Energiewende gestalten – Transformation, Technologien und Europäische Wertschöpfung

Highlights der Energieforschung: Potenziale nutzen & Zukunft gestalten

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Vice President Hydrogen & Industrial Energy

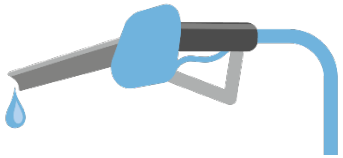
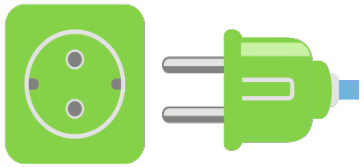
The future Energy System

Scenario Austria 2050

Public

Net Zero Scenario for Austria 2050

All values in TWh

							
Mobility	Passenger Cars	47,1		11,6		1,6	
	Truck Light	6,8	23,5	2,8	9,0	0,4	8,6
	Truck Heavy	16,7		6,1		8,2	
	Transit/Export	22,9		6,2		5,6	
	Other Mobility	15,2		2,2		12,4	
	Total Mobility	**108,8**		**29,0**	(Total: 32,8)	**28,2**	
Buildings	Gas	15,4	26,3	**7,2**	(Total: 20,5)		
	Oil	10,9					
Industry, Service, Agriculture	Gas	36,9	78,2	**25,8**	(Total: 67,8)	**39,0**	
	Oil	8,5					
	Coal	32,8					
Total		**213,3***		**62,0**	(Total: 121,1)	**67,2**	
		Status 2019		Replaced with electricity & hydrogen			

*…only end-use considered (excl. storage, export, gas for electricity production,…)

Austrian Electricity Scenario 2050 – Conclusions

- The **overall electricity demand** for Austria will **increase by ~125%** till 2050 if full decarbonization in all sectors is achieved
- In total, Austria will face an **energy deficit on balance of about 35 TWh**, excluding excess electricity this deficit increases to 44 TWh
- This energy deficit is mainly concentrated in the **winter months**
- The potential of **excess electricity** is in the range of **9 TWh**, but concentrated only over 2000 hrs
- The total **hydrogen demand** for Austria for **end use** is estimated to be **67 TWh**
- A significant amount of **hydrogen needs to be imported**, as local production of the full demand is unrealistic
- If the renewable electricity gap is partly closed by hydrogen power plants, the **total hydrogen demand** will increase up to **100 TWh**

Hydrogen and Hydrogen derivates will play a key role in decarbonization to supplement and close the gaps of renewable electricity in Mobility, Industry & Energy

Transformation

Public

Redrawing the Lines of Electrification

E-Mobility

We are relentlessly striving towards climate-neutral mobility. Not just by increasing the efficiency of multiple propulsion systems, but also by pioneering energy from green resources.

