

# Energy Materials – Meeting the Challenge

**ALSTOM**

**CORUS**

**DOOSAN** Doosan Babcock Energy

**e-on** UK

**energy technologies institute**

**ETD**



**IOM<sup>3</sup>**

The Institute of Materials, Minerals & Mining

**namtec**  
national metals technology centre

**npower**

**RWE Group**

**NPL**  
National Physical Laboratory

**Technology Strategy Board**  
Driving Innovation

**TWI**  
WORLD CENTRE  
FOR MATERIALS  
JOINING TECHNOLOGY

# ***‘Energy Materials – Meeting the Challenge’***

*Derek Allen,  
Chairman,  
MatUK Energy Materials Working  
Group*

*Burleigh Court, 9-10<sup>th</sup> October 2008*



- Background
- Why Energy?
- The Strategic Research Agenda (SRA) and implementation
- Structure and objectives of the Conference

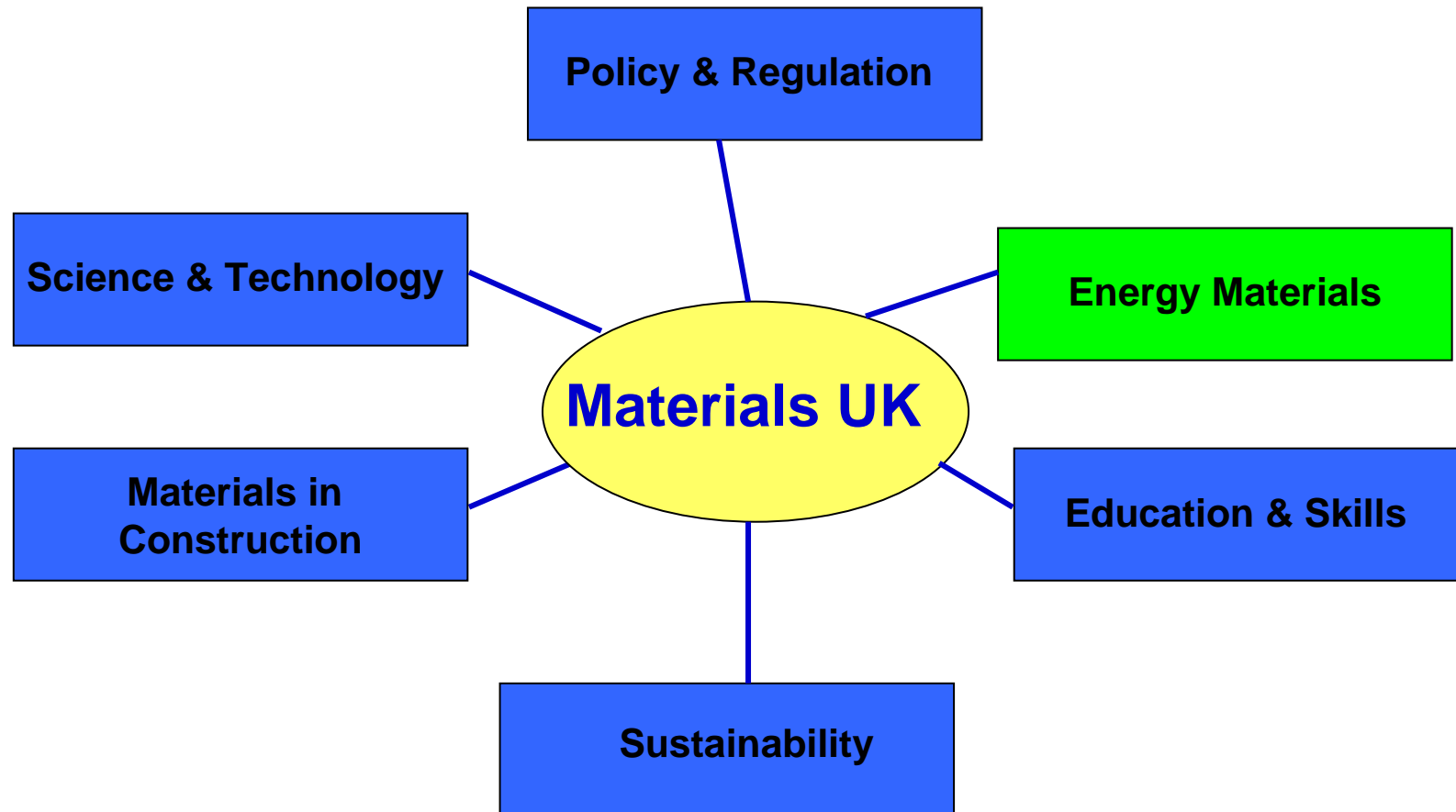


# The History

- The Materials Innovation and Growth Team (IGT) was set up in January 2005 by the UK Government to review materials industries. Its scope covered..
  - All materials, production, supply chain issues
  - Engaged Policy & stakeholders
- It reported in March 2006 after 15 months work
- Key outcome-to form MaterialsUK (MatUK) to implement its recommendations to develop a strategy for Materials in the UK
- MatUK formed a number of Working Groups in priority areas identified by the IGT



# Working Group Structure



## Who has been involved in the Energy Group?

- Advisory Committee,  
*Industry; Alstom, EON UK, Johnson Matthey, UKAEA, Siemens, Pilkington, Doosan Babcock, British Energy, BP, Rolls Royce, BNFL, Corus, Alcan, National Grid, RWE, AREVA, Pilkington, Rolls Royce Fuel Cells, UKAEA, Oxford Instruments,*  
*Other organisations; Materials KTN, IoM3, MoD, QinetiQ, NPL, Manchester University, TWI, Oxford University, BERR, Imperial College, Cranfield University, UKERC, EPSRC, Namtec, UKTI and RDA's.*
- Secretariat supplied by BERR
- 100's of companies around the UK have been consulted throughout the process

# .....*Why Energy?*



# Three Major Energy Challenges

## Security of Supply

By Mark Swales, October 19, 2006 Page 11

