

CETPartnership Projects: Putting the Net-Zero Industry Act in Practice

22 October, 13:00 – 16:00 CEST

Moderation

Florian Moritz, Austrian Ministry for Climate Action

Today's agenda

13:00 Welcome & introduction

13:10 Project presentations

CO2RR

GreenSmith

HyLife

STRAWBERRIES

14:10 Coffee break

14:30 Project presentations

TRANSMIT

WaMTec

15:00 Q&A Session

Breakout sessions with project
representatives

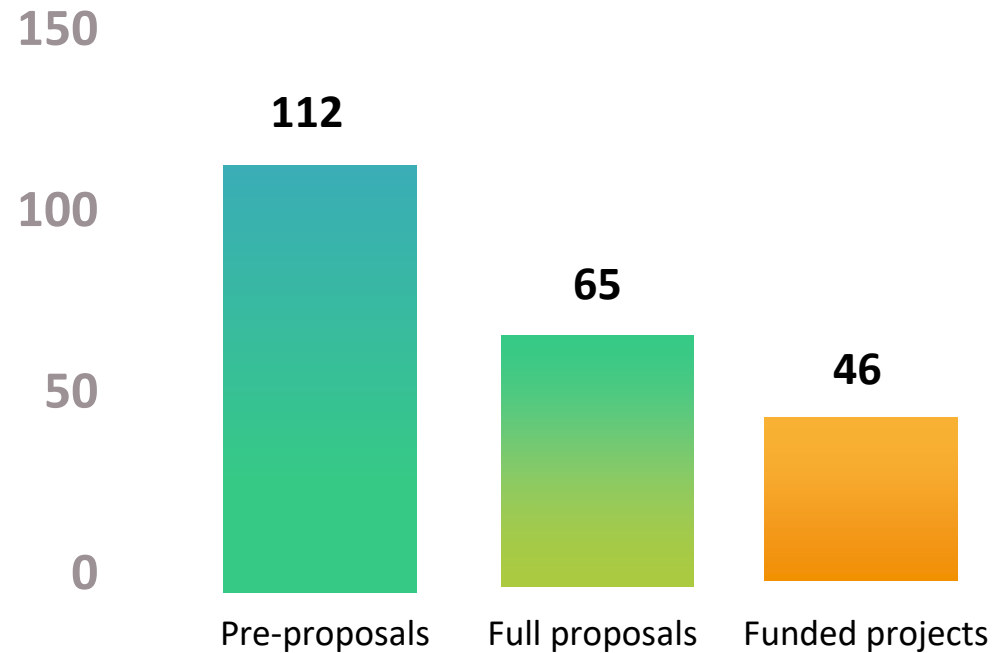
15:35 Wrap-up in plenary

16:00 Closing

Our Joint Calls



Joint Call 2022 – In numbers



513

Project Partners from countries

28

86.363.766,10 €

Funding

46

Participating National
Funding Organisations

Joint Call 2022 projects presented today



CO2RR

Dylan Marks



STRAWBERRIES

Fabian Feuchter



GreenSmith

Luca di Felice



TRANSMIT

Pedro Anacleto



HyLIFE

Nicole Dopffel



WaMTec

Marc Hoffmann

Carbon Rhine Route (CO2RR)



Dylan Marks, Airfix & South Pole, Switzerland

The Carbon Rhine Route project (CO2RR)

Establishing the first commercial, international
& multi-modal CO2 transport value chain in Europe



Focus & Key Innovations

CO2RR will demonstrate the feasibility and viability of creating such value chains for all parties, with a focus on business models and risk sharing, and ensuring incentives to continuously improve efficiency.

Innovative approaches:

Biogenic CO2 emissions

Small & medium-sized emitters

Cluster approach

Multi-modal transport

Risk-sharing models

Goals & Expected Impact

Goals:

- Establish a value chain to **capture, transport and store 1 million tCO₂ by 2030**
- Provide a **commercial CO₂ removal blueprint** for inland Europe by 2026

Contribution to clean energy transition:

- **Accelerating the deployment of Carbon Dioxide Removal (CDR)** and Carbon Capture and Storage (CCS)
- **Facilitating negative emissions** by capturing biogenic CO₂, aligned with the EU's targets
- **Supporting smaller emitters** with CO₂ removal solutions
- **Providing a scalable CDR/CCS solution**, enhancing carbon management infrastructure across Europe

CO2RR & the Net-Zero Industry Act

- **Supporting EU net-zero goals**, and the NZIA's injection capacity target of 50 million tCO₂ per year by 2030
- **Scalable CCS/CDR infrastructure** – with a multi-modal CO₂ transport network
- **Driving innovation** – with the development of business & risk-sharing models and promoting the cluster approach
- **Enabling fast commercialisation** – with NZIA's streamlined permitting and regulatory sandboxes
- **Skill development for long-term growth** – focus on workforce development ensures a skilled labour force

Thank you

Contact

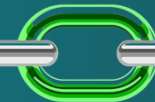
Dylan Marks

Airfix & South Pole

d.marks@airfixcarbon.com

GreenSmith



Green  Smith

The logo icon consists of two interlocking green rings, resembling a chain link or a stylized 'G' and 'S' combined.

Luca Di Felice, Paul Wurth Italia SpA, part of SMS group

At a glance

Paul Wurth Italia



Located in **Genova**, Italy

It counts around **300 employees**

Coke oven plants, Blast Furnaces, Water treatment and Direct reduction plants are part of our portfolio

SMS group

Experienced partner

150

Family business with a history of more than 150 years as a technology leader



Worldwide

More than 13,200 employees



Local

95 workshops and sites globally

Paul Wurth Italia product portfolio

● Blast furnace and auxiliaries-BF

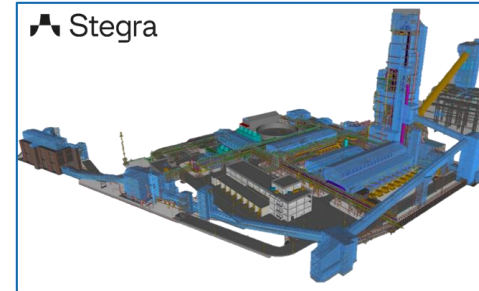


30 New constructions/remordanization since 2005 (date of creation of Paul Wurth Italia)

3 Complete BF Projects under execution

3 Projects on BF auxiliaries under execution

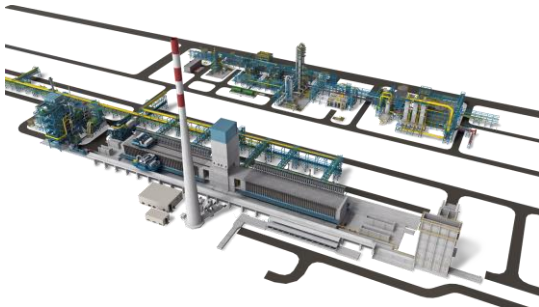
● Direct Reduction plant - DRP (MIDREX)



7 New construction since 2014 (start of Licence from Kobe Steel on Midrex technology)

4 complete DRP projects (3 in EU, 1 in APAC MEA) under execution

● Cokemaking projects under execution

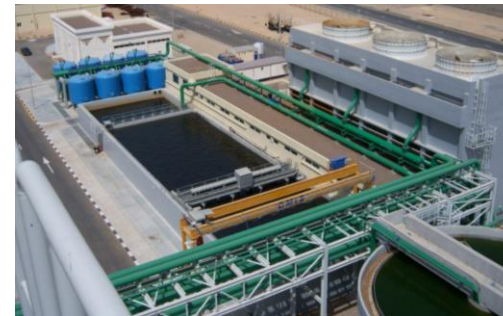


15 on Coke batteries

4 on Coke Gas Treatment plants

2 on Coke Machines

● Water treatment projects under execution



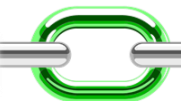
3 Direct Reduction WTP Projects in Ironmaking Area (1 in APAC MEA);

2 Steelmaking and Rolling Mill WTP Projects (2 in America)

1 EAF and 1 Rehaeting Furnace WTP project (1 in EU and 1 in America)

Challenges for Iron and Steel

- 7% of the world CO₂ industrial emissions come from Iron & Steel industry (avg 1.7-1.9 ton_{CO2}/ton_{steel}, accounting for 3 Gt_{CO2}/y)
- CO2 footprint reduction are expected by:
 - Increased scrap recycle
 - Improved efficiency of iron making
 - Switch reductant agents (e.g. H₂)
 - Capture CO₂ for further use or sequestration

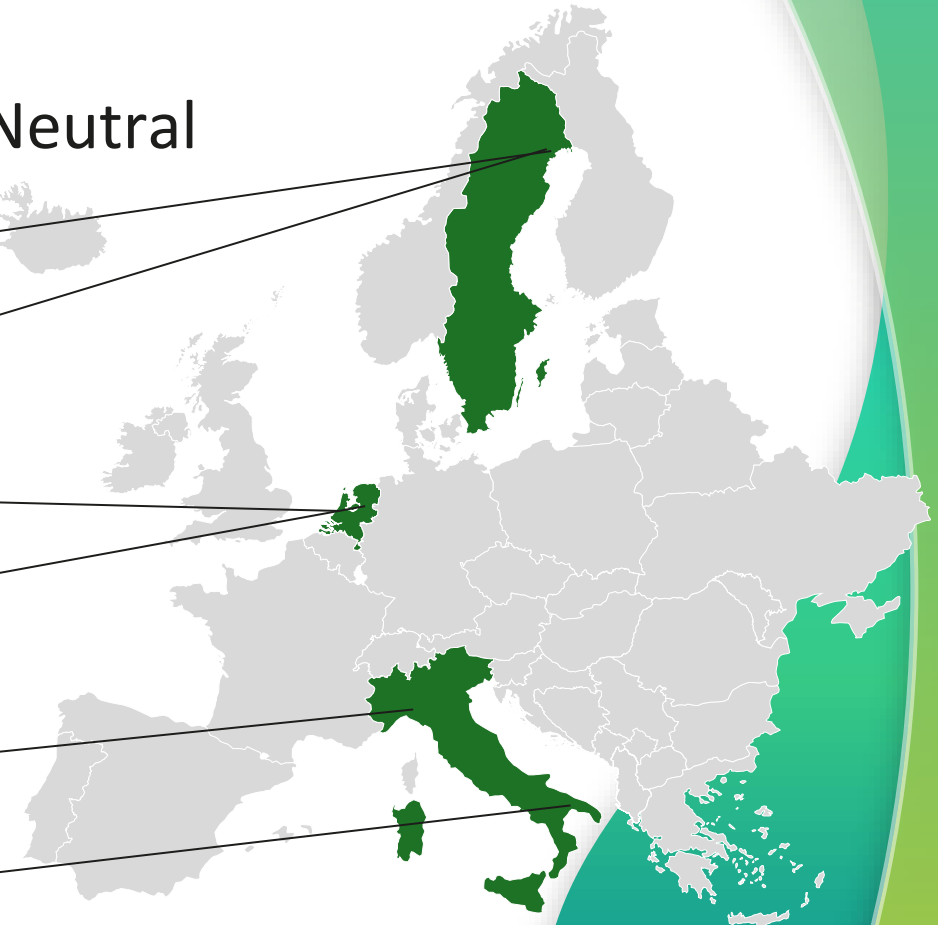
Green  **Smith**

Introducing GreenSmith Project & Consortium

- GreenSmith - Gas Processing for Climate Neutral Steelmaking

Full Value Chain covered:

