

Blackout in the National Electricity System

Conclusions and strategic decisions

Paulo Carmona

Director-General for Energy and Geology

XXVII Simpósio Luso-Alemão de Energia

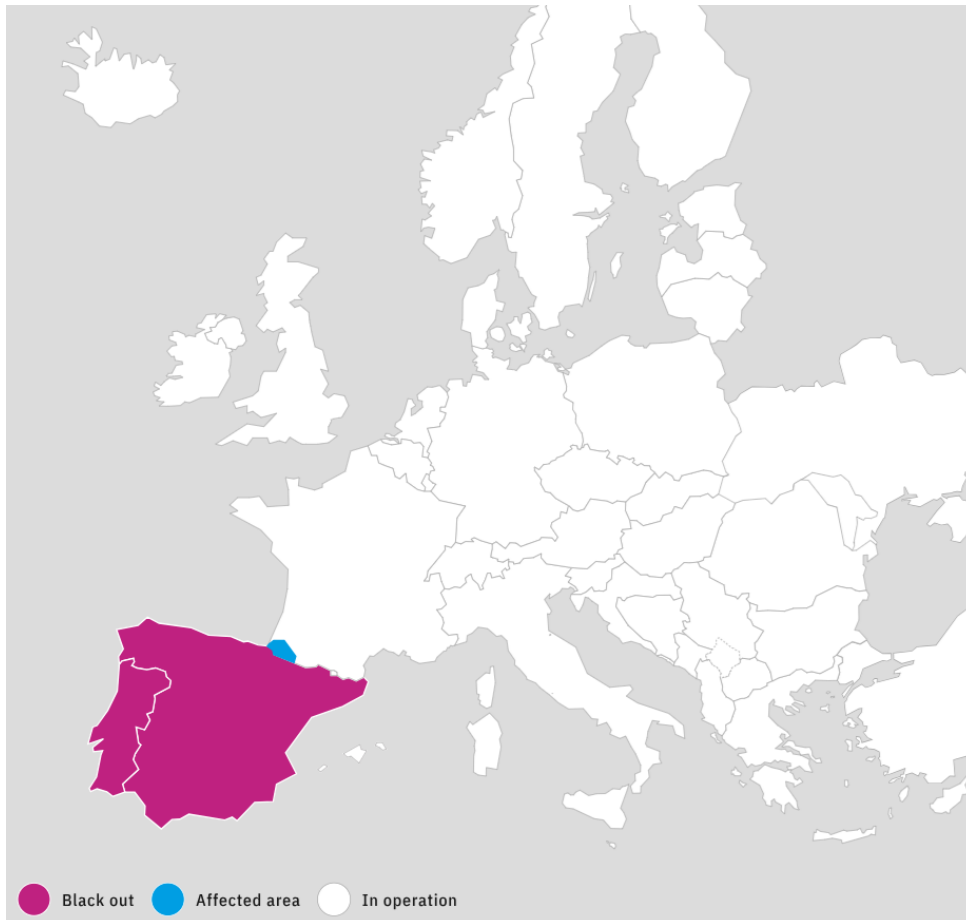
30 September 2025

Brief description of the event

Blackout in the National Electricity System

Conclusions and strategic decisions

Brief description of the event



Source: ENTSO-E

- Blackout in the Portuguese electricity system on April 28, 2025, beginning at 11:33h.
- Origin of event outside Portugal, beginning in Spain. Causes still under investigation (factual report by ENTSO-E on October 3 and final report after 3 to 4 months).
- A small area of the French electricity system, near the Spanish border, was also affected.
- Interruption of electricity supply to approx. 6,4 million customers in mainland Portugal.

Brief description of the event

- The National Electricity System was operating in Normal state, importing from Spain. At 11:30h renewables accounted for approx. 62% of total consumption (PV and wind approx. 46%).
- Between 11:00h and the time of the incident, two significant voltage and frequency oscillations in the Spanish grid spread to the Portuguese system.
- At 11:33h, a drop in frequency triggered load shedding, but the frequency did not recover, leading to the system collapse.

