PARIS REINFORCE

Delivering on the Paris Agreement in a fragmenting world

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Energy transitions following the Ukraine invasion: insights from Italy and Greece

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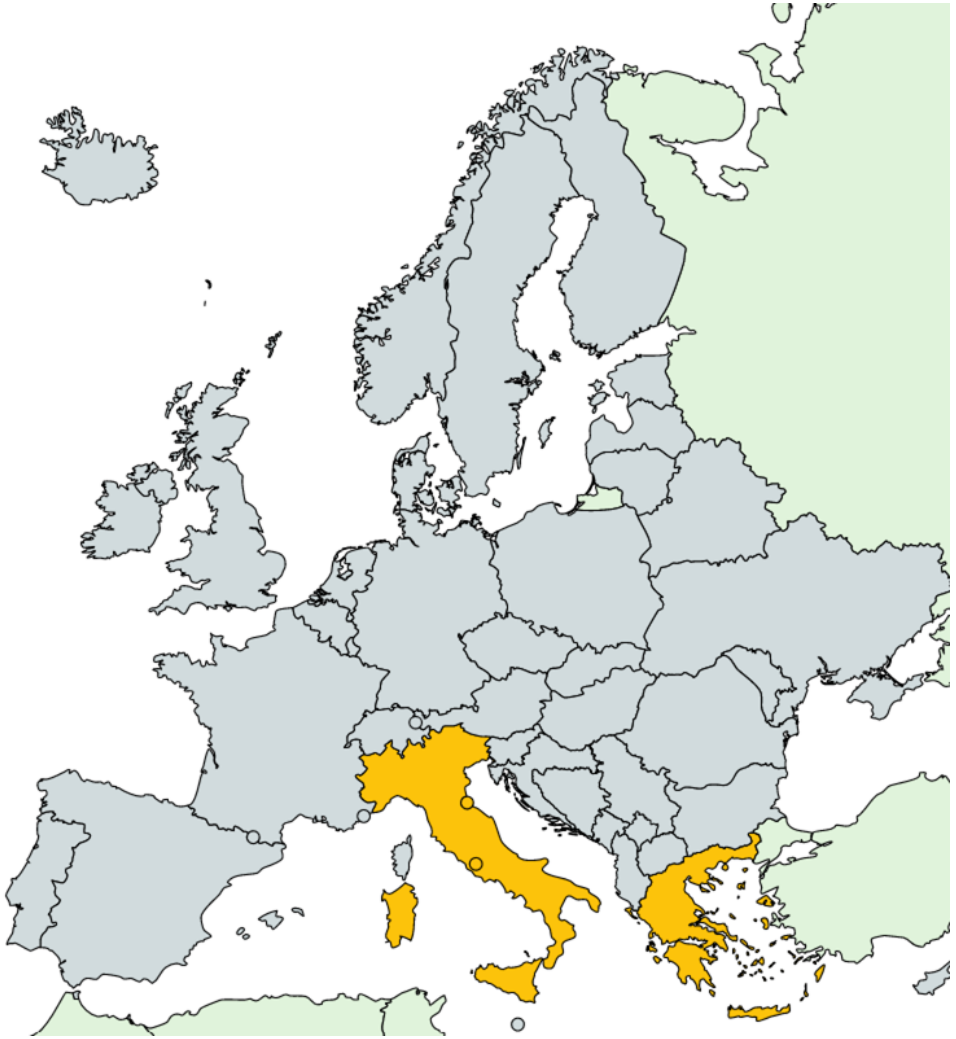
www.paris-reinforce.eu



REPowerEU strategy:

- urgently reduce dependency on Russian natural gas
- achieve affordable, reliable, and sustainable energy for Europe

Why Italy and Greece?

- natural gas dominates their electricity supply (~50% in Italy, ~40% in Greece)
- Both countries import more than 40% of their natural gas from Russia
- Energy affordability is a key concern in both countries

The PARIS REINFORCE project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 820846.

