NSW GOVERNMENT | Department of Industry

Report to NSW Parliament

Coal Innovation NSW Fund

Income, Expenditure & Evaluation of Projects

2015-2016

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Income and Expenditure, and Evaluation of Projects Report 2015/2016

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A. BACKGROUND

The Coal Innovation NSW Fund (the Fund) has been established and is governed under the *Coal Innovation Administration Act 2008 (*the Act*).*

Part 2, section 5 of the *Act* establishes the Purpose of the Fund, as follows:

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

Part 2, section 7 of the *Act*, details Payments out of the Fund, to include:

(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 CINSW, 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 low emissions coal technologies to the NSW public.*

Part 3, section 10 of the *Act*, prescribes the Membership of CINSW, as follows:

(1) CINSW is to consist of the following members appointed by the Minister:
(a) *an independent person appointed by the Minister to be the Chairperson of CINSW,*
(b) *2 persons, each of whom is employed in or by a government agency,*
(c) *2 persons who are nominated jointly by the Australian Coal Association and the Minerals Council to represent the New South Wales black coal industry,*
(d) *such other persons (up to a maximum of 4) as the Minister may appoint from time to time, being persons whom the Minister considers have qualifications or experience relevant to the functions of CINSW.*

Part 3, section 11 of the *Act* establishes Coal Innovation NSW (CINSW) and prescribes its functions.

(1) The functions of CINSW 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 low emissions 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 low emissions coal technologies,

(d) to advise the Minister on such other matters concerning low emissions coal technologies as the Minister may refer to the CINSW,

(e) such other functions with respect to low emissions coal technologies as the Minister may from time to time direct.

(2) CINSW may give its advice and make its recommendations either at the request of the Minister or without any such request.

(3) CINSW has such other functions as are conferred or imposed on it by or under this or any other Act.

The membership of the Ministerial Advisory Council to Coal Innovation NSW (CINSW) expires 31 December 2017.

The purpose of this report is to fulfil the requirements of the Act's Part 2, sections 7(3) to 7(6) inclusive. That is, to produce an Annual Report detailing CINSW Fund allocations and to provide an evaluation of the effectiveness of each of the projects.

The Fund was established as a fund in the Special Deposits Account under section 4 of the Act. The Fund receives funds and expends monies in accordance with the Act. The Fund has prepared a special purpose financial report for the year ended 30 June 2016 containing: statement of net assets; statement of comprehensive income; and associated note disclosures.

The Treasury has requested that the Auditor-General audit the special purpose financial report under section 27B(3)(c) of the *Public Finance and Audit Act 1983;* the signed Financial Report is attached.

B. PAYMENTS RECEIVED

During the 2015/16 financial year the Fund received:

- Interest earnings of $1,658,036 was received direct into Coal Innovation NSW Fund bank account. The interest is calculated under the Treasury Banking System (TBS) on the daily balance in the bank account and paid twice yearly. Funds earning interest within TBS are paid at the Reserve Bank of Australia cash rate.
- Reversal of 2015 accruals related to ACALET contributions on the NSW CO_2 Storage Assessment Program Stage 1B. As the program is near completion, and no contribution from ACALET was received in the 2015-16 financial year, the reversal could not be netted off.

Table 1 below summarises the income calculated as follows:

Table 1: CINSW Fund Income

Description	Value $
Interest	1,658,036
Total	1,658,036
Other income	
Australian Coal Association Low Emission Technologies Ltd (reversal accruals)	(3,171)
Total income 2015/16	**1,654,865**

C. EXPENDITURE

Coal Innovation NSW has dispersed funds received across the key areas as set out as follows:

C1: Coal Innovation NSW (Ministerial Advisory Council) & Technical Working Group costs

For the financial year ending 30 June 2016 the following funds in Table 2 *have been expended in relation to the costs of Coal Innovation NSW meetings and sitting fees.*

Table 2: CINSW meetings and Technical Working Group costs

Description	Value $
Total cost of Technical Working Group (TWG)	**63,426**
Total cost of Coal Innovation NSW (Council).	**8,542**
Future of NSW Coal Fired Electricity Generation Industry Study (Steering Committee Chair) and miscellanies	**1,548**
Total	**73,516**

C2: Coal Innovation NSW Secretariat

For the financial year ending 30 June 2016 the following funds in Table 3 *have been expended against salaries and on costs:*

Table 3: CINSW Secretariat costs

Description	Value $
Secretariat costs including salaries and on costs, professional fees not listed elsewhere, travel, and office supplies, (Audit costs disclosed separately)	**803,842**

C3: Research & Development (R&D) projects funded under Expressions of Interest process.

