

The use of an onboard [29] or stationary [33] energy storage device on a metro line makes it possible to ensure the constancy of the network power schedule and reduce energy losses in elements of ...

Practical use of such storage devices has shown that energy savings, line voltage stabilization, and catenary-free operation can be effectively achieved. Among many different chemistries, nickel-metal hydride (Ni-MH) and lithium-ion (Li-ion) batteries represent a standard solution for rolling stock manufacturers [17].

The results indicate that, by optimizing the placements of the storage devices, approximately 5% more energy savings can be achieved than by only optimizing the throttle position. ... H. Chan, Z. Yang, F. Lin, and B. Wang. 2015. "Optimal energy management, location and size for stationary energy storage system in a metro line based on genetic ...

This study presents the recent application of energy storage devices in electrified railways, especially batteries, flywheels, electric double layer capacitors and hybrid energy ...

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 ...

For improving the energy efficiency of railway systems, on-board energy storage devices (OESDs) have been applied to assist the traction and recover the regenerative energy.

An energy storage system based on Supercapacitor (SC) for metro network regenerative braking energy is investigated. The control strategy according to the various power requirements in metro line and differing characteristics of these storage devices are proposed to manage the energy and optimize the power supply system performance.

1 Introduction. Owing to the uncertain future state of energy resources and present concerns for environmental conservation, energy saving measures and clean energy sources have received significant interest for many electrified applications; public transport systems in particular have been the focus of efforts to conserve energy.

on-board energy storage devices, the voltage drop of the overhead line is restricted, the power supply voltage is stabilized, and a greater driving density is allowed ... and tram lines and Madrid Metro line in Europe, values of energy savings up to ...

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).

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Journal of Energy Storage, 2018. download Download free PDF View PDF chevron_right. ... ISSN 1743-3541 The recovery of train braking energy: the case of Catania (Italy) metro line R. De ~ietro", M. ~ ~ n a c c o & l o G. ~ 1nturri2 I FCE Railway Company, Catania, Italy 2~epartment of Civil and Environmental Engineering, Catania, Italy Abstract A ...

Recently, many energy storage-related technologies have been studied, such as flywheels, supercapacitors, hybrid energy storage systems, which can be divided into stationary energy storage devices (SESD) and OESD. Different from SESD, OESD avoids the loss of RBE on the catenary.

The redox flow battery (RFB) is an electrochemical energy-storage device that provides electrical energy using two active materials in liquid form. The two active materials are commonly separated by an ion-exchange membrane; reduction and oxidation reactions occur ...

Energy storage device is composed of energy storage medium and bidirectional DC/DC converter. ... Cap Energy: Qingdao Metro Line 2: SC: 2 MW/12 kWh [72] CHN: 2020: Cap Energy FGI: Qingdao Metro Line 8: SC: 4.5MW/36kWh ... R. Lamedica, R. Bartoni et al., "Energy saving in metro-transit systems: impact of braking energy management," Pisa, Italy ...

DOI: 10.1109/TPEL.2015.2411996 Corpus ID: 23925108; Line-Voltage Control Based on Wayside Energy Storage Systems for Tramway Networks @article{Cicarelli2016LineVoltageCB, title={Line-Voltage Control Based on Wayside Energy Storage Systems for Tramway Networks}, author={Flavio Ciccarelli and Diego Iannuzzi and Keiichiro Kondo and Luigi Fratelli}, ...

DOI: 10.1016/J.ENCONMAN.2011.11.019 Corpus ID: 109012849; Stationary super-capacitor energy storage system to save regenerative braking energy in a metro line @article{Teymourfar2012StationarySE, title={Stationary super-capacitor energy storage system to save regenerative braking energy in a metro line}, author={Reza Teymourfar and Behzad ...

1 Introduction. Modern railways feeding systems, similar to other conventional power delivery infrastructures, are rapidly evolving including new technologies and devices [] most of the cases, this evolution relates to the inclusion of modern power electronics and energy storage devices into the networks [2, 3] or in vehicles []. Nonetheless, some researchers are ...

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 ...

effect of the use of energy storage devices on future railways and the available types of installation are discussed. A comparison of each type of energy storage device is analysed and the rated capacities of the energy storage devices, in terms of power and energy density, are summarised by the Ragone plot. IET Electr. Syst.

This paper presents a control strategy for the power flow management of a wayside energy storage system based on a supercapacitor technology installed in a tramway network.

an Italian metro line and a Spanish metro line are presented in this paper where the increase of energy efficiency is assessed. The novelty of the paper lies in the evaluation, in two European ...

Compared with the wayside storage device, since onboard energy storage device has no line losses, it has higher energy transmission efficiency. ... there are many cases where on-board energy storage is implemented, for instance, Brussel metro and tram lines and Madrid Metro line in Europe, values of energy savings up to 27.3-36.3% [13, 14].

The indexes are used to perform a comparison between an operational metro-line in Spain and one in Italy. The results confirm their accuracy and significant improvements ...

Iannuzzi et al (5) using onboard SCESS integrated with traction drive system saves energy to 38%, reducing peak power up to 50% in accelerating regime, stabilizing voltage on DC bus to 1% ...

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), line 3 of Tehran metro network is modeled through a novel approach, in peak and off-peak conditions based on the real data obtained from Tehran metro office.

Focusing on the energy-conservation train operation issues, this paper proposes an effective real-time train regulation scheme for metro systems with energy storage devices. Specifically, to minimize train timetable deviation, passenger waiting and energy consumption, we formulate a mixed-integer nonlinear programming model to generate energy-efficient train ...

inverting substations [2,3] or energy storage devices [4,5]. The first solution, however, implies the modification of all ESS existent on the track. The second solution instead can be actuated without substantial change of the present supply system, because storage devices can be located both in the substations and in the

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 ...

Abstract: This paper presents an analysis on using an on-board energy storage device (ESD) for enhancing braking energy re-use in electrified railway transportation. A simulation model was

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