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NEWSLETTER

of the Coal Research Forum

EDITOR'S MUSINGS:

As I sit pecking away at the old PC we are in the run-up to Christmas but by the time you get to see this newsletter it will all be over. All the preparation and hype and before you know it the holiday adverts will be on TV and Christmas will be a thing of the past. Having said that, I hope that over the holiday period you will have enjoyed a happy and peaceful Christmas and I and everyone involved with the organisation of the CRF would like to wish you all a very Happy New Year.

The CRF held its 7th European Conference on Coal Research and its Applications in the principality in September. It attracted a record number of attendees some who had travelled from as far a field as South America, South Africa, China and Japan. We had not realised that it was the monsoon season in South Wales at that time but at least it gave our oriental visitors some nostalgic views of what the paddy field at home must have looked like.

Other well-attended events in the latter part of 2008 included the Robens Lecture given by Mike Farley of Doosan Babcock and a joint meeting of the Coal Preparation Division held at the University of Nottingham. Notes on both of these events and the conference are to be found in this newsletter

2008 has been a troubled and difficult year for many people in many ways. There is clearly nowhere to hide from the global economic downturn and its effects can be seen in so many places - job losses, company closures, house re-possessions, losses on investment and the list could go on. Conflict seems never ending whether it is in Africa or the Middle East and Asia. Even the issue of how we are going to address the seemingly insoluble but undoubtedly very expensive issue of controlling the climate has been pushed aside for the time being. And yet amidst all of this rather discouraging outlook you have only to go out and about to see that people are just cheerfully getting on with their lives and doing the best they can - as I guess they always have done. Lets us hope that despite the gloomy predictions for 2009 we can start looking forward to some good news in the not-too-distant future. Anyway, I must stop now as my turkey risotto is on the table, (would have been nice to have it on a plate but you can't have everything)!!

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7th European Conference on Coal Research & Its Applications 3rd – 5th September 2008 Cardiff University

The seventh biennial coal research conference organised by The Coal Research Forum was held in Cardiff in early September. The event, formally known as the 7th European Conference on Coal Research & Its Applications, was preceded as it has been in previous conferences by a workshop organised by the IEA Clan Coal Centre by Robert Davidson.

The conference was held from Wednesday 3rd to Friday 5th September and was hosted by Cardiff University. A late flurry of registrations resulted in the conference numbers being the highest of any previous CRF conference. Once again there was representation from a number of European countries such as Spain, Italy, France and Greece with some long distance travellers from Colombia, South Africa, Japan and Australia.

A full programme of oral presentations covered two and a half days in which 68 papers were given in 9 parallel sessions. I believe that there were no 'no-shows' which is at least in part due to the willingness of some presenters to 'step into the breech' at the last moment - thanks are due to them. In addition there was a full poster session held on Wednesday evening in conjunction with a buffet dinner in the Julian Hodge foyer.

The Conference Dinner was held on Thursday night in the convivial surroundings of Aberdare Hall. This once women-only hall of residence provided a pleasant atmosphere in which an excellent meal was enjoyed, we hope, by all.

Unfortunately, the warm welcome which we received from the local organisers did not extend to the weather which was particularly memorable for its almost incessant rain! We will remember this conference as 'The Wet One' remarked one of the attendee towards the end of the week.

My impression of the event as Conference Secretary was that although there were a number of minor technical problems it was on balance a success and did not detract too much from the overall enjoyment of the attendees. The editor would also like to place on record his thanks for the continuing support for this conference which we received from INCAR in Spain, the University of Nottingham and Imperial College London.

As a footnote for anyone who did not enjoy the conference, the Secretary and Treasurer will be different for the 8th ECCRIA and any past shortcomings should be directed to the as yet unformed organising committee!

My impressions of the 7th European Conference on Coal Research and its Applications, by Manuela Rallo, University of Nottingham

Attending the 7th European Conference on Coal Research and its Applications has been a great personal and professional experience for me as PhD student, despite all the floods in Wales!

The University of Cardiff was a good location for the conference. The level of the oral sessions was really technical and elevated, and also the poster session was well organized. The conference ran with two parallel sessions, with topics, I do believe, obtained interest from everyone. I have attended mainly those presentations are more related to the work I am doing here at Nottingham University that regards mercury behaviour and speciation in co-firing by-products. Thus, I have found the flue gas cleaning session very interesting for my research but also the co-firing and carbon capture presentations were particularly attractive.

The oral sessions I attended conferred to me the opportunity of presenting my work to a professional audience. Furthermore, I have received feedback and discussed in details technical aspects of my research with other researchers with a diverse range of background. This made me think how bringing together universities and industries is an important issue not only to exchange knowledge and broaden collaborations but mainly to improve science and technology fields.

Moreover, the conference was really well organized in term of food quality. As part of the conference programme, participants could enjoy good meals and refreshments per day and I would like to highlight the great service and extraordinary quality of the food that we received, especially in the Conference Dinner. I think it was most appreciated by all participants as each meal became a nice break between sessions and it definitely help to the smooth progress of the conference.

Minerals Industry Joint Seminar
26th November 2008

organised by the
Minerals Engineering Society Southern Group
the South Midlands Institute of Materials, Minerals and Mining
and the Coal Research Forum - Coal Preparation Division

This event was in some ways a repeat of last years as it was held at the same time and the same venue by the same organising groups. However, the presentations were different although the event did not have a name to identify its theme which was broadly coal preparation.

There was a very good attendance for the event, as last year, with around 40 people packed into the upstairs conference room of the Staff Club at the University of Nottingham.

The event was opened by Mike Gurr who was present in his role as President of the Minerals Engineering Society complete with chain of office. He claimed he had already been misidentified as the Mayor of Nottingham!

The first speaker was Dr Paolo Bozzato of Ecomin who gave his talk entitled "The design, construction and commissioning of Tabas coal preparation plant". Dr Bozutto explained that he would be giving a combined presentation which covered all aspects of the project and which would normally be given by other specialists.

The Tabas coal mines cover an area of around 20 thousand square kilometres in three Iranian provinces of Khorasan, Yazd and Kerman. The coal mines comprise the Parvardeh, Nayband, Mazino and Abdorghi zones.

The project consisted of the construction of all infrastructure, carrying out engineering of one of the mine and supply of suitable technology and machinery for the development of the mine as well as training, technical assistance and commissioning of the longwall, coal handling and the coal preparation plants.

The project which is being performed on a turn-key financed basis is a joint venture between Iritec and Irasco. Iritec, short for the Iran International Engineering Company, is an engineering and general contracting company. Irasco s.r.l. is an Italian supply and trading company founded in 1994 in Genoa, Italy and 49% owned by Iritec.

The second paper was given by Keith Wilkes and was entitled "Development and recent applications of WEMCO HMS and flotation cells". He began by explaining that Dorr Oliver and EIMCO joined the Smidth Minerals group in August 2007.

Keith then described the Dorr-Oliver Eimco WEMCO HMS systems equipment. The main component in this system is the WEMCO drum heavy media separator (HMS). A mixture of water and a heavy medium such as magnetite or ferrosilicon is rotated in a drum and feed material in the size range 6mm to 250mm is introduced into the drum. The design of the equipment allows for the continuous separation of feed material into 'float' and 'sink' fractions in a density chosen by the proportions of water and heavy medium used. Other designs which can accommodate liquids of two different densities can separate the feed material into three fractions i.e. floats, sinks and middlings. As well as beneficiating coal the HMS is used to upgrade mineral ores such as iron ore, chrome ore and lead / zinc ore.

An interesting application using the drum HMS is in the recycling of automobile and aerometal (ground up aeroplanes!) scrap. In this case the non-ferrous metals such as aluminium and magnesium alloys are capable of being separated from the other materials. This technique is used in Europe, the USA and Japan.

Keith then described the WEMCO HMS cyclone which is a similar device which processes coal and minerals but in this case in the range 0.5mm to 50mm.

Moving onto flotation cells Keith told the meeting that the WEMCO devices have secured ~70% of the world market for this type of technology.

Two devices were described, the WEMCO 1+1 Flotation machine and the SmartCell. The former device, which was said to be good for coal, was claimed to be superior to other mechanical flotation systems. It achieves this performance by the use of a patent rotor-disperser that delivers intense mixing and aeration. The device is said to be rugged and has abrasion-resistant components. It is available fro 1 to 3,000 ft^3 sizes so has wide applicability. The device is commonly used in coarse float applications such as phosphate and potash with feeds of up to 85% +65mesh and a maximum particle size as large as 10 to 12 mesh.

WEMCO SmartCell floatation machines were introduced in 1996 and since then most base metal floatation developments have selected this device. It is claimed to combine the WEMCO mechanism with cylindrical cell to optimise energy input, aeration and mixing. This configuration is said to reduce pulp turbulence and improve froth stability.

Keith then described some recent work in Australia at Stratford Coal Handling & Preparation Plant. A pilot plant trial using a $6m^3$ pilot SmartCell to scavenge coal from Jameson cell tailings proved to be very successful. This resulted in the

installation of a 130m^3 SmartCell which is the first installation of it type in the Australian coal industry. The device resulted in a 2% increase in overall fine coal yield which is equivalent to an additional 60,000 tonnes of saleable coal per annum. Additional benefits were also achieved including the cleaning up of the overflow on the tailings thickener and the removal of residual frother from the tailings thereby eliminating pump cavitation in the tailings co-disposal system.

Keith closed his talk with a number of other plant descriptions where significant improvements in performance had been achieved.

After a very pleasant lunch the afternoon session was opened by Nigel Yaxley from who gave his talk which was entitled "International Coal Markets". Nigel began by explaining that he was the Managing Director of the Association of UK Coal Importers, also known as CoalImp.

CoalImp, which was launched in April 2007, aims to present, promote and protect the role of coal in the UK with particular reference to imported supplies. The twenty two members account for the handling, transportation and use of the majority of imported supplies into the country. CoalImp includes major users, rail companies, ports and other infrastructure operators.

Nigel explained that coal is currently the world's fastest growing fuel and that the UK is the largest coal importer in Europe.

On a global basis China remains by far the most dominant country in terms of coal demand followed by the USA, the EU, India, Japan and Russia and most of the coal is produced and used 'at home'.

Only 15% of the worlds' coal production is traded, i.e. exported, and the dominant countries are Australia, South Africa, Russia and Indonesia.

China also drives hard coal production (2007, 2.5 billion tonnes), USA (just under 1 billion tonnes), followed by India, Australia, South Africa, Russia and Indonesia. Certain trends in production were noted with India, Australia and Indonesia increasing production but South Africa output being flat.

