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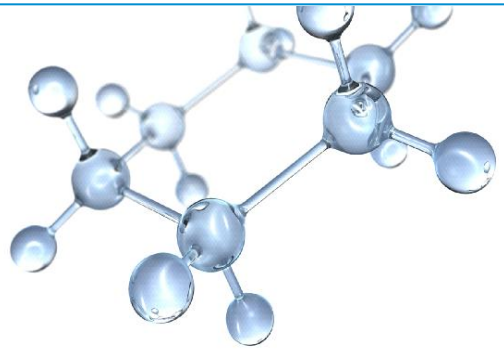
Natural Gas:

An abundant, cleaner-burning energy solution



Munich, 4th of July 2013

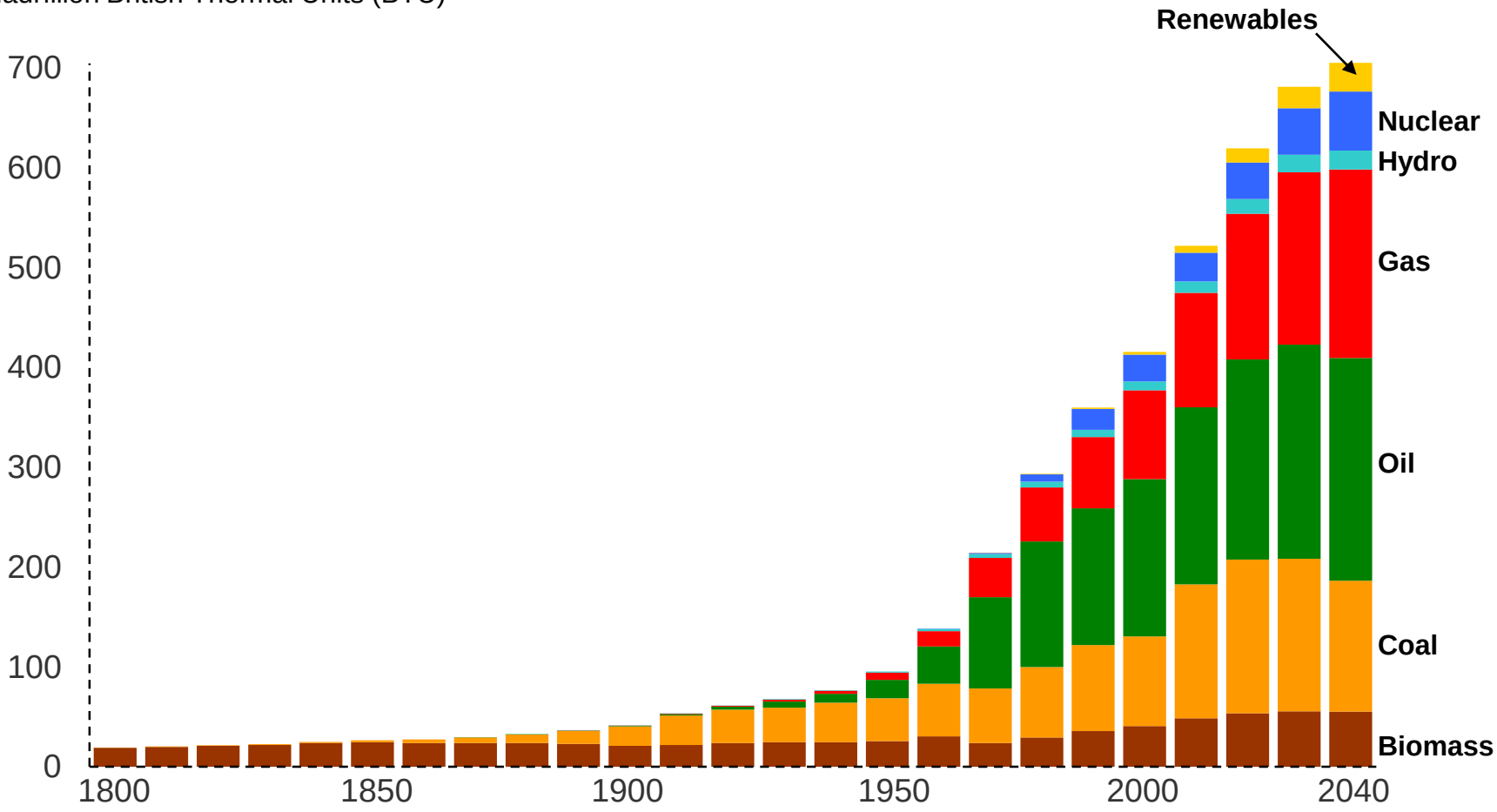
Olaf Martins– Public & Government Affairs

ExxonMobil Central Europe Holding

Energy Use Evolves Over Time

Global Demand by Fuel

Quadríllion British Thermal Units (BTU)



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Quelle: Smil, Energy Transitions (1800-1960)

