The IEA oil data system

Joint Rosstat- IEA Energy statistics workshop

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International Energy Agency

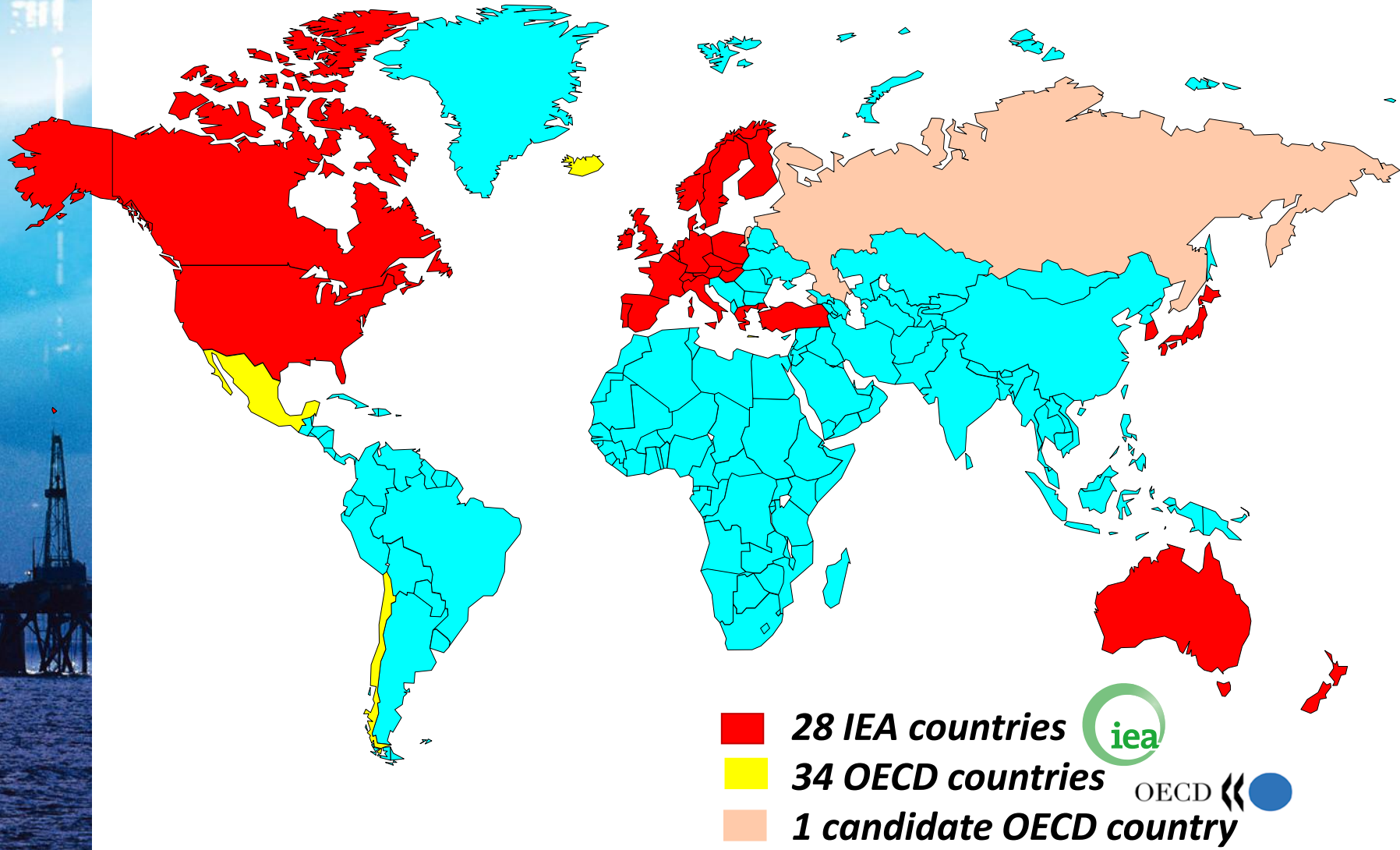
The IEA Oil Data System

Timeliness

Current	**QUE**	Supply Balance	14 oil categories	Stock Levels	Trade Origin & Dest.
Month-1	**JODI**	Supply Balance	7 oil categories		
Month-2	**MOS**	Supply Balance	21 oil products	Trade Origin/ Destination	Stock Levels
Year-1	**AOS**	Supply Balance	35 oil products	Trade Origin/ Destination	Transformation Energy Final Consumption

Detail

Geographical Coverage of OECD/IEA



IEA Oil data – geographical coverage

Questionnaire	Geographical Coverage
Annual	OECD, UNECE
Monthly	OECD
Emergency Data	IEA
Prices	Prices (OECD/IEA/some Non-OECD)
Other	
Non-OECD member country data	Non-OECD

Overview

- Importance of oil in the world
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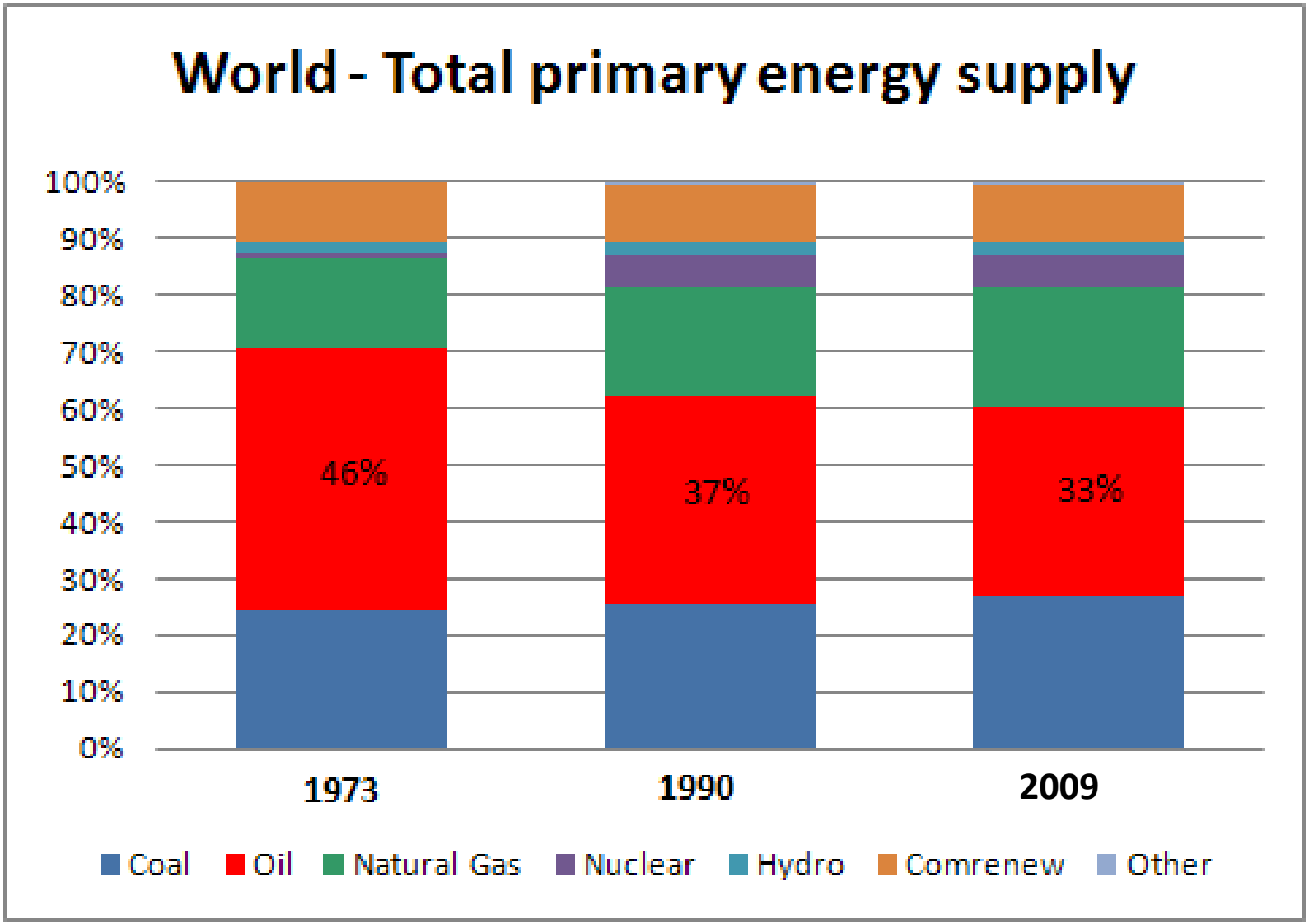
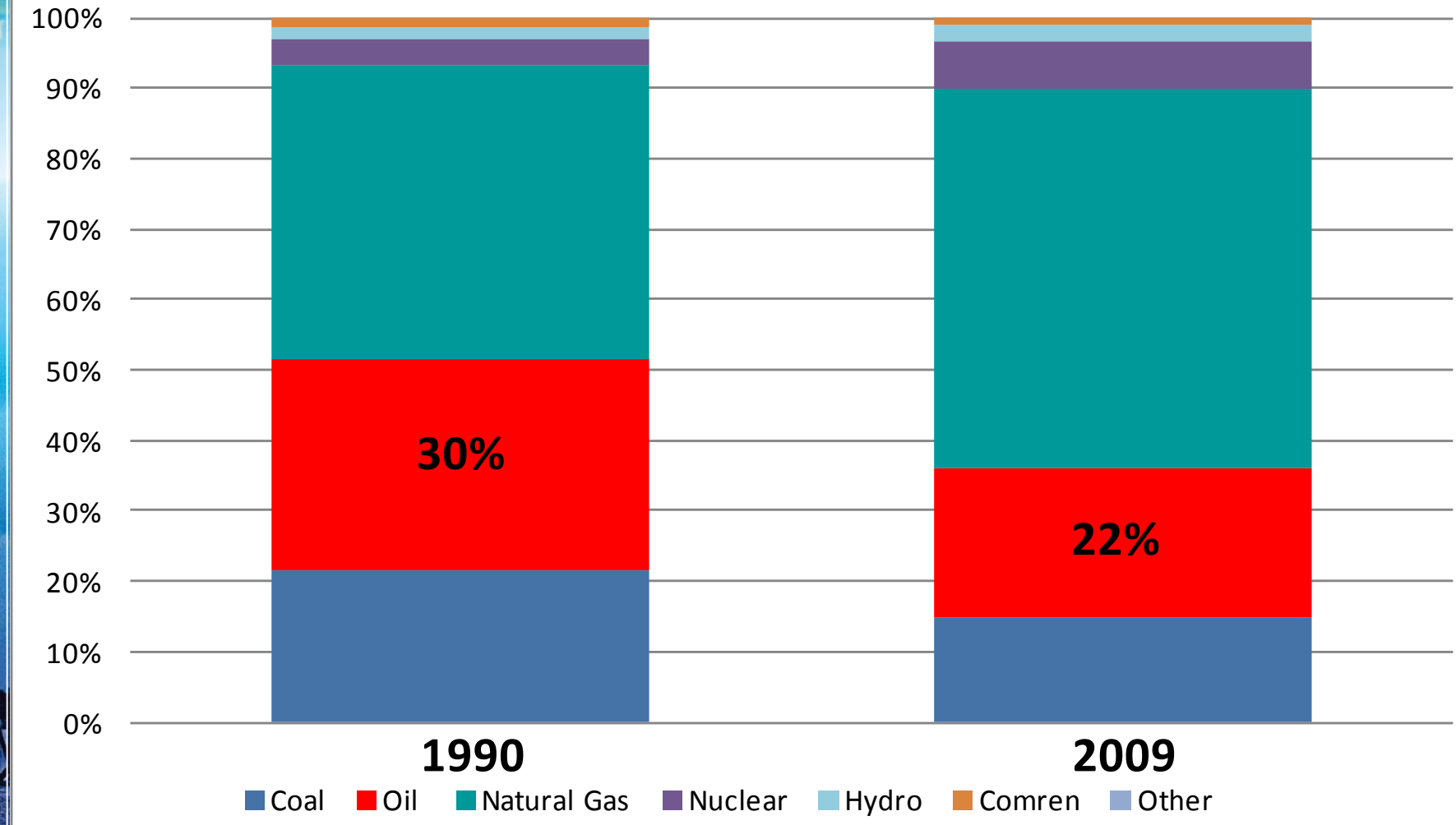
  - ✓ Tables 1 and 2
- Definitions of Flows
  - ✓ Tables 1 and 2
- Definitions of Sectors
  - ✓ Tables 3 and 4



