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# NEWSLETTER



*of  
the  
Coal Research Forum*



## **EDITOR'S MUSINGS:**

Once again it is that festive time of year when the committee of the Coal Research Forum are delighted to wish all of our readers a happy and successful new year.

2014 has been a busy and successful year in many respects for the Coal Research Forum. Our biennial conference, ECCRIA 10, was held in Hull and, as some of you will know, attracted a good attendance of well over one hundred and was judged by most as a success. Several students were awarded CRF bursaries to attend ECCRIA 10 and their impressions of the conference are included in this newsletter. For those who were unable to attend more than 70% of the presentations are now available on the CRF website for viewing, see <http://www.coalresearchforum.org/eccria2014.html>

This newsletter also contains a summary of the BF2RA Coal Science lecture given by Dr Nigel Burdett who described the conversion of Drax from a coal to a biomass firing station.

Details on the latest projects from the Research Fund for Coal and Steel i.e. those which started in 2014 are to be found in this newsletter.

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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,  
Energy Technologies Building,  
Innovation Park, Triumph Road,  
**Nottingham NG7 2TU**

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](http://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.

### **10<sup>th</sup> European Conference on Coal Research & Its Applications 15<sup>th</sup> to 17<sup>th</sup> September University of Hull Business School**

On 15<sup>th</sup> September 2014 delegates gathered in the Business School at the University of Hull for the 10<sup>th</sup> European Conference on Coal Research & Its Applications (ECCRIA 10). This two and a half day biennial event featured 80 oral presentations by speakers from 15 different countries.

The key aspect of the ECCRIA conference series is focusing on ways in which basic research as carried out in universities can be applied to the use of coal in industrial engineering processes.

The policy of the conference organisers has always been to offer an event at a cost which will encourage the attendance of research students, who are those who might benefit most from the opportunities to showcase their work and to network with other researchers.

Currently important topics covered by the conference included CO<sub>2</sub> capture and oxy-fuel technology and modelling, biomass torrefaction, gasification and low-rank coals, characterisation and trace element deposition, emissions and developments in their measurement and IGCC and gas turbine technology.

The conference was opened and the attendees were welcomed to Hull by the conference chairman Professor John Patrick from the University of Nottingham. On behalf of the host university Professor Stephen Kelly, Dean of the Faculty of Science and Engineering echoed

John's welcome and described some of the history of the University of Hull and its exciting plans for the future.

The keynote address was given by Professor Mohamed Pourkashanian who is Head of the of the University of Leeds' Energy Technology and Innovation Initiative and Director of the Pilot-scale Advanced Capture Technology (PACT) national facilities. His talk was entitled "Future power generation from coal in the UK – policy, technologies and supporting research" and he began by asking whether there was anyone in the lecture theatre who did not believe that coal had a future. Not surprisingly there were none and Professor Pourkashanian then asked if anyone knew how much of the current generation capacity was being produced by coal. It may have come as a shock to some that it was still at the relatively high level of 35% at that time on that day. With coal being responsible for more than one third of the current generating capacity Professor Pourkashanian said he would show how and why it does indeed have a future.

The important factors affecting the energy stability of the nation were identified, namely coal availability and security of supply, its cost and environmental impact. Coal is the most widely used energy source for generating electricity in the world, including currently in the UK, where coal generated more electricity than any other source in 2012 and 2013. Coal is also a secure source of energy. It is readily acquired from a number of mostly politically-stable suppliers and can be safely stockpiled in large quantities. Coal plants have a high level of availability and controllability and can deliver electrical power as required to meet consumer demand.

Technical innovations have overcome most previous objections to coal use due to environmental emissions, but the problem of CO<sub>2</sub> emissions is still outstanding. The UK is, however, in a relatively strong position to take benefit of the energy security advantages of coal since it has ready access to secure geological storage for CO<sub>2</sub> in the North Sea. The amount of storage is probably sufficient for centuries of use and, being offshore, the challenges in getting public acceptance for its use appear to be low. In addition to the enactment of appropriate government policy and electricity market and other regulatory measures questions of plant location and technology choice also need to be established.

The choice of coal conversion technology is also complicated by the need to incorporate CO<sub>2</sub> capture as well as another new requirement, that is, to operate in a UK electricity system with a high amount of intermittent renewable generation, namely wind.

Professor Pourkashanian also considered a number of coal and biomass conversion routes and how innovation may achieve cost reductions in their use under future UK energy market conditions. These were air-fired supercritical coal plant with post-combustion capture; oxy-fuel supercritical coal plant; coal gasification with conventional gas turbine combined cycle plants and unconventional power cycles using coal.

The keynote address provided the basis for a central message that demonstration of technical and economical features of carbon capture, utilisation and storage at RD&D scale will give confidence to the power sector, policy makers and the public that a practical carbon mitigation control option exists for the most widely available energy form at low cost to be used to meet the nation's energy needs in an environmentally acceptable manner.

Parallel sessions were planned for ECCRIA 10 to allow for a greater number of papers and wider scope of topic to be included in the conference. Several of the sessions focussed on the important topics of carbon capture and storage (CCS) and oxy-fuel. Aspects included the simulation and modelling of these technologies.

In carbon capture the use of calcium-looping as efficient post combustion process was discussed with reference to its use in cement plants, (Nikolopoulos), and also for improved heat integration opportunities and lower energy penalties, (Hanak). Results from a pilot scale amine capture plant in Poland were reported (Tatarczuk) whilst the benefits of being able to estimate the CO<sub>2</sub> loading in the flue gas stream through QSPR (Quantitative structure property

relationships) to optimise amine usage was presented by Stec. Lawal described the need for an integrated approach to CCS modelling which was investigated in the CCS Modelling Tool-kit project. This UK Energy Technologies Institute-funded project, completed in July 2014 and funded to £3M, was reported as having exceeded its objectives. Aneke presented initial work on the use as a cryogenic air storage system of by-product liquid nitrogen from the air-separation units needed in an oxy-fuel boiler plant.

Advances in the understanding of trace element partitioning in pulverised coal combustion were presented by Seames. It was found that arsenic is released in elemental form, selenium as its oxide or sulphide and antimony in elemental and as the oxide and chloride. A second paper by Seames described work on the development of a new predictive model for trace elements in the combustion zone of a boiler. Oboirien examined the distribution of major and trace elements in bottom ash from oxy-fuel firing. There appears to be some enrichment of elements in the bottom ash but operating conditions are also a factor. Rizvi showed that under oxy-fuel conditions the presence of CO<sub>2</sub> instead of nitrogen had little effect on corrosion if all other gaseous components were kept constant. However, the presence of increased levels of alkali from biomass can enhance deposition and corrosion. Potgeiter introduced the role of micro-Raman spectroscopy as one of a number of tools necessary to help predict slagging and fouling propensities in coals.

Sessions were held on coal-derived products and gasification. Castro-Diaz reported work on the rheometry of coking coals as a means of identifying coals liable to damage coke oven batteries although further work is needed to be able to predict the magnitude of wall pressures. While there are international standards for the determination of Coke Reactivity Index (CRI) and Coke Strength after Reaction (CSR), there are no such standards for coke production. Bennet described an investigation in Australia which showed that coking conditions have an impact on CSR and the extent that different coking conditions influence CSR depends on the rank and type of coal. Lester presented recent work on sophisticated image analysis of coke oven residues and particulate analysis which are helping to elucidate the mechanisms which occur during coal carbonisation.

Papers on biomass and its torrefaction were well represented. Darvell reported on the effect of particle size on the torrefaction of willow and eucalyptus while Bada reported on an investigation into the potential for co-firing a species of bamboo with coal in South Africa. Ndibe showed that pilot-scale testing of torrefied spruce pellets at high concentrations (100%) or co-fired with coal (50%) was technically feasible and unburnt carbon, NO<sub>x</sub> and ash deposition levels were acceptable.

Experimental studies into biomass ignition behaviour using visual drop-tube furnace methods were described by Bennet whilst Chalmers measured ignition behaviour of biomass coal particles under oxy-fuel conditions using an ignition chamber. Mason reported his recent work on flame combustion studies for single particles of biomass. Biomass char yields and reactivity were described by Jenkinson using a correlation with aromatic carbon content. Farrow found that when using a drop-tube furnace under oxy-fuel conditions that biomass could act as an effective catalyst to improve coal devolatilisation and combustion efficiency.

The important effect of weathering, self-heating and storage on biomass pellets was described by Graham. Depending upon the nature of the biomass the durability of the pellets varied. Thermally treated pellets performed best although all need indoor storage to maintain their durability.

Williams highlighted the deficiencies of the Hardgrove Grindability Index test for coal when applied to biomass. An alternative Bond Index test has been investigated and has proved more useful in assessing likely performance in a real milling scenario.

Lester showed how image analysis could be used to assist in the prediction of biomass char formation and burn-out when used as a co-firing component in power station boilers.

The session on low rank and brown coal was opened by Aekersberg of Loesche who described their Coal Enhancement Process which combined drying, grinding and classification. Results showed that the process using raw low rank coal was effective and the finished product could be fed directly into a briquetting press. Two summaries of Pakistani coals were presented, Tayyeb Javed reporting on Thar lignite and Rehman on coals from the Salt and Trans Indus regions. Rosin reported a new continuous lock-free process for pressing and feeding of briquettes into a gasifier.

Two papers were presented featuring smelting reduction (Lohmeier) and the utilisation of coals for blast furnace use (Steer). Hard coal briquetting proved successful in the application of smelting reduction and the direct injection of higher volatile content than normal coals into the blast furnace was found to be beneficial.

A paper on the retention levels in fly ash of mercury from oxy-fuel processes was presented by Fernandez Miranda. Any mercury in fly ash was found to be retained by adsorption onto the surface of residual carbon. The methodology to determine adsorbed mercury on carbon was presented by Rumayor.

Zhang opened the session on flow measurement with a paper on flow characterisation of coal and inert bed particles in circulating fluidised bed using an electrostatic sensor array. Coombes described an intrusive array probe sensor for monitoring particle size, velocity and concentration in a coal/biomass multiphase flow. The third paper by Xiangchen Qian was entitled "Concentration measurement of pulverised coal in pneumatic conveying pipelines using acoustic emission and electrostatic sensors". The final paper by Peng Xu described the development of a new model to study gas leakage in urban medium pressure pipelines.

The final session was on IGCC and gas turbines. Papers included a dynamic simulation study on the IGCC process with a novel activated carbon-based pre combustion CO<sub>2</sub> capture system (Wang), large eddy simulation of combustion instability in gas turbine engines (Wang), the application of Helmholtz resonators as combustion dynamics stabilising devices for advance power generation (Rubini) and a study into a CCGT power plant integrated with post combustion CO<sub>2</sub> capture and compression (Luo).

The poster session comprised 18 presentations whose topics included gas flow measuring, artificial oxidation of coals, co-pyrolysis of tyre waste and coal, characterisation of degraded solvents from amine scrubbers and many more varied topics.

It had been the objective of the organising committee that the information presented at this event would reflect a broad spectrum of current research not just in the UK but worldwide and it is believed that this aim was realised.

The conference was formally closed on Wednesday lunchtime by Professor John Patrick from the University of Nottingham. John thanked the delegates for attending and hoped they had enjoyed the latest ECCRIA conference. When asked about ECCRIA 11 the answer was that we intend to hold another conference but the venue remains to be decided!

## **Reports from ECCRIA 10 Student Bursary beneficiaries**

***Kehinde Adefila  
School of Engineering & Digital Arts  
University of Kent***

This is the report of Mr Kehinde Adefila who was awarded a travel bursary by the Coal Research Forum, to attend the 10<sup>th</sup> European Conference on Coal Research and its Applications (ECCRIA) held at the University of Hull from 15<sup>th</sup> to 17<sup>th</sup> September 2014.

The conference was sponsored by the Coal Research Forum and it was the first conference in the world to focus on scientific problems of coal characterization, products, utilization and conversion which led to discussions on the latest advances. More than 100 participants from over 10 countries worldwide, including scholars, experts and entrepreneurs from various energy sectors, attended the conference. Exchanges and discussions were carried out in different sessions of the 3-day Conference.

I am a 3<sup>rd</sup> year PhD student supervised by Professor Yong Yan in the Instrumentation, Control and Embedded Systems research group under the School of Engineering and Digital Arts of the University of Kent, and I delivered a poster presentation titled "Gaseous CO<sub>2</sub> Flow Metering using Averaging Pitot Tube with Flow Conditioning Wing". My particular interest in attending this conference was the opportunity to hear similar presentations in Session 1A and meet with other students who are also working in the Carbon Capture and Storage (CCS) research area. The 3-day conference held two parallel sessions on 16 specific topics. A total of 81 oral presentations were given and 18 posters were presented in the poster session.

The event was very well organized with easy navigation to the main venue, lecture rooms and accommodation. The organizing committee not only provided high quality food, but also gave us all a great memory about Hull city. There were plenty of exotic attractions and locations to see such as the historic Old Town, Hull Marina, Hull Truck Theatre and the Hull Football Club KC Stadium. In the end, the conference provided me with much professional and personal experience.

***Gaurav A Bhaduri,  
School of Chemical Engineering and Advanced Materials,  
Newcastle University***

This is the report of Mr Gaurav A Bhaduri who was awarded a travel bursary by the Coal Research Forum, to attend the 10th European Conference on Coal Research and Its Applications held at the University of Hull in Kingston upon Hull on the 15th-17th September, 2014. It was a very well organised in the beautiful port city of Kingston upon Hull. This was my first time to Hull and was a very pleasant experience from start to end. The conference organizers provided a very useful information and support for the accommodation and transport facilities.

