

Assessing the Profitability of Large-Scale Batteries in the UK Electricity Market

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July 31, 2023

Abstract

The transition towards an electricity market with a high penetration of renewable energy is characterized by higher price volatility compared to the more traditional electricity market dominated by conventional generation. The increasing share of intermittent generation requires a method of securing supply and matching demand with supply. Integrating batteries as fully controllable energy storage into the system is a solution to handling this issue. The inclusion and operation of batteries can contribute to the green transition if market participants can operate them profitably. This project aims to quantify these batteries' economic viability, increasing their incentive to be invested in and participate in the electricity markets.

In this paper, we run a two-stage optimization model based on forecasts of electricity prices in the day-ahead and in the intraday market. The model's performance relies on forecasts of the electricity prices, which we obtain using machine learning methods such as Decision Trees and Random Forests and simpler methods such as historical average prices.

We compute the profit from operating the batteries according to our algorithm during 2020 and 2021 in the UK electricity market. The chosen forecast methods can obtain profits in the range of 30-40% compared to the profit generated from perfect foresight of price developments, i.e., supplying the models with realized prices. In addition, we investigate how participating in both the day-ahead and the intra-day markets yields superior results compared to focusing on just one of the markets.