



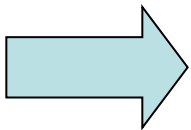
# Incorporating the ECORails instruments step by step into the PSC between Region Lombardy and TRENORD

## Results from the Lombardy Pilot Application

**Ferdinando Stanta, Nicola Pascal – ALOT**

## Present situation

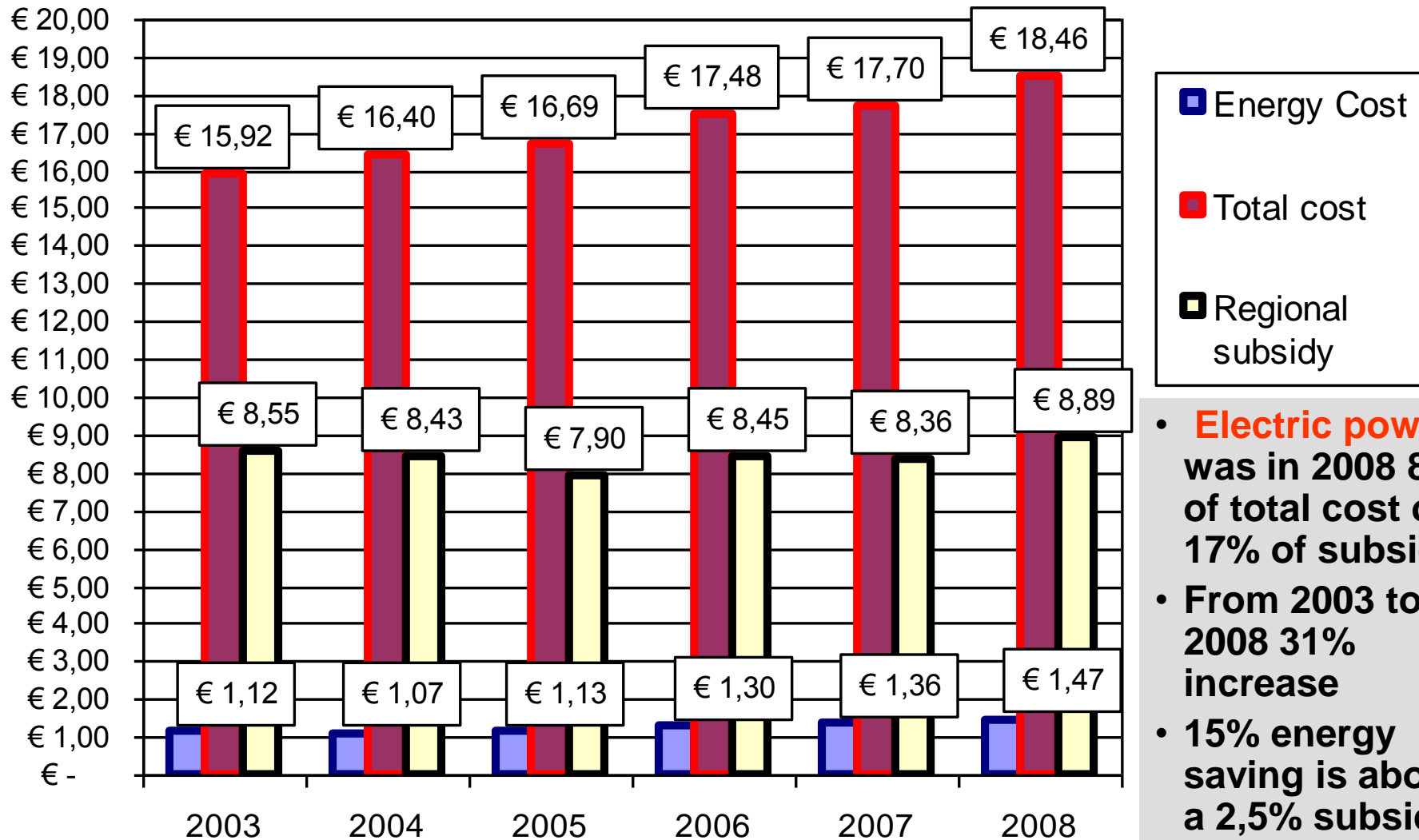
- **No environmental standards by law** for rail are known in Italy till now (except for noise)
- The **market of energy** is **open to competition** and regulated by an independent Authority: **incentives** to save energy are provided, but **not specifically for public transport**
- **TOCs pay:**
  - **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**

