

European-wide field trials for residential fuel cell micro-CHP

ene.field★

ID 303462

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PROJECT OVERVIEW



- Call: SP1-JTI-FCH.2011.3.7
- Application area: field demonstration of small stationary fuel cell systems for residential and commercial applications
- September 2012 - September 2017
- Budget:
 - Total budget: EUR 52,487,443.06
 - FCH JU contribution: EUR 25,907,168.77
- Summary: ene.field will deploy up to 1,000 residential fuel cell micro-CHP installations, across 11 key Member States. It represents a step change in the volume of fuel cell micro-CHP (micro FC-CHP) deployment in Europe and a meaningful step towards commercialisation of the technology. The programme brings together 10 established European micro FC-CHP manufacturers into a common analysis framework to deliver trials across all of the available fuel cell CHP technologies.
- Stage of implementation: 75% duration passed

WP1 is the demonstration WP and contains all on the ground trial activities.

This WP **produces data for other work packages** and for final reports.

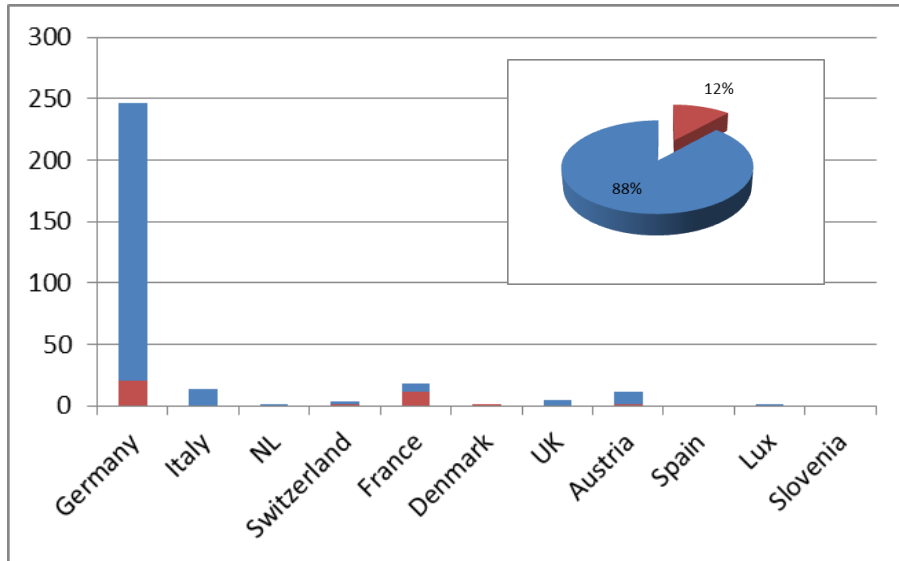
Dachs InnoGen	Cerapower FC10 Logapower FC10	PEMmCHP G5	Elcore 2400	Galileo 1000 N	Inhouse 5000+	ENGEN 2500	BLUEGEN	Vaillant G5+	Vitovalor
									
LT PEM 700W	SOFC 700W	LT PEM 2kW	HT PEM 300W	SOFC 1kW	LT PEM 5kW	SOFC 2.5kW	SOFC 2kW	SOFC 1kW	PEM 700W
Natural Gas	Natural Gas, Gas	Natural Gas + Biogas	Natural Gas	Natural gas + Biogas	Natural gas + Biogas + H2	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Floor	Floor	Floor	Wall	Floor	Floor	Floor	Floor	Wall	Floor
SenerTec	Bosch Thermotechnik	Dantherm Power	Elcore	Hexis	RBZ	Solid power	Solid power	Vaillant	Viessmann



- 100% of units installed are monitored - including 10% of all units with detailed monitoring

