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NEWSLETTER



*of
the
Coal Research Forum*

EDITOR'S MUSINGS:

Thanks for having a read of the second newsletter of 2015 - at least this is not about the General Election! At the moment this is all the media seems interested in, but thankfully by the time this edition hits the streets it will all be over, at least I hope it will be! I am sure even the politicians are getting bored with repeating the same messages. And how can we really believe what they tell us? For the uncommitted it seems very difficult to make an informed choice as to who to vote for. I must say that I haven't heard too much from the political parties about energy policy and the future of our energy resources (except from the Greens). Maybe I have missed it but given that the parties have radically different views on energy priorities and with the likelihood of a hung parliament maybe the already unclear future for our energy policy will stay that way – at least for some time to come.

The next CRF conference is in the early stages of planning and will be held at the Edge which is part of the University of Sheffield from the 5th to the 7th September 2016. Further details including all of the important deadlines will be available as an electronic flyer or via the CRF e-mail shots or the CRF newsletter.

The AGM of the Forum took place on April 15th at the University of Leeds and a report of the accompanying seminar held by the Coal Conversion Division on Underground Coal Gasification is included in this newsletter.

The latest status of the BF2RA and its project reports is also presented.

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Student Bursaries for 2015-2016

Travel and subsistence bursaries for up to £300 are on offer to bona-fide full-time students who wish to attend appropriate National and International coal-related conferences, (please see the Calendar of Coal Research Events for details of future conferences), and whose supervisor is a member of the Coal Research Forum. To apply, please send the abstract submitted to the conference with a brief supporting letter from your supervisor together with details of the expected expenditure and other sources of funding applied for, to:

Prof. J.W. Patrick,
Dept. of Chemical and Environmental Engineering,
Faculty of Engineering,
The University of Nottingham,
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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, this report will provide some brief details of the beneficiary, their topic of study and the reasons for wishing to attend the conference. Potential applicants should see the template for these reports on the CRF website, www.coalresearchforum.org, where such reports must comply with these requirements.

Please note that these bursaries are only for travel and subsistence to attend the conference, (i.e. not for conference or other fees). In addition, priority will be given to applicants who will be attending the whole of a conference rather than one day of a multi-day event and will be using the conference accommodation provided should this be required. It may not be possible to fund all applications for bursaries or meet the request in full as this will depend on the funds available at the time.

Preliminary notice of 11th European Conference on Coal Research and Its Applications

The next ECCRIA conference, number 11, has been arranged to take place at the University of Sheffield over three days starting on Monday 5th to Wednesday 7th September 2016. The organising committee has been agreed and specific venues have been identified. The call for abstracts is expected to be circulated by the time this newsletter is produced and the first key deadline for the submission of abstracts is 29th January 2016. Further key dates will be made known in the Call for Abstracts.

Report of 26th Annual Meeting and Meeting of the Coal Conversion Division 15th April 2015 University of Leeds

The 26th Annual Meeting of the Coal Research Forum was held in conjunction with a Coal Conversion Divisional meeting in the Engineering, (Houldsworth), Building of the University of Leeds. The format chosen was to hold the Annual Meeting at lunch time preceded and followed by a series of technical sessions.

The attendees were welcomed by Professor Alan Williams who, as urgent BF2RA duties called, then swiftly handed over to Dr Bill Nimmo to introduce the sessions. Session 1 of the Coal Conversion meeting was chaired by Professor John Patrick of the University of Nottingham and was entitled "Underground Coal Gasification".

The first paper was given by Dr. Lesley Sloss of the IEA Clean Coal Centre and was entitled "Underground Coal Gasification, the Present and the Future". Lesley began by briefly outlining the set up at the IEA Clean Coal Centre and explained that the organisation was neither pro or anti UCG – it simply reports the facts. The talk was structured to describe current and future energy paths, the drivers for clean coal and where UCG could fit into this scenario. Lesley admitted that she was not an expert in UCG and referred those in need of a detailed background to the 'bible' written by Gordon Couch in 2009 – IEA Report CCC151.

Lesley showed that although world energy demand is rising, electricity consumption in the non-OECD countries is rising at an incredible rate. The challenge is that although developed regions are focusing on energy efficiency and CO₂ reduction there still remain 1.3 billion people without electricity and 2.6 billion who lack clean cooking facilities even though they have potential access to coal. What emerging regions really need is investment in clean and affordable energy. Fossil fuel reserves are higher than many people realise with proven reserves for coal of 142 years, gas of 61 years and oil of 54 years.

[450 Scenario: A scenario presented in the World Energy Outlook that sets out an energy pathway consistent with the goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO₂.]

Lesley then showed a slide which outlined the increase in primary energy demand and CO₂ emissions with time. This showed a significant divergence away from the 450 Scenario meaning that the 2°C increase would not be met.

The concept of HELE technology (High Efficiency Low Emission) was then introduced. This involves high efficiency ultra and supercritical and gasification processes, state-of-the-art flue gas cleaning and CCS. Lesley indicated that HELE technology was almost available at this time but was not cheap. The Isogo Thermal Power plant in Japan, with an efficiency of ~47%, was illustrated to show what is achievable.

Legislation is taking place throughout most of the world to lower emission limits but it is proceeding at different rates. Legislation appears to be linked to the amount of energy used with high users such as Europe having the most demanding emission limits. The trend in OECD coal plants is towards efficient particulate control systems with >90% sulphur control and >80% nitrogen oxide control. Coal plants must either meet new emission limit values, must trade within bubbles, must switch fuels or must close and many coal plants in Europe and the USA are being phased out. In the EU, North America, Japan and China, coal plants which wish to continue operating into the next decade must be clean and efficient. Despite coal being "cheap", maintaining a compliant coal plant is becoming expensive and some older plants do not merit the investment to remain open. New plants must meet even stricter emission limits including, in some regions, either efficiency standards or CO₂ limits.

The current average for CO₂ emissions for coal plants is >900 kg/MWh. The proposed CO₂ limits for new build coal plants vary as follows:- European Investment Bank target (above which funding will not be given) 550 kg/MWh; USA 500 kg/MWh (1,100 lbs/MWh); Europe 500/450 kg/MWh and Canada 420 kg/MWh.

Lesley then showed data comparing the cost of a variety of clean coal options including nuclear, IGCC and others which indicated that UCG with CCS for a 350MW CCGT was the lowest cost option.

Getting funding is challenging and last year the World Bank announced a new directive to limit financing of coal-fired power plants to "rare circumstances" (although this may be reviewed). Similar policies issued by the Obama Administration have sought to prevent investments into coal-fired power plants by the Treasury Department and the Export-Import Bank, but South Africa alone has some 30 billion tonnes of coal reserves. Zimbabwe has another 500 million

tonnes. Tanzania and other countries also have plentiful coal resources. So what is the future for coal? In the developed world, the challenge is compliance - methods of coal combustion will need to change to meet HELE requirements to remain part of the future energy mix. In the emerging world, the challenge is more often funding and accessibility.

Does this mean that UCG may be a means of moving coal into the "healthier" gas market? Data was presented which showed UCG can be cleaner than conventional coal so it is possible although there is opposition, albeit often ill-informed, to UCG in much of the media.

Lesley posed the question "Can UCG be seen as a HELE option?" IEA comments are that UCG using state-of-the-art gas turbines could approach the efficiencies achieved by IGCC (up to 45% or more); UCG might offer a relatively simple and low-cost way of storing CO₂ and given favourable geological conditions CO₂ from reacted syngas could be stored underground in the cavities created by the UCG process.

A number of new developments have been announced including Linc Energy (MoU) for a 400 MW UCG project in Tanzania to provide power to the Tanzanian electricity grid by 2017 (announced 6th Aug 2014). On the 4th August 2014, it was announced that the Indian Government are preparing a draft policy on UCG. Several coal blocks have been identified for UCG purpose for government companies in the state and the applications for the same have been invited. New projects in the UK involve Cluff Natural Resources who currently has a 100% working interest in nine UCG licences in the UK covering a total of 690 km². This includes sites in the Dee Estuary, Kincardine, Durham and Maryport. Five Quarters are also investing in a UCG portfolio.

The potential markets for UCG in the UK includes feedstock for petrochemical industry; primary electricity generation (CCGT); fuel gas for energy intensive industry; gas-to-liquids processes; fuel for the Hydrogen economy and fertilizer (ammonia) and methanol production which will offset natural gas use.

Lesley closed her very interesting talk by summarising the challenges for UCG. These were obtaining funding towards commercialisation, proving its potential as an unconventional gas source; an improved media and public perception and finally proof of CCS potential and inclusion as a HELE option.

The next presentation was by Dr. Michael Green, UCG Engineering Ltd., who spoke about "UCG: Practical Experience with UCG Trials". Michael reviewed the major developments in UCG starting from the early Russian work of the 1930's through the continuing work in the USSR into the 1960's and 70s. Michael explained how technological innovations had improved the gasification process over the years and how following the US trials in the 1970's to 90's programme the EU embarked on its own programme. The success of the El Tremedal project in Spain, which ran from 1991 until 1997 and in which Michael had a major role, was also described. Many projects were discontinued due to physical challenges such as the depth or characteristics of the coal and the relative inexperience with the technology. Others closed simply due to the economics, with the drop in natural gas prices making some US projects no longer financially viable.

Currently there are activities ongoing in Europe with the EU funding the HUGE project at the Barbara mine in Poland as well as the TOPS project in Bulgaria, the latter aiming to combine UCG with CCS. BHP is currently a co-funder of the new Africary project in South Africa and Shemna Industries in China is claiming success with the SinoCoking Ltd syngas project. Mike seemed somewhat sceptical at the quantity of gas which the SinoCoking claim to have produced since the project started. Michael then closed his talk by expressing optimism for the new UCG projects being developed by CNR and Five-Quarters in the UK and listed what he regarded as the current leading UCG projects:

Linc Energy in Wyoming, USA; Carbon Energy in Queensland, Australia; SinoCoking in China; KHW in Poland; Eskom (Majuba) in South Africa; ENN Xinao Group in China and Yerotzigas in Uzbekistan

"The Commercialisation of UCG" was the topic of the next presentation which was given by Dr. Dermot Roddy of Five-Quarter Energy Holdings Ltd. Dermot began by outlining the scale of the UK opportunity for UCG with 10,000 billion tonnes of sub-sea coal being located under the North Sea. The scale of the global opportunities for coal, shale gas and tight gas was also highlighted.

[Tight gas is natural gas produced from reservoir rocks with such low permeability that massive hydraulic fracturing is necessary to produce the well at economic rates. Tight gas reservoirs are generally defined as having less than 0.1 millidarcy (mD) matrix permeability and less than ten percent matrix porosity].

A number of options need to be borne in mind before commercialisation of UCG is implemented. Firstly, should the manufacture of syngas for chemicals be the desired route and if so which sector from the many available should be chosen? Secondly, what business niche is the developer looking at? Would they be an owner-operator with a few assets, an international licensor of technology, a roving consultancy or some combination of all of them? Thirdly, does the developer have access to the right type of coal in order to produce the syngas of choice? From a company perspective, does the developer have a competitive edge and, if so, what is it and is it protected?

