50 years gas in NL
…..and beyond
…prepare for the next 50 years

Hans van Luijk, Chairman, Supervisory Board Gasunie

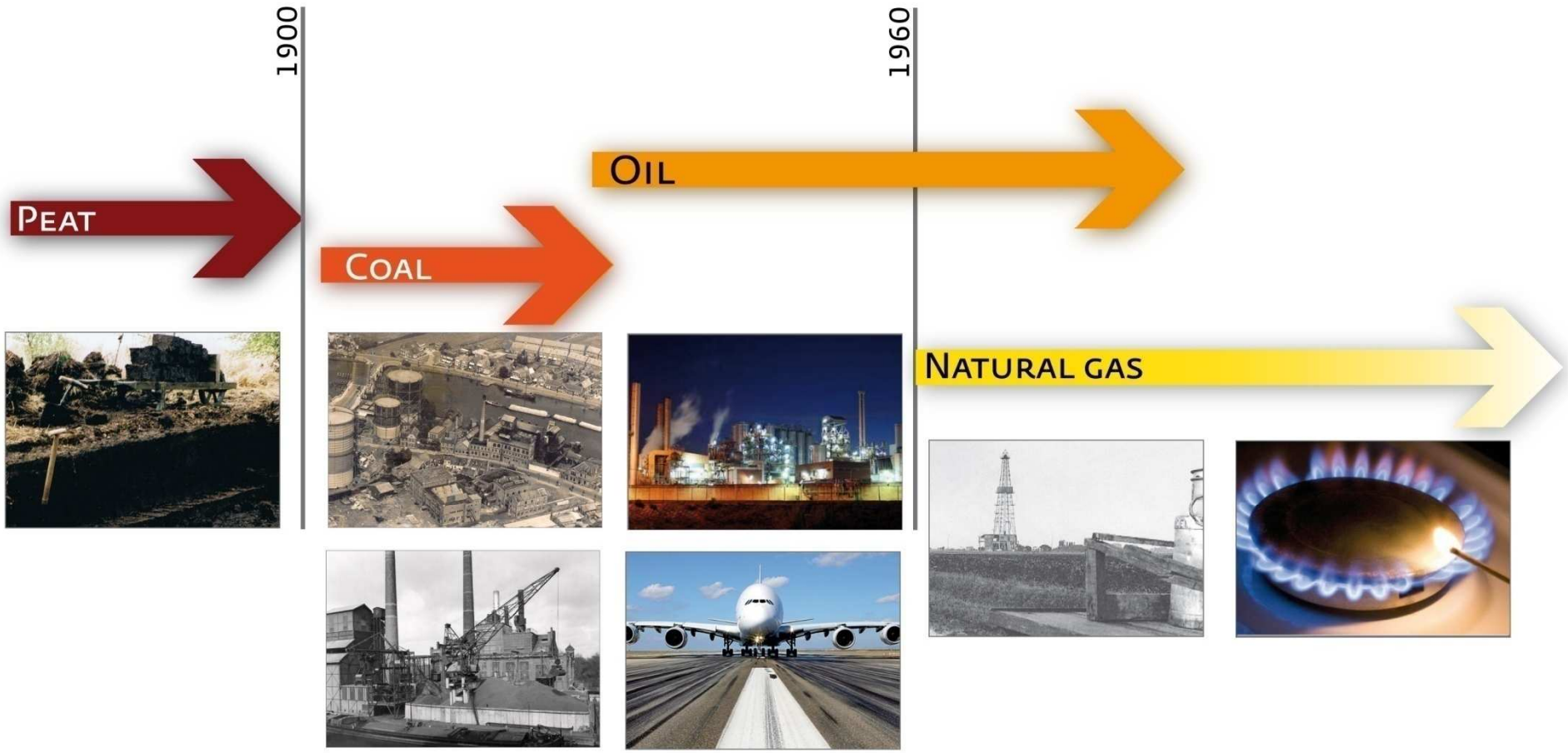
KIVI, 29 november 2012

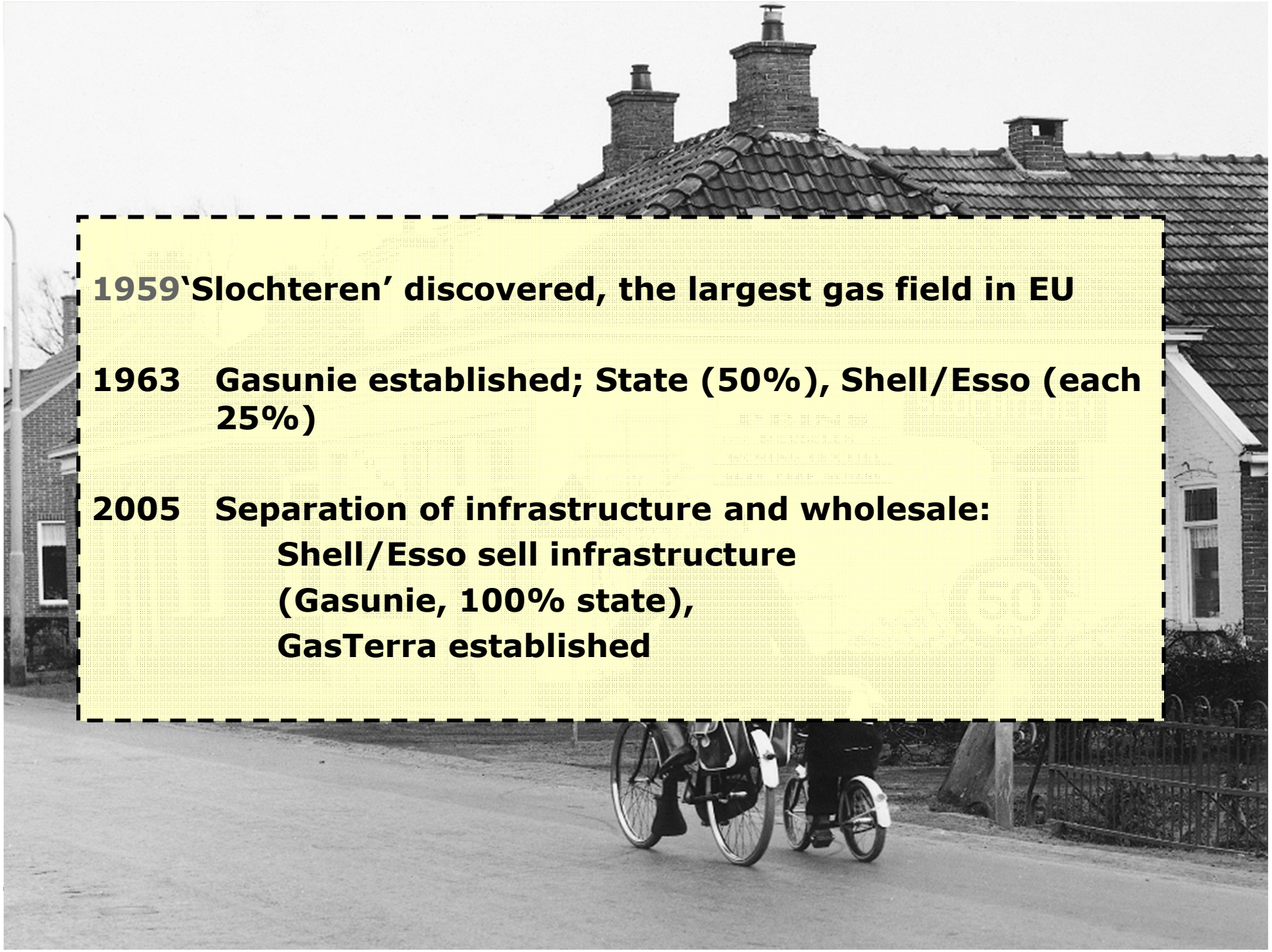
gasunie
crossing borders in energy

Agenda

- Introduction
- History of gas in the Netherlands (- 50 years)
- Tomorrow's challenges (+50 years)
- Future role of gas general
- Future role of gas: Dutch situation
- Conclusions

Energy lifecycles: from biology to geology



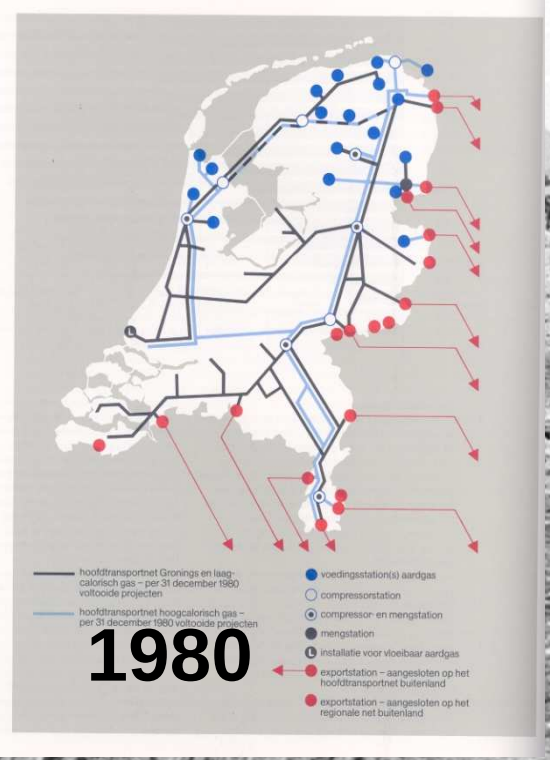


1959 **'Slochteren' discovered, the largest gas field in EU**

1963 **Gasunie established; State (50%), Shell/Esso (each 25%)**

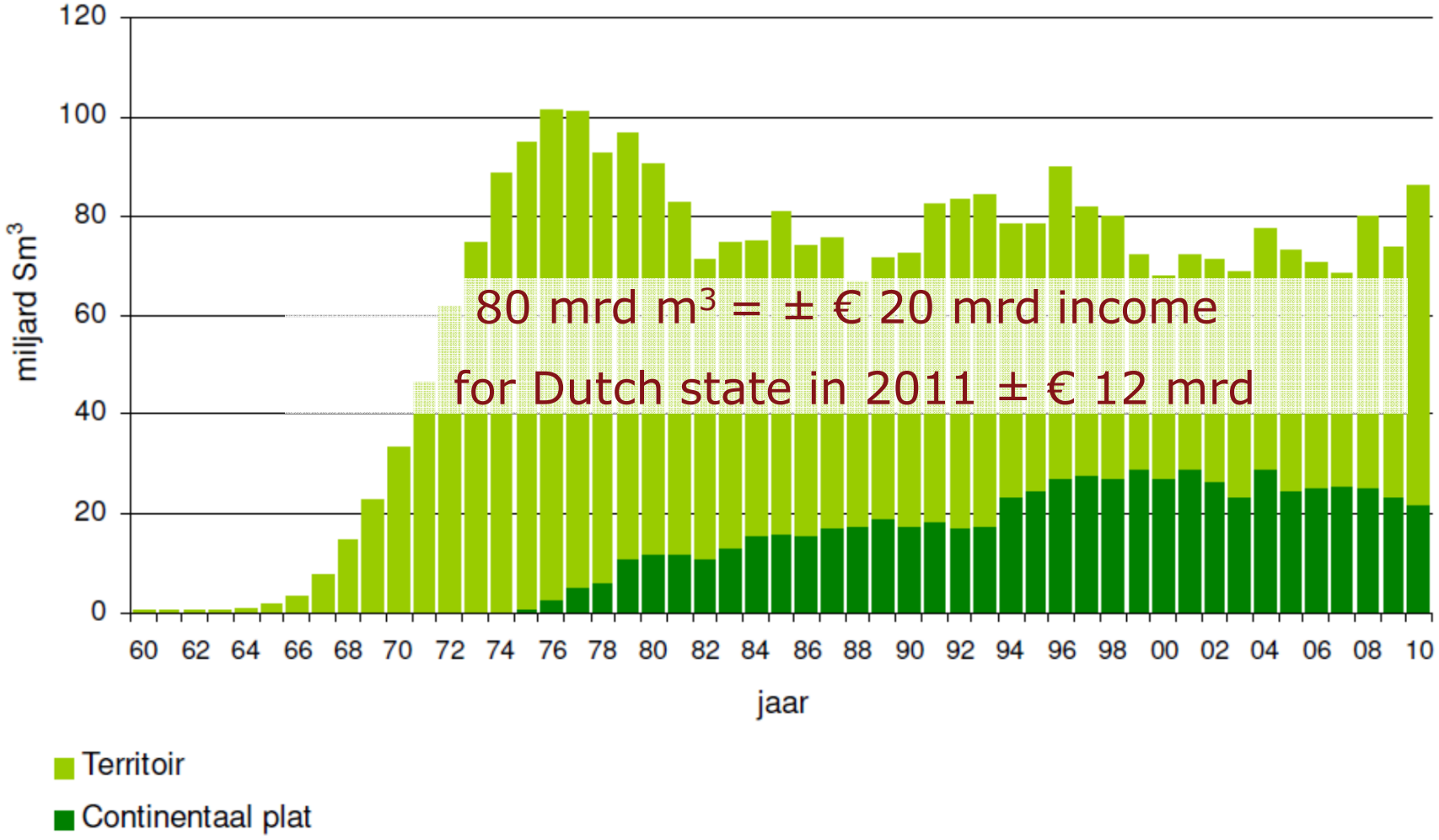
2005 **Separation of infrastructure and wholesale:**
Shell/Esso sell infrastructure
(Gasunie, 100% state),
GasTerra established

The Gasunie gas transport network then..