For the financial year ending 30 June 2016 the following funds in Table 4 *have been expended in relation to the R&D Round 2009 projects:*

Table 4: Project expenditure from R&D Round 2009

Applicant	Project description	value $
UCC Energy P/L	Project cancelled at end of Stage 1	*closed*
Centennial Coal (Mandalong) P/L	Fugitive Emissions (ventilation)	*milestones deferred*
CSIRO (Feron)	Capture Testing Solvents	(811)
CSIRO (Connell)	Fugitive Emissions (open cut)	*closed*
Uni of Newcastle (Moghtaderi)	Chemical Looping – oxyfuel	*completed*
Uni of Newcastle (Webb)	Social Research/Public Awareness	6,594
CSIRO (Shu Su)	Novel Capture & Energy Efficiency	*completed*
Uni of Newcastle (Scott Donne)	Direct Carbon Fuel Cell	21,061
Uni of Newcastle (GreenMag)	Mineral Carbonation	712,500
Total		**739,343**

C4: NSW CO_2 Storage Assessment Program

For the financial year ending 30 June 2016 the following funds Table 5 *have been expended in relation to the NSW CO_2 Storage Assessment Program:*

Table 5: NSW CO2 Storage Assessment Program

Description	Value $
Total NSW CO_2 Storage Assessment program – Stage 1B	**25,093**
Financial adjustments from previous financial period	**(48,674)**
Total NSW CO_2 Storage Assessment program – Stage 2	**1,332**

Note: The CO_2 Storage Assessment Program is a jointly funded agreement. Currently the Darling Basin drilling program has a $20.2 million budget and has/will receive income from the funding partners along with CINSW Funds.

C5: Future of NSW Coal Fired Electricity Generation Industry Study

For the financial year ending 30 June 2016 the following funds Table 6 *have been expended in relation to the Future of NSW Coal Fired Electricity Generation Industry Study.*

Table 6: Consultancy expenditure into Future of NSW Coal Fired Electricity Generation Industry Study

Description	Value $
Consultancy (Ernst & Young) and other professional service	**104,812**

C6: Audit Fees

For the financial year ending 30 June 2016 the following funds Table 7 *have been expended in relation Audit Fees.*

Table 7: Audit Fees

Description	Value $
Audit Fees for FY 2015-2016	26,300
Audit NSW CO_2 Storage Assessment Program	9,500
Total	**35,800**

D. EVALUATION

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

D1 Coal Innovation NSW (CINSW)

The *Coal Innovation Administration Act 2008* (*Act*), (amendments assented 22 August 2011), requires the formation of Coal Innovation NSW (CINSW), a Ministerial Advisory Council. As prescribed in Part 3, section 10 of the Act, CINSW is to comprise an independent Chair, and up to eight members appointed by the Minister, consisting of two appointed members from government and two from industry to represent the NSW black coal industry, and up to four additional members appointed by the Minister.

As at 1 July 2015 the membership of CINSW comprised:

- Dr Neil Shepherd, Chair
- Prof. Mary O'Kane, NSW Chief Scientist & Engineer
- Mr Michael Buffier, Chairman NSW Minerals Council
- Mr David Moult, Chairman NSW Minerals Council and CEO Centennial Coal
- Prof. Michael Dureau, Deputy Chairman, Warren Centre for Advanced Engineering
- Prof. Jim Galvin, Mining Engineer Consultant and Academic
- Prof. Dianne Wiley, Program Manager (CO_2 Capture) CO2CRC and Professor UNSW, School of Engineering.

As Dr Shepherd was not seeking reappointment at the conclusion of his term on 31 December 2015, he submitted his resignation, effective 30 November 2015, to ensure a smooth transition. Prof Galvin was appointed as the new Chair prior to the commencement of Council's consideration of assessment of R&D Expressions of Interest at the December 2015 meeting.

With the two year term of CINSW membership expiring on 31 December 2015 for most members and resignation of the Chair, the Minister approved the appointment of the new Chair, renewal of existing memberships and filling of vacancies.

Four existing members, Prof O'Kane, Mr Buffier, Prof Dureau and Prof Wiley (now Prof. Sydney Uni), were reappointed to CINSW for another two-year term. Dr Chris Yeats (Executive Director, Geological Survey NSW), Dr Noel Simento (Manager Director, ANLEC R&D) and Mr Greg Everett (Director, Sunset Power International) were appointed as new members. Mr Moult was replaced by Mr John Richards (Manager Director, the Bloomfield Group) and Mr Greg Sullivan (Director Policy, NSW Minerals Council) was appointed as a 'Deputy' to Mr Buffier and Mr Richards upon nomination by the NSW Minerals Council.

CINSW held four meetings in the 2015/16 financial year:

- 14 July 2015 – the 12th meeting
- 15 December 2015 – the 13th meeting
- 16 March 2016– the 14th meeting
- 16 June 2016 – the 15th meeting

On CINSW expenditure in this financial year, the remuneration of the new Chair has not been accounted. Of the $8,542 expenditure, $8,334 was paid as remuneration fees for the previous Chair and the remaining expenditure of $208 was sitting fees for other Council members.

The Technical Working Group (TWG) was engage to provide technical expertise related to assessing applications to the $10 million CINSW Research, Development and Demonstration (RD&D) Projects Expressions of Interest (EOI) Round 2015 and paid $63,426. Of the five TWG members, four received a $15,000 fee, the remaining costs being travel and meeting costs.

The expenditure of $1,548 (at daily sitting rates) was remuneration paid to the Chair of the Steering Committee (a member of CINSW Council) for the *Future of NSW Coal Fired Electricity Generation Industry Study*.

Evaluation:

The 12th meeting of CINSW on 14 July 2015 opened with presentations from O'Connor Marsden & Associates as the external auditors that undertook an assessment of the CINSW Fund. Their findings were regarding the practice and procedures surrounding the previous grants program, which were found to be robust and overall satisfactory. All recommendations will be incorporated into future grants process. The meeting focused on finalising the assessment process of a future round of RD&D project grants with discussion on Technical Working Group (TWG) membership, Program Administration Guidelines and project timelines. From this meeting, the Council recommended to the Minister the commencement of a $10 million CINSW *RD&D Projects EOI Round 2015*.

