

Hydrocarbon processing

Introduction – Energy

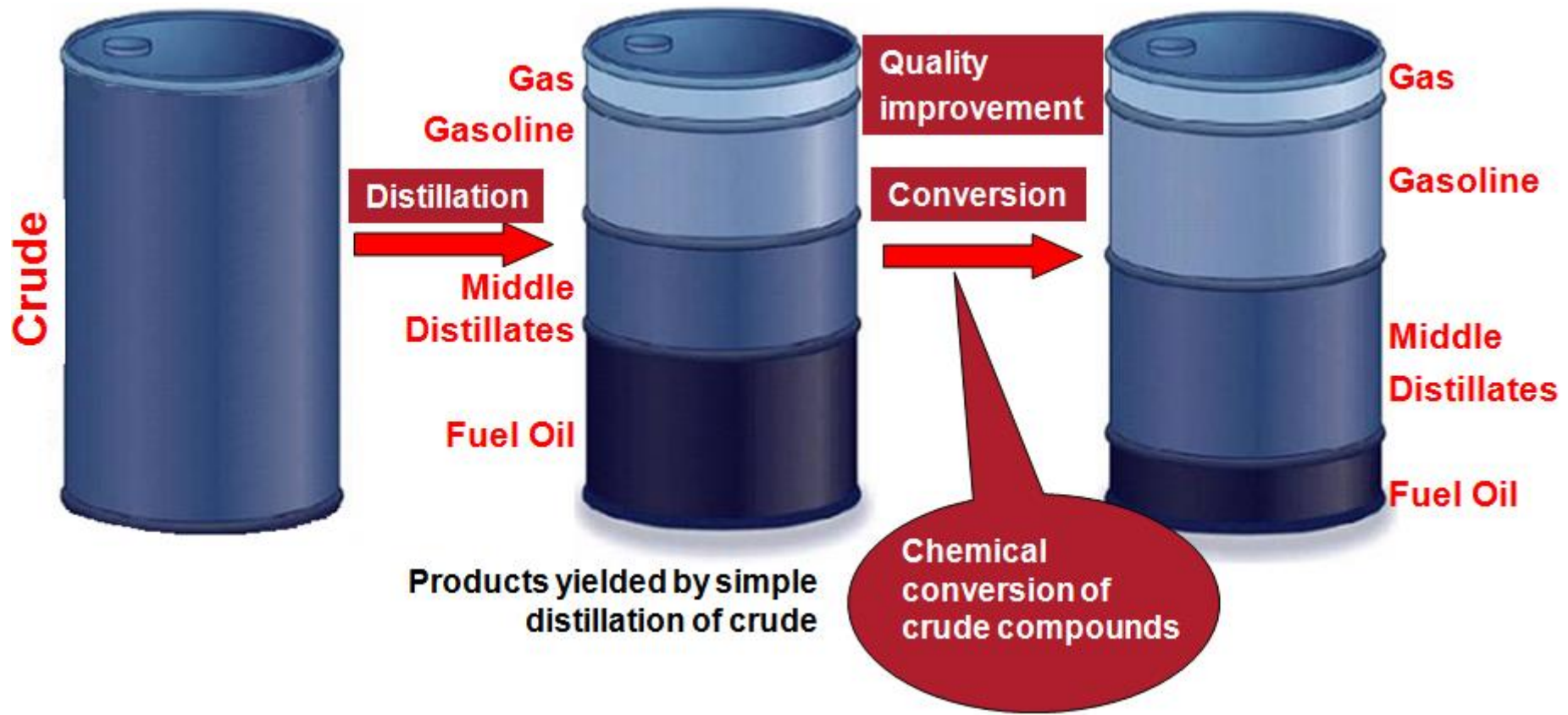
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2022
BME

Goal of the hydrocarbon industry:

- to produce energy storing products
 - for the transportation industry
 - for power generation
- to produce appropriate feedstock for petrochemistry
- to produce specialty products for other industries



Scope of the course:

