

ENVILINE™ ESS

Energy Storage System
for DC rail transportation



ENVILINE ESS – Energy Storage System

Reduce energy and peak power costs

Transportation is energy intensive and it is not surprising that electric rail transit operators are amongst the largest consumers of electricity in their urban territory. To increase sustainability, these operators can no longer consider energy as just a cost of operation and need to look for ways to reduce both their consumption and peak power demands.

Fortunately, mass urban transit systems offer an immediate opportunity, the recycling of the braking energy. When trains brake, their kinetic energy is converted into electricity and returned on the traction power line. Most of the time, on-board loads and distant trains can only take a portion of this energy, and the surplus is wasted into resistors.

ENVILINE ESS is a wayside energy storage system that stores and recycles this surplus energy, helping reduce the energy consumption up to 30 percent*.

Train braking lasts only seconds yet generates extremely large currents and occurs hundreds and thousands of times each day. Because of this, super capacitors represent an ideal and effective storage technology and the ESS uses the latest generation of double layer super capacitors. The ESS captures this braking energy and returns it seconds later to sustain the acceleration. Built with high performance and configurable controls, the ESS can be programmed to work optimally under a variety of site conditions and application requirements.

Reduction of starting power and demand charges

In addition to consuming large quantities of energy, trains also draw excessive peaks of power during their acceleration. This causes voltage drops which can lead to performance problems and results in large demand charges and peak power penalties from the utility company.

The ENVILINE ESS is an ideal solution for this. Because it returns the energy during the acceleration, the ESS limits the power drawn from the grid and sustains the voltage level of the train power. This reduces the demand charges and peak power penalties, and can also avoid or defer potential capital investments to fix voltage levels and quality problems.

Key benefits

- Lowers energy costs through energy recovery
- Reduces the demand charge and peak power penalties by cutting the starting power of trains
- Defers capital expenditures needed to sustain the voltage level of the DC traction power line
- Makes the substation smart and capable of generating benefits on the local grid and additional revenues for the rail operator
- Compatible with existing train systems and deployed with no impact on the train operation and traction power system

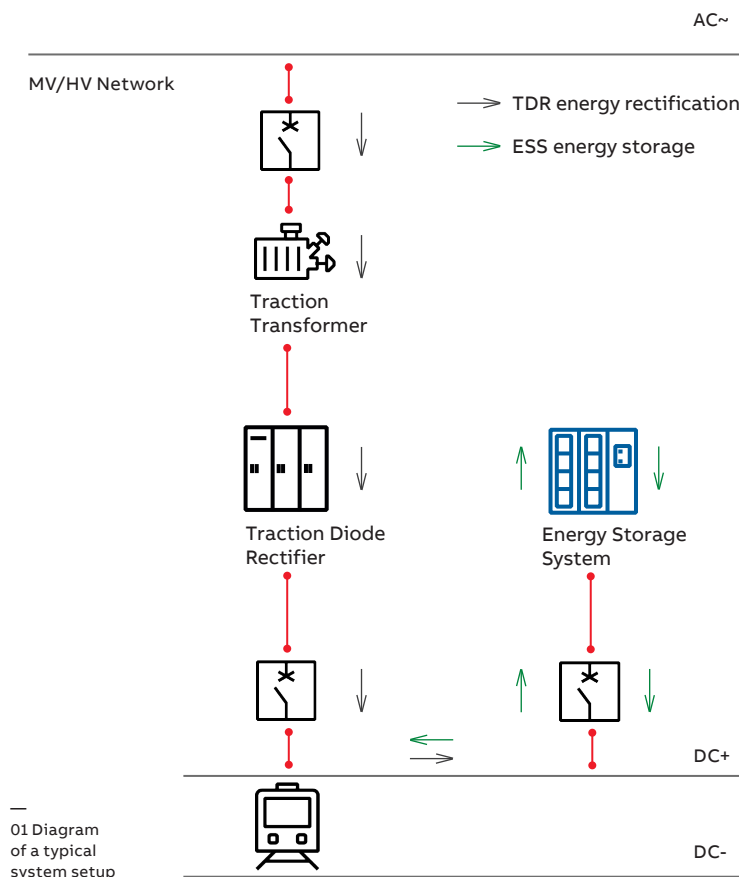
Key features

- Operates on 600, 750, 1500 and 3000 V
- Modular packaging allows independent sizing of power and storage
- Automatic rebalancing of the super capacitors to maintain the storage capacity
- Flexible programming to ensure optimum operation at each site
- Ease of deployment with no AC connection
- Provides emergency traction power
- Expandable with batteries to provide smart grid services and revenue generation
- Expandable to 4.5 MW and 60 MJ per line-up and parallelable for large applications
- Remote access and email notification
- Energy metering, operational dashboards and downloadable data files

*The level of savings will depend on the operating conditions of the train system. ABB can assist in determining the expected level of energy savings for specific scenarios.

ENVILINE

Reliability and efficiency on track



Fixed or mobile off-grid power

Long spacing between substations, maintenance activities and outages can often leave the rail operator with complex challenges and expensive measures to ensure reliable service.

The ENVILINE ESS can be deployed as a fixed or mobile off-grid substation connected solely to the overhead catenary system (OCS) or 3rd rail power. During the coasting period of the train, the existing infrastructure supplies virtually no power. The ESS uses these periods to capture and store energy, enabling it to later supply it back as needed to sustain the voltage and train operation.

A smart substation that can generate revenues

Utilities are challenged to remove their fossil-based generation in favor of renewable energies. For them, implementing demand response can be much more economical than building for peak capacity in the generation, transmission and distribution. The ESS can be configured with super capacitors and batteries to combine the benefits of braking energy recovery and peak power reduction with local grid support services such as frequency regulation, peak shaving or demand shifting. Talk to ABB to see how the ESS was deployed in Philadelphia to provide the regional train operator with revenue generating frequency regulation services on the local energy market of PJM.

Technical data	ENVILINE ESS 750	ENVILINE ESS 1500
Nominal TPS (Traction Power Supply)	600 / 750 V _{DC}	1500 V _{DC}
Converter cabinet power	750 kW	750 kW
Maximum system power	4500 kW	4500 kW
Converter cabinet current	1000 A	500 A
Maximum system current	6000 A	3000 A
Operating voltage range	500 to 1000 V _{DC}	1000 to 2000 V _{DC}
Efficiency	92 - 95 % typical	92 - 95 % typical
Total storage per cabinet	7.8 MJ	7 MJ
Nominal/Useable storage per cabinet	6 MJ	5.4 MJ
Maximum system storage	60 MJ	56 MJ
Maximum useable energy	16.2 kWh	15.6 kWh
Cabinet dimensions (W x H x D)	0.6 x 2.2 x 1.65 m	0.6 x 2.2 x 1.65 m
Maximum system dimension (16 cabinets)	9.6 x 2.2 x 1.65 m	9.6 x 2.2 x 1.65 m
Weight per cabinet (converter / storage)	950 / 925 kg	950 / 925 kg
Storage temperature	-20° to 60°C	-20° to 60°C
Operating temperature	0° to 40°C, no derating	0° to 40°C, no derating
Maximum temperature (with derating)	50° C	50° C
Elevation	1000 m	1000 m
Enclosure	NEMA 2 / IP30	NEMA 2 / IP30
Remote access	TCP/IP and RS485 (Modbus)	TCP/IP and RS485 (Modbus)
SCADA output	4 contacts (form C), option for more	4 contacts (form C), option for more
EMC	EN 50121-5	EN 50121-5
Standards	EN 60146-1 / EN 50328	EN 60146-1 / EN 50328

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