



# CORE TECHNOLOGY VENTURES SERVICES

**The European Hydrogen & Fuel Cell Industry  
from a Financial Perspective:  
A focus on seed and early stage players**

**The European Thematic Network on Hydrogen,  
Brussels, December 14, 2004**

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# Underlying Assumptions

## ❖ Assumptions:

- A disruptive technology is one that
  - i. Changes the way goods & services are produced and delivered
  - ii. Creates new product and service marketsExamples may include the printing press, gasification & electrification and the introduction of computers
  
- Disruptive technologies tend to be delivered by previously non-existing companies (Christensen)
  
- Our work indicates that Europe is awash with potential H2&FC companies
  
- Relative to the US financial market, Europe's financial markets consistently fail to nurture seed and early stage developers
  
- Given this 'market failure' European policy-makers will need to apply existing financing instruments more aggressively and devise new ones if Europe is to benefit from its independent H2&FC developers
  
- If successful, H2&FC technologies will be significantly disruptive, with huge implications for the way in which we consume and produce a multiplicity of products and have attendant implications for employment within the Union



# Agenda

## ❖ Part I: Background:

1. Equity Markets: The US advantage of size and regulatory unity
2. Quoted H2&FC companies: Europe Vs USA
3. The structure of Europe's independent H2&FC industry

## ❖ Part II: Finance:

1. The promise of policy in the field of H2&FC
2. Debt Vs Equity Finance: Europe's disadvantage
3. Concluding remarks



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# Part 1.

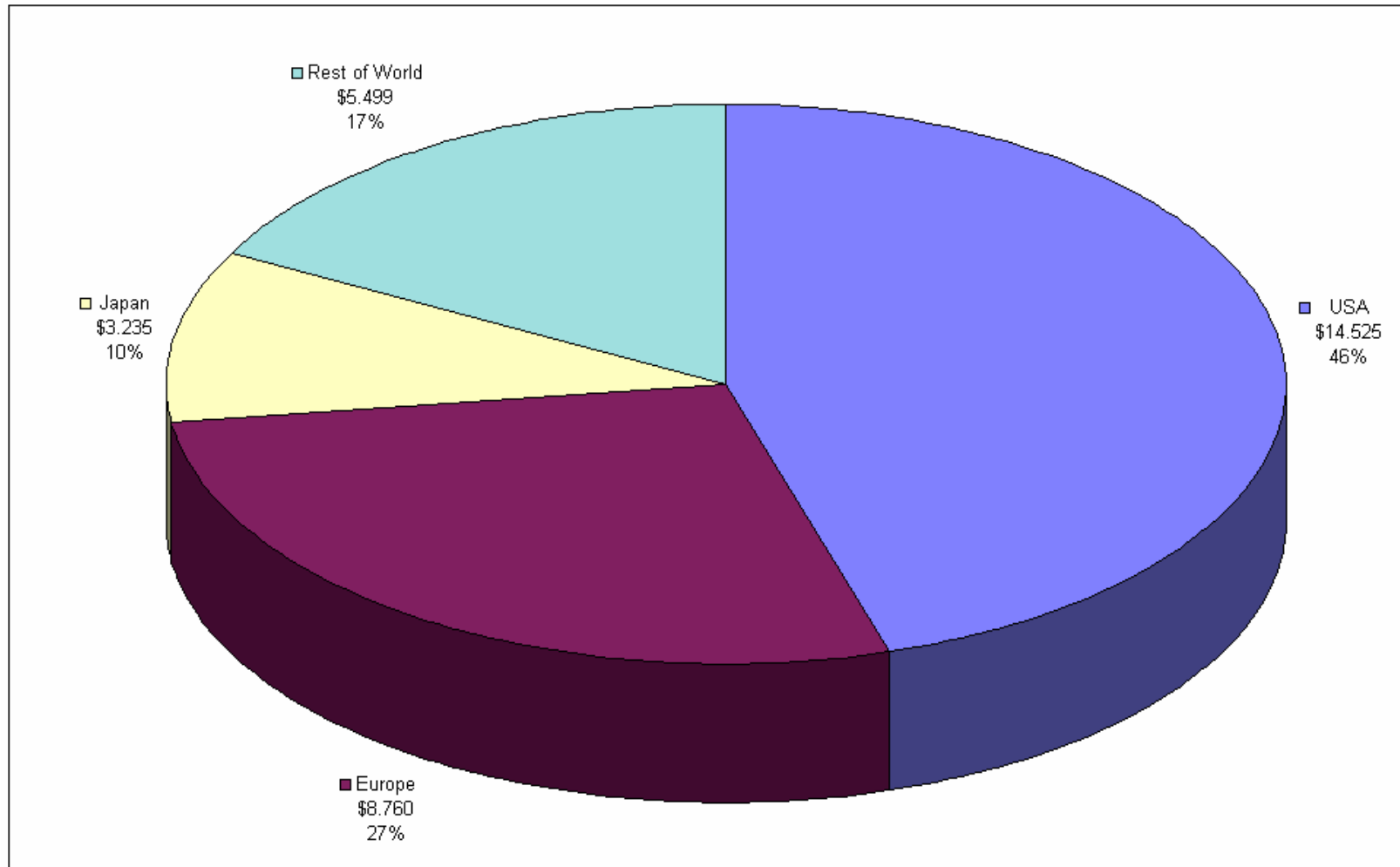
# Background

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**“Large increases in cost with questionable increase in performance can be tolerated only for race horses and fancy spouses.”**

