Oil reporting for the FQD

An assessment of effort needed and cost to oil companies

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Delft, March 2012

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Introduction

In 2009, the European Union (EU) adopted the Fuel Quality Directive (FQD, directive 2009/30/EC). Among other things, this directive requires oil companies to reduce the average well-to-wheel greenhouse gas (GHG) emissions of the road transport fuels sold in the EU, by 6-10% between 2010 and 2020, and to report on the carbon intensity of these fuels. It is one of the key pillars under EU climate policy in transport, next to the CO_2 standards in cars and light duty vehicles and a target of 10% renewable energy in this sector in 2020, as defined in the Renewable Energy Directive (RED).

The Fuel Quality Directive includes detailed reporting and calculation methodologies for biofuels and a set of mandatory sustainability criteria. In addition, the European Commission proposed a directive in October 2011 which provides detailed implementing measures for fossil fuels. This draft proposal is currently under discussion in the Environmental Council of the EU. It provides default GHG intensity values for various types of fossil fuel feedstocks, reporting obligations for fuel suppliers and Member States, and a baseline for 2010 GHG intensity to which GHG emissions should be compared. This draft proposal led to a debate on the need to distinguish between fuel sources based on their origin and GHG intensity and regarding the administrative burden that implementation of this directive would cause.

This study addresses part of the issues that are debated: it assesses the administrative burden and practical feasibility, and broadly explores the potential effects of the proposal on the EU refining sector. This study is based on literature research, combined with interviews with stakeholders and experts, and was commissioned by Transport & Environment.

Administrative efforts required

To assess practical feasibility and administrative practice, an overview was made of the most relevant issues in the life cycle of fossil fuels. The FQD draft proposal requires that the fuel suppliers report the origin, feedstock and GHG intensity of the fuels supplied to the market, so any reporting system should be able to transmit this information along the chain of transport, processing, refining and finally distribution to the consumers.

Comparing the requirements with the current reporting practice, it is concluded that for a large share of the fuels, the necessary data are already being reported to customs and Member States authorities. Reporting of oil sources is, however, not yet in place for the following:
- Final products (e.g. diesel and gasoline) imported into the EU.
- Intermediate products imported into the EU. These are oil-based products that have undergone processing outside the EU and are imported to be used as feedstock in EU refineries[1].
- Petroleum-based feedstock from the chemical industry. The volume of these streams is relatively small, but they are also feedstock for transport fuels and thus part of the FQD reporting and GHG reduction obligation.

The volumes of the first two streams are significant: 20 to 25% compared to total EU crude intake.

[1] For example, oil produced in the Middle East is transported to Russia, to be processed in a refinery to an intermediate product or fuel. This is then imported into the EU, where the intermediate is processed further in an EU refinery and the fuel is distributed to end users.

Apart from reporting to governments, large integrated oil companies monitor and report GHG emissions upstream and overall. While GHG intensities of their fuels are published in sustainability reports, they do not necessarily track fuel origin throughout the supply chain. Although these reports are verified through external assurance there is no harmonised and accepted industry standard.

This assessment leads to the conclusion that for the EU fuel suppliers the cost of reporting, as described in the draft FQD proposal, amounts to a total of approximately M€ 40-80 annually. This is about €ct 0.8-1.6 per barrel of imported oil, or about one quarter to half a Eurocent per full tank of 50 litre fuel.

Other impacts on the oil industry – upstream and downstream
Besides administrative cost, there is also the cost of meeting the target of GHG mitigation. With the current proposal, fuel suppliers can choose from quite a wide range of options: adding more biofuels, choosing biofuels with relatively low GHG intensity, reducing venting and flaring, shifting to electric transport or shifting to fossil fuels with low carbon intensity.

The current proposal allows almost all WTW GHG mitigation measures to contribute to the target[2]. This can have a positive impact on GHG mitigation cost: fuel suppliers can implement the most cost effective measures given their specific circumstances. Increasing the use of fossil fuels with low GHG intensity is one of the options available to them. However, it can also be expected to increase cost for fuel suppliers that want to rely on high carbon fuels in the future, as they would have to take compensation measures to meet the FQD target. This will affect oil prices and result in a growing price differential in favour of the low GHG intensity crudes. It is therefore important to maintain a level playing field between refineries and fuel suppliers, both within and outside of the EU: non-EU refineries should be treated the same as refineries inside the EU. If this is not the case, suppliers may get a competitive advantage by unaccounted exports of high carbon fuels to the EU. These kinds of impacts can be prevented by ensuring that all fuels and oil streams placed on the EU market use the same methodology to determine GHG intensity.

The proposal will have very limited impact on the origin of the EU's fossil fuels in the short term. However, it may impact investment decisions in the industry, and provide a sound basis to regulate and control CO_2 emissions of transport fuels in the future, where the share of unconventional oil is predicted to increase.

Recommendations
Supplier reporting of CO_2 intensity along the lines of the draft FQD proposal can be implemented at a relatively limited cost. The proposal will, however, benefit from a more detailed elaboration on accounting methodology and assurance standards. Furthermore, it is recommended to include a rule on how to deal with fuels for which the origin and GHG intensity is not reported. Also, the potential role of the Member States in steering their national fuel mix towards fuels and other energy sources with low GHG intensity – although outside the scope of this study - should not be overlooked. In the FQD, fuel suppliers are made responsible and accountable for well-to-wheel GHG intensity, whereas it is the Member States that effectively control tank-to-wheel emissions by supporting different types of fuels and cars (e.g. electric and natural gas vehicles).

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[2] Note that GHG mitigation of oil transport, storage, refining and distribution is not included, even though there is potential in these parts of the fuel life cycle as well.

1 Introduction

1.1 Context and purpose of this study

In 2009, the EU has adopted the Fuel Quality Directive (FQD, directive 2009/30/EC), which, among other things, requires oil companies to reduce the average well-to-tank GHG emissions of the road transport fuels sold in the EU, by 6-10% between 2010 and 2020[3]. The baseline emission value and overall reporting and calculation methodology to be used were not yet provided, only for biofuels.

This directive is one of the key pillars under EU climate policy in transport, next to the CO_2 standards in cars and light duty vehicles, and the Renewable Energy Directive that sets a target of 10% renewable energy in this sector for 2020.

The GHG calculation methodology provided for biofuels was quite detailed, but nevertheless led to much debate, especially regarding the incorporation of indirect land use change emissions. By far the largest share of the EU's transport fuels is, however, from fossil origin, where no GHG calculation methodology was given yet in the 2009 legislation. The European Union is now preparing a directive that provides detailed definitions and GHG calculation methodologies for fossil fuels, that both fuel suppliers and Member States will have to adhere to.

In October 2011, a draft of this proposal of implementing measures was published (although not in the public domain). This proposal provides different default emission factors for different types of fuel origin, summarised in Section 1.2, ranging from conventional crude to oil shale, natural bitumen and CTL (coal converted to liquid fuel). It also further details how and what suppliers and Member States should report, and defines the 2010 baseline emissions.

The FQD and this draft proposal have led to a strong debate between various stakeholders, the Commission and Member States, on the need to distinguish between different oil sources, on the GHG emission factors but also on the administrative burden and cost to the fuel suppliers that this draft directive would cause.

Transport & Environment commissioned a consortium of CE Delft, Carbon Matters and ECN to carry out a study with the following key objectives:
- to assess the practical feasibility of the EC proposal;
- to estimate the administrative cost to fuel suppliers;
- to broadly explore the potential effects of the proposal on the oil refinery sector and fuel cost.

3 6% of this target is mandatory, the rest is indicative, to be achieved in non-road transport, with technological options such as CCS and through CDM.

This report is based on literature research, combined with interviews with oil industry representatives (including Europia), government representative (incl. customs and statistics), independent assurance providers and a research institute. Note that biofuel sustainability data reporting requirements (incl. GHG emissions) fall under the RED and are additional to the FQD requirements. This report focusses on the fossil fuel reporting only.

1.2 The Commission's proposal

The EU FQD directive 78/90/EC (amended in 2009 with directive 2009/30/EC) puts in place two different, but related measures regarding the well-to-wheel greenhouse gas (GHG) emissions of transport fuels:

1. A reporting obligation of crude/product origin and CO_2/MJ content for transportation fuels (diesel/petrol, including biofuels, and electricity) for fuel suppliers.
2. A 10% (6+2+2) target for reduction in CO_2/MJ between 2011 and 2020 compared to the EU average in 2010. Of these 10%, 6% are mandatory, four are optional (given as 'indicative targets').

In the EC proposal, a European overall average 2010 baseline for petrol and diesel has been established at 88.3 gr average CO_2/MJ on a life cycle basis. This average currently virtually excludes high CO_2 intensity feedstocks as well as the 4.7% biofuels[4], currently achieved in petrol/diesel transportation fuels in 2010 (see Annex II of the proposal). Note that the directive is limited to road transport fuels, and does not address fuels used in waterway transport or other modes.

In order to arrive at the required 6% reduction in g CO_2/MJ in Member States, European fuel suppliers would have to report annual averages of:

- volume of each fuel supplied distinguished by feedstock;
- electric energy (with a signed statement from the first vehicle owner);
- fuel or electric energy type;
- greenhouse gas intensity for energy other than biofuels (calculated in accordance with the rules set out in the directive);
- GHG intensity of biofuels (also calculated in line with the rules set out in the directive);
- simultaneous co-processing of fossil fuels and biofuels;
- upstream emission reductions;
- place of purchase for fossil fuels and biofuels;
- annual reports of: origin of fuel or energy, defined as the type of feedstock used to produce the fuel or energy;
- periodic (i.e. less frequent) reports of: origin of fuel or energy in more detail, including information on the sources supplying the feedstock as well as the processing it undergoes, where the definition of sources include data on oil/gas field or group.

Suppliers are, in most cases, the entity responsible for passing fuel or energy through an excise duty point[5]. Note that this list only provides an overview, more detailed information can be found in the proposal.

Member States then have to transmit this information to the European Environmental Agency.

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4 EurObserv'ER, 2011: Biofuels Barometer.

5 Or, if no excise is due, any other relevant entity designated by a Member State.

A range of different crude types are distinguished:

- conventional crude[6];
- natural bitumen (tar sand oil);
- oil shale;
- LPG and LNG/CNG from any fossil sources;
- coal converted to liquid fuel (CTL), both with and without CCS of process emissions;
- natural gas converted to liquid fuel (GTL).

Default values of GHG intensity are given for each of these crude types to products routes.

In addition, the proposal provides default GHG intensity values for natural gas and coal converted to hydrogen, waste plastic to liquid transport fuel, and for electricity production in the various Member States.

Similar policies in the USA and Canada

California: LCFS

In 2009, the California Air Resources Board (CARB) approved the Low Carbon Fuels Standard (LCFS). The LCFS directive calls for a reduction of at least 10% in the carbon intensity of California's transportation fuels by 2020. Providers of transport fuels must track the fuels' carbon intensity of all fuels provided, through a system of credits and deficits. They must meet the carbon intensity standards annually, and credits may be banked and traded within the LCFS market. Rules and carbon intensity reference values were developed and approved in 2009, and came into force on January 1, 2011. However, lawsuits were filed, challenging the constitutionality of the LCFS. In December 2011, a federal judge granted a preliminary injunction against its implementation, concluding that the regulation 'treads into the province and powers of our federal government, reaches beyond its boundaries to regulate activity wholly outside its borders' – an argument that is relevant only in the US/California situation, and not for EU policy.

Fossil fuels are differentiated, to into high carbon intensity value crude oils (HCICO) and low carbon intensity fuels.

Practical experience with this system is still limited, but ICCT, 2011 reports that in April 2011, the Californian market had already started to differentiate high carbon intensity fuels from low carbon intensity fuels: corn ethanol with about 90 g CO_2/MJ cost $ct 2-3 more per gallon than corn ethanol with a carbon intensity of about 98 g CO_2/MJ, as the first are now more attractive to use than the latter.

Other states and regions in the US have shown interest to follow this example, but no one has yet implemented it into regulation.

Canada

Two Canadian provinces, Ontario and British Columbia, have expressed their intent to follow the Californian LCFS example.

USA: EISA

As part of the Energy Independence and Security Act of 2007 (EISA 2007), Section 526 prohibits Federal agencies from procuring alternative or synfuel unless its life cycle GHG emissions are less than those for conventional petroleum sources:

'No Federal agency shall enter into a contract for procurement of an alternative or synthetic fuel, including a fuel produced from nonconventional petroleum sources, for any mobility-related use, other than for research or testing, unless the contract specifies that the lifecycle greenhouse gas emissions associated with the production and combustion of the fuel supplied under the contract must, on an ongoing basis, be less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.'

