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EUROPE: BENEFITS OF INTEGRATING REGIONS AND ENERGIES TO THE SECURITY OF SUPPLY

GUILLAUME TAREL, PhD

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Energy Union Choices

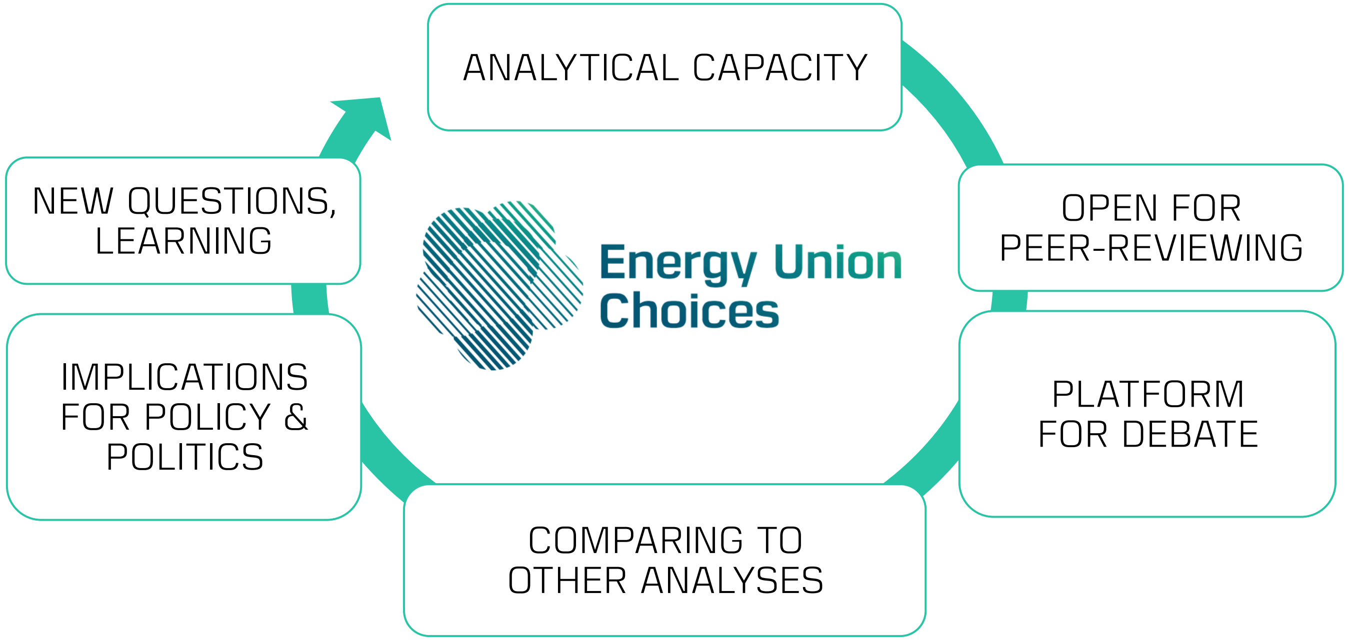
A Perspective on Infrastructure and Energy Security in the Transition

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"



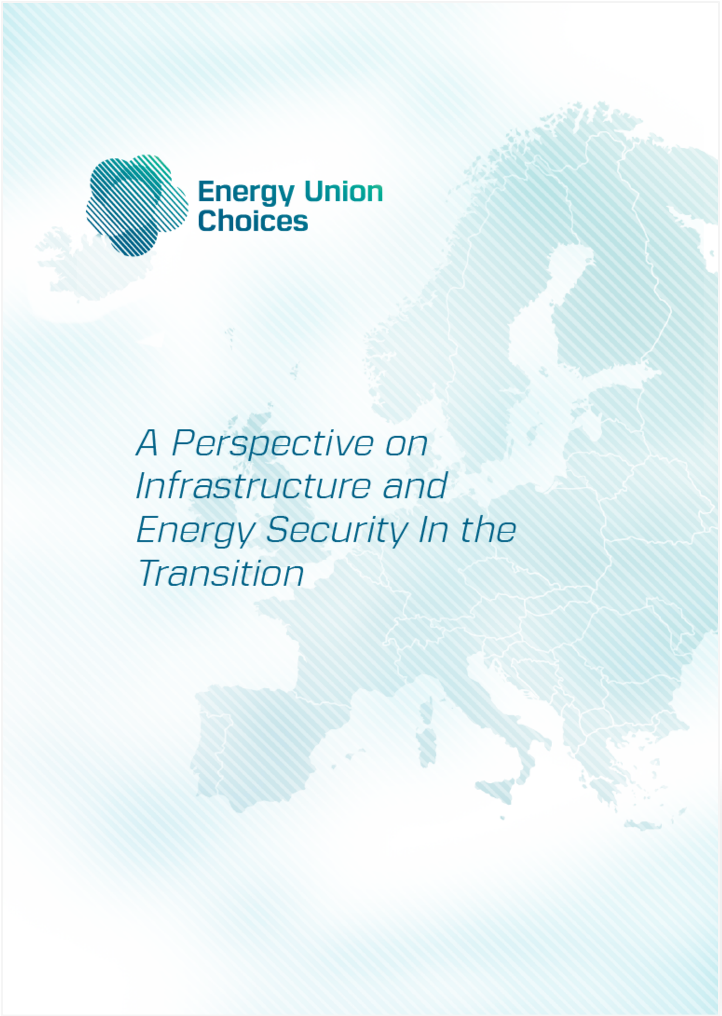
Agora Energiewende | European Climate Foundation | RAP | E3G | WWF

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

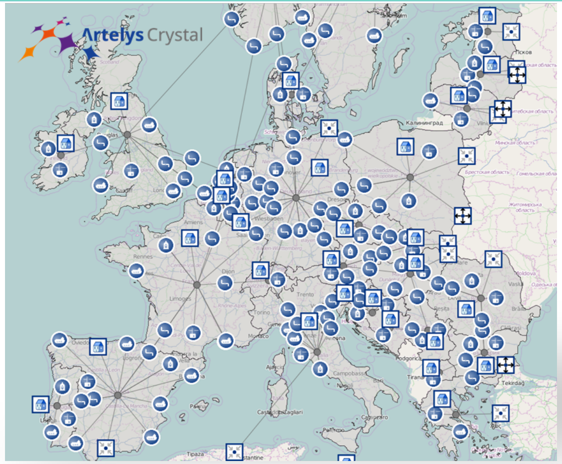
- Which infrastructure investments are lowest cost and least regret to ensure resilience throughout the transition?

