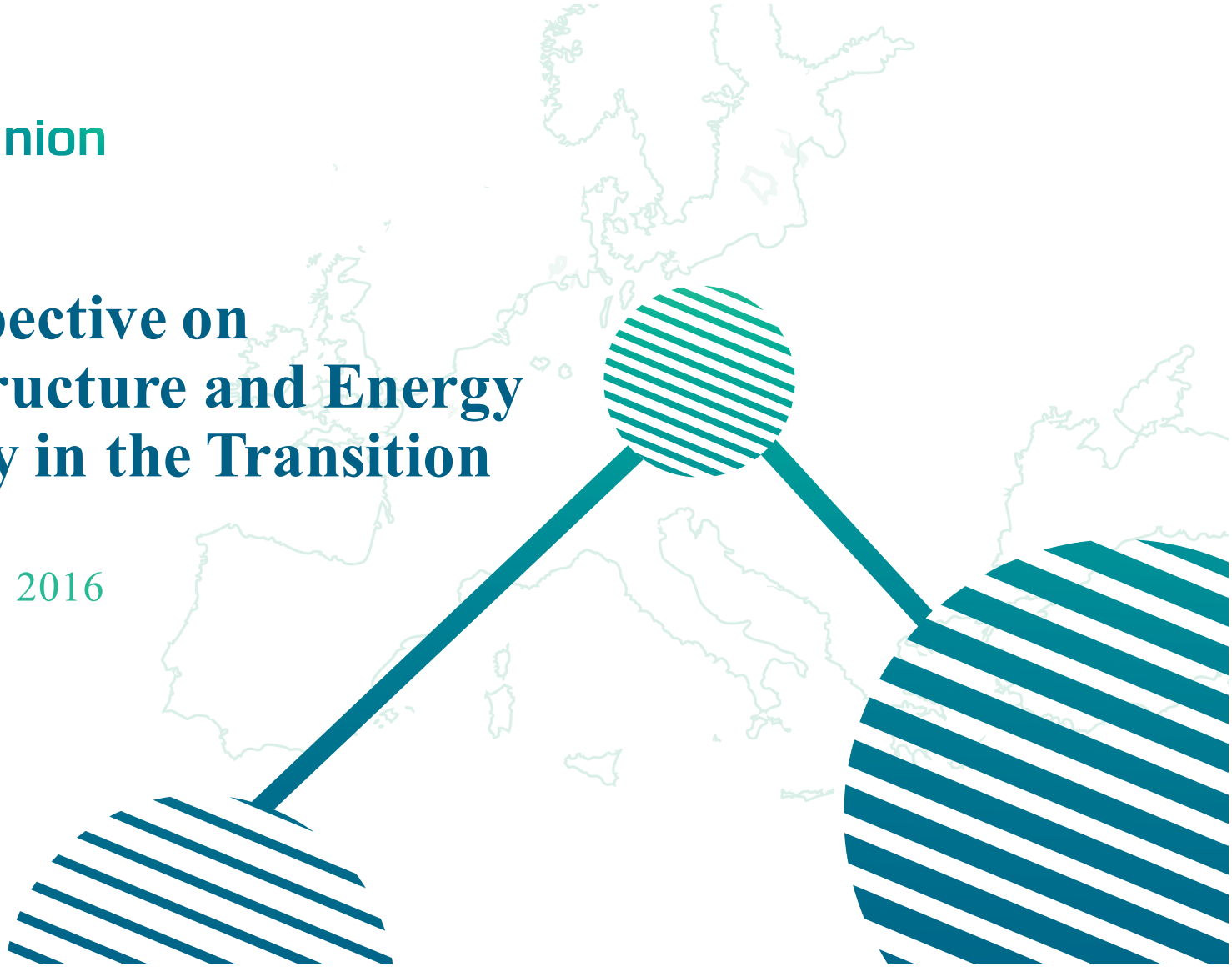
Energy Union Choices

# A Perspective on Infrastructure and Energy Security in the Transition

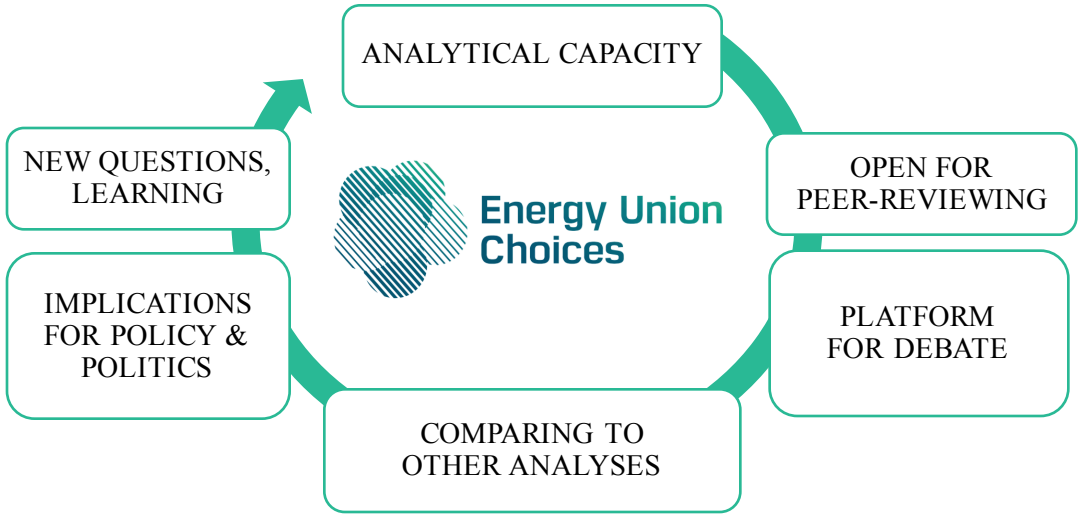
3rd of March 2016



# Introducing *Energy Union Choices*

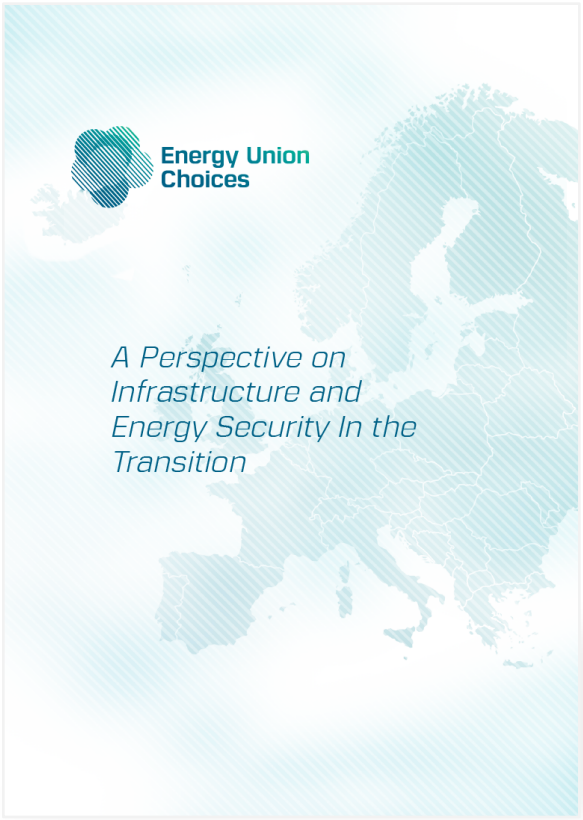
## Mission:

*"To build a better understanding of the choices and decisions required to accelerate the energy transition in Europe"*



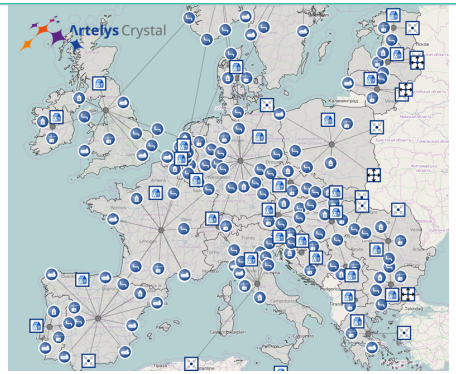
# Objective of the report

- A perspective on energy security, the resilience of the EU gas system and the adequacy of existing capacity under a set of different possible futures
- Which infrastructure investments are lowest cost and least regret to ensure resilience throughout the transition?
- Can an integrated view of infrastructure investments (across electricity, gas, and demand-side) help meet security of supply challenges at a lower cost?

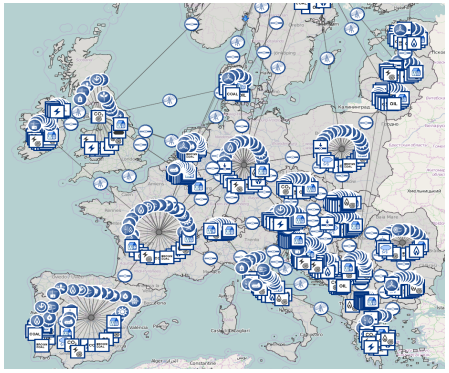


# Model and main assumptions

- Quantitative analysis based on an **integrated gas an power** model, country-granularity
  - Representation of gas and power supply and demand
  - Simulations are made at an hourly time step over a year
- **Joint optimization** of gas and power infrastructures using high performance computing
- Focus on **security of supply** (impact of investments on import prices are not modelled)




