



**Trade &
Investment**
Resources & Energy

Report to NSW Parliament

**NSW
Clean Coal Fund**

**Income and Expenditure
&
Evaluation of Projects**

2010/2011

NSW Clean Coal Fund

Income and Expenditure, and Evaluation of Projects Report 2010/2011

Author: Coal Innovation NSW Secretariat, Sydney, NSW

© State of New South Wales through Department of Trade and Investment, Regional Infrastructure and Services (NSW Trade & Investment) 2014

This publication is copyright. You may download, display, print and reproduce this material in an unaltered form only (retaining this notice) for your personal use or for non-commercial use within your organisation. To copy, adapt, publish, distribute or commercialise any of this publication you will need to seek permission from NSW Trade & Investment.

For updates to this publication, check www.trade.nsw.gov.au/publications

Published by NSW Trade & Investment

First published August 2014

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (November 2011). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of NSW Trade & Investment, or the user's independent advisor.

TRIM reference:MOC11/4734

Contents page

A.	Background	4
B.	Payments Received	4
C.	Expenditure	
	1. NSW Clean Coal Council & Technical Working Group	5
	2. NSW Clean Coal Council Secretariat – Salary costs	5
	3. Delta Carbon Capture and Storage Demonstration Project	5
	4. Research Projects	6
	5. State Wide Assessment of CO2 Storage Capacity.	6
	6. Membership of CO2CRC	6
D.	Evaluation	
	7. Evaluation of the effectiveness of each of the projects	7
E.	Conclusion	16

NSW Clean Coal Fund

Outcomes Achieved to 30 June 2011

A. BACKGROUND

Part 3 of the *Clean Coal Administration Act 2008* (the Act) established the Clean Coal Council (Council). Specifically, Section 11 of the Act, sets out:

- (1) *The functions of the Council are as follows:*
 - (a) *to give advice and make recommendations to the Minister concerning the funding from the Fund of projects and other activities for the purposes of the Fund, including advice about priorities for funding and recommendations concerning applications for funding,*
 - (b) *to advise the Minister on policies to encourage the development and implementation of clean coal technologies,*
 - (c) *to make recommendations to the Minister concerning opportunities for involvement by private and public sector entities in interstate, national and international research projects involving clean coal technologies,*
 - (d) *to advise the Minister on such other matters concerning clean coal technologies as the Minister may refer to the Council,*
 - (e) *such other functions with respect to clean coal technologies as the Minister may from time to time direct.*
- (2) *The Council may give its advice and make its recommendations either at the request of the Minister or without any such request.*
- (3) *The Council has such other functions as are conferred or imposed on it by or under this or any other Act.*

Members of the Council are appointed according to the Act; comprising five persons employed by Government Agencies, five persons jointly nominated by Australian Coal Association (ACA) and NSW Minerals Council, and three Minister's nominations. Members were appointed for a term of two years.

A Technical Working Group (TWG) supports the workings of the Clean Coal Council, providing guidance and advice on technical matters. The TWG is comprised of six members: five from industry and one member from Government. Members were nominated by Council in accordance with S.13 of the Act, Committees of Council.

Further, Part 3 of the Act established the Clean Coal Fund as such:

The Purposes of the Clean Coal Fund, Section 5 of the Act, are as follows:

- (a) *to provide funding for research into, and development of, clean coal technologies,*
- (b) *to provide funding to demonstrate clean coal technologies,*
- (c) *to provide funding to increase public awareness and acceptance of the importance of reducing greenhouse gas emissions through the use of clean coal technologies, and*
- (d) *to provide funding for the commercialisation of clean coal technologies.*

Section 7 of the Act, Payments out of the Fund, includes:

- (1) *There is payable from the Fund:*
 - (a) *payments approved by the Minister for the purposes of the Fund,*
 - (b) *administrative expenses incurred in relation to the Fund or the Council, and*
 - (c) *payments directed or authorised to be paid from the Fund by or under this or any other Act or law.*
- (2) *Any money paid into the Fund on the condition that is to be used only for a specified purpose, including any proceeds of the investment of that money in the Fund, is only payable from the Fund for the specified purpose and a proportionate share of the administrative expenses payable from the Fund.*
- (3) *The Minister is to produce an Annual Report detailing fund allocations and the projects and other activities that received funding under this Act during the year.*
- (4) *The Annual Report is to include an evaluation of the effectiveness of each of the projects and other activities that received funding under this Act.*
- (5) *The Annual Report is to be tabled in each House of Parliament within 6 months after the end of the financial year to which it relates.*
- (6) *The Minister is to publish each Annual Report, so as to promote clean coal technologies to the NSW public.*

The purpose of this report is to fulfil the requirements of the Act's Sections 7(3) to 7(6) inclusive. That is to produce an Annual Report detailing Clean Coal Fund Allocations and to provide an evaluation of the effectiveness of each of the projects.

