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Project full title:

Lighthouse Project for the Demonstration of Hydrogen Fuel Cell Vehicles and Refuelling Infrastructure in Scandinavia

Instrument	Collaborative Project
Thematic Priority	Demonstration of hydrogen fuelled road vehicles and refuelling infrastructure

D5.7b) Daimler – Report „Experience from operating a fleet of FCV sedans in Oslo and during the European hydrogen vehicle demonstration tours“

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Dissemination Level		
PU	Public	**PU**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1 Introduction

The first roadworthy fuel-cell-power vehicle from Mercedes-Benz was unveiled in 1994, making it the pioneer of this forward-looking drive technology. In the years that followed, numerous concept vehicles and prototypes were assembled. In early 2000, the first fleet of fuel-cell vehicles were put together, and the first ever customer trials under everyday conditions got underway. With the B-Class F-CELL, the second small series fleet was built. Within the H2moves Scandinavia project, there are 10 Mercedes B-Class F-CELL vehicles for demonstration of "Hydrogen Fuel Cell Vehicles" and refuelling infrastructure in Scandinavia, Oslo. Deliverable D5.7b) reports on the „Experience from operating the fleet of FCEV sedans in Oslo and during the European Hydrogen Road Tour in 2012."

2 Scope

The purpose of this document is to report the findings of the vehicle operation in Oslo, Norway. Also, this deliverable contains the framework conditions in Norway and Scandinavia. Another focus is the operation of the B-Class F-CELL during the European Hydrogen Road Tour 2012.

3 FCEV market preparation Oslo, Norway

The B-Class F-CELL vehicle assembly started at the end of 2010 at the Daimler production plant in Sindelfingen. The batch for the H2moves Scandinavia project was assembled in the first half of 2011. The internal final acceptance process was more or less also implemented for the B-Class F-CELL vehicles. A special tank check was implemented to meet the high standards of Daimler AG.

By the end of 2010, one communication vehicle was delivered to Oslo in order to prepare the market for the vehicles to come. With this communication vehicle, Bertel O. Steen did various events. They also supported the Mercedes-Benz World Drive at the end of May 2011 passing Scandinavia.

Pictures of Mercedes-Benz World Drive - B-Class F-CELL passing Scandinavia

Bertel O. Steen carried out several sales activities aimed at potential users of the 10 Fuel cell vehicles. Also, press/media test drives on individual basis took place through the autumn. The communication vehicle was lent to potential customers, and also some VIPs had the chance to drive the vehicles (e. g. Lord Mayor Oslo Fabian Stang and environmental minister Erik Solheim). Furthermore, the Motor Magazine "Bil" together with Bertel O. Steen provided a unique opportunity to the readers/public to get an impression of one of tomorrow's fuels – hydrogen. The B-Class F-CELL was handed over to a reader for a testing period of two weeks.

The communication vehicle was also used to test existing stations in order to assure refueling for the coming fleet of ten B-Class F-CELL vehicles. The existing Oslo Ökern station needed a closer look because some dispensed hydrogen was contaminated with particles.

4 Customer vehicle operation

In August 2011, the vehicles were shipped to the General Agent of Mercedes-Benz Bertel O. Steen, keeping in mind that there were still some tests at Oslo Ökern to conduct. Unfortunately, the source of the particle was never found, and another solution had to be found. To protect the fuel cell system from the particles, every single vehicle had to be upgraded with a 2 µm filter. Because of delivery problems of the filters, the process of exchanging the filters kept the aftersales department and also the workshop staff in Norway busy for months.

With the opening of the well-functioning new project fuelling station Oslo Gaustad (H2Logic), the process of delivering vehicles to final customers started in November 2011.
The customers showed a very high interest in the B-Class F-CELL. The uncertain refueling situation (it was not certain whether Oslo Ökern would stay in operation) led some customers to draw back.

