Waste biorefinery technologies
for accelerating sustainable
energy processes

Dr. Hagen Hilse

<u>Keynote:</u>

Sustainable technologies – from scientific research to market maturity – Examples from GICON®-Group

Our story

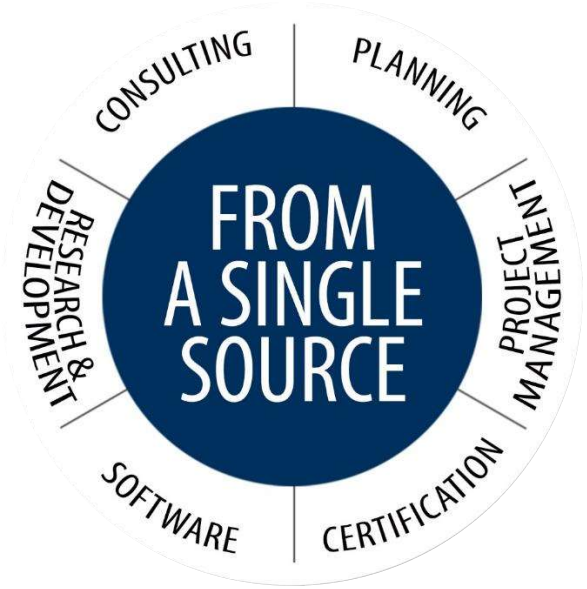
Foundation: 1994 | Headquarters: Dresden

Owner-managed Engineering Company

30 Years on the Market

Engineering services from concept to commissioning

More than 30 departments, special services and own research & development

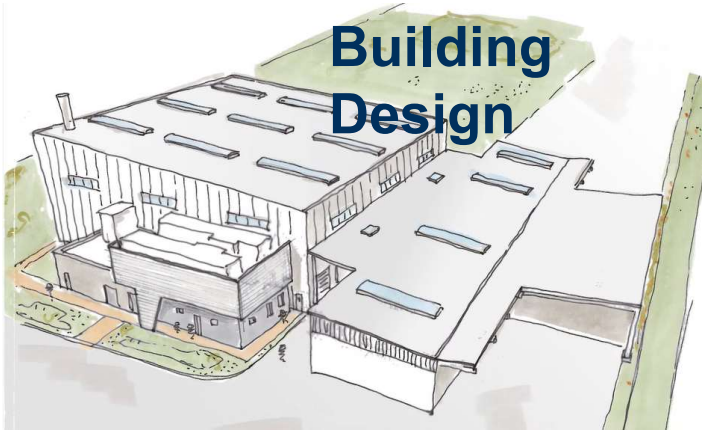


21 locations in Germany and offices worldwide

>500 employees stand for highly qualified solutions from a single source

>100 patents stand for the innovative power of our own green technologies

Departments

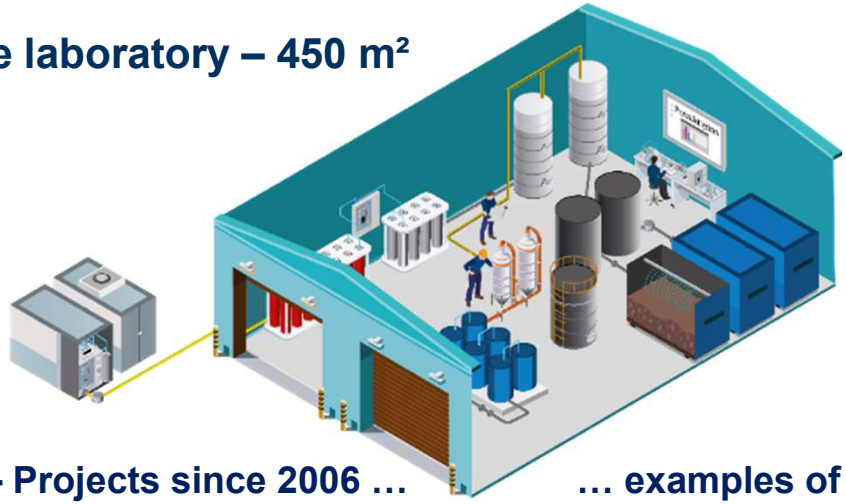


Sustainable technologies from scientific research to market maturity-Examples from GICON®-Group

Research & Technology Location Cottbus

GICON®

Large-scale laboratory – 450 m²



> 30 R&D – Projects since 2006 …

GICON® 2 stage -2 phase biogas process

- 2 Patents

Developed together with

b-tu Brandenburgische Technische Universität Cottbus - Senftenberg

… examples of success:

Biological Methanation via GICON® trickle bed process

- 1 Patent + 1 Patent application
- supply of „green“ natural gas and heat

Research & Technology Location Cottbus

Branch office

Large-scale Lab + technical center

Developed together with

Brandenburgische Technische Universität Cottbus - Senftenberg

Laboratory

according to the needs of our clients.

