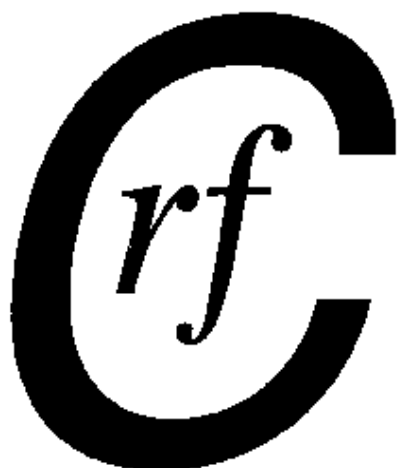


NEWSLETTER



*of
the
Coal Research Forum*

EDITOR'S MUSINGS:

Welcome to all of our readers – both our regulars and hopefully some new ones, as you will see below!

As for our 2012 conference in Nottingham we are including a copy of this newsletter in the delegate bags for each ECCRIA 10 conference attendee. We hope that it will encourage any non-member of the Coal Research Forum to think about the benefits of joining us. We believe it is well worth the modest annual membership fee and, in addition to the receipt of every newsletter, it enables free attendance at other CRF events and reduced fees for the ECCRIA conferences. Anyone who would like further information should contact David McCaffrey, the CRF Secretary (see below for contact details) who will be more than happy to provide information on costs and benefits. We hope that everyone who comes to the University of Hull for ECCRIA 10 will have an enjoyable and useful time with us.

This issue contains a report on a technical meeting held by the British Flame Research Committee, kindly provided by Dr Gang Lu of the University of Kent, and a report on the fifth annual Mineral Engineering Society symposium held jointly with the CRF and the South Midlands Mining and Minerals Institute, in Kegworth in May.

New EPSRC-funded projects in the energy sector which started after 1st September 2013 are listed towards the back of this newsletter.

The next stage in the development of the shale gas industry in the UK has now been revealed. The Government has decided to grant licenses to explore potentially suitable areas for the exploitation of UK shale gas reserves. Now it is my personal belief that the hysteria that surrounded the earlier attempts to evaluate suitable fracking sites is misplaced but is entirely predictable given the phobia for many of the new technologies engendered by the tabloid press. More must and should be done to determine the risks and benefits of the fracking process but surely the need for alternative energy supplies has never been greater given the current upheaval in Ukraine, Libya and the Middle East. However, I think the UK Government has missed a trick when it failed to unequivocally exclude National Parks from exploration. It would, in my opinion, have been far better to make it clear that these are special areas which are definitely off limits. I cannot believe that these areas are especially rich in shale gas reserves. To make a clear statement defining these exclusion zones would, hopefully, have sent a message of reassurance to the anti-fracking fraternity of the Government's shared concern for the environment and the need to protect it.

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Student Bursaries for 2014-2015

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, (please see the Calendar of Coal Research Events for details), such as the "Tenth European Conference on Coal Research and its Applications", (10th ECCRIA), to be held at the University of Hull on 15th to 17th September 2014. 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 requirements for eligibility for award of a bursary are that the recipient will submit a short report about his or her impressions of the conference to the Newsletter Editor for inclusion in the next edition. In addition, the report will provide some brief details of the beneficiary, their topic of study and the reasons for wishing to attend the conference.

The British Flame Research Committee In Collaboration with the CRF and the University of Kent

**Technical Meeting
Combustion Diagnostics, Control, Computational Methods & Process Optimisation
held at
The University of Kent, Canterbury
Thursday 2nd May 2013**

The following meeting summary was kindly provided by Dr Gang Lu of the University of Kent and the editor is grateful for this contribution to the newsletter.

The British Flame Research Committee (BFRC) in collaboration with the CRF and the University of Kent held a one day technical meeting on Combustion Diagnostics, Control, Computational Methods and Process Optimisation at the Darwin Conference Suite, the University of Kent at Canterbury on 2nd May 2013. The meeting aimed to provide a forum for combustion researchers, engineers and managers for exchange of up-to-date methods, developments and examples of use in continuous process monitoring and control and computational methods in combustion optimal diagnostics.

There were around 40 delegates from the UK, Italy, France and Germany who attended the event. Mr Roger Dudill, Chair of BFRC, opened the meeting. He welcomed all delegates to the meeting and then introduced Professor Leo Tognotti from the IFRF (International Flame Research Foundation) for the keynote presentation on combustion diagnostics and computational methods for process optimization. Professor Tognotti provided a deep insight into research capabilities and activities within the IFRF and described the IFRF's large-scale energy research facilities. He further discussed the importance of the subject of his address in the continuing efforts to improve the quality of data acquisition to minimise the uncertainties inherent in experimental work. There were 11 oral presentations broken down to three sessions which included laboratory-scale experience, CFD and computational analysis, and industrial-scale experience. Dr Will Quick from E.ON chaired the first session which had three presentations. Mr Youssef Joumani from L'Air Liquide R&D presented the experimental estimation of separated jet oxy-flames in a 1,000°C furnace. Mr Mohammed Hossian from the University of Kent gave a talk on the monitoring and characterisation of oxy-gas burner flames using digital imaging and spectral analysis techniques. Professor Mohamed Pourkashanian

from the University of Leeds introduced the national research and development facilities for carbon capture and bio energy. Professor Yong Yan from the University of Kent chaired the second session which comprised four presentations relating to computer modelling. During the session on computer modelling, Dr Angus Duncan from Doosan Power presented the validation of CFD modelling for conventional and unconventional combustion. A presentation of work carried out by personnel at the University of Stuttgart, RWTH Aachen University and the University of Rouen was made which described the experimental and computational investigation of flameless oxidation of pulverised coal at pilot scale (230kW_{th}). Professor Gordon Andrews from the University of Leeds introduced the internal gas composition and CFD predictions of counter-rotating axial swirlers with axial fuel injection between the two swirlers. Dr X. Liu from the University of Sheffield talked on the heat transfer of zinc galvanization. Professor Pourkashanian chaired session three which comprised four presentations relating to industrial applications. John Goldring from RJM International presented the results from a study on low NO_x combustion at SSE Ferrybridge. Rex Isaacs from Zeeco Inc. introduced the low NO_x burner retrofits with BMS for process heater optimisation. Mr Pallaniappan Valliappan from the University of Glamorgan talked about the monitoring and control of burners co-firing coal and biomass using joint time-frequency methods. Miss Gao from the University of Kent presented the in-line measurement of particle size distribution at a biomass-fired power plant.

There was also a Poster Session including six posters presented by Cardiff University, University of Leeds and University of Kent. Roger Dudill concluded the meeting, summarising how the meeting brought examples of all relevant development pipeline topics together to emphasise their inter-related benefits, and how these separate elements may work together to deliver emissions-compliant, fuel-flexible and efficient combustion systems that have predictable capabilities, whether the systems are modified and re-worked or *ab initio* designs. With the permission of the presenters it is the intention to make the all presentations and posters available on the BFRC website.

The 5th Annual Minerals Engineering Society Symposium "Minerals Engineering 2014"

**Co-sponsored by the Coal Research Forum and the
South Midlands Mining and Minerals Institute**

**Yew Lodge Hotel, Kegworth,
Thursday 15th May 2014**

This popular one-day seminar, which has seemingly found a home at the Yew Lodge Hotel in Kegworth, was once again well patronised although regrettably the newsletter editor was unable to attend in person due to holiday commitments. However, those who were able to attend, which included a small but enthusiastic group of CRF members, assured me that it was a day well spent. Seven papers were presented, four in the morning session and three in the afternoon. Summaries of the presentations have been provided where possible.

The attendees were welcomed by Mr Ian Flanagan, the MES chairman and the keynote address which was given by Dr Mike Richards, chairman of SMMMI was entitled "Energy is Power".

The first technical paper was given by Philip Garner who is Director General of the Confederation of UK Coal Producers (CoalPro). The title of his presentation was "The role of coal in the UK generation industry". Philip revealed that in 1983 there were 170 underground mines and these were operated by the National Coal Board. Six years later (1989) the power generation industry was privatised and a further five years after that (1994) privatisation of the coal industry followed. A snapshot of the power industry at the time of privatisation showed the generation capacity to be 77GW. Of this 59% was generated from coal, 18% from nuclear, 12% from gas, 6% from oil and 5% from hydro, biomass and waste combustion. The newest coal-

fired station was Drax, commissioned in 1974; the newest nuclear station was Heysham 2, operational in 1988 and the newest gas-fired generation plant was Cowes, Isle of Wight, commissioned in 1982 and, like all gas-fired plant at that time, operating gas turbines in open cycle mode. A snapshot in May 2013 showed a very different picture. Although total generation had risen from 77GW to nearly 93GW, coal consumption to generate power had fallen to 25%, gas had risen sharply to 34% and nuclear had fallen slightly to 9%. Compared to 1989 a wider range of renewable energy sources was providing a higher contribution to total generation.

Strikingly there are now only three deep mines operating in the UK (by 2015 just one), the newest coal-fired plant is still Drax and the newest nuclear plant is Sizewell B commissioned in 1995. The newest oil-fired plant is Pembroke, commissioned in 2012 but now mothballed.

So what happened between these dates? The privatised power generation industry struggled until the turn of the 20th century when the new electricity trading arrangements were introduced. TXU was a notable casualty and many stations changed ownership. The privatised coal industry was faced with competition from cheap imported coal and the U.K. Government's "dash for gas" in the 1990's both of which forced cost reductions. World coal prices were also cheap and new import capacity enabled generators to squeeze prices.

In 2003 and 2006 major Government reviews of the energy scene took place with increasing attention and importance being given to decarbonisation. The coalition government in 2010 proposed the Electricity Market Reform as a key component of their Energy Policy and the principal driver of the Energy Bill which became the Energy Act in December 2013.

