



24th International Conference on Renewable Energies and Power
Quality (ICREPQ'26)
Santander, Spain, 10 -12 June 2026

The blackout of the Iberian Peninsula on April 28, 2025

By

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Abstract

At 12:33 on 28th April 2025, a blackout occurred in the Iberian electricity system. Sixty million people lost the electricity supply. This is the first time in the history of the Spanish peninsular electricity system that a blackout has occurred. The most serious incidents in the peninsular system (July 1977, October 14, 1987, and August 24, 1994) never resulted in a blackout in the Iberian system. It is only comparable in continental Europe, in terms of severity, with the blackout of the Italian system on September 28, 2003.

On April 30, the Spanish government established a committee to analyze the electricity crisis, chaired by the Third Vice President and Minister for Ecological Transition and Demographic Challenge. On June 17, the Council of Ministers approved the report drawn up by this Committee. On June 18, Red Eléctrica, the Spanish TSO, presented its report on the events. On May 9, ENTSO-e established a panel of experts to investigate the incident. ENTSO-e presented its factual report on October 3.

This presentation summarizes the investigation conducted by a team led by the author at the request of Endesa and Iberdrola (the two largest Spanish electric utilities), examining the facts and circumstances that led to the blackout in the Iberian system on April 28, 2025. Although the investigation addresses all the facts and circumstances that led to the blackout, this presentation aims to bring to the audience's attention novel analyses that offer well-founded answers to unresolved questions arising from a careful study of the reports issued. In preparing the report, the team, led by the author, used non-public data provided by Endesa and Iberdrola. In particular, the presentation offers a contribution to the challenge posed by ENTSO-e in its press release of July 16, 2025:

“The Expert Panel is looking particularly at the cascading series of generation disconnections and voltage increases as the most probable trigger for the blackout. Such cascading voltage increases have never before been linked to a blackout in any part of the European power system. If confirmed, this high-voltage blackout mode will require a thorough analysis and investigation by all power system experts of the ENTSO-E community.”

Short biography of Prof. Dr. Luis Rouco Rodríguez



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Luis Rouco obtained his MSc and PhD degrees in Electrical Engineering from the Polytechnic University of Madrid in 1985 and 1990 respectively. He is Full Professor of Electrical Engineering in the School of Engineering of Universidad Pontificia Comillas.

He is the Director of the Course on Power System Operation jointly developed by Universidad Pontificia Comillas and Red Electrica de España. He has also served as Head of the Department of Electrical Engineering from 1999 through 2005.

Prof. Rouco teaches undergraduate courses on Electrical Machines and Power System Protection and graduate course on Electric Power Systems.

Prof. Rouco develops his research activities at Instituto de Investigación Tecnológica (IIT). His areas of expertise are modelling, simulation, simulation, control and identification of electric power systems where he has led more than 250 research projects for Spanish public administrations, Spanish electric utilities and other Spanish engineering and industrial companies. He has also developed research projects for foreign companies and institutions. Prof. Rouco has published more than 200 papers in international journals and conferences. Prof. Rouco is Senior Member of IEEE and Distinguished Member of Cigré.

He is president of the Electric Energy Systems-University Enterprise Training Partnership (EES-UETP), Member of the Executive Committee of the Spanish National Committee of CIGRE, Convener of the Advisory Group A1.5 New Technologies of the Study Committee A1 Rotating Machines of CIGRE, editor of IEEE Transactions on Power Systems, member of the Technical Program Committee of Power Systems Computation Conference (PSCC) and Technical Program Chair of the IEEE PowerTech Madrid 2021. Stanford University has included him in the 2% of the most cited scientists in the world since 2021.

He has been visiting scientist at Ontario Hydro (Toronto, Canada), MIT (Cambridge, Massachusetts, USA) y ABB Power Systems (Vasteras, Sweden).