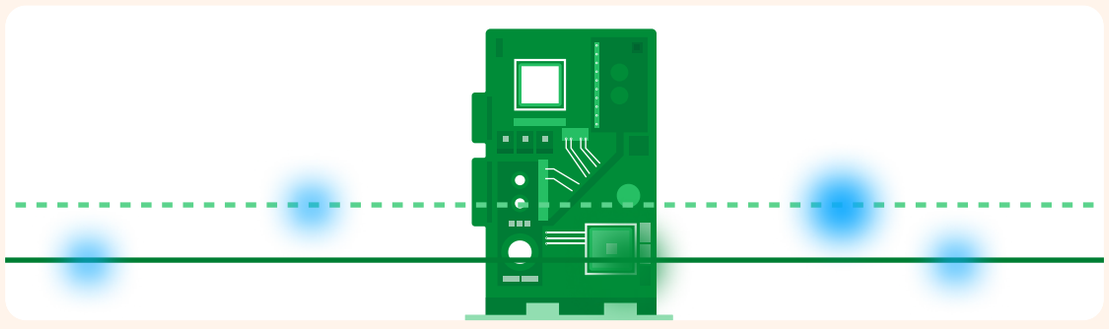
Benefits of virtual power plants

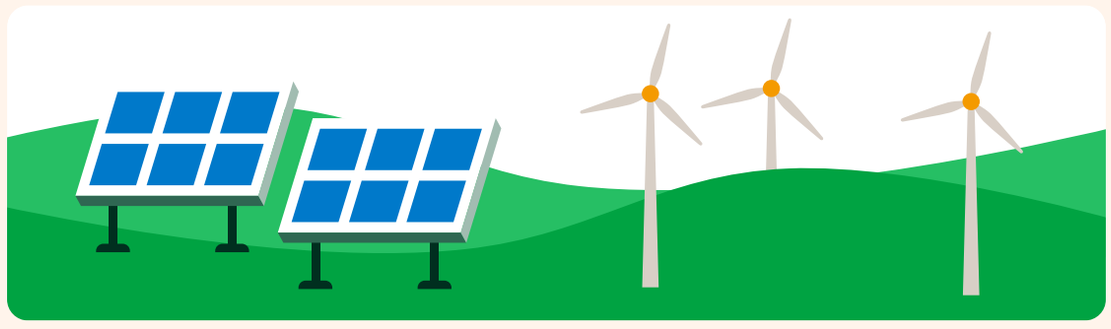
Virtual power plants create value for the electricity system by coordinating distributed resources that, individually, would have **limited response capabilities**. Their main **benefits** include:

Greater system flexibility and stability



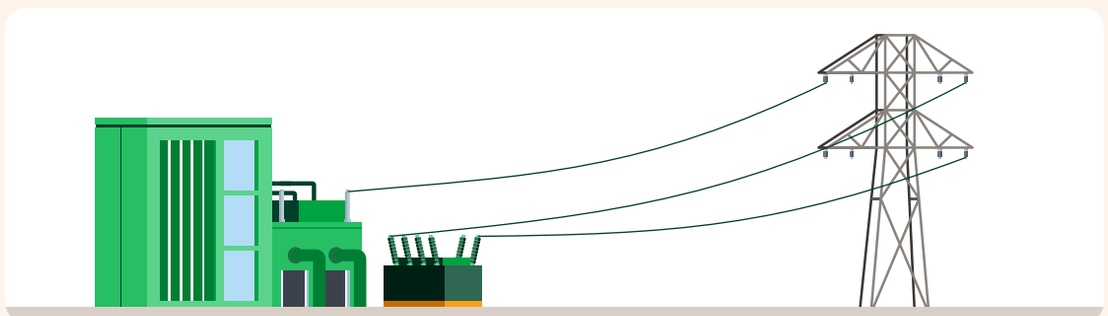
By coordinating multiple distributed resources, VPPs can help **balance supply and demand** and provide a **response capability** to variations in generation or consumption.