Other interesting observations were that Indonesia is now becoming the largest exporter of steam coal; Poland is suffering from underinvestment in capital projects which is affecting production; Colombia is a small but growing exporter and Kazakhstan exports some coal but predominantly to Russia.

Seaborne trade is growing as demonstrated by the fact that 90% of the 815 million tonnes of traded coal (2006) were transported by sea. In 2007 this figure rose to a total of 834million tonnes made up of 607 million tonnes of steam coal and 227 million tonnes of coking coal.

The hard coal trade pattern is divided into two sectors, the Asia/Pacific and Atlantic markets. Australia and Indonesia supply both markets although more is sent to the Asia/Pacific market. South Africa can easily supply both markets but it and Russia and Colombia currently supply mainly to the Atlantic market.

The USA presently imports steam coal and exports coking coal. India is starting to become a coal importer and receives supplies from South Africa. Australia exports coking coal to Europe. Australia the USA and Canada are major coking coal producers.

The major exporters of coal for 2007 are Australia (244Mt), Indonesia (202Mt), Russia (100Mt), Colombia (67Mt), South Africa (67Mt), China (54Mt), and USA (53Mt). Australia and Indonesia comprise ~50% of the exported coal. Russia is the largest exporter to Europe and also the UK. Major coal importers are as follows: Japan (182Mt), Korea (88Mt), Taipei (69Mt), India (54Mt), UK (50Mt), China (48Mt), and Germany (46Mt).

Coal reserves are available in almost every country worldwide, with recoverable reserves in around 70 countries. At current production levels, proven coal reserves are estimated to last 133 years.

The global reserves are stated to be over 900 billion tonnes which would last more than 160 years at projected consumption rates. Reserves are sometimes compared on a 'billion tonnes of oil equivalent basis'. Using this comparison the reserves have been estimated at 123btoe for North America, 163btoe for Asia / Pacific, 107btoe for the former Soviet Union, 26btoe for Europe, 34btoe for Africa and 9btoe for Central and South America. In terms of individual countries USA has ~30%, and China and Russia ~13% each. There are five countries which have almost 80% of the worlds proven resources - the others being India and Australia.

Nigel then moved on to the very volatile state of the price on coal. In terms of steam coal into Europe Nigel posed the question "Where next?" as the price had been $60 to $70/tonne at the beginning of 2007, went up to $200/tonne in July 2008 and are now less than $100/tonne. Currently the price is around $80/tonne and Nigel made the point that there was no basis for the peak prices in July 2008. Coking coal prices had been as high as ~$300/tonne earlier this tear but are likely to plummet as the demand for steel lessens. The price of coking coal, however, will always remain $20 to $30/tonne above the price of steam coal.

The price of coal was around $50/tonne in 1991 but rose in 2003 to around $75/tonne. After the severe price spike in 2008 the view is that it might steady to around $70 to $90/tonne which is, incidentally, well above the cash costs of production. For production up to 500 million tonnes the production costs were said by Nigel to be ~$40/tonne.

Freight costs for bulk coal transport have collapsed from ~$60/tonne in July 2008 from Richards Bay to Europe now at $6/tonne.

Overall world coal demand is projected to rise by 61% to 2030 but the view was that coal trade routes at this time will not be radically different from that of today. Australia is expected to export more to Japan and the EU will import more coal.

Nigel then moved onto discussing the UK situation. He indicated that in 2007 ~34% of UK power was from coal with a similar figure expected for 2008. Imported coal provided almost ¾ of the total coal supplied. The amount of steam coal imported in 2007 was 35Mt and coking coal accounted for 7.9Mt. Most of the steam coal came from Russia whilst some was imported from South Africa, Colombia and other countries. The coking coal was mainly from Australia with supplies also from Canada the USA and other countries.

"How did the UK arrive at this situation?" was then posed by Nigel. He went on to explain that in the early 1990's the demand for steam coal was met by UK production and was at a level of around 90Mt per year. Steam coal demand fell steadily through the 1990's as the 'dash for gas' kicked off. By 1997 steam coal demand had fallen to around 50Mt and was still just being met by UK production.

However, although demand stabilised at between 50 to 60Mt/year UK production continued to fall due to a lack of capital investment and problems with opencast mines. Thus this shortfall had to be made up with imported coal. Other factors also played a part such as lower sulphur content and lower NOx-forming coals compared with UK coals.

Russian coal imports to the UK are received at a number of ports, the main ones being Immingham, Hull, Avonmouth, Newport, Liverpool, Leith, Rosyth, Clydeport, London, Medway and Tyne.

Nigel closed his talk by summarising the continuing growth of use of coal, its abundance and distribution, and its price volatility in recent months. In conclusion he reminded the audience that although the UK remains a minor player on the world coal scene, it is the 5th largest importer of coal in the world.

This was followed by a talk from Mark Mounde from Scott Wilson on the trials and tribulations of surveying for coal in South America. It was entitled "Coal industry consultancy". Scott Wilson provides services to the mining industry at all stages of project development from exploration and resource evaluation through scoping, prefeasibility and feasibility studies, financing, permitting, construction, operation, closure and rehabilitation. We advise exploration and mining companies, financial institutions, governments, law firms and individual investors on the technical and commercial aspects of mineral property development.

National Instrument 43-101 is a law which sets conditions under which public exploration and mining companies are required to publish technical reports. The content of the reports and the qualifications of their authors are specified by the Instrument. The purpose of the Instrument is to ensure that securities commissions and investors are informed on technical matters materially affecting the financial status of the listed companies.

After a short break for refreshments the session continued with a talk with a video from Mike Davies the general manager of EnergyBuild about the developments at Aberpergwm Colliery. Mike began by describing the history of the mine. The Aberpergwm Mine is located in the Neath Valley, South Wales near to the villages of Glynneath and Blaengwrach just off the A465.

There had been a mine named Aberpergwm mentioned in records dating back to 1811. Although Aberpergwm drift's history probably began in the 1860's, at this time it was known as Pwllfaron. From the Inspector of Mines list 1896, there were 68 men employed, at Aberpergwm and 172 at Pwllfaron, both producing Anthracite.

A new drift was opened in 1906 and by 1908 the workforce had greatly increased to 741. Later came under the ownership of Aberpergwm Collieries Co. Ltd., and in 1918 there were 520 men employed.

From a list 1923, there were 113 working at Aberpergwm drift, producing from the Brass seam. At Pwllfaron the workforce numbered 938, working the Nine Feet, Brass and Eighteen Feet seams.

In 1969 severe geological problems threatened the pit's future and an exploratory heading was driven into the Eighteen Feet seam, to access pillars of coal left by earlier "pillar and stall" mining methods used 19th century. These pillars held sufficient high quality anthracite to justify the driving of a new 300 yard drift and immediate investment in new machinery.

During the 1970's a £750,000, improvement including installation of a Monorail and extending the workings across the Pentreclwylla Fault. At this time 298 men were producing 120,000 tons of Anthracite yearly. In September 1985, British Coal closed the Aberpergwm Mine under their national closure programme, the entries being sealed and the surface infrastructure demolished. The underground workings were allowed to flood. The Aberpergwm Mine remained closed for 10 years until it reopened in 1996 it re-opened.

In October 2003 it became part of Energybuild Holdings Ltd ("EBH"). Over the following 18 months working capital was obtained for the development of the Aberpergwm Mine and opencast activity in the locality. This also enabled relevant restoration bonds to be put in place with the local council. During this period, sales contracts were entered into with Aberthaw power station and E.H Bennett & Company Limited and further opencast planning permits were secured with the local planning authority. Grants were obtained from the Department of Trade and Industry under the coal investment aid scheme and a program of development was embarked upon which was and still is overseen by independent mining consultants working for the Department of Trade and Industry.

In June 2006 further resources were added to the existing resource base of EBH by the acquisition of Mineral Extraction and Handlings Limited, which included a Conditional Coal Authority Licence to mine coal seams within the Aberpergwm-Treforgan Extension subject to the grant of planning permission. The Treforgan Mine is a drift mine located 7km to the west of Aberpergwm in the Dulais Valley which has remained closed since October 1985 when British Coal ceased operations under the national closure programme.

The final paper of the day was give by Rod Stace of the University of Nottingham and was entitled "Rock mechanics research". Rod spent the first part of his talk by describing the set up at the University of Nottingham with its other campuses in China and Malaysia. He also indicated that the teaching of mining engineering had been terminated due to a lack of demand and that most of the mining research is being done by students from overseas.

The closing address and thanks was given by Andrew Howells who is the Chairman of the Coal Research Forum, Coal Preparation Division.

BCURA 2008 Robens Coal Science Lecture "A Clean Future for Coal-Fired Power" 13th October 2008.

Dr Michael Farley of Doosan Babcock Energy Ltd. presented the 2008 Robens Coal Science Lecture at The Royal Institution and was entitled "A Clean Future for Coal-Fired Power"

Mike is very eminent in his field and has worked for Doosan Babcock Energy Ltd. and it predecessors since 1974, initially within the Research & Development Department and later in the Technology Centre, becoming Director of Technology in 1998 and Director of Technology Policy Liaison in 2002. Dr Farley represents the company on the Advanced Power Generation Technology Forum and is a member of the Government's Advisory Committee on Carbon Abatement Technology.

These notes are for the benefit of those who were unable to attend the Robens lecture, which included, unfortunately, the newsletter editor. I will do my best to summarise the 93 slides which were presented!

Mike began by outlining the themes of his talk. Firstly, he explained why coal-fired power generation will play a vital role to 2050 and beyond, both in the UK and globally. He then summarised the status of coal-fired power-plant technologies, including carbon dioxide capture and storage, which can make coal-fired power very much cleaner, with near-zero emissions. He then moved on to the role of the UK industry and research-base in the clean-coal revolution at home and overseas. Mike then outlined UK and EU policies and actions and how these sometimes provide conflict for UK Government as governments who are seeking to meet their sometimes conflicting objectives of security-of-supplies, reduction of emissions and affordable energy. The lecture presented the case for more coal and less gas in the generation mix, and for cleaner coal, with mandatory carbon capture–ready (CCR) power plant. The case for multiple CCS demonstrations in the UK was presented. He concluded by seeking to answer the criticisms levelled at those who plan new coal power plant.

