

# **The TRANSEUROPEAN<sup>®</sup>: Demonstrating Electric and Hybrid Vehicles in Real Life**

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## **1 Abstract**

The TRANSEUROPEAN<sup>®</sup> is a demonstration event for electric, hybrid and fuel cell vehicles which aims to positively demonstrate the performance and reliability of electrically driven vehicles.

However, the widespread use of electric vehicles, particularly by particulars, has been hampered by the unscheduled use of the vehicles for occasional inter-city trips. The TRANSEUROPEAN<sup>®</sup> makes clear that the provision of public charging infrastructures can solve this problem. The presence of publicly accessible charging points, which can be easily provided under the form of suitably located power outlets, significantly enhances the operational flexibility of the electric vehicle. The event thus aims to promote the installation of efficient infrastructures for electric vehicles, through the elaboration of local demonstrations along the route in collaboration with city authorities and utilities. It is not a competition race, but an energy consumption ranking is made, in order to highlight the energetical and environmental benefits of electric driving. The same information is naturally even more useful for HEVs in pure electric driving mode.

**2 Keywords: demonstration, infrastructure, promotion, bicycle**

## **3 Introduction**

### **3.1 Background**

In urban traffic, due to their beneficial effect on environment, electric vehicles are an important factor for improvement of traffic and more particularly for a healthier living environment. The electric vehicle makes use of energy sources which make it particularly suitable for use in urban or suburban areas. Electric vehicles which are available on today's markets can perfectly cater the needs of a large part of corporate or administrative vehicle users, whose use of the vehicle is quite predictable and controlled through the execution of their duties in a given urban area. The daily duty cycle of such vehicles (mail delivery, goods delivery, municipal services, etc...) is usually not much more than 50 km, making electric vehicles ideally suitable for this task. A major part of electric road vehicles deployed in Europe during the last decade is actually used for such tasks.

Except in some areas where special incentives are offered, like Switzerland's Ticino canton, the number of electric vehicles used by private customers is very limited however; the private electric vehicle user is mostly a die-hard and knowledgeable enthusiast rather than an average citizen.

The use of vehicles by particulars is in fact much more arbitrary, consisting not only of daily commuting trips over a known route, but also of longer excursions undertaken for

leisure purposes. The use of the electric vehicle for trips further away than half of its range is hampered by the unsure availability of charging facilities at remote destinations.

The availability of a network of public charging points in different cities could make interurban use of the electric vehicle a much more attractive option, extending the useful range of the vehicle to at least its range, and making its practical operation area four times as large, covering an section corresponding to the typical extent of a region or small country, in which the typical user concentrates his or her displacements.

In order to demonstrate this feasibility of electric vehicles, CITELEC and AVERE have conceived a demonstration called TRANSEUROPEAN<sup>®</sup>, where electric vehicles are demonstrated in a number of cities on a trajet through different European countries.

### 3.2 Target groups

The TRANSEUROPEAN<sup>®</sup> aims to reach the following audience:

- The general public and the press, to sensitise them and to make them aware of the potential of electric and hybrid vehicles
- The local authorities in the cities visited, to make them aware of the opportunities of charging infrastructure
- The regional and national politicians
- The electricity production and distribution companies
- The vehicle manufacturers and dealers

### 3.3 History

The first TRANSEUROPEAN<sup>®</sup> was organised in 1998 at the occasion of the EVS-15 symposium in Brussels, going from there to Monaco.

The second edition in 2000 went from Monaco to the Expo 2000 in Hannover.

The third edition in 2001 linked Monaco to the EVS-18 symposium in Berlin. The results of this event will be documented on the dialogue presentation on EVS-18.



The departure of the second TRANSEUROPEAN<sup>®</sup> on the quayside at Monaco

#### **4 The first TRANSEUROPEAN® in 1998**

On Saturday, October 3, 1998, after the adjournment of the EVS-15 symposium, eighteen electric vehicles set off for the 1400 km long run of the first TRANSEUROPEAN®.

The demonstration ran through seven countries, involving all kinds of traffic: city streets, suburban avenues, country roads and mountain passes. The TRANSEUROPEAN® joined three major electric vehicle events: the EVS-15 symposium in Brussels, the ExpoVEL in Mendrisio, Switzerland, and the International Electric Vehicle Rendez-Vous in Monte Carlo with its exhibition, forum and electric vehicle rally.

A quite mixed participant field showed up for the event, featuring three electric bicycles, a scooter, two three-wheeled electro-muscular hybrids and a Twike. Among the four-wheelers there were several Peugeot 106 and Citroën Saxo, a Ligier Optimax, a Renault Express, a Mini Communication, a Honda EV Plus and finally a Mercedes Vito with Zebra battery.

After being flagged off at the Heysel Exhibition Centre by the Minister of Brussels Capital Region, J. Chabert, the participants had to find their way with the help of the road-book. Charging infrastructures were made available at suitable intervals, in most cases combined with a hospitality event in the cities visited.

The most challenging part of the TRANSEUROPEAN® was to cross the mountains of Switzerland over the Gotthard pass. A 1700-m elevation difference was overcome in two legs, with an intermediate stop suitably located in the hydro-electric power station at Göschenen. All participants, including the electric bicycles, made it to the summit, despite the cold temperatures and the first snow of the fall there. During the descent, the electric vehicles showed their energy regeneration capabilities.

