




SIEMENS

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Mass transit solutions for operation
without overhead contact line.


Sustainable. Energy-efficient. Trendsetting.

Answers for infrastructure and cities.

An aerial photograph of a city, likely Philadelphia, showing a wide river (the Schuylkill River) with a large stone arch bridge (the University City Bridge). The city skyline is visible in the background under a clear blue sky. The foreground shows various buildings and green spaces.

Demographics. The composition of the world's population is undergoing a process of change. It is particularly in industrial states that the ratio between generations is becoming imbalanced. The population is on the increase and aging – and there is a rising need for innovative mobility solutions.

Sustainable.
Mobility with a vision.



Climate change. Worldwide CO₂ emission levels have to be reduced. The transport sector in particular features enormous potential for cutting down on CO₂ emission. Solutions are to be found in a detail-focused approach – and in the use of future-proof technologies.

Urbanization. Megacities are growing, almost unlimitedly. Today, more than half the world's population lives in cities. Against this background, it is a question of harmonizing individual mobility and energy savings – a challenge for mass transit in particular.

Focus on the city. More than ever before, the quality of life and competitiveness depend on cost-effective, future-oriented transportation systems. The requirements facing mass transit systems are increasing – especially in metropolises and conurbations. What is in demand is an optimum combination of speed, capacity, attractiveness and environmental compatibility. This is because cities need air to breathe. That is why new technologies should be capable of becoming easily integrated into existing infrastructures. It is only in this way that town planners, infrastructure decision-makers and mass transit operators can secure their investments sustainably.

Energy-efficient. Technology with potential.

Less energy consumption. Less CO₂ emission. More efficiency. These are the objectives of local authorities and cities. Objectives which can only be achieved by using innovative mobility technologies – sustainable technologies which Siemens is focusing on.



Complete mobility.

With more than 160 years of experience in passenger transportation, Siemens knows the requirements encountered in the urban environment and offers conurbations a full-scale portfolio of future-proof technologies. With this in mind, we are applying our “Complete mobility” approach to implement solutions for sustainable city and transportation development. Environmental and climate protection are considered just like aspects of cost-effectiveness and efficiency. One innovative example is the SiTRAS® HES hybrid energy storage system.

Cost-effective energy storage systems.

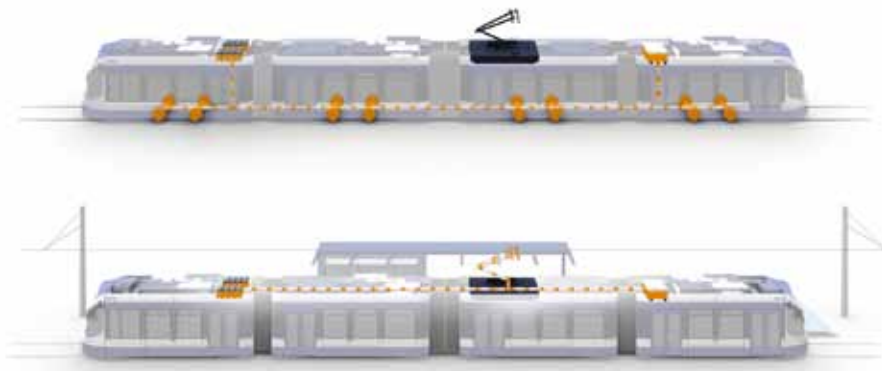
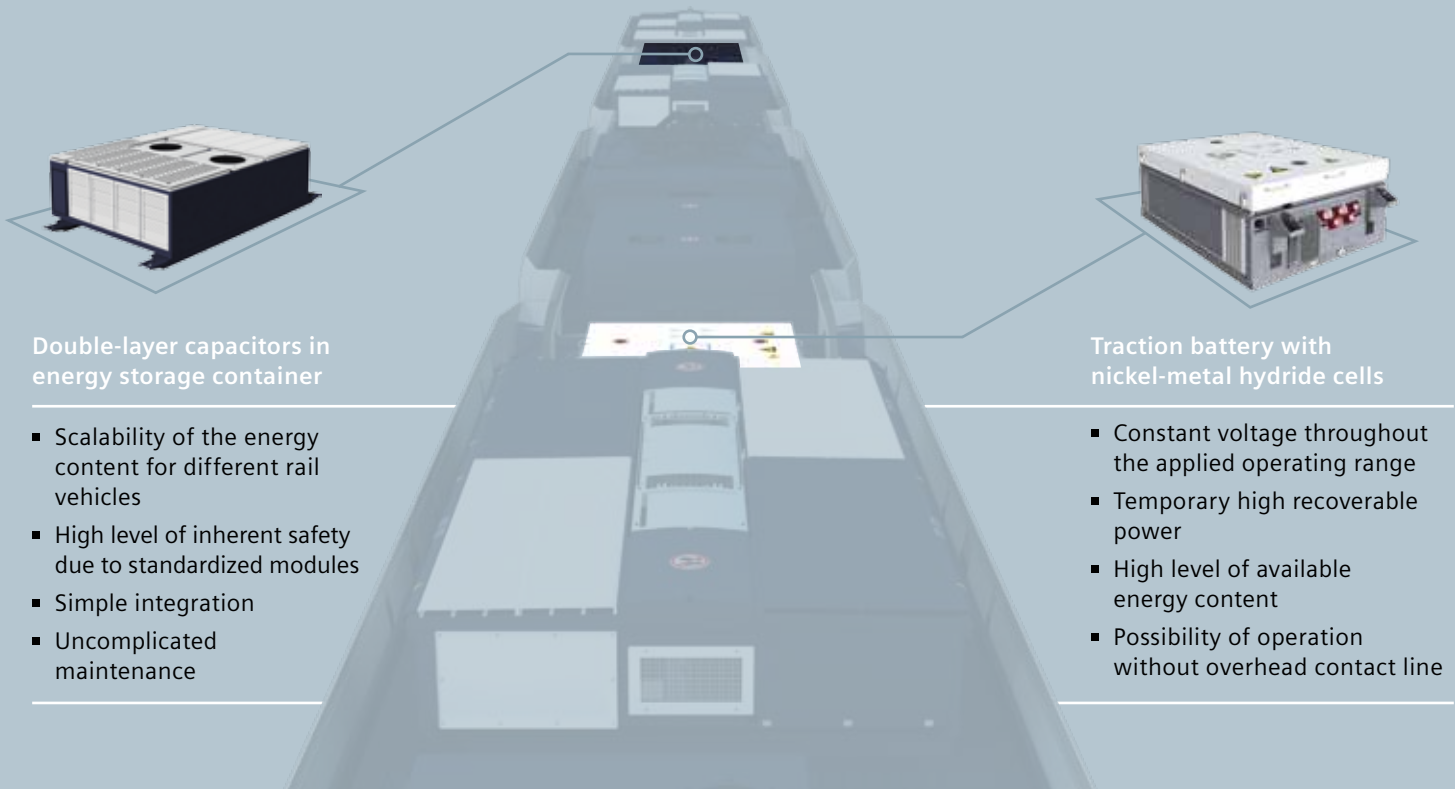
SiTRAS HES opens up entirely new perspectives for cities – thanks to its intelligent storage and usage of braking energy. Vehicles featuring this technology consume up to 30 % less energy per year and emit up to 80 tons of CO₂ less. What is more, the traction power supply becomes more stable since the voltage drop along the overhead contact line is reduced, particularly in high-peak operating periods. SiTRAS HES enables trams to run without overhead contact lines for distances of up to 2,500 m. Whether in

