



## Work package 3 - Analysis

Eva Ravn Nielsen and Jonathan Hallinder  
FCH Test Center  
DTU Energy Conversion

Till Bachmann, EIFER  
Lisa Ruf, Element Energy  
Massimo Santarelli, Politecnico di Torino  
Alessandro Graizzaro, Environment Park



London, 23-24 September 2013  
Second Project Meeting



#	Work task
3.1	Field support arrangements
3.2	Non-economic barrier analysis
3.3	<b>Total Cost of Ownership</b>
3.4	<b>Environmental Life Cycle Assessment</b>
3.5	<b>Regulation, Codes and Standards working group</b>
3.6	Utility working group

## Objective

- Review previous project on vocational training.
- Define best practice.

## Progress to September 2013

- Seminar - February 2013
- Deliverable 3.1.1: Field support report - May 2013

## Tasks and deliverable to June 2014

- Continuously compare the suppliers operating modes to highlight best practices...
- *Seminar in Month 24 (September 2014)*

**THEME [SP1-JTI-FCH.2011.3.7]**  
**[Field demonstration of small stationary fuel cell  
systems for residential and commercial applications]**



Deliverable 3.1 Field support reports  
Report submission date: 25/02/2013  
Work task leader: Envipark  
Status: ED

(D-Draft, FD-Final Draft, F-Final)

Dissemination level: PU

(PU – Public, PP – Restricted to other programme participants, RE –  
Restricted to a group specified by the consortium, CO – Confidential)

### Objective

Identify **key barriers to mass uptake** of the technology.  
Technical, political and consumer perception barriers.  
Performance, supply chain, issues to be addressed in policy.

### Progress to September 2013

- End-user questionnaire
- Installer questionnaire
- Coordination

### Upcoming Important Actions

- Translation and launching questionnaires - 1st week of Oct.
- **"Confidentiality policy" towards end-users**
- *Coordination with other tasks*

## **End-user questionnaire**

<https://response.questback.com/energysavingtrust/mnzv3ememl/>

## **Installer questionnaire**

<https://response.questback.com/energysavingtrust/0r8ledq8x6/>

## Objective

Economic comparison of FC-mCHP with other low carbon technologies

## Progress to September 2013

Specification of data requirements for the analysis

- **Supplier data:** Capital cost, installation and maintenance costs, lifetime (hrs, max on/off cycles)
- **Field data:** Gas, heat, electricity out and import/export fraction
- **Household data:** Number of occupants, size, climate etc.
- **External data:** Electricity & gas cost as  $f(t)$ , tariffs and incentives applied

Coordination with Task 3.4 (LCA) to ensure consistency

## Tasks and deliverable to June 2014

*Task starts in month 30, report due Feb 2015 and Feb 2016*

## **Aim**

- To assess **total cost of ownership** of mCHP systems across the range of member states
  - taking into account differing **house types, climatic zones and fuel prices**

## **Output**

For representative house types:

- **Predicted total cost of ownership**
- **highlighting optimum markets**

To make conclusions robust and valid requires:

- Real performance data of the mCHP systems in the field
- True demand profiles from the households, at sufficient resolution to recognise transient loads

### Objective

Life cycle environmental performance of 2 types of FC-mCHPs, also compared to conventional systems

### Progress to September 2013

Specification of data requirements for the analysis

Discussion with manufacturers to make the LCA as useful as possible:

- Analysing default FC-based  $\mu$ CHP systems with conventional systems
- Carrying out sensitivity analyses by varying factors such as climate region and household type.

Coordination with Task 3.3 (TCO) to ensure consistency

### Upcoming Important Actions

Finding consensus between manufacturers on the “default” FC systems and conventional systems to analyse.

- A proposal of system characteristics will be made and feedback is highly appreciated
- If corresponding data already exists, EIFER would be happy to receive them

Agreement in February 2014

## Objective

Describing and **comparing the environmental performance** of small decentralized heat and power generation systems

- installed for different use cases
- operated under different climatic conditions

taking a Life Cycle Assessment approach

(defining a functional unit providing the same service in terms of heat and power for all systems = meeting the same demand)

## Main question to be answered

- What is the environmental performance of mCHP fuel cells combined with back-up heating systems
  - as a function of differing climate conditions, use patterns (defined by building type, load curve, etc.)
  - as well as type of fuel cell and type of back-up heating system?
- How do these systems compare to conventional systems?

