Conclusions

Workshop Energy Efficiency and CO_2

Overview

- Introduction – Henning Schwarz
- Energy and CO2 performance of the rail sector and further reduction strategies – Raimondo Orsini
- The Railenergy Project – Mads Bergendorff
- Technical Recommendations – Enno Wiebe
- Spanish High Speed Trains: Energy Efficiency in operation - José Antonio Jimenez

Discussed targets 2030 & vision 2050

Climate Protection

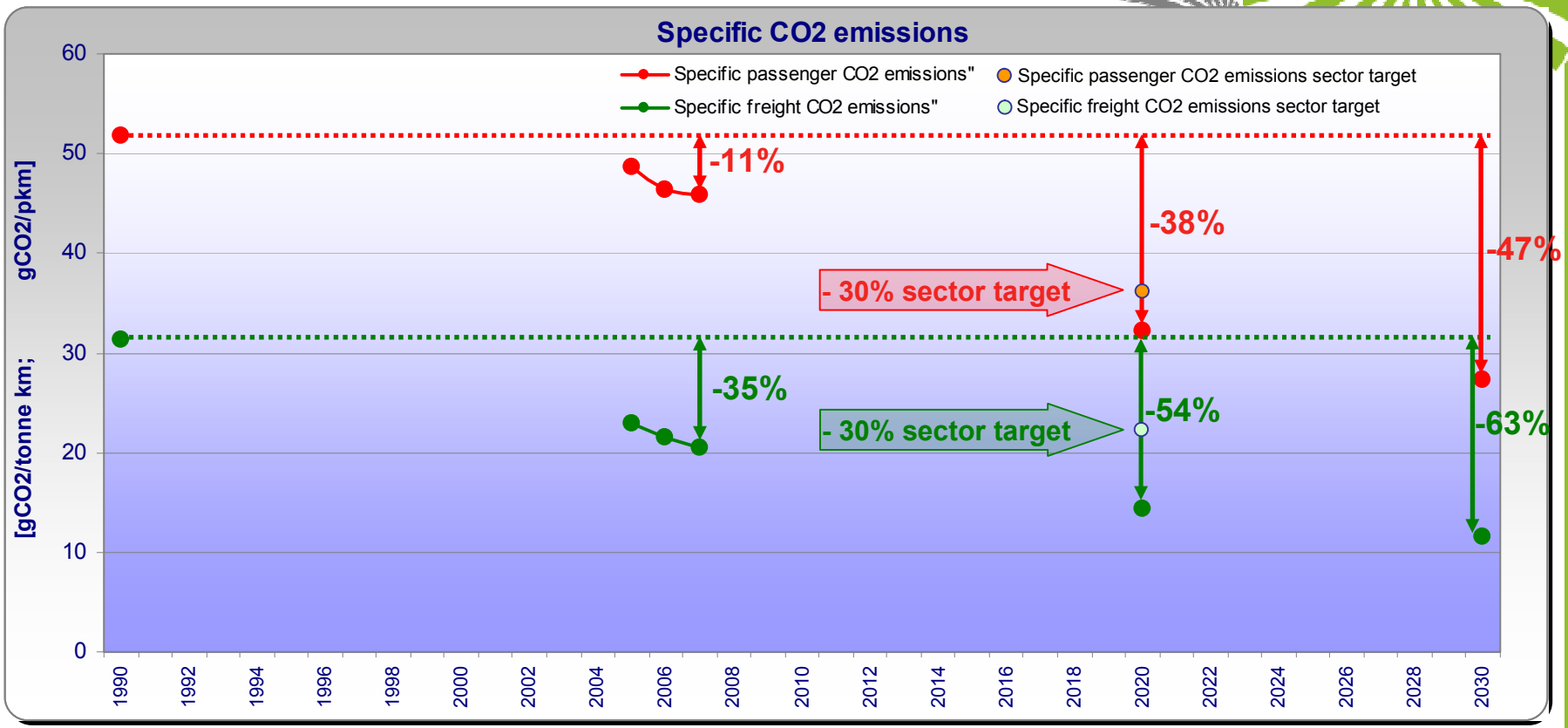
- **Target 2030**
  - **Reduction of specific CO2 emissions from train operation by 50% compared to base year 1990; measured per passenger-km (passenger service) and gross tonne-km (freight service).**
  - **not exceeding total CO2 emission from train operation in absolute terms even with projected traffic growth compared to base year 1990.**
- **Vision 2050**
  - **European railways will strive towards carbon-free train operation by 2050**

