

Power station closures - *what next for workers and the environment?*

NSW power stations are both big employers and big polluters.

The closures dates are in the calendar,
2023, 2025, 2029, 2033...

Hear from
speakers and join
the discussion

Lake Macquarie

Doyalson RSL

Thursday September 8th,
6-8pm

Hunter

East Maitland Bowling Club

Thursday September 15th,
6-8pm

Welcome to Wonnarua Country

Scott Franks
CEO Tocomwall





NSW coal-ash impacts




Hunter Community
Environment Centre


September
2022

Overview

- Legacy coal-ash waste in NSW
- NSW Treasury's Baseline Contamination Assessments
- HCEC sampling results
- Metal bioaccumulation in water birds
- The true cost of coal ash.



CURRENT
POWER STATIONS



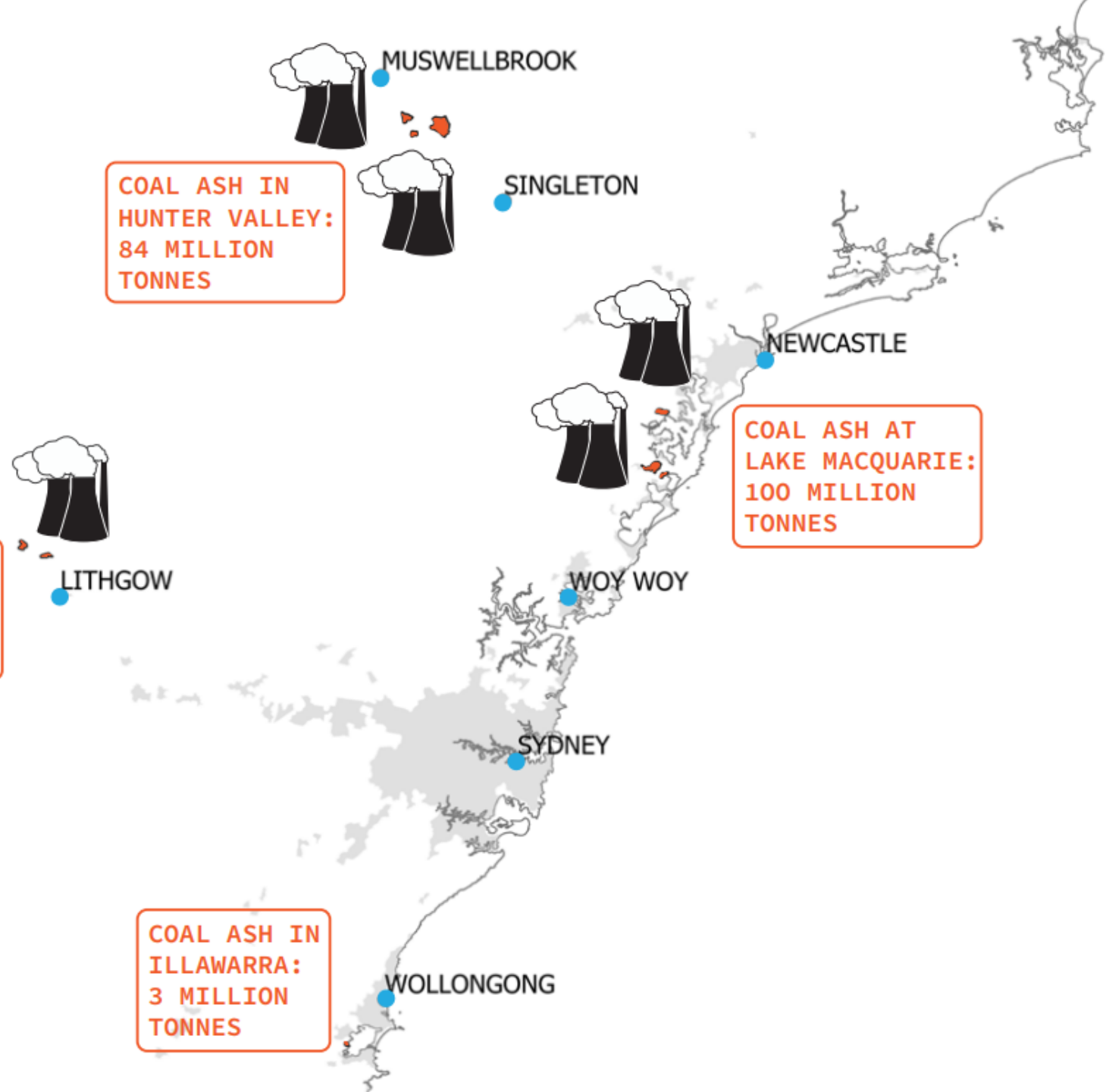
COAL ASH DAMS

COAL ASH
AT LITHGOW:
28 MILLION
TONNES

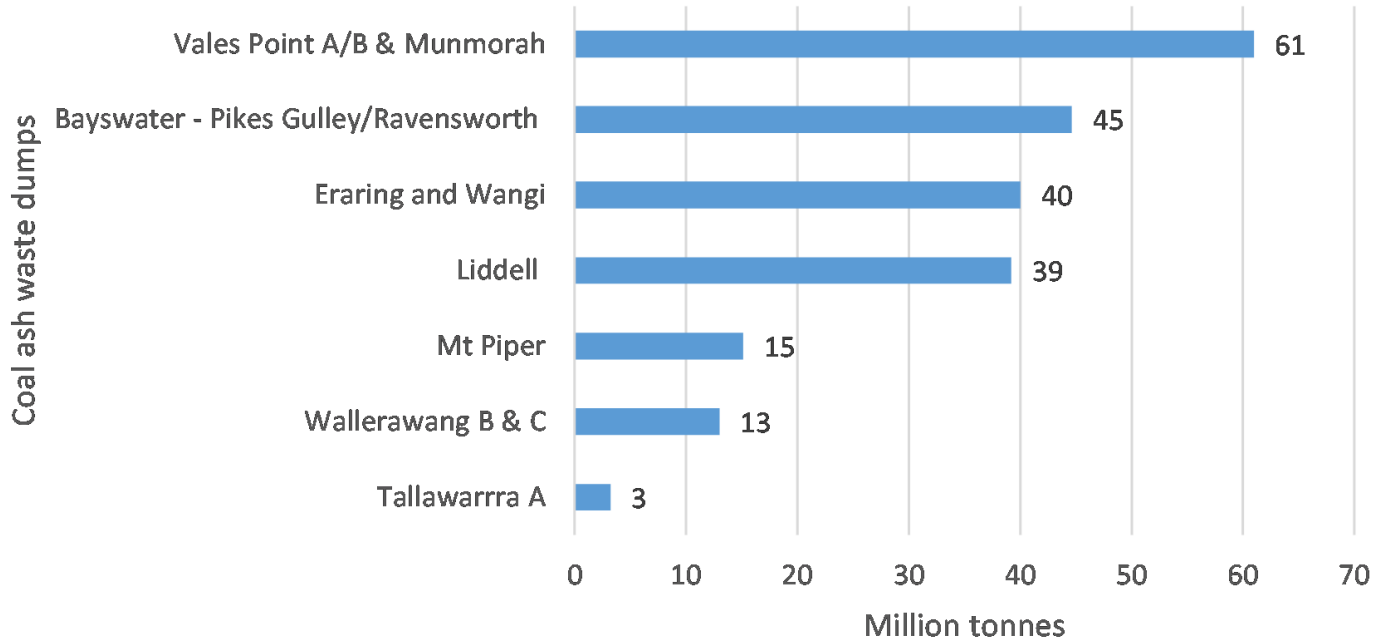
COAL ASH IN
HUNTER VALLEY:
84 MILLION
TONNES

COAL ASH IN
ILLAWARRA:
3 MILLION
TONNES

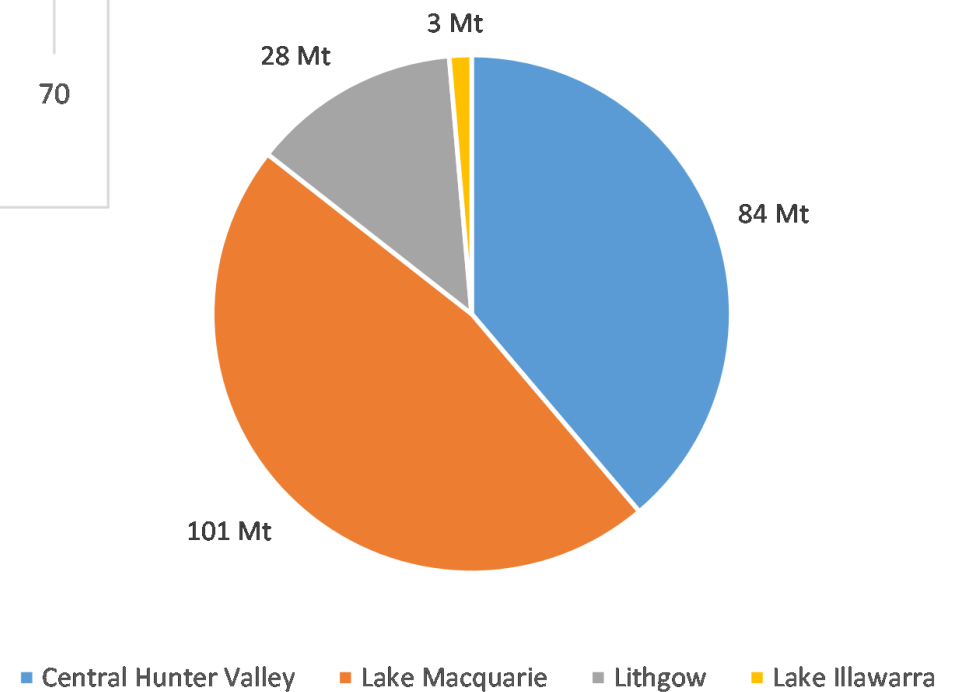
COAL ASH AT
LAKE MACQUARIE:
100 MILLION
TONNES



Accumulated coal ash waste



Regional accumulated coal ash waste



Liddell Environmental Site Assessment

- **Arsenic, cadmium, lead, nickel and selenium** in excess of the NHMRC drinking water values in groundwater across the site.
- **Lead, selenium and nickel** exceeded NHMRC recreational water guidelines in some areas.
- Substantial exceedances (above an order of magnitude of background) **boron, cadmium, lead, nickel, selenium, zinc** at the ash dam boundary.

Bayswater Environmental Site Assessment

- **Pikes Gully ash dam** - Boron, cadmium, copper, lead, manganese, nickel, and zinc in excess drinking water guidelines. Lead and nickel above the recreational use guidelines.
- **Ravensworth Rehabilitation Area** ash dump in contact with regional groundwater flow.
- Impacts observed in the other areas within this catchment would be minor contributors to the overall potential impacts arising from the ash dams.



