TRANSFORMATION ZU EINER KLIMANEUTRALEN ÖSTERREICHISCHEN INDUSTRIE

Status und Ergebnisse aus dem Programm NEFI und begleitenden Studien und Projekten

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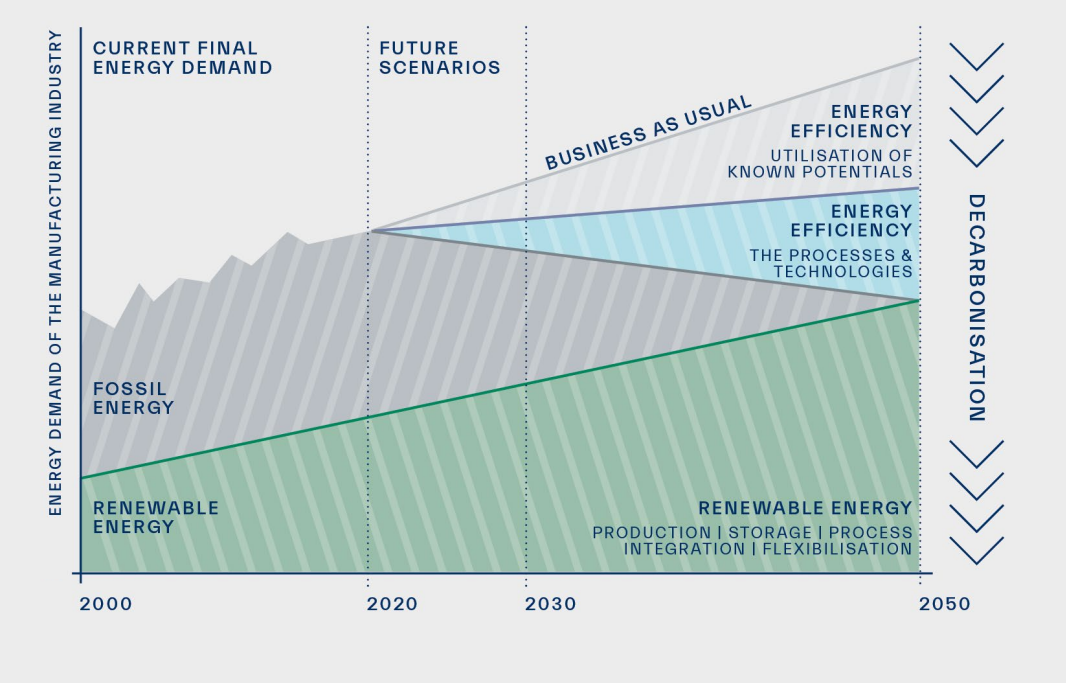
INHALTE

- Das Programm NEFI
  - Programmziele
  - Governance und Innovationsfelder
  - NEFI Szenarien
- Studie „Transform.Industry“
- Exemplarische NEFI Projekte
  - Advanced Heat-Pump Demonstrator: AHEAD
  - Greenbricks - CO2 neutral brick factory
  - NEFI-Greensteel –CO2 neutrale Stahlverarbeitung
- Zukünftige Bedarfe an Erdgas und Wasserstoff in der Industrie
- Importmöglichkeiten für CO2 neutralen Wasserstoff

NEFI VISION & GOALS

NEFI key technologies “Made in Austria” enable the decarbonisation of industrial energy systems and help to secure Austria’s position as an industrial location.