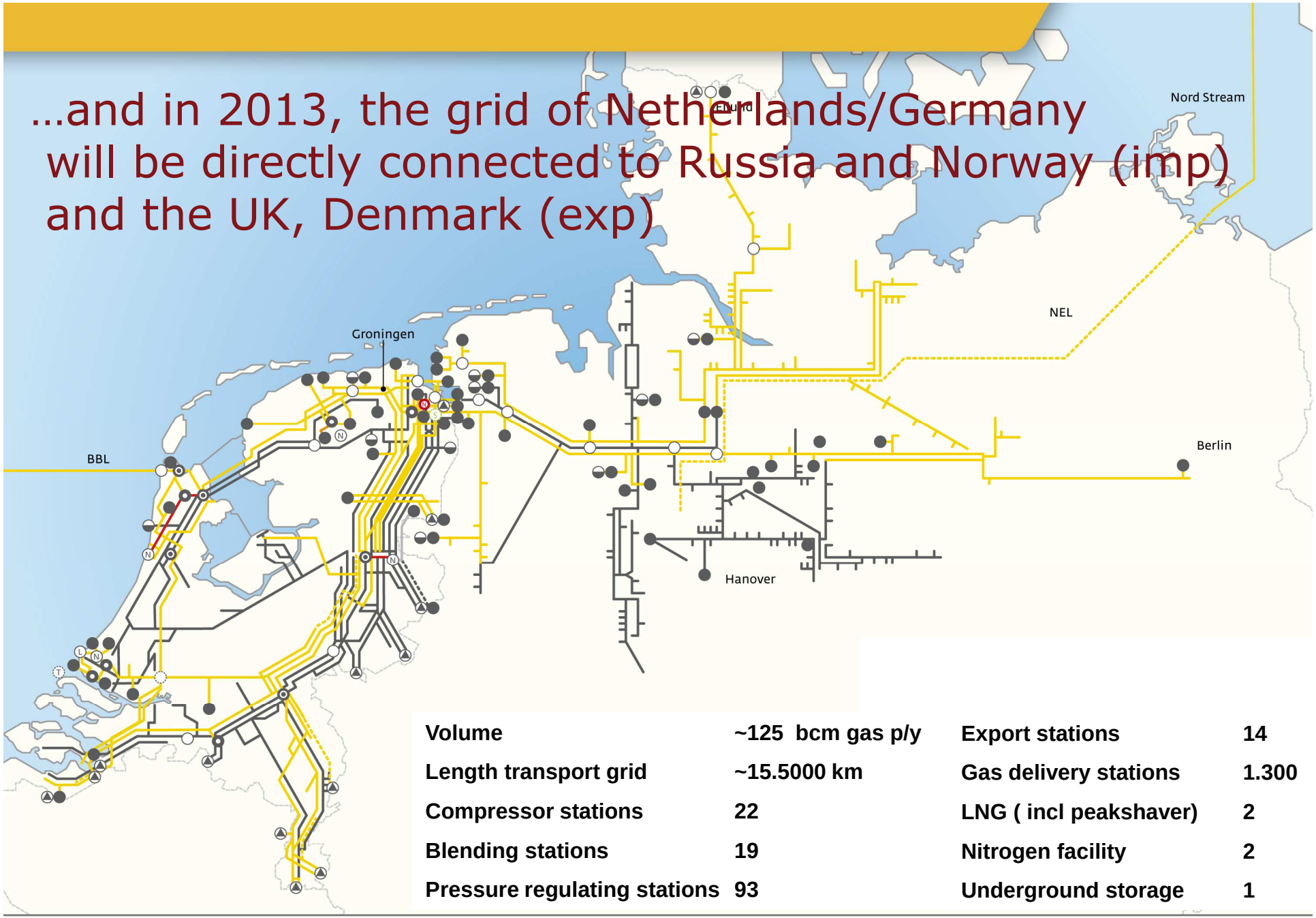


In 2012 bookvalue regulated transport system in NL: 5 bln euro

Indigenous production 1960 - 2010



…and in 2013, the grid of Netherlands/Germany will be directly connected to Russia and Norway (imp) and the UK, Denmark (exp)



Volume	**~125 bcm gas p/y**	**Export stations**	**14**
Length transport grid	**~15.5000 km**	**Gas delivery stations**	**1.300**
Compressor stations	**22**	**LNG (incl peakshaver)**	**2**
Blending stations	**19**	**Nitrogen facility**	**2**
Pressure regulating stations	**93**	**Underground storage**	**1**

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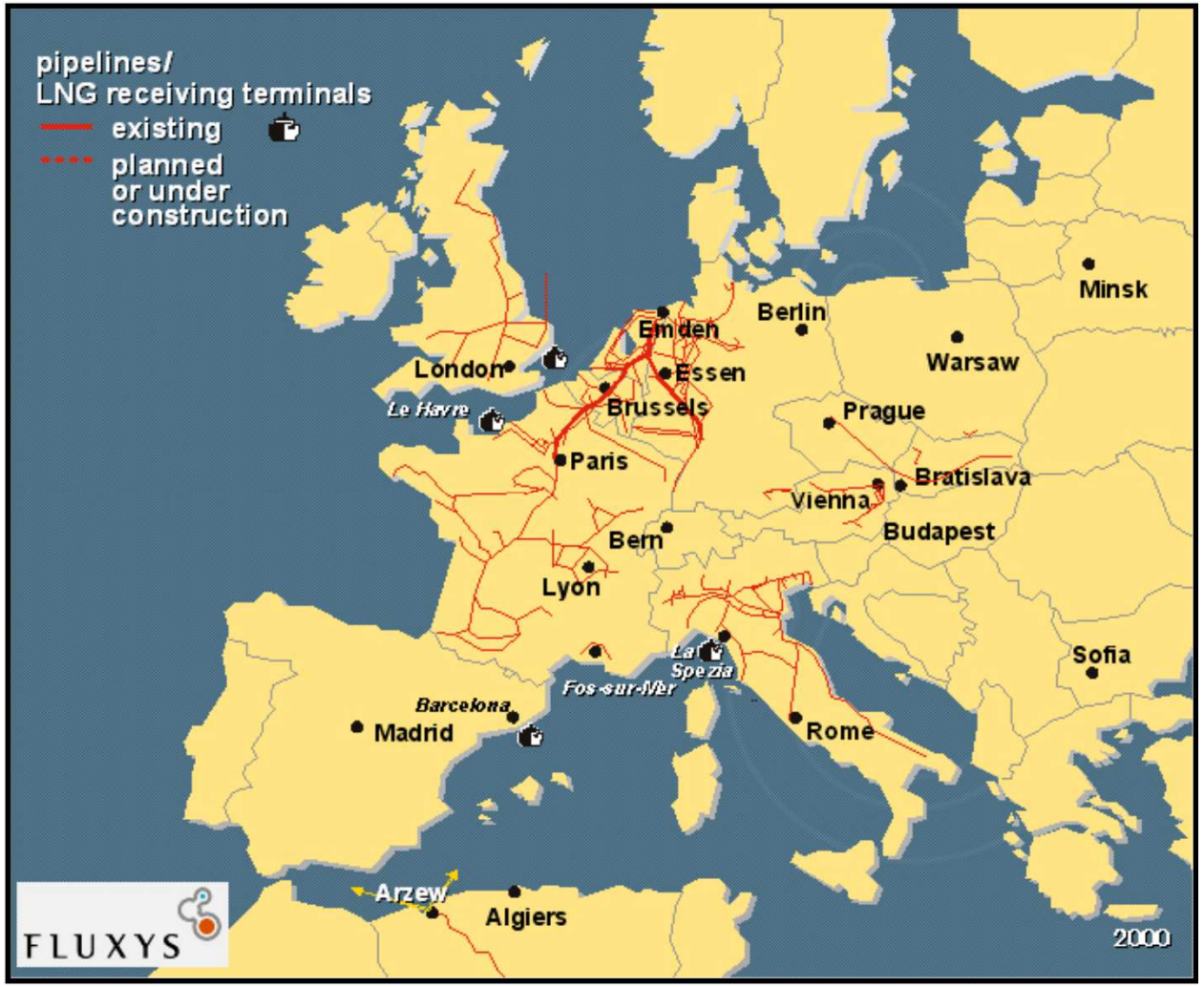
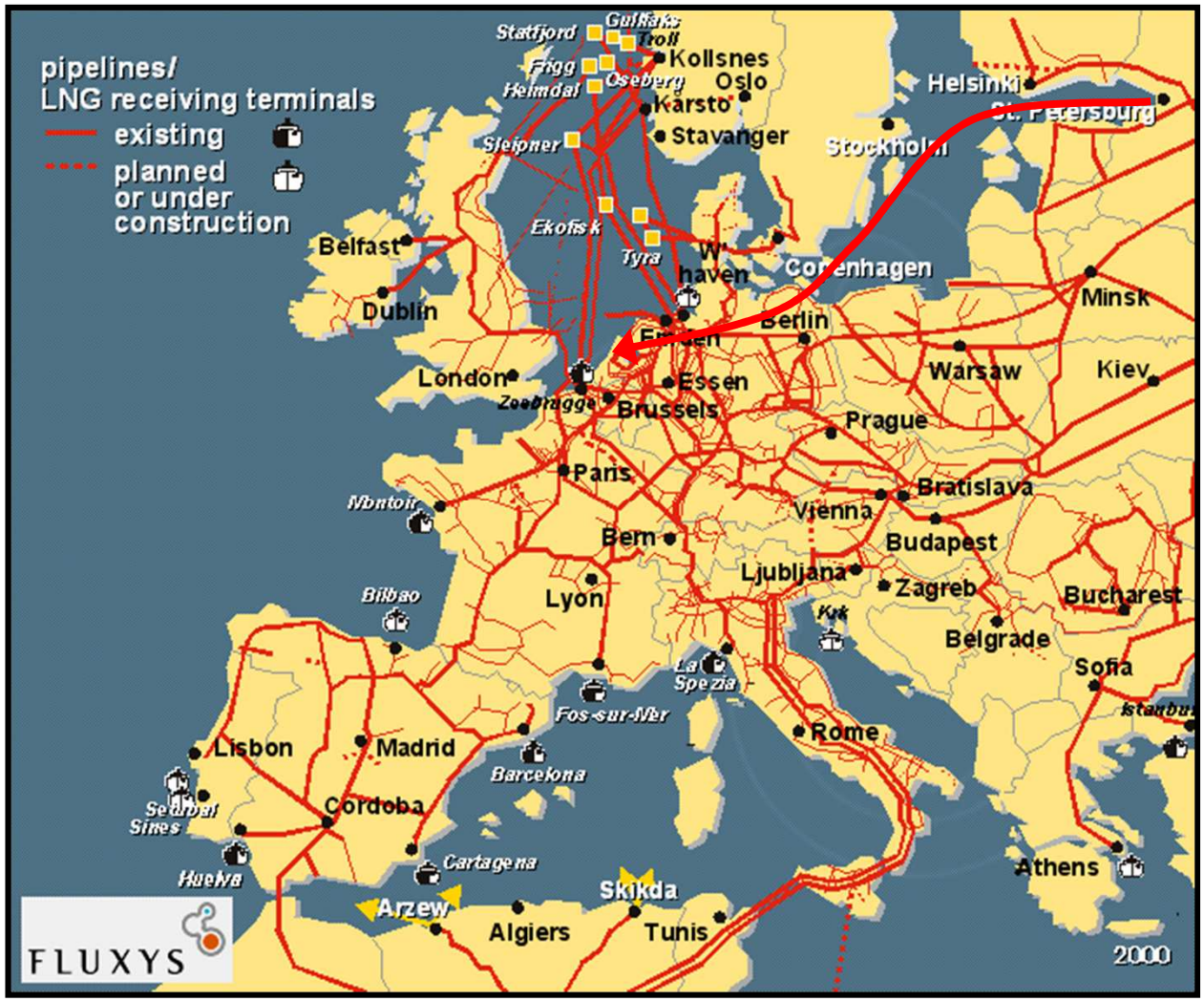
Transmission Grid 1970



Transmission Grid 2012



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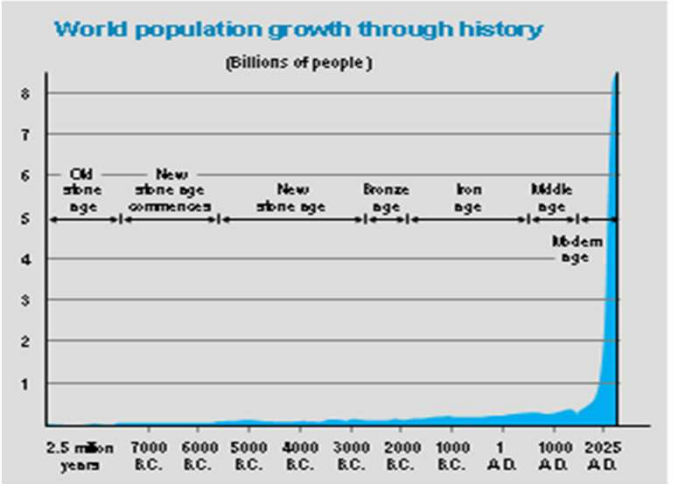
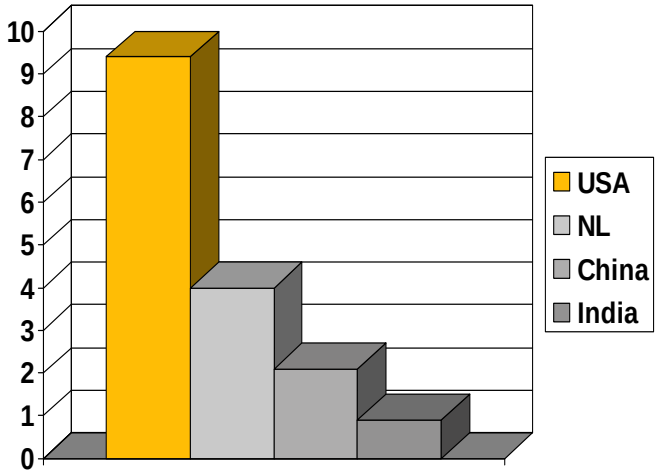
World population growth



