Coal Association of New Zealand

Coal e-Newsletter

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COAL NEWS

NEW ZEALAND

NZ coal industry overview

Coal is New Zealand's most abundant fossil fuel. New Zealand's coalfields have been well explored by government-funded surveys in the past, and most of the country's coal resources are well known. The main coalfields are in the Waikato and Taranaki regions of the North Island, and in the West Coast, Otago and Southland regions of the South Island.

The total in-ground resource for New Zealand is estimated at over 15 billion tonnes, of which 8.6 billion tonnes is considered to be economically recoverable. Current production is over 5.2 Mtpa (million tonnes per annum) or about 137 PJ/year.

Because of the extent of the proven indigenous resource, its opportunity to improve fuel diversity, and dwindling gas supplies, coal is playing an increasingly important role in New Zealand's energy mix. Coal mines are located in the Waikato (servicing principally New Zealand Steel's Glenbrook mill as well as the Huntly power station and several major industrial customers), Otago/Southland (servicing mainly local industrial and domestic markets) and the West Coast (servicing mainly export markets).

Previously, the special qualities of New Zealand's premium grade bituminous coals were promoted to international coal markets. These properties include extremely low ash and sulphur contents, and very high swelling characteristics, making them suitable for use in the chemical and steel industries and valuable for blending. Coal exports had reached approximately 1 Mtpa by 1994 and have increased steadily to over 2.3 Mtpa during 2005, generating export earnings exceeding NZ$200M. Exports of thermal coal are also becoming increasingly important.

NZ mineral and coal expenditure statistics

Latest Crown Minerals statistics show that total prospecting and exploration expenditure rose to $38.5M in the year ended 31 March 2006 - an increase of 88% from the $20.4M spent in the March 2005 year. To put this surge in expenditure into perspective, as recently as the 2001 reporting period, prospecting and exploration expenditure totaled only $2.5M.

Total expenditure statistics incorporate expenditure directly related to prospecting and exploration operations as well as consenting and 'other' expenditure directly attributable to prospecting and exploration permit areas.

Spring Creek underground coal mine to be expanded

Solid Energy has decided to go ahead with development and expansion of its Spring Creek underground coal mine just north of Greymouth. The Spring Creek mine previously had questions over its long term economic viability but recent mining of the first block of thick coal in the mine exceeded all productivity expectations.

Solid Energy decided to go ahead with a five year mine plan for development and extraction in a new area of the mine that has been externally peer reviewed by an Australian mining consultant. The mining operation has been assessed to be viable if it meets the development, production and market targets for accessing a further 3.1M tonnes of coal to the NW of the current mining area.

What's news?

Solid Energy plans to invest $25M over 3 years in new equipment for the mine, including two new road headers, and upgrading the coal washery to produce a low ash, low sulphur coal for international thermal and steel making markets. The company said it will also begin recruiting up to 15 experienced mineworkers.

About 7000 tonnes of coal a month will be produced during the year-long development phase. Production would then be ramped up to 65,000 tonnes a month (about 800,000 tonnes a year). Solid Energy said it will also begin detailed planning to develop a subsequent 15-year plan for the Rapahoe sector of the mine to access an additional 15M tonnes of reserves.

The company said it appreciated that the uncertainty over the mine has been difficult for staff and their families, but it had to be certain that in making this decision it had carried out a rigorous and comprehensive assessment of the mine plan and the mine's financial viability based on customer commitments.

Solid Energy's record sales, production and $85M profit

Solid Energy produced record sales in the latest year (ended 30 June) of $570M (up 42% from 2005) on record production of 4.67M tonnes. It also recorded a record after tax profit of $85.8M, a large recovery on the previous year's $6.3M profit when the company was hit by pre-tax asset write-downs of $46M largely related to the Spring Creek underground mine. Coal export volumes increased in the year by 13% to a record 2.47Mt, with markets again driven by very strong Chinese and Asian demand for steel and energy. Sales of coal within New Zealand of 2.2Mt remained in line with last year, with the company's market dominated by its two largest domestic customers, New Zealand Steel and Genesis Energy.