- Can an integrated view of infrastructure investments (across electricity, gas, and demand-side) help meet security of supply challenges at a lower cost?

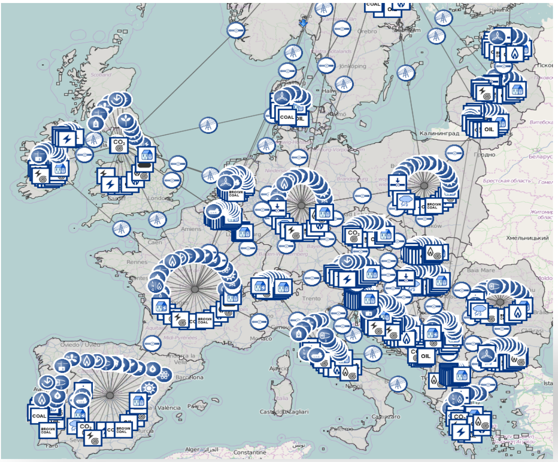


Model and main assumptions

- 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

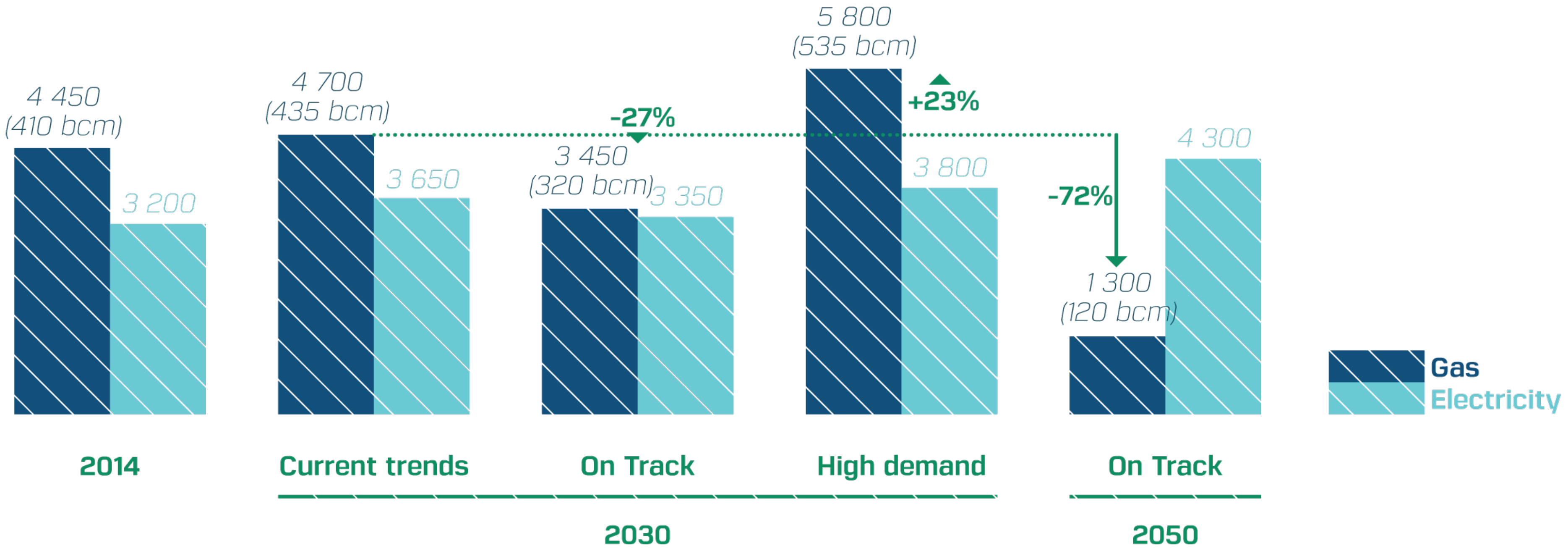


Power model

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



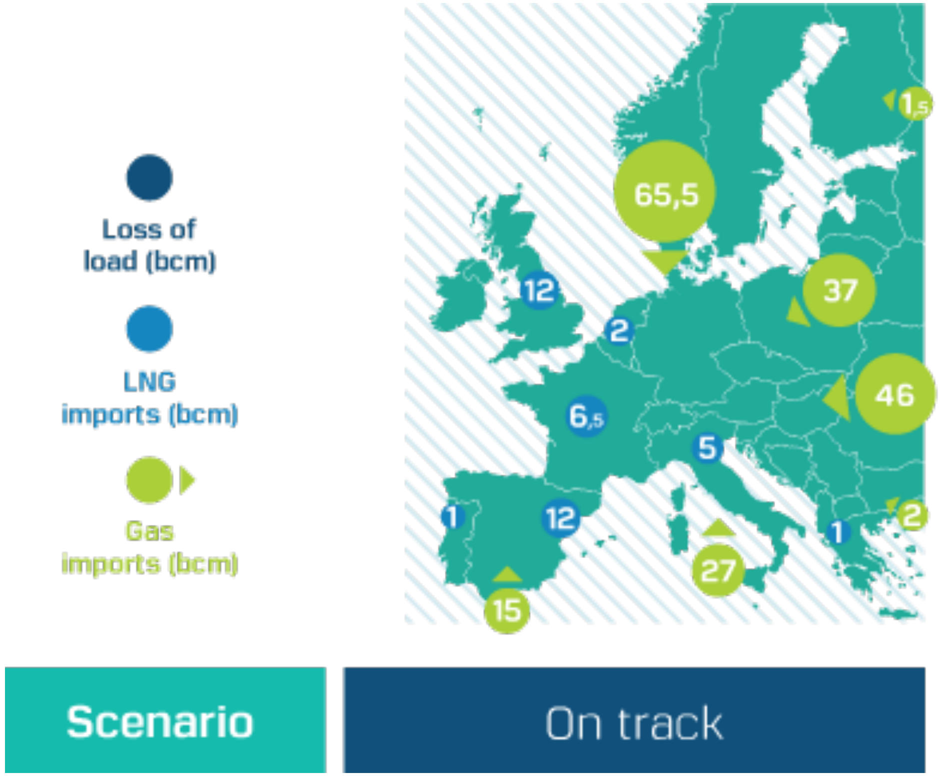
2030 Energy efficiency target	Not met (21%)	Met (30%)	Not met (less than 21%)	-

