

Solar Mobility



Solar Mobility

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- 1 Development of „Solar Mobility“**
- 2 Energy for „Solar Mobility“**
- 3 Vehicles and components**
- 4 The future**

Solar racing vehicles



Mercedes Benz, Tour de Sol 1985



Trykowski Team, Tour de Sol 1987, Switzerland



Aurora, World Solar Challenge Australia, 1999



NUNA II, Holland, Winner World Solar Challenge Australia 2001, 2003

Solar vehicles „production“-prototypes



Horlacher SAXO, made in Germany



Horlacher prototypes, Switzerland



Hotzenblitz, Germany



Corbin Sparrow, USA



SAM, Switzerland

- **Solar electric vehicles**
- **main vehicle components:**
body, drive system, control system, batteries
- **Solar mobility**
- **on land (cars, scooters, bikes)**
- **on water (solar boats)**
- **in the air (solar planes, first planes available)**

Clean sources: solar, wind, hydro-power etc.:

- real „zero emission vehicle“ due to „clean“ energy sources

Energy requirement

- low energy consumption - typically from 5 to 20 kWh per 100 km

•Solar energy supply

- solar generator (photovoltaic) on top of the vehicle
- or external solar supply through the „solar grid system“
- Park & Charge system of public charging stations for electric vehicles

Solar vehicles with built-in solar modules



First German Solar Vehicle for everyday use
Solarmobil Verein Erlangen e.V.
600 Watt solar generator

