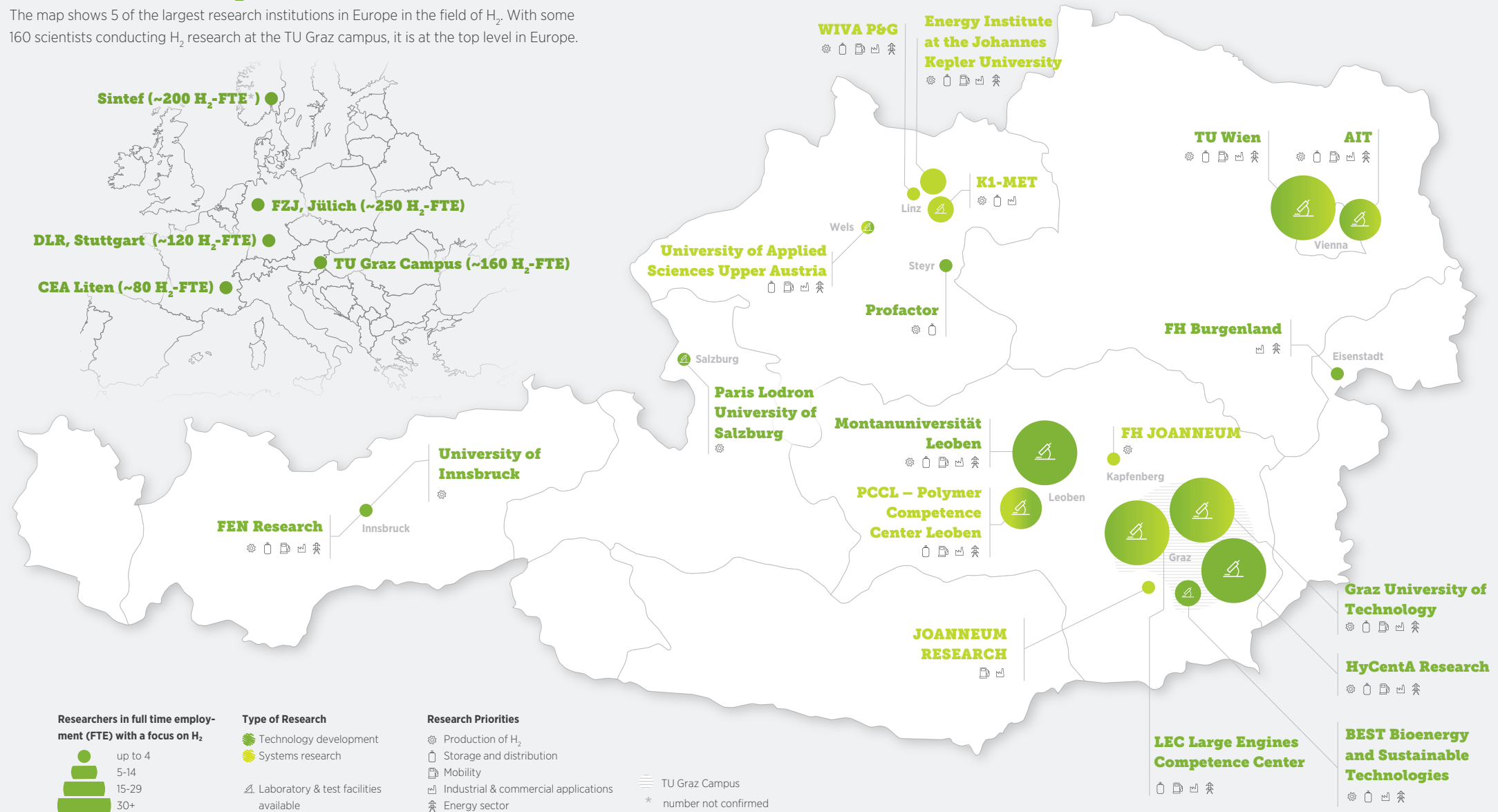


H₂ Research Austria

Academic and non-academic hydrogen research in Austria: Survey of June 2021

Cutting-Edge H₂ Research in Europe

The map shows 5 of the largest research institutions in Europe in the field of H₂. With some 160 scientists conducting H₂ research at the TU Graz campus, it is at the top level in Europe.



TU Graz - Graz University of Technology

H₂ researchers in FTE: **30+**

Over 3500 employees are involved in research at the TU Graz, over five fields of expertise in total. Research within the field of hydrogen is carried out in 5 different institutes, and includes the following areas of focus for research:

Research Priorities - Institute of Chemical Engineering and Environmental Technology

Working groups for fuel cells and hydrogen systems as well as for reaction engineering are leading the way in process and material development for fuel cells, hydrogen generation and industrial hydrogen technologies.

