FEVER

Future Electric Vehicle Energy networks supporting Renewables

Engineering and Physical Sciences Research Council

# WP4: Communications & Trading

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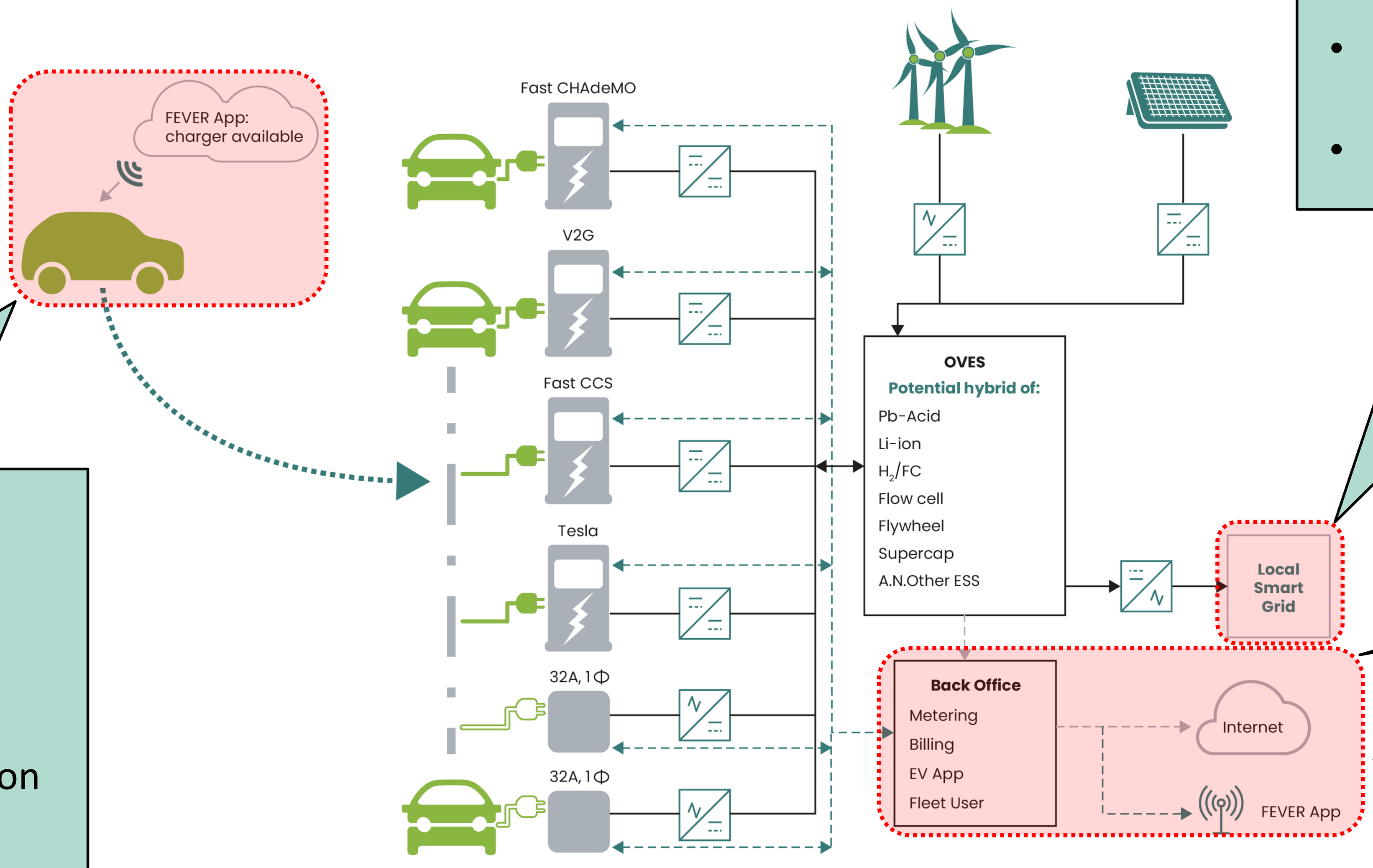
## Overview

**Aim:** Develop underlying ICT system for OVES charging stations




**FEVER App**

- Manages user charge sessions
- Provides availability information
- Offers routing advice
- Provides incentives to maximise utilisation and balance supply / demand

**Peer-to-Peer Trading**

- Trades with local smart grids, including other FEVER stations
- Provides appropriate market mechanisms