Key Findings

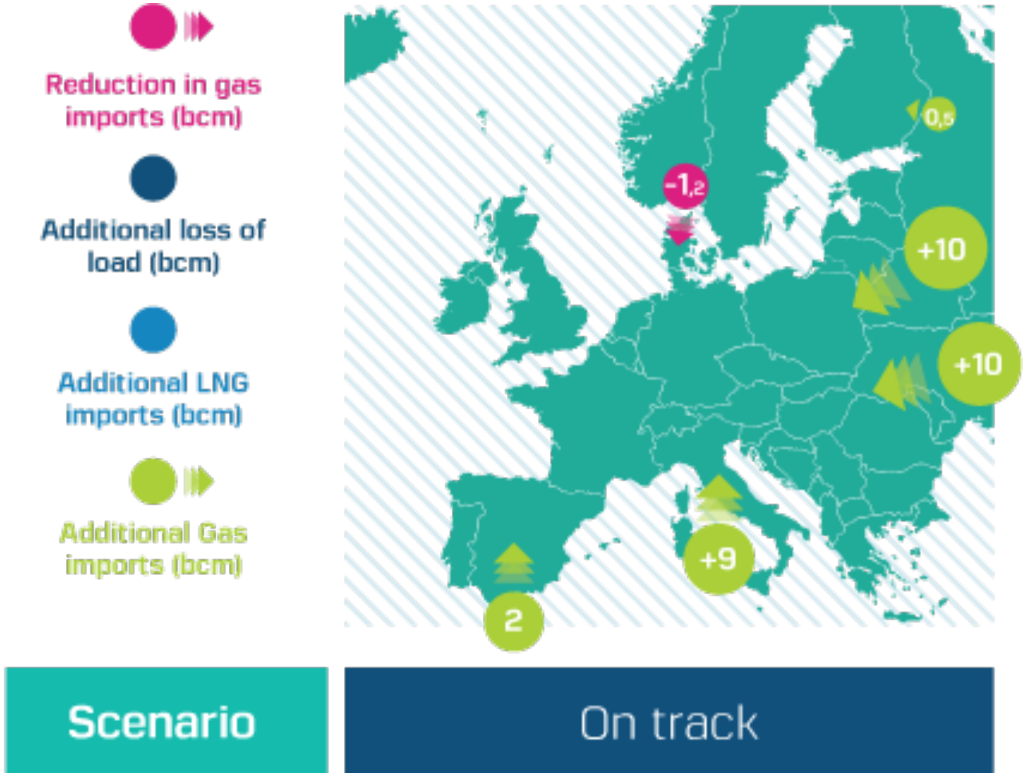
Finding 1:	Europe's current gas system is largely resilient to a wide range of demand futures and extreme supply disruption cases
Finding 2:	Demand reduction as a priority; buildings efficiency significantly reduces investments needs.
Finding 3:	An integrated and regional perspective on gas and electricity 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

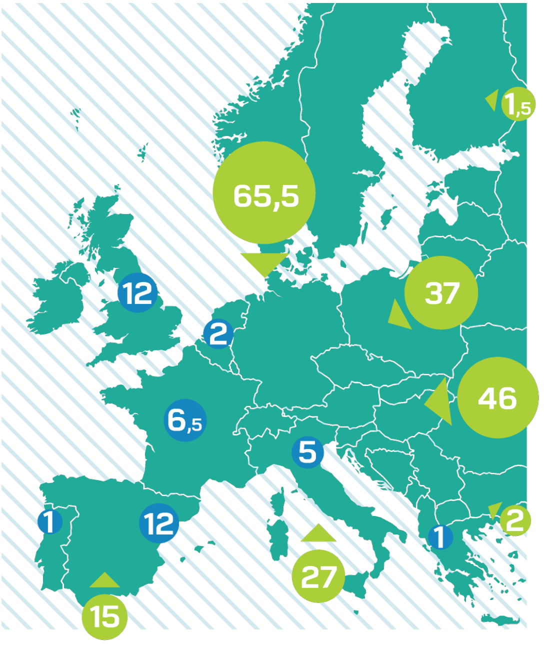
Finding 1: System is resilient to a disruption of imports from Norway

Standard conditions

Loss of load (bcm)

LNG imports (bcm)

Gas imports (bcm)



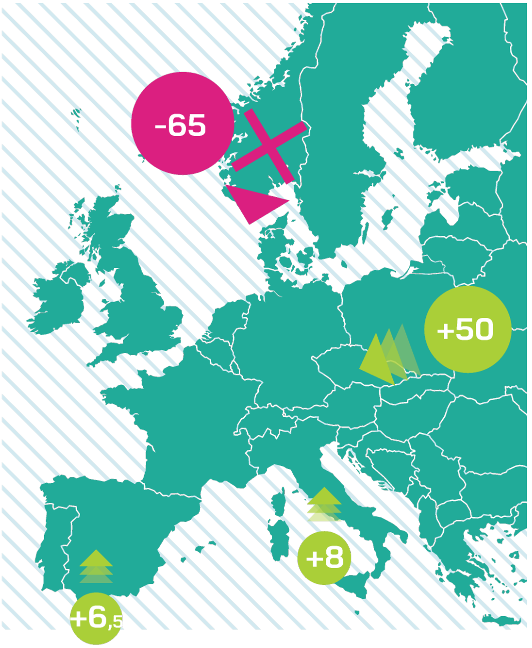
Scenario | On track

Norway imports disruptions

Disabled gas imports (bcm)

