www.HyLights.eu

HYLIGHTS

HYLIGHTS – TOOLS TO PREPARE THE LARGE-SCALE EUROPEAN DEMONSTRATION PROJECTS ON HYDROGEN FOR TRANSPORT

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DoE Workshop: Refueling Infrastructure for Alternative Fuel Vehicles:
Lessons Learned for Hydrogen
Sheraton Grand Sacramento Hotel, Sacramento California
April, 2-3 April 2008

HyLights wird gefördert
durch die
Europäische Kommission

Outline

- Project profile and goal
- HyLights task: cohesion of demo projects?
- Challenges identified
- HyLights tasks and first results

- Other European hydrogen infrastructure related projects
- Sample results from Germany and Norway

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Project profile

"Coordination Action (CA)" Project
6th. Framework Programme, Jan 06 – Dec 08

21 partners
Industry: 7 vehicle, 5 oil, 2 utility, 3 process; 4 institute

Funding
~ 4 M€ and additional funds from industry

Focus by (international) expert reviews

Executive Advisory Board (EAB)

Associated partners (German Transport Ministry, Chevron)

IPHE liaison project

Ludwig-Bölkow-Systemtechnik

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Goal

Assist the European Commission and European industry to plan the large-scale demonstration projects of the 7th Framework Programme (FP7) and Joint Technology Initiative (JTI) by

- the development of **assessment tools** and
- **supporting advice** on relevant key issues.

Focus

Demonstration activities on „Hydrogen for Transport”

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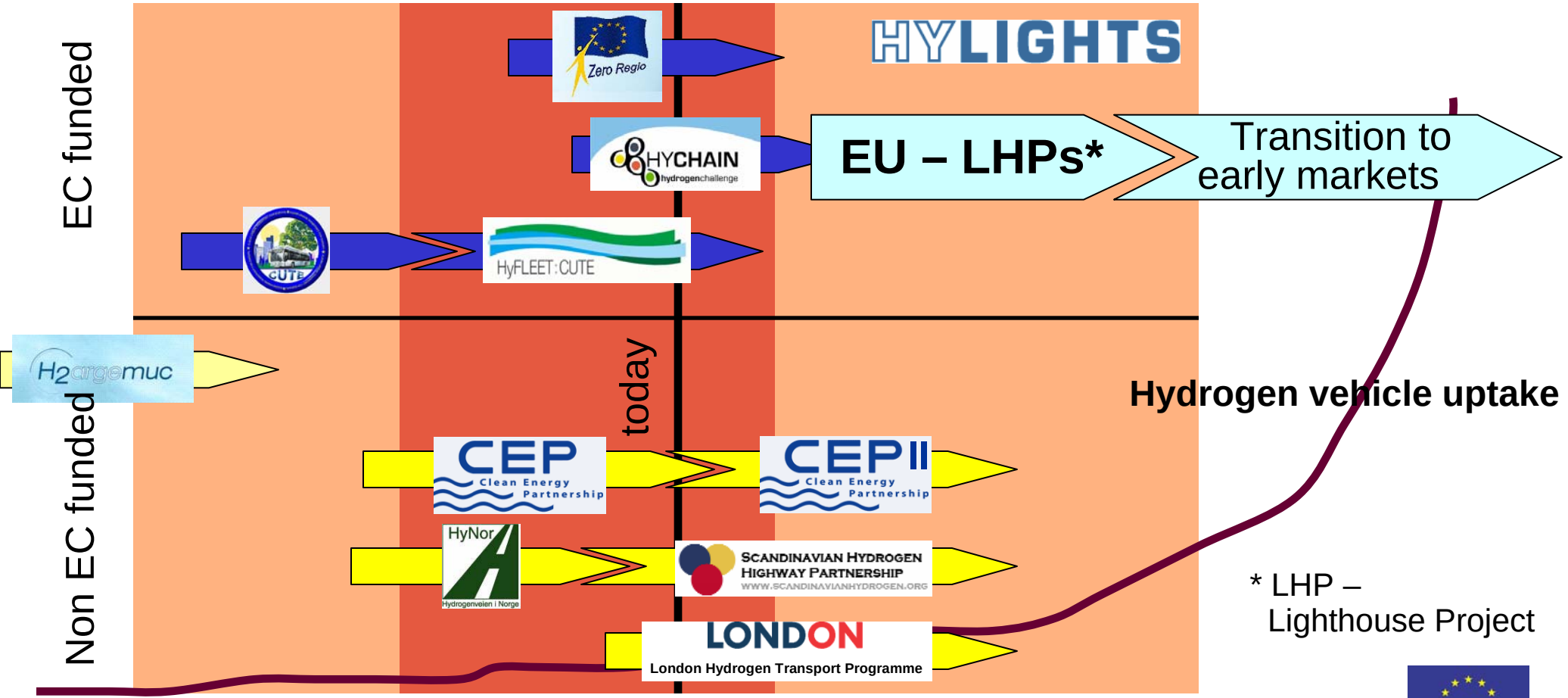
HyLights task: cohesion of demo projects on H_2 for transport

Learn from past projects *Provide advice/tools for future projects*

Support ongoing projects



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Challenges identified when kicking off HyLights

Missing overview / coherent learning from large number of individual demo projects!

Missing overview of regional strategies and relevance of activities and funds!

No comparability of project performance, no broadly accepted monitoring&assessment framework as foundation for EC or national/regional project negotiation!

Missing international benchmarking of strategies for demo projects!

Diverging regional and industry‘s interests asking for alignment under joint EU roof! Foster a more positive approach by “expectation management“.

