Federal Ministry
of Economics
and Technology

Innovation policy, information society, telecommunications

E-Energy

Paving the Way towards an Internet of Energy

www.e-energy.de

Text, Editorial Department and Print
Federal Ministry of Economics and Technology (BMWi)

Design and Production
Loesch*Hund*Liepold Kommunikation GmbH, Munich

Photo Credits
Fotolia (cover page, P. 16); RWE AG (P. 6, 7); E-Energy supportive scientific research (P. 5, 9); eTelligence (P. 9); EnBWAG (P. 10); MVV Energie AG (P. 7, 11); E-DeMa (P. 12); Vattenfall Europe Berlin (P. 13); RegModHarz (P. 13); SmartWatts (P. 14)

Publisher
Federal Ministry of Economics and Technology
Public Relations Division
10115 Berlin
www.bmwi.de

Last Revised
March 2009

The Federal Ministry of Economics and Technology has been awarded the berufundfamilie® audit certificate for its family-friendly HR policy. The certificate is granted by berufundfamilie gGmbH, an initiative of the Hertie Foundation.

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E-Energy

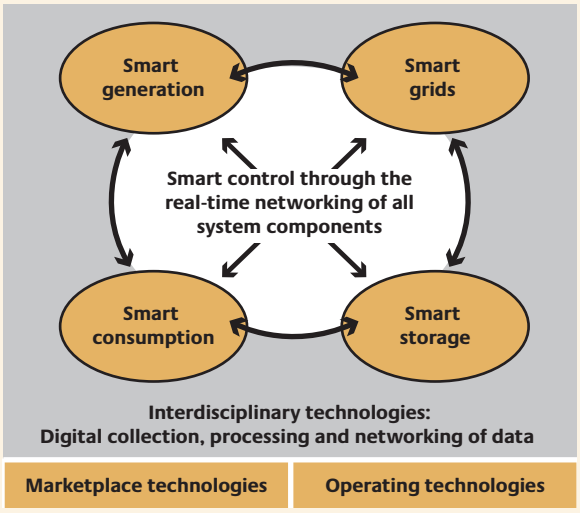
Paving the Way towards an Internet of Energy

Table of Contents

How does E-Energy benefit the energy systems of the future?

Electricity is the backbone of industry and society. Growing demand, depleting resources and climate change, however, are emerging as huge challenges for our generation. This is further compounded by the fact that only a fraction of the primary energy directed into the highly complex power supply system is turned into useful energy for end consumers. We urgently need to find solutions that guarantee and optimize energy supply security, efficiency and environmental compatibility. Information and communication technologies (ICT) will be key to implementing such solutions. With their help, we will have an "Internet of Energy" where multiple power generation plants – increasingly those harnessing renewable energy – communicate with electricity network facilities and millions of electrical devices and household appliances. This will give rise to completely new markets, previously unknown market roles and innovative business models. The result will be a win-win situation, with power generators, electricity providers, grid operators, private and commercial consumers, Germany and the environment benefiting from the Internet of Energy.

"E-Energy: ICT-based energy system of the future" is a technology funding initiative of the Federal Ministry of Economics and Technology (BMWi). A competition was held and consortiums in six model regions were declared the winners. Since December 2008, these consortiums have been developing and testing core elements for an Internet of Energy. Within the framework of interministerial collaboration with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the BMWi is providing some 60 million euros in funding for the R&D activities of these six technology alliances. The partners themselves are investing a further 80 million euros, with the result that some 140 million euros are being mobilized for the E-Energy model projects. "E-Energy is part of the "Germany: Green IT Pioneer" action plan, which prominent figures from the German government, IT industry and the world of science finalized in 2008 at the third national IT summit in Darmstadt. The action plan comprises a number of measures aimed at promoting the research, development and use of resource-efficient ICT products and services."



The Internet of Energy combines smart power generation, smart power grids, smart storage and smart consumption.

E-Energy drives innovation in energy and climate technology

Given the significant role it plays in energy and economic policy, the Federal Government and business have declared "E-Energy" a national beacon project that aims to motivate other businesses and regions to do their part in creating a highly efficient ICT-driven energy system.