Global Energy Demand Per Day

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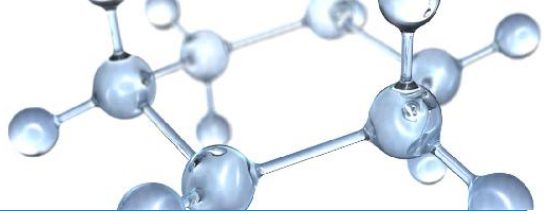
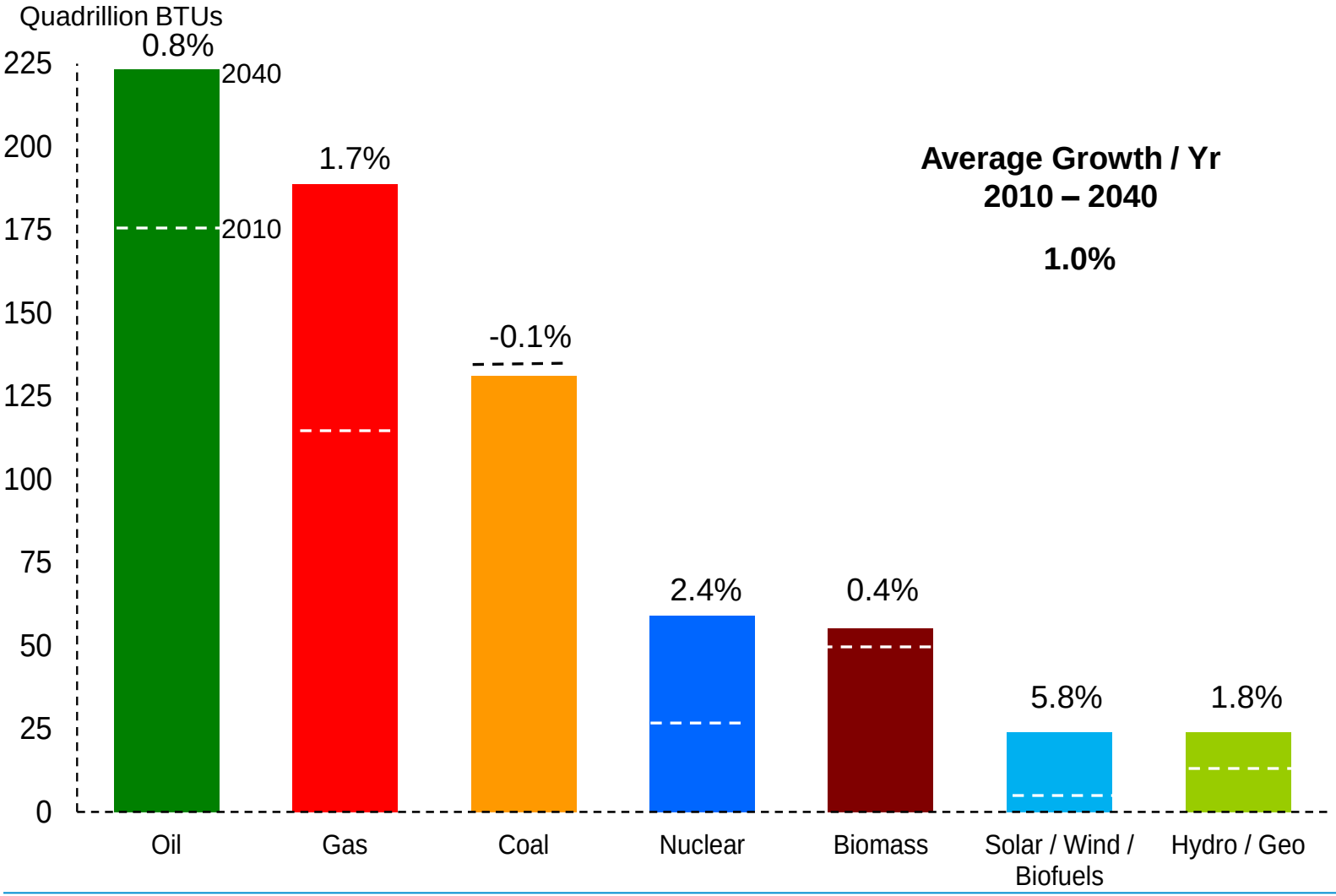
Global Energy Mix





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Clean

Natural gas is the cleanest burning fossil fuel.

Flexible

High energy content and ease of transport is making gas the fuel of choice.

Secure

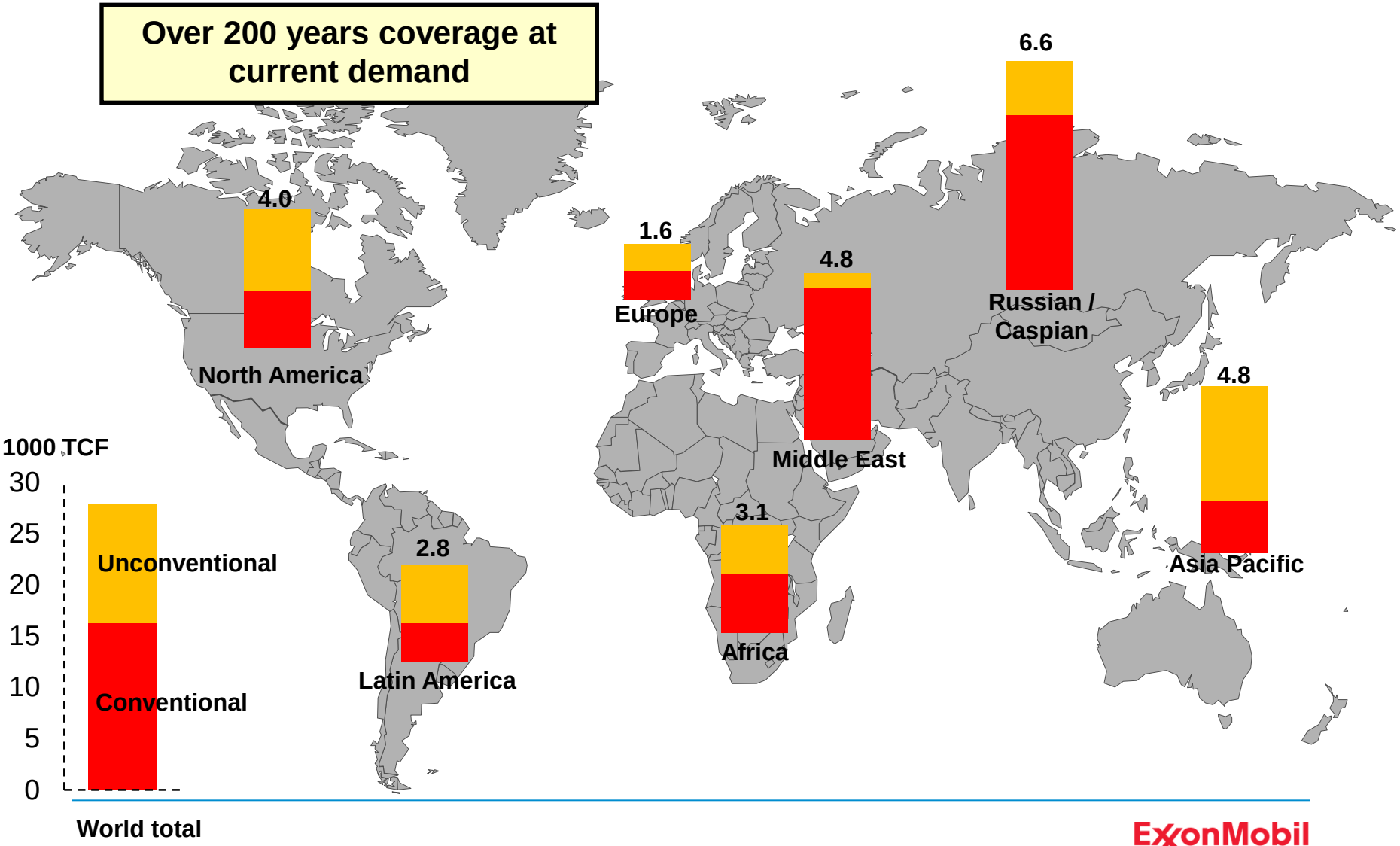
The world has abundant and easily accessible natural gas resources.