In 2007 all parties supported a policy of "no-new-coal-plant-without-carbon-capture". The Labour Government stated that "the UK will lead the world in developing CCS technology". This would be achieved by a DECC competition which would deliver up to four large-scale coal fired plants with CCS. The first DECC competition was restricted to post-combustion capture technologies. This was aimed at facilitating the retrofitting of existing stations in both the UK and globally. However, it showed a lack of understanding about current station efficiencies and the energy penalty of practising CCS. The proposals were reduced to a single contender (Longannet) but it was then realised that the economics did not work and the proposal was abandoned. The second DECC competition was re-launched by the present coalition government in 2010 and this time it included gas-fired power plants. Proposals were considered and two eligible projects were identified; the White Rose Project (Drax coal, to start in December 2013) and Peterhead (SSE gas, to start in February 2014). These proposals finally obtained funding to look at Front End Engineering Design (FEED) and this is expected to be complete by the end of 2015 - eight years after the first competition was announced! The White Rose project also received EU funding up to 300m euros in April 2014.

The UK government introduced its Electricity Market Reform in May 2012 which was underpinned by Emissions Performance Standards, Contracts for Differences (CFD) and a Capacity Mechanism. These initiatives then lead to the introduction of a Carbon Price Floor. In October 2013 after almost 10 years of thinking driven almost totally by decarbonisation opposition leader Ed Miliband reappeared with a suggested price freeze on electricity prices until 2017 if elected in 2015. Whether deliverable or not, it moved the focus back to affordability. At around the same time both Ofgem and the National Grid reported very tight capacity margins for the winter of 2014-2015 and even tighter margins for 2018-2019. The Government's response was to increase prices on CFD's for nuclear and renewables, to propose Capacity Market rules, discuss emergency plans for demand reduction and attempt to encourage investment in new plant.

The dichotomy is, according to Philip, that the U.K. needs fossil fuels (or nuclear) to provide some base load capacity for the foreseeable future as despite incentives we will only have a capability of delivering less than half our requirements at best on a windy, sunny summer's day. The first new nuclear station was going to be built by 2018 after the 2006 Energy Review, the reality is that Hinckley Point may not be ready to operate before 2025.

The bridge to a Low Carbon Future (LCF) is seen by DECC to lie with a generation fleet that contains a large amount of renewable capacity, some new nuclear plants, some coal and gas with CCS and a large proportion of gas plant to cover peak demand and the intermittency of renewables. Unfortunately, this scenario ignores the key element of fuel prices. For the last 18 months coal prices have been driven lower by the import of US produced coals which were displaced in that market by cheap shale gas. Coal-fired generation has produced electricity at half the cost or less of the electricity generated by gas even after taking the cost of carbon into account.

CoalPro commissioned a study on the effects of the Carbon Price Floor on the current power generation fleet. It concluded that if the Carbon Price Floor was frozen at this year's level of £9.55/tonne of CO₂ then some 13GW of the remaining coal-fired fleet opts to invest to comply with the Industrial Emissions Directive (IED); wholesale power prices are £18/MWh lower and consumers are £63/yr better off; the capital investment required to bridge through to a world of fossil fuels with CCS is reduced by £13bn and the 2030 emissions targets are still achieved but there is a possibility that 2020 targets are just missed dependent on load factors.

CoalPro believes that taking a more balanced view of the decarbonisation/affordability/ security of supply triangle leads to the conclusion that keeping coal in the mix until CCS is commercially developed gives a much more economically viable outcome for UK plc. Diversity of generation assets and fuel sources protects against market shocks. (Recent natural events and current geopolitics are just two of the potential supply disruptions.)

The Coal Authority believe there to be almost 4bn tonnes of potentially economic resources in the UK of which almost 1bn tonnes can be extracted from surface mines. If there was a continuous market for UK coal production there are prospects which would attract investors in the UK industry.

Philip concluded that the UK has a potential capacity crisis because its generation infrastructure has suffered from a lack of major plant replacement investment. Wind and solar power have a place in the mix but need the back up of conventional plant. CCS needs to happen NOW! Switching from coal to gas now and becoming highly dependent on gas is risky from both affordability and security of supply perspectives. Policy has to acknowledge that we are 8 years on from the 2006 Energy Review and re-set the baseline, the last government which presided over 3 day weeks did not stay in power for long. Philip's takeaway message was that investment in current coal-fired generation plant provides the least risk and most affordable bridge to a decarbonised fossil fuel generation fleet with CCS.

The second presentation given by Adrian Bull, External Relations Director at the National Nuclear Laboratory and was entitled "Nuclear Power in the UK Energy Mix". Adrian showed how a nuclear reactor works and explained the nuclear fuel cycle from obtaining uranium ore to its use as a fuel and its final reprocessing. The strengths of the UK nuclear industry were highlighted and included its pioneering role in nuclear generation, a full fuel cycle capability and a highly skilled workforce. Coupled to this is a mature and flexible supply chain and an exemplary safety record. The UK nuclear industry is a world leader in decommissioning nuclear reactors and associated facilities which puts it at the forefront of the current global nuclear renaissance. [Fukushima notwithstanding! Ed.]

Adrian provided a set of data for the UK electricity mix for 2013 which was interesting, partly because it differed from the data provided by Philip in the previous talk. Adrian showed that electricity derived from coal amounted to 39%, that from gas 28%, nuclear 19%, oil <1% and renewables ~13%. All data was from government websites. [Statistics can be used to prove almost anything as we all know! Ed.]

The UK nuclear industry employs 62,000 people about half of which are in the north west of England. A new nuclear programme could generate a further 40,000 jobs. Adrian also reminded

us of the extremely low greenhouse gas emissions associated with nuclear power compared with other sources. Availability of uranium is, apparently, not a problem and a disruption in supply, if it were to occur, would have no immediate impact unlike generation from fossil fuels.

The nine currently operating nuclear plants, a mixture of AGRs and PWRs are scheduled for closure by 2035 with the earliest being Wylfa in 2014 and the last being Sizewell B in 2035.

In 2008 the UK government produced a white paper on nuclear power. It concluded that nuclear power has a key role to play as part of the UK's energy mix. It felt that it would be in the public interest to allow energy companies the option to invest in new nuclear power stations. It also proposed the carrying out of Strategic Site Assessment (SSA) and Strategic Environmental Assessment (SEA) exercises. EU justification, to show that the benefits would outweigh any public health detriment was also required. A Pre-licensing (or Generic Design Assessment - GDA) process is planned to ensure that the Nuclear Inspections Inspectorate (NII) has adequate resources; also a funding framework for waste and decommissioning liabilities. Finally a National Policy Statement would be issued to ensure effective passage through the planning process.

Some uncertainty seems to exist regarding which type of new nuclear plant should be used in the UK in future. In contrast to France, which has 58 operational nuclear plants using essentially only three designs, the UK with only 19 (9 operational) nuclear plants has 15 different designs.

Eight 'designated' nuclear sites have been selected. All are locations at which nuclear facilities have been or are still situated. Two of the five sites owned by EDF are to be developed, namely Sizewell and Hinkley Point, the other sites are Hartlepool, Bradwell and Heysham. Horizon Nuclear Power is planning to develop Wylfa and Oldbury and NuGeneration Ltd. intend to develop Moorside near Sellafield. EDF's plans are for 1 x 1600MW Areva EPR's for both Hinkley Point and Sizewell. Horizon, (owned by Hitachi) is planning for two ABWR's at both Wylfa and Oldbury. NuGeneration (set to become a JV with Toshiba – Westinghouse/GDF Suez) is intending to build 3 x 1100MW AP1000's at Moorside.

Adrian gave a status update on Hinkley Point C, the most advanced of the new build nuclear projects. Its GDA was completed and site licence awarded by the end of 2012. Planning was approved in March 2013 and a strike price agreed in October 2013. This will be £92.50/MWh or £89.50/MWh if EDF Energy proceeds with Sizewell C.

To provide an incentive to develop new nuclear build a methodology has been introduced which allows for the "top-up" of any shortfall between the actual amount the generator receives based on the monthly market price of the electricity and a pre-defined price in the long-term Contract for Difference. Once the so-called 'strike price' is exceeded, the generator is required to pay the surplus back. The result is that generators neither suffer nor benefit from price volatility of generated energy.

The Fukushima accident caused serious global concerns regarding nuclear safety and future nuclear new build. However, surveys amongst the British public showed an increase in support for the replacement of nuclear plant due to be phased out in the next few years to a level which existed before the Japanese nuclear disaster.

There are challenges facing new nuclear build in the UK - some can be addressed by industry, others by Government. Investors in nuclear need certainty in the ability to licence the design, in the availability of supply chain and skills, in build schedule and cost, in the plant running cost and operational performance. All of these are the responsibility of the nuclear industry. Government must provide certainty in the ability to finance the projects and to secure planning approvals, provide certainty in the revenue from long-term stability in energy prices, in knowing their liabilities for spent fuel and decommissioning and in the underpinning political landscape.

UK public sector funding in fission R&D fell steadily from a figure of ~£450M in 1975 to almost zero in 1995; the workforce at nuclear facilities such as BNFL, UKAEA, the CEBG and NNI fell away correspondingly as nuclear laboratories throughout the UK closed.

In light of the need to replace fossil fuel powered electricity generation and the demise of much of the erstwhile UK nuclear industry the Government launched an inquiry to investigate whether the UK's nuclear R&D capabilities were sufficient to meet its energy requirements to 2050.

The outcome of the review process was the creation of a Nuclear Industry Strategy which would support long term Government energy policy, ongoing programmes and industrial exploitation. The key messages from the strategy were that a Nuclear Innovation Research Advisory Board (NIRAB) would be formed to advise Government and a Nuclear Innovation Research Office (NIRO) which would deliver NIRAB strategy. The National Nuclear Laboratory (NNL) would be the host. Government was to implement long term R&D programmes based on advice from NIRAB. NNL's mission was restated to give emphasis to supporting UK national programmes.

