



# Forschungskolloquium | Research Seminar

*Vortrag im Rahmen dieses Seminars*

Titel:

**Grid Connection Sizing of Hybrid PV–Battery Systems: Navigating Market Volatility and Infrastructure Constraints**

Autor:

**Samir Jeddi, M.Sc.**

Abstract:

The increasing share of intermittent renewable energy generation amplifies power price volatility, increasing the need for storage technologies such as battery energy storage systems (BESS). However, limited transmission infrastructure, particularly constrained grid connections, poses a major barrier to the deployment of both BESS and further renewable generation. Co-locating BESS with wind and solar assets can increase grid connection utilization and lower project costs. This study examines the effects of grid connection rationing on hybrid PV–BESS systems, accounting for weather-induced generation uncertainty and price fluctuations. Findings indicate that PV and BESS margins exhibit a strong negative correlation, leading to risk diversification in an optimal portfolio. Grid withdrawal constraints substantially reduce contribution margins and increase risk exposure, by lowering the diversification effect. In contrast, hybrid PV–BESS systems can reduce their grid injection capacity by up to 60% of their nameplate capacity without significantly affecting contribution margins, as peak solar generation coincides with low power prices. The risk exposure is not affected by grid injection constraints. Variable feed-in tariffs distort price signals, diminishing diversification benefits of hybrid PV–BESS systems and encouraging oversized grid connections by inflating the value of generation during low-price periods. These findings highlight the need for policymakers and network operators to design efficient grid connection pricing mechanisms and mitigate distortive interactions with feed-in tariffs.