



## Energy – Projects

An overview of the set of projects funded under the Targeted Programme Energy.

The aim of these projects is to establish a sustainable European energy system through measurement research.

Focus is placed on technologies that enable greatly reduced greenhouse gas emissions, whilst also ensuring the security of Europe's energy supply.

## Driving uptake of hydrogen vehicles

New measurements will enable fair pricing and quality assurance for greener hydrogen vehicles

Hydrogen is one of the most promising alternative fuels for future energy and transport applications, offering to increase energy security and reduce greenhouse gas emissions. To support its use as a low carbon transport fuel, an extensive infrastructure for hydrogen-powered vehicles is currently in development across Europe. However, the hydrogen industry cannot yet meet the measurement requirements of legislation surrounding the use of hydrogen fuel, due to a lack of methods and standards.

This project will develop methods, standards and calibration facilities to ensure accurate flow metering and fair pricing for customers at refuelling stations, and methods, reference gases and online analysers to provide quality assurance and control of the hydrogen dispensed. These results will support the uptake of low-emission hydrogen vehicles and the growth of Europe's hydrogen economy by increasing confidence among both manufacturers and consumers.



### Project 16ENG01

Metrology for hydrogen vehicles

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## Rapid commercialisation of emerging solar technologies

New energy rating metrics will provide better, fairer testing of emerging photovoltaic technologies

Currently, photovoltaic (PV) modules used to generate solar energy are sold on the basis of power produced under standard test conditions. However, these test conditions do not always reflect the real-world conditions in which PV modules will be operating. This impedes the uptake of emerging and innovative technologies, such as modules optimised for specific climates. An alternative is to value PV according to an energy rating metric that takes into account real-world factors.

This project will use results from ENG55 PhotoClass to support the adoption of this metric by improving PV energy rating standards, measurement equipment and methodologies to enable precise measurements of the parameters required for the energy rating. Adopting such a metric better aligns the interests of the manufacturer and customer, provides a fairer comparison between different PV technologies, and improves the accuracy of financial models. This will accelerate time-to-market for emerging PV technologies, which have the potential to significantly reduce the cost of solar energy.



### Project 16ENG02

Advanced PV energy rating

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## Accelerating development of innovative energy technologies

New capabilities to assess thin film performance will aid deployment in novel energy applications

Two key challenges facing developers of innovative energy technologies are ensuring their long-term durability and accelerating the time-to-market. One area in which both are particularly challenging is the development of thin films, used in a range of energy applications from photovoltaics to batteries. The complexity of thin films means that device performance and degradation are affected by a combination of characteristics, and their assessment requires a new analytical approach to combined data analysis.

This project will use results from ENG53 ThinErgy to develop a European hybrid metrology capability for the characterisation of thin film performance and durability in energy applications. This will include the development of new methods to enable datasets from multiple measurements to be combined. The new capabilities will aid the development of new, innovative energy technologies based on thin films, in turn supporting progress towards energy efficiency and renewable energy targets.



### Project 16ENG03

Hybrid metrology for thin films in energy applications

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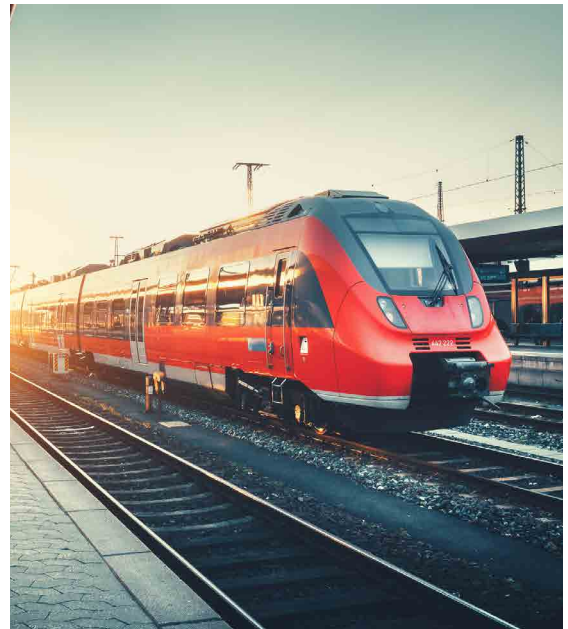
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## Increasing efficiency across Europe's rail networks

