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NEWSLETTER



*of the
Coal Research
Forum*

EDITOR'S COMMENTS:

As I sat down to write the editorial for this issue I thought, "How can I do it without sounding like a grumpy old man". Then I realised that as I was a grumpy old man there was probably little point in trying! However, I did try, I really did, but it proved very difficult to put a positive spin on things. As I write, Hurricane Gustav is rampaging through the Caribbean, possibly heading for New Orleans where exactly three years ago Katrina did the same thing, as we cannot forget, with devastating effects. Do we really believe that we can prevent nature from doing whatever it wants to do? I think not. The Chancellor has just told us that the economy is much worse than even he believed; we cannot get a fair price for our houses should we wish to sell them and the increasing number of fuel thefts speak for themselves regarding the price we now pay at the pumps. The West is now in dispute with Russia over Georgia at a time when, as seen in this newsletter, the UK, in particular, is getting even more reliant on their fuels. And if that was not enough, Derby County, freshly-relegated from the Premiership with a load of unwanted records now find themselves languishing at the foot of the Championship league!

And finally, if you feel that this newsletter has been produced, not to say thrown together, rather quickly and does not show the literary craftsmanship of previous editions, (who am I kidding!), it's because it has. The reason is the small matter of 7th ECCRIA which has been exercising the hearts and minds of myself and David McCaffrey somewhat over the last four months! Anyway, I hope that you got to this event; I hope it was a success and I hope you enjoyed it. There, I managed to find a positive note from somewhere on which to end! (AWT-ed).

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Joint CRF / BCURA meeting entitled
"Presentation of a Selection of Current and Recently
Completed Projects Funded through the
BCURA/DTI /Coal Research Programme"
held at Imperial College London
on 4th June 2008

This event was held in the Department of Chemical Engineering at Imperial College and attracted an audience of approximately 50. Professor Jim Harrison, Chairman of the BCURA Council, welcomed those present and reminded the audience that BERR (formerly the DTI) no longer provided financial support for BCURA activities. Consequently, the funds to support future coal research projects will be provided largely by the BCURA Industrial members. 16 PhD projects were currently funded by BCURA. Presentations were made on nine projects; some that had recently been completed, while others were still in progress. The presentations were divided into four sessions, namely projects that related to combustion, gasification, CO₂ capture or topics related to coal and biomass co-firing.

The first presentation was made by Dr R. Seneviratne, Imperial College, on "Low cost sorbents for mercury capture", (B73). Dr Senevirante reminded the audience of the Hg emission limits now in force in the USA, with similar regulations expected to be applied in Europe in the near future. While commercial sorbents are available, they are expensive. Thus the need to develop cheap, but efficient low cost alternatives, is of great importance. The project had shown that effective capture could be obtained from activated chars prepared from scrap tyres, sewage sludge and fly ash. In the range 100-200°C, the capture efficiency was found to decrease with increasing temperature, but the decreases were less than those shown by the commercial sorbents. Fly ash was found to be a poor sorbent, possibly due to the much lower surface area of the ash. The best all-round capture properties were shown by a steam activated pyrolysed scrap tyre rubber.

The second speaker was Mr J. Li, University of Nottingham, who gave a talk on "Mercury oxidation by fly ash constituents, with optimisation for control technologies", (B83). This project was still in progress. Fly ash is of potential interest since there are fly ashes available that contain up to 40% of carbon. Mr Li described the modelling procedures that have been established to investigate the reactions between flue gas components and Hg, HgCl₂, HgCl, H, HCl and Cl₂. Rate constants for both the forward and back reactions for the reaction $\text{HgCl} + 2\text{HCl} \leftrightarrow \text{HgCl}_2 + \text{H}_2$ in the temperature range 45-425°C had been determined. Six different fly ashes have been chosen for further study.

Dr J. Wang, University of Birmingham, then gave a presentation on "On-line condition and monitoring of pulverised coal mills using a model based on pattern recognition", (B85A). Coal-fired plants are required to have flexibility in processing coal from various indigenous and overseas sources, together with a range of biomass fuels. These fuels impact on mill safety, combustion efficiency and an ever present risk of explosions. The project has been undertaken with the help of EDF at Cottam, a utility that uses horizontal tube mills for pulverisation. An on-line package has been developed using a mathematical model based on physical and engineering principles and containing 17 parameters. Validation of the model has been made by comparing the measured and predicted gas outlet pressures and temperatures from the mill.

The fourth talk was given by Prof J.B.Moss, Cranfield University on "Properties and combustion characteristics of coal-derived fuels for industrial gas turbines", (B74). The composition of a Syngas produced from coal is very different to that of natural gas, consisting primarily of CO and H₂. The proportions of CO and H₂ vary with the type of the coal, the proportions of O₂ and steam used, the carrier gas for transporting the coal particles, temperatures and pressures. Turbine technologists are mainly concerned with the CV of the gas, the combustion volume, flame stability and gaseous emissions. Experimental investigations have shown that burning velocities decreased markedly with pressure up to 10 bars. Numerical simulations were made with a laminar flame and the results compared with experimental data from a laminar flame burner fuelled with a prepared Syngas substitute. Schlieren images were obtained to study the flame and flame stability. Data on laminar burning velocities at preheat temperatures up to 600K and with pressures to 6 bars were obtained. The agreement between predicted and experimental values was found to be less good at the higher pressures and with lean gas mixtures. Syngas containing high H₂ contents were found to give flames that were prone to thermal diffusion and disturbance and this observation may pose practical limitations for Syngas use in gas turbines.

The next talk was given by Fraser Wigley, Imperial College on "Coal mineral transformations under oxy-fuel combustion conditions", (B81). The combustion of pulverised coal in an atmosphere of oxygen and recycled CO₂ gas may provide gaseous products from which much cheaper methods of removing the CO₂ for subsequent capture may be developed. To date, little attention has been paid to the effect of the higher CO₂ partial pressures on the coal mineral transformations and the nature of the ash and deposits that form in the boiler. Most concern is for the effect of the CO₂ on the Ca bearing coal minerals. Would the higher CO₂ partial pressures delay the decomposition of Ca carbonate and gypsum, CaSO₄.2H₂O ? The presence of less CaO could increase the viscosity of the ash and thus change the proportions of bottom ash to fly ash in the boiler. An examination of deposits taken from the E.ON combustion facility at Ratcliffe, now modified for oxy-fuel combustion conditions, has been undertaken. Initial observations suggested that deposits formed under oxy-fuel combustion conditions were denser than those formed during conventional combustion. Ash particles formed under oxy-fuel firing are more angular in shape and contained less glass but higher proportions of crystalline mullite than were present when the same coal was fired under conventional conditions.

Mr Neil MacDowell, Imperial College, then spoke on "Improvements in amine flue gas scrubbing for coal fired plants", (B82). Post-combustion capture of CO₂ offers good process flexibility. Gas-liquid scrubbing is a well-understood technique; e.g. the oil industry has over 40 years of experience in amine scrubbing of CO₂. This method of separating the CO₂ from the other combustion products is a strong contender for the first demonstration plants for carbon capture and storage. The project had started by modelling two gaseous reactions, namely $2\text{NH}_3 + \text{CO}_2 \leftrightarrow \text{NHCOONH}_4$ and the reactions between NH₃, CO₂ and H₂O. The project will continue with a modelling of the reactions in a five component system, namely NH₃, CO₂, H₂O, N₂ and O₂.