**Lord Kelvin (1824 – 1907)**

# Global Equity Market Capitalisation 2004\* (\$ trn)

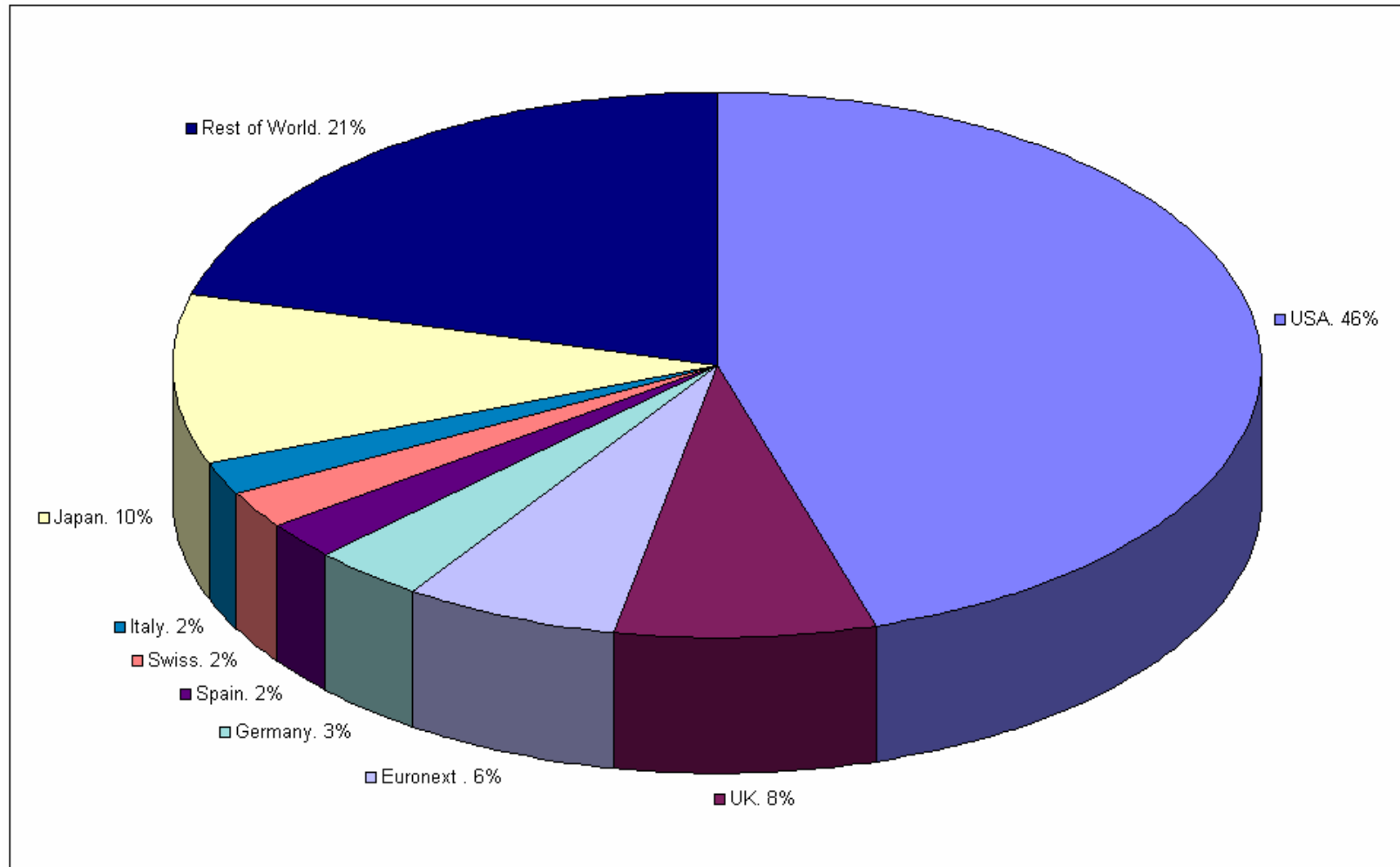


Source: Chart (CTV) based on World Exchanges data available at <http://www.world-exchanges.org/>

\*The data represent Jan-Sept 2004 month-end average values.



