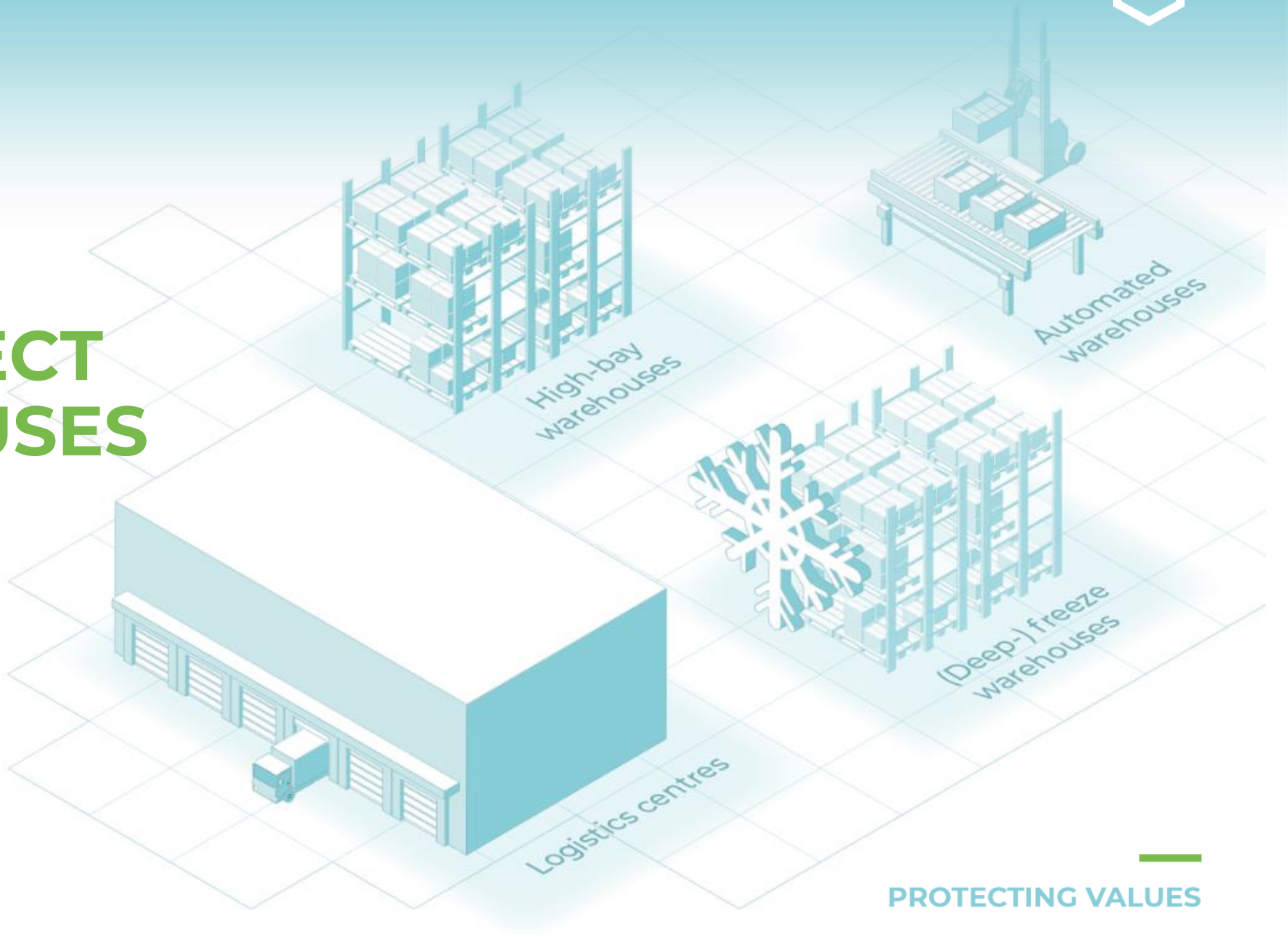

HY.AIR

+ WE STOP FIRE BEFORE IT STARTS

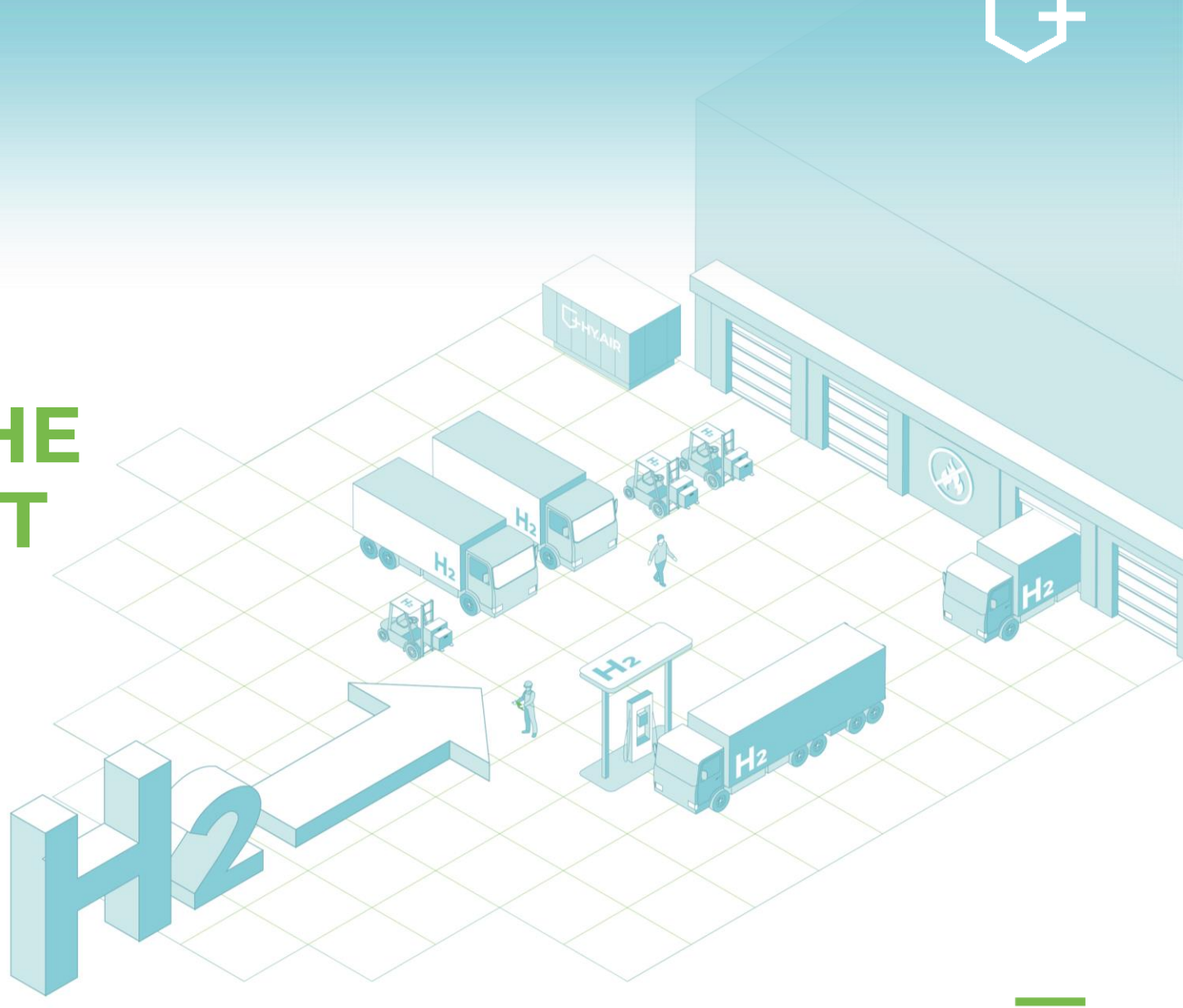
PROTECTING VALUES

+ WE PROTECT WAREHOUSES

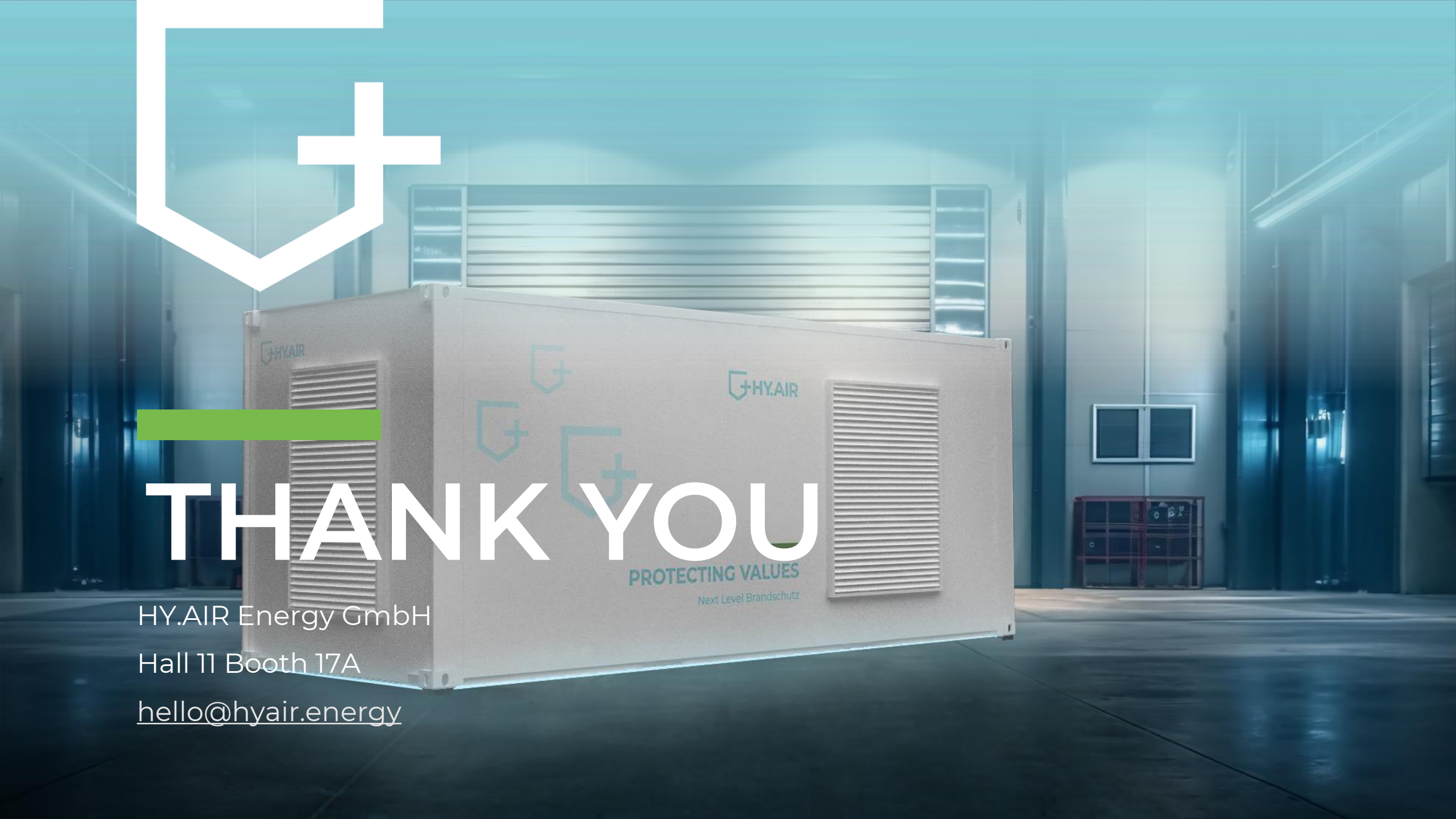


PROTECTING VALUES

+ WE FOCUS ON THE LOGISTIC MARKET



+ THE MOST EFFICIENT FUEL CELL SYSTEM WORLDWIDE



THANK YOU

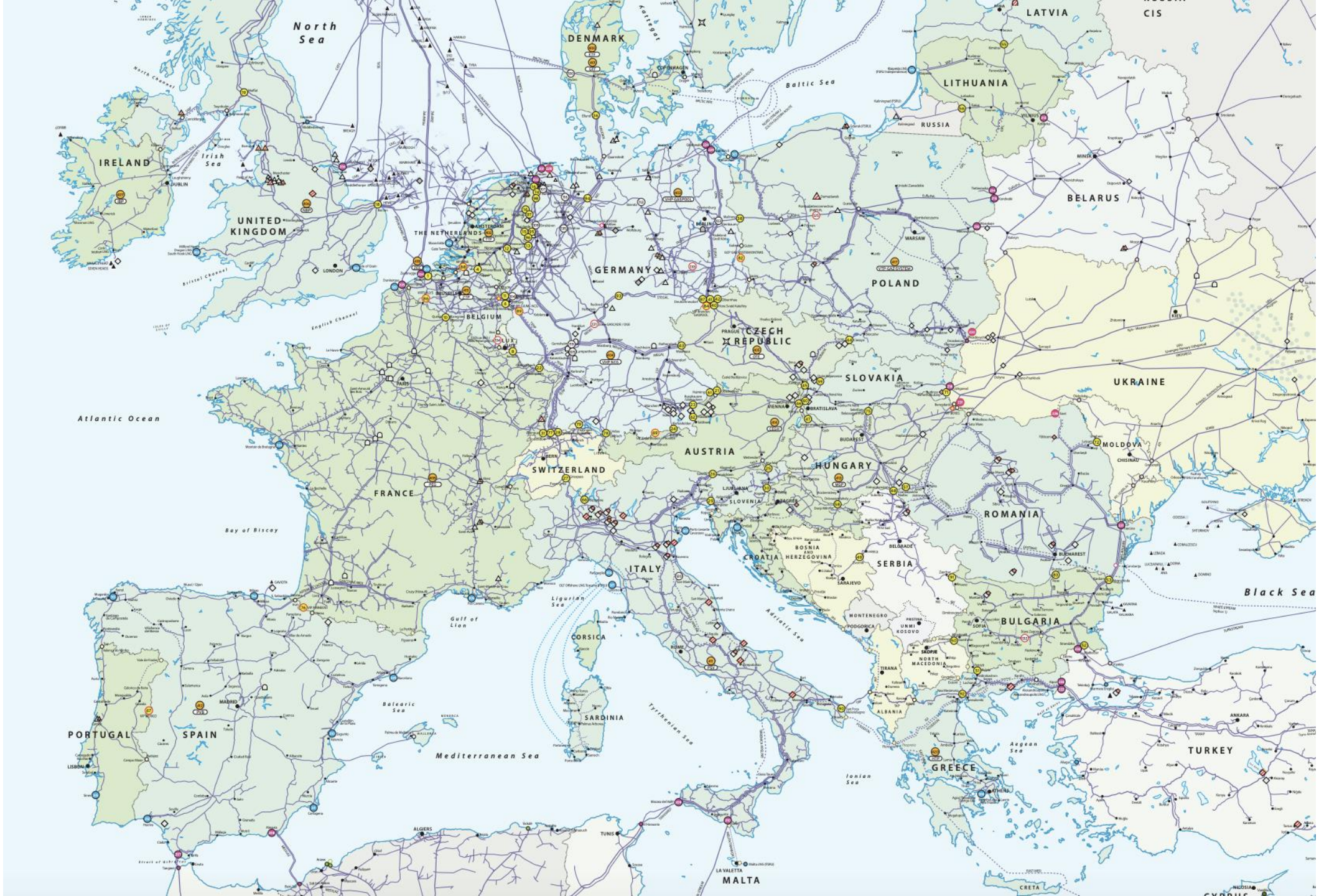
HY.AIR Energy GmbH

Hall 11 Booth 17A

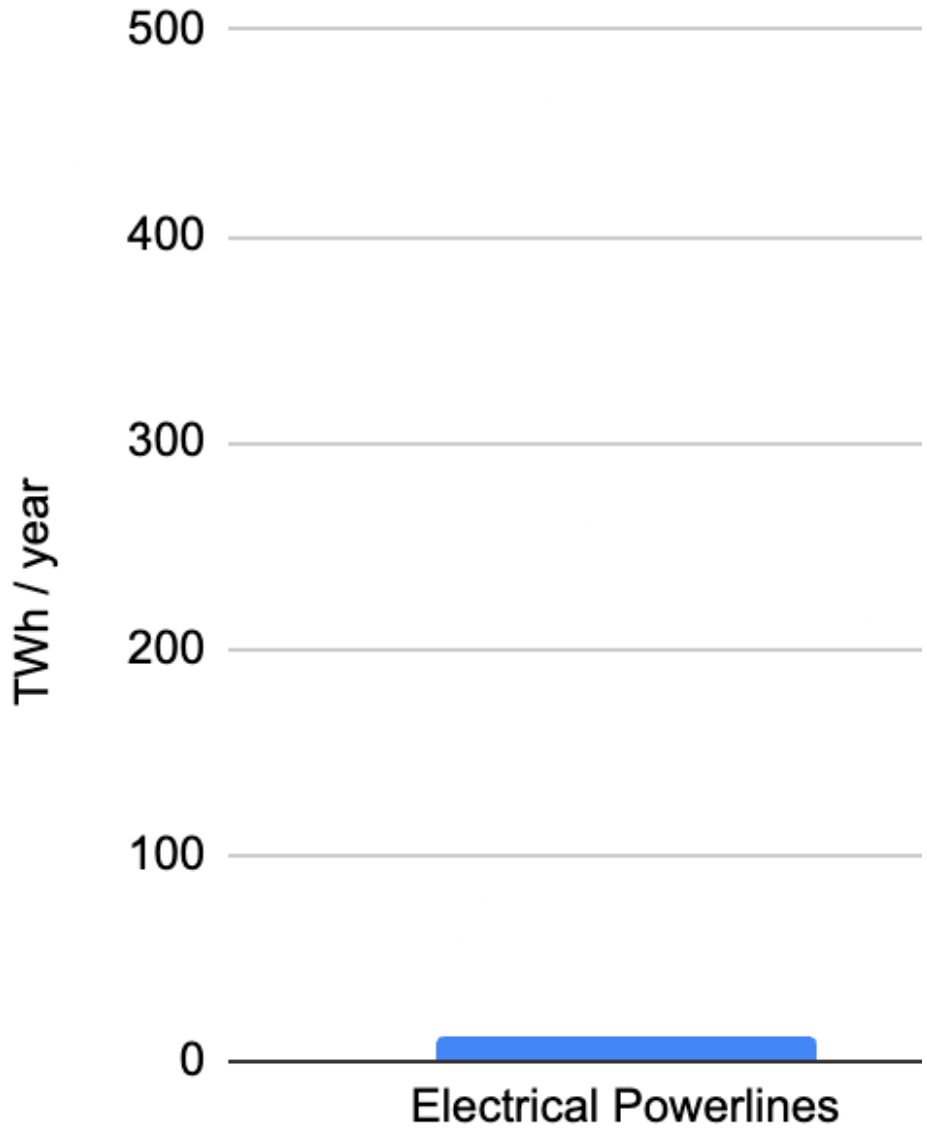
hello@hyair.energy

Turn2X

Decarbonizing the hard to abate sectors


North Sea
DENMARK
Kattegat
Baltic Sea
LATVIA
CIS
LITHUANIA
RUSSIA
IRELAND
Irish Sea
DUBLIN
UNITED KINGDOM
LONDON
Bristol Channel
English Channel
North Channel
THE NETHERLANDS
AMSTERDAM
BELGIUM
BRUSSELS
GERMANY
BERLIN
POLAND
WARSAW
BELARUS
MINSK
CZECH REPUBLIC
PRAGUE
SLOVAKIA
BRATISLAVA
VIENNA
UKRAINE
KIEV
AUSTRIA
HUNGARY
BUDAPEST
MOLDOVA
CHISINAU
SWITZERLAND
BERN
FRANCE
PARIS
Atlantic Ocean
