METROLOGY for HYDROGEN VEHICLES

Introduction to MetroHyVe

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24/01/2018

EMPIR EURAMET

This project has received funding from the EMPIR programme co-financed by the Participating States and from the European Union's Horizon 2020 research and innovation programme.

"Science of measurement"

European Metrology Programme for Innovation and Research

EMPIR

EURAMET

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

€20 million total EU funding
(€2 million per project)

2016	2017	2018	2019	2020	2021	2022
Health	**Energy / Environment**	**Fundamental metrology / Industry**	**Health**	**Energy / Environment**	**Fundamental metrology / Industry**	**Health**

Metrology for Hydrogen Vehicles

What are the main measurement challenges for hydrogen vehicles?

Metrology for Hydrogen Vehicles

What are the main measurement challenges for hydrogen vehicles?

CHALLENGE 1: FLOW METERING (OIML R 139-1)

Refuelling stations cannot cost their customers with required accuracies

Flow meters in the refuelling station must be accurate to 1% (OIML R 139-1)

Hydrogen supplied can vary up to 700 bar in pressure and between -40 to 85^{o}C during refuelling

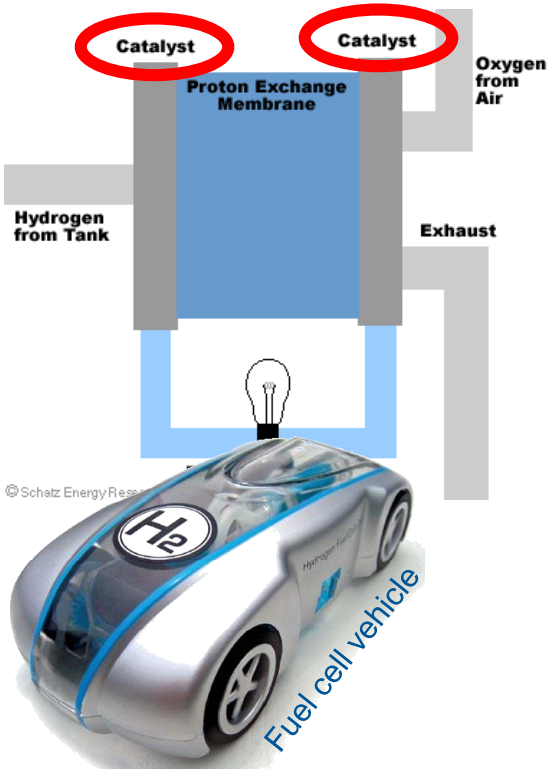
Unknown mass of hydrogen is lost during venting

Metrology for Hydrogen Vehicles

METROLOGY for HYDROGEN VEHICLES

What are the main measurement challenges for hydrogen vehicles?

CHALLENGE 2: QUALITY ASSURANCE (ISO 14687-2)



Reactive gases

•Water	(5 µmol/mol)
•Oxygen	(5 µmol/mol)
•Carbon dioxide	(2 µmol/mol)
•Total hydrocarbon compounds	(2 µmol/mol)
•Formic acid	(0.2 µmol/mol)
•Carbon monoxide	(0.1 µmol/mol)
•Ammonia	(0.1 µmol/mol)
•Total halogenated compounds	(0.05 µmol/mol)
•Formaldehyde	(0.01 µmol/mol)
•Total sulphur compounds	(0.004 µmol/mol)

Inert gases

•Helium	(300 µmol/mol)
•Nitrogen	(100 µmol/mol)
•Argon	(100 µmol/mol)

Non-gases

•Particulates	(1 mg/kg)

Metrology for Hydrogen Vehicles

METROLOGY for HYDROGEN VEHICLES

What are the main measurement challenges for hydrogen vehicles?

CHALLENGE 3: QUALITY CONTROL (ISO 19880-8)

Traceable gas reference standard

Validation of online analysers

Confidence at refuelling station

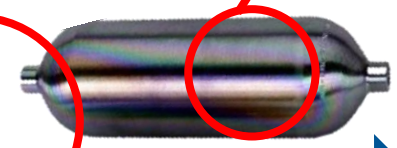
Metrology for Hydrogen Vehicles

What are the main measurement challenges for hydrogen vehicles?

