Oxford Institute for Energy Studies

Natural Gas Research Programme

The Changing Debate around Shale Gas: from Enthusiasm to Responsible Development

Chatham House FFER

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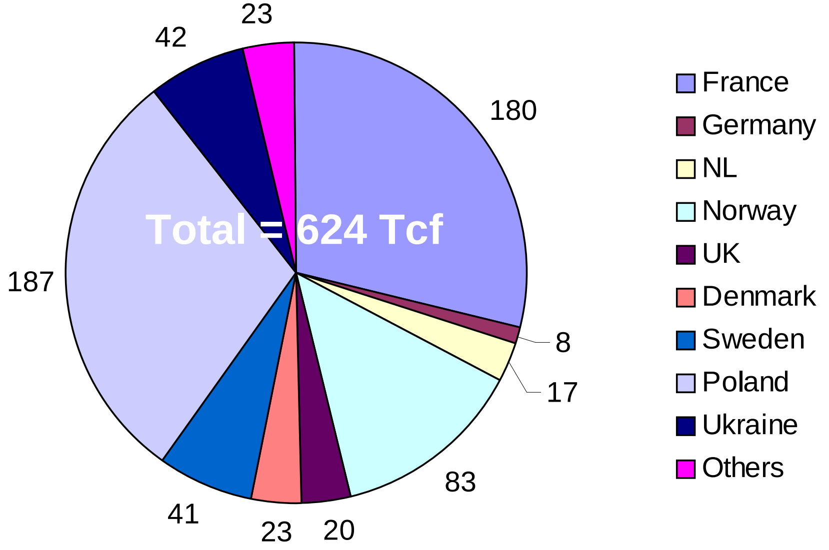
Shale gas resources will be part of the future European energy mix…

Shale gas technically recoverable resources



Source: EIA

Increasing share of natural gas in mix

Impact of carbon policies on OECD demand	2020	2025
Oil	-2%	-9%
Gas	-1%	-4%

Source: IEA WEO 2010

- Europe is endowed with both shale oil and shale gas on a large scale.
  - Shale oil in place not assessed
- Development of indigenous shale resources would help meet European energy security policy ambitions, at least at a country level.

- Continuous demand growth for oil and esp. gas, in particular from power generation.
- European carbon policy and emission targets supports increased use of natural gas.

License holders and exploration efforts in Europe

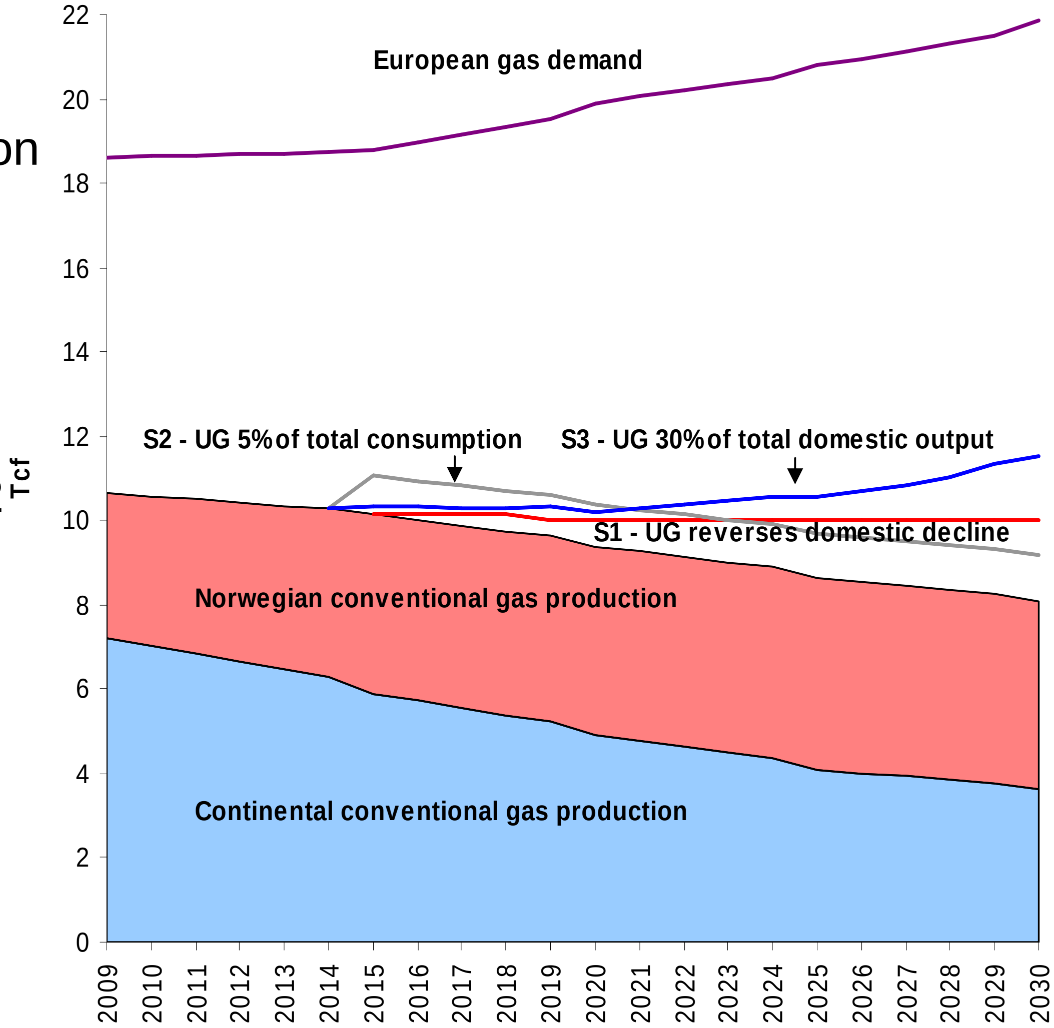
Source: press articles, company websites

