

Optimal Capacity and Feasibility of Energy Storage Systems for Power Plants Using Variable Renewable Energy Sources

Dumitru Braga

<https://doi.org/10.1109/SIELMEN53755.2021.9600392>

Abstract

Nowadays, the decarbonization of the global and national economies by shifting from using fossil energy sources to using renewable energy sources represents an upward trend. The greatest potential has wind and photovoltaic sources, which are characterized by intermittency and unpredictability due to the intermittent nature of wind speed and solar irradiance. Thus, the main challenge for the integration of variable renewable energy sources (VRESs) into existing power systems is the gap between the electricity load of final users and the electricity generation of VRES. The main solutions for this challenge include using the reserve generation capacity and/or the energy storage systems (ESSs). Energy storage can be realized at different levels of the power systems: the end-users, the power plants, or the electricity grid. In this paper, we present the feasibility evaluation of the different types of ESS (battery and fuel cells) for the smoothing of the peak generation curve of the power plants using VRESs and the economically optimal capacity of ESSs.

Keywords: photovoltaic systems, renewable energy sources, Low-carbon economy, batteries, energy storage, fuel cells, renewable energy sources, solar energy, wind energy

References

1. *Renewable capacity statistics 2021 International Renewable Energy Agency (IRENA) Abu Dhabi, 2021.*
[Google Scholar](#)
2. H. Ibrahim, M. Ghandour, M. Dimitrova, A. Ilinca and J. Perron, "Integration of Wind Energy into Electricity Systems: Technical Challenges and Actual Solutions", *Energy Procedia*, vol. 6, pp. 815-824, 2011, [online] Available: <https://doi.org/10.1016/j.egypro.2011.05.092>, ISSN 1876-6102.
[CrossRef](#) [Google Scholar](#)
3. "Electricity Storage and Renewables: Costs and Markets to 2030", *International Renewable Energy Agency Abu Dhabi, 2017.*
[Google Scholar](#)

**International Conference on Electromechanical and Energy Systems
(SIELMEN)
6-8 October 2021, Iasi, Romania
pag. 087-091**

4. [online] Available:
https://www.opcom.ro/pp/grafice_ip/raportPIPsiVolumTranzactionat.php?lang=ro.