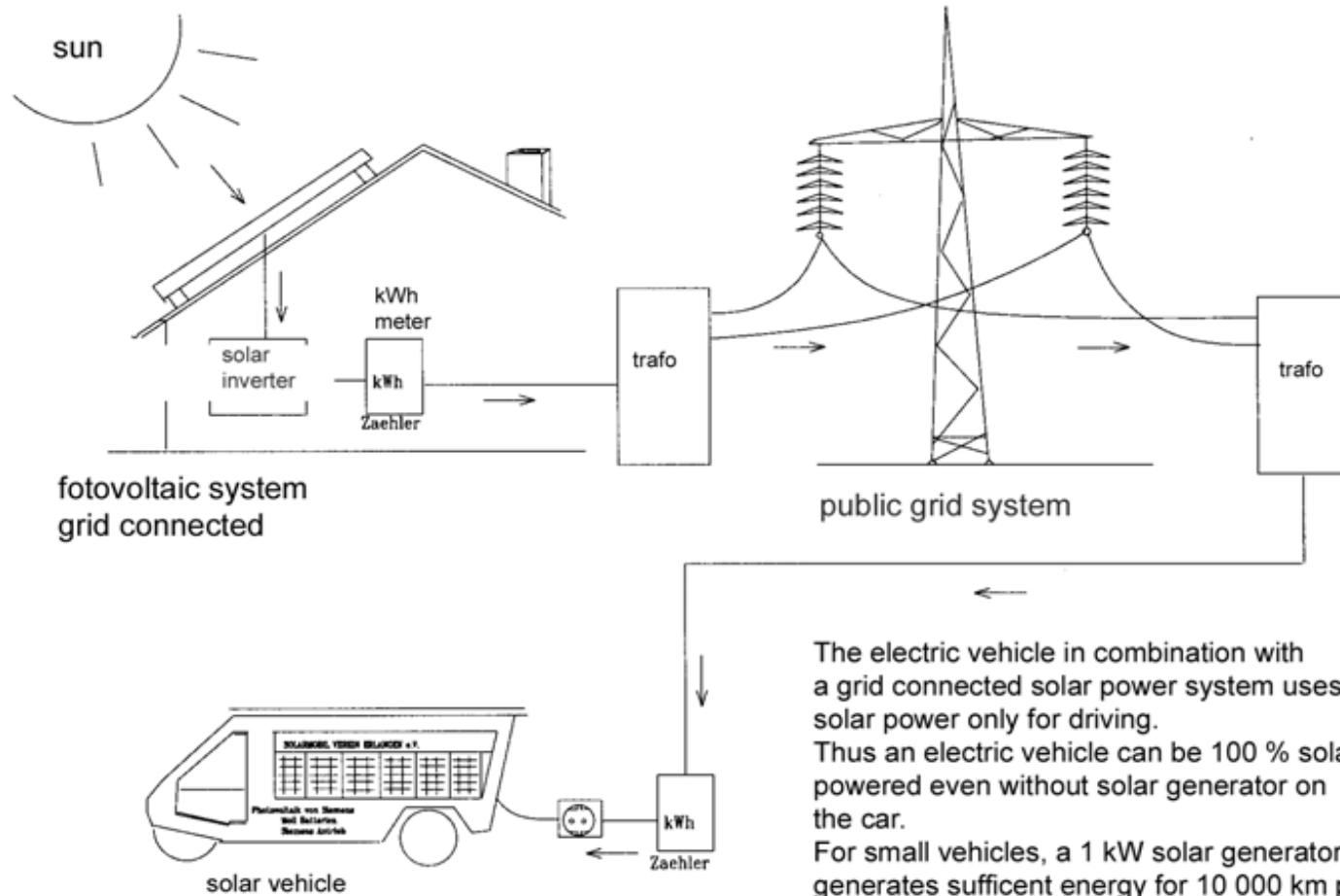


Trabi, Dresden, with 200 Watt photovoltaik modules

3,3 kW solar generator in Erlangen, Germany



The electric vehicle plus the solar grid system = solar vehicle



The electric vehicle in combination with a grid connected solar power system uses solar power only for driving. Thus an electric vehicle can be 100 % solar powered even without solar generator on the car. For small vehicles, a 1 kW solar generator generates sufficient energy for 10 000 km p.a.

Park & Charge station for electric vehicles



Internet:
www.park-charge.de

Park & Charge station



Park & Charge®
 **Solar-Stromtankstelle**

Sponsoren:
Horst Garthoff
 **Haberkorn**
☎ **0521 - 68136**

Ansprechpartner:
Solargruppe Bielefeld
Henning Braun
☎ **0521 - 205783**
Bundesverband
Solarmobil e.V.
☎ **040 - 7929329**

A large red arrow points downwards from the center of the sign to a small, light grey charging station mounted on a wall. The station has a label that matches the sign above it.

Park & Charge station in Bielefeld, Germany



Citroën SAXO électrique



Electric vehicles, France



Left: Kangoo electric RE, hybrid car with range extender and SAFT lithium batteries, special project for „La Poste“, France, made by SVE - Société de Véhicules Electriques

- Citroen Berlingo électrique (right)
- Peugeot Partner electric
- Renault Kangoo electric
- Renault Kangoo electric RE (RE = hybrid with range extender)



Société de Véhicules Electriques - SVE



Prototype or concept car made by
SVE (Dassault / Huliez), France, e-mail: info-sve@huliez.com
SVE has focused on batteries based on lithium-ion technologies (SAFT)

ZYTEC smart EV (UK)



Pure electric vehicle, pre-production model shown at EVS21 in Monaco

Zytec Electric Vehicles Ltd., www.zytek.co.uk

Other model: SMART hyper HEV, parallel hybrid prototype version of the smart two seater

City-El - single seater, Germany



Basic model

Internet:
www.cityel.de

Model Fun



TWIKE, two-seater hybrid, Germany



www.twike.de

TWIKE active: electric + pedal driven and TWIKE easy: electric driven only

The REVA (Bangalore, India, www.revaindia.com)



Production model, lead acid batteries

Concept car REVA-NGX with Zebra batteries



Maranello (Italy) drive systems: petrol, diesel or electric, www.effedi.it



KEWET (before: Denmark, now: Norway, www.elbilnorge.no)



