



Portuguese grid expansion and adequacy

a crucial aspect of the development of Renewable Energy

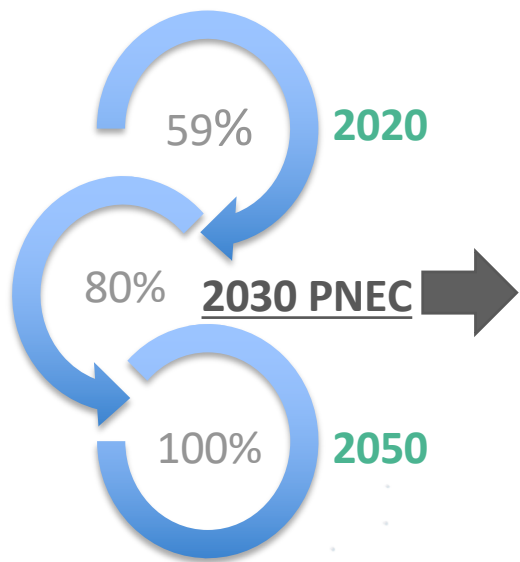
João Faria Conceição

15th December 2020

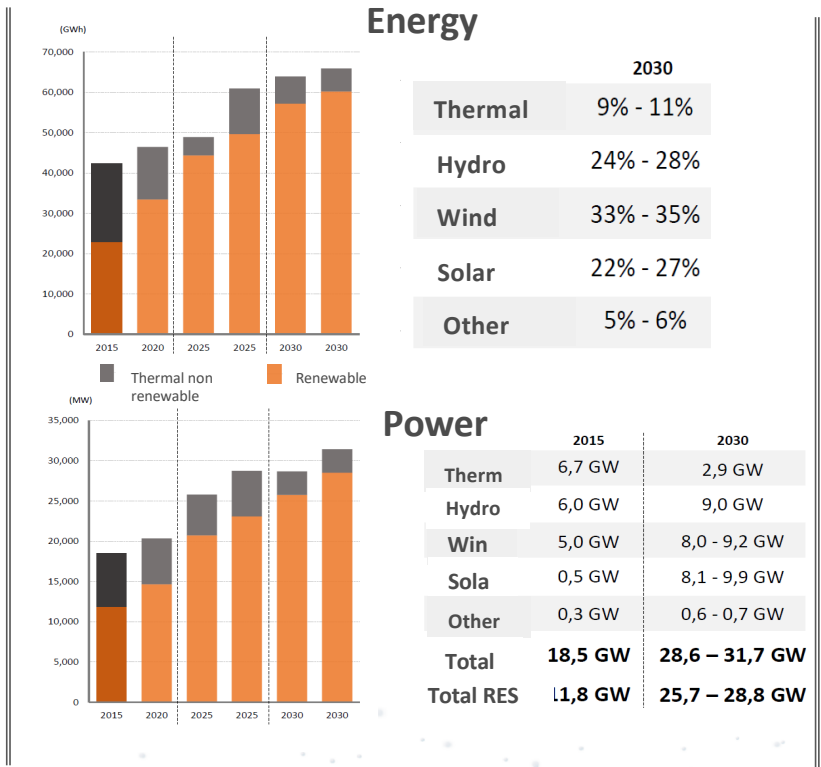
RES strong increase in 2030 electricity generation capacity mix

Variable RES growth challenges network and system management

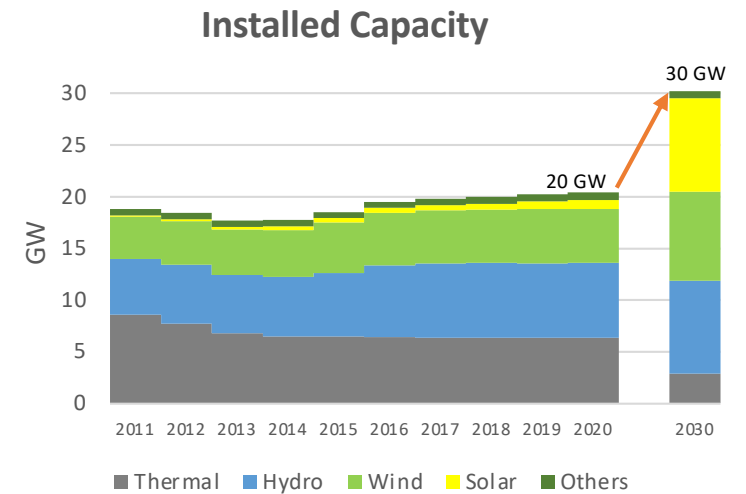
Portugal RES-E



NECP 2030 Portugal



Capacity from 20 to 30 MW in 2030



RES share evolves from 56% to 80%

Generation dispatch availability¹ is reduced while wind and solar must grow strongly

1. Available in the meaning of dispatchable generation to increase generation namely at night in a low precipitation year