The 13th meeting of CINSW held on 15 December 2015, focused on three items. Firstly, reporting on the assessment process of CINSW RD&D Projects EOI Round 2015, for which the Council was satisfied with the process conducted and initial banding results and shortlisted applications to be further assessed. The second item discussed was on the Technical and Economic Study – titled '*Study on the future of NSW coal electricity generation industry*' (the Study). Council endorsed the scope of the Study that was developed and refined at a NSW generators workshop including proposed deliverables and indicative timelines. The third item addressed was updating on Darling Basin drilling program and the development of a seismic survey.

At the 14th meeting of CINSW held on 16 March 2016, the Council accepted the assessment report of CINSW RD&D Projects EOI Round 2015 from the TWG and recommended the successful projects to the Minister for funding under this round. During this meeting, the Council also received a briefing on the tendering and tender evaluation process of the Study and accepted Ernst & Young (EY) as the preferred tender. The Council also received an update on the independent Ecological and Heritage Assessment related to the Darling Basin seismic survey.

The 15th meeting of CINSW held on 16 June 2016 focused on results and draft report provided by EY under Stage 1 of the Study. The Council determined that Stage 1 had satisfactorily achieved its aim and that EY could advance the Study to Stage 2. As a newly appointed member of the Council, Dr Simento gave a presentation on ANLEC R&D and its projects. Professor Scott Donne provided a presentation on his findings from the Direct Carbon Fuel Cell project, which was part of 2009 R&D Grants Program and reaching a final outcome.

D2 Coal Innovation NSW Secretariat – Salary costs.

Coal Innovation NSW Secretariat employs six staff:

- Program Director;
- 2 Senior Project Officers (Economist and Scientist);
- Project Officer (Finance);
- Geoscientist; and
- Graduate Officer.

Evaluation:

Employment at the Secretariat has continued to be stable, with a rotation of a new Graduate from the Department of Industry's Graduate program. This has allowed the Unit to maximise its efforts in utilising the staff's skills. Significant tasks for the financial year have centred on:

- managing existing projects, including working with researchers in the development of final R&D reports and enlisting independent peer reviewers;
- finalising program structure for future data acquisition program in the Darling Basin;
- release of an Expressions of Interest (EOI) Round 2015 calling for Research, Development and Demonstration (RD&D) projects and finalising assessments;
- release of a Request for Tender (RFT) for a study into the *Future of NSW Coal Fired Electricity Generation Industry* and finalising assessment;
- complete a Departmental Program Evaluation Review of the CINSW Fund, which found that the Fund provides significant value in positioning NSW with options to manage a carbon constrained future;
- ongoing work with CINSW and Chair in developing options for the CINSW Fund budget and future programs;
- consultation with industry and Commonwealth on future research options;
- involvement within policy debate at a National level; and
- continued upgrade of the CINSW website.

Overall the Secretariat has met goals and timelines put in place in establishing the new research and Study programs.

D3 Delta Carbon Capture and Storage Demonstration Project.

Project closed.
See report 2014/15 for details

D4 Research and Development (R&D) Projects 2009

A "Call for Expressions of Interest under the NSW Clean Coal Fund" closed on 4 December 2009, with 29 applications received and assessed. In May 2010, the then Minister approved 10 successful projects as shown in Table 8. After negotiations of funding agreements, some of the awarded amounts varied slightly:

Table 8: R&D Projects 2009

Applicant	project description	Awarded funding up to ($)	Duration	restructured funding agreements	Amount spent at closure ($)
Uni Newcastle / GreenMag	Alternative CO_2 storage	3,040,000	4 yrs	3,040,000	
UCC Energy	Combustion	2,581,000	4 yrs	closed early	38,174 (1)
Centennial Coal	Fugitive emissions	2,200,000	2 yrs	2,200,000	
CSIRO	Capture technology	1,300,000	3 yrs	1,582,319	1,582,319
CSIRO	Fugitive emissions	1,000,000	2 yrs	closed early	39,451 (2)
Uni of Newcastle	Combustion alternative	886,618	3 yrs	851,618	851,296
Uni of Newcastle	Social research	618,930	2 yrs	661,946	655,795 (3)
CSIRO	Capture technology	613,711	1.5 yrs	613,711	613,711
Uni of Newcastle	Carbon fuel cell	608,719	5.5 yrs	564,748	
OurSun P/L	Combustion technology	did not commence			
Total Funding Awarded		**12,848,978**			

Notes:

(1) UCC Energy received $50,000 in their first instalment to carry out a greenhouse gas life cycle assessment of their process. On a 1:1 shared costs basis for this study, $11,826 was returned to CINSW Fund as unspent monies on this study.

(2) CSIRO received $115,000 in their first instalment for this project. As a result of the Department terminating this agreement as the project was no longer viable without an industry partner, $75,549 in unspent monies was returned to the CINSW Fund.

(3) The University of Newcastle completed this project without incurring the costs associated with publications, and so $6,151 was retained by the CINSW Fund.

A detailed evaluation of each project follows:

D4.1 Project: UCC Fired Diesel Engines in the generation of electricity
Grantee: UCC Energy Pty. Ltd

Project closed.
See report 2012/13 for details

D4.2 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 for electricity generation.

