# Units and Measures used in the International Petroleum Industry.


**Lecture # 2**

# Lecture 2

1. The measurements used in international energy  trstatistics
2. Main terms and acronyms of international oil & gas industry


# 1. The measurements used in international energy statistics

# Measures used for:

1. Oil
2. Gas
3. Coal
4. Primary energy

# Oil measures

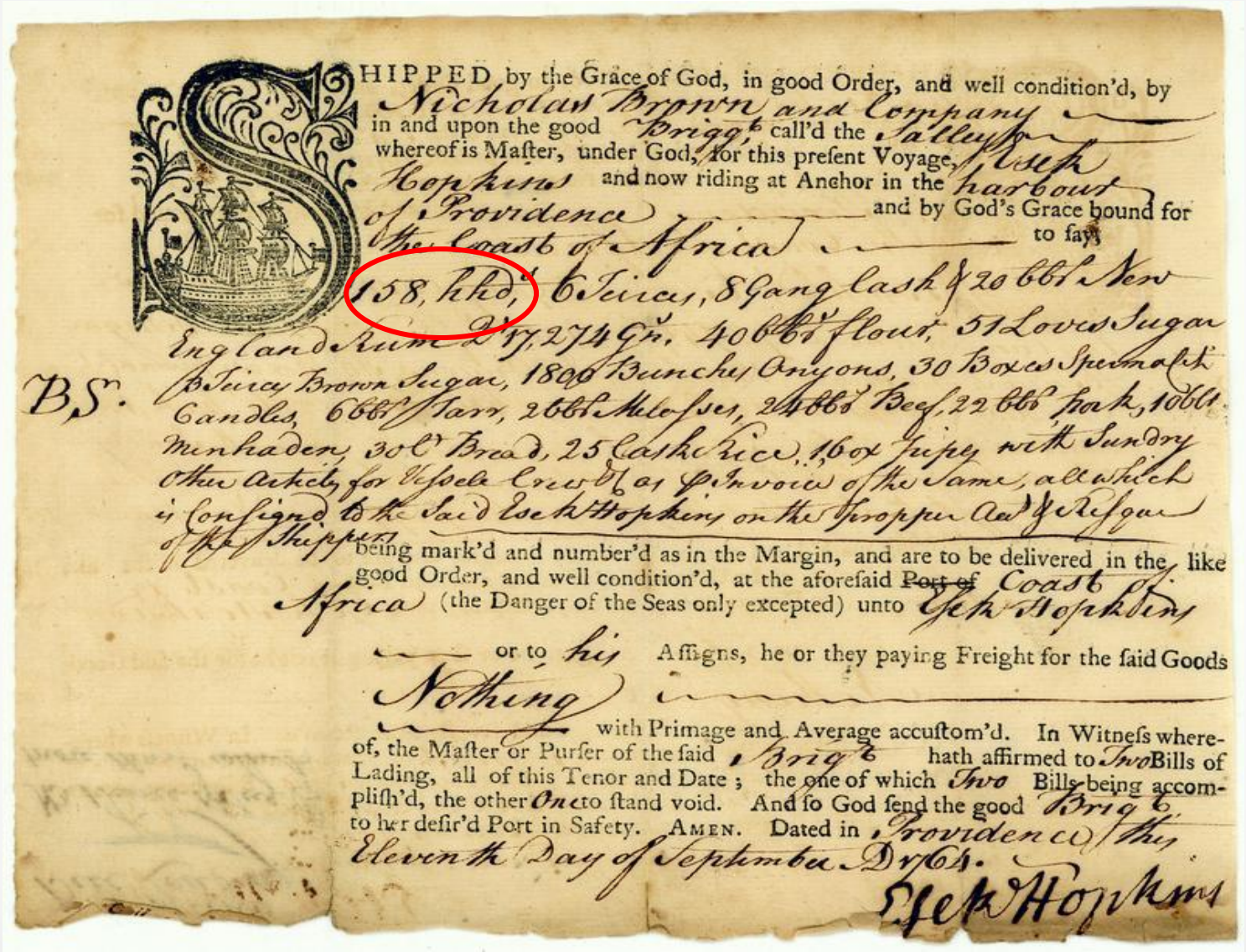
1. **Barrel (Bbl) –** unit of volume, equal to **159** liters
2. **Ton (metric)** – unit of mass equal to **1000 kg**
3. **US gallon (gal) -** is a measure of **liquid capacity** equal to **3.8** liters
4. **Kilolitre** - is a metric **unit of volume** or capacity equal to **1000** liters

# OIL

- **Bbl – blue barrel =** 158.987294928 L

**Basic version**:
Prior to 1872 - there were no any standards for oil measures.
In 1872 *Standard oil* company owned by J. Rockefeller began to ship kerosene in blue barrels.
Since 1872, blue barrel (159 liters or 42 gallons) was taken as the national standard.

