
De Nora & thyssenkrupp nucera Joint Open House Event

March 21st,
2024



De Nora at a glance



Listed on the
Milan Stock
Exchange

Pioneering
Electrochemistry
from 1923

Electrode Technologies ⚡

Expanding
Water Domain
from 2015

Water Technologies 🔄

Entering Energy
Transition
from 2017

Energy Transition ⚙️

100
Years of
Innovation

2000+
People

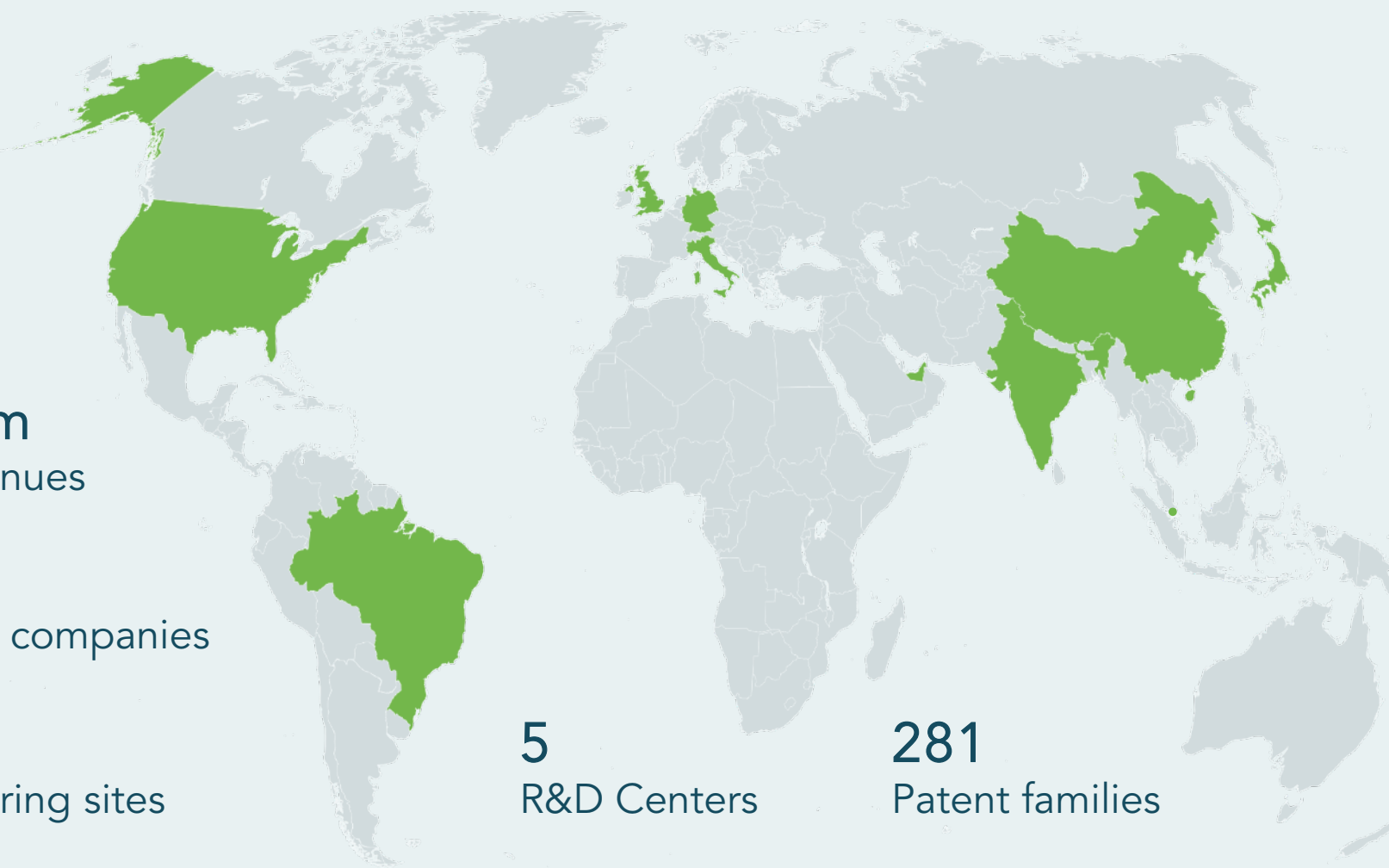
€856.4m
2023 Revenues

24
Operating companies

15
Manufacturing sites

5
R&D Centers

281
Patent families



Business Overview



Electrode Technologies ⚡

PRODUCTS

Anodes, Cathodes,
Catalytic Coatings,
Gas Diffusion Electrodes (GDE),
Cell Manufacturing

SERVICES

- ⚙️ Electrodes recoating, repair services, and spare parts
- 🔄 Performance upgrades and retrofits



Water Technologies 💧

PRODUCTS

Electrochlorination, Disinfection
and Filtration Technologies,
Electrodes for Pools

SERVICES

- 🧠 Technical assistance and remote support services
- 📊 Analytic services



Energy Transition 🔋

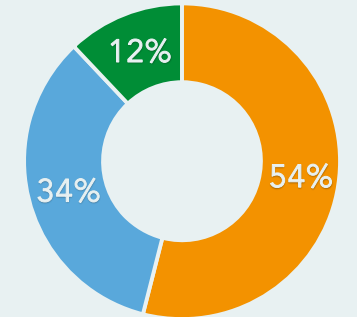
PRODUCTS

DSA® Electrodes for Alkaline
Water Electrolysis (AWE),
Electrolysis Cells for tk nucera,
GDE for Fuel Cells,
Dragonfly® system

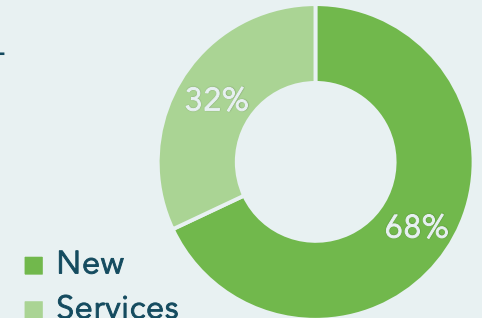
SERVICES

- 🏗️ Engineering design
- ⚙️ Supply and maintenance agreements

2023 Revenues by business unit



2023 Revenues New Installations vs Services



Strategic Goals

Growth & market positioning

- Profitable growth in Energy Transition
- Water platform expansion

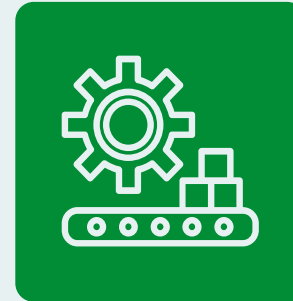


Product Leadership

- Leadership position consolidation
- Service level enhancement

Organization development

- Sustain Company growth
- Infrastructure improvement & ESG commitment



Manufacturing expansion

- Strategic scalable investment
- Execution enhancement

ESG Plan 2030

GREEN INNOVATION

- Circular Design Guidance in the R&D process
- Product Scorecard
- Reducing Noble Metals in products

