Hydrogen

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Introduction to the EMPIR Metrology Research Programme

Presentation of the *Hydrogen* project:

Metrology for sustainable hydrogen energy applications

Frédérique Haloua, PhD

CRÉER LA CONFIANCE LNE

European Association of National Metrology Institutes (NMI) is…

- "The gateway to Europe's integrated metrology community"
- Facilitate access to European measurement expertise and underpin the delivery of globally competitive, high impact metrology
- Ensure that Europe maintains its global reputation for excellence in measurement science
- Raise awareness of the value of measurement by demonstrating the impact of metrology on society's grand challenges

European Association of National Metrology Institutes (NMI)

Members:

37 European NMIs

28 of them are participating in EMPIR

Associates:

1 corresponding applicant

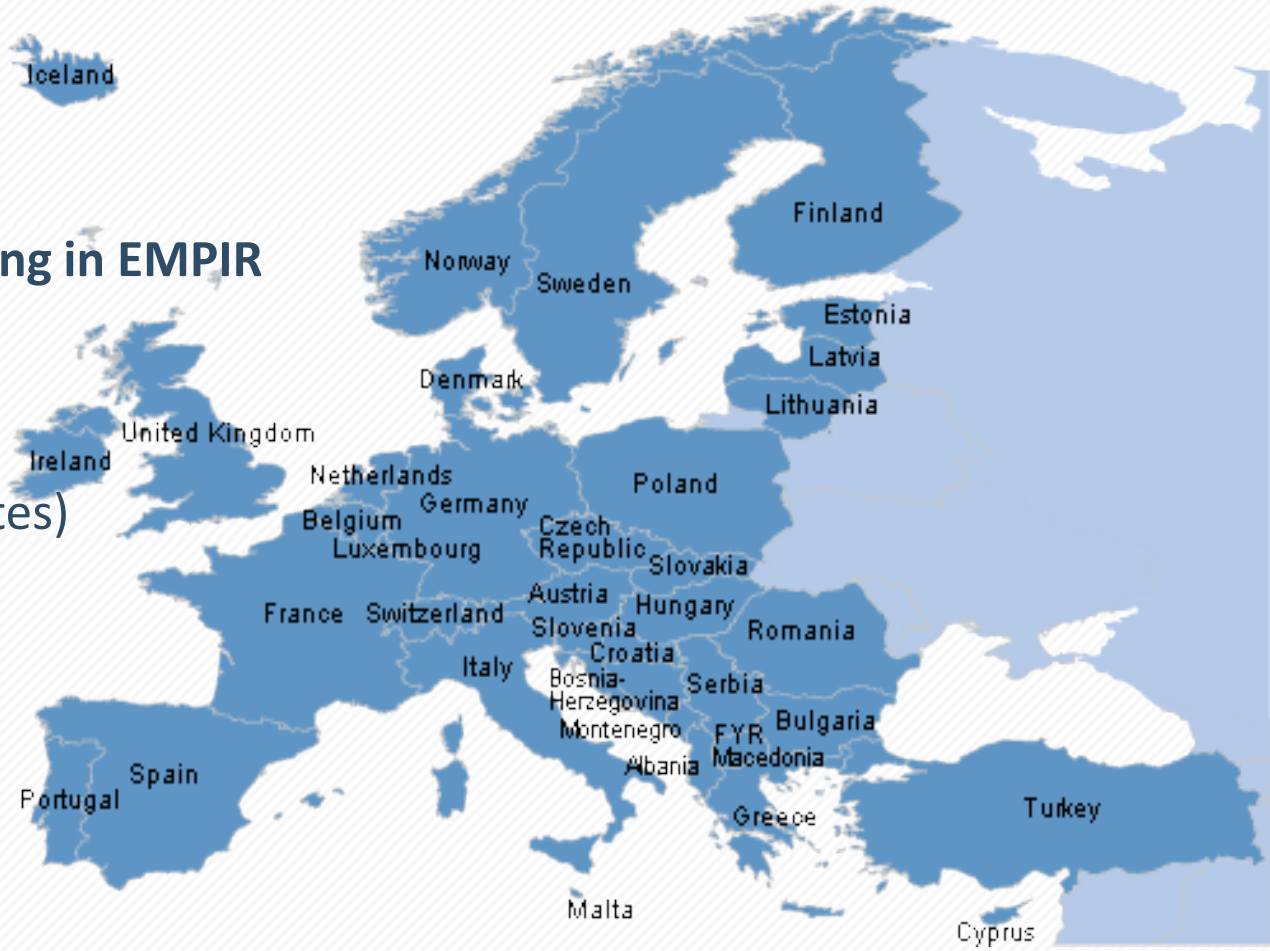
78 DIs (Designated Institutes)

