



National
Metrology
Institute



21st INTERNATIONAL METROLOGY CONGRESS

CIM 2023

METROLOGY
PARTNERSHIP



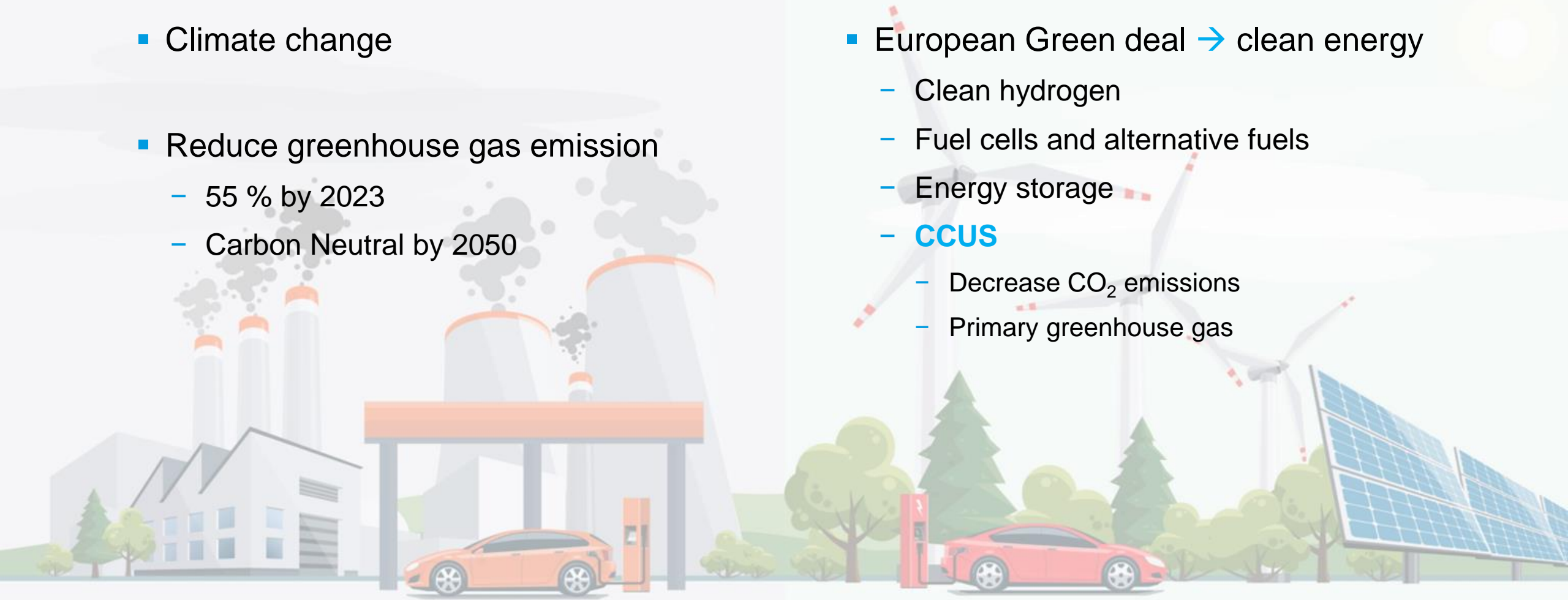
Metrology Support for Carbon Capture Utilization and Storage MetCCUS

