



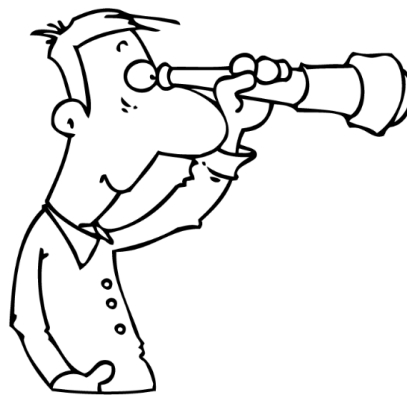
A Competence Centers View on the ECPE Network

Johann W. Kolar

Swiss Federal Institute of Technology (ETH) Zurich
Power Electronic Systems Laboratory
www.pes.ee.ethz.ch

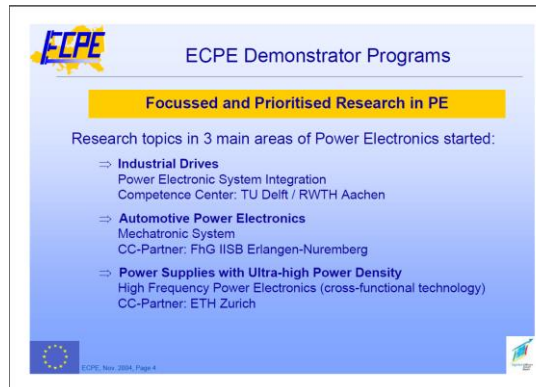
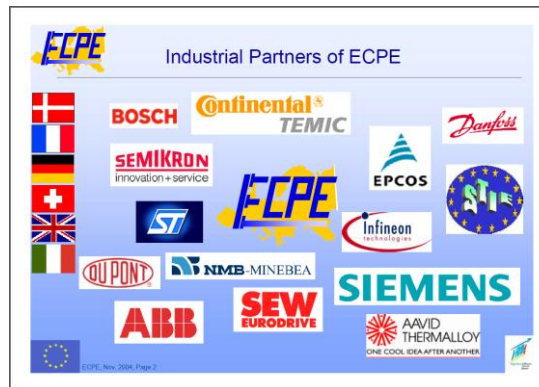
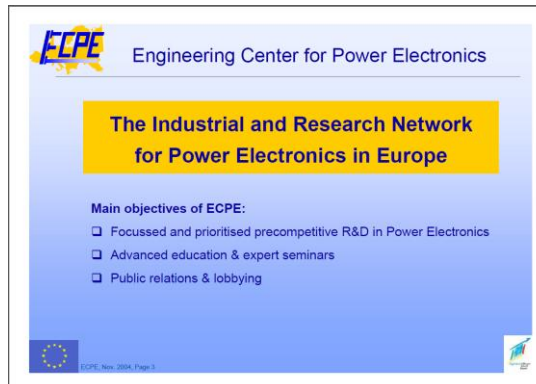
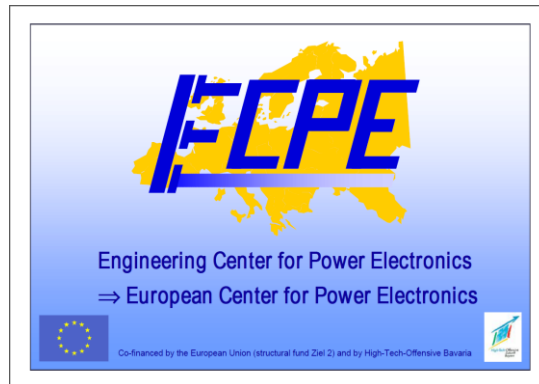


A Competence Centers View ...



- ▶ How It all Began
- ▶ What We Have
- ▶ New Targets

A Great Idea was Implemented...