Note: The Clean Coal Administration Amendment Act 2011 (the Amendment Act) was assented to on 22 August 2011. The Amendment Act changed the name of the Fund to the 'Coal Innovation NSW Fund' and the Council to 'Coal Innovation NSW'. As the Amendment Act had not commenced as at 30 June 2011 (the date of this report), the names and terms within the Act prior to amendment have been used.

B. PAYMENTS RECEIVED

Two payments were received from the NSW Climate Change Fund (via the Office of Environment & Heritage) to the NSW Clean Coal Fund in the financial year ending 30 June 2011;

Quarter payment	Amount
September 2010 (Q1)	\$ 6.25 ml
June 2011 (Q2, Q3 & Q4)	\$18.75 m
Total	\$ 25.0 million.

C. EXPENDITURE

The NSW Clean Coal Fund has dispersed funds received from the Climate Change Fund across the key areas, as set out in the details that follow.

1. NSW Clean Coal Council & Technical Working Group costs.

For the financial year ending 30 June 2011 the following funds have been expended in relation to the costs of the Clean Coal Council. (It is noted that the Technical Working Group of the Clean Coal Council did not meet during this period):

Description	\$
Total costs of the Clean Coal Council.	15,824.94

The Clean Coal Council met on the following dates during the 2010/11 financial year and discussed the following matters:

Date of meeting	Key issues of the meeting
21 Jul 2010	Update on projects and national initiatives
7 Sep 2010	Variations to 2 projects designs and milestones and recommendation to Minister
2 Dec 2010	Greenhouse Gas Storage Legislation

2. NSW Clean Coal Council Secretariat – Salary costs.

For the financial year ending 30 June 2011 the following funds have been expended against salaries and on costs:

Description	\$
Total salaries & on costs	522,161.46

3. Delta Carbon Capture and Storage Demonstration Project.

For the financial year ending 30 June 2011 the following funds have been expended in relation to the Delta Carbon Capture and Storage (CCS) project:

Description	Value \$
Delta CCS project milestone 2: <i>Appointment of Legal Services.</i>	112,092.35
Delta CCS project milestone 3: <i>Legal Plan & Road Transport & CO₂ Sales Studies Complete.</i>	109,314.87
Delta CCS project milestone 4: <i>Preliminary Risk Management Plan & Preliminary Engineering Feasibility Study Complete.</i>	69,099.63
Total	290,506.85

4. Research Projects.

For the financial year ending 30 June 2011 the following funds have been expended in relation to the Research & Development projects:

Applicant	Brief project description	Milestone Payments
UCC Energy P/L	Ultra Clean Coal Burning Efficiency	38,173.67
Centennial Coal (Mandalong)	Fugitive Emissions (ventilation)	1,013,046.00
CSIRO	Capture Testing Solvents	215,286.00
CSIRO	Fugitive Emissions (open cut)	115,000.00
Uni of Newcastle	Chemical Looping – oxyfuel	155,712.00
Uni of Newcastle	Social Research/Public Awareness	165,486.00
CSIRO	Novel Capture & Energy Efficiency	12,629.00
Uni of Newcastle	Direct Carbon Fuel Cell	42,122.00
Sub total		1,757,454.67
Advertising		2,279.57
Life Cycle Assessment methodology		14,800.00
Miscellaneous costs		3,693.43
Total		1,778,227.67

5. State Wide Assessment of CO2 Storage Capacity.

For the financial year ending 30 June 2011 the following funds have been expended and accrued in relation to the NSW State Wide Assessment of CO2 Storage Capacity:

Description	\$
Accrual - Drilling Program	11,758.05
Combined costs of Drilling Program expenditure	2,971,104.18
Total State wide storage assessment program	2,982,862.23

6. Membership of CO2CRC

For the financial year ending 30 June 2011 the following funds have been expended on the CO2CRC membership:

Description	\$
Annual membership fee of CO2CRC	250,000.00

D. EVALUATION

7. Evaluation of the effectiveness of each of the projects & other activities that received funding under the Act.

7.1 Clean Coal Council

Council met three (3) times in this financial year. The terms of the majority of Council members expired on the 22 September 2010 at the conclusion of a two year period. Council members did meet on 2 December 2010 as a group to provide follow-up industry and expert / industry advice on draft legislation that was being prepared for Parliament, concerning greenhouse gas storage.

