

### Institute of Networked Energy Systems

The DLR Institute of Networked Energy Systems is an institute of the German Aerospace Center (DLR) with currently around 180 employees at the Oldenburg and Stuttgart sites. With its departments of Urban and Building Technologies, Energy Systems Technology and Energy Systems Analysis, the institute is dedicated to system-oriented issues concerning the intelligent and efficient linking of the electricity, heat and transport sectors. The primary research goal is the development of concepts and technologies that ensure a stable energy system based on weather-dependent and decentralised power generation from renewable energies.

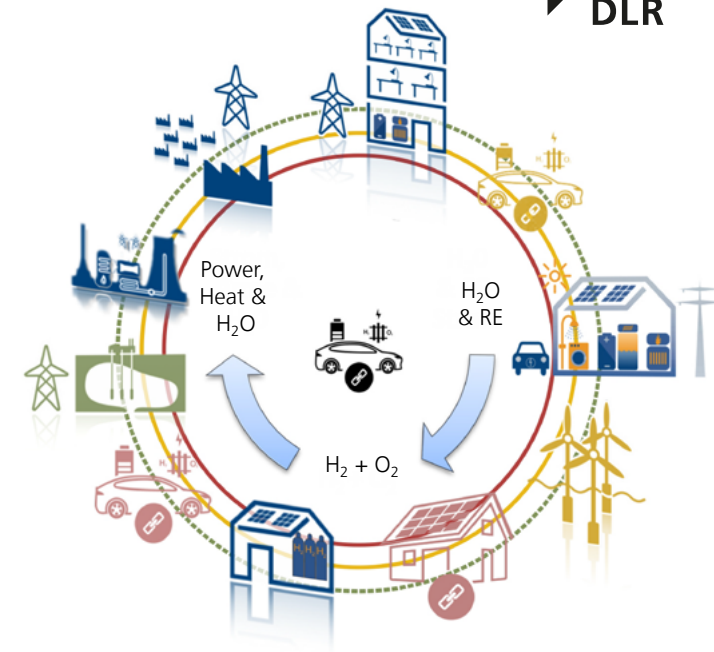
### Department of Urban and Building Technologies

The Department of Urban and Building Technologies works on the system-serving design and integration of innovative individual technologies and components. The focus of the work is on researching and technology concepts and related development in order to be able to reliably supply highly urbanized regions with energy in the future. Through sector integration, new flexibilities can be created to ensure people's mobility and the supply of electricity and heat as well as the provision of chemical precursors. The department consists of three research groups: sector integration mobility, sector integration gas technology and sector integration buildings.

### DLR at a glance

DLR is the Federal Republic of Germany's research centre for aeronautics and space. We conduct research and development activities in the fields of aeronautics, space, energy, transport, security and digitalisation. The German Space Agency at DLR plans and implements the national space programme on behalf of the federal government. Two DLR project management agencies oversee funding programmes and support knowledge transfer.

Climate, mobility and technology are changing globally. DLR uses the expertise of its 55 research institutes and facilities to develop solutions to these challenges. Our 10,000 employees share a mission – to explore Earth and space and develop technologies for a sustainable future. In doing so, DLR contributes to strengthening Germany's position as a prime location for research and industry.



### Imprint

Publisher:  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)  
German Aerospace Center  
Institute of Networked Energy Systems

Carl-von-Ossietzky-Str. 15, 26129 Oldenburg, Germany  
Phone +49 441 99906-0  
E-Mail [info-ve@dlr.de](mailto:info-ve@dlr.de)

[DLR.de/VE/en](http://DLR.de/VE/en)

## Hydrogen as a key component of the energy transition

Projects of the DLR Institute of Networked Energy Systems



Deutsches Zentrum  
für Luft- und Raumfahrt  
German Aerospace Center



## Hydrogen Research

### Hydrogen as a foundation of the energy transition

How can hydrogen contribute to a reliable energy system based on renewables? The integration of hydrogen into the future energy system requires buffering as well as large-volume intermediate storage of an energy carrier. Underground salt storage facilities are ideally suited for this purpose. The technical design, operational management and infrastructural embedding as well as production and usage are the subject of current research questions. In our labs we evaluate technologies how to use fuel cell vehicles for a future local supply of electricity and heat to buildings, neighborhoods and urban districts and in times of low renewable energy generation or blackouts.

#### Our hydrogen research is characterised by

- Modelling and simulation: validated models for gas networks and salt cavern storage as well as generation and consumption units
- Hydrogen gas quality analysis and purification methods
- Chemical and technical laboratories for the investigation of system related questions correlated with material-technical challenges
- Performance measurements for Hydrogen and energy applications for power and heat supply of buildings and areas questions.

With our research goals, we are supporting the successful implementation of a carbon neutral emission-free energy transition by 2035. Our focus lies on processes for the production, transport, storage and use of hydrogen. We design and develop technology approaches including validation of individual technologies.



## Mobility

### H<sub>2</sub> Quality for Mobility: HyCavMobil

In the HyCavMobil project (Hydrogen Cavern for Mobility), the storage of hydrogen in salt caverns and the subsequent use of hydrogen in the field of fuel cell mobility is being researched and evaluated. In particular, the influence of storage on purity is the focus of the research.

### Digitalized Hydrogen Process Chain: DigiHyPro

To model the complex interaction and sector integration between heat, power, hydrogen and mobility a digital twin of a smart energy transform box (SET), consisting of a fuel cell, an electrolyser, a system for H<sub>2</sub>-separation from the natural gas grid and a metal hydride storage is developed within this dtcc.bw funded project.

### Hydrogen purity: RingWaBe & Hydrogen Quality Europe

Round robin tests on hydrogen refuelling stations are conducted within the projects RingWaBe and Hydrogen Quality Europe. Sampling and analysis methods are developed for a reliable measurement of hydrogen as a fuel according to the existing ISO 14687:2019-11 and ISO 21087:2019-06 standards. Online gas analysis is also part of the RingWaBe project.



#### Your Contact Person:

Dr Michael Kröner  
For the group Sector Integration - Mobility  
michael.kroener@dlr.de



## Gas Technology

### Design and operation of energy systems: DESYS

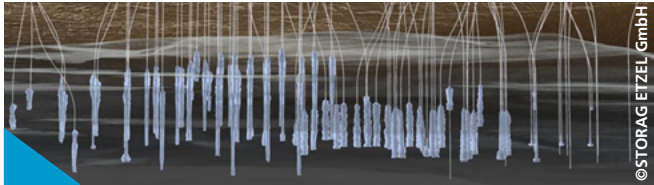
The challenges and opportunities of a coupled gas and electricity grid on a regional scale will be validated. Therefore, the infrastructure and the necessary sector integration components are modeled. Operating strategies for different scenarios are being investigated.

### Large-scale hydrogen storage: H2CAST-Ready /-Prove

The project objective is the development of a demonstration plant for cavern storage of hydrogen. Therefore, gas infrastructure and cavern are modeled and highly dynamic modes of operation are developed. In a second phase two caverns will be operated by using as brine pendulum procedure and parameters will be validated.

### CHP based energy supply: SORGLOS-BHKW

Development of a long-term resilient fuel cell based combined heat and power system. The objective is to develop operation modes and components for the operation with hydrogen natural gas mixtures and its validation in realistic long-term use.



#### Your Contact Person:

Dr Hendrik Langnickel  
For the group Sector Integration – Gas Technology  
hendrik.langnickel@dlr.de