Bay of Biscay
SLOVENIA
LJUBLJANA
ROMANIA
BUCHAREST
CROATIA
ZAGREB
BOSNIA AND HERZEGOVINA
SARAJEVO
SERBIA
BELGRADE
ITALY
ROME
Ligurian Sea
Gulf of Lion
Adriatic Sea
Black Sea
BULGARIA
SOFIA
MONTENEGRO
PODGORICA
UNMI KOSOVO
SKOPJE
NORTH MACEDONIA
TIRANA
ALBANIA
CORSICA
SARDINIA
Tyrrhenian Sea
Balearic Sea
Mediterranean Sea
PORTUGAL
SPAIN
LISBON
MADRID
GREECE
ATHENS
Aegean Sea
Ionian Sea
TURKEY
ANKARA
ALGIERS
TUNIS
LA VALETTA
MALTA
CRETA

Transport Capacity in TWh / year from Norway to Germany



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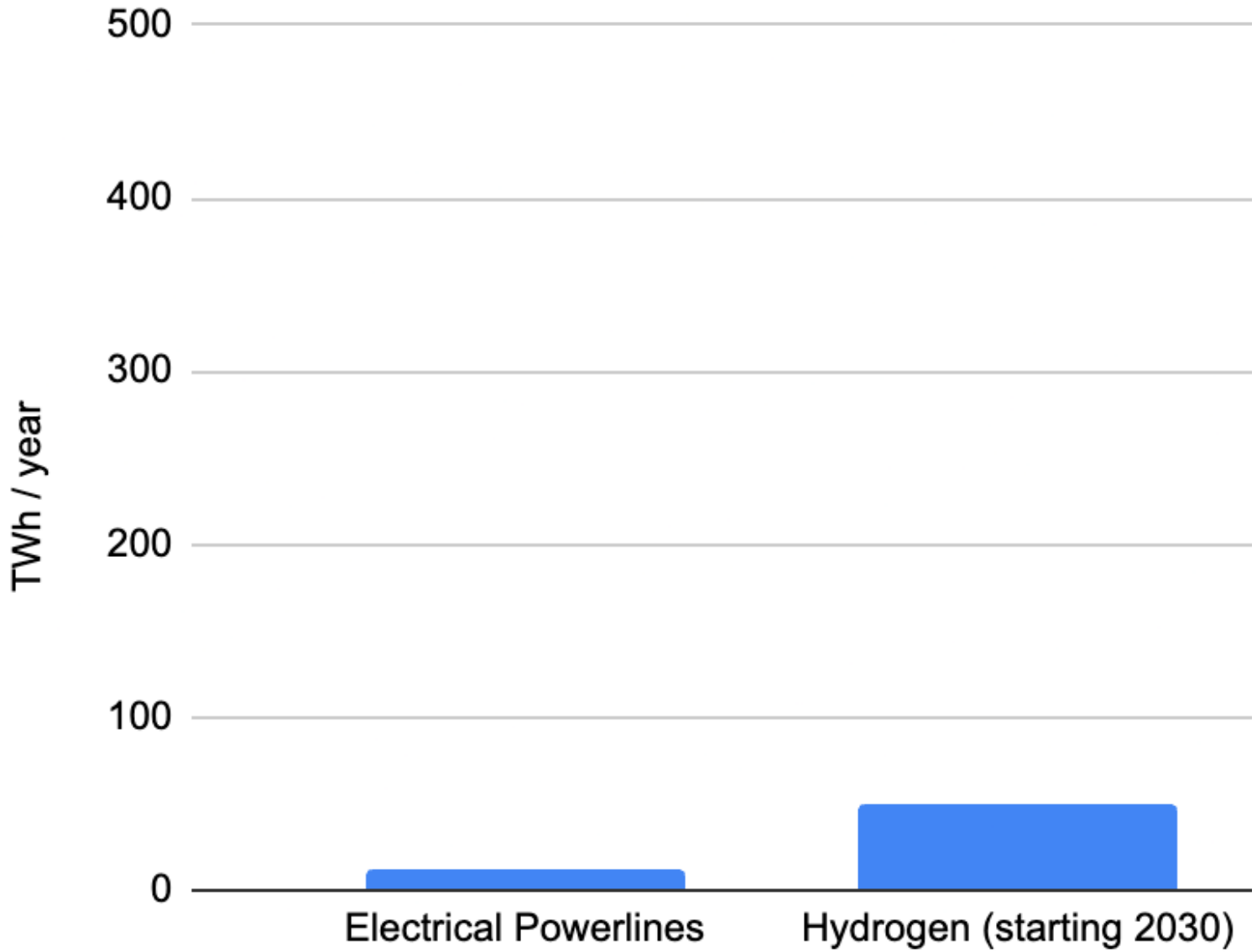

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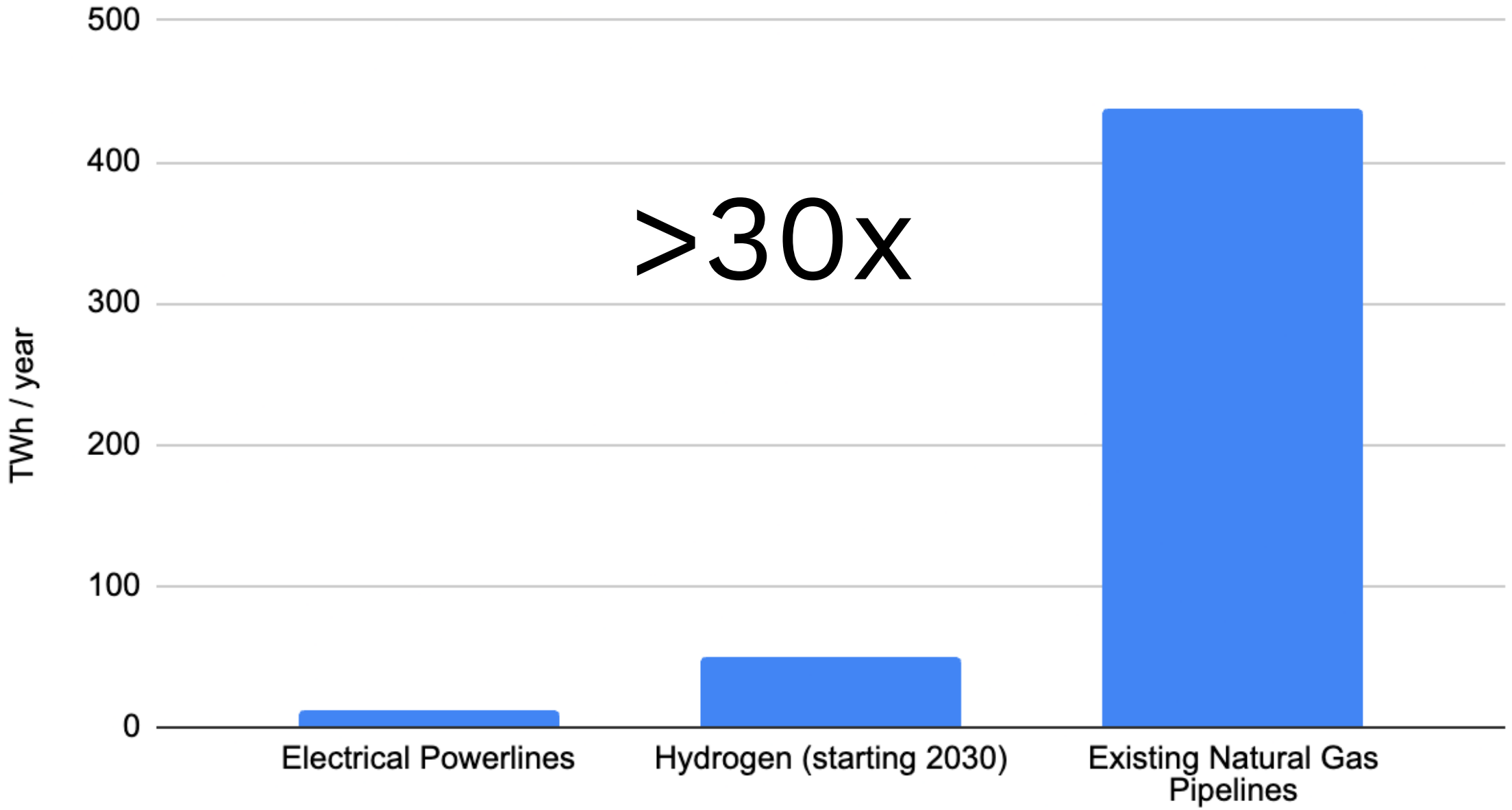
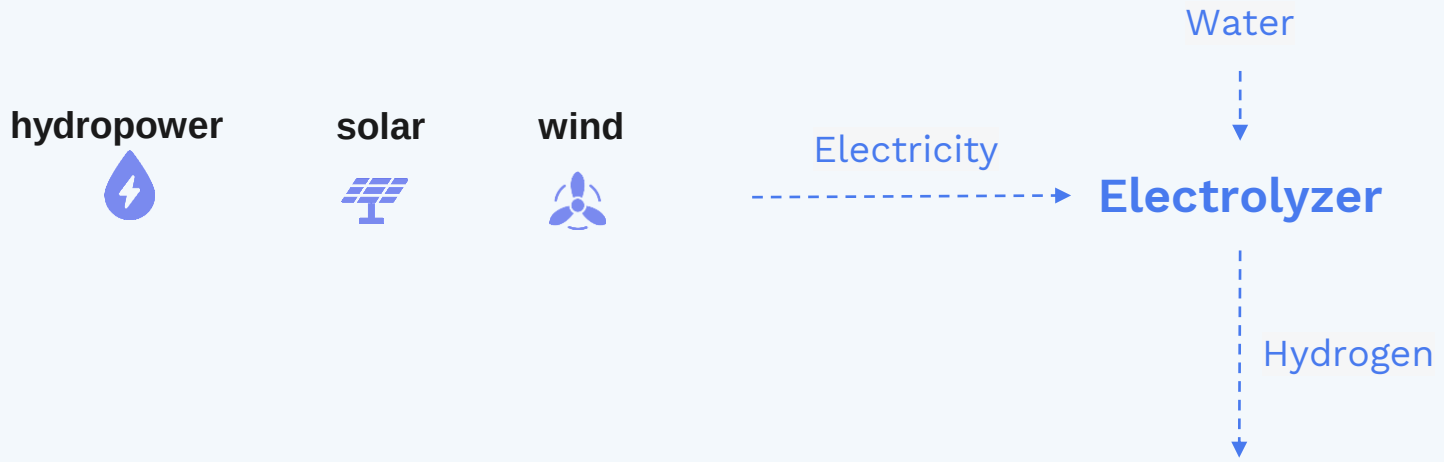


Secret Sauce

Turn2X producing renewable natural gas from water and air



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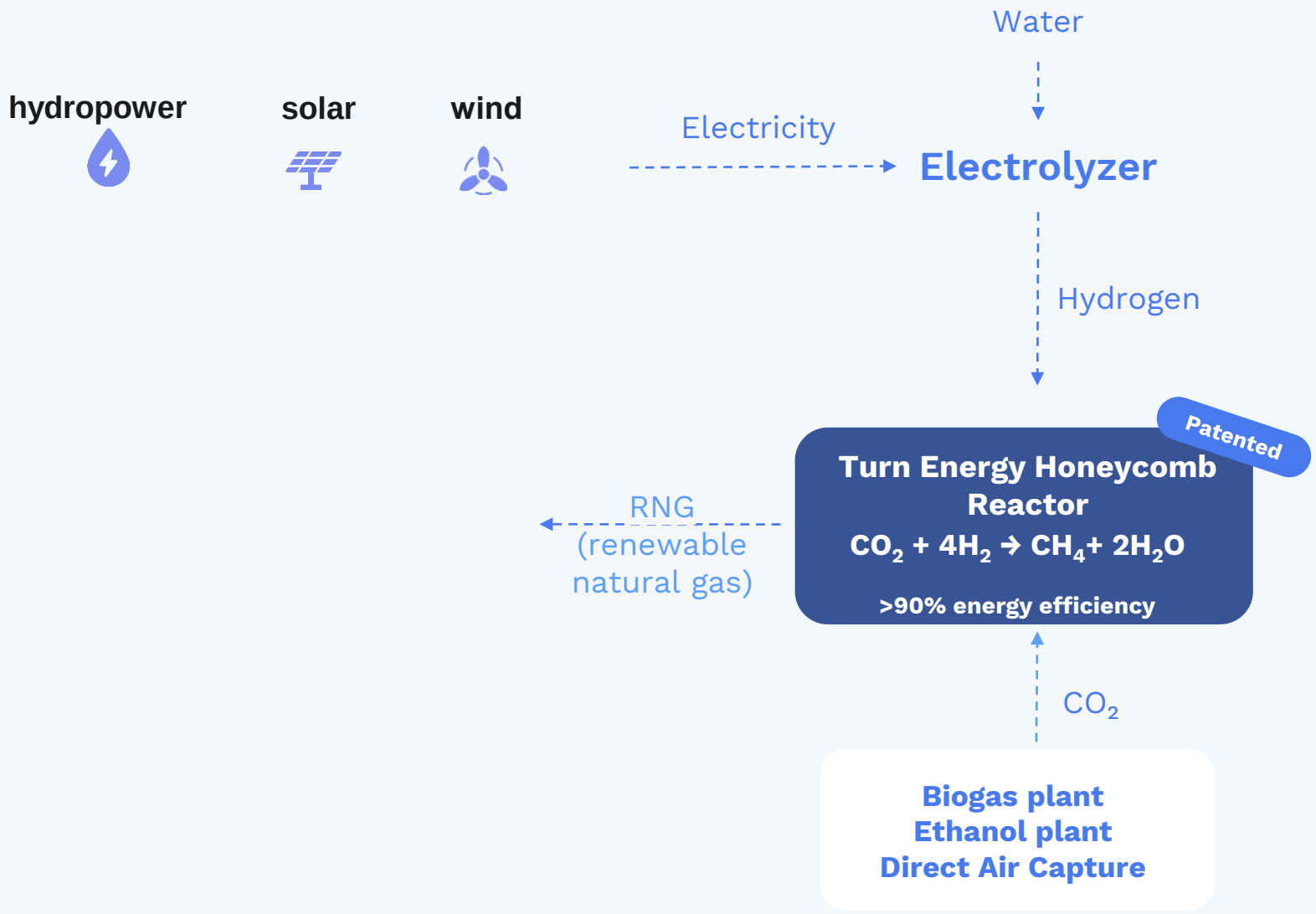