Liaison Organisations:

4 RMOs

3 NMIs beyond Europe

9 CO including BIPM



The road to EMPIR …

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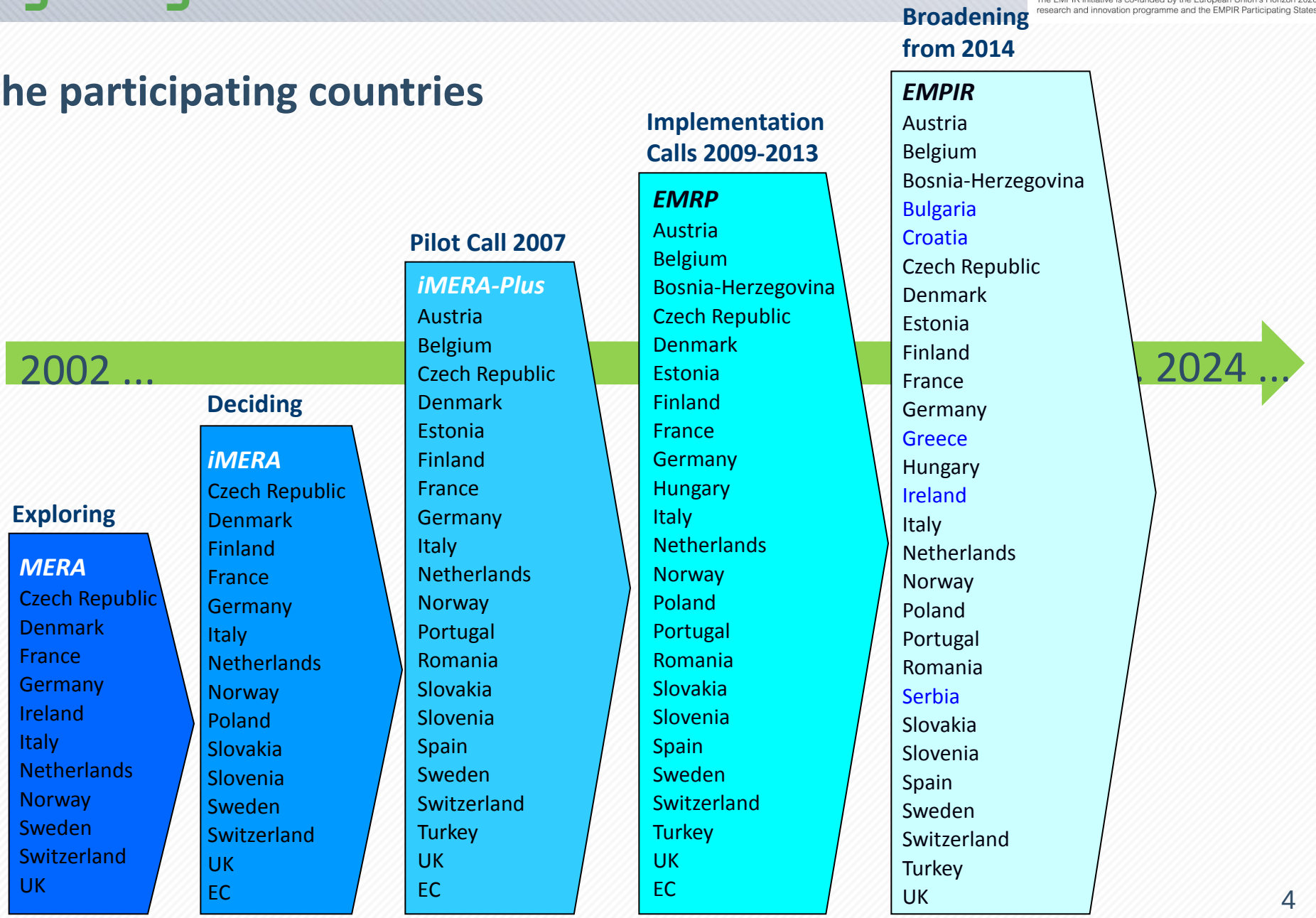
the participating countries



