Press release
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Launch of EU-funded project MetNH_3Energy to support ammonia use as a hydrogen energy carrier

Photo 1: Consortium picture at the Kick-Off Meeting, September 2025, in Braunschweig (Germany)

- *The MetNH_3Energy project aims at developing a comprehensive metrological framework that supports the deployment of ammonia.*
- *26 partners from 14 countries participate in this project, which started in August 2025 and will end in July 2028.*
- *Ammonia (NH_3) which enables hydrogen (H_2) transport over long distances could play a key role in the energy transition and decarbonization.*

Hydrogen is essential for decarbonization, but long distance transportation remains a major challenge. Ammonia (NH_3) is positioned as a key energy carrier to overcome this obstacle. In this context, the EU-funded project MetNH_3Energy (Metrology to support ammonia use in emerging applications) has begun its activities to develop a comprehensive metrological infrastructure, including reliable measurement techniques and standards throughout the entire ammonia value chain, addressing gaps in current infrastructure, and facilitating the broader adoption of ammonia in both existing and emerging applications.

Photo 2: Activity explanation at the Kick-Off Meeting

MetNH$_3$Energy will address this main objective from 5 perspectives:

- First, the project will establish new **primary reference materials and advanced gas analysis methods** for ammonia as an energy carrier, with a specific focus on impurities arising from various production process value chains.
- Second, MetNH$_3$Energy will establish **calibration and validation** procedures for **flow meters** to accurately measure both gaseous and liquid ammonia, specifically for custody transfer applications in real-world field conditions.
- Third, a **metrology infrastructure** will be established, utilizing SI traceable, controlled releases to accurately mimic real-world leak scenarios and enable the development of robust, quantitative methods for ammonia leak detection.
- Fourth, the consortium will develop **traceable and validated real-time online measurements** for both real-time online stack emissions (e.g., NH_3, N_2O, NO, NO_2) and flow monitoring, including estimations of uncertainty. This effort will also evaluate the effects of ammonia impurities on pollutant formation during the thermo-chemical conversion of ammonia.
- Last, the project will conduct **material compatibility studies** to determine the effects of various materials on reference material preparation and ensure safety throughout the ammonia value chain. All resulting data will be registered and disseminated to standardization bodies, metrology organizations, academia, and end-users, thus facilitating the early adoption of novel calibration services.

Outcomes for industrial and other user communities

The development of reference materials for impurities in an ammonia matrix will **support emerging applications** such as ammonia cracking and benefit industries across the energy, chemical, and maritime sectors. In addition, reference materials for emission species will

provide value to the road transportation sector. Results from flow measurement studies will enable manufacturers of flow metering devices to improve instrument design and calibrate their systems using cost-effective, validated methods. Similarly, advances in leak sensors and leak calibration procedures will allow sensor manufacturers to test their devices with greater accuracy and reliability. Furthermore, improved understanding of material performance and sensor behaviour in harsh ammonia environments will help industries select appropriate material–sensor combinations, enhancing operational safety. Last, the extended emission results from the validation tests will stand as a traceable database, whose purpose is to provide the legal metrological certainty required for carbon accounting and compliance with EU Emissions Trading System and FuelEUMaritime policies.

Photo 3: MetNH₃ Energy flyers

Outcomes for the metrology communities, scientific communities and standardisation

The project seeks to advance metrology and scientific standards through several key outcomes, including the establishment of Calibration and Measurement Capabilities (CMCs) for impurities in ammonia matrices. The use of surrogate fluids and optical techniques for ammonia flow calibration has the potential to simplify traceability while avoiding the need for significant infrastructure upgrades for both gaseous and liquid measurements. Developments in leak sensor traceability aim to enable their reliable integration across ammonia value chains, while investigations into sensor degradation will support improved understanding of measurement uncertainties in long-term applications. Overall, the project will focus on developing, optimising, and benchmarking traceable measurement standards and methods to strengthen the underlying metrological infrastructure.

Longer-term economic, social and environmental impacts

With the right supportive infrastructures, European companies, sensor manufacturers, calibration providers, maritime and trading partners, engine providers, and consulting companies will benefit through early market penetration and increasing market share by

providing high-quality products that are competitive with other geographies. The development of reference materials will allow the calibration of emission monitoring techniques, thereby enabling the stringent implementation of norms that, in the long run, will control and reduce emissions. This chain of events will lead to reduced environmental impact, allowing an increased standard of living for the society and the general population.

The project is funded by the European Union through the European Partnership on Metrology, co-financed by the European Union Horizon Europe Research and Innovation Programme and from the Participating States. In total, MetNH_3Energy has a budget of €3.5 million over its three-year duration.

