# The roles of industrial parks in the transformation: knowledge hub, innovation campus, business driver

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Process4 Sustainability

**Cluster for climate-neutral process industries in Hesse**

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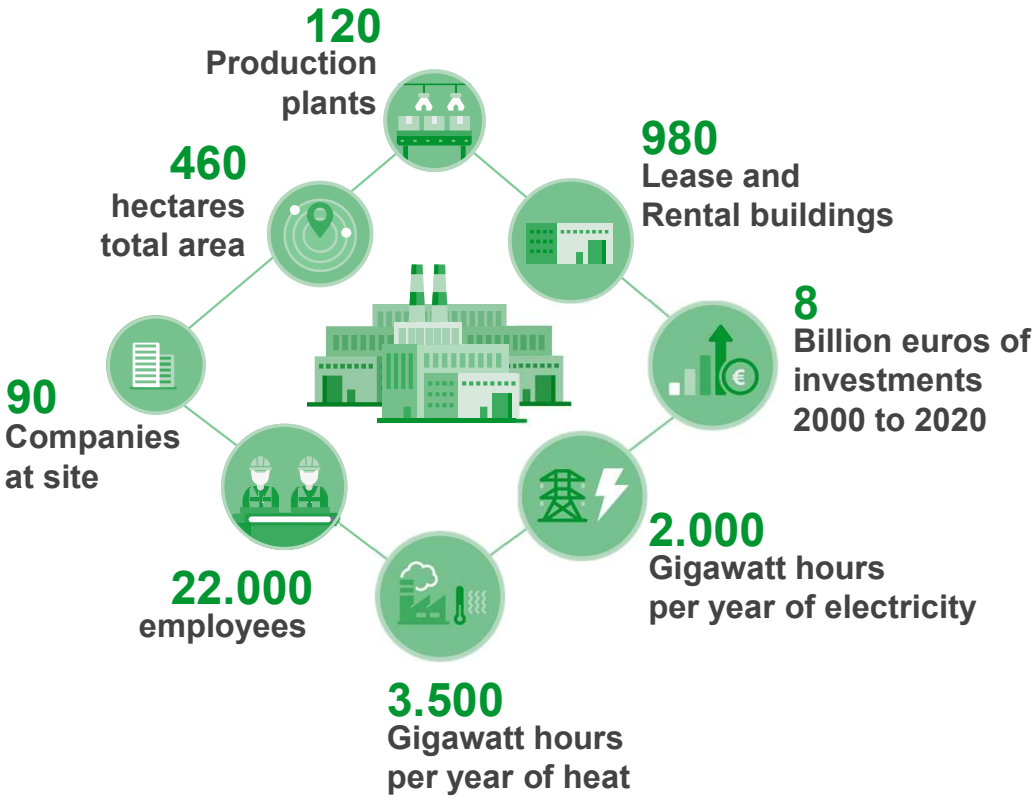
# Our key performance indicators at Industriepark Höchst

## Industriepark Höchst




## Infraserv Höchst

- In 1997, Infraserv Höchst began operating Industriepark Höchst, one of Europe's largest chemical and pharmaceutical sites.
- At home in the chemical and pharmaceutical industries, we are the leading site developer and expert for chemical-related services.
- Our customers are the Who‘s Who of the industry.
- Our turnover amounts to € 1 billion.
- With around 2,700 employees und 178 trainees we are the element of our customer‘s success.

