

Integrated Solutions for H₂ Economy

Stefanie Peters, Managing Partner of NEUMAN & ESSER GROUP

World Hydrogen Energy Summit 2021

November 2021

Family business since 1830

NEUMAN & ESSER GROUP



Lead by Peters family in
4th Generation



Taking the entrepreneurial risk in 10 countries with
30 companies combined in 5 business units

Caring for over 1300
employees and their families



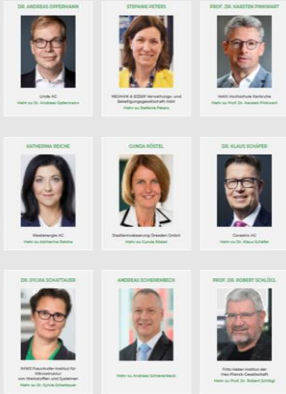
The
Federal Government



NATIONALER
WASSERSTOFFRAT

Accepting personal and social
responsibility in various organisations for
a sustainable future economy

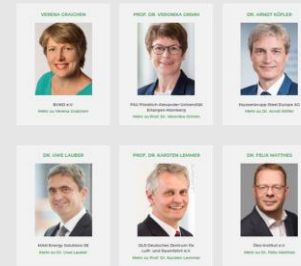
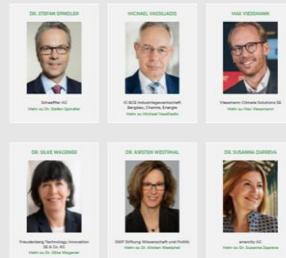
The National Hydrogen Council (NHC) advises the German government in development and implementation of H₂ strategy



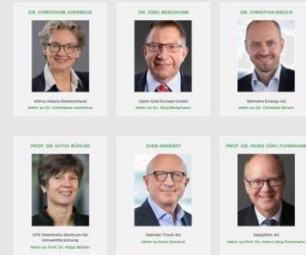
Commissioned in June 2020 together with the resolution on the National Hydrogen Strategy



Composed to depict a representative sample of major stakeholders in the H₂ Economy