Customized technology development and testing of technologies

GICON® biogas plant – commercial scale

The GICON® Process is specially designed for wastes with high levels of impurities as feedstock.

GICON´s business development strategy – Example 1

GICON®

Biogas: An Example of Innovation

Transfer from research results to commercial use

Developed together with

b-tu Brandenburgische Technische Universität Cottbus - Senftenberg

Two-stage GICON® Biogas Process

Patent	Lab-scale tests	Test facility	Pilot plant	Cottbus PSC	Projects
2004	2005	2007	2007	2008	from 2010

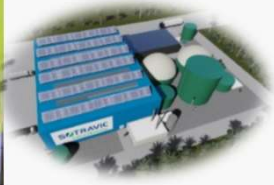
Research – Development - Realization

Hertnik Plant (wet) (Slovakia) (998 kW el)

Richmond Energy Garden (GICON) (Can) (1 MW el)

Klotzsche Plant (wet) (Germany) (500 kW el)

Biogasyl Plant (wet) (France) (615kW el)

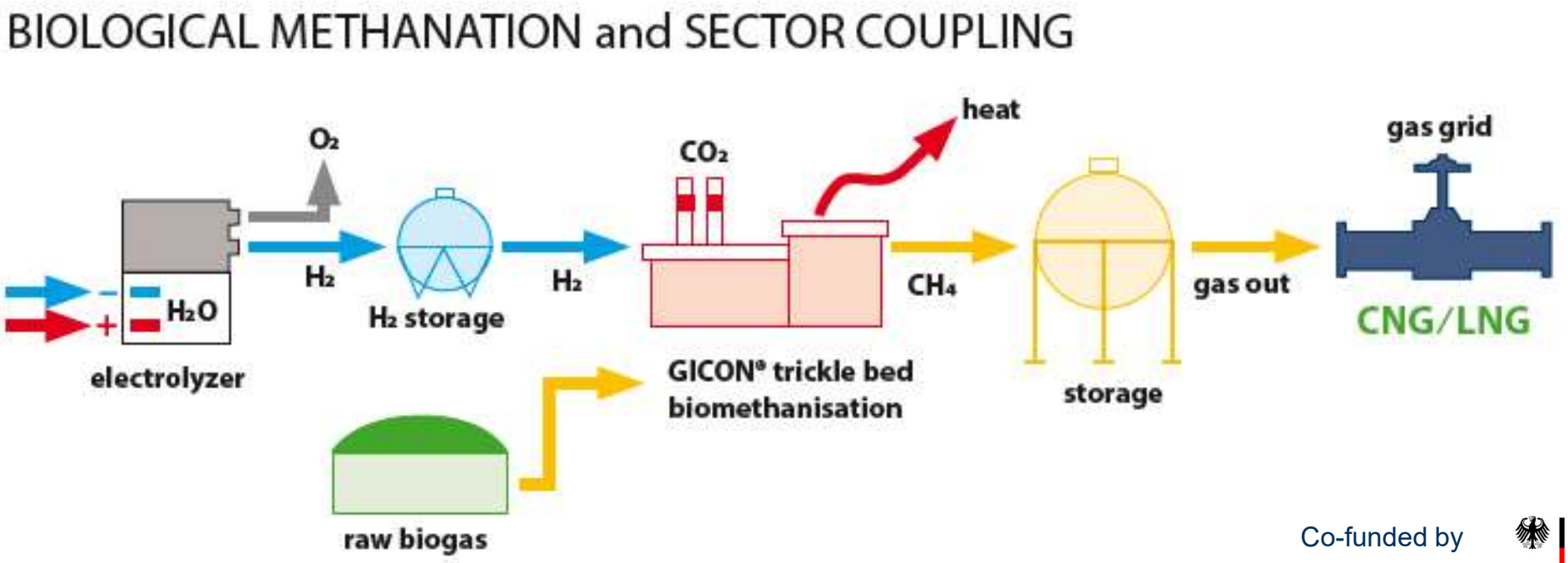


Sotravic Plant (GICON) (Mauritius) (1 MW el)

