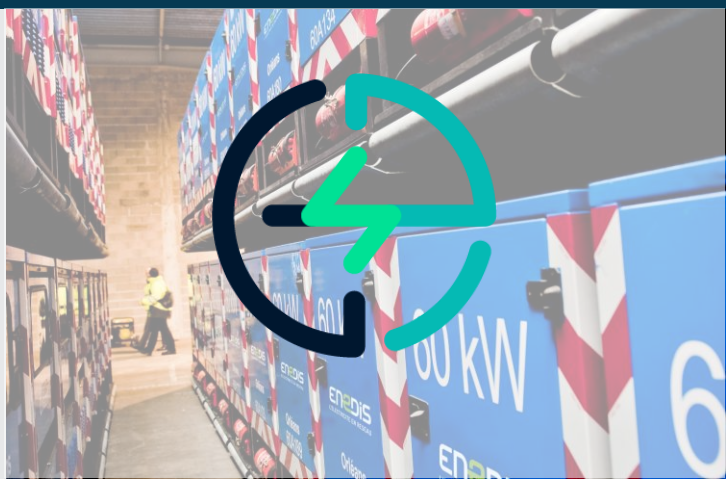
SUCCESS CASE 36.2025

PRODiGE

SIZING OPTIMISATION OF GENERATOR SETS FOR LV GRID INTERVENTIONS



THE CHALLENGE

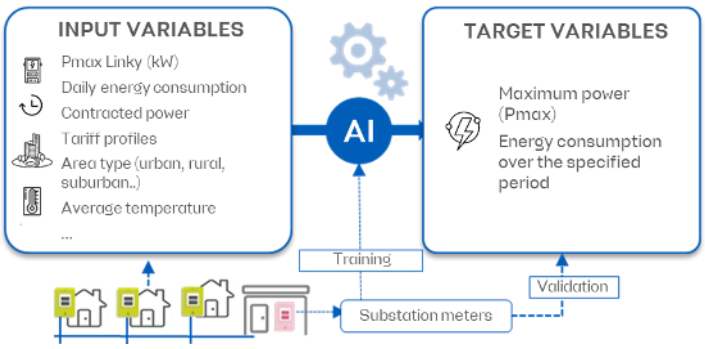
Enedis, the French DSO, operates more than 800’000 secondary substations to deliver a reliable electricity supply across its extensive low-voltage (LV) distribution network. Each year, around 20’000 network maintenance operations require the **temporary shutdown of secondary substations**. To maintain power continuity during these operations, **generator sets** (gensets) **are deployed**. Most gensets are owned by Enedis, however, rented gensets are also used when internal ones are unavailable or unsuitable. Genset capacity was usually determined by using simplified models based on transformer ratings and aggregated annual power demand data from Linky smart meters, deployed across the French LV network. However, these methods often resulted in oversized gensets and led to increased costs, higher carbon emissions, as oversized gensets emit more carbon per kWh produced than smaller ones, and underuse of low-emission generators.

THE SOLUTION

To optimise genset capacity during interventions, Enedis developed **PRODiGE**, an artificial intelligence (AI)-driven tool that leverages existing data to model load profiles at secondary substations over a specified timeframe.

Key predictors include:

- **Network Topology**: Structural and operational characteristics of the electricity grid, such as feeder configurations and load diversity.



AI-based model learning modalities.

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- **Linky Meter Data**: Aggregated consumption patterns from residential and enterprise customers.
- **Seasonal Trends**: Demand variability linked to weather patterns, seasons, and time of year.
- **Network Configuration**: Metrics such as the number of connected customers and the total contracted capacity of substations.

Among its many data sources, PRODiGE also leverages data from several hundred substation meters installed in representative areas of the network, covering a variety of geographic regions and network densities. These substation meters deliver detailed consumption data, including load profiles for both average and peak power. This granular insight into load behaviour allows for enhanced optimisation and validation of the AI algorithms.

MAIN ACHIEVEMENTS

Deployed nationally in 2025 after three years of experimentation, PRODiGE proved its effectiveness in genset optimisation. By using PRODiGE, genset oversizing is avoided in most interventions, which allows:

- Reducing internal genset operations costs, including transport, fuel and maintenance.
- Reducing genset rental costs.
- Improving operational efficiency.
- Increasing safety by reducing the number of cables required for higher-capacity gensets.
- Reducing environmental impact from exhaust smoke and the overall carbon footprint.

Live work reducing the impact of work on customers.

KEY SUCCESS FACTORS

The key success factor of the PRODiGE estimation tool is its reliability. The risk of genset undersizing, which can lead to operational impairments, must be almost completely alleviated. To mitigate this risk, a security factor was introduced into the model's predictions. The margin was calibrated to restore the fail rate to the value prior to the use of PRODiGE while maintaining a substantial gain in optimised interventions.

WAY FORWARD

PRODiGE's rollout highlights the importance of continuous learning from new data and the ability to adapt to evolving environments. One future upgrade includes **factoring in local energy production**, such as rooftop solar, into the model to further optimise its performance. As more interventions are performed and new use cases emerge, the model will continue to **improve in accuracy and adapt to operational challenges**.

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