Decarbonisation of industrial energy systems

100 % renewable energy supply at selected locations

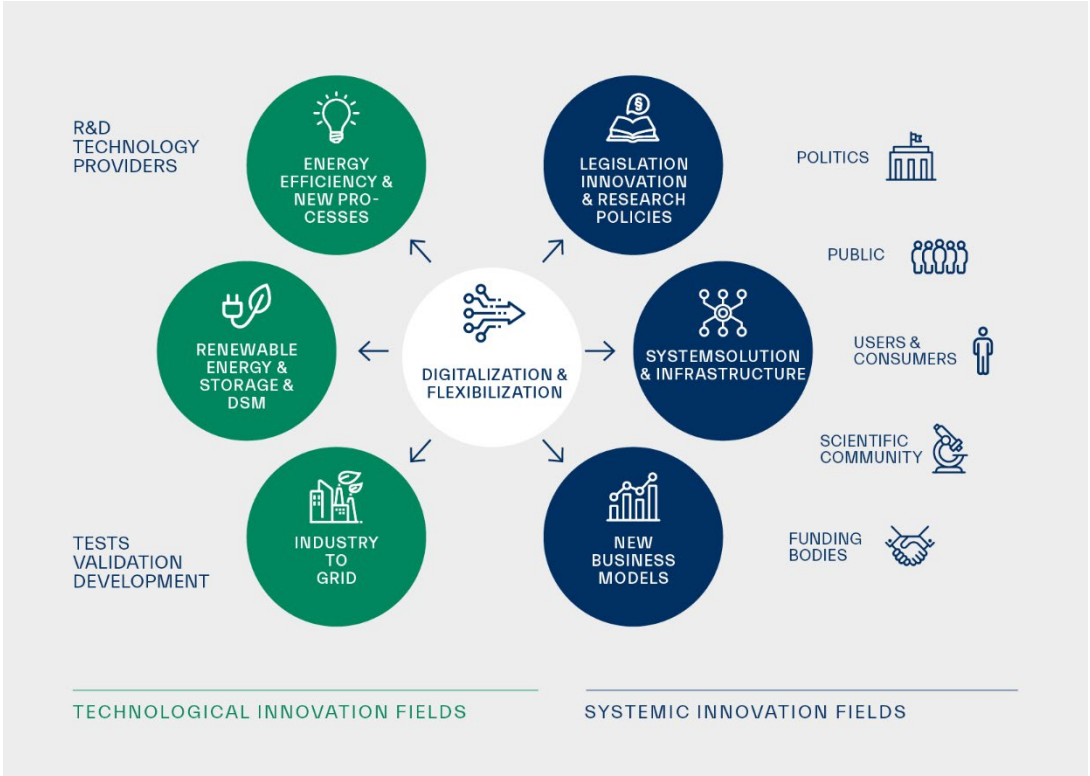
Added value “Made in Austria”

through export and technology development

Securing the industry location

contribution to the economic location Austria by user involvement

NEFI – INNOVATION ECOSYSTEM



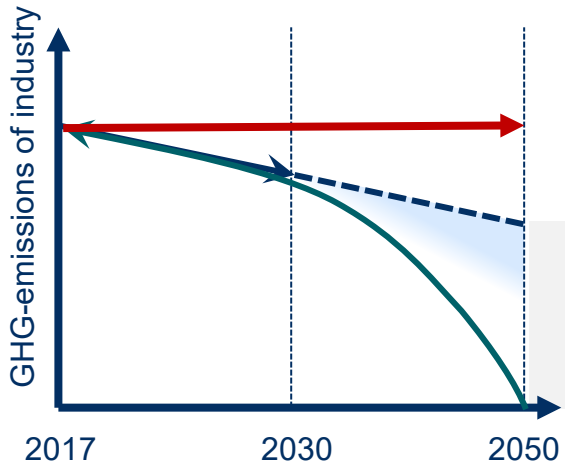
- 125 partners from industry, RTOs and public institutions
- 24 NEFI projects
- Funding: 30.2 Mill. EUR | investment ~100 Mill. EUR

KEY TECHNOLOGIES:

- Storage technologies
- Increased oxygen usage in the iron & steel sector
- Micro-grids
- Cross-company energy communities
- Load management in power networks
- Heat pump technologies
- Industrial waste heat solutions
- …

DECARBONISATION SCENARIOS

STAKEHOLDER ASSESSMENT IS CHALLENGED WITH NET-ZERO PATHWAY FROM SCIENTIFC BACKCASTING



Extrapolation of current trends
(Business-as-usual – BAU)

Assessment of sector development by industrial stakeholders
until 2030 and beyond (Pathway-of-industry – PoI)