## **Benefits to manufacturers**

- Environmental profile of typical mCHP fuel cells with and without back-up system / peak load boilers
- Being able to communicate about the environmental performance of these systems compared to conventional systems under different operating conditions

## Objective

Establish a common voice on RCS addressed to standardisation bodies.

- Analyse legislation, codes, permits and standards, including application procedures, construction and planning permits
- Support the development of standards and quality management in sales, design, installation and operation, in order to protect end-users and increase consumer confidence
- Support the preparation and application of legislative measures
- Prepare commitments with industry and stakeholders for the development of standards, labeling and certification systems

## Progress to September 2013

- Workshops - February 2013 and September 2013
- Working group meetings
- Questions and interviews with manufacturers
- Outline of report

## Tasks and deliverable to June 2014

Month 15: Position paper (December 2013)  
*and Month 51: Lessons learnt appendix*

## Task 3.5 – RCS Working Group

(Task leader: POLITO - Participants: CHP suppliers - Start: M1 - End: M51)

The work is divided in two different activities:

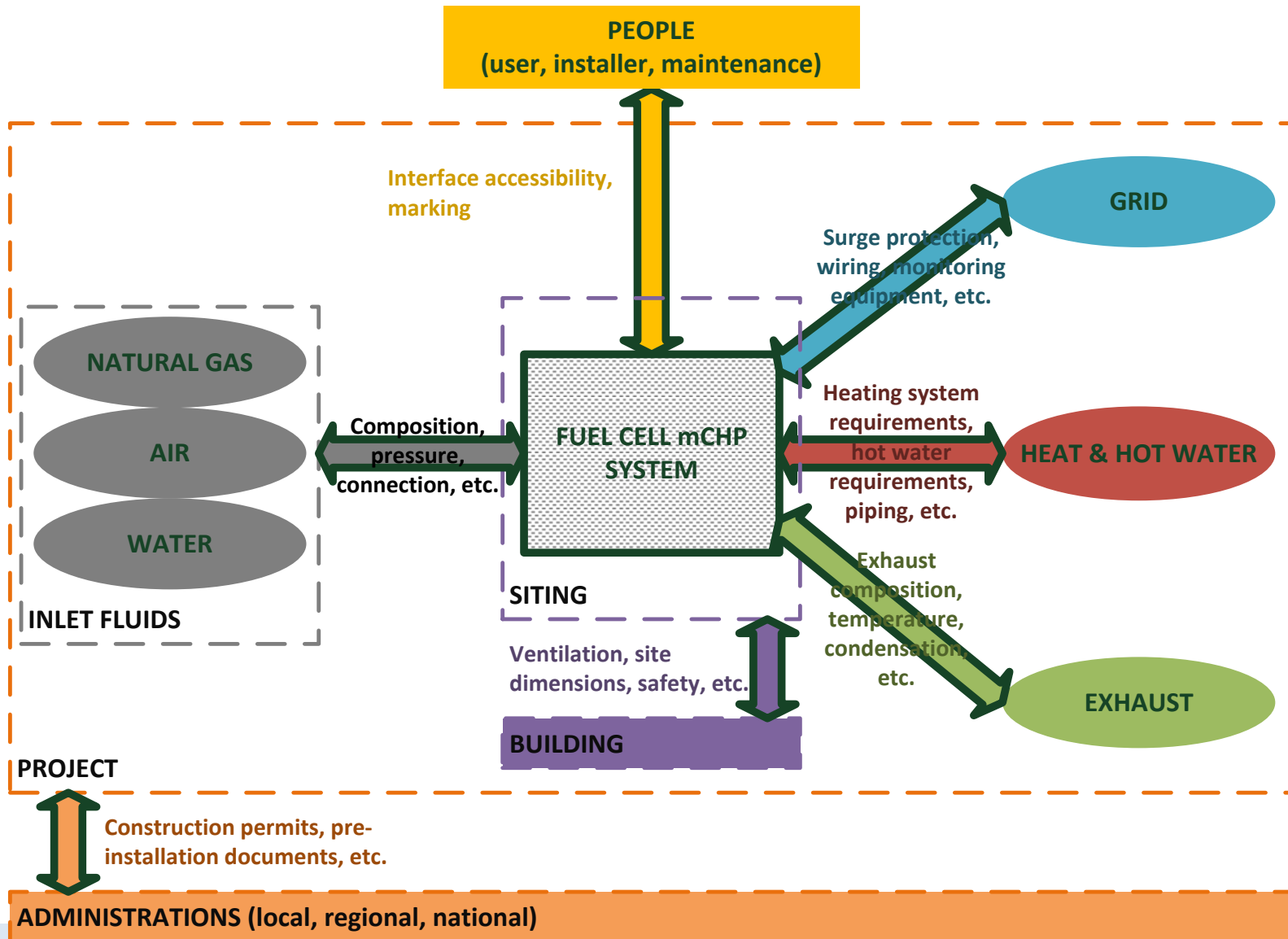
- 1) Prior to the installation of the systems (M1 - M15), a wide research in RCS applied to fuel cell micro-CHP systems will be done, with a position paper as main output.
- 2) After the installations, the activity will restart (M49 - M51)  
An appendix can be created using the gained "know how" of the micro-CHP manufacturers to further understand the RCS situation across the European Union.

