

Call Scope – Green Deal/Pre- and Co-Normative/Research Potential related to Green Deal

We are the EMN for Energy Gases which focuses on the metrology challenges for energy gases in Europe with a particular priority to support decarbonisation of energy gases. Based on consultation with European stakeholders from industry, research, regulation and standardisation, we have identified current and future trends for these energy gases and prioritised the measurement needs and challenges that may have the potential to create hurdles and bottlenecks in their utilisation. These challenges, collected in the Strategic Research Agenda 2020 for Energy Gases, have been explored across natural gas, hydrogen, biogas and CCUS and include for example flow metering, physical properties, gas composition, gas metrology, materials characterisation, combustion, leak detection and storage. There are specific sections of the Green Deal call that, if addressed, are relevant for a smooth decarbonisation of energy gases:

Supplying clean, affordable and secure energy

- **Further decarbonising the energy system is critical to reach climate objectives in 2030 and 2050.** A power sector must be developed that is based largely on renewable sources, complemented by the rapid phasing out of coal and decarbonising gas.
- **The clean energy transition should involve and benefit consumers.** The decarbonisation of the gas sector will be facilitated, including via enhancing support for the development of decarbonised gases, via a forward-looking design for a competitive decarbonised gas market, and by addressing the issue of energy-related methane emissions.
- **The transition to climate neutrality also requires smart infrastructure.** This framework should foster the deployment of innovative technologies and infrastructure, such as smart grids, hydrogen networks or carbon capture, storage and utilisation, energy storage, also enabling sector integration. Some existing infrastructure and assets will require upgrading to remain fit for purpose and climate resilient.

The EMRP projects “Metrology for Biogas” and “Characterisation of Energy Gases” EMPIR project “Metrology for Biomethane”, and the on-going EMPIR projects “Flow metering for renewables gases” and “Metrology for Hydrogen Storage” explore the feasibility of producing sustainable energy gases according to requirements given in standards and regulation and perform research on measurement methods for energy storage and transportation. New research should focus on supporting the upscaling of clean energy gases and their integration with other clean energies. Measurement needs are therefore related to a safe and efficient (and low cost) production, transport and storage of green hydrogen and other decarbonised gases. Challenges still to be addressed are:

- Create a robust and accurate European metrological infrastructure (calibration facilities, sampling methods, reference materials and proficiency testing) to ensure fair transport and trade of gaseous fuels in Europe
- Fast control methods to determine composition, presence of trace contaminants, moisture and particles
- Develop new specifications for odourisation of the gas grid
- Accurate determination of quantities of gas for billing
- Suitable materials to guarantee the integrity of the grid infrastructure and of storage vessels

- Reliable digitalisation of the gas grid to respond to the increased amount of data and to promptly interact with the electricity grid
- Modelling of physical properties and behaviour of pure clean gases as well as mixtures with natural gas
- Flow metering, physical properties, gas analysis and leak detection for carbon dioxide capture, transport and storage to understand losses and ensure efficient and cost-effective operation

Mobilising industry for a clean and circular economy:

- **Energy-intensive industries, such as steel, chemicals and cement, are indispensable to Europe's economy, as they supply several key value chains.** The decarbonisation and modernisation of this sector is essential as well as the use of hydrogen and CO/CO₂ to produce added value products of market interest.
- **Access to resources is also a strategic security question for Europe's ambition to deliver the Green Deal.** EU industry needs 'climate and resource frontrunners' to develop the first commercial applications of breakthrough technologies in key industrial sectors by 2030. Priority areas include clean hydrogen, fuel cells and other alternative fuels, energy storage, and carbon capture, storage and utilisation.

Metrological aspects under this section have not been fully addressed in previous research. Measurement methods to monitor energy use in industry, carbon sequestration and utilisation as well as validation of carbon dioxide (CO₂) emission inventories will contribute to the green deal objectives. Challenges under this section include:

- Testing protocols for determining how gas quality effects pipelines, storage, appliances and stationary fuel cells
- Robust measurements to explore the combustion process
- Understanding efficiencies of carbon capture and utilisation techniques
- Ability to quantify gas leaks and impacts of release into the atmosphere
- Methodologies to perform life cycle assessment of energy gases and CO₂

Accelerating the shift to sustainable and smart mobility:

- **Transport accounts for a quarter of the EU's greenhouse gas emissions, and still growing.** To achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050. Road, rail, aviation, and waterborne transport will all have to contribute to the reduction.
- The EU should in **parallel ramp-up the production and deployment of sustainable alternative transport fuels.** By 2025, about 1 million public recharging and refuelling stations will be needed for the 13 million zero- and low-emission vehicles expected on European roads.

EMPIR projects LNG sequel and MetroHyVe have started the development of high-accurate methods for flow measurements and composition.

New research should build up on the outcome of these projects to expand the measurement ranges and capabilities and meet the market needs.

Further challenges include:

- Reliable LNG methane number and methane slip measurements
- Scaling up traceable flow metering and gas analysis for larger hydrogen transport (HGVs, buses, shipping, trains, maritime and aviation)
- Online monitoring and sampling of liquified energy fuels
- Harmonised methods for accurate fuel cell testing to understand performance and degradation

- Suitable materials to guarantee the integrity of sample in quality control strategies
- Use of other energy carriers for transport including ammonia, hydrides and LOHCs.

Supporting metrology development in these areas also aligns directly with “increasing the EU’s climate ambition for 2030 and 2050” from the scope of the call. We encourage PRTs to address metrology needs in the following areas:

PRT	Green Deal objective
Green hydrogen and biomethane production	- <i>Supplying clean, affordable and secure energy</i>
Introduction of biomethane to replace natural gas and decarbonise the gas grid	- <i>Supplying clean, affordable and secure energy</i>
Using the existing gas grid, delocalised gas systems or on-site production to provide hydrogen for heat and industry	- <i>Supplying clean, affordable and secure energy</i>
Use of hydrogen for storage of energy from the electricity grid	- <i>Supplying clean, affordable and secure energy</i> - <i>Mobilising industry for a clean and circular economy</i>
Integration of carbon capture and storage to decarbonise energy gas production processes (such as hydrogen and biomethane)	- <i>Supplying clean, affordable and secure energy</i> - <i>Mobilising industry for a clean and circular economy</i>
Hydrogen and low carbon fuels for road, rail, aviation and waterborne transport	- <i>Mobilising industry for a clean and circular economy</i> - <i>Accelerating the shift to sustainable and smart mobility</i>
Utilisation of carbon dioxide and clean hydrogen from energy processes in manufacturing	- <i>Mobilising industry for a clean and circular economy</i>