# Global Equity Market Capitalisation 2004 (% of total)



Source: Chart (CTV) based on World Exchanges data available at <http://www.world-exchanges.org/>



# Publicly Traded Independent\* H2&FC Companies

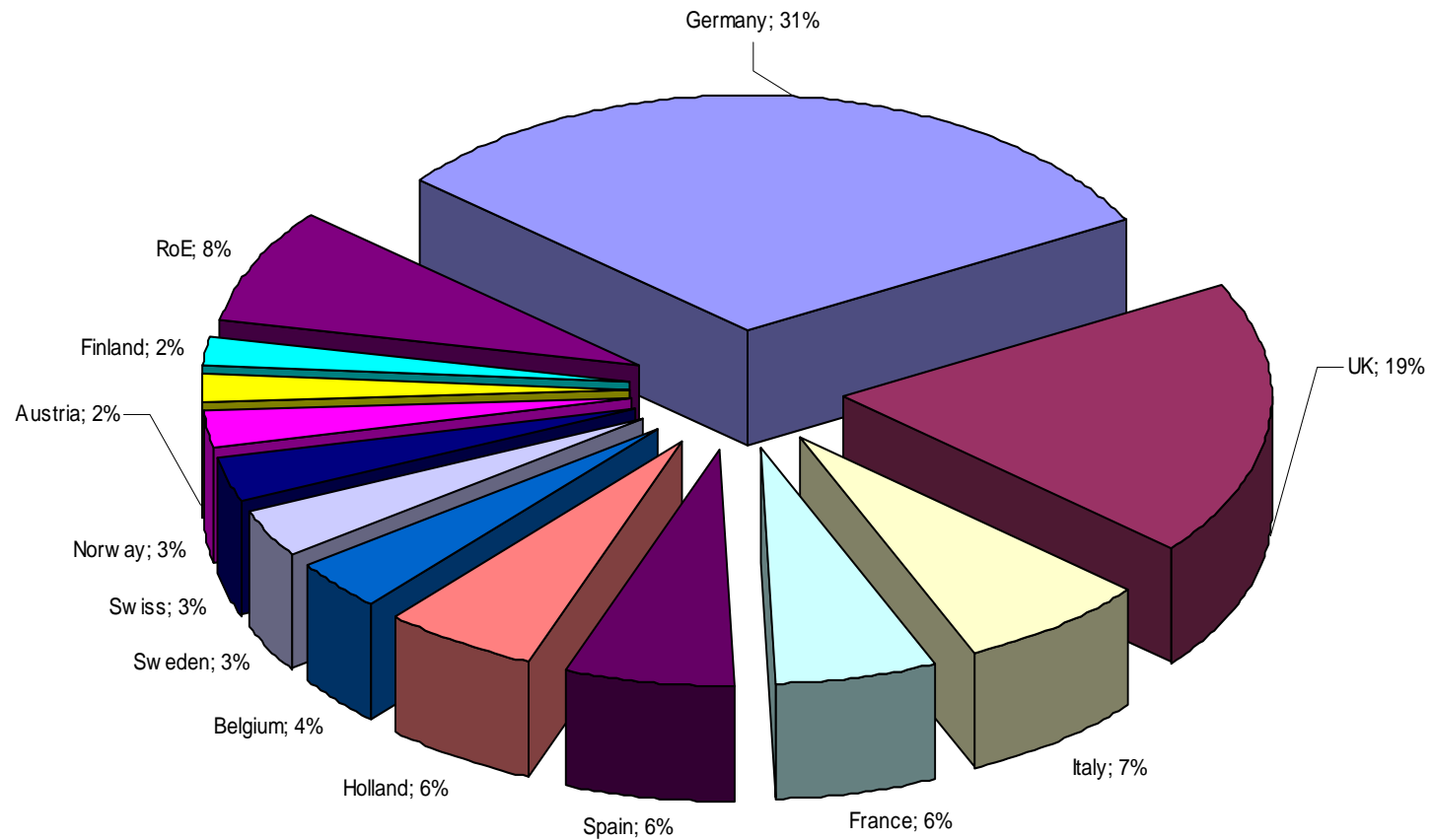
North America	Focus		Europe	Focus
Alternate Energy Corp	Fuelling Infrastructure			
Dynatec Industries	Fuelling Infrastructure			
Millennium Cell	Fuelling Infrastructure			
Quantum	Fuelling Infrastructure			
Stuart Energy	Fuelling Infrastructure			
Astris Energi (Can)	AFC			
Ballard	PEM		ITM Power (UK)	PEM
Distributed Energy Systems	PEM			
Hydrogenics	PEM			
Pacific Fuel	PEM			
Palcan	PEM			
Plug Power	PEM			
Snow Leopard	PEM			
Energy Visions	DMFC			
Manhattan Scientifics	DMFC			
Medis Technologies	DLFC			
Fuel Cell Energy	MCFC			
Fuel Cell Technologies	SOFC		Ceres Power (UK)	SOFC

\*For a company to be classified as independent it must simultaneously fulfil two criteria, namely

- 1) that its primary goal is to commercialise H2&FC systems including related infrastructure and
- 2) it must operate as an independent public company