Source: US census bureau

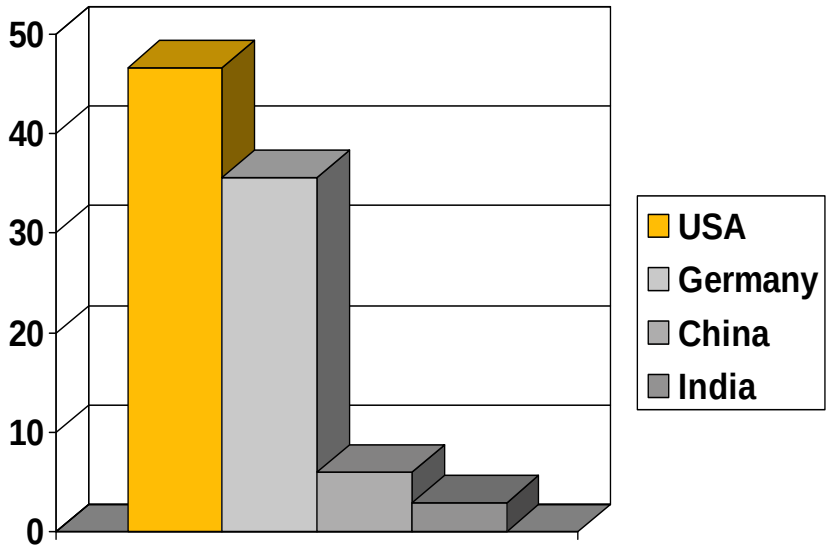
World resources consumption (indicative): ecological footprint



Ecological footprint (ha/cap)

Source: WWF

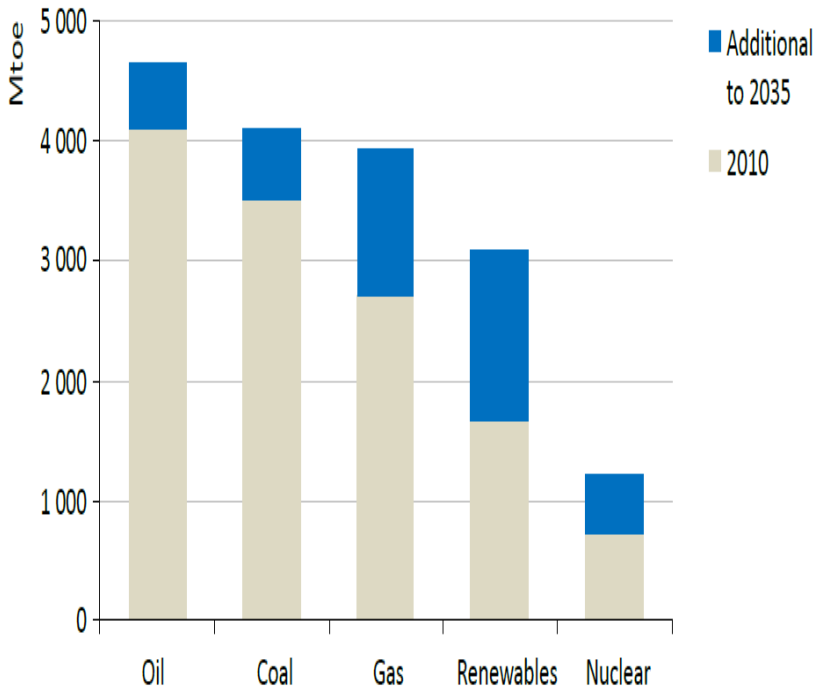
Per capita income (indicative)



GDP/capita *1000$

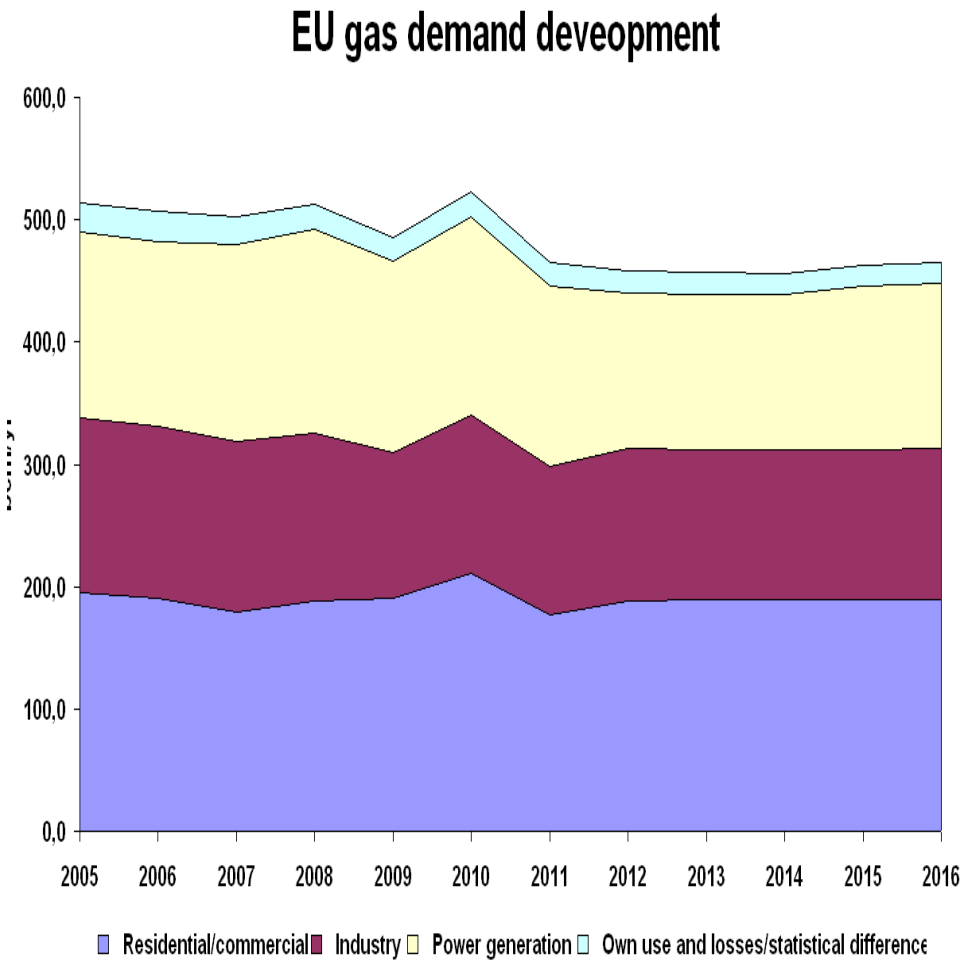
Source: World Bank

world energy demand



Renewables & natural gas collectively meet almost two-thirds of incremental energy demand in 2010-2035

EU gas demand



Source: based on IHS CERA Oct 2012

….contradictory expectations ……

- **Energy Scenario's are well known and very similar**

- **Headlines Shell, Exxon, BP, IEA :**
  - **World needs all the hydrocarbons we can get**
  - **Large investements in developing fossile**
  - **Modest investments in developing non fossil**
  - **Rely on CCS, ETS mechanisms to reduce CO2 emission**
  - **In the short term: energy efficiency and gas**

  But:
  - **EU targets 20/20/20**
    (NL: 16% sustainable by 2020, >80% in 2050?)
  - **Energy policies in Germany, Denmark, UK**
  - **Car industry moving fast to electric**

  Discontinuity?
  - **Technology: massive R&D money in sustainable energy**
  - **Disasters (e.g. Sandy, floods)**

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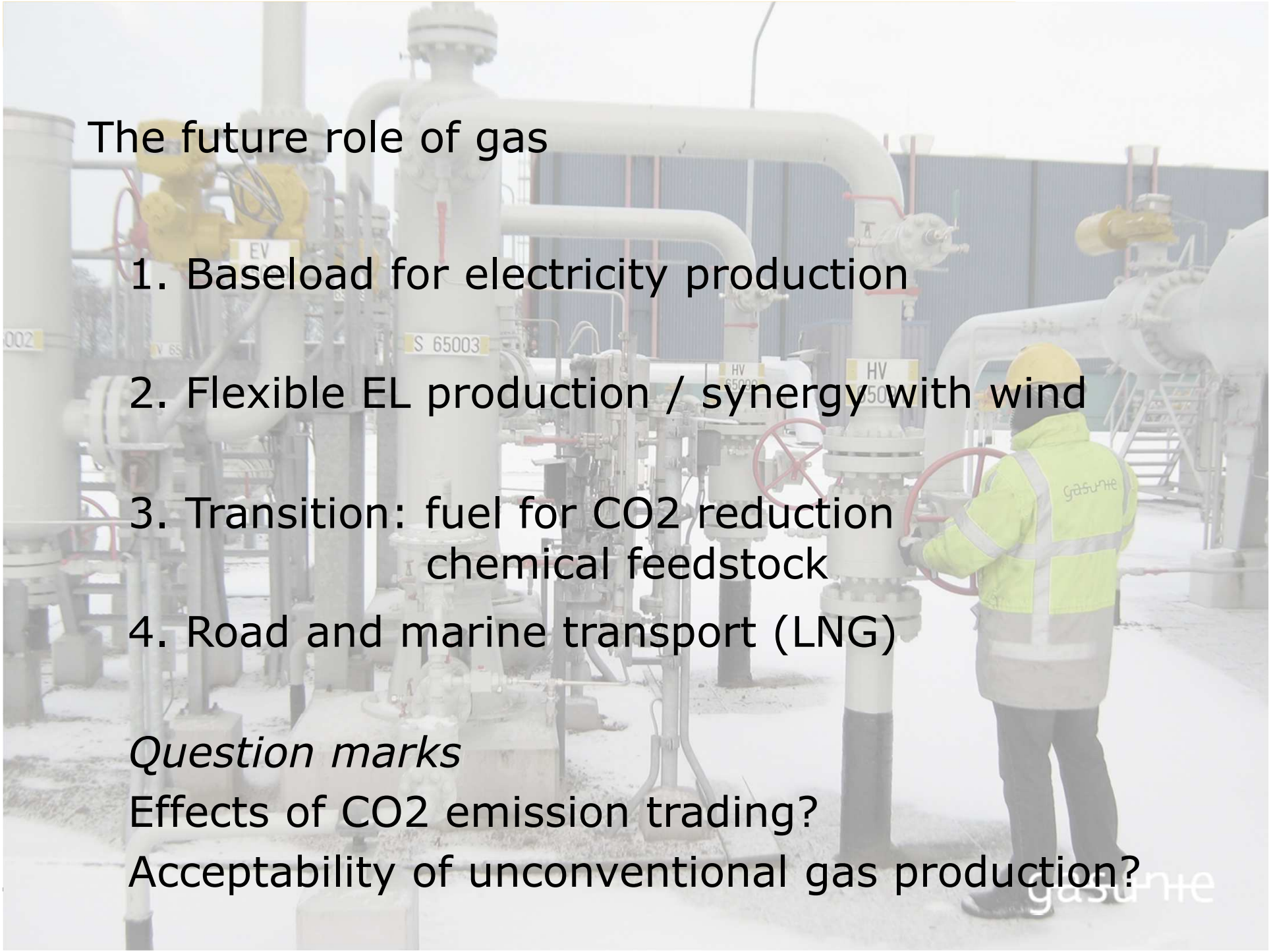


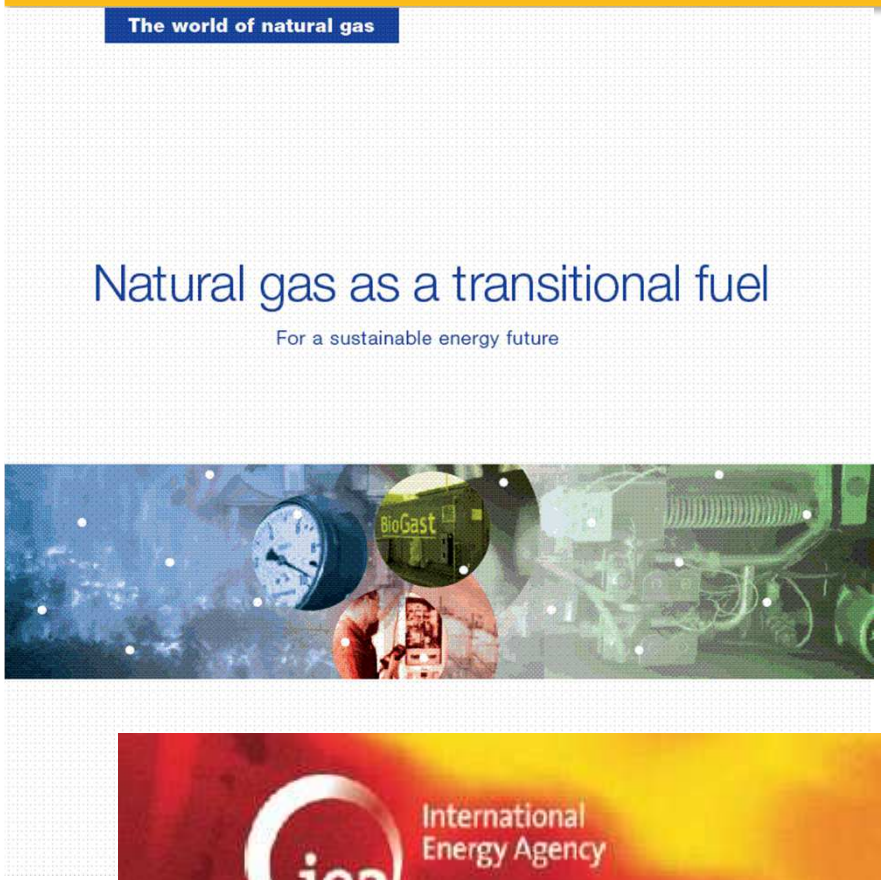
The future role of gas

1. Baseload for electricity production
2. Flexible EL production / synergy with wind
3. Transition: fuel for CO2 reduction
   chemical feedstock
4. Road and marine transport (LNG)

Question marks

Effects of CO2 emission trading?