# Version #2: Acronym Bbl is much older



SHIPPED by the Grace of God, in good Order, and well condition'd, by Nicholas Brown and Company in and upon the good Brigt call'd the Sally whereof is Master, under God, for this present Voyage, Esek Hopkins and now riding at Anchor in the harbour of Providence and by God's Grace bound for the Coast of Africa to say:

158 Hhd. 6 Tierces, 8 Gang Cask & 20 Bbls New England Rum 27,274 Gn. 40 Bbls flour, 51 Loves Sugar 8 Tierces Brown Sugar, 1800 Bunches Onyons, 30 Boxes Spermaceti Candles, 6 Bbls Starr, 2 Bbls Molasses, 24 Bbls Beef, 22 Bbls Pork, 10 Bbls Menhaden, 30 Cr Bread, 25 Casks Rice, 1 Box Supply with Sundry other Articles for Vessels Crew &c as p Invoice of the Same, all which is Consigned to the said Esek Hopkins on the Proper Acct & Risque of the Shippers, being mark'd and number'd as in the Margin, and are to be delivered in the like good Order, and well condition'd, at the aforesaid Port of Coast of Africa (the Danger of the Seas only excepted) unto Esek Hopkins or to his Assigns, he or they paying Freight for the said Goods Nothing with Primage and Average accustom'd. In Witness whereof, the Master or Purser of the said Brigt hath affirmed to Two Bills of Lading, all of this Tenor and Date; the one of which Two Bills being accomplish'd, the other One to stand void. And so God send the good Brigt to her desir'd Port in Safety. AMEN. Dated in Providence the Eleventh Day of September Dr 1764.

Esek Hopkins

B S.

- The Sally brig Manifesto, 1764: ***bbl*** already used in the text

# Metric tone

- The **tonne** (SI symbol: **t**) is a metric system unit of mass equal to 1,000 kilograms.
- The SI symbol for the tonne is "**t**".
- Non-approved abbreviations for tonne and "metric ton" include **"T"**, **"mT"**, **"MT"**, and "**mt**" (can be confused with million t or 1000 T)
- "**Mt**" is the SI symbol for megatonne.

# Tone of oil equivalent (TOE)

- The **tonne of oil equivalent** (**toe**) is a unit of energy: the amount of energy released by burning one tonne of crude oil.
- Approximately 42 GJ (as different crude oils have different calorific values),
- **Mtoe – Million tone of oil eq.**
- 1 toe = 11.63 megawatt hours
- 1 toe = 41.87 gigajoules
- 1 toe = 39,683,205.411 BTU
- 1 toe = 7.11, 7.33, or 7.4 barrel of oil equivalent (boe)
- 1 tonne petroleum equivalent (**TPE**), as used in renewable energy = 45.217 GJ (gigajoules).

# BOE

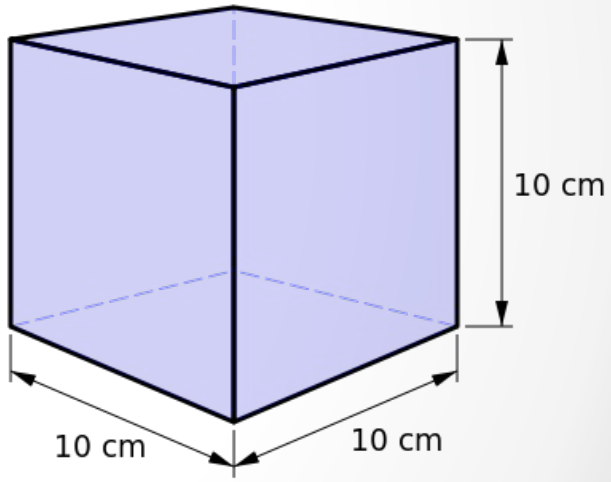
- **BOE -** The **barrel of oil equivalent** is a unit of energy based on the approximate energy released by burning one barrel of crude oil =
- Approximately is $6.1178632 \times 10^9$ J (6,12 GJ (HHV)) – 5,4 GJ (LHV)
- **MMboed** (or MMBOED, MMboepd), used to measure **daily** production and consumption,
- **BBOe** (also BBOE) or billion barrel of oil equivalent, representing $10^9$ barrels of oil, used to measure petroleum **reserves.**

