H2FLOWTRACE

Flow measurement traceability for hydrogen in gas networks

METROLOGY PARTNERSHIP | EURAMET

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Poitiers, France

CESAME-EXADEBIT / REMY MAURY

Gas Flow Metering Laboratory

- Legal Metrology
- Industrial Metrology
- R&D Support
- Fundamental Metrology

CESAME-exadébit SA

métrologie française
LNE-LADG

*LNE associated laboratory

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Joined Cesame-Exadebit in 2014

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To avoid the worst impacts of climate change, greenhouse gas emissions need to be dramatically reduced.

This will only be possible by reducing the EU’s reliance on fossil fuels.

Hydrogen offers a sustainable alternative, which can be distributec through gas networks, with the ability to fulfil societal, economic ecological and technological objectives.

Hydrogen can be stored underground, or in the existing natural gas network, which allows it to meet fluctuating energy demands in a way that is not practical for renewable energy sources such as solar and wind.

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.

This project will address this by contributing to the development of the required metrological infrastructure, which has the potential to reinforce Europe's leading position in the hydrogen economy.

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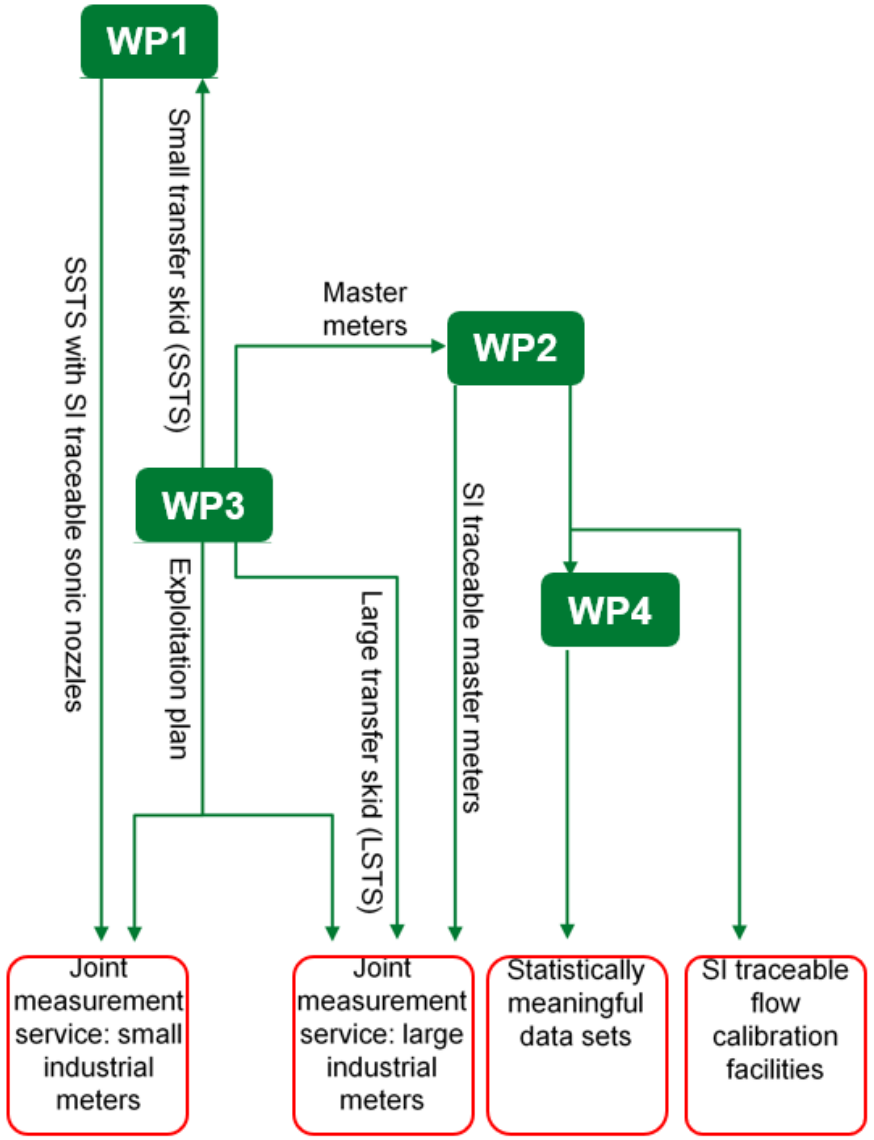
THE NEED

- European Green Deal: net zero CO_2 emissions by 2050, 50% reduction by 2030
- Crucial role for hydrogen in decarbonisation of gas networks: provide clean energy at point of use
- New metrological techniques and testing infrastructures are required to support the use of hydrogen
- Flow measurement is required for process monitoring and control, fiscal metering, billing and at each point of custody transfer