Research Facilities

Fuel cell and hydrogen laboratory, covering 400 m² over 15 test stands, involved in research and development of low-temperature fuel cells.

Contact Person

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Research Priorities - Institute of Internal Combustion Engines and Thermodynamics

Teaching and research in the field of energy, propulsion systems, transport and the environment; with a special focus on environmental issues. With specific respect to H₂, the institute is dedicated to hydrogen for mobility, with a focus on hydrogen ICE and fuel cells.

Research Facilities

€ 18m investment in test stands for drive systems with combustion engines and fuel cells as well as truck roller test stands for complete vehicles.

Contact Person

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Research Priorities - Institute of Thermal Engineering

Teaching and research across the full spectrum of thermal energy use, energy systems, fuel cell technology (gas processing and system analysis), renewable energy technology, heat storage, building technology and simulation. The research activities include theoretical work and computer simulation as well as experimental investigations.

Research Facilities

Electrolysis SOEC, fuel cell SOFC, H₂ generation, test stands and gas analysis over 300 m² + 10 measuring stands.

Contact Person

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HyCentA

H₂ researchers in FTE: **30+**

As the only non-academic research institution in Austria that deals exclusively with hydrogen technology, HyCentA carries out research and development projects into the generation, distribution, storage and use of hydrogen, as part of an international science and industry network.

Research Priorities

The areas of expertise of HyCentA include research, engineering, simulation, testing and training related to hydrogen technologies, including electrolysis, hydrogen storage, fuel cells, refuelling, measurement and safety systems. Further areas of focus for H₂ research include aviation and technologies for the renewable hydrogen economy.

Research Facilities

Test stands and laboratories for electrolysis (PEM and AEM), 2x multifunctional test stands (pressure supply up to 300 bar), 1x high-pressure multifunctional test stand (up to 1000 bar), fuel cells, gas analysis and materials laboratory, compressor and filling station systems covering some 1,200 m².

Contact Person

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Montanuniversität Leoben

H₂ researchers in FTE: **30+**

As part of the key innovation focus, HY-CARE - Hydrogen and Carbon Research Center, the University of Leoben brings together all the innovation activities that are concerned with the production of high-quality carbon, CO₂-neutral hydrogen, and other synthetic, renewable energy sources (especially natural gas and fuels).

Research Priorities

On the one hand, the core technology processes being developed within the scope of the HY-CARE Center are the pyrolysis of biogas and natural gas, as the basis for blue, CO₂-neutral or CO₂-negative hydrogen and high-purity carbon. While on the other hand, synthesis processes for the production of renewable natural gas and fuels based on hydrogen and CO₂ from industrial processes are also being promoted.

Research Facilities

Systems for further development of methane pyrolysis, separation of solid carbon and gas processing; approx. € 10m of additional testing facilities in other laboratories also cover the characterisation of carbon.

Contact Personen

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LEC GmbH – Large Engines Competence Center

H₂ researchers in FTE: **30+**

Research facility (COMET-K1 Center) dedicated to large engines for sustainable transport and energy systems.

Research Priorities

In addition to a focus on the energy sector and storage and distribution of hydrogen, specific research priorities include marine transport and power generation, mining vehicles and rail traction and other off-road applications.

Research Facilities

Laboratory and test facilities, with a value of € 25m and covering 1,000 m², feature 6 test stands for the areas mentioned above.

Contact Person

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PCCL – Polymer Competence Center Leoben

H₂ researchers in FTE: **15-29**

The leading Austrian centre of excellence for cooperative research in the field of plastics technology and polymer science. Basic and applied research activities cover the complete value chain from starting stock through to processing and on to material behavioural properties against various scales of measurement.

Research Priorities

In addition to the research priorities mentioned above, PCCL primarily conducts research into plastics and fibre composites for application in hydrogen technology.

Research Facilities

Facilities for chemical analysis, as well as optical, thermal, mechanical strength and fracture investigation, for the characterisation of plastics and fibre composites. Coming soon: Permeation

measuring cell to evaluate the barrier properties of polymers in relation to hydrogen gas (up to 1000 bar, -40°C to + 85°C).

Contact Person

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BEST Bioenergy and Sustainable Technologies

H₂ researchers in FTE: **5-14**

The research facility (COMET-K1 Center) bridges the gap between academic research and technology development through industry-driven, applied research and development into bioenergy, the sustainable bio-based economy and sustainable energy systems.

Research Priorities

Priority is given to large-scale plants for the production of H₂ from biomass, residual and (assorted) waste materials for industrial applications, chemical storage of H₂ (using syntheses) and energy management. A further focus area is small fixed bed systems for H₂ separation or chemical looping primarily for mobility and, to a lesser extent, for the energy sector and commercial applications.

