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Shale gas: Opportunities and challenges for European energy markets

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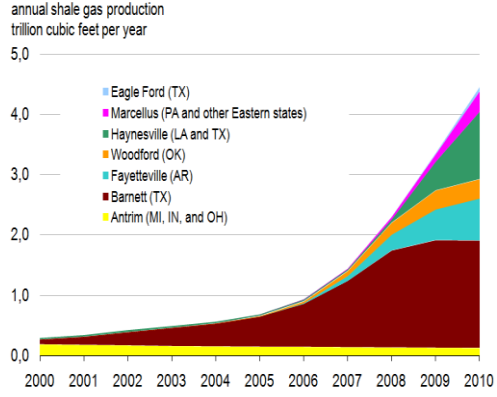
Outline

- Introduction
- What could be the impact of potential shale gas developments on the European gas market?
- How may shale gas developments affect the role of gas in the transition of the power sector?
- Key messages

Introduction

- Shale gas revolution in US
  - Shale gas as game changer: US no longer destined to be gas importer
  - Large coal to gas shift → largest reduction in CO2 emissions in the world
  - Low gas prices stimulus for particular industries
    - Will this be sustainable?
  - Impact on world gas supply – demand balance via LNG



Source: Newell (2010)

- Meanwhile in the EU…
  - There is shale gas potential, but commercial viability to be proven
  - Current coal-to-gas price ratio harms gas power plants
  - Calls for lenient position towards shale gas to support industry
  - Will shale gas be a game changer?

What could be the impact of potential shale gas developments on the European gas market?

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What determines the role for shale gas in Europe?

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Developments in Europe

- Technical potential
- Public perception
  - Safety / health risks
  - Sustainability
- Commercial viability
- Security of supply considerations

Developments in the US?

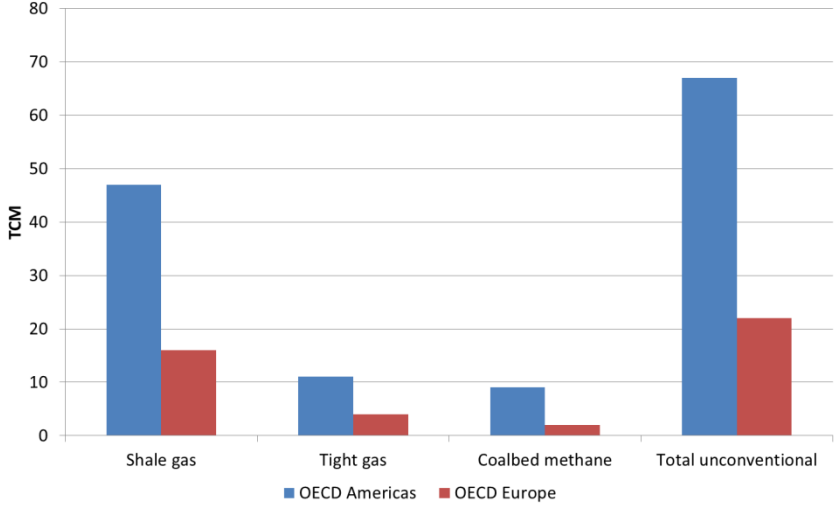
- Sustainable gas price level for US shale gas?
- Additional investment in US LNG export terminals?

Will shale gas be a game changer in Europe?

Global gas reserves: different positions for US and Europe

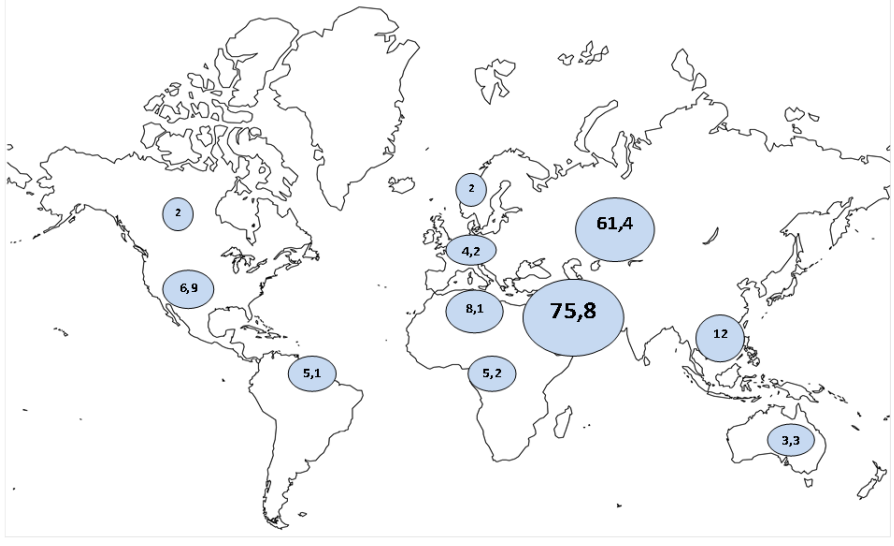
- North America shows larger technically recoverable unconventional gas reserves
- Europe is closer to existing conventional gas reserves