Eight out of ten B-Class F-CELL vehicles went into customer hands. Two of them remained in the hands of Bertel O. Steen to use for events and in the testing of fuelling stations. In addition, these were used as “Mobility vehicles” while servicing customer cars. Due to this, no customers were ever without a fuel cell vehicle because the remaining vehicles were also used as replacement vehicles when the customer’s vehicle was being serviced.
The following customers got a B-Class F-CELL to use in daily operation:

SINTEF:

SINTEF is the largest independent research organization in Scandinavia. SINTEF creates value through knowledge generation, research and innovation and develops technological solutions that are brought into practical use. Therefore, this organization is excellent as one of the early users. They used the vehicle on various occasions and also did events with the vehicle to educate the public.

BILFORLAGET AS:

Bilforlaget AS is Norway's largest publisher of automotive information and publishes magazines like Bil, YrkesBil and MotorBransjen. It is important that the leading automotive magazine publishing house is informed about the coming technology and also reports about it.

Magazines published by Bilforlaget AS
Source: Webpage: BilNorge.no Link: http://www.bilnorge.no/artikkel.php?aid=38535

HyOp:

HYOP AS drives two of the B-Class F-CELLs and is an independent company dedicated to bringing hydrogen fuel to the market. Their mission is to own and operate hydrogen refueling stations and hydrogen production facilities.

CampusKjeller:

Campus Kjeller is involved in developing good business ideas in the areas of research and business. They assist with financing and introducing products to the market. Kjeller Innovation focuses mainly on areas within the fields of energy, the environment, civil protection, biotechnology and health. With the new fuelling station in Lillestrøm on their premises, this is a perfect customer.

ASKO:

ASKO is a branch of NorgesGruppen and constitutes the wholesale part. ASKO serves thousands of warehouses all over Norway. The staff of ASKO uses the B-Class F-CELL as a fleet vehicle.
http://www.youtube.com/watch?v=I6rou32pxiA

Interview with Mette Lier, Director from ASKO Norge AS

IFE:

IFE is an international research foundation for energy and nuclear technology. IFE's mandate is to undertake research and development within the energy and petroleum sector on an ideal basis and for the benefit of society. The Institute strives for a more climate friendly energy system based on renewable and CO2-free energy sources.
http://www.youtube.com/watch?v=oBr_9qYxRXM

Vätgas Sverige:

Besides the communication/dissemination tasks in the H2mS project, Hydrogen Sweden promotes hydrogen as an energy carrier, especially in Sweden. The mobile refueling station of H2Logic was placed in Gothenburg, and therefore one B-Class F-CELL was operated in Sweden for some time. Every customer also got a short on-site introduction on how to refuel the vehicles.

Fuelling introduction for customers

Vehicle Branding

F-CELL with IFE sticker in Lilleström

F-CELL hand over to Campus Kjeller AS

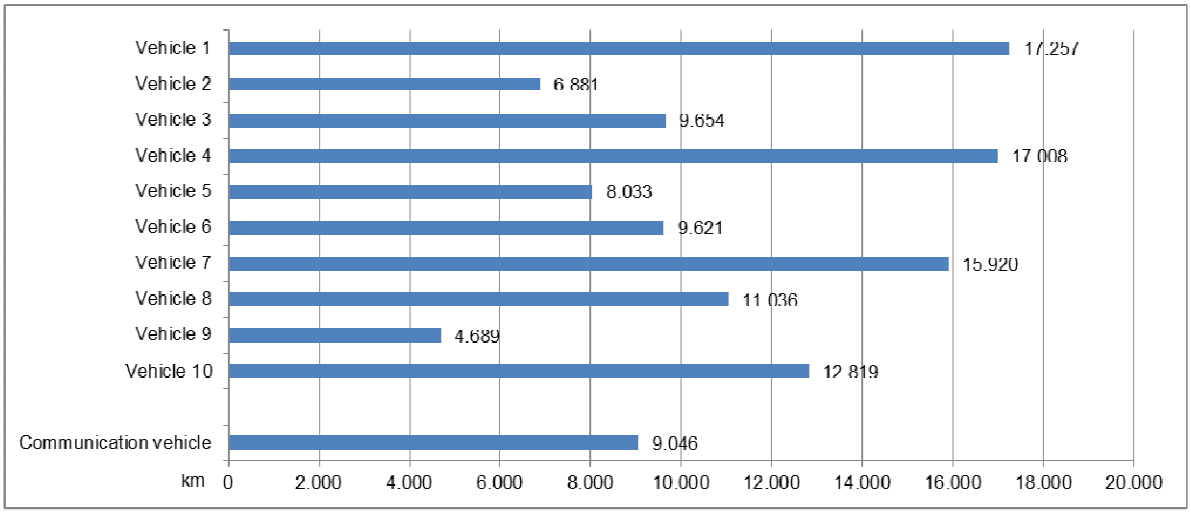
Customers got the opportunity to also brand their vehicle with their logo and advertisement. Customers liked this idea and got stickers with specific designs on their cars.

