

Does a stationary hybrid energy storage system work in Metro traction substations?

This paper focuses on the configuration of a stationary hybrid energy storage system, located in metro traction substations in turn located inside Metro stations. The recuperation energy of the metro braking phase is then reused to feed stationary electrical loads of metro stations.

What is a hybrid energy storage system?

A hybrid Energy Storage System termed Metro HESS foresees the storage and reuse of regenerative train braking energy through an active combination of batteries covering base power electrical consumer loads in Metro stations and supercapacitors able to receive the energy power peaks from train braking.

Can onboard energy storage systems be integrated in trains?

As a result, a high tendency for integrating onboard energy storage systems in trains is being observed worldwide. This article provides a detailed review of onboard railway systems with energy storage devices. In-service trains as well as relevant prototypes are presented, and their characteristics are analyzed.

Why do we need energy storage systems?

With the widespread utilization of energy-saving technologies such as regenerative braking techniques, and in support of the full electrification of railway systems in a wide range of application conditions, energy storage systems (ESSes) have come to play an essential role.

How does an energy storage unit work?

In a typical application, the energy storage unit is connected to the dc bus in parallel with two traction power rectifiers. Regenerated power from the braking train is fed through the third rail or overhead electric line to charge the energy storage unit.

How to select energy storage media suitable for electrified railway power supply system?

In a word, the principles for selecting energy storage media suitable for electrified railway power supply system are as follows: (1) high energy density and high-power density; (2) High number of cycles and long service life; (3) High safety; (4) Fast response and no memory effect; (5) Light weight and small size.

High electric energy consumption is one of the main challenges of metro systems, which the operators deal with. Among several energy saving methods, this paper focuses on the simultaneous application of speed profile optimization and energy storage systems, to efficiently utilize regenerative braking energy. With this approach, a substantial reduction in energy was ...

SAVING MONEY EVERY DAY: LA METRO SUBWAY WAYSIDE ENERGY STORAGE SUBSTATION
Octavio Solis VYCON Inc. Cerritos, CA USA Frank Castro Los Angeles County Metropolitan ... Figure 3:
LA METRO Westlake WESS Energy Saved by Train Schedule During the 5 minute headway intervals, WESS

saves an average of 0.45 MWh per day or 10% energy ...

Vycon has now turned its attention to the metro rail market, and has developed a new flywheel energy storage and delivery unit specifically to meet the unique requirements ...

DOI: 10.1016/J.ENERGY.2016.04.051 Corpus ID: 113886070; Analysis of a flywheel energy storage system for light rail transit @article{Rupp2016AnalysisOA, title={Analysis of a flywheel energy storage system for light rail transit}, author={Alexander Rupp and Hermann Baier and Pierre Mertiny and Marc Secanell}, journal={Energy}, year={2016}, volume={107}, ...

Hong Kong metro regularly transports 80,000 passengers per hour during peak time, which is four times higher than by bus [] Tokyo, the share of public transport is 36%, while railway accounts for 91.7% of it in Fig. 1.5 [].Urban rail transit is also characterised by short headway and dwell time, and a high number of stations with short interstation distances.

Hybrid energy storage technology, which consists of lithium-ion batteries (LiB) and super capacitors (SC), is an effective way to ensure the safety of power supply and realize ...

The system outputs 1500 V DC for use in metro trains. (2) The energy-storage system consists of supercapacitors and a bi-directional DC/DC conversion circuit. According to the state of the metro train's operation, the storage system can be controlled to inject or absorb energy, thereby stabilizing the DC busbar and compensating for energy ...

This article provides a detailed review of onboard railway systems with energy storage devices. In-service trains as well as relevant prototypes are presented, and their characteristics are ...

A brake voltage following energy management strategy of ESS is proposed to adjust the charging and discharging threshold voltage based on the analysis of train operation states to realize the maximum usage of the ESS. The utilization of a supercapacitor energy storage system (ESS) to store regenerative braking energy in urban rail transit can achieve an ...

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 ...

The purpose of this paper is to conduct thorough cost-benefit analysis to facilitate China's urban rail companies to make decisions on the use of such technology.,To evaluate the benefit from regenerative energy storage, the authors formulate an improved integrated scheduling and speed control model to calculate the net energy consumption ...

To improve energy sustainability, two different kinds of energy-saving devices have been introduced extensively in metro operations. One is operated with passive control ...

Request PDF | Energy saving in metro systems: Simultaneous optimization of stationary energy storage systems and speed profiles | High electric energy consumption is one of the main challenges of ...

A model framework on the extents of motoring/braking of train acceleration and station stopping, as well as the locations of switching train operation modes, for real-time cooperative control of multiple metro trains to minimize the net energy consumption with the consideration of utilizing regenerative energy is presented. With the increasing concerns on ...

Regenerative Braking Energy Recovery System of Metro Train Based on Dual-Mode Power Management. Feng Zhao, Xiaotong Zhu *, Xiaoqiang Chen, Ying Wang. School of Automation and Electrical Engineering, Lanzhou Jiaotong University, Lanzhou, 730070, China

Generally speaking, energy storage equipment is installed on board vehicles or at the track side. On-board Energy storage system (ESS) permit trains to temporarily store their own braking energy and reuse it in the next acceleration stages . On the other hand, stationary ESS absorb the braking energy of any train in the system and deliver it ...