The conference was sponsored by various industries like Alstom, Drax, EDF Energies, Haider Green, SSE and others. I think the conference was a great success bringing academics and industries closer seeing that there were many participants from various countries like China, Germany, Pakistan, Poland, South Africa and the United States of America along with well known academics and industrialist from the UK the United Kingdom. This is a conference that focuses on the topic of coal research and draws researchers from all the continents to simulate interesting research ideas and networking opportunities. The talks were very well listed giving me an opportunity not only to interact with experts in my subject area of carbon capture and storage but also interact with experts doing cutting edge research in coal research, an area that has intrigued my interest.

I am a 4th year PhD student at the School of Chemical Engineering and Advanced Materials, Newcastle University, UK supervised by Dr Lydia Filler. I gave an oral and poster presentation titled "Nickel Nan particles for enhancing carbon capture: Temperature dependent kinetics and Applications". The conference gave me an opportunity to present my work to a world audience in my subject area and helped me find new avenues of collaboration and facilities that I can tap in the UK for future research projects. The conference was divided into various sessions having respected researches giving talks on topics like coal combustion, carbon capture, biomass as an alternative fuel, oxy-fuel combustion and so on. I especially liked the key note address by Prof M. Pourkashanian from the University of Leeds that aptly summed and presented the policies, technologies and research related to coal based power generation and future of carbon capture and storage in it.

The conference dinner at the Guildhall, City Council of Hull was a highlight of the event. It gave me opportunity to talk with many of the participants attending the conference and network and socialise over dinner.

**James Robert Coombes**  
**School of Engineering and Digital Arts,**  
**University of Kent, Canterbury**

This is the report of Mr James Robert Coombes who was awarded a travel bursary by the Coal Research Forum, to attend the 10<sup>th</sup> European Conference on Coal Research and its Applications 2014 held at the University of Hull on 15<sup>th</sup> to 17<sup>th</sup> September 2014.

The Conference was organised by the Coal Research Forum and sponsored by Alstom, Drax, EDF Energy, Haider Green, Knowledge Transfer Network and SSE. The conference aims are to bring together academics and industry in the field of coal research and its applications.

I am a 3<sup>rd</sup> year PhD student supervised by Professor Yong Yan in the School of Engineering and Digital Arts at the University of Kent Canterbury. I delivered an oral presentation entitled "Development of an Electrical Array Sensor for Monitoring Particle Size, Velocity and Concentration in a Pneumatically Conveyed Coal/Biomass Flow". This was the first time I had to give an oral presentation outside of the University of Kent. It gave me the chance to present my research to a range of people of different backgrounds and professions.

I personally found the question and answer session after my presentation most useful to me since it gave an insight to considerations that I had not considered due to the varied backgrounds of the people in the audience asking the questions.

The event itself was well organised with a varied programme of over 60 presentations which gave a good overview of the types of research being carried out on all aspects of the coal industry; whether the burning process, fuel transportation or the use of biomass to increase the amount of renewable fuels used in addition to burning coal.

The times between presentations gave me the chance to look through the posters on display as another way to observe the other types of research being carried out in the field of coal combustion and related areas. The breaks between presentations also gave me a chance to catch up with fellow researchers from other universities around the world who are researching similar areas to me. Attending the conference has given me both personal and professional experience as well as allowing me to see areas where my research will have an impact. I would like to thank the CRF for providing me with a grant that has made my attendance at the conference possible.

**Dawid Hanak**  
**Combustion and CCS Centre, Energy Division**  
**School of Energy, Environment and Agrifood, Cranfield University**

This is the report of Mr Dawid Hanak who was awarded a travel bursary by the Coal Research Forum, to attend the 10<sup>th</sup> European Conference on Coal Research and Its Applications held at the University of Hull on 15<sup>th</sup> to 17<sup>th</sup> September 2014.

The 10<sup>th</sup> European Conference on Coal Research and Its Applications (10<sup>th</sup> ECCRIA) held at the University of Hull on 15-17<sup>th</sup> September 2014 was organised by the Coal Research Forum and focused on scientific problems of coal characterisation, utilisation and preparation.

I am a 2<sup>nd</sup> year PhD researcher supervised by Professor Vasilije Manovic and Dr Chechet Biliyok in the Combustion and CCS Centre, Energy Division of the Cranfield University and I delivered

an oral presentation entitled "Identification of heat integration opportunities in calcium looping CO<sub>2</sub> capture plant". This was an opportunity to share my research, which is on reduction of the energy penalty of the CO<sub>2</sub> capture for the coal-fired power plant.

I have decided to attend 10<sup>th</sup> ECCRIA to challenge myself in the environment of more than 130 participants, including scholars, experts and entrepreneurs from various energy sectors. The 3-day conference was divided into 18 sessions addressing various fields of scientific research on coal applications, such as CO<sub>2</sub> capture technologies, gasification, torrefaction of biomass, flow measurements, characterisation, coal and biomass combustion and emissions.

Although a total of 80 oral presentations were given and 22 posters presented throughout the 3-day Conference which gave me an opportunity to appreciate various aspects of coal characterisation, utilisation and preparation, I was primarily interested in the CO<sub>2</sub> capture related topics presented in Sessions 1A, 2A and 3A. These showed the current direction of the international research on CO<sub>2</sub> capture and other clean coal technologies. Also, I found the opening keynote lecture entitled 'Future Power Generation from coal in the UK' particularly important as it conveyed a key message that coal is and will remain the most common energy source across the world and the clean coal technologies are a must to mitigate severe climate change.

Finally, not only did attending the 10<sup>th</sup> ECCRIA result in a new insight into and stimulation of new ideas for my research, it also gave an occasion to meet with researchers not only from different universities across the UK, but also from countries like Poland, Germany, North Korea or Greece. Such a networking opportunity was undeniably a key benefit of such event as it allowed for knowledge sharing and discussions with the experts in the area of clean coal technologies.

***Md. Moinul Hossain,  
School of Engineering and Digital Arts,  
University of Kent, Canterbury***

This is the report of Mr Md. Moinul Hossain who was awarded a travel bursary by the Coal Research Forum, to attend the 10<sup>th</sup> International Conference on Coal Research and its Applications held at the University of Hull in UK on 15<sup>th</sup> to 17<sup>th</sup> September 2014. The Conference was sponsored by the Coal Research Forum and it was the first conference in the world to focus on scientific problems of coal, coal characterisation, coal products and coal utilisation which lead to discussions on the latest advances.

More than 200 participants from different countries worldwide, including scholars, experts and entrepreneurs from various energy sectors, attended the Conference. Exchanges and discussions were carried out in different sessions of the three days Conference. I am a 4<sup>th</sup> year PhD student supervised by Professor Yong Yan and Dr Gang Lu, Instrumentation Research Team, School of Engineering and Digital Arts, the University of Kent, Canterbury, UK. On behalf of the Kent Instrumentation Research Team, I gave an oral presentation entitled "3-D reconstruction and characterisation of oxy-coal flames on a 250kW combustion test facility" (Session 6A: Oxy-fuel combustion), and a poster entitled "A multiple linear regression approach to NO<sub>x</sub> emission prediction based on flame radical imaging and contourlet transform" at the Poster Session. My presentation and poster were well received by audience, and I have got very useful feedback from experts in the field which are valuable for my future research, particularly the 3-D imaging and characterisation of in the oxy-coal flames. In addition, I attended a several sessions relating to my research interests. I found that the technical programme of the event crossed a wide range of topics in coal research, which certainly expanded my knowledge in the area. I had also a chance to meet and discuss with the delegates and fellow researchers to share ideas and experiences, which were not only beneficial to my research but also future career.

I would also like to add that the conference was well organized. The accommodation, facilities and food was excellent. Breakfast at the accommodation, coffee and lunch breaks provided

good opportunities to meet academics, researchers and engineers from universities, industries and other fields from all over the world, which has certainly helped to establish a link with fellow researchers. In summary, attending the ECCRIA 2014 has given me an invaluable experience. I will certainly be interested in participating making my contributions to future ECCRIA conferences and other events organised by the CRF.

**Rachel Lewis**  
**Efficient Fossil Energy Technologies (EFET)**  
**Engineering Doctorate Centre,**  
**University of Nottingham**

I am a 3rd year EngD (Engineering Doctorate) student supervised by Professor Colin Snape in the Efficient Fossil Energy Technologies Centre at the University of Nottingham. At the Conference I delivered a poster presentation entitled "Characterisation of Degraded Solvents from Amine Scrubbing".

More than 100 participants from various countries worldwide, including academics, experts and entrepreneurs from various energy sectors, attended the conference. The conference was very well organised with several parallel sessions running over the 3-days and there was also a poster session on Monday evening.

My particular interest in attending this conference was the opportunity to hear from researchers and experts in similar fields to myself, such as emerging CO<sub>2</sub> capture technologies and it was also interesting to hear about modelling different aspects of CO<sub>2</sub> capture. The conference was a great opportunity to meet with other students who are also working in carbon capture related areas.

The conference was divided into several sessions covering many aspects of coal related research from CO<sub>2</sub> capture technology to torrefaction of biomass. A total of 80 oral presentations were given and 18 posters were presented in the poster session. Although I was only able to attend the conference for one day I found it very useful and interesting. The talks I attended gave me more insight into my own research area and provided many ideas as to how I could enhance my work.

Overall, the organisation of the conference and the delivery of the presentations made the 10<sup>th</sup> ECCRIA a success and a thoroughly enjoyable experience. I hope to attend future meetings and look forward to hearing more about ongoing coal related research as well as sharing my own research with the wider scientific community.

**Orla Williams**  
**Efficient Fossil Energy Technologies (EFET)**  
**Engineering Doctorate Centre,**  
**University of Nottingham**

This is the report of Miss Orla Williams who was awarded a travel bursary by the Coal Research Forum, to attend the 10th ECCRIA (European Conference on Coal Research and its Applications) held at the University of Hull in Hull on 15-17th September 2014.

The Conference was organised by the Coal Research Forum and sponsored by Alstom, Drax, EDF Energy, Haider Green, SSE, and the Knowledge Transfer Network and the conference aimed to bring together researchers in universities with participants from industry, to present the state of the art in coal research and its industrial applications

Since the first UK National Meeting on Coal Research and its Applications was held in 1996, the success of the biannual ECCRIA conference has led to it to become an internationally renowned conference on coal research with participants from USA, Australia, South Africa, and all over

Europe. This includes scholars, experts and entrepreneurs from various energy sectors who attended the Conference. Exchanges and discussions were carried out in different sessions of the 3-day Conference.

I am a 4th year EngD student supervised by Dr Carol Eastwick in the Energy & Sustainability Research Division in the Faculty of Engineering of the University of Nottingham, and I delivered an oral presentation entitled "Bond Index & Hardgrove Grindability Tests for Biomass & Coal". My particular interest in attending this conference was the opportunity to hear similar presentations in the Biomass and Coal Characterisation sessions, and meet with other students who are also working in biomass and coal research.

The conference was divided into 9 dual track sessions encompassing themes encompassing research developments in carbon capture technology, gasification, modelling, biomass torrefaction, coal derived products, combustion, coal and biomass characterisation, instrumentation and emissions. A total of over 50 oral presentations were given and several posters were presented in the poster session in the main reception area during the intervals

Following the conference welcome from the University of Hull, Prof Pourkashanian from the University of Leeds gave a keynote address entitled "Future power generation from coal in the UK – policy, technologies and supporting research", which summarised the current status of coal use in the power sector in the UK and the opportunities for coal research in the future, particularly in the areas of carbon capture, coal gasification, biomass and unconventional power cycles using coal. There were several sessions dedicated to the latest developments in carbon capture technology. Adam Tatarczuk from the Institute of Chemical Processing of Coal in Poland presented the results of testing at a pilot scale plant for advanced CO<sub>2</sub> capture using amine scrubbers, which showed the impact of multiple process parameters on processes efficiency and energy demand. Several presentations focused on the modelling of carbon capture systems. The potential of retrospective carbon capture adoption was presented by Nikolaos Nikolopoulos from the Centre of Research and Technology Hellas in Greece, where the integration of calcium looping technology into an existing cement plant for CO<sub>2</sub> capture was modelled to evaluate the process simulation and economic benefits of such systems compared to amine scrubbing technology. Elvis Agbonghae from the University of Leeds, UK, presented the process modelling and simulation of a 550MWe pulverised fuel coal fired supercritical power plant, and MEA-based post combustion CO<sub>2</sub> capture plant, and CO<sub>2</sub> compression train.