Dermot then discussed demonstrator projects. These very expensive exercises but they are necessary to show that you have the right coal for the job, to demonstrate that your competitive edge is real, to gather data needed for designing the commercial-scale plant and to win the confidence of investors, customers, regulators & communities. It needs to be recognised that raising money to build a plant that is not designed to make money is hard work!

The scale of investment and risk needs very careful scrutiny as global variations can affect the viability or otherwise of gasification plant. For example, in the US the cost of shale gas is six times lower than in Asia leading to a marked difference in ethylene cost (\$316 per ton compared with, \$1,717 per ton).

Two options for UCG were mooted; the so-called gas-to-wire concept where the gas produced is burnt in a system to generate electricity directly and as a fuel in an IGCC plant. The gas-to-wire concept would require agreements on the mode of running and power purchase.

A vital task in any development is the PR aspects of UCG. Concerns amongst the public include noise and nuisance, effect on aquifers, seismicity, gas explosions, wildfire, metal and organic substances and pollution migration and leaks. The degree of interrogation will increase as the larger the scale of the testing.

Key to the successful development of new UCG plant is the successful demonstration of CCS and Dermot presented a timeline which showed that by 2025, 20 million tonnes of CO₂ could be stored underground.

Greenhouse gas issues need to be addressed by the would-be developer of commercial scale UCG. Questions such as what percentage of CO₂ will be captured from your raw syngas? Starting from when and where will it be stored? Who is accountable for the CO₂ storage facilities? Are they mandatory or voluntary? What about GHG emissions arising in the gas processing plant itself? What is the carbon footprint of your utility supplies e.g. electricity for the ASU? What about GHG emissions during construction? More widely, what is the fate of CO₂ arising from use of the gases that you sell to others? Some may wish to draw the boundary

much wider than your facility and compare them with alternative routes to various end products from different raw materials.

Dermot then drew his presentation to a close with a summary of CO2 utilisation options, not capture, Safety, Health and Environment management considerations and an investment overview.

The next speaker was Mr. Tom Smyth, of the UK Government's Department of Business, Innovation and Skill who provided an insight into "UCG – Current UK Policy and Opportunities for Growth". As at the time of the meeting Parliament had been dissolved prior to the General Election and so Tom had had to remove all sensitive reference from his presentation. Tom first slide showed the industrial strategy of the UK Government where it attempts to provide a long-term approach to support business confidence and growth. One of the strands of this support was via Strategic Sector partnerships of which the one most relevant to UCG was the Chemical Growth Strategy.

[The Chemistry Growth Partnership (CGP) will enable Government and industry to work together over the long term to address the key challenges and opportunities for the chemical sector. The Partnership comprising business leaders from the chemical sector has agreed to pursue key work themes around energy, innovation and supply chains in order to achieve its vision of a 50 per cent growth by the year 2030.]

Deep coal mining in the UK will cease in 2017 with the closure of the remaining three mines although some surface mining will continue. However, there is a potentially significant role for coal to play in the future as a replacement for expensive naphtha which is derived from the extraction of oil. Steam cracking of naphtha is used to produce a vast array of chemicals but the feedstock is expensive, supply is insecure and carbon emissions are an issue. The growing market for chemicals could be supplied by exploitation of syngas from UCG (unconventional gas), or biofuels and wastes. This would reduce the energy costs and provide a cheaper feedstock and a more secure supply chain. Tom concluded his talk by showing how the creation of a new ethane cracker in the US provided a huge boost to the local business environment and produce significant profits in the future.

The closing talk before lunch was given by Mr Kenneth Fergusson, a member of the UCG Association, and was entitled "UCG versus Shale Gas: Chalk and Cheese". Ken, who was Chief Executive of The Coal Authority until his retirement in 2001, was able to give us the benefit of his experience in the field of coal-related developments in the UK over many years. He began by comparing the forecast UK generating costs of various power generation options. The cost had been generated in 2009 but Ken had found them to be little changed since then. For new fossil-fuel stations the cost of CCS was included Figures obtained are as follows:-

Offshore wind	£140 – 170/MWh
Onshore wind	£80 – 100/MWh
New nuclear	£93/MWh
Clean coal (combustion)	£110/MWh
Coal gasification (IGCC)	£110/MWh
Existing CCGT (No CCS)	£60 – 100/MWh
New CCGT + CCS	£90 - 110/MWh
UCG + CCS	£70/MWh (cost of coal not included)

So what about the costs of UCG in 2015? In 2010, the cost of generating power in the UK on a CCGT fed with UCG gas, including CCS, was calculated as £66/MWh (using the methodology of the Mott Macdonald report for DECC, June 2010, comparing a wide range of power generation methods). Today, that figure may have inflated to around £70/MWh. Note that no cost of coal (royalty) is included. UK bulk power prices have risen from £40/MWh to £50/MWh and may yet continue to rise. However, none of the forecast clean generation costs except UCG comes close to maintaining this.

According to Ken, the scope for UCG in the UK is clear. In common with many European countries, UK is facing a crisis of shortage of generation capacity and increase in generation costs. Coal has been the lowest-cost source of power, but coal burning has been coming under increasing environmental pressure. Even so there remain enormous resources of coal in Britain. No other generation method, not even prolific shale gas, can match the expected cost of power generated from UCG gas.

Ken then moved on to the main theme of his talk, the difference between UCG and shale gas. There are six areas of significant differences; composition of gas, CO₂ removal, economics, environment, licensing and area required.

Regarding gas composition, raw syngas is typically 20 – 40% CO₂, plus CH₄, CO and H₂, with CV about one-third that of natural gas. By scrubbing out this CO₂, the CV increases to about half that of natural gas. CH₄ and CO can be reformed to CO₂ plus H₂. By removing all of the CO₂ the residual fuel gas is essentially H₂. Syngas is not readily convertible to pipeline-specification natural gas equivalent; however shale gas, in contrast, is marketable as conventional natural gas.

It should be realised that burning UCG syngas in the UK required carbon capture. The UCG wellhead pressure is typically above 30 bars and its high CO₂ content allows the use of physical rather than chemical absorbents. The cost of CO₂ capture and storage from UCG is calculated at less than \$30/t carbon or \$14/t CO₂, much lower than has been reported for other systems. The cost of flue gas scrubbing from shale gas can be five times greater than for UCG syngas. Shale gas could be reformed and CO₂-scrubbed before combustion but would be expensive.

In economic terms the cost of shale gas is probably not likely to undercut UCG. Shale gas in the UK is forecast to cost around the same as the present cost of natural gas and may be burnt initially without CCS but not in the medium to long term.

Environmental differences between UCG and shale gas are very clear-cut. UCG requires the strata and groundwater to be undisturbed and gas-tight. Unlike fracking it does not entail fracturing or pumping water out or chemicals into boreholes.

Separate licensing regimes apply in the UK for the extraction of shale gas or for UCG development and both cannot be worked in practice in the same location.

The energy produced by UCG per sq km of licensed area is an order of magnitude, even orders of magnitude, higher with UCG than with shale gas, depending on the number of coal seams accessible. The comparison is analogous to coal bed methane (CBM) where a given block of coal will produce about 20 times as much energy by UCG compared to CBM.

Ken then showed a map of areas in England and Wales where UCG licenses had been granted.

To summarise his presentation Ken concluded by saying that compared with other available means of power generation, UCG offers the likelihood of being a major, affordable, clean, domestic energy source. Furthermore, UCG does not justify the “reading-across” of objections raised to shale gas.

The technical sessions resumed after a very pleasant lunch with the afternoon programme being chaired by Dr Dermot Roddy of Five Quarter Energy Holdings Ltd.

The afternoon session was opened by Dr. Yong Sheng of the Department of Civil Engineering at the University of Leeds who described some of his groups work on “Modelling of the Geo-mechanical Response of UCG Operation”. The research described by Dr Sheng was performed as part of a project entitled “Study of deep underground coal gasification and the permanent

storage of CO₂ in the affected areas" - acronym UCG&CO₂ STORAGE which was funded by the RFCS and of which the University of Leeds was one partner in a consortium.

The main subject of the UCG&CO₂ STORAGE project was to evaluate the potential of deep lying coal seams (>1200m, like those of Bulgarian Dobrudzha Coal Deposit (DCD)) for the development of UCG and the subsequent sequestration of CO₂ in the affected areas (e.g. the abandoned UCG cavity itself, the adjacent stressed coal or the overlying/underlying strata) by using the same borehole infrastructure. The key objectives were to investigate the factors that determine the technical suitability and environmental, and economic feasibility of the scheme, and demonstrate that the deep lying coal fields of the target area (DCD, and elsewhere), have the potential for deep UCG and are suitable for both energy production and CO₂ storage, using the same drilling infrastructure.

The task of Dr Sheng's group included 3D coupled thermal-mechanical modelling of cavity growth and surface subsidence. The team were able to model the growth of the cavity and the stress levels under ignition conditions from one to three days. The coal in this area was subjected to significant levels of geological faulting and the team were able to measure the stress at the distribution of the fault and bed of the coal seam.

One of the project tasks for the Leeds team was to develop a basic numerical model to couple geotechnical and thermal modelling based on simplified geo-mechanical and thermal conditions for the prediction of UCG cavity growth using software called ABAQUS. The derived model was used to assess the level of risk of the product gas migrating through geologic faults and fractures. Data was also able to assess the likelihood of roof collapse. One of the main results was to provide site selection criteria for safe UCG operation. This included recommendations on coal seam thickness, distance to the overlying water-bearing unit, coal aquifer characteristics, proximity to faults, geotechnical strata properties, and available coal resources, number of seams to be gasified and gross calorific value of coal.

Washing to cool and prepare the UCG cavity for receiving CO₂ was also modelled. When injecting CO₂ into a UCG cavity the injection pressure must exceed the hydrostatic pressures in order to displace cavity water. This will prompt a number of geo-mechanical responses, such as fracture dilation, crustal uplift, and will potentially induce fracture. This risk may be accentuated by the collapse of the cavity roof or walls. To assess these potential effects valid geo-mechanical models for stress and rock deformation are required, as are coupled geo-mechanical/fluid-flow simulators. Work has been done to address these issues and some progress has been made but a number of modelling challenges still remain to be solved.

Mr. Juan Alvarez-Vazquez of the University of Glasgow then described his work on "Thermo-chemical Modelling of UCG". Juan was able to show a series of animations which simulated the changes which take place during the gasification of a coal seam. It is based on known chemical and physical transformations and showed cavity growth, heat and gas profile changes and char formation over a period of time. The animations were convincing especially when considering the complexity of the modelling process and the difficulty in validating the simulations.

Dr. Vasilis Sarhosis of Cardiff University's SEREN (Sustainable Energy Earth) project gave a talk on UCG Developments in Wales. The project is supported by two other Welsh universities, some local industries and the British Geological Society. The main aims of the project are to make Wales self-sufficient in energy and to provide an economic renewal strategy for Wales. Project work packages were based on UCG, ground source heat and carbon sequestration in coal and soil.

There are large coal resources in the South Wales Coalfield which are suitable for exploitation by UCG and amount to 220MT. The rank of the South Wales coal field shows a variation from sub-bituminous to anthracite. Deep UCG licence have been granted in South Wales although the heavy faulting in the seams gives some cause for concern. Another hazard is the existence of

previous coal workings not all of which have been documented. Additional challenges include overcoming opposition to the plans by the local population and establishing the legal framework for UCG projects under national and regional regulations.