**Gas model**

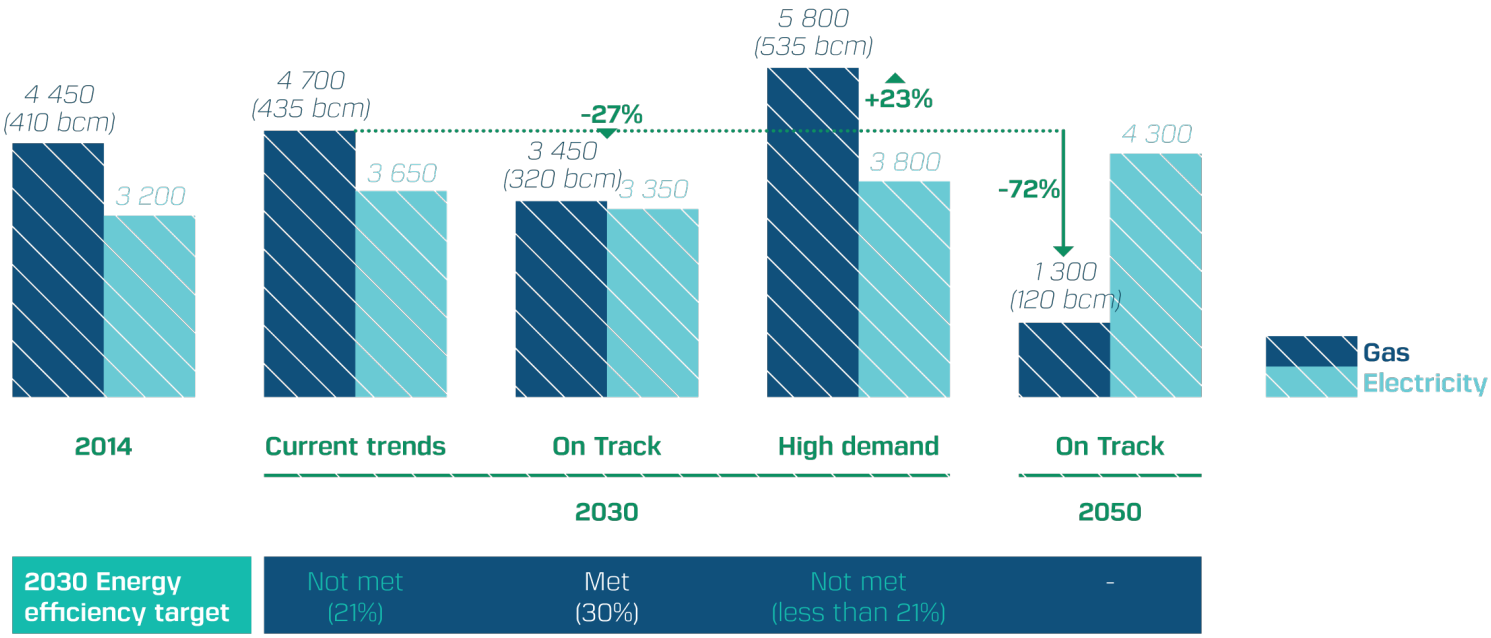


**Power model**

# Approach

Assessment of the investment requirements in the gas system for security of supply under a wide range of possible futures

- 4 different demand scenarios
- 4 disruption cases of one full year

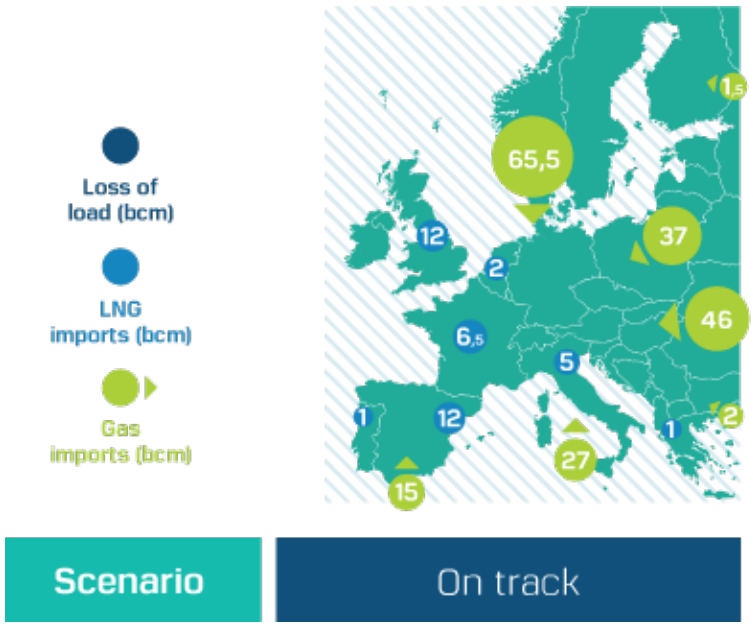


# Key Findings

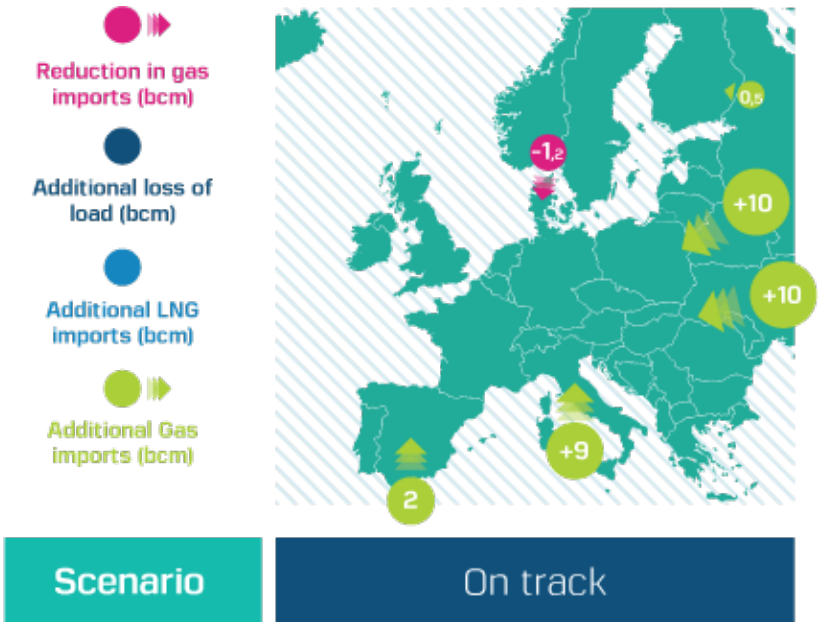
| | |
|---|---|
| Finding 1: | Europe's current gas system is largely resilient to a wide range of demand futures and extreme supply disruption cases |
| Finding 2: | Demand reduction as a priority; buildings efficiency significantly reduces investments needs. |
| Finding 3: | An integrated and regional perspective on gas and electricity helps meet supply security standards at significantly lower costs |
| Finding 4: | Delivering the EU's 2030 targets can significantly reduce gas imports into Europe |
| Finding 5: | New gas infrastructure assets will be superfluous by 2050. |

# Finding 1: System is resilient to extremely cold weather

## Standard conditions




## Cold weather conditions




- The current gas infrastructure can handle the higher demand, by increasing imports from Russia and North Africa