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Consortium

The consortium is made up of 26 partners from 14 countries

Partner logo	Description
PTB Physikalisch-Technische Bundesanstalt National Metrology Institute	Physikalisch-Technische Bundesanstalt (PTB, DE): PTB is Germany's National Metrology Institute and one of the world's leading centres for precision measurement. It develops and maintains national standards across physics and engineering, ensuring traceability and reliability of measurements worldwide. PTB coordinates MetNH_3Energy, providing scientific leadership and quality assurance. The institute contributes its expertise in gas analysis, flow metrology, and kinetic modelling to support traceable measurement methods for ammonia purity, leakage detection, and emissions monitoring—strengthening the metrological foundation for ammonia as a sustainable energy carrier. PTB is the coordinator entity of MetNH_3Energy.
BAM Bundesanstalt für Materialforschung und -prüfung	Bundesanstalt für Materialforschung und -prüfung (BAM, DE): BAM is Germany's Federal Institute for Materials Research and Testing, which ensures the safety and reliability of materials, chemicals, and engineering systems. As a scientific and technical authority, BAM conducts cutting-edge research in materials science and chemical safety, supporting sustainable and safe industrial innovation. In MetNH_3Energy, BAM leads the development of reference standards and analytical methods for ammonia impurities (WP1), contributing to

	improved quality control, safety, and traceability within the ammonia value chain.
	Cesame Exaderbit (Cesame, FR): Cesame is the French designated institute for medium and high gas flows. It holds, maintains and develops national standards in this field and is an active member of the European Reference for Gas Metering group (EuReGa). With long-standing expertise in high-pressure gas flow and participation in several hydrogen-related projects, Cesame contributes to MetNH_3Energy through the calibration of gaseous and liquid ammonia flow meters, safety assessments, and the development of best-practice guides for traceable flow measurement.
	Czech Metrology Institute (CMI, CZ): CMI is the Czech National Metrology Institute, responsible for maintaining and developing the national measurement standards and ensuring traceability within the Czech Republic. The institute conducts advanced research in gas metrology, optics, and thermodynamics. CMI brings in expertise in the field of flow measurement and static gas mixture preparation and verification. Within MetNH_3Energy, CMI supports the development and validation of gas reference materials (WP1) and measurement methods for ammonia and its emissions (WP3), contributing to accurate and traceable measurements for environmental and industrial monitoring (WP4).
	Denmark's National Metrology Institute (DFM, DK): DFM is responsible for maintaining the country's primary measurement standards and advancing precision measurement science. With over 20 years of experience in quantitative optical spectroscopy of molecules, DFM specialises in developing custom-made spectral fitting procedures and compact, field-deployable spectrometers for on-site gas analysis–work highly relevant to the environmental monitoring community. Within MetNH_3Energy, DFM contributes its advanced laser facilities and spectroscopic expertise to develop and validate optical measurement methods for ammonia detection, supporting the activities in WP3 on leak detection and calibration infrastructure, as well as emission monitoring across the ammonia energy chain.
	Center for Physical Sciences and Technology (FTMC, LT): FTMC is the largest scientific research institution carrying out unique fundamental research and technological development works in scientific fields of laser technologies, optoelectronics, nuclear physics, organic chemistry, bio and nanotechnologies, electrochemical material science, functional materials, electronics, etc. in Lithuania. In the Center not only innovative science but also high technologies expedient for business and society's needs are developed.

IPQ	Portuguese Institute of Quality (IPQ, PT): IPQ is Portugal's National Metrology Institute, responsible for maintaining national measurement standards and promoting quality and conformity assessment. It supports the Portuguese industry through calibration, testing, and metrological services. In MetNH_3Energy, IPQ contributes to WP1 and WP3, focusing on the preparation and validation of gas reference materials for ammonia and related pollutants such as NO_2 and SO_2. IPQ's expertise ensures reliable traceability in emission and leakage monitoring, supporting the creation of consistent and comparable measurement standards across Europe.
Justervesenet	Justervesenet (JV, NO): JV is Norway's National Metrology Institute, responsible for maintaining national standards and ensuring traceable measurements across science and industry. JV has a strong background in flow metrology, particularly for gases and liquids. Within MetNH_3Energy, JV contributes to WP2 on flow metering by identifying industrial needs, performing literature reviews, and evaluating calibration methods and surrogate fluids for ammonia flow measurements. JV's work helps establish a solid metrological foundation for accurate and safe ammonia flow measurement in future energy systems.
LNE	Laboratoire National de Métrologie et d'Essais (LNE, FR): LNE is France's National Metrology Institute, ensuring the reliability of measurements and compliance with national and international standards. With extensive experience in gas analysis, calibration, and traceable reference material development, LNE contributes to several work packages in MetNH_3Energy, particularly WP1 and WP3. The institute supports the creation of reference gas standards for ammonia and related pollutants, and validation of emission monitoring techniques. LNE's contribution ensures measurement consistency and comparability across the consortium.
TÜV SÜD	National Engineering Laboratory (NEL, UK): NEL, part of TÜV SÜD, is the UK's designated institute for flow measurement and one of the world's foremost authorities in flow metrology research. It provides calibration, testing, and consultancy services to support accurate flow measurement across industry sectors. Within MetNH_3Energy, NEL contributes to WP2, focusing on the calibration of gaseous and liquid ammonia flow meters, testing of surrogate fluids, and uncertainty analysis. Its work helps to establish reliable and traceable methods for ammonia flow metering, crucial for safe and efficient energy system deployment.