Large reduction in share of oil in TPES between 1973 and 2009

Russia - Total Primary Energy Supply



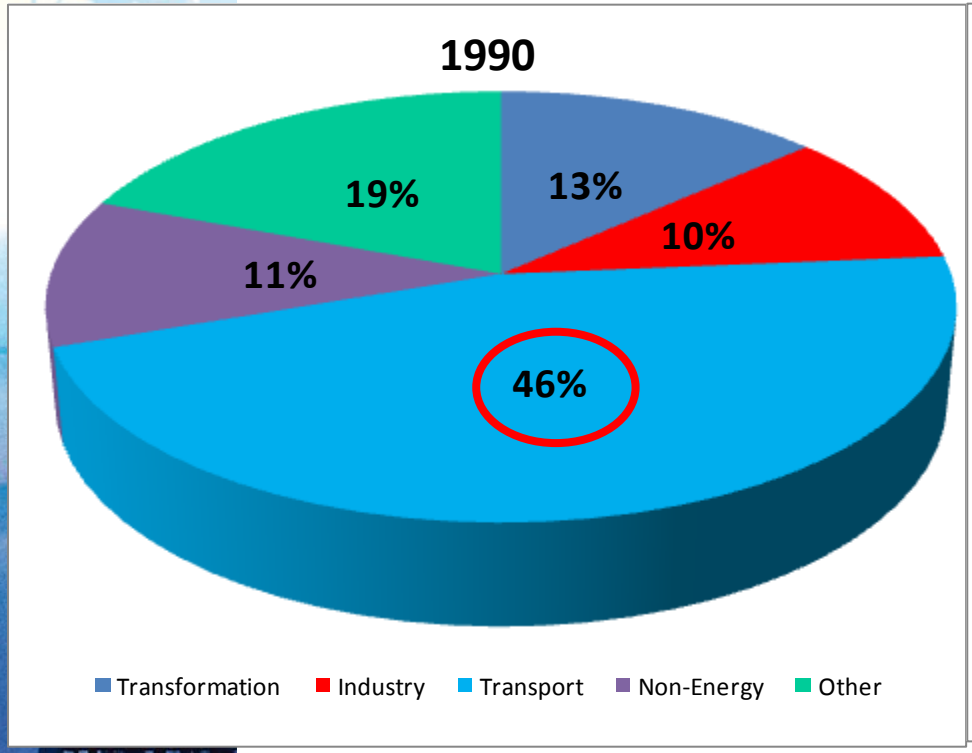
World Oil share in TPES

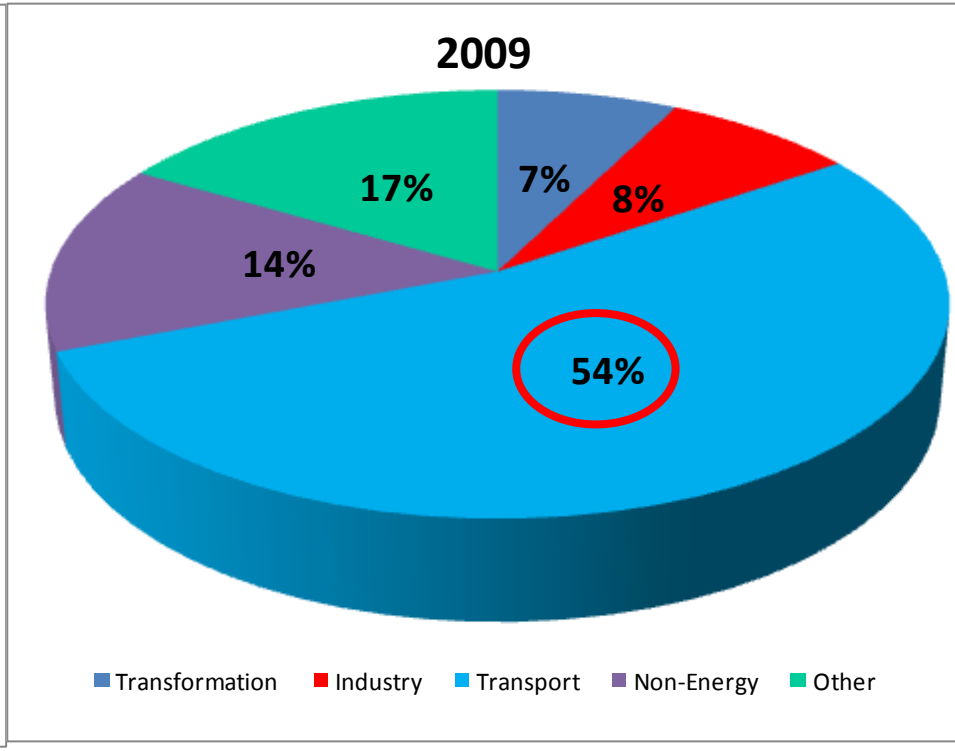
37%

33%

World uses of oil

1990 and 2009





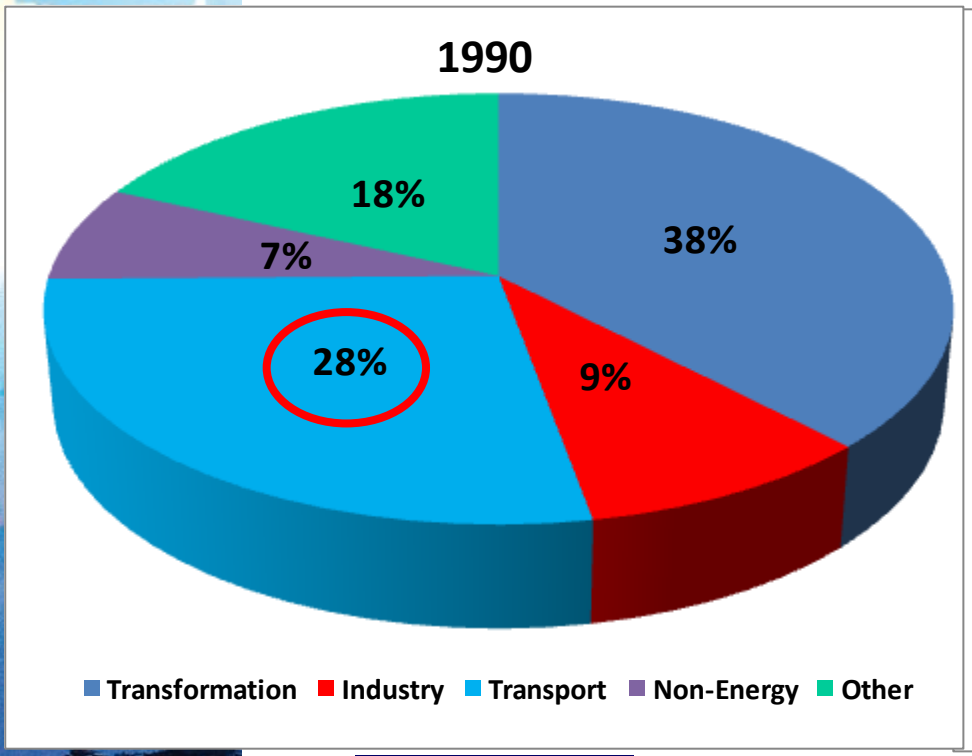
TPES = 8782 Mtoe

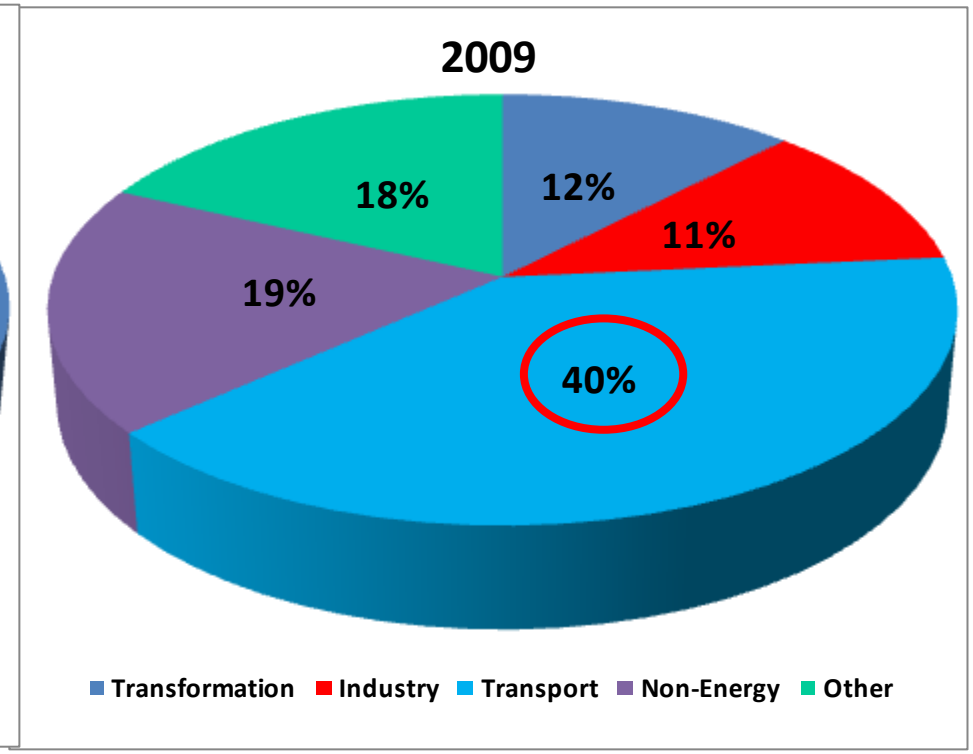
TPES=12 150 Mtoe

**Other includes energy sector use, losses and other sectors.*

Russia - uses of oil (*)

1990 and 2009





TPES = 879 Ktoe

TPES=647 Ktoe

World oil use – Transport

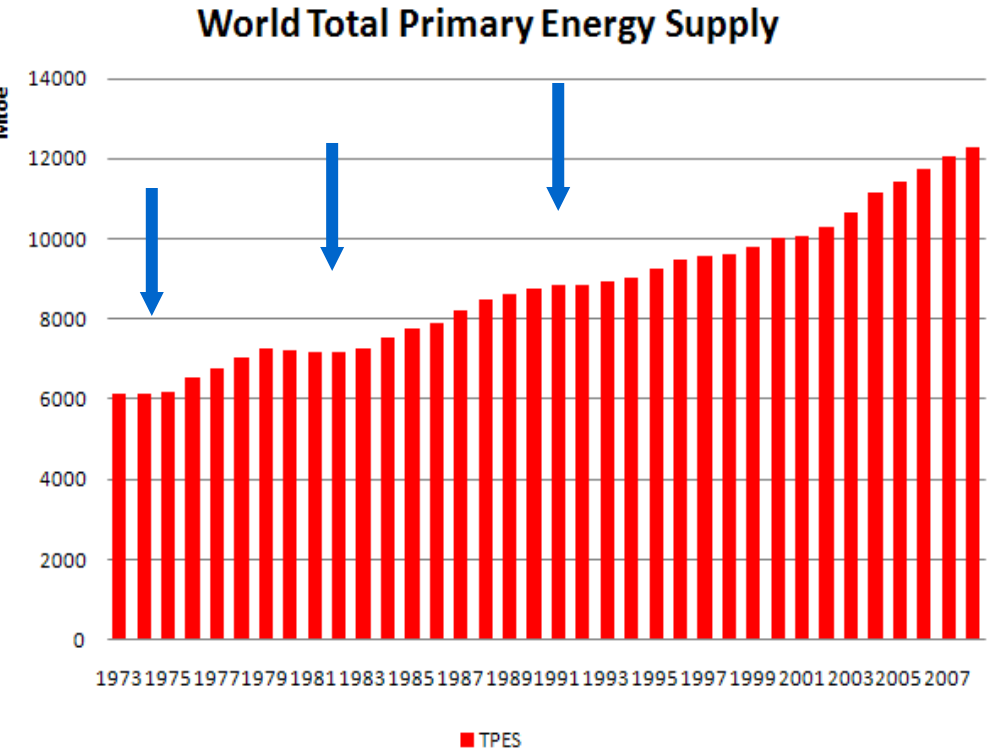
36% **53%**

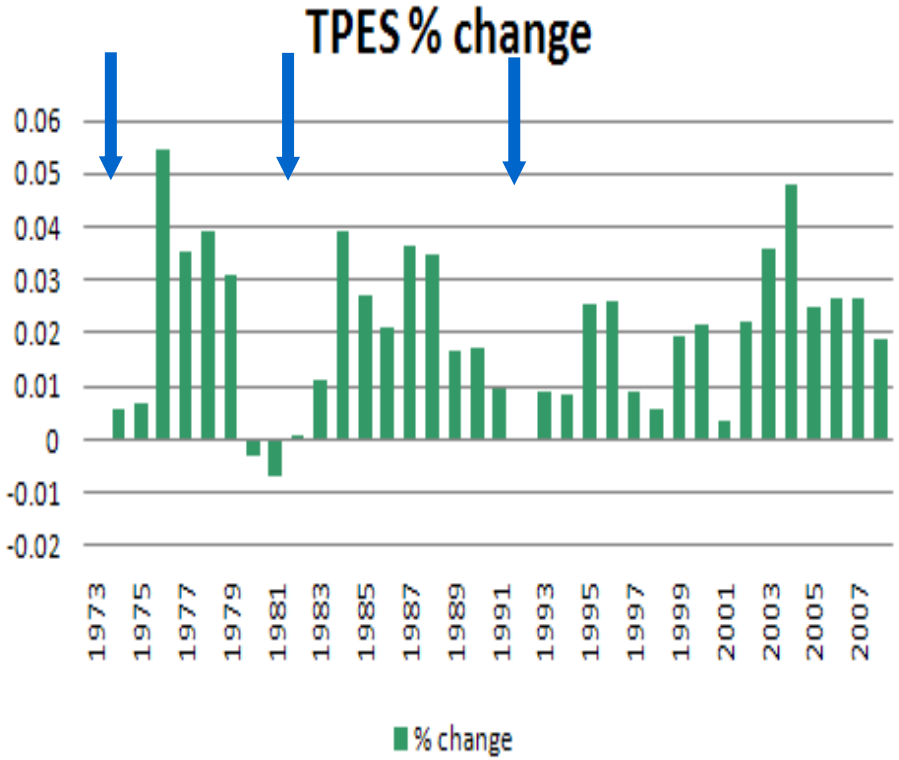
(*) excludes marine and aviation bunkers

Russia – Important facts

- Major oil producer : produces 12% of total world oil production
- Is second largest crude oil exporter after Saudi Arabia
- Is the fourth largest exporter of oil products: particularly gasoil and fuel oil
- Accounts for 3% of world oil consumption