Reflecting the increasing use of biomass in existing coal fired power stations, there were three dedicated sessions to biomass processing and combustion. Experimental studies on the pre-treatment of biomass through torrefaction, such as the effect of particle size on the torrefaction of willow and eucalyptus by Leilani Darvell from the University of Leeds, showed how greater understanding of the physical characteristics of biomass is improving the pre-treatment of biomass for combustion. Pilot scale testing of torrefied biomass was presented by Collins Ndibe from the University of Stuttgart in Germany, where the co-firing of torrefied fuels in a 500kW pulverised coal boiler is being investigated. The processing issues of biomass in coal mills were investigated by Orla Williams from the University of Nottingham, UK, by analysing the applicability of the Hardgrove Grindability Index and Bond Index tests on a range of biomasses. The differences in coal and biomass combustion were investigated in several presentations from researchers at the University of Nottingham. Prof Ed Lester presented the morphological differences in biomass and coal char structures, and Tom Bennet presented an experimental study of the ignition behaviour of coal and biomass in a visual drop tube furnace, which showed the impact of temperature and fuel properties on ignition behaviour. Also from the University of Nottingham, Archi Sarroza presented an experimental and computational fluid dynamic analysis of the impact of moisture on solid fuel combustion, and Patrick Mason from the University of Leeds presented a study on the influencing factors on single particle flame combustion for solid biomass fuels.

Of great interest at the conference was the recent developments in coal derived products. The impact of coking conditions on coke strength after reaction (CSR) and an evaluation of coking coals was presented by Philip Bennett from ALS Coal in Australia, which showed that coking coals impact the CSR and is dependent on rank and coal type. The processing of coal derived products was investigated by Reinhard Lohmeier from TU Bergakademie Freiberg in Germany, who presented a study on the processing of hard coal fines by binder briquetting for use in smelting reduction processes. Julian Steer from Cardiff University, UK, showed the opportunities for improving the utilisation of coals for blast furnace coal injection through drop tube furnace investigations of different coal blends and particle size. Ronald Aekersberg from Loesche, Germany, discussed the latest industrial developments in processing low rank and brown coals for various applications through the development of Loesche GmbH patented simultaneous grinding and drying process for low rank coals.

The 10<sup>th</sup> ECCRIA was a great success and provided great opportunities to meet fellow researchers from industry, and academia from all over the world. A diverse range of topics were covered and the conference was very successful in disseminating the latest advances in all areas of coal research. The excellent location and facilities at the University of Hull, and the well organised programme led to a successful and interesting conference. With permission of the presenters, it is the intention to make all the presentations available on the CRF website.

**BF2RA Robens Coal Science Lecture  
Institute of Chartered Accountants  
in England and Wales  
London  
30<sup>th</sup> September 2014**

The 2014 Coal Science Lecture which took place on 30<sup>th</sup> September was given by Dr Nigel Burdett who is Head of Environment at Drax Power Ltd. The lecture entitled "Coal and biomass – opportunities any synergies" was held at the Institute of Chartered Accountants in England and Wales in London.

Originally built, owned and operated by the Central Electricity Generating Board (CEGB), Drax Power Station was constructed and commissioned in two stages. Stage one (units 1, 2 and 3) was completed in 1974, some 12 years later in 1986 stage two (units 4, 5 and 6) was completed. It is the last coal-fired power station to be built in the UK. Each of the units has a capacity of 660MW when burning coal, giving a total capacity of just under 4,000MW, making Drax the largest power station in the UK

In July 2012, Drax announced that it planned to transform the business into a predominantly biomass-fuelled generator through burning sustainable biomass in place of coal. Drax has plans to convert three of its six generating units to burn biomass. The first of the three units was successfully converted in April 2013, and the new biomass receipt, storage and distribution systems to support the converted units were officially launched in December 2013. The second and third units were converted in 2014 and 2015 and further units may be converted later.

The major incentives to utilise biomass as a renewable energy source are that it is not dependent upon the weather; it is CO<sub>2</sub>-neutral and like coal can be used as a load following fuel.

Nigel's lecture covered biomass development at Drax - why they are where they are, why they are converting old coal power stations to biomass and what needs to be done to give them an extra decade or so of life. He also covered the science and technology underlying biomass use and the similarities and differences with that of coal and the future development potential, that is, why biomass is considered as a transitional technology rather than being a 'true renewable'.

A major theme of the lecture was that this technology, when used at large scale, is a new one and that newness has required the development of understanding of implications within Governments, the industry, regulators and stakeholders. The other, complementary, theme underlying all these is the work undertaken at Drax over the last 10 to 12 years. Nigel joined Drax when they were managing to burn just one truck load of biomass per day. They now have an operation bringing in more than 100,000 tonnes per week with that planned to increase by 50% next year.

Generators, such as Drax, now see a major shift away from the control of acidic emissions from coal towards eliminating its carbon emissions. Political parties are competing to make statements about how fast unabated coal should disappear from the energy landscape.

This is, of course why Drax have been advocating biomass - a renewable technology, saving CO<sub>2</sub>, which is considerably cheaper than most if not all other renewables, with the advantages of utilising existing plant, existing transmission systems, being quick to expand. Conversion of a large scale coal plant is possible, retaining all the benefits of coal in terms of operations and efficiency but being significantly more environmentally friendly in terms of emissions-particularly CO<sub>2</sub>.

Nigel said that a decade ago they would not have envisaged the progress that would be made. Even five years ago Drax was fairly circumspect about it. But that last five years have transformed pulverised biomass into the mainstream. That newness, of course, raises problems. For example:- How confident can UK Government be that the supply chains are there for large volumes of biomass power in 2020?; how efficient will it be?, will it have to be derated? In other words how much reliance can UK Government place on biomass when developing their strategic plan for compliance with their legally binding targets in 2020 and beyond?

To answer some of these questions the last decade has been for Drax one of extensive R&D, extensive testing of fuels, extensive supply chain investigation and investment, looking at different combustion systems and increasing fuel throughput.

However, as the volume of biomass increases, a whole range of new commercial, scientific, political and technical challenges emerge. These require a complete re-evaluation of much of the accepted art of coal procurement and combustion. In particular the synergies with the coal supply chain disappear - production of biomass, its transport and its storage present completely different technical challenges to those for coal.

The large scale use of pellets opens up opportunities for off-site fuel preparation and facilitates the use of pelletised wood from areas where there it is readily available, such as the USA and Canada where the technology and experience of pelletising is already in place.

At low throughputs biomass has little impact on coal combustion. Drax's initial aim was to build biomass throughput within a coal-fired boiler, but not attempting to burn 100% biomass. The advantage of that, of course, is that plant output need not be constrained by biomass - a failure in the logistics or a blockage in the delivery could be compensated for by burning additional coal. The boiler is still essentially coal-fired but with a slightly different fuel mix. The synergies with coal still pertain. However, moving on beyond the pilot stage involved conversion not co-firing. The current intention of UK Government is to enforce a one-way trip - conversion means a permanent conversion and not a temporary phenomenon enabling a return to coal.

Drax aims to progressively convert three units which is where the synergies with coal disappear. With co-firing it is always possible to argue that what exists is a coal-fired plant with all the NO<sub>x</sub>, SO<sub>x</sub>, particulate and ash management characteristics of a coal plant. In a converted unit, this is not the case and a new technical paradigm is created.

Four challenging technical and engineering issues need to be addressed regarding fuel handling; keeping the fuel dry, managing dust, learning how to safely store large quantities of fuel and getting the emergency management systems right.

Following conversion, old technology is no longer needed or practical. The FGD plant, so essential for coal or co-firing, but costly to install and operate, is not needed on a biomass unit. NO<sub>x</sub> levels are low using SCR and although this technology could be made to work in co-firing it is less effective with 100% biomass due to poisoning of the catalyst by trace impurities such as alkali metals.

The key point for the biomass pellet supply chain is that it is still embryonic. Unlike coal where there are many supply options this was not the case with biomass pellets. Drax had to start from scratch and build up and encourage a supply chain for itself and for suppliers by offering contracts. Drax is also building two pellet plants in the USA, each of around 450,000 tonnes capacity together with a port Panamax-capable facility at Baton Rouge.

There is also a fundamental issue over safety. This is where the major cultural change occurs in plant conversion. Coal is a relatively benign material – coal leaks and spills, whilst important are nowhere near as important a safety hazard as biomass. Biomass needs a much lower temperature to ignite and burns in a different way - it self-combusts when in piles or is exposed to hot parts of the plant.

Storing volumes of biomass presents completely new challenges. How long can you store biomass in large volumes without it setting fire? What type of biomass will be more prone to this tendency? What gases are released during large scale storage? Although extensive modelling of these problems has helped, first hand experience by trial and error has also played a part.

The combustion of biomass is not simple - the combustion regime is significantly modified compared with coal. The heat transfer characteristics of the boiler change radically. Major modifications are needed to reduce the primary air temperatures in the mills to prevent the biomass burning before it gets into the furnace – that requires considerable re-engineering of gas flows across the boiler. Low NO<sub>x</sub> systems also need re-engineering. The converted biomass units have demonstrated themselves to be as reliable as those firing coal once Drax had re-engineered the air flows and heat balances. The boilers are as efficient, as coal, are capable of the same output and have the same ramping capability.

Gaining stakeholder confidence in the environmental acceptability of large scale bioenergy projects is critical, not just for the interested public and environmental NGOs but also for investors and banks who have an interest in the longevity of the fuel streams Drax has spent a great deal of time with stakeholders and policymakers who all indicate that the key short and long term risks to large scale biomass development would be the use of a biomass which does not provide the anticipated benefits or that has unwanted negative impacts (directly or indirectly). Indeed these challenges rarely address the core science (and the forestry industry has been working on that for decades) but instead focus on modelling and on techniques such as Life Cycle Assessment (LCA).

So until the environmental and sustainability questions can be settled, the technology remains a transitional one. In the UK, the operating subsidy on which Drax depends expires in 2027. Some time ago the UK Government set out a discussion paper which indicated that it would not be possible to meet the 2050 CO<sub>2</sub> target without a significant amount of biomass power with carbon capture - this technology would mean negative carbon- i.e. a mechanism whereby CO<sub>2</sub> could be extracted from the atmosphere and stored underground. This is probably the only technology which could achieve that.

Nigel summarised his talk by reminding us that the technology works – biomass conversions do provide a firm source of large scale renewable power. The efficiency, the output and the

ramping rate of coal are retained but it is a low carbon- saving millions of tonnes of CO<sub>2</sub> per year. There is plenty of biomass available – Drax are intending to use about 8mt a year, other companies will be using perhaps the same levels overall. At large scale conversions, the technology is very different to that for coal and at any scale the key ingredient is to construct the supply chain to deliver the volumes needed.

And finally, despite its success, it is regarded as a transitional technology. The challenge all generators have to face over the next few years is to turn this around, to identify a level of biomass use which is compatible with the amount of residues that can be extracted from the forests and sawmills and to demonstrate just how effective the technology can be applied in practice.

### **New Funding for Carbon Capture and Storage (CCS) Innovation**

On 27 November 2014, DECC is making available additional funding for CCS research, development and innovation. This is part of DECC's Energy Entrepreneurs Fund (EEF) Phase 4 Competition with £5M for projects in Financial Year 2015/16, with up to £2.5M prioritised for CCS and related projects. Read the announcement [here](#) and details of this funding opportunity [here](#).  
<http://www.apgtf-uk.com/>

### **Appointment of Dr Meihong Wang as Professor in Energy Systems Engineering & CCS, University of Hull**

The Coal Research Forum is pleased to learn that Dr Meihong Wang has been promoted to Professor in Energy Systems Engineering & CCS. Meihong played an important role in bringing the recent ECCRIA 10 conference to the University of Hull and his enthusiastic support undoubtedly helped in the success of this event. Well done, Meihong!

### **RJM International appoints Dr. Gerry Riley as Principal Fuels and Combustion Engineer**

RJM International, the Winchester-based provider of emissions reduction solutions to power stations and large combustion plant, has appointed Dr. Gerry Riley, FIMechE, CEng as Principal Fuels and Combustion Engineer. Before joining RJM, Gerry Riley was Corporate Engineer for Fuels and Combustion within RWE npower's Engineering department. A Mechanical Engineering graduate, Gerry has over 27 years' experience in fuels, combustion, design, construction and commissioning of fossil-fuelled and biomass-fuelled plant in the power generation sector.

Most recently, Gerry has headed up a number of biomass-related projects including conversion feasibility studies and biomass fuel firing assessment programmes. As Manager of RWE's Combustion Test Facility, Gerry has also led programmes assessing other fuels, such as petroleum coke, Orimulsion, various imported coals and analysed the impact of related technologies including overfire air and coal re-burn.

We are also pleased to announce that Gerry has maintained his membership of the Coal Research Forum with his new employer.

## **The Greenhouse Gas Emissions Profile of Coal Bed Methane (CBM) Production: A Review of Existing Research**

by

**John Broderick and Maria Sharmina,  
University of Manchester 2014**

This report offers an overview of greenhouse gas emissions profile of coal bed methane production from the existing academic and grey literature. It does not provide any new empirical evidence although additional calculations have been performed to allow for comparison between studies and with data for other sources of natural gas. Having examined the available literature, the report identifies where there are gaps that are relevant to UK development of CBM. Link to full report:-

<https://www.escholar.manchester.ac.uk/item/?pid=uk-ac-man-scw:225295>

### **Newsletters from other organisations**

The most recent IEA Newsletter can be viewed here:-

[http://www.iea-coal.org.uk/publishor/system/component\\_view.asp?LogDocId=](http://www.iea-coal.org.uk/publishor/system/component_view.asp?LogDocId=)

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

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

### **ARTICLES FROM THE TECHNICAL PRESS**

#### **News alerts in coal and energy research**

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

#### **Peabody Energy told to scrub 'clean coal' claims**

**20<sup>th</sup> August 2014, Jessica Shankleman, businessGreen**

The world's largest private coal company Peabody Energy has been banned from touting the low-carbon virtues of its "clean coal" technology, after it ran adverts arguing fossil fuels represented one of the best solutions to the global energy crisis. The Advertising Standards Authority (ASA) said Peabody had misled the public when running the ad campaign earlier this year, by implying that "clean coal" technologies were emissions free, when in fact that was not the case. The claims were made as part of a national newspaper campaign dubbed Advanced Energy for Life that was developed in partnership with PR firm Burson-Marsteller. It warned that global energy poverty was "the world's number one human and environmental crisis", and added that this crisis could be solved through "today's clean coal technologies". For more.....