Unconventional gas reserves (in Tcm)



Source: IEA World Energy Outlook 2012

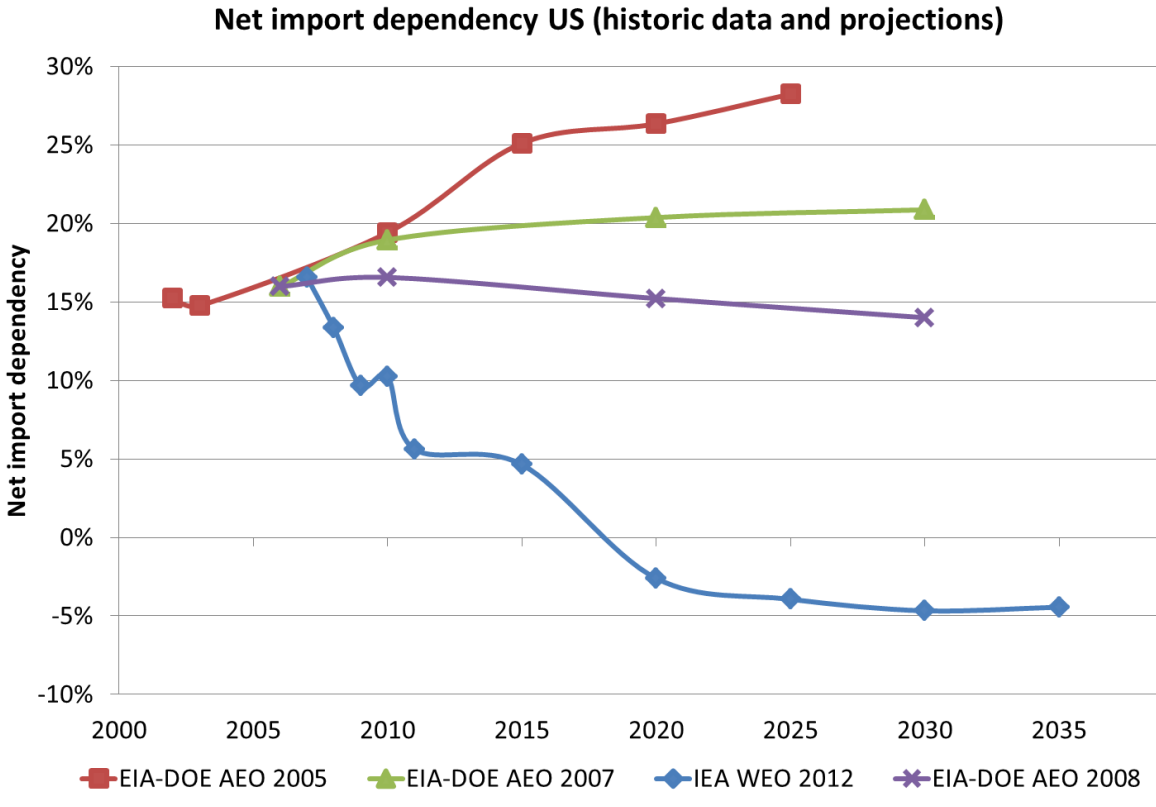
Conventional gas reserves 2010 (in Tcm)



Source: ECN, based on IEA Natural Gas Information 2011

Different demand-supply dynamics: US import dependency

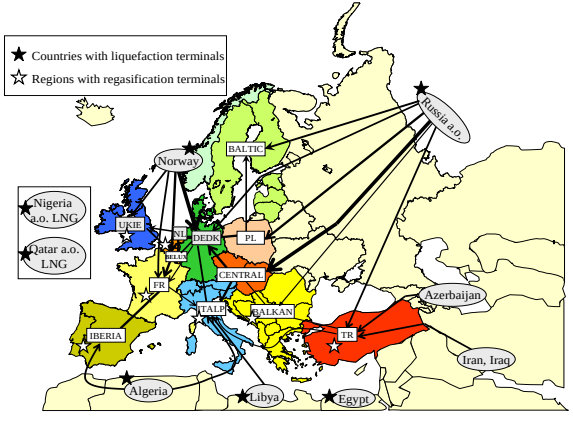
- Back in 2005, the US still expected large increase in gas imports
- Subsequent outlooks reduced expected net imports somewhat
- But only very recently shale gas 'changed the game'

