



NACO

Empowering
the **Green**
Energy
Revolution.

Raivis Nikitins
Co-founder, CCO

Fossil Free Economy

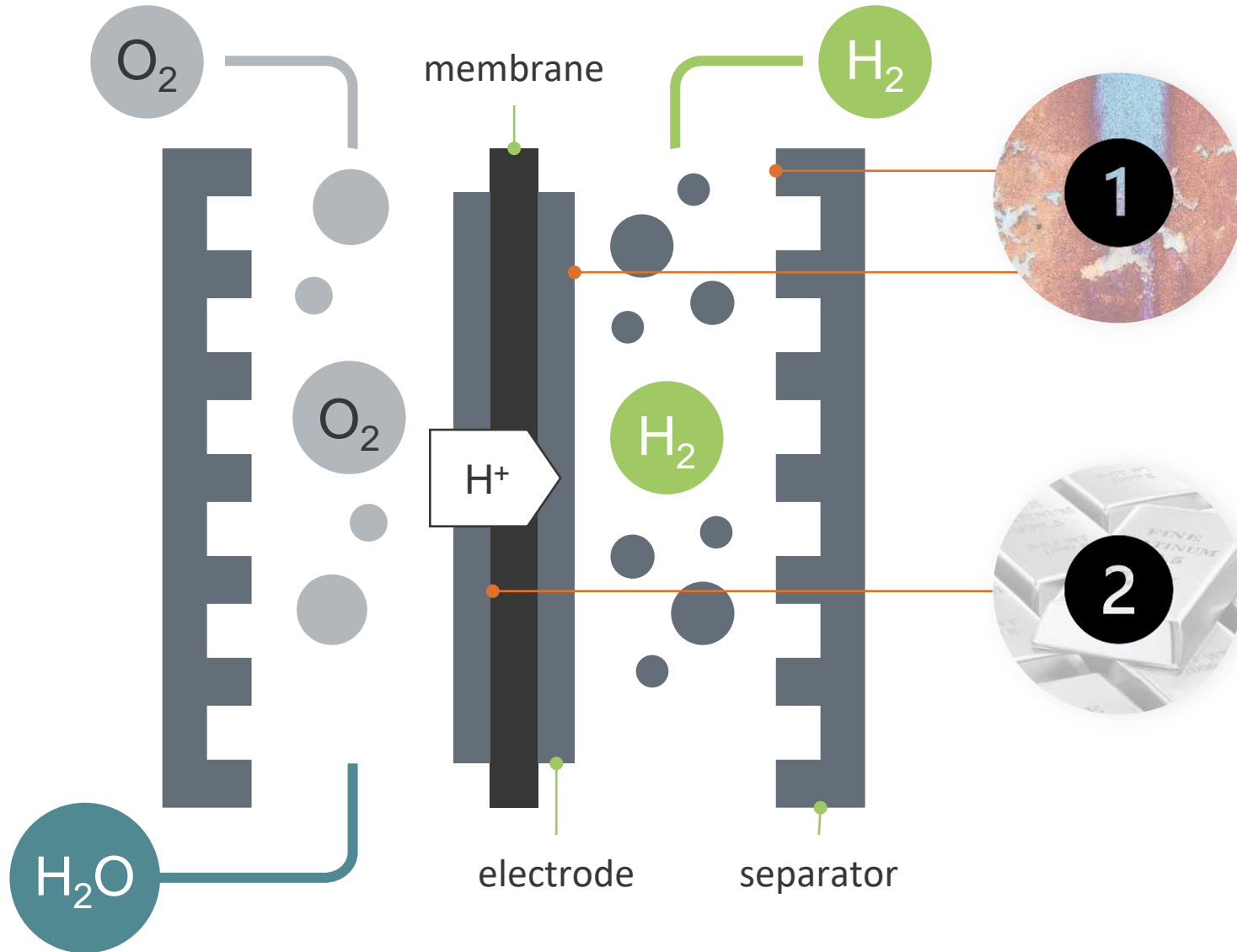
Green Hydrogen is the last missing element of fossil free economy.

It is produced from **wind or solar energy and water inside electrolyzers.**



This green source of energy can be used in households, transport and industry at any point of time.

Two Main Problems



1 Corrosion of components

Hydrogen is very aggressive and leads to corrosion. Thus, electrolyzers quickly become unreliable and require high maintenance costs.

2 High cost of catalysts

Catalytic materials like Pt and Ir are very **expensive** and rare earth metals have **limited availability**.

Our R&D Center

In our R&D center we create **new materials** in form of nano-coatings to protect hydrogen system components against corrosion and replace the need for rare earth metals. We have also built **the most powerful nano coating process.**



10x
Faster
Nano Coating
Process

Our Solution

1 We develop new materials.



Opposite to our competitors, we can use any material from periodic table and any material combination.

2 We coat components.



> 2x

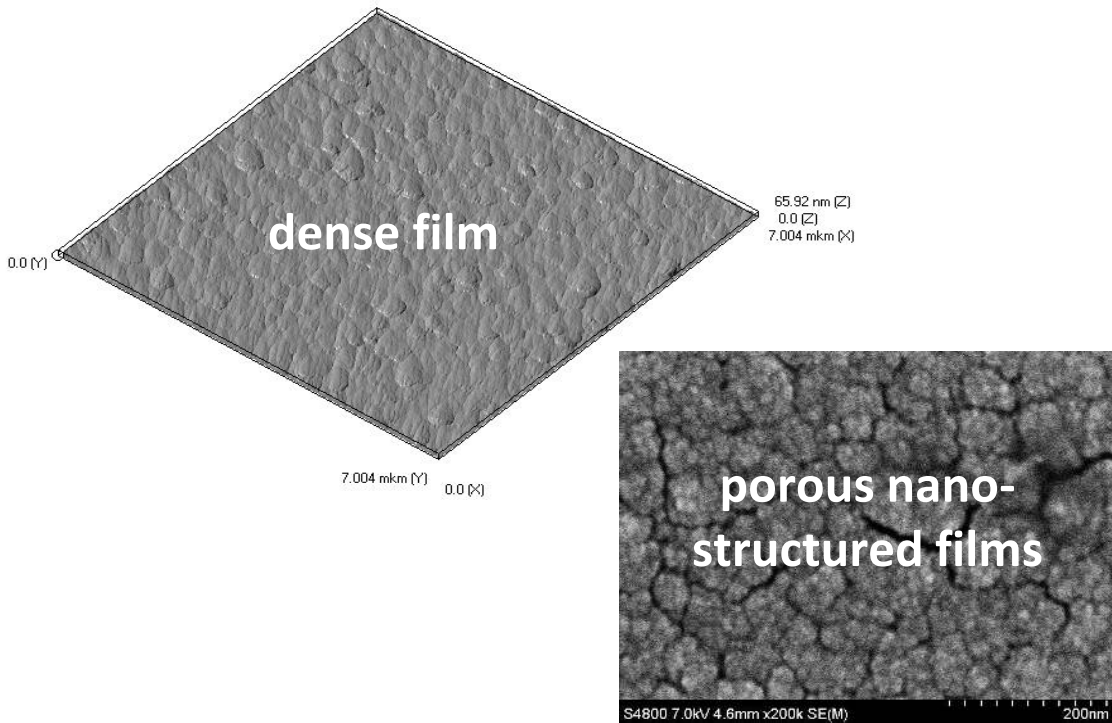
less corrosion

> 30%

lower cost

Our solution

High-speed magnetron sputtering (PVD tech)



