

# PERSPECTIVES ON BROWN COAL

THE NEWSLETTER OF BROWN COAL INNOVATION AUSTRALIA

December 2014: Number 12

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## CEO'S UPDATE

### 2014 – A year of advances in brown coal utilisation

It's hard to believe that the end of the year is nearly upon us. If you are like me, this year has flown past – and time always seems to run even faster at this time of year, with so much to complete before the holidays.

This has been a very eventful year for brown coal globally. The most significant story of the year has to be SaskPower bringing on-line the Boundary Dam Integrated Carbon Capture and Storage (CCS) Project – the world's first full-chain system integrating carbon capture at a coal-fired power station.

Hot on the heels of this, construction continues at pace at Southern Company's Kemper County Energy facility, with plans to capture up to three million tonnes per annum of CO<sub>2</sub> starting from 2016.

Both the Boundary Dam and Kemper County power plants are fuelled by brown coal. The integration of CCS at both facilities conclusively demonstrates the capacity of this low-cost fuel to provide low-emissions power.

BCIA is a member of the Global Carbon Capture and Storage Institute (GCCSI), which track the progress of CCS globally – the Institute provides an update on the Boundary Dam and Southern Company projects and other low-emissions options for brown coal on page 4.

Closer to home, in Victoria Australia, three major new coal upgrading projects are progressing under the banner of the Advanced Lignite Demonstration Program (ALDP); and the CarbonNet project continues its work in identifying storage sites. CarbonNet is Victoria's major CCS program focussed on industrial scale storage of CO<sub>2</sub>.

On the R&D side of CCS, the CO<sub>2</sub>CRC, of which BCIA is a member, continues its research program monitoring and testing CO<sub>2</sub> injection and storage at its Otway site, while the CO<sub>2</sub>CRC's spin-out company, UNO Technologies, continues to commercialise the UNO capture technology.

To assist in the development of such activities, BCIA recently held a stakeholder forum in the Latrobe Valley to discuss the opportunities for R&D to accelerate the wide range of planned pilot and demonstration projects that will be operating in Victoria in the next few years – the outcomes from the forum are reported on Page 5.

Projects under BCIA's 2014 funding round are now well under way. The Direct Injection Carbon Engine (DICE) program has completed a risk-review and this has identified pathways, opportunities and challenges for demonstration and commercialisation of the technology. The DICE project is targeting a significant reduction in both emissions and capital costs by utilising coal-water fuels for power generation from stationary, low-emissions diesel engines.

The CSIRO/IHI/AGL project that will build and operate a new carbon capture R&D plant in Victoria is at the design review stage, while BCIA's oxy-fuel and chemical looping projects – being undertaken by Monash University and partners – are progressing well.

In this issue of *Perspectives* you will also find information on research BCIA is supporting to simplify pathways for DME production. DME is a non-toxic, non-greenhouse fuel, and the project shows that it can be produced through catalytic coal gasification.

You will also read about research on the agricultural uses of brown coal, the skills development activities BCIA is undertaking, and we also spotlight Australia's newest university, Federation University, which has recently joined BCIA as a member.

Finally, I would like to offer my congratulations to Kirstyn Krausz, BCIA's Membership Support Manager, who will be taking 12 months maternity leave from the end of this year. Most of you will know Kirstyn, and I'm sure you will join with me in wishing her all the best with baby number two, and welcoming Shae Ford, who will be joining BCIA to cover Kirstyn's maternity leave. Shae can be contacted on [shae.ford@bcinnovation.com.au](mailto:shae.ford@bcinnovation.com.au) or phone +61 (3) 9653 9601.

As always, I trust that you will enjoy this issue of *Perspectives*. If this year has also been a busy one for you, I wish you a restful break to come – and to those of you in the Southern Hemisphere, I hope you enjoy the summer weather.

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### **First steps toward a new clean fuel from brown coal**

By David McManus, Research Investment Manager, BCIA

DME is a non-toxic, non-greenhouse fuel with similar properties to liquefied petroleum gas (LPG). Typically, DME is produced from natural gas, however this is a very energy-inefficient process. Research undertaken at Monash University has shown that the use of a novel catalyst can lead to a significant improvement in the energy efficiency of DME production from brown coal. David McManus explains further.

