

In this paper, a novel architecture of urban rail transit based on hybrid energy storage system (H-ESS) is proposed. Supercapacitor (SC) and UPS are used to smooth the pulse power of the metro train. The H-ESS integrated by high efficiency, three-port isolated bidirectional DC-DC converter (IBDC) module are parallel connected to the DC traction ...

Finally, some typical demonstration projects of rail transit energy storage technology are comprehensively compared. On this basis, key issues that remain unsolved in electrified railway energy storage system are summarized. ... "Application of Supercapacitors in Urban Rail Transit Vehicles," Railway Locomotive & Car, vol. 39, no. 2, pp: 83 ...

The traditional DC traction power supply system generally shows low utilization rate of train braking energy. High-voltage DC autotransformer traction power supply system (HDATPS) has been introduced to solve the problems. To further improve the utilization of train braking energy, an energy-storage based multilevel voltage-balancing DC-DC converter (ES-MVBDC) is ...

The introduction of flywheel energy storage systems (FESS) in the urban rail transit power supply systems can effectively recover the train's regenerative braking energy and stabilize the ...

The multi-port energy router (ER) is an effective topology for integrating train traction load, AC load, the energy storage system and photovoltaic(PV) energy. The start and stop process of urban rail transit trains and the access of distributed energy sources to rail transit ER lead to serious fluctuations of DC bus power, so it is necessary to route energy between ...

In order to reduce the peak power of traction substation as much as possible and make better use of the configuration capacity of battery energy storage system (BESS) in urban rail transit, a ...

In the field of urban rail transit, an optimal method with the minimum energy storage capacity configuration and an optimal recovery power target has been proposed for an on-board HESS, which can quickly recover braking energy and be used for starting and accelerating. The results showed that this method can effectively reduce operating costs ...

The electricity consumption of urban rail transit increases year by year with its rapid development. The regenerative braking energy generated by the train can be absorbed and reused by the ground energy storage systems, which can effectively reduce the traction energy consumption, so as to achieve the goal of low carbon and energy saving. It is necessary to consider how to ...

@article{Liu2021AdaptiveTA, title={Adaptive Threshold Adjustment Strategy Based on Fuzzy Logic Control

for Ground Energy Storage System in Urban Rail Transit}, author={Yuyan Liu and Zhongping Yang and Xiaobo Wu and Lifu Lan and Fei Lin and H. Su and Jiangbo Huang}, journal={IEEE Transactions on Vehicular Technology}, year={2021}, ...

Control Strategy of Flywheel Energy Storage Arrays in Urban Rail Transit Yong Wang¹, JinLi^{2(B)}, Gang Zhang^{2,3}, Qiyang Xu⁴, and Dawei Song⁵ 1 Standards and Metrology Institute, China Academy of Railway Sciences Corporation Limited, Beijing, China 2 Beijing Jiaotong University, Beijing, China 19126123@bjtu.cn 3 Beijing Rail Transit Electrical Engineering Technology ...

In order to analyze the energy flow characteristics of urban rail transit, this paper builds a simulation model of urban rail power supply system including energy storage device. The ...

To minimize the overall energy consumption of urban rail lines with limited ESDs, this paper addresses the collaborative optimization of ESD allocation and train speed profiles, in order to ...

Abstract: With the rapid development of urban rail transit, installing multiple sets of ground energy storage devices on a line can help reduce train operation energy consumption and solve the ...

In order to better realize the energy-saving operation of urban rail transit trains, considering the use of regenerative braking energy has become the focus of current academic research. Train operation chart optimization, energy storage system recovery, and inverter system feedback are the main technical means for its implementation.

In general, the pantograph-catenary is the primary energy supply for a train's operation in rail transit [1,2]. To improve the diversity and stability of energy supply in emergencies, renewable energy sources like photovoltaic power have also been introduced in rail transit []. On the other hand, as a supplement to the primary energy supply system, one key ...

A multi-variable synthetic optimization method is proposed to optimize the SCESS capacity, train operation diagrams and traction power system parameters collaboratively, and the pareto set of the multi-objective problem is obtained. The stationary supercapacitor energy storage system (SCESS) is one of effective approaches for the utilization of train's ...

Urban growth and the resulting highway congestion is driving up demand for rail transit. Rail, a significant component of transportation infrastructure, is critical to economic ...