Up to now, power supply has been primarily shaped by"consumption-oriented generation". A network of power generation plants produces sufficient electricity even if temporary load peaks arise.This will be increasingly difficult in the power supply system of the future, being based more than ever before on volatile sources of energy such as sunshine and wind. Electricity can only be stored to a very limited extent, storage units are expensive and a lot of energy is lost when power is converted. It is becoming more and more apparent that "generation-oriented consumption" is the answer. If the customer so decides, electrical appliances can be switched on if excess, and thus particularly inexpensive, electricity is available when winds are high, for example. This is all controlled by a network of centralized and distributed computers.

While not every electrical appliance or system is suitable, many are. Refrigerators, heat pumps, washing machines and dishwashers, for example, could be optimally controlled with ICT-based consumption-specific load management.

Wash your clothes while the sun shines: Smart ICT gateways are key to making the change from a consumption-oriented supply system to generation-oriented consumption

Large refrigerated warehouses and swimming pools, in particular, can be very flexible in choosing when to use electricity. Electric vehicles, however, will be the prime example of how this new system can work, as the actual time the vehicle battery is charged is irrelevant. What matters is that the battery is charged the next time the vehicle is to be used.

With its new ICT solutions, E-Energy forms the basis to the clever integration of electric mobility into the overall power supply system of the future. Via the Internet of Energy, vehicles can report their exact location, relay the current battery charge status and specify by when the battery is to be charged to a specific extent. The owner can program the vehicle so that the battery is charged at the lowest possible cost, or that only "green electricity" is used to charge the battery. And if the owner of the battery agrees, the E-Energy systems can even tap the electricity from the battery and feed it back into the grid to cover peaks in power demand.

The Internet of Energy interconnects the numerous stakeholders in the energy system, ranging from power generation and transportation companies to stakeholders in power distribution and consumption. Every appliance or unit that is connected to the power grid is added to the control system like a plug-and-play application. This results in an integrated data and power network featuring completely new structures and functions. Instead of the familiar electricity meter, this new system uses digital measuring instruments known as "smart meters".

In the Internet of Energy, these meters no longer simply measure electricity consumption or the power fed into the grid for the purpose of invoicing, but also supply the intelligent E-Energy network nodes with the information they need to be able to automatically harmonize power generation, grid load and electricity consumption to a large extent. This helps reduce the demand for expensive electricity at peak times, ease the load on the electricity grids and maintain supply security.

The E-Energy network uses predictive systems that forecast the consumption and generation of electricity depending on weather conditions. Based on this information, pricing signals are then sent to ICT gateways in households and industry, on the one hand, and to the control systems of energy producers on the other hand. The electricity producers and consumers will behave in line with market conditions and react accordingly. Depending on settings previously made, the ICT gateways can coordinate when consumer loads are switched on, loop in small cogeneration heat and power plants or feed in electricity from storage units. The result is a new electronic "energy marketplace" where customers can play a more active role as mini providers of electricity they generate themselves (through solar panels, for example), and where electricity is no longer simply traded. Rather, we will witness completely new services in this marketplace, such as "allow delayed switch-on", "feed into grid in event of demand peaks" or "only use in event of sunshine or high winds". In the E-Energy marketplace, power producers and consumers can also be rewarded for contributing to the secure, cost-effective and environmentally friendly provision of electricity. This, in turn, also helps reduce dependence on imported energy.

E-Energy is an engine for innovation and development

E-Energy also opens the door to greater transparency and competition along the entire value-added chain, ranging from power station and grid operation through to end consumers. This will drive innovation both in the area of technology and industry, and will force the pace on progress made in the liberalization of the energy market and the decentralization of power grids.

Refueling when the wind blows: With the E-Energy ICT solutions, the battery of electric vehicles can be charged when cheap electricity from renewable energy sources is available.

If ICT and the energy industry pool their efforts and develop cross-sectoral products, processes and services, the foundations can be laid for the power network of the future. Terminals have to be fitted with the necessary intelligence to integrate them into the Internet of Energy. New storage technologies will be promoted, and it will be possible to integrate even small, distributed storage systems into the grid. Decentralized power generation plants have to be designed in such a way that they not only generate electricity but also provide system services. And finally, E-Energy will create the technologies needed to integrate electric mobility into the system. The more E-Energy helps unlock the positive effects of integrating electric vehicles, the more incentives for innovation this technology will experience.

