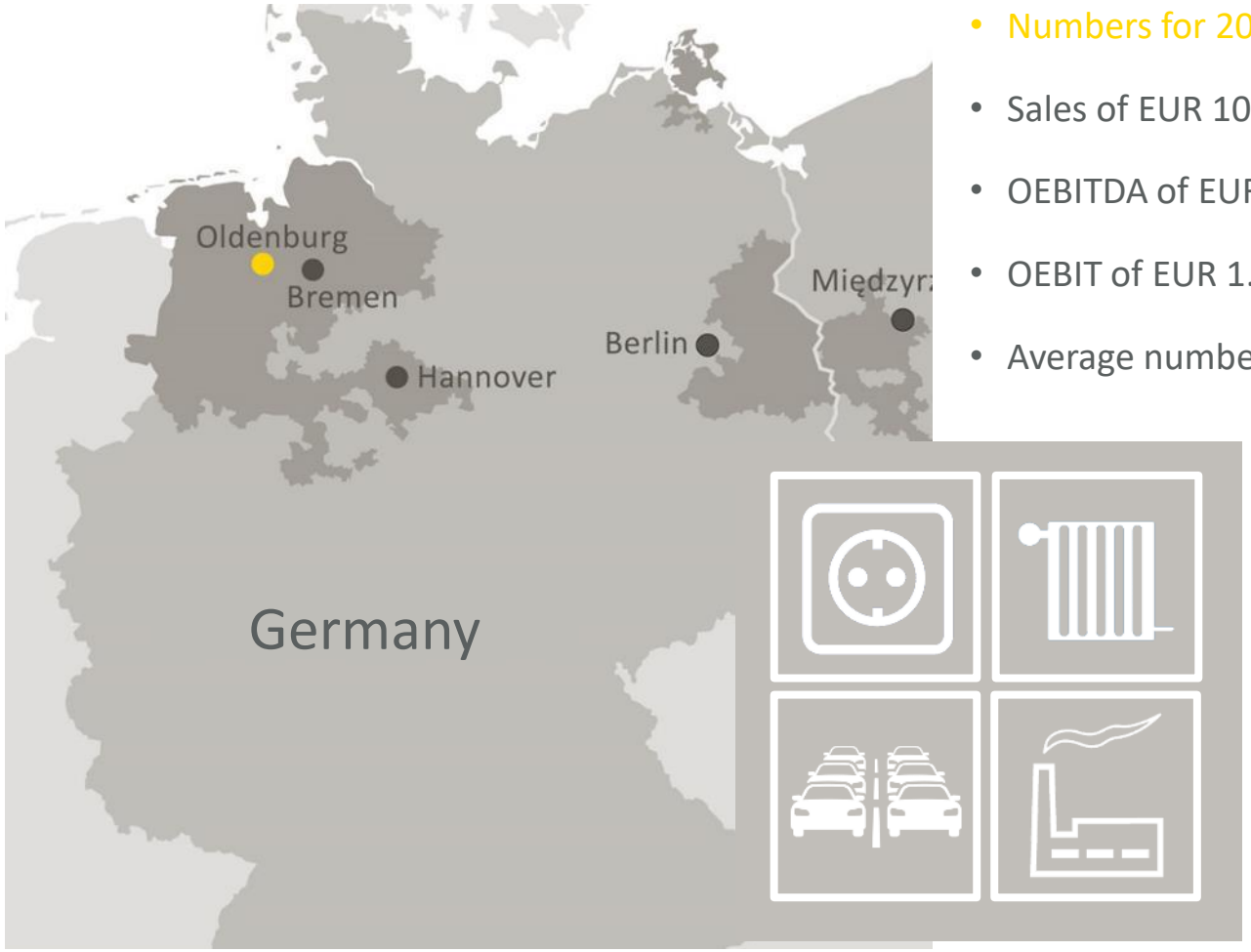
Standardisation for the integration of electrolysis plants into the hydrogen and electricity grid

EWE HYDROGEN GmbH
Dr. Geert Tjarks, Head of Business Development

EWE Group – Energy supply for North West Germany



- Numbers for 2023
- Sales of EUR 10.0 billion
- OEBITDA of EUR 1.6 billion
- OEBIT of EUR 1.0 billion
- Average number of employees 10,800

EWE aims to take a leading role in shaping the energy revolution and ensuring its implementation.