The previous programme EMRP

EMRP = European Metrology Research Programme

- Implemented by EURAMET, funded by **23 participating states** and supported by the European Union
- **6 specific fields (grand challenge calls)**: Industry, Energy, Environment, Health, New Technologies and SI units
- **400 M€** over 5 years (2009 - 2013)
- **119 projects** selected for funding
- Each Joint Research Project (JRP) ran for **three years (NMIs partners only)**
- **Link research and standardization** : outputs disseminated from these projects to 254 standards committees and working groups but…

The link between research and standardization needed to be improved in the following programme → EMPIR!

European Metrology Program for Innovation and Research

- It is implemented by EURAMET
- Integrated part of **European Horizon 2020** (EU Research and Innovation programme with nearly €80 billion of funding available over 7 years
- Co-funded R&D programme:
  - **600 M€** over 7 years (2014 - 2020)
  - **50% from the European Commission and 50% from the participating countries** (Article 185 of the Lisbon Treaty)
- It enables industry, research centres, standardization, regulators and academia to collaborate on **JRPs**

More cooperation is needed to meet new measurements challenges with decreasing budgets!

EMPIR Objectives

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Aim to target the needs of industry and accelerate dissemination of research outputs and innovative products to market

Improve measurement to drive innovation and competitiveness in Europe and to support regulation

Boost industrial uptake and improve standardization

Encourage active participation of representatives from industry, regulators and standardisation bodies in the projects

More information : https://msu.euramet.org/calls.html

Targeted Programmes of EMPIR

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Year	Calls	Additional calls
2014	Industry	Research Potential, SIP
2015	Health, SI Broader Scope	Pre-normative, Research Potential, SIP
2016	Environment, Energy	Pre-normative, Research Potential, SIP
2017	Fundamental, Industry	Pre-normative, Research Potential, SIP
2018	Health, SI Broader Scope	Pre-normative, Research Potential, SIP, **Networks**
2019	Environment, Energy	Pre-normative, Research Potential, SIP, Networks
2020	Fundamental, Industry	Pre-normative, Research Potential, SIP, Networks

- Same fields as the EMRP with additional themes: Fundamental, **pre-Normative**, Research Potential, Support for Networks (since 2018) and Support for Impact Projects

- **≥ 10%** of the programme budget → normative research strengthening links with standardization (**~ 70M€**)

Annual call for pre- and co-normative JRPs is issued

… after EMPIR (few words)

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- European will to extend Horizon 2020
- New European Metrology Research Programme is being studied to remain under Article 185 of the Lisbon Treaty

• **June 2018**	"Horizon Europe" proposal (2021-2027)
• **June/July 2018**	Development of the EURAMET Proposal
• **Autumn 2018**	Public Consultation on FP9 (EC proposal)

Overall objectives

For EU, standardization is recognized both as a great **recovery tool for research** and an **innovation dissemination vector**

Call scope 2018

*The overall strategic aim of the pre- and co-normative JRPs is to develop **metrological methods and techniques** required for **standardization, regulation and conformity assessment.** (…) EURAMET wishes to generate benefit for European and international SDOs whilst exploiting the unique capabilities of its member National Metrology Institutes and Designated Institutes.*

- Bring forward and address the standardization needs in R&D related to metrology
- **Serve/answer the needs** of European and International **Standards Developing Organisations** (SDO) CEN, CENELEC, ETSI, ISO, IEC, ITU in any area
- Develop research activities **to contribute to the current standardisation work programme** but also to **new topics** to feed any future standardisation work

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Cooperation agreement between CEN/CENELEC and EURAMET renewed for 5 years (Sept. 2015) with a target of strengthened cooperation in the frame of Horizon 2020

→ **STAIR EMPIR platform**

STAIR = **STA**ndardization, **I**nnovation and **R**esearch

- A joint strategic working group that provides support to integrate standardization in research and innovation projects
- Created in July 2014 by **CEN-CENELEC (STAIR)** and **EURAMET (EMPIR)**
- Established to facilitate dialogue between the community of R&D in metrology in Europe and members of CEN-CENELEC

STAIR EMPIR invite CEN and CENELEC TCs to submit their priority standardization needs every year for pre-normative metrology research.

