



# HySolarKit - Executive Summary

## The idea: to convert a conventional car into a hybrid solar vehicle

This project HYSOLARKIT focuses on the development, production and commercialization of a kit (equipment, along with associated techniques and methodologies), aimed at converting conventional cars into hybrid solar vehicles (Mild-Solar-Hybrid), reducing fuel consumption and emissions, without affecting performance and safety. The kit could potentially be applied to the majority of existing vehicle fleet, specifically front-wheel drive cars. The idea has been patented by a group of researchers and professors of the University of Salerno, with a wide International experience and numerous industrial collaborations.

## Development stage

The team, that has already developed a working prototype of a hybrid-solar vehicle within the framework of a EU project, is finalizing the development of the hybridization kit and its prototypal installation on a FIAT Punto, also based on a grant from Ministry of Education, University and Research (MIUR), and in collaboration with the University of Sannio.

## The team: expertise and awards

The project is proposed by Ivan Arsie, Vincenzo Marano, Cesare Pianese, Gianfranco Rizzo, Gina Scorziello and Marco Sorrentino. The team, working at the Department of Industrial Engineering of the University of Salerno, has received several honors and awards for the proposed hybridization kit, and the research activities focused on hybrid-solar vehicles, presented at several international events. The press and media have also focused their attention on this project (details at [www.hysolarkit.com](http://www.hysolarkit.com)).

## Innovation points

The product has original and innovative characteristics in the idea of combining photovoltaic recharge with the hybridization kit, employing currently available technologies (wheel-motors, photovoltaic panels, batteries), but ensuring flexibility for future upcoming technologies.

## Cost and payback

The cost of the kit is estimated at about 4000 € for the pre-series production, reducing to about 3200 € within 3-4 years. The payback for a consumer, in a short/medium term scenario (2-3 years) is expected to be about 3-4 years, with even lower values for the plug-in option (recharge from the grid). With respect to the purchase of a hybrid vehicle, costs are strongly lower.

## Target market and potential customers

The proposed product aims, initially, at the Italian automotive market, while in the medium term it can be foreseen a penetration into the European and International market, as well.

The kit is a new alternative for consumers looking for an after-market solution able to reduce consumption and emissions, without affecting performance and safety. Particular interest is expected by consumers who are relatively young and aware of energy-environmental issues.

## Business Model

The Business Model, B2C (Business to Client), involves the acquisition of most components from external suppliers (wheel-motors, flexible photovoltaic panels, lithium batteries) and the in-house development of the control software for system management, some processes, the assembling process and distribution of the kit to an installers network.



It is possible, that in case of eventual interest by industrial partners, know-how and patent might be transferred in a B2B (Business to Business) model.

## Production strategy and potential partners

The team expects to create a spin-off of the University of Salerno. The first phase, that will cover most of the first year, will be dedicated to the further development of one or more prototypes, with different options (different batteries, with or without plug-in capabilities) to demonstrate the feasibility and compatibility of the kit on existing vehicles. In a second phase, starting from the end of the first year, a pre-series production of 60 kits will be produced, to test on commercial fleets and/or local government fleets. Advanced contacts are underway with the City of Salerno. In the third, fourth and fifth years a medium scale production is expected (300, 600 and 1000 kits, respectively) and a distribution ensured by a network of installers.

Advanced contacts are already underway with industrial partners and/or consultants involved in the diverse technologies and methodologies that are needed to drive HySolarKit from the prototype phase to commercialization.

## Marketing

Starting from the first phase of activities, a constant and intense dissemination activity will be carried out, through multiple channels, in strong synergy with the research activities. The information on performance, cost and development of the kit will be publicized through congresses, shows, newsletters, media, press, web and social networks

## Competitive advantages

The project HYSOLARKIT represents the commercial evolution of a European patent recently filed by the team members (Italian with PCT extension). The company, that will be a University spin-off, has an additional competitive advantage in its own inclination towards research and innovation.

## Competitors

HySolarKit is the only product that sees the coupling of solar recharging with the hybridization kit, and it is protected by a patent. Currently, there are not such products in the market, and similar devices are still in the development phases, thus it is quite difficult to assess its performance with respect to competitive products. However, a preliminary market analysis has emphasized that:

- most of the hybridization kits do not offer photovoltaic recharge and use smaller electric machines, thus are not able to provide the same range in pure electric mode.
- conversion kits currently available in the market have different goals, and are usually vehicle-specific (i.e. Toyota Prius or other hybrid electric vehicles) and do not offer the same flexibility of HySolarKit.

Natural gas and LPG conversion kits represent possible indirect competitors. It is worth noting that, while HySolarKit realizes lower costs and emissions due to a reduction in fuel usage, the other systems base their economic advantages mainly on fiscal incentives, thus strongly sensitive to energy policy.

## Summary of economic and financial results.

Our analysis show a positive cash flow starting from the third year. The IRR (Internal Rate of Return) is about 42%. For further details, please refer to the complete Business Plan. An investment of 150.000€ is planned by the founders within the first three years, and the recourse to a bank loan of 40.000€ will be needed to complete the planned operations. The availability of external investors would allow a faster and stronger growth, and production volumes strongly higher.