



# PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 39th cycle

**THEMATIC Research Field: MODELLING AND ANALYSIS OF THE FISSION PRODUCT DEPOSITION IN GENERATION-IV MOLTEN SALT REACTOR**

**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**

In the framework of the sustainable development goals set by 2030 Agenda, the research on low-carbon energy source is of fundamental importance. In this view, nuclear energy can play a role in meeting climate objectives. Nevertheless, improved safety and sustainability of this sector calls for a strong research effort in the development of innovative nuclear reactor concepts. Among the Generation IV technologies, a promising and peculiar role is assumed by Molten Salt Reactors in which a mixture of molten salts act both as liquid fuel and coolant. During reactor operating time, solid fission products are dispersed and transported in the molten salt and they can deposit on various surfaces of the reactor, modifying the local heat exchanges performances and disrupting flow. The main objective of the PhD research is to study and improve the modeling of the fission product deposition with the final aim to analyze the deposition phenomena in the XAMR reactor proposed by NAAREA. The modelling and the analysis of the interaction with bubble transport and gaseous fission product will be also relevant. Experimental data will be used for the validation of the developed tool. The research is financed by NAAREA and the PhD candidate is required to work in collaboration with the company.

**Methods and techniques that will be**

Multiphysics modelling tool based on OpenFoam will be



<p><b>developed and used to carry out the research</b></p>	<p>exploited for the analysis of the MSR for the numerical activities, focussing on modelling of the fission products. Due to the wide dispersion of the fission products decay periods, a dedicated physical model will have to be built for adequate coupling with the CFD models. This model will rely on look-up tables produced by NAAREA chemistry team to determine which nuclides should be tracked. It will also be necessary to identify a simulation tool and physical model to correctly simulate particle tracking and plating phenomenon.</p>
<p><b>Educational objectives</b></p>	<p>The PhD candidate will develop high-qualified skills and expertise in the nuclear energy &amp; innovative reactors area, with a focus on Molten salt reactor. The presence of several international collaborations where the research activity is integrated will allow the student to interact with the main European and non-European institutions in this research field.</p>
<p><b>Job opportunities</b></p>	<p>The candidate profile will be highly attractive both in the research environment, where cross-disciplinary skills are more and more appreciated, and in the expanding field of fission energy system design, analysis, manufacturing and management.</p>
<p><b>Composition of the research group</b></p>	<p>1 Full Professors 2 Associated Professors 2 Assistant Professors 12 PhD Students</p>
<p><b>Name of the research directors</b></p>	<p>Stefano Lorenzi</p>

<p style="text-align: center;"><b>Contacts</b></p>	
<p>Phone +39-02-23993814 Email stefano.lorenzi@polimi.it Research Group web site <a href="http://www.nuclearenergy.polimi.it">www.nuclearenergy.polimi.it</a></p>	

<p style="text-align: center;"><b>Additional support - Financial aid per PhD student per year (gross amount)</b></p>	
<p><b>Housing - Foreign Students</b></p>	<p style="text-align: center;">--</p>
<p><b>Housing - Out-of-town residents (more than 80Km out of Milano)</b></p>	<p style="text-align: center;">--</p>



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**

**Increase in the scholarship for stays abroad:** euro 700 per month, for up to 6 months.

**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 1500 (gross amount) per year, in case of exceptional achievements in the research project, subject to the evaluation of the research director.