The NNL, which is a critical component of the strategy, was formally launched in July 2008 as the successor to Nexia Solutions. It is operated under the so-called GOCO (Government Owned Contractor Operated) model. Describing itself as a nuclear services technology provider covering the whole of the nuclear fuel cycle, NNL operates at six locations in the UK. It also has extensive links with academia, recently adding collaborative agreements on waste immobilisation and disposal with the University of Sheffield and on nuclear materials research with the University of Manchester to its portfolio.

Adrian rounded off his very comprehensive view of the UK nuclear scene by reminding us that the UK's nuclear industry is already a major contributor to meeting UK energy needs. Plans for new nuclear build in the UK are very much alive and the next important steps are the EU decision on the State Aid issue for Hinkley Point C, and EDF Energy's Final Investment Decision to proceed. The National Nuclear Laboratory is uniquely placed to support the industry – owned by UK Government, but run commercially and returning a profit.

The third paper was given by Dr Jeff Chapman, Director of The Carbon Capture and Storage Association and one of the technologies' most articulate advocates was entitled, "CCS, absolutely essential for the UK and the rest of the world" – (No surprise there, then! Ed).

Dr Chapman began by explaining what CCS is in regard to capture methodology, transportation and storage. Pre-, post-combustion and Oxyfuel methods for carbon capture were described as was the main proposed disposal method into aquifers or depleted gas fields. The UK has offshore facilities for CO₂ storage for more than 100 years - 7 to 10Gt in depleted oil and gas fields and 20 to 200Gt in saline aquifers.

Emissions of greenhouse gases (GHG) will increase the average global temperature by 1 to 6°C by the end of the 21st century, according to the Intergovernmental Panel on Climate Change (IPCC). A global warming of more than 2°C increase in global average temperature will lead to serious consequences, and IPCC have therefore stated that global GHG emissions should be reduced by 50 to 80 percent by 2050. This is the challenge and the reasons why CCS is the only viable global option are several in number. The world needs to have a mix of low carbon technologies to meet the current and growing need for energy and it needs to be able to provide energy security. CCS offers flexibility in that it can be applied to a number of different CO₂-producing systems. It will be cheaper in the long run than other options and will help to support the fossil fuel market.

The latest report from the IPCC AR5 warns that to stand a chance of limiting the global temperature rise to 2°C, CO₂ emissions must not exceed 800Gt of carbon. By 2011 the figure was 531 Gt C. At the present rate of evolution and capture the remaining 269Gt C will be

emitted by 2034. To limit the temperature rise to not more than 2°C by 2100 the rate of decarbonisation must increase to 6% per annum which is more than twice the best capture rate achieved so far. The IEA have reported that known energy resources are three times more than the target emission limit of not more than 269Gt C. CO₂ emissions are not confined to energy production but include transport, industrial and agricultural sources. Nuclear and renewable energy will assist but will not solve the increase in global temperature – only CCS will do this.

Jeff indicated that countries such as the UK that develop CCS early will benefit from the export of skills and technology internationally. The huge contribution that CCS will make to global emissions reductions will result in the development of an enormous new industrial sector potentially worth trillions of dollars annually. Countries blessed with suitable storage capacity, such as the UK – as well as those that take the early steps to develop CCS – will have a unique opportunity to benefit from this emerging sector. CCS could create 100,000 jobs across the UK by 2030, contributing £6.5 billion to the UK's economy. If the UK is one of the first to develop CCS, the industry could be as big as the North Sea oil industry, taking a significant share of a £5 trillion global CCS business by 2050.

A comparative table was shown in which the position of the UK on CCS was compared, (presumably with other developed nations). The UK was ahead on political and NGO support, the presence of abundant offshore storage space, developed regulation, Electricity Market Reform, an abundance of relevant skills, an industry coalition – CCSA and two projects under design. Where the UK was not further ahead was in its underestimation of the scale of challenge, mistakes made in Government procurement, the global economic downturn, a form of 'competition weariness', a legal commitment to renewables, a limited funding pot and competition for funding and the inevitable high cost of first projects.

The first CCS commercialisation competition involves two projects White Rose and Peterhead. The White Rose is located at Drax, and will be a 304MW oxy-fuel project; partners are Alstom, Drax, BOC and the National Grid. The FEED contract was signed 20 December 2013 and commenced 13 Jan 2014. The final investment decision is due in 2015/2016. Design work is in progress on a larger capacity 24" CO₂ pipeline enabling shared infrastructure and facilitation of further CCS projects. [For more information on the White Rose project see CRF Newsletter No. 70].

Peterhead is a CCGT station owned and operated by SSE in Aberdeenshire. It is a 340MWe plant retrofitted for post-combustion capture. Peterhead is situated on the coast, and lies close to available pipelines that can safely transport CO₂. The Goldeneye depleted gas field is about 100km offshore in the North Sea. This Project, with Shell, will investigate capturing more than 85% of CO₂ emissions that would otherwise be emitted to the air; this CO₂ will then be transported by pipeline to the Goldeneye platform in the North Sea for storage in a depleted gas reservoir about 2.5km below the sea bed. It is planned to store 10Mt of CO₂ over 10 years. The FEED contract was signed in March 2014.

The costs of a first project are always high because, in most cases, they are not full size and so lack any economy of scale. In addition there are high infrastructure costs, new design concepts to be incorporated and new commercial arrangements and challenging business models to be introduced. Finally there is a lack of market and thereby competition. However, past experience has shown on other new technologies such as, for example, FGD, that significant cost improvements can be found.

What is needed to get the CCS show on the road is that the first two projects start and can be seen to work, this will result in other following. A development plan and strategic infrastructure with (EOR) enhanced oil recovery with equality of opportunity with other LC technologies will move things forward.

Jeff then produced several rather cryptic slides which, unless you were there or knew the subject matter intimately are open to various interpretations. Since I was not there I can only report the slides titles as follows:- Equal treatment - power?; Policy anomalies; Planning Signals.

After lunch Rachel Bust, Chief Planner at The Coal Authority gave her talk entitled "The role of the Coal Authority in safeguarding coal resources for future energy needs".

The Coal Authority (CA) is a Government body established upon privatisation of the coal industry in 1994 and responsible to Department of Energy and Climate Change (DECC). It is tasked with protecting the public and environment in mining areas.

Its duties are as a statutory consultee to the planning system under planning laws. More specifically it manages the historic liabilities from past coal mining and operates a permitting regime to regulate access into coal/coal mine workings to ensure safe site investigations and remediation strategies. It provides an emergency service for hazards – land collapsing, gas emissions, handles subsidence claims for historic coal mining and manages the infrastructure and issues relating to mine water. It also operates a licensing regime to regulate the privatised coal industry and provides access to mining information.

One of the major activities of the CA is in planning and local authority liaison where it is tasked with protecting and promoting coal resources and ensuring that new development will be safe and stable. The CA also discharges statutory planning consultee duties by responding to emerging national planning policy and legislation; local authority development plans and acts as the primary point of contact for the organisation with local authorities and other key stakeholders on the coalfield for infrastructure projects.

The CA plays a part in the safeguarding of UK coal resources. Coal is still part of the energy mix for UK and accounted for 40% of electricity supplied in the UK during 2013. However, there has been an increasing reliance on imports. Indigenous coal production in 2013 was 12.8 million tonnes; a 25% reduction from 2012 whilst imports of coal were 10% up in the same period, to 49.4 million tonnes. (Source: DECC statistics 2013)

The CA operates within a framework of guidance on the issue of safeguarding coal resources. This includes a National Planning Policy. The CA seeks relevant emerging Development Plans to define a Mineral Safeguarding Area based on geological fact for whole surface coal area which includes a criteria based mineral safeguarding policy. It promotes prior extraction ahead of non-mineral development and requires developers to assess potential for prior extraction/mineral recovery as part of their development. The CA assesses the implications on mineral resources when allocating sites for future non-mineral development to include flexibility in policies for emerging technologies and defines areas of search or constraint for future mineral extraction.

Progress on development plans to date show that 57 of 96 (59%) of all coalfield local authorities now safeguard surface coal resources; i.e. England: 67% of plans, Wales: 57% of plans and Scotland: 43% of plans now include some policy context to protect coal resources from sterilisation. 39 of 96 (41%) plans awaited to comment on and influence.

The CA provides consultation responses to planning applications in relation to coal resources. The removal of coal resources at, or close to the surface as part of any ground preparation works for new built development is known as 'prior extraction' or 'pre-extraction'. The amount of coal removed/recovered should be considered on a case by case basis and can vary from hundreds to thousands of tonnes depending upon site circumstances. The CA promotes prior extraction especially where instability exists from past shallow mining activity. It publishes on-line monthly list of planning applications where prior extraction has been recommended.

Prior extraction of surface coal resources is judged to be desirable as it prevents sterilisation of nationally important mineral resource – national policy requirement, has a financial

contribution to the development, and offers an alternative remediation option for unstable land which can be incorporated into remediation strategy at the planning application stage. It also removes risk of gas from abandoned mine workings and creates greater certainty for ground conditions.

Rachel concluded her talk by reminding us of the role of the CA in that it will continue to protect and promote coal resources for future generations to meet their energy needs. The CA will remain a statutory consultee to the planning processes such as local planning policy, individual planning applications and development consent orders for nationally significant infrastructure projects.

Our invited overseas guest speaker, Dr Krzysztof Kapusta of the Central Mining Institute in Poland gave a talk entitled "Underground Coal Gasification in Poland. Experiences, results and future prospects".

The Central Mining Institute (GIG) is a research and development organisation which is focused on the Upper Silesian mining industry and region and has been in existence since 1945. An experimental mine, known as "Barbara" in Mikołów was established 20 years before the Institute was formed and is now part of it. Scientific and research activities at GIG comprise mining and geo-engineering, health and safety in industry, sustainable energy technologies, (clean coal technologies), environmental engineering, material engineering, radioactivity and ionising radiation.

Dr Kapusta demonstrated its importance by quoting figures which showed that coal provides 29% of global primary energy and generates 41% of world electricity. In Poland it is an even more important fuel with 84% of its power being generated by coal in 2012. Hard coal makes up 51% and lignite 33% of the fuels used to generate power in Poland. There are two main hard coal basins in Poland; the Upper Silesian and the Lublin basin – five other locations extract lignite.

