
EyeforFuelCells
Excellence in Fuel Cells
Hanover
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Agenda

- ❖ Fuel Cells
 - A financial view of the supply chain
 - European industry structure
 - Sector valuation

- ❖ Drivers and Hurdles
 - Developing world's demand for power (economic growth)
 - Energy insecurity
 - Local emissions
 - Global warming
 - EU renewables

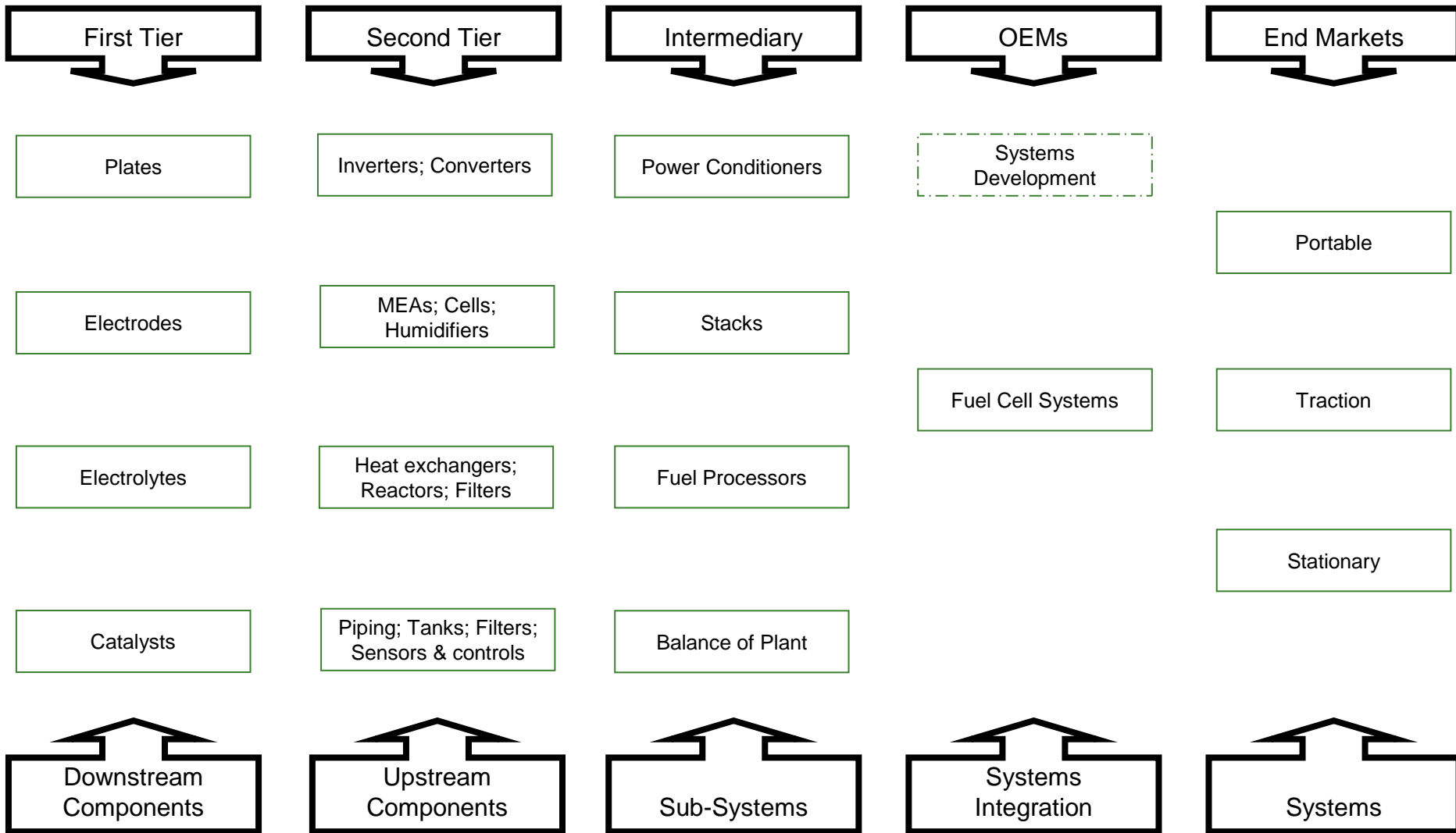
- ❖ Sample Stationary Projects & Demonstrations
 - U.S.
 - Continental Europe
 - Germany

- ❖ State & corporate financial support

- ❖ Conclusions

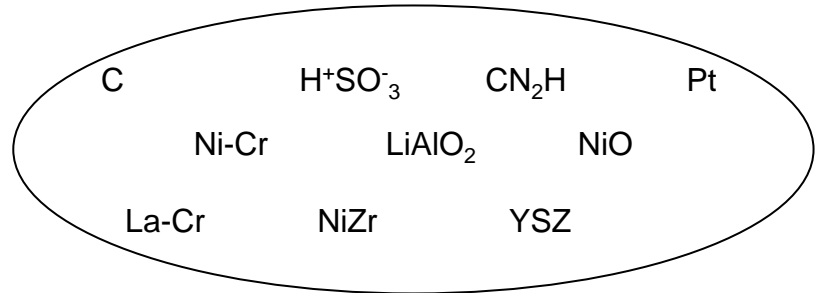
Fuel Cell Supply Chain & European Fuel Cell Industry Structure