Professor Sankar Bhattacharya at Monash University has recently announced the successful completion of the BCIA-funded project 'Catalytic steam gasification and assessment of dimethyl ether'.

This project had its roots in a 2009 agreement between the Victorian Government and the Kyushu Electric Power Company (KEPCo) to cooperatively pursue strategic basic research of high-level utilisation technology for Victorian brown coal.

Japan is the largest coal importer in the world, with Australia and Indonesia supplying 80 per cent of all Japan's imported coal. Japan is also Victoria's third largest trading partner, and has a strategic interest in the development of technologies for production of clean energy sources from Victorian brown coal.

Professor Bhattacharya's project investigated the feasibility of producing dimethyl ether (DME) via gasification of Victorian brown coal. DME is a non-toxic, non-greenhouse but highly flammable gas with properties similar to liquefied petroleum gas (LPG), and is regarded as a clean alternative to diesel fuel for internal combustion engines.

Japan is the world leader in the development of DME-fuelled vehicles, with Nissan and Isuzu conducting field tests of new engine prototypes. DME-fuelled engines are also being developed in China, Korea, the USA and Europe. Commercialisation of DME-fuelled engines is not far off, and is expected to create exciting new opportunities for export of DME derived from Victorian brown coal.

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The standard method for producing DME involves the catalytic conversion of methanol. The majority of methanol is currently produced from natural gas, but it can also be produced by gasification of coal. Worldwide, approximately 50 million tpa of methanol is produced from gasifier synthesis gas (syngas) using copper-based catalysts. However, this reaction is not energetically favourable, and the process has an efficiency of only approximately 20 per cent.

Professor Bhattacharya investigated the feasibility of producing DME from syngas in a single step, using a bi-functional catalyst incorporating both a copper-based methanol synthesis catalyst and an alumina methanol dehydration catalyst. A single-step reaction improves the energetics of the process, since the methanol is converted as soon as it is formed, and can increase the conversion efficiency to as high as 80 per cent.

The first part of the project involved the development of an ASPEN Plus simulation of the process, including integrated coal drying, gasification and DME synthesis. The simulation was initially used to define realistic operating conditions for the experimental program, which then allowed data to be obtained for the pyrolysis and gasification reactions of Victorian brown coal. Pyrolysis and gasification studies were performed in a thermo-gravimetric analyser and an entrained flow reactor.

Simulations using the ASPEN Plus model showed that gasification of brown coal at 900o C would produce syngas with the optimum composition for DME synthesis, without the need for further syngas conditioning steps. As such, the unique properties of Victorian brown coal seem to make it a better feedstock for DME synthesis than black coal.

The second part of the project involved detailed analysis of the performance of the bi-functional catalyst during DME synthesis. Experiments were performed in a high pressure fixed-bed reactor, using a synthetic syngas mixture. A variety of catalyst formulations was investigated, using mixtures of commercial catalysts and new catalysts synthesised at Monash University. Both physical mixing and co-precipitation-impregnation methods were used.

Structural changes in the catalysts were studied using X-ray synchrotron power diffraction. It was found that the catalyst was deactivated at temperatures above 300°C, accompanied by an increase in the size of copper crystallites in the methanol synthesis catalyst.

The alumina catalyst phase was found to be resistant to structural and chemical changes. The results suggested that the working life and efficiency of the bi-functional catalyst could be improved by refinements in the formulation of the copper-based catalyst phase. This is the key to the commercial viability of the single-step DME process, and will be the subject of on-going research at Monash University.

