



# Project Synopses Energy Systems, Grids and End-use

(Smart Grids, Green ICT)

Projects of the Austrian R&D Programmes 2007-2009

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# Project Synopses

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Vienna, May 2009



## **Preface**

To solve the energy issue is one of the most important challenges for the future. We have to build up a save, environmentally sound and economic energy system that comes up to the social needs of the human race. To achieve that goal, holistic, long-term and consistent strategies are needed.

This publication presents the results of completed and ongoing projects within the subject area “Decentralised Generation and Smart Grids” (2008-2009) of the programme “Energy Systems of Tomorrow” as well as projects financed by means of the Austrian Energy- and Climate Fund.

The participating research institutes and companies have achieved many remarkable and internationally acknowledged results. Some of them are already working on projects in order to carry out field tests and create concepts for live demonstrations. We are pleased to see extensive cooperation and commitment among the participants which has allowed for the high quality results we have seen until today.

Building on this and on the outcomes of a broad stakeholder involvement in the Austrian strategy finding process e2050 the topic is pursued within the subject area “Energy Systems, Grids and End-use”. I am looking forward to this challenging work in cooperation with the Austrian Industry and correspondent research networks, funding schemes and programmes as well on a national as on the European and international level.

Michael Paula

Austrian Federal Ministry for Transport, Innovation and Technology  
Head of Division for Energy and Environmental Technologies



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## Spatial models as a basis of decision making for the utilisation of regionally available energy potentials for a CO<sub>2</sub> neutral satisfaction of the local heat demand

(Original Project Title: Multifunktionale Energiezentren: Räumliche Modelle als Entscheidungsgrundlage für die Inwertsetzung regional verfügbarer Energiepotenziale zur CO<sub>2</sub>-neutralen Deckung des lokalen Wärmebedarfs)

Project No. 814139

### Synopsis:

Analytical GIS-methods to model regionally available renewable energy potentials for the evaluation of measures to achieve a CO<sub>2</sub>-neutral heating and cooling supply.

### Abstract:

In Austria more than half of the final energy consumption is needed for the provision of space heating & hot water (~30%) and process heating (~23%). Therefore measures in the heating sector will play an essential role when trying to tackle climate change. In this context a possible, sustainable approach is the exploitation of regional, renewable energy sources to satisfy the heat demand in a CO<sub>2</sub>-neutral way. The principal idea behind this is to meet a region's energy demand with locally available energy resources.

### Objective

The aim of this project is to provide a profound and objective basis for decision-making concerning this kind of question. For this purpose the project's main focus will lie in the development of transferable, spatial models to demonstrate to which

extent the demand for heating and cooling can be satisfied with regionally available, renewable energy sources. This information can be further used to make conclusions about the possibilities of a CO<sub>2</sub>-neutral supply.

### Workflow

The first part of this project will consist in the assessment of the "as-is" situation in the test-region (Murau & Feldbach/Radkersburg), which includes a spatially resolved mapping of the current supply of heating and cooling, its corresponding demand and the existing relevant infrastructures. Based on this information the project proceeds with the development of GIS-models for the estimation of regional solar thermal, geothermal and biomass potentials on the one hand and the representation of the demand for space heating and cooling, hot water and process heating on the other hand. The employment of geographical analysis methods with their functions of data aggregation and overlay allows the combination of several technical, legal ecological and economical factors on the basis of their spatial reference.

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## **Analysis of the potential use of renewable energy sources in the industrial region of Krems (Lower Austria)**

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(Original Project Title: Energiepotentialanalyse Industrieregion Raum Krems)

Project No. 815584

### **Synopsis**

Analysis and use of regional renewable energy sources and its integration in the regional and industrial energy structure, i.a. optimized energy structures in industry and efficient inter-firm energy supply

### **Abstract**

#### Starting situation

The region around Krems is on the one hand an important industrial location, on the other hand, a famous wine-growing area. A sustainable energy system is important for the region, hence, in ecological as well as economic regard. The resident industrial companies from the sections plastic, metal, chemistry and wooden processing with about 3000 employees have national function, they play as a buyer or supplier for regional enterprises an important role.

For the energy-intensive production plants, security of supply and competitive energy costs are important. The city of Krems has no own energy production, the raw materials for the thermal main power stations in the region must be imported. Neighbouring municipalities indicate interest to realize renewable energy supply projects with the local agriculture. Uncovering of saving potentials, the optimisation of the regional power demand and its cover by renewable energy from the region are on account of the low degree of the own care, hence, of high priority.

#### Project goal

The goal consists of the analysis of specific plans for the implementation of measures for increasing efficiency and the

integration of renewable energy sources in the Krems region and its environs. Accordingly, the main goals are a plan for an efficient and sustainable energy supply for the participating industrial operations in the contemplated region and the best-possible integration of the industrial energy supply into the energy supply for the region, which is the reason the overall energy situation for the region is also considered at the same time. Through the detailed analysis of selected industrial operations, conclusions should also be made regarding possible options for increasing efficiency, as well as integration options for renewable energy sources for similar operations.

#### Contents and approach

##### **Energy analysis for the Krems industrial region**

First, data regarding energy production, distribution and consumption for the Krems regions will be collected, with the focus on the final energy sources electricity, natural gas and fuels, other energy source for the provision of heat, and the internal production capacities of the region.

##### **Energy analysis for selected operations in the Krems industrial region**

The energy requirements and consumption structure of selected operations in the Krems region and environs will be analyzed with their assistance, with respect to their heating requirements and possible waste heat options in particular. The analysis will provide precise accounts of the energy structures of selected industrial operations, including possible starting points for the deployment of renewable

energy sources and the use of measures for increasing efficiency.

### **Energy analysis of the potential for renewable energy sources**

The region will be studied for options for renewable energy sources, possible conversion technologies, and potential industrial waste heat.

### **Synthesis and creation of a plan for a model regional system**

By consolidating the results of the analysis, the registered options for the deployment of renewable energy sources in the region and in the selected industrial operations will be reconciled with the options available.

### **Business plans for operational sites**

Sample business plans will be created for equipment that brings about increases in energy efficiency at operational sites for the specified operations, or for technolo-

gies in the field of renewable energy sources.

### Expected findings and results

After the 18-month project duration, a plan for a model regional system should exist. It will indicate the energy structures optimized for efficiency and for the use of renewable energy sources for selected industrial operations, and the integration of the industrial and regional energy structure, by means of joint use of regionally available renewable energy sources on the one hand, and by means of industrial waste heat in households and businesses on the other hand. The potential for CO<sub>2</sub> emissions reduction that can be achieved by converting to a renewable energy system will be indicated, as will the necessary customer and producer requirements for conversion.