Speed

up to 150 microns/hour



Longevity

more than 2x vs. other nano coatings



Thickness

as low as 5 nanometers



Pollution

none



Applicability

metals, carbides, oxides, composites, magnetic materials, nitrides etc.



Cost

as low as €5/m²

10x

less material

2x

less corrosion

3-4x

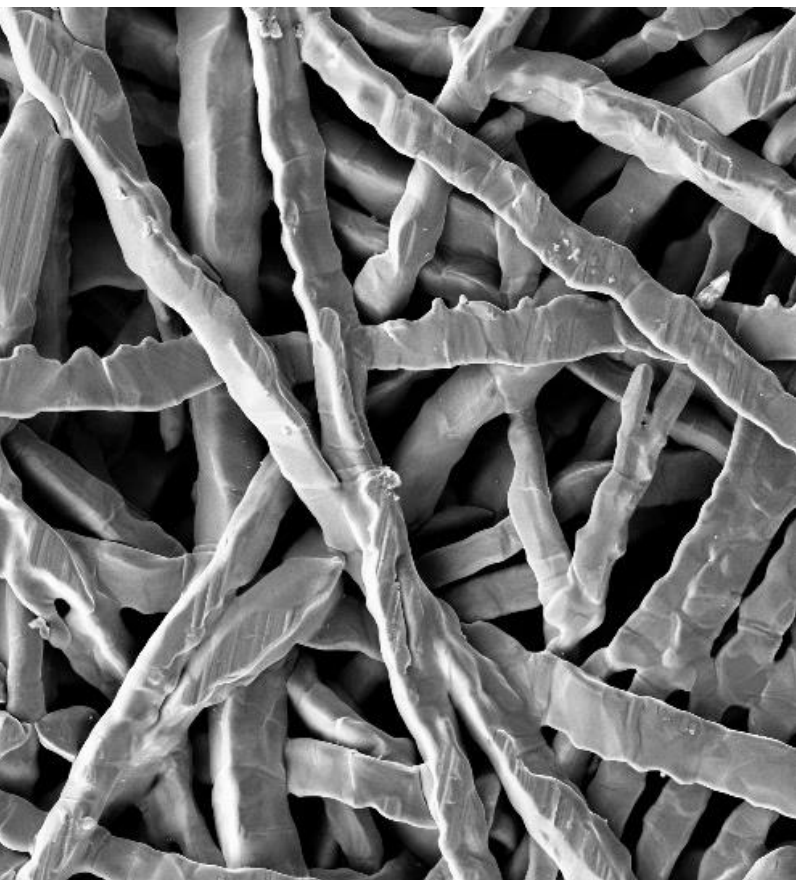
more compact equipment