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. By 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:

Despite the VAM-RAB operating successfully under a variety of test conditions, the commissioning process identified a number of issues that would impede the plant from plant from operating at its full capacity. A remedy to replace some of the brick work in the lower section of the chequer pack was pursued to rectify the way heat in the plant behaved, before phase 1 of the experimental plan, the simulation of Ventilation Air Methane (VAM) could be undertaken. Phase 2 of the experimental plan, which involves the connection of the VAM-RAB to the Mine, was put on hold until outcomes of a parallel VAM project being undertaken by both Centennial and the University of Newcastle are known. This parallel VAM project is being jointly funded by the Australian Coal Association Low Emissions Technologies Ltd (ACALET) and Commonwealth "Coal Mine Abatement Technology Support" (CMATS) fund and aims to develop safety guidelines for the industry through a scientific review process. This project is expected to start phase 1 of the experimental plan in Q3 2016

D4.3 Project: Further development of Post Combustion Capture (PCC)
Grantee: CSIRO Energy Technology

CSIRO Energy Technology received initial grant funding to support a research and development program dedicated to the chemical capture of CO_2 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). This innovative project continues to be the only current research and development pilot program on liquid-based absorbent Post Combustion Capture (PCC) technologies suitable for NSW power stations. The results also have applicability across the Australian black coal electricity generation sector.

The pilot-scale CO_2 capture plant used in the research was located at Delta Electricity's Munmorah Power Station on the Central Coast, north of Sydney. The Coal Innovation NSW Fund assisted the refurbishment, upgrade and move of the pilot plant from Munmorah to Delta Electricity's Vales Point Power Station so that this critical research program could continue.

Evaluation:

CINSW grant funding has enabled the consolidation and extension of technical infrastructure for the evaluation of PCC technologies for application in coal fired power plants in NSW to also test on NSW coals. The PCC pilot plant at Vales Point is unique in that it is the only capture facility in NSW that can actually evaluate technologies utilising real flue gases from coal combustion at a coal fired power plant.

The infrastructure is now available to be utilised to address issues that are pertinent to the development and deployment of environmentally benign and cost-effective PCC technologies. A project funded by the Australian Renewable Energy Agency (ARENA) aimed at the demonstration of solar thermal energy for regeneration of the liquid absorbents was one of the first projects to use this refurbished pilot plant. Since then, the UNSW in conjunction with researchers from the Cooperative Research Centre for Greenhouse Gases Technologies (CO2CRC) developed a custom built rig at this research facility to trial new hollow fibre membranes for capturing carbon dioxide from power stations. The project was funded by the Australian National Low Emissions Coal Research & Development (ANLEC R&D)

During the Research, Development and Demonstration (RD&D) Projects Expressions of Interest (EOI) Round 2015, several applicants, as part of their application, sought to avail themselves with the use of the Vales Point capture facility. This further highlights the value of this pilot plant.

D4.4 Project: Reducing Fugitive Emissions -Enhanced Drainage techniques
Grantee: The CSIRO Centre for Environment, Social and Economic Research

Project closed December 2012 and unspent moneys returned.

See 2012/13 report for full details

D4.5 Project: A Novel Chemical Looping Based Air Separation Technology
Grantee: The University of Newcastle Priority Research Centre for Energy

Project successfully completed

See 2014/15 report for full details

D4.6 Project: Managing Project Risk: The Role of Public Awareness
Grantee: University of Newcastle

Project successfully completed

See 2014/15 report for full details

D4.7 Project: Site Trials of Novel CO2 Capture Technology
Grantee: CSIRO Coal Technology

Project successfully completed

See 2014/15 report for full details

D4.8 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 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%). The higher efficiencies equate to substantial reductions in greenhouse gas emissions as less fuel is used per unit of electricity generated. In addition, the fuel cell emissions are almost entirely pure CO_2 which is therefore ready for sequestration 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 DCFC relies on the external supply of a fuel (in this case coal) which must be continually replenished.

The overall objective of this project is to obtain proof of concept for the technology and progress towards commercialisation of the DCFC through further development and optimisation of bench-scale and then pilot-scale systems.

Evaluation:

This project made steady progress on all milestone tasks in 2015/16 and it was completed within budget in Q1 2016. All the fundamental laboratory studies have been completed and these findings acquired has been implemented in the development and construction of bench- and pilot-scale DCFC demonstration system to achieve performance optimisation.

The fundamental findings of this project provide understanding of the mechanism through which coal is oxidised to in DCFC process. It also studied impacts of process variables on the performance such as the type and impurity level of the coal and whether coal washing is necessary, the nature and composition of the electrolyte, anodic catalyst, the operational temperature, and the gas-phase composition.

Another significant outcome of this project was the development and construction of two different size scale DCFC systems, both with the intent of implementing the fundamental project outcomes. While the bench-scale system successfully replicated the fundamental testing, the pilot-scale system enabled the introduction of advantageous fundamental findings on a larger scale such as kaolin catalyst and the use of optimally pre-treated coal.

A draft final report was submitted and its review will be reported on in more detail in the next 2016/17 Annual report.