Fraser Wigley, Imperial College, then returned to give a talk on "Coal-biomass ash deposition during deeply staged combustion", (B78). To reduce CO₂, SO₂ and NO_x emissions UK utilities are currently co-firing increasing amounts of biomass and low or ultra low sulphur coals along with a conventional bituminous coal. Deeply staged combustion conditions may soon be an additional requirement. Indonesian coals typically have ash contents of just a few percent, but yield an ash that is rich in Fe, Ca, Mg and alkalis. Thus, co-fired biomass and low sulphur coals may increase the slagging potential of the coal. Ashes and deposits were

obtained with mixtures of a bituminous 'high' ash coal, an Indonesian 'low' ash coal and various biomasses using an entrained flow reactor that simulated the pulverised coal combustion conditions. When firing the bituminous coal with the biomasses, the ash chemistry and ash viscosities were found to be dominated by the coal ash chemistry. However, increasing additions of the 'low' ash coal gave larger than expected changes to the ash chemistry, with rapidly increasing Fe_2O_3 contents and steadily decreasing SiO_2 concentrations. Additions of the low ash coal did not increase the rate of ash deposition but did increase the degree of ash sintering. A characterisation of the 'low' ash coal then revealed an ash content of 11%, considerably higher than the specification supplied. A low ash coal with a more typical ash content has now been acquired and the project continues.

Prof Alan Williams, University of Leeds, then presented the results of a study entitled "Co-firing coal/biomass and the estimation of burnout and NO_x formation" (B79). The project had used a UK coal (Gascoigne Wood), Russian and South African coals, together with biomasses that included wood, miscanthus, olive residues and palm kernel extracts. Thermal gravimetric analysis (TGA) of the biomass was used to characterise the devolatilisation process which was found to be dependent on the rate of heating and the moisture content of the biomass. Fluent was used to predict the formation of NO from the oxidation of NH_3 and HCN when the coals and biomass were co-fired in the RWE npower combustion test facility at Didcot. A comparison of the predicted and observed NO levels for varying proportions of biomass and coal was good. However, the prediction of carbon burnout was less good, with observed levels of unburned carbon higher than predicted. Improved aerodynamic modelling of the burner is expected to be the key to improved predictions.

The final presentation was given by Mark Flower, Imperial College, with a talk entitled "Characterising biomass particle behaviour under co-combustion conditions", (B80). The Renewable Obligation (RO) requires UK power generators to source increasing proportions of electrical power from renewable sources. In 2008 the proportion should be 7.9%, but this rises to 15.9% by 2015. Should a supplier fail to meet the obligations then the shortfall must be covered by the purchase of Renewable Obligation Certificates (ROCs). The buyout price for ROCs is currently £34 per MWh, but increases annually in line with the RPI. Currently all types of biomass are eligible for ROCs, however, in the near future only energy crops, such as SRC, miscanthus and grasses will attract a full ROC, while biomasses such as forestry residues, PKE and olive residues will be eligible for only 0.5ROC. Thus, the need to understand and optimise the pyrolysis and combustion of biomass has become pressing. For this project a new high temperature wire mesh apparatus (HTWM) with optical access has been designed and built to study biomass particle behaviour when rapidly heated. The apparatus consists of an electrically heated stainless steel mesh, with heating rates up to 2000 K s^{-1} to 900°C and capable of heating particles of 50mg. The presentation concluded with video footage showing the behaviour of particles of olive residues and wood when heated under the above conditions.

The meeting concluded with some brief remarks from Mr Greg Kelsall, Chairman of the BCURA Industrial Panel and Co-Chairman of the CRF. He thanked the organisers of the meeting and the speakers for their excellent talks. He commented on the relevance of each of the BCURA projects to some of the current issues facing the power generation industry. At a time of rapidly rising oil and gas prices, together with the issues of security of supply, he welcomed the Government's recent announcements that coal will play a significant role in providing electrical power for decades to come.

For these notes I am indebted to my cub reporter Professor Jim Williamson!!
Many thanks, Ed.

SNR Triggers First Blast To Commence Commercial Coal Production

21 August, 2008

Strategic Natural Resources PLC announced that its 74% owned subsidiary, Elitheni Coal (Pty) Ltd had taken a major step forward to commence coal production at its deposit at Indwe in the Eastern Cape in South Africa.

Granted a mining permit with an approved Environmental Management Plan to extract coal over 1,5 ha by South Africa's Department of Minerals and Energy in June 2008, Elitheni has been preparing an area for limited open cast mining culminating in the first blasting to remove overburden from the mining site. SNR is pleased to announce that the blast took place at midday, Monday 18 August.

This initial blast will be followed by another seven or eight blasts during the next six months over the open-cast mining area to enable approximately 50,000 tonnes of coal to be extracted by means of open-cast mining. This will be followed by a full-scale underground mining operation which has been planned to commence early in 2009 subsequent to Elitheni obtaining its underground mining licence from the DME. The underground mining plan will be implemented across the 37,000 ha over which Elitheni has exclusive rights in the Eastern Cape Province of South Africa.

SNR Chief Executive Jeremy Metcalfe said: "This has been an auspicious occasion for the Company and paves the way forward for its subsidiary Elitheni to become established as a fully operational mining company. Elitheni is the first operating coal mine in the Eastern Cape after many years. The achievement of this milestone enables IPSA Group PLC, the AIM and AltX quoted power development company, to proceed with even greater confidence to expand their plans for increased power generation in South Africa's Eastern Cape area."

<http://www.snrplc.co.uk/cms/regulator-news-service/snr-triggers-first-blast-to-commence-commercial-coal-production/>

Algae could help cut coal plants' carbon emissions

15 August 2008

With international attention focused on carbon dioxide and its role in global climate change, power companies might find a hero in humble algae, a speaker said yesterday at the coal industry's Coal-Gen 2008 conference in Louisville. Engineers are experimenting with chemical processes that could remove carbon dioxide from the flue stacks of coal-fired electric plants and store it underground. But fast-growing algae -- the slimy green stuff that coats ponds and poorly tended swimming pools -- soaks up carbon dioxide naturally and can thrive on coal-plant fumes, said Robert Healy, an associate consultant with Burns & McDonnell, a Kansas City, Mo., engineering construction consulting firm.

The resulting algae crop could become a valuable by-product, Healy said. Algae processing can squeeze out oils for use as biodiesel fuel, with the leftover material converted to animal feed or other products, he said. Storing carbon dioxide underground is costly and returns no revenue, he said. But turning the waste into something that can be sold looks promising.

Healy was one of dozens of speakers at the annual coal-industry meeting, which is being held here for the first time. The event, which ends today, drew about 4,000. It's too early to say whether "algae farms" would be a practical step for many power plants, Healy said, and the process would remove only a portion of the total carbon emissions. Operations could vary in size, but "our opinion is that about 100 acres is a good target" for an algae farm, he said. Healy said, however, that he didn't want to present algae as a magic bullet. "Algae is a promising option, but not the entire solution" to the world's carbon-dioxide problems, he said.

The idea has been tested at several locations. NRG Energy, a power company based in Princeton, N.J., participated with GreenFuel Technologies Corp. to try out GreenFuel's proprietary system at a 1,489-net-megawatt, coal-fuelled power plant in New Roads, La.

NRG spokesman David Knox said that he could not discuss the results, but that the utility is "interested in seeing what evolves from the GreenFuel technology as they do further research." "We feel that you need to invest in a lot of different technologies and advance them all," Knox said. Some "might not pan out, but you can't tell that until you actually try to develop them." Chip Keeling, a spokesman for Louisville's E.On U.S., said there are no plans to work with algae at E.On's two utilities, Louisville Gas and Electric Co. and Kentucky Utilities Co. He added, however, that "we believe that any research and development being considered to reduce carbon and reduce global warming is worth advancing."

The U.S. Department of Energy explored the idea of growing algae to produce biofuel from 1978 to 1996 in what was known as the Aquatic Species Program. It never proved cost-competitive with petroleum, but given the current run-up in crude-oil prices, the situation could be different now, Healy said.

A 100-acre algae-growing operation could produce about 4 million gallons of fuel a year -- more oil than would be generated with traditional biodiesel crops such as soybeans, he said. Because of the space requirement, algae facilities would be practical only at plants in rural areas with room to spread out, Healy said. The possible use of algae hasn't received much mainstream media attention, but it has been discussed in environmental magazines and on blogs, he said. "I think there's a lot of promise," Healy said. "There's also a lot of scepticism, justifiably so.

"I think what we need to do is invest the time and money to actually move this forward."

