CibusCell

SaaS for production & optimization of Green Hydrogen

Enabling the Green Hydrogen Revolution through Software & AI

INNOVATIONSPREIS RHEINLAND-PFALZ
PREISTRÄGER 2024

Co-funded by the European Union

Microsoft Managed Partner

Available on SAP Store

Problem

Green H_2 is in demand...

$11Bn
41 Mio t

today

$642Bn
170 Mio t

2030

$1.4Tr
600 Mio t

2050

- **Surging Demand**: Green hydrogen demand is set to rise sixfold by 2050.
- **Climate Goals**: 70+ countries rely on Green Hydrogen for net-zero targets.
- **Global Investments**: 3.5 $ Billion are being poured into green hydrogen projects.
- **Clean Production**: Produced sustainably using renewable energy sources.

*Source: Deloitte's 2023 global Green Hydrogen outlook

but compared to conventional H_2, expensive to produce

3€/kg

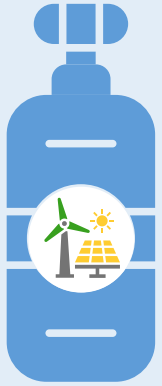
Conventional

4€/kg

Low Carbon

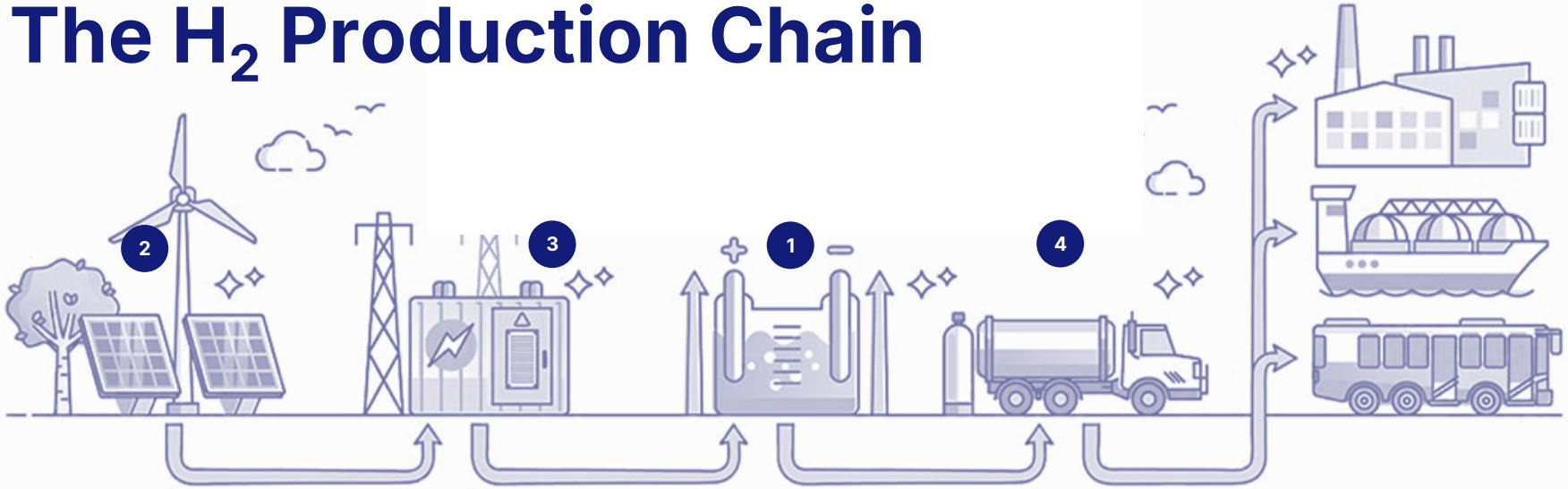
8€/kg

Renewable



Challenge

The H_2 Production Chain



1 Green hydrogen production mainly occurs through **electrolysis**, a process in which water is split into hydrogen and oxygen.

2 The electricity required to procuce Green Hydrogen comes from renewable sources like **wind** or **solar energy**.

3 However, **electricity costs remain high**, and fluctuations in energy availability due to **weather conditions** affect process efficiency.

4 Transporting, storing and using hydrogen in various industries presents further challenges, especially in **cost control** and efficient resource utilization.

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Cibuscell's SaaS & AI can help to **optimize the entire process** & improve the economic viability of hydrogen production.