# Distribution of the European H2&FC Industry



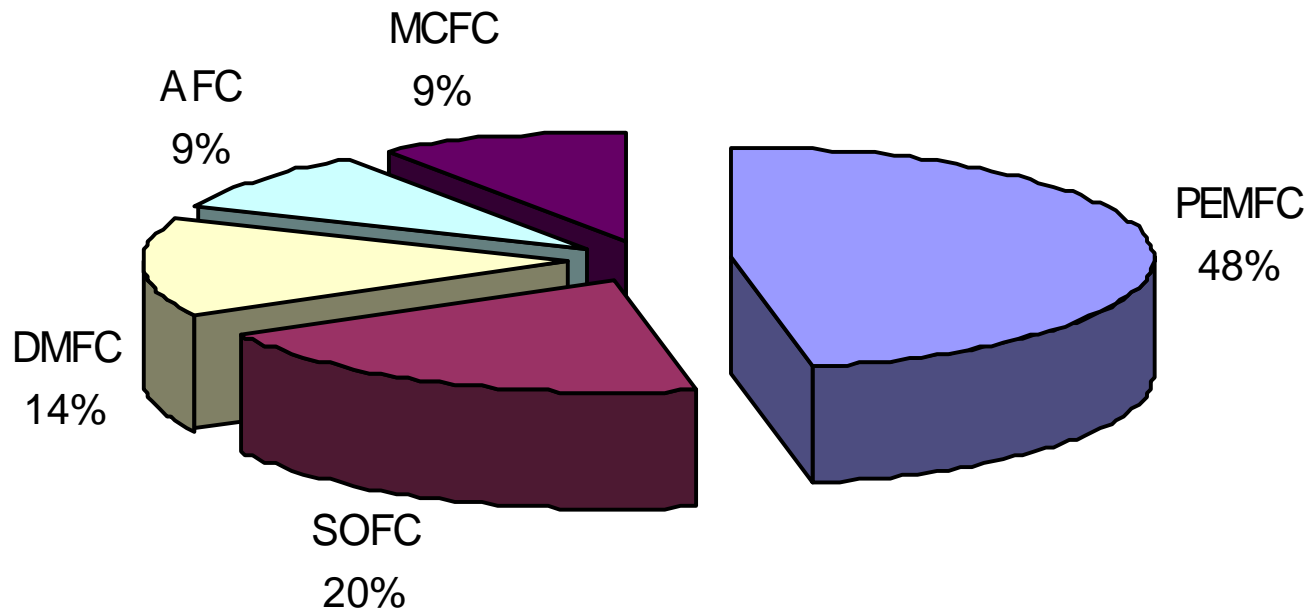
\*Source: CTV estimates. Data refer to number of European entities developing H2&FC related hardware but excludes well-capitalised & quoted companies





# Structure of the European Fuel Cell Industry

## Systems Developers

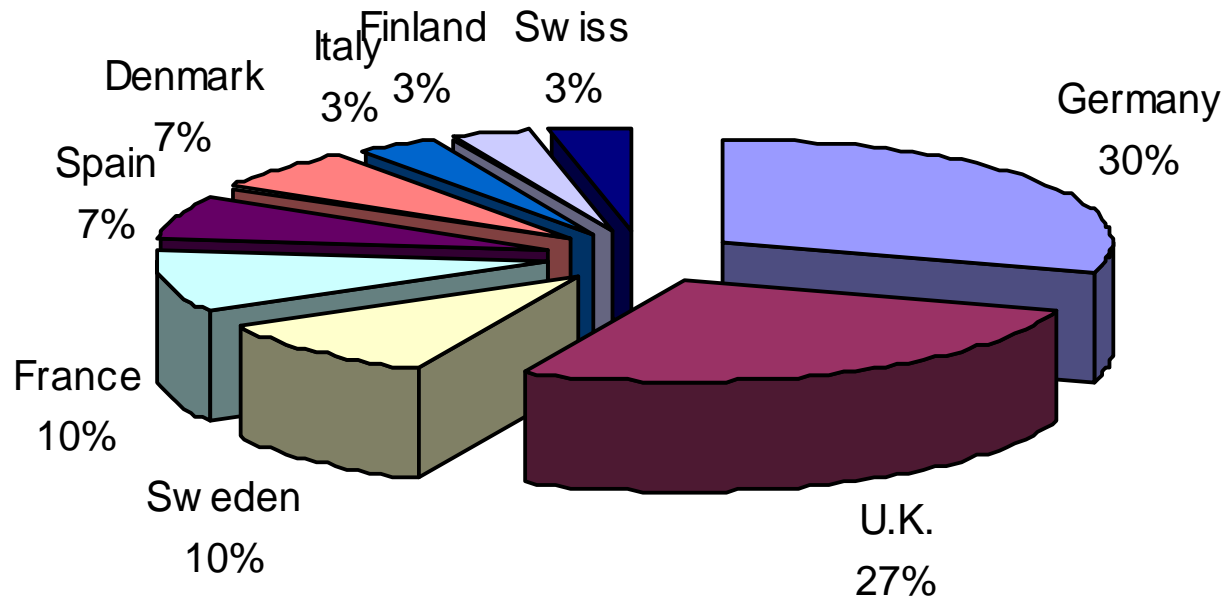


\*Source: CTV estimates. Data refer to number of European entities developing H2&FC related hardware but excludes well-capitalised & quoted companies