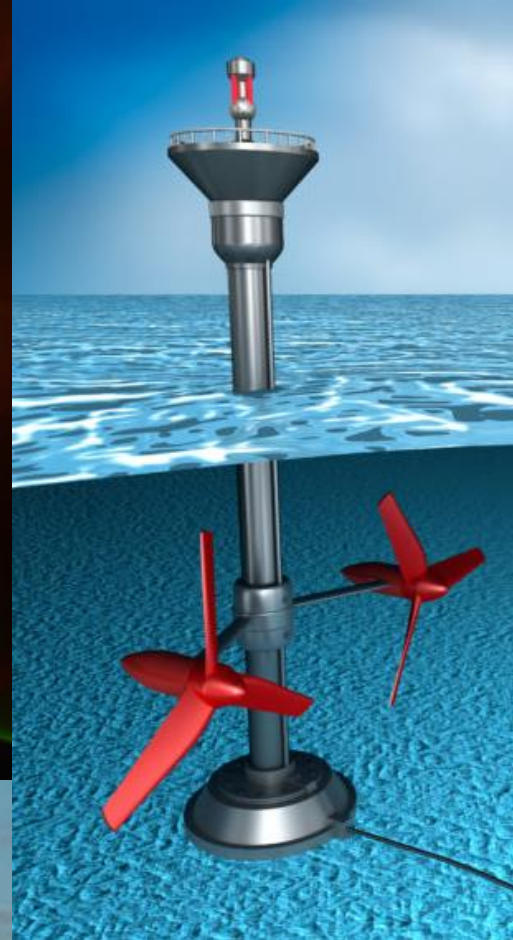
- Natural gas processing
- Crude oil processing

Homework:

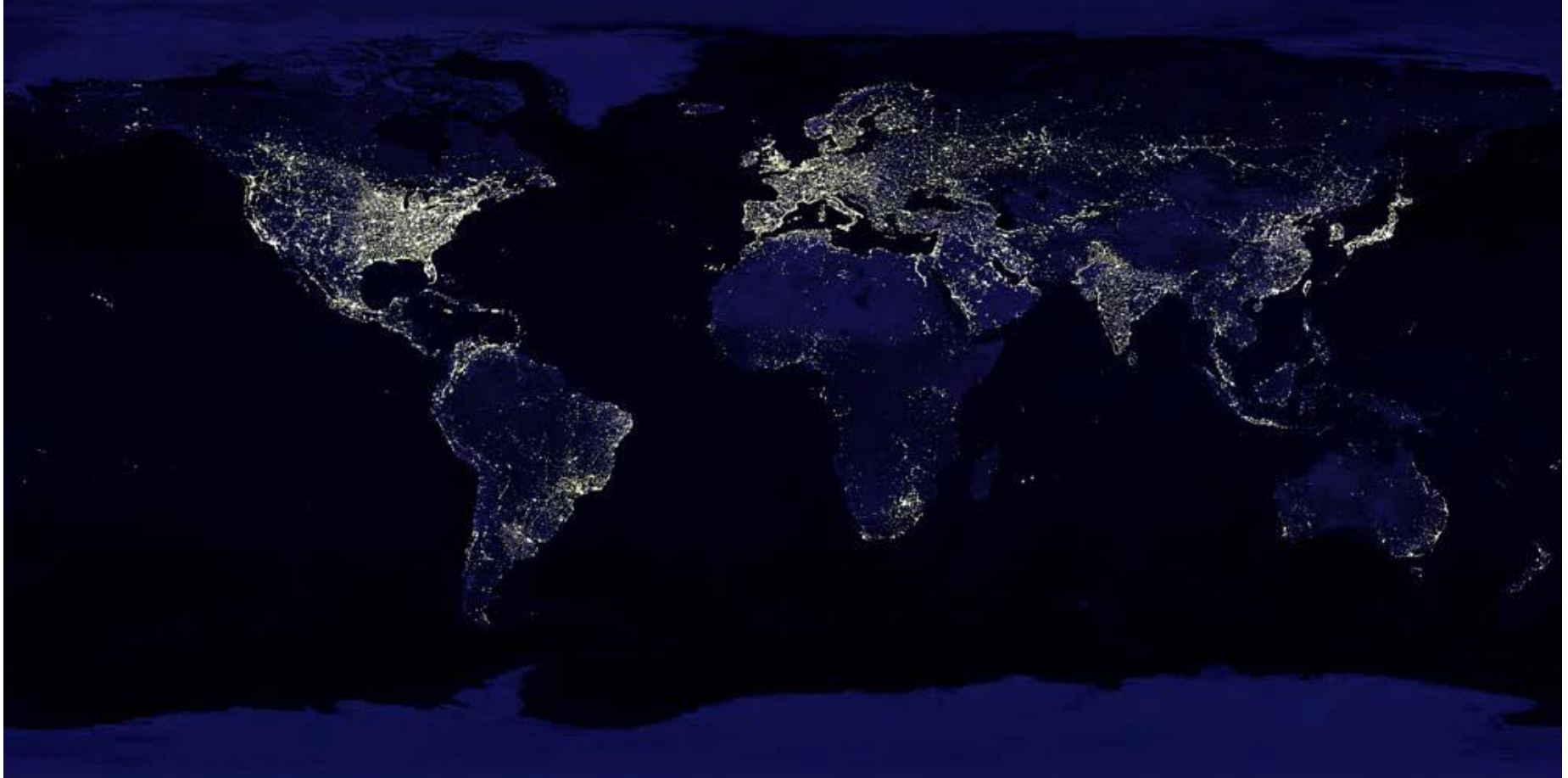
Comparison of countries by

- population (9,7 m)
- average age (40,6 y)
- car penetration (390 per 1000 people)