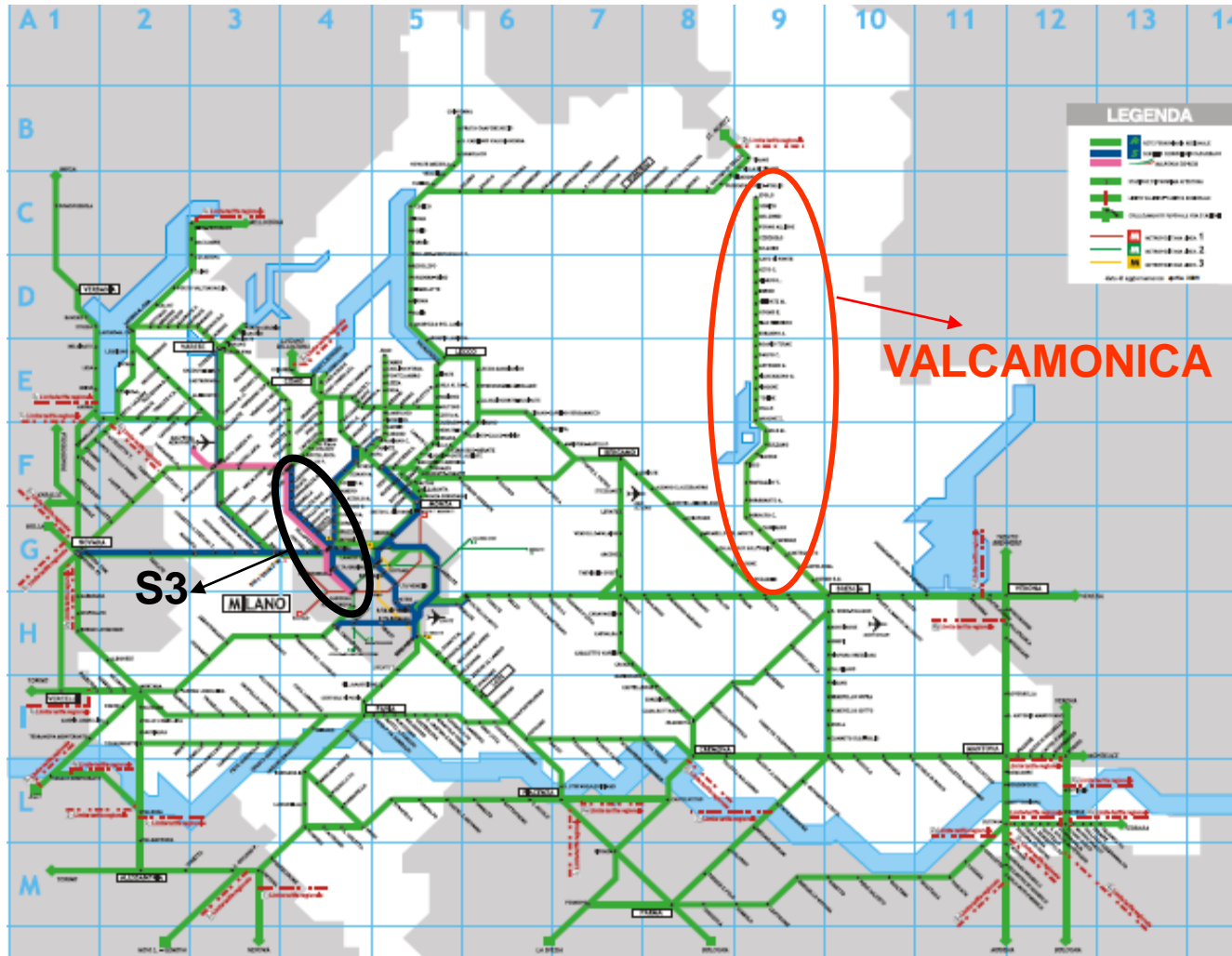


## Opportunities



- **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



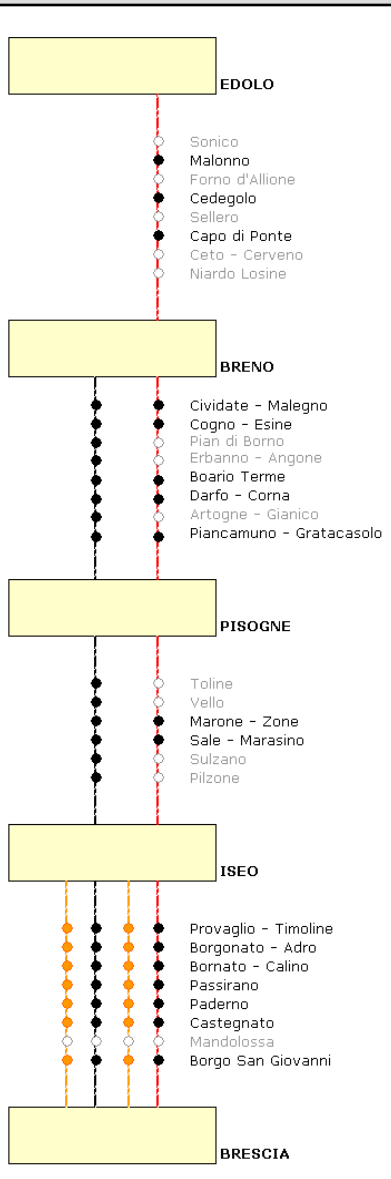
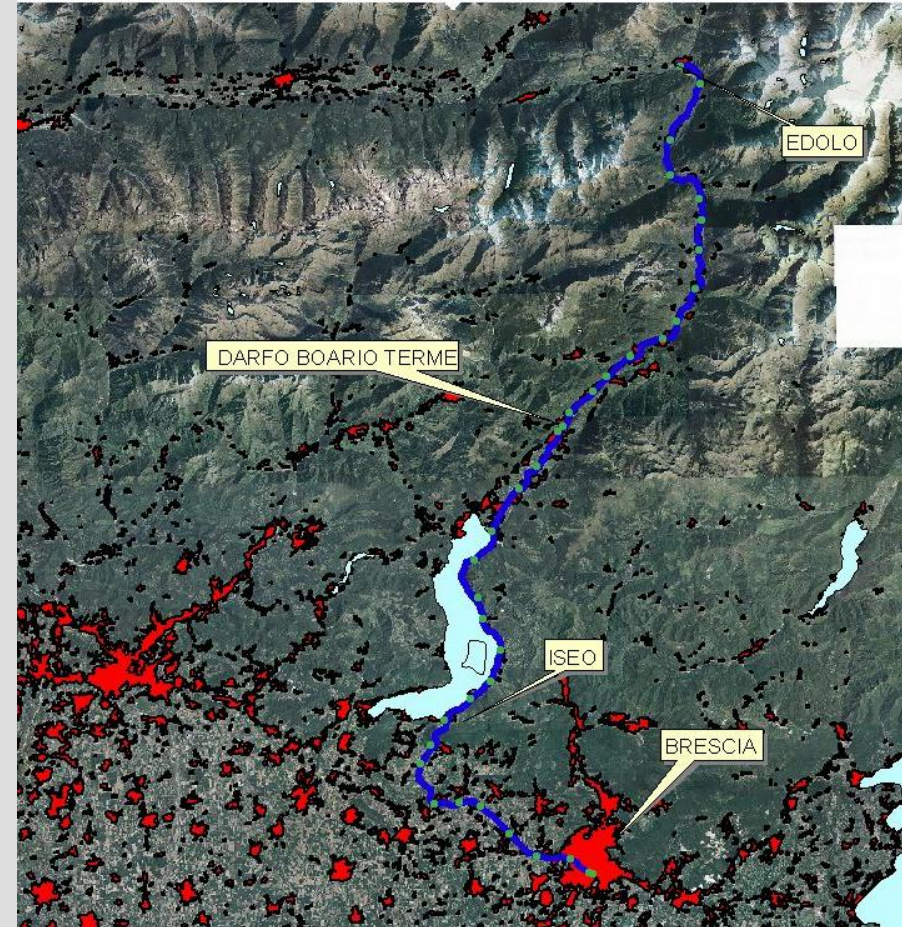
- **LENGH:** 1,921 Km
- **LINES:** 42 R + 10 S
- **TRAVELLERS:** 650,000/day
- **STATIONS:** 418
- **SUBSIDY:** 347.3 Million €/year (10.5 €/Km)
- **RUNS:** 2, 200/work-day
- **PRODUCTION:** 35 Millions Train\*Km/year
- **OPERATOR:** TRENORD
- **WORKERS:** 3,900
- **INFRASTRUCTURE MANAGERS:**
  - FerrovieNord (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