EWE is capable of seeing the energy revolution in a global context.

The areas of electricity, heat and mobility are reflected within the Group.

Image: EWE AG

EWE activities in the hydrogen economy

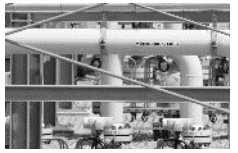


Pictures: EWE AG / swb AG













1 Renewable energies
On- and offshore capacity with additional potential for deployment

2 Initial pipeline grid
Connecting production, storage and usage of hydrogen via pipelines.

3 Hydrogen production
Integration of electrolysis plants into the electricity and hydrogen grid

4 Large scale storage facilities
Introducing flexibility to an energy system based on renewables

6 Market in industry sector
Usage of green hydrogen for industry applications like steel production

5 Market in transport sector
Usage of green hydrogen for heavy duty and other transport applications

Systemic integration of electrolysis plants

Systemic integration of water electrolysis systems

Integrated energy infrastructure planing

2025



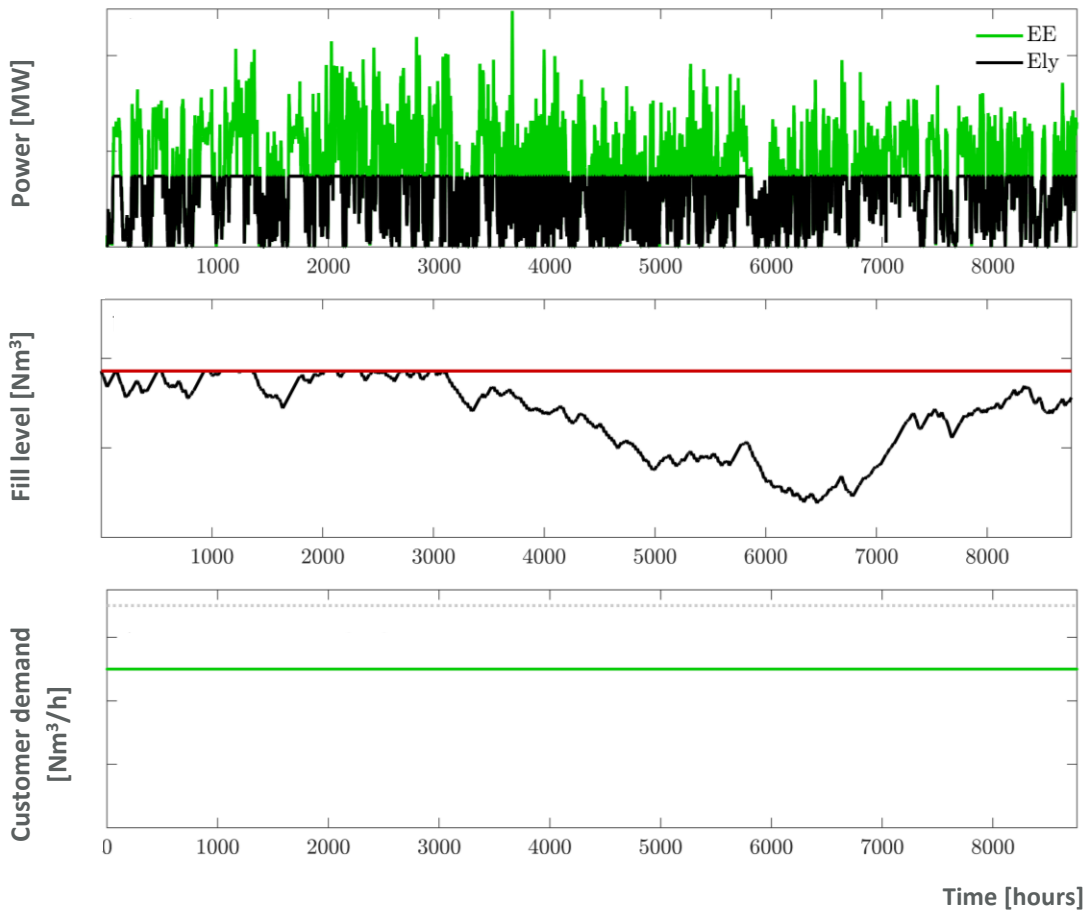
2035



Quelle: Quo Vadis Elektrolys?; Element Eins; 2021

- PtG locations will be synchronized with the power grid capacities
- Operation strategy is key for economic projects
- Scaling system size from a few MW to the GW scale

Large-scale hydrogen storage will be needed for systemic integration



Strict regulatory requirements for renewable electricity purchase for green hydrogen production

The storage facility can supply the customer during reduced production periods by storing at surplus periods

Customer-related demand profiles have an impact on the storage dimension and operation strategy

Pictures: EWE AG

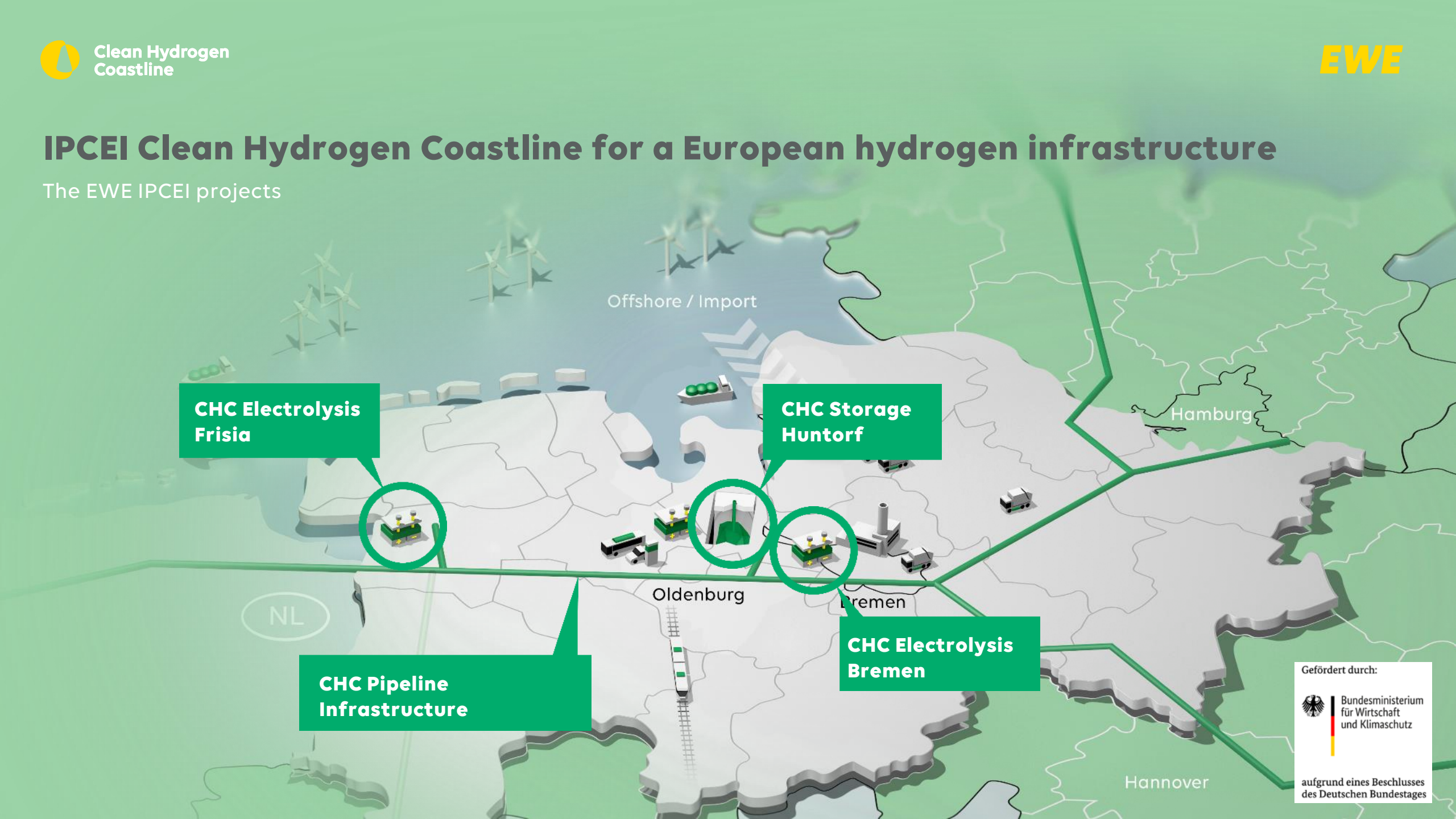
- Storage demand derives from volatile production as well as from customer-related demand profiles
- Compared to natural gas storage, hydrogen storage will require more dynamic in- and outlet phases
- **Hydrogen storage facilities will play a key role in the decarbonisation of the German electricity system**

