



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

THEMATIC Research Field: DEFOSSILIZATION OF HARD-TO-ABATE MOBILITY SOLUTIONS THROUGH ALTERNATIVE ENERGY VECTORS

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 de-fossilization of the hard to abate mobility sectors such as long-range heavy-duty trucks, shipping and aviation will require alternative energy vectors, such as hydrogen or carbon-based synthetic biofuels and e-fuels. The number of possible pathways and technology involved makes it difficult to identify the proper solution for each application.

The difficulties in energy vectors supply, the uncertainties in the final market and the evolving regulation push for flexible integrated infrastructures, able to manage different suppliers and switch among different products. The definition of competitive options and the development of tools to manage the decisional process for the supply chains of energy vectors for the heavy-duty transport is the focus of the proposed project. More specifically, the objectives of the project are:

1. to improve or develop drivetrains models, to compute energy performance of vehicle with conventional and innovative technical solutions;
2. to develop tools supported by simulation and digital solutions for the real time management of the decisional process related with multi-feedstock and multi-fuel hubs;
3. to optimize the energy supply chain and the local



	<p>infrastructures from a techno-economic-environmental point of view, focused on large scale applications (e.g., heavy-duty trucks fleets, ports, airports, ...) and different energy vectors (electricity, hydrogen and biofuels/e-fuels).</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research program requires the use of the following computational tools:</p> <ul style="list-style-type: none"> •Existing (e.g. VECTO) or specifically developed software (e.g. based on Matlab, Python or other languages), for the performance evaluation of (i) vehicles' drivetrains, (ii) design and off-design of components in the energy distribution infrastructures and (iii) conversion systems in the energy supply chain for transportation systems. •Optimization software (e.g., Matlab, GAMS, Pyomo) to support the decisional process in the definition of energy vectors supply chain, integrating real-time data and techno-economic-environmental assessments.
<p>Educational objectives</p>	<p>The PhD candidate will:</p> <ul style="list-style-type: none"> •Become expert of drivetrains simulation and evaluation of vehicles performance from energy consumption and GHG gases emissions point of view. •Become expert in critically analysing the performance of different conversion processes and energy supply chains from energy, environmental and economic points of view, with a specific focus on the transport sector. •Acquire specific modelling experience on the optimization of flexible multi-vector energy systems and on the real time optimization of operating conditions, applied to transportation hubs.
<p>Job opportunities</p>	<p>Apart from academia and research institutes, the main expected job opportunities after the PhD will be in industrial sectors (e.g., supply chain of biofuels, hydrogen-based infrastructures providers, vehicles manufacturers,</p>



	...) or in utilities (e.g., providers of services related with electrical mobility, ...). More in general, the targets will be companies of the hard-to-abate mobility sector that in the next decade will implement innovative energy vectors and the related technologies and infrastructures, aiming at reducing their carbon footprint.
Composition of the research group	6 Full Professors 9 Associated Professors 5 Assistant Professors 40 PhD Students
Name of the research directors	Giulio Guandalini

Contacts
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Research group: www.gecos.polimi.it

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	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>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 about Euro 3.000,00.</p> <p>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.</p> <p>Computer availability: individual use.</p> <p>Desk availability: individual use.</p> <p>Awards: Awards will be recognized to the PhD candidate up to Euro 4.000 (gross amount) per</p>



year, in case of exceptional achievements in the research project, subject to the evaluation of the research director.