OPTIMAL SCHEDULING OF BATTERY ENERGY STORAGE SYSTEM BASED ON NEWSVENDOR MODEL

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ABSTRACT

This proposal adopts a single-period Newsvendor model to predict optimal scheduling of battery energy storage system (BESS) to minimize electric bill while maintaining the desired level of battery state of charge (SoC).

1 INTRODUCTION

There is a rising demand for replacing destructive energy sources with renewable energy sources. To effectively manage microgrids with multiple power sources, a battery energy storage system (BESS) can improve grid stability and flexible power dispatch. This paper aims to optimally schedule the BESS based on load and PV prediction using a Newsvendor model.

NOMENCLATURE

b	Backorder cost (Electric bill from KEPCO)
d	Load (Demand)
s	Unused PV power (Salvage value)
y	PV generation (Decision Variable)

2 PROBLEM FORMULATION

To scale down the computational load and for easier access to data, this proposal aims to design the BESS of one of the school buildings. Also, possible various power sources will be scaled down to a single source, photovoltaic (PV) power.

To minimize the electric bill, maximizing the utilization of PV is crucial. Thus, this paper suggests building a daily BESS scheduling model based on the seasonal pattern of load and PV data. BESS will store the PV power during the low load conditions and dispatch the stored energy during the high load conditions like the summer daytime.

If PV power isn't enough to meet the loads' needs, we should buy electricity from Korea Electric Power Corporation (KEPCO). On the other hand, if there are unused PV power, we can sell the PV generated electricity back to KEPCO.

3 LIMITATIONS OF THE STUDY

- Since the model is built on the past seasonal data, it cannot adapt to unexpected real-time changes of load, PV generation and price of electricity market.

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