[6] Definitions of these categories are provided in the FQD.

This section is mainly relevant for fuels procured by the US military.

There has been some uncertainty about what exactly is covered by this article, and the US Defense Energy Support Center (DESC) provides three possible interpretations in (LMI, 2009):

- the Department of Defense is only constrained from specifically contracting for products produced from oil sands crude;
- products supplied to DESC cannot be predominantly produced from oil sands crude;
- products supplied to DESC can contain only incidental amounts of oil sands crude.

LMI conclude that DESC's bulk fuel purchases of fuels will be importantly affected by which of these interpretations governs.

This section 526 has recently been under debate, but it is still in force (see, for example:

- http://www.api.org/news-and-media/news/newsitems/2011/may-2011/api-repeal-of-section-526.aspx
- http://www.pewenvironment.org/news-room/fact-sheets/protect-section-526-for-americas-national-and-energy-security-85899361870
- http://www.whitehouse.gov/blog/2011/07/15/national-security-and-fuels-future-importance-sec-526

Sources:

- http://www1.eere.energy.gov/femp/regulations/eisa.html
- ICCT, 2009
- ICCT, 2011

2 An overview of the oil trade and refining, and current reporting practice

2.1 Introduction

To determine the potential effort needed to monitor the source and origin of fuels, this chapter provides an overview of the most relevant issues regarding the global oil market, including exploration, refining and trade.
The aim is
- to provide insight into the well-to-tank, and into current practices of crude oil and product blending throughout this part of the oil's life cycle; and
- to assess what kind of relevant monitoring is already in place.

Well-to-tank is defined here as the part of the oil's life cycle from its production (typically at an oil well) to the point where the fuel is being filled into the vehicle (the fuel tank).

The FQD reporting measures require tracking feedstock origin as the crude moves along the supply chain during transportation, processing, refining, and distribution. Data transfer along this chain of custody is not uncommon in the industry, as GHG emissions are already being tracked for the voluntary sustainability reporting that many major oil companies adhere to. However, even though this voluntary reporting also provides data on GHG intensity of the fuels, is not compliant with the draft FQD proposal. It reports GHG emissions upstream as well as overall but does not track the origin of the product as intended by the FQD. The integrated oil companies reporting GHG emissions have not yet agreed on a harmonised methodology. Some reports on 'equity' basis while others choose 'operatorship'[7].

In its simplest form, compliance with the FQD reporting measures means passing along information on feedstock origin along the supply chain as ownership is transferred. This is not complicated when the oil streams move along a straightforward route. In instances of blending, however, where crude oils or intermediate products are blended and processed, the complexity increases. There, the relative contribution of the different inputs must be determined prior to transferring ownership of the output. For example, a refinery that processes crude oil from 20-30 different sources on an annual basis, and 1-5 sources at the same time, will need to monitor the inputs in terms of feedstock origin - information mostly in its possession - and associate them with the outputs before transfer. The global nature of the industry, one in which blending and processing occur in different countries and streams enter the EU at different stages, would seem to pose challenges to this system. However, substantial amounts of information and systems for conveying it are already in place, meaning that the FQD reporting measures essentially require an additional data set to be included. The extent of the administrative burden required to fill the 'data gap' and ensure compliance with FQD objectives is thus relatively limited, and parallel to existing data streams.

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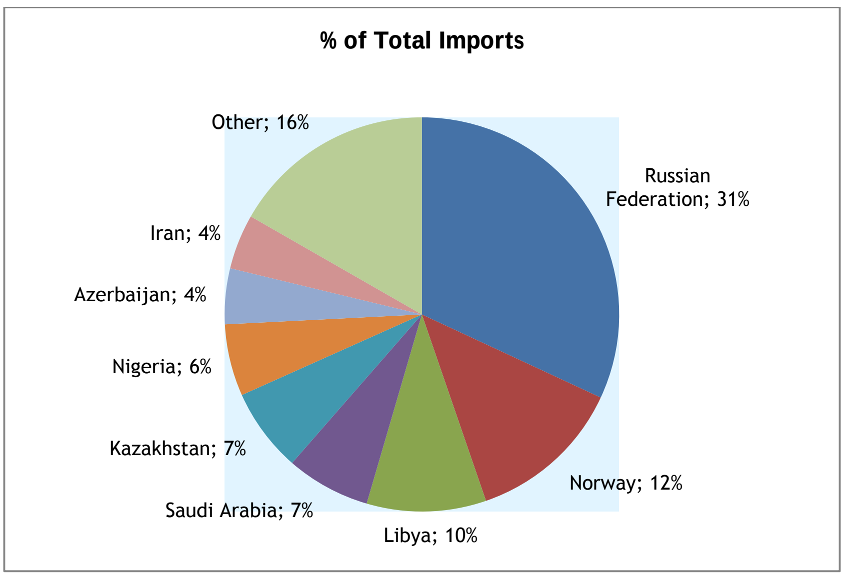
[7] Emissions allocation on equity basis relates to (partial) financial ownership of facilities or sites. Emissions allocation on operational basis allocates emissions to effective operational leading company in running respective site or facilities.

For the purpose of this study, the points of blending, processing and trade are the most relevant in the oil-to-fuel chain, as these are the points where information about oil sources would need to be combined, managed and transferred from one owner to another. Reporting and monitoring practices currently in place within the EU require information on imports and exports in addition to oil production data – the feedstock requirement in the FQD reporting measures will supplement this information and data with an additional element, and add reporting requirements to intermediate products and end products. The current reporting requirements and practices will be described in Section 2.3.

2.2 Oil exploration, production and refining

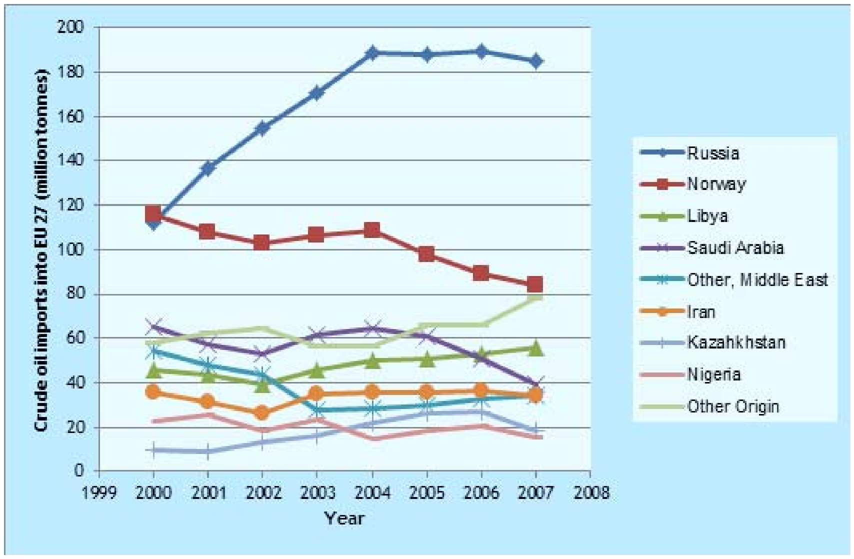
The European oil industry and oil trade is mainly based on foreign oil exploration and production: dependency on oil imports reached 83.5% in 2009 (EC, 2011). As Figure 1 illustrates, most of the imports are currently (2011) from the Russian Federation, followed by Norway and Libya, Saudi Arabia, Kazakhstan and Nigeria. This picture changes over the years, though, as the graph in Figure 2 shows.

Figure 1 Oil imports into the EU



Source: Data from EU DG Energy, http://ec.europa.eu/energy/observatory/oil/import_export_en.htm

Figure 2 Oil imports into the EU-27 over time

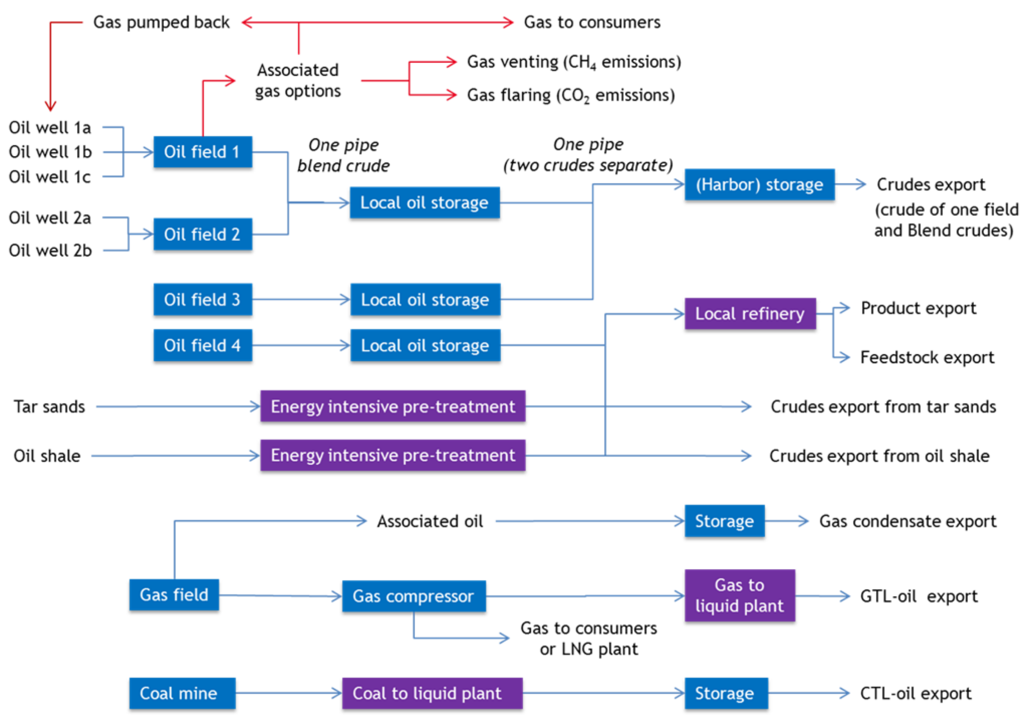


Source: Data from the EU Energy Pocket Book 2010
http://ec.europa.eu/energy/publications/statistics/statistics_en.htm

2.2.1 Oil exploration, production and refining outside the EU

In Figure 3, a schematic diagram of foreign oil exploration, production and refining is given.

Figure 3 Diagram of oil exploration and export



Looking at Figure 3, seven relevant types of oil can be distinguished in oil export:

- crude from one field;
- a blend crude from different oil fields;
- products of a foreign refinery;
- feedstocks or intermediate oil stream from a foreign refinery;
- GTL oil products made from natural gas;
- CTL oil products made from coal.

All steps in the diagram need energy and lead to GHG emissions. The crude can be either conventional or unconventional (e.g. from tar sands or oil shales), although in the latter case there may be a need for a separate pre-processing step to make it suitable as feedstock for refineries.

In the conventional oil chain, a main source of emissions is the associated gas produced during the oil production. The FQD also specifically mentions this emission source. If there are no customers in the direct area the best option is to pump it back in the field, to keep the oil on pressure (also illustrated in Figure 3). Another option is to flare this gas, which leads to a substantial amount of CO_2 emission. A last option is to vent it directly into the atmosphere. As this gas is mainly methane, CH_4, which has a large global warming potential, this flaring and venting may lead to very significant GHG emissions. Note that these conventional oils are typically blended at various points, for example when oil from various wells and fields are transported through one pipeline, or at storage facilities.

Instead of a conventional crude, tar sand oil or oil shale can also be the source of the imported products or crude. These oil types typically lead to higher GHG emissions than conventional oil, as both oil production and its pre-treatment are particularly energy intensive, as shown in various publications such as Brandt, 2011; S&T, 2011. Normally 'crudes' made from tar sand or oil shale (also known as synthetic crudes) are not imported in the European Union as European refineries do not have the (technical) capability of processing such crudes. They are either refined in specialised refineries (outside the EU) or pre-processed to make it suitable for a wider range of refineries. Technically, some refineries may be able to process a limited share of these oils (mixed with other crudes), but this is currently not an interesting route from an economical perspective.

Sometimes crudes from several fields are blended together to form a local blend crude. Note that it is not necessary to blend crudes if there is only one pipeline available. Crudes can be pumped through one pipeline in separate batches.

When gas or coal is converted to a liquid fuel using Gas to Liquid (GTL) or Coal to Liquid (CTL) processes, the conversion processes require energy which typically also lead to relatively high GHG emissions. GTL is a high value blending component which is separately imported for dedicated blending and therefore easily tracked. CTL is normally not exported to Europe.