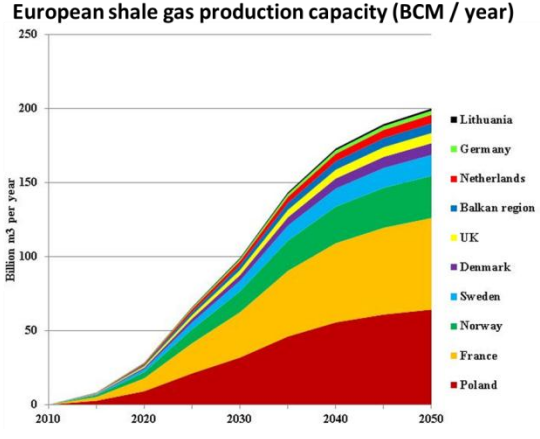


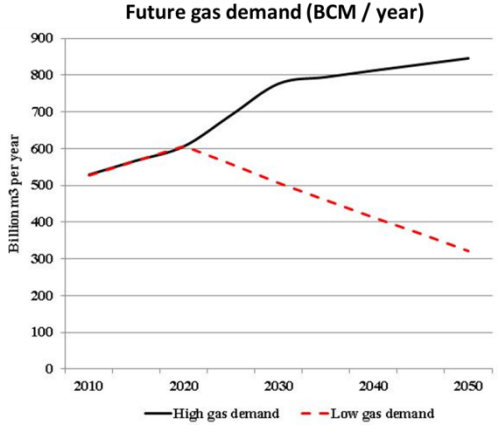
Source: several IEA and AEO Outlooks

Modelling the impact of shale gas on EU energy markets

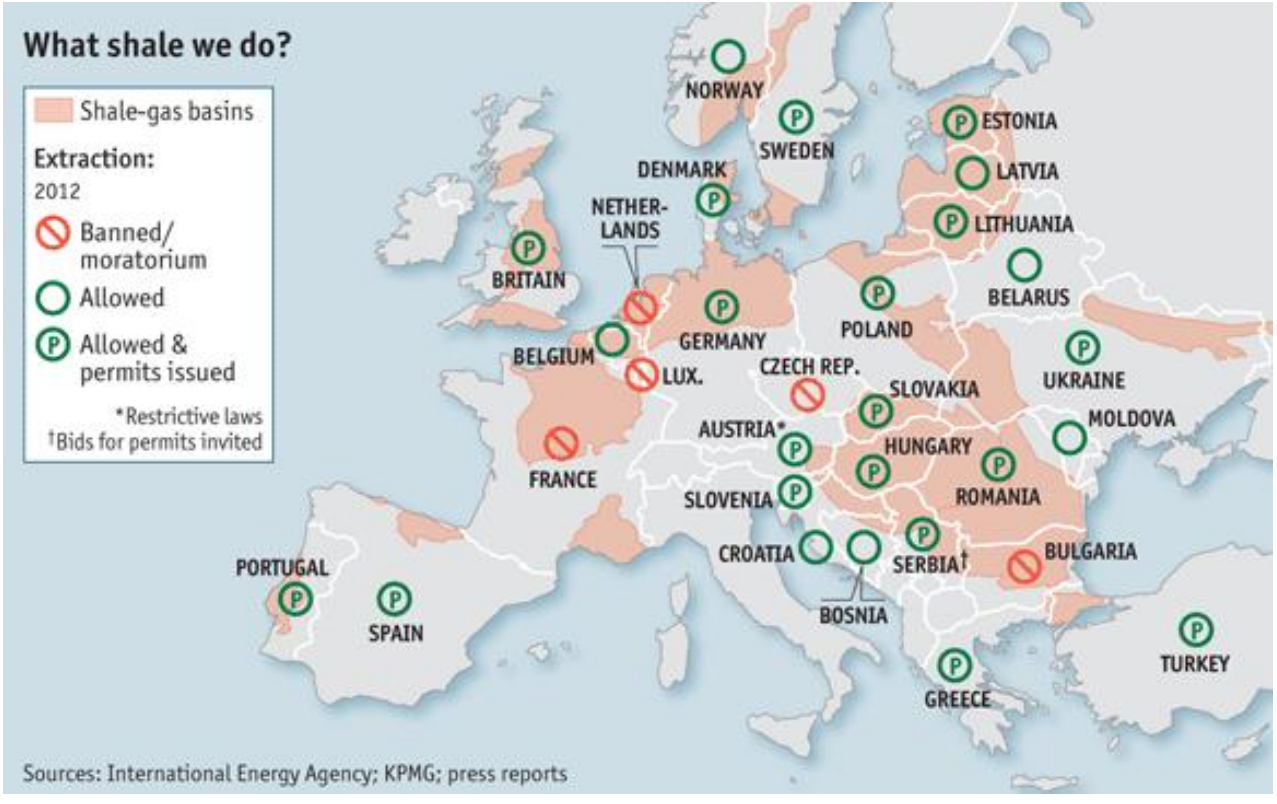
- Economic optimization model of gas market
  - Focus on Europe
  - Production
  - Incl. main gas infrastructure
  - Consumption in 3 sectors
- Investments in shale gas production assets based on estimates in literature (EIA, Geny, IEA)
  - European shale gas production costs $3 – 7 / Mbtu (or 14-26 €-cent / m^3)
- Assessment based on two demand scenarios
  - High demand scenario: BAU, CO2 targets not achieved
  - Low demand scenario: -80% CO reduction in 2050





