



# EURAMET TC-T News

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on behalf of EURAMET TC-T  
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# TC-T Line of action



The Technical Committee of Thermometry (TC-T) is concerned with all issues of measurement of

- temperature,
- humidity and moisture, and
- thermophysical quantities of materials
- as well as with scales, standards and reference materials necessary for metrology in these fields.



**Thermometry**

# TC-T Plenary



The TC-T is the **forum for scientific and technical cooperation** in the field of thermometry and related quantities.

We contribute to the **elaboration** and execution of the Metrology Research Programmes and we are **responsible for the execution** of the activities required by EURAMET as the European RMO for the fulfilment of the requirements of the CIPM MRA.

## 2021 Meeting, 26-29 April, online

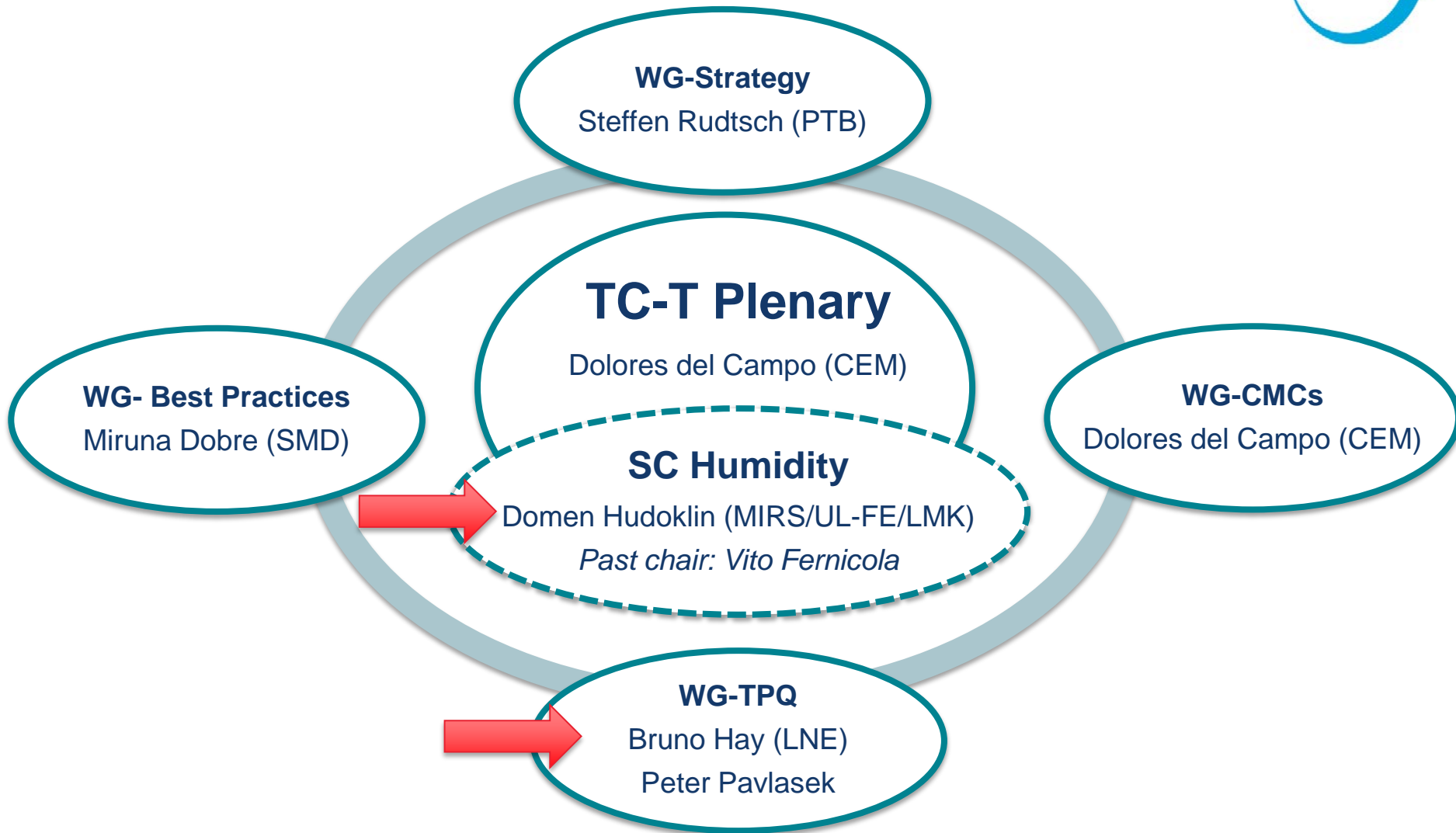
- WG meetings: ave. 20 attendees per meeting
- SC-H: > 60 attendees
- TC-T plenary: >70 attendees

