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Industrial energy storage system for photovoltaic and wind power systems - selected research results from the implementation of 0.5MWh lithium-ion energy storage system

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In recent years, the share of renewable energy sources in the Polish power system has grown very rapidly. Currently, the installed capacity in photovoltaic and wind sources constitutes over 40% of all power plants in the national power system [1]. Such a large share of unstable and very dynamic energy sources is a significant threat to the stability of the power system and ensuring a balance between supply and demand in the daily balance of electricity [2,3].

The answer to these problems may be high-power and high-capacity battery energy storage devices connected to the AC grid, among which lithium-ion technology currently dominates [4-7]. This type of energy storage can successfully balance the daily demand and energy production in the power system where there are not enough pumped-storage power plants [8,9] (in Poland, the share of these plants in relation to RES is only 5% [1]). As part of the ENERGAN strategic project, financed by The National Centre for Research and Development in Poland [10], DACPOL company has implemented a full-scale demonstrator of lithium-ion energy storage with a capacity of 500 kWh and a power of 125 kW, which cooperates with a photovoltaic installation with a power of 250 kWp and a low-voltage AC grid (3x400 V, 50 Hz). This article contains selected research results for this energy storage device, documenting, among other things, the energy efficiency of the NMC and LFP lithium-ion technology systems and the correct operation of the complex battery management system (BMS).

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