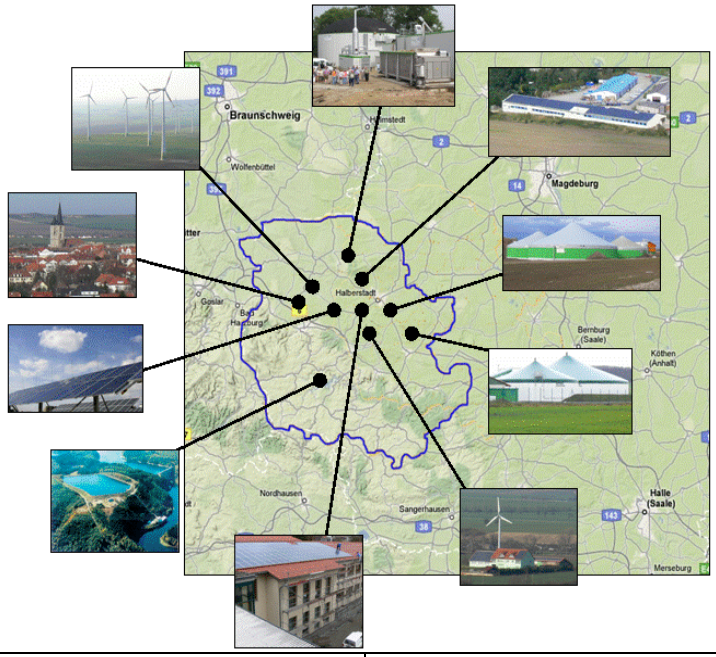
Project Summary
Regenerative Modelregion Harz

Project Description:

In a competition for the technology promotion initiative “E-Energy: An ICT-based energy system of the future” by the federal ministry for economics and technology (BMWi) and the federal ministry for environment, nature conservation and nuclear safety (BMU) consortia in six model regions were selected. One of these winners is the project “Regenerative Modelregion Harz (RegModHarz)” (regenerative model region Harz).

The objective of this project is the technical and economic development and integration of renewable energy sources (RES) by deploying modern information and communication technology (ICT). The project deals with the creation of an efficient energy infrastructure with a maximum share of regional renewable energies as well as with their organization and operation under market conditions.

Within this project, grid operators, energy suppliers, municipal utilities, wind farm operators, universities, research institutes and RES/ICT related companies will develop tools, infrastructures and strategies to supply a complete district with electricity solely from Renewable Energies. In the Renewable Model Region district Harz (RegModHarz), different renewable energy producers, controllable consumers and energy storage devices will be coupled by a variety of means such as electronic market places and distributed control mechanisms to a large virtual power plant (VPP).



Start Date: 2008-11-01	**End Date:** 2012-10-31	
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Project Participants:
Project coordination, virtual power plant, energy management: Fraunhofer IWES, University Kassel
Business models, energy management: CUBE Engineering GmbH, in.power
Grid operators: E.ON Avacon, envia, Vattenfall Transmission
Municipal utilities: Halberstadtwerke, Stadtwerke Blankenburg, Stadtwerke Quedlinburg, Stadtwerke Wernigerode
Wind farm operator: RKWH
ICT related companies: Siemens AG
Research for grid operation: University Magdeburg, Fraunhofer IFF

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CE1 – Integration of multiple distributed resource types

Description:
In the model region, the administrative district Harz, different types of renewable energy sources like wind farms, photovoltaic power plants, biogas systems, controllable consumers and energy storages like the a pump-fed power station Wendefurth and also electric-vehicles, will be combined to form a virtual power plant (VPP).This so called „ Regenerativer Energiverbund Harz – REVH" (renewable power plant Harz) is to prove, that a stable, reliable and consumer-oriented supply of electricity is possible – even with a high share of renewable sources of energy.

Key Deliverables:
- Stable and reliable combination of RES, controllable consumers and energy storages in a VPP

CE2 – Incorporation of dynamic rates or other approaches for connecting retail customers with wholesale conditions

Description:
In the project business models and processes will be developed, shaping the operation of the VPP on the basis of free market criteria as well as allowing efficient energy usage. In addition an internet platform will be created, which supports the trade of different energy products addressing customer groups like households, business customers, but also network operators.

For load management the communication connection of the consumers with the VPP is to be realized by means of a bi-directional energy management interface (BEMI). About 50 consumers with controllable loads (e.g. households, industry, supermarkets, cold stores etc.) will be connected to the VPP and the market platform using the BEMI. BEMI receives defined values from a central control center, e.g. the price profile for the subsequent day. The counter integrated in BEMI records the actual load and generation profile and transmits it for billing to the control center.