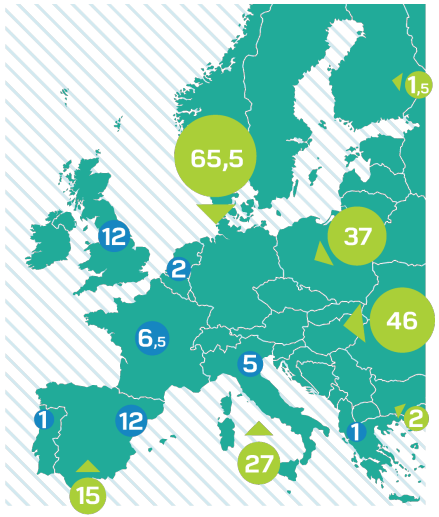
# Finding 1: System is resilient to a disruption of imports from Norway

## Standard conditions

Loss of load (bcm)

LNG imports (bcm)

Gas imports (bcm)



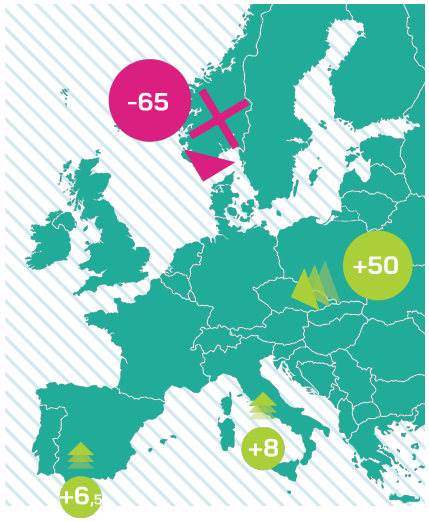

Scenario | On track

## Norway imports disruptions

Disabled gas imports (bcm)

Additional LNG imports (bcm)

Additional Gas imports (bcm)

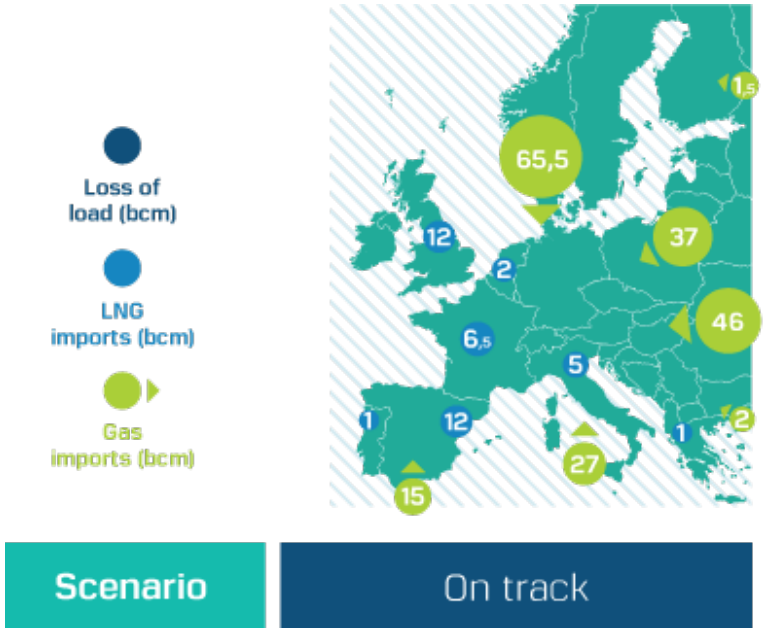



Scenario | On track

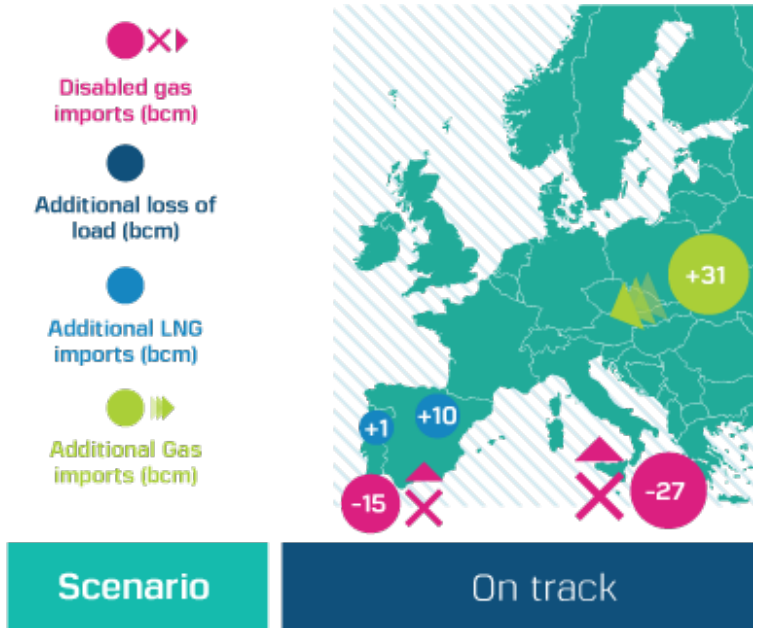
- The current gas infrastructure can face a depletion of Norwegian resources, by using more imports from Russia (mostly), Algeria and Libya.
- This remains true in the High demand scenario, with higher LNG imports, which increases confidence in the coal phase-out

