

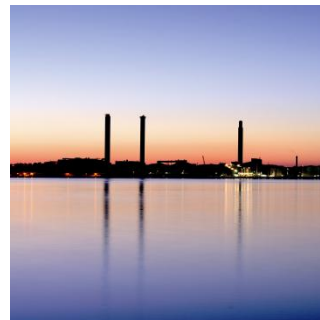
Unconventional gas: A game changer with implications for energy transition?

Jeroen de Joode



Energy research Centre of the Netherlands (ECN)

“ECN develops and brings to market high-level knowledge and technology for a sustainable energy society”



Efficiency & Infrastructure



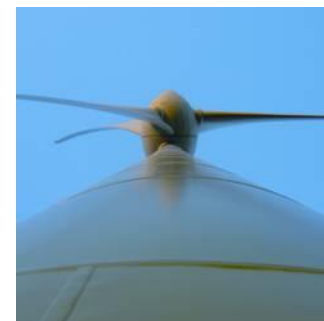
Policy Studies



Solar energy



Biomass



Wind energy

ECN Policy Studies Mission

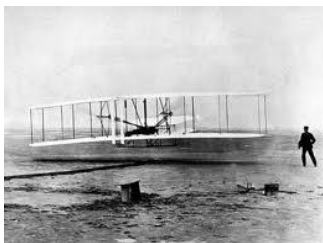
- *We contribute to making a more sustainable energy system by independent policy research for governments, industries and non-governmental organisations*
- Key characteristics
 - Think tank, 65 persons with multi disciplinary background
 - Independent
 - Integral: combine insights about energy use, markets, technology, behaviour and policies
 - Advanced in quantitative analysis
 - Offices in Petten and Amsterdam



Main questions addressed in this talk

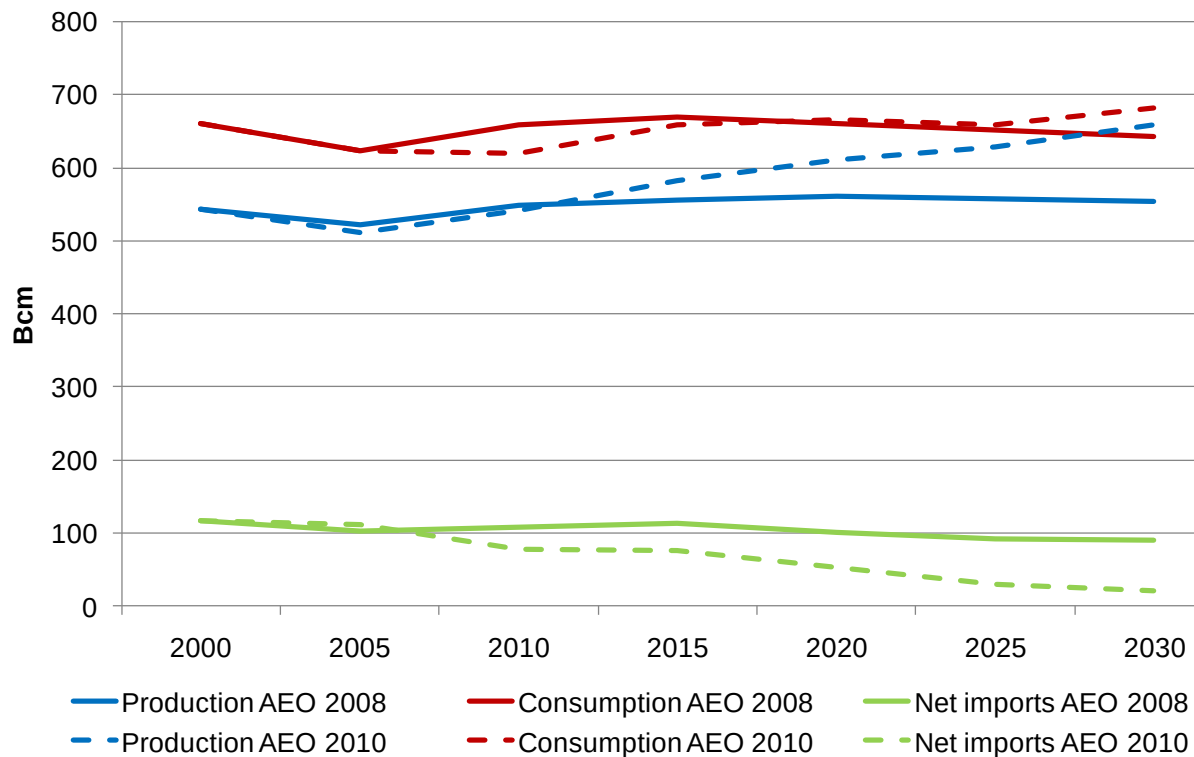
- Is unconventional gas a game changer for Europe (as it was for the US)?
- What could be the impact of unconventional gas on future energy transition?
- Medium (2030) to long-term (2050) perspective

Is unconventional gas a game changer for Europe (as it was for the US)?