20+
Years of Experience

5,700+
E-Mobility Experts

900+
Executed Battery Projects

6
Fuel Cell Tech Centers

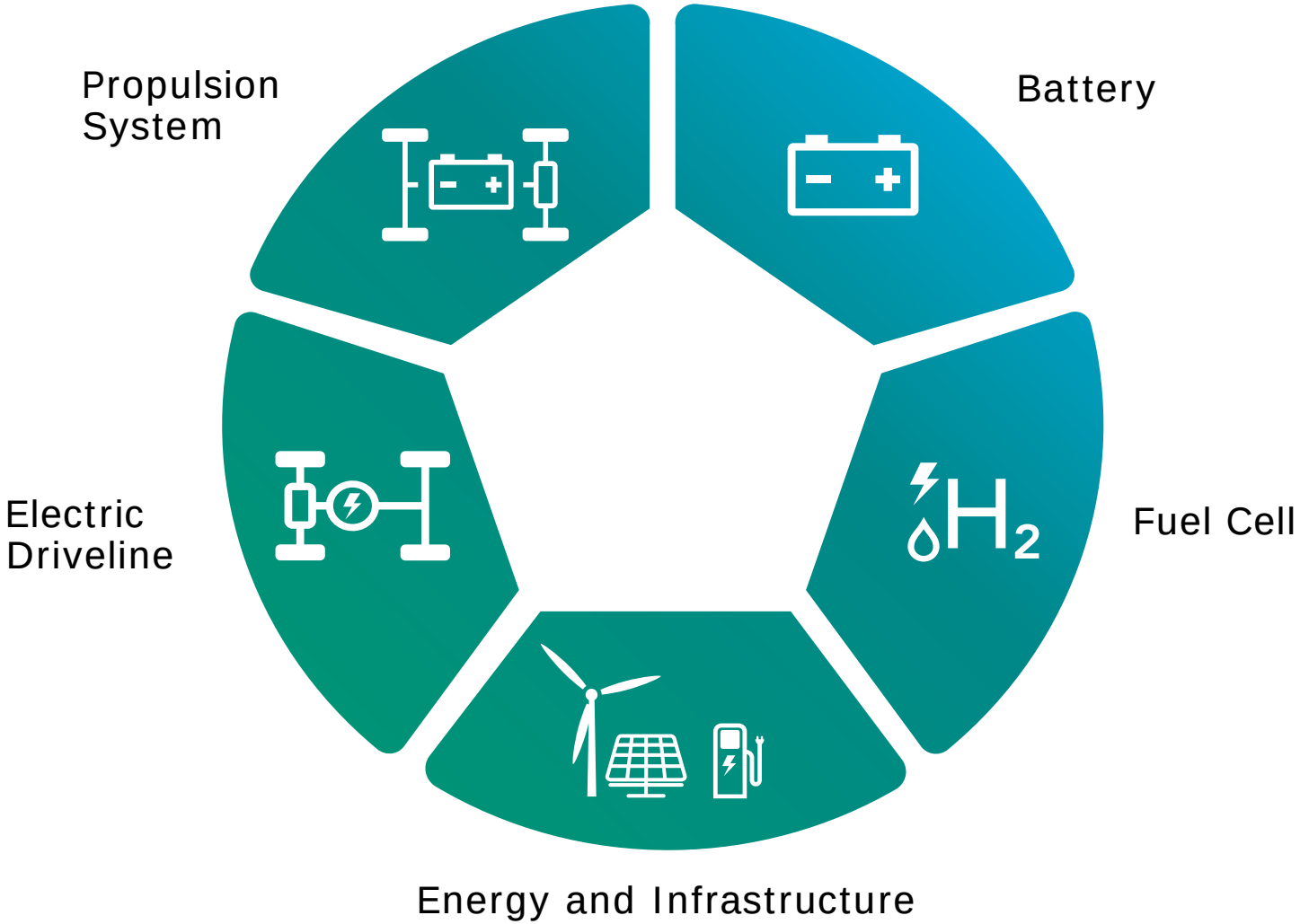
450+
Fuel Cell Engineers

300+
Executed Fuel Cell Projects

