POLITECNICO DI MILANO

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

PNRR_352 Research Field: DEVELOPMENT OF ADVANCED DESIGN METHODOLOGIES OF AXIAL TURBOMACHINERY FOR GEOTHERMAL ENERGY CONVERSION

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	The progressive increase of the share of renewable energy sources in the national and global energy scenario, is one of the most relevant key goals of the very next future. The decarbonization process, the so called "green revolution" and the Ecological transition are also one of the Mission of the PNRR Program, specifically mentioned in mission M2C2.1. For this aim the efficient use of geothermal energy sources may play a relevant role in the national and international frame. The development of new specific competences in the turbomachinery field for the large scale exploitation of the different geothermal energy sources already exploited and to be discovered and exploited in the near future is the core of the proposed research program. Development of novel and advanced turbomachinery concepts tailored for low and high enthalpy geothermal energy sources is crucial for the efficient energy production. The proposed research program will also consider the combined and optimized study and analysis of different thermodynamic approaches for the exploitation of the renewable energy source, like: Organic Rankine Cycles of different kind, Kalina cycles, direct expansion of the geothermal fluid and others. The research program is supported by Nuovo Pignone Tecnologie s.r.l, member of Baker & Hughes group. B&H, with operations in over 120 countries, is a leading partner

	to the energy industry and it is committed o achieving net-zero carbon emissions by 2050. Nuovo Pignone Tecnologie is a word leader in the design and manufacturing of turbomachinery for special application and will collaborate with Politecnico research group in all program pahses. During his PhD, the candidate will have the opportunity to spend a 6 months stage at the company headquarters located in Florence.
Methods and techniques that will be developed and used to carry out the research	The PhD candidate will have access to the design and optimization codes developed by the LFM research group operating at Politecnico di Milano. The numerical activities performed within the LFM group will be supported by the access to the cluster of CPUs available at the CFDHub@Polimi. Experimental activities, if requested during the development of the research program may be carried out at the Laboratory of Fluid-Machines @Polimi. The industrial partner company Nuovo Pignone Tecnologie, owns large and unique turbomachinery testing laboratories and other specific research facilities and research teams that may be involved when needed or requested. Both the University and the Nuovo Pignone Tecnologie will make available commercial and proprietary numerical codes at different accuracy level, depending on the requirements of the specific phase of the project: fluid dynamic design tools addressed to the design and the performance analysis of turbomachinery will be implemented for the specific use in both institutions.
Educational objectives	The PhD candidate will develop advanced skills for the design of novel turbomachinery for the specific field. At the same time he will develop the main competences and skills for leading, organizing, planning and managing R&D programmes at industrial and public extent, at the highest international quality in the renewable power production field. He will gain a high level of professional expertise in the development, management and coordination of research activities
Job opportunities	The professional role is the one of a specialist capable of

	performing high level research and of managing and designing innovation in the turbomachinery and more generally in the energy production field, e.g.: • leader, coordinator and manager (P.I.) of research and development in public and private entities, industrial companies, universities and research institutes; • proposing, creating and pursuing product innovation in the energy sector. • responsible for activities contributing to the design and development of products, solutions and systems. • responsible of activities linked to technical improvement of existing products or development of new products and components in the turbomachinery industry • Industrial positions requiring understanding of advanced and complex concepts, methods and procedures As partner research institutions already collaborating with the Politecnico di Milano research group, among the others we mention: • The Von Karman Institute for Fluid Dynamics (VKI), Brussels, Belgium • Denmark Technical University (DTU), Copenhagen, Denmark • Norwegian University of Science and Technology (NTNU), Trondheim, Norway.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 4 PhD Students
Name of the research directors	V. Dossena,G. Persico (PoliMi)-L. Cosi (NPT)

Contacts
Phone +390223998612 Email vincenzo.dossena@polimi.it phd-STEN@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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Nuovo Pignone Tecnologie Srl
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

Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding forparticipation in courses, summer schools, workshops and conferences, instrumentations andcomputer, etc. The amount is about Euro 5700.
Teaching assistantship: Availability of funding in recognition of supporting teaching activities by the PhD student. Thereare various forms of financial aid for activities of support to the teaching practice. The PhDstudent 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 PhDcandidates; 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 for this program) 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).
Industrial Stage: a stage of 6 months at Nuovo Pignone Tecnologie headquarters in Florence has been scheduled.