World – Effect of oil crises on the energy market





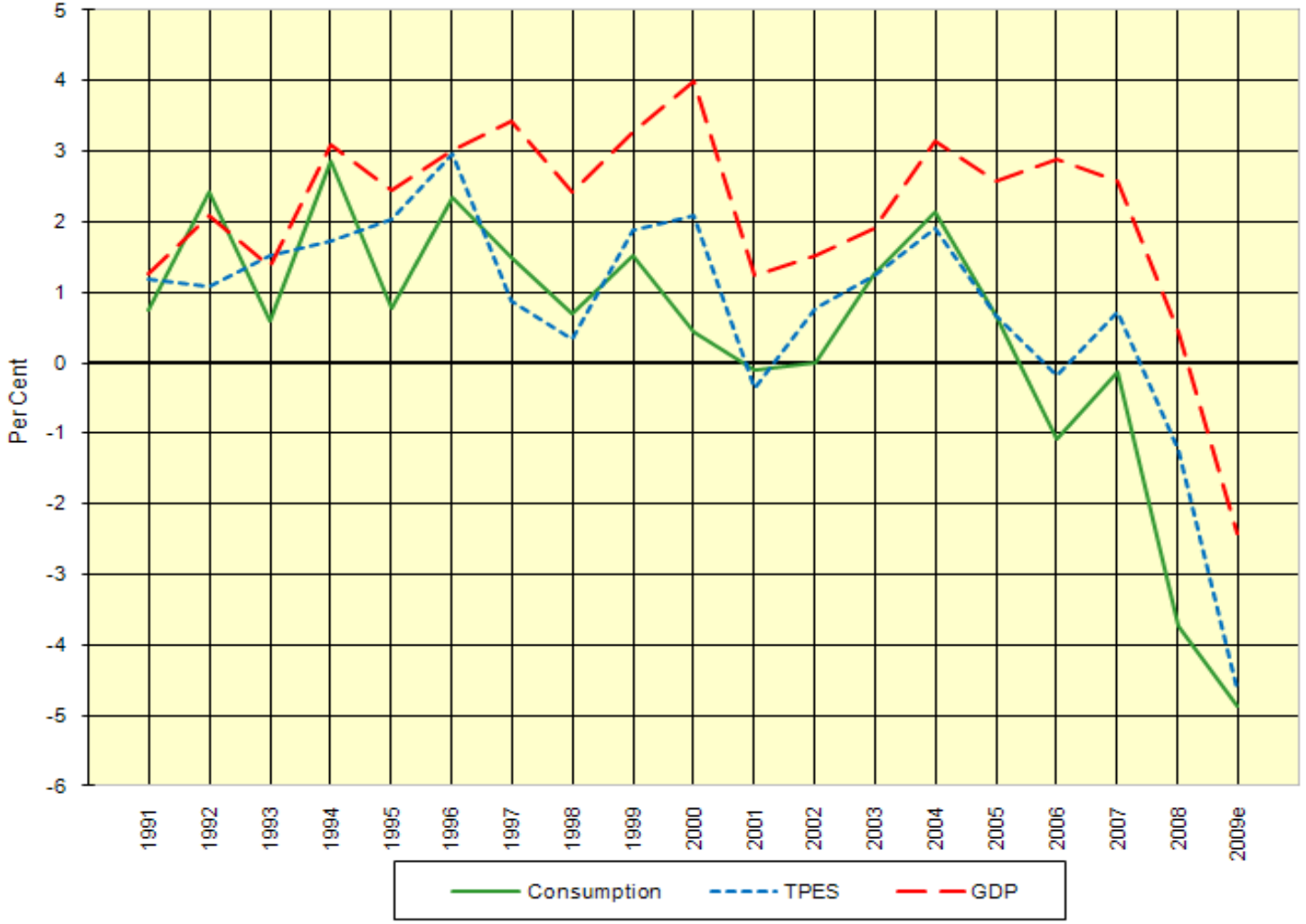
1973 oil embargo

1980 Iran/Iraq war

1990 Gulf crisis

Relationship between oil consumption, TPES and GDP

OECD

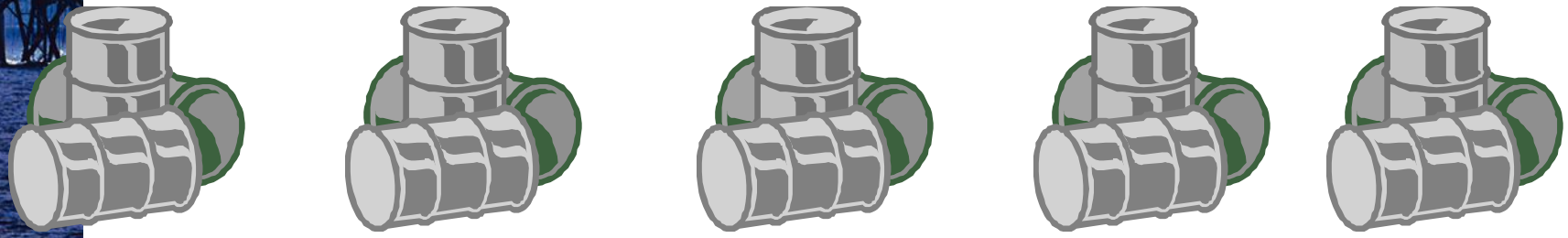


Overview

- Importance of oil in the world
- Introduction
  - ✓ A few concepts e.g. refining, units, conversion, etc
- Definitions of Products
  - ✓ Tables 1 and 2
- Definitions of Flows
  - ✓ Tables 1 and 2
- Definitions of Sectors
  - ✓ Tables 3 and 4

Some “oil” principles….

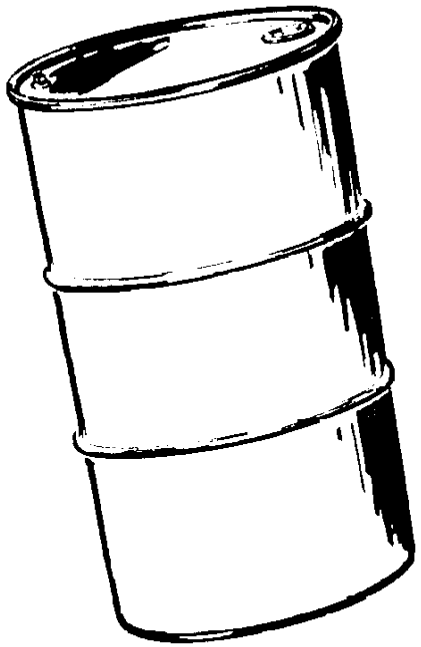
- Crude oil needs refining, because it has limited use in its raw state.
- Oil can be expressed in various units – how to convert ?
- Oil is the largest traded commodity in the world.
- Crude oil and petroleum products can be easily stored, and fulfill a security function.



A few words on Oil Refining

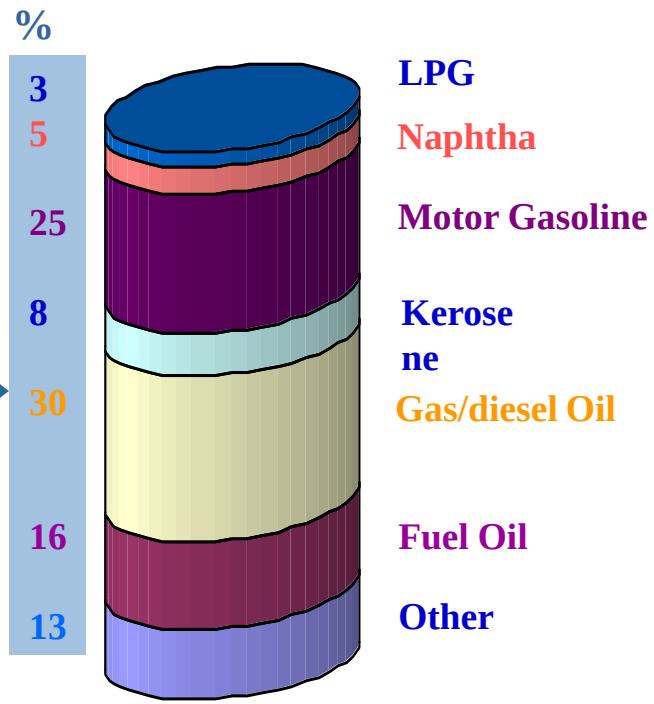
- What is produced?
- What is consumed?

Crude Oil



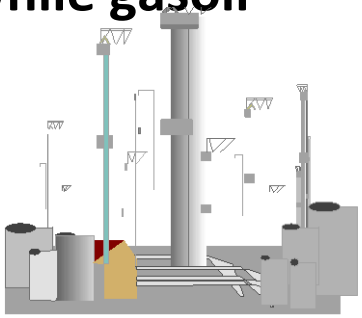
refining

World - Oil product consumption

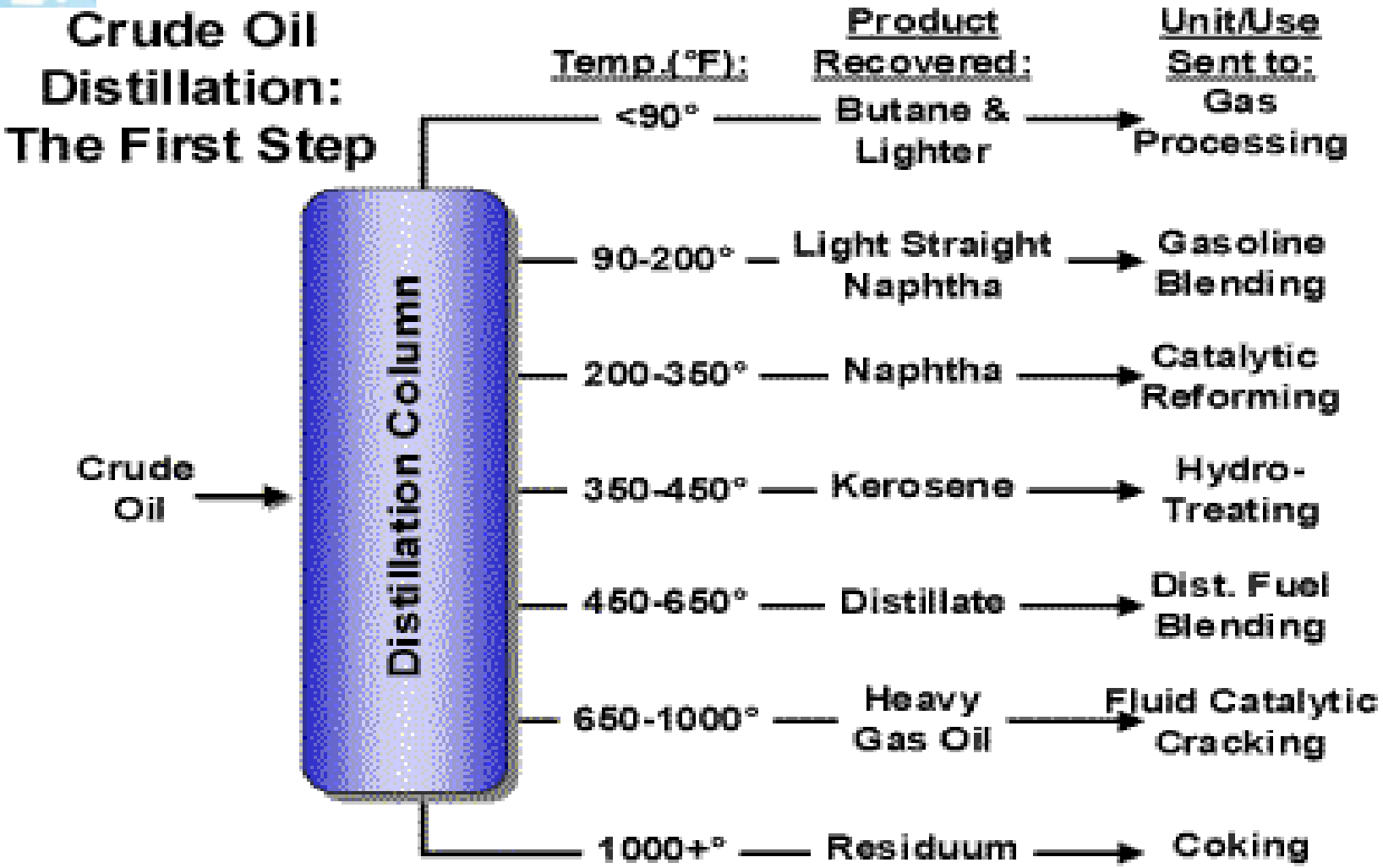


Refining

- First Process: simple distillation which separates the various hydrocarbons included in the crude oil into fractions. (Atmospheric Distillation)
- Crude oil is put into a distillation column and heated until the various fractions boil off. The different fractions have a different boiling point and are recovered at their specific distillation temperature.
- Lighter fractions distill at lower temperatures than heavier. E.g. LPG is recovered at less than 30 degrees C, while gasoil distills between 180 and 380 degrees C.

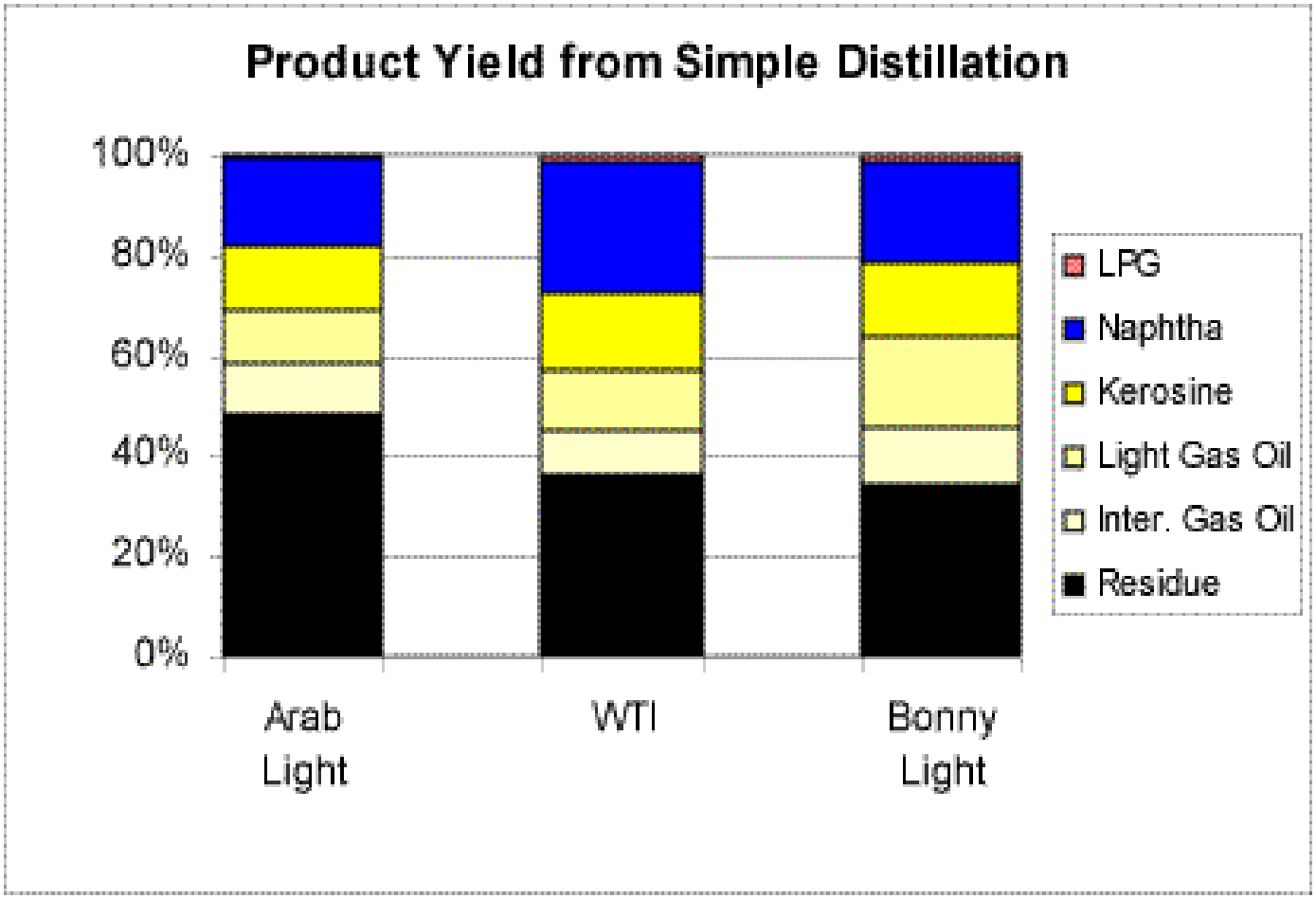


How are oil products derived?



