







Energy research Centre of the Netherlands

European gas market developments in different energy transition scenarios

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Introduction

- Increasing deployment of low carbon energy producing technologies towards 2050
- Affects markets and infrastructure requirements
- Strong interaction between electricity and gas markets requires integral research approach
- →What role for gas in future energy transition? (focus on transition in electricity generation)
- →What are gas market implications? (i.e. sourcing, infrastructure investment)



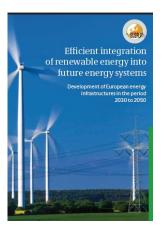
Introduction to SUSPLAN project

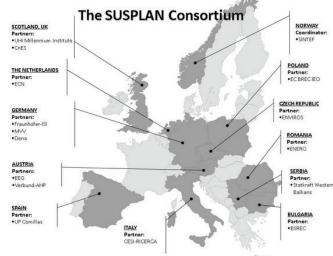




 EU FP7 project with focus on developing regional and pan-European guidelines for more efficient integration of renewable energy into future infrastructures

 ECN responsible for WP3 on transnational infrastructure developments







Research approach SUSPLAN

Model-based

- Simulation model representing European electricity market and transmission infrastructure (MTSIM model RSE)
- Simulation model representing European gas market and gas infrastructure (transmission, LNG, storage) (Gastale model ECN)
- Economic optimization
- Interactive analysis
 - Iterations between the two models, both allowing for optimal deployment of existing capacity and expansion of capacity
- Long-term perspective
 - Starting point 2030, analysis for 2030 2050



Positive public attitude

High environmental focus in population and business.

Reduced energy consumption and demand
for environmentally friendly products

Positive future for high RES integration, but too low technology development rate. Mainly decentralized development

Positive future for high RES integration. Both market pull and technology push existing.

Slow tech development

No major technology break-throughs; gradual development of current technologies Yellow

Green

Fast tech development

Major break-throughs several technologies, RES, grids, demand side

Red

Difficult future for high RES integration. Few new technologies are available, and low interest to invest. Mainly centralized development with traditional technologies

Blue

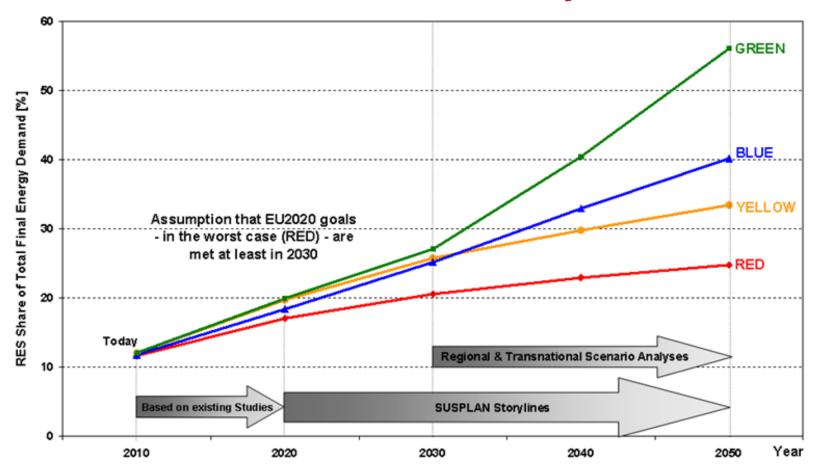
New technologies are available, but low interest to invest and use. Mainly centralized development, but with new technologies.

Indifferent public attitude

Low environmental focus in population and business. Higher energy consumption and no demand for environmentally friendly products or services

