GE VERNOVA

PATHWAYS TO NET ZERO IN ITALY

A STUDY BY GE VERNOVA CONSULTING SERVICES

ROBERTA GALLI – HYDRO POWER SERVICES GENERAL MANAGER, GE VERNOVA

MARCH 13TH 2025

Italy's Decarbonization Goals

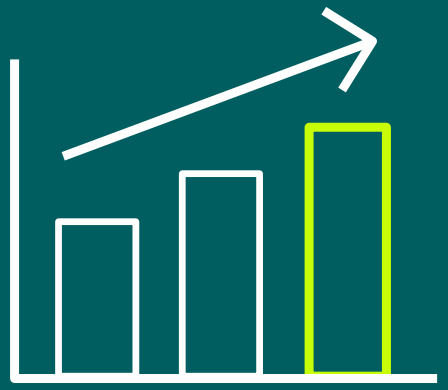
58%-66%
REDUCTION
in CO_2 emissions in power sector by 2030

53%
REDUCTION
Target renewable electricity consumption by 2030

90%
REDUCTION
in CO_2 emissions by 2040

NET ZERO
By 2050

Challenges



AN INCREASE OF
70%
Demand growth by 2050

MORE THAN
200 GW
Of new capacity will be required by 2050

~5X
The currently installed wind and solar in Italy

Investigating the role of various no or low carbon electricity generation technologies as well as the role of the electricity grid to efficiently enable this complex transition of the Italian power sector

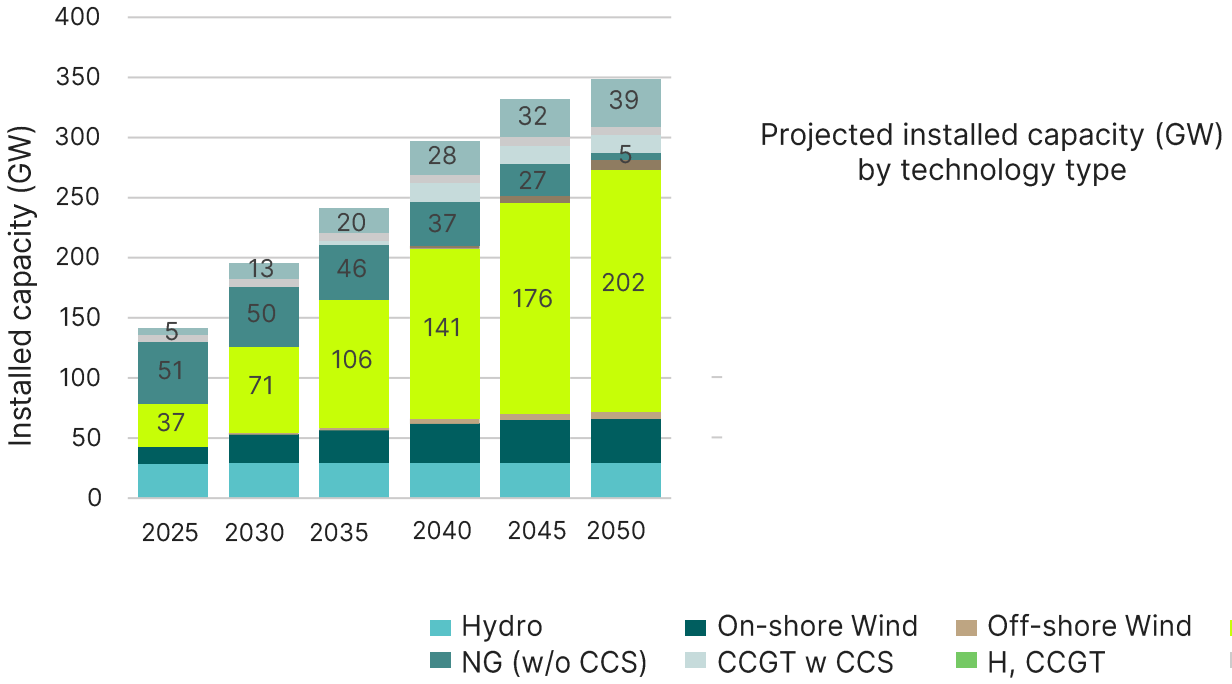
Pathway to Net Zero: scenario overview

RENEWABLE AMBITION

Assuming renewable additions can proceed at the pace required to achieve 2030 targets for renewable capacity as outlined in the PNIEC