Input from CEN and CENELEC TCs to EMPIR

- Exchanges between CEN and CENELEC TCs/WG and **NMI involved in standardization** are the best option to undertake a project
- CEN and CENELEC TCs/WG can circulate their measurements needs, to STAIR EMPIR by **filling in the Response Form:** EURAMET will put them in touch with researchers for further exchanges to prepare normative projects for the next year

STAIR EMPIR

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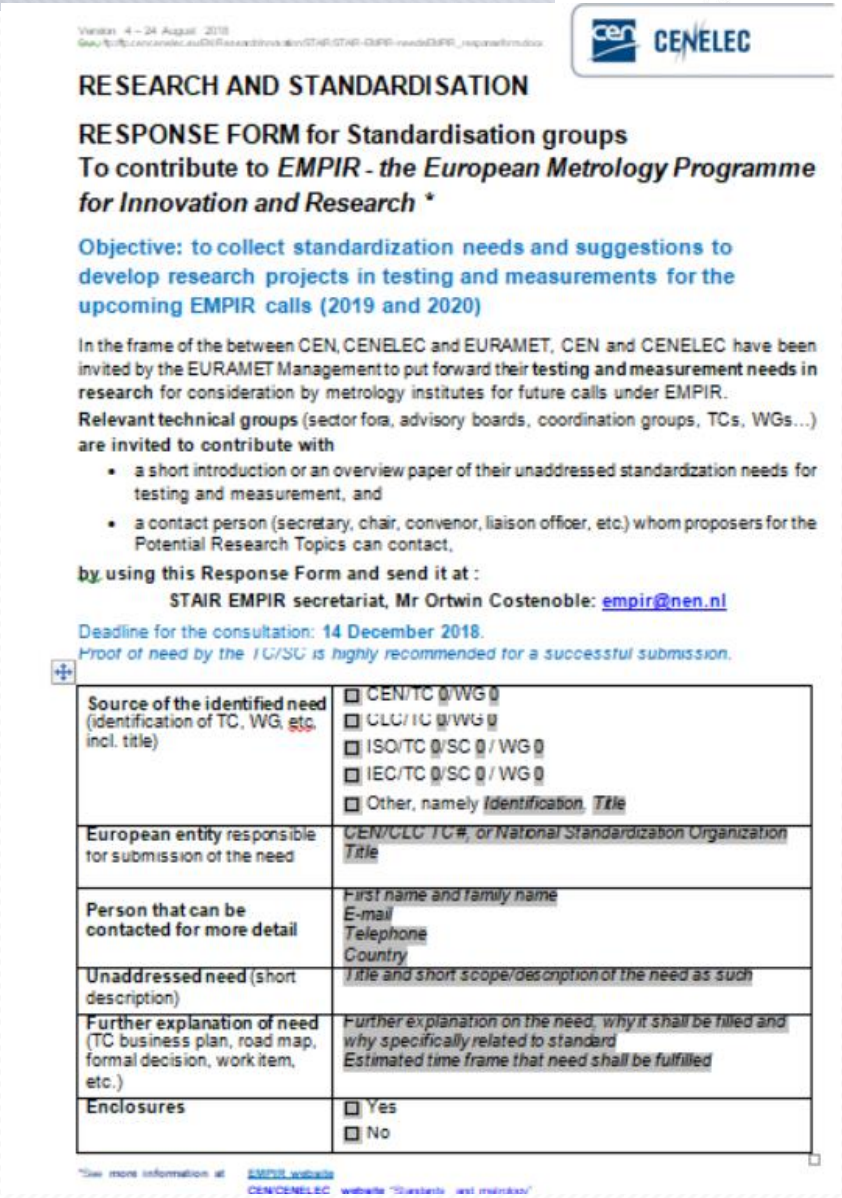
Response form available on CEN-CENELEC Website