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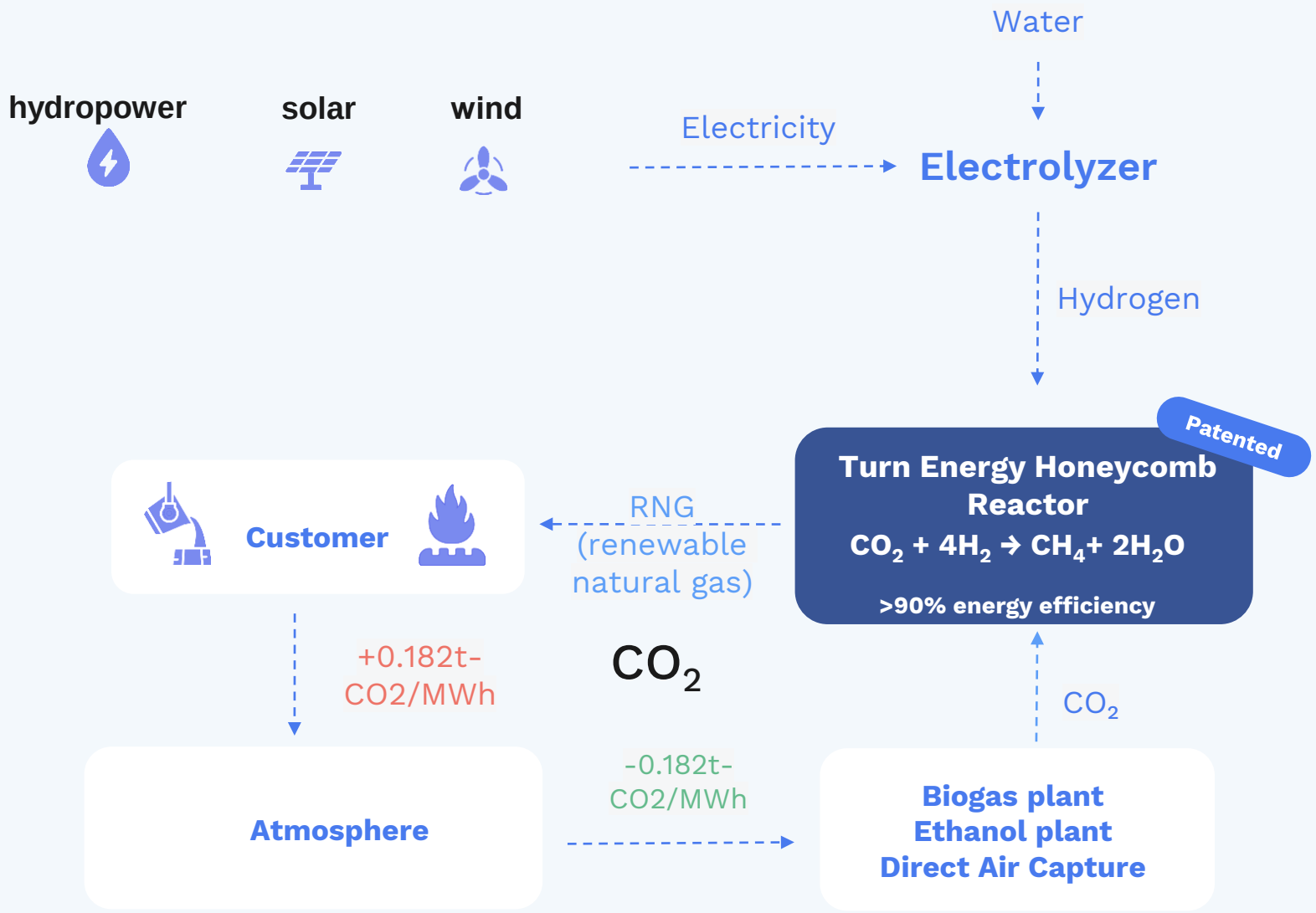



SOL

Energy Intensive Industries

25%
of global emissions

65 bn €
EU'S industry annual natural gas spending

Customers

noelle+ von campe

Siempelkamp

Source: IEA Gas Information 2022, ACER Gas factsheet

Utilities

35%
of global emisssions

42 bn €
EU's utilities annual natural gas spending

Customers

energie360°

Source: IEA Gas Information 2022, ACER Gas factsheet

Maritime

3%
of global emissions

3 bn €
EU's transport sector annual natural gas spending

Prospects

Hapag-Lloyd

CMA CGM

...

Source: IEA Gas Information 2022, ACER Gas factsheet

THE TEAM

Proven track record in deep tech and blitz-scaling new ventures

Philip Kessler

- Experienced in founding deep tech companies
- Raising millions in venture capital from international investors
- Successful exit to hidden champion

Dr. Dominik Schollenberger

- >12 years research on methanation and engineering of demo plants
- Several papers published and patents filed
- PhD in Chemical Eng. from KIT

Benedikt Stolz

- Project Finance professional (100M EUR+ projects)
- Started his own VC fund right out of college (now 30M+)
- Physicist (solid state and quantum physics)

Stefan Kaufmann

Former hydrogen Ambassador of the Federal Republic of Germany

Evan Horetsky

Built the Gigafactories for Tesla in NV and Berlin

Thomas Schaffer

Various CFO positions at Siemens

Christian Schneider

VP Blackrock Sustainable Financing

BASF The Chemical Company · TESLA · UnternehmerTUM VENTURE LABS · Fraunhofer · DVGW · KIT Karlsruher Institut für Technologie · SIEMENS · Mercedes-Benz

Scaling up

Building the largest RNG plant in the world by 2025

It’s all about execution

The one thing which would speed us up

Contacts to equity or debt investors to build even more plants

- Investment in SPV
- Investment of 10M+
- Customers would be ideal equity investors

Let’s stay in contact

Benedikt Stolz

ben@turn2x.com

It’s all about execution

The one thing which would speed us up

Contacts to equity or debt investors to build even more plants

- Investment in SPV
- Investment of 10M+
- Customers would be ideal equity investors

Reward: 12 million kilograms of CO2 saved annually

Let’s stay in contact

Benedikt Stolz

ben@turn2x.com


Thank you.

"You got 99 problems, but your waste ain't one"

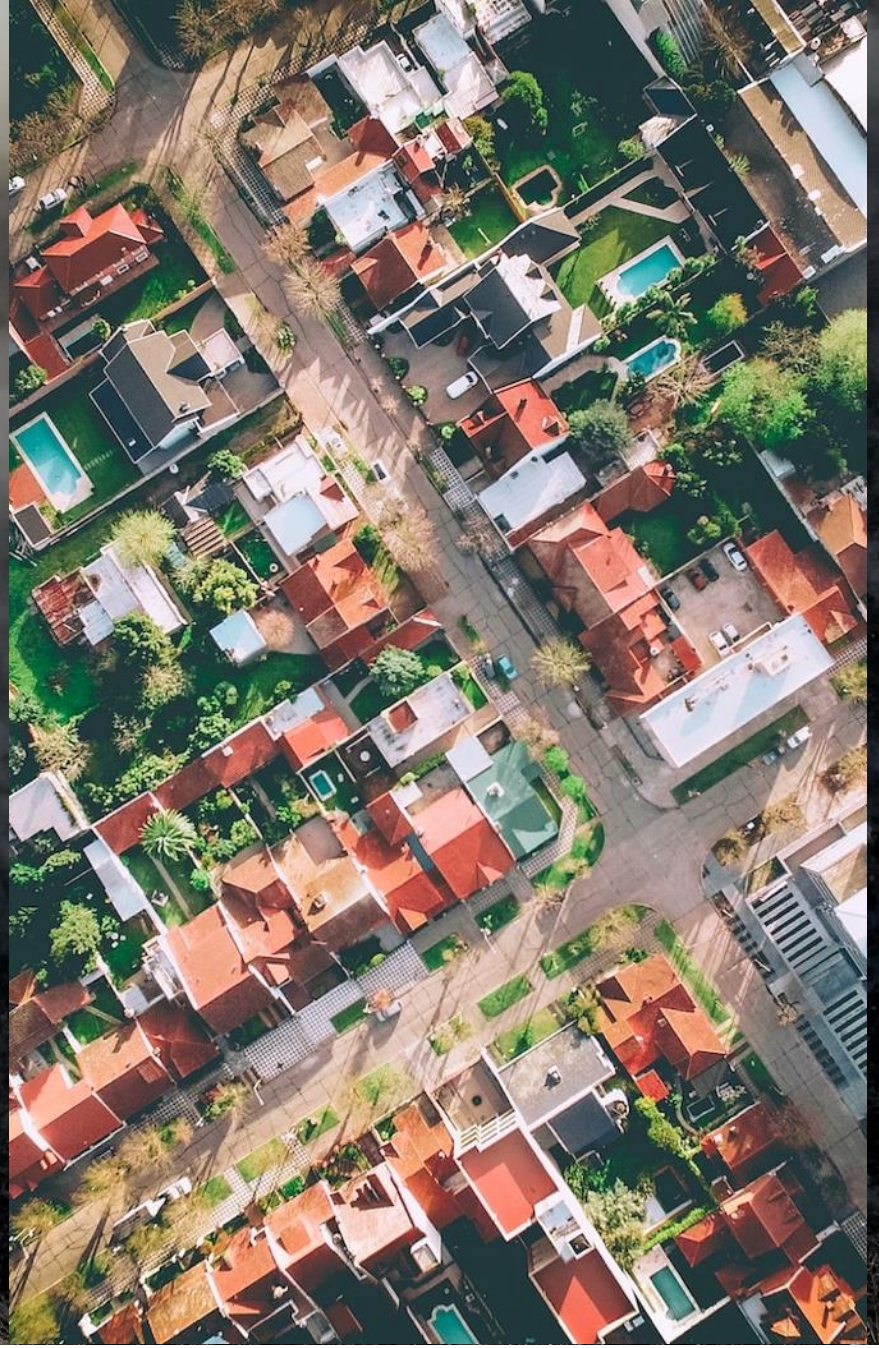
Boson Energy

We Make Zero Waste Possible

Heike Carl Zatterstrom
CCO Boson Energy
always@bosonenergy.com

PROBLEM

We started Boson Energy to take the ‘Non’ out of ‘Non-Recyclable Waste’



Local circular resource

Reduce infrastructure stress

Climate mitigation

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PROBLEM

We started Boson Energy to take the ‘Non’ out of ‘Non-Recyclable Waste’

Local circular resource

Reduce infrastructure stress

Climate mitigation

Conventional Recycling
– tops out at 50-60%

Waste Incineration
– inefficient, toxic ash, and no carbon capture

Pyrolysis
– important role but feedstock restrictions and often a toxic residue

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Boson Energy

SOLUTION

Boson Energy Gasification

100 tons

‘Non’-Recyclable Waste /day

50-200k People

< 30km radius

Gasification. Done right!

- One-step process
- No moving parts
- Zero ash residues
- Tolerates changing waste

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SOLUTION

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Boson Energy Gasification

7 tons H_2

100 tons CO_2 ETS Captured

80 MWh_{th} Heat

IMBY ROCK®

10 tons glass slag

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Hydrogen Economy?

Vehicles?

Infrastructure?

Photo credit: 20th Century Fox

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8 tons H_2

100 tons CO_2 ETS Captured

80 MWh_{th} Heat

IMBY ROCK®

10 tons glass slag

140 MWhe Local DC-DC Fast Charging or DC-AC grid support

600 – 1000 Buses or Trucks

Local 24/7/365 production

35 000 litres of diesel replaced

250+ tons of CO2 avoided

Cheaper than diesel

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OR

35 tons NH_3 or MeOH

Green Shipping & Circular Plastic

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Green Shipping & Circular Plastic

Vertical Farming

Food Security

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100 m3 Cell Glass

Circular Construction

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Vertical Farming

100 m3 Cell Glass

- Hydrogen should be Hydrogen as little as possible
- Avoid compression and transport of H2
- Avoid large-scale H2 infrastructure
- Beat fossil fuels on cost 'at pump'

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Boson Energy

Developed and own our core gasification technology

Demonstrated at commercial scale with real waste

TRL 7-8 confirmed by WSP

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Boson Energy

Developed and own our core gasification technology

Demonstrated at commercial scale with real waste

TRL 7-8 confirmed by WSP

- From science to fully integrated system – with leading partners
- All downstream systems established commercial technology – TRL 9
- 'Unlimited' capacity to manufacture, execute projects, and scale from Day 1

MVG Motala Verkstad Group · Worley energy | chemicals | resources · TOPSOE · PYROGENESIS · Honeywell · IMUBIT · RHI MAGNESITA · TU BERGAKADEMIE FREIBERG · UNIVERSITY OF BORÅS · ecopromt soli organic

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Project Development Status: Sweden, Poland, with pipeline in EU and beyond

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Project Development Status: Sweden, Poland, with pipeline in EU and beyond

CITY SOLUTIONS

- Developing together with incineration operators

- Hydrogen Capability
- DC-DC Charging
- Lower emissions
- Capture carbon

20+ identified CITY projects in the pipeline

PORT SOLUTIONS

- Developing together with the Wallhamn Port

- Electrify port operations
- Green Methanol
- Energy security
- 'First carbon-negative port in the world'

Ports from all over the world watching closely

Wallhamn AB

Boson Energy

Part of: GRIMALDI GROUP

ecopromt

Additional partners pending disclosure

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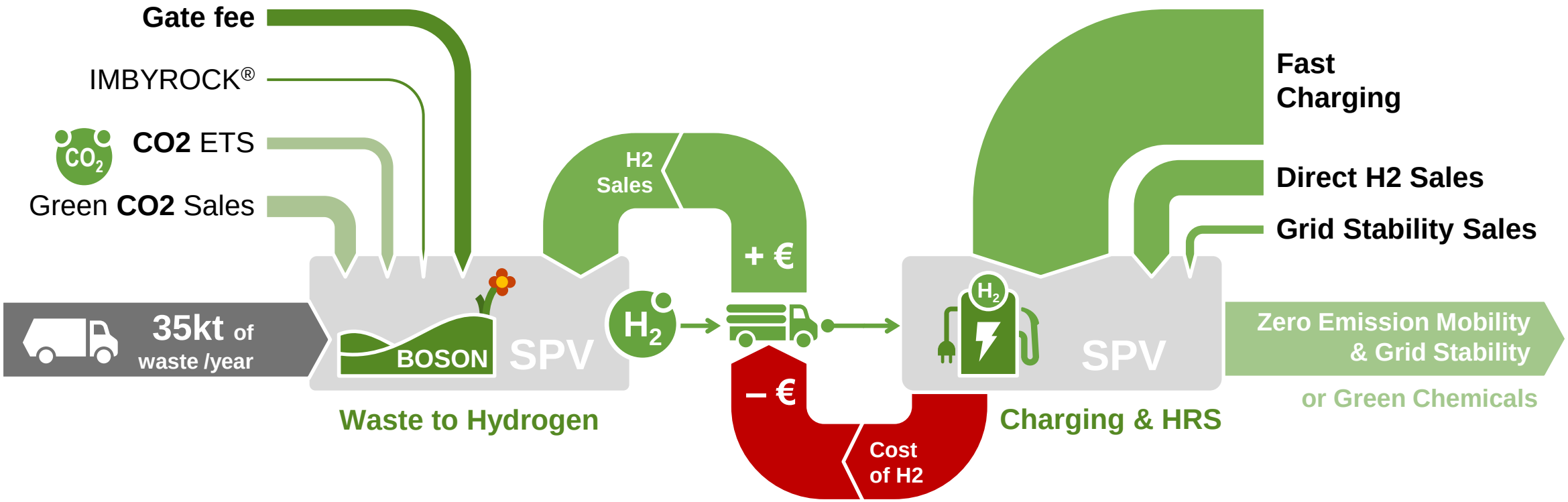
Business Model with strong drivers for Equity and Value Chain Partners

Up to 20x profit in the value chain
per ton waste treated, compared to incineration



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Managements Team covering all aspects of the technology and business

George Westinghouse Gold Medal 2010

Prof. Wlodzimierz Blasiak
Co-founder

40+ years researching Hydrogen from solid waste and biomass by gasification

Jan Grimbrandt
CEO & Founder

25+ years as an industrial cleantech entrepreneur taking tech to market

Exits to SIEMENS Ingenuity for life, NALCO

Liran Dor
CTO, Co-CEO
Co-founder

20 years within advanced waste treatment technology and execution

Bengt Andersson
Chairman & Investor

40+ years in waste and recycling

Exit to Veolia.
Cleantech investor.

CFO
Marcus Süllmann

SVP Systems
Shirly Maor

EVP HSE & Permits
Linda Westers

Head of Strategy & Asia
Aditya Sharma

Head of Poland
Krzysztof Switalski

Chief Comms. Officer
Heike Carl Zatterstrom

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Other team experience

AltOptronic, DHVMED, VEOLIA, VERIDIS ENVIRONMENT, PRC ENGINEERING, ORLEN, Tetra Pak, Kellogg's, DHL, vodafone, pwc, SECURITAS

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CONCLUSION

- First H2 from commercial project 2025

- 30 M€ raised to date
- 20-40 M€ round open opening now to go commercial – ‘ignite the main rockets’
- Next raise 50-100 M€

JOIN US!

Heike Carl Zatterstrom
Chief Communications Officer
always@bosonenergy.com

TARGET

1 million tons of Circular Hydrogen from Waste by 2030

20 million tons of H2 potential in EU waste alone

200 million tons globally

Questions on that?

