



Status of the first European Lighthouse Project to demonstrate hydrogen fuel cell cars in Scandinavia

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- Background
- Project ambition
- Project scope
- Expected learning
- Technical specifications
- Performance reporting
- European Road Tours





- Consolidate existing hydrogen-fueling hub in southern Norway and add one new station of latest design
- Roll-out latest state-of-the-art hydrogen fuel cell vehicles operated by private customers
- Communicate project performance
- Actively link Scandinavian Hydrogen Highway Partnership (SHHP) to European network

Project partners:

CRF Fiat, Italy
Daimler, Germany
H2 Logic, Denmark
Hydrogen Sweden
Hydrogen Link, Denmark
Ludwig-Bölkow-Systemtechnik, Germany
SP Technical Research Institute of Sweden
TÜV SÜD Industry Services, Germany



Lindesnes Lighthouse
(southern tip Norway)

Coordinator:

Vehicle & Infrastructure:

Dissemination:

Safety:



DAIMLER



Hydrogen Sweden





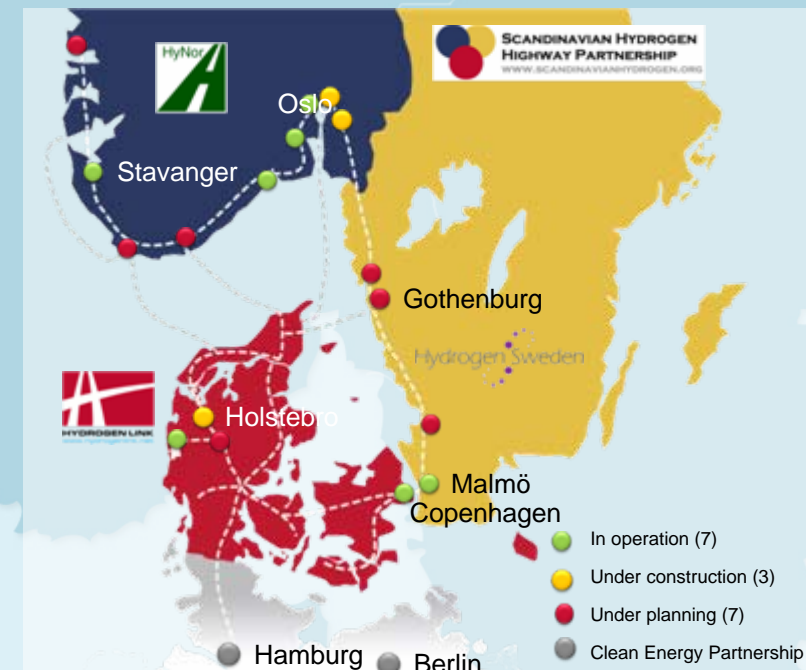
2015 target: At least 15 stations

Ambition

- Fulfill “Joint Undertaking H2&FC” goal to joint H2&FC commercialization
- Physically link existing demonstration sites by corridors

Implementation

- H2mS project budget secured by joint industry, EU (JTI) and national Norwegian (Transnova) as well as Danish co-funding
- Strong links with local Norwegian network HyNor and Scandinavian Hydrogen Highway Partnership (SHHP)
- H2mS project connected via Malmö (SE) and Copenhagen (DK) to German Clean Energy Partnership (CEP)





Vehicles

- 10 Daimler B-Class FCEVs
- 2 Alfa Romeo Mito FCEVs
- 5 Th!nk FC city cars



Fuelling stations

- 1 stationary hydrogen refuelling station in Oslo (in addition to an existing one), 70 MPa, capacity of min. 200 kg/day achievable (400 kg feasible)
- 1 mobile refueller for EU demo tours



Other activities

- RCS assessment (vehicle & HRS certification) across Scandinavia, safety alert concept
- Monitoring & assessment of car & station performance
- 5 EU vehicle road tours (extended vehicle fleet)
- Communication & dissemination (cooperation with EU H2&FC Regions and Municipality Partnership)
- Close cooperation with HyNor and SHHP projects



Vehicles (rolled out by early 2011)

- Everyday testing of latest generation fuel cell cars by private customers including harsh climate conditions (winter driving)
- Extended driving experience in an (inter)urban setting with multiple hydrogen refueling stations



Refueling station Oslo (installed in II / 2011)

- Daily experience with latest generation 70 MPa hydrogen refueling equipment including pre-cooling
- Use of hydrogen fueling station by multiple private customers including harsh winter conditions





