

**Lighthouse Project for the Demonstration of
Hydrogen Fuel Cell Vehicles and Refuelling
Infrastructure in Scandinavia
H2moves Scandinavia
(Grant agreement number 245101)**

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

Main objectives

- Demonstration of 17+2 latest state-of-the-art hydrogen powered FCEVs in Scandinavia (15 Oslo + 2 Copenhagen) in daily use
- Extend hydrogen refuelling station network in existing hub and demonstrate daily use of a latest state-of-the-art SAE J2601 station in Oslo
- Communicate widely, e.g. by a European Road Tour (with mobile refueler)
- Assess Scandinavia-wide state-of-play in certification (cars, stations)



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Fuel Cell Electric Vehicles (FCEV)

- **Target:** demonstration (also in harsh winter conditions) of
 - 10 sedan cars (Daimler F-CELL B-Class)
 - 2+2 further SUVs (Hyundai ix35)
 - 5 range extender city cars (basis: TH!NK, retrofit H2 Logic)
- **Hardware:**
 - 10+5 cars delivered to OSL
 - 2 (OSL) + 2 (CPH) certified & delivered
 - FCEVs in customer hands since JUN (5) and by end OCT (10)
 - workshops refurbished for hydrogen operation
 - local personnel trained
- **Certification:**
 - 10+5 cars certified (issuing local license plates challenging)
 - 2+2 cars certified (CPH/OSL)





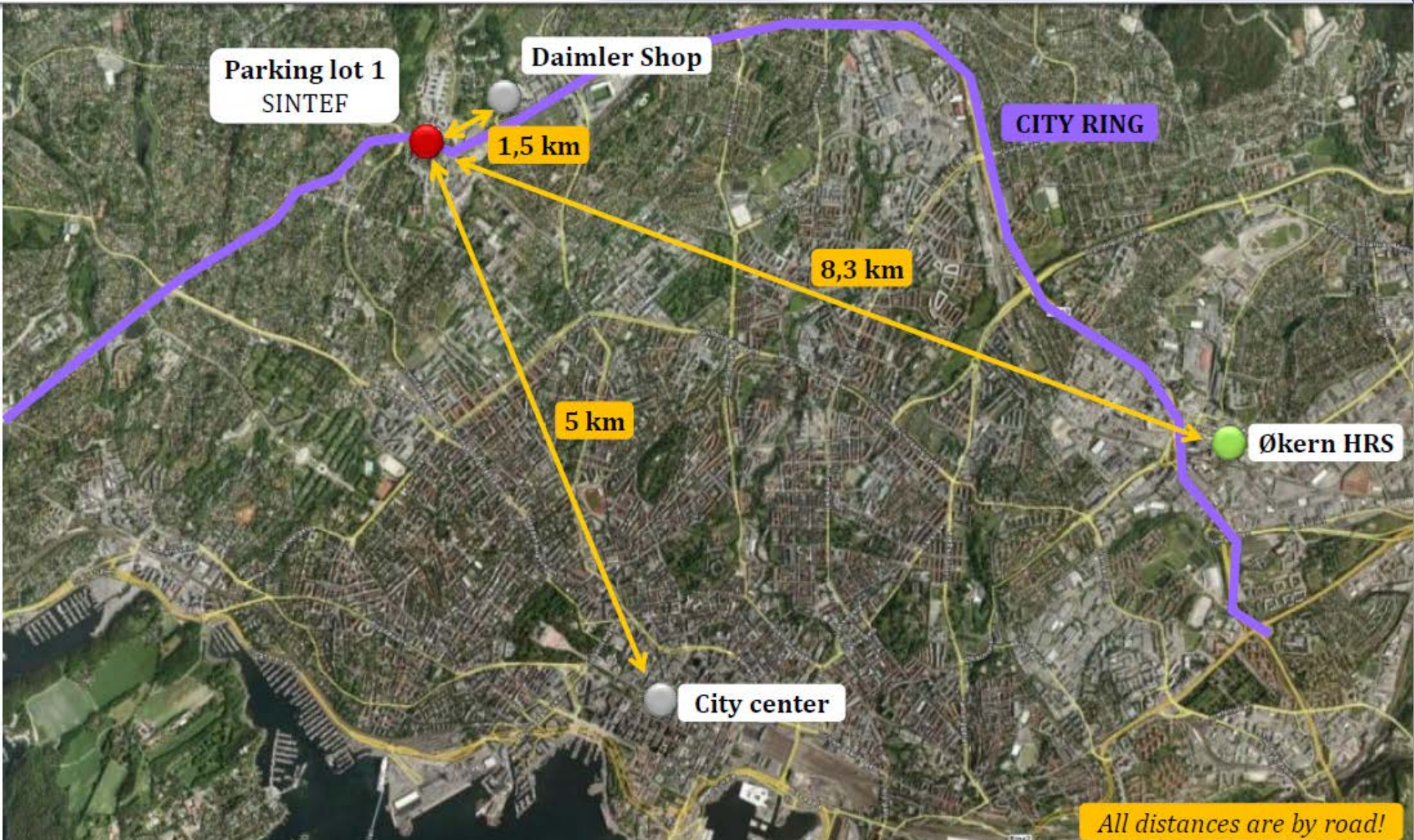
	Mercedes B-Class F-CELL	Hyundai ix35	Retrofitted TH!NK with FC range extender
Drivetrain power [kW]	100	100	FC: 25
Driving range (NEDC) [km]	380	525	250
Hydrogen storage capacity [kg]	3.7	5.6	1.5
Energy efficiency [ltr _{GE} /100 km]	3.3	3.7	n.a.
Maximum speed [km/h]	170	160	100
Acceleration [sec]	0-100km/h: 11.4	0-100km/h: 14.1	0-80km/h: 16
Payload [kg]	270 (4 pass.)	5 pass.	2 pass.