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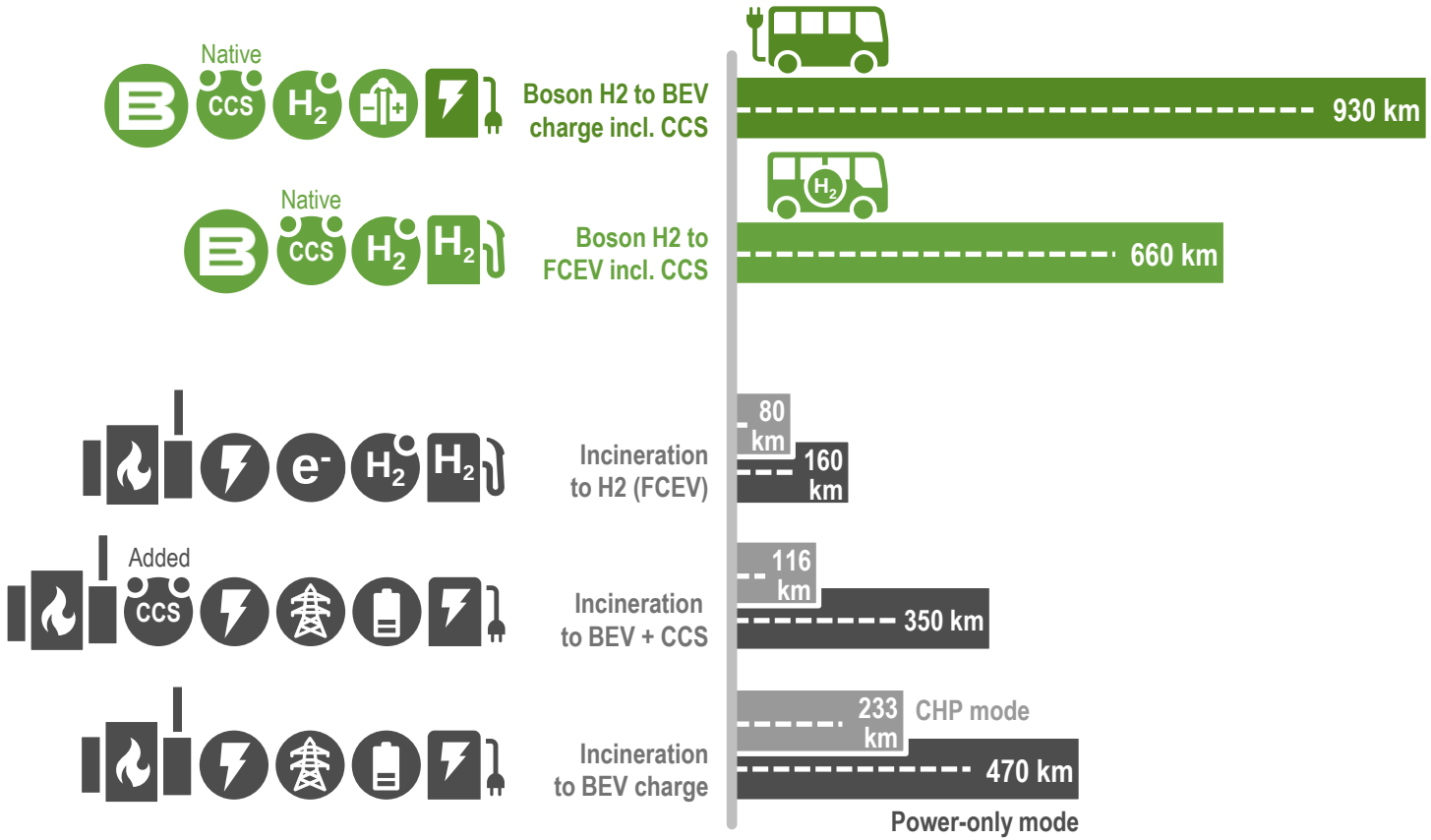
How many kilometres of Bus on 1 ton of waste? Incineration vs Boson

- **Boson Energy is platform agnostic** – no need to choose between Hydrogen or Battery Electric vehicles
- **BEV[1] charging** from Boson Energy H2 is **more efficient than H2 vehicles (FCEV[2])**
  - Stationary Fuel cells have lower H2 quality requirements – increasing net yield of H2
- **Incineration** suffers from inefficiency of power production, CCS power consumption, grid losses and the detour via electrolysis
- Resulting in 'H2 from incineration via electrolysis' producing **very high per-km emissions of CO2, NOx, PM, etc. – even higher than diesel**



Incineration efficiency: CHP 0.35 MWhe/ton waste, Power-only 0.7 MWhe/ton waste | CCS parasitic load: CHP 50%; Power-only 25%
Electrolyser system efficiency: 60kWhe/kg H2 | Incineration to charging losses excluded

Boson net H2 to FCEV (99.999% pure H2): 50 kg H2/ton waste. |. Boson net H2 to Fast Charge FC (95% pure H2): 70kg H2 /ton waste

H2-to-DCDC charging: 20kWhe/kg H2 | BEV consumption: 150 kWh / 100km. |. FCEV consumption: 7.5 kg H2 / 100km

1) BEV Battery Electric Vehicle. 2) FCEV: Fuel Cell Electric Vehicle

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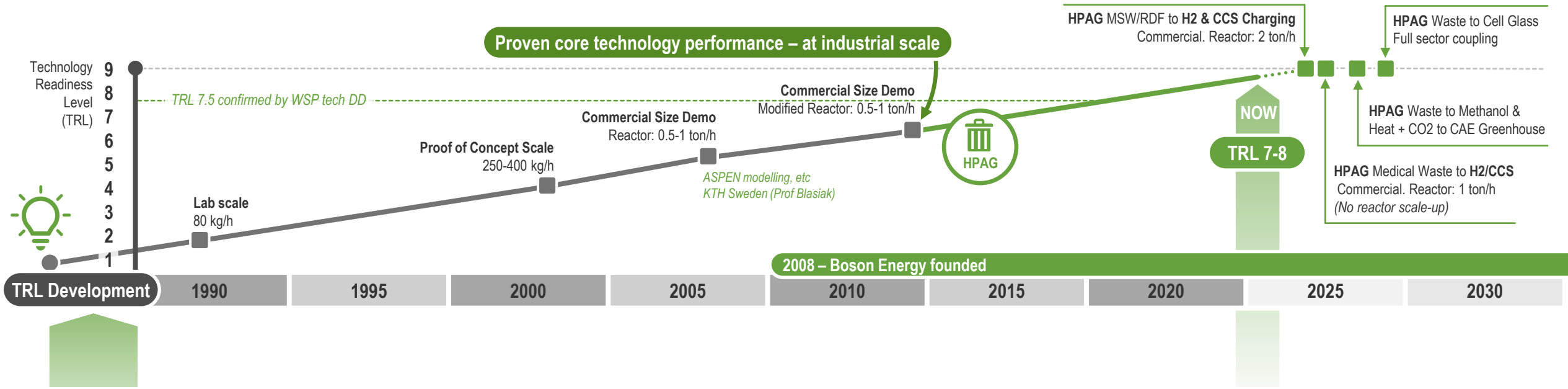
Boson HPAG development path – from science to current commercial rollout



Key challenges with gasification of waste have been addressed in design, engineering and demonstration of core technology at industrial scale

Key tech milestones			
Reactor Stability, Repeatability, Availability	Proven on campaign basis	Metals and minerals to vitrified slag – no leakage	Achieved
Reactor scaleup 80kg - 250kg - 1ton	Achieved	Stable syngas for H2 production (CO, H2, CxHy)	Achieved
Reactor geometry (time/temp/turbulence)	Achieved	Reactor scaleup (from 1 ton/h to 2 ton/h /reactor)	Engineered
Refractory composition, engineering and fabrication (process unique)	Achieved	System design (from technology to system)	Achieved
Plasma torches modified to increase process efficiency & MTBF[1]	Achieved	100% Stability, Repeatability, Availability of System	Engineered
Injection of air and steam engineered to increase process efficiency	Achieved	Syngas to H2 and CO2 (SMR, WGS, PSA)	Partner technology (TRL9)

1) MTBF: Mean Time Between Failure

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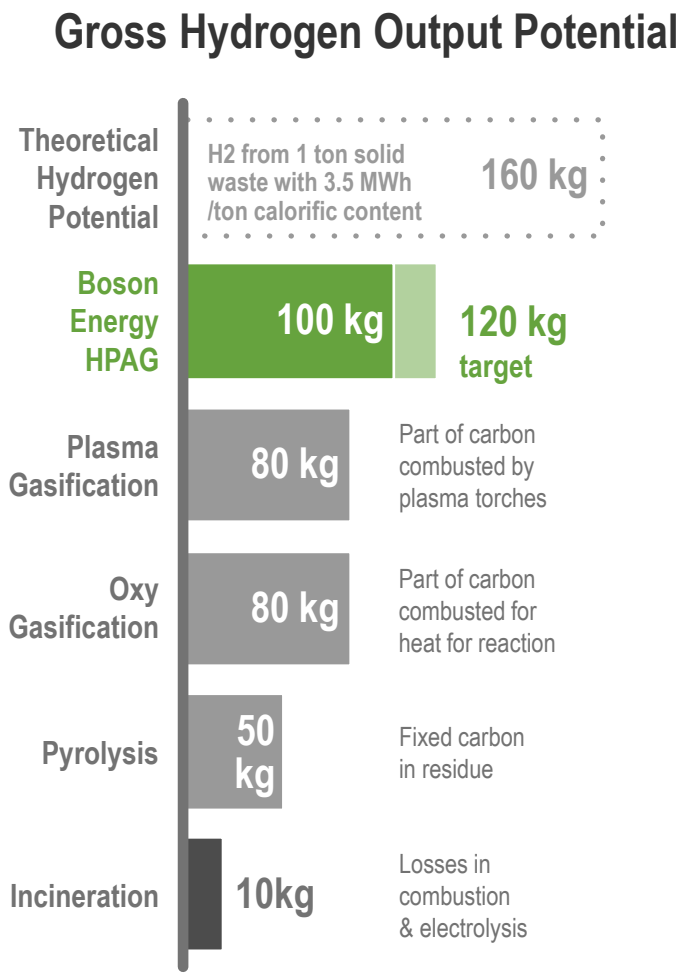
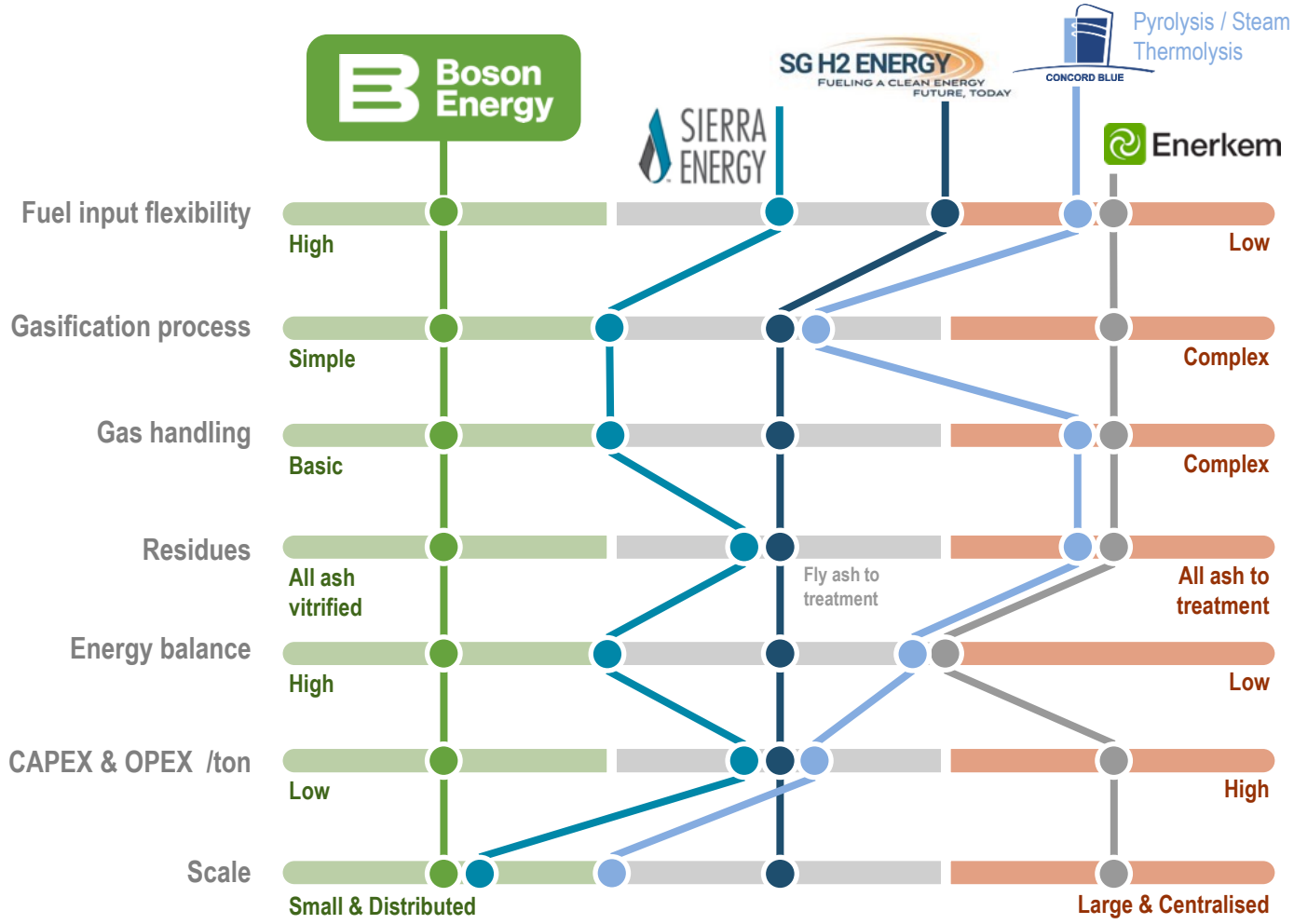
How Boson compares to other waste to H2 production technologies?





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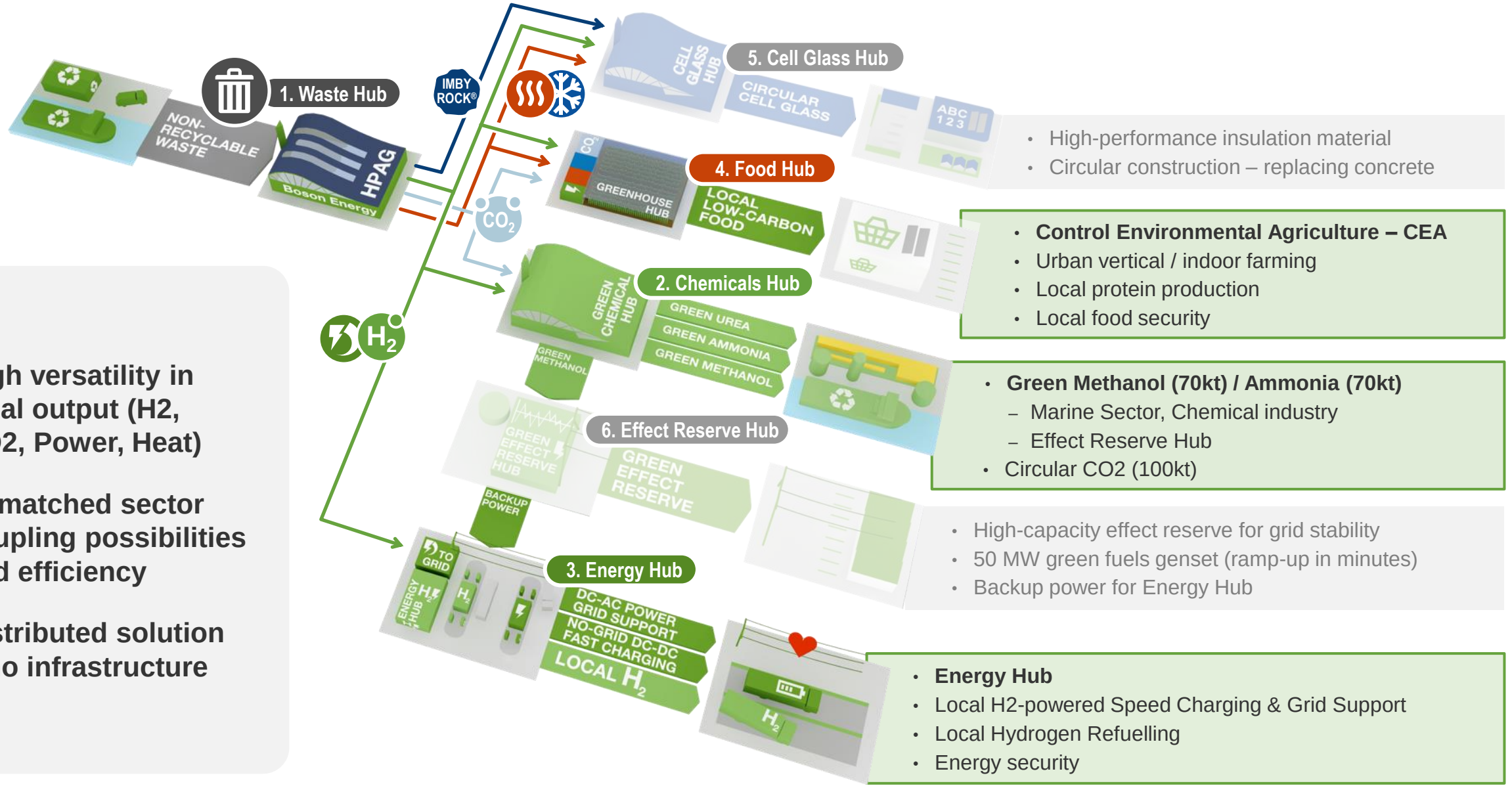
Boson Energy takes local sector coupling to strategic level

- **High versatility in local output (H2, CO2, Power, Heat)**
- **Unmatched sector coupling possibilities and efficiency**
- **Distributed solution = no infrastructure**



- High-performance insulation material
- Circular construction – replacing concrete

- **Control Environmental Agriculture – CEA**
- Urban vertical / indoor farming
- Local protein production
- Local food security