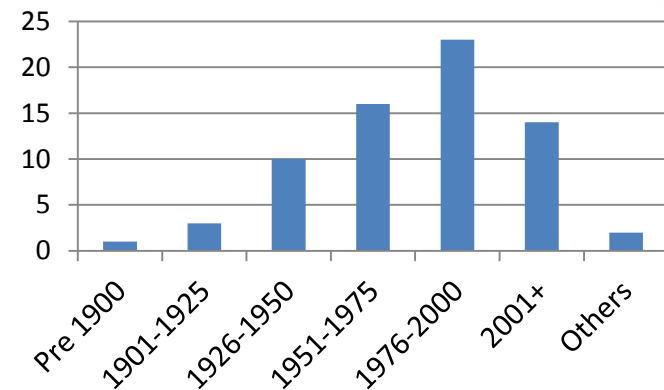
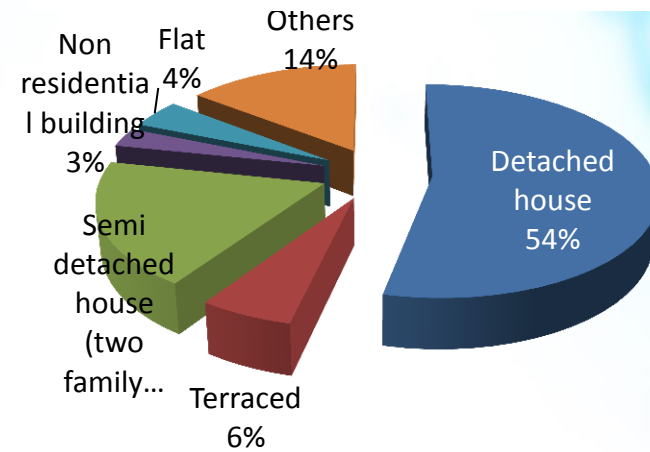
Monitoring status (detailed and standards)

No. installations



■ Detailed monitoring
■ Standard monitoring

Type of houses (first dataset)

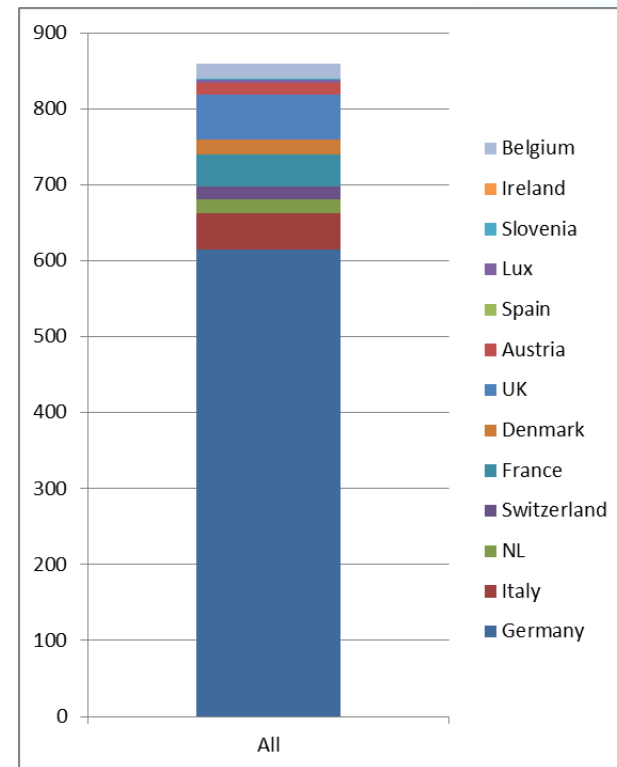
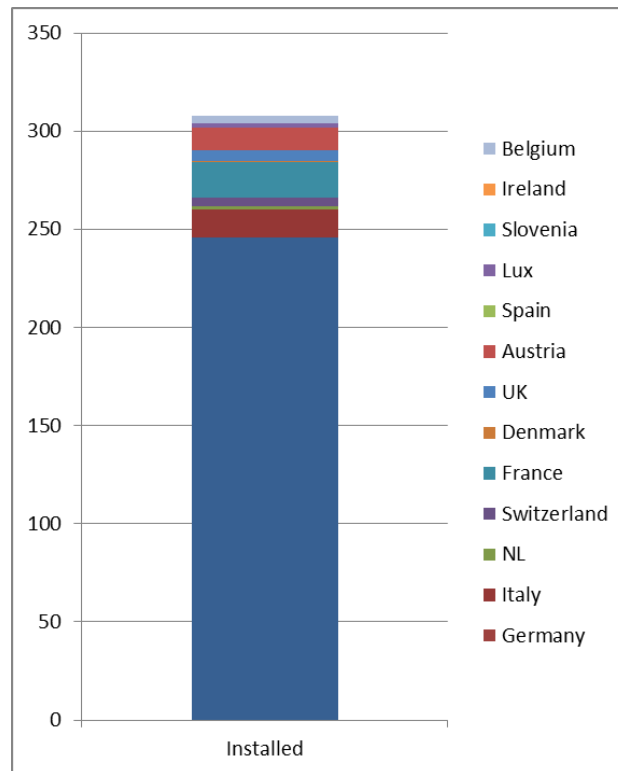