<http://www.courier-journal.com/apps/pbcs.dll/article?AID=/20080815/BUSINESS/808150405>

Australian coal emissions are worst, says global study

29 August 2008

Australians continue to lead the world on emissions from burning coal, pumping out 10 tonnes of carbon dioxide a year per person. The Centre for Global Development, a Washington think-tank, yesterday also revealed Australia is the planet's eighth biggest carbon polluter. The study of emissions from 50,000 coal-fired power stations put China, the US, India, Russia, Germany, Japan and Britain ahead of Australia in total carbon dioxide output.

But each Australian produced almost the same amount of emissions as Americans -- 9.5 tonnes per person -- and Indians -- 0.6 tonnes -- combined. The Chinese produced just 2.4 tonnes per person a year, but this year outstripped the US as

the biggest emitter. According to the study, which draws on the Carbon Monitoring for Action databank, Victoria's Loy Yang A, Hazelwood and Yallourn power stations are among Australia's dirtiest.

Resources and Energy Minister Martin Ferguson yesterday told the first meeting of the National Low Emissions Coal Council that developing carbon capture and storage technology was a priority. "Clearly, no serious response to climate change can ignore the need to reduce emissions from Australia's coal-fired electricity generation sector," a spokesman for Mr. Ferguson said. Coal produced about 80 per cent of Australia's electricity and about a third of its greenhouse gas emissions, he said.

Climate Positive research director Matthew Wright said: "We should . . . move away from using coal by retrofitting as many generators as we can to make . . . power from gas, as a first step, while we roll out renewable energy infrastructure."

<http://www.news.com.au/heraldsun/story/0,21985,24258884-664,00.html>

Durham scientists to tackle CO₂ storage in global warming challenge

23 July 2008

Scientists at Durham University (UK) are working on new ways of storing CO₂ emissions underground to help in the fight against global warming. The University has launched the Carbon Storage Research Group, which will be led by the newly-created position of Professor of Carbon Capture and Storage (CCS) and Energy.

Researchers aim to find efficient and reliable ways of gathering CO₂ from fossil-fuel fired power plants and storing it in former oil and gas fields or aquifers indefinitely so it cannot add to global warming.

The new professorship is a three-way partnership between Durham University's Centre for Research into Earth Energy Systems (CeREES), DONG Energy and Ikon Science. Durham hopes to attract a leading figure in the area of carbon capture and storage to take on the role.

CO₂ is a greenhouse gas that traps heat radiation trying to escape the earth's atmosphere which scientists say is behind the rise in global temperatures.

Capturing and storing that CO₂ is seen as an essential part of reducing the amount of carbon dioxide in the atmosphere.

At the recent G8 summit the world's richest nations stated their "vision" to cut CO₂ emissions by 50 per cent by 2050 and the UK has plans to build power plants with carbon capture facilities.

Research into carbon capture and storage further strengthens Durham's work in the field of green energy which includes research into wind and wave power, solar energy, biofuels and the social implications of new and renewable energy

Professor Chris Higgins, Vice-Chancellor of Durham University, Brent Cheshire, Managing Director of DONG Energy (UK) Ltd and Martyn Millwood Hargrave, Chief Executive of Ikon Science, will sign an agreement confirming the professorship in

a ceremony at Hollingside House, Hollingside Lane, Durham City, on Thursday, July 24.

Professor Richard Davies, Director of CeREES, at Durham University, said: "As demand for energy increases we need innovative and practical solutions where CO₂ can be removed from the atmosphere to counteract global warming.

"Our combined expertise will allow us to investigate ways of capturing carbon and ensuring that it remains underground once stored."

DONG Energy will lend its experience in producing and distributing energy while Ikon Science will develop new technologies for monitoring and modelling the injection of CO₂ into the earth.

Martyn Millwood Hargrave, Chief Executive of UK headquartered Subsurface Technology developer Ikon Science, said: "We look forward to working with the highly respected CeREES team in Durham to accelerate the development and take up of new technologies and methods including integration with our proven RokDoc® subsurface modelling system."

Brent Cheshire, Managing Director of DONG Energy (UK) Ltd, said: "We are delighted to be working together with Durham University and Ikon in this very important area and to build on the position we have already established in the UK both in renewable energy and West of Shetland hydrocarbon exploration."

Margaret Fay, Chairman of Regional Development Agency One NorthEast, said: "Reducing the amount of CO₂ released into the atmosphere is possibly the single most important issue facing the world today. "This announcement is further evidence of North East England's excellent reputation for research in the field of green energy. Global companies recognise that the region is fast becoming a hub for new and renewable energy research and development."

http://www.innovationsreport.de/html/berichte/umwelt_naturschutz/bericht-114872.html

UK Coal raises output to capitalise on higher prices

29 August 2008

UK Coal is seeking to cash in on rising energy prices through higher production and the end of long-term, low-priced legacy contracts. The company is already investing £55m each in its collieries at Thoresby in Nottinghamshire and Kellingley in West Yorkshire to open up new reserves and is expected to decide within the next six months whether to reopen the Harworth mine near Doncaster, which has been mothballed for more than two years.

Chief executive Jon Lloyd said he believed it was accepted that in the face of higher energy prices, and despite the impact of the large combustion plants directive, which limits power station emissions, coal would play a "significant and perhaps major part in the UK's energy mix over the next two decades".

"There will be environmental challenges but frankly it's a political must to keep the lights on," Lloyd said. He said the company would decide on Harworth either late this year or in the first quarter of 2009. If it was reopened, at a cost of up to £175m, it would eventually provide another 2.2 m to 2.3 m tonnes of coal a year. The key factors would be the geology, which would determine the cost of accessing the reserves, and their size — thought to be 25m to 40m tonnes.

Although the UK Coal chief executive is bullish about the outlook for the industry, he said it was unlikely that Britain would see any new coal mines. "To start from scratch, to drive shafts would cost about £1bn and take eight or nine years — even if you find the people who know how to drive shafts any more."

Yesterday UK Coal reported an interim pre-tax loss of £9.9m against a profit of £40.6m in the same period last year. However, the company, which operates a property portfolio, said it was confident of meeting expectations for the full year. City analysts have pencilled in profits of around £70m.

UK Coal said first half coal production had been lower than expected and it was more committed to meeting long-standing lower-priced contracts, so the benefits of the 45% increase in prices had been muted. However it said the second half would see "significantly higher production at a significantly higher sales price." Lloyd said UK Coal was committed to delivering 10m tonnes of coal on lower - priced legacy contracts but by the end of 2009 that would have fallen to between 3m and 3.5m tonnes.

UK Coal said that despite the problems facing the property sector in the face of the credit crunch, the like-for-like value of its property portfolio had risen by 5% to £438.4m and that it expected to see a further increase in the second half.

Lloyd said the company's portfolio had benefited from its holdings of agricultural land, where values had risen, and because many of its developments were at an early stage and thus less vulnerable to the impact of the downturn. While an upturn could be some way off, Lloyd said the company would be well-positioned to take advantage of the eventual rebound in demand.

<http://www.guardian.co.uk/business/2008/aug/29/ukcoal.mining>

Georgia Power to convert coal plant to wood biomass

28 August 2008

Georgia Power, a unit of Southern Co. with headquarters in Atlanta, Ga., has asked the Georgia Public Service Commission for approval to convert its 155 megawatt coal-fired unit at its Mitchell Generating Plant near Albany, Ga., to use wood, instead. The converted unit would produce 96 megawatts of electricity.

According to Lynn Wallace, a company spokeswoman for Georgia Power, the nameplate capacity for the converted wood biomass-powered unit would be 59 megawatts lower due to the different physical characteristics of wood in comparison to coal. Wood contains more moisture and produces only 4,000 British thermal units (Btu) to 5,000 Btu per pound compared to coal at 12,000 Btu per pound, she said.

As a wood biomass-powered unit, the facility would actually produce more electricity than it does as a coal-fired unit, Wallace said. The unit currently operates at low capacity and is not considered one of the company's base-load power units; however, the biomass-powered unit would operate continuously and be part of the company's base load.