Key Deliverables:
- Business models
- Internet based marked platform
- Load management with the communication interface of the consumers with the VPP

CE3 – Integration into system planning and operations

Description:
The VPP will offer energy products and ancillary services via an electronic market platform and will be able to supervise and control a group from different generators, storage devices and controllable loads.

Plants equipped with modern inverters can perform tasks such as reactive power compensation, active net filtering, voltage regulation, etc. Their contribution to ancillary services for grid operation like voltage regulation, maintenance of supply reliability, reduction of net losses, avoidance of grid equipment overloading and black start capability will become essential in the future. In order to make use of these characteristics, concepts for the operation of those devices must be developed on the basis of an efficient data communication and a structured communications network with a control technology. Thereby, different economic and ecologic aspects have to be considered by an optimization process including energy management. For the reliable and economic operation of the VPP, energy production forecasts for wind farms and PV as well as consumption forecasts are of central importance. Furthermore price forecasts and a connection to the electricity exchange (EEX) are necessary to generate incentive signals. Via the electronic market platform, the end customers should finally be able to select different tariffs and services and thus adopt an active role in the market action. In order verify the correct function of this complex system in advance, models of all components will be built and the interactions will be simulated. With this simulation environment not only the technical functioning can be tested, but also the business models are examined, analyzed and optimized on the basis of real time series.

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Key Deliverables:
- Direct control of RES to supply of ancillary services
- Energy management
- RES and CHP forecasts
- Optimization resource scheduling

CE4 – Application of critical integration technologies and standards

Description:
Basis for a functional VPP is that the individual components can exchange information. Thus, the appropriate infrastructure has to be developed. To guarantee the interoperability of all system components and to enable the scalability of the VPP, the interfaces of all communication components have to fulfil international standards (IEC 61850, IEC 61400-25, IEC 61968, IEC 61970). Beyond that the ICT has to cope with the high requirements of the energy industry concerning reliability and system security. This is realized among other things by the use of redundant components and most modern coding algorithms.

Key Deliverables:
- Application and adaptation of international standards for information exchanging
- Feed-back to standardization bodies
- Recommendation for economic and legal frameworks

CE5 – Compatibility with EPRI Smart Grid initiative goals and approach

Key Deliverables:
- Description of system architecture using UML (Use cases and others)
- Collaboration with standardizing bodies
- Interconnection of different RES and DER (decentralized energy resources)
- Interoperability of system components
- Development of business models for an micro-economic operation of RES
- Field tests to verify system management concepts

CE6 – Leverage of additional funding sources

Description:
This project is funded by the federal ministry for environment, nature conservation and nuclear safety (BMU) which provided about €10 million. In addition, there is a contribution of industry partners which amounts to approximately 40% of the total funding. That amounts to an overall budget of about €16 million.

Progress Summary (Conclusions, Recommendations):

The project is in the first of four years. In this early stage the work focuses on analysis and concepts. Simulations are about to start. Field tests will not start before beginning of 2012.

As the project is an early phase all the entries in this survey are representing our approaches, i. e. those things we are planning to do. The things to be put into practice will be determined by simulations and analyses. It is also restricted by the economic and legal framework.

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Preferred Criteria		Description of Project Element (if applicable)
1) Does the project integrate multiple distributed resource types?		yes
a	Demand Response	☒ Direct Load Control Program ☒ Demand Response Program ☒ Electric Vehicle Charging ☒ Thermal Storage for Electric Peak Shifting & DR Other:
b	Electric Energy Storage	☐ Behind the meter Battery Storage ☐ Utility System Battery Storage <= 100kWh ☐ Utility System Battery Storage > 100kWh ☐ Flywheel Other: Pumped-storage hydro
c	Renewable Generation	☒ Solar PV (Customer Owned) ☐ Solar PV (Utility Owned) ☐ Concentrated Solar ☒ Wind Generation ☒ Biogas Other:
d	Distributed Generation	☐ Diesel Generator ☐ Microturbine ☐ Fuel Cell ☒ Combined Heat & Power ☐ Compressed Air Energy Storage Other:
e	Other	
2) Does the project apply critical integration technologies and standards?		yes