Mike then presented what he views as key issues in what he termed 'A campaign for clean coal'. In this he stated that we must:-

- Recognise that despite energy saving measures we will probably need more clean electricity if carbon targets for heating and transport are to be met.
- Recognise that coal and gas cannot be avoided if people are to have sufficient energy and therefore that widespread implementation of CCS is ***urgent***.
- Recognise that while CCS technologies do not need to be invented they need progressive scale up, requiring a number of demonstration projects before wholesale implementation.
- Seek ambitious programmes for implementation of CCS demonstration*s i.e. Multiple capture technologies, coal and gas.*
- Question very seriously whether one UK demonstration is sufficient in the context of 20 GW of new fossil plant in the UK (Conservatives are saying they would support at least 3).
- Ensure all other coal and gas plants are genuinely capture-ready and plan retrofit of CCS onto capture ready plant as soon as reasonable- this will require incentives or regulation if price of carbon is not sufficient soon enough.
- Not allow politicians to discriminate against coal in favour of gas, such policy simply allows the UK to dodge the carbon issues temporarily, increases security and price risks and sets an example we would not want developing countries to copy.

Mikes final conclusions were his, by now frequently heard, rallying cry for action to accelerate clean coal and clean gas. The actions should be:-

- Consenting process to require all large combustion plant/fossil fuel power plant emitting more than 1Mt CO_2/yr to be built capture-and-storage-ready.
- UK CCS regulations should be in place by 2010.
- Provision should be made for the properly co-ordinated support for CCS Research and Development, bringing together the activities of the Research Councils, Technology Strategy Board, Carbon Trust, Energy Technology Institute and Environmental Transformation Fund.
- Three coal and one gas large scale CCS demonstration projects in UK, operational by 2015 (an appropriate share to meet EU, G8 and IEA objectives and maintain a leadership position for UK industry) should be funded from auction revenues or the EU 500.
- Development of incentives by 2010 to support a second tranche of CCS projects (to be committed by 2015 and operational by 2020).

- Development of a strategy to implement CCS on all CCR plants (coal and gas) on fast-track timescales that take account of the progress and performance of demonstration projects; the carbon price versus costs of CCS and the capacity of the industry to implement.

At the end of the lecture there was a short ceremony at which the Robens Coal Science medal was presented to Dr Farley. Following the presentation there was the usual reception with drinks and buffet for all those who attended.

For those who wish to view the whole presentation it can be found on the following web site:-
http://www.bcura.org

Can UK wind farms survive the latest challenges?

19 October 2008
Last week Britain committed itself to cutting greenhouse gases by 80 per cent. This week Gordon Brown will claim the UK is now a world leader in wind power. An Observer investigation reveals his hopes could be blown wildly off course. No country has tried to switch so fast to renewable energy - but rising costs and technical problems mean that, without urgent action and cash, the targets cannot be met.

A major threat to Britain's ambitions for renewable energy will emerge this week when wind industry leaders admit that targets set for 2020 are looking increasingly unrealistic.

They will use a high-profile conference in London to warn Gordon Brown that there is little chance of achieving the government's goal - of wind generating one third of all UK electricity within 12 years - without a huge injection of public money.

It comes as an Observer investigation reveals that planning delays, long delivery times, escalating costs, 10-year hold-ups in connection to the national grid and technical problems in building offshore wind farms all threaten to derail Brown's ambitions. The result could be electricity shortages by 2020, failure to meet climate change and energy targets and possible hefty fines from Europe.

The developments will come as a blow to the government. Last week Ed Miliband, the new minister for climate change, said Britain would increase its target for reducing greenhouse gas emissions by 2050 from 60% to 80%.

Brown will tell delegates at the annual conference of the British Wind Energy Association (BWEA) this week that the UK industry is now a world leader. But others will claim that there is a severe shortage of engineers and companies are reviewing their commitments to wind energy because of spiralling costs. Britain is legally committed to generating 15% of all energy from renewables by 2020. This means that wind power, which presently contributes about 4% of UK electricity, must expand to generate 36% within 12 years.

No country has tried to switch its electricity supply so quickly on this scale, and to achieve it the industry will need to build nearly 15,000 turbines, generating 35 gigawatts (GW) of electricity, on land and at sea. Many experts say it is technically feasible to meet the targets, but there is a growing conviction that the plans were rushed through so quickly by the government that it will now take substantial new money and guarantees to work.

It is a very different story elsewhere. This week, in a vast warehouse in Berlin, blades for the world's largest wind turbine are being handcrafted by teams of people and robots. Each is 20 metres longer than the wing of the world's largest aeroplane, and when perched on top of 140-metre concrete towers in Belgium next year their tips will soar nearly 250 metres above the ground - higher than any building in Britain.

Ten years ago most wind turbines in Europe could barely power 200 homes, but technological advances have been so great that this single seven megawatt (MW) machine, known as the Enercon E-126, should provide nearly 20 million kilowatt hours of electricity a year - enough to power a town the size of Penzance.

There are others even bigger being planned in the US, but independent analysts say there is little chance that one of these turbines will be installed in Britain for many years. Many are deeply sceptical, saying that the government should not have put so much faith in wind power without making it easier for the industry to operate.

'The numbers do not add up,' said energy analyst Professor Ian Fells of Newcastle University. 'It is physically impossible for the industry to meet its target. The most that any country has ever built offshore is 350MW in a year. But they need to install nearly 10 times that in 12 years, and most will be far offshore. It means they will have to install hundreds a week. They cannot do it.'

Even Maria McCaffery, chief executive at the BWEA, has admitted for the first time that the industry might not reach the ambitious targets. 'It's tough, but just about achievable,' she said. 'But how close we can get to the target depends on what happens in the next few years. It's not guaranteed, but it's too soon to be defeatist.'

Paul Cowling, head of Npower Renewables, one of the two largest wind companies in Britain, with 4.5GW of wind power planned but not yet approved, said: 'With the right commitments from government, it's just about do-able. But we have never had targets like this before. Everything must be joined up and a lot can go wrong.'

A senior executive in a power company, who asked not to be named, added: 'There is absolutely no room for manoeuvre. The old nuclear power stations will be out of service, the new ones will not be on stream and big renewable projects like the proposed Severn barrage have not even been agreed, let alone built. Wind is the main plank of the government's energy policy over the next 12 years, but if anything at all goes wrong anywhere, then the targets will be missed and we are all in trouble.'

New studies warn of looming financial and supply problems. Last week the Carbon Trust, a government agency, warned that the steep rise in the price of building offshore farms could undermine the whole project. 'Currently the risk/return balance for offshore wind is not sufficiently attractive, and regulatory barriers would delay delivery well beyond 2020,' it said.

Tom Delay, the Trust's chief executive, added: 'Industry costs have become very, very expensive, and both government and companies need to work hard to tackle this. Without urgent action, there is a risk that little additional offshore wind power will be built by 2020.'

Cambridge Energy Research Associates says that Britain should expect a 20 per cent increase in offshore wind capital costs over the next few years on top of the 50 per cent increase in the past three years.

In August, energy consultancy Sinclair Knight Merz reported that most existing wind turbine manufacturers were booked solid for the next five years. 'The cost of offshore projects has doubled in five years,' it said.

That is not to mention the powerful opposition on the ground. Yesterday countryside protection groups warned that resistance to wind farms would be fierce and that planning delays, public inquiries and protests were inevitable. There are likely to be outcries in Cornwall, Wales, Yorkshire and Scotland when the scale of some of the farms is seen and it is understood that they will need hundreds of miles of 60-metre pylons to criss-cross some of Britain's most beautiful landscape.

Dr Frank Mastiaux, chief executive of the climate and renewables division of German electricity supplier E.ON, which is now building a 180MW offshore farm at Robin Rigg in the Solway Firth, said the UK targets were 'extremely challenging'. He added: 'Future wind farms will need to have thousands of turbines, each so big it would be like a football field turning on top of a steel mountain.'

One major problem is planning laws, which have been holding up dozens of projects for years.

Stephen Tinsdale, head of communications at Npower renewables, said: 'It can cost up to £200,000 just to put an application in, and you can expect it to take three to four years to go through planning. Two-thirds of all applications are refused. On top of that, there are conditions from the Ministry of Defence over radar and conditions by local authorities on when we can and cannot erect them. England has very few places left where you can build large farms. There are potential delays at almost every stage.'

New laws should make planning speedier for the industry, but the Infrastructure Planning Commission, which will handle applications for all large farms and should be set up next year, has not been tested yet either in practice or in the courts.

Another problem facing companies is getting connection to the National Grid. Some companies in Scotland have been told to join a 13-year queue and are being asked for deposits of millions of pounds before the grid will agree to connect them. Currently, 115 Scottish renewable schemes, totalling 9GW of mostly wind power, are waiting to plug into the grid before they can supply electricity. Some already have planning permission but have to wait many years to connect.

'It is plausible to meet the target, but it is very deeply challenging,' said a spokeswoman for National Grid. 'We have signed agreements to connect 16GW of renewable generation throughout Great Britain, but over 75 per cent of this total is stuck in the planning system.

'Urgent reform to the UK's planning laws and energy regulation are needed. We're fully aware that some dates are later than some people would like. We will try to work with developers to bring the dates forward wherever possible.'

But in an unpublished paper submitted to the government, National Grid says that, while it is possible to connect new offshore farms in time, the onshore target of 14GW of wind is 'not credible'. 'This is an area where we are not optimistic. We believe that only 12.9GW is credible,' says the paper.

The real prize for governments looking for major increases in wind capacity is a series of giant 5-6GW farms with hundreds of the biggest turbines 10 to 20 miles offshore. The first are being planned to be built after 2014 in the Bristol Channel, the Wash and off Wales and Yorkshire. But wind companies are having increasing

doubts about their financial viability. While they are technically feasible, they are already more than twice the cost of onshore farms and the price is spiralling upwards.

Signals that UK offshore farms may not be profitable came in June when Shell pulled out of the consortium planning to build Britain's biggest offshore farm, the London Array in the Thames Estuary, in favour of developing more profitable wind projects elsewhere. Then last week the government of Abu Dhabi stepped in to help the project after Royal Dutch Shell withdrew.

Other developers are questioning whether they can justify the investment needed in Britain. Shell and BP are competing in the US to build the world's largest wind farms. 'Many are now recosting their plans and are attracted by other countries who are tempting them with tax breaks and a freedom to build what they want practically anywhere,' said one analyst.

Npower's Cowling said: 'We are going to need different boats, a whole fleet of vessels, offshore cable installers, helicopters. We are already getting close to our hurdle rates. If things get worse, it makes it a marginal decision whether we invest in them or not. It's all very risky. Because the UK is a difficult place to do business, the utility companies will just go elsewhere. We are not threatening to go, but if a utility finds a project which it can build quickly, it will go there. We are committed to the UK, but it is difficult.

'Until you get absolute consent from government, people will dither and it will take longer to install farms. Industry costs have become very, very expensive, and both government and companies need to work hard to tackle this.'