Surplus wood fuel for Plant Mitchell would come from suppliers operating within an approximately 100-mile radius of the plant. Wallace said the wood primarily would be waste wood, such as tree limbs, tree tops, needles, and leaves, which is

normally left behind by timber harvesting companies. "We wouldn't be competing with their wood supply," she said.

Wallace said consumers are asking to have more energy produced from feedstocks and from processes that produce lower emissions. She said the wood biomass-powered unit will produce less sulphur dioxide and nitrogen oxide emissions and will engender a net reduction in carbon emissions. Wood biomass is also less expensive than coal, Wallace added. The new feedstock requirement for the unit is expected to create between 50 and 75 new jobs related to waste wood recovery. She said waste wood that is left on the forest floor also emits methane gas and can easily fuel forest fires if it is not cleared away.

If approved, the plant would be one of the largest wood biomass plants in the United States, according to the company. The Georgia PSC is expected to rule on the proposal to convert Plant Mitchell to biomass by spring 2009. Retrofit construction would begin by spring 2011 and the biomass plant would likely begin operations in June 2012.

Power generation from wood biomass is nothing new for Georgia Power. The company recently signed a 15-year deal with Greenway Renewable Power LLC, an affiliate of Rollcast Energy Inc., which develops, owns and operates renewable power plants that generate electricity from wood waste. The contracted power supply will come from a biomass-fuelled facility which will be located near Franklin, Ga., in the west-central part of the state. The Greenway facility will process timber-harvesting residuals, non-commercial tree species, tree thinnings, lumber scraps and wood waste reclaimed from landfills. Under the contract, Georgia Power will purchase 100 percent of the plant's 50-megawatt capacity. The plant is expected to be operational in 2010.

Georgia Power and Yellow Pine Energy Co. LLC recently signed a 20-year contract for electricity generated from timber-harvesting residuals, non-commercial tree species, tree thinnings, lumber scraps and wood waste reclaimed from landfills. The biomass-fired Yellow Pine facility, which will be located near Fort Gaines, Ga., is expected to become operational in 2010 and produce 110 megawatts of electricity. Georgia Power is contracted to purchase approximately half of the plant's capacity.

In Forsyth County, Biomass Gas and Electric will use an updraft gasifier to deliver 28 megawatts to the grid in a power contract with Georgia Power. The plant will be located next to a construction and demolition landfill which will supply clean woody waste to the gasifier.

Georgia Power serves 2.3 million customers in all but four of Georgia's 159 counties.

http://www.biomassmagazine.com/article.jsp?article_id=1975

Coal's toxic legacy to the Arctic

18 August 2008

Coal burning in Western Europe and North America has been a prime source of heavy metal pollution in the Arctic. Scientists plotted levels of thallium, cadmium and lead in a Greenland ice core and linked them to other chemicals indicating coal as the main origin. Clean air legislation has reduced the heavy metal load in recent years. But writing in Proceedings of the National Academy of Sciences (PNAS), the team says increased coal burning in Asia may see levels of the metals rise. These substances accumulate in the bodies of plants and animals

living in the region, including whales, polar bears and caribou. Some Arctic people also carry high levels of the heavy metals, which can cause a number of medical conditions, in their bodies.

The study team, from the Desert Research Institute in Reno, US, analysed an ice core extracted in Greenland which gives a continuous record of pollutants deposited from the atmosphere back to 1772. They took readings of heavy metal levels on a month-by-month basis. Graphs show all three metals soaring between 1850 and 1900 as the industrial age took off. The early 20th Century saw inputs 10 times higher than in pre-industrial times. The Great Depression of the 1930s saw levels dip as economies contracted, then a rise as the global marketplace recovered. But by the 1970s, all three of the metals were decreasing in abundance, broadly coinciding with the adoption of clean air legislation in Europe and North America, the source regions for most of the input to the Greenland ice. "In North America and western Europe, there was a big effort to clean up the air," noted lead researcher Joseph McConnell. "Part of that was a shift from coal to oil and gas, and part was a move to burn coal at higher temperatures and burn it in a better way," he told BBC News. The rises and falls correlate well with fluctuations in the amount of black carbon and sulphur, products of coal burning, captured in the ice, suggesting that coal was the dominant source of these emissions. The one blip came from lead which showed a renewed rise in the 1950s, probably due to the swift increase in motoring.

Heavy metals are among substances that bio-accumulate; when they pass into animals, they stay there, immune to digestion and the body's waste removal processes. When that animal is eaten by another higher up the food web, the predator, whether human or not, generally takes on a substantial part of the toxic cargo. Most of the studies on Arctic peoples have concentrated on mercury, another heavy metal also produced by coal burning and other industries. They suggest that mercury may have contributed to neurological impairment in some communities. Some Arctic dwellers have been found to receive levels of cadmium above recommended safe limits through their diet. The metal's most important medical impact is kidney damage. "There's been very little study of thallium in the Arctic, though," said Dr McConnell. Thallium is a potent toxin. Once incorporated into rat poison, its use is highly restricted. It was an early suspect in the race to determine what killed former KGB agent Alexander Litvinenko in London two years ago.

The new study promises to help investigators studying the health of Arctic peoples by providing a detailed record of heavy metal input to the environment over time. Whereas previous studies suggested the cadmium load was highest in the 1960s and 1970s, the new research shows the peak input occurred decades earlier. As the global population increases, economies develop and natural gas supplies peak, the International Energy Agency predicts coal usage will increase globally, with the major Asian economies including China and India responsible for most of the increase.

Dr McConnell believes the picture of the last few years captured by his Greenland core suggests this renewed interest in coal burning is leading to an upturn in heavy metal input to the part of the Arctic he has studied. But he believes more cores are needed from different regions, and is proposing to drill in other parts of the Arctic, notably areas north of Russia and east Asia, to establish the global pattern.

<http://news.bbc.co.uk/1/hi/sci/tech/7568748.stm>

Siemens to Supply Coal Gasification Technology to Canada's First Low-CO₂ IGCC Power Plant

Siemens coal gasification technology has been selected for Canada's first low-CO₂ IGCC power plant. EPCOR Power Generation is planning to build an integrated gasification combined cycle power plant (IGCC) featuring carbon capture and storage in Genesee near Edmonton, Alberta.

The demonstration plant, with an installed capacity of approximately 270 megawatts, is scheduled to come on line in 2015.

In the first project phase, Siemens will provide the technology license, as well as the process and basic engineering design for the coal gasification island based on the Siemens SFG-500 coal gasifier. Following the completion of the front-end engineering design of the plant, EPCOR intends to enter into an agreement with Siemens to supply the gasification reactor and components of the feed system. The Siemens coal gasification technology will produce clean syngas from coal, which will be used to fire a gas turbine in the combined cycle plant to provide electricity to the local grid. The emissions from IGCC plants are significantly lower than those from today's conventional coal-fired power plants. The plant in Genesee is designed to capture approximately 85 percent of the CO₂ contained in the coal for enhanced oil recovery in existing oil fields.

"While we have secured a number of orders for our coal gasification technology in China, the U.S. and Australia, we are pleased to now have our first order in Canada. Our gasifier technology will be used for the first time for a full-scale IGCC project," said Michael Suess, CEO of the Fossil Power Generation Division of Siemens Energy. "In the future, IGCC power plants could make a significant contribution toward a more reliable energy supply with maximized climate and environmental compatibility," added Suess.

Within the framework of an action plan to mitigate climate change, Alberta Province recently announced a comprehensive investment program to finance technologies for reducing greenhouse gas emissions. There are provisions for the investment of two billion Canadian dollars purely for the promotion of carbon capture and storage (CCS) projects.

<http://www.azom.com/News.asp?NewsID=13344>

US generator to shut 229 MW of coal-fired generation to reduce CO₂

20 August 2008

Regulators approved a plan by Xcel Energy to shut down two coal-fired power plants in Colorado, thought to be the first time a utility has volunteered, and regulators have approved, a plan to shut down power plants because of CO₂ emissions. The closures are two to four years away and Xcel has proposed using natural gas to make up for the lost power supplies. Xcel proposed in 2007 to shut down the coal units at the Arapahoe power plant in Denver and the Cameo plant in Grand Junction.