Source: EIA

Refining yields

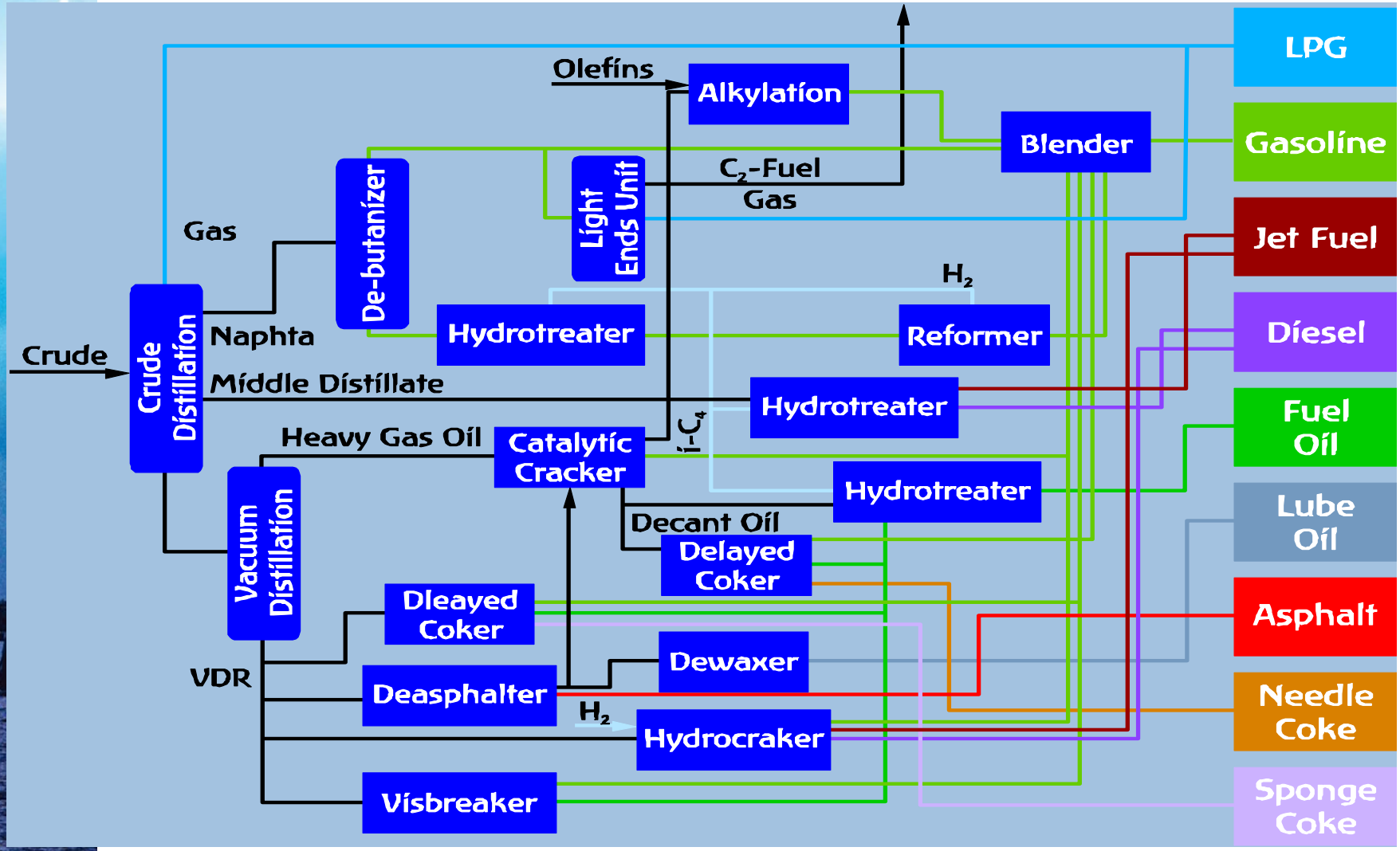


Source: Energy Intelligence Group, *Int'l Crude Oil Market Handbook*

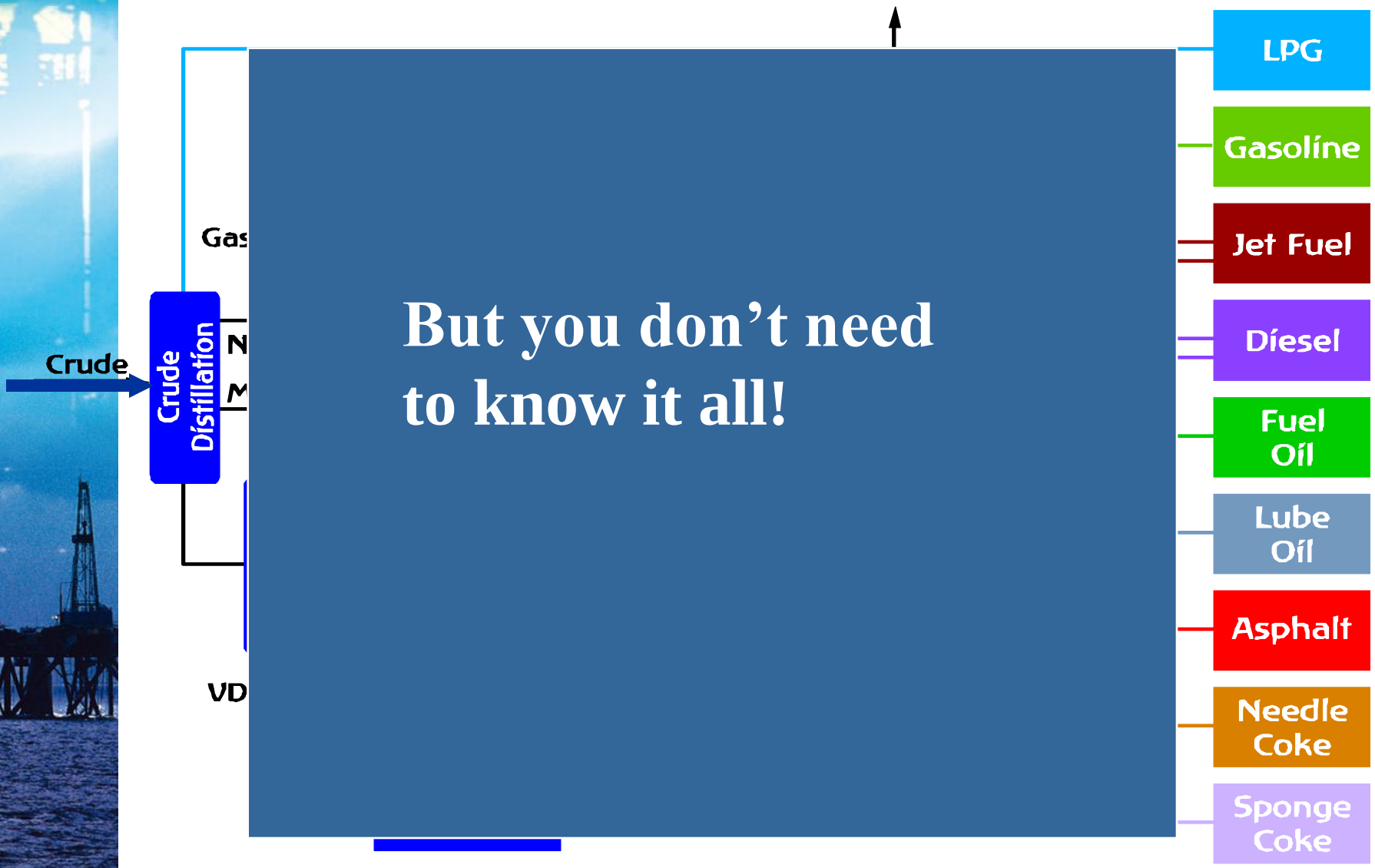
Further Refining

- To optimise (upgrade) output, further processing is needed, either by increasing heat, changing pressure, by adding catalysts, by removing sulfur or by breaking down the molecular structure.
- There are a variety of processes, many of them highly complex.
- Examples:
  - Vacuum distillation further distills the residuum where atmospheric pressure is reduced
  - Hydrotreater removes sulfur, using catalysts
  - Catalytic cracker uses distillate to produce finished heating oil and diesel by using a catalyst
  - Coker: a thermal process producing lighter products and petroleum coke from residuum

Oil Refining



Oil Refining: It is complicated !



The Refinery flows

Refinery Input

Crude oil

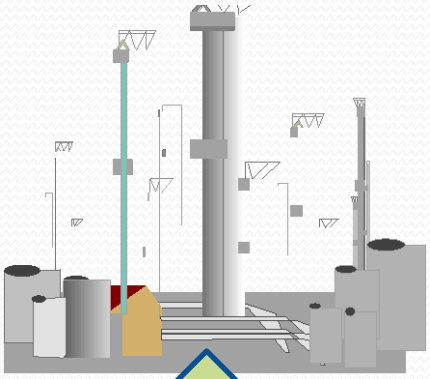
NGL

Refinery Feedstk

Additives/oxygenates/biofuels

Other Hydrocarbons

Refinery Losses



Refinery Fuel

Stock changes

Refinery Net Output

LPG

Naptha

Gasoline

Kerosene

Diesel

Fuel

Other

International Energy Agency

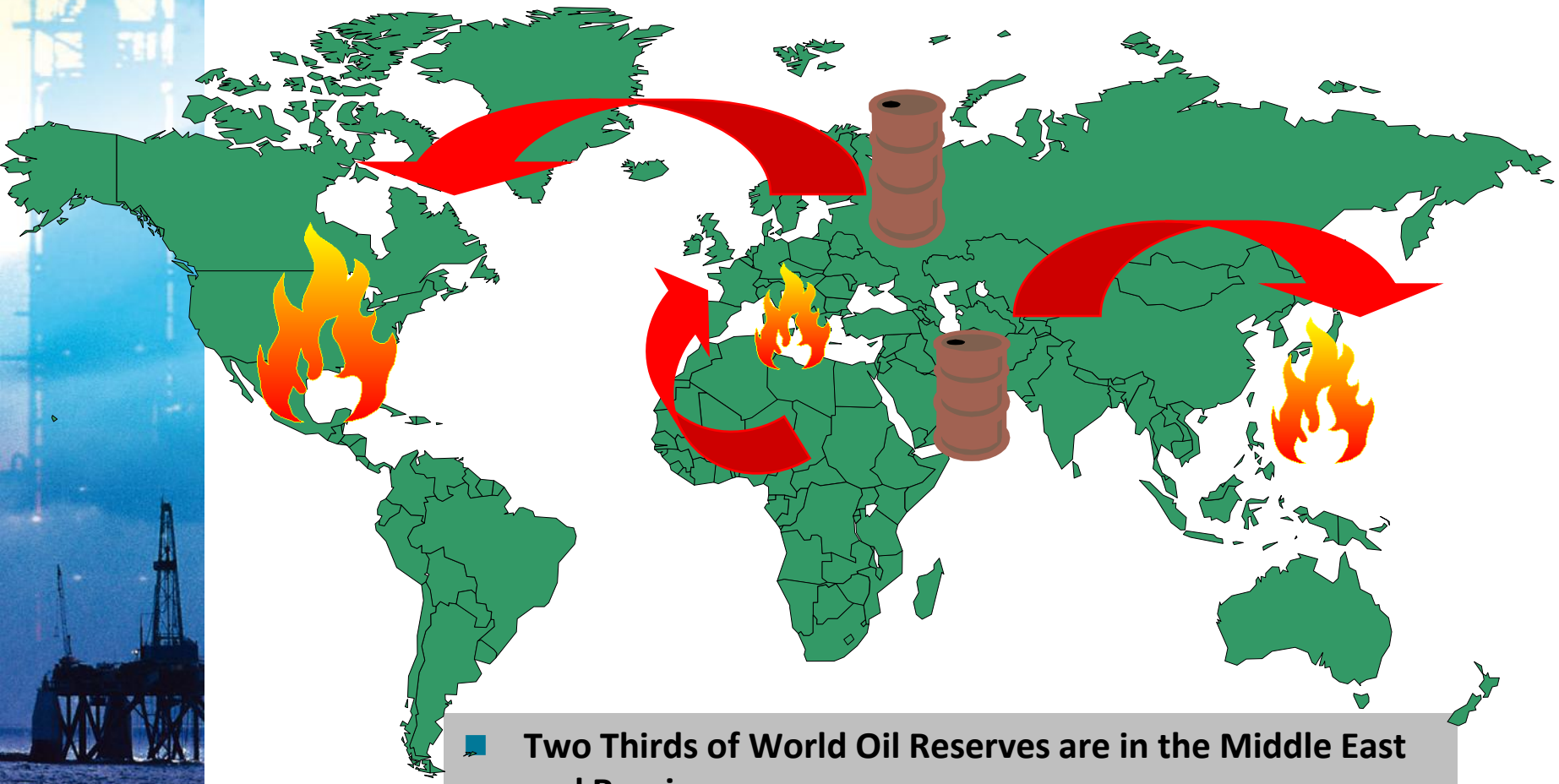
Units of reporting and Density

- Oil is usually measured in mass or volume.
  - Units of mass (weight) e.g. are metric ton
  - Units of volume are litres, barrel or cubic metres.
- Conversion from one mass to volume (and reverse) is essential.
- To convert, the density must be known.
- Density is mass per volume
- Density for oil is often shown as specific gravity, this is the relative mass per volume compared to water.
- Density differs according to the various crude oils and products
  - Examples, Specific gravity of Brent is 0.8311, while Mexican Maya is 0.9, Motor gasoline is between 0.7 and 0.79, while bitumen is between 1 and 1.1

Converting Volume to Mass (or reverse)

Imports	Reported data in barrels per day (volume)	Number of days/month	Density mass/volume (average)	Volume/mass tonne/barrel conversion factor	Converted data in metric tons (mass)
Crude oil	1020	31	0.13569	1/0.13569=7.37	(1020x31)/7.37=4290
Motor gasoline	546	28	0.11806	1/0.11806=8.47	(546x28)/8.47=1805

Oil Trade

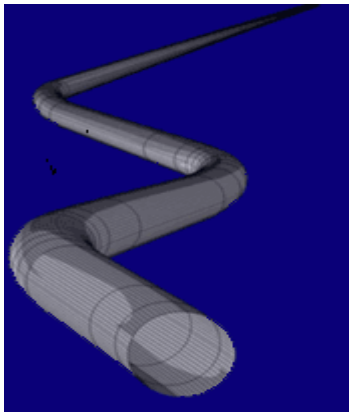


- Two Thirds of World Oil Reserves are in the Middle East and Russia
- 90% of consumption is in the rest of the world
- Oil is the most traded commodity in the world

Oil Trade (2)

- Crude oil needs shipping from producing to consuming areas
- Products need transporting from refining areas to consuming regions
- Oil can be transported easily through various means: tankers, barges, pipelines, railways, trucks etc.
- It is important to know how much your economy imports and exports in order to know

  the Import Dependence



Oil Stocks

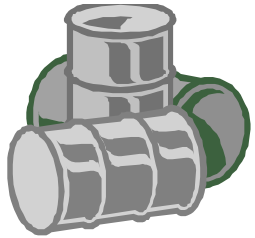
- Oil stocks are essential to sustain the global oil supply system
- Oil stocks balance supply and demand: build when supply larger than demand, drawn when demand larger than supply
- Oil stocks are a leading indicator of prices
- Product stocks as important as crude oil stocks
- Stocks fulfill a strategic need e.g. government stocks

Oil Stocks (2)

Three types of stocks – according to holder:

- **Primary stocks: held by companies supplying the markets: producers, refiners and importers, held in refinery tanks, bulk terminals, pipeline tankage, barges, coastal tankers, tankers in port (if they are to be discharged) and in inland ship bunkers. Also included are stocks held for strategic purposes (governments or stockholding organisations)**
- **Secondary stocks: stocks in small bulk plants and retailers (e.g. service stations)**
- **Tertiary stocks: held by end-consumers.**

  These could be power plants, industrial entities, households etc.