Unknown performance level and user demand of vehicles and refuelling infrastructure in the transition from demo phase to first commercial markets! Benchmarking required.

Missing knowledge on project governance, IPRs and legal issues!

No clear picture of required policy support mechanisms to effectively introduce hydrogen and fuel cell vehicles in demo phase and first commercial market phase!

Missing coherence of EU actors and different level of commitment in industry!

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HyLights task list

- Report on concluded / ongoing demo projects
- Overview active regions in Europe
- Monitoring & Assessment Framework (MAF)
- Gaps analysis for H_2-vehicles and –infrastructure
- Legal and project management issues in demo projects
- Assessment of policy support issues (demo projects, early markets)
- Support to the project family “Hydrogen for Transport”

H2moves.eu

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Projects Assessed by HyLights (to be expanded)

Project	Vehicles	Fuel stations	Hydrogen refuelled	
H2argemuc	4 ICE buses, 1 FC bus 1 ICE car, 1 fork lift	1	138,000 kg	past
ECTOS	3 FC buses	1	17,342 kg	past
CUTE	27 FC buses	9	> 192,000 kg	past
Zero Regio	5 in D & 3 in I FC cars	2	> 500 kg	ongoing
HyFLEET:CUTE	9 (+24) FC buses, 7 (+7) ICE buses	2 (+8)	227,252 kg	ongoing
CEP Clean Energy Partnership	16-24 FC and ICE cars, 1 FC bus	2	N.A.	ongoing
HYCHAIN hydrogenchallenge	34 wheelchairs, 40 cargobikes 30 scooters, 44 utility vehicles 10 midibuses	N.A.	0*	ongoing (planned)
HyNor	15 (+30) ICE cars, 0 (+5) FC cars 0 (+8) H_2 buses	2 (+6)	N.A.	ongoing (planned)
LONDON London Hydrogen Transport Programme	10-12 H_2 buses, 60 H_2 cars, vans, motor bikes and other vehicle types	tbd.	0*	ongoing (planned)

(decommis-sioned)

* hardware in preparation

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Overview active regions in Europe

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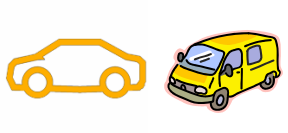
Ongoing and planned (2007 - 2015) demonstration activities



Region	Timeframe	Vehicles & Vans [e/p]	Buses [e/p]	Other vehicles [e/p]	Marine	refueling stations [e/p]
Berlin	2007-2016	17 / further vehicles	15 / 100-105 further buses	…	.../ 1 FC boat	2
Hamburg	2007-2020	1 / 40-50 vehicles	9 / 100-125 further buses	3 / +25	1 / 2 further boats	2 / 2
Nordrhein-Westfalen	2007-2011	0	3 / +8	1/50-100 (HyCHAIN)	…	2 (1 mobile,1*) / 1
Rhein-Main	2007-2012	2 / planned H2/NG fleet	plans	…	…	1
London	2007-2015	6 / +60	3 / +10-12	10	…	2 / several stations
Wales	2007-2015	… / 5-35 (H2/CNG)	1	…	1	1
Piemonte	2007-2015	3	1	10 in preparation	…	1 / 1
Lombardia	2005-2010	10 (H2/CNG)	2 (FC hybrid)	1	…	1 / 1
Toscany	2007-2010	… / fleet tests	1	…	…	1 / 2
Abruzzo	2007-2015	… / fleets (Methane/H2)	…	…	…	… / 1
Emilia-Romagna	2006-2011	…	…	1 / 22 (HyCHAIN)		… / refuelling facility
SHHP plans	2008-2015	… / 500	… / 100	… / 500	…	3 / 15 installed + 30 satellite
South Norway	2007-2012	15 / 5	plans for buses	…	…	2 / 4
West Sweden	2007-2012	1 / 10 (ICE)	2 / +100	0	…	1/1
West Denmark	2007-2012	…	…	6 / further LDVs	…	1 (2008) / 7
South Holland	2007-2012	…	… / 25-30	…	…	… / 1
Amsterdam	2007-2010	…	3 / further buses	…	… / 1 canal boat	2 / 1
Arnhem	2007-2010	… / 3-5	planned	planned	…	… / 1
Reykjavik	2007-2012	12 / up to 30 vehicles	3	1	… / 1	1
Luxembourg	2003-2007	…	3	…	…	1
Valencia	2007+	planned	planned	Planned	…	... /1
Castilla y León	2007-2011	… / 4	… / 2	30 / 45 (HyCHAIN)	…	HyCHAIN refueling facilities
Aragon	2007+	planned	… / 3	planned	…	... /1
Barcelona	2003-2007	…	3	…	…	1
Madrid	2003-2010	…	3 / 2	…	…	1
Rhône-Alpes	2007-2011	…	…	47 (HyCHAIN)		2 (1 mobile)
Nord Pas de Calais	2005-2008	…	2	…	…	1
Provence-Alpes Cote d'Azur	2012+	planned	planned	…	planned	…
Midi-Pyrénèes	2005-2008	…	3	…	…	1

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HyRaMP – EU Regions & Municipalities Partnership on H_2&FC

- **10 October 2007**
  The European Commission (EC) organises a Regions Workshop at the Technical Review Days in Brussels and announces to facilitate the establishment of a Regions representation in the to-be-established Joint Technology Initiative
- **10 November 2007**
  A Task Force Regions (TF) is formed with 8 volunteering regions to prepare the Statutes and the constitution of HyRaMP, HyLights becomes TF coordinator
- **14 April 2008**
  Constitutive Meeting of HyRaMP with high level representatives of the regions and the EC

