

SmartEnergy

The project

SmartEnergy is a research environment that allows to experiment with new services based on the real time exchange of information between electricity stakeholders and users. These services optimise part of or the entire system consisting of the electricity network (production, transport, distribution) and the consumer processes. They generate an economic and ecological gain for all participating partners.

SmartEnergy is a project resulting from the SmartGrids vision, the European Technology Platform for Electricity Networks of the Future (<http://www.smartgrids.eu>).

The team

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Background

Today, the online services offered to electricity consumers are limited. They include, for instance, the online access to current and past values of the load curve, or the remote control of thermal energy storage systems (heating systems, boilers).

The electricity field undergoes vast changes, with the market liberalisation engendering a high price volatility, the emergence of new decentralised production and storage modes, the saturation of certain transport infrastructures, the increased ecological awareness of the public, and financial penalties in case of differences between the estimated and the actual consumption.

The majority of consumers consider electricity as a power source that is always available, relatively cheap and which price varies little. The consumption of electricity is solely driven by the needs, without taking into consideration possible limitations as to the generation or the transport of electricity.

The development of information and communication technologies and the widespread availability of Internet access make it possible to set up services based on a distributed information system which connects electricity stakeholders and users.

The objectives

SmartEnergy is a collaborative environment based on a distributed information system which uses web technologies and connects electricity stakeholders and users.

SmartEnergy is an open research platform that supports multiple services. In a first step, two services, which are briefly described below, will be developed. Their precise definition is one of the project's components.

The services will be demonstrated and evaluated at a test site.

Demand side management

A technical optimisation of a system consisting of electric energy production units, transport and distribution infrastructures and consumer processes can be achieved by controlling the consumer processes, which are considered as freely varying.

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Being able to modulate the consumption means that the consumption can be adapted to the production (instead of adapting the production to the consumption), that production and transport infrastructures can be used with less back-up, that financial objectives can be pursued (matching consumption with prevision), that energy purchase and sale opportunities can be taken and that selective off loading can be set up in case of failure of a transport line.

The required electricity consumption profile and the reward for the consumers who conform to that profile are published on a website in a format that can be understood by computers. Consumer processes will be, in principle, automatically controlled according to the information available on the web server.

This service puts the consumers, who remain free to follow the recommendations or not, into the heart of the decision process.

The flexibility of certain processes will be qualified and evaluated. Thermal energy storage systems (i.e. heat pumps, refrigeration, air conditioning, etc.) and processes which allow a delayed execution (recharge of electrical car batteries, electrolysis for the production of fuel for car fuel cells, etc.) seem to offer the highest flexibility.

This service is intended to be offered by an energy provider to his clients. He must comply with the legislation in force.

Distributed energy sources and even decentralised energy storage installations can be controlled in a similar fashion.

Business models will be developed and evaluated to ensure economic gain for all partners involved.

The consequences of the introduction of such a service, mainly for the distribution grid, will be analysed.

This service will mainly involve changes in the power distribution over time, with equivalent energy. However, it has a positive ecological impact, as it allows a better use of the production and transport resources.

Dashboard for electrical energy consumption

This service aims at providing the electric energy consumers with an information summary that allows them to identify their energy guzzling processes and to make relevant decisions as to how to reduce their consumption. This information is presented in the consumer's energy dashboard.

The load curve is part of the data used for setting up the dashboard.

Ideally, the aim is to determine, independently of the consumers' energy processes, the information to be included into the dashboard, the raw data to acquire and the algorithms to apply to establish the information for the dashboard based on the data.



Target audience

The SmartEnergy environment is a research environment that allows to implement new services with limited means, to test them and to validate them. These services can be deployed by the owners of infrastructures who can optimise their exploitation, and by energy providers who will be able to respond to their clients' needs in a more targeted manner. Providers of IT solutions for the energy market can include an environment derived from SmartEnergy and/or services such as the ones developed within the project into their offer.

SmartEnergy is neither an EDM environment (Energy Data Management) nor a SCADA system (Supervisory Control and Data Acquisition) nor a trading platform nor an AMR system (Automatic Meter Reading). However, the applications developed within the SmartEnergy project can interact with any of these systems.

Project stages

- Establish a dialogue with the stakeholders of the electricity market (producers, vendors, distributors, traders, manufacturers and software developers) and interested consumers.
- Set up a collaborative environment based on web technologies.
- Specify the following services: “Control of electric energy consumer processes” and “Dashboard for electrical energy consumption”.
- For the process “Control of electric energy consumer processes”:
 - Qualify and quantify the degree of flexibility of industrial or domestic consumers and of the production and energy storage means;
 - Qualify the consequences of this control for the distribution grid;
 - Determine the business model(s) that allow(s) to take full advantage of this flexibility within a liberated electricity market.
- For the service “Dashboard for electrical energy consumption”:
 - Determine the parameters to include into the dashboard;
 - Determine the raw data to acquire and the algorithms for the calculation of parameters.
- Build a demo at a pilot site and quantify its economic and ecological efficiency in collaboration with partners.
- Build an interdisciplinary team at the HES-SO which is capable of dealing with problems related to the management of energy systems.