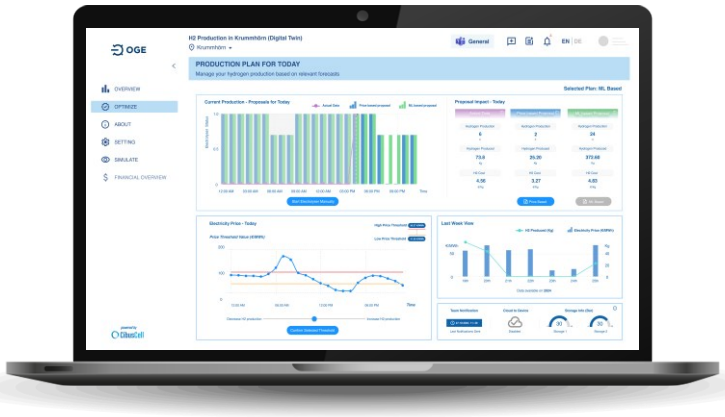
Complete Suite for H_2 Invest, Production & Optimization

Sizing & Costing of H_2 Plants

- **Customizable Plant Design** enables users to model plant configurations tailored to specific production goals, including capacity, technology selection, and site conditions.
- **Detailed Cost Analysis** provides a breakdown of CAPEX, OPEX, and lifecycle costs with time-series insights into operational expenses.
- **Scenario Planning and Optimization** allows comparison of multiple scenarios to identify the most cost-efficient dimensions of H_2 Production based on demand assumptions.
- **Integrated Value Chain Insights** incorporates upstream and downstream data to align plant sizing and costing with hydrogen production, storage, and off-take requirements.

H_2 Production Optimization

- **Connect** the hydrogen value chain end-to-end in a business process
- **Access** the real time electricity market prices & weather data
- **Monitor** an hourly view of current production across your locations and location clusters
- **Optimize production** for the next 24 hrs with real-time recommendations leveraging machine learning
- **Expand data** from other hydrogen value chains into one view
- **Collaborate to connect** the value chain with all coupled sectors & allow everyone to collaborate with one tool such as MS Teams



Financial Simulation & Optimization

- **Optimize** CAPEX and OPEX with the real data
- **Check** the revenue of electricity and H_2 production per hour
- **Monitor** the saved amount of CO2 emissions & corresponding gained value per hour
- **Simulate** the production plan over a period of 5 days to make the right business decision
- **Analyse** hydrogen production & price
- **Monitor** data to scale any certification process

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Reducing H_2 costs with our SaaS & AI

Electricity

AI helps to adjust production to maximize output when energy prices are low and minimize it during peak costs.

This can reduce energy consumption by at least 30%.

Supply Chain

Our SaaS can help plan & efficiently utilize raw material deliveries to avoid shortages and overcapacity. That way supply always aligns with current production needs.

Reducing storage costs and increasing flexibility by (3-4%).

OPEX / Personnel

Predictive maintenance solutions, powered by AI, utilize historical & real-time data to needs before issues arise

Thus, lowering operational costs significantly (3-4%).

Waste / Resources

AI-powered automation continuously monitors the process, detecting deviations in real-time.

This reduces waste and saves resources (3-4%).

Up to

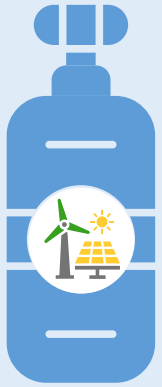
40%

reduction in costs

=

5 €/kg

Software-Optimized Hydrogen



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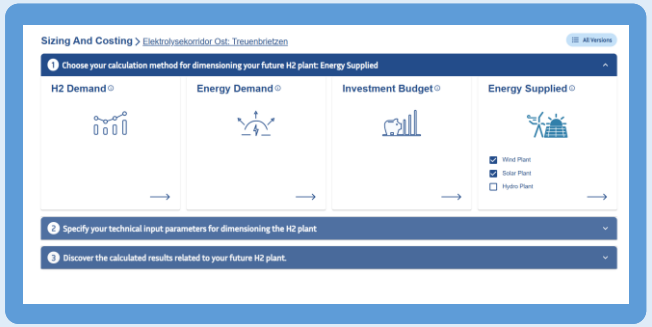
Optimized investment planning for H_2 Production

