



23rd International Conference on Renewable Energies and Power
Quality (ICREPQ'24)
Tenerife, Spain, 25 -27 June 2025

Contribution of synchronous compensators to the stability of inverter-based generation

By

Luis Rouco

Universidad Pontificia Comillas
Madrid, Spain

Abstract

The power system resulting from the energy transition will lack inertia and short circuit strength which affects the stability of inverter-based resources (IBRs) under grid-following control schemes ([1], [2]). Despite the developments in grid-forming control of IBRs, synchronous compensators are being proposed and installed in many power systems to address the aforementioned issues ([3], [4]).

This contribution discusses the contribution of synchronous compensators to the converter driven stability of type 3 and 4 wind generators. In addition, their contribution to the damping of inter-area oscillations will be addressed [5].

References

- [1] Ávila-Martínez, R., Rouco, L., García-Aguilar, J., Renedo, J., Sigrist, L., Impact of PLL control on small-signal stability of wind DFIGs, IEEE Power & Energy Society General Meeting - IEEE PES GM 2020, Montréal (Canada), 3-6 August 2020.
- [2] Ávila-Martínez, R., García-Aguilar, J., Rouco, L., Renedo, J., Sigrist, L., García-Cerrada, A., Small-signal stability of type 4 wind generators as affected by the bandwidth of current and PLL controllers, 27th International Symposium on Power Electronics, Electrical Drives, Automation and Motion - SPEEDAM 2024, Ischia (Italy), 19-21 June 2024.
- [3] Resolución de 27 de junio de 2024, de la Comisión Nacional de los Mercados y la Competencia, por la que se establecen las especificaciones de detalle para la determinación de la capacidad de acceso de generación a la red de transporte y a las redes de distribución. «BOE» núm. 162, de 5 de julio de 2024, páginas 84336 a 84356.
- [4] ABB, La tecnología integrada de ABB estabilizará la red eléctrica en la transición de las islas españolas a la energía verde. Nota de prensa, Madrid, España, 2024-06-05, <https://new.abb.com/news/es/detail/116318/la-tecnologia-integrada-de-abb-estabilizara-la-red-electrica-en-la-transicion-de-las-islas-espanolas-a-la-energia-verde>, visited 6 February 2025.
- [5] Rouco, L., Suárez-Porras, J., Fernández-Bernal, F., Sigrist, L., Damping local and inter-area oscillations with synchronous compensators: a fundamental study, 50th CIGRE Session - CIGRE 2024, París (France). 25-30 August 2024, Paper No. A1-10542.

Short biography of Prof. Dr. Luis Rouco Rodríguez



Address: Escuela Técnica Superior de Ingeniería ICAI
C/ Alberto Aguilera, 25. 28015 Madrid

Primary Email: rouco@comillas.edu

Phone Number: +34 915422800

Mobile: +34 650850060

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 Eléctrica 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).