

Discussing the future hydrogen economy: opportunities for Coal Regions in Transition

Coal regions in transition virtual week

17 November 2020



A few guidelines before we begin

We will use Slido for Q&A! To submit questions:

Step 1:

Go to [Slido.com](https://www.slido.com)

Please note this meeting will be recorded

Step 2:

Enter the code: [CRIT3](#)

If you have any technical issues, send a message via the chat to the host.

Step 3:

Submit your question, vote on other questions!

[Slido.com: CRIT3](#)

[Social media: #CoalRegionsEU](#)

Scene setting

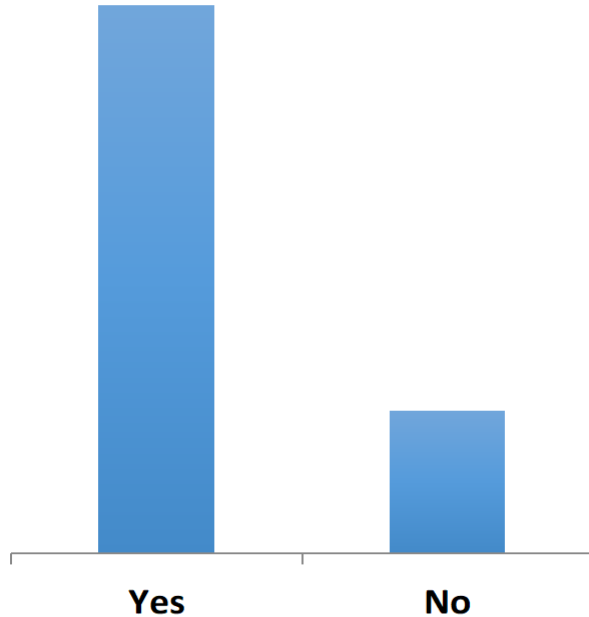
Carsten Rothballer

Secretariat of the Initiative for Coal Regions in Transition

Timon Wehnert

Secretariat of the Initiative for Coal Regions in Transition

Setting the scene: An EU hydrogen economy – potentials for coal regions?



Hydrogen jobs in EU Coal regions?

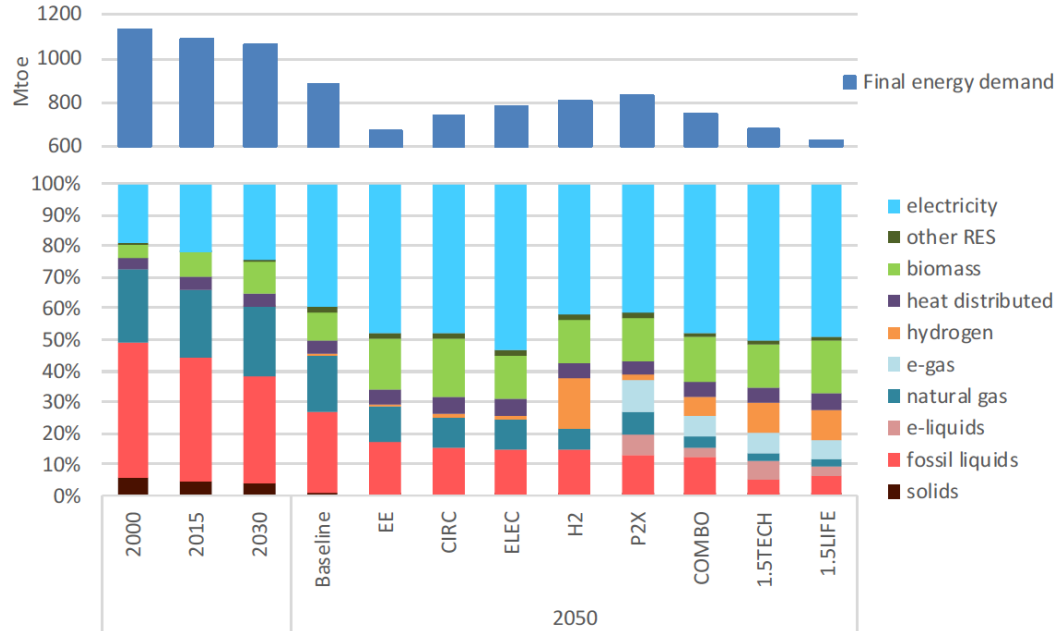
Poll in the registration to this session:

Do you expect that
hydrogen related business models **can create**
a significant amount of new jobs in EU coal regions?

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[Social media: #CoalRegionsEU](https://twitter.com/CoalRegionsEU)

Setting the scene: Hydrogen in EU Energy Scenarios



Use of hydrogen in 2050 – varies strongly based on different scenario assumptions

Source: In-depth analysis in support of A Clean Planet for all
https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

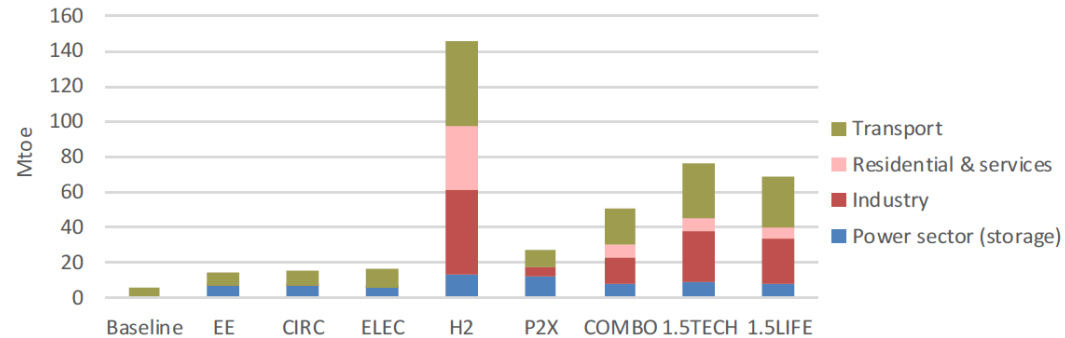
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Setting the scene: Future hydrogen use in different sectors

Hydrogen can serve as

- Energy carrier for long-distance and heavy duty transport
- Feedstock for industry
- A long-term energy storage option for electricity generation and possibly heating



Source: In-depth analysis in support of A Clean Planet for all
https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

Setting the scene: Future industrial hydrogen need in different regions

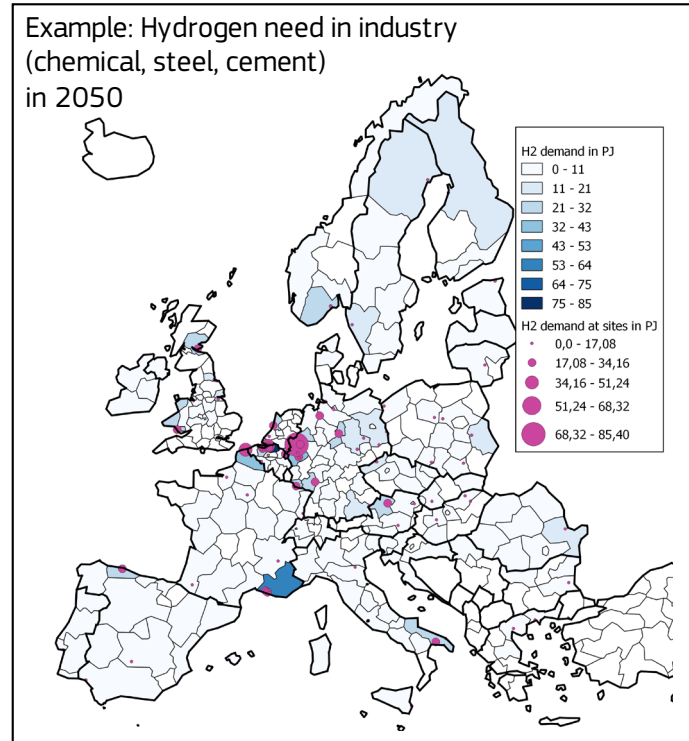
The need for hydrogen

will strongly vary from region to region

Demand hot-spots will be

- urban areas
- regions with energy-intensive industry

Regions with high renewable potential
can become providers of green hydrogen



Source Wuppertal Institute based on (Material Economics, 2019),
https://wupperinst.org/fa/redaktion/downloads/projects/INFRA_NEEDS_Policy_Brief.pdf

