



COAL INNOVATION NSW

Annual report - Coal Innovation NSW Fund - 2020-21

Income, expenditure and project evaluation

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Executive summary

Income and expenditure

For the financial year 2020-21, the Coal Innovation Fund (CIF, or the Fund) received income of \$109,748. Expenditure from the fund was \$3,569,008 and funds remaining at the end of the financial year total \$67,579,175 (Table 1 and Table 2).

Table 1: Coal Innovation NSW Fund financial summary

Extract from the CINSW Financial Statement	Value (\$)
Opening balance as at 1 July 2020 (credit)	71,038,435
Interest and other revenue	109,748
Total	71,148,183
Less expenditure (see Table 2)	3,569,009
Total at 30 June 2021 (credit)	67,579,174

Table 2: Coal Innovation NSW Fund expenditure

Description	Value (\$)
Coal Innovation NSW membership, meetings and sub committees	20,000
Coal Innovation NSW Secretariat	529,293
Research, Development and Demonstration (RD&D) projects	1,673,793
NSW CO ₂ Storage Assessment Program	1,318,553
Audit fees	27,370
Total	3,569,009

Evaluation

Coal Innovation NSW invests in low emissions coal technologies to mitigate the environmental impact of coal production and consumption, including from the electricity, mining, steel and cement industries.

The financial year 2020-21 was a period of success for Coal Innovation NSW (CINSW). Low emissions coal technologies were advanced through 10 of our Research, Development and Demonstration grants, the NSW CO₂ Storage Assessment Program and the Ventilation Air Methane Abatement Program. We also continued to provide analysis, advice and guidance to the NSW Government to help achieve our emissions reduction targets.

The NSW CO₂ Storage Assessment Program aims to identify safe and secure geological storage for CO₂ in NSW. Achieving this objective will secure a viable pathway to deep decarbonisation of the NSW economy, particularly in hard to abate sectors such as steel and cement manufacture.

Stage 1 of the NSW CO₂ Storage Assessment Program is complete. Stage 2 commenced this year and aims to expand and strengthen our understanding of the Darling Basin's CO₂ storage potential. The Central Darling seismic survey was successfully completed in May and June 2021. 180 km of high-quality seismic data was collected in the Pondie Range and Poopelloe Lake Troughs. The seismic data is being processed and used to build more accurate geological models of both troughs. This allows a more robust assessment of the region's CO₂ storage potential and will inform the next stage of exploration.

CINSW developed the Ventilation Air Methane (VAM) abatement program to reduce fugitive emissions from coal mining in NSW. The program builds on previous VAM work in Australia including projects funded by CINSW. CINSW will fund a project with an industry partner in the 2021-22 financial year to establish a world-first, state-of-the-art VAM abatement facility. The facility will demonstrate safe and efficient fugitive emissions reduction. CINSW also proposes funding for research, development and demonstration of next generation abatement technologies to enable safer and more efficient VAM abatement.

Purpose of the annual report

The *Coal Innovation Administration Act 2008* (the Act) requires an annual report detailing expenditure from the Coal Innovation NSW Fund (Section A and B of this report) and an evaluation of the effectiveness of the expenditure (Section C of this report).

The Act legislates four purposes for which money can be expended from the Coal Innovation NSW Fund (the Fund), noted in **Appendix A**. The Fund is administered by the NSW Government and kept in a Special Deposits Account, separate from Consolidated Funds. The *Public Finance and Audit Act 1983* mandates the Auditor-General audit the Special Deposits Account. The audited financial report is included in Section D of this report and comprises a statement of net assets, comprehensive income and associated note disclosures.

All figures are GST exclusive unless otherwise stated. This report is for the 2020-21 financial year, ending 30 June 2021.

The Coal Innovation Fund and Coal Innovation NSW

The Coal Innovation Fund was established by the *Coal Innovation Administration Act 2008*. CINSW is an independent advisory council that makes recommendations to the Deputy Premier and Minister for Regional NSW, Industry and Trade, responsible for expenditure from the Fund. Administration of the Fund is supported by the CINSW Secretariat, a team within Mining, Exploration and Geoscience (MEG), in the Department of Regional NSW (DRNSW).

Income, expenditure and evaluation

A. Payments received (income)

The Fund received the following income (Table 3):

- Interest earnings of \$109,748
 - This was deposited directly into the Fund's bank account. The interest was calculated on the daily balance of the bank account and paid at the cash rate, on a monthly basis, using the Westpac Interest Apportionment Service.
- No other revenue was received

Table 3: Coal Innovation NSW Fund income

Description	Value (\$)
Interest revenue	109,748
Total income	109,748

B. Expenditure

CINSW expended \$3,569,009 in financial year 2020-21 across the areas shown in Table 4.

Table 4: Coal Innovation NSW Fund expenditure

Description	Value (\$)
Coal Innovation NSW membership, meetings and sub committees	20,000
Coal Innovation NSW Secretariat	529,293
Research, Development and Demonstration (RD&D) projects	1,673,793
NSW CO ₂ Storage Assessment Program	1,318,553
Audit fees	27,370
Total expenditure	3,569,009

B1. Coal Innovation NSW membership, meetings and sub committees

Table 5 shows the expenditure on Coal Innovation NSW membership remuneration, meetings and subcommittee or working group expenses. This financial year, expenses were solely associated with remuneration of the CINSW Chairperson.

Table 5: Expenditure – CINSW membership, meetings and sub committees

Description	Value (\$)
Coal Innovation NSW member remuneration	20,000
Total	20,000

B2. Coal Innovation NSW Secretariat

Table 6 shows expenditure on the CINSW Secretariat including salaries, travel and staff development.

Table 6: Expenditure – CINSW Secretariat

Description	Value (\$)
Secretariat costs including salaries and on costs, telecommunications and office supplies	524,339
Travel	3,310
Training and staff development (including conferences)	1,643
Total	529,292

B3. Research, Development and Demonstration (RD&D) projects

CINSW has funded three rounds of RD&D grants through a competitive Expression of Interest process. Applications were assessed by a Technical Working Group and successful grantees endorsed by CINSW and the Deputy Premier and Minister for Regional NSW, Industry and Trade. The grant rounds commenced in 2009, 2015 and 2018. Expenditure was only incurred in the 2020-21 financial year for the 2015 and 2018 grant rounds.

