

# Fuel cells and hydrogen

## Joint undertaking

### FITUP

### (Grant Agreement 256766 )

**Fuel cell field test demonstration of economic and environmental viability for portable generators, backup and UPS power system applications**



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<http://www.fch-ju.eu/>

# 0. Project & Partnership description

**Starting Date:** 01/11/2010

**Duration:** 36 months

**Budget:** € 5.413.907

**Funding:** € 2.475.825

**Partners:** 10 consortium partners +  
1 additional final user

**Countries:** Italy, Switzerland, Turkey,  
Germany, Netherland, Austria

➤ FITUP will demonstrate the technical  
viability and economic maturity of backup  
power systems based on fuel cell  
technology

➤ 13 market ready systems from two  
suppliers are installed in selected sites  
across Europe for field trials and 6 systems  
are in testing in R&D centres for  
benchmarking

## UPS-Producers



## R&D Centres



## End Users



## Certification



# 1. Project achievements

- Technology will be demonstrated in various ambient conditions in real-life telecommunication applications while the data will be collected and analyzed.
- Technical objectives:
  - Reliability of greater than 95%
  - Durability of more than 1500 hours
  - More than 1000 cycles
- Uniform procedures for certification in selected EU countries, installation and testing of fuel cell backup power systems will be developed.
- Project will increase the visibility of fuel cells as a potential alternative to conventional backup power sources (batteries and diesel generators) and prove to potential telecommunication customers in real conditions their advantages.
- Lesson learned from project on installation and operation of fuel cell based UPS systems to avoid obstacles or hurdles for up-coming projects.

# 1. Project achievements

- ✓ Manufacturing and installation of 19 fuel cell systems complete
  - Installed systems for field testing

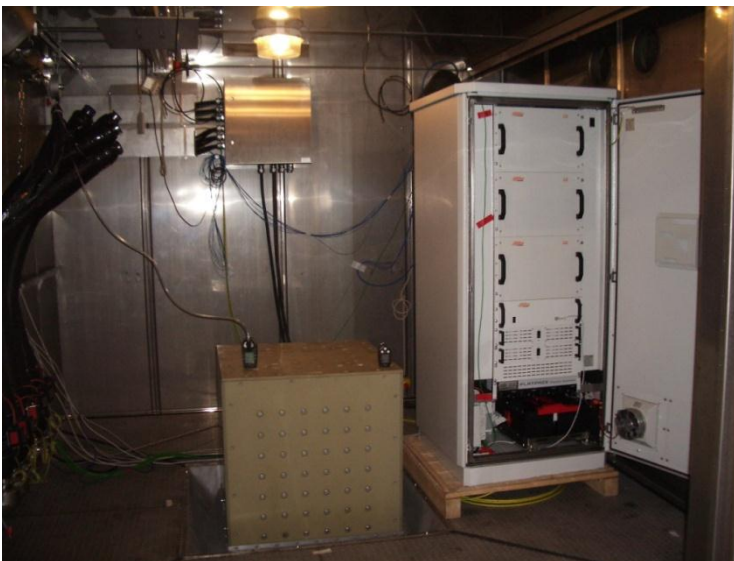
		Locality	End-user	Application	FC-UPS by	In/Outdoor	Power [kW]	Inst. Status
1	CH	Lucerne, Horw	Swisscom	Telecom	ElectroPS	Indoor	6	√ (M18)
2	CH	Lucerne	Swisscom	Telecom	FutureE	Indoor	6	√ (M18)
3	CH	Zizers	Swisscom	Telecom	ElectroPS	Indoor	6	√ (M18)
4	CH	Davos	Swisscom	Telecom	FutureE	Indoor	6	√ (M18)
5	CH	Chur	Swisscom	Telecom	ElectroPS	Indoor	6	√ (M18)
6	CH	Ennetbürgen	BKPNW	Polycom	FutureE	Indoor	4	√ (M18)
7	CH	Dallenwil	BKPNW	Polycom	ElectroPS	Outdoor	3	√ (M18)
8	CH	Alpnach	BKPNW	Polycom	FutureE	Outdoor	4	√ (M18)
9	I	Settimo Milanese	WIND	Telecom	ElectroPS	Outdoor	12 +elec.	√ (M18)
10	I	Milano Nicolodi	WIND	Telecom	ElectroPS	Outdoor	6 + elec.	√ (M18)
11	I	Pavia	WIND	Telecom	ElectroPS	Outdoor	6 + elec.	√ (M18)
12	TR	Bursa	Turkcell	Telecom	ElectroPS	Outdoor	6 + elec.	√ (M21)
13	TR	Bursa	Turkcell	Telecom	FutureE	Outdoor	4 + elec.	√ (M23)