Presentation of the EU hydrogen strategy and implication for Coal regions

Ruud Kempener

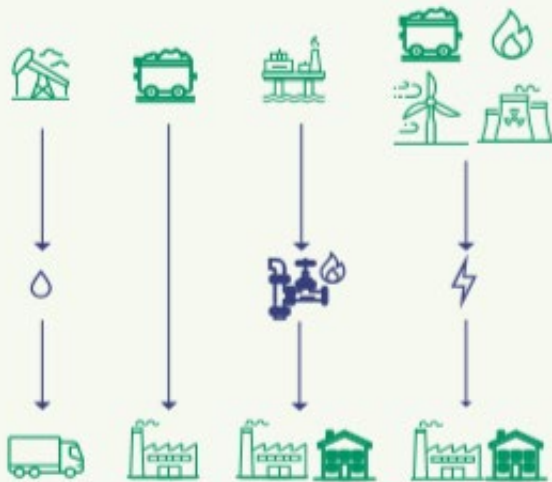
DG ENER, European Commission

Why now?

1. The EU needs to deliver on **climate neutrality** at the least cost, in line with Green Deal ambitions
2. The energy transition needs to deliver on other objectives: **security of supply, jobs, industrial leadership**
3. The energy transition presents significant **investment opportunities for Post-Covid recovery**

Laying the foundation for a climate neutral energy system

The energy system today : linear and wasteful flows of energy, in one direction only



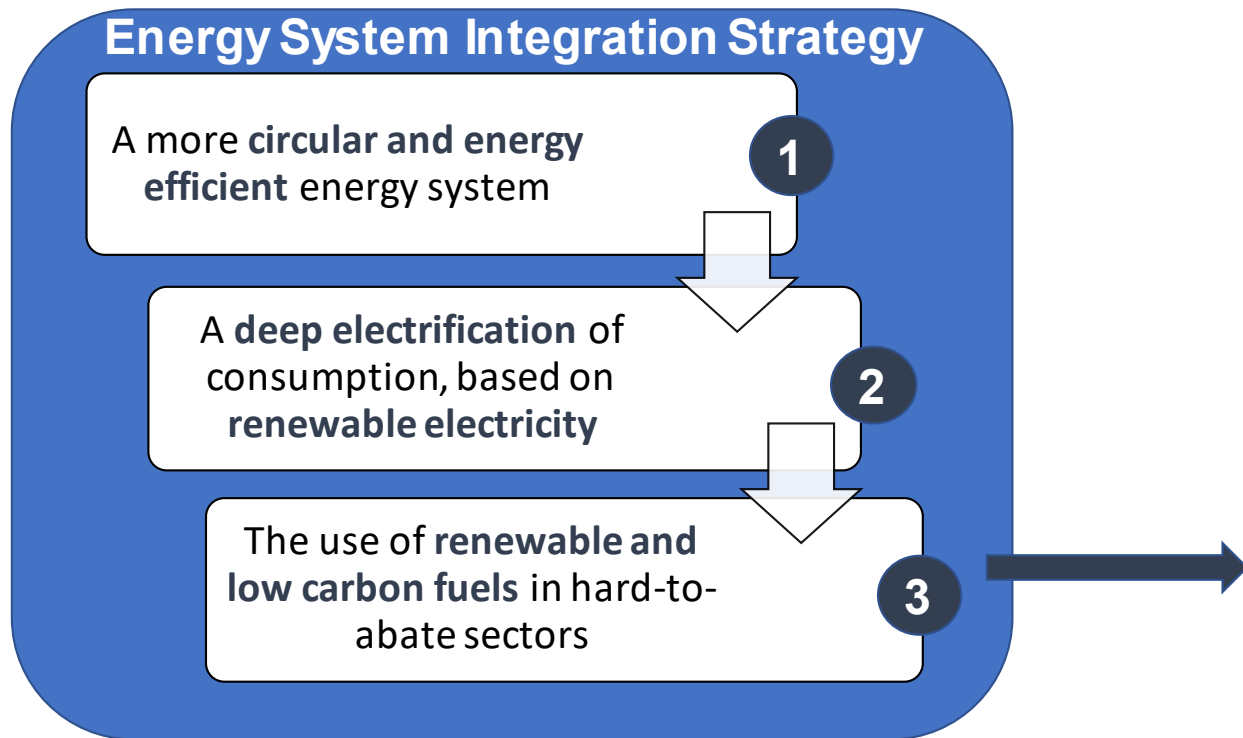
Future EU integrated energy system : energy flows between users and producers, reducing wasted resources and money



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Laying the foundation for a climate neutral energy system



Hydrogen Strategy

A full value chain approach to upscale hydrogen

+

Clean Hydrogen Alliance

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The Hydrogen Strategy – A roadmap to 2050

2024

- 6 **GW** of renewable hydrogen electrolyzers
- Replace **existing hydrogen production**
- Regulation for liquid hydrogen markets
- Start planning of hydrogen infrastructure

2030

- **40 GW** of renewable hydrogen electrolyzers
- New applications in **steel and transport**
- Hydrogen for electricity balancing purposes
- Creation of “Hydrogen Valleys”
- Cross-border logistical infrastructure

2050

- Scale-up to **all hard-to-decarbonise sectors**
- Expansion of hydrogen-derived **synthetic fuels**
- EU-wide infrastructure network
- An open international market with € as benchmark

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Social media: [#CoalRegionsEU](https://twitter.com/CoalRegionsEU)

Application areas for hydrogen

Segments



Transportation

Key subsegments

- Large cars (fleets) and taxis
- Trucks and buses
- Light commercial vehicles
- Trains
- Ships and aviation

Relative importance by 2050¹



Complementary decarbonization solutions

- Battery-electric vehicles
- Fuel cell electric vehicles
- Electrified trains
- Biofuels and CNG/LNG

HEAVY DUTY TRANSPORT



Heating and power for buildings

- Hydrogen blending for heating
- Pure hydrogen grids for heating



- Electrification of heating via heat pumps
- Energy efficiency measures
- Biogas/biomass



Industry energy

- High-grade heat



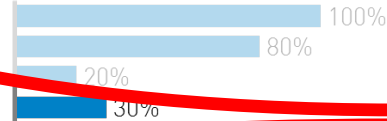
- Demand side and energy efficiency measures
- Electrification
- Biogas/biomass
- Carbon capture

INDUSTRY



Industry feedstock

- Ultra-low-carbon hydrogen as feedstock for
 - Ammonia, methanol
 - Refining
- Feedstock in steelmaking (DRI)
- Combined with CCU in production of olefins and BTX



- For steel:
- Coke from biomass
 - CCS on blast furnace
- For CCU:
- Pre-combustion
 - Post-combustion
 - Carbon storage



Power generation

- Power generation from hydrogen
- Flexible power generation from hydrogen



- Biogas
- Pre-combustion
- Post-combustion
- Carbon storage

RENEWABLES INTEGRATION

¹ In transportation: percent of total fleet; in heating and power for buildings: percent of total heating demand; in industry energy: percent of final energy demand; in industry feedstock: percent of total feedstock for production; in power generation: percent of total power generation; in power generation: percent of total power generated from natural gas

Hydrogen – an investment agenda

Next Generation EU, Invest EU, Cohesion Policy, CEF-E, CEF-T
ETS Innovation Fund, Horizon Europe

Renewable electricity
production

€220-340 BLN

Renewable
hydrogen

€24-43
BLN

Hydrogen
transport,
distribution,
and storage

€65 BLN

Transport
(HDV)
€13 BLN

Steel
€8 BLN

European Clean Hydrogen Alliance

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Social media: [#CoalRegionsEU](https://twitter.com/CoalRegionsEU)

Making it happen – an action plan for the hydrogen strategy

Full value chain approach,	Actions oriented towards
An investment agenda	<ul style="list-style-type: none">• Create project pipeline• €220-340 bln renewable power, €24-42 bln electrolysers, €65 bln infrastructure
Boosting demand and scale up production	<ul style="list-style-type: none">• Comprehensive terminology and EU-wide certification of hydrogen• Support schemes and CCfD for renewable and low-carbon hydrogen• Demand-side policies in end-use sectors
Develop hydrogen infrastructure and markets	<ul style="list-style-type: none">• Planning of hydrogen transport, storage and dispatch infrastructure• Ensure access, develop liquid hydrogen markets and integrity of internal gas market
Research and Innovation	<ul style="list-style-type: none">• Scale up electrolysers• Develop hydrogen value chain• Innovative hydrogen technologies
The international dimension	<ul style="list-style-type: none">• International standards, regulation and definitions for hydrogen• Promote cooperation



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Audience Q&A Session

 Start presenting to display the audience questions on this slide.