Together the plants can generate 229 MW. Xcel proposed replacing the coal-fired generators at Denver's Arapahoe power plant with 480 MW of natural gas-fired capacity. A regulatory decision on that plan has been postponed. The Cameo plant is scheduled to close by December 2010. The Arapahoe station would close by December 2012.

http://pepei.pennnet.com/display_article/337494/6/ARTCL/none/none/1/Xcel-to-shut-229-MW-of-coal-fired-generation/

Firms fear Russian grip on UK energy

29 August 2008

UK energy bosses warned that Russia's belligerence poses a major threat to the security of the country's power supply. Western businesses are becoming increasingly alarmed by the Kremlin's tough rhetoric, particularly after the treatment of BP's Russian joint venture plus recent threats that the country is ready for another Cold War.

UK Coal chief Jon Lloyd said Britain is acutely vulnerable given it imported 35% of its coal from Russia last year. He said: 'Given where we are at the moment, nobody wants to be in that situation. The writing is on the wall that Russia wants to control energy supply to Europe. More people, including the government, are now starting to realise the value of locally produced energy.'

Mike Wagstaff, chief executive of North Sea specialist Venture Production, agreed saying: 'They (the government) need to encourage people to get more gas from the North Sea. We can see that dealing with the Russians is tough.' Business Secretary John Hutton this week warned the Kremlin's aggression in Georgia is throwing Britain's energy security into question.

Data from the Economic Research Council shows the powerful grip Russia has over energy reserves. Three countries - US, Russia, and China - account for over 60% of the world's proven coal deposits. Some 56% of the world's natural gas reserves are in the hands of three countries - Russia, Iran, and Qatar. Wagstaff warned homeowners who are already struggling with recent 30%-plus energy price hikes that the era of expensive fuel is here to stay - and that prices could go even higher.

http://www.thisismoney.co.uk/news/article.html?in_article_id=451192&in_page_id=2&in_a_source=&position=moretopstories

If Russian gas is 'insecure', why not Russian coal?

22 August 2008

The government's defence for building coal-fired power stations rests on fears of dependence on gas imports from politically sensitive countries. But figures from DBERR, showing the UK's reliance on Russian coal, weaken the argument.

As the controversy over building new coal-fired power stations in 'low carbon' Britain heats up by the week, the defence for doing so relies more and more on 'energy security'. Without so-far-unproven technology to capture and bury pollution out of harm's way, coal power is mankind's most carbon-polluting habit. To justify more if it, the UK government argued coal was a cheap back-up to unreliable renewables and fickle gas suppliers, and would protect jobs and investment in the industry. But costs of building the stations and buying the fuel are rising steeply, and a growing list of experts are arguing the UK can easily keep the lights on and create jobs and prosperity by investing in renewable energy and efficiency.

But reducing the country's dependence on gas from Russia, so the argument goes, is still vital to protect the country from future power cuts and economic

gloom. So what to make of the latest figures published by the Department for Business Enterprise and Regulatory Reform (DBERR)?

They show not only that seven out of 10 lumps of coal come from overseas, but that nearly half of those imports come from our same friends in Russia. Coal experts point out that, unlike gas which often travels down expensive fixed pipes, it is relatively easy to switch suppliers of their product, and Russia has only a fraction of the global market. In 2006, it was the sixth biggest producer but still supplied less than 5% of global consumption.

But more importantly a closer look at gas imports shows that the UK is not yet dependent on Russian gas either – its biggest supplier is Norway, and Russian gas comes in the mix through the European grid.

Gas might eventually be more of a risk, but reliance on Russian coal does seem to back-up those who argue that no fossil fuel is as politically neutral as wind (simply "it's there", as one campaigner says) or efficiency.

Whatever your preferred alternative, coal imports do seem to further weaken the government's increasingly fragile case for building unabated new coal power. If ministers do decide to press ahead, they might have some explaining to do.

<http://www.guardian.co.uk/environment/blog/2008/aug/22/carbonemissions.fossilfuels>

Coal Power Plant Retrofit With Solar

20 August 2008

New South Wales, Australia is the site of a pilot project where solar thermal technology reduces the use of fossil fuels. Coal and solar generate electricity using the same turbines. Coal power plants can utilise solar to produce 15%-60% of the electricity. A higher quantity is possible, but requires significantly more modifications to be made to the coal boilers.

Solar Interface

Mirrors, called fresnal reflectors capture the sun's rays and heat water in the tube above. Steam lines deliver the solar energy to the adjacent coal power plant where existing coal turbines are used to produce an electric current. The ideal situation for retrofitting a coal power plant with solar includes:

- A large amount of land adjacent to the plant is needed for solar collectors. Ausra's fresnal reflector technology requires 2-2.5 acres of land per megawatt compared with 5 acres per megawatt for solar trough systems or 7 acres per megawatt for solar dish engine systems.
- High quantities of solar radiation, such as the American Southwest or the Saharan Desert in Northern Africa, give the solar system a higher return on investment and increase the consistency of the solar energy output.
- Coal power plants that are located in areas with a carbon tax or cap and trade system in place will have a higher return on investment from a solar retrofit.

Coal is a risky business these days and a solar retrofit provides many advantages.

Coal Prices Increasing

Electricity generated from coal has traditionally been much cheaper than electricity from most other sources. This trend is changing. As global demand for coal skyrockets, prices climb. "There's a real dilemma facing operators of coal powered plants," said John O'Donnell, Ausra's Executive Vice President. "The price

of coal has exploded recently and it continues to rise rapidly. Long-term coal contracts are coming in at 4 times the price of the last iteration of the contract.”

Carbon Emissions

Coal is responsible for a staggering 20% of the global carbon emissions. The joker in the deck is the future liability of these emissions and the risk that this creates for owners of coal power plants.

Australia recently ratified the Kyoto Protocol and will begin trading carbon in about a year. Carbon is likely to trade for \$30-\$60 per ton, according to John O'Donnell. Ausra's solar thermal retrofits are cost effective around \$30 a ton. "\$30 a ton is \$.03 a kilowatt hour [for electricity generated from coal]," said John O'Donnell. "For some of the older coal power plants, you are looking at a 30, 40, or 50% increase in the electricity price all at once and an ongoing uncertain future." Bank of America, Chase, and Citigroup are now considering climate change and carbon emissions among the risks in lending to money for electric power plant projects as part of the Carbon Principles. Greenhouse gas emissions are very likely to have a financial cost attached to it in many countries, but exactly how much is anyone's guess.

Solar Technology is Available Today

Although solar is evolving rapidly, it is available and ready to be implemented today. Ten solar thermal power plants have been operating in California's Mojave Desert since the 1980's, with a capacity of 354 megawatts of electricity. Solar technology has proven itself reliable for decades.

Carbon sequestration, which is another option for coal plants to reduce carbon emissions, is still being developed and is not ready to be implemented right away. Sequestration technology is also very expensive and doesn't remove mercury and other contaminants from the plant emissions.

<http://ecoworldly.com/2008/08/20/coal-power-plant-retrofit-with-solar/>

The Coal Bed Methane Story

Most gas in coal is stored on the internal surfaces of organic matter. Because of its large internal surface area, coal stores six to seven times more gas than the equivalent rock volume of a conventional gas reservoir. Gas content generally increases with coal rank, with depth of burial of the coalbed, and with reservoir pressure. Fractures, or cleats, that permeate coalbeds are usually filled with water; the deeper the coalbed, the less water is present, but it is often more saline. In order for gas to be released from the coal, its partial pressure must be reduced, and this is accomplished by removing water from the coalbed.

