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A Fuel Cell Supply Chain in the UK

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Development Director

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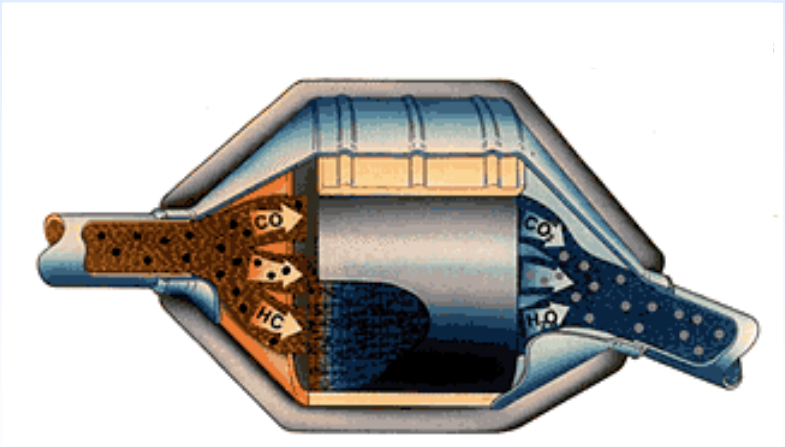
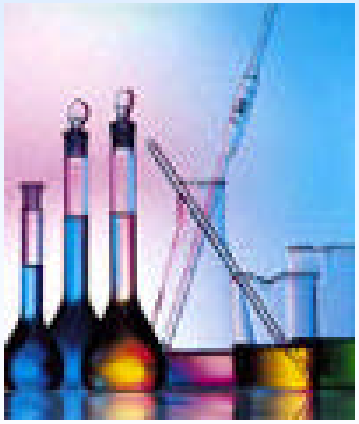
Johnson Matthey plc

- FTSE 100
- £192.5m profit before tax, Market Cap £2B
- 7600 employees
- Profits 44% NA, 39% Europe, 17% R.O.W.
- Precious metals, catalysts and fine chemicals





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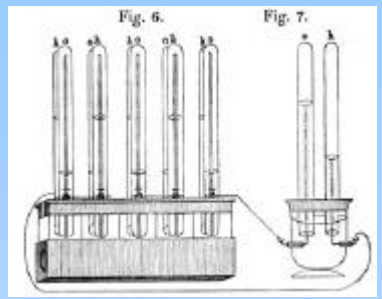
JM in Fuel Cells



- Supplied Pt electrodes to first fuel cell demonstration in 1838

- Catalysts and advanced materials into Gemini, Apollo & Shuttle

- Original investor in Ballard

- Largest JM development programme in ~ 185 years - 10 year programme before profitability

- November 2002: Johnson Matthey Fuel Cells Ltd formed as joint venture between JM plc and Anglo Platinum Ltd (82.5% JM, 17.5% AP)

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Johnson Matthey Fuel Cells

- Dr Jack Frost — Director Fuel Cells
  - Colin Jaffray — Commercial Director
  - Dr James Wilkie — Development Director
  - Mike Atkinson — Director EU Operations
  - Mike Cinaglia — President NA Operations
  - Stephen Smith — Financial Controller