GIG's Clean Coal Centre is based in two locations. In Katowice are GIG's testing laboratories where basic research on coal processing is carried out. Activities include coal quality characterisation and geological study, numerical and environmental modelling and laboratory research on CO₂ storage potential. Mikołów is where GIG's technological unit is located. Here the focus is on applied research on coal processing technologies, syngas processing and utilisation, coal-derived liquids and large scale experimental installations including UCG tests in real underground conditions.

The scope of activities at GIG's Laboratory of Experimental Installations are wide and include:- conducting R&D works in the field of prospective chemical technologies of coal processing, including in particular: the process of underground, (pressure or non-pressurised), coal gasification aimed at production of syngas with a high content of hydrogen and of gases for power use; pressurised fluidised gasification of solid fuels in surface conditions; a direct coal liquefaction process aimed at the production of engine fuels and chemical raw materials; the processes of hydrogenation and refinement of coal-derived substances; the separation and purification of process gases using membrane techniques and methods of absorption and adsorption, including the pressure swing adsorption PSA; and separation of CO₂ from process gases.

Dr Kapusta then moved on to describe the technology and methodology of UCG and how Poland first began its research programme in 1945. More recently GIG had been involved in large EU funded projects such as HUGE and HUGE 2. The HUGE (Hydrogen Oriented Underground Coal Gasification for Europe) project ran from 2007 to 2010 and its aims were to undertake a theoretical and experimental exploration of the possibilities of in-situ production of hydrogen-rich gas through the underground coal gasification (UCG) technique. HUGE2 (2011 to 2014) was a follow-on project which studied the environmental impacts of UCG. Both projects were funded by RFCS (Research Fund for Coal & Steel). Two other current projects are COGAR (project title "Underground Coal Gasification in operating mine and areas of high

vulnerability", also RFCS funded) which will run from 2013 to 2016 and TOPS (project title "Technology Options for Coupled Underground Coal Gasification and CO₂ Capture and Storage", Framework 7 funded) which will run for the same time period.

Dr Kapusta then completed his presentation by giving a status report on the projects currently underway. The facilities shown and data presented clearly demonstrate the high level of expertise present within the GIG organisation.

The final paper of the day was given by Colin Fletcher, Contracts Director of Shanks Waste Management Ltd was entitled "BDR Waste Partnership". Colin began by explaining that the BDR Waste Partnership is a collaboration between Barnsley, Doncaster and Rotherham Councils who have worked together managing waste disposal contracts since 1993. A Private Finance Initiative (PFI) funding of £77.4M was secured in 2007 and a £750M contract signed in March 2012. The process involves mechanical and biological treatment and the facility will come on line in July 2015. Waste from 350,000 households will be treated in the facility.

Problems with waste disposal are numerous and for traditional landfill the expense of gate fees, landfill tax and on-going maintenance costs. In addition there are environmental issues such as methane production and leachate treatment, a lack of suitable landfill space and the effect of adverse weather which can lead to temporary closure of sites.

From 2008 to 2012 the 12 potential contractor's submissions were evaluated and eventually reduced to a final successful bid. Criteria used in the evaluation process included design, reliability, sustainability and community benefits. Finally affordability and value for money were considered (after all it is in Yorkshire!! Ed)

The project involves the development of a waste treatment facility in Rotherham consisting of a Mechanical Biological Treatment (MBT) plant and Anaerobic Digestion (AD) plant. A by-product of the process, which is known as Solid Recovered Fuel (SRF), is to be used at Ferrybridge Power.

The MBT process receives municipal solid waste (MSW) and shreds and dries it. It is then sieved through a 20mm screen. The +20mm fraction is separated into plastics (optical sorter), ferrous metal (magnet), non-ferrous metal (eddy current) and a residue. Ferrous metal is separated from the -20mm fraction which is then further sieved using a flip-flop sieving system into -20+6mm and -6mm fractions. The -6mm fraction is feed material to the AD plant and the -20+6mm fraction passes into a density drum separator. The heavy fraction comprises glass and aggregate and the light fraction is combined with the residue from the +20mm stream. This material is compacted and becomes SRF. The feed to the AD plant processes the organic components and ultimately produces methane and carbon dioxide, the former of which can be collected and its heat value extracted.

The benefits expected from this project are a reduction in waste sent to landfill thereby reducing landfill tax payments, a reduction of greenhouse gas emissions and an increase in recycling useful and valuable resources. In addition there is the generation of heat, gas and electricity from non fossil fuels and opportunities for job creation, education and training.

The project achieved financial close in March 2012, and construction began in September of the same year. The MBT and AD plant are scheduled for completion in the winter of 2014. There will be a 6 month commissioning phase and the plant should be fully operational in the summer of 2015.

Despite the not unexpected alarmist media response to any new waste disposal plant it has been turned around by good community liaison. This was shown in that the project was short listed for the 2013 Awards for Environmental Excellence from the CIWM (Chartered Institution of Wastes Management). The plant will have a Visitor Centre opening in July 2015 and Colin invited the attendees to pay it a visit next year.

RSC Energy Sector PhD Thesis Award Competition

Press Release:- May 2014.

The RSC Energy Sector, an interest group affiliated to the Royal Society of Chemistry, is pleased to announce the winner of its PhD Thesis Award Competition 2013. The award is given for an outstanding PhD Thesis completed at a UK university in the calendar year 2013 in the field of Chemistry for the Energy Sector and assessed by a panel of experts drawn from the RSC Energy Sector Committee.

The winner is Dr Alissia Cotton for her PhD Thesis entitled *Engineering Scale-up and Environmental Effects of the Calcium Looping Cycle for Post-Combustion CO₂ Capture*. Her work explored the separation of CO₂ from fossil fuel combustion flue gas on a pilot-scale reactor and, through the course of her work, demonstrated techniques to improve CO₂ capture from 40% to almost 80% in a fluidised bed reactor. This work contributes to the developing technology in "carbon capture and storage" (CCS) to allow new fossil fuel power plants to operate in accordance with the 2010 EU Industrial Emissions Directive. Dr Cotton completed her PhD studies at Cranfield University under the supervision of Dr Kumar Patchigolla.

The purpose of the award is to spotlight UK PhD research in the energy sector. The competition is judged largely on the content and quality of an Executive Summary submitted by the candidate and considers the following criteria: (i) the level to which the work addresses a clear identified need in UK or global energy requirements, (ii) the level to which the work adds significant new understanding to an aspect of the energy sector and (iii) the level to which the work contributes to quantifiable environmentally sustainable energy provision.

For further details contact:

The Secretary, RSC Energy Sector Executive Committee rscenergysector@gmail.com

HRH The Prince of Wales contributes to the energy debate

In a [special video message](#) recorded to celebrate the Energy Institute (EI) 's centenary, HRH The Prince of Wales HonFEI, contributes to the energy debate and speaks of the role of energy in the circular economy.

With the EI actively engaged in providing a platform for knowledge sharing, grounded on evidence-based science and free from bias, the Prince was keen to bring his own views to the energy debate.

He says, 'The central argument [of the circular economy] is that all of the atoms and molecules that we require are already in existence. We just need them in different locations and different combinations. The challenge is to redesign the supply chain, develop innovative technologies and generate sufficient renewable energy to use and reuse those molecules, so that we have the closed loops we need as our population grows.'

The Prince recognises the environmental constraints, such as pollution and climate change, and identifies that we must find a way to operate within these parameters.

Ian Marchant FEI, President, Energy Institute, says, 'Energy plays a part in everyday life and the development of a safe, sustainable and affordable energy system is crucial to our modern way of life. We all need to respond to the challenges that lay ahead with a clear understanding of the issues involved. I welcome His Royal Highness' contribution to the debate and hope this will inspire others to become more active in advancing the solutions we need for the benefit to society as a whole.'

In his message, the Prince remarks on the values of the EI and its importance of delivering professionalism and good practice, particularly in climate change, resource scarcity and a global energy transition. He congratulates the EI and its members in the part they have played in the development of the energy industry and hopes they will continue to drive further innovations to shape the future.

As part of the [EI's centenary celebrations](#), the EI was pleased to present HRH The Prince of Wales with a Honorary Fellowship in recognition of his significant contribution to the promotion of sustainable living for more than 40 years. He joins his father, HRH The Duke of Edinburgh, and 70 other eminent professionals from across industry, government and academia.

BCIA funds Victoria's first 24/7 capable CO2 capture facility for brown coal power generation

4th August 2014

Brown Coal Innovation Australia today announced \$650,000 funding towards a research and development project which will target significantly reduced carbon emissions from brown coal power generation in Victoria and throughout the world.

The \$5M research project will combine CSIRO CO2 capture innovation with that of major Japanese technology vendor; IHI Corporation. The project targets a 40 per cent reduction in the energy usage of current plant post combustion capture (PCC) processes for Victorian brown coal-fired power plants. Capturing CO2 requires significant power and consequently increases energy costs.

BCIA Chief Executive, Dr Phil Gurney, said: "This research project will see the installation of a \$1M Japanese-built PCC pilot plant at AGL Loy Yang Power station; the first in Victoria to operate around the clock. The expected reduction in energy usage – as targeted by this project – would lead to significant savings in the cost of energy supplied to the consumer compared to implementing carbon capture using first-generation PCC plant."

Media inquiries:

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Email: mandy.frostick@messageworks.com.au

Newsletters from other organisations

The most recent IEA Newsletter can be viewed here:-

http://www.iea-coal.org.uk/publishor/system/component_view.asp?LogDocId=

The third edition of **EERA Bioenergy NEWS**, produced on behalf of the **European Energy Research Alliance** (EERA) Joint Programme on Bioenergy is to be found here:

<http://www.eera-bioenergy.eu/resources/EERA%20Bioenergy%20News,%20Issue%203,%20July%202014.pdf>

ARTICLES FROM THE TECHNICAL PRESS

News alerts in coal and energy research

Please be aware that links to some of the news articles are not retained on the web indefinitely. Consequently, links which were active when the newsletter was written may, in time, become unavailable. It is hoped that this will not detract from the value of the article.