Large amounts of water, sometimes saline, (an average of about 15,000 gallons per day, per well,) are produced from coalbed methane wells, especially in the early stages of production. While economic quantities of methane can be produced, water disposal options that are environmentally acceptable and yet economically feasible, are a concern. Water may be discharged on the surface if it is relatively fresh, but often it is injected into rock at a depth where the quality of the injected water is less than that of the host rock. Another alternative, being explored in Australia, is to evaporate the water and collect the potentially saleable solid residues; this scheme might be feasible in regions having high evaporation rates. In B.C. regulations state that water produced during CBM extraction cannot be released onto the land or into water bodies.

“Water production and disposal is a key issue in CBM development. De-pressuring the coal seam can generate large volumes of water of varying quality. Drilling and

production regulations require that water produced from natural gas operations, including CBM, be moved to an underground formation, unless otherwise permitted. Testing of the produced water determines the disposal method." Taken from: The Govt. of B.C., Ministry of energy, Mines and Petroleum Resources website.

With the above regulation in place, this October, Storm Cat Energy Corporation announced plans to ramp up their CBM pilot operations in the Elk River watershed to commercial production in 2008. Existing Storm Cat CBM wells are currently discharging toxic waste water directly into BrittCreek, a tributary of the Elk River. There is critical trout spawning habitat at the confluence of these two water bodies.

CBM wells are connected by a network of roads, pipelines, and compressor stations. These structures can compromise the scenic quality of the landscape, fragment wildlife habitat, and displace local wildlife populations. Over time, wells may be spaced more closely in order to extract the remaining methane. Additionally, the produced water may contain undesirable concentrations of dissolved substances. Water withdrawal may depress aquifers over a large area and affect groundwater flows.

http://www.bclocalnews.com/okanagan_similkameen/keremeosreview/news/27167964.html

FutureGen re-launched amidst Congressional enquiry

2 July 2008

The US Department of Energy has announced that it has restructured and reinstated FutureGen, its flagship clean coal research programme, with a focus on the challenges associated with control of the emissions of carbon and six other pollutants. On 24 June, the department said it plans to invest in several commercial-scale Integrated Gasification Combined Cycle (IGCC) power plants or other clean coal-based power generation technology using carbon capture and storage techniques.

The DOE came under heavy fire in January, after it suddenly announced that the soaring costs of the project meant it would largely pull out of FutureGen, which has been the centrepiece of the Bush administration's efforts to develop clean coal technologies since 2003. On 15 June, the department formally notified the FutureGen Alliance - a 13-member consortium that was due to build the first near-zero emissions coal-fuelled power plant in Mattoon, Illinois - that it had reversed a decision to cover three-quarters of the project's costs. The DOE's January announcement to quit the project had pitched it into a row with Illinois lawmakers - including presidential hopeful Barack Obama.

The decision to re-launch the project has attracted the censure of House of Representatives' Science and Technology Committee. The committee has been attempting to gain access to DOE documents relating to the decision since 2 April. 'The department is rushing forward with their plan for a restructured FutureGen before they have even provided reasonable answers to our questions,' said Democrat Bart Gordon, the committee's chairman. "The department is rushing forward with their plan for a restructured FutureGen before they have even provided reasonable answers to our questions"

The House committee was set to subpoena the department for access to the FutureGen documents, but reversed course at a meeting on 26 June after the

White House Counsel, who advises the president on legal matters, agreed to turn over the requested materials within days.

Before the meeting, committee staff members were allowed to review the documents in question, which had been withheld because the White House claimed they were privileged.

'We have not had adequate answers on FutureGen decisions and the only way to get them is from documents held by the department. I am pleased that the White House will provide the documents without a subpoena,' said Brad Miller, a North Carolina Democrat who chairs the committee's Investigations and Oversight Subcommittee. 'If things fall apart - and I hope they don't - we will be right back here in July.'

<http://www.rsc.org/chemistryworld/News/2008/July/02070801.asp>

UK slows introduction of biofuels

08 July 2008

The UK has scaled back its plans to introduce biofuels after a government-commissioned report warned of their wider social and environmental impacts. The government will now review its renewable transport fuel obligation, which required suppliers to ensure 5 per cent of all their fuel comes from renewable sources by 2010. That is now likely to be pushed back to at least 2013 as part of a 'more cautious approach' to biofuels.

The report, by Ed Gallagher, chair of the UK Renewable Fuels Agency, confirms concerns over the indirect effects of the growing biofuels industry - including rising food prices, and the risk of increasing rather than reducing greenhouse gas emissions.

'Our review makes clear that the risks of negative impacts from biofuels are real and significant, but it also lays out a path for a truly sustainable biofuels industry in the future,' Gallagher says.

In particular, Gallagher stresses the importance of avoiding land-use change that releases large amounts of carbon into the atmosphere. Ploughing up grassland and forest releases carbon previously trapped within the plants and the soil, which can take years to offset by growing the biofuel.

While it may take only 3 years to recover the carbon released when converting Brazilian grassland to grow sugarcane for bioethanol, converting US forestland to grow soya for biodiesel could take up to 481 years to offset. Gallagher calls for biofuel support to exclude feedstock cultivation with a carbon payback of longer than 10 years.

The report also says more incentives are needed to encourage R&D on advanced technologies that could deliver higher greenhouse gas savings, and calls for government policies to include a specific obligation on transport fuel suppliers to supply biofuels achieving a high level of greenhouse gas saving, possibly up to 75 per cent. New policies should also make use of waste feedstocks for fuels where possible.

The report was broadly welcomed by Clare Wenner, head of transport biofuels at the Renewable Energy Association, the industry body representing UK renewable energy producers. 'There are good and bad biofuels and the UK industry is 100 per cent committed to producing good biofuels,' she said. 'However, no progress will be made unless there is investment in production and research. The

Government needs to give consistent, reliable and long-term targets. The Gallagher proposals do not do this.'

<http://www.rsc.org/chemistryworld/News/2008/July/08070802.asp>

Carbon capture competition

August 2008

UK Business Secretary John Hutton has announced four companies that have passed the pre-qualification stage of the competition to build a carbon capture and storage demonstration plant. BP Alternative Energy, E.ON UK, Peel Power and Scottish Power will all now enter discussions with the government, before the winner is announced. The plant, due to become operational in 2014, will be built with financial backing from the government.

<http://www.rsc.org/chemistryworld/Issues/2008/August/BusinessRoundup.asp>

Carbon capture breakthrough revealed

August 2008

Arizona, US-based company Global Research Technologies (GRT) has revealed the technological breakthrough behind its plans to suck carbon dioxide economically from the air. The discovery, says company co-founder Klaus Lackner of Columbia University, New York, could allow millions of portable filters the size of shipping containers to alleviate global warming.

Removing CO₂ directly from the air is possible, but ruinously expensive. Chemicals such as sodium hydroxide bind strongly enough to rapidly capture CO₂ molecules even from atmospheric concentrations of 380 parts per million. But rejuvenating the chemical scrubber usually calls for energy-intensive electrochemistry or further reactions and heating cycles. Most carbon capture research focuses instead on removing CO₂ gas from power plant waste streams, where it's found in concentrations of around 10 per cent or greater - amenable to being picked up by amine solvents and zeolites.

Though power plant CO₂ capture is inevitably cheaper than air capture, GRT say their proposed portable scrubbers could be installed almost anywhere, potentially having a bigger impact on CO₂ levels. But Lackner had kept secret how the researchers proposed to beat the known cost and energy hurdles of air capture. A US patent application¹ now reveals that commercial ion exchange resins - such as those used in water softeners - can capture CO₂ from dry air and exhale it when exposed to warm water vapour. 'Instead of swings in temperatures to release carbon dioxide, we use a swing in humidity,' Lackner explains.

Lackner calculates that, depending on local climate conditions, the membranes should dry quickly enough after their moisture-induced CO₂ release to allow the capture of around a tonne of carbon dioxide a day. 'We collect CO₂ about a thousand times faster than a tree, though unlike trees the filters don't convert CO₂ into fuels. That would require a Fischer-Tropsch reactor bolted on to the end,' he told *Chemistry World*. A prototype scrubber, which Lackner hopes to demonstrate in two years, would cost around £100,000 to build.

