HyCoRA
Hydrogen Contaminant Risk Assessment

Jaana Viitakangas

http://hycora.eu/
jaana.viitakangas@vtt.fi

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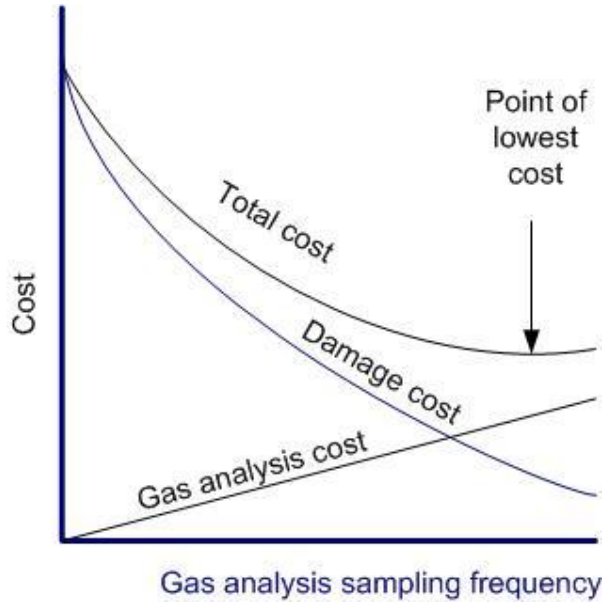
PROJECT OVERVIEW

Project Information	
Call topic	SP1-JTI-FCH.2013.1.5
Grant agreement number	621223
Application area (FP7) or Pillar (Horizon 2020)	Transport and refuelling infrastructure (FP7)
Start date	01/04/2014
End date	31/03/2017 + 3 months extension expected
Total budget (€)	3 906 912
FCH JU contribution (€)	2 159 024
Other contribution (€, source)	137 000 (from Research Council of Norway)
Stage of implementation	86% project months elapsed vs total project duration, at date of November 1, 2016
Partners	VTT, CEA, JRC, Protea Ltd, SINTEF, Powercell Sweden AB

PROJECT SUMMARY

The overall objective is to reduce cost of hydrogen fuel quality assurance (QA) for hydrogen refuelling stations (HRSs).

It will also provide recommendations for revision of existing ISO 14687-2:2012 standard for hydrogen fuel in automotive applications.



PROJECT PROGRESS – HCHO results

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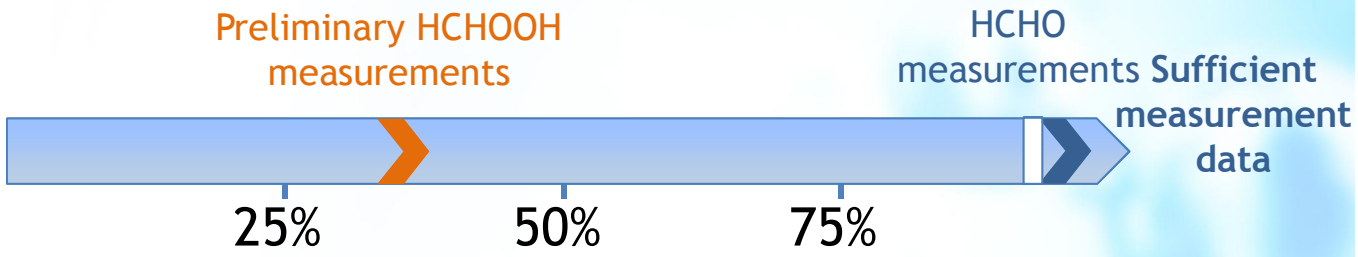
Achievement to-date

% stage of implement.