Network reinforcements under national development plan

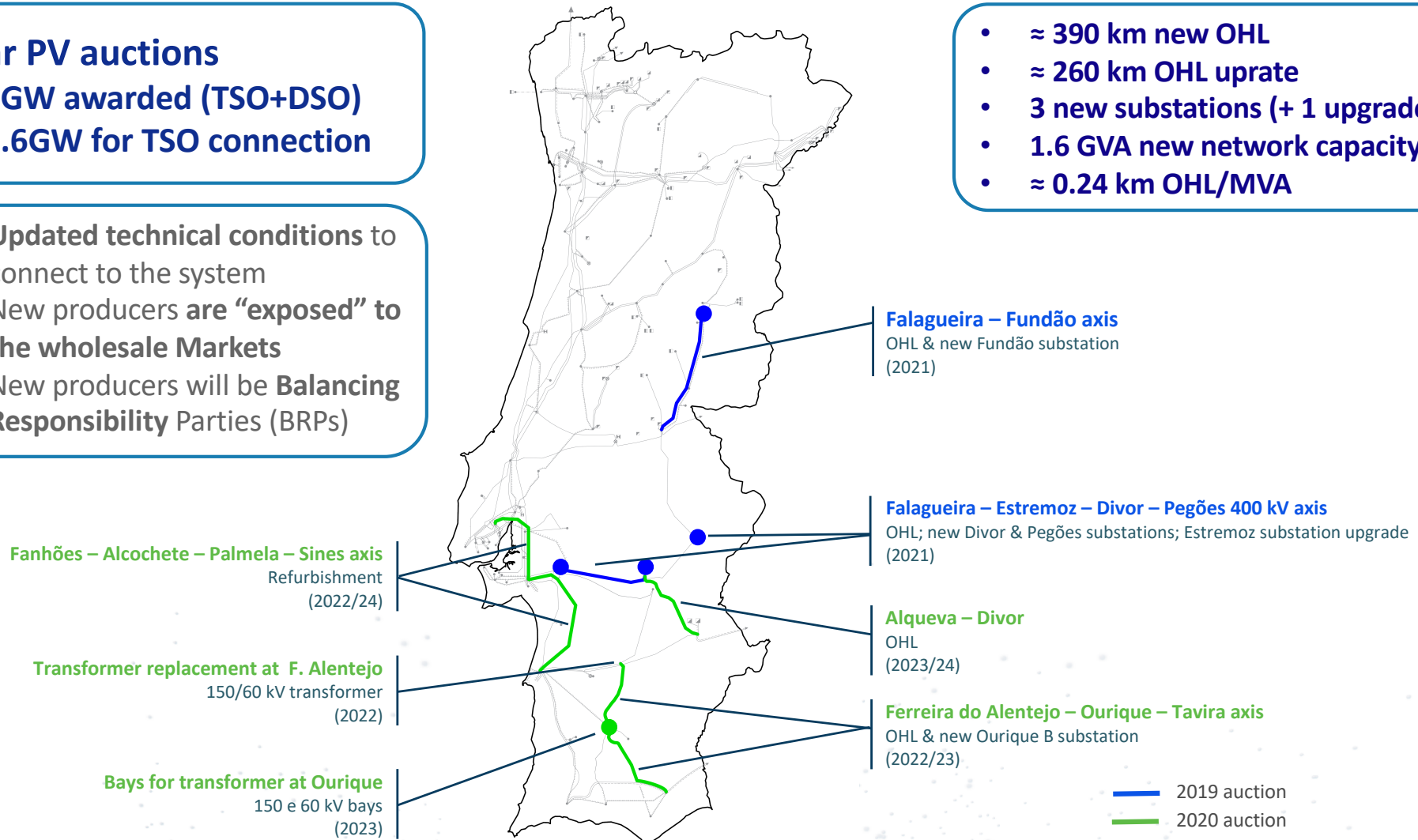
Example of projects required for 2019 & 2020 Solar PV auctions capacity