tunnels, on bridges or at major intersections, the system is particularly suitable for complex structural locations which make it difficult to install overhead contact line. Moreover, routes without overhead contact line mean less installation work, and that, in turn, entails lower electrification costs for operators and more flexible possibilities for town planning. The special feature of our system is that it is designed to function on narrow-gauge railways too. A system which both cuts energy consumption and adds to the attractiveness of the cityscape.

Effective combination.

Sitras HES consists of two basic components: the Sitras MES mobile energy storage unit and a traction battery. In addition to storing braking energy, Sitras HES uses this storage function to provide a new operating mode – operation without overhead contact line. Control in this energy-efficient operating mode can be adjusted to such a precise degree that the optimum solution required by the customer can be achieved – energy savings

and peak power reduction. If more energy is generated during braking than can be stored, this energy is fed back into the contact line. The hybrid concept can be integrated into new rolling stock and existing vehicles can be retrofitted with this system too. In this way, not only energy consumption, energy costs and CO₂ emission can be reduced, but the cityscape can also be visibly preserved and enhanced.



Charging of the energy storage system by braking during operation

Charging of the energy storage system on routes with overhead contact line and at charging stations or stops within just a few seconds by local charging units at stations or stops

Trendsetting.

Performance with a future.

Storage system for usage of braking energy. Worldwide CO₂ savings of up to 4.6 million tons. So that both human beings and the climate can breathe. Modular retrofitting and platform concepts ensure that these perspectives become reality.

Convincing hybrid concept.

Energy storage systems are future-proof – for both the climate and the operators. Siemens has therefore developed a retrofitting option which enables the energy storage unit to be subsequently connected outside the traction converter too. The Sitras MES and Sitras HES energy storage systems are optional components of Siemens' new Avenio tram platform. An efficient overall solution which has

already proved itself in practice. In Portugal, south of Lisbon, Siemens' Sitras HES hybrid energy storage system has been in passenger operation since 2008. With success too, since the trams run without overhead contact line on gradients of up to 2.6 % and save energy. Environmentally friendly and cost-effective at the same time, this system proves how smoothly both operating modes function.

Overview of benefits.

Cost-effective and environmentally friendly

- Reduction in energy demand by up to 30 %
- Optimization of life cycle costs with 99.8 % availability
- Lower cost-intensive peak power demand
- Larger intervals between stops and substations
- Reduction in CO₂ emission by up to 80 tons per vehicle per year

Powerful and safe

- Increase of performance by reducing the voltage drop within the traction power supply
- Scalable energy content
- Simple retrofittability
- Equipment for Avenio
- Tested by TÜV Süd (German Technical Supervisory Association) in line with BOSTrab (German Construction and Operating Code for Light Rail)





Future perspectives. Whether on roads, on rail or in the air – in future, transportation has to be controlled and networked even more intelligently. It is only in this way that the existing infrastructure can be used efficiently and, at the same time, our climate protected. With this in mind, Siemens offers a wide range of possibilities – and is continuously developing new systems, products and technologies which set new criteria in terms of climate neutrality. Thanks to their scalable energy content, our energy storage systems can be used not only for trams but also in other rolling stock. We benefit from our many years of experience and our technological know-how. What is the reason for our strength? We offer not only mobility solutions from a single source but also an incomparably full-scale portfolio.

Put your future on the right tracks and contact us!



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