- **Green Methanol (70kt) / Ammonia (70kt)**
  - Marine Sector, Chemical industry
  - Effect Reserve Hub
- Circular CO2 (100kt)

- High-capacity effect reserve for grid stability
- 50 MW green fuels genset (ramp-up in minutes)
- Backup power for Energy Hub

- **Energy Hub**
- Local H2-powered Speed Charging & Grid Support
- Local Hydrogen Refuelling
- Energy security

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Comparison price range with cost reduction for Waste2Hydrogen

Green Hydrogen[1] cost primarily dependent on balance between power prices and capacity factor

Blue Hydrogen[2] cost primarily dependent on cost of natural gas and CCS

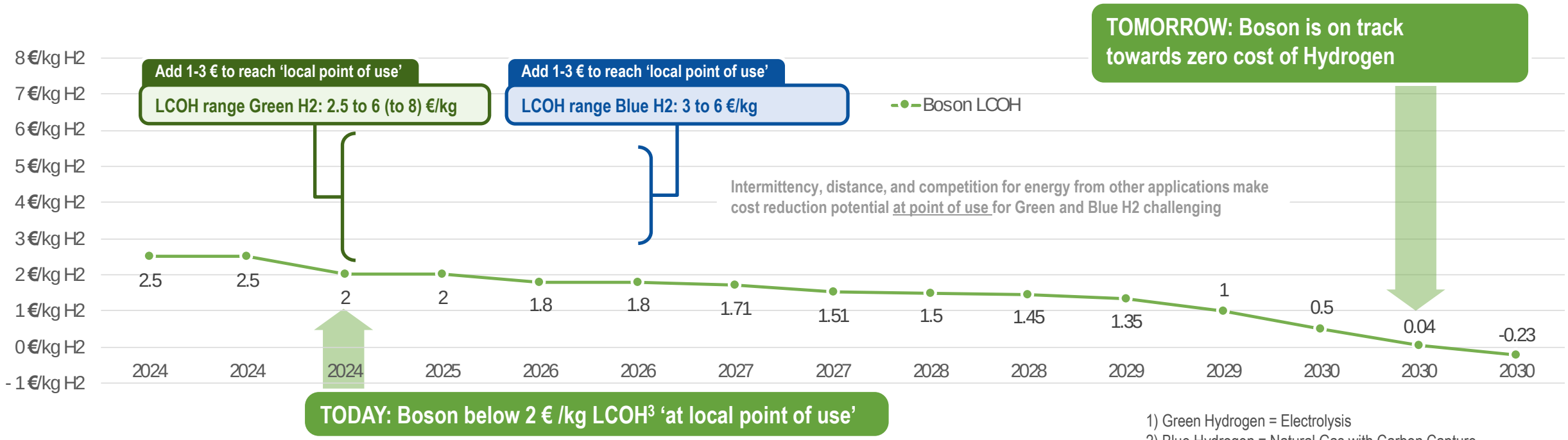
Add transport to local point of use – of either H2 or power / gas!

Boson Hydrogen cost TODAY benefits from already being produced close to point of use

- More economic activity = more local waste available for H2 production
- Multiple H2-derived output options = easier to all H2 used locally

Boson Hydrogen cost TOMORROW has substantial reduction potential – driven primarily by two things:

- Business development of additional revenue streams (CO2 ETS and Sales of CO2, Heat, IMBYROCK®)
- Operational efficiency and CAPEX reduction (standardisation, AI process control, etc)



1) Green Hydrogen = Electrolysis
2) Blue Hydrogen = Natural Gas with Carbon Capture
3) LCOH = Levelized Cost of Hydrogen

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HYGRO hydrogen as primary energy carrier

Jan Engelsman

HYGRO - General Manager

“From wind to wheel"

- Refilling Station (Hub - Satelliet)
- Zero-emission construction (Gensets)

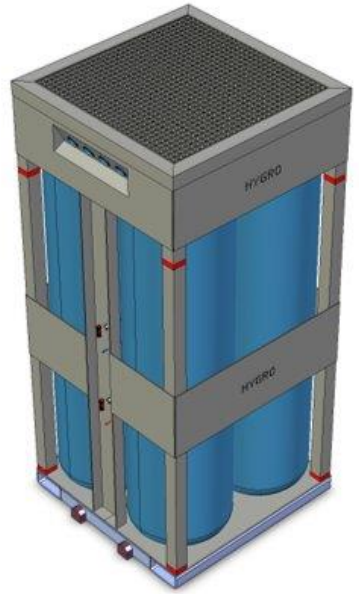
HYGRO hydrogen as primary energy carrier

HYGRO hydrogen as primary energy carrier

Impression iBundle

Transport through ‘smart’ storage

- Units equipped with 1000 bar type IV-V cylinders
- 4 carbon high pressure vessels
- Nominal capacity 75 kg
- Capacity and replacing compressor



YOUR CATERER
FOR ENERGY INDEPENDENCY

SoHHytec
SOLAR FUEL, THE SMARTER WAY

Jordan Bellatreche
Head of Business Development

Decarbonizing with Artificial Trees

Swiss Innovation for the World

World's Best Green Hydrogen producer

We **Develop**, Build and Operate Gardens and **Forests** of our proprietary **Arbs** (Artificial Trees) and provide

Hydrogen (fuel) & **power** as a Service

SoHHytec
SOLAR FUEL, THE SMARTER WAY

The ‘ARB’

World’s best technology

- Innovative **Integrated Photo-Electrochemical** device
- Concentrated light 1000x
- Smart thermal and mass-transport management
- Lifetime 25 years with minimal maintenance
- Plug & play automated co-generation system

25% Solar to H_2 efficiency (2x conventional)

36% Solar to electricity efficiency

80% Overall system efficiency

- On-site
- Renewable
- Cost-effective (target - H_2<$2/kg)
- Greener
- Safe

Our Arb

nature energy

Energy & Environmental Science

SoHHytec
SOLAR FUEL, THE SMARTER WAY

ARB

Versatile and Flexible co-generation system

MAGIC SAUCE

Integrated Photo-Electrochemical (IPEC) Technology

Multiple Outputs:

- H_2 (30 bar) (Purity: 99.999%)
- O_2 (>99.8% purity)
- Heat (70-80°C)
- Electricity (on-demand)

Versatile operation:

- Tunable outputs
- Various operating modes

Flexible (Hybrid Input) possibility:

- With only Sun: variable production profile
- **24-hour constant fuel production** at 100% capacity with Sun + Grid

SoHHytec
SOLAR FUEL, THE SMARTER WAY

DIVERSIFIED PRODUCT PROTFOLIO

3 Sizes of Arb catering to small-medium to centralized production needs

$1_{(50\ Arbs)} - 20_{(1000\ Arbs)}$ MW Equivalent

3,650 tons/year H_2

9-meter Arb
(20 kW_p)
10 kg/day

$40_{(1000\ Arbs)}$ MW Equivalent

7,300 tons/year H_2

13-meter Arb
(40 kW_p)
20 kg/day

$160_{(1000\ Arbs)}$ MW Equivalent

29,200 tons/year H2

25-meter Arb
(160 kW_p)
80 kg/day

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Developing Gardens for Fuel and Power production

Our current industrial Pilot in Switzerland

Solar + green Grid Operation

400 tons/year

CO_2 saving

- H_2: **18** tons/year
- O_2: **145** tons/year

~35% Cheaper than grey H_2 market price

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ARB's Forest

The way we scale up

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INVESTMENT OPPORTUNITY

Join our sustainable journey and get lucrative returns

Investment History:
- ~5 million USD raised.
- 2 million in SEED round (2 years back) + 3 million in grants

Patented solution:
- Core technology patented and already granted in India, USA and entire Europe.
- 8 additional TRADE SECRET IPs

Extensively Proven solution:
- World-record in performance
- 2 years of long-term testing of product in real world
- 2 scientific publications in **NATURE** ENERGY (world's highest rated journal in Energy) and 6 publications in other high impact & reputed international journals

Recognition and Traction:
- Our founder had been One-on-One with President of Switzerland, President of Chile, Vice President of Brazil, including the ministers of India, Brazil and Chile
- Internationally recognized expert in Green Hydrogen
- Extensive World-wide media coverage.

Market Traction:
- Potential pipeline of projects cumulatively worth > 1 Billion revenue over next 4 years.
- Key partnerships with world-leading material and sub-component suppliers

Competitive Advantage:
- 2x higher efficiency, 2x cheaper than any other competing solution, 2x more output per land area.
- 99.5% recyclable, 20 tons CO_2 saving per ton of Hydrogen produced, ~100 million tons CO2/year saving potential

- Pre-series A : ~ 5 million USD (1-2 months)
- Series A : 25-30 million USD (~6 months)

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SOLAR FUEL, THE SMARTER WAY

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Head of Business Development

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Mob. : +41 (0) 76 468 98 86

EPFL Innovation Park, Bâtiment C, 1015 -
Lausanne Switzerland

www.sohhytec.com

Totally transparent renewable energy certification, every hour of the day

European Hydrogen Week

Impactful & traceable certificates.

Renewabl is the platform that allows companies to meet their decarbonisation targets quickly and efficiently by matching clean energy certificates directly from wind and solar farms on a 24/7 basis.

Proud member of:

SUSTAINABLE ENERGY FOR ALL

United Nations

RECS ENERGY CERTIFICATE ASSOCIATION MEMBER

Nearly All Companies Will Miss Net Zero Goals Without At Least Doubling Rate of Carbon Emissions Reductions by 2030, Accenture

Today’s challenges

Companies are struggling to meet their decarbonisation targets. This is a big problem.

They are not able to find suitable / impactful solutions beyond PPAs. Most solutions are not reliable, traceable and hard to implement. Until now.

- Complex
- Not compliant
- Not transparent
- Time consuming

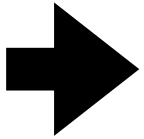
We focus on 3 key areas.

Impactful

Digital

Measure

1



Current Hourly Score

Target Hourly Score

Transact

2

Temporal Match

- Hour-by-hour matching of 24/7 RE certificates.

Local Swaps

- Certificate swaps between companies.

Verify & Report

3

- Compliant reporting
- Ledger traceability
- No Greenwashing

SCIENCE BASED TARGETS

RE100

CLIMATE GROUP

CDP

Benefits - Hydrogen

- Impactful
- Digital
- Precision and Accuracy
- Efficient Resource Utilisation
- Enhanced Transparency
- Environmental Accountability

Hourly matching made easy.

Questions?

renewabl.com

CibusCell

Digitally empowering a thriving green hydrogen economy

Marcus Ruebsam
Co-Founder & CEO

Microsoft Managed Partner

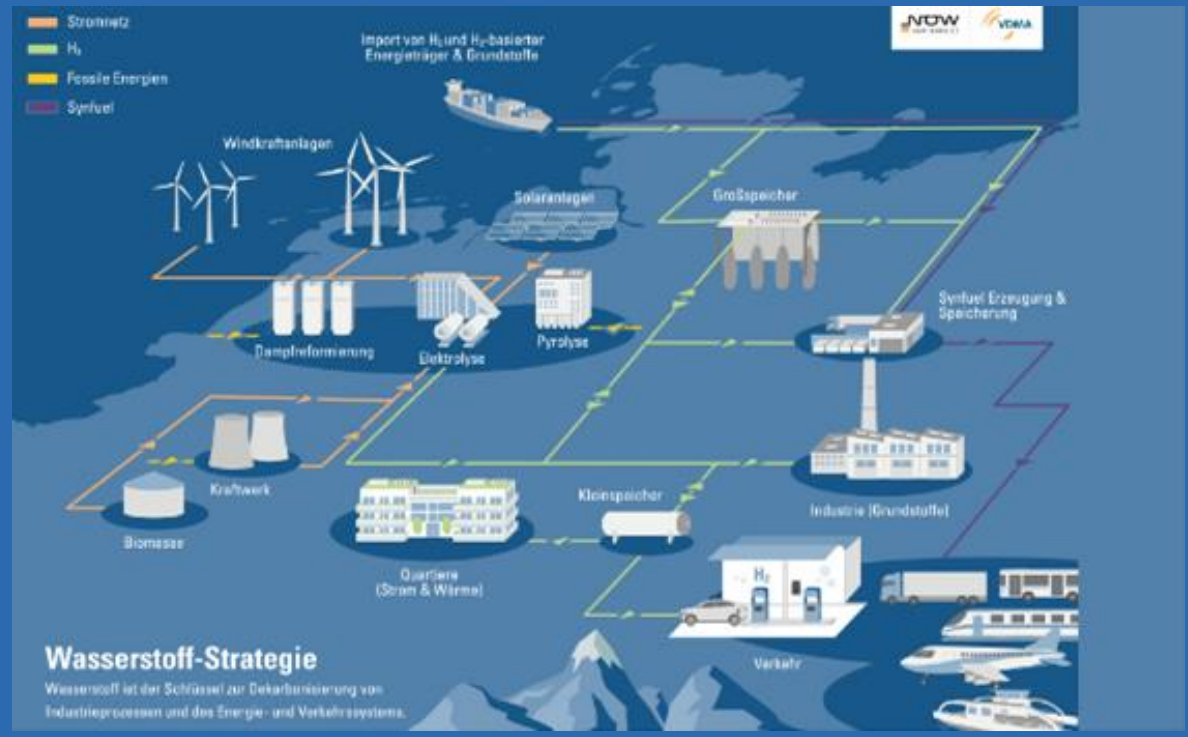
Challenge:

Developing new value chains

Hydrogen value chains, being digitally interconnected, can help to **minimize risks** and **optimize costs** right from the start.

Weather – a significant parameter of a green hydrogen economy – is volatile. All players can benefit from cross-sector interconnectedness enabling process control in real time:

- Manufacturers
- Network operators / logistics providers
- Storage providers
- Distributors
- Industrial consumers
- Industrial producers

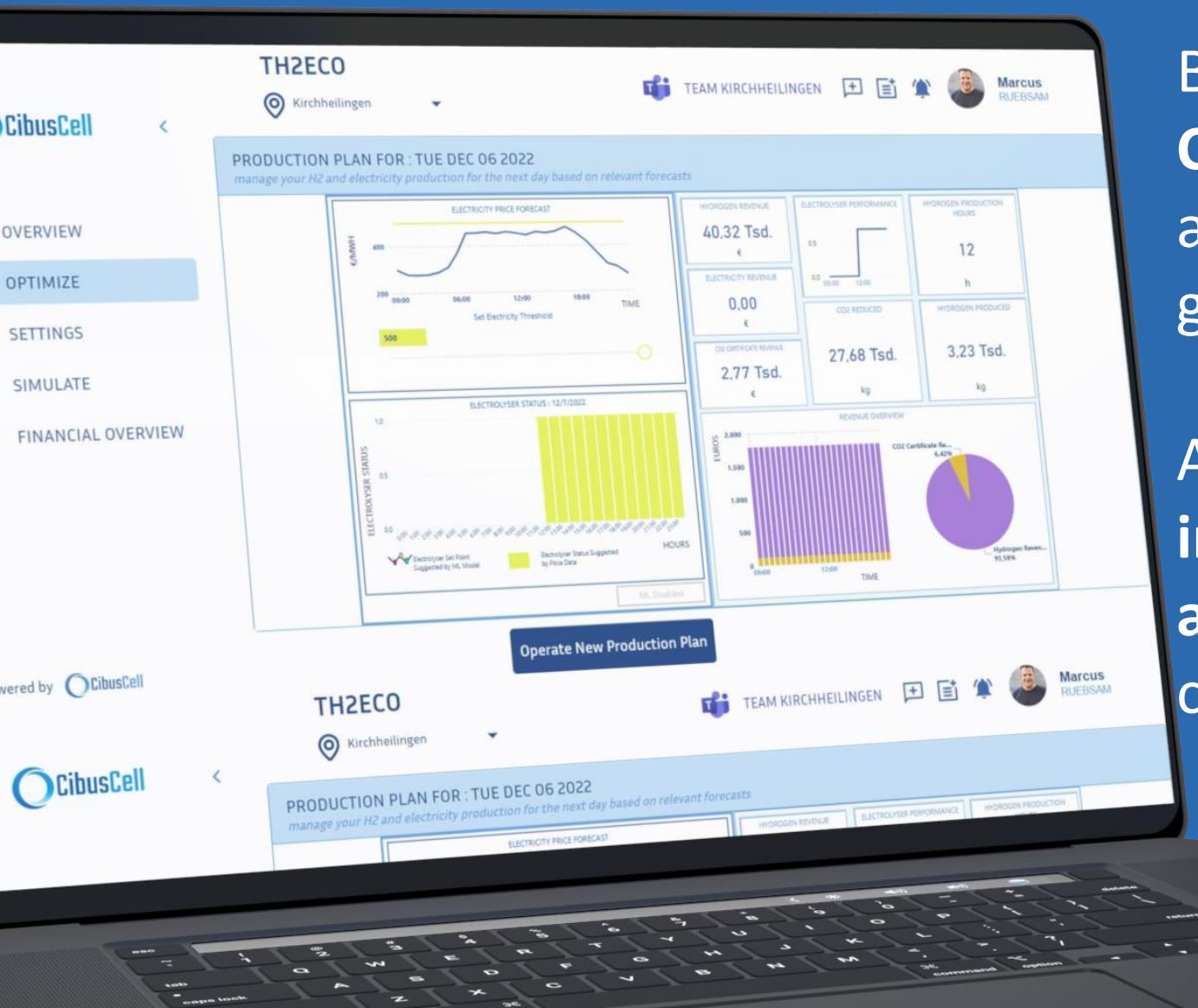


CibusCell

The CibusCell **Cloud solution** enables cross-sectoral alignment, paving the way for an **efficient green hydrogen economy.**

CibusCell consolidates data **across sites** and correlates them with relevant market data, enabling **efficient operational control**.