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## The Use of wind energy in skiing regions – Evaluation of the consume of electricity and dissemination of the results of the analysis

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(Original Project Title: Windenergienutzung in Schigebieten – Evaluierung der Strombereitstellung und Verbreitung der Ergebnisse)

Project No. 815602

### Synopsis

Skiing regions have an big potential to use wind power for producing energy. In this regions the needed infrastructure, such as electricity network and access routes is given.

Main goals of the project are the analysis of the location Salzstiegl concerning the coverage of their own electricity needs with an already existent windmill as well as a following dissemination of the outcome of the analysis in form of a workshop for all ski lift carriers of Austria.

### Abstract

According to CO2 and energy policy in Austria the use of wind energy is also important in alpine regions under consideration of the ecological criteria.

Generally the occurrence of wind rises depending on a change of the sea level.

The main topic of the project is the analysis of the windmill in the skiing region Salzstiegl, location Rosseben, which was built in september 2007. The type of the windmill is Leitwind LTW 77 with a capacity of 1.500 kW, a rotor diameter of 77 m and a hub height of 65 m. The wind power station is operated by the local skiing

region carrier. The generated energy is then used for the own needed electricity of the whole skiing area. Energetical surplus is beeing injected to the public electricity network.

In the future an water reservoir is planned not far away from the windmill. Energetical surplus will then be used for pumps which will pump water into the water reservoir.

The project is aimed to show:

- a) if the windmill is able to produce enough energy to cover the electricity need of the skiing region,
- b) if the measures, especially the ice warning system IGUS, are adequate, which effects icing will have on the supply of energy
- c) and the attitude of the tourists towards the windmill.

A workshop for all ski lift carriers as well as a publication are meant to spread the findings of the study.

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## Developing of a application for central visualisation of the energy and resource demand in a private household (ZENVIS)

(Original Project Title: Entwicklung eines Zentralen Visualisierungsgeräts für den Energie- und Ressourcenverbrauch in Haushalten (ZENVIS))

Project No. 815657

The main focus of the research project ZENVIS is set on the analysis of the benefits provided by a “visualization device”, which gathers the readings of energy and resource consumption (electricity, gas, water, heat energy and fuel consumption). This device ought to find its use in households and to allow the consumer to observe and to control his energy consumption.

If the energy transformation should be accomplished, first steps towards this change must be the reduction of the energy consumption – this is the common consensus of energy experts. The Austrian private households mark an enormous potential. In this sector relevant reductions are not realisable by big applied arrangements, but rather through meshing of many small changes of user behaviour like aware purchase and application of energy-efficient devices or reducing the use of standby-mode. The main idea of the device “ZENVIS” is to show all available energy consumption data in a household on one screen, whereas a psychological effect should be created such as a tachometer or as an on-board vehicle computer. The energy and resource consumption in households supposed to be perceived as constant cumu-

lative value and the consumer ought to be converted by his interposition from passive paying bills to acting responsible. The device has its own location, where it shows the current consumption of electricity, heat and water.

To support the development of this energy and resources consumption visualizing device in households, it is needed to make enquiries about potential of reduction in private households, user behaviour and the state of technology. Building on that, analysis about consumer behaviour and consumer acceptance via workshops and interviews with experts will be established and the technical feasibility of ZENVIS will be checked. Then the systems available on the market will be examined and evaluated.

Those systems, which have been proved as suitable, will be discussed together with the building developer regarding the application in the demonstration project and where needed and possible they will be adapted. Thereby the surplus costs of the system, the effect of marketing and the expected user acceptance will be analysed and a concept for the implementation of a centralised will be carried out.

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## Power stations and changing climate – impacts on electricity generation

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(Original Project Title: Kraftwerke im Klimawandel – Auswirkungen auf die Erzeugung von Elektrizität (KRAKE))

Project No. 818856

Changing climate conditions predominantly lead to changing ambient temperatures and shifting in precipitation events. All these effects have a direct impact on electricity generation for the public grid by hydro and thermal power stations. Each of these effects is known, whereas a consistent data basis which enables the assessment of interactions between thermal and hydro power stations has not been established as yet.

Ambient effects on different technologies of power stations are evaluated and documented as a basis for integrated simulations of the electricity production in hydro thermal power station systems. Additionally technological measures for the abatement of these ambient effects on power station technology (e. g. cooling of rejected water, inlet-air-fogging, evaporation cooling) are identified and critically evaluated for future integration. All this data is applied in a final demonstration

example which shows the interactions of ambient conditions, hydro power and thermal power stations at a chain of power stations at an Austrian river.

Results of the project:

- Consistent data on ambient effects on different technologies of electricity generation (hydro power, thermal power stations) as a basis for integrated simulations of hydro-thermal power station systems.
- Compilation of feasible technological measures for the abatement of ambient effects on power generation.
- Simulation example for the demonstration of data significance and quality.

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## Solar Safe

(Original Project Title: Solar Safe – Demonstration und experimentelle Entwicklung von technischen Lösungen zur effizienten Speicherung und und Bereitstellung von Energie aus regenerierbaren Energieträgern)

Project No. 818869

The Austrian industry, especially the energy intensive industry, uses a huge amount of fossil fuels for their technical processes. In spite of a high efficiency level, you always have areas, where industrial waste heat leaves the process. You can find these sources of waste heat in different quantities and qualities and they cannot be used any more for the industrial process. Nearly in the whole energy intensive industry you can find also consumers of heat (heat sinks). They also appear in different qualities and quantities. To bring these heat sources and heat sinks successfully together, you need special knowledge and a detailed process evaluation. That is the only way to ensure the success of such a project.

This project focuses on the main waste heat sources of an industrial company. A feasibility study will be made and this study has the aim to evaluate the possibility of producing electricity and heating water out of the heat sources. The main aim is a combined production of electricity and waste heat. Different techniques of producing electrical energy will be evaluated and then the existing techniques, for example the ORC (Organic Rankine Cycle), will be optimised for the individual waste heat source. Especially this optimisation includes a highly innovative part. The only way for industrial companies to deal with such topics is to cooperate with experts in this innovative process. Next to the evaluation of the combined solution (electricity and heating water), also the exclusive production of heating water should be handled.

Within a first step, the different waste heat sources will be analysed and the possibil-

ity to use them for the production of electricity or heating water will be evaluated. As mentioned, the optimisation of existing electricity production techniques is one main aim in this project. Also the technical risks of this project will be checked at this time. Technical risk means especially the handling with different forms of corrosion or the problem of depositions during the process of exchanging the process heat. Every individual waste heat source has to be evaluated according to this technical risk.

For the production of heating water the project will start with analysing the internal and external demand for heating water or also for hot process water. Then it's possible to decide, which of the heat sinks can be supplied and which backup systems are necessary. One of the innovative aspects in this part of the project is the idea of installing a heat buffer to bridge short breakdown times of the industrial process.

