

Consortium



Project coordinator: LAPLACE (Univ. Toulouse – France)

4 partners from 3 countries: Switzerland, Italy, France











Today's Railway Electrification Systems in EU



MVAC electrification systems:

			Lines in EU
15 kV 16,7 Hz (1905 ->)	 Specific generation and distribution grid Bulky substation transformers Locomotive on-board AC/DC conversion and 2.f filters 	No phase breakAC circuit breakers	33 000 km
25 kV 50 Hz (1950 - >)	Single Phase SubstationsNeutral SectionsLocomotive on-board AC/DC conversion and 2.f filters	Supply from public gridOverhead line cross-sectionAC circuit breakers	28 000 km

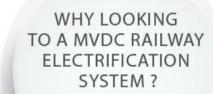
DC electrification systems

			Lines in EU
1.5 kV or 3 kV (1915 ->)	AC/DC conversion in substationOverhead line cross-sectionDC circuit breakers	 Substations in parallel Three-phase power Supply from public grid Simple locomotive on-board Power converter (Input Filter + Voltage Source Inverter). 	1.5 kV : 9200 km 3 kV : 38 000 km



Future Unified Dc Railway Electrification System







TO MIX ADVANTAGES
OF THE EXISTING
ELECTRIFICATION SYSTEMS

- power sharing between Substations
- three-phase power Supply from public grid
- simple locomotive on-board Power converter (Input Filter + Voltage Source Inverter)
- light overhead line and no inductive voltage drop



POWER ELECTRONICS IS MATURE ENOUGH

- HVDC power converters (up to +/- 800 kV, 3
 GW) are operated everywhere in the world
- Solid State DC Circuit Breakers for HVDC grids are tuned
- MV drives for industrial motors (6 KV to 10 kV) are commercially available
- SiC power semi-conductors enable the realization of compact MV traction converters

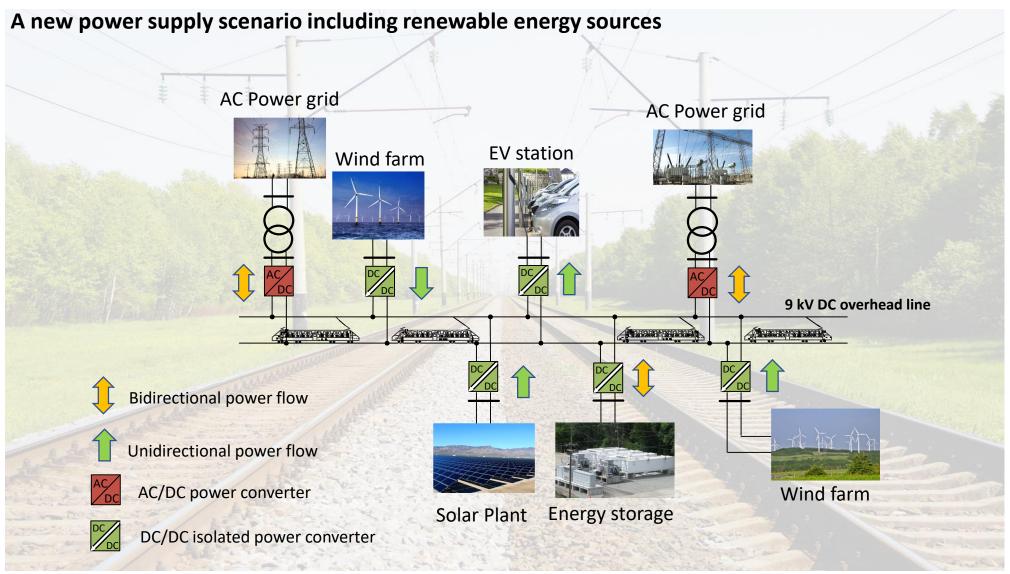
A REAL BREAKTHROUGH FOR THE FUTURE OF RAIL TRANSPORTATION

- a solution for countries which do not yet have electrified railway lines
- a solution for DC lines renewal (copper savings, energy efficiency increase)
- easier integration of renewable energy sources and storage elements (MVDC smart grid)



Future Unified Dc Railway Electrification System





Future Unified Dc Railway Electrification System



Regarding the energy challenge for the railway sector, the project FUNDRES presents a deep forward thinking scenario and proposes related work to define the future of railway.

FUNDRES focuses on a Medium Voltage DC electrification system that can serve as energy hub for renewable sources in order to:

> Significant cost savings for contactline renewal (several millions euros per 100 km)



increase the capacity while improving the energy consumption and limiting the environmental impacts

increase from 90% to 95%



decrease the investment and exploitation costs, while maintaining safety and service quality



Main Objectives