Is UK shale gas extraction posing a risk to public health?

17th April 2014, British Medical Journal

More needs to be done to investigate the risks to human health that extracting shale gas poses, suggests one expert, who says that risk reduction technologies should be deployed, but that reviewing the public health implications of shale gas development "requires more than merely gesturing to technological improvements. Best practices should not be mistaken for actual practices." The author asserts that scientific data should drive decisions on health and safety, instead of gestures to understudied assertions of best practice deployment.

http://www.sciencedaily.com/releases/2014/04/140417212508.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

British power sector continues to rely on coal

25th April 2014, H & V News

Coal provides 41% of British electricity, the Department of Energy and Climate Change has announced. The DECC has published energy data from December to February. The report showed that although the share of renewable energy on the British grid has increased in the three months ending in February, coal still dominates. For renewable energy resources, DECC said wind power dominated the sector with offshore wind capacity increasing 39% in the three-month period and onshore wind up 68% compared to the same period one year ago. For bioenergy, capacity increased 9.4% and the low-carbon share of electricity on the British grid increased by 7% to 36.7% year-on-year. Coal, however, provided 41% of the electricity generated, with natural gas and nuclear power accounting for the bulk of the remaining power share. The British economy relied more on imports as coal and crude oil production declined, Natural gas production, however, increased 1.3% compared with the same period one year ago. Energy consumption in general declined 7.6% compared to the same period a year earlier, DECC said.

<http://www.hvnplus.co.uk/news/british-power-sector-continues-to-rely-on-coal/8661814.article>

UK marine energy sector is at a "critical point" in proving long-term success

25th April 2014, ClickGreen

The UK marine energy sector has been warned it is at a critical stage of its commercial development and must halve costs within the next six years to prove it could be a significant long-term energy source. A new roadmap developed by the UK Energy Research Centre (UKERC) and the Energy Technologies Institute (ETI) has identified the research and development areas that need to be addressed to make marine energy cost competitive with other energy technologies.

For more visit:-

<http://www.clickgreen.org.uk/analysis/business-analysis/124524-uk-marine-energy-sector-is-at-a-critical-point-in-proving-long-term-success.html>

Why wave power has lagged far behind as an energy source

28th April, 2104, Dale Levitan, The Guardian

No commercial-scale wave power operations now exist, although a small-scale installation did operate off the coast of Portugal in 2008 and 2009. In February, U.S. corporate giant Lockheed Martin announced a joint venture to create the world's biggest wave energy project, a 62.5-megawatt installation slated for the coast of Australia that would produce enough power for 10,000 homes. Scotland, surrounded by the rough waters of the Atlantic and the North Sea, has become a hotbed of wave-energy research and development, with the government last year approving a 40-megawatt wave energy installation in the Shetland Islands. For more visit:-

<http://www.theguardian.com/environment/2014/apr/28/why-wave-power-has-lagged-far-behind-as-an-energy-source>

CSIRO and partners to test Direct Injection Carbon Engine to reduce brown coal emissions by up to 50%

28th April 2014, Green Car Congress

CSIRO (Australia's national science agency) and its industry partners plan to conduct a A\$1-million (US\$930,000) trial of the Direct Injection Carbon Engine (DICE) in Victoria's Latrobe Valley—the second largest and lowest-cost brown coal resource in the world—with the aim of reducing emissions from brown coal-generated electricity by 50% compared to current technology. DICE involves converting coal or biomass into a water-based slurry (called micronised refined carbon, MRC) that is directly injected into a large, specially adapted diesel engine. The fuel burns to produce intense temperature and pressure in the engine, which provides highly efficient power to turn electrical generators. For more visit...

<http://www.greencarcongress.com/2014/04/20140428-dice.html>

Scotland's secret tunnel under the Forth, 50 years old and forgotten

30th April, Fraser MacDonald, The Guardian

While two of Scotland's best known landmarks, the two bridges over the Forth, will be celebrated this year there is a third crossing which is a distant memory: a tunnel in the rock cut by the coal mining industry. For more see....

<http://www.theguardian.com/uk-news/scotland-blog/2014/apr/30/scotland-firthofforth-coal>

Uncertainty 'could hamstring UK'

30th April 2014, unattributed, RE News

Political uncertainty is damaging the UK's low-carbon ambitions and could prevent the nation from staying within its carbon budgets, a report claims. The UK Energy Research Centre asserts that while the UK remains committed to lofty climate change targets recent rises in energy prices, the impact of the 2008 financial crisis and heightened concerns about energy security have challenged the government's commitment to them. The report UK Energy Strategies Under Uncertainty features contributions from more than 30 academic experts on energy and identifies the key issues that have arisen as well as recommending strategies to tackle them. For more see:-

<http://renews.biz/65770/uncertainty-could-hamstring-uk/>

New SUPERGEN Hub to set UK's energy storage course

2nd May 2014, unattributed, nanowerk

A new, £4 million, collaboration between academics and industry that will set the direction and development of research and technologies in Energy Storage, was unveiled today by the Engineering and Physical Sciences Research Council (EPSRC), on behalf of the Research Councils UK Energy Programme. The SUPERGEN Energy Storage Hub will draw experts together from seven universities and fourteen industrial and governmental partners. They will address the technical and scientific challenges facing the wide variety of energy storage techniques. For more see:-

<http://www.nanowerk.com/news2/green/newsid=35413.php>

B&W wins DOE award for carbon capture research

2nd May 2014, unattributed, Utility Products

The U.S. Department of Energy awarded Babcock & Wilcox Power Generation Group Inc. (B&W PGG) a \$2.5 million award for Phase 2 development of iron-based coal direct chemical looping (CDCL) technology. B&W PGG and The Ohio State University have collaborated on the development of the technology, which was developed and successfully tested at bench scale at OSU's labs in Columbus, Ohio. B&W PGG is continuing research and testing at the B&W Research Center in Barberton, Ohio and OSU's labs as part of the commercial design effort.

In Phase II of the project, B&W PGG and its collaborators will test the CDCL process at a laboratory scale. CDCL is an advanced process for carbon dioxide (CO₂) capture. It uses a design where coal reacts with iron oxide-based oxygen carrier particles. The chemical reaction

converts the coal into a concentrated stream of CO₂ for use in enhanced oil recovery or for permanent storage and reduces the iron oxide. For more visit:-

<http://www.utilityproducts.com/articles/elp-archives/2014/05/b-w-wins-doe-award-for-carbon-capture-research.html>

China's coal solution has carbon downside across globe

3rd May 2014, Hal Bernton, The Seattle Times

Global carbon-dioxide emissions are climbing at rates that pose severe risks to the planet, and reversing that trend is heavily dependent on China making cuts in its emissions. For more see...

http://seattletimes.com/html/specialreports/pages/2023517279_chinaenergyxml.html

Swedish Vattenfall abandons research on CO₂ storage

10th May 2014, unattributed, CoalSteel Guru

Swedish energy giant Vattenfall announced that it has given up its research on CO₂ capture and storage, intended to make the company's coal power plants greener. The group in a statement said that "Vattenfall will discontinue its R&D (research and development) activities regarding coal power with CCS (carbon capture and storage)." The state owned giant had been investing in this technology for more than 10 years, with plans for a power plant equipped with CCS in 2016. Capturing and liquifying CO₂ coming from carbon combustion to later store it underground was meant to curb greenhouse effect gas emissions, but its costs and the energy it requires make the technology unviable. For more see...

http://coal.steelguru.com/other_region/15900/swedish_vattenfall_abandons_research_on_co2_storage

By itself, abundant shale gas unlikely to alter climate projections

14th May 2014, unattributed, Science Daily

A policy analysis finds that if natural gas is abundant and less expensive, it will encourage greater consumption of gas and less of coal, renewables and nuclear power. The net effect on the climate will depend on whether the greenhouse gas emissions from producing and consuming natural gas -- including carbon dioxide and methane -- are lower or higher than emissions avoided by reducing the use of other energy sources. For more visit:-

http://www.sciencedaily.com/releases/2014/05/140514133442.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

Control methane now, greenhouse gas expert warns

14th May 2014, unattributed, Science Daily

As the shale gas boom continues, the atmosphere receives more methane, adding to Earth's greenhouse gas problem. A greenhouse gas expert, and ecology and environmental biology professor, fears that we may not be many years away from an environmental tipping point -- and disaster. "Society needs to wean itself from the addiction to fossil fuels as quickly as possible," he said. "But to replace some fossil fuels -- coal, oil -- with another, like natural gas, will not suffice as an approach to take on global warming. Rather, we should embrace the technologies of the 21st century and convert our energy systems to ones that rely on wind, solar and water power." For more visit.....

http://www.sciencedaily.com/releases/2014/05/140514165251.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

Power plant emissions verified remotely at Four Corners sites, largest point source pollution in U.S.