TÜBİTAK	TÜBİTAK (TR): TÜBİTAK is the National Metrology Institute of Türkiye and establishes and maintains Türkiye's measurement standards. Besides, it also functioned as the Scientific and Technological Research Council of Türkiye and is the country's leading public agency for advancing science, technology, and innovation. Within MetNH_3Energy, TÜBİTAK contributes to WP1, WP3 and WP4, focusing on developing and validating traceable reference materials for ammonia and related pollutants, as well as designing advanced gas analysis systems and calibration facilities. With extensive experience in spectroscopy and metrological research, TÜBİTAK strengthens the project's analytical accuracy and supports the safe and reliable monitoring of ammonia across its energy applications.
VSL	VSL (NL): VSL is the Dutch National Metrology Institute that develops and maintains the Netherlands' primary standards for thermometry and optics (among many others) and ensures international traceability. VSL specialises in gas metrology and flow measurement, with advanced facilities for reference gas mixtures and calibration systems. In MetNH_3Energy, VSL contributes to WP1 and WP2, leading work on the development of traceable reference gas standards and calibration of ammonia flow meters using surrogate fluids. Its expertise ensures the comparability, precision, and reliability of ammonia measurements across the consortium and industry.
AALBORG UNIVERSITET	University of Aalborg (AAU, DK): AAU is one of Denmark's leading research universities, recognised for its strong engineering and environmental science programmes. AAU combines academic research with practical industrial applications in energy systems and fluid dynamics. Within MetNH_3Energy, AAU contributes to WP3, developing advanced computational fluid dynamics (CFD) models for simulating ammonia dispersion and leak detection scenarios. These models help optimise experimental field tests and support uncertainty analysis, providing essential insights for safe ammonia handling and emission mitigation.
Air Liquide	Air Liquide: A world leader in gases, technologies and services for industry and healthcare, Air Liquide acts as the backbone of numerous economic sectors, serving 4.3 million customers and patients across 59 countries with approximately 65,000 employees. In MetNH_3Energy, Air Liquide's Innovation Campus Frankfurt (DE) contributes to WP1 and WP4, leading the review of emission monitoring methods and supporting the development of reference materials and analytical techniques. Its participation bridges metrology with industrial applications, promoting the integration of traceable and practical measurement methods for ammonia in energy systems.

UNIVERSITY OF BIRMINGHAM	University of Birmingham (BHAM, UK): BHAM is a leading UK research university with internationally recognised expertise in clean energy technologies, advanced materials, and metrology. Within MetNH_3Energy, BHAM contributes across multiple work packages, including WP1 and WP3, focusing on ammonia impurity assessment, material degradation studies, and safety evaluations for emerging applications. The university leads the compilation of industrial requirements for ammonia purity and emission standards. Through its interdisciplinary research and strong industrial collaborations, BHAM supports the project's scientific depth and real-world relevance.
DTU Danmarks Tekniske Universitet	Technical University of Denmark (DTU, DK): DTU is one of Europe's leading technical universities, known for its excellence in engineering, energy, and environmental research. DTU has extensive experience in advanced spectroscopy, combustion processes, and emission analysis. Within MetNH_3Energy, DTU plays a key role in WP1, WP3 and WP4, developing innovative real-time emission monitoring techniques and modelling the behaviour of ammonia and nitrogen oxides in energy systems. DTU's work supports the creation of traceable, accurate methods for pollutant detection and contributes to safe, efficient ammonia-based combustion technologies for future clean energy applications.
GERG THE EUROPEAN GAS RESEARCH GROUP	European Gas Research Group (GERG, BE): GERG is a leading collaborative platform representing the major players in Europe's gas sector. It coordinates research and innovation projects that promote safety, efficiency, and sustainability in gas technologies. In MetNH_3Energy, GERG supports stakeholder engagement and dissemination of project outcomes, ensuring alignment with industrial needs and regulatory frameworks. By connecting metrology institutes and the gas industry, GERG helps facilitate the adoption of reliable and traceable measurement techniques for ammonia in the emerging hydrogen and energy markets.
OIL AND GAS INSTITUTE National Research Institute	Oil and Gas Institute – National Research Institute of Poland (INIG, PL): INIG is a centre of excellence in fuel technology, process engineering, and environmental protection. The institute provides testing, certification, and R&D services for the energy and gas industries. Within MetNH_3Energy, INiG contributes to WP3, leading field tests of ammonia leak detection systems and developing experimental setups to simulate realistic release scenarios. Its practical experience ensures that metrological innovations are validated under true operational conditions, supporting safety and environmental protection across the ammonia value chain.