**Communications System**

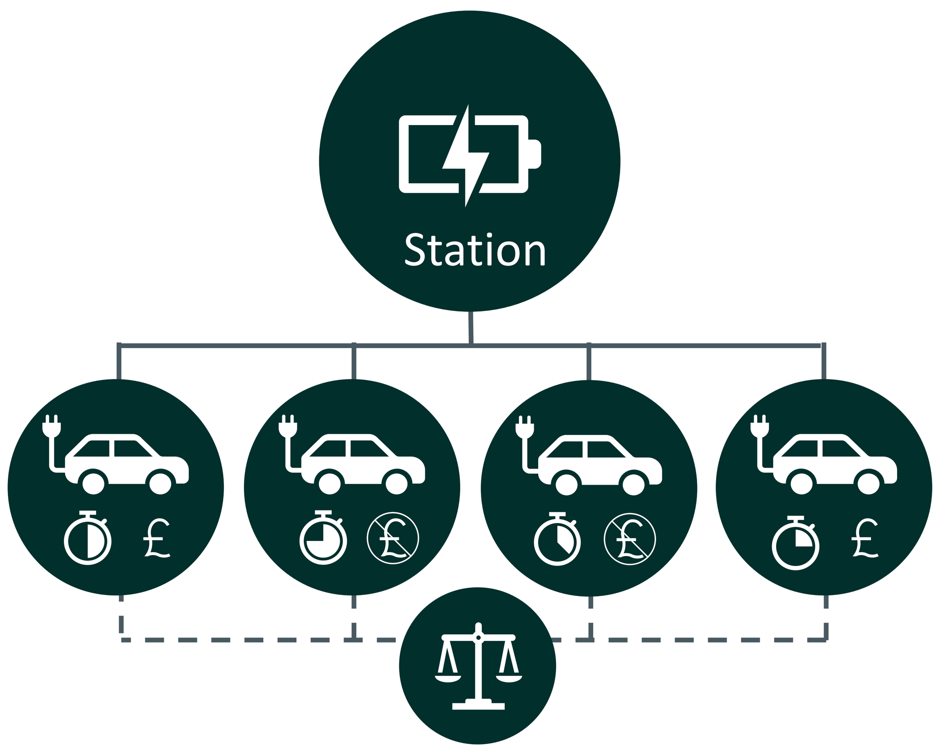
- Manages billing
- Allows remote monitoring

**Smart Charging**

- Controls charging to maximise efficiency and manage limited supply

## Smart Charging

**Aim:** designing a mechanisms to charge cars efficiently based on the setting, requirements and urgency.



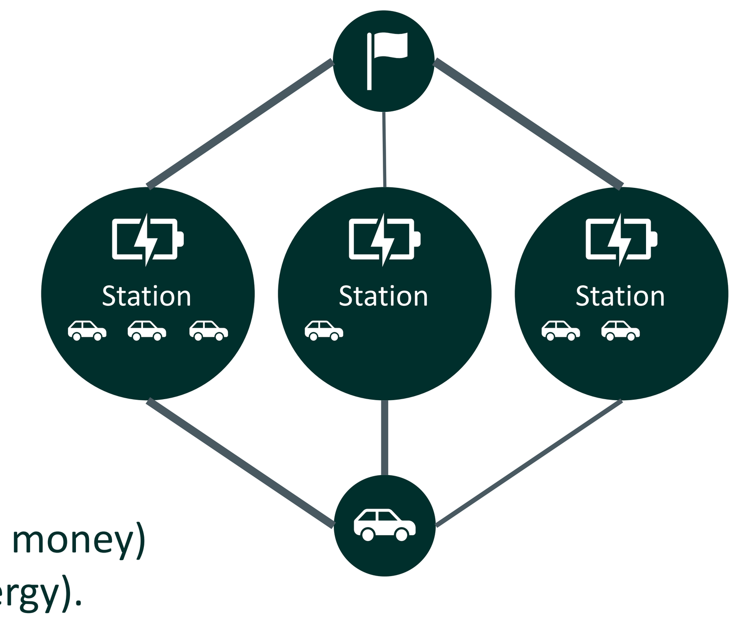

The **setting** may be classified as *free,* e.g. employees charging in a Company's car park, *chargeable, e.g.* a public charging station, *exclusive, e.g.* electric plane charging at an airport, or a combination thereof.

**Requirements** and **urgency** that constrain the operation are due to users' time and monetary constraints as well as the systems current and future available electricity

**Approach:** by controlling the payments and the amount and speed of charging the needs of the systems and the users can be balanced. Moreover, various levels of fairness (unpaid, unpaid vs paid) and preferential treatment can be taken into consideration.

## FEVER App

**Aim:** develop an app that increases the efficiency of charging stations, and the convenience and cost of users, i.e. drivers, by recommending routing options and adjusting the price of charging.