Value chain for hydrogen, infrastructure, clean hydrogen: the opportunities ahead

Hans-Joachim Polk

Member of the Executive Board at VNG AG



CASE STUDY BAD LAUCHSTÄDT PROJECT

Hans-Joachim Polk, Board Member VNG AG

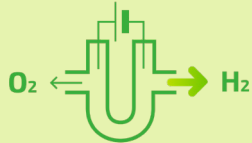
Project Set-up

1. Production

Local network (in total)



Wind farm
(40 MW output)



Large-scale
electrolysis
(35 MW output)



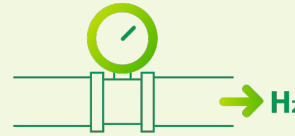
2. Storage



Underground storage /
cavern
(50 Mio. m³)



3. Transport



Conversion
of a natural gas pipeline
(100.000 m³/h)



4. Sales/ Utilization



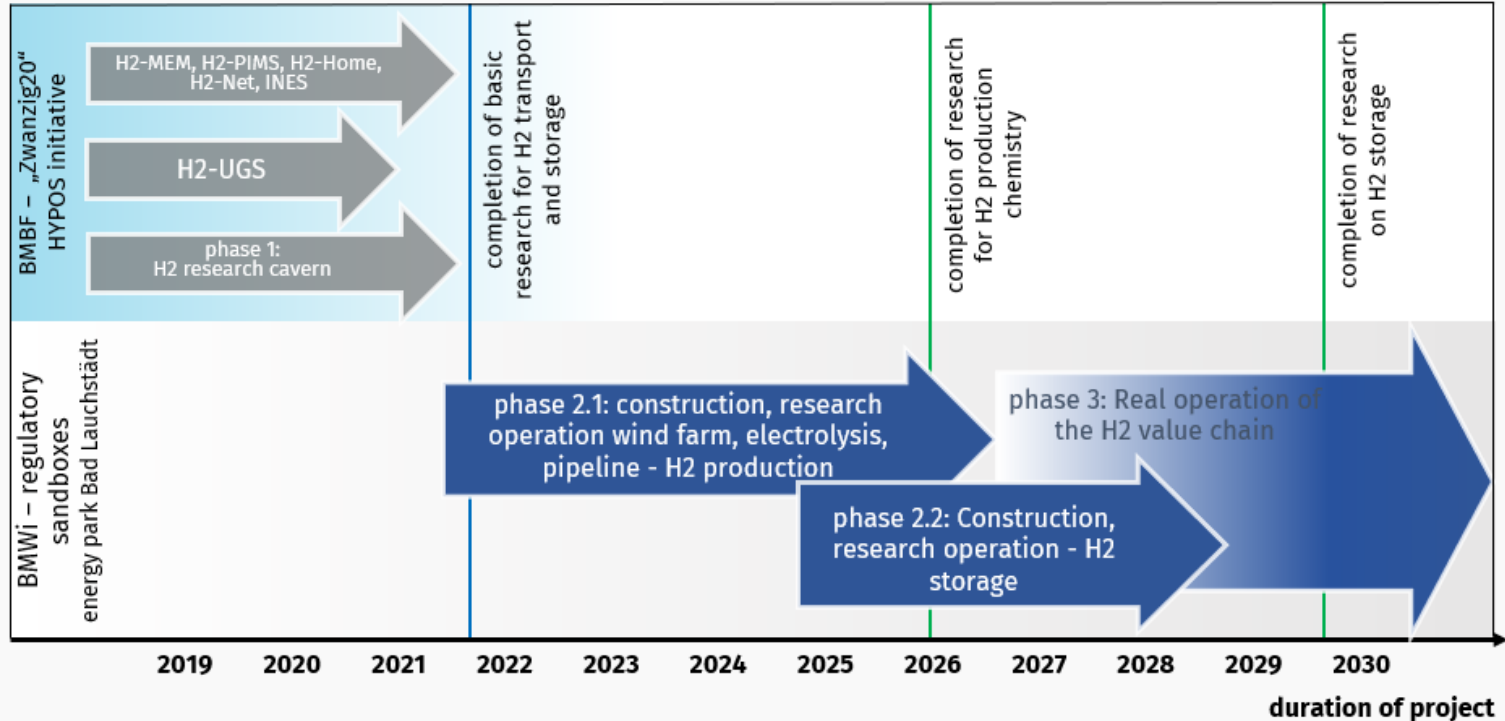
Chemical industry



Mobility

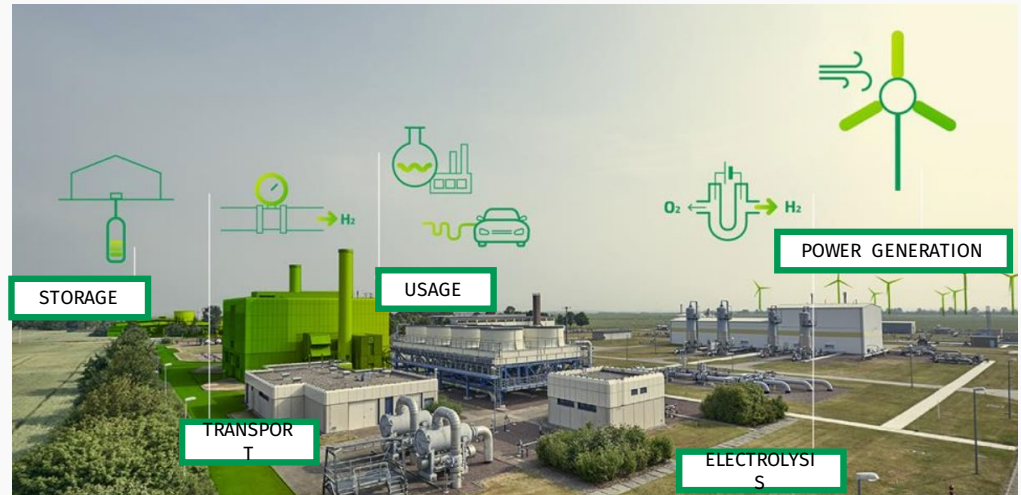


Timeline



Contribution to Energy Transition

- Reduction in CO₂ emissions
- Storage of renewable energy
- Linking of sectors: use of wind power for
 - Mobility (fuel cell vehicles)
 - Chemical industry (green hydrogen as a feedstock)
 - Urban energy supplies (heat and power)



Challenges

- Production costs of green hydrogen three times as expensive as grey hydrogen.
- Costs for storage increase hydrogen price even more.
- The added environmental benefit of green hydrogen is not rewarded. Thus, customers are not prepared to pay higher prices.
- Storage capacity in salt caverns is huge. Only high turnaround allows efficient operation. Production volumes of green hydrogen are relatively low.
- Regulatory framework allows little scope for experiments.