# Our key performance indicators at Industriepark Höchst

**Annual volume handled**

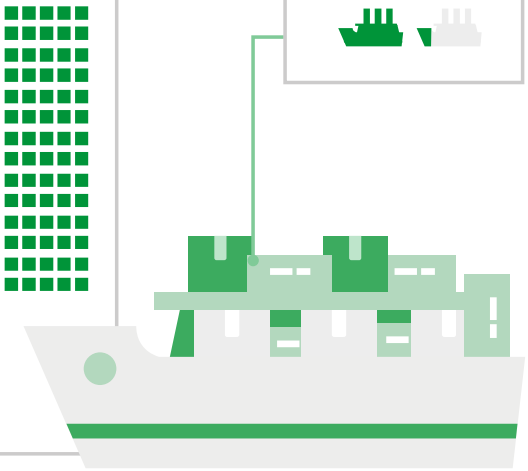
**32,000** Containers

**1,900,000** Tons of liquid

**1,400,000** Pallets

**1,200** Vessels

**Annual volume Handled at river port**



**In kilometers**

| 983 | 478 | 375 | 184 | 72 | 55 | 50 |
|---|---|---|---|---|---|---|
| Power lines | Utility supply lines | Pipelines and material lines | Water lines | Roads | Railroads | Cooling water and storm sewers |

# Some of our customers

# Chemical Production in Höchst since 1863
# > 150 years of Industriepark Höchst

**Meister Lucius & Co.**

Production of dyes (e. g. fuchsine, aldehyde green

**1863**

**Farbwerke Hoechst**

Start of drug production

**1892**

**IG Farben**

**1916**

**Farbwerke Hoechst AG**

Start of plastics production (Hostalen)

**1951**

**Foundation**
**Operator:** infraserv höchst

**1997**

**150th birthday**

**2013**

**25 years Infraserv Höchst**

**2022**

# The basic idea of sustainability in the chemical industry is not a new one ...

## Integrated Verbund site

Platform for sustainable chemistry; recycling management for efficiency and conservation of resources

Last 15 years


Today and in future

## Innovative recycling methods

Green chemistry through $CO_2$ recycling; pilot plants: knowledge about processes; further $CO_2$ reduction

**Anticipating and purposeful tackling of challenges from society and politics has a long tradition!**

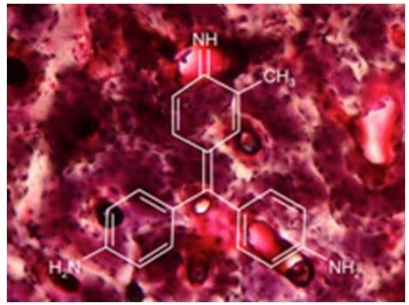
## Production-integrated protection of the environment

e.g. expansion of the biological wastewater plant at Hoechst in 1981

1970ies and 1980ies

## Utilisation of tar residues

Production of pigments:
Waste = required ingredient for other products



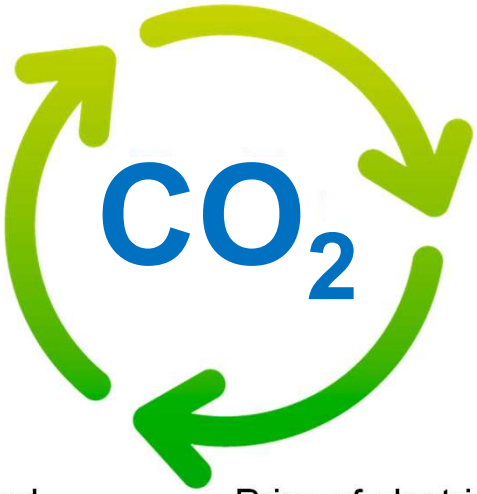

19th century

# Why engaged in converting $CO_2$ into products ?

Sustainable business models

Legislation requiring $CO_2$ reduction

Rising pressure for new methodologies and technologies




Paris Climate Agreement

Respond early to regulatory pressure using own portfolio

Increase in price of $CO_2$ emissions

Targeted research into and development of sustainable fuels

Price of electricity from renewable sources will drop

**MANAGING SUSTAINABLE DEVELOPMENT IS THE KEY TO LONG-TERM COMPETITIVENESS CREATING VALUE FOR BOTH THE CLIENTS AND SOCIETY**

# Energy and raw material supply IPH


2,000 GWh/a Electricity
3,500 GWh/a Heat

> 5,500 GWh/a Raw Materials

# $CO_2$ neutral chemical industry 2050 - What role can chemical parks play?

## Infrastructure

Energy supply
- Power generation
- Heat / Steam
- Hydrogen
- Biogas
- Biomethane
- ...