Wasserstoff Aktionsplan Deutschland 2021–2025

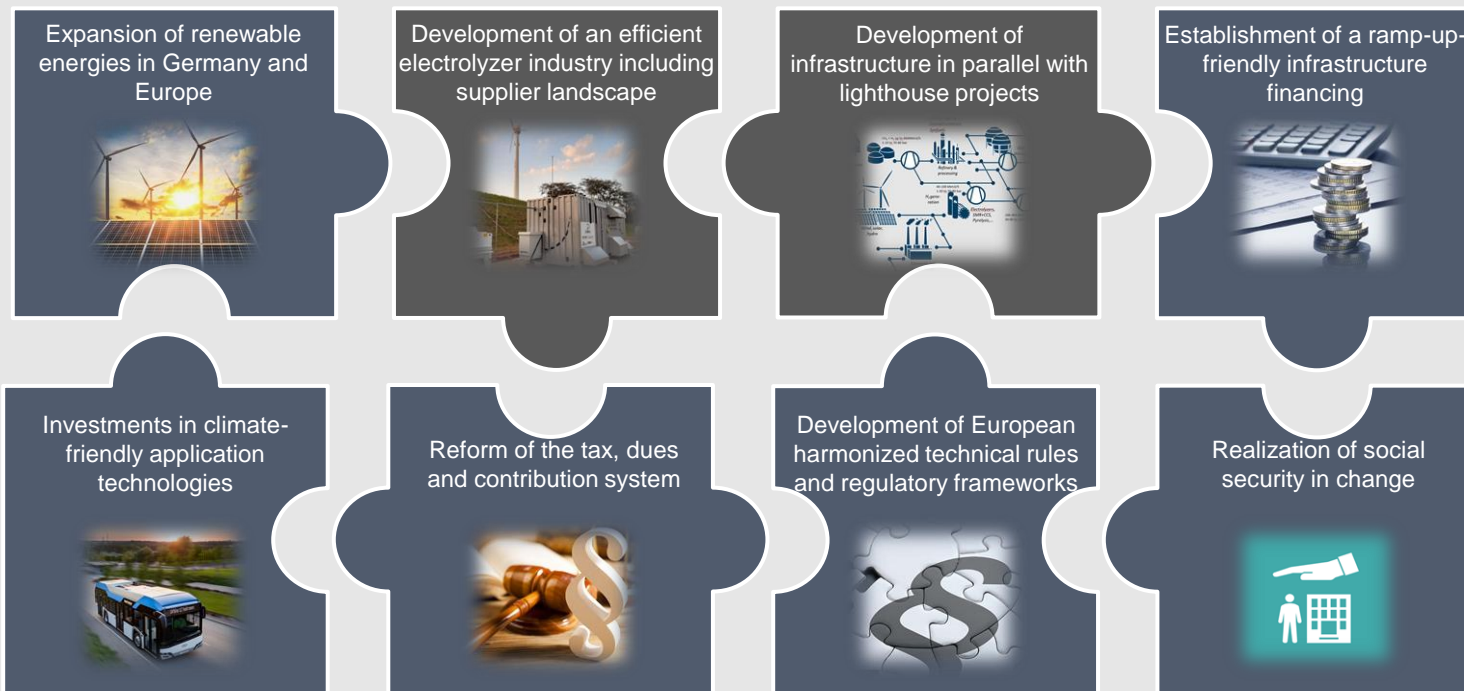


After several

- Position papers
- Statements
- Recommendations

The Hydrogen Council released a comprehensive “Hydrogen Action Plan for Germany 2021-2025” in Summer 2021

The NHC identified eight critical preconditions for the success of the German H₂ Economy – most of them are political



Legend:

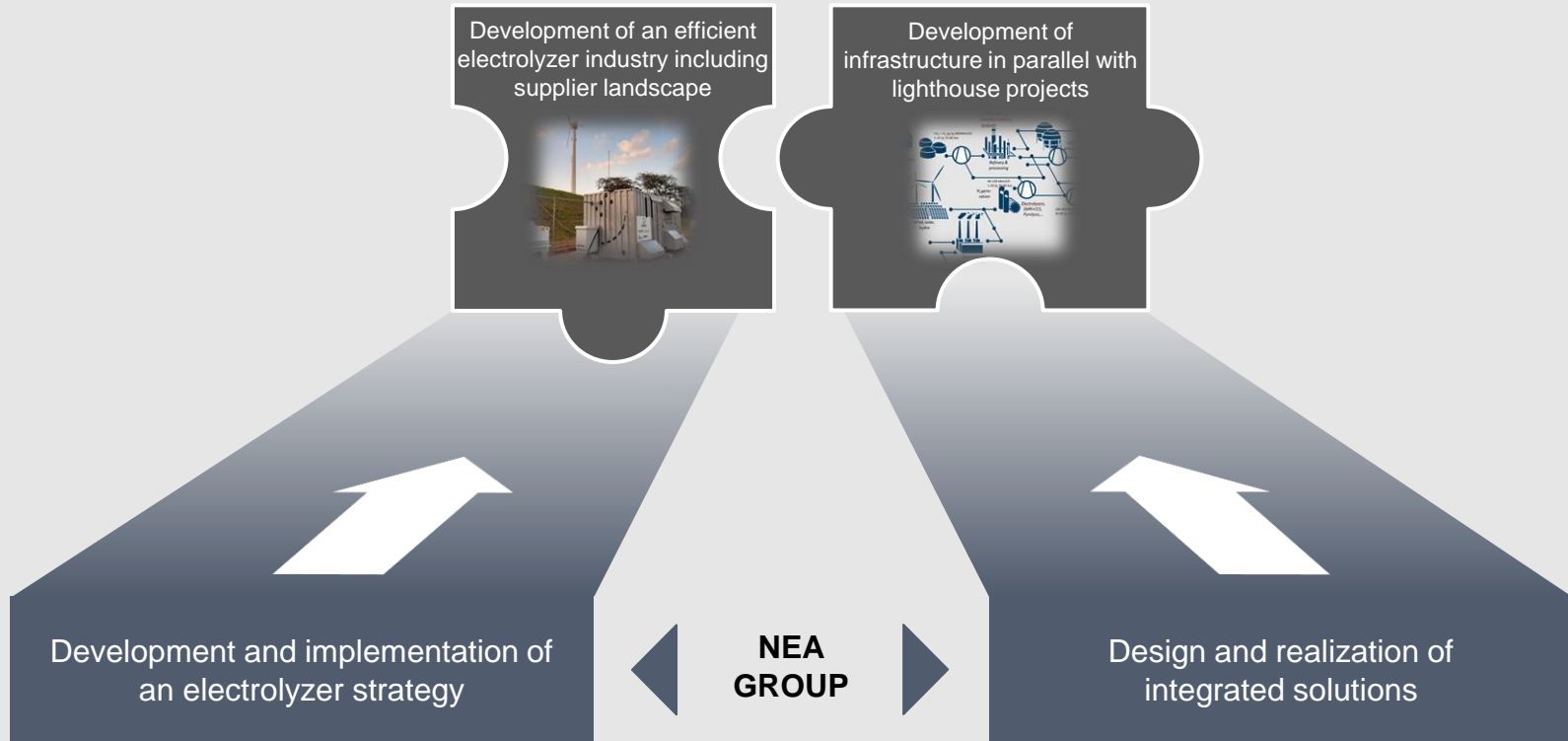


more political



more industrial

Two of the preconditions offer direct chances for industry – NEA GROUP with its long-standing experience took this chance



From compressor systems to integrated solutions for the H₂ Economy



“H₂ Experience for decades”

Design of compressor plants and hydrogen refueling systems with different technologies for several applications

Basic Strategy 2025

Complete redesign of our group wide strategic approach

Sustainability Strategy

Preparing for a climate neutral NEA GROUP in 2045



1830

2010

2015

2021

Structural Changes

Far reaching changes of our corporate governance structures

Product Portfolio Strategy

Diversification of our portfolio in order to match upcoming market needs

“Electrolyzer Strategy”

Development and realization of an electrolyzer production system including the supplier landscape

Paris Agreement
(December 2015)

Green Deal
(December 2019)

NWS
(June 2020)

Abbreviation: NWS = Nationale Wasserstoffstrategie (in English: National Hydrogen Strategy)



How we prepare the ramp-up of our integrated solutions



1 Building up experts

Integration of Hytron Energy & Gas into NEUMAN & ESSER GROUP



2 Development of product and production strategy

Development of integrated electrolyzer-compressor solutions and establishment of a new factory supported by IPCEI



3 Building up a high-performance supplier & customer landscape

Conclusion of cooperation agreements both at domestic and international level with suppliers and future customers



Abbreviation: IPCEI = Important Projects of Common European Interest

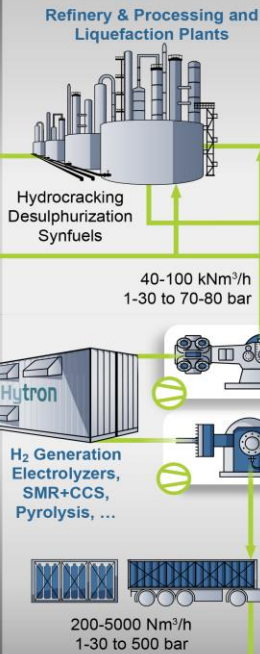
The NEA GROUP Portfolio for the H₂ Value Chain



