Post-doc "Energy System Design": "Development, control and testing of new energy technologies"

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Power electronics will play a fundamental role in the energy production, transport and utilization in the future energy systems. It offers advanced control and service provision possibilities, that are not available or are underperforming with classical electro-mechanical solutions. Furthermore, it enables the interconnection of different energy layers, by means of devices such as electrical heaters and combined heat and power systems.

On the other side, its large implementation in the energy system may cause new control and protection issues. Its fast dynamics and limited overload capability force the system operators to change the classical grid management approaches, opting for more advanced and complex solutions. For these reasons, the development of new testing approaches for power electronics-based networks is growing in importance. A comprehensive testing approach, that can cover the power electronics fast dynamics and can include the interconnection of different energy layers, is critically needed for designing the future energy system.

The Post-doc position shall covert the development of power electronics solutions for advanced control approaches, and their implementation in multi-modal energy systems. The positions will take place at the Energy Lab 2.0 facility, where the Real Time System Integration research group is located. The following tasks are foreseen for this position:

- Analysis of the stability and accuracy of the power hardware in the loop (PHIL) systems. This requires an evaluation with new mathematical methods, such as impedance-based modelling, as well as the development of new technical interfaces to increase the stability of the PHIL systems.
- Full automation of PHIL testing. The automation shall include automatic detection of installed hardware and simulated components. Transfer functions, interface parameter adjustments, and the like shall be considered to ultimately ensure the stability of the PHIL test environment. The automation of the system shall be evaluated experimentally at the PHIL lab.
- Development of intelligent controllers for power electronics based solutions to increase the controllability of the system. New control strategies will be developed, and implemented in sub-scaled prototypes that will be built for testing purposes. These prototypes and their integration into the control units are to be evaluated especially with regard to the performance capabilities in the PHIL plant.
- Support in the supervision of PhD students in the control and power electronics area. In particular, the Post-doc will supervise directly a small team (3-4 PhD students) and direct their research activities in coordination with the Team Leader (Dr.-Ing. Giovanni De Carne).
- Support in writing and carrying out research and industrial projects. It is expected that the Post-doc will be able to contribute actively in the writing of proposal, and manage the correct development of projects.