CLIMATE ACTION & CIRCULAR ECONOMY

- Decarbonization Action Plan and renewable energy
- Improve our waste management and packaging
- Enhance recycled key raw materials



PEOPLE: INCLUSION, WELLBEING, DEVELOPMENT

- Strengthen H&S governance and culture
- Affinity Networks and DE&I policy
- Mental health awareness project

LOCAL COMMUNITIES, SUSTAINABLE SUPPLY CHAIN

- Supplier evaluation and engagement
- ESG in procurement processes
- Educational partnerships

Main 2023 achievements

Leading External Recognition



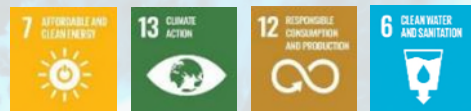
GREEN INNOVATION

- 22% Vitaly index
- +17 New Patents
- 66% R&D costs in ETr
- -5% noble metal in products¹ vs '21



CLIMATE ACTION & CIRCULAR ECONOMY

- 3.1 GWh PV plants installed production capacity
- +25% Electrodes re-used
- 12% Revenues in ETr
- 24% Revenues in WTS



PEOPLE & LOCAL COMMUNITIES

- Great Place to Work Award in Italy
- +22% women in managerial roles
- 64% Local Spent



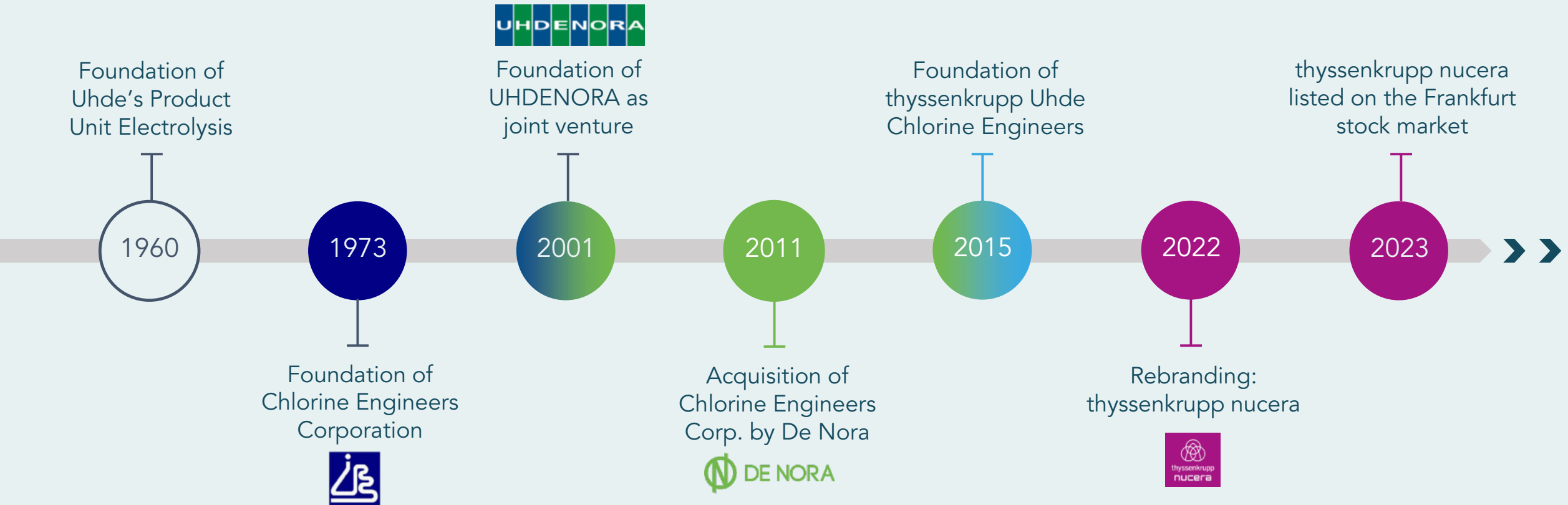
GOVERNANCE ETHICS & COMPLIANCE

- 90% of employees trained on anti-corruption
- Human Rights Policy adopted
- 20% target ESG in CEO remuneration



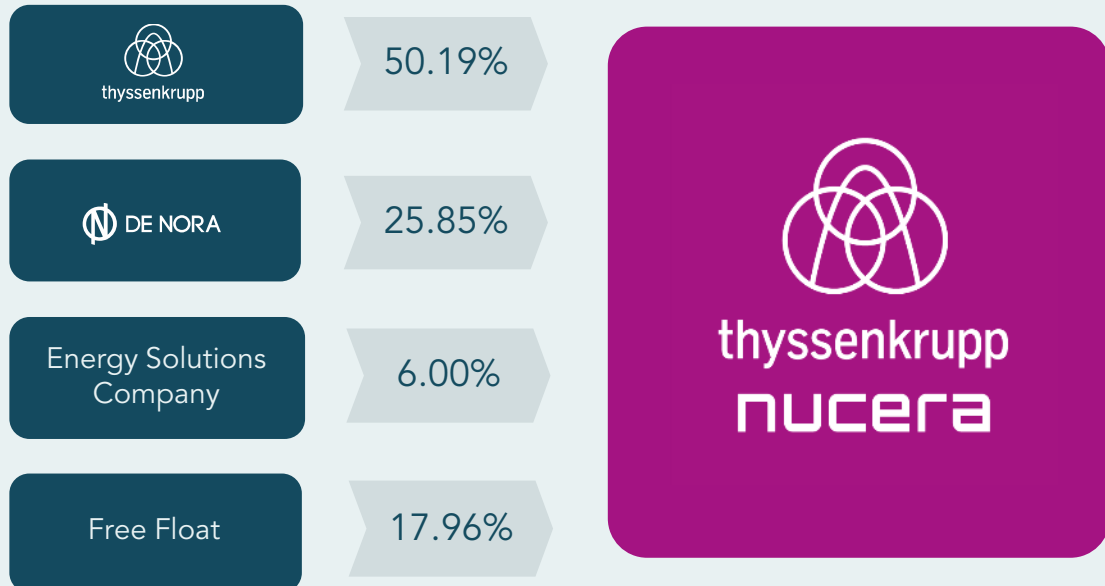
1. Membrane, Pools and Electrochlorination, Alkaline Water Electrolysis.