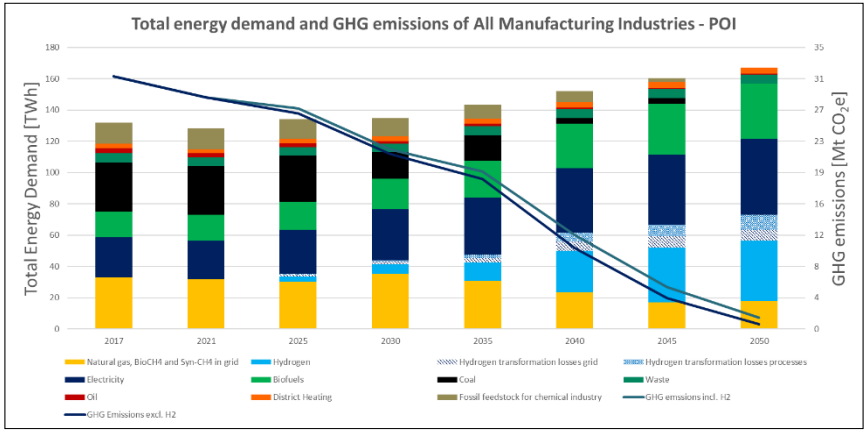
Gap analysis between industrial assessment and necessary decarbonisation pathway

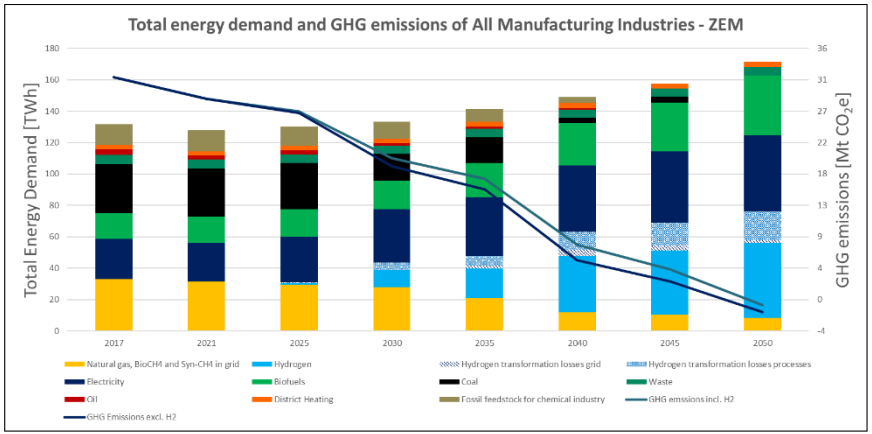
Pathway for net-zero emissions 2050 according to backcasting methodology (Zero-emission – ZEM)

DECARBONISATION SCENARIOS

NEW ENERGY FOR INDUSTRY

FEW DIFFERENCES BETWEEN POI AND ZEM INDICATE ROBUST RESULTS





Pathway of Industry decarbonisation is driven by a combination of technology levers

- CO_2-neutral gases for high temperature applications and feedstock
- CCUS especially for mitigation of geogenous emissions
- Electrification through heat pumps for low temperature applications
- Circular economy can reduce energy demand additionally

Zero Emission transformation needs

- Further pilot plants needed
- Scale-up of existing prototypes to industrial solutions
- Accompanying development of necessary infrastructure
- Further research (especially regarding integration of future industrial systems into the overall energy system)

