ENGIE – ENERGIEWENDE IN DEUTSCHLAND

Wasserstoffbezug und -import

Aktueller Stand

RESTRICTED | INTERNAL | SECRET

ENGIE-Gruppe: Führend bei der Klimaneutralität

170.000
Mitarbeitende weltweit

57,9 Mrd. €
Umsatz

In mehr als **50**
Ländern aktiv

11-12 Mrd. €
Investitionen in den Jahren 2019-2021

+ 4 GW
Erneuerbare Leistung 2022

Führend
bei der Entwicklung von Wasserstoff

Zahlen inkl. EQUANS

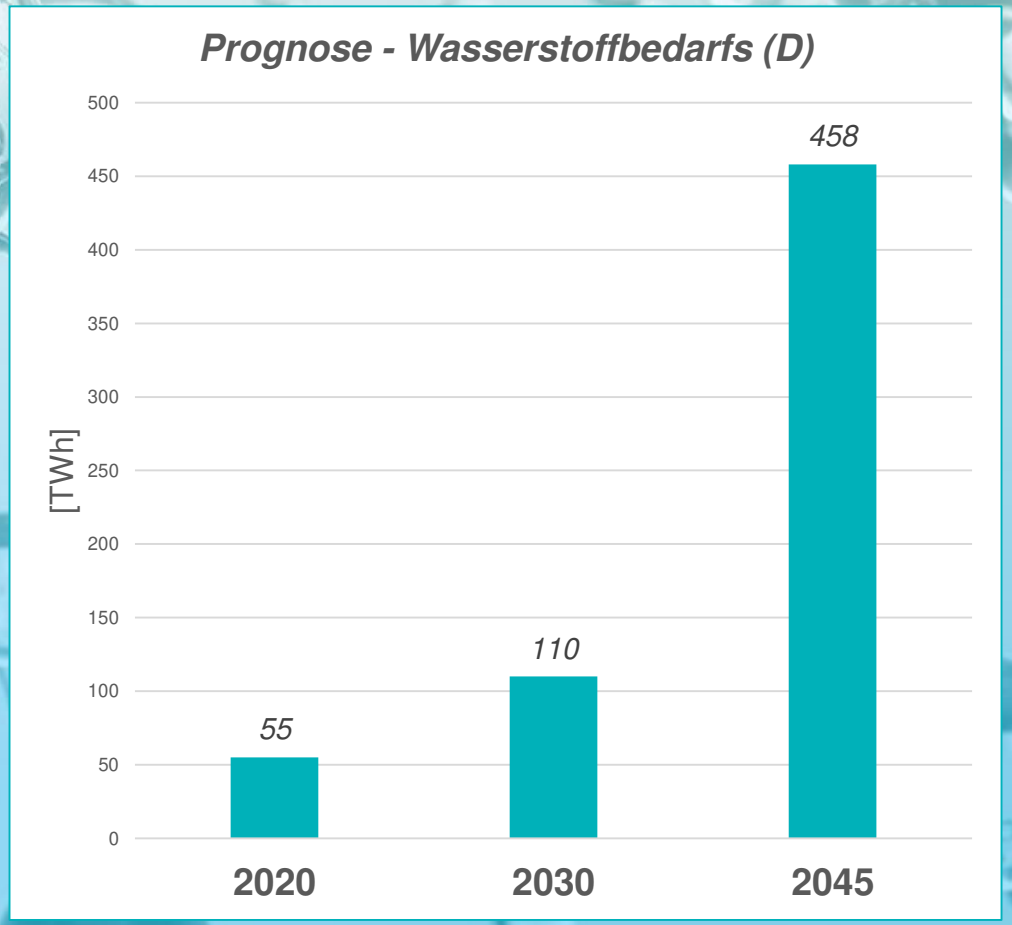
1

Wasserstoff – Bezug und Import in Deutschland

Bedarf an H2 in Deutschland

Wieviel (grauer) Wasserstoff wird in Deutschland heute verwendet?

