



Towards commercial deployment plans

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1. Budget (EC contribution) :

budget : 665 M €

administration : 19 M €

7 calls : 2014 – 2020

+ IG additional activities

2. Funding rates :

	Direct cost	Indirect cost flat rate of direct cost
R&I	100 %	25 %
I	70 %	17,5 %

3. Funding distribution :

	Research and Innovation	Innovation	Total
Transport	94 (±5)	213 (±10)	307
Energy	94 (±5)	213 (±10)	307
Cross-Cutting			32 (5%)
Total (in M€)	192 (29%)	426 (66%)	646

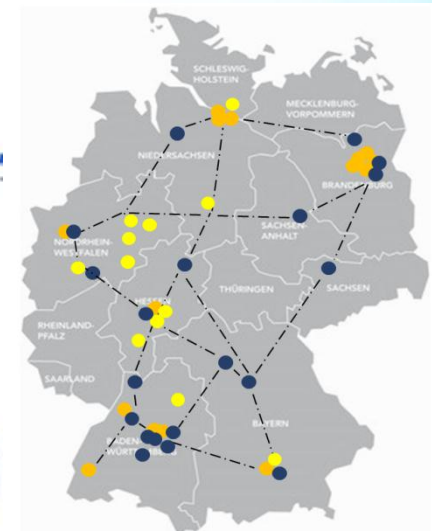
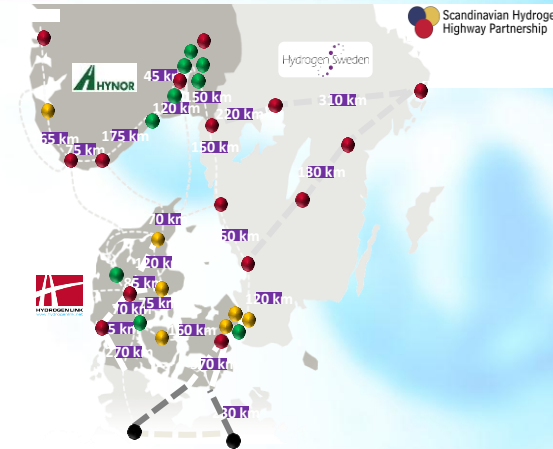
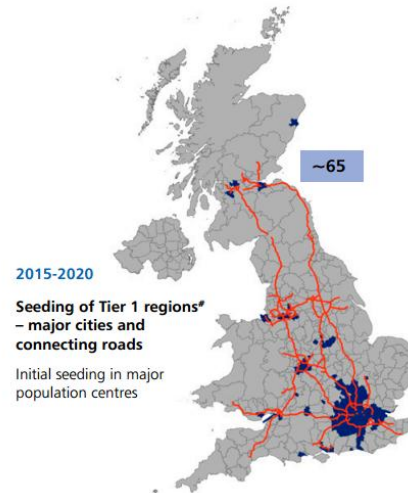
4. Objectives (transport & energy)

- reduce the (production) cost
- increasing the lifetime
- increase the efficiency
- demonstrate (large scale) hydrogen as RES integration and energy storage medium
- reduce ‘Critical raw materials’

FCH cars and HRS

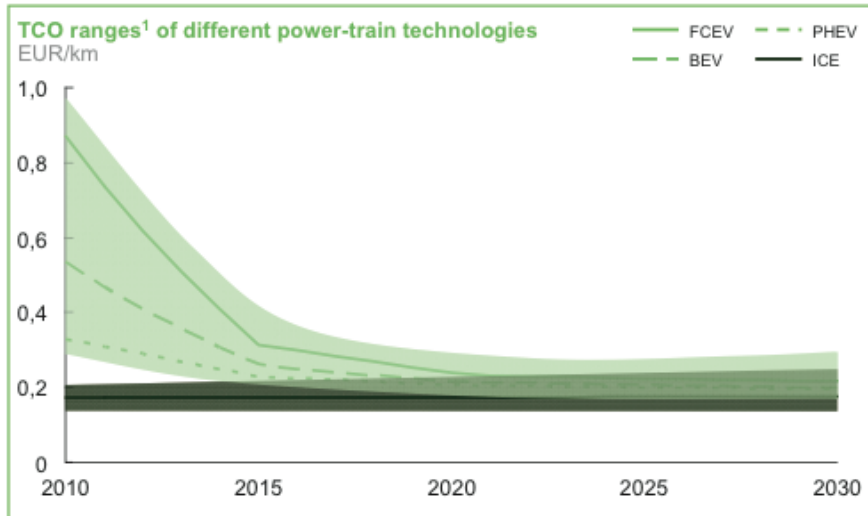
Advanced FCEV and HRS programs

- **France** – a large private consortium has agreed a strategy based on a transition from captive fleets to nationwide infrastructure for FCEVs.
- **Germany** –
 - 50 H2 stations by end of 2015 under the Clean Energy Partnership. Government and industry invest jointly over 40 M€.
 - the H2Mobility project has already signed a “term sheet” linking six industrial players to deploy 100 stations by 2017 and 400 by 2023 for 350 M€.
- **Scandinavia** – An initial network provides coverage for FCEVs, which can be purchased at equivalent ownership cost.
- **UK** – a consortium with significant Government presence has agreed a strategy based on seeding a national network of 65 stations by 2020. 7.5M£ have been committed by the Government for 15 HRS by 2015.