Navigating through an energy crisis

Challenges and progress towards electricity decarbonisation, reliability, and affordability in Italy

- We investigate **Italy's progress towards SDG7**, in light of the current energy crisis
- We asked **experts to evaluate** the impacts of key **policies and uncertainties** using fuzzy cognitive maps

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Italy: Methodology

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Step 1: FCM Design

Review of recent developments and INECP: **policies** and **uncertainties**

Review of recent literature: **causal links** and **system components**

Step 2: FCM Discussion & Weight Elicitation (Workshop)

Presentation of the constructed map
Introduction to the scope of FCMs

Discussion 1: Climate action & broader sustainability

Discussion 2: Key technologies for decarbonisation & security of supply

Discussion 3: Energy affordability – tackling energy poverty

Elicitation of **FCM weights** from the experts

Step 3: FCM Simulation

Definition of **policy strategies**

FCM simulations for each strategy and uncertainty

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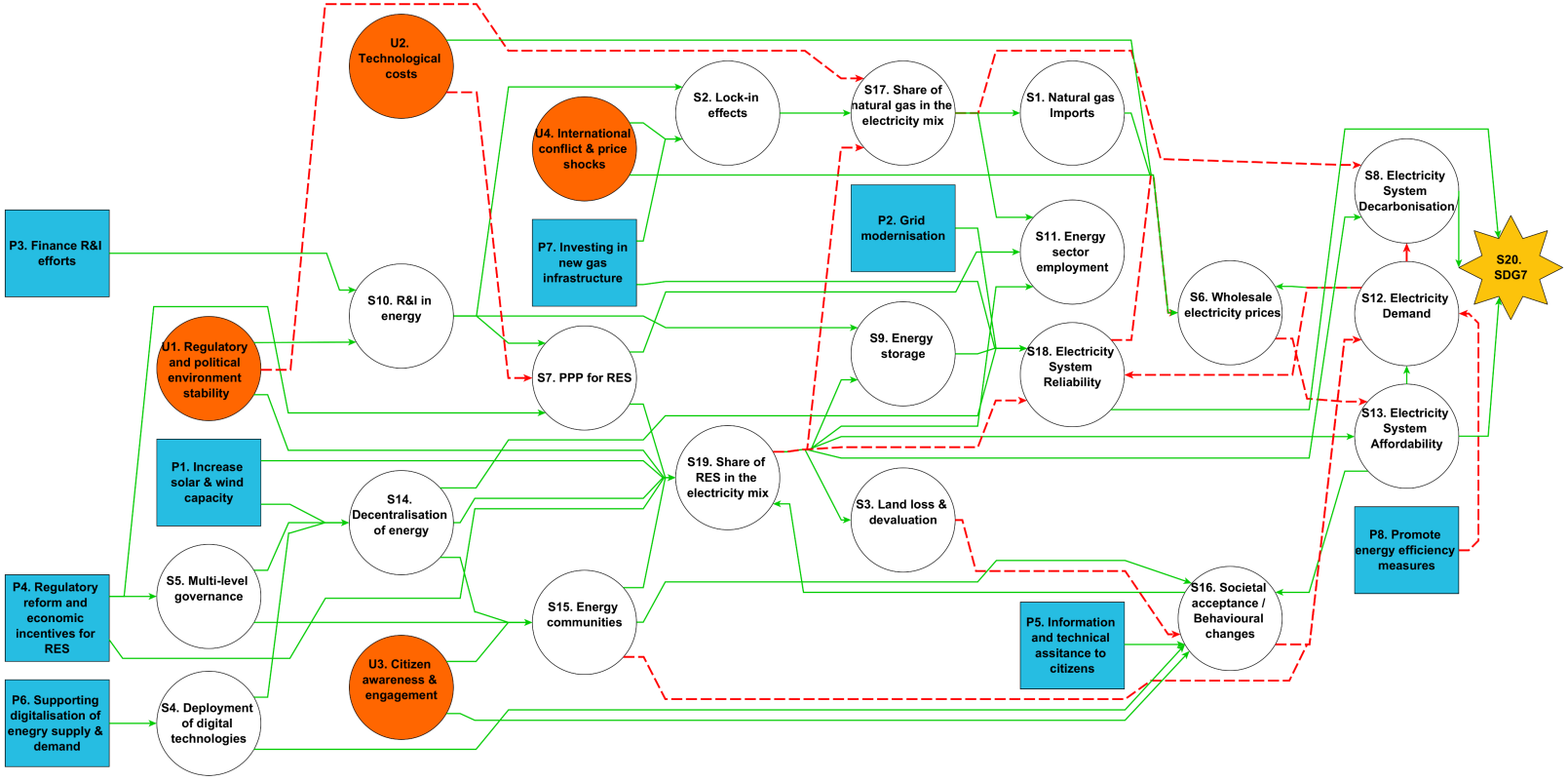
Italy: Design