Improved energy and power quality measurements will enable smart, energy efficient management of railway networks

The European railway system consumes about 36.5 terawatt-hours of energy each year. To meet the ambitious EU target of reducing CO<sub>2</sub> emissions from rail transport by 50 % by 2030, efficient use of energy across Europe's railway system is mandatory. This requires accurate and reliable knowledge of the energy exchanged between the train and the railway grid, and real-time power quality.

This project will develop the infrastructure needed for accurate measurement of energy exchange and power quality, under the highly dynamic conditions experienced in transit. The project will also focus on the characterisation of the railway subsystem as a producer-consumer, able to transfer excess energy, with a view to its integration in a wider smart grid. The results will underpin the energy efficient management of Europe's railway networks, and allow upcoming EU legislation concerning railway energy management to be met.



### Project 16ENG04

Metrology for smart energy management in electric railway systems

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## Diversifying Europe's gas supply

### New test methods will support safe, fair injection of biomethane into Europe's gas networks

Natural gas resources are declining and the EU depends increasingly on the import of biomethane for use in the natural gas grid. At the same time, the Renewable Energy Directive and EC targets specify that 20 % of energy consumption should come from renewable sources by 2020 and biofuels, such as biomethane, should account for at least 10 % of transport fuel consumption by 2020. There is now an urgent need to significantly increase the amount of biomethane used across Europe.

This project will use results from EMRP projects ENG01 Gas and ENG54 Biogas to develop standardised test methods for key parameters, including impurities, to be monitored when biomethane is injected into the natural gas grid and used as a transport fuel. Measurement standards for these parameters will also enable SI traceable calibration and measurement results. The project will liaise closely with the biogas industry, regulators and biomethane testing laboratories to ensure that the developed test methods are robust, efficient and can readily be implemented.



#### Project 16ENG05

Metrology for biomethane

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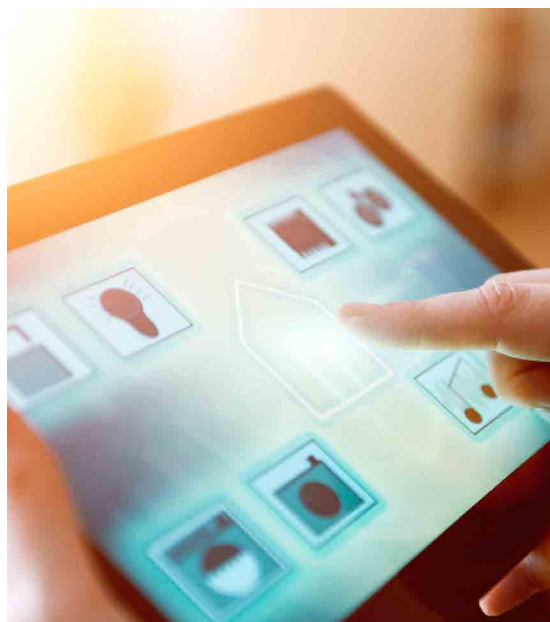
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## Increasing energy efficiency in next-generation networks

### Improved power and material measurements will enable development of optimised, future-proof electronic devices

The roll-out of 5th generation (5G) telecommunications across Europe by 2020, and the emergence of the Internet of Things (IoT) with 50 billion connected devices, will significantly increase energy demand due to the continuous power consumption of the electronic devices needed to deliver these technologies. Development of novel ultra-low power devices which support the sustainable adoption of these technologies requires traceable measurement techniques for the characterization of advanced materials and components, and for the generation of reliable and accurate data for efficient power management systems.