The universities are supporting the project with the production of models and assessment toolkits. Exploratory drill hole work has commenced at several sites in the south of Wales to help characterise the coal and also to evaluate the quality of water in the region. A semi-commercial trial in a 600 x 600 coal block is planned as part of the EU MEGA project.

The final presentation was given by Mr. Ben Roullier of the University of Nottingham on "Modelling the Environmental Impact of UCG". Ben described the model being developed to predict surface subsidence, groundwater contamination and groundwater depletion simultaneously. It aims to have applicability to operate over a range of scales and gasifier designs, operate on a non site-specific basis and be quick to run. The model combines two areas – mechanical and fluid parameters are considered together. The model has been run but is difficult to validate as actual real time data is difficult to obtain. The initial results have been promising but further work is needed to improve and refine the model.

Report on the RSC Energy Sector's Early Career Chemists Symposium 2014

The Third Energy Sector Early Career Chemists' symposium (after the highly successful meetings held at Cranfield University and UKERC, London in 2012 and 2013 respectively) was held at the Rolls-Royce Learning and Development Centre, Derby, on February 6th 2015.

The meeting, which attracted about 40 delegates from academia and industry, was attended by Alan Thompson on behalf of the Coal Research Forum. The CRF had agreed to provide up to three prizes of £100 each to presenters who were working in the area of fossil fuels.

The event was open to all chemists working in the energy area in the early stages of their careers. This included industrial chemists, academic researchers, post-graduates, undergraduate students and those with a background in chemistry but no longer working directly in the field.

The attendees were welcomed by Richard Wain, the local Rolls Royce contact who then introduced the keynote speaker Paul Stein the Chief Scientific Officer of Rolls Royce. Paul gave a very interesting review of the present state of global energy technology with particular reference to Rolls Royce and with an eye on future developments.

Two winners from the previous year, Alexander Kilpatrick from the University of Sussex, (winner of Early Career Poster Presentation) described how his career had progressed over the last year as did Alissa Cotton who had won the Energy Sector PhD prize for 2014.

There followed flash presentations from 22 of the short-listed poster presenters. This is quite a daunting prospect for many, as two minutes only is allowed and the time keeping was rigorously adhered to. Most did very well but key lessons to be learnt, I felt from my perspective were, keep the number of slides small and don't try to give too much detail but make sure you use up all of your available time.

During lunch the 22 posters were inspected and a judging panel of Stuart Norman, Anna Bonne, Stephen Preece and Alan Thompson awarded a score for each poster. The panel's task was made all the more difficult by the very high quality of all of the posters and flash presentations – and eventually came to a decision as to who would win the prizes. The prizes were awarded as follows: 1st Prize: Jo Humphrey, University of Bristol; 2nd Prize: Dr Emma Goosey, MTG Research Ltd/University of Leicester and joint 3rd Prizes: Sean Goodwin, University of Nottingham, Adam McCloy, University of Huddersfield, and Daniel Reid, University of Surrey.

Although the range of energy-related topics was extensive, the number of fossil fuel- related posters was small. As a result only a single CRF prize of £100 was awarded which went to Marco Facciotti from the University of Southampton whose poster was entitled “How can chemistry help National Grid to keep our lights on? A surface chemistry investigation on the anti-corrosion additive Irgamet™ 39”.

The remainder of the afternoon involved presentations from industry from Mr Stephen Preece, Chief Chemist at EDF Energy and Professor Upul Wijayantha from Loughborough University.

Following the awards the event was followed by an interesting visit to the Rolls Royce Heritage Collection.

World Coal Association calls for greater investment in cleaner coal technologies

13 February 2015 London

The World Coal Association (“WCA”) today called for greater investment in cleaner coal technologies, in order to meet growing global energy demand and reduce CO₂ emissions. Coal plays a vital role in society by providing over 40% of global electricity and as an indispensable ingredient in modern infrastructure. The International Energy Agency’s forecasts show that coal use is set to grow by around 17% in the next twenty years. With 1.3 billion people globally without access to electricity, it is clear all sources of energy will be needed to meet this demand, including coal. Greater investment is needed in cleaner coal technology to meet global energy demand, alleviate energy poverty and minimise CO₂ emissions.

Technologies such as high efficiency, low emissions (HELE) coal plants and carbon capture, use and storage (CCUS), can make a significant contribution to reducing global CO₂ emissions as part of the energy mix. Benjamin Sporton, WCA’s Acting Chief Executive, stated: “The WCA recognises the vital role that all low emission technologies can play and has created a global Platform for Accelerating Coal Efficiency (PACE) to promote adoption of these technologies. PACE’s vision is for the most efficient power plant technology possible to be deployed when coal plants are built. PACE’s objective is to raise the global average efficiency of coal-fired power plants and so minimise CO₂ emissions, whilst maintaining legitimate economic development and poverty alleviation efforts.” Increasing the average efficiency of the global coal fleet from the current level of 33% to 40% can be done with off-the-shelf technology that is currently available. This would make a significant contribution to global efforts, saving around 2 gigatonnes of CO₂ annually – roughly equivalent to India’s total annual emissions. Furthermore, CCUS technology is also a reality, as evidenced by the Boundary Dam coal fired power station in Canada. This pioneering project will reduce greenhouse gas emissions by one million tonnes of CO₂ annually, the equivalent to taking more than 250,000 cars off the road each year. Benjamin Sporton, stated: “Calls for divestment ignore the global role played by coal and the potential offered by HELE and CCUS technologies. It is essential that responsible investors actively engage with the coal industry. All low emission technologies are needed to meet climate targets. We cannot meet our energy needs, tackle energy poverty and reduce global emissions without utilising all options available to us, including low emissions coal.”

Source:- <http://www.worldcoal.org/>

Invest in coal: It's the answer, not the problem

By Frank Clemente, PhD.

Energy from fossil fuels is the lifeblood of modern society. Coal, oil and natural gas provide 85 percent of our energy and support an ever improving quality of life for billions across the world. Nevertheless, there is movement afoot to demand that universities and other institutions divest their financial holdings in fossil fuels. On February 13th, protesters held a “Global Divestment Day” on college campuses. Although there is enough misleading information from this group to go around, the most vitriolic of their attacks are against coal, particularly coal power plants. Since the responsibility of a University is to provide education, students and faculty should be

given a "cheat sheet" on why they should support coal if they truly seek a better world. Clean coal is the fuel of the future. The protestors apparently are unaware of the environmental benefits of new clean coal technologies as well as the rising tide of population growth; urbanization and energy demand that is sweeping developing nations. As a university Professor for over 30 years I can attest that campus rhetoric never produced one single kilowatt hour of electricity.

There are now 7.2 billion people and in the next generation the global population will grow to at least 9.6 billion and perhaps reach 11 billion. Energy demand will increase more than 50% and coal will be the continuing cornerstone of supply. Why is coal the world's fastest-growing major fuel in the 21st Century? It's not complicated. Coal is abundant, widely distributed, affordable, versatile and the scalable answer to not only improving the human condition but the physical environment as well. There is no substitute for coal. To replace the world's coal power plants would require: 100% of global natural gas production or 5,000 Hoover Dams or a nuclear power plant every four days for the next 25 years.

Coal provides 40 percent of electricity, the foundation of modern society. Electricity means life. But over two billion have inadequate access to electricity and another 1.3 billion have none at all. Almost three billion people use primitive stoves to burn biomass, wood, charcoal and animal dung, thereby be releasing dense black soot into their homes and the environment. Annual deaths from this household air pollution exceed four million per year, one every eight seconds. The gathering and burning of wood and other biomass leads to deforestation, erosion, land degradation and contaminated water supplies.

Electricity from coal is the solution to the human and ecological damage of this energy poverty. Global coal reserves approach one billion tons, are distributed across 70 countries and are accessible through an established and far reaching infrastructure to produce and deliver electricity. By 2030, 60 percent of the world's population will be urbanized. Coal is crucial to high volume production of electricity, steel and cement - the building blocks of cities. Urbanization protects the natural environment, getting billions off the land, allowing a flourishing biosphere, protecting watersheds and permitting greater agricultural production.

Coal is the environmental solution as well. Clean coal technologies work, as has been well demonstrated in the United States where coal based electricity has increased 125 percent since 1970 while key regulated criteria emissions per kWh decreased 90 percent. New pulverized coal combustion systems, utilizing supercritical technology achieve much higher efficiencies and globally emit almost 40 percent less CO₂ than traditional plants. That's why over 500 of these supercritical units are now operating or being constructed. Importantly, these advanced plants are precursors to development of carbon capture, utilization and storage (CCUS), which itself is broadly recognized as a prerequisite to meeting climate policy goals.

These marchers are behind the global curve. Technological and demographic realities have passed them by. The question is not whether the world will use more coal, but rather how that coal will be used. In a world closing on a population of 10 billion people, the power of coal will not be denied. The road to sustainable energy, a better environment and poverty eradication will be paved by clean coal.

Source:- http://www.power-eng.com/blogs/power-points/2015/02/invest_in_coal_its.html

Newsletters from other organisations

IEA Clean Coal Centre - Newsletter 86 - February 2015

http://www.iea-coal.org.uk/publishor/system/component_view.asp?LogDocId=83559&PhyDocId=9234

Bettercoal Newsletter April 2105

<http://us5.campaign-archive2.com/?u=7397767cb3326719da6e6ec38&id=08a881a5a6&e=ab51fab9b>

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.

Smart money is on storing energy, not carbon, says economist

8th January 2015, John Quiggin, Phys.Org.News

The question of whether the future will be powered by coal and oil or by renewable energy is crucially important, both to the medium-term future of the Australian economy and to the long-term future of the planet. For either to succeed there is a storage problem to overcome.

A future based on "clean coal" can only be achieved through the large-scale implementation of carbon capture and storage (CCS). That is, the [carbon dioxide](#) generated by [fossil fuels](#) must be captured at the point of combustion and then stored indefinitely in underground repositories, or perhaps in biomass such as trees.

For more visit:- <http://phys.org/news/2015-01-smart-money-energy-carbon-economist.html>

What would it take to slow global warming? Gigatonnes of restraint

9th January 2015, Michael Casey, CBS News

Imagine a world where coal is all but banned and the use of gas to fuel economies from China to the United States has been severely curtailed. Sound like science fiction? It's actually the latest projections from a Nature study out this week on what the world needs to keep global temperatures from rising more than 2 degrees C (3.6 degrees F) over what they were in pre-industrial times.

That's the goal that global leaders are expected to agree to when they meet in Paris later this year to sign a deal limiting greenhouse gas emissions starting in 2020. To have a 50 percent chance of achieving this, and thereby ensure the world averts the worst impacts of climate change, such as widespread droughts, heat waves and flooding, the study's authors Christophe McGlade and Paul Ekins, of the University College London, said cumulative emissions would have to be limited to 1,100 gigatonnes of carbon dioxide.

