the 2nd (!) Italian eHighway testsite: A35 “Brebemi”
The Company “Concessioni Autostradali Lombarde” (CAL) was established in 2007 for combined initiative of Italian Government and Lombardy Region with the aim to build three new motorways in Lombardy: A35-Brebemi, A36-Pedemontana, A58-Milano External ringroad.

CAL is the grantor of this 3 new motorways

In these years CAL has carried out its activity, as public outsourcer of the works, with the present achievement of 136 km of new motorways, 110 km of ordinary roads and other compensatory works on the land.
The global worth of the works exceeds 4.5 billion euros.

The Project Financing instrument has been used to make an investment of such entity: no equals in the public finance coverage in Europe.

Results achieved by CAL in its first ten years of activity demonstrate that public works can be realized with the due regard to planned times and costs, if Grantor adopts effective P&CM procedures.

- **A35 - Bre.Be.Mi.**
  - Works period: 2009-2014
  - Length: 62.1 km
  - Cost: 1.737.2 Mln euro

- **A58 - TEM**
  - Works period: 2012-2015
  - Length: 31.8 km
  - Cost: 1.659.9 Mln euro

- **A36 - Pedemontana**
  - Works period: 2010-2024
  - Actual length: 31.8 km
  - Total length: 73.0 km
  - Actual cost: 1.405.0 Mln euro
  - Total cost: 4.118.0 Mln euro
why a testsite on A35 «Brebemi»?

TECHNOLOGICAL BACKGROUND

1940
The FIRST electric road with trolley truck in Italy:
- from Tirano (428 m above sea water level) to Boscopiano (1950 m above sea water level): 66 km
- 16 trolley truck + 2 trolley trail + 2 trolley bus
- dismissed in 1956

1882
The first electric trolley bus in the world
Siemens “Elektromote”

2016
The first European testsite of eHighway on public road
why a testsite on A35 «Brebemi»?  

**ENVIRONMENTAL BACKGROUND**

The atmospheric pollution and the climatic changes are object of the Kyoto Protocol (1997) and of the Paris Agreement (2016) that Italy also has signed. Reduction of greenhouse gas emissions produced in all economic sectors by at least 40% by 2030 is requested.

On **February 19, 2019**, representatives of the European Commission, agreed on a compromise for setting carbon dioxide (CO₂) emission standards for new heavy-duty vehicles (HDVs) for the first time in the European Union (EU). **The targets will reduce the average CO₂ emissions from the highest emitting HDV segments by 15% in 2025 and by 30% in 2030, both relative to a baseline determined from 2019 and 2020 data**


why a testsite on A35 «Brebesi»?  ENVIRONMENTAL BACKGROUND

The “Bacino Padano“ area is characterized by a high density of emissive sources and by particular climatic conditions favorable to the stagnation of pollutants released into the atmosphere.

Italy must also reduce emissions to remedy the Italian infringements of EU directives (2008/50/EC) regarding air quality. The European Commission has started infringement procedures, and, by judgment of the Court of Justice of the European Union sentenced Italy (2012).
why a testsite on A35 «Brebemi»?  

The definitive project of the A35 “Brebemi” was approved with a specific prescription expressed by the Environmental Ministry which had the scope to let Brebemi define concrete measures to reduce vehicle emissions (CIPE resolution No. 42/2009).

This aims at bringing, the issues related to air quality and to the need of the motorway sector to participate in the definition of concrete measures to reduce vehicle emissions, inside the infrastructure management.

In a recent meeting set up in order to identify the measures envisaged by the prescription, all national and regional administration has confirmed the electrification intervention of the A35 Brebemi as a medium-long term action complying with the prescription itself.
why test site on A35 «Brebemi»?  

**PRODUCTIVE BACKGROUND**

The logistics area of Milan is the most important crossroads in Italy for the international economic relationships.

1,500 logistics companies and more than 15,000 freight transport companies, with a turnover of 20 billion euro - about 26% of the Italian market.