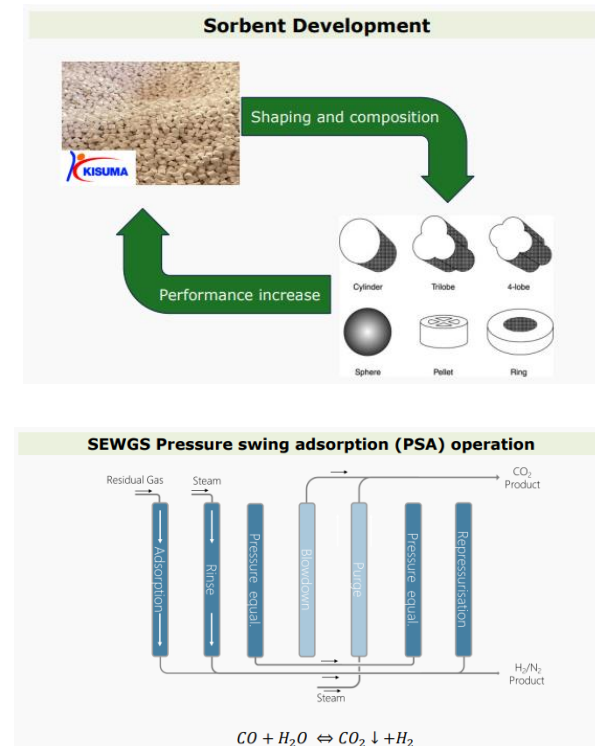
- End-Users
- Technology Suppliers
- Research organisations



GreenSmith Goals & Expected Impact

Demonstration of multiple integration routes advancing the decarbonization potential and maintaining a competitive set-up

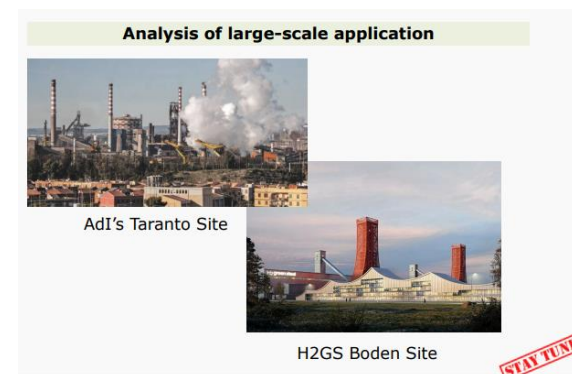
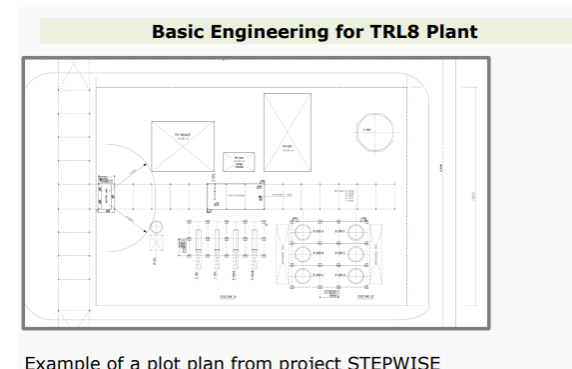
- Demonstrating a two-fold increase of SEWGS productivity by utilising **novel Himago™ adsorbents** crafted with advanced shaping techniques;
- **Achieving TRL5 demonstration** of H₂-rich product streams recovery by SEWGS from relevant mixtures of residual steel gas from **Blast-Furnace (BF)** route and novel CH₄- and H₂-based **Direct Reduction Plant (DRP)** route



GreenSmith Goals & Expected Impact

Demonstration of multiple integration routes advancing the decarbonization potential and maintaining a competitive set-up

- Establish a **Basic Engineering Design Package** for a **TRL8 roll-out of the technology** (50 ktonCO₂/y from BFG at ADI's site in Taranto, Italy), enabling the replication potential and market diffusion.
- Showcasing competitive performance in terms of sustainability and economics for two implementation cases through **full scale techno-economics and life-cycle analysis**



GreenSmith in the perspective of the Net-Zero Industry Act

- **Decarbonation** of iron-ore based steelmaking industry **by partly replacing coke with H₂** in the BF route through an efficient integration of SEWGS
- Optimized energy recovery and consumption, increased H₂ content and lower CO₂ emissions in the NG/H₂ based DRP process
- An overall **reduction of fossil-based fuels** consumption
- Technology applicable to both DRP and BF, impacting on an expected market size of **170 Mt/y of crude steel** production in EU by 2050
- SEWGS **carbon capture rate >95%** and **CO₂ purity >95%** on dry basis;
- Reducing C-footprint targets of state-of-the-art steel making from an intensity of 2.0 kg_{CO2}/t_{HRC} to **<0.4 kg_{CO2}/t_{HRC}** and beyond
- Levelized Cost of Hot Rolled Coil (LCOHRC) below **610 €/ton_{HRC}** and a CO₂ Avoidance Cost (CAC) below **41 €/ton_{CO2}**

Thank you!

Contact

Luca Di Felice

Paul Wurth part of SMS Group

luca.difelice@sms-group.com

HyLife CETP



Nicole Dopffel, NORCE, Norway

Introducing HyLife

= Microbial risks associated with hydrogen underground storage in Europe



Industry partners

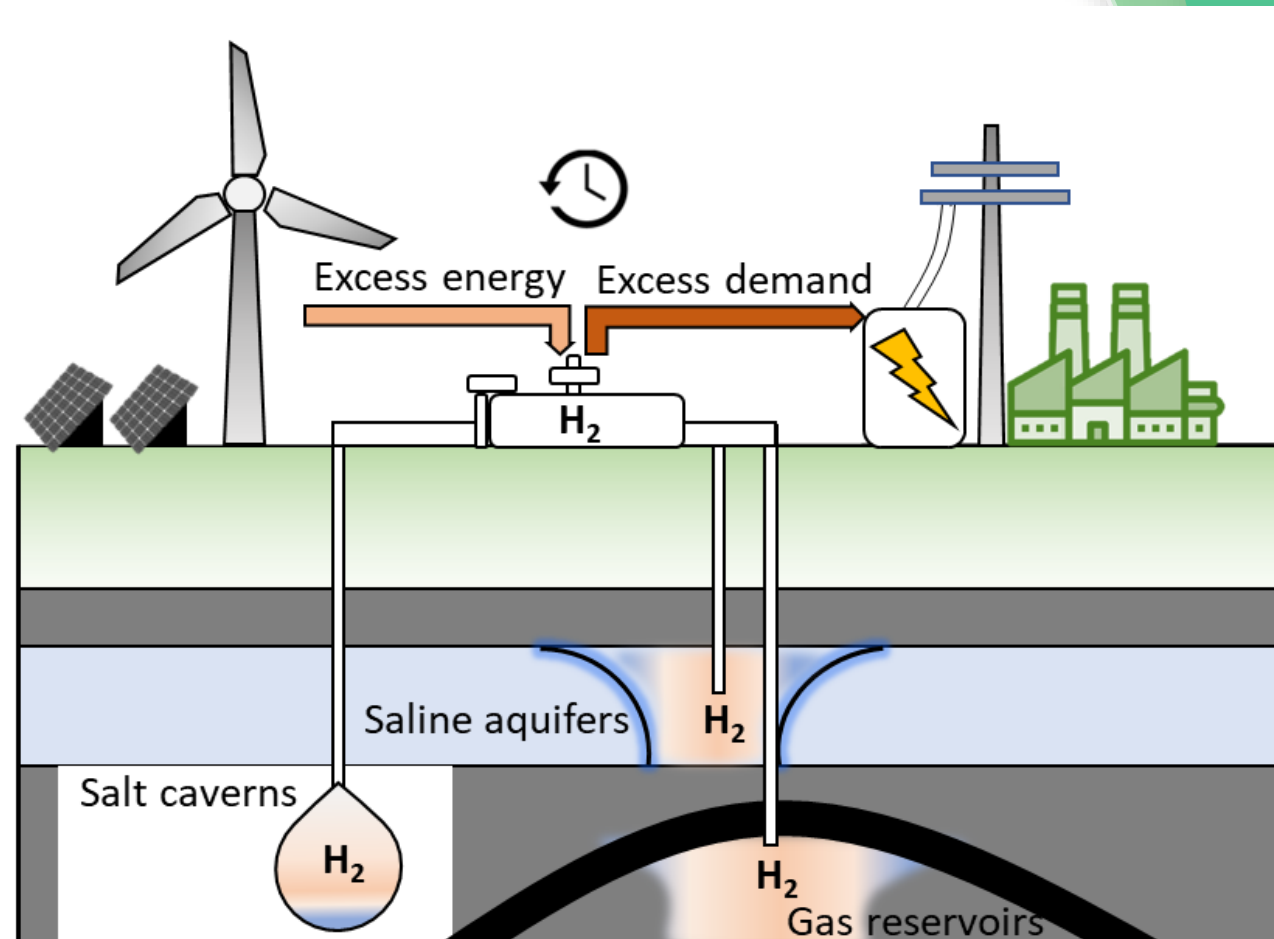
Lanxess (US/Germany)
SLB (Norway)
BP (US/UK)
OMV (Norway/Austria)
TotalEnergies (Norway/France)
Corronation (Netherlands)

Why hydrogen underground storage (UGS)?