Acceptability of unconventional gas production?


The world of natural gas
Natural gas as a transitional fuel
For a sustainable energy future
BioGast


iea
International
Energy Agency
ARE WE ENTERING
A GOLDEN AGE OF GAS?
Special
Report


De wereld van aardgas
STOP PRODUKTIE KERNAFV
SLUIT DE KERNCENTRALES
Whatever the weather
We only reach welfare
together
Als de kolenhaar brandt...
...komt u echt gezellig THUIS!
WIM KAN
Aardgas gevonden bij boring in Slochteren
De NV Nederlandse Aardolie Maatschappij heeft in haar exploratieboring
ONZICHTBAAR GOUD
DE BETEKENIS VAN 50 JAAR AARDGAS VOOR NEDERLAND

How will the gas be resourced?

- Conventional pipeline gas
- LNG
- Unconventional gas?
- Green gas

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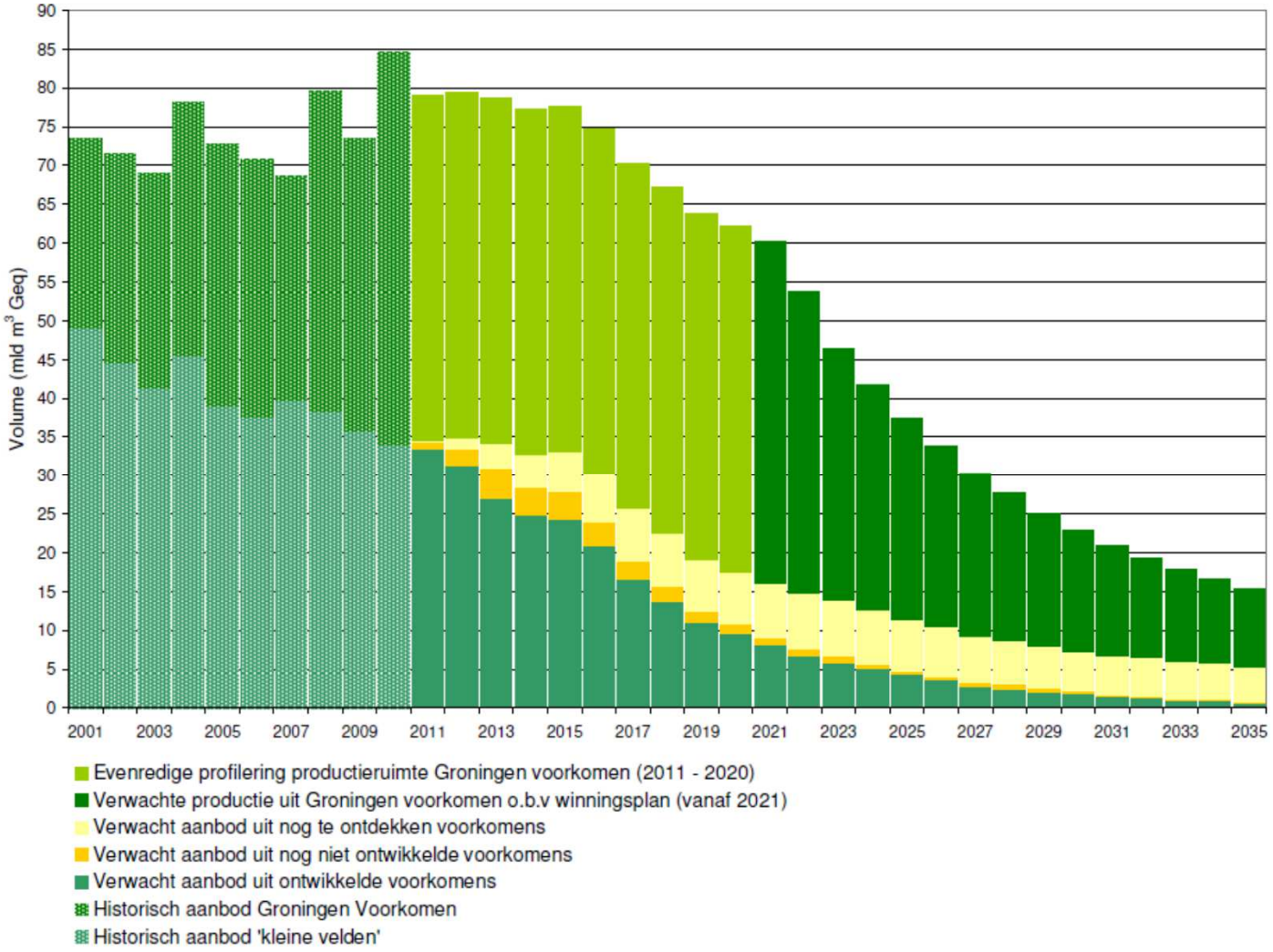
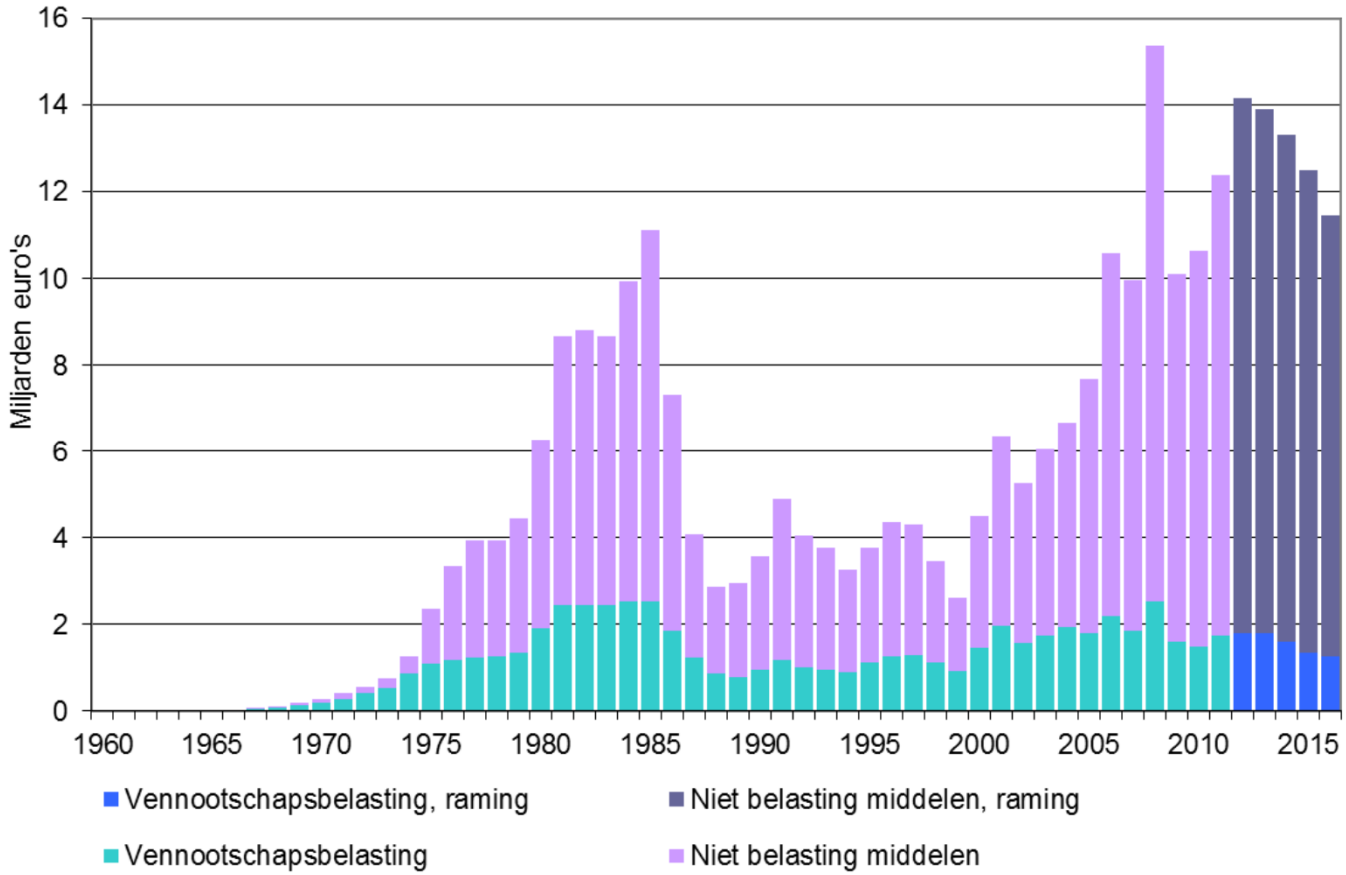
1. Pipeline gas

Production forecast Netherlands 2001-2035



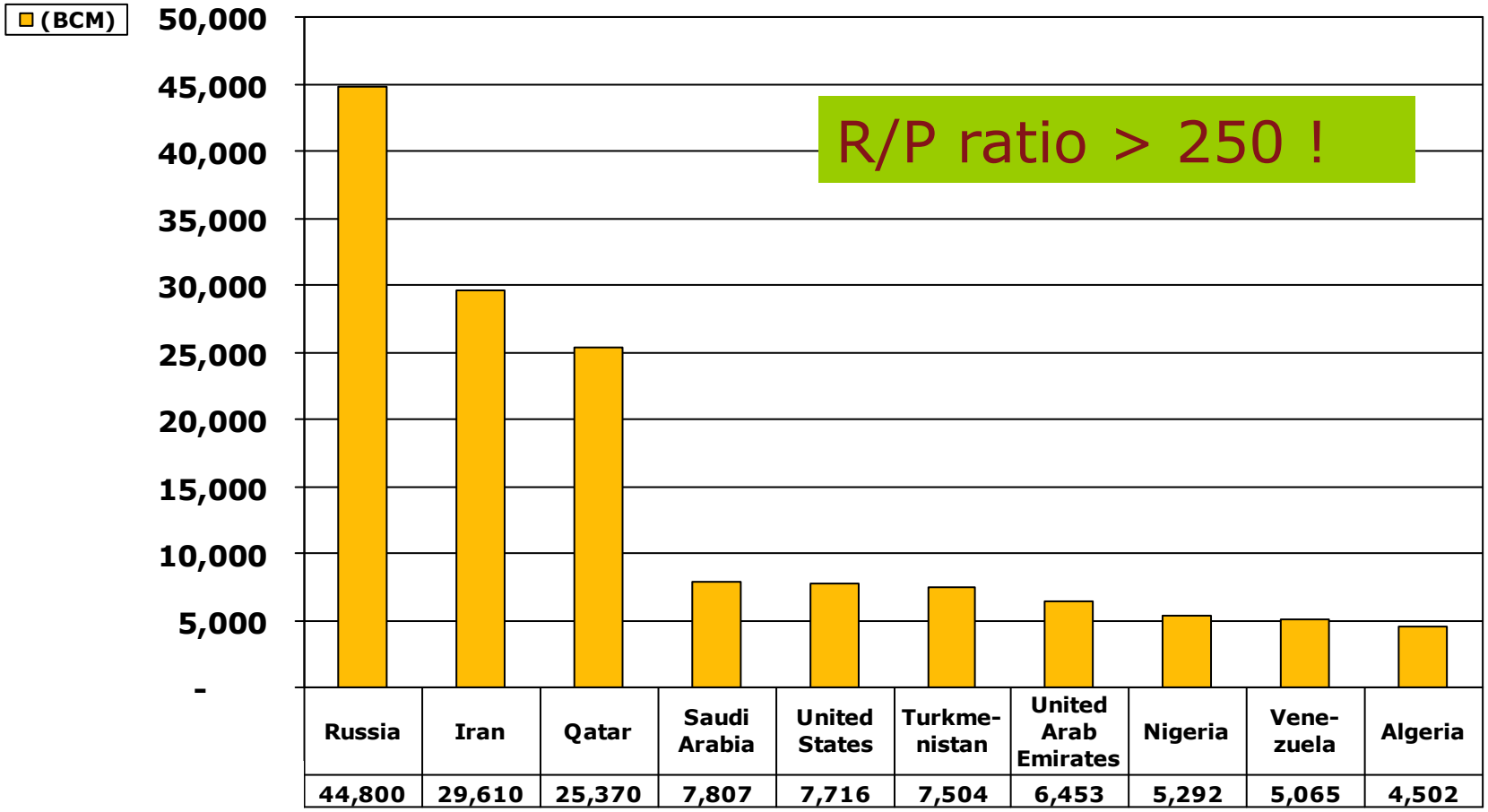
Jaarverslag Delfstoffen en Aardwarmte in Nederland

