



CENTER OF EXCELLENCE

ENERGY

**ACHIEVE MORE
THROUGH RESEARCH & DEVELOPMENT**

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RESEARCH &
DEVELOPMENT

ACHIEVE MORE WITH AUSTRIA'S STRONGEST RESEARCH UNIVERSITY

Successful businesses know from experience: Every euro that goes into research and development pays for itself many times over. This is because innovations give those businesses a decisive competitive edge, generating revenue and securing jobs in the long run.

As a centre of research, Upper Austria is in the fast lane, and the University of Applied Sciences Upper Austria (University of Applied Sciences Upper Austria) has become a driving force. Austria's most research-intensive university of applied sciences offers innovative businesses its four campuses and approximately 400 professors and academic staff. Currently, over 400 projects in 17 specialist areas of research are being implemented.

Areas of Applied Research:

- » IT (Hagenberg Campus)
- » Medical Engineering and Applied Social Sciences (Linz Campus)
- » Management (Steyr Campus)
- » Engineering (Wels Campus)

Perfect networking of the campuses makes it possible to achieve an optimal overall solution for each project.

The State of Upper Austria is undertaking joint initiatives in the areas of education, research and business through the strategic economic and research programme to ensure that Upper Austria retains a clear competitive edge.

The topic of energy is attracting ever more attention in the relevant industry sectors. Of particular importance is the networking of parties concerned and the promotion of joint projects. In the areas of storage technology and bioenergy in particular there will be many opportunities in the future for thriving not only at home but also abroad.


The Center of Excellence Energy was established in order to meet the requirements of the strategic programme 'Innovative Upper Austria 2020'. The Center's projects support the achievement of the programme's strategic objectives.

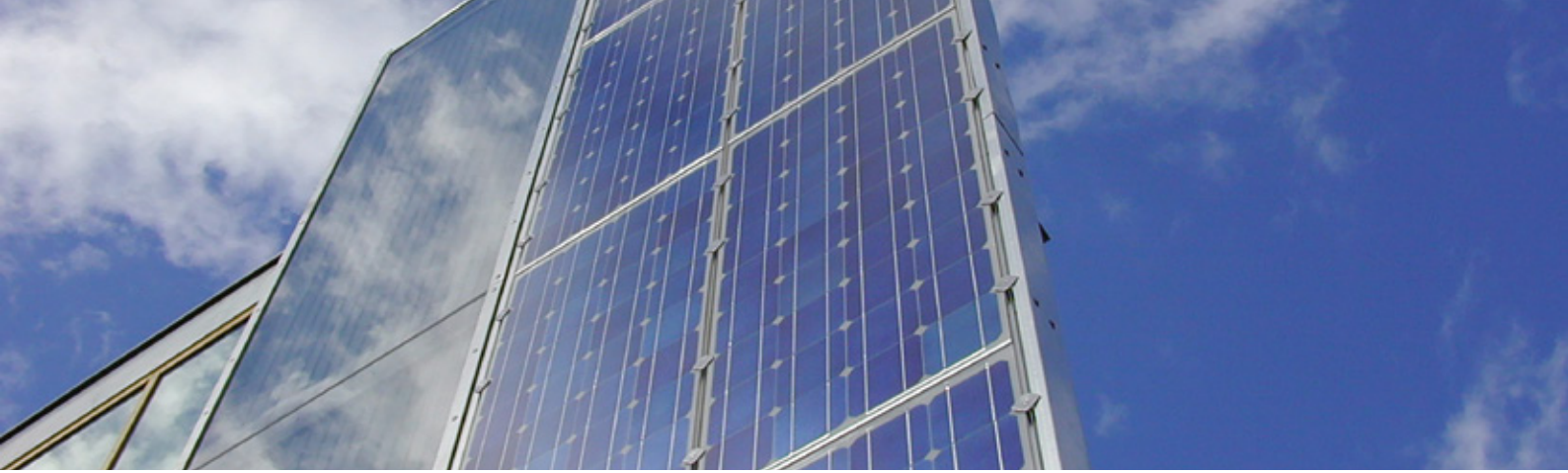
The State of Upper Austria has in the University of Applied Sciences Upper Austria a longstanding partner in the field of research and development that actively supports the achievement of its strategic objectives.