Table 7: Expenditure – RD&D projects

Description	Value (\$)
Round 2 grants (see Table 8)	556,083
Round 3 grants (see Table 9)	1,100,988
Peer reviews	22,766
Total	1,679,837

Round 2 RD&D grants

Table 8 shows expenditure on Round 2 RD&D Round 2 projects.

Table 8: Expenditure – RD&D Round 2

Applicant	Project description	Value (\$)
University of Newcastle (Donne)	Direct carbon fuel cell demonstration	556,083
Total		556,083

Round 3 RD&D grants

Table 9 shows expenditure on Round 3 RD&D grants.

Table 9: Expenditure – Round 3 RD&D grants

Applicant	Project description	Value (\$)
CO2CRC (Qadar)	Reducing greenhouse gas emissions in steel production	-8,224
CSIRO (Feron)	Water production from an amine based post-combustion CO ₂ capture process	435,297
CSIRO (Milani)	Highly integrated solar heat in carbon capture technology	238,361
CSIRO (Shi)	Ventilation air methane catalytic mitigator	0
CSIRO (Thiruvenkatachari)	Harnessing energy with CO ₂ utilisation	55,431
Sunset Power (Callen)	Battery energy storage system at Vales Point Power Station	-70,677
Toshiba (Byak)	Ultra-supercritical hybrid solar/coal pathway	142,000
University of Newcastle (Wall)	Manufacture of carbon fibres	161,457
University of Melbourne (Arranz)	Enabling broader low-emissions advocacy coalitions in the NSW coal related sectors	165,587
University of NSW (Walsh)	Silica gels for improved CO ₂ containment and mitigation	-18,244
Total		1,100,988

B4. Peer reviews

CINSW spent \$22,766 on seven independent peer reviews and \$740 publishing of grantee final reports (Table 10).

Table 10: Peer review expenditure

Project peer reviewed	Value (\$)
Independent peer reviews	22,026
Publishing	740
Total	22,766

B5. NSW CO₂ Storage Assessment Program

Table 11 shows expenditure on the NSW CO₂ Storage Assessment Program.

Table 11: Expenditure – NSW CO₂ Storage Assessment Program

Description	Value (\$)
Contractors, travel and other	1,318,553
Total	1,318,523

B6. Audit fees

CINSW spent \$27,370 on an independent financial audit (Table 12).

Table 12: Expenditure – Audit fees

Description	Value (\$)
Audit Fees for FY 2020-21	27,370
Total	27,370

C. Evaluation

The following is an evaluation of the effectiveness of each of the projects and activities funded by CINSW in the financial year 2020-21.

C1. Coal Innovation NSW membership, meetings and sub committees

The *Coal Innovation Administration Act 2008* established an independent advisory council (CINSW) that makes recommendations to the Deputy Premier and Minister for Regional NSW, Industry and Trade, who is responsible for expenditure from the Fund. The membership of CINSW is prescribed by the Act to comprise an independent chairperson, two members from government, two representatives of the NSW black coal industry and up to four independent members with relevant qualifications or experience.

Members of CINSW for the financial year were:

- Prof. Michael Dureau, Deputy Chair, Warren Centre for Advanced Engineering, Chairperson
- Dr Chris Yeats, Executive Director, Geological Survey NSW (resigned 13 November 2020)
 - Dr Kevin Ruming (Director Geoscience Assessment & Advice) sat in place of Dr Chris Yeats in Meeting 33.
- Mr Michael Buffier, Group Executive, Glencore
- Mr John Richards, Managing Director, The Bloomfield Group
- Prof. Dianne Wiley, Head of School, University of Sydney
- Dr Noel Simento, Managing Director, Australian National Low Emissions Coal R&D
- Mr Greg Everett, Managing Director, Sunset Power International (Delta Electricity).
- Mr James Hay, Deputy Secretary Energy Climate Change, Sustainability at Department of Planning, Industry and Environment NSW
 - Kate Wilson (Executive Director Climate Change & Sustainability) sat in place of Mr James Hay in Meeting 33.

Meetings of CINSW provide an agenda for the Secretariat and recommendations to the Minister responsible for the Fund. CINSW held three meetings in the financial year:

- Meeting 31 – 27 July 2020
- Meeting 32 – 19 October 2020
- Meeting 33 – 15 February 2021

Members of the CINSW are eligible to claim remuneration for their services as prescribed by the Public Service Commission's 'Classification and Remuneration Framework for NSW Government Boards and Committees'. Only the chairperson of the CINSW claimed remuneration for the financial year equating to \$20,000.

C2. Coal Innovation NSW Secretariat

Due to a Machinery of Government (MoG) change in early 2020, the Secretariat moved from the Department of Planning, Industry and Environment (DPIE) to the newly formed Department of Regional NSW (DRNSW). In addition, the Division of Resources and Geoscience, which housed the Secretariat, transitioned to Mining, Exploration and Geoscience (MEG).

The CINSW Secretariat comprises five staff:

- Manager
- Senior Project Officer
- Project Officer
- Assistant Project Officer
- Grant and Program Analyst (0.5 full time equivalent).

Significant tasks for the financial year centred on:

- Managing current grantee projects, including working with researchers to develop and review final research reports and engaging independent peer reviewers
- Providing updates and recommendations to CINSW through meeting 31, 32 and 33
- Developing plans, budgets and funding options for the Fund's future programs particularly the VAM abatement program and the NSW CO₂ Storage Assessment Program
- Commencing Stage 2 of the NSW CO₂ Storage Assessment Program and completing a high-quality seismic acquisition program in the Darling Basin
- Maintaining dialogue with industry, state and commonwealth governments on low emissions coal technologies to support achieving the NSW Government emissions reduction targets.

C3. Research, Development and Demonstration (RD&D) projects

CINSW has funded three rounds of grants through a competitive expression of interest process. Applications were assessed by an independent Technical Working Group and successful grantees endorsed by CINSW and the Deputy Premier and Minister for Regional NSW, Industry and Trade. The grant rounds commenced in 2009 (Round 1), 2015 (Round 2) and 2018 (Round 3).

Round 1 RD&D grants

The Round 1 RD&D grants program comprised eight projects with a value of \$11.8 million. No expenditure for these projects occurred this financial year as all projects are complete. Additional information on these projects can be found in previous annual reports or on the [CINSW website](#).