30-50%

lower cost

Test Results

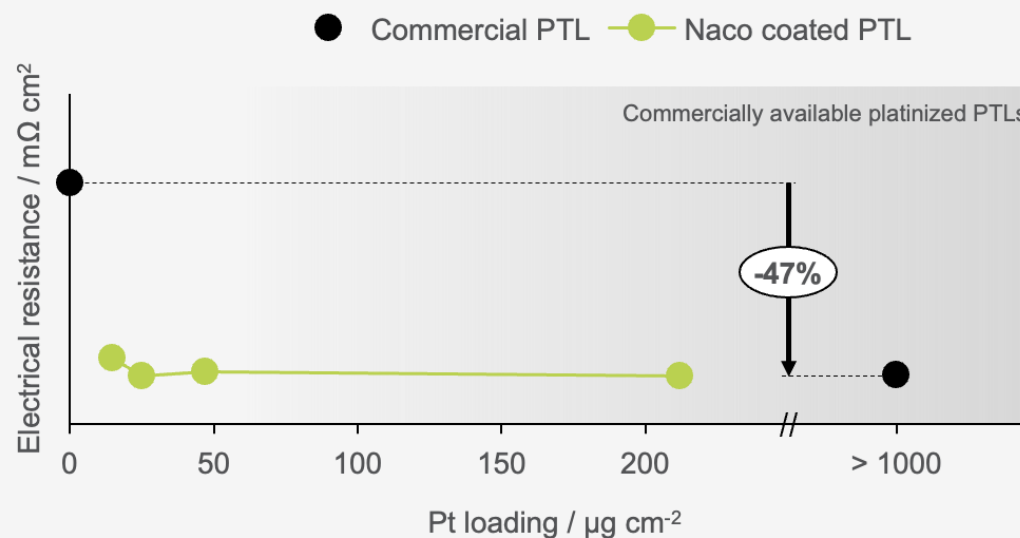
Electrolyzer PTL
with Naco coating



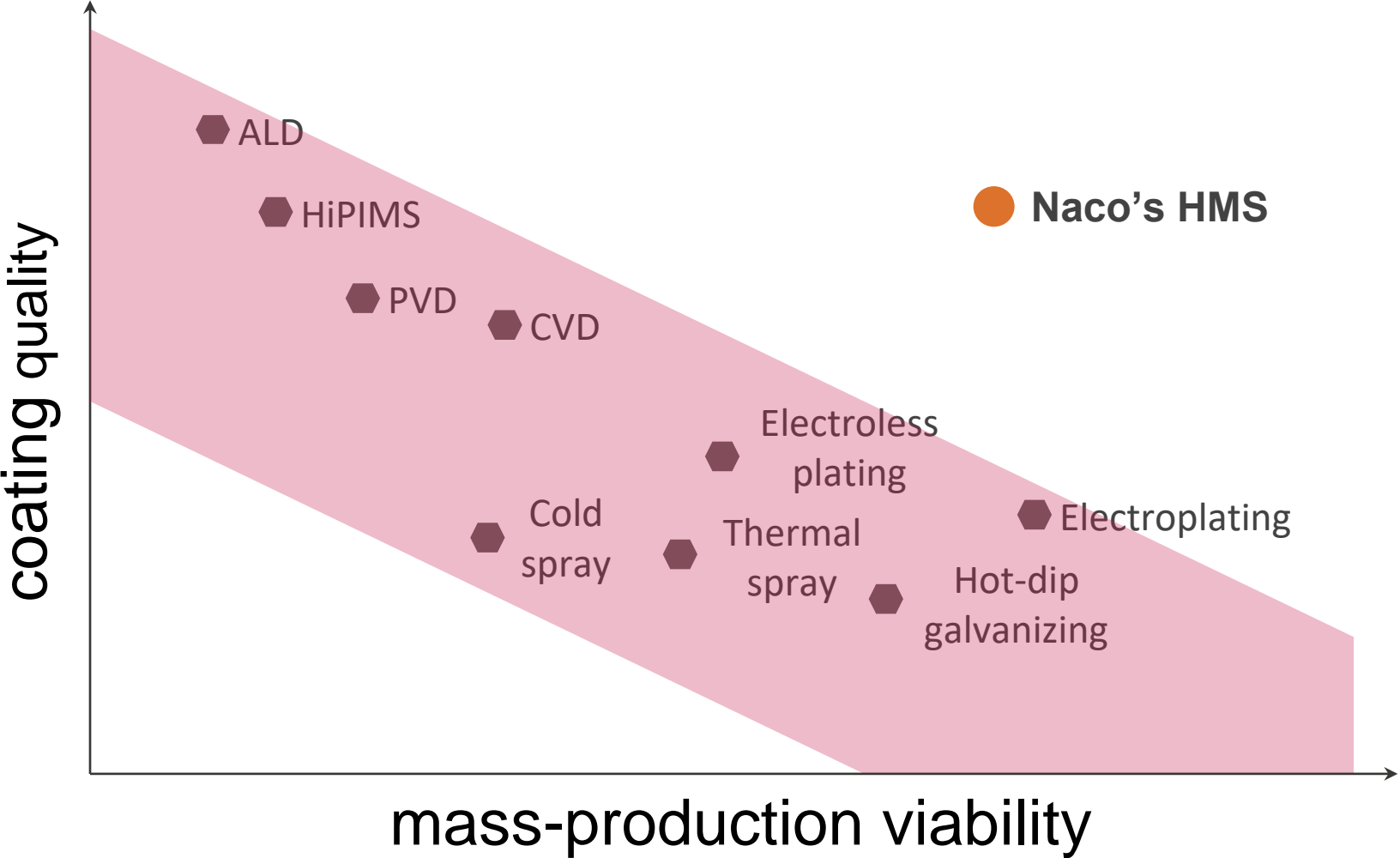
Optimum Pt
loading identified

40x

less catalyst is needed



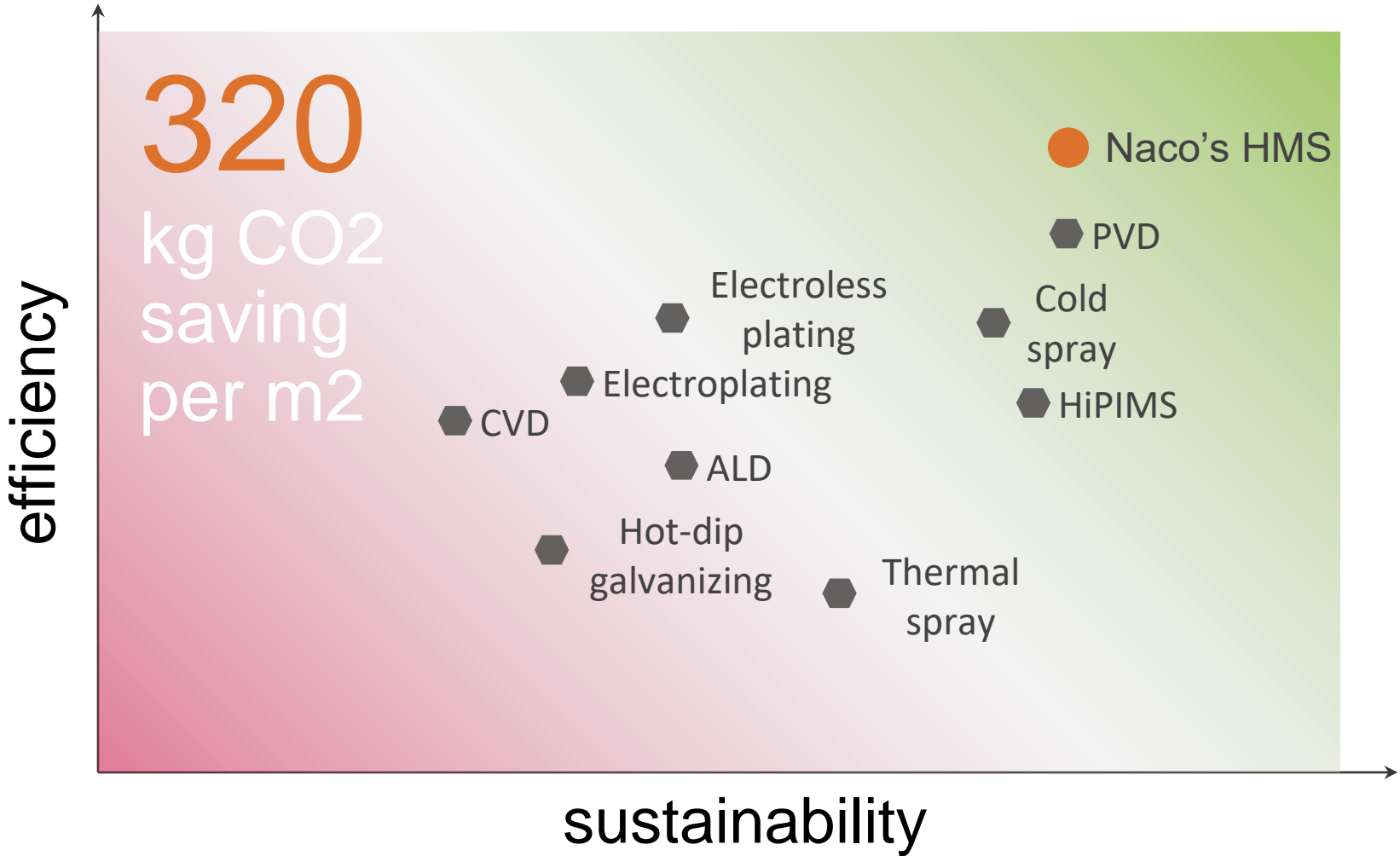
Coating Tech Trap



Current coating technologies are in “**quality vs. productivity trap**”.