Clean Hydrogen Coastline

EWE

IPCEI Clean Hydrogen Coastline for a European hydrogen infrastructure

The EWE IPCEI projects



Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

Clean Hydrogen Coastline

EWE

CHC Electrolysis Frisia

Current State

Milestones:

- Plant under construction
- Commissioning of 380kV transformers (already in June 2023!)
- Electrolysis system ordered
- Decision on the use of drinking water
- Submission of permit application 12.08.2024, (Deadline for participation of the authorities 14.09.2024)
- Starting of the sand fill





Power
320 MW

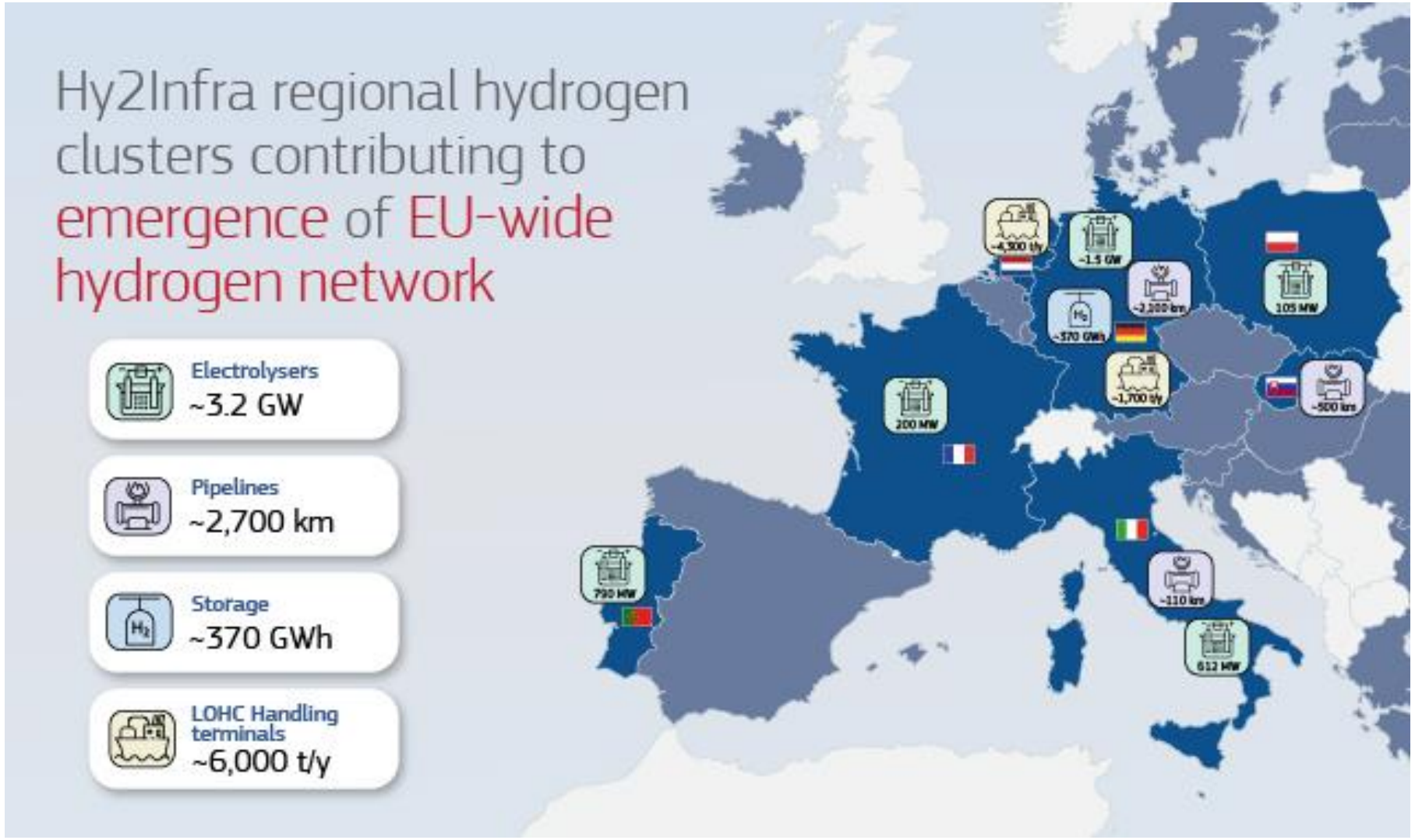
Production capacity
26,000 t/a hydrogen

Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

Exemplarische Darstellung, Quelle EWE AG

Important Project of Common European Interest

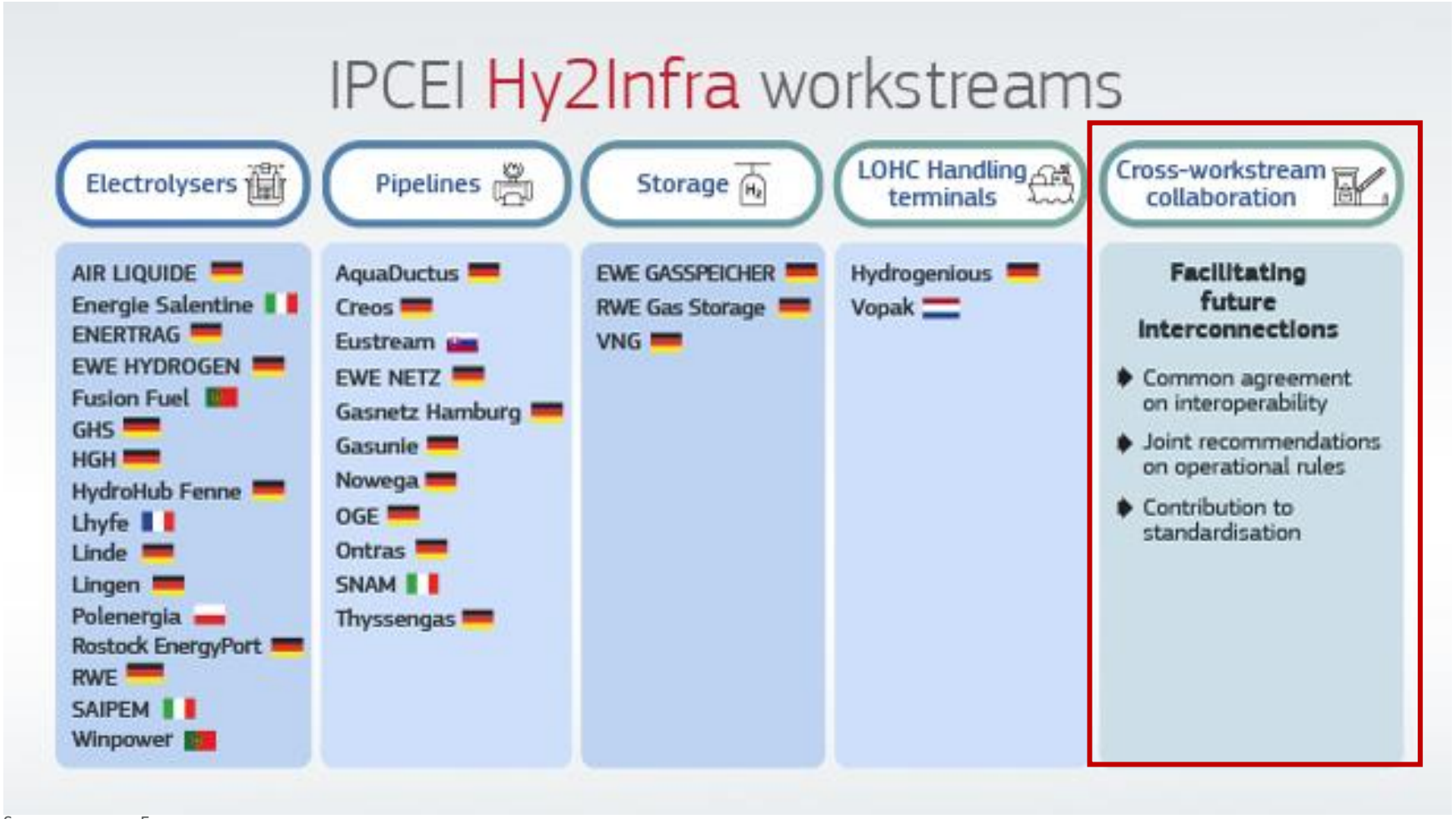
A union-wide approach for an initial hydrogen infrastructure