4 - Lake Liddell

Liddell Ash Dam

3 - Tinkers Creek

Hebden

Bayswater Ash Dam

6 - Pikes Gulley Creek

Liddell

2 - Bowmans Creek

1 - Bowmans Creek

Former fly ash disposal (now capped)

Void 4

Ravensworth

Howick

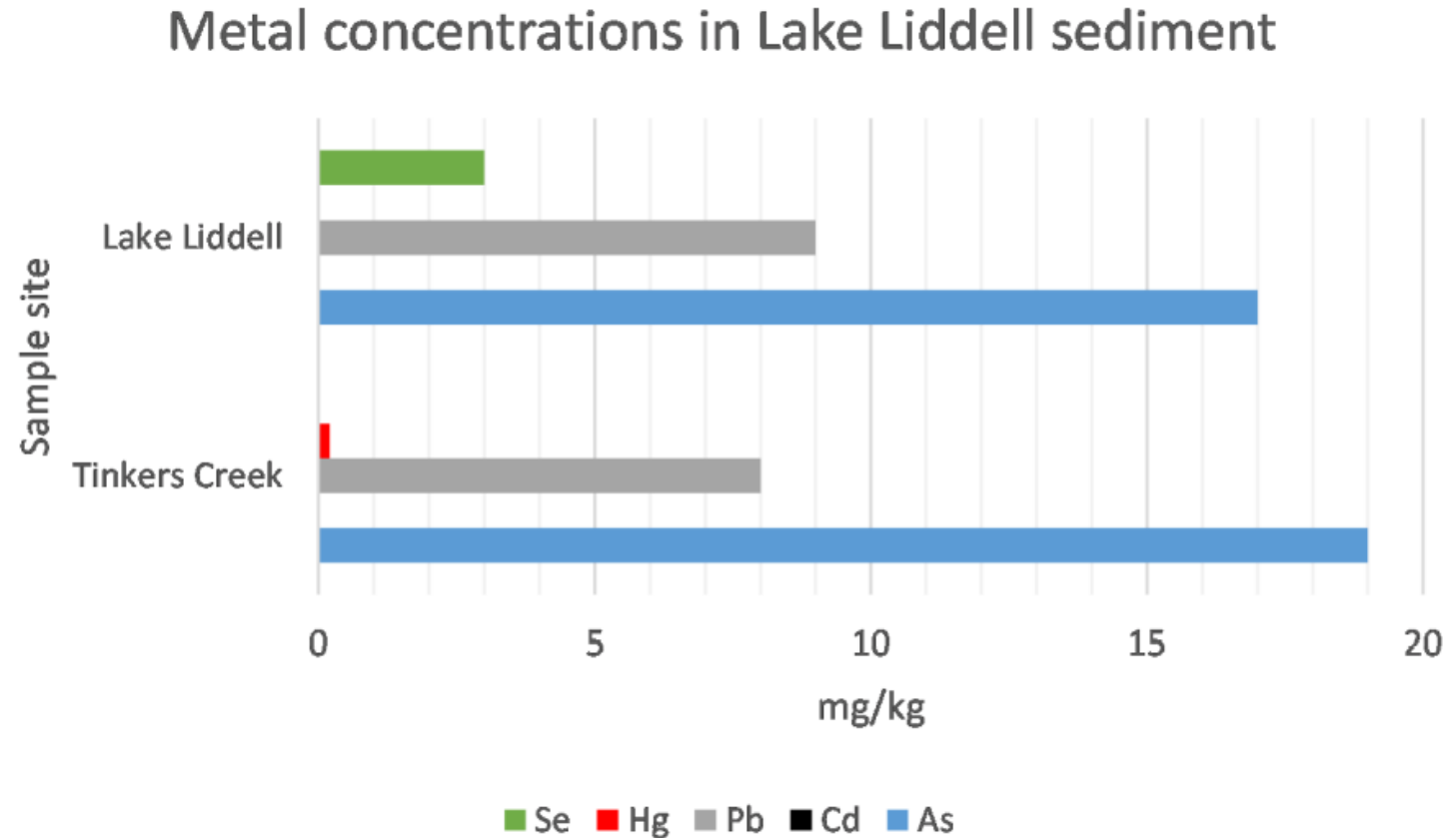
Current fly ash disposal

Image © 2020 CNES/Airbus
© 2020 Google

Google Earth

HCEC sediment testing: Bayswater and Liddell, 2020

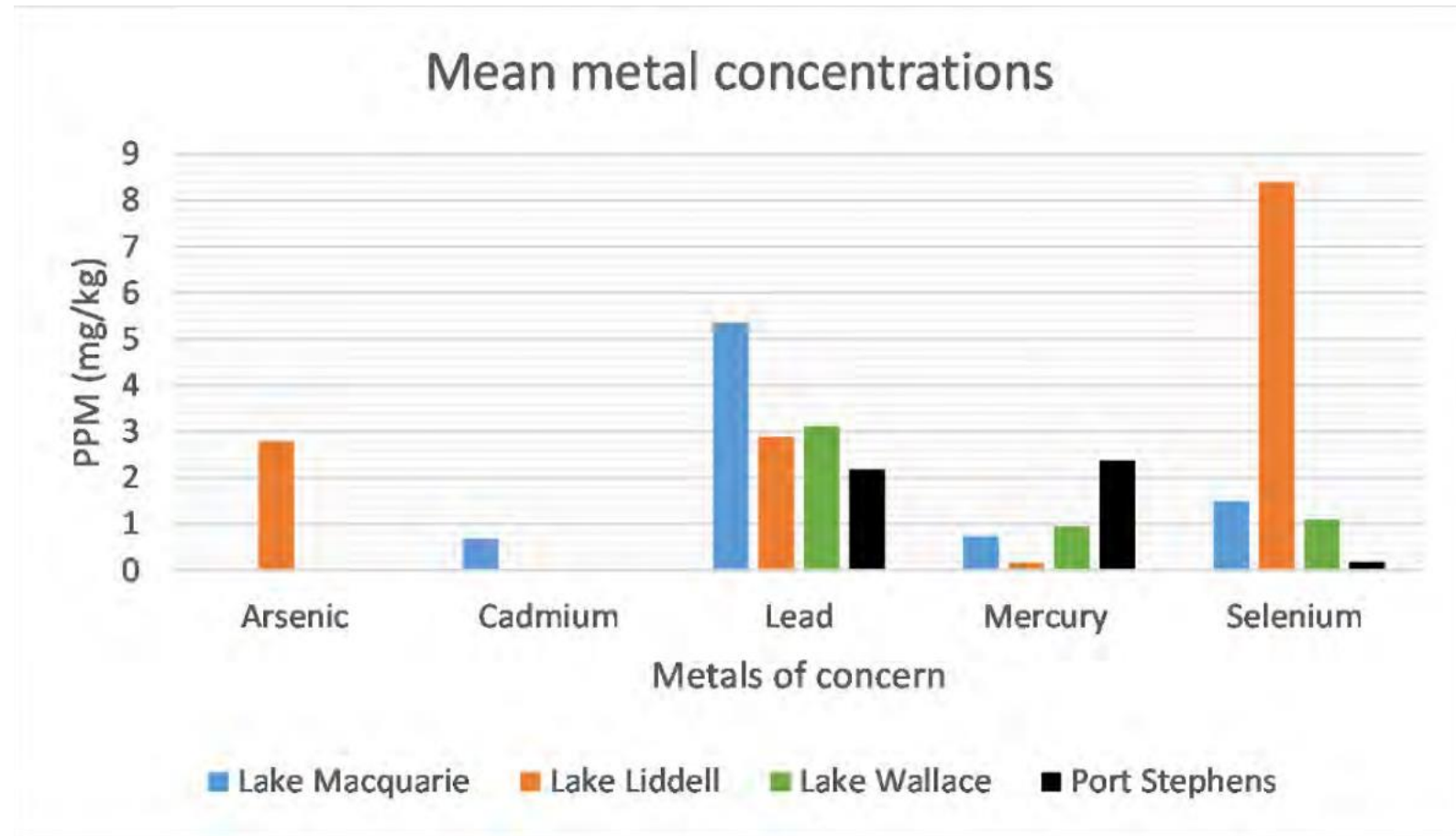
HCEC collected water and sediment samples from waterways draining AGL's Bayswater and Liddell ash dumps in July 2020.



