



## Launch of the H2FlowTrace project: Flow measurement traceability for hydrogen in gas networks

Press release – for immediate release

October 2024 – To mitigate the effects of climate change, greenhouse gas emissions must be reduced by decreasing the EU's reliance on fossil fuels. Hydrogen offers a sustainable alternative, which can be distributed through gas networks, with the ability to fulfil societal, economic, ecological and technological objectives. Hydrogen can be used as a form of energy storage, to integrate intermittent renewable energy sources such as solar and wind into the grid. Although large-scale decarbonised hydrogen projects are expanding across Europe, there is no large-scale verified metrological infrastructure to perform traceable pure hydrogen flow calibrations for gas networks.

In this context, the H2FlowTrace project was selected for funding as part of the European Partnership on Metrology call, co-financed by European Union Horizon Europe Research and Innovation Programme and from the Participating States. The project aims to develop the required metrological infrastructure, which has the potential to reinforce Europe's leading position in the hydrogen economy.

It will do this by:

- Establishing a robust metrological infrastructure for flow rates up to 1300 m<sup>3</sup>/h at 0.1 MPa or 45 m<sup>3</sup>/h at 3.3 MPa(g) with a primary focus on pure hydrogen, but also enabling traceability for hydrogen/natural gas blends in small industrial meters, with a measurement uncertainty of 0.20 % or less
- Establishing a robust metrological infrastructure for flow rates of 200 m<sup>3</sup>/h to 10 000 m<sup>3</sup>/h, and pressures of 0.3 MPa(g) to 6.2 MPa(g) for pure hydrogen and hydrogen/natural gas blends in large industrial meters, with a measurement uncertainty of 0.30 % or less
- Designing and testing traceability transfer skids for pure hydrogen and hydrogen/natural gas blends. In addition, to carry out intercomparisons to determine the equivalence of independent traceability chains based on primary standards, secondary standards using a bootstrapping/upscaling approach, and secondary standards calibrated with alternative fluids to hydrogen
- Performing (i) primary calibrations of domestic gas meters (ultrasonic, diaphragm, thermal mass flow) with air and/or methane and with pure hydrogen up to 30 m<sup>3</sup>/h at atmospheric pressure and (ii) primary and secondary calibrations of industrial gas meters (ultrasonic, rotary, turbine, mass flow) with air and/or natural gas and hydrogen/natural gas blends at flow rates of up to 1000 m<sup>3</sup>/h and pressures of up to 6.2 MPa(g). Based on these results as well as existing data, to deliver statistically meaningful datasets for air, natural gas, or other alternative fluid calibration for the transferability to hydrogen gas flow conditions for domestic and industrial flow meters

- Demonstrating the establishment of an integrated European metrology infrastructure and facilitating the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain (accredited calibration and testing laboratories, European Metrology Network for Energy Gases), standards developing organisations (ISOTC30, OIML TC 8/SC 7, CEN/TC 237) and end users (energy gas transmission, distribution operators, FARECOGAZ, ENTSOG, Hydrogen Europe).

The project, coordinated by Cesame, kicks off this October 2024, in Poitiers France. Seventeen partners (Cesame, CMI, FORCE, PTB, SMU, VSL, DNV, ENAGAS, GERG, GRTgaz, RMA, TG, UNIBO, Emerson, SICK, METAS, NEL) will work together on this project for 36 months. The consortium comprises National Metrology Institutes, Designated Institutes, research organisations, gas transmission system operators, technology companies and universities.