8 March 2023 – CIM – Lyon – France

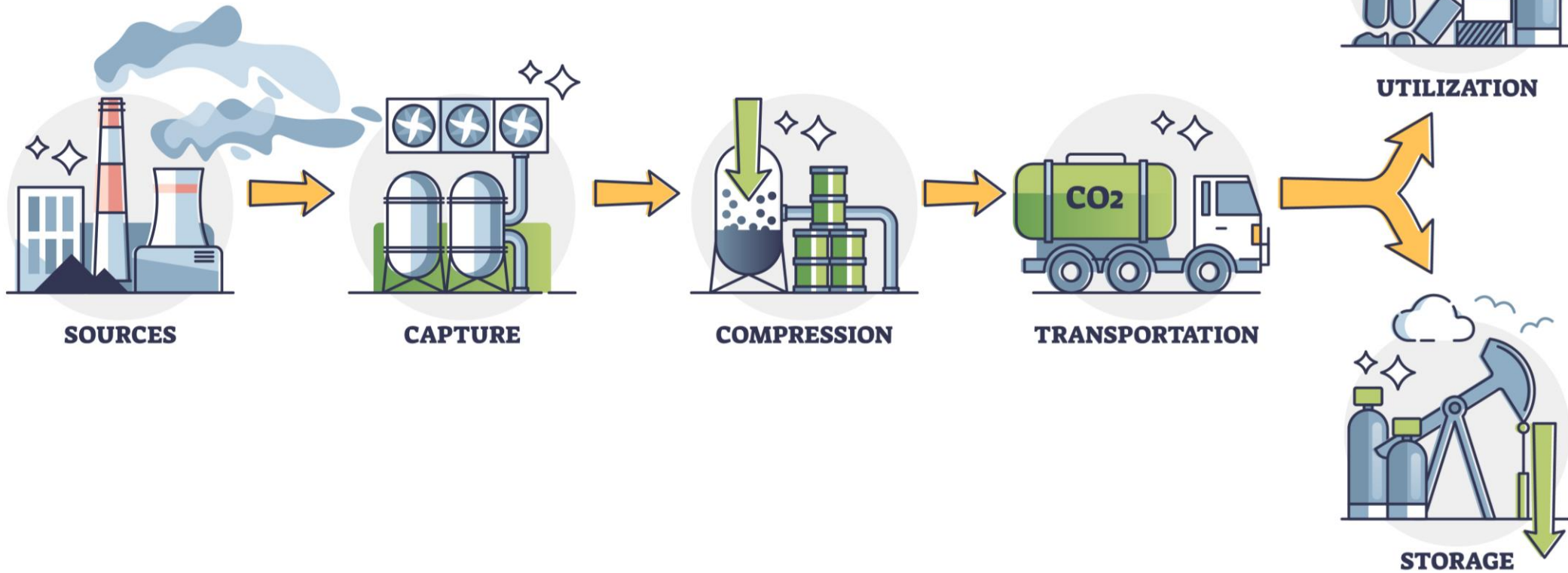
Iris de Krom

Carbon Capture Utilization and Storage (CCUS)

- Climate change
- Reduce greenhouse gas emission
 - 55 % by 2023
 - Carbon Neutral by 2050
- European Green deal → clean energy
 - Clean hydrogen
 - Fuel cells and alternative fuels
 - Energy storage
 - **CCUS**
 - Decrease CO₂ emissions
 - Primary greenhouse gas



CARBON CAPTURE





Metrology support for CCUS

METROLOGY PARTNERSHIP



- 1 October 2022 – 30 September 2025
- 21 participants



Justervesenet



RUHR UNIVERSITÄT BOCHUM



UNIVERSITA DEGLI STUDI DI TORINO



Danmarks Tekniske Universitet



Danish National Metrology Institute



Universidad de Valladolid

"The project has received funding from the European Partnership on Metrology, co-financed by European Union Horizon Europe Research and Innovation Programme and from the Participating States."