Technology Development
Sonning UK

FC component manufacturing
Swindon UK

FC catalyst & Fuel Proc.
Philadelphia US

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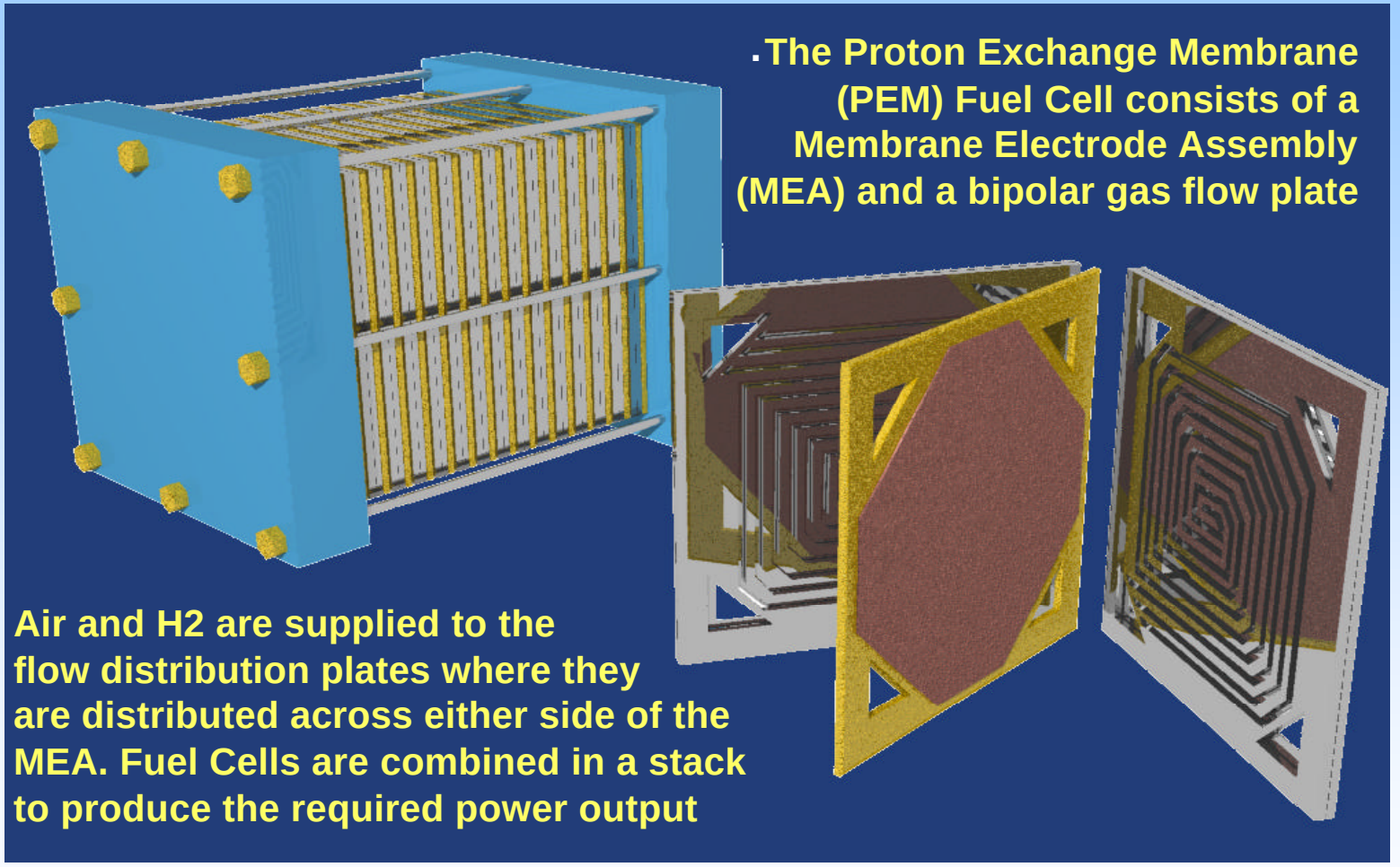
Fuel Cell stack