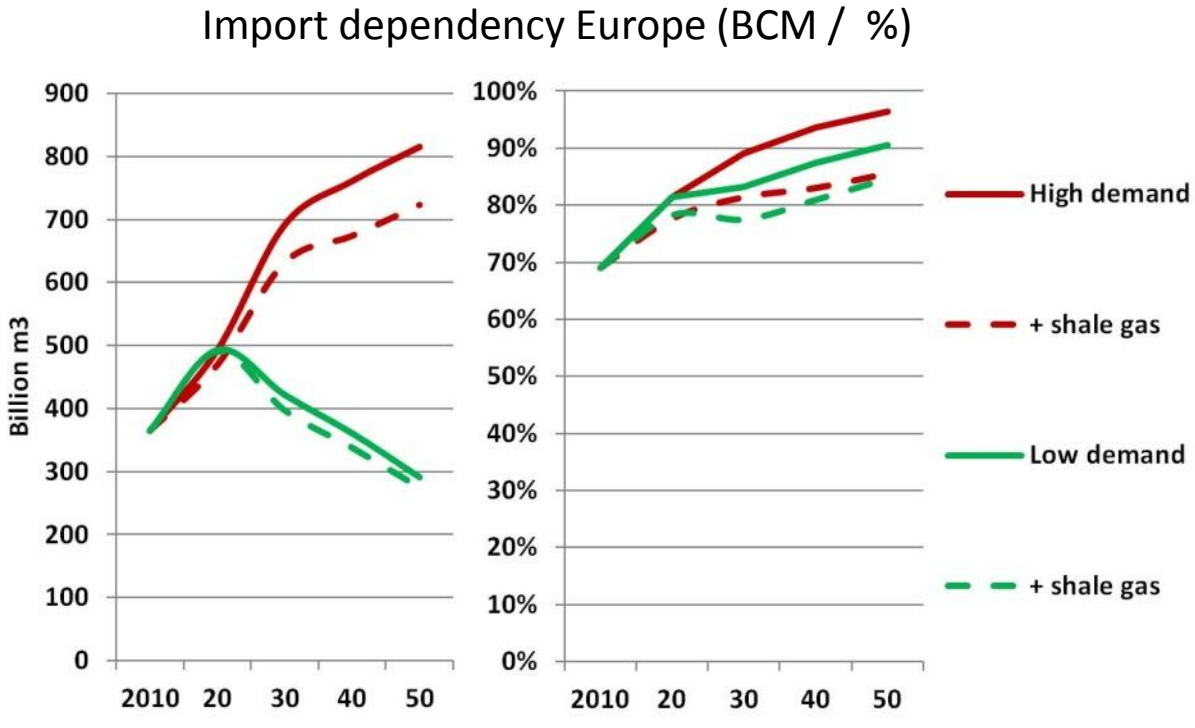


Current European positions on shale gas drillings



Source: The Economist, February 2nd 2013

In contrast to US, Europe will continue to be import dependent

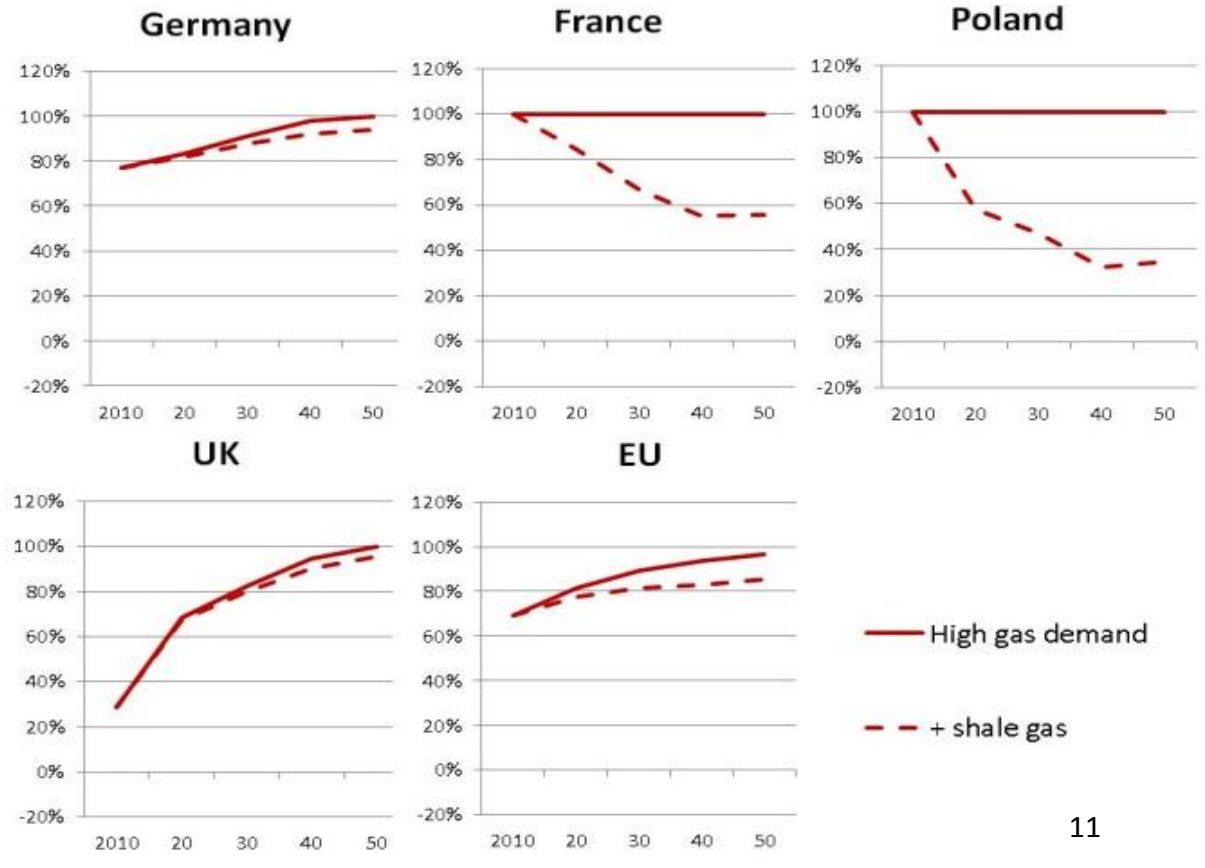


- Shale gas substantially reduces gas imports in **high demand future**
- But shale gas has a much smaller impact in **low gas demand future**
  - Due to unfavourable economics vis-a-vis conventional gas