The participants of the project are:

	<p><b><u>CESAME (FR):</u></b> Cesame is the French DI for medium and high gas flows. Cesame holds, maintains and develops national standards in this field. Cesame has been involved in hydrogen projects (e.g., EMPIR JRP 16ENG01 MetroHyVe, 19ENG04 MetroHyVe 2, 20IND11 MetHyInfra and Metrology Partnership JRP 21GRD05 Met4H2) and is a member of the European Reference for Gas Metering (EuReGa) group which establishes unified reference values for high pressure gas flow. Cesame has been coordinating work-packages in several European projects (EURAMET and Clean Hydrogen Partnership). Cesame will bring its expertise in hydrogen flow measurement to all technical work packages whilst providing its skills for managing the consortium during the project lifetime (by leading WP6).</p>
	<p><b><u>CMI (CZ):</u></b> CMI is the NMI of Czechia and provides services in all basic fields of metrology. CMI brings in expertise in the field of flow measurement and static gas mixture preparation and verification. CMI will contribute to WP3, WP4, WP5 and WP6. CMI has experience in European projects dedicated to hydrogen.</p>
	<p><b><u>DNV (NL):</u></b> DNV operates multiple ISO 17025 natural gas calibration facilities and has experience in the metrology of large flow meters in natural gas applications. DNV has in 2021 upgraded their facilities to operate under mixtures of natural gas and hydrogen. Since 2022 a small test facility for 100% hydrogen is in operation. In 2024 DNV will start a Joint_Industry_Project H2MET and the first step is to operate these facilities under 100 % hydrogen. In addition, scientists at DNV have performed multiple studies on the effect of hydrogen on flow meters. DNV will use its experience in building hydrogen flow metering facilities to support the consortium in metrology and share its experiences. DNV will participate in all work packages.</p>
	<p><b><u>Emerson :</u></b> Emerson M is a supplier of a great variety of mass and volume flow meters for both liquid and gaseous fluids in a wide variety of applications, from fiscal transactions in the petrochemical industry and natural gas applications to life science and food and</p>

beverage. As we see H2 increase rapidly, it is very important that traceability and regulations for hydrogen measurement are developed. By joining the project (in all work packages), Emerson M wants to be involved in the discussions about traceability and regulations, to benefit from the test data obtained and to build a relationship with other stakeholders. Finally, Emerson M sees participation in the project as a good reference in discussions with customers, notified bodies and other entities.



**Enagás (ES):** Enagás is a European TSO (Transmission System Operator) with 50 years of experience in the development, operation, and maintenance of energy infrastructures. It has more than 12,000 km of gas pipelines, three underground storage facilities, and eight regasification plants. The company operates in eight countries. In Spain, it is the Technical Manager of the Gas System and, as stipulated in Royal Decree-Law 8/2023, has been designated to operate as the provisional manager of the Hydrogen Backbone Network (HTNO). In line with its commitment to the energy transition, the company has announced its goal to be carbon neutral by 2040, with a firm commitment to decarbonization and the promotion of renewable gases, especially hydrogen.



**FORCE (DK) :** FORCE is a Danish DI, and is world leading within gas metering, calibration, and type-approval for the flow measurement of natural gas, air, water and liquids other than water. FORCE Technology provides traceability for natural gas flow and flow with air. FORCE Technology has a primary facility for natural gas which can also handle mixtures of natural gas with H2 up to a content of 25 %. FORCE will participate in WP2 with activities to ensure traceability for higher flow and a comparison between the test facilities for measuring HENG.

FORCE will contribute to WP3 and WP4 with calibrations of gas meters using different fluids. FORCE will also participate in WP5 and WP6. FORCE is a member of the European Reference for Gas Metering (EuReGa) group which establishes unified reference values for high pressure gas flow and is a member of EMN for Energy Gases. FORCE is an active member in several standardisation organisations which includes the role as Convenor of Welmec WG11 (utility meters gas and electricity).





**GERG (BE):** GERG (The European Gas Research Group), along with its member organisations, work with the European energy community to develop innovative solutions in the European gas infrastructure of the energy system. GERG is an association that represents R&D interests and coordinates corresponding efforts of its members on an EU level. GERG membership includes EU TSOs, DSOs, major NG suppliers, universities and research institutes, as well as international standardisation organisations.