Revenue Generator

Growing production provides jobs, tax revenue and personal income.

Remaining Global Gas Resource

Over 200 years coverage at current demand



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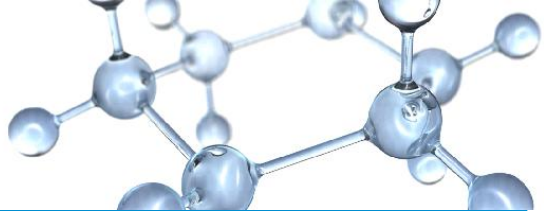
*Quelle: IEA; *Includes Europe Non OECD*

Character of the Source Rock

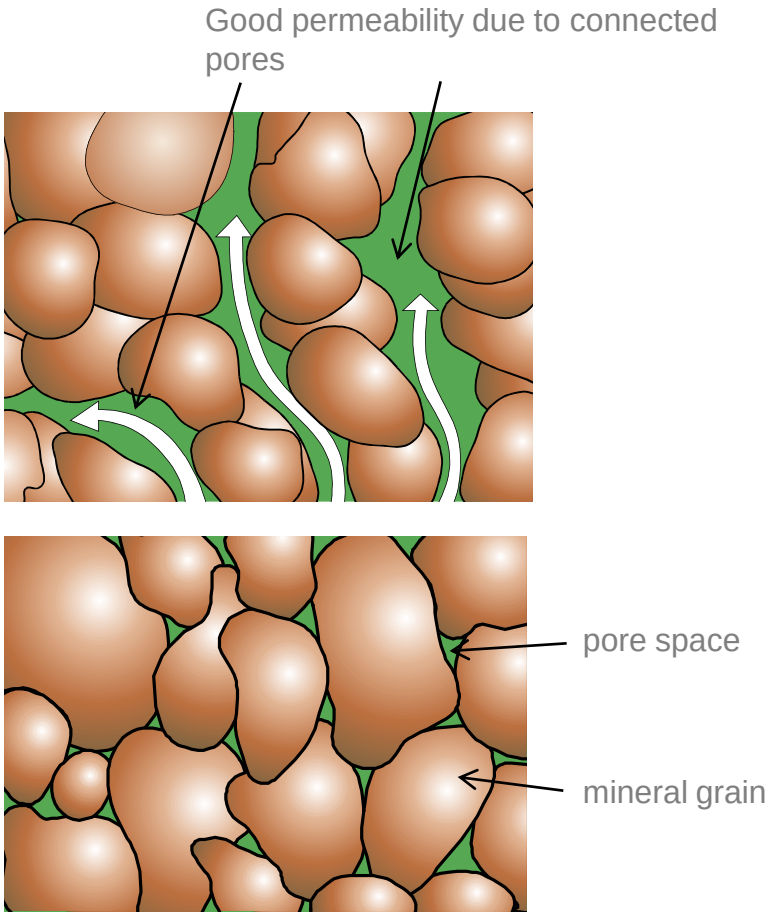


Conventional reservoir

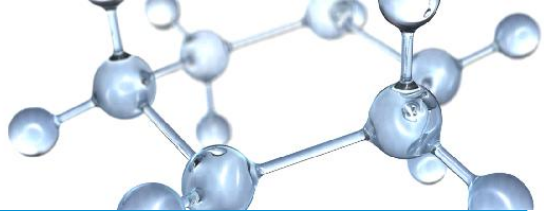
- Good permeability due to the pore fabric
- Natural Gas flows to the well due to reservoir pressure

Unconventional reservoir

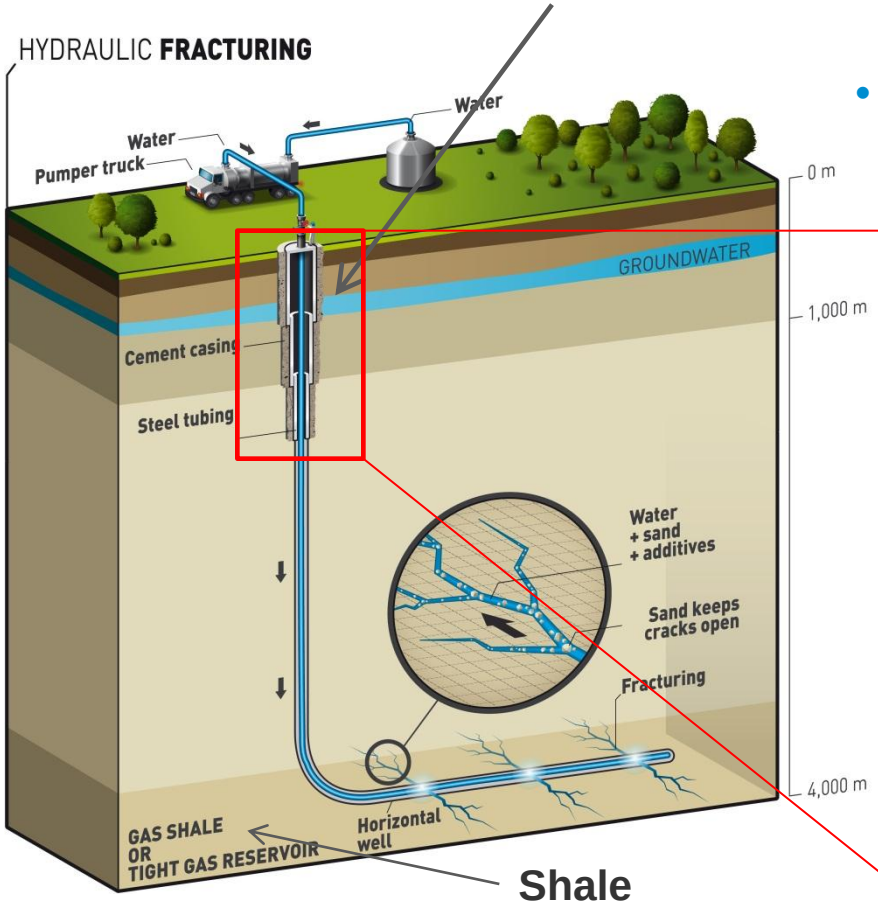
- Pore spaces very small (< 20 % of conventional reservoirs)
- Low to hardly any permeability (1/1000 of conventional reservoirs or less)
- Natural gas is not able to flow to the well by itself
- Formations: Tight Gas, **Shale Gas,** Coal bed methane



