2024 Global Methane Forum

Mobilizing Methane Action

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Australia CMM Update

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TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS
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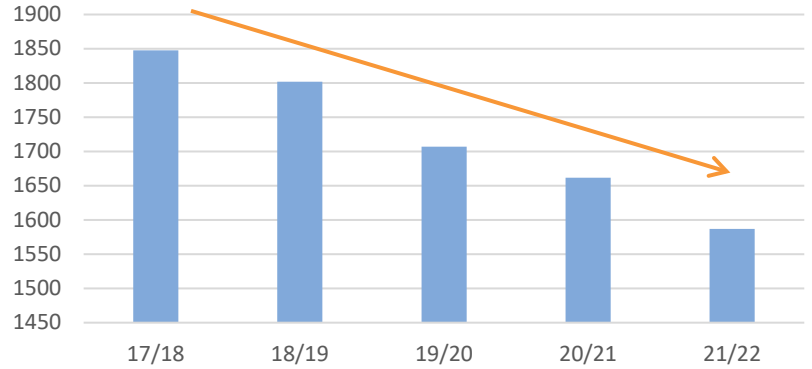
Coal Sector Trends Over the Past 5 Years

- Demand for coal nationally:
  - Coal consumption fell 4 per cent in 2021–22;
    - Coal-fired electricity generation accounts for about 88% of all domestic coal use.
    - The other notable usage is in Iron and steel production, which has remained mostly steady
  - In FY2022, Australian coal energy consumption decreased 5.5% from 2021 to 1,587 Petajoule (PJ).
    - The continued decline is attributed to lower coal-fired electricity generation
    - Coal contributed to 47% of total electricity generation in 2022, a notable decrease from 68% in 2009.
  - Coal consumption is expected to further decrease, according to the continued long-term decline in coal-fired electricity generation.

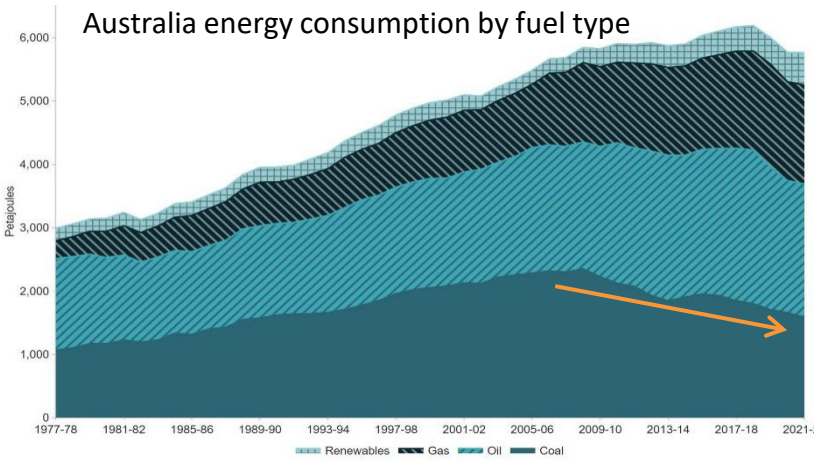
Coal consumption (in PJ) in Australia



1 PJ = 0.278 GWh=43,000 t of black coal

Data source: Australian Energy Statistics

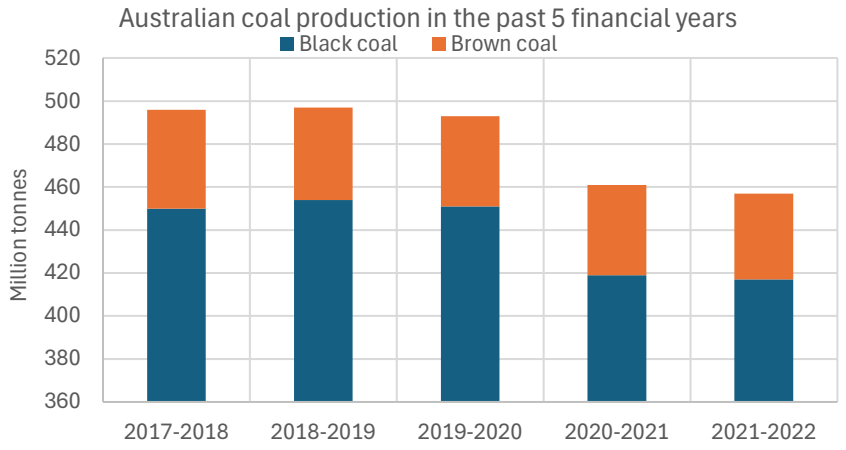
Australia energy consumption by fuel type