Solid Energy chairman Tim Saunders said high export prices and continuing strong New Zealand sales have returned the record profit. The trading result has significantly improved the company's financial position, placing it on a firm foundation for future investment in current and new mines and in other energy initiatives. The company is currently trialing coal seam gas in the Waikato, and it is now Australasia's largest non-forestry biomass energy company.

Chief executive officer Dr Don Elder said that in line with its diversification strategy, Solid Energy is now actively pursuing the potential for using Southland's huge lignite resources to the advantage of the company and the country. He said the company had an active programme of land acquisition to ensure access to sufficient lignite volumes to use this resource for a range of high value products that could include transport fuels, petrochemicals or urea. He said Solid Energy probably has the largest single NZ commitment to sustainable energy solutions as part of its $100M, 20-year technology research and development programme, including a leading role in developing carbon capture and storage for New Zealand conditions.

Eastern awarded two Southland coal prospecting permits

Queensland based coal company Eastern Corporation has been awarded two prospecting permits for sub-bituminous coal in Western Southland through its subsidiary Rochfort Coal Mining Pty Ltd. Rochfort has been awarded a 208 sq km permit in an area surrounding most of the current Western Southland coal permits including Solid Energy's Ohai mining permits, L&M Coal's exploration permit, as well as Eastern's two newly acquired mines now trading under the name Takitimu Coal Ltd. Eastern says the Southland subsidiary has been named after the nearby Takitimu Mountains, which overlook the Southland plains.

Eastern says in its recent annual report that the coal seams identified within Takitimu Coal's mining tenements extend into the prospecting permit, creating the potential to expand the original resource estimates.

Rochfort has also been awarded a 24 sq km permit for coal, lignite and oil shale at Orepuki on the western Southland coast at the southern end of the Longwood Range. The small sub-bituminous coal field at Orepuki has a previously estimated recoverable resource of about 8Mt. A mine operated between 1883 and 1962, extracting a total of 85,000 tonnes.

In the 2006 annual report Eastern describes its “New Zealand coal strategy”: “The New Zealand coal industry is growing strongly to meet the nation’s increasing energy requirements. There was record coal production in 2005, including a strong export coking coal sector. The value of coal mines has risen by a massive 23% year on year, underlining that coal in New Zealand is a high value business.

At the same time, coal imports into New Zealand also reached a record level, mainly for thermal coal for power generation. With thermal coal readily available in New Zealand, the potential for local mines to increase production to replace imports is very evident. There is a place for low volume mining. While the New Zealand industry is competitive, coal prices are sufficient to sustain a range of small-scale producers.”

"There is a long tradition of mining in the country, the geology is well known, there are extensive in-ground coal resources, the industry has a high degree of professionalism and the government provides experienced, efficient regulation that encourages exploration and development."

The annual report added that the barriers to entry into coal mining were also low in New Zealand. Whether considering acquisition or project development, Eastern says it can find existing mines and potential projects that are manageable in scale.

NZ Oil & Gas raises $175M

NZ Oil and Gas Ltd has raised $175M through a bank facility and share placement to fund future expansion. It said recently it had raised $135M in bank finance for its share in the development of the Kupe oil and gas field, and placed 17.5M new shares at $1 each with an additional 5.83M options with New Zealand based institutional investors. The company confirmed that it would float its Pike River Coal operation with NZ Oil & Gas shareholders being offered shares.

Denniston to become a heritage park

A historic rail line that for decades was the only link to an isolated West Coast coalmining town will be partly recreated at Denniston, 20km north-east of Westport. The steep Denniston incline rail line was an engineering feat when it was built in the 1870s by pick and shovel. Department of Conservation (DOC) said that for decades the incline was the only transport for people before a bridle track was built. It transported Denniston's coal until the late 1960s.

It will become a $1.5M heritage park project that will restore the upper section of line and brakehead, and renew viewing facilities. DOC said the project recognised the potential of the township, which sits on a plateau 700m above sea, as a tourist destination. Three kilometres away, 50m of the old Coalbrookdale mine will be opened to tourists – the only restored underground coalmine in New Zealand.

The project is shared by several organisations with land tenure – Solid Energy, the Buller District Council and DOC – and the West Coast Development Trust and community group Friends of the Hill, which has run a museum in Denniston for 13 years.

