Panel 3 (a)

Diesel Rail Services – Introduction

RAILENERGY Final Conference

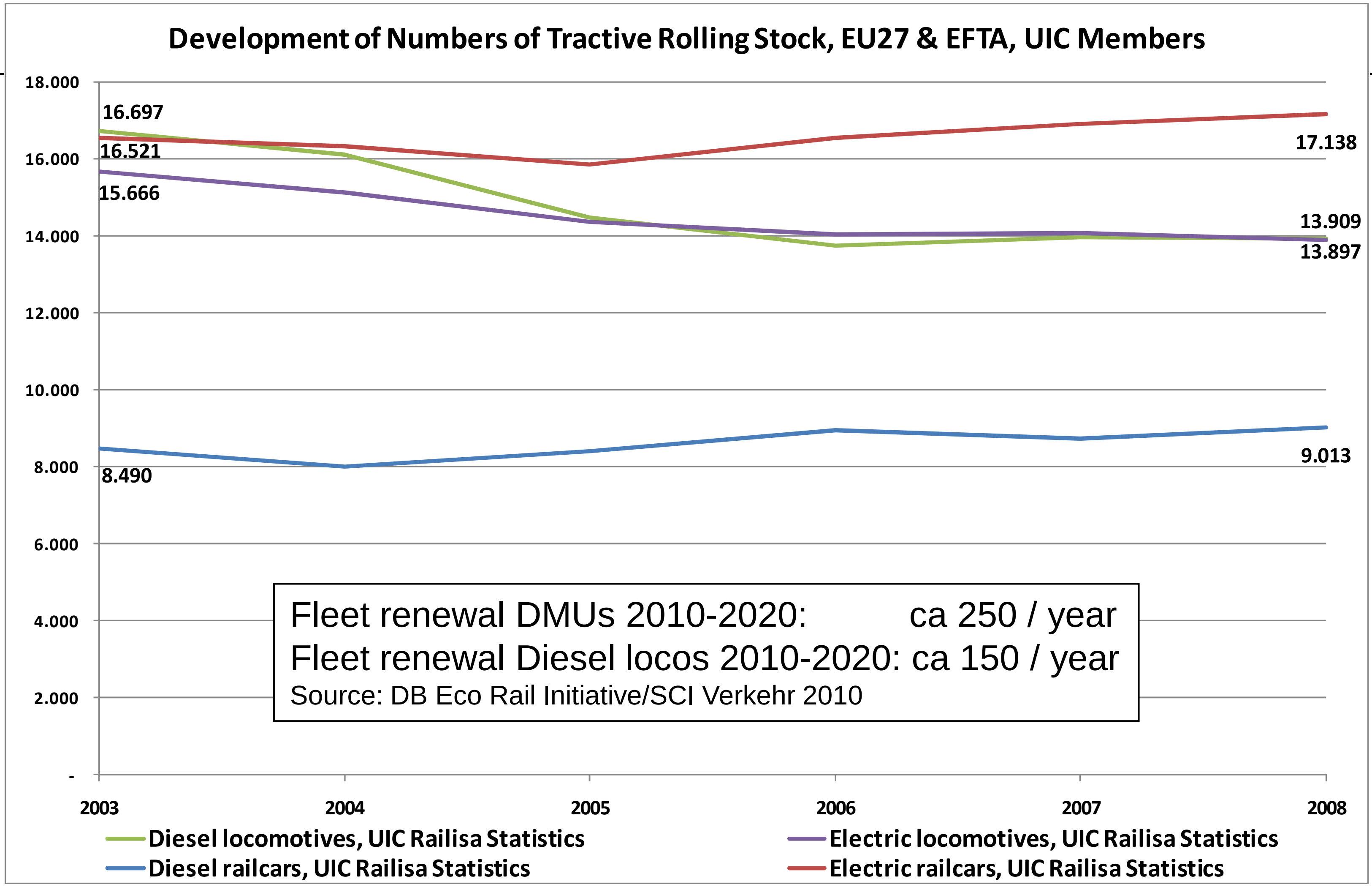
Brussels