Redrawing the Lines of Electrification

E-Mobility

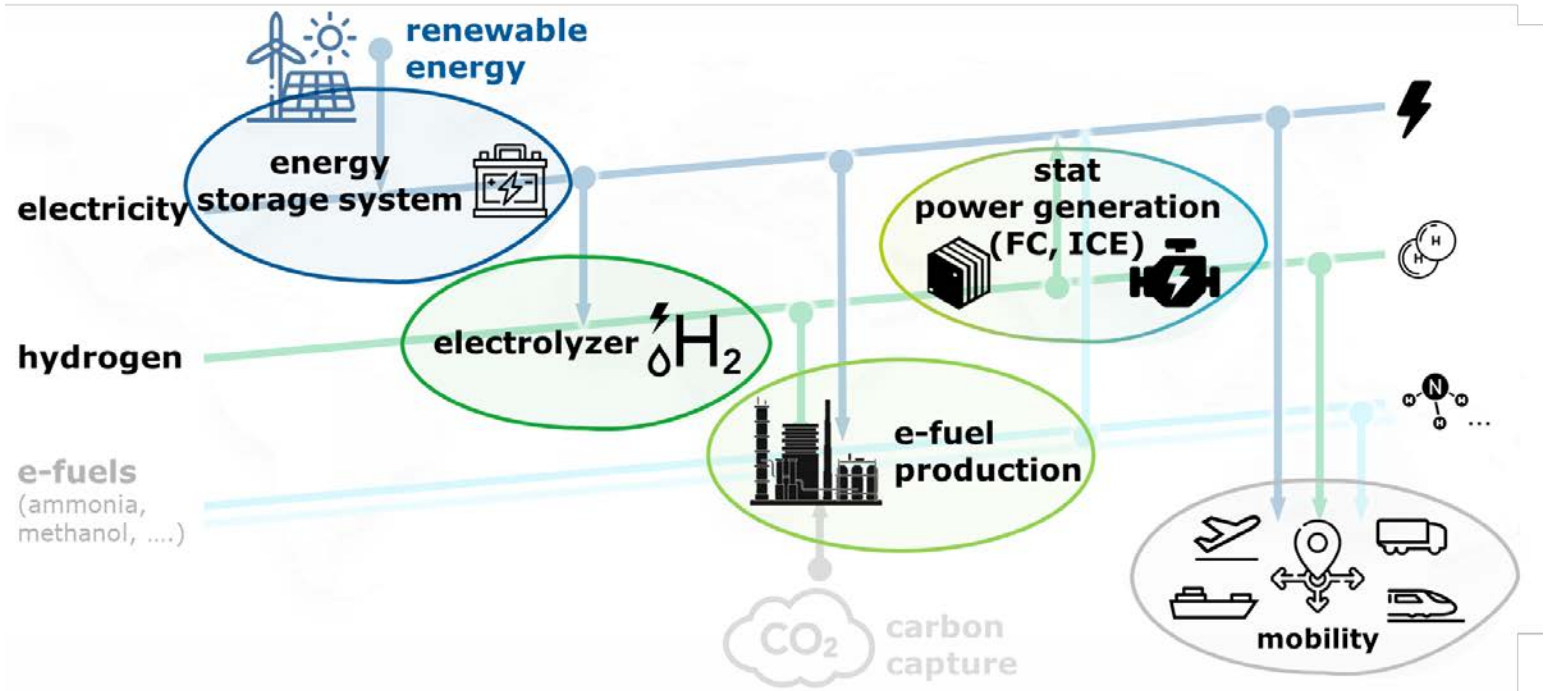
From battery to fuel cell technologies, we are paving the way for e-mobility by driving innovative and affordable solutions.