Evaluation:

Attendance at the Council meeting was high with a quorum (majority of members required) achieved at all meetings. The three meetings during the financial year achieved attendance rates of 11, 10 and 10 respectively out of the possible 14 members.

Council fulfilled its role with the provision of advice to the Minister concerning funded projects and aspects of national and international technology updates.

Of the \$15,824.94 expenditure, \$13,500.00 was remunerated to the Chair as the approved annual sitting fee.

7.2 NSW Clean Coal Council Secretariat – Salary costs.

The Clean Coal Council Secretariat employs four staff:

- Director,
- 2 Senior Project Officers (Scientist and Economist), and
- Project Officer.

Evaluation:

Employment at the Secretariat has been stable since the creation of the Unit within the Mineral Resources Branch of the Department. This has allowed the Unit to maximise its efforts in utilising the skills of the staff. Significant tasks for the financial year included the negotiations of Funding Agreements and the monitoring of milestones and ongoing review of reports as outputs within those agreements for the Research projects.

7.3 Delta Carbon Capture and Storage Demonstration Project.

In August 2009, the then Minister, approved \$9.43m from the NSW Clean Coal Fund for Stage 1 of the Delta Carbon Capture and Storage (CCS) project, being the 'Development and Approvals' phase.

The total for Stage 1 of the project is \$28.3m. Two thirds of the funding is being provided from the Commonwealth Department of Resources, Energy and Tourism,

and ACA Low Emissions Technologies Limited (ACALET) in equal shares, pending conditions of the Funding Agreement being met.

Stage 1 of the Delta CCS project is essentially an approvals and planning stage, the development of a storage site for CO₂ and the Front End Engineering and Design (FEED) stage. Stage 1 will Pioneer in NSW:

- community engagement on a CCS project
- gaining exploration permits for CO₂ storage
- establishment of storage leases
- planning and environmental approvals for CCS

Stage 2 will demonstrate the integrated process:

- validate Post Combustion Capture Technology on NSW coals
- verify geological storage techniques

This will provide a road map that is directly applicable to next generation and scale of plant

NSW has committed \$40 million to stage 2 of the project, Construction and Operation, along with the Commonwealth and ACALET. This is within the Clean Coal Fund budget.

Evaluation:

Delta has met the required milestones 1 to 6 within the Funding Agreement. The project is under budget, however the Funding Partner recognise that this under spending will be corrected in later stages as the program further develops.

The Project is still in the formative stages of planning and development and is programmed to accelerate over the next financial years.

7.4 Research Projects

The process has been that a “Call for Expressions of Interest under the NSW Clean Coal Fund” closed on 4 December 2009, 29 applications were received and assessed. In May 2010, the then Minister approved 10 successful projects as follows:

Applicant	Brief project description	Funding, up to (\$)	Duration
UCC Energy P/L	UCC Burning Efficiency	2,581,000	4 yrs
Centennial Coal (Mandalong) P/L	Fugitive Emissions (ventilation)	2,200,000	2 yrs
CSIRO	Capture Testing Solvents	1,300,000	3 yrs
CSIRO	Fugitive Emissions (open cut)	1,000,000	2 yrs
Uni of Newcastle	Chemical Looping – oxyfuel	886,618	3 yrs
Uni of Newcastle	Social Research/ Public Awareness	618,930	2 yrs
CSIRO	Novel Capture & Energy Efficiency	613,711	1.5 yrs
Uni of Newcastle	Direct Carbon Fuel Cell	608,719	5.5 yrs
# Uni of Newcastle & GreenMag	Mineral Carbonation.	3,040,000	3.5 yrs
## ourSUN P/L	Combined Brayton Rankine Cycle.	159,200	7 mths.
Total		\$ 13,008,178	

University of Newcastle & GreenMag Group – are yet to sign their funding agreement as they are seeking funding support from industry. The Commonwealth Government has confirmed matching funding support for this project.

##ourSUN P/L withdrew their application on 1 December 2010.