D4.9 Project: Permanent Large Scale CO2 Storage by Mineral Carbonation Grantee: Mineral Carbonation International

The GreenMag Group and University of Newcastle Priority Research Centre for Energy was awarded grant funding, contingent on the receipt of matching Commonwealth and industry funding, to develop and optimise a promising method of storing carbon dioxide gas emitted from NSW coal-fired power stations. GreenMag and the University of Newcastle formed Mineral Carbonation International Pty Ltd (MCI) with a commitment from Orica to match funding as the industry partner. This joint venture will undertake further research into mineral carbonation technology and establish a CO_2 mineral carbonation pilot plant at the University of Newcastle. The project aims to transform captured CO_2 emissions into forms of carbonate rock that will be trialled as new green building materials for the construction industry.

The Mineral Carbonation process takes advantage of a natural process whereby CO_2 is captured in mineral deposits resulting in it being stored in rocks. A key advantage of this process is that the CO_2 is permanently stored in the rocks. It would only re-enter the atmosphere if the rocks were subjected to extremely high temperatures.

The Project is intended to take existing known processes for mineral carbonation from bench scale to demonstration plant scale and to conduct complementary R&D activities, which each could reduce the overall cost of mineral carbonation that could eventually operate at industrial scale. The major goal for the Project is to reduce the cost of existing mineral carbonation processes from the current $70 per tonne of CO2 sequestered to $40 per tonne (with potential for further reduction) and to demonstrate that the process involved can be scaled up from the laboratory to this pilot scale and beyond.

The MCI project extends over a four-year period and encompasses three main strands including: 1) pilot plant construction and operation, 2) intensive research and development, and 3) program governance, communication and commercialisation. The project was officially launched 23 August 2013 by Minister for Mineral Resources at the Newcastle Institute of Energy and Resources, University of Newcastle (NIER).

Evaluation:

The highlight of the project for this year was the successful operation of the world first research pilot plant reactor under design operational conditions with several runs of carbonates producing kilograms of materials for characterisation.

Throughout the year this project constructed the pilot reactor plants, despite a slight delay in the delivery of the reactor due an international supplier entering liquidation. By mid-February the installation of the equipment and connection of all services was initiated. In parallel, the batch plant equipment was integrated into the control logic of the automated control system which allowed the commissioning of the batch pilot plant to be finalised by March. The equipment was found to comply with the specifications requested and performed satisfactorily.

The feedstock had been sourced and processed for the trial experiments to commence. Mineralogy of raw material feedstock study was also undertaken. Various fundamentals studies being carried out to support the experimental plan. Techno-economic assessments with power generation and Carbon Capture and Storage options, as well as Life Cycle Analysis have been carried out. Collaborative research agreements were also signed with Columbia University and Sydney University to extend the research capacity of the project.

D4.10 Project: A Simple Heat Engine for Sustainable Coal Generation Grantee: ourSUN Pty Ltd – application WITHDRAWN December 2010.

Application withdrawn December 2010.

See 2010/11 Report for full details

D5 NSW CO2 Storage Assessment Program

The drilling program is being developed in 3 stages as follows:

- Stage 1A – Sydney Basin (4 wells)
- Stage 1B – Darling Basin (2 wells)
- Stage 2 – further data acquisition in the Darling Basin

Funding Agreements between NSW Trade & Investment, the (then) Commonwealth Department of Resources, Energy and Tourism and industry and ACALET were signed for Stage 1 and announced on 4 June 2012. This announcement also advised of commencement of Stage 1B of the program. With the completion of Stage 1B and the related funding agreements, the focus in 2015-16 has turned to planning for a future program of exploration in the Darling Basin aimed at verifying and improving upon the promising results from Stage 1B.

Evaluation:
Having commenced in 2008, the Program is expected to run until the end of 2017. Program status is as follows:

- Stage 1A – Sydney Basin data acquisition and assessment (completed)
- Stage 1B – Darling Basin data acquisition and assessment (completed)
- Stage 2 – further data acquisition in the Darling Basin (defined based on Stage 1 outcomes).

The table below displays updated financial contributions, expenditure under the Funding Agreement:

	Stage 1A Contributions	expended during Stage 1A	Stage 1B contributions	expended during Stage 1B	Total expenditure todate
Commonwealth	$ 2,500,000		$ 7,200,000	$ 9,700,000	$ 9,700,000
ACALET	$ 300,000		$ 8,000,000	$ 8,300,000	$ 8,300,000
CINSW Fund	$ 7,550,000	$ 7,550,000	$ 2,200,000	$ 2,200,000	$ 9,750,000
			note 1	*note 2*	

note 1: ACALET reduced its contribution to Stage 1B by $1,400,000 (effectively contribution to the 20% contingency fund)
note 2: There is a surplus of approximately $566,000 from Stage 1B which will be expended in a future seismic campaign, but for this exercise it has been assumed to have been expended.

The 2014 drilling campaign in the Darling Basin (i.e. Stage 1B) met its aims and objectives and was successful in discovering the first prospective site in NSW for the storage of CO_2 captured from coal-fired power stations and other industrial point sources.

Specifically, three sandstone units overlain by extensive claystone units were intersected by the Mena Murtee-1 in the Pondie Range sub-basin as prospective storage reservoirs for CO_2. Analysis and modelling of the newly acquired data sets by the CO2CRC provided positive indications for large scale storage of CO_2 within the Darling Basin. The prospective intervals encountered in Mena Murtee-1 were identified through low resolution injectivity and capacity modelling to have suitable porosity and permeability for CO_2 storage. The computer modelling revealed that the porous sandstones may be capable of storing approximately 555 million tonnes of CO_2. Thus, these sites could theoretically permanently store 50 years' worth of the emissions captured from one of NSW's biggest emitters. To put another way, the sites could potentially store one-fifth of the CO_2 emitted over a 50 year period from the State's coal power sector.