- Heute: Gesamt = 55 TWh (1,7 Mio. t)
  [NWS 2020]
- 2030: Gesamt = 90 bis 110 TWh
  (davon in Industrie ca. 65 TWh; davon 14 TWh als grüner Wasserstoff)
  [NWS 2020]
- 2045: Gesamt = 458 TWh
  (davon in Industrie in 191 TWh) [dena 2021]



- Quelle : NWS 2020/ Dena (2021)

H2 – Elektrolysebedarf

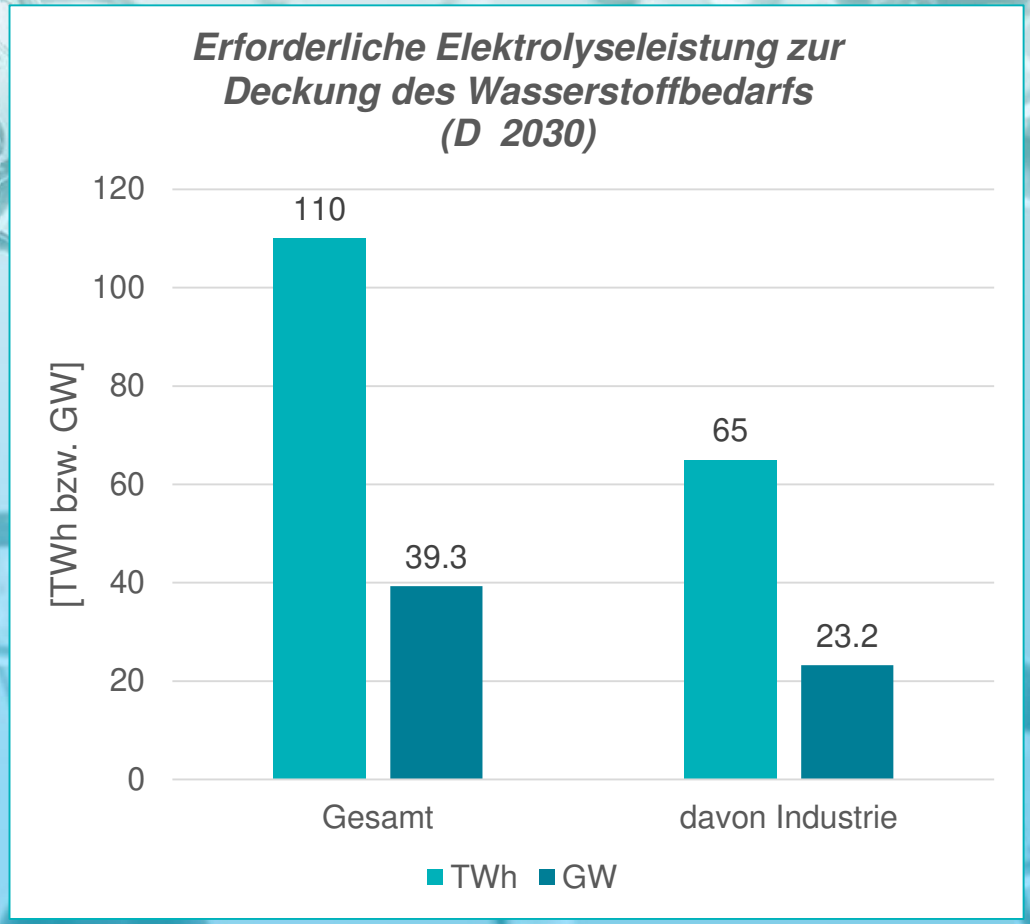
Welche Elektrolyseleistung ist erforderlich um den (grünen) Wasserstoffbedarf zu decken?

Grüne Erzeugung bis 2030:

- 90 TWH (32,1 GW) bis 110 TWh[1] (39,3 GW)

Ziele bis 2030:

- 10 GW
- < 0,1 GW (bis jetzt erreicht)



[1] Annahme: Wirkungsgrad 70 % H_u, 4.000 Volllaststunden [NWS 2020]