Lombardy, with over 300 million tons/year of goods handled on its roads in 2016 (ISTAT source data and Bocconi University elaborations on Bank of Italy data), is the main area of origin/destination in Italy (it affects about a quarter of the goods handled nationally) and one of the most important on a European scale. Over 90% of the total goods of the Lombardy region move on road.
why testsite on A35 «Brebemi»?

storehouses location in Lombardy Region

PRODUCTIVE BACKGROUND

storehouses location (sup > 20,000 m²) in Lombardy Region

• As a result of this particular condition, according to AISCAT data, heavy traffic on the A35 covers a greater percentage if compared with the other motorways in the North: 27.7% vs. 24%
why testsite on A35 «Brebemi»?  **PRODUCTIVE BACKGROUND**

**Impact** of A35 Brebemi construction on productive background:

- 18 new productive settlement, 6 already working
- 2,600,000 m² of area acquired by freight transport company
- 878,000,000 euros of investment
- 3,740 new job role
- 22,600,000 euros of tax already paid to local authority
why testsite on A35 «Brebemi»?  

PRODUCTIVE BACKGROUND

BRIVIO & VIGANO’:

number of kilometers travelled per year: 42,500,000 km

diesel consumption: 3 km / 1 liter

Total diesel consumption per year: 14,100,000 liters

greater cost reduction if the power supply is designed not only for the tractor but also for the refrigerated trailer

<table>
<thead>
<tr>
<th>COST ITEM</th>
<th>%</th>
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<tr>
<td>driver</td>
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<tr>
<td>diesel</td>
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<tr>
<td>maintenance</td>
<td>15</td>
</tr>
<tr>
<td>other</td>
<td>10</td>
</tr>
</tbody>
</table>
why testsite on A35 «Brebemi»?

- A35 is part of the comprehensive TEN-T network, directly connected to the A4 motorway part of the TEN-T Core Network
- A35 is located in a strategic position with respect also to the nodes of the central TEN-T network, as well as with:
  - the Mediterranean Corridor
  - the Rhone-Alps Corridor
  - the Scandinavian-Mediterranean Corridor
As a result of all this issues described above, the pilot study for an eHighway on A35 have had a strong support from all the involved administration and stakeholder in general: an endorsement to the pilot have been subscribed by two Ministry (Transportation and Environ) and by the President of Lombardy Region. Several transport company had subscribe the intention to participate in the pilot buying directly the hybrid trucks to be used in the pilot.

The Pilot Study is based on the implementation of about 3 km of Electric Road System, between the tollgate of Calcio and the tollgate of Romano di Lombardia (both direction).

Technical characteristics of the Pilot Study:
- overhead contact line with a continuous electric power (750 V)
- the height of the contact line will not be less than 5,5 m
- monitoring of the electrical parameters and the remote control of the infrastructure through a centralized system
- security ensured through automatic and manual systems that can interrupt the electric current in case of emergency
- 5 hybrid vehicles used by the involved logistics and transport operators
Example of technical issues to be studied with the Pilot Study:

- **inter-operability**: as an example to represent the problem, nowadays the catenary height of A5 test in Germany is not compatible with Italian regulation.

- **safety**: we know that, with a certain frequency, catenary are subjected to rupture due to pantograph deterioration/problems. How can we avoid this in an highway system where the consequences could cause critical accidents?

- **dynamic behavior of catenary subject to several loads**: what happens to catenary when many trucks load it generating different waves propagating in it?

- **operational phase**: (e.g.) how can we design the system in order to let the platooning being possible?
Main objectives of the pilot study:

- define the conditions that the system must undergo so that it can be **attractive** to private operators in the road freight transport sector and **effective/efficient**, with a view to cost benefits, for the public entity that must realize the infrastructure ➔ **definition of the business model**

- the results of the Study can be used both on a national and european scale for the **definition of the systems of governance** of the infrastructure and for the **definition of appropriate regulations of the characteristics of eHighway systems** ➔ **definition of standards and regulations**

- carry out a **risk analysis** aimed at identifying any critical element related to the safety during the operational phase ➔ **definition of technical specifications** of the infrastructure
ERS - ITALIAN PILOT STUDY

- verify and quantify the possible effects on the air quality by comparing the emission values of a traditional freight transport vehicle and a hybrid one operating in electric mode, where, in this case, emissions will be quantified making reference to those generated by the different systems of electricity production ➔ definition of the **effective environmental improvement**

- similarly to what has been implemented by the German Ministry of the Environment, the minimum infrastructure network will be defined to guarantee the achievement of the targets set at national level in terms of emission reductions by sector ➔ definition of **minimum infrastructure network extension** to be electrified

The analysis developed in the study will be carried out by two of the most important Italian university: **Politecnico di Milano** and **Bocconi University**.
CAL strongly believe that cooperation between European administration can play a key role advocating for the electric road systems development and the greening of economies at national and European level, and in helping our Countries to fulfil the UN Sustainable Development Goals.