Hydraulic Fracturing: Aquifer protection



Multiple layers of steel and cement casings



- Aquifers protected by several layers of steel and impermeable cement
- No different from a conventional oil or gas well, or geothermal well

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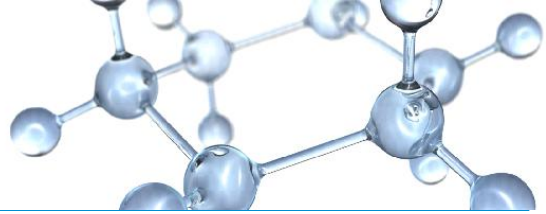
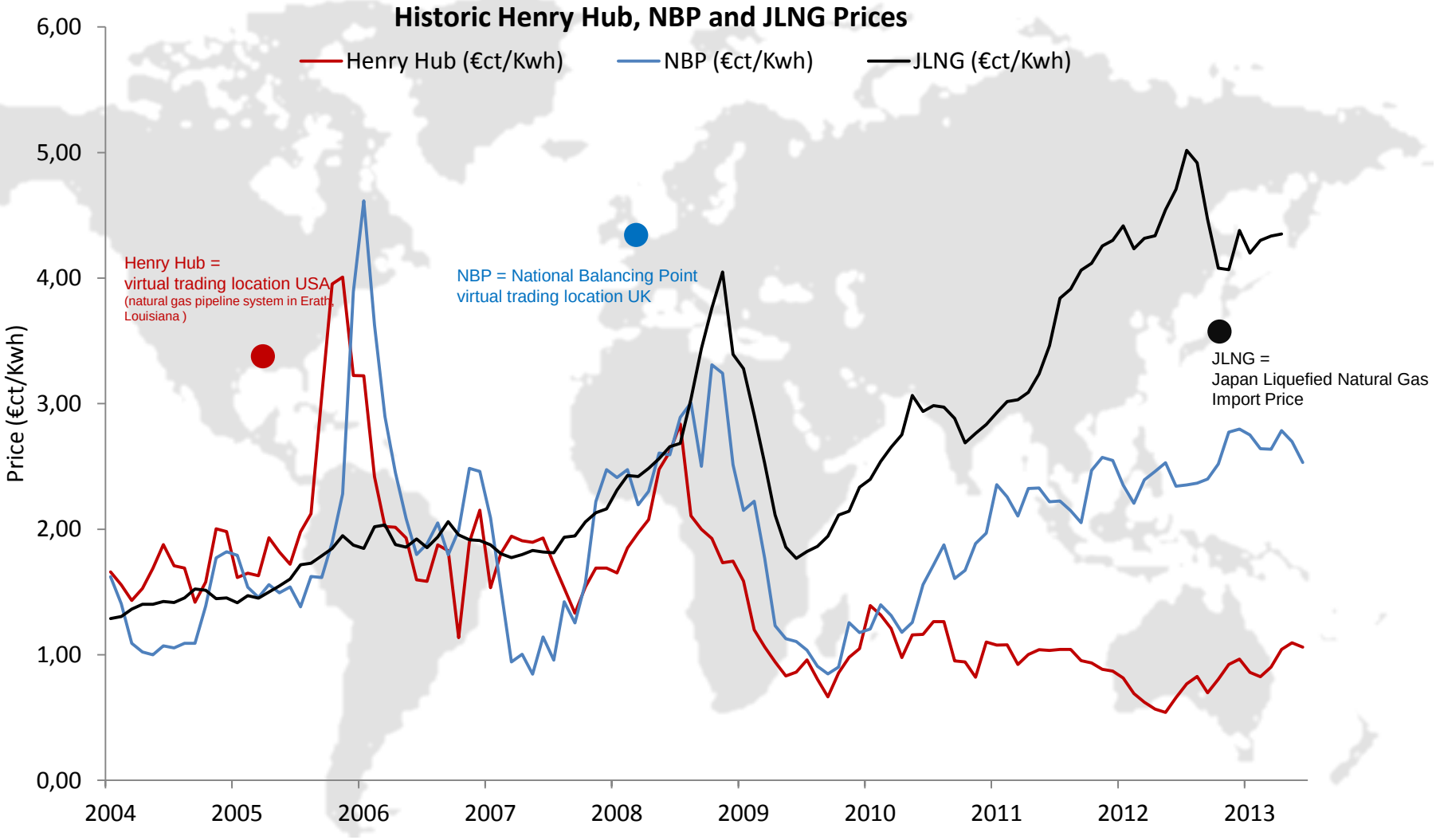
Source: OGP, Total