Aardgasbaten, 1960 – 2016



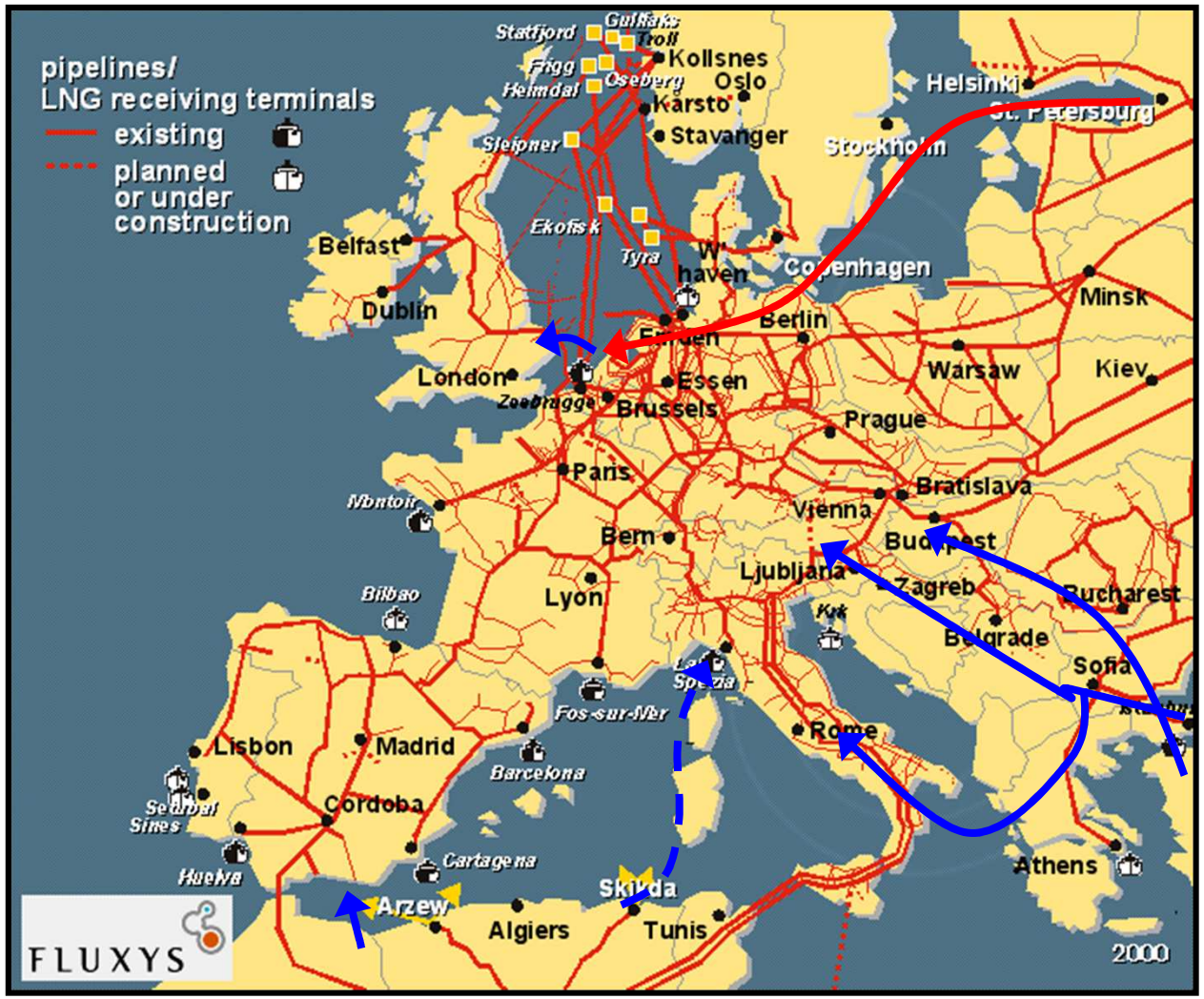
Jaarverslag Delfstoffen en Aardwarmte in Nederland

Proven gas reserves top ten countries



Source: CIA

Transmission Grid 2017?



Pipeline Gas potential supply to Europe

North stream

Length	2x1224 km
Capacity	55 bcm/yr
Dia / pressure	48”/220 bar

South stream

Length	4x900 km
Capacity	63 bcm/yr
Dia/pressure	32”/250 bar

Nabucco

Length	3900 km
Capacity	31 bcm/yr
Dia	56”

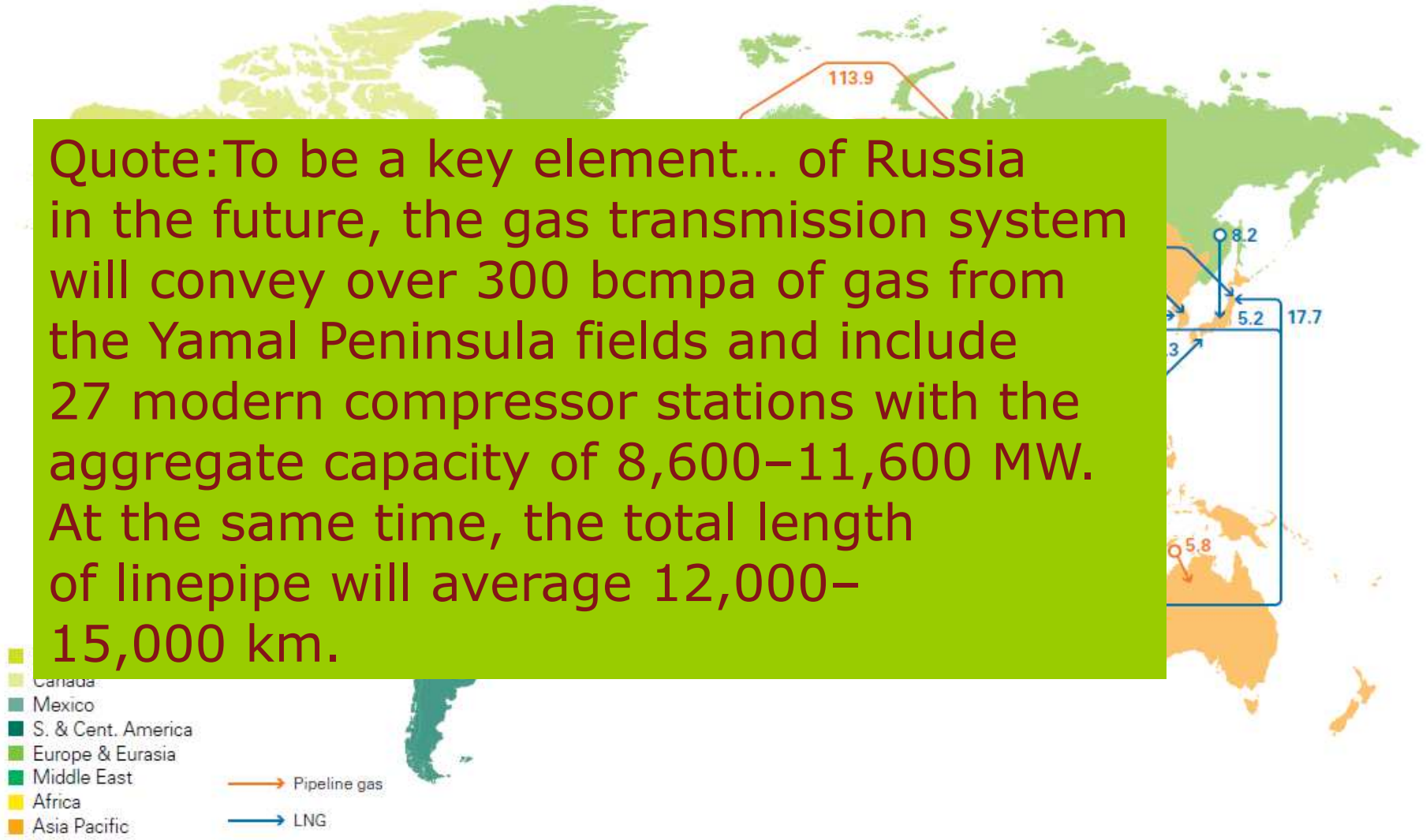
North stream construction

North stream construction

Northstream by numbers

- 2x 1224 km;
- length pipe: 12 m, (38 mm wall thickness, 1153 mm diameter)
- 2x 101,000 pieces pipe
- 2,4 mln tonnes of steel (242x Eiffel tower)
- 5 yrs from planning to S/U
- 50 years operational life
- 55 bcm (= 148,000 wind turbines or 33 Germ nuclear pp)
- 100 pieces of ammo removed
- 2585 pages of the Esproo report (impact study)
- Etc.

Major trade movements: pipeline gas and LNG (BCM)



Quote:To be a key element… of Russia in the future, the gas transmission system will convey over 300 bcmpa of gas from the Yamal Peninsula fields and include 27 modern compressor stations with the aggregate capacity of 8,600–11,600 MW. At the same time, the total length of linepipe will average 12,000–15,000 km.

Source: BP Statistical Review of World Energy 2011

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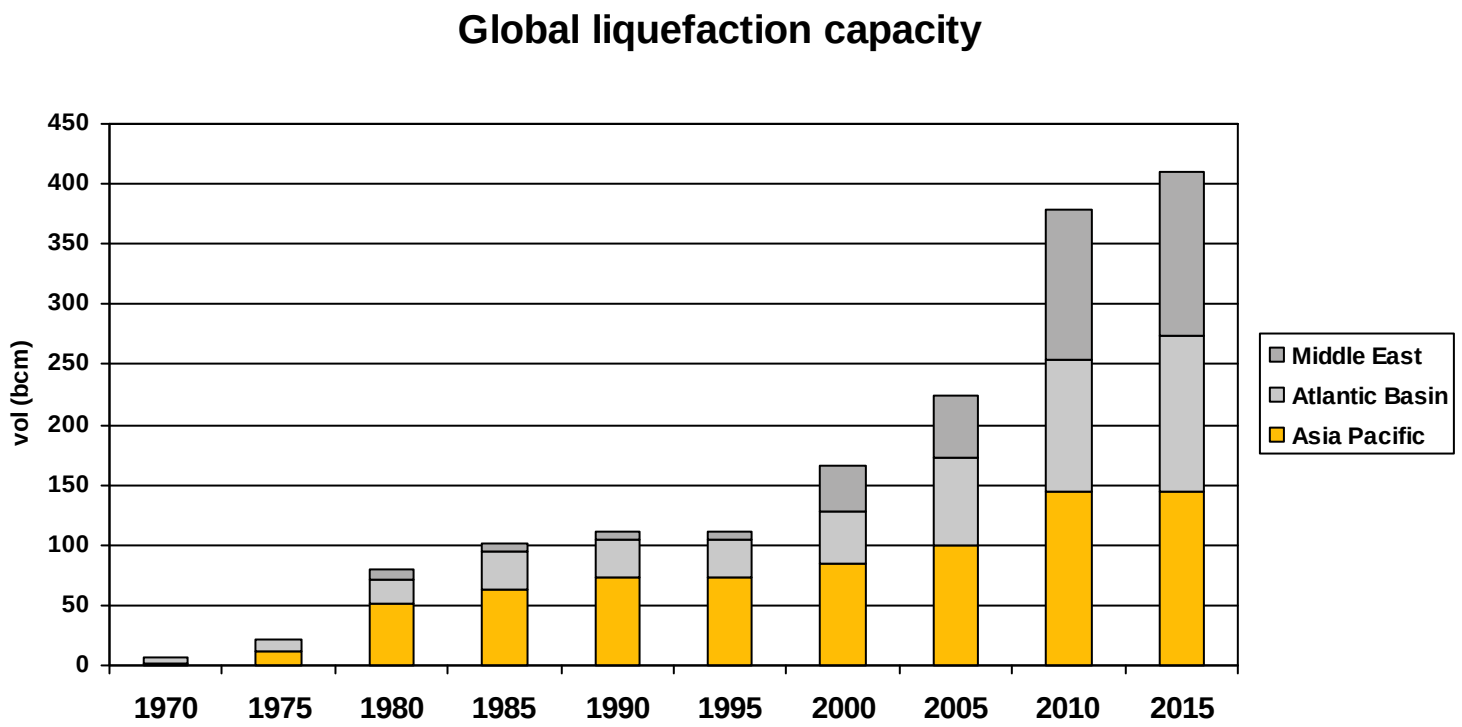
2. LNG
Evolution of global LNG liquefaction capacity




BRITISH TRADER
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New LNG markets: small scale use in **transportation**