Additional LNG imports (bcm)

Additional Gas imports (bcm)

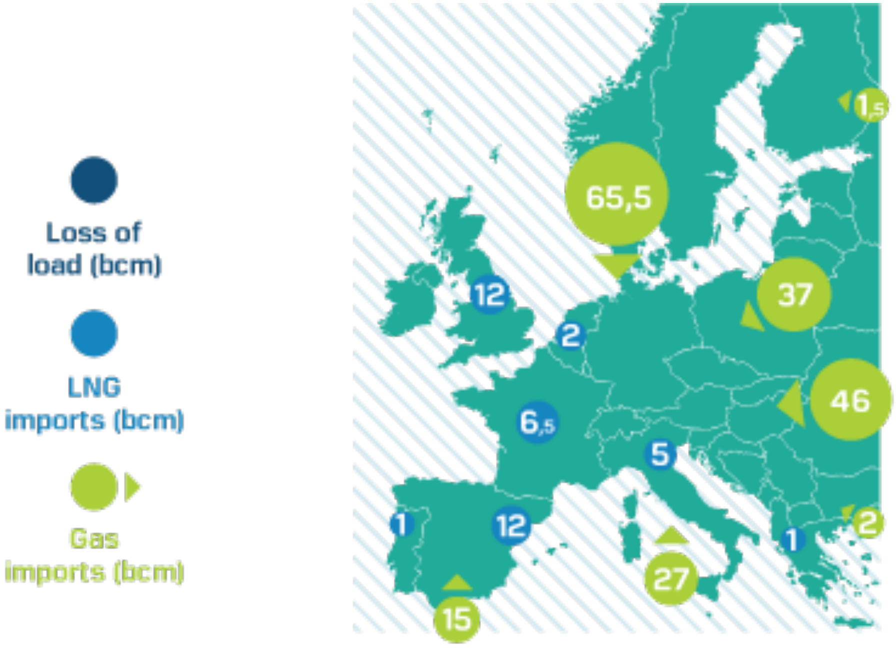


Scenario | On track

- 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

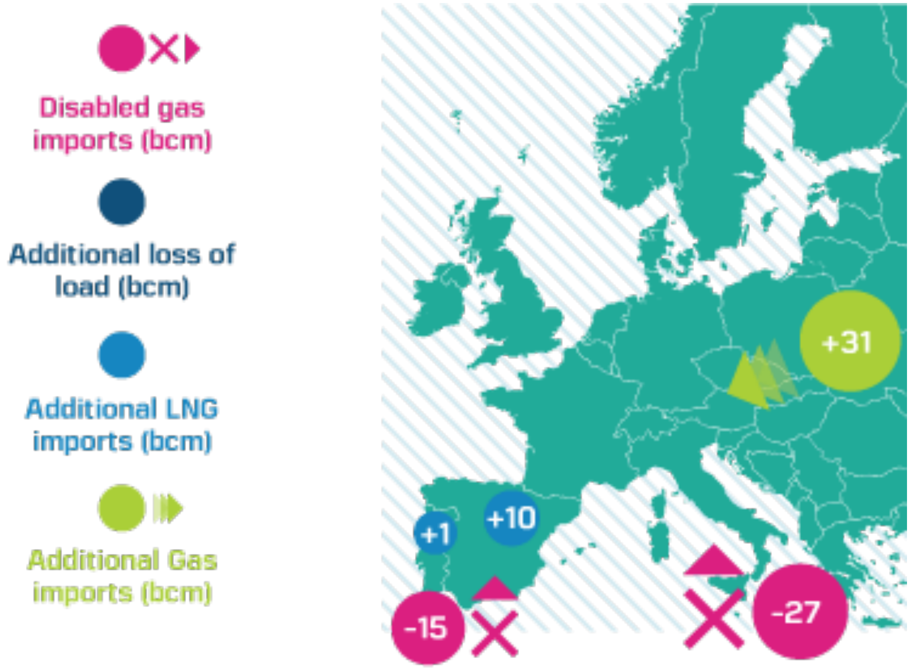
Finding 1: System is resilient to a disruption of imports from North Africa

Standard conditions



Scenario	On track

North Africa imports disruptions

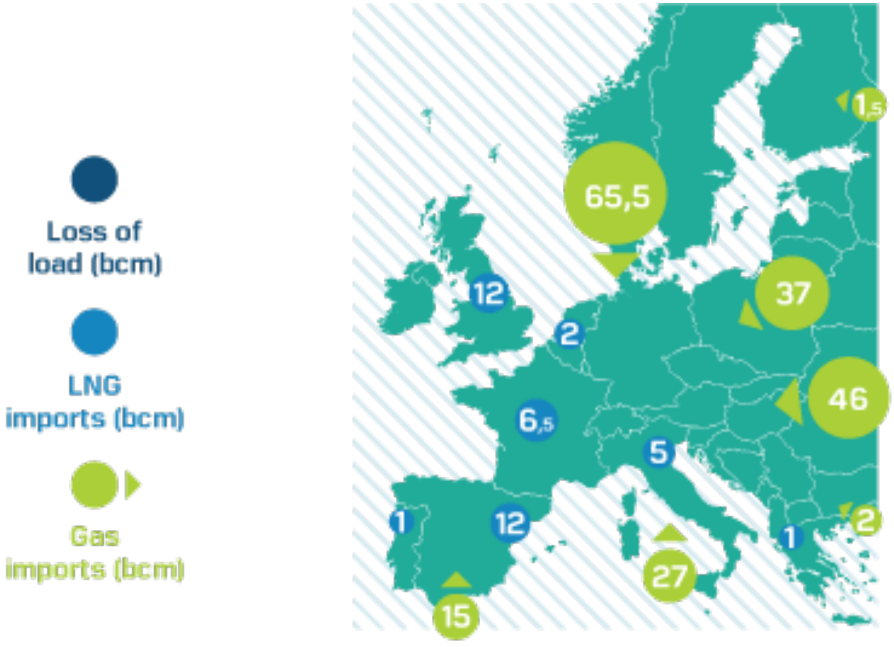


Scenario	On track

- 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.

