



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

**PNRR\_352 Research Field: MODELING AND EXPERIMENTAL ANALYSIS OF ADSORPTION ENERGY STORAGE SYSTEMS.**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1275.0**

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**

At present there is a great interest in the increase of energy efficiency of buildings since they are responsible for 40% of global energy consumption. Energy storage systems can play a crucial role in the energy transition, providing a solution to time-align energy production and demand and, therefore, leading to an increase in renewable energy sources diffusion. A consistent public and private funding is dedicated worldwide to increase sustainability in buildings. In particular, the Italian PNRR - Mission 2 Component 3 - aims at improving energy efficiency and promoting refurbishment of buildings. In addition, in this context the Italian government, through the recent D.M. 352/22, promotes and finances innovative doctorates to foster research in companies. The proposed research deals with the modeling, design, experimental analysis and optimization of sorption thermal energy storage (STES) systems, mainly of open typology. In particular, the project aims to study innovative STESs both at component and system level, through the following 1 / 3 main activities: i) development of phenomenological models of components; ii) design of innovative STESs; iii) prototyping of the devices; iv) experimental analysis of the prototypes; v) modeling and experimental analysis of



	the STESs integrated with other HVAC systems at building scale. The final aim of the work is to help to identify and overcome the current limitations of the technology, identifying where and how it can be effectively applied, to contribute achieving the energy efficiency targets for buildings set by the Italian PNRR.
<b>Methods and techniques that will be developed and used to carry out the research</b>	The experimental analysis will be carried out through the experimental facilities available at RSE S.p.A. and at Politecnico di Milano, appropriately integrated for this project. Modeling tools will be developed in the two research groups (RSE and Politecnico) to simulate the entire system (dynamic simulations in Matlab or TRNSYS) or each independent component (with Matlab or CFD codes). The student will spend at least 6 months at RSE labs.
<b>Educational objectives</b>	The student will deepen his/her knowledge in thermodynamics, transport phenomena and building/HVAC energy systems. Learning of advanced design and management of sorption thermal energy storage is also expected.
<b>Job opportunities</b>	Placement in enterprises operating in advanced HVAC systems and in buildings sector. The acquired experience permits to continue the research career in academia and in research centers.
<b>Composition of the research group</b>	2 Full Professors 3 Associated Professors 3 Assistant Professors 6 PhD Students
<b>Name of the research directors</b>	De Antonellis Stefano, Colombo Luigi Maria

<b>Contacts</b>
prof. Luigi Colombo (luigi.colombo@polimi.it) prof. Stefano De Antonellis (stefano.deantonellis@polimi.it) prof. Luca Marocco (luca.marocco@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	637.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	R.S.E. Spa
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	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 5000.</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.</p> <p>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.</p> <p>Accommodation in Politecnico's Residences (<a href="http://www.residenze.polimi.it">http://www.residenze.polimi.it</a>) is available for PhD candidates; special rates will be applied to selected out-of-town candidates (detailed info in the call for application). Research period abroad: Our candidates are strongly encouraged (6 months minimum is mandatory) to spend a research period abroad, joining high-level, research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 637 euro/month - net amount).</p>