HyLights motivation: support mutual understanding of regions and industry, “Expectation Management”

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Monitoring & Assessment Framework

*Handbook for the **European Commission** and **industry** for the assessment of demonstration projects as part of the European hydrogen and fuel cell strategy (input for project negotiation).*

*Sound basis to **compare project performance for demonstration projects** on hydrogen and fuel cells for road transport (vehicles and infrastructure).*

*To assess performance at **demonstration project level** (project governance, technical, operational) and **demonstration program level** (fulfillment of policy goals security of supply, mitigation of GHGs and international competitiveness).*

Template for Technical Vehicle Specifications Status: 20 December 2006, v1.0

Vehicle identification:
Date:
Name:

(PI-#)	ISSUE	UNIT	DATA
Vehicle			
(V-1)	Maximum constant speed	km/h	
(V-2)	Acceleration 0-50 km/hr (car)	s	
	Acceleration 0-60 km/hr (bus)	s	
	Acceleration 0-100 km/hr (car)	s	
	Elasticity 80-120 km/hr (car)	s	
(V-3)	Driving range	km	
Drivetrain			
(V-4)	Volumentric power density	l per kW	
	Gravimentric power density	kg per kW	
(V-5)	Ambient temperature limits for vehicle operation	min°C max °C	
Hydrogen storage			
(V-6)	Maximum hydrogen storage capacity of the vehicle	kg of H_2	
(V-7)	Energy density of the hydrogen storage system	w%	
		kg per liter	
(V-8)	LH_2 storage autonomy time of the vehicle	days from 50% state of filling to remaining range of 20 km	

Monitoring & Assessment Frameworky — funded by the European Commission

Template for Technical Hydrogen Refuelling Station Specifications Status: 20 December 2006, v1.0

Date:
Name:

(PI-#)	ISSUE	UNIT	DATA
Filling station			
(I-1)	Total number of hydrogen dispensers	#	
	Total number of H2 fuelling nozzels at the HRS	#	
	Total installed dispensing capacity at the HRS	kg per h	
	Total hydrogen onsite production capacity	$kg_{(H2)}$ per day	
(I-2)	Footprint of the total fuelling station (LxW)	m x m Description	
	Footprint of the onsite fuel production unit (LxWxH)	m x m x m Description	
On-site fuel storage			
(I-3)	Boil-off rate of LH2 storage	$g_{(H2)}$ per day	

Monitoring & Assessment Frameworky — funded by the European Commission

HRS = Hydrogen Refuelling Station

Gaps analysis for H_2-vehicles and infrastructure

Central question for HyLights industry partners (= OEMs):

"Who will be willing to pay more for hydrogen vehicles and which is the underlying motivation to bridge the gap between lighthouse projects and early commercialization phase?"
"How much (money), How many (vehicles), Who (customers) and Why (motivation)?"

- Evaluate today's operational characteristics on qualitative and quantitative basis such as daily driving range, travel and refuelling patterns
- Specifications for infrastructure
- In-depth interviews with fleet operators of any kind (city fleets such as cleaning, gardening, etc. and private fleets) in the committed regions
- Comparison of vehicle/refuelling station data with conventional vehicles/refuelling stations

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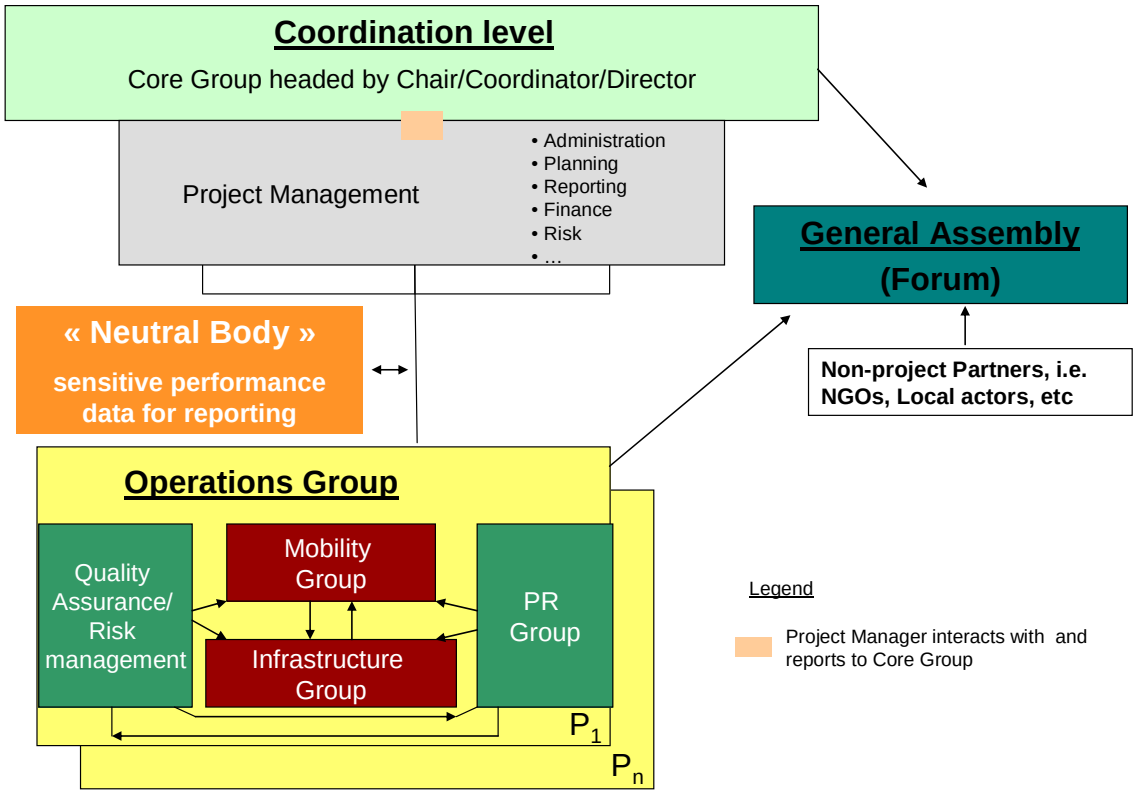
Legal and project management issues in demo projects