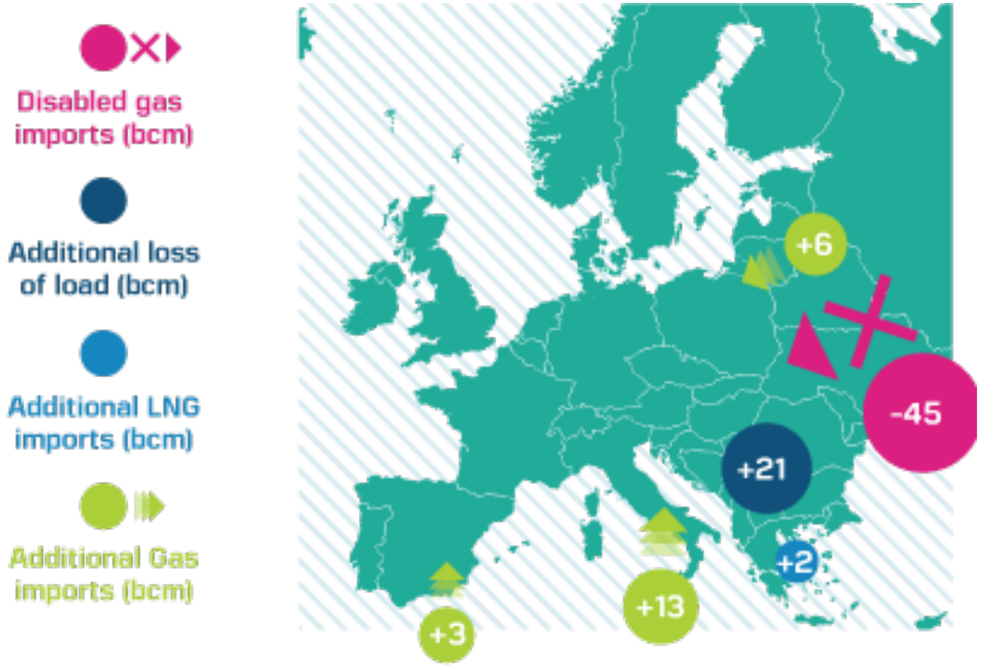
Finding 1: System is resilient to a disruption of imports from Ukraine transit, with the exception of South Eastern Europe