# Finding 1: System is resilient to a disruption of imports from North Africa

## Standard conditions



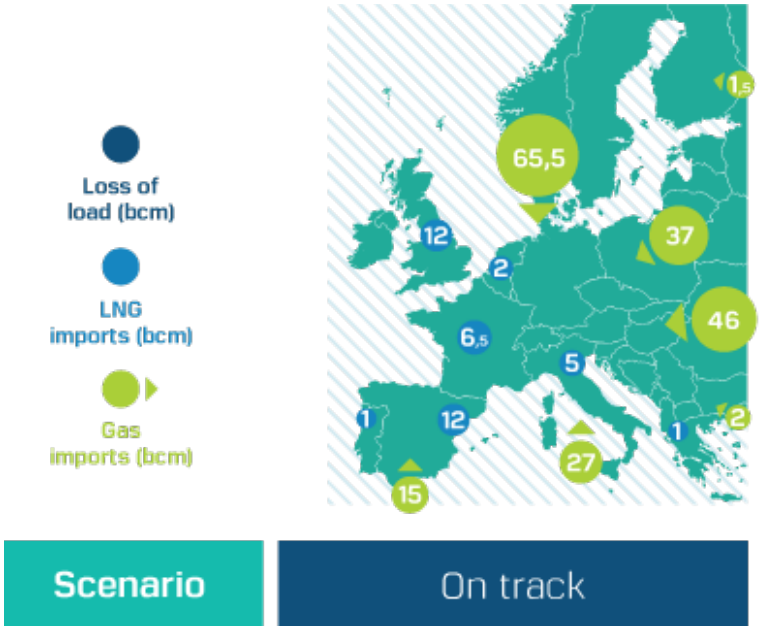

## North Africa imports disruptions



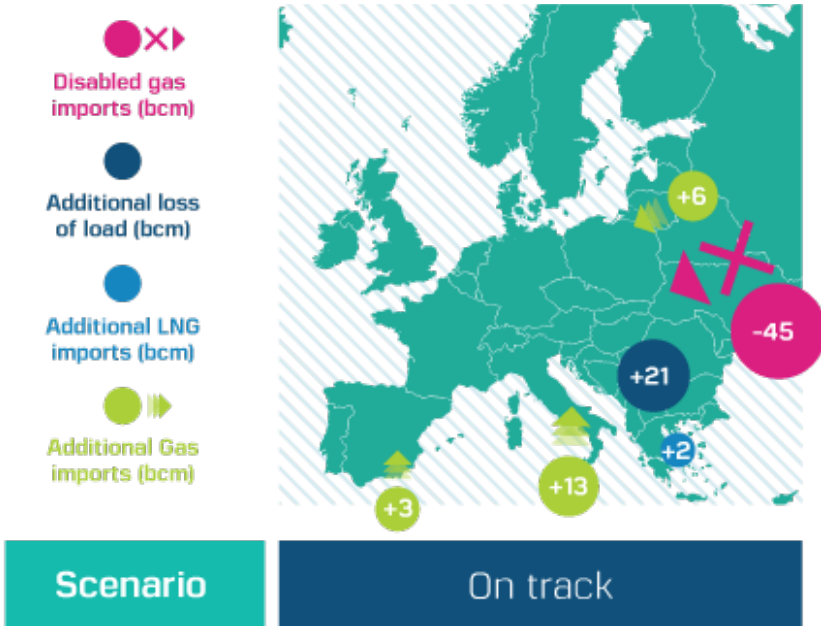

- The current gas infrastructures can also handle an cut of imports from North Africa, with larger imports from Russia and LNG in Iberia.
- Also the case in the High demand scenario, with higher LNG imports across Europe. This again increases the confidence in the coal phase-out.

# Finding 1: System is resilient to a disruption of imports from Ukraine transit, with the exception of South Eastern Europe