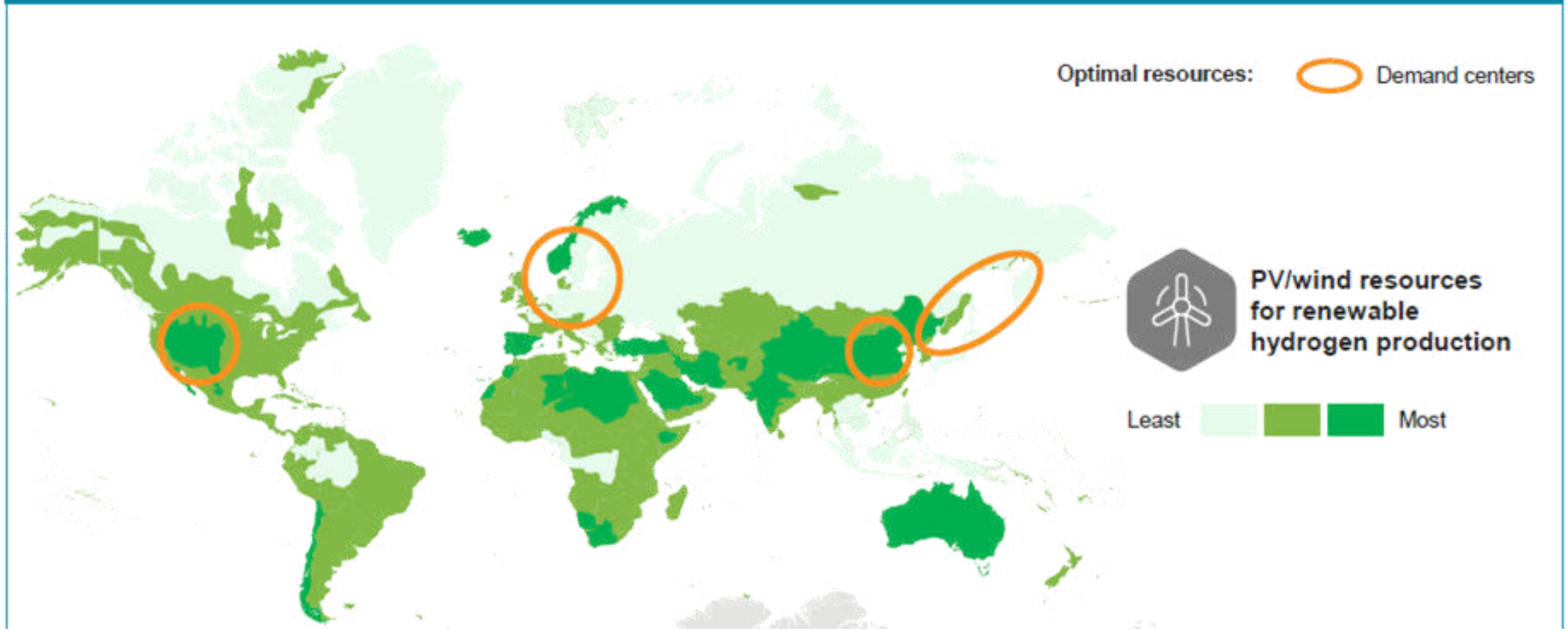
Wasserstoff – Woher sollen dies Kapazitäten kommen ?