Standard conditions



Scenario | On track

Ukraine imports disruptions

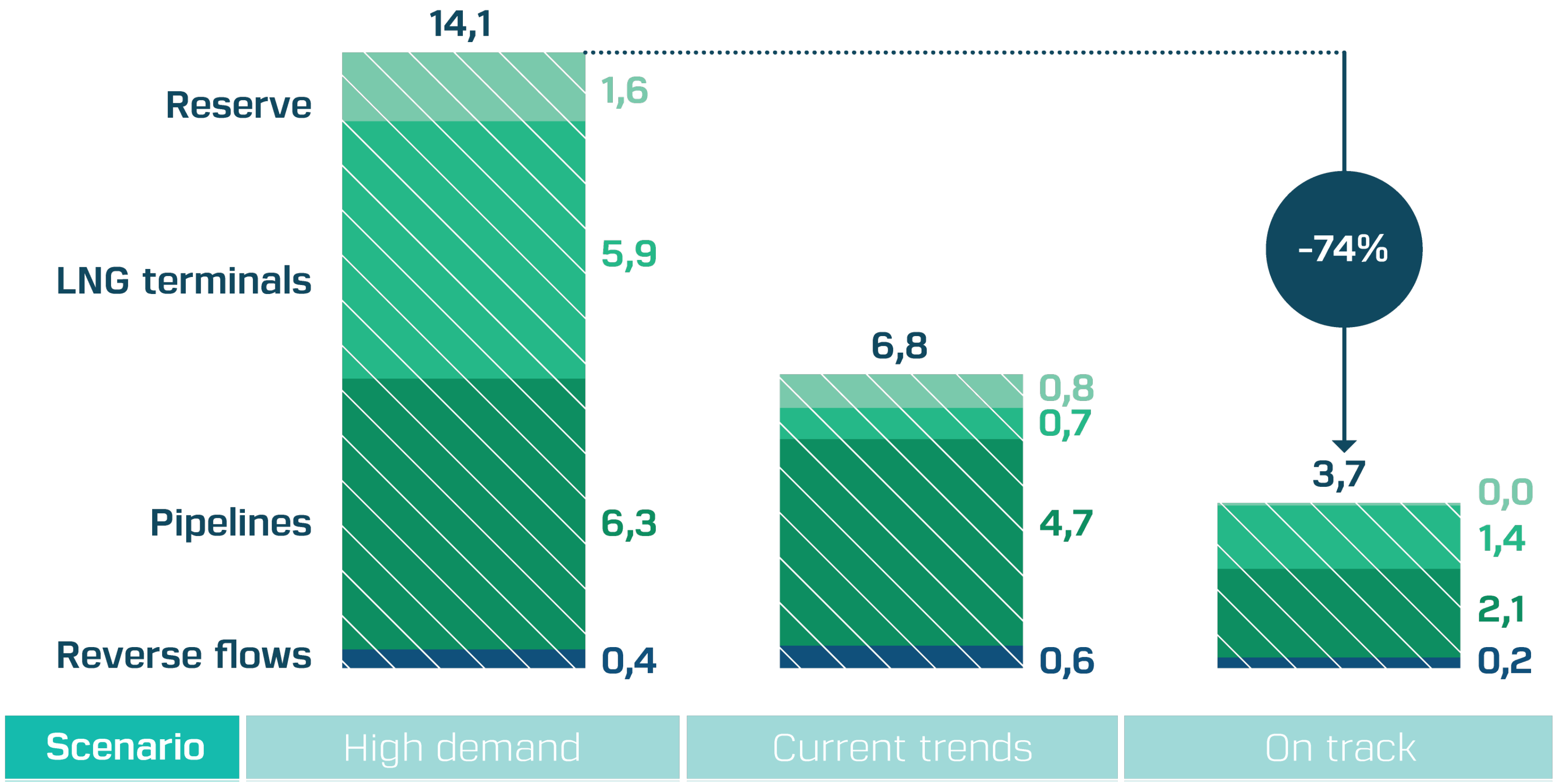


Scenario | On track

- 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

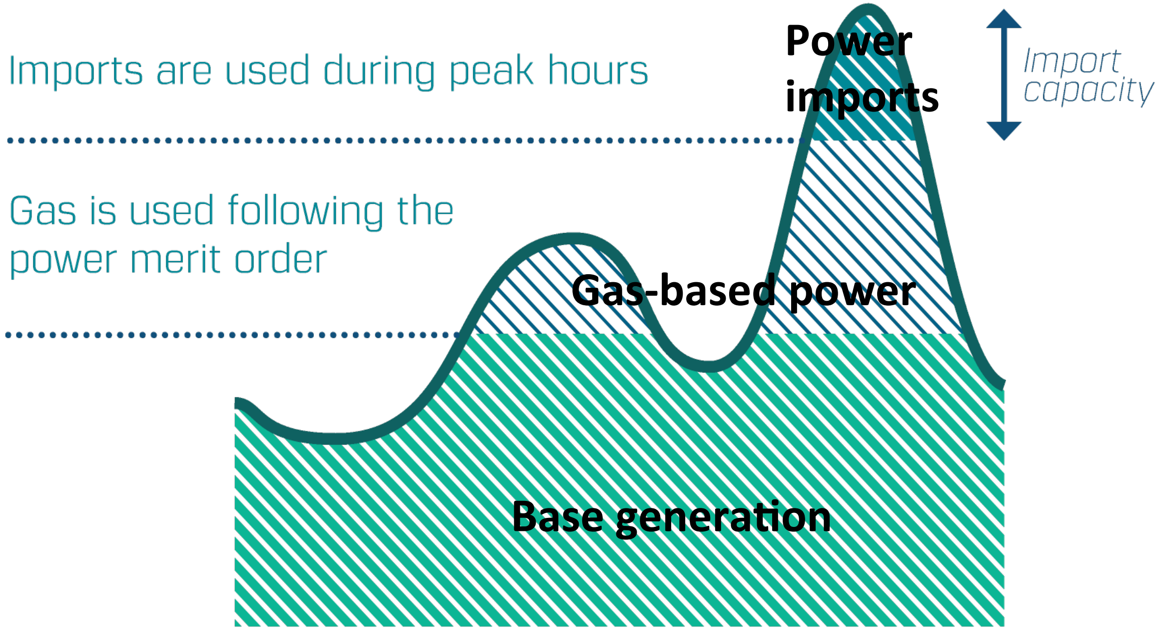
Finding 3: An integrated perspective on gas and electricity systems helps meet supply security at significantly lower costs