# US liquid gallon

- Is a measure of **liquid capacity** in both the US customary units and the British imperial systems of measurement
- Is equal to 3.79 liters is legally defined as 231 cubic inches.
- In order to overcome the effects of expansion and contraction with temperature when using a gallon to specify a quantity of material for purposes of trade, it is common to define the **temperature** at which the material will occupy the specified volume. For example, for purposes of trade, the **volume of petroleum products** is referenced to 60 °F (**16 °C)**.

# Kilolitre

- **kilolitre** - a metric unit of volume or capacity equal to 1000 liters
- The **litre** (International spelling as used by the International Bureau of Weights and Measures) or **liter** (American spelling) (SI symbols **l** or **L**) is a unit of volume equal to 1 cubic decimetre ($dm^3$), 1,000 cubic centimetres ($cm^3$) or 1/1,000 cubic metre



# Oil measures

| Used in/Unit | Barrel (Bbl) | Ton (metric) |
|---|---|---|
| **Reserves** | Thousand million barrels | Ton |
| **Consumption & production** | Million barrels daily (MMBbl) | Million tones (MMt) |
| **Prices** | US dollars per barrel ($/bbl) | US dollars per tone ($/t) |

# Conversion factors for oil

**Approximate conversion factors**

| Crude oil* | To tonnes (metric) | kilolitres | barrels | US gallons | tonnes/ year |
|---|---|---|---|---|---|
| From | | | Multiply by | | |
| Tonnes (metric) | 1 | 1.165 | 7.33 | 307.86 | - |
| Kilolitres | 0.8581 | 1 | 6.2898 | 264.17 | - |
| Barrels | 0.1364 | 0.159 | 1 | 42 | - |
| US gallons | 0.00325 | 0.0038 | 0.0238 | 1 | - |
| Barrels/day | - | - | - | - | 49.8 |

*Based on worldwide average gravity.

Source: BP

# Conversion factors for oil products

| Products | To convert barrels to tonnes | tonnes to barrels | kilolitres to tonnes | tonnes to kilolitres |
|---|---|---|---|---|
| | Multiply by | | | |
| LPG | 0.086 | 11.6 | 0.542 | 1.844 |
| Gasoline | 0.118 | 8.5 | 0.740 | 1.351 |
| Kerosene | 0.128 | 7.8 | 0.806 | 1.240 |
| Gas oil/diesel | 0.133 | 7.5 | 0.839 | 1.192 |
| Fuel oil | 0.149 | 6.7 | 0.939 | 1.065 |

Source: BP

# Gas measures

# Different markets - different measures

**Major natural gas markets:**

1. North American market
2. European market
3. Asia-Pacific Region (APR) Market

# Gas measures in N. American market

1. Gas volume measured in standard cubic foot: **$ft^3$, bcf, tcf**
2. Gas prices are quoted in: **$/MMBTU** (dollar per million Btu) «**термальная цена**»

# Volume measure

***Foot*** — abbreviation or **ft -** is a unit of length equal to **0,3048** meters (international foot).

It is an integral part of both the imperial and United States customary systems of units.

It is subdivided into 12 inches.

**Standard cubic foot (scf)** – (abbreviated as **scf**) is a measure of quantity of gas, equal to a **cubic foot** of volume at 60 degrees Fahrenheit (**15.6** degrees Celsius) and either 14.696 psi (1 atm or 101.325 kPa) of pressure.

- **1 scf= 0.0283 $m^3$**
- 1 scf=1000 BTU,

# Comparison of scf, L, m3

- 1 scf = 28 L
- 1 $m^3$ = 1000 L

**1 cubic foot is 36 times smaller than1 $m^3$**

# Abbreviations:

- **ccf** (hundred cubic feet)
- **Mcf** (thousand cubic feet)*
- **MMcf** (million cubic feet)*
- **Bcf** (billion cubic feet)
- **Tcf** (trillion cubic feet)
- **Qcf** (quadrillion cubic feet), etc.

* The ***M*** refers to the Roman numeral for thousand. **Two *M*'s** would be one thousand thousand, or one million. The *s* for "standard" is sometimes included, but often omitted and implied.

