



## Publishable Summary

The Clean Hydrogen in European Cities (CHIC) Project is the crucial next step for the full commercialisation of hydrogen powered fuel cell buses. CHIC will reduce the 'time to market' for the technology and support 'market lift off' – two central objectives of the Joint Undertaking.

The project started in 2010 and runs until 2016, involving 25 participants. The CHIC project will:

- Test the technology intensively, in order to generate knowledge for the final steps towards the commercialisation of the hydrogen powered fuel cell (H<sub>2</sub>FC) buses, in five European regions by:
  - Operating a minimum of 26 H<sub>2</sub>FC buses in medium sized fleets during normal city bus operation;
  - Operating a substantially larger hydrogen refuelling infrastructure than in the past.
- Embed the knowledge and experience gained from previous H<sub>2</sub>FC bus projects (e.g. CUTE & HyFLEET:CUTE).
- Accelerate the development of clean public transport systems in 14 further European Regions.
- Conduct a life cycle based sustainability assessment of the use of H<sub>2</sub>FC buses in public transport, based on a triple bottom line approach, considering environmental, economic and social aspects.
- Identify the advantages, improvement potentials, complementarities and synergies of H<sub>2</sub>FC buses compared with conventional and alternative technologies.
- Build a critical mass of public support for the benefits of 'green' hydrogen powered transport, leading to increased visibility and political commitment across Europe.



## Project partners

Participant no.	Participant organisation name	Abbreviation
1.	EvoBus GmbH	EvoBus
2.	Air Products Plc	AirProducts
3.	Azienda Transporti Milanesi S.p.A.	ATM S.p.A.
4.	Berliner Verkehrsbetriebe A.ö.R.	BVG
5.	Element Energy Limited	Element Energy
6.	Euro Keys SPRL	EuroKeys
7.	Air Liquide Hydrogen Energy	AL
9.	HyCologne - Wasserstoff Region Rheinland e.V.	HyCologne
10.	Hydrogen Fuel Cells and Electro-mobility in European Regions	HyER
11.	Infraserv GmbH & Co. Höchst KG	ISH
12.	BC Transit	BCT
14.	Linde AG	Linde
15.	London Bus Services Ltd	LBSL
16.	PE INTERNATIONAL AG	PE INT
17.	PLANET - Planungsgruppe Energie und Technik GbR	PLANET
18.	PostAuto Schweiz AG	PostAuto
19.	SHELL DOWNSTREAM SERVICES INTERNATIONAL BV	SHELL
20.	Spilett new technologies GmbH	Spilett
21.	Suedtiroler Transportstrukturen AG	STA AG
22.	TOTAL Deutschland GmbH	Total
23.	UNIVERSITAET STUTTGART	USTUTT
24.	Vattenfall Europe Innovation GmbH	VEI
25.	Ruter AS	Ruter
26.	Wrightbus Limited	Wrightbus Ltd
28.	hySOLUTIONS GmbH	HG



The main **project objectives** for the second period (April 1, 2011 to March 31, 2012) were:

- Finalization of **procurement of the fuelling infrastructure** in the **Phase 1 regions**;
- **Procurement of the FC buses** by each **Phase 1** partner using open tender procedures where applicable;
- Preparation (if applicable) and **operation of the FC buses** in the **Phase 0** cities;
- Preparation (if applicable) and **operation of the FC buses** in the **Phase 1** cities;
- Development and implementation of **maintenance concept** (maintenance personnel and workshop) for the site, if applicable in this period;
- Development and implementation of **training concept** for drivers and emergency services for each site, if applicable in this period;
- Establishment and activity of the **Task Force on Quality and Safety** to ensure good and rapid information flow between the sites to ensure safe operation of infrastructure;
- **Provision of operational data** and performance assessment of hydrogen infrastructure and buses in order to enable monitoring of achievement of the project objectives;
- Investigation **of the social acceptance** of a hydrogen based transport system in the general community, and the issues and information required to change opinions of the 'sceptics and critics' who express doubts or concerns about hydrogen powered transport;
- **Global dissemination** via the project website, regular project newsletters and presentation of the project at forums and conferences (national and international);
- **Dissemination for the next phase** of deployment in order to provide information and guidance for **Phase 2 cities**;
- **Cooperation** with other **initiatives** and demonstration projects.

## Progress of Work Packages: Overview on the activities and achievements in Period 2

### WP1: Hydrogen Infrastructure Operation

In this reporting period, the first monthly reports were compiled that summarise the performance data from the cities with their infrastructures in operation, such as kg of hydrogen refuelled or number of fillings.