Progress to date

Deployment characteristics

- > 300 units have been installed across the 8 active field trials as of October 2015 in 8 countries: DE, UK, FR, DK, AU, CH, LUX and IT
- The bulk of the units are deployed in Germany. This trend is expected to be continued as more units are installed. This is due to the existing financial supports in place locally Today (>300 units)

Final – projected (860 units)



<p>Review of Field Support Arrangements</p>	<p>25/02/2013</p>	<p>Findings : it is essential to make a more accurate analysis of what are the specific requirements of the end users to the manufacturers</p>
<p>European Supply Chain Analysis Report</p>	<p>30/04/2014</p>	<p>Findings: the main limiting factor for the development of the supply chain is the production volume that will lead to a reduction in the final cost of the systems either by allowing more cost effective outsourcing strategies with suppliers or through increased economies of scales</p>
<p>Position Paper on Regulations Codes & Standards</p>	<p>24/01/2014</p>	<p>Findings :the main barriers blocking the FC-based microCHP technology are non-homogeneity of Codes & Standards European framework and some legislative indications from Regulation Authorities</p>
<p>Grid Connection of Fuel Cell Bases mCHP</p>	<p>09/01/2015</p>	<p>Findings : Issues often relate to the increased cost due to requirements of new electric meters, differences in the inlet gas pressure when installing in different gas networks as well as the extensive amount of forms for feed in allowance and taxes that must be performed before export to the power grid is allowed.</p>

PROJECT TARGETS AND ACHIEVEMENTS

Programme objective/target	Project objective/target	Project achievements to-date	Expected final achievement
MAIP			
Target 2015 - 1,000 units / 10,000 € per system (1kWe + household heat)	860 units by Q4 2016 (adjusted from original following partner changes and slow start.	<p>~315 units deployed October 2015</p> <p>Structural changes in the utility market impact ability to deploy and final number risk.</p> <p>Changes in manufacturer partners reduce the total number fundable through the project</p>	The project is one year behind original schedule, but deployment is closely monitored and mitigation actions taken. The project aims to have 860 units installed by Q3 2016.
AIP			
Install sufficient numbers of systems to give confidence by redundancy (>25 identical units in the range of 1-10 kWe).	30–150 identical units from each manufacturer installed in 11 EU Member States	Installations in 8 countries in Europe with 4 manufacturers having installed over 25 units	Sufficient number of units installed.

PROJECT TARGETS AND ACHIEVEMENTS

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<p>Increase the operational experience of fuel cells in Europe and provide training of personnel. Provide proof of a suitable support concept</p>	<ul style="list-style-type: none"> • 10 FC CHP products trialed in up to 1,000 demo sites. • Monitoring for up to 2-3 year period • Diverse set of installations in domestic and small commercial applications representative of the sectors in each Member State . • 10 different manufacturers to provide training on the installation and maintenance of their systems to their networks 	<ul style="list-style-type: none"> • 10 FC CHP products trialed. >300 deployments • 300 units will be monitored for 2-3 years and 50 units for 3 years (across the 8 field trials) • Diverse set of installations 54% in detached houses • Frist data reporting July 2015. • Installers training and maintenance process, for all active field trials. • Review of Field Support published 2013 • Manufacturers workshop on lessons learned in installation (09/2015) 	<ul style="list-style-type: none"> • 10 FC CHP products trialed in up to 860 demo sites. • Monitoring for up to 2-3 year period on 35%of units and 1-2 years on 45% . Diverse installations representative of the sectors in each Member State . • 10 different manufacturers with trained installation workforces in Europe
<p>Provide proof of a suitable supply chain and increase capability including scaling up European manufacturing capacities</p>	<p>Significant volumes of units will optimise series production techniques and establish stable supply chains with component manufacturers, to allow the scale-up required for commercial deployment.</p>	<ul style="list-style-type: none"> • Consolidation of the sector has strengthened the position of key suppliers. • Collaborative partnerships with Asian partners to benefit from cost reductions realized via the Asian markets. • European FC mCHP suppliers are collaborating with European and worldwide component suppliers. 	<ul style="list-style-type: none"> • 10 manufacturers with scaled-up production • New supplier links established • Initial step in cost reduction achieved but further volume growth required.

