sccer mobility

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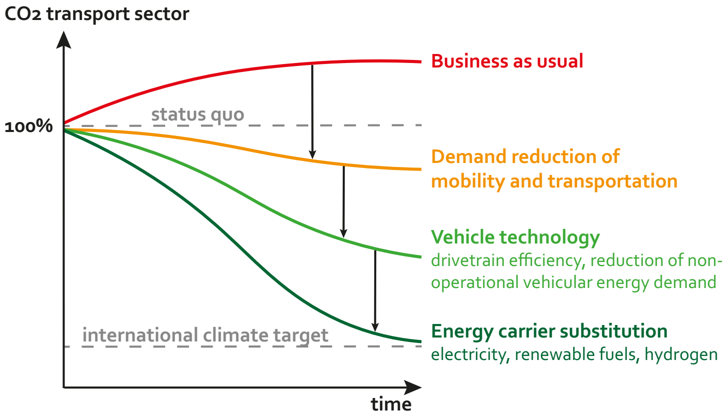
SCCER Mobility

Swiss Competence Center for Energy Research
Efficient Technologies and Systems for Mobility

Mission

Currently, the transport sector accounts for more than one third of the total energy demand[1] and for about 50% of CO_2 emissions (incl. international air travel)[2] in Switzerland. Adding to this, it is the only sector that has required more and more energy over the past three decades. To promote the energy transition and meet international CO_2 emission targets, this trend must be limited.

The Swiss Competence Center for Energy Research - Efficient Technologies and Systems for Mobility (SCCER Mobility) works towards this end. It develops essential knowledge and technologies to minimize the CO_2 footprint of the Swiss transport sector. Research efforts within SCCER Mobility take a systemic approach and focus on reducing mobility energy demand, improving vehicle technology and substituting conventional fossil fuel-based energy carriers.



Systemic approach of SCCER Mobility for reducing CO_2 emissions. Measures on both the demand and supply side are needed (displayed qualitatively).

SCCER Mobility brings together research teams from all around Switzerland (ETH Domain, cantonal universities and universities of applied sciences) and connects them with relevant partners from industry and government. It is one of eight competence centers funded by Innosuisse.

SCCER Mobility is structured into five so-called Capacity Areas:

- Systems and Components for E-Mobility
- Chemical Energy Converters
- Minimization of Vehicular Energy Demand
- Design, Demonstration and Dissemination of Systems for Sustainable Mobility
- Integrated Assessment of Mobility Systems

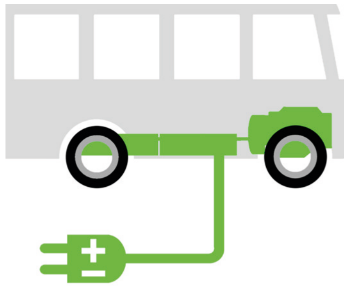
[1]Bundesamt für Energie (BFE). 2015. Schweizerische Gesamtenergiestatistik 2015.
[2]Bundesamt für Umwelt (BAFU). 2017. Entwicklung der Emissionen von Treibhausgasen seit 1990.

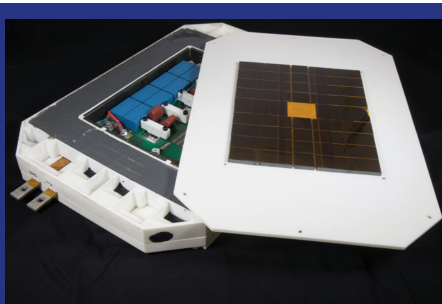
Systems and Components for E-Mobility

Capacity Area *Systems and Components for E-Mobility* addresses technical challenges related to storing electrical energy such as battery performance, reliability, charging time, lifetime and costs. These challenges are the main barrier for introducing electric propulsion and auxiliaries in automotive applications.

In particular, this Capacity Area focuses on electric storage solutions for rail, bus, construction, agricultural or municipal utility vehicles, thus addressing the needs of the niche automotive and railway industries in Switzerland.