E-Energy will give rise to new growth markets and future-proof, sustainable jobs

E-Energy unites the mega markets of the energy and ICT industry. This will result in new areas of employment and markets that require completely new forms of technical and corporate collaboration. Germany is assuming a pioneering role in this field with the E-Energy funding initiative. The knowledge and skills developed in the six technology consortiums, and the components of the Internet of Energy tested in the field, bolster Germany's competitive position in the global energy market. The E-Energy activities will draw more and more attention from abroad, with the result that new export markets can be opened up for the electronics industry and qualified cross-sectoral jobs can be created.

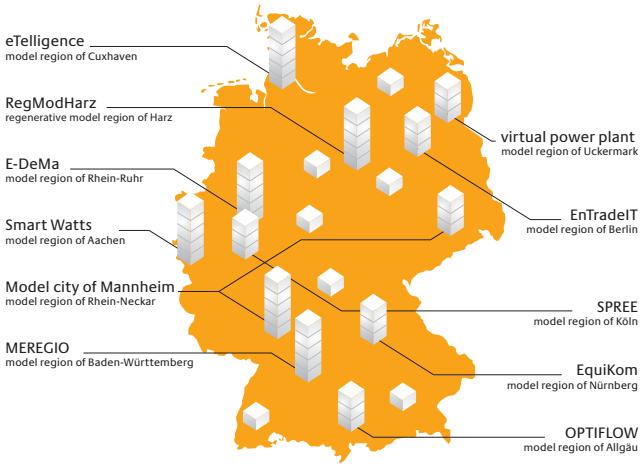
The R&D activities implemented as part of the E-Energy initiatives will rapidly give rise to a new market for automated control and regulation systems in power production plants and terminal equipment, along with markets for ICT gateways and smart meters, intelligent storage modules, forecasting and invoicing systems, user-friendly online references, as well as display and operating systems and many other products. This will create future-proof, sustainable jobs and generate new growth. New services with the most diverse pricing systems will come on the market as a result. Furthermore, new business models will also be developed, such as models that pool producers and consumers, offer "lowest price" or "prepaid" electricity, optimize private or commercial load profiles, or use the bi-directional ICT gateways to provide almost fully automated systems of controlling household appliances to maximize energy savings. In particular, E-Energy is key to the development of renewable energy and its integration into the power grid. The more E-Energy succeeds in integrating decentralized, renewable power generation plants into the grid, the greater the impetus for growth the mechanical engineering and plant construction sectors will witness as a result.

E-Energy will not only lead to new services but also to a wide range of new technical products. These, in turn, also have to be installed and serviced. Many small and medium-sized enterprises – not least the electrician trade – will benefit from E-Energy, as will engineering companies, hardware and software producers, and businesses involved in power plant construction with operations worldwide.

The Energiebutler® in the "Model city of Mannheim" project facilitates individual energy management, and the implementation of dynamic rates and demand-response mechanisms to switch refrigerators off, for example, if electricity is expensive or does not come from a renewable energy source.

The six E-Energy model projects

A technology competition identified six model regions to carry out research and development activities with support from the BMWi and the BMU. They follow an integral systematic approach that spans all value-adding segments. It includes all energy-specific business activities both at the market level and the technical operational level. Close contact is also maintained to the other finalists of the technology competition and other initiatives. The E-Energy beacon project will be the impetus for widespread development.



From the beacon into the regions: The six pilot regions (on the left) and the other finalists (on the right) in the E-Energy technology competition are developing solutions for the ICT-based energy system of the future.

- **eTelligence** – Intelligence for energy, markets and power grids, model region of Cuxhaven
  Stakeholders include: EWE AG, OFFIS, energy & meteo systems GmbH, BTC AG, Fraunhofer Energy Alliance (AST and ISE), Öko-Institut, i. a.
  www.etelligence.de

- **E-DeMa** – Development and demonstration of decentralized integrated energy systems on the way towards the E-Energy marketplace of the future, model region of Rhein-Ruhr
  Stakeholders include: RWE Energy AG, Siemens AG, ef.ruhr GmbH, Miele & Cie. KG, Stadtwerke Krefeld AG, Prosyst Software GmbH, i. a.
  www.e-dema.com

- **MEREGIO** – Minimum emission region, model region of Baden-Württemberg
  Stakeholders include: EnBW Energie Baden-Württemberg AG, ABB AG, IBM Deutschland GmbH, SAP AG, Systemplan GmbH, Karlsruhe Institute of Technology (KIT), i. a.
  www.e-energy.de/de/meregio.php