1. Excess energy during high wind & high solar influx & low demand
2. Transformation of energy (“Power-to-gas”)
3. **Storage of energy**
4. Higher demand
5. Direct use or Gas-to-Power

Large-scale storage options:

- Salt caverns
- Saline aquifers
- Depleted hydrocarbon reservoirs



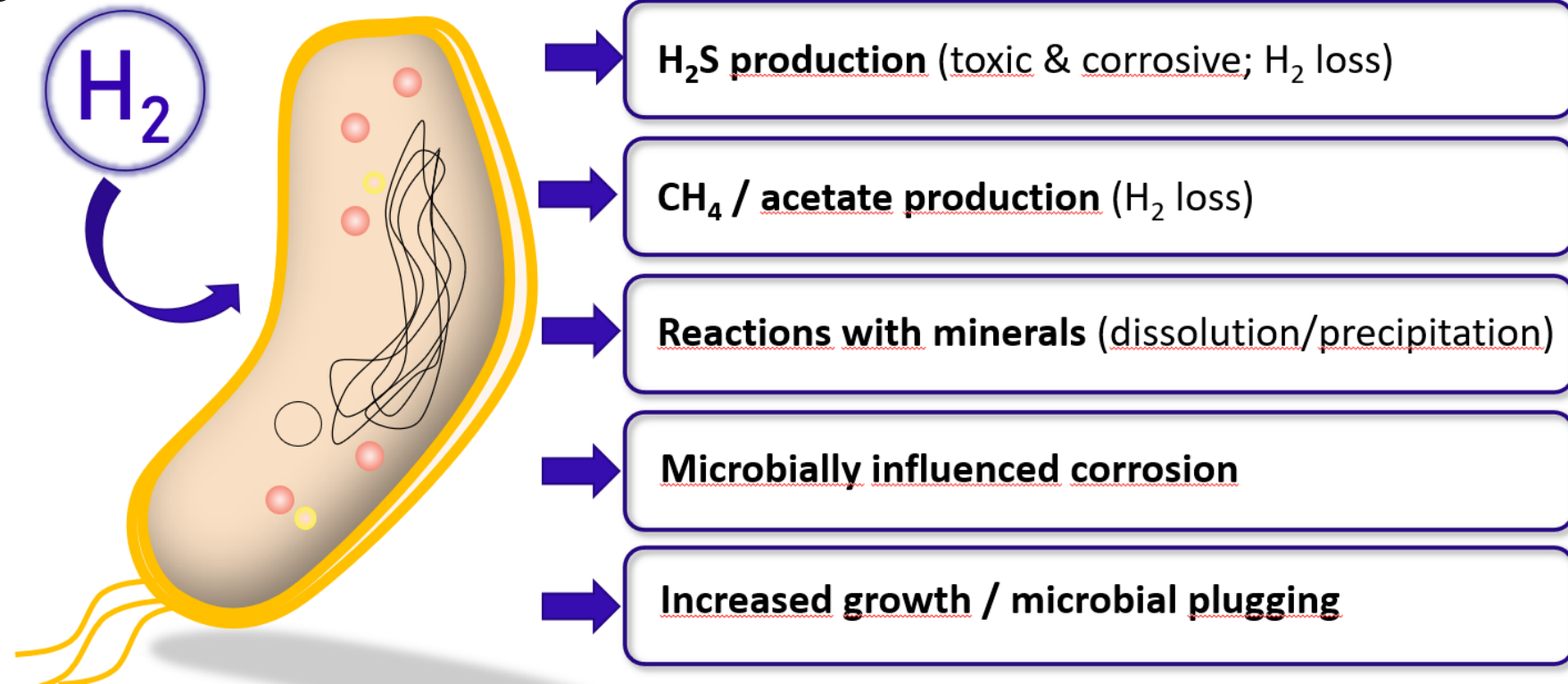
Microbes in the subsurface

Underground/subsurface storage is necessary for storing large amounts of hydrogen!

In Europe there are many existing gas storage sites and big potential to make more.

But the underground is not sterile and microbes can be found everywhere!

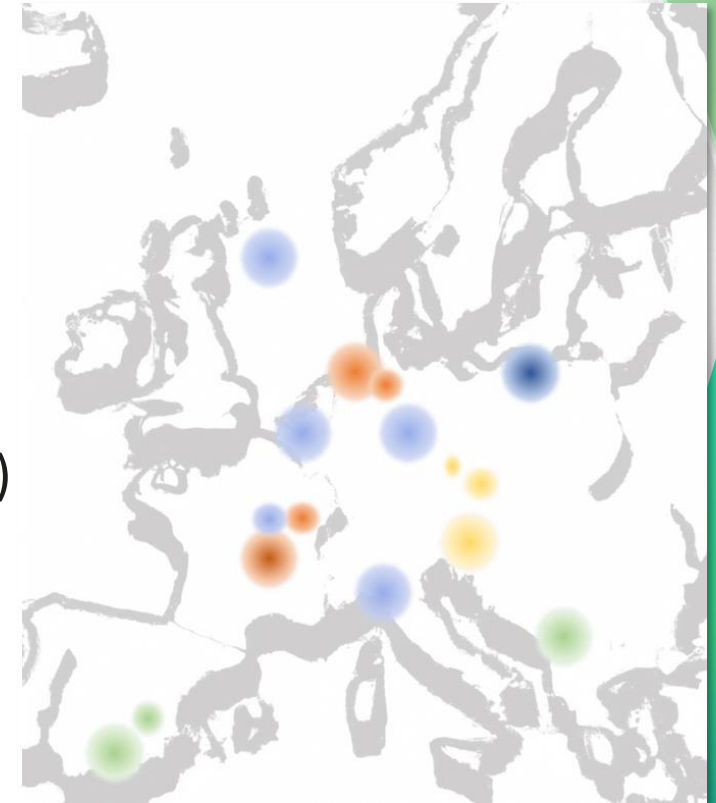
Microbes can consume hydrogen:



Microbiological network in Europe to answer our main question

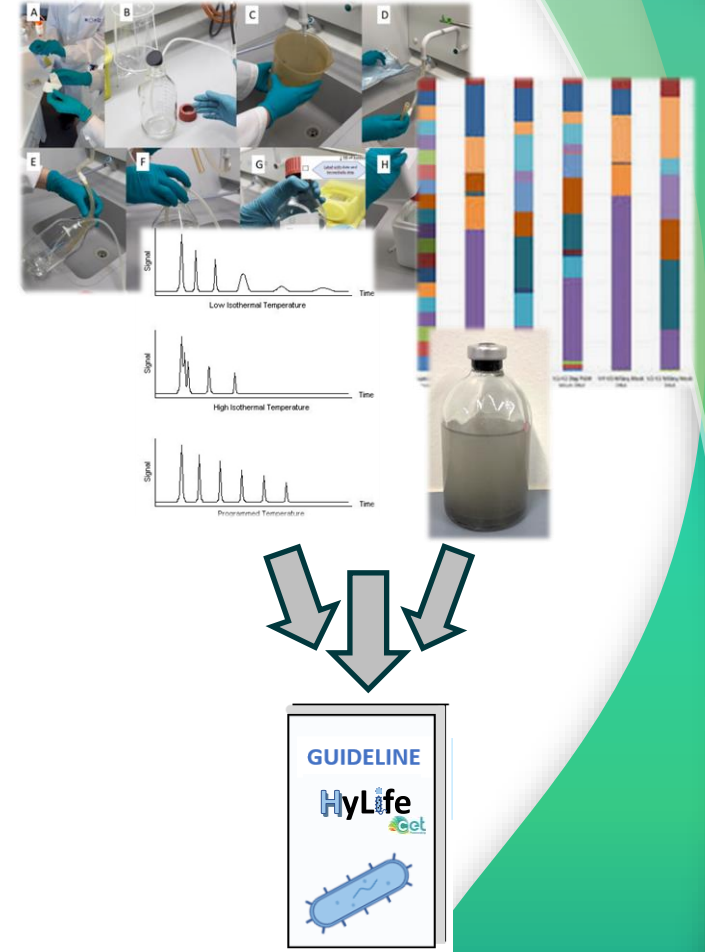
Is the microbial presence a risk for H₂ storage in **all** storage sites?

- Unite our microbiological strengths! (4 labs work together)
- Define standards and protocols across all partners
= best comparability between results
- Investigate as many storage sites as possible (→ open database)
- Test mitigation and understand business risks
- Write guidelines for operators and governments
- Actively use the aligned methods and findings in H₂ storage projects



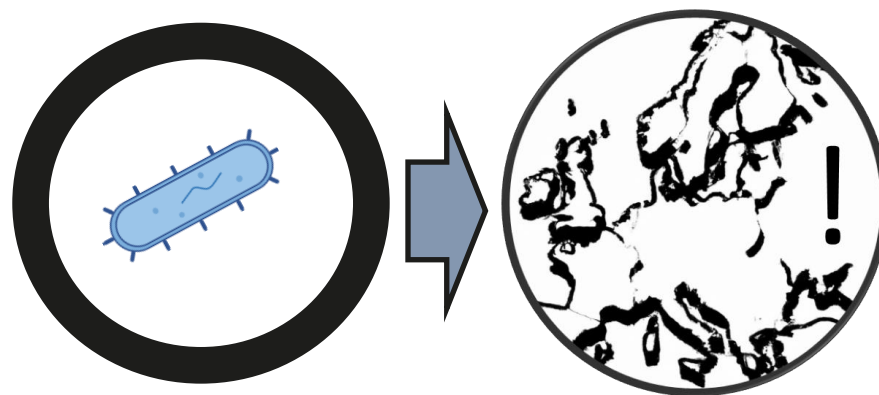
Outcomes of HyLife

- Identifying key indicators for microbial risks within underground storage
- Develop standards and protocols for future field trials
- Pioneer broad-scale microbial evaluation process and enable a microbiological-risk specific business profile case
- Develop mitigation and management strategies