Oil Stocks (3)

What needs to be reported?

- **Primary stocks**

Most Important!

- **Secondary stocks:**
- **Tertiary stocks:**

Difficult to collect data

The IEA oil questionnaire

- **25 product categories: crude oil, NGL, refinery feedstocks, additives/oxygenates, biofuels, other hydrocarbons, ethane, refinery gas, LPG, naphtha, motor gasoline, biogasoline, aviation gasoline, jet gasoline, jet kerosene, other kerosene, gas/diesel oil, biodiesel, fuel oil, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other.**
- **5 tables:**
  - ➔ Table 1: Refinery Intake
  - ➔ Table 2: Primary Supply Sector
  - ➔ Table 3: Transformation and Energy Sectors and Final Consumption Sectors
  - ➔ Tables 4 and 5 : Trade by origin and destination

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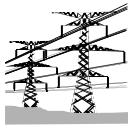
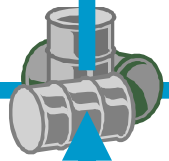
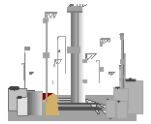
Crude, NGL and Feedstocks Balance





From Other Sources

Exports

Direct Use

Stock Change

Production

Refinery

Imports

Backflows from Petrochemical Industry

Products Transferred

Refinery Intake (Table1)

Unit: 1000 metric ton

		Crude Oil	Natural Gas Liquids	Refinery Feedstocks	Additives/ Oxygenates	Of which Biofuels	Other Hydrocarbons	TOTAL (A to F)
		A	B	C	D	E	F	G
Indigenous Production	(+) 1							0
From Other Sources	(+) 2				0	0	0	0
from coal	(+) 3							0
from gas	(+) 4							0
from renewable	(+) 5							0
Backflows from Petrochemical Industry	(+) 6							0
Products Transferred	(+) 7							0
Imports	(+) 8							0
Exports	(-) 9							0
Direct Use (includes transfers to consumption)	(-) 10							0
Stock Changes (+ or -)	(+) 11	0	0	0	0	0	0	0
REFINERY INTAKE (Calc.)(sum of 1 to 11)	(=) 12	0	0	0	0	0	0	0
Statistical Differences (+ or -) (12 minus 14)	(-) 13	0	0	0	0	0	0	0
REFINERY INTAKE (Observed)	(=) 14							0

MEMO ITEMS:

of which: Oxygenates	15							0
of which: Liquid Biofuels	16							0
Refinery Losses	17							0

TOTAL STOCKS on NATIONAL TERRITORY

Stock at - Opening	18							0
- Closing	19							0

AVERAGE NET CALORIFIC VALUES: *Unit: kcal/kg*

Indigenous Production	20						
Imports	21						
Exports	22						
Average	23						

AVERAGE SPECIFIC GRAVITIES: *Unit: kg/liter or kg/barrel*

	24						

Table 1 : Definitions of Oil: Crude Oil

- **1. Crude Oil**

  Crude oil is a mineral oil of natural origin comprising a mixture of hydrocarbons and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperature and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. This category includes field or lease condensate recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream.

- **Issues and Difficulties in reporting Crude Oil**
  - **Usually there are not too many problems in applying the definition.**
  - ✓ **Quality: crude oil can be of varying quality, colour, viscosity and mineral content. The two main factors determining the quality are the density and the sulfur content.**
  - ✓ **Density: Heavy crudes will yield less light products and are therefore in general of lesser quality.**
  - ✓ **Sulfur content: Similarly, high sulfur crudes need desulphurization and are often less valuable. Terms uses for high sulfur crudes is sour crudes, low sulphur are sweet crudes.**

Table 1 : Definitions of Oil: NGL

- **2. Natural Gas Liquids (NGL)**

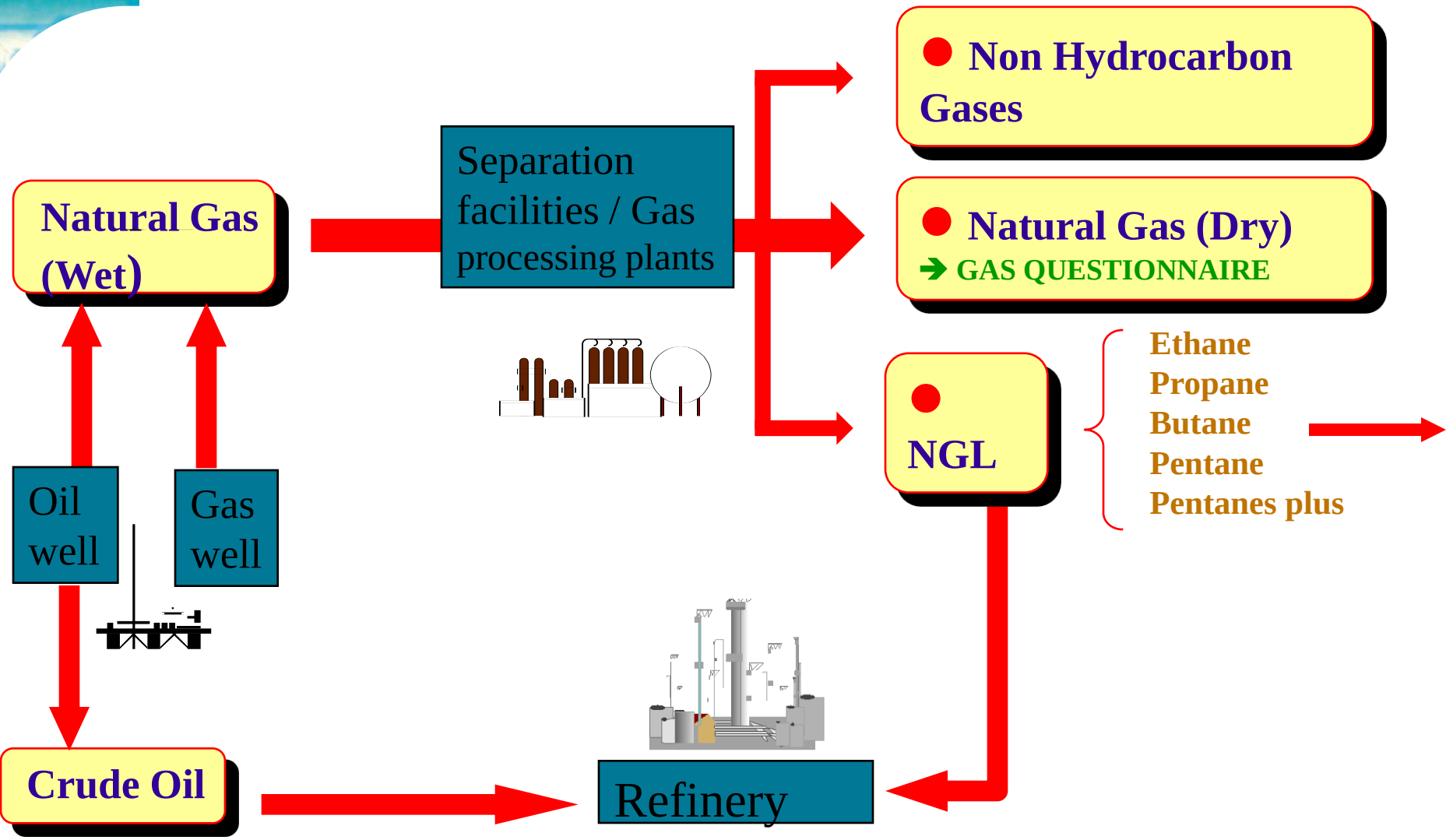
  NGL are liquid or liquefied hydrocarbons recovered from natural gas in separation facilities or gas processing plants. Natural gas liquids include ethane, propane, butane (normal and iso-), (iso) pentane and pentanes plus (sometimes referred to as natural gasoline or plant condensate).

- **Issues and Difficulties in reporting NGL**

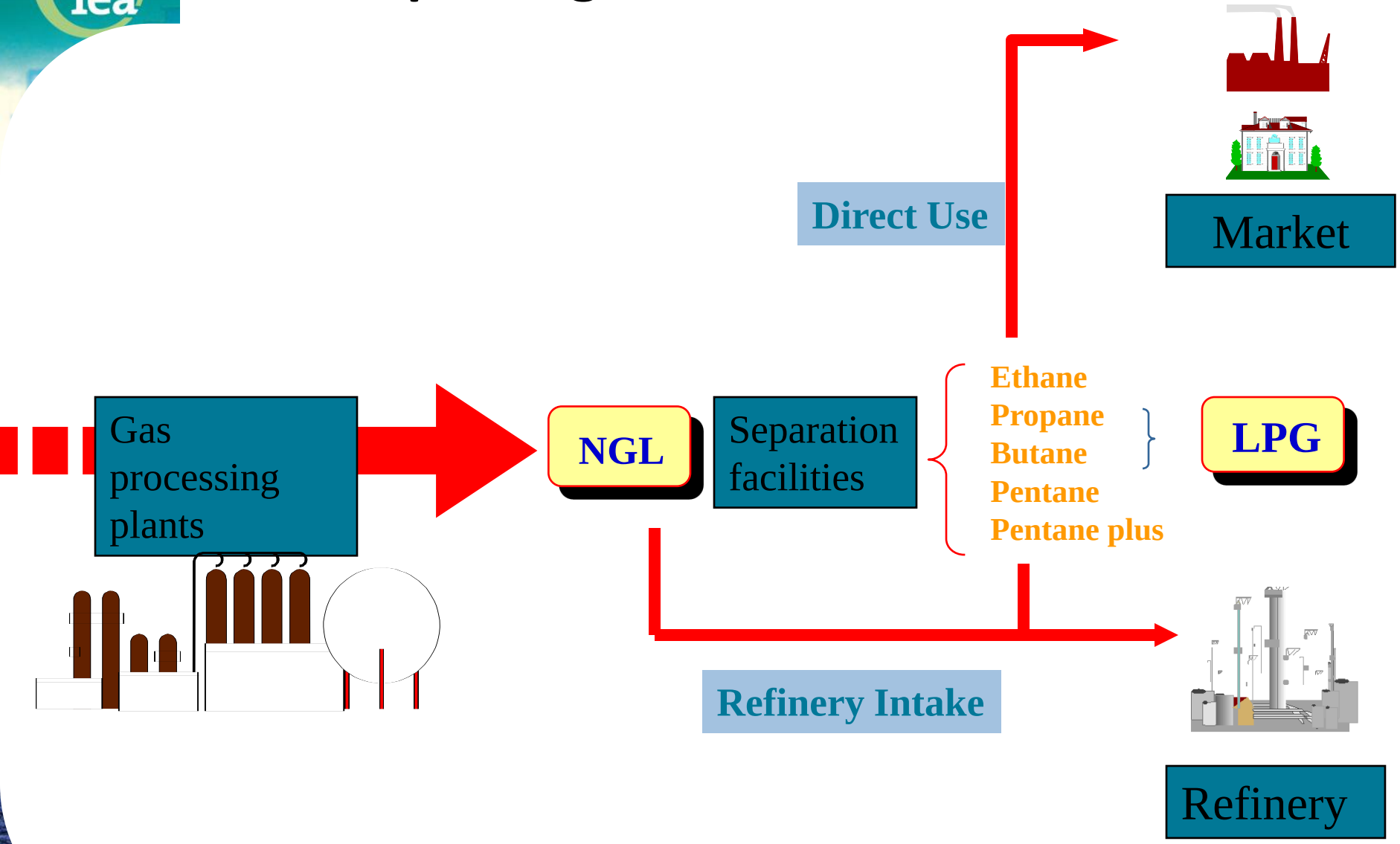
  Quite a lot of difficulties occur when reporting NGL:

  - ✓ **Natural gas liquids encompass a variety of hydrocarbons from ethane to pentanes but not methane (natural gas). They are produced from gas wells, and are separated in gas processing plants. This, because NGLs are produced have usually more value on their own than when left in the natural gas. After NGLs are removed from natural gas, they are reprocessed in a unit called a fractionator to break them out for individual sale as propane, butane and other products.**
  - ✓ **Problem: how to report NGL which is not used as feedstock in refineries.**

Crude Oil and NGL



NGL Reporting



Oil Product Flow Chart

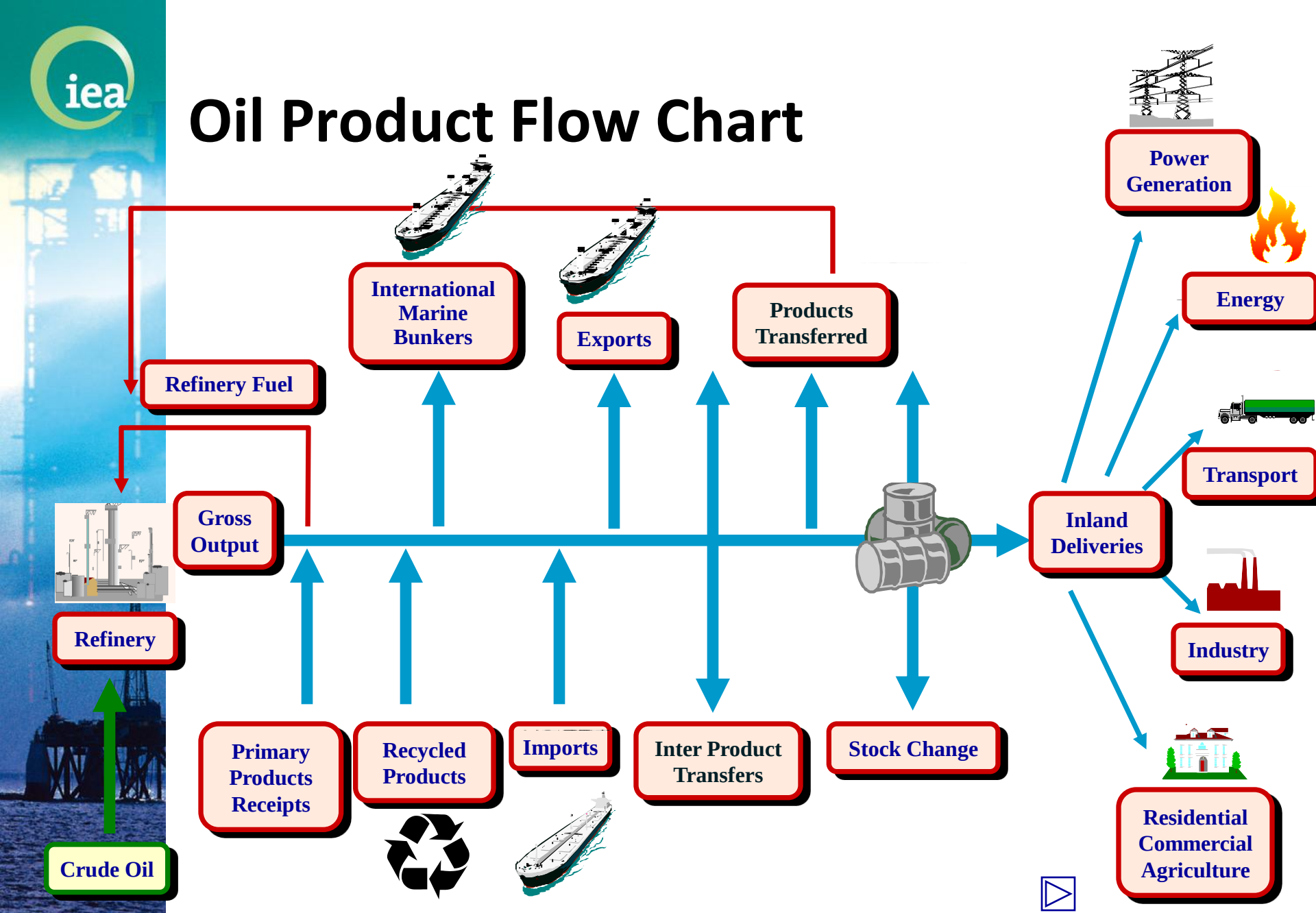


Table 2: Supply of Finished Products

TABLE = 2a

SUPPLY OF FINISHED PRODUCTS (1)