FLOW METROLOGY BARRIERS FOR H2 UPTAKE

- Building primary flow standards is prohibitively expensive for NMIs/DIs, barrier to fundamental research
- Lack of traceable calibration facilities to perform flow meter, R&D and certification
- Lack of accuracy data, standardisation groups cannot specify appropriate testing methods
- End users (gas network and storage operators, energy companies) unable to select suitable flow meters for H_2 and HENG

PROJECT PARTNERS

CESAME-exadébit SA — *Coordinator*

8 NMIs/DIs (incl. CESAME)

PTB Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

VSL National Metrology Institute

TÜV SÜD National Engineering Laboratory

FORCE TECHNOLOGY

METAS

CMI Czech Metrology Institute

SMU Slovak Institute of Metrology

2 Gas Operators

enagas

GRTgaz

1 R&D Institute

GERG The European Gas Research Group

3 Industry Flow Calibration

rma Pipeline Equipment

DNV

FCNG - MTV - 06 tifernogas

1 University

Alma Mater Studiorum Università di Bologna A.D. 1088

2 Meter Manufacturers

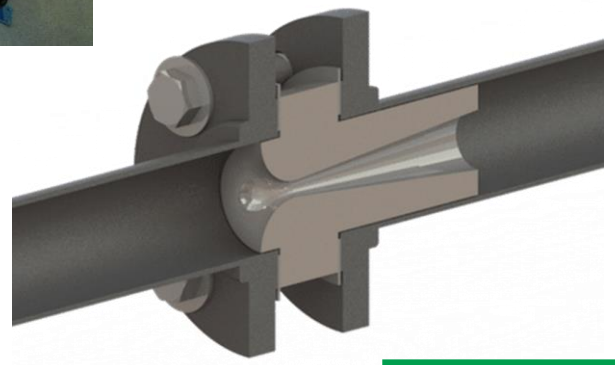
SICK

EMERSON

Work package 1: **Traceability for H_2 or HENG, small industrial meters**

- **Metrological infrastructure for H_2 and HENG, 0.1 m^3/h to**
- **400 m^3/h, 0.01 MPa(g) to 1.6 MPa(g), uncertainty < 0.2%**

M1 (secondary) Bench – CESAME



- **Calibration of small sonic nozzles with hydrogen at up to 20 kg/h using CESAME "PVTt" primary standard, bootstrapping up to 720 kg/h**
- **Laboratory intercomparison of world-renowned institutes**

Tasks	Description
Task 1.1	Traceability route for CFVN at low flow rates of up to 20 kg/h
Task 1.2	Traceability route for CFVN at medium flow rates of up to 120 kg/h
Task 1.3	Assembling the measurement uncertainties for hydrogen testing facilities at flow rates of up to 2500 Nm3/h via a laboratory intercomparison

WP Leader : METAS

METAS

D1	D2
Technical report (metrological infrastructure)	Paper (metrological infrastructures and their capabilities)

Work Package 2: **Metrological infrastructure for H_2 and HENG in large flows**

- **Metrological infrastructure for H_2 and HENG, 200 m^3/h to 10000 m^3/h, 0.3 MPa(g) to 6.2 MPa(g), target uncertainty 0.2%**

- **Calibration of large transfer skid (LSTS) master meters**
- **Laboratory intercomparison of the main H_2 and HENG test loop facilities**

H2-Loop - RMA

Gas Oil Piston Prover – VSL

Tasks	Description
Task 2.1	European facilities for testing and calibrating industrial gas meters with pure hydrogen and HENG
Task 2.2	Traceability and intercomparison of facilities for testing and calibrating large industrial gas meters with pure hydrogen and HENG
Task 2.3	Uncertainty budgets and summary report

WP Leader: PTB

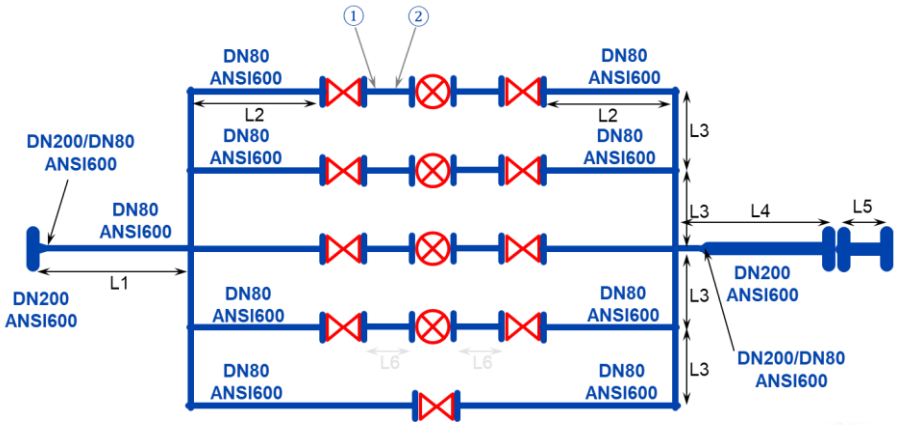
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