Results for Lake Liddell sediment included:
Selenium - 3mg/kg Arsenic - 19 mg/kg Lead - 9 mg/kg

Toxic Habitat: *Heavy metal impacts on water birds near NSW coal fired power stations*

Half of all birds from which we sampled feathers were potentially suffering health impacts from heavy metals emitted by coal-fired power stations.



Results summary: Bird feather study

Lake Macquarie

Significant concentrations of lead were found in all the waterbird feathers.

Lake Wallace

Seven of the nine feathers collected from Lake Wallace contained detectable concentrations of lead, mercury, and selenium.

Seven feathers had detectable lead. One almost six times the adverse health impact threshold.

Three of the nine feathers contained detectible selenium. All three were above adverse health impact thresholds

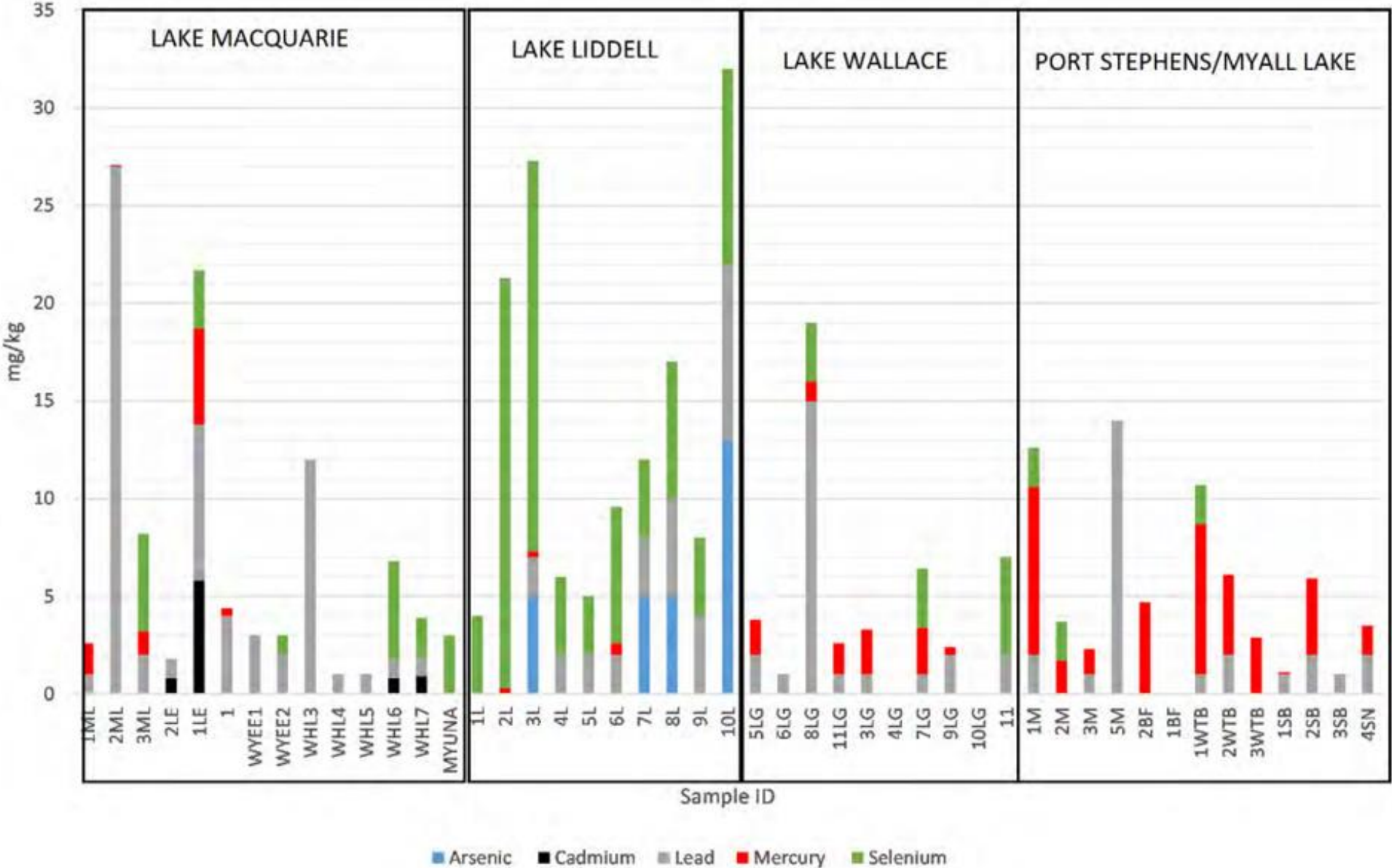
Lake Liddell

Selenium was found in all the feathers collected from Lake Liddell. Many in excess of estimated health impact thresholds.