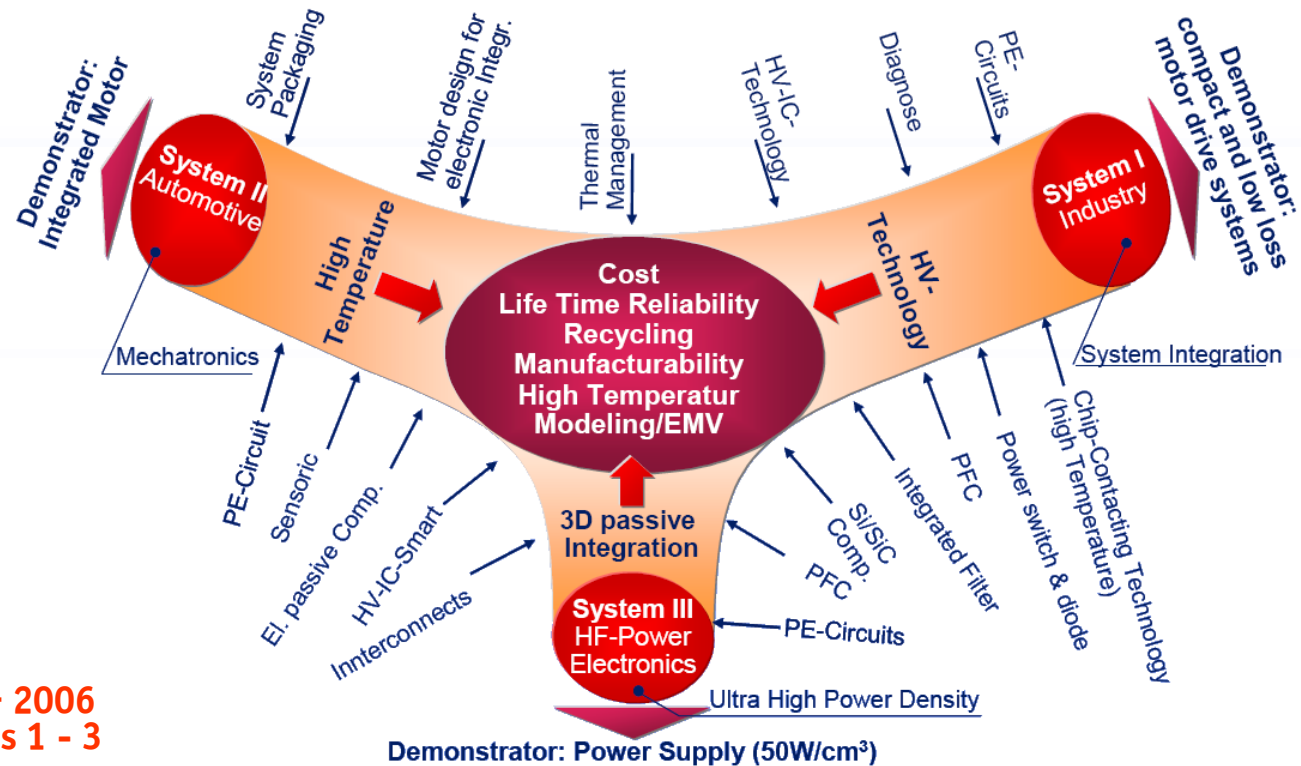


■ 2004

- ▶ Formation of an Industry Consortium
- ▶ Univ. Institutes as "Competence Centers"

A Great Idea was Implemented...

- ▶ Set-Up of a Demonstrator Program
- ▶ Technology Reports
- ▶ Expert Seminars



E.g. 2004 – 2006
ETH Projects 1 – 3

A Great Idea Started to Work ...