Reimagining Energy

Energy

Energy conversion & storage technologies for a future renewable energy system



15+ Years of Experience

250+ Experts

100+ Patents

6 Tech Centers

Looking Beyond the Limits of Technology

Passion for Innovation

Together with an international network of experts and with 45 Tech and Engineering Centers worldwide, we drive sustainable mobility trends for a greener future.

Styrian Innovation Award 2021 in the category of “Sustainability”.

10 %

Of Turnover Invested in Inhouse R&D

100+

University Cooperations

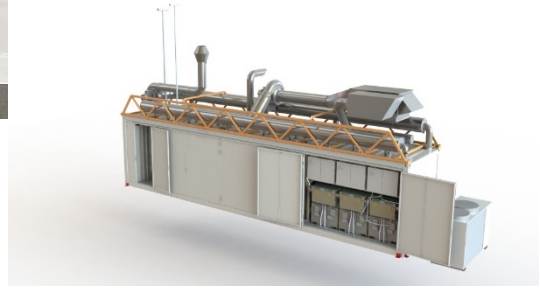
2,200

Granted Patents in Force

150+

Projects within European Programs for RTD

Next Generation Electrolyzer Technologies



NEWS

Ceres and Shell sign agreement for green hydrogen

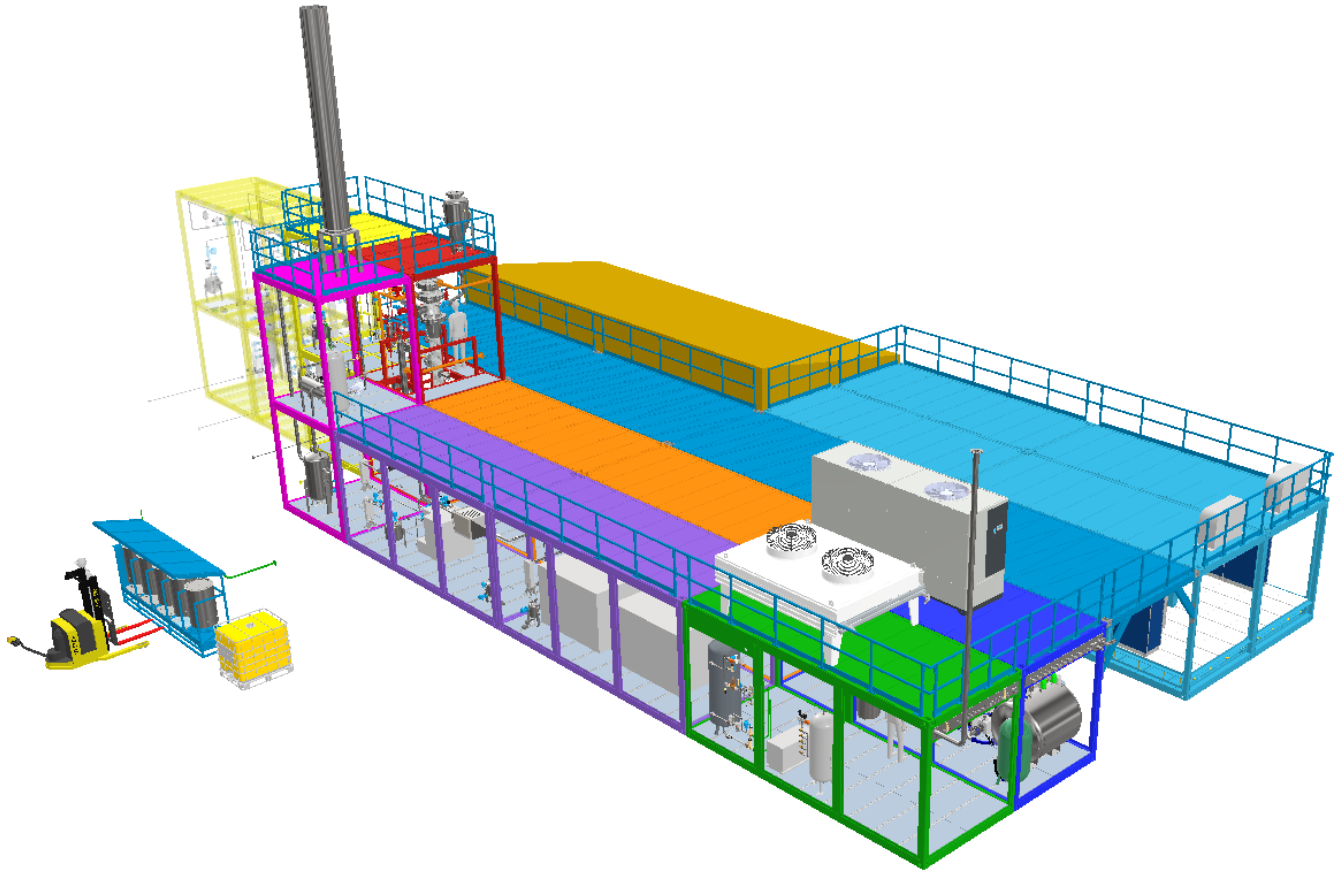
28 June 2022

- Megawatt scale demonstrator to be located in Bangalore, India
- Aim to deliver low-cost green hydrogen for industrial decarbonisation

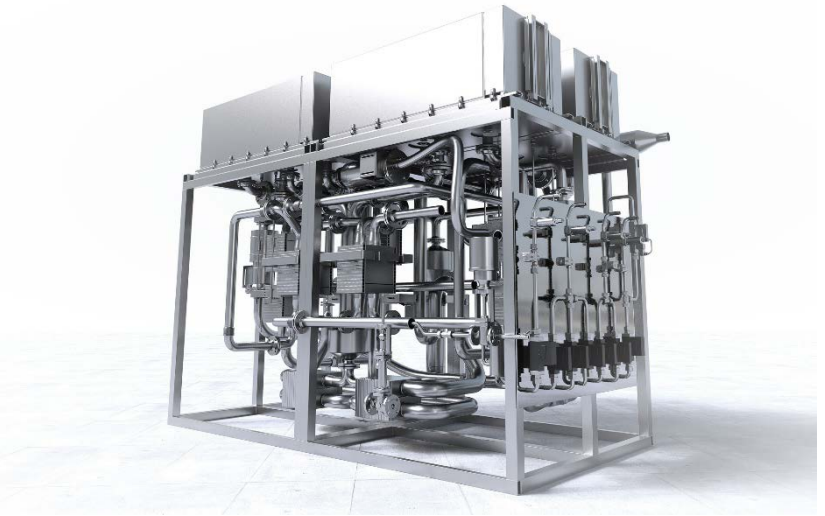
- 1MW Solid Oxide Electrolysis System
- Size: 40ft Container
- Steam electrolysis
- Efficiency:
  - **~87% demonstrated on SOEC module level!**
- Tests and commissioning @AVL Schrick ongoing

SOEC will be <u>the technology of choice</u> in industrial hydrogen and e-fuel production

SOEC Power-to-Liquid Demonstration Plant

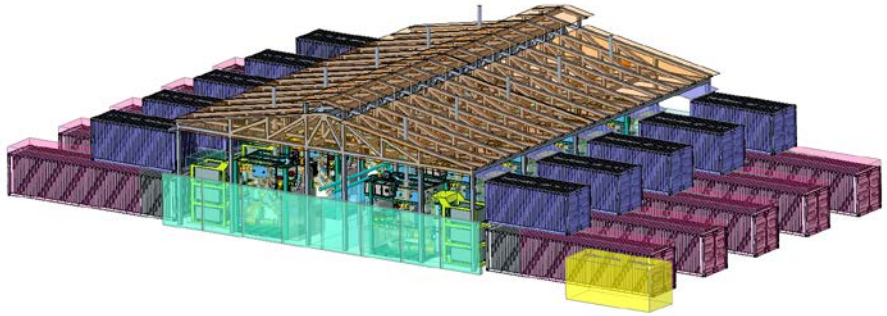


- 200kWel SOEC capacity
- ~100.000l production capacity of e-fuels per year
- Focus: Diesel and SAF (sustainable aviation fuels)
- ~400t/year CO_2 use
- >30% Efficiency Improvement in e-fuel production