Potentially more serious is growing competition from other countries both for turbines and other machinery, as well as engineers. The market for wind is very strong, with more than £40bn invested worldwide last year, demand for turbines going through the roof as countries rush to meet climate change targets, and the very few manufacturers producing turbines now looking only for large orders. Emerging Energy Research, a leading research and advisory firm analysing clean energy markets, expects the international wind power industry to increase 500 per cent over 12 years.

Vestas, the world's biggest turbine maker, now has a £6bn order book and its turbine prices have risen 74 per cent in the past three years. China plans 100GW of wind power by 2020, a ten-fold increase from today. Texas alone plans more wind power than is expected to be installed in Britain in the next 20 years. The net result is that prices are escalating and orders for equipment taking longer and longer.

'Everyone wants wind power. If you ordered today you could possibly get a turbine in 2011. But you would have to be a serious order,' said an Enercon spokesman. 'It is a very good time for wind.'

Targets
2008 Wind to generate 3GW of electricity – enough to power several million homes.
2010 Renewables to generate 10% of all UK electricity, of which wind is expected to constitute 60 per cent. Wind to generate 36 per cent of UK electricity by 2020.
2020 20% of all EU energy to be produced from renewables.
2050 UK to reduce carbon emissions by 80%.
http://www.guardian.co.uk/environment/2008/oct/19/renewable-energy-greenhouse-carbon-emissions

Launch of the European Energy Research Alliance

29 October 2008
Leading European energy research institutes have joined together to found the European Energy Research Alliance (EERA), with the aim of speeding up the development of the new energy technologies that Europe needs if it is to address the triple challenge of climate change, energy security and competitiveness.

Between them, the 10 institutes have an annual budget for energy research and development (R&D) activities of over EUR 1,300 million. Through the EERA, the institutes will design and implement joint, pan-European research programmes and promote the sharing of world-class national research facilities. The first joint programmes are scheduled for launch in 2009.

The creation of the EERA is one of a number of actions set out in the EU's Strategic Energy Technology Plan (SET-Plan). Launched in November 2007, the SET-Plan is designed to help Europe meet its ambitious climate change goals of reducing greenhouse gas emissions by 20% by 2020 and around 80% by 2050. The SET-Plan will also enhance European competitiveness by ensuring that Europe takes the lead in developing the innovative technologies needed in the low carbon economy of the future.

'The development of cutting-edge energy technologies requires the pooling of the best brains and resources beyond national borders. The creation of the European Energy Research Alliance that will coordinate national and European energy research programmes is a crucial step forward,' stated European Science and Research Commissioner Janez Potocnik. 'This test case of joint programming will enable us to leverage on a more efficient use of national and European resources and compete successfully on the international level.'

The 10 research institutes, along with the European University Association (EUA) and European Heads of Research Councils (EUROHORCS), which are supporting the initiative, signed a declaration of intent outlining their commitment to the EERA on 27 October.

'The primary focus of the EERA will be on the strategic and targeted development of next generations of energy technologies drawing on results from fundamental research and maturing technologies to the point where they can be embedded in industry-driven research,' they write.

Among other things, the EERA will promote research into key areas such as wind, solar energy, second-generation biofuels, carbon capture and storage, smart grids and fuel cells.

In addition to setting up joint research programmes in line with SET-Plan priorities and sharing research infrastructures, the partners commit themselves to strengthening links with industry; enhancing Europe's capacity to carry out large, high-risk, high-gain R&D programmes; and developing training, education and outreach activities. Once the fledgling organisation has been fully established, membership will be open to all research organisations that can contribute to its objectives.

Other activities foreseen under the SET-Plan include the establishment of European Industrial Initiatives, which will boost industrial research and innovation in six key sectors; the creation of a strategic information system on energy R&D activities; regular conferences and summits on energy research; and increasing the funds available for energy R&D in Europe.

'The SET-Plan offers a blueprint for Europe to develop a world-class portfolio of affordable, clean, efficient and low-emission energy technologies,' said Energy Commissioner Andris Piebalgs. 'The opportunity to be global leaders in low carbon technologies lies in front of us.'
For more information, please visit:
European Energy Research Alliance (EERA):
http://www.eera-set.eu/

European Strategic Energy Technology Plan (SET Plan):
http://ec.europa.eu/energy/res/setplan/

New way to follow mercury emissions from coal

8 October 2008
University of Michigan researchers have developed a new tool that uses natural "fingerprints" in coal to track down sources of mercury polluting the environment. The research is published in today's online issue of the journal

Mercury is a naturally occurring element, but some 2000 tons of it enter the environment each year from human-generated sources such as incinerators, chlorine-producing plants and coal-burning power plants. Mercury is deposited onto land or into water, where micro-organisms convert some of it to methylmercury, a highly toxic form that builds up in fish and the animals that eat them. In wildlife, exposure to methylmercury can interfere with reproduction, growth, development and behaviour and may even cause death.

Effects on humans include damage to the central nervous system, heart and immune system. The developing brains of young and unborn children are especially vulnerable.

"There has been a lot of controversy about how much mercury is coming from different types of industrial activities, compared to natural sources, but it has been difficult to figure out the relative contributions," said co-author Joel Blum, the John D. MacArthur Professor of Geological Sciences and a professor of ecology and evolutionary biology. "And even if you can determine how much of it is coming from natural versus human sources, there's still the question of how much is from global sources, such as coal-fired power plants overseas, and how much is being produced and deposited locally."

For the past eight years, Blum and co-workers have been trying to develop a way of reading mercury fingerprints in coal and other sources of mercury. The hope was that they could then find those same fingerprints in soil and water bodies, much as a detective matches a suspect's fingerprints to those found at a crime scene, and use them to figure out exactly what the sources of mercury pollution are in certain areas.

"For some time, we weren't sure that it was going to be technically possible, but now we've cracked that nut and have shown significant differences not only between mercury from coal and, say, metallic forms of mercury that are used in industry, but also between different coal deposits," Blum said.

The fingerprinting technique relies on a natural phenomenon called isotopic fractionation, in which different isotopes (atoms with different numbers of neutrons) of mercury react to form new compounds at slightly different rates. In one type of isotopic fractionation, mass-dependent fractionation (MDF), the

differing rates depend on the masses of the isotopes. In mass-independent fractionation (MIF), the behaviour of the isotopes depends not on their absolute masses but on whether their masses are odd or even. Combining mass-dependent and mass-independent isotope signals, the researchers created a powerful fingerprinting tool.

Previously, Blum and co-workers investigated the possibility of using the method to identify sources of mercury contamination in fish. The coal project was more challenging because of the difficulty of extracting and concentrating mercury from coal. The researchers developed a system that slowly burns the coal under controlled conditions in a series of furnaces and then traps the mercury that is released.

More work is needed to perfect the fingerprinting technique, but Blum envisions using it in a number of ways to track mercury and assess its environmental effects.

"Coal-burning plants are being built in China at an alarming rate—something like two per week—and the amount of mercury emitted to the atmosphere is increasing dramatically. We think we may be able to detect mercury coming from specific regions in China and watch it as it's transported and re-deposited around the globe," Blum said.

Closer to home, a number of coal-burning power plants have been proposed for construction in Michigan, and one question that arises during the permitting process is how much mercury may end up in nearby lakes and wetlands.

"Scientists have models and other ways of estimating how much mercury will be deposited locally, but we may, for the first time, be able to directly differentiate between mercury coming from local plants and mercury that has been transported longer distances."

In a project already underway, Blum's research group hopes to pinpoint which of the many mercury sources in the San Francisco Bay area are contributing most to the contamination of fish and wildlife.

"We don't know whether particular sources of mercury are more biologically available than others and thus more likely to accumulate in animals," Blum said. "If we can figure that out, then we can help local agencies decide where efforts will be most productive in terms of preventing wildlife from being exposed to mercury."

A major influence on Blum's research path into mercury isotopes was Clair Patterson, a famous geochemist on the faculty at Caltech when Blum was a graduate student there. Patterson developed and applied the lead isotopic fingerprinting technique to show the world that unhealthy levels of lead in humans could be traced to lead additives in gasoline. His work ultimately led to the removal of lead from gasoline in the U.S.

"The approach we are taking is similar to what Patterson did with lead isotopes, except the isotopic differences in mercury are about 50 times smaller," Blum said. "If we can do a tenth of what he did, in terms of alerting people to where mercury is coming from and how people are being exposed, I'll be thrilled."
Source: University of Michigan
http://www.physorg.com/news142694825.html

New university research centre to open in Wales

10 October 2008
A ground breaking research centre developed by the University of Glamorgan was due to be opened today by First Minister Rhodri Morgan. The hydrogen energy research and demonstration centre has been built at a cost of £2.2 million and is designed to demonstrate how hydrogen can be produced safely from renewable resources in Wales.

The results could have crucial repercussions for green energy production in Wales. The centre, at Baglan Energy Park in Port Talbot, will use a combination of established green technologies and newly developed techniques.

It will provide a number of opportunities for academic and industry research as well as prospects for public demonstration and organisational training. The centre can also host conferencing, demonstration and education activities. Mr Morgan said: "The use of renewable energy sources to generate heat and electrical power is a key priority for the Welsh Assembly Government. Hydrogen provides a potential solution to a number of significant energy challenges and can help to address climate change.

"But there is still some way to go before we can see the widespread use of hydrogen as an energy carrier and so I am fascinated by the work that will take place at Renewable Hydrogen Research and Development Centre.

Wales has one of the leading scientific communities in researching the development of technology, and I am most impressed at the level of technology and expertise in this field that exists in the centre."
http://www.istockanalyst.com/article/viewiStockNews+articleid_2699274.html

Mozambique to export coal by 2011

13 October 2008
Brazil's Mining giant Vale said on Monday it expects to start exporting coal from its Moatize mine in Mozambique in 2011. Vale Chief Executive Officer Roger Agnelli told Reuters the mine will eventually produce 40 million metric tonnes of coal a year. Vale, the world's second-biggest miner and the biggest iron-ore producer, won the government tender in 2004 and paid $123 million for licence to produce coal in Moatize.

The group, formerly Companhia Vale do Rio Doce CVRD, will export the coal by rail to the eastern port of Beira, more than 600 kilometers. The concession, located in an area with estimated coal reserves of 2.5 billion tonnes, has an expected life span of 25 years, according to the company. "Vale has this year spent $130 million in Mozambique, while the total amount invested in projects in the country comes to $250 million," Agnelli said. "The government has supported us and all the ministries are cooperating with (us)," he said. The Vale concession is for 25 years, and the area concerned contains estimated reserves of 2.5 billion tonnes of coal.
http://www.reuters.com/article/rbssIndustryMaterialsUtilitiesNews/idUSLD44728720081013

Survey claims huge hidden costs associated with Chinese coal

27 October 2008

China's dirty and dangerous coal mining industry cost the country a hidden $250 billion last year in lost and damaged lives, wasted energy and environmental devastation, according to a survey launched on Monday.

