



ETIP SNET

EUROPEAN
TECHNOLOGY AND
INNOVATION
PLATFORM

SMART
NETWORKS FOR
ENERGY
TRANSITION



ENERGY STORY:

Integrated electric vehicles and batteries to empower distributed and centralised storage in distribution grids

The goal of the Horizon 2020 project INVADE is to greatly speed up the energy transition process by using today's technologies to solve the energy system challenges of tomorrow.

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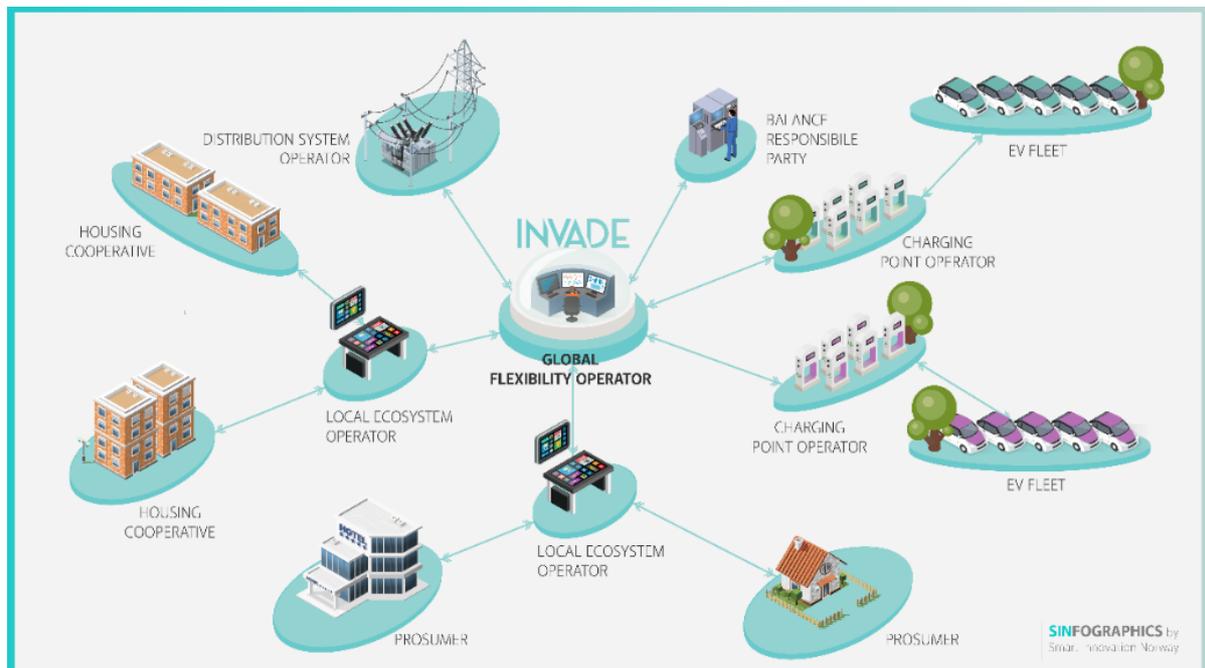


The increasing advancement of distributed renewables in Europe comes with a set of challenges for today's electrical infrastructure. In fact, renewable energy sources are typically *intermittent*: the electrical energy they produce is not continuously available since it derives from non-stored, volatile generating sources (e.g. wind, sun, etc.) that vary in their conditions on a fairly short time scale. Given the imbalance between renewable power generation and demand on the grid, increasing the share of renewable energy sources in the European energetic system requires a higher degree of resilience and flexibility from the current grid.

Renewable energies and electric vehicles (EVs) change the way we consume and produce electricity. It also changes the way for those who manage and distribute it; they must think about the electricity system – to always provide the best possible service for the connected customers. The traditional solution would be a new system infrastructure able to better accommodate the increasing use of renewables: This is, however, very expensive. Therefore, a more viable solution is to focus on a better use of the existing system, combining it with innovative but less expensive smart (ICT) technologies. Flexible management of energy demand together with an improved use of energy storage in the distribution grid can greatly increase grid reliability.

INVADE: using the technologies of today enhanced by smart technologies to solve the energy system challenges of tomorrow

The combination of existing technologies into a new framework to improve the resilience and flexibility of the existing grid is at the basis of the INVADE project, a three-year initiative funded under Horizon 2020¹. The 12 participants focused on the development of a **cloud-based flexibility management platform integrated with electric vehicles and batteries** empowering energy storage to increase the share of renewables in the *smart grid*.



¹ This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 731148



A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers supported by two-way digital communication. This system allows for monitoring, analysis, control, and communication within the supply chain to help improve efficiency, reduce energy consumption and cost.

Basically, INVADE uses a communication gateway to manage in a smart way the charging of stationary and EV batteries. Let's take the example of charging an electric car: when a vehicle is using 'smart charging', the charger is essentially 'communicating' with your car, the charging operator and the utility company through data connections. Vehicles are often plugged in for a longer time than they need to take power to load the battery. Thanks to smart charging, cars can be plugged in, but charged when it is the most efficient, both cost-wise and grid-use wise, always based on EV users preferences of when and how fast they need the EV battery to be charged and to what level. The management system of INVADE transmits information in such a way that enables ordinary users, operators, and automated devices to quickly respond to changes in conditions of the smart grid system.

The project has integrated the INVADE platform with existing infrastructure and systems at pilot sites in Bulgaria, Germany, Spain, Norway, and the Netherlands. Multiple solutions have been investigated, demonstrated and compared. This is done technically and at business model level. The project also focuses on current regulations in different countries and how they stimulate or just inhibit the necessary innovations.

Impact

The implementation of batteries and data technology of INVADE allows the support of the distribution grid and electricity market while coping with grid flow and voltage limitations, weather and demand uncertainty and electricity production variability. Additionally, the system allows for a smart control of domestic, electricity consuming appliances that will aid in load-balancing over the course of the day.

In its pilots, INVADE has shown that it is possible to coordinate different flexibility operations in different areas of Europe simultaneously and from the same platform. As a result, large-scale, synchronized cross-border operations can achieve significant impact on grid operations overall and in terms of positive climate impact. **INVADE has contributed to a reduction of electricity congestion across borders and helps in deferring transmission grid investments.**

Project Benefits

- Improved network management
- Reduced energy bills
- Decreased network costs
- Efficient business models and market

The smart use of energy storage can help to overcome the challenges of energy fluctuations and price variations in the market. As a consequence, new marketplaces will emerge to trade energy and energy services leading to **better end-user service**. INVADE puts in place a holistic and ambitious strategy to manage the flexibility of today's electricity grid and guarantees a stable and cost-efficient system with increasing penetration of renewables.

Keywords: Smart grids, EVs, smart charging, grid flexibility

More info at: <https://h2020invade.eu/the-project/>

Note: Project benefits based on specific criteria outlined in [ETIP SNET monitoring report](#)



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