CibusCell



Based on a wide range of data, **CibusCell** calculates achievable outcomes under given operating conditions.

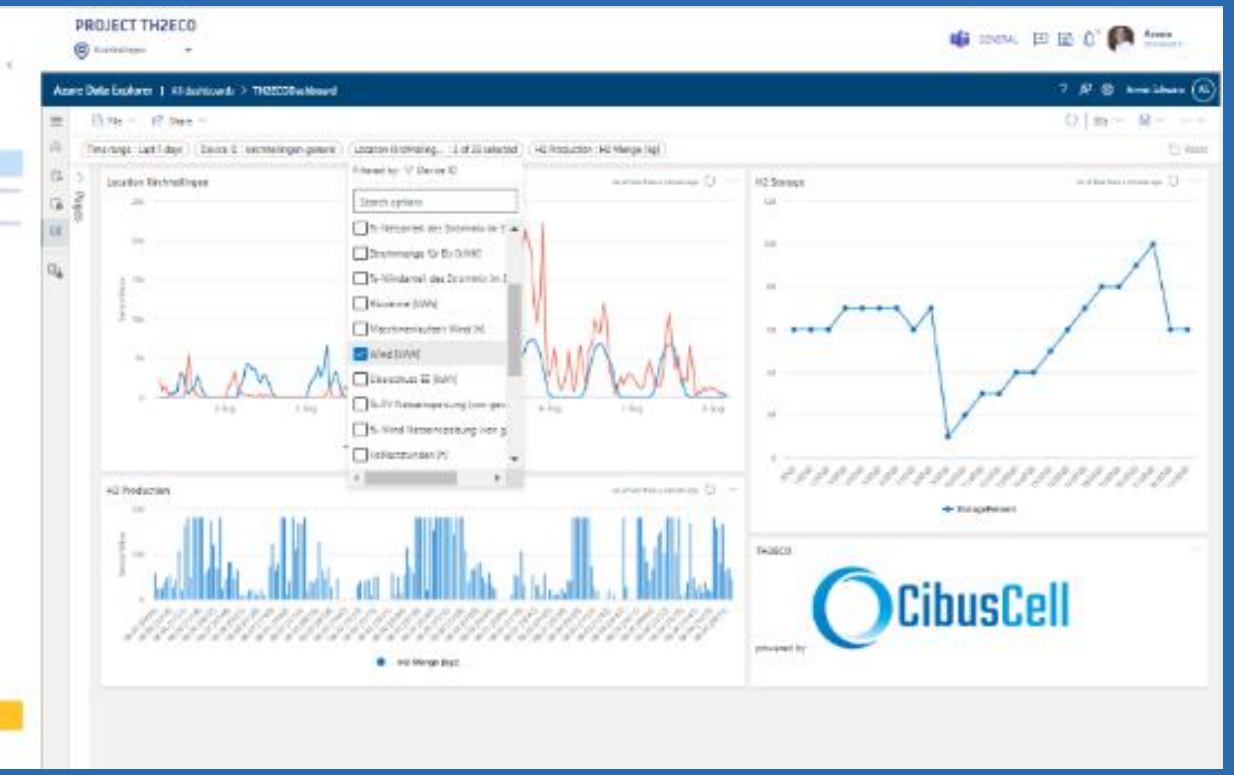
A mesh of **complex interdependencies automatically** feeds into the calculation.

CibusCell

CibusCell offers customizable dashboards displaying all relevant production parameters.

Leveraging artificial intelligence, data are meaningfully correlated with electricity consumption, output and energy prices. For faster and smarter decisions.

CibusCell



CibusCell leverages its cloud solution to **display and analyze** relevant data in **real time.**

A sound basis for vital business decisions.

CibusCell is essential for the market rollout of **green hydrogen**

Why CibusCell

Tangible benefits.

1 **Production-efficiency increase by up to 30%**
as a result of sector coupling

2 **ROI within 4 to 7 years**
Faster scaling of green hydrogen for commercial use

3 **Reduction of CAPEX and OPEX by 15 to 20%**
leveraging AI & IoT Data

THANK YOU FOR YOUR ATTENTION

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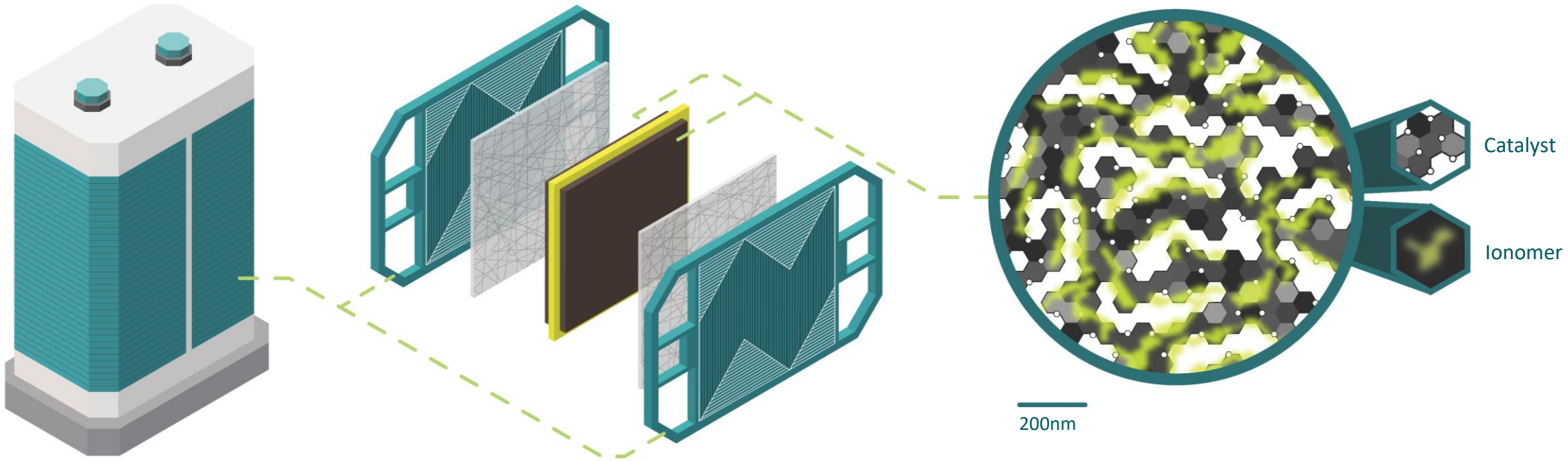
Introduction to ionysis

Hydrogen week
23.11.2023

STRICTLY CONFIDENTIAL

We focus on the core of any electrochemical converter: the membrane electrode assembly



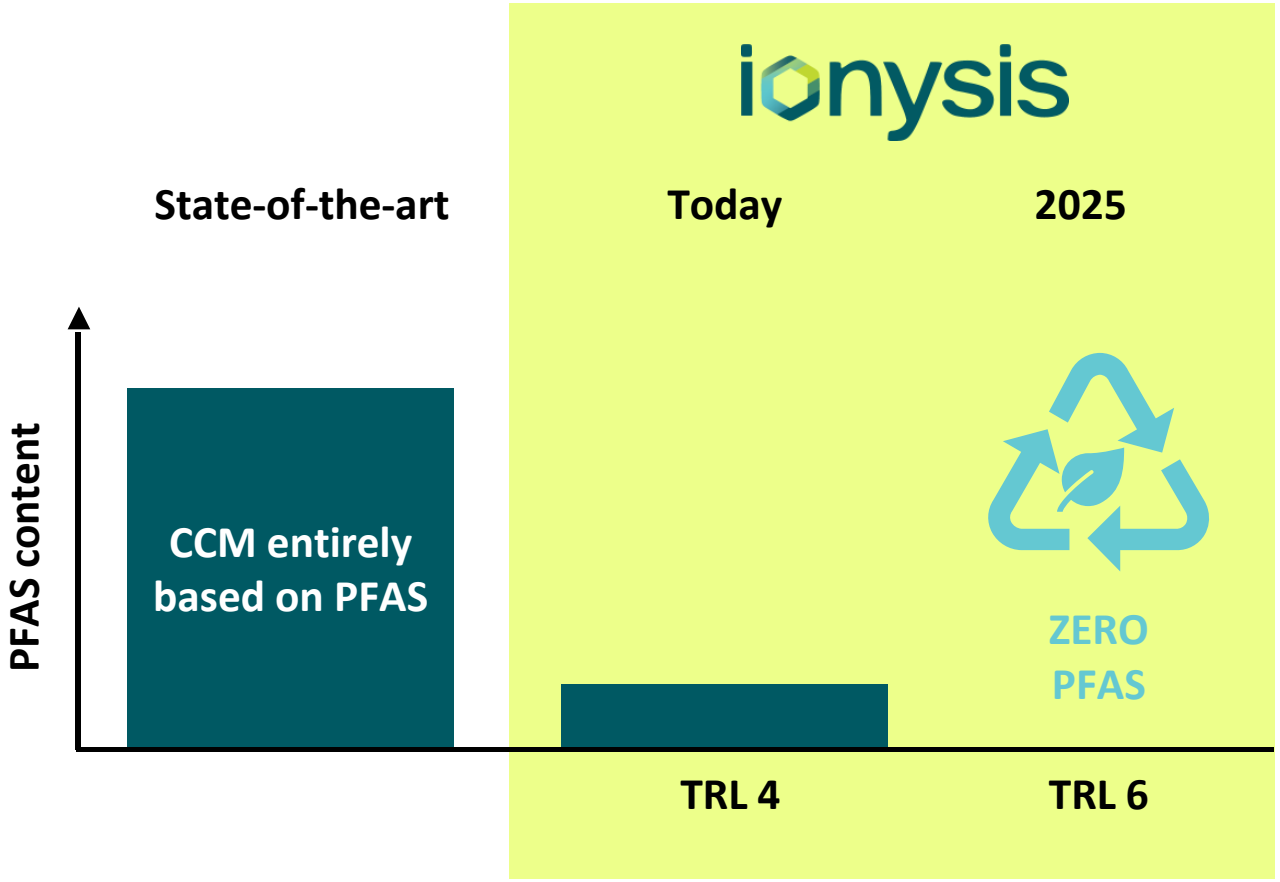
Fuel cell stack

Single fuel cell

Electrode

Our goal is to overcome the limitations of perfluorinated alkyl substances (PFAS) with hydrocarbon polymer materials

- Stable at operating temperatures > 100°C
- Reduced gas crossover
- Facilitated recycling of precious catalysts
- No regulatory risks („PFAS ban“)



State of development

Progress in our first year

- Successful transfer from 4 cm² to > 400 cm² coating areas
- Proprietary CCM coating process established (Patent pending)
- Hydrogen test infrastructure in place
- Proof on full size short stack level: > 2 A/cm² @ 0.6 V

CCM prototype at pilot scale

Next steps until Q2/24

- Expansion to electrolysis
- Own chemistry labs
- Own clean room for prototype fabrication
- Build-Up of Pilot R2R line in clean room

Pilot CCM coating experiment

JOIN
Join our team – we have various open positions!

COLLABORATE
Provide us your innovative, PFAS-free cell materials

FINANCE
Support our development in 2024 as new partner

supported by:

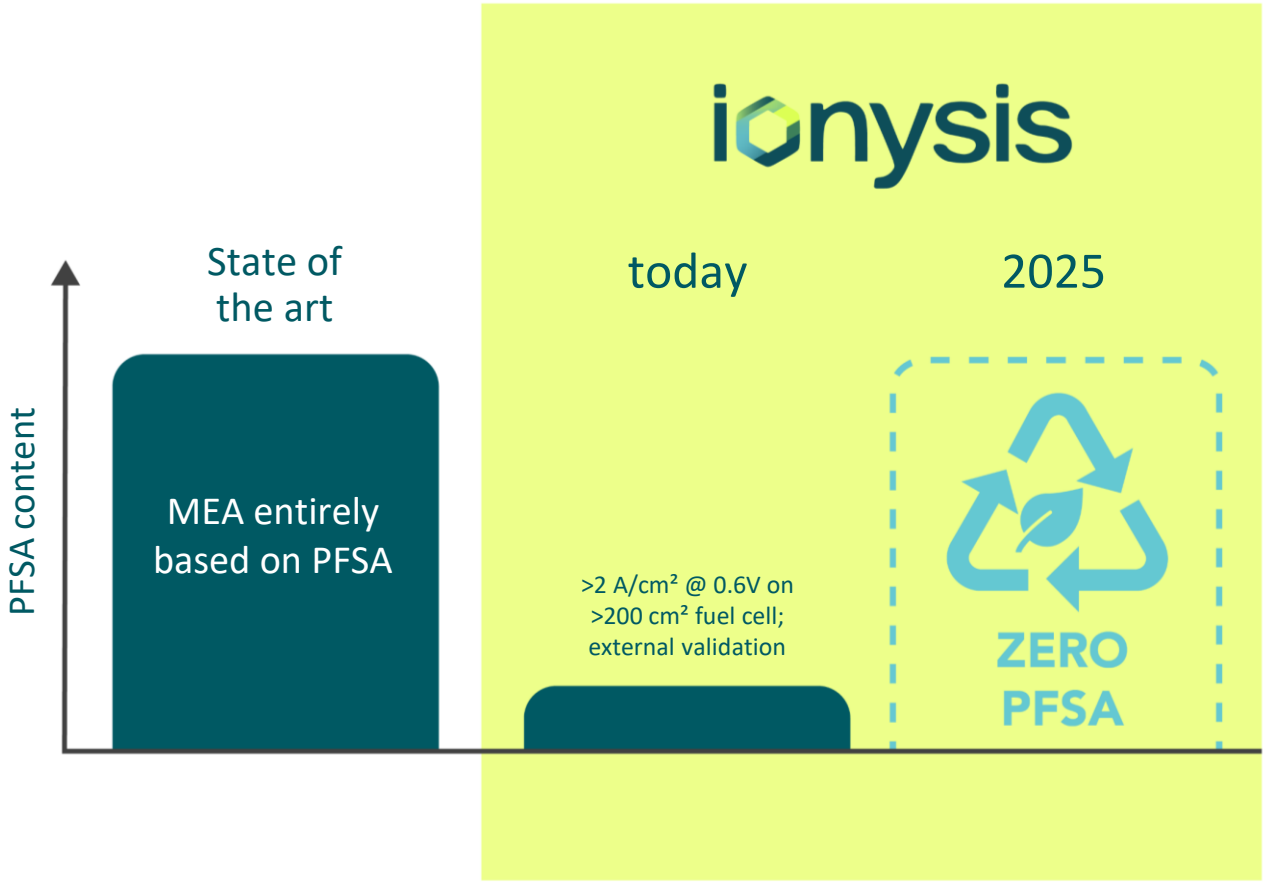
Bundesministerium für Bildung und Forschung

Bundesministerium für Wirtschaft und Klimaschutz

Funded by the European Union

Contact:
Dr. Matthias Breitwieser
matthias.breitwieser@ionysis.com

We overcome the shortcomings of todays' electrochemical converters



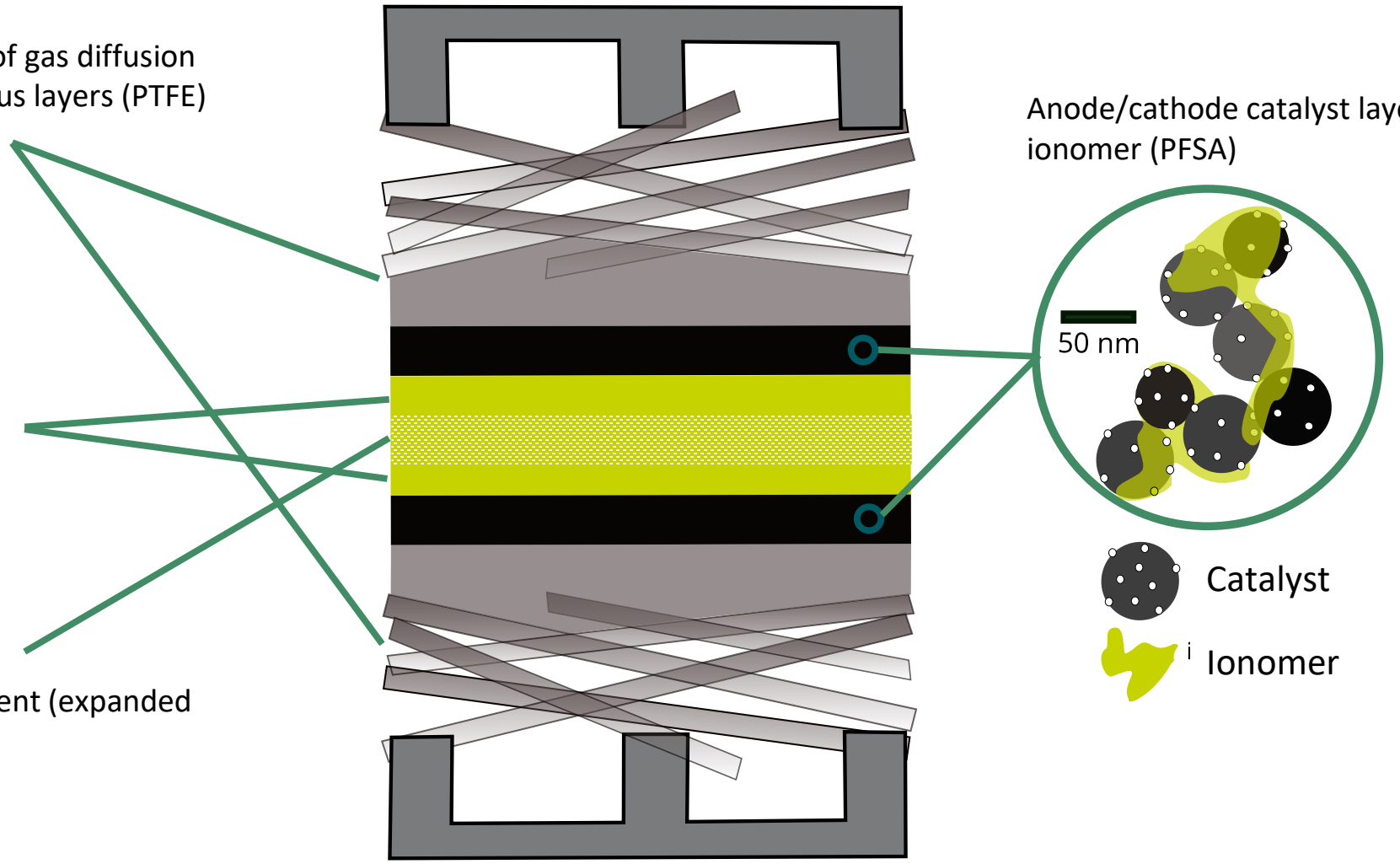
- No regulatory risks
- Environmentally safe and non-toxic
- Stable at operating temperatures > 100°C
- Reduced gas crossover
- Facilitated recycling of precious catalysts

Where are PFAS used today in membrane-electrode assemblies?