The CO2CRC concluded that the results acquired from the Pondie Range Trough provided reasonable justification for the expansion of an exploration program within this sub-basin to verify and build upon the initial yet promising findings and also in other underexplored areas of the Darling Basin.

Further collaborative research was also underway during 2015-16 with the CSIRO investigating aspects of the geothermal regime in the Darling Basin, and with ANLEC R&D studying aspects of the Mena Murtee-1 cap rocks. These two projects were both completed successfully and have provided additional insights into and validation of the promising results from the Mena Murtee-1 well. Final reports on the results and outcomes from Stage 1B exploration in the Darling Basin have been finalised and released to the public.

Planning of the Stage 2 Darling Basin drilling program funded through the CINSW Fund has progressed in line with a developed work plan based on the consolidation and synthesis of existing data, development of a peer-reviewed seismic acquisition program to fill existing data gaps, and the drilling of exploration wells located in key locations based on the outcomes from the new seismic acquisition. Stage 2 aims to verify and improve upon the promising results from Stage 1B and to also to explore in a new area (the Yathong Trough) as a contingency if the prospectivity of the Pondie Range Trough is reduced upon the assessment of the newly acquired information from the program.

An agreement has been signed between the Department and Geoscience Australia (GA) for GA to project manage and procure a suitable contractor to conduct the seismic survey within the Central Darling Basin. The Agreement's objectives include obtaining up to 250kms of new seismic data in the Pondie Range and neighbouring Poopelloe Lake Troughs within the Darling Basin, and to process and interpret this raw data adding to the region's geological knowledge. The new data will 'fill gaps' in the seismic coverage within these sub-basins and will assist in future positioning of exploration wells for 'Stage 2' of the NSW CO_2 Storage Assessment Program, by providing greater certainty and reducing drilling risk during forward planning.

As part of planning for the seismic surveys, a notification of intent to request an Access Arrangement was served on impacted landholders. Access arrangements have been secured to enable the seismic program to go ahead within the Pondie Range and Poopelloe Lake Troughs. Landholder sentiment within the areas remains good with liaison continuing between CINSW staff and landholders.

Based on current projections, the seismic survey is forecast to take place in Q2 2017 and is expected to take between 14 and 20 days to complete, weather permitting and at a rate of 10–15 km per day. The results will assist in planning a drilling exploration campaign due to commence in the the 2nd half of 2017.

A $2 million budget has been allocated to the seismic program.

D6 Membership of CO2CRC

Membership ceased on 30 June 2015.

Consideration is being given to renewing this membership based on a different membership contribution formula.

D7 Future of NSW Coal Fired Electricity Generation Industry

In 2015 CINSW Ministerial Advisory Council recommended to the Minister that a *Future NSW Coal Fired Electricity Generation Industry Study* project be undertaken.

CINSW Secretariat undertook a procurement process to conduct a study which would provide the NSW Government with a technical and economic evaluation of future options for the role of coal in providing a sustainable, safe, reliable and competitive form of electricity generation for NSW, whilst reducing its carbon emissions and maintaining State economic growth.

A robust procurement strategy was developed in consultation with Department's Procurement and Governance Units. After undergoing a round of competitive tendering a rigorous tender evaluation process, Ernst & Young, as the highest-ranked respondent, was awarded the contract to deliver a comprehensive study for a fee of $246,000 (plus GST).

The Study has been developed in two stages. Stage 1 will develop comprehensive baseline data and examine two reference scenarios. Stage 2 will model and investigate several options and scenarios that NSW could put in place to test outcomes under a carbon constrained future.

A Steering Committee of industry representatives has been established and a peer review panel will consider Reports at each Stage of the Project.

Evaluation:

The study commenced in April 2016 and a Final Report is expected by November 2016. This project is currently on track in relation to milestone delivery and budget in accordance to project plan and has completed Stage 1 of the work program.

A Stage 1 report has been reviewed by the Study Peer Review Panel (Commonwealth Office of Chief Economist and Australian Energy Market Operator) and been approved by the CINSW Council to move forward to Stage 2.

D8 Research, Development and Demonstration (RD&D) Projects Expressions of Interest (EOI) Round 2015

In 2015, CINSW Ministerial Advisory Council recommended to the Minister that a $10 million CINSW Research, Development & Demonstration (RD&D) Projects Expressions of Interest (EOI) Round 2015 be conducted.

CINSW Secretariat undertook to develop a Program Administrative Guidelines, Risk Register, and assessment process including an indicative timeline to evaluate projects. These documents formed the basis of an EOI that was opened for applications from 25 August 2015 to 12 October 2015.

A Technical Working Group comprising of six members was formed, and met during November 2015 to February 2016 to conduct a rigorous two-phase assessment process on all eligible applications. External auditors were also engaged to provide independent probity advisory services in relation to the EOI process. Their Probity Report found the process to be compliant with the probity principles in all material respects.

An announcement on successful projects is expected to be made in the next financial year, with projects expected to start by November 2016 to finish in September 2018.