EMPIR CALLS	Normative funded Projects	Number of needs submitted from CEN/CENELEC and SDOs
2014	0	
2015	4	21
2016	8	15
2017	5	25
2018	End of 2018	10



CENELEC

RESEARCH AND STANDARDISATION

RESPONSE FORM for Standardisation groups
To contribute to *EMPIR - the European Metrology Programme for Innovation and Research* *

Objective: to collect standardization needs and suggestions to develop research projects in testing and measurements for the upcoming EMPIR calls (2019 and 2020)

In the frame of the between CEN, CENELEC and EURAMET, CEN and CENELEC have been invited by the EURAMET Management to put forward their **testing and measurement needs in research** for consideration by metrology institutes for future calls under EMPIR.

Relevant technical groups (sector fora, advisory boards, coordination groups, TCs, WGs…) **are invited to contribute with**

- a short introduction or an overview paper of their unaddressed standardization needs for testing and measurement, and
- a contact person (secretary, chair, convenor, liaison officer, etc.) whom proposers for the Potential Research Topics can contact,

by using this Response Form and send it at :

STAIR EMPIR secretariat, Mr Ortwin Costenoble: empir@nen.nl

Deadline for the consultation: **14 December 2018.**

Proof of need by the TC/SC is highly recommended for a successful submission.

Source of the identified need (identification of TC, WG, etc. incl. title)	☐ CEN/TC 0/WG 0 ☐ CLC/TC 0/WG 0 ☐ ISO/TC 0/SC 0 / WG 0 ☐ IEC/TC 0/SC 0 / WG 0 ☐ Other, namely *Identification, Title*
European entity responsible for submission of the need	*CEN/CLC TC#, or National Standardization Organization Title*
Person that can be contacted for more detail	*First name and family name* *E-mail* *Telephone* *Country*
Unaddressed need (short description)	*Title and short scope/description of the need as such*
Further explanation of need (TC business plan, road map, formal decision, work item, etc.)	*Further explanation on the need, why it shall be filled and why specifically related to standard* *Estimated time frame that need shall be fulfilled*
Enclosures	☐ Yes ☐ No

https://www.cencenelec.eu/research/metrology/Pages/default.aspx

Early stages of the *HYDROGEN* Project

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State of the art / Needs ... in 2015

- Horizon 2020 Research and Innovation programme encourages the decarbonisation of the transport sector in order to reduce the green-house gases effect (Eur. Dir. **2014/94/EU**)
- The **MAWP** of the **FCH-JU** pointed out the expected hydrogen activities *"no simple methodology nor single instrumentation is available for low cost qualifications of hydrogen fuel. Today, the lack of harmonized RCS and PNR is a major barrier for the commercialization of FCH products"*
- A **NWIP** has been submitted in July 2015 for voting to merge the **ISO 14687** standards family and to create a new working group within ISO/TC 197 for hydrogen fuel quality (WG27)
- Newly created ISO/TC197/**WG 25** "Hydrogen absorbed in reversible metal hydride": kick-off meeting on July 2015 aimed at improving the normative framework related to **ISO 16111**
- Liaison with CEN TC 268

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1st JRP granted on hydrogen topic of the EMPIR Programme

Metrology for sustainable hydrogen energy applications

- 2016- 2019
- Coordination: LNE
- All the partners involved in standardization work at national or international level

10 partners: 5 NMI + 5 companies and research centres

Advisory board: 12 stakeholders

Two collaborators:

Project outputs towards…

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… Standardisation

- Input to **ISO/TC 197** "Hydrogen Technologies", **CEN/TC 268/WG 5** "Specific hydrogen technologies applications".
- In-progress work presentations at national mirror committees
- Mandatory reporting documents to ISO/TC 197

… Metrology

- **Traceable impurity measurements** of hydrogen samples from SMR, electrolysis and chlor-alkali plants
- **Validated analytical methods** to comply with ISO 14687 in routine laboratory analyses
- **Validated method** to determine the hydrogen mass absorbed in metal hydrides

… Industries

- Production process for **hydrogen suppliers**
- Anticipation of the degradation risk for **fuel cell manufacturers**
- Improved analytical methods for **gas analyser manufacturers**
- High level of reliability of hydrogen mass stored in containers for **tank suppliers**

