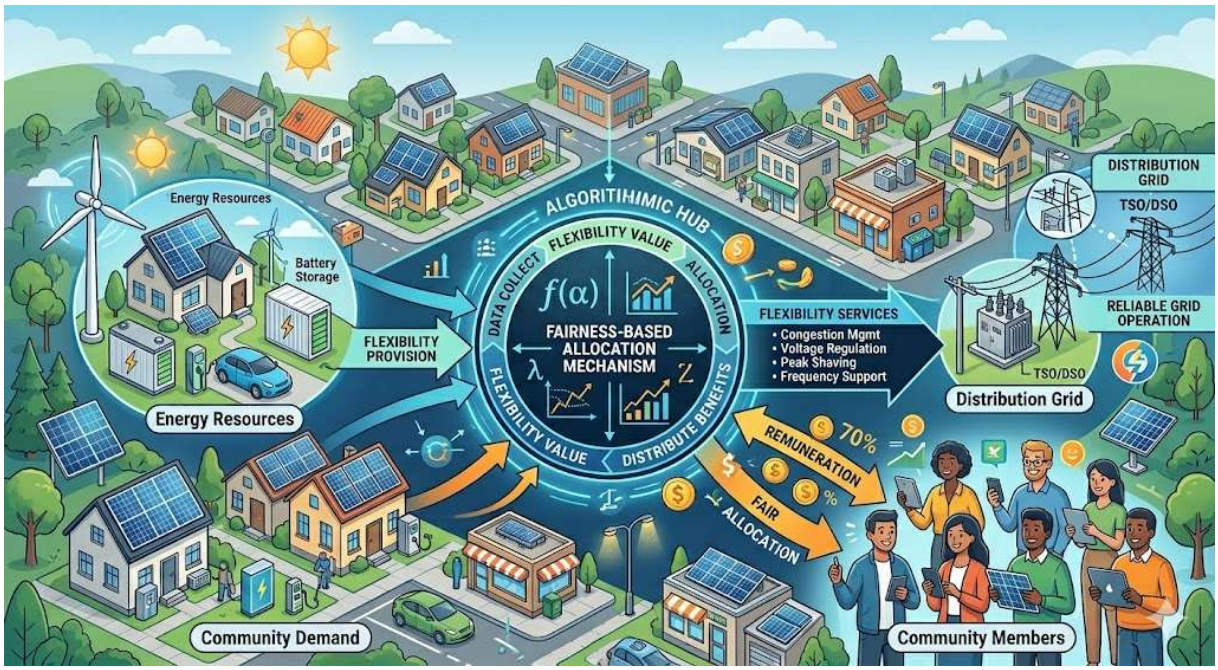
PhD Position in

Fair Provision of Flexibility Services in Energy Communities



Keywords: Energy communities, problem modelling, flexibility, optimization, power systems, electrical network operation

Lab: L2EP, Laboratory of Electrical Engineering and Power electronics, located at Lille – France (https://l2ep.univ-lille.fr), power system group.
The research project is managed by professors Bruno FRANCOIS and Joao SOARES

Abstract:
The transition of the power system towards increased renewable energy generation requires enhanced flexibility especially in low voltage networks where dynamics and excursions of power flows are higher. Collective self-consumption enables a better valuation of PV generation and appears also as a potential solution to manage consumer-level flexibility. In this context, two questions are addressed:

- How can intermittent pv generation be best managed for the mutual benefit of consumers and producers, while respecting grid constraints?
- How can sharing both PV production and flexible load demand improve the performance of an energy community?

So, the goal is to develop innovative methods for the optimal management of energy produced and consumed within a local energy community (LEC). These will share, in addition to the electricity produced, resources to implement flexibilities. Individual fairness, collective welfare optimization and grid services for the power system operation are essential and must be prior. Scientific developments are ordered following:

- A mathematical modeling of flexibility and discomfort for heterogeneous community members while considering sociological profiles.
- A multi-level optimization framework that balances individual fairness, collective community welfare, and grid service provision.
- Scalable computational methods for real-time deployment and digital twins.
- Validating behavioral and technical models with empirical data from LEC demonstrations.

By positioning fairness as a core design principle rather than an afterthought, this research will enable viable, socially acceptable, and scalable LEC capable of meaningful contributions to energy transition while providing valuable grid flexibility services. It will pool knowledge and skills developed by French and Portuguese research groups in energy management systems, optimization techniques, socio technical modelling and experimental implementation through real time simulations.

Ideal profile:

- A MSc in Computing Science or Electrical Engineering with a focus on power system design and operation
- Knowledge in energy communities, problem modelling, flexibility, optimization, power systems, electrical network operation
- Strong analytical and programming skills, experience in at least one software platform: Python, MATLAB
- Research experience/publications in project related areas
- The candidate must have the ability to work independently, good analytical, synthesis and innovation skills
- Good communication and writing skills in English

Benefits:

- Fully funded position with competitive stipends
- International R&D project with mentorship of experts of two laboratories (L2EP in France, GECAD in Portugal)
- Funding support for international conferences
- Experiences in two laboratories: 18 month in GECAD (Portugal) / 18 months in L2EP (France)
- Access to lab facilities, computational ressources and home industrial demonstrators for tests

Starting date: Between September and 1st December 2026, duration 36 months, full time position. Postdoc or Track chair position can be considered after the PhD.

How to apply ?

The application must include in the first round:

- Curriculum vitae (CV).
- Cover letter
- Obtained grades obtained during your last 3 years of graduate studies and program of courses attended by students graduated from a university abroad. Official academic transcripts must be provided for each semester of each year. If you do not have a transcript (examples: internships, breaks,...), you must enclose a justification.
- Copy (pdf) of your personal works (internship reports, professional experience, academic projects, etc...)

And in the second round:

- Photocopy of diplomas. For students with foreign degrees, the translation must be certified by a consular officer.
- Letter, name and email address of two referees
- Copy of your passport or ID card
- Deadline: 2nd May, 2026

Send your application to the following email address: bruno.francois@centralelille.fr

Key bibliography:

Allard, J., Stegen, T., Vallée, F., De Grève, Z., Glavic, M., & Cornélusse, B. (2024). Quantifying, Activating and Rewarding Flexibility in Renewable Energy Communities. IEEE ISGT Europe 2024.

From GECAD – ISEP Porto:

Soares, J., Lezama, F., Faia, R., Limmer, S., Dietrich, M., Rodemann, T., Ramos, S., & Vale, Z. (2024). Review on fairness in local energy systems. Applied Energy, 374, 123933.

Almeida, J., Soares, J., Aliyan, E., Limmer, S., Faia, R., & Ramos, S. (2024). Fairness Index Analysis in Local Energy Communities Considering Electric Vehicles and Energy Storage. In Proceedings of ICSC-CITIES 2024 (pp. 175-189). Springer.

From L2EP – University of Lille:

Bossu, A., et al. (2024). Energy Management Based on Coalitional Game Subdivision Applied to Energy Communities, Sustainable Cities and Society, Elsevier, vol. 117, dec. 2024, 105911

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