Simplified Fuel Cell Supply Chain

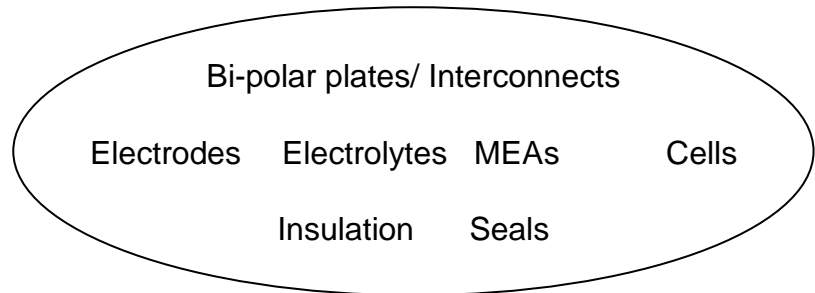


A Global Supply Chain

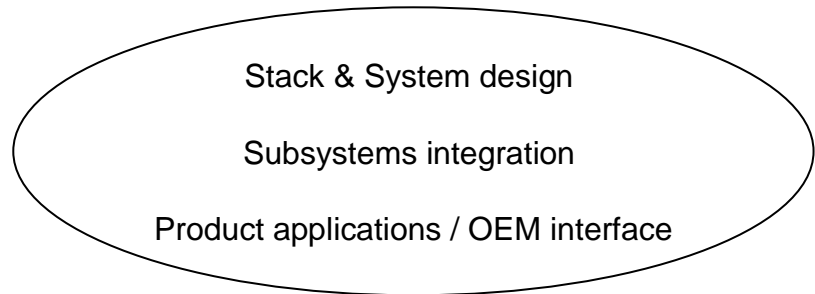
If basic materials
form the letters



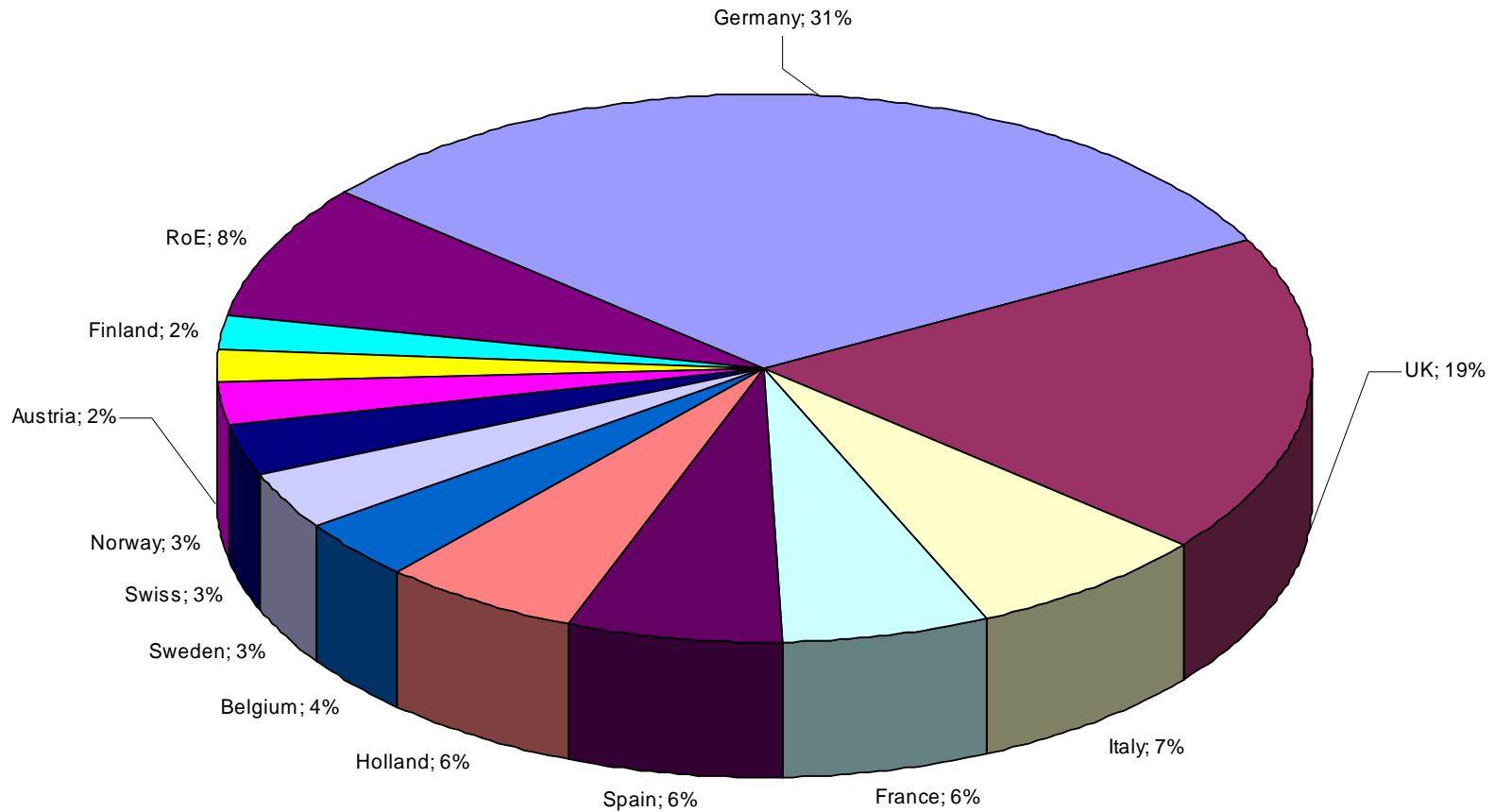
& functionally interdependent
components form the words



