FluMaBack
(301782)

FLUMABACK

Fluid Management component improvement for Back up fuel cell systems

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0. Project & Partnership description

FluMaBack

Fluid Management component improvement for Back up fuel cell systems

- **Starting date**: 1st July 2012
- **Project duration**: 36 months
- **Budget**: total 4.440.464 €,
- **FCH contribution:** 2.773.700 €
- **Partners**: 10 consortium partners
- **Countries**: Italy, Slovenia, The Netherland, Spain

R&D centres

University *of Ljubljana*

JRC EUROPEAN COMMISSION

FOUNDATION FOR THE DEVELOPMENT OF NEW HYDROGEN TECHNOLOGIES IN ARAGON

Industrial partners:

electro power systems

TUBIFLEX Flexibility!

DOMEL We create motion

ONDA Advanced Heat Transfer Solutions

Nedstack PEM FUEL CELLS To be sure.

ENVIRONMENT PARK

Institut "Jožef Stefan", Ljubljana, Slovenija

1. Goals, targets and milestones

- New design and improvement of balance of plant (BoP) components,
  - Air and fluid flow equipments: blower and recirculation pumps
  - Humidifier
  - Heat exchanger

- The goals of the project:
  - improving BoP components performance, in terms of reliability;
  - improving the lifetime of BoP component both at component and at a system level;
  - reducing cost in a mass production perspective;
  - simplifying the manufacturing/assembly process of the entire fuel cell system.

1. Goals, targets and milestones

Topics	Current state of the art	Advances
Blower		
Efficiency	15 %	> 30 %
Noise	65 dB	< 60 dB
Lifetime	6.000 h	20.000 h
Cost	60 €/kW	50 €/kW
Recirculation pump		
Lifetime	6.000 h	20.000 h
MTBF	6.000 h	20.000 h
Cost	40 €/kW	34 €/kW
Humidifier		
Cost	300 €/kW	< 100 €/kW
Size	3 dm^3	3 dm^3
Flexibility	2 sizes with different factor forms	4 sizes with same factor forms
Heat exchanger		
Internal loop length	80 cm	negligible
Connections number	8	4
Thermal capacity	6300 J/K	5000 J/K
Cost	40 €/kW (comprehensive of piping and connections)	30 €/kW

1. Goals, targets and milestones

Topics	Current state of the art	Advances
Addressed BoP		
BoP power consumption relative to 6 kW fuel cell system output power	15 %	8,3 %
Total cost*	440 €/kW	214 €/kW
Lifetime	6.000 h	20.000 h

*cost is referred to single kW of fuel cell system output power, that means more than 1200 € total savings for each 6 kW fuel cell system, plus savings coming from further downsizing of the fuel cell stack (about 10 %) thanks to efficiency improvement.

