



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 38th cycle

THEMATIC Research Field: EVOLUTIONARY MULTI-VECTOR AND MULTI-SECTOR ENERGY SYSTEM MODELLING TO STUDY TRANSITION PATHWAYS TO FULL DECARBONIZATION

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

In the context of energy transition towards decarbonisation, energy system modelling is an essential tool to assess and compare scenarios and alternatives. In a multi-sector perspective, long-term analyses can offer accurate perspectives on priorities and challenges of the actions. This PhD research has the objective of developing and extending energy system models for the analysis of integrated energy system at the nation scale, with a multi-sector (transport, civil, industry demand) and multi-vector (electricity, gas, hydrogen, liquid fuels) perspective, focusing on the transitional pathway between now and 2050 for the target of net-zero CO₂ emissions. The work will consider the role of hydrogen as energy vector for storage and integration purposes. Attention will be given to the exploitation of limited renewable resources (biomass, biomethane, waste), to the synergies between sectors and vectors, and to the waste heat potential (e.g., district heating from H₂ production facilities).

Methods and techniques that will be developed and used to carry out the research

The research aims at building an evolutionary energy system model capable to track the system and infrastructure modifications on a multi-annual span. The work will require the development of theoretical-numerical tools, combining analytical and computational research. First, the best suited framework will be identified among



	<p>First, the best suited framework will be identified among existing or new ones, to serve as basis for the development of the long-term model of system evolution, with strong attention on the need for sector and vector integration. Next, the PhD student will develop a description of the relevant sectors, and configure the model to represent the national energy system. Spatial and temporal resolution will be object of analysis. The tool will be customised to the Italian case, for the assessment of a set of scenarios, devoting significant attention to the sensitivity on economic and technical input data, also aiming to extract observations on policy implications. The PhD is supported by Fondazione Politecnico di Milano (FPM) within the university-industry collaboration “Hydrogen Joint Research Platform” (H2JRP). The work will be carried out at Politecnico di Milano and interactions with the industrial players are envisioned.</p>
Educational objectives	<p>The PhD student will work with two large and highly motivated and qualified research groups within the Department of Energy of Politecnico di Milano. Through this project, the PhD student will become an expert of advanced energy system modelling in the context of energy transition. The PhD student will develop a strong expertise in critically analysing the behaviour and performance of complex energy systems from energy, environmental, and economic points of view.</p>
Job opportunities	<p>At the end of the programme, the PhD graduate will be qualified for academic and research positions, as well as for professional careers in industries or organizations in the energy field. The main job opportunities could be related to industrial sectors (e.g., cement, steel, oil&gas, utilities) that in the next decades will implement decarbonization technologies, or to energy-related consultancy.</p>
Composition of the research group	<p>2 Full Professors 0 Associated Professors 2 Assistant Professors 6 PhD Students</p>
Name of the research directors	<p>P. Colbertaldo, F. Fattori, S. Campanari, M. Motta</p>



Contacts

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Additional support - Financial aid per PhD student per year (gross amount)	
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Housing - Foreign Students	--
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Housing - Out-of-town residents (more than 80Km out of Milano)	--
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Scholarship Increase for a period abroad	
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Amount monthly	750.0 €
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By number of months	6
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Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
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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. The amount is equal to 10% of the annual gross scholarship, 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.

Awards:

Awards may be recognized to the PhD student during the three years, according to the participation of the student to active collaborations.