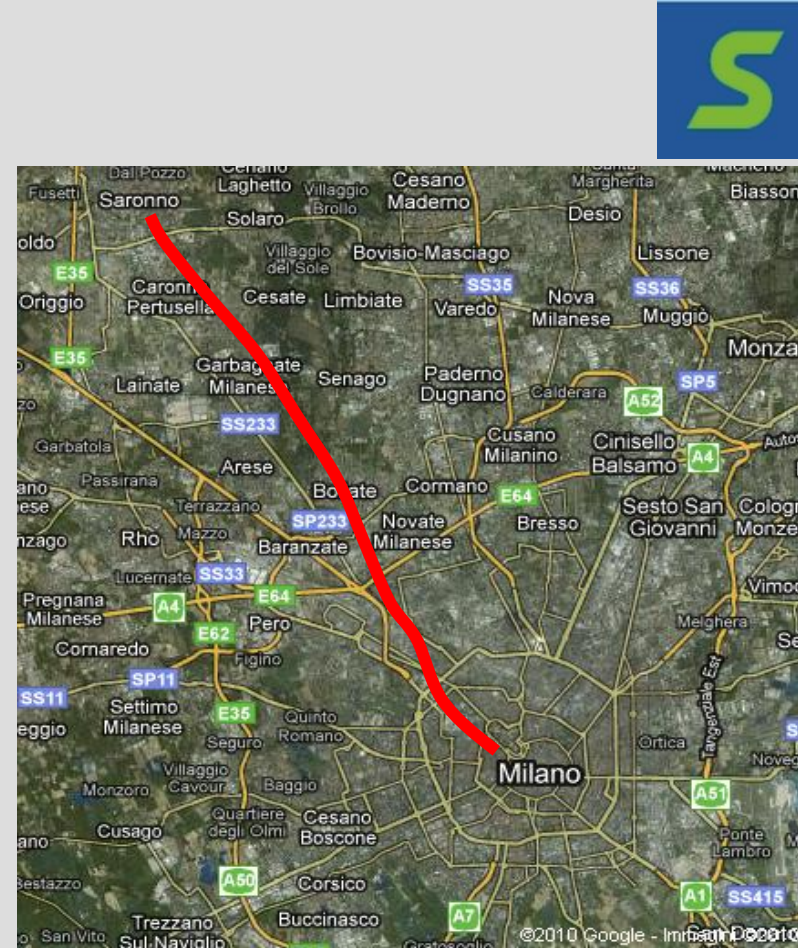
- **LENGH:** 103 Km
- **STATIONS:** 35
- **SUBSIDY:** about 8.5 ml € per year (about 7.7 €/Km)
- **RUNS:** 65/work-day
- **PRODUCTION:** 1.1 Million Train\*Km/year
- **OPERATOR:** TLN
- **INFRASTRUCTURE MANAGER:** FerrovieNord
- **TRACTION:** 100% diesel
- **ROLLING STOCK:** 10 trains (about 2.5 coaches)