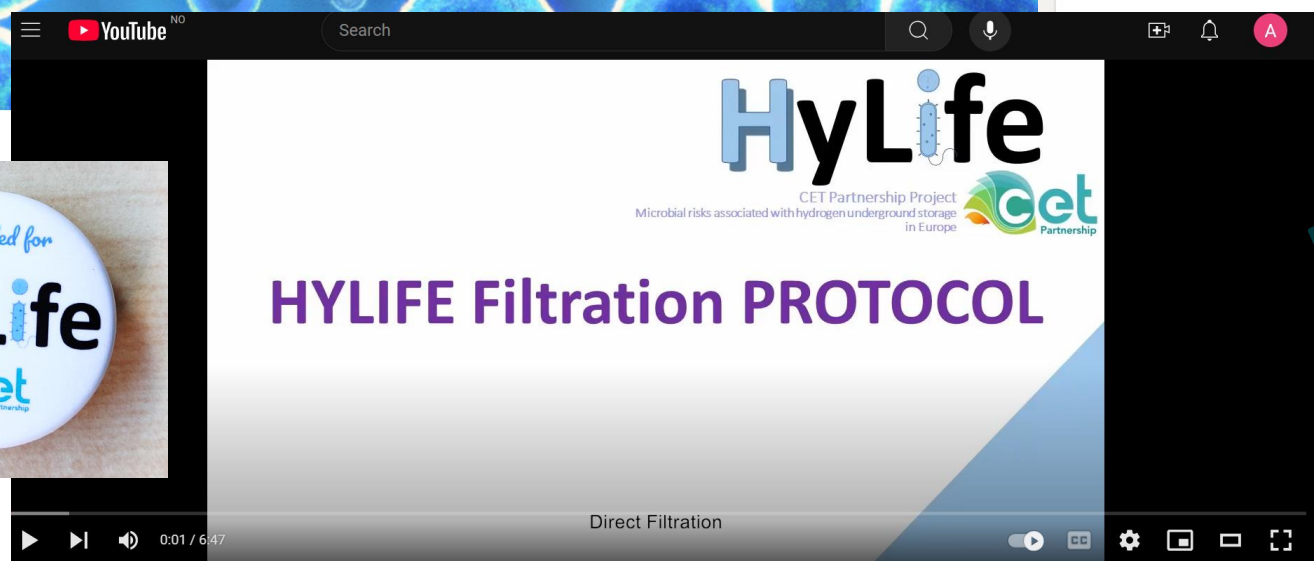
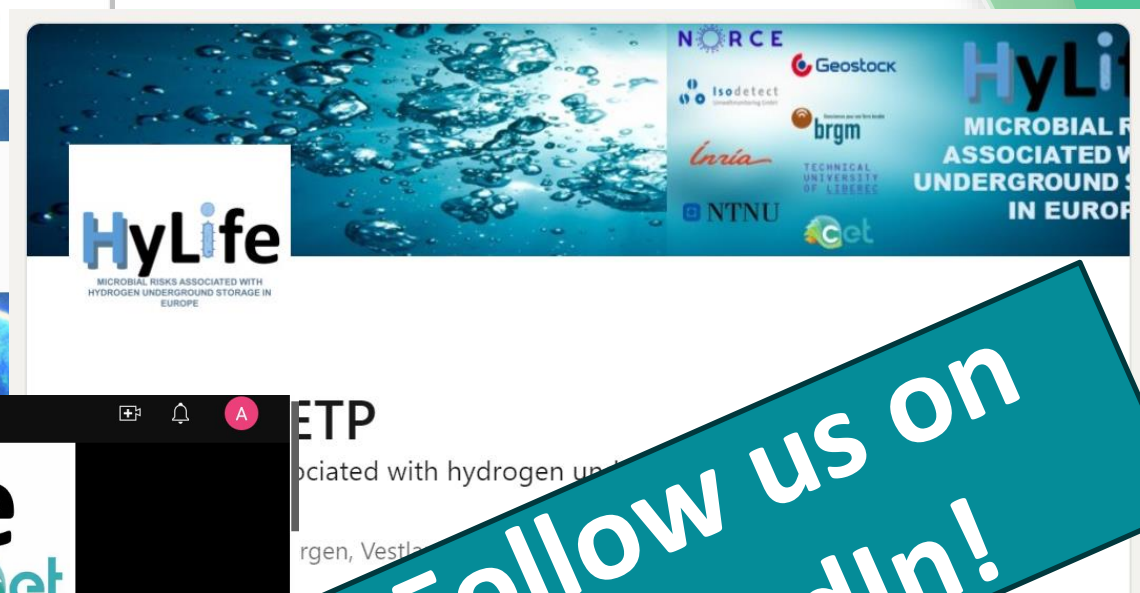


Impact of HyLife

- Pin-pointing stable hydrogen storage sites in Europe
- Provide selection criteria for most favourable storage sites minimizing microbiological risks to the business
- Enable **safe** large scale & long-term H₂ storage



Dissemination is key!



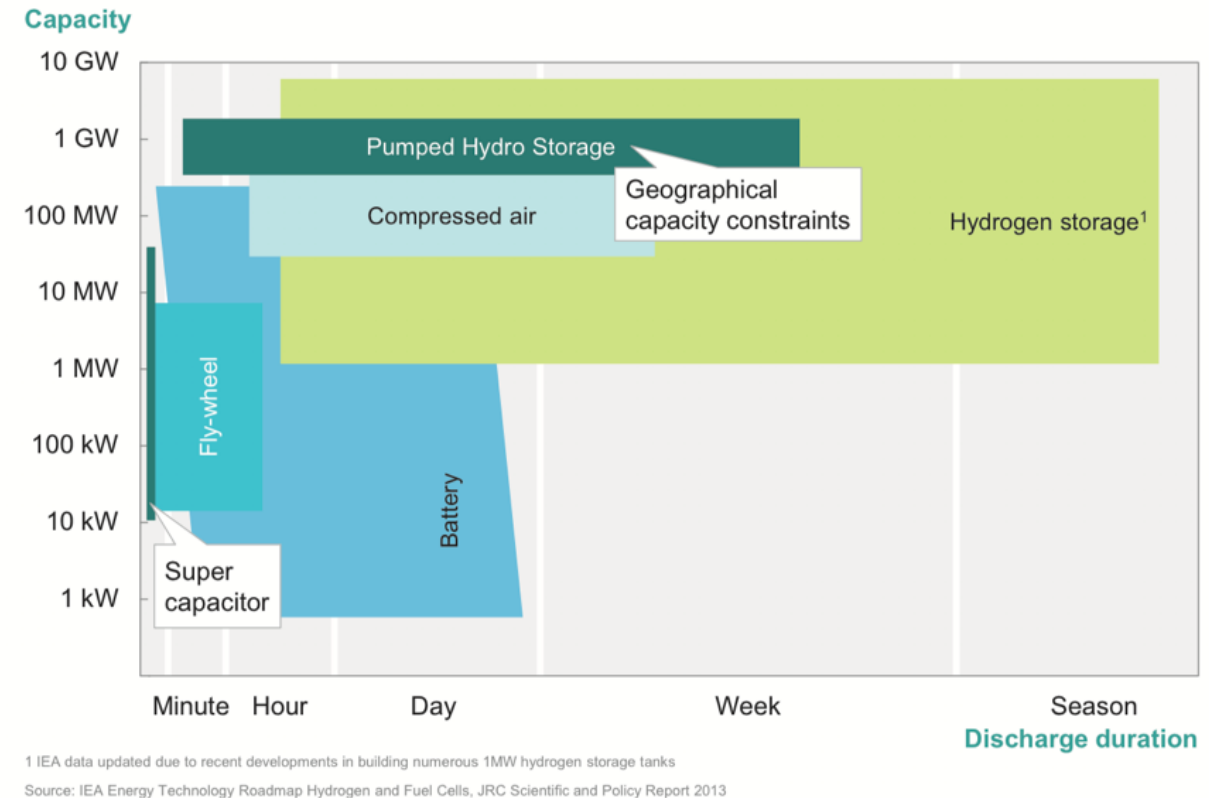
Follow us on LinkedIn!

HyLife in the perspective of the Net-Zero Industry Act

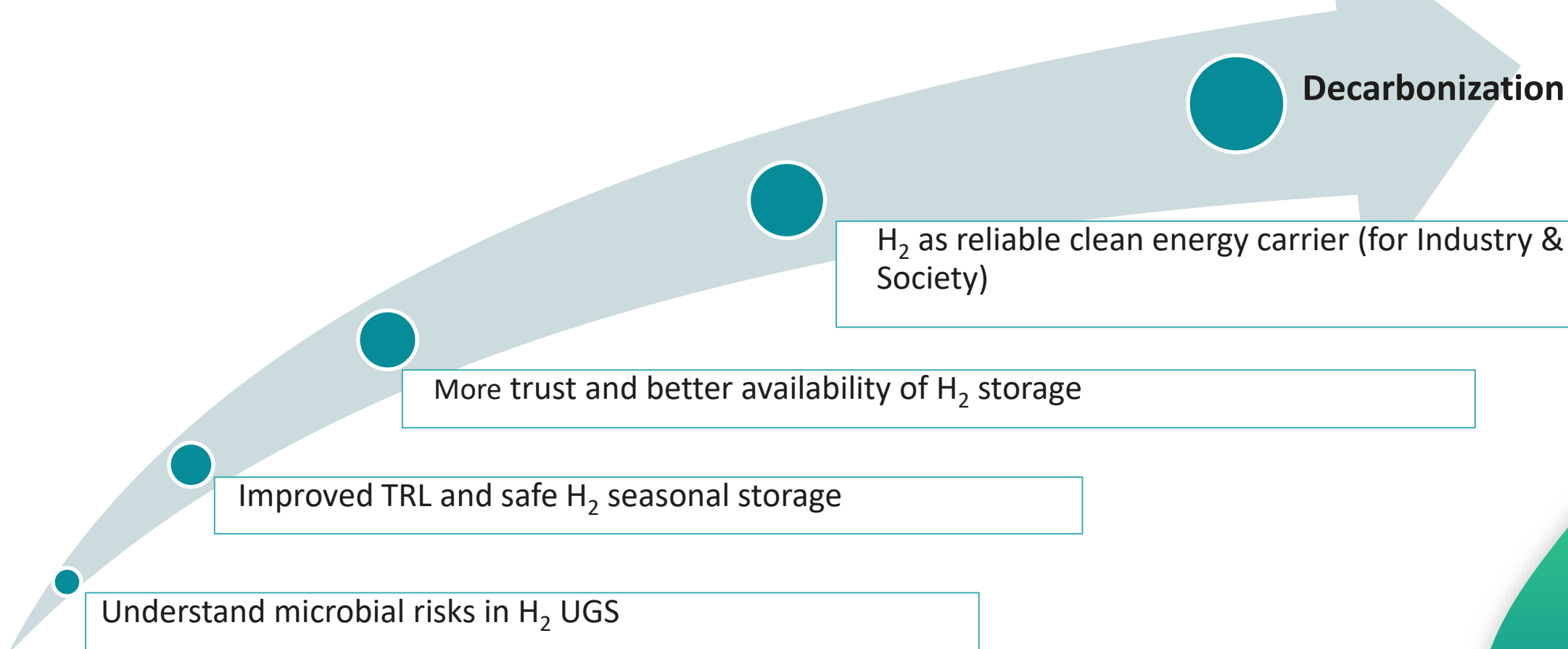
- Hydrogen storage is needed for seasonal energy storage to support electrification!

