del Peru	33	20	7	30	2016
	Suriname	Paramaribo	Staatsolie	8				2020
	Venezuela	Cabruta	PDVSA/Sinopec	400	80	80		2020
		Caripito	PDVSA	50				2018
		Puerto La Cruz	PDVSA/ENI	240				2017
		Puerto La Cruz	PDVSA	20		25	40	2020
		Santa Ines	PDVSA	100				2018
		TBD	PDVSA/CNPC	400				2020
Middle East	Bahrain	Sitra	Bahrain Petroleum Co.	100				2017
	Fujairah	Fujairah	IPIC	200		20	20	2020
	Iran	Bandar Abbas	Persian Gulf Star Oil Co.	120				2016
		Bandar Abbas	Persian Gulf Star Oil Co.	120				2020
		Hormuz/Soroush	National Iranian Oil Co.	300	100	51	40	2018
		Isfahan	National Iranian Oil Co.			84		2016
		Khuzestan/Abadan	National Iranian Oil Co.	180			75	2015
		Qeshm Island	Private Investors (TBD)	120				2020
		Qeshm Island	Private Investors (TBD)	160				2020
		Soroush	OPEX Dev. Fund	120				2019
		Tabriz	National Iranian Oil Co.	38		35		2017
	Iraq	TBD	Ministry of Oil, Refinery Admin.	100				2020
		Basrah	Ministry of Oil, Refinery Admin.	67				2015
		Karbala	Iraq Oil Co.	140		25		2017
		Kirkuk	Ministry of Oil	150				2020
		Maissan	Ministry of Oil	150		48		2020
		Nassiriyah (Southern Iraq)	Iraq Oil Co.	300		50		2017
		Northern Iraq	Iraq Oil Co.	70				2017
	Israel	Ashdod	Paz Oil Co.	14				2013
	Jordan	Zarqa	Jordan Petroleum Refining Co.	40			1	2017
	Kuwait	Mina Abdulla	Kuwait National Petroleum Co.	175			152	2019
	Lebanon	TBD	Qatar Petroleum Intl.	150		35		2019
	Oman	Al Duqm	Oman Ref. & Pet. Co. (ORPC)	200				2017
		Sohar	Oman Ref. & Pet. Co. (ORPC)	40				2020
	Qatar	Umm Saeed	QP	250		60		2015
	Saudi Arabia	Rabigh	Petro-Rabigh	425				2015
	Syria	Banias	Govt/CNPC/Sinopec	100				2020
		Dair al-Zour	Noor Financial & Other Investors	140				2019
		Dair al-Zour	CNPC/Ministry of Petroleum	100				2019
		Furoqlos	Govt/PDVSA/Others	140				2014
	Yemen	Aden	Aden Refinery Co.	30			23	2020
		Marib	Ministry of Oil and Mineral Resources	15				2020
		Mukalla	Private Investors (TBD)	100				2020
		Ras Issa	Hood Oil/Reliance	50				2017
		TBD	Govt	200				2020
Africa	Algeria	Arzew	NAFTEC	33				2016
		Tiaret	Sonatrach	300				2017
	Angola	Lobito	Sonangol	200		50		2016
	Cameroon	Pointe Limboh Limbe	Sonara-National Refining CL	26				2020
	Chad	N'Djamena	Govt/CNPC	30		14		2020
		N'Djamena	Govt/CNPC	20		9		2015
	Egypt	Ain Sukhna	EGPC/Consortium	200				2018
		Port Said/Damietta	Govt	350	30	40	40	2020
		TBD	Rongsheng Holding/CNCEC	300				2020
	Equatorial Guinea	TBD	Government	20				2015
	Ghana	Tema	New Alpha Refinery Ghana, Ltd.	200				2020
		Tema	Ghanaian Italian Petroleum CL	80				2016
	Kenya	Lamu	Kenyan Govt	120				2020
	Libya	Azzawiya	NOC	20				2016
		Misurata	NOC	200				2020
		Zuwara (Mellitah)	ODICO (Oil Development Investment Co.)	210	42		58	2017
	Morocco	Jorf Lasfar	SAMIR	200				2016
	Mozambique	Nacala	Ayr Logistics Ltd	300				2020

TABLE VI-17 (CONT'D)
SPECULATIVE REFINERY PROJECTS
(Thousand Barrels per Day)

				Capacity				
Region	Country	City	Company	Distillation	Coking	FCC	Hydro-Cracking	Potential Start-up
	Nigeria	Araromi	FPR, Inc.	160				2020
		Araromi	FPR, Inc.	160				2020
		Baro	Shark Petroleum/Govt	100				2016
		Brass	NNPC/China	300				2016
		Edo	Indian Oil CL	120				2020
		Lagos	Oando Energy	240		40		2018
		Lagos	NNPC/China	300				2016
		Port Harcourt	ONGC Mittal	100				2020
		TBD	TBD	200				2020
		TBD	Imo State Govt	100				2020
	Senegal	M'Bao (Dakar)	Ste. Africaine de Raffinage	35				2020
	South Africa	Coega	PetroSA	400				2015
	Sudan	Akon	Sudan Govt	50				2020
		Khartoum	China National Petroleum Corp.	100				2017
		Port Sudan	Sudan Govt/Petronas	150	40	30		2016
	Tunisia	Shkira	QP/Petrofac	150				2017
	Uganda	TBD	Ugandan Govt/Iran	100				2020
	Zambia	TBD	Zambian Gov't	20				2020
Europe	Croatia	Rijeka	INA		17			2020
		Sisak	INA		20			2020
	Hungary	Szazhalombatta	MOL				29	2019
		Szazhalombatta	MOL	26	6			2020
	Romania	Ploiesti	OMV Petrom (Petrobrazi)				34	2015
	Turkey	Ceyhan	Petrol Ofisi	300				2020
		Yumurtalik	Calik Enerji	212				2020
CIS Region	Armenia	TBD	Gazprom Neft	140				2020
	Belarus	Mozyr	Slavneft				54	2016
		Novopolotsk	P.O. Naftan Refinery	70				2015
	Georgia	0	Georgia Oil & Gas Corp	100				2020
	Kazakhstan	Atyrau (Guryev)	KazMunaiGaz	100				2020
		Pavlodar	KazMunaiGaz	120				2020
		Shymkent	PetroKazakhstan (CNPC/KMG)	120				2020
		Shymkent	PetroKazakhstan (CNPC/KMG)				25	2017
	Russia	Achinsk	Rosneft	40			19	2018
		Berezovka-Ivanovka	Lanta Oil/Xinghe Industries	100				2018
		Cape of Vostok (Nakhodka)	Rosneft	200	30	50		2020
		Moscow	MOGC/Sibir Energy	40				2017
		Nizhnekamsk	Tatneft	140			40	2017
		Nizhny Novgorod	Lukoil	100				2016
		Novoshakhtinsk	Yug Rusi	100				2017
		Orsk	Russneft		12	15	20	2019
		Oryol	Cepro	70				2020
		Primorsk	Surgutneftegas	140				2018
		Samara (Kuibyshev)	Rosneft			17		2020
		St. Petersburg	Rosneft	200				2019
		Tuapse	Rosneft		26			2020
		Tyumen	Antipinsky	56				2020
		Volgograd	Lukoil	30				2016
	Ukraine	Kherson	Kherson Oil Refy.				25	2018
		Kremenchug	Ukrtatnafta				20	2020
		Nadvornaya	Ukrtatnafta	30				2016
Asia	Bangladesh	Chittagong	Eastern Refinery Ltd.	70			15	2017
	China	Beihai	Sinopec Beihai	90		40		2015
		Caofeidian	Sinopec Caofeidian	200				2020
		Caofeidian	CNPC Caofeidian	200				2020
		Chongqing	CNPC Chongqing	200				2017
		Dalian	Dalian Shide Group/SABIC	200				2018
		Dongming	Dongming Petrochemical	100	29	30		2017
		Dongying	CNOOC Dongying	240				2020
		Guangzhou	Sinopec Guangzhou Petrochemical	50		30		2018
		Jinxi	CNPC Jinxi Chemical	200				2020
		Jiujiang	Sinopec Jiujiang Oil Refining	30			50	2016
		Lianyungang	Sinopec Lianyungang	400				2020
		Nanjing	Sinopec Yangzi Petrochemical	90	-30			2017
		Ningbo	Sinochem Ningbo	240	96	120		2020
		Ningbo	Formosa Plastics/JV	200				2020
		Panjin	ZhenHua Oil	80				2018
		Quanzhou	Sinopec Fujian Oil Refining (XOM)	160				2018
		Shandong	China Local Refineries		43			2012
		Shandong	China Local Refineries		20	28		2013
		Shangqiu	CNPC Shangqiu	200				2020
		TBD	CNPC TBD	300				2020
		Tianjin	CNPC Tianjin (Rosneft)	260		80		2017
		Yueyang	Sinopec Changling Petrochemical	40				2015
		Zhongjie	CNOOC Zhongjie	50		20	20	2017
	India	Allahabad	Bharat Petroleum CL	140				2020
		Bina	Bharat Oman Refineries Ltd	175	31		48	2017
		Bongaigaon	Indian Oil CL			10		2015
		Haldia	Indian Oil CL	300				2018
		Haldia (Kolkata)	Cals Refineries (Spice)	90	8	16		2015
		Kakinada	TBD	100		20		2020
		Koyali	Indian Oil CL	46				2015
		Lote Parshuram	Hindustan Petroleum CL	360				2017
		Madras	Chennai Refinery		38			2014
		Madras	Chennai Refinery	120				2016

TABLE VI-17 (CONT'D)
SPECULATIVE REFINERY PROJECTS
(Thousand Barrels per Day)

Region	Country	City	Company	Capacity: Distillation	Coking	FCC	Hydro-Cracking	Potential Start-up
	Indonesia	Balongan	Pertamina	200				2017
		Balongan	Pertamina	300				2020
		Bojonegara	Pertamina/JV	150				2016
		Bojonegara	Pertamina/JV	150				2020
		Cilacap	Pertamina/Mitsui			54		2015
		Dumai	Pertamina	76				2020
		Pare Pare	Pare-Pare Oil Refining Corp.	300				2018
		Selayar Island	Hemoco Selayar	250				2020
		Situbondo	Petrogas	150				2020
		Tanjung Sauh	SETDCO/PT Intan Megah	300				2020
		Tanjung Sauh	Gulf Petroleum Ltd	200				2020
		TBD	Essar	300				2020
		Tuban	Pertamina	200		50		2020
	Japan	Nishihara	Petrobras/Sumitomo		30			2015
	Korea S.	Daesan	S-Oil	480		75	75	2020
		Yosu	GS-Caltex			55		2020
	Malaysia	Manjung	MCPC/Chinese Consortium	200				2019
		Manjung	MCPC/Chinese Consortium	100				2019
		Melaka III	Malaysian Refining (Petronas/COP)	95	35			2020
		Yan	Merapoh Resources	350				2020
		Yan	SKS Devel./NIOC/CNPC	200				2020
	Pakistan	Khalifa Point	PARCO	300				2020
		Port Qasim	TransAsia	100		18		2020
		Rawalpindi	Attock Refinery Ltd.	12				2020
	Philippines	Mindanao	Petron Corp.	220	40		60	2020
		Tabangao	Pilipinas Shell Petroleum	20				2017
	Singapore	Jurong Island	Sinopec	200				2016
		Jurong Island	Concord Energy	150				2020
		TBD	Hin Leong Trading	300				2020
	Sri Lanka	Hambantota	Star Petro Energy LLC	100				2020
		Sapugaskanda	Ceylon Petroleum Corp.	50				2013
	Taiwan	Changhua	Kuokuang Petrochemical Technology Co.	150				2020
		Changhua	Kuokuang Petrochemical Technology Co.	150				2017
	Thailand	Sriracha	Thai Oil CL	25			25	2014
	Vietnam	Can Tho	Can Tho Oil Ref. Co. Ltd.	40				2018
		Hoa Tam	SP Chemicals	140				2018
		Ky Anh	Formosa Plastics	300				2020
		Long Son	PetroVietnam/Others	160				2020
		Nghi Son	PetroVietnam/Consortium	200				2020

VII. IDENTIFICATION OF KEY DRIVERS THAT IMPACT REFINERY COMPETITIVENESS

There are many factors or drivers that impact the profitability and therefore the competitiveness of refineries. Some of these are specific to the refineries in question, such as refinery size, configuration, location and cost structure, whereas others are more generic, such as the general economic and business environment in which the refinery operates.

For refineries, the business environment can be complex as it is influenced not only by the general business environment of the country in which it is situated (e.g. economic growth, level of corporation tax) but also by legislation targeted specifically at major energy consuming industries or the refining industry itself. These factors can include CO_2 reduction measures, so called "carbon taxes", bio-fuels legislation, environmental requirements, and special hydrocarbon taxes. These requirements can differ from country to country. However the refining industry is a global business with extensive and relatively transparent trade of crude oil and refined products between countries and regions. If any refinery is subject to significantly more rigorous requirements compared to neighbouring countries or regions then that refinery will be operating at a disadvantage. Discussion of the various drivers that can impact refinery competitiveness is given below.

REFINERY SPECIFIC FACTORS

REFINERY CONFIGURATION

The refinery configuration is a major contributor to the refinery's competitiveness. The configuration is the combination of type and relative size of the process units that make up the refinery. Aside from crude distillation there are many different types of unit with different functions that make up a refinery. A list of the most common unit types together with a summary of the unit functions is provided in the glossary.

A number of indicators have been developed over the years to describe refinery configuration. Two of the most commonly reported indicators are the Nelson Complexity Factor sometimes simply referred to as Complexity Factor, and FCC (fluidized cat-cracker) equivalency.

Nelson Complexity Factor

This measurement was developed in the 1960s by Wilbur Nelson and reported in the Oil and Gas Journal. He measured the capital cost of various different refining units (e.g. VGO cat-cracker, reformer, hydro-desulphuriser, bitumen plant etc.) and then assigned a factor to each of these units based on the unit capital cost per barrel of unit feed. Crude distillation by definition was assigned a reference value of 1.0. As an example a VGO cat-cracker costs 6 times as much per barrel capacity as crude distillation and so is assigned a complexity factor of 6.

With each unit on the refinery having a known capacity and complexity factor, then the complexity of the entire refinery can be calculated. This Nelson Complexity Factor is the sum of the product of each unit capacity and complexity factor divided by the crude distillation capacity. This is best illustrated by a simple example. Let us take a relatively simple refinery with crude distillation capacity of 100, semi-regenerative catalytic reforming capacity of 20 and diesel hydrotreating capacity of 30. The crude distiller has a complexity factor of 1.0, the semi-regenerative catalytic reformer a complexity factor of 5.0 and the diesel hydrotreater a complexity factor of 3.0. The refinery complexity factor would be

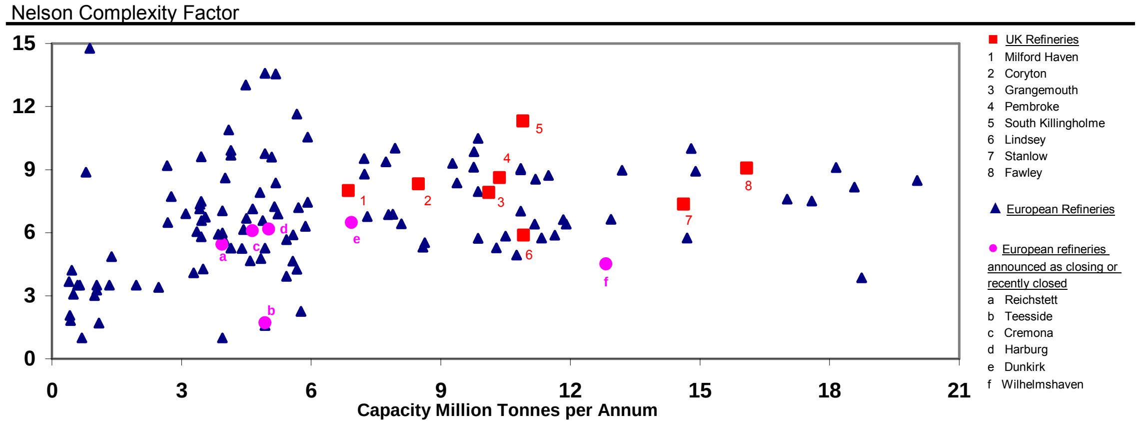
$$(100 * 1.0 + 20 * 5.0 + 30 * 3.0) / 100 = 2.9$$

The higher the calculated refinery complexity factor the more complex the refinery. More complex refineries usually generate higher profitability. This is because by virtue of their increased cost, they must have processes that add value by conversion or treating such that they generate a higher proportion of high value products from the crude oil that they process. However more complex refineries also have higher operating costs.

