

SUSTAINABILITY OF ENERGY SUPPLY AND RESOURCES IN NSW

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Background

The Hunter Community Environment Centre is a not-for-profit environmental resource centre located in Newcastle, established in 2004 to support grassroots community efforts to protect and preserve the important ecological assets of the greater Hunter Valley.

Through environmental investigation, report writing and research, skill-sharing, community engagement and outreach, the HCEC seeks to facilitate input from grassroots constituents towards improved social and environmental outcomes.

In addition to its active volunteer base, Management Committee and staff, the centre is connected with network of ecologists, researchers and academics, grassroots and professional campaigners, lawyers and other experts, as well as a database of over 2000 supporters across NSW and interstate.

Our staff and volunteers meet with MPs, Ministers and the EPA to share research and recommendations and on key local issues, which are informed by both community perspectives and environmental conservation considerations.

The centre has collaborated with numerous community and environmental advocates to campaign on the public health and environmental impacts of Newcastle's coal export industry, marine habitat destruction, the protection of threatened species habitat, and more recently on the Petroleum Exploration Licence 11 (seismic testing), and finally water contamination issues from coal-fired power stations, which will form the basis of this submission.

We would like request that hearings take place the Hunter and Lake Macquarie regions as part of this inquiry, so that the Committee may glean a fuller insight into the environmental and social impacts of the current energy system in these regions, and to expand on the information produced from the inquiry.

We thank the committee for its initiative, warmly welcome the Inquiry and the potential opportunities and pathways it may proffer for investment in sustainable and equitable infrastructure and outcomes for the regional communities and environments of New South Wales.

Out of the Ashes: recent research into pollution from aging coal-fired power stations

In February 2019, the HCEC released its most recent report, *Out of the Ashes: Water pollution and Lake Macquarie's aging coal-fired power stations*¹ attracting national media coverage² of the heavy metal contamination in Lake Macquarie's water, sediment and

¹*Out of the Ashes: Water pollution and Lake Macquarie's aging coal-fired power stations*, Paul Winn, Hunter Community Environment Centre, <http://www.hcec.org.au/content/out-ashes>

² *Coal ash has become one of Australia's biggest waste problems — and a solution is being ignored*, ABC Newcastle, Ben Millington, https://www.abc.net.au/news/2019-03-10/coal-ash-has-become-one-of-australias-biggest-waste-problems/10886866?fbclid=IwAR3UqXzRI_t-cRMmRGYGL6623gmFc4j994S5iF5mLog9Nachaj8N7TDkQrU

seafood, caused by discharge from the Vales Point (1320MW) and Eraring (2880MW) coal-fired power stations, and their leaching coal-ash waste dumps.

The report is the most recent contribution to a body of literature on the presence of accumulating heavy metals in the lake, and makes a case for the adoption of alternative rehabilitation methods to the current industry practice of ash dam capping with top-soil, such as the increased beneficial reuse of coal-ash in the production of cement and other building products.³

Human health impacts, on-going pollution and environmental risk are being created by the current rehabilitation regime, in part due to the construction of ash dams and power stations in Australia pre-dating the *Protection of Environment and Operations Act 1997*, meaning domestic ash dam's fall short of best-practice storage requirements.

Facilitating the safe and beneficial reuse of an expanding volume of toxic coal ash waste could hold the answer to both environmental and economic hurdles presented upon the closure of coal-fired power stations, in this and other regions.

With the Eraring facility slated for closure in 2032 and Vales Point in 2028, collaboration and consultation between State Government, the EPA, owners and operators, industry and community and environmental advocates will need to commence, so that implicit economic, environmental and social challenges of an energy transition can be addressed comprehensively.

The *Out of the Ashes* report adds to the research into potential and sustainable solutions to these challenges, with our submission outlining impacts of current coal-ash waste storage practices, followed by proposals to mitigate environmental issues, whilst generating positive social and economic outcomes for the Lake Macquarie and Central Coast region as a diversification away from coal-fired power plays out.

Environmental, community and public health impacts and risks of coal-ash waste

Coal-fired power stations are commonly associated with air pollution in the form of particulates and CO₂, and the attendant respiratory health and global climate impacts.