Discussed targets 2030 and vision 2050

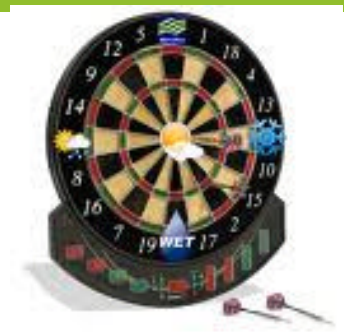
Energy Efficiency

- **Target 2030**
  - **Reduction of specific final energy consumption from train operation by 30% compared to the base year 1990**
- **Vision 2050**
  - **European railways will strive towards halving their specific final energy consumption from train operation by 2050 compared to the base year 1990; measured per passenger-km (passenger service) and gross tonne-km (freight service).**

CO2 performance of European Rail



- Specific CO2 emissions 1990-2007: Passengers: -11% Freight:- 35%
- Specific CO2 emissions 1990-2020: Passengers: -38% Freight:- 54%
- Specific CO2 emissions 1990-2030: Passengers: -47% Freight:- 63%



The suggested targets for 2030 are feasible!.....

2030 scenario:

- **50% electricity from non-fossil fuels (from UE forecast)**
- **80% passenger traffic and 90% freight with electric traction**
- **20% load factor improvement**
- **5% energy saving with eco-driving and fleet renewal**
- **20% biodiesel blend**

Smart and efficient energy solutions for railways

Railenergy

How to measure & analyse energy in railway systems?

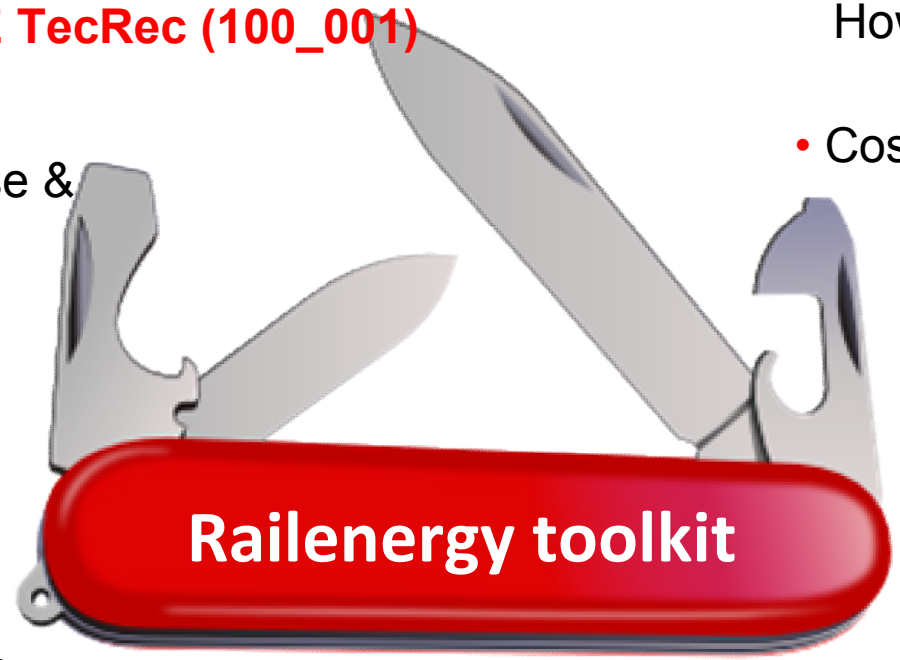
- **Common simulation methodology**
- **First UIC/UNIFE TecRec (100_001)**

How to define, browse & collect energy data?

- Railenergy KPIs
- **UIC energy & CO_2 database**

How to benchmark energy performance?

- Railenergy performance baseline
- Ranking of saving potentials
- Technology Assessment Reports



How to compare & prioritise different measures?

- Cost-benefit & effectiveness
- **Railenergy Calculator**
- Market readiness

How to save energy costs?

- LCC screening
- In/out of service view

How to plan strategically your fleet procurement & refurbishment?

- **Strategic Assessment Reports**
- Practical check lists for professionals

What is a TecRec?

TecRec
Technical Recommendation

- UIC/UNIFE standard designed to be used within the European region (voluntary standard)
- primary field of application is the European rolling stock domain and all associated interfaces with other subsystems

> Acceleration of and better influence over the European standardisation process

> All TecRecs are public documents and free of charge

TecRecs

- TecRec 100_001 Specification and verification of energy consumption for railway rolling stock”

- framework that will enable to generate comparable energy performance values for trains and locomotives on a common basis
- support benchmarking and improvement of the energy efficiency of rail vehicles
- Tec Rec to be transformed to a EuroNorm, via CEN/CENELEC