The first TRANSEUROPEAN® turned out a positive demonstration of the performance and reliability of series-built electric vehicles.

#### **5 The second TRANSEUROPEAN® in 2000**

The second TRANSEUROPEAN® was organised in July 2000 and linked Monaco to the Expo 2000 in Hannover.

The participant field encompassed battery-electric vehicles, mainly of PSA manufacture (Peugeot 106 and Partner; Citroën Saxo and Berlingo), lightweight electric vehicles (Ligier, Twike, AKASOL and a hybrid CityEl), as well as two Toyota Prius hybrids and an Audi Duo hybrid.

Two-wheel vehicles were represented by electrically assisted bicycles from the European E-Tour project. E-Tour demonstrates several hundreds of electric bicycles and scooters on different European sites. The physical condition of the cyclists during the trip was monitored in collaboration with the Physical Education faculty of the Vrije Universiteit Brussel. One of the Prius vehicles acted as assistance vehicle to the bicycles.



The awarding of prizes to participants of the TRANSEUROPEAN® at the Expo 2000  
The classification has been based on minimal energy consumption.

The two service vehicles, which carried the electrical connection equipment and which managed the whole event, were battery-electrics, highlighting the electric character of the event. To enhance charging power, a number of “booster” chargers allowing a semi-fast 7 kW charge were also carried.

On its 1600 km long trip through five countries, and visiting twenty-seven cities, the second TRANSEUROPEAN® met everywhere a warm welcome by local authorities and utilities, and received vivid interest from the press.

## **6 Results**

### **6.1 Generalities**

The TRANSEUROPEAN® turned out a positive demonstration of the performance and reliability of series-built electric vehicles, including hybrids and two-wheelers.

Furthermore, the event made possible a frequent exchange of information between the highly knowledgeable participants. One of the most essential results of the TRANSEUROPEAN® has been the contact with the population in the cities visited, and more particularly with city administrators, which this way have been convinced of the positive values of the electrically propelled vehicle.

### **6.2 Energy consumption**

During the whole event, the energy consumption of the electric vehicles was closely monitored. The consumption values obtained clearly showed the value of the vehicle technologies demonstrated, both electric and hybrid, and proved their competitiveness facing conventional combustion technologies.

The best values for energy consumption are illustrated in Table I.

		Energy consumption	Primary energy consumption	Fuel equivalent
Passenger car	Electric	15 kWh/100 km	37 kWh/100 km	3,0 L/100 km
Small van	Electric	18 kWh/100 km	45 kWh/100 km	3,6 L/100 km
Family car	Hybrid	5,7 L/100 km	61 kWh/100 km	5;7 L/100 km

**Table I: Consumption results of TRANSEUROPEAN®**

### 6.3 Electric bicycles



A courageous electric cyclist making it through the fog on the summit of the Gotthard pass

Electric two-wheel vehicles also showed their value, opening the use of the bicycle, and its associated physical exercise, to a larger number of people. The development of a suitable bicycle path network is also an element to be considered here. The electric two-wheelers showed their potential for a wide range of users and applications.

The physiological follow-up of the bicyclists showed that the moderate physical effort linked with the electrically assisted bicycle has a measurable positive effect on physical condition of those people who do not usually engage in sporting activities. The electrically assisted bicycle lowers the threshold towards bicycle use and thus opens the way to healthy physical activity for a large part of the population.

### 6.4 Infrastructure issues

The TRANSEUROPEAN® is clearly an efficient way to show the feasibility and efficiency of electric and hybrid vehicles for use in urban and suburban missions, if adequate infrastructures are available.

It was made clear that the need for the further deployment of electric vehicle infrastructure is strongly existing, and that the TRANSEUROPEAN® initiative is a good way to promote this development. The presence of publicly accessible charging points, which can be easily provided under the form of suitably located power outlets, significantly enhances the operational flexibility of the electric vehicle.

Examples of infrastructure were encountered en-route, such as the “Park&Charge” posts established in Switzerland, whose network has enabled inter-regional use of electric vehicles in that country.



A “Park & Charge” station at Mendrisio, Switzerland

Furthermore, longer-range operations can be made even easier by the provision of semi-rapid charging. The “Booster” technology (which is in fact using two – or three – standard chargers in parallel) is an easy and efficient way to enhance charging power (thus reducing charging times), without imposing too much of a burden on the fixed infrastructure. The necessary connection for the semi-rapid charging is in fact either a 32 A single-phase, or 3 x 16 a three-phase outlet, which can be easily installed without incurring a heavy fixed infrastructure cost like a fast-charge station.

The introduction of such charging infrastructure raises of course the necessary standardisation issues.

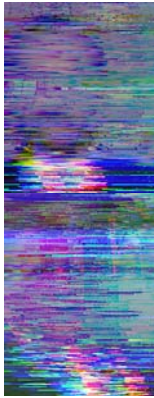
## 7 Conclusions

The effect of the TRANSEUROPEAN® as a demonstration event has been two-fold:

- Proving the reliability of series-production electric vehicles in various traffic and operational conditions, and thus highlighting the maturity of the technologies involved, which have clearly passed the prototype stage and can be considered real commercial products
- Highlighting the utility of the development of a network of charging infrastructures, particularly involving semi-fast charging, in order to allow interurban operation of electric vehicles and extending their potential share of the market.

The whole event, with its public impact and its association with major events such as the EVS-symposium or the world Expo, has been the ideal setting to illustrate these points.

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