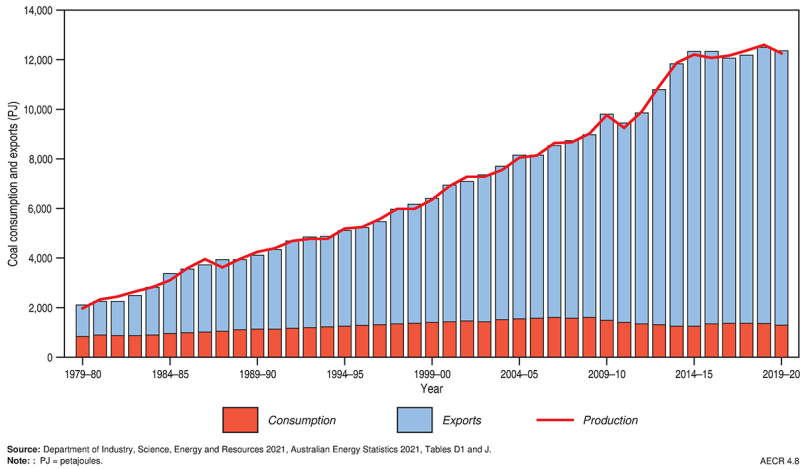
Source: DCCEEW (2023) Australian Energy Statistics, Table C

Coal Sector Trends Over the Past 5 Years

- Coal production:
  - Coal production in 2021/22 FY declined from its previous years:
    - Black coal production: 417 Mt, down from 454 Mt in 18/19.
    - Brown coal production: 40 Mt, down from 43 Mt in 18/19. It was 55% of its peak production in 09/10.
    - Coal productions between 2020-2022 were influenced by external factors including COVID-19, flooding, and China's restriction on coal imports.
  - Approximately 80% of coal is produced from open-cut mines.
  - 90% of Australian black coal production was exported.



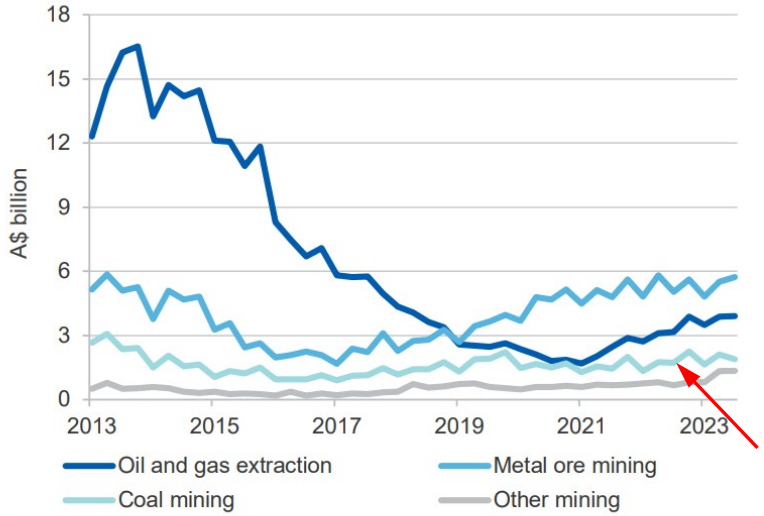
Data source: Annual Australian Energy Update



Coal Sector Trends Over the Past 5 Years

- Coal Industry
  - The coal industry is a significant contributor to Australia's economy.
  - Employed around 46,000 people and is projected to employ around 67,500 people by 2025.
- Coal exports are forecast to increase slightly in 2024-25
  - Metallurgical coal export is expected to lift from 156 Mt in 2022–23 to 169 Mt in 2024–25, as several new mines open.
  - Thermal coal export is projected to rise from 182 Mt in 2022–23 to 203 Mt by 2024–25.
- In general, the coal industry has experienced relatively stable investment levels in recent years