The park status would not affect mining operations or applications for future works. Several mine firms have operations on the plateau and others have exploration rights.

INTERNATIONAL NEWS

'New frontier' may host up to six coal mines (Australia)

With a largely unexplored coal reserve of more than 1200M tonnes, the Gunnedah coal basin has been labelled by industry experts as the NSW's "new coal frontier". According to the Association of Mining Related Councils Chairman, Tony Jones, by the end of 2007 the Gunnedah basin (in the northeast of the state) will be a likely home to six operational mines. Jones said these mines would employ up to 350 miners and the amount of coal being mined could double within 10 years. According to the latest industry figures, published in the NSW Coal Industry Profile 2005, 0.8M tonnes of coal was mined during 2003 and 2004.

Infrastructure development needed to meet future coal exports (Australia)

Significant development in coal supply infrastructure capacity is required in order for Australia to meet its full coal export potential over the period to 2025, according to a recently released ABARE report.

Over the period 2005 to 2025, global black coal consumption is projected to increase by 2.1 % a year to reach 7.6 billion tonnes. Based on this trend, world consumption of coal would be 2.6 billion tonnes higher in 2025 than it was in 2005.

The projected increase in global coal consumption provides an opportunity for strong growth in Australia's coal exports, particularly as much of this growth is projected to occur in the Asia Pacific region. However, the ability of Australian coal exporters to respond is contingent on the development of new mines and supporting rail and port infrastructure.

Coal boom fast-tracking rail upgrade (Australia)

The Australian Rail Track Corporation (ARTC) plans to upgrade the NSW rail system in time for the coal boom. ARTC detailed the plans, which include six possible alignment options over the Liverpool Range at a cost of between A$167M and A$465M. Though they have come up with the plan, ARTC made it clear the cost of the track upgrade and new alignment would be mostly funded by the coal industry.

SaskPower moves in on clean coal (Canada)

SaskPower has taken a big step toward building the world's first full-scale clean-coal plant, by selecting the key technology used in the removal of CO_2 emissions from the proposed C$1.5-billion power project.

Representatives of SaskPower, Babcock & Wilcox Canada and Air Liquide agreed to jointly develop oxyfuel technology for the world's first near-zero emissions, coal-fired thermal generating station. The oxyfuel process removes nitrogen from the combustion air, allowing the boiler to operate without nitrogen. The gases leaving the boiler are then easier to purify, compress and liquefy for use in enhanced oil recovery (EOR) projects or underground storage.

SaskPower expects to make the decision on whether to proceed with the clean-coal plant by mid-2007, following completion of the research on oxyfuel and other pre-commitment feasibility work.

Warning on surplus in coal supply (China)

China's top planning body, the National Development and Reform Commission (NDRC), has warned of a surplus in coal supply if no measures are taken to check new investments. The NDRC issued the warning in an analysis of performance of the coal industry in the first half of the year.

By the end of last May, there were 2,743 coal-related investment projects being carried out in China, involving a total investment of 343 billion yuan (US$43 billion). These projects, when completed, will increase the country's coal production by 800M tonnes to over 2100M tonnes. In 2005, the demand was 2100M tonnes.

Some industry analysts, however, disagree with the NDRC, believing that the growth of China's coal demand over the next few years may exceed the current 10%, which would not lead to a serious oversupply.

Cut in coal import tariffs (China)

China has this month cut the import tariffs on coal to 0-3% from 3-6%, and adjusted the export tariff on coal to 5%, the Ministry of Finance said. According to the Ministry, the administration has cut import tariffs for 58 goods,. The administration also adjusted export tariffs on 110 products.

Raising production threshold of new coal mines (China)

China will not approve the opening of new coal mines that have an annual production capacity of less than 300,000 tonnes. The National Development and Reform Commission (NDRC) has ordered an immediate halt to construction of previously approved coal mines that produce less than 300,000 tonnes unless they can be consolidated with other mines. Previously the limits on annual production capacity varied from region to region.

China plans to produce 2.45 billion tonnes of coal in 2010 with 75% produced by middle and large-sized coal mines. Figures show China produced 2.2 billion tonnes of coal in 2005 and coal mines currently under construction have a total production capacity of 600-700M tonnes.