To make this happen, the authors said the world must take some drastic steps in the next four decades. It would have to keep 82 percent of coal reserves, half of the gas reserves and a third of oil in the ground. Geographically, that would mean the United States couldn't exploit 92 percent of its coal reserves while China and India couldn't tap 63 percent of their gas reserves.

While acknowledging this would have "profound implications for the future utilization of oil, gas and coal," the authors didn't touch on how economies especially in the developing world can transition away from their heavy dependence especially on coal. India and China, especially, have shown no inclination to give up coal in the near future.

They also don't get into what would replace fossil fuels. Previous reports, including one from the [United Nations' Intergovernmental Panel on Climate Change](#) last year, called for a shift away from fossil fuels to [renewable energy](#), nuclear power and technologies that capture carbon dioxide emissions. The U.N. report also said there should be increased investment in energy efficiency in order to reduce emission to near zero by 2100.

Source :-

<http://www.cbsnews.com/news/what-would-it-take-to-slow-global-warming-gigatonnes-of-restraint/>

North Korean coal exports generate \$1 billion a year

9th January 2015, unattributed, nk News Org

North Korea's coal exports remained relatively constant over the course of 2014, and were North Korea's most valuable export between January and November last year, according to official data from Chinese customs. In terms of volumes, North Korea shipped on average 1.2 million tons a month, generating over a billion U.S. dollars over the course of 2014 and nearly \$5 billion since 2011.

"I think coal is their most valuable single export commodity to China – at least so far as the customs statistics tell us" David Von Hippel, a senior associate at the Nautilus Institute for Security and Sustainability, told *NK News*. Historically, the figures were slightly down when compared to those from 2013 over the same period, where coal exports earned North Korea over \$1.2 billion. With the exception of 2014, the last few years have seen Chinese imports rise steadily after a period of rapid growth prior to 2010.

<http://www.nknews.org/2015/01/north-korean-coal-exports-generate-1-billion-a-year/>

Pumping carbon dioxide deep underground may trigger earthquakes

9th January 2015, Charles Petit, Science News

The shaking in the nation's midsection has been intense enough in the last few years to break chimneys and scatter dishes. Those alarming earthquakes are in places where such things have been about as common (and as welcome) as laughing hyenas. Their cause: injection of watery waste fluids deep underground as part of natural gas and oil retrieval.

This worries some scientists who have high hopes for a way to curb global warming by getting rid of carbon dioxide that comes from, among other things, combustion of coal, gas and oil. These CO₂ emissions may be accelerating Earth toward a climate calamity as the land and seas warm and weather zones shift. One promising strategy for curbing climate change is to pump much of the CO₂ from fossil fuel-fired power plants into deep underground storage where everybody hopes it will remain for millennia. For more visit:-

<https://www.sciencenews.org/article/pumping-carbon-dioxide-deep-underground-may-trigger-earthquakes>

Only a mug would bet on carbon storage over renewables

16th January 2015, John Quiggin, The Ecologist

From Australia to the UK, governments are pinning their hopes on 'carbon capture' technology stuck onto coal power stations, writes John Quiggin. But their choice carries a high risk of failure - the smart money is on renewables, energy storage and responsive power grids.

The question of whether the future will be powered by coal and oil or by renewable energy is crucially important, both to the medium-term future of the economy and to the long-term future of the planet. For either to succeed, there is a storage problem to overcome.

A future based on 'clean coal' can only be achieved through the large-scale implementation of [carbon capture and storage \(CCS\)](#). That is, the carbon dioxide generated by fossil fuels must be captured at the point of combustion and then stored indefinitely in underground repositories, or perhaps in biomass such as trees.

On the other hand, the main renewable energy sources - wind and solar panels - face a different storage problem. Wind is intermittent and solar power is generated only during the day, as well as being affected by cloud cover. So a system dominated by renewables must either use variable pricing to manage demand, or include some form of energy storage.

Presented this way, the problem seems symmetrical. In reality, however, the problem of energy storage has many possible solutions, whereas that of CCS has only a handful, none of which look likely to work. To see why this is so, let's first consider the broader phenomenon of renewable energy. For more see:-

http://www.theecologist.org/blogs_and_comments/commentators/2711942/only_a_mug_would_bet_on_carbon_storage_over_renewables.html

Wind cuts UK fossil fuel imports 16th January 2015, unattributed, ReNews

Wind power displaced £579m of coal and gas imports in the UK in 2013, according to a study. Research by Cambridge Econometrics shows the sector reduced the need to import coal by an estimated 4.9 million tonnes and gas by 1.4 billion cubic metres.

Some 56% of the nation's gas supplies and 79% of its coal were imported in the period and the report suggests wind has the potential to make the UK's energy supply more resilient by cutting costly fossil fuel imports.

The work, commissioned by trade body RenewableUK, also looked ahead at how using either more wind or more gas would serve UK energy needs in 2020 and 2030. The study found that using more gas would cost £3.1bn in 2020, rising to £7.4bn by 2030. It concludes that as the cost of wind is predictable, using a greater amount essentially means the UK is "investing in an insurance premium against the uncertain cost of gas".

The researchers claim that if the cost of gas increases by 2030 in line with government's high prices forecast rather than its central prices forecast, giving a 41% increase, the cost of generating electricity would rise by 8%, whereas using more wind it would increase by less than 4%.

Cambridge Econometrics director Phil Summerton said: "Beyond the environmental benefits brought about by the continued deployment of wind power, this report shows wind energy is contributing to reducing fossil fuel import dependence and that this contribution will grow in future as wind capacity expands.

"Investment into wind power acts as an insurance policy against uncertainty in future wholesale gas prices and could provide a degree of stability to future electricity prices." RenewableUK chief executive Maria McCaffery welcomed the findings as evidence of the wider benefits of wind energy.

She said: "This report shows how much the UK relies on wind power to reduce our dependence on sources of costly fossil fuels imported from abroad. "The costs for the entire life of a wind farm are known very early on, whereas the volatile price of fossil fuels can never be accurately predicted. "Wind power is already helping us manage future price instability and industry is confident that by 2020 onshore wind will be the cheapest form of new generation of any form of energy."

Elsewhere, R-UK and Action for Renewables have unveiled the winning design of their British wind poster competition. More details [here](#).

<http://renews.biz/82521/wind-cuts-uk-fossil-fuel-imports/>

UK's shale gas revolution falls flat with just 11 new wells planned for 2015 19th January 2015, Adam Vaughan, The Guardian

The UK government's planned shale gas revolution has barely got out of the starting blocks with just 11 new exploratory wells for shale gas and oil due to be drilled this year even before the impact of plunging oil prices has fully begun to impact on the industry. David Cameron has said the government is going "[all out for shale](#)" but just a handful of new wells are in line to be created in 2015 and just nine wells – eight new and one existing – have been announced as candidates for fracking.

Professor Jim Watson, research director at the UK Energy Research Centre and author of [a recent report on the potential for shale gas](#) in the UK, said that statements by politicians on shale gas's potential had been speculative.

"Given the low number of wells that have been drilled in the UK, and the very low level of experience of shale gas production here, it is far too early to say how much shale gas could be produced.... The prime minister's [statement that shale could provide gas for the UK 'perhaps for as long as 30 years'](#) is therefore very speculative and optimistic," said Watson.

He added that it was unlikely the UK would have a significant shale industry until the early 2020s and even then the UK would still need to import the majority of its gas.

For more visit:- <http://www.theguardian.com/environment/2015/jan/19/uk-shale-gas-revolution-falls-flat-just-11-new-wells-planned-2015>

Sequestration on shaky ground: Natural impediment to long-term sequestration of carbon dioxide

21st January 2015, unattributed, Science Daily

Carbon sequestration promises to address greenhouse-gas emissions by capturing carbon dioxide from the atmosphere and injecting it deep below the Earth's surface, where it would permanently solidify into rock. The U.S. Environmental Protection Agency estimates that current carbon-sequestration technologies may eliminate up to 90 percent of carbon dioxide emissions from coal-fired power plants. While such technologies may successfully remove greenhouse gases from the atmosphere, researchers have now found that once injected into the ground, less carbon dioxide is converted to rock than previously imagined.

For more visit:-

http://www.sciencedaily.com/releases/2015/01/150121103234.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

World's oldest fire has been burning for 5,500 years

23rd January 2015, Patrick J. Kiger, Discovery

Nobody is sure how the coal seam beneath the exterior of [Australia's Burning Mountain](#), also known as Mount Wingen ("fire" in an aboriginal language), originally ignited. But a coal seam 90 feet below the surface been burning for an estimated 5,500 years, making it the longest continuous fire on the planet.

Ancient people actually used heat from rocky vents in the mountain to cook food and make tools. When an Australian settler found the mountain in 1828, he assumed that he'd discovered a volcano.

Today, the smoking mountain and its weird landscape have become a tourist attraction. [Australian Traveler](#) describes it: "Smell the acrid sulfur. Feel the heat from the roasting 350-degree surface. Watch the pale grey smoke waft into the air. Look for wedge-tailed eagles soaring on the thermal currents above. Imagine you're at the beginning of time. Or perhaps the end."

But as [Atlas Obscura](#) notes, there's a downside: "It has also caused massive ecological damage to the area's vegetation. The path of the fire has left a barren and rocky trail, with no traces of life."

There actually are many of these underground fires across the planet, They're a type of low-temperature, flameless combustion called a smouldering fire. They can be ignited by natural events such as lightning, though humans can set them accidentally or intentionally, by burning down forests. [Multiple fires](#), for example, recently have occurred at a coal mine about 700 miles from Burning Mountain, including on in early 2014 that burned for 45 days. The fires also are a source of greenhouse gas emissions, contributing billions of tons of carbon dioxide to the

atmosphere each year, according to this 2012 [blog post](#) by New York Times environmental reporter Andrew Revkin.

Source:-

<http://news.discovery.com/earth/worlds-oldest-fire-has-been-burning-for-5500-years-150123.htm>

Coal carbon capture could increase future climate risks, study finds

3rd February 2015, Simon Evans, Carbon Brief

Coal-fired power stations should be replaced by low-carbon energy sources rather than retrofitted with carbon capture and storage (CCS), according to new research from the University of Oxford. The study dents the idea that coal can be compatible with climate action as long as it uses CCS. It says finite CCS capacity should be held in reserve in case negative emissions technologies are needed to return dangerous greenhouse gas concentrations to a safe level after 2050.

The new report on [Stranded Carbon Assets and Negative Emissions Technologies](#) is published today by the Smith School of Enterprise and the Environment. The idea that companies could be sitting on fossil fuel assets they can't burn if the world tackles climate change has [now hit the mainstream](#). One study found nearly 90 per cent of the world's coal reserves are [unburnable](#) if we're to avoid dangerous warming. A counter-argument is that firms could carry on burning coal while capturing the emissions through CCS. Smith School analysis suggests this has the potential to capture 125 gigatonnes of carbon dioxide in total [by 2050](#), against today's [annual coal emissions](#) of around 12 gigatonnes. So coal plants could have another 10 years of business-as-usual operation without eating into carbon budgets, if they used all available CCS capacity to capture their emissions. Negative emissions technologies that remove carbon from the atmosphere could extend the operating life of coal plants even further, again assuming only coal emissions are offset.

