Extended abstract

Objectives and motivation
ZED – (Zero Emissions Distribution) is intended to implement a new logistics model at zero emissions (CO2), with a break-even energy balance and economic savings prospects for the distribution of FMCG – Fast Moving Consumer Goods (beverage) and perfumes and luxury goods, within large metropolitan areas and LTZ (Limited Traffic Zones) of Rome through the integrated use of renewable energy sources and innovative technologies that use solar energy (photovoltaic modules) to supply power for electrical vehicles through fast charging towers.

General description
In the historic inner-city area of Rome 25,000 vehicles are operating daily; 60% of those vehicles (15,000) generate 35,000 loading/unloading activities, while the remaining 40% cross the inner-city area without stopping (*Valeri e Stathopoulos 2010); this represents one of the major causes of pollution and ZED wants to solve this problem through a technological approach.

Project summary: Deliver more than 1,000 shipments per day in the LTZ zones of Rome by a warehouse located at 15 km from the city center (GRA - Tiburtina area) by n. 8 electric vehicles. The electric vehicles (2.5 t of payload and 60 kWh) will have an autonomy of 140 km and the possibility to exceed slopes greater than 21%. The electric vehicles will be able to deliver in the LTZ even 2 times x day. The warehouse will be covered by 1.500 square meters of photovoltaic panels and it will supply energy (DC) to 8 electric vehicles and to some fast-charging towers. The management model ZED will be supported by a dashboard, capable of: a) continuously monitor the energy balance of the system (the warehouse and vehicles); b) optimize the distribution activity, planning and monitoring the activities of electric vehicles.

In October 2014, the first electric vehicle started the distribution service in the historic center of Rome (ZTL), the second started in March 2015, while the whole fleet (6-8) will be deployed in full operation in May 2015.

Main Partners: Mancinelli Due (www.mancinellitrasporti.it), BIP – Best Ideas & Projects (www.bip-bestideaspotifications.it), POMOS (www.pomos.it), CNR (www.cnr.it), ACT OPERATION RESEARCH (www.act-operationsresearch.com)

Focus Research
• HUBs and TPs powered by photovoltaic energy panels: recovery/energy savings with the elimination of losses due to the absorption of the inverters in double conversion between direct and alternating current (DC –AC) and vice versa for battery recharging;
• Fast-charging electric vehicles charging station for electric vehicles (goal 30-40 minutes);
• Designing energy integral logistics platforms - Energy Performance of Buildings Directive;
• Electric vehicles with energy recovery through advanced braking systems and piezoelectric harvesting (range extension 160-180 km);
• “Smart” dashboard for monitoring the entire logistics-distribution model;
• Stations for quick replacement of batteries for electric vehicles (TBD).

Results and conclusions
1. To certify ZED as the best logistics solution for distribution in the LTZ within the environmental/eco-sustainable field (CO2=0). The certification of the model will be made by the CNR (Centro Nazionale delle Ricerche). The implementation of the ZED project entails a reduction in CO2 emissions, the effect of which corresponds to a reforestation of about 205 hectares (to be confirmed).
2. To develop repeatable/reproducible ZED at national and international level in the field of distribution logistics, to increase efficiency and effectiveness in the management of distribution circuits of the goods.
3. To reach a BEP (break-even point) < 3 years.
4. To achieve operative costs savings compared to the “traditional logistics model” of 10-15%.
5. To promote and encourage the creation and development at national and international public and private companies of green logistics, contributing to the creation of spin-offs and new jobs.
6. To introduce technological innovations to increase the autonomy of electric vehicles by 10 to 15% and to reduce energy demand due to recharging and storage infrastructures by 10 to 20%.

7. To develop and patent the dashboard as an operational tool for planning and optimizing logistics, electric vehicles fleets management and fixed installations for energy generation and recharging stations.

8. To fulfill a complete costs-benefits analysis.

9. To give birth to spin-off / start-up, especially for public transportation and to deliver goods for school canteens.

References


Keywords: green logistics ; electric vehicle ; logisticized