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LAMPO:
Developments of Protoscar's high performance battery electric vehicle and explanation of its unique efficiency features

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"LAMPO": where ultimate performances meet Guinness-efficiency!

The stylish LAMPO Showcar that Protoscar SA has unveiled at the past Geneva Motorshow on March 2nd 2009 is a full size sport cabriolet powered by two-hundred-sixty-eight (yes, 268 HP!) - totally clean and silent – "horses"!

Two electric BRUSA motors (one rear - and one front- mounted) are optimized for maximizing acceleration and regenerative braking respectively, developing a constant torque of over 440 Nm from 0 to 5'000 RPM! Thanks to a lightweight Lithium-Ion battery pack with a capacity of 35kWh, a range of over 200km is possible between recharges: those can be done using every standard EU plug. The on-board charger also recognizes automatically if an accelerated 7kW "booster" charge can be supplied by the electric network. A remote 16kWp photovoltaic plant (using amorphous silicon solar cells) produces 18'000 kWh/year, which results in enough clean energy for covering over 50'000 km/year saving 12 tons of CO2 at a lower km-price than gasoline and diesel.

The extremely high energy efficiency of the whole system allows to transform over 80% of each kWh produced by the photovoltaic plant into driven km: 3 times better (see: www.optiresource.org) than the best internal combustion cars can do with diesel fuel!

Never before such ultimate zero-emission performances have been demonstrated at such excellent level of overall Well-to-Wheel efficiency – and on top of it without any drop of oil.

Keywords: BEV, ZEV, electric drive, efficiency, solar energy

Who is Protoscar?

Protoscar SA (www.protoscar.com) is a design company specialized in CleanCars and based in Rovio (Ticino, Switzerland). At present it employs 14 specialists. We act like a "Minergie-architect", but apply the efficiency-concepts to cars, mainly by increasing their electrification. Our CleanCar experience started in 1985 with the design and realization of solar&electric racing cars using lightweight composite structures and body styles optimized by intensive wind-tunnel testing. During the nineties our experience was put into service of the VEL1 Project in Mendrisio (Europe's biggest EV demo project so far, carried out in Mendrisio - approximately 7'500 inhabitants - where over 400 electric vehicles, equivalent to nearly 8% of market share, were introduced, mostly to private users). Our unique experience and holistic approach allow us not only to develop forward looking strategies and outstanding vehicle concepts, but also to support the market introduction of CleanCars and the communication activity of these technologies.

We are proud to include worldwide companies like Daimler AG, General Motors, Rinspeed-Esoro and Nissan among our faithful clients.

Protoscar's objectives

At the end of 2007, Protoscar S.A. decided to engage in a new and unique project: the „electrification" of a full size sports car capable to avoid all typical technical limitations of an electric vehicle. This demanding project pursues various aims: primarily however the research and the practical implementation of new energy efficient features in a premium electric car, such as „intelligent charging", interactive GPS-based „range estimator" or „inflatable lightweight body parts".

The main goal is to realize a vehicle that will convince passive and even skeptic decision makers that modern electric vehicles allow the greatest driving pleasure thus showing that battery driven vehicles represent the most suitable solution. This conviction simply ought to be generated by the EXPERIENCE OF DRIVING the prototype – which will be definitely more effective than any possible power point presentation. In fact, the vehicle will be tested extensively by several OEMs.

Actually (since the era of Tour de Sol) even the most well known Swiss firms which successfully develop components, concepts and design for OEMs in the field of E-vehicles, could not yet fully prove their competence. In the nineties, Switzerland demonstrated, amongst other things, thanks to Horlacher and Winterthur Insurance (who performed real crash demonstrations) how passive safety can be achieved with lightweight construction. We wish now to demonstrate that extreme performances with extreme high efficiency can be combined – at zero emissions. Both were - and are - no contradictions.

According to customary market developments in the automotive sector – and not only – innovations (with the exception of those lawfully prescribed) normally only have a chance if they are introduced TOP-DOWN and initially show exclusive trendy characteristics. At first therefore the output of successful technologies is not very high; however the buyers in a position to purchase are prepared to pay for the technologies in these exclusive sectors – which lastly indirectly generate a price decrease thereby allowing the earliest access to a large number of people. Obviously, the whole project also touches on emotions: for most buyers – and for almost all decision makers – a car is essentially an emotional object, so that it is difficult (and history confirms it) to simply stake on rationality and suitability of a car concept. Our vehicle will therefore distinguish itself for its aesthetics and be recognized as a sports and efficient vehicle.