Figure 1.8: Mining capex by commodity, not seasonally adjusted

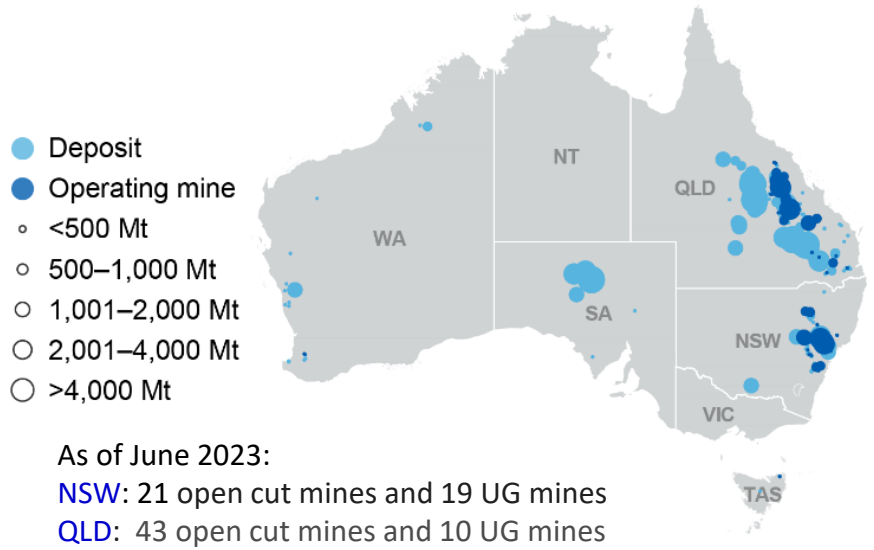


Notes: Other mining includes non-metallic mineral mining and quarrying and exploration and other mining support services; chart data is in nominal, original terms

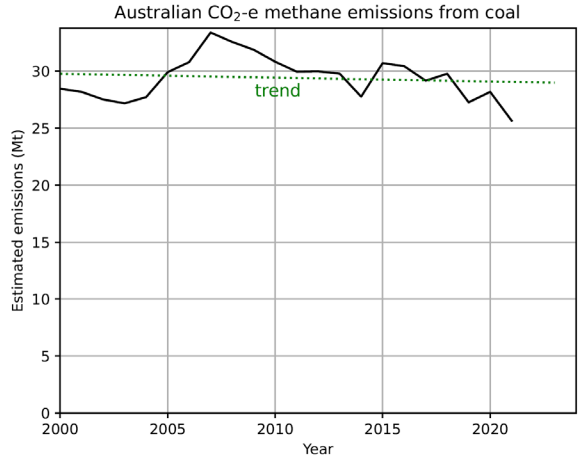
Source: ABS (2023) Private New Capital Expenditure and Expected Expenditure, 5625.0

Coal Mine Methane Outlook

- Number of operating coal mines, approximately
  - 69 open cut mines
  - 30 underground mines
- Methane emissions from coal mines in 2021:
  - Underground: 17.4 Mt CO_2-e
  - Open cut mining: 9.3 Mt CO_2-e
  - Abandoned mines: 0.8 Mt CO_2-e
  - CMM emissions have been declining from 2007
- Recent developments in coal mine methane mitigation:
  - Approximately 16 mines have implemented CMM extraction and mitigation projects
  - One full-scale VAM abatement site trial is in progress



As of June 2023:
NSW: 21 open cut mines and 19 UG mines
QLD: 43 open cut mines and 10 UG mines



Source: National Inventory

CMM Projects in Australia

Mine Type	Number of Projects	Use in Electric Generation	Flare	VAM/full-scale trial in progress
Active underground	20	11	8	1

Note: the numbers were summarised from publicly available information, and it may not have captured all the ongoing CMM projects in Australia.

A 63MW Power Station utilising coal mine gas (Source: Clarke energy)

Drainage gas flaring facility at a mine (2016)

- CMM projects have avoided substantial fugitive emissions from underground mines.

CMM Mitigation Efforts

- Governments
  - In 2023, the Australian Government funded two VAM R&D projects under the Resource Methane Abatement Fund Program. The projects are to complete by April 2025.
  - In 2024, QLD State Government introduced a $520 million Low Emissions Investment Partnerships (LEIP) Program, to accelerate investment in projects that will drive down emissions in Queensland's highest emitting facilities, with an initial focus on metallurgical coal sector.
  - Since 2009, NSW State Government has allocated $100 million Coal Innovation (CINSW) fund to assist emerging technologies (e.g. VAM) that can provide future solutions to reducing GHG emissions associated with coal mining and coal use.
- Industry
  - Continually provide funding through its ACARP program to R&D projects that can continually improve CMM management
  - A significant ACARP project is optimal goaf gas management ($2.0M), being undertaken by CSIRO, to develop strategies that can minimise CMM emissions while enhancing mining safety.