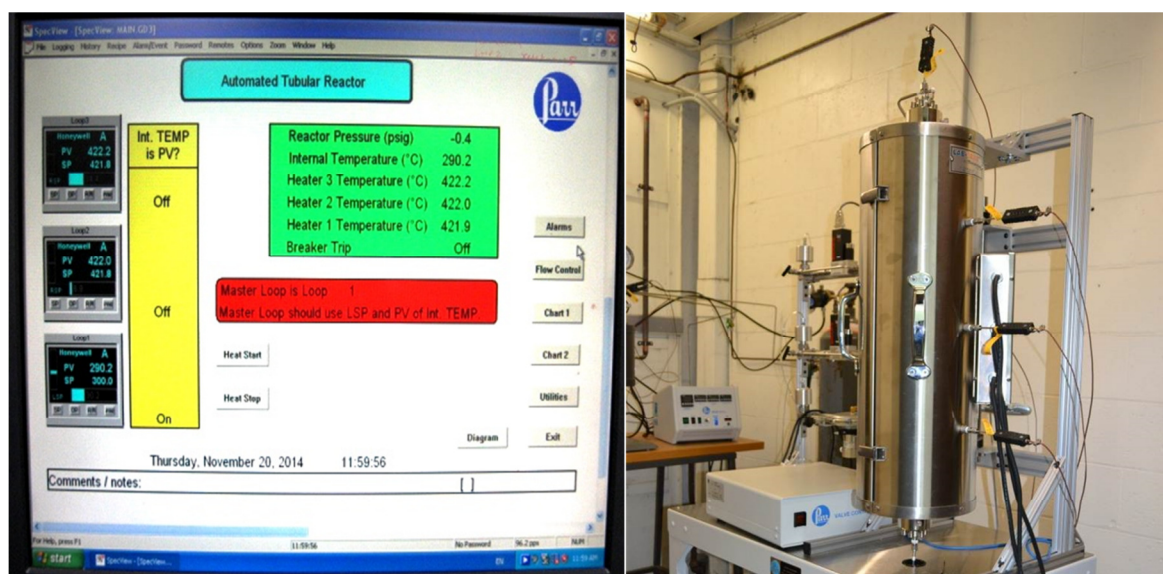
This project has, for the first time, demonstrated the technical feasibility of single-step production of DME via catalytic conversion of syngas from Victorian brown coal. While further work is required to improve the catalyst working life, the syngas composition is favourable and the reaction efficiency is high. There is every reason to believe that improved catalyst formulations can be developed for stable DME synthesis.

The DME project is one of four projects that have been funded by BCIA to support the development of oxygen-blown gasification of Victorian brown coal. Ms Joanne Tanner and Mr Tao Xu, recipients of BCIA PhD scholarships, are studying the fundamental reactions of brown coal under high temperature, entrained-flow gasification conditions.

Ms Sunaina Dayal, another PhD student working with Professor Bhattacharya, has been studying the flow behaviour of molten slag produced from brown coal in an entrained flow gasifier. These complementary projects are building a coherent knowledge base that can be applied to synthesis of a range of value-added products from Victorian brown coal.

The PhD student who worked on the DME project, Mr Bayzid Kabir, has recently taken up a position as Assistant Professor at the Bangladesh University of Engineering and Technology. A postdoctoral fellow, Dr Srikanth Srivatsa, is continuing the research on catalyst development.

Professor Bhattacharya hopes to continue his collaboration on DME with Japan, to build the foundation of a new export industry for Victoria.



*Above: DME synthesis reactor*

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### Boundary Dam pioneers CCS for power plants

By Tony Zhang, Senior Adviser – Carbon Capture, Global CCS Institute

Victoria has significant brown coal reserves with the potential to supply energy to Victoria for centuries to come. Brown coal has been providing power for Victoria for almost a century and still provides the majority of Victorian base load power, with an installed capacity of around 6.75GW.

However, brown coal being an immature coal and close to the surface, contains large amounts of water, often in the range of 48–70 per cent by weight. To quote a veteran boiler engineer in Latrobe Valley, ‘we need to burn the coal to dry the coal to burn the coal.’

Extra energy is required to vaporize the water contained in brown coal. As such, the brown coal power generation efficiency is often comparatively low, often in the range from 20–35 per cent. Such low thermal efficiency leads to a high carbon footprint.

Brown coal power stations generally emit more than 1 tonne CO<sub>2</sub> per MWh. Owners of brown coal power stations have invested significantly to maintain and to upgrade the boilers, turbines and other ancillary systems. For example, the Hazelwood Power Station has in recent years completed the upgrade of two units, including installing two new generation turbines, which increases the efficiency of the two units significantly. These power stations, with the new upgrades, can be kept operational for a long time.

