



PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 39th cycle

THEMATIC Research Field: ARCHITECTURES FOR ELECTRIFICATION IN RURAL AREAS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
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	<p>The symbiotic relationship between socio-economic development and access to energy is a very prominent topic, with various important stakeholders showing increasing interest. Energy planning requires a multi-dimensional analysis, considering various economic and socio-political factors, while contemplating the future evolution as well. Energy assessment allows for stakeholders to properly size the energy systems, obtaining the most adequate and cost-effective energy architectures.</p> <p>In rural areas, that are typically far from the national electric grid, the development of microgrids is seen as an attractive option to provide fast access to electricity. However, the technical solutions are diverse, and there is a clear need for systematic development and coordination among them. From a technological standpoint, there are implications for distributed control and robust resource regulation, as well as regulatory implications concerning the management of interconnected microgrids and their interface with the national grid. Another solution that is being investigated with growing interest relates to the development of DC microgrids, which require a different architecture compared to AC solutions, especially concerning the potential interconnection of different microgrids and their connection to the national grid. Finally, with regard to the development of off-grid systems, whether AC or DC, it is increasingly important to address the issue of electrical protections.. Moreover, these protections schemes should be coordinated among</p>



	<p>interconnected microgrids and/or the main grid. The proposed PhD project aims to address a systemic analysis of the problem, delving into the above-mentioned technological and planning aspects. Therefore, the proposed project is highly interdisciplinary and presents its strength in this aspect.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>Methods based on probabilistic procedures (e.g. MonteCarlo), fuzzy logic, neural networks, heuristic algorithms, chaos theory, game theory and other theory system analysis, together with traditional mathematical tools and programming, big data analysis and order reduction techniques. Dynamic modelling of small power systems with low inertia, both for the planning and operation phases. Other important methods include the usage of GIS, topological analysis and cost-benefit evaluations.</p>
<p>Educational objectives</p>	<p>Prepare researchers with high scientific qualifications and autonomous research ability in the Power System area: this includes specific skills in modeling of both technical and economic issues, simulations, critical analysis and validation of results.</p>
<p>Job opportunities</p>	<p>The main opportunities are offered, typically, by R&D departments of both small and large innovative companies and manufacturers, research centres, Transmission and Distribution Operators, Regulating authorities, Generation Companies.</p>
<p>Composition of the research group</p>	<p>2 Full Professors 3 Associated Professors 3 Assistant Professors 10 PhD Students</p>
<p>Name of the research directors</p>	<p>Marco Merlo</p>

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
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 equal to 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.