# Roman Numbers

| | | |
|---|---|---|
| C | 100 | One Hundred |
| D | 500 | Five Hundred |
| M | 1000 | One Thousand |

**c**cf (hundred cubic feet)
**M**cf (thousand cubic feet)*
**MM**cf (million cubic feet)*

# MMBtu

**MMBtu** (MBtu/ MBTU)- Million British thermal units/

The **British thermal unit** (**BTU** or **Btu**) is a unit of energy equal to about 1055 joules. It is the **amount of heat** required to raise the temperature of 1 pound (0.454 kg) of liquid water by 1 °F (0.56 °C) at a constant pressure of one atmosphere

**Calorie** (cal) —The **energy** needed to increase the temperature of a 1 gram of water by 1 °C at an atmospheric pressure.

# 1 BTU equal to:

- =252 - 253 call
- =0.25 kcall
- =1.054 - 1.060 kJ
- =0.293071 kW/h

# BTU conversion

- 1000 m3 of gas = **36-37 MMBTU**
- 1bbl = **5,8 MMBTU**

**Example 1:**

Price of Henry Hub Natural Gas Futures at NYMEX = **4,35 $/MMBtu**

Convert the price into $/1000 $m^3$:

4,35 $/MMBtu * **36,6** MMBtu/1000m3 =**159, 21 $/1000 $m^3$**

**Example 2:**

Gazprom's average wholesale gas price for Europe (2014 y) = **345 $/1000 $m^3$**

Convert the price into $/MMBtu:

345 $/1000 $m^3$ / **36,6** MMBtu/1000$m^3$ **= 9,4 $/MMBtu**

# BTU conversion (2)

**Example 3:**

Price of crude Brent is 105,4 $/bbl

What is the correspondent price of gas (at the equal energy value of oil and gas)?

Answer: 105,4 $/bbl / **5,8** MMBtu = **18 MMBtu**

# Gas measures at European gas market

- **Volume and mass** are measured in **1000 $m^3$ and toe**
- **Price of gas or LNG is quoted in:**
  - **Euro/1000 $m^3$ or dollars ($)/1000 $m^3$**
  - **Euro/MMBtu, $/ MMBtu (spot prices)**

# Cubic meter ($m^3$)

Abbreviations for $m^3$

- **Cm** – cubic meters
- **Mcm –** million cubic meters (sometimes stands for thousands cubic meters (**mcm**))
- **Bcm** – Billion cubic meters
- **Tcm** – Trillion cubic meters
- **Bcm/a** (Bcm per annum) – Billion cubic meters per year

# Conversion of M3 of gas

- **1 bcm = 0,9554 Mtoe**
- **1 bcm = 6,6 Mboe**

# Asia-Pacific Region (APR) gas market

**Historically APR gas market supplied by LNG**

- **Price of LNG in: $/MMBtu, $/ton of LNG**
- **Mass of LNG in: ton.**

# Tone of LNG

Metric ton (MT, t) of liquefied natural gas (LNG) = 1000 kg

- 1 million tone LNG= **1,36** bcm of gas
- 1 bcm = **0,74** million tone of LNG

- 1 t LNG = **1360** $m^3$ (cm)
- 1 kg LNG = **51 560** Btu

# Conversion factors for gas and LNG

| To: | Metric ton of LNG | $m^3$ of LNG | Standard $m^3$ of gas* |
|---|---|---|---|
| From: | Multiply by | | |
| Metric ton of LNG | 1 | 2,12 | 1360 |
| $m^3$ of LNG | 0,47 | 1 | 615 |
| Standard $m^3$ | $7{,}35*10^{-4}$ | $1{,}626 * 10^{-3}$ | 1 |

Source: IEA

Standard $m^3$ measured at 15° C and 750 mm Hg
(Normal) $m^3$ measured at 0° C and 750 mm Hg

# Tone of LNG

**Example:**

Vladivistok liquefaction plant capacity ≥ 15 M t/a

Convert in  m3: 15 Mt/a * 1,36 bcm/Mt = 20,4 bcm

That means 15 mt capacity of a liquefaction plant is equal to main (cross-country) pipeline capacity of 20,4 bcm/y

# Key measures for gas and LNG in international gas markets

| Market | Heating value | Volume |
|---|---|---|
| North America | MMBtu | $ft^3$ |
| Europe | MMBtu, kW | $m^3$ |
| Asia-Pacific | MMBtu | Ton of LNG |

