

Shift2Rail Energy KPI results



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FINE1 WP 4 Leader

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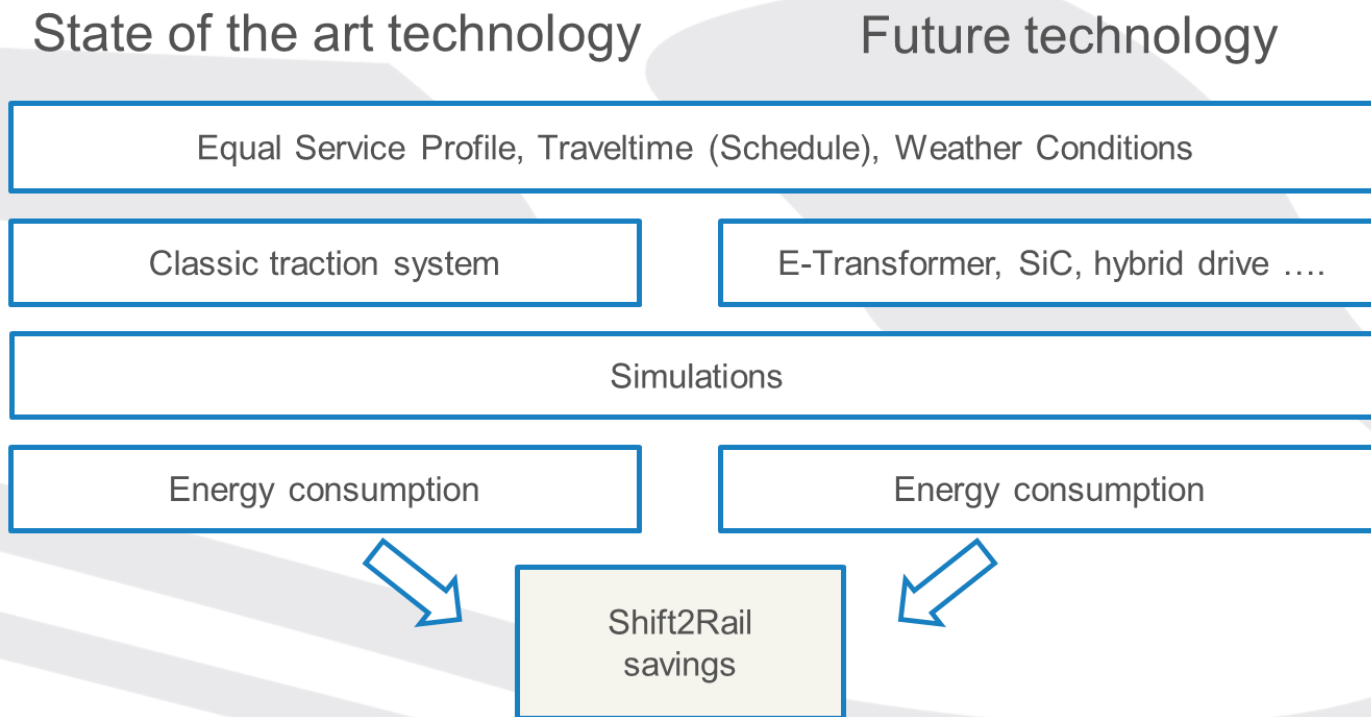
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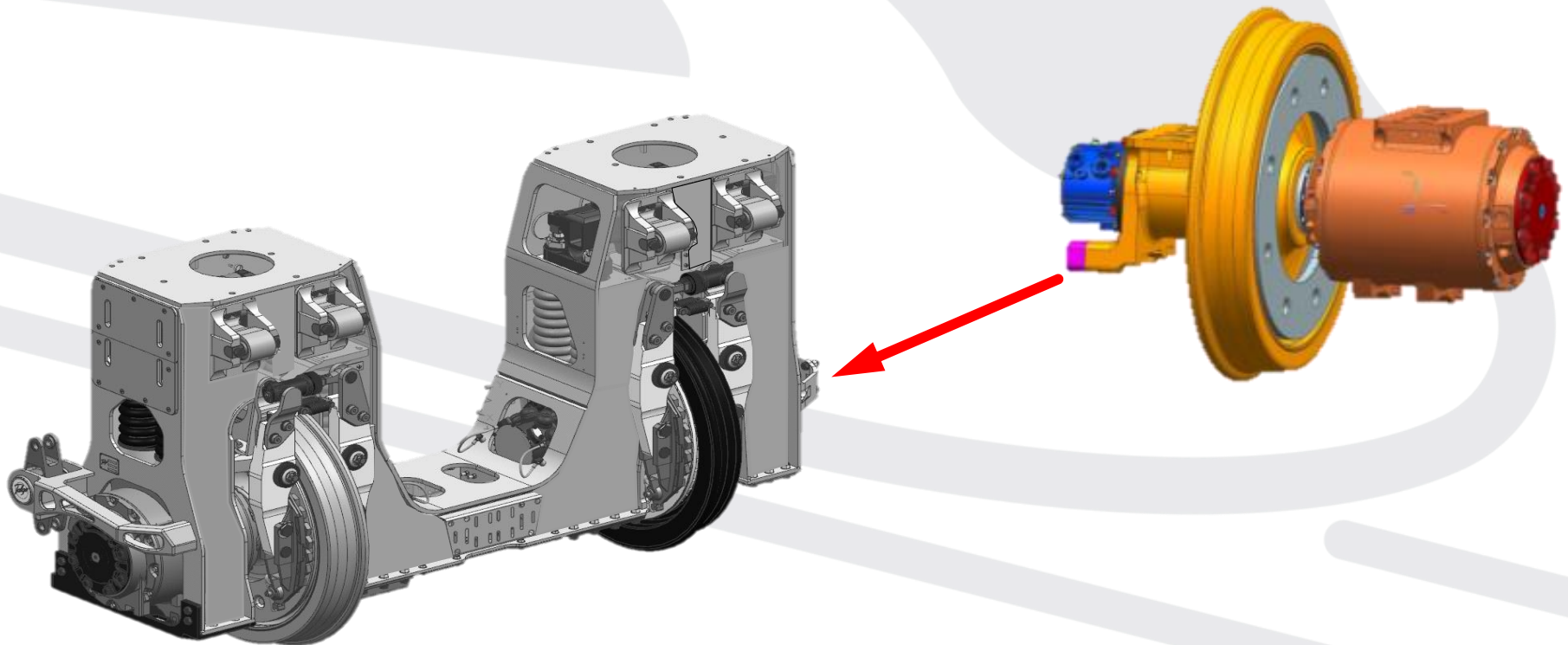
- 1. Introduction – What is an energy KPI?**
- 2. Future Technologies and Improvements**
- 3. Mapping of Technologies and SPDs**
- 4. KPI results**
- 5. Conclusion**