What Lackner's membrane filters gain in energy efficiency, they may lose in capital cost and fragility, points out David Keith, who works on carbon capture at the University of Calgary, Alberta, Canada. Keith expects to gain a provisional patent for his own proposal, relying on making energy-saving tweaks to the sodium or potassium hydroxide absorbent system. Such a well-understood system may be more suited to industrial-scale CO₂ capture from air, he says.

'If such materials can be devised, have longevity, and the machines made to work in vast numbers, [Lackner's] technique could become a vital tool in decarbonising the atmosphere. However each "if" has to work,' comments Stuart Haszeldine, an expert in carbon capture and storage at the University of Edinburgh, UK. 'The test is to see if these reagents and processes can move from the laboratory to build the first pilot machine, and then be scaled up to have impact.'

<http://www.rsc.org/chemistryworld/Issues/2008/July/CarbonCaptureBreakthroughRevealed.asp>

Sulphur price surge

August 2008

A tenfold increase in the price of sulphur in the last year is providing a windfall for energy companies, who produce the material as a waste when refining oil. Demand for fertiliser is fuelling the price rise.

[An opportunity for a come-back for the Wellman-Lord process? Ed]

<http://www.rsc.org/chemistryworld/Issues/2008/July/BusinessRoundup.asp>

Blueprint for £1bn UK technology drive unveiled

9 May 2008

The UK's Technology Strategy Board (TSB) has outlined how it will invest £1 billion over the next three years to boost innovative R&D and business. The plan means chemists could see more funding in areas such as energy generation, alternative building materials, nanotechnology and low carbon transport.

'We have to get innovation out of the laboratory to the forefront of business attention,' said TSB chief executive Iain Gray - echoing the sentiments of John Denham, the minister for the UK's Department for innovation, universities and skills (Dius), in his March 2008 white paper, *Innovation Nation*. First founded in 2004 to advise government funding, in July 2007 the TSB was turned into a business-led public funding body operating at arm's length from government.

"We have to get innovation out of the laboratory to the forefront of business attention" - Iain Gray

The TSB expects to generate private investment of over £1 billion to boost its own funding. Over 2008-11, half of the public cash will go to specific challenges such as healthcare and energy, distributed mainly via so-called innovation platforms. The Low carbon vehicles innovation platform, for example - set up in autumn 2007 - will now distribute £23 million of government money for sixteen new R&D and demonstration projects, Gray announced. In autumn 2008, a further £70 million will boost the delivery of low carbon vehicles to the market.

There was new support too for zero carbon buildings, with the launch of an innovation platform with initial three-year funding of £30 million. The first handout, a £4 million funding competition for businesses, will be launched on 15 May. Increasing the amount of government procurement for innovation - rather than 'business as usual' activities, is also on the agenda.

A quarter of the TSB's funding will be apportioned to technology areas - such as materials, nanotechnology and electronics. And the final quarter to supporting networks which connect universities, development agencies, small businesses, and industry; amongst them, the chemistry innovation knowledge transfer network (CIKTN) which was formed two years ago.

Investors did not always appreciate the importance of basic chemistry to new technologies, said Graeme Armstrong, chief innovation officer with Akzo Nobel and a member of the TSB's governing board. But he hoped chemists could get especially involved with the low carbon vehicles and zero carbon buildings platforms, where new materials were key.

The TSB has also pledged to simplify what former science minister David Sainsbury called in his 2007 review 'a bewildering array of organisations and schemes, many of which cover the same ground'.

The aspiration is clear, but when asked for a show of hands, few attendees at the launch were confident that the UK would be a global leader in innovation in 20 years' time. That attitude must be changed in the next five years, Denham said.

<http://www.rsc.org/chemistryworld/News/2008/May/09050801.asp>

Organic liquids capture carbon dioxide

14 August 2008

Carbon dioxide-binding organic liquids (CO₂BOLs) can hold more than twice as much CO₂ as current capture agents, say scientists in North America. The liquids could be used in coal power plants to capture the greenhouse gas from combustion exhaust.

David Heldebrant at the Pacific Northwest National Laboratory, Richland, US, and colleagues, made CO₂BOLs from mixtures of organic alcohols and strong organic bases. They found that the CO₂BOLs can store up to 19 per cent of their weight in CO₂, much higher than the maximum of seven per cent achievable with current aqueous amine systems.

'The biggest obstacle in efficient chemical CO₂ capture and release is the cost of stripping CO₂ from the aqueous capture agent due to the high specific heats associated with water,' says Heldebrant. Removing, or stripping, the CO₂ from the capture agent allows the liquid to be recycled and capture more CO₂. With CO₂BOLs, less fluid is needed to capture the same amount of CO₂, and less energy is needed to strip the CO₂, he explains. 'Such a system can potentially offer large energy savings for CO₂ stripping when employed on an industrial scale,' he adds.

"In the future, these mixtures could replace aqueous amine solutions as a way of removing carbon dioxide from post-combustion waste gases"
- Kazunari Ohgaki, Osaka University, Japan

In addition, Heldebrant's group found that the CO₂BOLs, which were designed to be a direct replacement for the aqueous amines currently used in coal plants, could go through five cycles of capturing and releasing CO₂ without losing activity or selectivity.

'The release of CO₂ in a controlled fashion is important for permanent sequestration of CO₂ or other applications such as carbonation in the beverage, dry cleaning or chemical industries,' explains Heldebrant. 'Just because CO₂ is a greenhouse gas doesn't mean it has no useful applications or market value.'

Kazunari Ohgaki, from Osaka University, Japan, an expert in carbon capture and storage, sees the potential of the study. 'In the future, these mixtures could

replace aqueous amine solutions as a way of removing CO₂ from post-combustion waste gases,' he says.

Heldebrant's team are currently modelling the system to check for any obstacles to implementation and also plan to investigate whether CO₂BOLs could be used to capture CO₂ before the fuel is burned.

http://www.rsc.org/Publishing/ChemTech/Volume/2008/09/carbon_dioxide_capture.asp

What is killing the bats of Pincher Creek?

[OK, so this is not a story about coal research as such but I think it is interesting and shows that not all new technologies are without some downsides, Ed.]

26 August 2008

A mystery surrounding the large number of dead animals on a wind farm in Alberta prompted a groundbreaking study at the University of Calgary that found the drop in air pressure around some turbines resulted in fatal respiratory injuries

Alberta proudly leads the country when it comes to producing wind energy, but in 2005, a troubling mystery began to emerge at a newly opened wind farm near Pincher Creek. A large number of migratory bats were being found dead at the bottom of wind turbines, and many didn't show signs of actually coming into contact with the turbine blades.

TransAlta Corp., a Calgary-based energy firm that owns the wind farm, quickly approached bat experts at the University of Calgary in search of answers. Sean Whittaker, vice-president of policy with the Canadian Wind Energy Association, said the fact that large numbers of dead bats have been found at only a few wind farms around North America at a time when hundreds are in operation made the deaths more perplexing. After a two-year study, University of Calgary researchers have found that most of the bats suffered severe injuries to their respiratory systems consistent with a sudden drop in air pressure - called barotrauma - that occurs near the turbine blades.

The study will be released today in the online edition of the journal *Current Biology*. Erin Baerwald, the research's project leader and a University of Calgary graduate student, said that bats rarely run into manmade structures because the flying mammals can detect objects with echolocation, the location of objects by reflected sound. "An atmospheric pressure drop at wind turbine blades is an undetectable - and potentially unforeseeable - hazard for bats, thus partially explaining the large number of bat fatalities at these specific structures," she said.

Bats, unlike birds, do not have a respiratory system that can withstand sudden pressure changes in the air. Ms. Baerwald said that one way in which energy companies could reduce or prevent bat fatalities is to increase the wind speed at which turbine blades begin to rotate during the bats' migration period, which runs annually from mid-July to mid-September in Alberta. This strategy would work, she added, because bats are more active when wind speeds are low.