DECARBONISATION SCENARIOS

NEFI
NEW ENERGY FOR INDUSTRY

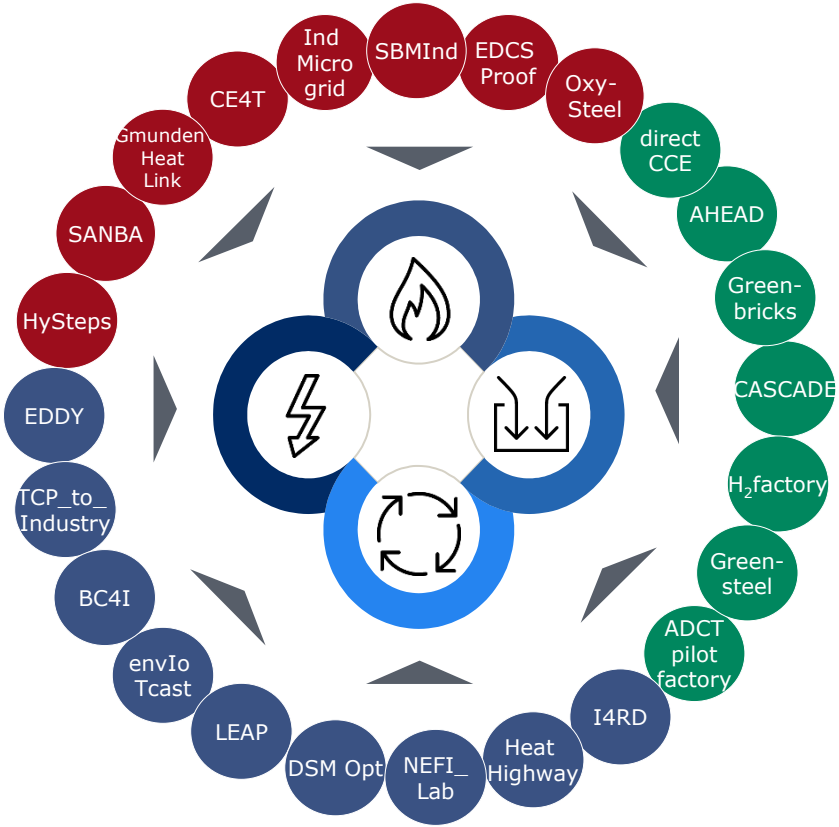
LEVERS OF ACTION

1. CO_2-neutral gases and biomass
- Hydrogen
- Bio-CH_4
- Synthetic CH_4
- Solid biomass

2. Electrification and energy efficiency
- Process efficiency improvements
- Heat pumps
- Stationary engines

3. Carbon capture
- Sequestration of geogenous emissions

4. Circular economy
- Increased use of end-of-life materials
- CO_2-Usage for material production



TRANSFORM.INDUSTRY

Goal Climate-Neutrality 2040

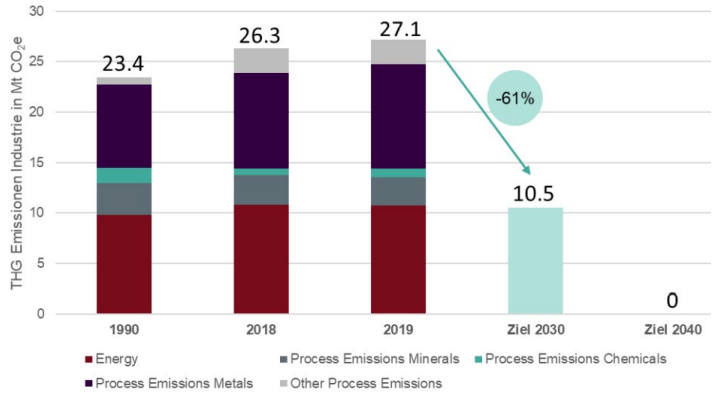
- Decarbonisation + Energy Efficiency + Security of Supply + Competitiveness

Expected Results

- Scenario-based **transformation pathways** of Austrian industry at sector level to reach climate neutrality 2040
- Identification of **fields of action in research, technology** and **innovation policy.**
- Development of **sector-specific action plans** that summarise the key results and fields of action per sector.

Boundary Conditions

- Long investment cycles
- Industry should invest in clean key technologies already in the **next investment cycle**
- Creation of framework conditions is essential.
- Focus on **Made in Austria** and export.



Quelle: Klimaneutralität Österreichs bis 2040 – Beitrag der Österreichischen Industrie, BMK.gv.at, AIT, EVT, EI-JKU, AEA

TRANSFORM.INDUSTRY - TECHNOLOGIES & METHOD

Five technologies are available: which are ideal for which application?