BUSINESS AS USUAL

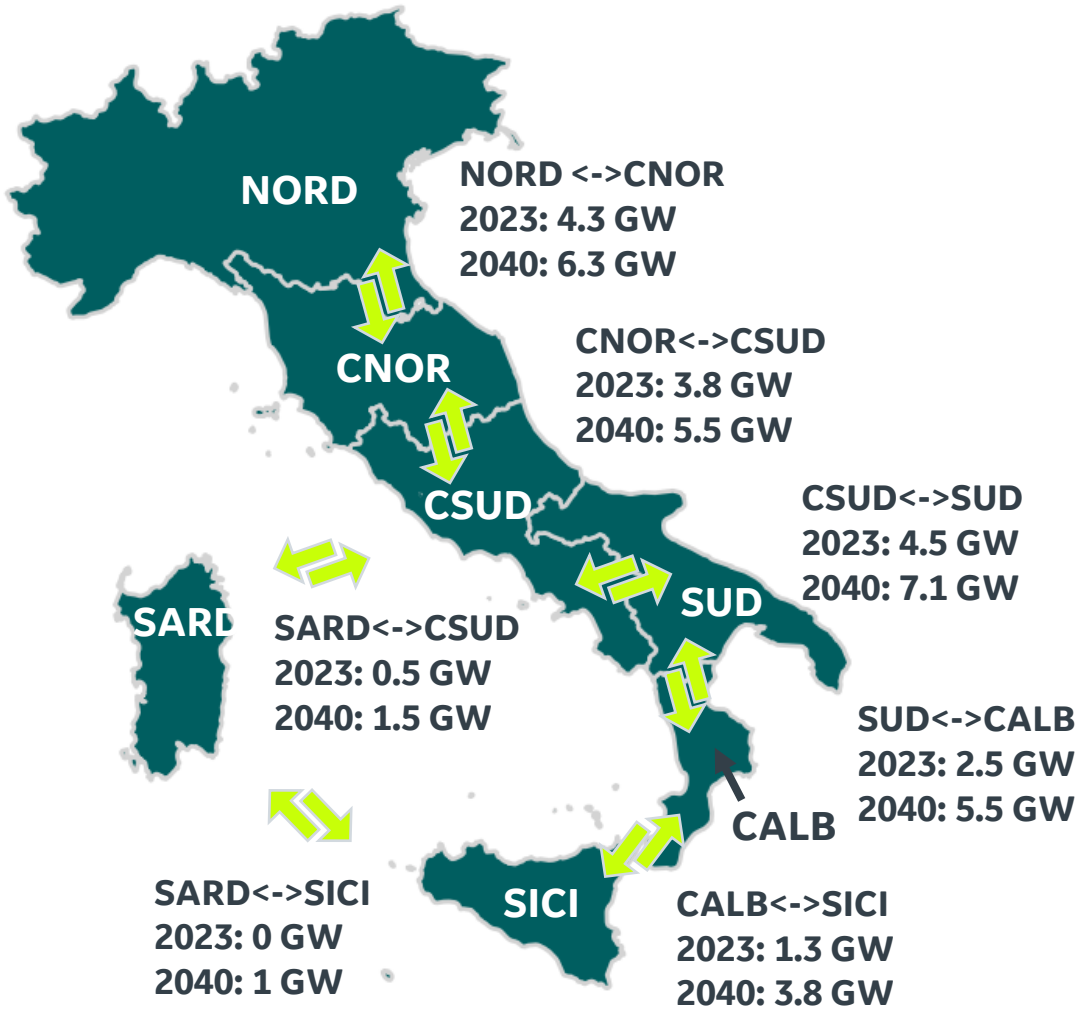
Assuming renewable additions proceed at the same pace of 2023; PNIEC targets are assumed to be missed, while an earlier introduction of CCS technology combined with additional Hydrogen-capable gas plants keep Italy on the 2050 net zero trajectory



Identical electricity demand growth … over 200 GW of new capacity and an overall electricity consumption of 510 TWh by 2050 … The key difference between the scenarios is the rate at which wind and solar additions can proceed in Italy

Role of electricity network in decarbonization

Transmission limits across electricity transmission zones in Italy



- Adequacy of electricity network infrastructure is key for integrating new renewable capacity while minimizing curtailment
- The total energy curtailment, in the Renewable Ambition scenario, is quantified to be:
  - ~19 TWh (circ. 5% of annual demand) in 2030
  - ~45 TWh (9% of demand) by 2040
  - ~82 TWh (16% of demand) by 2050 taking into account Hypergrid upgrades
- A significant part of the curtailment can be avoided if further transmission upgrades happen to alleviate congestion on the SUD to NORD and SARD to CNOR transmission corridors (undersea HVDC connections)
- Terna's Hypergrid projects will be realized between the 2035-2040 period, not addressing energy curtailment in earlier years

Accelerating transmission upgrades and further reinforcements in the south of Italy

Conclusions & Recommendations

GE VERNOVA

Ensuring required deployment of renewable energy

- Accelerate the deployment of **solar PV and wind power** to achieve around 100 GW of total by 2030, over 2X the 2024 wind and solar capacity
- Keep existing 29 GW **hydropower** capacity
- An accelerated growth in onshore wind and solar PV will require **streamlining administrative processes** and incentivizing investment

Flexible technologies as key enabler for Net Zero

- Approx 10% of installed capacity base will be **thermal generation** by 2050, meeting 30-35% of demand
- Mix of CCGTs with **carbon capture and sequestration** CCS (16-18 GW) and **nuclear SMR** (8 GW) are key for providing system flexibility and part of the increased electricity demand
- **40 GW of battery energy storage** (BESS) capacity needed for daily peak shaving and reduction of energy curtailment

Electrification transmission upgrades

- Accelerating **transmission infrastructure upgrades** and further reinforcements in the south of Italy to avoid curtailment of 82 TWh, approximately 16% of electricity demand by 2050
- **Terna's Hypergrid projects** are a vital investment, however most of them will be realized post 2035, not addressing the energy curtailment issues in earlier years

Decarbonization goals across the electricity, transport and heating sectors can be achieved in Italy through an efficient transformation of the power sector