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UIC WORKSHOP ON ENERGY EFFICIENCY OF FUTURE TRAINS

Infrastructure for energy efficiency:

Innovation technologies towards energy efficiency

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RFI: The infrastructure manager

- RFI, a company of Ferrovie dello Stato Group, has been established on July 1st 2001, at the conclusion of a restructuring process of the whole Group.
- RFI is the company responsible for the management and maintenance of the rail infrastructure.
- RFI manages the control and safety systems connected with train operations, defines the criteria for the use of the network and enters into contracts with railway companies for the access to the rail infrastructure.

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RFI: National railway infrastructure

… a big network

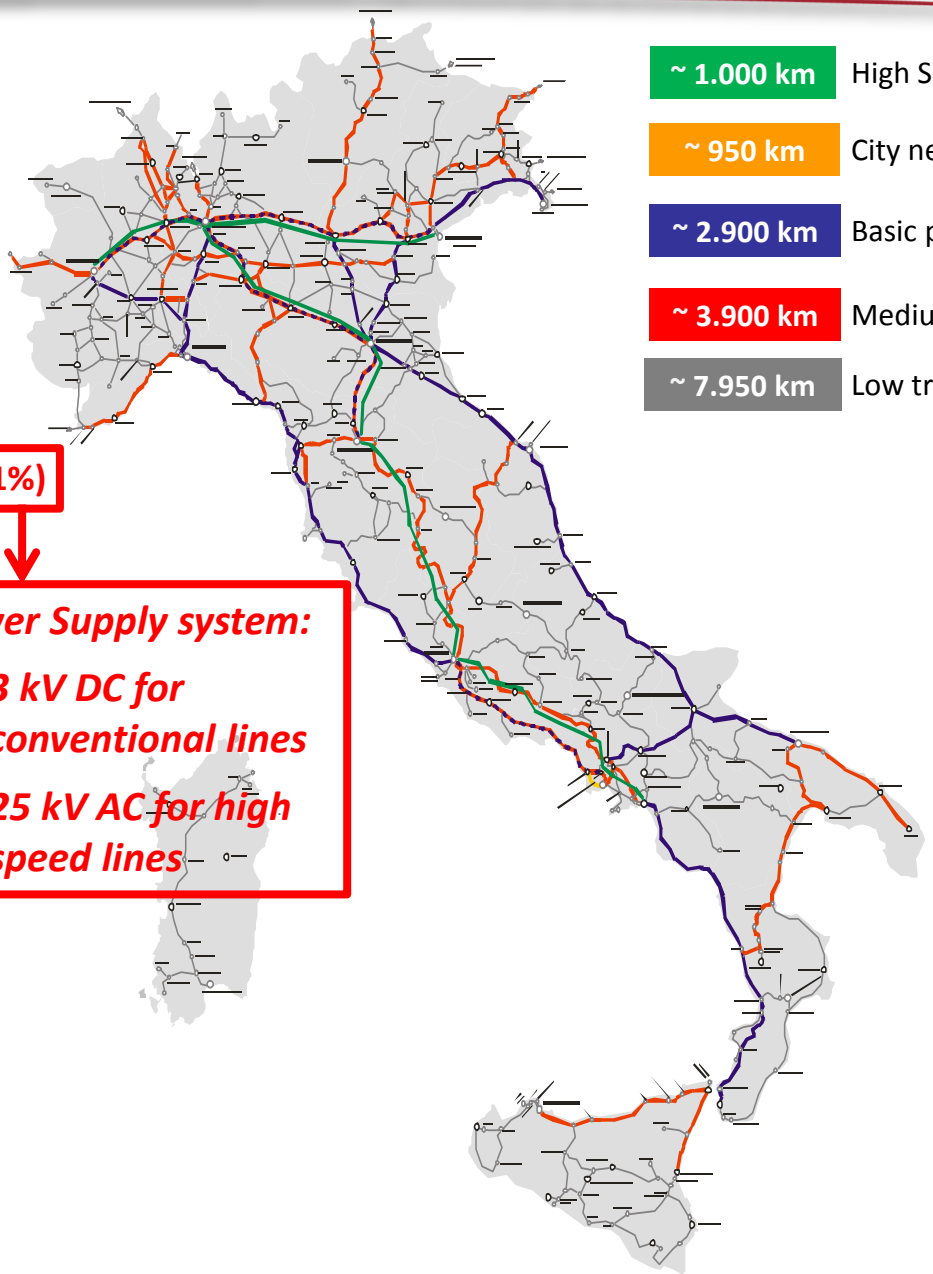
Network	**16.742**	**km**	
Double track	7.536	km	
Single track	9.206	km	
Power supplied lines	**11.932**	**km**	**(71%)**
Tunnels and bridges	1.980	km	
Stations	2.260		

Signalling technologies

SSC – SCMT	*16.742*	km
ERTMS	*671*	km
GSM-R	*9.000*	km

Power Supply system:

- ***3 kV DC for conventional lines***
- ***25 kV AC for high speed lines***



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RFI projects towards energy efficiency

RFI is involved in the research and the development of the following projects in the energy efficiency field:

- **On-board energy measurements;**
- **On-board energy efficiency: implementation of the eco-driving technique, realized by optimization algorithms.**
- **Energy recovery and voltage control systems in ESSs.**

MyRails (EC funded project)

RFI is involved in MyRails project that aims to develop the metrological infrastructure for accurate measurement of energy exchange and for reliable system monitoring, which underpins the implementation of an energy efficiency management of the European DC and AC railway, in order to reduce the CO_2 railway transport emissions by 50% by 2030.
Moreover, an error of 5% on 36,5 TWh, the energy consumption of the European railway system, equates to around 110 M€ savings.

