



Nedstack

PEM FUEL CELLS



FUEL CELL GIGA FACTORY

HAN H₂-Event


26th January 2023

© Nedstack Fuel Cell Technology BV ■ All Rights Reserved

Nedstack Company Profile

High-Power & High-Use PEM Technology Leadership

Name	Nedstack Fuel Cell Technology BV
Location	Westervoortsedijk 73-VB, Arnhem, the Netherlands
Founded	1999
Ownership	Privately

Website	www.nedstack.com
Industry	PEM Fuel Cells & PEM Power Solutions
Logo	 Nedstack PEM FUEL CELLS

• Company Highlights

- AkzoNobel spin-out. Independent since 1999
- Global Leader in High-Power / High-Use PEM-FC Technology
 - World's Longest PEM Power Plant in Operation > 10 years
 - World's First MW Sized PEM Power Plant
 - World's Largest PEM Power Plant > 2 / 3.6 Mwe
- In-house stack assy – systems with co-makers on Nedstack IP
- PemGen® proprietary PEM Power Plant portfolio
- Application Centers for:
 - Stationary & CHP
 - Maritime & Ports
 - Temporary Power



Energy Transition and a Hydrogen Economy

Hydrogen is critical to a NetZero Society



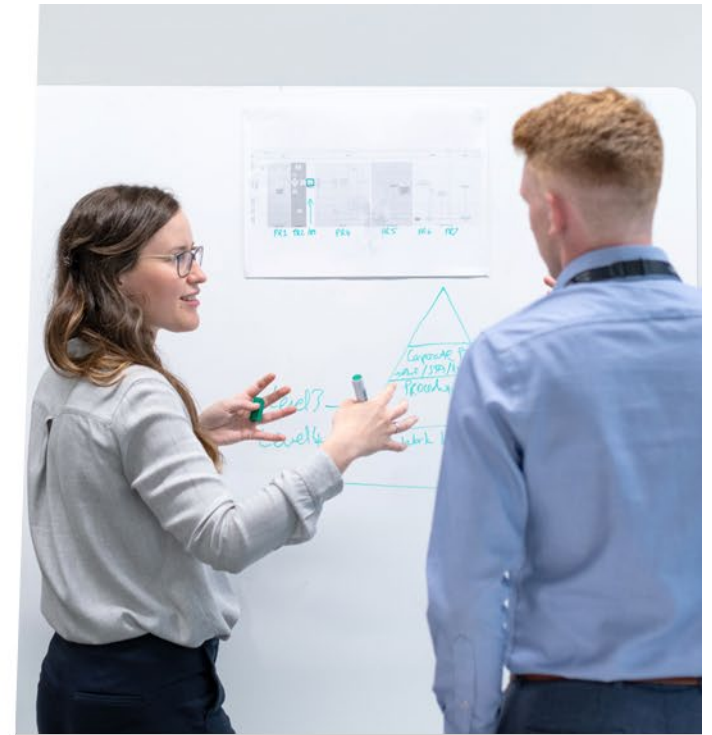
Climate Action

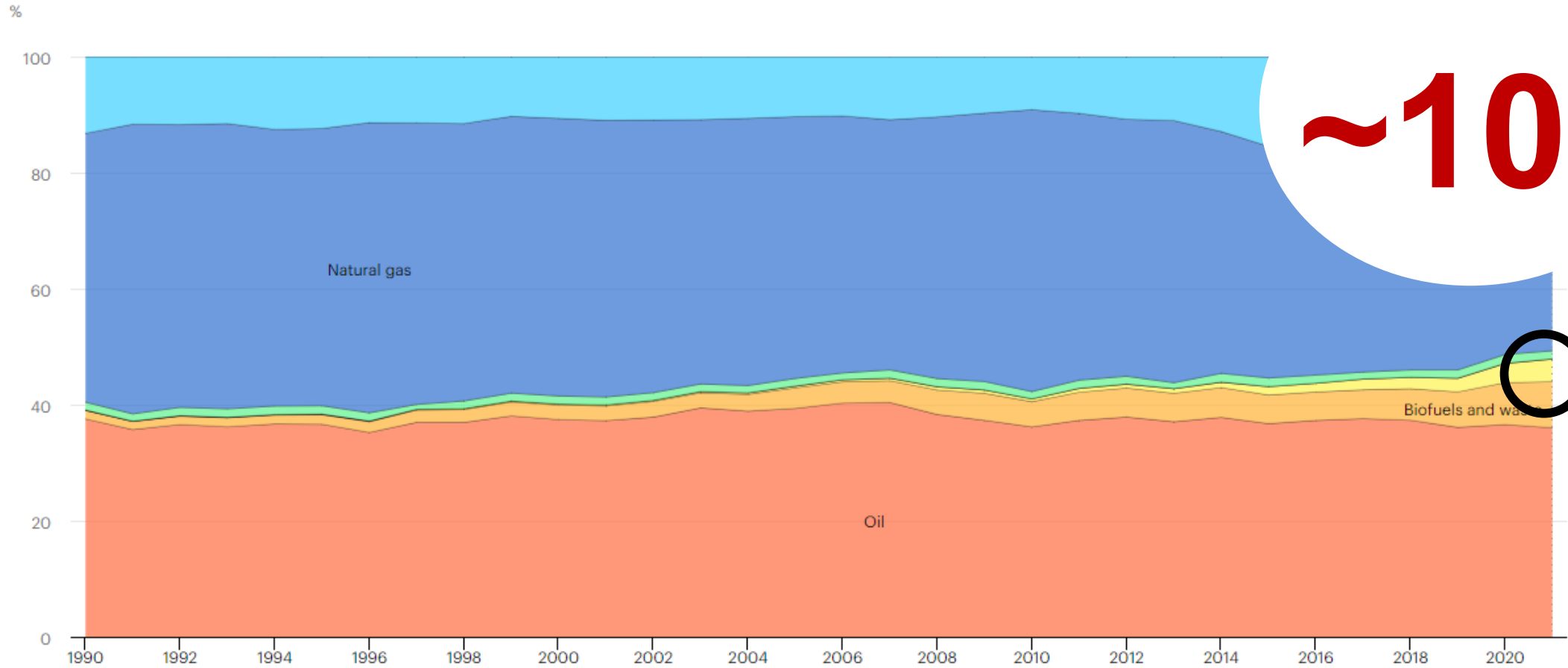
X

Energy Security

X

Green Jobs



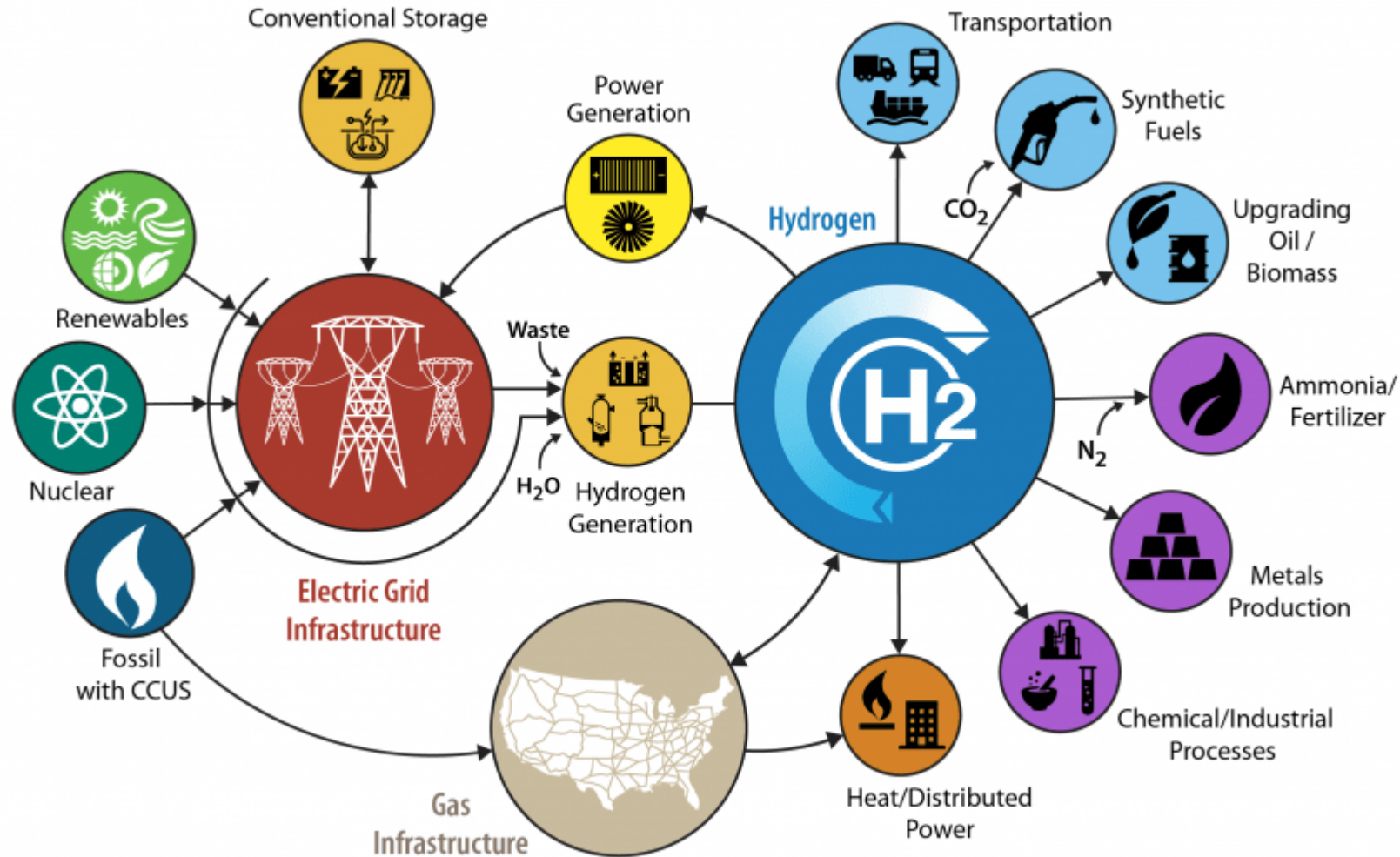


IEA. All rights reserved.

Coal Natural gas Nuclear Hydro Wind/solar, etc. Biofuels and waste Oil

Where do we see Hydrogen Making Sense

Understanding the H2 role in the NetZero Society



1) Based on the US DoE H2 Economy Map

Nedstack Heritage

>20 years of PEM Fuel Cell Excellence

NedStack fuel cell technology BV

- AkzoNobel and ECN jointly established Nedstack, combining AkzoNobel applied chemistry products with the fundamental PEM Fuel Cell expertise that was vested in ECN. In doing so they created a global first PEM-FC player with a commitment to high-power / high-use type PEM-Fuel Cell Applications.



AkzoNobel – IPKW (current Site)



Akzo Velperweg Arnhem (first site of Nedstack)

Process & Systems Engineering

Akzo Engineering

- PEM Power Plant Process & Instrumentation Design
- HAZOP & Safety Concept definition for PEM-FC systems in industry
- Process Engineering Capacity

