AUSTRIAN INSTITUTE OF TECHNOLOGY

Press Information

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Digital future for low-voltage networks

AIT is creating the basis for the large-scale, automated rollout of software applications for smart power grids as part of an international research project.

New developments such as electric mobility and the rising share of renewable energy sources are facing our networks with new challenges. This particularly impacts the low-voltage distribution networks transporting power between secondary substations and households. As coordinator of the ERA-Net Smart Grids Plus-funded project LarGo! (Large-Scale Smart Grid Application Roll-Out), AIT is working together with Siemens, Wiener Netze and other partners from Germany and Sweden on new approaches designed to make these networks fit for tomorrow's energy systems.

Digital solutions for distribution networks
"Traditional distribution networks largely consist of electrical and electromechanical components which are designed for continuous operation," says Mario Faschang, project manager of the AIT Center for Energy, explaining the background to the project. "But modern distribution networks have to be much more flexible to cope with the high capacities needed for electric mobility as well as the strongly fluctuating feed-in from renewable sources such as photovoltaics (PV) installations." The key to this flexibility lies in digital technology. In future, information and communication technologies (ICT) will increasingly take over central tasks such as voltage control and grid monitoring. The major challenge here lies in the large-scale, automated installation, configuration and subsequent updating of the necessary software applications – in parallel with grid operation, which uses the same communication channels. The described application deployment and management process cannot be accomplished manually, since there are approximately 10,000 distribution networks and substations in Vienna alone whose software will need to be constantly updated in future. Faschang illustrates the LarGo! goal using the following example: "In future the network operator should be able to choose the substations in which he wishes to install a particular application for network analysis or voltage control directly at the computer in the control room. The software can then be installed at all selected substations at the push of a button, without impacting grid operation." One such intelligent component which can be controlled by modern Smart Grid applications is the Smart Grid Converter developed by AIT. This is an inverter module which can differentiate between two network modes and react according to the network situation. In order to meet cyber security standards, the applications will also be certified and issued with a digital stamp.

Simulation and field tests
For safety and security reasons, the impact of such wide ranging rollout and updating processes cannot be tested in a real network. In parallel to process and application development, the ICT infrastructure will therefore be coupled with virtual distribution networks

to carry out comprehensive simulations over the next three years. A key component for these tests will be AIT's SmartEST lab, the only laboratory of its kind in Europe in which a series of distribution networks can be simulated simultaneously with real distribution network infrastructure. "By coupling the SmartEST lab with a substation specially developed for the purpose, the S4 – Smart & Secure Secondary Substation, we can run through different scenarios in order to see how the installed hardware and software components react," Faschang explains. Software applications derived from previous projects will also be further developed, tested, and their interaction examined. A major role is played by Seestadt Aspern, where selected applications will be rolled out in a large-scale field test.

Project partners
Coordinator: AIT Austrian Institute of Technology GmbH
Wiener Netze GmbH
Siemens AG
KTH Royal Institute of Technology, Sweden
Fraunhofer Institute for Solar Energy Systems ISE, Germany
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