Pollution affected water, land and air around mines, thousands died and many more were hurt in mining accidents, and acid rain-causing sulphur dioxide and mercury were among dangerous emissions when coal is burned in factories and power plants. None of this is reflected in low coal and power prices, according to "The True Cost of Coal," researched over three years by Chinese economists and environmentalists. "Behind China's large production and consumption of coal ... lie expensive and worrying environmental and social costs," their report warns.

Tariffs would need to rise by around a quarter to reflect the real burden for Chinese society, which in 2007 was 1.7 trillion yuan ($254.9 billion), they say. "Currently these costs are paid by the people in China suffering from the damage," Mao Yushi, one of the report's authors and chairman of the Unirule Institute of Economics, told a news conference at the launch of the report. Experts from the coal heartland of Shanxi province, Peking University, the government's top energy think-tank and the Chinese Center for Disease control also contributed research.

Last year nearly 3,800 miners died in explosions, flooding and other underground accidents. Although that marked a 20 percent decrease from 2006, it is still the most dangerous mining industry in the world.

For a country short of water and struggling to keep its food and air safe, it is also an environmental liability, said Yang Ailun from Greenpeace, who helped coordinate the report.

Each tonne of coal produced means 2.5 tonnes of water are polluted, while coal mining waste makes up some 40 percent of the country's solid industrial waste, she said.

The key problems identified by the report are government regulations that distort prices and weak oversight that allows miners to get land cheap, dodge safety and environment laws and ship their coal in dirty, dangerously overloaded trucks.
Extra taxes, stricter enforcement, and an end to the price caps that have kept electricity temptingly cheap would make coal prices more realistic and curb waste, deaths and the worst pollution, the report said.

The good news for a country that relies on the dirty fuel for more than two thirds of its energy is that the big price increase it calls for in the long term would mean only a tiny hit to the economy as efficiency soars and green energy firms prosper.
But for those who dream of a future powered only by windmills and dams, they warn that coal will not lose its dominance in China for decades. The report says the 23 percent price rise it recommends would cause only a 7 percent fall in consumption.

China is already the world's biggest producer and consumer of coal, which provides a cheap, domestic energy source at a time when volatile global oil markets have exacerbated worries about tight supplies.

Demand is growing so fast that its miners have to produce an extra 200 million tonnes a year to keep up, or the equivalent of the entire coal mining industry of major producer Indonesia.

A slight decline in consumption, in place of this frantic expansion, might give the industry room to improve their standards without starving the country of energy.
($1=6.845 Yuan)
http://uk.reuters.com/article/environmentNews/idUKTRE49Q4FI20081027?pageNumber=3&virtualBrandChannel=0

Global crisis delays German coal plant build

29 October 2008
Germany needs to replace most of its coal-fuelled stations over the next decade and many new coal plants are planned because of strong public opposition to nuclear power and concerns about relying too heavily on gas.

New coal projects already face strong public opposition over their carbon emissions and tougher penalties for operators under the European Union's emissions trading scheme. These obstacles now seem less important than the rising cost of scarce capital to build the new power stations Germany needs.

"There is no indication that prices to build plants are easing and it will become increasingly difficult to get credit for projects unless they can be financed from the cash flow," said Felix Matthes of the Oeko-Institut think tank.

Germany, Europe's biggest electricity market, has built 8,000 megawatts (MW) of new capacity since 2000 but needs to replace another 32,000 MW by 2020. Five out of 16 other projects planned up to 2012 are already under construction and will add another 7,000 MW, according to research by Reuters.

But the other 11 projects, with a total capacity of 11,000 MW, face intense scrutiny before getting the credit they need to progress, despite utilities' low risk profile, analysts say.

"Operators seeking finance for generation plants will be faced with high costs not because of their own ratings, which are still good, but because money in the capital markets is drying up," said Matthias Heck of private bank Sal. Oppenheim.
Heck said French GDF Suez' issue last week of an expensive two-part euro bond raising 1.9 billion euro ($2.36 billion) was a sign of how hard utilities were finding it to secure loans for their multi-billion euro plans.

The coupon prices were 6.25 percent for the five-year part and 6.875 percent for the 10-year part. German utility E.ON said last week it was confident about refinancing several billion euro in debt by next May.

Hopes that the financial crisis could cut, or at least tame, rising labour and materials costs that have dogged the construction sector over the last few years are also fading.

"There is no decline in the cost of power plant construction," said Bremen-based institute trend:research, which regularly polls engineers and their customers. The price for building a hard coal-fired plant, which already rose significantly to 1,500 euros/kilowatt in 2007, has risen by another 200 euros/kW in 2008, it said.
Environmental costs of running coal plants are also set to soar from 2012 when generators will be forced to pay for all the carbon they emit.

Coal-biased utility RWE has warned that its coal plants may become unviable if full auctioning becomes a reality and hopes coal-reliant eastern European states like Poland will help defeat moves towards tougher limits on coal.

European utilities have made billions of euros from passing on the cost to consumers of emissions rights they were given for free in the early stages of the EU's Emissions Trading Scheme. But that will all change from 2012 and investors' view of the sector may change with it.

"Special profit boosters such as free CO_2 certificates will become a thing of the past for utilities, which may change investors' view of whether this sector is attractive much longer," said Oeko-Institut's Matthes of the big German firms.

Half of Germany's power is generated by burning coal and there are few alternatives. Wind power has grown rapidly in Germany but is too unreliable to fill the void that will be left by coal over the next few years.

Meanwhile gas has become unattractive over the last two years because its price is linked to oil and because of heightened concerns about becoming over-reliant on Russian gas.

Southwest German utility EnBW for example is investing in big coal and hydropower projects and studying upgrades to an existing gas plant, but on a much smaller scale.

"It does not help gas if oil prices have a temporary dip, I cannot imagine the gas suppliers agreeing long-term supplies this early in the oil down-cycle," said an EnBW spokesman.

The current plan to close all Germany's nuclear power plants over the next decade means the coal-or-gas debate is not the only important issue for the country's future power supply, Manual Frondel, analyst at the Essen-based RWI Institute said.

"It is more important whether or not Germany holds on to its nuclear exit programme up to 2021, because if it does, we will get a huge power generation gap between 2015 and 2020 which renewable energies won't be able to fill," he said.
http://www.planetark.com/dailynewsstory.cfm/newsid/50807/story.htm

New tools to assist slagging prediction show promise

12 September 2008
The climbing coal costs are also giving power plants owners an incentive to innovate, says Carlos Romero, associate director of Lehigh's Energy Research Center.

In the past two years, Romero has worked with the Energy Research Co. (ERCo) of Staten Island, N.Y., to develop an optical technology that would allow power plant operators to make rapid adjustments to prevent boiler slagging and fouling problems.

The ERC and ERCo have applied a technique called laser-induced breakdown spectroscopy, or LIBS, to provide instant analysis of the elemental composition of

the coal being burned and correlation of the fusion temperature of the coal ash, which is affected by the ratio of the elemental ingredients.

The LIBS system uses a pulsating laser with two frequencies, one infrared (IR) and one visible light. The laser vaporizes a sample and gives a distinct elemental signature represented by intensity and wavelength. From these data, a software package containing artificial neural network models estimates ash fusion temperature and predicts coal slagging potential.

Traditional techniques for measuring coal composition and ash fusion temperature require operators to remove a sample from a boiler and test it in a lab, which can take up to three days. LIBS provides instantaneous data without interrupting the process.

Operators also have the option of taking the measurements with a nuclear analyzer that uses gamma rays. But the analyzer has a large footprint, says Romero, and is potentially hazardous. LIBS is the size of a table top and is relatively safe to use.

The LIBS system was verified in lab experiments and then tested at Brayton Point Station, a 1,150-MW coal-fired power plant in Somerset, Mass.

"Our results have been very positive," says Romero. "LIBS analyzes coal composition accurately and with good repeatability. It also predicts ash-fusion temperature accurately, with results that compare very favorably with the results obtained using the American Society for Testing Materials' (ASTM) standards."

The problems addressed by LIBS, says Romero, have been aggravated by changes in coal-buying patterns triggered by coal's growing cost.

Coal contains up to 10 component elements, including iron, aluminum, sodium and calcium. The ratios of these elements vary from one coal mine to the next and even among different seams from the same mine. These ratios affect ash fusion temperature, as some mineral compositions are more susceptible than others to high-temperature slagging.

"A ship or cargo can deliver 100,000 tons of coal at a time to a plant," says Romero. "Even if all of the coal comes from the same mine, it can come from different seams within the same mine, with each seam producing coal with a different composition. "These difficulties are compounded when coal comes from different countries, which is becoming the case more and more as rising costs force plant operators to buy coal on the spot market to get the cheapest price."

The Brayton Point Station is a case in point, burning Eastern U.S. bituminous coal along with a variety of coals from Colombia and Venezuela.

"The variability in coal feedstock at Brayton Point poses a significant challenge to the station," Romero wrote in a report coauthored with Ricardo Moreno and Zheng Yao. Moreno recently earned his M.S. in mechanical engineering from Lehigh. Yao is a researcher with Lehigh's Energy Research Center.

Because some of the coals burned at Brayton Point are susceptible to slagging, the station must sometimes take corrective action "on a retroactive basis," the report said.

The results from the tests at Brayton Point showed that LIBS analyses performed once an hour could provide sufficiently accurate feedback on ash fusion

temperatures to enable boiler operators to take remedial steps in real time, the report said.

Those steps can include minor adjustments to boiler operations, such as increasing combustion air supply. Operators can also decide more quickly and more intelligently when to blend good and bad ash, when to mix different types of coal, and when to route low-quality coal to a higher-performing boiler.

"LIBS would enable us to do a test online with the same accuracy as a three-day lab test while meeting ASTM standards," says Romero. "Any problem we detect can be corrected in real time.

"This will be a tremendous help to the utility industry. We get a lot of phone calls from utilities that are struggling because a supplier switched fuels and they have to blend fuels because of slagging."

In their lab and site tests, the researchers experimented with 16 different kinds of coals from the U.S., Indonesia, Russia and South America.

The researchers have been awarded a second DOE grant to fund development of a commercial prototype of the LIBS system.

http://www.sciencedaily.com/releases/2008/09/080909122806.htm

Cleaner coal for South Africa

5 September 2008
Eskom's coal-fired power stations are the mainstay of the South African economy and 93% of the country's electricity production needs are met by coal, reports Creamer Media's Research Channel Africa. However, these power stations pump millions of tons of carbon dioxide (CO_2) into the atmosphere and are one of reasons why South Africa is the largest contributor to greenhouse-gas emissions in Africa. As a result, the report states that South Africa is now at the forefront of research into so-called clean coal technologies (CCTs), aimed at reducing the huge volumes of greenhouse gases emitted by its power stations.

