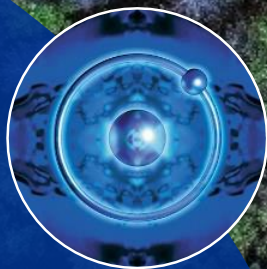


# The Hydrogen Market until 2050 Boosts and Barriers



**NAMIBIA GREEN HYDROGEN CONFERENCE 2022**  
Windhoek, 16th-17th August 2022

Dr. Hans Dieter Hermes  
Vice President Hydrogen, Worley



# A leader in the Energy Transition

delivering a more sustainable world



3415+ Project Experiences

210+ Hydrogen Projects, up to 36 GW

840+ Wind Projects

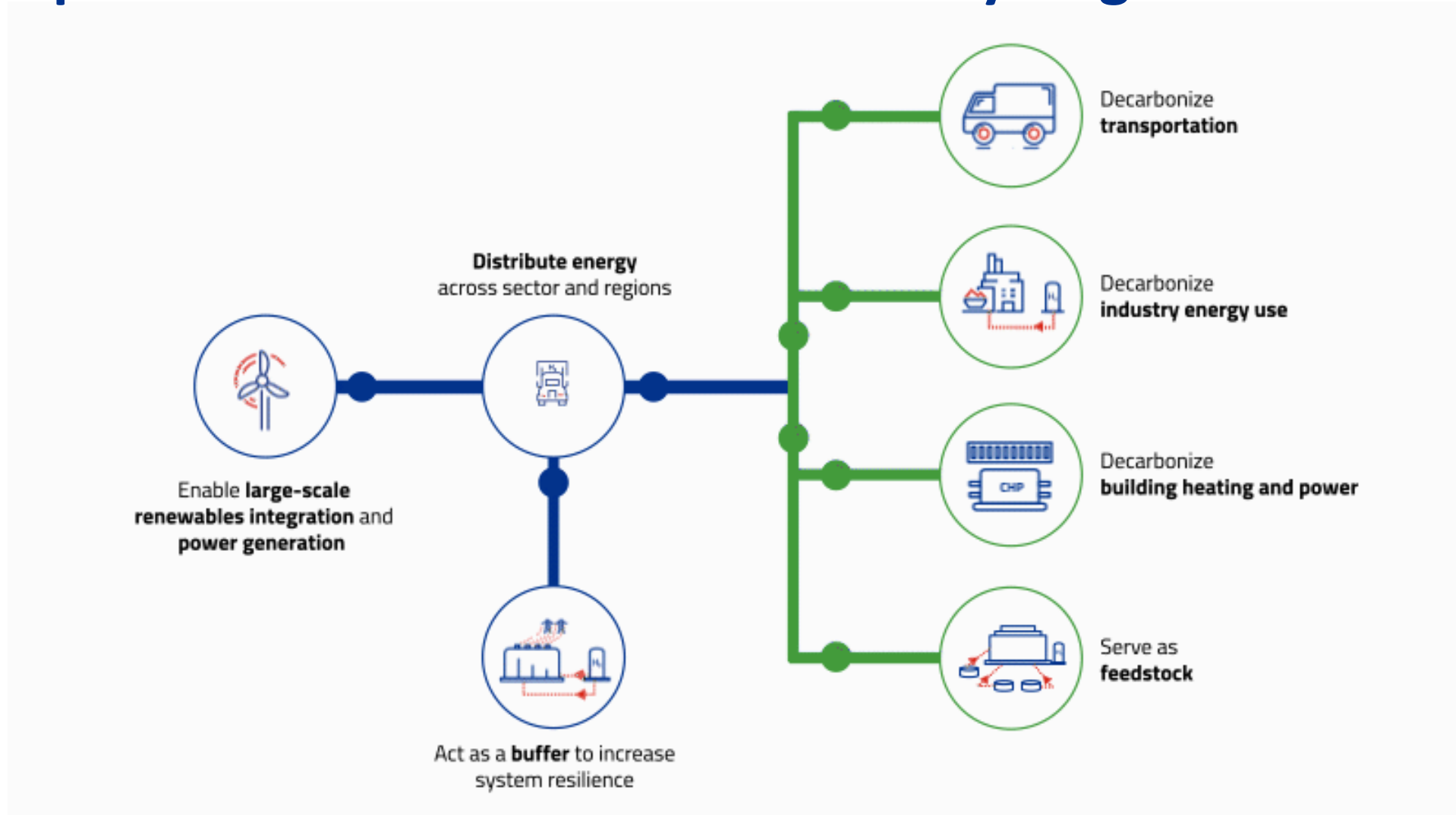
400+ Solar Projects

300 Renewable Fuel Projects

# Agenda

- **Hydrogen Market** *scaling up globally*
- **Hydrogen Supply** *hot spots – cost – key elements*
- **Boosts and Barriers** *pathways to hydrogen market 2050*

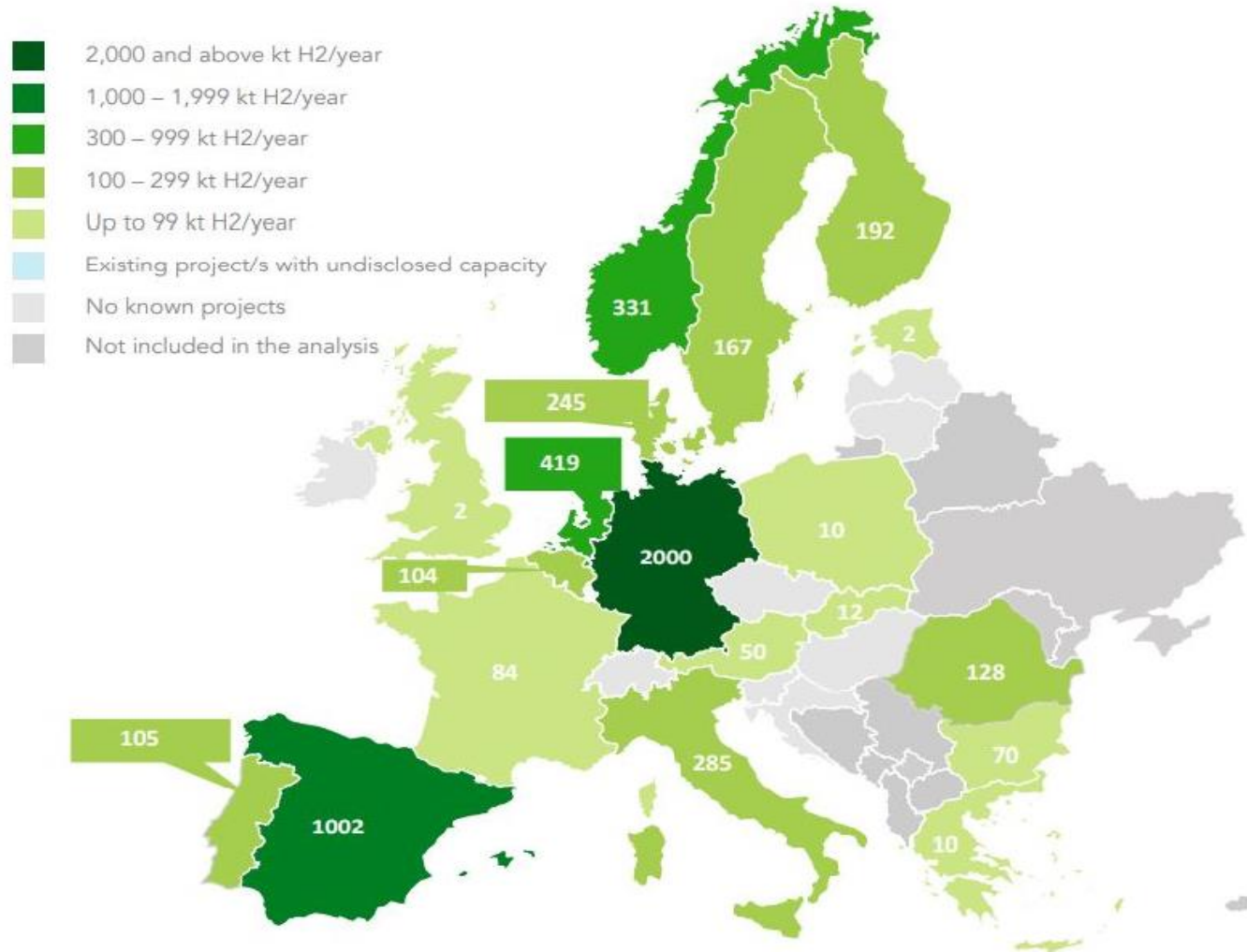
# High Expectations: Decarbonization and Hydrogen Demands



