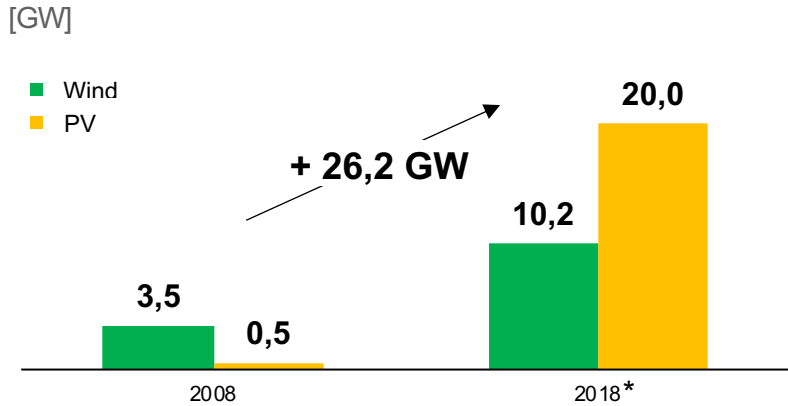


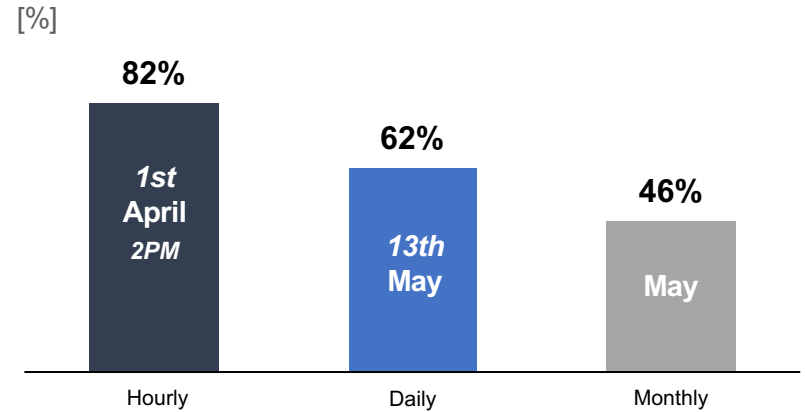
The context of the Italian Electricity System

Installed Capacity: Wind and Photovoltaic



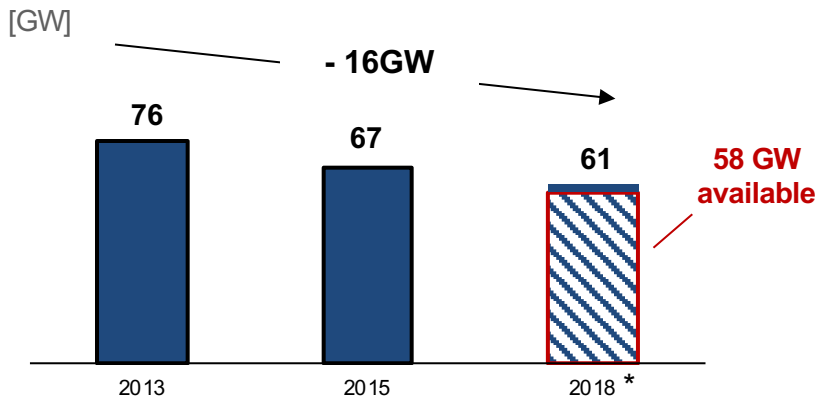
Significant increase of RES portfolio

Peaks of demand covered by RES (2018*)



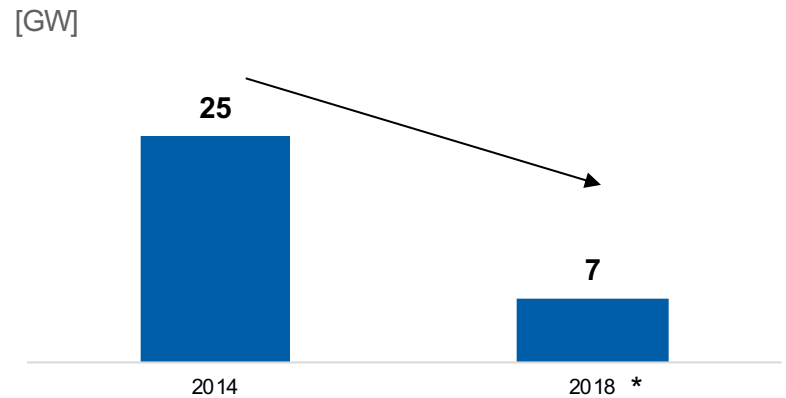
Significant share of demand covered by RES