According to the results of the feasibility study, the technical equipment which is necessary for the transport of the heat from the industrial process to the heat sinks, will be defined. Next to the focus on the technical feasibility study there will be done also an economical view of the solution.

Superior aim of this project is to find the best solution for using industrial waste heat for the production of electricity or heating water. This solution improves the thermal efficiency of the company and helps to reduce the input of fossil fuels and the emission of CO<sub>2</sub>.

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## OREANIS

(Original Project Title: Optimierter regionaler Energieausgleich in elektrischen Netzen durch intelligente Speicherung (OREANIS))

Project No. 818880

Present situation: The increasing energy demand requires a massive extension of electric power generation capacities. This process leads to energy systems which are more and more de-centrally organised and utilise more renewable energy sources. The demand structure is dynamically changing its pattern and is extremely difficult to forecast. In Austria, especially solar energy, biomass, wind and mini-hydro will play an important role in the future. Assuming positive framing conditions, there will be 20% of domestic power production covered by solar energy according to the recently published "Photovoltaik Roadmap"<sup>1</sup> until 2050.

The partly fluctuating feed-in and the even more dynamic development with respect to the varying loads are key challenges for the distribution sector. Besides the sophisticated integration of power generators the adequate storage of energy is the key task to be mastered.

Storage management is possible in the following ways:

- Storage of primary energy carriers (water, biomass)
- Storage of secondary energy carriers (electric energy, indirect storage via pumped storage plants, biogas)
- Load management as a load balance tool (Demand Side Management and load management such as load shifting or shedding)

**The primary objective of OREANIS is to compensate the natural generation fluctuations of renewable energy technologies by intelligent storage, control and optimisation of the energy demand and generation. Thus, an efficient load balancing mechanism in the regional grid can be achieved. Within the project basic issues and the premises for industrial research will be evaluated. Thus the basis for solutions for the challenges of network operation will be created**

In order to do so the potentials of the three mentioned strategies will be evaluated and a concept for their optimal integration will be elaborated.

Subject of Research: OREANIS investigates how; despite of the fluctuating generation caused by renewable generation, a regionally balanced energy and power provision can be managed. The energy balance considers the traditional generation units, the possibilities of energy storage and the options of demand side management.

<sup>1</sup> H. Fechner et al., Technologie-Roadmap für Photovoltaik in Österreich, Berichte aus Energie- und Umweltforschung, 28/2007

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## AMIS

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(Original Project Title: Systementwicklung Automatisches Metering- und Informations-System (AMIS) im Netz der Energie AG)

Project No. 818895

### Starting Point

Currently there is no communication possible among metering units in households and transformers. Essential measurements within the electricity network can just be traced back to the transformers, but not until the end customer. This means that the electric consumption has to be read out manually and that an individual adjustment of tariffs is just possible in a very limited way. Further there is no data exchange among control centre and meter, and the slip stream respectively circuit interrupters have to be activated via a audio frequency control diagram transmitted over power supply line (ripple control relay – data line – transformer station – transformer – low voltage – ripple control receiver – circuit interrupter). Moreover, the assignment for installation and configuration of the meter goes just via hard copy. All the mentioned reasons resulted in the decision, to test the newly developed **automatic metering and information system** (AMIS) in the net of an electric company (electricity supplier) for practical relevance and adopt the solution to the existing network.

The mentioned system consists of following hardware: -meter, -circuit interrupters and -external device gateway. These components communicate over DLC (distribution line communication) with the data concentrator placed in the transformers and with the AMIS control centre. The AMIS control centre is able to communicate with the data concentrators via different communication technologies and is finally integrated to the existing application centres (SAP, Power Quality Management, central network processor, etc.) to allow all processes like monthly clearing

or changes in tariffs being directly administrated from the application centres.

### Goals

In this demonstration project following should be worked off:

- (i) Testing of all component functionalities in regular operation at 10.000 customer facilities
- (ii) Establishing the entire integration and testing in regular operation
- (iii) Integrating and testing the entire system AMIS in existing as well as newly developed application centres
- (iv) Integrating all components in network management system for operational management

In the final stages the entire functionality with extensive test plans should be verified, as well as the availability and response times of operation processes by a so called stress test, where all occurring processes in regular operations can be accomplished simultaneously.

This means, that an advanced and end customer-oriented power management system should be developed, that is able to supply the end customer with detailed real-time information on energy consumption, so they can analyse and optimize their energy demand.

### Contents of the project (Methods)

...is the extensional testing of the completely new **automatic metering and information system** (AMIS) in the upper Austrian electricity network of currently 1.000 AMIS meters (proof of concept) up to 10.000 AMIS meters. In this process following tasks have to be fulfilled:

- development, testing and optimization of the workforce management system
- development and testing the integration of AMIS control centre with existing application centres
- installation of the AMIS infrastructure, counter and circuit interrupter
- evaluation of system characteristics of the communication infrastructure as well as testing the application centres in regular operations at 10.000 customers (definition and development of a testing environment suitable for daily use)

- development of the network management system (NMS)

### **Expected Results**

Evidence of the functional capability of all proposed tools and automated processes, as well as the metrological evidence that the response times of the various processes and the availability are suitable for real-time operation. Just be evaluated whether the NMS for the management of approximately 4,000 data concentrators and 490,000 terminals are suitable.

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## PowerSaver – Activity Based Implicit Energy Management

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(Original Project Title: Power Saver - Aktivitätsbasiertes implizites Energiemanagement)

Project No. 818898

The EU Action Plan for Energy Efficiency COM(2006)545 unveils on an **EU wide energy saving potential of more than 20% by 2020**, achievable without loss of economic strength or quality of life - and calls for action plans to reduce energy inefficiency. The Austrian energy efficiency Action Plan (according to EU regulation 2006/32/EG) has developed energy saving benchmarks, and a “National Plan of Energy Efficiency Measures”, among them being the “Development and Exploitation of Energy Efficient Appliances and Solutions” (Stand-by).

Today’s electronic equipment, machines and appliances, as a matter of convenience, provides features to be **explicitly switched** to reduced energy consumption modes (“stand-by” modes), when not in active use (but to be instantly ready for use upon explicit user invocation). Though bearing potentials as an energy saving solution, more and more empirical evidence is delivered by the analysis of behavioural patterns in user studies, reporting effects towards the exact opposite: With the ability to just put an appliance in stand-by mode when not in use, devices are no longer switched (totally) “off” – thus causing surprisingly high so called “stand-by losses”. The “stand-by mode” of electronic devices and appliances is thus subject to a discussion of prohibition in some of the member states.