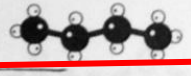
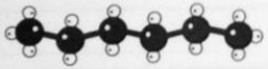
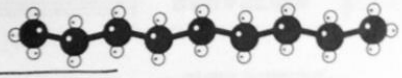
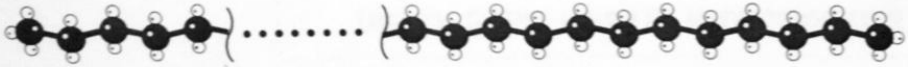
# Gas measures in international statistics

| Used in | Units | |
|---|---|---|
| Reserves | Trillion cubic metres | Billion tonnes oil equivalent |
| Consumption & production | Billion cubic metres | Million tonnes oil equivalent |
| Prices | $/1000m3 | US dollars per million Btu ($/Mmbtu) |

# Structure of Hydrocarbons

IFP Training

**Hydrocarbons — N-PARAFFINS — — *Straight chain alcanes* —** — Table B2 —

| | Number of carbons | | | | Physical state at 15°C - 1 ATM |
|---|---|---|---|---|---|
| Methane | C 1 |  | $CH_4$ | bp = - 161.5°C | GAS |
| Ethane | C 2 |  | $C_2H_6$ | bp = - 89°C | |
| Propane | C 3 |  | $C_3H_8$ | bp = - 42°C $sp.gr_4^{15} = 0.505$ | |
| Butane | C 4 |  | $C_4H_{10}$ | bp = - 0.5°C $sp.gr_4^{15} = 0.585$ | |
| Pentane | C 5 |  | $C_5H_{12}$ | bp = + 36°C $sp.gr_4^{15} = 0.631$ | LIQUID |
| Hexane | C 6 |  | $C_6H_{14}$ | bp = + 69°C $sp.gr_4^{15} = 0.664$ | |
| Heptane | C 7 |  | $C_7H_{16}$ | bp = + 98°C $sp.gr_4^{15} = 0.688$ | |
| Octane | C 8 |  | $C_8H_{18}$ | bp = + 126°C $sp.gr_4^{15} = 0.707$ | |
| Nonane | C 9 |  | $C_9H_{20}$ | bp = + 151°C $sp.gr_4^{15} = 0.722$ | |
| Hexadecane | C 16 |  | $C_{16}H_{34}$ | bp = 287°C mp = + 18 °C → melting point | SOLID |
| Eicosane | C 20 |  | $C_{20}H_{42}$ | bp = + 344°C mp = +36°C | |
| Triacontane | C 30 |  | $C_{30}H_{62}$ | bp = + 450°C mp = +66°C | |

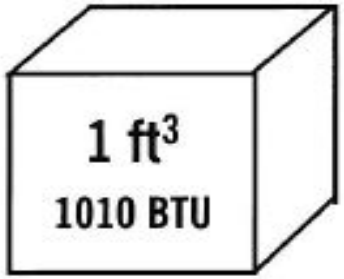
D CH 132 B

# Key conversional terms.

## UNITS TO BE USED IN THIS WORKSHOP

### Natural Gas Volumetric Units

| Volume | Symbols | Exponent | Cubic Meters |
|---|---|---|---|
| Standard cubic foot | CF | 1 | 0.0283 |
| Thousand cubic feet | MCF | 10^3 | 28.3 |
| Million cubic feet | MMCF | 10^6 | 28300 |
| Billion cubic feet | BCF | 10^9 | 2.83E+07 |
| Trillion cubic feet | TCF | 10^12 | 2.83E+10 |




Methane

### Gas and Liquids Thermal Energy Heating Values

| Thermal Energy | Heating Value Gross BTU/cf | Net BTU/cf | Ratio |
|---|---|---|---|
| Methane | 1010.0 | 909.4 | 0.9004 |
| Ethane | 1769.6 | 1618.7 | 0.9147 |
| Propane | 2516.1 | 2314.9 | 0.9200 |
| I-Butane | 3251.9 | 3000.4 | 0.9227 |
| n-Butane | 3262.3 | 3010.8 | 0.9229 |
| I-Pentane | 4000.9 | 3699.0 | 0.9245 |
| n-Pentane | 4008.9 | 3706.9 | 0.9247 |

