**PostDoc : Green Hydrogen supply chain optimisation**

The project provider

Based in Lyon, Persee is a startup serving the energy transition, and in particular hydrogen (H2) as a means of decarbonising urban areas and storing renewable energies. Positioned as an expert in the sector, the company develops cutting-edge tools to design, set up and manage new hydrogen infrastructures in an agile manner. Its vocation: to simplify and make accessible to all users the complexity of energy systems, and of hydrogen in particular. The team brings together skills in technological analysis, optimization, web development, IoT, automation.

General context

Fuel cell vehicles offer a great potential to facilitate the transition to zero-emission mobility, but their ability to achieve this potential depends on the establishment of a network of hydrogen refueling stations (called HRS) and ensuring competitiveness to build resilient H2 ecosystems. The supply of H2 to these stations is provided in particular by on-site production by electrolysis of water (decentralized or semi-centralized).

Project context

The project lies in a greater attempt to research optimal design, deployment and management of Green Hydrogen Supply Chains (HSC), and the development of associated software automation tools. Several research projects mostly led by Persee with European, National and local funding have helped progress on the topic and create connections with 2 important labs [CERMICS](https://cermics-lab.enpc.fr/) in Paris region and [LGC](https://lgc.cnrs.fr/en/) in Toulouse region and various [IEA TCP](https://www.iea.org/areas-of-work/technology-collaboration) tasks.

One of the main challenges revealed by the research work lies in the ability to understand in an integrated way the level of variability and complexity that exists in green hydrogen systems and to represent, with the ‘right’ level of granularity, the temporal, spatial, technological and cross-sectoral aspects of HSC.

The project

The project focuses on Green Power to Hydrogen mobility.

The ambition of the project is to enhance the techno-economic performance of a HRS network (with their production unit) in urban areas. Its objective is to further improve the existing methodology of Hydrogen Supply Chain (HSC) design which consists of production, storage, compression and distribution of hydrogen. This optimal design will be achieved by taking into account operational costs and uncertain parameters such as the arrival profile of vehicles at the station, and the price and availability of green electricity (sourced from the grid), electricity being the main energy source of production and the most important cost component.

The project duration is one year with the possibility of extension.

*The use case*

The use case is from California (where support for the hydrogen sector is very important).

See https://cafcp.org/ and associated resources https://cafcp.org/resources

Electricity is considered to be purchased day-ahead on the CAISO market http://www.caiso.com/TodaysOutlook/Pages/Prices.aspx where prices are volatile at hourly intervals and during periods of prohibition of production (known on D-1 in the morning).

*The project steps*

* Understanding the modeling of infrastructure elements to respond to two issues (dimensioning and control) in conjunction with the Persee team.
* Understanding the existing solution methodology based on Benders decomposition and its limitations
* Treating 2 years of historical data of a subset of Californian stations
* Identifying the uncertainties and the best modeling approach to integrate them smoothly to the existing model
* Identifying possible complementary resolution approaches that could leverage the current method besides alternative approaches
* Quantitative verification by use cases and comparison of approaches.

Required skills

* PhD in Computer Science, Operations Research, Applied Math or any related field
* Experience in mathematical modelling, stochastic optimization, exact and heuristic algorithms
* Experience in programming Python/C++/Julia and CPLEX/Gurobi
* Willing to work in an international team
* Interest in renewable energy and climate crisis

Contact: Sezin Afsar ([sef@pers-ee.com](mailto:sef@pers-ee.com)) with a CV, publications, motivation letter and references

Learn more about hydrogen and FCEVs

<https://www.californiahydrogen.org/resources/hydrogen-faq/>

<https://www.energy.gov/eere/fuelcells/increase-your-h2iq>