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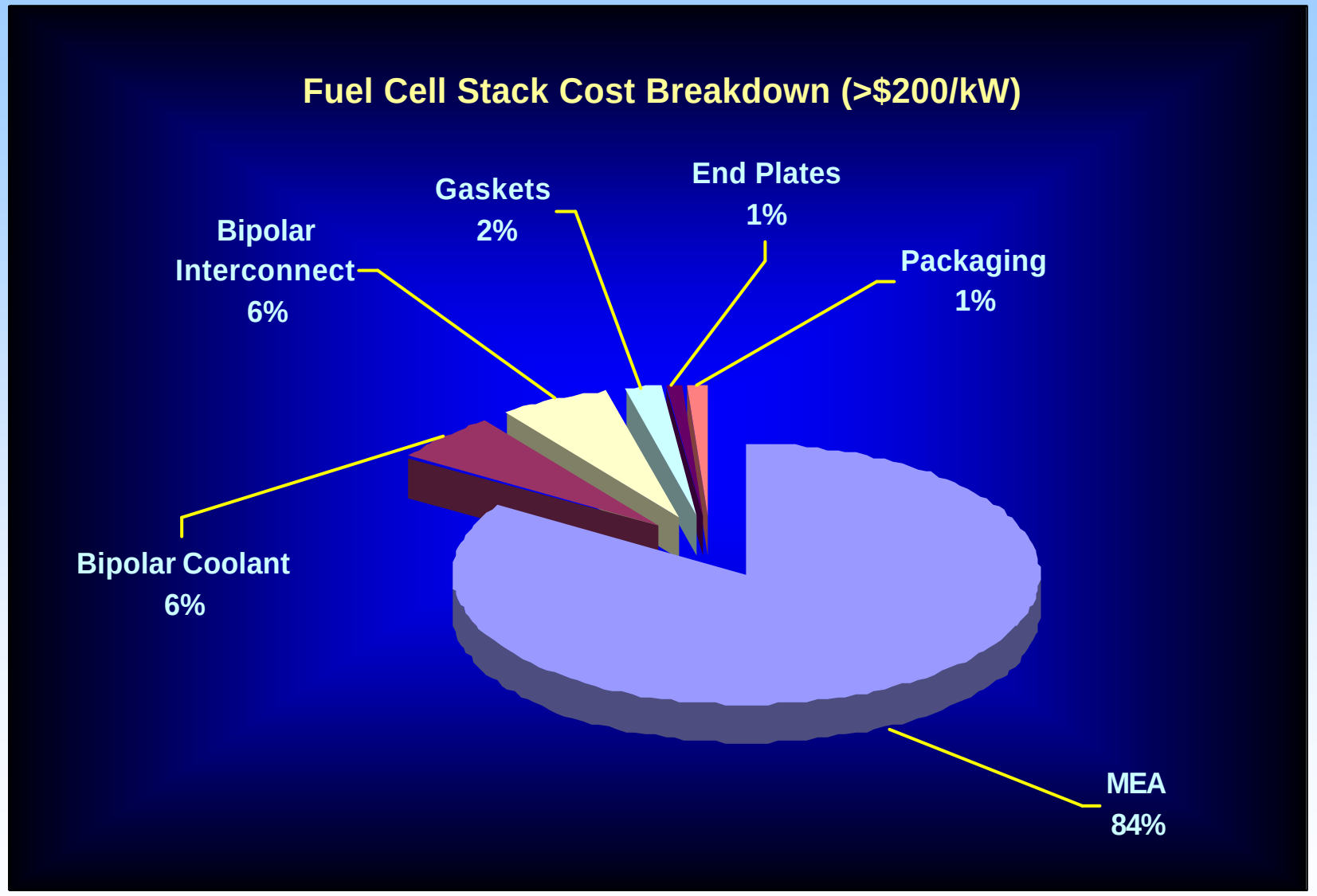
PEM Fuel Cell Costs