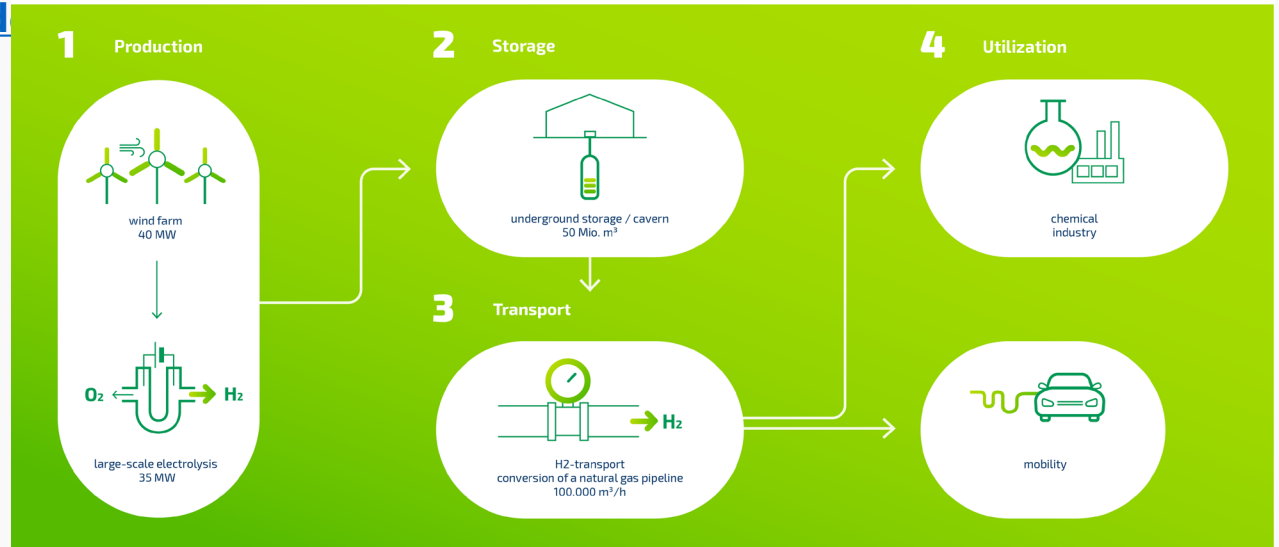
DEMANDS ON POLICY

- Incentives for the use of green hydrogen need to be created.
- Regulatory playing field for electrolyzers
- Regulatory framework for H2 Transport (similar to gas market)

Hans-Joachim Polk

VNG AG

Hans-Joachim.Polk@vng.d



Thank you!

Value chain for hydrogen, infrastructure, clean hydrogen: the opportunities ahead

Mara Bubberman

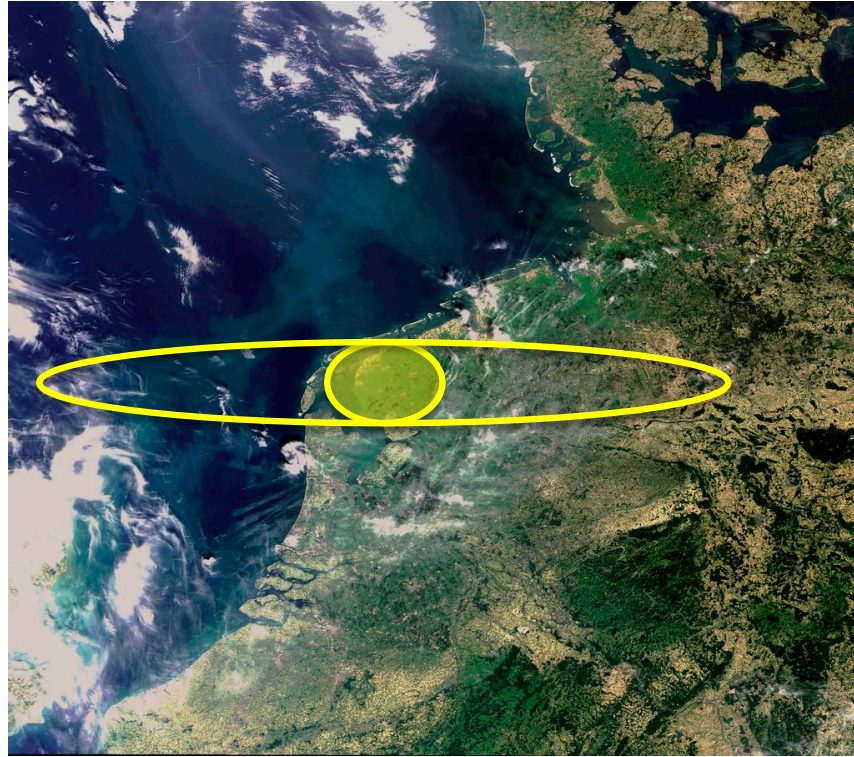
EU Public Affairs advisor, Northern Netherlands

Hydrogen Valley's and HEAVENN

Transition to a Hydrogen Economy

**Mara Bubberman, EU Public Affairs
advisor, Northern Netherlands on behalf of
Patrick Cnubben, New Energy Coalition**

Where are we located?



**Situation in the Northern
Netherlands**

**New
Energy
Coalition**

**Green Hydrogen
Economy in the
Northern Netherlands**

Just Transition Fund

Energy transition poses challenges:

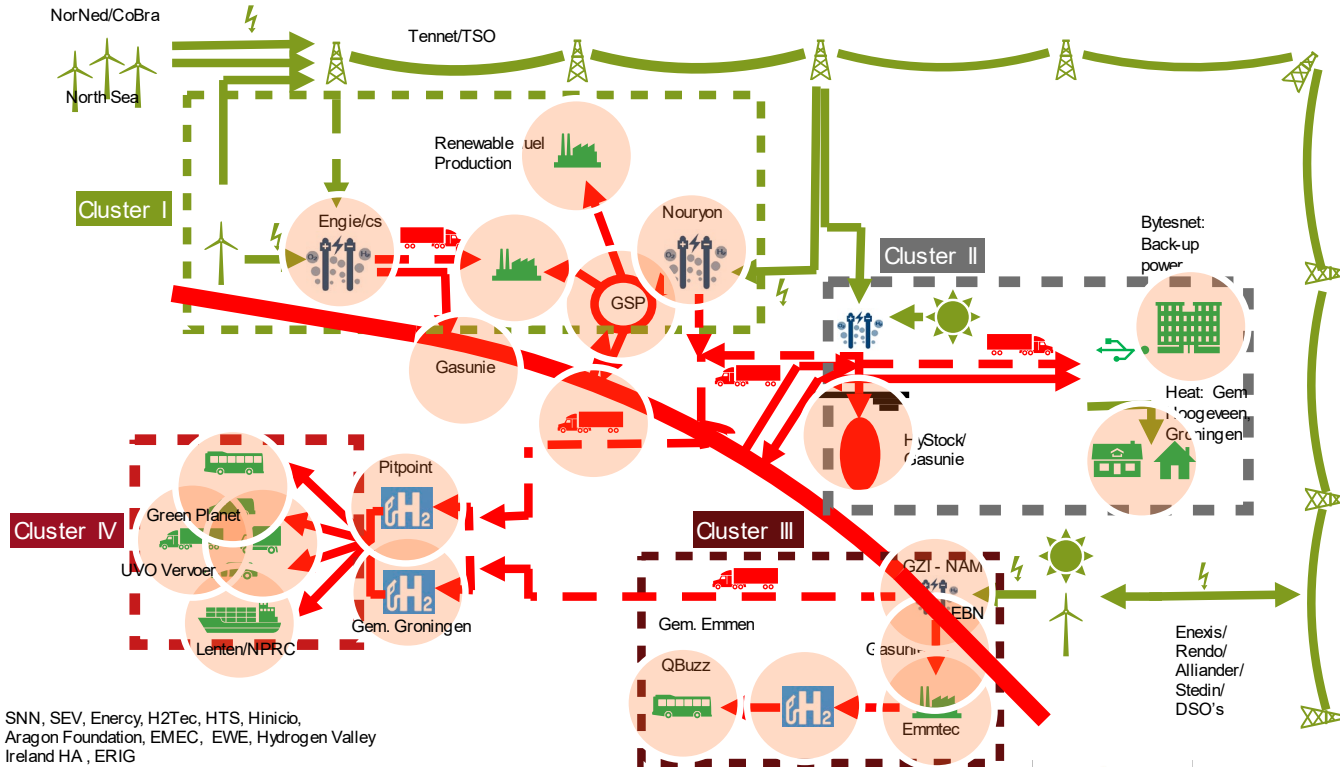
- Large energy intensive cluster
- Exit Natural Gas extraction
- Greenhouse gas emission reduction challenges

Dramatic loss of 20.000 jobs!!!