Cooling down of coal liquefaction (China)

To avert potential risks, China has raised the capital threshold for projects converting coal to liquid (CTL) fuel to brake a possible overheating in the coal-chemical industry, as excessive investment in such projects pollutes the environment and strains the water supply.

The National Development and Reform Commission (NDRC) issued a circular demanding that local governments tighten control of new CTL projects before the national CTL development programme is complete. The government will not approve coal-liquefaction projects with an annual production capacity under 3M tonnes.

Coal exporters most affected by reduction of VAT rebate (China)

China's Ministry of Finance announced that the value-added tax (VAT) rebate will be reduced. However, the impact of the VAT rebate would be felt only next year as the Ministry of Finance said that export contracts already signed are still entitled to the rebates, provided customs clearance applications are filed by Dec. 14. The move aims to readjust the export mix, thus easing mounting trade surplus. Coal enjoyed an 8% VAT rebate.

Coal exporters are expected to be the most affected as VAT rebates for coal exports will be totally eliminated. Profit forecasts for the next two years of coal producer China Shenhua Energy Co. Ltd. will be reduced by 2% and that of Yanzhou Coal Mining Co. Ltd. by 6%.

China Shenhua aims to become world's largest coal producer (China)

China Shenhua Energy Co. Ltd will increase its coal output by 15M tonnes annually within the next five years to make the company the world's biggest coal producer.

By 2010, the company's annual coal output is expected to exceed 200M tonnes. To reach the ambitious goal, Shenhua, the world's No. two coal producer, will spend 20-25 billion yuan (US$2.5-3.1 billion) between 2006 and 2008 on developing its core assets, including coal mines, railways, sea ports and power generators.

Joint power generation business soon to be entered (India)

Coal India Ltd (CIL) will soon enter the power generation business jointly with Neyveli Lignite Corporation (NLC). To begin with, a 2,000MW capacity thermal power plant is to be set up at the pithead of one of the mines located in the command area of Mahanadi Coalfields Ltd in Orissa.

The Coal Minister said that although it would be a new line of business for CIL, the company would gain in the long run by associating itself with the project as a promoter. The CIL-NLC combine is also planning to set up two other large thermal powerhouses in the command areas of Northern Coalfields of Madhya Pradesh-Uttar Pradesh and another in Jharkhand.

Bumi Resources to sell coal mining units (Indonesia)

PT Bumi Resources, Indonesia's largest coal exporter, will offer as much as a 20% stake at its coal mining units to potential investors after scrapping plans to sell them to an investment bank for US$3.2 billion. Bumi will sell between 10% and 20% of coal units including PT Kaltim Prima Coal and PT Arutmin Indonesia.

China group to take up Thar coal project (Pakistan)

The Shenhua Group of China has offered to take up the US$1 billion coal-based 600MW power project at Thar at the rate of 6.4 cents per unit. The project also includes mining of coal, which is to be used for power generation.

The project was earlier shelved because of a dispute between the government of Pakistan and Shenhua group of China on the question of power tariff. Key officials visited China in the recent past and managed to persuade the Chinese authorities to return to the negotiating table to resolve the differences.

Increased coal production (Russia)

Russia increased coal production 4.1% year-on-year in January-September to 223.4M tonnes, the Russian Industry and Energy Ministry said. Russian coal exports to non-CIS countries rose 16% to 59M tonnes, and exports to the CIS (former USSR) grew 5.8% to 6.4M tonnes.

Rio Tinto seeks new coal and diamond deposits (South Africa)

Rio Tinto Group was "one of the biggest applicants" for exploration permits in South Africa as it sought new coal deposits. Rio, the world's third-largest mining firm, opened an office earlier this year, with staff of 100 professionals. It is seeking to develop new mines in Africa, where it lags rivals BHP Billiton and Anglo American.

India to develop coal power plant (Sri Lanka)

The Government of India will help Sri Lanka develop its second coal power plant. Sri Lanka's ministry of power and energy will establish the island's second coal power plant at Sampur in Trincomalee district as part of efforts to meet the country's increasing demand for power and energy. This plant is targeting a capacity of 500MW by 2010 and 1000MW by 2012.