2

Kapazitätsaufbau Wasserstoff

RES Potenziale in der Welt

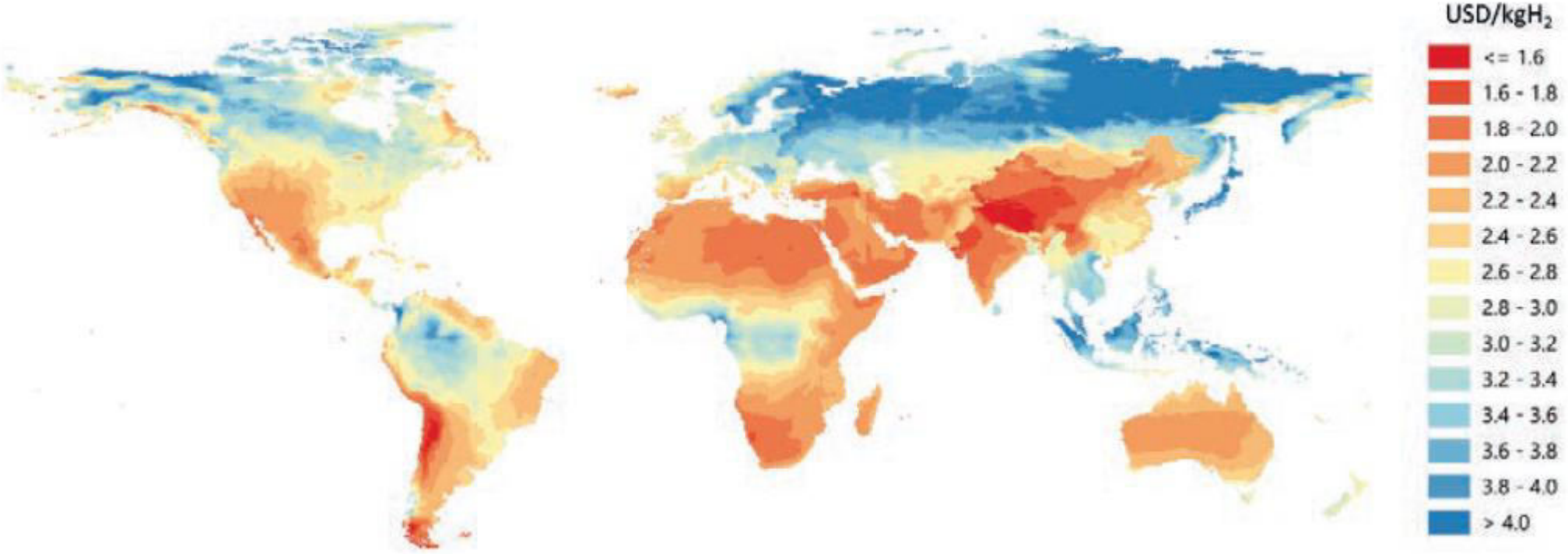
Exhibit 11: Distribution of global hydrogen resources and demand centers