Arsenic was found in 4/10 feathers from Lake Liddell. Feather from the other sites had no detectable arsenic.

Highest concentrations of arsenic, lead, and selenium was taken from an adult Black Swan carcass.

Cumulative metals – all sites



Annual metal leaching from NSW ash

Zinc	5t
Copper	3t
Selenium	3t
Chromium	2t
Arsenic	1.6t
Nickel	681kg
Nickel	681kg
Cadmium	193kg
Lead	80kg
Mercury	40kg

Metal (mg/k - ppm)		NSW coal-fired power stations					Mean ppm	Estimated annual leachate (kg)
		1	2	3	12	13		
Arsenic	As	12	4	6.6	12	43	16	1,634
Boron	B	25	56	89	75	80	65	44,428
Barium	Ba	393	420	653	393	510	474	29,668
Berillium	Be	22	15	4	9	6	11	1,473
Cadmium	Cd	0.4	0.9	0.25	0.44	0.35	0	193
Cobalt	Co	11	10	6	11	38	15	220
Chromium	Cr	50	40	18	45	72	45	2,017
Copper	Cu	52	50	28	47	151	66	2,940
Gernanium	Ge	40	18	5	10	10	17	2,998
Mercuy	Hg	0.02	0.03	0.15	0.12	0.22	0	39
Lithium	Li	180	28	48	58	106	84	12,540
Manganese	Mn	88	200	899	321	413	384	7,939
Molybdenum	Mo	8	5	5	6	10	7	10,802
Nickel	Ni	41	30	11	24	70	35	681
Lead	Pb	59	60	48	68	48	57	78
Antimony	Sb	2.9	2.3	3.1	3.9	2.9	3	760
Selenium	Se	5.2	4.7	2.5	3.5	3.7	4	3,068
Tin	Sn	10	12	6	10	11	10	13
Vanadium	V	128	120	49	109	172	116	10,896
Tungsten	W	5	7	6	6	3	5	1,805
Zinc	Zn	108	86	67	124	142	105	5,210
Zirconium	Zr	600	440	250	400	450	428	14
TOTALS								139,416

Critical Minerals in NSW ashes

Alumina	2.2Mt	\$21b
Germanium	3,650t	\$13b
Lithium	18,500t	\$1.2b
Nickel	7,740t	\$285m
Zircon	94,000t	\$235m
Cobalt	3,340t	\$197m
Copper	14,500t	\$180m

Metal (mg/k - ppm)		NSW coal-fired power stations					Mean ppm	Price per USD/Ton	Resources (tonnes) in 220Mt fly ash	Resource value AUD
		1	2	3	12	13				
High Purity Alumina							20%	6,500	2,200,000	21b
Arsenic	As	12	4	6.6	12	43	16			-
Boron	B	25	56	89	75	80	65	750	14,300	16m
Barium	Ba	393	420	653	393	510	474		104,236	-
Berillium	Be	22	15	4	9	6	11	3,500	2,464	13m
Cadmium	Cd	0.4	0.9	0.25	0.44	0.35	0	650	103	98,378
Cobalt	Co	11	10	6	11	38	15	40,000	3,344	197m
Chromium	Cr	50	40	18	45	72	45	9,000	9,900	131m
Copper	Cu	52	50	28	47	151	66	8,500	14,432	180m
Germanium	Ge	40	18	5	10	10	17	2,370,000	3,652	13b
Mercuy	Hg	0.02	0.03	0.15	0.12	0.22	0		24	-
Lithium	Li	180	28	48	58	106	84	45,000	18,480	1.2b
Manganese	Mn	88	200	899	321	413	384	1,000	84,524	124m
Molybdenum	Mo	8	5	5	6	10	7	26,000	1,496	57m
Nickel	Ni	41	30	11	24	70	35	25,000	7,744	286m
Lead	Pb	59	60	48	68	48	57	2,300	12,452	42m
Antimony	Sb	2.9	2.3	3.1	3.9	2.9	3	12,000	664	12m
Selenium	Se	5.2	4.7	2.5	3.5	3.7	4	650	862	824,023
Tin	Sn	10	12	6	10	11	10	40,000	2,156	127m
Vanadium	V	128	120	49	109	172	116	650	25,432	24m
Tungsten	W	5	7	6	6	3	5	6,000	1,188	11m
Zinc	Zn	108	86	67	124	142	105	3,200	23,188	110m
Zirconium	Zr	600	440	250	400	450	428	1,700	94,160	235m
TOTALS								AU\$36b		



The power station workforce in the Hunter and Lake Macquarie

Dr. Ingrid Schraner
Economist



**A snapshot of the power station workforce
in the Hunter and around Lake Macquarie**

**Presentation for the Hunter Community Environment Centre
by Dr Ingrid Schraner, Lilli Pilli Consulting Pty Ltd, August 2022**