Disposal (circular economy)
- Wastes
- Phosphate
- $CO_2$
- ...

*sustainable raw materials available*

## Innovation Campus

Initiative and coordination of funded innovation projects

Establishment of innovative start-up companies

Pilot and demonstration plants for PtG, PtL and PtX

First-of-its-kind plants for sustainable technologies

*Industrial infrastructure in place*

## Networks

Formation and active participation in networks with chemical companies

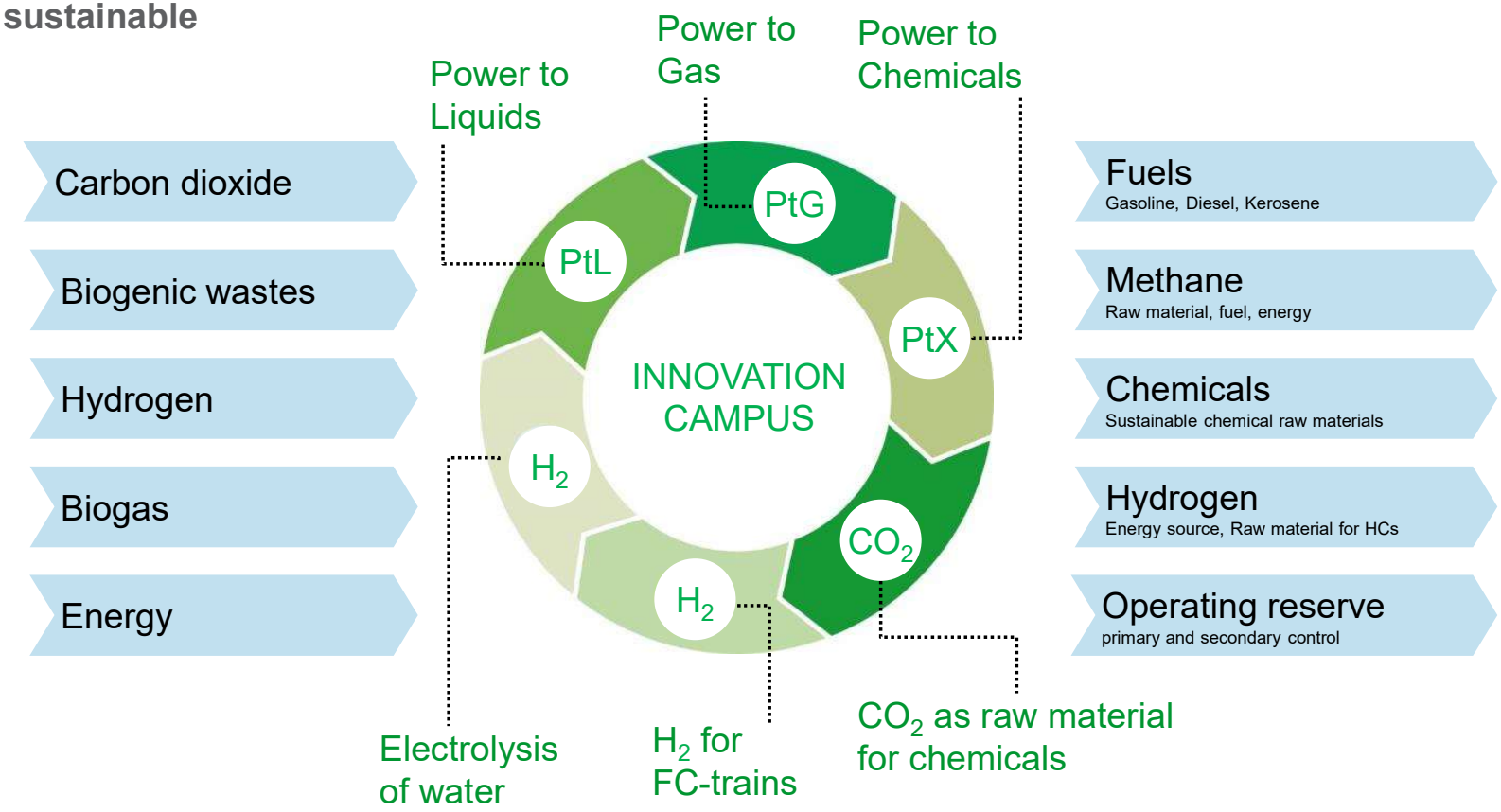
Experience has shown that regional clusters offer significant synergies.