Source: McKinsey & Company for Hydrogen Council, January 2021

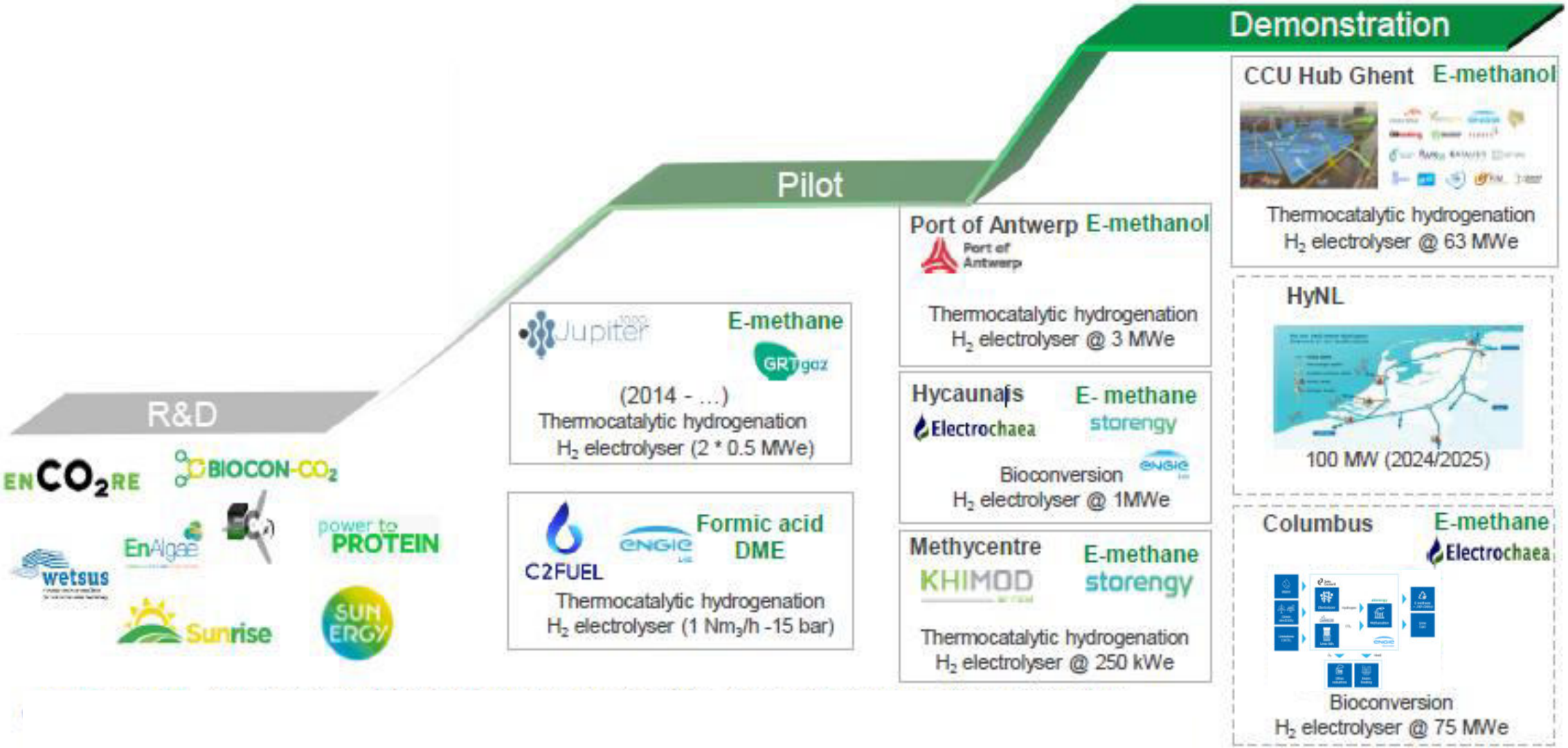
Produktionskosten weltweit

Figure 14. Hydrogen costs from hybrid solar PV and onshore wind systems in the long term



Source: IEA analysis based on wind data from Rife et al. (2014), *NCAR Global Climate Four-Dimensional Data Assimilation (CFDDA) Hourly 40 km Reanalysis* and solar data from renewables.ninja (2019).