Another important aspect is that the innovative technical features are to be run and examined through intuitive and attractive graphic interfaces. Up to now E-vehicles have been rather regarded as aircraft (technically for technicians): conversely the functions and their simple operation should be foremost. We also aim to provide a sexy appearance to this innovative technique as well as a user-friendly operation.

In short, with this project we wish to develop and produce a unique E-vehicle; to produce a Swiss Premium and sexy electric car with the best possible design – the combination of form and function – such as to facilitate through THE EXPERIENCE OF DRIVING TESTS the appreciation of the potential of the electric drive.

LAMPO's goals

The main goal is to develop a fully functional prototype that can convince passive and even skeptic decision makers that modern electric vehicles allow the greatest driving pleasure, and showing that battery driven vehicles represent the most suitable short term solution. This conviction simply ought to be generated by the EXPERIENCE OF DRIVING the prototype – the first time in May 2009 in Norway, where LAMPO will participate in the EVS-24 rally organized between Oslo and Stavanger.

Through LAMPO, Protoscar and its partners aim to be able to demonstrate the innovative technology which includes absolute innovations like „intelligent charging" or interactive GPS-based „range estimator" – and discuss potential applications together with car manufacturers, in order to implement these solutions into their plans for future CleanCars.

Special features

The research and practical presentation of new more efficient energy features is carried out in cooperation with various partners and relates to various areas:

a) „Four wheel drive for maximum traction"

When accelerating, the load is shifted to the rear axle while in braking it moves to the front axle. If there is traction on one axle only it cannot optimally succeed. If the two electric motors can take on differential tasks (primarily to pull or primarily to regenerate) the total efficiency of the vehicle can be considerably increased. This is exactly what should be demonstrated and – thanks to axles which can be singularly disconnected –- also tested for comparison.

b) „Intelligent charging"

Before possibly V2G will contribute to the net stability, the closest solution to avoid peaks is an "intelligent charging" obtained through a temporary interruption or a reduction of the charge. To that end the user of the vehicle should be able to choose and set - directly in the vehicle - some charging parameters which will influence the onboard battery charger, e.g.

- Earliest charging time/ latest charging stop
- Maximum charging yield
- Charging status to be achieved by end of the charging
- Theoretically in future one should be able to choose also origin (e.g. national, regional) or type (e.g. renewable) of the primary energy, should this information be provided by the power utility.

c) Interactive GPS-based "Range Estimator"

In a battery-driven vehicle the accuracy of the possible range is absolutely important. This however also depends on several variable factors, e.g. topography (upward/downward slopes) or environmental temperature. These variances should be included in the range specification. Thanks to an interactive chart based on GPS, the system should be in a position to calculate and illustrate the following information:

- "radar graph" of the remaining range, inclusion of the elevation differences, integrated and recorded on Google Map.
- Current position and destination, integrated and recorded on Google Map.
- In addition the following information can be read: notification of the closest charging stations and possibly charging station type.

Development

The vehicle has been 100% digitally simulated and optimized at Protoscar, before it was physically built. The chosen basic platform meets several important requirements.

1. We are talking about a full-sized platform, which can be defined as sportive and “Premium” and in parallel has a relatively light weight.
2. Thanks to its tubular chassis, modifications can be relatively simply executed (e.g. conversion into 4x4)
3. The non-structural bodywork permits a relatively light conversion into a new styling.
4. Because it is a cabriolet type vehicle, during a ride with open top, the concept of the electric car and therefore of its drive can be more directly experienced.

Further information

Detailed specifications, performances, images and further information will be undisclosed in the final presentation.

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Giorgio Gabba has studied aeronautics at the Politecnico of Milan. After his engineering degree, he started working in the field of composites materials. Later he worked in the development of electric vehicles and their components. In 1999 he joined Protoscar in charge of project management.

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Marco Piffaretti has studied Car-Design at the “Scuola d’Arte Applicata & Design of Torino” and the “Art Center College Europe”. In 1984 he started developing solar race cars and in 1987 he set up his own design company Protoscar, a “non-conventional-vehicle”-design consultant company.
From 1994 to 2001 he also was director of the most important European EV-demonstration project:
the “VEL-1”, in Mendrisio (Switzerland).