2010 → **2020**

Realization: More than 100 projects worldwide

Example 2 - GICON® trickle bed process



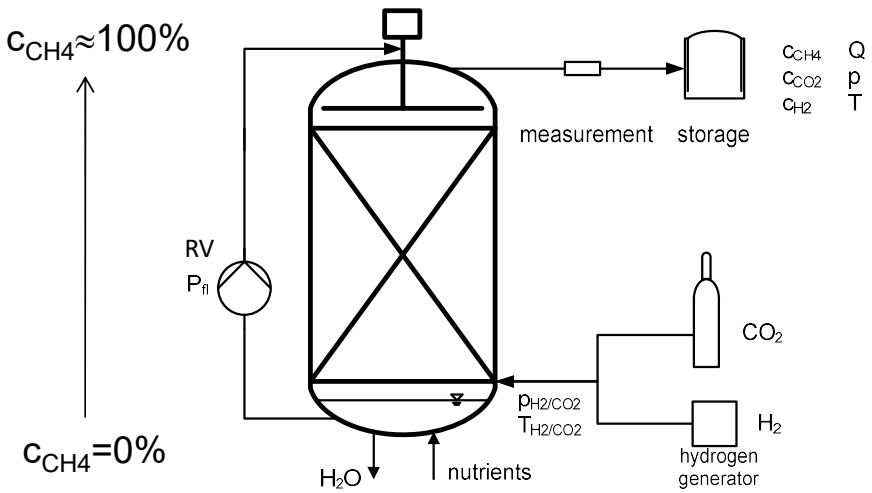
Co-funded by

Federal Ministry for Economic Affairs and Climate Action

ZIM Zentrales Innovationsprogramm Mittelstand

DBU Deutsche Bundesstiftung Umwelt

GICON® trickle bed process - Basic principle



$$4H_{2(g)} + CO_{2(g)} \xrightarrow{\text{hydrogenotrophe Archaeen}} CH_{4(g)} + 2H_2O_{(g)}$$

Developed together with

Brandenburgische Technische Universität Cottbus - Senftenberg

bioch.+phys. Challenge:

- Mass transfer J in the three-phase system

$$J_i = \frac{D_i}{Lc, g} \cdot a \cdot \left(p^*_{i,l} \cdot k_{H,i} - c_{i,l}\right)$$ **i=H_2, CO_2**

=f(Spec. surface, Temp., Pressure, Transport route, Partial pressure, + Dwell time)

- mesophilic/(hyper-)thermophilic conditions
- Micro, macro elements
- pH stabilisation
- Mono vs. mixed culture
- Trickle rate, room loading, stoichim. ratio,...