Game changer in US: rapid change in supply and demand fundamentals

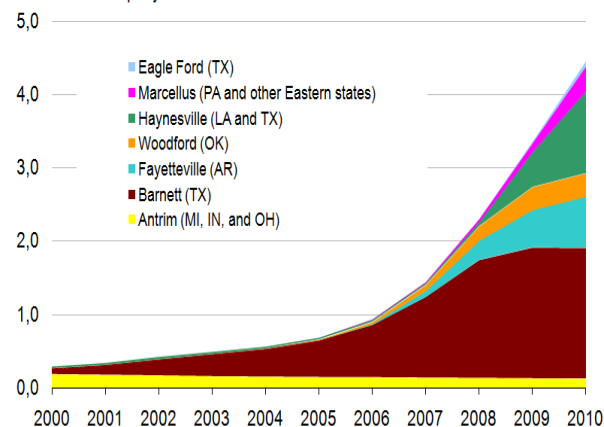
Projections of US gas demand and supply balance



Source: ECN based on EIA/DOE (2008, 2010)

14 fold increase in US shale gas production over the last few years

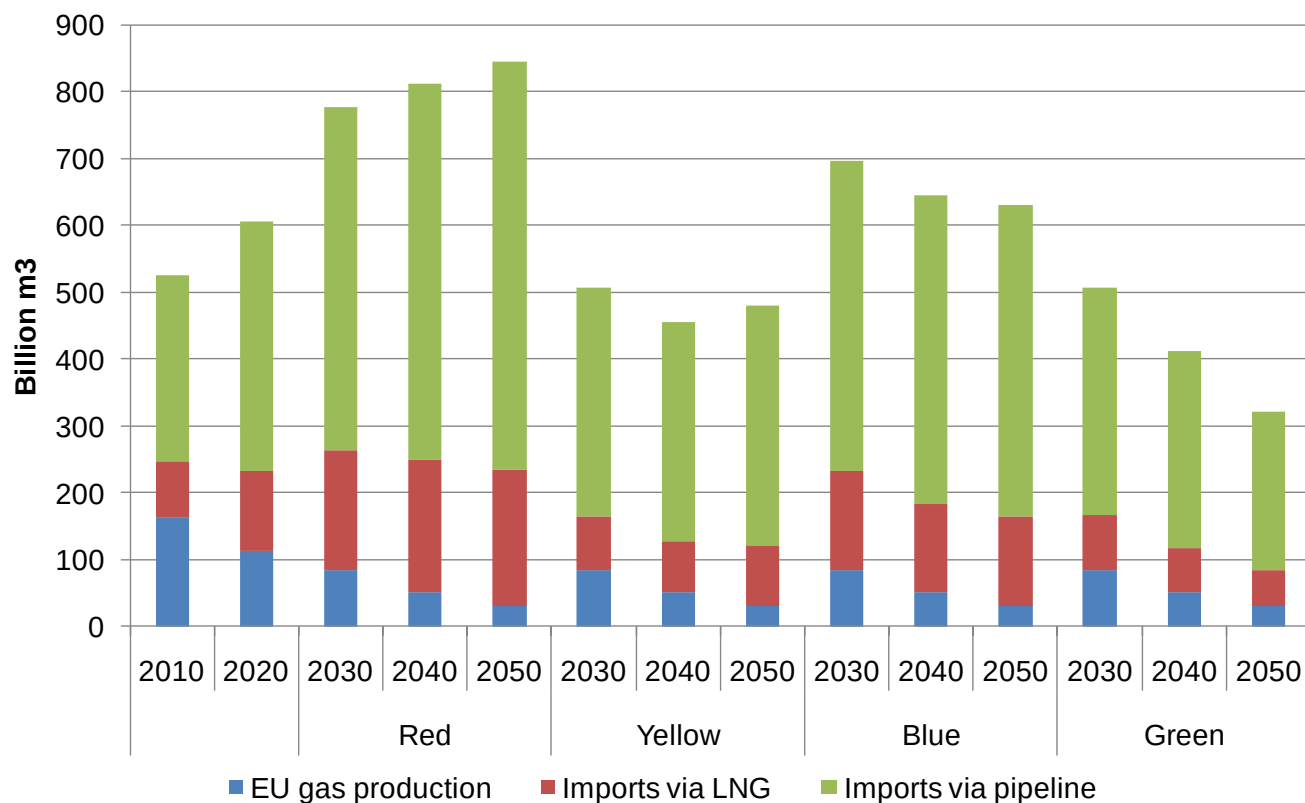
annual shale gas production
trillion cubic feet per year