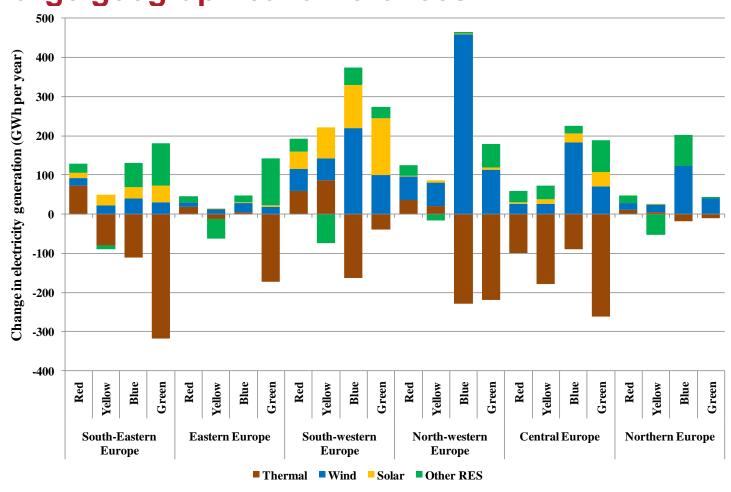


Share of renewables in total energy demand across SUSPLAN storylines



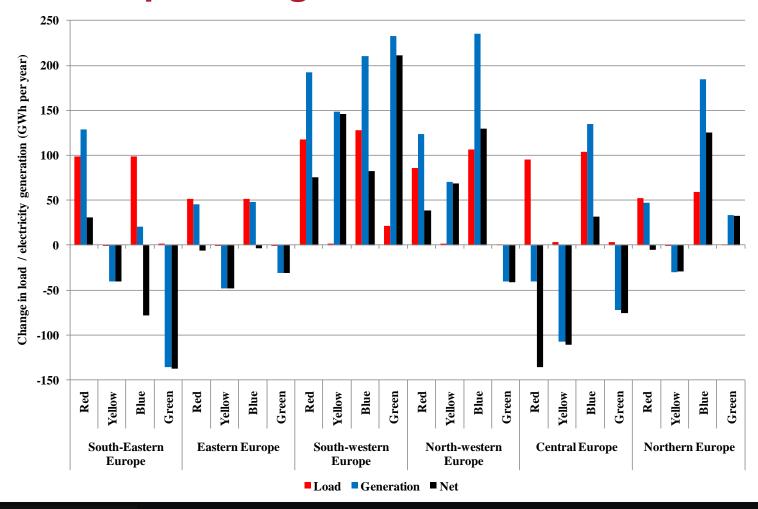


Developments in electricity generation Large geographical differences



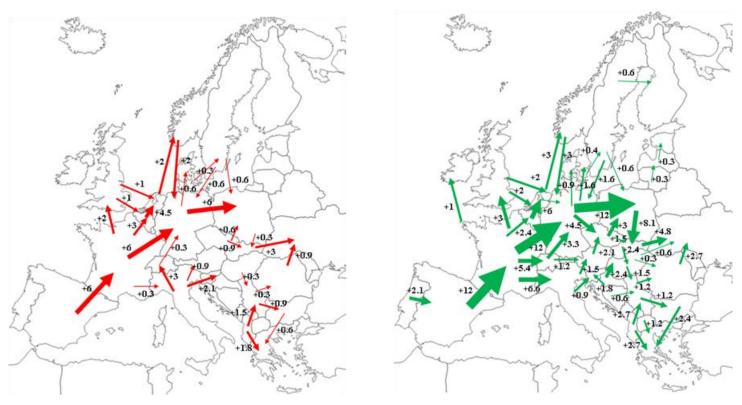


Total impact on generation and load





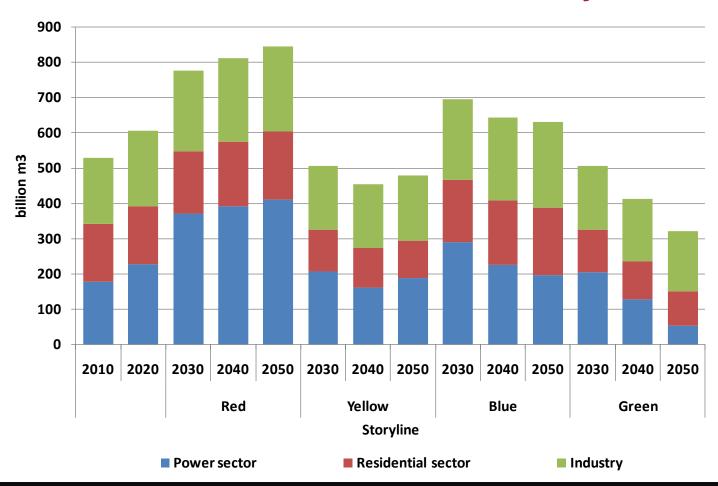
Implications for EU internal transmission infrastructure



 Larger RES penetration in combination with low demand causes larger need for infrastructure investment



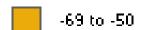
Total gas consumption Power sector is main driver across storylines



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Gas demand Change between 2010 - 2050 (in billion m³)



