Industrial electronics and sustainable electricity

Achieving ambitious decarbonization and emission goals always requires – beside efficiency improvements and many other aspects – a massive integration of renewable and clean energy such as solar and wind. These types of generation are typically connected to the grid via power electronic converters, one of the core competences of the Industrial Electronics Society (IES). The continuing innovation in the field of power electronics is the enabler for better, more flexible, and more affordable green energy in our electricity mix. New types of semiconductors open up new applications, in all voltage levels nowadays. Biao Zhao et al in this issue for instance tell in “Modular-Multilevel-Converter based on Integrated Gate Commutated Thyristor (IGCT) for Ultra-HVDC Application” how IGCT-based modular multilevel converters can be used for ultra-high voltage applications. An increased share of renewable generation, however, also constitutes a challenge to our grids. Jiefeng Hu et al write in “Voltage Stabilization – A Critical Step Towards High PV Penetration” about one of the limiting factors in renewable energy roll-out: Voltage problems in the feeders due to photovoltaic generation. It is in deed control and management that this growing number of power electronic converters will need, in order to contribute to an available, affordable, and sustainable power system. Yonghao Gui et al for instance discuss controls aspects of modern inverters in “Control of Grid-Connected Voltage-Source-Converters: Relationship Between Direct-Power-Control and Vector-Current-Control”. The basis of all analysis in this direction is how to model and describe these complex power system components. Giovanni de Carne et al contribute the article “Which deepness class is suited for modeling power electronics?” that serves as a guide for choosing the right model for grid integration studies. Being clear on what is needed for a certain study can not only speed up its numerical performance but also shorten the time of model development.

We regularly feature articles in this magazine that contribute to a sustainable future, and we need all disciplines that we bundle in the IES: Industrial communication networks are needed to coordinate renewable resources, computational intelligence will help to detect and use opportunities in ever more complex power systems, ubiquitous data acquisition will shed light on the inner mechanisms and feed into the models of our energy system. A magazine can help to inform our community about the latest developments, innovations, and discoveries in this field, and I am happy to feature four great articles on that this time. And as the field of industrial electronics innovates, so does the way how we publish our findings.

I am still digesting the many impressions I received at that IEEE Panel of Editors meeting early April in Chicago. One of the dominating topics was Open Access (OA) publications. Inspired by societal demands such as Plan S – an open access initiative, originating from the European Research Council – IEEE has developed a number of fantastic options to satisfy the need for openly available and still high quality scientific and industrial media. Currently the IEEE societies and other organizational units are implementing OA strategies and I will report soon in this column about the future of publishing with the IES. Another exciting and really welcome trend is the growing awareness for reproducability. Papers can tell how an algorithm or method might be structured and show its internals. But trying it
out for real is a different level or communicating scientific content. IEEE cooperates with Code Ocean which provides a cloud- and container-based executing platform. Authors can post their algorithm code there, and readers can execute and validate them in a comfortable way. Another great tool is IEEE DataPort, where data sets can be stored for sharing it with other researchers. The data sets receive a digital object identifier and are by that even referenceable. IEEE Access for instance accepts supplemental material (e.g., code, data, and even videos) for its article submissions and supports Code Ocean and IEEE DataPort.

I believe that open minds need open communication and it is great to see how this resonates within the IEEE publishing team. Sometimes it is good to be part of a bigger family. You can move more.