Clean Coal Technologies
Creamer Media's Research Channel Africa reports that South Africa's remaining coal reserves are generally of a lower quality than the coal that has been mined over the last three decades. CCTs have the potential to improve this coal, and uses large quantities of discard coal for economic and energy purposes through beneficiation.

One of the other CCTs being pursued is fluidised bed combustion, which can meet stringent nitrogen oxide (NO_x) and sulphur dioxide (SO_x) emission regulations. Through the rapid mixing of a bed of ash, pulverised coal and limestone can ultimately lead to the complete combustion of the fuel.

Another new development in CCTs is underground gasification, whereby coal is burned in the seam. The report states that this technology can be applied to high-ash, thin-seam and deep-seated coals that may not otherwise be commercially viable to mine. The gas produced through this process may be used for power generation, as well as the production of petrochemicals.

In addition, carbon capture and storage (CCS) involves preventing CO_2 produced through combustion from entering the atmosphere by storing it underground in

deep-seated porous rock strata, either on land or similar strata under the sea bed.

The report states that this is not yet a viable option in South Africa, as the country does not have much in the way of suit- able subterranean strata on land to store the excess CO_2.

Greenhouse-Gas Emissions
Meanwhile, the report states that reducing greenhouse-gas emissions and the development of clean coal technologies have become important economic and political issues. But new European Union (EU) environmental regulations, which took effect in January 2008, could potentially hurt South African coal exports to the EU.

The report states that, while South African export coal has a low sulphur content, it produces higher NOx emissions than coal mined in Indonesia and Colombia when heated in traditional boilers.

There are fears that the EU's Large Combustion Plant Directive (LCPD) will force European consumers of coal to source their coal requirements from countries producing coal with low NOx emissions, the report states. However, there is a growing awareness and acceptance in the EU of the importance of reducing and limiting the harmful emissions associated with coal-fired power generation. To this end, the EU is investigating CCTs and is proposing to launch 12 CSS demonstration projects by 2015, the report states. It has been suggested that the EU mandate that all new coal-fired power stations be built with CCS facilities by 2020.

Creamer Media's Research Channel Africa reports that it may be possible for South Africa to participate in one of the EU's 12 proposed CCT demonstration plants. As the world's biggest generator of coal-fired power, it makes environmental and political sense for South Africa to take a leading position in the clean-coal drive.
http://www.miningweekly.com/article.php?a_id=141336

Research institute for cleaner coal in Australia

19 September 2008
The Australian Government plans to spend around $US80 million setting up an international body to promote research and development into cleaner coal production. Prime Minister Kevin Rudd says he hopes the research institution will attract investment from countries keen to reduce their greenhouse gas emissions.

Mr Rudd says it's an important part of the Government's strategy to counter dangerous climate change. "Our objective is to have the Global Carbon Capture and Storage Institute up and running from January next year," Mr Rudd said.

The opposition Greens party has criticised the plans, saying research should be directed at renewable energy sources rather than helping the coal industry. "The coal industry should be paying for its own research the coal industry has made mega profits for many, many generations at the expense of the atmosphere and now we are all paying for that," Greens Senator Christine Milne said.
http://www.radioaustralia.net.au/news/stories/200809/s2369067.htm?tab=latest

Caution needed over heat from energy use

26 November 2008
Using clean energy to reduce carbon emissions may not be enough to prevent the world heating up, scientists have said. The increasing consumption of energy, which is released into the environment as heat, could play a large part in global warming in the future, the New Scientist magazine reported. Two British scientists from Newcastle University calculated that an increase in global energy use of 1% a year would mean that by 2100 the heat given off would be enough to cancel out the benefits of cuts in emissions.

Nick Cowern and Chihak Ahn of the School of Electrical, Electronic and Computer Engineering looked at a scenario which says cutting greenhouse gases over the next 40 years by phasing out coal would mean the greenhouse effect will start to fall by 2050, stabilising the climate. But they said although heat generated by energy consumption is relatively low, in 100 years time it could be enough to cancel out emissions cuts. They said in light of this possibility it was better to use solar power than nuclear power, which releases energy into the environment which would otherwise be locked up.

The cleanest energy options were wind and tidal power, which tap into existing energy flows, they said. Jonathan Gregory, a climate expert at the University of Reading, told New Scientist: "Human energy dissipation is currently small compared with other factors, but you can imagine it becoming much bigger." But he said energy production would need to grow significantly to have such an effect, adding: "It's fair to ask if we could ever produce so much power."
http://www.channel4.com/news/articles/science_technology/warning+over+heat+from+energy+use/2847602

European carbon capture and storage demonstration plant opened

11 November 2008
An industry group unveiled a £9 billion plan yesterday to set up as many as 12 demonstration power plants to test carbon capture and storage technology (CCS) on a commercial scale in Europe.

The European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP) met in Brussels yesterday to discuss the plan, which has the support of the European Commission. The group wants to see EU authorities and Member States speeding up plans for a "rigorous tender process" to hand out public funds to support the European CCS Demonstration Programme.

The programme would test CCS on plants above 300MW in scale. It would include CCS technologies in power plants using a range of different fuel types - coal, gas and biomass co-firing - and possibly also non-power industries like steel or cement plants. The programme will also include the three primary types of CCS technology - pre-combustion, post-combustion and oxyfuel.

It should also test different methods of transporting carbon dioxide captured from the emissions of power generation - both pipelines, onshore and offshore, as well as transportation by ship and a cross-border project. And, the industry group said it wanted to see demonstration of storing captured carbon emissions in depleted oil or gasfields as well as in saline aquifers.

The Zero Emissions Platform, which is sponsored by companies including BP, Shell, Statoil and Total, but also includes input from NGOs and scientists, believes its plan will speed up the commercialisation of CCS technology by 10 years.

It wants to see a "fast track" process where the demonstration plants are planned and permitted by 2010, built by 2013 and fully operational from 2015. The demonstration programme could open the door to 80 to 120 full-scale CCS plants in Europe by 2030, the ZEP said.

Announcing the plan, ZEP chairman Dr. Graeme Sweeney, who is also executive vice-president of future fuels & CO_2 at Shell, said: "It is widely accepted that CCS is one of the key solutions for combating climate change - while building a bridge to a truly sustainable energy system." As a result, it is imperative that CCS receives the support and structure required to become a commercial reality and realize its potential of reducing CO_2 emissions in the EU by up to 400 million tonnes a year by 2030," Dr Sweeney said. Currently it is believed that throughout Europe there are 34 projects being developed that could bid to be part of the EU programme according to the criteria in the ZEP plan.

Costs
Ultimately, the CCS demonstration programme is about removing risk from the process of setting up CCS plants, with the Zero Emissions Platform stating that projects will require public funding to cover start-up costs.

The ZEP plan said industry was prepared to share a "major portion" of the costs, but would require the public sector to co-invest. It favours an EU-wide funding mechanism, but with the EU Budget currently frozen until 2013, the funds would have to come from Member States, consumer electricity bills or the EU Emissions Trading Scheme. The European Commission is now favouring the Emissions Trading Scheme funding route, and speaking at the ZEP meeting yesterday, energy commissioner Andris Piebalgs said he was backing British MEP Chris Davies in his amendment to the proposed CCS Directive that would see 500 million emissions allowances reserved for CCS projects.

At 35 euros per emissions allowance (relating to a tonne of carbon emissions), that would bring in 17.5 billion euros (£14 billion).

Adding his support to the amendment ahead of talks between the Commission, the EU Parliament and Member States on the EU Council, Mr Piebalgs said: "The amendment can offer means of helping all new low carbon technologies demonstration, including early CCS projects, to cover part of the additional demonstration costs regular power plants will not face. "However, any use of the EU ETS new entrants' reserve for low carbon technologies, including CCS, must also be acceptable to Member States so as to contribute positively to a first reading agreement by December," the EU energy commissioner added.
http://newenergyfocus.com/do/ecco.py/view_item?listid=1&listcatid=32&listitemid=1921&section=

Coal power plan for nuclear site

20 November 2008
A new coal-burning power plant, which would be the first conventional station to come on stream in Scotland since 1980, is being planned for the Firth of Clyde. Denmark's state-owned energy company, Dong, has identified Hunterston, North

Ayrshire, as the preferred site. The 1600MW plant would be able to power the average needs of two million homes.

The first of two 800MW plants could be operating by 2014, but the more realistic timetable is for a switch-on 10 years from now. The facility would be located next to British Energy's nuclear plant and deep water port facilities, as it would be dependent mainly on imported coal, which has lower emissions than coal from Scottish fields.

It would also be suited for generating power from burning biomass, by-products from forestry and farming. The use of coal will be controversial, as environmental campaigners push to reduce Britain's heavy dependency on polluting fossil fuels for its electricity. But Brian Wilson, the former energy minister who is a consultant on the Hunterston project, said the plans for "clean coal" were distinct from old coal technologies.

Carbon capture

It is claimed that Dong already has experience of reducing emissions by a quarter in new plants when compared with old coal-burning stations. The plan is also to prepare Hunterston for carbon capture - the new technology that pumps emissions for storage in emptying oil wells. If this becomes viable, it is claimed emissions could be cut by 90%. Although the science can be shown to work, carbon capture is yet to be made commercially viable.

The Danish company is proposing a joint venture company with Peel Energy, a sister company of Clydeport which operates the Hunterston port. Their plan would be dependent on an upgrade of the National Grid connections from the Ayrshire site. At current costs, the proposal is priced at £1.5bn to £2bn.

Jens Kragholm of Dong Energy stresses the project is at a very early stage, as they investigate the environmental issues based on an outline design. A public consultation would follow.

According to Owen Michaelson, chairman of Peel Energy: "The Hunterston site is ideal, as it already handles a large proportion of Scotland's imported coal. "It makes perfect sense to build a new power station there, avoiding the need to transport millions of tonnes of coal a year across the country." While there has been rapid growth of wind farms in Scotland, the country's conventionally-generated electricity supply is facing a rundown as plants grow old.

Scottish Power has two coal-burning plants by the Firth of Forth. Longannet is having its life extended with upgraded equipment allowing for cleaner burning along with an investigation into its carbon capture potential, while the future of Cockenzie in East Lothian is under review.