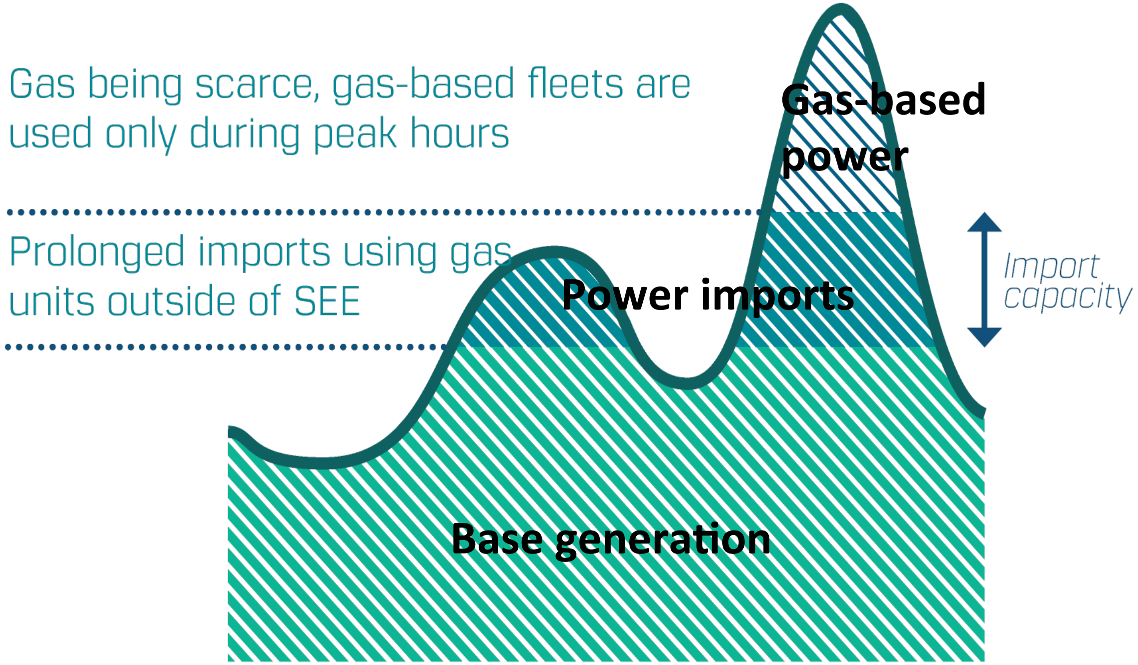
Standard Approach

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

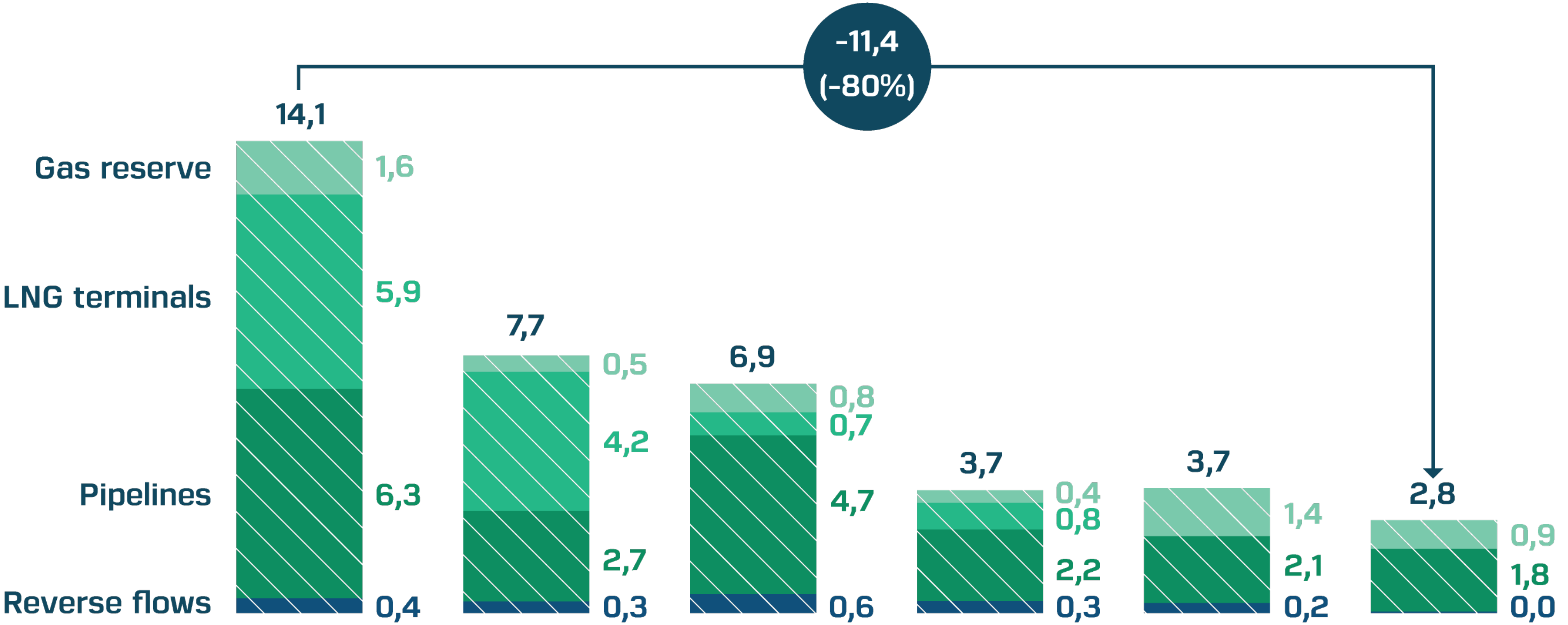
Integrated Approach

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



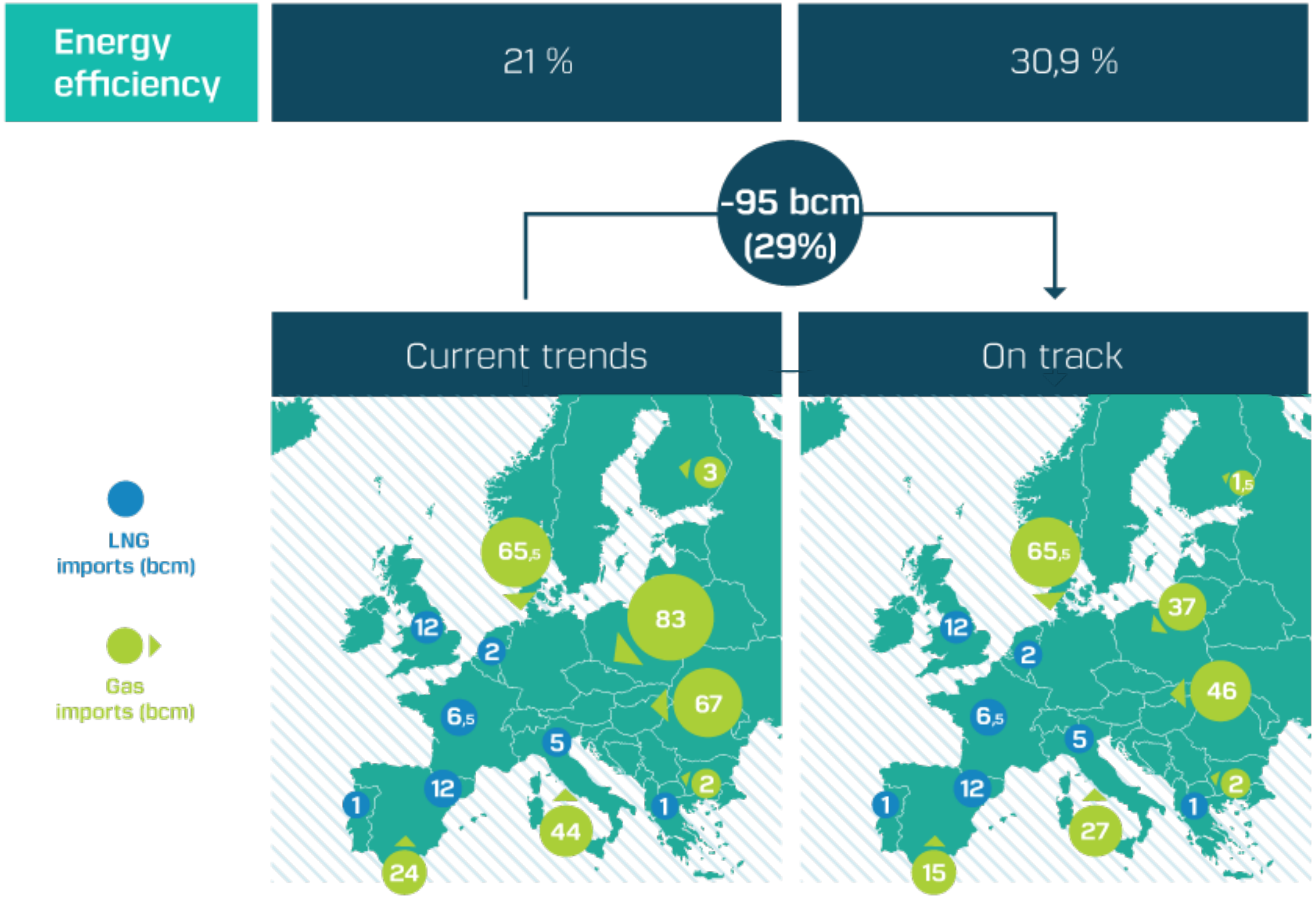


Finding 3: An integrated perspective on gas and electricity systems helps meet supply security at significantly lower costs