# 1. Project achievements

## - Installed systems for benchmarking

		Locality	End-user	Application	FC-UPS by	In/Outdoor	Power [kW]	Inst. Status
14	TR	Istanbul	ICHET	Benchmark	ElectroPS	Indoor	6	√
15	TR	Istanbul	ICHET	Benchmark	FutureE	Indoor	6	√
16	NL	Petten	JRC	Benchmark	ElectroPS	Indoor	6	√
17	NL	Petten	JRC	Benchmark	ElectroPS	Indoor	6	√
18	NL	Petten	JRC	Benchmark	FutureE	Indoor	6	√
19	NL	Petten	JRC	Benchmark	FutureE	Outdoor	6	√



# 1. Project achievements

Site in Switzerland –  
Polycom - EPS



Site in Switzerland – Davos – Swisscom - FutureE  
(2200 m, cable railway)



Sites in Turkey - Bursa  
– Turkcell - EPS



Site in Switzerland –  
Polycom - FutureE

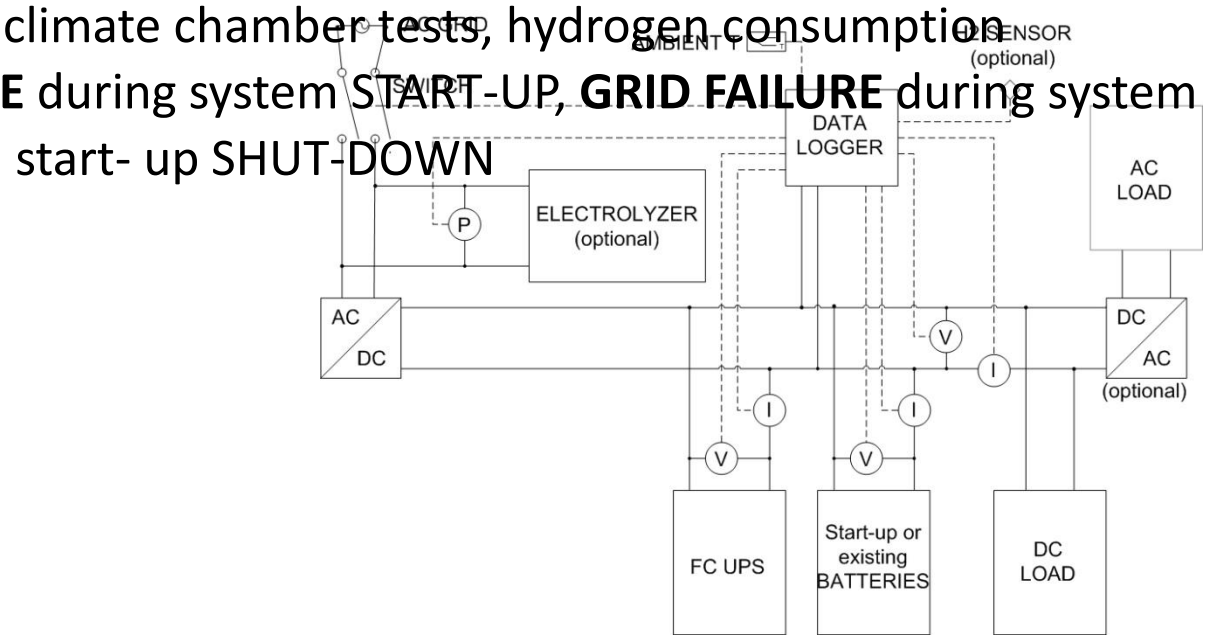


Sites in Italy - WIND - EPS



# 1. Project achievements

- A standardized test architecture (hardware and software) was developed for field and laboratory tests.
- Starting from test protocols adopted in previous projects, and existing test procedures a Test Protocol was developed with 5 different test procedures (benchmarking, final user, locations, system characteristics) considering a mix of grid failure simulations.
- Benchmarking includes: climate chamber tests, hydrogen consumption evaluation, **GRID RESTORE** during system **START-UP**, **GRID FAILURE** during system start-up **SHUT-DOWN**





# 1. Project achievements

- Test in progress at both Research centre and final user sites.
- Data analysis guidelines have been prepared to be performed on both on-field results and benchmark test results.
- Test results will be assessed in confidential and public reports to justify the technical objectives of the project set in the DoW:
  - Validation of availability > 95%
  - Validation of response time < 5 ms
  - Performance evaluation
- LCA guidelines have been prepared and methodology in FC-HyGuide final project document will be adapted.
- Existing requirements for the gas supply systems (hydrogen cylinder), installation and use of fuel cell systems in main EU countries has been collected and compared, new codes and regulations have been detected in Switzerland and Italy.