November 25th, 2010

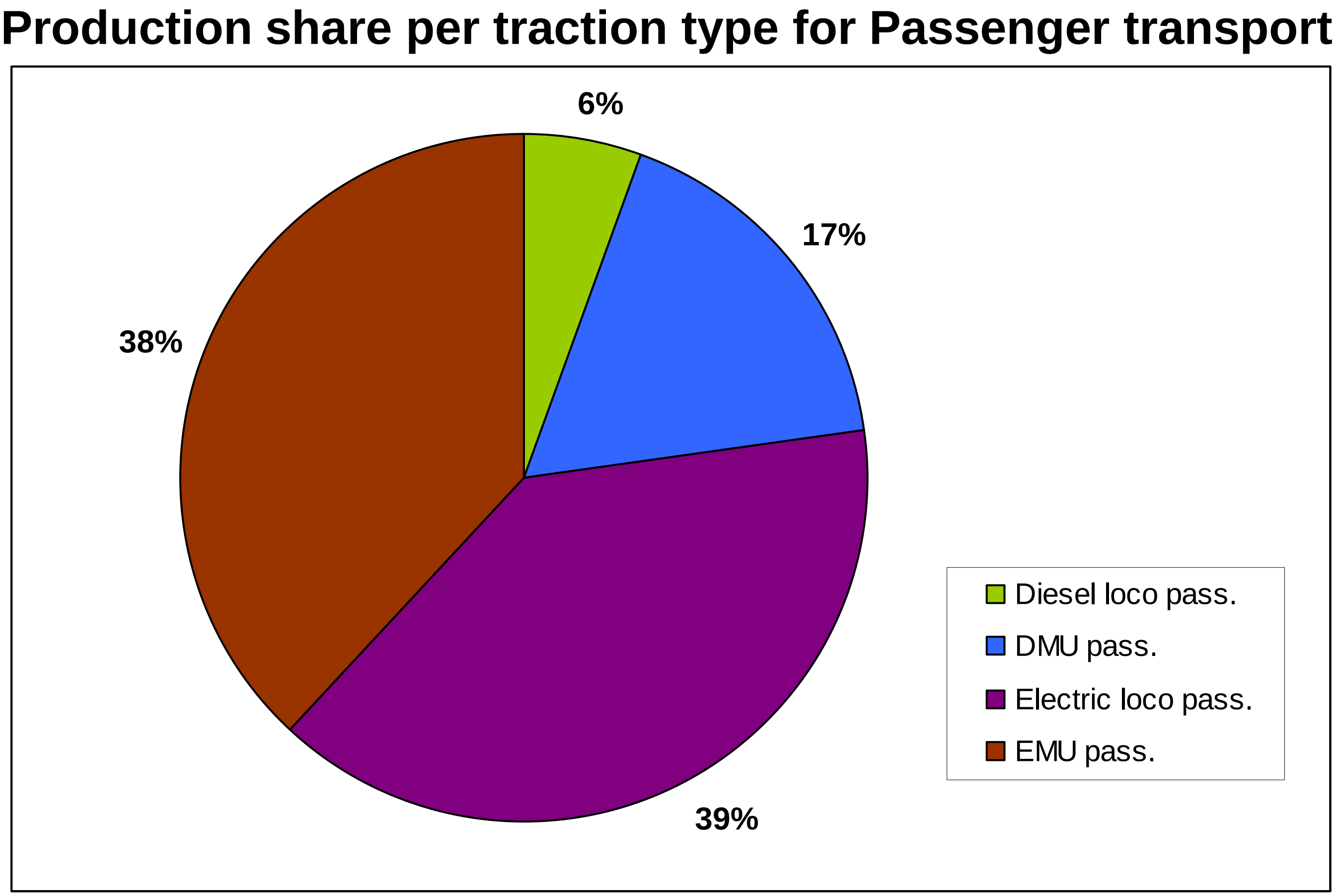
Dr. Roland Nolte

IZT Institute for Futures Studies and Technology Assessment