Source: Newell (2010)

Meanwhile, Europe has different gas supply and demand fundamentals

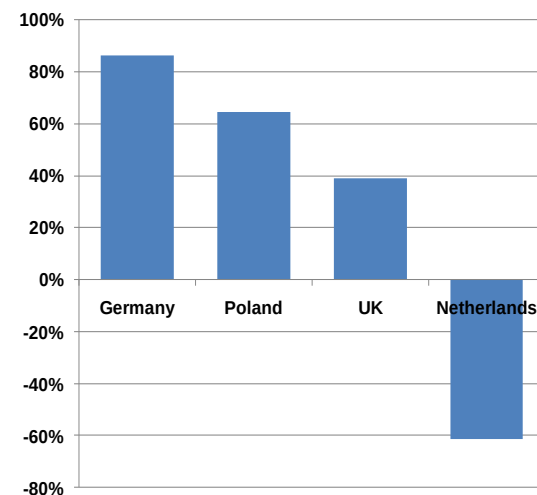
Sourcing of EU gas consumption



Source: de Joode *et al.* (2011)

- Europe has large regional differences

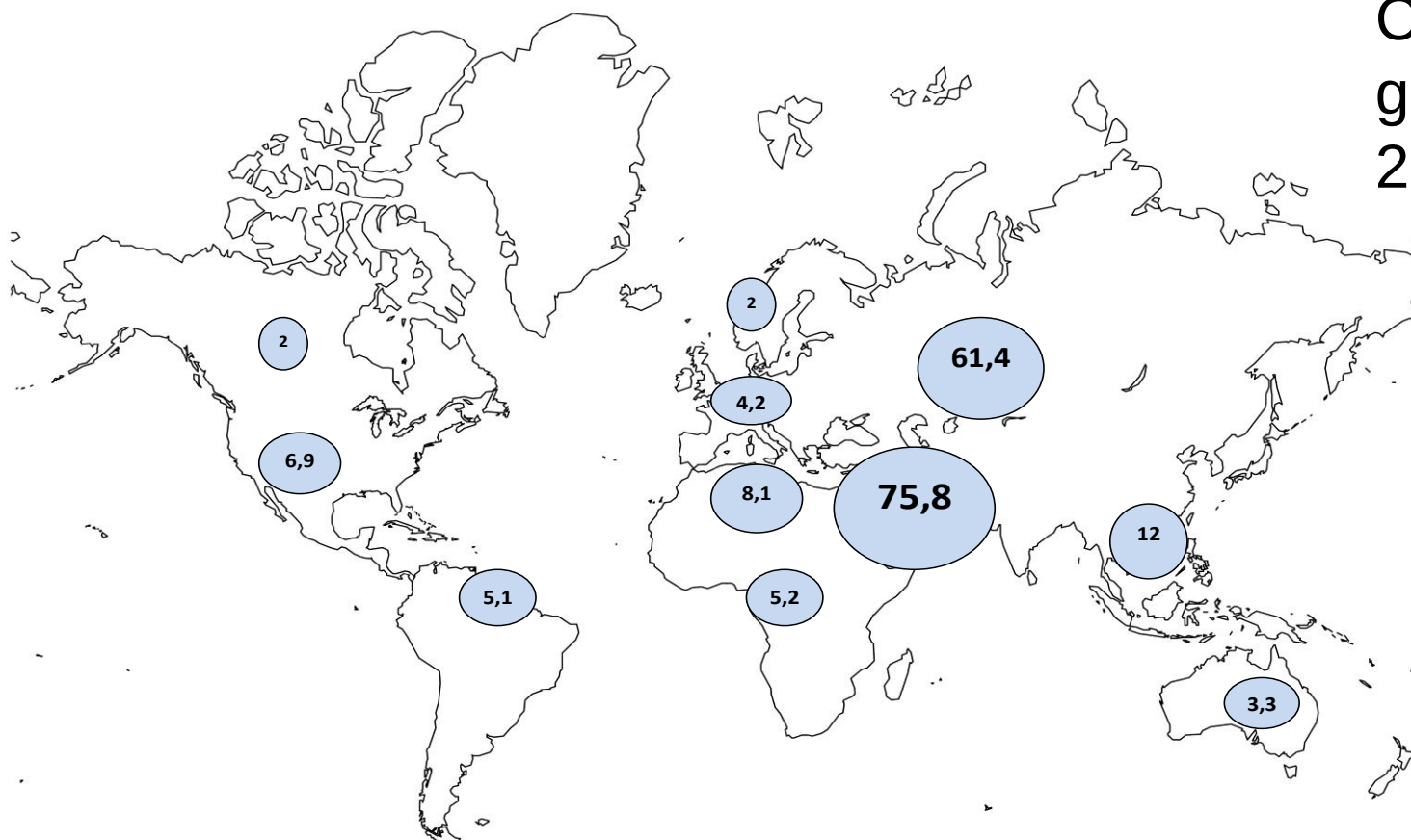
Import dependency in selected EU countries