Elektrification

- Heat pumps
- Stationary engines

Utilisation of CO2-neutral gases

- Hydrogen
- Bio-CH4
- Synthetic CH4

Carbon Capture

- Separation of (geogenic) emissions

Circular Economy

- Redesign
- Second life models
- Material-recycling

Energy efficiency

- Heat recovery
- Efficiency increase through exergetic optimisation of energy sources (Electricity / H_2)

Scenario-modelling

- ***„Renewable Gas“***
- ***„Circular Economy“***
- ***„Innovation“***
- ***„Sector-coupling“***

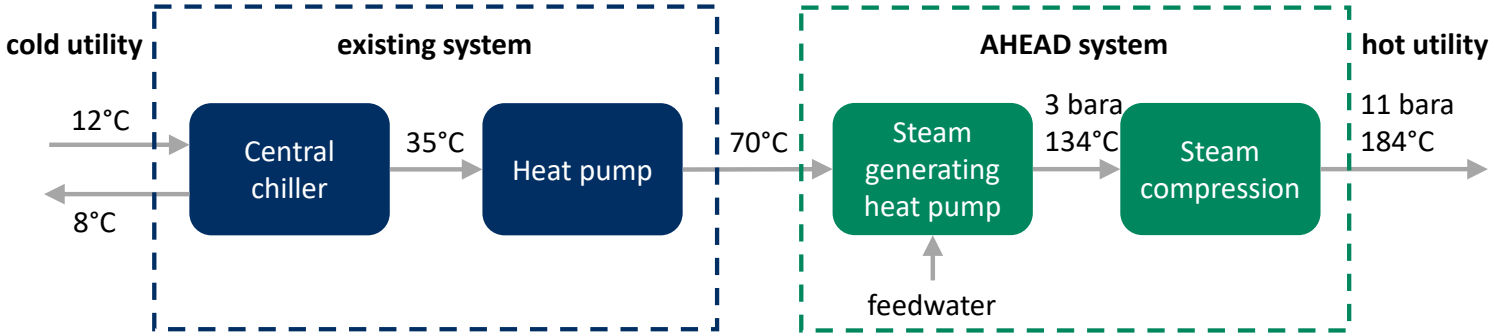
Quantitativ & Qualitativ

ADVANCED HEAT PUMP DEMONSTRATOR - AHEAD

NEW ENERGY FOR INDUSTRY

GOALS

- Decarbonised steam production through integration of high temperature heat pump (11bar, 184° C) at TAKEDA
- Operation of the AHEAD Systems for at least 4000 h, heating capacity of 1.7 MW
- Energy savings of 52% compared to fossil steam production
- CO_2 reduction of 46% at the production site, equals 1900 t/a
- Development of an AHEAD concept for roll-out at other Takeda sites in Austria and worldwide



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GREENBRICKS - CO_2 NEUTRAL BRICK FACTORY

AIMS

- Holistic optimization of the brick manufacturing process.
- Development of new CO_2-neutral clay mixtures considering site-specific product/clay properties and industrial production environments.
- Optimization of overall energy efficiency dryer - burner - HP heat network and adaptation of the brick drying technology to the new electric kiln and clay recipe.
- Integration and optimization of operation of the highly-efficiency, high temperature tunnel kiln for brick firing.
- Scaling up the concept and evaluate transferability of results to other sites as well as to related sectors.

KEY FACTS

Duration: 10/22 – 09/25

Project volume: € 30 Mio.

Wienerberger

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NEFI-GREENSTEEL –CO_2 NEUTRALE STAHLVERARBEITUNG

ZIELE

- Identifizierung CO_2-neutraler Energiequellen, um Erdgas in der Stahlverarbeitung zu ersetzen.
- Entwicklung effizienter Industrieöfen, die zu 100% CO_2-neutral beheizt werden.
- Sicherstellung einer hohen Produktqualität bei der Umstellung auf CO_2-neutrale Energieträger.
- Demonstration der entwickelten Konzepte und Technologien an realen Produktionsstandorten verschiedener voestalpine Produktlinien.
- Vorbereitung der Skalierung sowie Übertragung der Ergebnisse auf andere Produktionsstätten und Sektoren.

ECKDATEN

Laufzeit: 11/22 – 04/25

Projektvolumen: € 4,9 Mio.