This project will provide such traceable measurements of power, power losses and emerging electronic materials' properties, to aid the development of new materials and more efficient electronic components. The results will enable European industries to optimise devices and systems designed for 5G and IoT applications requiring ultra-low power, resulting in more efficient energy processes.



#### Project 16ENG06

Metrology for advanced energy-saving technology in next-generation electronics applications

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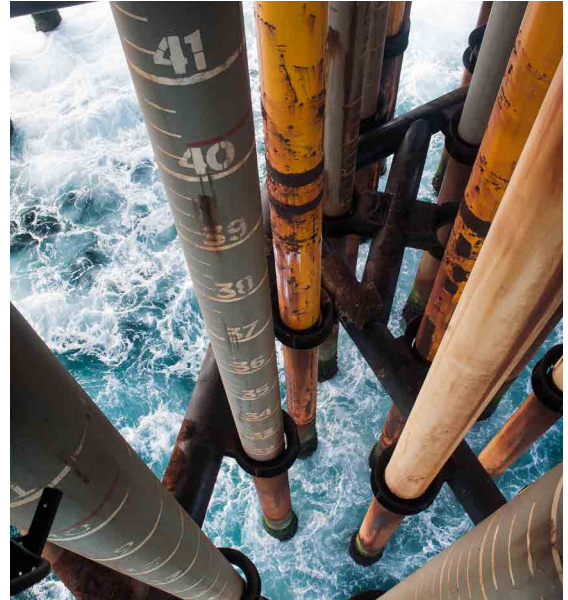
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## Multiphase flow measurements for oil and gas exploration

Harmonised multiphase flow measurements will support subsea exploration of new oil and gas reserves

Multiphase flow measurement is a fundamental enabling capability in subsea oil and gas production. However, field measurements exhibit high measurement uncertainty, costing the industry billions of euros each year in financial exposure and production inefficiencies. To rectify this, a reference measurement capability is needed that is consistent and comparable across the different test laboratories offering multiphase flow measurement services, to instil confidence in these essential measurements.

This project will apply the harmonised approach to multiphase flow measurements developed in EMRP project ENG58 to an enlarged network of laboratories, covering a wider range of flow conditions with applicability across a wider range of multiphase meter types. This will lead to lower uncertainty measurements and greater confidence in the deployment of multiphase metering technology. Such technology is a vital component of subsea engineering, the most economically effective means of exploiting new oil and gas reserves at the lowest possible cost.



### Project 16ENG07

Multiphase flow reference metrology

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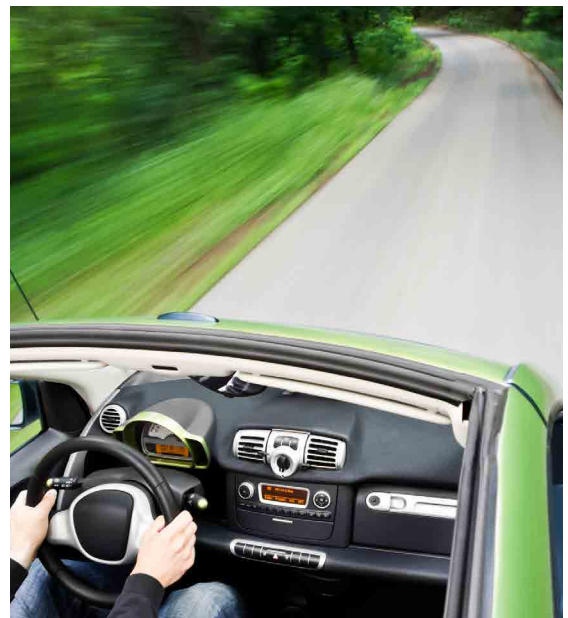
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## Inductive charging for electric vehicles

New power measurements will support safe and efficient charging of low carbon electric vehicles

Inductive charging is a promising charging technology that will be deployed by manufacturers of electric vehicles in the near future. This technology offers many advantages, such as the possibility of charging while driving along the road, small batteries and high-efficiency power transmission, as well as a reduction in CO<sub>2</sub> emissions and oil consumption. Reliable, accurate and traceable electric power measurements are needed for inductive power transfer applications, including electric vehicle manufacturers, as they are subject to strict international requirements concerning accuracy, safety and, in the near future, energy billing.