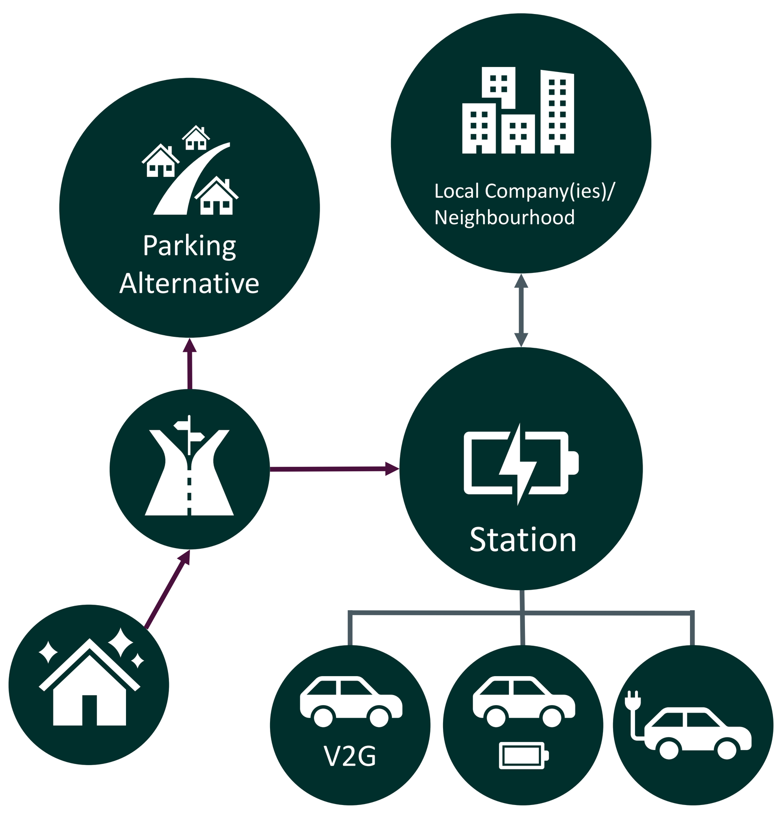

This aim is **constraint** by the circumstances of the users (current location, destination, available time, money) as well as of the stations (congestion, available energy).

**Approach:** pricing options may include charging a premium during peak hours in relating to a station's congestion or the overall load of the electricity grid, giving a discount to drivers who adapt their route, and charging a reservation price for advanced booking.

Routing algorithm publication: Shafipour, Stein, Ahipasaoglu (2023). Personalised electric vehicle routing using online estimators. AI4S Workshop.

## Trading and Participation

**Aim:** devising options for local smart energy grids with different participation modes and incentives to participate.



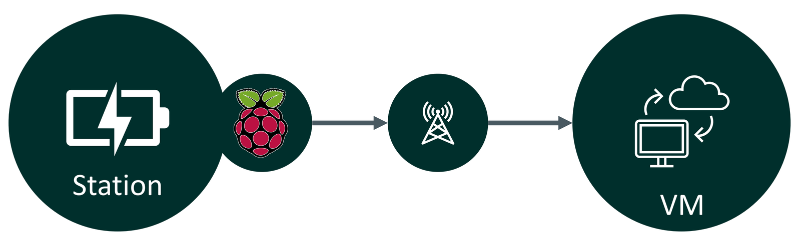

An example may be a combined car park and charging station (e.g. P & R) in which cars can be charged but also may provide their stored electricity to the local grid.

**Requirements:** for a system that is efficient and to the benefit of the users, the system must ensure that drivers' travel requirements and convenience are considered, and participation and costs associated with battery degradation are fairly compensated. These considerations will be affected by the operation, e.g. if the charging is free or discounted, if the cars can sell to the local grid (V2G) and if the cars can be used as temporary storage.

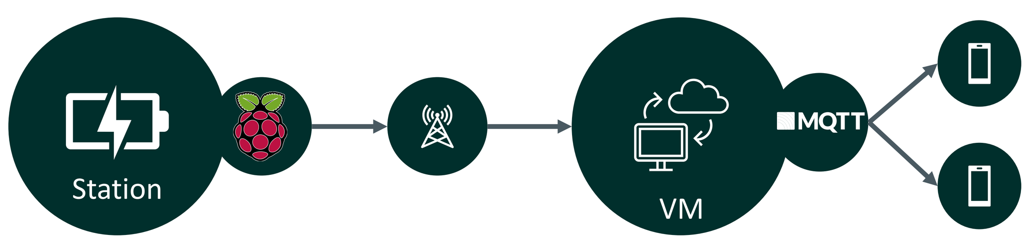
## Communication

Charging stations require a robust mean for communication and remote control to satisfy operational, legal and research related requirements.

A purpose-build communication system is being developed to satisfy these requirements. This systems capabilities are: 1) monitoring of the status of any FEVER station and 2) sending control commands to the FEVER station. The system utilises a Raspberry Pi to forwards data to a web-based data collection service as well as to receive commands.




A possible extension of the system could allow live on-the-go information via the IOT MQTT protocol.

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