The Nelson Complexity Factor gives an indication of refinery competitiveness, with a higher value likely to indicate a more competitive refinery. Often the only information given about a particular refinery might be the refinery capacity and complexity factor and not the full complexity factor calculation. If it can not be seen how the Nelson Complexity factor was calculated then the index value itself does not distinguish between different types of refinery complexity. The Nelson Complexity factors used in this report are calculated by Purvin & Gertz from our database of global refinery capacities and applied consistently across all regions.

Figure VII-1 shows a plot of European Refinery capacities against Nelson Complexity Factor.

FIGURE VII-1
EUROPEAN REFINERY CAPACITY AND COMPLEXITY 2010
Nelson Complexity Factor



It can be seen that generally UK refineries have higher capacity and complexity than many of the other refineries in Europe. It is also interesting to note that the majority of refineries either recently closed or currently announced as closing are grouped in lower capacity/less complex region of the plot, and that there are many more refineries also grouped in this section of the chart.

FCC Equivalency Factor

This is another calculated factor designed to give an indication of the upgrading capacity on a refinery. There are different types of cracking plants that upgrade low value heavy fuel-oil components to higher value lighter products such as gasoline and diesel. These plants include thermal crackers, catalytic crackers, cokers and hydrocrackers. Each plant is assigned a factor based on the yield structure of that plant (i.e. the amount of light products it produces and the amount of fuel oil it upgrades). The standard fluidized bed cat cracker has an FCC equivalency of 1.0. More complex residue cat crackers, hydrocrackers and cokers have a higher FCC equivalency value and simpler thermal crackers a lower FCC equivalency value.

The sum of the product of the cracking unit capacities and FCC equivalency factors gives the refinery total FCC Equivalent capacity. This is then often divided by the total crude capacity of the refinery to express an FCC equivalency factor as a percentage of crude capacity. Since light products are more valuable than the heavy fuel oil products a refinery with a high FCC equivalency factor is likely to have a higher gross margin and therefore be more competitive. As with the Nelson Complexity Factor, if the full calculation of FCC equivalency is not available then the FCC equivalency factor value itself does not distinguish between different types of refinery complexity. The FCC equivalency factors used in this report are calculated by Purvin & Gertz from our database of global refinery capacities. Note that the FCC equivalency factor is based only on plants which undertake cracking reactions, whereas the Nelson Complexity Factor considers all types of plant on the refinery

Types of Complexity

There are many different types of refinery plant, each with a different function and yield profile, and therefore each with different economics. It is possible for refineries to have similar Nelson Complexity Factors, yet their configuration, crude supply, production profile and performance could be very different. What is more important is how well the refinery production profile fits the refined product market in which it operates. The market has a particular refined product demand profile, and ideally the refinery should be configured to meet this demand profile. However refinery plants are often operational for decades and the demand profile can change substantially over this time period. Furthermore the elapsed time to design, build and commission major new units is usually between 4 and 5 years and requires many hundred million or billion US dollar investment. As a result many refineries have a product production profile that is different to the current market demand profile.

Purvin & Gertz, defines a number of benchmark refineries that explore the impact of different types of refinery complexity on the refinery margin - and hence competitiveness. A brief description of these benchmarks is shown in the table below. Refineries that process high sulphur crudes have “sour” feedstock, while those processing low sulphur crudes have “sweet” feedstock.

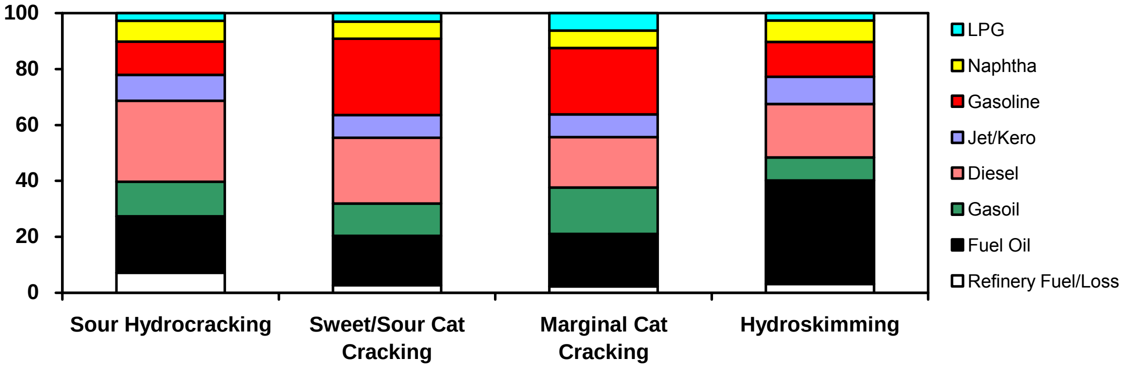
Purvin & Gertz North West Europe Benchmark Refineries

Refinery	Description
Sour Hydrocracking	200,000 B/D, 100% Urals Crude, products sold inland at CIF prices, competitive yield and cost structure **(1)**
Sweet/Sour Cat-Cracking	200,000 B/D, 70% Brent 30% Urals Crude, products sold inland at CIF prices, competitive yield and cost structure **(1)**
Marginal Cat-Cracking	100,000 B/D, 100% Brent Crude, middle distillates sold inland at CIF prices other products exported at FOB prices, less competitive yield and cost structure
Hydroskimming	200,000 B/D, 100% Brent Crude, products sold inland at CIF prices, competitive yield and cost structure **(1)**

1) Note: Competitive yield and cost structure is for that type of refinery - i.e. hydroskimming yields are not competitive with hydrocracking yields

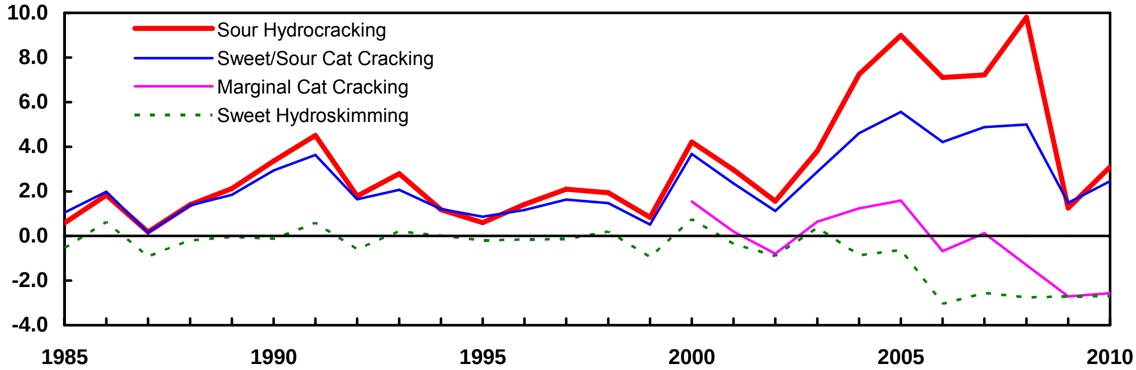
Of these benchmarks the hydrocracking refinery has the product portfolio with highest middle distillate yields, the cat-cracking refineries the highest gasoline yield, and the hydroskimming refinery has the highest fuel oil yield as shown in Fig VII-2.

FIGURE VII-2
PRODUCT YIELD PROFILE OF BENCHMARK REFINERIES
(wt %)



As the prices of the various refined products (and crude oils) change, the refining margin changes. Figure VII-3 shows historical net margins for the benchmark refineries based on historical crude and product prices. The net margin is defined as refinery product value minus refinery crude and feedstock cost minus refinery fixed and variable costs.

FIGURE VII-3
NWE BENCHMARK NET REFINING MARGINS
(Dollars per Barrel)



It can be seen that prior to 2000, the net margin for our benchmark sour hydrocracking and sweet/sour cat cracking refineries were very similar, with the sweet hydroskimming margin being lower at around break-even. Since 2000 refineries with a hydrocracking configuration have had higher margins than cat-cracking refineries and this is expected to continue. Well run competitively sized cat-cracking refineries with good access to the local inland market should continue to see a reasonable net margin.. This is because such a refinery would have lower costs per barrel owing to its larger size and would have access to an inland market which will allow it to sell product at higher prices (see below). However the margin outlook for smaller gasoline exporting cat-cracking refineries and hydroskimming refineries is bleak. This is because these refineries are producing products that have to be exported and so sell at a lower price than an inland sale, and in the case of hydroskimming refineries produce too small volume of high value light products and too large volume lower value fuel oil products.

The margin history shown above is clearly related to the changing demand profile of the North West European (and overall European) market, as discussed in Section IV with high and rising demand for diesel and jet fuel, and declining demand for gasoline and fuel oil.

REFINERY SIZE

Refineries benefit from economy of scale. A larger process unit requires similar manpower, maintenance activity and management time as a smaller unit, but will process a greater amount of hydrocarbon in the same time. Therefore the fixed operating costs per barrel (or per tonne) of throughput are lower for the larger unit while the upgrading margin earned per barrel is the same. Overall the larger unit will have a higher net margin per barrel.

A similar economy of scale is seen in construction capital costs. A process unit twice the size of an otherwise identical unit will only cost between 1.5 and 1.75 times as much, (the multiplier varies depending on the type of unit to be built). Therefore when looking at refinery investments, larger sized plants (or refineries) have a faster payback time and higher return on capital employed than smaller plants.

However this economy of scale is only true up to a certain maximum size. The maximum size for a single train refinery (a refinery with one crude distiller, one vacuum unit, one hydrocracker etc.) is around 250 to 300 thousand barrels per day (34 to 40 thousand tonnes per day). This size pushes the current boundaries for the maximum size of individual units that can be constructed, and explains why some of the current and planned new export refineries are large. Refineries with greater processing capacity than this will have double or multiple processing trains, and become effectively two or more almost separate refineries running within the same complex. Each train will require personnel to operate it, maintain it, and manage it. As a result the cost benefit of larger sized refineries is reduced.

There are many other factors as well as refinery size than can influence operating costs. However to give an indication of the impact of size, the calculated operating cost in 2010 for the PGI 200,000 barrel per day NWE benchmark sweet/sour cat cracking refinery was 2.65 $ per barrel assuming that all steam and electricity is generated internally. The calculated operating cost for the smaller 100,000 barrel per day NWE marginal cat-cracking refinery was 3.40 $/barrel, a difference of 0.75 $/barrel, which is significant given that historical complex net refining margins have been in the range of 2.0 to 8.0 $ per barrel.

REFINERY AGE

There has only been one grassroots refinery built in Europe in the last 25 years. Many refineries have been constructed and expanded over a number of decades and as a result have many units of different ages and size all combining to give the total processing capacity. Clearly a refinery of this total capacity would have higher operating costs than a newer single train refinery of identical total capacity. In addition, the complex interactions between the different refinery trains can lead to operational inefficiencies.

Older refinery plant requires more intensive maintenance than newer units. Therefore an older refinery is likely to have higher maintenance costs than a similar sized newer refinery.

Older refineries are likely to be less fuel efficient than newer refineries, simply as a result of better and more efficient modern designs. Therefore the fuel costs for an older refinery are likely to be higher than for a newer refinery. (Note that fuel efficiency also has a high dependency on the focus of operational maintenance and management personnel).

REFINERY LOGISTICS

An oil refinery must procure crude oil and other feedstocks for processing, and then must be able to distribute the products it makes to the market place. The quality of the infrastructure that allows access to crude oil and product markets is therefore most important.

Access to crude oil supply

Ideally a refinery should be located at a coastal location with deep water port that is capable of handling large crude carriers (up to 270 thousand tonnes DWT). This is important for long distance crude supply e.g. from Middle East to Europe, as it minimizes freight cost, and gives maximum crude supply flexibility. The requirement to handle the largest crude carriers is less important for Northern European refineries that process predominantly North Sea crudes as these crudes are generally sold in smaller parcels (around 80 -120 thousand tonnes DWT), and the distance from the load point to refinery is not so great. However as North Sea crude declines this factor will become more important again.

Crude oil supply by pipeline can provide an advantage if the refinery is relatively close to the producing fields. Examples in Northern Europe include Grangemouth refinery in Scotland that receives crude direct from the Forties pipeline, and the Fredericia refinery in Denmark that receives crude direct from the Dansk (Duc) crude field. In this situation the refinery receives crude avoiding the additional ship freight from crude load port to delivered location. This freight advantage is typically worth 0.8 to 1.5 $ per barrel.

Other refineries that receive crude by pipeline in Europe include those on the Druzhba pipeline system, the longest pipeline system in the world. This pipeline delivers Urals crude to refineries in Central Europe as well as to ports in the Baltic and Black seas for on-going sea-borne export. Historically refineries on the Druzhba pipeline system have received crude at a discount to the price at the sea-ports as the Russian crude export logistics were constraining production and marginal exports were by rail to coastal terminals. However with the opening of the ESPO crude line to the Far East in December 2009 this situation has changed and the inland discount has virtually disappeared. Note that long distance transport of crude oil by pipeline is the only viable method for transport of crude from land-locked oilfields. Similarly crude supply by pipeline is the only cost effective option for inland refineries with supply from major port or oilfields. Examples include the refineries in South Germany, Switzerland and Austria which are fed with crude from Mediterranean ports via the SPSE, IKL and TAL pipeline network. This increases the cost of crude for inland refineries, but this may be offset by increased product prices.

Crude oil supply to refinery by rail or truck is usually not cost effective. Such a supply system is not suitable for the large volumes of crude that a refinery processes, and usually occurs because the producing field or fields are remote, only produce relatively small volumes and are unable to justify the investment in more efficient transport logistics. If this is the only supply route for the refinery and the crude producer has another outlet then this would put the refinery at a distinct disadvantage. However crude supply by rail and truck is sometimes the only method of moving the crude oil from the producing field to refinery, and therefore the only method of monetizing the crude oil. In this situation the refiner has the upper hand and the value of the crude oil at source is lower to reflect the cost of moving the crude to the refinery

Access to refined product market

Ideally a refinery should be located close to the product market, such as major population centre, airport, or sea port, or be integrated with an associated petrochemicals complex. In this situation the cost of getting the various refined products to consumers is minimized and therefore increases the profitability of the refinery.

Good logistics to access more distant markets is also an advantage. Examples include product pipelines to other major inland terminals and population centres, access to major inland waterway (e.g. river Rhine), and access to deep water port for product imports and exports.

Costs of transporting product from refineries to market vary significantly depending on the mode of transport used. Naturally product demand at the refinery gate incurs no additional transport cost. The table below shows typical transport costs for different transport modes for delivery to terminals 200 km and 500 km distant from supply source.

Comparison of Typical European Product Distribution Costs (2010)

Distribution Mode	Distance (km)			
	200		500	
	$/tonne	$/barrel	$/tonne	$/barrel
Pipeline	6 - 10	0.8 - 1.3	14 - 24	1.9 - 3.2
Rhine Barge	7	1.0	19	2.5
Rail	16	2.3	21	3.0
Truck	14	2.0	24	3.5

It can be seen that the primary distribution costs by various different modes are significant in comparison with historical complex net refining margins of 2.0 to 8.0 $ per barrel on crude. A refinery that has a significant local demand close to its location therefore has an advantage over a different refinery that has to transport product to that location over some distance.

Refined product market structure

The supply demand balance and economics of the local refined product market are also important. If the local market is short of products then the product prices will be higher as additional supplies have to be imported to meet demand. For inland markets the cost of moving product from the import location to the market also has to be covered. A refinery located in such a market therefore has a product pricing advantage, equivalent to the additional distribution costs of its competitors.