Methodology approach

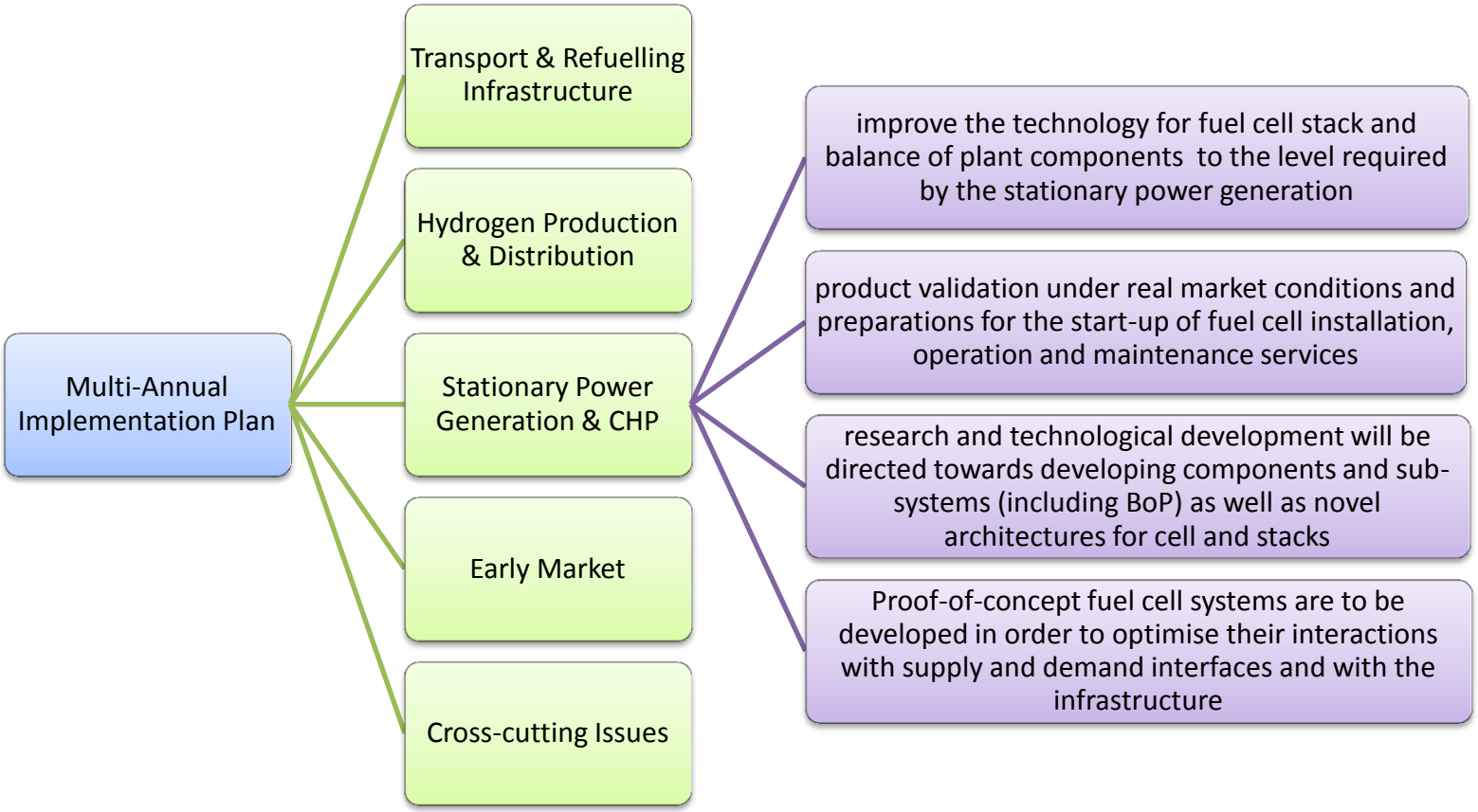
1. Assessment of functional Requirements of BoP
2. BoP component development
3. Back-up fuel cell system development
4. Testing and data analysis (procedures and protocoles to be defined within WP5)
5. Market preparation and environmental sustainability assessment

1. Goals, targets and milestones

Milestone no.	Milestone	Work package	Lead beneficiary	Delivery date
MS1	Kick-off meeting	1	ElectroPS	M1
MS2	Website with contents running	7	UL	M6
MS3	Guideline for the Dissemination Strategy	7	UL	M6
MS4	First release prototypes of each BoP component	3	Domel	M10
MS5	First release prototypes of fuel cell systems	4	ElectroPS	M17
MS6	Second release prototypes of each BoP component	3	Domel	M19
MS7	System simulation aligned with first test results	4	ElectroPS	M19
MS8	First campaign of test completed	5	EP	M19
MS9	Second release prototypes of fuel cell systems	4	ElectroPS	M24
MS10	Second campaign of accelerated tests completed	5	EP	M34
MS11	Final meeting	1	ElectroPS	M36

2. Alignment to MAIP/AIP

MAIP application areas



2. Alignment to MAIP/AIP

Fuel Cells and Hydrogen Joint Undertaking (FCH JU)
Annual implementation plan 2010

Topic SP1-JTI-FCH.2010.3.3: Component improvement for stationary power applications

Rationale

It is necessary to improve availability and cost-competitiveness of balance of plant (BoP) components, systems and sub-systems as well as their suitability for mass production to meet performance and lifetime targets.