Close collaboration with Universities and Research organisations

*entire value chain present*

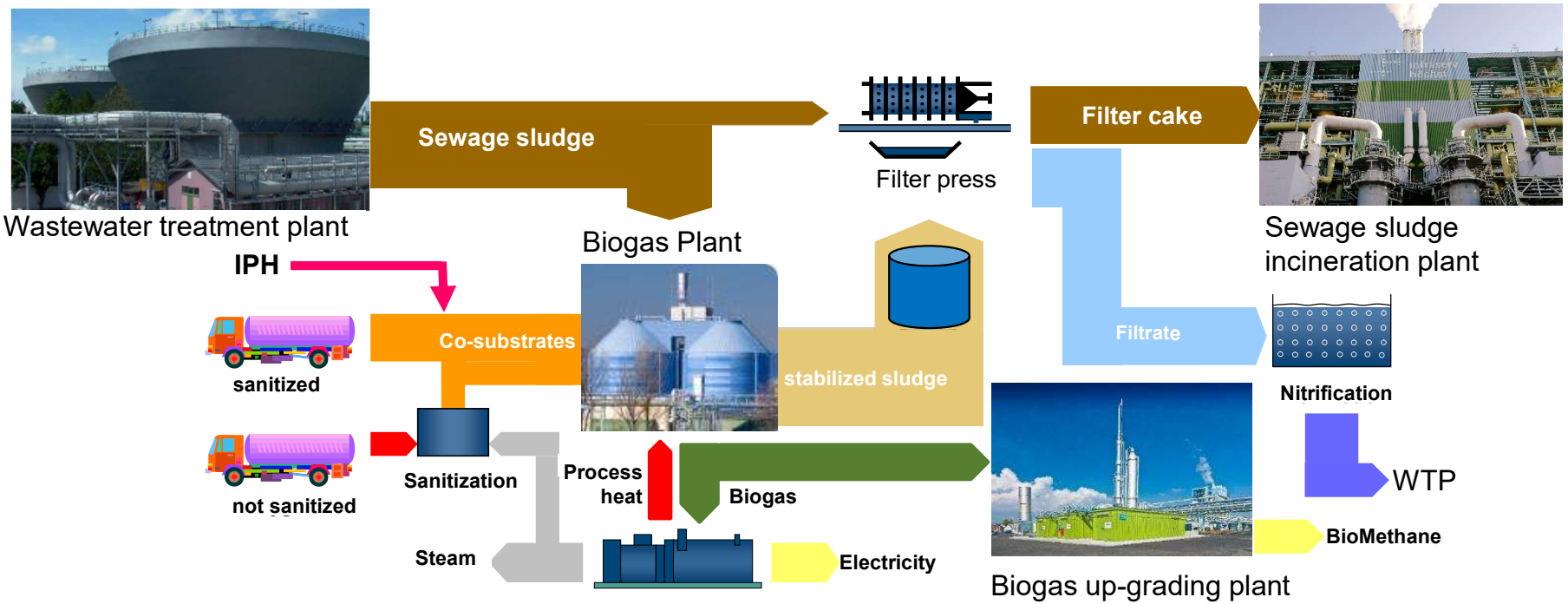
# Industrial parks offer opportunities for circular economy and carbon neutral production chains