GICON® trickle bed process

Brandenburgische Technische Universität Cottbus - Senftenberg

technical lab
80 l trickle bed reactor

2011
Laboratory 30 l

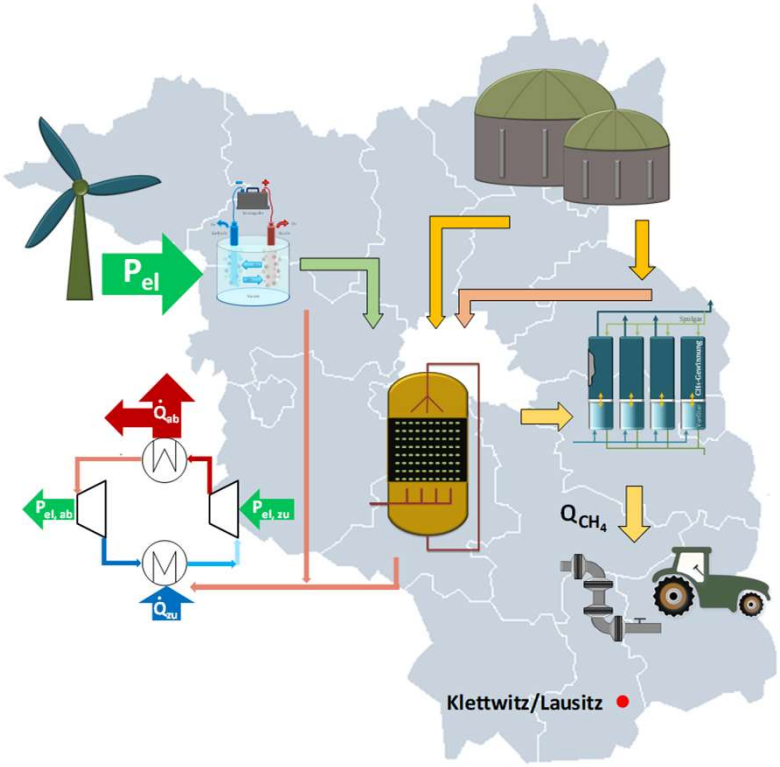
2013 Patent application

2014 License agreement BTU - GICON

2015-2021

2017 - today
large scale research facility, 10 m³ + 1,8 m³ trickle bed reactors TRL 5/6

Biomethanisation using the trickle bed process and waste heat utilisation by a high-temperature heat pump at the Klettwitz/Lausitz site



Integration of biomethanisation in the innovative GICON® trickle bed process into the energy network of biogas plant, wind power plant and local heating network

DLR Deutsches Zentrum für Luft- und Raumfahrt

GICON® Großmann Ingenieur Consult GmbH

energiequelle ENERGIE MIT ZUKUNFT

YADOS Energie mit Zukunft

b-tu Brandenburgische Technische Universität Cottbus - Senftenberg

GICON® - Upscaling an international level

cométha

Partenariat d'innovation
Cotraitement des boues des eaux usées du SIAAP et de la fraction organique des ordures ménagères résiduelles du Syctom

cométha

Partenariat d'innovation
Cotraitement des boues des eaux usées du SIAAP et de la fraction organique des ordures ménagères résiduelles du Syctom

We are still looking for members of our Paris team 2023/24!

Example 3 – GICON® photobioreactor for cultivation of microalgeas

GICON®

Engineering of microalgae production plant in 2000 (Kloetze/ Germany, now owned by Roquette).

2000

First Patent application for tubular Photobioreactor

2010

Commissioning first GICON-PBR in Köthen. Hugo Junckers Prize for Innovative Technology.

2011

Founding of the Biosolar Centre in Köthen in cooperation with the Anhalt University of Applied Sciences (Köthen)

2013

Successful feeding trials with laying hens. More animal welfare and egg production recognisable.

2016

2019

Commissioning of the first industrial unit at the Cottbus site.

Successful completion of the AlgaPork project. Less use of anitbiotics through microalgae in pig feed.

2022

2021

First photobioreactor goes into operation in Saudi Arabia

GICON® photobioreactor for cultivation of microalgeas

GICON®

R&D project AlgaPork
Microalgae in pig fattening

What was done?

In 6 test series, 300 young pigs each received 200 l daily of fresh microalgae suspension mixed directly from the GICON-PBR into the feed over a period of 7 weeks.

Partners:

Agraset

GICON®

fodjan

Universität Rostock Traditio et Innovatio

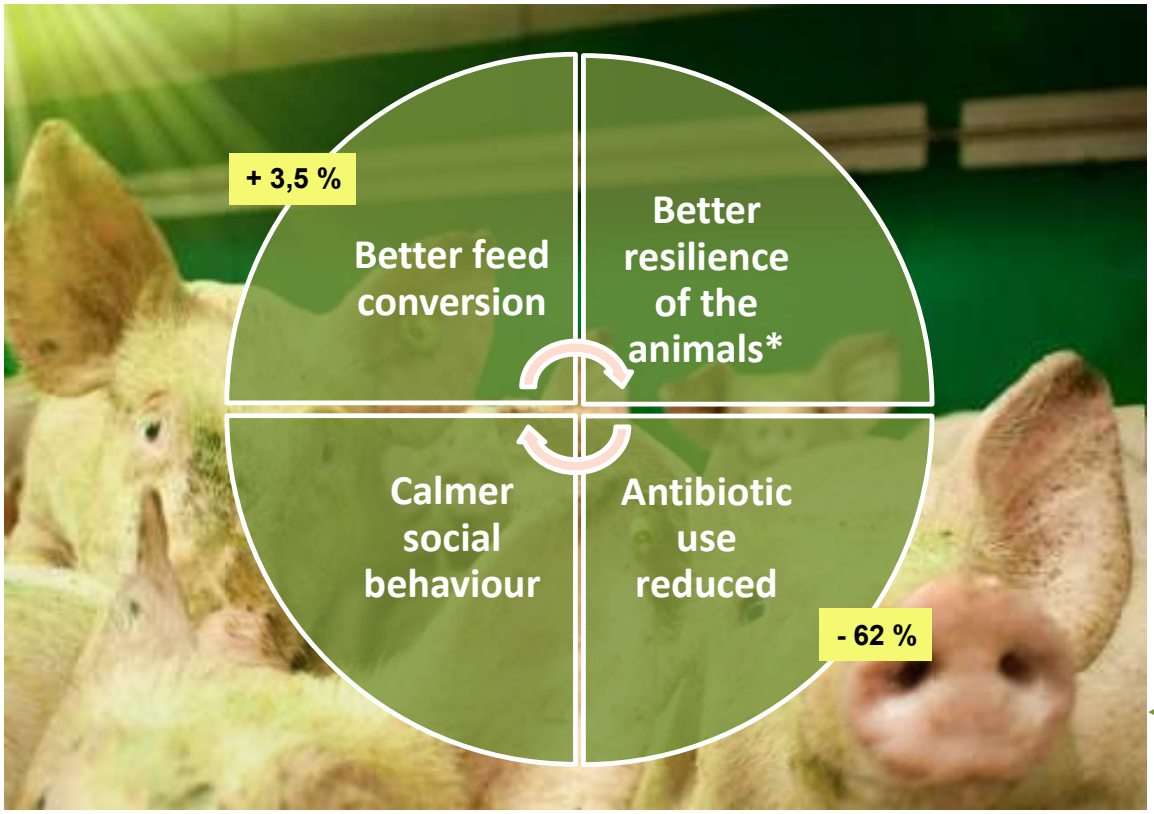
Co-Funding by:

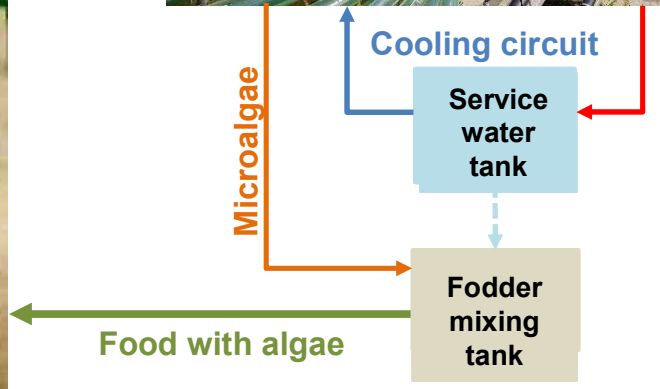
LfULG Sachsen

PARTICIPATING IN eip-agri

R&D project AlgaPork
Microalgae in pig fattening

GICON®



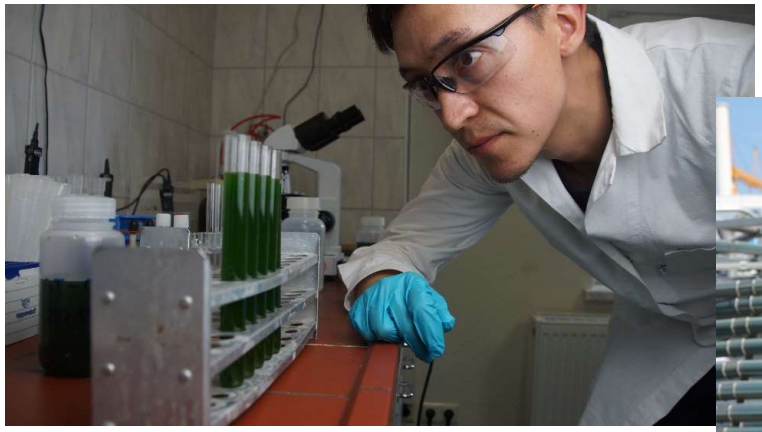


*Based on 45% fewer animal removals due to illness, death, injury or behaviour.

Microalgae make pig fattening more resource-efficient and cost-effective, and they increase animal welfare!