In addition, each vehicle was also labeled with the project name and the funding source.

B-Class F-CELL with H2moves Scandinavia sticker

5 Data reporting of Norwegian B-Class F-CELL fleet

The ten vehicles drove in total about 113.000 km in the operation phase 21.11.2011 – 31.12.2012. In addition, the communication vehicles were operated in Norway and accumulated 9.046 km on Norwegian roads.



Km driven with the B-Class F-CELL vehicles in Norway

The fleet was operated 2.700 hours within the project time frame.

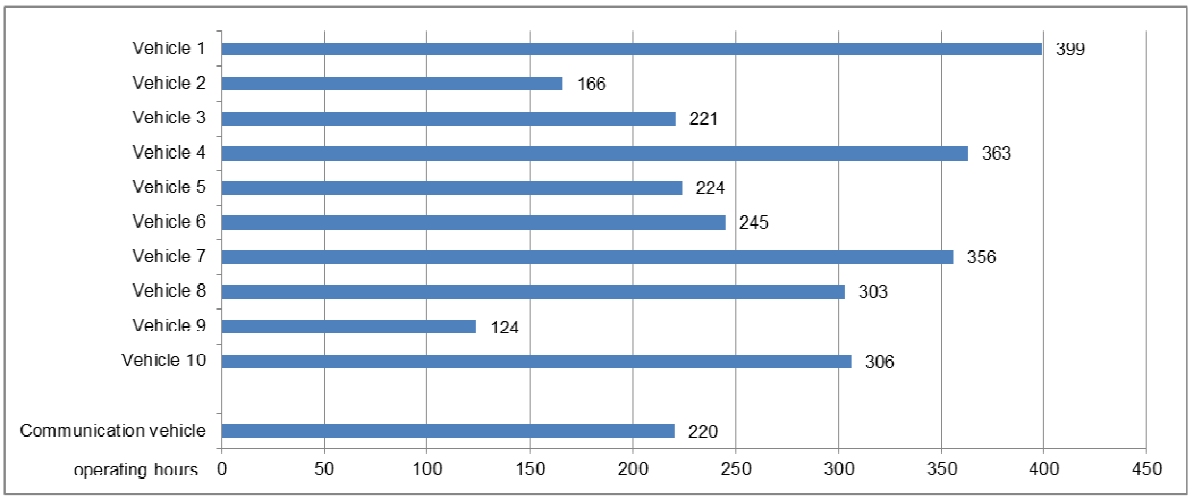


Chart of operating hours B-Class F-CELL

More technical data and charts can be found in Work package 7 – Technical demonstration monitoring & assessment. The performance data of the B-Class F-CELLs were reported according to the MAF Handbook to LBST.

Outreach with vehicles

Many events were held with the customer vehicles. In 2010, the B-Class F-CELL took part in the ZERO Rallye 2012. The annual rally for zero or low emissions vehicles, including FCEVs, took place

from the 14th to 16th of June, crossed country borders for the first time and ran along the 'Green Highway' between Östersund in Sweden and Trondheim in Norway. Over 50 teams took part in the 2012 rally, among them were three Daimler B-Class F-CELLs.