## Innovativ and sustainable



# Disposal of biogenic waste
# waste treatment and biogas generation

## Waste-to-Energy

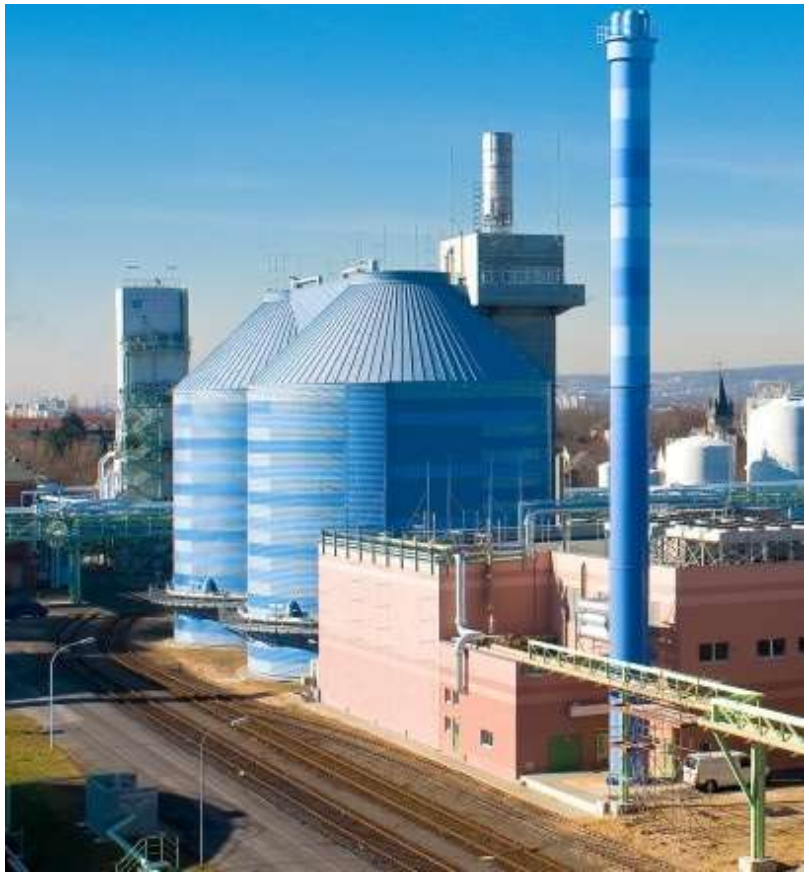



**IN CONTRAST TO MANY OTHER BIOGAS PLANTS, NO FOOD OR AGRICULTURAL PRODUCTS ARE CONVERTED INTO BIOGAS**

# Biogas plant
# Facts and Figures

## TECHNICAL DATA

- Digester volume:
  2 x 10,800 m³
- Capacity:
  310,000 t/a sewage sludge and about 190,000 t/a co-substrates
- Biogas production:
  approx. 30,000 m³/d
- Output
  electrical 5.1 MW; thermal 3.9 MW; 10 MW Biomethan
- Waste types:
  > 100 types of waste.
  Including: homogenized food waste; pharmaceutical industry waste; oil and grease trap waste; biogenic refuse from biochemical processes or food production; mother liquors or solvent mixtures; slaughterhouse waste such as blood; sewage sludge; alcohols, glycerins, stearate, etc.



# Industriepark Höchst has benefited from a reliable hydrogen supply for over 100 years.

## Hydrogen infrastructure

- Processing of 50 million scm of hydrogen per year
- Several compressors
- Gasometer 10,000 m³ & storage at 200 and 300 bar
- $H_2$ grid > 20 km at 1, 7, 200 and 850 bar