Surface and groundwater pollution from coal-ash waste storage dams, and smoke stacks in the case of mercury, is a lesser known and distinct problem, yet one of national significance.

- It is estimated that over 400 million tonnes of ash waste is stored in unlined dams across Australia
- In 2016, ash produced by Australia's coal-fired power stations represented 20% of all domestic waste
- Ash dumps in Australia lack impervious membranes designed to contain leachate which has caused groundwater contamination in a number of instances⁴

³ *Capping with topsoil was employed in South Australia by Flinders Power, as part of the Port Augusta power station rehabilitation, and resulted in on-going air-pollution incidents and respiratory issues in nearby communities, as well as suspected water contamination*

⁴ *Unearthing Australia's Toxic Coal-ash Legacy*, Bronya Lipski, Environment Justice Australia, https://www.envirojustice.org.au/wp-content/uploads/2019/06/EJA_CoalAshReport.final_.pdf

- Coal-ash contains numerous toxic trace elements including heavy metals, which cause a range of human health and ecological impacts when over-exposure occurs
- There are no regulations or requirements for financial bonds to be set aside by owners/operators for waste site rehabilitation
- Ash dumps are exempted from certain regulations which comparable waste sites are subject to

The coal-ash waste stored on the shores of Lake Macquarie, amounts to over 60 million tonnes (Vales Point: 28Mt, Eraring: 32Mt approx.), with leaching and direct discharge of via cooling-water outlets of heavy metals are currently effecting ecology and recreational use of the lake.

Lake Macquarie is the largest coastal estuary in eastern Australia, covering an area of 110km², attracting a healthy population of tourists, and being heavily utilised for sailing, boating and fishing, with numerous clubs in the region.

The industrial history of the lake encompasses the former Pasminco lead and zinc smelter at Boolaroo, with legacy smelter pollution in water and sediment present primarily in the Northern portion of the lake.

Due to little exchange of water between northern and southern portions of the Lake, and low rates of tidal flushing, the historic heavy metal inputs from the smelter and the current inputs from both power stations into the southern portion, can be easily distinguished.

In addition to reviewing existing literature and government tests for heavy metal in the lake, the HCEC conducted water sampling and analysis in Lake Macquarie during late 2018-early 2019, and identified exceedances of *Australian and New Zealand Environment and Conservation Council guidelines*⁵ and trigger points for marine and recreational waters in southern Lake Macquarie.

- Our testing revealed at all water samples taken near the Vales Point power station were found to exceed the concentrations recommended for aluminium, iron, and/or manganese under the ANZECC water quality guidelines for recreational purposes.
- Exceedances of NSW guidelines were also found for copper, nickel, zinc, cadmium and lead at various sample points near Vales Point.
- All the samples taken near to the Eraring power station were found to be contaminated with copper, lead, nickel and/or zinc at concentrations that exceeded ANZECC (2000) trigger values for marine waters.
- There are also a host of exceedances at groundwater monitoring points at both stations, with Vales Point exceeding concentration limits for arsenic, lead, chromium and copper, and Eraring showing exceedances for zinc, nickel, copper and arsenic.
- The Environmental Protection Licences (EPLs) for both facilities fail to account for the actual contaminants being released, with Vales Point (EPL 761) having no concentration limits on any heavy metals discharged, and Eraring (EPL 1429) setting

⁵ ANZECC & ARMICANZ (2000) water quality guidelines, <https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armicanz-2000>

concentration limits for just copper, iron and selenium, but at just one monitoring point.

- The effects of exposure to high heavy metal concentrations in aquatic organisms is of concern due to the tendency to bio-accumulation, causing deformation in fingerlings, reduced growth-rate and decreased reproductive success.
- Recreational fishing and consumption of fish from Lake Macquarie has been impeded, with a health warning to limit the consumption of fish from the lake due to high selenium concentrations being imposed for decades, and recent testing exposing high levels of cadmium in mud and blue swimmer crab.⁶

The community and social impacts of the huge volume of coal-ash waste in this area were recently highlighted with the closure of the Myuna Bay Sport and Recreation Centre.