Target region for Just Transition Fund

- Research and Innovation → advanced technologies
- Deployment → Clean and renewable energy, efficiency, GHG reduction
- Upskilling and reskilling of workers.

HEAVENN, 1st Hydrogen Valley of Europe



SNN, SEV, Energy, H2Tec, HTS, Hinicio,
 Aragon Foundation, EMEC, EWE, Hydrogen Valley
 Ireland HA, ERIG



Supported by:



Hydrogen Investment Plan 2.0



Team up in Hydrogen Valley's



Let's team up!



Patrick Cnubben

p.cnubben@newenergycoalition.org

Value chain for hydrogen, infrastructure, clean hydrogen: the opportunities ahead

Marc Rechter

Co-Founder and CEO at Resilient Group



Just Transition Platform Meeting Coal Regions in Transition

Marc Rechter
Co-Founder & CEO Resilient Group
Co-Chair European Clean Hydrogen Alliance

From Innovation to Scaling up



Distributed*
Solar*
Production*



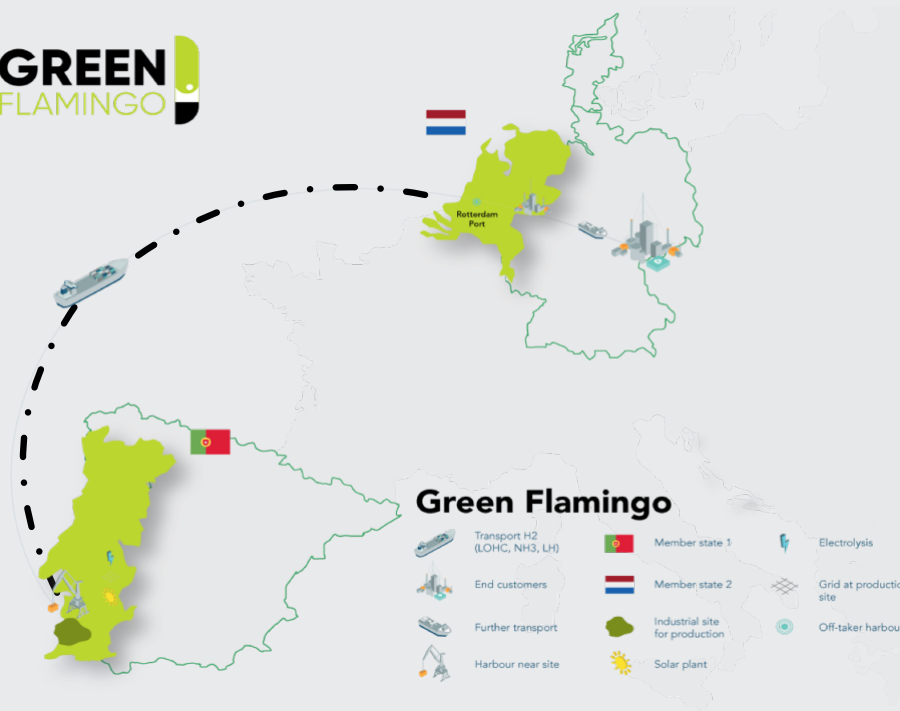
Digitalisa1on*
Enablement*



Green*
Hydrogen*



European GH2 Supply Chain



Initial context NL - PT

But goal is an EU and Global Green Hydrogen Market

Requires a Pan-European Masterplan for

Infrastructure

Supply Chains

GH₂ Markets

Liquidity

Transparency



Cross Domain Goals

facturing



HSR Network

FC Busses

Digitalisation



European GH2 Market Creation



Portuguese government confirms world record solar price of \$0.01316/kWh

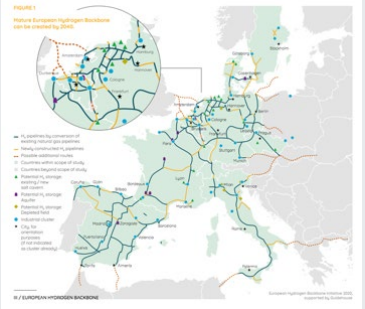
The Portuguese government has revealed some of the preliminary results of the national solar auction which closed on Tuesday. Antonio Delgado Rigal, chief executive of energy forecasting service Alossoft, said that the 15-year contracts awarded in the auction were the key to understanding the reason of such a low price. This, combined with the rights for land and grid connection guaranteed by the auction, makes attractive bidding at low prices.

AUGUST 27, 2020 EMILIANO BELLINI
 ENERGY STORAGE | FINANCE | GRID & INFRASTRUCTURE | HEADLINES | MARKETS | POLICY | SUSTAINABILITY
 ENERGY STORAGE | FINANCE | GRID & INFRASTRUCTURE | PORTUGAL