## $H_2$ Innovation Campus

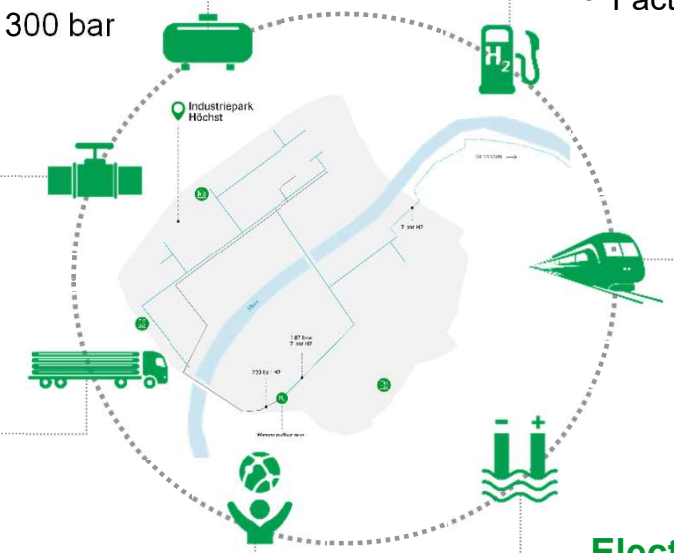
- Settlement of start-ups and funded R&D projects
- Projects in the fields of sustainability, $H_2$, $CO_2$, PtL, PtG

## H2 Trailer filling

- 200 and 300 bar, from 2022 also 500 bar

## Consulting

- Concepts, infrastructure assessment, market research and analysis, studies, technology consulting
- Support in planning and approval process




## Public hydrogen refueling station since 2006

- Supply via 1,000-bar pipeline from Industriepark Höchst
- Refueling cars, trucks and buses at 350 and 700 bar
- Factory buses in Industriepark Höchst run on hydrogen

## Refueling station for rail vehicles from 2022

- Hydrogen supply for 27 Alstom "Coradia iLint" fuel cell trains
- Hydrogen requirement 2,000 - 2,400 kg per day
- replacement for diesel commuter trains