The project, estimated to cost US$500M, is funded by a loan scheme of the Government of India, and the plant will be constructed by the Indian ministry of power. The first coal power plant is being set up at Norochcholai in Puttalama district of Sri Lanka.

Seeking US investor for Mchuchuma coal power project (Tanzania)

Tanzania is scouting for investors to produce power from the giant Mchuchuma coal mine in one of a number of desperate measures to alleviate the frequent power cuts and the punitive loadshedding regime currently being experienced.

The Industry, Trade and Marketing Minister was on an official visit to New York and said Tanzania was seeking a strategic investor for the mine, which has an estimated 585M tonnes of coal. Kiwira coal mine, another mine rich in coal deposits, has enhanced it power generation from the current 6MW to 200MW following the signing of an agreement with the government.

The decision to look for an investor for the Mchuchuma mine seems to have settled the debate on whether power from the mine or linking up with the Southern African Power Pool (SAPP) should take precedence. The SAPP project, which has been on the drawing board for some time, has been the subject of intense speculation, with government officials complaining about delays in getting it implemented.

Powergen plans £1000M 'super' coal-fired station (UK)

Powergen, the energy supplier owned by E.ON of Germany, unveiled plans yesterday to invest £1000M in the UK's first "super" coal-fired power station to try to curb carbon emissions.

The company expects to apply for formal consent next month to build two new 800MW units at its Kingsnorth station in Kent using "super-critical" technology. They would replace the station's four existing units from 2015, enabling Kingsnorth to operate at much higher levels of efficiency while producing fewer carbon emissions.

Developing clean coal fuelled multi-MW solid oxide fuel cell system (USA)

FuelCell Energy, Inc., announced it has finalised terms with the US Department of Energy (DOE) for a US$36.2M Phase I award to develop a coal-based, multi-megawatt solid oxide fuel cell-based hybrid system. This award provides funding for the first stage of the 10-year, three-phased Fuel Cell Coal-Based Systems project, part of the DOE Solid State Energy Conversion Alliance (SECA). Total project funding for this and the other two planned phases is anticipated to be approximately US$180M.

The programme's overall objective is to develop solid oxide fuel cell (SOFC) technology, fueled by coal synthesis gas (coal gas) that will be used in highly-efficient central generation power plant facilities. The advanced fuel cell-hybrid system will have an overall efficiency of at least 50% in converting energy contained in coal to grid electrical power. In contrast, today's average US coal-based power plant has an electrical efficiency of approximately 35%.

In addition, the envisioned SOFC-hybrid system is expected to capture 90% or more of the system's CO_2 emissions for environmentally safe disposal while being cost-competitive with other base load power generating technologies.

US energy secretary announced funding for coal research (USA)

US Energy Secretary Samuel Bodman announced US$450M in grants during the next decade to further research into technology that would lessen the environmental impacts of coal use. DOE projects that coal sequestration could play a major role in meeting the Bush administration's goal of reducing the intensity of greenhouse gas emissions by 18% by 2012.

AEP begins permitting for clean-coal power plants (USA)

American Electric Power (AEP) has applied for environmental permits from Ohio and West Virginia to build clean-coal integrated gasification combined cycle power plants in both states.

Environmental protection agencies in each state will test the effects of emissions in the areas before approving construction. AEP cannot confirm how long the process will take.

The clean-coal power plants will convert coal into synthesised gas that eliminates most of the sulphur dioxide, nitrogen oxides, mercury and other emissions that come from burning coal. The synthesised gas fuels a combustion turbine generator, while the exhaust gas is used to heat steam that drives a steam turbine generator.

TECHNOLOGY & OTHER NEWS

Solid Energy to investigate South Island CO_2 storage potential

Solid Energy is to survey potential land based CO_2 storage sites in Otago and Southland, a project that is part of a 20-year, $100M investment the company is making in clean coal technology. The first stage of the survey, to be carried out over the next six months, will involve detailed geological and data analysis. If and when potential sites are identified, the company expects to move to a detailed drilling programme to investigate potential structures. The initial project will be undertaken using expertise developed through the Australian-based Cooperative Research Centre for Greenhouse Gas Technologies (CO_2CRC), in which Solid Energy is a participant. Future research will involve New Zealand scientists.