Source: www.ec.Europa.eu

Important Project of Common European Interest

A union-wide approach for an initial hydrogen infrastructure



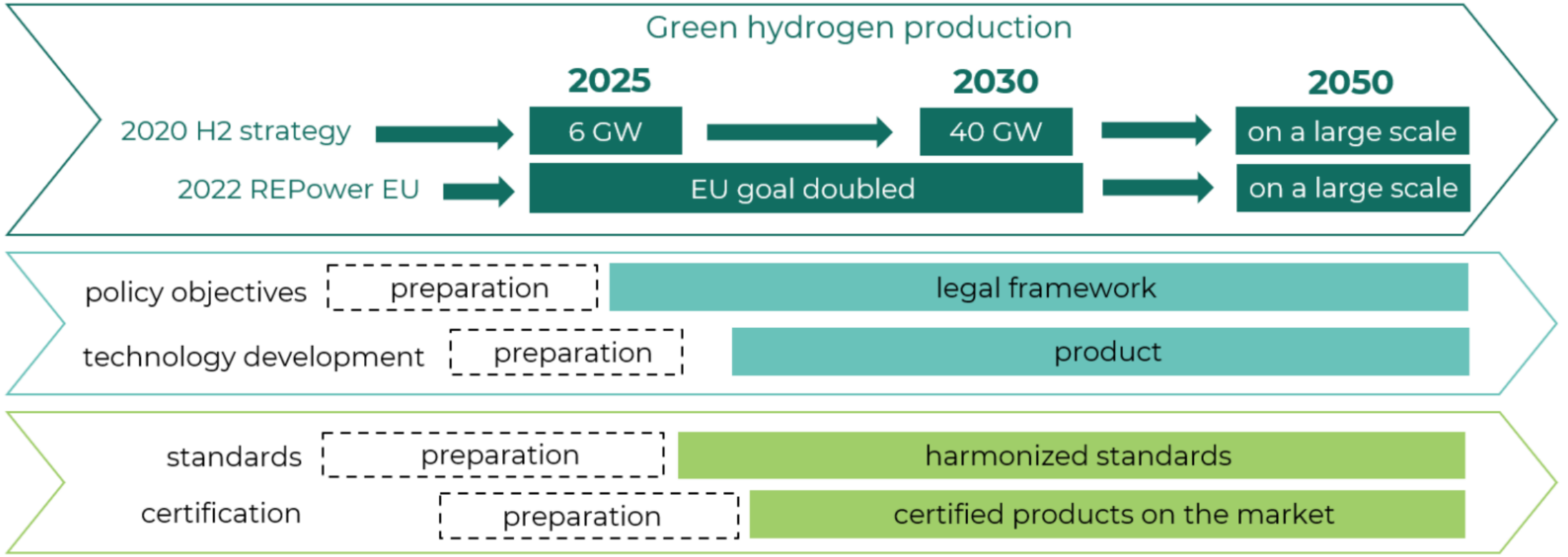
Source: www.ec.Europa.eu

It is not the goal of Hy2Infra to design or develop standards. This is the mandate of the European standardisation bodies CEN, CENELEC, and/or of their international counterparts ISO or IEC. Still, Hy2Infra will contribute with recommendations.

Standards for hydrogen production

Alignment of standardisation to the entire market development

Certification and standards are still lacking behind the political framework



Source: European Clean Hydrogen Alliance roadmap on standardisation

Standardisation for hydrogen production

Production				
production technologies:	2023			2030
- electrolyser	to be developed	under development		in place
- pyrolysis	to be developed	under development		in place
- steam methane reforming	to be developed	under development		in place
electricity grid connection	to be developed	under development		in place
Power to X	under development		in place	
gas quality aspects:	under development		in place	
safety aspects:				
- material compatibility	PNR	to be developed	under development	in place

Source: European Clean Hydrogen Alliance roadmap on standardisation

- For hydrogen production different technologies are relevant e.g. electrolysis, steam reforming
- Production includes compression and purification
- Especially electrolysis is interlinked with other value steps like the electricity grid, storage, transport

Highlight topic – Grid connection on the electricity side

- Technical specifications of the grid operators cannot be implemented in the relevant size classes