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a	Customer System Interfaces	☐ 6LowPAN ☐ ANSI C.12.xx ☐ BACnet ☐ DNP3 ☐ HomePlug ☒ IEC 61850 Family ☒ Internet Based (wired or wireless – IP, TCP, HTTP) ☒ MODBUS or MODBUS/TCP ☐ oBix ☐ OpenADR / OASIS Energy Interop ☐ Smart Energy Profile (SEP) 1.0 or 2.0 ☐ ZigBee (802.15.4) Other:
b	Distribution System Interfaces	☐ DNP3 ☐ IEC 60870 (ICCP) ☒ IEC 61850 Family ☒ IEC 61968 Family ☒ IEC 61970 Family ☒ Internet Based (wired or wireless – IP, TCP, HTTP) ☒ MODBUS or MODBUS/TCP ☐ Multispeak Other: IEC 61400-25
c	Transmission System Interfaces	☐ DNP3 ☐ IEC 60870 (ICCP) ☒ IEC 61850 Family ☒ IEC 61968 Family ☒ IEC 61970 Family ☐ Internet Based (wired or wireless – IP, TCP, HTTP) ☐ MODBUS or MODBUS/TCP ☐ Multispeak Other: IEC 61400-25

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d	Aggregator/Service Provider System Interfaces	☐ ANSI C.12.xx ☐ Cellular Based (1xRTT, GPRS, EVDO, CDMA, etc.) ☐ DNP3 ☐ FixML ☐ IEC 60870 (ICCP) ☒ IEC 61850 Family ☒ IEC 61968 Family ☒ IEC 61970 Family ☒ Internet Based (wired or wireless – IP, TCP, HTTP) ☐ Multispeak ☐ OpenADR / OASIS Energy Interop Other: IEC 61400-25
e	Operations System Interfaces	☐ DRBizNet ☐ FixML ☐ IEC 60870 (ICCP) ☐ IEC 61850 Family ☒ IEC 61968 Family ☒ IEC 61970 Family ☒ Internet Based (wired or wireless – IP, TCP, HTTP) ☐ Multispeak ☐ OpenADR / OASIS Energy Interop Other: IEC 61400-25

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f	Energy Markets System Interfaces	☐ ANSI C.12.xx ☐ DNP3 ☐ DRBizNet ☐ FixML ☐ IEC 60870 (ICCP) ☐ IEC 61850 Family ☐ IEC 61968 Family ☐ IEC 61970 Family ☒ Internet Based (wired or wireless – IP, TCP, HTTP) ☐ Multispeak ☐ OpenADR / OASIS Energy Interop Other:
g	WAN Communication Architecture	☐ AMI Infrastructure (Two-Way) ☐ RF Tower ☐ RF Mesh ☒ Public Internet ☒ Cellular Based (1xRTT, GPRS, EVDO, CDMA, etc.) ☒ Powerline Based ☐ WiMAX Other: DSL
h	Cyber Security	☐ Audit trails ☒ Authentication ☒ Certificates ☒ Encryption ☐ Intrusion Detection Other:
i	Other	
3) Does the project incorporate dynamic rates or other approaches for connecting retail customers with wholesale conditions?		yes
a	Customer Diversity	☒ Residential Customers ☒ Commercial Customers ☒ Industrial Customers

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b	Price Based	☐ Real-Time Pricing (RTP) ☒ Day Ahead Pricing ☐ Critical / Variable Peak Pricing ☐ Time of Use Rates ☐ Block (or Reverse Block) Rate
c	Incentive Based	☒ Emergency Demand Response ☐ Demand Bidding/Buyback ☐ Capacity Market ☒ Ancillary/Regulation Services ☐ Interuptible/Curtailable ☐ Direct Load Control Other:
d	Other	
4) Does the project integrate with system planning and operations?		
a	Integration with System Operations	☐ Visibility of DER with Real-Time Sys Ops ☐ Integration with Distribution Management System Other:
b	Integration with System Planning	☐ Visibility of DER for future planning ☐ DER treated on equal footing as Generation Other:
c	Tools for Integration	☒ Modeling and/or Simulation Tools Other:
d	Other	
5) Is the project compatible with EPRI's initiative and approach?		
a	Business case development	yes
b	Use cases as documentation of important applications and requirements	yes
c	Use of Standards in Utility Domains	☒ Customer Domain ☒ Distribution Domain ☒ Transmission Domain ☒ Aggregator/Service Provider Domain ☒ Operations Domain ☒ Energy Markets Domain

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d	Enables Widespread integration of DER	☒ Public Sharing of Business Cases ☒ Public Sharing of Use Cases ☐ Public Sharing of Cost Benefit Analysis ☒ Public Sharing of Lessons Learned ☒ Working Directly with Standards Bodies ☐ Leveraging or Advancing Open Source Software
e	Other	
6) Does the project leverage additional funding sources?		yes
a	Leverage Additional Funding Sources	☒ Government (Local, State, Federal) ☐ Research Organizations besides EPRI ☐ Universities, Consortiums ☐ Vendors Other:
b	Other	