Source: IECN based on EA energy statistics (2010)

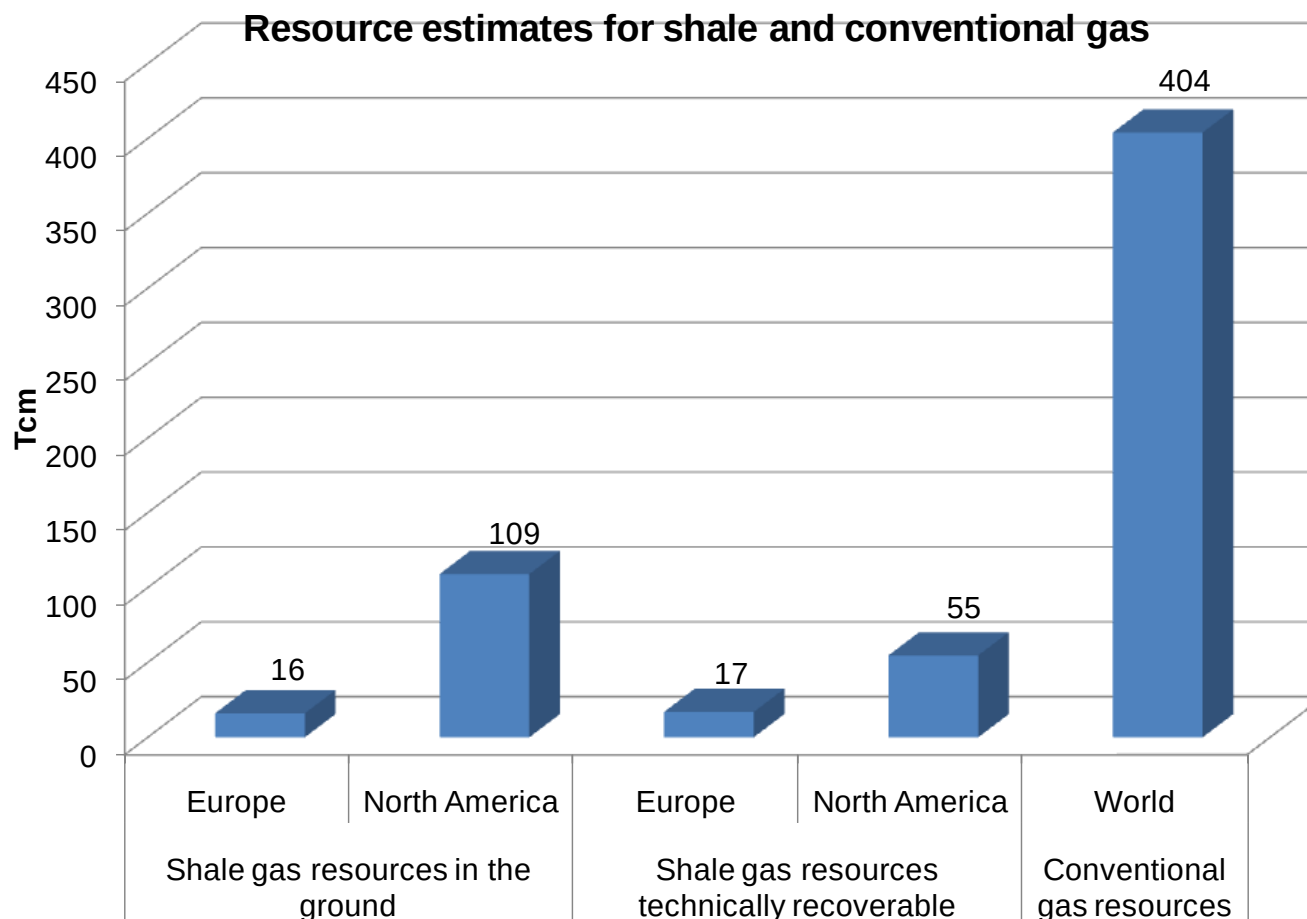
And also proximity to global conventional gas reserves differs

Conventional
gas reserves
2010 (in Tcm)