- In particular, electrolysers must be able to operate through grid faults, e.g. voltage drops
- It is partly unclear which specifications must be achieved in the high frequency range
- Complex technical specifications for power electronics increase costs
- At the same time, grid stability must be ensured

Contributed	Topic	Description	Standard	Status	TC
RT1 Production	electrolysers	electricity grid connection for ancillary services by electrolysers and regarding power quality requirements - standardisation (other than regulation on system operation at national level) of procedures for testing, inspection and certification of facilities and performance; Measurement and assessment of power quality characteristics of grid connected electrolysers; EU harmonised protocols for testing of low temperature water electrolysers, JRC 2021	to be identified	to be identified	CEN/CLC JTC 6

Source: European Clean Hydrogen Alliance roadmap on standardisation

Highlight topic – Grid connection on the hydrogen pipeline side

- Requirements for gas quality for the pipeline inlet is still unclear
- Different use cases require different quality standards
- Especially for repurposed midstream infrastructure high quality standards are an issue
- Pressure level for pipeline inlet is still unclear
- Increasing costs for specific projects due to additional compressors

Contributed	Topic	Description	Standard	Status	TC
RT2 T&D	gas quality aspects - purity	hydrogen quality in pipelines	CEN/TS XXX (WI 00234096) EN 17124 Hydrogen Fuel - Product Specification And Quality Assurance - Proton Exchange Membrane (PEM) Fuel Cell Applications for Road Vehicles ISO 14687 Hydrogen fuel quality — Product specification	(1) in preparation (2) under revison	CEN/TC 234, CEN/CLC JTC 6, ISO/TC 197