Bringing together the collective expertise of renowned global electrolysis leaders



We are the Alkaline Water Electrolysis (AWE) and Chlor-Alkali (CA) technologies provider globally


Shareholder structure post-IPO



CA

Order backlog Dec '23:
~0.5bn €

Select CA Customers



AWE

Order backlog Dec '23:
~0.9bn €

Select AWE Customers

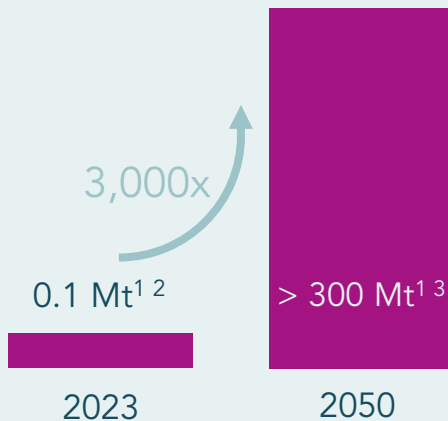


Green hydrogen market is expected to grow 3,000-fold by 2050

Globally accelerating demand for gH2 creates significant growth opportunity for electrolyser OEMs

3 main drivers shape the global markets

Green hydrogen amount (p.a.)



Hydrogen demand



Renewable energy supply



Governmental support

Electrolyser manufacturing capacity needs to significantly increase to fulfil strong demand growth

1. Energy content of 1 kg of hydrogen is 141.9 MJ (HHV) = 39.4 kWh 2. Produced amount of green hydrogen in 2023. Source: IEA (2023), Global Hydrogen Review, Figure 3.1, <https://iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf> 3. Expected annual amount of green hydrogen to achieve climate neutrality. Source: IEA (2023), Net Zero Roadmap, Figure 3.21, <https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach>



>60GW

overall project pipeline¹



>19GW

actively pursued projects²



3GW+

contracted



>1.5GW

annual AWE capacity



0.9bn€

AWE order backlog



1. Includes actively pursued projects and substantial pipeline, i.e. projects which thyssenkrupp nucera had first interactions with and that are being monitored closely. 2. Projects which already passed the pursue / non-pursue gate. 3. Capacity reservations.



750+
employees
worldwide



600+
electrochemical projects
delivered



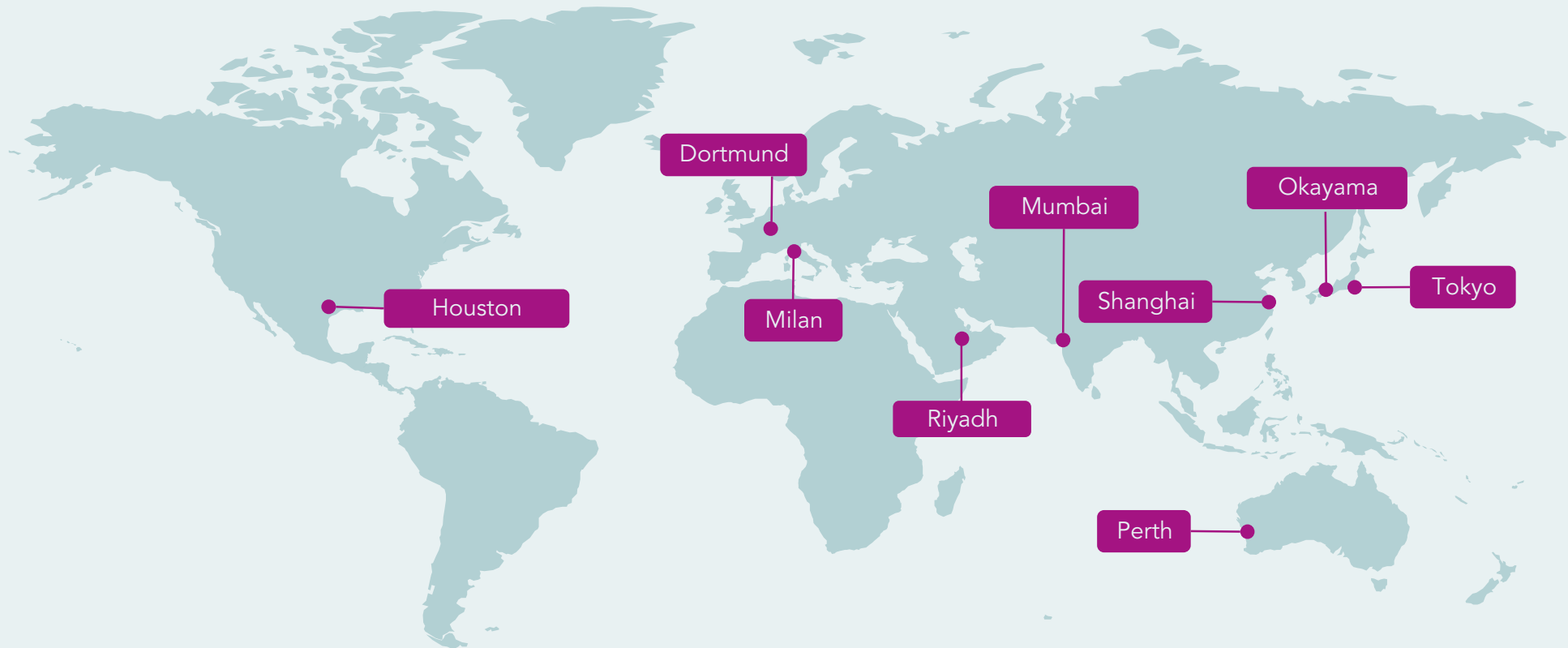
653mn€
Group sales in FY 22/23



>6x
AWE sales growth in FY
22/23



761mn€
Net financial assets
(31 Dec '23)