The company said that internationally the coal industry is investing significantly in developing and introducing clean coal technologies that will improve the efficiency of burning coal and reduce emissions from coal fired power stations and industry. Solid Energy is leading the way in developing these technologies to support New Zealand's sustainable energy future in a world facing more scarce and expensive energy, while simultaneously seeking to reduce CO_2

emissions. "Solid Energy probably has the largest single New Zealand commitment to these solutions as part of our $100M, 20-year technology research and development programme. This includes a leading role in developing carbon capture and storage (sequestration), seen internationally as a key option, for New Zealand conditions."

Solid Energy is a founding shareholder, with several Australian coal, oil and gas majors in a CO_2CRC-related company formed to operate Australasia's first project to trial CO_2 storage technology in the onshore Otway Basin of western Victoria. The trial is due to start before the end of 2006 and will involve about 40 Australian and overseas researchers.

One of the major Australian research initiatives is the coal industry's COAL21 research fund of A$300M over five years, based on an industry levy of up to A$0.20/tonne of black coal per annum. By comparison, Solid Energy's commitment of $5M per annum over 20 years represents NZ$1.00/tonne, five times more than the Australian fund.

Coal facts from WCI

The World Coal Institute has released the 2006 version of its annual 'Coal Facts' fact card. Featuring key data on the global coal industry (largely sourced from the International Energy Agency), the card provides an overview of coal market developments in 2005 (available on www.worldcoal.org).

Coal production increased by over 7% in 2005, to 4973M tonnes – with China accounting for 2226M tonnes of this total. Global coal consumption increased from 4646M tonnes in 2004 to 4990M tonnes in 2005.

2005 Top Ten Hard Coal Producing Nations (in million tonnes)

PR China	-	2226
USA	-	951
India	-	398
Australia	-	301
South Africa	-	240
Russia	-	222
Indonesia	-	140
Poland	-	98
Kazakhstan	-	79
Colombia	-	61

Reducing CO_2 emissions

A new report from accountancy firm Pricewaterhouse Coopers (PwC) has revealed that carbon capture and storage will be vital to future reductions in greenhouse gas emissions, given the projected rapid growth in emissions from developing countries.

The World in 2050: Implications of Global Growth for Carbon Emissions and Climate Change Policy was released by PwC in September. It details how China is set to overtake the US as the leading carbon emitter by 2010, while total E7 (China, India, Brazil, Russia, Mexico, Indonesia and Turkey) emissions would be more than double total G7 emissions by 2050.

The EU's share of global emissions is set to decline from around 15% now to just under 9% by 2050. The report analyses the effects of world GDP growth on global energy consumption and carbon emissions. It then reviews technological and policy strategies for mitigating global carbon emissions without requiring a serious sacrifice of economic growth.

Coal: Liquid fuels

A new report is released by the World Coal Institute this month - "Coal: Liquid Fuels". The report looks in detail at the current energy situation and reviews energy security concerns that are driving the renewed interest in coal to liquids technology.

Deriving liquid fuels from coal can offer a huge energy security benefit, reducing exposure to oil price volatility and providing ultra-clean fuels for transport, domestic use and power generation. Coal: Liquid Fuels considers the benefits and costs of the technology and details new developments around the world. It goes on to look at the incentives that may be initially required to enable the energy security benefits of coal to liquids technologies to be realised and includes technical descriptions of the various processes.

The environmental impacts of this technology are also considered. While the use of the product compares favourably to conventional oil products –being sulphur-free, low in particulates, with low levels of oxides of nitrogen - the emissions of CO_2 from the manufacture of these fuels must be mitigated. Carbon capture and storage offers a viable route to

reducing emissions, and co-processing with biomass can reduce overall emissions yet further. Co-storage of sulphur and carbon can reduce costs significantly.

Underground coal gasification – a revival

Underground coal gasification (UCG) is not a new concept or a new technology but there is growing interest and activity in the field, prompted by increasing concerns over security of energy supplies and the challenge of CO_2 emissions. UCG is a method of converting un-worked coal into a combustible gas, which can be used for industrial heating, power generation or the manufacture of H_2, synthetic natural gas or diesel fuel.