Carbon capture and storage (CCS) has the scale and application to enable the power sector to produce base load with significantly reduced emissions. The IPCC Fifth Assessment Synthesis Report, released in November 2014, notes that without CCS the cost of meeting global climate goal could be nearly 140 per cent higher (compared to scenarios with CCS), indicating CCS is an important component of a portfolio of technologies to combat climate change.

What many don’t know is that CCS is now operational at large-scale in the power sector. The world’s first application of CCS at large-scale on a power station went live at SaskPower’s Boundary Dam facility in Canada in October this year. This project will capture one million tonnes of CO<sub>2</sub> per annum.

Two more CCS projects in the power sector are under construction in the United States and are planned to commence operation in 2016 – at the Kemper County Energy Facility in Mississippi and the Petra Nova Carbon Capture Project in Texas. The Kemper County facility will capture around three million tonnes of CO<sub>2</sub> per year, Petra Nova around 1.4 million tonnes per annum.

The Boundary Dam plant uses lignite (brown coal) as its fuel source, as will the Kemper County facility. The fact that the first two CCS projects to become operational in the power sector happen to be based on brown coal is based on a range of factors, an important consideration being the commercial competitiveness of the brown coal feedstock.

Continued deployment of large scale projects will improve efficiency and cost of CCS technology. We are already seeing this in action, with CCS demonstration in the power sector gaining valuable design, construction and operational experience by ‘learning by doing’.

Being a first-of-a-kind project, Boundary Dam’s operator, SaskPower, has stated that a capital cost reduction of up to 30 per cent is achievable for its next CCS project. The world’s power industry is taking a close interest, in particular how the savings, commissioning procedures and standard operations can be applied to projects elsewhere.

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## **Latrobe Valley Brown Coal R&D Stakeholder Roundtable Forum**

More than 50 brown coal industry, government and R&D stakeholders attended a roundtable forum hosted by BCIA at Federation University’s Churchill Campus in the Latrobe Valley about six weeks ago.

The aim of the forum was to inform the development of an industry-led brown coal R&D agenda for Victoria. Our focus for this roundtable event was on shorter-term research activity, where outcomes can be delivered in a timeframe that will help accelerate the development of low-emissions, value-added, brown coal industries over the next five to ten years.

Presentations were given by companies considering major new brown coal projects in Victoria, with a particular focus on possible and expected technology challenges, and from universities and research organisations which outlined their major research streams and capabilities.

In addition to the presentations, facilitated discussion enabled the participating organisations to contribute to the definition of common areas of research focus that offered the potential to contribute to multiple projects, as well as key areas of research activity that could accelerate or optimise specific individual projects.

The event helped build a consensus on future research topics required to support the development of environmentally responsible uses of brown coal and, equally importantly, new value-added industries and associated employment opportunities.

Topics of interest were extremely varied, and included brown coal upgrading for oils, chemicals and liquid fuels (including coal-water fuels), higher value coal products for iron and steel manufacture, briquetting and handling of dried coal products, hydrogen production from coal, Carbon Capture and Storage (CCS), and the use and processing of waste streams from coal upgrading processes.

BCIA intends to use the outcomes of the forum as a foundation for future plans, including providing input into R&D focus areas, and the timelines and resourcing that will be needed to ensure focused R&D is undertaken to enable the development of new brown coal industries.

The forum will also assist BCIA’s consideration of how to best fund identified research areas through grants, tenders or commissioned research, open innovation challenges, or by partnering with research teams and institutes with expertise in specific areas.



One early outcome of the event has been the development of a proposal, for submission to the Australian Research Council (ARC), for a research hub focussed on advanced manufacturing opportunities for upgrading raw brown coal to a variety of value-added products.

As funding available for brown coal R&D in Australia is currently very limited, the results of the BCIA forum will help identify the R&D priority areas that will enable the development of new industries, markets and diverse products from brown coal, and hence support regional development in the Gippsland area and Victoria more broadly.

A further outcome from this event is the list of identified research topics that may help support the short-term demonstration activity. If you wish to receive a copy, please send an email requesting this to [shae.ford@bcinnovation.com.au](mailto:shae.ford@bcinnovation.com.au).

