

PhD Position in Building Energy and Environment Group- BEE Group (VAC-2021-24)

Title of the PhD project: Data intelligence and advanced control technologies to enable energy flexibility and renewable energy in low and medium voltage electricity networks

INTRODUCTION:

The International Centre for Numerical Methods in Engineering (CIMNE, www.cimne.com) is a research centre, created in 1987 by consortium between the Catalan Government and the Universitat Politècnica de Catalunya (UPC-BarcelonaTech), devoted to the development and application of numerical methods to a wide range of areas in engineering. CIMNE has been selected as a Severo Ochoa Centre of Excellence for the period 2019-2023, the highest level of recognition of excellence and leadership awarded to a research centre in Spain.

POSITION DETAILS

Number of vacancies: 1

Category: PhD (PHD2)

Location: Terrassa

Yearly salary (gross): 20.000 EUR

Working hours: Full time

Duration: 3 years

Starting date: No later than Sept 2021

FUNCTIONS TO BE DEVELOPED BY THE APPLICANT

CIMNE is looking for a **PhD Researcher** to be part of the Research and Technical Development (RTD) Group on Building Energy and Environment (BEE).

The functions assigned to the candidate will be:

- Complete a PhD on Electrical Energy Systems at the Campus in Terrassa, of the Universitat Politècnica de Catalunya – Barcelona Tech. The candidate is expected to complete the PhD thesis in a maximum of three years.
- Collaborate with various research groups within CIMNE and worldwide.
- To publish a minimum of two papers in JCR journals during the PhD period, author and co-author articles in high-impact international journals.
- Carry out quality research, training and management.
- Participate on the dissemination and outreach activities associated with the project.

- Participate in international conferences presenting her/his work.

DESCRIPTION OF THE PHD PROJECT:

The introduction of flexible and distributed energy resources in the low and medium voltage networks, is one of the main challenges that distributed generation systems and smart grids should face. Such resources need the development of new Demand Response (DR) services which are necessary to guarantee a stable operation of the distribution and transmission networks. They are as well a key issue for the massive deployment of renewable energy (RES) generation and storage systems, as well as for the effective integration of prosumers in the energy system.

At the level of TSOs and DSOs there are initiatives to open the electricity markets to aggregators or to energy communities. However, the engagement of these agents will be linked to their capability to compete in bid based marketplaces, where an advanced control of end users generation/consumption/storage profiles should be managed. At the present time, the engagement of end users, as well as the role of the DSOs in this new paradigm is still missing. On the other hand, the massive penetration of smart meters and the increasing monitoring of the low and medium voltage electricity network makes large amounts of data available and ready to contribute to increase the grid management intelligence.

This PhD is devoted to develop new data driven methods, as well as new edge intelligent systems that should enable an effective connection between the DSOs, the aggregators, the distributed Energy resources (DER) and the small scale end-users. The availability of local data will permit to provide optimal forecasting and predictive control methods for the end users, based on the analysis of their consumption, generation and storage capabilities. Moreover, by using Artificial Intelligence (AI) techniques, as well distributed intelligence at the edges of the grid, district level profiles will be issued, permitting not only to analyze solutions for end users, but also for energy communities. The PhD is supported by a very active network of Catalan DSOs (PEUSA, ESTABANELL and Bassols), which are fully engaged in offering their electricity infrastructure and all their data management architecture as real operational test-beds for the developments to be carried out within this PhD proposal.

References

Control of power converters in AC microgrids; Rocabert, J.; Luna, A.; Blaabjerg, Frede; Rodriguez, P.; IEEE transactions on power electronics; Vol. 27, num. 11, p. 4734-4749; DOI: 10.1109/TPEL.2012.2199334

Flexible grid connection and islanding of SPC-based PV power converters, Rodríguez, P.; Citro, C.; Candela, J.; Rocabert, J.; Luna, A. IEEE transactions on industry applications, Vol. 54, num. 3, p. 2690-2702 DOI: 10.1109/TIA.2018.2800683

A review of deterministic and data-driven methods to quantify energy efficiency savings and to predict retrofitting scenarios in buildings. Grillone B., Danov S., Sumper, A., Cipriano, J. Mor G. Renewable and Sustainable Energy Reviews/Volume 131, October 2020, Article number 110027.

REQUIREMENTS

1. Education in either MSc in Computer Science, MSc in Telecommunications, MSc in Electrical Engineering, MSc in Data Science
2. Overall marks profile with an average higher than 7,5 over 10 (following the Spanish score) or equivalent
3. Good knowledge of IoT tools and protocols (Node Red, MQTT, VPN...)
4. Minimum knowledge of Data Base management (relational and non-relational)
5. Minimum knowledge of Cloud based systems and tools (Docker, AWS, Azure)
6. Good knowledge of electrical engineering related to low and medium voltage networks
7. Good level of Python or R programming
8. Good English communication skills
9. Spanish or Catalan will be positively considered

EVALUATION OF CANDIDATES

The requirements and merits will be evaluated with a maximum mark of 100 points. Such maximum mark will be obtained by adding up the points obtained in the following items:

- Academic record (60%)
- Previous research and academic experience in the field of the position (20%)
- Programming skills (10%)
- Language skills (10%)

HOW TO APPLY

Candidates must complete the "Application Form" form on our website, indicating the reference of the vacancy and attaching the following documents **in English**:

- Curriculum vitae
- A motivation letter
- Academic transcripts from all Undergraduate and MSc degrees
- Name and institutional contact information of two possible referees

The deadline for registration to the offer ends on 31st May, 2021 at 12 noon.

The shortlisted candidates may be called for an interview. They may also be required to provide further supporting documentation.

CIMNE is an equal opportunity employer committed to diversity and inclusion. We are pleased to consider all qualified applicants for employment without regard to race, colour, religion, sex, sexual orientation, gender identity, national origin, age, disability or any other basis protected by applicable state or local law. CIMNE has been awarded the HRS4R label.