Natural Gas Spot Price
USA/ Europe/ Asia





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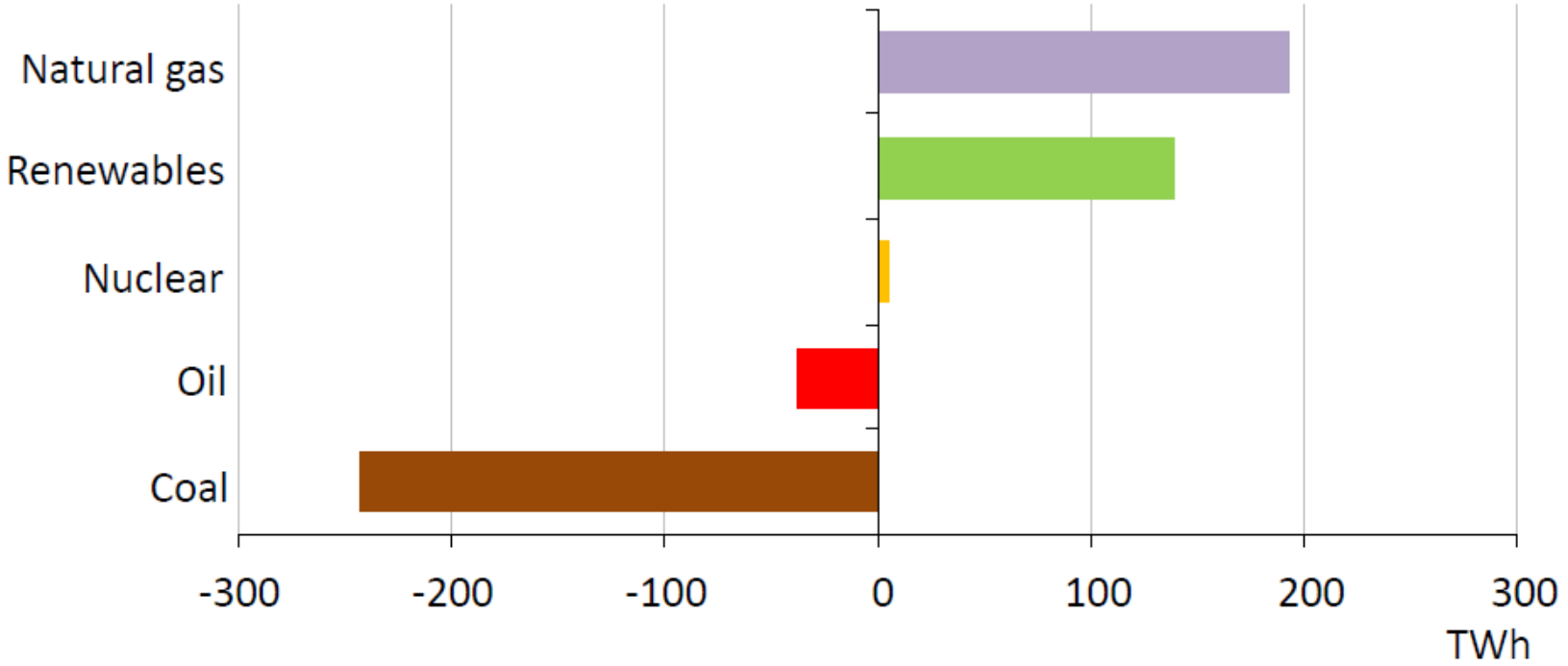
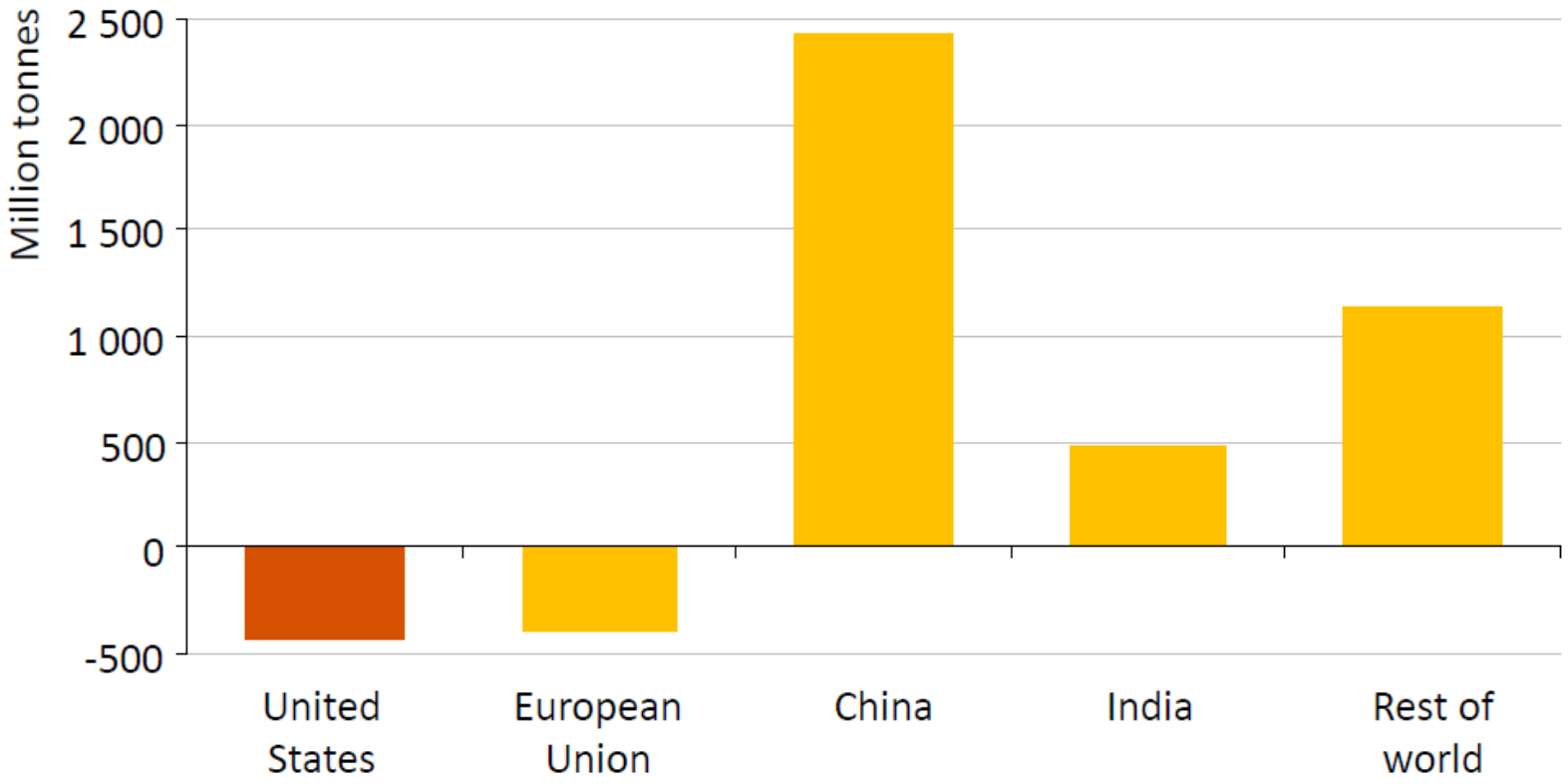
US electricity generation growth 2006-2011



Over the past 5 years, natural gas & renewables were the leading sources of incremental electricity generation in the United States