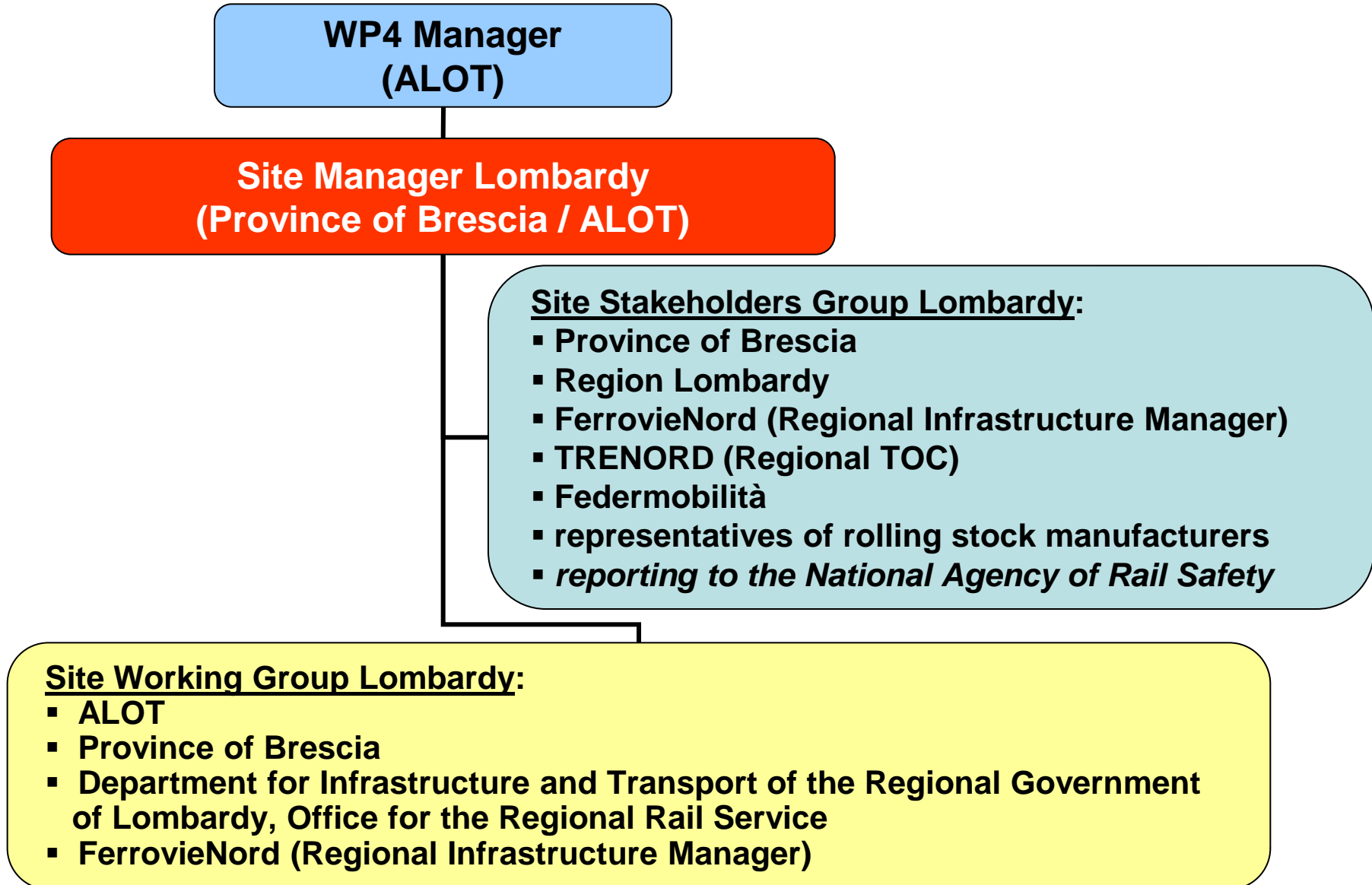
## Milan S3 line Milano Cadorna - Saronno