High-speed Magnetron Sputtering (HMS) revolutionizes coatings by merging the superior quality of PVD and ALD with the cost-efficiency and scalability of mass-production methods like electroplating.

Coating Tech Impact



Conventional coatings technologies require either high temperatures or harmful chemicals that lead to high energy consumption and pollution.

HMS employs physical processes instead of chemical reactions, which **reduces energy consumption and avoids hazardous chemicals.**

IP Protection

one patent granted and submitted **two patent applications** related to new materials, high-speed coating process and magnetron design.

IP for our **unique catalytic material on membranes** is under development.

3

Patent Apps

New

Catalytic nano-coating directly on membrane

Core Team



Our core team that is developing these solutions is a mix of material scientists, vacuum coating technology specialists and engineer designers.

Market Opportunities



passenger car



truck



bus



off-highway



rail



aerospace



marine



APU



handling



Our main customers are those producing electrolyzers as well as those manufacturing transport and industrial devices that based on hydrogen fuels cells.

Nacoline ONE is launched
- ready to deliver nanocoated components at scale already now

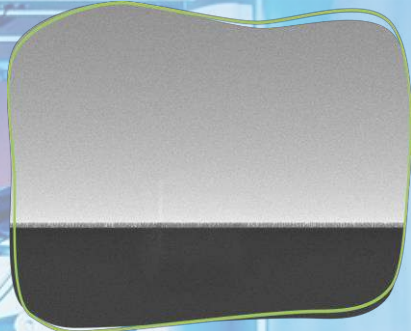
400x400mm
frame size

500k
components/year

Nacoline XL - 2027

1x2m
frame size

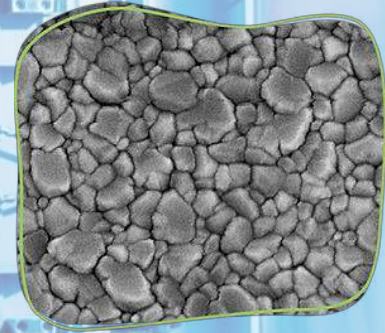
10M+
components/year



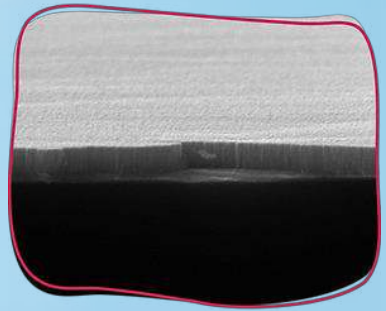
Platinum for BPP



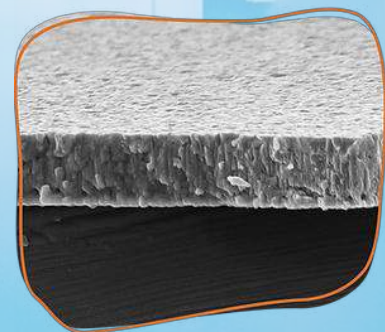
Platinum for PTL



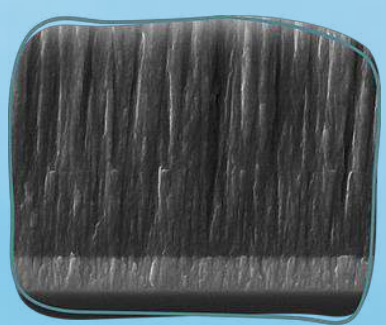
Nickel for Electrodes



Bimetallic-nitrides for BPP



Oxides for Interconnects



Carbon for BPP

and more ...