Subsurface H₂ storage will provide safe, cost-effective and large scale storage of renewable energy!

We need to understand the differences between storage sites, what to look for and how to mitigate!



HyLife in the perspective of the Net-Zero Industry Act



Thank you!

And thanks to all our partners!

hylife-cetp.com or on LinkedIn

nicd@norceresearch.no



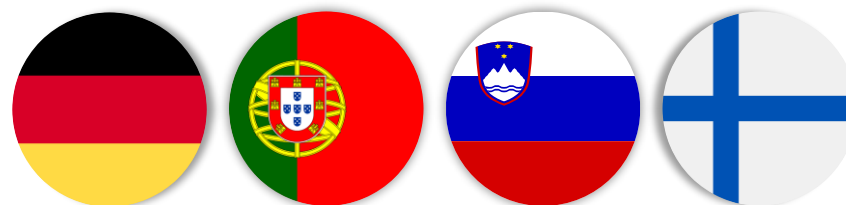
STRAWBERRIES



Fabian Feuchter, Institute of new Energy Systems (TH Ingolstadt), Germany

Introducing our Project & Consortium

Solar Thermal Agriculture with Bifacial Collectors for Farming Synergies



Research Institutions



Industry & SMEs



Energy Cooperative



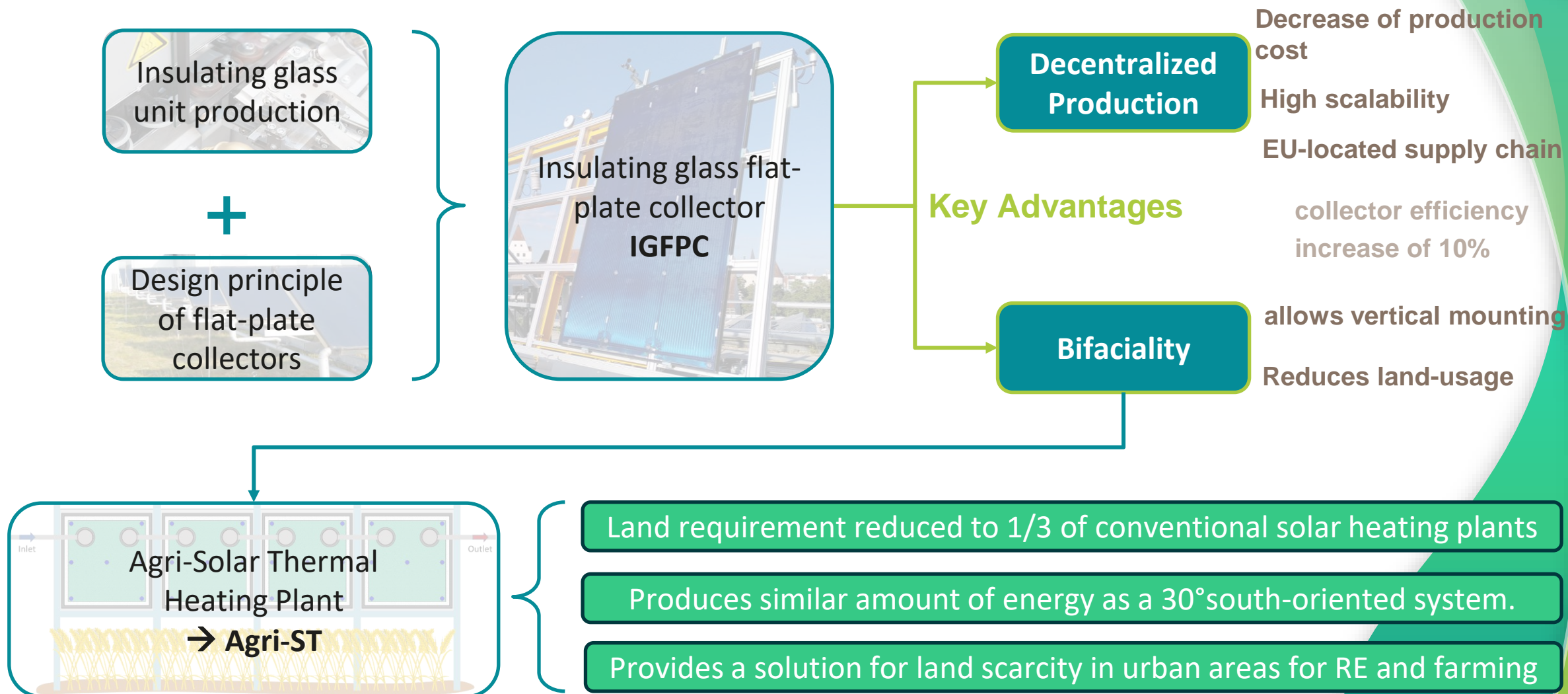
Our Research Focus & Key Innovations

What are we researching or developing?

What innovative approaches are being explored?

How is STRAWBERRIES pushing the boundaries of current knowledge or technology?

Our Research Focus & Key Innovations



Our Goals & Expected Impact

Impact on the energy transition...

- Bifacial solar thermal systems will reduce the land demand and put solar heat in an attractive position for district heating systems in urban areas.
- As renewable source of heat it will save GHG emissions in the heating sector and will use available agricultural land more effectively.

Real world contribution...

- Assuming a 10% solar fraction of the technology in solar district heat it could at least lead to CO2 emission savings of 665,000 tons / year
- A demonstration plant will feed into a local district heating network and contribute to decarbonization.

A

Successful demonstration of the Agri - Solar Thermal concept

B

Roll-Out and distributed mass production strategy by 2030

C

Provide a solution for land-competition of renewable heating and farming.

STRAWBERRIES in the perspective of the Net-Zero Industry Act

How does the project address the goal of competitive and sustainable manufacturing of EU clean energy technologies?

What impact does it have on boosting EU production of clean energy technologies?

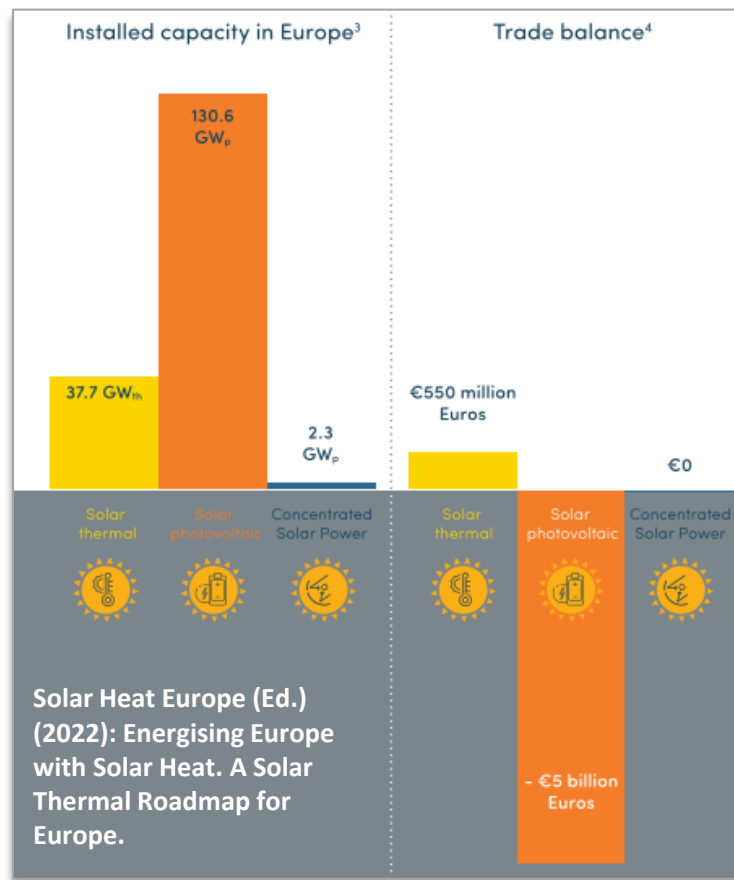
To what extent could NZIA support commercialisation and scale up?

STRAWBERRIES in the perspective of the Net-Zero Industry Act

- **STRAWBERRIES provides a solution for two industries to create a new market segment**
STRAWBERRIES connects the dots between a well-established, highly automated glass manufacturing industry in Europe with a growing solar heat sector and provides a solution for scale-up and deployment of a land-efficient clean-tech heating technology.
- **Regulatory sandboxes can help testing in manufacturing or planning plants with this technology**
The regulatory sandboxes proposed in NZIA-regulation offers OEMs in collaboration with research institutes to explore adaptability for their manufacturing case with reduced economical insecurity.
- **Solar Thermal Plants can be defined as projects of strategic interest**
Through NZIA large-scale solar thermal plants can be defined as projects of strategic interest and benefit from more streamlined permission planning.