- Shale gas is no game changer from import dependency perspective

Source: ECN calculations

Non-uniform impact on import dependency across EU

- Shale gas could make a difference in countries such as Poland and France, while import dependency in Germany and UK remains relatively unaffected

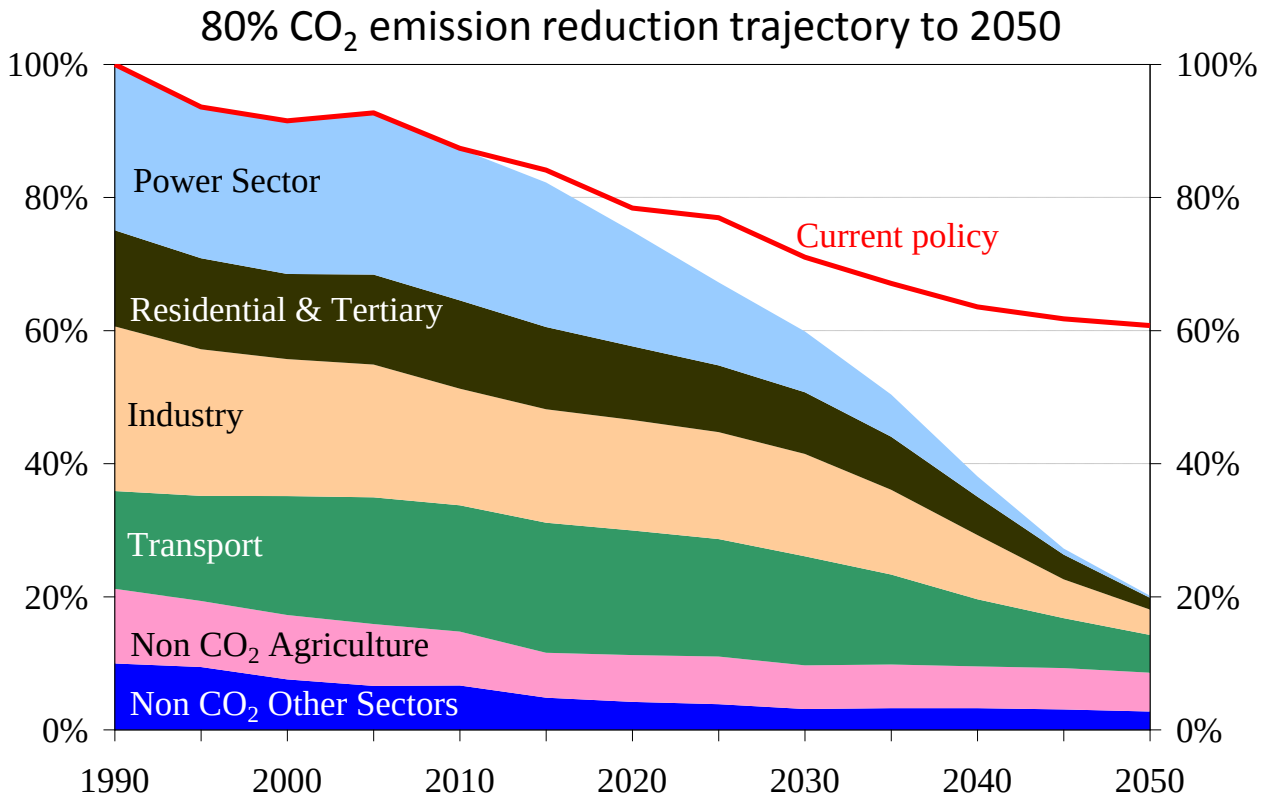


Source: ECN calculations

How may shale gas developments affect the role of gas in the transition of the power sector?