EMPIR
EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States
Horizon 2020
European Union Funding
for Research & Innovation

RFI on-going energy efficiency projects

❖ Project presently being developed in Italy:

ERTMS High Density

ERTMS level 2 on city railway network with ATO (Automatic Train Operation)

Integrated with ERTMS

Test of a DAS prototype

on a regional train (in co-operation with Trenitalia) – Driver Auxiliary System

External supporting device

The ***main advantages*** are:

- ❑ punctuality improvement;
- ❑ carbon footprint reduction;
- ❑ energy costs decrease.

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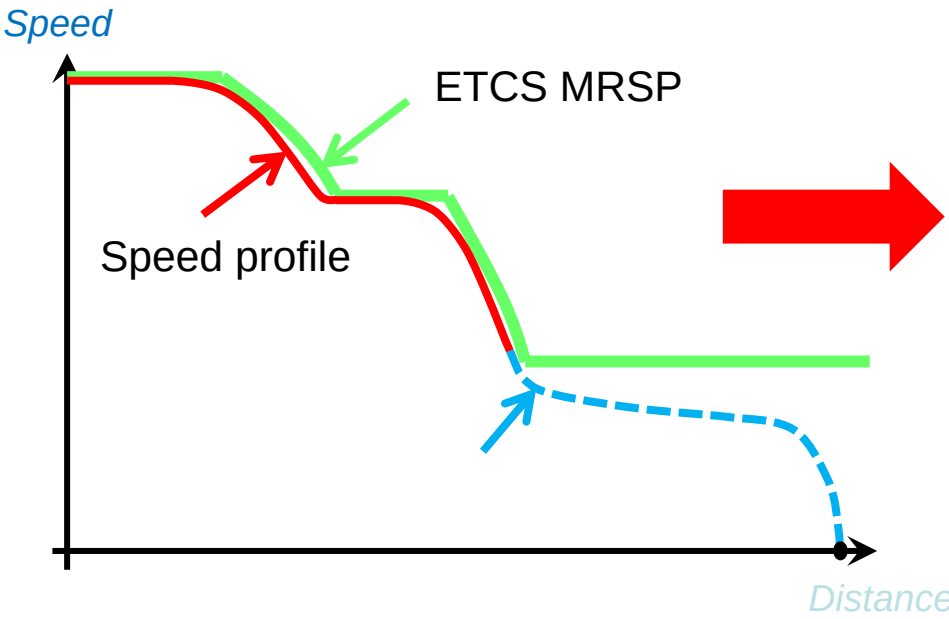
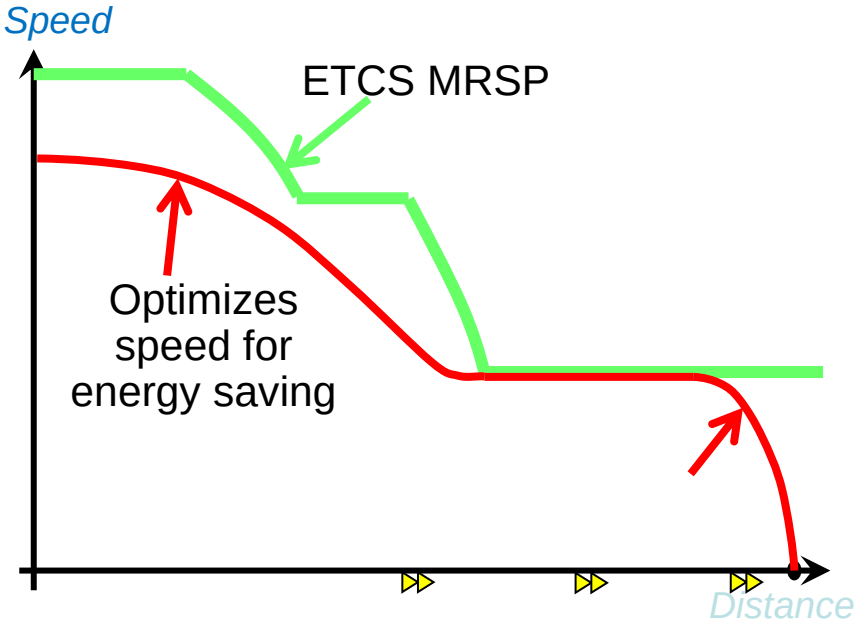
Speed profiles

Current speed profile:



Final goal:



Energy recovery and voltage control systems in ESSs

The **energy recovery and voltage control system** is an innovative system designed for the 3 kV DC power supply system.