### BLACKOUT BRAIN

**Not since the 1970s have we been at greater risk of power cuts. So is it time to stock up on candles?**

**S**INCE the Republic of Ireland's electricity supply was taken over by the state in 1987, the UK has been at greater risk of power cuts than any other major industrialised country. And the risk is increasing. The UK's electricity supply is now more dependent on gas than ever before. And the UK's gas supply is now more dependent on imports than ever before. The UK's electricity supply is now more dependent on gas than ever before. And the UK's gas supply is now more dependent on imports than ever before.

by Michael Hanlon

THE 2006 winter is expected to be the most difficult yet for the UK's electricity supply. The UK's electricity supply is now more dependent on gas than ever before. And the UK's gas supply is now more dependent on imports than ever before.

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## Climate change

### THE CHINA CRISIS

Spectacular growth now biggest threat to environment

|   |  |  |  |   |   |
|---|--|--|--|---|---|
| <b>Consumption</b><br>China - growing at nearly 10% a year - already consumes 90 million barrels of oil per day. Total world production today is less than the United States. | <b>Wealth</b><br>China's population in 20 years - when per capita income will be equal to that of the United States. | <b>Oil</b><br>On current trends, China will by 2021 be consuming 90 million barrels of oil per day. Total world production today is less than the United States. | <b>Forestry</b><br>China is already the biggest driver of rainforest destruction, says Greenpeace. Half of all rainforest has been lost. | <b>Global warming</b><br>By 2025, China will overtake the US as the top emitter of greenhouse gases causing global warming. | <b>Cars</b><br>By 2031, China would have 1.1 billion cars if it matches current US trends - bigger than the current world fleet of 800 million. |
|---|--|--|--|---|---|

## Fuel costs to rise again

Lucinda Kemeny and Dominic O'Connell

BRITAIN'S biggest manufacturing companies are being told they need to accept power rationing or face blackouts this winter. Last week National Grid (NG), the monopoly gas and electricity distributor, approached its biggest customers and made clear they needed to consider cutting their use of power over the winter.

Companies that are big users of power, such as Rio Tinto and Alcan, have been approached by NGT to sign special "shutdown" contracts in which they agree to have their power cut by a specified amount after just a few hours' notice.