ENGIE in allen Phases des Aufbaus



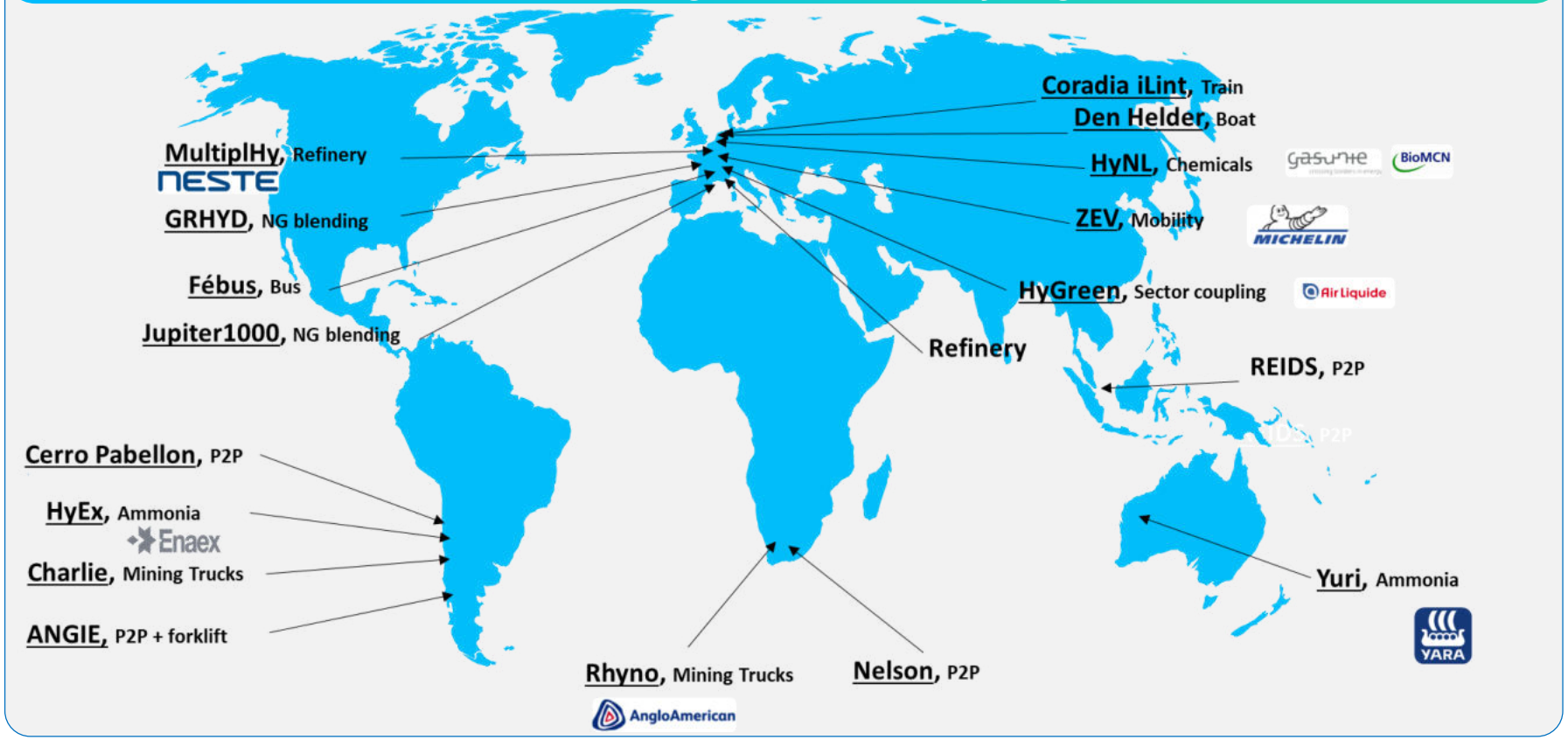
ENGIE HYDROGEN

Rund **70**
Projekte in Bearbeitung

Rund **200**
Mitarbeiter weltweit

In über **10**
Ländern tätig

ENGIE hydrogen in action
A selection of references along the renewable hydrogen value chain



RHYno
ENGIE | Anglo American
Project Overview

Purpose:
Co-create the first hydrogen-powered mining haul truck

H2 usage:
Energy for fuel cell-based powertrain

First milestone:
First truck in motion in 2021

End game:
Industrialization of the solution

Innovation :
First renewable H2 produced at a mine.
Quickest large scale refuelling

Current status:
EXECUTION

Yuri
ENGIE | YARA
Project Overview

Purpose:

Design, invest in, build, operate a renewable energy-powered renewable H2 plant

H2 usage:

Ammonia production.
Ammonia as renewable fertilizers, industrial feedstock and fuel for Australian and international markets

First milestone:

Double digit MW, industrial scale by 2023

End game:

GW league by 2030

Innovation :

Establishment of a first-of-a-kind industrial value chain, harvesting the abundant renewable power in Western Australia to make renewable hydrogen and ammonia to serve local and export markets.

Current status:

FEED

Wasserstoff – Wie sollen diese Kapazitäten nach Deutschland in die Industriegebiete kommen ?