Analysis on **legal & contractual forms** of cooperation (PPPs) for the realisation of H2 road transport demonstration projects (LHPs); **benchmark** of advantages & disadvantages

Knowledge on efficiency and effectiveness of different **project management structures**

Indicative list of key **"Project Governance Indicators"** for future LHPs

Program Management – Comparison with other EU JTIs and U.S. DoE Hydrogen Program



Proposal for generic project organisation structure

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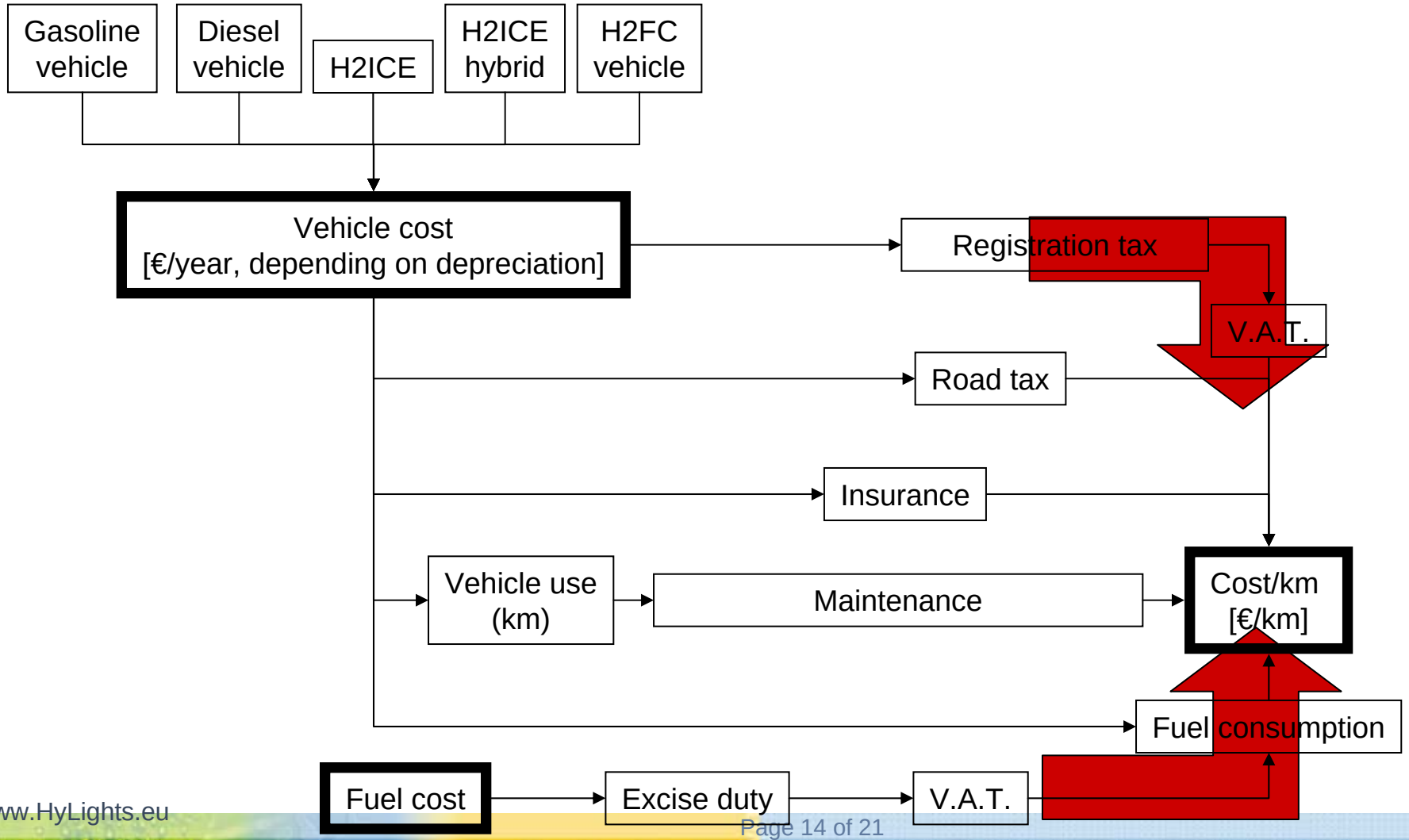
Assessment of policy support issues (1)
(Demo projects, first markets)