PROJECT TARGETS AND ACHIEVEMENTS

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<p>Show commitment to running the systems after the end of the support phase</p>	<ul style="list-style-type: none"> The systems will be installed in customers' homes, as a permanent replacement / supplement to their current heating system. It is the intention to leave the units in the homes beyond the end of the ene.field project and to continue to periodically report on the data. 	<ul style="list-style-type: none"> Customer interest in installation continues. 70% positive feedback . All manufacturers continue to install with the intention of life for the product beyond the end of the field trials. Some units will run for 4 years as of date 	<ul style="list-style-type: none"> Consolidated customer commitment Sustained long-term installation
<ul style="list-style-type: none"> Estimate full life cycle costs and revise periodically Carry out an environmental sustainability assessment 	<p>A full life cycle cost (LCC) and life cycle environmental assessment (LCA) will be delivered.</p>	<p>The work for the LCC and LCA study is at an advanced stage. The LCA study is under review for delivery Date?</p>	<ul style="list-style-type: none"> LCC and LCA reports disseminated.
<p>Understand the benefits and risks of smart grid integration</p>	<p>Utility Working group, chaired by an independent research organisation, will provide position papers on the potential role of micro-CHP in future grid systems</p>	<p>Utility working group established. First position paper on grid connection published September 2014. Position paper on smart-grids published in November 2015.</p>	<ul style="list-style-type: none"> Reports on grid connection and smart grids available Reports contents taken un in wider smart grids stakeholder group.

PROJECT TARGETS AND ACHIEVEMENTS

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Efficiency minimum of 35% (electrical) and overall efficiency >85% (LHV)	All products in the trial will meet and exceed 35% electrical efficiency and 85% overall efficiency.	Lab tests ongoing.	Efficiency threshold reached
Progress towards economic lifetime target of 8-10 years	All systems are expected achieve a lifetime greater than 10,000 hours without stack replacement, with the majority of units expected to achieve >20,000 hours	Lab tests ongoing.	Large data to be presented on unit lifetime
<ul style="list-style-type: none"> • Cost below €20,000 per unit • Identification of minimum performance for acceptable initial proposition. • Cost reduction towards targets in the MAIP including 2015 target cost of € 4,000-5,000/kW for CHP of < 100kW 	<ul style="list-style-type: none"> • Minimum performance and cost criteria will be established as part of the analyses. • Demonstrate pathways for driving down costs to the required economic thresholds for entry (in the case of residential mCHP estimated at <€10 000/kW). 	Study ongoing. It will include commentary from all consortium partners.	High quality report disseminated.

PROJECT TARGETS AND ACHIEVEMENTS

- **An unprecedented scale for FC mCHP:** includes all of Europe's major fuel cell micro-CHP manufacturers.
 - Majority of manufacturers have installed a significant amount of units in different countries
 - Additional partners recruited 2015
 - New business models and channels to market emerging
- **Achieve meaningful research advances** for FC mCHP.
 - Review of Field support arrangements(2013); European Supply chain analysis(2014); Regulations Codes and standards(2014); Grid Connection of Fuel Cell Based mCHP (2015)
- **Establish commercial prospect** and develop supply chains and support networks.
 - Training of new installer channels/ routes to customers (4 manufacturers)
 - Component and process innovation for cost reduction underway.
 - Linking to market through Hannover Fair and wider trade show presence
- **Increase support by and provide advice for policy makers.**
 - Regulations Codes and Standards report used by industry stakeholders
 - Dialogue with DG RES and DG ENER established
 - Participation of ene.field in EUSEW 2014,2015