There have been a number of recent developments that have helped to drive interest in UCG:

- Security of supply and cost advantages of coal. Coal is in plentiful supply: the European reserve alone is 130 billion tonnes; the Russian Federation is 157 billion tonnes; while the US reserve is 246 billion tonnes.
- Cost – previous cost estimates of around £2.5 per gigajoule (GJ) for UCG clean gas is substantially below the current price of natural gas, at £6/GJ.
- The rapid disappearance of cheap natural gas is also putting UCG in a prime position as a conversion technology, taking advantage of recent advances in drilling, completion and exploration technology.
- New oil and gas technology offers access to much deeper coal seams, where environmental challenges are easier to overcome.
- UCG offers improved safety for the extraction industry.

UCG in combination with CO_2 capture and storage (CCS) is recognised as a potential route to carbon abatement from coal. A number of UCG processes are oxygen-fuelled, which means only CO_2, water and SO_x/NO_x (no nitrogen gas) are produced after combustion, thereby making CO_2 separation simpler and cheaper. In addition, the production gases are also open to pre-combustion capture and can benefit from the high partial pressures of the CO_2 in the product gas.

A key area of future research is the study of UCG with local CCS. UCG creates voids in the coal and a highly stressed area above it. Under the right conditions, these could be suitable for permanent CO_2 storage. Possible storage receptors for CO_2 include the deeper coal seams in the vicinity of the UCG process and the use of the abandoned cavity and surrounding stressed area. A research project to investigate this option, involving mining centres throughout Europe is currently being promoted.

DOE project injects 700 tonnes of CO_2 into Texas sandstone formation

When scientists recently pumped 700 tonnes of CO_2 a mile underground as a follow-up to a 2004 effort, they initiated a series of tests to determine the feasibility of storing the CO_2 in brine formations, a major step forward in the US DOE's carbon sequestration programme.

The Frio Brine project, managed by DOE's National Energy Technology Laboratory, is designed to determine how the CO_2 moves through brine-filled highly porous sandstone representative of formations found worldwide. By closely monitoring the CO_2 flow with technologically advanced instruments over the next year, the researchers will add to their knowledge of whether these formations can effectively store CO_2 over long periods of time.

DOE created a network of regional government/industry partnerships to help determine the best approaches for capturing and permanently storing gases in different areas of the country.

Innovative oxygen separation membrane prototype

Gasification systems offer coal-fired power plant operators a way to utilise coal more efficiently and cost effectively and in a more environmentally responsible manner. Yet many improvements still are needed to overcome remaining barriers to industry acceptance of full gasification systems, such as gas separation processes, components, and systems. A key requirement for tomorrow's energy technologies is a continuous supply of nearly pure O_2 in industrial quantities.

The new technology, known as Ion Transport Membrane (ITM) Oxygen, is based on a novel class of membranes composed of perovskite ceramic oxides. The electrochemical properties of these membranes make it possible to selectively separate oxygen ions from a stream of air at high temperature and pressure.

Compared to conventional air-injected combustion boilers, O_2-enriched coal combustion and gasification processes are capable of achieving higher efficiencies with near-zero emissions through more complete fuel utilisation. As the nation moves toward a H_2 economy in which H_2 becomes the preferred energy carrier, improved gas separation technologies will be needed to cost effectively separate H_2 from gaseous fuels such as synthesis gas (syngas).

Carbon offset opportunity programme

As the debate on global warming intensifies in the United States and abroad, new greenhouse gas reduction technologies and offset mechanisms can be facilitated by industry partnerships. The US DOE's National Energy Technology Laboratory (NETL) has developed the Carbon Offset Opportunity Program (CO-OP), an innovative online tool to assist utilities, coal companies, manufacturers, and other energy users to find greenhouse gas reduction opportunities through carbon sequestration, energy efficiency, and renewable energy use.

CO-OP provides a searchable database for high-tech matchmaking, and links potential project developers and investors, as well as educational resources to help those new to greenhouse gas reduction methods. It was developed in consultation with a group of West Virginia stakeholders close to NETL's Morgantown campus. Stakeholders include Appalachian Power, CONSOL Energy, the West Virginia Coal Association, and the West Virginia Department of Environmental Protection, among others.

