

# Energy Efficiency and the More-Electric-World

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For many years, power electronics has been a well developing industrial segment with solid annual growth rates and a very dynamic technology progress e.g. in power semiconductor technology or system integration.



As a cross functional discipline, power electronics is a key and enabling technology for many industrial segments such as automotive, home and office, communication, automation, energy supply and distribution, etc. But in spite of this important role, power electronics is not well recognised outside the power community, there is almost no awareness in public. This was one motivation for European power electronics industry to found the ECPE Network with one focus on public relations and lobbying for power electronics in Europe, apart from the other activities in precompetitive research as well as education and advanced training.

Two negative consequences of this shadowy existence are that research funding programmes do not target at power electronics innovations, and that power electronics is not attracting young engineers.

It seems that this situation has changed overnight, thanks to the ubiquitous discussion on CO<sub>2</sub> emission, future energy supply and energy efficiency. Power electronics topics moved into the focus of public, politicians

and policy makers, power electronics experts are invited to discuss about energy supply and improved efficiency.

People have realised that power electronics can contribute to energy saving and improved efficiency in several aspects:

- Increasing efficiency of power electronic components, modules and systems by optimised component technology or circuit topology e.g. for photovoltaic inverters or power supplies.
- Improving energy efficiency on system level applying power electronics e.g. by introducing variable speed drives or enabling energy recovery or recuperation of electric drives e.g. in trains, cars or lifts.
- Energy savings with intelligent power electronics. The key for customer acceptance and market penetration is costs requiring a (mechatronic) integration of power electronics in the application system, together with sensors and information and communication technologies.

A major impact lies in the integration of power electronics, ICT and sensors to save electrical energy with more intelligent systems in various power electronics applications. Some examples for smart (remote) controlled power electronic systems are smart battery management systems or smart home including lighting, heating and cooling. Further examples are load management, the use of decentralised energy storage systems for power quality function and grid stabilisation or smart remote control of decentralised PV converters for active power factor correction.

Discrete solutions are possible today, but significant cost reduction and performance improvement is necessary for a market penetration. This can be achieved by smart integrated power electronic modules. On the other hand, these advanced integrated modules applying high temperature power electronics and ultra-high power density mechatronics will facilitate to keep power electronics production in Europe.

The finiteness of fossil energy sources and the need for energy saving and improved

energy efficiency are pushing forward an electrification of our society. Today, we are discussing about electric vehicles but also about more-electric aircrafts and more-electric ships. In the next decades, we will see a transition from the burning of fossil fuels towards green electricity, step by step. For example Japan is aiming for a full electrified society in 2050 to be independent from fossil materials. Power electronics will be a dominant technology.

ECPE is driving this public discussion since the European Workshop on 'Energy Efficiency – the Role of Power Electronics' in February 2007 in Brussels. We summarised main results in a Position Paper which found its way through the Brussels offices of the European Commission. ECPE was invited to discuss on 'Intelligent power electronics for energy efficiency' within the Information & Communication Technologies (ICT) Programme of the European Commission. We are very confident that Power Electronics will be part of the ICT funding programme in the near future.

In parallel, ECPE is running a programme on Power Electronics Research & Technology Roadmap development where energy saving and improved energy efficiency is a key driver as well. Research and technology roadmaps are an important strategic tool to identify and guide a mainstream for medium to long term research.

In general, the energy saving discussion gives us strong arguments to attract young people. But power electronics engineers can make significant contributions to protect environment and to save our world. Renewable energy generation with wind turbines, photovoltaic and wave or water power are not viable without power electronics.

We will continue our public relations activities e.g. with the ECPE Students Day at PCIM Europe Exhibition. Future is bright for power electronics but we have to spread our message.

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