HyTrEc

Hydrogen Transport Economy for the North Sea Region

HYDROGEN EDUCATION – VEHICLES 2

2015

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FUEL CELL VEHICLES

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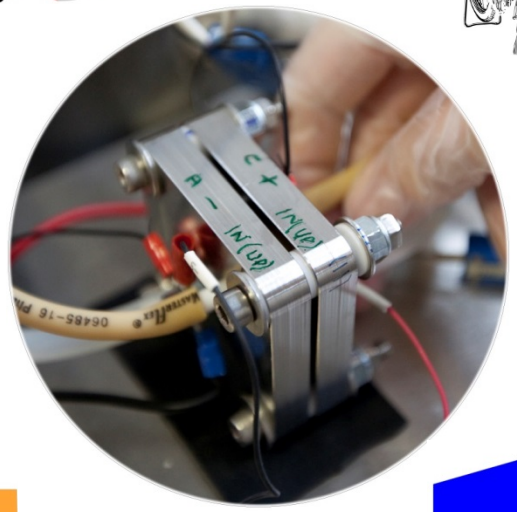

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FUEL CELL DEVELOPMENT FOR VEHICLES

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- Weight
- Energy density
- Cost

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AUXILIARY POWER UNITS

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FORKLIFTS

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BUSSES

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SYNERGIES AMONG ENERGY SOURCES

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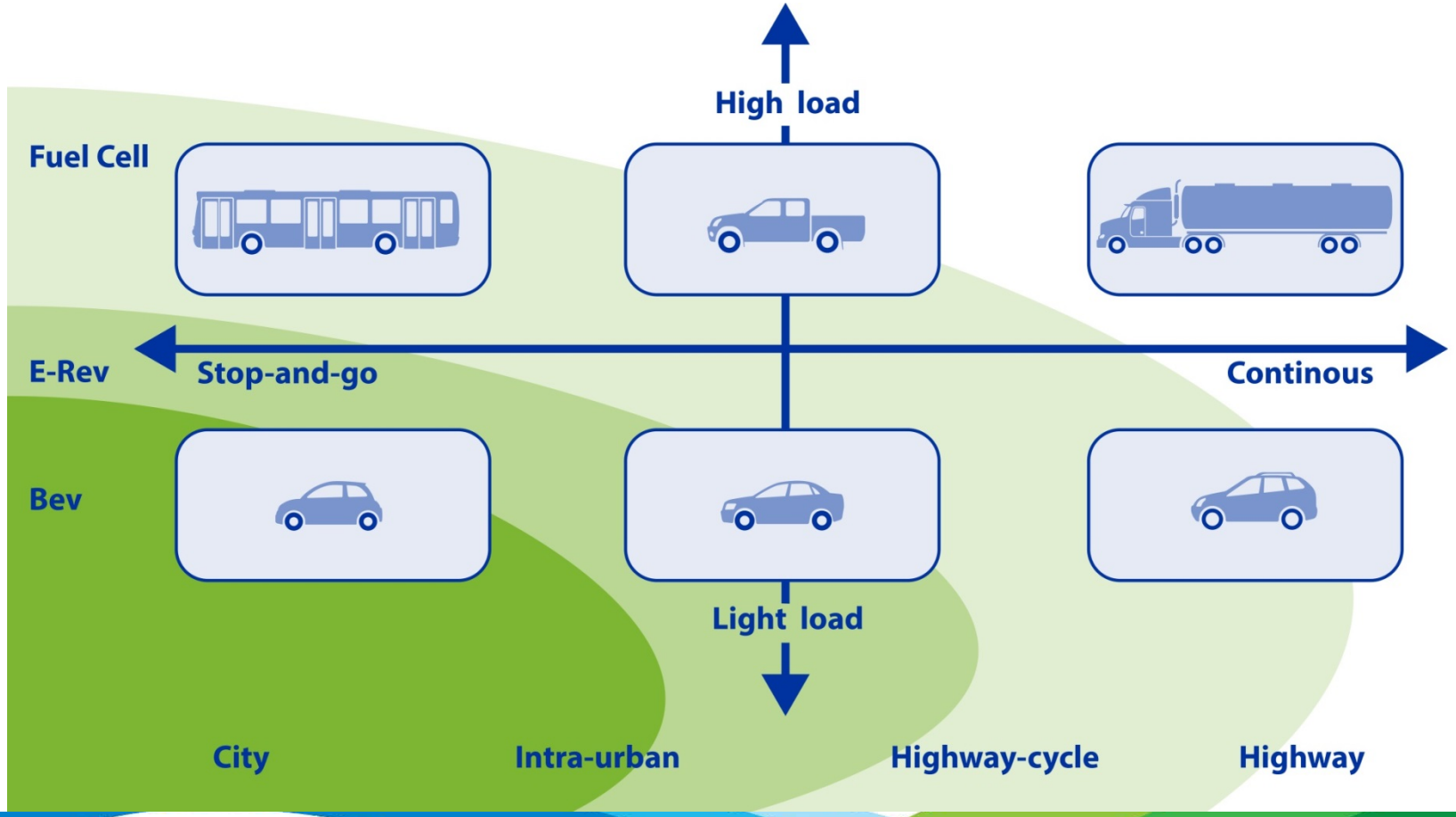