Power station workforce

Workforce Liddell & Bayswater: 620

Geographical distribution of coal-fired power stations



Workforce Eraring 350

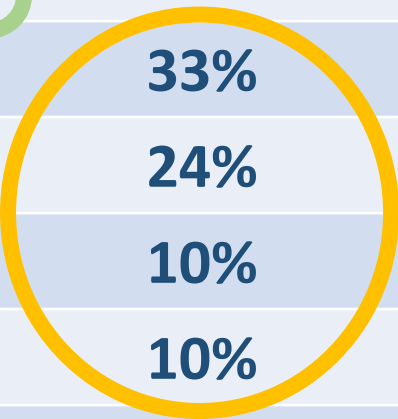
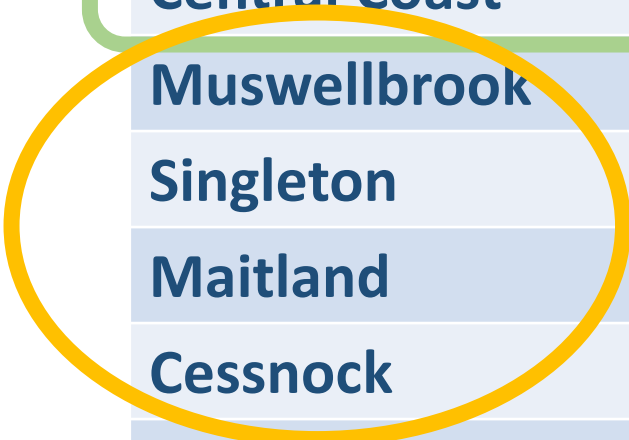
Workforce Vales Point 260

2016 Census Data "Electricity Generation"
Hunter Valley, Lake Macquarie, Central Coast

Where the majority of the “Electricity Generation” workforce lives

2016 Census Data	Central Coast (Vales Point p/s)	Newcastle & Lake Macquarie (Eraring p/s)	Hunter Valley (Bayswater & Liddell p/s)
Lake Macquarie	30%	60%	4%
Central Coast	60%	20%	
Muswellbrook			33%
Singleton			24%
Maitland			10%
Cessnock			10%
Newcastle		10%	4%

“Electricity Generation”
= power station workers
& sub-contractors



* SA4 Statistical Area Level 4
 ** POW Point of Work

Workforce age structure in 2016

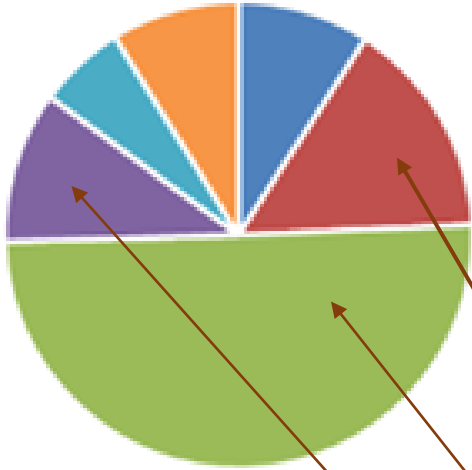
2016 Census SA4* (POW)**	Central Coast (Vales Point p/s)	Hunter Valley excl. Newcastle (Bayswater & Liddell p/s)	Newcastle & Lake Macquarie (Eraring p/s)	Total
15 – 49 years	39%	61%	67%	58% or ~700
50 – 64 years	52%	33%	30%	36% or ~440
Total workforce	260 or 20%	620 or 50%	350 or 30%	1,230 or 100%

Power stations: early retirement funding for less than 440 people

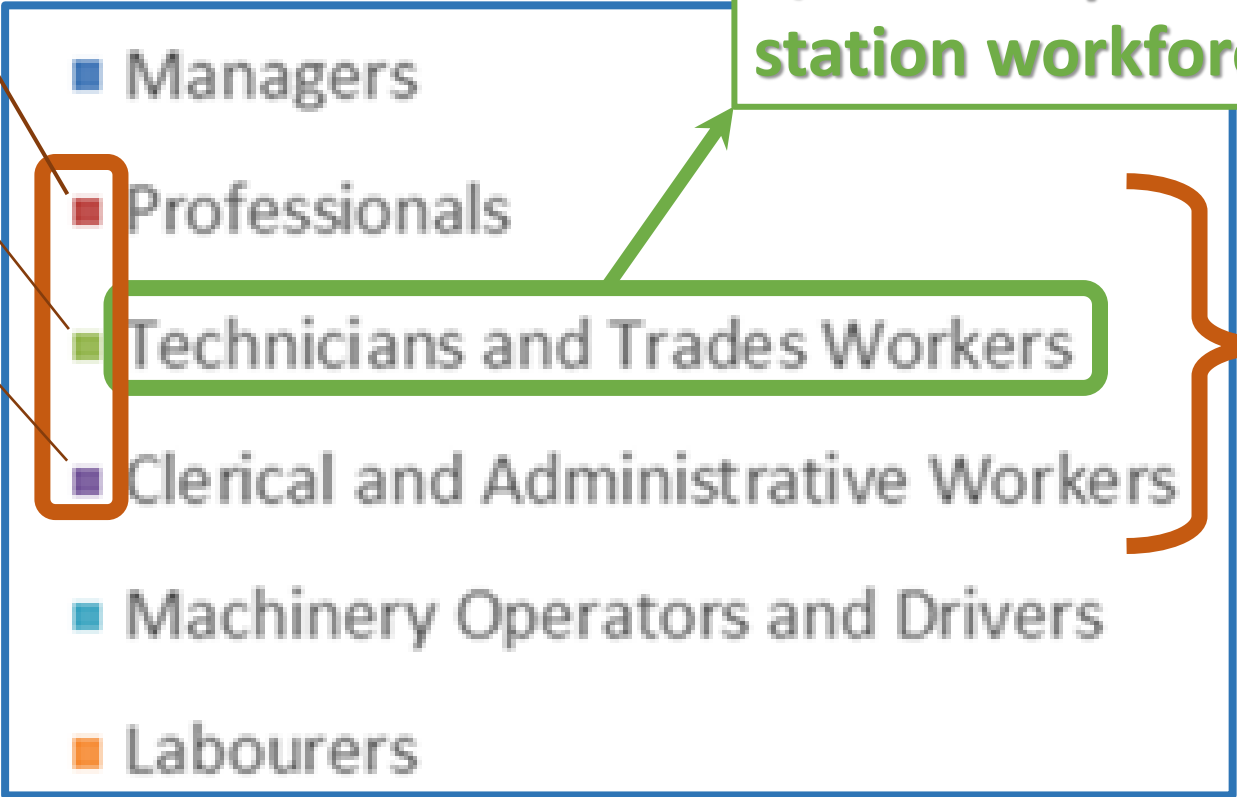
However: local economy needs 1,230 new jobs – not only 700