The established Swiss Battery Research Platform with battery testing facilities at BFH, Empa and NTB provides essential research infrastructure for the development of battery systems for specialized vehicles. Research activities also include power electronics for batteries, e.g. to interface propulsion and inductive charging systems.





Advanced charging technologies such as this receiver for inductive charging are developed and tested at NTB.

The eDumper (eMining AG) battery cells, -management system and -pack were developed in collaboration with the SCCER Mobility battery research platform.

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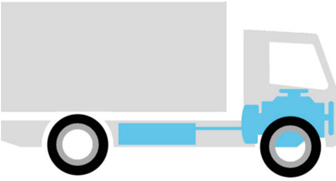
Capacity Areas

Chemical Energy Converters

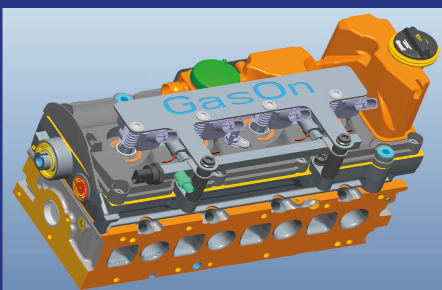


Capacity Area *Chemical Energy Converters* works towards shifting conventional fossil fuel operated powertrains to more efficient internal combustion engines, renewable fuels and fuel cell technologies. The focus is on long-range and heavy-duty applications, as electric propulsion is not expected to meet the demands of these sectors.

Research on internal combustion engines focuses on increasing energy efficiency, reducing greenhouse gas and pollutant emissions as well as utilizing renewable synthetic fuels. Investigated synthetic fuel options are based on renewable surplus electricity and biogenic or solar-chemical processes.

In the area of fuel cells, projects concentrate on cost reduction and improved operating conditions as well as hydrogen production from excess electricity from fluctuating renewable energy sources.

Lab-scale test environment at PSI for fuel cell characterization. The goal is to build a thermoneutral short stack demonstrator (>1 kW).



In the GasOn project, Empa is supporting the development of a gas-only internal combustion engine. It uses 20% less fuel than the best conventional gas engine.

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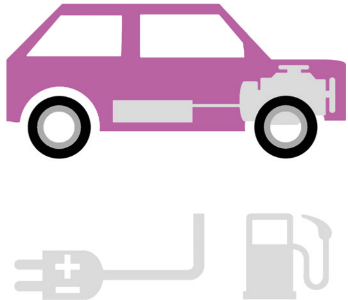
Minimization of Vehicular Energy Demand

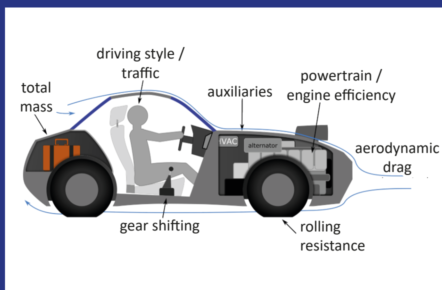
Capacity Area *Minimization of Vehicular Energy Demand* investigates technologies and strategies to minimize non-propulsive energy demand of vehicles for improved efficiency.

This includes the reduction of vehicle mass by replacing conventional materials such as aluminum or steel with lighter ones. To achieve this, new processing routes for high volume production of lightweight thermoplastic and bio-inspired composites with outstanding mechanical properties are being developed.

In addition, this Capacity Area elaborates a modeling framework to assess the actual energy demand of conventional and alternatively propelled vehicles, which are investigated in other Capacity Areas. In a second step, this will be used to determine optimal combinations of new lightweight materials and alternative propulsion systems.



New materials using i.a. bicomponent fibers are developed at ETH Zurich. Their application can be tested in an industry scale warm press for stamp forming.



The propulsive and non-propulsive energy demand of vehicles depends on many factors. This is modeled under real-world conditions at ETH Zurich.