The Smith School report looks at what types of negative emissions technologies are available and how much breathing space they might inject into the [carbon budget for two degrees](#). For more information visit:-

<http://www.carbonbrief.org/blog/2015/02/coal-carbon-capture-could-increase-future-climate-risks-study-finds/>

RIP FutureGen: Energy Department kills troubled Bush-era coal electricity project

3rd February 2015, Ben Geman, National Journal

The US Energy Department is walking away from FutureGen, a public-private effort to create a power plant that traps and stores carbon emissions, which began but faltered under President George W. Bush and was revived by the Obama administration.

DOE is yanking funding for the project that was authorized to receive \$1.1 billion in funding via the 2009 stimulus law, though the bulk was never spent. Bush, who proposed FutureGen in 2003, envisioned a pioneering plant that would demonstrate sophisticated technology that uses coal cleanly on a commercial scale. Since then, other projects designed to trap power-plant emissions have begun moving ahead, though large-scale carbon capture remains far from widespread commercial deployment in the electricity sector.

"The U.S. Department of Energy has directed the suspension of FutureGen 2.0 project development activities. The DOE has concluded that there is insufficient time to complete the project before federal funding expires in September 2015," said Ken Humphreys, CEO of the [FutureGen Alliance](#), the private-industry side of the initiative.

"In order to best protect taxpayer interests, the Department of Energy has initiated a structured closeout of federal support for the project that will help maximize the value of investments to

date while minimizing ongoing risks and further costs," DOE spokesman Bill Gibbons said. For more visit:-

<http://www.nationaljournal.com/energy/rip-futuregen-energy-department-kills-troubled-bush-era-coal-electricity-project-20150203>

Preventing greenhouse gas from entering the atmosphere

5th February 2015, unattributed, Science Daily

A team of researchers has developed a novel class of materials that enable a safer, cheaper, and more energy-efficient process for removing greenhouse gas from power-plant emissions. The approach could be an important advance in carbon capture and sequestration.

The team, led by scientists from Harvard University and Lawrence Livermore National Laboratory, employed a microfluidic assembly technique to produce microcapsules that contain liquid sorbents, or absorbing materials, encased in highly permeable polymer shells. They have significant performance advantages over the carbon-absorbing materials used in current capture and sequestration technology. The work is described in a paper published online today in the journal *Nature Communications*.

"Microcapsules have been used in a variety of applications, for example, in pharmaceuticals, food flavouring, cosmetics, and agriculture, for controlled delivery and release, but this is one of the first demonstrations of this approach for controlled capture," said Jennifer A. Lewis, the Hansjörg Wyss Professor of Biologically Inspired Engineering at the Harvard School of Engineering and Applied Sciences (SEAS) and a co-lead author. Lewis is also a core faculty member of the Wyss Institute for Biologically Inspired Engineering at Harvard. For more visit:-

http://www.sciencedaily.com/releases/2015/02/150205083700.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29

Early closure threat for Longannet coal plant?

17th February 2015, Priyanka Shreshtha, Energy Live News

The future of the Longannet coal-fired power station could be under threat as it could close earlier than planned. Last year ScottishPower, which operates the plant in Fife, said it would not be entering the plant into the government's auction to provide back-up capacity in the winter 2018/19 as a result of high grid connection costs.

The location of Longannet, which provides electricity for around two million homes, puts it at a disadvantage when competing against power stations in England. According to the Scottish Government, generators in Scotland, including Longannet account for around 12% of the capacity connected to Britain's electricity network but pay around 35% of the charges.

A ScottishPower spokesperson said: "We are concerned about Longannet and are currently doing all that we can to guarantee the future of the power station as it plays an essential part of the energy system in Scotland." Although the energy company is in talks with the National Grid about the future of the power station, the electricity system operator said the decision to close the plant is "ultimately for the operator to make". A National Grid spokesperson added: "Transmission charges reflect the cost of building the network to transport electricity from power stations to major towns and cities where demand for power is greater. When power stations are further away from centres of demand, it means more miles of network need to be built and maintained. The additional network costs are included in the charges to both the power station and the energy suppliers. "The aim is to encourage generators and suppliers to consider this when making decisions on where to locate so it can reduce the need for extra network and keep costs down for customers." National Grid added it has been working with the industry and Ofgem to review the charging regime. Scotland's First Minister [Nicola Sturgeon is urging David Cameron](#) to review the security of the nation's electricity supply.

Source:-<http://www.energylivenews.com/2015/02/17/early-closure-threat-for-longannet-coal-plant/>

Forest Research and E.ON to lead ETI project on characterising UK grown bioenergy feedstocks

17th February 2015, unattributed, PoliticsHome

The Energy Technologies Institute (ETI) has announced that Forest Research and E.ON will deliver the latest project in its bioenergy programme – a study into the Characterisation of Feedstocks.

The project will provide an understanding of UK-produced “2nd generation” biomass properties (derived from plants and generated through photosynthesis), how these vary and relate this variability to the origins of the samples tested. It will involve the sampling of several types of biomass from across the UK under various planting, growing, harvesting and storage conditions. The results will be analysed to understand the scale of variation and what impacts different production and storage methods have on biomass properties.

Forest Research is one of the world’s leading centres of research into woodlands and forestry and an executive agency of the Forestry Commission conducting world-class scientific research and technical development relevant to forestry to support and inform the policies for sustainable forest management. E.ON UK is part of the E.ON group – one of the world’s largest investor-owned power and gas companies generating electricity and retailing power and gas. For more visit:-

<https://www.politicshome.com/document/press-release/energy-technologies-institute/forest-research-eon-lead-eti-project>

Methane hydrates are a promising energy resource

17th February 2015, Edward Dodge, The Energy Collective

Methane hydrates are getting increased attention as a major new source of clean hydrocarbon energy. These enormous deposits of natural gas have never been developed commercially, but research and development has been promising, and expectations are that the gas could begin coming to market within a decade.

Known as flammable ice, methane hydrates are molecules of gas contained in an ice matrix found in permafrost regions of the arctic and on the seafloor at continental margins below 500 meters of depth. Methane hydrates are subject to research both around their role in the global carbon cycle as well as potential commercial development as an energy resource. Hydrates form along the continental margins at low temperatures and high pressures and are distributed around the world, many countries have significant resources of them. For more see:-

<http://theenergycollective.com/ed-dodge/2193161/methane-hydrates-are-promising-energy-resource>

UK politicians unite to shut down coal

17th February 2015, Ruth Krause, DW

A new agreement between three major UK political parties aims to cut carbon emissions by phasing out coal. But environmentalists are disappointed the agreement fails to mention a time frame. The leaders of the UK’s three main political parties have signed an agreement aimed at phasing out “unabated” coal power generation. Environmental groups broadly welcomed the move, but said the agreement lacked detail.

Conservative Prime Minister David Cameron, Deputy Prime Minister Nick Clegg of the Liberal Democrats and Labour opposition leader Ed Miliband committed to ending power generation from coal plants that do not use carbon capture and storage (CCS) technology. CCS compresses CO₂ and stores it deep underground, rather than releasing it into the atmosphere.

The UK is the first industrialized country to announce plans to phase out the carbon-heavy fuel. The coal industry played an important role in its economy from the industrial revolution on.

Today coal provides a third of the UK's electricity. Susanne Neubronner, a coal expert at Greenpeace, said the agreement sent an important message ahead of international climate talks at the end of the year, aimed at a new, binding, international climate treaty. "Overall, it is a good sign for Europe and the world that the UK, one of the biggest coal nations, would like to quit using coal in the long run," Neubronner told DW. But she added that the agreement failed to mention a time frame. For more see:-

<http://www.dw.de/uk-politicians-unite-to-shut-down-coal/a-18262136>

University of Sheffield aims to become a global leader in energy research and innovation

18th February 2015, unattributed, University of Sheffield

The University of Sheffield will work to tackle the world's greatest energy challenges by bringing together international scholars, industry experts and government officials through a pioneering initiative driving forward energy research and innovation. More than 40 new leading academic energy researchers will significantly expand the University's existing expertise in energy research as part of the [Energy 2050](#) initiative – a world-leading hub of excellence set up to address the 'trilemma' of making energy more affordable, secure and sustainable. For more see:-

<http://www.sheffield.ac.uk/news/nr/global-leader-in-energy-research-innovation-1.441971>

Largest coal mine in Russia opens

20th February 2015, Cole Latrimer, Australian Mining

The new Arshanovsky open cut mine, in south eastern Siberia, has set a goal of two billion tonnes of coal extracted over its mine life, at a rate of around 10 million tonnes per annum, [according to the Siberian Times](#). One of Australia's largest coal mines, Adani's Carmichael mine, has an operational life of only 60 years.

The Russian mine will be located in the Khakassia region of Siberia, with plans to construct additional rail infrastructure to support the operation. The opening comes as Russia also announces the [construction of two new coal ports in Siberia](#), which gives the nation more access to Chinese, Japanese, and Korean coal markets.

Source:- <http://www.miningaustralia.com.au/news/largest-coal-mine-in-russia-opens-1>

Lithium from the coal in China

26th February 2015, unattributed, Science Daily,

Coal from China could become a major source of the metal lithium, according to a review of the geochemistry by scientists published in the *International Journal of Oil, Gas and Coal Technology*.

Lithium is an essential component of rechargeable batteries used almost ubiquitously in mobile gadgets such as phones, laptops, tablet computers and in many electric vehicles. Worldwide annual consumption of this metal grew from 15100 tonnes in 2003 to 37,000 tonnes by 2012, a 145 percent increase and demand is expected to rise even further as we move more towards sustainable power and electrical storage capacity increases.

Shenjun Qin of Hebei University of Engineering, in Handan, China, and colleagues point out that coal is a highly polluting energy source that is still widely used for electricity generation and other applications. They suggest that the recovery of valuable rare metals from coals or coal-processing byproducts could be a promising way to make the inevitable long-term use of this fossil fuel resource more economic, efficient and cleaner. Indeed, the extraction of lithium from coal would offer an ironic twist to its continued use.

The team explains that lithium has been found dispersed and even anomalously enriched in coal deposits, and is potentially extractable. They explain that two analytical techniques inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma as an

excitation source (ICP-AES) are widely used for assaying the chemical elements in coal and coal ash and either of these techniques could be used widely to optimize sources for lithium, or any given metal, for subsequent extraction. For more see:-

http://www.sciencedaily.com/releases/2015/02/150226101627.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy%2Ffossil_fuels+%28Fossil+Fuels+News+---+ScienceDaily%29

New carbon accounting method proposed 10th March, unattributed, Science Daily

Established ways of measuring carbon emissions can sometimes give misleading feedback on how national policies affect global emissions. In some cases, countries are even rewarded for policies that increase global emissions, and punished for policies that contribute to reducing them. Consumption-based accounting, also known as carbon footprints, has been suggested as an alternative to today's production-based accounting. For more see:-

http://www.sciencedaily.com/releases/2015/03/150310104800.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29

New material captures carbon at half the energy cost

11th March 2015, unattributed, Science Daily

Capturing carbon from power plants will likely be necessary in the future to avoid the worst effects of climate change, but current technologies are very expensive. Chemists have now developed a new material, a diamine-appended metal-organic framework, that captures carbon dioxide with much reduced energy costs compared to today's technologies, potentially lowering the cost of capturing and sequestering this greenhouse gas. For more see:-

http://www.sciencedaily.com/releases/2015/03/150311185834.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29

Global CO2 emissions 'stalled' in 2014

13th March 2015, Helen Briggs, BBC

The growth in global carbon emissions stalled last year, according to data from the International Energy Agency. It marks the first time in 40 years that annual CO2 emissions growth has remained stable, in the absence of a major economic crisis, the agency said. Annual global emissions remained at 32 gigatonnes in 2014, unchanged from the previous year. But the IEA warned that while the results were "encouraging", this was "no time for complacency". "This is both a very welcome surprise and a significant one," said IEA Chief Economist Fatih Birol. "It provides much-needed momentum to negotiators preparing to forge a global climate deal in Paris in December: for the first time, greenhouse gas emissions are decoupling from economic growth." And IEA Executive Director Maria van der Hoeven said while the data was "encouraging", this was "no time for complacency" and "certainly not the time to use this positive news as an excuse to stall further action".