Round 2 RD&D grants

The Round 2 RD&D grants program comprised eight projects with a value of \$8.6 million. All projects are complete. Additional information on these projects can be found in previous annual reports or at the above link. Expenditure occurred for only one Round 2 project during the financial year.

Table 13: Evaluation – Round 2 RD&D Projects

Applicant	Project description	Status	Awarded funding (\$)	Expended FY20/21(\$)
University of Newcastle (Donne)	Direct carbon fuel cell (DCFC) demonstration	Complete	1,643,001	1,643,001
Total				1,643,001

Direct carbon fuel cell demonstration

Grantee: University of Newcastle

The University of Newcastle received funding to build on its previous studies to develop and optimise a world first Direct Carbon Fuel Cell (DCFC) demonstration unit. The DCFC is not a new concept and the technology has undergone a major boost in international research interest in recent years, however technical barriers have prevented commercialisation.

This project aimed to deliver a technology package capable of being licensed as a 1-kilowatt DCFC module based on laboratory findings and pilot plant optimisation. This project bridged a crucial gap between research and commercialisation of DCFC technology.

Evaluation:

This project commenced in June 2017 and was accepted as complete in July 2021.

The project included two discrete streams. The first stream included fundamental pilot-scale work building on the previous University of Newcastle DCFC project. A small DCFC test rig was built in the laboratory to allow testing of fundamental aspects of the electrochemical generation of electricity from coal. A large amount of laboratory data and results were generated that improved understanding of the functioning of the technology.

The second stream used these data and results to build and operate the 1kW fuel cell system, the largest operating system of its kind built to-date.

Round 3 RD&D grants

The Round 3 RD&D grants program comprised 14 projects with a total value of \$7.0 million. Nine projects are complete, one is under review prior to publication and four are ongoing.

The Round 3 RD&D grant funding was distributed across two funding streams; a research stream capped at \$1.5 million per project and a maximum duration of three years, and a seed stream capped at \$100,000 and one-year duration. The research stream aimed to support projects demonstrating reduced deployment timeframes of a specific technology to garner market advantage or share. The seed stream aimed to support projects generating new ideas to achieve a specific goal, test an innovation or undertake essential desktop studies. The status of the Round 3 projects which progressed this financial year is provided in Table 14. An evaluation of their progress this financial year follows.

Table 14: Evaluation – Round 3 RD&D Projects

Grantee	Project description	Status	Awarded funding (\$)	Expended FY2020-21 (\$)
CO2CRC (Qadar)	Reducing greenhouse gas emissions in steel production	Complete	387,550	387,726
CSIRO (Feron)	Water production from an amine based post-combustion CO ₂ capture process	Ongoing	1,347,874	1,000,594
CSIRO (Milani)	Highly integrated solar heat in carbon capture technology	Complete. Pending approval of final report.	505,145	505,145
CSIRO (Shi)	Ventilation air methane catalytic mitigator	Ongoing	1,496,424	1,014,905

CSIRO (Thiruvengkatachari)	Harnessing energy with CO ₂ utilisation	Complete	154,923	154,923
Sunset Power (Callen)	Battery energy storage system at Vales Point Power Station	Complete	460,000	389,323
Toshiba (Byak)	Ultra-supercritical hybrid solar/coal pathway	Complete	946,500	946,500
University of Newcastle (Wall)	Manufacture of carbon fibres	Ongoing	753,468	478,990
University of Melbourne (Alfonso)	Enabling Broader Low-Emissions Advocacy Coalitions in the NSW Coal Related Sectors	Ongoing	418,828	260,795
University of NSW (Walsh)	Silica gels for improved CO ₂ containment and mitigation	Complete	90,000	71,756
Total				5,201,657

Reduction of greenhouse gas emissions in steel production

Grantee: CO2CRC Limited

This project explored pathways to reduce CO₂ emissions in steel production. The main cause of CO₂ emissions from a steel plant is the essential use of coal in the steel making process. The grantee assessed the application of carbon capture in the steel making process and the use of innovative technologies to improve the efficiency and productivity of the process. Using carbon rich gases to provide high-quality value-added products was also explored. The grantee assessed more efficient use of coal, reducing greenhouse gases and generating new revenue streams in steelmaking.

Evaluation:

This project is complete and has been accepted by the Secretariat. The grantee completed a review of the Australian and global steel industry and GHG emission reduction initiatives. Post combustion capture (PCC) of CO₂ was the most effective way to achieve large scale emissions reduction at Port Kembla. PCC could reduce emissions by 2.86 million tonnes per annum, or 45% of total emissions from the steelworks.

Energy efficiency measures were reviewed and noted as a pathway to emissions reduction. Many of the measures were already implemented at the Port Kembla steelworks, with many efficiency measures already close to their thermodynamic thresholds. This means the scope for improvement is limited particularly when retrofitting to steel plants.

Water production from CO₂ capture

Grantee: CSIRO

This project is ongoing and aims to undertake a pilot plant demonstration of a desalination process integrated with an amine-based CO₂-capture process. This addresses the obstacle of increasing the specific cooling load, and hence water requirement, of coal fired power plants that implement CO₂ capture. The project will establish principles underpinning process and equipment design, identify the most suitable (or best performing) desalination membrane to incorporate into amine carbon capture, and evaluate the process from a techno-economic perspective for NSW coal fired power plants.

Evaluation:

The project has been delayed and is currently on hold due to restrictions from the COVID-19 pandemic. This has been driven by the delay of supplies and limited capability to conduct onsite work.

Suitable amines and membranes for the Forward Osmosis process were selected and analysed in a laboratory environment. This informed the process and equipment design for operation in the Vales Point PCC pilot plant. The Forward Osmosis rig was delivered to Vales Point power plant in April 2021 and a number of runs conducted before being placed on hold. These employed difference combinations of liquid solutions and utilised either a 'once through' or 'recirculation' approach, both of which could be conducted independently from the PCC pilot plant.

A novel platform for highly integrated solar heat in carbon capture technology

Grantee: CSIRO

This project involves a desktop investigation of the use of a customised solar stripper (So-St) array as an alternative means of stripping out captured CO₂ from the CO₂-loaded solvent in a PCC process. The novel process involves replacing the conventional, energy intensive desorber unit with a specially developed solar array where a rich solvent is heated with solar energy to strip out the captured CO₂. This innovative approach could enhance the commercial viability of carbon capture and advance commercialisation of this technology.