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Offer

concerning a Demonstrator Program on the

Development of Ultra Compact Three-Phase Power Supplies

for



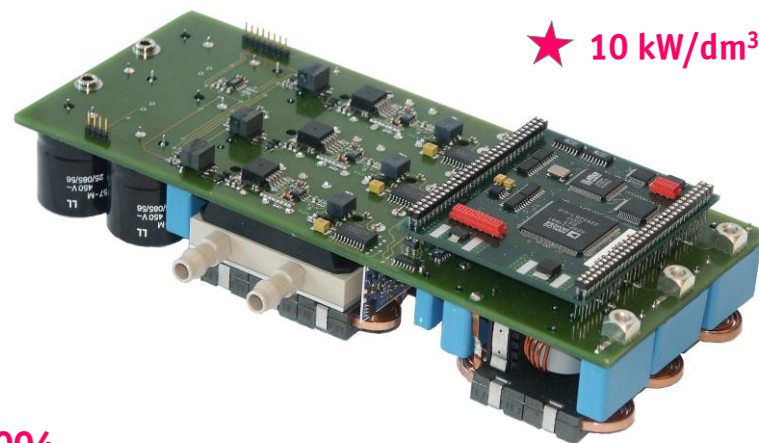
Project Coordination

ETH Zurich
Power Electronic Systems Laboratory
ETH Zentrum, ETL H22
Physikstrasse 3
CH-8044 Zurich
Tel.: +41-1-632-2834
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PE

Power Electronic Systems
Laboratory

Prof. Dr. Johann W. KOLAR
Zurich, Sept. 20 / 2004



★ 10 kW/dm³

■ 2004

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

10TH ANN
VER
SARY

What We Have Today ...

► Unique Opportunities for the CCs

- **Financial Support of Research Projects**
- **Organization of EU Funded Joint Research Projects**
- **Opportunity to Present Research Capabilities to 70 Potential Ind. Partners**
- **Reaching an Even Larger Audience through the ECPE Supported Conferences & Seminars**

ECPE Network: 69 Industrial Members

The image displays a collection of logos for various industrial companies, arranged in a grid-like fashion. The logos include:

- BOSCH**
- SIEMENS**
- Continental**
- SEMIKRON** (Innovation + Service)
- Infineon**
- Valeo**
- Heraeus**
- ST**
- 3%** (three percent)
- SMA**
- Mouser Electronics**
- VAC** (VACUUMSCHNELZE)
- EADS**
- BAWAG**
- LSET**
- SEW** (SEW EURODRIVE)
- Volkswagen**
- ABB**
- LEM**
- EPCOS**
- SCHAEFFLER** (Energy efficiency and reliability)
- DENSO**
- ROGERS** (CORPORATE ELECTRONICS)
- Vincotech**
- Minebea** (European Operations)
- VACON** (DRIVES BY DESIGN)
- InPower**
- WARTSILA**
- SOL**
- ALSTOM**
- FAIRCHILD** (SEMICONDUCTOR)
- LIEBHERR**
- SEME LAB**
- freescale**
- PHILIPS**
- FRIWO**
- J-LASSL** (P)
- SENSOTEC**
- VISHAY**
- MAICON** (RECTOR LINE CONTROL)
- DYNEX**
- TRIDION**
- Anvil** (Semiconductum)
- AUXEL**
- IFRONIS**
- Schneider Electric**
- AVL**
- SILVER ATENA**
- EMERSON**
- CONTROL TECHNOLOGIES**
- HUTTINGER Elektronik** (optoelectronic components)
- ENERGIERegion Nürnberg e.V.**
- ECPE** (European Council of Power Electronics)

A central map of Europe is also visible, with the ECPE logo overlaid on it.

[illegible]

► But, Showing Poor Results → Could Easily Ruin Your Reputation



Further Advantages ...

- **ECPE Joint Booth @ PCIM Exhibition**
- **ECPE Seminar Program → Presenter or Listener**
- **ESREF / CIPS Conference → Timely Publication of Research Results**



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POWER ENGINEERING
SOCIETY WITHIN VDE

Final Program
CIPS 2010
6th International Conference
on Integrated Power
Electronics Systems

March, 16-18, 2010
Nuremberg / Germany

<http://www.cips-conference.de>

Wednesday 13 May 2009 – Conference Program

12:35 – 14:00 LUNCH BREAK

Room Paris
ECPE Round Table »Vehicle to Grid«
14:00 – 16:00

Chairman:
Prof. Leo Lorenz, Infineon Technologies China, RC
Thomas Harder, ECPE e.V., D

Participants:
H.-P. Faustel, Continental Automotive, D
Prof. Dr. J. Schmid, ISET e.V./Universität Kassel, D
Prof. Dr. G. Spiegelberg,
Siemens AG Corporate Technology, D

Plug-in hybrid electric vehicles (PHEVs) which
combines today's hybrid automotive technology with
larger battery systems that can be recharged from
the electrical grid are announced to enter the market
in 2010. At the same time, full electric city cars using
lithium-ion energy storage technology enabling a
driving range of 100 – 250 km will be available.
Fleet tests are running in several European cities e.g.
in London and Berlin. Recently, four German Federal
Ministries have launched a »National Development
Plan on Electric Mobility« announcing a plan to put
a million plug-in cars on the roads by 2020.