Hydrophobization of gas diffusion layers / micro porous layers (PTFE)

Membrane ionomer (PFSA)

Membrane reinforcement (expanded PTFE)



Anode/cathode catalyst layer ionomer (PFSA)

STRICTLY CONFIDENTIAL

We make green hydrogen possible!

WEW GmbH

Founder Team

Dr. Wiebke Lüke

- Developement & Marketing

Dr. Gregor Polcyn

- Technology & Production

Dr.-Ing. Lukas Lüke

- Business Development & Plant Integration

More than 35 years of combined experience in H_2 technology, business and network!

Facts and Figures

Founded

January 2021

Location

Felicitasstr. 2

44263 Dortmund, Germany

Employees

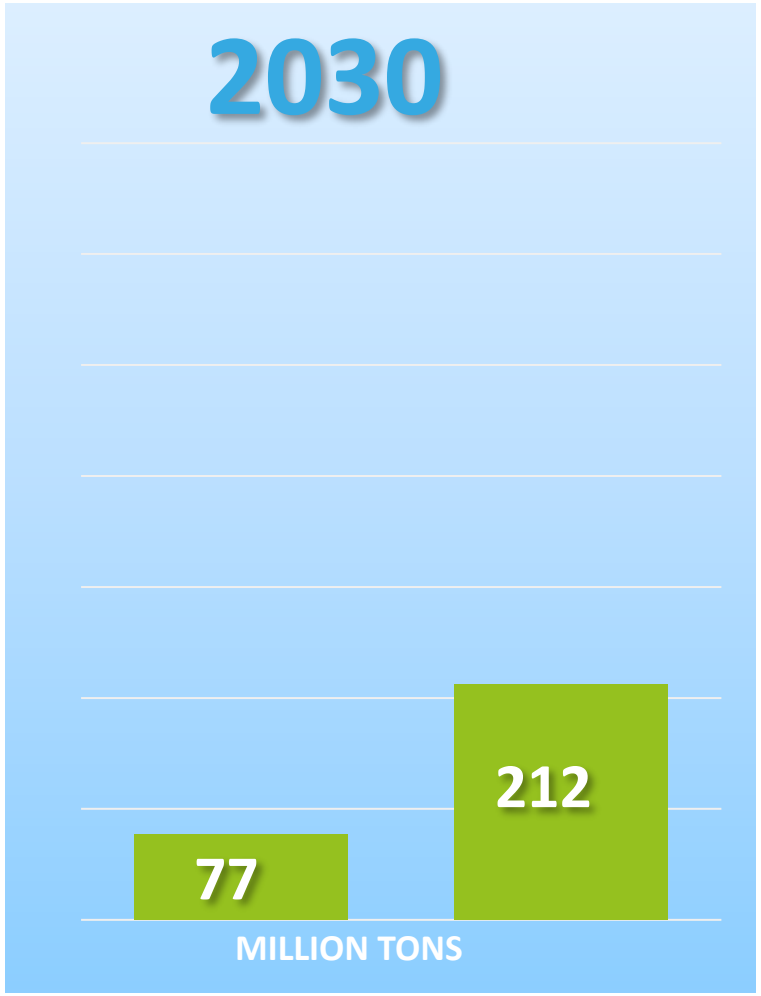
20 and growing

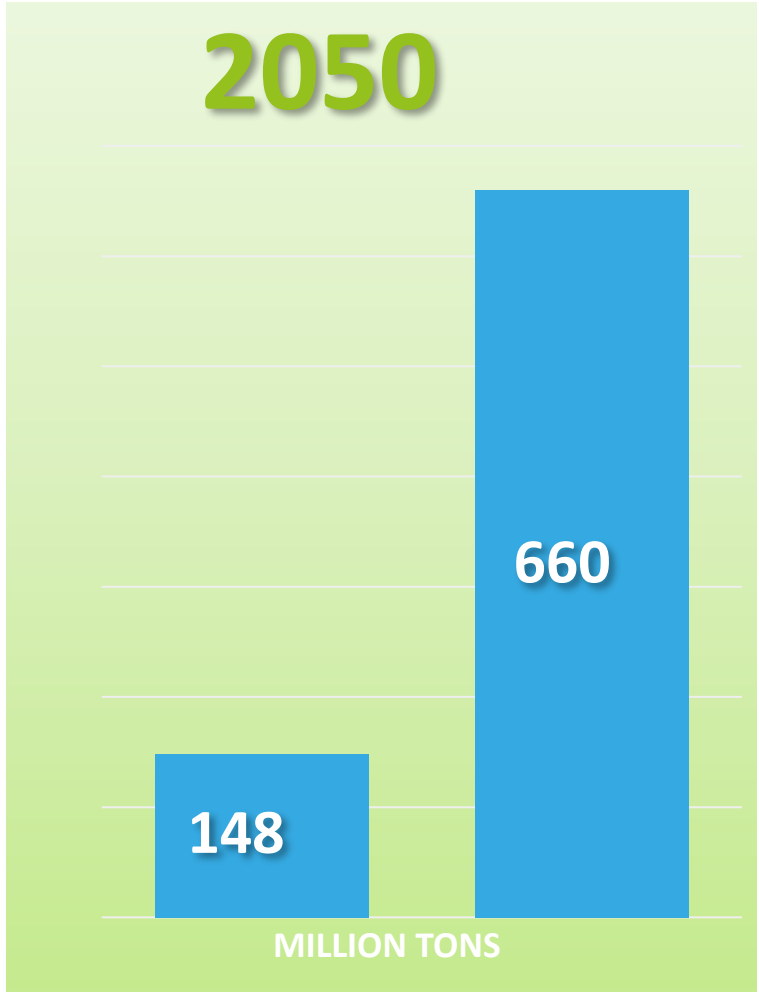
Focus

Development and production of alkaline water electrolyzers & engineering support

WATER ELECTROLYSIS WORKS

Hydrogen Demand





M. Wappler, W. Lueke et al., Building the Green Hydrogen Market, Int. J. Hydrogen Energy, 2022, https://doi.org/10.1016/j.ijhydene.2022.07.253

WEW Business Modell Analogy

The stack of a water electrolysis systems is comparable to the battery and the e-motor used in an e-bike

- Independent manufacturer with electrochemical know-how produce batteries and e-motors for the e-bike market
- Traditional bicycle manufacturers without expertise in battery manufacturing can purchase standard components from these independent manufacturers and integrate them into their bicycles
- This has opened the e-bike market to existing and new participants.

Providing the technology

Integration into existing products

WEW Approaches to Cost Reduction

Design & Resources

Manufacturing & Logistics

Design to cost

- Revolutionary stack design
- Reduction of material input (e.g., thickness reduction)
- Avoidance of cost-intensive input materials

Plug and Play

- Minimal manpower required for on-site system integration

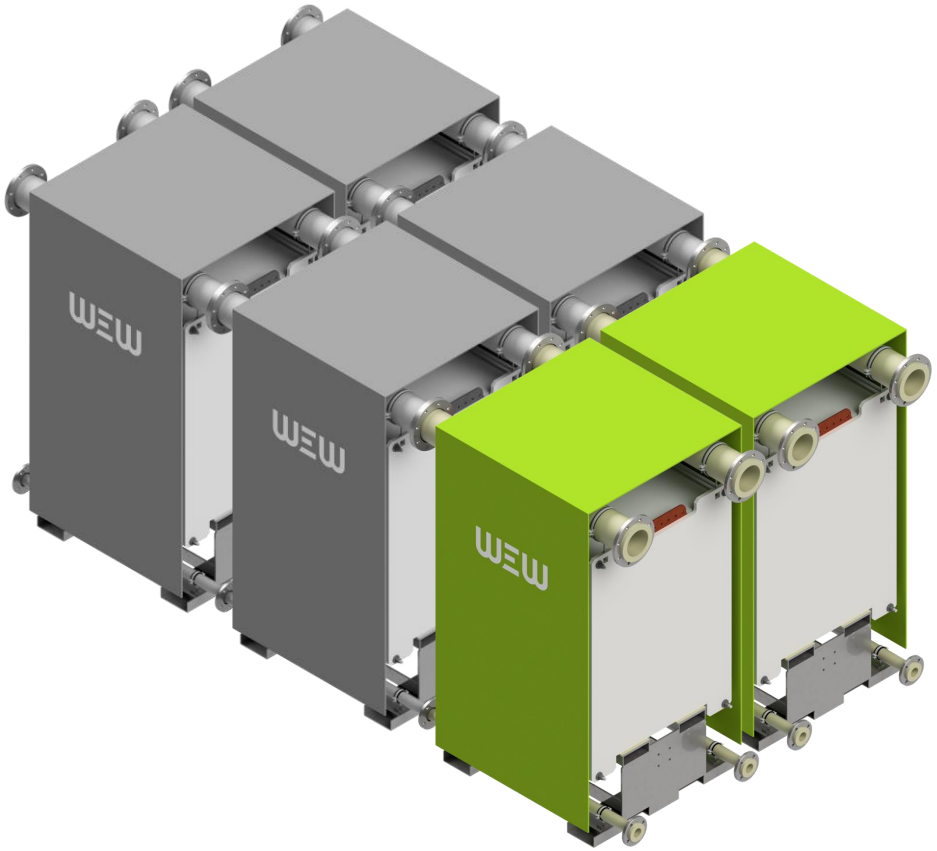
Design to manufacturing

- Optimized stack design for highly automated manufacturing
- High volume manufacturing technologies

Design to logistics

- Optimized stack design for minimum space requirement during transport

Our Product



H_2 production (per 0.5 MW stack)

- Max. continuous output: 100 Nm^3/h
- Dynamic load variation possible (20 – 100 %)
- H_2 outlet at up to 0.4 bar(g), and 90 °C.
- Specific power consumption: 4.5 kWh/Nm^3 H2
- Oxygen valorization possible

Dimensions

- Base plate: 1.1m x 1.1m
- Height: 2.1 m
- Weight: 2 t (dry)

Pilot Plant Details

Specifications

- Atmospheric pressure
- Temperature: max. 90 °C
- Current max. 4000 A
- Up to 150 kW
- Separated or mixed electrolyte cycles
- Shortstack, full electrode area

Operation

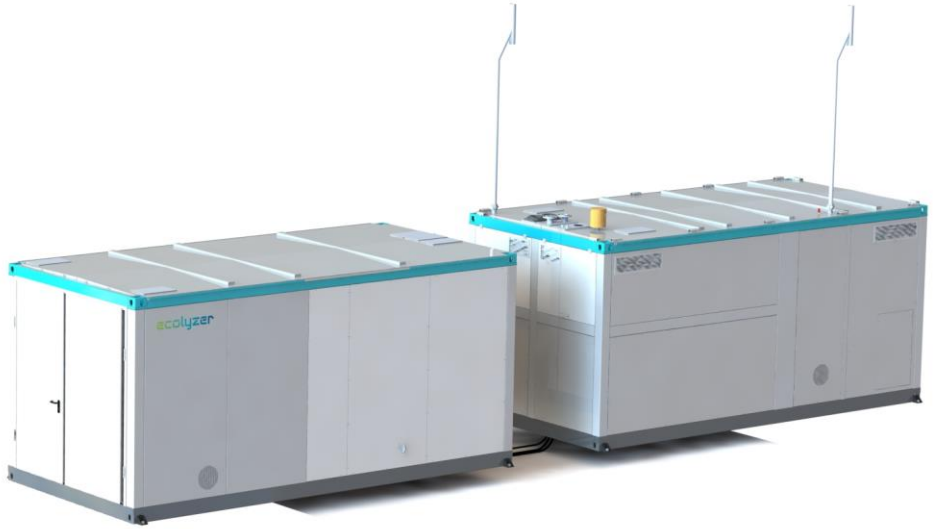
- Focus on operating strategies, dynamics, lifetime

Photo: Kreutzmann, TU Clausthal

First Demo Projects

BROCKHAUS HYDROGEN

ecolyzer by Ecoclean



Thank you for your attention.

WATER ELECTROLYSIS WORKS

Robert Rauert

- Sales Manager
- Business Development & Demo Projects

www.wewhydrogen.com

Adele Hydrogen

Scaling Green Hydrogen Production

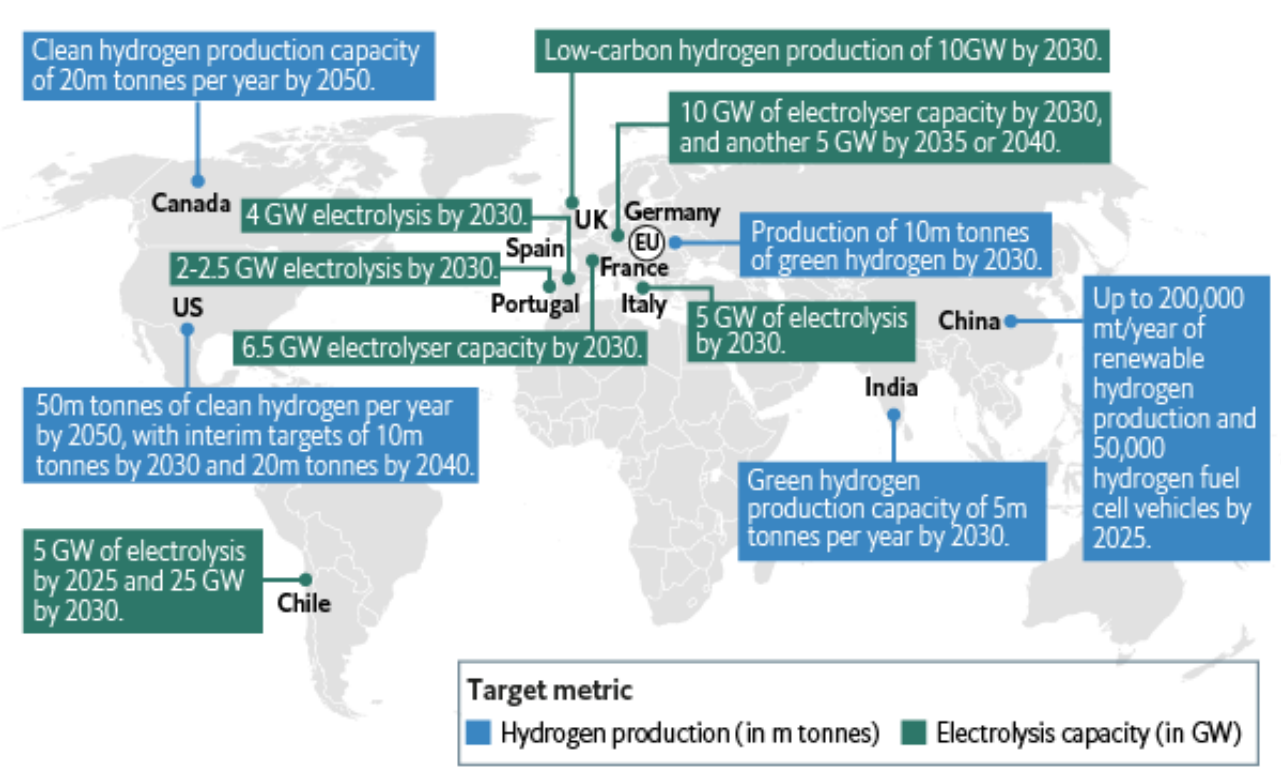
Short Pitch Deck

November 2023

The problem - scaling up green H2 generation

The world needs an unprecedented increase in clean hydrogen production… Can it be done?