The **main advantages** are the following:

- ❑ Regulation of the contact line voltage and the increase of the operational advantages;
- ❑ Improvement of the energy saving by recovering the rolling-stock braking energy.

The **innovative ESSs** are composed by:

- ❑ Supply transformer for interconnection of HV and MV supply systems;
- ❑ AC/DC converter for the power conversion and for the voltage control in the DC railway system;
- ❑ DC/DC converter for conversion of rolling-stock braking electrical energy;
- ❑ Energy storage device.

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Energy recovery and voltage control systems in ESSs

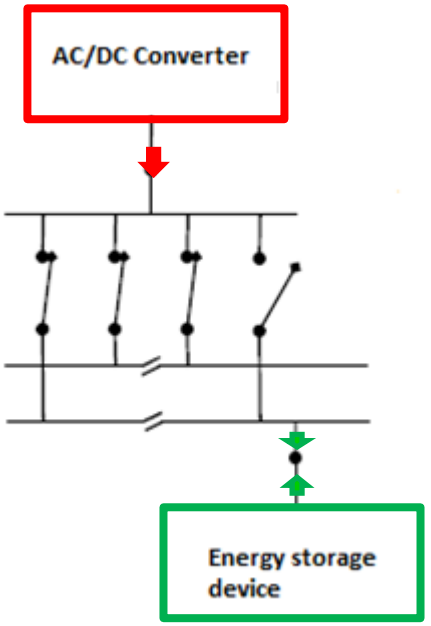
The **main characteristics** of the components are:

- The *AC/DC converter* in active rectifier mode behaves as a traditional converter and shall provide maximum 10MW overload capability.
- The *DC/DC converter* is bidirectional in order to store the rolling-stock braking electrical energy and reuse it into 3 kV DC line.

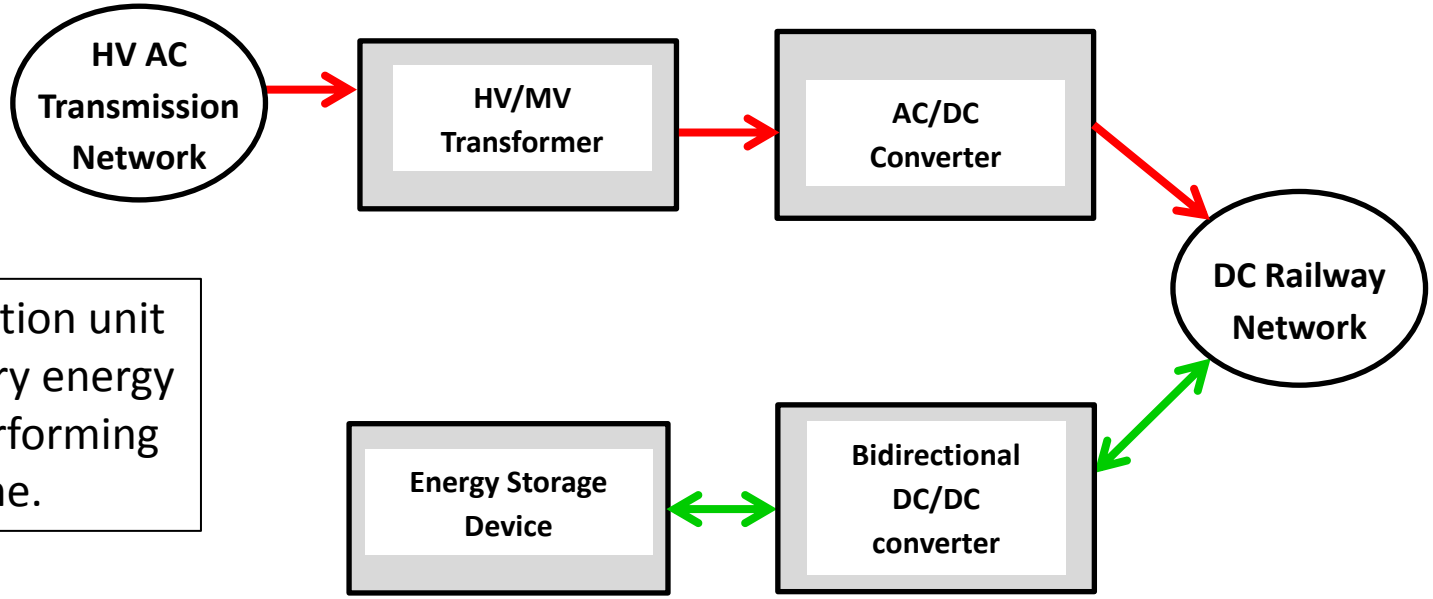
The *energy storage device* consists of a supercapacitors bank and it is connected directly with the contact line.

The supercapacitors are designed to handle the power peaks caused by the rolling-stock braking and to store the related energy.

This energy will be given back to the rolling-stock during the traction phase.



Energy recovery and voltage control systems in ESSs



The transformation unit and the recovery energy unit are not performing at the same time.

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Thank you for your attention