

Ph.D. position offer:
Integration of hydrogen energy in electric power systems of
French islands: placement, sizing and management

2021-04-20

Keywords

hydrogen energy, electric power system, planning, energy management, sizing, placement, renewable energy, energy storage, optimization

Context

Due to climate change and its consequences, the need to transition to cleaner energy sources has never been more important than today. For most islands, electricity generation mostly depends on fossil fuels and a transition to intermittent renewable energy sources would require a profound rethink of how energy is produced, managed and consumed. The HyLES project, funded by the French research agency ANR, aims to study the role that hydrogen energy can play to decarbonize energy in the following islands: Corsica, La Réunion and French Polynesia.

The Ph.D. position is part of this project. It is funded for a duration of 36 months. The student will spend 18 months at Université de La Réunion and 18 months at Université Bourgogne Franche-Comté (UBFC).

Scientific objectives

The focus of the Ph.D. thesis is on the optimal integration of renewable energy and hydrogen in the power system of the islands studied in the HyLES project. The main steps of the thesis will be as follows:

- Review of the related state-of-the-art,
- Collection of the necessary data and modeling of island power systems,
- Preliminary study of the integration of renewable energy and energy storage equipment, considering scenarios and constraints identified in the project,
- Design of an electric energy management strategy for the proposed systems, also considering mobility applications (e.g., refueling stations),
- Placement and sizing problem formulation, implementation and solution,
- Writing of the thesis document and defense.

The selected applicant will also be expected to:

- Publish in international journals and conferences,
- Participate in project meetings, in the writing of deliverables as well as in communication and dissemination events,
- Participate in the scientific activities of the respective laboratories and universities.

Expected qualifications

- Master's or *ingénieur* degree in electrical engineering, applied mathematics or a related field,
- Interest for energy issues and research,
- Knowledge in power systems, renewable energy, hydrogen energy, optimization,
- Experience with Python and/or Matlab programming,

- Good level of written and oral English and, preferably, French.

Supervision

The selected Ph.D. student will be supervised by:

- Dr. Robin Roche, Associate Professor HDR at UBFC, FEMTO-ST and FCLAB,
- Prof. Michel Benne, Professor at Université de la Réunion, ENERGY-lab,
- Dr. Dominique Grondin, Associate Professor at Université de la Réunion, ENERGY-lab.

Application

Please send a detailed CV and transcript of results to the following email addresses:

- robin.roche@utbm.fr
- michel.benne@univ-reunion.fr
- dominique.grondin@univ-reunion.fr

Additional information

About the HyLES project

HyLES is a research project funded by the French Research Agency (ANR) from 2021 to 2024. It aims to study the role that hydrogen can play to decarbonize energy in islands, with a focus on the following French islands: La Réunion, French Polynesia and Corsica. The project brings together a multidisciplinary group of researchers from electrical and thermal engineering as well as climate sciences, economics and sociology. For more information, see: <https://projects.femto-st.fr/hyles>.

About Université Bourgogne Franche-Comté

Université Bourgogne Franche-Comté (UBFC) is a community of universities and institutions which gathers seven higher-education and research institutions. UBFC currently hosts more than 60,000 students and 8,800 staff. It spreads across 13 sites in the Bourgogne Franche-Comté region in France. FEMTO-ST is a joint research unit of several UBFC institutions (Université de Franche-Comté, ENSMM, UTBM) and CNRS, the French national research center. With over 800 researchers and staff, it is a leading institute in the field of engineering sciences. Its Energy department is located in Belfort, France, and hosts the largest French research group in hydrogen energy. FEMTO-ST is a partner of FCLAB, a CNRS unit dedicated to applied hydrogen energy research and transfer. For more information, see <https://www.ubfc.fr/> and <https://www.femto-st.fr/>.

About Université de La Réunion

Université de La Réunion is a French public higher education and research institution, located in the heart of the Indian Ocean, one of Europe's outermost regions. By virtue of its unique geostrategic position it is the only European university in the region. 15 000 students are admitted every year at six sites on the island. ENERGY-lab is a research unit associated with the Science and Technology Department of the Université de La Réunion, created in 2006. Composed of nearly 40 researchers and staff, the unit is structured in three scientific operations (SO) articulated around the central axis of optimisation of solar or intermittent intelligent energy systems:

- SO 1 – Solar field: variability in La Réunion and in the tropics, metrology and modelling,
- SO 2 – Energy storage and conversion: Fuel Cell (FC) systems and hybridisation,
- SO 3 – Energy optimisation of sensor networks.

For more information, see <https://www.univ-reunion.fr/>.