- **Model city of Mannheim** – Model city of Mannheim in the metropolitan Rhein-Neckar region, model region of Rhein-Neckar
  Stakeholders include: MVV Energie AG, DREWAG-Stadtwerke Dresden GmbH, IBM Deutschland GmbH, Power PLUS Communications AG, Papendorf Software Engineering GmbH, University of Duisburg-Essen, ISET – Verein an der Universität Kassel e.V., ifeu Heidelberg GmbH, IZES gGmbH, i. a.
  www.modellstadt-mannheim.de

- **RegModHarz** – regenerative model region of Harz
  Stakeholders include: RegenerativKraftwerk Harz GmbH &Co KG, E.on Avacon AG, Siemens AG, in.power GmbH, ISET e. V, Vattenfall Europe Transmission GmbH, four regional municipal utility companies, Cube Engineering GmbH, Fraunhofer IFF, IEE-RE (University of Kassel), OvG-Uni Magdeburg, i. a.
  www.regmodharz.de

- **SmartWatts** – Greater efficiency and consumer benefit with the Internet of Energy and the "smart kilowatt-hour" model region of Aachen
  Stakeholders include: utilicount GmbH & Co. KG, Research Institute for Operations Management (FIR) at RWTH Aachen University, Kellendonk Elektronik GmbH, PSI Büsing & Buchwald GmbH, SoptimAG, Stadtwerke Aachen AG, i. a.
  www.smartwatts.de

Striking a balance for volatile power generation

In an interview, Dr. Wolfram Krause – project manager of the model region of Cuxhaven – explains the key features of the eTelligence E-Energy project.

What is the primary idea behind eTelligence?
eTelligence focuses on the intelligent system integration of power producers and consumers. By "system integration", we mean that aspects of both the power grid and the market are taken into consideration. In terms of the power grid, we must ensure that even a large percentage of decentralized power producers - such as wind farms - do not jeopardize supply security. With regard to the market, the objective is to integrate all the stakeholders. This intelligent system integration of large and small market players is only possible with modern ICT solutions. Market regulations, products and access mechanisms also have to be defined to make this a reality.

What is the main thrust of eTelligence?
The eTelligence project unites electricity producers, consumers, energy service providers and power grid operators in an innovative energy marketplace. Even small stakeholders are to be integrated via a sustainable, future-proof ICT infrastructure. The aim is to bring the electricity consumption of industry, business and private households in line with the power generation by decentralized energy sources, including wind farms. For example, a refrigerated warehouse can be cooled more than usual if winds are high.

Dr. Wolfram Krause and representatives of the model regions at the "E-Energy – Change and Opportunity with the Internet of Energy" convention.

These cooling reserves can then be used to react to a temporary period when winds are low. The cooling units are throttled, the temperature in the refrigeration area increases and fluctuations in the wind energy fed in are balanced out.

Are there different focal areas within the project?
Three separate levels form the focus of the eTelligence project, namely the marketplace, ICT infrastructure and technology. The regional marketplace for electricity brings together the supply and demand of the individual stakeholders. The ICT infrastructure links the individual components at both the field and business process level and is the bedrock of innovative applications. At the technology level, smart business management mechanisms are developed to optimally integrate the stakeholders into the overall system while taking their specific characteristics and individual needs into account.

E-Energy project: eTelligence

Intelligence for energy, markets and power grids

Cutting-edge communication technology is the key, with a whole new marketplace for energy developing in and around Cuxhaven. Producers and consumers can not only use this marketplace to buy and sell electricity, but can also offer system services and idle power, and help reduce the load on the power grid. With minimum effort, even private households can put minute amounts of electricity on the market by using almost fully automated plug-and-play appliances that operate automatically in the market in line with the preprogrammed instructions of the appliance owners.

The E-Energy marketplace in Cuxhaven primarily takes advantage of the many refrigerated warehouses and the spa in the town. The water in the pool is heated if the electricity from the CHP power plants is needed. The refrigerated warehouse is cooled more than usual when electricity is cheap, with controls developed within the framework of E-Energy ensuring that the frozen fish does not spoil in the process.

Stakeholders: EWE AG, OFFIS, energy & meteo systems GmbH, BTC AG, Fraunhofer Energy Alliance, Öko-Institut

Development of a certificate to reduce CO_2 emissions

In an interview, Hellmuth Frey - project manager of the model region of Baden-Württemberg – explains the special features of the MEREGIO project, the project's objectives and the technical components used to implement the project.