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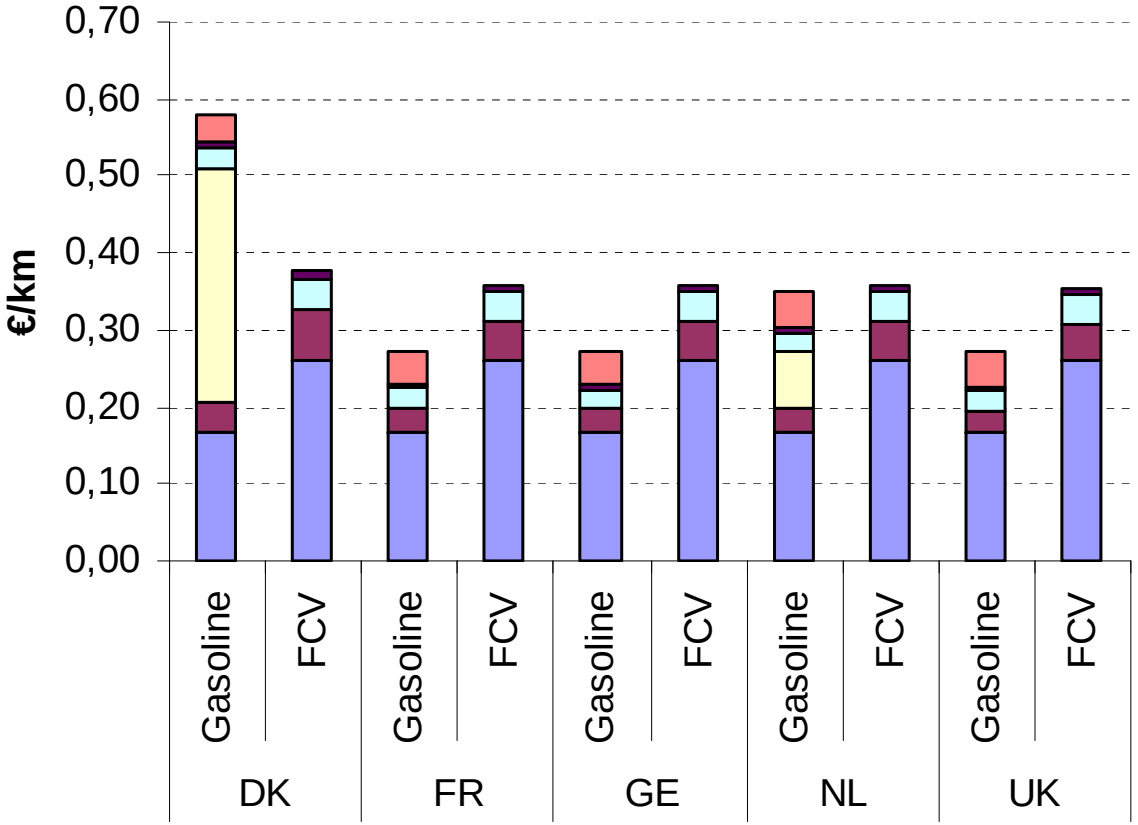
Assessment of policy support issues (2)
(Demo projects, first markets)

Example: Driving costs for gasoline vehicles in Europe in early markets
(with de-taxed alternative vehicles)



First observations:

- Differences in vehicle costs have large impact on €/km cost
- Impact increases in countries with vehicle registration tax
- Fuel cost impact is of second order

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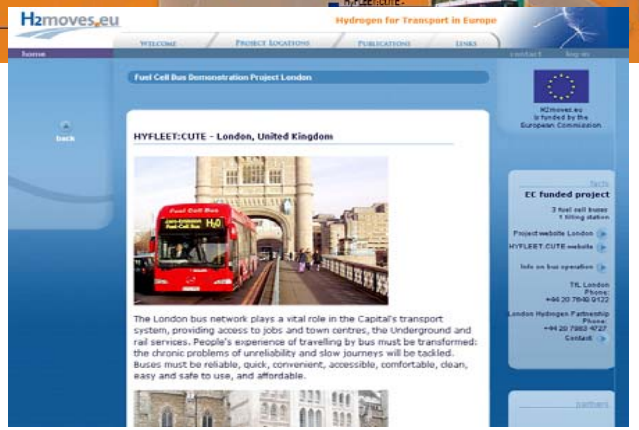
Support to the project family “Hydrogen for Transport”



H2moves.eu

Other European hydrogen infrastructure related projects

Selected projects

HyWays [Europe, 2004 – 2007]