- GDP (16.700 \$/person)

Energy: Demand – usage



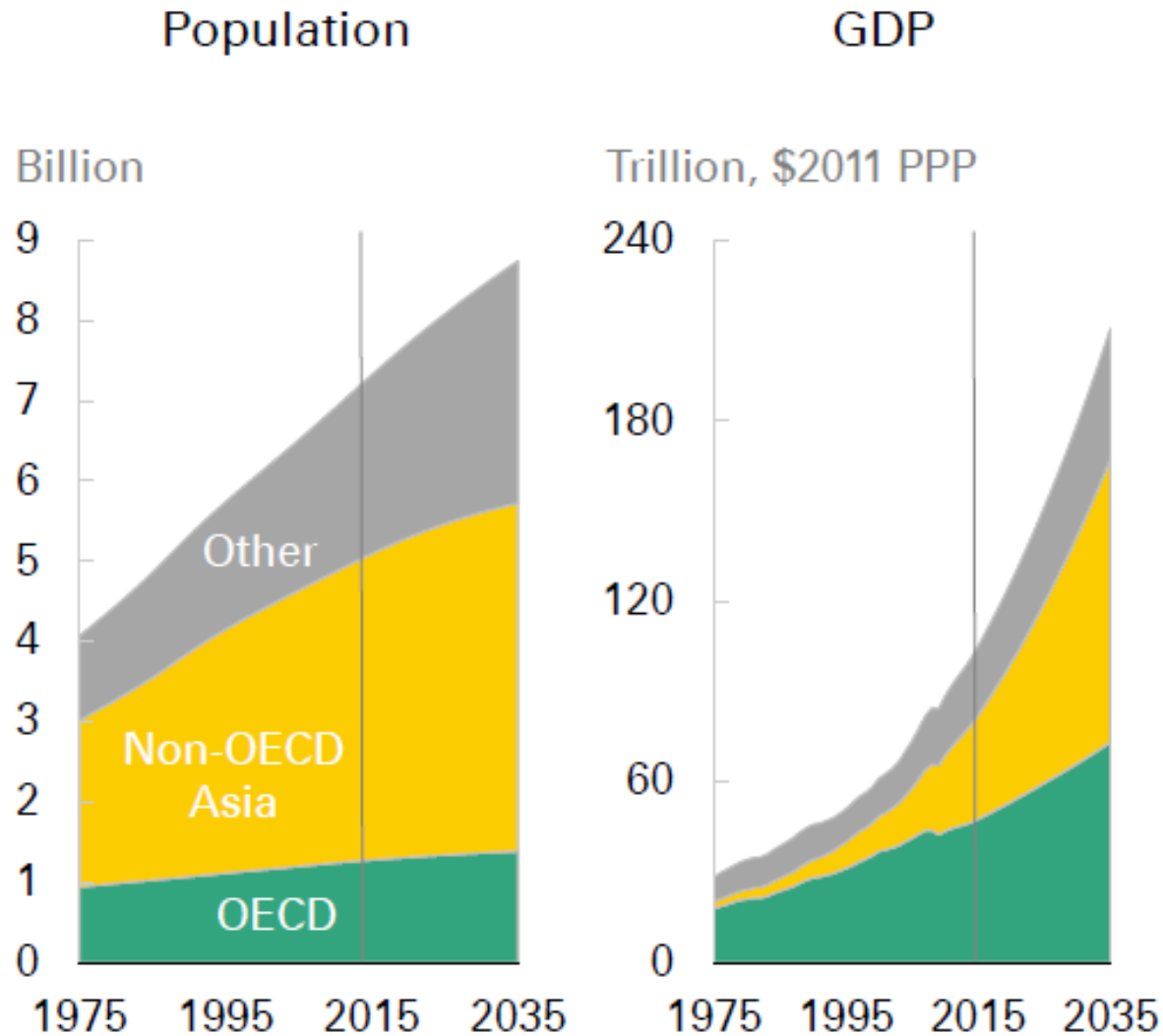
The **energy consumption** is unbalanced on the world