- Concerns about the structural integrity of the dam wall conveyed in an engineers report created for Origin Energy, were shared with the Office of Sport prompting the abrupt closure and same-day evacuation of the recreation centre.⁷
- Subsequently an internal review was launched, to investigate the validity of the engineers report, and attempts by local community and government to see the centre re-opened ensued.⁸

The closure of the recreation centre due to uncertainty about the integrity and risks of Origins ash dump, indicates the burden unwittingly placed on local communities by inadequate coal-ash storage practices and management.

Risks, degradation to local environments and loss of community assets are part of the load communities are made to bear due to poor regulation, and lax management of coal-ash, which could be avoided if the removal and beneficial reuse of ash was prioritised and incentivised.

Opportunities to support regional economic development: fly ash and coal-ash reuse

Coal-ash is reused in Australia and around the world, with the global market for fly ash expected to increase to USD 6.86 billion by 2026, from 4.13 Billion in 2018.⁹

⁶ *Crabs in Lake Macquarie contaminated with 'unhealthy' levels of cadmium*, ABC Newcastle, Ben Millington, <https://www.abc.net.au/news/2019-03-11/crabs-lake-macquarie-nsw-contaminated-with-cadmium/10887750?fbclid=IwAR3UOL-feBeLS3mDwvyf4xuFSLiCjI2d9t2Vg2CBQlgxgLAAdTNSAIsbz-Zs>

⁷ *Myuna Bay Sport and Recreation Centre received a call to close — and these documents dispute the reason why*, ABC News, Nancy Notzon, Ben Millington, <https://www.abc.net.au/news/2019-07-17/myuna-bay-sport-closure-after-coal-ash-dam-earthquake-risk/11314374>

⁸ *Lake Macquarie MP Greg Piper starts petition to have Myuna Bay Sport and Recreation Centre reopened after NSW Office of Sport closure*, Newcastle Herald, Max McCinney, <https://www.newcastleherald.com.au/story/5984825/total-betrayal-of-our-community-furious-mp-starts-petition-to-save-myuna-bay-rec-centre/?src=rss&fbclid=IwAR10jE026WWw-ROcN0s7YFwgxi6Eu7cmElgvsS4na2hOQVJ4MW5MIZVGwU>

⁹ <https://www.globenewswire.com/news-release/2019/08/27/1907318/0/en/Fly-Ash-Market-To-Reach-USD-6-86-Billion-By-2026-Reports-And-Data.html>

The use of fly ash as a supplementary material in cement production being one of, if not the most environmentally sustainable form of reuse, and comes with a range of other benefits and potentials.

Some of the current applications of fly ash, including for mine site rehabilitation and mine void backfilling, agricultural soil amendments, fertilisers and potting mixes pose further risks of environmental damage through heavy metal exposure to groundwater and the food-chain¹⁰.

Coal-ash is well known to be an effective substitute for cement in concrete production, and is thus in demand from construction and manufacturing industries for whom its reuse presents new business and job opportunities.¹¹

Beyond Zero Emissions has estimated that once all coal-fired power stations in Australia are closed down, there are sufficient stockpiles of suitable fly ash to supply an estimated 20 years or more of domestic cement production.

Furthermore, the reuse of coal-ash in cement production could also substantially reduce greenhouse gas emissions from the cement industry, responsible for about 3 billion tonnes per year, or 8 percent of the world total.

In the case of Lake Macquarie, coal ash utilisation is necessary to address environmental issues caused by the toxic and leaching stockpiles and while it is viable.

An optimal scenario for fly and coal-ash utilisation from the Vales Point and Eraring dumps involves the establishment of an on-site manufacturing plant, with the raw material being processed into cement blocks or a light weight aggregate called Lytag at the dump sites.

The benefits of an on-site industry include an alternative employment opportunity in the same location for the power sector workforce, who may be exposed to job-loss and retrenchment as the nature and operation of coal-fired power stations evolve to accommodate other forms of energy coming online.

The existing rail infrastructure at both power stations could facilitate the export of the products, while minimising truck movements and transport costs.¹²

¹⁰ In January 2019, AGL suspended sales of coal ash and ash by-products from its Bayswater and Liddell power stations after testing of coal ash showed elevated levels of heavy metals, including chromium, cadmium and copper, which exceeded limits set by the Coal Ash Order 2014.