Research Facilities

1 MW pilot plant for gas generation, process plants (2x Fischer-Tropsch, 1x mixed alcohol synthesis) for hydrogen storage in the power range from 5 kW to approx. 100 kW synthesis capacity; under construction: fixed bed gas generator for chemical looping (~ 20 kW fuel input)

Contact Person

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JOANNEUM RESEARCH

H₂ researchers in FTE: **up to 4**

LIFE - the Institute for Climate, Energy and Society at JOANNEUM RESEARCH - is one of the leading research institutes for fundamental issues on climate change, climate risks and energy transition research towards a climate-neutral society.

Research Priorities

Industrial, commercial and mobility applications: Development and evaluation of transition paths for the industrial and transport sector towards climate neutrality, where hydrogen applications can play a core role. Commercial and economic viability assessments of hydrogen-based technologies as well as business modelling of the hydrogen economy and volatility of renewable electricity production, including forecast models and scenario planning systems.

Contact Person

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FH JOANNEUM - University of Applied Sciences

H₂ researchers in FTE: **up to 4**

The Institute for Energy, Mobility and Environmental Management is primarily concerned with issues relating to technological protection of the environment, energy efficiency and intelligent mobility. The critical challenges investigated by this unit include urban planning that is sustainable, both in terms of transport and energy, and new energy strategies for our regions and states.

Research Priorities

Research is being conducted within the area of Fuel Cell Production - Development of Core Competences, as part of the DFC-Core research project (in cooperation with Graz University of Tech-

nology). Based on technical developments at TU Graz, electrodes are being produced where the amount of platinum used in the fuel cell systems is reduced even further through the use of a novel, inexpensive catalyst. Combining both simulation and experimental research, cell components are being developed and dimensioned, and then produced, tested and evaluated regionally.

Contact Person

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Vienna

TU Wien - Vienna University of Technology

H₂ researchers in FTE: **30+**

The Vienna University of Technology is Austria's largest research and educational institution within the field of natural sciences and applied technology. More than 4,000 scientists conduct research on Technology for People covering five main research areas and eight faculties. As a driver of innovation, the Vienna University of Technology strengthens the business location, facilitates cooperation and contributes to the prosperity of society.

Research Priorities



Examples of specific technologies and projects include: Pure hydrogen from the natural gas network using a new and efficient filter and compressor system - HylyPure®; green fuels from biogenic waste - flexible production of valuable energy sources from various residues; investigation into the Sorption Enhanced Reforming process (calcium looping) for the generation of a hydrogen-rich gas or hythane; digital twins for Energy 4.0 - to reduce total energy consumption, CO₂ emissions and costs, taking into account different energy sources (electricity, heat, H₂) and enabling optimum coupling across sectors (industry, buildings, mobility); materials engineering and chemical processes for the use of H₂; Energy Economics Group concerned with developing economic models and scenarios for energy.

Research Facilities

A comprehensive range of laboratory and test facilities are available.

Contact Person

Research into H₂ is conducted by a large number of institutes, and the first point of contact for interested parties from industry and business is the Office for Industry Relations:
wirtschaftskooperationen@tuwien.ac.at

AIT Austrian Institute of Technology

H₂ researchers in FTE: **15-29**

The AIT Austrian Institute of Technology is Austria's largest non-academic research institution. The AIT Center for Energy conducts research on the energy system of the future: Public Power Systems, Industrial Power Systems, and Cities & the Built Environment.

Research Priorities



The AIT Center for Energy is structured around the following core themes, at both a technology and systems level:
1) Development and integration of hydrogen technologies and synthetic gases in the energy infrastructure for efficient coupling of sectors, taking into account energy management aspects.
2) Application of hydrogen feedstock and energy in industrial processes to decarbonise industry.

Research Facilities

SmartEST laboratory facilities: for testing, verification and R&D within the field of integration of decentralised energy systems and smart grid applications. Functional Coatings Lab: Material synthesis and characterisation for water (photo)electrolysis, CO₂ reduction, photovoltaic cells and other energy conversion technologies.

Contact Personen

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Stephan Abermann | Head of Competence Unit Energy Conversion & Hydrogen,
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Upper Austria

K1-MET

H₂ researchers in FTE: **5-14**

K1-MET GmbH is one of the leading international metallurgical centres of excellence for ferrous and non-ferrous metallurgy based in Austria. Research work is funded under the Austrian CO-MET Competence Centers for Excellent Technologies program and conducted under four research areas:

- 1) Raw Materials and Recycling;
- 2) Metallurgical Processes;
- 3) Low Carbon Energy Systems and
- 4) Simulation and Analyses.

Research Priorities

Research is focused on industrial and commercial application, storage and distribution and finally the production of H₂.

Research Facilities

Pilot plant for the extraction of crude steel from iron ore by means of hydrogen plasma melting reduction, covering some 280 m² (plant + gas tanks + container with control room and covered storage area) and - €2.2 m in value.