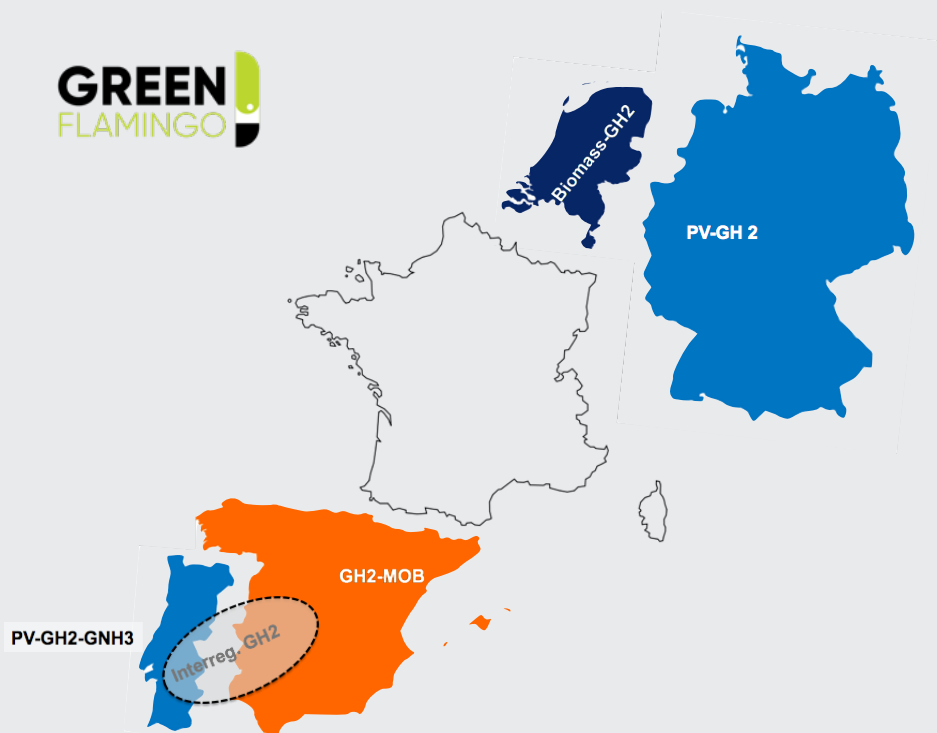
€10/MWh

€1/KG



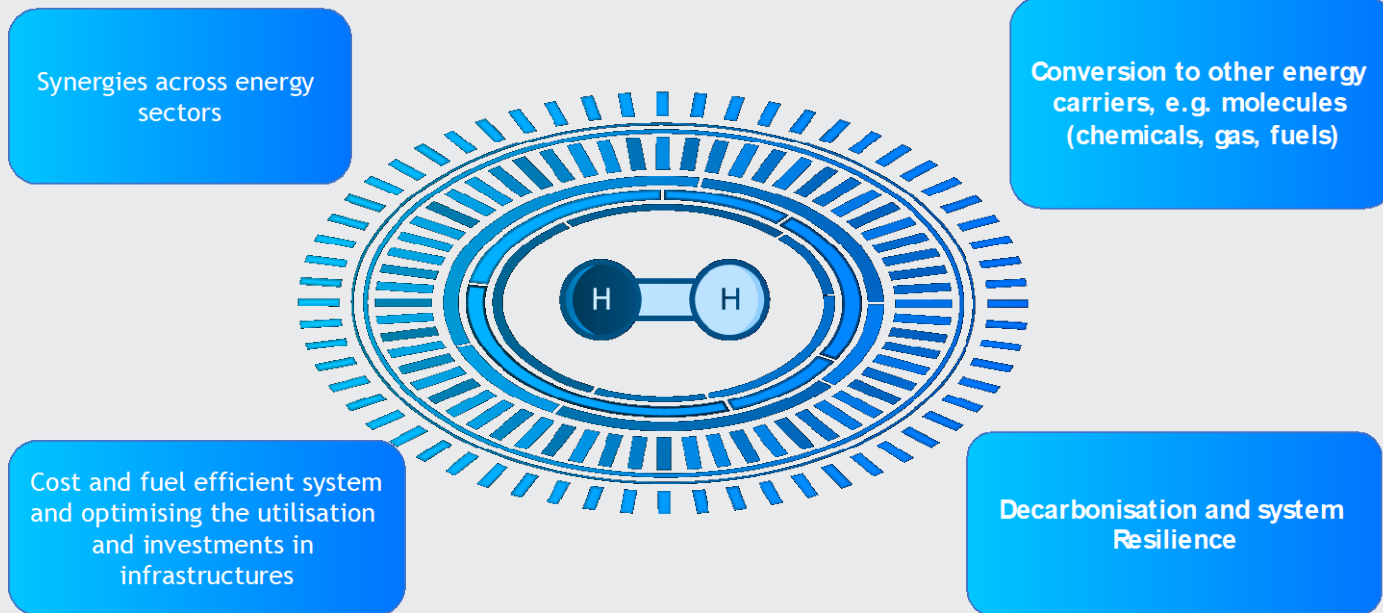
2040?

Maximize Impact - Mega Project vs. Bottom-Up

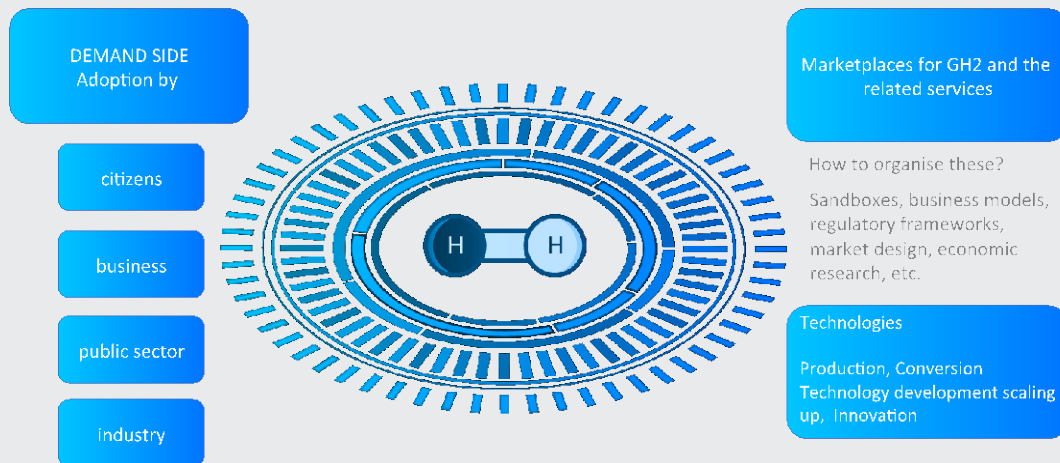
A dark blue map of Europe with a list of impact goals overlaid in white text. The European Union flag is visible in the bottom right corner.

- Maximum Impact
- New Industry / Jobs / Investment
- Regional Project Development
- Embed value creation
- Decentralised Energy
- Regional Roadmaps
- Prioritise SME involvement

System of Systems Approach



Demand vs. Supply - Balancing Act



Demand:

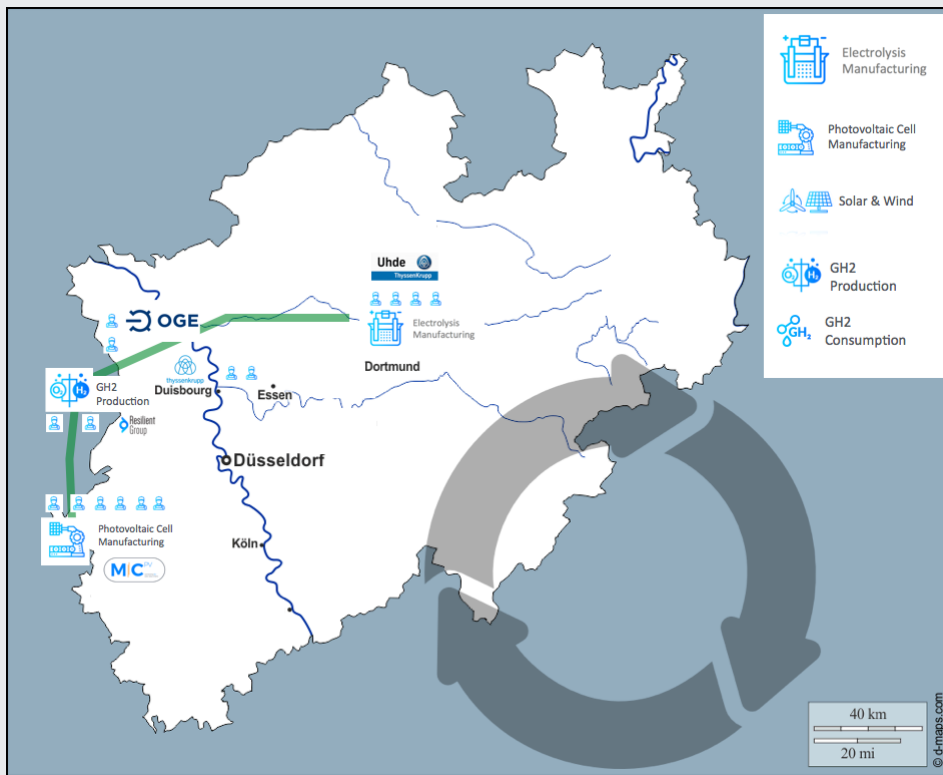
- **Socio-economic**
- **Financial**
- **Glocal relevance**
- **Decentralisation**

vs.