Evaluation:

The project is complete and is currently undergoing review by the Secretariat. Modelling identified and optimised key design parameters for the solar array. A reaction kinetics and physico-chemical study was also completed, as well as the development of operational control modes and control logistics. The grantee developed two control strategies to achieve the 90% CO₂ capture target and addressed solvent storage requirements. The grantee concludes their report by detailing two pathways to improve process efficiency and thus the economics of their technology.

The grantee produced a paper *'Tailored solar field and solvent storage for direct solvent regeneration: A novel approach to solarise carbon capture technology'* that was published in the journal of Applied Thermal Engineering.

Development and site trials of a novel pilot ventilation air methane catalytic mitigator

Grantee: CSIRO

This project involves undertaking the further development of a novel technology that aims to reduce the greenhouse gas emissions (GHG) from underground coal mining. Approximately 50-85 per cent of coal mining methane, a potent GHG, is emitted to the atmosphere through mine ventilation air, depending on mine site specifications. Ventilation air methane (VAM) is very challenging for the coal industry to mitigate or use as an energy source because the air volume is large, and the methane resource is dilute and variable in concentration. CSIRO has previously successfully trialled a novel VAM mitigator (VAMMIT) at the Appin coal mine in southern NSW and is using the current funding to improve the performance and safety of this technology.

This project aims to reduce the operating temperature of the VAMMIT to much safer levels by incorporating two layers of catalysts inside the refractory bed of the existing VAMMIT unit at Appin mine. Then, the unit will be commissioned and trialled with VAM to demonstrate its performance.

Evaluation:

The project is currently on hold due to site restrictions imposed by the COVID-19 pandemic. Lab testing shows the catalytic VAMMIT can be operated at 300-600 °C (i.e. below the 450-750 °C originally planned). Test unit designs and fabrication of the catalytic beds have also been completed and the beds successfully installed in the VAMMIT at the Appin mine. Commissioning and function tests are ongoing, and progress is expected to continue once travel bans due to COVID-19 are lifted.

Harnessing energy with CO₂ utilisation: A feasibility study

Grantee: CSIRO

This project involves a feasibility study of a novel method of simultaneously mixing CO₂, that has been absorbed into a liquid CO₂ capture solvent as part of a PCC process, with wastewater brine rejects from coal mines in order to harvest electrical energy and produce a saleable product (bicarbonate soda).

The fundamental principle behind this technology is harnessing the mixing energy of two aqueous electrolytes through porous carbon composite electrodes, as well as using the CO₂ mineralisation process to produce a useful carbonate salt. The ability to strip out the CO₂ from the capture solvent (i.e. regenerate the solvent back to its original state) used in a PCC process also offers a potentially more efficient alternative to conventional thermal regeneration techniques. CSIRO has developed electrodes made from carbon composites considered suitable for this process. This feasibility study aims to conduct a life cycle assessment to provide an estimate of potential CO₂ emissions reductions from the process, evaluate the economic viability of this technology, and assess its commercialisation pathway.

Evaluation:

The project is complete and has been accepted by the Secretariat. The grantee has developed process configurations, simulations and cost estimates for two electrochemical processes. A life

cycle analysis (LCA) for both processes was completed based on a technical review of processes, CO₂ utilisation with bicarbonate production and the associated LCA methodologies. Lastly, an economic evaluation was carried out to assess the feasibility of the electrochemical processes. The grantee notes the path to commercialisation as being the validation of the technology at a laboratory scale followed by a demonstration plant. They also note the barriers as being the availability of inputs from industrial processes required to make the process commercially viable.

Battery storage at Vales Point Power Station

Grantee: Sunset Power International Pty Ltd

This project includes a techno-economic assessment of integrating a battery energy storage system (BESS) with an existing turbogenerator at Vales Point Power Station. The proposed system will enhance the generation capability of the plant and provide frequency stabilising support to the electricity network to compensate for instability attributable to the increasing proportion of intermittent forms of renewable energy generation.

The BESS will contribute to a reduction of greenhouse gas emissions from the power station and the national electricity market (NEM) overall. This is achieved by reducing losses in the turbogenerator caused by constant frequency oscillations of up to 10 MW required to provide frequency services to the NEM while minimising plant ramping and cycling operations.

Evaluation:

The project is complete and has been accepted by the Secretariat. Through a review of commercially available battery storage technologies, lithium-ion batteries were found to be the preferred application for utilities due to rapidly decreasing costs and a developed supply chain. A BESS sizing of 40MW/20MWh for each of the two Vales Point units was adopted based on assessment of the most advantageous grid services and revenues potentially provided by a 'behind the meter' installation. Potential locations within the Vales Point site were identified for installation, a 14-month construction program was planned, development approvals pathways were identified, a risk register was developed, and a detailed control system strategy for providing contingency frequency control ancillary services (FCAS) with a BESS was described.

Whilst shown to be technically feasible, the cost for large scale energy storage was found to outweigh the anticipated revenues from this BESS configuration due to high battery capital costs and a relatively short project life of 10 years. It was therefore concluded that the BESS and synchronous generator configuration put forward in this case study would be difficult to realise in the NEM without additional market mechanisms to value and support the provision of energy capacity or spinning reserve.

300-200MW ultra supercritical hybrid solar/coal R&D pathway study

Grantee: Toshiba International Incorporation Pty Ltd

This project involves developing a design pathway for ultra-supercritical (USC) hybrid solar/coal plants. This pathway is set to reduce emissions substantially compared to the existing sub-critical plants in NSW, by adopting a 300 MW class USC hybrid solar/coal plant with an energy ratio of 25 per cent/75 per cent. The long-term objective is for a horizon pathway which includes molten salt energy storage and CO₂ capture using oxyfiring.

A key aim of this research is to show that coal can be an integral part of the energy mix, that it can remain competitive in the rapidly changing low emission market where a large focus is on dispatchable generation. The USC hybrid solar/coal plant will show significant commercial and technical advantages over alternative hybrid dispatchable solutions such as solar or wind plus battery storage solutions.