- **LENGH:** 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

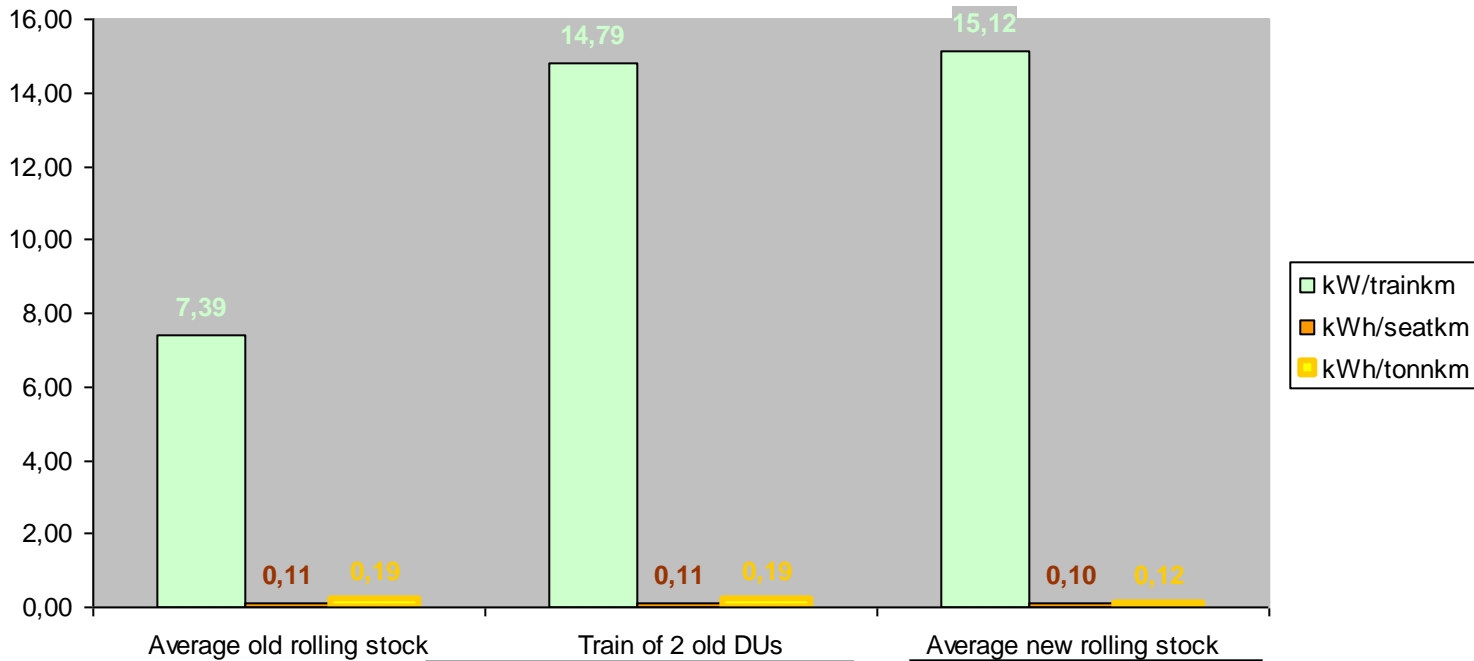


## On-site measurement

- **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

## Valcamonica line: diesel traction

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



**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**

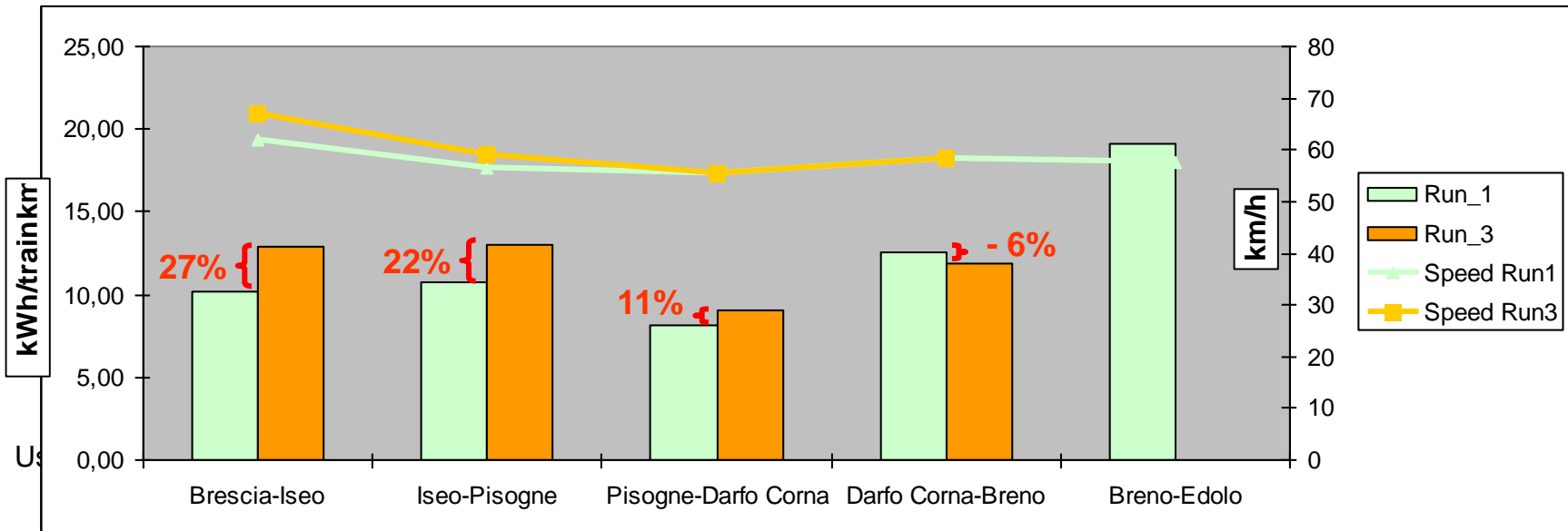


## Valcamonica line: eco-driving diesel

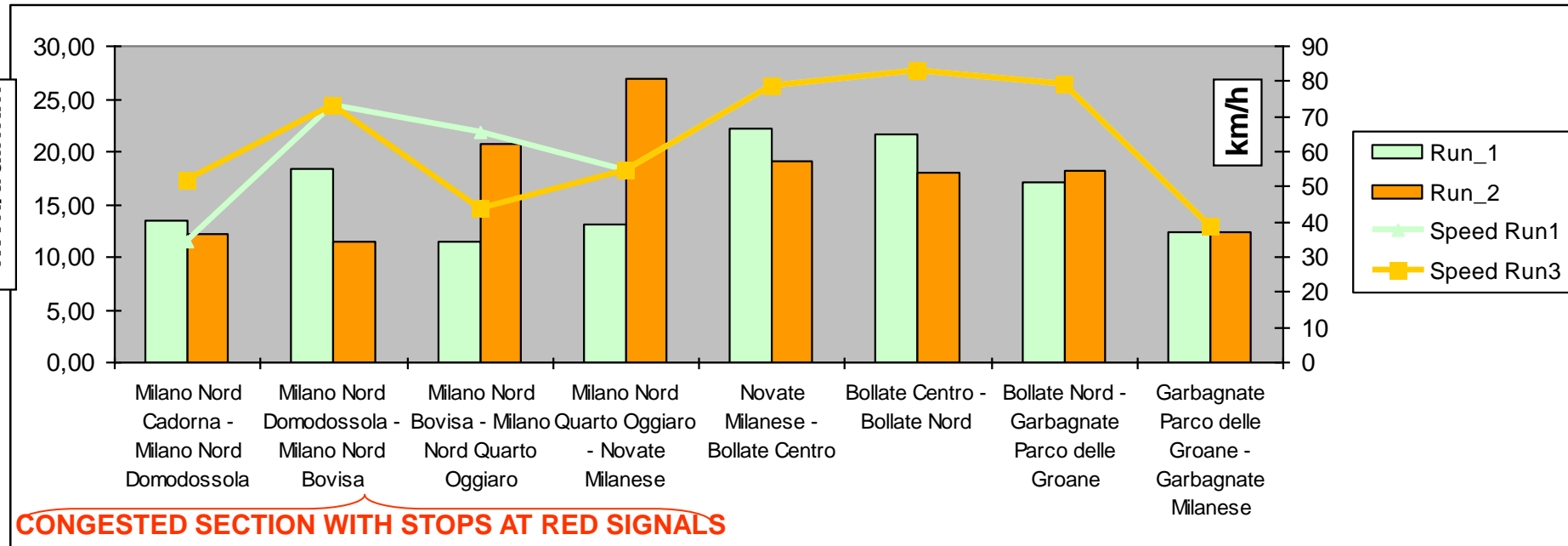


ATR 220 PESA

- Test runs on diesel Valcamonica line on 4<sup>th</sup> 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%**

## 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&comunication standards
- Claims and refund prescriptions
- Monitoring system