**GRTgaz (FR):** GRTgaz is a European leader in NG transmission and a world expert in gas systems. In France, the company operates more than 32,000 km of buried pipelines to transport gas from suppliers to consumers connected to its network. Within GRTgaz, the R&D Center for Energy (RICE) is the division dedicated to R&D in Research, Development and Innovation for gas infrastructure. GRTgaz-RICE provides tested and proven industrial applications, as well as technical offers based on the development and the sharing of innovative ideas, scientific knowledge and technical expertise developed within the framework of


the gas infrastructure, covering 3 main areas: 1) Integrity of metallic and non-metallic networks; 2) Improvement of operational performance, industrial safety and asset management of industrial infrastructure, and 3) Analysis, odorization, detection and metering of gases.

 **METAS (CH) :** METAS is a Swiss National Metrology Institute. The flow laboratory includes a broad range of primary flow standards based on the gravimetric principle, such as for hydrogen flow metering for HRSs (in EMPIR JRP 16ENG01 MetroHyVe). METAS is involved in several other hydrogen projects (EMPIR JRPs 19ENG04 MetroHyVe 2 and 20IND11 MetHyInfra). METAS will contribute to the work on hydrogen flow metering and its traceability chains in WP1 (WP leader), WP3 and WP4. METAS will also participate in WP5 and WP6. METAS is an Associated partner to all the Internal beneficiaries.

 **NEL (UK) :** NEL is the Designated Institute responsible for maintaining the UK National Standards for Flow Measurement. NEL has relevant experience for hydrogen flow metrology with the recent construction of a hydrogen calibration facility for domestic gas meters and a portable gravimetric primary standard for hydrogen refuelling station verifications. As the WP4 leader, NEL will coordinate the activities to collect statistically meaningful datasets for domestic and industrial gas meter calibrations with hydrogen, HENG and alternative fluids. NEL is an Associated partner to all the Internal beneficiaries.

 **PTB (DE) :** PTB is the National Metrology Institute of Germany. The gas department at PTB is responsible for the calibration of the flow standards that are used in the legal metrology infrastructure and by accredited laboratories. In addition, the gas department at PTB carries out conformity assessments of gas meters and other instruments related to gas metering as a notified body. There are different primary and secondary calibration facilities available which are usable with air and partly with technical gases including burn gases. PTB will use their experience in type testing, in the calibration of flow standards, in working in international organisations like OIML, CEN and WELMEC and in the development of test facilities. PTB will use the knowledge which was gathered during different key comparisons of CCM (WGFF) and by multilateral comparison with air and other gases. PTB will lead WP2 and will participate in all other work packages.

 **RMA (DE) :** RMA is a company with worldwide activity, and it is a producer of a wide range of equipment for the gas industry such as valves and gas meters. RMA has operated a natural gas high pressure calibration facility since 2012. Since 2022, RMA has operated the biggest hydrogen high pressure calibration facility worldwide. With knowledge of gas meters, natural gas loops and H2 loops, RMA is an important participant. RMA will be involved in WP2 for the laboratory comparison and in WP4 for the calibration of industrial gas meters with pure hydrogen and natural gas. RMA will also participate in WP3, WP5 and WP6.

 **SICK (DE) :** SICK is a world leading manufacturer of gas analysers for the process industry as well as ultrasonic flow meters for custody transfer and process measurement in the oil and gas industry. SICK will bring more than 30 years of expertise and experience in the design, testing and production of ultrasonic flow meters, to contribute to the development of the urgently needed traceability chain for hydrogen applications. It will provide expertise in flow measurement as well as flow meters for tests in WP2, WP3 and WP4. SICK has been

active in preceding hydrogen metrology projects: EMPIR JRP 18NRM06 NEWGASMET and Metrology Partnership JRP 21GRD05 Met4H2. SICK will also participate in WP5 and WP6.