then the system developers
write the text



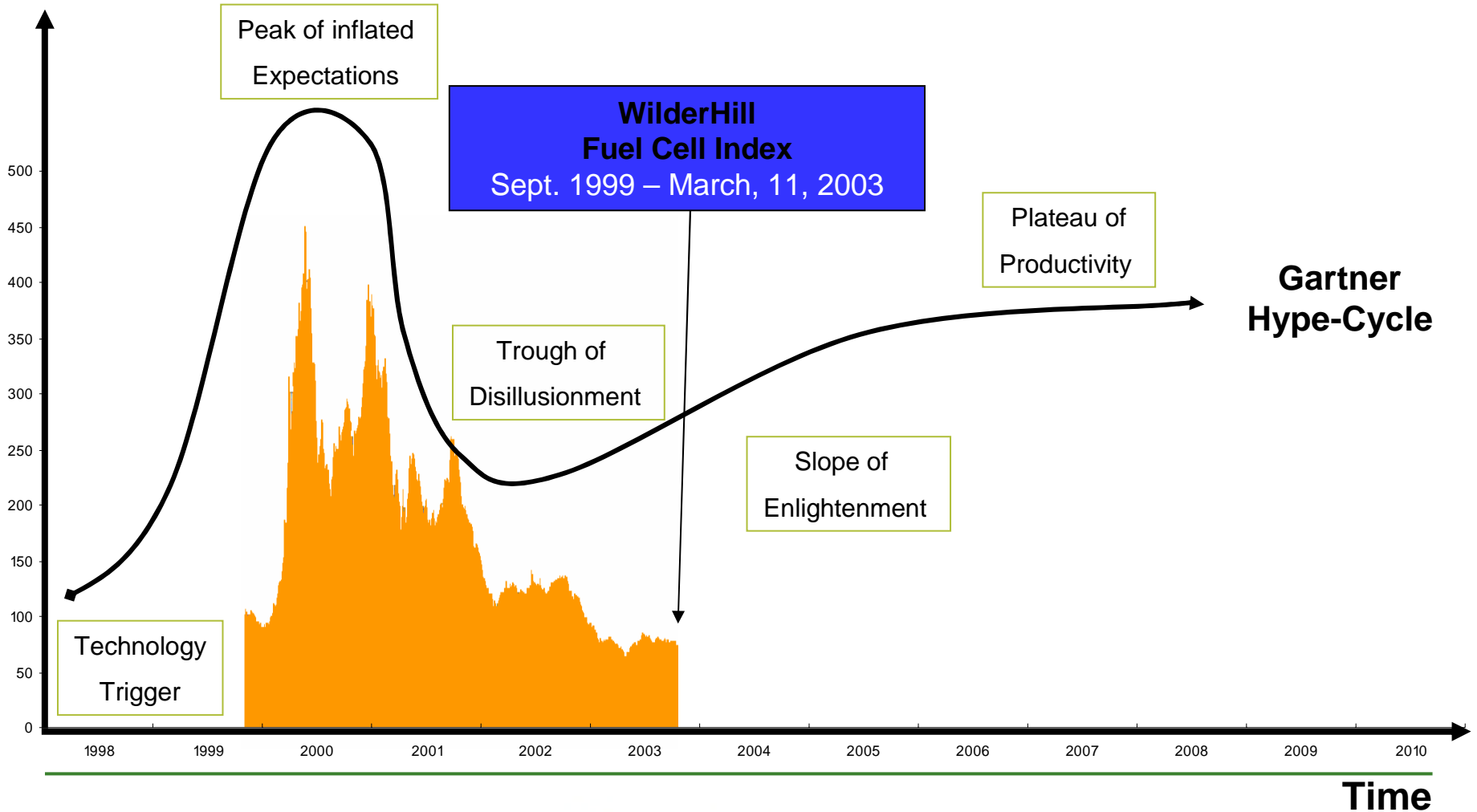
Distribution of the European Fuel Cell Industry*



*Source: Core Technology Ventures LLP.
Data refer to number of European entities developing fuel cell related hardware but excludes well capitalised & quoted companies

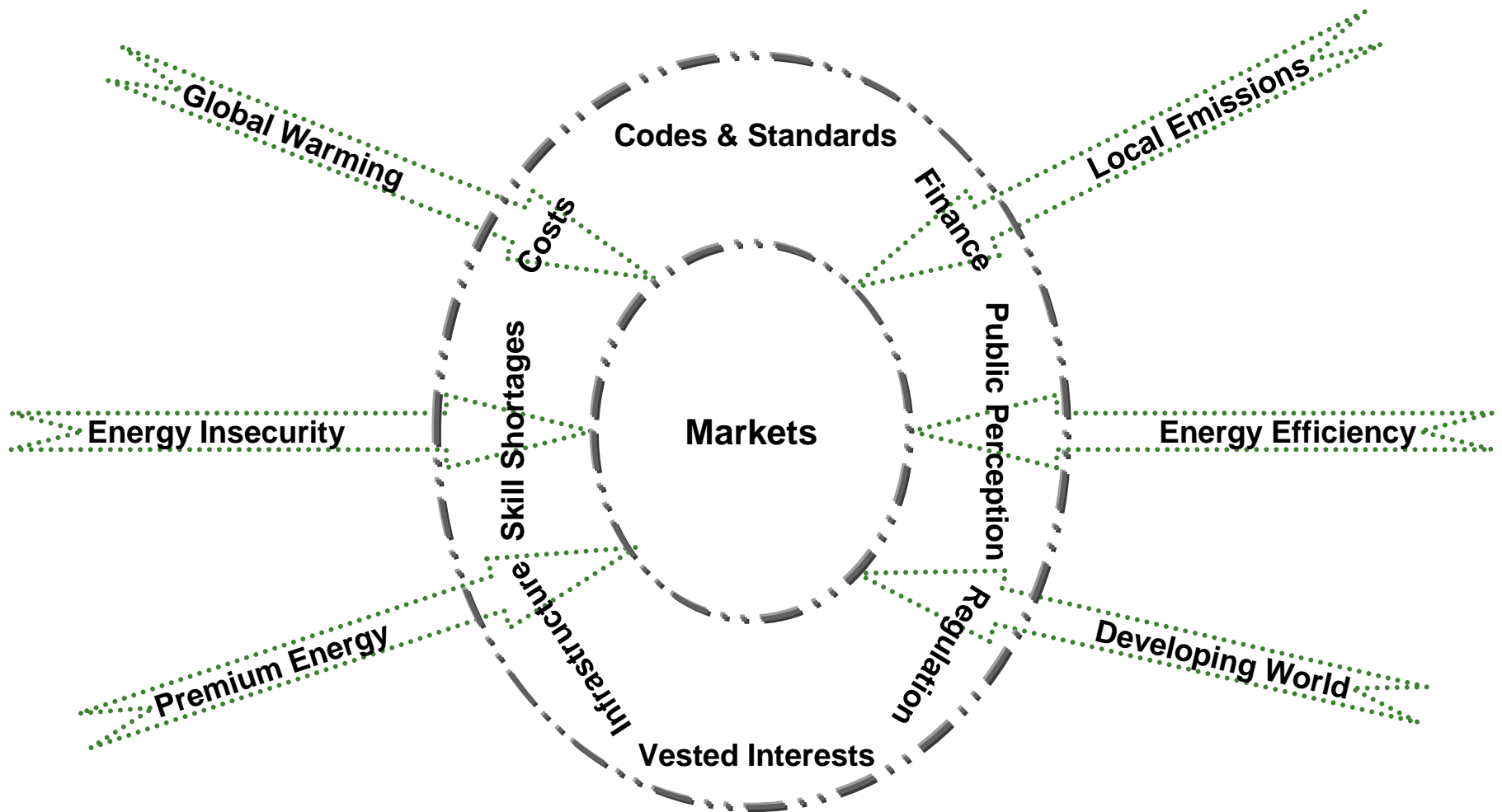
Corrected Company Valuations:

Visibility

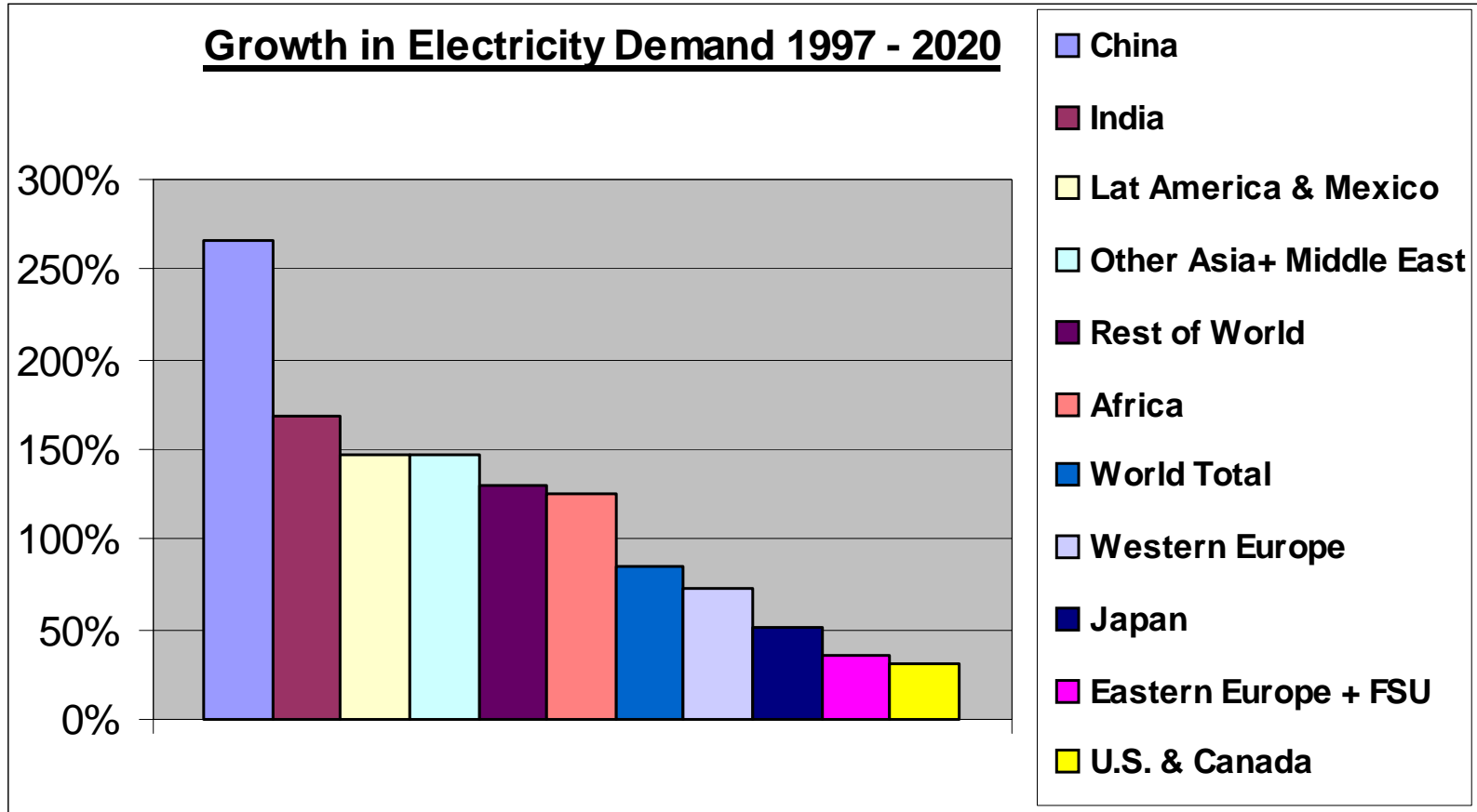


Drivers

Drivers and Hurdles

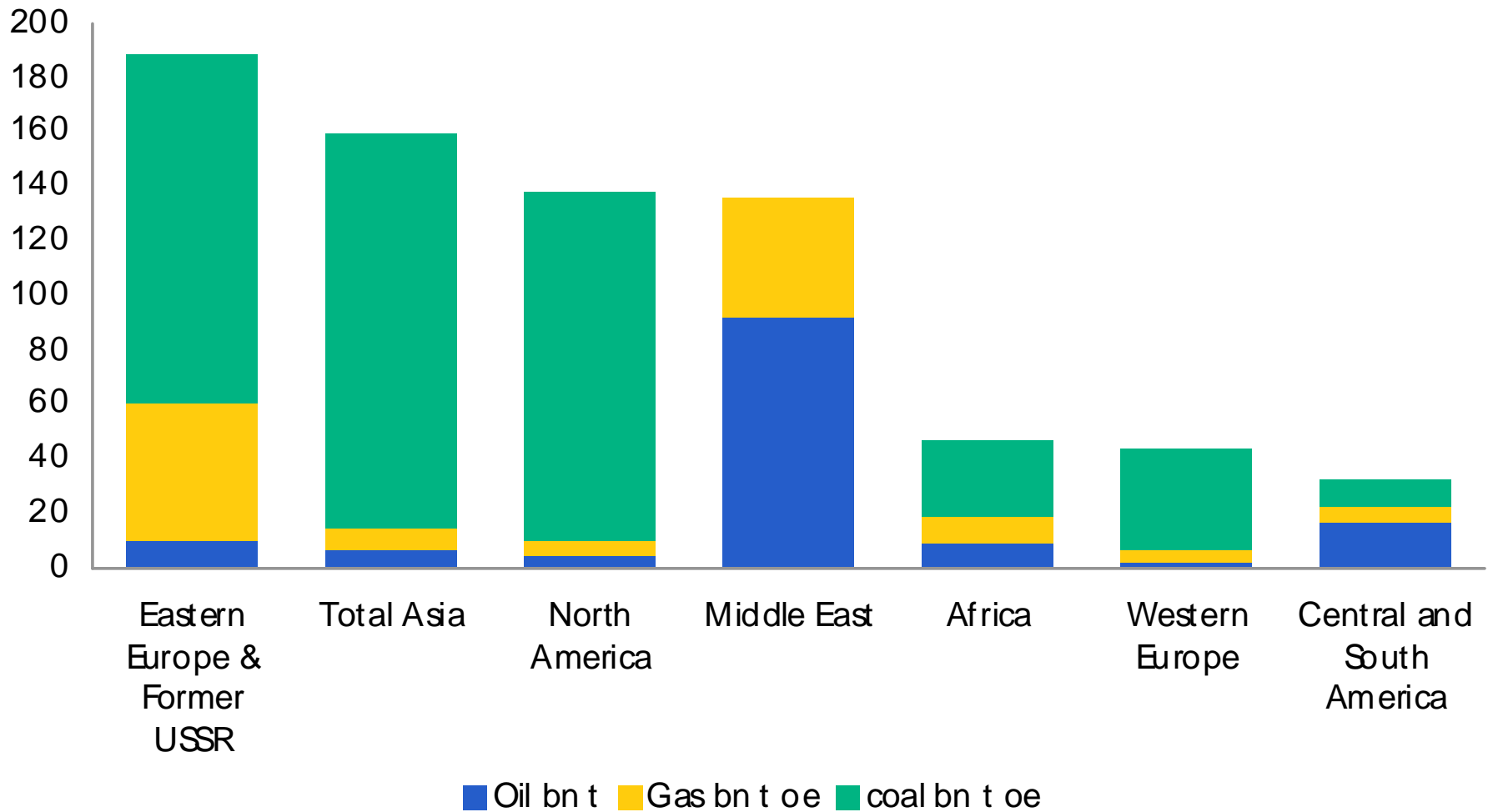


Developing World Electricity Demand

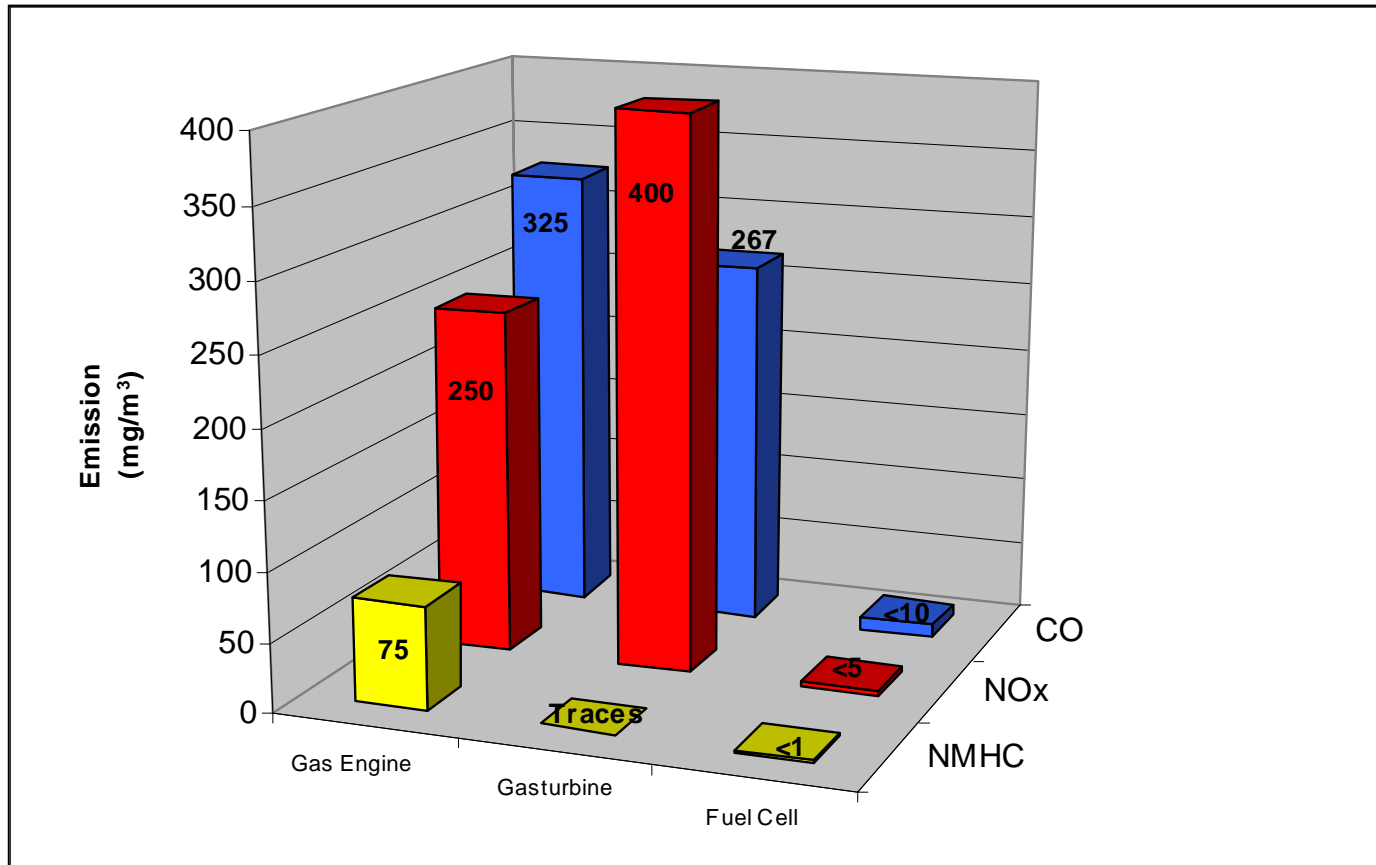


- ◆ China's generating base will rise by around 270% over the period, almost 10 times greater than North America
- ◆ Yet China's 2020 per-capita base of just 643kW will be less than one fifth of the North American per capita base

Energy Insecurity:

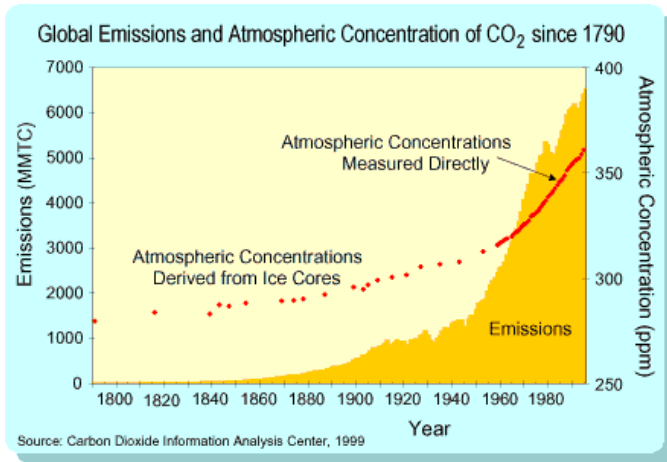


Local Emissions: fuel cells Vs heat engines

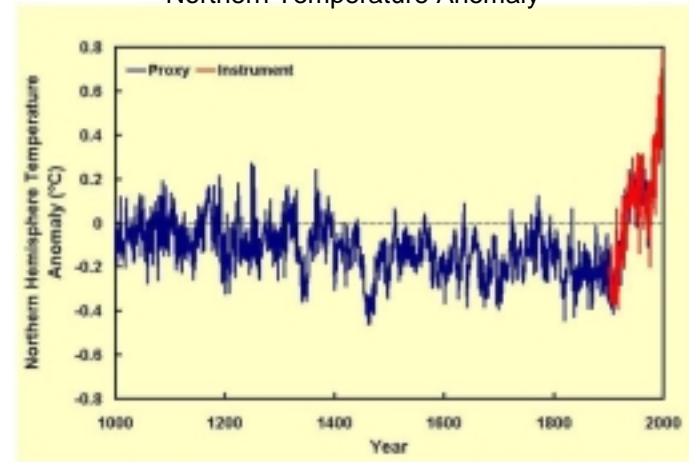


Source: Verband der Industriellen Energie- und Kraftwirtschaft e. V. (VIK) Bericht Nummer 214

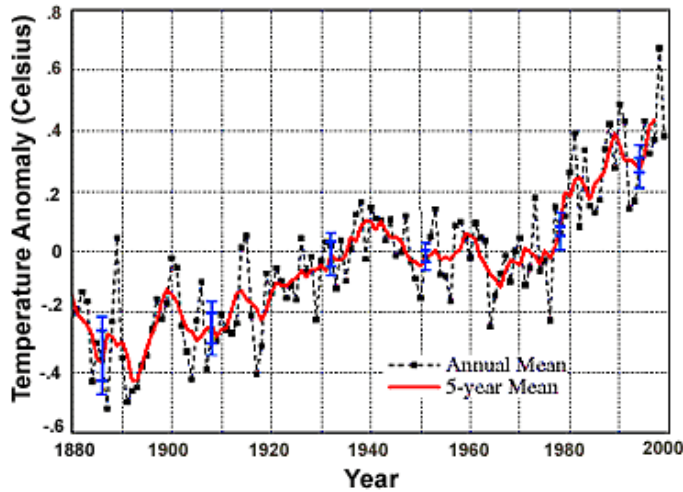
Global Warming



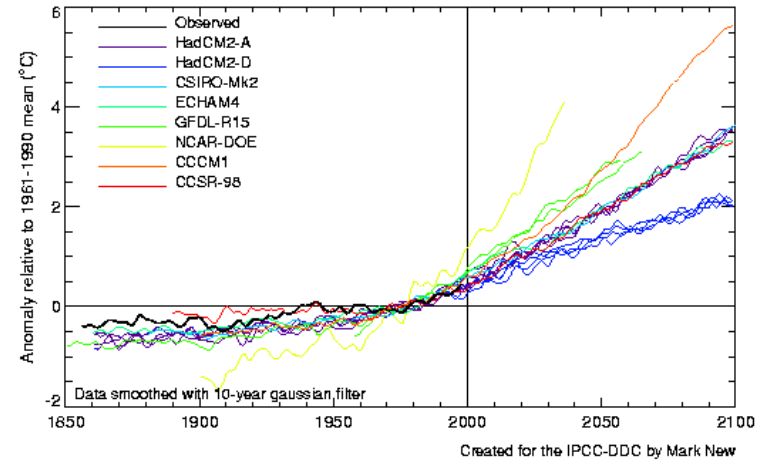
Northern Hemisphere Temperature Anomaly



Global Temperature



GGa - GLOBAL TEMPERATURE



European Policy Drivers: Squaring the circle

“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: European Union Energy Outlook to 2020, p9, DGTREN, Nov 1999.

Environment

- Green House Gasses
- Pollutants

Energy

- Security
- Sustainability

Renewable Energy policy

“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.