Greater integration of renewable energy



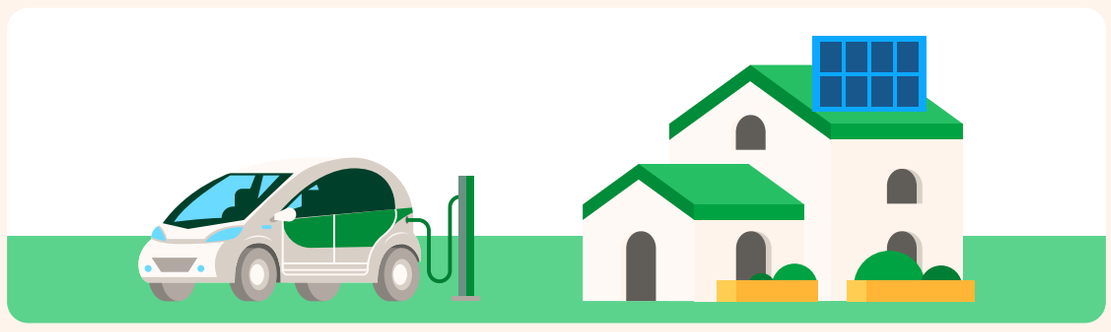
Intelligent management of energy storage and flexible demand makes it possible to make better use of **solar and wind generation**, offset some of their variability and facilitate the **electrification** of new energy uses.

More efficient use of infrastructure



By optimising existing resources, VPPs can help **reduce the need for network reinforcement** and make better use of available capacity in electricity networks and other electrical infrastructure.

New value opportunities for consumers and businesses

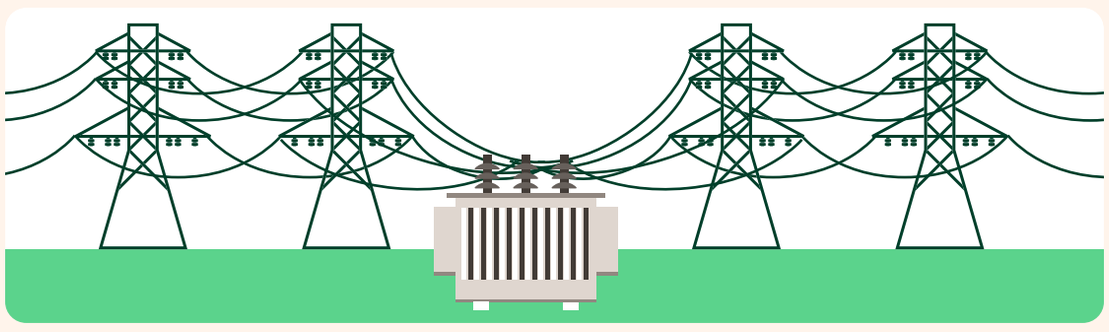


Users with batteries, **electric vehicles, solar facilities** or flexible consumption can participate, through aggregated and regulated mechanisms, in **solutions** that put their flexibility at the service of the electricity system.

The **challenges** facing virtual power plants

The deployment of **virtual power plants** offers significant opportunities, but it also presents **technical, economic** and **regulatory** challenges that need to be addressed to facilitate large-scale deployment.

Regulation and market adaptation



The participation of distributed and flexible resources in electricity markets and network services requires **clear regulatory frameworks**, aggregation mechanisms and **operating rules** adapted to each system.

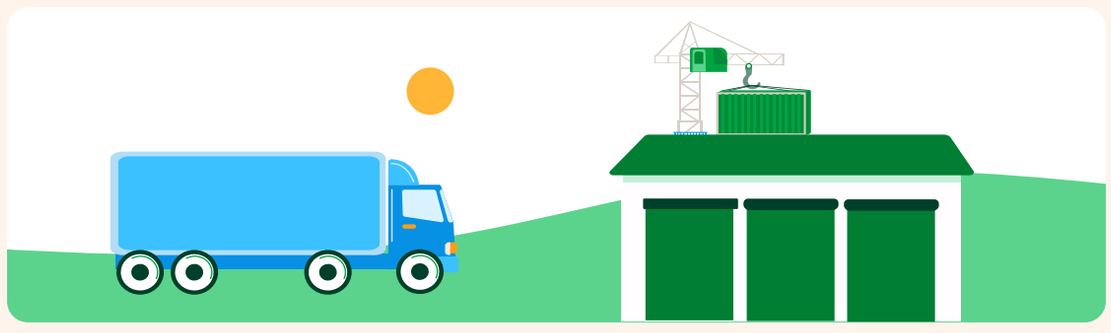
Technological and management complexity

Coordinating thousands of devices in real time requires advanced control and communications systems, as well as **interoperability** between different manufacturers and robust **cybersecurity** measures.

Initial costs and investment barriers

Setting up a VPP requires **investment in technology** and digital infrastructure, which can **slow** adoption if incentives or a supportive regulatory framework are not in place.

Availability and forecasting of renewable resources



Renewable energy **generation** depends on factors such as **sunlight** and **wind**, so VPPs need advanced forecasting and management systems to **ensure a stable supply.**