What is an Energy KPI?

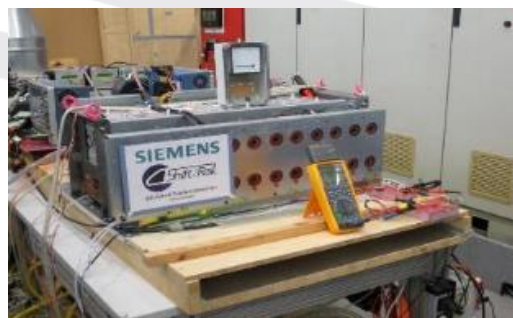
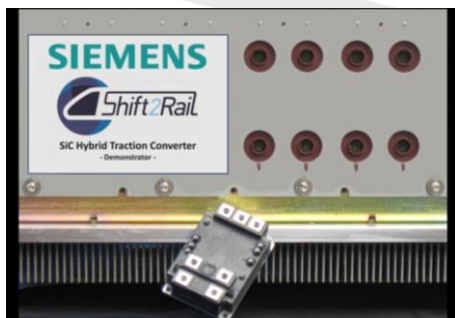


- ➔ **Energy KPI quantifies relative savings** of the TD innovations compared to the energy baseline
- ➔ The **Energy KPI summarizes overall savings per SPD**, assuming technical improvements reported by the TDs are applied