**Demands from all sectors will require large installed capacities and an international trade market.**



# The European Hydrogen Demand Landscape: Large imports to come



Map of total planned clean hydrogen consumption by country in ktH2/year by 2030.  
Source: „Hydrogen Monitor 2021“, Hydrogen Europe Association, Oct. 2021

European Commission's  
“REPowerEU” Plan

Targets for Green Hydrogen by 2030:

10 million tons of domestic production

+

10 million tons of imports

# Agenda

- Hydrogen market
- **Hydrogen Supply**
- Boosts and Barriers

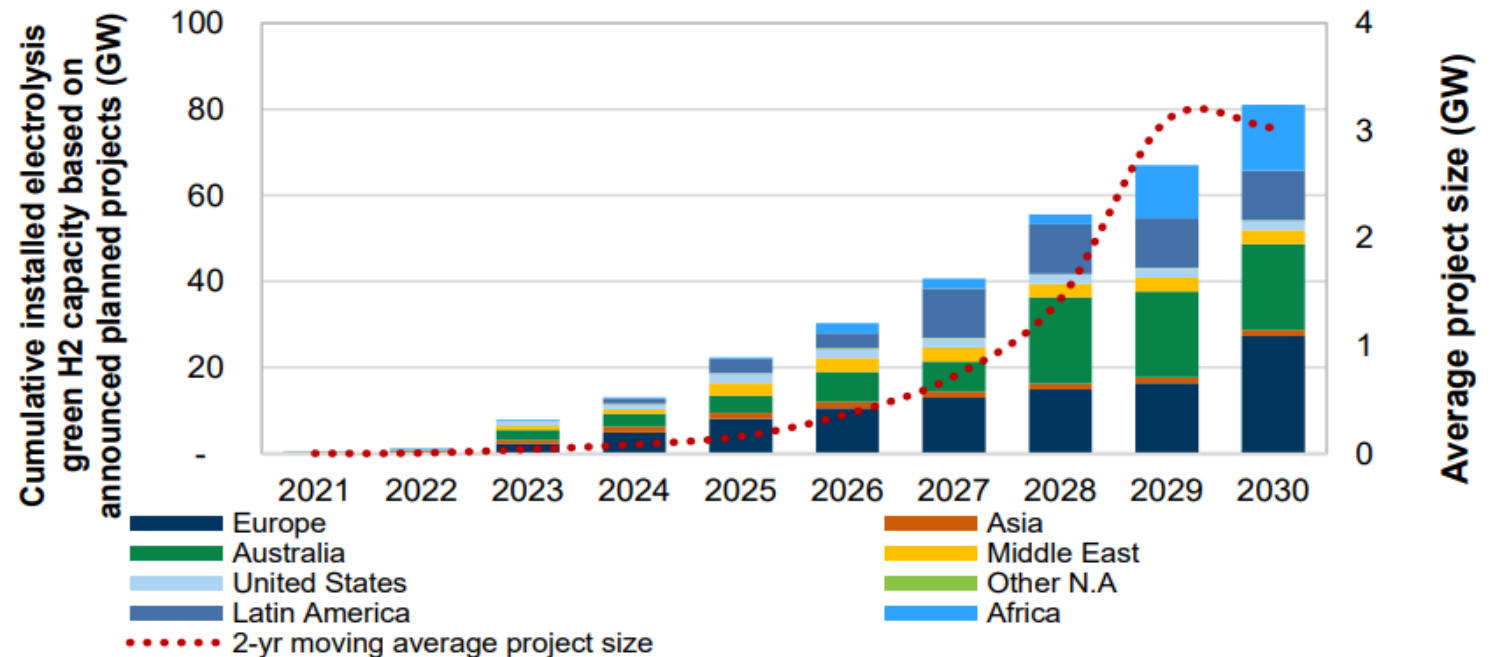
hot spots – cost – key elements

# Green Hydrogen Projects Pipeline

“Europe leads the green hydrogen projects pipeline in the near term....