What are the objectives of your model project?
Our project centers on the Karlsruhe/Stuttgart model region and aims to demonstrate that a shift from the present-day power supply system to "minimum emission regions" is possible by intelligently combining technical energy management and innovative ICT. By "minimum emission regions", we mean regions whose power supply systems are optimized to ensure minimum emission of greenhouse gases. Particular attention is focused on the area of electric mobility, as it deals with all the aspects relevant in the context.

What is so special about MEREGIO?
An important part of this project involves the development of a certificate for "minimum emission regions", and the subsequent certification which we would like to perform in the model region by way of example. In addition, our project consortium is also developing a set of measures, and advises regions on how they can improve their energy efficiency. Furthermore, simulation models provide the means for examining and analyzing different concepts and strategies in greater detail.

9.5 billion kWh in electricity can be saved in Germany every year with smart electricity meters

What technical components are being developed in your model project?
As part of a pilot project, EnBW has already equipped 2,000 customers with smart meters and user applications. This system is to be used and enhanced throughout the course of the project. Such systems can be deployed in the future as part of an innovative energy management system that helps control and regulate consumer loads and decentralized plants. One such example would be building automation systems that control heating, ventilation, air conditioning and lighting systems while also ensuring the security of the premises.

MEREGIO

The move to "**M**inimum **E**mission **Regio**ns"

The E-Energy MEREGIO model house generates power on the roof or using a mini combined heat and power plant (CHP) in the basement. The household appliances are interlinked via communication technology and connected to a smart system platform. The electric vehicle is parked in the garage: the vehicle battery is charged when the mini-CHP produces more electricity than the grid can take. If necessary, the electricity from the battery can also be fed into the grid. As a partner of the electricity provider, the consumer can view the processes in the system via an Internet portal and play an active role in market activities.

Stakeholders: EnBW Energie Baden-Württemberg AG, ABB AG, IBM Deutschland GmbH, SAP AG, Systemplan GmbH, University of Karlsruhe (TH)

Creating a virtual marketplace

In an interview, project manager of the E-Energy Model city of Mannheim – Andreas Kießling – explains the special features of the project, the requirements of the city of Mannheim and the developments witnessed in this region so far.

What are the objectives of your model project?
The primary objective of the project is to increase energy efficiency by creating a virtual energy marketplace for power generators, consumers and grid operators. In the new energy marketplace, customers will be able to view the origin and price of the electricity, and have an immediate impact on the marketplace by directly controlling when energy is tapped from the grid, as well as the supply of energy to the grid from their own decentralized power production systems. With new energy services, consumers can not only use energy more effectively but also make long-term savings and thus help protect the environment.

What makes Mannheim particularly suitable as an E-Energy model region?
Mannheim has a wide range of renewable power production plants and controllable loads, which can be used to develop and test the functions of an intelligent power network. Through numerous pilot projects, for example those focusing on the integration of photovoltaic systems, the "Smart Metering" research project of the BMWi, as well as our experience with the "Energiebutler", we have created specific approaches which the project can build upon and develop further. The associated system of monitoring the energy efficiency of electricity and district heating, as well as the centralized heat and power cogeneration blocks, also constitute a good framework for the E-Energy project. Interconnecting the power grid across a wide area with a broadband powerline is also an important module of the intelligent network, as it facilitates real-time communication between all power generators and consumers on the basis of the Internet protocol.

What is so special about the Model city of Mannheim?
We are taking a multisectoral approach that comprises electricity, gas and water, as well as district heating. This approach examines new business models and incentive systems, and explores ways to achieve stable, real-time grid control. Over the course of four years, three field trials in both Mannheim and Dresden will focus on enhancing the "Energiebutler" and examining the efficiency potential among customers, as well as intelligent network behavior with associated services. A total of some 3,000 customers are taking part in the project.

Model city of Mannheim

Model city of Mannheim in the model region of Rhein-Neckar

The Model city of Mannheim project concentrates on an urban conurbation with a high penetration rate in which renewable and decentralized sources of energy are used to a large extent. Within the framework of the E-Energy project, a representative large-scale trial is being conducted both here and in Dresden to demonstrate the project can be applied and translated to other regions. The trial uses new methods to improve energy efficiency, grid quality, and the integration of renewable and decentralized sources of energy into the urban distribution network. The focus is on developing a cross-sectoralapproach (involving electricity, heating, gas and water) to interconnect the consumption components with a broadband powerline infrastructure.