Mag. Thomas Stelzer
State Governor of Upper Austria




Markus Achleitner
Minister of Economy of Upper Austria



COOPERATION MADE EASY

With more than 400 researchers, the University of Applied Sciences Upper Austria is on hand as a flexible and reliable partner for addressing research and development issues with businesses and institutions from industry and society.

The possibilities for cooperation are numerous and varied:

- » Applied R&D projects with business partners
- » Academic research projects
- » International R&D projects
- » Symposia and workshops
- » Students' bachelor's and master's theses

Project time frames can range from a few months to up to five years.

The University of Applied Sciences Upper Austria aims its R&D support at businesses and institutions from industry and society.

This includes on the one hand businesses which lack personnel resources or have limited financial resources for their own research and development activities (e.g. small and medium-sized enterprises).

On the other hand, solutions for companies needing specialised support (e.g. in the form of special equipment) are also available. For the University of Applied Sciences Upper Austria's cooperation partners, a joint project is, above all, a financially straightforward and efficient undertaking.

Geared towards the needs of the client, innovative solutions will be developed that can be put directly into practice.



*Dr. Gerald Reisinger
President University of Applied Sciences Upper Austria*



*Prok. Prof. Priv.-Doz. Dipl.-Ing. Dr. Johann Kastner
Vice President FH OÖ Forschungs & Entwicklungs GmbH*



Thematic Areas:

- » Smart Grids
- » Process Optimisation Using Simulation and Measurement Technology
- » Sustainable Energy Systems
- » Bioenergy

ACHIEVE MORE THROUGH SUSTAINABLE STRATEGIES AND SMART SYSTEMS

Industry and the economy only thrive when a sustainable supply of energy is guaranteed. The Center for Smart Energy Systems (CENSES) initiates, monitors and supports projects in the energy sector, including international projects. To this end, the Hagenberg and Wels campuses have pooled and coordinated their existing competencies. The Center focuses its work on the following thematic areas:

Smart Grids

Increasing energy efficiency is a clear goal of EU policy. However, this can only be achieved by developing intelligent networks (smart grids), integrated innovative energy solutions at district scale (smart cities) and resource-efficient technologies as well as optimising manufacturing processes.

- » **Grid Applications:** Demand side management, integration of systems for decentralised energy conversion (renewable energy), monitoring
- » **Smart metering**
- » **Smart customers und smart home:** Usability, technologies (protocols, standards, etc.)
- » **Electromobility and Vehicle2Grid applications**
- » **Smart grid security**
- » **Communications technology:** Wireless and circuit-based transmission methods (e.g. power-lines), transmission protocols
- » **Energy optimisation:** ICT-based systems
- » **Integration of real and virtual data (Big Data):** Integration of real and virtual sensor values, supply and demand projections, tracking of vendor-supplied components in real time

Process Optimisation Using Simulation and Measurement Technology

The transport of energy in liquid or gaseous states plays an important role in many technical processes. Multi-physics simulations save additional time and money when developing energy-efficient components:

- » **Multi-physics simulation** of power electronics components in combination with heat dissipation and component positioning
- » **Development of new calculation methods** for fluid mechanics
- » **Multi-phase flow**
- » **Friction-optimisation** of bearings in engines
- » **Development of CFD toolkits** for the execution of specialised calculations
- » **Comparison of simulation models** by measuring chosen system parameters

Sustainable Energy Systems

This area of research deals with topics such as photovoltaics, wind energy, heat engineering, energy-efficient buildings, electrical energy supply, sustainable heating and air-conditioning technology. Solar and storage systems are also researched and refined.

- » **Development and implementation of smart grid approaches** in the energy technology sector
- » **Development of components and protective technology** for electrical engineering
- » **Development and construction of test generators** for cost-efficient simulations of direct current supplies (batteries, PV facilities, etc.)
- » **Optimisation of complex energy systems** with multiple producers and consumers using analytical and heuristic methods and artificial intelligence
- » **Development of methods and components** for future solar systems with the aim of lowering costs and increasing usage rates
- » **Development of methods** for solar radiation and PV performance forecasts
- » **Integration and operation** of energy storage systems based on thermochemical materials (TCM) or phase change materials (PCM) as well as electrical storage
- » **Research in the field of powertrains and air conditioning systems** for electric mobility
- » **Energy optimisation** of buildings (energy-efficient buildings, energy-plus buildings, building-integrated solar energy use, simulations) as well as resource-friendly construction methods (gray energy, life cycle considerations)
- » **Quality assurance of building envelope and building technology** (airtightness, thermal imaging, measurements, monitoring, user satisfaction)
- » **Heat engineering and combustion technology** (with special focus on biomass)
- » **Methods and procedures as well as products** for increasing commercial and industrial energy efficiency
- » **Construction of a research laboratory** for the use of solar heat in the 100°– 200°C temperature range for industrial process heating

