

## **ADINE - ACTIVE DISTRIBUTION NETWORK**

### **Project presentation**

Project started 1. October 2007

Project instrument: FP6, Specific targeted research project, STREP

#### Contact information

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### **BASIS OF THE PROJECT**

Considerable amount of renewable energy in Europe represents distributed generation (DG). However, the distribution systems have been designed without considering interconnection of DG. One of the main barriers for the penetration of DG at distribution network level is the complexity of the interconnection of DG. Each planned interconnection requires accurate modelling, simulation and analysis to tackle potential problems concerning stability, protection and voltage control in the network. The main cause of complexity is the present methods for managing distribution networks as well as the features of the different DG components themselves which are not designed to enable an easy interconnection.

### **OBJECTIVES**

The overall aim of the ADINE project is to develop, demonstrate and validate a new Active Network Management (ANM) method of distribution network including DG. The ANM method improves the overall management of the electric distribution network including distributed generation compared to present methods. The viability of the ANM method is demonstrated through an integrated simulation environment including real-life devices. Compared to present methods, the ANM method is capable of:

- ensuring safe network operation including DG
- increasing network reliability including DG
- maximizing the use of the existing network when network bottlenecks are related to voltage issues
- maintaining the required level of power quality despite non-predictable power production or consumption

ANM method needs enabling solutions to support it. The solutions cover protection, voltage and reactive power control and planning and information systems of networks. The solutions operate as active components in managing the network allowing easier interconnection of DG units.

## RESULTS

As the result validated ANM method is increasing the security of distribution grids, improving the stability of the grid in fault situations and enhancing the optimal management of network.

During the project following enabling solutions are developed and demonstrated:

- new protection devices, fault location algorithms and coordinated protection planning to adopt the easy interconnection of DG
- droop control as a plug-and-produce solution for DG interconnection
- centralized voltage control of a medium voltage network
- new-generation separate compensator STATCOM capable of filtering harmonics, eliminating flickers, compensating reactive power, improving recovery of the network during line fault and controlling the voltage level of the distribution network.

ANM method adds value at European level by increasing the potential for renewable energy and by enabling more efficient management of distribution network assets for network owners.

## STRUCTURE OF THE PROJECT

The work flows from basic planning to demonstrations and monitoring so that best knowledge of the partners is involved in each stage. The results from the demonstrations of solutions are combined together in SP5 into one integrated simulation environment in order to demonstrate and validate ANM method.

### Sub projects are:

SP1 - Project management and dissemination

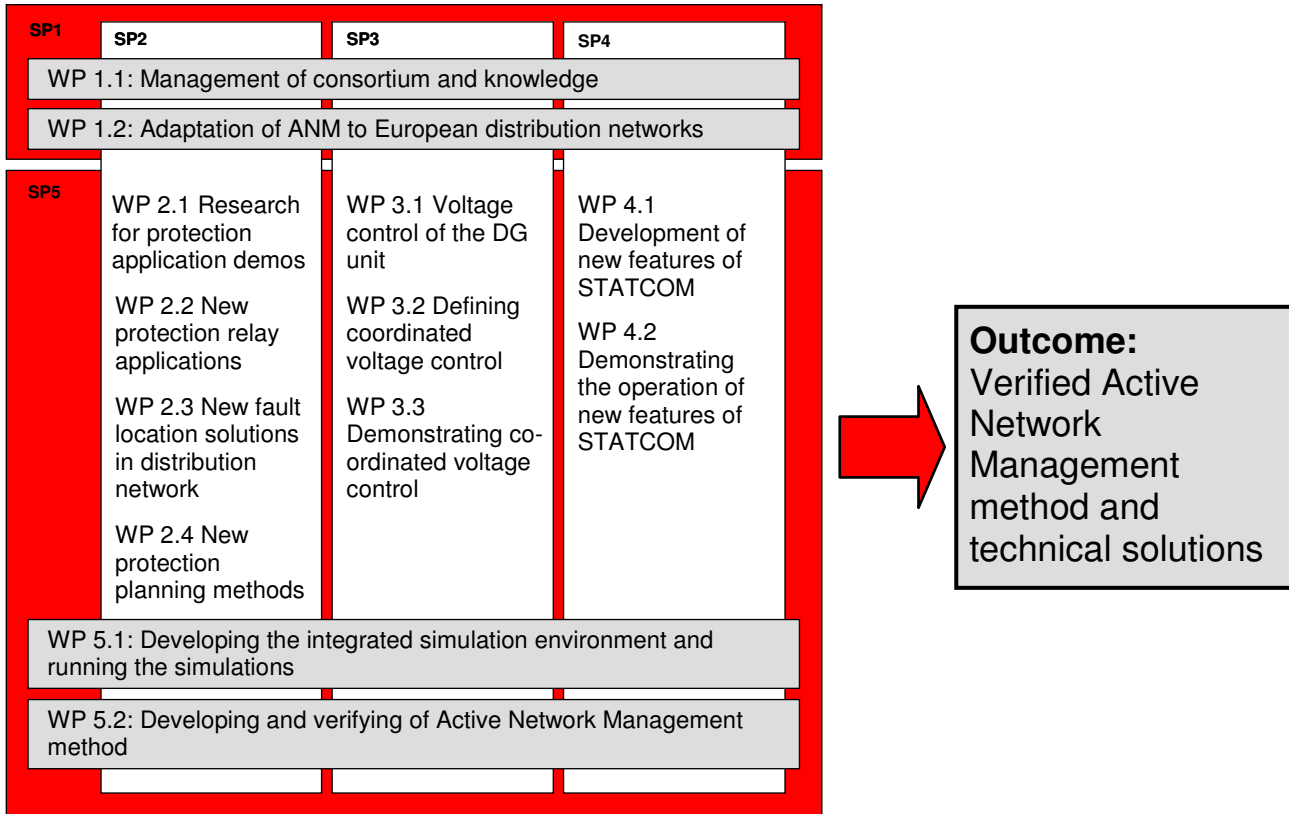
SP2 - Protection of distribution network including distributed generation