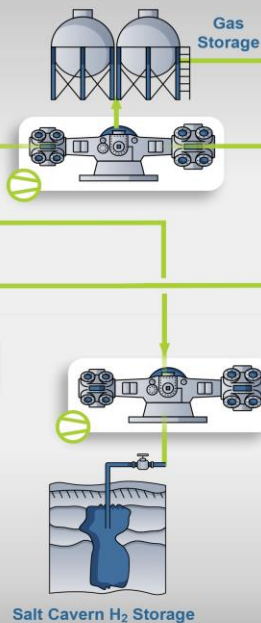
Primary Energy



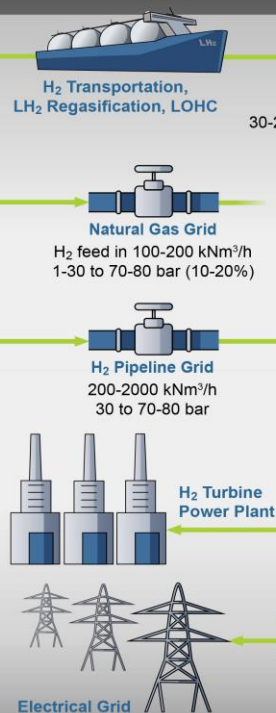
Conversion & Processing



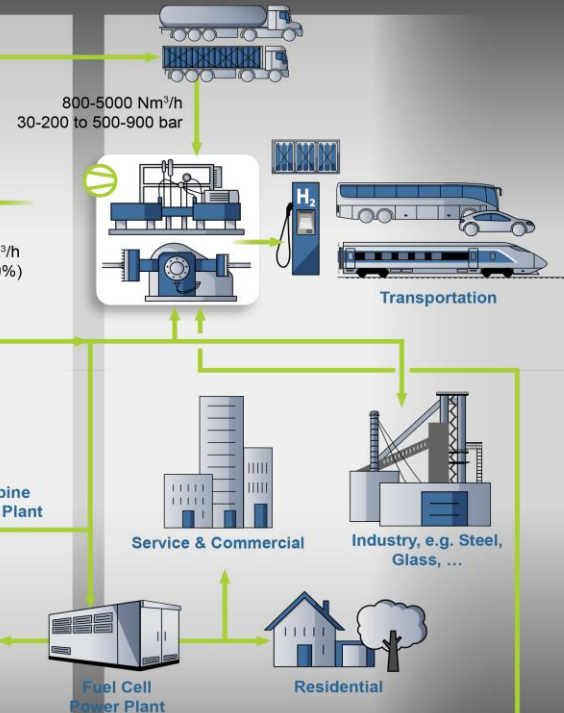
Storage



Transport & Distribution



Final Energy Demand



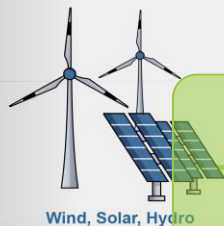
The NEA GROUP Portfolio for the H₂ Value Chain



Primary Energy



Biomass
CH₄ + H₂ up to 8000 Nm³/h
1-10 to 70-80 bar



Wind, Solar, Hydro



Surplus Power from
Conventional Power Plant



Conversion & Processing

Refinery & Processing and
Liquefaction Plants



Hydrocracking
Desulphurization
Synfuels

40-100 kNm³/h
1-30 to 70-80 bar

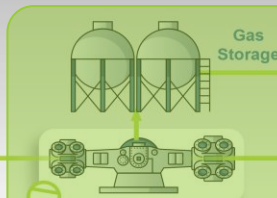


H₂ Generation
Electrolyzers,
SMR+CCS,
Pyrolysis, ...

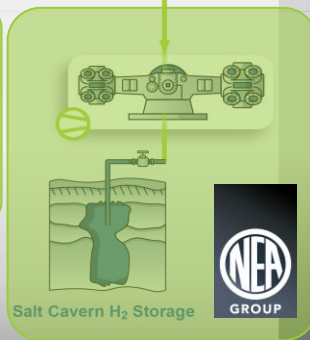


200-5000 Nm³/h
1-30 to 500 bar

Storage



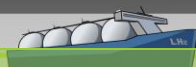
Gas
Storage



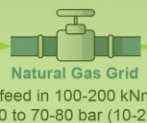
Salt Cavern H₂ Storage



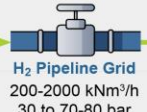
Transport & Distribution



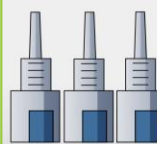
H₂ Transportation,
H₂ Regasification, LOHC



