



*The IPHE is a unique international mechanism for national government representatives of 17 countries and the European Commission to better coordinate activities and share best practices regarding the acceleration of hydrogen and fuel cell commercialization globally.*

## **Roundtable Meeting “IPHE – Hydrogen and Fuel Cells Stakeholders”**

*November 17<sup>th</sup>, 2011 | Berlin, Germany*

# Panel Discussion on Stationary Applications



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## ❖ We are all here to experience the day when we will make this announcement:

*«...The fuel cells industry takes orders for 100s of MW, and it is ramping up production.*

*Stationary fuel cells will generate more power than a nuclear power plant<sup>1</sup>, in a shorter time than building one<sup>1</sup>,*

*Every GW **production** capacity will create ca. 3000-6000 jobs<sup>2</sup>*

*Every GW of **installed** capacity will create ca. 1500-3000 jobs<sup>2</sup>...»*

## ❖ Can this day be today?

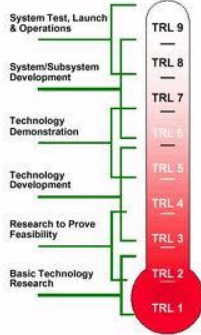
**2** factors are what is needed:

- **Grid parity**
- **Market visibility**

*(I'm sure you have noticed...  
subsidies are not in the list)*

1) 1 GW, 7-12y, Nuclear Energy information Service <http://www.neis.org/literature/Brochures/npfacts.htm>

2) Data from own production and from the supply chain.



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## Technical Readiness

- Stationary Fuel Cell are commercially available for kW to MW installations (TRL<sup>1</sup>>8)
- The performances have exceeded expectations.
  - > 50%, up to 60% delivered electrical efficiency<sup>2</sup>, 90% total efficiency<sup>2</sup>
  - Durability in the range of 10-20kh is demonstrated.
  - Highest «investment efficiency» (energy savings or CO<sub>2</sub>-reduced per €-invested)
- Fuel cells can separate CO<sub>2</sub> (CCS) with minor impact on efficiency or investments compared to «combustion» technologies<sup>3</sup>,
- and produce CO<sub>2</sub>-free electricity from fossil fuels (even from coal)<sup>4</sup>
  - ❖ Technical readiness, fuel availability or infrastructure are not THE barriers.
  - ❖ Grid parity is one the the 2 factors we are looking for.

1) Technical Readiness Level. A standardized evaluation method for the maturity of new technologies/products

2) CFCL (AU,GER), own resulty, EPFL (CH)