<http://www.businessgreen.com/bg/analysis/2361034/peabody-energy-told-to-scrub-clean-coal-claims>

#### **Low carbon displaces coal in Poland's plan**

**21<sup>st</sup> August 2014, unattributed, World Nuclear news**

Poland will reduce dependence on brown and black coal by introducing nuclear power and renewables, according a draft energy policy to 2050 released for consultation. The Polish government put forward two main scenarios for future energy supply. Both see nuclear power introduced in 2020 and expanding to become "an important element of the energy sector after 2025", along with renewable sources. For more visit:-

<http://www.world-nuclear-news.org/NP-Low-carbon-displaces-coal-in-Polands-plan-2108141.html>

## **Coal-fired power plant installations rise in China**

**22<sup>nd</sup> August 2014, San Dodson, World Coal**

According to a new report from Precergy, new research suggests that Chinese coal-fired power plant installations are set to rise strongly in the short-term, as coal power capacity experiences a mini renaissance. Just 42 GW of new coal-fired power plants were installed in 2013 – the worst year for coal capacity additions in China since 39 GW were installed in 2004. During the intermediary period, a peak level of 82 GW/year was achieved in 2006 before levels stabilised to around 60 GW/year between 2008 and 2011. However, after the high coal prices witnessed in 2008, 2010 and 2011 impacted the profitability of China's big five power producers, there was a clear slowdown in coal power project investment. That is, the big five and other coal power project developers delayed final investment decisions (FIDs) and extended project completion timelines to reduce the risk of incurring financial losses as a result of prolonged high coal prices and an inflexible tariff system. Consequently, new coal power plant additions dropped sharply to 48 GW in 2012 before hitting a decade low level in 2013. In this regard, market forces had the impact of supporting the Chinese government's plans to both diversify the power capacity mix and reduce the country's dependence on highly polluting coal. However, project economics for coal-fired plants in China have improved greatly since 2012 and provided a strong investment signal for such projects. So, in spite of Premier Li Keqiang declaring war on pollution, annual coal power capacity additions are actually set for a mini renaissance in 2014 and 2015 before starting back on the overriding long-term downward trajectory. For more visit:-

[http://www.worldcoal.com/news/power/articles/Chinese-coal-power-capacity-to-rise-in-short-term-1242.aspx#.VCPq1\\_lXfk](http://www.worldcoal.com/news/power/articles/Chinese-coal-power-capacity-to-rise-in-short-term-1242.aspx#.VCPq1_lXfk)

## **Existing power plants will spew 300 billion more tons of CO<sub>2</sub> during use**

**26<sup>th</sup> August 2014, unattributed, Science Daily**

Existing power plants around the world will pump out more than 300 billion tons of carbon dioxide over their expected lifetimes, significantly adding to atmospheric levels of the climate-warming gas, according to UC Irvine and Princeton University scientists. Their findings, which appear Aug. 26 in the journal *Environmental Research Letters*, are the first to quantify how quickly these "committed" emissions are growing -- by about 4 percent per year -- as more fossil fuel-burning power plants are built. Assuming these stations will operate for 40 years, the power plants constructed globally in 2012 alone will produce about 19 billion tons of CO<sub>2</sub> during their existence, the researchers' project. "Bringing down carbon emissions means retiring more fossil fuel-burning facilities than we build," said Steven Davis, assistant professor of Earth system science at UCI and the study's lead author. "But worldwide, we've built more coal-burning power plants in the past decade than in any previous decade, and closures of old plants aren't keeping pace with this expansion." "Far from solving the climate change problem, we're investing heavily in technologies that make the problem worse," he added. For more visit:-

[http://www.sciencedaily.com/releases/2014/08/140826142443.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy%2Ffossil\\_fuels+%28Fossil+Fuels+News+--+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/08/140826142443.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy%2Ffossil_fuels+%28Fossil+Fuels+News+--+ScienceDaily%29)

## **Full extent of global coal 'binge' is hidden, say researchers**

**26<sup>th</sup> August 2014, Matt McGrath, BBC News**

The climate impacts of the world's fossil-fuelled power plants are being underestimated because of poor accounting, say researchers. Governments would get a truer picture if they included the lifetime emissions of a facility in the year it goes into production. These "committed emissions" have been growing by 4% a year between 2000 and 2012, the scientists say. Power plants in China and India alone account for half of this commitment. At present, UN accounting procedures only include the emissions from coal and gas powered electricity generation in the year in which they occur. According to the authors of the new paper, this method means they are missing a significant part of the picture. "We are trying to get past a kind of myopia that sets in when people focus exclusively on the emissions of the day," said one of the authors, Prof Robert Socolow from Princeton. By taking an expected production life of 40

years, the researchers calculated that the new coal and gas plants built in 2012 would, in total, produce around 19bn tonnes of CO<sub>2</sub>. This is significantly more than the 14bn tonnes produced by all the existing fossil fuel plants in the world in the same year. "We've been hiding things from ourselves," said Prof Socolow. For more see.....

<http://www.bbc.co.uk/news/science-environment-28942403>

## **New coal power stations threat to EU's emissions target**

**27<sup>th</sup> August 2014, Karl Mathiesen, The Guardian**

New coal power stations designed to burn Europe's massive deposits of lignite pose a serious threat to the continent's decarbonisation efforts, according to figures released on Wednesday. Analysts from Greenpeace's Energydesk compiled data from the German government that shows burning Europe's reserves of lignite would wipe out the EU's entire carbon budget from 2020 until the end of the century. Lignite – also known as brown coal – power stations currently make up more than 10% of the EU's total CO<sub>2</sub> emissions. Greenpeace said that if Europe is to continue to play its part in keeping the world within the internationally accepted limit of 2C of warming, 90% of the carbon contained in its lignite reserves must remain buried. Despite this, lignite-fuelled power stations are still being built, locking in consumption of the fuel for decades. There are 19 such facilities in various stages of approval, planning or construction in Bulgaria, Czech Republic, Greece, Germany, Poland, Romania and Slovenia. Greenpeace figures show these new projects alone would emit almost 120m tonnes of CO<sub>2</sub> every year – equivalent to three-quarters of the annual carbon output of the UK's energy sector. The average lifespan for a coal power station is about 40 years, meaning the plants could release nearly 5bn tonnes of CO<sub>2</sub> into the atmosphere. For more see:-

<http://www.theguardian.com/environment/2014/aug/27/coal-power-stations-eu-emissions-target>

## **China - is it kicking its coal habit?**

**12<sup>th</sup> September 2014, Kieran Cooke, The Ecologist**

There are hopeful signs that China, the world's biggest emitter of greenhouse gases, is becoming less reliant on the polluting coal that powered its rapid economic rise, writes Kieran Cooke. Great news for China, and the planet - but worrying for coal exporters! There are still doubts. The statistics might be proved wrong. But it looks as if China might be starting to wean itself off its coal consumption habit. China produces and consumes nearly as much coal as the rest of the world combined. Coal, the most polluting of all energy sources, has powered the growth of China's flyaway economy. But as incomes have risen, so has pollution. The country is now the world's No.1 emitter of greenhouse gases.

For more visit:-

[http://www.theecologist.org/News/news\\_round\\_up/2548646/china\\_is\\_it\\_kicking\\_its\\_coal\\_habit.html](http://www.theecologist.org/News/news_round_up/2548646/china_is_it_kicking_its_coal_habit.html)

## **Molecular sieve promises cheaper way to capture carbon**

**16<sup>th</sup> September 2014, unattributed, The Engineer**

UK researchers have created a molecular sieve that could help cut the cost of removing carbon dioxide from the atmosphere. The scientists from Cambridge and Manchester universities have developed a method of baking polymer membranes to create specifically shaped channels in them that only allow certain molecules to pass through. They claim this could be a cheaper and more energy-efficient way of separating carbon dioxide and other greenhouse substances from the other gases in exhaust streams or the atmosphere than existing technologies.

'The secret is that we introduce stronger forces between polymer chains,' said Dr Qilei Song from Cambridge's Cavendish Laboratory, lead author of a paper on the research in the journal *Nature Communications*. 'Heating microporous polymers using low levels of oxygen produces a tougher and far more selective membrane which is still relatively flexible, with a gas permeability that is 100 to 1,000 times higher than conventional polymer membranes.' The synthetic membranes, made of materials known as polymers of intrinsic microporosity (PIMs),

mimic the hourglass-shaped protein channels found in biological membranes in cells. The tiny openings in these molecular 'sieves' – just a few billionths of a metre in size – can be adjusted so that only certain molecules can pass through. For more see.....

<http://www.theengineer.co.uk/energy/news/molecular-sieve-promises-cheaper-way-to-capture-carbon/1019201.article>

### **Research on use of CO2 in geothermal energy extraction in Mexico**

**16<sup>th</sup> September 2014, Francisco Rojas, ThinkGeoenergy**

Lehigh University in the US and the San Nicolas de Hidalgo University in Mexico are working to find a way to use superheated CO2 instead of water as a better medium for heat extraction. In a recent press release by Lehigh University in the US, their Energy Research Center is currently working alongside with San Nicolas de Hidalgo University in Michoacán, Mexico on utilizing carbon dioxide to extract geothermal energy from aquifers. According to the press release, "Lehigh's Energy Research Center is leading an effort to recycle the carbon dioxide produced by fossil fuel power plants while simultaneously helping Mexico increase its use of renewable energy sources and reduce national CO2 emissions. For more see....

<http://thinkgeoenergy.com/archives/19789>

### **Carbon dioxide converted into a valuable resource**

**18<sup>th</sup> September 2014, unattributed, Science Daily**

Researchers at Aalto University have opened a pilot plant that converts carbon dioxide and slag, the by-product of steel manufacturing, into a valuable mineral product. The product, Precipitated Calcium Carbonate (PCC), is used in e.g. plastics, papers, rubbers and paints. The innovative plant represents the next stage prior commercialization of a new process that consumes carbon dioxide in order to convert a low-value by-product into a highly valuable resource for industry. For more visit:-

[http://www.sciencedaily.com/releases/2014/09/140918091034.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/09/140918091034.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29)

### **Fracking's environmental impacts scrutinized**

**21<sup>st</sup> September 2014, unattributed, Science Daily**

Greenhouse gas emissions from the production and use of shale gas would be comparable to conventional natural gas, but the controversial energy source actually fared better than renewables on some environmental impacts, according to new research. The UK holds enough shale gas to supply its entire gas demand for 470 years, promising to solve the country's energy crisis and end its reliance on fossil-fuel imports from unstable markets. But for many, including climate scientists and environmental groups, shale gas exploitation is viewed as environmentally dangerous and would result in the UK reneging on its greenhouse gas reduction obligations under the Climate Change Act. University of Manchester scientists have now conducted one of the most thorough examinations of the likely environmental impacts of shale gas exploitation in the UK in a bid to inform the debate. Their research has just been published in the leading academic journal Applied Energy and study lead author, Professor Adisa Azapagic, will outline the findings at the Labour Party Conference in Manchester on 22 September. "While exploration is currently ongoing in the UK, commercial extraction of shale gas has not yet begun, yet its potential has stirred controversy over its environmental impacts, its safety and the difficulty of justifying its use to a nation conscious of climate change," said Professor Azapagic. For more see.....