The **energy industry** changes continuously

- The used **energy types** are changing¹
 - Banning conventional cars (2030-2035 in many countries) by governments
 - Car-makers to convert production to electric only within 15 years
- The **balance of demand** is changing
- **New sources** do appear on the scene, e.g.
 - shale gas
 - tight oil, shale oil
 - ultra-deepwater oil
 - new forms of renewable energy (solar energy – Chile²)
- **Countries** do expand and contract (India vs. Venezuela)
- Energy production and consumption are affected by **disruptions**, like outrageous events (Niger delta riot, ISIS) or extreme weather (forest fire: Canada, Alberta 2016/05³, 1,1mbpd, Hurricane Harvey 2017/08)
- **New policies** are created to address climate change or bolster energy security

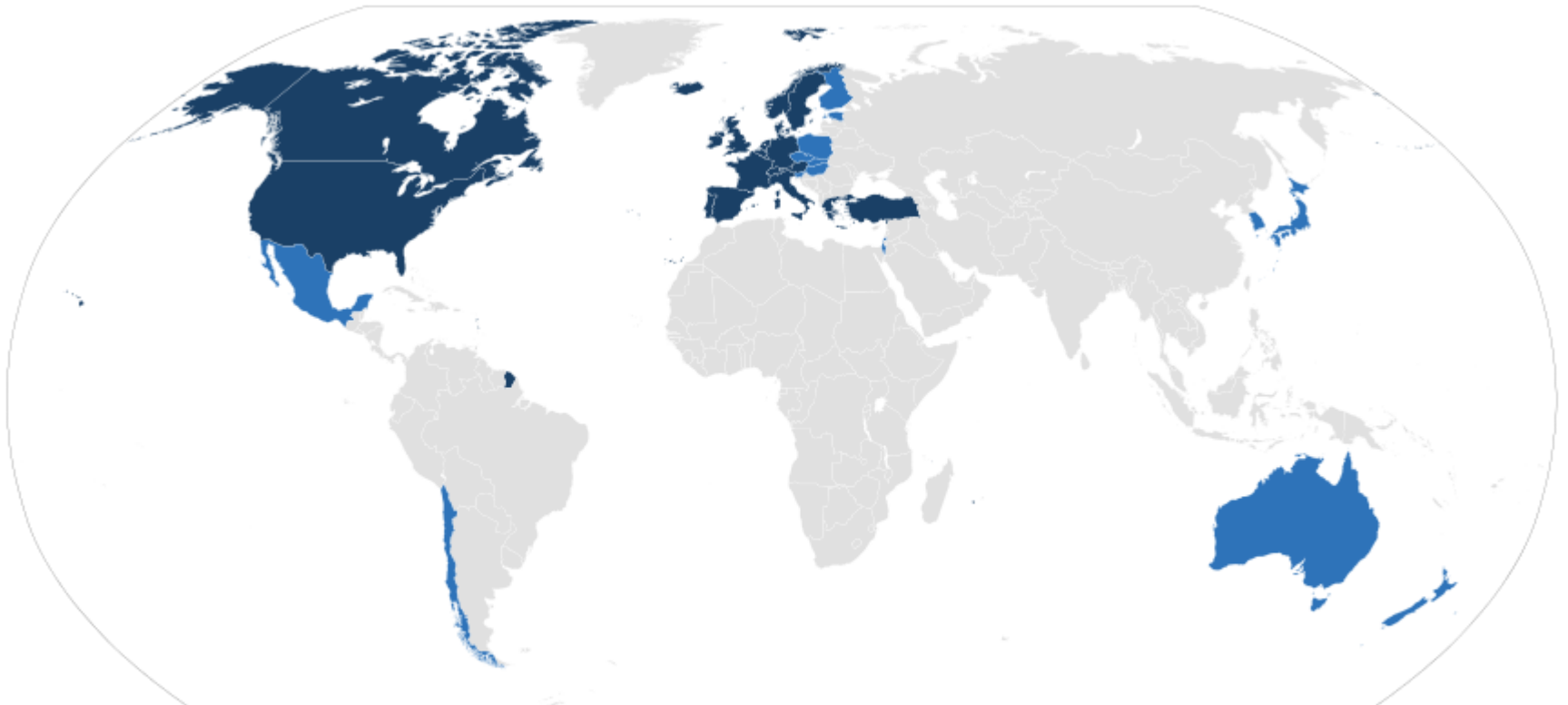
Key drivers behind growing demand for energy



OECD member countries

Significant outsiders:

African, South-American and Arab countries, China, India, Russia



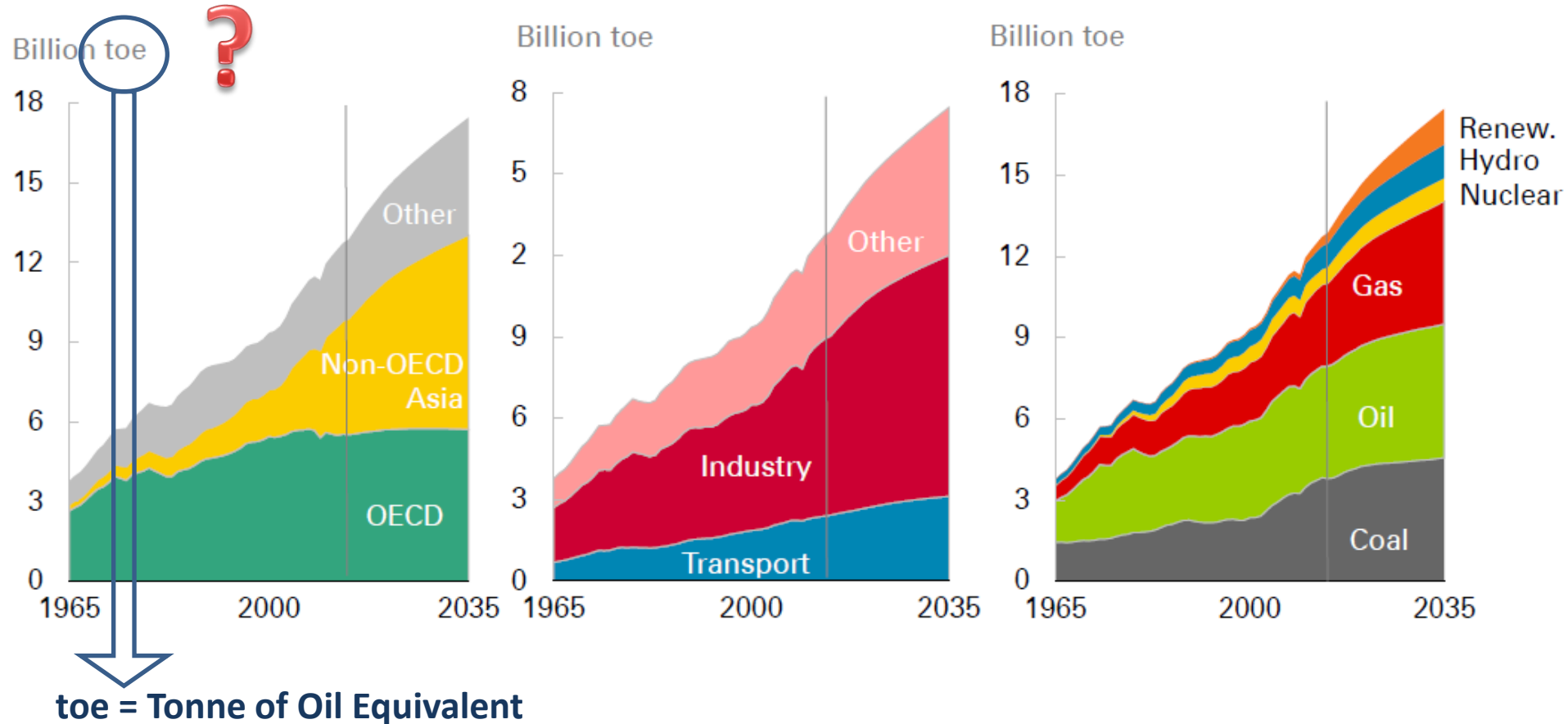
Organisation for Economic Co-operation and Development⁸