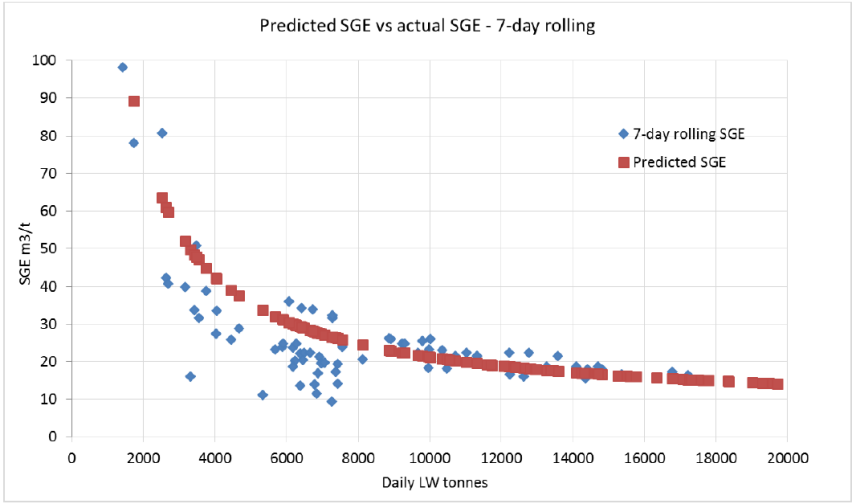
CMM Research Progress at CSIRO: VAM

- High TRL VAM technologies
  - VAMCAT – novel catalytic gas turbine system operating with 0.8% CH4 in air for power generation
  - VAMMIT – newly structured regenerative bed to destroy ≥0.3% CH4 in the air
  - VAMCAP – novel carbon composite adsorbents and associated process for enriching VAM
  - Catalytic VAMMIT – destroy ≥ 0.1% CH4 at low temperature with high capacity
- Emerging technologies
  - Photocatalytic oxidation – destroy CH4 at ambient conditions using sunlight, targeting ultra dilute CH4 emissions, with potential applications in open cut mines
  - Low-cost non-precious metal catalysts for VAM thermal catalytic oxidation

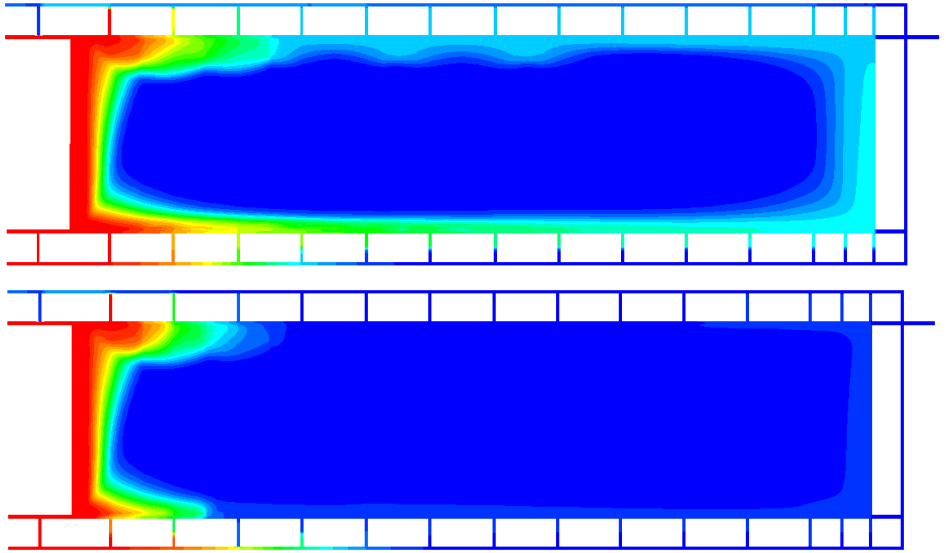
CMM Research Progress at CSIRO: CMM Capture

Continually improve data, methods and technologies to assist industry in capturing and reducing CMM

- Reliable methane emission prediction
  - A new methane emission estimate model that can better guide coal production and gas management
- Enhancing gas drainage
  - Innovative drainage design, layout and operational strategies
  - N2 injection for improved pre and post drainage



Improved longwall gas emission prediction



Improved goaf gas management and drainage