## Standard conditions



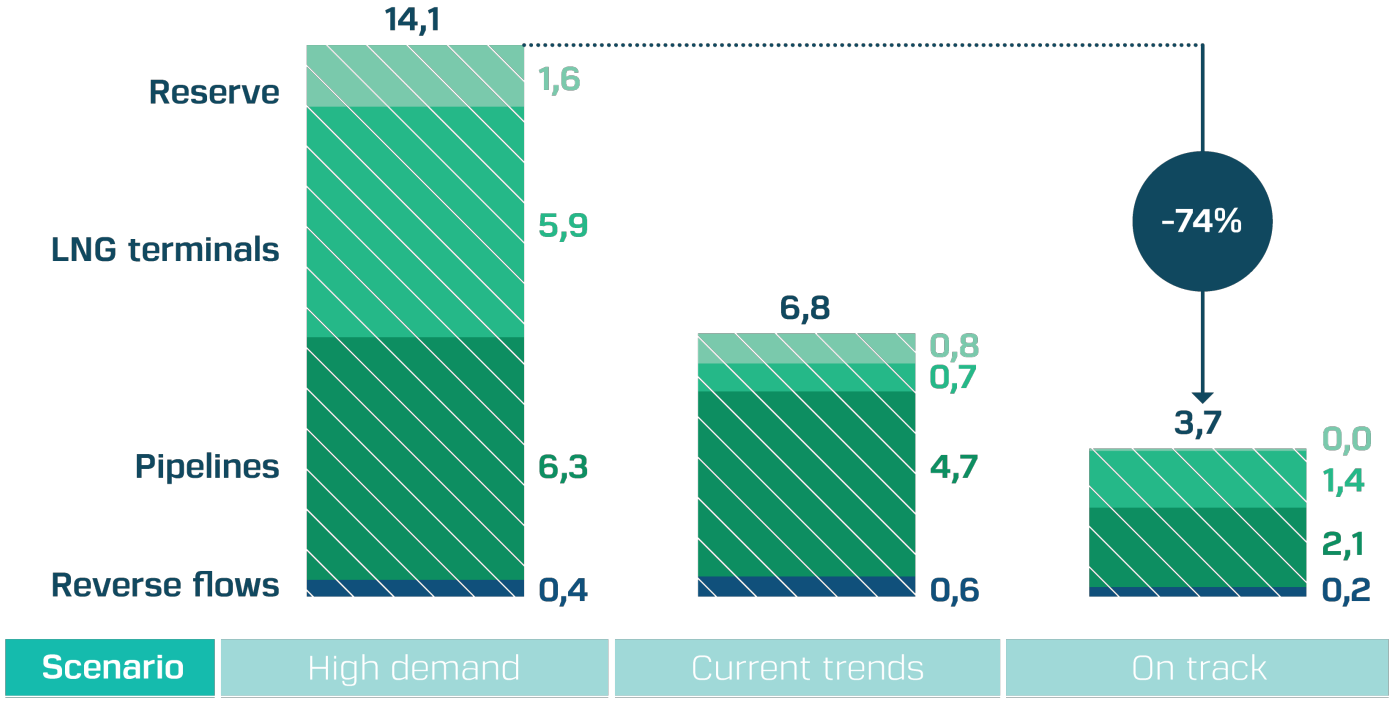

## Ukraine imports disruptions




- The current gas infrastructure can mostly handle a cut of imports from Russia through Ukraine with larger imports.
- Issues arise in South Eastern Europe with 21 bcm of missing supply in this disruption case
- In the high demand scenario, this loss of load in SEE increases to ~50 bcm

# Finding 2: Demand reduction as a priority; buildings efficiency significantly reduces investments needs

**Investment requirements, bn€**

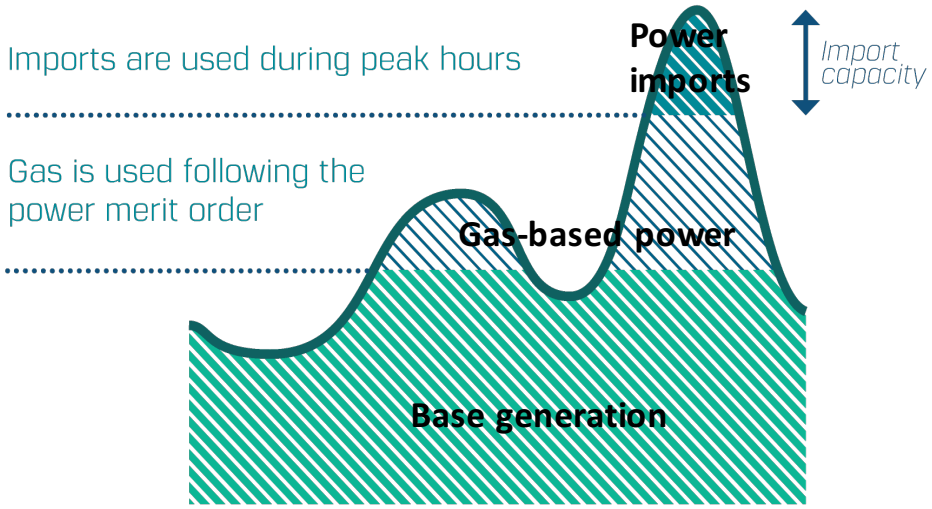



- Infrastructure investment needed to avoid any loss of load in SEE range from 3.7 to 14.1 bn€, depending on the gas demand levels

# Finding 3: An integrated perspective on gas and electricity systems helps meet supply security at significantly lower costs

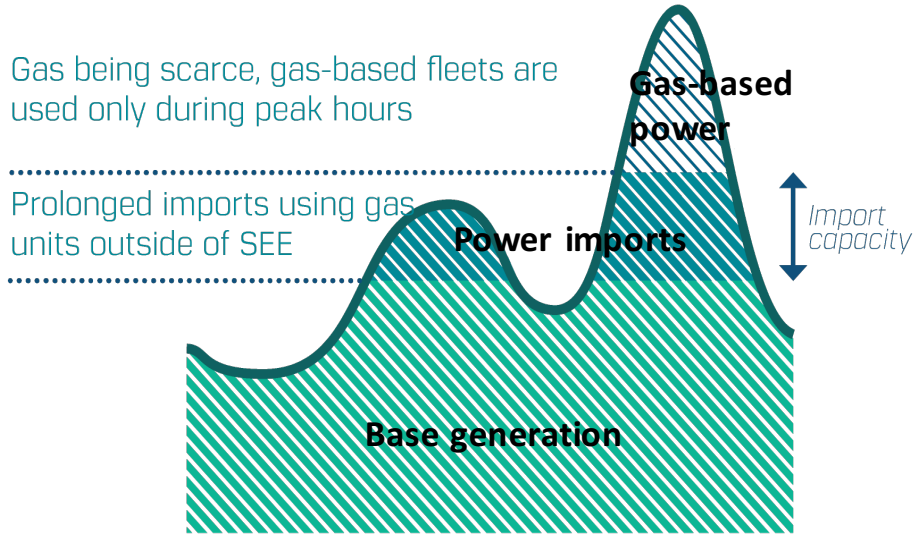
## Standard Approach

- Gas solutions for gas problems
- Dimensioning of gas infrastructures using standard operation of gas-based fleets