CHALLENGE 4: SAMPLING (ISO 19980-1)

Hydrogen refuelling station

Selection of sampling vessel



Hydrogen sample

Hydrogen purity laboratory

Correct sampling procedure

EMPIR Energy (projects starting in 2017)

Energy ranked list			
1	16ENG01	JRP-g07	MetroHyVe
2	16ENG02	JRP-g11	PV-Enerate
3	16ENG03	JRP-g16	HyMet
4	16ENG04	JRP-g12	MyRailS
5	16ENG05	JRP-g03	Biomethane
5	16ENG06	JRP-g04	ADVENT
7	16ENG07	JRP-g18	MultiFlowMet II
8	16ENG08	JRP-g05	MICEV
9	16ENG09	JRP-g15	LNG III
10		JRP-g02	MetroLIB
11		JRP-g14	SmartLighting
12		JRP-g08	Smart Grid III
13		JRP-g13	Fuel injection
14		JRP-g01	RawGas
15		JRP-g09	NuclearSAFE
16		JRP-g06	H2NG
17		JRP-g17	FutureGrid2

Formula for success

Clear identification of challenges

+

Highly capable partners

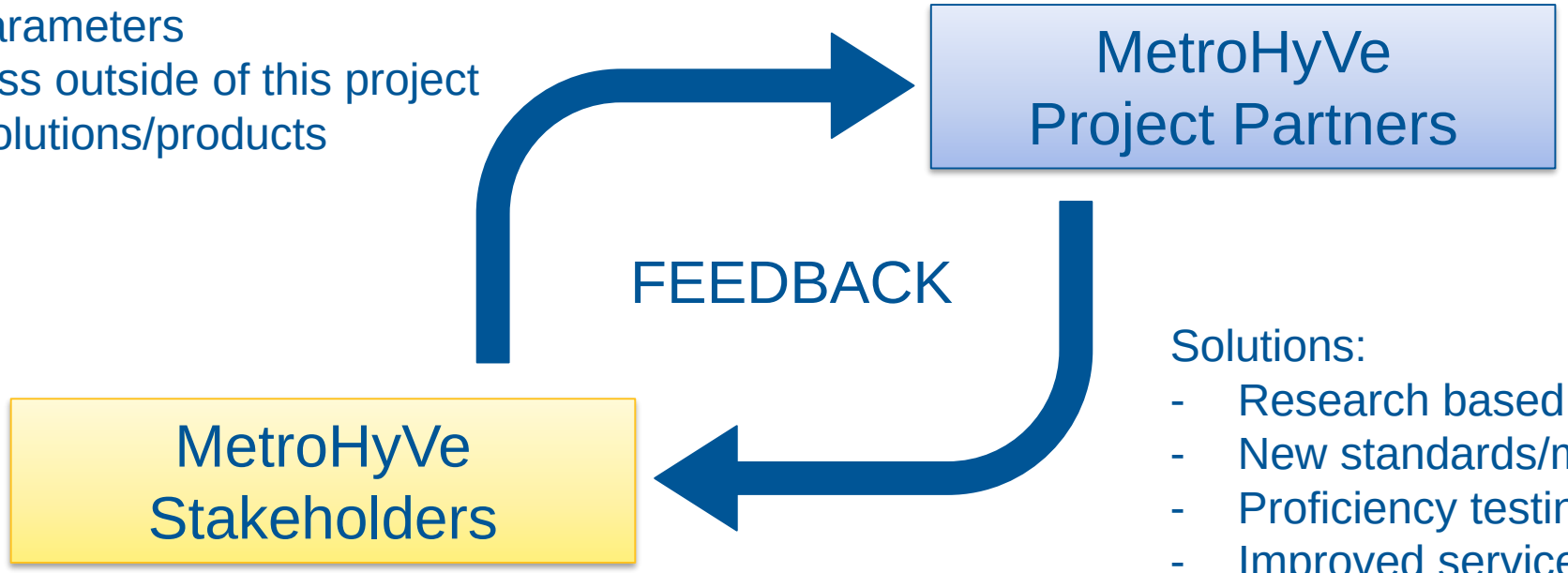
+

Support from stakeholders
(over 50 letters of support in total…)

THANK YOU!

MetroHyVe Stakeholder Advisory Board

Advice:
- Changes in needs/requirements
- New standards/legislation
- Test parameters
- Progress outside of this project
- Your solutions/products



Solutions:
- Research based on what you need
- New standards/methods
- Proficiency testing/validation
- Improved services/facilities
- Good practice guides
- Standardisation

OR evidence for MetroHyVe Part 2…

Todays agenda

09:00	Registration
09:30	Welcome to NEN / house rules *Harold Pauwels (NEN) / Business unit manager NEN standards*
09:45	Introduction to MetroHyVe *Arul Murugan (NPL) / MetroHyVe Project coordinator*
10:00	Introduction to Hydrogen Vehicles *Speaker, Vincent Mattelaer (Toyota Europe)*
10:30	Coffee break
10:45	WP 1 ‘Flow metering’ *Marc de Huu (METAS), WP 1 leader*
11:30	WP 2 ‘Quality assurance’ *Thomas Bacquart (NPL), WP 2 leader*
12:15	Lunch
13:15	WP 3 ‘Quality control’ *Janneke van Wijk (VSL), WP 3 leader*
14:00	WP 4 ‘Sampling’ *Oliver Büker (RISE), WP 4 leader*
14:45	Coffee break
15:00	WP 5 ‘Creating impact’ *Indra te Ronde (NEN), WP 5 leader*
15:15	Panel Q&A / Wrap up *Arul Murugan (NPL)*
16:00	Drinks