Our way forward: strategic focus areas



Maximize growth & profitability

Capacity expansion

Process automation & serial fabrication

Strategic partnerships & diversification

Organizational ramp-up

Best in class in CA market

Preferred cost-efficient AWE technology



Leading competitive position
& resilient operations

Full commitment to sustainability and responsible business

ESG strategy is reflected in 4 action fields

1 Sustainable value chain



2 Ethical business development



3 Sustainable product



4 Great place to work



Reporting timeline

FY 22/23

Ensure GRI¹-readiness

FY 23/24

Publication of GRI report & carbon reduction goals

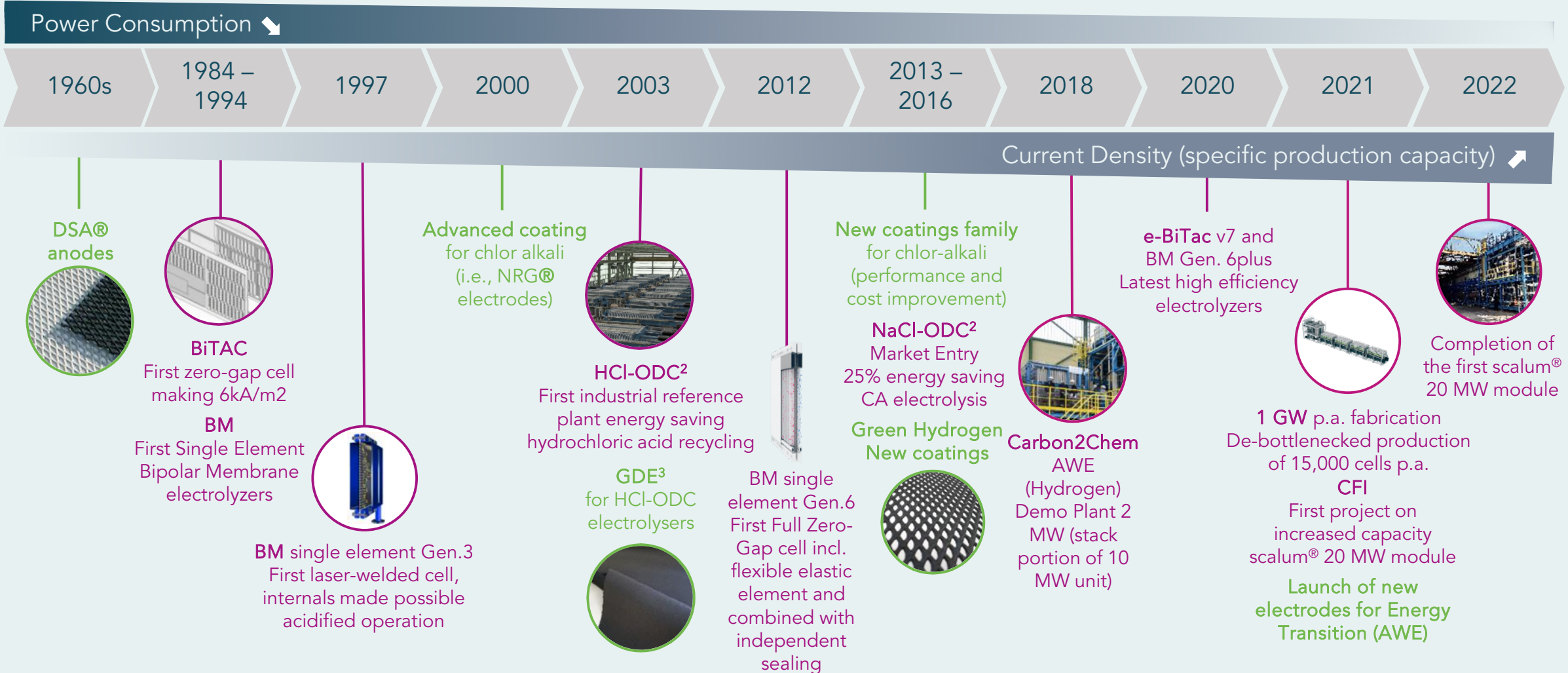
FY 24/25

Publication of integrated financial and ESG report according to ESRS²

Let's dive into our technologies!



Leading Innovation



Strong technology basis for AWE scale-up



Chlor Alkali

- > 600 projects
- 240,000 cell elements
 - ~1,500,000 sqm. for new building
 - ~5,000,000 sqm. for service
- >10 GW of capacity installed



Industry-leading electrolyzer cell

thyssenkrupp nucera

Design of cell, electrolyzer and balance of plants

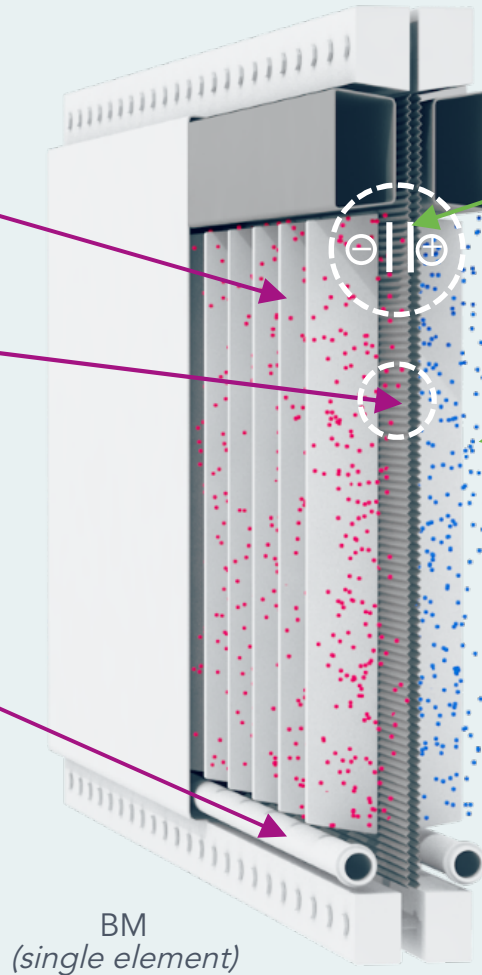


Selection of separator (membrane/diaphragm)



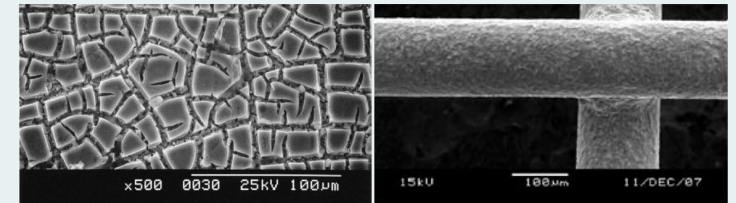
Other parts including:

- Selection of corrosion resistant materials
- Current distribution & electrical contacts
- Gas-liquid fluids handling & distribution
- Sealing
- Adaptations for different operating conditions, procedures, concepts (e.g. with or without ODC)