■ PEM Fuel Cell Building Blocks from AkzoNobel Group – Advanced Chemicals

Ketjen

- Carbon & Graphite Expertise

Noury

- Catalyst Expertise

Enka Glanzstoff

- Polymers & lamination Expertise

Akzo Zout

- Electrolyte Expertise

Sikkens

- Coating Technology

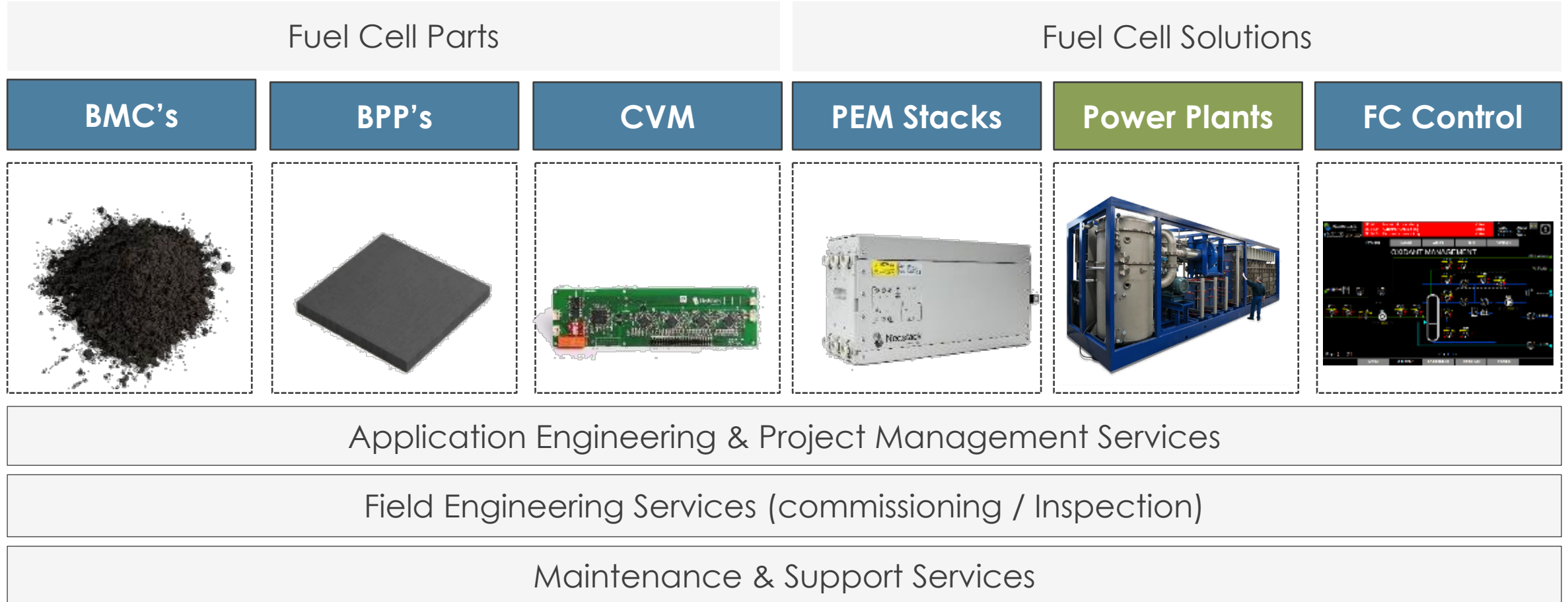
PEM Fuel Cell Expertise & Technology

Energieonderzoek Centrum Nederland (ECN)

- PEM-FC Engineering & Test Expertise
- PEM-FC Testing laboratory
- Electro-Chemical Engineering Capacity
- Applied Membrane expertise

Technology & Engineering Services Portfolio

PEM Fuel Cell Excellence from Powder-to-Power



 Engineering & IP-ownership by Nedstack / Built Process by Co-Maker

Flagship Demonstrators – Unique Recognitions

Leadership in the High-Power / High-Use Domain



Longest Running PEM Power Plant



- > **AkzoNobel Delfzijl (NL) Plant**
- > Live since 2007
- > Using H₂ from Chlor-Alkali
- > 70k Running hours accumulated



First MWe Sized PEM Power Plant



- > **Solvay Antwerps (Be) Plant**
- > Now transferred to Martinique (Fr)
- > Installed in 2011, under transit
- > Using H₂ from Chlor-Alkali



Largest PEM Power Plant



- > **Ynnovate Yinkou (PRC) Plant**
- > Installed in 2016
- > Developed in DemcoPEM Project
- > Using H₂ from Chlor-Alkali