Electricity is offered to customers close to the point of generation and directly when the power is generated. This avoids transporting power (and associated power loss), and includes the use of decentralized energy storage units. Proactive users in the energy market ("prosumers") can gear their power consumption and their power generation towards variable pricing structures. Furthermore, real-time information and energy management components also aim to help the customer contribute to even greater energy efficiency.

Stakeholders: MVV Energie AG, DREWAG – Stadtwerke Dresden GmbH, IBM Deutschland GmbH, Power PLUS Communications AG, Papendorf Software Engineering GmbH, University of Duisburg-Essen, ISET – Verein an der Universität Kassel e. V., ifeu Heidelberg GmbH, IZES gGmbH

The ICT gateway: the bridge between the power grid and the Internet

In an interview, project manager of the E-DeMa E-Energy project – Prof. Dr. Michael Laskowski – explains the special features of the model region of Rhein-Ruhr, the implementation of integrated homes and the significance of E-Energy.

What are the objectives of your model project?
The E-DeMa model project will develop solutions that will put the decentralized generation of energy and energy consumption in sync with one another in the future. To make this a reality, an energy marketplace and special mechanisms are to be made available to enable automated transactions between the power producers and prosumers. Private customers receive an energy efficiency solution that not only reduces their energy consumption but also shifts it to times when sufficient energy is available at a low cost.

What is so special about E-DeMa?
E-DeMa is putting its model into action in the city of Mülheim. In addition to E-DeMa, Mülheim also implements smart meters and solutions from the area of e-Mobility. The model region is located in the most densely populated part of Germany and represents all sections of society. An important focus of the E-DeMa project is the general application of the solutions, i. e. the aim is to develop solutions that can be generally applied to every household.

The E-DeMa project consortium at the kickoff event in Mülheim an der Ruhr in November 2008

Do you already have concrete plans to implement "SmartHomes"?
In the E-DeMa project, the ICT gateway is the basis for implementing the "integrated home" or "SmartHome". Furthermore, the specification and standardization of protocols also constitutes an important milestone. The same applies to terminals and appliances such as washing machines, heating systems or electric shutters.

What importance do you attach to the overall E-Energy project?
If successfully implemented, E-Energy will change the entire energy landscape on the medium term. The E-Energy solutions will be particularly important for integrating renewable sources of energy into the overall system.

E-DeMa

Development and demonstration of decentralized integrated energy systems on the way towards the E-Energy marketplace of the future.

Highly heterogeneous density of supply is characteristic of the model region of the E-DeMa project, which comprises rural and urban areas with two different distribution networks in the Rhine-Ruhr area. This results in particular technical challenges, which are overcome by the creation of an intelligent ICT infrastructure. The research project builds on the existing distribution of digital smart meters to drive energy efficiency in integrated homes (new "ICT gateway"). The focus of the project includes the development of an intelligent power consumption control system and the real-time collection and provision of consumption data. Furthermore, the project also aims to optimize network operation management in decentralized distribution networks.

Stakeholders: RWE Energy AG, Siemens AG, ef.ruhr GmbH, Miele & Cie. KG, Stadtwerke Krefeld AG, Prosyst Software GmbH

Using ICT to integrate electric vehicles into the power grid

In an interview, overall project coordinator of the regenerative model region of Harz – Heinrich Bartelt – explains why the region is suitable for the E-Energy program, the importance attached to electric mobility within the model project, and the role this area will play in the future.

Consortium partners of the Harz renewable energy model region at the kickoff event at the Wendefurth pump-fed power station in December 2008.

Why is the Harz region particularly suitable as a model region for E-Energy?
The model region is a very rural region that already boasts a high percentage of renewable energy sources today. The project encompasses a very broad range of diverse partners, from scientific research centers and technology development companies to power suppliers. In addition, all the grid operators and power utility companies active in the region are taking part in the project and combining their efforts to make the project a success. Furthermore, acceptance for our project among the public is very high.

How significant is electric mobility to your model project and are there concrete plans to integrate it?
Integrating electric mobility into the power network plays an important role in the project, with plans to equip and operate multiple vehicles. The vehicles will be provided with a bi-directional interface and will also be able to feed energy back into the power grid. In addition to using vehicles as storage units, the project also aims to examine the possibilities of load management, where the vehicle is charged at times that are most favorable for the energy system. Besides technically testing system services, business models that address all the business issues associated with integrating electric vehicles into the power supply system are also to be developed in the course of the project.