Firms are being offered lucrative deals to encourage them to sign up to the power-rationing programme. They are being promised money upfront and subsequent payments. If any power cuts need to be made, the extra development is in response to concerns that a cold winter could lead to blackouts as Britain's power industry struggles to keep up with demand.

NGT wants to ensure that it has enough power reserves to keep the lights on and the heat on in millions of British households during the winter months.

An NGT spokesman said: "Instead of bringing on more generation it is about controlling the demand side."

NGT is run by Roger Irwin, chief executive, and is one of Britain's largest public companies with a market capitalisation of £1.3 billion.

Companies that are likely to sign up for the controversial deals are those that do not require continuous heat and power for their manufacturing processes, or have alternative supply sources.

The Energy Intensive Users Group (EIUG), which represents Britain's biggest power users, estimates that 1,400 megawatts of power - equiv-

alent to that produced by two large power stations - could be made available to NGT under such agreements.

The contracts could be worth a total of £56,000 an hour to cover customers' lost production time. The amount would have to be at least equivalent to, if not more than, the cost to the customer of keeping its facilities powered up and running.

Companies can pay as much as £40 to use one megawatt of power for an hour during times of peak demand, compared with the average price of about £15, so NGT could face a very steep bill.

However, insiders said NGT had acquired a "sense of urgency" over the winter months as the government introduced the New Electricity Trading Arrangements. For the first time, electricity generators had to trade power in a market system and the cost of the power soon fell to 10p.

TXU, the American-owned power company, collapsed last year and British Energy, the nuclear generator, almost followed because of the slump in prices. At the same time, many of Britain's power stations have fallen into the hands of their creditors because they are no longer producing a profit.

Some have been shut down and others temporarily moth-balled.

The result has been a rapid cut in overcapacity and growing fears that a cold winter could leave parts of the country in darkness. The looming crisis has already begun to take shape as companies start their annual negotiations to renew their power contracts from October.

Many companies are being quoted renewal prices as much as 50% higher than last year and restructuring experts fear that Britain's shuddering manufacturing sector will be hit hard.

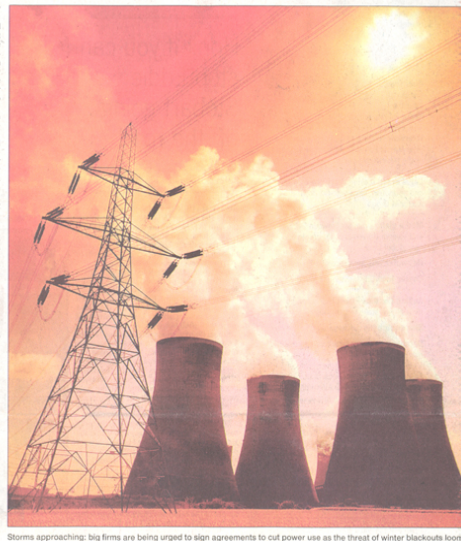
Gerard Hughes, a partner at Ernst & Young, said: "There are still a lot of problems for manufacturing and any increase in direct costs would adversely affect the sector."

Jeremy Nicholson, an EIUG director, said price rises were of concern because power costs were so important to members. He said an aluminium smelter might spend 40% of its production costs on power. Heavy industrial users spend £3.5 billion a year on electricity.

The EIUG has raised the issue with Ofgem, the regulator, which has promised to keep a close eye on the situation.

Power prices are just as important to smaller companies. The Imperial Bathroom Company, based in the West Midlands, said: "We had been trying to renew our contract and we had great difficulty getting a reasonable price because people were quoting us a 30% increase, but we managed to negotiate 10%."