Source: ECN, based on IEA Natural Gas Information 2011

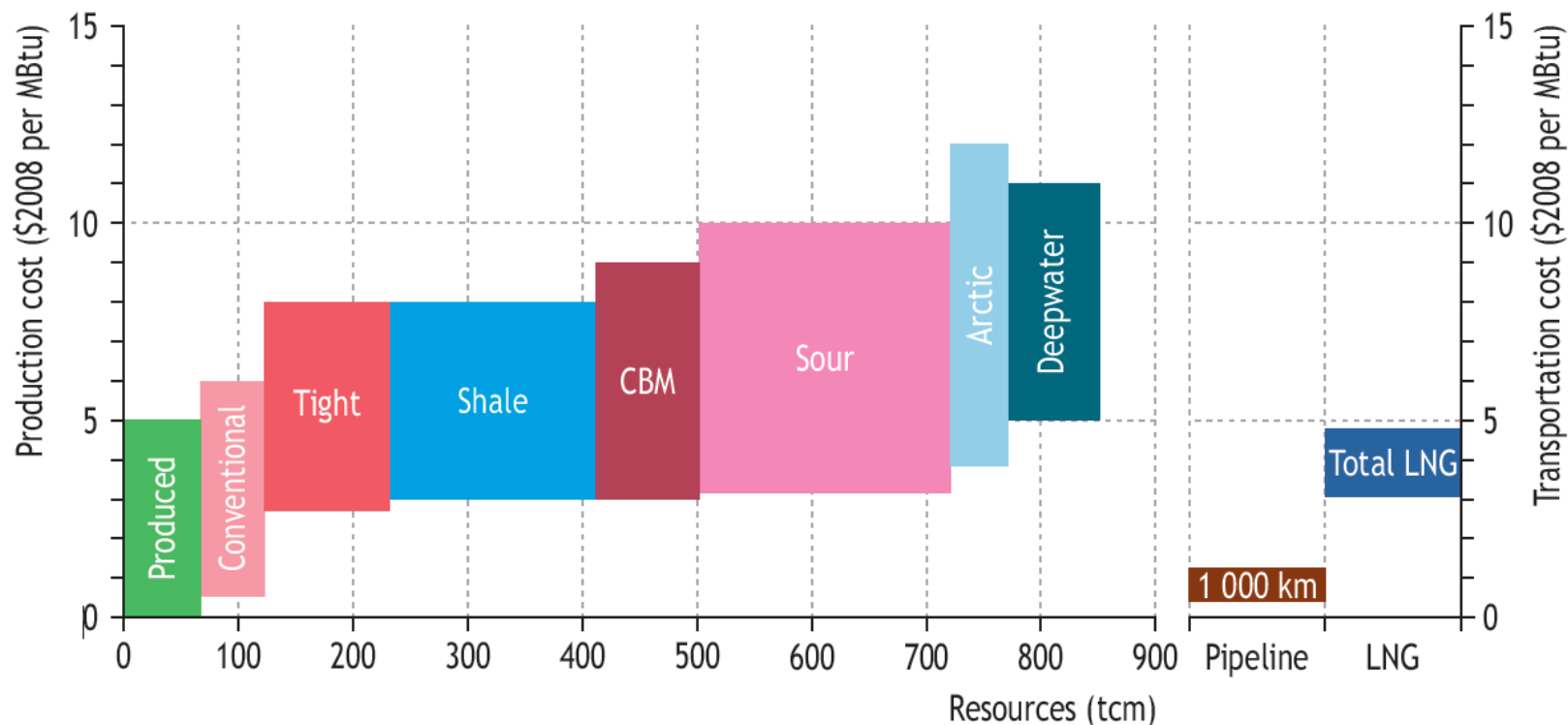
Shale gas prospects for US & Europe vary



Source: ECN based on EIA (2011), IEA (2009)

Need for unconventional gas depends on economics & security of supply considerations

Long-term gas-supply cost curve



Source: IEA World Energy Outlook (2009)