E. CONCLUSION

The financial year 2015/16 was a successful year for CINSW, with progress on many fronts. The highlights of the financial year have seen several research projects concluding with significant achievements attained. Final Reports for these projects have been assessed, peer reviewed and placed on the Department's website. Additional research results from the Darling Basin drilling program have confirmed evidence of the potential for commercial-scale storage of CO_2 in NSW. These results demonstrate that NSW could theoretically permanently store 50 years' worth of CO_2 emissions captured from one of NSW's biggest emitters.

2015/16 has also been a major planning year with emphasis on the delivery on projects over the following two years from the RD&D Projects EOI Round 2015 and future drilling program. Outcomes of the Study that has been undertaken will also provide significant future work for the Secretariat.

Expenditure for this year was comparably low, as the majority of CINSW's activity was planning for future work. Over the next two years significant expenditure is expected to occur with the RD&D ($10 million budget) and drilling ($20 million budget) programs.

Overall Financial Balance (Net Assets)

(Extract from Financial Statements)	Value $
Opening balance as at 1 Jul 2015 (credit)	85,159,351
Interest revenue	1,658,036
Revenue adjustments from ACALET (excess revenue recognised in 2014-15 reversed in 2015-16)	(3,171)
total	**86,814,216**
Less expenditure	1,735,064
TOTAL as at 30 June 2016 *(credit)*	**85,079,152**

Expenditure for financial year 2015/16:

Major Expenditure incurred	Value $
Coal Innovation NSW (Advisory Council) costs and TWG	73,516
Secretariat costs including salaries	803,842
R&D projects grants	739,343
CO_2 Storage Assessment Program Stage 1B and Stage 2 (excess expense recognised in 2014-15 reversed in 2015-16)	(22,249)
Future of NSW Coal Fired Electricity Generation Industry Study	104,812
Audit Fees	35,800
GRAND TOTAL	**1,735,064**

COAL INNOVATION NSW FUND

Financial Report

30 June 2016

Coal Innovation NSW Fund

Financial Report
for the year ended 30 June 2016

STATEMENT BY DEPUTY SECRETARY

I declare that in my opinion:

a) The accompanying financial report provides details of the transactions of the Coal Innovation NSW Fund for the year ended 30 June 2016;
b) The financial report has been prepared as a special purpose financial report in accordance with the basis of preparation described in Note 2; and
c) The accompanying financial report exhibits a true and fair view of the financial position of the Coal Innovation NSW Fund as at 30 June 2016 and of its income and expenditure for the period ended on that date.

Further, I am not aware of any circumstances which would render any particulars included in the financial report to be misleading or inaccurate.

K Hargreaves

Kylie Hargreaves
Deputy Secretary Resources & Energy

Date: 28/10/16

Beginning of the Audited Financial Report

COAL INNOVATION NSW FUND
STATEMENT OF COMPREHENSIVE INCOME FOR THE YEAR ENDED 30 JUNE 2016

	2016 $000	2015 $000
Revenue		
Interest revenue	1,658	1,781
Other revenue	(3)	56
Total revenue	**1,655**	**1,837**
Expenses		
Advertising and promotion	3	-
Auditor's remuneration – audit of financial report	26	45
Auditing – other services	10	29
Consultancy	101	10
Insurance	-	14
Legal	17	-
Membership	-	250
Motor vehicle expenses	5	8
Operating lease rental expense – minimum lease payments	-	41
Other contractors (Refer note 2 (a))	51	614
Personnel services		
Salaries and wages (including recreation leave)	621	586
Superannuation	57	54
Long service leave	-	2
Payroll tax and fringe benefits tax	37	36
Research and development grants	739	1,304
Telecommunication	1	2
Training and staff development	10	1
Travel	25	24
Other operating expense	32	31
Total expenses	**1,735**	**3,051**
Net result	**(80)**	**(1,214)**

The accompanying notes form part of the financial report.

COAL INNOVATION NSW FUND
STATEMENT OF NET ASSETS AS AT 30 JUNE 2016

	2016 $000	2015 $000
ASSETS		
Current assets		
Cash and cash equivalents	84,462	84,830
Receivables		
Interest receivable	810	836
Net GST receivable	12	11
Accrued income	-	56
Total current assets	**85,284**	**85,733**
Total assets	**85,284**	**85,733**
LIABILITIES		
Current liabilities		
Payables		
Creditors	117	26
NSW Department of Industry, Skills and Regional Development (NSW Department of Industry)	88	548
Total current liabilities	**205**	**574**
Total liabilities	**205**	**574**
Net assets	**85,079**	**85,159**

The accompanying notes form part of the financial report.

COAL INNOVATION NSW FUND
NOTES TO THE FINANCIAL REPORT FOR THE YEAR ENDED 30 JUNE 2016

1. COAL INNOVATION NSW FUND

Entity

The Coal Innovation NSW Fund (the Fund) is a not-for-profit entity (as profit is not its principal objective) and the Fund does not have a cash generating unit.

The Fund has been established and is governed under the *Coal Innovation Administration Act 2008* (the Act). Part 2 Section 4 of the Act establishes the Fund as a Special Deposits Account.

The financial report has been prepared on the basis that the Fund is a non-reporting entity under the Australian Accounting Standards. The financial report for the Fund is therefore a special purpose financial report with the financial period being from 1 July 2015 to 30 June 2016.

