Panel 1: Methodology, Results & Calculator

Railenergy Final Conference
Bruxelles

November 25th 2010

Mads Bergendorff
UIC/Macroplan Consulting
Assessment Methodology

How to measure & analyse energy consumption in railway systems?

Real railway operations

Simulated railway operations
What energy is simulated?

<table>
<thead>
<tr>
<th>Out of service</th>
<th>Grid losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heating and/or pre-cooling</td>
<td>Cleaning and/or maintenance</td>
</tr>
</tbody>
</table>

Main focus

- Traction
- Non-traction
- Preheating
- Cleaning
- Hibernating
### Technology assessment approach

<table>
<thead>
<tr>
<th>Energy supply type</th>
<th>Servicetype</th>
<th>suburban</th>
<th>regional</th>
<th>intercity</th>
<th>high-speed</th>
<th>freight mainline</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 1.5 kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC 3 kV</td>
<td></td>
<td>10,0%</td>
<td>3,5%</td>
<td>5,0%</td>
<td></td>
<td>2,0%</td>
</tr>
<tr>
<td>AC 15 kV 16.7 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC 25 kV 50 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Transparent baseline definition is key
Strategic assessment approach

Estimated technology exploitation rates based on costs & availability

Simulated energy savings in relation to baseline technology

European railway production & Baseline energy consumption

Aggregated energy saving potential
Strategic Assessment Reports

1. Summary
2. Scope and status today
3. Technical Performance
4. Economic Performance
5. Strategic Assessment
6. Recommendations
What is the Railenergy Calculator?

- Web-based decision support tool for the European rail industry to align energy calculations, methodology and common understanding sectorwide
- A business to business screening tool for R&D, procurement and upgrade projects
- Analysis & prediction of energy savings, CO₂ emissions and simplified life cycle costs
- The Railenergy Calculator is NOT a comparison tool between transport modes like Ecotransit or Ecopassenger!
Railenergy Calculator – for whom?

Technicians, procurement, energy and management staff from:

- Railway operators
- Infrastructure managers
- Leasing companies
- Railway manufacturers & suppliers
- Rail traffic authorities & transport agencies
- Consultants and academia
Why the Railenergy Calculator?

How could we improve our (customers) railway energy performance?

Could I persuade my colleagues & management to take (more) action?

I need some help... please!
Accessing the Calculator – It is so easy!

1) Start your PC (Internet connected)
2) Open your normal browser (IE or Firefox)
3) Go to www.railenergy.eu (online very soon)
4) Click the Railenergy Calculator button:
Getting started… Three options

1) **Quick start**: If you have no rail data or just want a "quick test" of options

2) **New inquiry**: If you have some rail data or want a detailed configuration

3) **Examples & saved inquiries**: If you want to start from predefined examples or retrieve own data from previous sessions
The Calculator has 9 steps

1. Inquiry Start
2. Scope & targets
3. Present setup
4. Saving potentials
5. Energy sources
7. Energy pricing & LCC
8. Economic performance
9. Sensitivity analysis
Welcome!

The Railenergy Calculator is a decision support tool based on the results of the EU Railenergy project. It will help you make investment decisions by analysing different configurations of new energy efficient technologies and operational measures with regard to their energy, CO2 and economic performance.

How does it work?
The Calculator comprises 9 steps. Enter information on your location, present operational setup, energy saving technologies, operational measures and energy prices to find out saving potentials. Perform a sensitivity analysis with your results in the last step. Technical aspects are covered in steps 1 to 6. Step 7 is for filling out economic data, if you wish to continue the analysis. You can save your inquiry for later use anytime. Additionally, a PDF report can be generated.

Choose how you want to start by opening one of the sections below.

Quick start

Country: Germany
Energy supply: AC 15 kV 16 2/3Hz
Service type: intercity
Energy / CO2 target: 5%

New inquiry
Examples and saved inquiries
Please provide country/energy carrier data.

Current energy mix

- Country specific mix of primary energy carriers
  - Germany
    - Solid fuels: 45.2%
    - Oil: 0.0%
    - Gas: 8.8%
    - Nuclear: 29.9%
    - Renewables: 14.0%
    - Other: 1.4%

- Company specific mix of primary energy carriers
  - Solid fuels: %
  - Oil: %
  - Gas: %
  - Nuclear: %
  - Renewables: %
  - Other: %

- Company specific CO₂ intensity
  - g CO₂/kWh

- Check your input
### Sensitivity Analysis

#### Technical parameters
- Technology-related saving potentials
- Energy efficient driving
- Parked trains management
- CO₂ intensity

#### Economic parameters
- Energy price development
- Discount rate
- Payback time
- Implementation rate

---

### Economic Data

- **Energy price**: 75.00 Euro
- **Discount rate**: 6.00%
- **Payback time (basic)**: 5 years

---

### Energy Savings

- **In service**: 4.87 GWh
- **Out of service**: 0.00 kWh

---

### Energy Mix & CO₂

- **Current CO₂**: 52.7 g/kWh

---

### Present setup

- **Country**: Germany
- **Energy supply type**: AC 15 kV 16 2/3 Hz
- **Rail service**: Intercity
- **Transport volume**: 508 mio seat-km/a

---

### Log in | Register (Why?)

---

**Copyright © UIC 2010**
TEST THE CALCULATOR YOURSELF IN THE HALL
Recommendations (1)

- Eco-driving is always recommended:
  - Level 1 driver training
  - Level 2 onboard device
  - Level 3 fluid traffic management

- Management of onboard energy consumption (software/standards):
  - in service (with passengers/load)
  - out of service (parked trains)
Recommendations (2)

Start using our Railenergy common language:

- UIC/UNIFE TecRec 100_001: Specification and verification of energy consumption of railway rolling stock
  - For procurement and major upgrades
- Railenergy online Calculator [www.railenergy.eu](http://www.railenergy.eu)
  - For clarification and screening of options before decision making
- Railenergy Key Performance Indicators
  - For system benchmarking and comparisons
Thank you very much for your attention!

Mads Bergendorff
Founder & Executive consultant

Macroplan Consulting
macroplan.dk
mads@macroplan.dk