

South Burgenland Innovation Cluster for Integrated Regional Energy and Transport Systems



If we are to meet the energy demands of the region using 100% renewables, we need innovative concepts aimed at creating an integrated regional energy and transport system. Important elements will include energy conversion technologies, finding ways to make links between different types of infrastructure, storage systems, and sector coupling between power, heating/cooling and transport systems. The Oberwart-Stegersbach region is serving as an innovation lab where futuristic solutions for integrated regional systems are being researched and tested in real operating conditions.



Foto: stock.adobe.com

Integrated energy and transport concepts create added value for the region

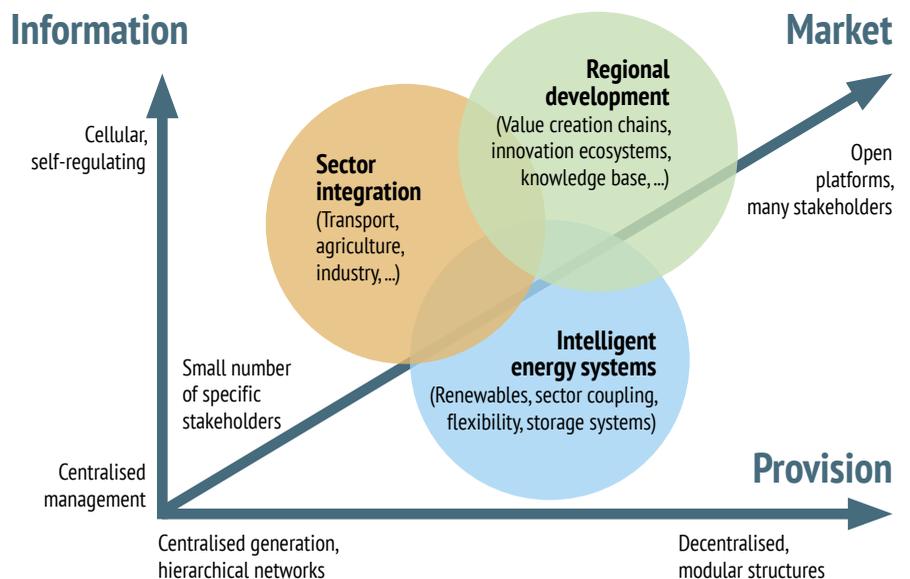
The energy systems of the future will be structured in much more decentralised and modular ways than those of today. This change will be driven partly by the liberalisation of the energy markets, enabling increasing numbers of participants to make an active contribution to the energy supply. Another factor is the policy goal of a CO₂-free economic system based on renewable energies, including a high proportion of volatile solar and wind power. Combined with new technological options for energy conversion and consumption, and intelligent cross-linking of participants, this will result in new structures for energy production and consumption in buildings, industry, agriculture and transport. Changing expectations for resilience and security of supply also play a key role in this trend and require self-regulating system components that can react to various influences both in the short term and on a more long-term basis. Artificial intelligence and high-performance information and communication systems will become increasingly important factors.

tight integration of different sectors. For example, the regional mobility system is supplied with energy (in future, for instance, electro-mobility will be provided at charging points which are integrated into the electricity system). This also contributes to the energy system (e.g. by transporting stored energy in the form of fuels, such as hydrogen).

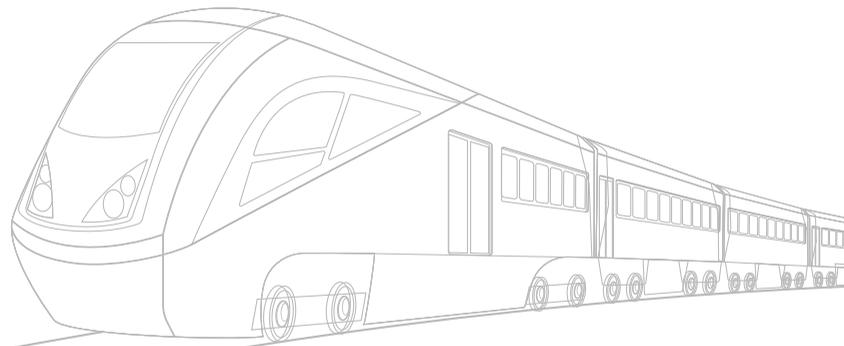
To ensure this is successful and that the local value creation chains within the integrated regional energy system are appropriately supported, it is important to involve all regional stakeholders, from users to providers of solutions and services, from the innovation stage onwards.

Integrated regional energy systems that are able to meet the demand for energy using 100% renewables will also maximise the potential of conversion between different forms of energy, and of synergies and options for creating links between different infrastructures. Used in combination with storage systems, these allow the flexibility to maximise the benefits of energy generated within the region.

