

ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

PNRR - Renewables for Resilience of Communication Infrastructures

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	<p>The research envisions the integration of renewable power supply systems in the communication access infrastructures with the objective to jointly increase network sustainability and resilience and focuses on the design of smart energy-aware network operation mechanisms that adapt communication and computing resource allocation to energy availability.</p> <p>PNRR M4C2, Investimento 1.3 - Avviso n. 341 del 15/03/2022 - PE0000001 REsearch and innovation on future Telecommunications systems and networks, to make Italy more smart (RESTART) - CUP E13C22001870001</p>
Objectives	<p>The PhD will develop in the context of the PNRR activities on Telecommunications and will focus on the timely and strategic objective of making the communication networks sustainable and resilient. In particular, the research investigates how the introduction of renewable energy sources can contribute to achieve the twofold goal mentioned above. Both sustainability and reliability call for the introduction of new power supply systems that heavily rely on renewable energy sources. On the one hand, renewable energy sources can reduce the impact on the environment of the growth of the communication infrastructures. On the other hand, by becoming self-sustainable through distributed energy resources, the communication infrastructure improves in resilience with respect to power supply instabilities, a fundamental goal to cope with emergency and disaster management situations, as well as a strategic objective in the path for a higher degree of independence of the country in terms of energy supply and of robustness to cyberattacks.</p> <p>The research is organized in three main tasks:</p> <ol style="list-style-type: none">1. The first task is to develop resource and energy management strategies that jointly take into account the available energy, communication and

computation resources. The scheduling of such resources will consider: the demand for service ;the availability of communication and computation resources, with their energy requirements; the availability of energy, possibly coming from different sources, with associated price and environmental impact.

2. In the second task, the research will focus on incentive-based mechanisms for the effective interaction between smart the grid and the communication infrastructure.

3. Data-driven failure detection and management mechanisms will be designed to improve resilience by predicting the occurrence of failures and anomalies, and proactively managing the possible critical issues.

Skills and competencies for the development of the activity

Knowledge on communications and networking. Programming skills.
Competence on machine learning techniques.