POLITECNICO DI MILANO

PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 41st cycle

THEMATIC Research Field: METODI DATA DRIVEN PER IL MONITORAGGIO ED IL CONTROLLO DELLA SICUREZZA DEI SISTEMI ELETTRICI DI POTENZA

Monthly net income of PhDscholarship (max 36 months)
1500.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The research aims at developing data-driven approaches to monitor electromechanical oscillations, estimate system inertia and short-circuit power of specific areas, characterize voltage stability. The methods will make it possible to increase the awareness about which devices to install (in a planning phase), where, or which device to displace (in operation) and which size they should have. The new tools will be able to improve the quantification of benefits coming from new control devices (e.g., synchronous condensers, STATCOMs, resistors, HVDCs) or procedures both from the technical and the economic sustainability points of view. The proposed methods are expected to integrate the analysis of emerging physical phenomena that may impact the security and quality of the power supply (e.g., disturbances introduced by wind power). Through these advanced tools, the project intends to anticipate and address the challenges of the energy transition, ultimately contributing to a more innovative and sustainable management of the energy system.
Methods and techniques that will be developed and used to carry out the research	Data-driven methods are emerging at an exponential rate, becoming central to the management of complex systems. In recent decades, advanced mathematical tools grounded in machine learning and data-driven approaches have opened new possibilities for managing and controlling energy systems. As many EU countries

	and controlling energy systems. As many EU countries drive forward with decarbonization initiatives, these systems are becoming increasingly complex and challenging to control. Data-driven technologies allow improving monitoring, forecasting, and control actions, thus enhancing system reliability and security. Recently developed data-driven engineering tools use reduction techniques such as Singular Value Decomposition (SVD), Dynamic Mode Decomposition (DMD), and similar methods. Some of these tools have already been implemented at the national control center of Terna SpA, the Italian Transmission System Operator, and will be further enhanced, also improving global stability indices to identify targeted control actions to increase the power system security.
Educational objectives	Prepare researchers with high scientific qualification, autonomous research ability in the Power System area: this includes specific skills in modelling of both technical and economic issues, simulations, critical analysis and validation of results.
Job opportunities	The opportunities are offered by R&D departments of both small and large companies, research centres, T&D Operators, Regulating authorities, Generation Companies, Academia.
Composition of the research group	3 Full Professors 2 Associated Professors 3 Assistant Professors 8 PhD Students
Name of the research directors	Prof. Alberto Berizzi

Contacts
https://www.energia.polimi.it/laboratori/laboratorio-di-calcolo-numerico-in-ambito-di-sistemi-elettrici-per-lenergia-eps-lab/ alberto.berizzi@polimi.it phd-elt@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities:

Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc. This amount is about 10% of the annual gross amount, for 3 years.

Teaching assistantship:

Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: individual use.

Desk availability: individual use.