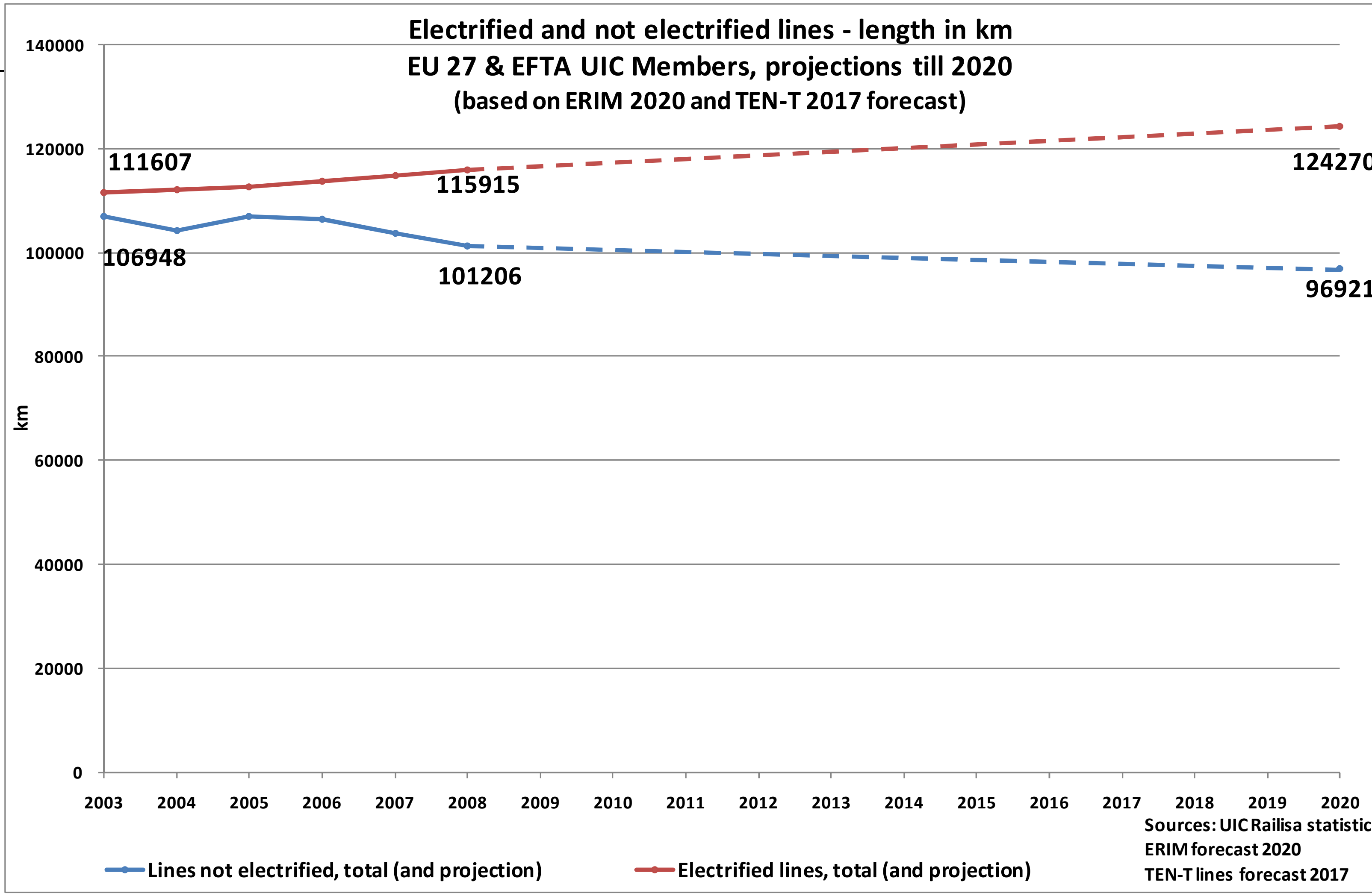
Fleet development & Fleet renewal



Production in train-km – Share of Traction Type (2008)