Similar initiatives are starting or running in other countries: **Austria , Belgium, Finland, Netherlands** (plan to be published before the end of 2014), **Switzerland**.

FCH cars and HRS



EU HRS infrastructure by 2020

- 250¹ units at 1M€/unit & 0,1M€/Y

FCEV in EU by 2020

- 100.000 cars at 50.000 €/car
- Current price : 65.000 € – 100.000 €

¹ Numbers are indicative and based on public statements from each initiative

possible FCH JU funding for EU HRS infrastructure :

- 75 HRS at 70 % + 2 year opex : 60 M€
- remaining 175 HRS by CEP, CEF, national governments (ref CPT)

possible FCH JU funding for FCEV :

- estimated 2000 cars at 70 % with max (FCEV at 500 €/kW and FCEV RE² at 2000 €/kW) : 60 M€
- remaining 98.000 FCEV ?

Current study

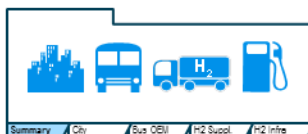


- Local high-level cost analyses
- Mobilisation of interested locations
- Preparation joint procurement



- Engineering of H₂ refueling infrastructure

2014-2015



- Detailed cost analyses



- Grant application for demo project



- EU roadmap/discussion on regulation

2016



- Execution of demo projects

Scale effects
Incentives
Regulation

- Local, national and EU funding schemes for demos



- Regulations framework to support roll-out

2017-2020

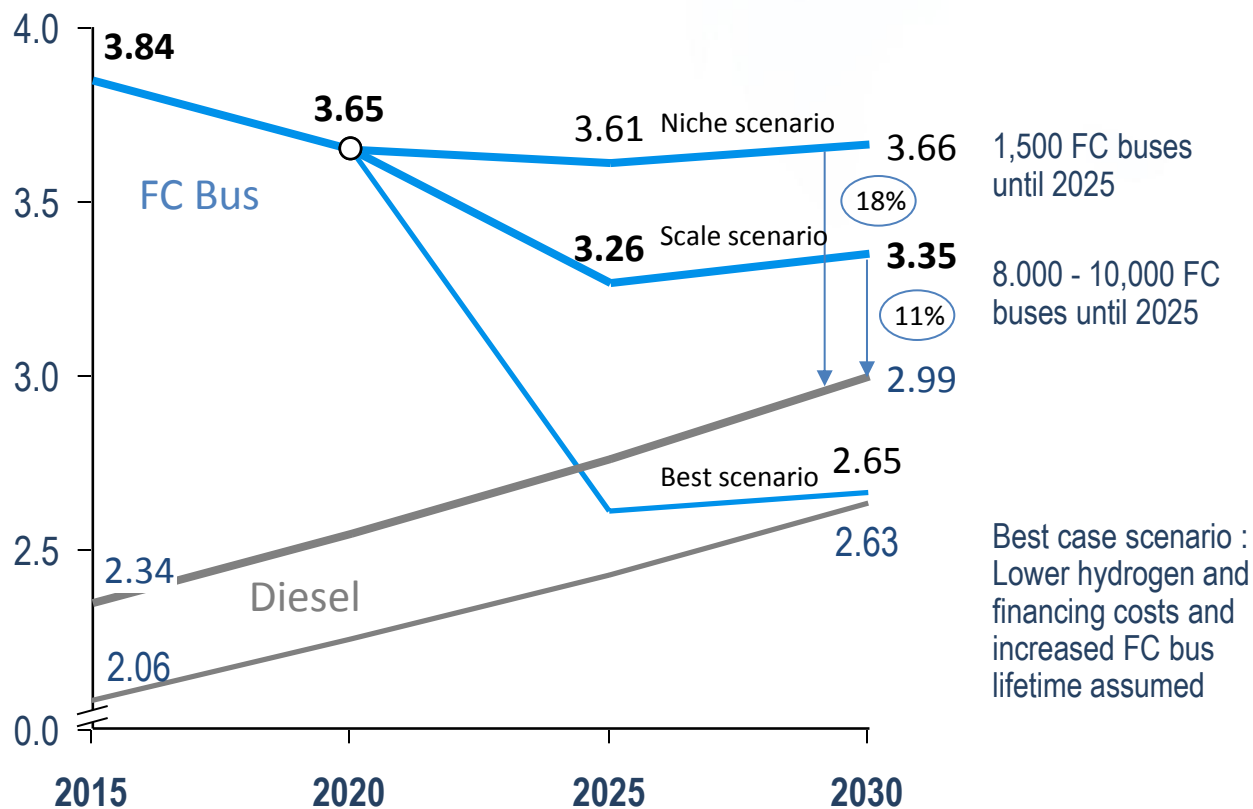
VISION –
FC electric buses commercially viable
and rolled-out in Europe



