The Italian Zero Emission Transport Platform
Summary Report Synthesis

The Report explores the potential technological paths for zero-carbon freight transport in Italy, focusing on vehicles (*Improve*), without deepening the strategies related to modal rebalancing (*Shift*) and the reorganization of the transport system (*Avoid*). The study considers three specific technologies: battery-powered vehicles (**BEVs**), catenary-powered vehicles (**ERS**), hydrogen-powered fuel cell vehicles (**FCEV**).
It is **assumed** that the **end of sale** for new internal combustion vehicles (**ICE**) commercial **vans** is set for **2035** and for new ICE **heavy duty vehicles (HDV)** from **2040**.
The **objective** is to evaluate the technical-economic potential of the different solutions to totally reduce the CO2 emissions of road freight transport, taking into account the **characteristics of the Italian freight system** and **infrastructure requirements**.
The **analytical team**, made up of *Cambridge Econometrics* and the *Politecnico di Milano*, worked in coordination with the *European Climate Foundation*, *Transport & Environment*, *Motus-E* and *Kyoto Club* to understand, in the specific Italian case, which are the **potential ways of decarbonization** and related **costs** (vehicle and fuel costs, necessary infrastructure) and **benefits** of their implementation (CO2 and other emissions).
The Report shows that a rapid transition to zero-emission power trains can significantly reduce the CO2 emissions associated with Italy's road freight fleet. As the energy sector is expected to do the same, CO2 emissions from both *tank to wheel* and *well to wheel* will in turn decrease, further contributing to neutrality climate pursued, throughout the process from the procurement of raw materials to wheel drive (*Well to Wheel*).
The use of zero-emission vans and trucks requires the simultaneous implementation of **adequate charging and refueling infrastructures** to support the growing fleet of alternative propulsion vehicles. Scenarios dominated by ERS or hydrogen fuel cell vehicles require a greater total investment in infrastructure than an equivalent scenario with pure **BEVs**.
Analysis of the total cost of ownership (**TCO**) shows that zero-emission trucks will be **cheaper than ICEs:** in the coming years for BEV and BEV-ERS, and from 2030 for the FCEV. The cost of technologies will decrease over time as economies of scale that will make vehicles with advanced power trains more cost-effective. For example, from 2010 to 2020 the costs of battery technology fell from $ 1,100 / kWh to around $ 160 / kWh (source*: International Energy Agency*) and according to *Bloomberg New Energy Finance* they will be below $ 60 / kWh by 2030. Furthermore, zero-emission trucks will further benefit from additional policies that reduce the cost of these technologies.
Scenarios and archetypes used in the Report should be considered as **hypothetical scenarios** to imagine the role that zero-emission technologies may have in the future, to achieve the decarbonisation objectives of the road transport sector. What will actually happen will depend on the institutional, political and business choices, on the evolution of the market and the availability of charging infrastructure.
More in detail, with the Summary Report we have summarized the results of the Cambridge Econometrics Report, "*Potential Options and Technology Pathways for Delivering Zero-Carbon Freight in Italy"* which aims to answer **three key questions**:
1. Which are the possible technological decarbonisation solutions for vans and HDV (under 3.5 tons and above 16 tons)?
2. Which of the zero-emission road freight technology solutions brings the greatest economic benefits to users and logistics system?
3. Which are the infrastructure investment requirements associated and necessary for the paths of decarbonization in Italy?

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The **answers** can be summarized in the following 3 sets of remarks:

1. The **zero-emission solutions for freight transport**, compared with the current Euro 6 diesel vehicles and also with Euro 7 of the expected forthcoming European decision, are:

- Battery electric vans, trucks and articulated lorries (**BEV**).
- Trucks and articulated lorries for long range electric but powered by catenary systems, with acronym **ERS**, which means of transport are coupled with a pantograph long-distance freight.
- Vans, trucks and articulated lorries powered by a Fuel Cell which transforms hydrogen into electricity (**FCEV**). If technically these are electric vehicles (traction is guaranteed by an electric motor), the means, charging infrastructures, production and distribution of hydrogen, constitute a different solution from BEVs.

2. From the study, the **BEV vans and trucks emerge as the best solution** either from an environmental point of view, helping to reduce CO2 emissions and local pollutants, both from an economic point of view, as evidenced by the achievement of cost parity right from the start from 2025. These advantages not only become evident over the years in relation to vehicles diesel, but also compared to competing solutions, hydrogen and catenary, due to the lower costs of purchase and operation, as well as for the greater ease of dissemination of vehicles and infrastructures necessary to feed them. However, even in the Tech BEV scenario, a percentage is expected significant of fuel cell vehicles powered by green hydrogen especially for transportation heavy long haul.