[http://www.sciencedaily.com/releases/2014/09/140921092938.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy%2Ffossil\\_fuels+%28Fossil+Fuels+News+--+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/09/140921092938.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy%2Ffossil_fuels+%28Fossil+Fuels+News+--+ScienceDaily%29)

## **Phasing out coal as an electricity source would slow global warming**

**22<sup>nd</sup> September 2014, unattributed, RTE News**

Phasing out coal as an electricity source by 2050 would bring the world half a degree Celsius closer to the UN's targeted cap for climate warming, an analysis said on the eve of tomorrow's UN climate summit. Instead of warming of 3.7C by 2100 projected on current trends, replacing coal for power generation with cleaner renewables would yield global average temperatures about 3.2 C higher - a major step nearer the 2C limit targeted by the UN. "In other words, phasing out coal emissions from the power sector alone would ... achieve 25% of the task of reducing warming from 3.7C under current policies to below 2C," said the analysis titled Climate Action Tracker. Electricity generation yields about 40% of global carbon dioxide - the most abundant climate-altering greenhouse gas, and coal accounts for about 70% of that. For more visit:-

<http://www.rte.ie/news/2014/0922/645542-climate/>

## **Coal has no future in the world's energy mix, UN warns, ahead of New York summit**

**23<sup>rd</sup> September 2014, Jake Sturmer, 7 News**

The UN has warned that coal has no future in the world's energy mix, as world leaders gather ahead of a major climate summit in New York. The (Australian) Federal Government says coal will serve as an affordable, dependable energy source for decades to come, but the UN's climate chief has questioned whether that is in Australia's best interest's long term. "It is certainly within Australia's purview to decide how Australia is going to pursue its energy generation and energy growth," Christiana Figueres said. "It is just a question of really thinking through very carefully what is in the best long-term interest of Australia and of the Australian population, making careful decisions that are informed both by today's reality of climate change impacts as well as tomorrow's but very soon reality of a low-carbon society." More than 120 world leaders, including US president Barack Obama and UK Prime Minister David Cameron will attend the UN secretary-general's climate summit starting today. For more visit:-

<https://au.news.yahoo.com/a/25083181/coal-has-no-future-in-the-worlds-energy-mix-un-warns-ahead-of-new-york-summit/>

## **Cameron calls for coal phase out**

**26<sup>th</sup> September 2014, Rachel Huggins. The Engineer**

UK Prime Minister David Cameron has called for existing coal-fired power plants in the UK to be phased out in the next 10 to 15 years in a tweet following his speech at the UN climate summit in New York. His words come despite concerns in the industry that coal is still needed to play a vital role in energy generation and supply. Cameron's tweet, posted by the UK Mission to the United Nations, read: 'We've said no to new coal [without] carbon capture and storage and plan to phase out existing coal over next 10-15 years.' While not stated explicitly in his speech at the climate summit, the UK team at the UN in New York said on the Twitter social media site afterwards that the UK government intends to phase out existing coal stations, with new coal-fired power stations to use carbon capture and storage technology. For more visit:-

<http://www.theengineer.co.uk/news/cameron-calls-for-coal-phase-out/1019257.article>

## **SaskPower to launch carbon-capture power plant**

**28<sup>th</sup> September 2014, Clare Clancey, The Canadian Press**

Saskatchewan's government-owned power utility is set to launch its flagship carbon-capture-and-storage project this week when it cuts the ribbon on a \$1.4-billion addition to its Boundary Dam power plant near Estevan. Billed by SaskPower as the world's first and largest commercial-scale, carbon-capture operation of its kind, the project outfits part of the coal-fired power station with a mechanism to capture carbon dioxide emissions and transport the gas through a steel pipeline into storage deep underground.

While its proponents say the project represents a way to burn fossil fuels -- such as coal -- more efficiently with less greenhouse gas, critics argue carbon capture simply enables the status quo and does little to mitigate the damage caused by carbon emissions. "It's a waste of vital capital that should be invested in conservation, efficiency and renewable (energy)," says Sierra Club Canada director John Bennett. "It doesn't get us off fossil fuels. We can no longer talk in terms of using less of them, we have to be working towards eliminating them."

The project aims to reduce carbon dioxide emissions by one million tonnes annually, which amounts to about 90 per cent of the emissions from the plant. "We sincerely expect this to become a model for plants around the world," says SaskPower CEO Robert Watson. "This is what we think is a long-term, fiscally responsible way of getting less emissions into the air."

Source:-

<http://www.ctvnews.ca/business/saskpower-to-launch-carbon-capture-power-plant-1.2028250>

### **Peabody Energy call for greater use of advanced coal technology 29<sup>th</sup> September 2014, unattributed, BizNews.com**

Criticism continues to be heaped on coal because of the carbon emission problems associated with its global use as an energy source. However, it is clear from this analysis of the controversial issue by private-sector coal company Peabody Energy, a global authority on clean coal technology, that banning coal is not the solution to the problem. Pointing to a "direct correlation between greater coal use and greater GDP", the company says coal is set to overtake oil as the world's largest energy source in coming years. At the same time, Peabody expresses deep concern over flawed electricity policies designed to eliminate clean and efficient electricity from coal.

While Rio Tinto's energy chief, Harry Kenyon-Slaney, may well have said earlier this month that developing clean coal technology was a "challenge greater than the first moon landing", Peabody's stance on the issue will be welcomed by coal producers in South Africa. Our coal quality may not be the best in the world, but we have reserves that are sufficient to help meet the global carbon emission challenge...with the help of unfolding clean coal technology After all, the moon landing did happen! For more visit:-

<http://www.biznews.com/mining/2014/09/29/peabody-energy-calls-greater-use-advanced-coal-technology/>

### **Merkel adviser lashes Abbott's 'suicide strategy' on coal 2<sup>nd</sup> October 2014, Lisa Cox, Sydney Morning Herald**

A lead adviser to German Chancellor Angela Merkel on climate policy has attacked Australia's complacency on global warming and described the Abbott government's championing of the coal industry as an economic "suicide strategy". Hans Joachim Schellnhuber said most countries had given up on Australia setting tougher targets to reduce greenhouse gas emissions and the country was now viewed alongside Canada as not contributing its fair share to global efforts to reduce climate change.

Professor Schellnhuber, a former personal adviser to Chancellor Merkel, co-chairs the German Advisory Council on Global Change, which advises the Merkel government on environment policy – the equivalent of Australia's Climate Change Authority. Professor Schellnhuber was dismissive of the Abbott government's direct action policy, which is still in limbo after the axing of the former Labor government's carbon tax, describing it as "weak" and he criticised a "ridiculous" energy green paper published the day before the UN summit that advocated greater coal use in decades to come. For more visit:-

<http://www.smh.com.au/federal-politics/political-news/merkel-adviser-lashes-abbotts-suicide-strategy-on-coal-20141002-10ouu6.html>

## **New Chief Scientific Advisor at DECC**

**2<sup>nd</sup> October 2014, unattributed, EnergyLive News**

The Department of Energy and Climate Change (DECC) has appointed its new Chief Scientific Advisor. Professor John Loughhead will start in his new position on October 22<sup>nd</sup> but will continue part-time in his current role as Executive Director at the UK Energy Research Centre (UKERC) until the end of the year.

A chartered engineer by training, he has been involved in energy research for more than 30 years, predominantly in industrial development for the electronics and electrical power industries, according to DECC. Mr Loughhead has also been awarded an OBE and been a member of the European Advisory Group on Energy, is presently the UK-China Science Focal Point for Energy and Renewables and a member of the European Energy Research Alliance Executive Committee.

Energy Secretary Ed Davey said: "With vast engineering experience across academia and the private sector, Professor Loughhead brings a depth of knowledge that will be invaluable in areas such as shale gas as well as keeping the UK as an energy world leader and creating momentum towards a global climate change deal." The role was previously held by Professor David MacKay. Source:- <http://www.energylivenews.com/2014/10/02/new-chief-scientific-advisor-at-decc/>

## **China's emissions cuts 'negated' by industrial boom, study finds**

**5<sup>th</sup> October 2014, unattributed, businessGreen**

Emissions savings from China's huge investment in more efficient equipment and technology may have been outweighed by exponential increases in production, scientists have warned. The world's largest emitter saw carbon intensity, a measure of emissions per unit of GDP, rise three per cent from 2002 to 2009 despite efficiency improving in nearly all its provinces following a raft of investments in less wasteful technologies, according to new research from the University of East Anglia published in the journal *Nature Climate Change*.

The study finds rampant growth has expanded carbon intensive activities, such as mining, metal smelting and coal-fired electricity generation, which has negated any emissions gains made through efficiency improvements. For more visit:- <http://www.businessgreen.com/bg/news/2373911/chinas-emissions-cuts-negated-by-industrial-boom-study-finds>

## **Lib Dems vow to end coal-fired power generation by 2025**

**7<sup>th</sup> October 2014, unattributed, BBC News Politics**

The Lib Dems have said they will ban coal-fired power plants within a decade if they help form the next government. The Energy Secretary, Ed Davey, told the party's conference in Glasgow coal was the ultimate "climate destroyer".

If the Lib Dems are in power after the election, electricity generation from coal would be phased out by 2025. He also announced £100m in immediate funding for the Green Deal scheme to pay for better household insulation and other domestic energy saving measures. The extra money will be available next month. In his speech, Mr Davey defended his party's record in government on the environment and claimed that progress on delivering cleaner energy would be "stopped in its tracks" in the event of a Conservative victory at next year's election. For more visit:- <http://www.bbc.co.uk/news/uk-politics-29525171>

## **A cost-effective and energy-efficient approach to carbon capture**

**9<sup>th</sup> October 2014, unattributed, Science Daily**

Scientists have developed a slurry-based process that can revolutionize carbon capture. The slurry, consisting of a porous powder suspended in glycol, offers the efficient large-scale implementation of a liquid while maintaining the lower costs and energy efficiency of solid carbon-capturing materials. For more visit:-

[http://www.sciencedaily.com/releases/2014/10/141009091939.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/10/141009091939.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+--+ScienceDaily%29)

## **Fracking boom will not tackle global warming, analysis warns**

**15<sup>th</sup> October 2014, Damian Carrington, The Guardian**

An unrestrained global fracking boom that unleashes plentiful and cheap gas will not tackle global warming by replacing coal and cutting carbon emissions, according to a comprehensive analysis that takes into account the impact on the rest of the energy supply. Burning natural gas produces half the carbon dioxide released by coal, and shale gas proponents argue that gas can therefore be a "bridge" fuel, curbing emissions while very low carbon sources such as renewable and nuclear energy are ramped up.

But a new analysis published in the journal Nature shows that a gas boom would cut energy prices, squeezing out renewable energy, and is likely to actually increase overall carbon emissions. The researchers conclude that only new interventions, such as a long-sought international climate change deal or significant global price on carbon pollution, would be effective in tackling warming. For more visit:-

<http://www.theguardian.com/environment/2014/oct/15/gas-boom-from-unrestrained-fracking-linked-to-emissions-rise>

## **Warning over Aberthaw Power Station emissions**

**16<sup>th</sup> October 2014, Iolo ap Dafydd, BBC News South East Wales**

The UK could be referred to the European Court of Justice over claims a coal fired power station in the Vale of Glamorgan is breaking emission regulations. The European Commission says the Aberthaw station has not complied with nitrogen oxide gases limits since 2008. The UK government has two months to respond to the commission's concerns.

Plant operator RWE npower says new equipment will be installed at Aberthaw from next year. Nitrogen oxides released into the environment from burning fuels have serious consequences for human health and the environment, causing respiratory illnesses, acidifying soil and surface water, and damaging vegetation. The commission said the power station near Barry, which has been operating since 1971, currently emits more than double the legal limit of gases. Tougher regulations on power plants will be introduced in January 2016 throughout the European Union. For more visit:-

<http://www.bbc.co.uk/news/uk-wales-south-east-wales-29640387>

## **Major fire at gas-fired Didcot B power station**

**20<sup>th</sup> October 2014, unattributed, BBC News**

Fire crews have been battling a major blaze at Didcot B Power Station, Oxfordshire Fire and Rescue has said. At the height of the fire, which broke out in one of the cooling towers, 20 fire appliances were at the scene Energy company RWE npower, which owns the gas-burning power station, has said the fire is now under control and there have been no injuries.

Police have warned local people to stay indoors and close their doors and windows. The plant was shut down and all areas isolated before crews moved in to tackle the fire. Energy Secretary Ed Davey said: "First, I want to thank the emergency services who are at Didcot working to tackle the blaze. "I've been reassured by National Grid that there is no risk to electricity supplies. I will be keeping in touch with the relevant authorities throughout. "My priority is to understand the cause of the fire and get the affected unit back generating electricity as soon as it's safe to do so." For more visit:-

<http://www.bbc.co.uk/news/uk-england-29684205>

## **Massive coal field discovered in China's Xinjiang**

**22<sup>nd</sup> October 2014, Tang Danlu, XinhuaNet**

A massive coal field with 11.6 billion tonnes of coal has been discovered in northwest China's Xinjiang Uygur Autonomous Region, local authorities said Wednesday, providing a fresh supply for the country's energy strategies. Located in the southern part of the Sandaoling Mining Area, Hami Prefecture, the coal field boasts high-quality steam and civil coals, according to Xinjiang's coalfield geology bureau. Extraction work began last year within an area of 913.22 square km, the bureau said.

Hami Prefecture is one of the five major coal bases in Xinjiang, with an estimated reserve exceeding 570 billion tonnes. In recent years, a dozens of state-owned energy enterprises have moved to tap the coal resources there, steering coal power and increasing Hami's strategic status in China's energy industry. Beginning in 2012, the local government stepped up development in seven coal mining areas in the prefecture, expecting its coal production capacity to top 150 million tonnes by 2015.

Source:- [http://news.xinhuanet.com/english/business/2014-10/22/c\\_133735535.htm](http://news.xinhuanet.com/english/business/2014-10/22/c_133735535.htm)

## **Coal-rich Poland ready to block EU climate deal**

**23<sup>rd</sup> October 2014, Monika Scislowska, PhysOrgNews**

European Union leaders meeting in Brussels to set their new greenhouse gas emissions plan are facing staunch opposition from coal-reliant Poland and other East European countries who say their economies would suffer from the new target.

Poland says it's ready to veto the plan that would oblige the bloc's 28 states to jointly cut their greenhouse gas emissions to 40 percent below the 1990 levels by the year 2030. The EU plan would also require climate-friendly, renewable energy to provide 27 percent of the bloc's needs and demand that energy efficiency increase by a third in the next 16 years. Poland says that pace is too fast for Eastern European countries that are trying to grow their economies as they restructure old, energy-dependent industries.