Evaluation:

The project is complete and has been accepted by the Secretariat. Hybrid designs were refined and the refining of some technological parameters led to variations in the final designs of the hybrid

pathways. The plant control logic developed considers three operational modes: boiler only mode, hybrid solar/coal mode, and boiler plus PV mode. A 300 MW class USC hybrid solar/coal plant with an energy ratio of 25:75 per cent was found to substantially reduce emissions compared to existing sub-critical plants in NSW. The grantee concludes however that long-term objective is for a horizon pathway which includes molten salt energy storage and CO₂ capture using oxyfiring.

Low emission coal in the manufacture of carbon fibres

Grantee: University of Newcastle

This project is further developing a low emission industrial process to manufacture carbon fibres from coal. If coal could be substituted for polyacrylonitrile (a petroleum-derived material currently used in the manufacture of 90 per cent of carbon fibres) it would reduce the industry's emissions by ~34 per cent (minimum estimate) and significantly reduce the cost of production (by at least 50 per cent). Coal is uniquely placed to overcome this cost barrier but requires the extrusion process to be further developed for fibre production.

This project builds on advanced research into coal conducted at the University of Newcastle, whereby carbon fibres are manufactured by separating and concentrating coking coal's vitrinite component and then thermally extruding this material as it softens and becomes fluid. The extruded material is then drawn down to commercial fibre size (to fractions of a millimetre in thickness) and strengthened by annealing at high temperature.

Evaluation:

This project is currently delayed as the grantee looks to improve the quality of fibres produced from the continuous extrusion process. Coal samples have been acquired and preparation techniques to concentrate vitrinite have been explored. The characterisation of feed samples has been completed and included the mapping of different temperature and extrusion pressure conditions. Batch extrusion was successful, achieving filament sizes of 320µm when drawn down. Continuous extrusion has proved difficult however, and the grantee is currently looking to produce quality fibres to send to Carbon Nexus for further testing.

Enabling broader low emissions advocacy coalitions in the NSW coal-related sectors

Grantee: University of Melbourne

This social-science project aims to better understand and utilise the mechanics of 'advocacy coalitions' for low carbon technologies in coal and coal-related sectors (notably mining, electricity and steel-making). State-of-the-art sociological research shows that coalitions (groups of like-minded people) have either core or peripheric beliefs, which determine the likelihood of them joining other coalitions or changing their interim goals. Further, it is key opinion leaders (KOLs) in these coalitions who will largely be responsible for spreading awareness of, support for, or opposition to a technology. Therefore, this study examines the ways, if any, of making as many NSW low-carbon advocacy coalitions as possible converge in their beliefs and goals about low emissions coal technologies, not least by targeting the KOLs in these coalitions. Policy proponents can leverage this knowledge for better targeting of funding and resources for low emissions coal technologies, most notably carbon capture and storage.

This project aims to understand who specifically forms the advocacy coalitions that operate in the NSW low carbon technologies space and what their belief systems are. This process will facilitate identifying their KOLs. The study then seeks to learn from interactions between KOLs in order to both help improve any communication strategy and commence new coalition building.

Evaluation:

The project is progressing well and is on-track to be completed at the end of 2021. Social media and content analysis is ongoing throughout the project to identify different opinions across NSW on Australia's energy future. The grantee has conducted a Delphi Forum with KOLs from different

'advocacy coalitions' and is in the process of developing a communication strategy to facilitate coalition building.

Deployment of silica gels for improved CO₂ containment and risk mitigation

Grantee: University of New South Wales

This project involves a preliminary investigation into the feasibility of deploying silica sols in fractured wellbore cement to mitigate CO₂ and carbonated brine leakage from wells used to store captured CO₂ underground. Long-term sequestration of CO₂ requires robust and effective caprock barriers and wellbore seals to prevent vertical migration of carbonated brines or supercritical CO₂ from the storage reservoir. This project investigates the potential for colloidal silica gels to serve as an effective barrier to the leakage of carbonated brines and supercritical CO₂.

This technology could provide a mitigation strategy reducing the risks of long-term CO₂ storage, or a rapid response to prevent leakage. Importantly, by reducing the risk of leakage, silica gels have the potential to reduce the costs of CO₂ sequestration even if not deployed, as this technology would lower insurance costs associated with long-term sequestration sites, by reducing the potential hazard of adverse events.

Evaluation:

The project is complete and has been accepted by the Secretariat. The grantee modelled fractures in a wellbore environment by exposing cement samples to supercritical CO₂ and carbonated brine. In addition, the grantee also studied unreacted samples, as well as samples exposed to hydrochloric acid to simulate more extensive degradation of the cement. The permeability of these samples was measured before and after being plugged with silica sol gels. The results of the permeability studies demonstrate that sol gels can successfully plug open cement fractures and that the resulting seals are robust despite significant changes in the fracture stress. Study into the effects of brine exposure on silica gels indicates that the gels are relatively insensitive to prolonged exposure to brines of even quite high salinity (2M, or 117g/L) and low acidity (<2 pH).

C4. Peer reviews

CINSW spent \$22,766 on seven peer reviews (Table 15). When required, CINSW engages external peer reviewers to assess project stage-gate and final reports. These independent reviewers have specialist knowledge in various areas of low emission coal technologies. Their contributions reduce the risk to CINSW when assessing project outcomes, results and recommendations. The table also includes publishing expenses, these were incurred to ensure final reports published on the CINSW website met accessibility guidelines established by the NSW Government. No expenditure on the CSIRO (Yin) grant occurred this financial year, however the independent peer review was completed in this financial year.

Table 15: Peer review expenditure

Project peer reviewed	Value (\$)
Toshiba (Byak) - Ultra-supercritical hybrid solar/coal pathway	2,842
CSIRO (Thiruvengkatachari) - Harnessing energy with CO ₂ utilisation	2,842
CSIRO (Yin) - Retrofitting calcium carbonate looping to an existing cement plant for CO ₂ capture	2,132
CO2CRC (Qadar) - Reducing greenhouse gas emissions in steel production	2,842
CSIRO (Halliburton) - Aerosol-formation pathways in a liquid absorption-based CO ₂ -capture process	4,263
University of Newcastle (Donne) - Direct carbon fuel cell (DCFC) demonstration	2,842
CSIRO (Milani) - Highly integrated solar heat in carbon capture technology	4,263
Publishing	740
Total	22,766

C5. NSW CO₂ Storage Assessment Program

Coal Innovation NSW are custodians of the NSW CO₂ Storage Assessment Program. The program aims to 'make NSW CO₂ storage ready' by identifying large, safe carbon geosequestration sites in NSW.

