

Materials UK – Energy Materials Town Meeting

Friday 24th November 2006, DTI Conference Centre

Notes of Break-out Discussions on Biomass, Fuel Cells and Hydrogen (no particular order or priorities agreed)

Attendees:	John Oakey	Cranfield University
	John Kilner	Imperial College
	George Morris	Qinetiq
	Peter Edwards	Oxford University
	Pat Stoneham	University of East London
	Tak Ishikawa	Ilika Technologies
	Gary Wright	Rolls Royce
	Alan Chapman	Ceramic Fuel Cells Ltd
	Geraldine Verschoor	Verschoor Consulting
	Xiao Guo	Queen Mary, University of London
	Suzanne Ellis	Johnson Matthey
	Joseph McCarney	Johnson Matthey
	Neil Bateman	EPSRC

Biomass

Drivers:

- Environment – CO₂ (cycle must be closed)
- Security of supply/diversity (domestic) – in terms of energy sources
- Synergy with fossil technologies
- New direction for the farming sector – financial benefits
- Increases biodiversity
- Synergy with waste management
- Low tech. – suitable for emerging economies
- Local ‘systems’ benefits

Technology Challenges/R&D Priorities:

- Diversity of types/variability – need controlled supplies
- Food v. energy – land availability
- Energy balance/sustainability
- Science base – technology, materials
- Process improvements
- Impurities/corrosion – including tolerance of catalysts, gas separation
- Materials costs – plant cost, coatings, catalysts, supply chain
- Multi-disciplinary engineering
- Opportunity to use waste biomass

Barriers:

- Gaps in fuel supply chain
- Competition from other options
- Difficulties with network connection
- RAMO – cost and risk issues re. end user and finance availability
- Current legislation and structure of incentives
- Lack of availability of suitable construction materials
- Lessons from other sectors

Recommendations:

- Support for demonstration projects
- Support for materials R&D to increase plant efficiency, reduce plant costs and cost of electricity – spin-off for other sectors
- Improved incentives (local and national) and streamlined legislation
- Facilitation of grid connection

People taking this forward:

- Lead - John Oakey
- Supporters - to be determined

Fuel Cells

- Drivers: (in addition to security of supply and environmental benefits)
- Scaleability – CHP to large scale generation
 - Efficiency – cost benefit and CO₂ reduction
 - Portability – automotive pull should provide infrastructure
 - Easily delivered complex systems
 - Back-up/emergency/remote electricity supplies
 - Steady supply cf. other types of renewable generation

Technology Challenges/R&D Priorities:

<i>Low Temperature (PEM)</i>	<i>Both</i>	<i>High Temperature (SOFC)</i>
	New materials Cost	
Polymer stability – seals/membranes		Ceramic processing
O ₂ reduction Poison tolerance – CO, S, ..	Catalysts (systems) New options – scalable, manufacturability Avoid precious metals	Failure mechanisms – lifing
Corrosion		BoP corrosion, especially at 900oC
Polymers, precious metals	Recycling	NiO, Co, ...
	Modelling	
	Systems, Degradation, mechanical behaviour, validation (accelerated testing), electro-chemical, ...	

- Barriers:
- Manufacturability – supply consistency, quality, volume
 - Cost – metals
 - Market entry
 - Lack of commitment – government, companies

Recommendations:

Funding – research (UK strength – innovative materials),
deployment/demonstration
Focus on materials supply – globally
Window of opportunity – now!

People taking this forward:

Lead - John Kilner (Imperial College)
Supporters – Gary Wright (Rolls Royce)
- Alan Chapman
- Patricia Stoneham
- Geraldine Verschoor

Hydrogen

Drivers: (in addition to security of supply and environmental benefits)
Energy carrier
Clean at the point of use
Flexible supply options

Technology Challenges/R&D Priorities:

Production with minimal CO₂ emissions (coupled with CCS)
Separation membranes
Catalysts for a range of feedstocks
Photo-catalysis
Storage materials/systems
Different scales need different solutions
Technical solutions to perception issues
System efficiency – fuel cells + GTs
Transportation – methanol, ammonia, ..
RAMO

Barriers: Lack of existing infrastructure
Funding
Lack of vision
Perception
Economics

Recommendations:

Co-ordination of H₂ and conversion technology initiatives
Funding – demonstrations, bridging technologies

People taking this forward:

Lead - Peter Edwards (Oxford)
Supporters - Xiao Guo (Queen Mary)
- George Morris
- Patricia Stoneham
- Geraldine Verschoor

John Oakey – 3 December 2006