# Distribution of European PEM Systems Developers:

## PEMFC Systems Developers

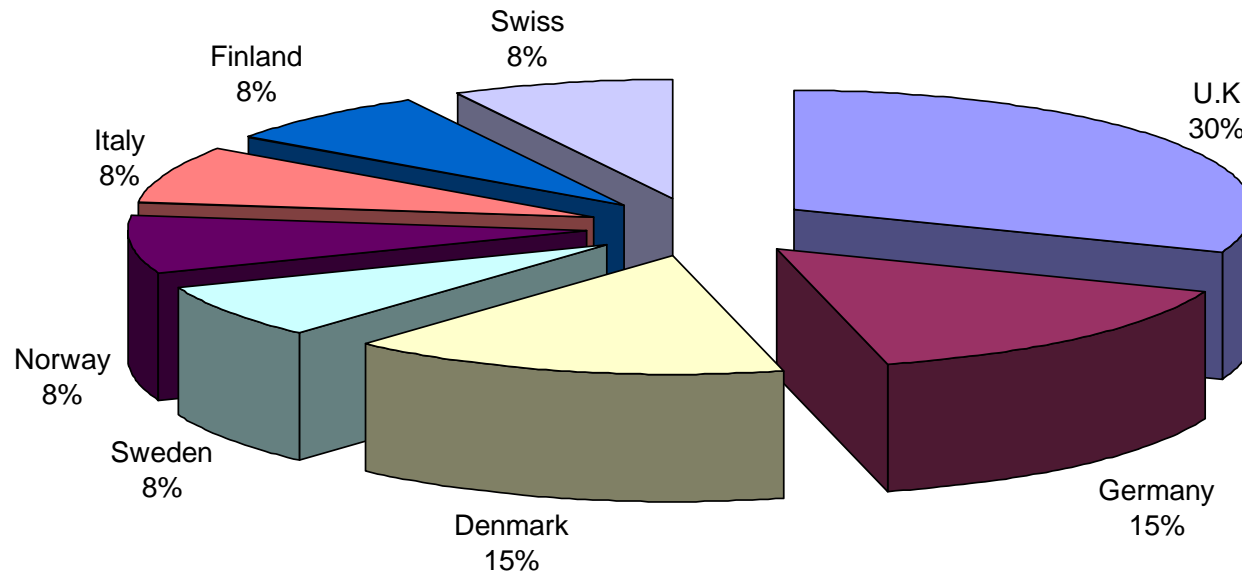


\*Source: CTV estimates. Data refer to number of European entities developing H2&FC related hardware but excludes well-capitalised & quoted companies