...and **Africa** scaling up notably post 2025”

Cumulative installed electrolysis capacity based on announced/planned green hydrogen projects

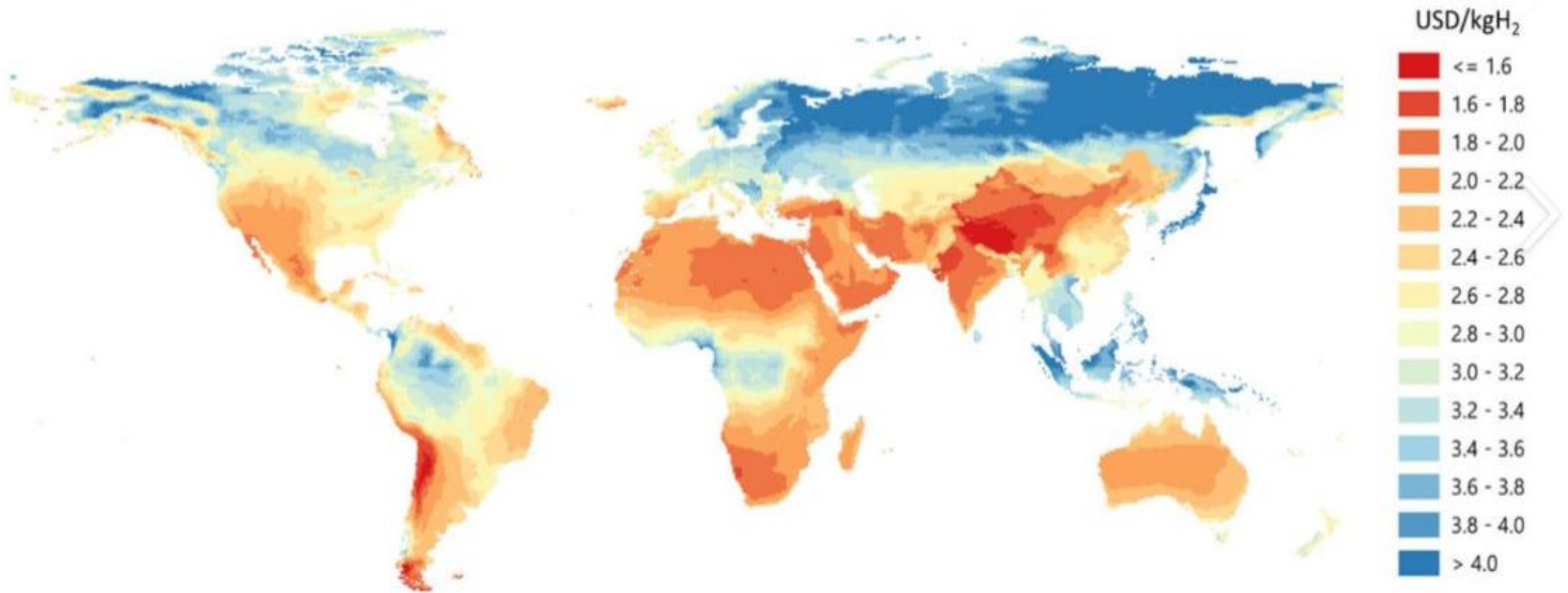