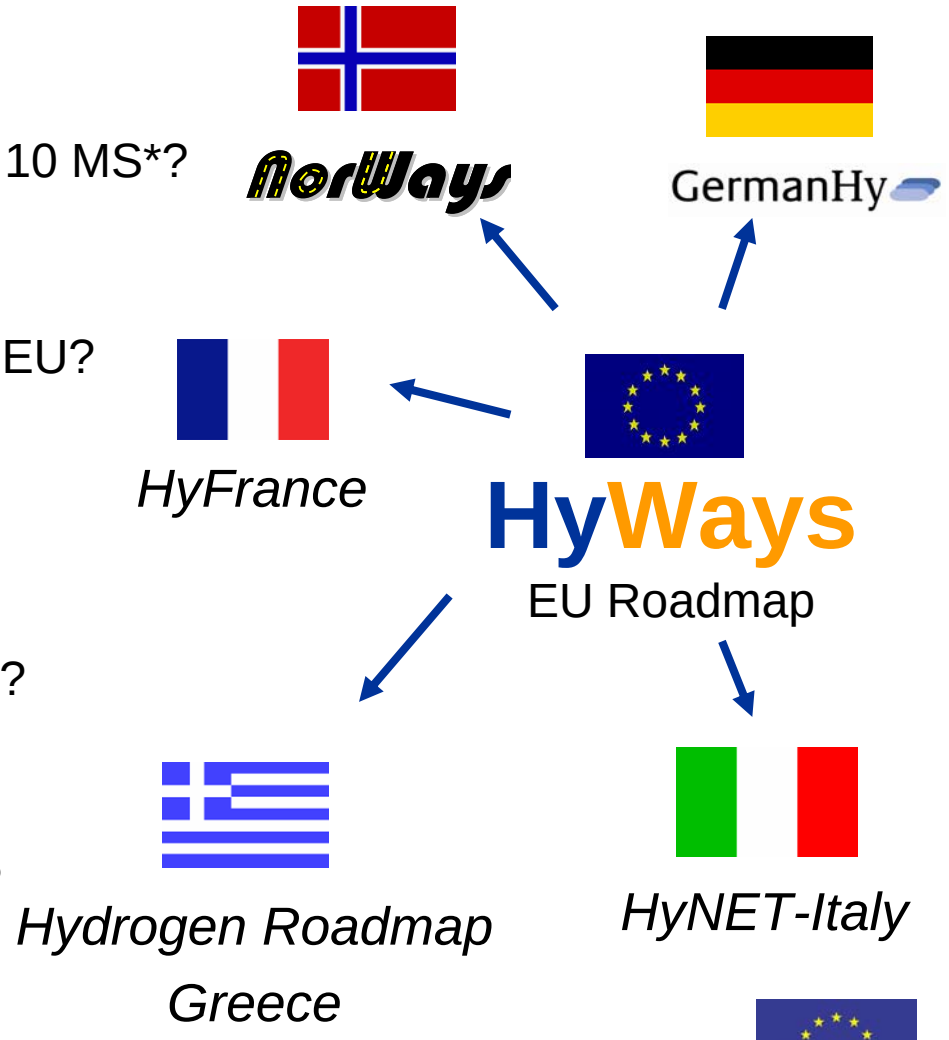
- How will the hydrogen demand develop in 10 MS*?
- How will the infrastructure be built up?
- What are economic and social impacts?
- How do the regional views diverge across EU?
- Which are relevant policy measures?

GermanHy [Germany, 2007-2008]

- Specifically addressing reduced fossil fuel availability or emission constraints:
- Where will hydrogen come from until 2050?
- How will the infrastructure emerge?

NorWays [Norway, 2006 – 2008]

- How will the infrastructure emerge locally?
- Is export of hydrogen a relevant option?



* MS – member states

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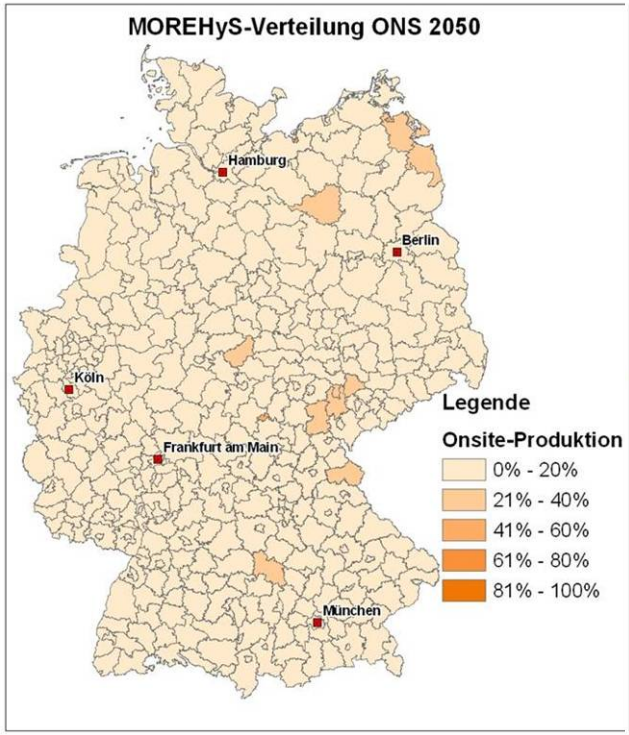
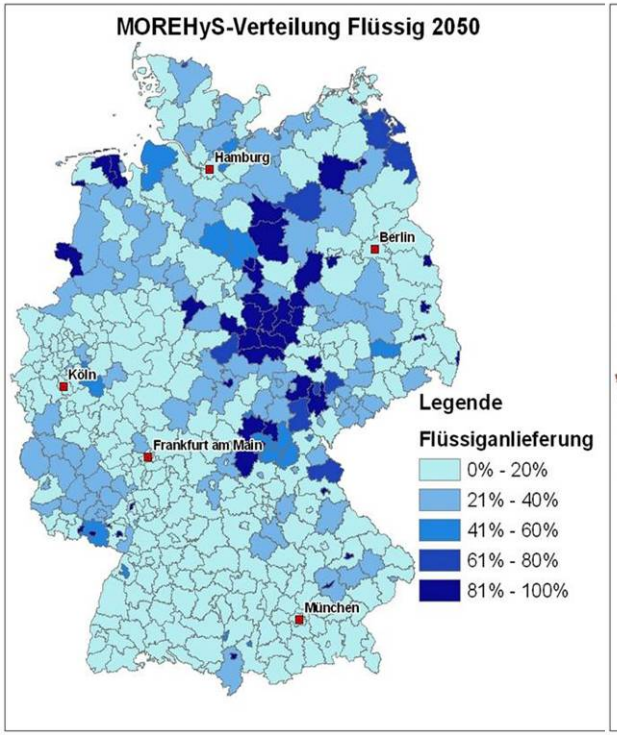
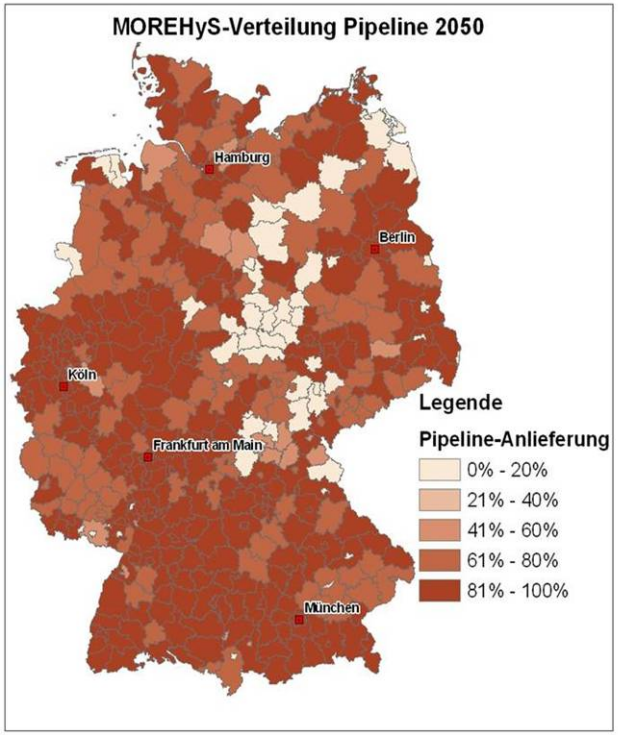
Infrastructure evolution for Germany (*onsite* vs *liquid* vs *piped*)