Industrial carbon emissions have been captured, transported and safely stored underground in naturally occurring reservoirs since the 1970's. Carbon capture and storage could help NSW reduce emissions from hard-to-abate sectors such as steel and cement manufacture, or support the production of clean hydrogen from fossil fuels. This would support the ongoing economic contribution of these emissions intensive industries in NSW without compromising our emissions reduction goals.

Stage 1

The Stage 1 exploration in the Darling Basin discovered the first prospective site in NSW to store CO₂ captured from coal-fired power stations and other industrial sources. Expert analysis of data from the Mena Murtee-1 well north of Wilcannia, revealed multiple sandstone reservoirs with the potential to permanently store 555 Mt of CO₂. For context, this site could permanently store all NSW industrial emissions generated over a 40-year period.

It is important to note that this initial assessment is based on limited exploration data and more comprehensive exploration and site characterisation is required to confirm this promising discovery.

Stage 2

The aim of Stage 2 is to expand and strengthen understanding of the carbon storage potential of the Darling Basin in regional NSW. A comprehensive seismic survey, the Central Darling seismic survey, was planned and executed this year to help identify key locations for further exploration. An exploration strategy is also being designed to resolve key geological and hydrogeological uncertainties of three potential carbon storage sites within the Darling Basin. Further details regarding the Central Darling Seismic Survey and upcoming exploration program are provided below.

The Central Darling seismic survey

Acquiring new 2D seismic data was deemed a critical part of the Stage 2 exploration campaign. The data would improve the geological model of the Pondie Range and Poopelloe Lake troughs and determine the best location of follow up drilling. As such, CINSW planned the Central Darling seismic survey (CDSS) to acquire 180km of high-quality shallow and deep crustal seismic data. Six seismic lines were planned which cover seismic data gaps shown in Figure 1.

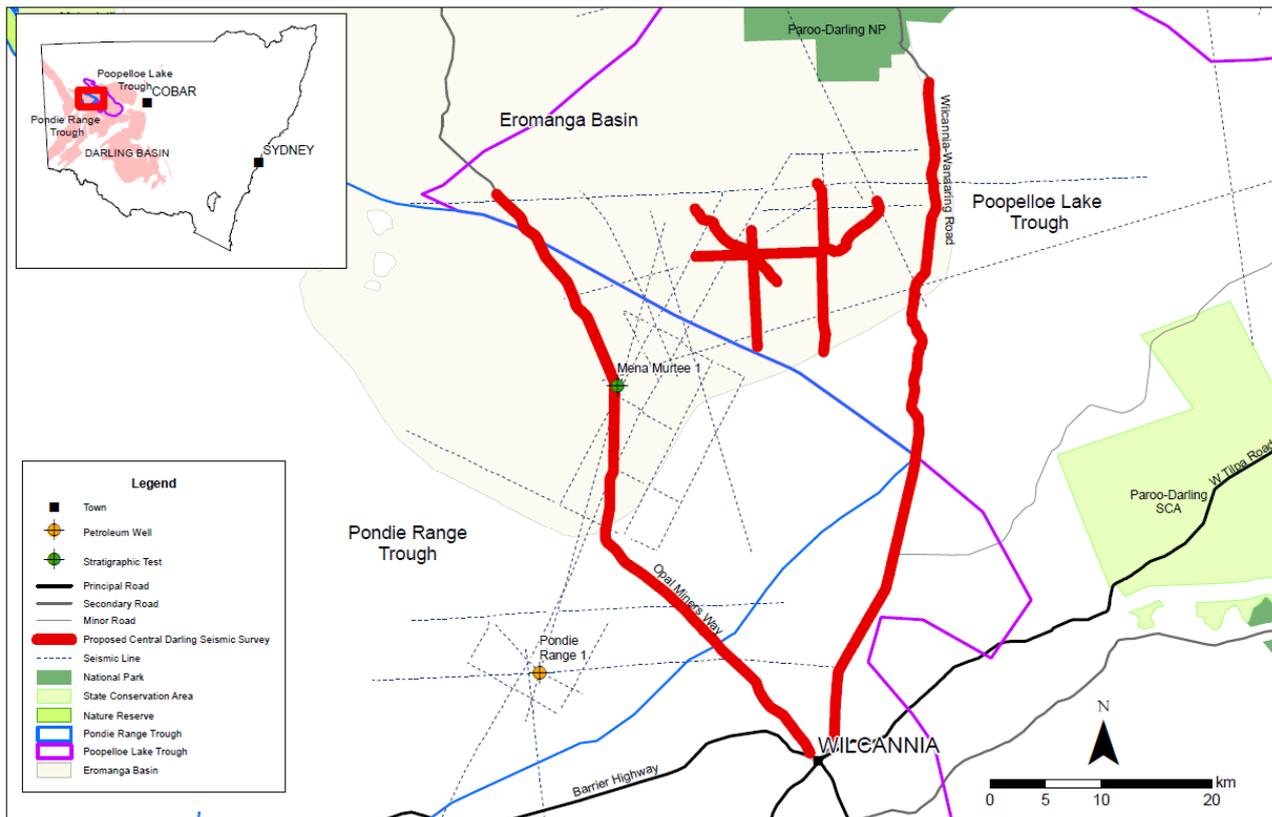


Figure 1: Central Darling seismic survey seismic lines

The CDSS was successfully completed on time and within budget over the course of one month in May and June 2021. The survey was conducted on public roads and private property within the Department's exploration license (EL8066). No safety or environmental incidents occurred. The project was well received in the surrounding communities of White Cliffs and Wilcannia, NSW.

Drilling program

CINSW is working closely with the Geological Survey of NSW (GSNSW) to identify drilling targets. Once processed, the newly acquired data from the Central Darling Seismic Survey will be used by the GSNSW to enhance understanding of the Darling Basin and plan the best location for drilling.

Following interpretation of the new seismic data, CINSW is planning to conduct a three well exploration program. One well is to be drilled in each of three prospective troughs - the Pondie Range, Poopelloe Lake and Yathong troughs. Each well will be drilled to approximately 1,600–1,800 m depth to intersect the prospective Ravendale Formation.