It should be noted that the research themes included in this document are by no means an exhaustive list of the R&D activities required to support future environmentally responsible uses of brown coal, but are primarily a reflection of the focus on advancing the outcomes of those projects presented on the day.

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## **BCIA sponsors the 'Carbon Reduction' group awards at the AIE Postgrad Student Energy Awards**

BCIA Research Investment Manager, Dr David McManus, recently presented awards to two winners of the 2014 Australian Institute of Energy (AIE) Postgraduate Student Energy Awards held in Melbourne.

Hosted by the AIE Melbourne branch in conjunction with the All-Energy Australia Exhibition and Conference, the 'Awards Poster' competition was held in as a part of the exhibition, allowing for 25 posters to be displayed.

BCIA has sponsored the AIE Postgraduate Student Energy Awards for the past two years. The student posters were judged by a panel including five representatives from the various Awards' sponsors and the AIE. The judges commented on the high standard of design and presentation and the student explanations of their projects.

The students were divided into three groups, based on their research topics, designated 'Carbon Reduction', 'Renewable Energy' and 'Future Energy' (covering a wide range of other leading edge projects), with nine students receiving awards ranging from \$500 to \$1000 and a commemorative plaque.

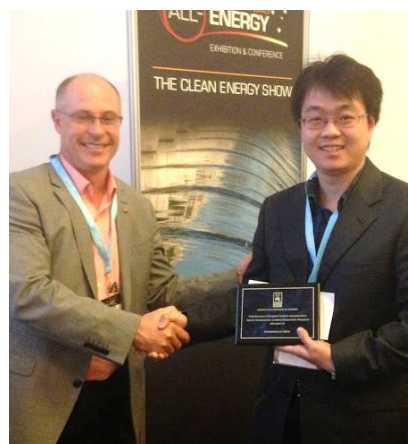
BCIA sponsored the 'Carbon Reduction' group of projects, with first prize awarded to Mr Adam Rady of Monash University, a BCIA PhD scholarship holder, for his poster 'Evaluation of Victorian brown coal as a fuel for Direct Carbon Fuel Cells'.

Frank Wu from the University of Melbourne received the Highly Commended award in this category for his poster on 'Rate based modelling of Potassium Carbonate precipitating absorption columns in carbon capture'.

BCIA continues to invest in these types of programs as part of our commitment to strategic investment in skills development to secure the scientific, engineering and trades expertise required for the development of new low-emissions brown coal technologies.



*Above: Mr Adam Rady receiving his Best Project award from BCIA Research Investment Manager, Dr David McManus*



*Above: Mr Frank Wu receiving his Highly Commended award*

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### WHAT'S NEWS AT BCIA?

#### SKILLS DEVELOPMENT UPDATE

Each year, the Royal Society of Victoria (RSV) awards four prestigious competitive prizes to post-graduate doctoral students in the areas of Biomedical & Health Sciences, Biological Sciences (Non-human), Earth Sciences and Physical Sciences.

This year Monash University PhD student and BCIA researcher, Mr Sharmen Rajendran, was runner up in the Physical Sciences category, for his presentation 'Chemical looping combustion of Victorian brown coal with inherent CO<sub>2</sub> capture and H<sub>2</sub> generation'.

Mr Rajendran is in the final stages of his PhD and is working with Professor Sankar Bhattacharya as part of BCIA's 'Chemical Looping Combustion' research project. Mr Rajendran received a certificate and a cash prize of \$250, plus free membership of the RSV for a period of two years and the opportunity to participate in the Society's mentoring program.



*Above: Sharmen Rajendran (centre) with other winners of RSV awards  
(Source: <http://www.royalsocietyvictoria.org.au/awards-and-prizes>)*

The RSV awards are open to PhD candidates at Victorian universities who are completing the third or fourth year of their doctoral candidature. The next round of applications will open on 1 June 2015. Further details can be found at [www.royalsocietyvictoria.org.au/awards-and-prizes/young-scientist-research-prizes](http://www.royalsocietyvictoria.org.au/awards-and-prizes/young-scientist-research-prizes).