Hydrogen refuelling station Oslo at GAUSTAD

- **Target:**
 - Demonstration of latest state-of-the-art fuelling station in Oslo (700 bar, SAE J2601 A-level with pre-cooling)
- **Hardware:**
 - 200 kg/day and 20 kg within one hour corresponding to 50/5 cars, combined
 - onsite electrolysis (REN-el)/trucked in
 - positive learning from Holstebro (DK) forerunner
- **Certification and launch:**
 - (extensive) permit achieved by local OSL authorities
 - site work: SEP; shipping/delivery/operation: OCT
 - customer convenient location: Oslo West







Supporting tasks for demonstration part

- **Target:**
 - Facilitate smooth demonstration phase (challenging coordination task)
 - monitor and report hardware performance
 - disseminate widely inside & outside Scandinavia (separate slide)
- **Certification & approval study:**
 - Draft report on state-of-play for DK, NO and SE (to be updated): no major hurdles for operating cars; more standardization required across Scandinavia
 - Draft report "Safety and Emergency Plan"
- **Performance monitoring and reporting:**
 - Prepared for start of demo phase
 - based on HyLights MAF: learning expected from demo phase





End-user contracts

Cars (on local license plates):

- **Daimler F-CELL:** mostly VIP customers, or those with high public exposure, multiple customers for vehicles over time (facilitated by Bertel O. Steen)
- **Hyundai:** HyNor (OSL) and Hydrogen Link Denmark (CPH) customers for daily use with and w/o public driving and at highly visible public events
- **TH!NK range extender FECVs:** private customers (vehicles refuelling & maintenance at Lillestrøm refuelling station); vehicles with local driving radius

Hydrogen refuelling stations:

- **OSL:** Owner and operator is H2 Logic (DK), site operated by SINTEF-Oslo (N); convenient location on west side of town, where most car customers are
- **CPH:** existing station (350 bar); new hydrogen refuelling station(s) expected

Denmark



Norway





Correlation of the project with the corresponding Application Area (MAIP/AIP)

