

**ECORails –
Energy efficiency and environmental criteria in the awarding of regional rail transport
vehicles and services**

ECORails

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Evaluating rolling stock

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Energy consumption of a rail vehicle definition

Amount of energy that, through the diesel fuel tank or the electrical supply collector (pantograph), flows to the train, irrespective of how that energy is used,

minus regenerated energy that flows back, through the electrical supply collector (pantograph), to the overhead contact line

Overview of criteria

Performance indicators	Indirect indicator	Parked train mode	Technologies	operational measures
kWh per • pass. km • seat km • train km • gross tkm	mass per seat	comfort functions	most prominent • braking energy / onboard equipment • braking energy / fixed installations (sub-stations, supercaps) • braking energy / diesel operations	most prominent • energy-efficient driving (timetable, training, technical advices)
traction energy consumption		• assessment of risks and costs (LCC, CBA) • state of the art • availability on the market • future availability on the market		

- Evaluation of vehicles?
- Evaluation of operations?
- Estimation of standard energy costs

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How to include in award procedure (rolling stock)

- 1) Analyse the data situation
- 2) Decide whether new vehicles will be required or existing ones will be accepted
 In the latter case: Decide about consumption levels or technological standards to be accepted
- 3) Decide upon instrument:
 a) Requirement; b) weighting & scoring; c) combination
- 4) Select the relevant indicator (e.g. kWh per seat km)
- 5) Define maximum/reference levels; define scoring method

How to include in award procedure (rolling stock)

- 6) Decide upon service profile
- 7) Describe selected service profile(s) according to the standardised methodology
- 8) Require declaration of traction energy consumption from the manufacturer
→ according to the defined methodology
- 9) Define requirements for verification
- 10) Integrate text modules and documents in the tender documents

Related actions

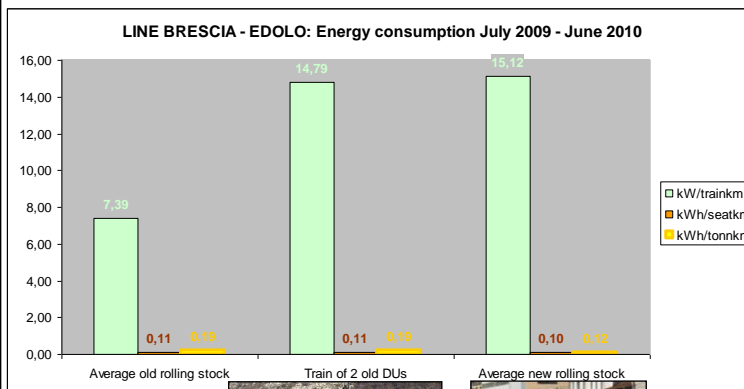
- Define comfort parameters
 - Interior design
 - heating
 - air condition
- Require energy meters or monitoring devices for fuel consumption
- Require advices for energy-efficient driving styles (as part of the manufacturer's manual)

Evaluation of rolling stock

Relevant in the following cases:

- Procurement of rolling stock by the PTA
- Awarding of services, rolling stock provided by the TOC (if specifications given by PTA)
- (Awarding of services, rolling stock provided by the PTA: evaluation may be necessary if information base is still too small.)

Valcamonica line: diesel traction



**OLD ↔ NEW
ROLLING
STOCK**

kWh/trainkm:
new rolling
stock
consumes 2%
more than the
older

kWh/seatkm:
new rolling
stock
consumes 10%
less than the
older

kWh/tonkm:
new rolling
stock
consumes 37%
less than the
older

Instruments

- Requirements
- Weighting and scoring
- Penalties (if a defined quality is not realised during the contract duration)
- Incentives (bonus/malus) for good performance or improvements during the contract period



Instruments for including in award procedures

(1) Requirement:

“The energy consumption must not exceed x kWh per seat km when used on the specified test cycle (service profile).”

(2) Weighting and scoring (example):

“The reference consumption level ... is x kWh per seat km... Offered fleets with higher energy consumption will get zero points in the category.”
 (Then the amount of points for fleets with reduced energy consumption needs to be defined.)