**Combustion of Methane**

$$CH_4 + 2O_2 \xrightarrow{\text{Heat}} CO_2 + 2H_2O$$

| | |
|---|---|
| 1BTU | =1055 joules |
| 1MMBTU | =1.055 giga-joules |
| $6/MMBTU | =$5.69/giga-joule |
| 1 MMBTU | =251.6 MM calories |

| | |
|---|---|
| 1 Therm | =100,000 BTU |
| 1 Dekatherm | =10 Therms |
| 1Dth | =1 Million BTUs |
| $6/Million BTU | =$0.60/Therm |

| | |
|---|---|
| 1 $m^3$ | =35.31 $ft^3$ |
| | =35,663 BTU |
| $6/Million BTU | =$214,000 $m^3$ |

| | |
|---|---|
| 1 kWh | =3413 BTU |
| 1MWh | =3.413 Million BTU |
| $6/Million BTU | =$20.50 MWh |

- The **watt** (symbol: **W**) is a derived unit of power in the International System of Units (SI).
- The megawatt is equal to one million **($10^6$) watts.**
- A large residential or commercial building may use several megawatts in electric power and heat.
- The unit is defined as 1 joule per second and can be used to express the rate of energy conversion or transfer with respect to time.
- It has dimensions of Mass ·Length$^2$ ·Time$^{-3}$.

# Conversion factors for the gas volume

| To: | Bcm | Mln tons | bcf | tcf | Pj | Twh | MBtu | Mtoe |
|---|---|---|---|---|---|---|---|---|
| From: | Multiply by: | | | | | | | |
| Bcm | 1 | 0,7350 | 0, 09681 | 0,03534 | 40,00 | 11,11 | $3,7912 *10^{7}$ | 0,9554 |
| Mln tons | 1,360 | 1 | 0,1317 | 0,04808 | 54,40 | 15,11 | $5,16 *10^{7}$ | 1,299 |
| Bcf | 10,33 | 7,595 | 1 | 0,3650 | 413,2 | 114,8 | $3,91*10^{8}$ | 9,869 |
| Tcf | 28,30 | 20,81 | 2,740 | 1 | 1,132 | 314,5 | $1,07*10^{9}$ | 27,04 |
| Pj | 0,02500 | 0,01838 | 0,002420 | 0,0008834 | 1 | 0,2778 | $9,47*10^{5}$ | 0,02388 |
| Twh | 0,09000 | 0,06615 | 0,008713 | 0,003180 | 3,600 | 1 | $3,41*10^{6}$ | 0,08598 |
| Mbtu | $2,638*10^{8}$ | $1,939*10^{-8}$ | $2,254*10^{-9}$ | $9,32*10^{-10}$ | $1,055*10^{-6}$ | $2,93*10^{-7}$ | 1 | $2,520*10^{-8}$ |
| Mtoe | 1,047 | 0,7693 | 0,1013 | 0,03698 | 41,87 | 11,63 | $3,97*10^{7}$ | 1 |

Based on gas with $40Mj/m^3$
Source: IEA

# Conversion factors for price of gas and LNG

| To: | USD/MBtu | USD/1000 $m^3$ | USD/tonne | USD/MWh | USD/Tj |
|---|---|---|---|---|---|
| From: | | | | | |
| USD/MBtu | 1 | 37,912 | 51,56032 | 3,412 | 0,0009478 |
| USD/1000 $m^3$ | 0,02638 | 1 | 1,3600 | 0,09000 | 0,00002500 |
| USD/tonne | 0,01939 | 0,7350 | 1 | 0,06615 | 0,00001838 |
| USD/MWh | 0,2931 | 11,11 | 15,11 | 1 | 0,0002778 |
| USD/Tj | 1055 | 40 000 | 54400 | 3600 | 1 |

Based on gas with 40Mj/$m^3$
Source: IEA

# Coal

**Coal is measured by:**

1. Tonnes,
2. Tonnes of coal equivalent (TCE)
3. Tonnes of oil equivalent (TOE)

**Ton of coal equivalent (TCE**) – is a unit, representing **energy** generated by burning **one metric ton** (1000 kilograms or 2204.68 pounds) of coal, equivalent to the energy obtained from burning **5.2** barrels (700 kilograms) of oil or **890** m3 of natural gas that is, **29.39** GJ, 27.78 million Btu (MMBtu), or 8.14 megawatt hours (MWh).

