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eHighway Pilot Project on A35 Brebemi (Italy)

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Summary

The eHighway Pilot Project on "A35 Brebemi" is part of the Global Project for the electrification of the whole "A35 Brebemi" motorway.

The Pilot Project is methodologically linked to other similar projects implemented in Europe and develop a Study with pilot activities that defines the business model to be implemented to promote the development and widespread deployment of a eHighway technology.

The electrified pilot highway stretch of about 3 km in both directions that will allow the development of the study on real data, will be carried out in the Lombardy Region (Italy), connected to the Core Network of TEN-T.

1 Research Questions

Italy must reduce emissions to respect the Kyoto Protocol commitments and remedy the Italian infringements of EU directives (2008/50/EC) regarding air quality. Since in the various areas and agglomerations of the national territory - including Lombardy - the limits for PM10 and NO2 are exceeded, in effects the European Commission has started infringement procedures, and, by judgment of 19 December 2012, the Court of Justice of the European Union sentenced Italy.

The critical issues connected to atmospheric pollution and to climatic changes object of the Kyoto Protocol and of the Paris Agreement, are particularly felt in the so called "Padano basin" area in Italy characterized by a high density of emission sources and by climatic conditions particularly favourable to the stagnation of pollutants emitted into the atmosphere.

The Pilot Project of electrification of a section of the A35 highway is intended to test the technical and economic feasibility of the "Global Project" of electrification of the entire A35 Brebemi highway as an answer to that critical issue.

The Global Project for the electrification of the A35 Brebemi highway will respond to the need of bringing into the management of the highway infrastructure the issues related to air quality and the need for the highway sector to take part in the definition of concrete measures to reduce vehicle emissions, with particular reference to those deriving from freight transport.

The objective of the Global Project is therefore the creation of a "green corridor", i.e. low emission of polluting substances, for freight transport between the logistics centres of Milan and Brescia and the Malpensa HUB through the TEN-T highway network of which CAL is the grantor body.

The specific objectives of the Pilot project are multiple:

1. Define a business model that makes the initiative sustainable even from an economic point of view;

2. To quantify the environmental benefits of electrification of sections of the motorway network in the Po river basin and in the core nodes of the TEN-T network located in it. The key indicator for this objective will be the measurement of the reduction of CO2 emissions (Tons/year) due to the implementation of the Action;
3. Define an involvement model for logistics and transport operators, with particular reference to how to intercept systematic local movements;
4. Check the soundness of the adopted technology and carry out a risk analysis aimed at identifying any critical element related to the safety of the works.

2 Methodology

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.

According to AISCAT (Italian Association of Motorway and Tunnel Concessionaire Companies) data, heavy traffic on the A35 covers a greater percentage (27.7% vs. 22-26% of the other motorways in the North) compared to other motorways in the Po Valley area, and continues to grow thanks also to the opening of the interconnection with the A4 occurred in November 2017.

Because of its geographical position and the strength of its economy, the logistics area, in the context of which the A35 operates, is the most important crossroads of the Italian system of international economic relations, thus constituting a decisive junction for the development of the country. Almost a third of all Italian trade with foreign countries is generated by Lombardy, which has as main trading partners the EU countriesThe location of the Pilot Project is identified in a section between the tollgate of Calcio and the tollgate of Romano di Lombardia (a 3 km stretch) of the A35 motorway.

The A35 motorway is located in Lombardy, Italy connected to the A4 Milan-Brescia motorway, part of the TEN-T Core Network and the Mediterranean Corridor. Furthermore, the A35 is located in a strategic position in order to intercept the existing freight flows with respect to the nodes of the TEN-T central network identified above, as well as with the two other corridors that together with the Mediterranean Corridor affect the Lombardy Region, i.e. the Rhine-Alps and the Scandinavian-Mediterranean Corridors.

From the east, the A35 develops starting from the Brescia South Ring Road and from the A4 motorway in the section between the Brescia West and Ospitaletto tollgates. For about 6 kilometres, the motorway platform consists of two separate carriageways, each with two lanes in addition to the emergency lane; after which it is instead made of three lanes in each direction in addition to the emergency one.