	Instrumatic Marines A/S (DK): Instrumatic is a Danish company specialising in gas analysis and emission monitoring systems for maritime and industrial applications. The company develops high-performance sensor technologies and portable analytical instruments. In MetNH$_3$Energy, Instrumatic contributes to WP4, collaborating with metrology institutes to develop and validate compact sensors for real-time detection of ammonia and related pollutants. By bringing industrial know-how and instrumentation expertise, Instrumatic bridges research outcomes with practical solutions for emissions control and process monitoring.
	LEC GmbH (LEC, AT): LEC is a leading Austrian research organisation focusing on sustainable large engine technologies and innovative energy systems. The centre collaborates closely with industry to improve efficiency and reduce emissions in combustion processes. Within MetNH$_3$Energy, LEC plays a major role in WP2 and WP4, hosting large-scale engine test campaigns to assess ammonia combustion and emission monitoring techniques. By providing experimental facilities and practical expertise, LEC ensures that new metrological methods are validated under realistic operating conditions
	OWI Science for Fuels gGmbH (OWI, DE): OWI is a German non-profit research institute specialising in the development of innovative, sustainable, and efficient energy and fuel technologies. OWI conducts applied research for the energy and transport sectors, focusing on cleaner combustion processes and fuel performance. Within MetNH$_3$Energy, OWI contributes to WP3, leading material compatibility and degradation studies to assess how ammonia interacts with metals, coatings, and sensor materials. Its work supports the safe integration of ammonia into industrial and energy systems by providing scientific data on material behaviour and durability under ammonia-rich environments.
	Technical University of Delft (TU Delft, NL): TU Delft is the oldest and largest technical university in the Netherlands, known for pioneering research in energy, materials, and environmental technologies. TU Delft combines academic excellence with strong industrial collaboration. In MetNH$_3$Energy, TU Delft contributes to WP2, developing calibration and measurement approaches for ammonia flow systems and supporting uncertainty analysis for liquid and gaseous flow metering. Through its expertise in fluid mechanics and metrology, TU Delft helps to establish reliable flow standards for ammonia applications in clean energy systems.

Univerza v Mariboru	University of Maribor (UM, SL): UM is Slovenia's second-largest university, known for its strong research in engineering, materials science, and environmental technologies. Within MetNH_3Energy, UM contributes to WP1, WP3 and WP4, developing innovative fibre-optic gas sensors for detecting ammonia and nitrogen oxides in air. These sensors are designed for both laboratory and field applications. By combining optical expertise with practical testing, UM supports the creation of compact, high-precision monitoring systems that advance safety and emission control across the ammonia energy value chain.
NOVA UNIVERSIDADE NOVA DE LISBOA	NOVA University Lisbon (UNL, PT): UNL is one of Portugal's leading research universities, internationally recognised for excellence in science, engineering, and environmental studies. Within MetNH_3Energy, UNL contributes to WP3, focusing on leak detection and calibration methods for ammonia monitoring systems. The university leads reviews of commercial sensor technologies and helps establish best practices for portable detector calibration. UNL's expertise strengthens the project's focus on safety, reliability, and environmental protection in ammonia-related infrastructures.
EMERSON	Emerson M (NL): Emerson M is a global technology and engineering leader providing automation solutions for process industries. It's known as 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 beverage. Within MetNH_3Energy, Emerson contributes to WP2 and WP3, supplying industrial flow meters and sensor components for testing and validation under ammonia conditions. Its participation ensures that research outcomes are aligned with real-world industrial needs, supporting the development of accurate, safe, and traceable ammonia flow measurement techniques.
Endress+Hauser	Endress+Hauser SICK GmbH+Co. KG (EHS, DE): EHS 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, bringing 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. Within MetNH_3Energy, Endress+Hauser SICK contributes to WP3 and WP4, providing sensor technology and industrial know-how for ammonia detection and emission monitoring. By supporting laboratory validation and field testing of gas analysers, the company helps bridge the gap between metrological research and industrial implementation– advancing reliable, traceable measurement solutions for the emerging ammonia energy sector.