Installed Capacity: Thermolectric



Progressive reduction of non-RES installed capacity

Minimum yearly Reserve margin

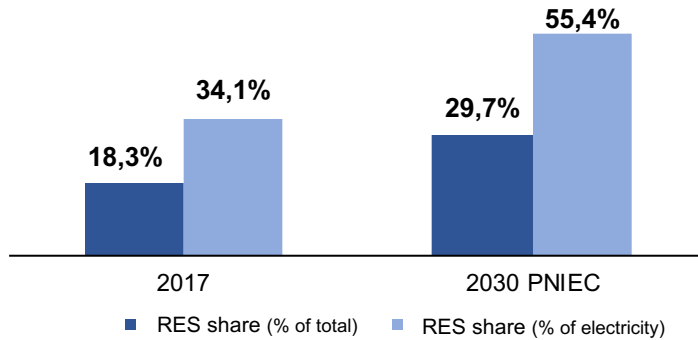


Reduction of Reserve margin

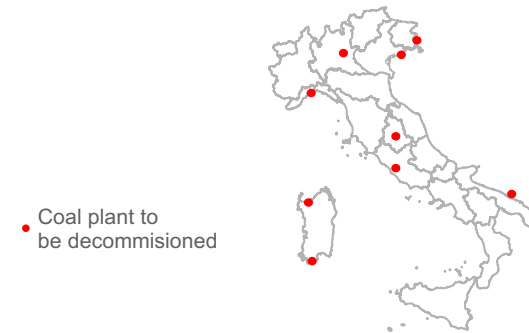
Main targets PNIEC



RES coverage

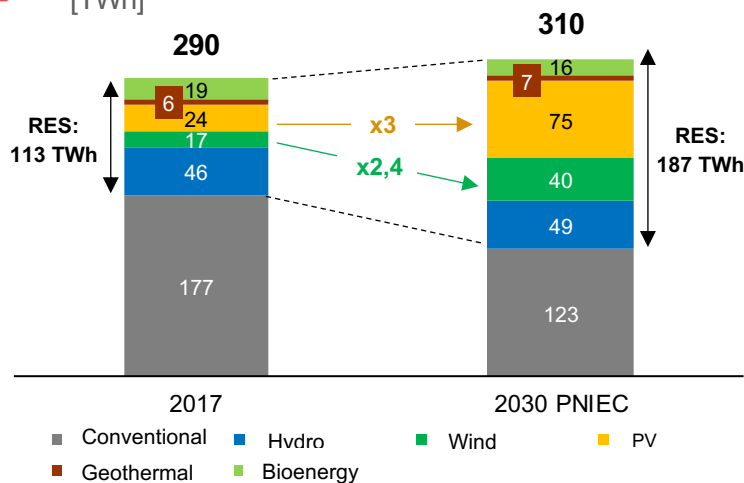


Coal Phase-Out (2025)

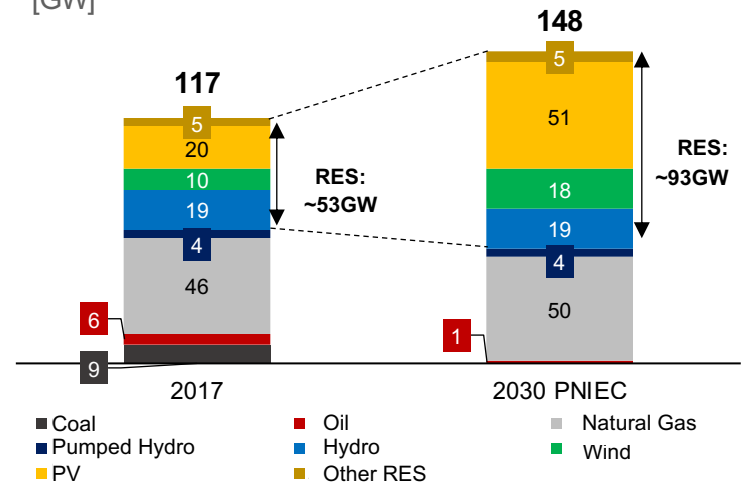


2030 scenarios

National electricity production [TWh]