-49 to -30

-29 to -10

-9 to 10

11 to 30

31 to 50

51 to 70

71 to 90



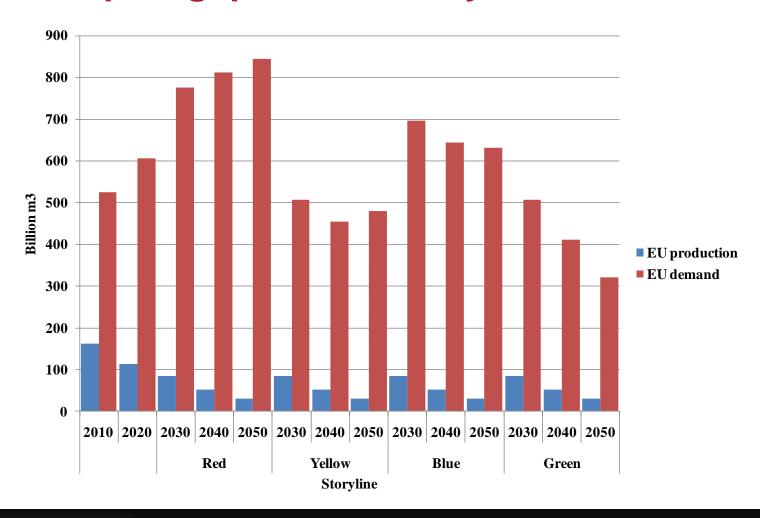






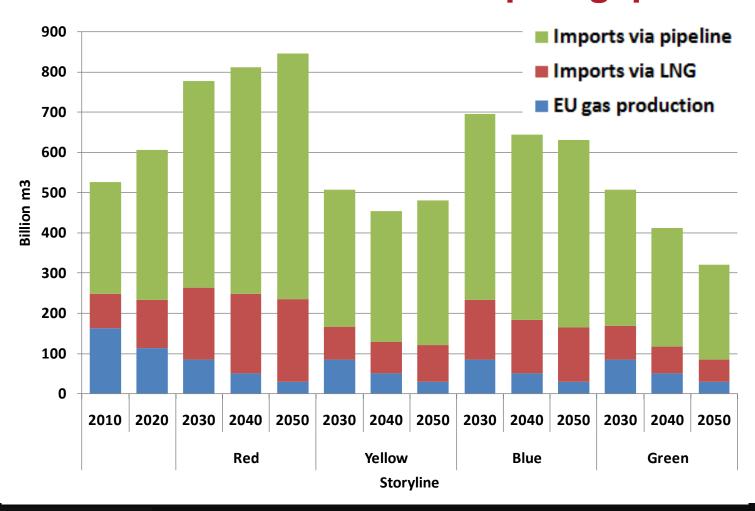


EU import gap across storylines





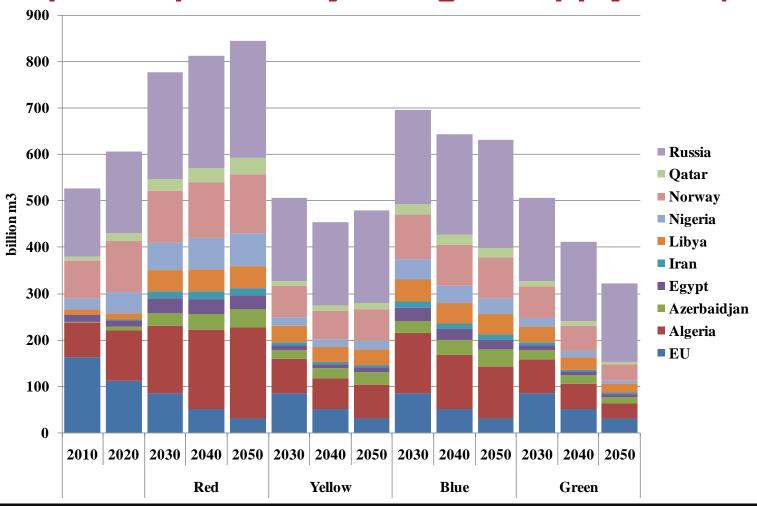
How does the EU fill this import gap?



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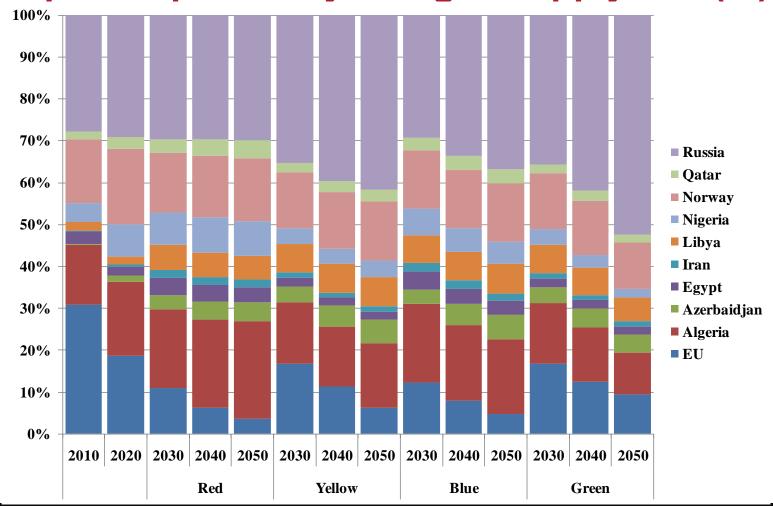