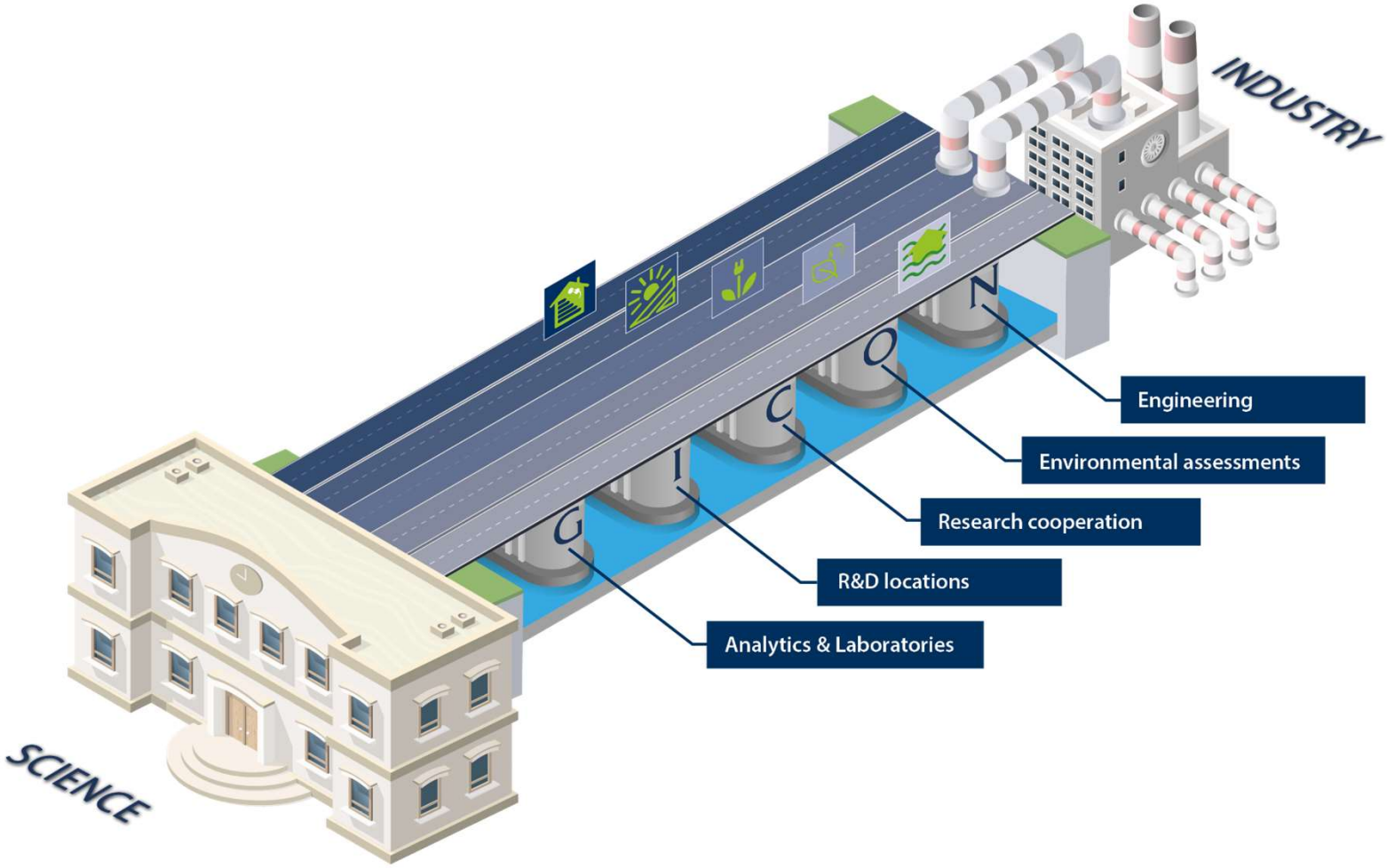
GICON® group – bridge between science and industry

As an internationally active engineering service provider, we also pay attention to regionally valuable projects, with regional partners for improved value creation.



GICON wants to develop a new R&D-Site including branch office in Cottbus!
Partners are welcome!

GICON® group – bridge between science and industry



Let‘s connect!

GICON®

Thank you for your attention.

GICON®

www.gicon.de