YEAR = 2010

Menu

Country

Unit: Thousand Metric Tons

		Crude Oil	Natural Gas Liquids	Refinery Gas (not liq.)	Ethane	LPG	Naphtha	Motor Gasoline	*Of which Biogasoline*	Aviation Gasoline	Gasoline Type Jet Fuel	Kerosene Type Jet Fuel	Other Kerosene
		A	B	C	D	E	F	G	H	I	J	K	L
Primary Product Receipts (2)	(+) 1												
Gross Refinery Output (3) (including refinery fuel)	(+) 2												
Recycled Products	(+) 3												
Refinery Fuel	(-) 4												
Total Imports (4)	(+) 5												
Total Exports (5)	(-) 6												
Intl. Marine Bunkers	(-) 7												
Interproduct Transfers (6) (+ or -)	(+) 8												
Products Transferred (7)	(-) 9												
Stock Change (+ or -) (8)	(+) 10												
GROSS INLAND DELIVERIES (Calculated)	(=) 11	0	0	0	0	0	0	0	0	0	0	0	0
Statistical Difference (9)	(-) 12			0	0	0	0	0	0	0	0	0	0
GROSS INLAND DELIVERIES (Observed)	(=) 13	0	0	0	0	0	0	0	0	0	0	0	0
STOCK LEVELS:													
Total Stocks on National Territory - Opening	14												
Total Stocks on National Territory - Closing	15												
MEMO:													
Refinery Fuel for - Electricity Generation	16												
Refinery Fuel for - CHP Production	17												
Stock Changes Public Utilities	18												
MEMO:													
Net Calorific Value of Gross Inland Deliveries (kJ/kg)	19												

1. Includes Crude Oil and indigenous NGL which does not pass through an oil refinery.
2. This mainly concerns Crude Oil (indigenous or imported) and indigenous NGL which does not pass through an oil refinery.
   Total Product Receipts on Table 2A (cell X1) should be equal to Total Direct Use on Table 1 (cell G7).
3. Total Gross Refinery Output on Table 2A (cell X2) should be equal to Observed Refinery Intake on Table 1 (cell G11) minus Refinery Losses on Table 1 (cell G12).
4. Should correspond to Total Imports on Table 4.
5. Should correspond to Total Exports on Table 5.
6. Must add to zero in cell X8 on Table 2A.
7. For definition see instructions for completing Individual Tables (Table 2A). Total (cell X9) must equal Total Product Transfers on Table 1 (cell G4).
8. Opening Stock Level minus Closing Stock Level (row 14 minus row 15). Figures may have positive or negative signs.
9. Statistical Differences occur when independent figures for Gross Inland Deliveries are available and are different to those calculated. The sign of the differences can be positive or negative.
10. Report that part of refinery fuel included in the row above (4) which is used to produce electricity and/or heat.

Table 2 : Definitions of Oil: LPG

- **9. Liquefied Petroleum Gases (LPG)**

  LPG are light paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane (C3H8) and butane (C4Hl0) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.

- **Issues and Difficulties in reporting LPG**

  - ✓ **LPG Volume to Mass conversion is variable for most countries, depending on the combination of use between propane and butane. IEA uses a 40/60 split of propane and butane**
  - ✓ **Confusion often arises with NGL. When it is traded as a finished product, i.e. propane or butane, then it should be reported as LPG.**

Table 2: Definitions of Oil: Naphtha

- **10. Naphtha**

  Naphtha is a feedstock destined for either the petrochemical industry (e.g. ethylene manufacture or aromatics production). Naphtha comprises material in the 30oC and 2l0oC distillation range or part of this range.

  Naphtha imported for blending is reported as an import of naphtha, then shown on the inter-product transfer row, as a negative entry for Naphtha, and a positive entry for the corresponding finished product.

- **Issues and Difficulties in reporting naphtha**
  - ✓ **2 main uses of naphtha: gasoline blend stock and petrochemical feedstock.**

Table 2: Definitions of Oil: Motor Gasoline

- **11. Motor Gasoline**

  Motor gasoline consists of a mixture of light hydrocarbons distilling between 35oC and 215oC. It is used as a fuel for land based spark ignition engines. Motor gasoline may include additives, oxygenates and octane enhancers, including lead compounds such as TEL (Tetraethyl lead) and TML (tetramethyl lead).

- **Issues and Difficulties in reporting motor gasoline**
  - ✓ **Probably best known product – Statistics reporting fairly straightforward.**
  - ✓ **Product well defined and identified in most economies.**
  - ✓ **Blending components should be included.**
  - ✓ **If biogasoline is blended in motor gasoline, the total including biogasoline needs to be reported.**

Table 2: Definitions of Oil:

of which: Biogasoline

- ***12. of which Biofuels***

Amount of biogasoline included in gasoline should be reported.

- **Issues and Difficulties in reporting biofuels**
  - ✓ **Only those amounts of biofuels which will be blended with motor gasoline**

Table 2 : Definitions of Oil: Kerosene Type Jet Fuel

15. Kerosene Type Jet Fuel

This is a distillate used for aviation turbine power units. It has the same distillation characteristics between 150oC and 300oC (generally not above 250oC) and flash point as kerosene. In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA).

This category includes kerosene blending components.

Issues and Difficulties in reporting Jet Kerosene

- ✓ Use of Jet kerosene by international companies
- ✓ should not be shown as an export.
- ✓ Jet Kerosene is a product with very strict specifications,
- ✓ when it loses its properties it is often used as normal kerosene.
- ✓ The line inter-product transfer is used for this.

Table 2: Definitions of Oil: Gas/diesel Oil

- **17. Gas/Diesel Oil (Distillate Fuel Oil)**

  Gas/diesel oil is primarily a medium distillate distilling between 180oC and 380oC, and mainly used for diesel compression ignition (cars, trucks, etc.), usually of low sulphur content.

- **Issues and Difficulties in reporting Gas/Diesel oil**

  - ✓ **2 Types :**
  - ✓ **Transport Diesel: on-road diesel oil for diesel compression engines (cars, trucks, etc). This type of diesel of environmental concerns usually has a low sulphur content.**
  - ✓ **Heating and Other Gasoil: light heating oil for industrial and commercial use, marine diesel and diesel used in rail traffic, other gas oils including some heavy gas oils which distil between 380 degrees and 540 degrees C and which are used as petrochemical feedstock.**
  - ✓ **Diesel used in international marine bunkers**

Table 2: Definitions of Oil: of which Biodiesel

- ***18. of which Biofuels***

  Amount of biodiesel included in gas/diesel oil should be reported.

- **Issues and Difficulties in reporting biodiesel**
  - ✓ **Include quantities of biodiesel which will be blended with transport diesel**

Table 2: Definitions of Oil: Fuel Oil

- **19. Fuel Oil**

  This covers all residual (heavy) fuel oils (including those obtained by blending). Kinematic viscosity is above 10 cSt at 80oC. The flash point is always above 50oC and density is always more than 0.90 kg/l.

- **Issues and Difficulties in reporting Fuel Oil**

  - ✓ **Both Low and High sulphur fuel need to be reported.**
  - ✓ **A large amount of fuel oil is delivered for international marine bunker use.**
  - ✓ **Fuel oil other main use is for power generation and in the industrial sector.**

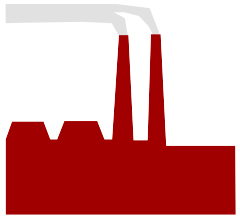


Table 2: Definitions of Oil: Petroleum Coke

- **24. Petroleum Coke**

  Petroleum coke is a black solid by-product, obtained mainly by cracking and carbonising petroleum derived feedstock, vacuum bottoms, tar and pitches in processes such as delayed coking or fluid coking. It consists mainly of carbon (90 to 95%) and has a low ash content. It is used as a feedstock in coke ovens for the steel industry, for heating purposes, for electrode manufacture and for production of chemicals. The two most important qualities are "green coke" and "calcinated coke". This category also includes "catalyst coke" deposited on the catalyst during refining processes; this coke is not recoverable and is usually burned as refinery fuel.

- **Issues and Difficulties in reporting additives/oxygenates**
  - ✓ **Petroleum coke used as feedstock in coke ovens should be reported in the Coke ovens category of the Transformation Sector, because most of it is used to supplement the carbon content and the properties of the coking coal which is used. Some of the petroleum coke may also be used for energy purposes and should then be reported in the Energy Sector - Coke ovens.**
  - ✓ **If it is used for heating it should be reported as energy use in the appropriate sector.**
  - ✓ **It can also be used as non-energy to produce electrodes and carbon black – report it in the relevant industry sector as Non-energy.**

Overview

- Importance of oil in the world
- Introduction
  - ✓ A few concepts e.g. refining, units, conversion, etc
- Definitions of Products
  - ✓ Tables 1 and 2
- Definitions of Flows
  - ✓ Tables 1 and 2
- Definitions of Sectors
  - ✓ Tables 3 and 4

Table 1 - Flows

SUPPLY OF CRUDE OIL, NGL, REFINERY FEEDSTOCKS, ADDITIVES AND OTHER HYDROCARBONS

Unit: Thousand Metric Tons

		Crude Oil	Natural Gas Liquids	Refinery Feedstocks	Additives (1)/ Oxygenates	*Of which Biofuels (1)*	Other Hydrocarbons	**TOTAL (A to F, excl. E)**
		A	B	C	D	E	F	G
Indigenous Production	(+) 1							0
Other Sources	(+) 2							0
Backflows from Petrochemical Industry (2)	(+) 3							0
Products Transferred (3)	(+) 4							0
Total Imports (4)	(+) 5							0
Total Exports (5)	(-) 6							0
Direct Use (includes transfers to consumption) (6)	(-) 7							0
Stock Change (+ or -) (7)	(+) 8							0
REFINERY INTAKE (Calculated) (sum of 1 to 8)	(=) 9	0	0	0	0	0	0	0
Statistical Difference (+ or -) (9 minus 11)	(-) 10	0	0	0	0	0	0	0
REFINERY INTAKE (Observed)	(=) 11							0
MEMO ITEMS:								
Refinery Losses	12							0
STOCK LEVELS:								
Total Stocks on National Territory - Opening	13							0
Total Stocks on National Territory - Closing	14							0

AVERAGE NET CALORIFIC VALUES: *Unit: kJ/kg*

Indigenous Production	15						
Imports	16						
Exports	17						
Average	18						

MEMO ITEMS: From Other Sources:

of which from Coal	19							0
of which from Natural Gas	20							0
of which from Renewables	21							0

1. Please see product definitions.
2. Total (cell G3) should correspond to Total Backflows on Table 2B (cell X5).
3. Total (cell G4) should correspond to Total Products Transferred on Table 2A (cell X9).
4. Should correspond to total imports on Table 4 (cells A101 to G101).
5. Should correspond to total exports on Table 5 (cells A94 to G94).
6. Should be carried over to Primary Product Receipts on Table 2A (row 1).
7. Opening Stock Level minus Closing Stock Level (row 13 minus row 14).

Crude, NGL and Feedstocks Balance

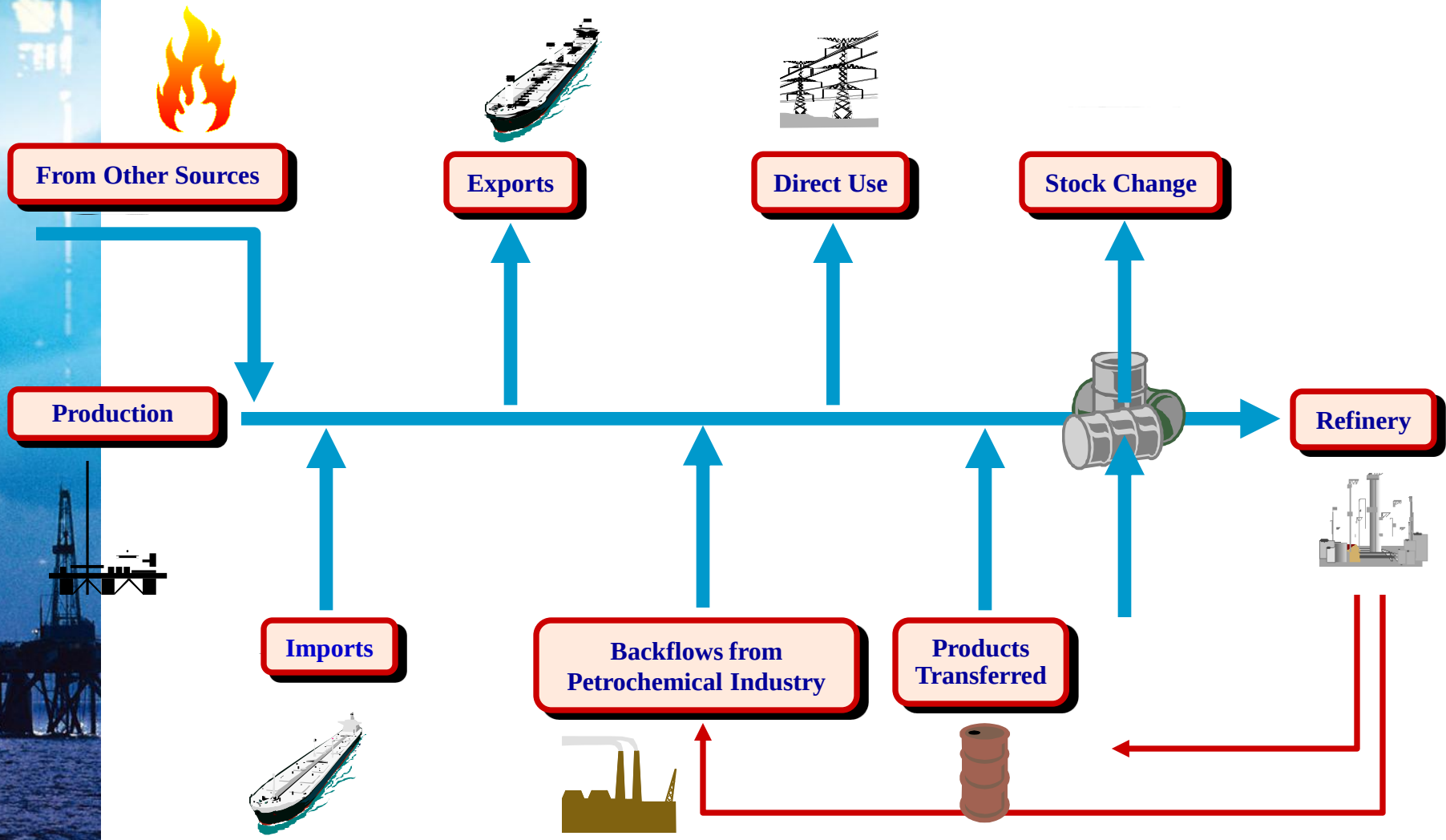


Table 1 : Flow Definitions

- **Indigenous Production:**

  Report all production within national boundaries including off-shore production. Production should only include marketable production, excluding volumes returned to formation. Such production should include all crude oil, NGL, condensates and oil from shale and tar sands, etc. It should also include the receipts of additives/oxygenates by refineries and blending plants from outside the refinery sector.