Scenario	High demand		Current trends		On track	
Strategy	Gas only	Integrated	Gas only	Integrated	Gas only	Integrated

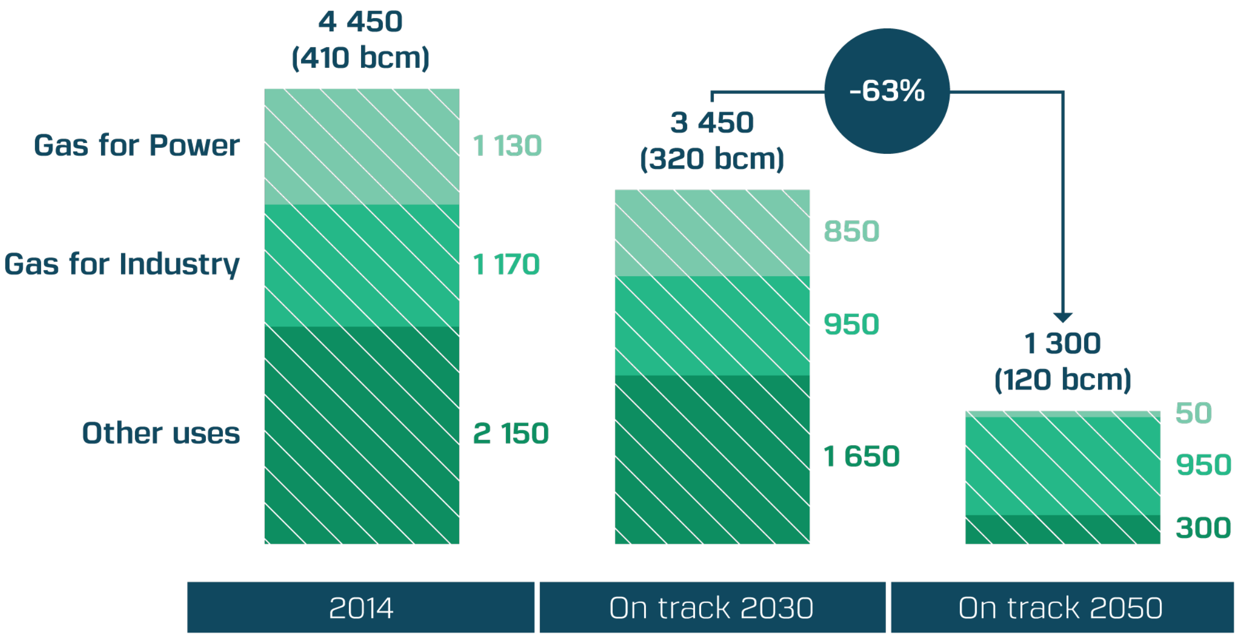
Finding 4: Delivering the EU's 2030 targets can significantly reduce gas imports into Europe



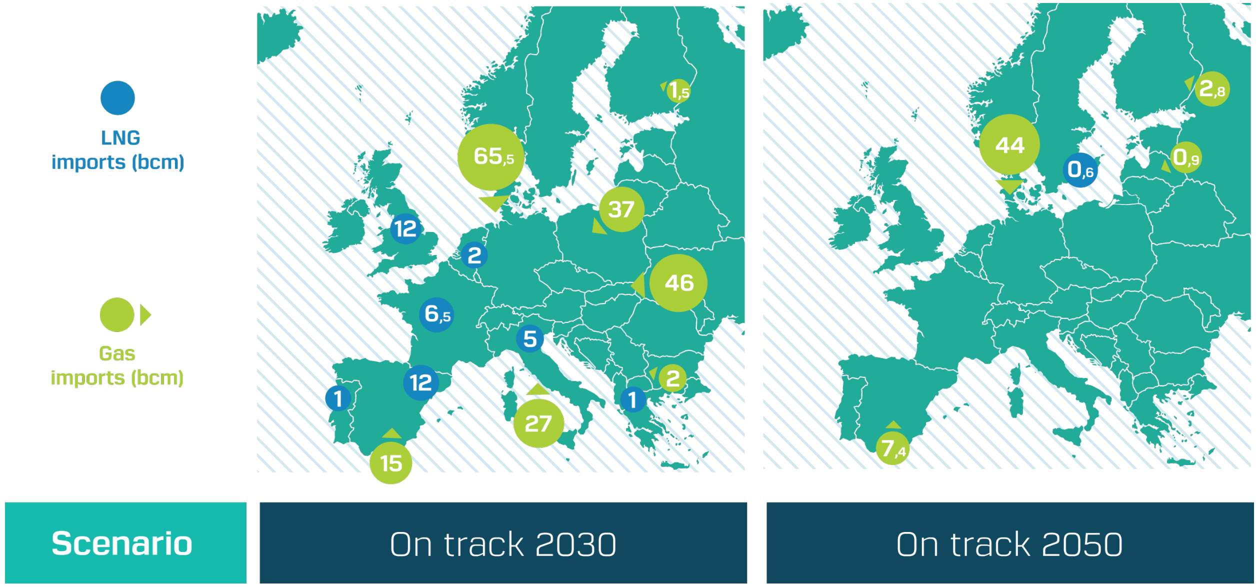
For every 1% of increase in energy efficiency…

… 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!