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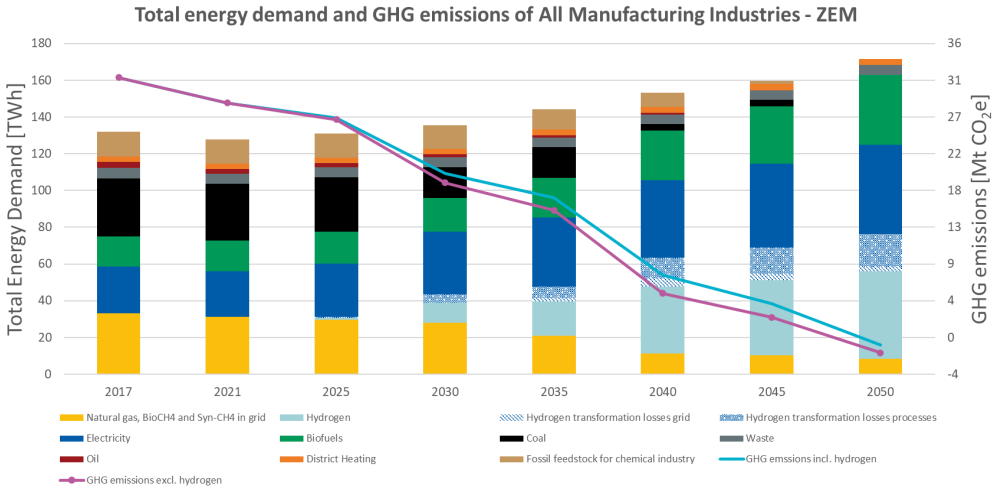
AICHELIN Heat Treatment Systems
Buderus | Edelstahl
NOXMAT industrial heating technology
UDDEHOLM a voestalpine company
VILLARES METALS a voestalpine company
voestalpine ONE STEP AHEAD.

„ZERO EMISSION“ SUMMARY

AVAILABILITY OF RENEWABLE ENERGY SOURCES IS CRUCIAL

- Technology change allows phase-out of fossil fuels by 2035
- Emission reductions from then on through an increasing share of renewable electricity and g
- **GHG-neutral supply is required:**

49 TWh power: +91% compared to 2017
48 TWh hydrogen, +68 TWh power
38 TWh biomass: +130% compared to 2017
8.4 TWh CH_4:
-75% compared to natural gas 2017



HERAUSFORDERUNGEN - TECHNISCH

NEW ENERGY FOR INDUSTRY

Die Elektrifizierung von vielen Industrieöfen ist technisch nicht möglich – insb. bei Bestandsanlagen oder Anlagen mit hoher Leistungsdichte (= Hauptenergieverbraucher)

H2-TRANSPORT BIS HIN ZU DEN ENDVERBRAUCHERN

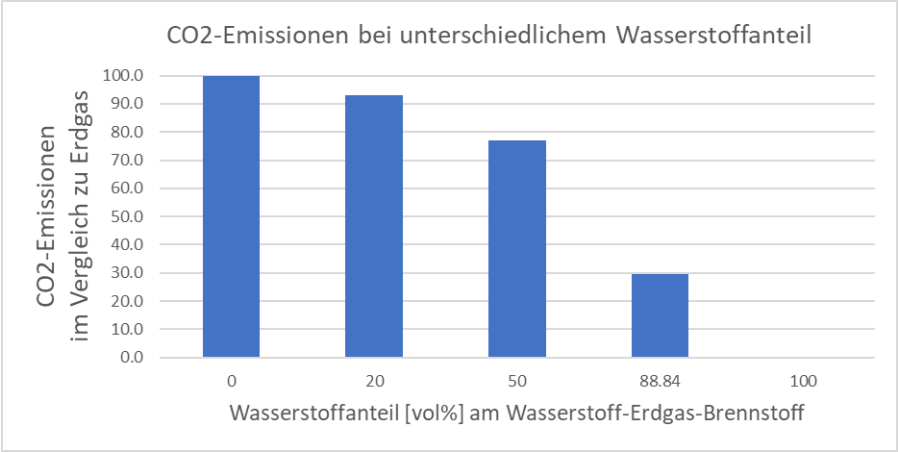
- Lokale Erzeuger / Import-Terminal → Hydrogen Backbone → Verteilnetz → Industrienetz → Industrieöfen → H2-Brenner