- **Eight policies** (Italy's climate strategy and energy response to Ukraine)
- Objective: **progress to SDG7**
- From policies to objective: **19 system components**
- Shocks: **4 uncertainties**.

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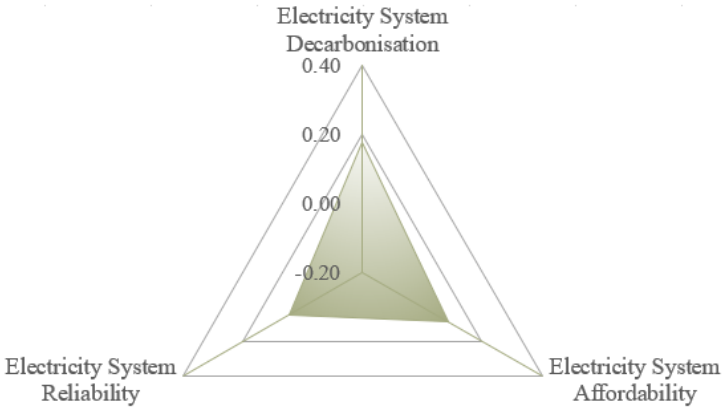
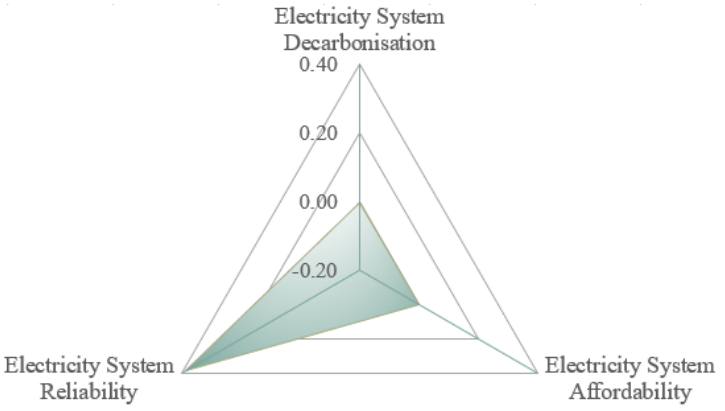
Italy: Simulation & Results (strategies)

- All strategies found to contribute to SDG7 progress (in absence of uncertainties)
- "*Large-scale RES diffusion*" & "*Grid enhancement*" perceived as the most effective