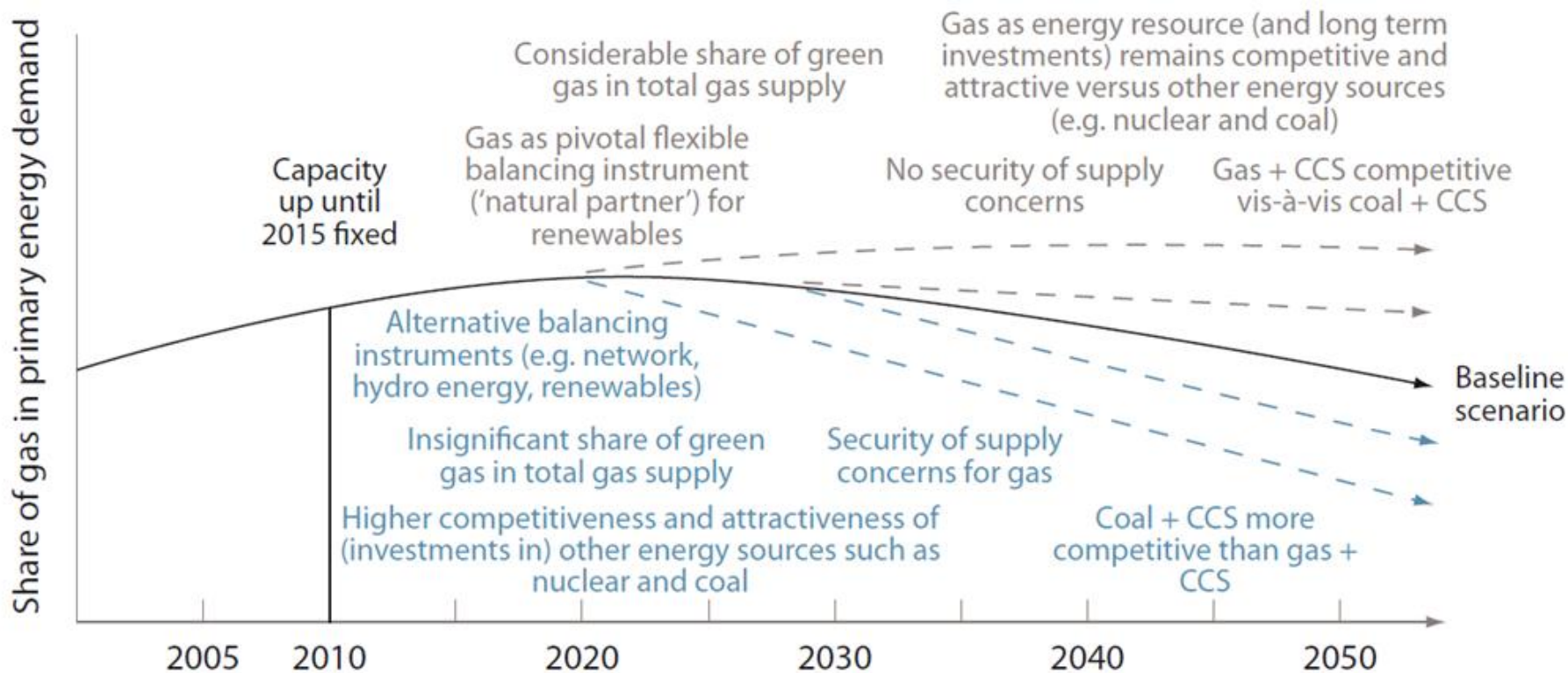
Is unconventional gas a game changer for Europe (as it was for the US)?

- No
 - Different gas demand and supply fundamentals and dynamics
 - Different technical recoverability prospects
 - Different economics of gas supply from existing sources
 - Possible other differences: legal / ownership rights issues, public attitude, etc.
 - But, there may be different local / regional perspectives (e.g. Poland)

What could be the impact of unconventional gas on future energy transition?



Role of gas in energy transition: Transition and destination fuel?



Source: ECN

Does unconventional gas affect future energy transition in the *medium* term?

