

## When everything went dark, three homes stayed lit

On 28 April 2025, the Iberian Peninsula suffered a massive blackout. Three homes built by PAPIK Group kept running completely normally thanks to their energy self-sufficiency.

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On 28 April 2025, a massive failure in the electricity grid plunged the Iberian Peninsula into darkness. Spain and Portugal experienced one of the most extensive blackouts in their recent history: traffic lights out, trains halted, hospitals running on emergency generators and millions of homes without supply for hours. In many areas, the outage lasted between ten and twelve hours.

In the middle of that scenario, three homes built by PAPIK Group kept running completely normally. Lights on, appliances working, mechanical ventilation in operation, fridge and freezer uninterrupted. None of their occupants noticed the slightest change to their routine. It was no coincidence: it was the result of design decisions taken years earlier, when a blackout was still a remote possibility and not a newspaper headline.

### K-Llavaneres: where it all began

Built in Sant Andreu de Llavaneres, K-Llavaneres was the first PAPIK Group project conceived from the outset as an energy self-sufficient home. With 198 m<sup>2</sup> of floor area, the house incorporates a photovoltaic system with lead-battery storage that covers all of its electricity demand.

During the blackout, K-Llavaneres operated completely autonomously for more than fourteen consecutive hours. The energy management system detected the grid failure and switched automatically to island mode in less than a second, without the residents perceiving any change. The family was at home that afternoon: the children were doing homework, the induction hob was working normally and the mechanical ventilation system kept renewing the air like any other day.

It was the first real proof that the model worked beyond theory. After more than a decade in service, the K-Llavaneres system responded exactly as it had been designed to.

### K-Codines: self-sufficiency in an urban fabric

K-Codines, a 212.75 m<sup>2</sup> home in a consolidated urban setting, posed a different challenge. To prove that energy self-sufficiency is not exclusive to detached houses with large roofs and perfect orientation, but is perfectly viable in the middle of an urban fabric with its limits on surface area and shading from neighbours.

The K-Codines system has a storage capacity of 14.4 kWh in lead batteries. This decision, which may seem counterintuitive in an era dominated by lithium, reflects a holistic sustainability criterion: lead batteries are significantly more recyclable than lithium ones, with recovery rates above 95%. In addition, their manufacture generates a smaller environmental footprint in terms of recyclability and life cycle, and does not depend on extracting scarce minerals in unstable geopolitical contexts.

On the day of the blackout, the occupants of K-Codines found out about the power cut through their phone: a neighbour called to ask whether their supply had been cut too. They had not noticed. The lighting, the climate control, the MVHR system, the fridge and even the internet connection (powered by a router with a UPS integrated into the system) kept working without any perceptible interruption.

## K-Valld'Or: the present already living in the future

The most recent of the three homes, K-Vall d'Or, has 280 m<sup>2</sup> and represents the natural evolution of the model: zero operational emissions, an aerothermal system for climate control and domestic hot water, and intelligent energy management that optimises consumption in real time. The storage system, also lead batteries, allows more than twenty-four hours of autonomy under normal consumption conditions.

K-Valld'Or combines photovoltaic generation, battery storage and a high-efficiency aerothermal heat pump. The result is a home that not only draws no energy from the grid, but at certain times of the year exports its surplus. During the April blackout, the family kept its usual routine: hot-water showers, the kitchen running, climate control active. They learned of the power cut when they went out into the street and saw the traffic light at the end of the block switched off.

## What made it possible for nothing to fail

The technical answer is relatively simple: solar generation, battery storage and an inverter capable of running in island mode. But the real answer is deeper. In all three cases, energy self-sufficiency was not an add-on at the end of the project; it was a design principle built in from the very first sketch.

When a Passivhaus home consumes 75–90% less heating and cooling energy than a conventional one, the amount of energy it must store to run autonomously is reduced proportionally. A conventional home would need batteries three or four times larger to achieve the same level of autonomy. Efficiency is not a luxury: it is what makes self-sufficiency viable.

## Beyond blackouts: independence as a principle

The blackout of 28 April exposed the vulnerability of the centralised energy model. When a single failure can affect tens of millions of people, distributed generation and self-consumption stop being ideological choices and become practical resilience measures.

But it would be a mistake to think of energy self-sufficiency solely as insurance against blackouts. Energy independence is a design principle that protects against multiple scenarios: tariff rises, contracted-power limits, outages from extreme weather events, and the growing volatility of an energy market in full transformation.

PAPIK Group's three houses are not experimental prototypes or luxury projects disconnected from reality. They are functional homes, lived in by families going about their normal lives. The difference lies in the fact that they were designed with a long-term vision, where energy efficiency and autonomy are not add-ons but structural pillars of the project. After more than fifteen years building this way and more than 120 homes delivered, the April blackout simply confirmed what we already knew: when you build well, the system responds.

Energy self-sufficiency is not a technological luxury: it is a design decision that turns each home into an independent, resilient node. The April blackout was not a proof of concept; it was a normal day for three families living in well-thought-out houses.