In order to better realize the energy saving operation of urban rail transit trains, considering the use of regenerative braking energy has become the focus of current academic ...

current research situation, the storage and utilization of regenerative braking energy in urban rail transit is prospected. ... battery may have the potential to be used in rail transit systems. Battery energy storage

technologies are relatively easy to achieve large-capacity energy storage,

This paper developed a domestic magnetic flywheel energy storage system for brake energy regeneration in urban rail transit. To minimize the heating of flywheel, low-loss magnetic bearings and permanent magnet motor/generator are designed. Also the sensorless vector control based on sliding mode observer is discussed to achieve low cost and high reliability. The ...

Many studies and surveys about energy storage systems and multimodal propulsion concepts are found in the literature. In, the authors review onboard and wayside applications of electrochemical batteries, ...

At present, previous studies have shown that regenerative braking energy of urban rail transit trains can reach 30-40% of traction energy consumption [].If the energy storage system equipped on the train can recycle the braking energy, the economical and environmental protection of urban rail transit systems will be greatly improved.

Adaptive Threshold Adjustment Strategy Based on Fuzzy Logic Control for Ground Energy Storage System in Urban Rail Transit Abstract: The installation of a ground energy storage system (ESS) in the substation can improve the recovery and utilization of regenerative braking energy. This paper proposes an energy management strategy (EMS) of ...

Recuperation of braking energy offers great potential for reducing energy consumption in urban rail transit systems. The present paper develops a new control strategy with variable threshold for wayside energy storage systems (ESSs), which uses the supercapacitor as the energy storage device. First, the paper analyzes the braking curve of the train and the V-I ...

In order to reduce the peak power of traction substation as much as possible and make better use of the configuration capacity of battery energy storage system (BESS) in urban rail transit, a BESS control strategy based on energy transfer is proposed. Based on the actual subway line data, the load characteristics of urban rail transit with different departure intervals are analyzed ...

This paper studies the control strategy of stationary supercapacitor energy storage system in the application of urban rail transit the beginning, a mathematical model including trains, energy ...

where q is the anti-vibration factor and $q > 0$ ($q = 0.1$ in this paper).. 2.2 DC BUS Voltage Control Based on Improved ADRC. In the urban railway system, the control of the DC bus voltage of the power supply network is crucial, which is of great significance to the safe operation of the whole system, so the ADRC control strategy with strong anti-interference performance is ...

In recent years, the introduction of Energy Storage System (ESS) into rail transit has increased the ratio of regenerative energy recovery. However, the investment of energy storage devices and ratio of energy saving varies due to different types of ESS. To overcome the problem, hybrid energy storage system (HESS) is an

effective solution to ...

With the development of urban rail transit, the energy consumption and carbon emissions of subway operation are increasing. How to reduce the energy consumption of subway operation, lower costs, and carbon emissions has become an important issue to be addressed in the subway industry. Energy feedback and ground energy storage technologies, as two key technologies ...

There are three major challenges to the broad implementation of energy storage systems (ESSs) in urban rail transit: maximizing the absorption of regenerative braking power, ...

Coordinated Energy Management Strategy of Onboard Energy Storage System in Urban Rail Transit Abstract: The wayside energy storage system has been widely used in the subway, but it cannot solve the "regeneration failure" problem. Therefore, an implement using onboard energy storage system to replace onboard braking resistor is proposed ...

Many studies and surveys about energy storage systems and multimodal propulsion concepts are found in the literature. In, the authors review onboard and wayside applications of electrochemical batteries, supercapacitors (SCs), and flywheels in urban rail systems. Particular detail is given to the analysis of standard techniques for the energy ...

supply system including energy storage device. The urban rail transit DC traction power supply network structure is shown in Fig. 1 [24]. It includes traction substations, trains and wayside BESS. The upline and downline trains run at the same time.

The application of stationary super capacitor energy storage systems (SCESS) is an effective way to recover the regenerative braking energy of urban rail transit vehicles. The ...

The modeling complexity of the traction power system and variation of traffic conditions bring challenges for the optimization of energy management strategy for supercapacitor energy storage systems in urban rail transit. Therefore, in this paper a deep-reinforcement-learning-based energy management strategy is proposed: the energy ...

The stationary supercapacitor energy storage systems (SCESS) in urban rail transit systems can effectively recover the regenerative braking energy of the trains and reduce the fluctuation of the traction network voltage. Generally, the charge/discharge states of SCESS is determined by the voltage of the traction network; however, in actual operation, the fluctuation of the no-load ...

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Urban rail transit energy storage