What role will electric mobility play in the future?
The future belongs to electric vehicles. Even with today's technology, electric vehicles could replace conventional combustion engines. A number of advantages are associated with electric vehicles, including no direct emissions, low noise pollution, time-tested technology and a high level of efficiency. Electric vehicles are a perfect alternative for commuters and will soon be a standard feature of urban traffic.

RegModHarz

Regenerative model region of Harz

With E-Energy, the control room at the renewable energy combined-cycle power plant in the Harz region receives real-time information on the energy situation in the region. With a complete overview of power generation, storage and consumption, it is possible to make forecasts, and optimum use can be made of the renewable energy sources. The Harz model region boasts extensive sources of renewable energy, ranging from wind farms and solar power systems to hydroelectric power stations.

Stakeholders: RegenerativKraftwerkHarz GmbH& Co KG, E.ON Avacon Netz GmbH, Siemens AG in.power GmbH, ISET e.V, Vattenfall Europe Transmission GmbH, Cube Engineering GmbH, Halberstadtwerke GmbH, Fraunhofer IFF, IEE-RE (University of Kassel), Otto-von-Guericke University of Magdeburg, envia Mitteldeutsche Energie AG, envia Verteilnetz GmbH, Harz Regenerativ Druiberg e.V., HSN Magdeburg GmbH, Stadtwerke Blankenburg GmbH, Stadtwerke Wernigerode GmbH, Stadtwerke Quedlinburg GmbH, Harz district

The smart kilowatt-hour is key to a self-regulating energy system

In an interview, project manager of the Smart Watts E-Energy project – André Quadt – explains the special features of the Smart Watts project, what is planned in the development of smart, integrated homes and why Aachen is particularly suited to act as a model region.

What is so special about the Smart Watts project?
SmartWatts focuses on the concept of the "intelligent kilowatt-hour", where power is supplied along with information on the power, such as the current price or how the power was generated. The integration of time-specific power consumption information and the transmission of control information within the energy system provides the basis for accurate invoicing and thus usage-based distribution of risks. This causes project participants to optimize their behavioral patterns, which includes the smart control and regulation of power consumption in the household.

How does your model project contribute to the creation of an "energy marketplace"?
The full potential of the smart kilowatt-hour and the increased self-regulating ability of the energy system can only be harnessed in a liquid market where pricing can be agreed with low transaction costs and low risk.

Smart Watts implements the concept of the smart kilowatt-hour in Aachen

In this context, the "Smart Market" component project focuses on the automatic initiation of business transactions to facilitate the exchange of flexible power supply products, such as power consumption forecasts for example. This is being developed in the "Smart Market" component project to make an energy marketplace a reality.

Smart Watts

Increasing the self-regulating ability of the energy system by using the "smart kilowatt-hour" and the Internet of Energy.

If you look up the definition of the word "smart", you will find terms like "clever", "intelligent" or "sophisticated". With precisely these kinds of ideas, Smart Watts is developing new approaches for the energy market, portfolio management, the measurement and analysis of power consumption, and invoicing systems. Customers receive a smart kilowatt-hour and can see where the electricity was produced, how it was transported and how much the power currently costs.

Smart Watts defines the Internet of Energy on three levels: at the system level (C), a number of power generation, consumption and control systems communicate with one another. At the business level (A), the stakeholders plan, control, monitor and optimize the efficient use of plants and contract conditions depending on their particular market role. The information level (B) is the centerpiece of E-Energy, linking the other two levels and allowing the stakeholders and systems in the "energy Web" to safely communicate with one another in real time.

Stakeholders: utilicount GmbH & Co. KG, Research Institute for Operations Management (FIR) at RWTH Aachen University, Kellendonk Elektronik GmbH, PSI Büsing & Buchwald GmbH, Soptim AG, Stadtwerke Aachen AG

E-Energy: the impetus for widespread development

E-Energy is a complex innovation program, constituting far more than just technical progress. The acquisition of transferable knowledge, the formation of networks for the rapid exchange of new E-Energy know-how, and the creation of effective, overarching collaborative structures to solve critical horizontal issues are primary objectives of the program.

To this end, the BMWi commissioned "supportive scientific research" that evaluates the progress made in the model regions on an ongoing basis, guarantees the interoperability of the solutions, and organizes the exchange of knowledge and information. The supportive scientific research develops networks of excellence, thereby guaranteeing the widespread effect of the program.

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