CO2 emission targets as starting point

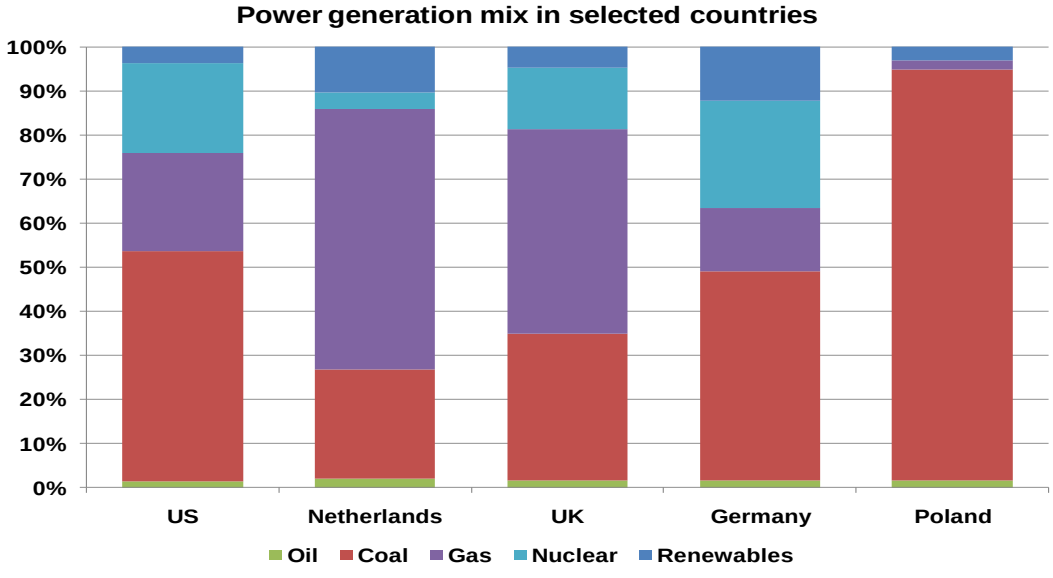
- Road Map 2050: 80% reduction of CO2 emissions targeted (100% =1990)
- Medium and long term role for gas is different



Source: ECF Roadmap 2050

Medium term perspective on transition

- Shale gas could boost the position of gas in the power generation mix → *substitution*
- Security of supply may be less of an issue
  - More abundant reserves
  - More even spread in reserves
- Scope for substitution varies across Europe



Source: ECN based on IEA energy statistics (2010)

Impact of climate policy on the role of shale gas in energy transition

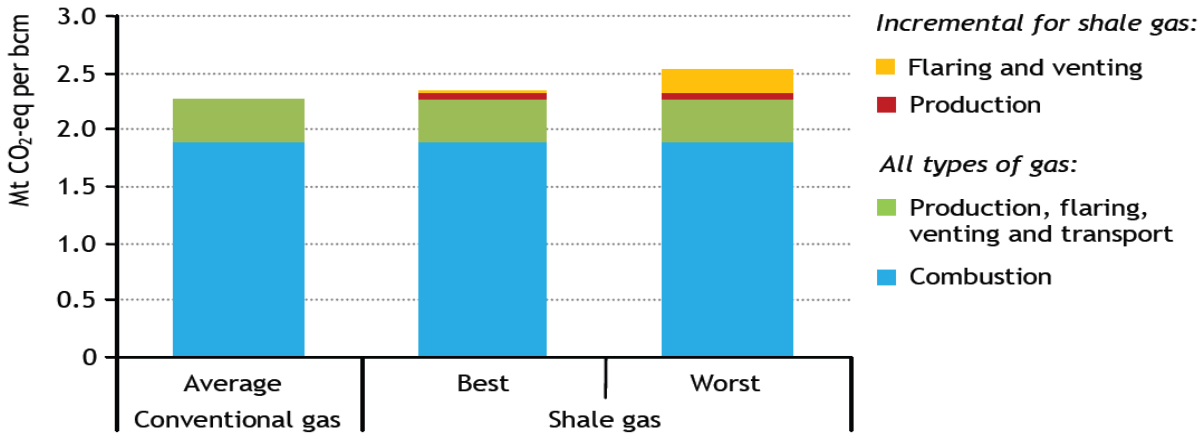
- RFF (2010), *Abundant Shale Gas Resources: Some Implications for Energy Policy*, April 2010
- Focus on US

CASE: weak climate policy	CASE: strong climate policy
• Displacement of some competing options in power generation sector (coal, nuclear, renewables)	• Displacement of primarily dirty competitors
• Resulting in an increase in 2030 CO_2 emissions	• Resulting in a decrease in 2030 CO_2 emissions