De Nora

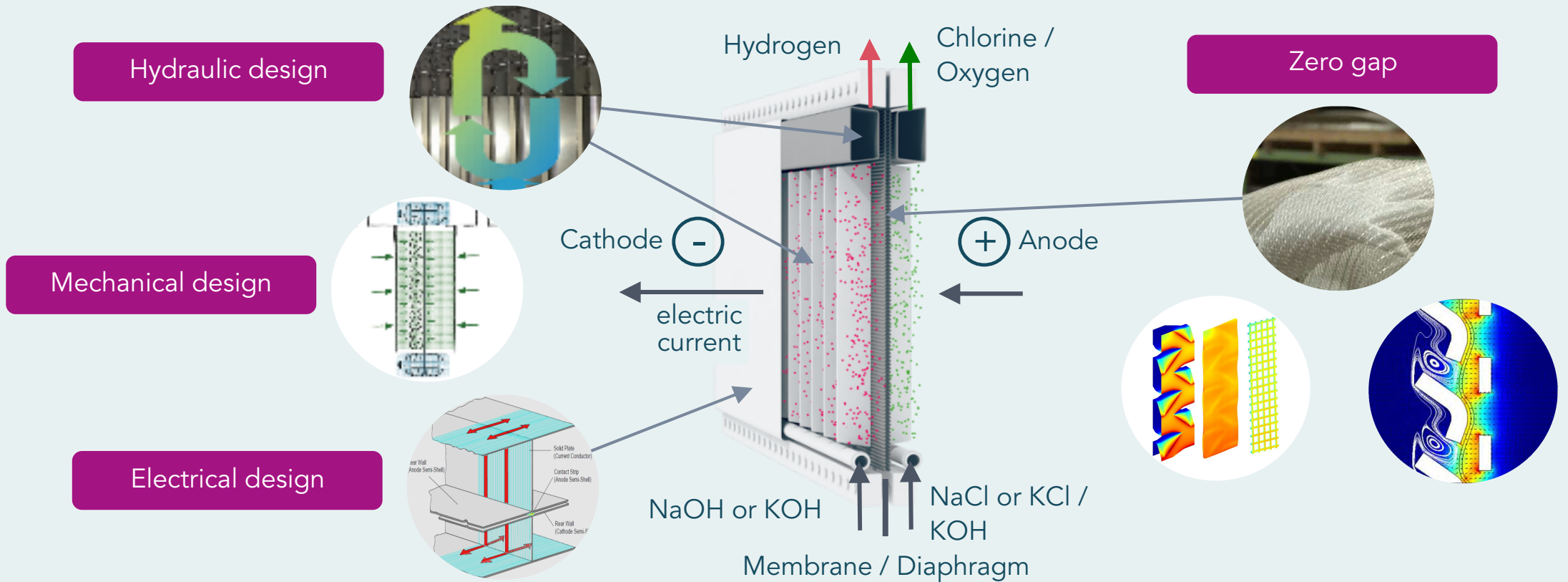
Anode and cathode catalytic coatings, and GDEs



Manufacturing of half-shells



thyssenkrupp nucera's unique technology with leading design

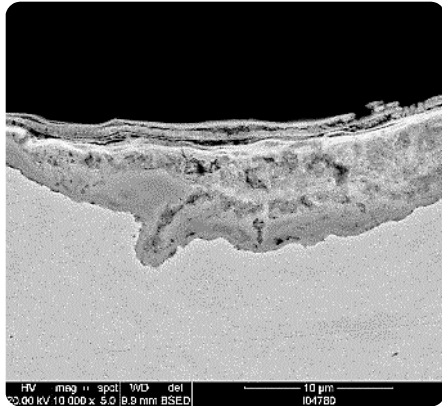


Know-how and technologies needed for implementing effectively high current density and high efficiency

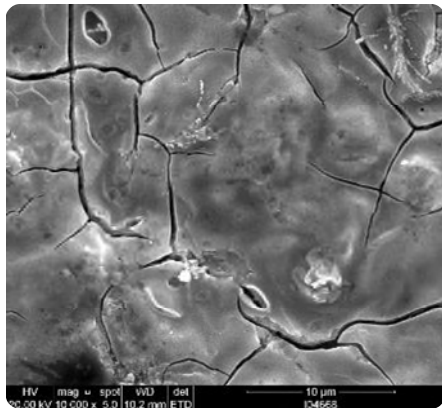
De Nora electrocatalysts design

Chemical composition, structure definition, and manufacturing details of the coated electrodes