# Conversion of TCE

- 1 TCE= 0.7 TOE
- 1 TCE = 7000 kcal
- 1 TCE= 5.2 bbl
- 1 TCE= 890 m3 of gas
- 1 TCE= 29.39 GJ
- 1 TCE= 27.78 MMBtu
- 1 TCE= 8.14 MW/h

# Coal measures

| Used in | Units | |
|---|---|---|
| Reserves | Million tonnes | Million tonnes oil equivalent |
| Consumption & production | Million tonnes | Million tonnes oil equivalent |
| Prices | US dollars per tonne ($/t) | |

# Measures for other energy sources

| Type of energy | Mass | Power |
|---|---|---|
| Nuclear energy | Million tonnes oil equivalent | terawatt-hours |
| Hydro energy | Million tonnes oil equivalent | terawatt-hours |
| Other renewables | Million tonnes oil equivalent | terawatt-hours |
| Biofuels production | Thousand tonnes oil equivalent | - |
| Primary energy | Million tonnes oil equivalent | - |

# Unit converters

- IEA: http://www.iea.org/stats/unit.asp
- BP conversion factors: http://www.bp.com/conversionfactors.jsp

На русском:

- http://www.convert-me.com/ru/convert/energy/toe.html,
- http://www.unitjuggler.com/

# 2. Terms and Acronyms used in International gas trade

# Crude oil benchmarks

- **Benchmark crude oil –**A **benchmark crude** or **marker crude** is a crude oil that serves as a reference point for the many other crudes available. There are three primary benchmarks: WTI, Brent Blend, and Oman-Dubai.
- **WTI -** West Texas Intermediate also known as **Texas light sweet**, is a grade of crude oil used as a benchmark in oil pricing. This grade is described as ***light*** because of its relatively low density, and ***sweet*** because of its low sulfur content. It is the underlying commodity of Chicago Mercantile Exchange's oil futures contracts.

# Crude oil benchmarks II

- **Brent (Brent blend)** –marker crude produced in the North Sea since 1970. The name comes from the field of the same name, in turn, formed from the acronyms of the names of field's horizons - **Broom, Rannoch, Etive, Ness and Tarbert.** Since 2002, Brent crude is a mixture (blend) of oils from 3 fields: **Brent, Forties and Oseberg**. Often referred to as the **BFO**. Later Ekofisk crude was added to creating BFOE Quotation. Brent blend – is a standard for the price of oil in Europe (on ICE).
- **Dubai Crude** - is a marker crude produced in Dubai. Is a benchmark in export oil pricing in the Gulf region, particularly exported to the **Asia-Pacific region.** Gradually replaced by another marker: Oman crude.

# Gas transportation and conversion

- **PNG** – Pipeline natural gas
- **LNG** - Liquefied natural gas
- **CNG** – Compressed natural gas
- **NGH** – Natural gas hydrate
- **LPG –** Liquefied petroleum gas -смесь пропана-бутана технических (**СПБТ)**
- **NGL** – Natural Gas Liquids – нестабильный газовый бензин (или широкая фракция легких у/в (ШФЛУ)), получаемый при переработке газа (или ПНГ) на ГПЗ. **Includes**: ethane, propane, butane, pentane.

# International Organizations

- **OPEC** – Organization of Petroleum Exporting Countries (est. in 1961 г.) – established with the aim to stabilize oil prices.
- **IEA -** International Energy Agency (est. in 1974 г.)- promotes the interests of energy-importing countries.
- **OECD** - Organization for Economic Cooperation and Development (est. in. 1961 г.) – Int. economic organization of developed countries that accept the principles of democracy and a free market economy.
- **GECF** – Gas Exporting Countries Forum (est. 2001/2008) – «Gas OPEC» - promotes interests of gas-exporting countries.
- **IGU**- International Gas Union (NGO)- promoting the political, technical and economic progress of the gas industry.
- **GIIGNL** – International Group of Liquefied Natural Gas Importers (NGO) - Facilitates the development of the LNG industry: purchases, import, processing, transportation, regasification etc.

# Trading platforms

- **ICE Futures** (**IPE** before 2005) - International Petroleum Exchange, ICE- Intercontinental Exchange (London) –is one of the world's largest energy futures and options exchanges. Its flagship commodity, *Brent Crude*. Exchange also trades futures contracts and options on fuel oil, natural gas, electricity, coal, carbon emission allowances with the European Climate Exchange (ECX). It is electronic trading platform.