How to reduce the energy consumption of metro trains by optimizing both the timetable and control strategy is a major focus. Due to the complexity and difficulty of the combinatorial operation problem, the commonly-used method to optimize the train operation problem is based on an unchanged dwelling time for all trains at a specific station. Here, we develop a ...

o Many variables influence excess energy utilization -Rail system design (substation & station/stop locations, speeds, track gradients) -Train headways (spacing) and relative locations of trains on opposite tracks ... o VYCON WESS at LA Metro 24 Flywheel Energy Storage Systems Course or Event Title 24 o Manufacturers for Transit ...

UNDERSTANDING RAIL WAYSIDE ENERGY STORAGE REQUIREMENTS AND RELATIVE COSTS FOR HIGH-POWER, HIGH-CYCLABLE TECHNOLOGIES . SHMUEL DE-LEON . DAVID TURNER

Figure 5 shows the energy profile of a typical metro train with a WESS installation from Bombardier [3]. At 0 to 30 seconds a train is accelerating and a

During emergencies, the metro trains are also equipped with high-capacity batteries to ensure that they keep running. The project authority, the Dhaka Mass Transport Company Limited (DMTCL) said the metro rail employs the energy storage system, or ESS, which means the trains" braking system will be used to recharge their batteries.

AbstractReducing energy consumption without degrading the normal operation of metro trains and service

quality has received increasing attention. ... Dastfan, and M. Assili. 2018. "Energy saving in metro systems: Simultaneous optimization of stationary energy storage systems and speed profiles." J. Rail Transp. Plann. Manage. 8 (1): 78-90 ...

Conventional rail comprises suburban and regional services, while urban rail aggregates metro and light rail transit. Passenger transport is mainly operated by electric trains, while freight transport still relies more on diesel propulsion. ... 3 REAL APPLICATIONS OF ONBOARD ENERGY STORAGE SYSTEMS. Rail transport has experienced significant ...

DOI: 10.1016/j.est.2022.106115 Corpus ID: 254329489; Metro traction power measurements sizing a hybrid energy storage system utilizing trains regenerative braking @article{Leoutsakos2023MetroTP, title={Metro traction power measurements sizing a hybrid energy storage system utilizing trains regenerative braking}, author={George Leoutsakos and ...

This paper investigates the benefits of using the on-board energy storage devices (OESD) and wayside energy storage devices (WESD) in light rail transportation (metro and tram) systems. The analysed benefits are the use of OESD and WESD as a source of supply in an emergency metro scenario to safely evacuate the passengers blocked in a metro train ...

An advanced metro operation system is becoming imperative for promoting energy sustainability and commuting efficiency with the rapid developments of metro construction in cities. To improve energy sustainability, two different kinds of energy-saving devices have been introduced extensively in metro operations. One is operated with passive control modes, such ...

PDF | This paper presents an analysis on using an on-board energy storage device (ESD) for enhancing braking energy re-use in electrified railway... | Find, read and cite all the research you need ...

In (Su et al., 2015; Li and Lo, 2014; Zhao et al., 2017) while train speed profiles were optimized, recovery of regenerative braking energy was also maximized by timetables adjustment. An optimization method for multi-train network with regenerative braking system was proposed to solve the energy saving problem, and showed that by only minimizing traction ...

Regenerative braking energy can be effectively recuperated using wayside energy storage, reversible substations, or hybrid storage/reversible substation systems. This chapter compares these recuperation techniques. ... One of the approaches to maximizing reuse of regenerative braking energy is through optimizing train timetables. One of the key ...

DOI: 10.1016/j.jrtpm.2018.03.003 Corpus ID: 264257712; Energy saving in metro systems: Simultaneous optimization of stationary energy storage systems and speed profiles @article{Ahmadi2018EnergySI, title={Energy saving in metro systems: Simultaneous optimization of stationary energy storage systems and speed profiles}, author={Saeed Ahmadi and Ali ...

DOI: 10.1016/j.aos.2023.114183 Corpus ID: 264359868; Pareto multi-objective optimization of metro train energy-saving operation using improved NSGA-II algorithms @article{Zhang2023ParetoMO, title={Pareto multi-objective optimization of metro train energy-saving operation using improved NSGA-II algorithms}, author={Zhenyu Zhang and Xiaoqing ...

Vycon has now turned its attention to the metro rail market, and has developed a new flywheel energy storage and delivery unit specifically to meet the unique requirements of rail braking regeneration. The Vycon flywheel system stores kinetic energy in the form of a rotating mass, and is designed for high-power short-discharge applications.

The Hybrid Energy Storage System (HESS) design developed for the Athens Metro combines efficiently the higher power density and (dis)charging cycles of supercapacitors (coping the high frequency ...

On-board energy storage devices (OESD) and energy-efficient train timetabling (EETT) are considered two effective ways to improve the usage rate of regenerative braking ...

Energy-saving equipment, such as Regenerated Energy Devices (RED) and Energy Storage Devices (ESD), could help to produce or collect the regenerated energy from decelerating trains. The collected or stored energy then could offer electricity for the traction of trains, auxiliary lighting, or air conditioning, reducing energy consumption in general.

6.2.2 Track-Side Energy Storage Systems. A detailed analysis of the impact on energy consumption of installing a track-side energy storage system can be performed using a detailed simulation model, such as the one presented in Chap. 7, that incorporates a multi-train model and a load-flow model to represent the electrical network. Newton-Raphson algorithm is ...

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