Source: Goldman Sachs Global Investment Research



# World wide hydrogen supply hot spots:

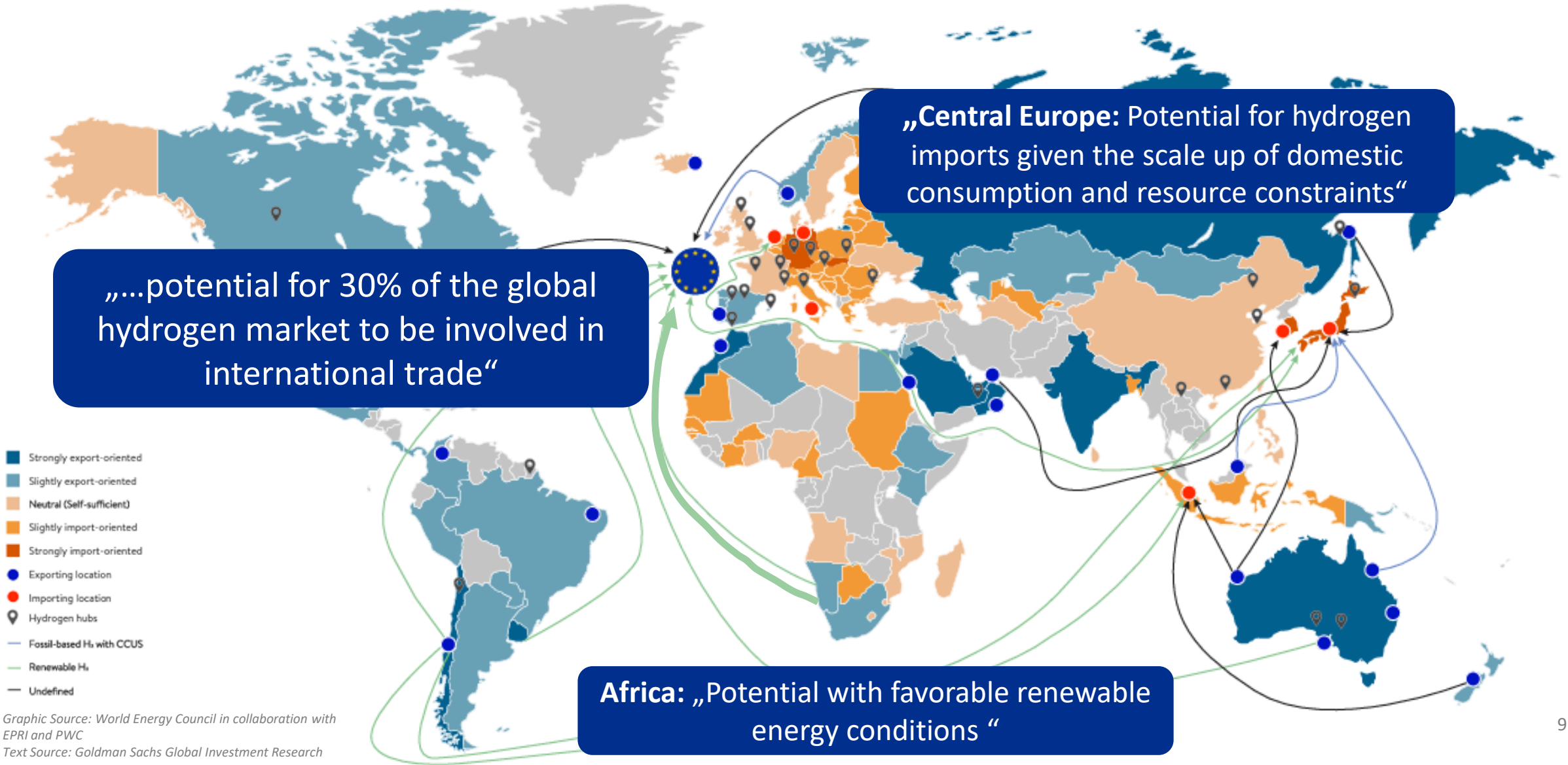
Hydrogen production costs from hybrid solar PV and onshore Wind systems