Main HRS specifications

- 200 kg/day & 20 kg within one hour
- Corresponding to 50/5 vehicles
- Prepared for future upgrade to 400 kg/day
- Refuelling according to SAE J2601
- Station to be placed at existing gasoline station in Oslo
- H2 Logic A/S will design and install the station

Status of work & overall time plan

- Overall HRS specifications & design specified
- Preparation of HRS manufacturing commenced
- Site selection in final stages – expected selection in late 2010
- Opening of HRS expected during summer 2011

H2 Logic A/S will design and install the station



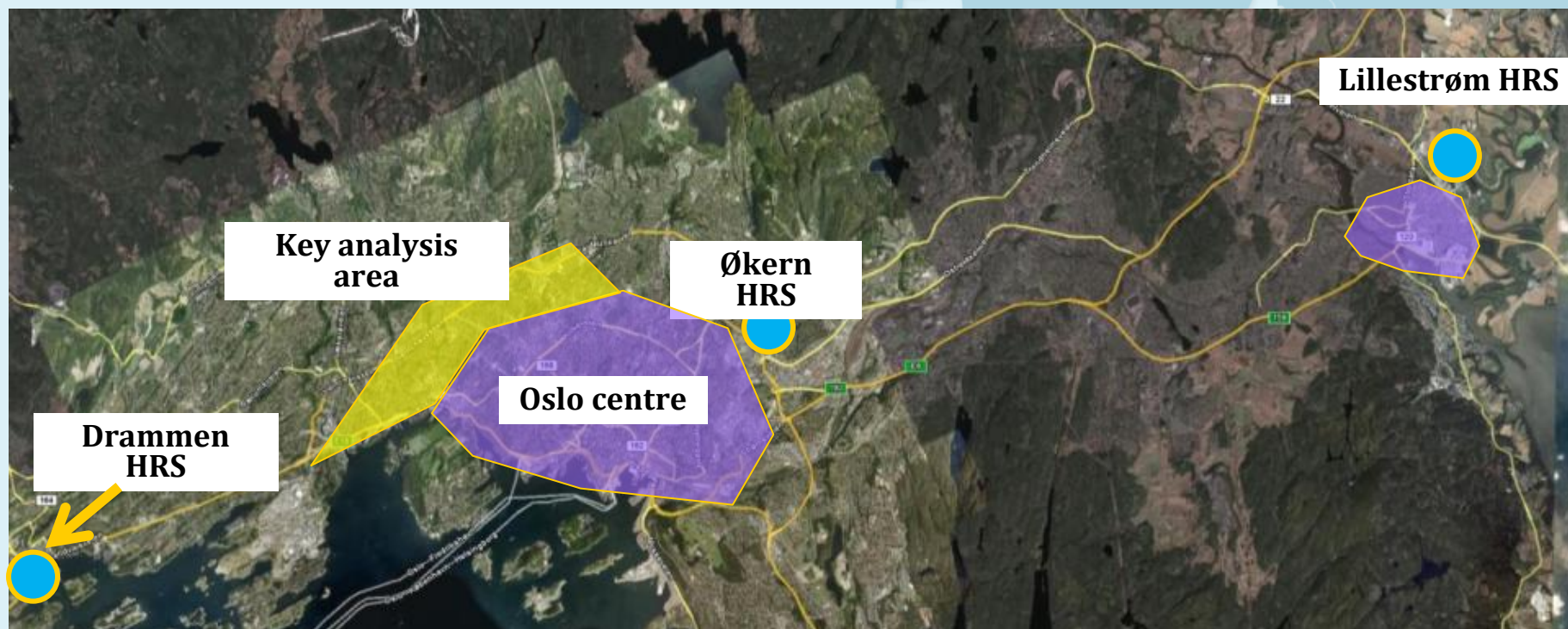


Optimal placement in relation to other HRS's

- Identification of a HRS site in West Oslo is prioritized
- This will ensure HRS on both sides of the city centre and two HRS in the suburbs on each side

General learning's

- At most of the analyzed potential sites, space is the main issue!
- Sites in the city centre in particular are confined and small
- Sites at main entry roads to city centre are both larger and can be reached by more cars





- More than 30 potential sites in Oslo have been pre-evaluated
- Main evaluation criteria's were:
 - Location in relation to existing HRS's – ensuring a wide covering HRS network in Oslo
 - Ease of integration – sufficient space at site for the HRS with necessary safety distances
- Around 10 sites are undergoing further detailed analysis
- Expected selection of site in late 2010