Fuel Cell Vehicles at the ZERO Rally 2012

Another big event was the Øyafestivalen at the Medieval Park in Oslo. This is Norway's biggest annual music festival and attracts nearly 100.000 people. The B-Class F-CELL was displayed there and used as a VIP taxi.

The Technoport Conference Trondheim in April 2012 was also a good opportunity to show the fuel cell technology to many people. At a ride&drive, people had the opportunity to test drive the vehicle.
One lady was really impressed with the vehicle and twittered:
"Drove this hydrogen car at Technoport 2012 together with
Dr. Shaikha al-Maskari. Great experience. I want one!"

Source: http://twitter.com/MetteLinKS/status/192540493207453696

Source: Mette Laursen - B-Class F-CELL test drive at Technoport Conference Trondheim

Bertel O. Steen was also present at the NBF (Norwegian Car Dealers Association) and NAF (Norwegian Automobile Association) Conference.

One fuel cell vehicle was also presented to the "Norges Taxiforbund" Norwegian Taxi Association in August 2012. They are very positive in regards to electric vehicles with fuel cell.

Article in the magazine Taxi about the B-Class F-CELL

In August, the technology was also introduced at the Norwegian Car Dealers Association (NBF) and in September at the NAF (Norwegian Automobile Association) conference.
In November and December 2012, one of the B-Class F-CELLs was at the mobile refueling station of H2Logic in Gothenburg, Sweden. Our H2mS Project Partner Hydrogen Sweden was operating the vehicle. This gave about 150 people the opportunity to also test drive and experience the vehicle.
The drivers were mainly from related industries, including policy makers and officials from local/regional government in western Sweden. Two local newspapers and the local radio station interviewed Hydrogen Sweden and published/broadcasted it.
Source: http://sverigesradio.se/sida/artikel.aspx?programid=104&artikel=5372762 Source: http://www.direktpress.se/goteborg/Hisingen/Nyheter/Elbil-med-vatgas-testas-pa-Hisingen/

People were in general pleasantly surprised when seeing and driving the car. The following are some quotes:
"This is really fun; I am impressed!" "This is really the future!" One person had driven a hydrogen car ten years ago, and he was very astonished at how far the technology has progressed.



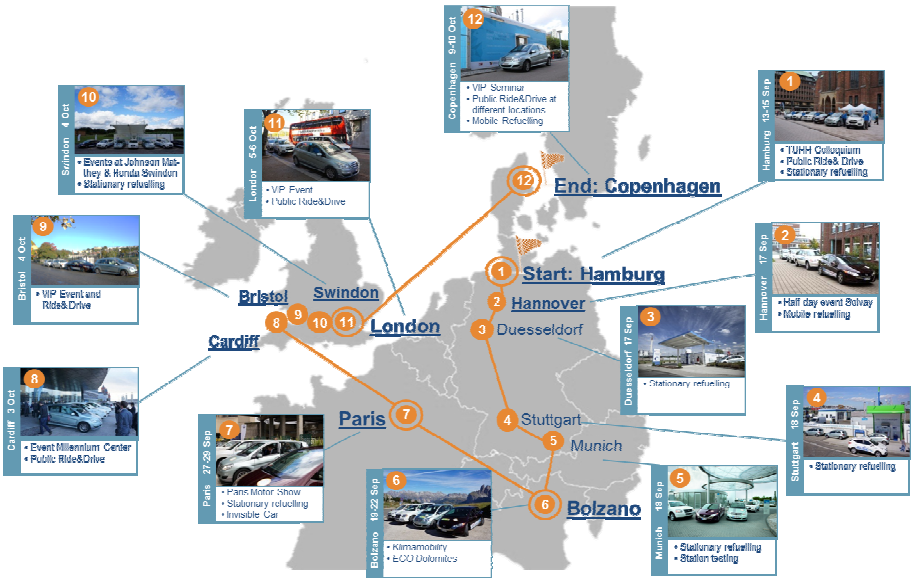
Björn Aronsson from Vatgas showing the refueling of a B-Class F-CELL in Gothenburg.
Anna Alexandersson of SP explaining the vehicle; Photograph: Dick Gillberg