2020 onwards

FC bus deployment costs analysis indicates financing gap/cost premium

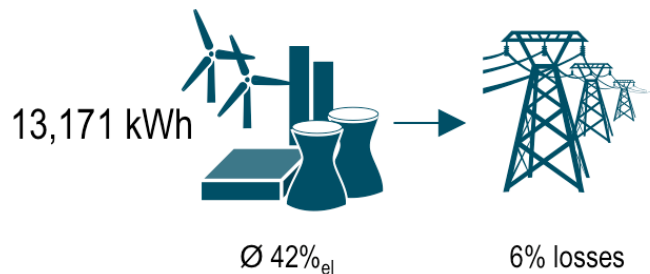
Total Servicing Cost development scenarios (EUR/km)



- > Deploying more buses earlier will support scale effects and cost reduction
- > More locations as first-movers need to be mobilized
- > TSC gap to the diesel bus expected to decrease to 11%, but can remain higher
- > Synergies with fuel cell passenger car industry offer further significant cost reduction potential (not depicted here)

Typically, distributed CHP is more efficient than central generation due to superior technologies and avoidance of transmission losses

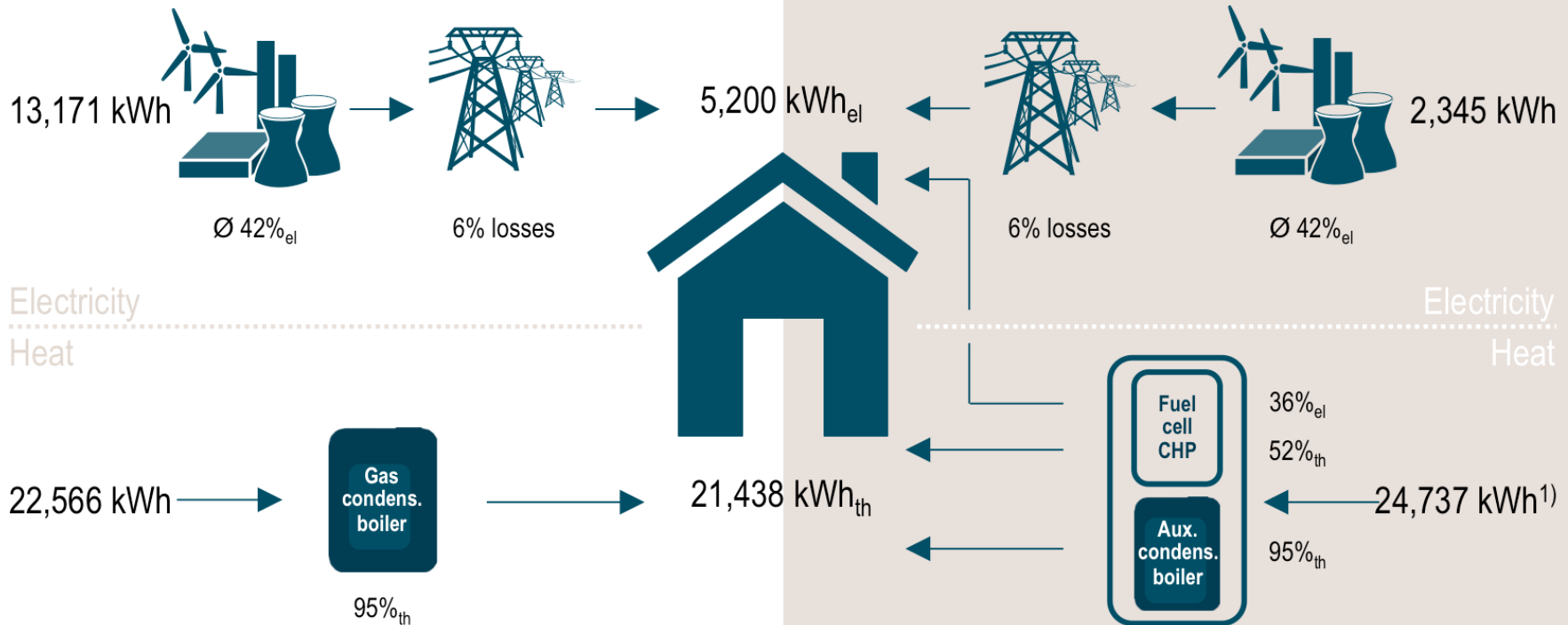
Central generation



Electricity
Heat

vs.