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COMPARISON BETWEEN HYDROGEN, ELECTRIC AND GASOLIN

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	HYDROGEN	ELECTRIC	GASOLIN
Mass energy (1kg)	100 km	1 km	30 km
Refueling time	minutes	hours	minutes
Driving range	500 km	100 km	600 km
Infrastructure	Demo-stage	Charge at home	Well established
Exhaust	H_2O	Nothing	CO_2 and more

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RUNS BELOW FREEZING?

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"One report witnessed a car starting as normal at -27 C"

Source: EU-project "H2Moves Scandinavia"

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POWER MANAGEMENT

Fuel cells and batteries complement each other

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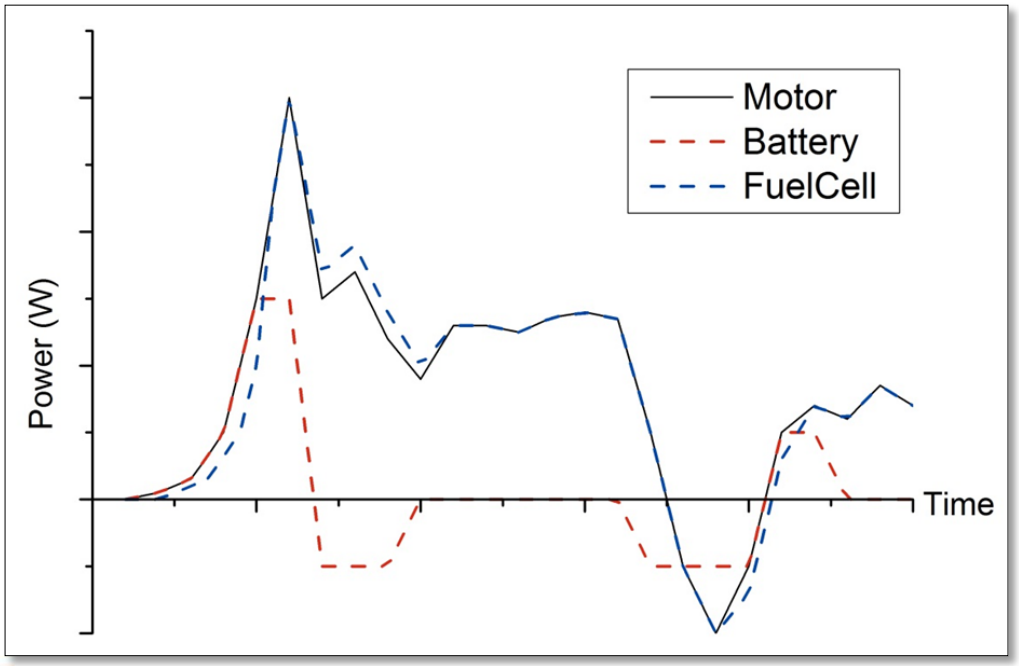

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CAR MANUFACTURES DEVELOPING FUEL CELL CARS

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* **Honda**
* **Hyundai**
* **Toyota** + BMW
Ford + Daimler + Nissan
Audi
Chrysler
Fiat