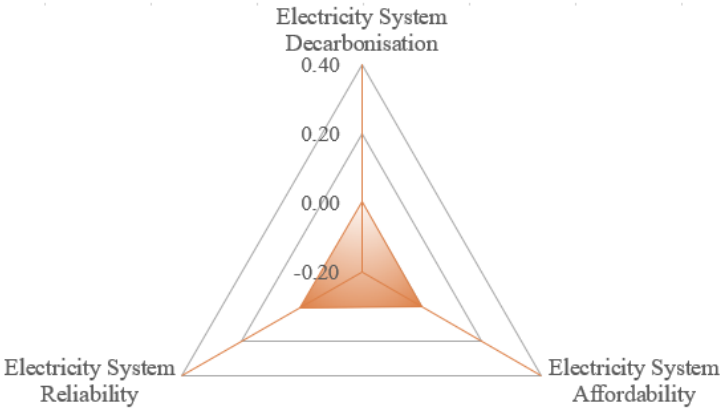
Strategy 1 – Large-scale RES diffusion



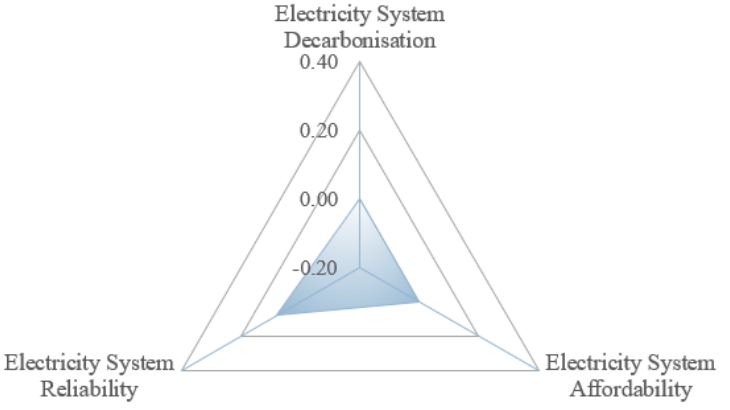
Strategy 2 – Grid enhancement



Strategy 3 – Demand-side transformation



Strategy 4 – Grey investments & innovation



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Italy: Simulation & Results (uncertainties)

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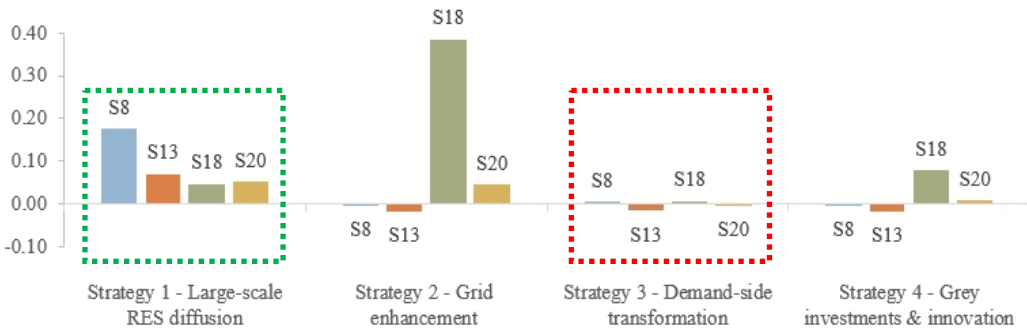
Regulatory & political environment stability

Citizen awareness & engagement

Technological costs

International conflict & price shocks



FCM results for the implementation of each policy strategy under uncertainty relative to a no policy – no uncertainty scenario

Electricity System Decarbonisation
Electricity System Affordability
Electricity System Reliability
Progress on SDG 7

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Transitioning amidst an energy crisis

A stakeholder-informed modelling study for Greece: the role of natural gas and climate ambition

- Soaring fossil-fuel prices throughout 2022
- Greece still plans to use gas as transition fuel
- Heavy investments on LNG

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Greece: Methodology

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Step 1: Modelling

LEAP

energy demand: transport, households tertiary, industry, and agriculture

OSeMOSYS
Open Source Energy Modelling System

electricity generation trajectories, investment requirements by source, and CO_2 emissions

Step 2: Evaluation of model results (Workshop)

Presentation of the model results to diverse stakeholder group (workshop)

INCOGNITIVE

Concern 1: Persisting fossil-fuel price shocks

(Set of) concerns 2: Technical constraints (unavailability)