## Affordable Energy

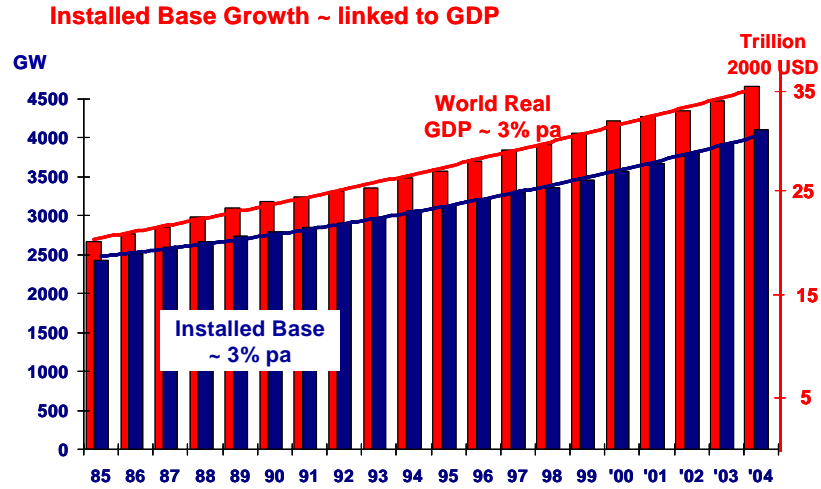


Storms approaching: big firms are being urged to sign agreements to cut power use as the threat of winter blackouts looms

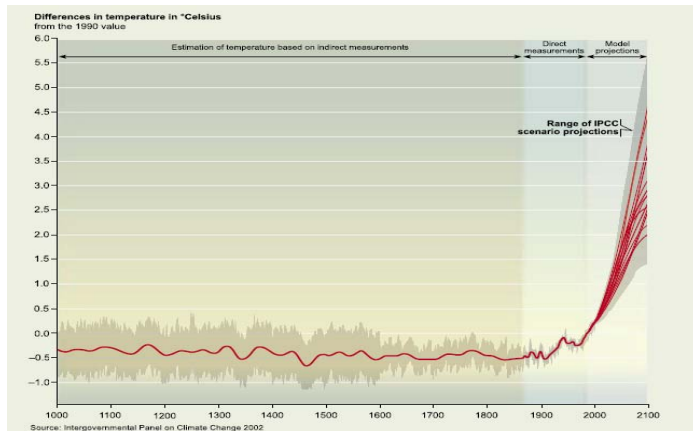
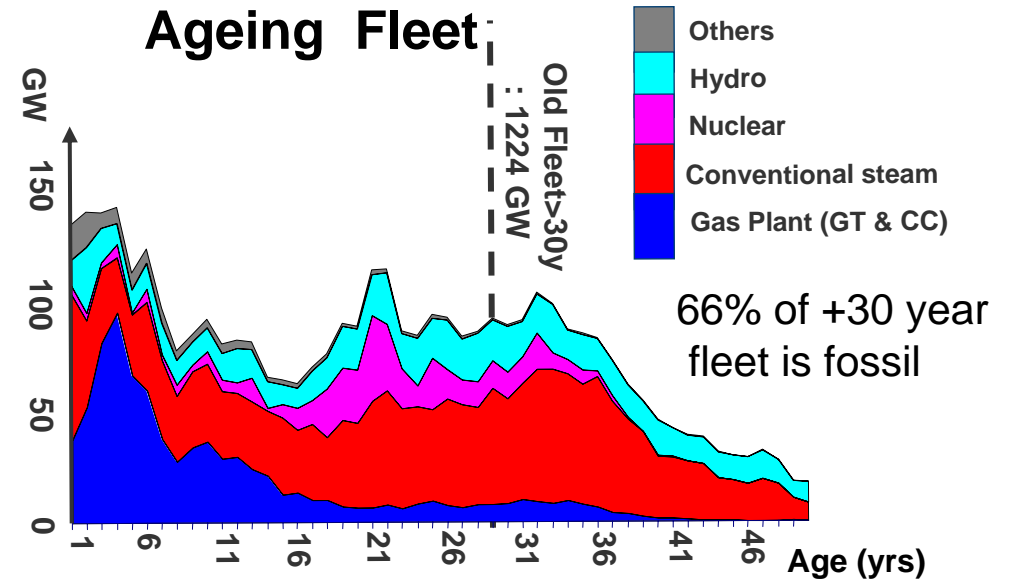