Business Model: Coating Production

NACO



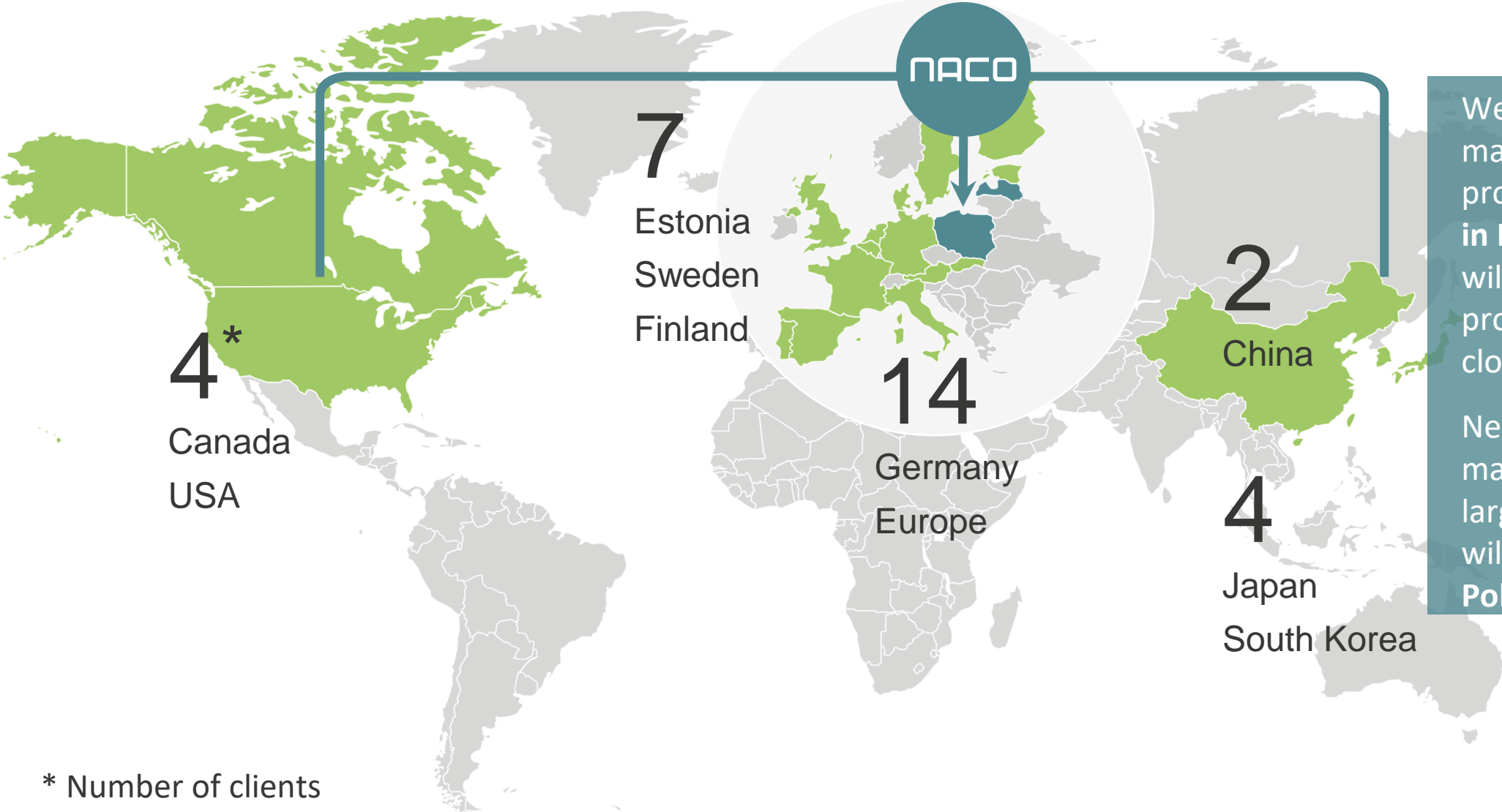
Uncoated components



Stack assembly



Scaling: Next Factories



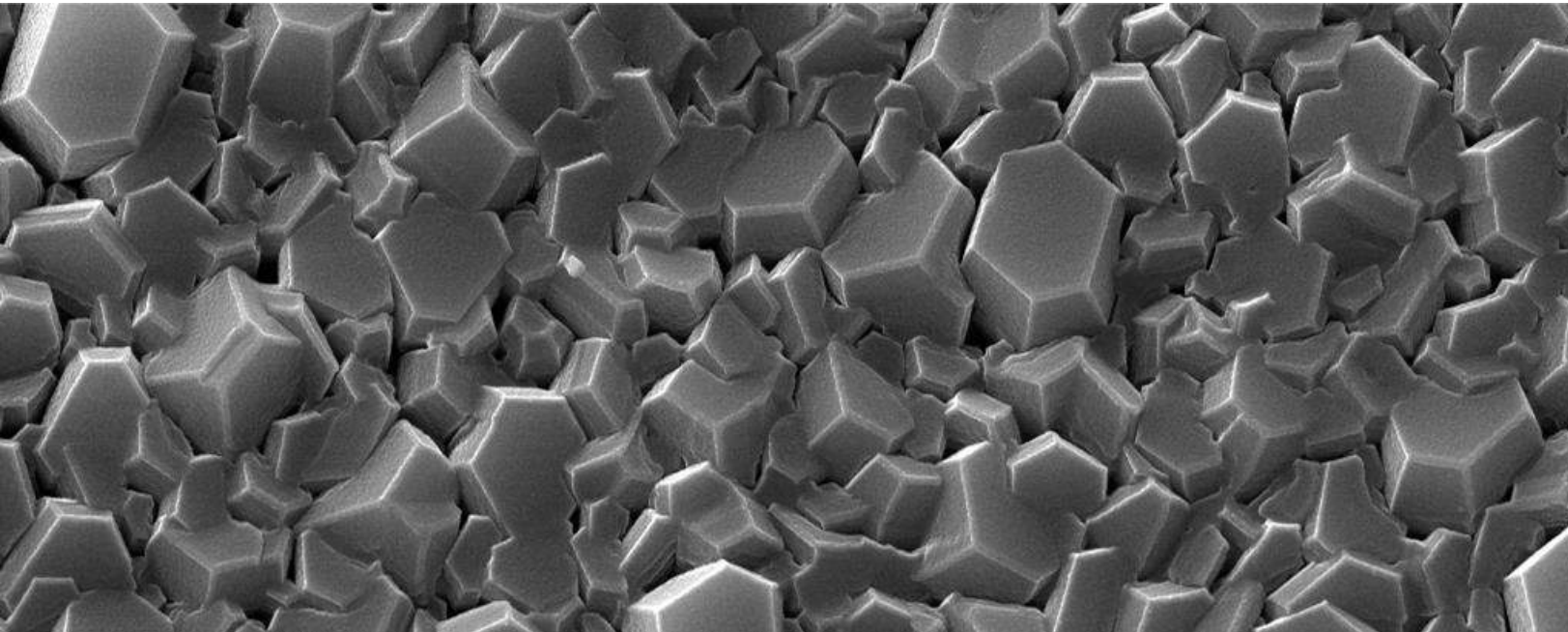
We already have mass-scale coating production **factory in Latvia**. We also will build further production units closer to our clients.

Next large-scale manufacturing (20x larger than in Latvia) will be located in **Poland**.

* Number of clients

Important R&D projects

«Novel nano-coated catalysts on membrane» - 2023-2026



- <10x reduced catalyst loading
- simple one-step coating process
- improved catalyst efficiency
- little or no PGMs
- suitable for PEM and AEM
- mass-production ready

Supported by:



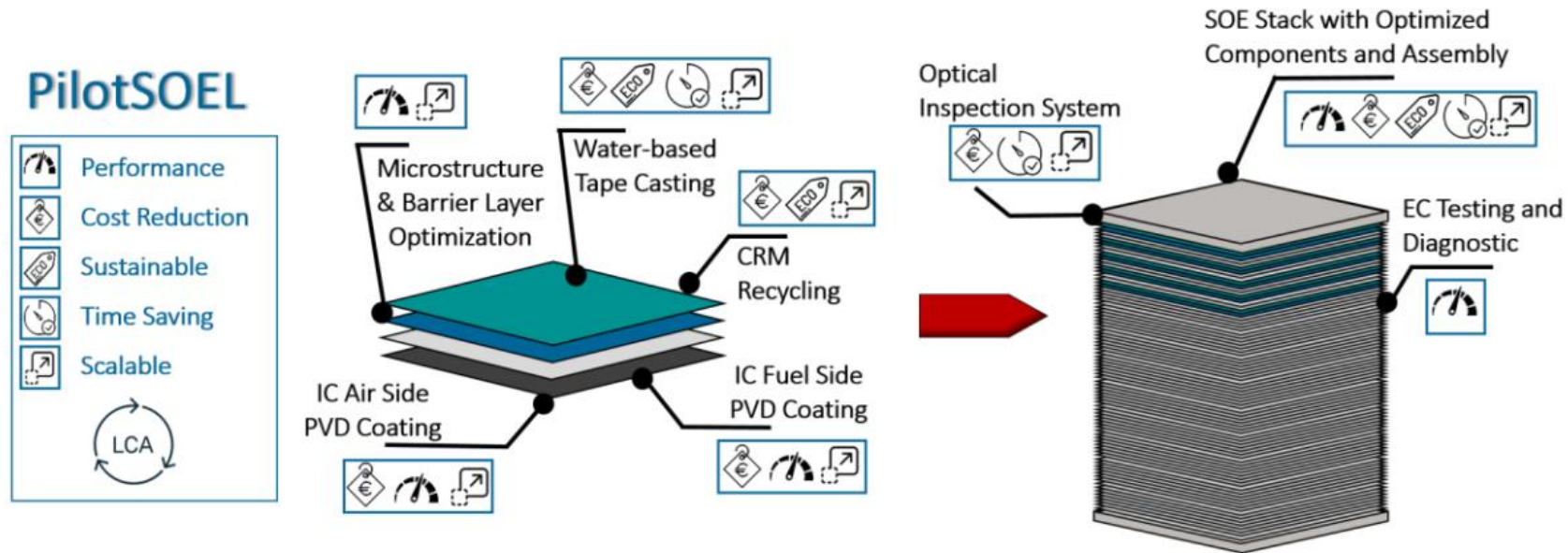
BALLARD[®]