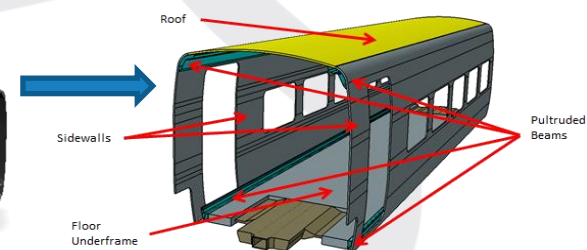
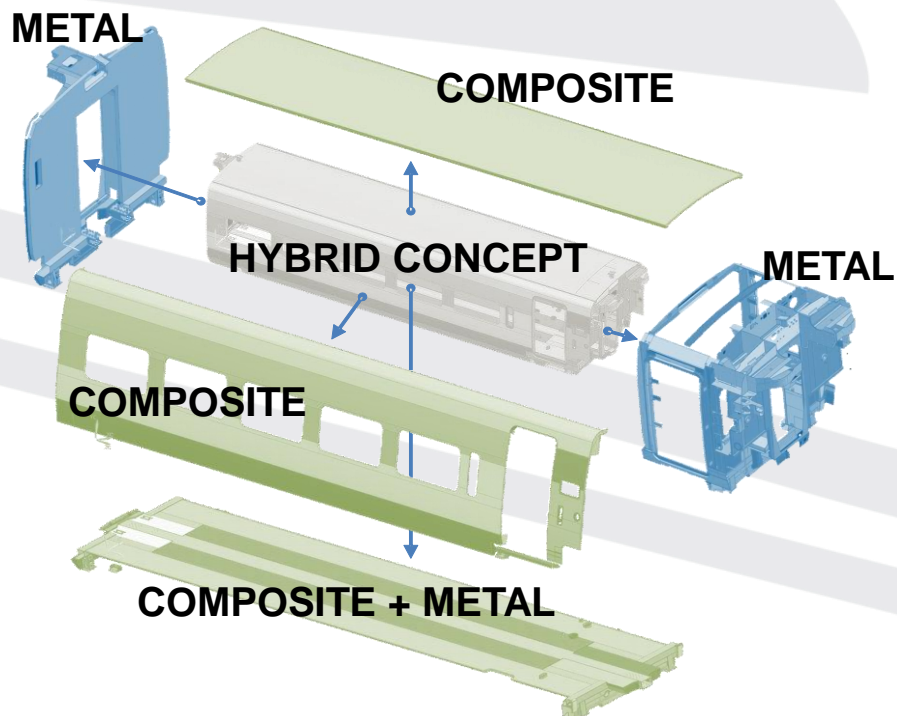
TD1.1: independently rotating PM motor-wheel-system → improved gearbox efficiency



TD1.1: Silicon Carbide (SiC) converter (Metro & Tram)



