

The background image shows a subway tunnel with tracks receding into the distance. Overlaid on the image are various digital elements: a Siemens logo in the top left, a blue box with the text 'Energy-Optimized Operation' and a subtitle, a white box with the URL 'siemens.com/mobility', and several circular icons containing symbols like a leaf, a lightning bolt, and a bar chart. There are also wavy lines and a code snippet on the left side.

SIEMENS

Ingenuity for life

Energy-Optimized Operation

Improving energy efficiency
by linking the signaling and power system

[siemens.com/mobility](https://www.siemens.com/mobility)

Reliable and continuous operation of metro systems is a key factor for a sustainable city. Assuring efficient operations, metro operators can increase the share of public transportation. With a high level of quality of service and quick, predictable trip times from A to B, passengers are rather willing to choose the metro for their daily journeys to meet family and friends, travel to work or discover new cities.

The availability of the necessary power supply is a major prerequisite for metro operators to offer high-quality service for their passengers. Increasing energy prices and awareness for preserving the environment and smart city concepts further strengthen the need to consider energy-conscious operations on mass transit networks.

Intelligent algorithms for sustainable operations

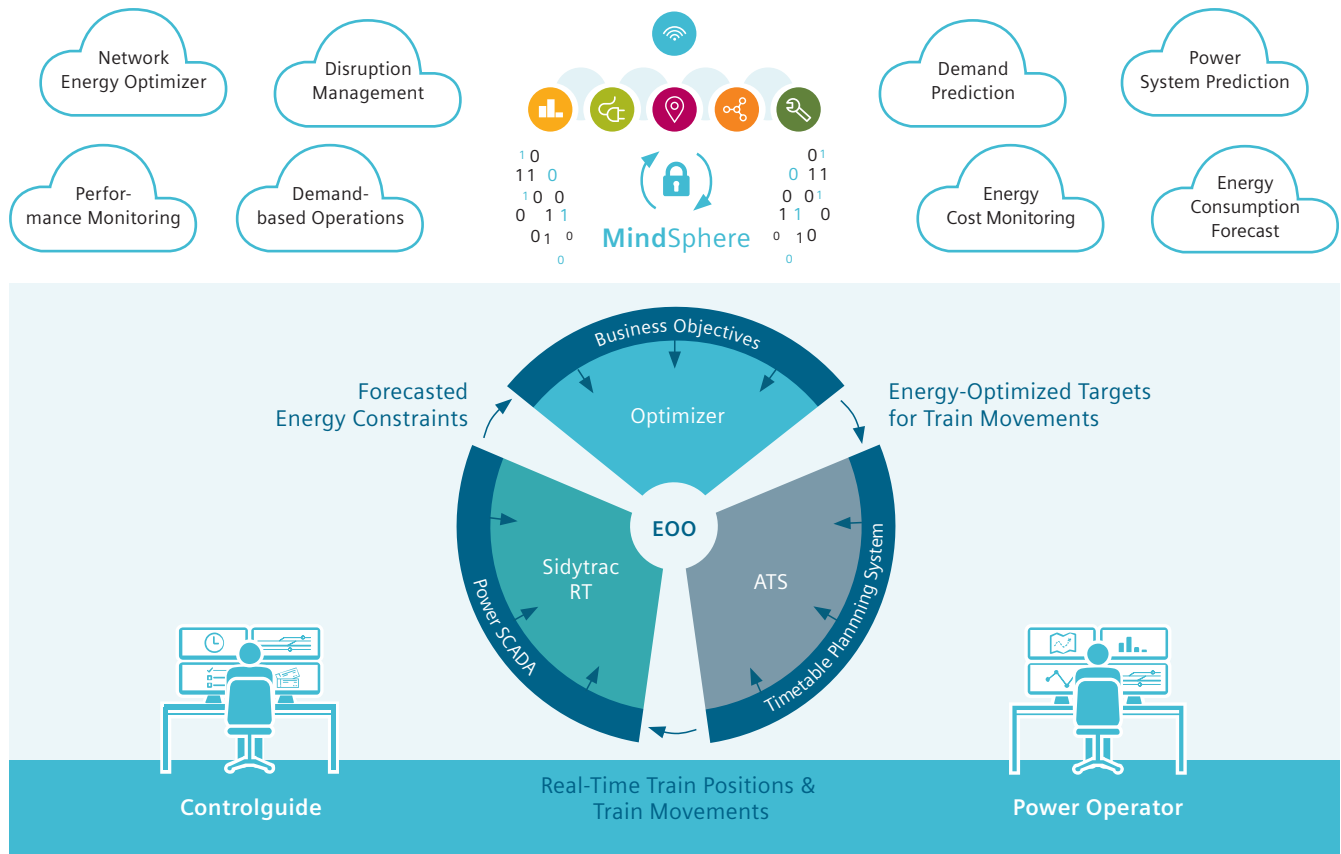
Energy-Optimized Operation of Siemens' digital portfolio meets this demand by offering a system which integrates online train regulation and timetable planning with a real-time model of the electric network. This real-time model is able to forecast the behavior of the electrical system based on data from the train regulation system

and the power SCADA. Energy conflicts, including system breakdowns can be identified before they occur and operational measures can be taken to prevent these disturbances from happening and ultimately affecting the availability of mobility services. Depending on the payment models, energetic and operational constraints can be set to automatically receive energy-optimized timetables, considering, e.g., penalty payments for overshooting a limit for contracted energy consumption or not meeting obligations for offered transport capacity.

Integrating data for optimized operations

By integrating signaling and energy management systems, Siemens offers transparency on the interdependency between energy consumption and metro operation. This allows to define timetables considering headway and energy consumption optimization at once. The priority of the KPIs can be adapted to operational times (peak / off-peak). Energy-Optimized Operation uses real-time data from the ATS and SCADA to increase the availability of service and allows for energy savings, thus providing metro operators with a single interface where they can prioritize energy-based vs. operational and commercial KPIs.

Energy-Optimized Operation (EOO)



Metro operator

- Opportunity of significant CAPEX and OPEX cost reduction due to optimized system design
- Fewer disruptions of service due to forecasts of failures of the electric system and adaption of operation
- Possibility to take energetic restrictions into account during operation and for timetable planning
- Possibility to tailor operation to fit contracts with the energy supplier
- Optimized use of existing infrastructure



Power operator

- Availability of real-time information of the status of the electrical network
- Forecast of possible failures and decision support / automatic reaction of the system to prevent impact to operation
- Improved transparency about impact of operation on power system
- Improved performance of power system due to comprehensive analysis



Individual passenger

- Improved journey experience through higher availability of the transportation system
- Less CO2 emissions for a healthier environment, contributing to a more sustainable city environment



Infrastructure owner

- Opportunity of significant CAPEX and OPEX cost reduction due to optimized system design
- Reduced OPEX due to controlled energy consumption and reduced maintenance cost
- Increased transparency about energy consumption allows better negotiation position and planning



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