



PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 39th cycle

**PNRR 118 PA Research Field: ELECTRIC POWER SYSTEMS - REGIONAL ENERGY
PLANNING: AOSTA VALLEY CASE STUDY**

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

Regional Energy Planning (REP) is a multidisciplinary approach that plays a pivotal role in addressing the complex challenges associated with the sustainable development of energy systems at the regional level. With the ever-increasing global demand for energy and the urgent need to mitigate climate change impacts, it has become imperative to adopt comprehensive and well-structured planning strategies. REP involves the strategic analysis, assessment, and optimization of energy resources, technologies, and policies within a defined geographical region, with the ultimate goal of achieving energy security, environmental sustainability, and socio-economic well-being.

The concept of REP has emerged as a viable approach to devise integrated energy strategies tailored to the unique characteristics and requirements of specific geographic areas. REP encompasses a wide array of factors, including geographic location, natural resource availability, technological capabilities, socio-economic conditions, and policy frameworks.

REP involves several critical components:

- a. Data Collection and Analysis: Accurate data on energy consumption, resource availability, population trends, and socio-economic indicators form the foundation of REP. Advanced modeling and analysis tools are employed to assess the potential impact of various energy scenarios.
- b. Stakeholder Engagement: Effective REP incorporates the perspectives and inputs of various stakeholders,



	<p>including government authorities, private sector entities, academia, community representatives, and non-governmental organizations.</p> <p>c. Policy and Regulatory Frameworks: An enabling policy and regulatory environment is essential for the successful implementation of energy planning initiatives.</p> <p>d. Technological Innovation: Integrating cutting-edge energy technologies and innovation is pivotal in transforming the regional energy landscape. REP evaluates the feasibility and suitability of emerging technologies to enhance energy efficiency and sustainability.</p> <p>With respect to the regulatory framework, the project is related to the CUN Area 09 "Ingegneria industriale e dell'informazione"; the main goals (as defined in the Italian DM 118 2023) are:</p> <ul style="list-style-type: none"> - "partecipare al governo, all'organizzazione e alla direzione strategica di amministrazioni pubbliche (sia al livello nazionale che regionale e locale) attraverso l'attuazione di innovative strategie fortemente orientate agli utenti e all'efficacia delle azioni poste in essere, nonché alla valorizzazione delle risorse"; - "potenziare la capacità amministrativa in relazione alla formulazione e al disegno delle politiche pubbliche, sia sviluppando capacità diagnostica sia assumendo la responsabilità del coordinamento del ciclo di policy per quanto concerne la fenomenologia delle problematiche possibili nelle fasi di definizione dei problemi e individuazione delle soluzioni...".
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>System modelling through modern methods based on probabilistic procedures (Montecarlo-based), fuzzy logic, neural networks, genetic algorithms, chaos theory, game theory and other theory system analysis, together with traditional mathematical tools and programming, big data analysis, order reduction techniques. GIS tools, topological analysis and cost-benefit evaluations will also be part of the techniques under investigation, in particular to perform energy master plan for the areas under investigation.</p>



	<p>The proposed research path will be focused on the electric energy layer, nevertheless the other layers (mobility, heating, telecommunication, social, and environmental) will also be properly evaluated.</p> <p>Key topics, to be investigated, will be: energy infrastructures planning and operation, renewable energies, decarbonization, Renewable Energy communities, e-Mobility.</p> <p>The investigate case study will be related to the Aosta Valley Region.</p>
Educational objectives	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.
Job opportunities	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.
Composition of the research group	2 Full Professors 3 Associated Professors 3 Assistant Professors 10 PhD Students
Name of the research directors	Prof. Marco Merlo

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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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Centro Osservazione e Attività sull'Energia - COA Energia Finaosta (under the supervision of the Autonomous Region Valle d'Aosta).
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	The project promotes collaboration with relevant international universities and research centers. The foreign institution will be selected during the 3 years research program in agreement with the industrial partner.
By number of months abroad	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.