These different system components also contribute to the overall system, through active participation in interregional energy exchange and stabilisation. This also results in a



Two innovation initiatives were launched in South Burgenland in 2018, with the aim of developing pioneering **integrated energy and transport solutions** and testing these in real operating conditions. With support from the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Climate and Energy Fund, ground-breaking concepts and technologies are being researched and demonstrated in practical conditions with involvement from the users in the region. □



Innovation initiative to create a digital renewable energy system

The innovation laboratory act4.energy comprises ten communities in Burgenland, working together with several companies and research partners in the Oberwart-Stegersbach region to bundle and implement forward-looking projects and activities for a sustainable, regional energy system. Their focus is on the development of innovative, cross-sector system solutions for integrated energy infrastructure with extensive use of renewable energy.

www.act4.energy



Innovation project working on rail mobility

Open Rail Lab is both a think-tank and a test driver. The aim of the initiative is the investigation and practical testing of futuristic concepts for rail-based mobility in the region. The innovation project has numerous corporate and research partners, and was launched by the Schieneninfrastruktur-Dienstleistungsgesellschaft mbH in cooperation with the Federal Ministry for Transport, Innovation and Technology (BMVIT), Austrian Federal Railways AG (ÖBB) and Verkehrsinfrastruktur Burgenland GmbH.

www.openraillab.at

INNOVATION FOCUS AREAS



Efficient infrastructure			Automation			Reliability		
moving block	using existing infrastructure	precise location-tracking	autonomous mobility	radio technology	UAV support	systems redundancy	cyber security	
	reporting train completeness		locating objects	block-chain	measurement technology	signal box of the future		reduction of external facilities
				central operational control			security of supply	
digital business models		trust	energy efficiency		online monitoring	sector coupling	H2 storage systems	
			cost reduction	load management		H2 for rail transport		regional energy systems
convenience			mobility services		compatibility with infrastructure		intermodal transport systems	local energy community
User friendliness			Cost-effectiveness			Integrated systems		

Innovation laboratory **act4.energy** Researching and testing integrated energy solutions



From L to R: Photovoltaic e-charging station for electric cars, e-charging infrastructure for the tourism industry, photovoltaic facility and waterworks, photos: act4.energy

To facilitate the development of pioneering, integrated systems for the regions, based on 100% renewable energy, new digital, cross-sector technologies and solutions need to be researched, developed and tested. In addition to technical issues, there are also numerous economic and social challenges to be overcome.

The **innovation laboratory act4.energy** initiates and supports research and innovation projects for the development and testing of new products, solutions and services for an integrated regional energy system. Under this initiative, for example in the Oberwart-Stegersbach region, amongst others, experimental conditions are being set up and operated, creating the necessary infrastructure for the development of energy innovations. Numerous stakeholders from companies, research institutions, local authorities and civil society are working together in open innovation processes. They are developing and demonstrating efficient new technologies, solutions and business models.

One important goal is to improve the options for maximising the use of regional renewable energy sources. The question then arises, of how to ensure the regional energy supply remains stable, in spite of the fluctuating availability of renewable energies. One possible solution is targeted, permanently optimised energy load-shifting. With the help of digitally controlled regional energy management systems for multiple buildings along with new storage options, it should be possible in future to integrate a large proportion of renewable energy.

One key topic is **optimising consumption of photovoltaic power generated and used on a local basis** throughout the region. The goal of new technologies and system solutions is to optimise end-users' consumption of locally produced PV power in the future, to feed surplus energy into the network, and to be able to benefit from local renewable energy communities and flexible tariff models.

With the "Sonnenkraftwerk-Burgenland" (Burgenland solar power station) photovoltaic initiative, the act4.energy innovation laboratory region already has a well-developed photovoltaic network, with many different types of photovoltaic installations (in private, community-based or agricultural settings, as well as those on commercial and corporate premises and citizen-owned installations). The geography and demographic structure of the region (approx. 20,000 inhabitants) make this area an ideal test environment.

The concepts and solutions for the future of energy developed here are intended to serve as models which can then be applied to other regions. The creation of an international competence centre for regional energy systems will be conducive to networking and the exchange of knowledge in future. ■

act4.energy services

- > development, support and implementation of R&D proposals including networking activities for the establishment of consortia
- > proposals for optimising the use of infrastructures (photovoltaic infrastructure, storage systems, e-charging systems, software for demand side management systems, software for e-car operation centre, etc.)
- > access to a range of different user groups
- > development and implementation of open innovation processes
- > measures to promote networking with relevant stakeholders
- > organisation of topic-specific information events

act4energy strategy team

- > AIT Austrian Institute of Technology GmbH
- > BlueSky Energy GmbH (Greenrock)
- > Fronius International GmbH
- > Kapsch BusinessCom AG
- > Kioto Photovoltaics GmbH
- > Rabmer Greentech GmbH
- > Siblik Elektrik GmbH & Co. KG
- > Siemens Österreich AG