SP3 - Voltage control of distribution network including distributed generation

SP4 - Flexible STATCOM for distribution network

SP5 - Development of Active Network Management method

Each sub project is further divided into several interconnected work packages (WP) as described in the following figure:



The actual development work flow starts from SP5, where the basic planning of the ANM method defines functional criteria and network monitoring principles for the technical solutions to be developed and demonstrated in SP2, SP3 and SP4. It also defines the boundaries for the development of integrated simulation environment, which is later on used to demonstrate the viability of AMN method. All partners are participating in this basic planning stage in SP5.

Basic planning is followed by technical development of each enabling solution in SP2, SP3, and SP4 in parallel with the development of the integrated simulation environment in SP5. The technical solutions are tested in appropriate simulations in each work package and after that the real-life demonstrations are planned, built and taken to operation. The integrated simulation environment of SP5 is used to adjust the controllers and to define the network management concept in the detailed planning of the demonstrations. The network behaviour before and during the demonstration as well as the operation of technical solutions are monitored.

In the final stage of the project the actual controllers and monitored data from the demonstrations of technical solutions are taken into integrated simulation environment to study the behaviour of network and interference of demonstrations. The final ANM method is defined according to findings and conclusions based on these simulations.

## PARTNERS

There are seven partners that establish the consortium. Partners are technology providers and international research institutes from Germany, Sweden and Finland. Three of them are SMEs. Technology Centre Hermia Ltd is the co-ordinator of the project. Partners are:

Name	Web address	Country
Technology Centre Hermia Ltd	<a href="http://www.hermia.fi">www.hermia.fi</a>	Finland
Tampere University of Technology - Department of Electrical Energy Engineering	<a href="http://www.tut.fi">www.tut.fi</a>	Finland
ABB Ltd Distribution Automation	<a href="http://www.abb.fi">www.abb.fi</a>	Finland
Lund University - Department of Electrical Measurements and Industrial Electrical Engineering and Automation	<a href="http://www.lu.se">www.lu.se</a>	Sweden
Compower AB	<a href="http://www.compower.se">www.compower.se</a>	Sweden
AREVA T&D Ltd	<a href="http://www.nokiancapacitors.fi">www.nokiancapacitors.fi</a>	Finland
AREVA Energietechnik GmbH	<a href="http://www.nokiancapacitors.de">www.nokiancapacitors.de</a>	Germany

Two local distribution network owners and one industrial electricity user are providing test sites and infrastructures for demonstrations.

Since the project team is including specialists only from three European countries, project team has a plan to bring the expertise from other countries into the project as well. During the project information about the project work and preliminary results are disseminated to the specialists in those European countries where the penetration of DG is expected to proceed fastest in the near future. (Preliminarily Finland, Sweden, Germany, Spain, Portugal, Great Britain). The workshops with distribution network owners and other interested parties arranged in the target countries provide information about the local boundary conditions and barriers to be tackled in order to get the ANM method into practice in those countries.

## FINANCING

Project is started 1. October 2007. The duration of the project is 36 months. The project is financed by the 6th Framework Programme of the European Commission, Priority 6.1 Sustainable Energy Systems. The total cost is about 3,2 M€ and the community grant is about 2,1 M€. Work carried out by partners is 379,5 person months.

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