Almost 90 percent of Poland's electricity comes from coal. The nation intends to continue that way for decades because mining creates 100,000 direct jobs and many thousands more in related sectors. Warsaw argues that green energy, large wind farms and solar panels still create energy that is too expensive. For more visit:-

<http://phys.org/news/2014-10-coal-rich-poland-ready-block-eu.html>

## **EU leaders agree CO2 emissions cut**

**24<sup>th</sup> October 2014, unattributed, BBC News**

EU leaders have reached a landmark deal to cut greenhouse gas emissions by 40% by 2030, compared with 1990 levels. The binding decision came after heated discussions at a summit in Brussels, as some members had argued that their varied interests should be protected.

Correspondents say **the final deal** is a compromise between countries that rely heavily on coal, and those willing to instil greater emissions cuts. Environmental groups welcomed the deal, but said it did not go far enough. The bloc also agreed to boost the use of renewable energy to 27% in the total energy mix and increase energy efficiency to at least 27%.

There were deep divisions within the EU on emissions cuts. Poland, which is heavily reliant on coal, fears that the costs of decarbonising its economy will slow business growth. Its concerns at the summit were echoed by other central and east European members. The President of the European Council, Herman Van Rompuy, said afterwards that some poorer EU members would get help - including additional funds - in reaching the agreed targets. The UK also had opposed nationally binding targets for renewables - mainly wind, solar and hydroelectric power. It is embracing shale gas and nuclear as alternatives to the current over-reliance on oil and gas imports. For more visit:-

<http://www.bbc.co.uk/news/world-europe-29751064>

## **Energy Quote of the Day: 'Highly unlikely that global carbon dioxide emissions will fall anytime soon'**

**2<sup>nd</sup> November 2014, Jared Anderson, the energy collective**

The main reason carbon emissions are unlikely to decrease in the short term? Coal. Leave it to Manhattan Institute Senior Fellow Robert Bryce to rain on the renewable energy parade. It's not that he is anti-renewable energy, or even pro coal, but his analysis starkly demonstrates current energy fundamentals and projected trends, which are heavily dominated by what he refers to as the "black fuel" in a report released today.

In "*NOT BEYOND COAL – How the Global Thirst for Low-Cost Electricity Continues Driving Coal Demand*," Bryce examines 9 countries collectively about to build roughly 550 gigawatts of new coal-fired capacity over the next two and a half decades. Until a fuel source is discovered or invented that can outcompete on cost, scale, and reliability, coal will dominate the global power generation business, Bryce says. For more visit:-

<http://theenergycollective.com/jared-anderson/2149626/energy-quote-day-highly-unlikely-global-carbon-dioxide-emissions-will-fall-an>

## **Fossil fuels should be phased out by 2100 says IPCC**

**2<sup>nd</sup> November 2014, Matt McGrath, BBC News Science & Environment**

The unrestricted use of fossil fuels should be phased out by 2100 if the world is to avoid dangerous climate change, a UN-backed expert panel says. The Intergovernmental Panel on Climate Change says in a stark report that most of the world's electricity can - and must - be produced from low-carbon sources by 2050. If not, the world faces "severe, pervasive and irreversible" damage. The UN said inaction would cost "much more" than taking the necessary action. The IPCC's Synthesis Report was published on Sunday in Copenhagen, after a week of intense debate between scientists and government officials. For more visit:-

<http://www.bbc.co.uk/news/science-environment-29855884>

## **Coal emission reduction technology still five years off, says CSIRO**

**3<sup>rd</sup> November 2014, Lenore Taylor, The Guardian**

CSIRO technology to clean up power stations cited by Greg Hunt as one of the two big things the world can do to immediately reduce greenhouse emissions is at least five years away and "still ... relatively immature and unproven", the CSIRO itself says.

Asked about the findings of the latest synthesis report from the Intergovernmental (IPCC), which called for immediate and rapid emission reductions and the phasing out of coal-fired power, the environment minister said: "Well, what we have to focus on is reducing emissions and the best thing we can do is to actually clean up existing power stations. "What ... we are proposing right now is to work with power stations, and we have the research of CSIRO which is talking about 30-50% reduction in emissions from brown coal power stations through their research on direct injection combustion engines," Hunt told ABC radio. For more visit:-

<http://www.theguardian.com/environment/2014/nov/03/coal-emission-reduction-technology-still-five-years-off-says-csiro>

## **Eggborough Power Station sold to EPH**

**5<sup>th</sup> November 2014, unattributed, BBC News**

A power station that employs hundreds of people in North Yorkshire has been sold to a European energy company. Eggborough Power Station, near Selby, will now be run by Czech energy company EPH, subject to European Commission approval. The coal-fired power station employs 300 full-time staff and supplies 4% of the UK's power. Earlier this year, bosses at the power station warned that it might have to be shut down after a bid to convert from coal to biomass was blocked. Source:- <http://www.bbc.co.uk/news/uk-england-york-north-yorkshire-29913006>

## **WA Parish carbon capture project**

**November 2014, unattributed**

Petra Nova, a 50/50 joint venture between NRG and JX Nippon Oil & Gas Exploration, is developing a commercial-scale post-combustion carbon capture project at NRG's WA Parish generating station southwest of Houston, Texas. This project is designed to capture approximately 90 percent of the carbon dioxide (CO<sub>2</sub>) from a 240 MW slipstream of flue gas and use or sequester 1.6 million tons of this greenhouse gas annually. The demonstration project is expected to be operational in 2016. For more details, view the WA Parish Factsheet.

<http://www.nrg.com/sustainability/strategy/enhance-generation/carbon-capture/wa-parish-ccs-project/>

## **Underground Coal Gasification gets new start in USA**

**6<sup>th</sup> November 2014, Edward Dodge, Breaking Energy**

Linc Energy recently received a research & development license for Underground Coal Gasification (UCG), the first issued in the USA in twenty years. Linc Energy is moving ahead with a demonstration phase project in Wyoming's Powder River Basin, one of the country's most active coal mining regions.

In addition to the R&D license, the EPA and Wyoming Department of Environmental Quality (WDEQ) approved the final Aquifer Exemption permit on Sept. 8, 2014, that allows Linc to move forward in Wyoming. Multiple public comment periods were held where stakeholders and residents were able to address their concerns. The aquifer exemption permit is required anytime a process injects anything into an aquifer. Regulators will strictly monitor Linc's activities to ensure they remain in compliance. For more visit:-

<http://breakingenergy.com/2014/11/06/underground-coal-gasification-gets-new-start-in-usav/>

## **Dirty coal power plants could still be running in 2030, scientists warn**

**10<sup>th</sup> November 2014, Will Nichols, Business green**

The UK's coal power stations could operate into the 2030s and risk breaching mandatory emissions reduction targets unless the government acts, a report has found. David Cameron has pledged to close all unabated coal power stations in the mid-2020s, in line with European clean air regulations. But researchers at Imperial College London modelling the effect of current government policy on the UK's 11 coal-fired power plants found nearly half of the UK's existing 40 to 50 year old coal-fired generating capacity could still be operating in 2030.

"Imperial College's economic modelling shows that it is unwise to simply assume that coal-fired power stations will all close in the 2020s," said Rob Gross, the report's lead author. "We modelled a variety of scenarios and, with the UK's existing suite of energy policies, in every instance coal still played a role in generating electricity and 2030 emissions targets were missed." For more visit:-

<http://www.businessgreen.com/bg/analysis/2380248/dirty-coal-power-plants-could-still-be-running-in-2030-scientists-warn>

## **Green energy 'creates more jobs than fossil fuels', study says**

**10<sup>th</sup> November 2014, Will Nichols, Business green**

New renewable energy projects create 10 times more green jobs than similar-sized fossil fuel investments, new research has found.

A study by the UK Energy Research Centre (UKERC) taking data from the US, Europe, and China, suggests green energy could provide a boost to employment, through both short term construction jobs and lifetime plant jobs. The study, published last week, looked at job impacts from renewable energy or energy efficiency policies and found that solar electricity creates between 0.4 and 1.1 jobs per gigawatt hour of electricity generated, compared to the 0.1 to 0.2 jobs created by coal and gas power. Meanwhile, wind energy is found to generate between 0.05 and 0.5 jobs per GWh generated and energy efficiency policies result in between 0.3 and one job per GWh saved. For more visit:-

<http://www.businessgreen.com/bg/analysis/2379994/green-energy-creates-more-jobs-than-fossil-fuels-study-says>

### **'Major' coal find under Firth of Forth**

**10<sup>th</sup> November 2014, BBC Scotland Business News**

An energy firm has announced plans to extract gas from under the waters of the Firth of Forth following a major coal find. Cluff Natural Resources said a report by independent assessors estimated there were up to 335 million tonnes of coal under the seabed. It now plans to build the UK's first deep offshore underground coal gasification (UGC) plant. Cluff said the find was enough to power millions of homes. But environmental group WWF Scotland said the move was "irresponsible" and should be "a complete non-starter". Cluff said its assessment had identified two coal seams at its Kincardine UGC licence which had 43 million tonnes of "stranded" coal of sufficient quality for a UGC plant. The licence covers an area of 37.6 sq km of tidal estuary waters. For more visit:-

<http://www.bbc.co.uk/news/uk-scotland-scotland-business-29987033>

### **In the UK, coal faces its biggest challenge yet**

**10<sup>th</sup> November 2014, Paul Verrill, World Coal**

**Paul Verrill, EnAppSys, UK, looks at the future of coal-fired power in the UK.**

For 65 years, coal-fired power plants have been the primary source of electricity generation in the UK, providing more than three times as much power as gas-fired and nuclear plants, over six times as much as oil-fired plants and nearly twenty times as much as renewable power sources.

Fast-forward to 2013/14 and coal remains the dominant fuel type in the UK, providing 36% of total power generation in the year to March 2014. Each unit of capacity at a coal-fired power plant provided almost 60% more electricity than the same unit of capacity at a gas-fired plant. In the last 65 years, coal has faced competition from a variety of power sources. Back in 1998, gas had overtaken coal as the UK's largest source of electricity following the dash-for-gas boom, which started in 1990. Since then, installed capacity at combined cycle gas turbine (CCGT) plants have risen to more than 30 GW. Coal has also survived the rise of the nuclear industry, which began with the opening of Calder Hall in Cumbria in 1956.

In the year to March 2014, the share of generation from the various fuel mixes was: 36% coal, 26% gas, 20% nuclear, 9% wind, 5% biomass and 4% other.

There are several reasons why coal has returned to its position as the most dominant UK fuel, even though its share of the power generation mix has declined in recent years:

- The rise of shale gas in the US, which has resulted in low US gas prices and a switch from coal to gas generation. This in turn has diverted more US coal to the global market.
- The Fukushima disaster, which triggered a rethink of nuclear power in countries such as Germany and an immediate switch from nuclear to gas-fired power generation in Japan. This drove up world gas prices, making gas generation less economically viable.
- Failed emissions markets, due to the global downturn, which triggered a glut of permits in Europe.

For more visit:-

<http://www.worldcoal.com/news/special-reports/articles/World-Coal-The%20future-of-coal-in-the-UK-Paul-Verrill-Industry-View1549.aspx#.VHm4IzGsVnA>

### **Fossil fuel promises are being broken, report says**

**11<sup>th</sup> November 2104, Roger Harrabin, BBC News**

World governments have been breaking promises to phase out subsidies for fossil fuels, a report says. The Overseas Development Institute says G20 nations spent almost £56bn (\$90bn) a year finding oil, gas and coal. It comes despite evidence that two thirds of existing reserves must be left in the ground if the world is to avoid dangerous climate change. A government spokesman said the North Sea oil and gas industry "creates jobs and generates investment" in the UK. The spokesman said the tax regime for oil and gas includes a number of allowances which reduce

the tax burden on specific, challenging gas or oil fields. Allowances did not constitute a subsidy, he added. The UK government has previously said it was helping firms find fossil fuels within the UK to increase energy security, attract royalties and help with the balance of payments. For more visit:-

<http://www.bbc.co.uk/news/uk-politics-29985382>

## **Major class of fracking chemicals no more toxic than common household substances, analysis finds**

**12<sup>th</sup> November 2014, unattributed, Science Daily**

The 'surfactant' chemicals found in samples of fracking fluid collected in five states were no more toxic than substances commonly found in homes, according to a first-of-its-kind analysis. In a new study published in the journal *Analytical Chemistry*, the research team identified the surfactants found in fracking fluid samples from Colorado, Louisiana, Nevada, Pennsylvania and Texas. The results showed that the chemicals found in the fluid samples were also commonly found in everyday products, from toothpaste to laxatives to detergent to ice cream.

"This is the first published paper that identifies some of the organic fracking chemicals going down the well that companies use," said Michael Thurman, lead author of the paper and a co-founder of the Laboratory for Environmental Mass Spectrometry in CU-Boulder's College of Engineering and Applied Science. "We found chemicals in the samples we were running that most of us are putting down our drains at home." For more visit:-

[http://www.sciencedaily.com/releases/2014/11/141112132119.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/11/141112132119.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29)

## **Ministers' shale gas 'hype' attacked**

**12<sup>th</sup> November 2014, Roger Harrabin, BBC News**

Ministers have "completely oversold" the potential of shale gas, energy experts say. Researchers from the UK Energy Research Centre (UKERC) told the BBC promises of lower prices and greater energy security from UK shale gas were "hype" and "lacking in evidence". UKERC, an academic consortium covering 30 institutions, has produced a report on the future of gas in the UK. The Treasury said the potential of shale gas was "too big to ignore". The report authors said shale gas - a natural gas that can be drawn from rock through hydraulic fracturing, or fracking - was so early in its infancy it was impossible to know how much could be extracted and at what cost. For more visit:-

<http://www.bbc.co.uk/news/uk-politics-30013668>

## **With electron beams, NRL to clean up NO<sub>x</sub> from coal power plant**

**17<sup>th</sup> November 2014, Kyra Wiens, NRL News**

The U.S. Naval Research Laboratory (NRL) has partnered with a power company to apply its pulsed electron beam technology to reduce the nitric oxide and nitrogen dioxide (NO<sub>x</sub>) emitted by coal power plants. "This is an opportunity for NRL to get a technology that we developed here out in the real world," says Dr. John Sethian, the plasma physicist leading the project at NRL, "not only to show the technology works, but that NRL's contributing to cleaner energy."