# Hydrogen trade routes

Map of potential low-carbon hydrogen import-export dynamics in 2040

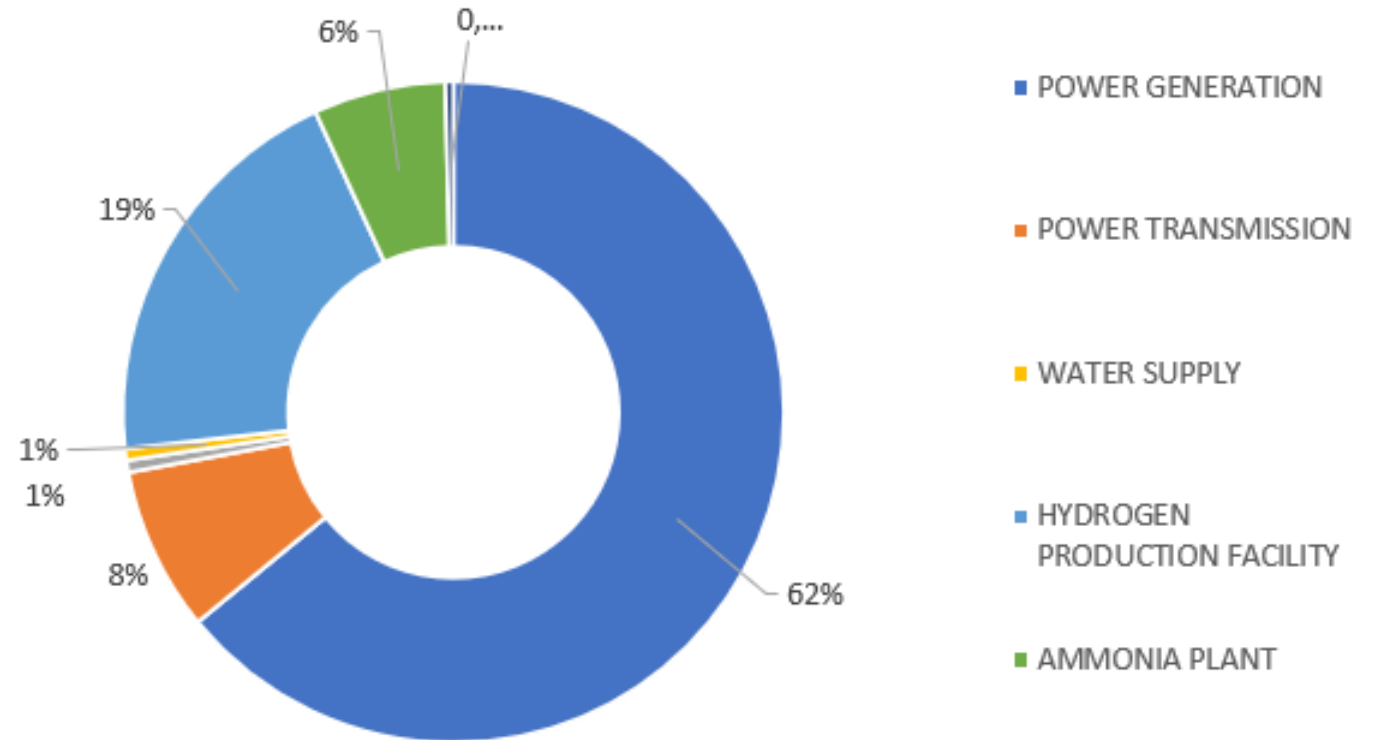


Graphic Source: World Energy Council in collaboration with EPRI and PWC

Text Source: Goldman Sachs Global Investment Research

# Investment Cost are driven by solar and wind energy

**Power Generation  
(Wind, Solar),  
Transmission &  
Distribution  
make ~70 % of the  
Total Investment Cost**

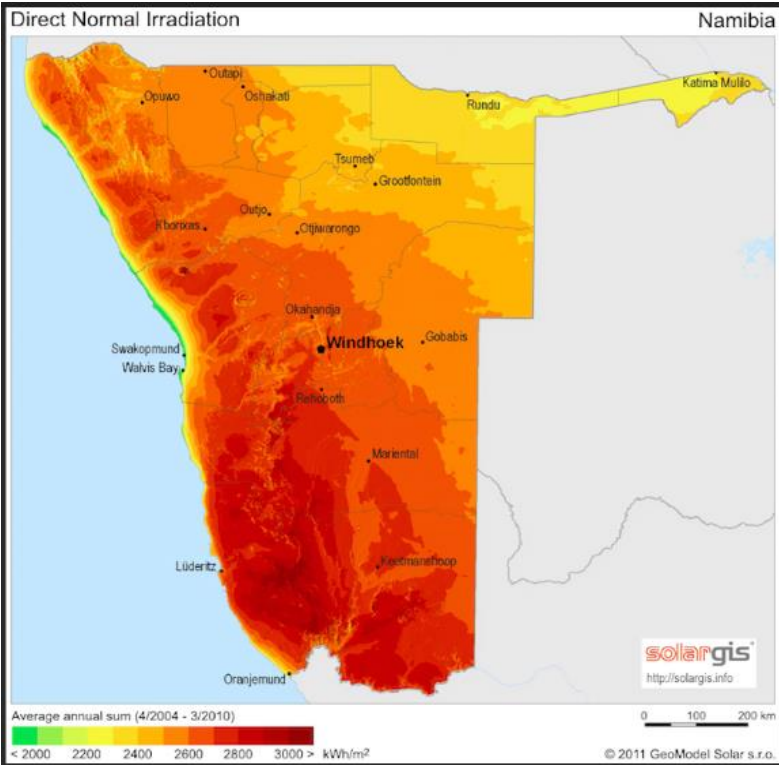


Typical Cost Breakdown of a Greenfield Green Ammonia Project

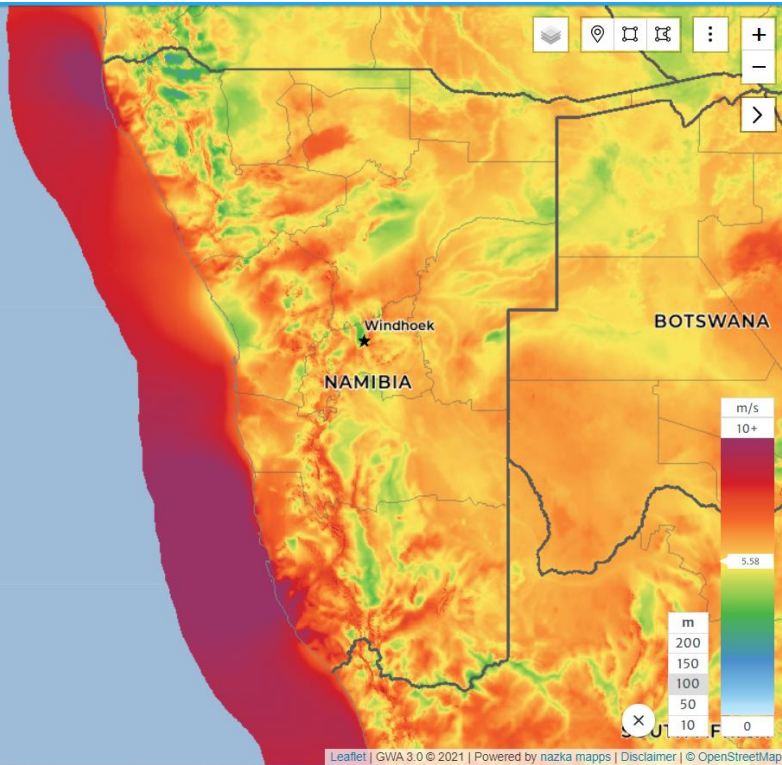


# The key elements in Namibia....

## Solar



## Wind



## Ports



SOLAR RESOURCE MAP  