3. The calculation model, also gave results on the infrastructures necessary for refueling vehicles **cheaper for BEV charging infrastructure** than both solution catenary, (comparison only on heavy vehicles) and to the hydrogen one. To the quantitative evaluations obtained, we must also add some qualitative considerations:

- The **ERS catenary infrastructures are not easy to build**, because they are a state planning and intervention are most required, with a potential expansion of the times of realization; because suitable means for these solutions could only be operational once these infrastructures were fully operational realized; and because connection costs are not easily available or estimated to the electricity transmission and distribution networks for a massive diffusion, at least on main catenaries' motorway networks. In this context it is not easy to predict either the actor, public or private, who should invest in the implementation of the system power supply, nor what would be the price of the energy transmitted to the vehicles.
- Furthermore, the catenary ERS solution is suitable only for transport flows **long distance on highways and expressways**, while our distribution system of goods, linked to the widespread productive and settlement system, cannot be largely satisfied by the ERS system and this constitutes a limit.
- Distributors for compressed **hydrogen still have numerous uncertainties on costs operational and maintenance**, as well as the necessary standardizations are still to be developed. Furthermore, the consolidation of the hydrogen distribution system remains uncertain, upstream of the refueling stations, as it appears uncertain the supply of **renewable electricity**, sufficient to guarantee the production of green hydrogen needed to power all means in the relative scenario.
- For **recharging infrastructures**, of vans and HDV, **careful and long-term public planning will be needed**. However, in Europe it already exists an established market for van infrastructure and so-called *megachargers* (charging devices with a power greater than 500 kW for each charging point. they are not very different from the High-Power Chargers that are installed for motor vehicles - M1).

- The European Commission's proposal for a **Regulation on Infrastructure for alternative fuels (AFIR)** already provides for a minimum geographical coverage of large companies motorway arteries with charging and refueling devices dedicated to the transport of goods long-haul by road, enabling the use of battery-powered electric heavy vehicles and hydrogen on routes over 300 km in our country.

Further measures and policies to achieve zero emissions by 2050

The results of the analysis on the environmental impacts of the four scenarios considered, combined with the end of sale of the ICE vans by 2035 and the ICE HDV to 2040, even if they **contribute decisively to the reduction of pollutants and greenhouse gases**, **do not ensure climate neutrality by 2050.**
The share of vehicles being used for over 20 years result in an 11% of **ICE vehicles still in circulation in 2050**. And also, from the consideration that the end sale of ICE HDV by 2040 with an average useful life of 12 years would still see a significant share of vehicles in circulation by 2050.
Given that the *European Green Deal* strategy imposes 55% reduction of CO2 by 2030 and climate neutrality by 2050, this is a very relevant problem and further measures to limit the circulation of older vehicles by 2050 are therefore necessary.
Furthermore, this study result confirms that other technological solutions for vehicles proposed such as "transitional", fueled with fossil fuels, such as LNG, will not be in a position to ensure climate neutrality by 2050.

The Report's eight recommendations

1. **The need for a national strategy for the decarbonisation of zero-emission freight transport by 2050**, which must be prepared by the competent Ministries, anticipating the PGTL (General Transport and Logistics Plan) in progress elaboration, with coherent measures and actions.

2. **Electrification of transport requires a massive development of renewable energy**, at the service of all potential technologies explored in the study (BEV, ERS and FCEV). This goal must be at the basis of the PNIEC (*Integrated National Plan for Energy and Climate* 2030) update, in which an installed power requirement of renewable energy sources plants equal to 70 GW by 2030 to make the Italian energy mix ever cleaner. Regarding the production of hydrogen, it is considered essential that the production through electrolysis is powered by renewable energy, so as to be consistent with a transport sector zero emissions.

3. **Promote the acceleration of the construction of charging infrastructures for freight transport** through:

    - The support for the adoption of the AFIR, which provides for mandatory minimum targets along the main highways and junctions urban areas of all Member States starting from 2025, so as to guarantee sufficient capacity for recharging for battery-powered trucks that will populate the market in the coming years.

    - The anticipation of the contents of the aforementioned Regulation proposal with the implementation charging infrastructure for freight transport.

- The update of the PNIRE (*National Infrastructure Plan for Recharging Electricity-Powered Vehicles*), inserting a chapter dedicated to the infrastructure of the freight transport, not contemplated now.

- Financial support to market operators, both on public and private land.

4. **Invest heavily in Italy in research of new battery technologies** and promote their production in the following years. Invest in the same way in **recycling and reuse** of batteries.

5. **Adopt a system of incentives for road hauliers, for the purchase of zero-cost vehicles** including leasing or long-term rental. Introduce discounts on road tolls and motorways for zero-emission freight vehicles.

6. **Progressively redirect the *Environmentally Harmful Subsidies*** (from SAD to SAF) for road transport towards zero-emission freight vehicles and for the construction of infrastructures of charging.

7. **Plan a national strategy to limit the circulation of older vehicles**, starting from urban and metropolitan areas, so as to significantly reduce the impact of these vehicles and continue towards a goal that favors the circulation of zero-emission vehicles by 2050.

8. Regarding the risk of failure to achieve climate neutrality by 2050, highlighted in Report despite a phase-out of internal combustion HDV sales by 2040: there is a need for **further measures through policies** that favor modal rebalancing (*shift*) and the efficiency of the system (*avoid*), on the one hand, and take concrete actions aimed at creating necessary preconditions to anticipate a sustainable transition to zero-emission vehicles for some categories of transport, on the other.

The Summary Report has been signed by: *ABB, Cambridge Econometrics, Confartigianato Imprese, Confartigianato Trasporti, Italscania S.p.A, Kyoto Club, Motus-e, Politecnico di Milano, Tesla, Transport and Environment Italia, UPS Italia.*

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