LNG carrier

LNG receiving terminal & break bulk

vaporizer

Pipeline

Road trailer

Satellite plant

LNG carrier for break bulk

bunkering

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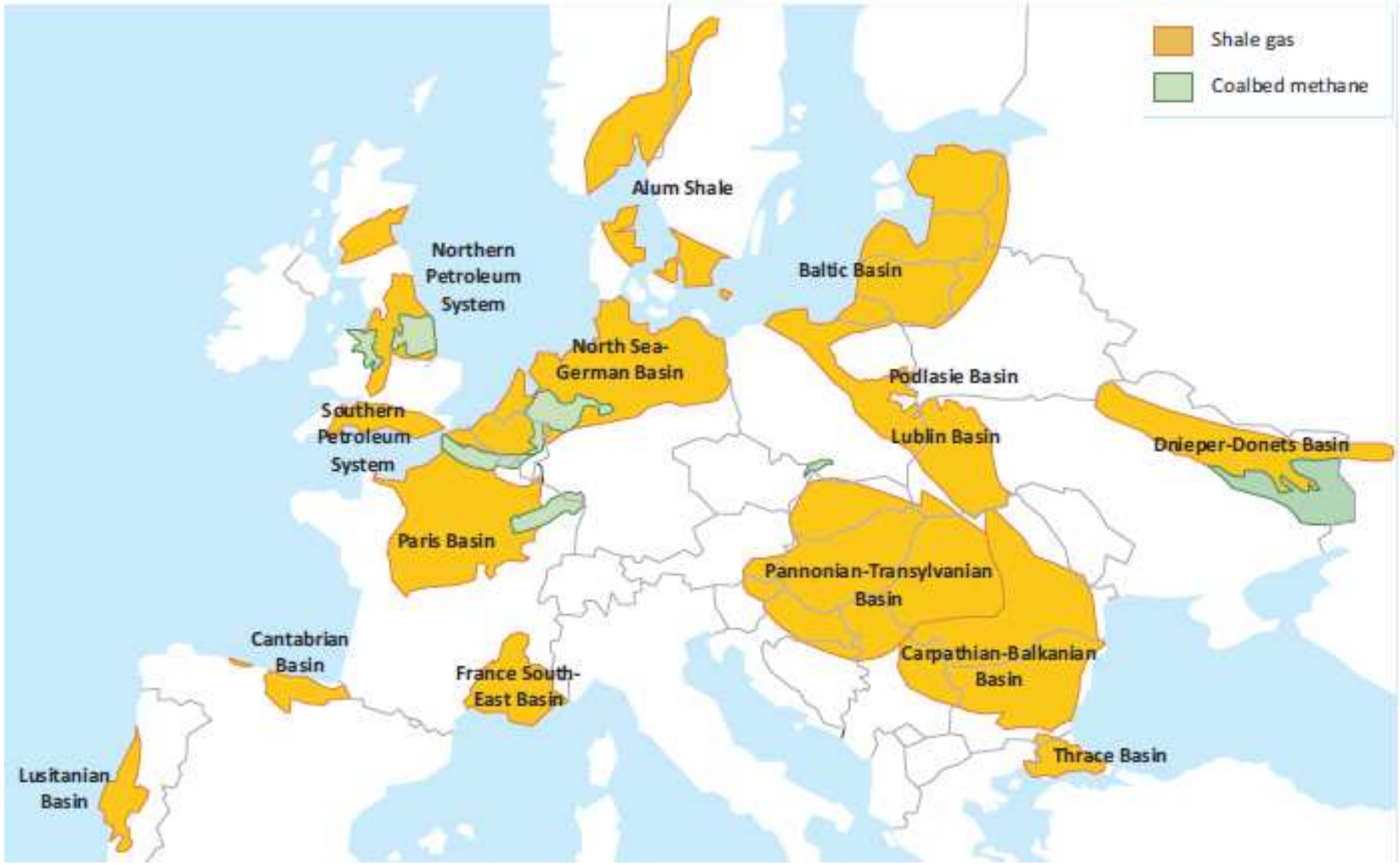
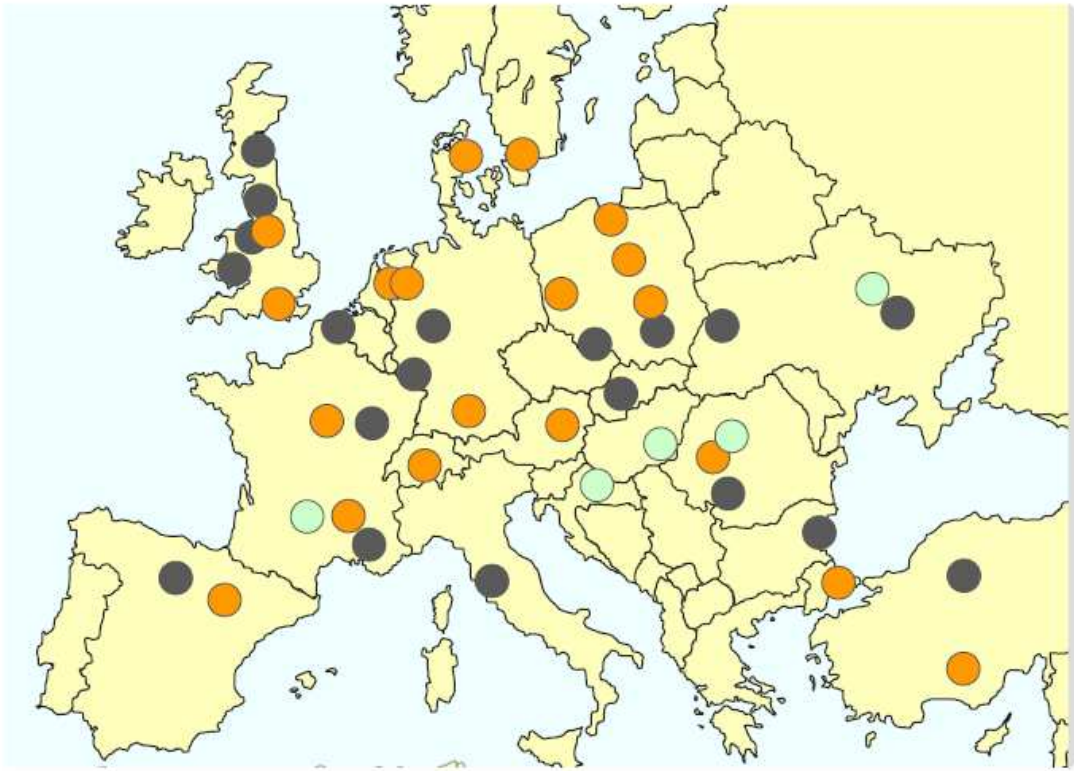
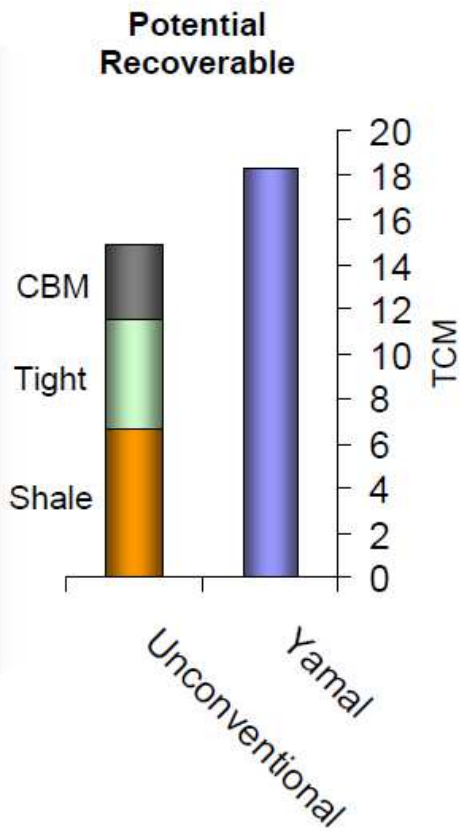
3. Unconventional gas Europe



Source: IEA, Wood Mackenzie

European Unconventional Potential





Source: Wood Mackenzie, IEA

6

ExxonMobil
Taking on the world's toughest energy challenges.

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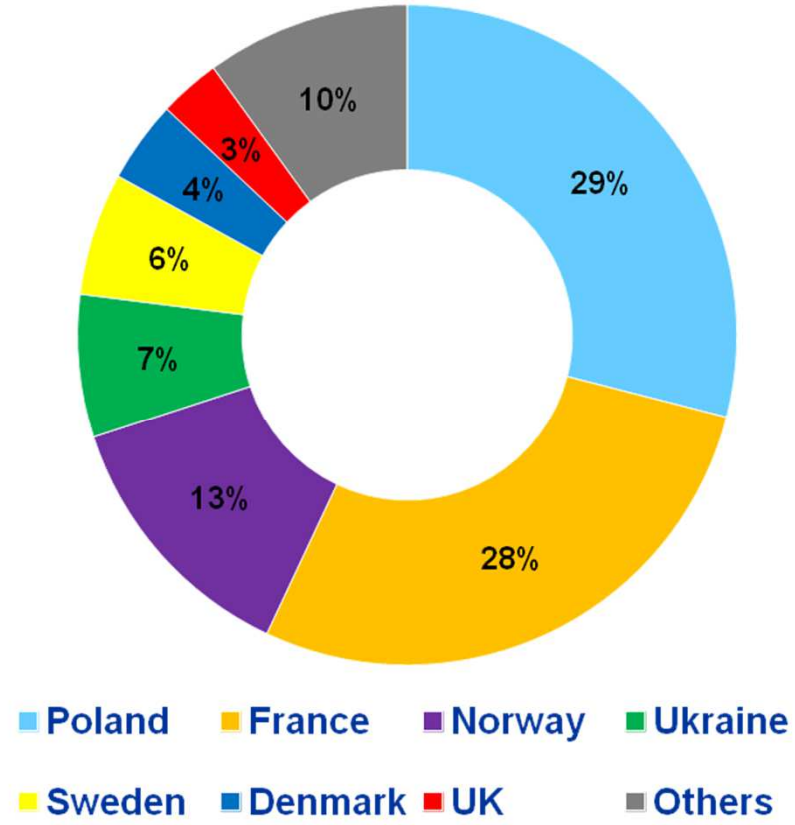
Distribution of technically recoverable shale gas resources in European countries



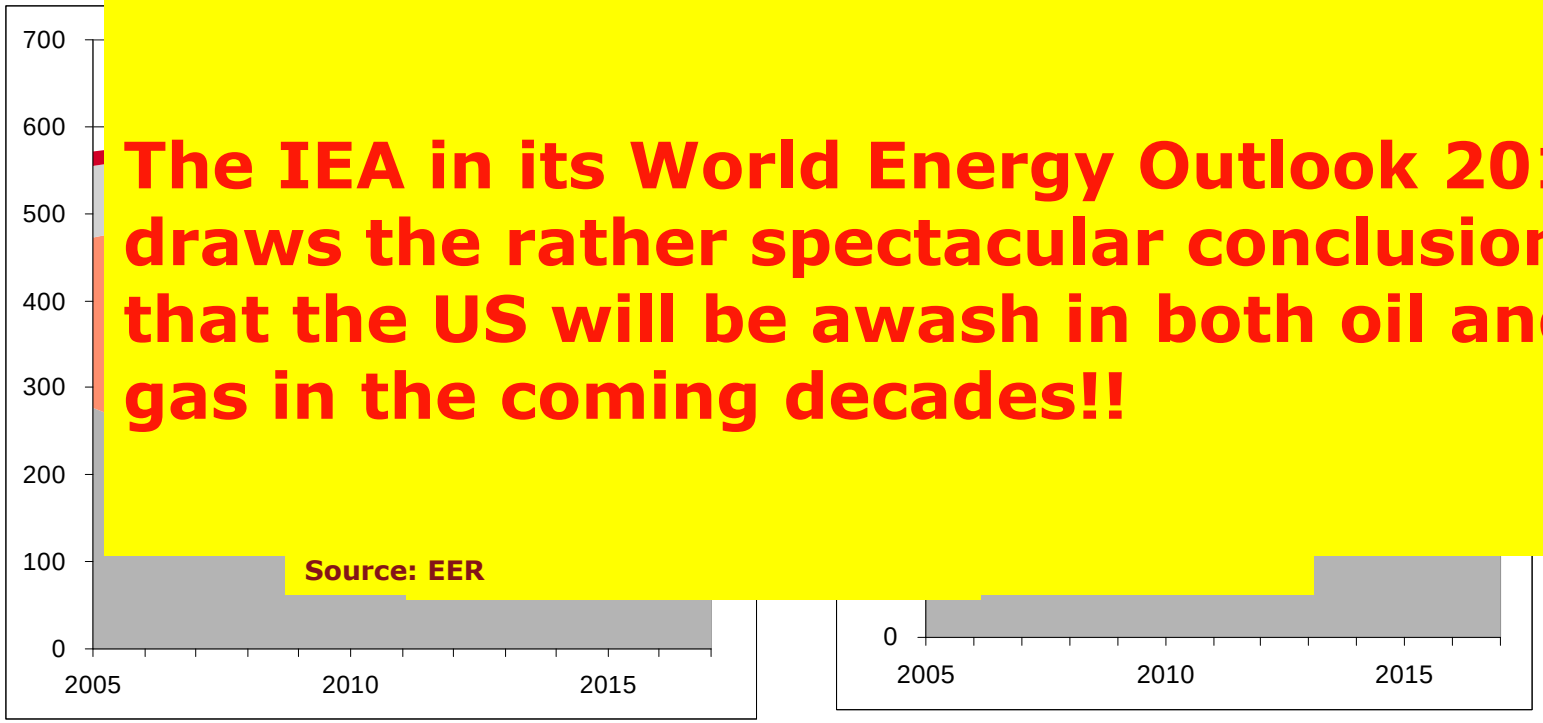
Total: 18 tcm

Source: IEA, U.S. Energy Information Administration

Changing the supply play

US forecasts February 2008

US forecasts August 2010

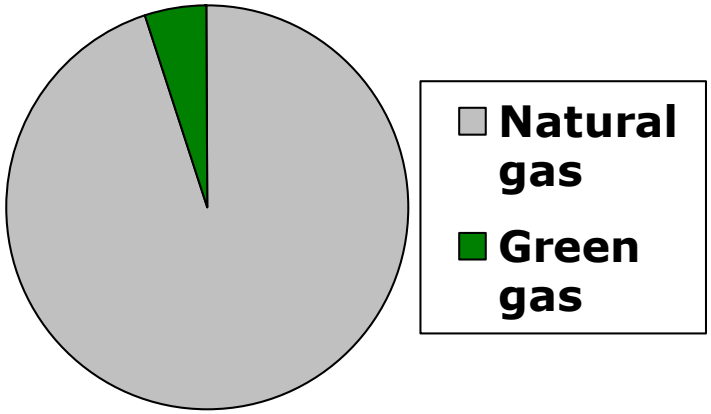


The IEA in its World Energy Outlook 2012 draws the rather spectacular conclusion that the US will be awash in both oil and gas in the coming decades!!

Source: Clingendael International Energy Programme

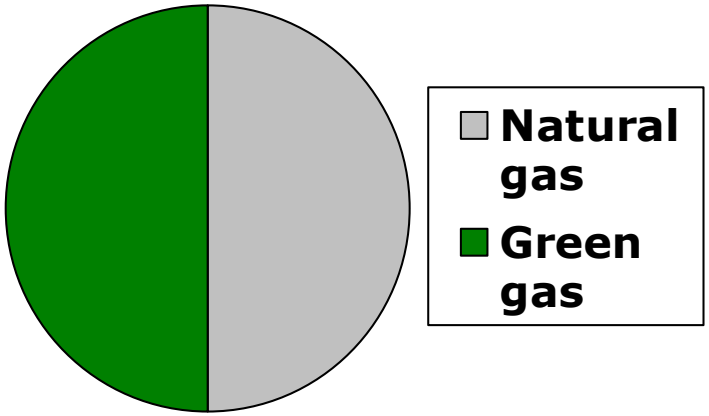
4.Potential for Green Gas the Netherlands

from 5% of gas consumption



2020

to 50% of gas consumption!



