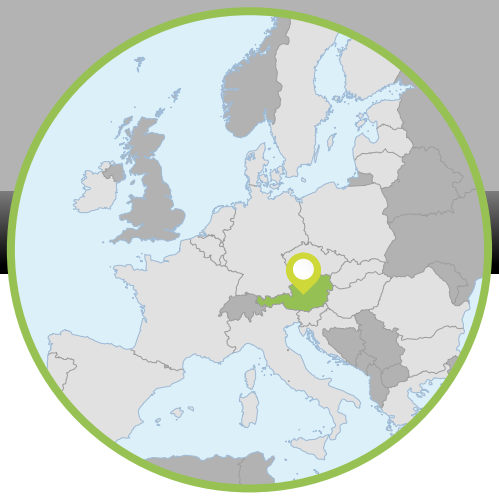
European Commission

INNOVATION FUND

Driving clean innovative technologies towards the market

Green the Flex: Achieving significant greenhouse gas emission reductions by intelligent electricity load shifting on the customer level



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Electric vehicles are integrated in the virtual power plant and can help to save CO_2 and support the expansion of renewable energies

The Innovation Fund is 100% funded by the EU Emissions Trading System

Project summary

The Green the Flex (GtF) project aims to open the electricity market to decentralised units and use these units' flexibility to provide load-shifting management[1] service. To do so, the project will connect and integrate more than 2 500 small devices into one entity (a virtual power plant - VPP) that can then participate in the energy market and provide flexibility to harmonise the electricity demand with the generation. The project will have the capacity to shift demand of 4.4GWh annually from peak-hour to off-peak hour, thereby supporting the integration of renewables and diminishing the need for fossil fuel peak load plants. This project will also provide ancillary grid services and avoid all greenhouse gas (GHG) emissions produced by a conventional technology to generate the equivalent amount of electricity.

COORDINATOR
EVN

LOCATION
Austria

SECTOR
Intra-day electricity storage

AMOUNT OF INNOVATION FUND GRANT
EUR 2 418 000

RELEVANT COSTS
EUR 4 030 000

STARTING DATE
01 January 2022

PLANNED DATE OF ENTRY INTO OPERATION
01 March 2025

[1] Load-shifting is a demand-side management measure involving shifting electricity consumption from one time period to another, usually from on-peak to off-peak periods by decreasing the peak demand without changing total energy consumption.

Climate Action

Electric vehicles, heat pumps, heating rod and other end customer devices can be integrated into the virtual power plant and thus help to save CO_2

An innovative virtual power plant to enable demand response and flexibility on a large scale

The project is aiming to open the energy market and especially the control reserve market provided by the transmission grid operator to more than 2 500 smaller, decentralised devices like heat pumps, PV storage systems or electric car charging stations in three years. These decentralised units will be pooled in a single entity, a VPP, enabling the businesses and households owning the devices to bring flexibility services to the electricity market and generate revenues. Together, they will make more than 6 MW of power accessible to the grid and provide 4.4 GWh/a short term load shift potential.

The project will use remotely controlled, home optimization devices and existing communication channels from original equipment manufacturers (OEMs) to identify and manage potential for load shifting and increased self-consumption. This potential will then be aggregated and used to provide energy markets with flexibility and grid stability services. The connection between both sides is controlled via advanced algorithms and optimised according to the needs of customers and the energy system.The project goes beyond the state of the art by closing the chain from the customer flexible assets to the different markets. In particular, it brings a full vertical integration in terms of making several optimization steps from behind the meter optimization (e.g. PV self-optimization) over a possible optimization in an energy community to an aggregation in the VPP system and active flexibility management in real time. The VPP offers the possibility to decide quickly and switch between different markets, making it fully integrated horizontally.

This fully integrated solution allows the operator to monitor the system and change parameters instead of handling the single devices separately. For the end-customer, the concept provides new ways to fully use the potential of devices, support the energy system and gives a better understanding of energy consumption and production patterns. It will also provide new digital services.

Enabling households and businesses to become actors in the energy transition

Renewable electricity generation is always fluctuating and hard to predict in the short-term, requiring more efforts to harmonise the demand and supply in real time, both in terms of time and location. The project is designed to provide load shifting management and grid stability services that represent the most important solutions to support such harmonisation. The connection between load shifting services and energy markets will therefore greatly support the integration of the additional renewable capacity and reduce the need for mostly fossil fuel based flexible capacities to cover peaks of demand. This will lead to a successive avoidance of GHG emissions and enable the transition towards 100% renewable energy generation. Green the Flex will not only enable VPP participants to become actors in the energy transition; it will also provide additional concrete benefits, for example, by optimising consumption savings and creating new revenue streams (today in the form of a fixed subsidy). Generated revenues and other benefits are in turn passed on to households and businesses participating in the VPP. Overall, this approach decreases energy costs and the total costs of ownership for systems like solar PV and battery storage (including EVs). The project will raise participants' awareness on their energy usage (through the visualisation of the energy flows within the system) and incentivise them to use energy more wisely. It will also provide new digital services (such as an alarm system for heat pumps) and will support households for future changes in regulation.

A highly replicable solution, suitable for a wide range of market applications

The project will initially target smaller, mostly residential units like heat pumps, EV charging stations, hot water generation, and storage systems. However, with the VPP being designed as decentralised and modular, the solution is highly replicable and suitable for a wide range of market applications. It is also applicable to a wide range of clients of any electricity supply company. EVN will explore opportunities for further use cases such as renewable energy communities and flexible grid tariffs.

There is considerable potential for application across the economy because of the relevance of the proposed technological solutions to rapidly expanding energy transition technologies and because the demand side management approach is cost effective in all sectors of the economy as a means to improve energy efficiency and also reduce GHG emissions from electricity production.