STRAWBERRIES in the perspective of the Net-Zero Industry Act

At last... the bigger picture of it



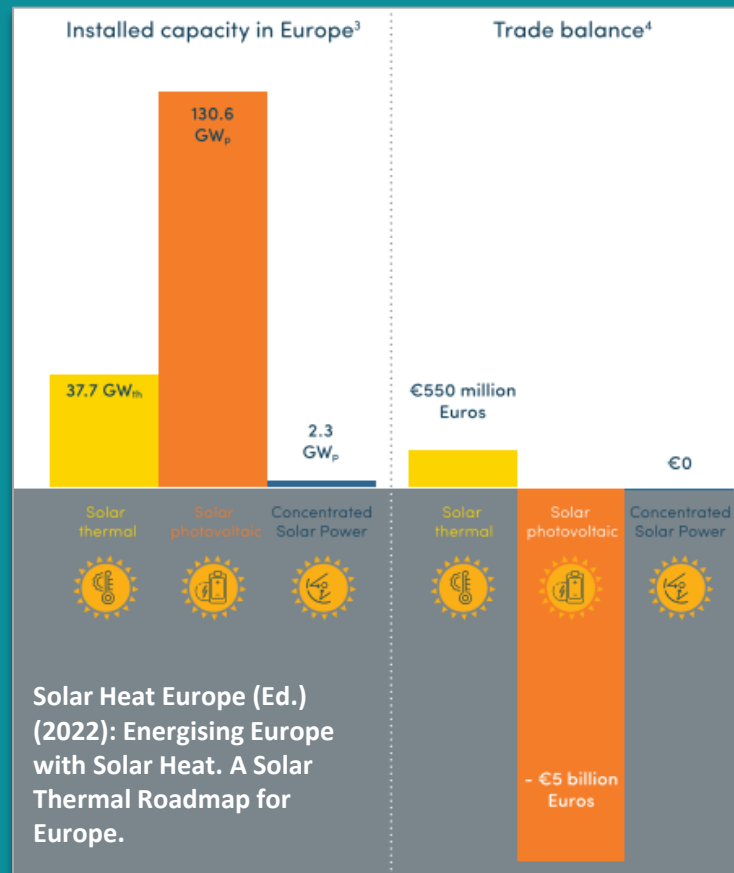
Heating and cooling account for 50% of the EU's energy demand. The share of renewables in H&C is at 25%. [1]



EU solar thermal manufacturers meet 90% of European demand and export over 70% of their production. [2]

Solar heat can be an important complimentary part of a european clean tech solution for decarbonization of the district heating sector

STRAWBERRIES in the perspective of the Net-Zero Industry Act



So if we already have an existing and stable supply chain in the EU, a proven technology and a market that's steadily growing...

Why don't we make more out of that?

Thank you!

Contact

Fabian Feuchter, Research Associate

Institute of new Energy Systems, University of Applied Sciences Ingolstadt

Fabian.Feuchter@thi.de

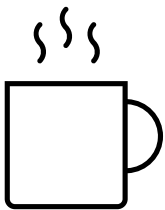
<https://www.linkedin.com/in/fabian-feuchter/>

<https://thi.de/go/energy>

References

[1] European Commission, Eurostat (2022): Renewable energy for heating & cooling up to 25% in 2022. Online available under <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/w/ddn-20240227-2>. Accessed on 18.10.2024.

[2] Solar Heat Europe (Ed.) (2024): The EU solar thermal industry is one of the sectors which can help preserve “our welfare, environment and freedom”, in line with the Draghi report. Written by Anna Ledro. Online available under <https://solarheateurope.eu/2024/09/09/the-eu-solar-thermal-industry-is-one-of-the-sectors-which-can-help-preserve-our-welfare-environment-and-freedom-in-line-with-the-draghi-report/>. Accessed on 18.10.2024.



Coffee break

We will continue at **14:30 CEST** with:

- | | |
|----------------------|---|
| 14:30 – 15:00 | Project presentations: TRANSMIT, WaMTec |
| 15:00 – 15:35 | Q&A Sessions in breakout rooms |
| 15:35 – 15:00 | Wrap-up discussion & final reflections |
| 15:50 – 16:00 | Closing & Outlook to Day 2 of the Conference |



Interested in our Joint Call 2024?

- **Pre-proposal submission deadline** is on **21st of November**.
- Do you have questions? Then join our **Q&A session** tomorrow, 23 October, 14:00 CEST.

Scan the
QR Code
to register



TRANSMIT



Pedro Anacleto

INL - International Iberian Nanotechnology Laboratory

Portugal

Before getting into the details

let me take you to the city

- Worldwide, cities are becoming:
 - bigger, taller, and full of “energy-hungry” buildings
- There are high expectations regarding the “buildings of the future” as they must be:
 - Energy self-sufficient
 - Produce the energy they consume on-site
- Here, photovoltaics (PV) can help!

But ...



New York City, USA (8.3 million people)

Before getting into the details

let me take you to the city

- There is not a lot of space in cities for PV deployment.
- “Space” is a rather scarce and expensive resource.
- Building rooftops offer limited space for PV installation, especially in tall structures with numerous floors.

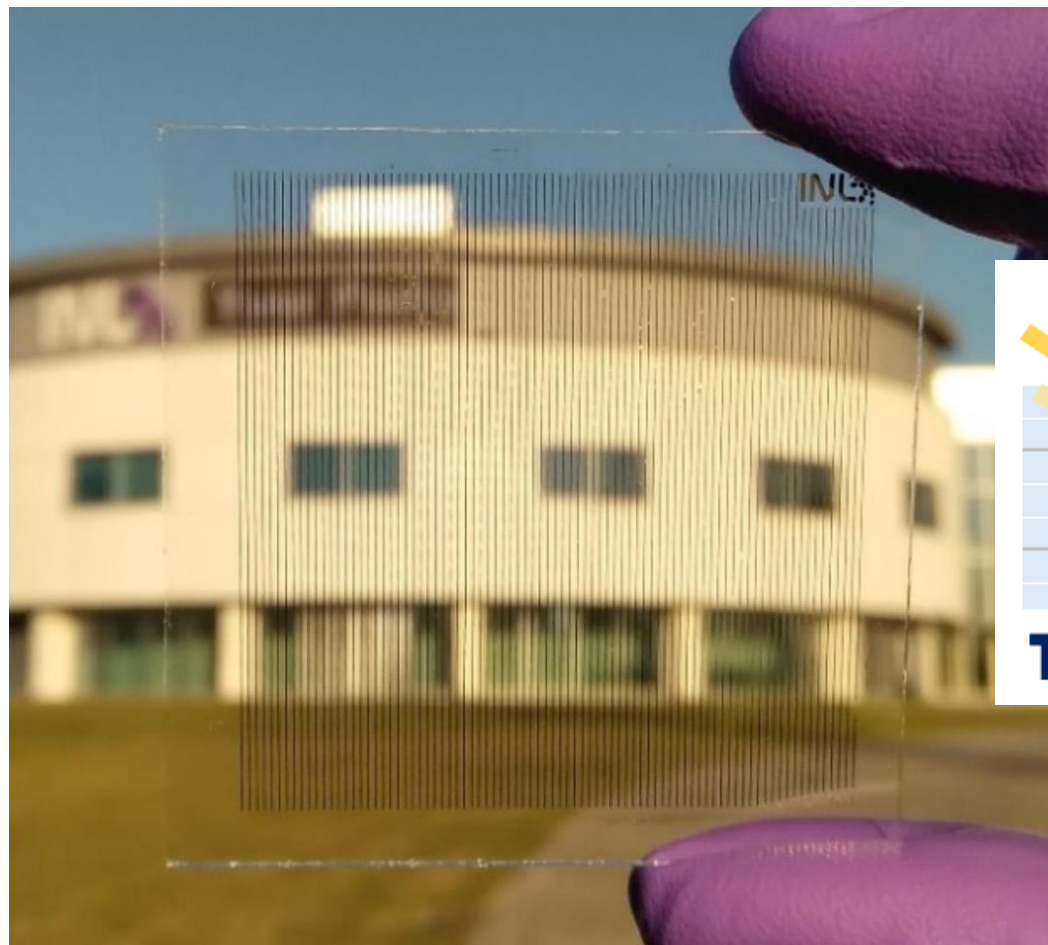
However, there is plenty of room in ...



“Central PV Park”

... Buildings' windows

TRANSMIT: Semi-transparent micro-striped thin-film photovoltaics for energy-harvesting windows



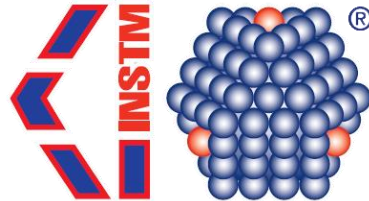
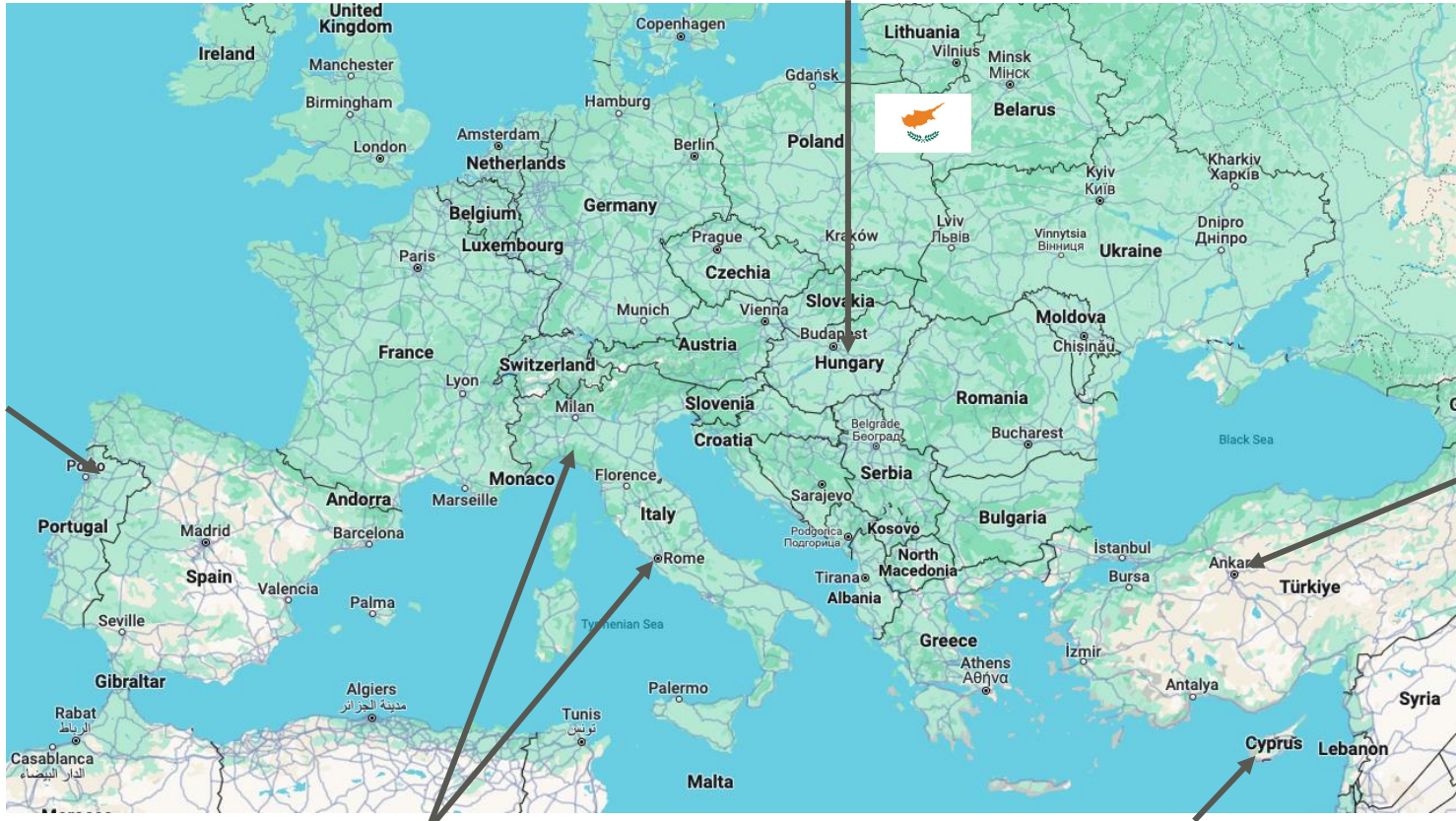
TRANSMIT Consortium