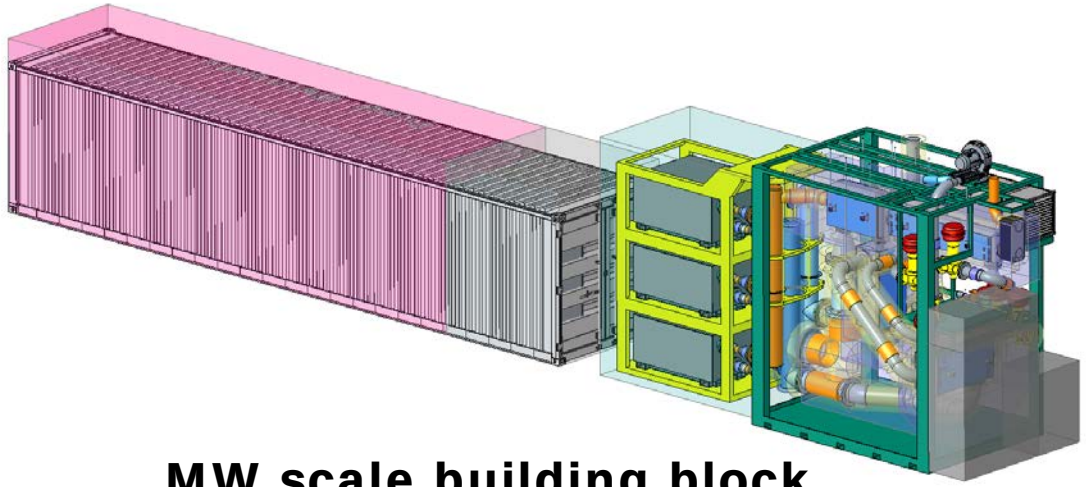


Industrialization of SOEC – AVL IPCEI Initiative

European Commission Hydrogen IPCEI initiative



10 MW Plant Layout

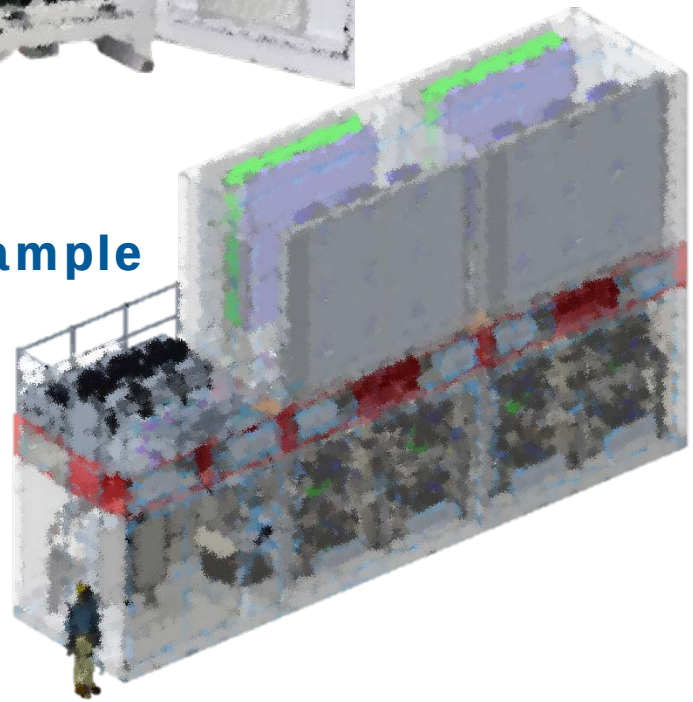


MW scale building block

H2 PEM Fuel Cell Power Generation for Data Centres

250 kW demonstrator modul

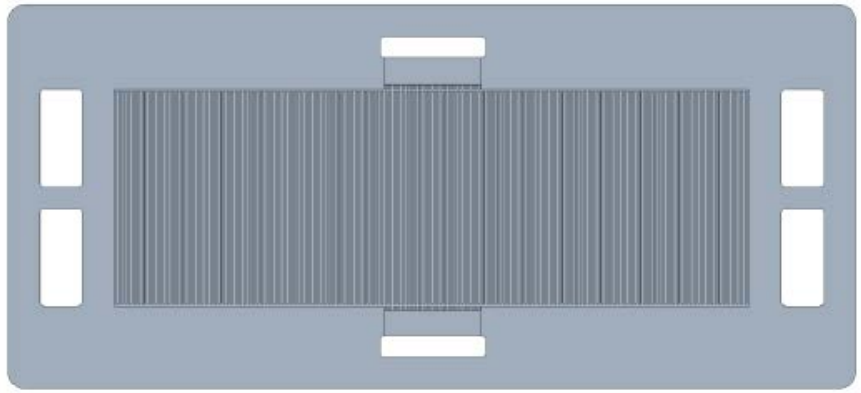
500 kW A-Sample



- Using multiple automotive fuel cell systems and components
- AVL Powerplant design, build and testing of complete hardware and controls
- Approved by authorities
- Black-start capability
- Status:
  - 500 kW demonstrator deployed at data center (03/2023)
  - 500 kW product under development (KoM 08/2023)
  - 3 MW deployment in preparation

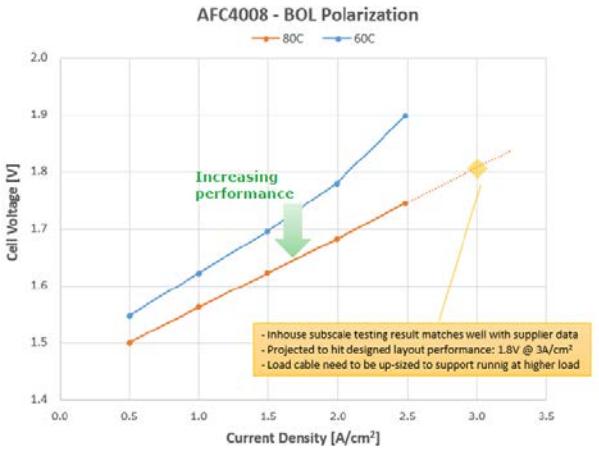
AVL PEM Electrolyzer Stack Platform

Property	Unit	Target	AVL Electrolyzer Stack (BoL)
Efficiency	kWh/kg H_2	≤ 51	~47 *incl. electrochem. compression to 20bar*
Efficiency	% $_{LHV}$	≥ 65	~71 *incl. electrochem. compression to 20bar*
Operation mode	-	Differential	Differential
Operating pressure	bar(a)	30	30



AVL Electrolyzer stack platform will be demonstrated with a short stack by end of 2024

AVL Electrolyzer stack platform could be a starting point for customer-specific electrolyzer stack design



Europäische Wertschöpfung

Public


PROTECTONISTIC
PRAGMATIC
IRA
Protecting
Industry
Driven by
Visions
Risking industrial
value creation &
competitiveness
Having
already
protected
strategic
resources
EU squeezed between two strong poles