**PHOTOVOLTAIC POWER POTENTIAL**

WORLD BANK GROUP  
 ESMAP SOLARGIS

<https://globalwindatlas.info>

<https://www.globeinst.org>

# ...and the future enabling elements



Regulatory Frameworks



Infrastructure



Supply Industry



Available Trained Specialists



# Agenda

- Hydrogen Market
- Hydrogen Supply
- **Boosts and Barriers** pathways to hydrogen market 2050



# Boosts and Barriers for Decarbonization

## Technology Development

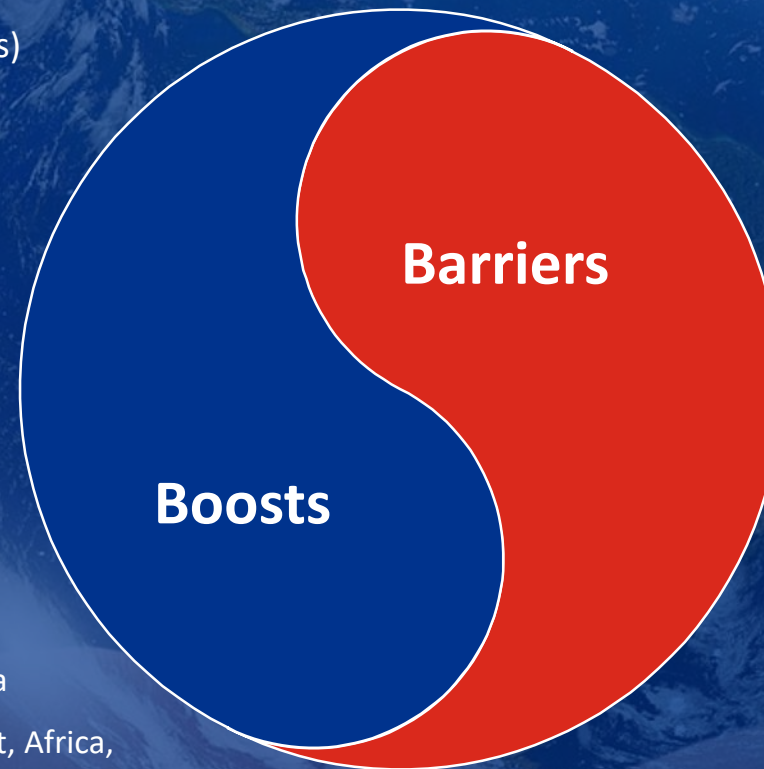
- Upscaling size of electrolysis (e. g. increased number of stacks, modules)
- Improvement in performance and energy efficiency
- Innovation along the entire value chain