Oil shales production and use in the EU
Estonia is one of the main oil shale producers in the world. More than 90% of the electricity produced in Estonia comes from oil shale, and 80% of oil shale used globally is extracted in Estonia.

Only a relatively small part of current oil shale production is used for oil, but this may well change in the coming decade, as Estonia has plans to develop the oil shale technology further, and shift use from electricity production towards the transport sector.

Oil shale deposits can be found in many parts of the world, with the bulk of the world's oil shale resources in the USA.

Sources:
- OGJ, March 2011 (http://petroleuminsights.blogspot.com/2011/03/estonian-company-plans-utah-oil-shale.html)
- http://www.mkm.ee/june-8th-2009-oil-shale-conference-in-tallinn-univer/
- IEA, 2009
- http://www.stat.ee/49452

2.2.2 Oil refining

The total import of crude and gas condensate in the EU-27 in 2009 was 570 Mtoe, 100 Mtoe was produced inside the EU. With the export of 50 Mtoe, this results in an gross inland consumption of 620 Mtoe. The import of oil products was about 130 Mtoe, somewhat more than the export of 110 Mtoe. The import and export of oil products between EU-27 countries was about 180 Mtoe.
Oil products can be used for energy production but can also be used as a feedstock for refineries, as a feedstock for the petrochemical industry (producing basic chemicals and blending components for gasoline) and as a blending component for wholesale trade[8].

Currently there are over 190 important types of crude oils in world trade (OGJ, 2011a). Because every crude has its own properties and conversion profile in refinery processes, a refinery needs to know the source of the crude they buy. With the official name of the crude also the country of origin and the state, region or province are known (or can be traced). So even if a crude is resold five times during sea transport and is pumped from one vessel into another at open sea, this information is not lost. However, the number of crudes is much higher. Oil & Gas Journal mentions over 6,000 important oil fields in the world. Specifically, in the USA there are 39,791 oil fields with 373,648 producing oil wells (OGJ, 2011b).

Next to crude, a relative small amount of gas condensates is used as refinery input. These are a side stream of natural gas production. Gas condensates may come from different fields and are blended prior to export or processing. For condensate it is important that a GHG emission allocation takes place between oil and gas at production. This complication is not covered by the draft FQD proposal[9].

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8 To illustrated the amounts. In the Netherlands the refineries use about 7% feedstocks. This is about the same amount as the production of oil products from the petrochemical industry, which sell it to refineries or wholesale trade. Compared to the Dutch refinery production about 10% of the oil products is blended in the wholesale trade.
So for about 17% of the oil production the crude is not directly known.

9 It is, however, covered under the WRI/GHG reporting method.

As mentioned in the previous section, refineries sometimes use different crudes at the same time. In addition intermediate products are exchanged between refineries (both within the EU and between non-EU and EU refineries) and co-fed to the refinery crude intake at relevant unit feed streams for further processing. Information on feedstock origin is known to the first refiner and other qualities of the inputs are tracked, but incomplete information-management practices on feedstock may result in the information not being transferred. The data will only be available in case the first refinery uses one local crude. An overview of the relevant Eurostat statistics is shown in Table 1. Compared to the crude use, the statistics mention about 3% refinery feedstock import in the EU-27. Next to this, also petroleum products might be used as a feedstock. This is about 19% compared to the crude use[10]. From a substantial amount of oil products the Eurostat statistics do not specify the country of import of export. The not specified import is 3% of the crude use.

From these data, it is concluded that the volumes of the intermediate and product imports are significant, about 20 to 25% compared to total EU crude intake. The import from outside the EU-27 (including not specified) is 6% for motor gasoline (compared to a total gasoline refinery production of 125 mln. ton) and 14% for transport diesel (refinery production is 162 mln. ton). However, also other oil products might be imported and used for gasoline and diesel.

Table 1 Import of Petroleum products in the EU-27 in 2010 (data source: Eurostat, compiled by ECN)

Year 2010 (mln. ton)	Import			Export		
	Outside EU-27	In EU-27	Not specified	Outside EU-27	In EU-27	Not specified
Crude and feedstocks	544.8	48.0	0.9	16.9	47.0	0.3
Crude oil	519.9	36.9	0.2	12.0	35.5	0.2
Natural Gas Liquids	7.5	2.8	0.0	0.3	1.6	0.3
Refinery Feedstocks	17.4	8.4	0.7	4.6	9.9	-0.2
All petroleum products	117.1	176.8	18.8	107.2	156.9	24.2
LPG	9.7	4.3	0.1	1.7	4.3	0.0
Naphta	14.0	17.7	1.6	3.9	12.1	4.4
Motor Gasoline	2.3	18.3	5.2	40.7	18.6	7.9
Kerosenes - Jet Fuels	17.7	12.5	3.1	3.1	8.2	3.8
Gas/Diesel oil	38.6	73.3	3.4	23.1	59.7	3.9
of which transport diesel	24.5	47.3	2.8	10.7	34.7	3.0
Residual Fuel Oil	22.2	33.9	5.4	27.6	35.3	3.1
Other petroleum products	11.6	15.5	0.6	6.8	18.0	1.8
Not specified	1.0	1.3	-0.6	0.4	0.7	-0.7
Biofuels	0.1	0.5	0.0	0.0	0.3	0.0
Biogasoline	0.0	0.1	0.0	0.0	0.1	0.0
Biodiesel	0.1	0.5	0.0	0.0	0.2	0.0

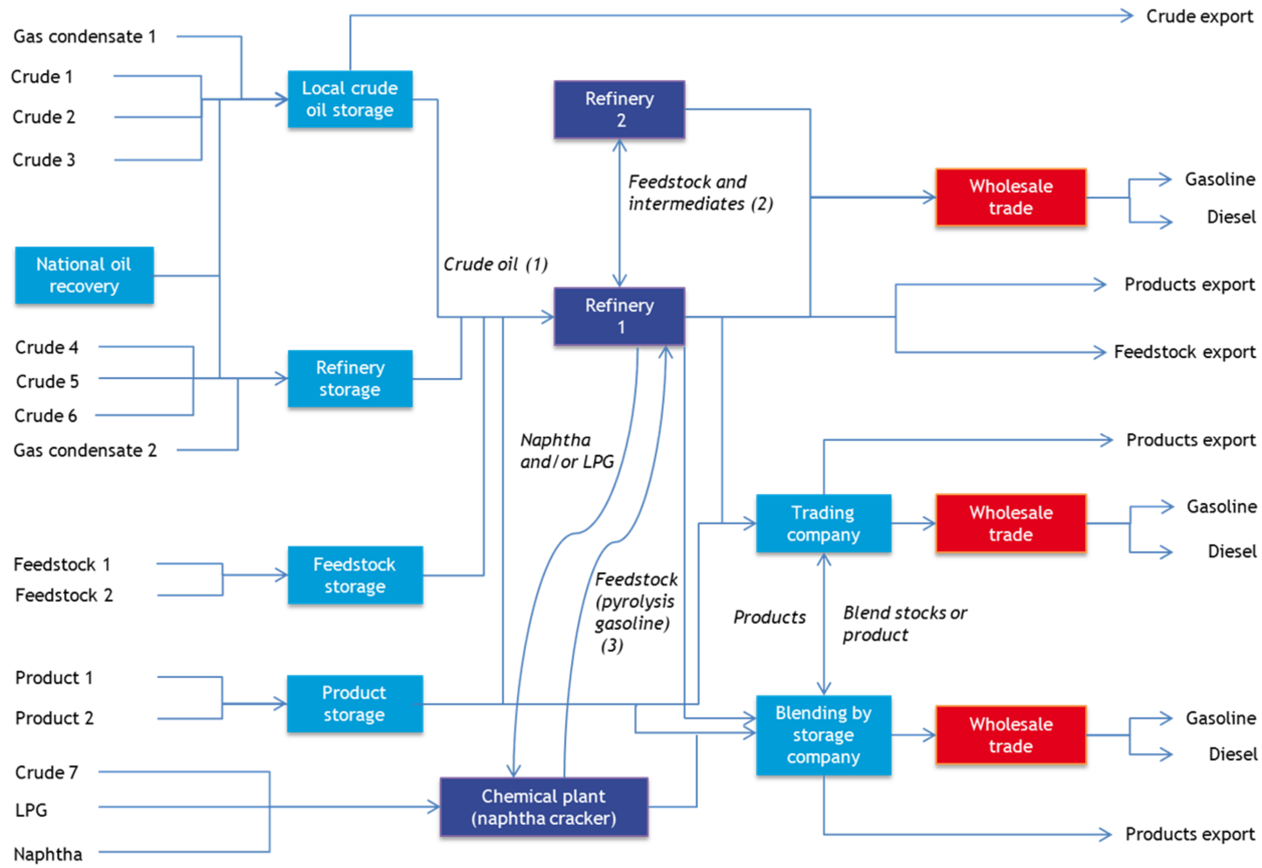
[10] Note that in the statistics, intermediate and final products are not differentiated. Also, the difference is not always clear. For instance, an important part of diesel/gasoil from Russia is reprocessed in European refineries to lower the sulphur content.

Figure 4 shows which oil streams can typically be imported in an EU country. Together with any oil produced nationally, this can be fed into the refineries or exported to another country. However, not only the refineries produce oil products, also chemical plants produce blend stocks for gasoline. Finally storage and trading companies can make their own product by blending different oil streams or blending components. Unfortunately, a clear overview of the volumes of the various streams in the EU is not available. Many relevant data are available at Eurostat, but these are not easy to compile and analyse due to the complexity of the market.

The excise duty point is the last point where the supplier can submit upstream and refining CO_2/MJ data to a designated authority with the upstream (well-to-tank) GHG intensity values given in the FQD proposal. Beyond this point, the supplier does not have any direct control anymore, reaching FQD targets (well-to-wheel) from here the resulting GHG intensity (LCA basis) depends on the national car fleet composition and transport related policies of the Member State.

A schematic overview of the various feedstock and product streams in- and out of refineries is given in Figure 4.

Figure 4 Diagram of oil streams into refineries, and their output (see Figure 6 for a simplified version with data availability included)



- refineries process crude oil [1], feedstock and intermediates from other refineries [2] and feedstock from chemical plants [3];
- different types of crude oil and feedstock, and oil from various sources can be blended before final processing;
- oil, products etc. may be stored and traded at various points in the life cycle;
- part of refinery output is used as feedstock for chemical plants;
- country and EU borders may be anywhere in this graph.

An illustration: some key data of the refinery sector in the Netherlands
In the Netherlands, with 8% of the EU refinery capacity, there are for instance six refineries, three naphtha cracker locations (with together six crackers) and about 100 companies in the wholesale trade of oil products[11]. This number is relatively high due to the large refinery sector, which produces large quantities of products for export, has large storage facilities and a very significant bunker fuels market.

In 2010, 2,200 oil tanker ships visited the port of Rotterdam. About 1,100 were < 80,000 DWT and mainly used as product tankers. About 1,100 were larger (> 80,000 DWT), and mainly used for crude transport. These are about 100 crude oil tankers per month delivering ≈50 different crudes (Havenbedrijf Rotterdam, 2011).

Of the global total of 655 refineries mentioned in the Oil & Gas Journal (OGJ, 2011c), 109 (16,5%) are located in the EU-27. Of the world capacity of ethylene production by steam cracking, 29% is located in the European Union. The 54 EU crackers are situated at 44 locations (Seddan, 2010). Therefore, we conclude that if the FQD requires oil origin reporting for all fuels sold in the EU, for at least 153 European locations detailed data has to be calculated on use of crude and feedstock, and the related production of gasoline, diesel and related oil streams and the emissions in the production process related to these oil streams. This could be, for example, a monthly balance corrected for oil volumes in storage tanks.

2.3 Current reporting practice

Several laws and regulations require information on imported products placed on the European marketplace, including origin, tariff classification, mass or volume, and physical characteristics. This means that robust systems have already been created for communicating this information along the supply chain, and other systems are created to ensure its accuracy in the instance of a challenge by competent authorities at customs or elsewhere.

Given this context, the main questions raised by the FQD reporting measures are twofold: whether the available information is sufficient to comply with reporting obligations on feedstock origin, if not, what modifications are needed to the existing systems to track and convey feedstock origin along with the other required information that is provided. As shown below, given the construct of the current laws and regulations, a significant part of the required information is available upon importation and, once in the European marketplace, additional obligations ensure this information transferred through the chain of custody as it moves about the European Union. Additional efforts may be required, however, to make it more systematically accessible and to ensure that all feedstocks for transport fuel production are included, as (implicitly) required by the FQD.