This financial report for the year ended 30 June 2016 has been authorised for issue by the Deputy Secretary on the date the accompanying Statement by Deputy Secretary was signed.

Key activities

Part 2 Section 5 of the Act establishes the purpose of the Fund as follows:

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

Funding sources for the Fund

Part 2 Section 6 of the Act states that:
(1) There is payable into the Fund:

(a) all money advanced by the Treasurer to the Fund, and
(b) all money appropriated by the Parliament for the purposes of the Fund, and
(c) the proceeds of the investment of money in the Fund, and
(d) all money directed or authorised to be paid into the Fund by or under this or any other Act or law, and
(e) all money received for voluntary contributions to the Fund made by any person or body.

(2) A voluntary contribution to the Fund may be made on the condition that the contribution is to be used only for a specified purpose.

Payments out of the Fund

Part 2 Section 7 of the Act states that:
(1) There is payable from the Fund

(a) payments approved by the Minister for the purpose of the Fund, and
(b) administrative expenses incurred in relation to the Fund or Coal Innovation NSW (CINSW), 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 it 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.

COAL INNOVATION NSW FUND
NOTES TO THE FINANCIAL REPORT FOR THE YEAR ENDED 30 JUNE 2016

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of preparation

This financial report is a special purpose financial report that has been prepared in order to account for the transactions of the Fund under the Act.

This financial report has been prepared in accordance with the significant accounting policies disclosed below. Such accounting policies are consistent with the previous period unless stated otherwise.

The Statement of Net Assets and the Statement of Comprehensive Income have been prepared on an accruals basis and based on historic costs and do not take into account changing money values or, except where specifically stated, current valuations of non-current assets.

All amounts are rounded to the nearest one thousand dollars and are expressed in Australian currency.

(a) Research and development expenses

The Fund engages contractors to conduct work for site preparation, drilling, engineering, project management and research activities. This activity is classified as in research phase for the project and no expenses have been capitalised. An asset will not be recognised until clear and quantifiable future benefit is established. However there is acknowledgement that any grant is from the Fund and any future economic benefits (assets) arising out of it may belong to NSW government and/or the research partner.

(b) Accounting for Goods and Services Tax (GST)

Income, expenses and assets are recognised net of the amount of GST, except that:

(a) the amount of GST incurred by the Fund as a purchaser that is not recoverable from the Australian Taxation Office is recognised as part of the cost of acquisition of an asset or as part of an item of expense and

(b) receivables and payables are stated with the amount of GST included.

(c) Income recognition

Income is measured at the fair value of the consideration or contribution received or receivable. Additional comments regarding the accounting policies for the recognition of income are discussed below.

(a) Grants and contributions
Grants and contributions include industry contributions and grants from Commonwealth and New South Wales government. They are generally recognised as income when the Fund obtains control over the assets comprising the grants and contributions. Control over grants and contributions are normally obtained upon the receipt of cash.

However, some revenue is recognised when the Fund issues invoices in relation to partnership agreements where work is completed and grants are based on actual expenses incurred in the previous quarter. The invoices are issued after the Steering Committee accepts the financial report and the actual expenses for the quarter.

(b) Interest Revenue
Interest revenue is recognised using the effective interest method as set out in AASB 139 Financial Instruments: Recognition and Measurement.

(d) Receivables

Receivables are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. These financial assets are recognised initially at fair value, usually based on the transaction cost or face value less an allowance for any impairment. Any changes are recognised in the net result for the year when impaired or derecognised.

COAL INNOVATION NSW FUND
NOTES TO THE FINANCIAL REPORT FOR THE YEAR ENDED 30 JUNE 2016

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

(e) Payables

These amounts represent liabilities for goods and services provided to the Fund and other amounts. Payables are recognised initially at fair value, usually based on the transaction cost or face value.

(f) Personnel services

The Fund does not have any employees and receives administrative, secretarial support and operational assistance from the NSW Department of Industry. The Fund has an arrangement with NSW Department of Industry to reimburse them for personnel services expenses.

3. CASH RECEIPTS AND PAYMENTS	**2016 $'000**	**2015 $'000**
Opening cash balance	**84,830**	**74,381**
Cash receipts:		
The Fund is authorised to receive amounts in accordance with Section 6 of the Act.		
(1)(a) all money advanced by the Treasurer to the Fund	-	-
(b) all money appropriated by the Parliament for the purposes of the Fund	-	-
(c) the proceeds of the investment of money in the Fund	1,729	8,138
(d) all money directed or authorised to be paid into the Fund by or under this or any other Act or law	-	-
(e) all money received for voluntary contributions to the Fund made by any person or body.	-	-
(2) a voluntary contribution to the Fund may be made on the condition that the contribution is to be used only for a specified purpose.	58	5,143
BAS receipt	16	-
Cash payments:		
Payments from the Fund are in accordance with Section 7 of the Act.		
(1)(a) payments approved by the Minister for the purpose of the Fund	(1,307)	(2,028)
(b) administrative expenses incurred in relation to the Fund or CINSW	(864)	(804)
(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 it 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.	-	-
Closing cash balance	**84,462**	**84,830**

4. EVENTS AFTER THE REPORTING DATE

There are no events subsequent to the balance date that affect the financial information disclosed in this financial report.

End of audited financial report