* Graph from IEA Presentation: A Future for Gas by Fatih Birol

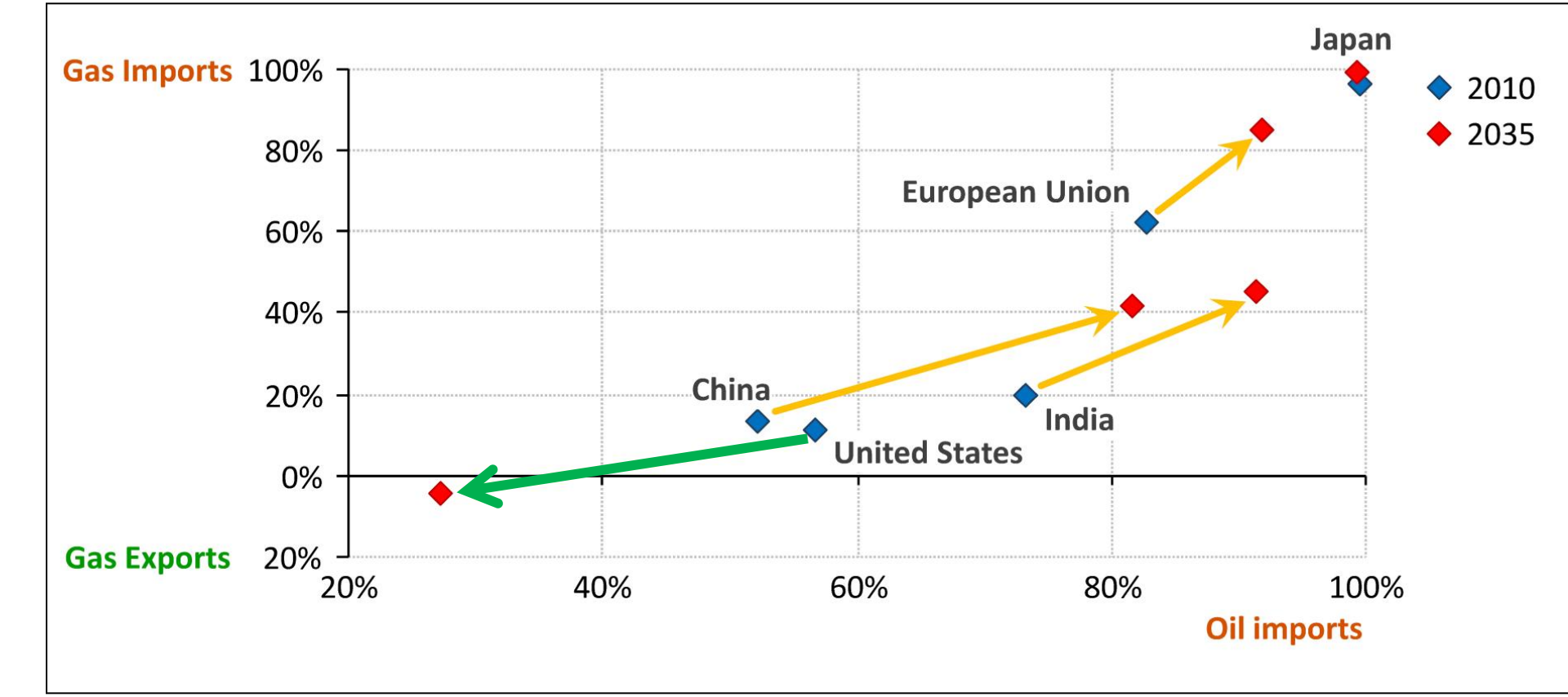
Global CO2 emissions growth 2006-2011*



CO2 emissions in the United States have now fallen by 430 Mt (7.7%) since 2006, the largest reduction of all countries or regions

* Graph from IEA Presentation: A Future for Gas by Fatih Birol

Oil and Natural Gas imports 2010-2035



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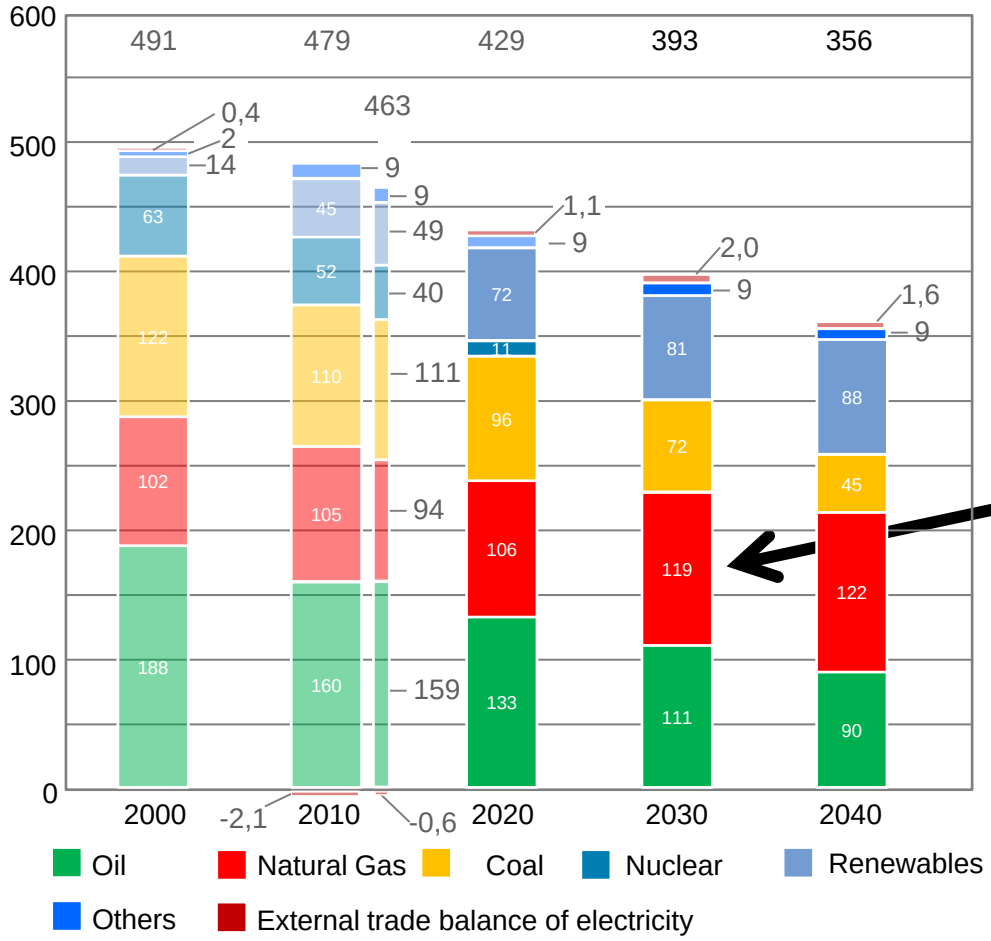
Source: IEA World Energy Outlook 2012