Life-cycle assessment
Life Cycling Cost



Coordinator
CIGS-based STPV



Perovskite-based
STPV



University
of Cyprus

Device validation in relevant
environment



ODTÜ GÜNAM
CENTER FOR SOLAR ENERGY RESEARCH AND APPLICATIONS

Socio-Economic Impact



METU

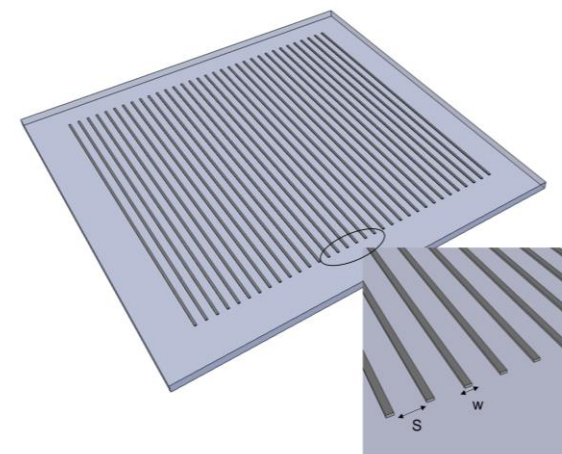
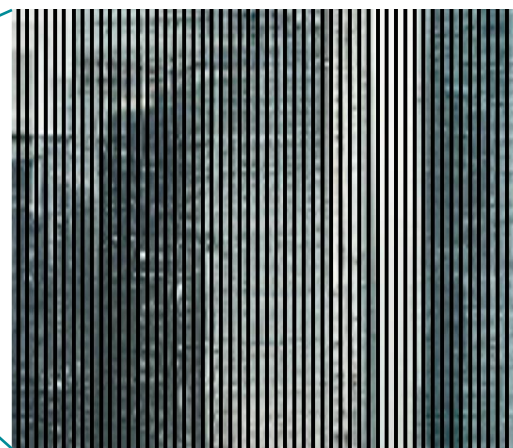
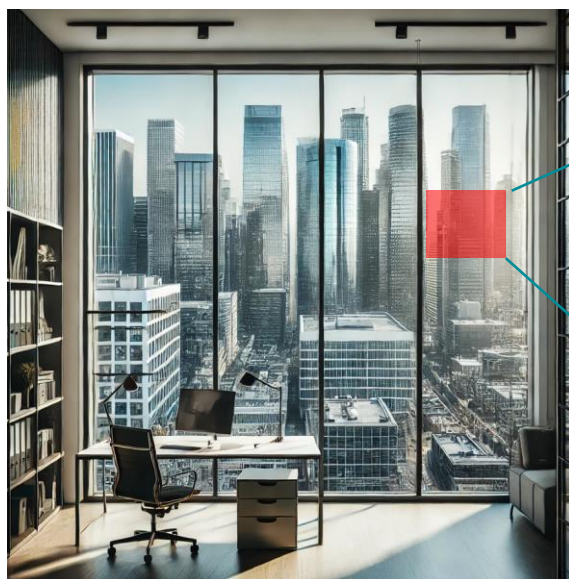
Building Energy Performance
Assessment



Co-funded by
the European Union

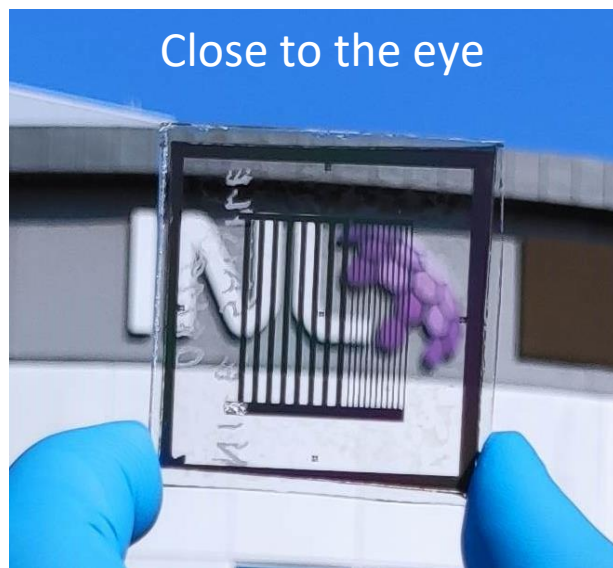
Our Research Focus & Key Innovations

- Developing **STPV - semi-transparent photovoltaic devices** based on Cu(In,Ga)Se_2 (CIGS) and Perovskite micro-stripped solar cells separated by a fully transparent gap.
- Innovative design: the solar cells (SC) are **indistinguishable to the human eye** at a distance.



Our Research Focus & Key Innovations

- By adjusting the micro SCs width and pitch, we can control the amount of light that passes through and **tailor the device to a specific application.**
- We are pushing the state-of-the-art by delivering **aesthetically pleasing and color-neutral** PV devices with **high efficiency.**



Our Goals Expected Impact

- **Fabricate and validate TRL 5** CIGS and Perovskite-based STPV mini-modules at ($5\times 5\text{ cm}^2$ and $10\times 10\text{ cm}^2$, respectively), achieving 8% efficiency and 50% device transparency.
- Assess the **environmental impact** (life-cycle analysis, CO_2 emissions) and **economic viability** (life-cycle costing).
- Analyse the impact on **building energy use and thermal comfort**, and **social acceptance**.

Expected Impact

- **Win stakeholder confidence, investors, and partners by** presenting a visually appealing solution that seamlessly integrates PV into building windows, prioritizing the end user's comfort and well-being.
- **De-risking.** Technical risks are reduced at this stage as the technology moves towards higher maturity and market readiness.
- At **TRL 9**, this technology **can massively increase city PV deployment, enabling on-site electricity production** in Net Zero Buildings.

Our project in the perspective of the Net-Zero Industry Act

- Building sector accounts for **36% of energy consumption** and **40% of energy-related CO₂ emissions**. STPV enhances the capacity of buildings to generate clean electricity and reduces their dependence on fossil fuel-based energy sources.
- Promote the development of **European-based semi-transparent PV technology** to ensure EU-produced solutions remain globally competitive.

Our project in the perspective of the Net-Zero Industry Act

- The manufacturing of this technology is **similar to optimized CIGS processes in Europe**, with only one additional fabrication step distinguishing it from conventional opaque solar cells
- Beyond NZIA's efforts, focusing on lower TRL innovations in academia and **aiding their transfer from lab to market** can further accelerate clean energy commercialization

Thank you!

Contact

Pedro Anacleto

INL – International Iberian Nanotechnology Laboratory

pedro.anacleto@inl.int

WaMTec



Marc Hofmann, Fraunhofer Institute for Solar Energy Systems (ISE), Germany

Introducing our Project & Consortium

- WaMTec = From **Wa**fer to **Mo**dule: Cost-Effective High-Efficiency Silicon **Technologies**
- Coverage of the full value chain from Si wafer via solar cell to solar module

Introducing our Project & Consortium



From South to North:

- Turkey: GUNAM (R&D), Smart Solar (Module)
- Germany: Fraunhofer ISE (R&D), Schmid (Production tools)
- Ireland: Nines Photovoltaics (Production tools)
- Norway: NorSun (Cz-Si wafers)



Image: mapofeurope.com

Our Main Objectives & Key Innovations

- High-quality large p-type **silicon wafers** with lowered cost
- High-efficiency TOPCoRE **solar cells**, increased efficiency of 25.5%
- Improved light management in **solar modules**
- Proof of technology by outdoor tests in Turkey and Germany
- 10% lower cost of solar cell production

Value chain



Images: NorSun, Fraunhofer ISE



Co-funded by
the European Union

Key Innovations

- Example: ultra-low water-consuming atmospheric dry etching technology
- Development of silicon etching processes applying zero-GWP gas F_2 demonstrating applicability on industrial Si wafers



Image: Fraunhofer ISE

Key Innovations

- Example: Plating of Cu contacts replacing screen-printed Ag contacts of solar cells
- Lowering the cost and decreasing the usage of Ag