In October, the Australian Institute of Energy (AIE) held the 2014 National Postgraduate Student Energy Awards, in conjunction with the All-Energy Exhibition & Conference in Melbourne.

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The AIE Postgraduate Awards provide an opportunity for postgraduate research students to interact with the energy community, and to inform AIE members and the public about the current energy research. BCIA was a sponsor of the AIE Postgraduate Awards, and provided the awards in the Carbon Reduction category.

Mr Adam Rady, a BCIA PhD Scholarship holder from Monash University won first prize in the 'Carbon Reduction' category for his poster 'Evaluation of Victorian brown coal as a fuel for Direct Carbon Fuel Cells'; see page 6 to read more.

Ms Karen Little recently submitted her PhD thesis and has expressed interest in continuing research on humates in soils. As the year draws to a close, many of the PhD students working on BCIA projects are also working hard to finalise and submit their theses.

We recently learned that some former PhD students who worked on BCIA research projects have since taken up postdoctoral positions overseas:

- Mr Chiranjib Saha – the first PhD student to work on the BCIA-funded chemical looping project – initially went to CANMET Energy in Canada, and is now working with Southern Company and the Mesaba IGCC project in Minnesota.
- Mr Bayzid Kabir has submitted his thesis on gasification and DME synthesis and is now engaged as an Assistant Professor at the Bangladesh University of Engineering and Technology.
- Mr Lachlan Ciddor is now working as a research fellow at Aston University, Birmingham, UK and putting the finishing touches to his PhD thesis on lignite-based CO<sub>2</sub> adsorbents.

Postdoctoral work overseas is widely regarded as a very beneficial career move for PhD graduates. It provides them with an opportunity to work with leaders in their field and helps them establish a global network of collaborators.

It also gives graduates access to ideas and experiences that they couldn't get by staying in one place and their creative skills are enhanced by overcoming the challenge of living in a new society. International experience is encouraged for PhD graduates because it will ultimately enrich their future careers.

BCIA wishes our PhD students every success in finalising their research work, completing their dissertations and undertaking the next phase of their professional careers.

## RESEARCH AND DEVELOPMENT – AGRICULTURAL USES OF BROWN COAL

Victorian brown coal deposits are about 30 million years old, and comprise the decomposed remains of ancient plants and trees. The readily degraded polymers, cellulose and hemicellulose, have been consumed by soil microbes, leaving only lignin residues. When reacted with alkali, the lignin material breaks down further to form humates, which can be used in agriculture to build soil structure and promote plant growth.

Associate Professor Tony Patti is currently leading a team of researchers in a project based at Monash University to investigate the agricultural applications of humates and fertilisers containing Victorian brown coal. This has involved an extensive review of the published literature, as well as a series of greenhouse studies and field trials with a range of different crop plants in a bid to understand the mechanisms involved.

Associate Professor Patti's team has learned that, while there is evidence to suggest that humates can have a significant effect on plant growth under certain circumstances, the result seems to be dependent on a range of different factors which include, the crop itself, source of the humates, soil type, as well as application rate. Consequently, the effect of humates on plant growth is very variable.

Humates seem to have an indirect effect on plant growth, acting through stimulation of a range of soil microbes, including nitrogen-fixing bacteria and beneficial soil fungi. Further work is needed to unravel the web of interactions that are likely to be involved.



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Interestingly, the humates themselves are not quickly broken down in the soil, which is consistent with the longevity of the original brown coal deposits. This raises the possibility of using Victorian brown coal as a soil amendment, to boost the carbon content of agricultural soils for improved structure and water-holding capacity.

While brown coal has been used in commercial soil amendments in the past, the effects on soil structure have not yet been extensively studied. Increasing the soil carbon content is likely to improve crop productivity and lift the amount of atmospheric CO<sub>2</sub> fixed in the soil. Further work is needed to quantify the potential benefits of using Victorian brown coal in this manner.

Another interesting finding is that coal-derived humates can interact with conventional chemical fertilisers and potentially increase their availability to plants. Preliminary results have shown that the nutrient availability from both nitrogen- and phosphorus-based fertilisers can be improved by blending with brown coal.