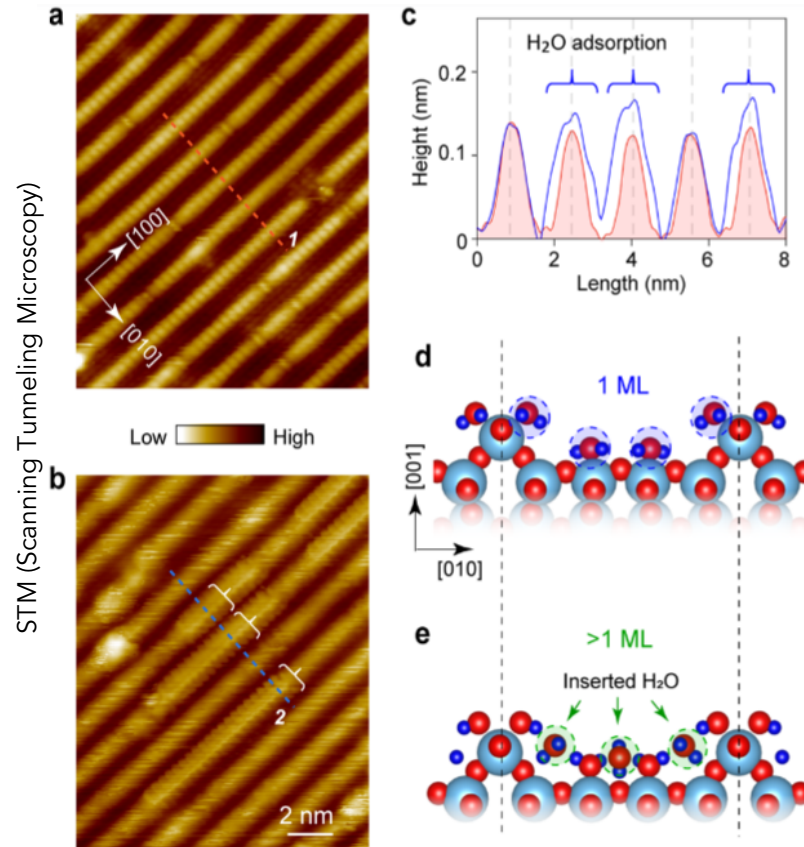
CROSS SECTION



FRONT IMAGES

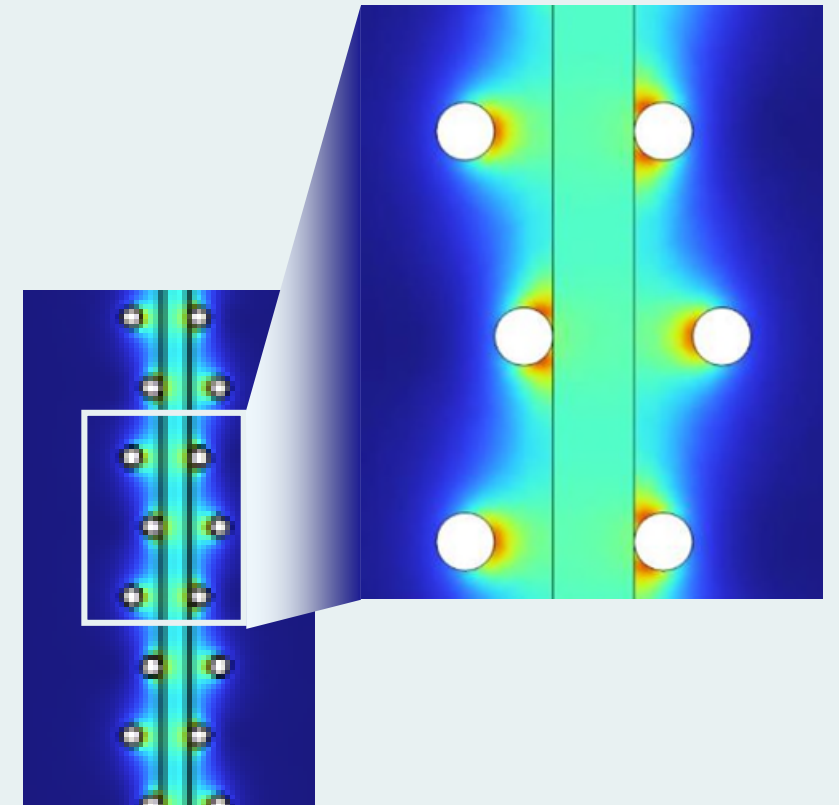


SEM analysis of a DSA® electrode
Magnification: 10 000x



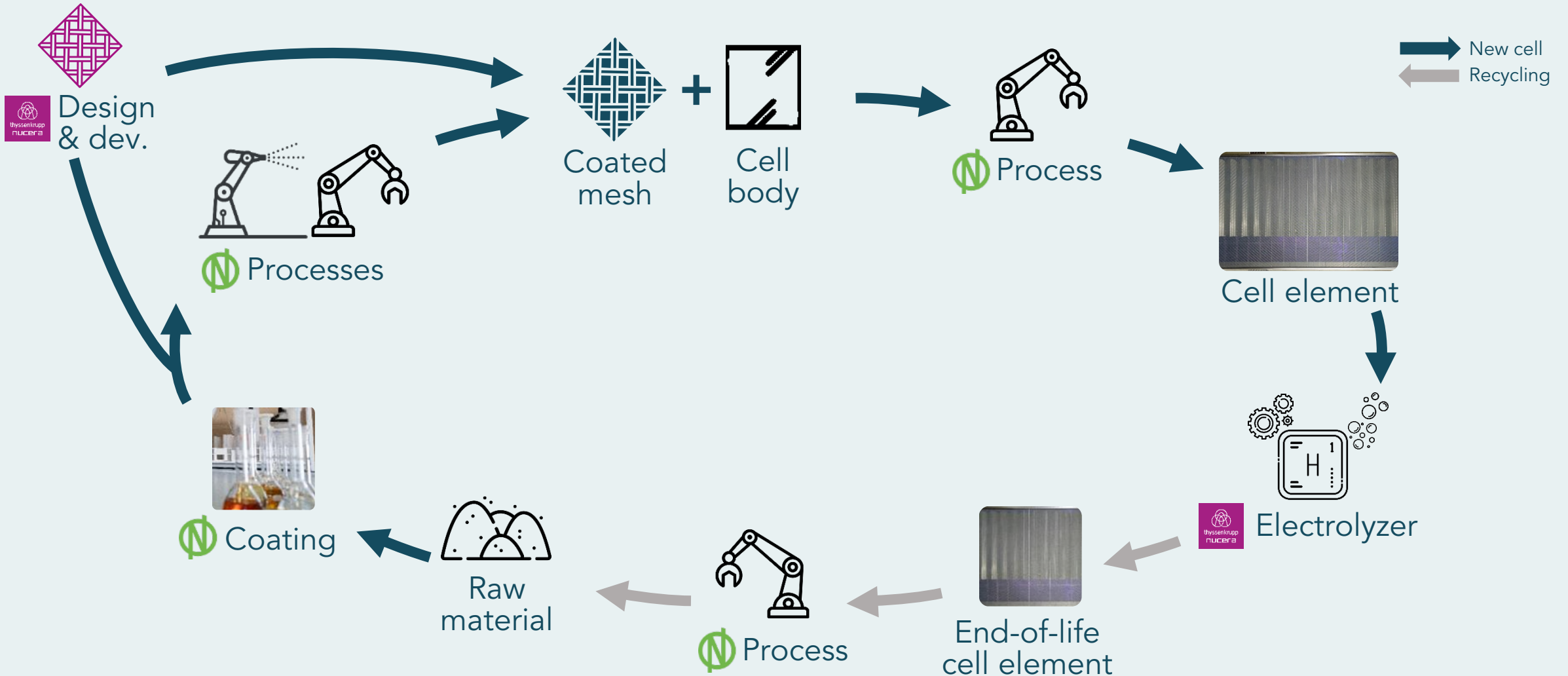
Xiaochuan et al. (2022): Hydrogen-Bond Network Promotes Water Splitting on the TiO₂ Surface, *JACS*

Current distribution during operation defining catalyst distribution on the final electrode

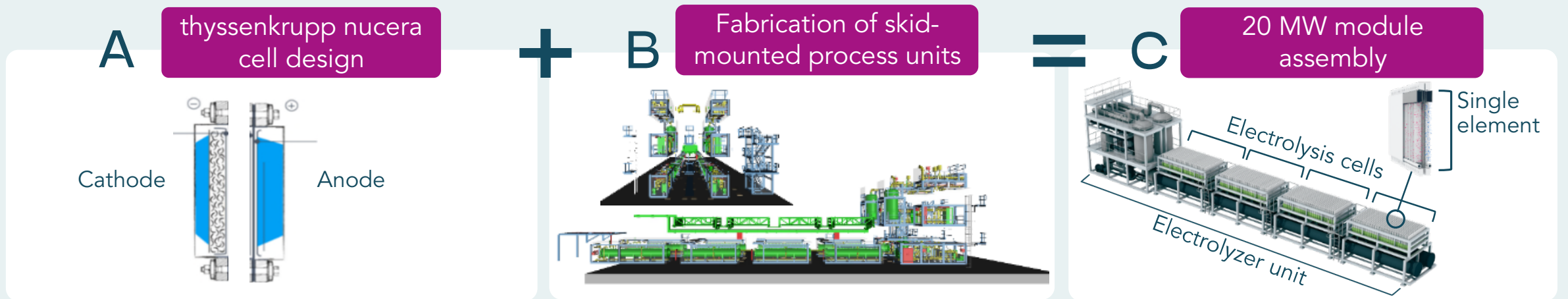


Finite Element Analysis – Model (Femlab®)

Cell manufacturing & circular economy



thyssenkrupp nucera provides meaningful value-add across each step of the manufacturing process



thyssenkrupp nucera supply chain of cell components:

- Half shells manufacturing according to thyssenkrupp nucera's IP design (De Nora)
- Electro-catalytic coating and production techniques (De Nora)
- Other cell components (e.g. separator / diaphragm, gasket frames and sealing, bolted flange, insert and distribution pipes, fittings and hoses for connection to the headers)

thyssenkrupp nucera supply chain of process & plant equipment:

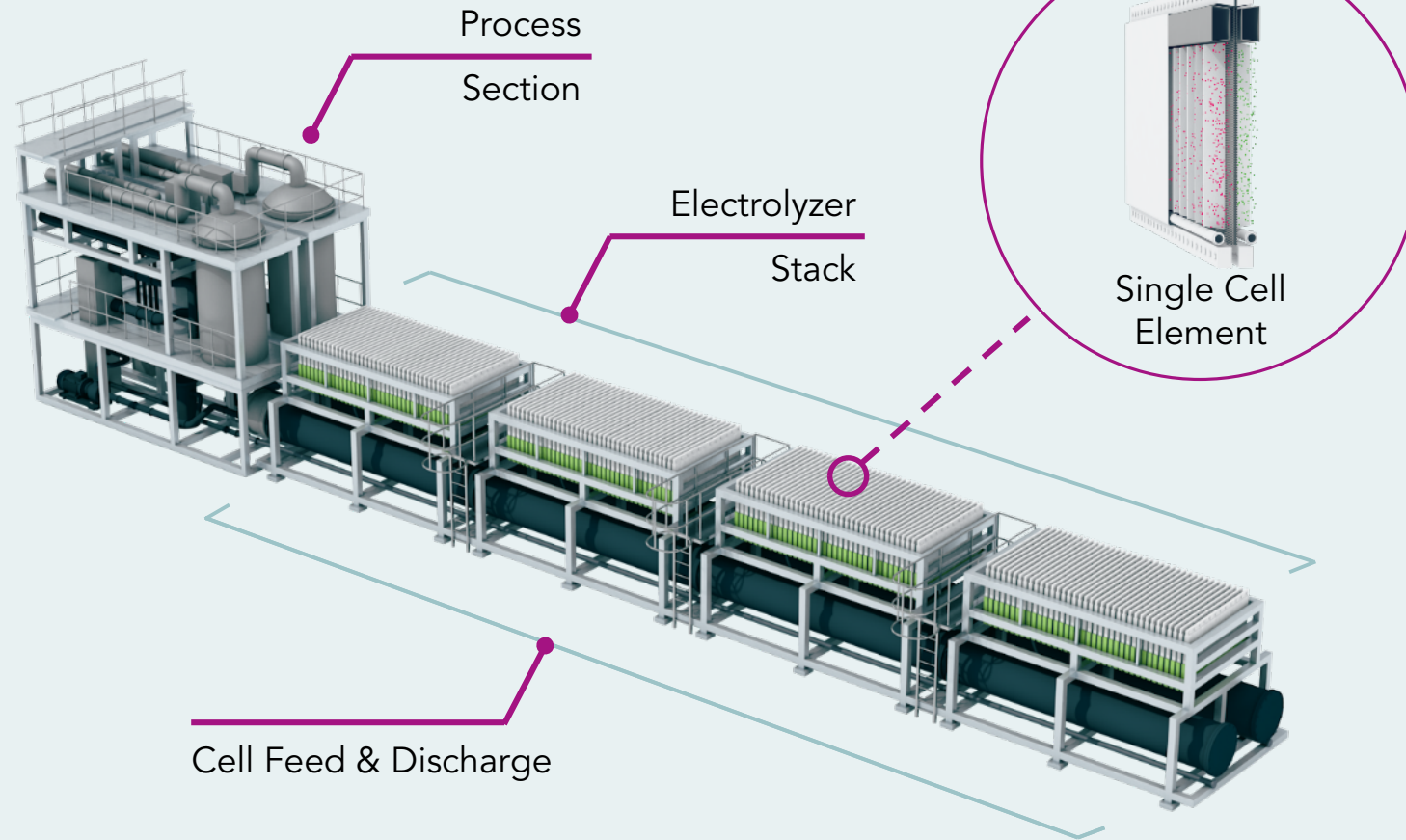
- Tanks, pumps, filters
- Piping, valves & heat exchangers
- Electrical, instrumentation and control
- Power electronics

thyssenkrupp nucera assembly:

- Assembly of cells at customers' site or at thyssenkrupp nucera workshop
- Assembly of process units at customers' site

thyssenkrupp nucera's AWE business follows a holistic serial fabrication concept to capture demand

scalum[®] | Our technology for industrial-scale roll-out

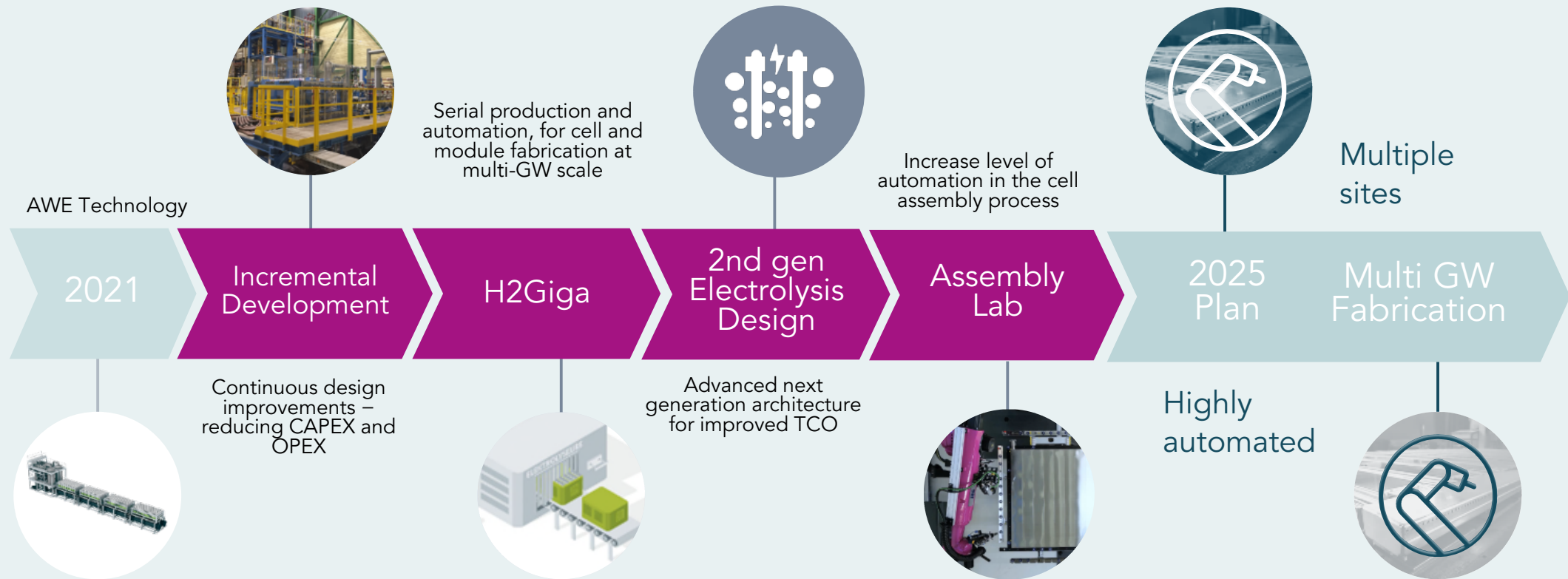


- ✓ Safety | Explosion-proof cells as confirmed by the Federal Institute of Materials Research & Testing
- ✓ Quality & Longevity | Proven cell design
- ✓ Sustainability | Low power consumption
- ✓ Fast dynamics | Suitable to renewable power sources
- ✓ Leading total cost of ownership (TCO)
- ✓ Compact footprint | High current density
- ✓ Service | Global service network with partners
- ✓ Certified design | Certified by TÜV Rheinland to meet requirements of chapter 4 of ISO 22734:2019