Natural Gas Grid
H₂ feed in 100-200 kNm³/h
1-30 to 70-80 bar (10-20%)



H₂ Pipeline Grid
200-2000 kNm³/h
30 to 70-80 bar



H₂ Turbine
Power Plant

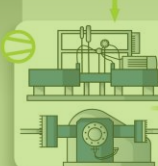


Electrical Grid

Final Energy Demand



800-5000 Nm³/h
30-200 to 500-900 bar



Transportation



Commercial



Industry, e.g. Steel,
Glass, ...



Fuel Cell
Power Plant



Residential

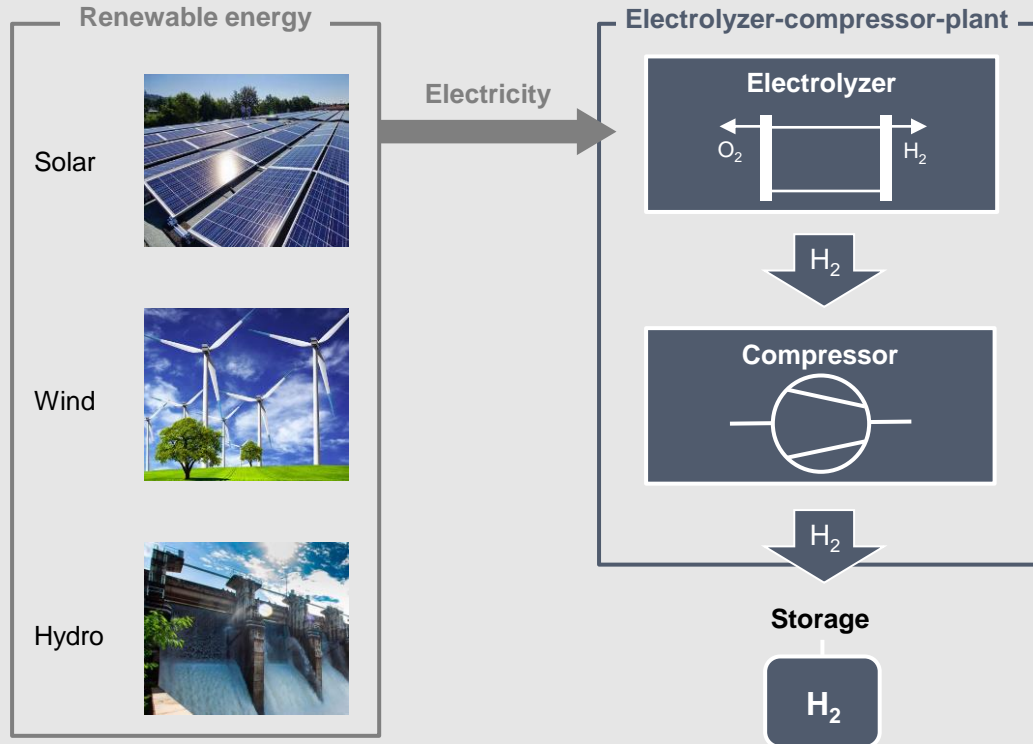


AE

ALTERNATIVE
ENERGY
DRIVEN
SOLUTIONS

Integrated solution for production of green hydrogen*

Integrated solution for green hydrogen



Data from a project

2 MW PEM-electrolyzer



Discharge pressure [bar(a)]
H₂ volume per year [kg]

30-40
ca. 130,000 kg

Diaphragm compressor (KTD180)



Suction pressure H₂ [bar(a)]
Discharge pressure H₂ [bar(a)]
Standard flow rate [Nm³/h]
Power [kW]