CCUS measurement challenges

Flow metering



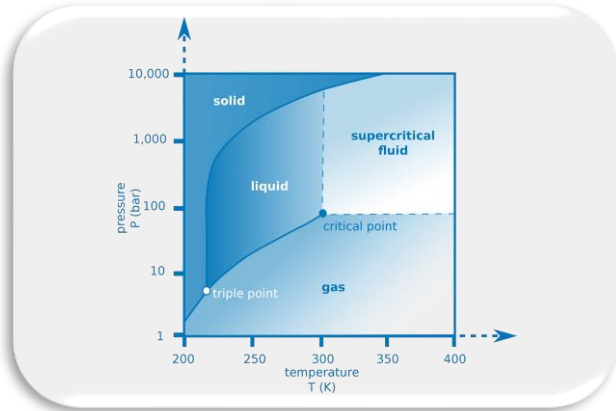
Emission monitoring



Chemical metrology



Physical properties



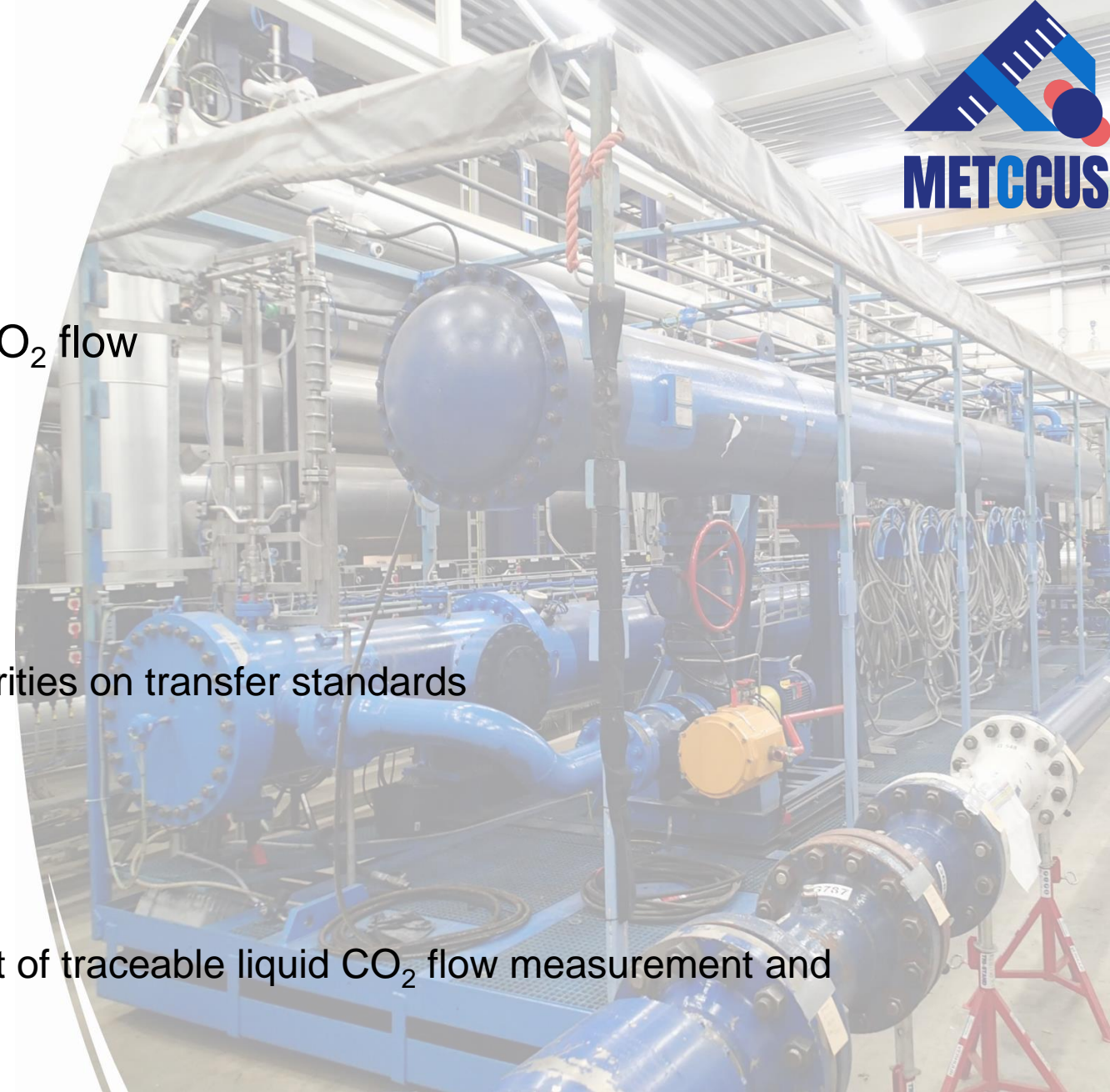
Flow metering

Gas-flow

- Metrology infrastructure for monitoring CO₂ flow
 - < 50 m³/h and low pressure
 - Up to 400 m³/h and higher pressure
- Primary and transfer standards
 - Intercomparison
 - Theoretical investigate the impact of impurities on transfer standards
- Uncertainty 1.5 % - 2.5 %

