Portuguese grid expansion and adequacy
a crucial aspect of the development of Renewable Energy

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RES strong increase in 2030 electricity generation capacity mix
Variable RES growth challenges network and system management

Portugal RES-E

NECP 2030 Portugal

Capacity from 20 to 30 MW in 2030

RES share evolves from 56% to 80%

Generation dispatch availability\(^1\) is reduced while wind and solar must grow strongly

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\(^1\) Available in the meaning of dispatchable generation to increase generation namely at night in a low precipitation year

Source: RNC - 2050; PNEC 2030
Network reinforcements under national development plan
Example of projects required for 2019 & 2020 Solar PV auctions capacity

Solar PV auctions
• 2GW awarded (TSO+DSO)
• 1.6GW for TSO connection

• Updated technical conditions to connect to the system
• New producers are “exposed” to the wholesale Markets
• New producers will be Balancing Responsibility Parties (BRPs)

• ≈ 390 km new OHL
• ≈ 260 km OHL uprate
• 3 new substations (+ 1 upgrade)
• 1.6 GVA new network capacity
• ≈ 0.24 km OHL/MVA

Fanhões – Alcochete – Palmela – Sines axis
Refurbishment (2022/24)

Transformer replacement at F. Alentejo
150/60 kV transformer (2022)

Bays for transformer at Ourique
150 e 60 kV bays (2023)

Falagueira – Fundão axis
OHL & new Fundão substation (2021)

Falagueira – Estreemoz – Divor – Pegões 400 kV axis
OHL; new Divor & Pegões substations; Estreemoz substation upgrade (2021)

Alqueva – Divor
OHL (2023/24)

Ferreira do Alentejo – Ourique – Tavira axis
OHL & new Ourique B substation (2022/23)

Additional >20GW on Direct Agreements requests with the TSO

Transformer replacement at F. Alentejo
150/60 kV transformer (2022)

Bays for transformer at Ourique
150 e 60 kV bays (2023)
System Operation with high RES penetration
Flexibility is an essential requirement of the energy transition

- **New stakeholders** in the Balancing Markets:
  - Small generators connected to the distribution grids (via aggregators)
  - Consumers connected to the distribution grids

- **Balancing Market participation for the newcomers** or curtailment schemes

- **European Balancing Platforms will introduce cross border competition** (TERRE, IGCC, ...)

- **Mandatory Observability and Controllability** by the System Operator (SO)
  - SO must monitor real time operation (to be able to act pre-emptively)
  - SO must control the resources (to be able to activate system services)

![Graph showing increasing flows from Distribution to Transmission](image)
Energy transition is pressing the transmission grid assets to be exploited towards their technical limits, demanding new approaches for asset design, construction, maintenance and operations.
Final Remarks
New paradigm for network management and system operational flexibility

- Ambitious RES targets in the energy mix
- New challenges for network and system management
- New models for network planning and RES integration
- New balancing system platforms, approaches and stakeholders
- More flexibility, extended observability and control for System Operation
- Transmission grid reinforcements and interconnections mandatory
- Asset and risk management for acceptable resilience, availability and quality of service

Global risk management acceptance by all stakeholders