# Drivers

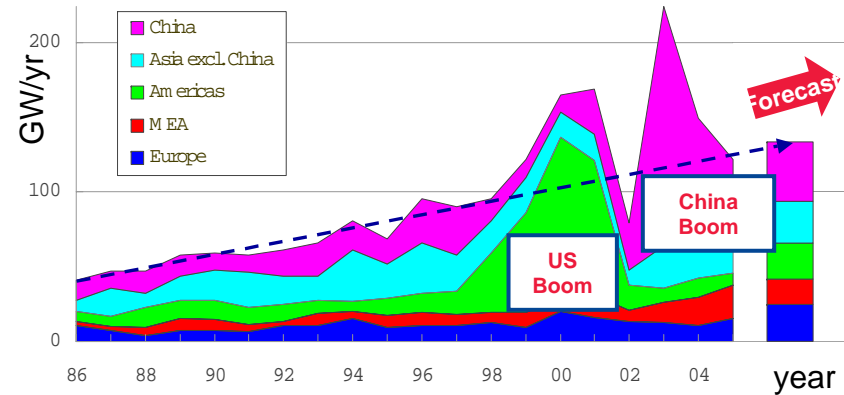
## GDP Growth



## Ageing Fleet



## Environment



## Market Forces

# Our Objectives

## The SRA is Industry led & market driven

A means by which we can;

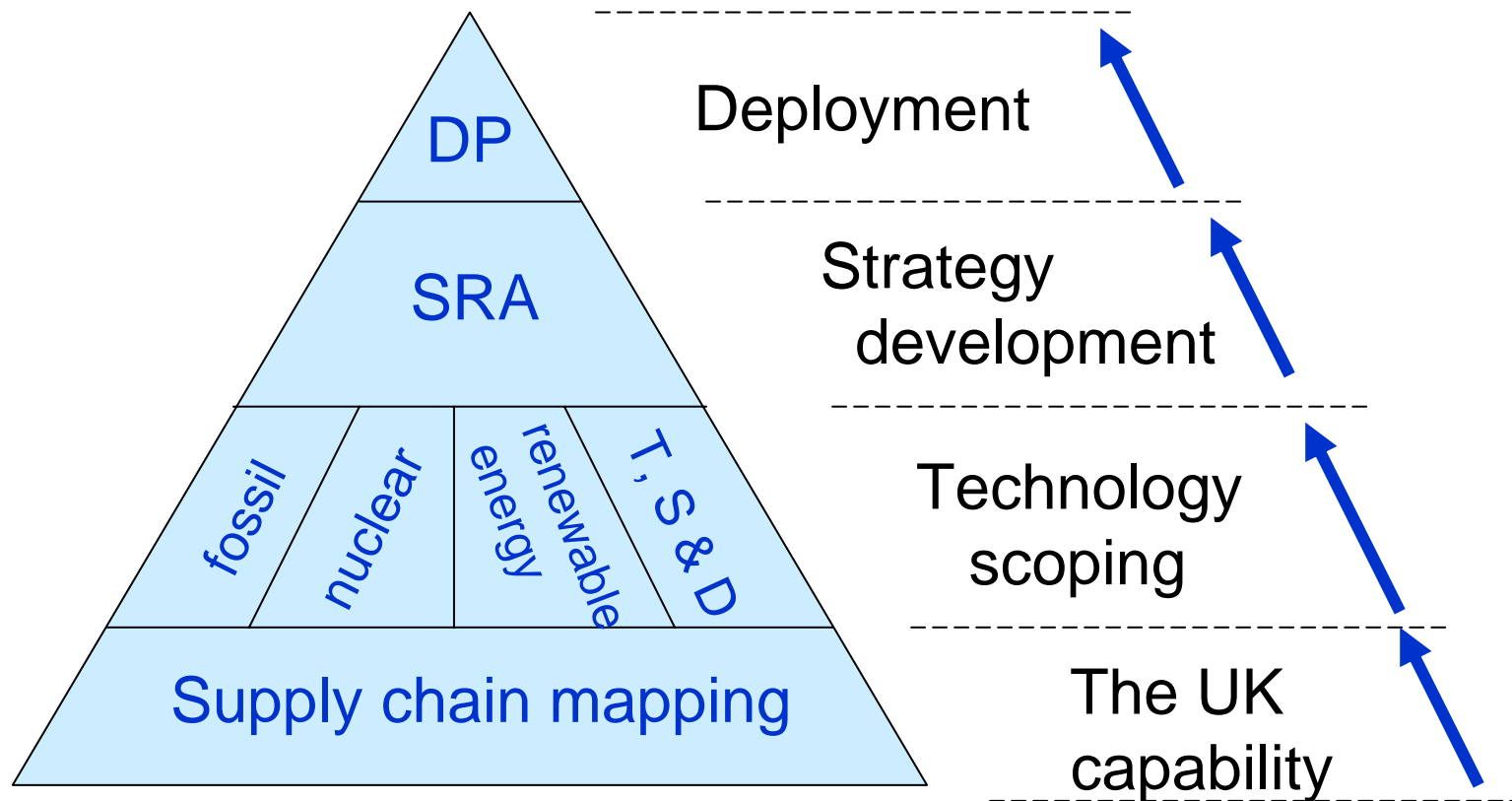
- Identify and deliver materials solutions to the energy sector to help meet Energy Policy objectives
- Identify business opportunities for the materials community in UK