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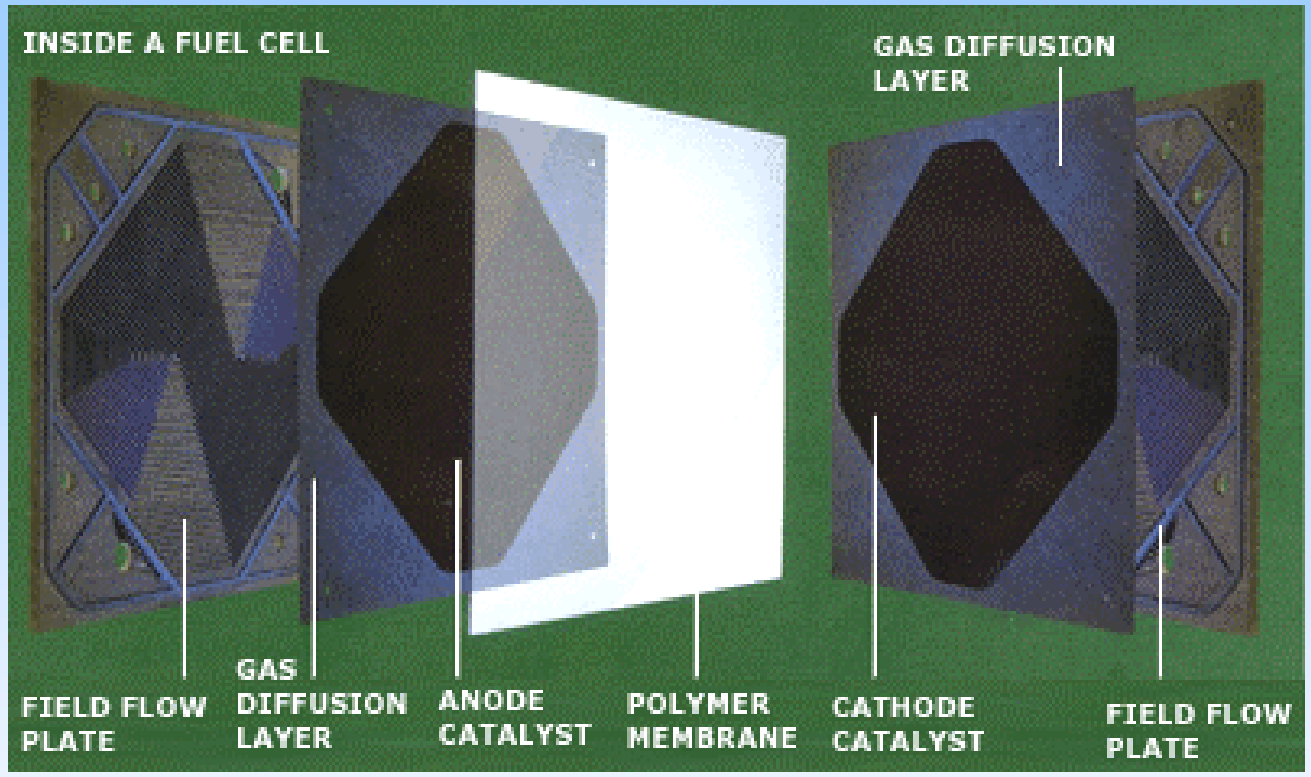
Parts of an MEA