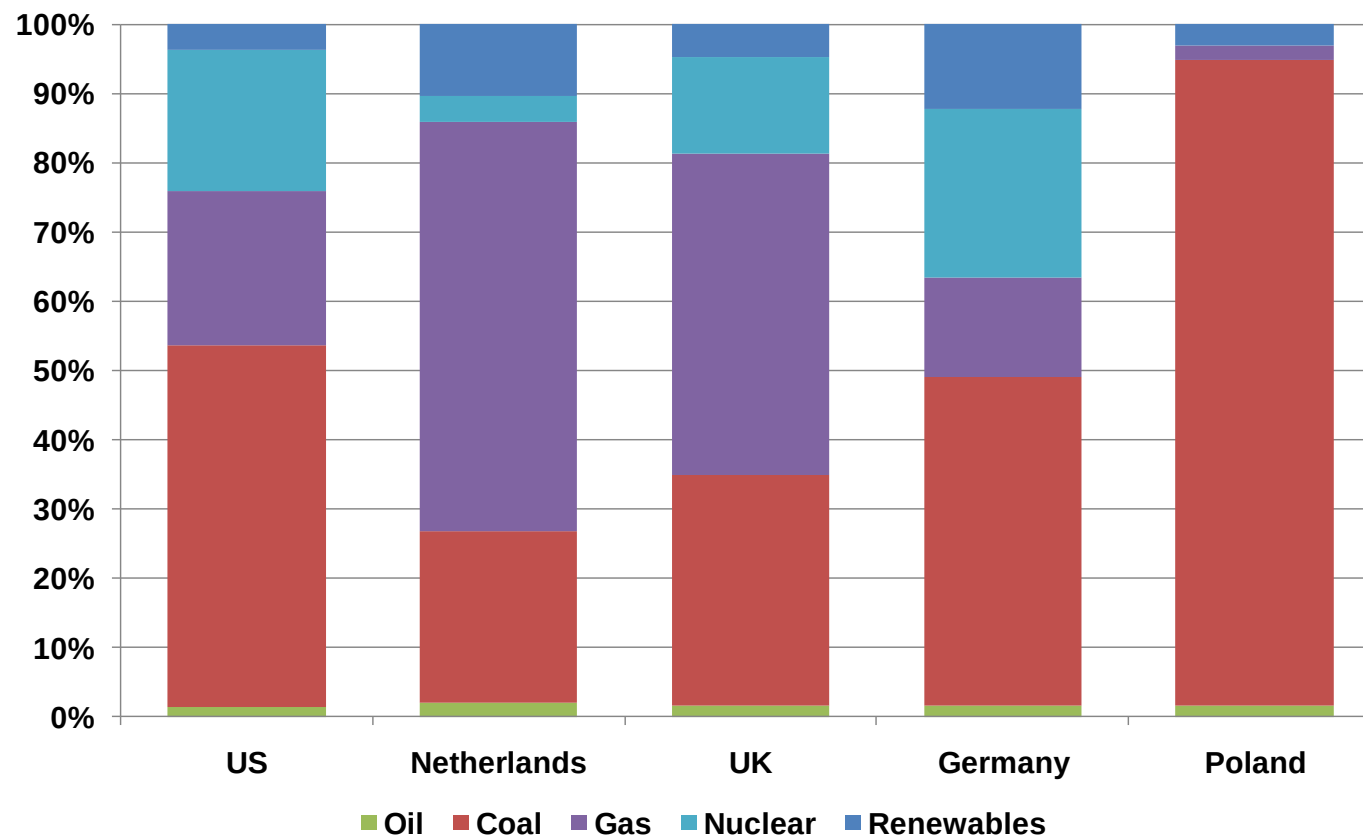
- Leaving aside for a moment possible environmental and safety issues, real cost of production, public acceptance, etc.
- Possible positive impact on position of gas in energy technology mix
 - Unconventional gas provides for more abundant resources
 - Downward pressure on prices?
 - Gas less scarce, lower gas prices
 - Less security of supply concerns (due to geographical spread of unconventional resources)
 - Substitution from 'dirty fuels' to gas?

Impact depends on implemented climate policy according to model-based study for US

- RFF (2010), *Abundant Shale Gas Resources: Some Implications for Energy Policy*, april 2010.
- Gas abundance in US leads to lower gas prices with different effects:
 - When climate policy is 'weak':
 - Displacement of some competing options in power generation sector (coal, nuclear, renewables) resulting in a net increase in 2030 CO₂ emissions
 - When climate policy is 'strong' (i.e. *effective* cap-and-trade system):
 - Displacement of primarily dirty competitors
 - Lower CO₂ price giving rise to cheaper climate policy implementation
 - Other sectors than power generation sector relatively unaffected in terms of substitution.

Scope for substitution in power generation technologies varies across Europe

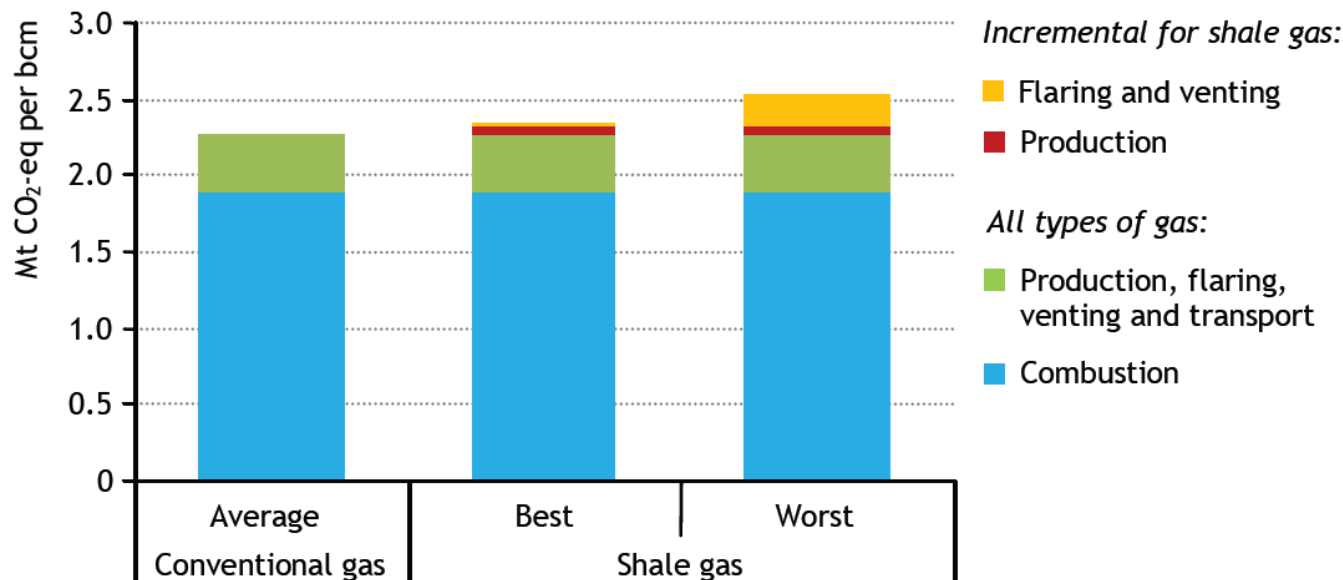
Power generation mix in selected countries