Energy consumption

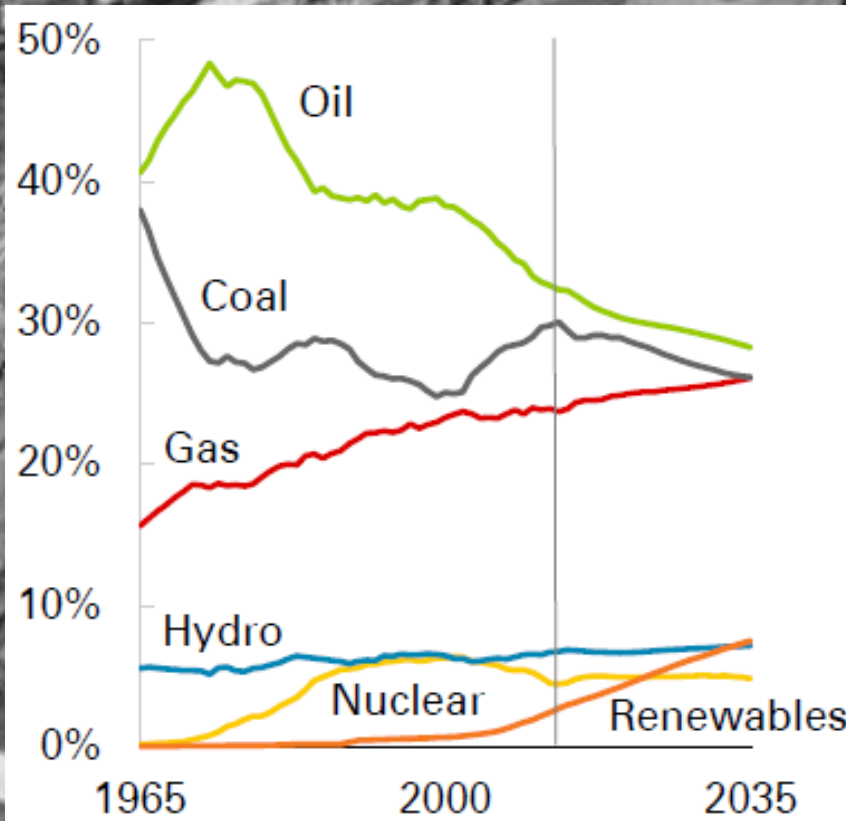
by regions

by final sector

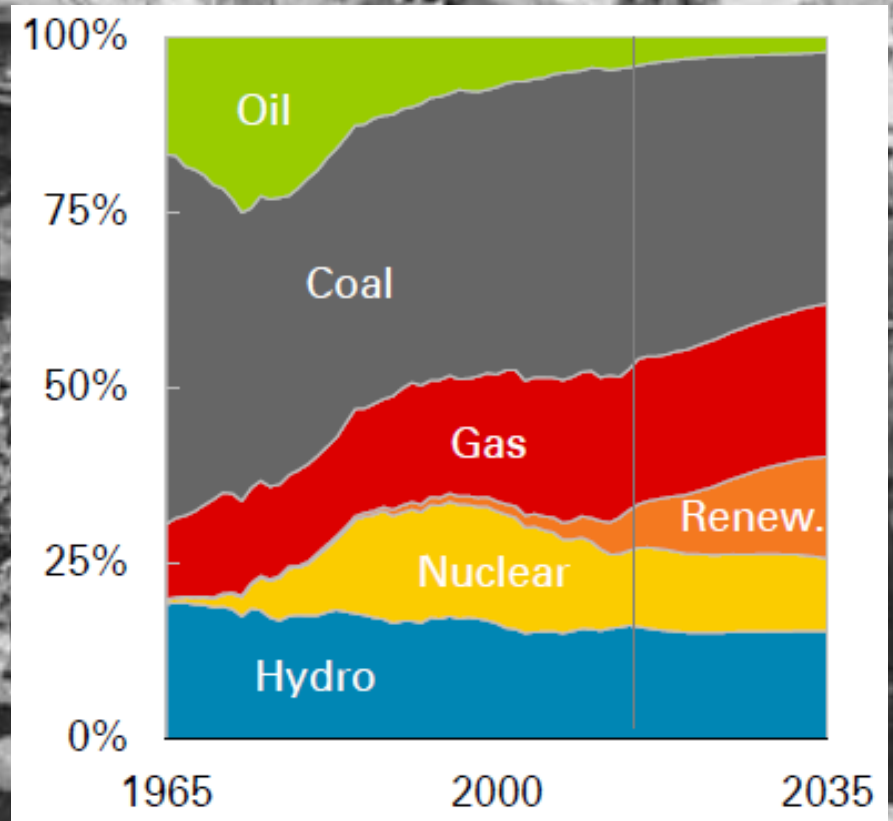
by source



Primary energy consumption



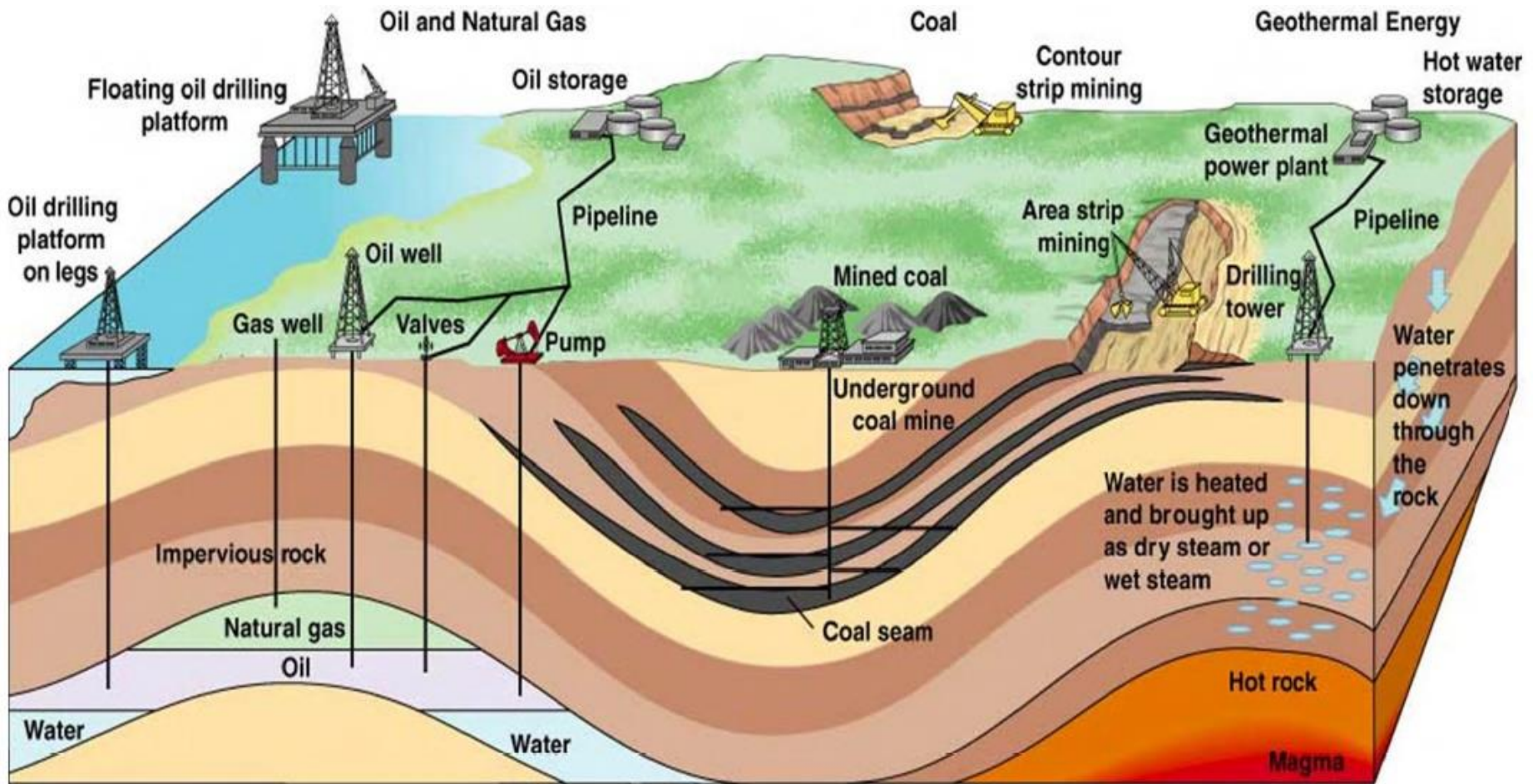
Shares of primary energy



Primary energy to power

Sources of energy

Possible energy sources **underground**



Other energy sources



Internal combustion engine types

- Engines
 - Otto engine
 - fuel: gasoline
 - principle: air and fuel vapour compressed to high pressure and ignited by a spark generated by the sparking-plug
 - main parameter of the fuel: octane number (RON – research octane number), describing the compression resistance of the given gasoline fuel
 - Diesel engine – diesel (gasoil)
 - Fuel: diesel
 - Principle: air is compressed to high pressure, fuel vapour is injected into the piston and autoignited due to the high pressure and temperature
 - Main parameter of the fuel: cetane number, describing the auto ignition capability of the given diesel fuel

Gasoline

- Very complex gasoline standard specification – EU
 - Octane number (research vs. motor): min.95 (RON)
 - Sulphur content: <10ppm
 - Aromatic content: <35%
 - Benzene content: <1%
 - Density range
 - Final boiling point (FBP): <210°C
 - E70, E100 cut ratio
 - Oxygen content
 - Reid vapour pressure (RVP)
 - Bio component – bioethanol
 - ... and many more

Suggested literature

- 1 Norway and the conventional cars: <http://www.origo.hu/gazdasag/20170726-nagy-britannia-bejelentette-a-2040-ig-szolo-kornyezetvedelmi-tervet.html>
- 2 Chile and the solar energy: http://index.hu/tudomany/2016/06/08/chile_mar_nem_tudja_hova_tenni_a_napot/
- 3 Wildfire in Canada: <http://www.orientpress.hu/cikk/tovabb-tombol-az-erdotuz-kanadaban>
- 4 BP Energy Outlook 2035: <http://www.bp.com/en/global/corporate/energy-economics/energy-outlook-2035.html>
- 8 OECD webpage: www.oecd.org