JM offers a fully integrated MEA

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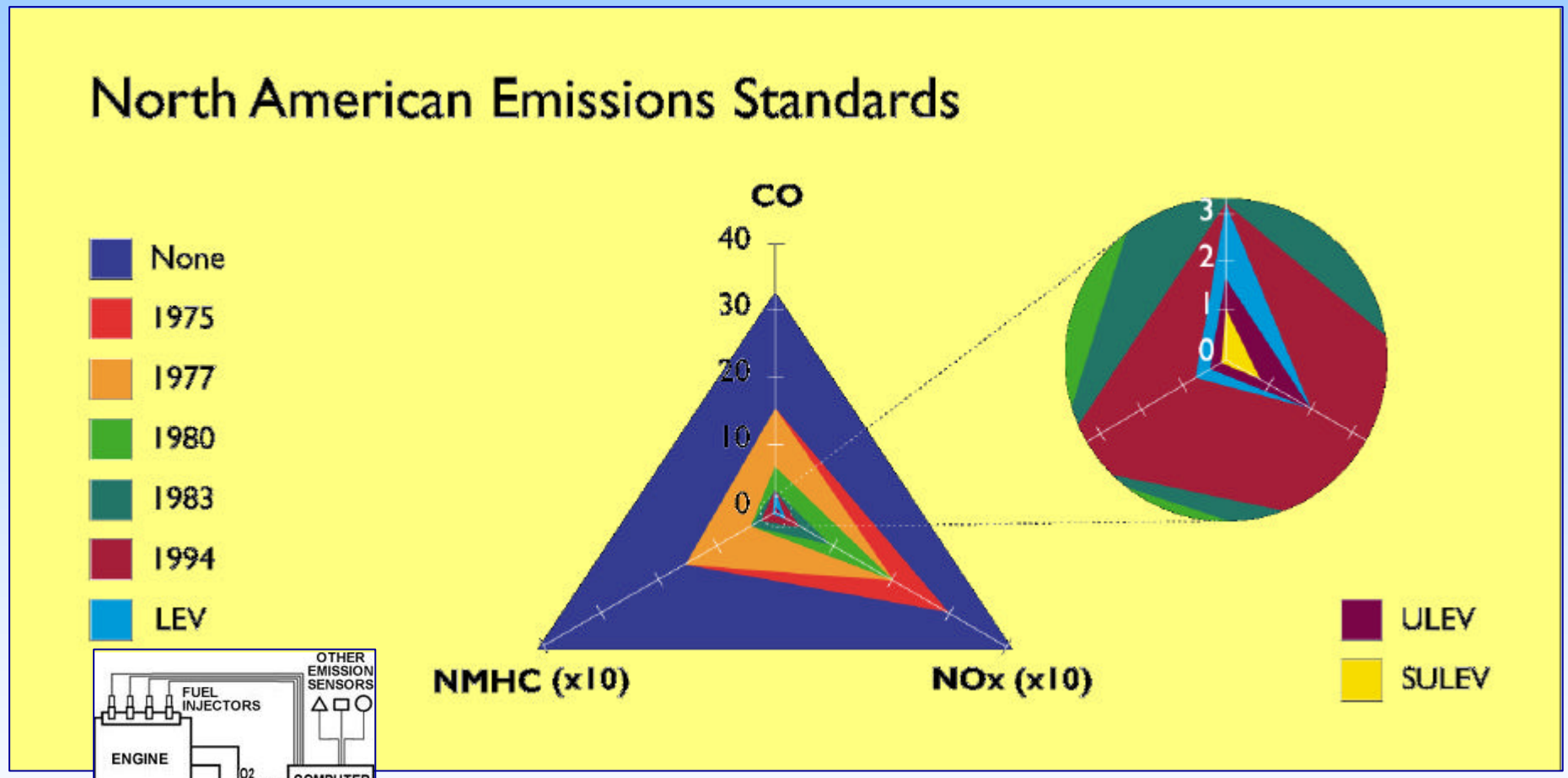
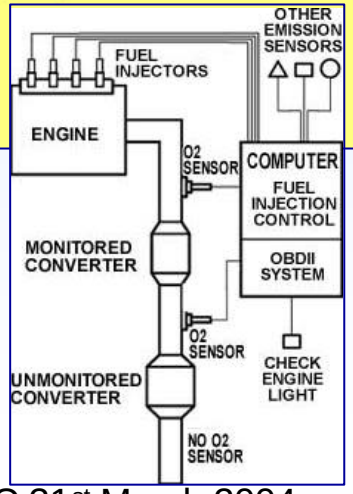
The MEA – a critical component

JM has selected the MEA as its key product offering to the fuel cell industry :

- **Contains expensive materials including Pt catalysts**
- **Major determinant of fuel cell system performance**
- **Considerable scope for performance improvement and cost reduction**