2.3.1 Customs legislation

Due to globalisation of the industrial world, the origin of a product is not always easy to determine. Products move across borders, undergo transformation into new products, and then move across borders again. But rules have been crafted to facilitate the determination of origin for trade and environmental purposes. In addition, from a trade perspective, customs legislation is the basis for taxation of imported goods and for compilation of

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11 Source Statistics Netherlands. Many companies can be found at: http://www.webtop20.nl/groothandel_olie_en_benzine/

national and EU statistics on trade. Several systems are in place with relevance to the FQD reporting measures.

Combined Nomenclature (CN)

In EU customs legislation, the Combined Nomenclature (CN) is critical in the categorisation of oil types. This CN consists is based on the Harmonised Commodity Description and Coding System (HS), which is developed and maintained by the World Customs Organisation (WCO). The HS system classifies goods by using a division of sections and chapters and by the use of digit codes. The 170 members of the WCO have committed themselves to use this classification system, but are allowed to differentiate the height of tariff duties. This system has been adopted by the European Union and extended with additional divisions in the CN. Each CN subdivision has its own 8-digit code accompanied by a description. The list of CN-codes is updated annually, following the update of the HS-system.

The CN-codes should be used when importing or exporting goods into or out of the European Union.[12] On the one hand CN-codes help to determine tariff duties and play an important role in trade negotiations at the WTO level.
On the other hand the CN-coding system is also used for statistical purposes.

The codes that are relevant for fossil oil are in Section V (mineral products), chapter 27. 'Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes'[13], and are given in Table 2. According to the Dutch national law implementing the Fuel Quality Directive, at the national level the CN-code for LPG is 2709 00 00. For CNG, LNG and GTL-diesel this is CN-code 2711 21 00.[14]

Table 2 **CN-codes for crude oil and crude feedstocks**

Code	Name
2707 99	**Other: Crude oils:**
2707 99 11	Crude light oils of which 90 % or more by volume distils at temperatures of up to 200°C
2707 99 19	Other
2709 00	**Petroleum oils and oils obtained from bituminous minerals, crude**
2709 00 10	Natural gas condensates
2709 00 90	Other
2711	**Petroleum gases and other gaseous hydrocarbons**
2711 21 00	**Natural gas**
2714	**Bitumen and asphalt, natural; bituminous or oil-shale and tar sands; asphaltites and asphaltic rocks**
2714 10 00	Bituminous or oil-shale and tar sands
2714 90 00	Other

Therefore, natural bitumen and oil shale are classified under the same CN-code and crude oil has its own code. There are no specific CN-codes (yet) for CTL- or GTL-based fuels, these are reported together combined with other product types.

12 http://ec.europa.eu/taxation_customs/customs/customs_duties/tariff_aspects/combined_nomenclature/ _en.htm

13 http://www.cbs.nl/NR/rdonlyres/40D2B18B-725A-44DF-880A-19793529835F/0/cn10en05.pdf

14 http://wetten.overheid.nl/BWBR0029916/geldigheidsdatum_02-09-2011

Proof of Origin

In order to assess the classification of goods a proof of origin is required. This customs declaration and other documentation should be verified by the customs authorities. The Modernised Customs Code contains several articles dealing with the origin, such as Articles 35-38, which set out the concept of acquisition of origin and the obligation to report it:

– 'Goods wholly obtained in a single country or territory shall be regarded as having their origin in that country or territory.'
– 'Goods the production of which involved more than one country or territory shall be deemed to originate in the country or territory where they underwent their last substantial transformation.'

Because of the concept of substantial transformation, a review of customs declarations might not provide enough information regarding place of oil extraction. This could be relevant for, for example, Canadian tar sands extracted and processed domestically before undergoing further refining in the United States, and then imported into the EU. The European Commission is charged with adopting measures for the implementation of the acquisition of origin, including the concept of substantial transformation – until then it will remain a point of discussion. Nevertheless, in Article 37, the Modernised Customs Code allows customs authorities to require importers to provide additional information to prove the indication of origin is accurate.[15] Overall it can be concluded that customs legislation includes the need to provide proof of origin and the underlying origin of any good when required by competent authorities.

Commodity code

An important source of information is the commodity code, because origin and CN-code are combined here. The commodity code includes the CN-code and two additional numbers for the Taric-code (Integrated Tariff of the European Communities[16]). After this code there is space for 4 numbers (first additional Taric-code), for two numbers (second additional Taric-code), and 4 numbers Additional national code[17]. In case of oil, the additional codes are used for oil products with special tax tariffs. So in case of crude oil the combination of the CN-code (see Table 2) and the country code can give general information of the source of the oil.

2.3.2 Administration in relation to movement of goods

Entry of goods

Before the **Entry of goods** in the European Union an **Entry summary declaration** (ENS) has to be completed (for bulk goods four hours prior to arrival in the first EU port) and send to the local entry customs office. Mineral oil is an acceptable description in this summary[18]. Main target for this declaration is to select which loads are checked by the customs authority. Also in other forms general information about the ship, its travel, load and crew is needed.

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[15] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:145:0001:0064:EN:PDF

[16] http://en.wikipedia.org/wiki/TARIC_code

[17] http://www.douane.nl/bibliotheek/handboeken/handboek_douane/hd_6-00-00-06.html

[18] http://ec.europa.eu/taxation_customs/resources/documents/customs/policy_issues/customs_security/acceptable_goods_description_guidelines_en.pdf

It is possible that the country of entry of goods (first EU country in which a ship arrives) is not the same country as that of the import of goods. However, in the first EU harbour, it must be clear what the destination of the goods is and how the goods are transported (e.g. by ship, train, pipeline or truck) to the importing country. This declaration is not needed for goods which enter by pipelines or for goods from Norway[19]. If the goods are unloaded for storage a **Declaration for temporary storage** (SAL) is needed. For temporary storage entered by sea, next steps are needed within 45 days.

Import of goods

For the **import of goods** or release for free circulation a Single Administrative Document[20] has to be filled in or an electronic declaration has to be made in the New Computerised Transit System (NCTS).[21, 22] The declaration is the same in all EU countries and is standardised in the Community Customs Code (EC, 1992; Revenue, 2011). Furthermore the same document is used for other applications such as export of goods, transport of goods between countries and a number of handlings around storage[23]. This is a major advantage of the document. Depending on the use, certain boxes have to be filled in.
But not all the countries require the same boxes to be filled in. For example, the EU guidelines say that the box that registers the origin of the good can be left empty. So, although the document is the same, there are still country depending differences. As this is a rather complicated document, for most oil imports an electronic declaration will be used.

Every importing company has to use its own EORI (Economic Operation Registration and Identification) number. Besides data on who and where, other data need to be filled in if appropriate:
- the means of transport (by a code);
- the country of origin of the product (by a code);
- the product (by a code);
- the statistical value (and currency);
- the gross and net mass (kg).

Copies of the (electronic) document are submitted to the national statistical bureau or, in case of transport between member states, to both statistical bureaus.

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19 Norway and the European Union have through Protocol 10 of the EEA Agreement established an equivalent measure of security on goods entering or leaving the external borders of their customs territories. The agreement waives the obligation for traders to provide customs with advance electronic information for security purposes in bilateral trade between Norway and the EU. It was signed on 30 June 2009 and entered into force on 1 July 2009. The agreement foresees that Norway implements in its trade with third countries customs security measures that are equivalent to those applied by the EU. Source: www.toll.no

20 In Belgium and the Netherlands called: ENIG document.

21 http://ec.europa.eu/taxation_customs/resources/documents/customs/procedural_aspects/transit/common_community/transit_manual_en.pdf

22 http://ec.europa.eu/taxation_customs/resources/documents/annex_i_transit_brochure_en.pdf

23 Depending on code in Box 1: A: Export /Dispatch, B: Customs warehousing of pre-financed goods for export, C: Re-export after a customs procedure with economic impact other than the customs warehousing procedure (inward processing, temporary importation, processing under customs control, D: Re-export after customs warehousing, E: Outward processing, H: Release for free circulation, I: Placing under a customs procedure with economic impact other than the outward processing and customs warehousing procedures (inward processing (suspension system), temporary importation, processing under customs control), J: Placing in type A, B, C, E and F customs warehouses, K: Placing in a type D customs warehouse. L Temporally storage.

The country of origin is the country where the crude oil is extracted. However, the box for the region code is not always filled in (in many countries this is not obligatory), although this may change when Member States implement the FQD reporting measures. Furthermore, the origin of the crude oil may disappear from the data after refining if not managed and transferred appropriately.
So for refined products, in the current situation the country of origin may not always be the same as the country of extraction, as there is no need to ensure this information remains accessible.

The customs organisation also uses the Transit system (the New Computerised Transit System, NCTS) for exporting and importing excise goods from or to third countries.

2.3.3 Reporting on the import or delivery of crude oil

Another very specific source of information is related to Council Regulation (EC) No. 2964/95. Any person importing crude oil from third countries or receiving a crude oil delivery from another Member State must provide information to the Member State in which he is established concerning the characteristics of the imports and deliveries. Every Member State, at regular intervals, reports this information to the European Commission. The purpose is to have insight in the origin of oil from an oil-security perspective.

This report has to contain:

- the designation of the crude oil, including the API gravity (a measure of how heavy or light a petroleum liquid is, and an important characteristic in the definition of the various oil types in the FQD proposal[24]);
- the quantity in barrels;
- the CIF price (Cost, Insurance and Freight) paid per barrel;
- the percentage sulphur content.

Therefore, this information, which includes the designation of the crude and often the location of extraction, is already collected and submitted to the government by the various oil companies. Results can be found on the market observatory site of DG Energy[25]. These data for the crude register are collected from the oil importing companies by the national statistical bureau and confidentiality provisions apply. Note that this statistics includes data of crude oil imports that are very relevant to the FQD, but it does not cover imports of intermediates or final products such as diesel.

2.3.4 Statistics

As stated earlier, custom classification systems such as the Customs Nomenclature and the Harmonised System are used to determine tariff duties, but can also be used for statistical purposes. In this section the main oil statistics will be discussed.

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24 API is the density compared to water. If the API is greater than ten, it is lighter and floats on water; if less than ten, it is heavier. One of the criteria for ‘natural bitumen feedstock’, as given in the FQD proposal, is that it has an API of 10 degrees or less, one of the characteristics of ‘conventional crude’ is that the API is higher than 10 degrees.

25 http://ec.europa.eu/energy/observatory/oil/import_export_en.htm

Eurostat

Data on the import from non EU Member States is collected from the customs authorities[26]. Products are classified[27] according to the common classification for products as already described in Section 2.3.1[28]. A sample of import and export data is given in Table 3, where a distinction is made between EU member states and others. Production and storage is included not in Table 3. In total, Eurostat differentiates between about 270 countries of which about 70 are active in importing or exporting of crude oil or natural gas condensates (in 2005).

An overview of EU oil import data were provided in Section 2.2.1, where it is shown that the Russian Federation accounts for about 31% of the EU's oil imports[29]. Total EU oil import amounted to almost 900 million barrels in 2011. The EU export of 91 mln. ton was for almost 50% to the US and Canada (BP, 2011).

Table 3 Sample data from Eurostat on crude oil and natural gas condensate

Year 2005	Crude oil (27080090)				Gas condensates (27080010)			
	Import outside EU-27	Import from EU-27	Export outside EU-27	Export to EU-27	Import outside EU-27	Import from EU-27	Export outside EU-27	Export to EU-27
Austria	7.6	0.2	0.0	0.0				
Belgium	4.2	27.2	0.0	0.0	2.7	0.2		2.6
Bulgaria	0.0		0.0					
Cyprus								
Czech Republic	7.7	0.0		0.1		0.0		
Germany	90.9	23.6		0.9		0.1		
Denmark	1.8	0.0	1.2	12.4	0.9		0.0	
Estonia		0.0			0.0			
Spain	58.0	0.7		0.0	1.2			
Finland	8.1	1.5	0.0		1.0			
France	77.7	7.3	0.0	0.0		0.0		0.0
United Kingdom	53.4	0.7	17.5	32.9				0.2
Greece	18.9	0.0						
Hungary	0.0	0.0	0.0	0.0		0.0		
Ireland	2.4	0.7		0.0		0.0	0.0	
Italy	87.7	1.3		1.0	0.0			
Lithuania	9.7			0.1				
Luxembourg	0.0	0.0		0.0		0.0		
Latvia	0.0	0.0	0.0					
Malta			0.0					
Netherlands	67.8	9.4	0.0	0.0	6.7	2.9	0.0	0.0
Poland	17.5	0.1	0.0	0.2				
Portugal	12.7	0.3	0.0	0.0		0.0		

26 http://www.cbs.nl/nl-NL/menu/themas/internationale-handel/methoden/dataverzameling/korte-onderzoeksbeschrijvingen/statistiek-internationale-handel.htm

27 http://www.cbs.nl/NR/rdonlyres/5AC0A8C9-BD14-416E-BCC4-7D2350093C80/0/2009gnafdelingv.pdf

28 http://epp.eurostat.ec.europa.eu/portal/page/portal/external_trade/documents/External_Trade_FAQ.pdf

29 Detailed data on EU oil imports can be found on http://ec.europa.eu/energy/observatory/oil/import_export_en.htm

Year 2005	Crude oil (27080090)				Gas condensates (27080010)			
	Import outside EU-27	Import from EU-27	Export outside EU-27	Export to EU-27	Import outside EU-27	Import from EU-27	Export outside EU-27	Export to EU-27
Romania	8.7	0.0			0.0			
Sweden	12.8	6.8	0.0	0.0	0.1			
Slovenia		0.0	0.0	0.0				
Slovakia	5.4	0.0		0.0				
Total	553.3	79.8	18.7	47.7	12.6	3.2	0.0	2.8

Note: Probably some export data from the Netherlands to Germany and Belgium are missing.