Funding Agreements are now in place for 8 of the above projects for “up to” the approved funding. Funding Agreements were signed in late 2010 and early 2011. Projects are still in their early stages of progress.

7.4.1 Project: UCC Fired Diesel Engines in the generation of electricity

Grantee: UCC Energy Pty. Ltd

UCC Energy Pty Ltd has received initial grant funding for a Life Cycle Assessment (LCA) of their project. The project itself is to further develop their process of producing Ultra Clean Coal (UCC) and assess its use as coal-water fuel for firing in diesel engines to generate electricity. As diesel engines have higher thermal efficiencies than most power plant combustion engines, funding will assess whether UCC can efficiently and effectively operate in diesel engines large enough to generate electricity in a redistributed energy network.

The UCC process already removes most of the coal’s impurities and ash through a chemical cleaning process. The end product is micronised refined coal that can be mixed with water and additives to form a slurry fuel for use in diesel engines. Further testing however needs to establish if the long term use of this fuel is viable and can operate in diesel engines.

This project has the potential to fuel small power stations (50-250 MW) based on diesel engines which could be strategically located within the grid. The advantages of this distributed power generation include reduced transmission line losses, fast start capability, and the potential to provide a solid base to support intermittent renewable power sources like wind and solar. This project could provide an alternative pathway to low emissions power based on coal.

Evaluation:

Funding for this project is in two stages with a decision gate at the completion of Stage 1 prior to the approval of Stage 2. Stage 1 was to undertake a Life Cycle Assessment (LCA) on the production of UCC and its proposed use in diesel engines against a baseline of current NSW electricity grid including transmission.

UCC Energy Pty Ltd commissioned Worley Parsons (WP) to prepare an LCA. The LCA prepared, examined and analysed the combustion efficiency of UCC fuel and its greenhouse gas intensity. UCC has satisfied Stage 1 of the project.

Further consideration will be given to approval of Stage 2, a demonstration of UCC in a diesel engine (at demonstration scale) with post combustion capture following a review of the greenhouse gas assessment by Coal Innovation NSW, its recommendations to the Minister and Ministerial approval if all is satisfactory.

7.4.2 Project: Fugitive emissions abatement from ventilation air

Grantee: Centennial (Coal) Mandalong Pty Ltd

Centennial Mandalong P/L has received initial grant funding to trial an exciting new technology termed a VAM-RAB (Ventilation Air Methane Regenerative After Burner) that has potential to mitigate fugitive methane emissions escaping from underground coal mines. These emissions are notoriously difficult to abate because this naturally-

occurring gas becomes diluted by the large volumes of ventilation air that is flushed through the mine during standard mining operations. As methane typically constitutes less than 1% of the ventilation air expelled from the mine, the gas concentration is too low to burn-off (often referred to as flaring) or process to generate electricity.

The VAM-RAB system overcomes this problem by directing the ventilation air through what is essentially a large industrial oven where it is heated up to approximately 1000° C. Using this oxidation technique almost all of the methane (> 99%) is converted to carbon dioxide and water. A key feature of the technology is the ability to be self-sustaining without the need for additional energy to maintain the temperature in the combustion chamber. This is accomplished by preventing the heat from migrating out of the chamber via a periodic change in direction of the flow of the ventilation air through the system; hence the title 'Regenerative After Burner'.

Evaluation:

The contract for the Centennial Mandalong's VAM-RAB Demonstration Project was exchanged on 4 March 2011. The project has progressed well towards meeting its set milestones and budget. These milestones include completing a geotechnical investigation and environmental assessment and commencing detailed designs, risk assessments, procurements and off-site fabrication and manufacture of the VAMRAB component.

7.4.3 Project: Further development of post combustion capture

Grantee: CSIRO Energy Technology

CSIRO Energy Technology has received initial grant funding to support a research and development program dedicated to the chemical capture of CO₂ emitted in the flue gas from NSW coal-fired power stations. The program is specifically tailored to focus on NSW black coals and the power stations which they fuel and aims to optimise and improve the aqueous ammonia absorbent process under real working conditions (i.e. operating on an existing power station). The pilot-scale CO₂ capture plant used in the research is currently located at Delta Electricity's Munmorah Power Station on the Central Coast, north of Sydney.