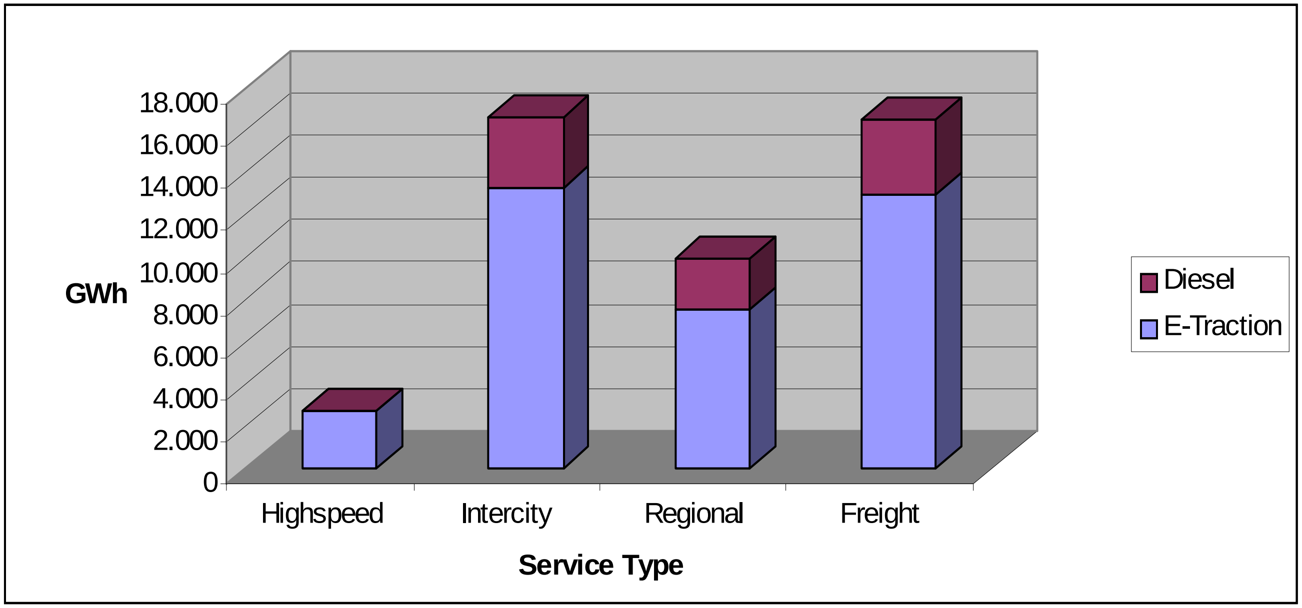
Electrification



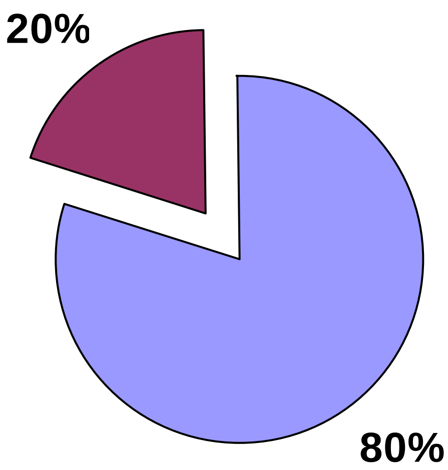
Railenergy

Energy Consumption of Diesel Rail Services

Final Energy Consumption per Service Type



Share of Final Energy



Importance of Diesel traction & Framework for Energy Savings (1)

- About 45% of European Networks are not electrified
- Electrification rate is low
- Diesel Traction consumes 20% of total final energy & produces 23% of pass train km
- **Diesel traction will still be significant in 2020**

Importance of Diesel traction & Framework for Energy Savings (2)

- Since fleet renewal until 2020 is small, the biggest saving potential for this time horizon have
  - **Operational measures**
  - **Efficiency Technologies for existing rolling stock**
- Following presentations: Overview and concrete examples for energy efficiency technologies

Railenergy

Panel 3 (b)
Innovative Diesel Components

on behalf of

Christian Lauszat

Bombardier Transportation GmbH

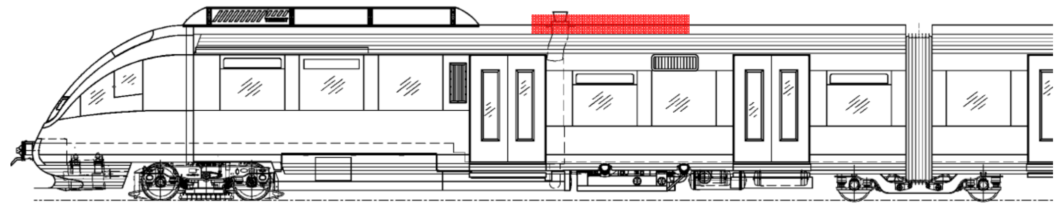
christian.lauszat@de.transport.bombardier.com