Long term perspective on transition

- There is nothing 'unconventional' about the CO_2 content of shale gas…

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

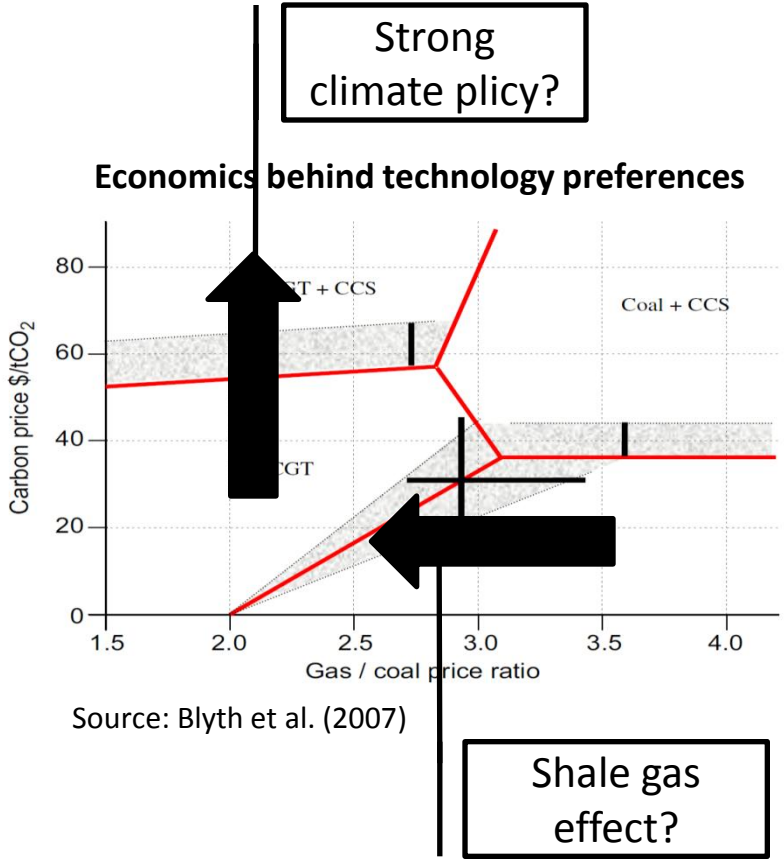


- Combination with CCS required for CO_2 neutral energy system

Source: IEA (2011)

Shale gas may affect gas+CCS economics

- Competition between coal+CCS and gas+CCS in a carbon neutral power mix
- Gas+CCS requires a relatively high CO2 price and low gas/coal price ratio.
- Will shale gas have a permanent downward effect on gas prices?
- Carbon price is another key driver…



Source: Blyth et al. (2007)

Key messages

- Prospects for European shale gas widely differ from US case
  - Different reserve potential, different competition, different market dynamics
- Shale gas is unlikely to be a game changer in Europe
- Impact of shale gas on energy transition in the medium and long term crucially depends on gas vs. coal prices and the 'penalty' on CO_2 emissions

Thank you for your attention

Questions?

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EDGaR
Energy Delta Gas Research

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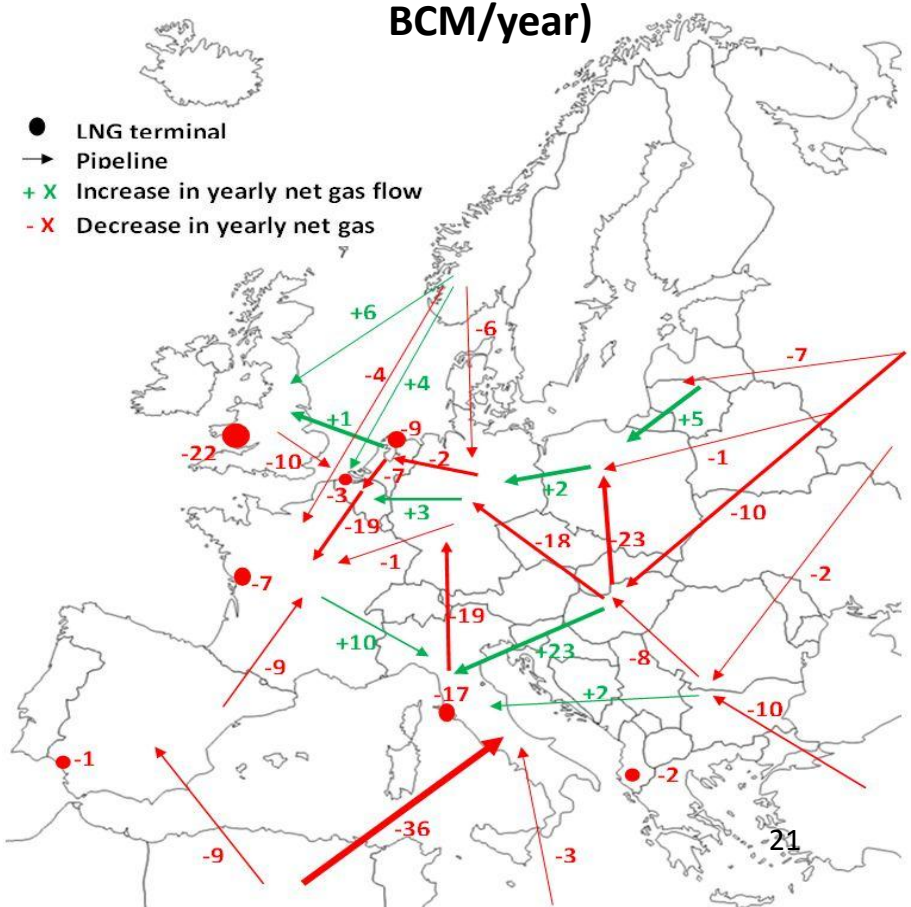
Extra slides