Import dependency and gas supply mix (bcm)





Import dependency and gas supply mix (%)



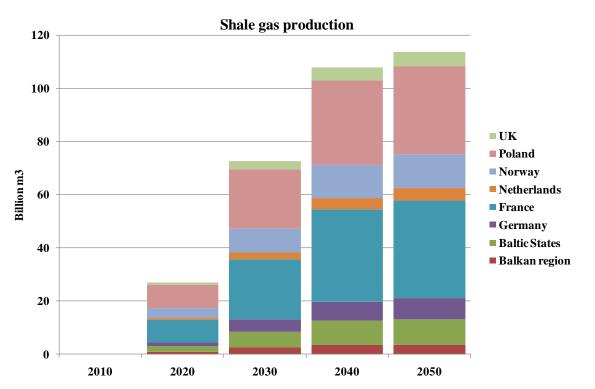


What are possible implications of shale gas developments across Europe?

- Unconventional gas provides for more abundant (local) resources
- Downward pressure on prices:
 - Gas less scarce, lower gas prices
 - Less security of supply concerns (due to geographical spread of unconventional resources)
- Substitution of EU external supplies with (new) local supplies?



Role for shale gas?

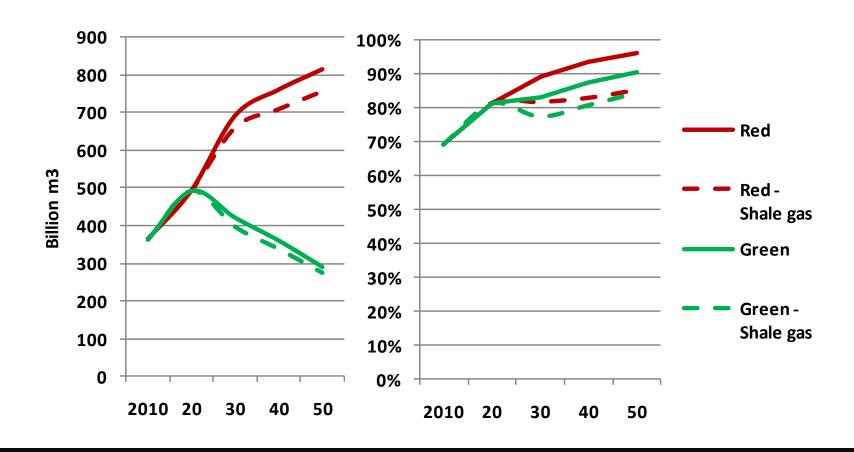


- Assumptions:
- Production capacity:
 - 2020: 28 billion m³
 - 2030: 99 bcm billion m3
- Cost: 8 12 €-ct / m³
- 'Optimistic scenario'

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Shale gas implications for import dependency and supply mix





Shale gas implications for infrastructure investment

- Increased investment in parts of Europe due to changing gas flow pattern
 - For example in Eastern Europe due to Polish exports
- Less investment in LNG import capacity
 - Avoided LNG imports from a.o. Nigeria, Egypt
- Relatively little decrease in Russian gas imports
 - 'Cheap' available pipeline capacity



Conclusions

- Gas and electricity demand interdependent, peak in gas demand likely in 2025/2030
- Highly diversified supply for EU as whole (with regional differences) irrespective of level
- Shale gas implications: some internal investment required + substitution of most expensive supply options: limited overall EU impact?
- More research needed on:
 - Interactions between gas, electricity and CO₂ markets
 - Implications for EU infrastructure investment strategies





EDGaR:

Understanding gas sector intra- and inter-market interactions (UGSIIMI)

- Cooperation between TU Delft, RUG, KEMA, and ECN
- Focus:
 - Explore and understand gas sector interactions within the gas sector amongst technology, players, and markets, and interaction between gas and electricity
- http://www.edgar-program.com/nl/projects/A1



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Thank you for your attention

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