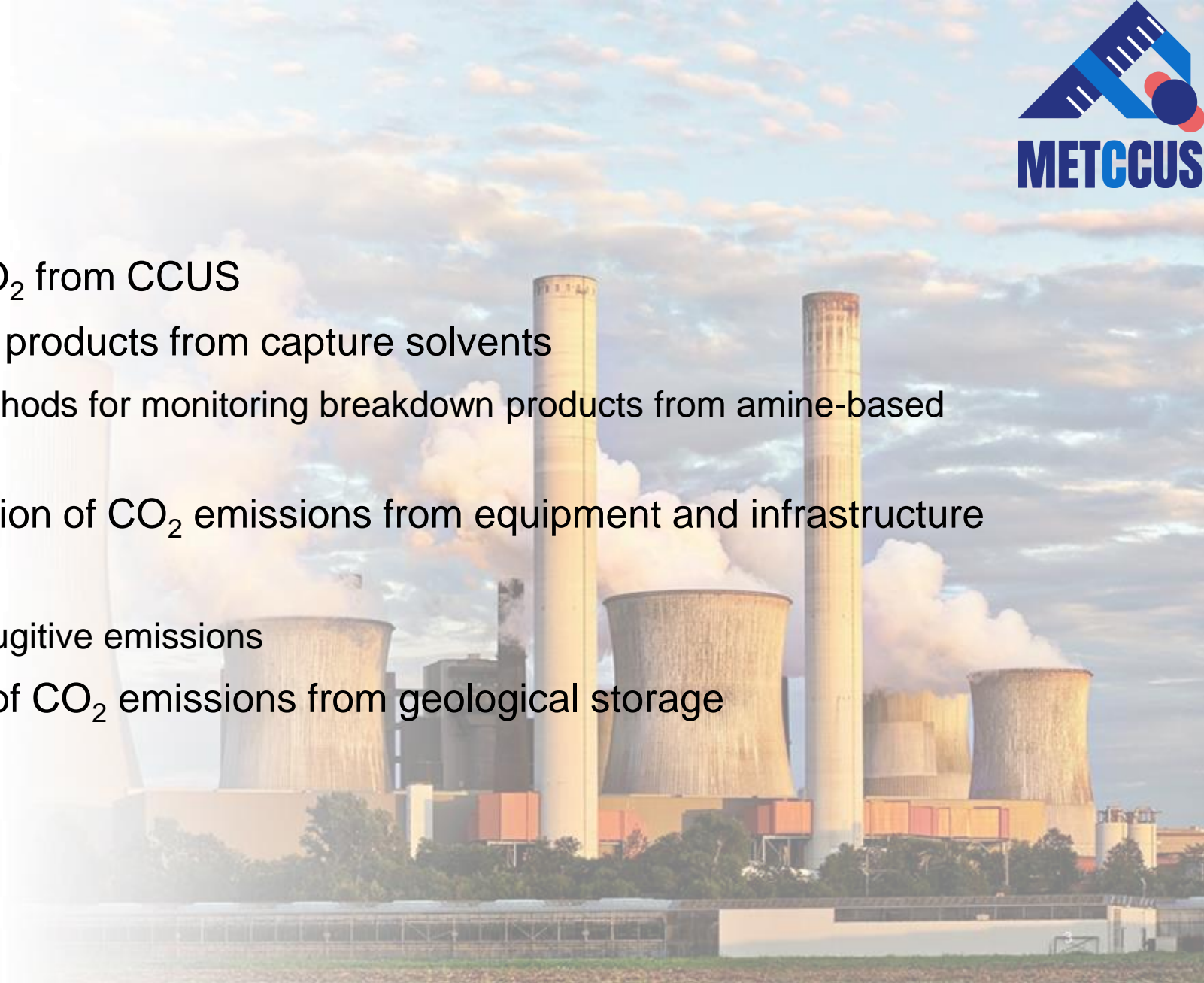
Liquid flow

- Study to determine the current state of the art of traceable liquid CO₂ flow measurement and liquid CO₂ primary standard requirements



Emission monitoring

- Atmospheric emissions of CO₂ from CCUS
- Measurement of degradation products from capture solvents
 - First European reference methods for monitoring breakdown products from amine-based solvents (CEN/TC 264)
- Measurement and quantification of CO₂ emissions from equipment and infrastructure
 - Leaks → fugitive emissions
 - Facility scale → diffuse and fugitive emissions
- Detection and quantification of CO₂ emissions from geological storage
 - Isotopic measurements
 - Addition of tracers
 - Use of acoustic techniques