If the local market is over-supplied then product prices will be lower as the surplus products have to be exported. Suppliers will compete strongly to sell into the local market rather than incur the costs of export (i.e. transport costs to the coast, shipping freight and port charges). A refinery located in such a market therefore has a product pricing disadvantage.

The level of competition in the local market is also important. In a free market if many different suppliers have relatively easy access to the market then product pricing will be competitive and prices should be lower. This then reduces the profitability of the supplying refineries. If however the market has limited supply owing to constrained logistics or few suppliers then the local product pricing is likely to be higher improving the refinery profitability.

REFINERY ORGANISATION AND PERSONNEL

It is important for any refinery to have an organisation structure that allows for efficient running of the refinery. The refinery should have a strong management team that understands the refinery technical and economic issues, communicates these to the workforce and ensures that appropriate actions are taken. The workforce should be well educated, and well trained on the units that they operate and maintain. Since a refinery is a 24 hour a day 365 days a year operation the workforce must be capable of acting on immediate operational issues without input from the senior management team. The operational workforce should be backed up by a pool of highly skilled technical support staff for process optimisation, improvement, and trouble shooting.

Aside from the day to day operation and maintenance of the plant, good access to skilled support services is also important. This covers issues such as major equipment overhaul, where equipment may need to be sent off site for maintenance, provision of skilled contractor labour for major maintenance shutdowns, and expert assistance for more complex trouble shooting.

A well managed refinery with competent workforce and good working practices is able to focus on issues that maximise the refinery margin, namely optimum plant performance, refinery reliability, and refinery operating costs. There is an important balance to be achieved here as sufficient level of expenditure on safety and reliability and margin improvement items is required, while cutting out inefficiencies. Note that the lowest cost refineries are rarely the most profitable refineries as expenditure is reduced too far and this ultimately impacts reliability and profitability.

In general refineries in the developed world are able to recruit and retain staff of sufficient calibre to ensure good operation of the refineries. However in the developing world resourcing of sufficient personnel with the right skills and potential to fulfil both operational and management roles can be a problem.

OTHER FACTORS

IMPACT OF DIFFERENT HYDROCARBON TAXATION ON CRUDE AND BULK REFINED PRODUCTS

Specifically this item refers to the situation where taxation rates on crude oil or refined products impacts the refinery margin by changing the relative value of crude oil and refined products for the refiner. It does not refer to taxes applied to the hydrocarbons when sold to the final consumer. The most well know example of such a tax regime occurs in Russia, and the impact that this tax regime has on Russian refining margins has significant consequences for the European oil refining industry. Similar oil exports tax regimes also exist in some other former Soviet Union countries including Belarus and Kazakhstan.

Russian Oil Export Tax System

The Russian government levies export taxes on crude oil and refined products that are exported from the Russian Federation. These taxes provide a source of government revenue and also serve to depress local prices, reducing consumer price inflation as this makes it more attractive for Russian refiners to sell product inland in Russia rather than export.

The tax levied on crude is based on a defined formula that relates to the average of the means of the quoted prices for Urals crude in N.W. Europe and the Mediterranean. Higher oil prices result in a higher export tax, both in absolute terms and as a percentage of crude oil prices. The details of the tax formula itself and the period for which it applies are subject to change in accordance with Russian government policy, potentially at short notice. With a few periodic exceptions the formula has remained essentially unchanged since September 2004 and the tax calculation is based on the formula provided below.

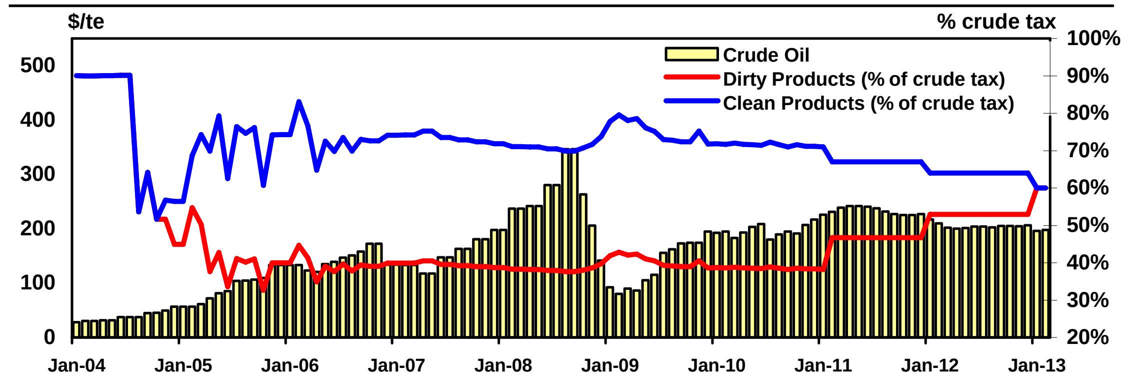
RUSSIAN CRUDE OIL EXPORT TAX

Crude Price, $/bbl	Marginal Tax Rate
Less than $15	0%
Between $15 and $20	35%
Between $20 and $25	45%
Greater than $25	65%

According to the formula, 65% of the price above $25 per barrel is taken as tax, so at $100 per barrel crude the seller pays $52.75 in export taxes. The local price at a Russian refinery, after allowing for export costs (i.e. internal Russian pipeline costs and ship freight to Rotterdam) is just over $40 per barrel. This figure will vary depending on the prevailing freight rates and exact location of the inland Russian refinery.

The export taxes levied on refined products are related to the tax on the export of crude. The tax rate for products was initially set at 90% of the rate on crude. However in September 2004, the policy was changed to encourage refineries to maximize the sale of refined products rather than crude oil. Substantial cuts were made in the export tax levied on products, with the deepest cuts made to black oils (fuel oil, residues etc). No calculation method that sets the tax on products as a proportion of the tax on crude was laid out in the period through 2005 to the end of the third quarter 2006, and the tax levels fluctuated significantly. In October 2006, however, consistent formulae for light and heavy products were introduced and have been in operation since. These formulae have the same form as formulae used to calculate the crude oil tax. However, they use different coefficients, such that the taxes on products are lower than the tax on crude. The parameters are different between light products and black products. The export tax on light products has been kept within 69%-80% of the crude export tax and the export tax on black products within 37%-43% of the crude export tax. Figure VII-4 shows the changes in export tax for both crude and refined products that have taken place monthly since mid 2003.

FIGURE VII-4
RUSSIAN EXPORT TAX, CRUDE AND REFINED PRODUCTS
(Dollars per tonne, products as % of crude)



From the beginning of 2011 export taxes on light products are falling to 67% whereas those for dirty products are increasing to 46.7%; a further revision is scheduled for 2012, before the application of a 60% rate on all products from 1st January 2013. However, these rates are understood to be under discussion and have yet to be finalised. A longer-term impact of these changes is likely to be a net increase in refinery complexity and a reduction in the export of lower-value heavy products as taxes at these levels will encourage refinery investments that upgrade heavy fuel oil to clean products.

The large difference in export tax on products relative to crude has massively improved the economics of refining in Russia, because refining to export products provides the benefit of not paying the higher tax that would otherwise be payable on crude export. This has made it possible to keep refineries operating that would have not been viable otherwise. As an example in January 2011 the difference in export tax rates on crude and refined products was worth 21 $ per barrel to a refiner, a figure which massively exceeded global refining margins in the free market.

Many Russian refineries are located inland at very long distances from potential export ports such as Primorsk and Ventspils in the North and Novorossiysk on the Black Sea. Products are transported by a combination of rail, rail plus pipeline, and in summer inland waterways to the export ports. The cost of transport over such long distances is expensive, of the order of $50 to $100 per tonne (6.7 to 13.5 $ per barrel) depending on distance and transport mode. The alternative cost of pipeline crude transport over similar distance is around 25 $/tonne or 3.4 $ per barrel. Products can be delivered to the ports and on to the European markets at a profit only because of the export tax differentials.

As a result of this situation Russian refiners have had a large incentive to refine crude in Russia and export products to European markets and beyond. Therefore exports of products, particularly middle distillates and fuel oil from Russia to Europe have grown substantially from 2003 through to 2010, as shown in the balances in Section IV. This has had a major impact on European refining margins. The large surplus of fuel oil and fuel oil components has caused the price of fuel oil in Europe to drop low enough to allow for disposal of the product by export to Asia. The low fuel oil price has in turn resulted in sustained negative margins for European refineries that produce significant quantities of fuel oil, namely simple distilling and hydroskimming refineries as shown in Figure VII-3 above. As a result a number of these refineries are idled or have closed.

A similar impact on middle distillate prices in Europe has not been seen because the strong European demand for these products outstripped the additional supply from Russia and other CIS countries. In 2005 and beyond the import demand in Europe exceeded the supply capability from Russia and the CIS and the marginal supply of middle distillate into Europe was from the Middle East and Asia. The recession of 2008/9 has lessened the impact of this but as the European economy recovers the price of middle distillate in Europe will have to be high enough to attract product from more distant and price sensitive sources.

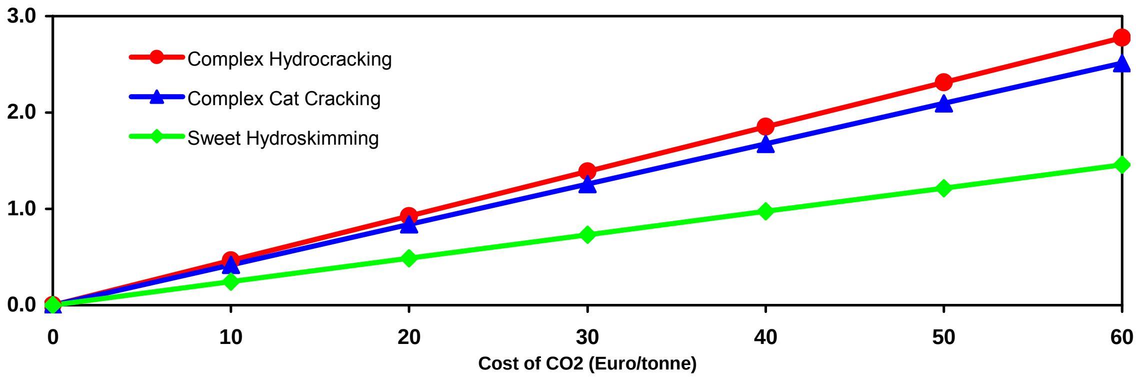
It can be seen that Government taxation policies on export of crude and refined products can influence local refinery profitability and that if the industry impacted is large enough this can have significant consequences for refineries in other regions.

IMPACT OF EMISSIONS TRADING SCHEMES OR "CARBON TAXES"

Oil refining is a global business, and as the trade balances in Sections III, IV and V show refined oil products can and do move from region to region on a large scale. There are few barriers to the movement of products around the globe, other than the transport and logistics costs involved. This freedom of movement of oil products means that oil refining can be subject to "carbon leakage". Carbon leakage is when an increase in carbon dioxide (CO_2) emissions occurs in one country (or region) as a result of emissions reduction in a different country or region that usually has a stricter climate change policy.

PGI have previously evaluated the potential impact on refinery margins that a charge or cost on CO_2 emissions would produce, if the refinery would have to pay the CO_2 charge on its entire CO_2 emissions. This is shown in Figure VII-5 below.

FIGURE VII-5
IMPACT OF CO2 COSTS ON REFINERY MARGINS
($/B)

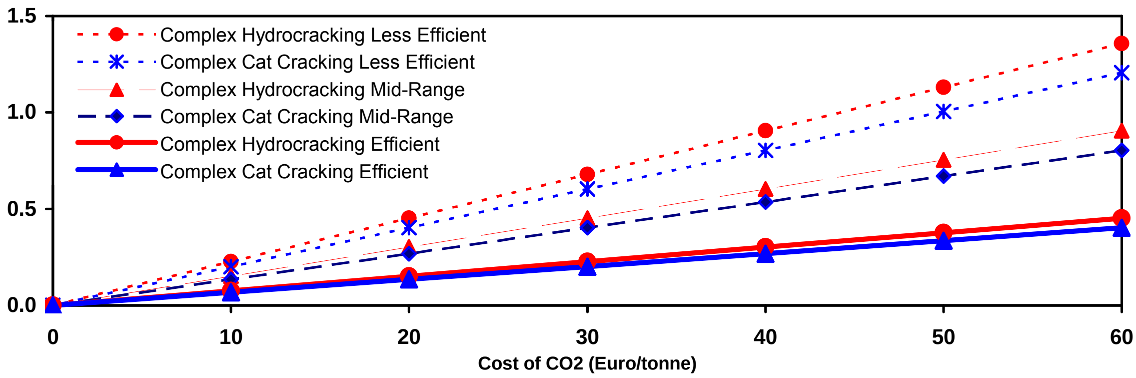


It can be seen that even a moderate cost of CO_2 charged on entire CO2 emissions would have a major impact on the profitability of a refinery.

In the EU Emissions Trading Scheme Phase 3 starting in 2013, in recognition of the carbon leakage effect, EU refineries will receive free CO_2 allowances at the outset of the period, but not for 100% of their emissions. Firstly all electricity generated on the refineries would be subject to full auctioning, even though this electricity is mostly used for the refinery processing rather than exported to the grid. Then the allocation for other emissions is proposed to be based on performance versus a benchmark, with the benchmark being the average emissions level of the top 10% most efficient refineries. By definition this means that only the top 5% most energy efficient refineries will receive full free emissions (excluding electricity), with the remaining 95% having to purchase some amount of CO_2 emission credits.

There is a significant spread of energy efficiency performance across the global and European refining industry. Mid-range efficiency refineries in Europe consume 25 to 35% more fuel than the most efficient refineries while some of the least efficient refineries consume greater than 50% more. In February 2011, forward prices (futures) for CO_2 emission credits put prices in the range of 15.4 to 17.2 Euro/tonne CO_2 for the period 2013 through to 2014. If we assume that the most efficient refiners get their CO_2 emission credits free, then the additional cost that a mid range efficiency cat-cracking or hydrocracking refinery would incur would be in the range of 0.2 to 0.25 $ per barrel crude processed. For the least efficient refineries this cost would increase to 0.3 to 0.4 $ per barrel. This is shown in Figure VII-6 below.

FIGURE VII-6
ESTIMATED IMPACT OF CO2 COSTS ON REFINERY MARGIN - INCREMENTAL ABOVE BENCHMARK ($/B)



Note that the incremental costs can increase substantially if the cost of CO_2 emissions credits rises above the current forecast range of 15 to 17 Euro/tonne, which may reasonably be expected to occur in later years.

The requirement for the majority of EU refiners to have to purchase some CO_2 emissions credits therefore would put them at a disadvantage to refiners situated outside the EU, particularly those that are close by such as in North Africa, Ukraine or Belorussia. In the longer term this could further discourage operation and investment in EU refineries leading to an increased reliance on sourcing products from other regions.

Typically refineries in Europe and North America are among the most energy efficient globally. Refineries in Latin America, the Middle East and CIS generally have poorer (and in some cases substantially poorer) energy efficiency performance. Perversely the introduction of phase 3 of the EU Emissions Trading Scheme and its application to EU refineries could result in an increase in overall CO_2 emissions per barrel of refined product produced as production migrates to less energy efficient refineries outside the EU that are not subject to a CO_2 emissions cost.

A possible solution would be for the EU to impose an import tariff on refined products coming to the EU that are sourced from locations that do not have an equivalent CO_2 emissions reduction scheme. This would create a level playing field for EU and non-EU refiners with respect to CO_2 costs. However such a tariff may fall foul of WTO free trade agreements.