UMBAUTEN AN DER INDUSTRIEINFRASTRUKTUR FÜR SIGNIFIKANTE DEKARBONISIERUNG NOTWENDIG

- Gasleitungen und –armaturen
- Öfen: Brenner, Feuerfest, Regelung
- Einhaltung der NOx-Emissionen (H2 verbrennt bei höheren Temperaturen; Abgasnorm nicht geeignet)

MÖGLICHER NEGATIVER EINFLUSS EINER H2-VERBRENNUNG AUF DIE PRODUKTE TEILWEISE UNGEKLÄRT

- Stahl, Aluminium, Glas, Ziegel, Feuerfest, …



Bei einer Wasserstoffbeimischung von 20 vol% werden nur 7% CO2 eingespart.

Für eine signifikante Dekarbonisierung sind Wasserstoffanteile > 90 vol% notwendig!

frontier economics

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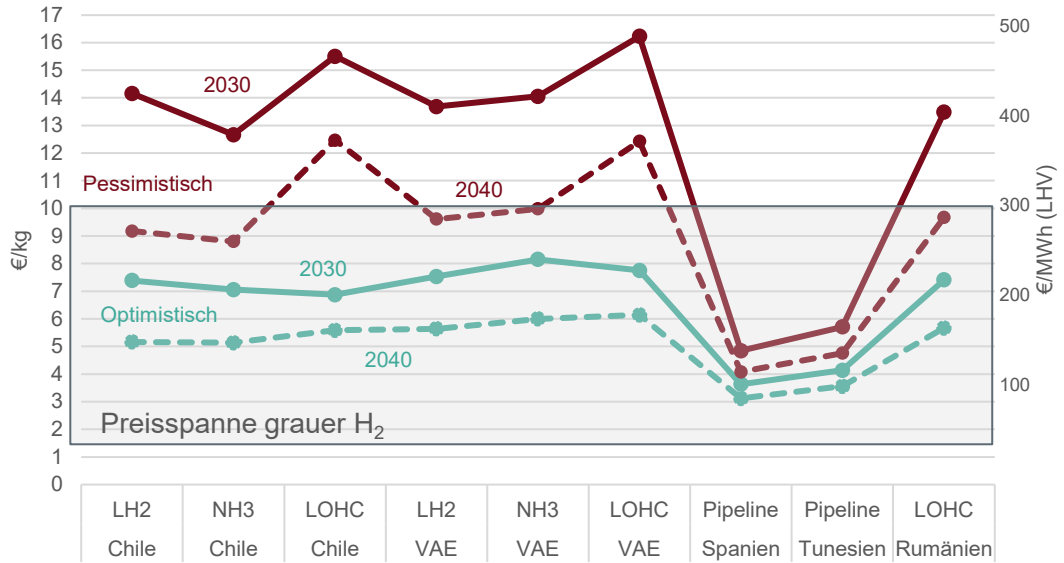
IMPORTMÖGLICHKEITEN FÜR ERNEUERBAREN WASSERSTOFF

KOSTEN H2 IMPORT: SZENARIO & ZEITVERGLEICH

Die Schwankungsbreite zwischen dem optimistischen und pessimistischen Szenario ist groß. Bis 2040 ist bei allen Routen und Destinationen eine Kostensenkung zu erwarten



- Die Kosten für den Pipelinetransport sind mit weniger Unsicherheiten behaftet als andere Optionen
- Bei den Schifftransport-Routen sind die Kosten in pessimistischen Szenarien ca. doppelt so hoch wie in den optimistischen Szenarien
- Die Gesamtkosten für H_2 liegen 2030 zwischen 3,6 und 16,2 €/kg und 2040 zwischen 3,1 und 12,5 €/kg. Die Gesamtkosten sinken von 2030 auf 2040, je nach Route, um 14 – 35 %

THANK YOU!

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