



RESEARCH INTERN :
**CHARACTERISATION OF THE OPERATING CONDITIONS OF FLOATING
PHOTOVOLTAIC SYSTEMS**

- **In short**

The internship focuses on Floating Photovoltaic (FPV) systems, which generate solar energy on lakes, primarily artificial ones. The internship has two main parts : a literature review examining FPV operating conditions, temperature variances compared to traditional systems, and the impact of configuration on performance ; and the development of a numerical model to assess different FPV designs and their impact on electricity production. This involves exploring various modeling approaches, from simple thermal models to complex computational fluid dynamic models.

- **Place**

LOCIE Laboratory UMR CNRS 5271 University Savoie Mont Blanc bât. Hélios, 60 av. du lac Léman, Savoie Technolac, 73376 Le Bourget du Lac

- **key-words**

floating photovoltaic, solar energy, literature review, research project, thermal energy

Content of the internship

Floating Photovoltaic (FPV) is gaining growing interest as it allows for the generation of photovoltaic energy in large areas with much less land use competition. FPV projects have been developed worldwide. The basic concept of FPV consists of installing PV systems in lakes, often artificial (dams, former quarries). These PV systems are mounted on floats, and the generated electricity is transported to land.

Unlike classical ground or roof-mounted PV systems, the operating conditions of FPV are not entirely known due to the presence of the lake. Indeed, the lake presents a high inertial, low-temperature source likely to influence the temperature of the FPV and, consequently, its performance in terms of electricity production. Additionally, it is of interest to investigate the influence of the FPV system on the lake, as some recent studies suggest that it could reduce the evaporation rate of the reservoir, which would be beneficial during dry periods.

This internship will be divided into two parts. The first part will involve conducting an in-depth literature review on the operating conditions of FPV and their impact by addressing, among other questions :

- What are the operating temperatures of FPV compared to classical PV ?
- What are the gains/losses inherent in this operating temperature ?
- What is the influence of the FPV configuration (spacing, technology, type of floats, etc.) on the operating conditions ?

This literature review will need to provide a comprehensive and worldwide overview of the mentioned issues and will take the form of a concise summary.

The second part of the internship will involve creating a numerical model of an FPV system to test different types of designs and evaluate their impact on electricity production. Various modeling approaches will be tried, from simple 1-2D thermal models accounting for heat exchange between the PV system and the environment to more complex 2D-3D computational fluid dynamic models.

Your profile

You are currently enrolled in a 5-year engineering degree program, specializing in Mechanics, Energy, Thermal Sciences, or General Engineering, and are seeking a 6-month internship. Proficient in English (reading and writing), you possess a genuine interest in scientific research. Your expertise includes thermal and fluid sciences, and you have coding skills in languages such as Python, and potentially Matlab. Being proficient in French would also be an asset,

We offer

This internship work will be carried in the framework of collaboration between Ciel et Terre International and the LOCIE Laboratory (UMR 5271 CNRS – Université Savoie Mont Blanc, Institut National de l’Energie Solaire). The internship will take place at the LOCIE laboratory, 60 av. Du lac Léman, Savoie Technolac, 73376 Le Bourget du Lac.

- At **Ciel & Terre**, we are deeply engaged in the development of the international and fast-evolving floating PV market with more than 1.6G Wp installed or under-installation, which implies experience and a high-level of expertise, and we have the ambition to remain leaders and go further to realize its potential.

- **USMB** (Université Savoie Mont Blanc) - With 15,000 students, a rich and multidisciplinary offer of academics and 18 internationally recognised research laboratories, Université Savoie Mont Blanc (Chambéry) is a high-level research and multidisciplinary university which has developed significant expertise in solar energy, energy efficiency in buildings, and modelling and information sciences.
- **CNRS** (French National Centre for Scientific Research) is among the world's leading research institutions. Its scientists explore the living world, matter, the Universe, and the functioning of human societies in order to meet the major challenges of today and tomorrow. Internationally recognised for the excellence of its scientific research, the CNRS is a reference in the world of research and development, as well as for the general public
- **INES** (National Institute of Solar Energy) is a global leader in R&D, expertise, and training for advanced solar technologies, their integration into systems, and intelligent energy management.

Practical information

Start date : March 2024

Supervision by : **Martin Thebault** (CNRS), **Christophe Ménézo** (USMB), Olivier Nocture (CTI)

Duration : 5-6 months

Gratification : around 575 €/month

Application : **Deadline the 31st of January, send CV and motivation letter to martin.thebault@univ-smb.fr**