and develop;

- **Coordination**
- **Long term strategy and funding policy**
- **A unified 'voice' with influence**
- **International links**

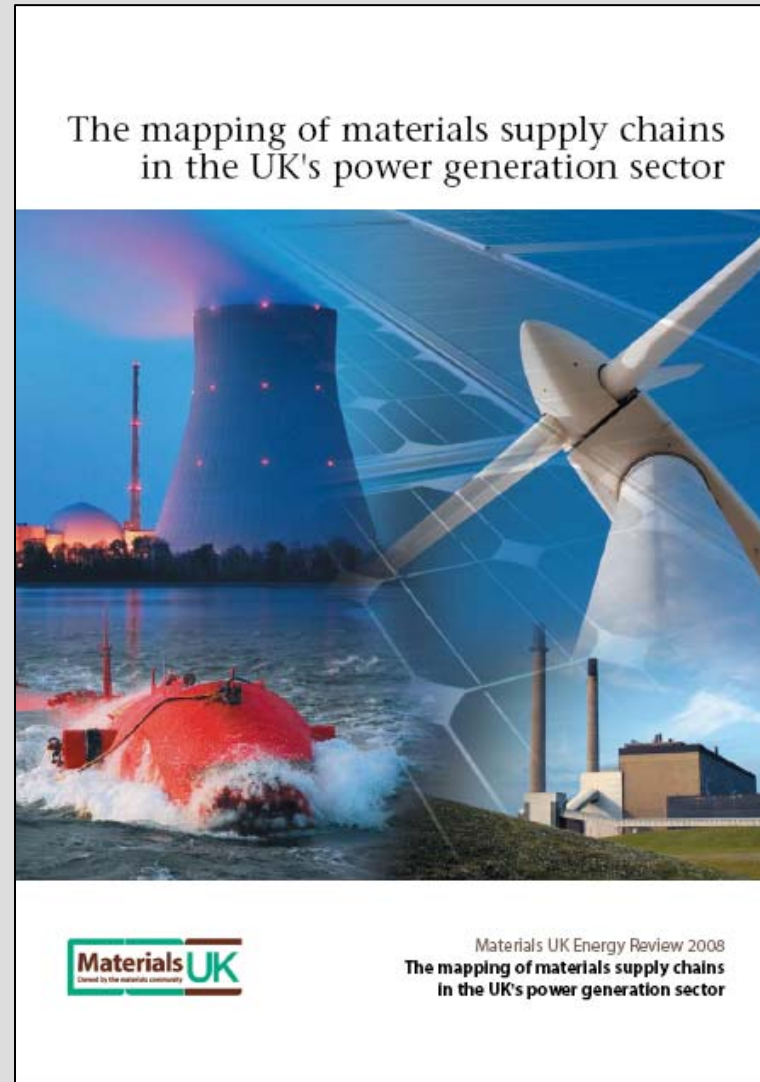
which will;

- Advise government and funding agencies on priority areas
- Help define UK priorities for overseas funding where UK has direct input (FP7)



# What have we delivered?

A review of the  
UK Energy Materials  
supply chain published  
May 2008



## What have we delivered?

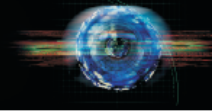
...4 key technology scoping reports and the SRA published December 2007