Occupations in Hunter Valley, Lake Macquarie, and Central Coast

Electricity Generation



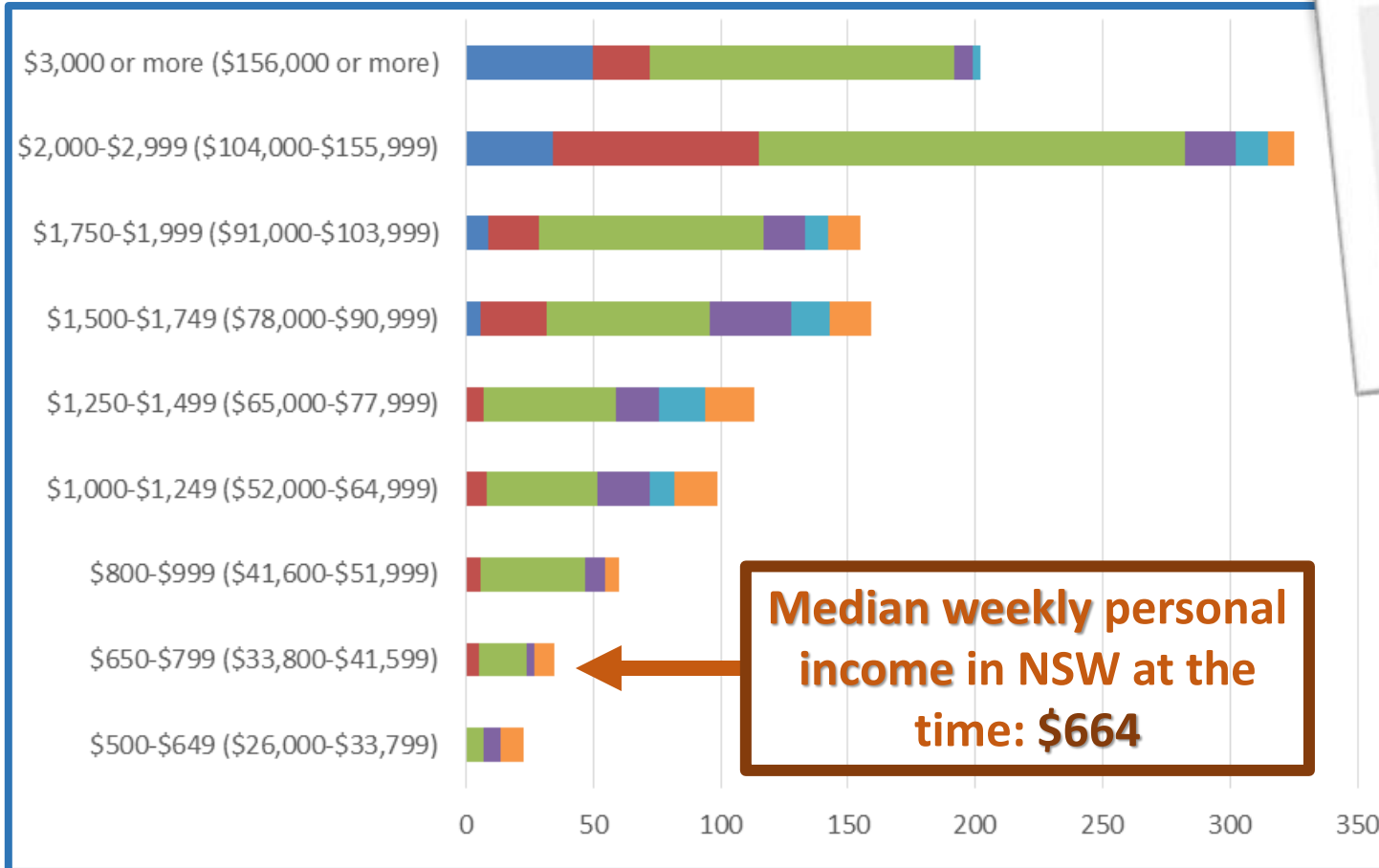
All Industries



1/2 of the power station workforce

3/4 of the power station workforce

Income structure by occupation in Electricity Generation



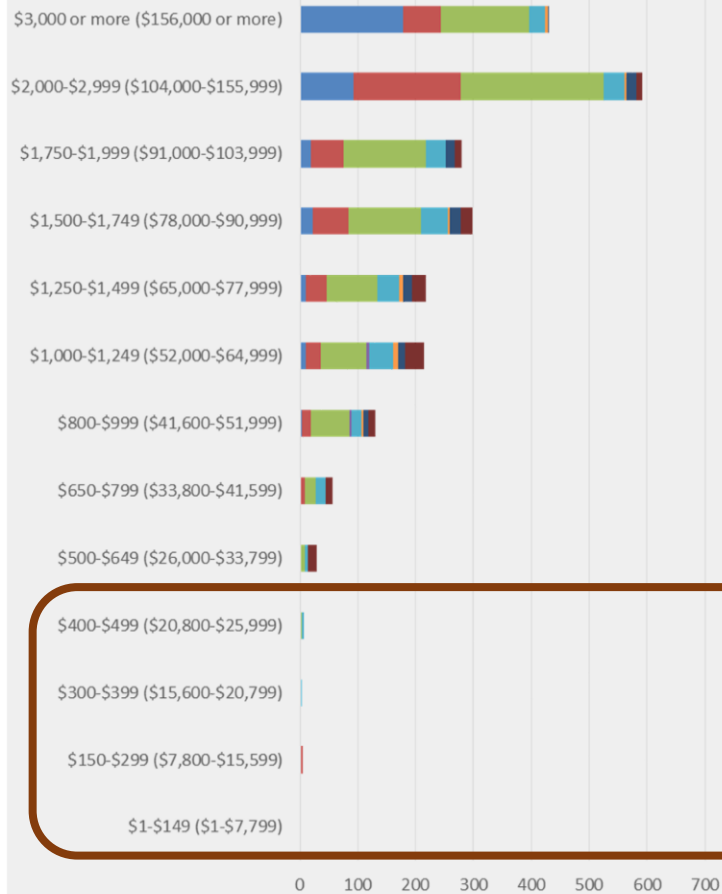
**Hunter Valley,
Lake Macquarie,
and Central Coast**