This innovative project continues to be the only current research and development pilot program on liquid-based absorbent PCC technologies suitable for NSW power stations. The results also have applicability across the Australian black coal electricity generation sector. The NSW Clean Coal funds will assist in upgrading the pilot plant and moving it from Munmorah to Delta Electricity's Vales Point Power Station so that this critical research program can continue.

Evaluation:

This project began in March 2011 following the execution of contract on 25 February 2011. In moving the pilot plant, CSIRO had a number of conceptual ideas to address within the current pilot plant arrangement. The first stage was to assess these conceptual ideas and to integrate them into the pilot plant design. CSIRO has commenced engineering design and documentation of the proposed changes to the pilot plant. Many engineering related aspects including the resourcing of staffing are underway. Due to a later start than anticipated, the complete engineering design, tendering and engagement of contractors are behind schedule.

7.4.4 Project: Reducing Fugitive Emissions -Enhanced Drainage techniques **Grantee: The CSIRO Centre for Environment, Social and Economic Research**

The CSIRO Centre for Environment, Social and Economic Research has received initial grant funding to undertake a 'world-first' trial to confirm whether the volume of methane gas drained from a NSW coal mine can be dramatically increased before open-cut mining commences. The 'enhanced drainage' technique embraces recent advances made overseas in effectively extracting methane from deep un-mineable coal seams by pumping inert gases such as nitrogen, carbon dioxide or flue gas into the seam. The inert gases act to flush out the methane from the coal seam where it is then drained using bore wells.

The novel NSW Clean Coal funded project is, in essence, a step towards creating a 'greenhouse gas-less mine'. The experiment involves injecting inert gases into a shallow coal seam in an attempt to flush out a much larger volume of methane than would otherwise be extracted by current 'primary drainage' techniques. The drained gas can be used for power generation rather than being uncontrollably released during the mining process into the atmosphere where it is a problematic greenhouse gas.

Evaluation:

This project began in March 2011 following the execution of contract on 25 February 2011. Due to a fire incident in January 2011 at the proposed Xstrata Blakefield site, the milestones for Q2, 2011 have not been met. The fire caused "in-kind" resources from the third party to be diverted to rectify the site. This diversion remained in place for a significant period of time and did not allow the researchers to access the site.

The project was put on hold, and will need to be restructured to account for the delays to the original timeline.

7.4.5 Project: A Novel Chemical Looping Based Air Separation Technology **Grantee: The University of Newcastle Priority Research Centre for Energy**

The University of Newcastle Priority Research Centre for Energy has received initial grant funding to undertake research into a novel way of producing pure oxygen for use in the efficient burning of coal to generate electricity. The technology relies on the principles of 'chemical looping' and uses the cyclic interaction of a metallic compound (called a metallic oxide carrier) with air as a means of separating out the oxygen. The proposed technology promises to be a cost effective means of mitigating one of the major barriers to the adoption of carbon capture technologies such as oxy-firing as conventional air separation is notoriously expensive. The specific power requirements of the Chemical Looping Air Separation system is about 26% of that of the most advanced cryogenic air separation unit. This equates to a corresponding oxygen production cost of 0.64 vs 2.4 cents/m³ and greenhouse gas emissions of 72 vs 270 gCO₂-e/m³ oxygen produced.

In addition to greatly reducing the greenhouse gas emissions from air separation processes, the Chemical Looping Air Separation technology could accelerate the commercial-scale deployment to low emissions electricity generation utilising cost effective highly-advanced coal technologies currently being developed such as Oxy-

Fuel Combustion. With support from the NSW Clean Coal Fund, a five-year program will be pursued to get this innovative air separation technology commercially ready.

Evaluation:

This project began in January 2011 following the execution of contract on 23 December 2010. The complexity and extensive scope of each activity will be largely met by staff resources. The finalisation of staffing recruitment has been fully met. Other milestone tasks 1 and 2 for Q2, 2011 are both related to the design and construction of the laboratory-scale dual fluidised bed reactor. Both milestone tasks have been successfully completed and the setup is being constructed ahead of the agreed timetable. We anticipate partial results within the next financial reporting year.

7.4.6 Project: Managing Project Risk: The Role of Public Awareness

Grantee: University of Newcastle

The University of Newcastle's Research Institute for Social Inclusion and Well-being has received initial grant funding to use an innovative approach to understand the network of relations between industry, society and government that impact on public acceptance of low emission coal technologies.

