# PLATFORM FOR **ENERGY**

## **ACHIEVE MORE**
## THROUGH RESEARCH & DEVELOPMENT

www.fh-ooe.at/research

UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

# Achieve more
## with Austria's strongest research University of Applied Sciences

Successful businesses can tell you from experience: Every euro which goes into research and development pays for itself a thousand times over.

This is because innovations give those businesses a decisive competitive edge, generating revenue and securing jobs in the long-run.

The research location of Upper Austria is in the fast lane, and the University of Applied Sciences Upper Austria (FH Upper Austria) has evolved into a powerful engine. Austria's strongest research University of Applied Sciences offers four schools with around 400 professors and academic staff to innovative businesses.

Currently, over 300 projects in 16 specialist areas are being implemented. The practice-oriented topics range from IT (FH Upper Austria Hagenberg Campus), to Medical Engineering and Applied Social Sciences (FH Upper Austria Linz Campus), as well as Management (FH Upper Austria Steyr Campus), and Engineering (FH Upper Austria Wels Campus).

Perfect networking of the schools ensures that it is possible to achieve an optimal complete solution for each project.

The strategic programme "Innovative Upper Austria 2020 – Research. Business. Future" was accommodated by the Platform for Energy. This Platform's projects provide support in achieving strategic key objectives:

» **The locational advantage for Upper Austria** in 2020 lies in its excellent infrastructural resources, designed for energy services, and as a consequence thereof, high quality and security of supply at competitive prices.

» **By 2020, Upper Austria will have optimally developed its energy infrastructure and research in the direction of more flexible systems** and will have adapted to constantly growing demands.

» **Upper Austria strengthens the production and research location** by developing technologies, products and services which contribute to an increase in energy efficiency of all energy sources and which, compared to other countries, facilitate particularly energy-efficient production processes.

*Dr. Josef Pühringer*
*Governor of Upper Austria*

*Mag. Thomas Stelzer*
*Vice Governor*

Upper Austria has introduced the possibility for joint initiatives in the sectors of education – research – business through the strategic economic and research programme "Innovative Upper Austria 2020", in order to ensure that Upper Austria has a clear competitive edge.

The topic of energy is experiencing a continual upturn in the respective subject-specific sectors. Of particular importance are the networking of participants and the promotion of joint projects. Future, multi-layered possibilities are particularly evident in the storage technology sector and in bioenergy, in order to ensure cross-border success.

With the FH Upper Austria as a long-term, reliable partner in the sectors of research & development, the State of Upper Austria is provided with support in achieving the implemented, strategic key objectives.

# Achieve more:
## Cooperation made easy

With its 400 plus researchers, the FH Upper Austria is on hand as a flexible and reliable partner for businesses and institutions from industry and society when it comes to problems in research & development. The possibilities of cooperation are diverse:

» applied R&D projects with business partners

» academic research projects

» international R&D projects

» symposia and workshops

» students' bachelor's papers and master's theses

The project time frame can range from a few months to up to five years.

The FH Upper Austria´s R&D offers are aimed at businesses and institutions from industry and society.

On the one hand, this addresses those businesses which lack personnel resources or have limited financial resources for their own research and development activities (e.g. small and medium-sized companies).

On the other hand, solutions for companies which need support in specialist fields are also developed (e.g. in the form of specific devices). Above all, a joint project is, for the FH Upper Austria's cooperation partners, a financially straightforward and efficient undertaking.

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

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

*Prok. FH-Prof. Priv.Doz. Dipl.-Ing. Dr Johann Kastner*
*University of Applied Sciences Upper Austria Research & Development*
*Chief Technology Officer*



# 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, follows and supports projects in the energy sector – also on an international scale. For this, the existing competences at the Hagenberg and Wels schools are pooled together and coordinated. The specialist areas of the work of the Platform are:

## Smart Grids

Increasing energy efficiency is a clear goal of EU policy. However, this can only be achieved by constructing intelligent networks (smart grids), energetically developing cities (smart cities), 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 and 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):** connection of real and virtual sensor values, sales and demand forecasts; tracking of supply components in real time

## Process optimization by means of simulation and measurement technology

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

- **Multi-physics simulation** of power electronics components in combination with heat removal 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 means of measuring chosen system parameters

## Sustainable energy systems

Here, topics such as photovoltaics, wind energy, heat engineering, energy-efficient buildings, electrical energy supply, sustainable heating and air-conditioning technology are considered. Solar and storage systems are researched and further developed in close cooperation with the Austria Solar Innovation Center (ASIC).