General Motors
Kia
Mazda
Mitsubishi
Peugeot
Renault
Volkswagen

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FUEL CELL POWER TRAIN

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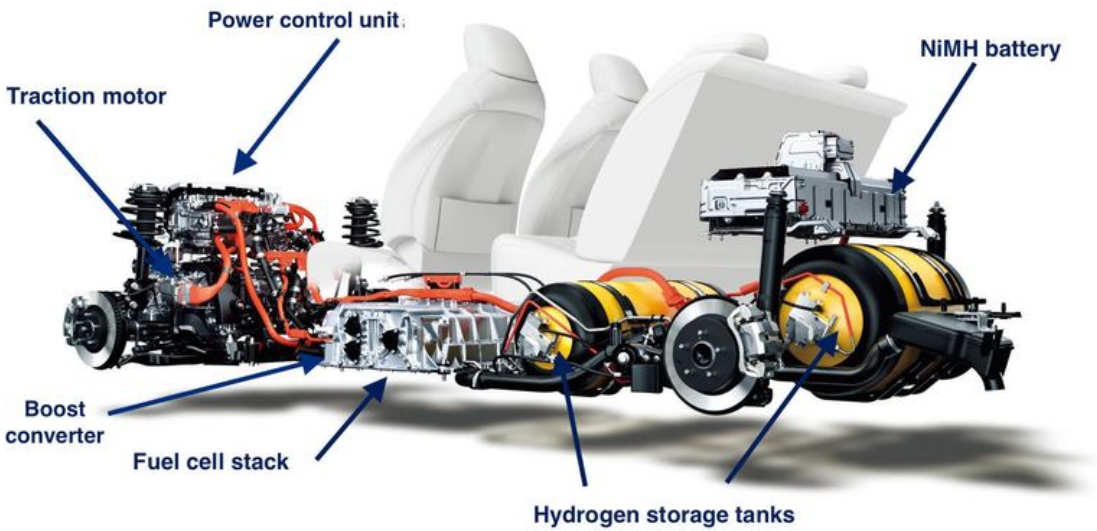

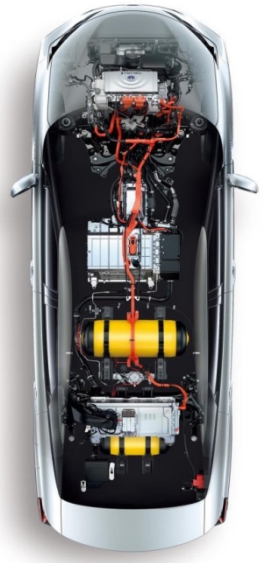

Toyota FCV Mirai

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EU DIRECTIVE

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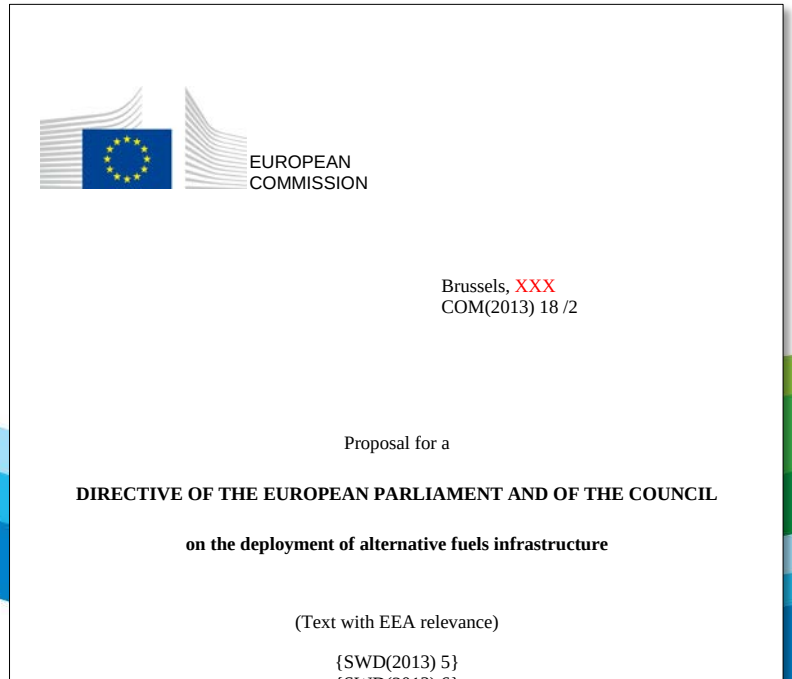
The clean power for transport package.

