Revolutionary power: Direct current in buildings

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Siemens, working together with European partners, is studying if and how direct current (DC) could be used inside buildings in addition to the usual alternating current (AC). This addition could save energy when used in certain applications, such as in office buildings. It could also be advantageous for the integration of renewable energy sources and for grid stability. The project, known as DC Components and Grid (DCC+G), is funded by a number of European research ministries and will run until spring 2015. The picture shows an office where many laptops are at work. Their DC power supply could in the future be replaced by a large rectifier.

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According to a European Union directive, buildings constructed after 2020 will have to be nearly energy-neutral. The main por-tion of their power requirement must be generated on site using renewable sources. In comparison, buildings are currently among the world's biggest energy consumers, being responsible for around 40 percent of the total consumption.

Almost every one of today's consumption points in buildings utilizes DC. Every system or device has its own power supply that takes 230-volt AC from the low-voltage grid and converts it into an appropriate DC voltage. A DC power network within a building would enable the innumerable decentralized power supplies to be replaced by several large rectifiers. Such centralization would boost efficiency for the IT sector, for example, because the power supply units of laptops and computer clusters suffer relatively high losses. The situation is similar in the case of lighting systems that contain light-emitting diodes. LEDs are becoming a mass market item, and could receive another boost if DC networks were used.

The DCC+G consortium, which is led by Corporate Technology (CT), Siemens' global research department, wants to set up an optimized 380-volt DC network, taking an office building and a superstore as examples. The researchers expect to achieve energy savings of five percent in each case. The partners in the project, which include Philips, Infineon Technologies, and the Fraunhofer Institute for Integrated Systems and Device Technology (IISB) in Erlangen, are working on new semiconductor technologies for high-efficiency control components, switching systems for net-work protection, and rectifiers that serve as network-stabilizing interfaces to the conventional secondary distribution

network. They are also studying network architectures and energy management systems for optimal energy distribution in the DC net-work. Siemens is focusing here on sensor systems. Among other things, researchers at CT want to develop and integrate new kinds of electrically isolated current and voltage sensors for direct volt-age systems with large bandwidths. They also intend to push forward innovation in sensor systems for monitoring electrical energy flows.

DCC+G is linked to ENIAC (European Nanoelectronics Initiative Advisory Council) and is supported from EU and several european research ministries. In Germany the Federal Research Ministry supports DCC+G with four million Euro using the research pro-gram IKT 2020. The support of highly efficient and economic energy systems reflects the focus of the national research in the ICT sector.

Provided by Siemens

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