MEGA - mini lorry – Aixam, France – www.mega.de



MEGA - Nutzfahrzeuge



> Châssis cabine

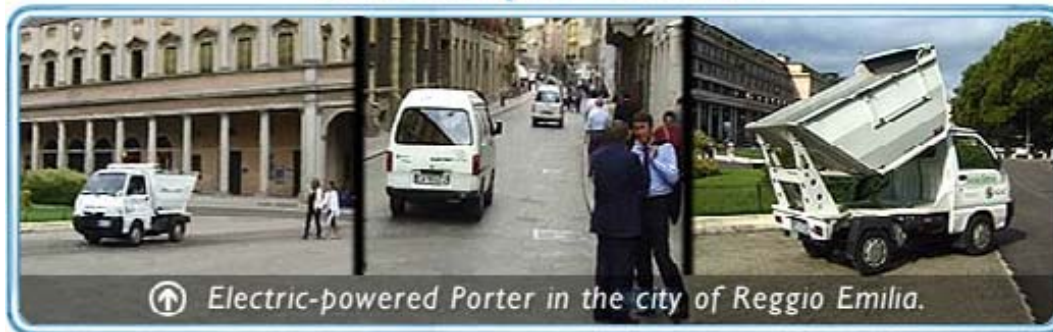


> Plateau ridelles

Electric Porter, Piaggio, Italy, www.piaggio.com



⬇ Electric-powered Porter



Bi-Scot (France), www.soffimat.com



GEM neighbourhood electric vehicle
(GEM, a DaimlerChrysler company, USA), www.gemcar.com



EVT Scooter 4000 and 168, Taiwan



Honda prototype electric scooters (JAPAN)



Honda Fuel Cell Scooter

Honda Hybrid scooter and electric moped



eton and e-max, scooters, China



Vectrix scooter (USA - Europe) – www.vectrixusa.com



Pre-production models, shown April 2005 in Monaco, Electric Vehicle Symposium

env bike with CORE fuel cell system



6 kW motor, 1 kW air cooled fuel cell system, hydrogen energy 2,4 kWh plus 48V 15Ah lead acid battery

Top speed 80 km/h, range 160 km

Intelligent Energy Holdings plc, UK, - www.intelligent-energy.com

Helio (egobike), USA and China



www.egovehicles.com

www.egovehicles.de

swizzbee powerbike, Switzerland



www.swizzbee.com

MZ - Charly - Germany



<http://www.muz.de/2002/motobike/charly/charly.html>



www.laposte.fr



Examples of electric vehicles for public transport



Electric bus, China - powered by Li-batteries (Thunder Sky), www.thunder-sky.com



Velotaxi - a new concept
www.velotaxi.com



Zebra battery technology (Switzerland)



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Tel +41-(0)91-641-5311
Fax +41-(0)91-641-5333

Internet:
www.mes-dea.ch

MES DEA offers in the Medrisio area of Switzerland the electric vehicle:
TWINGO Quickshift Elettrica with ZEBRA batteries for Swiss residents only.

Lithium battery technologies

FORTU Germany
www.fortu.de

EVC Electric Vehicle Cell
zur Speicherung großer Energiemengen

Wichtige Eigenschaften

➤ Spannung	4 V
➤ Kapazität	65 Ah (später 80 Ah)
➤ Geometrie HxBxT	155 x 116 x 34 mm ³
➤ Gewicht	1300 g
➤ Spez. Energie	200 Wh/kg (C/5)
➤ Energiedichte	426 Wh/l (C/5)
➤ Dauerentladestrom	65 A (1C)
➤ Innenwiderstand	< 5 mOhm



Thunder-sky li-batteries, China, www.thunder-sky.com

Lilon Battery Progress www.acpropulsion.com

- Li Ion cells now in mass production
 - 18650 cells used for laptops
 - Many producers, millions per month
 - High durability, reliability, uniformity
 - 170 Wh/kg now and increasing
 - \$500/kwh now and decreasing



Valence Saphion, USA, www.valence.com

Concept cars with lithium batteries, USA



T-Zero – www.acpropulsion.com



Volvo



Venturi Fetish – www.venturi.fr

Manufactured in the Principality of Monaco, Fétish is sold in Monaco, Europe, Japan and California. We are currently touring those areas throughout shows and major events:

Sept. 2004 - Paris Motor Show <http://www.mondial-automobile.com>
Jan. 2005 – L.A Auto show <http://www.laautoshow.com>

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Price: 450.000,00€ without VAT

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Solar boats



www.solarwaterworld.de



www.kopf-solardesign.com



www.mwline.ch

Solar-pavillon in Berlin-Köpenick, Germany



Internet: www.solarwaterworld.de

Mini- solar rail (Internet: www.solarbahn.de)



„My“ solar cars