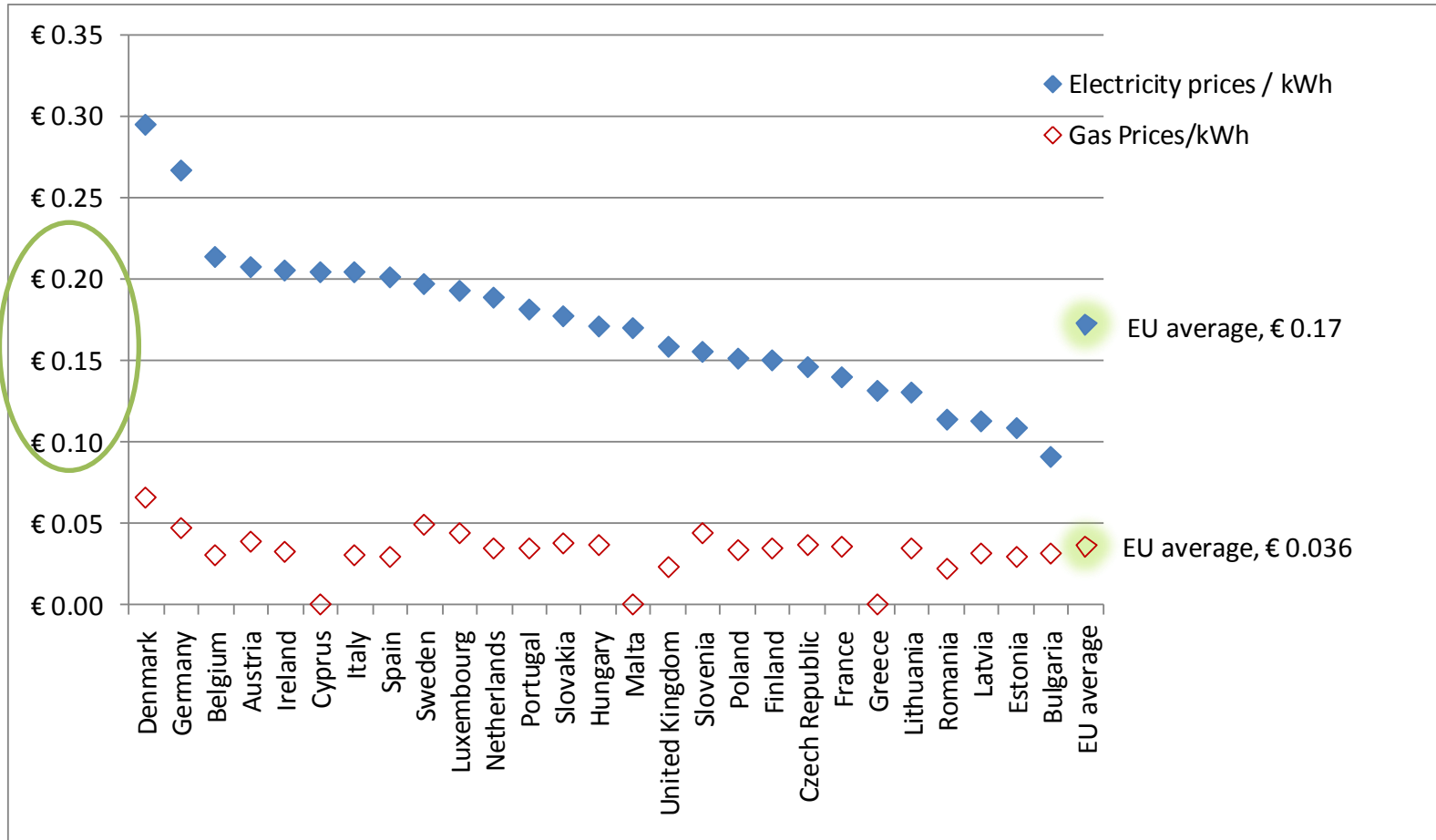
3) 20 th European Symposium on Computer Aided Process Engineering – ESCAPE20 S. Pierucci and G. Buzzi Ferraris (Editors)

4) FCE Fuell Cell eEnergy



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## European Electricity and Gas Prices (retail)



Grid Parity



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## Grid parity

Electricity production cost <sup>1</sup>  
sufficiently lower than:

0.2 €/kWh → 0.10 €/kWh el

Investment cost

4-5000 €/kW → 3000 €/kW

**Production capacity**

**1 MW/y → 100s MW/y**

How to get  
here?...

... If «subsidizing the way to volumes» is not an option?

1) (indicative values, depending on gas , electricity prices & taxation)



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- New mass products, with new technologies are introduced every day.
  - Many don't have an «attractive business case» or the end user..
    - Who buys an iPhone because it's cheaper?
    - or an Euro 5 car because of its payback, compared to an EURO 4 car?
  - Yet billions are invested in the development and demonstration
  - The first phone or vehicle sold is produced in low(er) volumes and costs much more than its final price;
  - Yet the first customer pays the first as much as the 1-millionth.
  - How can they do it?
  - By «knowing» how many they will sell.
  - Car manufacturers can estimate how many cars, Apple can estimate how many iPhones will be sold. The volumes are visible, the market is sufficiently de-risked.
- ❖ **Make a mass market visible.**  
and together with the grid parity it will be a profitable, mass market




## How to de-risk a market without subsidies ?

- Regulation is a cheap substitute to subsidies,
- **provided that** it is introduced at the right time, in the right way:
  - it must be coordinated with grid parity,
  - so that it increases disposable income. It should not be a transfer of fiscal burden on the final user.
  - It's open to multiple technology and product solution
  - It sets a clear roadmap and targets in terms of volumes.



## 3 steps for the stakeholders :

- 
1. FC manufacturers communicate the production volumes to achieve grid parity.
  2. Public sector prepares an appropriate regulation, that confirms a market of that size.
  3. Provided that, orders for capacity of  $\times 100$  MW will be made, ramp-up to mass production will start ( e.g. Utilities)