URBAN AND REGIONAL DEVELOPMENT

Open Fiber SpA/CRT/DENERG - Italian Platform for Renewable Energy Communities

Funded By	Dipartimento DENERG Open Fiber S.p.A. [P.iva/CF:09320630966] FONDAZIONE CRT CASSA DI RISPARMIO DI TORINO [P.iva/CF:06655250014]
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Context of the research activity	With the aim to exploit the available energy resources, an Italian energy platform is under development to accelerate the energy transition allowing to achieve energy and climate targets according to European Directives and international agreements. The Italian energy system is strongly depended by abroad and by fossil fuels, then the more effective solution is the self-production by renewable energy sources. This solution is possible with the use of place-based approach and GIS energy modeling.
	In accordance with the contents of the "Integrated National Plan for Energy and Climate" (PNIEC) and the Decree of the Minister of Environment and Energy Security (MASE) of 7 December 2023 n. 414 ("CACER Decree"), the project aims to realize a national platform based on the use of the Geographic Information System (GIS). Through the adoption of a top-down and place-based approach, each territory will be involved in the energy transition according to its specific potential, socio-economic conditions and environmental problems. The platform will allow to identify the most suitable areas for the realization of Renewable Energy Communities (RECs) based on the spatial distribution of energy consumption, the availability of renewable sources, the production of clean energy, the territorial constraints and the potential future production. The objectives of this research can be summarized as follows: - Collect and pre-process databases on renewable energy resources (QGIS) on a national, regional, provincial and local scale. - Collect and pre-process databases on consumption profiles in relation to the types of energy users (residential, tertiary, industrial, agricultural), the environmental context (territorial morphology and local climate zone), the built heritage (e.g. the use and construction period of buildings) and the socio-economic characteristics of the population (e.g. demographic characteristics, energy poverty). - Creation of geo-datasets and geo-packages for renewable energy sources and energy consumptions.

Objectives	- Inventory of the main technologies utilized in Italy that exploit renewable energy sources considering their conversion efficiencies, minimum laws' requirements and territorial constraints. - Energy modeling of renewables and consumptions implementing the geo-datasets and geo-packages taking into account their accuracy, flexibility, scalability, and applicability. - Definition of indicators and indexes to measure the effectiveness of energy communities in a territory from an energetic, economic, environmental and social point of view. - Simulation of scenarios in accordance with the defined indicators and indexes; also considering the National Integrated Energy and Climate Plan PNIEC (updated on 30 June 2024) and the latest European directives Energy Performance of Buildings Directive EPBD, Energy Efficiency Directive EED and Renewable Energy Directive RED. - Design of the back-end and front-end of the energy platform considering the different stakeholders in the territory; the technical specifications of all elements of the platform will be implemented according to the standards for interoperability of data, services and information. The development and optimization of renewable energy systems are some of the most necessary topics to advance towards secure and sustainable energy models. The use of optical fiber was investigated in monitoring photovoltaic systems and wind power plants, and will be analysed for demand-supply based optimization, accessing real-time data for renewable energy communities. The optical fiber network can support the energy community, allowing real-time data exchange between energy consumers/producers/prosumers, renewable energy plants, storage systems, etc. Then, energy communities will be fully connected thanks to optical fiber network and "governed" by the energy platform. Future scenarios will be analysed with the evaluation of different indicators/indexes (i.e., energetic, economic, environmental and social ones) considering short-medium-long terms and various spatial scales (within RECs and with the aggregation of RECs).

Skills and competencies for the development of the activity	Master's Degree in: URBAN AND REGIONAL PLANNING, ENERGY AND NUCLEAR ENGINEERING, DIGITAL SKILLS FOR SUSTAINABLE SOCIETAL TRANSITIONS Experience in urban buildings energy modeling (UBEM) and energy production at territorial scale. Mastery in the use of QGIS or ArcGIS.