Smart system of renewable energy storage based on INtegrated EVs and batteries to empower mobile, Distributed and centralised Energy storage in the distribution grid

Reporting

Project Information

INVAVE
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Project website

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Coordinated by SMART INNOVATION NORWAY AS
Norway

Periodic Reporting for period 2 - INVAVE (Smart system of renewable energy storage based on INtegrated EVs and batteries to empower mobile, Distributed and centralised Energy storage in the distribution grid)

Reporting period: 2018-07-01 to 2019-12-31

Summary of the context and overall objectives of the project

The overall objective of the INVAVE project is to deliver a Cloud-based flexibility management system integrated with EVs and batteries empowering energy storage at mobile, distributed and centralised
levels to increase the share of renewables in the smart grid. A higher share of renewables requires a greater ability to maintain balance between power generation and demand on the grid, even in the face of diminishing dispatchable resources. An increasing number of new, small-scale players, such as prosumers and batteries, must be integrated into a system that is turning out to be much more complex as a result of the intermittent behaviour of the renewable resources. Flexible management of energy demand and storage in the distribution grid can greatly increase grid reliability. A combination of renewables and demand flexibility using batteries will become cost-competitive over the next few years. Electric vehicles are emerging as an integral part of the transport sector and present a secondary market for energy storage and flexibility in the distribution grid.

**Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far**

The principal goal of exploitation has been to bridge the gap between R&D and business development. An Exploitation User Group (EUG) with individuals solicited from principal stakeholders was established where different experts interacted with the project on issues related to user acceptance, business models, technologies and markets.

A systematic analysis of the environmental impact according to the customized LCA method presented earlier in the project was essential to determine specific and general climate gains based on the findings in the pilots. The general conclusion, taken the national energy mix into account the, is that peak shaving does make a positive climate difference.

The data hub embedded in the INVADE platform has been established on principles of uniformness and non-proprietary principles. This represent an efficient way of integrating different data streams with very little engineering.

INVADE has shown how stationary batteries and batteries “on wheels” can help to raise the share off renewables through careful control. Theoretically and through big scale testing it has been shown how increased self-consumption can be achieved to cut cost and level out peaks for the energy user.

Challenges mentioned in the European Parliament resolution T7-0061/2013 titled “Making internal energy markets work” have been directly addressed in INVADE on several accounts. The business model and concepts around this are turfed on the concept of a “value network” with a Flexibility Operator at its centre organizing an ecosystem where end-users and others share facilities and where price can be used as an incentive for exchange of priorities and energy. All pilots have demonstrated that end-users hold the key to a successful flexibility business.

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INVADE has shown that it is possible to coordinate different flexibility operations in different areas of Europe simultaneously and from the same centred control. As a result, we can envision that large-scale, synchronized cross-border operations based on the way the pilots have been conducted can achieve significant impact on grid operations overall and in terms of positive climate impact. INVADE will contribute to a reduction of electricity congestion across borders and will help in deferring transmission grid investments.

Given the right end-user incentives and the building of a “critical mass of users” a Flexibility Operator (FO) can organize resources that are well capable of absorbing more renewables.

All the commercial partners have vouched for a continued business and product development after the completion of the project. Managers, sales and business developers were currently involved. The interactions with EUG members and other stakeholders have produced quality advice and requirements to help create successful products and services and to help open up the market.
The technical aspects the INVADE platform, the role defined for the Flexibility Operator and the associated business model that has been defined for this role cater for almost unlimited replicability and scalability.

**Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)**

The INVADE platform has been designed to be able to hook up and integrate with a wide set of peripheral devise and controllers. The data hub accommodated within the platform provides a generic API that simplifies the connection process and makes it easy to become part of the ecosystem offered by the FO.

A combination of enabling technology components, dynamic pricing and new business models as well as involvement of a full chain of stakeholders, specifically consumers/prosumers e.g. households and EV users have been integrated in the INVADE platform to allow consumers/prosumers make informed decisions for freeing up electricity in times of peak demand, for maximising energy usage in times when there is minimum congestion, thus delivering services to the grid and for that providing them with monetary and social benefits instead of making new energy generation installations at the grid level.

INVADE can provide balancing services across the continent by forecasting and optimizing peaks that can cause congestions or costly non-conformances. However, it has proven hard to convince BRPs to engage in this before “proof of concept” has been verified.

INVADE has identified business cases that make investment in storage systems interesting without the need for government support. New services have emerged that exploit the findings in INVADE in different ways. New service bundles where storage, stationary or mobile, have also been born as a result of. Regulations in some countries still represent a barrier for some services. Managing storage units to increase self-consumption and cut cost for prosumers is one and currently the most obvious service.

The control and storage concept applied in the different pilots have shown how INVADE can compensate for the intermittent and variable nature of renewable energy production by levelling out the feed. The improvement in self-consumption shows that the mismatch between production and consumption peak times can be reduced too. The storage facilities act as effective buffers. This surplus energy when stored at various levels in the distribution grid offers direct value for the end-user while reducing the feed-in level.

The consortium demonstrates strong synergies with the transport sector. The envisaged use cases incorporate EV users with focus on smart charging using open standards. Empirical evidence from the Dutch pilot shows that smart charging can increase the self-consumption rate for office buildings with at least 7%. The use cases addressing peak load management by means of smart charging in homes have seen reduction rates of up to 59%.

INVADE has been a proponent of standards from the inception of the project. Its contribution to open protocols is probably the most significant. INVADE can possibly claim a 90% contribution to Open Charge Alliance latest version of the OSCP protocol.
INVADE reimagines the power grid
Funded by the European Union's Horizon 2020 Research and Innovation programme

INVADE Horizon 2020
Great things are coming

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

Renewable energies and electric vehicles (EVs) change the way we consume and produce electricity. It also changes the way those who manage and distribute it must think about the electricity system – to always provide the best possible service for the connected costumers. But these things are difficult, and often take a long time.

The goal of the European-funded H2020 project INVADE is to greatly speed up this process, by showing that the technologies and solutions we have today, only must be connected in new ways to

Homepage of the project website https://h2020invade.eu/

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