



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

**PARTENARIATO PNRR Research Field: SYSTEMS FOR E-FUELS PRODUCTION VIA FISCHER-TROPSCH PROCESS**

**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

**CUP D43C22003090001**

**Decreto di concessione D.D. 1561 del 11/10/2022**

The defossilization of the hard to abate mobility sectors such as long range shipping and aviation will require carbon-based synthetic bio-fuels and e-fuels. The former pathway involves the conversion of CO<sub>2</sub> and green hydrogen into hydrocarbons that may be used for propulsion in conventional engines. One of the most promising routes for e-fuels production is via Fischer-Tropsch process, which is the focus of the proposed project. More specifically, the objectives of the project are:

**Motivation and objectives of the research in this field**

1. to develop process models to compute mass and energy balances and economic performance indicators of e-fuel production via Fischer-Tropsch;
2. to assess the technical and economic implications of operating such plants flexibly, to adapt to the availability of intermittent renewable electricity;
3. to optimize the overall e-fuel production system in terms of PV and wind capacity, electricity and hydrogen storage capacity, Fischer-Tropsch plant load following, via yearly simulations with hourly discretization.



<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>The research program requires the use of the following computational tools:</p> <ul style="list-style-type: none"> <li>• Aspen Plus software, for the design and off-design simulation of e-fuel plants, calculation of heat and mass balances at different loads</li> <li>• Optimization software (e.g. Matlab, GAMS) for the optimization of e-fuel plants integrated with intermittent renewable energy supply.</li> </ul>
<b>Educational objectives</b>	<p>The PhD candidate will:</p> <ul style="list-style-type: none"> <li>• Become expert of process simulation of Fischer-Tropsch process simulation methods. This expertise can be easily adapted to process simulations of other chemical processes</li> <li>• Become expert in critically analysing the performance of energy conversion processes from energy, environmental and economic points of view.</li> <li>• Acquire specific modelling experience on the optimization of energy systems dominated by intermittent renewables.</li> </ul>
<b>Job opportunities</b>	<p>Apart from academia and research institutes, the main expected job opportunities after the PhD will be in industrial sectors (e.g. oil &amp; gas, electric utilities), that in the next decade will implement innovative processes and technologies to reduce their carbon footprint.</p>
<b>Composition of the research group</b>	<p>5 Full Professors 6 Associated Professors 10 Assistant Professors 20 PhD Students</p>
<b>Name of the research directors</b>	Matteo Carmelo Romano

<b>Contacts</b>
<p>matteo.romano@polimi.it http://www.gecos.polimi.it/</p>



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.

**Awards:** Awards will be recognized to the PhD candidate up to Euro 3000 (gross amount) per year, in case of exceptional achievements in the research project, subject to the evaluation of the research director.