For more visit:-

<http://www.bbc.co.uk/news/science-environment-31872460>

Australia urged to shut coal-fired power plants urgently as analysis reveals huge emissions

18th March 2015, Oliver Millman, The Guardian

The Australian government has been urged to place US-style regulations on coal-fired power plants to ensure they shut down, as a new analysis highlights the vast scale of emissions pumped out by the largest carbon dioxide polluters in the country. Just 10 companies are responsible for a third of Australia's total greenhouse gas emissions, according to the Australian Conservation Foundation (ACF) study.

"We have got to close down the worst polluting plants in Australia," said Geoff Cousins, ACF's president. "At the moment the government is offering no incentives for companies to get off fossil fuels." Cousins said he would welcome the kind of direct regulations [placed by Barack Obama's US administration on coal-fired plants](#), effectively making them untenable without expensive carbon capture technology. "In Australia there are taxpayer subsidies to keep these plants open, whereas in the US, China and parts of Europe, the government is taking actual direct action to close them down," Cousins said. For more visit:-

<http://www.theguardian.com/environment/2015/mar/19/australia-urged-shut-coal-fired-power-plants-urgently-huge-emissions>

Scientists to solve mystery of mega-chunk of north-east coal

18th March 2015, Jamie Ross, Press & Journal

Scientists in Aberdeen will soon start work on solving the mystery surrounding a massive piece of coal that washed up on the beach of a north-east village. The University of Aberdeen's geosciences department has offered its services to help bring an end to the speculation surrounding the mammoth find after it was dug up from the sands at St Combs.

Ian Tait, 63, a retired fabricator from Cairnbulg who made the find, was walking his dog in the early hours of the morning when he stumbled across the fossilised carbon. And while the coal would go some way in heating his stove, he is more interested in finding out how the 150lb find made its way to the village. Last night, he packaged a chip of the coal for delivery to the university.

He said: "If they can tell me where it's come from, it would be really interesting. "There's been people up photographing it, but nobody has ever seen anything this size. Everyone is shocked at the size of it – about how big it must have been before rolling around on the bottom. It must have been a fair chunk at one time." His own theory is that the coal came from a collier wreck near the coastline. But Mr Tait, a coastguard for 18-years, has been unable to verify that as fact. He said: "There's lots of wrecks here. The university might have records of wrecks and might know better." The university's science department had reached out to inspect the coal after coverage in the Press and Journal.

A spokesman for the city campus said that academics would perform a number of tests on the sample to determine its microfossil content and could be able determine where it had come from. He said: "There are spores and pollen in coal samples, depending on its type. These could tell our researchers what age the coal was and possibly where it came from. They may even be able to work out which specific coal seam this piece came from."

Source:- <https://www.pressandjournal.co.uk/fp/news/north-east/522618/scientists-to-solve-mystery-of-mega-chunk-of-north-east-coal/>

Beijing's last coal plant will close in 2016

25th March 2015, unattributed, Asia News

The Chinese capital has a pollution level twice the national average. Four mega coal based power plants have operated for decades. Coal still provides about 70% of the country's energy needs, but the damage to the environment is incalculable. The city of Beijing has announced that it will close the China Huaneng Group Corp, the last coal-fired power plant still operating in its territory by 2016. In recent weeks, the closure of the three other coal plants which provided energy to the megalopolis was also announced. According to the government these will be replaced by gas stations, able to increase the production by 2.6 times compared to current standards.

The decision is part of a larger plan for the modernization of the national energy system, which still depends 70% on coal. The central government wants to reduce use of this highly polluting material by 13 million tons. According to national plans, energy needs will be met by an increase in imports of oil and gas from abroad.

The issue is not just economic. Burning coal produces emissions that have devastated the environment and air quality in the major cities of the country. In Beijing alone there are nearly 300 days of "bad" weather conditions which have resulted in a significant increase in respiratory diseases and even damaged the normal physical development of children.

For more visit:-

<http://www.asianews.it/news-en/Beijing.-the-last-coal-plant-will-close-in-2016-33814.html>

UK Coal pits face closure after Government refuses £338m funding

26th March 2015, unattributed, The Telegraph

The Government will not provide an extra £338 million to keep UK Coal's pits at Kellingley in North Yorkshire and Thoresby in Nottinghamshire open for a further three years, ministers have announced. The decision confirms that the two pits will close by the end of the year, leaving one deep mine left in the UK, at Hatfield in South Yorkshire.

Business minister Matthew Hancock said committing public sector funding on the scale necessary to extend UK Coal's closure plan by three years was not affordable and did not represent value for money to the taxpayer. "The £338 million requested approximates to a cost of more than £75,000 per UK Coal employee per year over the three-year closure plan," he said. The minister added that the Government was prepared to provide additional funding to keep the closure plan on track. UK Coal has asked for an extra £10 million so the closures can go ahead this year. For more see:-

<http://www.telegraph.co.uk/news/earth/energy/coal/11496359/UK-Coal-pits-to-close-after-Government-refuses-338m-funding.html>

EU sues UK over coal power plant emissions

27th March 2015, Priyanka Shreshtha, Energy Live News,

The European Commission is taking the UK to Court for failing to reduce emissions at one of its power stations. It said the Aberthaw coal-fired power plant in Wales exceeded the limits of the toxic pollutant nitrogen dioxide (NO_x).

Under EU rules, member states had until 1st January 2008 to reduce emissions of a number of pollutants from power plants. The Aberthaw power station currently operates under a permit which sets a NO_x emission limit of 1,200mg per normal cubic metre (Nm³) – more than twice the 500mg/Nm³ limit set out by the Commission.

It said in a statement: "The Commission welcomes more recent indications from the UK authorities that investments will be made to upgrade the plant but at present the plant continues to operate under a permit which allows it to emit high levels of the toxic gas NO_x. The Commission is therefore referring this case to Court." The Department for Environment, Food & Rural Affairs (Defra) added it would "continue to work with the European Commission".

Source :-

<http://www.energylivenews.com/2015/03/27/eu-sues-uk-over-coal-power-plant-emissions/>

Minister 'determined' to avert early Longannet closure

25th March 2015, unattributed, BBC

The Scottish government has said it is determined to explore any option which could avert the premature closure of Longannet Scottish Power has announced plans to close its huge coal-fired power station at Longannet in Fife early next year. The move comes after the energy firm failed to win a crucial contract from National Grid. Energy Minister Fergus Ewing told MSPs he would "strain every sinew" to get the best possible outcome.

During a statement at Holyrood, he said the premature closure of Longannet at a time of falling spare capacity in the system was a "national scandal". He also defended the government's renewables policy against claims it was harming power stations such as Longannet. MSPs heard earlier this month that [Longannet would close](#) unless Scottish Power secured the £15m

National Grid contract, which will run from April 2016 to September 2017. The SSE-operated gas-fired power station at Peterhead won the contract at the expense of Scottish Power and a third bidder.

For more visit:- <http://www.bbc.co.uk/news/uk-scotland-scotland-business-32056941>

Project worth £4.2m to research new coal power station announced

27th March 2015, unattributed STV News

A project worth more than £4m to research plans for a new coal power station has been announced. The proposed coal-gasification power plant would be built in Grangemouth and use carbon capture and storage technology. The announcement comes after it was revealed the coal-powered station at Longannet was likely to close next year.

The Fife facility failed to secure a National Grid contract, with owners Scottish Power saying they were "extremely disappointed" at the decision. Now the Seattle-based Summit Power Group will undertake feasibility studies with a view to building their proposed Caledonia Clean Energy Project in Grangemouth. The UK Government's Department for Energy and Climate Change provided £1.7m for the project and the Scottish Government provided £2.5m. Ed Davey, secretary of state for energy and climate change said: "Carbon Capture and Storage could be crucial in helping us meet our ambitious climate change goals. "The UK is one of the world's frontrunners in this sector and the UK Government is leading Europe with its support of the two competition projects at Peterhead in Scotland and White Rose in Yorkshire.

"Developing CCS more widely is vital if it is to become cost-competitive technology, and I'm excited at the prospect of Grangemouth contributing to the UK's low carbon future." A programme of research and development work will now take place over the next 18 months to explore the engineering design of the project. If completed, the project will be the first to combine and integrate coal gasification and carbon capture technologies in a single facility able to produce 570MW of electricity.

For more visit:-

<http://news.stv.tv/stirling-central/315314-project-to-research-new-coal-power-station-in-grangemouth-announced/>

UN green climate fund can be spent on coal-fired power generation

29th March 2015, Suzanne Goldenberg, The Guardian

The UN fund to help developing countries fight climate change can be spent on coal-fired power plants – the most polluting form of electricity generation – under rules agreed at a board meeting.

The green climate fund (GCF) refused an explicit ban on fossil fuel projects at the contentious meeting in Songdo, South Korea, last week. "It's like a torture convention that doesn't forbid torture," said Karen Orenstein, a campaigner for Friends of the Earth US who was at the meeting. "Honestly it should be a no-brainer at this point." The fund was set up as part of the ongoing UN climate negotiations to help developing countries finance clean energy and measures to help adapt to climate change.

Its [website states](#): "The fund will promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions." It has struggled for support, however, with industrialised countries paying only about 1% of the \$10.2bn (£6.9bn) committed at the UN climate negotiations in Lima last December. The deadline for contributions is 30 April. With no clear rules on climate finance, much of the funds can be channelled to dirty energy, campaigners say.

For more visit:-

<http://www.theguardian.com/environment/2015/mar/29/un-green-climate-fund-can-be-spent-on-coal-fired-power-generation>

UK and Scottish governments commit £4.2m for carbon capture research 30th March 2015, Charlotte Malone, blueandgreen tomorrow

The UK and Scottish governments have jointly committed to providing £4.2 million for industrial and feasibility research for a carbon capture storage coal-gasification power plant located in Grangemouth, Scotland. The latest funding is made up of £1.7 million from the Department of Energy and Climate Change and £2.5 million from the Scottish Government. It will allow Seattle-based Summit Power Group to undertake industrial research and feasibility research with the objective of designing, siting, financing and building the proposed 570 megawatt Caledonia Clean Energy Project.