2050

Green Deal

groengasnl
Stichting Groen Gas Nederland

approx 30 million m3 currently

X 10 = 0,3 bcm in 2014

X 10 = 3 bcm in 2025/30 (1.5 – 2 million households)

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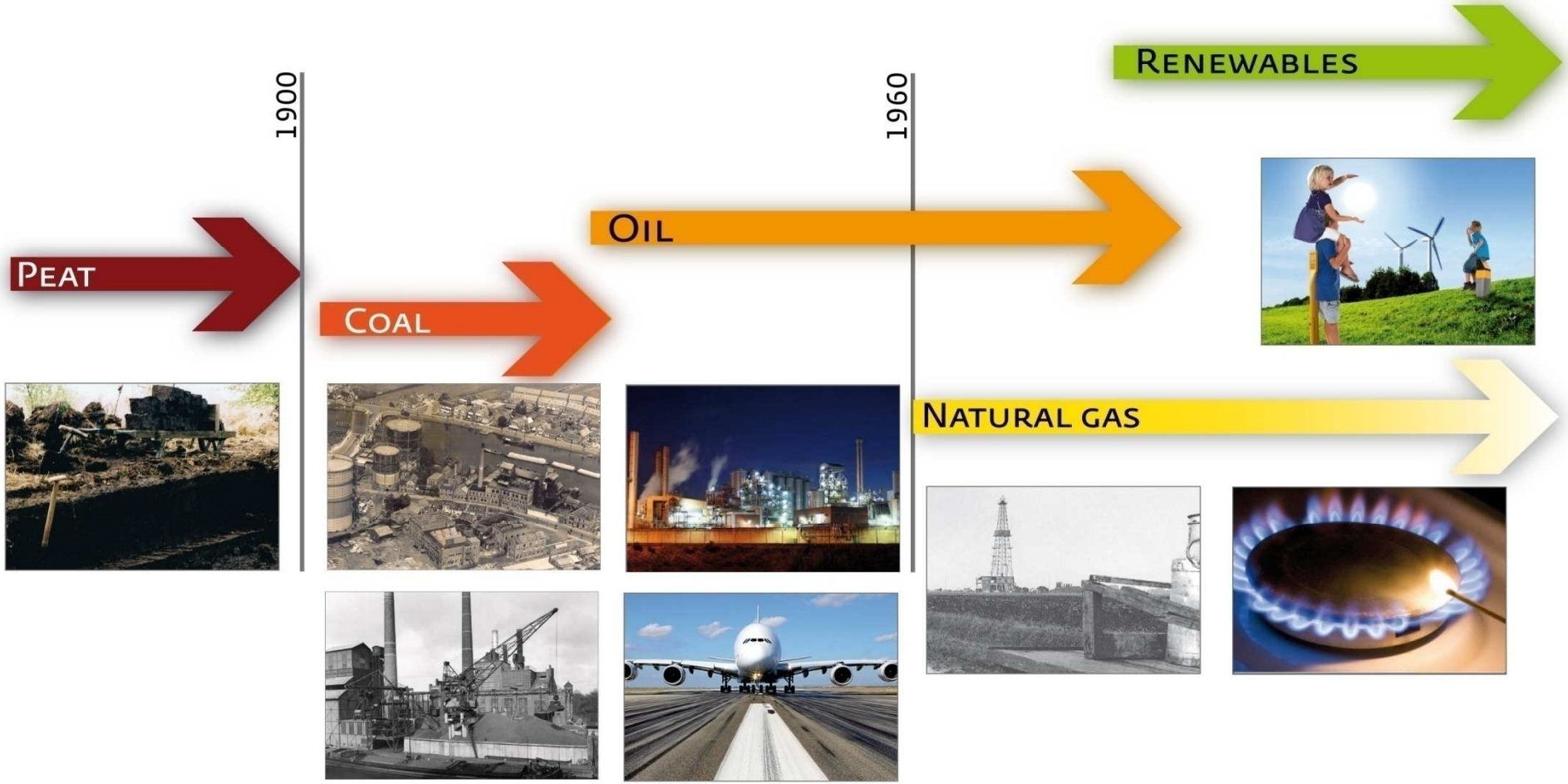
Uncertainty: Technology breakthroughs: from geology back to biology?



From uncertainties (long term)….

- Supply/Demand/price pattern (e.g electric cars?)

- Country policies on fossil energy (Dk, D)

- Technological breakthroughs

- Acceptability of unconventional gas, underground storage (gas or CO2 from CCS)

- Effects of CO2 emission trading system (ETS)

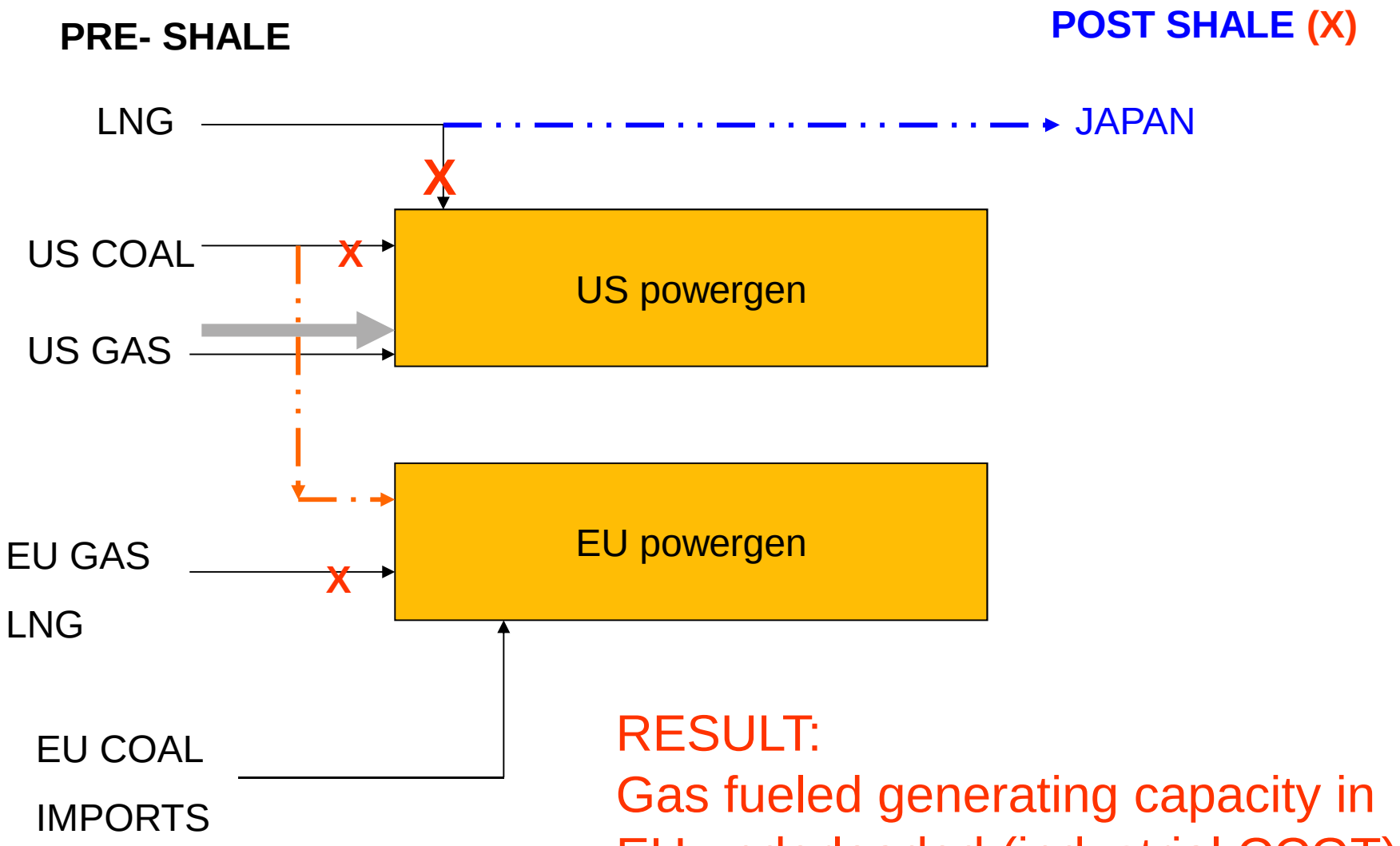
… to uncertainties today, real life ….

Competitive pressures e.g.:

- LNG:
  - vs pipeline gas
  - regional LNG markets/prices
  - LT contract prices
- Coal:
  - Large swings in gas & coal prices
  - Coal vs gas competition:

    oil indexed gasprice much less attractive for power generation;

Effect of US unconventional gas development



RESULT:
Gas fueled generating capacity in EU underloaded (industrial CCGT)

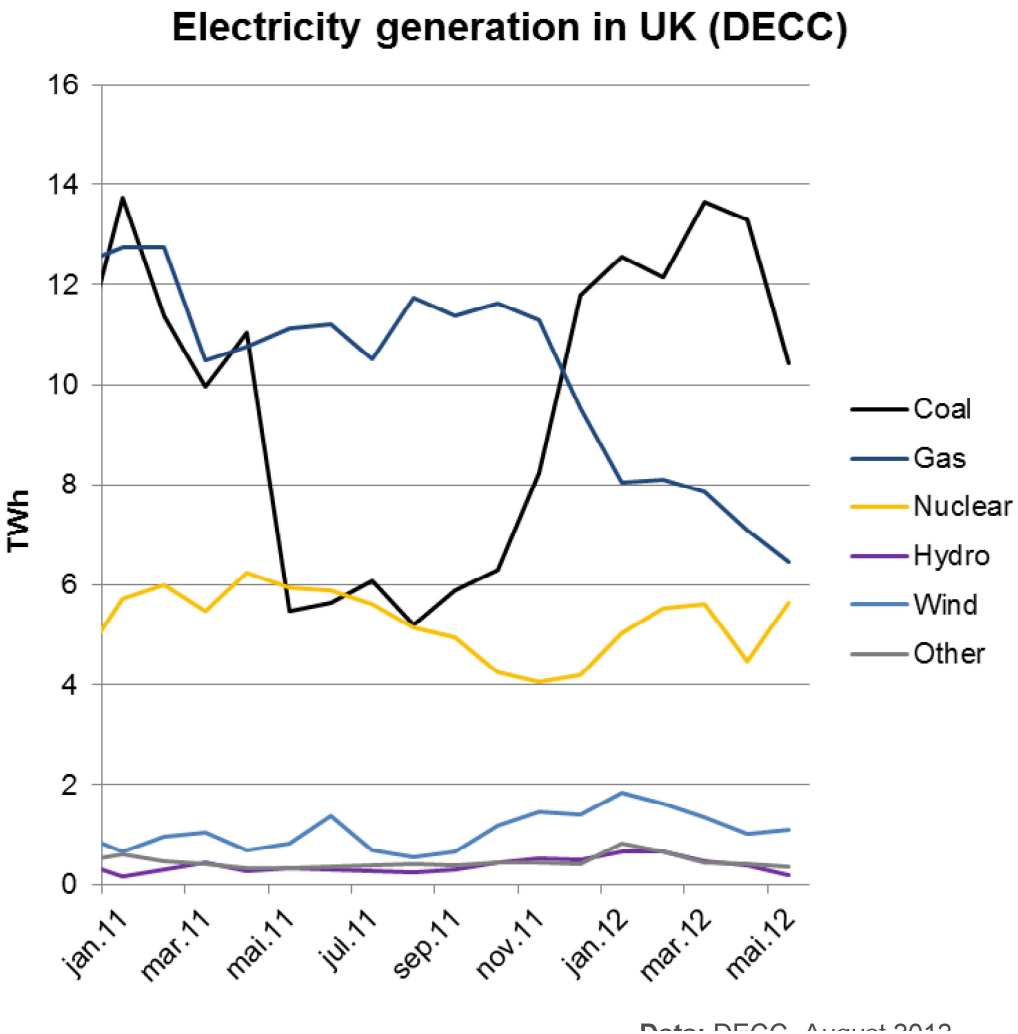
UK 3 months

- Coal up 50%
- Gas down 36%
  (April lowest in 15 years)
- Nuclear down 12%
- Hydro down 16%
- Wind up 7%
- Other (biomass) down
- Net imports tripled