For this reason, CAL hope that we can move away from the logic of the individual pilot studies carried out by each individual Country and arrive at a single European project/laboratory for the development of ERS technologies to ensure maximum efficiency and completeness of the tests carried out, which can be coordinated between the different states and where each state could be responsible for a number of in-depth activities and where, for example, hybrid vehicles can be shared to solicit the system in the most appropriate.
For this reason a MoU has been already signed between Hessen Mobil and CAL. The data which we can expect to share should include:

- the **Business Model** (investments costs and operating costs compare to a toll system)
- the **standards** to establish in order to let the trucks use the overhead system in different countries
- with reference to greenhouse gas (GHG), the **reduction of emissions and the effects on environment expected and obtained**
- the effectiveness and **efficiency of overhead technology** in the Italian infrastructural context compared to Germany one
- the **effective costs for maintenance and management** of overhead structure
- the **best way to involve stakeholders** in the process
To enlarge the cooperation between Countries, at the moment we are convinced that the Call LIFE 2019 is a very good opportunity to give international dimension to the concept of eHighway and to fund the preliminary steps of the Italian demo (and possibly one other Country interested like France) and to fund tests in Germany, Sweden.

Following the Call guidelines, we are convinced that a project proposal would be feasible and competitive if it has the following features:

**Main objective:**
- demonstration of the interoperability of eHighway concept across EU MS and road networks;

**Main activities:**
- the current interoperability framework (regulation, technical aspects, etc.)
- test of the current eHighway vehicles in real-life environment
- test monitoring and lessons learnt
- guidelines for a common eHighway concept
- business planning
- design of an interoperable eHighway concept
- demonstration of an interoperable eHighway concept
- monitoring and environmental impact assessment
MAIN ACTIVITIES PROGRAMME

• **Activity 1: Setting the scene and pilot project definition** -> from May 2019 to March 2020
  – 1.1 Solutions for highway electrification - benchmarking with European experiences
  – 1.2 Electric commercial vehicles and eHighway connection tools - the state of the art
  – 1.3 Methodology of technical, environmental and economic evaluation
  – 1.4 eHighway pilot on the A35 - the definitive project plan

• **Activity 2: Pilot preparation** -> from March 2020 to December 2020
  – 2.1 Executive project plan - eHighway pilot on the A35
  – 2.2 Preparatory activities for the pilot - expropriation and compensation
  – 2.3 Installation of the eHighway pilot - electric part
  – 2.4 Installation of the eHighway pilot - civil works
  – 2.5 Preparation of electric vehicles with pantograph
  – 2.6 Installation of hardware and software systems

• **Activity 3: Start-up and test phase of the pilot** -> from December 2020 to February 2023
  – 3.1 Preparatory activities for the start-up of the electrified pilot route and fleet of hybrid vehicles
  – 3.2 Commissioning and testing
  – 3.3 Monitoring of operation and performance
  – 3.4 Optimization of systems and operation
  – 3.5 Environmental monitoring

• **Activity 4: Analysis of results and definition of the business model** -> from July 2020 to March 2023
  – 4.1 Technical analysis
  – 4.2 Environmental analysis
  – 4.3 Economic analysis and business model definition

• **Activity 5: Project management, dissemination and exploitation** -> from May 2019 to March 2023
  – 5.1 Project coordination
  – 5.2 Monitoring of project progress, indicators and quality control
  – 5.3 Reporting
  – 5.4 Risk management
  – 5.5 Dissemination and exploitation
THANK YOU FOR THE ATTENTION
Alberto Rigoni

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