JM has an existing business model…





- Supply a critical component
- Partnerships with OEM

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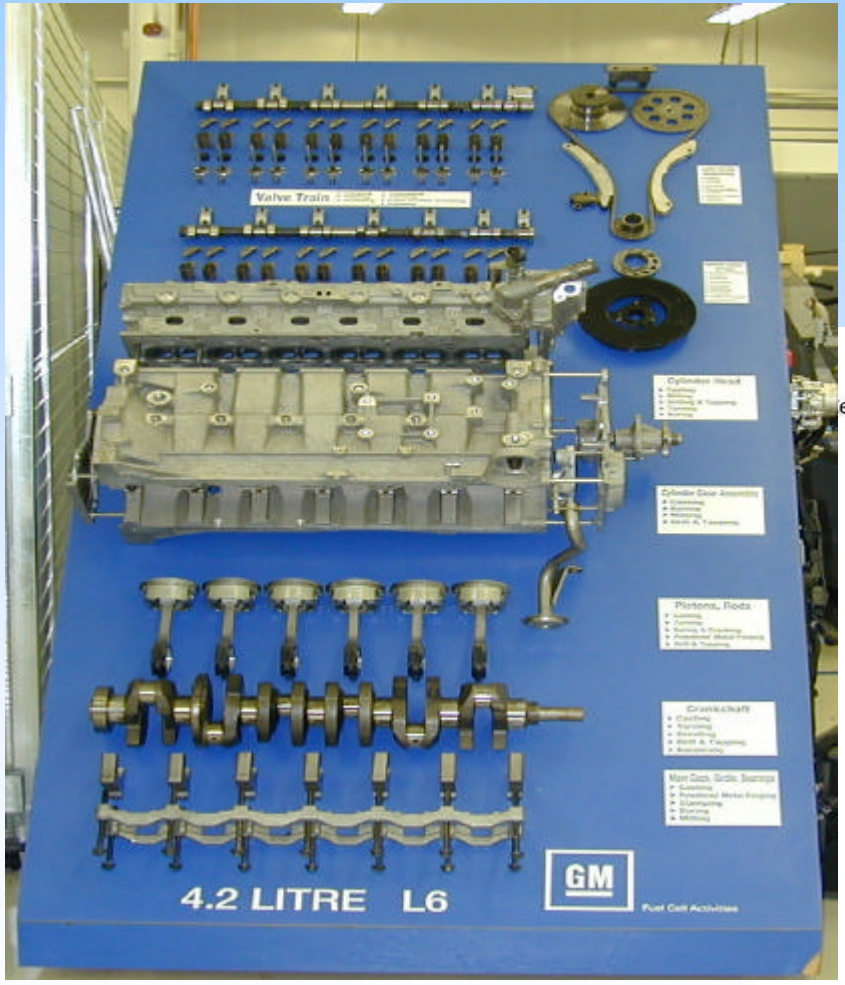
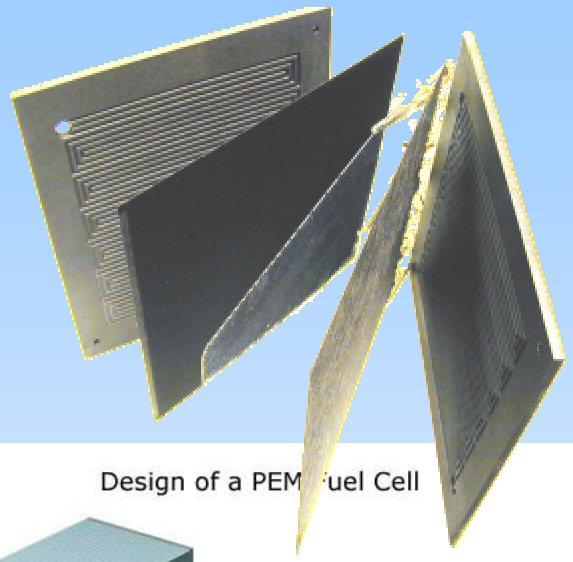
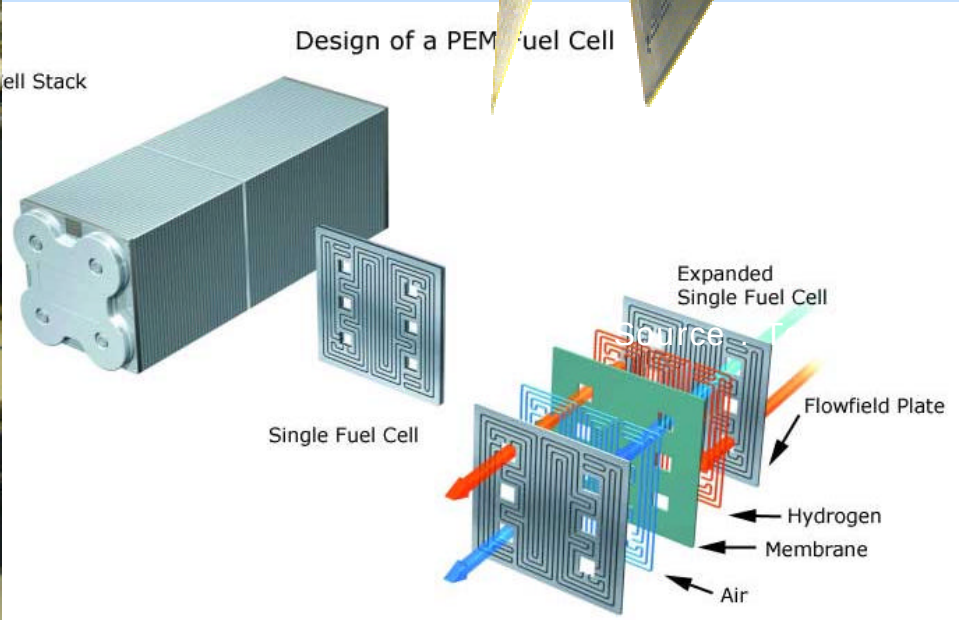
ICE vs Fuel Cell