The concept is to inject electron beams into the exhaust of a fossil fuel power plant and, firing them in pulses, break apart the NO<sub>x</sub> bonds. When the bonds between the nitrogen (N) and oxygen (O) atoms are ruptured, says Sethian, "They naturally want to combine into just pure nitrogen and pure oxygen, because those are the most stable substances. That's what you're breathing right now."

NRL chemist Dr. Matthew Wolford has already proven the concept works at a small scale, using a mixture of just nitrogen and NO<sub>x</sub>. Wolford's now testing with a more realistic sample. "Real

flue gas," says Sethian, "may have nitrogen, carbon dioxide (CO<sub>2</sub>), oxygen, water vapor, sulfur oxide (SO<sub>x</sub>), and particulates—depending on what the coal is." For more visit:-  
<http://www.nrl.navy.mil/media/news-releases/2014/with-electron-beams-nrl-to-clean-up-nox-emissions-from-coal-power-plant>

### **UK and Canada sign joint deal for carbon capture and storage 18<sup>th</sup> November 2014, unattributed, ClickGreen**

The UK and Canadian Governments have signed an agreement to work together on research and knowledge sharing for carbon capture and storage (CCS) – a technology which has the potential to dramatically reduce carbon emissions.

The Joint Statement identifies how the two countries will work together on research and innovation cooperation, knowledge sharing and international engagement and builds on the work both nations already undertake in increasing the use of low carbon technologies. CCS has the potential to be one of the most cost effective technologies for decarbonisation of the UK's power, enabling fossil fuels coal and gas) to be kept in the electricity mix. If developed CCS would reduce carbon dioxide emissions, and store it deep underground. CCS projects are also important contributors to the UK's growth – high quality, high value and high expertise. Energy Minister Matthew Hancock said: "Carbon capture and storage could help us tackle climate change. I welcome the fact that the UK and Canada will be working together to advance the technology. Our agreement is an important step forward for the carbon capture and storage sector, and I look forward to further UK-Canada cooperation."

The UK has positioned itself as one of the world's frontrunners in this sector and is leading Europe with two commercial scale carbon capture and storage projects in development, Peterhead in Scotland and White Rose in Yorkshire. For source visit:-  
<http://www.clickgreen.org.uk/news/international-news/125227-uk-and-canada-sign-joint-research-deal-for-carbon-capture-and-storage.html>

### **Germany's climate targets unattainable with coal power, analysts say 20<sup>th</sup> November 2014, unattributed, EurActiv.com**

Economists at the German Institute for Economic Research are calling for old coal-burning facilities to be shut down as soon as possible, indicating that it's the only way Germany will reach its climate target for 2020. [EurActiv Germany reports](#).

Shutting down old coal plants would create a moderate increase in energy market prices. However, this shift is likely to make power generated from natural gas profitable again, according to a study released on Wednesday (19 November). Research was conducted by the DIW Berlin, on behalf of the Heinrich-Böll Foundation and the European Climate Foundation.

"The energy sector should contribute more toward reaching the short- and medium-term climate targets by replacing CO<sub>2</sub>-intensive, inefficient coal power plants with more efficient gas-fired power plants. Because this helps the climate and energy markets simultaneously, it even offers a double dividend," explained Claudia Kemfert, director of the department for Energy, Transportation, Environment at the DIW Berlin. For more visit:-  
<http://www.euractiv.com/sections/energy/germanys-climate-targets-unattainable-dirty-coal-power-analysts-say-310170>

### **China needs to speed up work on coal-fired carbon capture projects 21<sup>st</sup> November 2014, Geoff Hiscock, The Australian**

China will need to speed up work on its large-scale carbon capture and storage (CCS) projects in the coal power sector if it is to keep pace with the United States over the next few years in efforts to slow the growth of carbon dioxide emissions. Between them, China and the US accounted for 44 per cent of the world's total CO<sub>2</sub> emissions of 35.1 billion tonnes in 2013 — hence the global interest in the greenhouse gas emissions deal the two nations reached earlier this month.

Unlike the US, where natural gas has supplanted coal as the number one fuel source for energy generation, courtesy of the North American shale revolution, coal still dominates China's power sector and will continue to do so for decades to come. Even with massive investments in hydro, nuclear, solar, wind and gas-fired power plants, coal will still provide 64 per cent of China's power needs in 2030, according to a recent report by energy analysts Wood Mackenzie. That equates to another 2 billion tonnes a year of coal, on top of the 4 billion tonnes that China now consumes. For more visit:-

<http://www.theaustralian.com.au/business/china-needs-to-speed-up-work-on-coalfired-carbon-capture-projects/story-e6frg8zx-1227130304681?nk=09922ea5d38b2a7b94158a4c77b4b899>

### **SA coal-related R&D inadequate – ASSAf**

**26<sup>th</sup> November 2014, Leandi Colver, Creamer Media's Mining Weekly**

South Africa's investment in coal-related research and development (R&D) was inadequate, given the fact that coal would continue to dominate the country's energy supply for the foreseeable future, a recent study by the Academy of Science of South Africa (ASSAf) showed. In its study, titled 'The State of Energy Research in South Africa', which was aimed at improving the understanding of the energy research landscape in South Africa to support the South African National Energy Development Institute to fulfil its functions in terms of energy research support and coordination, ASSAf noted that clean coal technologies were not sufficiently funded and that carbon capture and storage research programmes were insufficient. The study also found that the bulk of R&D in the coal space was being performed by only four entities. For more visit:-

<http://www.miningweekly.com/article/sa-coal-related-rd-inadequate-assaf-2014-11-26>

### **Inside the Dynamak: A fusion technology cheaper than coal**

**26<sup>th</sup> November 2014, Evan Ackerman, IEEE Spectrum**

In October, Lockheed Martin Corp. revealed that it's been working on a type of fusion reactor that could be made small enough to transport by truck. Lawrenceville Plasma Physics raised money through crowdfunding in June to advance its alternative proton-boron fusion. Helion Energy is developing a type of fusion based on magnetic compression, and General Fusion is working toward a power system that involves shock waves inside a vortex of liquid metal.

A particularly promising approach was unveiled recently by a University of Washington research group, led by plasma physicist Tom Jarboe. They've been developing a type of fusion reactor called a dynamak. The researchers involved say the technology is unique in that it offers a path to a power plant that's backed up by demonstrated physics and because such a reactor also promises to be even more economical than a coal-fired power plant. For more visit:-

<http://spectrum.ieee.org/energy/nuclear/inside-the-dynamak-a-fusion-technology-cheaper-than-coal>

### **'Blue energy' plant opens in the Netherlands**

**27<sup>th</sup> November 2014, Helen Tunnicliffe, tce today**

A new 50 MW test power station which exploits the difference in salt concentration between seawater and freshwater to generate electricity has opened in the Netherlands. The "blue energy" plant, situated on the Afsluitdijk, a long dyke on the Dutch coast, was opened by King Willem-Alexander on 26 November. Its developers, REDstack and the University of Twente, say that blue energy has the potential to provide 10% of the electricity needed in the Netherlands. Blue energy has major advantages over wind and solar energy in that it can be generated continuously and is not dependent on conditions or weather. The developers also say that blue energy will be cheaper than wind or solar energy, although still slightly more expensive than energy generated from fossil sources.

The pilot plant has a maximum theoretical capacity of 50 MW, enough for 100 households. It uses two specialised membranes separating freshwater and saltwater. One only allows the passage of negative ions while the other only allows the passage of positive ions. This results in

a difference in voltage which can be converted into electricity, effectively a battery. In the plant, membranes are arranged in stacks of hundreds around 0.3–0.5 mm apart to maximise the power that can be produced in a small space.

“At the moment our membranes in the lab can supply a capacity of about 1.3 W/m<sup>2</sup> of membrane. We need to increase this to 2–3 W/m<sup>2</sup> in order to make blue energy economically profitable. Our PhD candidates will use the power plant on the Afsluitdijk as a research facility for improving efficiency on a large scale and to research the effects of using the natural sea and river water,” says Twente professor Kitty Nijmeijer. For more visit:-

<http://www.tcetoday.com/latest%20news/2014/november/blue-energy-plant-opens-in-the-netherlands.aspx#.VHsPtzGsVnA>

### **DECC earmarks £5m for new wave of 'Energy Entrepreneur' funding**

**27<sup>th</sup> November 2014, James Murray, businessGreen**

The government has today announced the latest wave of funding awards from its Energy Entrepreneurs' Fund (EEF), dishing out £9m between 19 early stage firms while confirming that a further £5m is now up for grabs. The Department of Energy and Climate Change (DECC) said the new £5m comes on top of the £35m already awarded through the EEF and will now be assigned through the fourth round of bids to the fund. It also confirmed part of the funding would be targeted at a specific sector with £2.5m earmarked for start-ups working on carbon capture and storage (CCS) technologies. For more visit:-

<http://www.businessgreen.com/bg/news/2383829/decc-earmarks-gbp5m-for-new-wave-of-energy-entrepreneur-funding>

### **Brazil auction favours fossil fuels over renewable sources**

**27<sup>th</sup> November 2014, unattributed, Sputnik News**

Brazil is posed to award contracts for natural gas- and coal-fuelled power plants, in an auction on Friday, reversing a drive to prioritize renewable sources, Bloomberg reported Thursday. “It’s important for the security of the system that we have more thermal energy – it was because of thermal that we avoided rationing last year,” Jose Carlos de Miranda Farias, the director electric energy research of Brazil’s energy research and planning agency EPE, said in a phone interview with Bloomberg.

Unlike previous auctions, which saw Brazil favour clean energy projects, Friday’s auction will have gas and coal competing with renewable energy sources on equal terms. With the awarding of the contracts Brazil is set to see the building of its first new thermal plants in three years. Thermal plants are faster and easier to bring on stream than wind or hydroelectric facilities. They could be a stopgap to ensure uninterrupted energy supplies to the country, which is suffering from its worst drought in eight decades, hampering hydro-dams that produce 70 percent of Brazil’s power. To avoid having to ration its energy, Brazil is looking to diversify its sources of energy. For more visit:-

<http://sputniknews.com/latam/20141127/1015239625.html>

### **Missed target costs power firm £28m**

**28<sup>th</sup> November 2014, unattributed, The Courier**

Britain’s single largest power generator is to pay a record penalty of £28 million after it failed to meet a target on helping poor households save energy. North Yorkshire-based Drax, which meets 8% of the UK’s electricity demand, was one of two companies punished by Ofgem for not doing enough under the Government’s Community Energy Saving Programme (CESP). The regulator said the actions of Drax and InterGen meant several thousand households in some of the most deprived areas in Britain missed out on energy-saving measures which would have helped lower bills. Investigations are continuing into four other energy companies which failed to deliver their obligations under the CESP scheme. For more visit:-

<http://www.thecourier.co.uk/business/news/missed-target-costs-power-firm-28m-1.708045>

## **E.ON to quit gas and coal and focus on renewable energy**

**1<sup>st</sup> December 2014, unattributed, The Guardian**

Germany's biggest utility firm, E.ON, has announced plans to split in two and spin off most of its power generation, energy trading and upstream businesses, responding to a crisis that has crippled the European energy sector. E.ON said it wanted to focus on its renewable activities, regulated distribution networks and tailor-made energy efficiency services, citing "dramatically altered global energy markets, technical innovation, and more diverse customer expectations". "E.ON's existing broad business model can no longer properly address these new challenges," the chief executive, Johannes Teysen, said in a statement.