High gas prices vs. coal main explanation

- Preference for coal expected to continue

Much the same in other parts of Europe

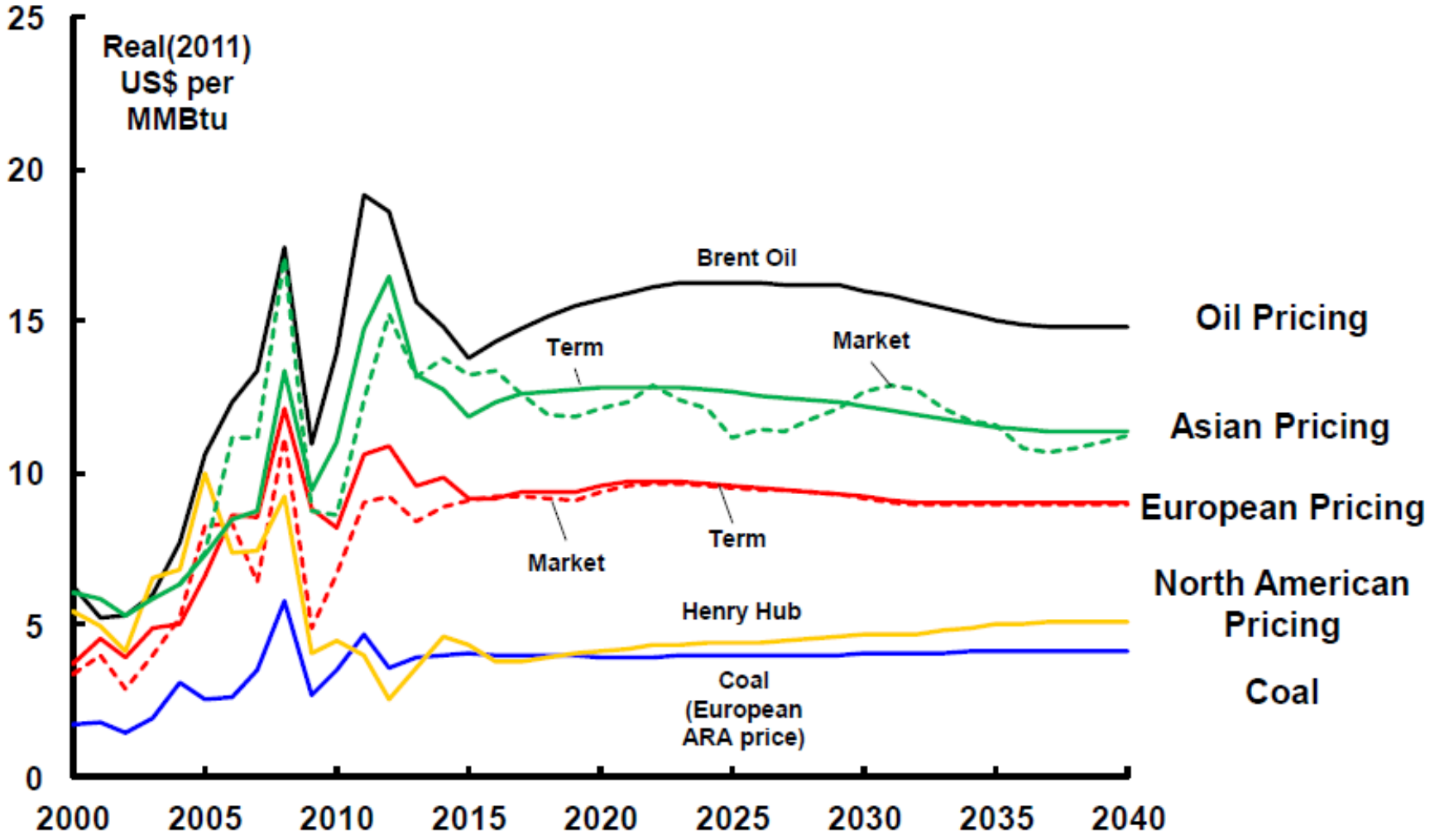


Source: DECC, August 2012, Sundenergy

World LNG estimated landed prices – September 2012

Source: FERC, August 2012, Sundenergy

Regional Price differentials



Source: IHS CERA 2012

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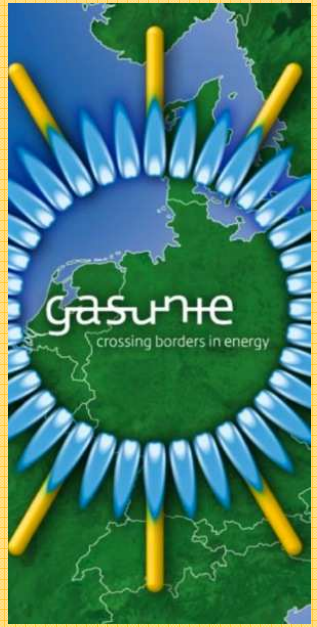
Gasunie Mission:
Security of supply

Strategic pillars

Optimise value of existing assets

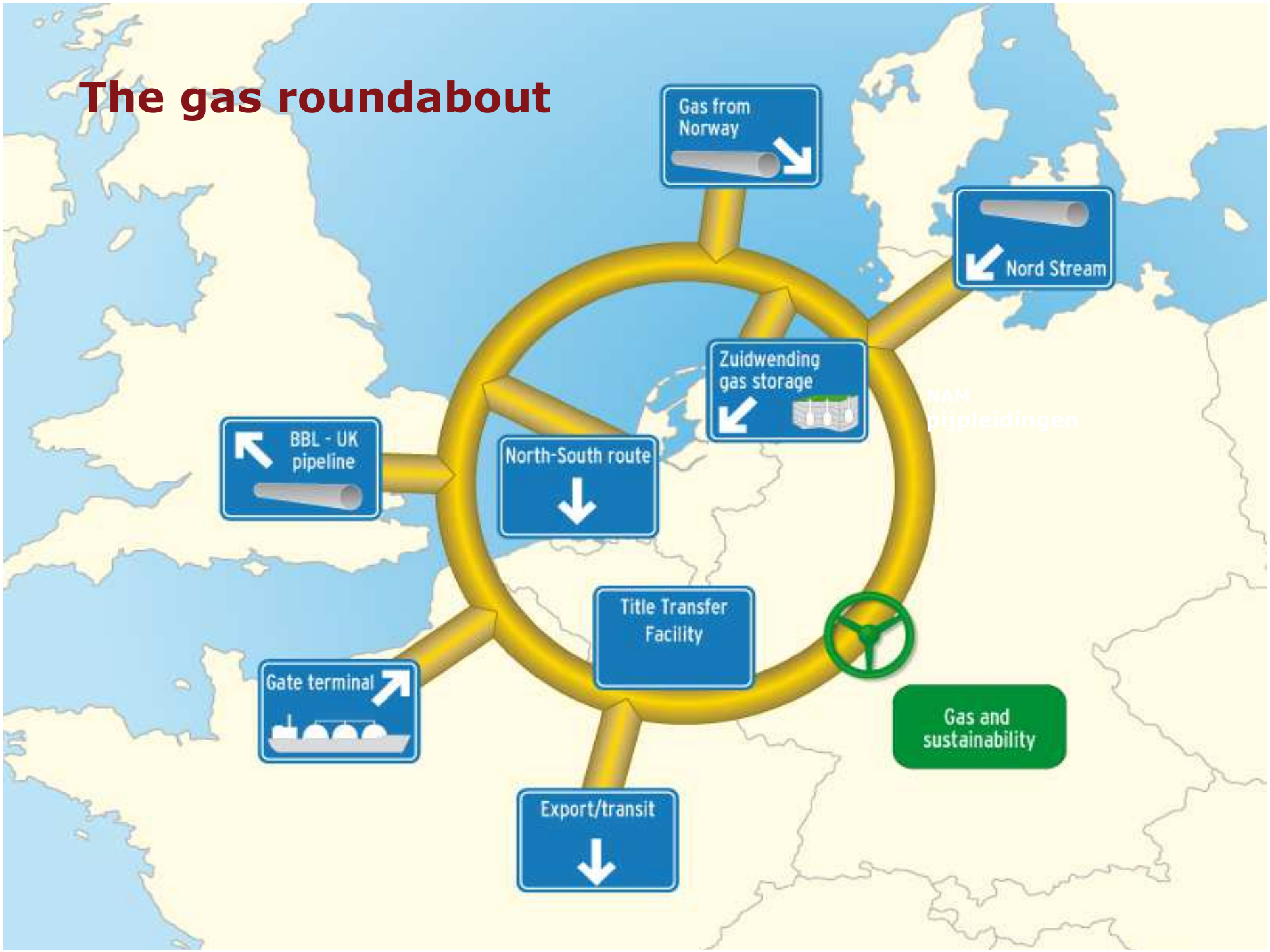
Strengthen leading position as cross-border gas infrastructure company in Europe



Enable transition towards more sustainable energy usage


Gasrotonde !
Gas roundabout!
gasunie

The gas roundabout



GATE LNG terminal Maasvlakte

3 tanks, 2 jetties
Capacity 12 bcm/yr; planned 16 bcm/yr
Net capacity tanks: 180.000 cum per tank
Hoogte tank: 40-55m
Diameter 86 m
Type tank: Full containment
Discharge capacity: 12.500 m3/hr LNG
Schips expected: 180 /yr
Start: September 2011

Gasopslag in Zuidwending

Gas storage in underground salt caverns

- Opening phase 1: 27 January 2011 (4 caverns)
- Completion phase 2: 1 January 2014 (1 cavern)
- Gas quality: Low caloric gas (G-gas)
- Working gas volume: approx. 200 million m3
- Total withdrawal capacity: 1.6 million m3/h
- Total injection capacity: 0.8 million m3/h

Wetenswaardigheden cavernes

- vier cavernes van ieder ca 660.000 m^3
- Hiervoor is 2,4 mln m^3 zout opgelost, dit is een trein met 58.000 wagons vol zout, zo'n trein is ruim 500 km lang
- Hiervoor is 16 mln m^3 water gebruikt, dit is een vijver met een diameter van 1500 m en 10 meter diep
- De Eiffeltoren (300 m) kan rechtop in een caverne staan
- Het water waarmee het zout werd opgelost werd met een totaal-flow van 1000 m^3 per uur verpompt. Een éénsgezinswoning zou binnen een half uur van kelder tot dak met water zijn volgepomt.

…however, specific investment uncertainties….!

- **(normal) uncertainties in business case**
- **Competition from international (private) companies**
  - **Other TSO's , fin institutions**
- **Regulation**
  - **Benefits elsewhere!**
  - **Effect on project profitability**
- **Financing**
  - **Rating!**
  - **Balance sheet**
- **Permits etc**

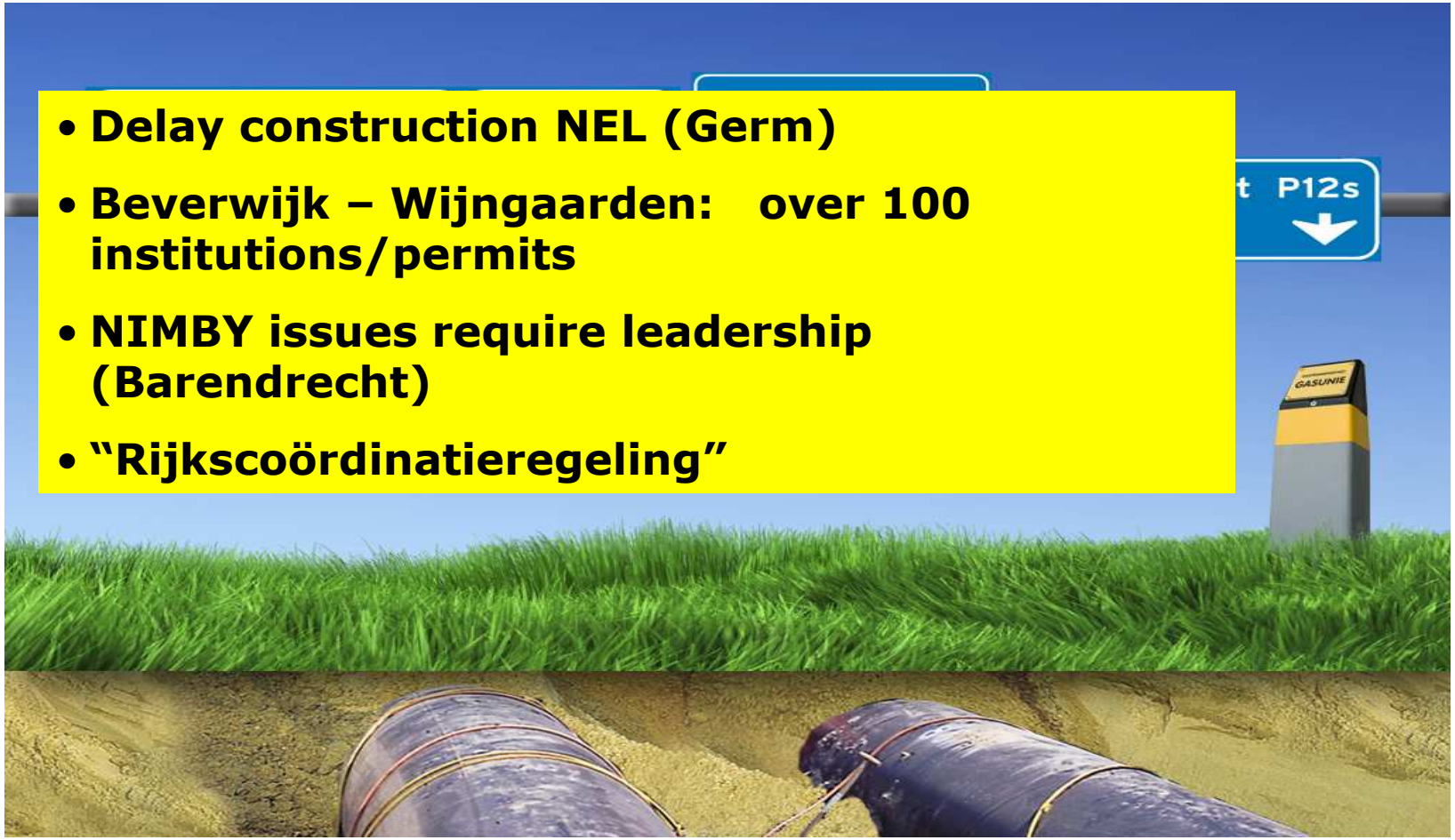
Regulation

- **National focus**
- **Unpredictable (risk)**
- **Changing politics**
- **TSO investments: low returns, high risk**

Financing

- **Not necessarily a problem**
- **Financial institutions willing to invest**
- **TSO hold the construction risks, they need proper incentives**
- **Privatisation?**

Permitting



- **Delay construction NEL (Germ)**
- **Beverwijk – Wijngaarden: over 100 institutions/permits**
- **NIMBY issues require leadership (Barendrecht)**
- **“Rijkscoördinatieregeling”**

In conclusion

1. little/no demand growth in (NW-EU)
2. Reducing production EU/new supply sources
3. liberalisation and harmonisation in EU

Effect on Dutch gasinfrastructure:

- imports & transit (major trunk lines, LNG)
- more flexibility (storage)
- develop as EU player (to load existing asset base)
- maximise cross border efficiencies

Thank you for your attention!