

## The project provider

Based in Lyon, Persee is a startup serving the energy transition, and in particular hydrogen 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.

## 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 these stations is provided in particular by on-site production (decentralized or semi-centralized) by electrolysis of water.

## The project

The ambition of the project is to facilitate / accelerate the deployment of an HRS network (with their production unit) in urban areas. Its objective is to further improve the existing design of production and its storage, and the optimal control of these. This will be achieved by taking into account the main uncertainties such as the arrival profile of vehicles at the station and the price of electricity which is the main energy of production and the most important cost component.

## The use case

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

See <https://cafc.org/> and associated resources <https://cafc.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

- Modeling of infrastructure elements to respond to two issues (dimensioning and control) in conjunction with the Persee team.
- Modeling of the electricity system from CAISO data and taking as reference the publication "Forecasting performance of time series models on electricity spot markets: a quasi-meta-analysis" to compare different approaches and choose the one that suits best.
- Improving vehicle profiles through data processing
- Optimization of hydrogen production, taking as a reference the publication "Large-scale unit commitment under uncertainty: an updated literature survey" for an overview of existing methods
- Identification of possible resolution approaches
- Development of a resolution by a minimalist approach, pragmatic if possible (two even better)
- Quantitative verification by use cases (and comparison of approaches if time permits).

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

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