Germany's power sector has been in turmoil, hit by a prolonged period of weak demand, low wholesale prices and a surge in renewable energy sources which continue to replace gas-fired and coal-fired power plants. E.ON said it would prepare next year for the listing of the new company created by its breakup, with the spin-off taking place after its 2016 annual general meeting. For more visit:-

<http://www.theguardian.com/environment/2014/dec/01/eon-splits-energy-renewables>

## **Research confirms how global warming links to carbon emissions**

**1<sup>st</sup> December 2014, unattributed, Science Daily**

Research has identified, for the first time, how global warming is related to the amount of carbon emitted. A team of researchers has derived the first theoretical equation to demonstrate that global warming is a direct result of the build-up of carbon emissions since the late 1800s when human-made carbon emissions began. The results are in accord with previous data from climate models. A team of researchers from the universities of Southampton, Bristol and Liverpool have derived the first theoretical equation to demonstrate that global warming is a direct result of the build-up of carbon emissions since the late 1800s when human-made carbon emissions began. The results are in accord with previous data from climate models. For more visit:-

[http://www.sciencedaily.com/releases/2014/12/141201113036.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/12/141201113036.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29)

## **Atmospheric carbon dioxide used for energy storage products**

**2<sup>nd</sup> December 2014, unattributed, Science Daily**

Researchers have discovered a fascinating new way to take some of the atmospheric carbon dioxide that's causing the greenhouse effect and use it to make an advanced, high-value material for use in energy storage products. Chemists and engineers at Oregon State University have discovered a fascinating new way to take some of the atmospheric carbon dioxide that's causing the greenhouse effect and use it to make an advanced, high-value material for use in energy storage products. For more visit:-

[http://www.sciencedaily.com/releases/2014/12/141202140639.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/12/141202140639.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29)

## **Buckyballs enhance carbon capture**

**3<sup>rd</sup> December 2014, unattributed, Science Daily**

Amines bound by buckyballs can absorb carbon dioxide from emissions at industrial plants and at natural gas wells, according to new research. Tests from one to 50 atmospheric pressures showed the newly developed compound captured a fifth of its weight in carbon dioxide but no measurable amount of methane. Rice University scientists have discovered an environmentally friendly carbon-capture method that could be equally adept at drawing carbon dioxide emissions from industrial flue gases and natural gas wells. For more visit:-

[http://www.sciencedaily.com/releases/2014/12/141203171854.htm?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+sciencedaily%2Fmatter\\_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29](http://www.sciencedaily.com/releases/2014/12/141203171854.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy+%28Matter+%26+Energy+News+---+ScienceDaily%29)

## **Investigation finds dirty coal projects being financed by climate funds**

**3<sup>rd</sup> December 2014, Deirdre Fulton, Global Research**

Close to \$1 billion in funds meant to finance global climate-mitigation projects is going toward the construction of power plants fired by coal—the biggest human source of carbon pollution—according to an *Associated Press* investigation. The findings underscore the lack of rules designed to steer the United Nations' 'climate finance' initiative, through which rich countries funnel money to poor countries to help tackle global warming, Karl Ritter and Margie Mason wrote for the *AP*.

"The money for coal highlights one of the biggest problems in the UN-led effort to fight climate change: A lack of accountability," they pointed out. "Climate finance is critical to any global climate deal, and rich countries have pledged billions of dollars toward it in UN climate talks, which resume Monday in Lima, Peru. Yet there is no watchdog agency that ensures the money is spent in the most effective way. There's not even a common definition on what climate finance is." The news outlet reported Monday that Japan, a top contributor of so-called climate finance, gave \$958 million to help build three coal-fired plants in Indonesia—plants they said burn coal more efficiently than older facilities. For more visit:-

<http://www.globalresearch.ca/investigation-finds-dirty-coal-projects-being-financed-by-climate-funds/5417696>

## **University of Chester site to host world class fracking research centre**

**4<sup>th</sup> December 2014, David Holmes, The Chester Chronicle**

The University of Chester's Thornton Science Park near Ellesmere Port is to become a world class fracking research centre as part of a £31m government project. The Energy Security and Innovation Observing System, comprising two sub-surface test centres, will analyse results from hundreds of boreholes across Britain as the government tries to reassure residents the controversial gas extraction method hydraulic fracturing, known as 'fracking', is safe. Thornton, gifted from Shell to the University of Chester in 2013, is expected to be the site of the first of the two centres. The second site is still to be agreed. For more visit:-

<http://www.chesterchronicle.co.uk/news/chester-cheshire-news/university-chester-site-host-world-8230202>

## **Heriot-Watt launch Scottish Energy News Researcher of the Year Award**

**4<sup>th</sup> December 2014, Phyllis Stephen, The Edinburgh Reporter**

Heriot-Watt University's Energy Academy has started a search for the best company executive or worker, researcher and student undertaking energy-related research, R&D, or study in Scotland. Working in partnership with Scottish Energy News, the Energy Academy has launched a competition called the Heriot-Watt Scottish Energy News Researcher of the Year Awards and will make prizes of £500 available in each of the following categories: – Energy and the environment; Energy and the marine environment; Energy materials and storage; Fossil fuels; Energy infrastructure and society and Energy entrepreneurship. The awards will be hosted at the head office of the UK Green Investment Bank in Edinburgh and prizes will be presented in May 2015 by Fergus Ewing, MSP, Scottish Government Minister for Energy, Enterprise and Tourism. For more visit:-

<http://www.theedinburghreporter.co.uk/2014/12/heriot-watt-launch-scottish-energy-news-researcher-of-the-year-award/>

## **China: Power plant burns banknotes instead of coal**

**10<sup>th</sup> December 2014, Unattributed, BBC News**

A company in one Chinese city has money to burn, and is using it to make electricity, it's reported. The power plant in Luoyang, central Henan Province, is burning old and damaged banknotes instead of coal - the first time this has been done in China, the official Xinhua news agency reports. The plant says one tonne of notes can generate more than 600 kWh of electricity, and is better for the environment than burning coal. The country's central bank, the People's Bank of China, has given permission for the notes to be burned, and says it's an

efficient way to make electricity. With the province's unused paper money the company "can help generate 1.32 million kWh of electricity annually, which is equal to burning 4,000 tonnes of coal", a member of staff at the bank tells Xinhua.

Banknotes which are withdrawn from circulation in China after being worn out by handling or other damage are most commonly used to make paper products, according to the Dahe Daily news website. The idea of setting fire to the city's cash has amused Chinese social media users. "Burning money? Luoyang is such a rich city!" says one Weibo user, while another person writes: "I'm willing to go a year without electricity, please give me a pile of cash!" But one user has a craftier suggestion: "Hire me as an employee, I promise I won't take any money." Source: - <http://www.bbc.co.uk/news/blogs-news-from-elsewhere-30410568>

### **Is this the end of coal?**

**6<sup>th</sup> December 2014, Geoff Lean, The Telegraph**

China and Germany are cutting back dramatically on the dirty fuel that has powered Earth since the industrial revolution. Maybe, just maybe, we will look back on the last weeks as one of those moments when history turned. For they have witnessed increasing signs that the world is beginning, unexpectedly, to reject its dirtiest fuel.

In an astonishing reversal – virtually unpublicised in Britain, and little noticed elsewhere – China, which burns more coal than the rest of the world put together, has announced it will cap its use within six years. Even more surprisingly there are signs that it is already declining, way ahead of schedule, as the country undergoes a largely unrecognised green revolution.

The United States, the next biggest consumer, is also taking new measures against the fuel. And Germany, Europe's largest coal consumer – much-criticised for increasing use after resolving to phase out nuclear power – this week began to curb it. This could have enormous implications for controlling climate change – now the subject of negotiations in Lima, Peru: King Coal is the biggest single emitter of carbon dioxide. But the surprise is even greater, for use of the fossilised carbon has been increasing rapidly in recent years. For more visit:-

<http://www.telegraph.co.uk/news/earth/11276264/Is-this-the-end-of-coal.html>

## New RFCS coal-related projects started in 2014

Project Number	Project category	Short title	Title	Duration (months)	Start date	Co-ordinator	Total Funding (EU Support) (€)
RFCR-CT-2014-00001	TGC 1	LoCAL	Low-Carbon After-Life (LoCAL): sustainable use of flooded coal mine voids as a thermal energy source - a baseline activity for minimising post-closure environmental risks	36	01.07.2014	Główny Instytut Górnictwa, Poland.	1,621,998 (973,195)
RFCR-CT-2014-00002	TGC 1	TeleRescuer	System for virtual TELEportation of RESCUER for inspecting coal mine areas affected by catastrophic events	36	01.07.2014	Silesian University of Technology - Politechnika Śląska	2,142,007 (1,285,203)
RFCR-CT-2014-00003	TGC 1	COAL2GAS	Enhanced Coal Exploitation through UCG Implementation in European Lignite Mines	36	01.07.2014	Institutul de Studii Si Proiectari Energetice Sa, Romania	2,208,195 (1,324,915)
RFCR-CT-2014-00004	TGC 1	GasDrain	Development of Improved Methane Drainage Technologies by Stimulating Coal Seams for Major Risks Prevention and Increased Coal Output	42	01.07.2014	Główny Instytut Górnictwa, Poland.	3,818,294 (2,290,975)
RFCR-CT-2014-00005	TGC 1	EXPRO	Prediction and mitigation of methane explosion effects for improved protection of mine infrastructure and critical equipment	36	01.07.2014	Asociacion Para La Invest. Y El Desar. Industrial De Los, Spain.	2,402,465 (1,365,851)
RFCR-CT-2014-00006	TGC 2	ALTERAMA	Developing uses of alternative raw materials in coke making	42	01.07.2014	University of Nottingham	1,976,512 (1,185,906)
RFCR-CT-2014-00007	TGC 2	CaO2	Calcium looping CO2 capture technology with extreme oxy-coal combustion conditions in the calciner	36	01.06.2014	Endesa Generacion SA, Spain	3,166,109 (1,583,054)
RFCR-CT-2014-00008	TGC 2	CERUBIS	Corrosion and Emission Reduction of Utility Boilers through Intelligent Systems	48	01.07.2014	Instytut Energetyki, Poland	2,768,186 (1,660,911)
RFCR-CT-2014-00009	TGC 3	DRYLIG	Competitive pre-drying technologies and firing concepts for flexible and efficient lignite utilisation	36	01.07.2014	Centre For Research And Technology Hellas, Greece	2,207,633 (1,295,047)
RFCR-CT-2014-00010	TGC 3	OnCord	On-line corrosion monitoring for the combined combustion of coal and chlorine-rich biomasses in pulverised fuel and circulating fluidised bed systems	36	01.07.2014	Technische Universitaet Muenchen, Germany	2,918,723 (1,751,232)
						TOTAL	<b>25,230,122 (14,716,289)</b>
						EU Support (average %)	<b>58.3</b>

Technical Group Coal (TGC) 1 projects:-

Coal mining operation, mine infrastructure and management and unconventional use of coal deposits

Technical Group Coal (TGC) 2 projects:-

Coal preparation, conversion and upgrading

Technical Group Coal (TGC) 3 projects:-

Coal combustion, clean and efficient coal technologies, CO2 capture

## CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
2 <sup>nd</sup> to 3 <sup>rd</sup> April 2015	World Clean Coal Conference, Indonesia	Jakarta, Indonesia	For more information visit: <a href="http://www.worldcleancoal.org/id/">http://www.worldcleancoal.org/id/</a>
<b>Wednesday 15<sup>th</sup> April 2015</b>	<b>“Underground Coal Gasification, (UCG)”</b>  <b>Coal Research Forum Annual Meeting and Coal Conversion Divisional seminar</b>	<b>University of Leeds</b>	<b>Prof. John W. Patrick</b> <b>Chairman of the CRF Coal Conversion Division</b> Tel : 0115-951-4175 E-mail : <a href="mailto:john.patrick@nottingham.ac.uk">john.patrick@nottingham.ac.uk</a>
28 <sup>th</sup> April to 1 <sup>st</sup> May 2015	14 <sup>th</sup> Annual Conference on Carbon capture, Utilization and Storage	Pittsburgh, Pennsylvania, USA	For more information visit:- <a href="https://ukccsrc.ac.uk/news-events/events/annual-ccus-conference-2015">https://ukccsrc.ac.uk/news-events/events/annual-ccus-conference-2015</a>
4 <sup>th</sup> to 7 <sup>th</sup> May 2015	The World of Coal Ash (WOCA)	Nashville, Tennessee, USA	For more visit: <a href="http://www.ecoba.com/conference.html">http://www.ecoba.com/conference.html</a>
17 <sup>th</sup> to 21 <sup>st</sup> May 2015	7 <sup>th</sup> International Conference on Clean Coal Technologies	Central Mining Institute of Poland, Kraków, Poland	For more information visit: <a href="http://www.cct2015.org/ibis/CCT2015/home">http://www.cct2015.org/ibis/CCT2015/home</a>
31 <sup>st</sup> May to 4 <sup>th</sup> June 2015	40 <sup>th</sup> International Technical Conference on Clean Coal & Fuel Systems	Sheraton Sand Hotel, Clearwater, Florida, USA	For more information visit: <a href="http://www.coaltechnologies.com/pages/call_for_papers.html">http://www.coaltechnologies.com/pages/call_for_papers.html</a>
9 <sup>th</sup> to 11 <sup>th</sup> June 2015	Power-Gen Europe & Renewable Energy World Europe 2015	Amsterdam, Netherlands	For details visit:- <a href="http://s36.a2zinc.net/clients/pennwell/PGE2015/Public/Content.aspx?ID=41884&amp;_ga=1.218674649.1157970709.1408389995">http://s36.a2zinc.net/clients/pennwell/PGE2015/Public/Content.aspx?ID=41884&amp;_ga=1.218674649.1157970709.1408389995</a>
<b>September 2015</b>	<b>“The Control of Mercury and Trace Element Emissions”</b>  <b>Coal Research Forum Environment Divisional seminar</b>	<b>Imperial College, London</b>	<b>Dr. Bill Nimmo</b> <b>Chairman of the CRF Environment Division</b> Tel : 0113-343-2513 E-mail : <a href="mailto:w.nimmo@leeds.ac.uk">w.nimmo@leeds.ac.uk</a>
8 <sup>th</sup> to 10 <sup>th</sup> December 2015	COAL-GEN 2015	Las Vegas Convention Center, Las Vegas, Nevada, USA	For more information visit:- <a href="http://www.coal-gen.com/index.html#showcase_3">http://www.coal-gen.com/index.html#showcase_3</a>