

## SmartGrid Demonstrator

*Production – Auto-consumption – Storage – Flexibility – Mobility*

*Project's technical framework*

### CONTEXT

Public distribution networks are, depending on the zone, strongly impacted by decentralized wind and / or photovoltaic energy production. Distribution System Operators (DSOs) are therefore at the heart of the problem, connecting several megawatts of wind and solar renewable energy production on both the medium and low voltage networks.

The French energy transition law will accentuate this trend with an ambitious short-term renewable energy production target, set at 32% by 2030. In addition, this same law and the low carbon strategy tends to favor the development of electric vehicles with scenarios for 4 million electric vehicles by 2028 with as many charging points.

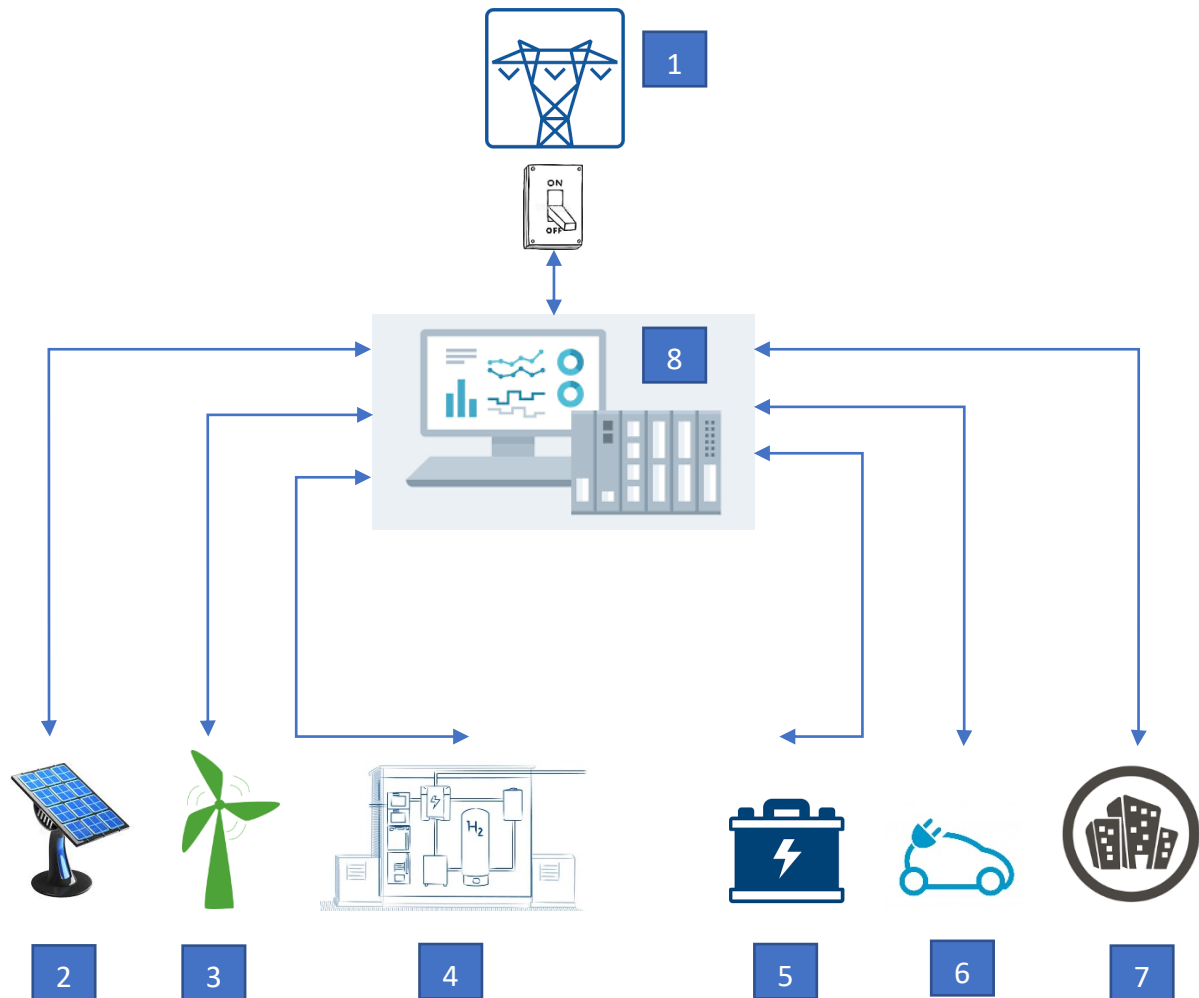
After the PACTE law, the climate energy law of November 9<sup>th</sup> 2019 widened the scope of collective self-consumption on an experimental basis to installations located on the same local low voltage network. The application decree of November 21, 2019 specifies this perimeter with a maximum distance of 2km separating the delivery points and a cumulative power of 3MW from the production facilities.