BIOFUELS WITHIN THE EU

In 2003, the EU Commission published the Biofuels Directive (2003/30/EC). This set out targets for the penetration of biofuels in the transport sector to be reached by 2005 and 2010. In this directive biofuels are defined as any of the following:

- Bioethanol and biomethanol
- Biomethylether
- Biodiesel – a methyl ester produced from vegetable oil or animal fat
- BioMTBE – MTBE produced with biomethanol. Calculated as 36% biofuel
- BioETBE – ETBE produced with bioethanol. Calculated as 47% biofuel
- Biogas – fuel gas produced from biomass
- Synthetic biofuels, biohydrogen and pure vegetable oil

The Directive requires member states to ensure that a minimum proportion of biofuels is placed in the market and that indicative targets are set. The reference value for the target was 2% on the basis of energy content by the end of 2005 and 5.75% by the end of 2010. However, the 2010 target across the EU was not met with an actual figure of about 4.35% of transport fuel consumption on an energy basis achieved. Nonetheless, the conformance to meeting EU targets has increased. In 2005, the EU consumed around 1% biofuel compared to a target of 2%, representing a 50% conformance. The 2010 4.35% represented 75% of the 2010 target.

Initially, the main means of promoting biofuels, given the inherently unfavourable economics relative to conventional fuels, was through relief of excise tax on the biofuel component of the blend. Tax incentives have generally been targeted to overcome both the higher cost of feedstock and operating costs for biofuels compared with the supply of mineral oil fuels. These tax incentives were applied at the national level and were not comprehensive throughout the EU. Consequently, the uptake of biofuels was concentrated in a few member states and fell short of the targets set for the EU as a whole. National governments have recognized that funding biofuels (if only by a loss of tax revenue through excise duty exemptions) is not sustainable, especially if much of the biofuel is imported, because of high local production costs, such as experienced recently in Germany. The US ‘splash and dash’ taxation policy enabled US supplies to under-cut local production up to April 2009, causing significant damage to the local biodiesel production industry. These measures have been countered and US biodiesel imports have significantly reduced to the EU. Most of the higher petroleum demand countries in Europe have been unwinding their biofuel excise duty exemptions and replacing them with biofuel mandates and obligations.

The low uptake of biofuels began to concern the EU and there was a move to set a firmer requirement for biofuel to contribute 10% of fuel by 2020, rather than the non-binding targets of 2003/30/EC. During 2007, the increasing demand for biofuels came at a time of poor harvests internationally, resulting in competition from fuel for food crops. This in turn resulted in food prices escalating with fuel prices. At the same time, there was growing disquiet that some biofuels, particularly imported biofuels, were being produced in a non-sustainable manner and were detrimental to the environment overall. The Renewable Energy Directive has set a target of 10% renewable fuels to be used in transportation, as discussed above. Certain sustainability criteria have been included in the Directive. There is an expectation that other non-traditional biofuel sustainable sources will contribute to meeting the renewable targets, without prescribing the specific mix of energy sources. These sources include second-generation biofuels or other forms of energy generated from biomass and waste in a sustainable way. Such other forms of energy could include electricity generated from biomass and waste. Within the Renewable Energy Directive certain renewable fuels are counted at a multiple of their physical contribution to the level of energy provision. This approach has been taken to encourage the development of renewable transport energy sources from technologies such as second-generation fuels which are seen to be more environmentally sustainable that traditionally produced biofuels. There is concern that the availability of feedstock throughout the world may not be enough to meet official targets and that biofuels will be produced by traditional means for sometime to come.

Nevertheless, the increasing number of policies being implemented to apply national obligations is likely to achieve a higher degree of conformance to targets. With the exception of early biofuel proponents such as France and Germany, the obligated levels tend to lag the original EU biofuel targets in Directive 2003/30/EC

Technological changes to lignocellulosic and second-generation fuels that enable the use of non-food feedstocks is considered to be some way from large scale commercialization, and due to the multiple counting rules within EU directives, reduces the actual physical provision of renewable energy to meet targets. Many EU states are placing a high priority on electrical vehicles in the future that would be deemed to use electricity from renewable sources such as wind, hydro, tidal, photovoltaic and biomass sources.

The main route through which biofuels are expected to develop is through the replacement of methanol for MTBE manufacture by bioethanol and the direct injection of ethanol in the gasoline blend, as well as through Rapeseed Methyl Ester (RME) for biodiesel and, to a lesser extent, the processing of hydrogenated vegetable oils (HVO) in refining processes. This development is used to produce biofuel jet fuel, which is attracting much attention to promote positive publicity towards the aviation industry, even though this industry does not currently fall within the transport fuels defined in EU directives. Additional volumes of biodiesel are expected to be derived from the esterification of used cooking oils. Recent developments to process fatty acids in refining processes (HVOs) to create what is known as ‘green fuel’ could assist the supply of biofuels provided the feedstock is available. The environmental advantages of many of these alternatives continue to be the subject of debate.

The bio-fuel mandates have impacted refiners in two ways. Most notably, the increase in blending of bio-ethanol and other bio-gasoline components into the gasoline pool has reduced the demand for conventional (refinery) gasoline in North America and Europe. This has increased the potential for over supply of gasoline particularly in the European markets, increasing the economic pressure refineries that were primarily designed to produce gasoline. By contrast bio-diesel production and blending has partly helped to ease the tight supply situation for diesel, particularly in Europe.

The requirement to blend bio-fuels into diesel and gasoline has meant that additional tankage and blending facilities had to be provided at refineries and terminals to store the bio-fuels before blending. Therefore some capital investment was required to meet the mandate with little investment return. The impact of bio-component blending on refinery margin is different for every refiner, depending on which properties constrain the refinery gasoline and diesel pools, and the changing prices of the biofuel component compared to conventional refined fuels.

FUELS QUALITY DIRECTIVE

The Fuels Quality Directive (2009/30/EC) was agreed on 23rd April 2009. The Directive modifies and replaces prior directives relating to the qualities of gasoline, diesel and gasoil and also brings in some quality specifications previously covered by the Sulphur in Liquid Fuels Directive. The Directive also introduces legislation aimed at reducing the life-cycle greenhouse gas emissions of transportation fuels. The key points in the Directive are as follows:

- The gasoline specifications defined in EN228 remain. However, Member States with low ambient summer temperatures which currently employ the higher summer vapour pressure specification of 70kPa, compared to the standard 60kPa, must now apply for a derogation from the European Commission taking account of socioeconomic impacts, environmental and health consequences. Member States can also apply for a derogation from the 60kPa specification to enable them to increase the ethanol content of gasoline. A sliding scale of ethanol content versus vapour pressure waiver is specified with a maximum waiver of 8kPa at 5% ethanol content.

- The diesel specifications in EN590 remain with the exception of an increase in the permitted FAME content to 7% from the previous 5% maximum. However, this limit does not apply to other biofuels components such as hydrocarbons produced from biomass via the Fischer-Tropsch process or hydrotreated vegetable oils. In addition, it is stated that diesel with higher than 7% FAME can be permitted by Member States but consumers must be provided appropriate information where this is the case.

- Member States shall ensure that gasoil intended for non-road mobile machinery, including inland waterway vessels, tractors and recreational craft (i.e. “off-road” diesel) of less than 10 ppm sulphur content shall be placed on the market by 1st January 2008. In addition, this specification becomes mandatory from 1st January 2011. In some Member States, off-road diesel quality for most off-road applications was already the same as on-road diesel quality.

- From 1st January 2011, fuel suppliers must report to Member States on the greenhouse gas intensity of the fuel they supply within each Member State. The minimum information to be provided shall include the total volume of each type of fuel supplied and the life cycle greenhouse gas emissions per unit of fuel energy. The European Commission is working on developing guidelines for fuel suppliers in respect of this requirement. The key issue is whether to use default values for greenhouse gas emissions per unit of energy for gasoline and diesel, allow calculation of these emissions for each fuel supplier or some mixture of the two.

- Member States shall require fuel suppliers to reduce life cycle greenhouse gas emissions per unit of energy supplied by up to 10% by 31st December 2020 compared to a, yet to be established, baseline standard. There is flexibility as to how the 10% reduction can be delivered in that 2% can be achieved through use of technologies, including carbon capture and storage, and 2% through purchase of credits through the Clean Development Mechanism of the Kyoto Protocol.

Biofuels may be used to reduce the life cycle greenhouse gas emissions per unit of energy and the Directive provides extensive definition of life cycle greenhouse gas emissions by biofuels type. The definition of how this regulation will work in practice is still under development. One key issue is how imports of fuels into Europe will be treated. There is also a provision to include the contribution from electric vehicles in some manner but again this is not yet defined. The potential cost associated with fuel suppliers reducing their life-cycle greenhouse gas emissions is another burden on the European downstream industry.

One significant impact of the directive will be on demand changes, with increase in demand for 10ppm sulphur diesel or gasoil and a reduction in demand for gasoil at 0.1% sulphur. Those refiners with high 10ppm diesel production and high de-sulphurisation capacity are likely to benefit from this spike in demand (see Section IV).

COMPULSORY STOCK OBLIGATION (CSO)

The United Kingdom is required to maintain a minimum level of oil stocks as a member of both the European Union and International Energy Agency. The level of obligation required is different for the EU and IEA. By virtue of the UK previously producing more oil than it imported, the EU requirement is to stock 67.5 days of consumption of designated fuels. The IEA requirements call for stocks to meet 90 days of net oil imports. Currently for the UK the EU obligation is the larger of the two.

The recent EU Directive 2009/119/EC seeks to more align the EU stockholding requirements towards those set by the IEA, namely to require Member States to hold the greater of 90 days of net imports or 61 days of daily consumption. As UK production of crude oil declines, it is anticipated that the quantity of stocks held would need to increase after 2016 due to the obligation being based on net imports.

The current UK compulsory stock obligation (CSO) is met by placing the obligation on refiners and importers. Based on previous year sales, these suppliers are obliged to hold stock equivalent to 67.5 days consumption of gasoline, middle distillates (diesel, gasoil, and jet/kerosene) and fuel oil. The level of hydrocarbon stock held in refineries and terminals counts towards this obligation.

Obligated parties have the option to delegate the obligation to a third party. This can be achieved in two ways. The first is to delegate the obligation to a central stock holding entity, the second to a third party through a contract known as a stock ticket arrangement. Currently the UK does not have a central stockholding entity. In the instance of using a stock ticket the stock is held by a third party who then sells the stock ticket to the obligated party. The cost of stock-tickets varies with the strength of the market and is set by the cost of storage and the working capital tied up in the stock held. Stock-tickets for middle distillate are usually more expensive than for gasoline or fuel oil, as these are in greater demand. Tickets can be held with parties outside of the obligated party’s country subject to a bi-lateral agreement being in place. The new EU directive allows for tickets to be held across the EU without bi-lateral agreements.

The UK has a number of bi-lateral agreements with other EU countries including Denmark, Ireland, The Netherlands and Sweden, and informal arrangements with Belgium and France. This allows UK CSO stock to be held in these different countries either physically, or under stock ticketing arrangements. Companies holding stocks abroad under bi-lateral agreements must have plans in place to be able to repatriate these stocks in the case of an emergency. Nevertheless the fact that these stocks are not held in the UK increases the risk that they may not be readily available in the case of an emergency, thus defeating the object of the obligation.

The compulsory stock obligation represents a cost to players in the UK downstream industry. The costs are absorbed by the different suppliers and in theory this is recovered in the price of the product sold via the retail or wholesale businesses. Such an arrangement is not transparent, as the CSO costs for different suppliers are not the same and the recovery of CSO costs may or may not be specifically applied in product pricing.

There are other compulsory stock obligation mechanisms that exist, for example having a central national stock holding agency responsible for holding strategic stock. These agencies can be government owned or public companies. Such agencies are often financed by a specific CSO tariff or levy placed on the sale of hydrocarbon products. The agency ensures that sufficient stock is held in country (or under bi-lateral agreements) to meet the obligation, and operates independently from the day-to-day product supply market. Nevertheless there is often significant co-operation between the agency and suppliers, and often sharing of transportation and storage facilities. Such a system has the advantage that it ring-fences the cost of holding CSO stock away from the commercial supply chain, and usually ensures that the majority of stock is held in-country. Many EU countries including Germany, France and Ireland operate such central stock agencies, albeit with different structures.

We understand that the current UK CSO system is under review. The existing system does not disadvantage refineries per-se. At present the cost of the obligation to the downstream industry is covered in the final sale price of product to the consumer. The normal level of stock held in refineries that is required for refinery operation can be used to partly or wholly cover the obligation, effectively providing a modest income stream for the refinery. A refiner with little downstream integration is likely to be holding “spare” stock and can sell stock tickets to other parties that have a shortage. Any proposed replacement CSO system should not disadvantage refineries in comparison to the current system.

RELATIVE IMPORTANCE OF FACTORS

Of the factors outlined above, those which have most influence on refinery competitiveness in order of influence are

1. Major Government policy not in accord with international free market principles
2. Refinery Configuration
3. Market structure
4. Logistics and access to market
5. Refinery size / Operating costs
6. Other issues

From our benchmark refineries it can be seen that these specific refinery configuration differences result in margin differences of $8 per barrel (the difference between hydroskimming margin and hydrocracking margin). There are more complex refineries than that represented our hydrocracking benchmark that have additional conversion capacity such as cokers and manufacture of speciality products such as lubricants or base petrochemicals that would give an even greater margin difference.

The market structure (i.e. local pricing) which is related to the logistics of supply can also have a significant impact. An inland market located a long distance from sea-ports will have high prices if the market is short, as transport costs of imports to that location would be high (e.g. approximately 20$/t of product, equivalent to $2.7 per barrel of product). The impact on the refinery margin would depend on the fraction of the production that the refinery sells into that market. If all products were sold inland at the $2.7 per barrel premium margin increase would be around 93% of this, i.e. $2.6 per barrel, allowing for the consumption of fuel on the refinery. However if some of the products had to be exported (e.g. fuel oil, and increasingly gasoline) then these exports also incur the transport costs to get to market, and the inland location becomes a disadvantage for the exported products, substantially reducing the refinery margin.

Refinery size and associated operating costs are also important. As shown above operating costs for our benchmark 100,000 barrel per day marginal cat-cracking refinery are $3.4 per barrel compared to cost of $2.6 per barrel for our larger benchmark 200,000 barrel per day cat-cracking refinery, a difference of approximately $0.8 per barrel. This is a lower level impact than configuration and market economics. However it is very possible for operating costs to increase substantially on a refinery that suffers from poor operational management

The factors above apply to all refineries world-wide, and the location, configuration and size of the refineries were factors known to the original refinery owners when the refineries were constructed or upgraded. Changes in the market dynamics are outside of the refineries' control but this is a risk that all refiners have to accept.

Carbon costs would only apply to those refineries subject to climate change legislation. The current expectation of the price of emissions permits is modest, resulting in an impact on affected refineries of $0 to $0.4 per barrel. This is a significant impact. However there is potential for this impact to increase substantially, for example if an artificially high floor on the price of carbon credits is applied. The difference between carbon costs and the other factors detailed above is that carbon costs are additional costs that are expected to be applied to EU refiners but not to non-EU refiners. If these carbon costs become too onerous then this would have the potential to damage the competitiveness of the EU refining industry and reduce the security of supply of refined products in the EU.

VIII. ANALYSIS OF UK REFINERY COMPETITIVENESS AND IDENTIFICATION OF KEY COMPETITORS TO UK REFINERIES

Previous work undertaken for DECC concluded that the profitability of UK refiners in terms of net cash margin relative to their European competitors was poor. It should be noted that this analysis over 2005 to 2008 covered a period when the British pound was strong against both the Euro and the US dollar, which would increase the operating costs for UK refiners compared to their European or US counterparts. In 2009 and 2010 the pound was significantly weaker against both the Euro and US dollar, directionally reducing operating costs for UK refiners compared to their European or US counterparts.

In section VII above it was noted that generally UK refineries have higher capacity and complexity than many of the other refineries in Europe. Such factors should contribute to a higher refinery margin and so would contradict the previous analysis. However the bulk refined product market in the UK is one of the most competitive in Europe as there are many suppliers and in most cases the distance to an alternative supplier is relatively small. Marketers under pressure from tight retail and wholesale marketing margins seek to minimize their supply costs by very competitive price negotiation with their suppliers - the refineries and importers.