Uncertainty 3: All goes sideways

Step 3: Model iterations

Definition of new model scenarios

Uncertainty analysis

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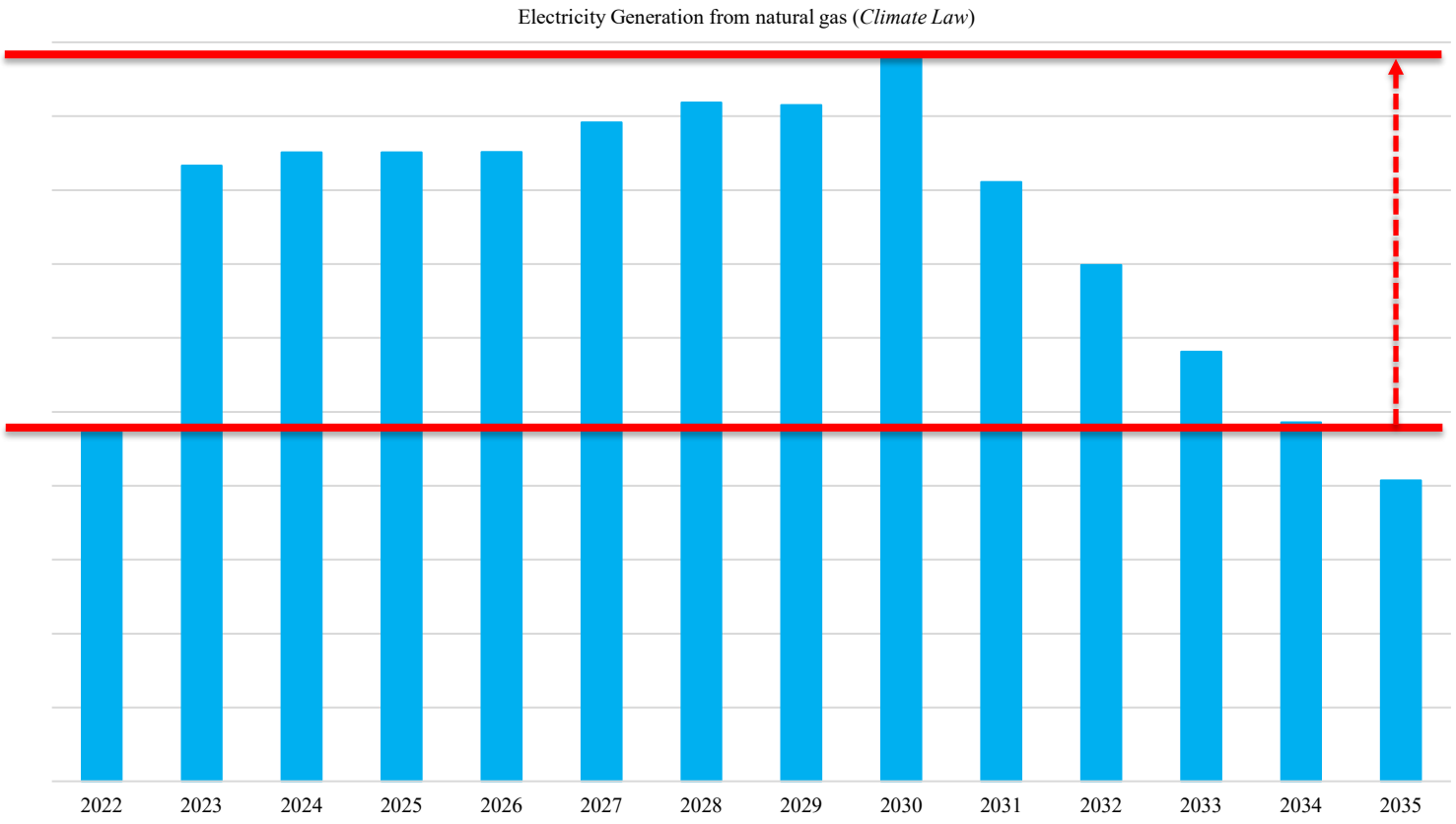
Greece: Role of gas in Climate Law