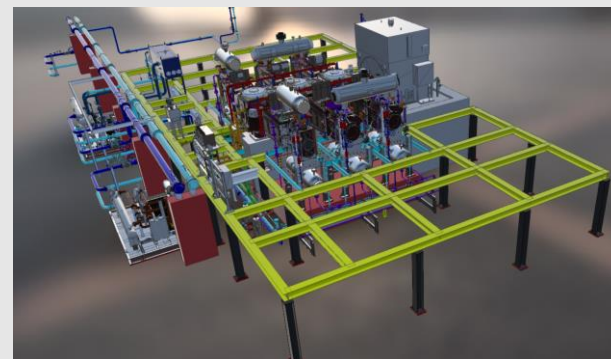
30-40
410
402
25

H₂ Piston compressor for storage and transport



H₂ Piston compressor for caving storage

Stage	2
Gas	H ₂
Suction pressure [bar(a)]	60
Suction temperature [°C]	20
Discharge pressure [bar(a)]	200
Standard volume flow [Nm ³ /h]	300,000
Power [MW]	15



H₂ Piston compressor for the gas pipeline network

Stage	1
Gas	H ₂
Suction pressure [bar(a)]	25
Suction temperature [°C]	20
Discharge pressure [bar(a)]	75
Standard volume flow [Nm ³ /h]	494,200
Power [MW]	20,5



*The data refer to completed projects

Integrated solutions for Hydrogen Refueling Stations (HRS)

Design of compressors for HRS

**Piston
compressor with
hydraulic drive**



**Diaphragm
compressor**

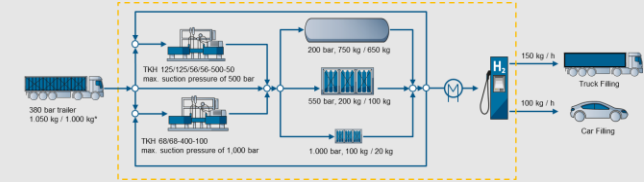


Integrated
HRS
solution

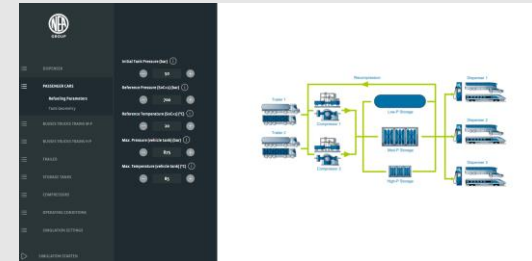


Development of concepts for HRS & simulations

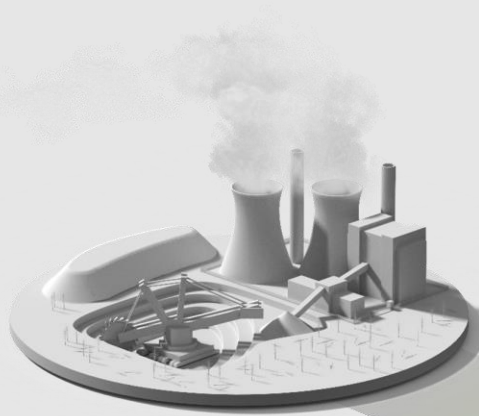
Development of the HRS concept



Dynamic simulation of the concept



Development to a provider for integrated solutions



From a local machine manufacturer ...

... to become a global provider of integrated solutions



Summary and conclusion



I

Based on our experience with hydrogen from classic applications in OIL & GAS, we decided early to play an active role in the upcoming H₂ economy.

Every company has to decide to take the chances and to accept the challenges or not.

II

The National Hydrogen Council advises the German government in development and implementation of the H₂ strategy.

Familiarize yourself with the "big" strategies of your country - you can only be successful in the H₂ market if you fit and function as a piece of the puzzle in the overarching system.

III

For taking the challenges of the H₂ Economy, we realigned our strategies – from the basic setup to our product portfolio.

Ultimately you need the right people and partnerships – H₂ is no one-man-show.

IV

We come from a local manufacturer and became a global provider of integrated solutions for the H₂ Economy.

Be brave to go to new shores and try to stay in your lane even if it is hard sometimes.

Integrated Solutions for H₂ Economy

Stefanie Peters, Managing Partner of NEUMAN & ESSER GROUP

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November 2021