# Distribution of European SOFC Systems Developers:

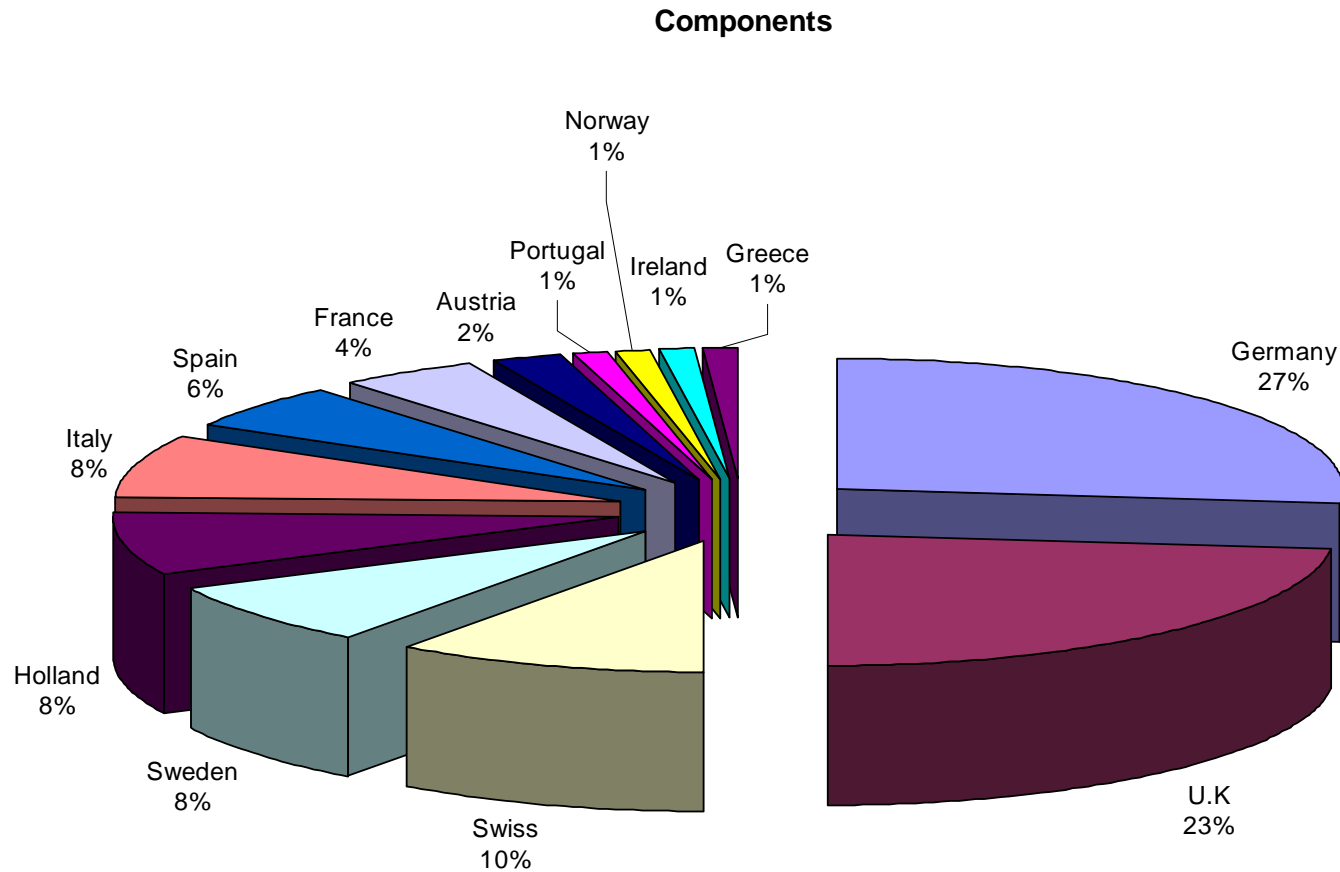
## SOFC Systems Developers



\*Source: CTV estimates. Data refer to number of European entities developing H2&FC related hardware but excludes well-capitalised & quoted companies



# Distribution of European H2&FC Components:



\*Source: CTV estimates. Data refer to number of European entities developing H2&FC related hardware but excludes well-capitalised & quoted companies



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# Seed & Early-stage Finance

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**“In every industry, large companies promote safe, predictable bureaucrats”**

**Economist Survey of Emerging Technologies, Oct 1993**

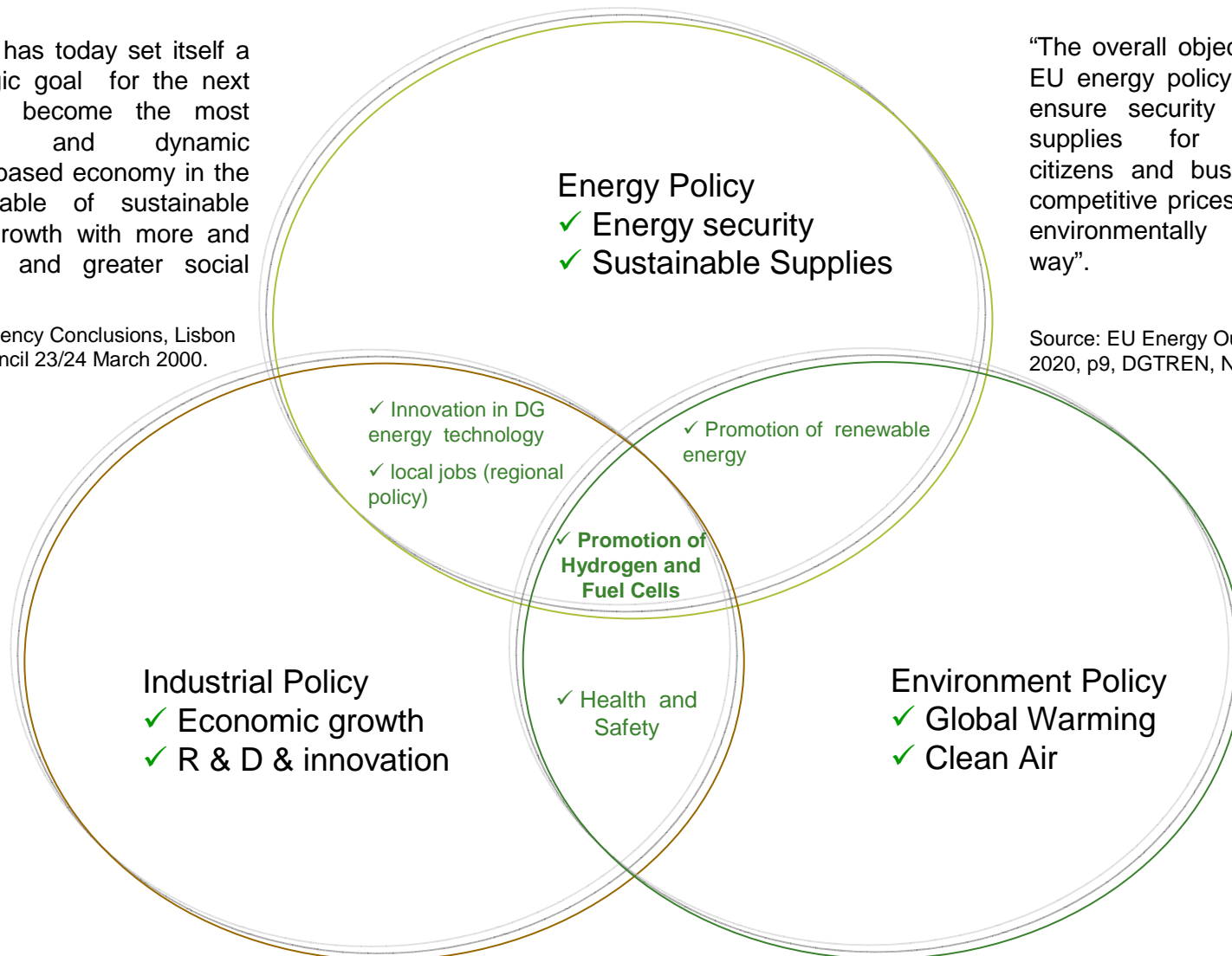
# The Policy Overlap, a Cause of Excitement

“The Union has today set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”.