## Markets for Hydrogen

- High future demand from all sectors
- High development activities for hydrogen supply from emerging markets
- Hydrogen supply based on
  - Offshore wind: e.g., N-Europe, N-America
  - Solar and onshore wind: e.g., Middle East, Africa, Australia , ...

## Cooperation

- New project partnerships (off-taker + developer, port with port, etc.)
- Cross-regional partnerships: X with Australia, MENA, Namibia,...



## Regulatory Requirements

- Drive standardization/taxonomy, certification
- Offtake facilitation instruments (CfD, guarantees)
- Enable forming of a hydrogen products trading price

## Supply Chains

- Security of supply – international trade routes
- Cost of components: e. g. PV panels from ~500 to >800 €/kW are a 2022 peak? Or the new normal?
- Development of local supply chains
- Circular economy and environmental questions

## Infrastructure and shipping

- Shared Assets for projects (pipelines, HV-Lines,...)
- Investments in ports (“hydrogen ready” terminals), storage capacities, pipelines, distribution
- Shipping: various technologies for different end products possible



**Governments, developers,  
investors, suppliers, engineers,  
researchers, traders, off-takers,  
and societies, need to cooperate,**

**to remove the barriers  
to scale up low carbon hydrogen  
to meet the demand.**

**Then, we do have a chance to  
reach net zero emissions by 2050.**

**Dr. Hans Dieter Hermes**  
Vice President Hydrogen  
Hansdieter.hermes@worley.com



# Additional Information



# Delivering our five-year ambition:

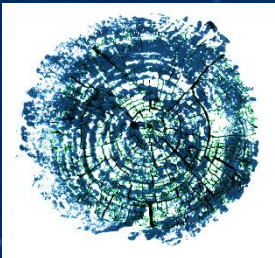
We will be recognized globally as the leader in sustainability solutions

## Our Ambition



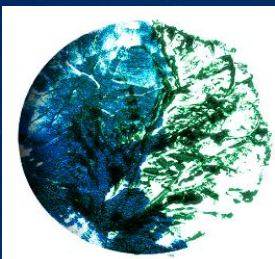
## Our People

We energize and empower our people to drive sustainable impact



## Our Portfolio

We are our customers' most trusted partner, providing best-in-class solutions



## Our Planet

We partner with customers as stewards of a more sustainable world

~\$7.5b

value of all wins<sup>3</sup> in  
FY22 to end Q3

Up 30% on pcp

~\$3m

average size (revenue)  
of traditional project  
wins<sup>4</sup>

Up 22% on pcp

↑ 67%

FY22 Q3 average  
sustainability project  
win size by revenue<sup>4</sup>

on pcp

2200+

FY22 Q3 number of  
sustainability wins<sup>4</sup>

Up 10% on pcp

\$15.4b

Backlog at 31-Dec-21  
(excluding Russian  
contracts)

~\$3.7b

backlog as at  
31-Mar-22  
Sustainability-  
related business

1. TRCFR – Total recordable case frequency rate based on the number of cases per 200,000 hours worked  
2. SCFR – Serious case frequency rate y

3. Represents the expected revenue for project wins in FY22  
4. Across FY22 up to end Q3, and comparison with Prior Corresponding Period (PCP) is FY21 up to Q3