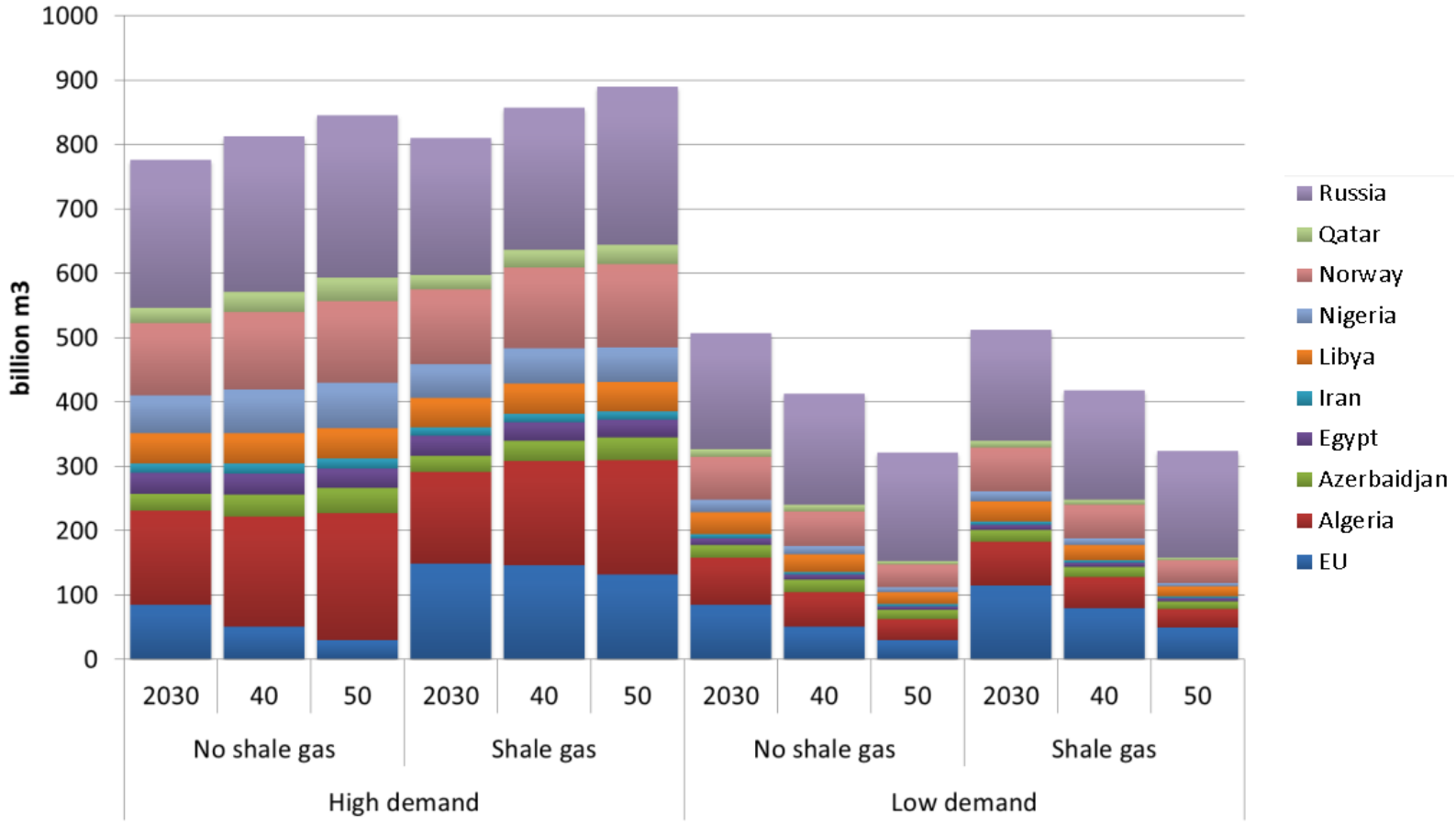
Change in gas flows and infrastructure requirements

- Shale gas replaces conventional supplies:
  - LNG, Algeria, Russia
- Shale gas production changes regional gas balances:
  - E.g. less imports for Poland, Germany and France, exports from France to Italy
- Re-routing of gas flows:
  - Gas from Balkan to Itaty instead of central Europe
- Different investment requirements:
  - Lower LNG investment, Lower external pipeline investment, higher internal pipeline investment

Change in gas flows in 2050 (in BCM/year)



Level of gas supply diversification improves



Level of gas supply diversification improves