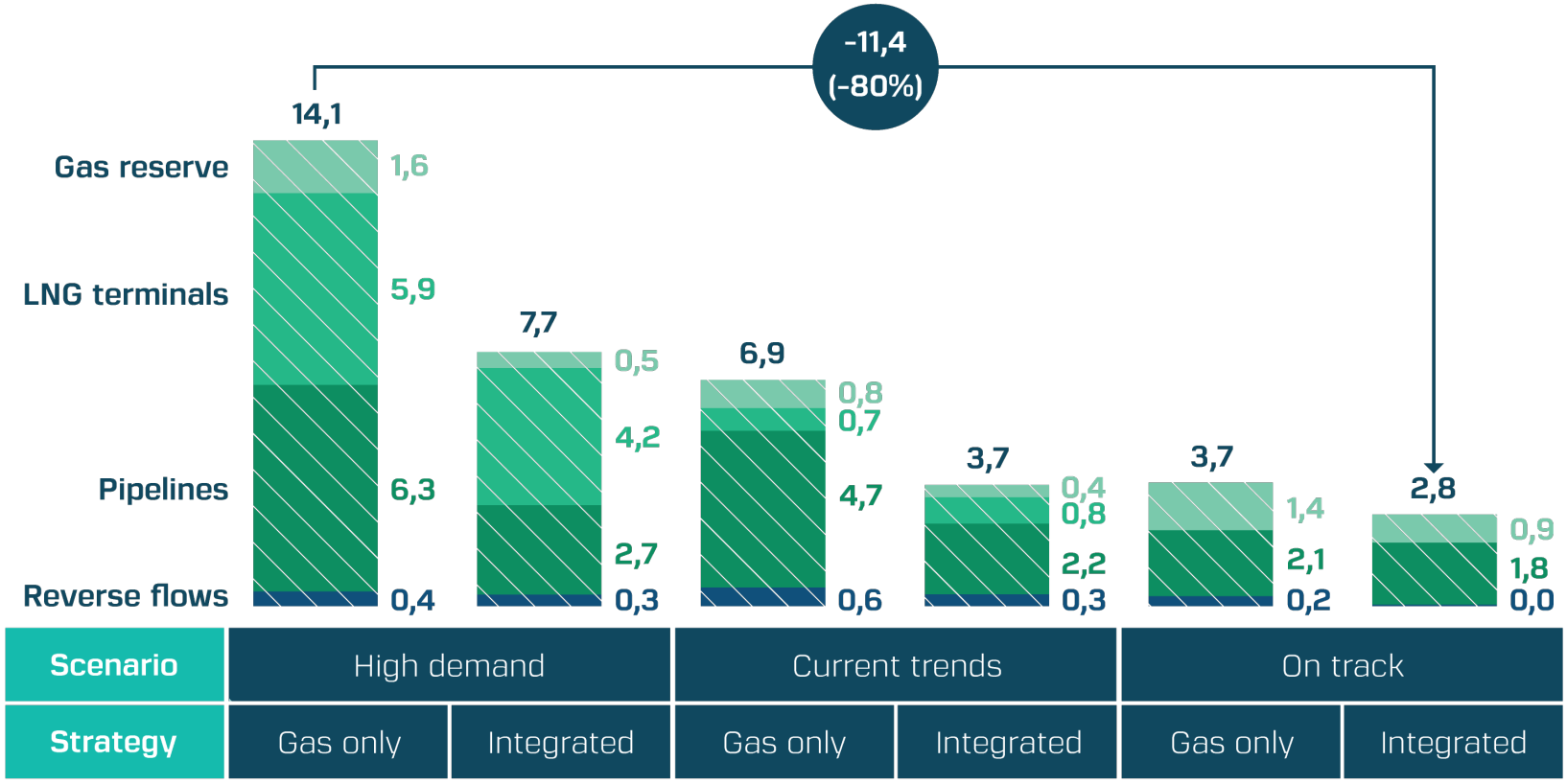



## Integrated Approach

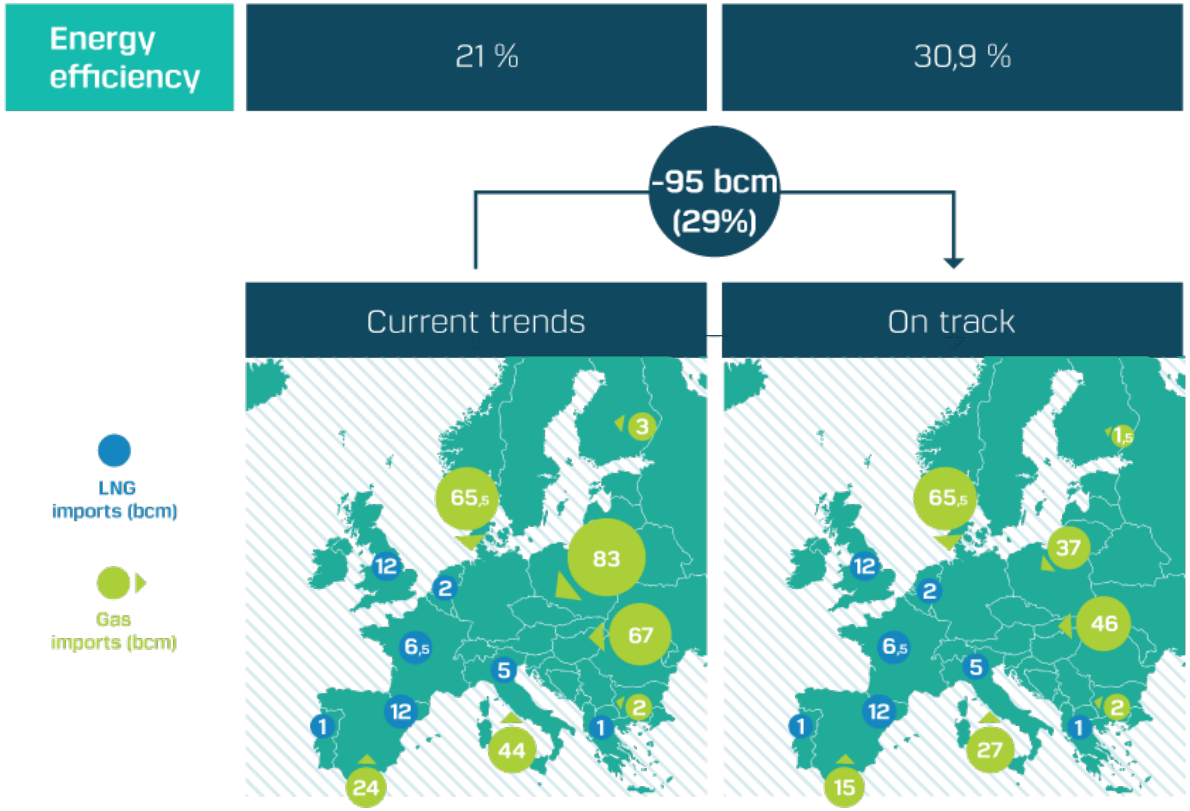
- Joint optimization of gas & power (operation & infrastructure)
- Use of the power system flexibility and existing interconnections to reduce investments requirements



