Finally the days of tedious planning and improvised solutions are over! The over 170 scientists, technicians and administrative co-workers of E.ON Energy Research Center (E.ON ERC) at RWTH Aachen University are now working, with ample space and under optimal conditions, in the new Main Building located at the northern border of the Campus. As the former neighboring building had soon become too small, the move into the new energy-efficient building — affording spacious, bright rooms amply supplied with climate control — is a welcome change.

“The cooperation of our five Chairs from four faculties is already working excellently,” concluded Professor Rik W. De Doncker, the founding director of E.ON ERC, as he summarized the four years of cooperative research. The ERC-Director continued, “and the collaboration will even be stronger in this building which can be judged a success in every respect. Ultimately, it was one of the fundamental ideas of this Public Private Partnership to bring together, also spatially, the defining pillars of energy research in this...
project at RWTH Aachen University. It was definitely worth it that the people involved took sufficient time to integrally plan this building, down to the last detail”. The result is, in particular, an efficiently climate-controlled and brightly illuminated building, which is an excellent work environment and facilitates communication between the different disciplines. This is proven by the enthusiastic response of the employees at E.ON ERC. (The Institute for Energy Efficient Buildings and Indoor Climate (EBC), directed by Professor Dirk Müller, developed the building concept; see the next edition of Research News about this.)

The new Main Building of the E.ON ERC fulfills the highest quality requirements for architecture and technology with economically sensible solutions. Energy-efficiency, flexibility and sustainability are key principals in the planning, construction and use of the building. At the same time, the innovative interior concept — with its light-flooded central spaces — affords multiple perspectives among the various floors, science areas and the surrounding landscape of the building. Thanks to generous space for chatting and resting, these areas entice the researchers to exchange ideas beyond their disciplines. Moreover, the modern bright office rooms, laboratories, seminar and conference rooms offer ample space for focused scientific work towards an environmentally friendly, secure and affordable energy supply of the future.

Secure Supply of Power for Fundamental Research

The E.ON Energy Research Center has been commissioned to develop and to exhaustively test a simulation model for the safe and efficient power supply of the European Spallation Neutron Source facility (ESS) in Lund, Sweden.

With its highly complex technical equipment, the ESS is especially sensitive to disturbances in the power supply. In this case, data might be lost, thus, a new substation for the electrical energy would be needed for a completely secure power supply concept. Moreover, existing overhead lines need to be replaced by high-performance cable connections. In addition, it is the intention of the ESS designers that the power supply ought to be completely generated from renewable resources.

"The efficiency of the energy supply of ESS was already a decisive criterium in the selection of the site Lund. Compared to conventional solutions, our concept calls for a 20%-savings of energy, a 100%-use of renewable energy resources as well as the use of waste heat in the district-heating supply system,” explains ESS director Patrik Carlsson on the occasion of the contract signing. Professor Rik W. De Doncker is convinced that traditional systems of power transmission and distribution do not suffice for such difficult problems: “Linking an extremely dynamic load for electricity with the inherently volatile electricity generation from renewables such as wind energy can hardly be accomplished with today’s network technologies. Work on a reliable and efficient ESS-power supply will further accelerate the current innovation process and will lead to solutions that we urgently need for the Smart Grids of the future.”

The simulation project is being funded in part by the contribution of the German Federal Ministry for Education and Research to the EES project.

Also decisive for the finalizing of the cooperation agreement was the fact that the Aachen energy researchers have at their disposal the currently most powerful Real Time Digital Simulator (RTDS) of Europe (see picture). This RTDS allows the power transmission and distribution networks to be simulated in real time. The researchers of the Institute for Automation of Complex Power Systems (ACS) at E.ON ERC, under the direction of Professor Antonello Monti, are thus able to transfer theoretical ideas into "virtual practice" and to test these concepts in depth before complicated and expensive units are actually built. Thus, this modeling prevents expensive faulty investments.
GGE | Coordination for Research Project

Researchers Optimize the Tapping of Deep Geothermal Energy

“The exploitation of deep geothermal energy for the supply of heat and electricity can only be economical when expensive faulty bored wells, wasting millions in assets, are prevented. Therefore, the certain evaluation of geothermal reservoirs is especially important for the success of geothermal projects. Thus, in our new research project called ‘MeProRisk II — Optimization Strategies and Risk Analysis for Deep Geothermal Reservoirs’, we — together with our colleagues from Aachen, Berlin, Freiberg and Kiel — are applying methods that had been developed by individual work groups in the project "MeProRisk I," explained Professor Christoph Clauser of the Institute for Applied Geophysics and Geothermal Energy (GGE) on the occasion of the granting of funds for the MeProRisk II-project by the German Federal Ministry for the Environment. In this project, one of the tasks is to determine the optimal positions for borings. Moreover, production conditions will be visualized by state-of-the-art 3D-techniques in order to fit the technical design of the units to further boundary conditions. The Institute for Applied Geophysics and Geothermal Energy of the E.ON Energy Research Center of RWTH Aachen University is coordinating this project.

The 3D-visualization of the site-specific characteristics and processes in the reservoir aid the technical design of the geothermal installation.

