Hydrogen is the only carbon-free storable fuel. When combined with renewable energy sources (wind, solar, hydro, wave and tidal), it has the potential to become one of the main contributors of a sustainable future as a green energy vector.

The project aims to handle dynamic management of a decentralized Power-to-Hydrogen system where electricity is converted into hydrogen fuel for a zero-emission mobility. Multiple economic agents with conflicting interests are involved in the renewable electricity-based hydrogen supply chain.

This PhD thesis will focus on bilevel modeling the Stackelberg game played between two decision makers: a renewable energy supplier and a hydrogen asset operator. The former competes in a day-ahead energy spot market and offers other services (such as ancillary services) besides energy while facing an uncertain energy generation, changing spot prices and a varying demand. The latter focuses on producing hydrogen while respecting operational constraints and limitations at a minimum cost.

Bilevel programs are inherently hard to solve, especially under uncertainty. Therefore, there will be a strong emphasis on finding efficient exact and/or heuristic solution methodologies. Different types of real-life or realistic data will be available for testing.

We are offering a 3-year CIFR PhD thesis at PersEE Innovation, a Lyon-based startup company (Sezin Afsar), in collaboration with Ecole des Ponts ParisTech (Michel De Lara).

Keywords: supply chain, renewable energy, hydrogen, stochastic optimization, bilevel optimization, game theory

Required Technical Skills:

- Master's degree or equivalent in Industrial Eng, Computer Science, Applied Math or any relevant subject **from a European institution**
- Experience in Python/C/C++ and solvers such as GAMS, CPLEX or Gurobi
- General knowledge of mathematical programming and optimization. Expertise in stochastic and integer programming is an advantage.
- Familiarity with at least one of relevant fields (energy systems and markets, renewable energy, supply chain management, metaheuristics…)

Behavioral Skills:

- Adaptability to team work
- Curiosity and enthusiasm to learn
- Flexibility
- Being open to new ideas and innovations
- Willingness to contribute to a cleaner future
- Speaking French is a plus

Candidates may send their CV, transcript, motivation letter and references to saf@pers-ee.fr until 31/07. Start date will be 01.12