This project will accurately measure the efficiency of inductive power transfer, and provide the means to reliably demonstrate compliance with existing safety standards for human exposure. The project will also develop the measurement tools needed in the development of high-efficiency couplers needed for inductive charging of electric vehicles. These results will support safe and efficient charging of low carbon electric vehicles.



### Project 16ENG08

Metrology for inductive charging of electric vehicles

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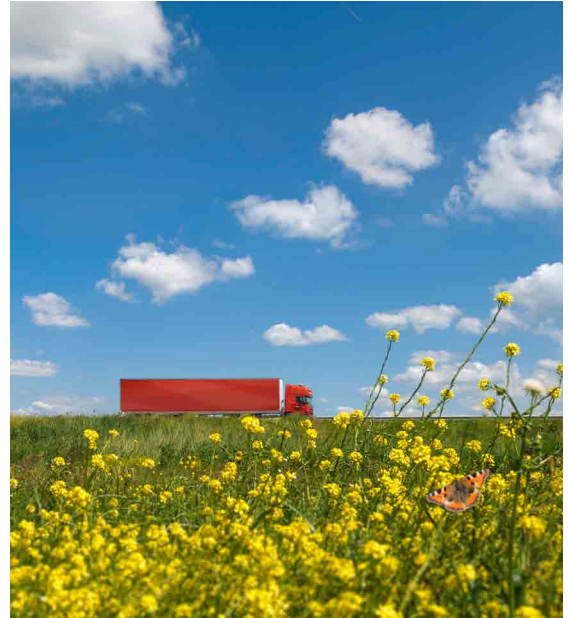
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# Enabling the roll-out of cleaner transport fuels

New test capabilities for liquefied natural gas and biogas will enable roll-out of alternative transport fuels

Use of liquefied natural gas (LNG) and liquefied biogas (LBG) as transport fuels constitutes one of the pillars of the European clean fuel strategy. LNG and LBG are particularly suited to long-distance road and water transport, and the use of LNG enables the stringent pollutant emission limits of future Euro VI standards to be met more cost-efficiently compared to conventional fuels. However, the large-scale roll-out of LNG and LBG as transport fuels requires reliable determination of their amount, composition and physical properties.

This project will use results from EMRP projects ENG03 LNG and ENG60 LNG2 to establish the necessary test facilities and validation methods that will enable this large-scale roll-out, taking an essential step towards the development of measurement traceability for custody transfer. The project will combine expertise from industry, instrument manufacturers and research institutes. These results will be implemented in various relevant written standards to enable and promote the use of LNG and LBG as cleaner transport fuels.



## Project 16ENG09

Metrological support for LNG and LBG as transport fuel

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## **Europe's National Measurement Institutes working together**

**The majority of European countries have a National Metrology Institute (NMI) that ensures national measurement standards are consistent and comparable to international standards. They also investigate new and improved ways to measure, in response to the changing demands of the world. It makes sense for these NMIs to collaborate with one another, and the European Association of National Metrology Institutes (EURAMET) is the body that coordinates collaborative activities in Europe.**

The European Metrology Programme for Innovation and Research (EMPIR) follows on from the successful European Metrology Research Programme (EMRP), both implemented by EURAMET. The programmes are jointly funded by the participating countries and the European Union and have a joint budget of over 1000 M€ for calls between 2009 and 2020. The programmes facilitate the formation of joint research projects between different NMIs and other organisations, including businesses, industry and universities. This accelerates innovation in areas where shared resources and decision-making processes are desirable because of economic factors and the distribution of expertise across countries or industrial sectors.

EURAMET wants to involve European industry and universities at all stages of the programme, from proposing Potential Research Topics to hosting researchers funded by grants to accelerate the adoption of the outputs of the projects.



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The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States