SUCCESS CASE 32.2024

Zero-emission Generators

FIRST OPERATIONAL IMPLEMENTATION OF A SOLUTION TO PREPARE THE REPLACEMENT OF CONVENTIONAL GENERATOR SETS WITH BATTERY-BASED SETS

THE CHALLENGE

With the goal of reaching carbon neutrality by 2050, Enedis is fully committed to reducing its direct CO_2 emissions. Essential to the quality of service for customers, gensets are deployed by Enedis when they are the best alternative to ensure the continuity of power supply in the event of disconnection due to an incident or during maintenance work on the distribution grid. However, the current conventional units have some drawbacks, primarily their CO_2 emissions, but also the emission of noise pollution and unpleasant odours. This project aimed to identify and test less-polluting alternatives.

THE SOLUTION

Enedis' ambition is to replace its conventional gensets with new environmentally friendly solutions. Today, Enedis is primarily focusing on technologies that would :

- Release less CO2 along their whole life cycle.
- Emit no particulate matter nor other air pollutants.
- Generate no noise.
- Be odourless.

So far, various types of solutions have been tested by Enedis and its operational teams, including battery-based solutions and hydrogen fuel cells. In addition, a few low-CO_2 emission solutions are also being investigated such as hybrid solutions (a battery coupled with a thermal unit) or thermal units powered by biofuel.

FOCUS ON BATTERY-BASED GENERATORS

Enedis has tested multiple battery-based generators with a power of 160kW and 400kW. Their dimensions can vary from one model to another but, overall, their form factor is a

container that can be transported to any point of the grid. Among the tested solutions are:

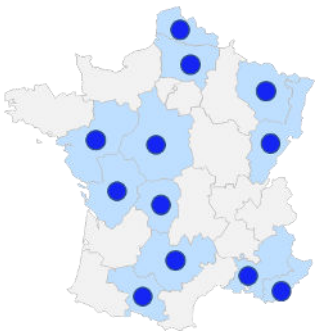
- 160 kW Lithium-Ion (Li-Ion) generator set with 3 hours of autonomy at maximum power (480 kWh): 4.5 m long x 2.2 m wide x 2.2 m high, with a weight of 8 tons. This equipment is designed to be transported and lifted by the Enedis logistics chain.
- 400 kW Li-Ion generator set, with 2 hours of autonomy at maximum power (800 kWh), 12 m long x 2.6 m wide x 3.8 m high. This equipment is designed to remain permanently on a 26-ton lorry.

Both models are composed of a set of Li-Ion batteries (LiFePO4). These batteries are connected to inverters that convert direct current into alternating current or vice versa. These inverters can work in grid-forming and grid-following mode.

The battery-based generators, which can be recharged either from the grid or a standard electric vehicle (EV) charger, are able to provide a temporary power supply to customers that are connected to an islanded part of the electricity grid during planned works or following incidents. The battery-based generators are also compatible with renewable energy sources (such as solar farms): they do not need to disconnect these sources prior to supplying electricity to the islanded network, and they are able to disconnect or connect these renewable resources by managing the frequency.

MAIN ACHIEVEMENTS

Enedis is currently carrying out the experimental phase, aiming to assess whether these technologies meet their needs across different configurations, various regions, and a wide range of operational teams.



These trials have been conducted since 2022 in several regions of France:

- In 2022, two first Li-Ion battery generator prototypes were deployed in two regions.
- Since April 2024, an additional ten Li-Ion battery generators has been deployed across ten other regions.

Today, there are twelve Li-Ion battery generators in operation nationwide at Enedis.

WAY FORWARD

The next steps are to complete the current trials and assess other solutions, such as hybrid generators and modular battery generators, to build in 2025 a roadmap for replacing Enedis' conventional generators.

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