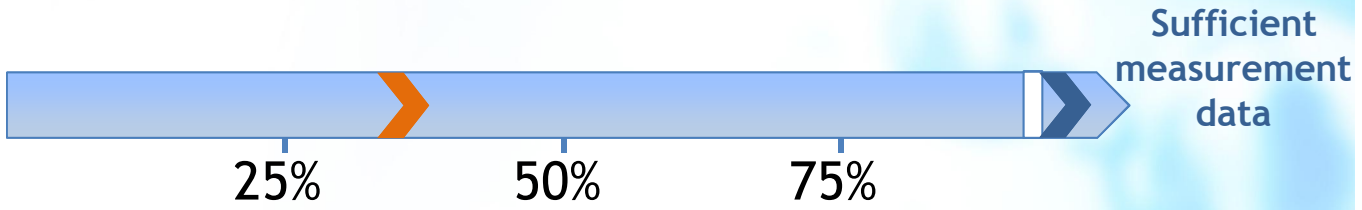


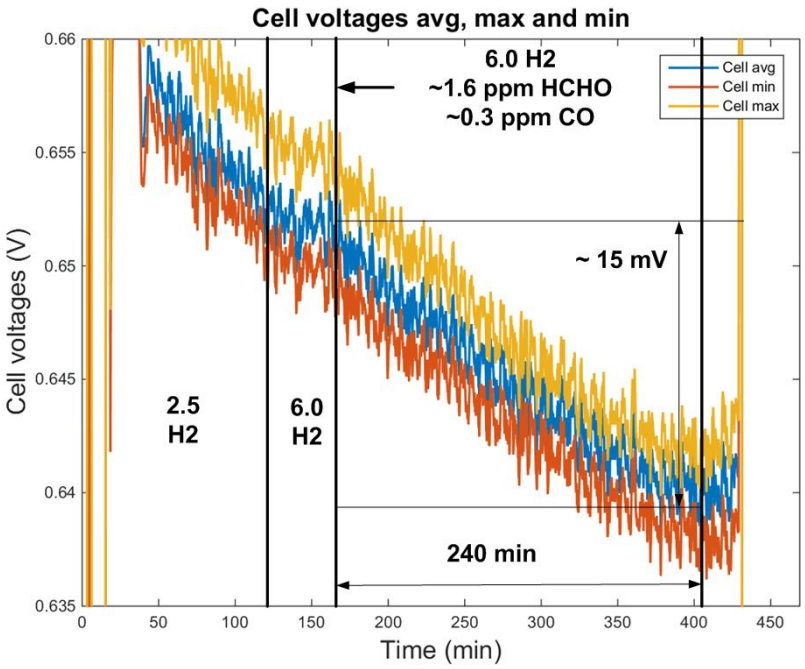
Aspect addressed	Parameter (KPI)	Unit	SoA 2016	FCH JU Targets		
				Call topic	2017	2020
Impurity limits of hydrogen fuel for PEMFCs	HCHO data for standard revision	-	Insufficient data	Recommendations for revision of existing (draft) ISO standard		Revision of max allowable impurity levels and participation in standards development
	HCOOH data for standard revision					

Future steps:

Publication of HCHO measurement data, continued study of the decomposition products of HCHO, measurements of HCOOH in H2

PROJECT PROGRESS – HCHO results





Two runs (4 and 3 hours) @ 0.6 Acm^{-2}, with fuel utilisation of 99.5-99.6% (contaminant enrichment factor of 200-250)

A very small (~ 10 mV) average voltage drop in 4 hours due to HCHO

- In CO reference poisonings 1.86 ppm led to 50 mV average voltage drop in 67-71 min