Of the two remaining nuclear power plants in Scotland, Hunterston B is scheduled for shut-down in 2016 and Torness in East Lothian should keep running until 2023. The Scottish Government has said it will use its planning powers to block proposals for any new nuclear power plant. This has provoked a debate over Scotland's reliance for its electricity supply on renewable and fossil-burning sources, while the UK Government presses ahead with a new generation of nuclear at sites in England.
http://news.bbc.co.uk/1/hi/scotland/glasgow_and_west/7739287.stm

Student Bursaries for 2009-2010

Up to 6 travel and subsistence bursaries for up to £300 are on offer to bona-fide full-time students wishing to attend appropriate National and International coal-related conferences, such as the "8th European Conference on Coal Research and Its Applications" to be held in 2010, (please see the Calendar of Coal Research Events for details of similar events at the end of this Newsletter). To apply, please send the abstract submitted to the conference with a brief supporting letter from your supervisor to:

Prof. J.W. Patrick
School of Chemical & Environmental Engineering
The University of Nottingham
University Park
Nottingham NG7 2RD

The bursaries come with no obligations to the recipient other than to supply a short essay about his or her impressions of the conference to the Newsletter for inclusion in the next edition.

Update on current EPSRC Energy Projects

(as of January 2009)

Grant Title	Investigator	Value (£)
A feasibility study for a new approach to designing non-tracking solar concentrators	Dr M McCulloch	107,190
A Feasibility Study Of A Silicon Enabled Hydrogen Fuel Economy	Professor J Foord	324,398
A feasibility study to assess the potential of organic crystals as hydrogen storage materials.	Professor N McKeown	193,830
A novel device architecture for high-performance organic solar cells	Professor H Sirringhaus	133,811
Advanced Analysis of Building Energy Performance using Computational Intelligence Approaches	Dr T Schnier	254,261
Advanced Spectroscopic Techniques for the Optimisation of Photo-electrochemical Hydrogen Production	Dr AG Dutton	138,585
Aerogel photocatalytic diodes for carbon dioxide reduction	Professor A Mills	167,530
Biological and Engineering Impacts of Climate Change on Slopes: Learning from full scale	Dr S Glendinning	95,973
Biological and Engineering Impacts of Climate Change on Slopes: Learning from full scale	Dr D Hughes	22,321
Biological and Engineering Impacts of Climate	Professor N Dixon	30,855

Change on Slopes: Learning from full scale		
Biological and Engineering Impacts of Climate Change on Slopes: Learning from full scale	Professor W Powrie	30,652
Biomimetic hybrid semiconductor photovoltaic devices	Dr LR Wilson	157,679
Chair in Decommissioning Engineering	Professor TB Kelly	275,577
Chair in Power System Engineering	Professor D Kirschen	818,336
Chair in Radiation Chemistry	Professor SM Pimblott	270,054
COincident Probabilistic climate change weather data for a Sustainable built Environment (COPSE)	Professor C Underwood	84,790
COincident Probabilistic climate change weather data for a Sustainable built Environment (COPSE)	Professor S Sharples	81,564
COincident Probabilistic climate change weather data for a Sustainable built Environment (COPSE)	Dr MH Nikolopoulou	101,418
COincident Probabilistic climate change weather data for a Sustainable built Environment (COPSE)	Professor GJ Levermore	374,360
COST-EFFECTIVE PRODUCTION OF RENEWABLE LIQUID BIOFUEL AND CHEMICALS THROUGH THE THERMOCHEMICAL LIQUEFACTION OF AQUATIC BIOMASS	Professor JM Jones	135,848
Decision support for building adaptation in a low-carbon climate change future	Professor PFG Banfill	633,471
Delivering Low Carbon Anaerobic Wastewater Treatment and Renewable Energy Production	Dr E Cartmell	199,108
Direct Carbon Fuel Cell System Development Study	Professor J Irvine	142,473
Distributed Hydrogen Production with Carbon Capture: A Novel Process for the Production of Hydrogen from Biomass	Dr J Dennis	175,850
Electrolytic Silicon and Iron Powders as Alternatives to Hydrogen as Energy Carrier and Store	Dr GZ Chen	151,939
Energy management decisions under real-time uncertainty in both price and load	Professor P Duck	144,789
Energy project officer	Professor G Tomlinson	80,191
Energy research development manager at Imperial College London (Linked to	Professor NP Brandon	193,377

EP/E011705)		
Engineering the soil carbon sink: a novel approach to carbon emission abatement	Professor DAC Manning	239,700
Enhanced biomass production and energy conversion for use in water-scarce areas of India	Dr PA Davies	716,657
Enhanced biomass production and energy conversion for use in water-scarce areas of India	Professor RE Critoph	294,073
Enhanced biomass production and energy conversion for use in water-scarce areas of India	Dr MJ Tierney	74,531
Enhanced Management and Performance for a Sustainable UK Energy Infrastructure	Professor S Swingler	2,484,941
Enhancement of Electrochemical Energy Efficiency via Process Intensification	Dr H Yeung	220,349
EPSRC Energy Project Manager	Professor RK Aggarwal	94,425
EPSRC Star Academic Proposal	Professor J McDonald	709,745
Exploration of the hydrogen storage capacity of pillared nanographite intercalates	Professor N Skipper	204,744
Exploration of the hydrogen storage capacity of pillared nanographite intercalates	Professor SM Bennington	92,301
Feasibility of an Innovative Methodology for Testing Marine Current Turbines in Unsteady Flow	Dr A. H. Day	133,282
Feasibility of an Innovative Methodology for Testing Marine Current Turbines in Unsteady Flow	Dr R Harris	34,979
Feasibility study for a new gas separation process, with application to carbon dioxide capture	Dr MB Sweatman	272,702
Feasibility Study of Optimisation of Scroll Air Motors and Energy Recovery from Exhaust Compressed Air	Professor ASI Zinober	80,737
Feasibility Study of Optimisation of Scroll Air Motors and Energy Recovery from Exhaust Compressed Air	Dr J Wang	108,825
Feasibility Study of the Potential for Electric Vehicle Batteries to be Used for Network Support	Professor DG Infield	153,752
FEASIBILITY STUDY OF UREA FUEL CELL	Dr S Tao	87,874
High Throughput Discovery of "Hydrogel	Professor A	148,315

Nanoclathrates"	Cooper	
High Throughput Synthesis and Screening of Novel Hydrogen Storage Materials	Professor P Edwards	485,413
High Throughput Synthesis and Screening of Novel Hydrogen Storage Materials	Professor WIF David	243,193
Hydrogen generation from biomass derived glycerol using sorption enhanced reaction processes	Dr V Dupont	270,319
Increasing Photocurrents in Biosolar Cells using Microporous Electrodes - A Feasibility Study	Dr PJ Holliman	110,020
Innovative Accelerator Technology for Accelerator Driven Subcritical Reactors	Professor RJ Barlow	142,341
Iron Pyrite / a super absorber for PV solar energy	Professor SJC Irvine	177,843
Keeping the Nuclear Option Open	Professor RW Grimes	6,114,715
Killing two birds with one stone: Can fuel cells operate on a high energy density fuel derived from coal?	Dr A Kucernak	188,049
Measurement, Modelling, Mapping and Managenmment (4M): An Evidence-Based Methodology for Understanding and Shrinking the Urban Carbon Footprint	Professor K Lomas	2,726,669
Nanofuels as Future Energy Vectors	Dr D Wen	179,443
Novel Ammonia-Based Energy Storage Technology	Professor SG Davies	267,602
Novel Catalytic Membranes for CO2 Removal and Recovery	Dr PM Budd	149,042
Novel Multi-functional Membrane Reactors for Energy Conversion and CO2 Capture via Pre-combustion Decarbonisation Route	Professor K Li	170,073
Photophysical Strategies and Novel NIR Dyes for Optimisation of Luminescent Solar Concentrators	Professor BS Richards	160,093
Photophysical Strategies and Novel NIR Dyes for Optimisation of Luminescent Solar Concentrators	Dr N Robertson	147,591
Real-time wave field mapping for the offshore renewable energy industry	Dr T Bruce	237,809
SCORE - (S)tove for (CO)oking, (R)efrigeration and (E)lectricity supply: an affordable appliance for remote and rural communities	Dr KR Pullen	229,346
SCORE - (S)tove for (CO)oking, (R)efrigeration and (E)lectricity supply: an affordable	Professor C Lawn	302,238

appliance for remote and rural communities		
SCORE - (S)tove for (CO)oking, (R)efrigeration and (E)lectricity supply: an affordable appliance for remote and rural communities	Dr AJ Jaworski	407,068
SCORE - (S)tove for (CO)oking, (R)efrigeration and (E)lectricity supply: an affordable appliance for remote and rural communities	Professor CM Johnson	617,864
Screening New families of Metal Organic Frameworks for Hydrogen Storage	Professor ZX Guo	89,654
Screening New families of Metal Organic Frameworks for Hydrogen Storage	Dr C Redshaw	177,996
Semi-Biological Photovoltaic Cells	Dr A Fisher	155,256
Short Term Deterministic Wave Prediction as a Tool for Enhanced Performance with Survivability for Wave Energy Converters.	Dr MR Belmont	166,264
SI/SIGE NANOWIRE ARRAYS FOR THERMOELECTRICITY	Dr K Fobelets	123,625
Solid state NMR for dynamics and kinetics of hydrogen uptake and transport in novel bionanomaterials for energy applications ('Nano-NMR')	Professor LE Macaskie	119,972
Squeezing hydrogen out of biomass; new catalysts for clean energy generation.	Professor M Wills	185,603
SUPERGEN - PV Materials for the 21st Century	Professor K Durose	4,199,407
SUPERGEN - The Energy Storage Consortium	Professor MS Islam	2,156,535
SUPERGEN 1 Renewal Core - FlexNet: Renewal of the Supergen consortium on Future Network Technologies	Professor J McDonald	6,974,971
SUPERGEN 2 - Conventional Power Plant Lifetime Extension Consortium - CORE	Professor RC Thomson	4,295,007
SUPERGEN BIOMASS BIOFUELS AND ENERGY CROPS II CORE	Professor JM Jones	6,387,325
Supergen Marine - Core	Professor R Wallace	5,539,980
SUPERGEN Photovoltaic Materials for the 21st Century	Professor K Durose	6,270,876
The Supergen5 Biological Fuel Cells Consortium	Professor FA Armstrong	2,022,490
The Use of Probabilistic Climate Data to Future-Proof Design Decisions in the Buildings Sector	Dr D Coley	519,402

The use of probabilistic climate scenarios in building environmental performance simulation	Professor VI Hanby	261,684
The use of probabilistic climate scenarios in building environmental performance simulation	Professor P Jones	53,197
The Use of Probabilistic Climate Scenarios in Decision Making for Adaptation of Building and Property Drainage	Dr L Jack	299,674
UK-Japan Hydrogen Storage Research Network	Dr D Book	143,919
United Kingdom Sustainable Hydrogen Energy Consortium (UK-SHEC) CORE PROGRAMME	Dr T Mays	5,965,477
Wind Energy Technologies	Professor PJ Tavner	2,552,788