**SMU (SK) :** SMU is the NMI of Slovakia and provides measurement and calibration services with traceability to the basic SI units. This is also the case for the traceability of flow and pressure measurements which are covered by internationally accepted calibration measurement capabilities (CMCs). As part of these measurement capabilities SMU provides the national calibration of flow meters for water, gases and petroleum-based fuels. Part of SMU's expertise in this field has been put into research on gas flow measurements in the EMRP JRPs ENG01 GAS, IND03 HighPRES and ENG54 Biogas. These projects focused specifically on greener alternatives to natural gas, enabling alternative and renewable gaseous fuels to be used in the European gas pipeline system, improving high pressure measurements for industry and diversifying the natural gas supply in order to promote the use of biogas. Based on previous experience, and internal capabilities, SMU's main activities in this project will be in WP3 and WP4. In these WPs, SMU will make the preliminary design for the CFVN transfer skid together with subsequent virtual testing, will furthermore review the available research on calibration methods, on the achievable accuracy for gas flow meters operated with hydrogen and HENG and they will calibrate domestic gas meters at atmospheric pressure and at maximum flow rates of up to 30 Sm<sup>3</sup>/h. SMU will also participate in WP1, WP5 and WP6.



**TIFERNOGAS (IT) :** TG (Tifernogas) is an Italian independent entity providing services in several fields of gas measurement. Among other things, it performs gas meter calibration thanks to an internal laboratory accredited according to ISO/IEC 17025. In addition to that, it performs conformity assessments for gas meters in accordance with the MID Directive as an EU Notified Body (n.2142) In the global legal-metrology framework, Tifernogas operates also as OIML Issuing Authority and Testing laboratory for the recommendation OIML R137 – gas meters. Tifernogas also has an extensive experience in volumetric measurements with hydrogen. It is able to cover flow rates from 0 cm<sup>3</sup>/h to 30 cm<sup>3</sup>/h with CH<sub>4</sub> blending, air, nitrogen and hydrogen up to 100 % in composition. Tifernogas has, indeed, special facilities for hydrogen measuring and a dedicated laboratory (H<sub>2</sub> Lab). Tifernogas will contribute to the activities included in WP4 by performing calibrations of gas meters using nitrogen, air, helium, natural gases and hydrogen at up to 30 m<sup>3</sup>/h. TG will also participate in WP5 and WP6.



**UNIBO (IT) :** At almost 1000 years old, the University of Bologna (UNIBO) is known as the oldest University of the western world. Nowadays, UNIBO still remains one of the most important institutions of higher education across Europe. The activities of UNIBO will be conducted within the Department of Industrial Engineering (DIN) and specifically by a research team belonging to Industrial Mechanical Plants academic discipline. UNIBO's research team's activities include the design of industrial mechanical plants, multiphase flow engineering, Power to Gas, safety, renewable energy. Furthermore, the research team has a long experience in the design, commissioning and operation of experimental test benches. UNIBO will be mainly involved in the preliminary design of the test benches (WP1, WP3) and supporting other partners during the completion of the executive design and the commissioning phases. Based on its academic role, UNIBO, will also coordinate the participants in writing scientific papers and contributions for national and international conferences (WP5). UNIBO will also participate in all other work packages with a minor role.



**VSL (NL) :** VSL is the NMI for the Netherlands. It has decades of experience with performing SI-traceable flow calibrations using a variety of flow meters in high pressure, low pressure, and liquid environments using water, air, natural gas and liquefied gas media. VSL has a leading position in the field of water flow, gas flow and cryogenic flow measurement through its water, gas flow and LNG flow calibration facilities. It is a member of the European Reference for Gas Metering (EuReGa) group which establishes unified reference values for high pressure gas flow and is the coordinator of the EMN for Energy Gases. VSL will lead WP3 where traceability transfer skids will be developed. In WP2 and in WP4, VSL will calibrate industrial flow to deliver datasets on the alternative fluid calibration of industrial gas meters, providing traceability at primary level that will be directly applicable to the gas grid. In WP4, VSL will also contribute to domestic gas meter calibrations with alternative fluids and hydrogen (blends).

**About the European Partnership on Metrology.** The European Partnership on Metrology research funding programme is co-funded by the Member States and the EU (under Horizon Europe). The programme was proposed by EURAMET and it follows EMRP and EMPIR funding programmes. More information on previous and current calls can be found via <https://www.metpart.eu/>

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*H2FlowTrace Press Release ends.*

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