Renewable Energy

Federal Sustainability Plan

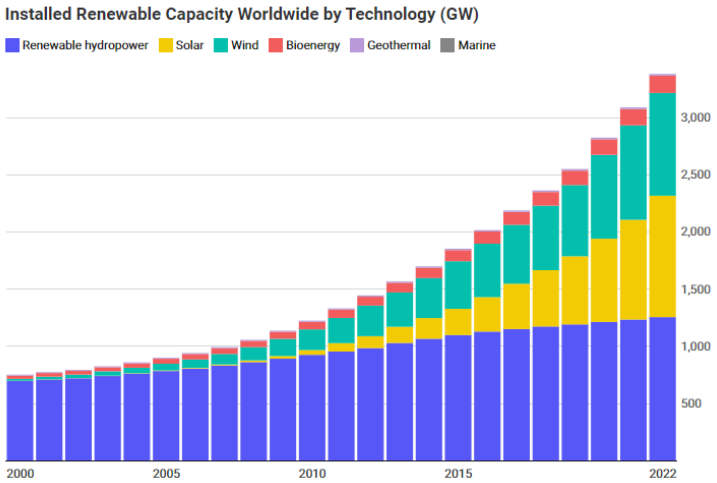
33GW PV in 2023
6GW Wind in 2023

RED

56GW PV in 2023
18GW PV in 2023

Installation targets in the Five year plan

217GW PV in 2023
90GW PV in 2023



Strong growth in PV – stagnation in wind

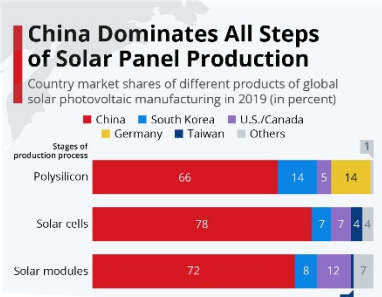
Green-Tech Production

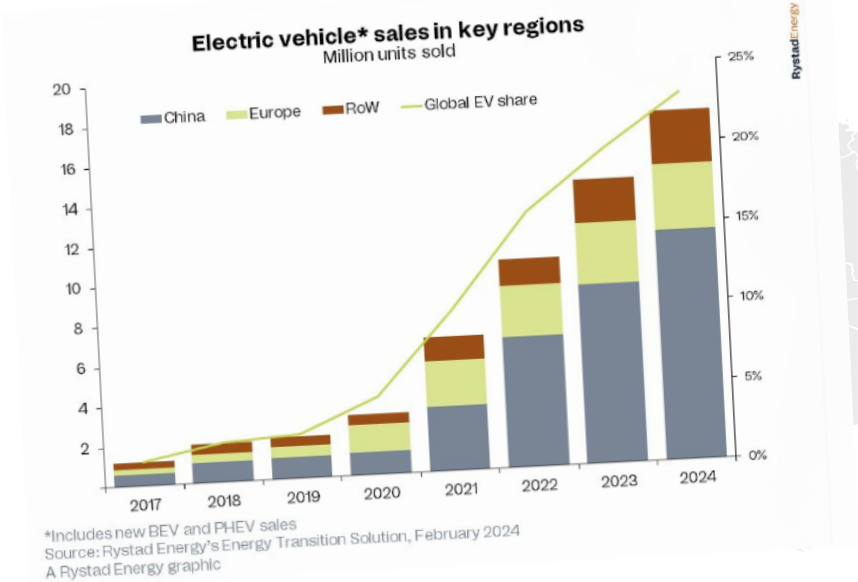
China dominates (60-80% market share):

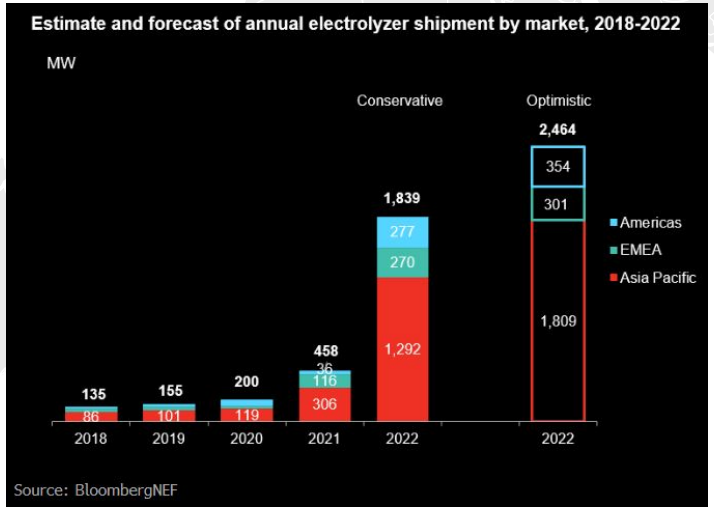
- ***Battery materials***
- ***Battery production***
- ***Photovoltaic***
- ***EV production***
- ***Electrolyzer production***
- ***Fuel cell vehicle production***