Instruments for including in award procedures

The PTA needs to know which level of energy consumption can be expected; sources:

- monitoring of operations
- simulations
- database, e.g. from Railenergy or other projects

Relevant indicators

- **kWh / passenger km:**
 Main overall objective but within award procedures, measures for improved occupancy and improved EE should clearly be separated from each other.
- **kWh / seat km:**
 Most relevant indicator; applicable for awarding services and procurement of vehicles; applicable for assessment of MUs, loco-hauled trains (as a whole) and for comparing MUs with loco-hauled trains
- **kWh per train km:**
 Technical basis (in terms of measurement) for calculating kWh per seat km; in certain (very few) cases helpful to simplify the process when used as such
- **kWh per gross tonne km:**
 the most relevant indicator for the assessment of locomotives

Performance Indicators – challenges and restraints

- Clear definition of train configuration and interior design
- Service profiles to be clearly defined
- Clear definition of secondary conditions
- Technology for monitoring the energy consumption required (e.g. energy meters)
- Comfort functions for passengers to be analysed separately
- Parked train modes to be analysed separately

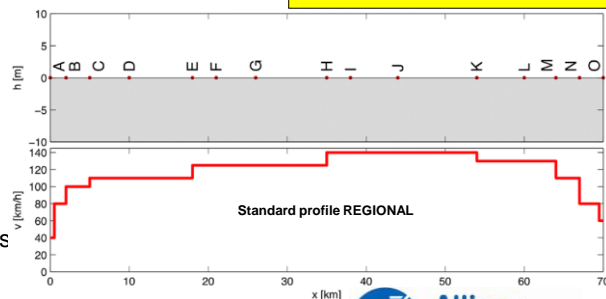


Relevant service profiles

The PTA (or TOC) may define a specific service profile which

- is representative for the own network;
- can easily be used for testing.
- Relevant parameters need to be described:
 - Infrastructure
 - Diesel fuel specifications
 - Operational requirements
 - Environmental (ambient) conditions

**Most relevant reference:
 UIC/UNIFE
 TEC REC 100 001**



Energy consumption as criterion for the awarding

- Two-step procedure proposed:
 - PTA sets a maximum of consumption based on its own targets, which is not to be exceeded by the bidder
 - The bidder is free to offer lower maximum consumption which will be considered in the awarding (scoring, monetarisation)
 - Important: To avoid confusion, only traction energy without comfort functions should be targeted
 - After awarding the data are to be demonstrated during a test run

Vehicle analysis: Traction without comfort functions

Energy costs: Traction plus comfort functions

Text modules: awarding criteria

Text module for the Awarding Text:

1. The maximum energy consumption of an offered vehicle on the respective network must not exceed 12.75 kWh per train kilometre (exclusive comfort functions). If lower values are offered, it will lead to a better weighting for the bid. The PTA provides a detailed profile of the network in the technical specifications in order to enable the potential bidders calculating their offers accurately.

Text module for the Public Service Contract:

1. Before starting operation the TOC has to prove the offered values for energy consumption by a test run on the network. The test run has to be done with at least one vehicle from the offered type series.
2. If the test run identifies higher values, the franchise payments will be cut by this amount the TOC was better weighted in the awarding phase. In addition, an abatement of another 10 cent per train kilometre will be realised, too.
3. If the TOC has not offered own values for energy consumption, the franchise payments will be cut by 16.1 cent per train kilometre (equivalent to 10 percent of the reimbursement for energy costs). Furthermore, the TOC has to develop a concept for the adherence to the maximum consumption values as soon as possible. This concepts demand the affirmation of the PTA.
4. If the TOC can prove the adherence of the maximum values, the abatement of the compensation will be suspended. The abatement can also be suspended, if the TOC uses replacement vehicles, which meet demands regarding energy consumption and quality standards.

Options when existing rolling stock may be accepted

- Definition of maximum consumption level to be accepted
- Adapt the weighting & scoring system to the broader range of possible energetic performances
- Require certain technological standards or equipment (if consumption data are not available)
- Check potentials and rationale for modernisation
- Set incentives for modernisation

Options for Verification

- (1) Simulation by the manufacturer:
 - Reliability too limited for verification
 - Should be required for plausibility check of offers
- (2) Certified documentation of test runs by the manufacturer:
 - Future availability expected with reference to SSPs
 - Independent certification compulsory
- (3) Test runs under auspices of PTA
 - Compulsory for verification with reference to specific service profiles
 - On the real line or on dedicated test facilities
 - Who will bear the costs of the test campaign?

If verification fails

- Set an appropriate deadline for a new verification attempt, allowing the manufacturer or TOC to apply corrective measures.
- Define a penalty for every train km or seat km which is performed by non-compliant rolling stock.
- Shorten the contract duration.
- Terminate the contract (LAST OPTION).

The appropriate action depends on:

- the degree of failure;
- the potential for (short-term) improvement;
- the bidder's (non-)compliance with other requirements or agreements;
- the quality, price and plausibility of the competing offers;
- legal positions of the competing bidders;
- alternatives available;
- urgency of starting operation with the non-compliant rolling stock.

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