Kigali user-side energy storage solution for peak load reduction and valley filling

A strategy for grid power peak shaving and valley filling using vehicle-to-grid systems (V2G) is proposed. The architecture of the V2G systems and the logical relationship between their sub-systems are described. An objective function of V2G peak-shaving control is proposed and the main constraints are formulated. The influences of the number of connected ...

It also demonstrates with several other disadvantages including high fuel consumption and carbon dioxide (CO 2) emissions, excess costs in transportation and maintenance and faster depreciation of equipment [9, 10].Hence, peak load shaving is a preferred approach to efface above-mentioned demerits and put forward with a suitable approach [11] ...

Optimal sizing of user-side energy storage considering demand management and scheduling cycle. ... looked at thermal energy storage as a promising solution for ensuring peak power supply and improving customers" energy efficiency. These studies, which considered energy storage as a demand management resource [27], focused primarily on the ...

Users with high load magnitude and large load peak-valley difference experience economic benefits upon installing ES, while users with mismatched load characteristics (e.g. small-sized and medium-sized industrial ...

For peak shaving and valley filling as well as the storage of abandoned electricity for grid connection, it is a typical energy demand scenario for EST without strong constrains on discharge/charge time and power rate, which can be used for operation cost reduction by storing energy at low market price and selling energy at high price [34].

The load reaches its peak at 11:00-13:00 and 19:00-23:00, and the load in the evening peak is normally higher than that in the noon peak, as shown in Fig. 23. In the morning, due to the low temperature and going out to work, the residential load is low.

With a low-carbon background, a significant increase in the proportion of renewable energy (RE) increases the uncertainty of power systems [1, 2], and the gradual retirement of thermal power units exacerbates the lack of flexible resources [3], leading to a sharp increase in the pressure on the system peak and frequency regulation [4, 5].To circumvent this ...

The technologies of joint dispatching of distributed generations (DGs) and energy storage devices (ESS) for load peak shaving and valley filling are widely concerned (Sigrist et al., 2013; Setlhaolo and Xia, 2015; Aneke and Wang, 2016; and Sahand et al., 2019).

Kigali user-side energy storage solution for peak load reduction and valley filling

Minimizing the load peak-to-valley difference after energy storage peak shaving and valley-filling is an objective of the NLMOP model, and it meets the stability requirements of the power system. The model can overcome the shortcomings of the existing research that focuses on the economic goals of configuration and hourly scheduling.

For this purpose, different control algorithms were designed. Levron and Shmilovitz [14] have analytically developed the optimal solution for using an energy storage system for peak load shaving. Its main drawback is the assumption that the energy storage system is lossless, which unfortunately reduces the scope of this method to very small ...

As far as existing theoretical studies are concerned, studies on the single application of BESS in grid peak regulation [8] or frequency regulation [9] are relatively mature. The use of BESS to achieve energy balancing can reduce the peak-to-valley load difference and effectively relieve the peak regulation pressure of the grid [10].Lai et al. [11] proposed a ...

The energy storage device is an elastic resource, and it can be used to participate into the demand-side management aiming to increasing adjustable margin of power system through shaving peak load and filling valley load. Therefore, this paper researches on a demand response-based business mode and operation strategy of user-side storage device.

When the energy storage is centric in the power grid-centric scenario, The peak-valley difference can be reduced and the service life of the energy storage system effectively extended by maximizing the charging and discharging power from the perspectives of valley filling scheduling, peak trimming scheduling, electricity scheduling, and ...

The large-scale integration of these vehicles will impact the operations and planning of the power grid. In this paper, we focused on an electric vehicle charging/discharging (V2G) (Vehicle to grid) energy management system based on a Tree-based decision algorithm for peak shaving, load balancing, and valley filling in a grid-connected microgrid.

In this study, an ultimate peak load shaving (UPLS) control algorithm of energy storage systems is presented for peak shaving and valley filling. The proposed UPLS control algorithm can be implemented on a variety of load profiles with different characteristics to determine the optimal size of the ESS as well as its optimal operation scheduling.

The user-side shared energy storage Nash game model based on Nash equilibrium theory aims at the optimal benefit of each participant and considers the constraints such as supply and demand ...