PRESIDENZA  
STRUTTURA CONTRATTI  
in data 15/11/2009  
di 13006/000

**CONTRATTO DI SERVIZIO  
PER IL TRASPORTO PUBBLICO FERROVIARIO  
DI INTERESSE REGIONALE E LOCALE**

TRA  
**REGIONE LOMBARDIA  
DIREZIONE GENERALE INFRASTRUTTURE E MOBILITA'**  
E  
**LeNORD S.r.l.**

RELATIVO AGLI ANNI 2009 - 2014

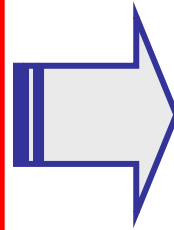
**FINES WHEN PRESCRIPTIONS  
ARE NOT FULFILLED AND  
MINIMUM STANDARDS ARE NOT  
REACHED**

GIS LN 2009-2014\_29-10-09 8\_firma.doc

## 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



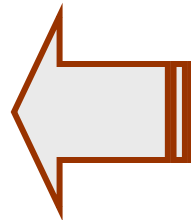
### PREPARATION STEP:

- 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

## 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 CO<sub>2</sub>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

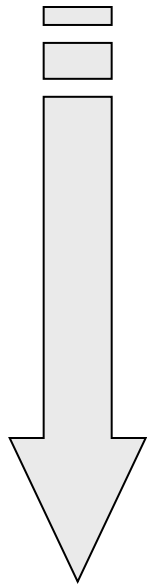
**"The TOC must accept a monitoring system for the traction energy consumption and provide the necessary equipment and database."**

### 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



### Advanced

- ↓ 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
  - or
  - by paying an addition to the subsidy
- ↓ 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".**

## Text module: purchase of rolling stock

### 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 CO<sub>2</sub> 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

### Province of Brescia

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