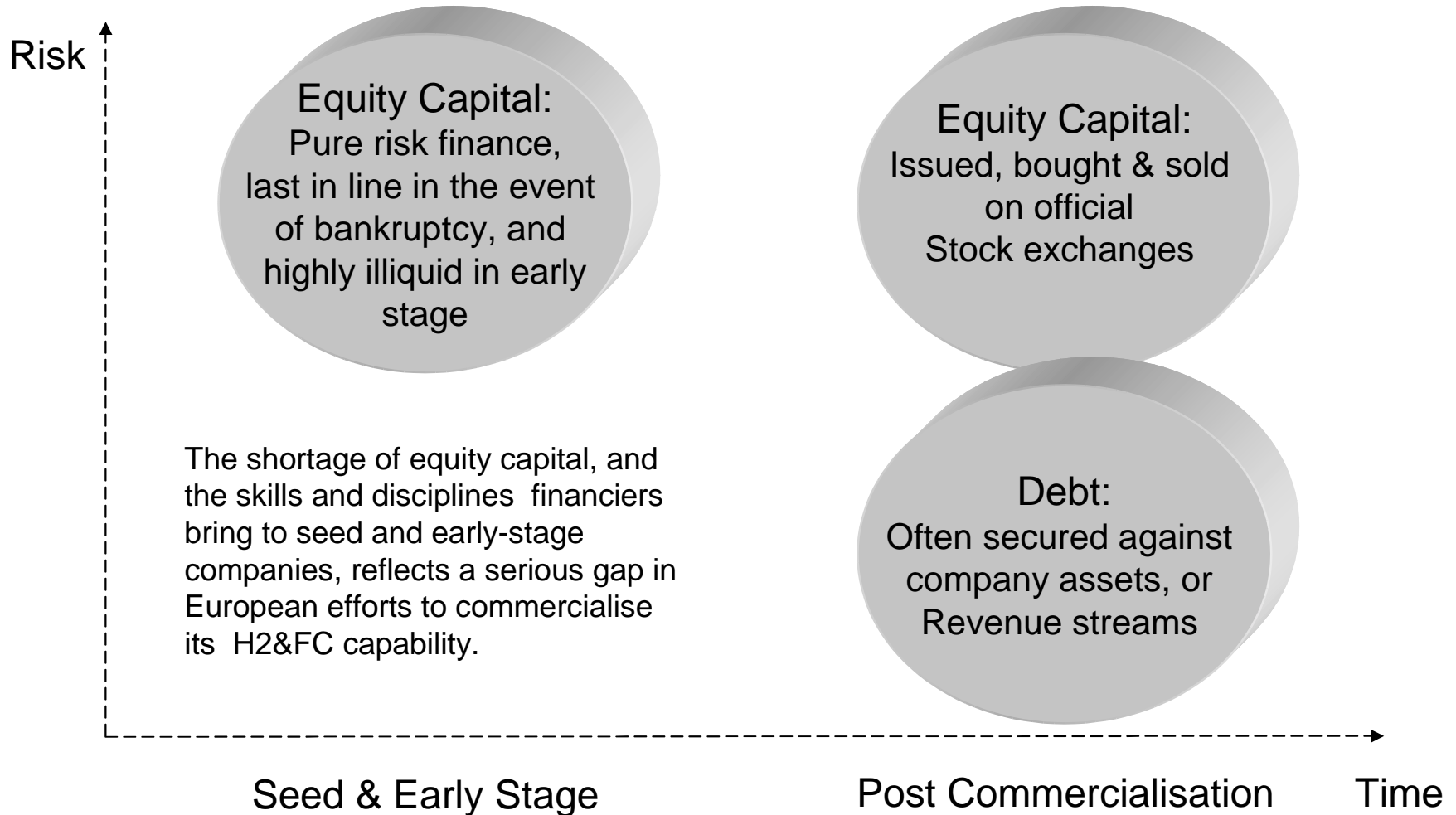
Source: Presidency Conclusions, Lisbon European Council 23/24 March 2000.

“The overall objective of the EU energy policy is to help ensure security of energy supplies for European citizens and businesses at competitive prices and in an environmentally compatible way”.