Nevertheless the refined product market structure of the UK is similar to the overall structure of the European market and North West European market in particular. These markets are all short of middle distillates and long gasoline and fuel oil. As a result the markets have import related pricing for diesel, gasoil, and jet/kerosene and export related pricing for gasoline and fuel oil. The markets (or individual countries within those markets) are all competing with each other for supply of middle distillates, and for export gasoline markets. Price differentials between countries are therefore based on the differences in freight from supplying locations. Some examples of pricing build-up for different UK and European locations are shown below. As the countries of North West Europe are relatively close to each other, freight differentials are relatively small. Therefore bulk prices for refined products in the UK are close to those in the other major coastal markets including ARA and Northern France. The UK is therefore neither significantly advantaged or disadvantaged when competing for imports compared to other surrounding countries in the North West European market.

Gasoline pricing

As the markets are long gasoline, the price (or more accurately value) is set by the price at the final export destination minus the freight to move the gasoline to that location. This is often the price in New York Harbor minus freight, or West Africa minus freight. The difference in export value for gasoline in other North Europe coastal locations and the UK is therefore small, as freight differentials are around 1-2 $/t.

Bulk Gasoline Pricing Example UK vs Other European locations 2010	Rotterdam	UK west coast	UK east coast	Le Havre
Gasoline Price at New York Harbor ($/t)	744.4	744.4	744.4	744.4
Freight Europe location to NYH ($/t)	17.4	16.7	18.7	17.7
Price (value) of gasoline in European location ($/t)	727.0	727.8	725.7	726.8
Differential to ARA ($/t)	0.0	0.8	-1.3	-0.2

If the exporting refinery does not have good logistics and has to export to Rotterdam in small coasters for bulk-up into large cargo for re-export, then the value of gasoline at that refinery is substantially reduced. This is however a function of the specific refinery logistics rather than the overall structure of the market.

Diesel pricing

Within Northern Europe diesel is exported from Scandinavia and Russia via the Baltic Sea into the importing locations of ARA, UK, and Northern France. In addition to this trade flow, diesel is imported from the Middle East and Asia in large ships delivered into ARA and occasionally other large ports. The price for diesel in ARA must therefore be high enough to attract these imports from the Middle East and Asia. Cargos delivered into ARA from Scandinavia or the Baltic locations also achieve the same value at ARA. The value of the diesel at load port is the ARA price minus the freight cost from load port to ARA. For the UK to attract such a cargo away from ARA, the UK must pay a price at least equivalent to that which the supplier would have received if the cargo went to the ARA market. Consequently the bulk price of diesel in the UK is similar to the bulk price of diesel at other coastal locations in North Europe, the difference being due to small differences in freight.

Bulk Diesel Pricing Example UK vs Other European locations 2010	Rotterdam	UK west coast	UK east coast	Le Havre
Diesel Price at Ventspils ($/t)	682.7	682.7	682.7	682.7
Freight Ventspils to Europe location ($/t)	12.3	15.8	14.3	16.5
Price (value) of Diesel in European location ($/t)	695.0	698.4	697.0	699.1
Differential to ARA ($/t)	0.0	3.4	2.0	4.1

Jet/Kerosene pricing

The UK is a major jet/kerosene importer primarily owing to the large demand at the London Heathrow Gatwick and Stansted airports. Cargos arrive in large product carriers at Southampton and the Thames estuary, sourced primarily from the Middle East and Asia. A similar trade flow takes place into Le Havre and Rotterdam, providing fuel for the major hub airports at Paris, Amsterdam and Frankfurt. These trade flows set the price of Jet/Kerosene in Northern Europe, and so the UK and Northern Europe have similar bulk jet/kerosene pricing.

Fuel Oil pricing

As the region is oversupplied with fuel oil, Europe and North Europe are exporters of fuel oil. Cargos are bulked up and exported on large product carriers to the Middle East and Asia. Much of this activity takes place in the ARA ports. UK refiners that export fuel oil in smaller cargos have to send this material to Rotterdam for re-export, and so receive a value of Rotterdam price minus freight cost to Rotterdam. If they have facilities, larger cargos could be exported direct thus avoiding the additional freight charges. In general the UK price for high sulphur fuel oil will be lower than the Rotterdam price. If refiners can produce 1% sulphur fuel oil then this achieves a higher price as it can be sold into the North Sea SECA market

ANALYSIS OF UK REFINERY COMPETITIVENESS

METHODOLOGY

The UK refineries have been compared with a number of selected competitor refineries. These competing refineries have been selected to provide a reasonable cross section of refineries based in different regions. The list of refineries in the analysis is shown in the table overleaf. The refineries have been deliberately chosen as those which are likely to be more competitive and as a result could supply products into the UK market and therefore compete directly with the UK refineries.

The European refineries have different technical sophistication and capacities, but are generally complex refineries at coastal or near-inland locations. Some other refineries in more distant locations are also included in the analysis, particularly those known to be targeting the European market for product exports. These include the new Reliance refinery at Jamnagar India, and Yanbu refinery in the Middle East and a generic export refinery located in Ufa, Russia. Comparison is also made with some highly complex refineries on the US Gulf coast that export some middle distillate (but not other light products) to Europe. Finally the analysis also includes Purvin & Gertz defined benchmark European refineries for comparison.

LIST OF REFINERIES FOR ECONOMIC EVALUATION

Country/Refinery	Owner in 2010
UK	
Coryton	Petroplus
Fawley	ExxonMobil
Grangemouth	Ineos
Killingholme	ConocoPhillips
Lindsey	Total
Milford Haven	Murphy
Pembroke	Chevron
Stanlow	Shell
NWE	
Belgium	
Antwerp	ExxonMobil
Antwerp	Total
Finland	
Porvoo	Neste
France	
Donges	Total
Gonfreville	Total
Petit Couronne	Petroplus
Port Jerome/Gravenchon	ExxonMobil
Lithuania	
Mazeikiai	PK Orlen
Netherlands	
Rotterdam	ExxonMobil
Nerefco Rotterdam	BP
Rotterdam Pernis	Shell
Vlissingen	Total/Lukoil
Norway	
Mongstadt	Statoil
Sweden	
Lysekil	Preem
Other Locations	
Sarroch Sardinia	Saras
India (Jamnagar)	Reliance
Baton Rouge (US Gulf Coast)	ExxonMobil
Deer Park (US Gulf Coast)	Shell
Middle East	Generic Export Refinery
Russia	Generic Export Refinery
PGI Benchmark Refineries	
NWE Sour Hydrocracking	
NWE Sweet/Sour Cat-Cracking	
NWE Marginal Cat-Cracking	
NWE Hydroskimming	

The gross refinery margin for each refinery has been modelled using Purvin & Gertz' proprietary LP model. Refinery plant capacities have been taken from our global refinery capacity database which is based on published information on refinery configuration and operation. In each case the refineries have been optimized for maximum profitability by changing process conditions and crude/feedstock composition within the model. Refinery operating costs have been modelled using Purvin & Gertz proprietary refinery operating cost model. Product prices for each refinery are based on CIF quotes for the relevant products with freight adjustments for known refinery positions. A refinery that is exporting a product would receive a discount on the CIF quote, whereas a refinery in an importing location would receive a premium over the CIF quote. This then allows us to estimate the net margin for each refinery as shown in the table below.

Calculation of Refinery Margins

Gross Revenue	= Product Production multiplied by Product Prices
Gross Margin	= Gross Revenue minus Cost of Crude Oil and Other Feedstocks
Net Margin	= Gross Margin minus Fixed and Variable Cash Operating Costs

MIDDLE DISTILLATE AND LIGHT PRODUCTS SUPPLY COST INDEX

Comparison of refinery margins gives a good indication of a refinery's competitiveness in its own market, but not whether it can out-compete another refinery in a different market. For example a Central European inland refinery taking crude from the Druzhba system and selling all its products into the local land-locked (and therefore high priced) market may enjoy a high refining margin. However none of the products produced by such a refinery would reach the UK and so this refinery is not competing directly with UK refineries.

PGI has developed a methodology to benchmark the competitiveness of diverse refining assets in a specific market. PGI considers this parameter to best characterize the ability of different suppliers to supply into a specific market, in this case the UK. The light products supply cost index for each refinery is shown as a percentage of the average market price of light products (gasoline, diesel, gasoil, jet, kerosene) in the UK market.

A variation on this analysis is the middle distillates supply cost index where the analysis is based on the middle distillates comprising diesel, gasoil, jet and kerosene. This may be more pertinent for the UK market as it is a net importer of middle distillates.

For refineries not located in the market being analyzed (i.e. UK), the freight cost to move the products from the refinery location to the UK market has to be taken into account. The UK refineries deliver directly into the UK market, so do not incur this freight cost. For overseas refineries delivering into the UK we have taken the delivery point to be the Thames as a proxy for delivery into the UK.

The analysis only covers oil refining to produce refined product fuels and petrochemical feedstock. Any integration with petrochemicals and petrochemical margins are not included in this analysis, although such integration would most likely improve the overall economics of the refining/petrochemicals site. Note that the analysis also excludes items such as return on capital, depreciation, interest charges and other non-cash items. The results of our analysis are presented below.

COMPETITIVENESS OF UK REFINERIES – RESULTS

The results of our analysis on refinery competitiveness are shown in Tables VIII-1 through VIII-6. The tables show the same output, but are sorted by the different metrics to show the most competitive down to the least competitive in each case.

Estimated Gross Margin and Net Margin

Figure VIII-1 shows the comparison of refinery gross margins and figure VIII-2 shows the comparison of refinery net-margins.

On gross margin out of the 28 refineries included in the analysis, the UK refineries rank 7th, 8th, 14th, 15th, 16th, 20th, 25th and 26th. On net margin the UK refineries rank 6th, 11th, 13th, 15th, 18th, 23rd, 25th and 27th.

The average ranking for the UK refineries in this analysis is 16th out of 28 for gross margin and 17th out of 28 for net margin. Given that the competitor refineries deliberately selected for this analysis were refineries most likely to be able to compete with UK refineries (i.e. in general relatively complex large refineries located reasonably close to the UK) this is a reasonably creditable result. As shown in Section VII there are many refineries in Europe that are smaller and less complex than both the UK refineries and the competitors selected for this analysis that would be expected to have poorer margins. The refinery with highest margin in the analysis is the generic Russian Hydroskimming refinery, which gains a very large margin boost as a result of the Russian oil export tax regime as explained in Section VII.

FIGURE VIII-1
COMPARISON OF REFINERY GROSS MARGINS, 2010
($ per barrel)

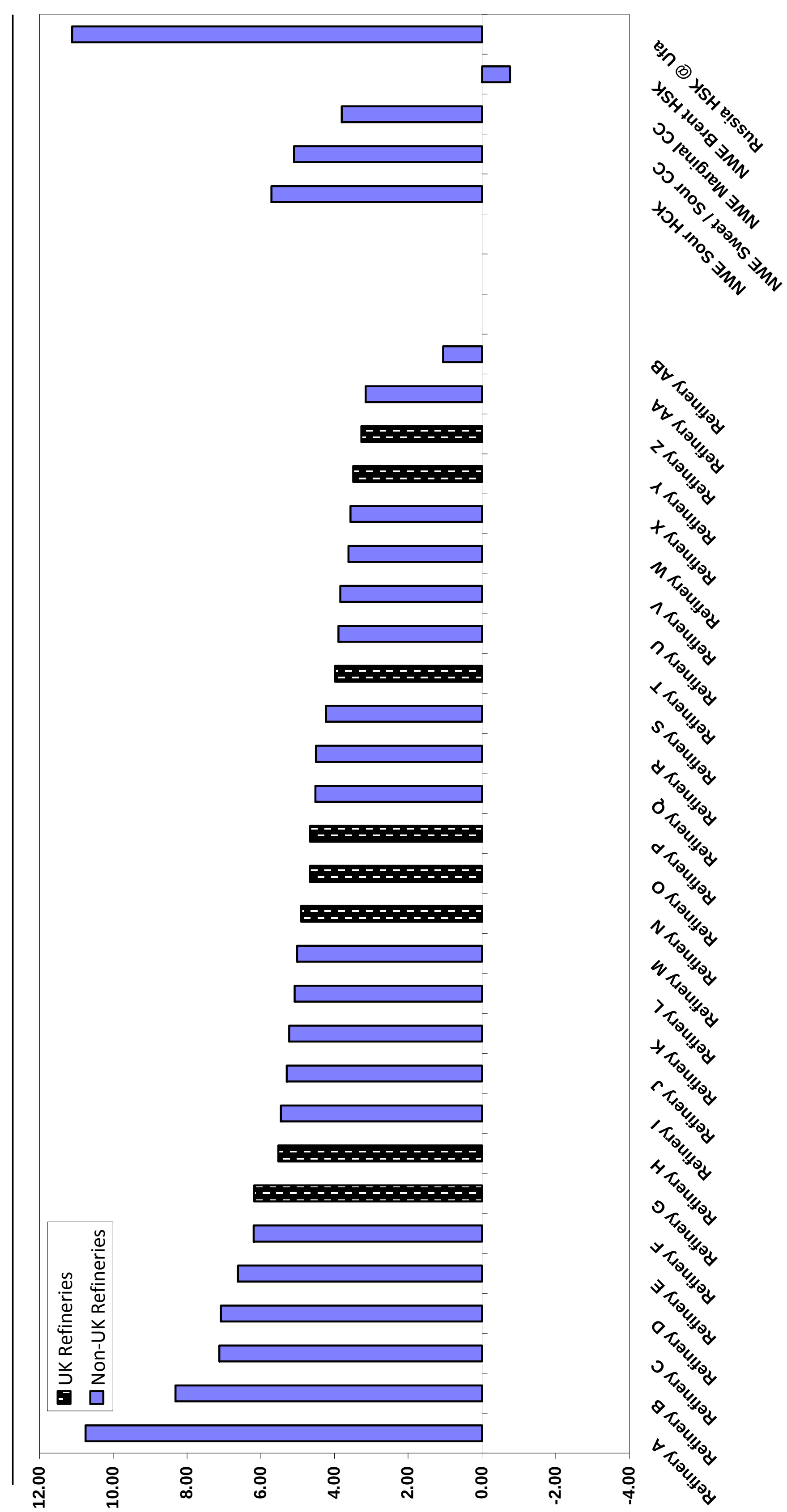
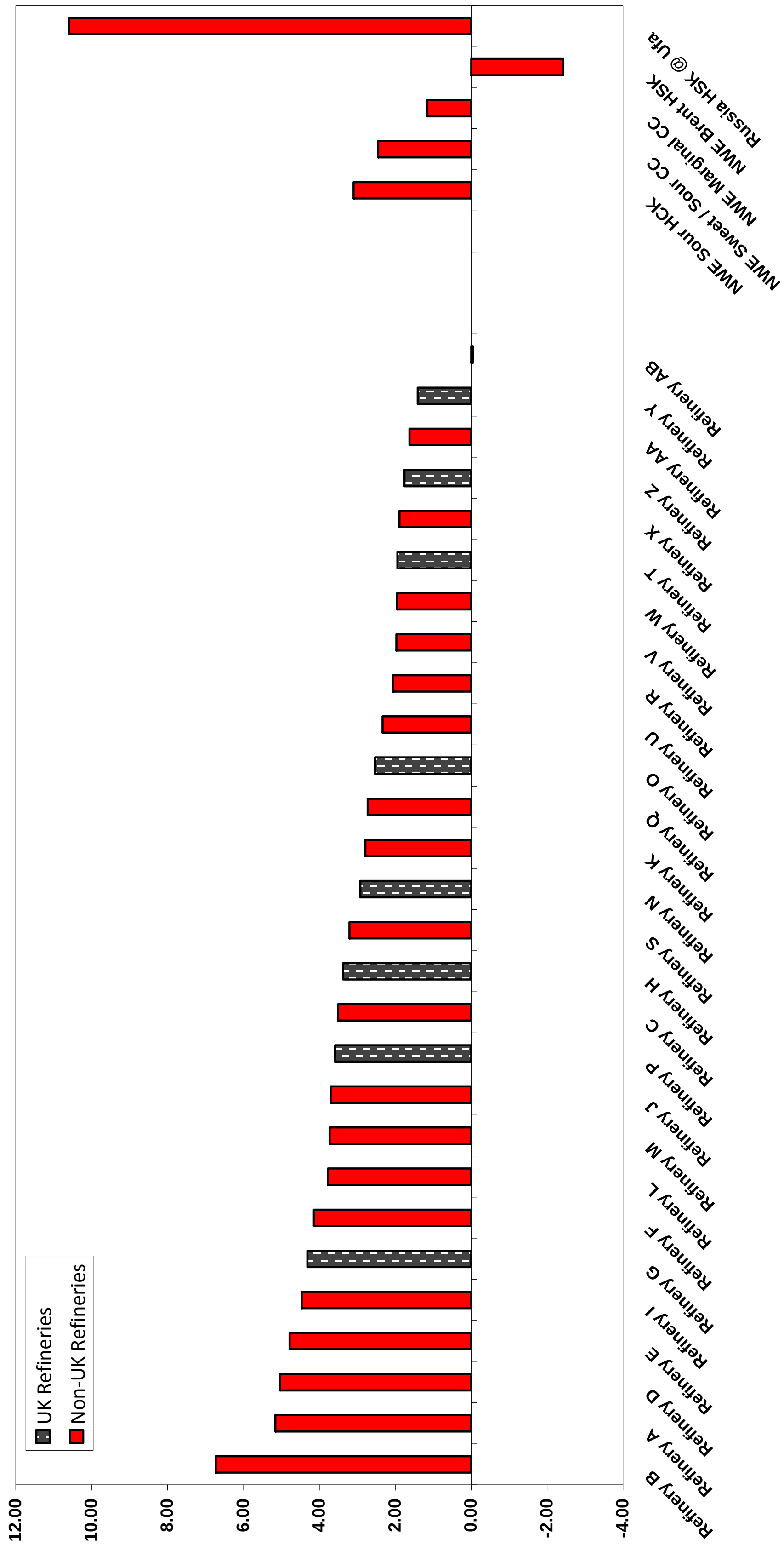