….but how much? Can Shale Gas be a game-changer for Europe?

- European level:
  - Flatten out domestic production decline → S1
  - Account for 30% of domestic production by 2030, like in the US 12 years ago → S3
  - Meet 5% of European gas consumption from 2020 → S2

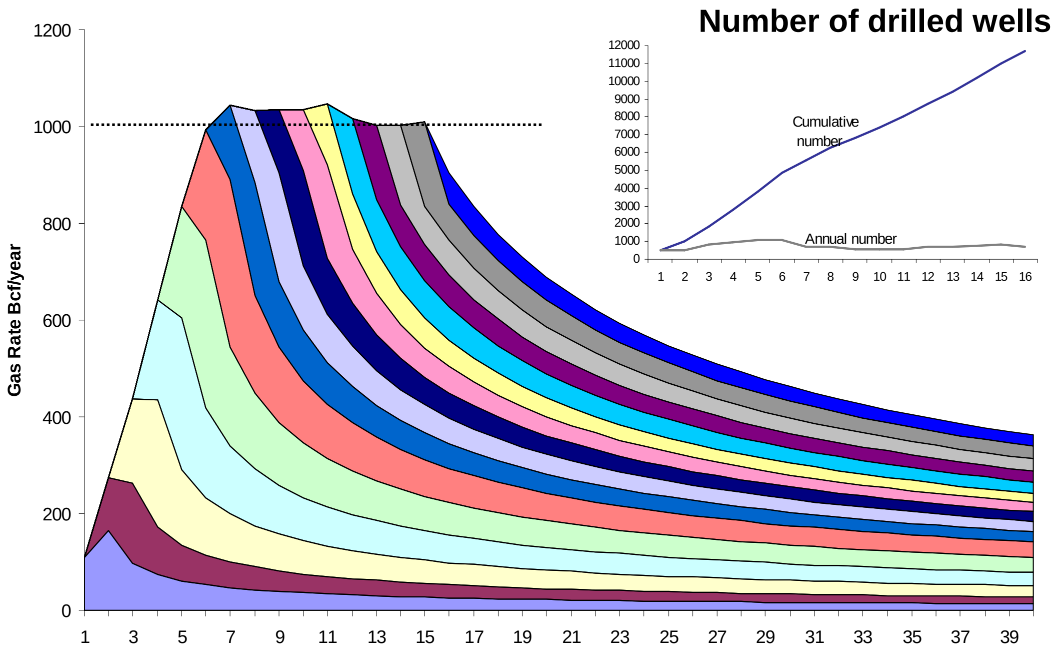
  → **Production of 1 Tcf / year minimum from 2020**

- National level:
  - Change gas supply mix significantly



Source: IEA WEO 2009, Author

Operational requirements to produce 1 Tcf/year



Source: Author

Wells and pads per year	Rigs	New land surface per year	Net Water consumption per year
Between 700 and 1000 wells and 70 to 100 pads	Around 150	Ca 2 sq kms	70 to 200 million barrels per year