Installed Capacity [GW]



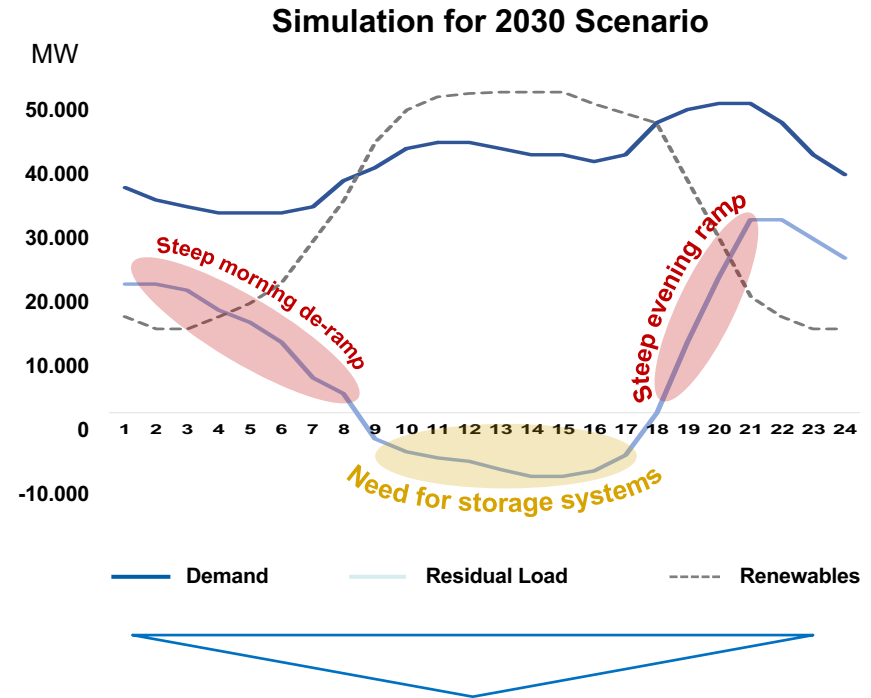
The PNIEC targets the phase-out of the coal portfolio by 2025 and a push towards the increase of demand covered by RES

Impacts and implications for the Electricity System

Main impacts on the Electricity System

- Increasing **steepness of the load ramp** to be covered during night time due to the significant reduction of PV production in the same hours
- Increasing times of non programmable RES **over-generation**
- Low **regulating capacity** due to the growing share of RES in the national energy generation mix
- Limited up-ward **reserve margins** to cover the peak load following the decommissioning of a significant amount of installed thermal capacity
- Non homogeneous distribution of RES across the Country (higher concentration in the South) causes **grid congestions**
- Limited availability of resources which are able to provide **voltage regulation** (reactive power) and frequency regulation (rotational **inertia**)

Demand and residual load curves



NEW NEEDS!

The increasing penetration of RES and the continuous decommissioning of the conventional thermoelectric portfolio pose new challenges for the TSO

Key enablers of the energy transition

1

Transmission grid development

- **Strengthening** of North-South **backbone** and **grid reinforcement** in the South of Italy and the Islands
- **Foreign interconnections - Reinforcement** and **meshing of nation transmission grid**
- **Investments** in **voltage regulation and inertia** of the electricity system

Focus

2

Long-term price signals

- **Capacity Market** to deliver long-term price signal to encourage investments in new efficient and flexible generation
- **Power Purchase Agreements (PPAs)** long-term power purchase contract for RES

3

Storage system

- **Pumped hydroelectric storage** to contribute to adequacy and security of supply (frequency/voltage regulation), they allow to increase RES integration, decreasing overgeneration and ensuring stability of the grid
- **Electrochemical storage** both utility scale and distributed, as an alternative to and along with pumped hydro storage

4

Market evolution

- **Participation of new flexible resources in ancillary services market**, i.e. demand, distributed generation, non-programmable renewable energy sources and storage, including electric vehicle-to grid
- **Evolution of the structure of the ancillary services market** to cope with new needs (voltage regulation, inertia,...)

Focus

5

Innovation and digitalisation

- **Digitalisation of the Transmission Grid** (Assets and processes)
- **Digitalisation of the System Operator** (Data management)

Focus