Co-funded by
the European Union

Important R&D projects

PilotSOEL: Cost-efficient, high volume solid oxide electrolysers for green hydrogen production – 2023-2026

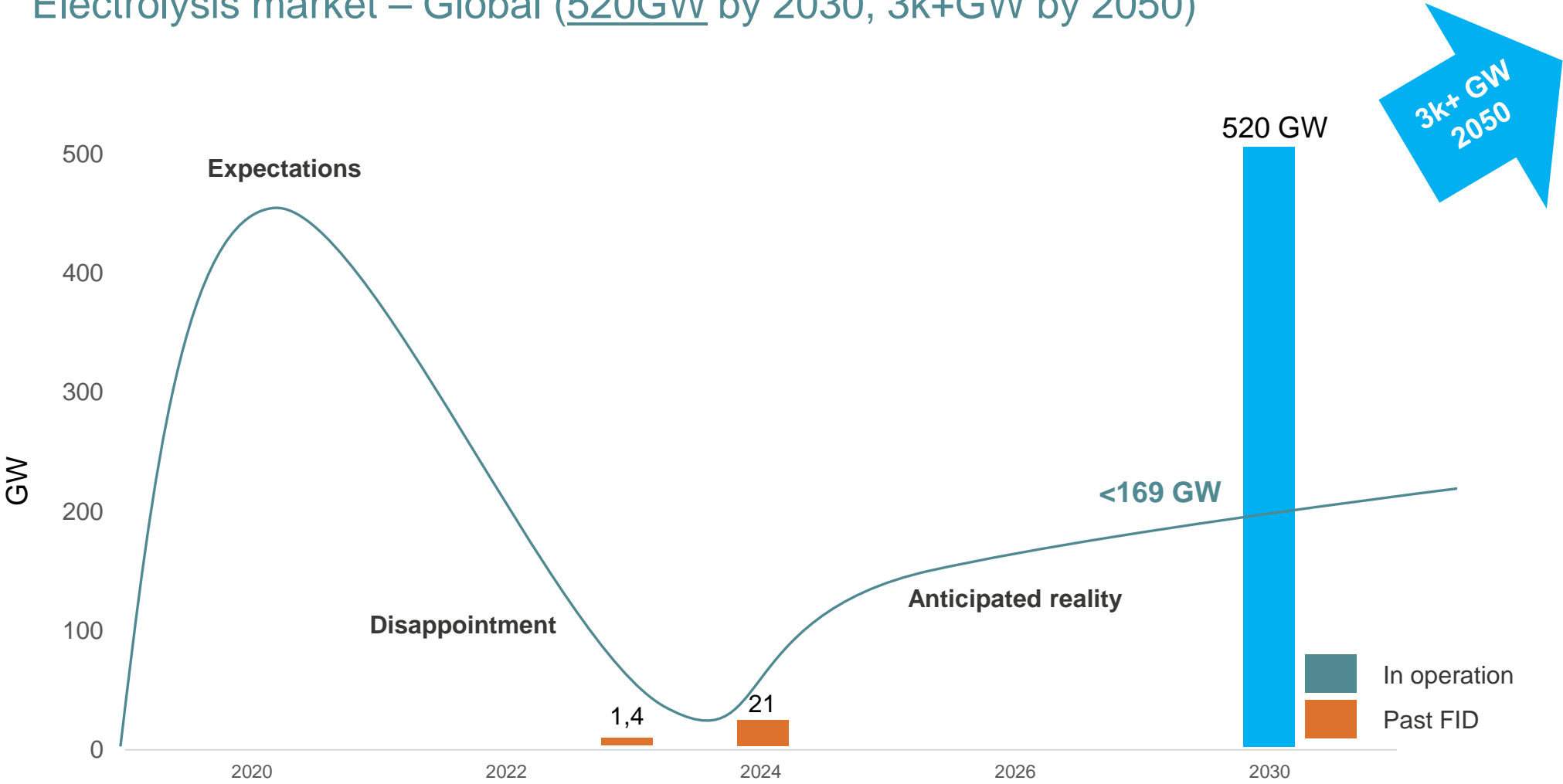


Co-funded by the European Union

The project is supported by the Clean Hydrogen Partnership and its members.