- Goal for year 2020
- Cover H_2, biogas and electricity
- Gas station within 300 km
- 14 countries



EUROPEAN COMMISSION

Brussels, XXX
COM(2013) 18 /2

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the deployment of alternative fuels infrastructure

(Text with EEA relevance)

{SWD(2013) 5}

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INFRASTRUCTURE IN EUROPE

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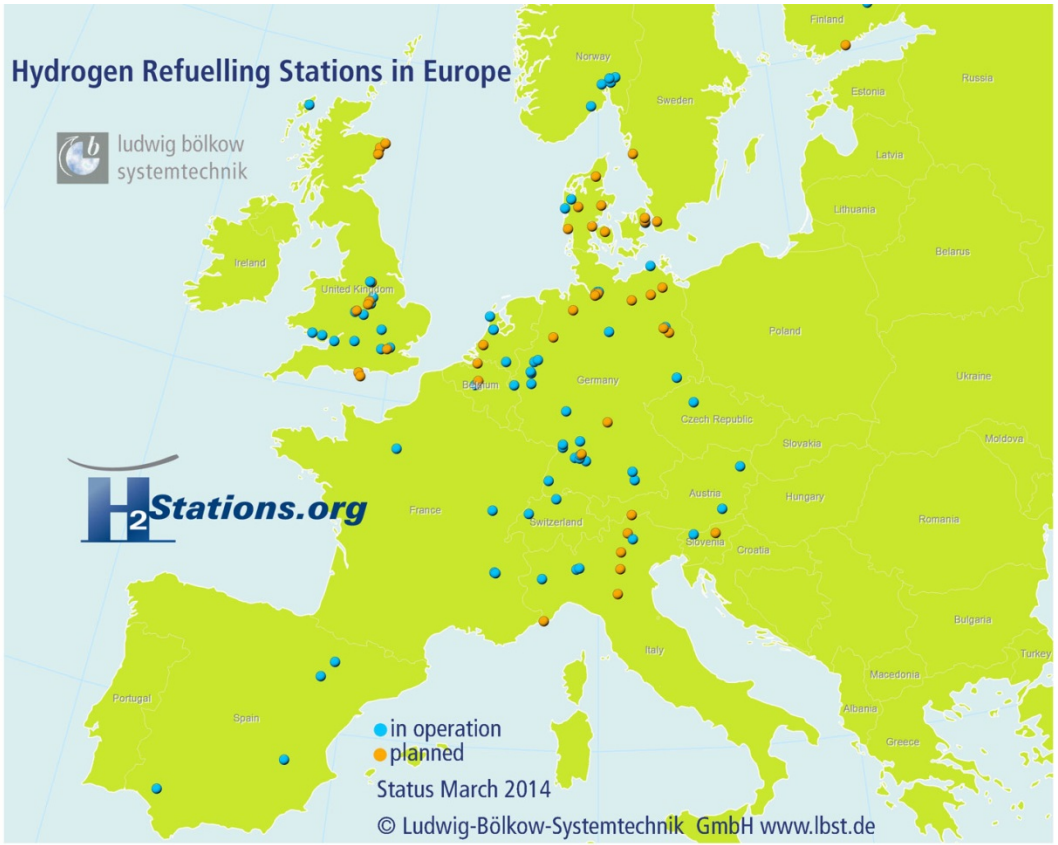
- 75 fueling stations in Europe
- 10 fueling stations in Scandinavia



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FUELING STATIONS

- International standard
- Safety comparable with biogas stations

- 3 min fueling time for cars
- Fueling busses at 35 Mpa (350 bar) and cars at 70 Mpa (700 bar)

- Possibility to produce hydrogen on site – No fuel transportation needed

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GROWING INFRASTRUCTURE

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- Germany, USA, Japan and South Korea has a national plan
- Scandinavian Hydrogen Highway Partnership Cooperation in the Nordic European countries

ESTIMATED COSTS 2015

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Cars

- € 50-60 000/year

Fueling stations

- 20 kg/day 20 MSEK (2 M€)
- 1000 kg/day 80 MSEK (8 M€)

Hydrogen

- Today 10 €/kg –> 0.1 €/km
- Future cost for end user comparable with other fuels?

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