1) DemcoPEM has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under Grant Agreement no. 621265

PemGen Focus Markets

Servicing the High-Power / High-Use Domain



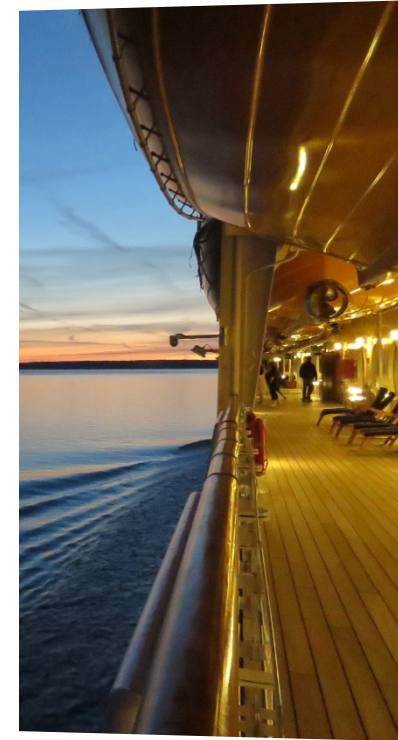
Industry



Utility Power to Power



Distributed Power / RAPS



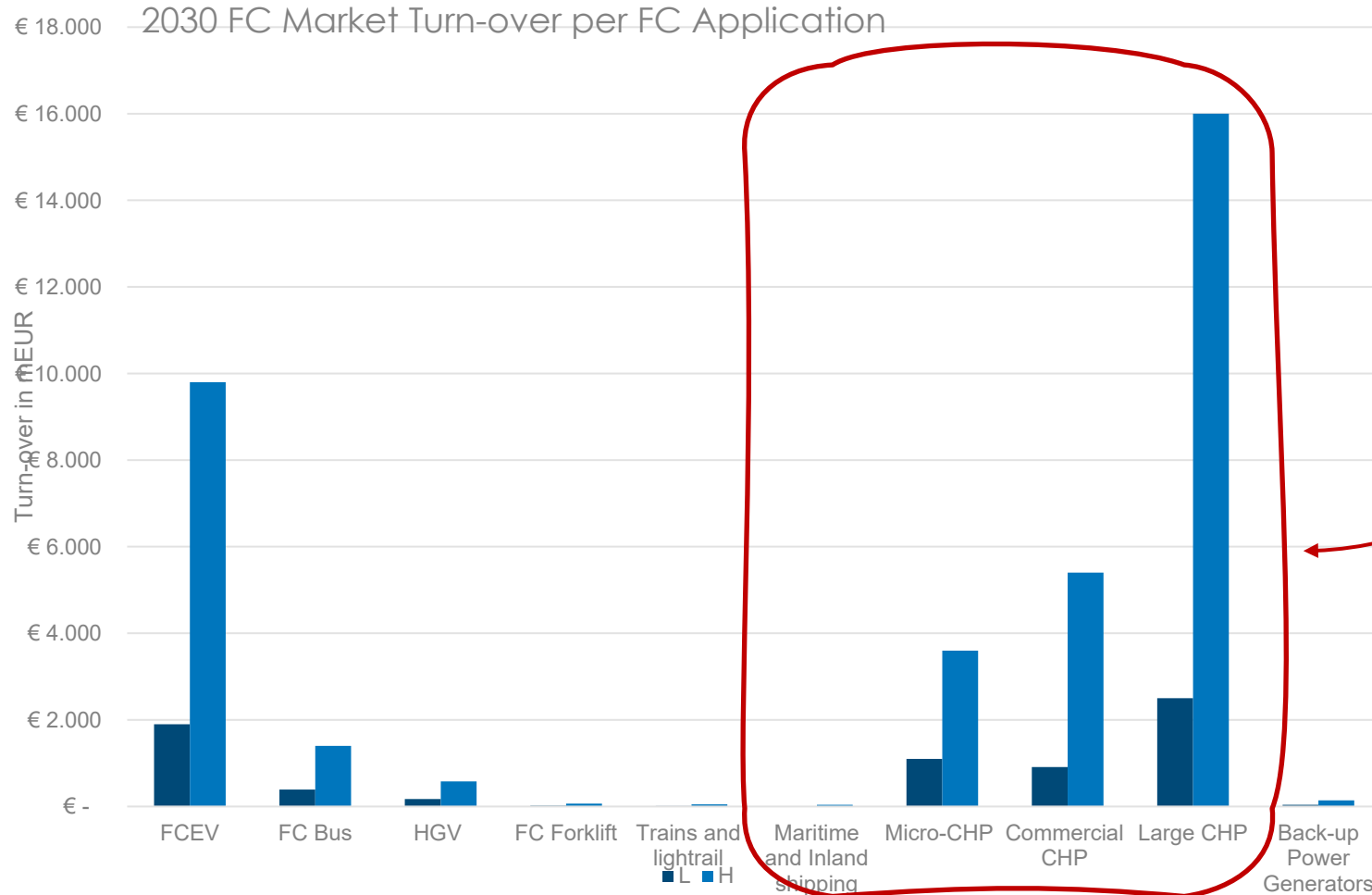
Maritime & Ports

PemGen - Focus Markets

- PemGen focus markets are focused at delivering technology and cost (LCoE) leadership for high-power / high-use markets.
- PemGen® pursues leadership at the utility scale level with power plants intended for 20 years in the field, having advanced safety concepts.
- The PemGen portfolio is tuned for either land-based use (in compliance with EC directives and IEC standards) or maritime use (in compliance with IMO codes, maritime Class Rules and IEC standards).
- The PemGen® business model assumes configure-to-order type technology delivery models where customer value is maximised.

An Informed Look at Growth Driving Applications

Nedstack Signature Markets will dominate PEM-FC deployment



1) Based on 2019 FCH-JU / E4Tech Evidence Report – Ambitious Scenario

IPCEI Project Structure

Nedstack FCGF-Project in larger framework

Commission approves up to €5.4 billion support by 15 Member States for an Important Project of Common European Interest (IPCEI) in the **Hydrogen Technology value chain** "IPCEI Hy2Tech"



1. New Semi-Automated Production System;
 2. New Test Benches (PTS's)
 3. Expansion & ReVitalization of Building VB;
 4. Construction of H2Backbone at IPKW Park;
 5. Upgrade of FieldLab @IPKW
- ... and more

1) FCGF (Nedstack or #NL06 – 21,7mEUR max)

Why Arnhem?