Using a contemporary methodology of the Actor-Network Theory (ANT) which can explain how technology and people interact over time, the research will identify and implement those contemporary public awareness methods, beyond traditional consultation and public relations, to increase the public awareness and positive social attitudes to support the adoption and applications of low emission coal technologies.

This project will undertake research in regional and metropolitan areas, and look at varying technological applications to implement solution focused mechanisms and strategies for government, society and industry to increase public awareness and acceptance.

Evaluation:

This project began in January 2011 following the execution of contract on 23 December 2010. The project has progressed well and met all milestones within specified timeframes. Key Research Personnel have been appointed. A rapid review of literature report has been developed and the design research methodology for the project has been completed. The project has commenced a systematic literature review, preliminary policy framework analysis and modelling network analysis. The project is developing along efficiently.

7.4.7 Project: Site Trials of Novel CO₂ Capture Technology

Grantee: CSIRO Coal Technology

CSIRO Coal Technology has received initial grant funding to investigate the ability of a novel, patented technology to physically separate out CO₂ emitted from NSW coal-fired power stations. The technology uses Honeycomb Monolithic Carbon Fibre Composite (HMCFC) adsorbents which are a type of nano-structured adsorbent material. The technology enables dry CO₂ capture at room temperature and atmospheric pressure and in dusty environments with low pressure drop, reducing the operational and maintenance cost of the post-combustion capture process. In

addition, the heat in the flue gas can be utilised in the process thereby further reducing the electricity requirements of capturing CO₂. Thus this technology promises to play a key role in the cost effective and environmentally responsible generation of electricity in the future.

Through the support provided by the NSW Clean Coal Fund, an adsorption test unit will be installed at Delta Electricity's Vales Point power stations on the Central Coast, north of Sydney. The effect of real flue gas on the operation and performance of the test unit will be tested and CO₂ capture process demonstrated. Information on the commercial application of the technology will also be generated from the field trial.

Evaluation:

This project was to begin in January 2011, however as the contract was executed on 25 February 2011 the proponent requested the project be rescheduled by 3 months to start on 1 April 2011 to ensure the milestone to complete power station site investigation and project plan could be achieved. This request was approved and the proponent met the milestone within this new period.

The project is progressing well and is awaiting relocation of the pilot plant from Munmorah to Vales Point as outlined in Project 7.4.3 above due to the proposed sharing of infrastructure.

**Project: Development and Optimisation of the Direct Carbon Fuel Cell
Grantee: University of Newcastle's Discipline of Chemistry**

The University of Newcastle's Discipline of Chemistry has received initial grant funding to research and develop a Direct Carbon Fuel Cell (DCFC). This technology is yet to be commercialised but is widely promoted as being the 'holy grail' of coal-fuelled electricity generation as it has the capacity to generate electricity with much higher thermal efficiencies (~70-80%) than engines and turbines (~35-55%). In addition, the fuel cell emissions are almost entirely pure CO₂ which is therefore ready for capture and storage without the need to firstly separate out other gases such as nitrogen which are present in the flue gases emitted from power plants.

In a DCFC, electricity is generated directly from coal through the chemical oxidation of coal which has been ground and purified of ash and other contaminants. This differs substantially to the way electricity is traditionally generated – coal is burnt to boil water to make steam to turn a turbine, to turn a generator, to produce electricity. In essence, a fuel cell can be compared to an electrochemical battery. They differ in that a battery stores electrical energy chemically whilst a fuel cell relies on the external supply of a fuel (in this case coal) which must be continually replenished.

Evaluation:

This project began in January 2011 following the execution of contract on 23 December 2010. Like many fuel cell types, DCFCs are susceptible to cell degradation from contaminants originating from the fuel source. An important aspect of the experimental work is to understand the different structural aspects of coal to understand its performance in the DCFC.

The laboratory testing program has commenced and experimental work has been undertaken. There has however been a delay of in appointing a post-doctoral

research fellow due to scarce pool of academics in this field. Appointment has been made at the end of June and proponent is examining options to make up time.

**7.4.8 Project: Permanent Large Scale CO₂ Storage by Mineral Carbonation
Grantee: GreenMag Group and the University of Newcastle**

The GreenMag Group and University of Newcastle Priority Research Centre for Energy will receive grant funding to develop and optimise a promising method of storing carbon dioxide gas emitted from NSW coal-fired power stations. The Mineral Carbonation process takes advantage of a natural process whereby CO₂ is captured in mineral deposits resulting in it being stored in rocks. A key advantage of this process is that the CO₂ is permanently stored in the rocks. It would only re-enter the atmosphere if the rocks were subjected to extremely high temperatures. Building products and the extraction of noble metals left over from the mineral carbonation process may also assist in offsetting the economic costs of sequestering CO₂.

