

Tomasz ZARĘBSKI

West Pomeranian University of Technology, Szczecin
Department of Power Systems and Electric Drives

Analysis of the efficiency of energy storage systems

Abstract. *The paper presents the problem of choosing the right way to select an energy storage system from renewable sources. The main criteria for selection are the efficiency of the energy storage system and the possibility its of easy implementation.*

Keywords: energy storage system, renewable energy source, efficiency.

Introduction

The continuous increase in demand for electricity and care for the natural environment are the main reasons for the development of renewable energy technologies. The most popular from renewable energy sources, wind and solar energy, are characterized by high variability of supply depending on weather conditions. As a result, the methods of storing energy produced as a result of good atmospheric conditions during a reduced demand for it are becoming more and more important.

Energy storage systems

There are many methods of energy storage. The most popular of them are:

- supercapacitors,
- chemical batteries,
- compressed air energy storage ,
- pumped storage power plant,
- fuel cells,
- flywheel energy storage,
- superconducting magnetic energy storage.

Each of these methods has its own specificity and the resulting limitations. These conditions and the cost of the equipment needed to implement the method will be the basis for analyzing the efficiency of the method in selected application [1].

Assumptions of the analysis method

Some energy storage methods, for example pumped storage power plant or compressed air storage systems, are designed to work with large energy sources. Due to the dynamic development of prosumer activities, the next part of the work focused on investments up to 1 megawatt.

A prosumer is a person who consumes and produces a product, for example electricity. In recent years, many European Union programs have allowed ordinary citizens to buy and install household power plants. Most often were solar or wind power plants. As mentioned earlier, they are most dependent on atmospheric conditions. The most popular method of energy storage in such cases are chemical batteries. An example of such a solutions is present in Fig. 1.

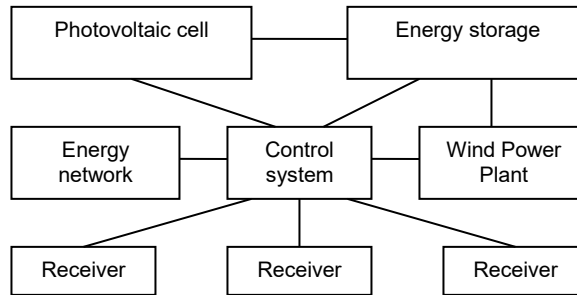


Fig.1. Block diagram of the prosumer system [2].

Conclusion

The development of modern technologies has influenced the development of distributed energy generation. This created a category of prosumers who are both consumers and energy producers. Their producer installations are usually based on energy sources dependent on atmospheric conditions. This fact causes, especially in off-grid installations, the need to use energy stores, and thus, the creation of algorithms to facilitate the optimization of the selection of these storages

References

1. Zarębski T., *Problemy magazynowania energii elektrycznej z odnawialnych źródeł*, Energetyka, nr 3, s. 193-194, 2008.
2. Zarębski T., *Integracja alternatywnych źródeł energii z inteligentnymi instalacjami elektrycznymi*, Przegląd Elektrotechniczny, R.84, nr 7, s. 186-188, 2008.

Author: dr inż. Tomasz Zarębski, West Pomeranian University of Technology, Szczecin, Sikorskiego 37, 70-313 Szczecin, e-mail: tomasz.zarebski@zut.edu.pl.