Dimensioning of future H_2 Plants

Leverage different input parameters

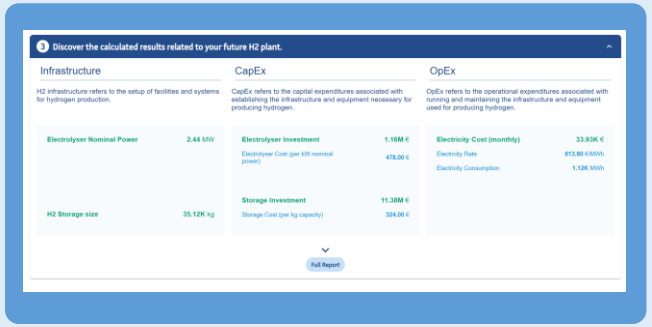
Investment scenarios for your business planning

Full reports of future H_2 production scenarios

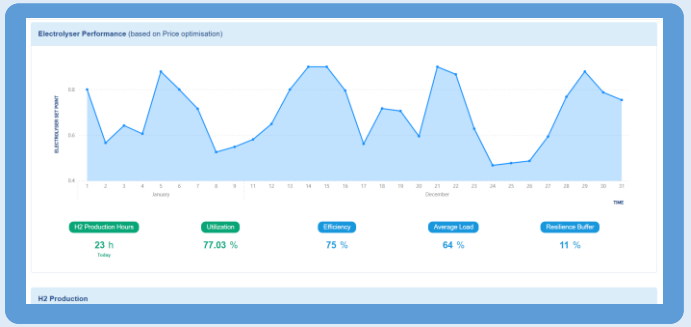


Software-based support for the optimal design of your hydrogen plants.

Transparent assumptions for the cost calculation of H_2 production and storage.



Concrete and transparent results for investment decisions and subsequent planning steps.



PDF of the calculated results for internal investment and management decisions.

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Business Value for early H_2 Investment Planning

Solving the CapEx vs. OpEx dilemma

Large CapEx (Electrolyser & H_2 Storage): fewer operating hours to leverage most cheap electricity prices, **decrease** of expenses on electricity as main **OpEx** driver

Smaller CapEx: need for more operating hours, risking to suffer from high electricity costs (**large OpEx**)

Gaining insights on future operational costs (OpEx)

Calculate different scenarios of **electricity sourcing**:
- Spot market electricity, e.g. European Energy Exchange (EEX) **day-ahead** prices
- Electricity power purchase agreements (**PPAs**)
- Own renewable energy sources, e.g. wind or solar park

Sizing H_2 Production optimally according to energy demands

Simulate H_2 Production operations with dynamic CibusCell optimization. Gain insights on how **dynamic electricity sourcing** reduces operational costs while meeting your estimated energy demands.

Software optimization right from the start

Explore how **24/7 production optimization** can be achieved for your future H_2 plant. Get to know a full **digitalization concept** for your H_2 production. Identify technical requirements and potential next steps together with CibusCell.

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Start now and reduce risks of your investment in H_2

H_2 Investment Planning: Scope & Results

From 2 hours

- Recording the status quo of your energy supply
- Predefined electricity prices (EEX)
- Use of templates for electrolyzer & storage sizing
- PDF of the calculated results for internal investment and management decisions

Price: 800€

Up to 2 days

- Design Thinking workshop
- Evaluation of electricity supply contracts
- Calculation of different variants of your H_2 production incl. transparent CAPEX & OPEX calculations
- Creation of a digitalization concept for optimized operational management of your future H_2 plant

Price: 7.990€

Next Step: CibusCell Optimization

- Setup **hydrogen operating system**
- Implement system design (electrolyser, storage, off-take streams, etc.)
- **Roles & parameters** for production optimization
- Model **training** for optimization
- Implementation of **analytical** and visualisation requirements

Hydrogen Project Example

OGE: Krummhörn

Live Client Info

KRUH2 Project by Open Grid Europe

OGE

A major project to promote hydrogen technology and the energy transition in Lower Saxony, Germany.

- Hydrogen cycle at an OGE operating site; production of hydrogen by local electrolysis
- Use of the generated H_2 for on-site heat supply (boiler feed) renewable power generation & Mobility
- Partnerships / Collaborations with **Uniper**
- **This is 1 of 53 locations** that could be producing & supplying Hydrogen.