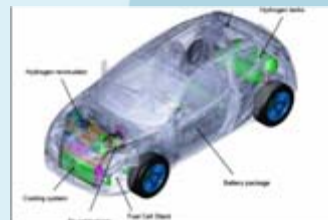




**Mercedes B-Class
F-CELL**



**Alfa Romeo
Mito**



**Th!nk FCV
City car**



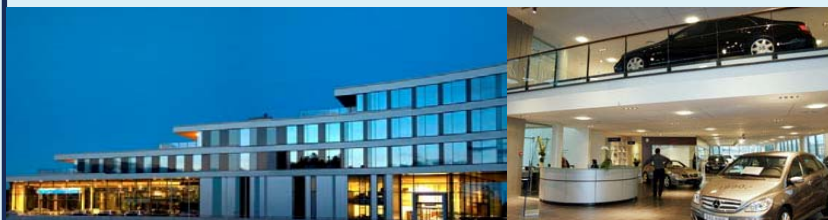
Drivetrain power [kW]	100	30-100 (FC: 85)	FC:10
Max. torque [Nm]	290	230	-
Payload [kg]	4 passengers	4 passengers	2 passengers
Driving range [km]	385 (NEDC)	450	250
H2 capacity [kg]	3.7 @ 70 MPa	4.3 @ 70 MPa	1.5 @ 70 MPa
Cold-start [°C]	-25	-20	-
H2 consumption [l _{DE} /100km)	3.3	3.2	-



In 2010 the main focus of the project was the preparation of the Mercedes-Benz B-Class F-CELL Demonstration in Oslo which included the following:

Preparation of workshop

The General Agent of Mercedes Benz in Norway Bertel O. Steen was chosen to distribute the FCEVs for the demonstration phase of the project in the Oslo region.



The cars can be repaired in a standard workshop environment. Special tools/equipments were delivered to the workshop.

Training of workshop staff

Dedicated workshop staff attended a fuel cell specific training in June 2010 to be able to repair the FCEVs. The main focus was on high voltage and FC specific parts.



The dedicated workshop staff is now able to repair the Mercedes-Benz B-Class F-CELL.



CRF FCEVs - operational & maintenance model

- vehicle delivery to local representative
- training of local representative personnel on vehicle use



Norwegian representative responsible to

- maintain cars as main customer and driver during EU demo tours
- to identify and deliver cars to “real” customers (government, universities, press, ...) and train final customers in driving



- Final customers will drive cars on the road



- In case of failure final customers will return cars to the local representation
- Local representation people will collaborate with the “maintenance & repair center” (workshop) for repairing cars; center to be provided with trained personnel and equipped with necessary safety features



Expected results:

- Collect operational parameters for analysis in real conditions during daily operation of FCEVs
- Acquire experience and customers acceptance about normal use, repair and maintenance of FCEVs



Background

- A 1st generation FC city car was developed in 2008
- One vehicle has since then been in test operation in Denmark
- In parallel an optimized 2nd generation car has been developed

Improvements in 2nd generation

- Increase of pressure to 70 MPa – increase of range to 250 km
- Use of excess heat from fuel cell system for cabin heating
- Noise reduction due to floating fuel cell operation (depending on vehicle speed)

2nd generation demonstration status & plans

- In 2009 six units of the 2nd generation commenced operation in Copenhagen
- In 2011 8 units of the 2nd generation in total to commence operation in DK (3) and Oslo (5)





Main vehicle specifications

- City car – 2 persons – standard electric vehicle from TH!NK
- Plug-in electric with fuel cell range extender
- Range 250 km (~110 km battery and ~140 km fuel cell)
- 14 kW fuel cell system
- 70 MPa onboard storage

Status of work & overall time plan

- End-users selected and contracts closed
- Cars to be used in Lillestrøm outside Oslo – and use local HRS (opens 2011)
- Vehicles in production – expected delivery late 2010

**Integrated fuel cell system
from H2 Logic A/S**





Regulations, codes & standards

- Identify and suggest improvement of necessary regulations/approval/certification procedures for cars and refueling stations throughout Scandinavia in preparation of commercial markets