This move to a more electric mobility will challenge
the electrical grids. An infrastructure is needed to
change the electric vehicles from the grid which has
to supply the energy for this additional load. On the
other side, it is discussed to make the distributed
energy storage capacity of these EVs available for
the grid while increasing the share of fluctuating
renewable energy sources.

Power electronics together with information and
communication technologies is the key to meet these
challenges providing the bidirectional flow of energy
and information between the electric car and the grid.

15:30 COFFEE BAR OPEN

Please see www.pcim.de for the speakers' biographies

CONFERENCE PROGRAMME

**20th EUROPEAN SYMPOSIUM
RELIABILITY OF ELECTRON DEVICES,
FAILURE PHYSICS AND ANALYSIS**

*Bordeaux - France
5 - 9 October 2009*

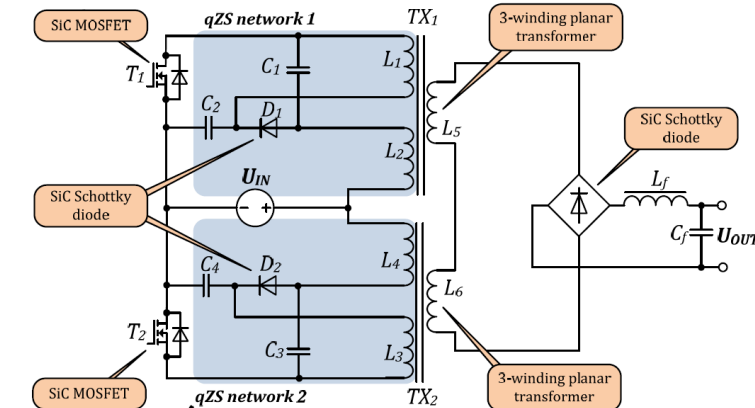
with the technical co-sponsorship of:
IEEE - Electron Devices Society
IEEE - Reliability Society

in conjunction with: **anadef** - France and **ECPE** - Germany

organised by: **Laboratoire IMS** - CNRS
Université Bordeaux 1 – ENSEIRB

How Well It Works → Example I

qZS-derived Push-Pull DC/DC Converter* with Wide Input Voltage Range



Specifications

- Input voltage 60...260 VDC
- Output voltage 400 VDC
- Power 1.3 kW
- Switching frequency 100 kHz
- "Full-SiC" design

- Tallin University
(Prof. Vinnikov)
Joins ECPE as Comp.
Center in 2012

- New Topology /
Demonstrator Syst.,
Now in Step 2 (3)

• Was developed within the project 2012/PC05 "Quasi-Impedance-Source based Galvanically Isolated Step-Up DC/DC Converters"



TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

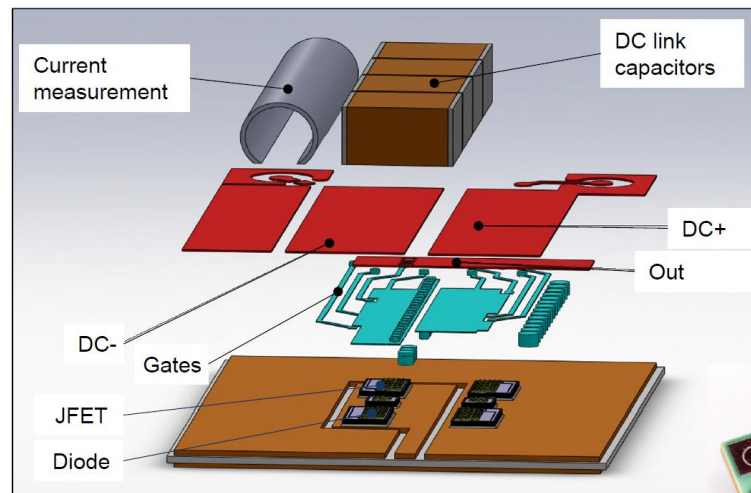
POWER GROUP
ELECTRONICS



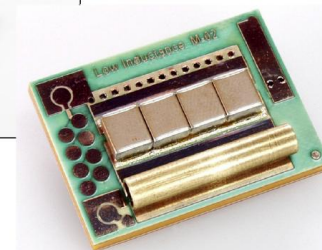
How Well It Works → Example II

PEMC – Power Electronics and EMC

Ultra-Low Inductance Package for SiC: Embedded Module



- Full bus bar structure using PCB process on a DBC
- DC capacitors on the module
- DC link current measurement included



- Joint Research
Projects Combining
Strength of Several
Competence Centers

Dr.-Ing. Eckart Hoene

What More ?



Extension of ECPE Scope _____ ECPE 2020

- Keep / Establish a **Close(r) Link of Roadmapping and the Demonstrator Program**

BUT

- Not Any More Too Many “Low Hanging” Fruits

- Low-Power Power Electronics (**below 1kW**) **Heavily Integrated**
- PCB Based Demonstrators Do Not Provide Too Much Information (!)
- Comp. Centers Need to Team Closely with Ind. Partners for **Technology Access**
- Keep Link to International Partners (**CPES/US, and AIST/Jap., and BRIC Countries**)

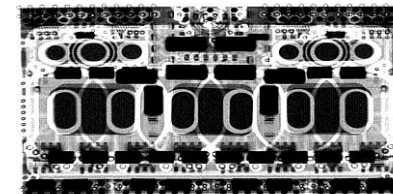


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Extension of ECPE Scope _____ ECPE 2020

■ More Wishes Concerning Roadmapping

- Should be Substantiated by Basic Physical Considerations
- Should also Consider “Far-Out” Technologies
- Establish a Link to the IEEE FEPPCON (Future of Electr. Power Proc. & Conv.)

Extension of ECPE Scope _____ ECPE 2020

- **Establish Database** for Data Not Easily Accessible to Universities / Comp. Centers

E.g.

- Cost Models, Reliability Data, etc.

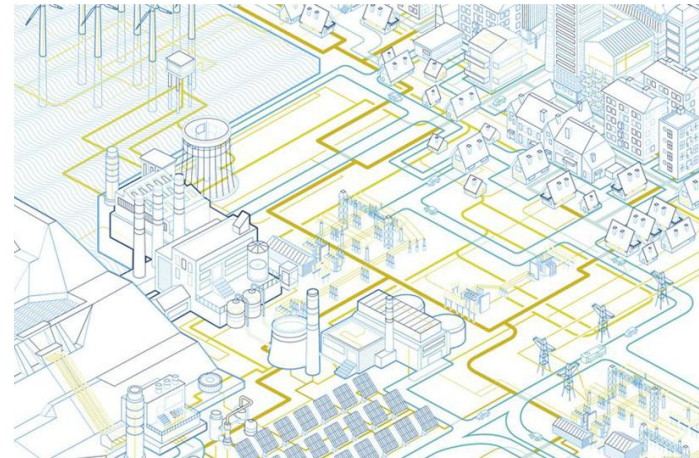
→ Optimization / Focus Moves from Power Density & Efficiency to **Costs & Reliability** - Very Limited Data is Available Here for Universities
Models are Lacking → No Results → Chicken & Egg Problem

Extension of ECPE Scope _____ ECPE 2020

■ Link to **Neighboring Disciplines**

E.g.

- Power Systems
- Packaging



- The **“SMART Grid”** Should Not be Left to the ICT Community
- Power Electronics is as Much an Enabler as ICT (!)
- Join / Establish a **Demonstration Case with a Team of Competence Centers**
- **Packaging** → Material Science, Mech. Eng. etc.
- Set Up a Program for **Joint Training**

Extension of ECPE Scope _____ ECPE 2020

- Include Activity in “Micro-Power Electronics”

E.g.