TD 1.3: Carbody mass reduction



30% WEIGHT REDUCTION

TD 1.5: Mass reduction new braking systems

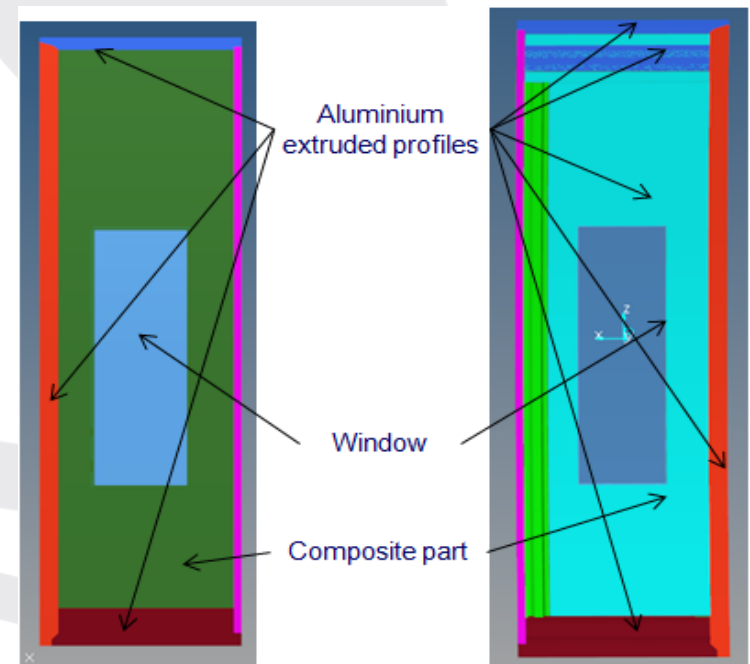
TD 1.6: Mass reduction doors

Doors: Concept design

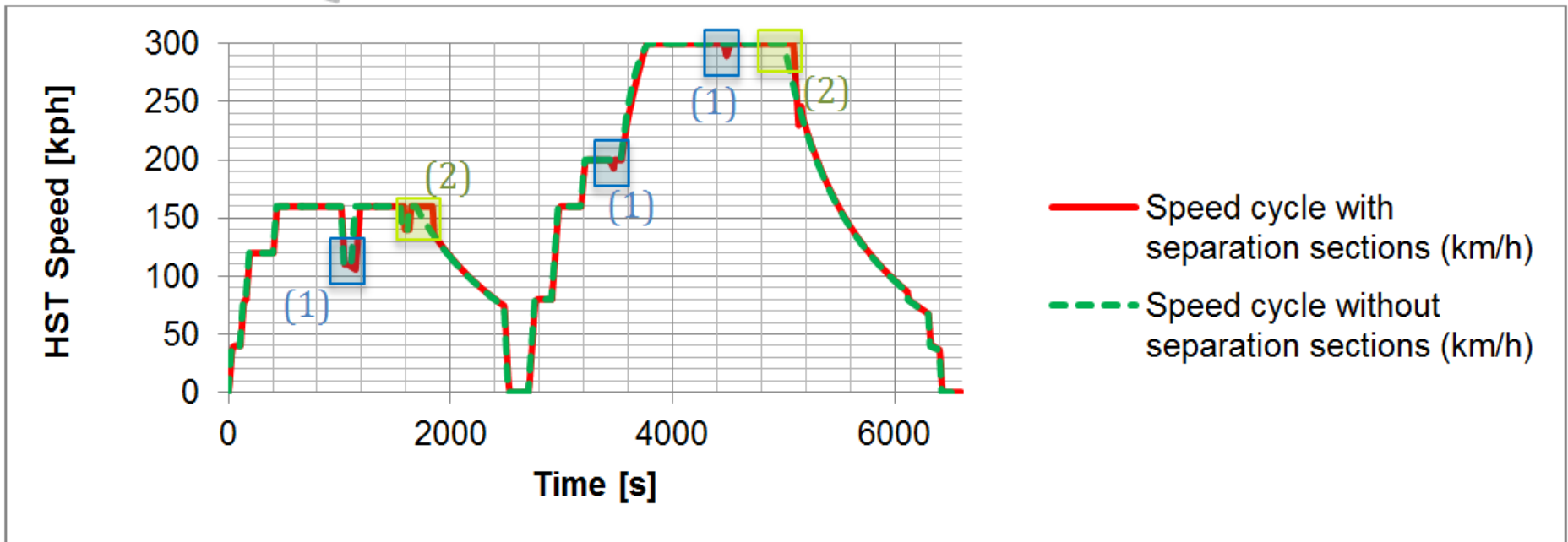
Composite sandwich base with aluminium extruded profiles.

- Extruded profiles: aluminium.
- Composite part - materials:
 - Core: PET foam.
 - Semipreg Biaxial E-Glass epoxy resin FST
 - Semipreg Biaxial Carbon epoxy resin FST
- Window