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



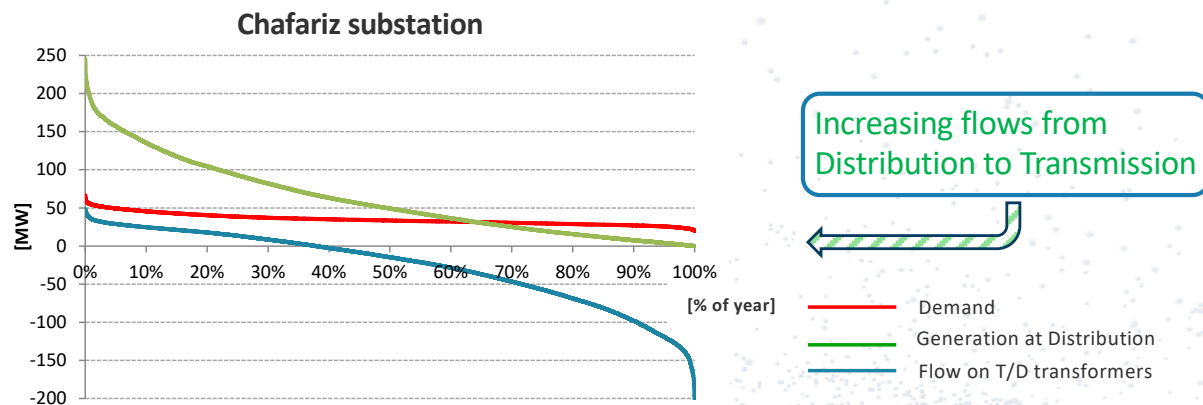
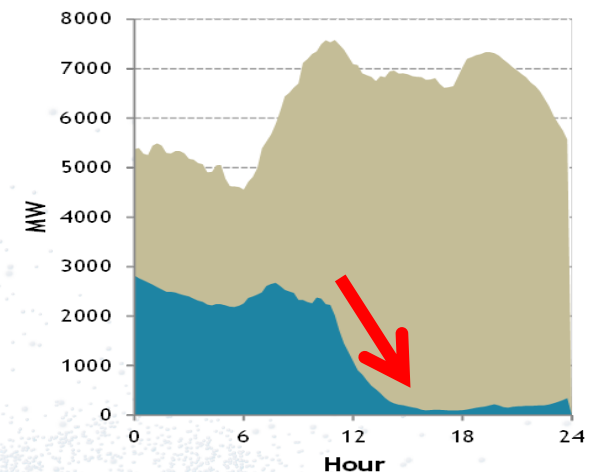
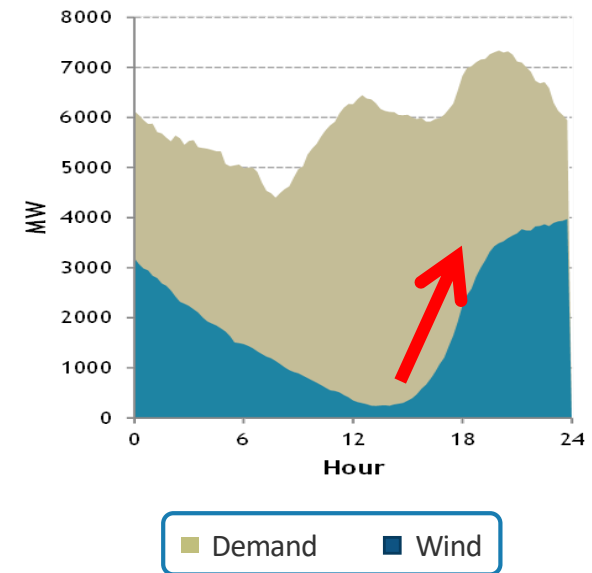
Additional >20GW on Direct Agreements requests with the TSO

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)

Fast and strong generation changes (1,000 MW/h)



Asset Management in a New Age

Adapting to new requirements and challenges driven by the energy transition



Innovation

New techniques (e.g. augmented reality)

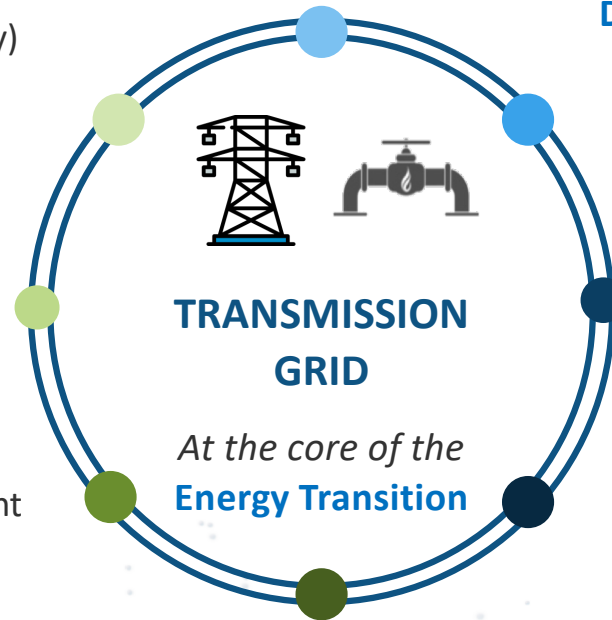
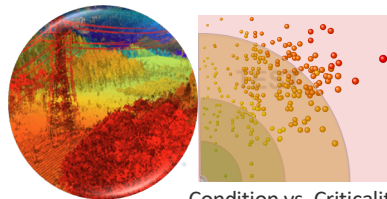


Design and construction optimization



O&M | Risk based

Extended monitoring for risk management



Climate change and environment adaptation

- RoW management
- Resilient design
- Environmental impact assessment



Digital transformation

Big data and analytics



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