Preliminary information







[Source: GermanHy 2008]

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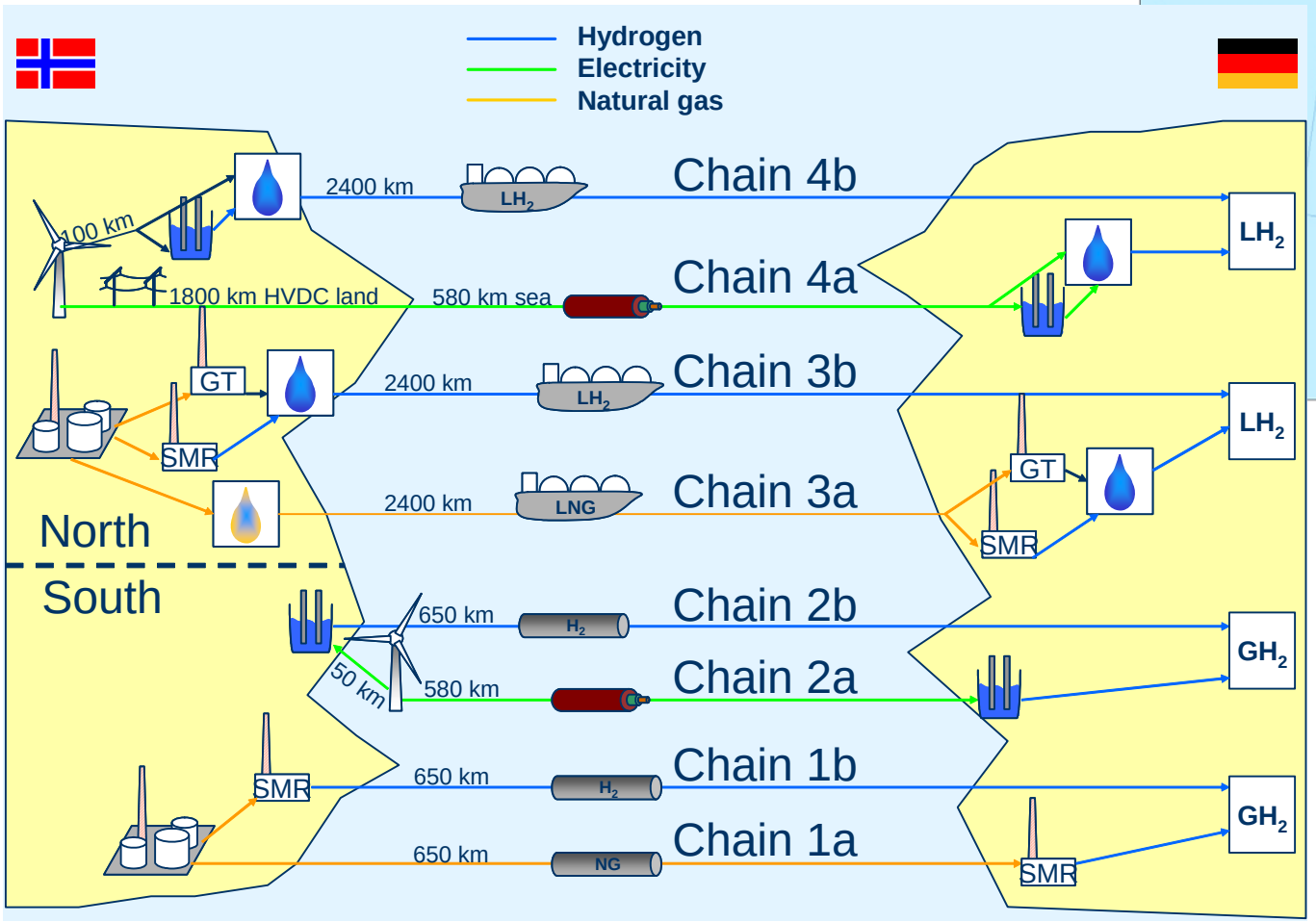
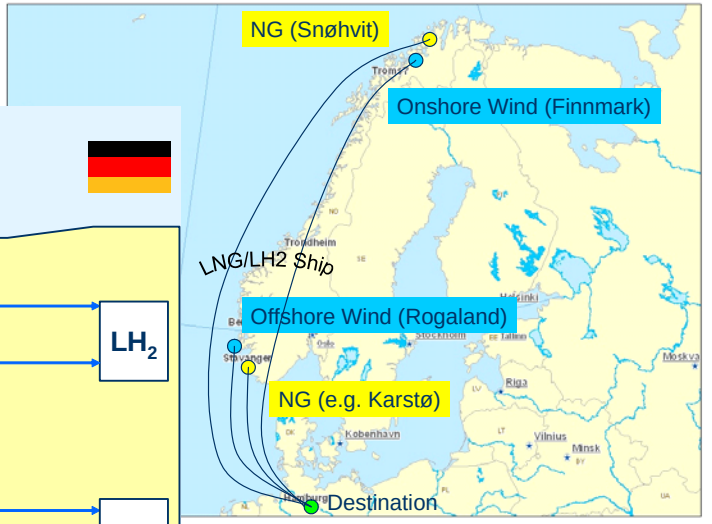
Hydrogen export chains from Norway to Germany