The **PowerSaver** research project proposes a power management solution

based on sensors for activity and context recognition, in order to avoid standby losses of electronic equipment, machines and appliances. It builds on an automatic (or **implicit**) switching of stand-by modes of these devices, based on the recognized or anticipated situation (rather than forcing users to explicitly switch among those modes). Clearly, such a solution is highly reliant to a reliable and robust recognition of user activities (like walking, standing, sitting, lying; working, reading, cooking; editing or “in conversation”, etc.), and user situations (or contexts) like “at his desk” or “in a meeting”, etc. We have developed the architecture of such a solution, together with the methods and algorithms involved in context recognition and activity tracking [Fers07a].

As a cooperation among one of the largest power authorities and network operators in Austria, Energie AG, and the Institut für Pervasive Computing (University of Linz), this project will develop an activity based implicit energy management solution, and install and validate it in a testbed of about 12.000 newly installed Energie AG smart meters. Activity and context recognition methods based on technical sensors (accelerometers, gyroscopes, acoustic sensors, etc.) in different embeddings (body worn, integrated in artefacts or into the environment) will be studied and empirically validated in two case studies (“office” and “home”).

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## Development of an innovative and profitable small-scale wind turbine to generate energy for households and small companies

(Original Project Title: Entwicklung einer innovativen und rentablen Kleinwindkraftanlage zur Energiegewinnung für Haushalte und Kleingewerbe (SMARTWIND))

Project No. 818905

### Synopsis:

Within the „Neue Energien 2020“ project the development of an innovative and cost-effective small wind turbine including a new wing shapes from composite material for private use is realized. The aim is to develop a profitable and environmentally compliant wind engine that generates already at a low wind strength electrical energy, and therefore allows independent, decentralized, efficient and CO<sub>2</sub> neutral energy.

### Abstract:

The aim of the project SMARTWIND in the program “new energy 2020” is to create a database for the development of a simple and economical small-wind-powered plant for decentralized applications. Planend markets are private user, local federations and companies who want to produce independently energy for there own. This project combines 5 partners with different skills from the ranges of energy, electrical and composite technology, flow dynamics and research establishments to a unique interdisciplinary team. A new design of the wind wheel geometry should make it possible to win electricity efficiently, already with small wind forces and over the complete range of the wind energy spec-

trum, and allows the use of it in different applications in houses or companies. Goal of this development is to place it to the market as an efficient and economical wind power plant that makes a return of investment possible after 6 to 8 years also without governmental sponsorship.

On the one hand the innovation of this wind wheel development will be ensured by a new geometrical design and the modular structure as well as the used recyclable composite materials. Caused by the principle conception and the, out of it, optimized manufacturing cost an economical plant will be realised. Furthermore by the development of an intelligent and compact electronic unit, which gets along with standardized components, the costs of the system are kept low and the energy output high. A further goal of the project is the integration of this system into already existing photovoltaic plants, to use already existing resources. This kind of renewable energy will work as stand alone solution as well as in existing electricity networks. Energy storage and the feeding-in of energy in public grid will be also part of the project investigations.

The project will create all the necessary technical, legal and economical data for a successful development of such systems.

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## **e-Motivation Optimization of Energy Billing for the Motivation of Energy End Users**

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(Original Project Title: e-Motivation - Energieabrechnungs-Optimierung zur Endverbraucher motivation)

Project No. 818909

Given the yearly increase in energy demand of 2.7% in Austria, covering the growing energy demand in the medium and long run - whilst holding security of supply at least constant and fulfilling the Kyoto protocol - can only be successful with a strong increase in energy efficiency.

The energy service directive 2006/32/EC of the European Commission and the 1st Energy Efficiency Action Plan of Austria put a strong emphasis on the importance of initiating changes in the behaviour of consumers. Guiding consumers towards a more efficient use of energy is considered to be a prior measure to achieve Austria's energy and CO<sub>2</sub>-reduction goals.

A recent study has shown that 97.5% of the households do not know how high their energy consumption is. To initiate a change in consumer behaviour the consumers need to be informed about their energy consumption habits. Without detailed and easily understandable information about the individual energy consumption a successful realization of the end energy and CO<sub>2</sub> saving goals is not possible. To solve these problems in consumer information an innovative and intelligent system of energy metering is indispensable.

The aim of this project „e-MOTIVATION“ is the development of realisable and viable systems of intelligent energy billing procedures for a sustainable motivation of energy consumers towards an efficient and ecologically friendly use of energy.

Within this project which is undertaken by a project consortium consisting of scientists, energy suppliers, equipment manufacturers and consumers technological, administrative and judicial claims on the creation and implementation of intelligent

energy billing procedures (Smart Billing) on the basis of intelligent measurement systems in Austria are specified. This project does not only concentrate on the current discussions of “Intelligent measurement of electricity”, it also has an eye on all grid-bound and non-grid-bound energy sources, analyses existing solutions in Austria and abroad. As a result the project develops optimized solutions for Austria.

The possibility of a direct implementation of the results on the market is an essential part of the project as it has a high economic and ecological potential. Even though the project focuses on possibilities of motivating the consumers through intelligent measurement systems e-MOTIVATION also has a sight on the position of energy suppliers, questions of cost efficiency of such new systems and financing aspects of a potential area-wide application of intelligent energy billing procedures.

A further essential core-piece of e-MOTIVATION is the accomplishment of a pilot project. Within the pilot project the developed prototypes of billing systems will be tested and their effect on the consumers end energy consumption will be evaluated. The pilot test will be carried in the supply area of one project partner who has already installed smart meters (12.000 pieces) and will cover about 1.000 households. Given the evaluation results of the pilot project the billing systems effectiveness on the end energy consumption of consumers will be analysed and additionally a system for quantifying end energy savings and climate protection potential of intelligent billing systems will be conveyed. Such a systematic on the basis of real data is necessary for offsetting the

achieved energy and CO<sub>2</sub> savings of the systems to the energy and emission reduction goals of the European Commission. In this context the project accomplishes a direct contribution to the compli-

ance of European directives (for example the directive 2006/32/EG) and of climate protection agreements.

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## KWKW.OPT

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(Original Project Title: KWKW.OPT - Optimierung der Energieeffizienz von Kleinwasserkraftwerken)

Project No. 818923

The project includes the design of a computer program for calculation of the economic efficiency of existing small hydro power plants (SHP) (notice: in Austria are about 3300 existing small hydro power plants).

The basis of the calculation is the technical check of all components. A systematically approach of the small hydro power plant with the software ensures a cost-efficient analyses and shows possible improvements.