Increase of gas-powered electricity generation by 50% by 2030

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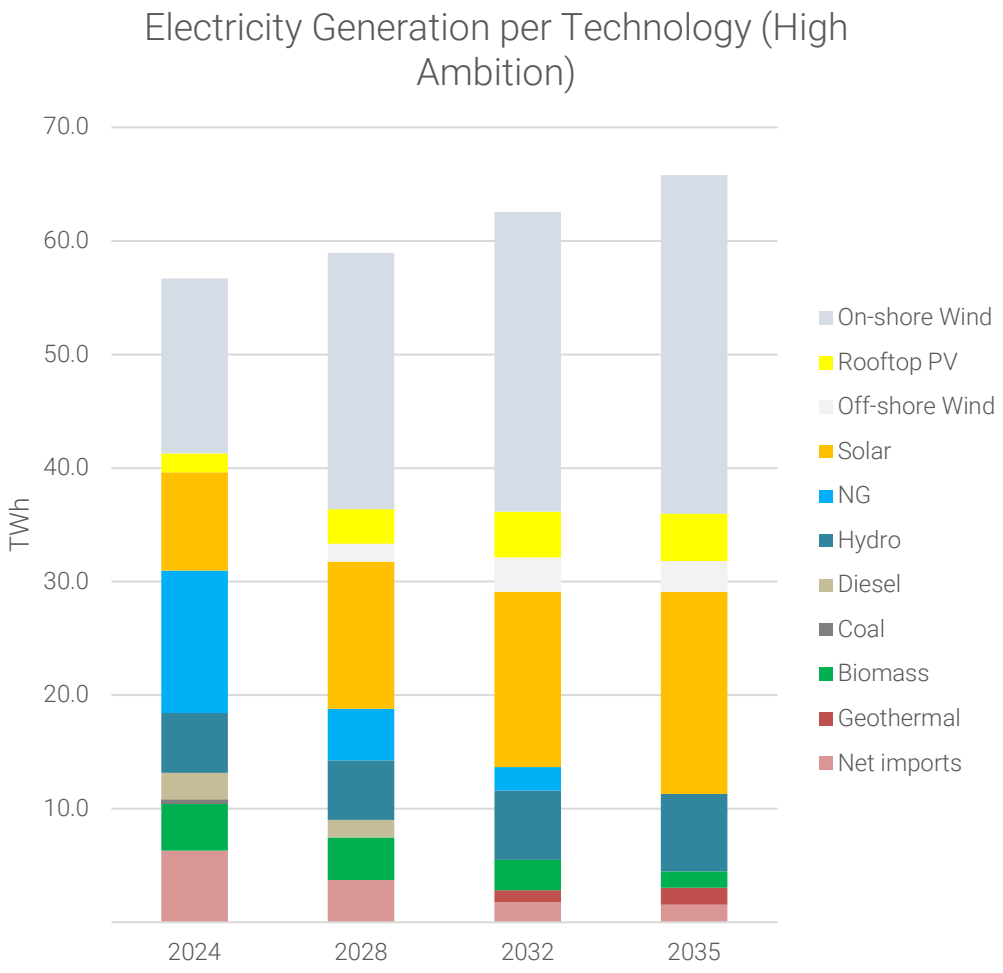
Greece: High ambition scenario



- Delignitisation by 2030
- Degasification by 2035
- RES: 80% (2030), 100% (2035)
- Independence from RU gas by 2026

Feasible, but:

- Considerable increase of solar, wind
- Requirements for technologies with limited so far role