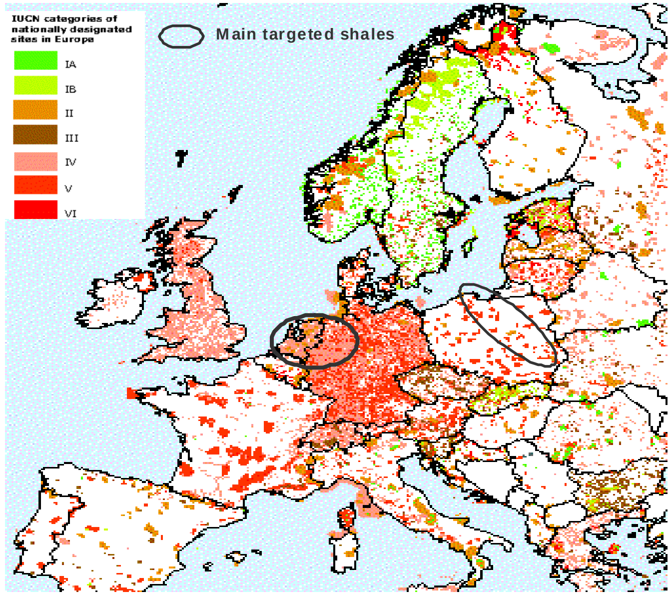
* Analysis over a 15-year period

Timeframe: 2020 earliest

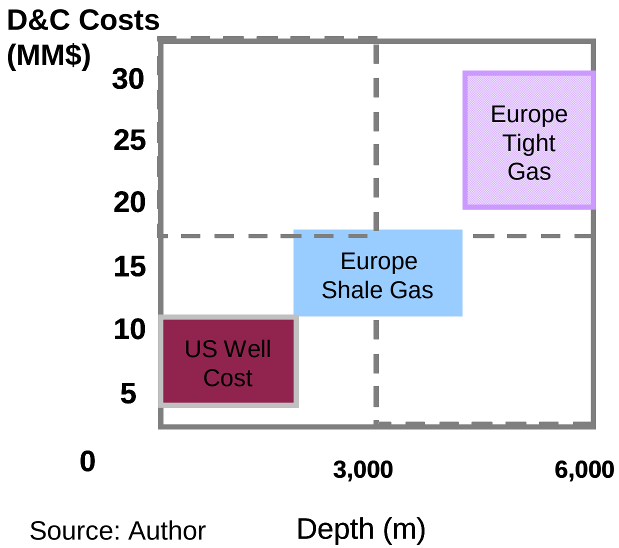
Development challenges

- Access to land surfaces and land usage rate
- Water access
- Costs and relative poor project economics
- Policy - Taxation, Regulations and Environmental concerns

Environmental site protection



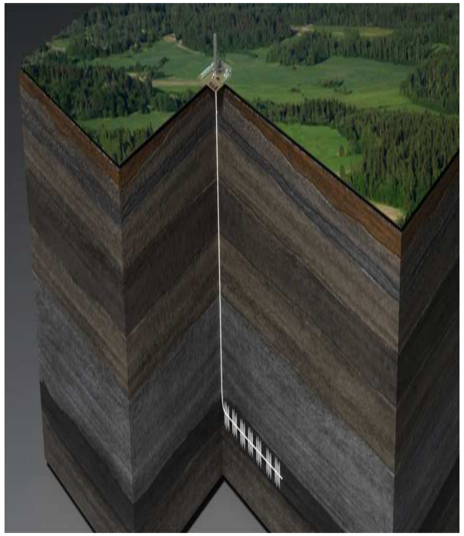
Source: European Environment Agency



Source: Author

Potential HSE impacts of shale gas operations?

- Main HSE concerns in Europe
  - Water management in context of water stress or shortages
  - Specific to shale operations:
    - Contamination of groundwater through leakages
    - Soil contamination
    - Well blowouts
    - Lifecycle GHG emissions?
- Risks relevant mainly in case of big scale exploitation, and manageable
- HSE risks and negative performance of operations in US could jeopardise development of shale resources in Europe.
  - France 1st country to prohibit hydraulic fracturing



Potential for public/private cooperation on shale operations in Europe

Policymakers

- Fragmented, complex and incomplete regulatory frameworks
  - Shale gas an afterthought in EU energy policy-making
  - DG of environment to take a more proactive stance?

Operators

- Longstanding history of drilling in Europe
  - Majors and large companies are prudent with strong focus on HSE and CSR
  - Joint R&D with service industry

COLLABORATION

Governance

- Establish operational standards for well stimulation and completions
- Establish specialised oversight bodies