Good progress has been made on the procurement and implementation of the “second generation” refuelling stations, taking into consideration the experiences from the implementation of the “first generation” facilities, as well as what was learned from previous projects. The infrastructure in London is in regular operation. Infrastructures in Aargau, Milan and Oslo are under construction and are planned to start operation in the next reporting period (Infrastructure of Aargau s. Figure 1). Interim solutions are in place where required, such as mobile refuellers.



**Figure 1 - Hydrogen infrastructure for Aargau (Phase 1 city)**

Regarding the Phase 0 sites, the Cologne station opened in May 2010 and started regular operation in this period after having entered in regular service two fuel cell buses in September 2011. Considering Hamburg, the new station in HafenCity has been operating since February 2012. Whistler has been operating its buses and hydrogen infrastructure since the Winter Olympics in early 2010.

The “Task Force on Quality and Safety” started the work by ensuring a regular exchange of information between the sites and thus the reliable and safe operation of the infrastructure.

### WP2: Fuel Cell Bus operation

All Phase 1 Cities except Bolzano have successfully concluded their procurement process and have already begun operation or are currently preparing the start of operation. Bolzano published its tender for five buses at the end of March 2012; therefore the procurement procedure is still ongoing.

Fuel cell buses are currently in regular operation in London and Aargau. The bus operation in Oslo will begin in May and the official bus operation in Milan will begin in September after the induction of the hydrogen refuelling station. The tender of Bolzano was announced on March 30<sup>th</sup>, 2012 and will be open until the end of May. Aargau and Oslo started their maintenance and training concepts (maintenance personnel and workshop); Milan will follow in the coming months.



**Figure 2 - Fuel cell PostAuto operating in Aargau**



**Figure 3 - Cologne bus in daily operation in Huerth, south of Cologne**

Regarding the Phase 0 cities, British Columbia operates 20 buses regularly and has been since the beginning of 2010 (Olympics). Cologne started the operation of their two buses in September 2011 (s. Figure 3). Hamburg started the operation of the first three buses in March 2012. The fourth bus will start operation soon and three more buses are planned to start at the end of 2012.

A task force “Fuel Cell Buses” has been established and started work in order to ensure the information exchange between the cities.

**WP3: Performance and Sustainability Assessment**

The first version of the Assessment Framework was finalised during the preceding reporting period. The definitions of data points and performance indicators were largely based on a similar document from the HyFLEET:CUTE project. But more complex hydrogen infrastructure facilities were expected in particular, with more than one stream of hydrogen production and supply in parallel, requiring revised definitions. This revision process was a major activity during the second project year.

In parallel, procedures for automated data acquisition and data transfer were established at the individual sites in cooperation with the data analysis team. These procedures ensure efficient supply of data, feeding of the data into the SoFi database and meaningful data analysis.

Regarding the social assessment, the interview concept has been finalized and the first interviews in the regions took place (Aargau/ Brugg in Switzerland and Bolzano in Italy).

## WP4: Dissemination

Regarding the general dissemination, the CHIC Project Dissemination Strategy and CHIC Dissemination Calendar are continuously updated. Furthermore, the communication tool kit contains different promotional materials that have been adapted.

The dissemination for the next phase of deployment was characterised by many events in which the CHIC representatives were participating. Besides that, a Guidance Document to facilitate the commercialisation road map of hydrogen buses was developed to provide guidance for the Phase 2 cities. It will be published in the next reporting period.

The most significant result in this reporting period is the establishment of a collaboration with the World Economic Forum to secure CHIC bus presence at the future editions of the WEF in Davos, a close cooperation established with EU Sustainable Energy Week, the first coordinated event, i.e. Phase 2 workshop organised with the other FCH JU FCH bus project High V.LO - City.

Furthermore, the CHIC website reached 17,000 unique visitors within one year of its launch.

According to the communication board for interested Phase 2 Cities, new interested cities could be added to CHIC Phase 2 city list.



Figure 4 - Homepage on CHIC website (<http://chic-project.eu/>)

## WP5: Project Management

The project management is operational on project level and on site level.

Two biannual meetings were organised during the last period: in Aargau, October 2011, and in Milan, March 2012. The biannual meetings are designed to have a good mix of technical discussions on the fuel cell bus and infrastructure technologies and also to address program management and work package topics.



In order to ensure a continuous and permanent information exchange between the experienced Phase 0 Cities and the Phase 1 Cities, additional intermediate telephone conferences were established with representatives of the cities, industry and consultants.

The 3<sup>rd</sup> Steering Committee meeting took place in Berlin, on September 13, 2011 and the 4<sup>th</sup> Steering Committee Meeting took place in Milan on March 13, 2012.

Work Package Leader Meetings took place during the biannual meetings in Aargau and Milan.