A comprehensive data acquisition program will be undertaken in each well comprising geophysical logging, coring, flow testing, fluid sampling, and hydrogeological appraisal. The resultant data will be interpreted and modelled to improve understanding of the geological targets, build confidence in the adequacy of the three key requirements for geosequestration (CO₂ capacity, injectivity, containment), and reduce key uncertainties.

A number of consultancy studies were undertaken in the first half of 2021 to help in the design and planning of the drilling program, including:

- CO₂ storage in the Darling Basin: A geological & geophysical data review and static model update.
 - A consultant was procured to incorporate the newly acquired data from the Central Darling Seismic Survey into a representative geological model. The first stage of the project has commenced through a rigorous review of the geological and geophysical

data from existing relevant wells in the Darling Basin. This data, along with the existing and newly acquired seismic data and other key information, will be used to update the existing static model for the exploration area of interest.

- Well cost review for CINSW Darling Basin Stage 2 drilling program
 - A specialist exploration drilling management firm was procured to perform a review and develop high level cost estimates for the planned drilling program. Alternative approaches to achieve the required Stage 2 project outcomes were also assessed. Recommendations from this study have been used to update the drilling strategy and budget.
- Well Testing Review for CINSW Darling Basin Stage 2 Drilling Program:
 - A consulting firm was procured to provide advice on the design of comprehensive flow test. The test will; enable estimation of the prospective carbon storage reservoirs' size and properties, collect representative reservoir fluid samples, and estimate well deliverability. The flow test is being initially designed based on the existing well data from Stage 1B and will be fine-tuned using Stage 2 well logs as they become available. The design work will form the basis for procuring the right service companies and test equipment. A draft report has been received and is under review.

C6. Audit fees

CINSW spent \$27,370 on an independent financial audit. The *Public Finance and Audit Act 1983* mandates the Auditor-General audit the Coal Innovation NSW Fund as it is a Special Deposits Account. The audited financial report is included in Section D of this report and comprises a statement of net assets, comprehensive income and associated note disclosures.

© State of New South Wales through the Department of Regional NSW 2021. The information contained in this publication is based on knowledge and understanding at the time of writing (October 2021). However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Department Regional NSW or the user's independent adviser.

Appendices

Appendix A - Sections of the *Coal Innovation Administration Act 2008* relevant to the annual report

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.

Section 7 of the Act, details Payments out of the Fund as follows:

- (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.

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) two persons, each of whom is employed in or by a government agency,
 - (c) two 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.

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.

Appendix B – CINSW Fund Independent Auditor’s report



INDEPENDENT AUDITOR'S REPORT

Coal Innovation NSW Fund

To the:

- The Treasurer of New South Wales (the Treasurer)
- Minister for Regional New South Wales (the Minister)

Opinion

I have audited the accompanying special purpose financial report (the financial report) of the Coal Innovation NSW Fund (the Fund), which comprises the Statement by the Deputy Secretary, Mining, Exploration and Geoscience, Department of Regional NSW (the Deputy Secretary), the Statement of income and expenditure for the year ended 30 June 2021, the Statement of net assets as at 30 June 2021, and notes comprising a Summary of significant accounting policies and other explanatory information. The financial report has been prepared by the Deputy Secretary, as delegate of the Minister, using the basis of accounting described in Note 1 to the financial report.

In my opinion, the financial report presents fairly the net assets of the Fund as at 30 June 2021, and of the financial transactions of the Fund in accordance with the basis of accounting described in Note 1 to the financial report.

My opinion should be read in conjunction with the rest of this report.

Basis for Opinion

I conducted my audit in accordance with Australian Auditing Standards. My responsibilities under the standards are described in the 'Auditor's Responsibilities for the Audit of the Financial Report' section of my report.

I am independent of the Fund in accordance with the requirements of the:

- Australian Auditing Standards
- Accounting Professional and Ethical Standards Board's APES 110 'Code of Ethics for Professional Accountants (including Independence Standards)' (APES 110).

I have fulfilled my other ethical responsibilities in accordance with APES 110.

Parliament promotes independence by ensuring the Auditor-General and the Audit Office of New South Wales are not compromised in their roles by:

- providing that only Parliament, and not the executive government, can remove an Auditor-General
- mandating the Auditor-General as auditor of public sector agencies
- precluding the Auditor-General from providing non-audit services.

I believe the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Emphasis of Matter - Basis of Accounting and Restriction on Distribution

Without modifying my opinion, I draw attention to Note 1 to the financial report, which describes the basis of accounting. The financial report has been prepared for the purpose of fulfilling the Fund's financial reporting obligations requested by the Treasurer's delegate. As a result, the financial report may not be suitable for another purpose. My report is intended solely for the Deputy Secretary, the Minister and the Treasurer, and should not be distributed to any other parties.

The Deputy Secretary's Responsibilities for the Financial Report

The Deputy Secretary is responsible for the preparation and fair presentation of the financial report in accordance with the basis of accounting described in Note 1 to the financial report, and for such internal control as the Deputy Secretary determines is necessary to enable the preparation and fair presentation of the financial report that is free from material misstatement, whether due to fraud or error. The Deputy Secretary has determined that the accounting policies described in Note 1 are appropriate for the purpose of fulfilling the Fund's annual financial reporting obligations requested by the Treasurer's delegate.

In preparing the financial report, the Deputy Secretary is responsible for assessing the Fund's ability to continue as a going concern, disclosing as applicable, matters related to going concern and using the going concern basis of accounting.

Auditor's Responsibilities for the Audit of the Financial Report

My objectives are to:

- obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error
- issue an Independent Auditor's Report including my opinion.

Reasonable assurance is a high level of assurance, but does not guarantee an audit conducted in accordance with Australian Auditing Standards will always detect material misstatements. Misstatements can arise from fraud or error. Misstatements are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions users take based on the financial report.

A description of my responsibilities for the audit of the financial report is located at the Auditing and Assurance Standards Board website at: www.auasb.gov.au/auditors_responsibilities/ar4.pdf. The description forms part of my auditor's report.

The scope of my audit does not include, nor provide assurance:

- that the Fund carried out its activities effectively, efficiently and economically
- about the security and controls over the electronic publication of the audited financial report on any website where it may be presented
- about any other information which may have been hyperlinked to/from the financial report.