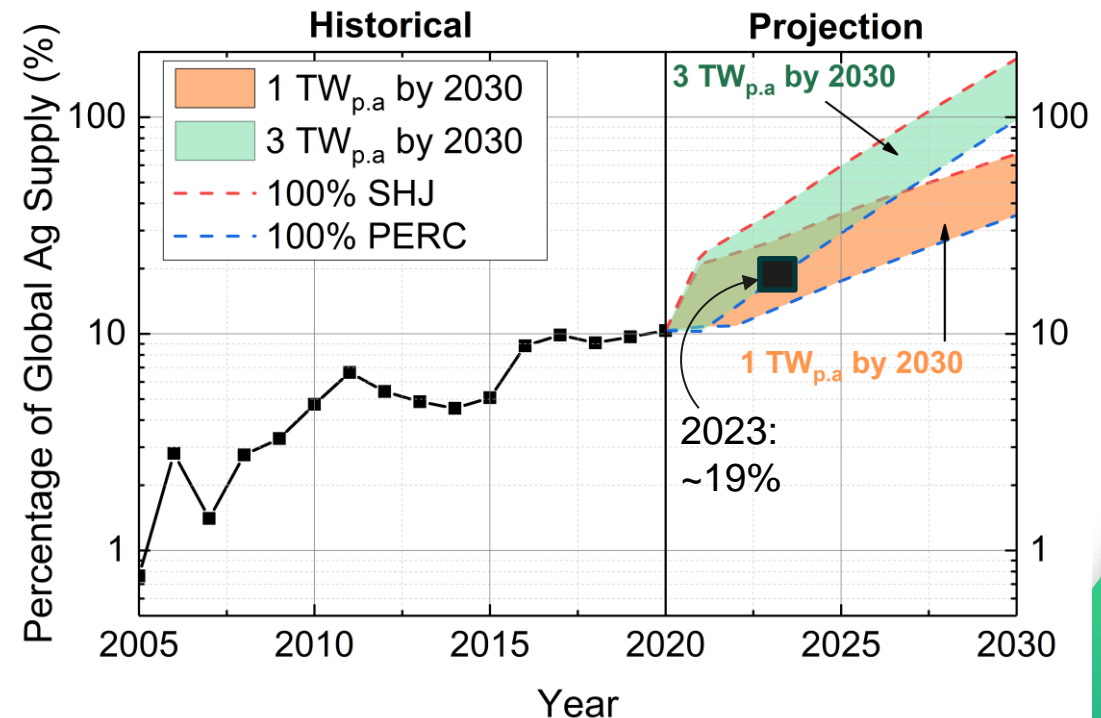


Image: J. Bartsch et al., "The role of silver in terawatt PV production - Perspectives and options," Photovoltaics International, vol. 48, 2022

2023 datapoint: World Silver Survey 2024, The Silver Institute

Our Goals & Expected Impact

- The lowered cost & increased efficiency of Solar PV will allow
 - an even stronger distribution of PV technology in the society
 - the partners to increase participation in the PV market
 - foster low-carbon low-cost electricity



Images: solaranlagen-portal.com, Fraunhofer ISE

Our Goals & Expected Impact

- *How will this project contribute to the clean energy transition in real-world applications?*

→ The innovations will be mass production-compatible and can be transferred to industry quickly.

→ The applicability of the novel technologies will be shown in outdoor tests in 2 climate zones, in Türkiye and Germany.



Images: schmid-group.com, Fraunhofer ISE

Our project in the perspective of the Net-Zero Industry Act

- WaMTec's innovations help *lowering the cost of PV-generated electricity*. Goal: Decrease the solar cell production cost by 10% and the levelized cost of PV electricity by ~4%.
- → *Industrial production* more viable applying WaMTec's innovations.
- For real-world industry re-ramping up of the full value chain of PV production in Europe, strong political support is needed to create the required frame conditions. **A quick and powerful Net-Zero Industry Act implementation in all EU member states is desperately needed**, in sight of the rather small leftovers of Europe's PV industry and the current ultra-cheap prices of Chinese PV modules in the EU.

Our project in the perspective of the Net-Zero Industry Act

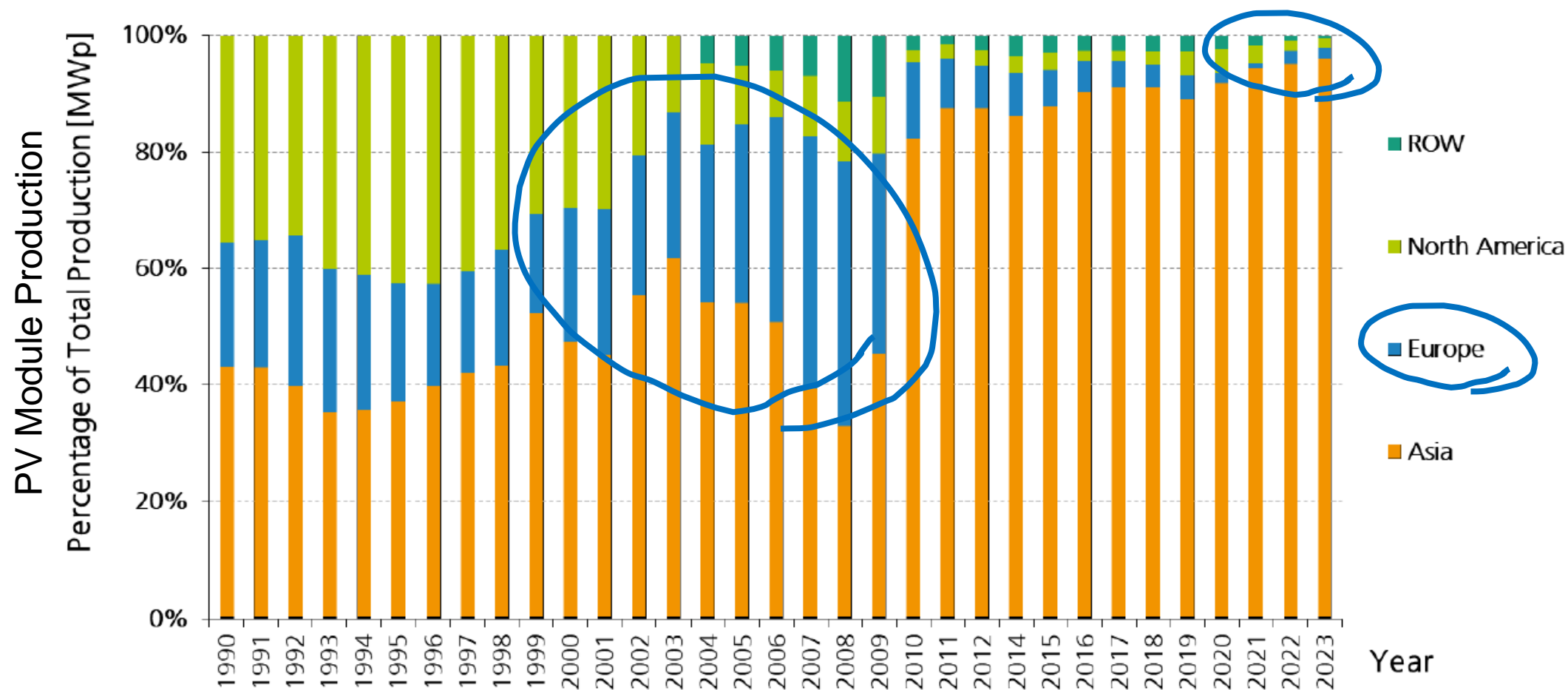


Image: Fraunhofer ISE, <https://www.ise.fraunhofer.de/en/publications/studies/photovoltaics-report.html>

Thank you!

Contact

Dr. Marc Hofmann

Fraunhofer ISE

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Q&A Session – Ask your questions!

Room 1:

CO2RR, GreenSmith, HyLife

Moderator: Aage Stangeland, Research Council of Norway

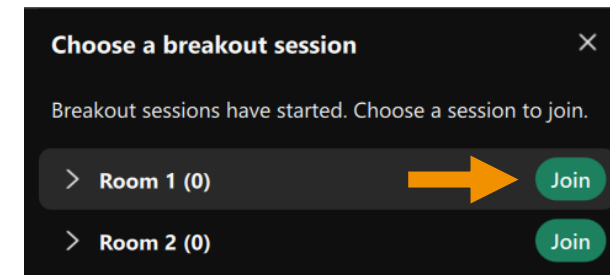
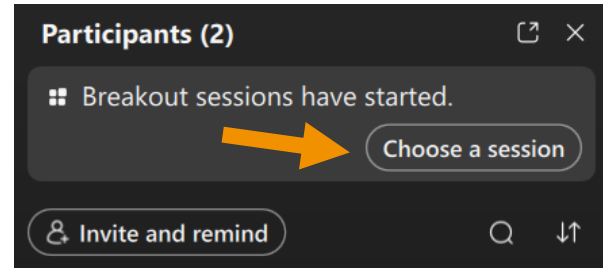
Room 2:

TRANSMIT, STRAWBERRIES, WaMTec

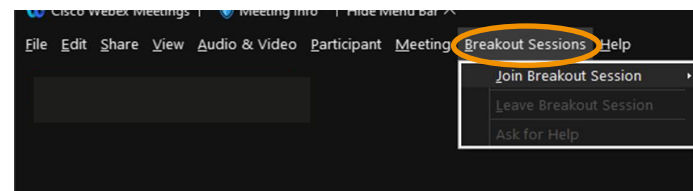
Moderator: Isabel Cabrita, Portugese Science and Technology Foundation

If you have problems joining, please **write in the chat** which room you would like to be allocated to and we will send you there.

How to join? – Via the app



How to join? – Via the browser



Wrap-up in plenary

What to expect tomorrow? Day 2 of our Annual Conference

09:00 – 09:20

Welcome & introduction

The CETP project portfolio and accompanying activities

09:20 – 09:45

The EU Net-Zero Industry Act and Regulatory Sandboxes

Andrea Hercsuth, Policy Officer, DG ENER, European Commission

Living Labs and Sandboxing

Martina Desole, Director, European Network of Living Labs (ENoLL)

09:45 – 11:30

Parallel interactive sessions (2 rounds)

Knowledge Community Workshop: 'Predicting and Preparing for Regulatory Shifts: A Horizon Scan'

Impact Workshop: 'Driving Clean Energy Innovation: Exploring Competitiveness, Market Readiness, and Sustainability'

11:30 – 12:00

Wrap-up and fish-bowl discussion

What to expect tomorrow? Day 2 of our Annual Conference

12:00 – 12:30

Final reflections and outlook in the future

Deputy Head of Unit - Clean Energy Transition, European Commission DG RTD, Davide Amato



14:00 – 14:45

Joint Call 2024 Q&A Session

Thank you for a successful Day 1 of our Annual Conference!