20th May 2014, unattributed, Science Daily

Air pollution and greenhouse gas emissions from two coal-fired power plants in the Four Corners area of northwest New Mexico, the largest point source of pollution in America, were

measured remotely. The study is the first to show that space-based techniques can successfully verify international regulations on fossil energy emissions. For more visit...

http://www.sciencedaily.com/releases/2014/05/140520100527.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy%2Ffossil_fuels+%28Fossil+Fuels+News+--+ScienceDaily%29

Coal-fired capacity to surpass 2 TW by 2020

28th May 2014, Jonathan Rowland, World Coal

The global coal-fired power capacity is expected to grow to 2072.8 GW by 2020, according to a new report from Grand View Research. Coal's low cost will drive Asian demand. The availability of and low costs of the fuel in coal-rich Asian countries will stay the key driver for the market, while rising electricity consumption – especially in emerging markets – is also expected to have a positive impact on demand. On the downside, regulatory action in Europe and North America, along with a push for cleaner energy sources, may hinder market growth in these regions over the next six years. Commercial usage dominates coal-fired power demand. In terms of application, commercial uses dominated coal-fired power demand, accounting for 55.7% of the total market in 2014. Commercial applications are also expected to be the fastest growing application sector with a CAGR of 5% from 2014 to 2020. The report also analysed the technology market for the coal-fired power sector and found that pulverized coal systems accounted for over half of the capacity installed in 2013. Meanwhile, alternative cyclone furnace systems will grow at a CAGR of 2.6% to 2020 to reach 614.6 GW of installed capacity.

http://www.worldcoal.com/news/power/articles/Coal_fired_capacity_to_surpass_2_TW_by_2020_coal897.aspx#.U9vIGPlDXfk

Imperial receives £14 million funding to boost future energy research

29th May 2014, Gail Watson, Imperial College News

Research Councils UK has committed £14 million to the Imperial-based UK Energy Research Centre to advance future energy systems research. This new funding comes from three research councils The Engineering and Physical Sciences Research Council (EPSRC), the Natural Environment Research Council (NERC) and the Economic and Social Research Council (ESRC) via the Research Councils UK Energy Programme to allow the UK Energy Research Centre (UKERC) to continue to act as the focal point of UK energy research.

The funding has been welcomed by UKERC Research Director, Professor Jim Watson, based at Imperial's Faculty of Engineering, who said: "This further support for UKERC is welcome, and comes at a critical time in the development of energy systems in the UK and abroad. We know that these systems need to change radically to tackle climate change and other societal goals, but the way forward is increasingly uncertain. UKERC's research and engagement activities will help to inform policy development, industry strategies and wider energy debates." For more see...

http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_29-5-2014-15-5-3

Carbon-capture breakthrough: Recyclable material absorbs 82 percent of its weight in carbon dioxide

3rd June 2014, unattributed, Science Daily

Rice University scientists have created an Earth-friendly way to separate carbon dioxide from natural gas at wellheads. A porous material invented by the Rice lab of chemist James Tour sequesters carbon dioxide, a greenhouse gas, at ambient temperature with pressure provided by the wellhead and lets it go once the pressure is released. The material shows promise to replace more costly and energy-intensive processes. Results from the research appear today in the journal *Nature Communications*. For more see.....

http://www.sciencedaily.com/releases/2014/06/140603114319.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

US EPA proposal calls for major cut in CO2 emissions, coal

3rd June 2014, Rebeka Silva, HNGN

The United States power sector must cut carbon dioxide emissions 30 percent by 2030 from 2005 levels under federal regulations unveiled by the Obama administration, according to The Associated Press. The Environmental Protection Agency's proposal is one of the most significant environmental rules proposed by the United States, and could transform the power sector, which relies on coal for nearly 38 percent of electricity, the AP reported. Gina McCarthy, EPA administrator, said on Monday the amount of carbon dioxide the proposal would reduce would be more than double the carbon pollution from the entire U.S. power sector in 2012, according to the AP. "The flexibility of our Clean Power Plan affords states the choices that lead them to a healthier future. Choices that level the playing field, and keep options on the table, not off," McCarthy said in remarks at EPA headquarters on Monday, the AP reported. For more.

<http://www.hngn.com/articles/32852/20140603/epa-proposal-calls-for-major-cut-in-carbon-dioxide-emissions-coal.htm>

New Cumbrian coal mine could create up to 500 jobs

10th June 2014, unattributed, News & Star

A major study is to start into the possible opening of a new coal mine that could create up to 500 jobs. West Cumbria Mining has secured millions of pounds to develop the first stage of the project, which has been hailed by a senior county councillor as "very good news indeed". The private company wants to extract coking coal from a mine next to the former Haig Colliery in Whitehaven. It believes there are more than 750 million tonnes of reserves spread across a 200 square kilometre area. The coal is within three main seams, most of which are offshore and were mined at Haig. For more visit:-

http://www.newsandstar.co.uk/news/new-cumbrian-coal-mine-could-create-up-to-500-jobs-1.1141547?cache=cacheHiguain%25253FresourceView%25253Dvideo%23.U1lj_f_VyhM.twitter%3FshowResult%3Dtrue

The cost of coal plant closures

25th June 2014, Jonathan Rowland, World Coal

A new report from the Institute of Energy Research (IEA) has called for an end to the closure of coal-fired power plants in the US, arguing that forcing such plants to shut will harm supply reliability, affordability and security. The report – "[Protect the American people: moratorium on coal plant closures essential](#)" – was authored by Dr Roger Bezdek and Dr Frank Clemente and provides a response to the newly proposed greenhouse gas regulations proposed by the US Environmental Protection Agency. It found that policies that adversely impact the US coal-fired power plant fleet will significantly increase wholesale electricity rates – possibly by as much as 80%. This will hit those who least can afford it – low income families, minorities, children and the elderly – most. Taking the 2013/14 winter as an example, the report noted that coal met 92% of the year-on-year incremental electricity demand for the first two months of 2014 and that during this time, without coal plants, parts of New England, the Midwest and other regions would have experienced brownouts and blackouts. For more see....

http://www.worldcoal.com/news/power/articles/The_cost_of_US_coal_plant_closures_coal1015.aspx#.U9ytq.IdXfk

New research on methane leakage questions climate benefit of natural gas

27th June 2014, unattributed, Climate Science Watch

New research from scientists at NOAA and Carnegie-Mellon finds that natural gas production globally may be leaking enough methane to negate the climate benefits of gas over coal during the next two decades. Over a 20-year time period, methane is 86 times as potent a greenhouse gas as carbon dioxide. For more visit:-

<http://www.climatewatch.org/2014/06/27/new-research-on-methane-leakage/>

UK energy policy 'hostile to coal'

9th July 2014, unattributed, The Press Association

The UK's energy policy has been "hostile" to coal as the industry faces the prospect of having just one deep pit because of fresh closures, MPs have been told. A special session of the Energy and Climate Change Select Committee heard there was "no real effort" being made to use coal produced in this country in power stations. Labour MP Ian Lavery (Wansbeck), a former official of the National Union of Mineworkers (NUM), posed a series of questions on how the government could do more to save coal from total extinction. He asked Nigel Yaxley, managing director of the Association of UK Coal Importers, whether the UK energy policy had been hostile to coal. Mr Yaxley replied: "Yes. There hasn't been sufficient attention to affordability and security." He said a package of measures has come forward for renewable energy, but efforts to boost carbon capture and storage in coal-fired power stations had been much slower, and he added: "It can be as cheap as offshore wind." For more see...

<https://uk.news.yahoo.com/uk-energy-policy-hostile-coal-131816514.html#aJLO5yM>

Drax celebrates biomass subsidy court victory

14th July 2014, unattributed, businessGreen

Drax Group is celebrating today after the High Court ruled that one of its high-profile coal-to-biomass conversion projects was eligible for support under the government's new clean energy subsidy scheme. The energy giant, which operates the UK's largest power station in Yorkshire, confirmed this morning that the court had ruled in its favour, effectively quashing the government's decision to exclude one of its proposed coal conversion biomass projects from its Final Investment Decision (FID) Enabling programme. For more visit:-

<http://www.businessgreen.com/bg/news/2355175/drax-celebrates-biomass-subsidy-court-victory>

Wind turbine fires 'ten times more common than thought', experts warn

17th July 2014, Emily Gosden, The Telegraph

Wind turbines may catch on fire ten times more often than is publicly reported, putting nearby properties at risk and casting doubt on their green credentials, researchers have warned. The renewable energy industry keeps no record of the number of turbine fires, meaning the true extent of the problem is unknown, a study backed by Imperial College London finds on Thursday. An average of 11.7 such fires are reported globally each year, by media, campaign groups and other publicly-available sources, but this is likely to represent just the "tip of the iceberg". For more see...

<http://www.telegraph.co.uk/earth/energy/windpower/10971762/Wind-turbine-fires-ten-times-more-common-than-thought-experts-warn.html>

UK and Germany biggest coal polluters in the EU

22nd July 2014, Charlotte Malone, blue & green tomorrow

The UK and Germany top the list of the biggest coal polluters in the EU, with nine of the dirtiest power plants each, according to research. The report argues that unless action is taken, the EU's target for cutting greenhouse gas emissions could be at risk. The report – *Europe's Dirty 30* – has been released by CAN Europe, WWF, the European Environment Bureau (EEB), the Health and Environment Alliance (HEAL) and Climate Alliance Germany. The report found the top 30 polluting coal power plants in the EU and ranks them according to their total CO2 emissions in 2013. The UK and Germany rank joint first, with nine of these power plants apiece.

For more visit:-

<http://blueandgreentomorrow.com/2014/07/22/uk-and-germany-biggest-coal-polluters-in-the-eu/>

Coal-seam gas 'half CO2 of coal'

22nd July 2014, Graham Lloyd, The Australian

Electricity generated using coal-seam or shale gas produced less than half the carbon dioxide emissions of electricity from burning coal, a study has found. The report, published today in

the *Proceedings of the National Academy of Sciences*, says the life-cycle carbon dioxide footprint of coal-seam and shale gas is the same as conventional gas supplies. Quantifying the benefits of using unconventional gas as a transitional fuel for climate-change mitigation has been - controversial. Lead author of the *PNAS* report Garvin Heath, of the National Renewable Energy Laboratory, says the results pull together the findings of wide-ranging research, but more work is needed to better understand the impact of fugitive emissions or methane that leaked during unconventional gas exploration or production. For more visit:-

<http://www.theaustralian.com.au/national-affairs/policy/coalseam-gas-half-co2-of-coal/story-e6frg6xf-1226996664698?nk=5870c8e66ac44e53dca72effab2c069>

Further fears for future of troubled Kellingley Colliery

22nd July 2014, Sam Cooper, Wakefield Express

An employee buyout deal to secure a long-term future for Kellingley Colliery has been thrown into doubt after unions met UK Coal directors. Earlier this month, workers at the pit gave their backing to the National Union of Mineworkers (NUM) deal, which would see them invest £2,000 each into a scheme to keep the pit open until 2020. But after meeting UK Coal's chief operating officer Derek Parkin, the NUM say the deal would not raise enough to secure a future for the site. Earlier this year UK Coal announced plans to close Kellingley and another site in Thoresby, Nottinghamshire, due to the cheap costs of importing coal. For more see...