Energy Outlook Germany

Primary Energy Consumption

Millions of tons SKE



Primary Energy Consumption decreases by 25%

Natural Gas will become energy source #1

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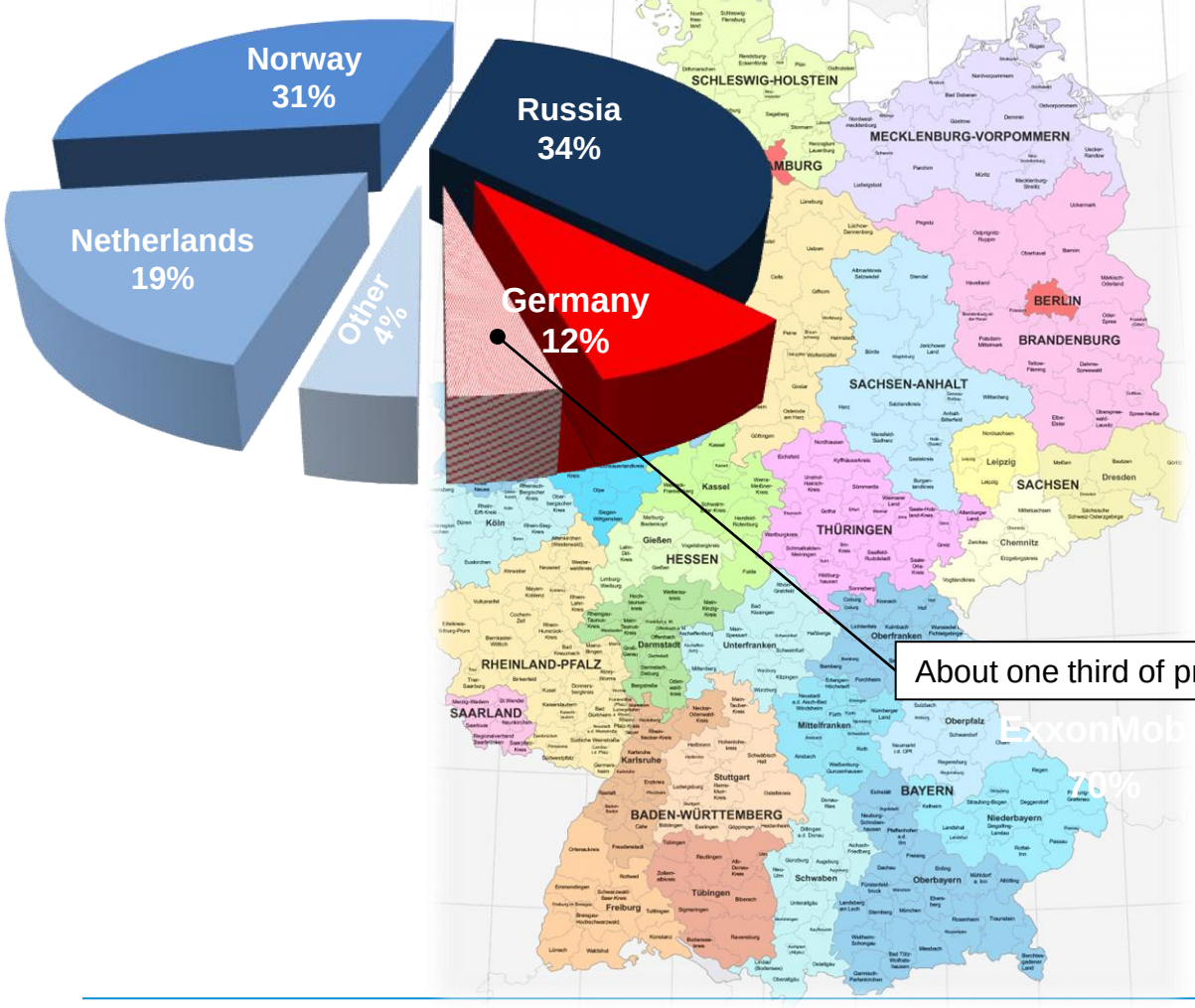
Natural Gas Supply Germany 2012



About one third of production based on hydraulic fracturing

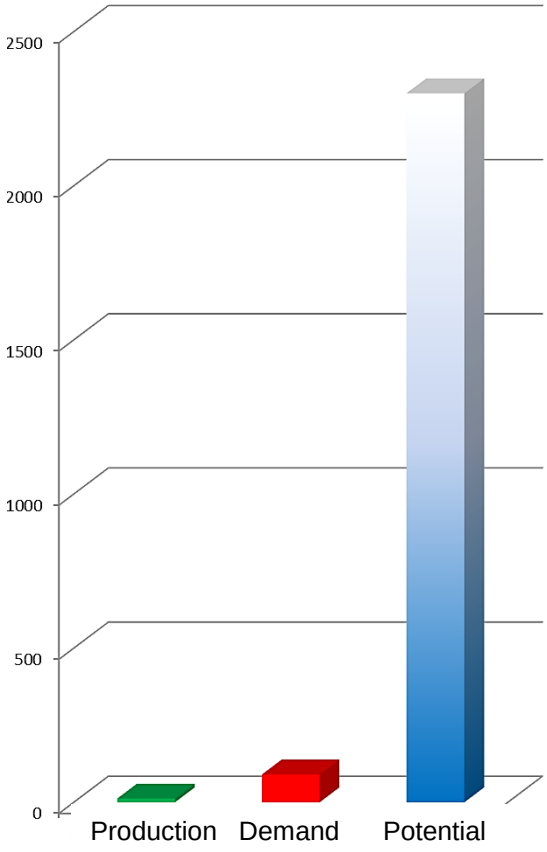
Potential in Germany

- BGR: up to 22.3 trillion m³ Shale gas
- Cautious approach: ~10% recoverable, meaning:

0.7 up to 2.3 trillion m³

4.3 Schiefergasressourcen

In Deutschland gibt es bislang keine Schiefergasförderung und deshalb auch keine Erfahrungswerte zum technisch gewinnbaren Anteil aus den GIP-Mengen. Produktionsdaten aus den USA zeigen, dass der Gewinnungsfaktor zwischen 10 % und 35 % der GIP-Mengen schwanken kann. Im Sinne einer konservativen Abschätzung wird in dieser Studie von einem technischen Gewinnungsfaktor von 10 % der GIP-Mengen ausgegangen. Entsprechend würde sich die technisch gewinnbare Erdgasmenge auf 0,7 bis 2,3 Bill. m³ belaufen (Tab. 4-2). Diese Menge liegt damit deutlich über Deutschlands konventionellen Erdgasressourcen mit 0,15 Bill. m³ und Erdgasreserven mit 0,146 Bill. m³.



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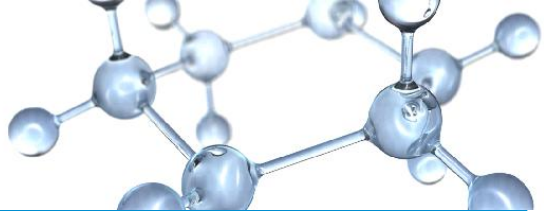
Decades of Experience



1919:
Erfindung der 2-D-Seismik durch Ludger Mintrop.