Associate Professor Patti currently has two PhD students investigating the mechanisms involved. It is hoped that this research will support the development and optimisation of a range of new fertiliser products.

This project is particularly interesting because it demonstrates the potential for using Victoria's carbon-rich brown coal resource to improve the productivity of Australia's carbon-poor farming soils.

Furthermore, improving the efficiency of nitrogen and phosphorus delivery to plants through improved fertiliser formulation is of paramount importance for food security, environmental and economic benefits.

There is significant commercial interest in developing new agricultural products based on Victorian brown coal, both for domestic and export markets. Associate Professor Patti is keen to work with industry to establish validated field trial data for selected coal-derived products.

For further information, contact Tony Patti by emailing [tony.patti@monash.edu](mailto:tony.patti@monash.edu) or telephone +61 (3) 9905 1620.

## COMMUNICATIONS AND STAKEHOLDER RELATIONS

During October, BCIA held a Brown Coal R&D Stakeholder's Forum in the Latrobe Valley, focussed on the development of an industry-led brown coal R&D agenda for Victoria.

The forum was very well attended and examined and prioritised critical shorter-term research activity, where outcomes can be delivered in a timeframe that will help accelerate the development of new low-emissions brown coal industries over the next five to ten years. See page 5 for more information.

BCIA is also continuing to hold a number of background briefings for industry representatives, research institutes, parliamentary and local government representatives, media outlets and other significant stakeholders. These briefings enable BCIA to update stakeholders on our progress in securing a sustainable future for Australia's brown coal resource.

BCIA's Membership Support Manager, Kirstyn Krausz will be going on maternity leave at the end of the year to have baby number two. We wish Kirstyn all the best and would like to welcome Shae Ford to the team, who will be covering Kirstyn's maternity leave for 12 months. During this time Shae can be contacted on [shae.ford@bcinnovation.com.au](mailto:shae.ford@bcinnovation.com.au) or phone +61 (3) 9653 9601.

As highlighted in the October edition of *Perspectives*, BCIA has developed a company page on the social media site; LinkedIn. The new page provides another way for BCIA stakeholders to connect and show their support for investment in brown coal low-emissions technology innovation.

The BCIA LinkedIn company page also provides another channel for sharing information about low-emissions brown coal research and development.

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If you already have a LinkedIn profile, you can use the link below to access and 'follow' BCIA's company page <http://www.linkedin.com/company/3700933?trk=tyah&trkInfo=tarId%3A1412128758064%2Ctas%3Abrown%20coal%2Cid%3A2-1-7> or you can simply search for 'Brown Coal Innovation Australia' on the LinkedIn site.

As previously outlined, we have also added a page to our public website which provides links and pdfs of recent news clippings, interviews and articles. The new web page can be found at <http://www.bcinnovation.com.au/BCIAbrowncoalresearchinthenews> on BCIA's website.

We will be progressively adding to the web page as further news announcements are made, so make sure you check the page regularly or 'follow' our BCIA LinkedIn company page to keep informed.

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### BCIA MEMBERSHIP

As a member-based company, BCIA undertakes a range of programs of interest to brown coal stakeholders including industry, research and education providers, governments and international coal technology organisations.

BCIA industry stakeholders encompass a broad range of sectors including coal-fired energy operators, original equipment manufacturers, companies involved in the conversion of brown coal to value-added products and services companies operating in the brown coal sector.

Membership enables BCIA's stakeholders to work with like-minded organisations to drive the future of the brown coal sector through active participation in our skills, networking and R&D programs.

On the next page, you can read about this edition's new member in the spotlight, Federation University.

For more information about BCIA membership, contact [info@bcinnovation.com.au](mailto:info@bcinnovation.com.au).

BCIA has updated our membership programs for 2014. Our current members include:



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### **SPOTLIGHT ON BCIA MEMBER**

#### **Federation University Australia**

Federation University Australia's Churchill Campus lies on the doorstep of Victoria's greatest brown coal assets.

FedUni is the nation's newest university and as a new university with a community focus we are committed to further research into the responsible utilisation of brown coal in our region for the benefit of all stakeholders. There is growing scope for new manufacturing industries producing value added products particularly gases and liquids based on the State's large carbon resource.

