POLITECNICO DI MILANO

PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 38th cycle

PNRR_352 Research Field: GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR RENEWABLE ENERGY DEVELOPMENT

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 decarbonization process is one of the most relevant challenges that the society should face in the next years in order to limit the impact of climate changing and to improve livability. The so-called "green revolution" and the "ecological transition" are among the missions of PNRR Programme (M2C2). Renewable energies is one of the main topic in "Scenari Energetici del Fututo" extended Partnership in PNRR M4C2 investment. The PNRR requirements for new installation of Renewable Energy Sources (RES), mainly photovoltaic and wind, set important goals: the objective is to increase the installed capacity of RES by 6 GW (M2C2). Among them, it is expected to install 1,04 GW of agrivoltaic (M2C2, investment 1.2) and 200 MW of offshore and floating installations (M2C2, investment 1.3). In order to achieve these goals, it is important to identify the available areas for the installation of new RES, to map them with all the technical and regulatory constraints, and to optimize the selected installation. The main purpose of this research is to develop and test an innovative method based on Geographical Information System (GIS) for mapping and identifying areas in which it is possible to install RES. The system should consider different sources of information, such as land coverage and usage, position of the existing transmission and distribution network, historical weather database, and regulatory constraints. This research activity is inspired and developed in Politecnico di Milano, mainly in SolarTechLab, starting from the latest state of

	the art applications and from the experience provided by A2A. Then, it will be fine tuned and tested in real world case studies. In this phase, many activities will be carried at A2A, that will provide all the data and the experience required to test the developed method in a real word case study.
Methods and techniques that will be developed and used to carry out the research	The proposed research will be carried out using specific GIS software, such as QGIS and GRASS GIS, and programming languages, like Matlab and Python. The data analysis and processing will be performed by exploiting graph theory, circuit theory, and non-linear optimization theory. Advanced Computational Intelligence methods, such as Machine Learning, Evolutionary Optimization, Deep Learning, and Fuzzy Logic, can be successfully implemented to achieve the desired goals. All these models, algorithms, and methods will be combined leveraging and extending existing procedures for GIS database analysis.The project is at the intersection of different fields of investigation: energy engineering, electrical engineering, and computer science. The PhD candidate is thus expected to interact with a multidisciplinary team of researchers.
Educational objectives	The aim is to form a highly qualified engineer in a highly motivated and qualified research group, gaining experience, knowledge and skills in cutting edge technologies of the implementation of computational methods in the renewable energy, power generation, and system optimization field, involvement in international and EU projects as well as in the cooperation with leading industries and R&D institutions.The candidate will learn how to identify critical aspect specifically link to mathematical modelling of energy production and use.The candidate will learn how to communicate the results of the Ph.D. research presenting results and analysis in a scientific and industrial context.
Job opportunities	This research activity will qualify the candidate for future academic and research positions, as well as for a highly qualified professional career in industries in the energy and electrical mobility field, e.g. A2A.

Composition of the research group	2 Full Professors 4 Associated Professors 2 Assistant Professors 6 PhD Students
Name of the research directors	Prof. Sonia Leva, Alessandro Niccolai

Contacts
sonia.leva@polimi.it alessandro.niccolai@polimi.it phd-elt@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)	A2A S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	This research project will foster collaboration with relevant international universities and research centers. The foreign institution will be selected during the 3 years research program in agreement with the industrial partner.
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 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. 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 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.