1 Abstract

a) Synopsis

Upcoming challenges for LV grids include a high penetration of distributed energy resources and electric vehicles. The project aims to enable an efficient and cost effective use of existing grid infrastructures based on a three-step concept: intelligent planning, on-line monitoring, active LV grid management. Communication-based systems for automatic control concepts for low voltage grids will be developed and evaluated by putting them into practice.

b) Abstract

In the future, new requirements on the medium and low voltage distribution networks have to be fulfilled due to increased penetration of decentralized generation from renewable sources, but also due to new network participators like electric vehicles. This comes along with a paradigm shift. While distribution grid operation in the past got along without monitoring of real-time information due to adequate dimensioning, trends aim for more and more on-line monitoring. Consequently, active interventions during grid operation will be used in the future to guarantee voltage bands, line load conditions etc. This will be possible due to emerging technologies such as Smart Metering-related communication systems that improve the affordability of low voltage automation infrastructures.

Following this paradigm shift, the project “DG DemoNet – Smart LV Grid” searches for solutions for an active network operation at the low voltage level. The project develops and evaluates smart planning, monitoring, management and control approaches for the system integration of local energy production and flexible loads (e.g. heat, e-mobility) in low voltage networks. Especially, a solution for the interaction of grid components by means of communication will be developed. Thereby the power quality with a high amount of distributed energy resources and electric vehicles must be secured according to EN 50160 without any or at a minimum of grid reinforcement.

The project objective is to solve above challenges with acceptable costs regarding investment, maintenance and operation. In the project, real tests of solution approaches for central and distributed monitoring, management and control concepts will be performed. DG DemoNet – Smart LV Grid aims to create actual voltage problems in selected low voltage segments and implement the developed control concepts there. Thus, it becomes possible to estimate how successful these concepts are and in how far they can improve the network quality parameters. Furthermore, an economic analysis of the concepts, such as the feed-in losses due to power curtailment (how often, how long, etc.) will be performed. On this base, concepts for future standards, connection conditions and feed-in models will be worked out. Thus, the project offers far reaching system integration approaches for Smart Grid solutions in the field of low voltage networks for the first time.