FIGURE VIII-2
COMPARISON OF REFINERY NET MARGINS, 2010
($ per barrel)



Middle Distillate Supply Cost Index at refinery gate

Figure VIII-3 shows the comparison of middle distillate supply cost index at the refinery gate. Out of the 28 refineries included in the analysis, the UK refineries rank 3rd, 11th, 12th, 13th, 14th, 15th, 24th and 25th. Average performance of the UK refineries is 15th out of 28.

Light Products Supply Cost Index at refinery gate

Figure VIII-4 shows the comparison of light products supply cost index at the refinery gate. Out of the 28 refineries included in the analysis, the UK refineries rank 4th, 9th, 11th, 16th, 17th, 18th, 26th and 27th. Average performance of the UK refineries is 16th out of 28.

FIGURE VIII-3
COMPARISON OF DISTILLATE SUPPLY COST INDEX, EX REFINERY, 2010
(%)

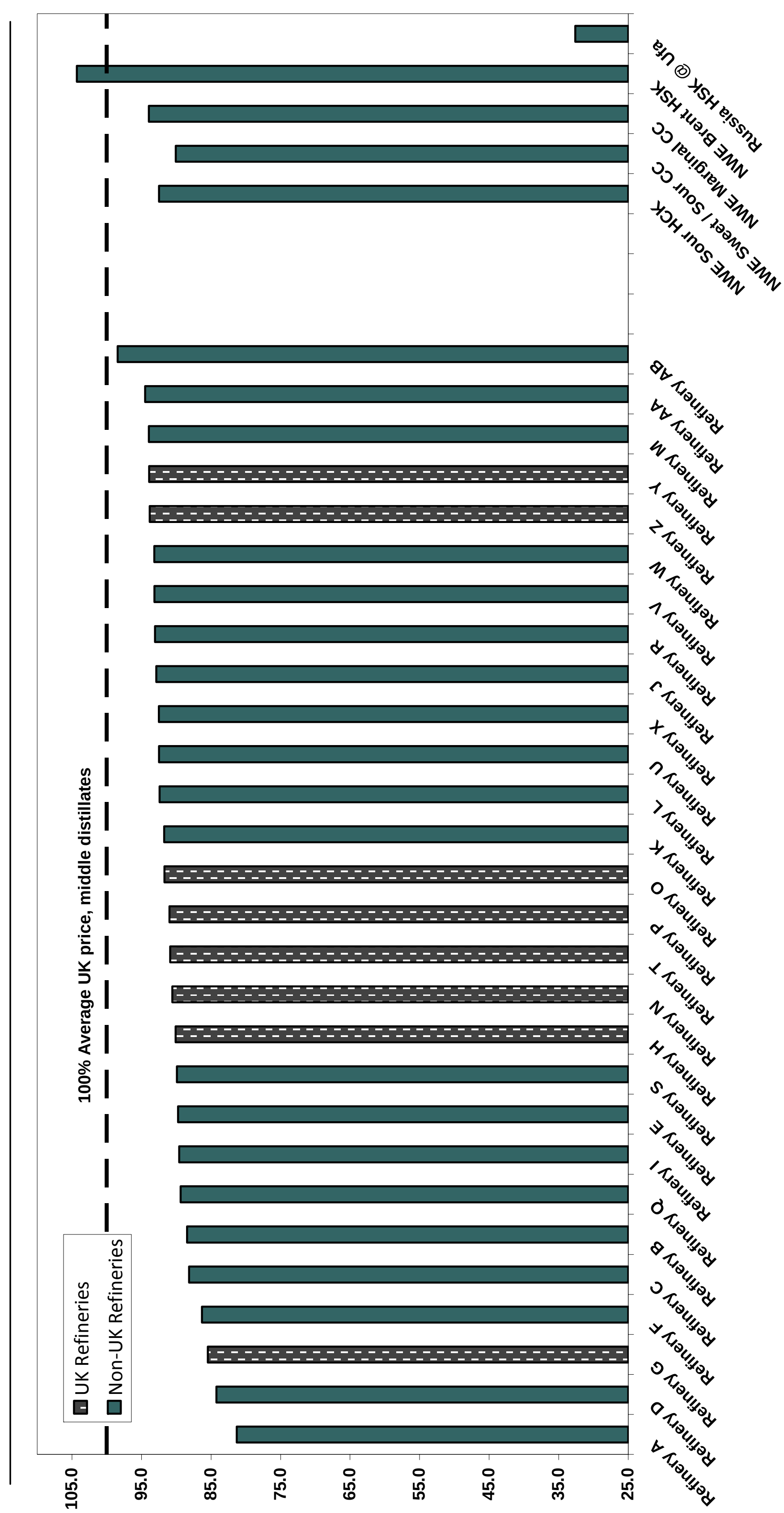
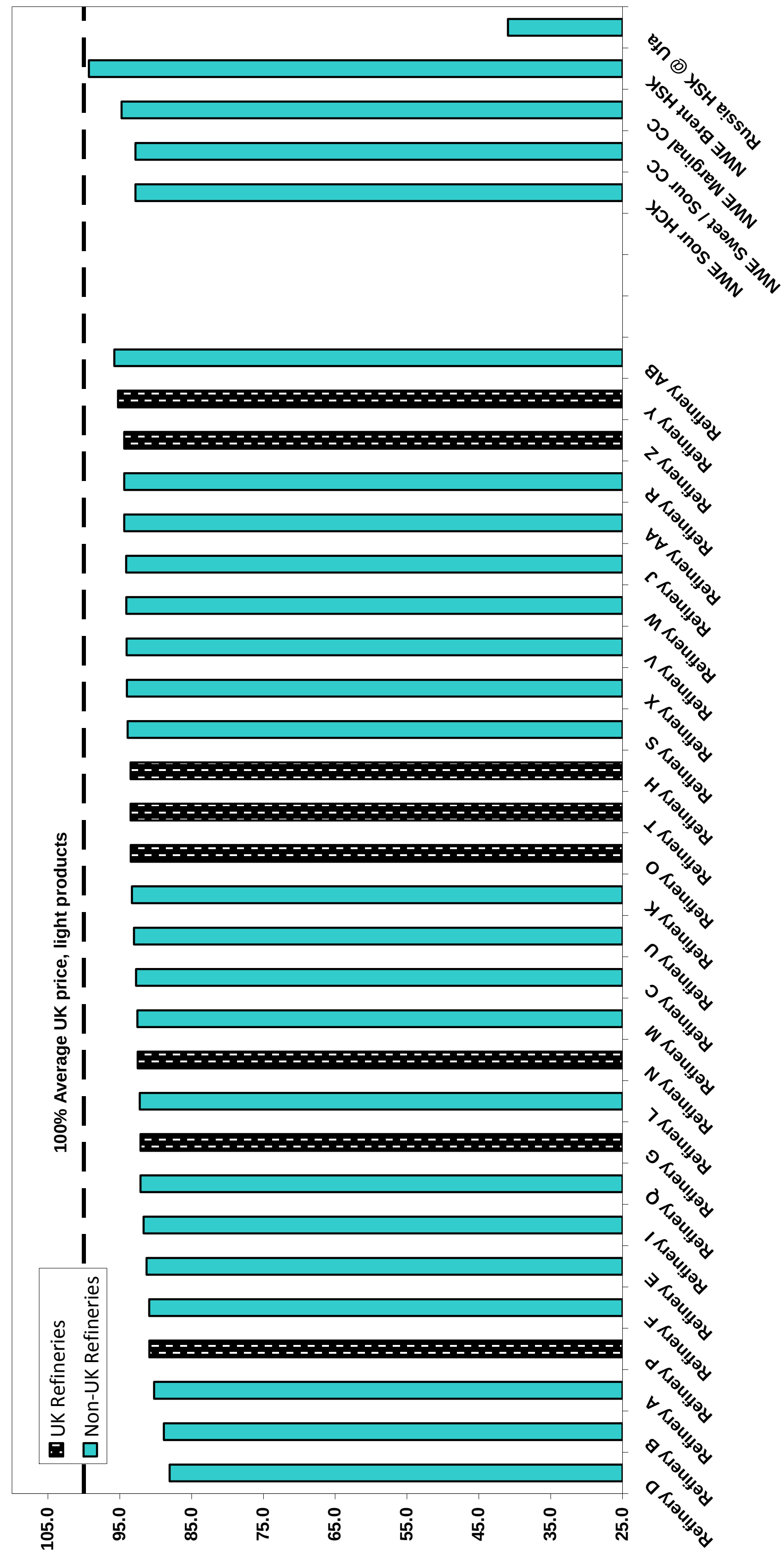


FIGURE VIII-4
COMPARISON OF LIGHT PRODUCTS SUPPLY COST INDEX, EX REFINERY, 2010
(%)



Middle Distillates Supply Cost Index delivered to UK

Figure VIII-5 shows the comparison of middle distillates supply cost index as delivered into the UK. This best represents the ability of the individual refineries to compete for middle distillate sales into the UK, should they choose to do so. For the UK refineries, the values are the same as for at the refinery gate. For the non-UK refineries the impact of freight cost to move product to the UK is shown by the additional bar on the chart.

Out of the 28 refineries included in the analysis, the UK refineries rank 2nd, 6th, 7th, 8th, 9th, 12th, 15th, and 17th. Average performance of the UK refineries is 9th out of 28.

Note that the average bulk price of middle distillate (jet, diesel and gasoil) in the UK in 2010 was $698 per tonne, or $92 per barrel. This is represented as 100% on the chart. This is higher than the middle distillate supply cost index delivered to the UK for all the refineries in this analysis bar one and our generic PGI hydroskimming benchmark refinery.

Light Products Supply Cost Index delivered to UK

Figure VIII-6 shows the comparison of light products supply cost index as delivered into the UK. This best represents the ability of the individual refineries to compete for light product sales into the UK, should they choose to do so. For the UK refineries, the values are the same as for at the refinery gate. For the non-UK refineries the impact of freight cost to move product to the UK is shown by the additional bar on the chart.

Out of the 25 refineries included in the analysis, the UK refineries rank 3rd, 4th, 5th, 9th, 10th, 11th, 15th, and 17th. Average performance of the UK refineries is 9th out of 28.

Note that the average bulk price of light products (jet, diesel, gasoil and gasoline) in the UK in 2010 was $705 per tonne, or $91 per barrel. This is represented as 100% on the chart. This is significantly higher than the light products supply cost index delivered to the UK for all the refineries in this analysis with the exception of our generic PGI hydroskimming benchmark refinery.

FIGURE VIII-5
COMPARISON OF DISTILLATE SUPPLY COST INDEX, DELIVERED TO UK, 2010
(%)