The project will combine carbon capture technologies with coal gasification at a single facility. The proposed power station will be fitted with technology designed to capture 90% of CO₂ emissions, which would then be transported via pipelines and stored 2 kilometres beneath the North Sea. For more see:-

<http://blueandgreentomorrow.com/2015/03/30/uk-and-scottish-governments-commit-4-2m-for-carbon-capture-research/>

Scotland adds to their renewable portfolio with new biomass research center

30th March 2015, Jaclyn Brandt, Fierce Energy

Scotland is becoming an important name in renewable energy, and they are adding biomass to that list. An £11 million grant will allow construction to begin on University of St. Andrews' £25 million green energy center, located at a former paper mill on 36 acres at Guardbridge. According to Social Justice Secretary Alex Neil, the loan was provided by the Scottish Partnership for Regeneration in Urban Centres (SPRUCE) Fund, a joint Scottish Government and European Regional Development Fund initiative.

"The construction of the Guardbridge energy centre will act as a springboard for the regeneration of the village, which will provide an economic boost for the wider Fife economy," Neil said. "The centre's projected carbon savings will help the environment and the local area will benefit from the university's commitment to job creation and apprenticeships." For more visit:-

<http://www.fierceenergy.com/story/scotland-adds-their-renewable-portfolio-new-biomass-research-center/2015-03-30>

Beijing's four major coal-fired power plants will completely shut down

31st March 2015, Cynthia Shahan, Clean Technica

Coal, which has nearly done in Beijing, is soon to be done itself in Beijing. China is cutting pollution in an effort to lose its role as the world's largest carbon emitter and also clean up the air its citizens breathe. Next year, the last of Beijing's four major coal-fired power plants will completely shut down. China Huaneng Group Corp.'s 845-megawatt power plant will close in 2016. Plants owned by Guohua Electric Power Corp. and Beijing Energy Investment Holding Co. closed this month according to a statement on the website of the city's economic planning agency. Last year, a major power plant owned by China Datang Corp. also shut down. For more visit:-

<https://cleantechnica.com/2015/03/31/beijings-four-major-coal-fired-power-plants-will-completely-shut/>

Prominent climate change sceptic set to make millions by digging giant open-cast mines on Northumberland family estate

1st April 2015, Tom Bawden, The Independent

Viscount Ridley, a prominent climate change sceptic, is to dig two giant open-cast mines on his national park family estate in Northumberland that will produce an estimated £20m of coal – increasing criticism that his championing of fossil fuels is tainted by self-interest.

The Ridley family have been mining coal on their 18th century Blagdon Estate since the 1940s. The present Viscount Ridley – the Conservative peer, science writer and former banker Matt Ridley – was granted permission for two new mines in 2014.

The Shotton Triangle mine is forecast to produce about 290,000 tons of coal while the Shotton South West site has a target of about 250,000 tons. The mines, first reported by the website DeSmogBlog.Com, could generate £21.5m at the current coal price.

For more visit:-

<http://www.independent.co.uk/news/uk/home-news/prominent-climate-change-sceptic-set-to-make-millions-by-digging-giant-opencast-mines-on-northumberland-family-estate-10150247.html>

Carbon floor price hike will trigger UK coal slowdown, say analysts

2nd April 2015, Arthur Neslen, The Guardian

Coal-fired power plants are set to be taken offline this year as a result of the doubling of the UK's top-up carbon tax on Wednesday, according to market analysts. The carbon floor price went up from £9.54 to £18.08 per tonne of CO₂, raising the cost of a tonne of carbon for British power plants to £23, when allowances on the EU's emissions trading system (ETS) are factored in.

The [carbon floor price](#) was designed to set a minimum price, related to emissions from fossil fuels, which would rise annually and encourage manufacturers to switch to greener fuels. It was introduced in 2013.

"We would expect to see reduced running hours for UK coal power plants from this summer," Yan Qin, a market analyst at Reuters Thomson Point Carbon told the Guardian.

The agency believes that up to 20 TerraWatt hours (TWh) of coal generation could be replaced by gas, with uncertainty about new EU industrial emissions rules next year spurring early action.

Drax, [the largest coal-fired power plant in the UK](#) produced [26.2 Twh of electricity in 2013](#). "The rise in the floor price is putting additional pressure on coal-fired assets for sure," said Dirk Forrister, the president of the International Emissions Trading Association. For more visit:- <http://www.theguardian.com/environment/2015/apr/02/carbon-floor-price-hike-will-trigger-uk-coal-slowdown-say-analysts>

The huge carbon cost of converting land for biofuel crops

2nd April 2015, unattributed, Click Green

The drive to convert land to grow crops to match the demand for biofuels could have caused as much carbon dioxide to be released into the atmosphere as 34 coal-fired [power](#) plants operating for one year, according to new research.

Clearing grasslands to make way for biofuels may seem counterproductive, but University of Wisconsin-Madison researchers show in a study today that crops, including the corn and soy commonly used for biofuels, expanded onto 7 million acres of new land in the U.S. over a recent four-year period, replacing millions of acres of grasslands.

The study, from UW-Madison graduate student Tyler Lark, geography Professor Holly Gibbs, and postdoctoral researcher Meghan Salmon, is published in the journal Environmental Research Letters and addresses the debate over whether the recent boom in demand for common biofuel crops has led to the carbon-emitting conversion of natural areas. It also reveals loopholes in U.S. policies that may contribute to these unintended consequences. For more visit:-

<http://www.clickgreen.org.uk/research/data/125845-the-huge-carbon-cost-of-converting-land-for-biofuel-crops.html>

Ordinary clay can be used for carbon capture

8th April 2015, unattributed, Science Daily

Carbon capture will play a central role in helping the nations of the world manage and reduce their greenhouse gas emissions. Many materials are being tested for the purpose of capturing carbon dioxide. New results show that ordinary clay can work just as effectively as more advanced materials. "It is quite remarkable that clay can capture as much CO₂ as other materials that are being investigated," says Jon Otto Fossum, professor at the Department of Physics at the Norwegian University of Science and Technology (NTNU).

Clay offers many benefits compared to other materials, particularly because other potential materials can be expensive, difficult to produce, toxic and not particularly environmentally friendly. A possible practical future use of this discovery could be to include clays in CO₂ filters for industrial-scale CO₂ emissions reduction. "What we are doing is basic research," Fossum says. "It will take more research to develop the technology, so we don't expect clay-based CO₂ capture to be readily available anytime soon." For more visit:-

http://www.sciencedaily.com/releases/2015/04/150408090319.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29

How unwanted CDs and DVDs could help cut carbon emissions

8th April 2015, unattributed, Science Daily

Now that most consumers download and stream their movies and music, more and more CDs and DVDs will end up in landfills or be recycled. But soon these discarded discs could take on a different role: Curbing the release of greenhouse gases. Scientists report a way to turn the discs into a material that can capture carbon dioxide, a key greenhouse gas, and other compounds. For more see:-

http://www.sciencedaily.com/releases/2015/04/150408113752.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29

Could abandoned coal mines produce renewable energy?

14th April 2014, Jessica Shankleman, businessGreen

In a novel example of the transition from high to low carbon infrastructure, researchers in Nottingham have discovered how abandoned coal mines could produce renewable heating for tens of thousands of homes and offices in the UK. As part of a two-year project, researchers at Nottingham Trent University worked with renewable energy firm Alkane Energy to explore how water at the former Markham Colliery in North East Derbyshire could be condensed in a heat pump and fed through a district heating network.

The team took naturally lukewarm water from the mineshaft and pumped it to the surface, where a heat exchanger extracted its thermal energy. The energy was then condensed through a heat pump to increase the temperature further while the water was returned to the mine where it becomes lukewarm again. The team explored a series of old mines in the UK, which they estimate could provide enough heat for around 45,000 homes. Professor Amin Al-Habaibeh of Nottingham Trent's School of Architecture, Design and the Built Environment, who led the study, said he hoped the breakthrough would provide a new lease of life to abandoned mines.

For more see:-

<http://www.businessgreen.com/bg/news/2403797/could-abandoned-coal-mines-could-produce-renewable-energy>

The Biomass and Fossil Fuel Research Alliance (BF2RA) – Progress Update (April 2015)

The main objectives of BF2RA are to promote research and other scientific studies into:-

- the production, distribution and use of biomass and fossil fuel and their derivatives.
- the minimisation of by-products arising from the use of biomass and fossil fuel and to assess the environmental impact caused by such materials and the development of products thereof and
- the provision of funding for such work and to publish the useful results, to make grants to any person or persons engaged in or connected with research work, and to advance the education of such persons.

In addition BF2RA has organised the Coal Science Lecture since 2012. To reflect broadening energy interests this event has now been renamed the Energy Science Lecture.

Currently membership of BF2RA comprises seven 'world-class' power generation, equipment supplier, research and coal utilisation organisations, namely, Alstom Power, British Sugar plc., Doosan Power Systems, Drax Group Ltd., EDF Energy, E.ON New Build and Technology Ltd. and EPRI,. To date BF2RA has established a portfolio of 18 R&D projects with several more scheduled to be let later in 2015.

Details of the BF2RA project portfolio together with information about the Energy Science Lecture follow.

BF2RA Project Portfolio

In early 2014 BF2RA ran its 3rd Open Call for Proposals. This Call was extremely successful and resulted in BF2RA offering four research grants (numbers 17-20 in the following list). With the completion of three research projects in 2014 (Grants. 2,3 and 9) there were 14 live projects at the end of 2014.

BF2RA held its 4th Open Call for Proposals in early 2015 and the review process of proposals received is now underway. It is anticipated that this latest Call will result in several new projects being let later this year.

Information on the current project portfolio follows. For information on completed projects please refer either to earlier editions of the CRF Newsletter or to the BF2RA website (details given later).

Grant 01 - Dynamic Modelling and Simulation of Supercritical Coal-fired Power Plant with CO₂ Capture Ability (2011 to 2015)

University of Hull. Academic Supervisor - Dr Meihong Wang

The aim of this project is to develop a dynamic model for the whole supercritical coal-fired power plant. It is proposed to model the water/steam cycle and the air/flue gas cycle of a typical supercritical coal-fired power plant. This dynamic model for supercritical coal-fired power plant will be linked with the dynamic model for CO₂ post-combustion capture plant (being developed by another PhD project). This will enable us to explore a key design and operation issue - whether such a supercritical plant with CO₂ capture ability can satisfy the UK grid requirement. This research is now essentially complete with the final review meeting scheduled for May 2015.

Grant 04 - Avoiding Sintering of Coal-Fired Shallow Fluidised Beds (2011 to 2015)
University of Nottingham. Academic Supervisor – Dr Hao Liu

The project is focusing on the investigations of the main causes of bed sintering/defluidization during 'lump' coal combustion in shallow fluidized bed combustors. The project is also investigating the effect of co-firing biomass on the bed materials' sintering and fluidization. The 'alkali getter' technique is being explored to alleviate/avoid bed sintering/defluidization during co-firing biomass with lump coal in shallow fluidized beds. This research is scheduled to complete in late 2015.

Grant 05 - Milling and Conveyance of Biomass (2011 to 2015)

University of Nottingham. Academic Supervisor – Dr Carol Eastwick

The aim of the project is twofold, to investigate milling behaviour of a range of biomass materials and to investigate how these milled biomasses impact pipe wear. This is being achieved by bench scale milling, analysis of the milled products and design and use of a test rig to rank milled products in a test pipeline. This research is scheduled to complete in late 2015.