Countries are setting ambitious green H2 production goals
corresponding to a **x 140-fold increase in ten years**



Vast amounts of renew. energy

To meet the EU goal of producing 10mt of green hydrogen, it would need to generate the same amount of electricity from wind and solar power as its 27 members combined produced in 2021

x50 ~ x100 electrolysis capacity

Will require to between 170 GW and 365 GW by 2030, from 3GW by the end of the year 2023

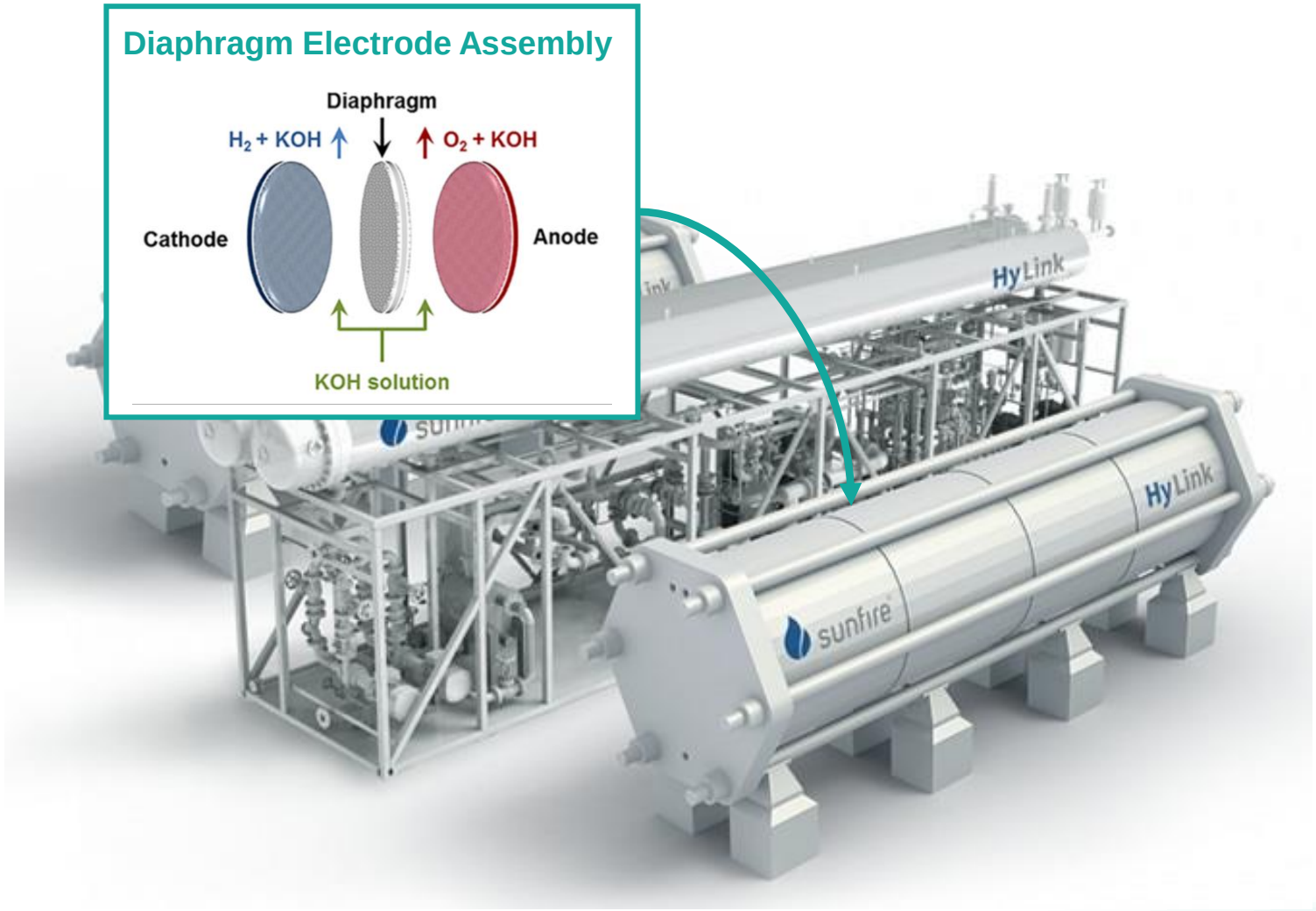
Increased metal demand & prices

Electrolyzer production is metal intensive. A rapid expansion in demand will raise prices and the cost of H2 production

International Energy Agency, Economist Intelligence Unit, United States Geological Survey.

Our focus - Mission critical alkaline electrolyzers

The workhorses of green hydrogen generation



20 MW Alkaline Electrolyzer from SunFire GmbH

Large scale H2 prod. ready

Used in both small and large-scale applications, including industrial-scale hydrogen production and grid balancing. Popular for larger installations (fertilizer, petrochemicals, green steel)

50% market share

Alkaline electrolyzer (AEL) are well proven at industrial scale. They will supply half of the green hydrogen supply in 2030, requiring installed capacities from 100 GW to 200 GW

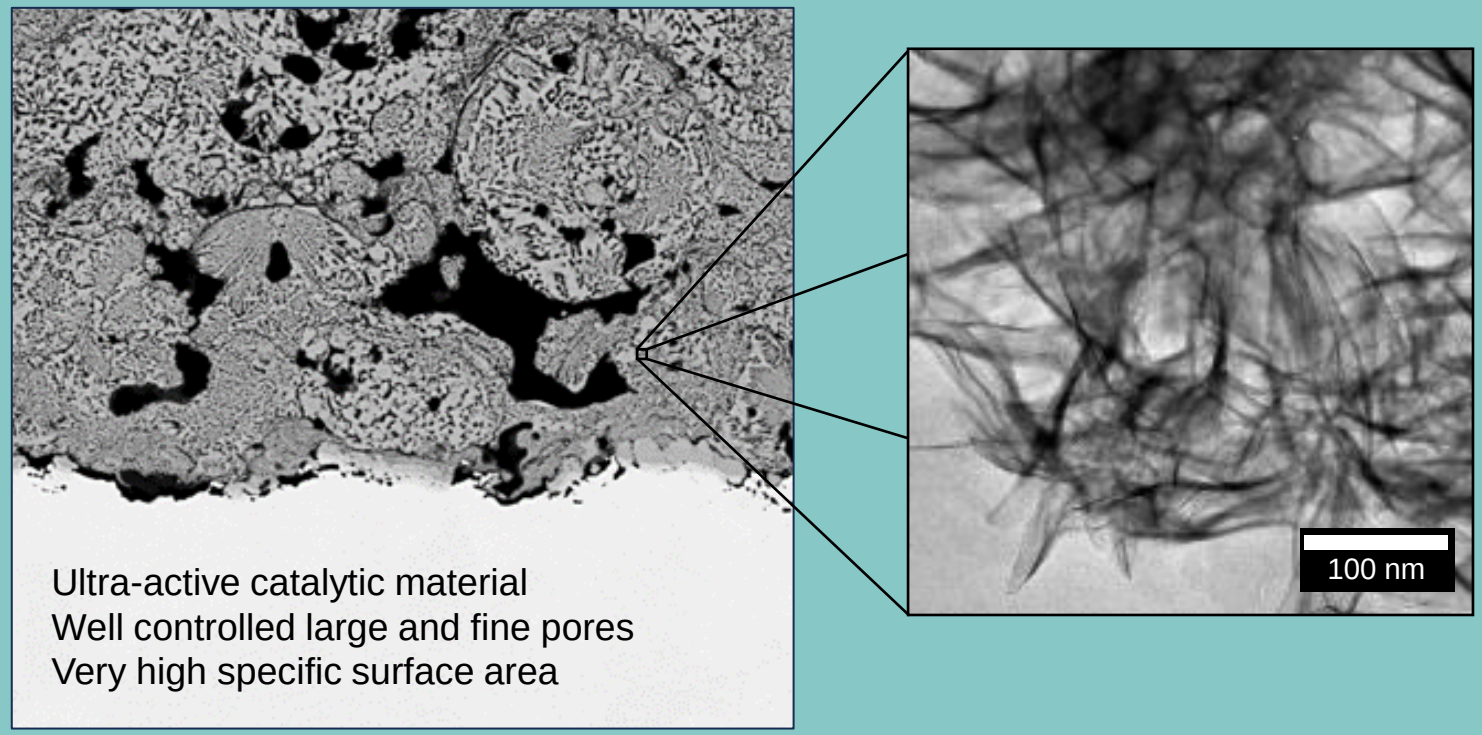
Fast expanding market

Established electrolyzer companies and EPC companies moving in the electrolyzer space are investing billions to increase alkaline manufacturing capacity, expect to reach 10 GW/year in 2025

Our solution – the best performing alkaline electrolyzer electrodes

Achieving massive CAPEX reduction and increased efficiencies from a single component

Adele's Electrodes



Ultra-active catalytic material
Well controlled large and fine pores
Very high specific surface area

Lowest consumption

Our electrodes achieve the lowest power consumption per kg of H2 produced, down to 45 kWh/Kg H2

Highest production rate

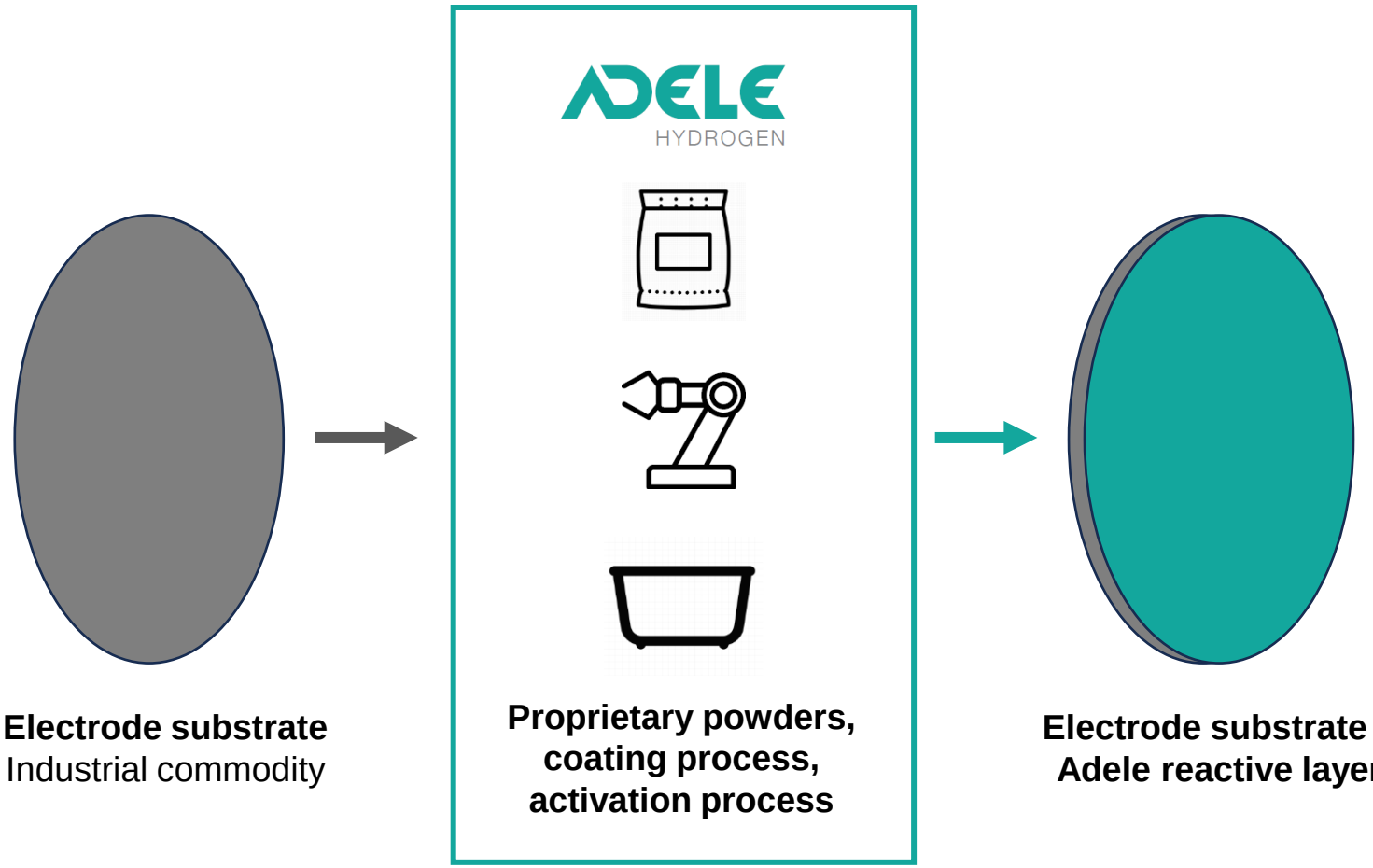
Our electrodes can support up to double H2 production rates, decreasing CAPEX costs

No Noble or CRM materials

Our electrodes does not use Noble metals, Platinum Group Metals or Critical Raw Materials (CRM)

Our solution – a readily implementable and scalable surface treatment

Adele's proprietary coating process is applicable to existing electrode's designs



Electrode substrate
Industrial commodity

Proprietary powders, coating process, activation process

Electrode substrate + Adele reactive layer

Drop in product

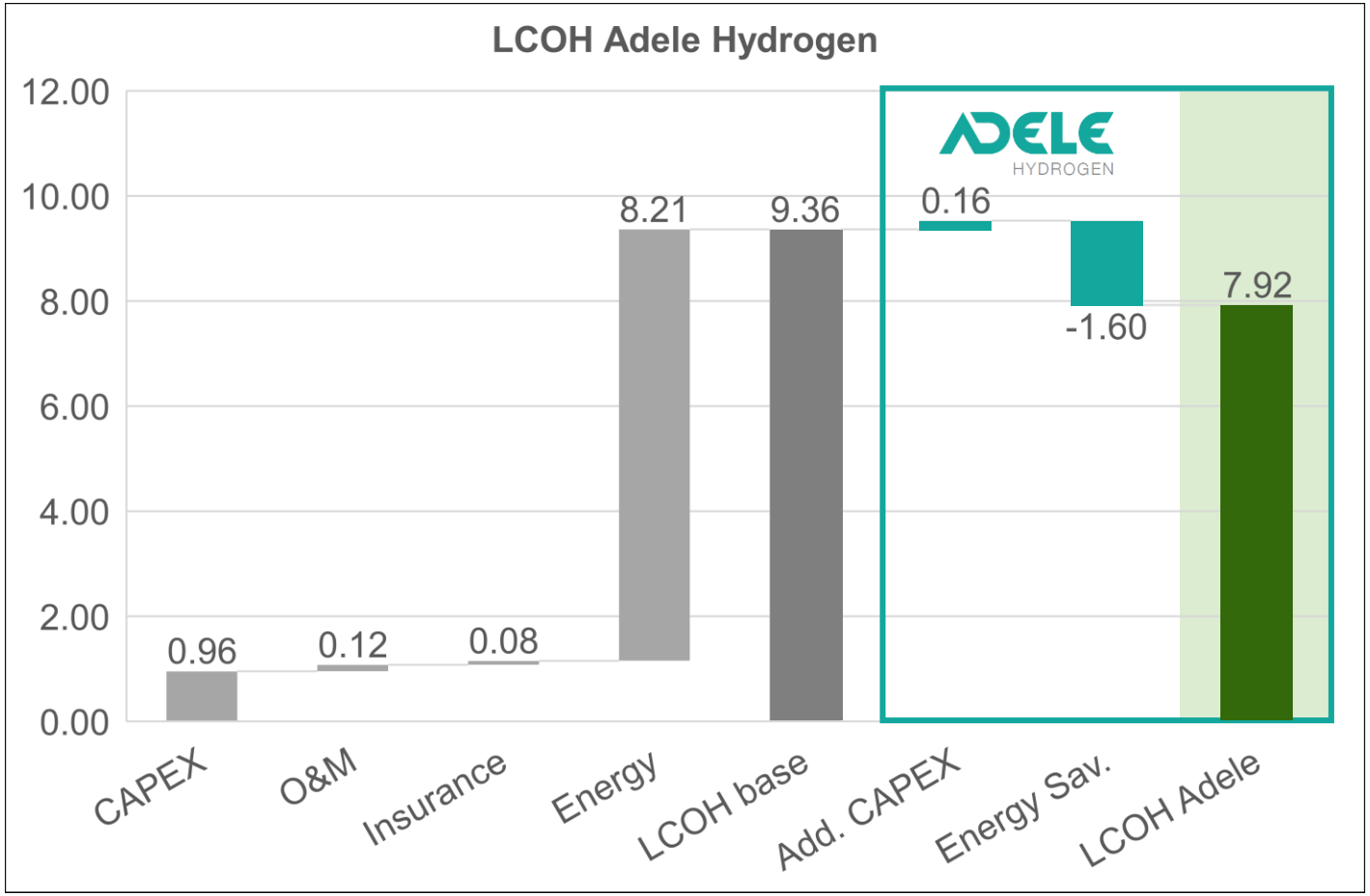
Our electrodes does not require change in electrolyzer designs, coated electrodes can be readily integrated into electrolyzers

Scalable process

The production process is using currently available equipment and technologies

Our solution – an attractive value proposition for green hydrogen developers

Using Adele's electrodes, project developers can achieve lower hydrogen production costs



Higher efficiency

Adele Hydrogen significantly increases efficiency, from 53% in the base scenario to 64% with Adele Hydrogen electrodes

Significant savings

This results in significant savings for project developers. In the considered scenario, an electrolyzer using grid electricity, the energy savings are 1.6 $/kg, largely offsetting the additional CAPEX cost of using Adele Hydrogen electrodes

Thank you and…. Let’s connect!

We’re looking for clients, partners and are raising funds!

vincent@adelehydrogen.com

Thank you for your attention

www.adelehydrogen.com