# What have we achieved?

- Worked with the Technology Strategy Board to help develop the Autumn 2007 Call on Energy Materials (£12m)
- Through chairmanship of EuMat worked within FP 7 to deliver a call on Energy Materials in December 2007

## Technology Strategy Board



### Materials for Energy Autumn 2007 Competition for Funding

The Technology Strategy Board and the Engineering and Physical Sciences Research Council have allocated an indicative amount of £12M to fund highly innovative collaborative research proposals in Materials for Energy. Funding is available for industry-led collaborative projects across a range of Technology Readiness Levels, from basic research to applied research and development in materials technologies that will enable the UK to rapidly meet the urgent and difficult challenges posed within the global Energy Sector.

The focus will be on the development of materials technologies for:

- Energy generation
- Energy transmission and distribution
- Energy storage
- Energy conservation

It is also anticipated that materials developments in these areas will have spillover energy-related benefits for other industrial sectors; e.g. transport, including aerospace.



## European Commission funding for projects on *Novel materials for energy applications*



Joint Call between two areas of the European Commission's Framework Programme 7 (FP7) - Energy and Nanosciences, nanotechnologies, materials & new production technologies (NMP)

### Key aspects of FP7

- Research and demonstration programme
- Collaborative (min. of 3 different member states or associated countries in proposal consortium)
- Cost sharing:
  - > Research - 50% (75% for SMEs, public bodies, universities)
  - > Demonstration - 50%
- Innovative
- European impact

### Call for Proposals

- Call to be published on 30<sup>th</sup> November '07
- Stage 1 deadline likely to be in February '08
- Budget 25M€
- 2 stage submission process:
  - Evaluation Stage 1 proposals: February/March 2008
  - Evaluation stage 2 proposals: May/June 2008

The Call is currently only in draft format however early indications are that the priority fields of application for energy technology are likely to be energy conversion and storage, photon capture and CO<sub>2</sub> capture and storage.

To receive more information please contact [energie@enviros.com](mailto:energie@enviros.com) (UK National Contact Point for Energy in FP7).

# The Strategic Research Agenda

## Why is the SRA unique?

- Delivery of the UK Energy policy will require a balanced portfolio of low carbon technologies to deliver its objectives.
  - This means that a wide range of underpinning materials R&D is needed
- This has instigated a detailed materials review across the numerous energy technologies from generation to storage. The 1<sup>st</sup> in UK but also in Europe
- It speaks on behalf of the community-industrially driven by need and opportunity
- Its recommendations are already advising and influencing both the UK funding agencies and Europe

## The SRA covers the following issues;

- Overview of energy market
- UK materials supply chain
- Sustainability/Natural resources
- Skills
- International collaboration
- Technology challenges
- Funding
- Recommendations





## Key Areas for Materials to address

The recommendations of the Task Groups have been distilled down into 3 key common technology themes where UK materials R&D should focus:-

- Reducing time to market and life cycle costs (eg. solar, fuel cells, marine)
- Higher performance in harsher environments (eg. Carbon capture, co-firing, nuclear)
- Improved life management and reliability (eg offshore wind, nuclear)

## 7 key recommendations to support delivery

- Communication
- Establish Coordination & Delivery Body
- Stable/Sustainable funding
- Energy Materials Knowledge Management
- Innovative Technology Transfer
- International Engagement
- Development of Skills and Resources



## Implementing the recommendations of the SRA

- Key stakeholders perspectives
- How to meet the technology challenges and benefit the UK
  - Fossil
  - Renewables
  - Transmission, distribution, storage
  - Nuclear
- An international perspective from the USA
- Networking, exhibition and posters
- Defining the next steps to implementation

# The Challenges:- Looking ahead

- Global electricity generation predicted to almost double by 2030
- 15% energy from renewable sources by 2020 (ie >30% electricity from renewables)
- 7000 new wind turbines by 2020
- Zero Carbon homes by 2016
- 10 billion Euro investment in 12 CCS plants across Europe
- Globally the overall value added of the low carbon energy sector could be as high as \$3 trillion per year worldwide by 2050, it could employ more than 25 million people in jobs.
- etc, etc

.....and finally

Don't believe everything you are told.

Please engage, challenge and debate.

.....and enjoy!!

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