Overall project objectives / Scope of Work

Sub-system components based on developed stack designs including:

- Power generation unit (integrated stack/ BoP)
- Power electronics
- Reforming and fuel/oxidant processing
- Heat exchangers/Thermal management
- Humidification
- Air and fluid flow equipments, including subcomponents
- Fluid supply and management including pumps, turbines, compressors, valves, flow meters, desulphurisation, gas separation membranes
- CO2 separation systems/units

The project activities shall focus on:

- Novel designs and optimisation of non-stack components

2. Alignment to MAIP/AIP

Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

Annual implementation plan 2010

meters, desulphurisation, gas separation membranes

- CO_2 separation systems/units

The project activities shall focus on:

- Novel designs and optimisation of non-stack components
- Manufacturing process and control techniques for mature components
- Validation of lifetime, durability/robustness in application environment
- Demonstration of end-of-life specifications
- Cost assessment vs. target cost
- Concepts for rework, recycling, disposal including cost
- Environmental sustainability assessment by means of Life Cycle Assessments studies carried out according to the International Life Cycle Data System (ILCD) Handbook requirements.

Proposals need to identify and will be measured against technology and application specific targets. The activities are open to all fuel cell technologies, pertinent fuels and levels of power.

Expected Outcome

Development of improved components which are

- viable for mass production
- meeting projected lifetime >10 years
- achieving cost targets (e.g. system cost per kW of € 2000 for industrial and € 5000 for domestic micro CHP by 2020)

Projects should identify potential for recyclability of solutions meeting performance targets.

2. Alignment to MAIP/AIP

Project activities for reducing costs and improving efficiency and lifetime

Blower

- geometry optimization, compact design, noise reduction
- improved performance, reliability and durability through vibration analysis and fault detection

Recirculation pump

- design optimization – single motor, two chamber centrifugal pump
- identification of the most suitable materials and manufacuring technology
- reduced noise through geometry optimization and sound absorbing materials

Humidifier

- new geometry design and optimization of connections
- increased flexibility and reduce costs

Heat exchanger

- improvement in configuration and realization
- assembly simplification, reduction of volume, internal loop, thermal inertia and connections

3. Crossing-cutting issues

Short-term impacts:

- Promote technological knowledge about fuel cells.
- Definition of specific application requirements to facilitate market penetration.
- Support the implementation of the RTD priorities of the Multi-Annual Implementation Plan of the FCH JU.
- Disseminate the technology and its possibilities against current technology.
- Visibility of hydrogen technologies and fuel cells, Involving industry and SMEs as final user of results.
- Launching of new and innovative initiatives and products.
- Show the functional capability of the new technology.
- Set up the bases for implementation of hydrogen and fuel cells as usual applications.

Mid- and long-term impacts:

- To contribute to improve energy efficiency.
- Aim to encourage increased public and private RTD investment in fuel cells and hydrogen technologies
- Development of market applications and facilitate additional industrial efforts towards a rapid development of fuel cell and hydrogen technologies.

4. Enhancing cooperation and future perspectives

Partners involvement in other projects / organizations

International

- STREP – Fuel cell testing
- FCTESQA – Safety and quality assurance
- FCANODE – Non-noble catalysts for PEM fuel cell
- FCTEDI – Fuel cell teasting and dissemination
- DECODE – Understanding of degradation mechanisms to improve PEFC
- FITUP – Demonstration of portable generators, backup and UPS system application
- HyProfessionals – Education and training in hydrogen and fuel cell technology