E.ON ERC | International Cooperation

International Approach Further Strengthened

Aachen energy scientists cooperate with Swedish university

In a Memorandum of Understanding (MoU), the E.ON Energy Research Center of RWTH Aachen University and Chalmers University of Technology of Göteborg, Sweden have agreed to cooperate, in particular, in teaching and in research regarding the areas of energy saving, energy efficiency and environmentally friendly energy systems. The planned cooperation is another important step within the globally targeted “International Energy Cooperation Program” (IECP) of E.ON ERC (see box on page 4). The aim of this successful program is to intensify the international exchange with renowned universities worldwide. “We are happy about this further important building block of our globally positioned Interna-
Within the scope of the “International Energy Cooperation Program” (IECP), the E.ON Energy Research Center and RWTH Aachen University are cooperating with other universities, research centers and similar scientific institutions worldwide. Extending beyond this collaboration, there is also an exchange of students and scientists.

Through this Memorandum of Understanding, both universities affirm their intention to exchange scientific publications and other information of interest to each party. Another important point of this agreement is to promote academic exchange that infers, in particular, the exchange of scientific personnel in research and teaching. Also students of both universities ought to profit from the cooperation. Future engineers and scientists from Sweden are just as welcome in Aachen as the Aachen students are in Swedish Göteborg. Moreover, research topics are to be identified for which the necessary investigations can be conducted in close and efficient cooperation, with work allocated among the five E.ON ERC institutes and the Chalmers University of Technology. The joint planning and realization of seminars and conferences also belong to the comprehensive list of planned activities in this German-Swedish cooperation.

E.ON ERC I Colloquium

Smart Homes – The Path to the Commercial Product

Decentralized and flexible electricity generation, storage, grid overhaul, demand-orientation, bidirectional energy-and information flows, a more active role of the customer in the energy system — all these key words aptly fit the (expectable) development of the energy supply. The driving force for this is the increasing importance of vacillating renewable energy resources.

The exploitation of renewable energies necessitates a bundle of measures to be taken, ranging from extensive grid development up to the massive expansion of storage capacities urgently needed for “smoothing” an increasingly volatile power generation. This also includes the (further) development of formerly only consuming households to so-called ‘Smart Homes’. Addressed here is the intelligent integration of energy consumers into the whole energy system. The palette of possibilities extends from the automatic electricity price-dependent use of electrical appliances based on external information to target-oriented power generation in mini- or micro-heating plants down to the remote monitoring and -control of engineered safety devices.

“How to Make ‘Smart Home’ Ready for Mass Customization” — as implied by the title of his talk at the E.ON ERC Colloquium Series, Dr. Markus Ewert (see picture) of E.ON AG pointed out more than the potentials of Smart Home technologies. At the same time, Ewert stressed that the development of technical possibilities, however attractive they might be, is merely a first step towards a full-scale market launch of such technologies. Equally decisive for success are primarily lower costs through mass production, new electricity applications such as heat pumps and electric cars and new electricity rates that give consumers an incentive for flexible behavior.

Suitable sales channels need to be found, and attractive so-called “Entry Products” have to be developed for the market launch. In his talk, Evert explained that one would have to start, for example, with an offer for the simple controlling of electric components via SmartPhones and the optimization of energy demand in the household. A next feasible step could then be to optimally integrate the self-generation of power from a photovoltaic system or of a micropower plant.

For the first step, E.ON will launch concrete products on the market this year. In parallel, further developments with additional functions will be promoted and tested.
More Efficient Thanks to Power Electronics

In light of the expected doubling of the energy consumption within the next twenty years, Professor Frede Blaabjerg contends that, in the future, we need to focus on generating, distributing and using energy as efficiently as possible. According to this distinguished engineer on the occasion of his visit to E.ON ERC, two technologies are exceptionally important for solving future problems: i.e. electricity production based on renewable energy resources and the increasing application of power electronics in the generation, transmission, distribution and conversion of electrical energy. In his talk entitled “Power Electronics — The Intelligent Interconnection of Renewables”, Blaabjerg impressively showed that high-efficient power electronic components will play an exceptional role in the restructuring of the energy supply system to one based extensively on renewable energy sources such as wind and solar power. Other topics covered during the colloquium included technology development and application, converter technologies and system control as well as feasible future developments.

E.ON ERC | Teaching Commission

Courses on Patent Law

Patent Attorney Dr. Hans-Dieter Jostarndt (picture) of Aachen has been commissioned to teach German patent law (for Bachelor students) and international patent law (for Masters students) within the scope of lecture series at E.ON ERC. The curricula range from the history of patent law to the choice of suitable inventions, German and European procedural law, grounds for revocation, objection procedures, actions for annulment, to the presentation and discussion of strategies for enforcing protective rights. After earning his doctorate degree in physics, Dr. Jostarndt studied to become a patent attorney at the University of Cologne. Jostarndt looks back at many years of experience gained in science and industry in Germany and abroad.

Events/Dates at E.ON ERC

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>June 11 - 13, 2012</td>
<td>IEEE Workshop on Complexity in Engineering</td>
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<td>Institute for Automation of Complex Power Systems</td>
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<tr>
<td>June 14, 2012, 3:30 pm</td>
<td>Colloquium: The Dawn of Solar</td>
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<td>Dr. Stefan Christ, E.ON AG</td>
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<tr>
<td>June 29, 2012, 3:30 pm</td>
<td>Colloquium: Rethinking Energy Demand</td>
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<td>Prof. Clark Miller, Arizona State University</td>
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<td>July 19, 2012, 4:00 Uhr</td>
<td>Colloquium: Envisaging Cradle-to-Cradle Biorefineries, Dr. Fabrizio</td>
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<td></td>
<td>Sibilla, Nova-Institut/Dr. Pablo Dominguez de Maria, RWTH Aachen</td>
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Information/E-Mail: colloquium@eonerc.rwth-aachen.de