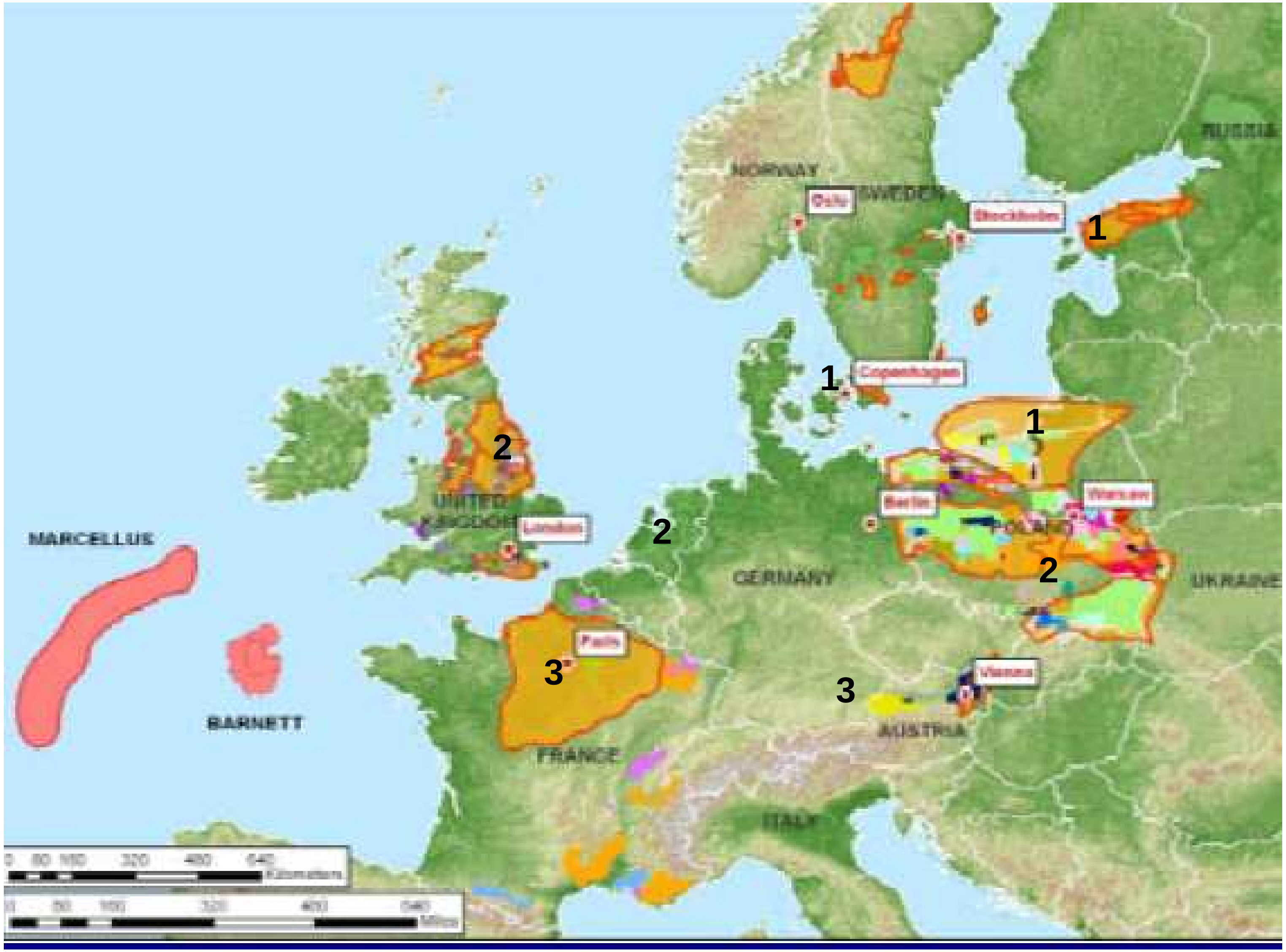
Technology development / R&D

- US example: GRI, RPSEA
- Areas in need: water efficiency, reservoir characterisation, well stimulation, enhanced recovery

THANK YOU !

Paper available at http://www.oxfordenergy.org/geny.php

European shale gas provinces



1: Lower Paleozoic 2: Carboniferous 3: Posidonia (bituminous) Source: Advance Resource International

The European response needed

- **New business model need to emerge**
  - R&D and Sweet spot operational approach
  - More efficient technologies for drilling, fraccing and re-using water
  - Governmental support in E&P and fiscal regulations
  - More local engagement of operators
- **Increase focus on shallow Tight Gas beside Shale Gas**
- **Develop home-grown trained workforce**

Macro-implications on gas markets

- **Policy or market drive?**

- **A potential non pan-European game changer with shifts in continental regional dynamics**
  - Potential to stabilise overall gas dependence of Europe?
  - Game-changing effects more likely at a national level- potential extreme effects

- **Price effects: no fundamental shift after 2020**
  - Competition with alternative sources of gas supply and capping effect on pricing of new marginal projects
  - Price: Contractual structure will have to provide high price, depending on governmental incentives
  - Downward effect on prices as in US unlikely given quantities to be expected