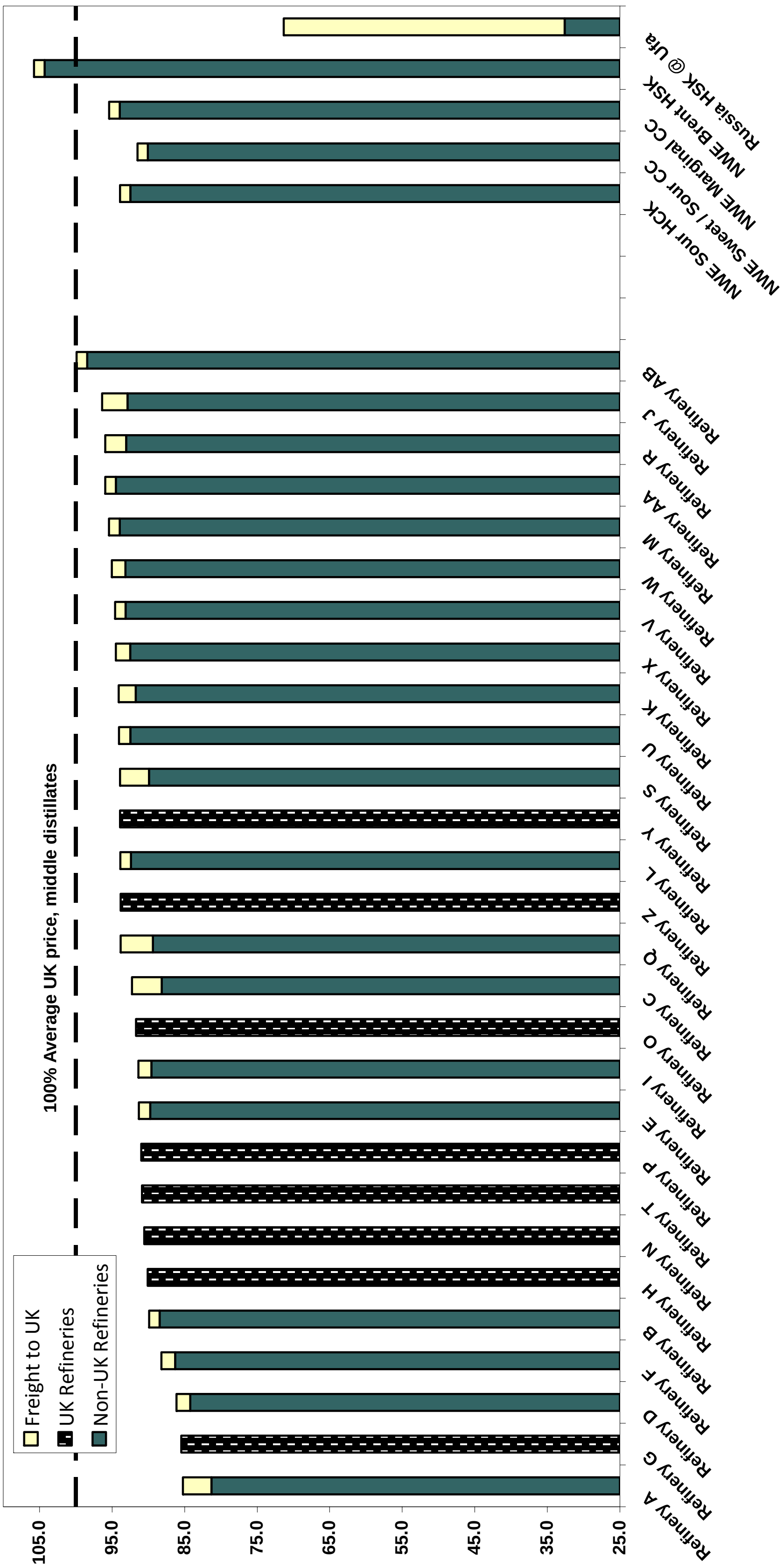
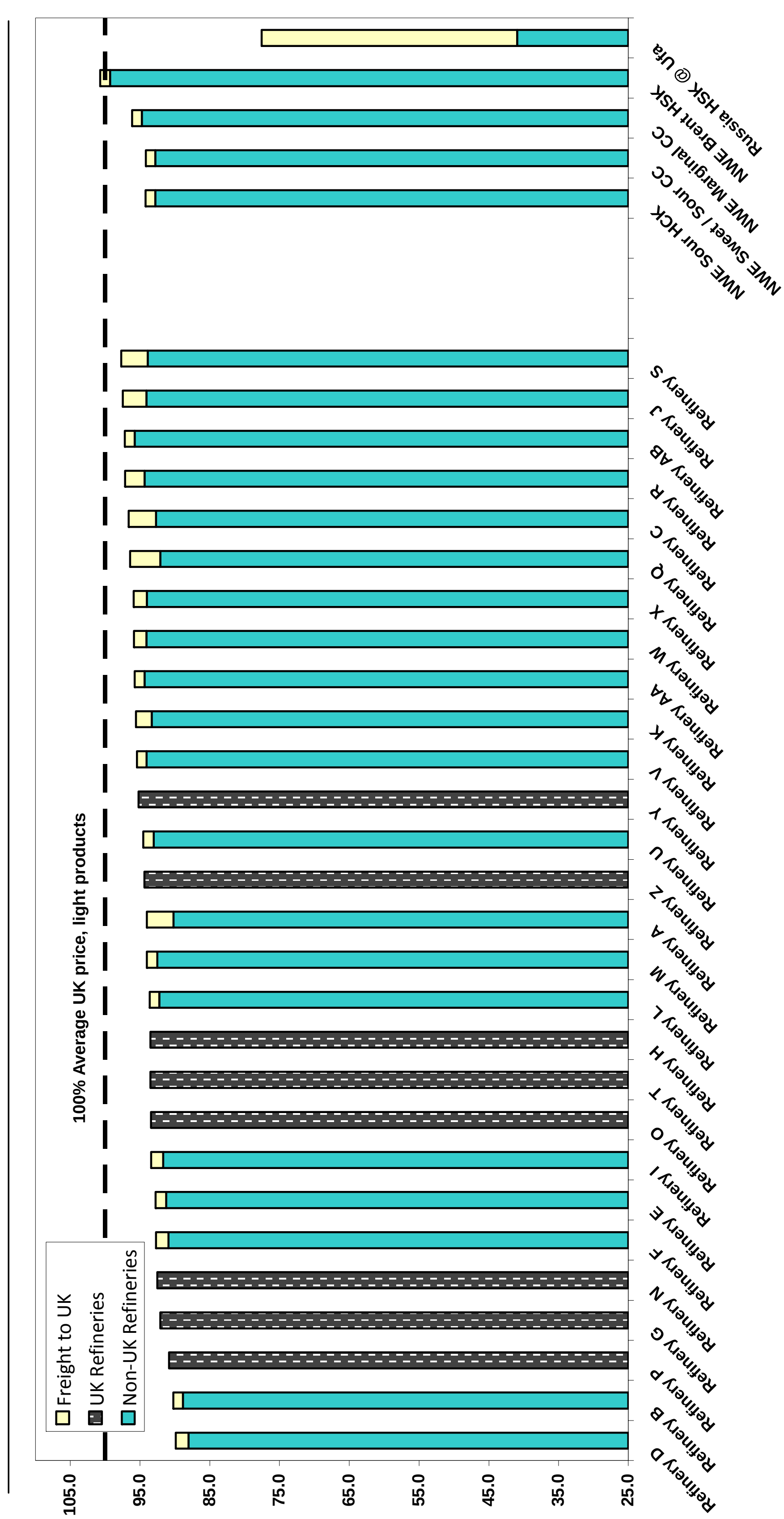


FIGURE VIII-6
COMPARISON OF LIGHT PRODUCTS SUPPLY COSTS INDEX, DELIVERED TO UK, 2010
(%)



CONCLUSIONS

Although there is some spread in the results, the average margin performance of the UK refineries is reasonable when compared to other peer refineries in North West Europe. This peer group of refineries is larger and more complex than the European average and therefore represents a challenging group of competitors. There are many smaller and less complex refineries in Europe (see section VII) that would not be so competitive.

The middle distillate and light product supply cost indices show that within the UK market the UK refineries are more competitive than most of their peer group competitors. Any non-UK refinery has to cover the cost of freight from that refinery to the UK. In this analysis the freight costs range from $1.2 to $3.5 per barrel which is significant. It should also be recognized that for refineries located in most of North West Europe, sales of product into their own local market (which will have similar pricing to the UK market) will give a better netback to the refinery than export to the UK (or any other location). Therefore even though some of the refineries in the analysis could in theory export to the UK and effectively compete with the UK refineries, most would not do this when they can more profitably serve their own local markets.

One key point to note is that complex refineries located in India or US Gulf Coast and the Middle East may have higher gross or net refinery margins than many UK refineries, yet these refineries are much less competitive when it comes to supply of product into the UK market. This is a result of the high freight cost of moving product over long distance from the US Gulf coast or India to the UK.

It should also be noted that the average price of middle distillates or light products in the UK (and European) market is in most cases significantly higher than the cost of producing these products. This reflects the fact that for middle distillates the UK and European prices must be high enough to attract product from as far afield as Asia to meet the demand. The UK and European price therefore has to cover both manufacturing cost in Asia and the long distance freight cost to the European market.

TABLE VIII-1
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 gross margin)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

TABLE VIII-2
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 net margin)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

TABLE VIII-3
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 distillates supply cost index, ex refinery)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

TABLE VIII-4
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 light products supply cost index, ex refinery)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

TABLE VIII-5
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 distillates supply cost index, as delivered to UK)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

TABLE VIII-6
SUMMARY OF REFINERY MARGINS / OTHER METRICS
(ranked by 2010 light products supply cost index, as delivered to UK)

	Refinery Gross Margin ($/B)		Refinery Net Margin ($/B)		At Refinery: Distillate Supply Cost Index		At Refinery: Light Product Supply Cost Index		As Delivered to UK: Distillate Supply Cost Index		As Delivered to UK: Light Product Supply Cost Index	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Refineries												
Refinery D	6.84	7.08	4.80	5.04	80.59	84.23	86.08	88.05	82.40	86.12	87.80	89.86
Refinery B	5.89	8.32	4.30	6.73	90.48	88.46	89.85	88.86	91.93	89.89	91.26	90.24
Refinery P	3.68	4.66	2.61	3.59	91.33	90.97	90.90	90.86	91.33	90.97	90.90	90.86
Refinery G	5.78	6.18	3.92	4.32	82.74	85.48	91.65	92.10	82.74	85.48	91.65	92.10
Refinery N	3.94	4.91	1.96	2.92	90.89	90.57	93.12	92.51	90.89	90.57	93.12	92.51
Refinery F	4.34	6.19	2.29	4.14	88.80	86.31	92.73	90.91	90.63	88.21	94.47	92.72
Refinery E	4.78	6.62	2.94	4.79	91.47	89.75	92.61	91.26	92.99	91.32	94.09	92.79
Refinery I	4.63	5.45	3.65	4.46	89.00	89.60	91.55	91.69	90.92	91.39	93.38	93.41
Refinery O	3.48	4.67	1.34	2.53	93.05	91.71	94.29	93.45	93.05	91.71	94.29	93.45
Refinery T	4.05	3.99	2.01	1.94	87.99	90.86	93.29	93.49	87.99	90.86	93.29	93.49
Refinery H	4.84	5.52	2.70	3.38	89.11	90.11	93.44	93.50	89.11	90.11	93.44	93.50
Refinery L	4.01	5.08	2.70	3.78	92.95	92.42	91.99	92.23	94.41	93.85	93.40	93.62
Refinery M	3.86	5.01	2.58	3.73	94.59	93.93	92.49	92.54	96.02	95.43	93.87	94.01
Refinery A	n/a	10.76	n/a	5.16	n/a	81.30	n/a	90.21	n/a	85.23	n/a	94.02
Refinery Z	2.92	3.27	1.41	1.76	93.15	93.81	94.18	94.38	93.15	93.81	94.18	94.38
Refinery U	2.67	3.89	1.12	2.34	94.19	92.46	94.05	93.02	95.73	94.05	95.52	94.54
Refinery Y	3.40	3.49	1.32	1.41	92.37	93.89	95.20	95.24	92.37	93.89	95.20	95.24
Refinery V	3.16	3.84	1.29	1.98	93.23	93.13	94.25	94.04	94.71	94.58	95.65	95.43
Refinery K	3.75	5.23	1.32	2.79	93.27	91.75	94.42	93.33	95.71	94.09	96.76	95.58
Refinery AA	2.50	3.15	0.98	1.63	94.97	94.48	94.53	94.36	96.44	95.93	95.94	95.75
Refinery W	3.36	3.62	1.69	1.95	91.85	93.18	93.52	94.10	93.72	95.05	95.28	95.87
Refinery X	2.66	3.56	0.98	1.89	93.19	92.51	94.52	94.01	95.20	94.49	96.44	95.90
Refinery Q	3.88	4.52	2.09	2.73	88.45	89.39	92.06	92.10	93.56	93.81	97.03	96.42
Refinery C	n/a	7.12	n/a	3.51	n/a	88.17	n/a	92.73	n/a	92.24	n/a	96.65
Refinery R	3.48	4.50	1.05	2.07	93.78	93.06	94.88	94.36	96.81	95.96	97.78	97.15
Refinery AB	0.69	1.05	-0.40	-0.04	99.17	98.43	95.67	95.77	100.66	99.89	97.09	97.17
Refinery J	2.77	5.30	1.18	3.71	96.77	92.89	96.86	94.10	101.22	96.37	101.13	97.47
Refinery S	4.91	4.23	3.89	3.21	84.77	89.93	91.45	93.89	89.26	93.90	95.71	97.69
PGI Yardstick Refineries												
NWE Sour Hydrocracking	4.05	5.71	1.25	3.10	94.49	92.46	94.10	92.81	95.95	93.89	95.50	94.20
NWE Sweet / Sour Catalytic Cracking (70% Brent / 30% Urals)	4.32	5.09	1.49	2.46	89.97	90.05	93.51	92.81	91.43	91.48	94.89	94.17
NWE Brent Catalytic Cracking	3.37	3.80	0.54	1.16	93.74	93.94	95.33	94.74	95.20	95.38	96.72	96.12
NWE Brent Hydroskimming	-0.87	-0.76	-2.65	-2.42	106.00	104.29	100.16	99.30	107.50	105.76	101.60	100.72
Russia Hydroskimming @ Ufa	5.20	11.12	4.67	10.59	50.29	32.63	51.26	40.94	86.31	71.32	87.50	77.55

IX. ANALYSIS OF CHANGING COMPANY PROFILES OF UK AND GLOBAL REFINERY OWNERS

REFINERY OWNERSHIP PROFILES

MARKET EVOLUTION

The structure of the oil industry has changed markedly since its early days. The structural changes started with the nationalization of crude oil resources in the Middle East producing countries which occurred in the 1970s. This move dramatically changed the level of integration that existed within the international majors, as prior to this they controlled the entire supply chain from the production of crude oil to the end consumer. The cost of crude oil was kept low and profit was made in the downstream.

The split of the supply chain resulted in two effects. The first was a dramatic rise in the price of crude oil which shifted the profitability of the industry from the downstream to the upstream. The second was to encourage the development of oil exploration and production outside the OPEC countries. The latter effort was successful and heralded an era of benign crude prices which lasted until 2003. The growth of demand for energy in Asia will in future increase world dependence on OPEC supplies again as non OPEC supply is unable to keep up with world growth.

The breaking of the international oil companies control on crude supplies also opened up a new market in traded crude oil, allowing a new class of independent refiner to emerge. Before the widespread use of Very Large Crude Carriers (VLCCs) which can transport more than 250,000 tonnes of crude oil (1.8 million barrels), most crude moving from the Middle East to Europe transited the Suez Canal in smaller 100,000 tonne ships. A number of export refineries were built by entrepreneurs in Italy and Greece to take advantage of this trade. These companies were able to purchase crude directly from the Middle East producers and other OPEC suppliers.

With the separation of crude oil supply from refining and the growth of independent refineries came the next development; a growing market for traded products. This in turn allowed marketing companies without any crude oil production or refining interests to emerge, purchasing their products from local refiners and export based refiners elsewhere.

These developments have resulted in the current fragmented state of the industry with each of the crude oil production, refining and distribution and marketing segments operating largely independently of each other. There are now widespread and liquid markets for crude oil, refined products and refinery feedstock. As a result each segment can be easily measured against the market and its profitability assessed. Most oil companies now steward their businesses in this way.

In general the upstream market has been more profitable than the downstream market, owing to commodity markets focusing on crude oil and some control of crude oil prices exercised by OPEC, holding back production from the lowest cost producing fields under the OPEC quota system. This has allowed development of much higher cost crude oil resources (such as deepwater fields and oil sands) but has also squeezed profitability in the downstream business.

REFINERY OWNERSHIP CATEGORIES

In analyzing the profile of refinery owners we have identified five broad categories of owner, all of whom are present in the European industry. These are as follows:

IOC - Integrated Oil Company. These are companies that are integrated partly or wholly from crude oil production to branded sales to the consumer. They often operate internationally and can vary in size. Examples are ExxonMobil, Shell, BP, Chevron, ConocoPhillips, Lukoil, Murphy Oil Company.

NOC - National Oil Company. These are either state companies or companies that were formerly owned by the state and that are still strongly influenced by the home-country national interest. Generally their operations are concentrated in their country of origin but they may have migrated overseas to a modest extent. This category includes companies such as Saudi Aramco, NIOC, Kuwait Petroleum, Nigerian National Petroleum Corporation, Eni, MOL, INA, and Statoil.

Independent Refiners. These are companies that are focused primarily on the refining industry. They may own one or more refineries and may be spread geographically. They do not own upstream assets but may be involved in marketing downstream of the refinery. Some are publicly quoted on a stock exchange and in many cases a controlling stake is owned by an individual or family. This category includes companies such as SARAS, ERG, Motor Oil (Hellas), Petroplus, Preem, Valero.

Conglomerates. These are companies that own refineries but refining is not their core business. In some cases the refinery ownership has arisen due to the purchase of related assets (e.g. Ineos) or a deliberate diversification into a new business area (e.g. Hyundai, Essar). This category includes companies such as Ineos, Lyondell Basell, Reliance, Essar, S-Oil, and Tupras.

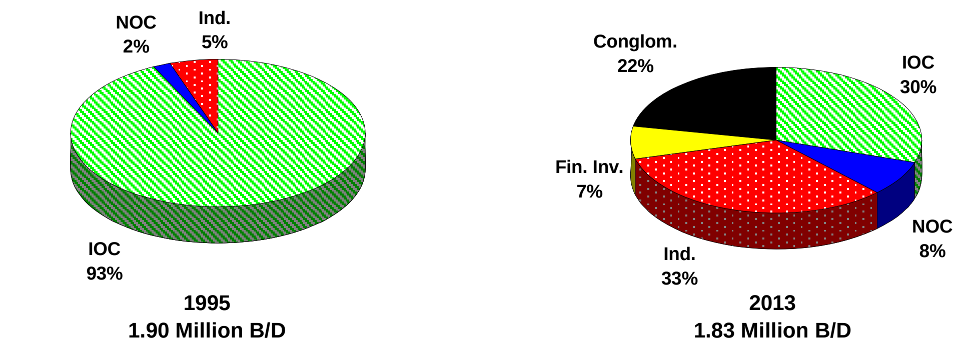
Financial Investors. These are companies that have invested in refining purely as a financial opportunity. In some cases they represent an investor fund and in some cases a wealthy individual or group of individuals. In general they seek to employ high levels of debt. There are limited examples of this type of investor in the European industry, the most recent being Klesch & Co. Other financial investors known to consider refining assets are Carlyle, Riverstone, Backstone, and Goldman Sachs Capital Partners.