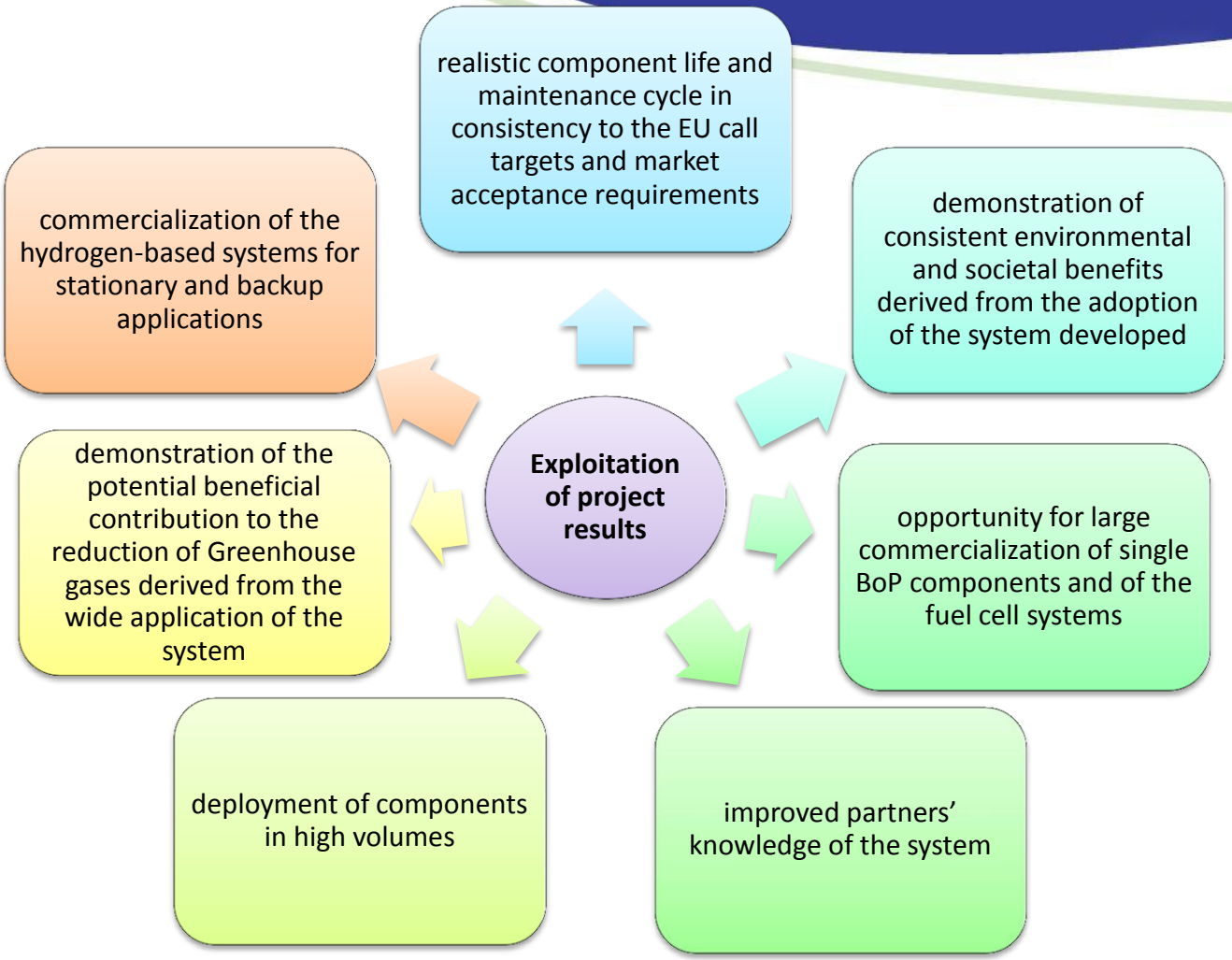
National

- SIHFC- Slovenia Hydrogen and Fuel Cell Technology Platform
- RCVT – Research Centre for Hydrogen Technologies
- CO NOT – Centre of Excellence for Low Carbon Tecnologies
- EFESO – Development of SOFC based micro CHP for residential use
- HYTRACTOR – Development of fuel cell based tractor for agricultural applications

Regional

- EPSTACK – Specific power electronics for back-up fuel cell system
- HySyPower – Solutions for energy management in fuel cell UPS devices
- Electro-SELF – Development of back-up fuel cell system with hydrogen generator
- Mhyto – Development of 100 kW fuel cell system for road transport applications
- NANOSOFC – Development of planar low cost SOFC for residential CHP applications

4. Enhancing cooperation and future perspectives



4. Enhancing cooperation and future perspectives