Incorporating the ECORailS instruments step by step into the PSC between Region Lombardy and TRENORD

Results from the Lombardy Pilot Application

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Present situation

• No environmental standards by law for rail are known in Italy till now (except for noise)

• The market of energy is open to competition and regulated by an independent Authority: incentives to save energy are provided, but not specifically for public transport

• TOCs pay:
  – electric power through the infrastructure managers
  – fuel at market prices

• Rail Infrastructure Managers buy the electric power on the market

• TOCs do not correctly feel the real cost of electric power:
  – under the law, the fare applied by the national infrastructure manager (= 0,357 €/km) is heavily under the market cost
  – the costs paid by the TOCs on every kind of rail infrastructure are not linked to the energy consumed by each train (flat fare)

• PTAs pay to the TOCs a contract price from 8 to 10 €/train*km where the share due to the cost of energy is not known; the increased costs of energy are usually paid by the PTAs

Need of incentives to energy efficiency in the rail market
Opportunities

- Electric power was in 2008 8% of total cost or 17% of subsidy
- From 2003 to 2008 31% increase
- 15% energy saving is about a 2.5% subsidy reduction
Lombardy: regional rail and test lines

- LENGTH: 1,921 Km
- LINES: 42 R + 10 S
- TRAVELLERS: 650,000/day
- STATIONS: 418
- SUBSIDY: 347.3 Million €/year (10.5 €/Km)
- RUNS: 2, 200/work-day
- PRODUCTION: 35 Millions Train*Km/year
- OPERATOR: TRENORD
- WORKERS: 3,900
- INFRASTRUCTURE MANAGERS:
  - FerrovieNord (321 Km)
  - RFI (1,600 Km)
- TRACTION: 93% electric
- ROLLING STOCK: 330 trains (average 5 coaches long), of which 64 diesel
The Pilot Application Lombardy

- Two lines of the regional rail network:
  - **Valcamonica** line, from Brescia to Edolo: *mixed diesel service including the Brescia metropolitan area, rural villages and the mountains*
  - **S3 line**, from Milan to Saronno: *included in the Milan suburban network of “S” lines*

- The **Regional Government of Lombardy** - together with the **Province of Brescia** for the Valcamonica line – plays the role of **PTA** by planning the service specifications and paying the financial compensations

- **Rolling stock:**
  - new DMUs for the Valcamonica line
  - recent EMUs for the line S3

- **Direct awarding** to the public/private operator Trenitalia-LeNORD (TLN) by the use of a **Public Service Contract**. Competitive tendering was experimented in past years.

- **No use of Energy Efficiency (EE)/Environmental (Env) criteria in current contracts**
Valcamonica line

- **LENGTH**: 103 Km
- **STATIONS**: 35
- **SUBSIDY**: about 8.5 ml € per year (about 7.7 €/Km)
- **RUNS**: 65/work-day
- **PRODUCTION**: 1.1 Million Train*Km/year
- **OPERATOR**: TLN
- **INFRASTRUCTURE MANAGER**: FerrovieNord
- **TRACTION**: 100% diesel
- **ROLLING STOCK**: 10 trains (about 2.5 coaches)

IEE/08/690, 06.05.2009 – 05.07.2011
Milan S3 line Milano Cadorna - Saronno

- LENGTH: 21.5 Km
- LINE: S3
- STATIONS: 13
- RUNS: every 30 minutes
- PRODUCTION: 592,000 Tr*Km per year
- OPERATOR: TLN
- INFRASTRUCTURE MANAGER: FerrovieNord
- TRACTION: 100% electric
- ROLLING STOCK:
  - double deck EMUs class TAF
  - electric car + coaches
  - Capacity:
    - TAF: 467 seats
    - Other: from 363 to 875 seats
Organization and involvement of Stakeholders

WP4 Manager (ALOT)

Site Manager Lombardy (Province of Brescia / ALOT)

Site Stakeholders Group Lombardy:
- Province of Brescia
- Region Lombardy
- FerrovieNord (Regional Infrastructure Manager)
- TRENORD (Regional TOC)
- Federmobilità
- representatives of rolling stock manufacturers
- reporting to the National Agency of Rail Safety

Site Working Group Lombardy:
- ALOT
- Province of Brescia
- Department for Infrastructure and Transport of the Regional Government of Lombardy, Office for the Regional Rail Service
- FerrovieNord (Regional Infrastructure Manager)
On-site measurement

- **LeNord** (now part of the newco TRENORD) supported the ECORailS pilot application with a measurement campaign:
  - energy meter on board of the EMU TAF n.27 to measure the consumed and recovered energy
  - daily measurement of consumed fuel for each vehicle on the Valcamonica line
  - testing eco-driving measures during ECORailS