26 kg → 19 kg

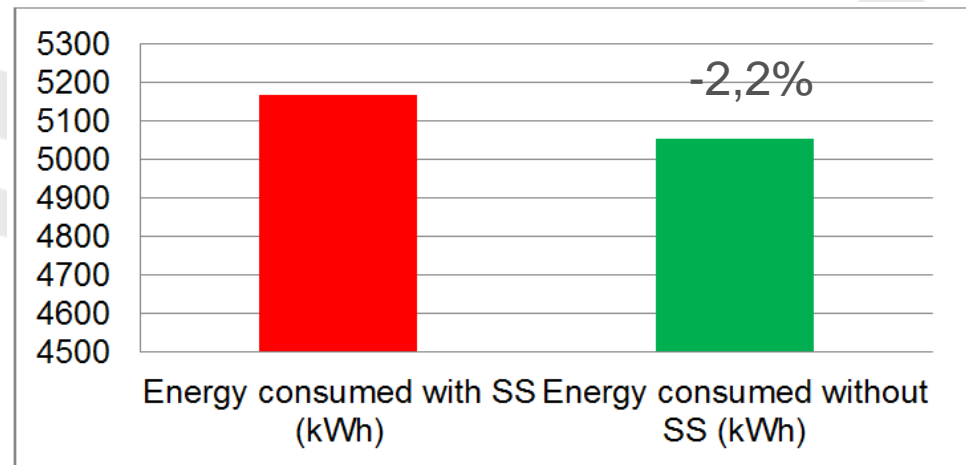
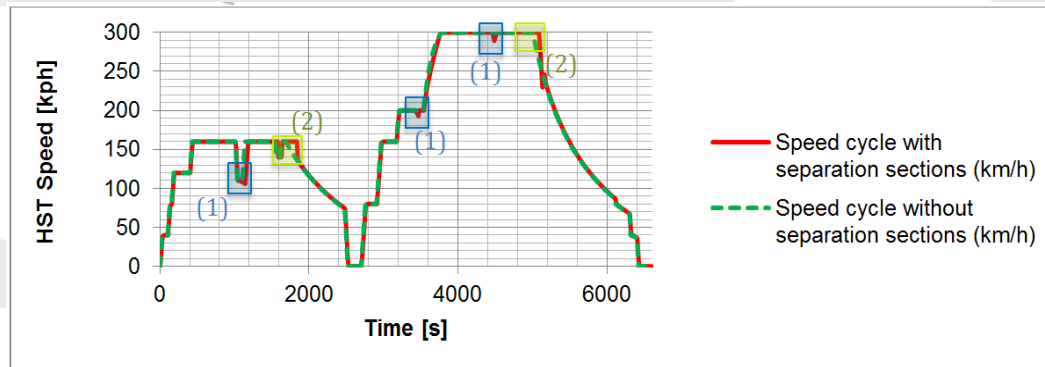


TD3.9: New substation with double side feeding in 25 kV / 50 Hz AC networks avoids separation sections