Energy Capital of the Netherlands & Hydrogen Valley

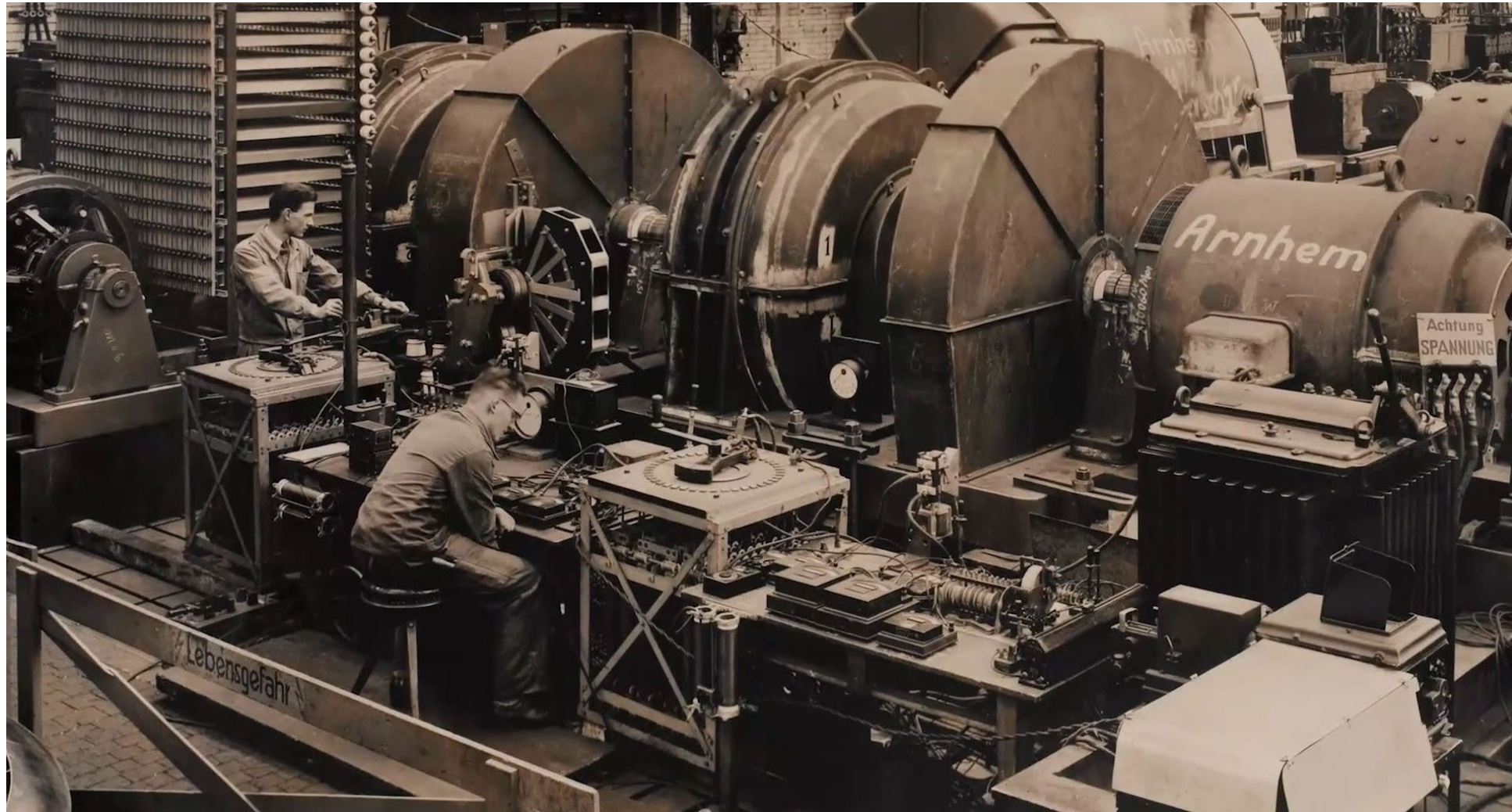


15th Century – Molenplaats Sonsbeek First Industry Site



1927 – KEMA

World's Largest Power Lab



1969 – Tennet

Home to the Dutch TSO



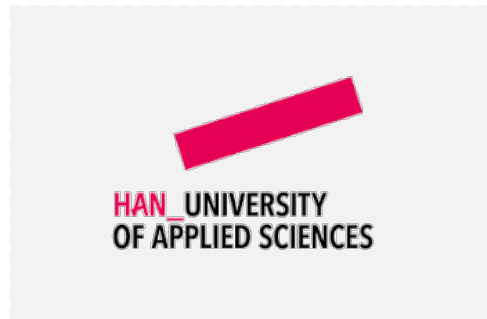
1999 – Nedstack / AkzoNobel

A Netherlands Stacking Company for Fuel Cells



The Nedstack x HAN symbioses

Human Capital Partners in the H2-Economy



Talent Development



Joint Traineeship



Partnership



Shared Internships

1

A European NetZero society

Needs H2-tech for climate action, energy security and green jobs

2

Arnhem

is the energy capital of the Netherlands and leads the NL H2 Economy

3

Nedstack

Leads fuel cell industrialization by delivering semi-automated fuel cell manufacturing at the gigawatt scale.

H2ero Net Zero

The Energy Transition has
always been about



YOU