Hydrogen market dynamics

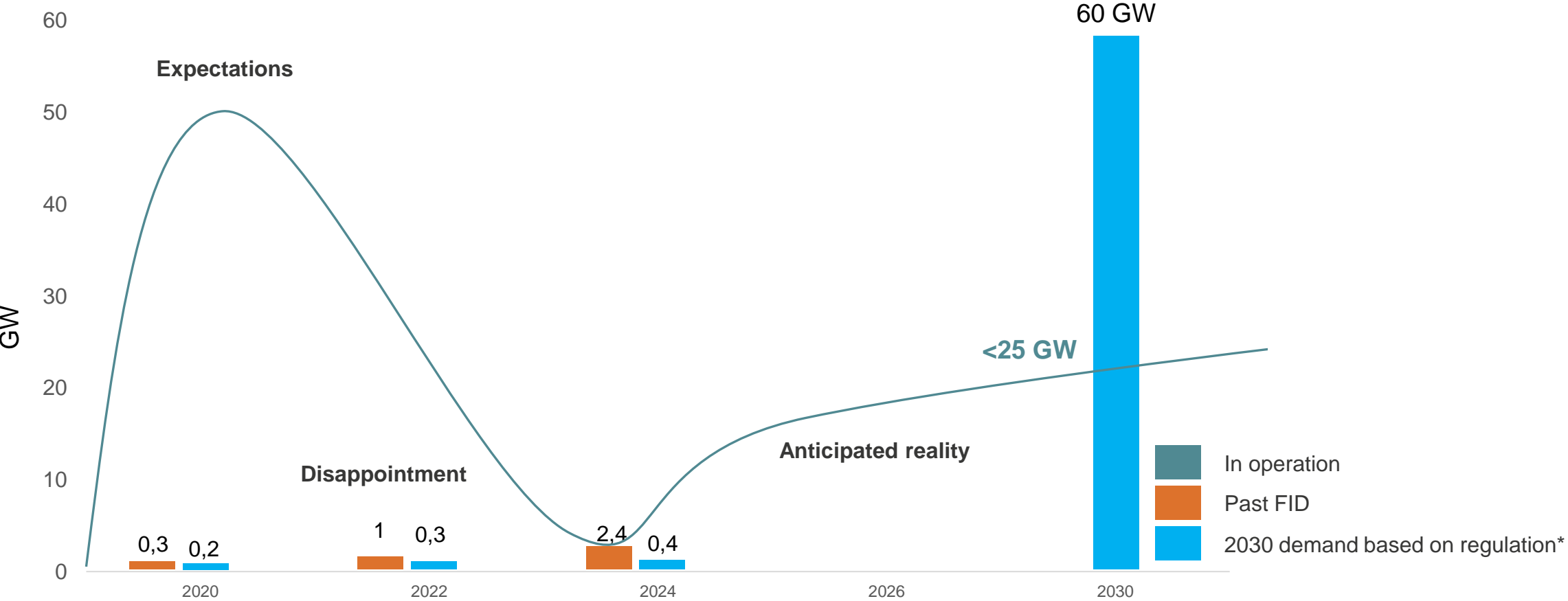
Electrolysis market – Global (520GW by 2030, 3k+GW by 2050)



Electrolysis manufacturing capacity 2024: <40GW/y (CN-45%, EU-25%)

Hydrogen market dynamics

Electrolysis market – EU (60GW by 2030)



EU hydrogen strategy
REPower EU

Hydrogen Bank
IPCEI

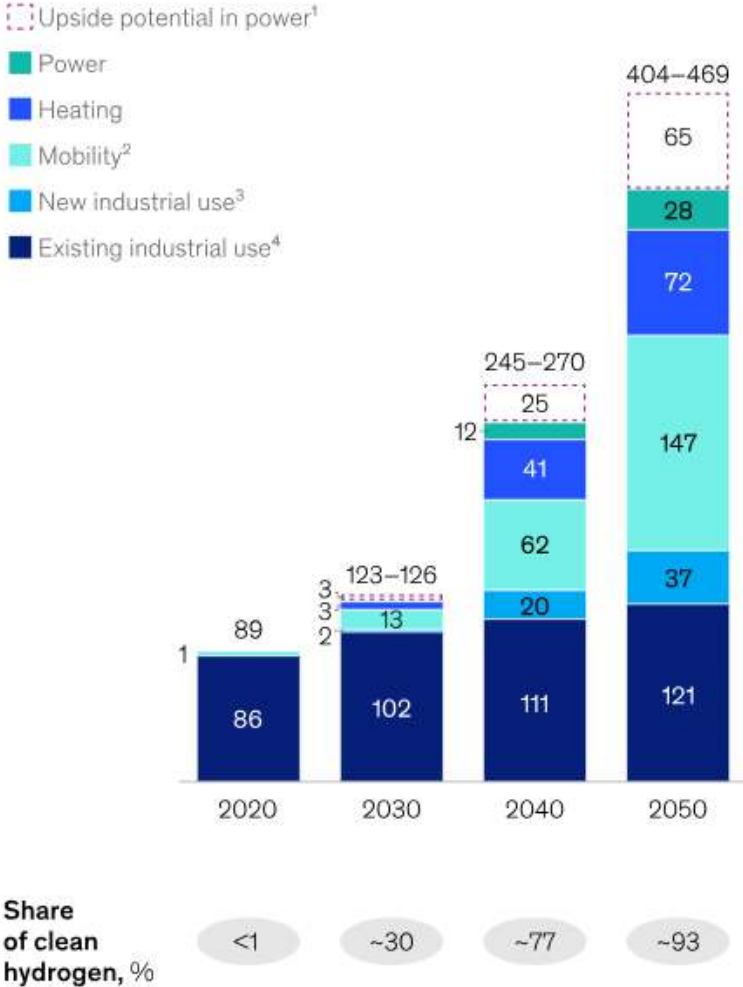
*
ReFuelEU Aviation
RED II

RED III
ReFuelEU Maritime

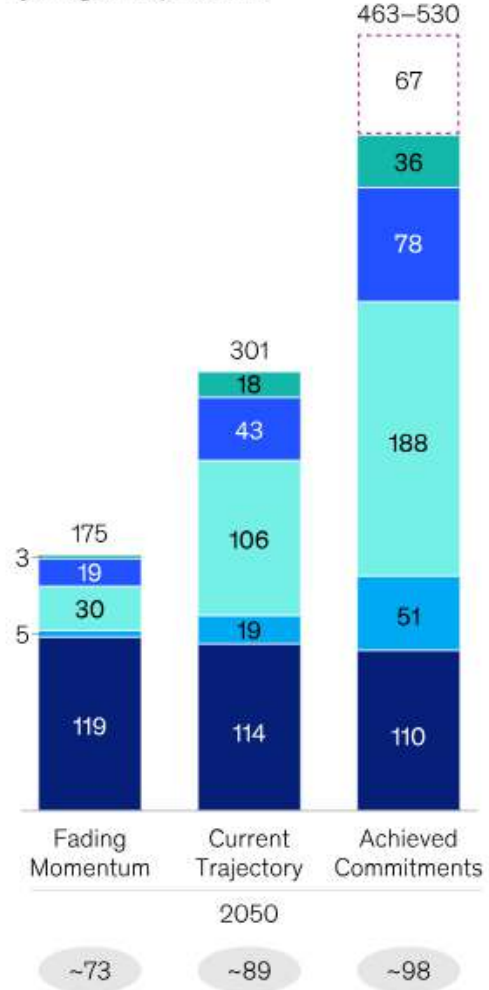
Hydrogen market dynamics

H2 off-takers

Total hydrogen demand by sector, Further Acceleration scenario, Mt per year of hydrogen equivalent



Total hydrogen demand by sector, other scenarios, Mt per year of hydrogen equivalent