➡ **50x** **roll-out possible with CibusCell**

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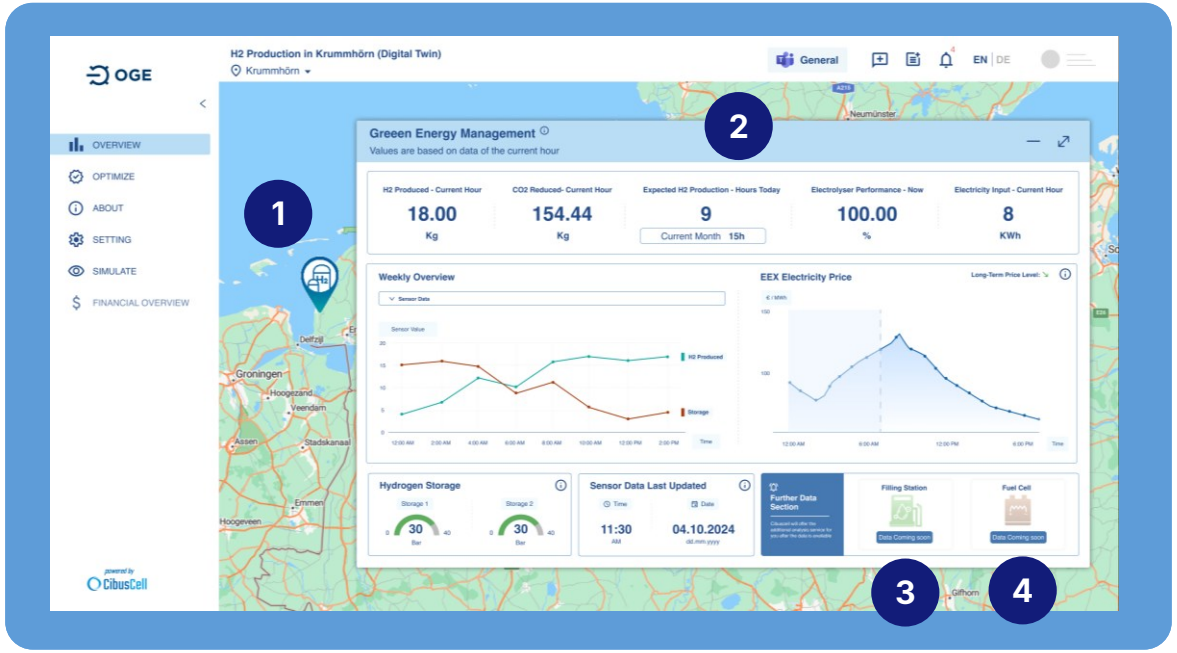
KRUH2

Gas Compressor Station

24h live data of KRUH2's H_2 Production



OVERVIEW

The main dashboard of the digital twin shows:

1. A map view of the hydrogen production site
2. A collection of real-time data from all connected hardware points
3. H_2 Filling station
4. Fuel Cell – Heat Supply

OPTIMIZE

Next **Day Plan** of Hydrogen Production Electrolyser Production Schedule

6. Production Optimization of H_2 in real-time with optimal electrolyser usage
7. Different Production Plan Scenarios & Recommendations
8. Today's Electricity Price
9. H2 Produced this week

AI tells you when to produce H_2

Live Client Info: OGE / KRUH2

1. Optimized Electrolyser utilization with intermittent renewables with optimal efficiencies
2. Three Different Electrolyser Production Schedules (Actual Data, Price based Proposal, ML based Proposal.
3. Cloud to Device option to start the electrolyser via CibusCell manually
4. Optimized electricity procurement considering electricity market and weather conditions
5. H_2 Production based on High Price and Low Priced Threshold
6. User can decrease and increase the H_2 production via Threshold Slider easily

Compare H_2 production scenarios

Showing 3 different production proposals and their impact on the H_2 production and Costs per KG of H_2:

1. Production based on actual Data
2. Production based on Electricity Price
3. **Machine Learning** based Proposal

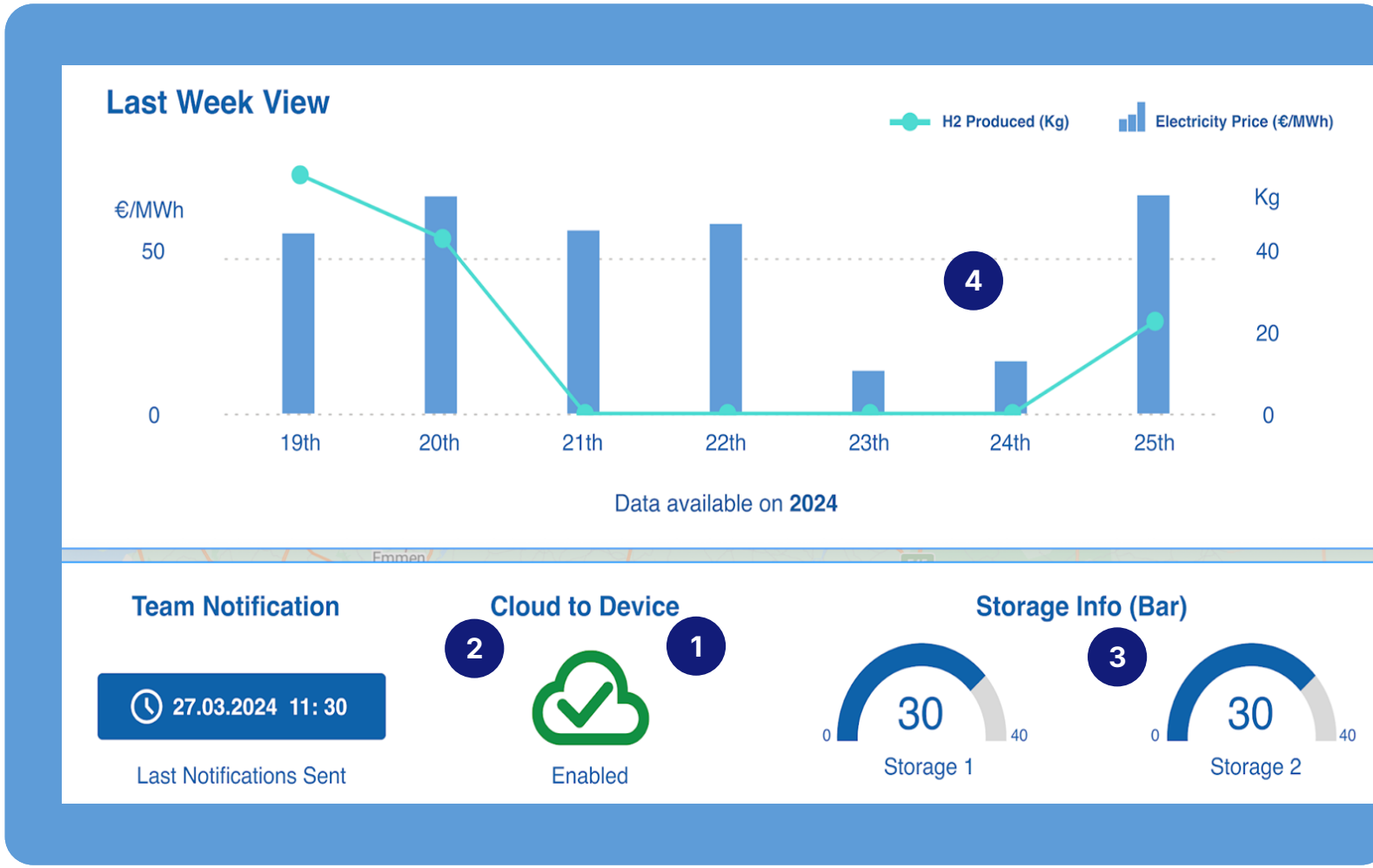
The latter optimizes OGE's operations by **analysing weather, electricity prices, demand patterns, and hardware performance.**

Savings of more than €1 per kg of H_2.

Review & monitor H_2 production

1. Cloud to Device enables full automation of hydrogen production reducing OPEX and personnel for decentralized sites
2. MS Teams Notifications allow decentralized teams to always know what is going on
3. Optimization of H_2 storage and demand management
4. Also shows how much H_2 was produced per day and according to which electricity price

Cloud to Device CibusCell allows to run the value chain fully automated.



Live Client Info: OGE / KRUH2

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Attractive SaaS Pricing (per plant site / 3 years)

Small Edition

€20,000
setup costs

€3,000
monthly costs

5	2MW
user licenses	plant size

Medium Edition

€45,000
setup costs

€6,000
monthly costs

10	8MW
user licenses	plant size

Enterprise Edition

€58,000
setup costs

€10,000
monthly costs

50	50MW
user licenses	plant size

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