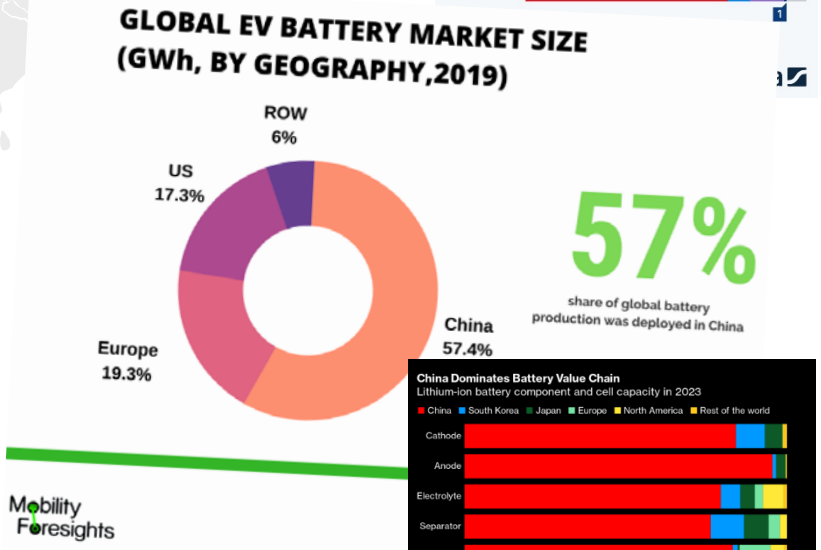
IRA

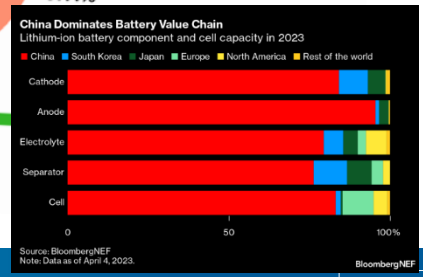
NZIA





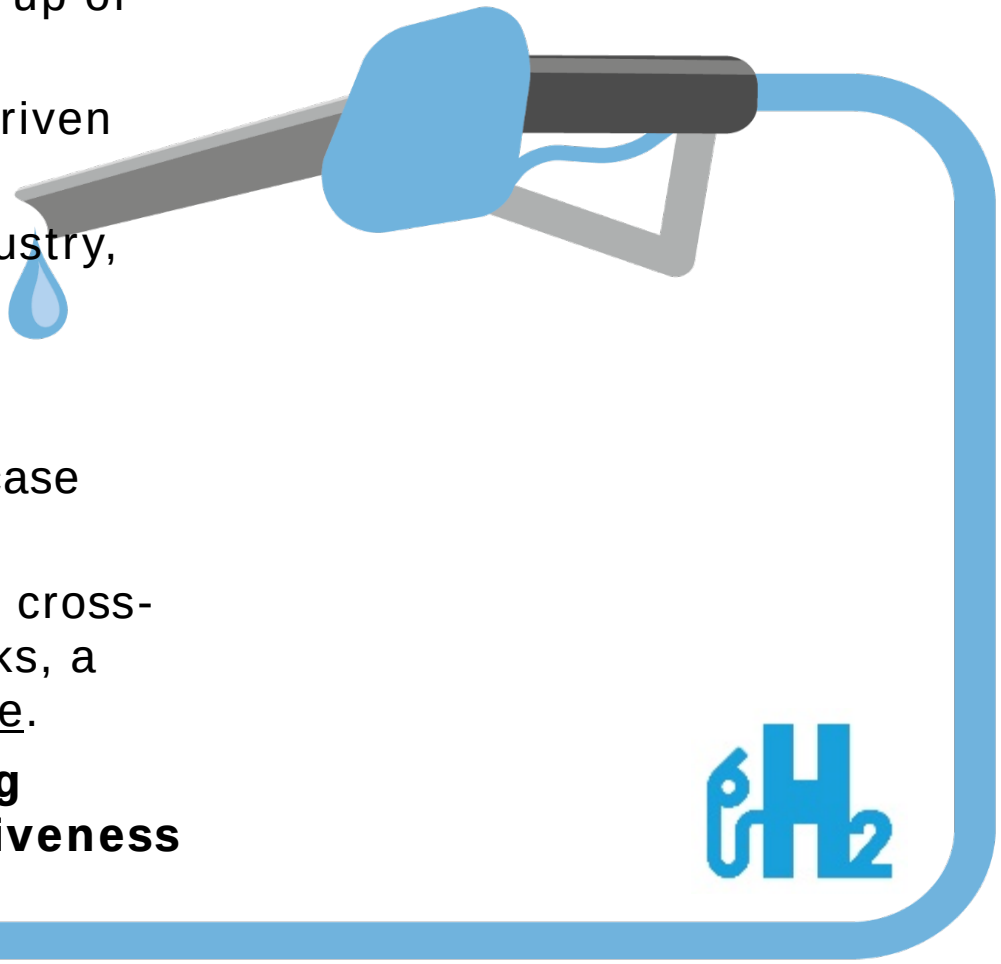






What should we do?

- Top priority needs to be given to fast local build-up of renewable energy (wind, solar, hydro)
- Hydrogen demand and implementation will be driven largely by industry
- For competitiveness of our energy-intensive industry, priority should be given to pipeline import from North/South Europe and Northern Africa
- The energy transition is except PV & solar in geographically preferred region not a business case (yet), therefore progress is slow
- Energy transformation will require commitment, cross-industry collaboration, stable political frameworks, a levelized playing field with fossil energy and time.
- **Europe needs to become better in balancing climate objectives with industrial competitiveness (NZIA, CBAM,…)**



Thank you

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