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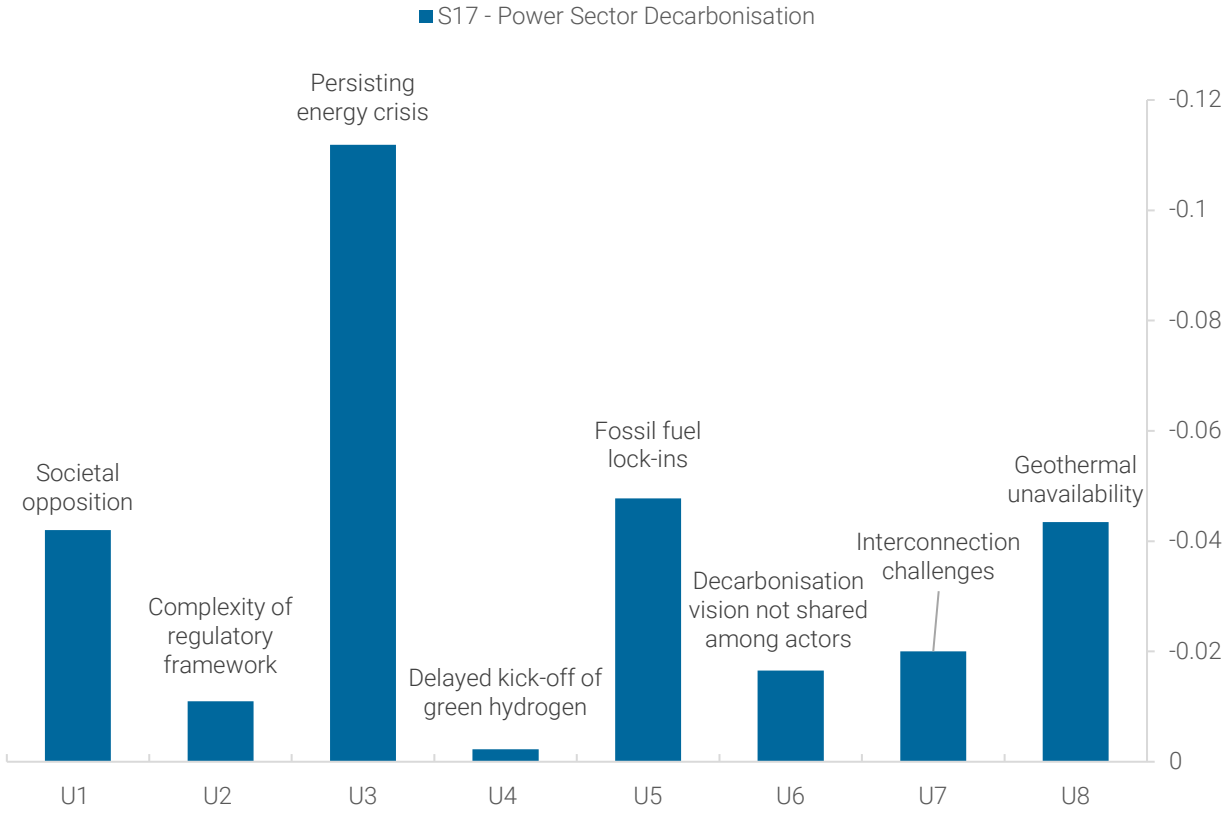
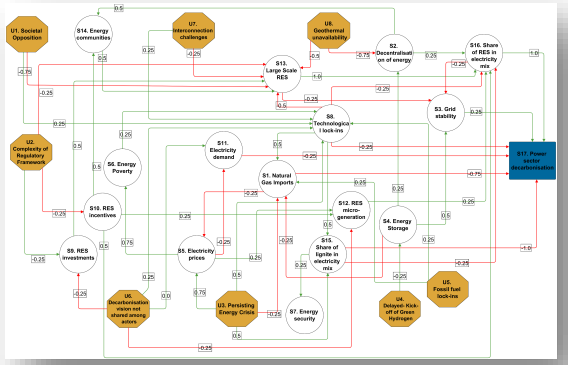
Greece: Stakeholder top concerns