# Trading platforms II

- **NYMEX** - New York Mercantile Exchange – is a commodity futures exchange**.** The energy products (WTI crude, gas, coal etc), metals, and other commodities being bought and sold here on the trading floor and the overnight electronic trading computer systems for future delivery.
- **DME** – Dubai Mercantile Exchange – is a commodity exchange based in Dubai currently trades its flagship futures contract: **Oman Crude Oil Futures Contract (OQD).** DME aims to become the crude oil pricing benchmark for the Asian market with its **OQD** contract.

# Gas hubs

- **NBP** - National Balancing Point: is a virtual trading location for the sale and purchase and exchange of UK natural gas. It is the pricing and delivery point for the **ICE** natural gas futures contract. It is the most liquid gas trading point in Europe
- **HH –** Henry Hub **–** is a distribution (transport) hub on the natural gas pipeline system in Erath, Louisiana**. It is a** pricing point for natural gas futures contracts traded on the NYMEX
- **TTF –** Title Transfer Facility is a virtual trading point for natural gas in the Netherlands. Physical short-term gas and gas futures contracts are traded and handled by **APX-ENDEX**

# Organizations (USA)

- **DOE US -** Department of Energy of United States
- **EIA** - Energy Information Administration; part of US DOE.
- **FERC -** Federal Energy Regulatory Commission (United States); responsible for regulation of the US interstate oil and gas pipeline businesses.

# Trade and economic terms

- **Futures contract** (**futures**) - is a standardized contract between two parties to buy or sell a specified asset of standardized quantity and quality for a price agreed upon today (the futures price) with delivery and payment occurring at a specified future date. There are two types of futures : **physical delivery** and **cash settlement**.
- **OTC** - Over-the-counter; off-exchange spot trade – внебиржевая сделка.
- **GSP** – g**overnment** selling price – отпускная государственная цена
- **JCC** – Japan Customs Cleared (oil price) or Japan Crude Cocktail – is the average price of customs-cleared crude oil imports into Japan. It is a commonly used index in long term LNG contracts in Japan, Korea and Taiwan,
- **PPI** - Producer price index- индекс цен производителей промышленных товаров.

# Contracts

- **MOU** – Memorandum of understanding
- **SPA** – sales and purchase agreement
- **MPSA** – master sale and purchase agreement
- **TOP -** Take-or-pay- a contractual commitment on the part of a buyer to take a minimum volume of gas, usually over a 12-month period, and expressed as a percentage of the annual contract quantity
- **ACQ** - annual contract quantity
- **DAT** – delivered at terminal (Incoterms)
- **DES** – delivered ex ship (Incoterms)

# Others

- **FSU –** Former Soviet Union
- **CIS** - Commonwealth of Independent States (СНГ)
- **UGS –** Underground gas storage
- **FPSO** - Floating Production, Storage and Offloading:
- **FLNG** – Floating liquefied natural gas
- **TPA** - Third-party access- legal right (on nondiscriminatory basis) of gas producers to use the pipeline gas transportation and storage services by paying transportation tariff.
- **TPES** - Total primary energy supply of the country (region, World)
- **GTL-** Gas-to liquids – is a refinery process to convert natural gas or other gaseous hydrocarbons into longer-chain hydrocarbons such as gasoline or diesel fuel
- **CCGT -** Combined-cycle gas-turbine power station: ПГУ

# Homework

I. **To learn basic conversion factors (for everybody)**:

1. Bbl per day to mt per year
2. Bbl to tone
3. Bbl to MMbtu

4. 1000m3 of gas to MMbtu
5. 1 t of LNG to m3 of gas
6. Bcm of gas to mtoe

II. **To prepare presentation by CHAPTER 1: *World petroleum business/industry today and it's basic features (for Gasoil team).***

1. Overview of industry
2. Today's production and forecast
3. The structure of the World's recourse base
4. Energy  efficiency of production
5. Who is owner of recourses?
6. The nuances of petroleum business.
7. Petroleum business (industry) in Russia
8. Where the money is rising at petroleum Business?
9. Some common problems of petroleum monetization.

# How to do H/w?

I. **How to learn basic conversion factors**:

- Try to associate numbers with some significant numbers in your life or with some funny and unusual stuff.

**II. How to prepare presentations?**

**1.** To read all chapter

**2.** To understand the core ideas, to search for additional info about topic.

**3.** To make the presentation by listing the core ideas and interesting facts with animation ( graphs, pics, photoes, movies, .

# FLNG - floating liquefied natural gas


Prelude FLNG by Shell (Western Australia) – the world's first FLNG project. Now 3 in the world.