

A considerable reduction in consuming energy obtained for Cat Linh-Ha Dong metro line, Vietnam has been verified by simulation results on MATLAB and MAPLE software indicating that applying PMP, the highest operation energy saving is 10.15%, but if both solutions PMP and SCESS are applied, the energy saving level increases up to 14.7% in comparison with simulation results of ...

Rail transport, specifically diesel-electric trains, faces fundamental challenges in reducing fuel consumption to improve financial performance and reduce GHG emissions. One solution to improve energy efficiency is the electric brake regenerative technique. This technique was first applied on electric trains several years ago, but it is still considered to improve ...

When SEPTA's trains brake at each stop to load and unload thousands of Pennsylvania passengers, the kinetic energy of the train is converted into electricity. The agency will capture the regenerative braking energy of trains through a large-scale battery storage system and will deploy that energy as virtual power into the region's supplier of wholesale power ...

Energy storage systems to exploit regenerative braking in DC railway systems: Different approaches to improve efficiency of modern high-speed trains ... An energy-efficient scheduling approach to improve the utilization of regenerative energy for metro system. Transp. Res. Part C (2015) R.R. Liu et al. ... Electric train energy consumption ...

This paper focuses on the use of modeling and simulation for the renewable energy. An energy storage system for improving performance of electric vehicles is presented. The supercapacitor contributes to the rapid energy recovery associated with regenerative braking in electric vehicles. This power system allows the acceleration and deceleration of the vehicle ...

The main objective of this work is to develop a hybrid energy storage to use in full or hybrid electric vehicles. The hybrid energy storage system consists in a combination of batteries and ...

(DOI: 10.1109/TIE.2018.2793184) The utilization of a supercapacitor energy storage system (ESS) to store regenerative braking energy in urban rail transit can achieve an energy-saving effect. This paper proposes a brake voltage following energy management strategy of ESS to adjust the charging and discharging threshold voltage based on the analysis of train operation states. The ...

The most common form of regenerative brake involves an electric motor functioning as an electric ... The use of a capacitor allows much more rapid peak storage of energy, and at higher voltages. Mazda uses this system in some current (2018) road cars, where it is branded i-ELOOP. ... The Delhi Metro reduced the amount of carbon dioxide (CO₂) ...

In this paper, the stationary super-capacitors are used to store a metro network regenerative braking energy. In order to estimate the required energy storage systems (ESSs), ...

Battery is the oldest electric energy storage technology, which is widely used in different applications. A battery ... Metro line in Europe that show 18.6%-35.8% and 24% energy .

Applying the energy storage system, the so called MITRAC Energy Saver, to Metro systems results in similar range of energy savings, special for 600V and 750 V Metro systems, but the savings occur ...

The proposed EMS defines current references for the FC system, the battery system, the SC system, and the braking resistor .The current supplied by the pantograph, when available, and the current supplied to/by the DC bus capacitor depend on the DC bus capacitor voltage which can be indirectly controlled. The current consumed by the motor drives and the ...

In battery-operated electric vehicles, a regenerative brake system is an additional feature that recovers kinetic energy back to the battery energy storage. Due to losses in the cyclic charge/discharge of battery characteristics such processes give low energy conversion efficiency. Supercapacitor, on the other hand, has an advantage over battery in terms of recovering an ...

Supercapacitor-Based Energy Storage Systems in Metro Considering Train Operation State Zhihong Yang, Student Member, IEEE, Zhongping Yang, Member, ... Section III, a brake voltage following energy management strategy considering the train operation state is proposed. In

The article reviews the existing methods of increasing the energy efficiency of electric transport by analyzing and studying the methods of increasing the energy storage resource.

In the aim of harnessing regenerated braking energy from Metro trains, storing it in sets of stationary super-capacitors and batteries and reusing it upon demand on station electrical loads such as lighting, ventilation, escalators, pumping, etc., a Hybrid Energy Storage System is proposed in concept and its feasibility is investigated.

This simulation tool is used to study the most convenient ESS alternative for the case of a Brussels metro line. When compared with a conventional metro line, the total energy consumption reduction achieved with stationary ESS varies in function of the traffic conditions, ESS size, and ESS distribution along the line.

In DC electric railways, energy storage systems (ESSs) have been addressed to assist in the energy efficiency improvement, which is achieved by exploiting the captured excess braking energy of ...

The regenerative braking of electro-hydraulic composite braking system has the advantages of quick response and recoverable kinetic energy, which can improve the energy utilization efficiency of the whole vehicle [[1],

Metro electric brake energy storage

[2], [3]]. Nowadays, the energy storage component for the regenerative braking mostly adopts the power supply system composed of pure battery, ...

A flywheel as a way-side energy storage system for metro's, trams and trains can regenerate brake energy and provide peak shaving, reducing grid congestion, energy consumption, costs and improving energy efficiency while being a sustainable solution.

The studies conducted so far on the recovery and utilisation of regenerative braking energy of metro trains have focused on the development of on-board energy storage systems or energy storage ...

The electric energy storage systems used in diesel - electric trains are onboard (OESS) and stationary (SESS) energy storage systems. The power and energy capacities required

Aiming at realizing short headway and frequent start and braking in metro trains, this paper studies a kind of train operation schemes that can enhance the utilization of the regenerative ...

In Assumption 2.3, considering the energy loss associated with the storage and extraction of energy in ESDs, if there is a braking train nearby, the accelerating train will prioritize the immediate use of regenerative energy. Such an assumption is widely used in literature on metro storage devices (Liu et al., 2018, Wang et al., 2023).

This paper proposes an energy storage system (ESS) for recycling the regenerative braking energy in the high-speed railway. In this case, a supercapacitor-based storage system is integrated at the DC bus of the back to back converter that is connected to the two power phases of the traction power system (TPS). In order to ensure the suitability of the ...

The main research on energy efficiency in metro systems covers the following topics (Bomhauer-Beins, 2019): o Increased efficiency through Energy Storage Systems (ESS) ...

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