HYDROGEN CROSS BORDER CONFERENCE

HOW DO WE ACHIEVE COMPLETE VALUE CHAINS?

Production — **Distribution** — **End-use application**

Feedstock
Hydrogen & Derivative Products
Storage
Transport
Use/Application

Pipelines

Feedstock

Conventional

Challenge: volatility of renewables combined with harsh criteria of EU delegated act during upscaling

Solution: Postponement of the dates from which criteria become valid (e.g. simultaneity only from 2035)

Wind

PV

Nuclear

Challenge: high electricity prices possible

Hydro power

Usage of excessive energy

Solution: Dissolving EEG remuneration

Splitting of bidding zones in GER

Water

Challenge: availability of water

Solution: Usage of sea water

water

Challenge: lack of knowledge in hydrogen sector (vocational and universal education)

Solution: increase of educational offers

Waste

Biomass

GAS

Challenge: lack of planning reliability

Solution: fixed EU and national agenda for hydrogen development with fixated goals

Hydrogen & Derivative Products

Challenge: increase in efficiency, longevity, resilience, decrease of costsreduction of chemical requirements

Solution: increase of R&D activities on EU and global scale and exchange of knowledge/ experiences

Challenge (NL): high grid connection costs due to low net capacities

Solution: Improved net congestion management: Usage of battery energy storage systems for buffering

Usage of excessive energypooling

Waste Heat Utilization

Challenge: High prices for hydrogen in the scale up phase

Solution: subsidies for production of hydrogen

Water Treatment

Electrolysis

Challenge: selection of "right" technology (project depenent)

Solution: Build-up and sharing of (operational) experiences ("best practices")

Pyrolysis

Gas processing

Challenge: usage of blue hydrogen not focused in the regions at the moment

Solution: Possibility for cross-border pilots GER and NL

Steam Reformer

CCS / CCU

CO2

Underground Storage

Storage

Challenge: quality in pipelines vs. costs

Solution: economically optimization of grid

Compressor & Control system

Cavern Storage

Challenge: lack of sufficient usable storage capacity

Solution: increased exploration and construction of hydrogen storage cavern

R & D on alternative storage solutions

Challenge: Financing requirements for renewable hydrogen projects

Derivative Production for Transportation

Storage-Plants

Liquifier

LH2 TANK

Energy Carrier molecules

Challenge: H2 trading currently focusing on large producers and large buyers

Solution: build-up of "aggregators" for small scale producers and buyers

Compressor / Filling Equipment

Transport

Challenge: volatile hydrogen production and available amounts for ramp-up phase of pipeline usage (transport grid stability)

Challenge: approval periods for pipeline construction especially in / near nature reserves and similar

Solution: well-timed commissioning of the network, even across national borders

Solution: acceleration of approval procedures for important infrastructure projects

Challenge: gas processing only for large volumes

Gas processing

Solution: clustering of demands

R&D for low-scale gas processing units

Reconversation

Challenge: Efficiency low and costs high

import vs. local production

Transport vehicles

Challenge: Space requirements in ports for import

De-centralized Power Generation

Challenge: Grid connections on distribution level as a challenge

Solution: funding for connections

framework for DSOs cost reduction

Gas processing

Use/ Application

Steal prdoction

Process heat

Lime & concrete

Challenge: technological uncertainties (electrification vs. hydrogen)

Challenge: Lack of demand for green products (price?)

Solution: Creation of leading markets for green products via quot

Industry

Challenge: lack of demand (no cost parity to fossile)

Solution: politically induced increase in demand: Funding of usage of hydrogen in differential costs (for example: climate protection agreements)

CO2 prices

Waste Heat Utilization

Chemical usage

quota (for example: percentage of used hydrogen has to be RFNBO)

Heating (Districts & Households)

Challenge: hydrogen for low-temperature application too expensive

Solution: only punctual usage of hydrogen in households when overall regional business cases can be applied

Central Power Generation

Methanol

E-Fuels

Challenge: no political commitment to CO2-neutral technologies in mobility sector

RFNBOS

Amonia

Challenge: cost competitiveness RFNBOS vs. fossile fuels

Solution: politically increase in demands

Challenge: High general costs for hydrogen mobility applications

Solution: Increase of funding scheme, quote and sub-quota for RFNBOS

Airplane with E-Fuel/ Hydrogen

Challenge: Supply of CO2-neutral fuel for vessels and ships

Train with Methanol/ Hydrogen

mobility

Ship with E-LNG/ Methanol/ Hydrogen

Challenge: inflexible regulations for refueling

Solution: more hands on regulations

Solution: Level playing field to electricity (EU delegated Act for RFNBOS)

Cracker

Combustion engine

Usage of hydrogen for small-scale mobile applications, usage of (low quality) hydrogen in ICE)

Challenge: which technology for mobile applications? Fuel Cell vs. internal Combution Engine

Level playing field for FC & ICE

increase in R&D

Fuel Cell

Road Mobility with Hydrogen