An example: Statistics Netherlands

In the Netherlands, additional data is collected on the API index of the crude (this is an indication on how heavy the crude is, also used in the FQD proposal to distinguish between a number of crude types). Also the target of the crude is collected: is it for export or storage, direct use or inland refining? However, after the crude is imported, the target may change without notification of the change. When the crude is imported from a different country where it has been processed, the original oil producing country is not listed but his information may be requested by customs authority to ensure proper origin. But the refinery itself, still wants to know the quality of the crude, which is directly related to its origin.

For the oil production data, data is collected every month[30] from the main oil traders and refineries (electronic form). Data is checked on reliability by using a mass balance (what gets in has to come out) in which energy efficiency of the refinery processes is taken into account. For blending of oil products in the refinery sector the efficiency must be at least 98%, for the petrochemical industry it has to be at least 95%. Deliveries between companies are checked (this results in data for the small oil traders) and import and export data are compared with the oil import and export statistics. The definitions are for 95% comparable to the CN8 definition used for the import and export statistics. For the energy statistics all EU members use the same definitions.

Joint Organisation Data Initiative (JODI)

After the Seventh International Energy Forum, six international organisations decided in June 2011 to work on a common data reporting exercise, called the Joint Oil Data Exercise. The organisations are APEC, Eurostat, IEA/OECD, OLADE, OPEC and the UNSD. The outcome was a questionnaire asking for month-old and two-month-old information. Later, the decision was made to make the JODI a government reporting obligation for the member countries of the six organisations. Since 2005, the IEF Secretariat coordinates the JODI, which resulted in the development of a worldwide database on monthly oil statistics.[31]

30 http://www.cbs.nl/nl-NL/menu/methoden/dataverzameling/aardoliegrondstoffen-prod-ob.htm

31 http://www.iea.org/stats/jode.asp

For each country the following information is provided in the JODI database.

Flows
- Production.
- Closing Stocks.
- Imports/Exports.
- Stock Changes.
- Demand.
- Refinery Intake.
- Refinery Output.

Products
- Crude oil.
- LPG.
- Gasoline.
- Kerosene.
- Gas/diesel oil.
- Heavy fuel oil.
- Total oil products.

2.3.5 Data availability in the oil industry and refineries

Apart from the data reporting requirements described above, relevant oil source data are also monitored and tracked in the industry itself. The oil refineries need detailed data on the oil they process, these data allow to determine the type of oil.

Note that this only holds for the crude oil that refineries process. At the moment, feedstock they receive from the chemical industry or intermediates they receive from other refineries (which may be outside the EU) are not traced back to the original crude oil type. Also, data on oil origin is currently not being transferred when end products such as petrol or diesel are imported because refineries have not yet had reason to request it.

2.3.6 Voluntary reporting of GHG emissions

Many companies in the oil and gas sector report their GHG emissions on a voluntary basis. The standard tool for this reporting is the API/ IPIECA GHG Compendium (API, 2009), which was developed by the American Petroleum Institute (API), the International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil & Gas Producers (OGP)[32].

The methodology is based on a standard for GHG reporting developed by the World Bank and the World Resources Institute. It includes a compendium of emissions estimation methodologies, software for emission estimation and inventorying, and guidelines to assist in the accounting and reporting of emissions. The guideline provides detailed calculation methods and emission factors by split process operation. This covers the calculation or estimation of emissions from the full range of industry operations, including exploration and production. As in other reporting initiatives, a distinction is made between different types of emissions:
- Scope I (direct emissions from processes owned by the company);
- Scope II (energy-related indirect emissions); and
- Scope III (other indirect emissions).

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32 The following companies participated in the GHG Reporting Task force (Marathon, BP, Chevron, BP, ExxonMobil, Hess, Petrobras, Repsol, Shell and Total).

The guideline notices that accurately estimating Scope 3 emissions is a challenge for many companies.

In a recent report on Company GHG Emissions Reporting (ERM, 2010), costs and benefits of GHG reporting initiatives have been assessed. No specific data are reported for the GHG reporting oil & gas industry. However, multinational production companies in other sectors report costs in a range of approximately € 100,000-450,000 for voluntary GHG reporting. On top of this, costs for verification are estimated to be in the order of € 100,000. It can be assumed that these costs will depend largely on factors such as the size of the company, the number of production facilities and the complexity of processes. These data can be compared to information obtained directly from the oil industry under Section 3.4.3, which are confirming this range of costs.
One off costs for the development of assurance standards are additional.

It is worth noting that these existing voluntary reporting GHG activities do include the GHG emissions of intermediates and products for the processing under accountability of the suppliers. Reporting is limited to upstream and overall GHG emissions of the suppliers themselves.

These data cover the whole range of feedstock-fuel chain, from crude oils but also intermediates and imported end products (diesel).

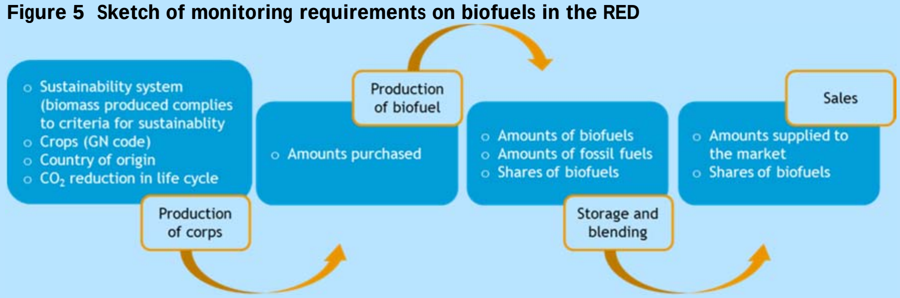
Reporting of biofuels in the framework of the RED

Under the Renewables Energy Directive the share of renewable fuels in transport will rise to 10% in 2020. The Directive aims to ensure that the EU only uses sustainable biofuels, which generate a clear and net GHG saving and have no negative impact on biodiversity and land use.
From this perspective, schemes have been established for monitoring the (sustainable) source of biofuels and the net GHG emission reductions of biofuels. The latter is used to confirm that a biofuel meets the minimum GHG reduction threshold. The same value is also used in the FQD, to calculate the contribution of biofuels to the GHG reduction target.

In this monitoring the origin of every biofuel is monitored, i.e. every product batch is accompanies with a 'label' that states the sources.

The major steps in this monitoring are sketched in **Figure 5**. The monitoring requires strict schemes for verification. In this respect, two elements are crucial:
- verification of the sustainability of production of crops and biofuels;
- verification of the mass-balance (from production to sales).

Figure 5 Sketch of monitoring requirements on biofuels in the RED



Actual cost of biofuels monitoring has not (yet) been determined, but they were estimated in the context of the FQD Impact Assessment of the Commission.
"The application of the monitoring regime will involve some additional cost for those that fall under the obligation and for governments. For instance, studies in the UK in relation to the administrative costs of a monitoring scheme for biofuels, have estimated the cost for

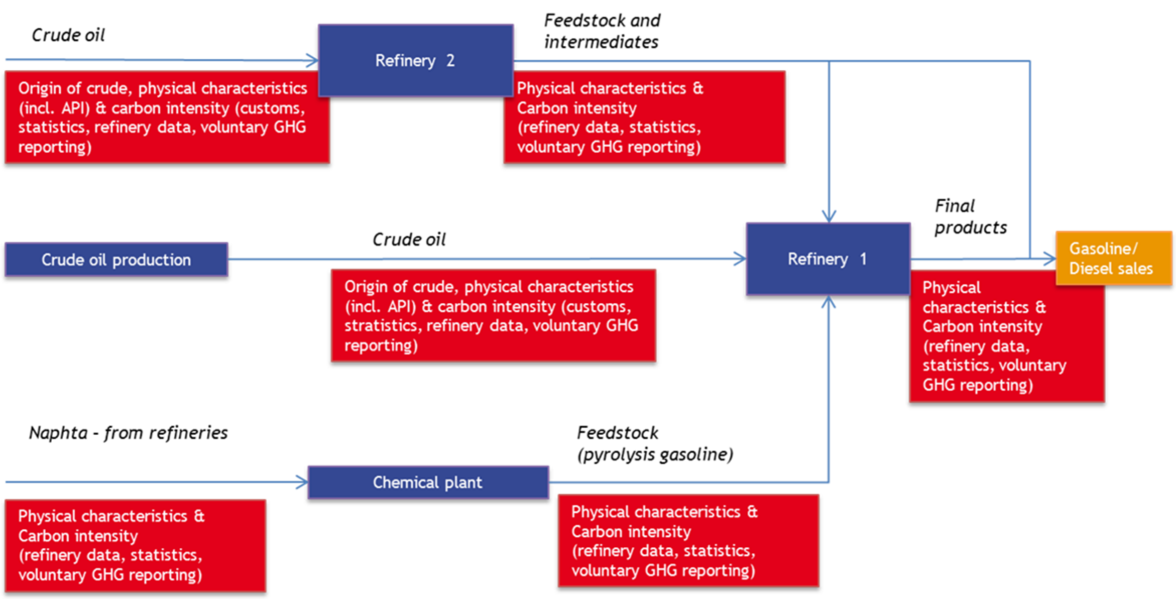
developing the methodological tools at €300-450k. Total costs for data collection and verification are estimated to be approximately 0.03 €c/litre biofuel or 0.0015€c/litre transport fuel (in the case of 5% biofuel blending). It must be noted that having a standardised methodology across the EU, rather than Member States developing individual methods under their domestic policy will reduce administrative costs substantially, not the least for industry that may otherwise be faced with a proliferation of national monitoring schemes for greenhouse gases."
Source: Impact Assessment of a Proposal for a Directive of the European Parliament and of the Council modifying Directive 98/70/EC relating to the quality of petrol and diesel fuels, European Commission SEC(2007)55, 2007.

2.4 Conclusions

Although the fossil fuel life cycle may seem complex or daunting at first glance, it has been designed to ensure the transfer of large quantities of information in order to comply with existing reporting obligations. This leads to data being reported at various points along the life cycle and a system to ensure its transfer along the supply chain.

A schematic overview of the data that are currently being reported is shown in Figure 6. This graph is a simplified version of the much more comprehensive Figure 4, with the available data sets indicated in the red text boxes. Note that the physical characteristics are only related to the specific product concerned (i.e. not to the original crude once it has undergone processing). Carbon intensity values are monitored by most (major) oil companies, not by all traders, in the context of the voluntary reporting described above..

Figure 6 Schematic overview of data availability and reporting in the fossil fuel life cycle



3 Efforts and cost of crude oil source reporting

3.1 Introduction

This chapter addresses the data gaps between the current reporting practice and the FQD requirements (following the October 2011 proposal). A number of potential solutions to fill these gaps are described, as was as the additional administrative efforts of both Member States and suppliers. Cost estimates of the latter are provided.

3.2 Data gaps

When comparing the October 2011 proposal of the EC with the current reporting requirements and practices described in the previous chapter, the following conclusions can be drawn:
- The source (country of origin) of crude oil that is imported into the EU is reported to customs and statistics.
- The type of oil that is imported into the EU is reported to customs and statistics, although the categories that are differentiated (CN-codes) differ from those in the FQD proposal. For example, CTL and GTL do not have a specific custom code, but are both included in the 'conventional crude' category, whereas the FQD provides different GHG intensity values for these fuel types. However, the oil companies keep track of this type of information internally, as it is relevant for their processes and pricing.
- Refineries (and all other upstream parties involved in oil trade and transport) know the sources of the oil the process, or know the characteristics of the oil that can be used to determine the source. This information is currently not reported to authorities, but is available in the (electronic) management systems of refineries.