- Most pressing concern: energy crisis persisting
- Fossil fuel lock-ins, lack of geothermal energy, social opposition to new RES important bottlenecks



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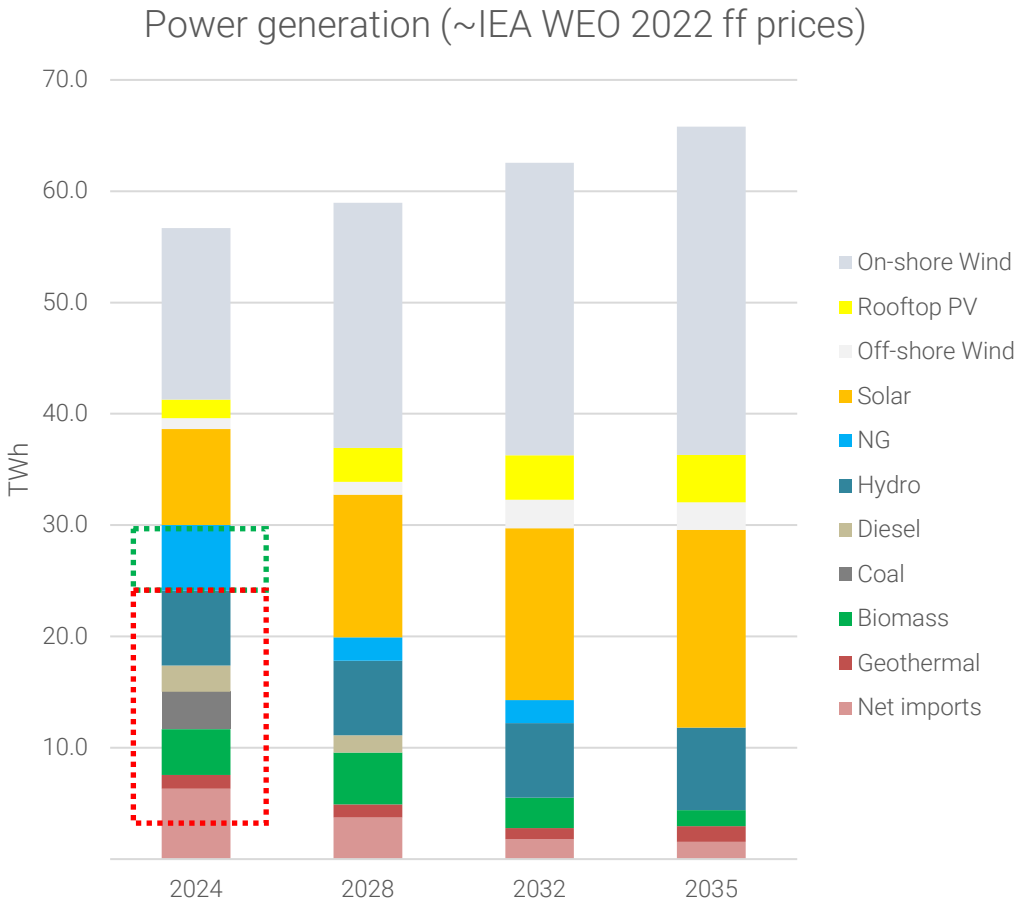

- High ambition scenario: still feasible against uncertainties
- Also: much better response to price shocks compared to Climate Law
- However: higher shares of expensive technologies as well as lignite

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Greece

- Current policies increase gas use by 50% in 2030 (relative to 2022)
- Ambitious RES strategy:
  - reaches complete independence from Russian gas by 2026
  - penetration of new and expensive technologies (but cost for citizens much lower in the longer run)
- Diversified renewable mix robust to technical constraints

Italy

- RES diffusion preferred over new gas infrastructure
- Policies promoting renewables:
  - more robust against uncertainties
  - could tackle affordability challenges
- Solely urging citizens to reduce demand may not drive SDG7 progress in the longer run

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Thank you!

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