D3
Paper (intercomparison of facilities for testing and calibrating)

D4
Summary report (testing of the newly developed metrological infrastructure)

Work Package 3: **Traceability transfer skids for H_2 and HENG**

- **Development of 2 transfer skids to deliver SI traceability**



Credits: Hycenta

- **Design, construction, uncertainty assessment**
- **Joint measurement service: future exploitation of the transfer skids**

Tasks	Description
Task 3.1	Designing and testing of a Small-Scale Transfer Skid (SSTS) for pure hydrogen
Task 3.2	Designing and testing of a Large-Scale Transfer Skid (LSTS) for pure hydrogen and hydrogen blends with Qmax at 1000 m3/h and pmax at 6.2 MPa(g)
Task 3.3	CMC estimation of the SSTS and LSTS

D5
Technical, operational, metrological, and safety documentation (SSTS & LSTS)

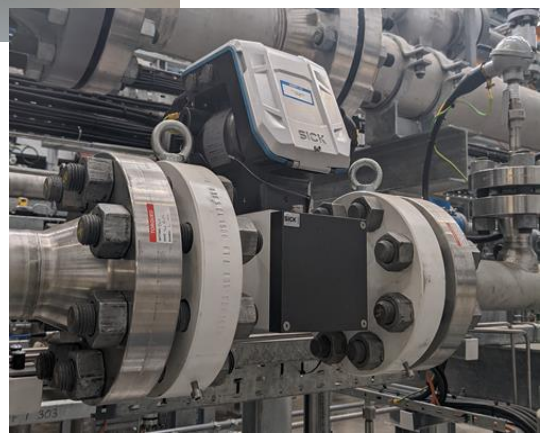
National Metrology Institute

WP Leader : VSL

Work Package 4: **Evaluation of domestic and industrial gas meters**

- **Providing statistically meaningful data sets for accuracy of domestic and industrial meters**
- **Alternative fluid calibrations for H_2 and HENG**

Gas meter calibration bench – CMI



Sick ultrasonic gas meter

- **Largest test programme to date, ≥ 25 domestic and ≥15 industrial gas meters, identified in stakeholder workshop**

Tasks	Description
Task 4.1	Background research and definition of a test plan
Task 4.2	Domestic meter calibrations with hydrogen, HENG and alternative gases
Task 4.3	Industrial meter calibrations with hydrogen, HENG and alternative fluids
Task 4.4	Assessment of calibration methods

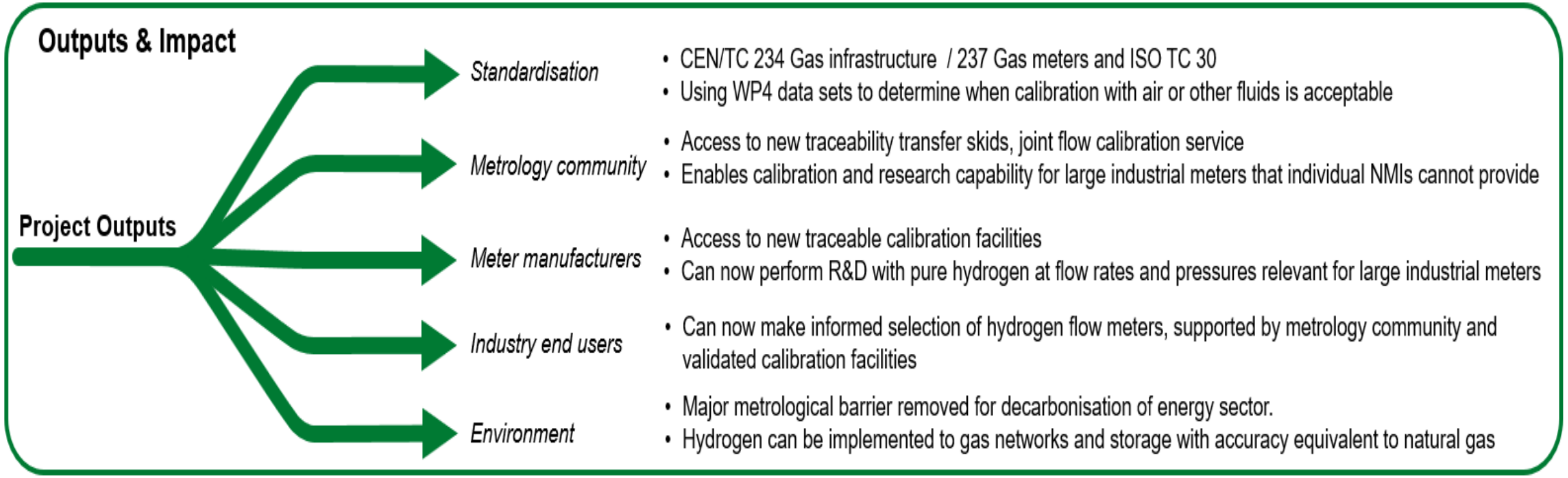
WP Leader : NEL

D6
Good practice guide (industrial gas meters and the calibration method)