General Directorate Manufacturing and Maintenance

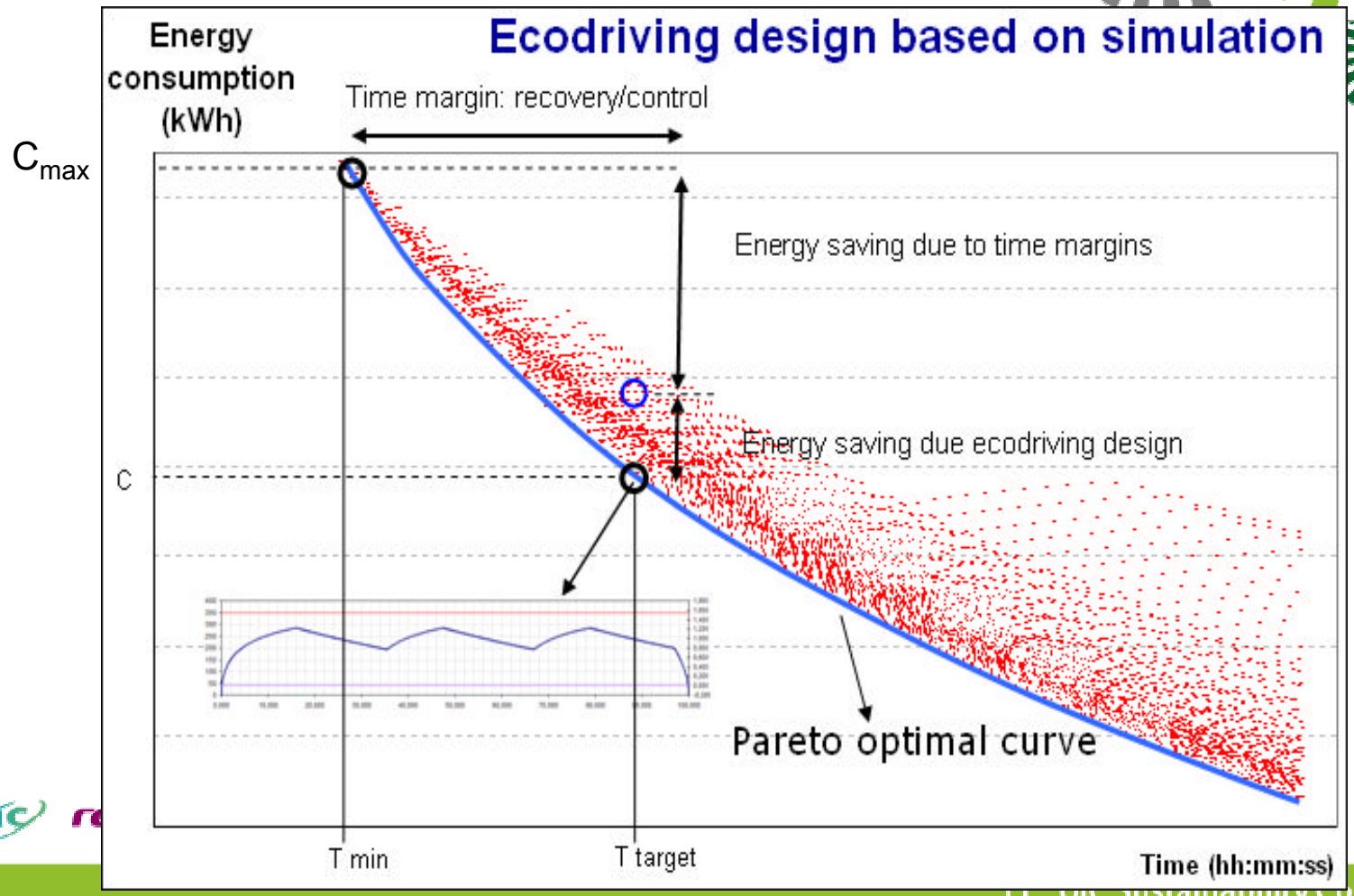
Products Design Directorate

17/06/2010

Spanish high speed trains. Energy efficiency in operation: driving designs based on simulation

José Antonio Jiménez-Redondo, Ph D. & MBA
Products Design Director

Once the simulation model has been fixed, a lot of computer calculations were developed using different time margins in order to choose the final ecodriving



The average of energy savings is about 21% at Madrid - Zaragoza section. (Madrid-Barcelona HSL)

	Time	Consumption (kWh)			
	Margin	**Non-guided**	**Ecodriving**	**Difference**	**%**
Madrid-Guadalajara	0:03:51	1350	1000	350	25,9
Guadalajara-Calatayud	0:03:59	2300	1900	400	17,4
Calatayud-Zaragoza	0:05:01	1350	900	450	33,3
TOTAL	0:12:51	5000	3800	1200	**24,0**

	Time	Consumption (kWh)			
	Margin	**Non-guided**	**Ecodriving**	**Difference**	**%**
Zaragoza-Calatayud	0:02:54	2005	1534	471	23,5
Calatayud-Guadalajara	0:01:34	2950	2875	75	2,5
Guadalajara-Madrid	0:12:02	850	350	500	58,8
TOTAL	0:16:30	5805	4759	1046	**18,0**

Similar results have been obtained in other HSL:

- **Madrid – Sevilla**
- **Madrid - Málaga**