



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

THEMATIC Research Field: NUMERICAL MODELLING AND EXPERIMENTAL ANALYSIS OF THE 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. This peculiar feature provides strong safety capabilities to the reactor and it allows the operation also as breeder reactor or burner reactor for the incineration of nuclear waste. On the other hand, this reactor is characterized by a strong coupling among the different physics (neutronics, heat transfer, fluid dynamics, ...) requiring advanced simulation tool, numerical methods and experimental validation for MSR characterization, both for design purposes and for safety assessment. The objective of the research is to improve the current numerical capabilities focussing on i) the modelling of gaseous and metallic fission products and their interaction in the reactor and in the salt purification systems, ii) the coupling of the multiphysics 3D model of the reactor fuel with the intermediate and power conversion system-code modelling, iii) the validation of characteristic features with the DYNASTY-



	eDYNASTY facility, a natural circulation loop present in the laboratory of the research group.
Methods and techniques that will be developed and used to carry out the research	Multiphysics modelling tool based on OpenFoam will be exploited for the analysis of the MSR for the numerical activities, focussing on modelling of the fission products. As for the coupling of the fuel circuit and the power conversion system, a Modelica based model will be employed, focussing on the Functional Mock-up Interface.
Educational objectives	The PhD candidate will develop high-qualified skills and expertise in the nuclear energy & 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.
Job opportunities	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.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 12 PhD Students
Name of the research directors	Stefano Lorenzi

Contacts	
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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. The amount is about Euro 5700.

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. Accommodation in Politecnico's Residences

(<http://www.residenze.polimi.it>) 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. 700 euro/month - net amount).