Environmental group slams watchdog after second Hunter power station coal ash problems, The Herald, Joanne McCarthy,

<https://www.newcastleherald.com.au/story/5856141/agl-admits-hunter-power-station-coal-ash-breaches/>

¹¹ *Special Report: Out of the Ashes*, ABC News, Ben Millington, <https://vimeo.com/322678824>

¹² Use of existing rail loops being preferable, due to the current frequent movements of Boral and Cement Australia's flyash trucks through the small towns of Dora Creek, Morisset and Mannering Park, degrading council roads and disturbing residents.

In the 1990's Pacific Power and Fly Ash Australia carried out a major investigation into the Lytag process with a small lab scale manufacturing plant set up at Eraring, and a full design and costing of the plant was carried out for a 500,000 tonne per annum plant.

Fly ash aggregates were also made at the CSIRO facility at North Ryde with satisfactory test concretes made with the finished material.

Post-privatisation, the plans did not proceed, however had it gone ahead together with the existing concrete market, most fly ash generated at Eraring would have been utilised, alleviating the need to expand the ash dam, and the heavy metal burden.

HCEC believes about 500,000 tonnes of Lytag (from the same amount of Lake Macquarie coal ash) could be sold into the high value lightweight concrete markets of Sydney, Newcastle, and Wollongong each year.

Barriers to the beneficial reuse of fly and coal-ash

Currently, both Vales Point and Eraring power stations have incredibly low reuse rates, a situation indicative of a broader trend across Australia, with 9.4 Mt of the 12.3 Mt of coal ash generated in 2016 being dumped in on-site ash dams, and only 1.8 Mt used in high value-added applications such as cement and concrete.

Eraring power stations ash waste management is a prime example of the failures in regulation as well as the commercial circumstances, working against beneficial reuse.

- In 2007, Eraring secured approval to expand its ash dumps and agreed to a target for coal ash reuse of 80% of all ash (both fly ash and furnace ash) by 31 December 2015. In 2015, Eraring was achieving 55% reuse but it is now reusing only 28% .
- Origin has an active application to raise Eraring's dam wall and expand its capacity by 5 million cubic tonnes, projected to facilitate ash storage only until 2024, eight years prior to decommissioning and the end of ash production.

There are technical, market and regulatory points to be addressed before the beneficial reuse and the creation of new industries to address the problem of ash waste pollution can be alleviated, and so too the environmental and community burdens.

Chemistry and material considerations

There is a distinction to be made between fly ash and bottom ash (or coal-ash), and while each share similar chemical compositions, their uses are different.

Fly ash, a grey powder similar to cement, is used in a range of cement-based products. Bottom ash, most of which is placed into ash waste dumps, is coarser and used as a sand replacement, aggregate for lightweight concrete blocks, a road-base component, for agricultural drainage mediums and as engineered bulk fill.

Due to its finer consistency and greater surface area, fly ash generally has higher concentrations of heavy metals than bottom ash.

Amendments to Regulation and Classification

All proposed coal ash applications should be thoroughly investigated by the EPA for their potential to cause environmental harm. Currently, responsibility for testing for heavy metals and other toxic material in coal ash that is sold for reuse is left to the ash generator, and improved regulation and EPA oversight is essential to minimise the risks associated with all reuse pathways.

The regulatory framework surrounding fly ash from Australian coal-fired power stations, specifically excludes it from hazardous waste classification, under the Commonwealth Controlled Waste National Environmental Protection Measure.

Unlike most landfill sites, coal fired power stations are not required to provide a financial security for the rehabilitation of coal ash dumps, partly to encourage the re-use of coal ash from power stations.¹³

This and other regulatory exemptions, including not being required to track or monitor the transportation of the material taken off-site, have failed to translate into higher reuse rates and the HCEC believe that shifting the cost-burden onto the power stations and charging a dumping fee, would provide a viable incentive for waste producers to pursue reuse.

Commercial structure of the cement industry

Besides the ease of dumping ash, the vertically integrated structure of the cement industry is major barrier to reuse on the necessary scale.