D7
Paper (findings from the primary and secondary calibrations)

Work Package 5: Outputs & Impact

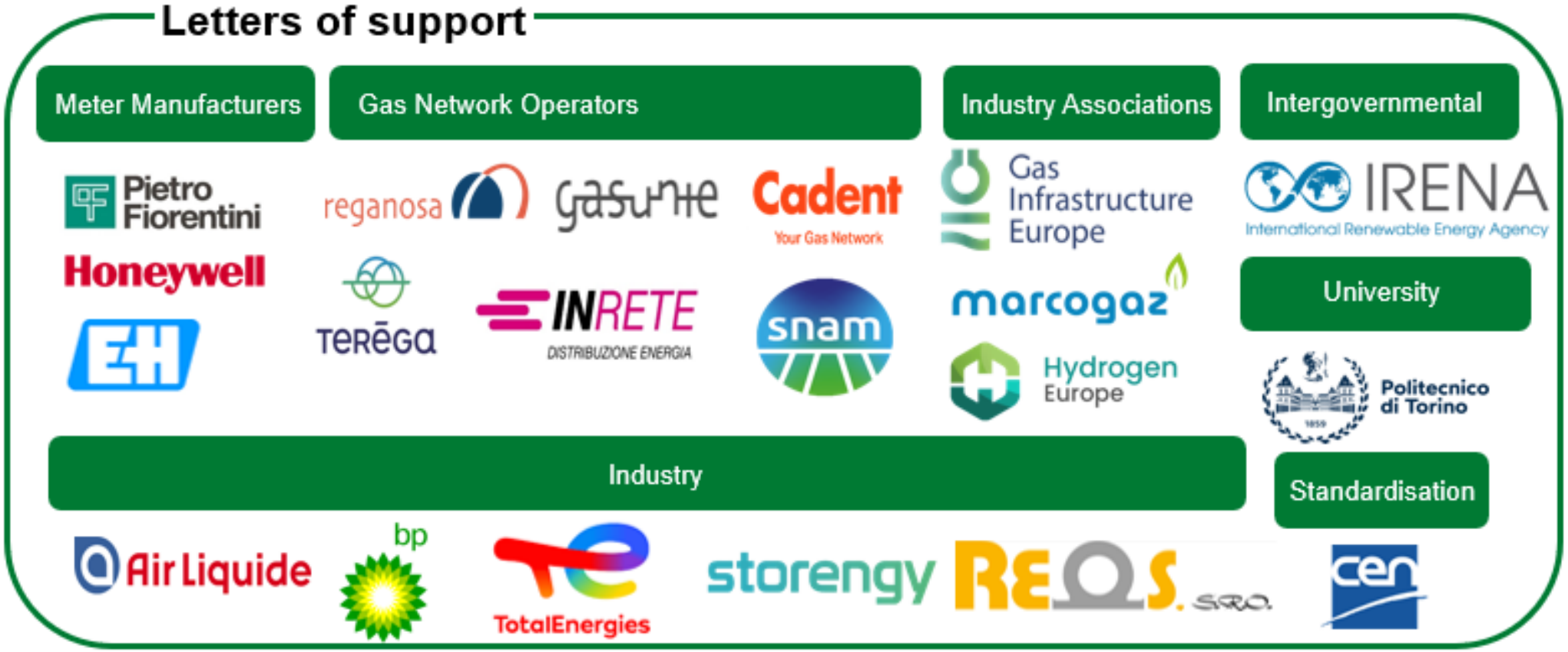
WP Leader : GERG



LinkedIn: @H2FlowTrace Project

Tasks	Description
Task 5.1	Dissemination and communication
Task 5.2	Exploitation and uptake

Letters of Support



Deliverables – M36

D8
Evidence of contributions to or influence on new or improved international guides, recommendations, and standards with a specific focus on the following guides and committees: ISO TC30, OIML TC8, CEN/TC237, EN/TC234, GERG, EUREGA and others

D9
Delivery of all technical and financial reporting documents as required by EURAMET

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THANK YOU

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HTTPS://H2FLOWTRACE.EU/

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METROLOGY PARTNERSHIP

EURAMET

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