The main data gaps identified are the following:
- Crude oil origin and type are currently not being reported for end products (incl. petrol and diesel) and intermediates that enter the EU. Only the last country where the product or intermediate was processed (e.g. refined) is known.
- Intermediates or crude oil derivatives from the chemical industry are also used as feedstock for refineries, and thus part of the source of fossil fuels, and included in the FQD reporting obligation and GHG reduction target. The origin of these products is currently not being reported.
- Refineries do not require suppliers to provide the origin and type of oil used to produce the intermediates and products that they process.
- Data on the origin of oil is currently not tracked beyond the refineries, i.e. in the trajectory from refinery to the excise duty point. Supplier feedstock origin is not included with the other information provided along the chain.

It is worth noting that some of the high-GHG intensity crudes, in particular tar sand oil (natural bitumen) and oil shale, can currently not be processed in most EU refineries[33], and will typically be processed and/or refined before

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[33] Some oil shale is converted into liquid products in Estonia.

export (and import into the EU). These oils will thus only enter the EU as intermediate, petrol or diesel, and their origin is currently not being reported to governments. It is to be expected, though, that suppliers have this information in their administrative and management systems, especially since there are only a limited number of countries and refineries that export these crudes and because this is reflected in the carbon intensity reports included in annual sustainability reports of the oil companies.

3.3 Actions needed to fill the data gaps

The FQD proposal is quite clear on the reporting requirements itself, but does not elaborate on the implementation of these requirements. The efforts and administrative cost involved will depend on the actual implementation methodology. Biofuel reporting requirements are also part of the FQD requirements, notably GHG emission and sustainability criteria (they are also part of the RED).

In general, the FQD requires the following data gathering, management and reporting.

The origin of every crude, intermediate and end product that is used for road transport fuel sold in the EU is monitored, i.e. every product batch should be accompanied by some sort of 'label' or certificate that either states the oil source(s) and process(es), or the upstream unit GHG intensity of the batch. The latter would have to be determined at the point of oil production using the default values given in the FQD proposal, and recalculated at every point of blending or processing (e.g. using a mass balance approach at the refinery).

As crude oils, intermediates and fuels are often blended several times, it may be easier to set up the certificate for GHG intensity (which would be one number) instead of oil sources and processes (often a whole list, of maybe 20 or 30 feedstocks). However, from a verification viewpoint, the full list is preferred, as this would enable a full tracking-and-tracing system back to the origin of the crude oils.

Setting up this system might seem complex, and would require additional effort by all parties involved in oil production, trading and transport, blending, refining and distribution, both in- and outside of the EU. However, when these products are handled, information is transferred anyway, e.g. of its chemical properties. These (electronic) data management systems would need to be adapted to include information about oil source(s), following the fossil fuel categories given in the FQDl.

As the system might be vulnerable for fraud as intermediates and final products can be blended easily and markets are volatile, verification will be important (see recommendations later).

The administrative process could potentially be simplified if it could be limited to only those streams that contain non-conventional feedstock – only a very small share of the current EU's refinery feedstock mix. Oil from tar sands (natural bitumen), oil shale, LPG, LNG, CTL and GTL are typically only produced in a limited number of countries, and the reporting obligation could in principle be limited to oils (and products made from them) from these countries of origin[34]. The vast majority of oils currently used in the EU, conventional oil, would then not require any labelling or certification. However, the advantage would be very limited: the origin of crude oil imports is already being monitored and reported, and the problem of lack of data on origin of the imported intermediates and products would not be resolved. These streams would still need tracking and reporting of their origin, to determine if they are produced from countries with oils of high GHG intensity. The benefit of this simplified approach would therefore be very limited.

The National Aggregation proposal

The Dutch government recently proposed an alternative solution to fill the data gap: instead of using GHG intensity data per supplier, GHG intensity data are derived per country, and used for all suppliers. This would have the advantage that the data that are needed for this approach are already available, and oil companies do not need to set up a separate data reporting system.

This proposal is not considered further in this study, as it deviates from the basic FQD principle that the fuel suppliers are individually responsible for meeting the GHG reduction target. It also creates a fundamental difference in approach between biofuels and fossil fuels, which would disturb the level playing field between these two types of fuel.

Moving to a national aggregate approach would lead to a much lower and less clear incentive to suppliers to use low carbon fuels or implement upstream measures to reduce GHG emissions: if a refinery uses high-GHG emission oils, all refineries in that country would be penalised, as the GHG intensity of their product would also increase. This would thus remove the competitive advantage of using low carbon oil – and at the same time significantly lower the competitive disadvantage of the high carbon users. This significantly reduces the incentive to a fuel supplies or refinery to reduce the GHG emissions of its fuel pool – any benefit of using low-GHG emission oil would then be shared equally between all competitors in a country.

3.4 Administrative efforts required

3.4.1 General remarks

The oil industry representatives that were interviewed for this study confirm that it is feasible to establish a system in which the required data can be reported for fossil fuels, this as far as imported crudes are concerned. In principle, this would be similar to the reporting obligation for biofuels. Complexities do arise with the so called intermediate products, as also discussed in the previous paragraph. On this point, importers will have to make arrangements with their foreign suppliers, i.e. refiners, to ensure the availability of required data. Other data already travel along the supply chain, so this approach is feasible.

The challenge with respect to reporting is twofold:

1. The Member State verification effort.
2. The provision of the audit trail to Member State designated authorities for verification, by the suppliers.

Enforcing compliance to the 6-10% reduction is a separate matter that is not specifically addressed in the current FQD proposal. We will not assess this in detail here, but note that potential verification methods and risks of fraud should be considered when designing a reporting methodology.

[34] Note that this approach might create legal issues, for example with the WTO regulations (World Trade Organisation). This has not been investigated further in this study.

It is expected that each refinery would have to produce a regular report on the origin of their feedstock, and provide that with the fuels that they deliver. Current refinery reporting is on an annual basis. Suppliers (i.e. the parties that have the GHG reduction obligation) then need to submit their reports annually to the authorities. As there are already electronic reporting practices between oil and fuel suppliers and buyers, this could basically be managed by adapting the existing electronic tools.

In addition to information from the refinery processes, the relevant data should also be produced for imports of products. The GHG emissions of a large part of these products are in the current situation already part of existing voluntary GHG reporting of suppliers, although the data may not be complete for bought intermediates.

3.4.2 Member State data related costs (verification)

Verification of data submitted by suppliers will be a crucial factor, in order to prevent fraud. Overall it should be kept in mind that the monitoring is part of a mandatory system which will impact the markets, that these markets are highly volatile and that technically, intermediates and products can be easily blended. This makes verification potentially complex, but very relevant to the proper functioning of the policy. According to the current Commission's proposal, verification is up to the Member States. This chapter looks into ways that this can be implemented.

Verification would include that for every product batch the sources of the batch can be determined, by means of labels of certificates. In this respect verification should include monitoring of all 'batches' of fossil fuel, both from 'unconventional sources' (tar sands, oil shale, etc.) and conventional sources – a system similar to the current biofuels regulations.

Furthermore, in similarity to the registration of biofuels, an administrative system will be necessary that 'follows' and 'calculates' the shares of different sources in intermediate and final products delivered to the market. This administrative system should also be verified.

It can be expected that Member States will transfer the responsibility for the verification to the suppliers, by means of obligatory verification systems.

Note that in the current voluntary reporting practice (described in Section 2.3.6), independent verification systems are already in place – the term voluntary does not mean without obligations – but reporting practices are not yet harmonised between suppliers. Verification of the data reported for the FQD could follow the same lines, and is therefore practically feasible, but defining a method and assurance standards remains a requirement for current as well as for new reporting requirements.

Apart from verifying the CO_2 intensity position of suppliers, Member States will also need to enforce the individual suppliers to contribute to lower levels of CO_2 intensity, according to the proposal. This mechanism is left for agreement between designated authorities and suppliers.

In order to monitor sources and CO_2 emissions of fuels on the European market, the oil and gas companies that were interviewed underline that documentation of a harmonised European calculation methodology is required (see for example the WRI/GHG protocol and ISO 14064 standard, and the biofuels sustainability assurance methodology). For biofuels, these procedures are specified in both the RED (Art. 18) and the FQD (Art. 7c), and practical implementation is currently ongoing. These standards, processes and implementation guidelines, when also provided for fossil fuels, would enable Member States to ensure suppliers to provide the required and EU consistent audit trail.

For the suppliers, the process to get to a set of EU harmonised assurance standards and processes is a once off effort and can be estimated to be completed in two years. This is a process where the International Auditing and Assurance Standards Board (IAASB) will design the required assurance process. All external assurance providers allocated time and effort to this process but no actual payment is made to this Board.

Assurance standards will be defined under the following headings:
1. Method and level of assurance (limited or reasonable).
2. What is exactly to be reported?
3. What is the required level of expertise of the verification team? And
4. What part of the verification process needs to be reproducible? (to be filed for later reference).

Although no direct payment to the IAASB is to be made the industry may well claim costs up to € 2-3 million total Europe wide over the two year period. The additional annual cost for suppliers (calculation and internal assurance) as well as for Member States external verification depends on the adopted calculation method, allocated time, use of consultants and standards for assurance and verification. We would expect that the FQD verification could be combined with that of the voluntary reporting systems, for those fuel suppliers that adhere to the WRI or ISO standards. However, as explained above, since the reporting requirements and methodology for the FQD are different to that of the voluntary reporting, additional cost would still be involved. The FQD also offers the possibility to report lower than default value CO_2 values in case the supplier can prove lower values to be applicable. For this proof the supplier would need to continue the full WRI/GHG protocol/ISO 14064 processes.

3.4.3 Supplier's data related cost (Chain of Custody/CO_2 content)

Apart from 'own identity' the FQD suppliers' reporting obligation is on annual overall volume/origin and place of purchase basis. Enforcing supplier compliance to agreed targets requires supplier specific data.

When looking at the current voluntary reporting, it is clear that the sustainability reports of main suppliers already report upstream/downstream and aggregated total CO_2 emissions and CO_2 intensity 'well to gate'. Providing the audit trail for Member State verification could be allocated to the FQD but since sustainability reporting is in place already these costs are not fully additional. Statutory auditors provide external assurance for suppliers and in total these costs add up to several tens of millions annually for global players. The majority of the costs is taken up by financial assurance with sustainability verification being an estimated maximum of 10% of that cost. EU specific CO_2 intensity assurance costs (i.e. the cost related to the current voluntary reporting practice) is estimated at € 200,000 to 400,000 per integrated supplier with potentially similar cost to the Member State in cost for the provision of external assurance.

Tracing the crude origin of each individual fraction in refinery products (the Chain of Custody as required by the FQD), would constitute a new set of data that would attract additional cost to generate and present in an auditable format. Tracing the crude origin(s) for intermediates, imported from outside Europe, would be even more difficult. Since such data currently are not available dedicated arrangements with individual foreign suppliers would be required to allow for such crude origin tracing system also for intermediates. Completing and implementing a full chain of custody would enable the supplier and or the designated authority to apply the default CO_2/MJ values of the FQD proposal and comply with the FQD requirements

Cost of development of tools

Assuming that required input data for both crude intake end intermediates as feed stream are available, we estimate the cost for developing a system to track crude/feed streams through an integrated supplier (refinery) at an investment of 20-30 FTE (full time equivalent, i.e. man years), when starting from scratch. This figure is based on experiences with the development of optimisation and simulation tools for refineries as well as additional internal and external assurance. Extrapolating of this figure to the 98 refineries in Europe results in an investment of app. M€ 200 for the total of suppliers of oil and gas to the European markets.

In actual practice, however, most refiners do have simulation tools available to simulate and optimise their operations, dependent on the quality of crude/feed intake. Depending on the size and complexity of the refinery it is estimated that still some 5-7 FTE for a more simple refinery and 10-15 FTE for a complex refinery, respectively, is required to adapt existing tools for tracking crude origin and CO_2 intensity through an integrated refinery.

For calculation purposes we assumed 30 complex refineries and 68 smaller or less complex refineries. With these additional assumptions included, our cost estimate for development of simulation tools comes down to M€ 80-110 for the total of suppliers in the European market (see Table 4, Once-off investment).