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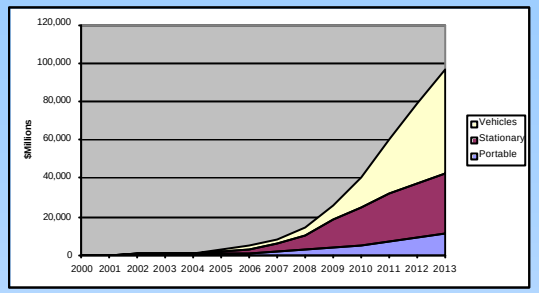
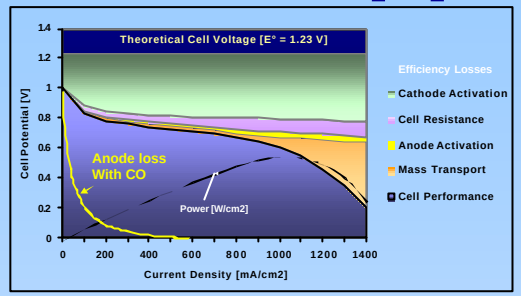
Fuel Cell cars – the supplier's dilemma





- **Potentially large but no market yet**
- **Technically demanding**
- **Substantial product development needed**
- **New materials and mfg. processes**
- **High barriers to entry**

Conclusion : No one company has all the skills and resources to bring fuel cells to market

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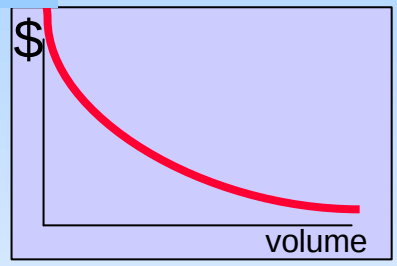
Where will cost savings come from ?

- **Mass production existing materials (volume assembly, volume prices)**



- **New materials –**

System savings
(Hotter, drier FC operation)

More kW power
Less costly components

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Suppliers of MEA's must be able to…

- **Work closely with the OEM development teams**
- **Scale production from 'thousands' to 'millions' of parts over a few years while maintaining quality**
- **Develop successive generations of products with much lower cost and higher performance**
- **Access key suppliers of their own**

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The JMFC business model

- **MEA integrator supplying FC stack builders**
- **Source MEA materials from internal and external sources (non UK !)**
- **Work with OEM's to assemble and customise MEA to their requirements**
- **Form a group of UK companies with complementary expertise to co-develop and manufacture components of the MEA**