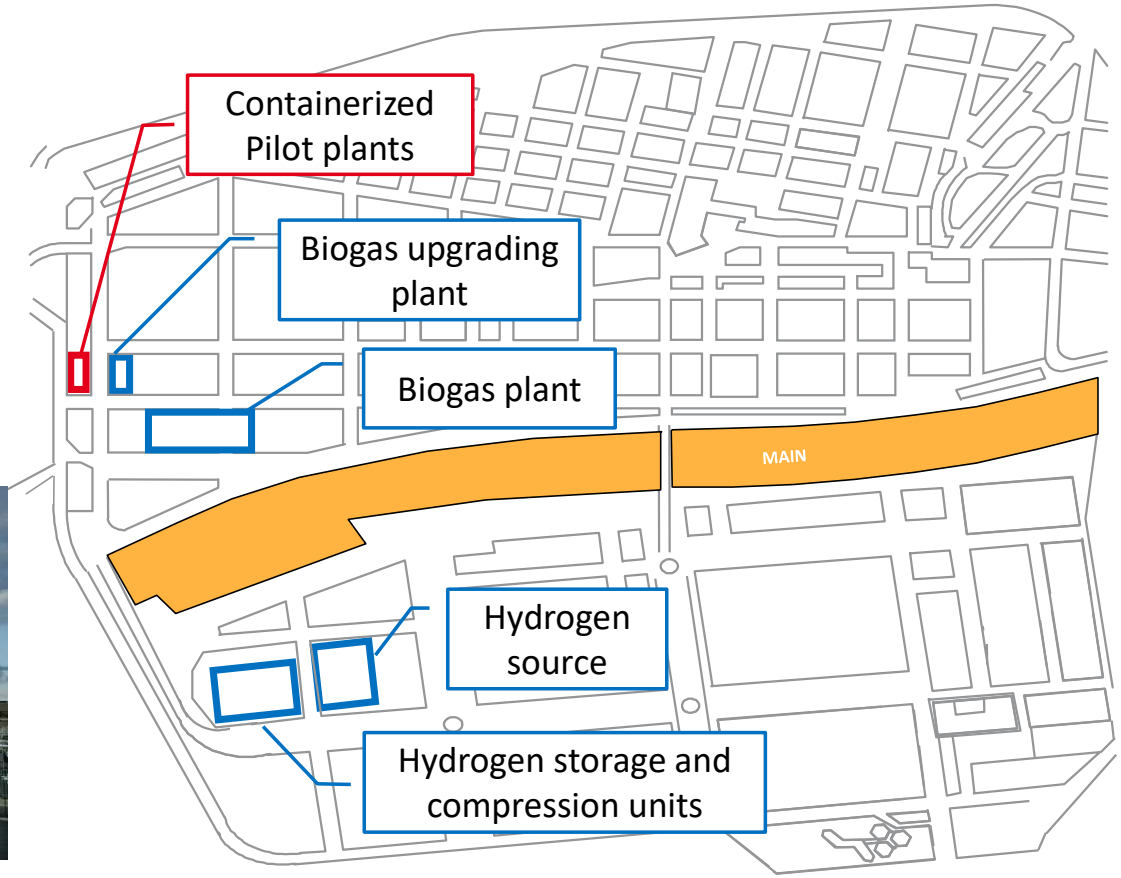
## Electrolysis from 2022

- Construction of a PEM electrolysis plant with 5 MW
- Test of a 1 MW overload-capable PEM electrolysis (2.3 MW) in the funding project *MethFuel*

# Industrial Park Höchst: Locations

## Infraserv Höchst provides:

- Hydrogen from an electrolysis plant
- Carbon dioxide from biological wastes
- A location for pilot units




# Example ICO2CHEM – a containerized chemical pilot plant will be installed and operated at the Industriepark Höchst

## EU funded project (2017 – 2022)

- Producing raw materials for the chemical industry (white oils and waxes) from renewable resources
- Demonstration in an industrial infrastructure