- Targets Application Area “AA1 - Transportation and Infrastructure”:
 - **2010: ~10 additional road vehicles (single site)** plus mobile deployment to sites with **existing refuelling infrastructure capable of refuelling up to 50 vehicles**
 - **2015: ~ 500 LDVs** (mainly cars) at 3 additional sites with 3 new stations
 - **H2mS: 17+2 FCEVs** in 1(2) sites with existing hydrogen refuelling station with additional refuelling station capable of refuelling up to 50 vehicles
- AIP 2008 Call text: *“At least 5 vehicles shall be provided and be operational for onsite demonstration by 2010 accompanied by at least one additional fully integrated filling station capable of serving 100 vehicles (together with the existing station). In addition, at least 2 more vehicles shall be made available and operated at different European sites. For this purpose, a logistics concept for hydrogen refuelling must also be provided.”*



Project activities & results / achievements versus MAIP/AIP targets

- **AIP 2009 targets:**

- Total cost fuel cell system < 100 €/kW
- System lifetime > 5,000 h
- Refuelling time < 5 min
- Hydrogen price at pump < 13 €/kg
- Demo of at least 10 vehicles at 1 demo site
- HRS functionality and end-user acceptance
- Certification procedures

- ▶ achievable in long-term
- ▶ achievable next gen.
- ▶ 3 min achieved
- ▶ price: YES, cost: NO
- ▶ achieved for OSL
- ▶ to be demonstrated
- ▶ covered by WP2



Project activities & results / achievements versus MAIP/AIP targets

- **AIP 2009 targets:**

- Regional collaboration (OSL) (i.e. pooling resources)
 - Role of MSMs/SMEs
 - Raise public awareness (expectation mgmt.)
- ▶ through Transnova and EUDP (CPH)
 - ▶ through H2 Logic
 - ▶ strong dissemination towards public with industry monitoring



Gaps / bottlenecks in RTD&D proposed by MAIP/AIP documents

- Extremely slow start, project suffered massively from difficult pioneering role (other causes were economic crises and BEV hype)
- Project negotiation too slow and bureaucratic (national processes much simpler, spec. in Scandinavia)
- Service type of activities funded unattractively (coordination/management, communication, performance reporting)
- No FCH JU support to align European with national or regional funds

BUT

- FCH JU funds were welcome and – together with national funds – helped to sustain the momentum in FC&H when losing a strategic industry partner



Supporting tasks for demonstration part

- **Target:** Disseminate hydrogen powered fuel cell cars widely inside & outside Scandinavia
- **Dissemination:**
 - In full swing
 - VIP Launch Event Oslo**
21 NOV 2011
 - 1st public driving Oslo**
26 NOV 2011
- **EU Road Tour:**
 - 2-3 weeks in JUN 2012
 - (inviting participation of other FCEV OEMs)



TV moderator Ole Andres` Sivertsen
Oslo Lord Mayor Fabian Stang
CEO SINTEF Unni Steinsmo
CEO H2 Logic Jacob Krogsgaard