Our Gippsland Campus has a long history of involvement in brown coal research, including being the site for the Victorian Brown Coal Council research laboratory, which opened in 1984. Our vision is to create research facilities that combine both community energy education with laboratories and services that assist industry with the demonstration and operation of their new generation of brown coal technologies.

Currently, there is no single entity devoted to applied research and practical demonstration of known and novel technologies for the sole purpose of developing Victoria's brown coal resource. We have recently created a new research centre to offer technology developers advanced facilities and technical support to undertake research from concept through to commercial demonstration.

The Churchill Campus setting is vast and the proximity to the existing coal extraction sites minimises constraints that would be rapidly apparent in an urban setting.

FedUni has a strong tradition of education and training delivery which spans more than 140 years via our predecessor institutions, the University of Ballarat and Monash University's Gippsland Campus.

FedUni is Australia's only regional, multi-sector university and a pivotal provider of post-secondary education for regional Victoria.

With a proud track record in business innovation and entrepreneurship, we strive to enhance the relevance and currency of our education, training, research and consultancy capabilities.

For more information, please visit [www.federation.edu.au](http://www.federation.edu.au).

### **EVENTS CALENDAR**

#### **4–5 February, 2015**

##### **World Clean Coal Conference (Delhi, India)**

Under the event theme, tailor-made topics will radiate a wide spectrum on coal-to-gas, coal-to-liquid, coal/petcoke gasification, coal upgrading, environmental issues and other related CCTs. There will be more than 200 key players, including senior government officials, clean coal project developers and leading technology licensors from India, U.S., UK, Japan, Australia, South Africa etc., gather in Delhi with their excellent experience.

Visit <http://www.worldcleancoal.org/in/>

#### **25–26 March, 2015**

##### **Gasification 2015 (Prague, Czech Republic)**

This conference will comprise two days of formal presentations, interactive roundtable discussions and excellent networking opportunities, providing an ideal setting to convene with your peers to discuss both current operational and future planned gasification plants, end product markets, potential barriers and support policies as well as project economics and finance.

Visit <http://www.wplgroup.com/aci/conferences/eu-ecg4.asp>

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## **27–28 March, 2015**

### **Istanbul Clean Coal Forum (Istanbul, Turkey)**

This will be a unique opportunity to exchange ideas, scientific information, experiences, new technologies and innovations on such technologies among the participants, including industry leaders, researchers, company representatives, and governmental representatives. A number of keynote and invited speakers from various countries as well as technical sessions will make the Forum an unforgettable event.

Visit <http://www.cleancoalforum.org/#ana-sayfa>

## **31 May–4 June, 2015**

### **The 40th International Technical Conference on Clean Coal & Fuel Systems (Florida, US)**

#### **Clearwater Clean Coal Conference**

The State-of-the Art in coal utilisation will be presented in up-to-date technical papers, tutorials, and panels, covering cutting-edge developments on a range of timely topics. Presentations will deal with technical solutions to problems; specific strategies; projects; innovations; industry trends; and or/regulatory compliance. The program presents an extensive overview of emerging, evolving, and innovative technologies, fuels and/or equipment in the power generation industry.

Visit <http://www.coaltechnologies.com/>

## **17–21 May, 2015**

### **The Seventh International Conference on Clean Coal Technologies – CCT2015 (Kraków, Poland)**

Organised by the IEA Clean Coal Centre and the Central Mining Institute of Poland (Główny Instytut Górnictwa), CCT2015 is a leading international forum for research into clean coal technologies, including; high efficiency, low emissions plant; developments in carbon capture; air pollution control; and low rank coal utilisation.

Visit <http://www.cct2015.org/ibis/CCT2015/home>

## **27 September–1 October 2015**

### **2015 ICCS&T, MCEC (Melbourne, Australia)**

The 15th International Conference on Coal Science & Technology will be visiting Australia for the first time. The conference aims to bring together academic, industrial, and government communities to exchange ideas, concepts and innovations for the shared purpose of facilitating coal research advances.

Visit <http://www.engineersaustralia.org.au/iccst-2015>