The analysis of existing small hydro power plants (SHP) consists of:

- step 1: check of design of the small hydro power plant

- step 2: check of construction
- step 3: check of electrical engineering, control and turbine technology
- step 4: calculation of efficiency of small hydro power plant
- step 5: economic efficiency calculation
- step 6: check of technical feasibility for implementing an online-control-tool in a small hydro power plant

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## Intelligent Energy Management - Energy Efficiency with Active Climate Protection

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(Original Project Title: Energiepark - Neue europäische Energieeffizienz mit aktivem Klimaschutz)

Project No. 818938

### Synopsis

For the energy park Plesching the LINZ AG installed an intelligent energy management system for the first time with private customers, trade customers and municipal customers in completely Austria. The Intelligent Energy Management signifies for the users more quality of life at a higher degree in residential comfort and a lasting reduction of the total energy consumption.

### Abstract

ENERGY PARK – Economically, efficiently and ecologically

### Intelligent Energy Management:

An overall system is installed for the distant query, control, evaluation and charging by consumption data. The electricity, water, warmth and gas counter dates will transfer with each other combined by means of the most modern Powerline technology. New rates and

Online-Monitoring contribute to a total energy reduction of 7%.

### Infrastructure Management:

The Infrastructure Management offers special control possibilities for the public street lighting and road lighting, pressure control systems (water, sewage and gas) as well as available heating kettles, heat pumps and a lot of other technical equipment of public buildings in addition to the options of efficiency 1.

Other 3-5% of whole energy can be saved by these load-optimised control possibilities.

These optimised control possibilities saves more 3-5% of total energy.

The total project of the energy park encloses 121 residential properties in the categories flats, terraced houses and row houses.

**The total saving potential of the energy park is 550 to CO2 per year.**

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## LIBS – Lithium-ion battery system development

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(Original Project Title: LIBS – Lithium Ionen Batteriesystem-Entwicklung)

Project No. 818856

### Synopsis

The project content consists of basic research and development to the point of concept maturity, incl. validation of electric storage systems (high-energy and high-performance batteries) for automotive applications (hybrid and electric vehicles).

### Abstract

Massive changes of the boundary conditions for the automotive industry with regard to environmental issues open up the opportunity and challenge for the submitter to establish a new business in the field of electric energy storage systems.

The research content of the current research period is focused on 3 work packages:

- high-energy/high-performance battery (based on lithium-ion technology) with prismatic cells for application in hybrid and electric vehicles
- high-performance battery (based on

lithium-ion technology) with prismatic cells for application in mild-hybrid and full-hybrid vehicles

- development of a simulation and validation method

The technical challenge consists of developing entirely new battery systems that meet the manifold, interdependent and technology-specific requirements of the lithium-ion technology in the context of lack of experience in the field.

The methods include technical literature research, interviews with potential technology suppliers and experts from universities, competition analysis, measurement of function models, concepts, calculation, modeling, simulation, hardware/software development, set-up and validation of prototypes.

We expect a battery function model (concept maturity) as result of our project.

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## MILA ELECTRIC VEHICLE

(Original Project Title: MEV – MILA ELECTRIC VEHICLE)

Project No. 818940

### Synopsis

The climatic changes, which appear to become more and more problematic, and their associated current or future market requirements prompted our company to develop in the course of a research project a vehicle that at first will be a so-called plug-in hybrid vehicle, but finally a purely electric vehicle that owing to its minimized manufacturing-energy use and its unique recyclability opens the door to a new, environmentally conscious market segment.

### Abstract

Initial situation / motivation

In the course of the climatic changes, necessary countermeasures - such as restrictions regarding the entire vehicle fleet CO<sub>2</sub>-emission of automotive manufacturers - have already found their way into political regulations. The political specifications could be met by adding to the product range so-called „zero-emission“ vehicles (electric vehicles) in order to considerably reduce the emission of the vehicle fleet.

Another argument for research-intensive activities in the field of cost-effective electric vehicles, which is not based on political calculations, arises from the foreseeable change in the income distribution curve, i.e. decline of the middle class. This means that the relevant market will split into two segments, low-cost mass products and high-priced individual products. Furthermore, owing to the continuously increasing demand for resources, the prices for raw materials will rise enormously. A vehicle requiring only a low energy input for manufacturing, which

means reduced costs for raw materials, could therefore be offered at competitive prices.

Contents and targets

On the basis of the above market and environment analysis, a “zero-emission” plug-in hybrid vehicle will be developed in the course of this research project. Not only can this vehicle be operated with a minimum of energy consumption, but excels with components of low energy content. The term „zero-emission vehicle“ - as set out in the legal regulations - can be applied if the fuel tank capacity is smaller than 12l and if the vehicle can be operated purely electrically over a distance of 51 miles. This means that components must be produced by means of low-energy manufacturing methods and be made of biomaterials and recycling materials mainly used for interior and exterior parts. By integrating range extenders – small, output-optimized combustion engines – it should be possible to spark not only the interest of customers using this vehicle mainly for city driving, but also of customers driving on country roads or highways. Another challenge is our intention to separate all supporting elements from the body to allow of a modular, OEM-specific outer appearance of the vehicle. This vehicle will be exhibited at the 79th International Automobil-Salon in Geneva. The main target, however, is the integration of an improved energy storage system to allow of operation without the range extender, i.e. to use this car as pure electric vehicle.

Methodical procedure

At first, a powertrain with two electric motors, an energy accumulator and a range extender will be set up and operated on a test field in order to carry out a rough

tune-up. Then this powertrain will be integrated in a mule vehicle for on-vehicle testing and tune-up. An energy storage system will be used that – up to now – does not meet the cruising range requirements.

#### Expected results

In the first quarter of 2009, a platform for an electric vehicle with a modular, integrated battery system will be developed on the basis of the results achieved with the mule vehicle.

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## Super-4-Micro-Grid – Sustainable power supply regarding climatic change

(Original Project Title: Super-4-Micro-Grid - Nachhaltige Energieversorgung im Klimawandel)

Project No. 818954

**Synopsis:** Because of climate change, risks for a secure and sustainable power supply arise. In this project the influences on the security of power supply, new tasks for transmission systems and storage power plants for a trans-regional, energy-based balancing under integration of micro grids as well as an optimal mix of regenerative energy sources are investigated.

**Abstract:** The future shortage of fossil resources, caused by increasing demand of industrialized countries and industrialization of developing countries will affect the security of supply and accelerate the climate change. In future the renewable energy supply tends into two directions with centralized and decentralized technologies. Centralized technologies are represented by hydraulic power stations of the type of run-of-river, pumped storage and large wind parks, which are directly connected to the transmission systems. Decentralized technologies form micro grids with the integration of photo voltaic, solar thermal, geo thermal, small-scale hydro, wind power and biomass cogeneration.

By the climate change it can be presumed, that extreme weather conditions can influence unfavourable the predominant renewable energy supply. By supra regional interconnection of decentralized and centralized technologies a balance

between regions can be established. Centralized pumped storage plants can provide balancing energy and respectively store surplus energy.