Supply:

- **Scale**
- **Financial**
- **Centralisation**

Example NRW Regional

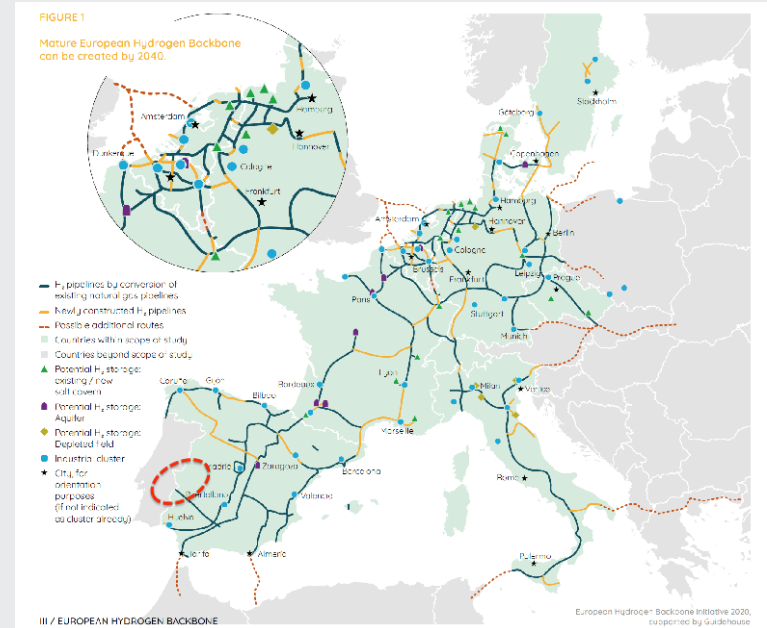


Integrated Regional Projects
Support Funding Impact
Design for Local Competitvety
Regional SME & Corporates
Manufacturing
Regional Deployment
Just Transition

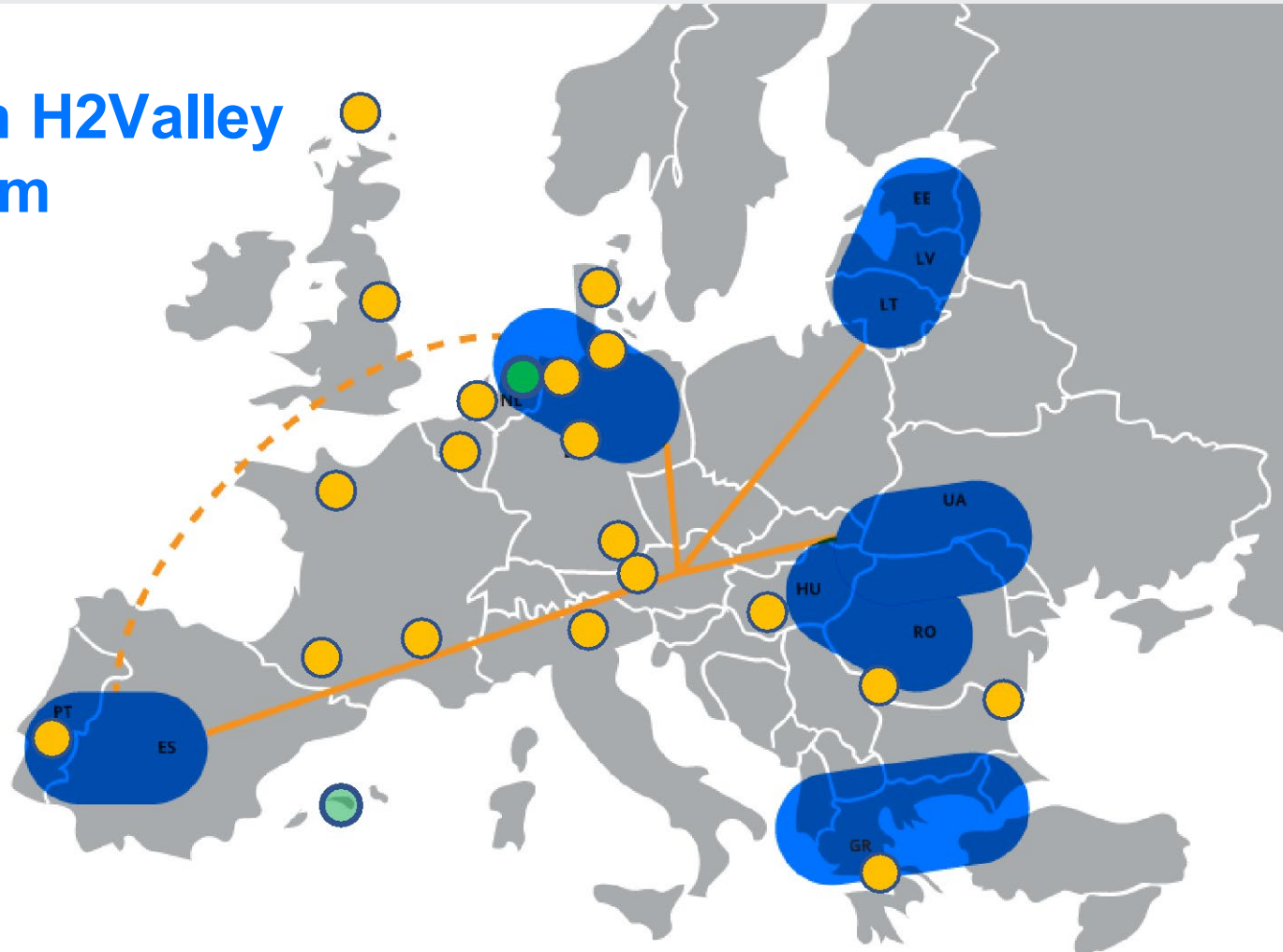


Example Interregional Roadmap

Roadmap Municipal & (Inter)Regional



European H2Valley Ecosystem



 m.rechter@resilientgroup.eu

 Marc Rechter

 marc_rechter

Thank you.



Value chain for hydrogen, infrastructure, clean hydrogen: the opportunities ahead

Jakub Przyborowicz

ENTSO-G



ENTSO 2050 ROADMAP ACTION PLAN

Enablers for Coal Regions transformation with Gas Grids

Just Transition Forum

Jakub Przyborowicz GAZ – SYSTEM, ENTSOG Representative

Brussels 17.11.2020

ENTSOG 3 Pathways of transition with gas grids

- Depending on Member States and regional/local choices, gas grids can facilitate coal-to-gas-to-hydrogen switch

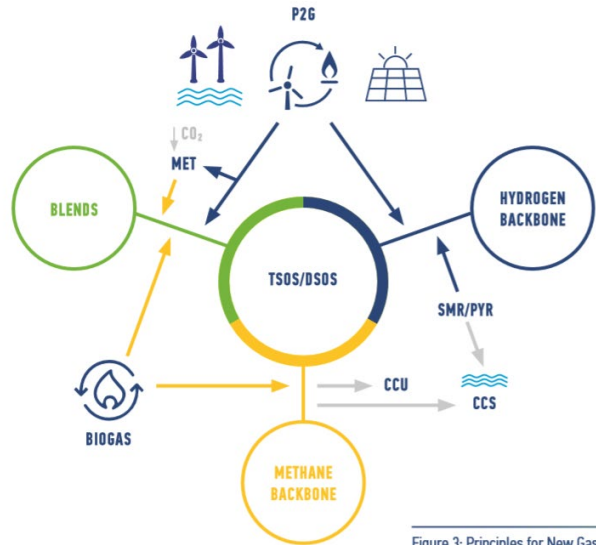
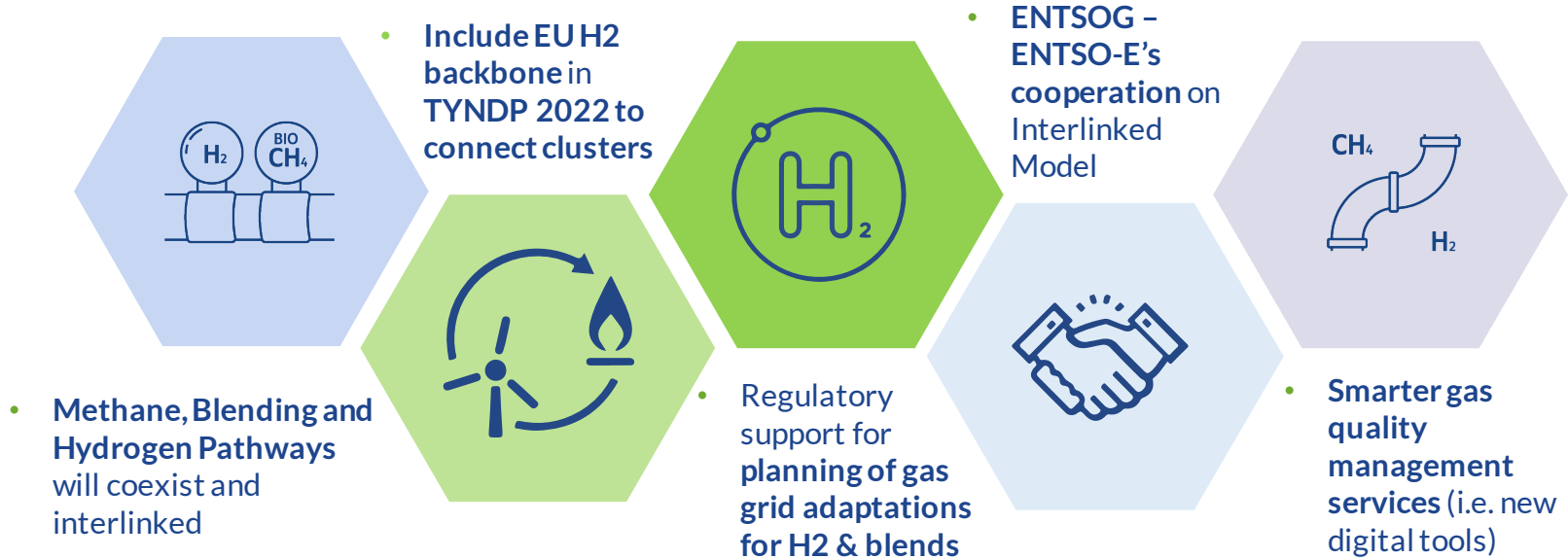