Table 4 **Indicative cost estimate for development and maintenance of refinery tools for FQD tracing of crude origin and CO_2 intensity of fuel products**

Calculation basis: Adaption existing refinery optimisation tool				
		Complex	Simple	Total
Once-off Investment				
Min. Manpower required	FTE	10	5	
Max. Manpower required	FTE	15	7	
EU-27 Refineries	Nr.	30	68	98
Cost per FTE	K€	120	120	
Min. Once-off Investment - Refineries	**M€**	**36**	**41**	**77**
Max. Once-off Investment - Refineries	**M€**	**54**	**57**	**111**
Annualised Investment Cost				
Min. Once-off Invest – Depreciation/10 yr	M¤	5	5	10
Max. Once-off Invest – Depreciation/10 yr	M€	7	7	14
Annual cost				
Min. Annual Manpower per Refinery (Reporting)	FTE	2	1	
Max. Annual Manpower per Refinery (Reporting)	FTE	4	2	
Min. Annual Cost Verification per Refinery	K€	150	75	
Max. Annual Cost Verification per Refinery	K€	300	150	
Min. Total Cost Annual - Refineries	**M€**	**12**	**13**	**25**
Max. Total Cost Annual – Refineries	**M€**	**23**	**27**	**50**

Calculation basis: Adaption existing refinery optimisation tool				
		Complex	**Simple**	**Total**
Total Cost				
Annualised Invest + Annual cost + Refiners + Traders	120%			
Min. Total cost Refiners + Traders	M€			42
Max. Total cost Refiners + Traders	M€			77

Source: own calculations.

Annual costs

A first, very indicative estimate of costs for monitoring the FQD data (tracing of the origin of the oil of the fuels supplied) is app. 2-4 FTE per year per complex integrated supplier (refinery) and 1-2 FTE per year for smaller or less complex refineries on the European market, once appropriate tools are available. This estimate is based on the assumption that required crude origin data are available, also for intermediates and chemical feedstock streams. Extrapolation of this figure amounts to app. M€ 15-30 for the EU-27 market (see Table 4).

In addition to this registration and monitoring, efforts will have to be made for internal and external assurance and verification. As stated earlier, it can be expected that Member States will transfer the responsibility for the verification to the suppliers, by means of obligatory verification systems. In line with earlier estimates in par. 3.4.3 (k€ 200–400 per integrated supplier) we estimate a cost of verification of k€ 150-300 per annum for complex refineries and k€ 75-150 per annum for smaller or less complex refineries, this based on averaging years of full audit and years of internal/external verification only. This results in estimated costs of approximately M€ 10-20 for internal and external assurance and verification for the entire European market (see Table 4).

In summary we estimate total yearly costs, including depreciation of once-off investments, at M€ 40-80 for the total European market. In this latter number a 20% increase on the total number has been included to account for additional costs trading companies will incur, as also these companies will need to live up against FQD reporting requirements

These cost estimates take existing reporting requirements and internal data availability into account.

3.5 Conclusions

Based on the interviews and the insight in the market and reporting practices gained, it is concluded that supplier CO_2 intensity reporting, in line with the FQD proposal, can be done at yearly costs in a range of app. **k€ 250-1.000** per integrated supplier per year for the EU Market. For the total of all suppliers, this results in overall yearly costs of app. **M€ 40-80**. These cost include annualised once-off investment costs, and assume that the basic data on crude origin is and can be made available by suppliers, also for intermediates and chemicals streams and for imports from outside the EU envelope.

A prerequisite to make this effective is a pre-defined explicit calculation method and harmonised set of assurance standards – somewhat similar to the approach regarding biofuels (in the RED and FQD).

Compared to the objective of emission reductions in the FQD (in 2020 10% reduction relative to 2010 is 10% of 4,050 Mton CO_2 emissions or in total about 400 Mton CO_2 reduction in 2020), the administrative costs are expected to be in the range of **0.10-0.20 €/ton CO_2.** Relative to the import of barrels of oil to the EU-27 (in 2009 5,100 Mbbl/yr), this amounts to **0.008-0.016 €/bbl**. Cost per litre fuel are negligible: In 2009 the total EU product demand was 880 milj. ton/yr (Pervin & Gertz) so that above estimated costs per litre product are calculated at **0.005-0.01 €c/l**.

4 Other impacts on the refinery industry

4.1 Introduction

The FQD proposal will require reporting from the suppliers and others in the fossil well to wheel chain, plus independent auditing and verification by Member States. However, this is, clearly, not the main impact of this policy: it will reduce the life cycle GHG emissions of transport fuels, and it will have an impact on the market for crude oils and, potentially, on refineries.

This chapter aims to provide an overview of the expected mechanisms that may take place once fossil fuels receive different GHG intensity factors in the FQD. The main issue will be that oils with low GHG intensity (and products and fuels produced from this) will become more attractive than high-GHG oils, and thus get a competitive advantage. However, suppliers may also use other means to meet the FQD target, such as reduced flaring and venting, as described in Annex I (3) of the proposal, increase the biofuels share or shift to the use of biofuels with low GHG emissions.

4.2 Measures to meet the FQD

Without going into any details of the impacts of the FQD target on the industry, a broad overview of the potential measures they can take to meet the target is provided in the following.

Biofuels

With up to 85% of the life cycle CO_2 emission in combustion (under customer's ownership) the blending in of low CO_2 biofuels is potentially one of the more effective emission reduction measures - assuming that the GHG emission threshold for biofuels are effective, and emissions from indirect land use change are prevented[35]. The 2010 baseline GHG intensity is based on fossil content only, so all GHG savings with biofuels would be able to count toward the target. As the RED target for transport (10% renewable energy, in 2020) is expected to be met largely with biofuels, a significant share of the FQD target can be expected to be met with biofuels.

In 2010, the share of biofuels was, on average, 4.7% in the EU (EurObserv'ER, 2011). In the coming years, fuel suppliers are expected to increase this share, in response to Member State policies that are implemented to meet the RED target mentioned above. In 2020, these biofuels are expected to achieve minimally a 50-60% GHG reduction, according to the RED (and FQD) GHG accounting methodology (RED, Art. 17.2). Assuming that this leads to an average biofuels share of 7%, at an average 60% GHG reduction, this would contribute to 4.2% GHG reduction in the FQD - leaving a gap of 1.8% towards the mandatory FQD target, to be met by other means[36].

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[35] Which is currently (February 2012) not the case.

[36] In determining the 2010 baseline of 88.3 gr CO_2/MJ for petrol/diesel the current 5% biofuels are excluded.

Regarding biofuels, additional GHG reduction can then be achieved for the FQD by two different means: by adding more biofuels, or by shifting to biofuels with more GHG reduction.

Cost of biofuels are high compared to fossil fuels, and most likely also compared to upstream GHG reduction measures in the fossil fuel chain. In view of future tightening of sustainability criteria (e.g. inclusion of ILUC), these costs are not likely to reduce in the near future. Therefore, we do not expect that adding more biofuels than necessary to meet the RED would be an economically attractive option in the context of the FQD.

Choosing low-GHG biofuels rather than biofuels with higher emissions might be more attractive – depending on price (i.e. availability) of these biofuels. For example, if suppliers manage to achieve an average 80% reduction with biofuels, rather than the 60% assumed above, they would already achieve 5.6% GHG reduction with a 7% biofuels share. However, this does not hold if a significant (and perhaps increasing) share of the biofuels are produced from waste and residues, and are counted double towards the RED target, in line with RED Art. 21b. Increasing the share of double counting biofuels reduced the biofuels volume needed to meet the RED target, but it has a counterproductive effect on meeting the FQD target, where these biofuels are not counted double.

Up- and midstream reduction options
With an estimated 15% of life cycle CO_2 emissions in production and manufacturing of fossil transportation fuels (i.e. well-to-tank), significant life cycle CO_2 intensity improvements in this part of the cycle will be challenging. However, the FQD formulation of upstream CO_2 emission reductions is wide and offers integrated suppliers much scope to allocate current and future flaring and venting reductions to European emission targets. There will, of course, be certification cost in order to prevent fraud and double counting.

Refinery optimisation will also result in CO_2 intensity reduction, but this will be more limited compared to upstream options. In the current draft FQD proposal, these measures can not be used to contribute to the FQD target, as it only allows upstream reductions, at oil production and extraction sites. CO_2 mitigation at the refinery is, however, included in the CO_2 intensity numbers of the voluntary reporting systems (WRI/GHG and ISO 14064).

Shifting to fuels with lower GHG intensity
In the FQD proposal, a number of fossil fuel options exist that have lower lifecycle GHG intensity than the conventional oil that was used as a benchmark: LPG, LNG, CNG and GTL/CTL with CCS (and some hydrogen options, but these are expected to only have very small market shares in the coming years due to their cost). A shift to electric vehicles will have the same impact. Therefore, increasing the use of these fuels may also contribute to meeting the FQD target.

Especially LNG and CNG may be an interesting option In a number of EU Member States, where incentives exist for the use of these fuels in road transport. Increasing use of electric vehicles is not expected to have very significant impacts on GHG emissions in the short term, but could be a very interesting option to reduce emissions of the transport sector in the longer term. Without government incentives, however, these will be costly options to develop for fuel suppliers, as an infrastructure of filling stations needs to be developed and consumers and hauliers have to be persuaded to buy vehicles that are suitable for CNG, LNG or electricity.

A shift to oils with higher GHG intensity

It may be possible to meet the FQD target with biofuels and up- and midstream reduction options. However, if, at the same time, suppliers shift to oil sources with higher GHG emissions (e.g. tar sands, oil shales or CTL), they would have to take more of these (potentially costly) measures to meet the FQD target, as a compensation measure.

Therefore, if the FQD is implemented effectively and according to the proposal, it can be expected to limit the import of high-GHG intensity oils - the EU refineries and fuel importers will then be incentivised to continue to use the current fuel and oil mix, which is largely based on conventional oil.

Accountability: Well-to-tank or Well-to-Wheel?

The FQD approach to GHG intensity is defined as 'life cycle' (sometimes referred to as Well to Wheel WTW), which means CO_2 content as built up from production up to and including combustion. However, effectively the suppliers can only reduce Well to Tank (WTT) emissions. Beyond this point it comes to the choice of vehicle technologies that reduce CO_2 emissions, for example electric cars, and the supplier has little influence over the choice of this technologies.

TTW emissions are mainly due to the fuel type, as can be seen in Annex I of the FQD proposal. Increasing the share of diesel in the fuel mix, for example, will increase the average WTW GHG intensity of transport fuels, whereas a shift from petrol and diesel to LPG, CNG, LNG or electricity will reduce it. These kind of shifts are typically a result of government policies such as excise duties, vehicle taxation and other incentive schemes.

4.3 Potential impacts on the oil market and EU refineries

One of the effects of the FQD proposal is therefore that fuels (and oil) with lower GHG intensity will become economically more attractive, and others with higher GHG intensity will become less attractive within the EU. This will result in an increase of price differentials: a price increase of the first, and a price reduction of the high-GHG oils.

Estimating the extent of these price impacts are outside the scope of this study, but as the share of high-GHG oils in the EU's fuel supply is currently negligible, the overall impact can also be expected to be negligible in the short term. In addition, any impacts on the global oil market and exploration can be expected to be limited as the EU demand is only about 16% of the global demand for oil[37]. A small change in the EU's demand will thus have only limited impact on oil prices. If the EU oil suppliers and refiners prefer not to use high-carbon oils, they will be used in other regions where there are no GHG emission targets for fuels[38].

However, the impact of this FQD proposal on the market can be expected to increase in the future, for two reasons. Firstly, the supply of conventional oil is expected to decline, and production of unconventional oils (including the high-GHG intensity oils such as tar sands and oil shale) is expected to increase (see, for example, (EC, 2007)). The impact of the FQD could then increase, raising the price of conventional oils, compared to the situation without FQD

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[37] IEA Oil Market Report data for 2011, http://omrpublic.iea.org/tablessearch.asp.

[38] In general, however, reducing demand for a product (in this case high-carbon oils) will impact price, profitability and investments in that product. Note that the risk of ' CO_2 emissions leakage' that is described here is quite common in EU climate policies.

target. And secondly, as we have seen in Section 1.2, there are a number of other countries and regions that have already implemented comparable policies, or consider doing so in the future. If this type of policy covers a larger share of the global oil market in the future, the impact on oil production and market can be expected to be higher.