The ownership structure of the cement industry and its over-capacity of production, means the actual value of coal ash is less than the cost of cement production. Ironically, this limits the motivation of vertically integrated cement and concrete industries to reduce cement consumption and replace it with coal ash. Concrete companies only use as much fly ash as their fully-owned cement producers want them to.

This situation has led to cement manufacturers being prosecuted by the Australian Competition and Consumer Commission (ACCC) for breaching the Trade Practices Act in Queensland by entering into contracts with power stations to prevent them selling their coal ash to other buyers.

HCEC believes the cement industry is behaving in a similar way in NSW. Fly ash Australia (FAA), a joint venture equally owned by Boral and Cement Australia has a contract for exclusive rights to raw fly ash from Eraring power station's fabric filters - concrete grade fly ash that needs little processing. FAA only purchases half of the cement-grade shake

¹³ In NSW, consumers of coal ash are also exempted from licensing requirements under s48, and licensed waste facility contributions under s88 of the POEO Act, and from obligations for tracking and transportation of waste, waste facility reporting and notification, and restrictions on the application of waste to land used for growing plants.

ash produced by Eraring, and denies competitors access to the remainder. Fly ash Australia also has exclusive contracts to buy or use fly ash at Mount Piper and Bayswater power stations in NSW and Collie power station in WA.

With appropriate regulation and government incentives, we see coal ash reuse facilitated by on-site industries capable of addressing on-going contamination issues, reducing greenhouse pollution and providing for new enterprises and employment avenues for a redeployed workforce.

Summary

The specific and local nature of the issues articulated in this submission are symptomatic of the broader landscape of problems presented by thermal coal, and mining industries.

Mining for thermal coal in Lake Macquarie and the Central Coast for domestic burning, and of course the Hunter Valley for export is putting massive strains on human health, environmental and climate stability in Australia, the Pacific and across the world.

The necessity of adequately regulating polluting industries and specific industrial facilities is evident, and particularly pertinent upon closure and diversification to avoid legacy pollution issues going un-checked and increasing in severity and cost, both economically and ecologically.

In order to fully evaluate and embrace the possibilities of sustainable energy in NSW, the assessment and reparation of the environmental and social impacts of an energy system heavily reliant on thermal coal, on local, state and national scales should be pursued.

As outlined in the submission, adopting resource recovery and recycling options into the rehabilitation program of coal-fired power stations could be a driver of economic activity, and see the pressures placed on local communities and environments alleviated.

The longer it takes Governments, industry and communities to respond proactively and collaborate on solutions to these challenges, with environmental and community impacts left to intensify, the more the opportunities and options for diversification strategies capable of addressing the needs of diverse stakeholders will narrow.

With attention and resources from the NSW Government and EPA, the HCEC strongly believes in the viability and potential of establishing an on-site processing industry capable of generating market activity around Lake Macquarie's coal-ash and setting a new and improved precedent for the rehabilitation of toxic sites in NSW and the country.

Recommendations

- The EPA launch a full investigation into coal ash disposal and reuse, including the identification and publication of the concentrations of heavy metals in NSW coal ash to determine the environmental risks and whether all its current applications are appropriate for a hazardous waste.

- The NSW Government launch an investigation into possible safe commercial uses of coal ash and look to incentivise new on-site industries around safe coal ash reuse as a means of ridding the heavy metal burden of coal ash landfills, rehabilitating coal ash dams and providing affected workers with alternative employment when the State's coal-fired power stations are decommissioned.
- The EPA revoke the Coal Ash Exemption 2014 and ensure NSW power station operators obtain a 'Waste storage - hazardous, restricted solid, liquid, waste licence for ash dams and a 'Hazardous waste recovery licence for its beneficial reuse.
- To reduce the amount of coal ash dumped in ash dams in NSW and encourage its safe reuse, the NSW Government list coal ash as an assessable pollutant in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009, and the EPA impose a load-based licence fee of at least \$20 a tonne on all coal ash disposed of in ash dams, landfills, and mine voids; and review load-based license calculations and amend them to reflect the pollutants discharged and additional water pollutants including arsenic, cadmium, chromium, copper, lead, and zinc be added to Water Pollutants in Schedule 1 of the Protection on of the Environment Operations (General) Regulation 2009 under the heading "generation of electrical power from coal"

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