Altogether, there are 15 junctions that guarantee the connection of the A35 Brebemi motorway with the main road network in the area and with the crossed production areas crossed.

The project under study consists in the electrification of a pilot section with a total length of about 3 km for each direction, i.e. the minimum length necessary to achieve the objectives set by the Pilot Study. The electrification of this section, involves the construction of an overhead contact line positioned at the slow lane, fed by continuous electricity with a voltage of about 750 V.

In detail, the catenary will be supported by overhead line poles positioned on the motorway embankments protected by safety barriers of an appropriate class according to law. The height of the contact line will not be less than 5.5 meters.

The power supply will be provided through a new connection point to the network of the energy distributor able to guarantee the supply of the required electricity.

The centralized remote control of the entire system will be managed by an ad hoc software, to guarantee the monitoring of the electrical parameters and remote control of the equipment as well as the supervision of the section. All system components will be connected to the central control panel.

Safety in the event of an emergency will be preserved by installing automatic and manual systems that can interrupt the electric current in the contact lines in case of an emergency.

For the pilot project, 5 hybrid vehicles will be constructed, equipped with a double pantograph to come into contact with the two catenary cables. The use of these vehicles will be carried out directly by operators working in logistics and transport in the Milan logistics area, following the signature of specific agreements.

3 Results

The first main objective of the Study is to 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 of the road artery.

In this sense, it will turn out to be an instrument of absolute importance in order to put public and private stakeholders and all stakeholders in general, in conditions to take decisions based on objective elements.

The second aim of the project is to improve the integration of the road transport mode with other sustainable transport modes present in the Milan logistics area, reducing the current emissions into the atmosphere. The intention therefore is to complete the sustainable mobility system, which includes freight transport on water and on medium and long-distance roads, guaranteeing the possibility to use low-emission gas-altering means for the connection from the intermodal centres to the existing logistics platforms and/or end users.

The purpose of this Study is to support the diffusion of a technology that allows a significant and positive impact on the environment through the reduction of emissions of polluting gases into the atmosphere in general and of climate-altering gases in particular. All aimed at respecting the objectives set by the Kyoto Protocol and the Paris Agreement and resolving, as far as the road freight transport sector is concerned, the long-standing question of air quality of the Po Valley basin.

Finally the Pilot project will have effects on regulatory legislation for electric road systems. The impact of the regulations that will be implemented for the development of a currently unconventional hybrid transport system is fundamental and affects many different but related areas. They go from the modification of the Highway Code to allow the circulation to new hybrid vehicles equipped with a pantograph, to the regulations for the construction of the necessary infrastructures and their commissioning, to the management of the electricity grids and to the distribution of energy to the system network. Through the Pilot Study we aim, among other objectives, to identify the main critical issues of this new sector, so as to facilitate the definition of legislation in a coherent and favourable legal framework for its economic, technological and environmental development.

Acknowledgments

List acknowledgments here if appropriate.

References

[1] Authors, *Title,* edition, year

Authors

Giacomo Melis: Managing director at Concessioni Autostradali Lombarde S.p.A. (CAL), a public company operating in the infrastructure sector as motorway grantor.

As Managing director at CAL Giacomo Melis has been responsible, among all, for the general management (final and detailed design, execution of works, operation) of:

- Brescia-Milano motorway grant 62.1 km, total amount € 1,737.2 million;
- Milano external ring road grant: 31.8 km, total amount € 1,792.0 million;
- Pedemontana Lombarda grant: 65.0 km, total amount € 4,118.0 milion;

- Accessibility road system to the Milan EXPO 2015 universal exhibition, executive design, 6.7 km, total amount € 146.7 million.

Alberto Rigoni: in CAL as responsible of the Quality, Environment, Health and Safety Area, he directs, coordinates and supervises all environmental aspects during the design, execution and operation of the works. It manages relations with Ministries and local authorities both during permitting and surveillance.

He is also responsible for: achieving the required quality levels, for the correct application of the sector's regulations, for respecting the deadlines and costs for establishing relations with national and local authorities during the various environmental authorization procedures.