Bioenergy

The biosciences research group develops technologies in the following areas:

- » **Renewable energies/residual current/biogenic processes**, e.g. material and energy-based use of biomass and residual current, energy from organic secondary raw materials, etc.
- » **Fermentation processes** for the development of value-added products such as secondary metabolites, anti-inflammatory substances and food supplements from agricultural and industrial residues
- » **Molecular biological optimisation of organisms** for the production of value-added products
- » **Development of processes for producing energy sources** and value-added products through CO₂ reduction with microalgae and cyanobacteria
- » **Identification of new types of algae** from high-alpine regions of Central Europe for use in sustainable industrial production processes



ACHIEVE MORE WITH THE EXPERTS FOR ENERGY

Cutting-Edge Infrastructure on Each Campus

- » Home and Building Automation Lab (EIB/KNX, LonWorks, digitalSTROM, etc.)
- » Smart Metering Lab
- » Wireless and network planning tools (ASSET 3G/Aircom, etc.)
- » HeuristicLab (Framework for optimisation procedures and machine learning)
- » Measuring instruments: Rhode & Schwarz spectrum analysers and signal generators
- » Contact reliability test bench
- » Glowing and hot contact test bench
- » 1000V capacitor battery and 100 kA short circuit test bench for switching devices
- » Pressure measuring technology for high temperatures and rapid changes in pressure
- » Spectroscopic temperature measuring for plasmas
- » High-speed camera capable of 200 fps
- » Magnetic field measuring technology for rapidly changing and spatially resolved magnetic fields
- » Outdoor PV test bench
- » Individual PV module testing
- » Multi-physics simulation software package ANSYS
- » CFD FLUENT software
- » Data-logging hardware and software
- » Pilot facility for producing bioethanol from waste materials
- » Biogas laboratory facility
- » Photobioreactors for algae
- » Indoor solar simulator
- » Sorption energy storage development laboratory
- » Building thermography and blower door measuring equipment
- » Mobile ultrasonic heat meter for industrial applications

CURRENT DEGREE PROGRAMMES

Current Research Projects

- » **INDUGRID** – Industrial microgrids, development of energy exchange concepts in the industrial environment, Energy Model Region NEFI
- » **CASGrIS**: Center for Applied Smart Grid Systems / COIN Capacity Building / Properties of interfaces for energy systems
- » **iniGrid** – Intelligent components for active distribution networks / smart grids demo / Partners: AIT Austrian Institute of Technology, Eaton, Infineon, Zelisko, Sprecher Automation, TU Wien, Linz Strom, MOOSMOAR Energies
- » **Combined agro-forest biorefinery (CAFB)** – EFRE Energy / Partners: JKU – K-Wood and State of Upper Austria
- » **SKD** – High quality products derived from algae / COIN Capacity Building / Partners: MCI, ADSI
- » **Algenetics** / Interreg V-A Austria-Czech Republic / Partner: Mikrobiologický ústav AV CR, v.v.i
- » **E-StoreM**: Electricity Storage Management / Energy research, development of an energy management system for photovoltaics and energy storage
- » **Metabolism and biodiversity** of snow and ice algae / FWF / Partner: University of Innsbruck

Hagenberg Campus

M	Embedded Systems Design
M	Energy Informatics
B	Hardware and Software Design
B M	Mobile Computing
B M	Secure Information Systems
M	Software Engineering

Wels Campus

M	Plant Construction
B M	Automation Engineering
B M	Bio- and Environmental Technology
B	Electrical Engineering
B	Eco-Energy Engineering
M	Sustainable Energy Systems
B	Process Engineering and Production

B = Bachelor's degree programme, M = Master's degree programme

YOUR POINTS OF CONTACT



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