<http://www.wakefieldexpress.co.uk/news/local-news/further-fears-for-future-of-troubled-kellingley-colliery-1-6743856>

Beauty spots still at fracking 'risk', say campaigners

28th July 2014, unattributed, BBC News

Fracking licences can only be issued for beauty spots in "exceptional circumstances", according to new rules issued by the government. It said the regulations for the new bidding round for licences - the first in six years - are stricter than before. And companies applying to frack near beauty spots will have additional obligations. But some environmental campaigners say the new rules are not tough enough. For more see....

<http://www.bbc.co.uk/news/business-28513036>

US exports help Germany increase coal, pollution

28th July 2014, Kirsten Grieshaber and Dina Cappiello, Associated Press

One of Germany's newest coal-fired power plants rises here in Luenen, Germany, from the banks of a 100-year-old canal that once shipped coal mined from the Ruhr Valley to the world.

Now the coal comes the other way. The 750-megawatt Trianel Kohlekraftwerk Luenen GmbH & Co. power plant relies completely on coal imports, about half from the U.S. Soon, all of Germany's coal-fired power plants will be dependent on imports, with the country expected to halt coal mining in 2018 when government subsidies end. Coal mining's demise in Germany comes as the country is experiencing a resurgence in coal-fired power, one which the U.S. increasingly has helped supply. U.S. exports of power plant-grade coal to Germany have more than doubled since 2008. In 2013, Germany ranked fifth, behind the United Kingdom, Netherlands, South Korea and Italy in imports of U.S. steam coal, the type burned in power plants. For more see....

<https://uk.news.yahoo.com/us-exports-help-germany-increase-coal-pollution-040226369.html#POTSTtx>

Rule aims to help clear air around Grand Canyon

28th July 2014, Felicia Fonseca, WMBF News

The largest coal-fired power plant in the West will produce one-third less energy by 2020 and could close in 2044 under a proposal that the federal government adopted to cut haze-causing emissions of nitrogen oxide at places like the Grand Canyon. The U.S. Environmental Protection Agency announced Monday that the owners of the Navajo Generating Station could either shut down one of the plant's 750-megawatt units or reduce power generation by an equal

amount by 2020. The owners would have until 2030 to install pollution controls that would cut nitrogen-oxide emissions by 80 percent. The power plant near Page on the Navajo Nation would close in 2044 unless the tribe opts to take over the operation. For more see...

<http://www.wmbfnews.com/story/26131278/wests-largest-coal-fired-plant-on-track-to-close>

Australia approves huge coal mine

28th July, unattributed, Bangkok Post

Australia has approved a massive coal mine that could ultimately provide electricity for up to 100 million Indians, angering environmentalists who warned Monday it may threaten the Great Barrier Reef. Environment Minister Greg Hunt said approval for Indian firm Adani's Aus\$16.5 billion (US\$15.5 billion) Carmichael coal mine and rail project in Queensland state was subject to 36 conditions. "The absolute strictest of conditions have been imposed to ensure the protection of the environment, with a specific focus on the protection of groundwater," he said in a statement. The development proposes open-cut and underground coal mining some 160 kilometres (100 miles) northwest of Clermont in central Queensland, as well as a 189-kilometre rail link. It is forecast to produce 60 million tonnes of thermal coal a year for export. For more..

<http://www.bangkokpost.com/news/world/422833/australia-approves-huge-coal-mine>

China to ban all coal use in Beijing by 2020

5th August 2014, unattributed, ABC News

China's smog-plagued capital has announced plans to ban the use of coal by the end of 2020 as the country fights deadly levels of pollution, especially in major cities. Beijing's Municipal Environmental Protection Bureau posted the plan on its website Monday, saying the city would instead prioritize electricity and natural gas for heating.

The official Xinhua News Agency said coal accounted for a quarter of Beijing's energy consumption in 2012 and 22 percent of the fine particles floating in the city's air. Motor vehicles, industrial production and general dust also contributed to pollution in the 21 million-person city. Even with the Beijing ban, coal use is expected to soar in China. Coal-fired power and heating is a major generator of greenhouse gases and has helped turn China into the world's largest emitter of carbon and other heat-trapping gases.

Pressure is growing on China's central government to clean up the country's polluted environment, as discontent over smog and water and soil contamination increases among China's expanding middle class. The central government recently listed environmental protection as one of the top criteria by which leaders will be judged. In September, the government announced a prohibition on new coal-fired power plants around Beijing, Shanghai and Guangzhou. For link see....

<http://abcnews.go.com/International/wireStory/china-ban-coal-beijing-2020-24842745>

Ferrybridge power station repair workers move in

6th August 2014, unattributed, BBC News

Workers have begun assessing the damage at Ferrybridge C power station in West Yorkshire after a massive fire. Large cranes were set to move in to help engineers access the damaged Units 3 and 4 of the site. The fire, which broke out last Thursday, caused the partial collapse of a tower on the site but no-one was injured.

External cladding will be pulled from the affected structure on Wednesday, energy company SSE said. An SSE spokesman said: "Work has begun to fully assess the damage caused, and to examine the different options for repair." The assessment process - which is likely to be lengthy - will take place in stages. "The first stage will work to gain access to the affected structure and to remove external cladding. This will enable specialist engineers to fully assess the damage caused." At the fire's height, about 75 firefighters were brought in to tackle the 100ft (30m) high flames. Firefighters finally left the site on Monday, after four days tackling the blaze.

Group manager Martin Langan, of West Yorkshire Fire and Rescue Service, said: "Over the course of the weekend we maintained a scaled down presence at the site with a crew who monitored the building for signs of fire, as well as checking the temperature of the building with thermal imaging cameras." SSE said Unit 3 would not be operational until at least 1 November and Unit 4, where the fire started, would be out of action until 4 March at the earliest. For link see:-

<http://www.bbc.co.uk/news/uk-england-leeds-28674121>

Carbon dioxide 'sponge' could ease transition to cleaner energy

10th August 2014, unattributed, Science Daily

A sponge-like plastic that sops up the greenhouse gas carbon dioxide (CO₂) might ease our transition away from polluting fossil fuels and toward new energy sources, such as hydrogen. The material -- a relative of the plastics used in food containers -- could play a role in President Obama's plan to cut CO₂ emissions 30 percent by 2030, and could also be integrated into power plant smokestacks in the future. The report on the material is one of nearly 12,000 presentations at the 248th National Meeting & Exposition of the American Chemical Society (ACS), the world's largest scientific society, taking place here through Thursday.

"The key point is that this polymer is stable, it's cheap, and it adsorbs CO₂ extremely well. It's geared toward function in a real-world environment," says Andrew Cooper, Ph.D. "In a future landscape where fuel-cell technology is used, this adsorbent could work toward zero-emission technology."

CO₂ adsorbents are most commonly used to remove the greenhouse gas pollutant from smokestacks at power plants where fossil fuels like coal or gas are burned. However, Cooper and his team intend the adsorbent, a microporous organic polymer, for a different application - one that could lead to reduced pollution. For link see...

http://www.sciencedaily.com/releases/2014/08/140810124200.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

EU energy policy 'hampers UK firms'

13th August 2014, unattributed, The Courier.co.uk

The European Union's energy policy is not working and its rules have played an "increasing" role in "reducing Britain's industrial output and in destroying jobs" an independent business campaign group has warned. Rising energy costs threaten up to 1.5 million jobs in the energy intensive sector, with 363,000 of these jobs being at high risk, research by Business for Britain has claimed. EU energy regulations have cost the UK economy between £86.6 billion and £93.2 billion (net) so far, according to the group's research of Government Impact Assessments contained in its paper on EU energy policy.

The report entitled "Energy policy and the EU - How a better deal could bring down the cost of energy and save jobs", analysed the impact of recent EU energy laws and concluded the EU should devise one target for reducing emissions with member states free to determine their own policies to meet this target.

It found energy prices across the EU were among the highest in the developed world, with medium sized industrial consumers in the EU paying around 20% more for electricity than companies in China, approximately 65% more than companies in India and more than twice as much as companies based in the US and Russia. For more visit.....

<http://www.thecourier.co.uk/news/politics/eu-energy-policy-hampers-uk-firms-1.520243>

Cutting energy costs of brown coal CCS

13th August 2013, Richard Jansen, tce today

An Australian research group is planning to develop technology that could cut the energy needed to capture emissions from brown coal power plants by up to 40%.

Brown Coal Innovation Australia (BCIA) says it will spend A\$650,000 (US\$605,000) on the pilot project, which aims to cut down the so-called 'parasite' energy needed to run the carbon capture equipment. The project will be based in the Latrobe Valley in the Australian state of Victoria, which has the second-largest and cheapest brown coal resources in the world.

Using funding provided by national research organisation CSIRO it will spend two years testing a combination of liquid absorbents, new process designs and an advanced gas/liquid contactor. "The combination of these three aspects represents a significant step forward in post-combustion capture technology application for Victorian brown coal-fired power stations," says BCIA CEO Phil Gurney. For more visit.....

http://www.tcetoday.com/latest%20news/2014/august/cutting-energy-costs-of-brown-coal-ccs.aspx#.U_HJO_lDXfk

Coal generation down as Germany breaks yet another renewables record 13th August 2014, Jessica Shankleman, businessGreen

Renewable energy generators delivered 28 per cent of Germany's power production during the first half of this year, according to new figures, marking the latest milestone for the country as it continues its high-profile *Energiewende* low carbon transition.

Analysis by the Fraunhofer Institute for Solar Energy published this week reveals that wind and solar power projects significantly increased their levels of generation in the first half of 2014, compared with the same period last year, thanks to a combination of mild temperatures, high winds and increased capacity. For more see....