**Infraserv Höchst**
Integration in the industrial infrastructure, supply of $CO_2$, $H_2$ and further utilities

$CO_2 + H_2$

**$CO_2$** from biogas upgrading plant

**$H_2$** from Chloralkali electrolysis plant

**INERATEC & VTT**
Mobile synthesis unit for FT-Reactor

**VTT**
Catalyst development

$CO_2 + H_2$

**ALTANA**
Product testing

**INERATEC, POLITO & VTT**
Catalyst testing, Energy integration and Process modelling

**PHS & VTT**
TEA and LCA analysis

# Example ICO2CHEM – a containerized chemical pilot plant will be installed and operated at the Industriepark Höchst

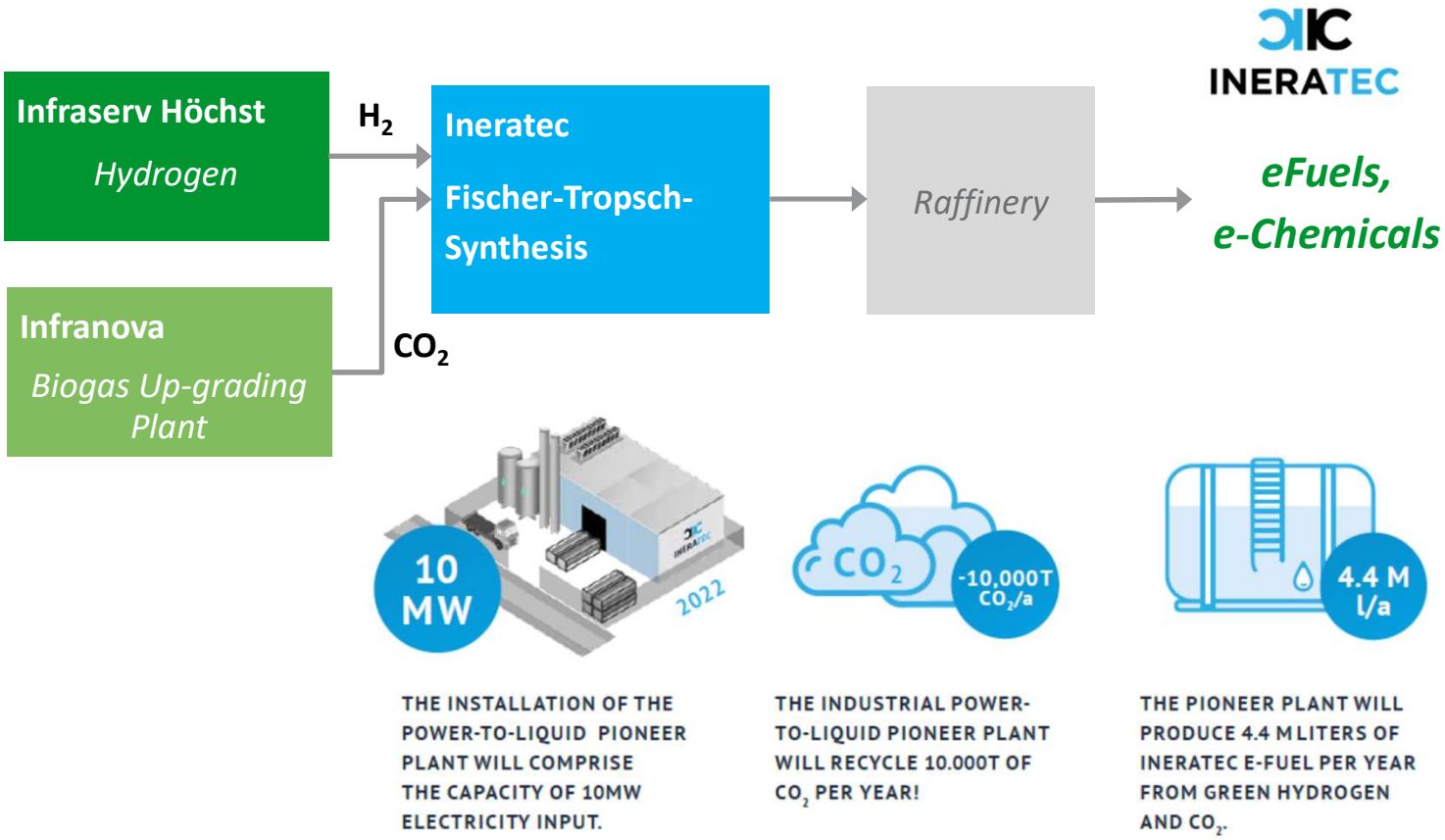
## Infraserv Höchst

- Connecting MOBSU to the industrial infrastructure (incl. engineering, procurement and authority management)
- Suppling feed gases, energies and utilities ($CO_2$. $H_2$, power, etc.)

# Settlement of Ineratec and construction of a PtL plant

## PtL Pioneer Plant

- Industrial Power to Liquid pioneer plant in Germany
- Production of 3,500 tonnes of INERATEC E-Fuel and e-Chemicals annually
- Feedstocks are $CO_2$ from a biogas plant and hydrogen from renewable electricity
- The pioneering plant will be the largest of its kind in the world and will pave the way for further INERATEC PtL projects.




Quelle: Ineratec GmbH

# There is no better place than …
# … the Industriepark Höchst

**Customers, tenants and investors benefit from a highly competitive position:**

- Green platform for sustainable and ecological chemistry – upstream and downstream
- Combining commercial success with sustainability
- Resource-conserving “Verbundstruktur”
- High quality and cost-efficient services
- Good investment conditions for R&D and production plants – cases pay off
- Pilot plant for $CO_2$ conversion
- New level of customer orientation
- High acceptance in society

The champions of tomorrow set a sustainable course today!

**THE GREEN PLATFORM IS REALITY EVEN TODAY –**
**DESPITE MANY UNCERTAINTIES WE PURSUE OUR WAY TO SUSTAINABILITY**

# Thank you for your attention

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