6 European Hydrogen Road Tour

The major event of the whole H2mS project was surely the European Hydrogen Road Tour in September/October 2012. Besides the H2mS project FCEVs (2 Hyundai ix35, 2 Mercedes-Benz F-CELLs), Toyota (1 FCHV-adv.) and Honda (FCX Clarity) came along and toured through Europe to demonstrate the technology. The tour was from the 13th of September until the 10th of October 2012 and went through 5 European countries and 12 cities to demonstrate the following to politicians, the industry, the press and the public:

- unity and commitment among the partners to commercialize FCEVs
- the technology is ready for commercialization
- hydrogen infrastructure is needed across the EU

The European Hydrogen Road Tour included seminars & receptions for key delegates from the industry, government, media and universities as well as public Ride & Drive opportunities.



The two B-Class F-CELLs drove about 3.400 km without any technical failure at the European Hydrogen Road Tour 2012. This mileage was accumulated from test drives on site and drives from location to location. A Daimler internal lottery was organized on the intranet, where people could apply to drive a leg of the tour. Therefore, the vehicles were driven between Hamburg - Hannover and Düsseldorf. In addition, the vehicles drove through Wales. Each vehicle also drove a leg in Scandinavia (Copenhagen – Gothenburg and Gothenburg – Oslo).

In total the B-Class F-CELLs were refueled nearly 30 times at 8 different refueling stations in Europe. In particular, the following fuelling stations were visited to refuel:

- Hafencity Hamburg, Germany
- Hamburg Cuxhavener Straße, Germany
- H2L moveable HRS Hannover / Copenhagen / Gothenburg
- Air Liquide Düsseldorf, Germany
- OMV Stuttgart Airport, Germany
- Linde Unterschleißheim, Germany
- Air Liquide Paris, France
- BoC Swindon, UK

About 70% of the tracked refuelings ended between 80 – 100% State of Charge (SOC). The data shows that especially the mobile refueller of H2Logic achieves refuelings with a high SOC end level.

During the whole tour, no overheating (T < 85°C) took place. All refueling were safe.

