

SMARTGRID IMPLEMENTATION IN THE CASE OF ELEKTRO MARIBOR

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ABSTRACT

Limited sources of fossil fuels and emissions of greenhouse gases related with the combustion of these fuels force use to increase the use of renewable energy sources. Unfortunately, the renewable energy sources are often distributed in the space and are not always available. Technical solutions for utilization of renewable energy sources are relatively expensive while the cost of energy, produced in this way, are too high to be economically bearable without national support schemes.

In spite of aforementioned drawbacks, European Union and Slovenia have made political decisions to support energy production from renewable energy sources. The electrical power generation based on renewable energy sources in Slovenia is focused on utilization of sun energy, water energy and biomass. A substantial increase in the number of installed electric power generation units, based on renewable energy sources, has been reported the last years. The share of photovoltaic power plants is dominant. It must be pointed out that the power system, as well as the transmission and distribution networks, were designed and build considering the energy flow from the power plants towards consumers. However, the increasing share of distributed electrical power generation units, connected to the electricity network, can change the direction and increase the dynamics of changes in the power flow. Such operation could cause problems in the electricity networks not designed for that kind of operation. The solution called SmartGrids should help to solve problems, related with the increased share of distributed power generation connected to the electricity networks.

A SmartGrid can be treated as a human made artificial system. Such an artificial system needs a nervous system in the form of information and communication technologies (ICTs) that makes it alive. ICTs make possible the information flow and exchange between the sensors and control system and between the control system and actuators. The quality of system's behavior, control and performance depend on the quality of sensors, control system, actuators, and implements ICTs. Only all of them together can make an artificial system alive.

An artificial system in the form of a SmartGrid uses the information flow, together with appropriate sensors, control system and actuators, to control the flow of electric energy. To make a SmartGrid alive, a lot of knowledge as well as learning and experimental work under real conditions is required. Decision, to acquire required knowledge and experiences, has been made in Elektro Maribor d.d., where a SmartGrid will be implemented.

For the pilot project in Elektro Maribor d.d., an existent low voltage distribution grid, that contain from different type of consumers, is applied. After the reconstruction, the transformer station 10/0,4 kV will be automated and remote controlled on both voltage level. By different connection points of the existent photovoltaic power plants and also of all further renewable energy sources, in pilot distribution grid the approximate of real conditions will be assure. Smart meters will be used by all users in pilot distribution grid. For the information flow, an optical connection will be used. In describes network, develop of the algorithms for control of the distribution grid can be enabled. In the following phases of pilot SmartGrid project: a bigger specific consumer will be connected into the grid; completely automation of the transformer station is planned; the smart charging stations for electrical vehicles can also be included into the SmartGrid project; the use of energy storages is provided, etc. For the system operator, connection of the distributed generation in such a network will be allow, the provision of god quality care of electrical energy will be easier and system losses optimization can also be allow. On the consumption side, saving in the cost of electrical energy can be possible.

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