<http://www.businessgreen.com/bg/news/2360089/coal-generation-down-as-germany-breaks-yet-another-renewables-record>

Exporting U.S. coal to Asia could drop emissions 21 percent 19th August 2014, unattributed, Science Daily

Under the right scenario, exporting U.S. coal to power plants in South Korea could lead to a 21 percent drop in greenhouse gas emissions compared to burning it at less energy-efficient U.S. plants. Other emissions, including sulfur dioxide, nitrogen oxide and particulate matter, could also drop. But this success, researchers say, depends on which fuel source the coal replaces in South Korea, and which fuel is used to replace it in the U.S. For more visit.....

http://www.sciencedaily.com/releases/2014/08/140819113050.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29

UK lobbying to keep open one of Europe's dirtiest coal power stations 19th August 2014, Karl Mathiesen, The Guardian

The UK government is lobbying the European commission (EC) to keep open one of Europe's dirtiest coal power stations, even though its nitrogen oxide (NOx) emissions exceed new legal limits by five times.

The EC has begun infraction proceedings against the UK because its proposals for reducing emissions under new European laws have been littered with "inconsistent or missing" data. Aberthaw power plant in south Wales was named in the top 30 highest carbon-emitting plants in Europe by an alliance of NGOs last month. But its emissions of NOx, which causes respiratory problems and lung disease, are also extremely high.

The plant is specifically designed to burn coal from the local area, which is unusually difficult to ignite and needs a chemical catalyst added to make it burn. This process results in NOx emissions of around 1,000 mg/Nm³. The limit on NOx set by the European industrial emissions directive (IED) is 200 mg/Nm³. Under this new law, the 1,555MW plant would have to be shut down by 2016. For more visit.....

<http://www.theguardian.com/environment/2014/aug/19/uk-lobbying-to-keep-open-one-of-europes-dirtiest-coal-power-stations>

EPSRC new projects started after 1st September 2013

Conventional Generation & Combustion projects (Start date after 01.09.13)

Grant reference no	Title	Start date	End date	Organisation	Value
EP/K02115X/1	Development and Evaluation of Sustainable Technologies for Flexible Operation of Conventional Power Plants.	16/09/2013	15/09/2018	University of Durham	£1,944,440.55
EP/L505845/1	Oxy-hybrid Power Cycle with Advanced Heat Recovery Network	24/02/2014	23/02/2015	Cranfield University	£73,808.02

£2,018,248.57

CCS projects (Start date after 01.09.13)

Grant reference no	Title	Start date	End date	Organisation	Value
EP/K035878/1	DiSECCS: Diagnostic Seismic toolbox for the Efficient Control of CO2 Storage	11/09/2013	10/09/2016	NERC Grouped	£893,883.48
EP/K021869/1	Reducing uncertainty in predicting the risk of geological storage of CO2 - Improved geomechanical models and calibration using seismic data	01/10/2013	30/09/2018	University of Leeds	£1,013,147.39
EP/K036025/1	The impact of hydrocarbon depletion on the Treatment of cAprocks within performance assessment for CO2 Injection schemes - CONTAIN	01/10/2013	30/09/2017	NERC Grouped	£925,472.50
EP/K035355/1	Bio-inspired sulfide nanocatalysts: From proof of concept to 'real' catalysis	01/11/2013	31/10/2016	UCL	£1,086,896.93
EP/K035967/1	CO2 injection and storage - Short and long-term behaviour at different spatial scales	01/11/2013	28/02/2017	Imperial College London	£1,212,204.88
EP/L022958/1	Novel techniques for seabed monitoring of CO2 leakage and monitoring campaigns based on reservoir, cap rock and overburden migration models.	25/11/2013	24/11/2016	Scottish Association For Marine Science	£169,897.37
EP/K036033/1	Fingerprinting captured CO2 using natural tracers: Determining CO2 fate and proving ownership	01/12/2013	30/11/2015	University of Edinburgh	£236,177.98
EP/L020777/1	CO2 Post-Combustion Capture Using Amine Impregnated Synthetic Zeolites	01/01/2014	31/12/2016	University of Nottingham	£192,102.58
EP/L022427/1	Minerals for Sustainable COst and energy efficient chemical looping combustion Technology	01/01/2014	31/12/2015	University of Cambridge	£168,506.07
EP/L021064/1	Post-Combustion Carbon Capture Using MOFs: Materials and Process Development	28/03/2014	27/03/2016	University of Edinburgh	£197,691.39
EP/L016362/1	EPSRC Centre for Doctoral Training in Carbon Capture and Storage and Cleaner Fossil Energy	01/04/2014	30/09/2022	University of Nottingham	£3,452,111.63

EP/M001369/1	Multi-scale Energy Systems Modelling Encompassing Renewable, Intermittent, Stored Energy and Carbon Capture and Storage (MESMERISE-CCS)	01/10/2014	30/09/2018	Imperial College London	£996,574.36
EP/M001482/1	Selective Exhaust Gas Recirculation for Carbon Capture with Gas Turbines: Integration, Intensification, Scale-up and Optimisation.	01/10/2014	30/09/2017	Cardiff University	£1,099,891.32
EP/M001342/1	Organic Mixed Matrix Membrane Technologies (ORGMEMT) for Post-Combustion CO2 Capture	01/10/2014	30/09/2018	University of Liverpool	£826,848.14
EP/M001458/1	Process Intensification for Post-combustion Carbon Capture using Rotating Packed Bed through Systems Engineering Techniques	01/10/2014	31/03/2018	University of Hull	£1,274,436.61

£10,913,339.26

BIOENERGY projects (Start date after 01.09.13)

Grant reference no.	Title	Start date	End date	Organisation	Value
EP/K036734/1	Bioenergy value chains: Whole systems analysis and optimisation	01/09/2013	31/08/2017	Imperial College London	£1,560,085.72
EP/L002477/1	Energy from Rice Straw	01/09/2013	31/08/2016	University of Manchester	£660,826.65
EP/K036793/1	Increasing energy yield from the integration of anaerobic digestion and pyrolysis	30/09/2013	29/09/2016	Aston University	£901,123.35
EP/K036548/1	Development of fast pyrolysis based advanced biofuel technologies for biofuels	01/10/2013	30/09/2017	Cranfield University	£1,150,479.06
EP/L002639/1	Understanding the barriers to the introduction and uptake of clean/improved cook stoves in Southern Africa	01/10/2013	30/09/2016	University of Nottingham	£685,405.80
EP/K036750/1	Clean Energy Utilisation from Biogas and Biomass Gasification	21/10/2013	20/10/2016	Lancaster University	£487,679.52
EP/L505894/1	The Feasibility of Using Microwave Induced Plasma Torrefaction for the Production of an Energy Dense, Carbon Neutral Fuel from Wood Pellets	04/02/2014	03/02/2015	Liverpool John Moores University	£84,125.22
EP/L50581X/1	Light capture and processing technology for enhanced biofuel production by microalgae	31/03/2014	30/03/2015	University of St Andrews	£76,284.64
EP/L014912/1	EPSRC Centre for Doctoral Training in Bioenergy	01/10/2014	31/03/2023	University of Leeds	£4,336,514.11

£9,942,524.07

CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
Monday 15 th to Wednesday 17 th September 2014	10 th European Conference on Coal research & Its Applications (ECCRIA 10)	Business School, University of Hull	For further information on this Conference, please see the Conference website :- www.maggichurchosevents.co.uk/crf
Tuesday 30 th September 2014	The 2014 Coal Science Lecture Organised by the Biomass and Fossil Fuel Research Alliance, (BF2RA), with sponsorship from the Coal Research Forum, (CRF), to be presented by Dr. Nigel Burdett, Head of Environment of Drax Power Ltd.	The Chartered Accountants' Hall, 1, Moorgate Place, London, EC2R 6EA.	Mr. John Gardner, Gardner Brown Chartered Accountants, Calderwood House, 7 Montpellier Parade, Cheltenham, GL50 1UA. Tel : 01242-224886. Fax : 01242-577116. E-mail : john@gardnerbrown.co.uk
5 th to 9 th October 2014	12th International conference on greenhouse gas control technologies: GHGT-12	Austin, TX, USA	Sian Twining, IEAGHG, Orchard Business Centre, Stoke Orchard, Cheltenham, Gloucestershire GL52 7RZ, UK Tel: +44 1242 680753 Fax: +44 1242 680758 Email: sian@ieaghg.org Internet: ghgt.info/index.php/Content-GHGT12/ghgt-12-overview.html
6 th to 9 th October 2014	2014 International Pittsburgh Coal Conference	David L. Lawrence Convention Center in Pittsburgh, PA.	For details visit: http://www.engineering.pitt.edu/PCC.aspx?id=2147488856
14 th to 15 th October 2014	EUROCOALASH 2014	Munich, Germany	For details please see http://www.vgb.org/eurocoalash2014.html or http://www.ecoba.com/eurocoalash.html
4 th to 6 th November 2014	4 th IEA CCC Workshop on Co-firing Biomass with Coal	Nittany Lion Inn, State College, Pennsylvania, USA.	For details visit: http://cofiring4.coalconferences.org/ibis/cofiring4/home
Wednesday 15 th April 2015	"Underground Coal Gasification, (UCG)" Coal Research Forum Annual Meeting and Coal Conversion Divisional seminar	University of Leeds	Prof. John W. Patrick Chairman of the CRF Coal Conversion Division Tel : 0115-951-4175 E-mail : john.patrick@nottingham.ac.uk
9 th to 11 th June 2015	Power-Gen Europe & Renewable Energy World Europe 2015	Amsterdam, Netherlands	For details visit:- http://s36.a2zinc.net/clients/pennwell/PGE2015/Public/Content.aspx?ID=41884&_ga=1.218674649.1157970709.1408389995
September 2015	"The Control of Mercury and Trace Element Emissions" Coal Research Forum Environment Divisional seminar	Imperial College, London	Dr. Bill Nimmo Chairman of the CRF Environment Division Tel : 0113-343-2513 E-mail : w.nimmo@leeds.ac.uk