Source: ECN based on IEA energy statistics (2010)

Does unconventional gas affect future energy transition in the *long* term?

Well-to-burner greenhouse-gas emissions of natural gas

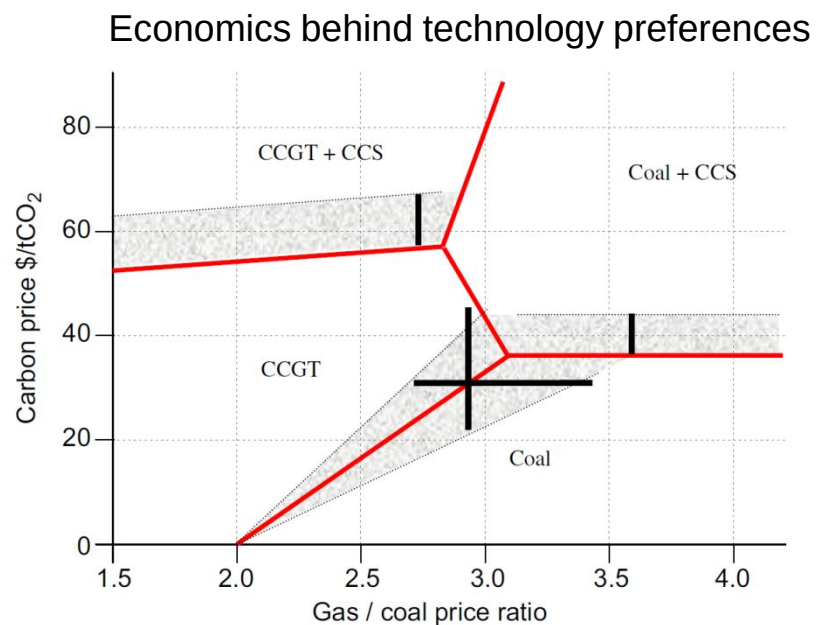


Source: IEA (2011)

- Unconventional gas alone does not contribute to a CO₂-free future energy system
- (Un)conventional gas plus CCS technology or bio-gas ('green gas') would

Long-term role for (un)conventional gas in power generation depends on CO₂ & gas price

- Competition between coal+CCS and gas+CCS power generation technologies
 - Unconventional gas could push down gas prices
 - Gas+CCS requires a relatively high CO₂ price and low gas/coal price ratio.
 - Hence: unconventional gas may make gas+CCS more attractive
- *This crucially depends on interaction between gas, electricity and CO₂ markets!*



Source: Blyth et al. (2007)

What could be the impact of unconventional gas on future energy transition?

- Displacement of coal-based power generation investments, dependent on energy mix
- Competition between gas+CCS and coal+CCS?
- Key uncertain factors:
 - Gas price (vs. competitors such as coal)
 - Climate policy (CO₂ price development)

Concluding remarks

- Unconventional gas developments have had significant short-term market impact but it is not a game changer for Europe in terms of gas demand and supply fundamentals (as it was for the US)
- Unconventional gas may have a positive impact on energy transition in the medium term (via displacement of coal in energy mix) and increase prospects for gas+CCS in the long-term
- CO₂ price dynamics / climate policy is key uncertain factor
- More research warranted on:
 - Interactions between gas, electricity and CO₂ markets
 - Implications for medium to long-term EU infrastructure strategies
 - Institutional perspective: lock-in / path dependency effects

Thank you for your attention

dejoode@ecn.nl