- **FerrovieNord**
  - the Infrastructure Manager of the regional network, also responsible for the provision of new rolling stock in Lombardy – has already experimented the inclusion of some EE/Env criteria in the provision of diesel rolling stock: the Molteno line tender IEE/08/690, 06.05.2009 – 05.07.2011
Valcamonica line: diesel traction

## LINE BRESCIA - EDOLO: Energy consumption July 2009 - June 2010

<table>
<thead>
<tr>
<th>kW/trainkm</th>
<th>kWh/seatkm</th>
<th>kWh/tonnkm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old rolling stock</td>
<td>7.39</td>
<td>0.11</td>
</tr>
<tr>
<td>Train of 2 old DUs</td>
<td>14.79</td>
<td>0.11</td>
</tr>
<tr>
<td>New rolling stock</td>
<td>15.12</td>
<td>0.10</td>
</tr>
</tbody>
</table>

**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/tonnkm: new rolling stock consumes 37% less than the older

User Platform ● 22 June 2011

IEE/08/690, 06.05.2009 – 05.07.2011
Valcamonica line: eco-driving diesel

- Test runs on diesel Valcamonica line on 4th September 2010:
  - Run 1: most energy efficient driving (LeNORD instructor)
  - Run 3: faster and with more use of brakes
- Example of existing ranges among driving styles
- On the common section Brescia-Breno (72 km) Run 3 consumed 16% more energy
S3 Milano–Saronno line: electric traction

Two test runs with different energy consumption 8%
- different driving styles
- different traffic conditions

Recovered energy about 10%

CONGESTED SECTION WITH STOPS AT RED SIGNALS

IEE/08/690, 06.05.2009 – 05.07.2011
The present public service contract

- Object (annex) = list and timetable of the runs to be done, with specifications: rolling stock to be used, minimum number of seats, accessibility and other features
- Subsidy = 7.22 €/km
- Procedures to add/delete/change runs
- Payments = cash advance and balance depending on cancelled runs and fines
- Obligations related to the rolling stock (costs of maintenance)
- Quality standards of rolling stock
- Reliability of the service (delays and cancelled runs)
- Cleaning standards
- Ticket selling standards
- Information&communication standards
- Claims and refund prescriptions
- Monitoring system

FINES WHEN PRESCRIPTIONS ARE NOT FULFILLED AND MINIMUM STANDARDS ARE NOT REACHED
A new awarding text: the agreement RL-TN

Present Contract:
- direct awarding
- detailed specifications
- no EE/Env criteria and meters
- global subsidy 7.22 €/km
- energy cost about 1.50 €/km
- penalty system
- rolling stock partially owned by the Region

PREPARATION STEP:
- starting of a monitoring system
- energy meters gradually installed
- mandatory energy meters on vehicles
- improved regulations (track access)
- cooperation with Infrastructure Manager

TRIMMING STEP:
- monitoring completed
- energy efficiency and emission targets for the whole regional rail service
- eco-procurement of rolling stock
- subsidy subject to standard energy consumption and cost
- eco-procurement of electricity

KICK-OFF STEP:
- monitoring extended
- targets of energy efficiency and emission reduction, referred to specific lines or rolling stock
- training of drivers and technicians
- eco-procurement of rolling stock
- incentives, linked to investments

[Document Image]
Role of the Infrastructure Managers

- **To support measurement of energy consumption** (special runs, data collected from the substations, …)
- **To test and install infrastructure-based energy efficiency solutions** (capacitors to recover energy in fixed installations, reversible DC substations)
- **To bill the TOCs with energy fares based on real consumption**
- **To optimize energy consumption during design of train paths and traffic control:**
  - prevention for traffic conflicts and other delay or stop causes
  - improved planning of traveling times which avoids lengthening and speed reductions
  - application of infrastructure maintenance plans to avoid the prescription of speed reductions
  - gradual upgrade of the infrastructure, aimed at removing the causes of speed reductions
- **To analyze the energy-mix and to promote the use of renewable sources and/or with the lowest CO₂ emissions**
Monitoring of operations

GUIDELINES

- Direct indicator = kWh/seatkm
- Side-conditions relevant
- Network profile relevant
- Service profile:
  - Standard
  - Real
- Energy meters specified and required
- Comfort functions aside

"The TOC must accept a monitoring system for the traction energy consumption and provide the necessary equipment and database."