Preliminary information





[Source: NorWays 2008]

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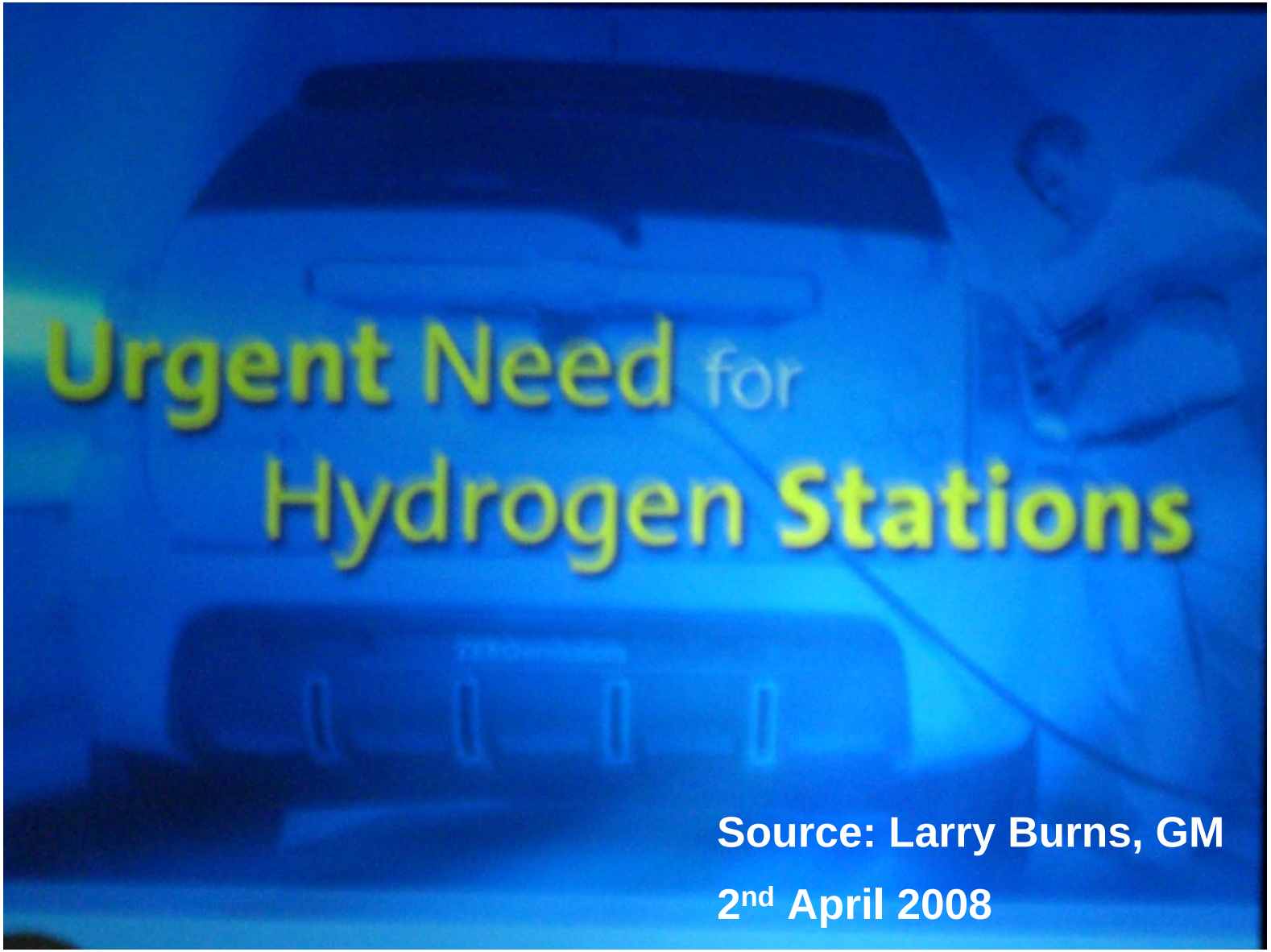

Source: Larry Burns, GM

2nd April 2008

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Relevant websites

HyWays – ***The European Hydrogen Roadmap***

4 final documents + full background documentation

www.HyWays.de

HYLIGHTS – ***Preparation for the European demo projects*** *(H_2 for transport)*

Project database and intermediate reports (full background reports on request)

www.HyLights.eu

H2moves.eu – **The project family of European demo projects**

Regions database

www.H2moves.eu

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