1925:
Erste drehende Bohrung in Deutschland mit dem von Howard R. Hughes 1909 patentierten Zweirollenmeißel.

1950er:
Gas wird in zunehmendem Maße in städtische Netze eingespeist (Kokerei- bzw. Stadtgas). Es dient zunächst vor allem zum Kochen.

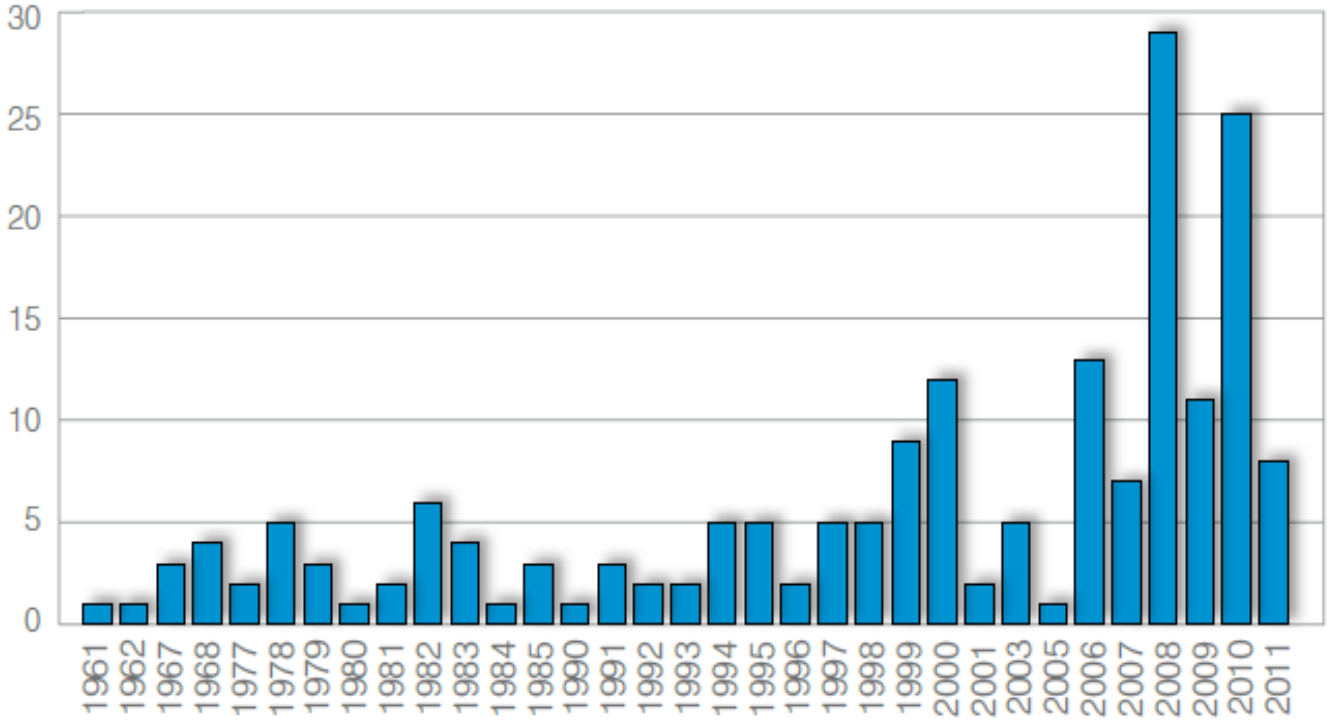
1961:
Die erste Anwendung des Hydraulic Fracturings erfolgt in Niedersachsen.

- ExxonMobil produces Natural Gas from about 230 wells in Lower Saxony
- So far industry-wide about 300 Fracs in 50 years in Germany
- So far about 800 billions m³ natural gas were produced
- Engineering-know-how: World-record-project Söhlingen Z10 in 1995

50 Years of Hydraulic Fracturing

Number of Fracs in Germany since 1961

about 300 -> 180 executed by ExxonMobil or subsidiaries



Public Perception is Shaped by Images

Dialogue with Communities

Public Information and Dialogueprocess

Process facilitators: Ruth Hammerbacher und Dr. Christoph Ewen

Work group of social actors

- *Communities*
- *Group of residents and interest groups*
- *Cultural-historical associations (Heimatverbände)*
- *Water and nature conservation authorities*
- *Environmental groups*
- *Water Management, regional and supra-regional*
- *Agriculture*
- *Tourist boards*
- *Trade Associations*

Neutral Body of Experts

Geology/ Hydrogeology:
Prof. Dr. Martin Sauter
University of Göttingen

Scientific Coordinator: Water Conservation/ Ecosystem analysis:
Prof. Dr. Dietrich Borchardt
Helmholtz Centre for Environmental Research

Multi-phase flow in the subsurface:
Prof. Dr. Rainer Helmig
University of Stuttgart

Environmental Chemistry/ Drinking Water:
Prof. Dr. Fritz Frimmel
Karlsruhe Institute of Technology

Toxicology/Bioanalytical Ecotoxicology:
PD Dr. Rolf Altenburger
Helmholtz Centre for Environmental Research

Risk Assessment and Water Rights:
Prof. Dr. Alexander Roßnagel
University of Kassel

Human Toxikology:
Prof. Dr. Ulrich Ewers
Institute for Environmental Hygiene and Toxicology

Plant Safety:
Dr. Hans-Joachim Uth
Formerly German Federal Environment Agency

Public events

Presentation and discussion of the results

Citizens

Online dialogue

Recent Studies

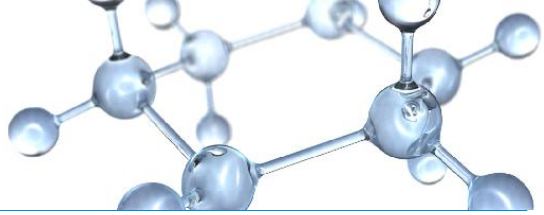
Consensus findings of all four Study:

- No reason to ban the technology, Definition of excluded areas
- Step-by-Step proceeding with scientific participation
- Continuation of Exploration
- Reassessment of the risks as more data is available

Adding further data:

- Plant safety, Wellintegrity,
- Monitoring, Frac-Additives, Frac-Model
- Watermanagement, Disposal, diffused Methane

Summary



- **In 2030 Natural Gas will be energy source #1 in Germany**
- **Domestic Shale Gas has a significant potential**
- **Local production offers numerous advantages:**
  - **Provides greater energy security**
  - **Creates local and national economic benefit**
  - **Maintains high environmental and safety standards for production**
  - **No need for transport – saves energy and emissions**