- **Development and implementation of smart grid approaches** in the energy technology sector
- **Development of components** for electrical engineering
- **Development of protection technology** for electronic storage and direct current systems
- **Development and construction of test generators** for cost-efficient simulations of direct current supplies (batteries, PV facilities, etc.)
- **Development of methods and components** for future solar systems with the aim of lowering costs and increasing usage rates
- **Integration and operation** of energy storage systems
- **Research in the sector of drivetrains** for electromobility
- **Life-cycle considerations** of energy-optimised buildings
- **Quality assurance in building technology and management**
- **Heat engineering and combustion technology** (with particular focus on biomass)
- **Methods and procedures as well as products** for increasing energy efficiency in the sector of operations
- **Construction of a research laboratory** for using solar heat in the temperature range of 100° – 200°C for industrial process heating
- **Solar drinking water production**

## Bioenergy

The Bioethanolics working group develops technologies in the following research fields:

- **Renewable energies/residual currents/ biogenic processes,** e.g. material and energy-based use of biomass and residual currents, energy from organic secondary raw materials, renewable energy technologies, etc.
- **Fermentation processes** for producing bio-fuels such as bioethanol, biodiesel, biobutanol from agricultural and industrial waste materials
- **Development of value-added products** such as polyhydroxyalkanoate, citric acid, food supplements, etc.
- **Development of processes for producing energy sources** and value-added products through CO2 reduction with microalgae and cyanobacteria
- **Improvement of the efficiency of biogas facilities** along the complete process chain from substrate production, new facility concepts (with facility manufacturers), generation of new energy sources (e.g. hydrogen), biogas facilities as energy storage systems
- **New fermentation technologies** for producing energy storage systems and value-added products (e.g. bio-hydrogen from purple bacteria)
- **Strategies for avoiding, reducing and exploiting waste** in the food sector. Specialist area: gastronomy and industrial kitchens

# Achieve more
## through pioneering infrastructure

» 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 the usage of heuristic optimisation methods)
» Measuring instruments: Rhode&Schwarz spectrum analyzers 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, which takes up to 200 pictures per second
» Magnetic field measuring technology for rapidly changing and spatially resolved magnetic fields
» Outdoor PV test bench
» Individual module (energy-autonomous PV module test bench)
» Multi-physics simulation software package ANSYS
» CFD software FLUENT
» Data-logging hardware and software
» Pilot facility for producing bioethanol from waste materials
» Biogas laboratory facility
» Photobioreactors for algae
» Chemical instrumental analytics

# Achieving more:
## current research projects

» **SOLEX** – solar energy supply / COIN (Cooperation and Innovation) development / Partner: ASIC

» **iniGRID** – smart grids demo (intelligent components for active distribution networks) / FFG (The Austrian Research Promotion Agency) energy / Partners: AIT Austrian Institute of Technology, Eaton, Infineon, Zelisko, Sprecher Automation, TU Wien, Linz Strom, MOOSMOAR Energies

» **Storage of renewable energy via CO2 absorption** through electro-biotechnology / ERDF Regio 13 – energy / Partners: JKU, Profactor

» **Next generation biodiesel** / ERDF Regio 13 – energy

» **SKED** – high quality products, derived from algae

» **biogas+** – development of micro-facilities and establishment of an expert system / ERDF Regio 13 – energy

» **Straw ethanol** – production of ethanol from straw / ERDF Regio 13 – energy

» **Solar condensation facility** / COIN cooperation

» **Radon levels in passive houses** / commissioned project

» **Plastic solar panels** / cooperation project

# **Achieve more:** Studies with reference to the topic of energy / energy informatics

## School of Informatics, Communications and Media, Hagenberg Campus

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

## School of Engineering Wels Campus

Automation Engineering ..... B M
Bio and Environmental Technology ..... B M
Electrical Engineering ..... B
Eco-Energy Engineering ..... B
Sustainable Energy Systems ..... M

B – Bachelor's Degree Programme, M – Master's Degree Programme

# At your service: Your contact partners

## Head of Energy Department


**Contact:** FH-Prof. Dipl.-Ing. Dr. Christoph Schaffer
**Address:** Softwarepark 11, 4232 Hagenberg
**Phone:** +43 5 0804 22810
**Email:** christoph.schaffer@fh-hagenberg.at


## Head of Energy Department, Wels Campus


**Contact:** FH-Prof. Dipl.-Ing. Dr. Peter Zeller
**Address:** Stelzhamerstraße 23, 4600 Wels
**Phone:** +43 5 0804 43440
**Email:** peter.zeller@fh-wels.at


# PLATFORM FOR **ENERGY**


**University of Applied Sciences Upper Austria**
**Research & Development**

Franz-Fritsch-Straße 11 / TOP 3
4600 Wels / Austria
Phone: +43 5 0804 14120
research@fh-ooe.at
www.fh-ooe.at/research



**Imprint:** Responsible for the content:
FH Upper Austria President Dr. Gerald Reisinger,
Prok. FH-Prof. Priv.Doz. Dipl-Ing. Dr. Johann Kastner,
Text: Christine Pointinger, MA; Platform spokesperson
Photos: Thomas Smetana, Fotolia, FH Upper Austria
State of Upper Austria, Bilderbox