

Studienarbeit

Topic/Thema: Analysis, control and optimal placement of battery energy storage system (BESS) in permanent magnet synchronous generator (PMSG) based wind power plants (Analyse, Steuerung und optimale Platzierung des Batterie-Energiespeichersystems in Windkraftanlagen auf Basis von Permanentmagnet-Synchrongeneratoren)

In recent years, wind energy has made impressive strides in turbine technology, resulting in the emergence of PMSG-based turbines as the optimal choice. These turbines offer superior control, generate higher-quality power, and maintain grid stability during disturbances.

Nonetheless, as we increasingly rely on renewable energy sources such as wind power, it has become imperative to devise more efficient methods of storing excess energy produced on windy days for use during low wind. This is where BESS prove invaluable, as they store surplus power when needed. Both PMSG-based turbines and BESS contribute to creating more dependable and sustainable energy systems.

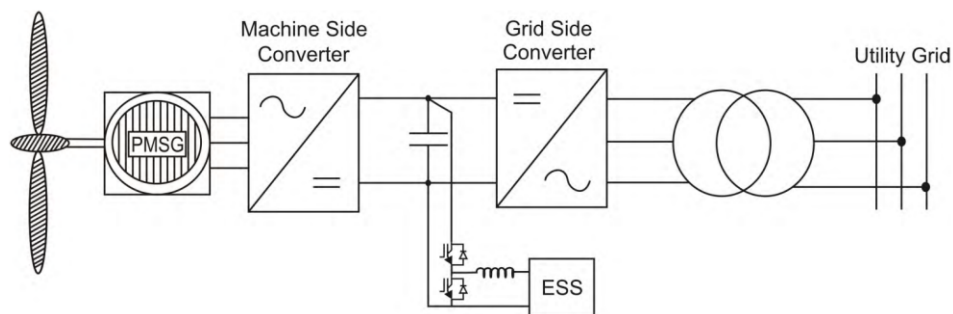


Fig.1. Grid-connected wind turbine with an energy storage system on a common DC-bus.

This work aims to determine the most efficient positioning and control techniques for BESS and validate it using simulation.

Work tasks / Arbeitsaufgaben:

- Literature review on the PMSG-based wind turbines and BESS, focusing on integration strategies and optimal placement techniques;
- Modeling and simulation of the proposed system in Matlab/Simulink;
- Implementation of control schemes for ESS;
- Analysis of optimal placement strategies through simulation results;
- Design of the storage components based on the system limits.