

How much energy does a tram use?

The greater the distance between stations, the greater the demand energy. The first interval has the largest distance and maximum energy consumption. If the recovered braking energy is not included, the energy consumption is 7.012 kwh. Fig. 3. DC bus demand energy curve. The tram adopts the power supply mode of catenary free and on-board SESS.

How does a supercapacitor improve the battery life of a tram?

Wang et al. comprehensively considered the characteristics of the tram HESS, line conditions, and traction characteristics, took the mass of the supercapacitor as the optimization goal, optimized the parameters, and extended the battery life while reducing the mass of the ESS.

How do energy trams work?

At present, new energy trams mostly use an on-board energy storage power supply method, and by using a single energy storage component such as batteries, or supercapacitors.

What is a hybrid energy storage system in Guangzhou Haizhu Tram?

The optimal HESS has less mass, size, cost and minimum charging state than original one in Guangzhou Haizhu tram. A hybrid energy storage system (HESS) of tram composed of different energy storage elements (ESEs) is gradually being adopted, leveraging the advantages of each ESE.

What power supply mode does a tram use?

The tram adopts the power supply mode of catenary free and on-board SESS. The whole operation process is powered by a SESS. The SESS only supplements electric energy within 30s after entering each station. The power supply parameters of the on-board ESS are shown in Table 2. Table 2. Power supply parameters of on-board ESS.

How to obtain optimal energy storage elements in Guangzhou Haizhu Tram?

An improved PSO algorithm with competition mechanism is developed for obtaining the optimal energy storage elements. The optimal HESS has less mass, size, cost and minimum charging state than original one in Guangzhou Haizhu tram.

On-board energy storage systems have a significant role in providing the required energy during catenary free operation of trams and in recovering regenerated energy from braking. The...

The purpose of this paper is to explore the concept of utilising stationary Electric Vehicle (EV) batteries in a P& R facility to act as lineside energy storage for urban dc tram systems as a method of reducing the capital expenditure required to achieve operational efficiency improvements in the tram system.

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The authors investigated the use of: OESD with batteries for a catenary free section for different scenarios (full route or a catenary free section between two stations); the charge of OESD...

Braking energy of trams can be recovered in storage systems. High power lithium batteries and supercapacitors have been considered. Storage systems can be installed ...

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This pilot project's energy storage unit offers a capacity of approximately 500 kWh and is made up of around 20 battery systems which were previously used to cover thousands of miles in the eCitaro as part of operational testing.

An on-board energy storage system for catenary free operation of a tram is investigated, using a Lithium Titanate Oxide (LTO) battery system. The battery unit is charged by trackside...

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 ...

This paper studies a hybrid energy storage system (HESS) for traction substation (TS) which integrates super-capacitor (SC) and vanadium redox battery (VRB). According to the ...

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This paper studies a hybrid energy storage system (HESS) for traction substation (TS) which integrates super-capacitor (SC) and vanadium redox battery (VRB). According to the characteristics of the traction load under actual operating conditions, an energy management strategy with fixed-period control (FPC) is proposed, which fully ...

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In order to design a well-performing hybrid storage system for trams, optimization of energy management strategy (EMS) and sizing is crucial. This paper proposes an improved EMS with energy ...

On-board energy storage systems have a significant role in providing the required energy during catenary free operation of trams and in recovering regenerated energy from braking. The energy consumption of a commercial tram for a total journey length of 13km has been simulated for proper sizing of the on-board energy storage.

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