Optimal Component Sizing for Peak Shaving in Battery Energy Storage System for Multiple Industrial Clients
Rodrigo Castro Martins, Petr Musilek

BACKGROUND
Recent attention on industrial peak shaving applications sparked an increased interest in battery energy storage. Among other studies, there have been several reports examining optimal sizing of such storage systems for individual clients which results in the battery energy storage system standing idle most of the time. A study of nearly 300 industrial load profiles within Germany showed that in 2017 about 10% of all load profiles result in a static return of investment (ROI) of 5 years and below and can be described as interesting for peak shaving. Also, the study shows the perspective of investment reduced by 30% and price per kW raised by 30%.

OBJECTIVES
Objective: “Energy storage as a service”
This work proposes a new business model where battery energy storage is offered as a service by a new stakeholder. This new model allows sharing a single battery storage system among multiple clients.

RESULTS
The results show that sharing batteries in peak shaving applications for multiple clients shortens the payback period. The payback for clients with individual BESS installation is 5 years on average and the system shaves around 9% of the peak load. Considering multiple clients with only one storage system providing peak shaving, the payback period decreases to 2 years and the system can cover 21% of the peak load.

FUTURE DIRECTIONS
A case study conducted using real-world industrial profiles shows the applicability of the approach as well as the strong battery energy storage system dispatch and resulting return on investment dependence with respect to the industry load profile. This highlights the need for general mathematical optimization approaches to effectively tackle the challenge of peak shaving using energy storage systems. The study highlighted an alternative to maximize the usage of battery energy storage system for peak shaving application and reduce the idle time of such systems. Future research should consider industrial load profiles from Canada, as well as the local energy and power price schemes.

PARTNERS
Project T06-P02: Modern energy systems provide plethora of data (including data on generation, loads, weather and market conditions) that can be harnessed for the design, monitoring, and control of electric power grids. Under the smart grid framework, this data and information is gathered and processed using information and communication technologies (ICT) and can be used to enhance the reliability, efficiency, flexibility, and resilience of power systems. In future energy systems, an additional degree of complexity will be brought by mass introduction of renewable energy sources (RES) and storage devices. This integrated research program will address the major challenges expected within the future grids through data-driven methods, and develop principles for building grids capable of adaptation to changes not yet anticipated in the future.

Early research on peak shaving was conducted with Smart Power GmbH & Co KG, a company from Munich, Germany, that deals with the design, construction and turnkey commissioning of complete storage systems on an industrial scale.

Sample data for simulation studies presented in this poster were provided by ATCO Electric.

FES PROJECT OVERVIEW

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