# Finding 3: An integrated perspective on gas and electricity systems helps meet supply security at significantly lower costs



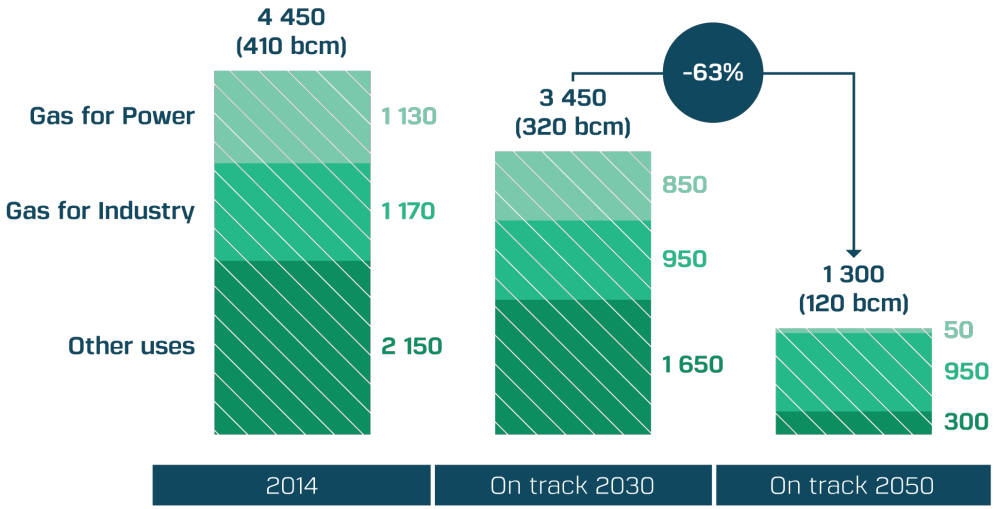
# Finding 4: Delivering the EU's 2030 targets can significantly reduce gas imports into Europe



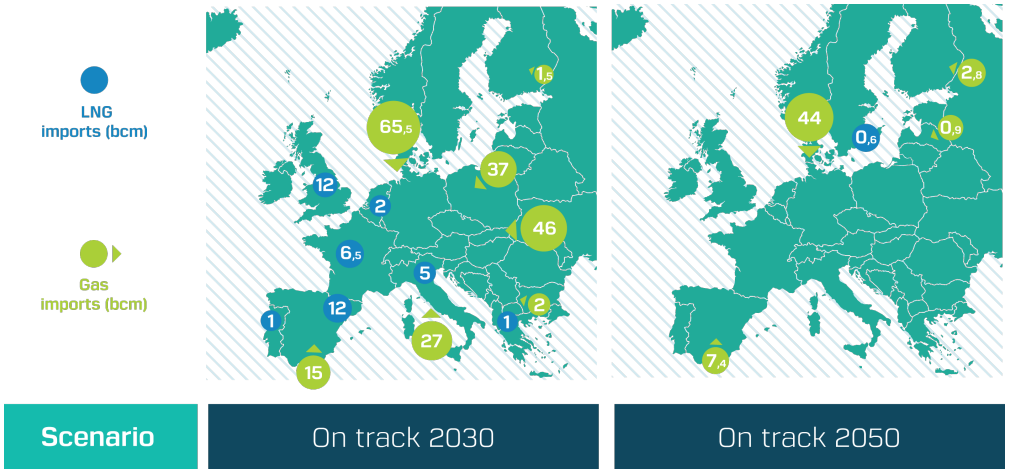

**For every 1% of increase in energy efficiency…**

**… gas imports fall by 2.9%**

# Finding 5: New gas infrastructure assets will be superfluous by 2050




- Gas demand may fall as much as 63% between 2030 and 2050 in a low carbon scenario
- No loss of load or investment needs identified in that timeframe



# Conclusions

- Europe's investment requirements in infrastructure for security of supply range between 3,7bn€ and 14,1bn€

- The lowest range can be achieved by:
  - Efficiency measures (especially in the gas-heavy sectors, such as heating for buildings)
  - Leveraging synergies between electricity and gas systems

- Together, investment in gas infrastructure can be reduced by ±80%

Energy Union Choices

**www.energyunionchoices.eu**

Thank you!