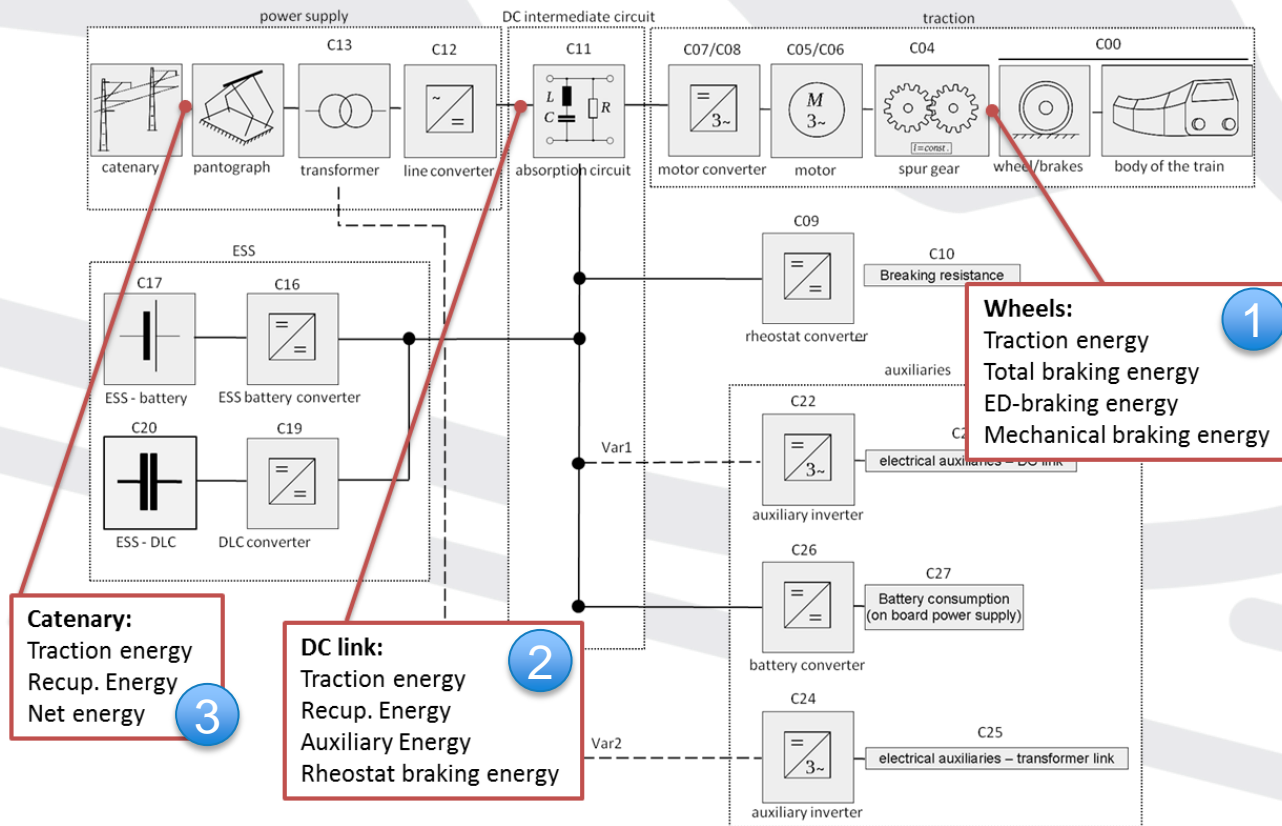


SPD	Smart Power Supply	Mass reduction carbody	Mass reduction doors	Mass reduction brakes	Improved line converter (SiC)	Improved motor converter (SiC)	Direct drive with improved gearbox
HST300	X	X	X	X	X	X	X
HST250		X	X	X	X	X	X
Intercity			X	X	X	X	
Regional 160			X	X	X	X	
Regional 140			X	X	X	X	
Metro			X	X	n.a.	X	
Tram			X	X	n.a.	X	
Freight					X	X	

TD3.9: New substation with double side feeding in 25 kV / 50 Hz AC networks avoids separation sections



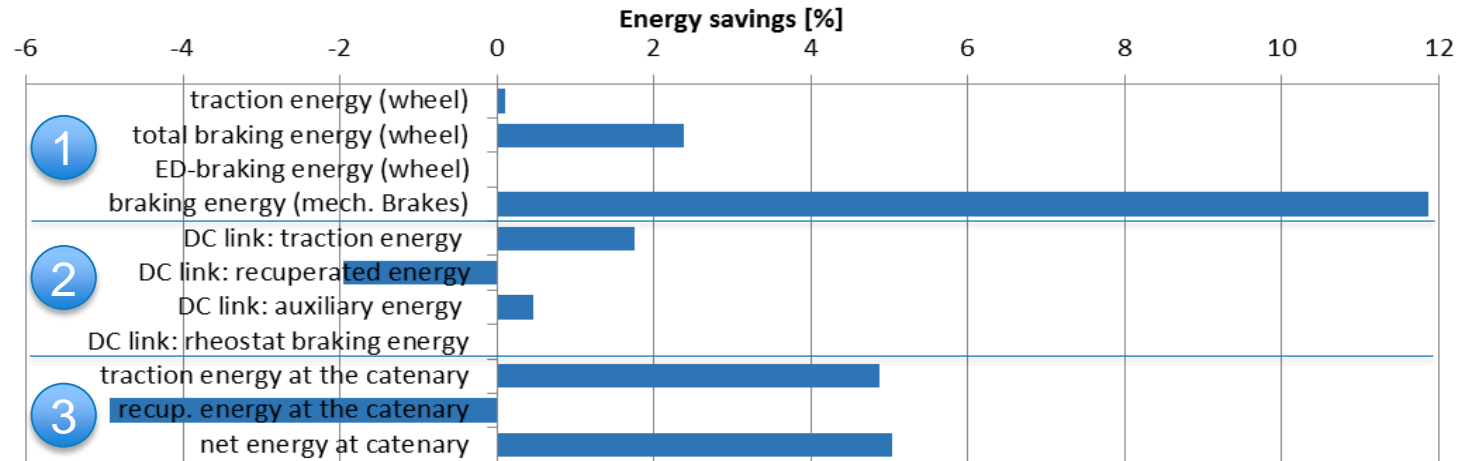
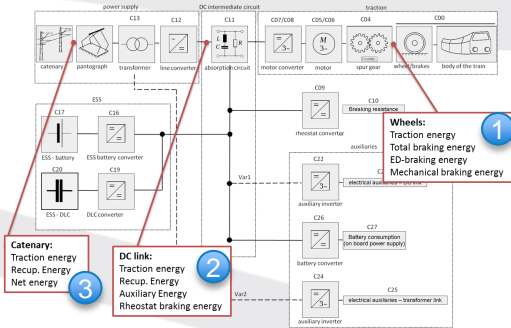
Combined assessment of mass reductions and efficiency improvements – comparison of energy demand