The expected influences on climate change are gained from analyses of records of historical weather data and extreme weather conditions. Effects on hydraulic energy conversion are derived from run-off probabilities for variable averaging-cycles. For wind and solar energy, historic time series are taken. Out of historic weather analysis and extrapolation of climate change, it is also possible to gain information about coupled risks on restrictions of energy generation by different types of regenerative sources. So, strategies for mixed energy generation with diminishing risks can be gained.

Expected results: Which regenerative generation mix is necessary for a low in risk supply? Which seasonal coverage with regenerative energy is possible at which increase of energy efficiency? What are the possibilities to minimise the risks by using various generation mixes and energy storages? How can the risks be minimised by a supra-regional interconnection of wind power? Is it possible to realise a fully regenerative power system by the use of pumped storage plants? Which effects can be achieved, when using vehicle batteries for storing surplus energy as well as using them as energetic recovery systems?

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## Smart Safety

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(Original Project Title: Smart Safety - Personensicherheit als unabdingbare Voraussetzung für Smart Systems und verteilte Energiesysteme)

Project No. 818955

Smart Systems and distributed energy systems are a way to implement decentralized renewable energy sources and thus to reduce CO<sub>2</sub> output. Smart Systems with distributed energy sources are currently not in practice on a broad basis. These systems offer in principle the possibility of an autonomous and independent power supply in case of black-outs, provided it is ensured that the legal requirements (electrical engineering Act 1992), Regulations (Elektrotechnikverordnung) are fulfilled and standards (e.g. ÖVE-B1/1976, ÖVE / ÖNORM E8383,...) are met

Presently research and feasibility studies concerning such networks are carried out. But considerations regarding human safety have never been carried out, even in the legally prescribed TN networks. Questions about safety in such networks have not been asked and there are no answers yet in a general technical discus-

sion.

In this technical feasibility study the present lack of safety of persons and the resulting risks due to the lack of protective equipment in Smart system and distributed energy systems is analysed. This research is carried out both analytically and with the help of an analogue network model to show the improvement potentials for achieving the necessary protection tripping currents. **Without appropriate safety measures an operating these networks is inadmissible.** Through the use of new techniques and new technologies can re-establish the safety in these networks restored and assured. These are necessary investigations and laboratory tests in relation to innovative equipment, surveillance equipment as well as the interplay of communication facilities and equipment necessary components.

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## Pilot development Smart Metering for residential and commercial customers with monthly billing

(Original Project Title: Smart Metering HH IND - Entwicklung Pilot Smart Metering Privatkunden & Gewerbe und monatliche Abrechnung)

Project No. 818963

### Synopsis:

The Energy Service Directive (2006/32/Ec) requires to equip customers with individual meters, in order to get the real consumption and time of use of their energy. Additionally the energy consumption shall be billed more often. Therefore it is necessary to change business processes, hardware and IT applications.

Before spending this big amount of financial and organisational effort, it is being checked how smart a metering and billing system has to be that the customer changes his or her consumption behaviour. Further it shall be analysed how much energy is saved at all and the sustainability looks like.

### Abstract

The standard process of energy billing in the customer segment of residential and small businesses in Austria looks like that there is a yearly billing of energy. During the year there are advance payments requested from the customer. The Energy Service directive 2006/32/EC mentions beside different other measures to increase the energy end-use efficiency, the visualisation of the energy consumption as trigger for a change in the energy consumption behaviour as very important.

The change of the current situation in the area of metering and billing towards the cyclical accounting more often than yearly has major impact on the utility internal process design (billing, dates and time, printing, shipping, debt management and

rebate management, etc.). In addition, the customer is affected by these changes.

In order to be able to increase the billing frequency, it is necessary to change the manual meter reading with an automated remote meter reading. Therefore it is necessary to change the actual meters by digital meters with load profile for remote meter reading and connect them with a telecommunication system. This implies also that the increased amount of data (15 minutes values) must be stored in the billing system in time and in the correct record to be validated before the billing routine is run. Then the consumption data will be compared with data from former time periods and also additional data are calculated like costs or CO2 exhausts. The visualisation for the customer will be done by eg. in-home displays or personalized web portals.

Within this pilotproject smart meters will be installed in around 300 households, service companies and public buildings. The project is for evaluating the assumption in the above mentioned Energy Service Directive and other sources, that visualisation saves energy consumption. Additionally the sustainability of savings due to energy consumption visualisation has to be checked. This project will give answers to the question how an automated meter reading and billing system has to look like to be accepted by the customer to trigger the energy consumption behaviour change. Further it will give answers to volume and sustainability of energy end-use efficiency and savings.

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## PV-Leuchten

(Original Project Title: Feldtest PV-Leuchten - Markteinführung und Erprobung innovativer Photovoltaik-Straßenleuchten in unterschiedlichen kommunalen Einsatzsituationen)

Project No. 818978

Since many years self-sustaining, grid-independent photovoltaic lights are available in different types on the market. They do not need grid connection and can become an important part of a sustainable decentralised energy system ("no grid system"). Due to different disadvantages in function and design an implementation for those lights for professional application on a broader market could not be established so far.

The applicant has developed an novel, independent PV-street light, meeting the requirements for professional application for example in street-, parking and pavement lightening. It was our aim to develop a light matching high illumination, attractive design and a solid operation (even in winter and during a longer period of bad weather). It should be obtained an innovation step in the area of independent PV-lights, rendering this environmental friendly type of lightening for Central Europe to an attractive alternative to conventional lightening solutions.

Core element of the innovation is a powerful PV-module in tubular design, offering a particular good energy yield also at low light conditions. In connection with an intelligent energy management system and the high efficient LED-technology a reliably operation during winter time should be achieved.

First prototypes of this innovative PV-light have already been developed successful-

ly. In the framework of this demonstration project the operational reliability of his innovative high-tech-photovoltaic outdoor light in a test run shall be checked out on the national market, before producing the light in a bigger lot for the abroad market (Mediterranean area, Middle East). For that purpose the light should preferably be tested in different locations and under different weather conditions and if necessary be improved. For that reason 50 lights will be installed in cooperation with Austrian municipalities and within the scope of a year tested in a monitoring-operation. The monitoring figures will identify any defects and show opportunities for improvement of the light. The test run shall however also increase the acceptance of this environmental friendly light within the participating municipalities and therefore create a basis for a broader market roll-out.

In cooperation with our project partner, disposing of excellent contacts to environment-oriented municipalities, we will invite those municipalities and select 50 locations. In order to increase the acceptance, the municipalities can purchase the lights on very favourable conditions and can decide at the end of the monitoring operation, whether they want to acquire the lights definitely or give them back. Accompanying public relation shall raise the interest for this environmental friendly kind of lightening.