**Deliverables:** Month 15 (position paper) and month 51 (lessons learnt appendix)

**Aims of the RCS working group on FC-based micro-CHP systems are:**

- to analyse legislation, codes, permits and standards, including application procedures, construction and planning permits
- to support the development of standards and quality management in sales, design, installation and operation, in order to protect end-users and increase consumer confidence
- to support the preparation and application of legislative measures
- to prepare long-term voluntary commitments with industry and other stakeholders for the

# Definition of the systems structure and boundaries (both PEMFC and SOFC)



	Reference standard(s)	Question A (choose one)			Question B (choose one)			
		Improve it	Confirm it	Remove it	Very good	Good enough	Bad	
1 Natural gas quality	EN 50465 <sup>(1)</sup>	X					X	The
2 Natural gas supply system	EN 50465 <sup>(2)(3)</sup> IEC EN 62282-3-300							The beca local inter
3 Air supply system	EN 50465 <sup>(3)</sup>	X					X	Air q outd to no
4 Hydrogen production unit	ISO 16110			X				
5 Electrical system installation	IEC EN 60335 (electrical appliances) IEC EN 60364 / HD 384 (electrical installations) EN 50438	X					X	inve right It wo chan phot
6 Islanding	IEEE 1547							Have
7 Power quality	EN 50438 IEEE 1547							
8 Electromagnetic compatibility	IEC EN 61000							
9 Energy metering	CEN/CLC/ETSI/TR 50572 IEC EN 62052 IEC EN 62053 IEC EN 62054							Up to mete
10 Thermal insulation	EN 50465 IEC EN 62282-3-100 EN 12828							
11 Hot water	EN 50465 <sup>(3)</sup> EN 12828 EN 12897 (heat storage)	X						Nati repla
12 Exhaust & environment	EN 50465 <sup>(3)</sup> IEC EN 62282-3-300						X	Envi regio

- **Introduction**
- **Previous projects**
- **Analysis of the International and European RCS for fuel cell mCHP systems status**
- **Ene.field countries RCS for fuel cell mCHP installation**
  1. Introduction
  2. Austria
  3. Belgium
  4. Denmark
  5. France
  6. Germany
  7. Ireland
  8. Italy
  9. Luxembourg
  10. Netherlands
  11. Slovenia
  12. Spain
  13. United Kingdom
- **ENEFIELD Position: installation-related RCS needs at EU level**
- **Conclusions**

### **Objective**

- Exchange lessons learnt from trials
- Assess grids connection issues
- Review smart grid capacities

### **Progress to September 2013**

- Establishment of working group
- Collect grid connection issues - requirements
- "Role of the utilities" workshop
- First preparations for position paper

### **Tasks and deliverable to June 2014**

- Position paper on grid connection Month 18 (Feb 2014)

## *Contacts:*

Eva Ravn Nielsen

[evrn@dtu.dk](mailto:evrn@dtu.dk)

Jonathan Hallinder

[jnhal@dtu.dk](mailto:jnhal@dtu.dk)

*Please copy both of us in the communication. Thanks!*