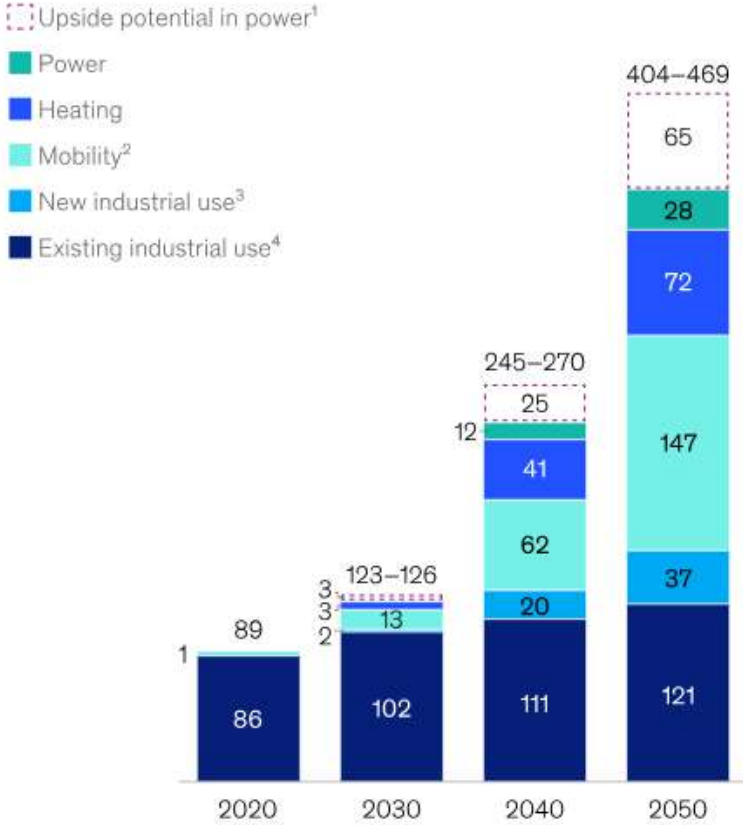


- 1- Upside potential in power estimated to account for 0–1% in 2035 and 1–3% in 2050 of the gross generation in different regions. Actual development could be affected by different drivers such as cost reductions, government targets, support schemes, etc.
- 2- Including maritime, aviation, and trucking.
- 3- Iron and steel production via H₂-DRI-EAF route.
- 4- Refining and chemicals (ammonia and methanol production).

Hydrogen market dynamics

H2 off-takers – Trucking (intermediate steps to rump up the industry)

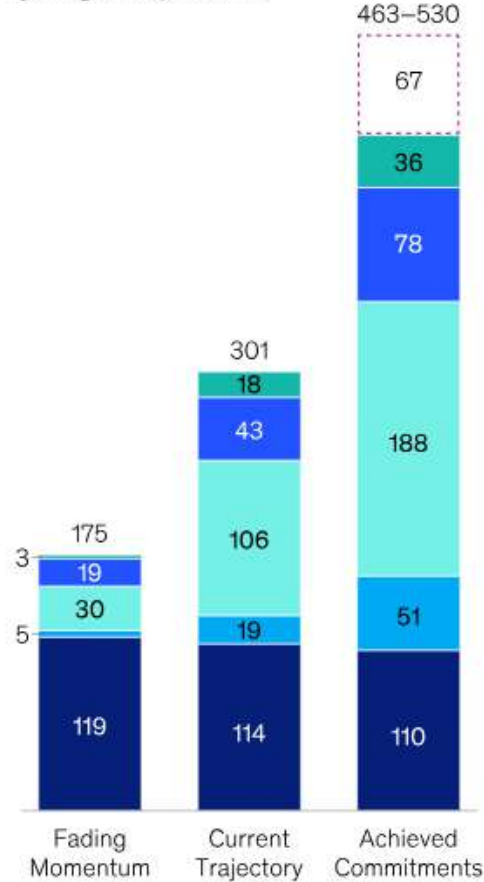
Total hydrogen demand by sector, Further Acceleration scenario, Mt per year of hydrogen equivalent



Share of clean hydrogen, %



Total hydrogen demand by sector, other scenarios, Mt per year of hydrogen equivalent



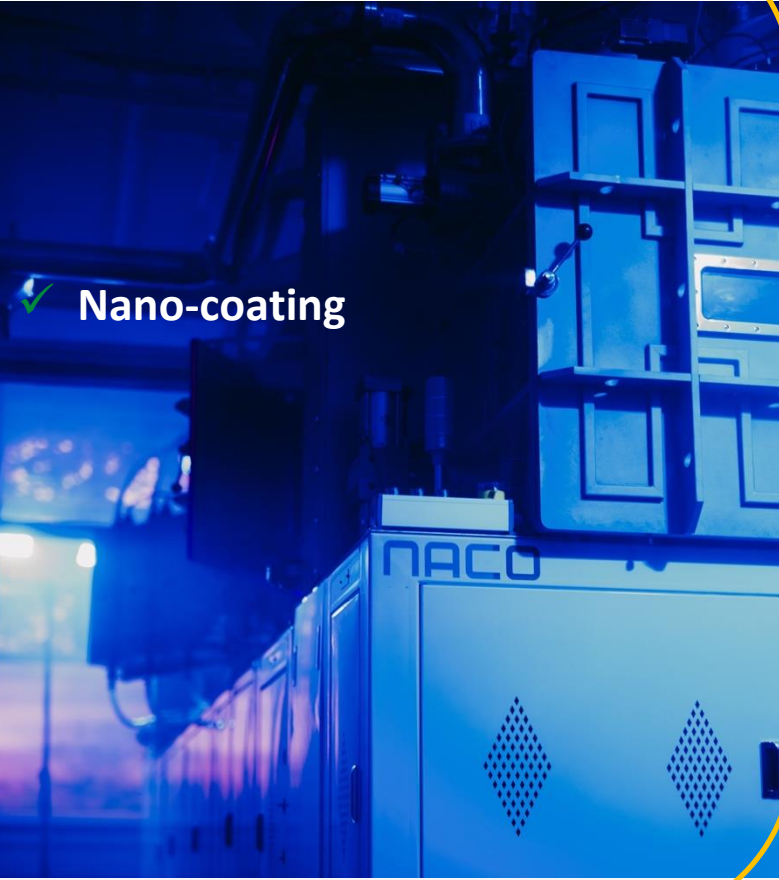
Latvia's opportunity: component manufacturing for the H2 industry



COMPETENCES AVAILABLE IN LATVIA

Uncoated components

- ✓ Design engineering
- ✓ Lab testing
- ✓ Metal production



Stack assembly





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**Are You
interested to join
Green Energy
Revolution?**

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