Min Lee
Director, Financial Audit

Delegate of the Auditor-General for New South Wales

25 October 2021
SYDNEY

Appendix C - Audited Financial Statement for the CINSW Fund

for the year ended 30 June 2021

Coal Innovation Fund

Financial Report

for the year ended 30 June 2021

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Coal Innovation NSW Fund
Statement by the Deputy Secretary
for the year ended 30 June 2021

I declare, on behalf of the Coal Innovation NSW Fund (the Fund) that in my opinion:

1. The accompanying financial report provides details of the transactions of the Fund for the year ended 30 June 2021;
2. The financial report has been prepared as a special purpose financial report in accordance with the basis of preparation described in Note 1(b); and
3. The accompanying financial report presents fairly the net assets of the Fund as at 30 June 2021 and of its income and expenditure for the year 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.



Georgina Beattie
Deputy Secretary, Mining, Exploration and Geoscience
Department of Regional NSW

Date: 22 October 2021

Coal Innovation NSW Fund
Statement of income and expenditure
for the year ended 30 June 2021

	Notes	Actual 2021 \$'000	Actual 2020 \$'000
Revenue			
Interest revenue	1(e)	110	510
Total revenue		110	510
Expenses			
Auditor's remuneration - audit of financial report		27	27
Research and development grants		1,651	3,681
Other contractors and professional expenses	1(c)	1,171	304
Salaries and wages (including recreation leave)		460	430
Superannuation		42	37
Payroll tax and fringe benefits tax		24	25
Other operating expense		23	23
Travel		14	4
Administration fees		-	1
Training and staff development		2	3
Telecommunication		1	1
Motor vehicle		-	1
Total expenses		3,415	4,537
Net result		(3,305)	(4,027)

The accompanying notes form part of the financial report.

Coal Innovation NSW Fund

Statement of net assets

as at 30 June 2021

	Actual 2021 \$'000	Actual 2020 \$'000
ASSETS		
Current assets		
Cash and cash equivalents	69,742	72,454
Prepaid expense	155	-
GST receivable	50	66
Total current assets	69,947	72,520
Total assets	69,947	72,520
LIABILITIES		
Current liabilities		
Accrued expenses	551	720
Payable to Department of Regional NSW	1,663	761
Total current liabilities	2,214	1,481
Total liabilities	2,214	1,481
Net assets	67,733	71,039

The accompanying notes form part of the financial report.

Coal Innovation NSW Fund Notes to the financial report

for the year ended 30 June 2021

1. Summary of significant accounting policies

(a) Reporting entity

The Coal Innovation NSW Fund (the Fund) is a not-for-profit fund (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 not a 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 2020 to 30 June 2021.

This financial report for the year ended 30 June 2021 has been authorised for issue by the Deputy Secretary, Division of Mining, Exploration and Geoscience, Department of Regional NSW, on the date the accompanying Statement by the 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,
- 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.

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.

Under the Administrative Arrangements (Administrative Changes – Public Service Agencies) Order 2019, dated 2 April 2019, the Department of Planning and Environment (DPE) was abolished with effect from 1 July 2019 and its status as an employing and a reporting entity ceased. DPE's functions were transferred to the newly formed Department of Planning, Industry and Environment (DPIE). Subsequently, under the Administrative Arrangements (Administrative Changes – Regional NSW and Independent Planning Commission) Order 2020, dated 2 April 2020, person employed in the Regions, Industry Agriculture and Resources Group in DPIE were transferred to Department of Regional NSW (DRNSW). These administrative changes have no financial impact other than the transfer of staff allocated to administer the Fund's activities being transferred to new Departments.

Coal Innovation NSW Fund

Notes to the financial report

for the year ended 30 June 2021

1. Summary of significant accounting policies (cont'd)

(b) 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 income and expenditure 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.

(c) Research and development expenses (Contractors and Professional expenses)

The Fund engages contractors to conduct work for site preparation, drilling, engineering, project management research activities and peer review of research results. This activity is classified as in the 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.

(d) Accounting for the Goods and Services Tax (GST)

Income, expenses and assets are recognised net of the amount of GST, except that 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 an asset's cost of acquisition or as part of an item of expense and
- receivables and payables are stated with the amount of GST included.

(e) 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.

Interest Revenue

Interest income is recognised using the effective interest rate method. The effective interest rate is the rate that exactly discounts the estimated future cash receipts over the expected life of the financial instrument or a shorter period, where appropriate, to the net carrying amount of the financial asset.

(f) Receivables

Trade receivables and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as receivables. Receivables are measured at amortised cost using the effective interest method, less any impairment. Changes are recognised in the net result for the year when impaired, derecognised or through the amortisation process.

Short-term receivables with no stated interest rate are measured at the original invoice amount unless the effect of discounting is material.

(g) Payables

Payables represent liabilities for goods and services provided to the Fund and other amounts. Short-term payables with no stated interest rate are measured at the original invoice amount where the effect of discounting is immaterial.

(h) Personnel services

The Fund does not have any employees and received administrative, secretarial support and operational assistance from DRNSW during the year. The Fund had an arrangement with the Department to reimburse the Departments for personnel services expenses and other costs incurred on behalf of the Fund.

Coal Innovation NSW Fund
Notes to the financial report
for the year ended 30 June 2021

2. Cash receipts and payments

	Actual 2021 \$'000	Actual 2020 \$'000
Opening cash balance	72,454	76,535
Cash receipts:		
The Fund is authorised to receive amounts in accordance with Section 6 of the Act.		
(1) (a) the proceeds of the investment of money in the Fund	110	510
(b) all money directed or authorised to be paid into the Fund by or under this or any other Act or Law		
 BAS receipt	 -	 476
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	(1,651)	(3,680)
(b) administrative expenses incurred in relation to the Fund or CINSW	(1,171)	(1,387)
 Closing cash balance	 69,742	 72,454

3. Events after the reporting period

As at 30 June 2021, the Fund assessed the impact of COVID-19 on the fair value of its financial assets and Fund's operations. This was based on historical sales information, expectation of macroeconomic conditions and outlook at the time of assessment. Given continued uncertainty of the COVID-19 factor, it is possible that post 30 June 2021 there may be some new evidence that impacts this fair value assessment materially.

There are no other known events that would impact on the state of affairs of the Fund or have a material impact on the financial statements.

End of audited financial report.