HOPE

High Density Power Electronics for FC- and ICE-Hybrid Electric Vehicle Powertrains

1. Project summary

According to the "Joint Call on component development and system integration of hydrogen and fuel cells for transportation and other applications" the main aim is to develop generic technology and modular systems – built up from components that can be manufactured in essentially similar configurations, but with different qualities, to meet the specific performance, lifetime and cost requirements of the different applications (e.g. FC stacks, Membrane Electrode Assemblies, batteries, **power electronics**)".

The project **HOPE is addressing power electronics**. It is based on previous EU research projects like the recently finished FP5 HIMRATE (high-temperature power modules), FP5 PROCURE (high-temperature passive components), and MEDEA+ HOTCAR (high-temperature control electronics) and other EU and national research projects.

The general objectives of HOPE are: Cost reduction; meet reliability requirements; reduction of volume and weight. This is a necessity to bring the FC- and ICE-hybrid vehicles to success.

2. Work Packages

WP1 defines specifications common to OEM's for FC- and ICE-hybrid vehicle drive systems; Identification of common key parameters (power, voltage, size) that allows consequent standardisation; developing a scalability matrix for power electronic building blocks PEBBs.
The power ranges will be much higher than those of e.g. HIMRATE and will go beyond 100 kW electric power.

WP2 works out one reference mission profile which will be taken as the basis for the very extensive reliability tests planned.

WP3 is investigating key technologies for PEBBs in every respect: materials, components (active Si- and SiC switches, passive devices, sensors), new solders and alternative joinings, cooling, and EMI shielding.

In **WP4** two PEBBs will be developed: IML (power mechatronics module), which is based on a leadframe technology; and SiC-PEBB inverter (silicon carbide semiconductor JFET devices instead of Si devices).

WP5 develops a control unit for high-temperature control electronics for the SiC-PEBBs. Finally

WP6 works on integrating the new technologies invented in HOPE into powertrain systems and carries out a benchmark tests. All the results achieved in HOPE will be discussed intensively with the proposed Integrated Project HYSYS where the integration work will take place.

It is clear from the start that many innovations are necessary to meet the overall goals of HOPE. An own IP management group will be formed as well as a reliability testing group and a standardisation group which will make contact to CENELEC as well as to IEC.
The consortium is well experienced in all the research topics and is a good mixture of OEM's, first tier suppliers and research institutes.

3. Participant list

Participant no.	Participant name	Participant short name	Country
1	Siemens CT	SCT	D
2	DaimlerChrysler	DC	D
3	ETH Zurich	ETHZ	CH
4	Fraunhofer IISB	FHG-IISB	D
5	INRETS	INRETS	F
6	Maga Steyr	MSF	A
7	Renault	REGIENOV	F
8	Robert Bosch	BOSCH	D
9	Siemens VDO	SVDO	D
10	VALEO	VESL	F
11	Volkswagen	VW	D
12	University of Technology Belfort-Montbéliard	UTBM	F
13	Warsaw University of Technology	WUT	Pl