This cutting edge project will be a 'world first' in the building and operation of a mineral carbonation pilot plant. The pilot work will be supported by laboratory research to optimise and demonstrate the technical and economic feasibility of two mineral carbonation processes to speed up the chemical reaction between concentrated CO₂, (that has been captured from power station flue gas, stripped and then pressurised) and finely ground rock (serpentinite mined in NSW). The underlying aim is to optimise the processes with a lower energy penalty.

Evaluation:

This project has received in-principle matching funding support from the Commonwealth Government and is now seeking matching funding from industry. This will make up a total of \$9 million for the project.

**7.4.9 Project: A Simple Heat Engine for Sustainable Coal Generation
Grantee: ourSUN Pty Ltd – application WITHDRAWN December 2010.**

Evaluation:

This application was withdrawn before the completion of the Funding Agreement negotiations. As such no monies were expended on the project. The withdrawal was on the initiative of the applicant who was unable to secure a NSW project partner.

7.5 State Wide Assessment of CO₂ Storage Capacity

Industry & Investment NSW has developed a Business Plan for the State Wide Assessment of CO₂ Storage Capacity, which is a three stage process. A budget is estimated at \$54.3 million.

Funding Agreements between DTIRIS, the Commonwealth Department of Resources, Energy and Tourism (DRET) and industry, ACA Low Emissions Technologies Limited (ACALET) are being finalised.

The drilling program is being developed in stages as follows:

- Stage 1A – Sydney Basin (4 wells)
- Stage 1B – Darling Basin (4 wells)

- Stage 2 – to be determined based on results from Stage 1 and further desktop analysis.

Evaluation:

DTIRIS engaged drilling contractors to commence gathering pre-competitive data to determine potential geological storage for CO₂ in NSW. Exploratory drilling and testing has taken place in 4 wells in the Sydney Basin. Drilling reports from 2 wells have provided prospective results requiring further analysis.

Full reports are required as part of the Funding Agreement Milestones and will be finalised prior to the next Report to Parliament.

The Funding Partners have acknowledged this start by NSW as NSW early contributions to the funding agreement.

7.6 Membership of CO2CRC

“The Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) is one of the world's leading collaborative research organisations focused on carbon dioxide capture and geological sequestration (geosequestration, carbon dioxide capture and storage, carbon capture and storage, or CCS). CO2CRC is a joint venture comprising participants from Australian and global industry, universities and other research bodies from Australia and New Zealand, and Australian Commonwealth, State and international government agencies. Its resources come from the Federal Government Cooperative Research Centres Program, other Federal and State Government programs, CO2CRC participants, and wider industry”.¹

Evaluation:

NSW has had a long standing commitment of membership to the CO2CRC with a fee structure of \$250,000 per year. A new Accession Deed was signed that admits the State of NSW represented by the then, Department of Industry and Investment NSW, to the Cooperative Research Centre for Greenhouse Gas Technologies.

Membership of this world leading research organisation has been and will be of further benefit to NSW as it commences and develops its carbon capture and storage research and demonstration programs. The Coal Innovation Secretariat Scientific Officer has attended several seminars and forums for scientists and exchanged valuable information on NSW programs.

¹ <http://www.co2crc.com.au/about/>

E. CONCLUSION

Expenditure for financial year 2010/11:

Total costs of the Clean Coal Council	15,824.94
Secretariat costs including salaries	522,161.46
Total CCS Delta Demonstration Project	290,506.85
Total Costs of R&D projects	1,778,227.67
Total State Wide Storage Assessment Project	2,982,862.23
Legislation work for Greenhouse Gas	88,397.88
CO2CRC membership	250,000.00
GRAND TOTAL	5,927,981.03

Financial Balance:

# Adjusted balance brought forward 2009/10:	\$19,638,251.15
## Internal adjustments & other revenue:	\$ 28,249.61
### Refund from "Meetings Manager":	\$ 21,942.15
Income (from Climate Change Fund):	<u>\$ 25,000,000.00</u>
Total Revenue:	\$ 44,688,442.91
Total Expenditure:	<u>\$ 5,927,981.03 -</u>
Balance:	\$ 38,760,461.88 = In credit

The previous financial year's balance (2009/10) was detailed as \$20,366,531.45 in credit. However, a journal for \$728,280.30 was processed in the following financial year, on 12.10.10 that adjusted the "balance brought forward" to the figure of \$19,638,251.15 in credit. This amount has been assigned to the State Wide Assessment of CO₂ Storage Capacity project in the 2009/10 accounts.