Gigawatt technology for the energy transition



thyssenkrupp nucera's dedicated product development roadmap



De Nora development



- Sustainable coatings for chlor-alkali and other industries (low power consumption)
- Lower critical metal content for Energy Transition business
- Exploring new cutting-edge technologies sustaining decarbonization and energy storage
- New manufacturing technologies to sustain serial production on a GW scale

Manufacturing Excellence

From *single* to *thousands* of cells,
ensuring:



Replication



Quality



Efficiency



Manufacturing expansion

Increase existing plants' capacity with automation and technology upgrades. Energy Innovation Center



Synergic plan of expansion for China & Japan. Multi-year scalable project



Okayama expansion ongoing



Strengthen further manufacturing set-up in Germany to enhance Energy Transition productivity

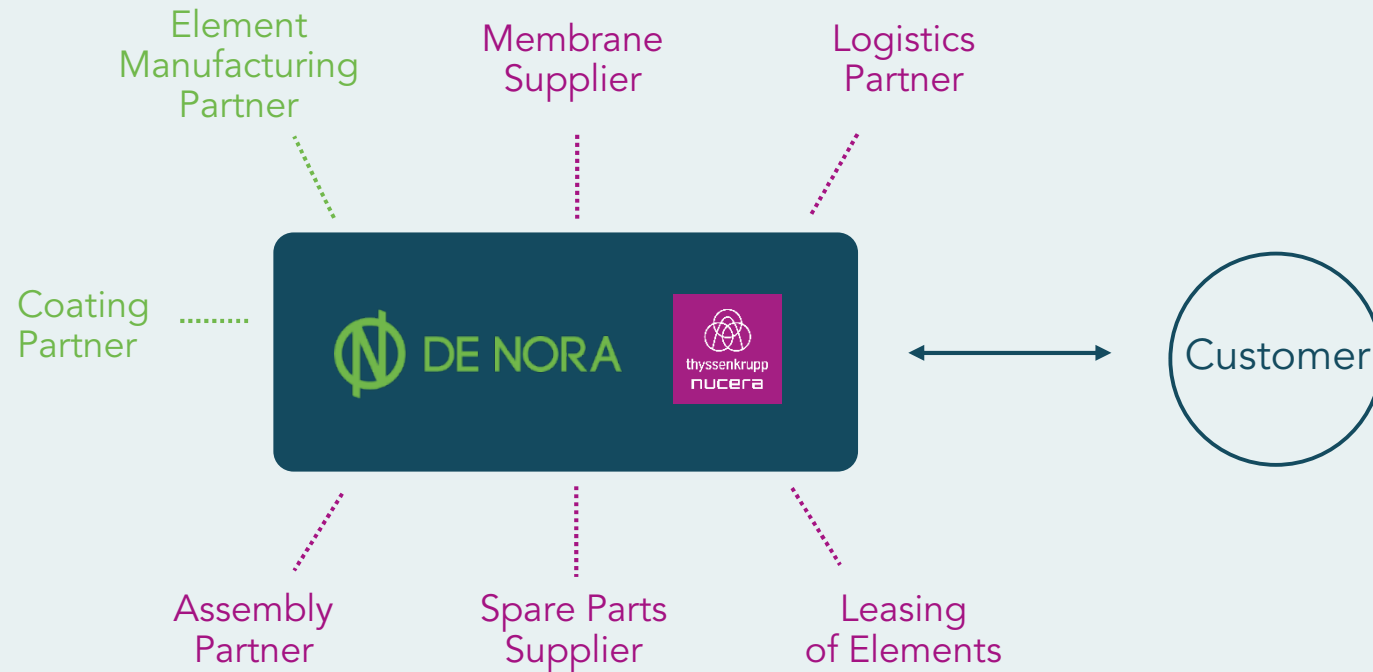


2023: 2.5 GW eq. elements

2026E: 4.5 GW eq. elements

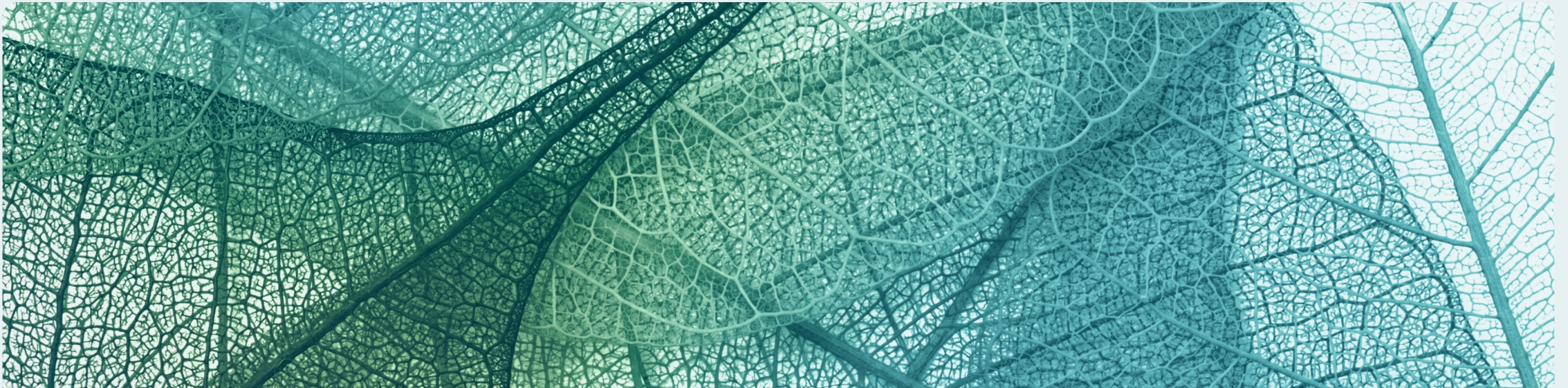
Full-service solutions from a strong partnership

-  Element Recoating
-  Element Upgrade
-  Element Exchange
-  Various other maintenance & revamp activities



Together we drive the green H₂ market

- 1 Deep knowledge, long-standing expertise, and strong strategic partnership
- 2 Global leadership in electrodes, electrolyzers technologies, and R&D
- 3 Clear commercial leadership
- 4 Manufacturing excellence and largest capacity globally
- 5 Strong balance sheet to finance future growth
- 6 Industry-leading project pipeline driven by high demand for green H₂



Thank you