Introducing the policy now might thus have limited impact on the origin of the EU's fossil fuels in the short term, but it may impact investment decisions in the industry, and it can provide a sound basis to regulate and control CO_2 emissions of transport fuels in the future. It can thus prevent that GHG emissions of fossil fuels increase in the future, in line with an increasing share of unconventional oil, and it will make suppliers responsible for these emissions.

Even though the average impact can be expected to be limited or even negligible, it could be worth exploring whether there might be more significant impacts to individual refiners or fuel suppliers. The main mechanism that can be expected is that those industries that process high-GHG intensity oils will be at a competitive disadvantage, compared to those that process conventional oils (and/or supply LPG and LNG/CNG). As the EU refineries are currently not capable of processing non-conventional, high-GHG oils, this does not seem to pose a problem for the EU refinery sector.

From the point of view of creating a competitive level playing field, however, it could be very important that the correct FQD GHG intensity values apply equally to fuels that are processed in the EU and outside of the EU. It has to be ensured that refineries outside the EU that process oil from high-GHG sources cannot import them as low-GHG fuels into the EU, as in such a case they could get a competitive advantage, once the high-GHG oil sources become cheaper than conventional oils.

4.4 Conclusions

Fuel suppliers can chose from a number of options to meet the GHG reduction target set in the FQD. For example, adding biofuels will reduce GHG intensity of the fuels (provided they meet the sustainability criteria), where some will provide more savings than others. These will thus be more attractive to the industry. The draft FQD proposal will enable fuel suppliers to also benefit from GHG reduction options in the fossil fuel chain or a shift to other energy carriers: measures to reduce flaring and venting can contribute to the target, as well as a shift to fossil fuels with lower GHG intensity or a shift to electric transport. Each supplier is free to choose the measures that best fit their operations.

The FQD proposal can thus be expected to impact on fuel and oil prices: those with lower GHG intensity will become economically more attractive within the EU, and others with higher GHG intensity will become less attractive. This will result in higher price differentials in favour of the lower GHG intensity crudes.

These impacts on prices will be very limited in the short term, but it may impact investment decisions in the industry for the longer term. It can prevent that GHG emissions of fossil fuels increase in the future, due to an increasing share of unconventional oil, and it will make suppliers responsible for these emissions.

5 Conclusions and recommendations

5.1 Conclusions

Based on the interviews and the insight in the market and reporting practices gained, it is concluded that that supplier GHG intensity reporting as outlined in the draft FQD proposal can be done at relatively modest cost. A prerequisite to make this effective is a pre-defined calculation methodology and assurance standards, somewhat similar to the approach regarding biofuels (in the RED and FQD).

Supplier GHG intensity reporting can be done at yearly costs in a range of app. k€ 250-1.000 per integrated supplier per year for the EU Market. For the total of all suppliers), this results in overall yearly costs of app. M€ 40-80, assuming that the basic data on crude origin also for intermediates and chemicals stream is and can be made available by suppliers. Relative to the import of barrels of oil to the EU-27, this amounts to 0.008-0.016 €/bbl.

Fuel suppliers can then meet the FQD target by a variety of options, such as adding biofuels, using biofuels that achieve relatively high GHG emission reductions, GHG mitigation measures at oil production and shifting to oils and fuels with lower GHG intensity. If they decide to use oils and fuels with higher GHG intensity, compensation measures have to be taken. These measures are likely to increase the cost of using these unconventional fuels to suppliers and consumers to some extent. However, the impact of the fossil fuel differentiation itself can be expected to be limited, as at the moment a very small share of these fuels is used in the EU and can be processed in the EU refineries – either due to their high cost (CTL/GTL) or due to technical limitations (natural bitumen and oil shale).

It is important to establish a level playing field between the various refineries and fuel suppliers (both EU and non-EU), to prevent potential negative competitive impacts in the longer term. If foreign refineries would be able to import high carbon crudes without accurate tracing mechanisms, they would be free to use these crudes for EU fuels without having to invest in compensating measures. This would potentially create a competitive advantage for non-EU refineries and it would enable a form of 'carbon leakage', thus reducing the effectiveness of the FQD.

The following are more detailed conclusions regarding the administration of fossil fuel origin, as described in the FQD proposal of October 2011.

Current crude oil and fossil fuel reporting practice

- Data of oil imports are reported and registered at the point of entry into the EU, at the customs. Oil, its derivatives and fuels are categorised at that point into different categories (using CN-codes) which are similar but not the same as the categories used in the FQD proposal. Customs also require a proof of origin at that point.
- These points of origin are not always the country where the oil is produced. In case the oil has undergone processing before entering into

the EU, the country where the oil underwent its last substantial transformation will be reported.
- In addition, every Member State has to report on import or delivery of crude oil on a monthly basis. This information is supplied by the oil importing companies, and collected by the national statistical bureau.
- Apart from the official data reporting requirements, the industry itself monitors relevant data on oil type and characteristics, as this is very relevant information for their operations. However, once the oil has been processed in a refinery, information on oil origin is not monitored in the industry either, and it can not be derived from the physical characteristics.
- Many oil companies already report GHG intensity data of their operations, in Annual Sustainability reports, following industry standards such as WRI/GHG and ISO 14064.

Additional efforts required for the FQD proposal

- Crude oil origin and source are known and reported for oil that is being imported and used as feedstock in refineries. However, origin and source are not known for intermediates and end products (e.g. diesel) that are imported into the EU, and for intermediates and products from the chemical industry within the EU. Especially the intermediate and end product imports have significant shares in the total feedstock for EU transport fuels.
- These data gaps would have to be resolved for the FQD, as crude oil origin of these products (or GHG intensity) also need to be known and reported to ensure a level playing played with fuels from EU refineries.
- Furthermore, data on origin of oil is currently not tracked beyond the refineries, i.e. in the trajectory from refinery to the excise duty point (i.e. the end user).
- To fill these data gaps, a full tracking-and-tracing system needs to be set up in the industry, in which every oil, intermediate and product batch should be accompanied by a certificate that states the necessary information on oil sources and origin. This does not require much additional effort for crude oil that is being imported and then refined in the EU, but it would require a new system for intermediates and final products, either imported or from the chemical industry. GHG intensity is then derived through application of pre-set default values.
- A more simplified certificate system, limited to oils and products from countries where non-conventional feedstock is produced, does not offer significant advantages nor cost reductions. It would still require to set up a system to differentiate between intermediates and products from conventional and non-conventional sources.
- This system follows the chain of custody that is also in use for the existing voluntary GHG reporting of the mayor oil companies. This clearly indicates that it is practically feasible to implement and verify. Note that the methodology used to calculate the GHG intensity for the voluntary (WRI or ISO) reporting system is different from that described in the FQD.
- There are a number of methodological choices to be made regarding the accounting methodology, and different choices lead to different values of calculated GHG intensity of fuels. In the current FQD proposal, guidelines and regulations for a harmonised approach are left to the Member States. We recommend that the Commission develops these as EU guidelines to avoid ‘cherry picking’ of the most favourable methodology, and ensure a harmonised approach throughout the EU.

The FQD is an important cornerstone of GHG policy in transport, next to vehicle fuel efficiency standards, pricing policies and the RED. The future GHG emission reduction target of the transport sector of 60% in 2050 (EU White Paper for Transport) require that all parties involved need to receive strong incentives and regulatory targets to improve efficiencies and reduce emissions. In the past decade the fuel efficiency improvements have been realised by the automotive industry and a further reduction will stem from these efforts lowering vehicle emission from 130 (2015) to 95 gr CO_2/km by 2020.
A 6-10% reduction requirement to be achieved by the oil industry in this time frame does not seem unreasonable in this context. The end target of 80% CO_2 emission reduction (60% in 2050, according to the 2011 White Paper on Transport) requires however much more than fossil fuel CO_2 intensity reduction in the future – the current FQD target is only a first step in that development.

5.2 Next steps

The following next steps are suggested:

1. In order to implement the FQD proposal effectively, we recommend that the Commission defines a GHG intensity calculation methodology, as well as assurance standards. These should be developed in line with the existing reporting obligations and data availability, and with the methodologies prescribed for biofuels. There is a clear need for defining a set of clear and harmonised accounting rules and regulations, as several options exist - somewhat comparable to the issue of GHG emission allocation methodology and mass balance system that are provided in the biofuels regulations. These could help implementation of the system.
2. It is also recommended to include in the FQD a rule on how to deal with fuels for which the origin and GHG intensity is not reported. If these fuels would automatically receive the highest GHG intensity value, this could provide a strong incentive for a speedy implementation of monitoring and reporting systems in the industry.
3. The potential role of the Member States in steering their national fuel mix towards fuels and other energy sources with low GHG intensity should not be overlooked. Excise duty/tax based incentives for low GHG intensity fuels such as gas, CNG, bio LNG and electricity will have a profound effect on life cycle GHG intensity of transport fuels that merits to be exploited.
4. The FQD does not provide a very strong supplier incentive towards electricity, and the biofuels GHG calculation methodology does not yet include indirect land use change (ILUC) emissions. We recommend addressing both these issues in the final regulation: including ILUC is a prerequisite for the FQD to be effective even in the short term, incentivising electric transport could be an important step towards the very low-GHG transport technology needed to meet climate policy targets in the longer term.

References

API, 2009
Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry
Washington DC : American Petroleum Institute (API), 2009

BP, 2011
BP Statistical Review of World Energy June 2011
London : BP, 2011

Brandt, 2011
Adam R. Brandt
Upstream greenhouse gas (GHG) emissions from Canadian oil sands as a feedstock for European refineries
Stanford (Calif.) : Stanford University, 2011

EC, 1992
Council regulation (EEC) No 2913/92 of 12 October 1992 establishing the Community Customs Code
In : Official Journal of the European Communities (EC), No L 302
19 October 1992, p.1

EC, 1995
Council Regulation (EC) No 2964/95 of 20 December 1995 introducing registration for crude oil imports and deliveries in the Community
In : Official Journal of the European Communities (EC), No L 310,
22 December 1995, p.5-6

EC, 2007
World Energy Technology Outlook - 2050: WETO H2
Luxembourg : Office for Official Publications of the European Communities (EC), 2007

EC, 2011
Key figures : Market Observatory for Energy (MOfE)
S.l. : European Commission, Directorate-General for Energy, 2011

ERM, 2010
Andrew Marsh-Patrick
Company GHG Emissions Reporting: A Study on Methods and Initiatives
Manchester : ERM, 2010

ICCT, 2009
Anil Baral
Summary Report on Low Carbon Fuel-Related Standards
S.l. : International Council on Clean Transportation (ICCT), 2009

ICCT, 2011
United States Low Carbon Fuel Policies: Policy Update Number 12
S.l. : International Council on Clean Transportation, 2011

IEA, 2009
Transport Energy and CO_2: Moving Toward Sustainability
Paris : IEA, 2009

IPIECA et al., 2011
IPIECA, API, OGP
Petroleum industry guidelines for reporting greenhouse gas emissions, 2nd edition
London : Washington DC ; Brussels : IPIECA, API, OGP, 2011

LMI, 2009
Michael E. Canes, Rachael G. Jonassen
EISA Section 526: Impacts on DESC Supply
McLean (VA) : LMI, 2009

OGJ, 2011a
OGJ Guide to Export Crudes: Crude Oil Assays Survey 2011
PennWell (OK) : Oil & Gas Journal(OGJ) research center, April 2011

OGJ, 2011b
Worldwide Production: 2012 Special report
In : Oil & Gas Journal (OJG), Vol.109, Iss. 49, December 2011

OGJ, 2011c
Worldwide Refineries: Capacities as of Jan. 1, 2012 Special report
In : Oil & Gas Journal (OJG), Vol.109, Iss.49, December 2011

Pervin & Gertz, 2008
Study on Oil Refining and Oil Markets
S.l. : Purvin & Gertz Inc., 2008

Port of Rotterdam, 2011
Oil and Refinery
Available at: http://www.portofrotterdam.com/en/Business/liquid-bulk/Pages/refining-pipelines.aspx

Revenue, 2011
AEP Helpdesk, Office of the Revenue Commissioners
Automated Entry Processing (AEP) Import Trader Guide
Nenagh : Revenue, Irish Tax and Customs, 2011

Seddan, 2010
D. Seddan
Catalytic Science Series - Vol. 8
Petrochemical economics: Technology Selection in a Carbon Constrained World
London : Imperial College Press, 2010.

S&T, 2011
Review of studies on oil sands and oil shale
Delta (CA) : $(S\&T)^2$ Consultants Inc., 2011

WRI/WBCSD, 2004
The Greenhouse Gas Protocol
Geneva : Washington : World Resources Institute (WRI) ; World Business Council for Sustainable Development (WBCSD), 2004