Contact Person

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Energy Institute at the Johannes Kepler University Linz

H₂ researchers in FTE: **5-14**

With around 80 R&D projects each year, the Energy Institute at the Johannes Kepler University Linz conducts activities, under the three divisions of Energy Industry, Energy Law and Energy Technology, into further development of energy infrastructure that has a positive influence on habitat, economic and environmental aspects, thus strengthening European economies and reducing fossil fuel use as far as possible.

Research Priorities

Research is currently being conducted

into potential uses and application of hydrogen from an interdisciplinary perspective, ranging from techno-economic aspects to social acceptance and to the legal barriers at a national and international level.

Contact Person

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University of Applied Sciences Upper Austria

H₂ researchers in FTE: **up to 4**

The University of Applied Sciences Upper Austria has more than 440 researchers that continuously apply their expertise to 17 core topics. With an available annual R&D budget of € 21 m, some 540 ongoing national and international projects are funded. This, in combination with 630 business and public sector partners, make it the most research-intensive university of applied sciences in Austria. The capability extends from technology and business to health and social issues.

Research Priorities

Within this specified scope, research is further focused on measurement and testing and control technology; including systems research and special aspects of hardware, such as, H₂ storage and phase change materials for H₂ filling stations, etc.

Research Facilities

H₂ demonstrator including electrolyser, fuel cell, compressor, storage, control unit and sensors.

Contact Person

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WIVA P&G

H₂ researchers in FTE: **up to 4**

The (WIVA P&G - H₂ Initiative Flagship Region Austria Power & Gas) association, promotes R&D into network and storage technologies and application of hydrogen and renewable gases and measures for dissemination of these activities. A key aspect of this is coordination of the WIVA P&G model region.

Research Priorities

WIVA P&G conducts R&D into all the key issues related to hydrogen. Over the next few years, the association will demonstrate how Austrian technologies, already tried and tested in the domestic market, can actively reduce greenhouse gas emissions worldwide.

Contact Person

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Profactor

H₂ researchers in FTE: **up to 4**

IRResearch has been conducted, under the H₂Desorb - FFG project, into the improvement of (stationary) H₂ storage systems, along the full value-chain from generation to storage and application. Profactor has been responsible for nano-structuring of magnesium wire pellets, used in the project.

Research Priorities

Technologies and solutions within the field of photocatalytic hydrogen production using nanostructured surfaces.

Contact Person

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Tyrol

FEN Research

H₂ researchers in FTE: **up to 4**

FEN Research conducts both independent basic research as well as industrial research and experimental development, and disseminates the results of this R&D through teaching, publications and knowledge transfer. The focus is on multi- and interdisciplinary tasks and projects.

Research Priorities

R&D of multi- and interdisciplinary processes for building a green hydrogen economy, directed toward building a business case.

Contact Person

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University of Innsbruck

H₂ researchers in FTE: **3-4**

Department of Physical Chemistry at University of Innsbruck - Materials and Electrochemistry Group.

Research Priorities



Investigation of interfacial processes to elucidate reaction pathways and mechanisms at the solid/liquid interface.

Reactions of interest: Hydrogen evolution reaction, CO oxidation and reduction, CO₂ reduction, alcohol oxidation.

Materials synthesis and characterization for energy conversion and storage with application in fuel cells, electrolyzers and (post)lithium-ion batteries.

Contact Person

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Burgenland

University of Applied Sciences Burgenland

H₂ researchers in FTE: **up to 4**

The Center for Building Technology researches efficient system solutions for the sustainable energy supply to buildings. This takes into account both user-specific requirements and current developments in the regulatory framework, as well as economic factors.

Research Priorities

A whole-system, holistic R&D approach is taken, including passive efficiency measures for building physics, research into decentralised energy supply concepts that integrate regenerative energy and the required intelligent communication between generation, distribution and usage. A particular focus of the R&D activities is the development of scalable load and storage management solutions that take into account sector coupling technologies (heat pumps, SOFC and rSOC systems and integration of electromobility, etc.).

Research Facilities

Fuel cell laboratories, test building for SOFC and rSOC system integration

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Salzburg

Paris Lodron University of Salzburg

H₂ researchers in FTE: **up to 4**

The long-term goal is to contribute to the development of solutions within the field of energy storage, both through the development of functional materials, facilitated by (scalable) solid-state chemical syntheses and simple deposition techniques, and through the development of basic scientific understanding of structure-property relationships of energy storage materials that will lead to improving and making these materials more durable.

Research Priorities

The University of Salzburg focuses on the production of H₂ using photoelectrochemical or photocatalytic water splitting.

Research Facilities

Small laboratory setup for the determination of photocurrents and Faraday efficiencies of photoelectrodes (2-40 cm²) and determination of hydrogen evolution of a photocatalyst (200 ml reactor).

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