

**SUMMARY DESCRIPTION OF THE PROJECT (Max. 3 pages; to be completed in national language)****Project title:**

Solar Aided Vehicle Electrification

**Project objectives:****General context**

The EU's CO2 targets for transport are ambitious with respect to US, China or Japan. They aim for a 95 g CO2/km cap by 2020 with further tights foreseen beyond 2020 (68-78 g CO2/km was proposed for 2025). Air Quality Directive of 2008 has also tightened the NOx emissions Regulation and most major European countries desire for higher energy independence and a shift towards a less oil intensive transport.

Authoritative analyses show that EV (Electric Vehicles) thrust (1,8% of registration in 2013) is to gradually increase in EU both on the consumers side and for automotive industry with a major role for alternative powertrains in European mobility in the next future. If there is no doubt that EV vehicles are increasing, the final scenario will be for sure the combination of 3 drivers: *Governments Stimulus*, *Consumer demands* and *Industry Policy*, mutually affecting each other. Indeed the burden and the initiatives to reach the target are shared among the broad set of involved stakeholders, from manufacturers to cities administrations up to end-users and drivers with their related collective costs.

Global studies acknowledged by ACEA - European Automobile Manufacturers' Association - found that *this system manages to be both expensive and ineffective because it does not address the bulk of the vehicles already on the road. As it is, meeting the 95g CO2 target will cost manufacturers an estimated €1,000-2,000 per car by 2020*

**Objectives vs context**

*-Reaching TRL 9 with HySolarKit* (Figure 1): an add-on tool for the modification of Internal Combustion Engine Vehicles (ICEV hereinafter) to solar-powered hybrid electric

*-Technically enable the kit to serve both passenger cars* (M1 class), de facto making them hybrid and *reduce fuel consumption up to 25%, & Light electric vehicles*, (L6/7 classes, Figure 2) saving up to 12% of the energy required for recharge through the solar panels.

*-Setting the base to address the aftermarket channels* in order to tackle all the vehicles already on the road when on the market

*-Keep production costs low in order to reach a payback period of 3-4 years'* for the users with an envisaged target price around 3/3.5 k€ for an average yearly mileage consistent with most of the EU urban driving pattern

*-Assemble 4 high-level prototypes and set a performance and environmental demonstration schedule in Europe* with a particular strategical setting in Malta

*-Defining capacity, economics & financials of a joint venture* between the partners

**Actions and means involved:**

The retrofit kit integrates state-of-the-art, high TRL, technologies connecting in-wheel brushless electric motors (Landi Renzo) and solar panels (Solbian) with a power electronic to interface them with a battery pack and with the vehicle management interface and control units (eProInn) (Figure 1). The best components integration and power management must be achieved to reach the technical, environmental, economic and awareness targets through the following actions:

**A** - 1 action: improving component integration design to cover the route from regulation assessment, executive design, simulations for the control strategy and interface improvement up to the definition of the Bill of Material for procurement.

**B** - 2 actions. 1) BoM review for Industrial design, procurement and realization of 4 vehicles mounting

the kit; bench and road tests scheduling to monitor performances, prototypes homologation and permissions to test and drive in order to proceed with the demo campaign.

2) Replicability: increase market insight in specific countries assessing regulation hindrances & users will to pay, cost analysis for up-scaling, transferability analysis through patents and technology intelligence to find extra-sectoral use. On the business generation side strategic alliances will add to the definition of a NewCo with its key resources (HR, commercial, logistic) business plan, investment and financial needs.

**C** - 2 actions dedicated to assess and monitor the Performance Indicators. Specific effort will be dedicated to an LCA and defining relevant business cases concerning private cars and fleets. The specific testing ground of Malta will be analysed at socio-economic level for replicability. Briefs will be produced for better divulgation

**D** - 2 actions for participation to dedicated events and exhibitions, off-line and on-line multimedia initiatives to reach industry, authorities, mobility services and end-users. A final HySolarTour up to Bruxelles will be set with a final conference and a video reportage. 2 prototypes will be used for demos, testing and business development in Malta.

**E** - 3 actions for Management, procurement monitoring and management of subcontractors and AfterLife planning, defining the NewCo time to market, operational and financial capacity,

Homologation, transferability, LCA, NewCo definition and prototyping of the 2 Light electric Vehicles will require external expert companies. 24 months are sufficient to face all possible delays (e.g. homologations)

#### Expected results (outputs and quantified achievements):

**During the project** the following results will reach LIFE SAVE objectives:

- The **improvement of system-integration** through upgraded power electronic systems and the realization of a BOOST for 45V batteries architectures which will be already taken to industrial level
  - The **realization of 5 complete kits** (10 in-wheel, 5 solar panel groups, related electronics and control units). 4 kits to be integrated on as many new vehicles and 1 more to upgrade an existing original concept demonstrator owned by eProInn (the kit conceiver and patent owner)
  - **4 prototypes mounting the kit: 2 commercial M1 passenger cars and 2 original design Light electric vehicles from L6 and L7 classes and their homologation by accredited bodies**
  - **The definition of bench tests architectures and protocols at component, kit and vehicle levels to assess**
    - Consumptions and emissions** in defined driving conditions with respect to baseline values known from previous tests and specifications of in-wheel motors (-25% consumption, i.e. CO2) and Solar Panels (they can contribute up to 12% to 1 day city driving saving this power for recharge from the network)
    - performance and driving safety** decreasing by 23% the time from 0 to 100 km/h and improving adherence on the front wheels with the integration of the wheel motors which make the vehicle a 4x4
  - **Industrial cost optimization to keep sale price below 3,5 k€ per kit**, to keep the payback time for the user c.a. 3 years
  - **The definition of a joint venture** between the partners based on a NewCo and the full assessment of its capacity, logistics, structure, HRs and business plan to become operative within 6/12 months right after the project
  - **The definition of commercial and licence agreements with OEM & after-market representatives** (e.g. retailers, IAM ) through Landi Renzo and Solbian networks, at least 1300 distribution points in EU and the engagement of at least 1 Fleet owner (public or private)
  - **At least 2 agreements in Malta** with public & privates transport companies and insurance firms through a dedicated framework contract
  - **Awareness/demo campaign** in Malta & EU by multimedia communications to different stakeholders, briefs, layman reports, reportages, exhibitions and ride-and-drive users trials among others
- On top of that Business and AfterLife plans will evidence the NewCo capacity of averagely 5000 units per year in the first 5 years with an aggregated turnover of 84 Million EUR growing with 15 new jobs (worst case) and plan its financial needs

Is your project significantly climate-related?

Yes  No