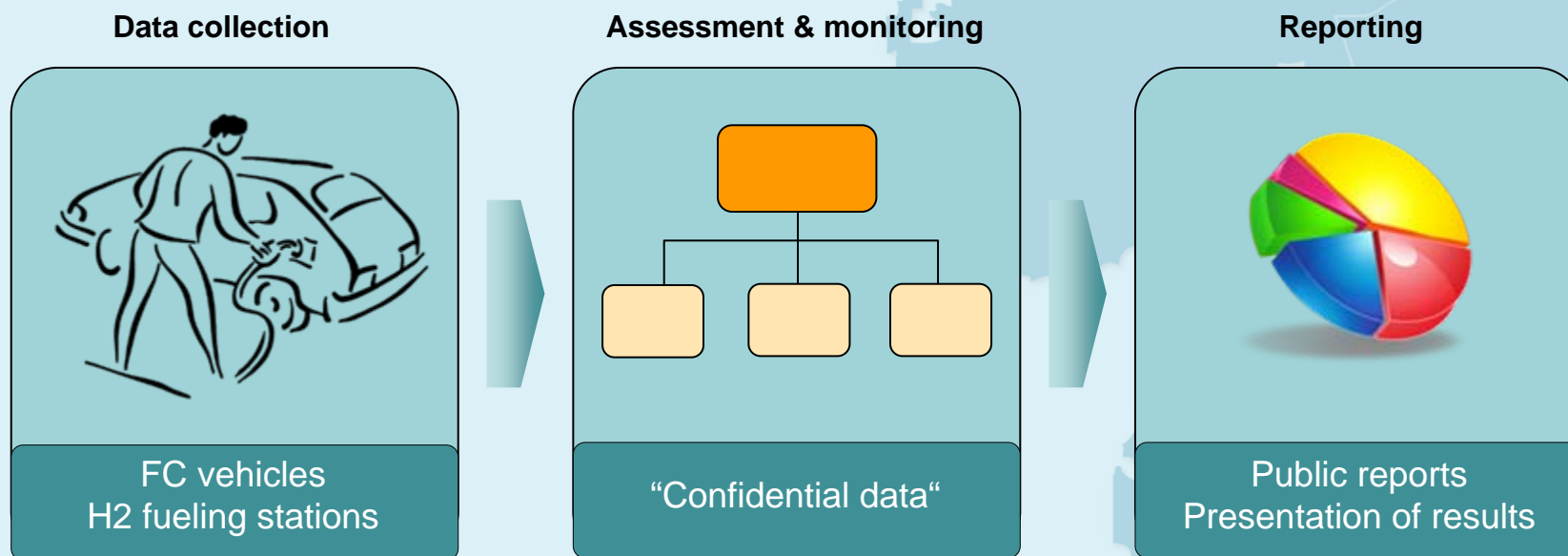
Project safety alert procedures

- Definition of safety relevant emergency mechanisms and routines for cars and fueling station as well as road tours.
- Coordination with other projects of EU demonstration project family for transport





- **Technical specifications** (are reported: e.g. vehicle speed, fuelling capacity)
- **Cumulative performance data** (are measured: e.g. travelled km, refuelled H2,...)



Guideline: HyLights MAF Handbook, developed by European industry & EC in 2008



Ambition

- Provide a more dynamic, compelling and ambitious dissemination package that actively promotes the **customer acceptance** for electric vehicles with fuel cells

Highlights

- Utilize the possibilities and outreach provided by **new and social media**
- Creation of a **Hydrogen Vehicles Drivers Club** to capture the enthusiasm and stimulate a positive attitude and media coverage
- Creation of a **Potential Candidate Regions Networking Platform** to encourage other regions throughout Europe to start their implementation of hydrogen infrastructure
- Done in collaboration with **HyRaMP**



Ambition

- Communicate role of the JTI-JU in the demonstration and introduction of FCH technology in Europe and highlight state of play in Europe
- Facilitate purchase of hydrogen vehicles and accompanying fueling infrastructure
- Market role of involved OEM's, hydrogen infrastructure and hydrogen providers

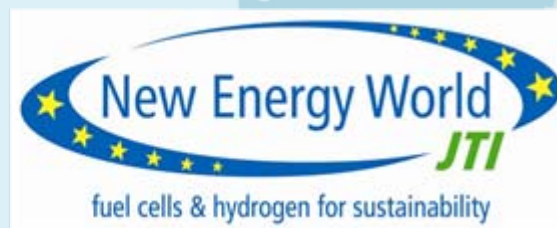


Organisation

- Highly visible road tour to 5 different EU regions with best outreach to educated stakeholders and the public
- Tour to additional regions and additional hydrogen cars possible
- Done in collaboration with HyRaMP



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