- **Important:**

  Marketable production: exclude volumes which are recycled or returned to the wells.
  Onshore and off-shore production
  Primary production includes oil from shale and tarsands

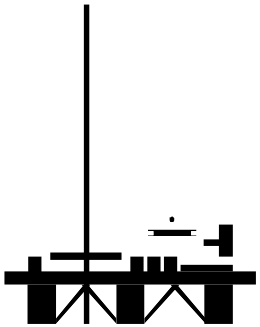


Table 1 : Flow Definitions

- **From other sources:**

  Report supplies of Additives, *Biofuels* and Other Hydrocarbons, the production of which has already been covered in other fuel balances e.g. in NZ the manufacture of synthetic gasoline requires natural gas as feedstock. The amount of gas for methanol manufacture is accounted for in the natural gas balance, while the receipts of methanol are reported as inputs `from gas as other sources' in the oil balance. The other sources are divided to three sources below;

  - ***From Coal: Additives and other hydrocarbons produced from coal***
  - ***From Gas: Additives and other hydrocarbons produced from gas***
  - ***From Renewable: Additives, biofuels and other hydrocarbons produced by renewable energy***

- **Important:**

  To account for all oil and additives entering the market it is essential to capture the inputs from other energy forms which are blended with oil and oil products

Table 1 : Flow Definitions

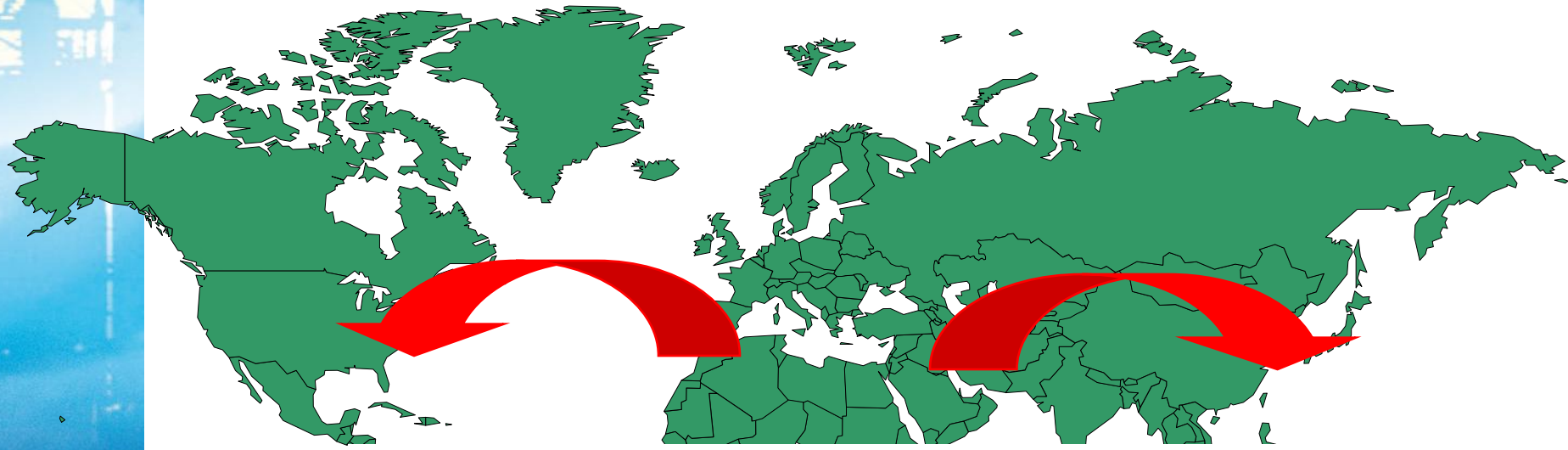
- **Imports and Exports:**

  Data should reflect amounts having crossed the national territorial boundaries, whether customs clearance has taken place or not. Quantities of crude oil and products imported or exported under processing agreements (i.e. refining on account) should be included. Crude oil and NGLs should be reported as coming from the country of ultimate origin; refinery feedstocks and finished products should be reported as coming from the country of last consignment. Any gas liquids (e.g. LPG) extracted during the regasification of imported liquefied natural gas should be included as imports in this questionnaire. Petroleum products imported or exported directly by the petrochemical industry should be included.

- ***Note: Imports or exports of ethanol (reported in the Additives/Oxygenate column) should relate to the quantities destined for fuel use.***

- ***- Re-exports of oil imported for processing within bonded areas should be included as an export of product from the processing country to the final destination.***

Table 1 : Flow Definitions: Imports and Exports



- Imports and Exports
- Important
  - Physical flow (not customs flows)
  - Crude Oil, NGL: country of origin
  - Oil products: country of last consignment
  - Transit trade not included
  - Include imports by large industries
  - e.g. Petrochemical industry

Table 1 : Flow Definitions

- **Total stocks on national territory:**

  All stocks on national territory, including stocks held by governments, by major consumers or by stockholding organisations, stocks held on board incoming ocean vessels, stocks held in bonded areas and stocks held for others, whether under bilateral government agreement or not.

- **Important:**
  - **It is important that an as complete as possible statement is made of oil stocks in your economy. (emergency and security purposes)**
  - **Stocks are reported on a geographical basis, i.e. report stocks on your national territory.**
  - **All stocks (primary and secondary) should be included except consumer stocks (tertiary stocks)**
  - **Include stocks held for strategic purposes, or under government control.**

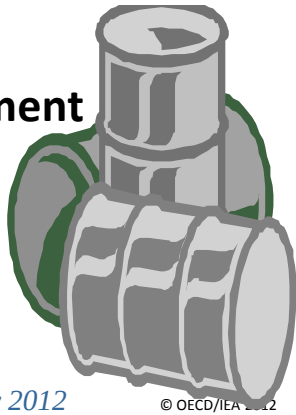


Table 1 : Flow Definitions

- **Stock Changes:**

  Stock changes should reflect the difference between opening stock level and closing stock level for stocks held on national territory. A stock build is shown as a negative number, and a stock draw as a positive number.

- **Important:**

Opening Stock level
- Closing Stocks level
= Stock Change

+	**Stock reduction**	-	**Stock increase**

Table 1 : Flow Definitions

- **Refinery Intake (observed):**
  - **This is defined as the total amount of oil (including other hydrocarbons and additives) observed to have entered the refinery process.**
- **Important**
  - **This flow is usually well known and monitored by the refineries**
  - **The information is usually quite easy to obtain**
  - **Refineries need to include all their inputs, crude oil, NGL refinery feedstock transfers, additives and oxygenates, biofuels and other hydrocarbons**

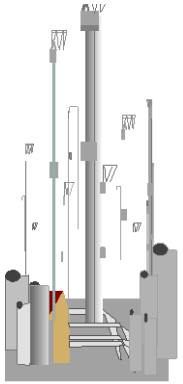


Table 1 : Flow Definitions

- **Statistical Differences:**

  This is the difference between calculated and observed Refinery Intake.

- **Important**

Refinery Intake Calculated
- Refinery Intake Observed
= Statistical Difference

TABLE = 2a

SUPPLY OF FINISHED PRODUCTS (1)

YEAR = 2010

Menu

Country

		Crude Oil	Natural Gas Liquids	Refinery Gas (not liq.)	Ethane	LPG	Naphtha	Motor Gasoline
		A	B	C	D	E	F	G
Primary Product Receipts (2)	(+) 1							
Gross Refinery Output (3) (including refinery fuel)	(+) 2							
Recycled Products	(+) 3							
Refinery Fuel	(-) 4							
Total Imports (4)	(+) 5							
Total Exports (5)	(-) 6							
Intl. Marine Bunkers	(-) 7							
Interproduct Transfers (6) (+ or -)	(+) 8							
Products Transferred (7)	(-) 9							
Stock Change (+ or -) (8)	(+) 10							
GROSS INLAND DELIVERIES (Calculated)	(=) 11	**0**	**0**	**0**	**0**	**0**	**0**	
Statistical Difference (9)	(-) 12			0	0	0	0	
GROSS INLAND DELIVERIES (Observed)	(=) 13	**0**	**0**	**0**	**0**	**0**	**0**	
STOCK LEVELS:								
Total Stocks on National Territory - Opening	14							
Total Stocks on National Territory - Closing	15							
MEMO:								
Refinery Fuel for - Electricity Generation	16							
Refinery Fuel for - CHP Production	17							
Stock Changes Public Utilities	18							
MEMO:								
Net Calorific Value of Gross Inland Deliveries (kJ/kg)	19							

1. Includes Crude Oil and indigenous NGL which does not pass through an oil refinery.
2. This mainly concerns Crude Oil (indigenous or imported) and indigenous NGL which does not pass through an oil refinery.
   Total Product Receipts on Table 2A (cell X1) should be equal to Total Direct Use on Table 1 (cell G7).
3. Total Gross Refinery Output on Table 2A (cell X2) should be equal to Observed Refinery Intake on Table 1 (cell G11) minus Refinery Losses on Table 1 (cell G1
4. Should correspond to Total Imports on Table 4.
5. Should correspond to Total Exports on Table 5.
6. Must add to zero in cell X8 on Table 2A.
7. For definition see instructions for completing Individual Tables (Table 2A). Total (cell X9) must equal Total Product Transfers on Table 1 (cell G4).
8. Opening Stock Level minus Closing Stock Level (row 14 minus row 15). Figures may have positive or negative signs.
9. Statistical Differences occur when independent figures for Gross Inland Deliveries are available and are different to those calculated. The sign of the differenc
10. Report that part of refinery fuel included in the row above (4) which is used to produce electricity and/or heat.

Oil Product Flow Chart

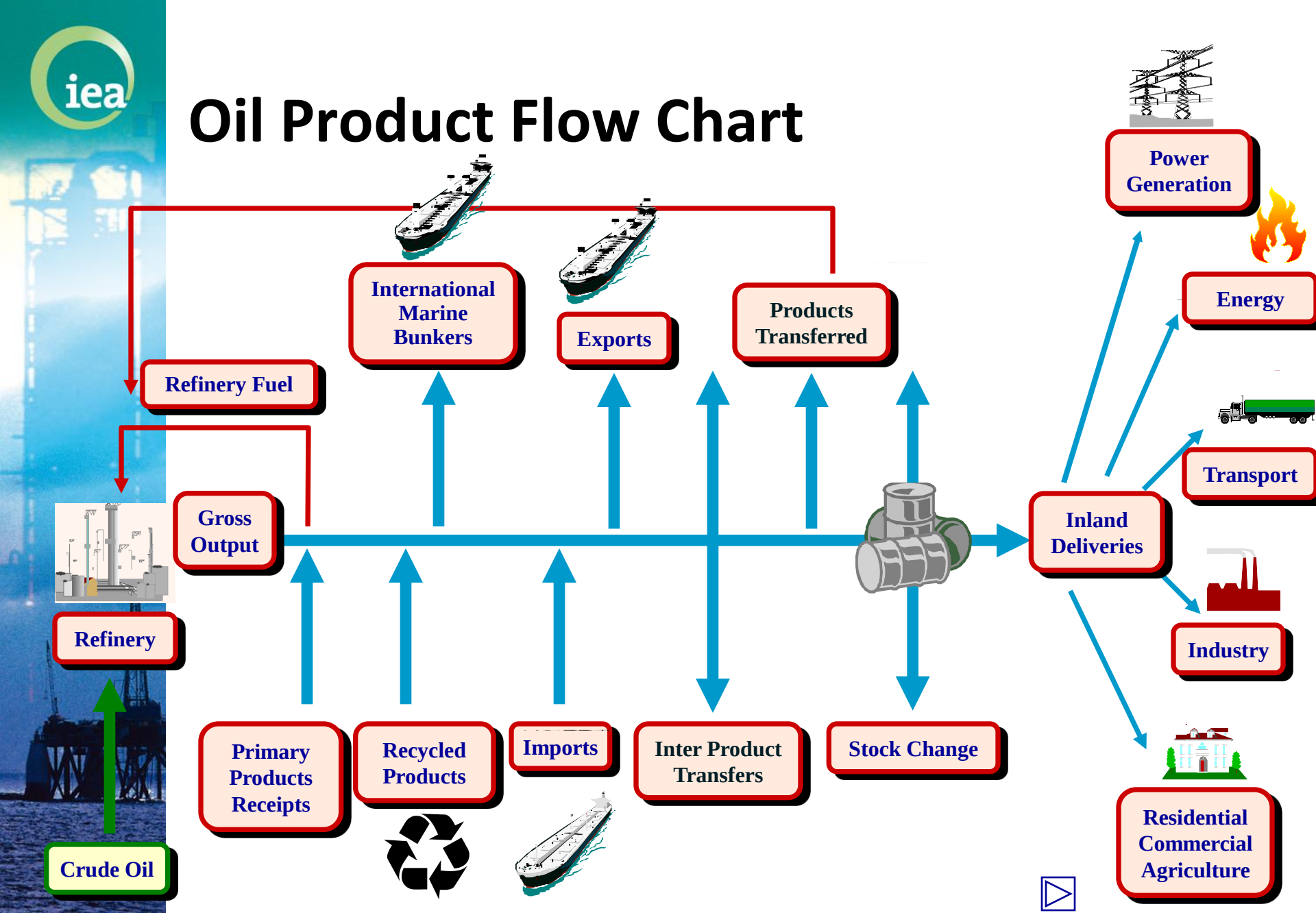


Table 2: Flow Definitions

- **Gross Refinery Output:**

  This is production of finished products at a refinery or blending plant. This category excludes Refinery Losses, but includes Refinery Fuel.