Metrology research studies for ISO standards input contribution

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Hydrogen purity measurements according to ISO 14687 and risk assessment for fuel cells

ISO 14687
Hydrogen fuel quality- Product specification

ISO 19880-8 (new standard)
Gaseous hydrogen - Fuelling stations -- Part 8: Fuel quality control

Validated analytical methods to fulfill ISO 14687 impurity specifications

ISO 21087 (new standard)
Gas analysis -- Analytical methods for hydrogen fuel -- Proton exchange membrane (PEM) fuel cell applications for road vehicles

Traceable methods for mass measurements of hydrogen absorbed in metal hydrides

ISO 16111
Developing transportable gas storage devices - Hydrogen absorbed in reversible metal hydride

Under the responsibility of ISO TC 197 "Hydrogen technologies"

Creating impact

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Dissemination of the project's outputs towards **the end-user community, scientific and metrology communities, standardization bodies and identified ISO TC 197 WGs**

- ✓ **Contribution to the ISO TC 197 WGs**: projects outputs, validated assessment reports sent at ISO levels for potential use of results in normative documents (Technical Report, Technical Specification, guidance report, informative annex...)
- ✓ **Supply and receive feedback from standardization committees** (at national, European and International levels) based on an uptake and exploitation plan
- ✓ **International workshop in November 2018 at Air Liquide new premises**

Here we are!

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Hydrogen

- The *Hydrogen* project was one of the four JRPs granted in 2015 of the first pre- and co- normative call
- Pioneer call within a metrology research programme
- Excellent assessment from the EMPIR board at mid-term review (January 2018)
- Energy and Normative calls in 2019
  - standardization request
  - metrology needs
  - industrial opportunities with metrology support

Contact your NMI or LNE to join and collaborate in EMPIR project proposals. Timeline from January to November 2019 (final ranking list publication of granted projects)!

Thank you

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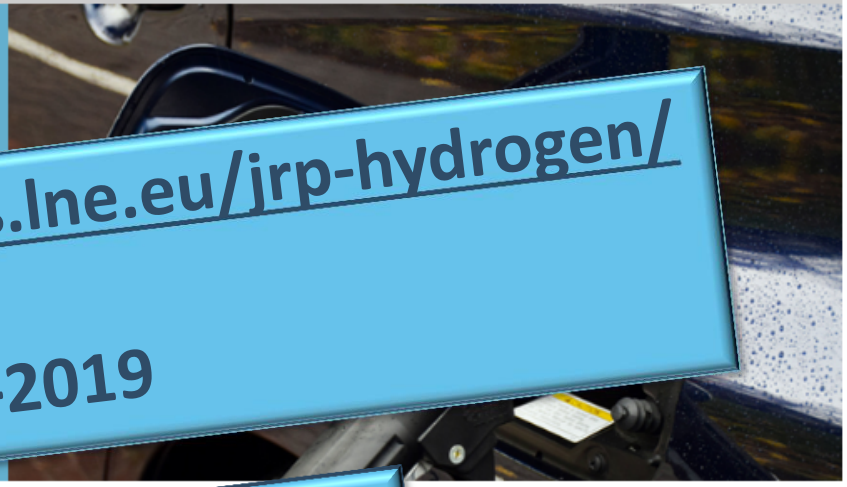
Metrology is the science of measurement

Metrology gives confidence in measurement results

To measure is to compare
To compare to make the right decisions

Hydrogen



Follow us at https://projects.lne.eu/jrp-hydrogen/

until mid-2019

frederique.haloua@lne.fr

The new European policy
sectors defined in the Ho
programme encourage t
order to reduce the green
the transport sector in
house gases effect.

The overall objective of the *Hydrogen* project is to address the standardisation needs in the hydrogen-energy sector that meet the requirements of the European Directive on the deployment
/EU in order to bring forward the st

are currently too
of hydrogen fuel and

pecification –
nd ISO
versible
s and

A workshop related t
November 2018. More info here!

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NEWS

Workshop at Air Liquide R&D Centre: November 7 & 8, 2018

Hydrogen quality: publication in International Journal of Hydrogen Energy, April 2018

Upcoming events

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