Grant 06 - A New Classification System for Biomass and Waste Materials for use in Combustion (2011 to 2015)

University of Nottingham. Academic Supervisor – Professor Colin Snape

The overall aim of this project is to develop a classification system for non-coal materials, analogous to those which have been widely applied in the utilisation of coals. This includes characterisation of biomass and waste materials in terms their elemental and chemical analyses and investigation of de-volatilisation and char burn-out and to develop the new classification system as a predictive tool for combustion behaviour and its efficacy when applied to blends with coals. This research is scheduled to complete in late 2015.

Grant 08 - Modelling chemical and micro-structural evolution across dissimilar interfaces in power plant alloys (2011 to 2015)

University of Nottingham. Academic Supervisor – Professor Graham McCartney

This project addresses the Materials Development priority theme of the BF2RA call in that it is directly relevant to the performance, in-service, of fusion welded joints between dissimilar alloys (eg steels and nickel alloys or different steel grades). It is also pertinent to the development of advanced plant components which require protective coatings by weld overlay or thermal spraying for the more aggressive operating environments of biomass combustion. This research is scheduled to complete in late 2015.

Grant 11 - Development of Novel Coatings to Resist Fireside Corrosion in Biomass-fired Power Plants (2012 to 2015)

Cranfield University. Academic Supervisor – Professor John Oakey

The fundamental research challenge being addressed in this PhD project, and its overall aim, is to use a novel, rapid coating development methodology to identify coating compositions that will resist the fireside corrosion environments found on super-heater and re-heater tubes in combustion plants firing a high proportion of biomass fuels. This research is scheduled to complete in late 2015.

Grant 12 - Integrity of Coated Ferritic Alloys under High Temperature Creep and Fatigue (2012 to 2016)

University of Nottingham. Academic Supervisor – Dr Wei Sun

The overall aim of this project is to concentrate on investigating the integrity of coated samples subjected to high temperature exposure and steady / cyclic mechanical loadings. Specific objectives include gaining a better understanding of presently developed coatings and the associated key failure mechanisms, ranking of the potential coatings based on testing results and provision of generic understanding of factors limiting coating service life.

Grant 14 - Biomass Exacerbated Cyclic Oxidation of Steels in Steam (2013 to 2017)
University of Birmingham. Academic Supervisor – Dr Brian Connolly

The overall aim of this research is the development of a model for steam side oxidation growth and spallation both prior to and after the initial spallation event based on laboratory observations in simulated cyclic steam oxidation experiments. This is building on current research at the University of Birmingham investigating/modelling steam oxidation and spallation of austenitic stainless steels.

Grant 15 - Biomass Co-firing to Improve the Burn-out of Unreactive Coals in Pulverised Fuel Combustion (2013 to 2017)

University of Nottingham. Academic Supervisor – Professor Colin Snape

The overall aim of this research is to determine for a selection of unreactive bituminous coals the extent to which relatively small emissions of biomass can (i) increase volatile yields and so reducing ignition temperatures and (ii) improve char burn-out. Key deliverables from this research will include an understanding of how biomass can improve the combustion performance of unreactive bituminous coals and quantification of the amount of biomass needed to maximise the beneficial effects.

Grant 16 - Modelling of Biomass Milling (2013 to 2017)

University of Nottingham. Academic Supervisor – Dr Carol Eastwick

This study will use data generated by the Milling and Conveyance of Biomass project (Grant 05) and use this as a base to investigate and validate modelling approaches. The overall aim of the research is to identify the most pragmatic modelling approaches for use in the energy industry and so understand the implications of milling to biomass choices. The output from this research will be a validated model and an understanding of the fundamental science behind biomass milling, with a clear appreciation of the advantages and limitations of the modelling methods.

Grant 17 – Modelling Fireside Corrosion of Super-heaters and Re-heaters following Combustion of Coal and Biomass (2015 to 2018)

University of Cranfield, Academic Supervisors - Drs Nigel Simms, Joy Sumner and Adriana Encinas-Oropesa

The overall aim of this research is to develop a suite of interconnected models to predict the degree of fireside corrosion damage experienced by super-heaters/re-heaters in coal- and biomass- fired boilers. The applicability of these models to anticipated future boiler conditions will also be integrated.

Grant 18 – Assessment of Spontaneous Combustion Risk including Biomass (2015 to 2018)

University of Leeds, Academic Supervisors - Professors Jenny Jones and Alan Williams

The aims of this research are to advance the understanding, diagnostic and predictive capability for detecting self-heating in biomass piles, and for prediction of risk from the knowledge of biomass type and properties. This research will be undertaken in two stages – first there will be 3 to 6 month teams projects and then a circa. three and a half year Ph D study. The start-up meeting was held at Leeds in December 2014 and the research commenced in January 2015.

Grant 19 – Slagging and Fouling Prediction using an Advanced Ash Fusion Test (2014 to 2018)

University of Nottingham, Academic Supervisors - Professor Ed Lester and Dr Thomas Huddle

The aim of this project is to develop a novel method to predict the slagging and fouling potential of different types of coals, biomass and blends using an advanced ash fusion test. This 4 year EngD research commenced in October 2014.

Grant 20 – Interpretation of Small Specimen Creep Test and Recommendations on Standardisation of Impression Creep Test Method (2014 to 2018)

University of Nottingham, Academic Supervisor - Professor Wei Sun

The aim of this research is to establish a framework for the implementation of the results of small specimen creep testing for assisting in long-term power plant material performance assessment and component life management. Specific objectives will include:-

- Development of improved modelling and data interpretation procedures
- Evaluation and development of ranking methodologies and
- Development of a recommendation for standardisation of power plant applications

This 4 year EngD research commenced in October 2014.

The Energy Science Lecture (Coal Science Lecture until 2014)

BF2RA has been organising this event since 2012 with the financial help of sponsorship from several organisations including the Coal Research Forum.

The 2014 Lecture was presented by Dr Nigel Burdett of Drax Power and was entitled "Coal and Biomass – Synergies and Opportunities". The lecture was well received by an audience of just under 100 gathered at the Institute of Chartered Accountants for England and Wales (ICEAW) premises at Moorgate, London in late September 2014.

Professor Rachel Thomson of the University of Loughborough has accepted the invitation to present the 2015 ESL that will be held on the 6th October 2015 at the ICEAW. Further details will be posted on the BF2RA and CRF websites in due course.

The intention is to extend the format of the ESL event this year to include an afternoon technical session with oral presentation of BF2RA research projects that complete in 2015 and poster presentations of ongoing BF2RA research.

Participation at the ESL event is by invitation only so if you are interested then please email your details to the BF2RA Company Secretary at bf2ra@gardnerbrown.co.uk for an invitation.

For further information about BF2RA and Membership please visit www.bf2ra.org or email technical@bf2ra.org

CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
Thursday 14 th May 2015	"Minerals Engineering 2015", organised by the Minerals Engineering Society, (MES), and co-sponsored by the Coal Research Forum, (CRF), and the South Midlands Mining and Minerals Institute, (SMMMI)	Yew Lodge Hotel, Kegworth, East Midlands.	Mr. Andrew Howells, Secretary of the MES, Tel : 01909-591787 Mobile : 07510-256626. E-mail : hon.sec.mes@lineone.net
31 st May to 4 th June 2015	40 th International Technical Conference on Clean Coal & Fuel Systems	Sheraton Sand Hotel, Clearwater, Florida, USA	For more information visit: http://www.coaltechnologies.com/pages/call_for_papers.html
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
Monday 20 th to Wednesday 22 nd July 2015	1 st Chemistry in Energy Conference (1 st CEC)	Heriot-Watt University, Edinburgh, Scotland	For more information visit the Conference website, www.chemistryinenergy.org , where the Call for Abstracts is still open for poster presentations
16 th to 17 th September 2015	5 th IEA CCC Workshop on Cofiring biomass with Coal	Drax power station, Yorkshire	For details visit:- http://cofiring5.coalconferences.org/ibis/cofiring5/home
27 th September to 1 st October 2015	2015 International Conference on Coal Science and Technology, (ICCS&T)	Melbourne, Australia	For all event information, www.engineersaustralia.org.au/iccst-2015
5 th to 8 th October 2015	International Pittsburgh Coal Conference	University of Pittsburgh, Swanson School of Engineering	For details visit:- http://www.engineeringx.pitt.edu/pcc/
Tuesday 6 th October 2015	The 2015 Energy Science Lecture Organised by the Biomass and Fossil Fuel Research Alliance, (BF2RA), with sponsorship from the British Coal Utilisation Research Association, (BCURA), to be presented by Prof. Rachel Thompson, University of Loughborough	The Chartered Accountants' Hall, 1, Moorgate Place, London, EC2R 6EA	Mr. J.D.Gardner, BF2RA Company Secretary, Gardner Brown Ltd., Calderwood House, 7 Montpellier Parade, Cheltenham, GLOS , GL50 1UA. Tel : 01242-224886 Fax : 01242-577116 E-mail : john@gardnerbrown.co.uk
Late October/Early November 2015	"Prioritising CCS R&D to Achieve Cost Reduction", Joint CRF APG Division/Advance Power Generation Technologies Forum, (APGTF), Seminar	A London Location	Mr. Peter Sage Chairman of the CRF Advance Power Generation Division Tel : 01242-233509 E-mail : p_sage@sky.com
17 th to 20 th November 2015	11 th Workshop on mercury emissions from coal	GRT Grand Hotel, Chennai, Tamil Nadu, India	For details visit:- http://mec11.coalconferences.org/ibis/MEC11/home

Wednesday 2 nd December 2015	<p>“The Control of Mercury and Trace Element Emissions” and “Options for Biomass Energy with CCS, (BECCS), the Theory and Practice”</p> <p>Joint Seminar of the Coal Research Forum Environment and Combustion Divisions</p>	The Edge, University of Sheffield, Sheffield	<p>Dr. Bill Nimmo Chairman of the CRF Environment Division Tel : 0113-343-2513 E-mail : w.nimmo@leeds.ac.uk</p> <p>Prof Jon Gibbins Chairman of the CRF Combustion Division Tel : 0131-650-4867 E-mail : jon.gibbins@ed.ac.uk</p>
8 th to 10 th December 2015	COAL-GEN 2015	Las Vegas Convention Center, Las Vegas, Nevada, USA	For more information visit:- http://www.coal-gen.com/index.html#showcase_3
April 2016	<p>Provisional Title, “The Analysis and Characterisation of Coal for Utilisation”</p> <p>Seminar of the Coal Research Forum Coal Characterisation Division</p>	Imperial College London	<p>Prof. Ed Lester Chairman of the CRF Coal Characterisation Division Tel : 0115-951-4974 E-mail : edward.lester@nottingham.ac.uk</p>
Monday 5 th to Wednesday 7 th September 2016	11 th European Conference on Coal Research & Its Applications, ECCRIA 11, Biennial Conference Organised by the Coal Research Forum	The Edge, University of Sheffield, Sheffield	For further information on this Conference, please see the Conference website, www.maggichurchosevents.co.uk/crf