Update on current EPSRC Climate Change Projects

(as of January 2009)

Grant Title	Investigator	Value (£)
Carbon Calculations over the Life Cycle of IndustrIal Activities (CCaLC)	Professor A Azapagic	979,435
Challenges and Opportunities for the UK in Moving Towards a Low-Carbon Future	Dr G Walker	522,732
Fuel Cell Technology, Enabling a Robust Clean Energy Economy	Professor J Irvine	533,875
Sand Transport in Oscillatory Flow In The Sheet Flow Regime	Professor T O'Donoghue	312,027
SCORCHIO: Sustainable Cities: Options for Responsing to Climate cHange Impacts and Outcomes	Professor GJ Levermore	319,234
SCORCHIO: Sustainable Cities: Options for Responsing to Climate cHange Impacts and Outcomes	Professor P Jones	51,225
SCORCHIO: Sustainable Cities: Options for Responsing to Climate cHange Impacts and Outcomes	Professor J Hall	124,385
SCORCHIO: Sustainable Cities: Options for Responsing to Climate cHange Impacts and Outcomes	Professor S Sharples	60,497
The Development of a Local Urban Climate Model and its Application to the Intelligent Development of Cities (LUCID)	Professor M Davies	608,174
The Development of a Local Urban Climate Model and its Application to the Intelligent	Professor M Kolokotroni	179,953

Development of Cities (LUCID)		
The Development of a Local Urban Climate Model and its Application to the Intelligent Development of Cities (LUCID)	Professor SE Belcher	238,330
Unlocking Low Carbon Potential	Professor P Reason	818,926

Update on current EPSRC Towards a Sustainable Energy Economy Projects

(as of January 2009)

Grant Title	Investigator	Value (£)
Advanced Bio-Photovoltaic Devices for Solar Energy Conversion	Dr A Fisher	1,170,275
Advanced Bio-Photovoltaic Devices for Solar Energy Conversion	Professor LM Peter	353,538
Artificial Photosynthesis: Solar Fuels	Professor RJ Cogdell	1,606,485
AURA-NMS: Autonomous Regional Active Network Management System	Professor TC Green	2,512,336
BMT-CES: Biofuel Micro-Trigeneration with Cryogenic Energy Storage	Professor NJ Hewitt	117,762
BMT-CES: Biofuel Micro-Trigeneration with Cryogenic Energy Storage	Professor Y Ding	351,194
BMT-CES: Biofuel Micro-Trigeneration with Cryogenic Energy Storage	Professor A P Roskilly	678,201
Carbon Dioxide and Alkanes as Electron-sink and Source in a Solar Nanocell: towards Tandem Photosynthesis of Carbon Monoxide and Methanol	Professor CJ Pickett	678,849
Carbon Dioxide and Alkanes as Electron-sink and Source in a Solar Nanocell: towards Tandem Photosynthesis of Carbon Monoxide and Methanol	Professor R Perutz	369,069
Carbon Dioxide and Alkanes as Electron-sink and Source in a Solar Nanocell: towards Tandem Photosynthesis of Carbon Monoxide and Methanol	Professor M George	328,660

Carbon Dioxide and Alkanes as Electron-sink and Source in a Solar Nanocell: towards Tandem Photosynthesis of Carbon Monoxide and Methanol	Professor WR Flavell	312,239
Delivering sustainable water systems by optimising existing infrastructure via improved knowledge, understanding and technology - project NEPTUNE	Professor NJD Graham	2,326,981
Designing Novel High Capacity Multicomponent Hydrides for Near-Ambient Solid State Hydrogen Stores	Dr G Walker	442,190
DIAMOND: Decommissioning, Immobilisation And Management Of Nuclear wastes for Disposal	Professor SR Biggs	4,276,704
Energy Efficient Cities	Professor I Leslie	2,862,119
EPSRC - Energy Research Senior Fellow	Professor NP Brandon	1,029,817
Future reliable renewable energy conversion systems & networks: A collaborative UK-China project.	Dr M Mueller	98,661
Future reliable renewable energy conversion systems & networks: A collaborative UK-China project.	Professor PJ Tavner	310,586
Future reliable renewable energy conversion systems & networks: A collaborative UK-China project.	Professor GM Asher	121,794
Future reliable renewable energy conversion systems & networks: A collaborative UK-China project.	Professor P Mawby	115,683
Future reliable renewable energy conversion systems & networks: A collaborative UK-China project.	Professor GY Tian	236,601
High stability and high efficiency printable photovoltaics (OPV) for large-scale energy production	Professor DDC Bradley	887,240
Impact of DMF on Engine Performance and Emissions as a New Generation of Sustainable Biofuel	Dr HM Xu	519,808
Intensification of syngas cleaning and hydrogen separation	Professor G Akay	150,892
Mop fan and electrofilter: An innovative approach for cleaning product gases from biomass gasification	Dr H LIU	174,695
New and Renewable Solar Routes to Hydrogen Energy	Professor NP Brandon	4,191,875

Optimisation of Biomass/Coal Co-Firing Processes through Integrated Measurement and Computational Modelling	Dr E Lester	88,814
Optimisation of Biomass/Coal Co-Firing Processes through Integrated Measurement and Computational Modelling	Professor M Pourkashanian	369,042
Optimisation of Biomass/Coal Co-Firing Processes through Integrated Measurement and Computational Modelling	Professor Y Yan	411,147
PERFORMANCE COMPARISON OF TRADITIONAL AND EMERGING DOUBLY-FED GENERATOR TOPOLOGIES FOR GRID-CONNECTED WIND POWER APPLICATIONS	Dr M Jovanovic	132,897
PERFORMANCE COMPARISON OF TRADITIONAL AND EMERGING DOUBLY-FED GENERATOR TOPOLOGIES FOR GRID-CONNECTED WIND POWER APPLICATIONS	Dr DJ Atkinson	135,327
Power Networks Research Academy	Professor P Moore	1,119,084
Small Scale Biomass-Fired CHP System	Dr H LIU	134,976
Sustainability Assessment of Nuclear Power: An Integrated Approach (SPRIng)	Professor A Azapagic	2,123,000
Thermal Conductivity Enhancement of High-Temperature Thermal Energy Stores For Use with Solar Power Plants	Dr CY Zhao	712,779
Transition pathways to a low carbon economy	Professor GP Hammond	2,110,867
Understanding walking and cycling	Professor CG Pooley	958,923

CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
10-11 February 2009	4th International Conference on Underground Coal Gasification	London, UK	Julie Lauder, UCG Partnership Limited, Network House, Bradfield Close, Woking, Surrey GU22 7RE, UK Tel: +44 870 803 0665 Email: julie.lauder@ucgp.com
11-12 February 2009	9th Advanced Power Generation Technology Forum Workshop on Carbon Abatement Technologies for Fossil Fuels : Development and Implementation of Future UK Strategy.	The Conference Centre, 1, Victoria Street, London.	All details on www.apgtf-uk.com

11th March 2009 (Provisional)	**"The Integrated Pollution Prevention & Control Directive" (joint meeting between the CRF Environment Division and the Combustion Engineering Association, (CEA).**	**British Sugar Plc. Conference Centre, Holmewood Hall, Near Peterborough, Cambridgeshire.**	**Dr Michael Whitehouse** **E-mail: michael.whitehouse@rwenpower.com** **Tel: 01793 894 118**
23–25 March 2009	9th European Gasification Conference	Dusseldorf, Germany	Mrs Rosemary Cragg, Conference Department, Institution of Chemical Engineers, Davis Building, 165-189 Railway Terrace, Rugby CV21 3HQ, London Tel: +44 1788 578 214 Fax: +44 1788 560 833 email: rcragg@icheme.org www.icheme.org/gasification2009
14-16 April 2009	5th Annual Eurocoke Summit 2009	Rome, Italy	Rob Stead, IntertechPira UK, Cleeve Road, Leatherhead, Surrey, KT22 7RU, UK Tel: +44 1372 802 087 Email: robert.stead@pira-international.com
22 April 2009, (Provisional)	**The CRF/CUSG Annual Meetings together with a joint Combustion/Advanced Power Generation Divisional Meeting.**	**Department of Fuel and Energy, University of Leeds.**	**Dr.D.J.A.McCaffrey, CRF/CUSG Secretary.** **E-mail : mail@coalresearchforum.org**
4-7 May 2009	World of Coal Ash 2009 Conference	Lexington, KY, USA	Ms Alice Marksberry, Center for Applied Energy Research, University of Kentucky, 2540 Research Park Drive, Lexington, KY 40511-8410, USA Tel: +1 859 257 0311 Email: wocasubmission@caer.uky.edu
18-20 May 2009	4th International Conference on Clean Coal Technologies	Dresden, Germany	IEA Clean Coal Centre, 10-18 Putney Hill, London SW15 6AA, UK Tel: +44 20 8780 2111 Email: mail@iea-coal.org.uk
31 May - 4 June 2009	Clearwater coal conference: 34th International Technical Conference on Coal Utilization & Fuel Systems	Clearwater, FL, USA	Barbara Sakkestad, Coal Technology Association, 601 Suffield Drive, Gaithersburg, MD 20878, USA Tel: +1 301 294 6080 Fax: +1 301 294 7480 email: Barbarasak@aol.com www.coaltechnologies.com
7-10 July 2009	10th International Conference on Energy for a Clean Environment	Lisbon, Portugal	Instituto Superior Técnico, Mechanical Engineering Department, Av. Rovisco Pais, 1049-001 Lisbon, Portugal Tel: +351 21 841 7378 Fax: +351 21 847 5545 email: cleanair@ist.utl.pt rgesd.ist.utl.pt/cleanair
21-24 September 2009	2009 International Pittsburgh Coal Conference	Pittsburgh, PA, USA	Conference Secretary, International Pittsburgh Coal Conference, University of Pittsburgh, 1249 Benedum Hall, Pittsburgh, PA 15261 USA Tel: +1 412 624 7440 Fax: +1 412 624 1480 email: ipcc@pitt.edu www.engr.pitt.edu/pcc/index.htm
26-29 October 2009	15th International Conference on Coal Science & Technology (ICCS&T)	Cape Town, South Africa	Mrs Angelique Freyer, Syngas and Coal Technologies, Sasol Technology Research and Development, 1 Klasie Havenga Avenue, PO Box 1, Sasolburg 1947, South Africa Tel: +27 16 960 4505 Fax: +27 11 219 1095 email: angelique.freyer@sasol.com www.iccst.info