While the University of Calgary is well known for its bat research, Ms. Baerwald said there is still a dearth of knowledge about these animals, and conducting this study was difficult but ground-breaking for the field. The researchers examined the carcasses of nearly 190 bats killed at turbines in southern Alberta.

"They aren't seen as sexy animals," she said. "People love to sit in their backyards and watch birds. It's much harder to watch bats because they are nocturnal." She said the animals - nine species of bats are found in Alberta - are important because they play a major role in pest control. An average bat can gobble up its body weight in insects every night.

Ms. Baerwald plans to expand on the latest study, which was funded by government, industry and conservation groups, by researching bat migration. Jason Edworthy, director of stakeholder relations at TransAlta Corp.'s wind arm in Calgary, said the company welcomes the study's findings. "It was important for us to determine as much as we could about this issue," he said.

Mr. Edworthy said even before the research was finished, the company began experimenting with ways to reduce bat fatalities, and that they've already seen results. He said lack of information about bats was initially a barrier. "We had to be quite patient, mainly because we were started from a knowledge base that wasn't quite zero but very, very low."

There are 473 commercial wind turbines operating in Alberta, the vast majority in the southern portion of the province.

Deadly whirl

Bats are dying as they fly into low-pressure zones around wind turbines. The sudden low pressure causes the air in their lungs to expand and cause tissue damage, called barotrauma. Low-pressure area: most severe immediately out from the blades and decreases as it gets closer to the centre of the turbine. There is also a low-pressure area down the shaft.

Why Bats Fare Worse Than Birds

Bats have large, pliable lungs and hearts that expand, causing tissue damage when exposed to a sudden drop in pressure. Birds have compact, rigid lungs that do not expand in the same conditions.

<http://www.theglobeandmail.com/servlet/story/RTGAM.20080826.wbats26/BNStory/Science/home>

Call for research with China on cleaner fossil fuels

22 August 2008

The EPSRC have announced a call for collaborative research proposals with China in cleaner fossil fuels. The proposals are expected to demonstrate the added value that the activities will bring to current UK activities in cleaner fossil fuels. A total of £4 million from the Research Councils' Energy Programme has been earmarked for this call. The closing date for the call is 11th November 2008.

For more information regarding the call visit:-

<http://www.epsrc.ac.uk/CallsForProposals/CleanerFossilFuels.htm>

Student Bursaries for 2008-2009

Travel and subsistence bursaries are on offer from the Coal Research Forum and the Coal Utilisation Subject Group of the IChemE to bona-fide full-time students wishing to attend appropriate National and International coal-related conferences, such as the recent "7th European Conference on Coal Research and its Applications" which was held at Cardiff University earlier this month, (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 new current BCURA Projects

B80 IMPERIAL COLLEGE LONDON, (DEPT. OF MECHANICAL ENGINEERING), "Characterising Biomass Particle Behaviour under Co-combustion Conditions", Dr.J.R.Gibbins, (01/10/06 to 30/09/09).

B81 IMPERIAL COLLEGE LONDON, (DEPT. OF MATERIALS), "Coal Mineral Transformations under Oxy-fuel Combustion Conditions", Mr.F.Wigley, (01/01/07 to 31/12/08).

B82 IMPERIAL COLLEGE LONDON, (DEPT. OF CHEMICAL ENGINEERING), "Improvements in Amine Flue Gas Scrubbing Systems for Coal Fired Power Plants", Dr.C.S.Adjiman, Dr.A.Galindo, Prof.G.Jackson and Dr.J.R.Gibbins, (01/10/06 to 30/09/09).

B83 UNIVERSITY OF NOTTINGHAM, "Mercury Oxidation by Fly Ash Constituents and Flue Gases and its Optimisation for the Development of Mercury Control Technologies", Dr.M.Maroto-Valer and Prof.C.E.Snape, (01/10/06 to 30/09/09).

B84 UNIVERSITY OF GLAMORGAN, "Optimisation of Fluidised Bed Combustion of Mixtures of Coal and High Moisture Content Biomass", Dr.D.R.Garwood, Prof.J.Ward, Dr.S.J.Wilcox and Mr.M.Fisher, (01/10/06 to 30/09/09).

B85A UNIVERSITY OF BIRMINGHAM, "On-line Condition and Safety Monitoring of Pulverised Coal Mills Using a Model Based Pattern Recognition Technique", Dr.J.Wang, (01/10/06 to 31/12/08).

B86 TES BRETBY, "The Maintenance of the BCURA Coal Bank", Mr.G.Bradley, (01/04/07 to 31/03/10).

B87 UNIVERSITY OF SOUTHAMPTON, "Enhancing Mercury Capture by Wet FGD Systems", Dr.S.M.Ullrich and Prof.T.W.Tanton, (01/01/08 to 31/12/10).

B88 UNIVERSITY OF CARDIFF, "Environmental Impact of Carbon Capture from Coal Fired Power Plant by Amine Absorption", Prof.K.Williams, Prof.A.Griffith and Dr.M.Spratt, (01/10/07 to 30/09/10).

B89 UNIVERSITY OF GREENWICH, "Improved Performance of Discharge Equipment for Coals with Poor Handling Characteristics", Prof.M.S.A.Bradley and Mr.R.J.Farnish, (01/10/07 to 30/09/10).

B90 UNIVERSITY OF KENT, "Dynamics and Movement Behaviours of Biomass/Coal Flow", Prof.Y.Yan, (01/10/07 to 30/09/10).

B91 IMPERIAL COLLEGE LONDON, "The Interactions of Coal-Biomass Ash with Supercritical Boiler Materials", Mr.F.Wigley, (01/01/08 to 31/12/09).

B92 UNIVERSITY OF LEEDS, "Applying Coal Milling Technologies to Thermally Pre-treated Biomass – Proof of Concept", Prof.J.M.Jones and Prof.A.Williams, (01/10/08 to 31/12/09).

B93 CRANFIELD UNIVERSITY, "The Effects of Impurities for Capture Technologies on CO₂ Compression and Transport", Dr.A.Bosoaga and Mr.J.E.Oakey, (01/10/08 to 30/09/11).

CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
Tuesday 2 September 2008	IEA Coal Science Workshop on "Perspectives on Cofiring and Coprocesing"	University of Cardiff, Cardiff	Robert Davidson. IEA Clean Coal Centre Gemini House, 10-18, Putney Hill, London, SW15 6AA. Tel : 0208-7890-2111. robert@iea-coal.org.uk
Wednesday 3- Friday 5 September 2008	7th European Conference on Coal Research and its Applications	University of Cardiff, Cardiff	Dr A W Thompson Tel : 02476-192-569 or 01332- 514768 E-mail : awt_crf@btinternet.com
7th - 19th September 2008	China-UK Summer School on Efficient and Environmentally Friendly Energy Generation from Biomass	Zhejiang University, Hangzhou, China	Contact Details China: Professor H Zhou State Key Lab of Clean Energy Utilization, Zhejiang University Hang zhou, Zhejiang 310027 P R China Tel : +86-57187952598 E-mail: zhouhao@cmee.zju.edu.cn UK: Professor Y Yan and Dr. G Lu Department of Electronics University of Kent Canterbury, Kent CT2 7NT, UK Tel : +44-1227-823015/823706 E-mail: y.yan@kent.ac.uk; g.lu@kent.ac.uk

13th November 2008	Air Quality in the UK: A Technical and Regulatory Update	IChemE, Rugby, UK	For further information or to register to attend, please contact: Gemma Jones, E-mail : gjones@icheme.org , Tel : 01788-534433.
February 2009 (Provisional)	"The Integrated Pollution Prevention & Control Directive" (CRF Environment Division, Combustion Engineering Association and the Combined Heat & Power Association Association,	Venue to be announced.	Dr Michael Whitehouse E-mail: michael.whitehouse@rwenpower.com Tel : 01793-894 118
10th to 11th 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, E-mail : julie.lauder@ucgp.com
14th to 16th 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
4th to 7th 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, E-mail : wocasubmission@caer.uky.edu
18th to 20th 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, E-mail: mail@iea-coal.org.uk