Innovative Diesel Components – Overview

Technologies investigated in RAILENERGY:

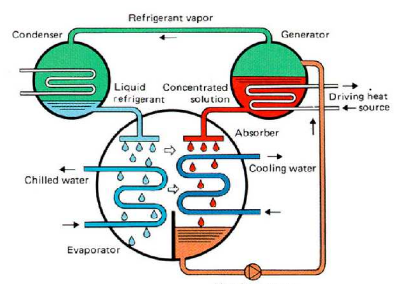
- Use of waste heat for climatisation
  - Absorption refrigeration technology
- Permanent Magnet Technology
  - Permanent magnet excited (PM) generator and traction motor
- On-board energy storage
  - Batteries, flyweels, supercaps, combinations (battery + supercap)
- Hybrid diesel electric propulsion system
  - PM technology combined with an on-board energy storage

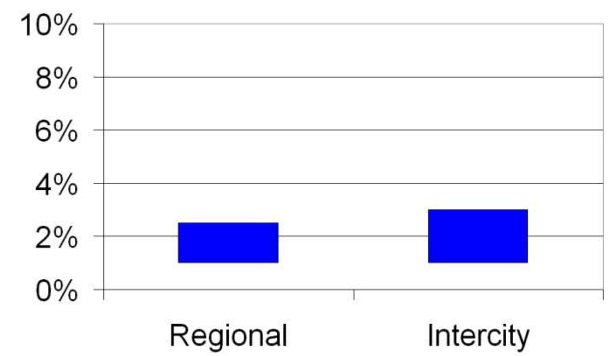
Railenergy



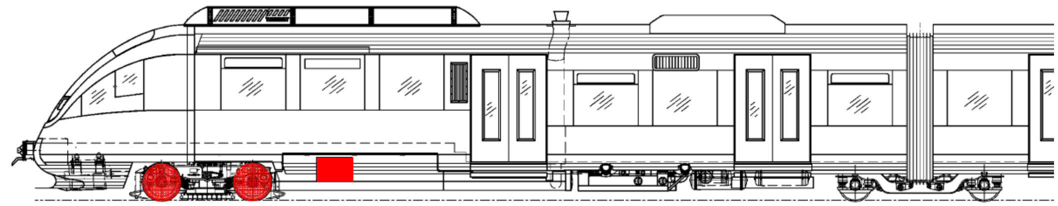
Main achievements - Use of waste heat

- Use the waste heat from exhaust air of the diesel engine for air conditioning (heating and cooling)
- Laboratory status for mobile applications, available for stationary use
- Additional weight, complex system, cooling power limited by ambient temperature, could be used for mild climate
- Fair saving potential
- Pure waste heat used for heating is best practise