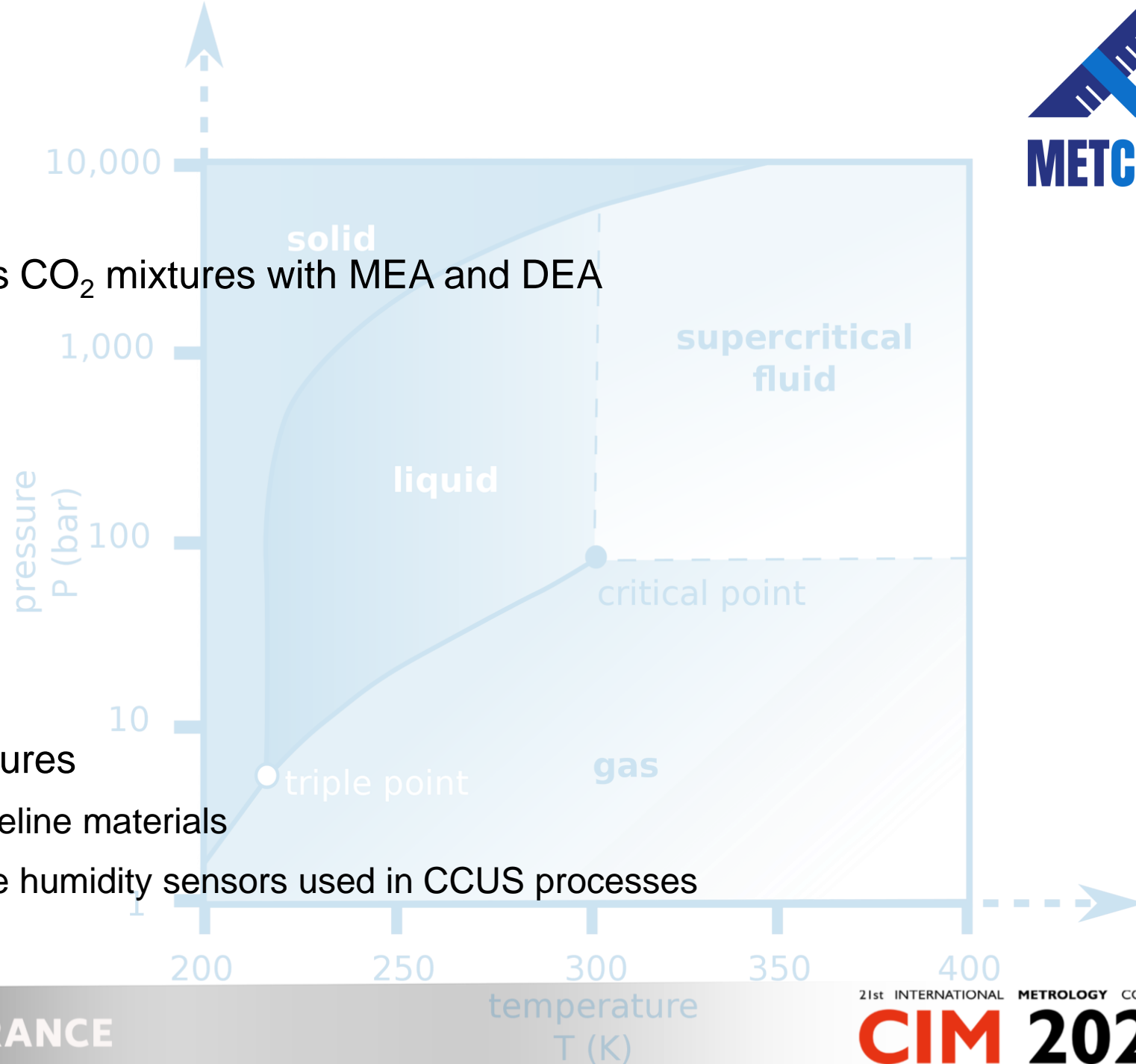
Chemical metrology

- Primary reference materials for impurities in CO₂
 - Key impurities e.g.; H₂O, NO_x, sulphur compounds, hydrocarbons, alcohols
 - Permanent gases: O₂, Ar, N₂, CH₄, CO, H₂
- Material compatibility for CO₂ sampling
- Online CO₂ monitoring
 - Development and validation of online methods
 - Round Robin Test for the measurement of impurities in CO₂
- Offline analytical methods for CO₂ quality
 - CO₂ capture, transport and storage
 - CO₂ conversion, utilisation and recycling



Physical properties

- Experimental measurements CO₂ mixtures with MEA and DEA
 - Density
 - Speed of sound
 - Viscosity
 - Heat capacity
- Equation of state models
 - CCUS processes
 - Flow metering
- Monitoring CCUS infrastructures
 - Corrosion testing of CO₂ pipeline materials
 - Calibration method for online humidity sensors used in CCUS processes



Impact MetCCUS

- Development of
 - Standards and reference materials
 - Calibration and measurement methods
 - Good practice guides
 - Literature reviews & peer reviewed articles
- Support
 - Development of key documentary standards, specifications and regulation
 - EU Emissions Trading System
 - Safe and efficient CCUS operation
 - CCUS industry to become carbon neutral and overcome climate change

Interested in MetCCUS

- Visit
 - www.metccus.eu
- Join the stakeholder advisory board

- Contact

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**METROLOGY
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**VSL Booth
2C86**