



# Basic Research Begins on Breaker Technologies for DC Power Grids: Research Objective Is Innovative Electronic Circuit Breaker for Renewable Energy and On-Board Grids

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Neubiberg, Germany – July 1, 2014 – Direct current offers many advantages compared to the conventional alternating current used today: For example, losses in power grids and electric devices are a total of 5 to 7 percent smaller than with alternating current. Direct current also makes it possible to more efficiently feed electric energy from regenerative sources into power grids and energy storage and to improve grid stability; with direct current it would be possible to build much more compact electric devices.

In the past the lack of efficient and cost-effective circuit breaker technologies has made it impossible to fully exploit the potentials of direct current, e.g. in distribution grids in data center, photovoltaics and telecommunication systems or in on-board grids for aviation and shipping, electric vehicles and railway technology. The only electromechanical circuit breakers available today implicate the risk of arcing when switching direct current and voltages; furthermore they are slow to react, heavy, unwieldy and expensive.

Funded by the German Federal Ministry of Education and Research (BMBF), the research project “NEST-DC” aims to investigate the foundations of an innovative semiconductor-based and completely electronic circuit breaker for DC power grids and applications. The new circuit breaker should be able to switch direct current on, and most importantly switch it off, as quickly and safely as possible at voltages of up to 1,500V. Among other things NEST-DC will explore innovative semiconductor components such as the Over Current Blocking Field Effect Transistor (OCB-FET). New structure and connection technologies and switching topologies for the circuit breakers that will use OCB-FETs are to be formulated and tested. There will be demonstrators for the project results in the areas of on-board aviation grids, electromobility and photovoltaics, as well as for direct current distribution networks.

## NEST-DC partner research assignments

The NEST-DC research partners represent the complete value creation chain from the semiconductor chip all the way to the DC power grid system. The team includes the University of Bremen’s Institute for Electrical Drives, Power Electronics, and Devices (IALB) and the four companies Airbus Group, E-T-A Elektrotechnische Apparate GmbH, Siemens AG and Infineon Technologies AG (project coordination). Support is also being provided by the European Center

for Power Electronics e.V. (ECPE), headquartered in Nuremberg, Germany.

Within the project, the IALB will handle investigation and simulation of novel semiconductor structures for use in the OCB-FETs, static and dynamic measurement of the newly developed circuit breakers and testing their thermal behavior and destruction limits. Airbus Group Innovations will define the requirements for aviation applications, researching a suitable topology and developing a demonstrator together with the NEST-DC partners. The hardware tests will be carried out by Airbus Group in Ottobrunn, Germany.

Siemens will concentrate on the structure and connection technologies of the circuit breakers. E-T-A Elektrotechnische Apparate will define the requirements for industrial applications and, together with the partners, will validate the circuit breakers for voltage classes up to 1,500V. Infineon is leading the project, contributing its power semiconductor expertise and researching power semiconductors intended for use in the OCB-FETs.

The NEST-DC research project is receiving approximately Euro 2.3 million in support from the BMBF in the context of the funding focus area “Power Electronics for Increasing Energy Efficiency”. The project began in October 2013 and will run for three years. NEST-DC abbreviates the German for “ Innovative Electronic Direct Current Circuit Breakers for Renewable Energies and On-Board Power Networks”.

## **About Airbus Group**

Airbus Group is a global leader in aeronautics, space and related services. In 2013, the Group – comprising Airbus, Airbus Defence and Space and Airbus Helicopters – generated revenues of Euro 57.6 billion (restated) and employed a workforce of around 139,000 (restated). Further information is available at > [www.airbus-group.com](http://www.airbus-group.com) (<http://www.airbus-group.com>)

## **About E-T-A Elektrotechnische Apparate GmbH**

E-T-A Elektrotechnische Apparate GmbH achieved a group turnover of Euro 85 million in 2013. Today E-T-A has some 1,373 people on the payroll in more than 60 countries. 5 production sites, 13 subsidiaries and great number of representatives give impressive proof of E-T-A's internationality. Production, Sales, Purchasing, Marketing and Design are concentrated at the headquarters in Altdorf. E-T-A designs, produces and sells a comprehensive product range of protection and power management devices. It reaches from thermal circuit breakers for equipment protection to complex solutions, protecting electrical and electronic systems against overload and short circuit. E-T-A serves almost every industry, e.g. process control and automation, telecommunications, chemical and medical industry, manufacturers of household appliances and garden equipment, aerospace, automotive and marine industry. For more

details please visit > [www.e-t-a.de](http://www.e-t-a.de) (<http://www.e-t-a.de>)

## About Siemens AG

Siemens AG (Berlin and Munich) is a global powerhouse in electronics and electrical engineering, operating in the fields of industry, energy and healthcare as well as providing infrastructure solutions, primarily for cities and metropolitan areas. For over 165 years, Siemens has stood for technological excellence, innovation, quality, reliability and internationality. The company is one of the world's largest providers of environmental technologies. Around 43 percent of its total revenue stems from green products and solutions. In fiscal 2013, which ended on September 30, 2013, revenue from continuing operations totaled Euro 75.9 billion and income from continuing operations Euro 4.2 billion. At the end of September 2013, Siemens had around 362,000 employees worldwide on the basis of continuing operations. Further information is available at > [www.siemens.com](http://www.siemens.com) (<http://www.siemens.com>)

## About University of Bremen

The University of Bremen was founded in 1971 and was promoted to a “university of excellence” in 2012. Having 250 professorships and 19,000 students the university is of medium size in Germany. Their 12 faculties offer a broad range of disciplines and internationally competitive top-level research. The 1994 founded Institute for electrical Drives, Power Electronics, and Devices (IALB) of the University of Bremen is doing research and education in the fields of electrical drives, mechatronics and renewable energy as well as power semiconductor components and their application. The focus with semiconductor devices is alternative semiconductor materials, material basics, device concepts, simulation, packaging, reliability, and the influence of parasitics. Further information at > [www.ialb.uni-bremen.de](http://www.ialb.uni-bremen.de) (<http://www.ialb.uni-bremen.de>)

## About Infineon Technologies AG

> **Infineon** (</cms/en/product/>) Technologies AG, Neubiberg, Germany, offers semiconductor and system solutions addressing three central challenges to modern society:  
> **energy efficiency** (</cms/en/focus-areas/energy-efficiency/>),  
> **mobility** (</cms/en/focus-areas/mobility/>), and > **security** (</cms/en/focus-areas/security/>). In the 2013 fiscal year (ending September 30), the company reported sales of Euro 3.84 billion with close to 26,700 employees worldwide. Infineon is listed on the Frankfurt Stock Exchange (ticker symbol: IFX) and in the USA on the over-the-counter market OTCQX International Premier (ticker symbol: IFNNY). Further information is available at > [www.infineon.com](http://www.infineon.com) (</cms/>)

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## **Press Photos**



The R&D project “NEST-DC” aims to investigate the foundations of a circuit breaker for DC power grids and applications.

### **NEST-DC**

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JPG | 1.01 mb | 1799 x 1200 px

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