Includes an error in journal adjustment of \$26,278.43 (for motor vehicles - cars & trucks).

Last year's report noted that as at 3 August 2010, the Meetings Manager advised of a \$21,942 credit coming back to Industry & Investment NSW for the cost of the Low Emissions Technology Summit.

The overall forecasted expenditure budget for the 2011/12 financial year for the Coal Innovation NSW Fund is approximately **\$15.184 million**

Foot note:

Please note amendments to the Clean Coal Administration Act 2008, were assented to on 22 August 2011. The Act will now be called the **Coal Innovation Administration Act**, the Council will now be called **Coal Innovation NSW** and the Fund will now be known as **Coal Innovation NSW Fund**. Future reports will incorporate this change.

**Independent Audit Report
For the NSW Clean Coal Fund to the
NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS)**

Scope

We have audited the Statement of Income and Expenditure of the NSW Clean Coal Fund for the period 1 July 2010 to 30 June 2011. The Resources and Energy Division is responsible for the preparation and presentation of the information contained therein. We have conducted an independent audit of the Income and Expenditure Statement in order to express an opinion on it.

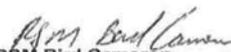
The Income and Expenditure Statement is for distribution to the NSW Department of Trade and Investment, Regional Infrastructure and Services for the purpose of fulfilling the reporting obligations in respect of funding received under the NSW Clean Coal Fund. We disclaim any assumption of responsibility for any reliance on this report, or on the Income and Expense Statement to which it relates to any other person other than the NSW Department of Trade and Investment, Regional Infrastructure and Services or for any purpose other than that for which it was prepared.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the Income and Expenditure Statement is free of material misstatement. Our procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the Income and Expenditure Statement. These procedures have been undertaken to form an opinion as to whether, in all material respects, the Income and Expenditure Statement is presented fairly in accordance with Accounting Standards.

The audit opinion expressed in this report has been formed on the above basis.

Statement

In our opinion, the Statement of Income and Expenditure for the period 1 July 2010 to 30 June 2011 that has been prepared on a cash basis is in agreement with the accounting records of the Resources and Energy Division.


RSM Bird Cameron
Chartered Accountants


Cameron Hume
Director

Dated at Sydney 9th December 2011

Liability limited by a
scheme approved under
Professional Standards
Legislation

Birdanco Nominees Pty Ltd
ABN 33 009 321 377
Practising as
RSM Bird Cameron
ABN 65 319 382 479

Major Offices in:
Perth, Sydney,
Melbourne, Adelaide
and Canberra

RSM Bird Cameron is an independent member firm of RSM International, an
affiliation of independent accounting and consulting firms. RSM International
is the name given to a network of independent accounting and consulting firms
each of which practises in its own right. RSM International does not exist in any
jurisdiction as a separate legal entity.

NSW CLEAN COAL FUND
STATEMENT OF INCOME AND EXPENDITURE
1 JULY 2010 to 30 JUNE 2011

Funds paid to the NSW Clean Coal Fund from the NSW Climate Change Fund (Office of Environment & Heritage)

Total Funds Received	\$ 25,000,000
Expenditure	
Total costs of the Clean Coal Council	\$ 15,825
Secretariat costs including salaries	\$ 522,161
Total CCS Delta Demonstration Project	\$ 290,507
Total costs of R&D projects	\$ 1,778,228
Total State Wide Storage Assessment Project	\$ 2,982,862
Legislation work for Greenhouse Gas	\$ 88,398
CO2CRC membership	\$ 250,000
Total Expenditure	\$ 5,927,981
Surplus Funds Carried Forward per 2009/10 Report to Parliament	20,366,531
Less transfer to Government Appropriation Fund	<u>(728,280)</u>
Adjusted Surplus Funds Carried Forward 2009/10	19,638,251
Plus internal adjustments & other revenue	28,250
Plus refund from Meetings Manager	21,942
Surplus Funds Carried Forward 2010/11	<u>38,760,462</u>