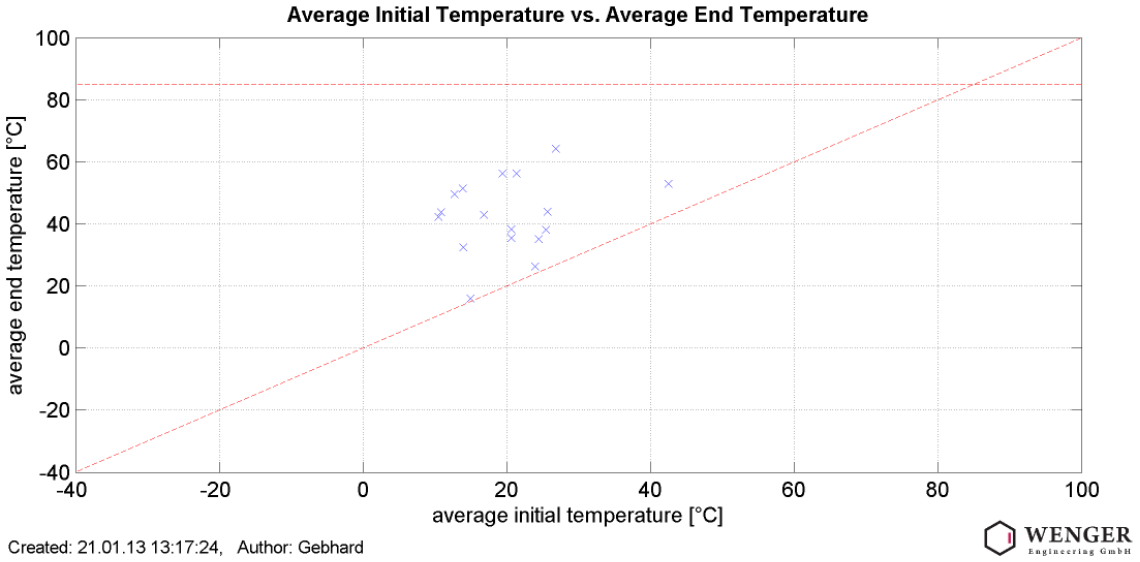
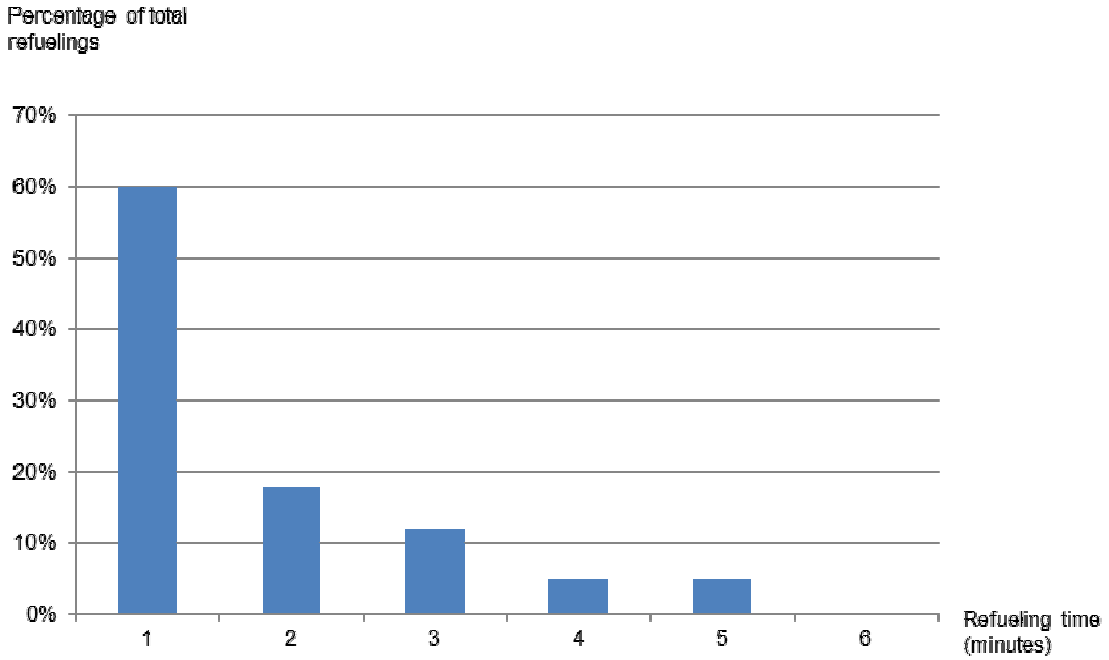


Chart Wenger Engineering GmbH – Average initial temperature vs. average end temparature

70,6 % of the fuelings end between 80 and 100 % SOC.

About 60% of all refueling took about one minute. The European Hydrogen Road Tour proved that the Fuel Cell Electric Vehicles can be refueled in less than three minutes, if the refueling standard is in accordance with the SAE J2601.



The Chart shows the refueling time in minutes at the European Hydrogen Road Tour.

7 Lessons learned

Lessons learned from the H2moves Scandinavia Project:

- At least two operational hydrogen refueling stations per demonstration site are required to guarantee customer satisfaction
- It is recommended to have additional Fuel Cell vehicles at the workshop for displaying to potential customers and as replacement vehicles for customers.
- The F-CELL functioned even in the cold climate of Norway very well, and most people were impressed with the smooth driving and comfort, and felt it was comparable to a conventional car.
- Even if the driving range is quite high, this is one of the major criticisms from the customers about the car - especially as there are quite few refueling stations at this point in time.
- Although it is a relatively small market, Norway is an important pilot-market, with environmentally friendly people, who are very open for new technologies.

The research leading to these results has received funding from the European Union's Seventh Framework Programm (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement Project No. 245101