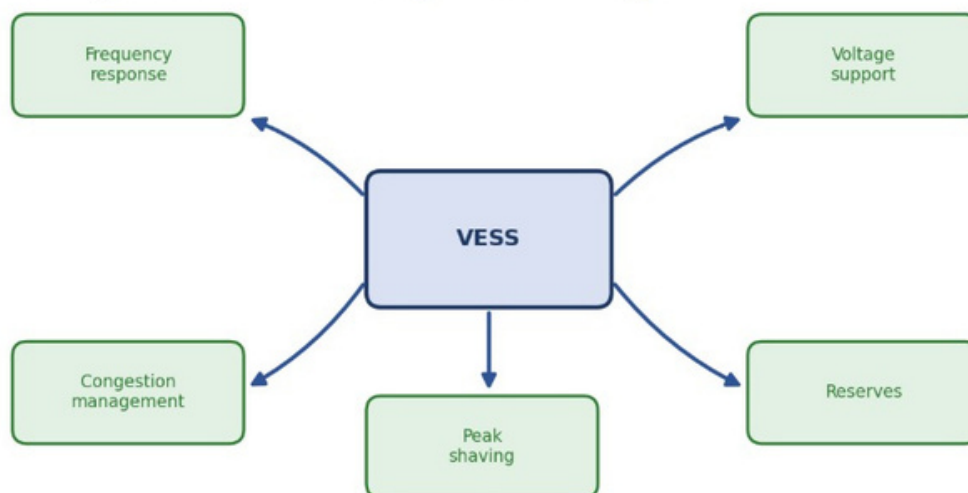


Flexibility services explained: How small resources keep the grid steady

We often think of the electricity grid as something fixed and effortless — power simply arrives when we flick a switch. In reality, the grid is balanced second by second, matching supply and demand with remarkable precision. As more renewable energy comes online, maintaining that balance requires a new ingredient: flexibility. FlexCHESS is built around providing exactly this.

Flexibility services a VESS can provide to the grid



In energy terms, flexibility means the ability of a system to adjust its electricity generation or consumption — within an acceptable timeframe and at an acceptable rate — to support the operation of the grid. Traditionally, this job fell to large power stations that could ramp up or down on demand. FlexCHESS shows how distributed resources, working together, can do the same.

A Virtual Energy Storage System can provide a range of valuable flexibility services. It can help with frequency response, reacting quickly to keep the grid's frequency stable. It can support voltage regulation and help manage congestion on the network. It can shift energy across time — storing surplus generation and releasing it when needed — and provide reserves that the system operator can call upon. Because coordinated distributed resources can respond rapidly, they are often well suited to services that demand fast, precise action.



The resources that provide these services are diverse: flexible demand (including heat pumps and electric vehicles), distributed generators such as solar and wind, and energy storage units. Each has different characteristics in terms of cost, certainty and response. FlexCHESS quantifies the flexibility available from each — in terms of how much, how fast, for how long and at what cost — and coordinates them to provide stable, cost-effective services. By combining resources with complementary strengths, the system can offer reliable flexibility that no single resource could provide alone.

These services are also a matter of policy. The recast Electricity Market Directive (EU) 2019/944 and the EU's electricity market design reform open flexibility markets to new participants, including aggregators and energy communities. FlexCHESS shows how the combined flexibility of distributed resources can be quantified, coordinated and offered into these markets — turning a regulatory opportunity into a practical service.

These services benefit everyone. The grid gains stability and a greater ability to absorb renewable energy. Distribution and transmission system operators gain new tools to manage their networks. And the owners of distributed resources gain the opportunity to be rewarded for the flexibility they offer.

FlexCHESS demonstrated these services across its five pilot sites, showing how the combined flexibility of many small contributors can help keep Europe's grid steady as it grows greener.



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