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Selected Voltage Control Methods in a LV Local Distribution Grids With High Penetration of PV

Abstract. A large number of new prosumer electricity generators (especially PV) has led to problems with power quality in the LV distribution network. The main problems occur with the increase of the voltage value above the normative values. This may result in damage to electrical household appliances. The inverters connecting the energy source with the power grid are also switched off. In the scientific literature you can find a number of articles describing this problem as well as ways to solve it. The article will present selected ways of reducing the voltage of the low-voltage distribution network, which are the result of the authors' own research. Results will be presented showing the use of energy storage (ES) to provide voltage regulation services with active and reactive power [1]. These are the results of experimental research using an energy storage prototype (100 kW and 100 kWh). Then, the concepts of using static compensators or hybrid transformers to regulate the voltage in the LV network by generating additional compensation voltage will be presented [2]. The last part of the article will concern the concept of increasing electricity consumption during the occurrence of large generation from prosumer installations (demand response) [3]. The results of analyzes will be presented, showing that by increasing the demand for energy, the value of the voltage in the grid can be reduced as well as the amount of energy fed into the grid from renewable energy sources can be increased (tytuł w języku Polskim: Wybrane metody regulacji napięcia w lokalnych sieciach dystrybucyjnych niskiego napięcia o dużej penetracji PV).

Some research results

Fig. 1a shows the results of tests of voltage regulation in the network using an energy storage with a capacity of 100 kW, 100 kWh (Fig. 1b). The results are made for a comparable day of the week and show the voltage change in the LV distribution network without and with the energy storage providing the network voltage regulation service.

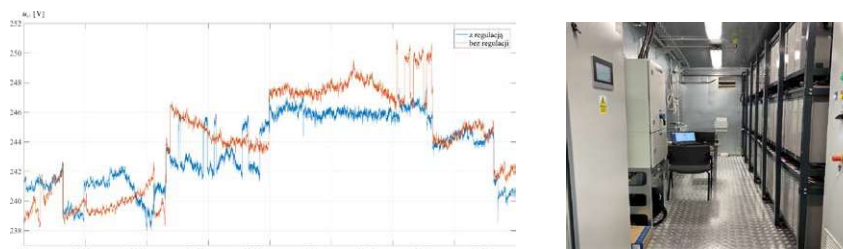


Figure 1. Voltage regulation using ES: a) voltage change in the LV distribution network without and with an energy storage providing the network voltage regulation service, b) interior of a container with an energy storage with a capacity of 100 kW, 100 kWh made in VRLA technology.

References

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