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## Increasing Energy Efficiency in Technical Rooms and Data Centers at Telecommunications Companies

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(Original Project Title: SETDAT - Steigerung der Energieeffizienz in Technikräumen und Datacentern von Telekommunikationsunternehmen)

Project No. 818986

The increasingly growing data technology and telecommunications market constitutes an indispensable part of our modern society. Simultaneously this sector – with two percent of worldwide CO<sub>2</sub> emissions – contributes considerably to the rise in greenhouse gases.

The high thermal load of the **technical rooms due to the thermal load of the systems** causes a rise in the demand for ventilation and air conditioning technology.

A wide variety of air conditioning systems are offered on the market today. For broad deployment on the mass market, flexible device deployment is of primary importance. Technology that is tuned to the special requirements of telecommunications and data technology and is used, regardless of the size of the company, by many small consumers – such as in utilizing a climatogram to the utmost to draw up a concept for optimal operation of systems/devices – for various room loads, room sizes and geometries, is indispensable for increasing energy efficiency.

Based on the general requirements of a telecom provider with its diverse applications such as:

- forecasted rise in electrical energy due to increased data volume, computer capacity and redundancies
- permanent increase in the density of thermal load in the data centers and technical rooms

- increased availability of the technical facilities
- rising focus on environmentally relevant considerations
- a large number of existing systems,

a basis will be created within the framework of this research and development project, so that the further growth of energy consumption and the accompanying environmental impact will be able to be reduced. The goal is to reduce energy consumption by up to 20% in existing and new systems by means of an innovative optimized method of operation.

To reach this goal it is important to view this problem holistically. This will entail the following steps:

- analysis of existing systems to determine strengths/weaknesses
- examination of new technologies of the fundamental components with possible waste heat utilization to lower energy consumption
- energy-related assessment of existing and possibly future system technologies
- testing of selected measures from a holistic viewpoint

This will result in a general master plan to reduce energy consumption in technical systems in the telecommunications and data processing sector.

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## NELA – Sustainable energy consumption and lifestyles in poor households

(Original Project Title: NELA – Nachhaltiger Energieverbrauch und Lebensstile in armen und armutsgefährdeten Haushalten)

Project No. 819000

### Synopsis

NELA analyses through social scientific methods underlying motives, factors and causes of energy consumption in households that are poor or in risk of poverty and develop target group specific measures for energy efficiency and reduction with a concurrent improvement of life standard of affected households.

### Abstract

Without an understanding of the social nature of energy consumption, measures aiming at energy efficiency and energy saving will be of limited success. Before this background, the project NELA analyses lifestyle-specific patterns of energy consumption in households that are poor or in risk of poverty and that are under special pressure due to increasing energy prices.

The research will be guided by questions on i) which socio-cultural and everyday life images shape energy consumption in poor households and those in risk of poverty, ii) which typical styles of household and of dealing with energy can be identified and

iii) which target group specific strategies and measures can be developed in order to combine energy efficiency and reduction of use with an improvement of living standards. NELA proceeds in six work packages: investigation and processing of existing knowledge, consulting of experts, interviews in 60 households in Vienna, experts workshop, pilot projects (application of target group specific measures of energy efficiency), and further dissemination activities (publications, presentations).

Energy consumption in its diverse manifestations, the underlying motives, the driving forces and the causes will be analysed through a qualitative approach and from a social science and cultural studies perspective. Besides the generation of system and action knowledge, transformation knowledge will be compiled with selected households and experts from energy industry, administration, consumer protection, politics etc. in order to detect possibilities and barriers to strategies of energy efficiency close to everyday experience and specific milieus. In the project, environmental and socio-economic objectives are closely connected.

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## LIFE STYLE - END USE 2030 - Outlook "Life Style 2030"

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(Original Project Title: LIFE STYLE - END USE 2030 - Outlook "Life Style 2030" - Determinanten für den Energieverbrauch in österreichischen Haushalten)

Project No. 819005

### Background

According to statistics the electrical energy consumption in the domestic sector has risen significantly for more than two decades. Within 1990 and 2006 household power consumption increased by 30 % despite considerable gains in energy efficiency at the same time. This was for several reasons – first of all raised saturation levels (number of appliances per household) as well as demographic trends were effective as main influencing factors.

An enormous energy efficiency increase plays a crucial role in all scenarios in the context of energy politics. It's undoubted amongst experts that a detailed examination of the recent domestic power consumption trend is urgent. Although the complex background for people's behavior is challenging indeed – economical consideration opposes cultural and psychological aspects in a synchronous way.

Instruments, which are designed for reduction of energy consumption, are applied in a demanding and hardly controllable arena. Moreover already existing studies contain quantitative data only in a very poor resolution.

### Primary aims and content of the project

- Target as well as primary result of the project is an assumption for the trend of domestic power consumption in the period 2010 to 2030, reflecting different structural types of households. Based on a qualitative and quantitative analysis of electrical power consumption in this sector serving as a description of the status quo the most relevant influencing factors are evaluated in the context of socio-economic aspects and life style con-

cepts. These factors, e.g. energy consumption per category, specific energy consumption, demographic aspects, wealth level, energy efficiency, tariffs, market offer, saturation levels, needs as well as demand for services, and their dynamic evolution are assessed in a holistic approach. Consequently valid outcomes for policy design processes can be provided in order to reduce power consumption enduringly.

- A direct involvement of stakeholders is a precondition for a successful implementation of the project's outcomes. This will be done on different levels within the project.
- Resulting from an assessment of existing and expected energy efficiency potentials for several technologies in the domestic area the most likely paths will be identified. This will be supplemented by a fundamental exploration of the area of conflict "needs and related solutions on technical level". Potential users will be involved to identify and develop more sustainable innovative concepts.
- The development of different scenarios, based on participative methods for stakeholder involvement (Delphi scheme), will support establishing a dynamic bottom up model for assessing energy consumption trends in the period of 2010 to 2030.
- In an open discussion with stakeholders sensitivity analyses will be accomplished to debate critical paths. The following parameters will be considered amongst others: changes in climate, variation of tariffs, demographic trends, saturation levels, etc.

- Following the analysis of scenarios and the evaluation of possibilities for interaction the main focal points for a sustainable transformation of the sub-system domestic electricity use will be identified. As an important result from the project a catalogue of appropriate

measures on national level will be elaborated. This catalogue will comprise hierarchized activities, which are synergetic or complementary to actual and upcoming EU policies.

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## ENERGY STYLES

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(Original Project Title: ENERGY STYLES - Klimagerechtes Leben der Zukunft - Energy Styles als Ansatzpunkt für effiziente Policy Interventions)

Project No. 819016

Die Studie leistet einen substantiellen Beitrag zu einer neuen empirisch abgesicherten Endkunden-Segmentierung und steigert das Verständnis darüber, mit welchen Programmen und Instrumenten die Haushalte/die Endkunden am effektivsten erreicht werden können, auf Klimaschutzziele sensibilisiert und zu entsprechendem Verhalten geleitet werden können.