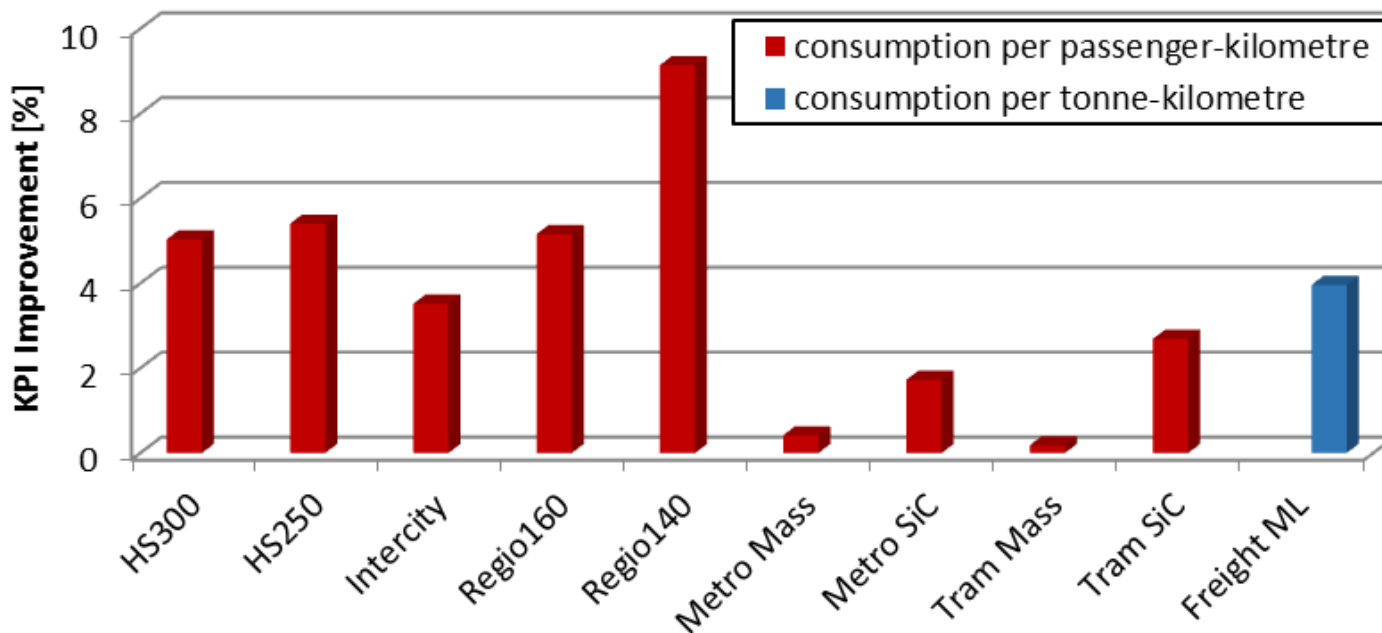
Example: KPI improvement for SPD HST300

Combined assessment of mass reductions and efficiency improvements

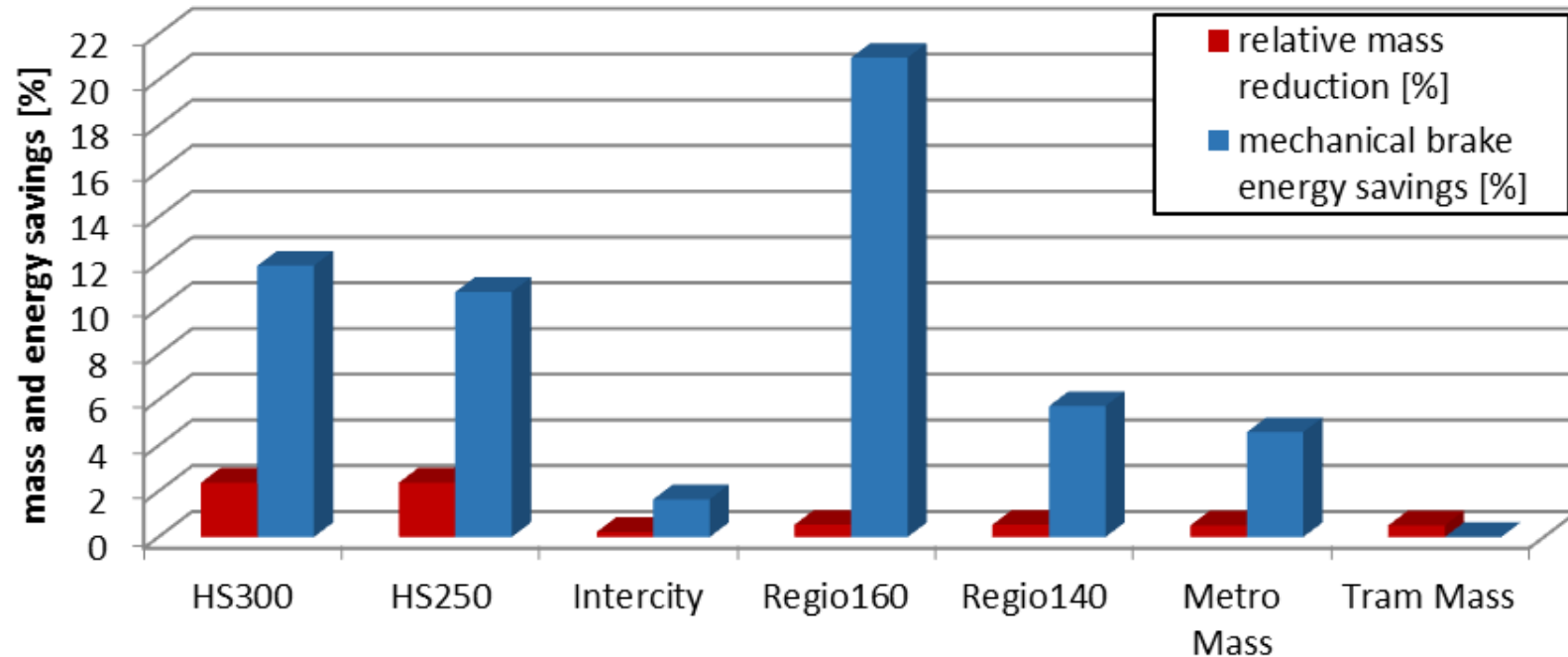


	net energy at catenary	recup. energy at the catenary	traction energy at the catenary	DC link: rheostat braking energy	DC link: auxiliary energy	DC link: recuperated energy	DC link: traction energy	braking energy (mech. Brakes)	ED-braking energy (wheel)	total braking energy (wheel)	traction energy (wheel)
HS300 savings [%]	5,04	-4,94	4,88	0,00	0,47	-1,96	1,76	11,87	0,00	2,39	0,10

Energy KPI improvement



- ➔ Improvements of energy KPI between 3.5% (SPD Intercity) and 9.1% (SPD Regional140).
- ➔ Metro and Tram: SiC converter application improves energy KPI by 1.7% (Metro) and 2.7% (Tram)



➔ Mass reductions lead to significant reduction of brake wear

What FINE1 achieved:

- **S2R energy expert network was established**, connecting people and topics throughout S2R technological and cross-cutting activities;
- Development of **methodology, process and tool to assess S2R technologies** and their impact on energy demand;
- **Reference scenarios and system platform datasets** (energy baseline) have been defined and distributed in S2R;
- Validation and application of the **OPEUS single train energy simulation tool** for KPI analysis;
- Energy KPI evaluations indicated **energy savings of up to 9%** with future S2R technologies;



Questions and Answers

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Thank you for your attention!

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