→ The effect of HCHO is noticed to be smaller than the effect of CO

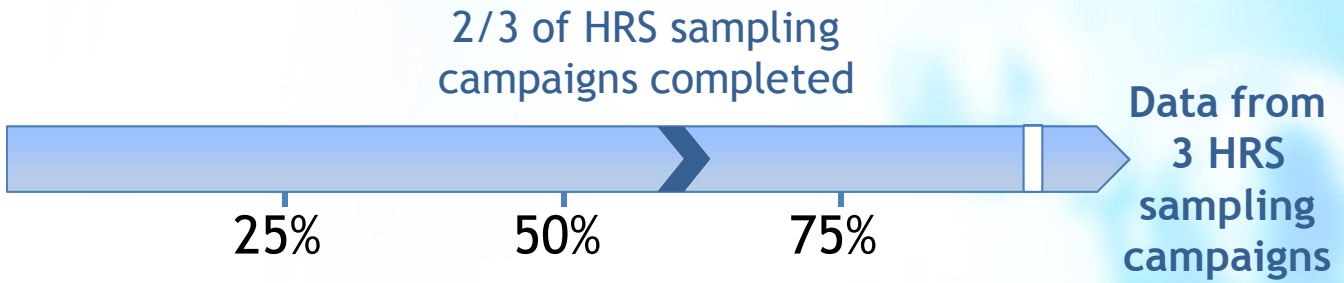
Current limit for HCHO (ISO 14687-2:2012) is 0.01 ppm

PROJECT PROGRESS – HRS sampling

HyCoRA

Achievement to-date

% stage of implement.

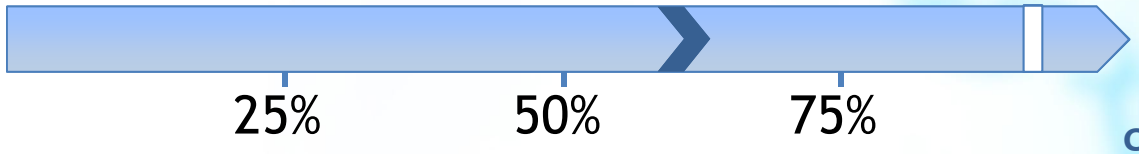


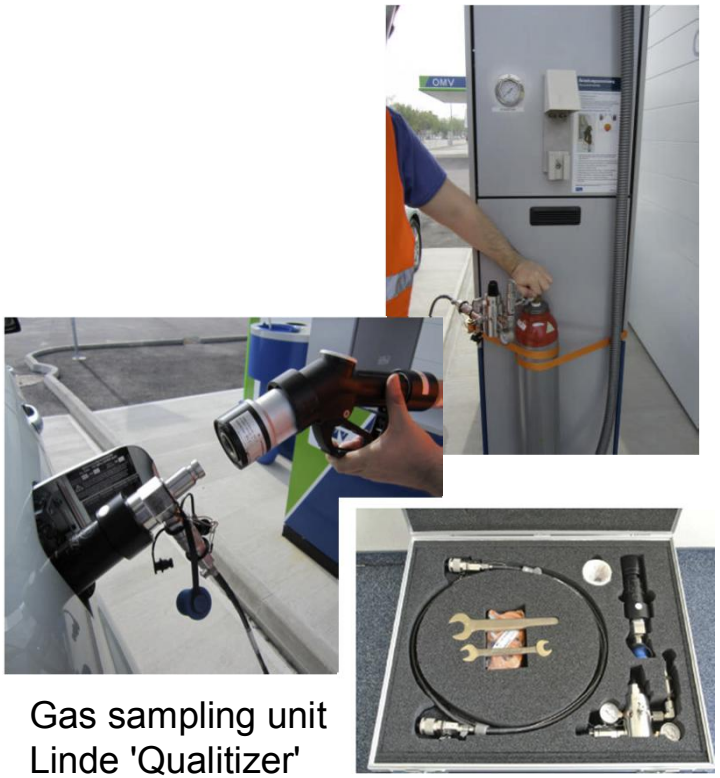
Aspect addressed	Parameter (KPI)	Unit	SoA 2016	FCH JU Targets		
				Call topic	2017	2020
Fuel quality variation at HRSs	Technical data	-		Technical data for (fuel compositions and) impurity concentrations at HRS nozzle		

Future steps:

The third measurement campaign will be performed early spring 2017.
The evaluation of analytical methods will be completed.
The development of new analytical methods will be completed.
New pre-concentration devices will be evaluated.