## 2022 Meeting, 25-29 April

• ...



# TC-T Structure



# TC-T links to Energy Gases



There are two main fields of interest within the TC-T for this EMN:

- **Temperature and humidity** measurements in energy gases
- **Thermophysical quantities** of energy gases

✓ Past and running projects with TC-T participation linked to energy gases



**MetCUSS**

**Met4H<sub>2</sub>**

- The **green deal** put together the challenges on sustainable and renewable energy, with the monitoring energy production impacts on the environment and climate.
- Several running projects in meteorology and climate (COAT, CRS, INCIPIT, ...)

# TC-T challenges linked to Energy Gases

The TC-T prepared two (Thermometry+ TQ) orientation papers to guide our community in the forthcoming Partnership Calls

## Challenges in temperature measurements:

- **Improving the Efficiency of Energy Supply**
  - ✓ Self-validating drift-free sensors: Long term research is needed to develop in-situ traceable monitoring of temperature – sensors are then always right
  - ✓ Distributed temperature sensing and sensor networks e.g. gas grids
- **Improved methods for gas temperature measurements**
  - ✓ Current measurement techniques for gas temperature have serious limitations due to their heat capacity, thermal radiation exchange with the environment, stem conduction or maximum operation temperature. Needs for further improvements are applications regarding combustion processes.
  - ✓ New developments in photonic thermometry, spectroscopic gas thermometry and acoustic gas thermometry offer promising options for significant improvements of gas temperature measurements.

# TC-T challenges linked to Energy Gases **EURAMET**



## Challenges in humidity measurements:

### Quality of hydrogen

- Validated methods and standards for hydrogen purity analysis
- Poor traceability for H<sub>2</sub> quality analysis in the process about **water content**
  - On-line analysis of **trace water** below 5 ppm @ H<sub>2</sub> process pressure
  - Enhancement factor data for **moisture in H<sub>2</sub>** are sparse or missing
  - Industrial **trace water sensors in H<sub>2</sub>** at rated pressure are unreliable.

### Quality of biogas

- Reliable trace **moisture and water contamination** sensors in biogas are lacking of traceability with respect to gas matrices and composition
- Enhancement factor data for trace water in biogas and biomethane are sparse.

### Safety of CCUS

- Reliable process monitoring of CO<sub>2</sub> drying in transport and storage to prevent pipeline corrosion and infrastructure failure
- Lack of traceable standards
  - No traceable calibration available for **moisture sensors in CO<sub>2</sub> matrix**
  - Enhancement factor data for **moisture in CO<sub>2</sub>** are missing and critically difficult to achieve.



## Challenges in thermophysical quantities measurements:

- **Decarbonising the energy sector**

- ✓ The thermophysical properties metrology can contribute to this challenge for different types of non-fossil energies.

- **Hydrogen energy**

- ✓ Gross calorific value measurements of biomethane or hydrogen-enriched natural gas,
- ✓ Supply of improved thermodynamic data for determining physical properties of hydrogen, biomethane or hydrogen-enriched natural gas in the grid, or carbon dioxide for Carbon Capture and Storage (CCS),
- ✓ Development of accurate models describing thermophysical properties of complex mixtures of enriched natural gases,
- ✓ Characterisation of thermal properties of materials used for the storage and transportation of hydrogen and liquefied natural gas (LNG) ⇔ Measurements at cryogenic temperatures.







Thank you for your attention!