High-fidelity process co-simulation of advanced power generation systems

The R&D 100 award-winning Advanced Process Engineering Co-Simulator (APECS), developed at NETL, enables design engineers to better understand and optimise power plant performance with respect to coupled fluid flow, heat and mass transfer, and chemical reactions.

APECS is a suite of software tools providing a powerful co-simulation capability by facilitating, for the first time, the efficient and systematic integration of process simulation with computational fluid dynamics (CFD) models of key equipment items, such as combustors, gasifiers, syngas coolers, steam and gas turbines, heat recovery steam generators, and fuel cells.

By coupling process/CFD cosimulations with advanced visualisation and high-performance computing, APECS also offers opportunities for using virtual plant simulation to reduce the time, cost, and technical risk of developing high-efficiency, zero-emissions power plants such as the DOE's FutureGen plant.

Cost and performance of activated carbon injection for mercury control

The clock is ticking for U.S. coal-fired power plants as they prepare to comply with final regulations for controlling mercury emissions, issued May 18, 2005, by the U.S. Environmental Protection Agency. The Clean Air Mercury Rule requires coal-fired power plants to reduce their total mercury emissions from current levels of 48 tonnes per year to 15 t/yr by 2018 - a reduction of almost 70%.

Because coal-fired power plants burn a broad range of coals and employ a variety of air pollution control devices, one size does not fit all when considering technologies for controlling mercury. Consequently, as they develop their individual mercury control plans, coal-fired power plant owners must closely evaluate the results of ongoing tests of several promising control technologies.

One such technology is activated carbon injection (ACI), in which the powdered activated carbon (PAC) is injected into the combustion flue gas upstream of a particulate control device - either an electrostatic precipitator or fabric filter. The PAC adsorbs the mercury and is subsequently captured, along with the fly ash, by the particulate control device. Assessing the preliminary performance and cost of ACI technologies from various field tests provides valuable input to guide research efforts and utility compliance planning.

EVENTS

13-14 Dec 2006, 2006 Coal trading conference, New York City, NY, USA, Teresa Coffer, 2890 E. Northern Avenue, Suite B4, Phoenix, AZ 85028, USA, Tel: +1 602 485 4737, Fax: +1 602 485 4847, Email: info@americancoalcouncil.org, Internet: www.americancoalcouncil.org/events/event120606.htm

15-17 May 2007, 3rd international conference on clean coal technologies for our future, Cagliari, Sardinia, Italy, Consulcongress Srl, Via San Benedetto, 88-09129 Cagliari, Italy, Tel: +39 070 499242, Fax: +39 070 485402, Email: info@cct2007.it , Internet: www.cct2007.it,

28-31 Aug 2007, International conference on coal science and technology: ICCS&T, Nottingham, UK, Prof. Colin E. Snape, Nottingham Fuel & Energy Centre, University of Nottingham, University Park, Nottingham NG7 2RD, UK, Tel: +44 115 951 4166, Fax: +44 115 951 4115, Email: Colin.snape@nottingham.ac.uk

10-14 September 2007, Call for papers – 24th Annual International Pittsburgh Coal Conference will be held in Johannesburg, South Africa. For a paper to qualify for acceptance, please submit a one-page abstract before 1st March 2007 to pitt2007@sasol.com or Coal processing abstracts to www.sacoalprep.co.za

9-15 Nov 2007, World energy congress, Rome, Italy, , Mike Treacher, PennWell UK Office, PennWell House, Horseshoe Hill, Upshire Essex EN9 3SR, UK, Tel: +44 1992 656 636, Fax: +44 1992 656 700, Email: miket@pennwell.com , Internet: www.rome2007.it

16-20 Nov 2008, 9th international conference on greenhouse gas control technologies, Washington, DC, USA, John Gale, IEA Greenhouse Gas R&D Programme, Orchard Business Centre, Stoke Orchard, CheltenhamGL52 7RZ, UK, Tel: +44 1242 680753, Fax: +44 1242 680758, Email: johng@ieaghg.org, Internet: mit.edu/ghgt9

FEEDBACK

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