Figure 3: Principles for New Gases Transportation, ENTSOG, 2019.



To learn more about possible grids configurations you can visit [ENTSOG Roadmap](#) watch this [ENTSOG film](#)

Infrastructure: Delivering Europe's Future Energy Networks



Enablers for Coal Regions transformation with Gas Grids

- While decarbonizing: Use the potential of existing infrastructure and markets
- For energy system integration Enable the technology neutral level playing field for all energy carriers based on the life cycle analysis and quantified CO2 emissions cuts
- Discuss the optimal technological choices in local conditions with wider stakeholder engagement
- Prepare a clear framework for projects promoters in terms of availability of financial tools – regional funds, central EU lending, Recovery and innovation frameworks
- Allow for testing the business models and operating schemes within regulatory sandboxes allowing the NRAs for space to experiment and transfer solutions into their regulatory/organizational practice.

Agenda for Decarbonising Europe's Gas Grids



Markets	Infrastructure	TSO's role
<p>Same market principles for all gases including H2</p>	<p>Delivering EU's Future Gas Networks, including H2</p>	<p>TSO's as integrators of energy systems</p>
<ul style="list-style-type: none"> • Open access to grids & neutral TSOs • EU-wide GOs & certificates linked to ETS • GHG assessment of all energy carriers 	<ul style="list-style-type: none"> • Include EU H2 backbone in TYNDP 2022 to connect clusters • ENTSOG & ENTSO-E Interlinked Model • Cross-sectoral infrastructure planning 	<ul style="list-style-type: none"> • TSOs as owners & developers of H2 infrastructure • TSOs as system integrators for molecules & with electrons • Smart TSO services already supporting clusters



Thank you for your attention

Jakub Przyborowicz GAZ – SYSTEM, ENTOSOG Representative

ENTSOOG - European Network of Transmission System Operators for Gas

Avenue de Cortenbergh 100, 1000 Bruxelles

www.entsog.eu | info@entsog.eu



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1. Is a regional hydrogen strategy under development in your region / the coal region you know best?

 Start presenting to display the poll results on this slide.

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2. To harvest hydrogen related business models in coal regions - where do you think skills and

 Start presenting to display the poll results on this slide.

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Which kind of jobs do you expect that a hydrogen economy could bring to EU coal regions?

 Start presenting to display the poll results on this slide.

Interactive discussion

01

Hans-Joaquim Polk

VNG AG

02

Mara Bubberman

Northern Netherlands

03

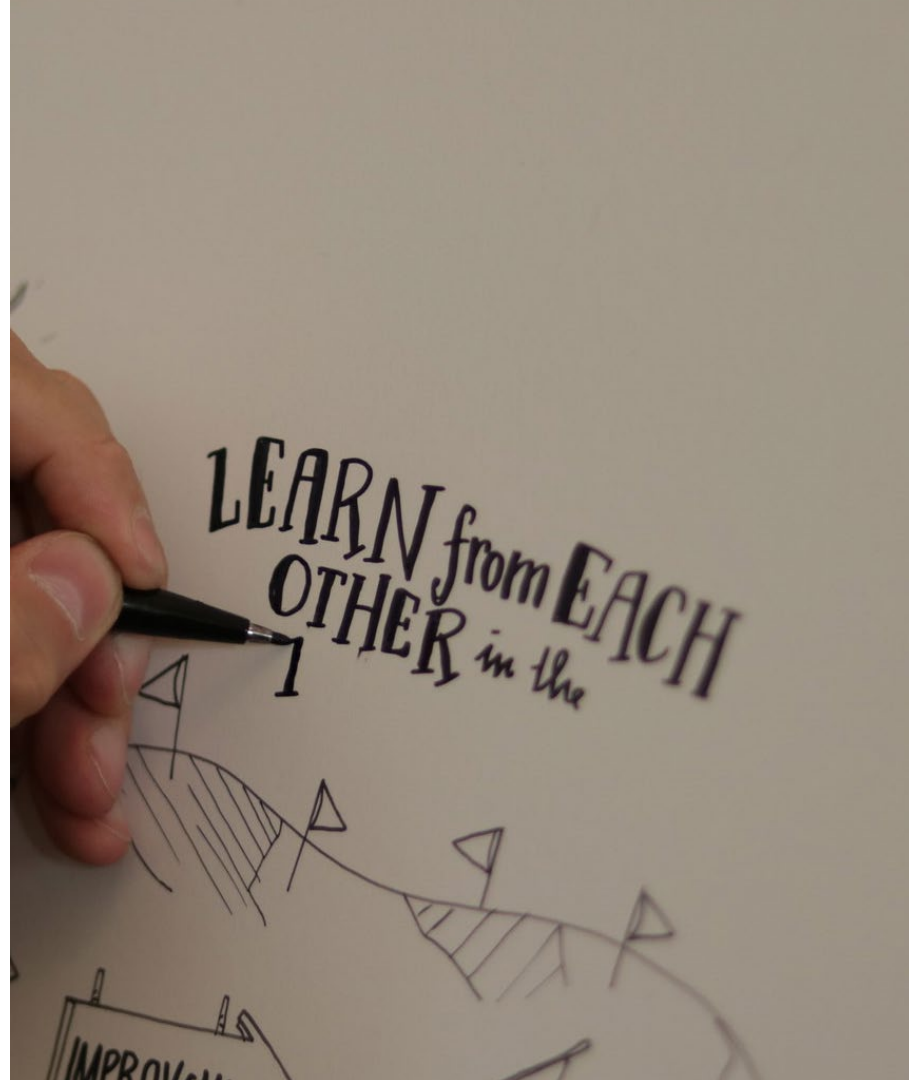
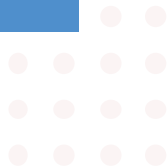
Marc Rechter

Resilient Group

04

Jakub Przyborowicz

ENTSO-G



Conclusion

Carsten Rothballer

Secretariat of the Initiative for Coal Regions in Transition

Timon Wehnert

Secretariat of the Initiative for Coal Regions in Transition

Thank you

secretariat@coalregions.eu

[Website](#)

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Twitter: [@Energy4Europe](#)

[DG Energy's YouTube channels](#)

