Lesotho energy storage for peak shaving

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The remainder of the paper is organized as follows. Optimal sizing model is presented in Section 2. Section 3 introduces the rolling forecasting method. We then establish two models of charging and discharging control process in Section 4. Section 5 presents the simulation results.

The BESS capacity is measured in two dimensions, i.e., power capacity and energy capacity, respectively. The power capacity is represented by the maximum discharging power and the maximum charging power. The power capacity varies in different scenarios. On the generation side, the power capacity is relevant to the peak load and the capacity of generators. On the transmission and distribution side, however, the power capacity is relevant to the possible maximum load and the transmission capability.

To achieve continuous peak load shaving, the remaining energy at the end of the day should be the same as that at the beginning of the day, which is represented by E(n)=E(0) (5)

The final energy capacity of the BESS is determined as follows. First, based on historical load curves, we evaluate the energy capacity required to accomplish peak load shaving for each day. Among these results, pick an energy capacity that can cover p percentage of the peak load shaving tasks. The p percentage, which ranges from 0% to 100%, is assigned to be the percentage of the mission-completed days under a specified energy capacity and different daily loads.

Load forecasting is essential to peak load shaving and the forecasting accuracy directly affects the effectiveness of peak load shaving. Short-period forecasting methods include time series analysis, regression analysis, artificial neural network, support vector machine (SVM), among others. Regression analysis is the

cornerstone of the rolling load forecasting (RLF) proposed in this study.

When predicting the load through regression analysis, the real loads of early time in the day are needed to obtain the optimal regression parameters, which will be used when predicting the loads in the rest of the day.