AGREEMENT RL-TN

- Plan to install energy meters:
  - priority to “sample” vehicles
  - mandatory for new purchase
  - fitting during planned maintenance
- Energy consumption monitored together with side-conditions:
  - train specifications
  - regularity of service
  - load factor
  - operating speed
  - stopover time (planned or not)
  - speed restrictions
  - weather conditions
- Use of the ECORailS KPIs:
  - KPI1: kWh/Ton*km
  - KPI2: kWh/seat*km
  - KPI4: kWh/passenger*km
  - KPI5: kWh (or%) consumed off-duty
  - KPI6: kWh (or%) recovered
Different approaches for incentives

**Beginner**

- First result is to make the TOC aware of the energy consumption
- If a TOC does not benefit of flat energy rates, it is an incentive itself to save energy
- A bonus/malus scheme can share this benefit between the TOC and the PTA
- A starting incentive scheme can give a bonus when consumption is under the baseline:
  - By leaving a share of the saved cost to the TOC
  - By paying an addition to the subsidy

**Advanced**

- When the database is consolidated and the saving potentials of main technologies acknowledged, a target of energy consumption is fixed:
  - The energy cost share of the subsidy is paid depending on this target energy consumption
  - Periodic update of the target
Incentives to save energy

**GUIDELINES**

- Calculation of a reference value
- Be aware of unstable infrastructure and operation conditions
- Careful decision of targets and thresholds
- Periodic revision of values
- Balanced incentive with other penalties (punctuality)
- Bonus/malus values take into account relevance of energy prices for the TOC and contract value

**AGREEMENT RL-TN**

- During kick-off 80% of the savings will be set aside to finance investments for increasing the energy efficiency; the remaining 20% will be kept by the TOC
- After kick-off:
  - standard energy consumption elaborated by monitoring system
  - standard energy cost to pay the subsidy
Text module: payment of subsidy

Article 6 – Compensation Payment

1. Once reached the Trimming step of the Operational Plan, the PSC compensation for the part dealing with energy costs, may be standard determined by applying:

   a. To each class of rolling stock and service profile, standard energy consumption elaborated by monitoring system. Consumption standards will be developed taking into account the tests carried out to define the optimal operation and a reasonable deviation due to real conditions during the year.

   b. To each kWh or liter of fuel of standard consumption, standard Energy costs will be defined by RL on the basis of market trends and sources of primary production.

2. Incentives can be confirmed, as those foreseen in article 5.

3. The selection by the IMs of energy providers which use renewable sources will be stimulated.
### Extended RAM clause for new rolling stock

#### USUAL RAM

- Pre-defined running conditions, referred to line and service involved
- Reliability, Availability and Maintainability indexes describing the minimum levels of faults or performances guaranteed by the manufacturer
- 24 months guarantee with penalties (to be extended if needed)
- Continuous monitoring during the 24 months period

#### AGREEMENT RL-TN

- Usual RAM clause upgraded by asking the manufacturers to **add an energy Consumption index (C)** referred to the infrastructures and service profiles of the tendered rolling stock
- Description of infrastructure and service profile in tender specification document
- The **RAM+C indexes** offered by the competitors will be **evaluated to award the tender**
- Contract with winning manufacturer will ask for the check of real energy consumption of all delivered vehicles. The manufactures will pay a fine in case of lasting differences after a 24 months service

#### GUIDELINES

As the manufacturer is not responsible for the operation of the rolling stock, the level of energy consumption must be offered and verified according to a defined test cycle:

"The energy consumption must not exceed x kWh per seat km (litres of diesel per seat km) when used on the specified test cycle".
Article 7 – Purchase of rolling stock

1. When purchasing new rolling stock, the PTA and the TOC will require the installation of energy meters compliant with the international norms and standards.

2. The PTA and the TOC commit themselves to require and/or to reward in the call for tenders for new rolling stock capable of achieving greater energy efficiency, even in the auxiliaries, and the reduction of CO₂ emissions and noise.

3. The usual Reliability, Availability, Maintainability (RAM) clause in contracts for the purchase of new rolling stock will be upgraded by asking the manufacturers to add an energy Consumption index referred to the infrastructures and service profiles of the tendered rolling stock. Description of the infrastructure and of the service profile will be in the tender specification document. The RAM+C indexes offered by the competitors will be evaluated to award the tender. The contract with the winning manufacturer will ask for the check of real energy consumption of all delivered vehicles. The manufactures must be fined in case of lasting differences after a 24 months service.

4. For the purpose of encouraging technological innovation, in the evaluation of tenders energy saving features of the rolling stock will be favored by higher scoring than their influence on the full cost of the tendered vehicles.
Contacts

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