Source: European Clean Hydrogen Alliance roadmap on standardisation

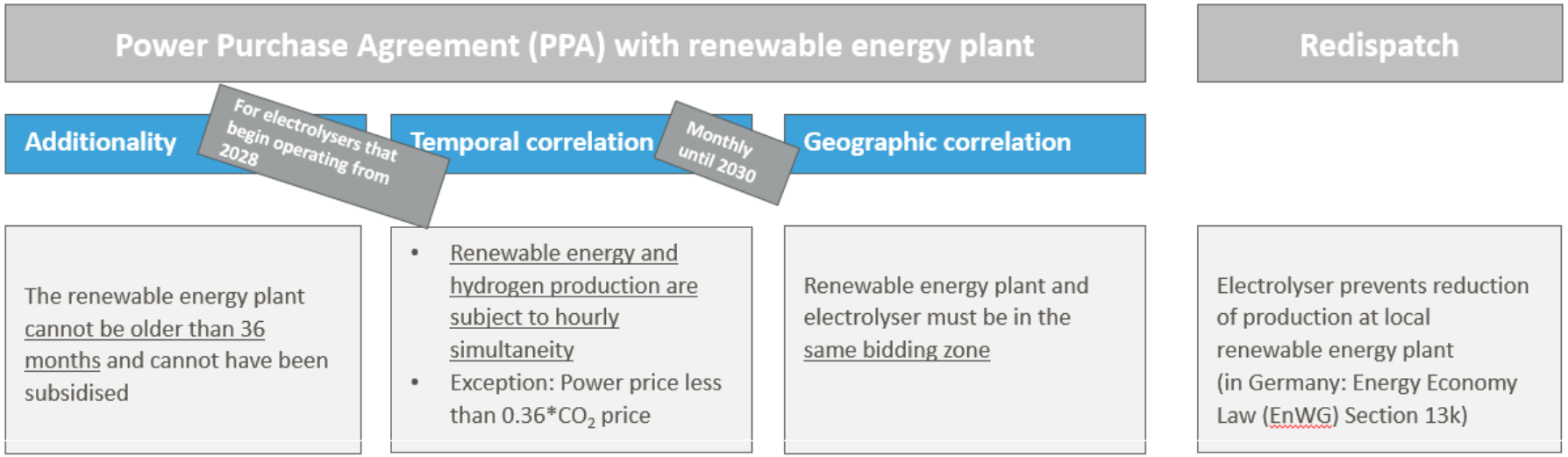
Highlight topic – Technical standards for the electrolysis

- Control strategies in combination with degradation of the plants are unclear
- Common standards to compare systems from different suppliers were not present
- Requirements coming from the grid are not addressed by suppliers
- Clear measurement methods to verify the performance are not in place

Contributed	Topic	Description	Standard	Status	TC
RT1 Production CEN-CENELEC	electrolysers	control strategies for integrating electrolysers with intermittent renewable energies (mapping operational boundaries)	to be identified	to be identified	CEN-CLC/JTC 6
RT1 Production CEN-CENELEC	electrolysers	electrolyser - development of measurement methods and test procedures for electrolyser performance dedicated to the needs of ancillary service requirements	to be identified	to be identified	CEN-CLC/JTC 6

Source: European Clean Hydrogen Alliance roadmap on standardisation

Highlight topic – Certifying low carbon and green hydrogen



- Requirements for certification are coming from the RFNBO and low carbon delegated act
- Certification scheme is still not in place
- Projects have to stick to the requirements

Contributed	Topic	Description	Standard	Status	TC
RT7 Cross-cutting ECH2A Industry	energy / hydrogen carrier	Definition and standards for certifying low carbon and green hydrogen as well as liquid hydrogen - either as an end product or for logistics reasons	to be identified	to be identified	to be identified

Source: European Clean Hydrogen Alliance roadmap on standardisation

Summary

a. A clear regulatory framework to give direction to the detailed standardisation work;
b. The publication of standardisation requests, which are mandates of the European Commission to prepare specific standards;
c. The engagement of industry in topics that “need to be developed” and/or topics for which no standardisation committees are exist or are yet active; furthermore, a good information exchange with associations such as Hydrogen Council, IPHE, IRENA, Hydrogen Europe and others is needed;
d. The need for an overall coordination of hydrogen standardisation activities focusing on the technical needs of industry; the alignment with European Commission policies and legislation and the implementation capacity of CEN-CENELEC;
e. Increased cooperation between European and international standardisation bodies based on the existing agreements (Vienna / Frankfurt agreement).

Source: European Clean Hydrogen Alliance roadmap on standardisation

Thanks!

EWE Aktiengesellschaft
Tirpitzstraße 39 - 26122 Oldenburg
info@ewe.de - ewe.de