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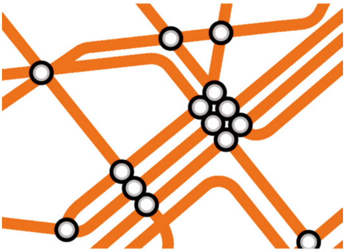
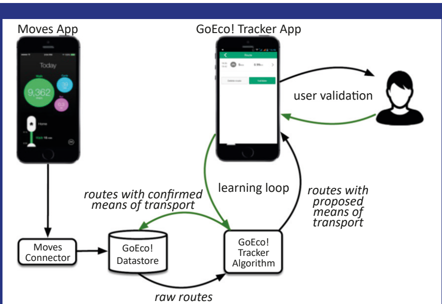
Capacity Areas

Design, Demonstration and Dissemination of Systems for Sustainable Mobility





With the GoEco! app mobility user behavior is monitored with the goal of calculating and communicating energy saving options. This is a joint effort between SUPSI and ETH Zurich.

The BFH Dencity platform supports and implements concepts for urban densification. It elaborates solutions that can be integrated into the market immediately.

Capacity Area *Design, Demonstration and Dissemination of Systems for Sustainable Mobility* deals with increasing mobility energy efficiency from a systemic perspective. This approach takes all aspects of mobility into account, i.e. mobility technology, infrastructure and users, and relates them to mobility patterns, urban planning and environmental data.

One focus lies on designing and optimizing the infrastructure for renewable energy carriers (supply of charging stations, hydrogen filling stations and logistics).

On the user level, research deals with assessing new IT and information service technologies to foster energy-saving mobility choices.

This Capacity Area interlinks mobility choices and patterns with environmental and spatial planning to develop a decision support tool for consumers, municipalities and policy makers leading to energy demand reduction.

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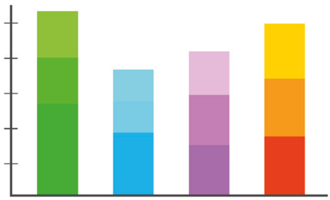
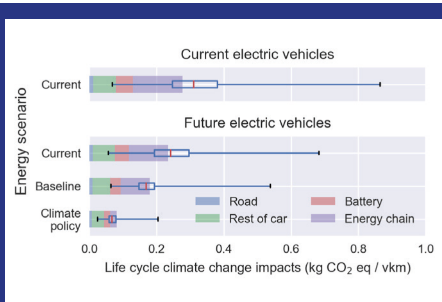
Integrated Assessment of Mobility Systems

The central objective of Capacity Area *Integrated Assessment of Mobility Systems* is to evaluate the future Swiss mobility system considering environmental, economic and social criteria (e.g. energy demand, emissions, resource depletion, costs and risks) and user preferences.

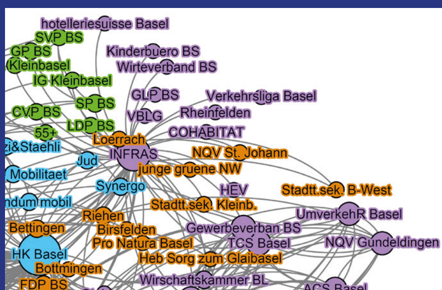
This builds on the interdisciplinary assessment of different technology options for individual, public and freight transport. The results are fed directly into an energy-economic model to analyze long-term mobility scenarios in terms of costs, CO2 emissions and energy demand and to identify technology options that meet the objectives of the Swiss energy strategy.

Key factors affecting mobility behavior and demand are analyzed by means of i.a. “living labs”. This includes the acceptance of novel technologies by investors and consumers. Ultimately, recommendations and guidelines to promote a socio-economic transformation will be formulated.





At PSI, future mobility choices such as electric vehicles are evaluated based on life cycle impact-, cost- and risk assessments.



The ZHAW project Smart Commuting explores ways of combining work and life with intelligent transport system services.

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Key figures 2017

- More than **100** collaboration partners
- **10** prototypes, pilot plants and demonstrators
- **6** relevant innovative products, processes and services
- **4** patent applications and **1** spin-off company
- **16** models and datasets
- **~200** scientists funded by SCCER Mobility and related activities
- **49** Master and **6** PhD theses completed

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Academic research partners

SCCER Mobility network

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