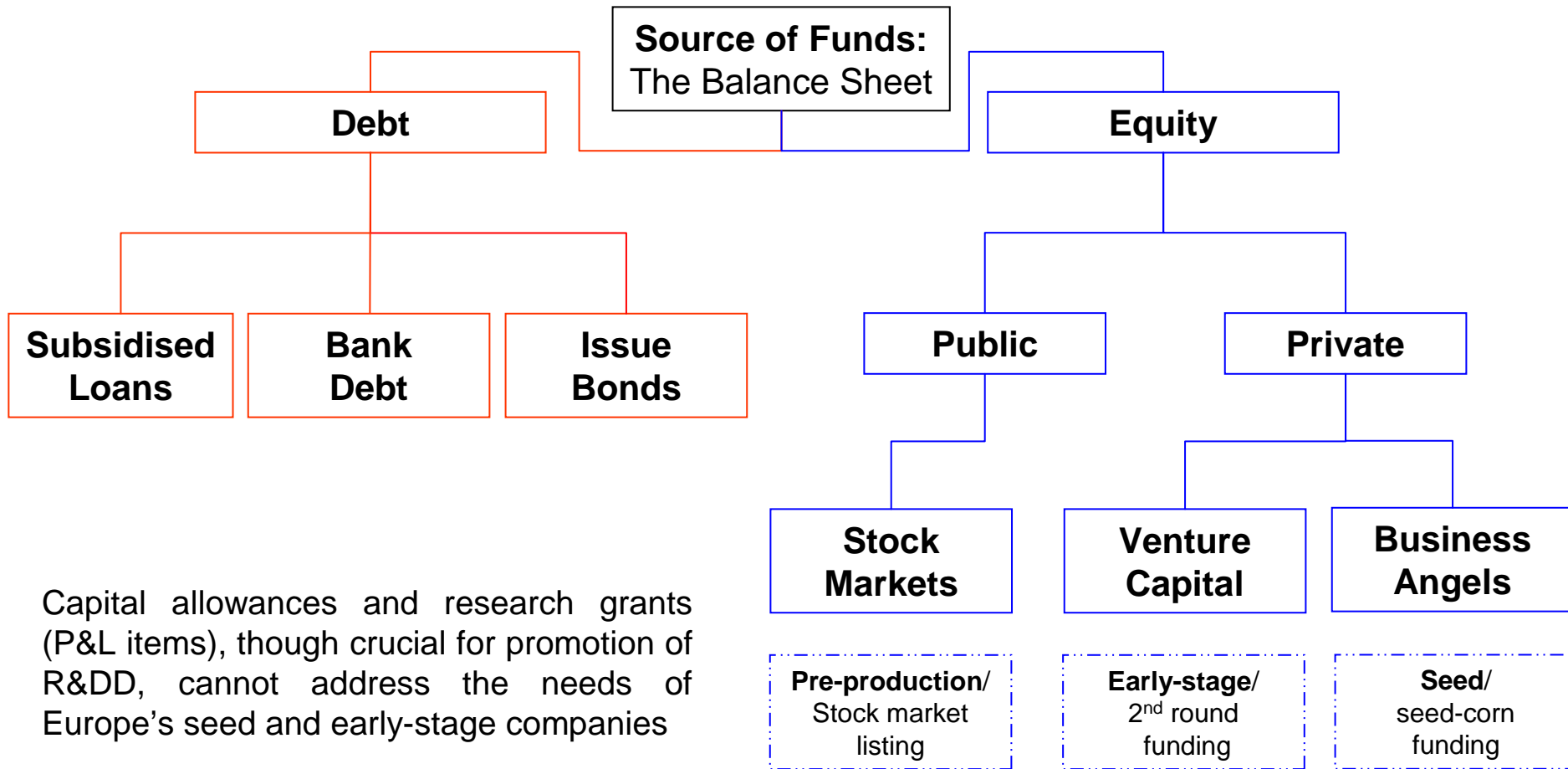
Source: EU Energy Outlook to 2020, p9, DGTREN, Nov 1999.



# Access to Capital: Debt and Equity



# Access to Capital: The Balance Sheet





# Concluding Remarks

- ❖ The North American H2&FC industry benefits from the USA market being a single source of funds with a single regulatory regime, a more mature venture capital industry and a generally greater tolerance to risk
- ❖ By contrast, Europe's largely invisible H2&FC industry faces fragmented finance markets, relatively immature venture capital markets and risk averse investors, which combine to leave European independent H2FC developers significantly under-capitalised in terms of both finance & human capital
- ❖ Worryingly, evidence is emerging of the North American venture capital community filling the European vacuum, looking for interesting technology in Europe, which could ultimately spell the migration of European technology out of the Union
- ❖ However, Europe could build on its highly successful renewable energy policies, which have created the world's largest wind industry, by extending its vision to Europe's hydrogen and fuel cell industry
- ❖ Official support of Europe's H2&FC industry would lend credibility to policy and ultimately draw in private finance and may include:
  - The creation of the position of an inter-departmental EU director/manager with the power to co-ordinate H2&FC activities, (particularly given the societal implications of the successful introduction of H2&FC technologies)
  - The integration of clean conversion technologies into renewable sources policies
  - The consideration of H2 production from fossil sources as renewable for a transition period
  - The consideration of how public procurement could be used to help generate the sales volumes required to get down the cost curve
- ❖ On the specific difficulties faced by Europe's independent H2&FC developers, consider:
  - Making risk capital available to appropriately qualified specialist H2&FC European venture capitalists focused on European seed & early-stage developers
  - The establishment of a DG-Research Trust, along the lines of the UK's Carbon Trust as an additional method of making risk capital available to venture capitalists focusing on the commercialisation of European universities' H2&FC technologies
- ❖ **If the assumption is correct, that disruptive technologies tend to emerge from previously unknown entities, then failure to provide risk capital for Europe's independent hydrogen and fuel cell community could lead to the migration of both technology and human capital out of the European Union**