**Ausgangslage:**

Es laufen zahlreiche Klimaschutz-Programmen, die auf Energieeffizienz bzw. Energiesparen sowie auf die Nutzung erneuerbarer bzw. weniger CO<sub>2</sub>-intensiver Energieträger abstellen. Trotz dieser Programme, der technologischen Fortschritte sowie der prinzipiellen Bereitschaft der Bevölkerung zum Klimaschutz steigt die von den österreichischen Haushalten benötigte Energie an. Von der erforderlichen Reduktion der Treibhausgasemissionen kann keine Rede sein.

Der Faktor Mensch und dessen Lebensstil, der auf seinen Einstellungen und Werten basiert, ist für die Erreichung der Klimaschutzziele nicht minder wichtig als das Bereitstellen entsprechender Technologien. Energierrelevante Life Style Forschung muss sich damit auseinandersetzen, wie die zugrunde liegende Werterhaltung und das bisherige Verhalten zu Gunsten eines klimagerechten Lebensstils veränderbar ist. Denn die offensichtliche Diskrepanz zwischen klimaschutzpolitischen Zielsetzungen und der tatsächlichen

Zielerreichung macht nicht nur verstärkte Anstrengungen, sondern auch ein differenziertes segmentspezifisches und damit effektiveres Vorgehen notwendig. Durch ein segmentspezifischeres Vorgehen – so die Annahme - kann die Effektivität von Klimaschutzprogrammen gesteigert werden. Zu diesem Zweck müssen die Zusammenhänge zwischen Energieverbrauch eines Haushalts und den bestimmenden Einflussfaktoren noch besser erforscht werden. Eine verbesserte lifestylebezogene Endkunden-Segmentierung steigert die Effektivität von „Social Marketing“ und hilft, die vorhandenen Technologien und Techniken noch stärker in den Markt zu bringen

**Projekttablauf:**

Durch die Evaluierungen von Energie- bzw. Klimaschutzprogrammen wird erforscht, ob Lifestyle-Typen bei der Gestaltung von endkundenbezogenen Klimaschutzprogrammen in Österreich bislang überhaupt eine Rolle gespielt haben. Eine breit angelegte empirische Untersuchung dient dazu, in der Folge eine für Klimaschutzprogramme empfehlenswerte Endkundensegmentierung zu entwickeln. Im darauf folgenden Schritt werden mit Hilfe der Szenario-Technik die möglichen Treibhausgas-Einsparpotenziale durch eine optimierte Endkundenansprache in Verbindung mit Policy Interventions quantifiziert. Dies mündet in der Formulierung von Empfehlungen für Policy-Maker und ManagerInnen von Endkunden-Programmen.

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## Evaluation of youth work activities for awareness-raising in the field of energy efficiency and environmental measures

(Original Project Title: Evaluierung von Aktivitäten zur Bewusstseinsbildung für Energiespar- und Umweltschutzmaßnahmen in der offenen Jugendarbeit)

Project No. 819019

### Synopsis

The project will evaluate pilot projects of youth work for awareness-raising in the fields of climate protection and energy efficiency. The aim is to identify strengths and potential improvements.

### Abstract

The target groups of open youth work are mainly young people with low educational standards. These groups can hardly be approached by common practices of environment education. This research project aims to describe and evaluate newly designed energy- and climate-

projects of youth work activities, with the goal to identify strengths and potential improvements. The evaluation process will be based on qualitative interviews before, during and after the activities have taken place.

The results are processed for adoption within youth work and (environment) education. They can serve as basis for educational work in practice and as well be the basis for further development of youth work and environment education in theory.

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## Optimal Multi MW Induction Generator of Doubly Fed Type for Wind Energy Plants

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(Original Project Title: Multi MW WTG - Optimaler Multi MW Asynchrongenerator in doppeltgespeister Variante für Windkraftanlagen)

Project No. 819052

### Synopsis

Development of optimal doubly fed asynchronous generators for wind energy plants with respect to weight under consideration of different voltage levels and cooling methods.

The project is organized in three phases: pilot study, engineering and validation.

### Abstract

So called doubly fed induction generators (i. e. induction generators that are fed via the stator as well as via the rotor winding) begin to establish themselves as standard for wind energy plants.

The majority of doubly fed induction generators operate in the power class of 2 MW.

The trend, however, is going towards higher power. Higher power implies an

increase of generator weight and required space, which is of disadvantage for wind energy plants due to additional cost for construction of towers and less space in the nacelle.

Furthermore for higher power levels one is confronted with the question concerning optimal voltage level (currently an unsolved problem).

The goal of this project is to clarify the open questions to build optimal next generation doubly fed induction generators for power levels above 4 MW.

The project is structured into 3 work packages: Pilot study: creative solutions to minimize weight; Engineering: implementation of ideas of work package 1; Testing and Validation

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## Database about energy consumption of Austrian households. Development and empirical validation (Styles of energy use)

(Original Project Title: Datenbank zum Energieverbrauch österreichischer Haushalte: Erstellung und empirische Überprüfung (Energieverbrauchsstile))

Project No. 819053

### Synopsis

This project aims at developing a comprehensive database which relates the demand for energy services in Austrian households to socio-economic and cultural factors in order to provide a well-established set of information for public decision makers and politics.

### Abstract

In order to provide well-established information for public decision making and energy policies, a database is required, which relates the demand of energy services in Austrian households to socio-economic and cultural factors, in particular to aspects of the individual lifestyle. In order to bridge this gap, the considered project defines so-called “styles of energy use” (SEU), which shall be verified by a representative public survey carried out in Austria. The study will include all main sectors of private (not work-related) energy use (heating, electricity) in households as well as the energy use for private mobility.

These SEU depend on the energy patterns of households. This energy use behavior

is assumed to be governed by people's lifestyles. In order to determine these SEUs, the concept of “Erlebnismilieus” (social milieus of experience) used in motivation research shall be connected quantitatively with the energy consumption of Austrian households – a unique approach in Austria so-far. To this end, the survey inquires the “Erlebnismilieus”, socio-economic data as well as the behavior of energy use. The allocation of typical constellations of strategies to the respective “Erlebnismilieus” finally leads to the SEU.

The goal of this project on the one hand is to develop a comprehensive, statistically analysed data base and on the other hand to provide a detailed qualitative and quantitative description of these SEU. The empirically validated SEUs shall provide a fruitful insight into the energetically relevant behaviour of the Austrian population and furthermore trigger future communication of innovations and the design of energy services as well as support policy making for a sustainable development of the Austrian energy system.

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