## 2. Alignment to the MAIP 2008-2013

### **Application Area: Early Markets**

- Project will bring EU companies on par with those active in the US and at the forefront of fuel cell technology worldwide for these applications.
- RTD is supported to overcome market entry barriers in Europe.
- Sustainability and competitiveness of the technology will be assessed thoroughly with its environmental, social and economic impacts.
- Public awareness and acceptance of the technology will be promoted.
- Market penetration made possible by this project will help achieve FCH-JU targets of goals of 9000 UPS/backup power systems by 2015.

## 2. Alignment to the AIP 2009

### **Early Markets / Portable generators, backup and UPS power systems**

#### **(SP1-JTI-FCH.2009.4.2)**

Project will meet following objectives of this call:

- Development and deployment of the technology
- Demonstration of commercially ready fuel cell products
- Assessment of fuelling infrastructure requirements
- Validation and product testing
- Benchmarking of technologies
- Dissemination of results to wider audience and potential customers
- Certification procedures and RC&S development
- Life cycle assessment

## 2. Alignment to the AIP 2009

Expected output AIP Topic: 4.2 Call: 2009		Objectives Project	Status at 50% of the project	Expected revised objectives
Number of FC back-up systems	5-10	19	19	15
Reliability	100%	>95%	N/A (tests not finalized)	>99%
Response time of less than	5 ms	< 5 ms	N/A (tests not finalized)	Nonsense for telco DC back-up
Lifetimes greater than	5 years	>1500 h	N/A (tests not finalized)	1500 h
Target system cost	5 k€/kW	5 k€/kW	5,5 k€/kW (including hydrogen generators)	3500 €/kW
Number of start- stop cycles	1000	1000	N/A (tests not finalized)	1000

### 3. Cross-cutting issues

- Test architecture and test protocols developed in this project will be standardized.
- Certification procedures will be developed and/or amended for installation of fuel cell UPS systems. TUV Sud will supervise these activities.
- Potentially interested industries will be aware of the technology by disseminating project results in conferences, fairs and trade shows. ElectroPS presented the project at GSMA 2011 and 2012, FutureE at Hanover Fair 2011 and Cleanpowernet in 2012, LUASA at the European Fuel Cell Forum in 2011 and 2012, ICHET at Workshop on Small Scale Fuel Cell Technology for Residential and Industrial Applications in 2012.
- Public awareness at large will be maintained with newsletters, internet and published material (3 press releases done). Project website is up and updated.
- At the end of the project a report on non-technical barriers will be published.



## 4. Enhancing cooperation

### FCTESQA

- Fuel Cell Systems Testing, Safety & Quality Assurance (FCTESQA) led by JRC is a Specific Targeted Research project co-financed within FP6.
- Test protocol developed in FITUP will be shared and a common standardization procedure will be sought.

### IEC (International Electrotechnical Committee)

- Project partners work actively in IEC Fuel Cell Technologies technical committee (TC 105). Project outcomes will be discussed in IEC workgroups.

### FC-HyGuide

- Life Cycle Assessment Guidance for Fuel Cells and H<sub>2</sub>-Technologies is a project funded by FCH-JU.
- Outputs of FC-HyGuide will be used to carry out LCA in FITUP project.

## 4. Future perspectives

➤ Lesson learned up to now from current project:

1. more difficulties/time than expected for installation because of:

- Hydrogen infrastructure, hydrogen handling, cylinder replacing at final user sites (limited access to site, no responsibility for cylinder connections)
- Special Custom rules in extra EU countries (Switzerland and Turkey)

2. Systems with electrolyser seem to be more interesting in commercial means because it doesn't need hydrogen logistics.

## 4. Future perspectives

### ➤ Follow up of the project:

1. Help market adoption of fuel cell systems as a back-up solution
  - Public incentives/ tax rebate for mass adoption of fuel cell back-up systems
  - Application of RoHS Regulation (Directive 2002/95/EC) in telecommunication / broadcasting etc.: significant decrease of lead acid batteries substituted by new state of the art - fuel cell back up systems.
2. Need of international collaborations in Middle-East, Asia and Africa where reliability of the grid is much lower than that in Europe. Emerging countries more suitable markets for fuel cell backup power systems.



**Thank you for your attention!**

**For more information:** [http:// www.fitup-project.eu](http://www.fitup-project.eu)

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