Smart Grid Microcosm at FH Aachen

FOR TECHNOLOGY GENERALISTS WHO WANT TO EXPERIENCE THE WIND OF CHANGE

Students slip into the roles of power engineers, dispatchers and energy traders. This is because if you want to maintain the energy cycle, you have to understand it and bear in mind the interaction between energy resources, distribution and marketing.

It is hard to imagine a better location to study power engineering than the Jülich Campus at the FH Aachen University of Applied Sciences. Flat countryside with impressive wind speeds almost all year round. And the state-of-the-art university building with its first-class laboratory facilities also ensures that the students are very close to the energy sources.

Professor Stefan Bauschke of the power engineering faculty has recreated an extensive smart grid here, into which he has integrated every conceivable load, energy source and factor influencing grid operation. He has thus provided his students with a unique teaching environment with a realistic energy cycle.

Jülich campus at FH Aachen

PRACTICAL TRAINING FOR USE IN PRACTICE

Bauschke has an industry background and, having worked for a major power engineering supplier for over 15 years, knows exactly what requirements the energy experts of the future will have to meet. “As well as specialists, we also need generalists who can develop a broad understanding of processes and interrelating factors and are able to identify and solve problems. To enable them to do this, they need to develop a basic understanding of the other players in the electricity grid at an early stage of their training,” explains Bauschke, whose enthusiasm for his special field is clear to see. He wants to share this enthusiasm with his students, which he manages to do by allowing them to approach the complex system of the grid model on a step-by-step basis. Each of the laboratory’s stations can be used as a self-contained workstation. The students emulate a wind turbine generator on one station, the function of solar power on the next one and a consumption load, such as an electricity-intensive factory, on another one. Based on the model of the real interconnected grid, a system control level has been developed with the SCADA software, which is used to monitor and control the model grid. In addition, a power exchange model is in operation so that students can also experience grid accounting groups and power station schedules. This modular structure is facilitated by the Lucas-Nülle systems.

“In the second step, we look at the interaction between the individual factors. Because you need to know how certain settings and influences affect the grid in order to be able to develop the necessary problem-solving skills,” says Bauschke.

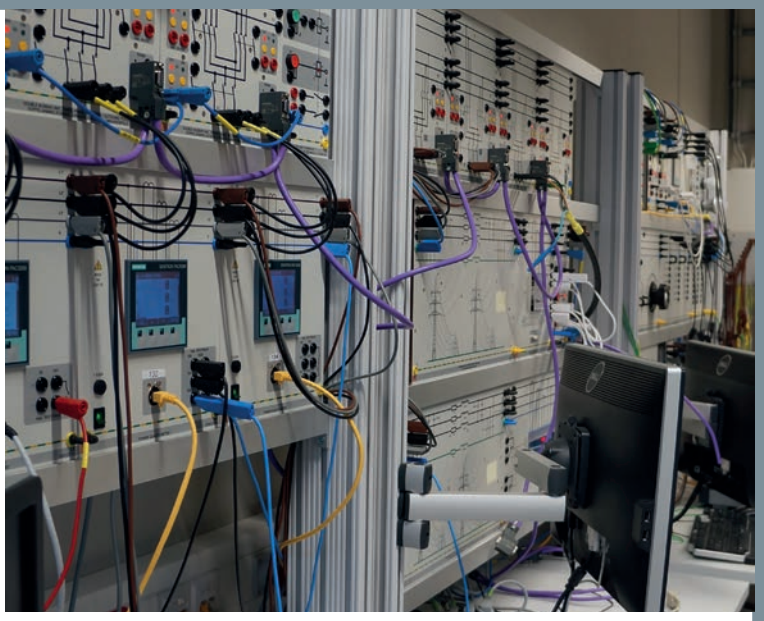
GENERALISTS SEE THE OVERALL PICTURE

The energy grid of the future will integrate many energy sources and consumers. Power engineers have to direct the interaction between them and quickly identify any irregularities. Trade will also have an increasing influence on the grids. Bauschke is therefore simultaneously training electrical engineers, energy industry IT specialists and mechanical engineers in his laboratory while also integrating the electricity exchange into his smart grid as a player as well. Because load management is teamwork. It generally takes five to six weeks for the students to get an overview of sources, loads, influencing factors and the entire grid accounting group management as a whole. During this time, they get used to working with the systems. Before long, they can carry out their own experiments independently. This has a motivating effect, even if they don’t understand all the interrelating factors to start with.

A COMPLETE SMART GRID IN AN EDUCATIONAL FORMAT

The students are enthusiastic about the laboratory's practical relevance and state-of-the-art equipment. "Our people can really put themselves to the test here and implement their own projects. In my experience, this is very conducive to the learning process for all students. After two hours of practical exercises, most of them find it hard to drag themselves away from the laboratory and their experiments," says Bauschke. "When this discipline was established here, this is exactly how I imagined the seminars would be." He gives Udo Schopen a wink. Lucas-Nülle's sales director of many years' standing has been involved in the development of the laboratory from the beginning. "The walls had just been put in here," he recalls, "so we were able to give advice and coordinate the design of the laboratory with our systems. Installing the equipment was an unbelievably exciting project for us as well because up until then hardly any establishment had installed our complete smart grid system. We learned a lot at the Jülich Campus, so we shared and exchanged a great deal of ideas and information in the initial phase."

Prof. Bauschke recreates a complete smart with Lucas-Nülle training systems



The different training systems can be used stand alone or as one complete system

The two men remain in regular contact today. "I am still fascinated every time I visit the Jülich Campus. It makes me proud that Prof. Bauschke has managed to recreate such a realistic, multifaceted energy grid which is pretty much a perfect simulation of future power engineering, and that he has been able to do so using our systems," says Schopen. Prof. Bauschke's new ideas for expanding the system mean that there will be further cooperation.

THE CLASSROOM MANAGER AS A CORE TOOL

Professor Bauschke used the Classroom Manager's export function to integrate the training courses associated with the systems into the university's own ILIAS learning platform, thereby allowing students to access the content from their own PCs for preparatory and follow-up work. In theory, Bauschke could control his entire laboratory by computer-based remote control. This is made possible by the multimedia learning software and the network connection via standard interfaces: cutting-edge technology which can be implemented very quickly at the Jülich power engineering faculty.