- Power Supplies on Chip

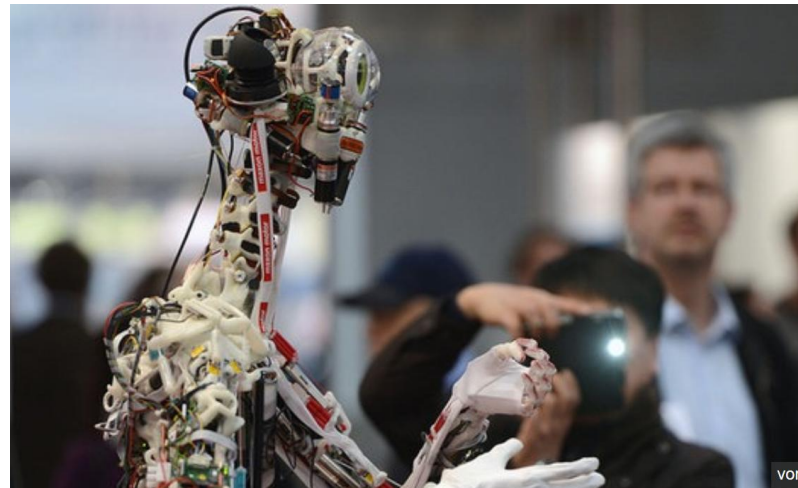
- Requires Access to Technologies of Industry Partners
- Very Specific Topic Frequently Tied to Special Applications

Extension of ECPE Scope _____ ECPE 2020

- Showcases which **Don't Show "Only" a Power Converter**

E.g.

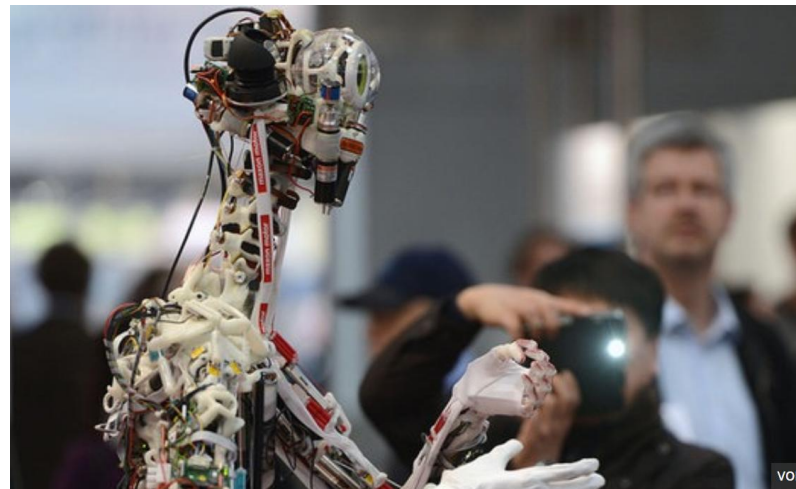
- Robotics, Bio-Inspired xxx, Hybrid Cars, Smart Homes, etc.
- Lighthouse Projects Designed for (Pure) Advertisement



Extension of ECPE Scope _____ ECPE 2020

■ Showcases which Don't Show "Only" a Power Converter

→ Power Electronics can Only
be Advertised to the Non-
Specialist (Politician) Through
an Appealing Application



Some Further Ideas ...

- ▶ **ECPE Power Electronics Textbook**
- ▶ **ECPE Distinguished Lecturer Program**
- ▶ **ECPE Webinars**

- ▶ **ECPE Fellowship**
- ▶ **ECPE Competence Center Award**

- ▶ **ECPE App** (e.g. for PCIM Exhibition, Seminars, etc.)

But, ...

But, ...

... it's Already Great as It is !

THANK YOU

... in the Name of All
Competence Centers

- ▶ For Setting It All Up
- ▶ For the Continuous Financial Support
- ▶ For the Support with Organizing Seminars
- ▶ For the Patience Concerning Late Delivery of Project Reports
- ▶ etc.

10 years
and growing stronger