From L to R: critical infrastructure (water supply), photovoltaic e-bike charging station, power-to-heat equipment at biomass heating plant, photos: act4.energy

South Burgenland urban storage cluster Living lab for cross-sector energy management

Even for energy customers whose annual consumption is under 100,000 kWh (i.e. in the small and micro-user sector) there is great potential in energy flexibility. Heat pump systems, battery storage systems and in future also mobile storage systems in e-vehicles, could all be used for temporary storage of power produced from renewable sources, with the help of smart energy management systems, helping to balance out peaks in production and consumption, and stabilising the network.

In order to access this potential, small-scale options for flexibility must be pooled in clusters. Under the project “Urbane Speicher-cluster Südburgenland” (South Burgenland urban storage cluster)* a **living lab testing programme** for energy management is being set up, centred on two urban storage clusters (Oberwart and Stegersbach) based on renewable energies, each with at least 15 participants. In these clusters, electrical, thermal and mobile storage systems are pooled from private households, small and medium-sized businesses, community facilities and centralised district storage systems, as well as public e-charging stations. This intelligent, cross-sector energy management system is linked with innovative tariff models, and aims to find a way to commercialise these flexibilities in the future.

Key issues being addressed by the project include interface compatibility, building-specific investment costs and possible tariff and citizen-ownership models. An easy-to-use customer interface is also being developed by the project team. Numerous economic and legal, as well as security-related and social aspects are also being explored. ▣

Project goals

- > realistic solutions and approaches for implementation of the storage cluster
- > defining the relevant framework conditions and realisation of electrical storage systems at district level
- > devising a basis for individualised standards for cluster participants
- > development and testing of components and software systems
- > solutions for creating interfaces for the cross-sector system
- > development of a visual interface for users (customer interface)
- > project-specific legal aspects, business models and citizen ownership models
- > reports on activities so far and recommendations for action by “active” participants in a storage cluster

* Project partners: Energie Kompass GmbH (Innovation laboratory act4.energy), B-Süd Gemeinnützige Wohnungsgesellschaft m.b.H., Energy Institute at Johannes Kepler University Linz, FH OÖ Forschungs & Entwicklungs GmbH, HOVAL Gesellschaft m.b.H. (tbc), KEBA AG, Kreisel Electric GmbH, Schlaustrom GmbH, Seier GmbH, Siemens AG, Stadtgemeinde Oberwart, Tourismusverband Golf- und Thermenregion Stegersbach, Zentrum für Ökomobilität GmbH

Supported by the Climate and Energy Fund as part of the Smart Cities initiative www.smartcities.at

H2BAhnLog Innovative concepts for hydrogen on rails

Hydrogen is a versatile form of stored energy that can be produced using renewable energy sources and is notable for its ease of storage and transport. It has great potential for the future, particularly in the mobility sector, as well as for the storage of renewable energy. While technical solutions have already been developed for hydrogen-powered vehicles in road-based transport, in the area of rail transport, solutions for H₂ systems still need more research.

In the H₂BAhnLog project, locally produced hydrogen is not only being used as fuel for goods transport on rails, but also itself being transported and distributed via the rail network. In this innovative concept, the railways are being used as a mobile storage system for hydrogen. The aim is to develop **efficient hydrogen logistics** and to investigate the potential for distribution through the rail networks and any possible synergy effects. A smart H₂ logistics tool is intended to support the efficient organisation of hydrogen distribution.

The scope of the project includes analysis of the technical, security, legal, organisational, ecological and economic factors. It also includes the development of hydrogen-based mobility options for public passenger transport at the interface between rail and road. **□**

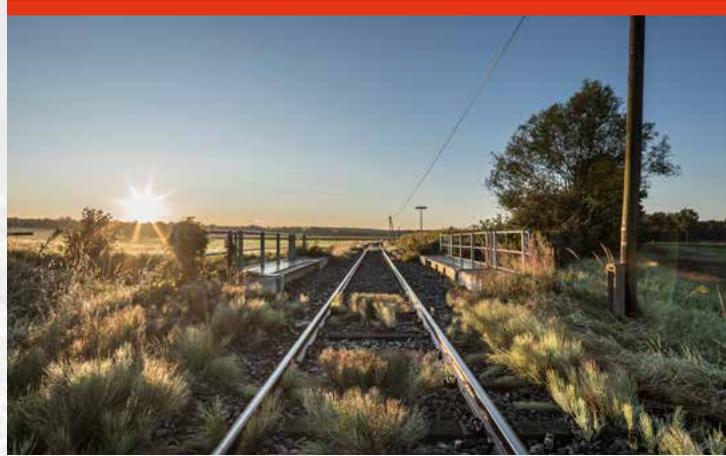


Photo: Open Rail Lab

Options for the use of H₂ in rail transport:

- > hydrogen as a fuel technology for rail vehicles
- > mobile, decentralised storage of hydrogen in the rail environment
- > transport and distribution of hydrogen from mobile storage for supply to decentralised mobility applications in the urban environment

* Project partners: Energie Kompass GmbH (Innovation laboratory act4.energy), HyCentA Research GmbH, Verkehrsinfrastruktur Burgenland GmbH (VIB), Energie Burgenland Windkraft GmbH, Grazer Energieagentur GmbH, Logistik Service GmbH, MiRo Mobility GmbH

Funded by the BMVIT programme "Future Mobility"



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Photo: Open Rail Lab

Open Rail Lab Reinventing rail!

The world of transport is changing rapidly. Rail is an enormously important part of this landscape. The Open Rail Lab has set itself the task of reinventing rail, making it an innovation driver for Mobility 4.0. And to secure the rail network's long-term position as an essential and sustainable transport artery in the rural context.

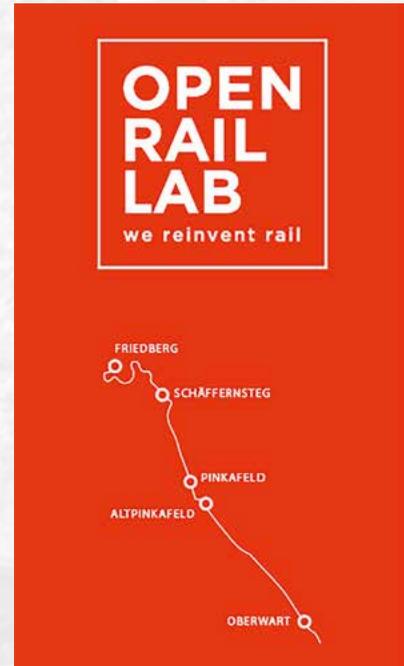
The Open Rail Lab is Europe's first test environment for self-driving trains on open track. Here various companies and research institutions can test system functionalities in various development areas, from rail vehicles (e.g. drive control systems for automated driving, doors, route monitoring, hybrid systems, communication infrastructure for vehicles). New railway technologies can also be tested, such as engines with automatic recognition of level crossings or obstructions on the tracks. An initial detailed survey of various industry partners, conducted in cooperation with Austrian Federal Railways (ÖBB), has already identified 34 applications that can be tested on this stretch of track.

The test route between Friedberg in Styria and Oberwart in Burgenland is over 25 kilometres long. In the Open Rail Lab, it is possible to run through the entire range of technology for self-driving trains - from the first computer simulations to test driving in everyday rail operation.

New stimulus for growth

The Open Rail Lab is a leading edge research project in Burgenland. The launch of this innovation project in rail transport will be an important stimulus for growth in the region.

- > Rail as an employment generator
- > Real estate and attractiveness for industrial development
- > Establishment of the region as a location for technological innovation



Rethinking collaboration

Innovations need agile creative thinking and a partnership working style. The Open Rail Lab lives up to its name. It is open to ideas.

- > Collaboration between business and research
- > Support for start-ups and SMEs
- > Practical research leadership creates clear frameworks

www.openraillab.at

Technical features of the test track

- > Track length approx. 25.5 km
- > Standard gauge, single track, not electrified
- > Maximum speed 40 km/h
- > Track type: C3
- > 8 stops (6 stations, 2 halts)
- > 36 level crossings
- > 42 rail bridges and constructed culverts
- > 1 tunnel
- > Low level of traffic
- > No timetabled traffic
- > 2 freight trains
- > Facilities in good condition

Collaboration for integrated energy and transport systems



Photo: act4.energy

In our act4.energy innovation laboratory, new digital energy systems are developed and tested in real operational conditions. We offer a leading example of community collaboration in an open innovation process, and how this can involve the local population and form an effective motor for innovation processes. The cross-sector approach of cooperation with the Open Rail Lab represents an important impulse for achieving our goal – to create an integrated, regional energy and transport system.

**Andreas Schneemann, Managing Director
Energie Kompass GmbH and Innovation laboratory act4.energy**

The Open Rail Lab will enable us to secure a leading position in Europe both for the rail industry and for rail users. Innovative collaborations provide employment and guarantee ongoing secure and cost-effective rail business. Mobility and energy are always closely interlinked, as fundamental pillars of a modern society. This is why I am delighted about this constructive collaboration between act4.energy and ORL.

**Ulrich Puz, Managing Director
Schieneninfrastruktur-Dienstleistungsgesellschaft mbH**



Photo: Johannes Zinner

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