Public Launch Event, SINTEF, Oslo GAUSTAD, 21 November 2011

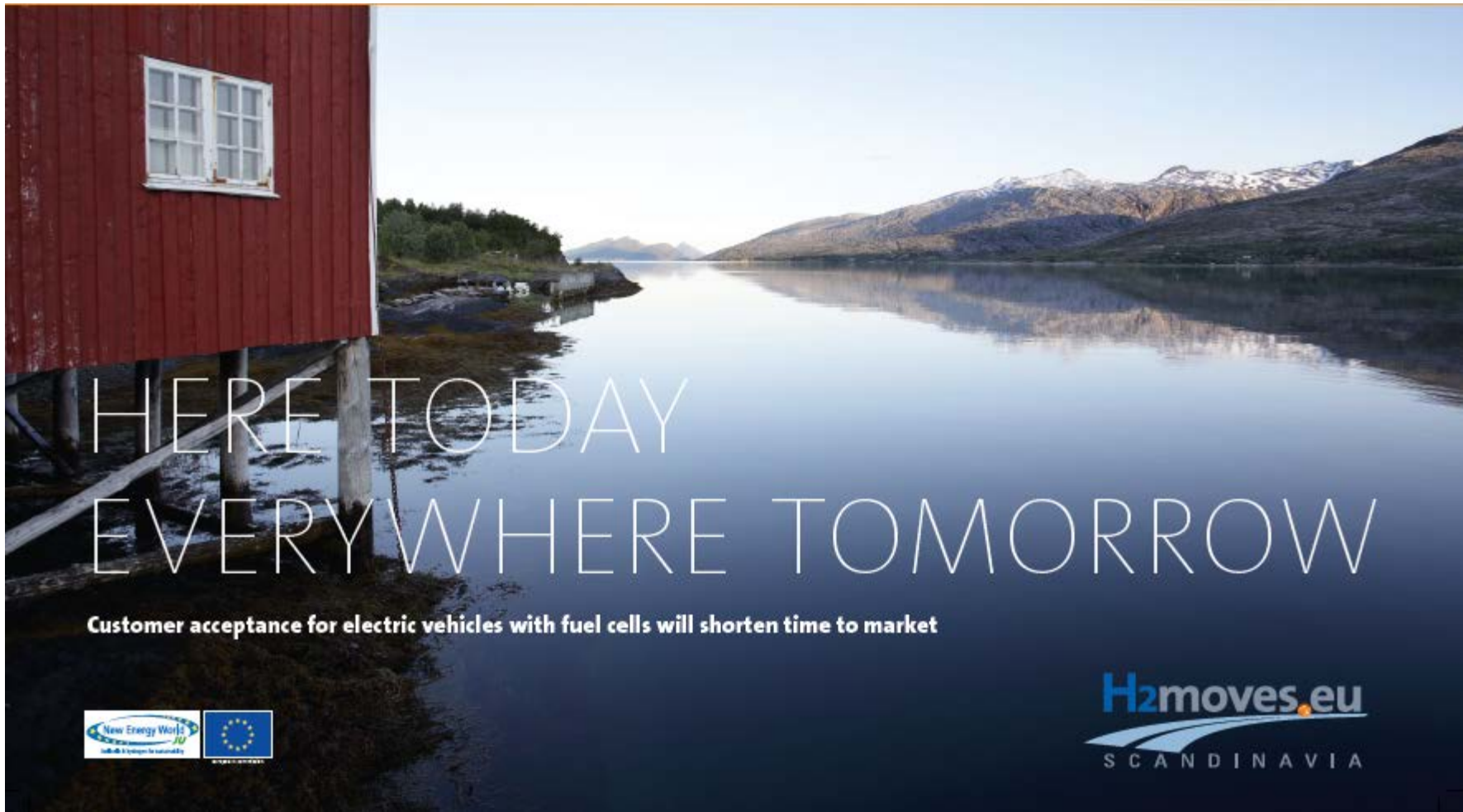


Oslo Lord Mayor Fabian Stang



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HERE TODAY
EVERYWHERE TOMORROW

Customer acceptance for electric vehicles with fuel cells will shorten time to market



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Technology Transfer / Collaborations

- Future of hydrogen and fuel cell strategy in Norway and Scandinavia secured through political support by national co-funding (N-Transnova and DK-EUDP)
- Close link of European funding agency FCH JU and Norwegian funding agency Transnova
- H2mS project embedded in Norwegian Hydrogen Highway group HyNor and Scandinavian Hydrogen Highway Partnership SHHP
- H2mS cooperation in 2nd LHP project “London-Copenhagen” through strategic infrastructure planning activity, strategic project link
- Close industry relation to AA1 via Daimler as partner and coordinator



Project Future Perspectives

- It is anticipated that project helps to demonstrate the viability of fuel cell vehicle technology under everyday driving conditions in a region with harsh winter climate
- This project helps to keep the momentum on H2&FC in Scandinavia a challenging phase (economic crisis, important industry partner pull-out, distraction by BEV strategy)
- The project specifically aims at a Scandinavia wide integration of activities with partners from DK, N and S involved
- Even though funding turned out to be a challenge, H2 Logic as SME became one of the major hardware project partners



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The project partners would like to thank the EU for establishing the fuel cells and hydrogen framework and for supporting this activity.

CO-Funded by