RISKS AND MITIGATION

- Risk to deployment of 860 units by Q3 2016
 - Reallocation of units between partners
 - Introduction of new partners
 - Close monitoring monthly installations
 - Requirement for manufacturers to focus on detailed monitoring in 2015.
- Slow emergence of data delays analysis
 - Updated Data Handling Agreement (Q4, 2015)
 - Detailed exchanges between Work package leaders to verify requirements
- Need to adjust project profile, currently too low.
 - New communications taskforce
 - Communications refocused on market communications

SYNERGIES WITH OTHER PROJECTS AND INITIATIVES

- Links with funding opportunities at the national and regional levels in Germany, Italy and the Netherlands.
- Contacts with Callux, IBZ and enefarm (Japan) maintained.
- Communications workshop with IBZ on outreach for ene.field
- Roland Berger study work on stationary fuel cell market being disseminated and supported by project and partners.

HORIZONTAL ACTIVITIES

- Training and education
 - 10 different manufacturers training on basic installation and maintenance of the system with their own field support systems and delivery partners.
 - Two seminars/workshops D3.1.1 State of the art document for start of trials (2013) D3.1.2 Review of the lessons learned on training and qualification during ene.field(2015). An additional update of the field support report will be available M40.
- Safety, regulations, codes and standards
 - Ene.field report on Regulations, Codes and Standards report 2014.
 - Inputs and collaboration with standardisation work conducted by the VDMA in Germany through the German manufacturers involved in the project and in Brussels through COGEN Europe.
- Public awareness
 - Diversity of “routes-to-market” brings a level of public dissemination.
 - WP4 dissemination is reshaping Sept-Dec 2015 to better target market and policy maker groups. (website, www.enefield.eu; newsflashes, press releases on first installs and publications).
 - Participating in myCHP campaign of COGEN Europe

DISSEMINATION ACTIVITIES

REGIONAL WORKSHOPS	PROJECT PRESENTATIONS	PUBLICATIONS/general
<p>3 regional workshop with the attendance of local energy companies, agencies, utilities, DSOs, grid operators and other relevant stakeholders were organized in:</p> <ul style="list-style-type: none"> • Will continue in a more targeted format to national policy makers 2015-2017 	<ul style="list-style-type: none"> • Ene.field project meeting 9-10 September 2015, Brussels • EUSEW – 15-19 June 2015, Brussels • COGEN Europe Annual Conference – 19-20 May 2015, Brussels • Hannover Fair, April 2015 • 7 th Citizens' Energy Forum Conclusions London, 12-13 March 2015 • Ene.field seminar, Brussels, 25 February 2015 	<ul style="list-style-type: none"> • FiB (Research in Bioenergy, Hydrogen and Fuel Cells) – EU tester 1.000 mikrokraftvarmeanlæg – halvdelen med SOFC-celler (March 2015) • L'Installateur – Quand la pile à combustible deviant réalité (April 2015) • Data delivered to JU FCH data base • 12 press releases • Website updates • Developing myCHP application

EXPLOITATION PLAN/EXPECTED IMPACT

- Ene.field partners committing future funding to further develop the FC mCHP market, and embark on next stage of cost reduction for wider **commercial introduction**.
- Ene.field partners will use the technical results through industry associations and national industry channels to **influence decision makers** to create a supportive regime for micro-CHP commercialisation within the energy and climate policy of the member state.
- Researchers will benefit from the **databases** developed in the study and use and reference the findings in their wider work.

Established tools

- Website – www.enefield.eu
- Newsletters & press releases
- Engagement plan & Information Packs
- Regional Workshops

Upcoming events

- November CEO event
- myCHP campaign
- February Project Meeting
- Hannover Fair

Next steps

- Communications Taskforce
- New Data Handling Agreement

THANK YOU

Coming soon in 2016...

- LCA analysis
- First results from users and installers questionnaires