Main emergency measures

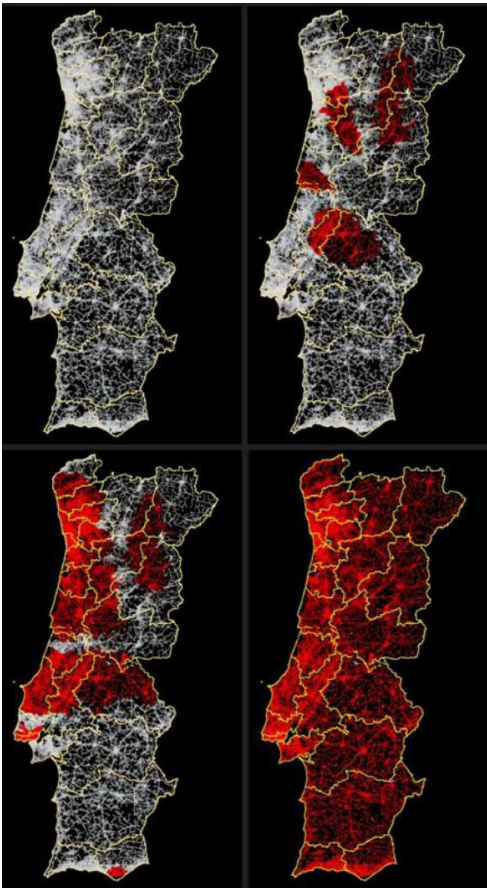
Blackout in the National Electricity System

Conclusions and strategic decisions

Main emergency measures

- Energy crisis declaration (Council of Ministers Resolution).
- The TSO immediately activated the National Restoration Plan, in close coordination with the power plants that participated in the process, with the DSO and with the Spanish TSO.
- The restoration process begun through the black start of the two national power plants with that capability (Castelo do Bode Hydroelectric and Tapada do Outeiro CCGT).
- For a safe restoration and prevention of repetitions or other negative effects in the system, electricity imports were fully suspended in a first stage. This restriction was gradually lifted until June 20.

Main emergency measures



Source: E-REDES (DSO)

- 11:35 Request of the black start of Castelo do Bode power plant
- 11:43 Request of the black start of Tapada do Outeiro power plant
- 15:11 1st restoration island, through Castelo do Bode power plant
- 16:26 2nd restoration island, through Tapada do Outeiro power plant
- 17:36 3rd restoration island, via synchronous connection to Continental Europe grid
- 19:01 Beginning of synchronization between previous restoration islands
- 20:35 4th restoration island, via synchronous connection to Continental Europe grid
- 23:22 Restoration completed in the Transmission Network
- 03:00 Restoration completed in the Distribution Network

Main successes in the restoration process

Blackout in the National Electricity System

Conclusions and strategic decisions

Main successes in the restoration process

- According to current information, the Portuguese electricity network and its components behaved appropriately, revealing no dimensioning problems that would have delayed the return to service or aggravated the consequences of the incident.
- The restoration process was efficient and well coordinated between the Portuguese TSO and DSO, the relevant producers and the Spanish TSO, mainly due to pre-existing and well-trained plans.
- The restoration process was geared towards the priority supply of electricity to all critical infrastructure and all major consumption centers.

Main difficulties in the restoration process

Blackout in the National Electricity System

Conclusions and strategic decisions

Main difficulties in the restoration process

- There was a delay in the start of the restoration process due to several problems with the internal systems of the two power plants with black start capability.
- Given the geographical scope of the blackout, for several hours it was impossible to use interconnections with Spain to help the restoration process. This difficulty should be duly taken into account when assessing and monitoring the National Electricity System's security of supply.

Main measures to strengthen the security of the National Electricity System

Blackout in the National Electricity System

Conclusions and strategic decisions

Main measures to strengthen the security of the National Electricity System

- The black start service by two additional power plants (Baixo Sabor and Alqueva) will be available on January 1, 2026.
- The operation of Tapada do Outeiro CCGT (black start capability) will be ensured until 2030.
- 137 M€ in investments for voltage control resources were approved, provided for in the proposal for the Development and Investment Plan of the National Electricity Transmission Network for the 2025-2034 period.
- Launch of an ancillary services market based on battery storage, including an auction for contracting at least 750 MVA, by January 2026.

Main measures to strengthen the security of the National Electricity System

- Development of the National Strategy for Energy Storage, which will include a relevant component of pumped hydro storage.
- Acceleration of the installation of storage solutions, through exemption from environmental impact assessment in specific cases.
- Upgrade the launch of periodic auctions for injection capacity, to provide predictability and transparency to the sector.
- Simplify the permitting process for self-consumption projects and energy communities.
- Strengthen the electricity system's cybersecurity, through the expeditious application of the NIS 2 Directive.

Main measures to strengthen the security of the National Electricity System

- Improve the grid connection model, including redesigning the operation of High Demand Zones.
- Strategic Environmental Assessment Study for Renewable Energy Acceleration Areas, which will provide additional security for investors, allowing them to anticipate projects with simpler permitting processes.
- Redesign the planning model for the electricity transmission and distribution networks.
- Include an operational security analysis of the Public Service Electricity Network in the annual Security of Supply Monitoring Report (published by DGEG in cooperation with the TSO).

Thank you
for your attention

Paulo Carmona

Director-General for Energy and Geology