Social Cohesion

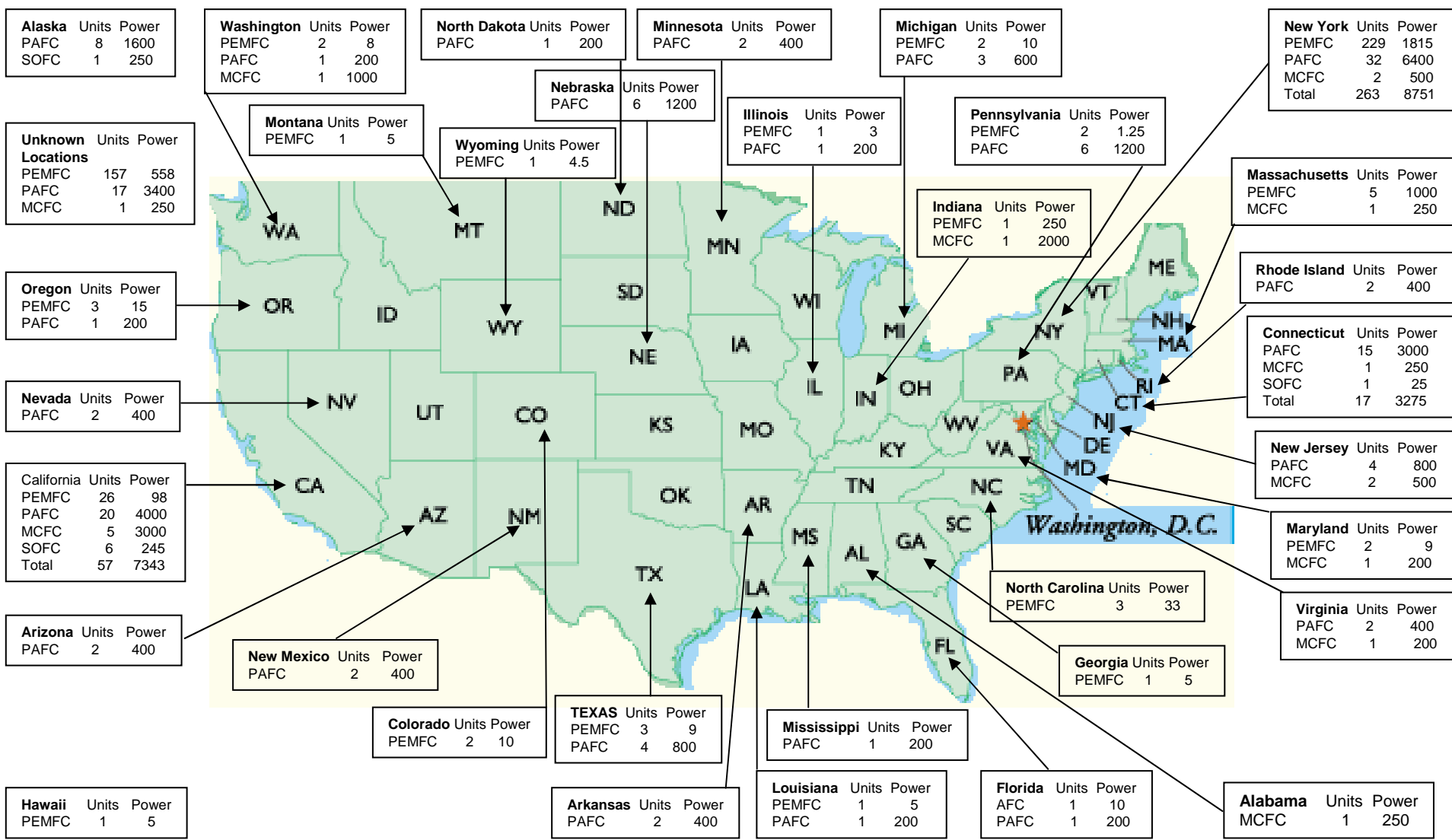
- Local employment

Competition

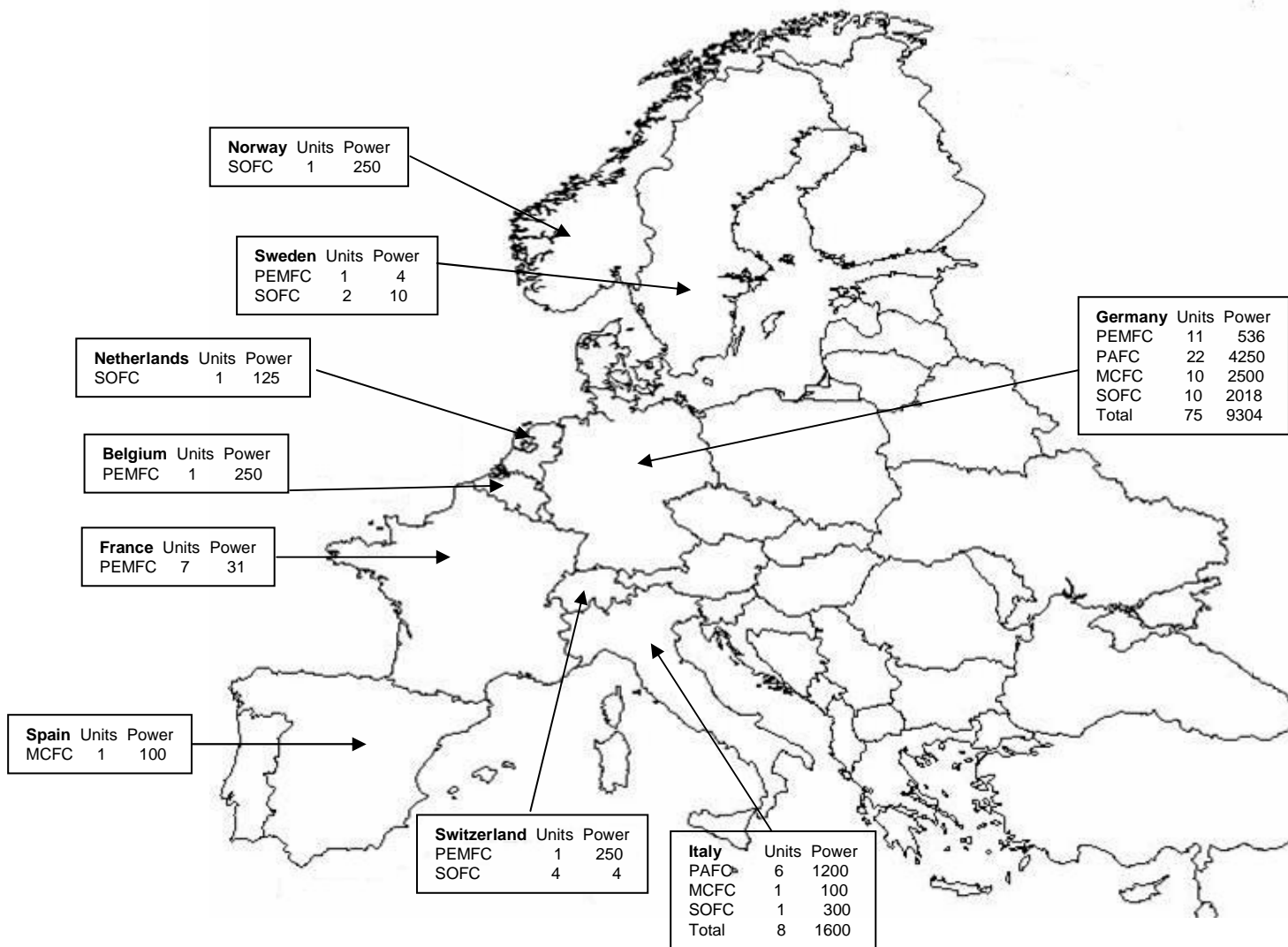
- Technology
- Employment

Sample Projects & Demonstrations

US Fuel Cell Demonstrations:

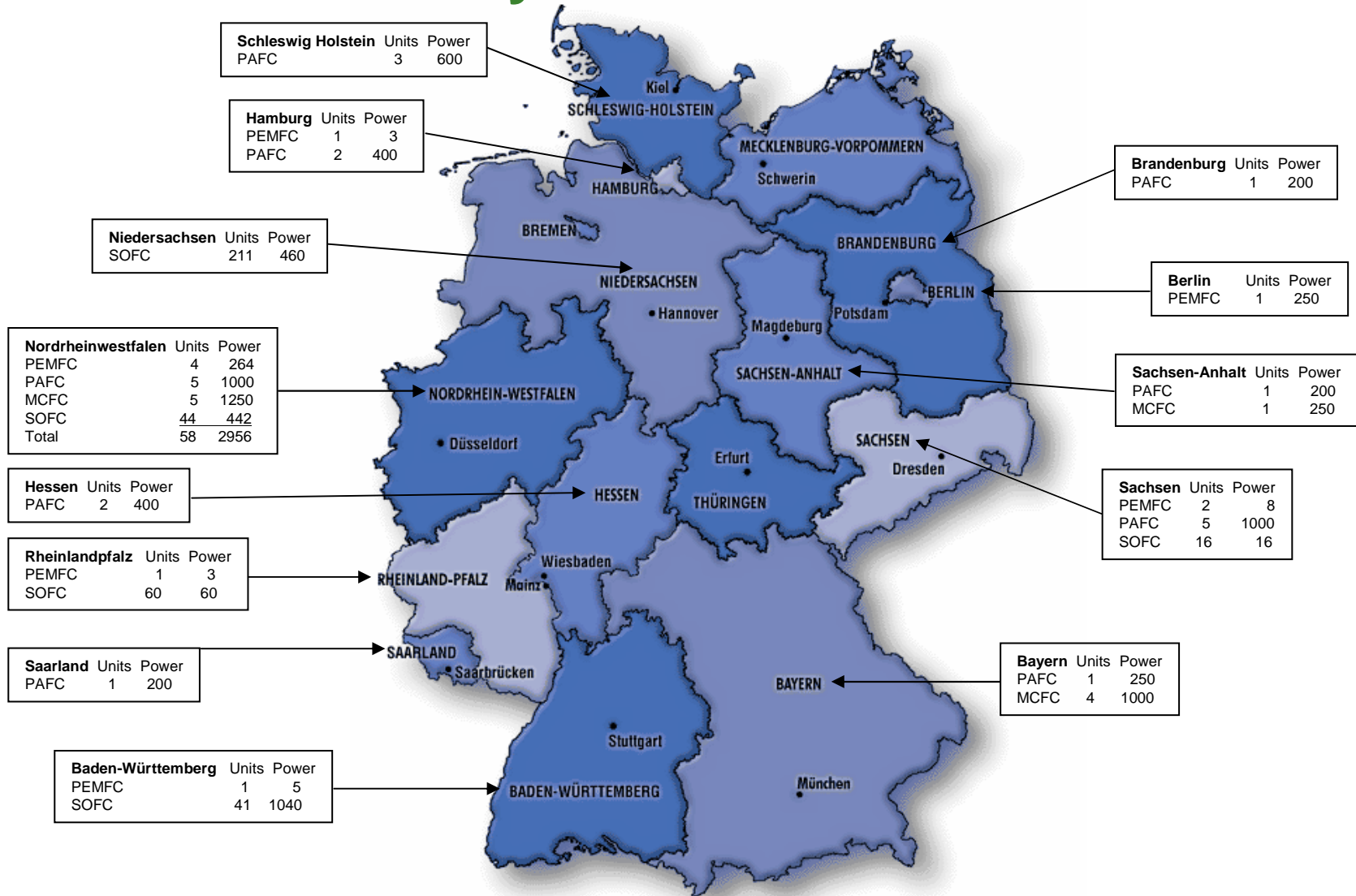


Continental Europe Fuel Cell Demonstrations:



Total 12,000kW

German Stationary Fuel Cell Demonstrations:



Total 9,300kW

State & Corporate Support

State & Corporate Financial Support

❖ Government's annual fuel cell spend:

Region	Spend ⁽¹⁾	Per Capita
- Japan	\$220m	\$1.74
- U.S.	\$210m	\$0.81
- European	<u>\$ 60m</u>	\$0.19
- Total	\$490m	\$0.69

Corporate expenditure

- Annual industry spend up to \$3 billion
- Auto industry alone has invested \$4.5bn to-date

Existence of a Quoted Sector in North America

- A pure fuel cell quoted sector exists in North American
- North American fuel cell companies have raised >\$1.5bn via both primary and secondary offerings
- US investors have exposure to North American fuel cell companies

In contrast there is no European quoted sector

- Restricting fund managers access to fuel cell companies
- Limited venture capital available

⁽¹⁾ Sources: Fuel Cells 2000; US Dept of Energy; Japanese Fuel Cell Development Information Centre; European Commission

Conclusions

- ❖ The emerging fuel cell supply chain is inherently knowledge based with significant barriers to entry
- ❖ The severe correction in company valuations makes the emerging European fuel cell industry ripe for a focused and a specialised venture capitalist VC
- ❖ The industry is supported by a number of powerful drivers including:
 - Demand for economic growth in the developing world and the demand for premium energy in industrialised countries
 - An increasing awareness of the precariousness of energy supplies
 - Global warming and ever tightening emissions legislation
- ❖ Fuel cells are a natural complement to renewable energy sources. European policy has created the largest wind industry in the world. The next logical step would be to extend this vision to incorporate fuel cells
- ❖ Large-scale demonstration projects are underway, particularly in the US and Germany
- ❖ The potential size of the fuel cell industry is massive, implying huge investment requirements and corresponding job opportunities