The integration of renewable energy, collective self-consumption and electric mobility must necessarily be considered in both the construction and management of the future networks and in the services to be offered to network users.

It is within this context that a Partner DSO wishes to act, prepare and support this change. This DSO's Microgrid demonstrator aims to integrate this shift in energy production and management and to make it possible to qualify the new integrated system in an operational environment.

## PROJECT PRESENTATION

The project consists in the construction of a microgrid; a mini network made up of different sources of renewable energy production and storage, according to the diagram set out below:



1. Low-voltage public distribution network

2. Photovoltaic production with a maximum power of **100 kWp** composed of fixed panels, solar shade and / or trackers

3. Vertical axis wind turbine with a maximum power of **6 kW**

4. Hybrid Hydrogen generator/storage system with a power between **20kW and 70kW**, H2 storage of around **100kg**

5. Electrochemical battery sodium / lithium - ion **20kW - 100kWh**

6. Electric vehicle vs H2 / Electric charging station vs H2 / V2G

7. Decentralized storage (powerwall)

8. Monitoring / supervision system (BMS-EMS-DMS)

## GOALS

The system must make it possible to test and validate the optimization of production and consumption flows by:

- o Energy production forecast,
- o Efficient production management,
- o Using the battery of electric vehicles for network needs: Vehicle-to-Grid (V2G),
- o Planning and monitoring energy self-consumption (predicted and realized rate)
- o The storage and use of energy according to users' and flexibility needs both from a network point of view (system services) and from an economic development point of view for the user.

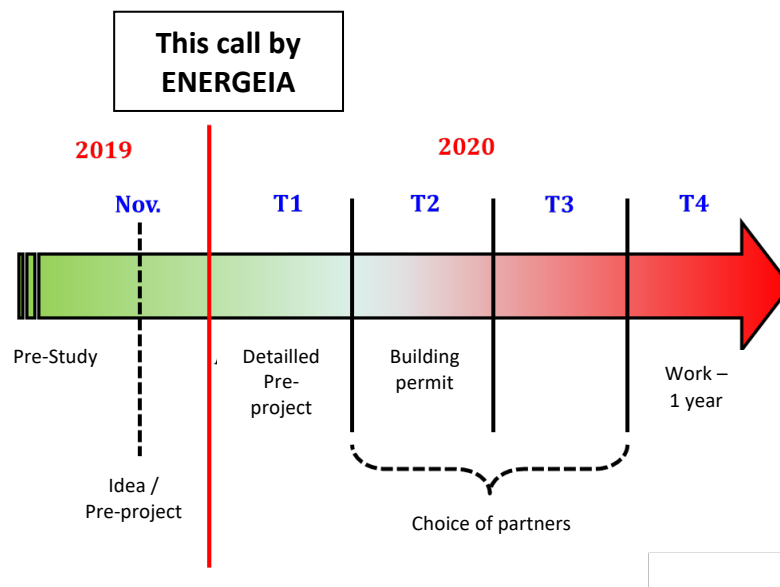
The system must also incorporate an off-grid function (Off Grid).

The installation will mostly be piloted by a supervision system already used by the DSO which will therefore have to communicate with the energy management systems (EMS) and the battery management systems (BMS). It will also be tasked to inform of the various interactions with the nearby building.

An educational showroom representing the various power supply components of the adjacent building (lighting, office automation, supervision, servers, etc.) is thus envisaged in order to identify the priority services to be maintained in the event of a power outage and therefore the contribution of the production tool for feeding these different components.

The aim of the installation is also to present innovative solutions with a minimum Technology Readiness Level (TRL) of 6.

## PLANNING



Companies can participate directly in one or more of the bricks identified in the diagram above according to the sizing presented or complete this PoC by proposing the adaptation / addition of a functionality/technology responding to the themes of the competition:

- Renewable energy production
- Energy storage
- Carbon-free mobility
- Energy optimization