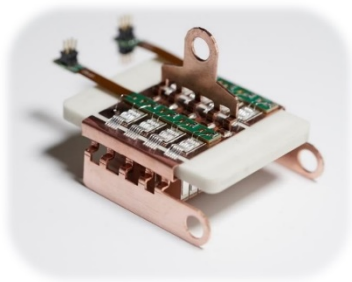


## Summary Network Meeting 7<sup>th</sup> - 8<sup>th</sup> October 2021, Holiday Inn City Centre, Munich

On the 7<sup>th</sup> and 8<sup>th</sup> of October 2021, the ECPE network meeting took place as a hybrid event in Munich, after more than two years since the last meeting in 2019. Approximately 80 participants were present on-site, joined by more than 60 participants remotely. Interesting presentations on the future of power electronics in grid-related applications and the role of artificial intelligence on the first day, and hydrogen/fuel cell driven mobility and transport and its role in grid related applications on the second day, led to animated discussions amongst the participants.

The integration of renewable energies into the power grid and alternative drives beyond the standard gasoline combustion engine are main topics in the future of power electronics. Not only extraction, storage and usage of this energy is of importance, but also the processing. The transformation from one energy form into another needs to be as effective as possible. Ways to calculate differential power and synthesis of suitable effective, low-weight and low-volume power modules were presented and discussed. In the future, artificial intelligence will become more and more important when designing power electronic systems. The role of the designer will change from calculator to domain expert focusing on the definition and design of proper reward functions for the reinforcement learning.



*1200V SiC power module on ceramic heatsink (Fraunhofer IISB, CeramTec)*

Apart from the future in the design process, also the role of power electronics in future mobility and grid-related applications was discussed. Looking into solutions for power converters for automotive, aircraft and railway applications based on wide bandgap power semiconductors showed the need for research in the whole value chain from power packaging to system integration, in order to get low-cost and lightweight converters for transport applications. More electric vehicles mean a higher strain on the power grid and a higher demand of electrical energy. A key question remains however, as to how the existing power grid structure would have to be redeveloped to be able to manage the increasing amount of energy fed in by volatile sources (like wind and solar) on the one hand, whilst also providing this energy to cover the increasing need of electrical energy on the other hand. The future here could be DC-grids, where power electronics plays a major role when it comes to transforming energy with solid state transformers and DC/DC converters. Importantly, there is not only the issue of the stable supply of electrical energy, but also the savings in raw materials like copper become a significant factor.



*1H<sub>2</sub> for large scale energy storage (A. Tremel, Siemens Energy)*

On the second day, the focus of the topics presented and discussed shifted to 'Potential and Limitations of Hydrogen and Fuel Cells'. Hydrogen was discussed as a supporting technology for renewable energy sources, as a means to fill the gap between the amount of energy required and the amount which can be produced in some areas of the world.

Also, the possibilities and trends in road vehicles, especially trucks, and ships were tackled. Whilst in long-haul trucks, it is important to "refuel" quickly and plan overnight stays without requiring a special infrastructure, this is more difficult in battery powered trucks, where the

recharging method takes significant time and infrastructure. In addition, the safety of fuel cells in accidents has been tested intensively and seems not to be a major issue of concern when compared to risks associated with combustion engine vehicles.

In trucks and buses, the role of the fuel cell concentrates on the locomotion. Ships on the other hand cannot make tank stops every day. Here it is even more important to use the energy as efficiently as possible. High-temperature fuel cells will provide efficiency through the co-generation of electric power and heat.