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1. EV technology

WP1 will create a common knowledge platform for all consortium partners. The knowledge will be gathered through a study of state of the art EV technology and participation in international working groups, including a dialogue with international car and battery manufacturers. A survey on driving patterns will also be conducted. The results of the survey will be important input for the system architecture design. The final subtask of WP1 will include modelling of batteries. These models will be important in both system design and technology development. This WP is lead by Dansk Energi.

2. System architecture design for EV systems

WP2 focuses on the development of generic V2G system architectures based on various scenarios in vision, and consequently analysing and evaluating their impacts on power systems and electricity market operation, as well as political and economic implications. An integrated control scheme will be developed to coordinate between wind power, EVs and central power plants in the market environment. Optimal car portfolio management for V2G system will be developed based on necessary analysis and evaluations. WP2 will also produce a recommendation for grid integration code of EV systems, open for further discussions and standardisation activities. This WP is lead by DTU-CET.

3. Distributed integration technology development

The objective of WP3 is to develop a technical system for intelligent system integration of distributed EVs connected in private homes, office parking lots etc. A main challenge is to develop the aggregation technology for low-cost, efficient, plug-and-play integration of small-scale distributed energy resources (here EVs) in the power system. The WP will utilize results from WP2, and the technical solutions is expected to benefit from virtual power plant (VVP) technology, which is currently under development for microCHP's, as well as ongoing demand response activities. This WP is lead by IBM.

4. Central fast charging and battery-swapping station design assessments

The objective of WP4 is to develop the technologies for central fast charging stations and battery swapping stations, including control methods for optimal utilization of the battery capacity in the power system. Some of the main challenges with this type of solutions are the crucial and very strong grid connections and handling of the large power in a cost-effective way. This WP is lead by Siemens.

5. Physical EV interface development (power and information)

The objective of WP5 is to develop and test the EV power and communication interface for different architectures. This WP is lead by EURISCO.

6a. Platform for demonstration

The purpose of WP 6a is to test the proof-of-concept of the EV-charging control systems, and test of battery models developed in previous WPs. Test will be conducted as laboratory test on SYSlab at Risø. This WP is lead by DONG Energy.

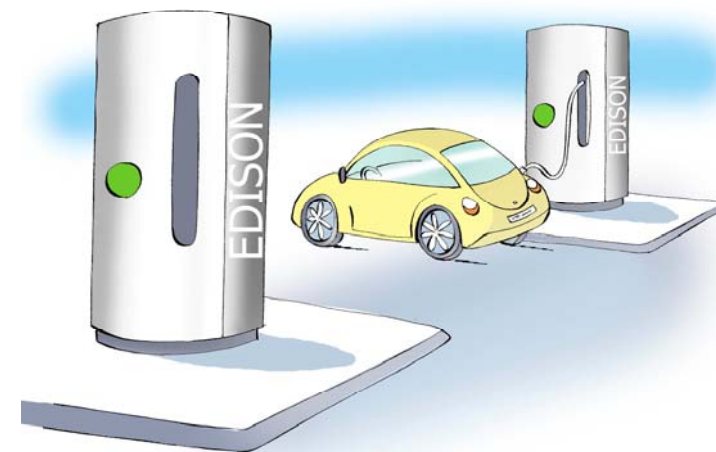
6b. Platform for demonstration

The purpose of WP 6a is to test the proof-of-concept of the EV-charging control systems developed in the consortium. The test will be conducted with a few EV's and charging stations installed in the distribution grid on Bornholm. This WP is lead by Østkraft.

7. Consortium management

The objective of WP7 is to form a steering group with the purpose of ensuring dissemination of project results on all scales, and provide efficient project management. Dansk Energi has the overall project management

Electric vehicles in a distributed and integrated market using sustainable energy and open networks



www.edison-net.dk

Background

Electric vehicles are a unique opportunity to change the energy consumption in the transport sector from fossil fuel to fuel based on renewable energy e.g. electricity produced on wind turbines, photovoltaic, or on biomass in combined heat and power plants. In the Danish case there is a political decision on supporting the development of wind power and it is expected that 50 % of the power should be based on renewables. This causes major challenges for the power grid in ensuring a stable system when 50% of the capacity is based on fluctuating sources. EVs create a unique opportunity to support the power system by acting as a storage device and to ensure use of renewable energy in transportation as well.

To utilize the full benefit of the interaction between EVs and the power grid with a large amount of power from fluctuating sources implies development of systems that enables EVs to charge when there is a surplus of energy in the system or by resupplying energy to the grid when there is a lack of power in the system.

In Denmark we have a lot of experience regarding integration of disbursed energy resources, and Danish companies and research institutions are very qualified regarding design, development and operating power systems with extensive knowledge about high penetration of distributed generation.

Furthermore, Danish industry is involved in technologies which are essential to a widespread use of EVs such as strategy for optimised battery charging/discharging, and power electronics related to battery charging/discharging. This forms an ideal base for system development and integration solutions for EVs.

The Danish competence can be utilized to develop optimal system solutions for EV system integration, including network issues, market solutions, and optimal interaction between different energy technologies. Furthermore, the Danish electric power system provides an optimal platform for demonstration of the developed solutions, and thereby, provides the commercial basis for Danish technology export. Furthermore, the advantage of being a “first mover” constitutes a business advantage, as well as, a possibility of a strong Danish influence on future standards for system integration of EVs.

The EDISON project

The overall purpose of the EDISON project is to gather research institutions and major industry enterprises and to cover all stages from research through concept and technology development to demonstration. This project mainly focuses on the two first parts: research and concept and technology development.

The project also includes proof of concept where the developed technologies will be tested on a few EVs and charging stations installed in grid on the island Bornholm. Bornholm is chosen for the pilot test because it gives a good opportunity to show the interaction between wind turbines and EVs in an isolated system. After a successful proof of concept test, we expect to be ready for a large scale demonstration by the end of 2011.

The aim of the project is:

- To develop system solutions and technologies for EVs and PHEV which enable a sustainable, economic, and reliable energy system where the properties of EVs are utilized in a power system with substantial fluctuating renewable energy.
- To prepare and provide a technical platform for Danish demonstrations of EVs with emphasis on the aspects of power system integration.
- To develop standard system solutions for EVs which are applicable globally by utilizing the Danish leading knowledge within distributed energy resources and operation of energy systems with high wind power penetration, and thereby, release the potential for Danish export of technology, system solutions, and knowledge.

Project organization

The project is organized in 7 work packages which are described in the following.

Funding

The Project is subsidized by the Danish ForskEL 2009 funding scheme.