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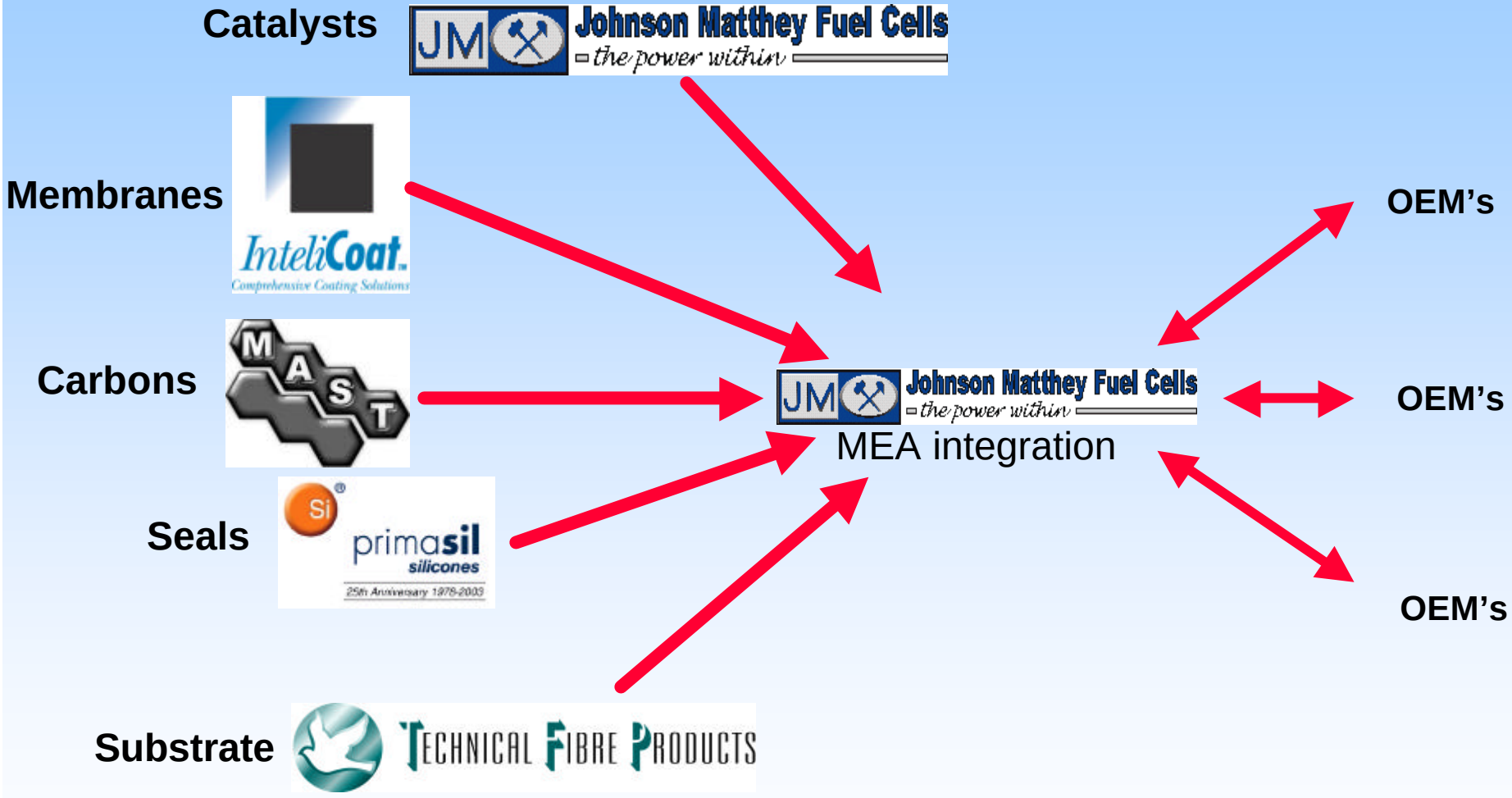
Structure of DTI supported project



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Fuel Cell Supply Chains

- **Fuel Cell supply chains are critical to the success of fuel cell vehicles BUT**
  - **Potential suppliers may be in different industries or lack resources**
  - **Long term nature of development may deter some suppliers**
  - **Market uncertainty is very high**
- **The UK MEA supply base is addressing this by**
  - **Solid commitment from Johnson Matthey**
  - **Advanced technology collaborations**
  - **Co manufacturing and development**
  - **DTI support for R+D**

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"We believe the UK should be the location of choice for international OEM's to develop fuel cell products"

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