The above distinctions are in some degrees becoming blurred and some companies could be considered in more than one category. For example we have categorised Total as an IOC even though it has a strong national base in France. The same reasoning may be applied to Russian company Lukoil which has grown an international presence and has extensive upstream interests.

UK REFINERY OWNERSHIP

Figure IX-1 shows how the ownership profile of the UK refining industry has changed between 1995 and that expected in 2013 based on the current sales activity. In this plot it has been assumed that the two remaining refineries for sale will be sold to a financial investor and an independent refiner purchaser. The future profile may therefore look different to that projected here.

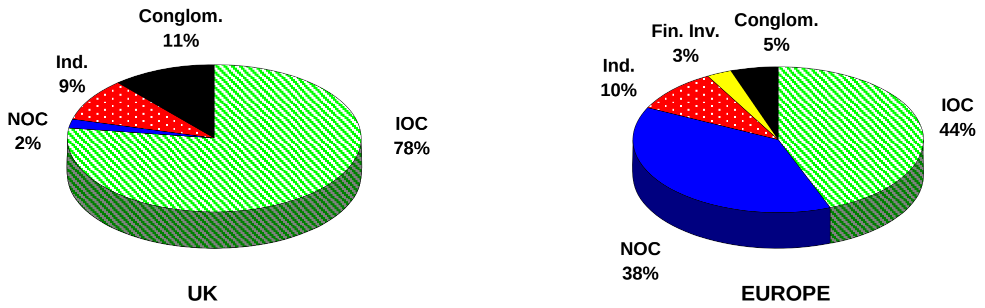
FIGURE IX-1
UK REFINERY OWNERSHIP PROFILE: 1995 AND 2013*



**Assumes Lindsey sold to Independent and Milford Haven sold to Financial Investor*

The UK refinery ownership structure is very different to that in Europe as a whole, as shown in Figure IX-2.

FIGURE IX-2
UK AND EUROPEAN REFINERY OWNERSHIP PROFILE: 2010



In 2010 the UK industry was dominated by the IOCs which controlled 78% of capacity and six out of ten of the operating refineries. There was one Independent, Petroplus with 9.5% of capacity and one Conglomerate INEOS with just over 11% (Note the sale of 50% of INEOS Grangemouth to Petrochina (NOC) was announced in January 2011). This profile has changed significantly since the early 2000s following the sale of the BP refineries in Grangemouth and Coryton. Before this, IOCs accounted for over 90% of UK capacity. The recent sales and expected additional transactions have the potential to reduce the IOC control of the UK industry to below 30% assuming that the Lindsey, Pembroke and Milford Haven refineries are all sold to companies other than IOCs. The recent announcement that Valero is to purchase the assets of Chevron increases the share of the independent refiners and has been included in the 2013 figures in Figure IX-1.

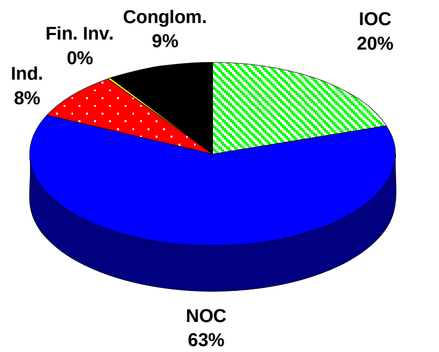
National oil companies have a much greater role in Europe, diluting the IOC's share to below 50%. The European share of capacity owned by Independents is the same as in the UK, although the share owned by Conglomerates is lower.

When considering the role and evolution of NOCs in Europe a parallel can be drawn with BP in the UK. BP progressively expanded beyond the UK borders through organic growth initially and more recently through acquisitions. The sale of shares by the UK government freed the company from all state control and national obligations. Eventually its UK base became sufficiently small that the sale of assets in its home country became economically desirable.

In the rest of Europe many governments retain a level of ownership or influence in their "national" oil companies. Most of these companies, like BP, are seeking to expand outside of their national borders and many have acquired assets in diverse geographies. For example Eni has acquired refining assets in the Czech Republic, Germany and Portugal. The Hungarian company MOL has acquired refineries and retail assets in Italy, Slovakia and Croatia.

If the ownership analysis is extended to the rest of the world the pattern of ownership changes again as shown in Figure IX-3.

FIGURE IX-3
REFINERY OWNERSHIP REST OF THE WORLD 2010
Percent



In the rest of the world, NOCs dominate with over 60% of refinery capacity, the share of the IOC's reduces to 20% and the independent sector represents around 8%. This profile in part mirrors the state control of economies in the Middle East, Asia and Russia and the CIS. Many of the NOCs are becoming active overseas investors as their European counterparts did, and in many cases the investment made in the downstream is connected with access to crude oil resources. For example CNPC invested in refining in Sudan as part of a deal that gave access to crude oil production. Essar, an Indian conglomerate has recently started to seek downstream oil investments outside its home market with the acquisition of the Shell Stanlow refinery in the UK.

STRATEGIC POSITIONS OF REFINERY OWNERS

Whilst there will be as many strategic plans as there are companies active in any particular industry or industry segment, there are themes which emerge which are described below.

INTERNATIONAL OIL COMPANIES

The higher profit potential and associated large investment costs in the upstream segment have become the strategic focus of most of the IOCs. In order to maintain their oil reserves they have to spend increasing sums on exploration and development of new oil resources and capital is being redirected away from other activities, particularly the downstream. The lower returns on investment achieved in the downstream have caused most IOCs to reduce their downstream exposure, particularly in the mature, low growth markets. This is particularly true in Europe where declining gasoline demand and a wide range of increasingly complex regulation erodes profitability. As a result, IOCs are selling downstream assets in a move to reduce their overall exposure to the segment and to upgrade the profitability of their remaining asset portfolio. In some cases they are refocusing on growth markets to maintain a downstream presence, in other cases some are looking to dispose of refining assets while maintaining their retail marketing presence.

The IOCs will respond to political pressure/commercial expedient where upstream access is linked to downstream presence. In the 1970s a UK presence in the downstream, particularly refining was seen as a plus point in gaining North Sea acreage. The same was true in the Netherlands and Norway. In the UK there were some tax advantages in owning refineries in the UK if producing crude oil from the UK sector of the North Sea.

NATIONAL OIL COMPANIES

In general the NOCs continue to maintain a high priority towards their local markets. In many cases the national government can exercise a high degree of control even when its shareholding is reduced to a minority level. They usually have either a monopoly or majority interest in refining and marketing in their home country and a high share of the retail and commercial fuels market. National supply security is generally a high priority.

In some cases the “National” status results in commercial pressure to retain uneconomic or poorly performing assets in their home markets.

Another category of NOC is the national companies from the oil producers and centrally controlled states such as Russia and China. Historically, the Middle East producers have made investments into the downstream in their consuming markets, a policy that was started during a period of severe market competition between OPEC suppliers and which was part of a strategy to gain/maintain market share. An added benefit was seen as the transfer of commercial knowledge of the motivation and practices of crude oil buyers, and also to provide an opportunity to train nationals in a commercial business environment or in refining technical expertise.

As the crude oil market tightened the need to secure outlets reduced and has now essentially disappeared. A new generation of western educated managers meets the needs of their companies in regards to expertise. In most producers the imperative has become domestic investment to provide employment opportunities to a young and growing workforce, and the most obvious investment choice is into the oil and gas and related industries to take advantage of their natural resources base. Many of the export oriented downstream projects in the Middle East stem from job creation initiatives. In some cases the products that would be exported have the potential to threaten employment in the importing locations.

Other NOCs that are active in the downstream outside of their home markets include the Russian and Asian companies. The strategy behind Russian companies securing downstream assets is typically to secure outlets for crude oil. The priority has been to acquire assets on the export pipeline systems or those refineries that process a high proportion of Russian crude. A secondary consideration is to diversify their income away from their home country. However there is growing political pressure to increase investment inside their home countries in the same way that the Middle East NOCs have changed strategy.

Chinese companies PetroChina and CNPC have also been active in acquisition of downstream assets although the motivation for this is not yet clear, other than a reported strategy of building a broad business platform in Europe and becoming leading international energy companies.

INDEPENDENT REFINERS

The Independent refiners in Europe split into two categories, those legacy companies that entered the business back in the 1960s and 1970s and the more recent entrants which have acquired existing assets sold by the majors/IOCs and NOCs. The former have tended to migrate to niche markets, although some such as ERG and Saras have developed very large refineries. They have been long term investors and many have invested heavily to develop their companies, building world class facilities. Their focus tends to be on cash generation rather than return on assets.

The new Independents have been able to acquire assets cheaply and operate them with a low overhead and low cost business model. Their funding sources are a combination of venture capital and equity; this limits access to funds, and as a result investment capital is tight. The Independents can be unwilling to make substantial, non-return mandatory investments and may either sell or close a site where this is required. In many respects this mirrors the decisions that an IOC would take when faced with the same situation. However the Independents do not have the alternative of investing in higher return upstream projects.

One of the imperatives for an independent is to build a portfolio of assets. A company with a diversified portfolio of operating assets is more attractive to investors as operating risk is diluted. A portfolio of assets also allows corporate overheads to be spread, reducing unit costs.

The independents typically have experienced industry managers who are commercially focused. They are responsible and experienced operators and invest in developing their assets. Generally their interest is long term and as their focus is on the refining and possibly marketing sector they tend to be well managed.

CONGLOMERATES

Conglomerates have had only a very limited presence in the European refining sector and the few that are present are exclusively petrochemical companies that have integrated upstream into feedstock supply. Currently the only conglomerate present in the UK refining sector is INEOS, at Grangemouth. However, the expected acquisition of the Stanlow refinery by Essar Energy introduces a new, more diversified conglomerate.

Conglomerates dominate the refining industry in certain countries in Asia. In Korea in particular local conglomerates had ownership interests in all of the refineries. In India, Reliance and Essar, both local conglomerates, have substantial interests and a portfolio of other businesses.

Often conglomerates are owned by a family which has a controlling stake. They have typically developed in an emerging market and have enjoyed a degree of government support. They can take a longer term view of business and be prepared to make substantial investments to develop their companies in the longer term. However, there can be issues regarding their ability to adapt to business practices in new countries of operation and “cultural” issues can arise. In particular there may be an expectation of a level of government support similar to that enjoyed in their home country, which may not be forthcoming elsewhere.

FINANCIAL INVESTORS

It is known that financial investors have considered acquiring downstream oil assets for several years. Recently the first purchase of a refinery by a financial investor has been completed with the sale of the Heide refinery in Germany to Klesch & Co.

Financial investors typically, but not always will have a short term time horizon for asset ownership, expecting to resell at a profit within a five year time frame. Any acquisition is likely to be highly leveraged and therefore vulnerable to a sustained period of poor profitability.

Although highly astute business people financial investors are unlikely to have in-depth knowledge of the refining industry and will rely on the employees of the business they acquire to continue operations. Generally they would not embark on a major investment project as they do not have the management skills to control it. Also the typical time to develop and implement a major refinery project is around four years, which is approaching their limit of tenure, and therefore does not provide enough time to pay back the substantial investment required. However financial investors will consider capital investments that they consider will add value to the business particularly if this value can be captured when the assets are sold.

IMPLICATIONS OF CHANGING UK REFINERY OWNERSHIP ON SECURITY OF SUPPLY

Historical ownership of refineries by IOCs has meant that the capability to undertake large investment projects on UK refineries has been there, both in terms of technical ability and also ability to provide the necessary finance. Increased ownership by smaller independent companies or conglomerates where refining is only a much smaller part of the overall company portfolio could result in additional barriers to major investment. Technical expertise for major upgrading can be provided by a number of technology/engineering contractors so the technical barriers are not insurmountable. However the ability to finance a major project (i.e. $1 billion investment with long pay-back time) is likely to be more of an issue.

The closure of another UK refinery represents the greatest threat to the UK refined products security of supply. Depending on the refinery location, the closure could have a significant local or regional impact. For the country, the reduction in gasoline production would not be a major issue, as the remaining UK refineries would be able to make up the difference by reducing exports. However the reduction in middle distillate production would have to be made up by additional imports, further increasing the dependency of UK supply on the international markets. In this respect, the fact that UK refineries that are for sale appear to be attracting positive buyer interest is promising. The new owners will have invested considerable sums in purchasing the refineries and are therefore unlikely to consider closure in the short term.

APPENDIX

APPENDIX
EUROPEAN GDP ASSUMPTIONS
(Annual Percent Change)

	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Albania	7.3	5.8	7.7	3.3	2.6	3.2	3.6	4.6	6.4	6.1	4.5	4.2	3.8
Austria	0.1	0.7	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.0	0.0
Belgium	0.3	0.6	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.2	0.2	0.2
Bosnia and Herzegovina	5.2	4.0	5.7	-3.1	0.5	3.0	5.0	6.3	5.6	5.3	4.5	4.3	4.1
Bulgaria	5.4	6.2	6.0	-5.0	0.0	2.0	4.0	4.2	5.0	4.8	4.9	4.7	4.5
Croatia	3.0	4.2	2.4	-5.8	-1.5	1.6	2.5	3.8	3.7	3.5	4.6	4.4	4.0
Cyprus	5.0	3.9	3.6	-1.7	0.4	1.8	2.5	3.0	3.5	4.0	4.0	3.2	3.2
Czech Rep	-0.1	0.2	0.9	0.6	0.0	0.1	0.2	0.2	0.3	0.4	0.3	0.2	0.1
Denmark	0.3	0.3	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.1	0.1	0.1
Estonia	10.0	9.4	-5.1	-13.9	1.8	3.5	3.4	4.0	5.0	4.3	4.0	3.9	3.8
Finland	0.2	0.3	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1
France	0.5	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.0	0.0
Germany	0.1	-0.1	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0
Gibraltar	3.8	2.0	1.5	0.8	1.2	2.6	4.0	3.5	3.0	2.5	2.4	2.3	2.3
Greece	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1
Hungary	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.1	0.1	0.0
Iceland	1.3	1.6	1.9	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.5	0.4
Ireland	1.3	2.2	1.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.5
Italy	0.0	0.7	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.1	0.5	0.0
Latvia	6.9	10.6	-4.2	-18.0	-1.0	3.3	4.0	4.5	5.0	4.2	4.0	3.9	3.8
Lithuania	3.3	7.8	2.8	-14.8	1.3	3.1	2.6	3.1	4.0	4.2	4.0	3.9	3.8
Luxembourg	1.4	1.5	1.8	1.9	1.5	1.4	1.3	1.3	1.2	1.1	1.0	1.0	1.0
Macedonia	4.5	4.1	5.0	-0.8	2.0	2.7	3.4	4.0	4.7	4.5	4.2	4.5	3.8
Malta	-1.0	4.0	2.6	-2.1	1.7	1.7	2.0	2.2	2.5	2.8	2.4	2.5	2.5
Netherlands	0.8	0.2	0.4	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Norway	0.7	0.7	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.3	0.3	0.3
Poland	-0.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Portugal	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Romania	2.9	4.2	7.3	-7.1	-1.9	1.5	4.4	4.5	5.0	4.4	5.1	4.9	4.5
Serbia	15.5	5.3	5.6	-3.2	1.5	3.0	5.0	6.1	6.1	5.8	4.5	4.5	4.2
Slovakia	-0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Slovenia	4.4	4.5	3.5	-7.8	0.8	2.4	3.0	3.2	2.8	2.5	2.8	2.6	2.5
Spain	0.8	1.7	1.5	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.5	0.4	0.3
Sweden	0.1	0.4	0.8	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.2	0.2	0.2
Switzerland	0.6	0.6	1.3	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.6	0.6	0.6
Turkey	1.6	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.7	0.6
UK	0.4	0.6	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.3	0.3

Data Source: Eurostat; IMF