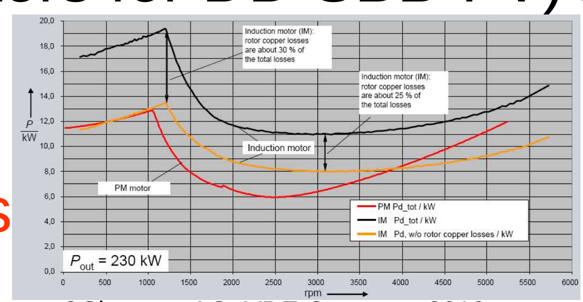


Railenergy

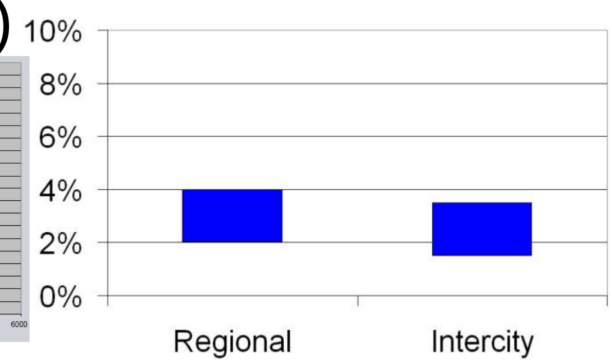


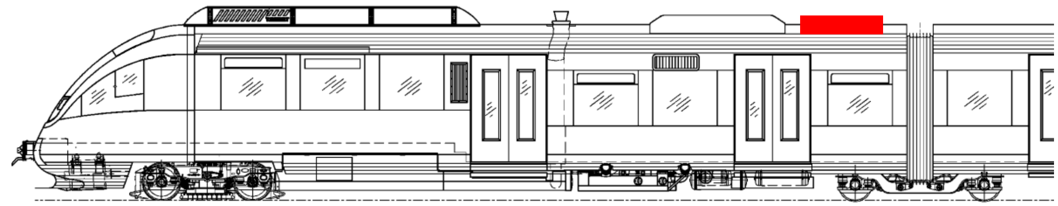
Main achievements - PM technology

- Traction generator + traction motor in PM technology
- Higher efficiency, increased torque and power density and lower mass compared to induction machines
- PM motor tested in several prototypes (i.e.Gröna Tåget)
- Technology available for new projects (i.e. power pack for Desiro ML, traction motors for DD SBB-FV)
- Suitable for DMU´s
- Good saving potentials



©Siemens AG, VDE Congress 2010

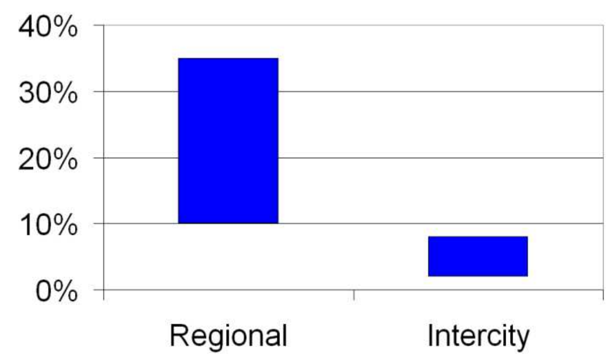


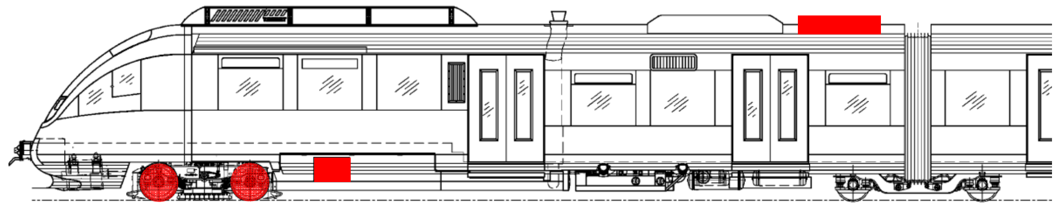


Main achievements - On-board energy storage

- Most suitable technology for DEMU: supercaps

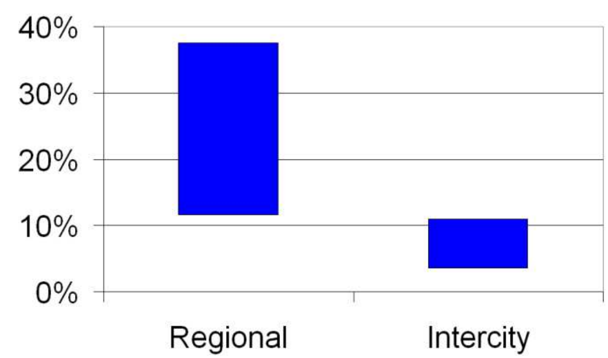
- Already in operation in LRV service
- Additional power for acceleration
  - Compensate for time delays
  - Apply coasting in case of time reserve
- Best for frequent stops,short distances
- Promising saving potential in Regional service





Main achievements - Diesel hybrid

- Combination of PM technology and supercap
- Optimisation of the efficiency for acceleration and deceleration
- Best for frequent stops,short distances
- Promising saving potential in Regional service



Conclusions & Outlook

- Use of waste heat for heating state of the art and best practise
- PM technology offers additional energy savings (wide range of applications)
- On-board energy storage very promising for Regional service
- Combination of PM technology and on-board energy storage leads to higher overall savings