- **Important**

  - **As refinery intake, this flow is information that refineries monitor very well, and the data is usually easily available.**
  - **Note that refinery output is Gross: i.e. it includes the amount of oil used for the operation of the refinery (or refinery fuel).**

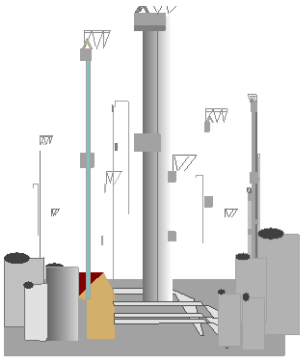


Table 2: Flow Definitions

- **Refinery Fuel:**

  These are all petroleum products consumed in support of the *operation* of a refinery. This should not include products used by oil companies outside the refining process, e.g. bunkers or oil tankers. Fuels used for the production at the refineries of electricity and heat sold should also be included in this category.

- **Important**

  - **The most frequently used refinery fuel product is refinery gas, some fuel oil and to a lesser extent gas/diesel oil are also used.**
  - **Refineries should be able to provide this information. On average about 6 to 7 % of the fuel intake is used as refinery fuel**

Table 2: Flow Definitions

- **International Marine Bunkers:**

  Bunkers cover the quantities of fuels delivered to sea-going ships of all flags. Consumption of warships should be included in Final Consumption under Other Sector, Not Elsewhere Specified. Consumption by ships engaged in fishing and in transport in inland and coastal waters is not included.

- **Important**

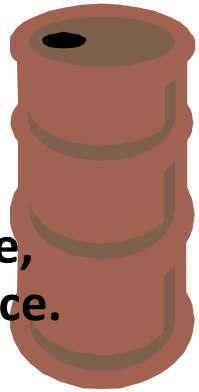
  - **These are deliveries of oils to ships for consumption during international voyages**
  - **The oils are used as fuel by the ship and are not part of the cargo.**
  - **Ships must be undertaking international voyages, i.e. their first port of call must be aforeign country.**

Table 1 : Flow Definitions

- **Products Transferred:**

  These are imported petroleum products which are reclassified as feedstocks for further processing in the refinery, without delivery to final consumers. For example, naphtha imported for upgrading would be first reported as imports of naphtha, and then appear also as products transferred of naphtha.

- **Important:**
  - **Oils which are reclassified under another name.**
  - **The flow is reported in the Refinery Balance and in the Product balance**
  - **Transfers are negative quantities in the product balance, but are shown as positive receipts in the refinery balance.**



Product Transferred

Table 1

		Crude Oil	Natural Gas Liquids	Refinery Feedstocks	Additives/ [1] Oxygenates	Other Hydrocarbons	TOTAL (A to E)
		A	B	C	D	E	F
Indigenous Production	(+) 1						
Other Sources	(+) 2						
Backflows from Petrochemical Industry [2]	(+) 3						
Products Transferred [3]	(+) 4			**1800**			**1800**
Total Imports [4]	(+) 5						
Total Exports [5]	(-) 6						
Direct Use (includes transfers to consumption) [6]	(-) 7						
Stock Change (+ or -) [7]	(+) 8						
REFINERY INTAKE (Calculated) (sum of 1 to 8)	(=) 9						
Statistical Difference (+ or -) (9 minus 11)	(-) 10						
REFINERY INTAKE (Observed)	(=) 11						

Table 2A

		TOTAL
		W
Primary Product Receipts [2]	(+) 1	
Gross Refinery Output [3] (including refinery fuel)	(+) 2	
Recycled Products	(+) 3	
Refinery Fuel	(-) 4	
Total Imports [4]	(+) 5	
Total Exports [5]	(-) 6	
Intl. Marine Bunkers	(-) 7	
Interproduct Transfers [6] (+ or -)	(+) 8	
Products Transferred [7]	(-) 9	**1800**
Stock Change (+ or -) [8]	(+) 10	
GROSS INLAND DELIVERIES (calculated)	(=) 11	
Statistical Difference [9]	(-) 12	
GROSS INLAND DELIVERIES (observed)	(=) 13	

e.g., of which

- **Naphtha 120**
- **Gasoil 1100**
- **Other 580**

Should be equal!

Table 2: Flow Definitions

- **Gross Inland Deliveries (observed):**

  This is the observed delivery of finished petroleum products from primary sources (e.g. refineries, blending plants, etc.) to the inland market. This figure may differ from the calculated figure due, for example, to differences in coverage and/or differences of definition in different reporting systems.

- **Important**
  - **Gross inland deliveries are a measure of what is consumed in your economy**
  - **Inland deliveries, as this flow excludes international marine bunkers (inland) and refinery fuel (deliveries)**
  - **Gross Inland deliveries as it still includes the gross deliveries to the petrochemical plants. When the backflows are deducted, then it becomes Net inland deliveries.**

Overview

- Importance of oil in the world
- Introduction
  - ✓ A few concepts e.g. refining, units, conversion, etc
- Definitions of Products
  - ✓ Tables 1 and 2
- Definitions of Flows
  - ✓ Tables 1 and 2
- Definitions of Sectors
  - ✓ Tables 3 and 4

Table 3 : Gross Inland Deliveries by sector

Gross Inland Deliveries

- Transformation Processes
- Energy industry own use
- Losses
- Final Consumption
  - Transport Sector
  - Industry Sector
  - Other Sectors

Memo: Non-Energy Use

		Crude Oil	Natural Gas Liquids	Refinery Gas (not liq.)	Ethane	LPG	Naphtha
		A	B	C	D	E	F
GROSS INLAND DELIVERIES (1)	1	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL TRANSFORMATION SECTOR	2	**0**	**0**	**0**	**0**	**0**	**0**
Main Activity Producer Electricity Plants (2)	3						
Autoproducer Electricity Plants (3)	4						
Main Activity Producer CHP Plants (2)	5						
Autoproducer CHP Plants (3)	6						
Main Activity Producer Heat Plants (2)	7						
Autoproducer Heat Plants (3)	8						
Gas Works	9						
For Blended Natural Gas	10						
Coke Ovens	11						
Blast Furnaces	12						
Petrochemical Industry	13						
Patent Fuel Plants	14						
Non-specified (Transformation)	15						
TOTAL ENERGY SECTOR	16	**0**	**0**	**0**	**0**	**0**	**0**
Coal Mines	17						
Oil and Gas Extraction	18						
Coke Ovens	19						
Blast Furnaces	20						
Gas Works	21						
Own Use in Electricity, CHP and Heat Plants	22						
Non-specified (Energy)	23						
Distribution Losses	24						

Transformation

Quantities of fuel that will be transformed into another energy form

TOTAL TRANSFORMATION SECTOR
Main Activity Producer Electricity Plants (2)
Autoproducer Electricity Plants (3)
Main Activity Producer CHP Plants (2)
Autoproducer CHP Plants (3)
Main Activity Producer Heat Plants (2)
Autoproducer Heat Plants (3)
Gas Works
For Blended Natural Gas
Coke Ovens
Blast Furnaces
Petrochemical Industry
Patent Fuel Plants
Non-specified (Transformation)

- **Main Activity Producer Plants**: plants that are either owned by public or private utilities but for which the main activity is to produce power
- **Autoproducers:** plants which activity is not only to produce power, their main activity is e.g industrial activity

Transformation processes

What needs to be reported?

TOTAL TRANSFORMATION SECTOR
Main Activity Producer Electricity Plants (2)
Autoproducer Electricity Plants (3)
Main Activity Producer CHP Plants (2)
Autoproducer CHP Plants (3)
Main Activity Producer Heat Plants (2)
Autoproducer Heat Plants (3)
Gas Works
For Blended Natural Gas
Coke Ovens
Blast Furnaces
Petrochemical Industry
Patent Fuel Plants
Non-specified (Transformation)

- **Main Activity Producer Plants: all fuel used for all production**
- **Autoproducers: all fuel used for all electricity produced and only fuel used for heat sold only**

Energy industry own use

Quantities of fuel that will be consumed to support the oil and gas extraction or the transformation activity

TOTAL ENERGY SECTOR
Coal Mines
Oil and Gas Extraction
Coke Ovens
Blast Furnaces
Gas Works
Own Use in Electricity, CHP and Heat Plants
Non-specified (Energy)

Natural Gas Blending Plants: Report own consumption of oil in process for blending natural gas

Biofuel Processing: Report own consumption of oil in biofuel plants

Note : Oil consumed in support of the operation of oil and gas pipelines should be reported in the Transportation sector.

Distribution losses

Losses which occur outside the refinery due to transport and distribution, including pipeline.

Distribution Losses	27

This includes tanker spills e.g 1989 Exxon Valdez at the Alaska Coast, pipeline leakage, train car derailments and tanker and truck accidents.

Note: Sometimes distribution losses are included in statistical differences

Final Consumption

FINAL CONSUMPTION	1
TOTAL TRANSPORT SECTOR	2
International Civil Aviation	3
Domestic Air Transport	4
Road	5
Rail	6
Inland Waterways	7
Pipeline Transport	8
Not Elsewhere Specified (Transport)	9
TOTAL INDUSTRY SECTOR	10
Iron and Steel	11
Chemical (incl.Petro-Chemical)	12
Non Ferrous Metals	13
Non Metallic Mineral Products	14
Transportation Equipment	15
Machinery	16
Mining and Quarrying	17
Food, Beverages and Tobacco	18
Pulp, Paper and Printing	19
Wood and Wood Products	20
Construction	21
Textiles and Leather	22
Not Elsewhere Specified (Industry)	23
TOTAL OTHER SECTOR	24
Commerce and Public Services	25
Residential	26
Agriculture	27
Fishing	28
Not Elsewhere Specified (Others)	29

MEMO ITEM: *Below categories are already included in the above sectorial breakdown.*

TOTAL NON-ENERGY USE	30
Transformation Sector	31
Energy Sector	32
Transport Sector	33
Industry Sector	34
of which: Chemical (incl. petrochem.)	35
Other Sector	36

- ✓ **All energy delivered to final consumers: in the Transport, Industry and Other sectors**
- ✓ **Energy and Non-energy use**

- ➢ **Transport Sector**
- ➢ **Industry Sector**
- ➢ **Other**
- ➢ **Non-Energy** (separately, included above)

Transport Sector

Oil used for transport activity, regardless of the sector

TOTAL TRANSPORT SECTOR	2
International Civil Aviation	3
Domestic Air Transport	4
Road	5
Rail	6
Inland Waterways	7
Pipeline Transport	8
Not Elsewhere Specified (Transport)	9

International Civil Aviation: all consumption of aviation fuels other than for domestic aircraft activities.

Domestic Air Transport: consumption of aviation fuels by domestic aircraft - commercial, private, agricultural, etc.; include oil used for purposes other than flying, e.g. bench-testing of engines. ***It excludes use by airlines of motor-spirit for their road vehicles. Military use of aviation fuels also should be excluded here.***

➢ Breakdown ***International*** / ***Domestic*** Air Transport VERY important for the **CO2 calculation**

Note: Oil consumed for heating and lighting at stations and airports should be reported in the Commercial sector and **not** in the Transport sector.

Transport Sector (2)

Oil used for transport activity, regardless of the sector

TOTAL TRANSPORT SECTOR	2
International Civil Aviation	3
Domestic Air Transport	4
Road	5
Rail	6
Inland Waterways	7
Pipeline Transport	8
Not Elsewhere Specified (Transport)	9

Road: exclude gasoline used in stationary engines (incl Other sector) and diesel oil for non-highway use in tractors (incl Agriculture).
Lubricants for use in road vehicles should be included here. Bitumen for use in road surfacing and gasoil for engines at construction sites should not be incl but in Industry subsector Construction.
Rail: oil for rail traffic, including industrial railways.
Inland Waterways: oil used for inland waterways and by coastal shipping, e.g. small craft, barges, coastal ships not incl on International Marine Bunkers.
Pipeline Transport: oil consumed in support of the operation of pipelines.
Not Elsewhere Specified: Report transport activities not included elsewhere.

Industry Sector

Oil used by industrial undertakings in support of their primary activities

TOTAL INDUSTRY SECTOR	10
Iron and Steel	11
Chemical (incl.Petro-Chemical)	12
Non Ferrous Metals	13
Non Metallic Mineral Products	14
Transportation Equipment	15
Machinery	16
Mining and Quarrying	17
Food, Beverages and Tobacco	18
Pulp, Paper and Printing	19
Wood and Wood Products	20
Construction	21
Textiles and Leather	22
Not Elsewhere Specified (Industry)	23

Report quantities of oil consumed for autoproducer heat (Heat) and (CHP) that is not sold but used by the plant itself.

oil consumed for the production of heat that is sold, and for all production of electricity, should be in the transformation sector.

Chemical (incl Petrochem) should be reported net of backflows. Backflows are reported in the Transformation Sector

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Other Sectors

Oil used by the Other Sectors

TOTAL OTHER SECTOR	24
Commerce and Public Services	25
Residential	26
Agriculture	27
Fishing	28
Not Elsewhere Specified (Others)	29

Commercial and Public Services: Oil consumed by businesses and offices in the public and private sectors.

Residential: all consumption by households including households with employed persons.

Agriculture: oil consumption by users classified as agriculture, hunting and forestry.

Fishing: *Report oil consumption by users classified as fishing (inland, coastal and deep-sea fishing) and aquaculture. Fishing ships of all flags including international fishing should be covered.*

Not Elsewhere Specified: *Report activities not included elsewhere. Fuel consumption by road vehicles of airlines and all military activities are also reported here.*

Non – Energy Use

Energy products used as raw materials in the different sectors; i.e. not consumed as a fuel or transformed into another fuel.

MEMO ITEM: *Below categories are already includ*

TOTAL NON-ENERGY USE	30
Transformation Sector	31
Energy Sector	32
Transport Sector	33
Industry Sector	34
of which: Chemical (incl. petrochem.)	35
Other Sector	36

Non-energy use in the chemical and petrochemical industry: should include feedstocks used for the purpose of producing ethylene, propylene, butylene, synthesis gas, aromatics, butadiene and other hydrocarbon-based raw materials in processes such as steam cracking, aromatics plants and steam reforming.

Thank you!