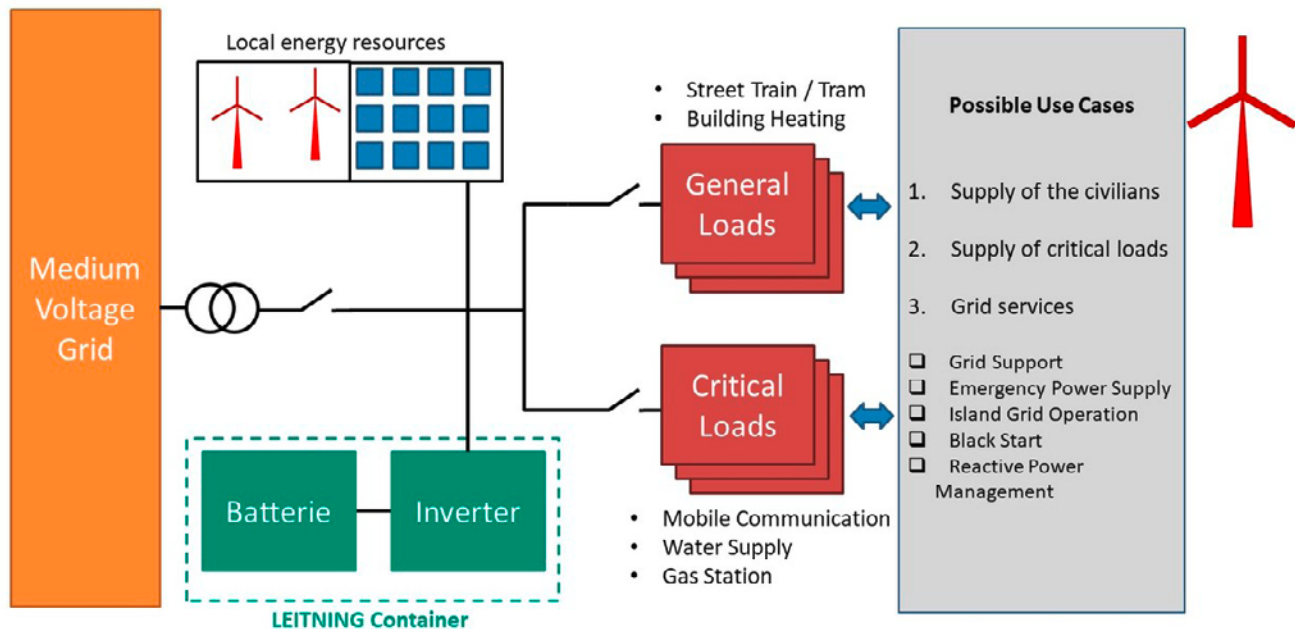


INSTITUTE OF TECHNOLOGY, RESOURCE AND ENERGY-EFFICIENT ENGINEERING (TREE)



The professorship for electro-mobility and electrical infrastructure at Bonn-Rhein-Sieg University of Applied Sciences (H-BRS) performs research in the entire field of power electronics for grid integration of renewable energies and electric vehicles. Additionally, it is a part of the Institute for Technology, Resource and Energy Efficient Engineering (TREE). At the TREE institute, around 20 professors from various fields perform research for example on the sustainable transformation of the energy system together with their academic staff and doctoral students.

A focus lies on the development of new types of power converter solutions with the latest component technologies, on future-oriented applications in the field

of renewable energies, energy storage and on alternative drive systems.

Essential parts of the work:

- Topology investigations using modeling and simulation software
- Characterization of gallium nitride (GaN) and silicon carbide (SiC) power semiconductors by using a self-developed switching cell test bench
- Design and optimization of magnetic components in power electronic converters with help of finite element methods and loss investigations using a self-developed calorimeter

Further topics include control strategies for system services provided by electric vehicles, photovoltaic systems and wind

power plants. In addition to methods for traditional grid-parallel operation, innovative grid-forming control strategies are also being researched, e.g. for battery inverters in the interconnected grid and in island grids (see Figure 1 e.g. project LEITNING).

With the help of Power-Hardware-in-the-Loop (P-HIL) systems and digital twins, we verify and validate our own power converter solutions as well as our own converter, battery and power grid models. The theoretical concepts, such as novel control methods for power converters and energy management solutions for battery inverters, are carried out in an application-oriented and reproducible manner.