HyNetherlands – Gigawattscale

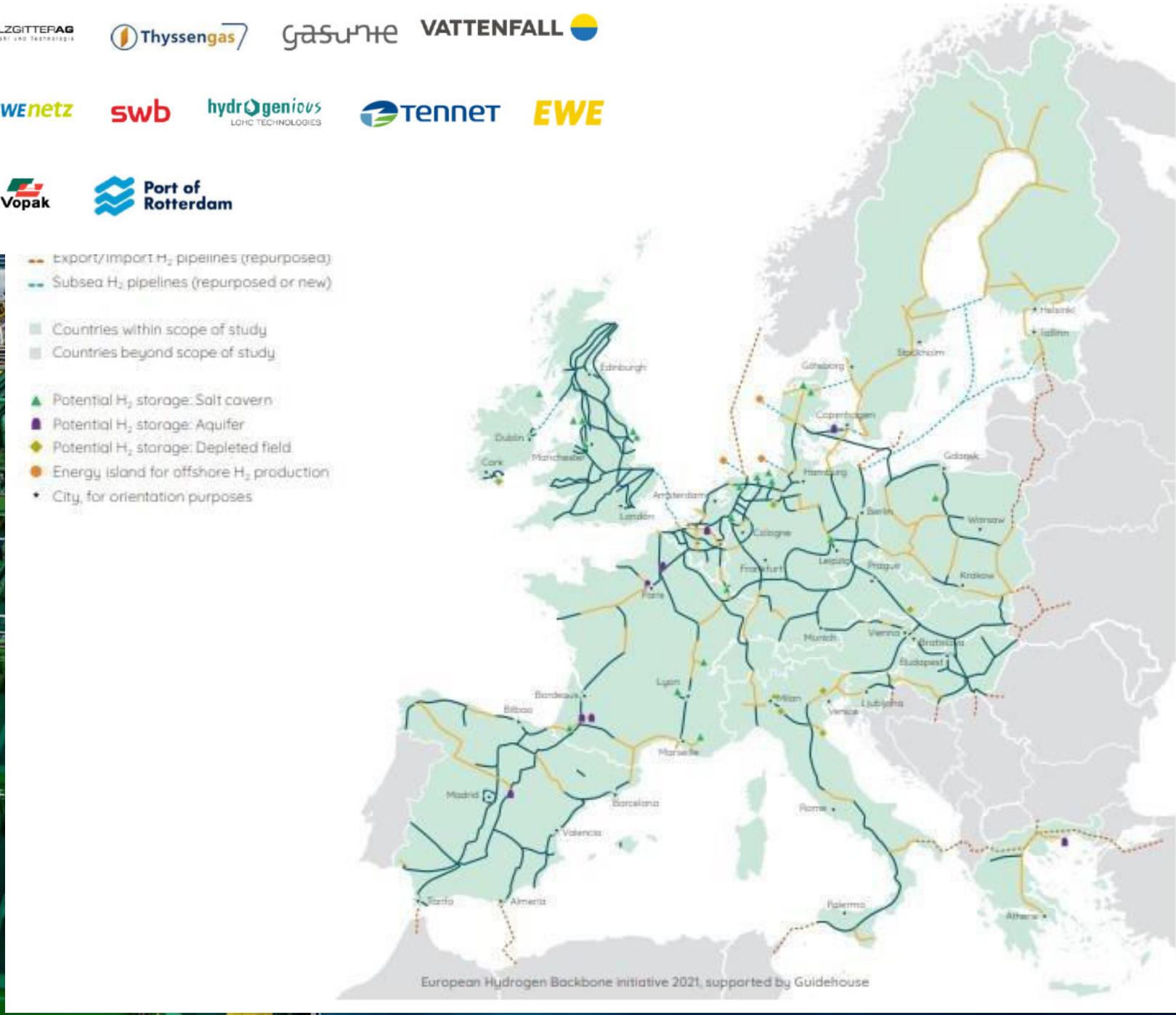
ENGIE – Eems Niederlande

- ***IPCEI*** Projekt
- ***H2*** und ***e-Methanol***
- ***Gasunie*** als Partner
- COD ***2025***
- Ausbau in 3 Phasen
  - 2025
  - 2030
  - 2035

… mit Ambition von Lieferungen nach Deutschland

H2 Global
2024
€ 900m Phase 1
Engie als
Gründungsmitglied
ENGIE

GETH2 IPCEI
ENGIE


Export/import H2 pipelines (repurposed)
Subsea H2 pipelines (repurposed or new)
Countries within scope of study
Countries beyond scope of study
Potential H2 storage: Salt cavern
Potential H2 storage: Aquifer
Potential H2 storage: Depleted field
Energy island for offshore H2 production
City, for orientation purposes
Edinburgh
Dublin
Cork
Manchester
London
Amsterdam
Cologne
Frankfurt
Paris
Hamburg
Berlin
Leipzig
Prague
Munich
Vienna
Budapest
Warsaw
Gdansk
Stockholm
Gothenburg
Copenhagen
Helsinki
Tallinn
Lyon
Bordeaux
Bilbao
Marseille
Madrid
Barcelona
Valencia
Porto
Almeria
Palermo
Athens
European Hydrogen Backbone initiative 2021, supported by Guidehouse

Offshore hydrogen production platform

Tractebel is developing an innovative platform concept for the large-scale production of green hydrogen from offshore wind energy. The modular concept comprises seawater desalination, compression and electrolysis units – designed for an electrical power of 400 MW.

LOCATION	Offshore (worldwide)
PERIOD	ongoing
CAPACITY	400 MW (modular)
SERVICES PROVIDED	**Concept study**

- Conceptual design of electrolysis plant, balance-of-plant and platform structure (topsides)
- Definition of the system configuration
- Layout planning and 3D visual design
- CAPEX/ OPEX estimation
- LCOH calculation
- Economic & Financial model
- Techno-economic analysis of transport options

3

Rahmenbedingungen

Fit for 55

RED II (III)

Taxonomie

IPCEI