Distributed generation



Electricity
Heat

35,737 kWh primary energy ——— -24% ——— 27,082 kWh primary energy

1) Exemplary case of a German, partially renovated 1/2-family dwelling 2) Net gas consumption after crediting the primary energy equivalent of power feed-in from CHP

To become economically competitive however, capital costs must be reduced substantially by increasing production volumes

Use-case specific economic benchmarking

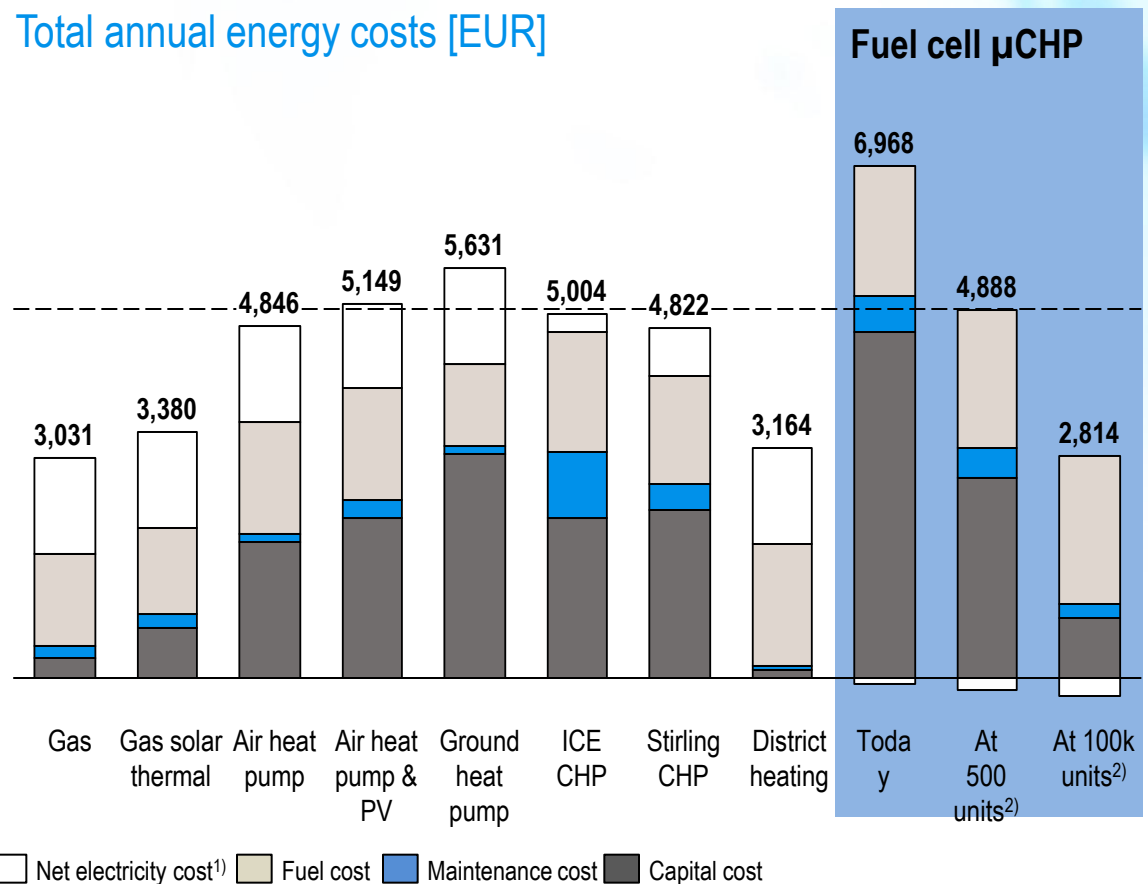


MUNICH

Fuel cell micro-CHP system

Electric capacity	1 kW _{el}
Thermal capacity	1.45 kW _{th}
Electric efficiency	36%
Thermal efficiency	52%
System lifetime	15 years
Required stack replacements	2

Total annual energy costs [EUR]



1) Negative electricity cost reflect higher earnings from power feed-in than residual purchase of grid power. 2) Cumulative production volume per supplier.

Next to FCH Research and Innovation activities on Energy and Transport and cross cutting activities, FCH 2 JU will help

- to realise FCH **cost reduction** through initial deployment
- for FCH applications for **cars, HRS, busses** and **μ-CHP**
- with a mandate to search for **co-financing** :
 - European Structural & Investment Funds, ...
 - Smart Specialisation (05/02/15)
 - Financial Engineering