PROJECT PROGRESS – HRS sampling





Gas sampling unit
Linde 'Qualitizer'

Particulate sampler
HYDAC PSA-70

- 2nd campaign: newly commissioned HRS
- 1st campaign: impact of feedstock on fuel quality
- Hydrogen fuel quality generally good
  - Impurities does not correlate with H_2 feedstock
  - No correlation between commissioning date and fuel quality found

PROJECT PROGRESS - Risk model

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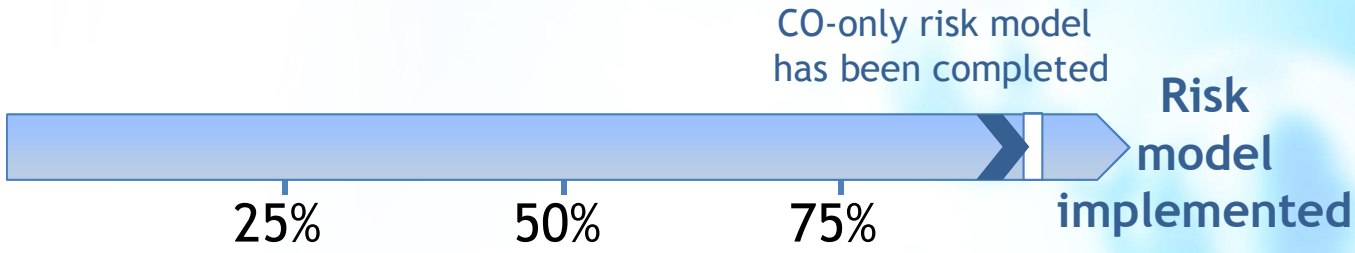
Achievement to-date

% stage of implement.



Aspect addressed	Parameter (KPI)	Unit	SoA 2016	FCH JU Targets		
				Call topic	2017	2020
Quantitative risk assessment	Implementation of the risk model	-		Determination the need for gas quality		

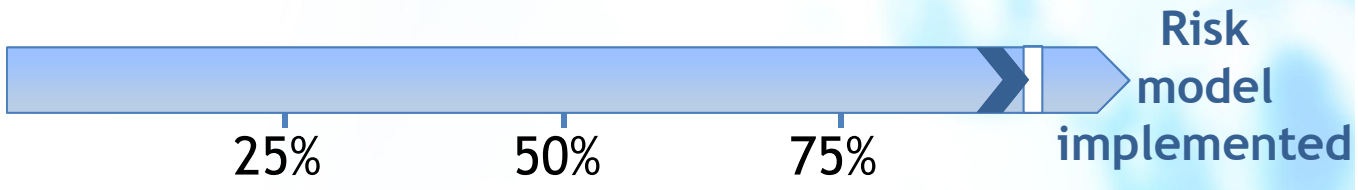
Future steps:

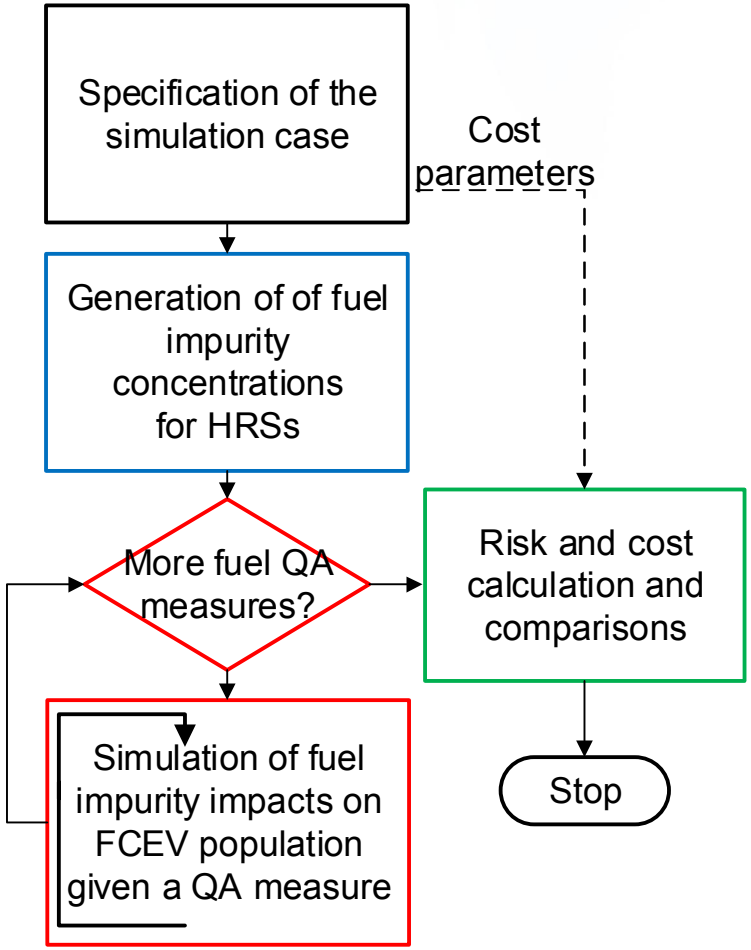
Quantitative risk model will include irreversible contaminants, especially sulphur

The parameters in the quantitative model will be improved

Publication of risk model

PROJECT PROGRESS – Risk model





Risk model:

assessing the impacts of hydrogen fuel quality control measures

on the risk of degraded FC vehicle performance caused by contaminants in the fuel, and fuel costs

SYNERGIES WITH OTHER PROJECTS AND PROGRAMMES

Interactions with projects funded under EU programmes	
Stack-Test	Stack-testing methodologies were developed. From HyCoRA, input was given concerning dead-end and recirculation measurements.
HyQ	WP1, WP2 in HyCoRA project are partially based on the developments in pervious HyQ project.
PEMBeyond	Sharing part of PEMFC stack characterization data between projects. Powercell Sweden Ab is a partner in both projects, and same type of PEMFC stacks, but with different membrane-electrode assemblies (MEA), are used. Part of the characterization data (e.g. pressure losses) are applicable in both projects.
Interactions with national and international-level projects and initiatives	
ISO WG	(*Latests/coming next*:)TC197 ISO meetings in Munich; results from HyCoRA WP1 was presented by SINTEF as input to the discussion on tolerance limits for HCHO and HCOOH in the revision of the ISO 14687 standard. JRC will organize the ISO TC197. For the upcoming meeting of WG27, SINTEF has been asked to provide information from HyCoRA.
LANL	Collaboration efforts with VTT and JRC on the impacts of contaminants on H2 fuel quality were regarded valuable

DISSEMINATION ACTIVITIES

Public deliverables

- D1.1 Review on the impact of impurities on PEMFC and analytical methods for hydrogen QA
- D1.2 Report on reference measurements and test protocols
- D2.3 Intermediate report on the performance of existing and new hydrogen purity analysis methods
- D3.1 Hydrogen sampling unit tested and certified
- D3.2 Measurement of hydrogen quality variation at various HRS with different fuel feedstock

Conferences/Workshops

- **1 conference**, Materials Challenges for Fuel Cells and Hydrogen Technologies 2016 (HyCoRA one of the organizers), and **2 OEM workshops organised**
- **6 conferences/workshops participated** (in which HyCoRA project results were presented); FCH Nordic 2016, 4th IW HI&T, 3th IW HI&T, EFCF 2015, EFCD 2015 workshop, IW PEMFC stack and stack component testing
- In addition; active liaison with the standards drafting organizations (ISO TC 197)

Social media

Publications: 0 to date (multiple drafts)

Patents: 0

Thank You!

Jaana.Viitakangas@vtt.fi