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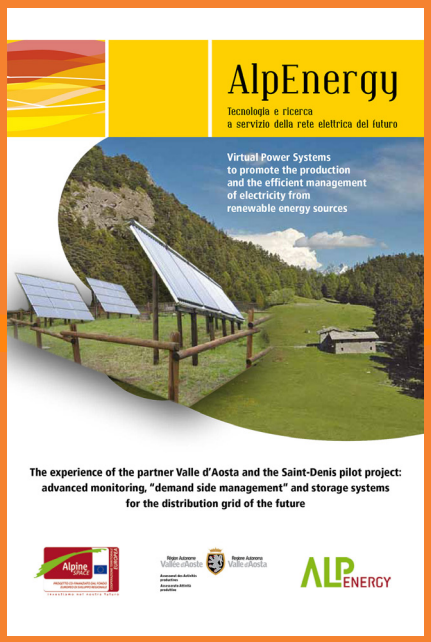
AlpEnergy

Virtual Power Systems to promote the production and the efficient management of electricity from renewable energy sources

KEYWORDS:
- ☐ Building culture
- ☐ Construction
- ☐ Closed loops
- ☐ Governance
- ☑ Planning Tools
- ☐ Ecology
- ☑ Energy efficiency
- ☐ Indicators
- ☐ Mobility
- ☑ Technology transfer

TARGET GROUP:
- ☐ Architects
- ☐ Builders
- ☐ Citizens
- ☑ Craftsmen
- ☑ Home Owners
- ☐ Planners
- ☐ Politicians
- ☑ Policy Makers



Results and outcomes (use cases):

Renewable energy sources have the characteristic of being discontinuous and non-programmable and, often, the generation of energy is not in line with consumption. Considering that storing electricity cheaply is difficult and that the long-distance transmission of surplus elecricity generates heavy losses, generation and consumption must be, as much as possible, simultaneous and local. In addition, diffused generation can cause grid overload problems with failures and risks of mini blackouts. For the system these aspects introduce new challenges in managing the grid that must adapt to new demands of a more rational use of energy and new rules for buying and selling the surplus produced. The AlpEnergy project accepts this challenge with the aim of analysing and testing possible technological and economical solutions for the development of electricity distribution networks in an area as difficult as the Alps, adopting VPS. VPS is a system of distributed power production and consumption linked by an electricity network (typically a distribution network), suitably completed by a communication system (electronic network). The spatial extension of a VPS may vary from very small settlements to entire countries. The first distinctive feature of a VPS compared to the existing electricity supply system is that the power production is more distributed, i.e. provided by a larger number of smaller units, and mainly based on renewable energy resources including combined heat and power plants (CHP). It is mainly the intermittent nature of solar and wind power, the generally smaller size, and the distributed location of almost all renewable power plants, compared to most conventional power plants, which make the consideration of VPS necessary.

The territory identified for the pilot implementation is the Municipality of Saint-Denis, a typical scattered mountain village with about 370 inhabitants and a territorial extension ranging from 500 m to 1500 m asl. Starting with an ideal long-term model of VPS focused on the pilot municipalities, the project concentrates on certain parts: from monitoring and analysis of data consumption and production from RES, up to the implementation of different modes of load management and storage systems.

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Description:

The Aosta Valley Department of Production activities has been a partner of AlpEnergy, a European project funded by the Alpine Space Programme 2007-2013. AlpEnergy aims to increase the competitiveness and attractiveness of the regions involved by studying the potential and applicability, in the Alps, of a new technological paradigm in electricity distribution, usually known as "Smart Grids", called in the project Virtual Power Systems (VPS).
For the implementation of the activities, the regional Department of Production activities, given the technologically advanced environment that characterizes the VPS, decided to seek the scientific advice of the Laboratory of Mechatronics at the Polytechnic of Turin. This collaboration has brought into focus the study and experimentation on some technical aspects that underlie the development of the VPS:

- the advanced monitoring of loads and production from RES (in particular solar PV);
- the testing of some methods of load management (demand side management);
- the reduction of absorption peaks (peak saving) through the use of battery storage systems.

Relevance for inter-municipal planning (AlpBC):

The pilot Municipality of Saint-Denis is one of the Municipalities included in the Mountain Community Monte Cervino, the Aosta Valley inter-municipal area of the AlpBC project.
Although the pilot implementation was conducted on a small number of users, therefore on a small portion of the grid, the availability of real operating data allows accurate assessment of the technical and economical benefits of the proposed solutions, as well as provide important information to the function simulations of the VPS in terms of data setting and validation of the results. This experience, as capitalization of the results of a European project, will be a good practice to take into account for the inter-municipal energy planning, as a new technology for the management of the existing electricity supply system. The potential in the control of power flows on the network and in the coordination between production and consumption of local energy, the data collected in the monitoring activities (energy consumption and production) and the impacts, could be an important base to consider in AlpBC for the sensitization of local decision makers and citizens.

Relevance for policy goals (Alpine Space, Europe and the region):

In the last few years, the production of electricity from renewable sources has grown exponentially and in the near future, related to the European goals of 20-20-20, it is intended to develop further. The existing grid, designed to deliver electricity from large power plants to users, is not prepared to receive a high power production, in the opposite direction generated by diffused renewable sources. The challenge of AlpEnergy is to find a solution to this problem.
The social impact of the project is relevant and will ensure users to embrace a new concept of efficient use of energy resources available locally; the final objective of the regional Department of Production activities is to support, at regional level, a shared vision of the opportunities offered by the advent of "Smart Grids", a vision involving all the players implicated in the process of modernising the electric system with the ability to ensure a greater integration between research centres and production systems.

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