**Median weekly personal
income in NSW at the
time: \$664**

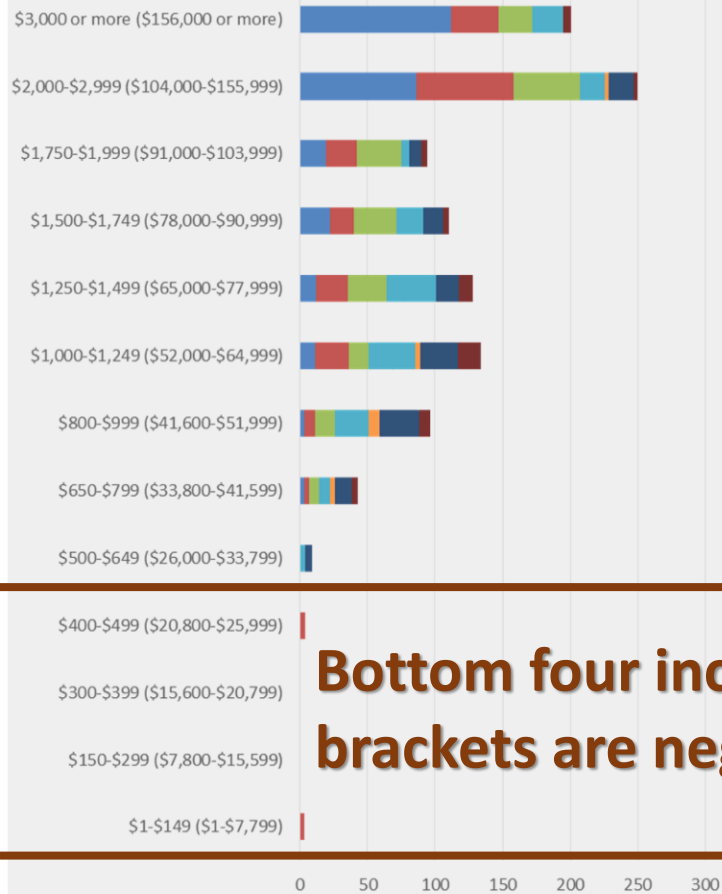
- Managers
- Professionals
- Technicians and Trades Workers
- Clerical and Administrative Workers
- Machinery Operators and Drivers
- Labourers

Income structure by occupation (NSW)

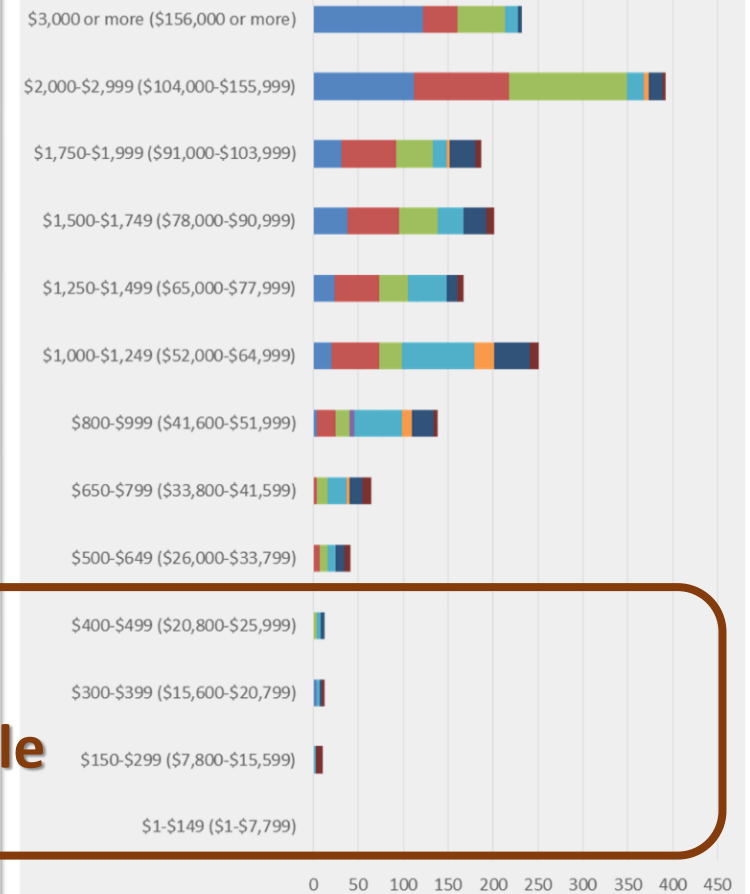
Electricity Generation



Petroleum & Coal Product Manufacturing



Basic Chemical Manufacturing



Bottom four income brackets are negligible

A successful Flagship Project

- **300 jobs for each local economy, all above median income,**
- **Half the jobs for Tradies, at least half of them in top 3 income brackets (\$91,000/year or more)**
- **Sizeable apprenticeship programs for all trades**
- **Career paths to top management in all trades**
- **Project to be integrated in local economy**
- **Low carbon footprint and ongoing social licence**

Address from Justin Page

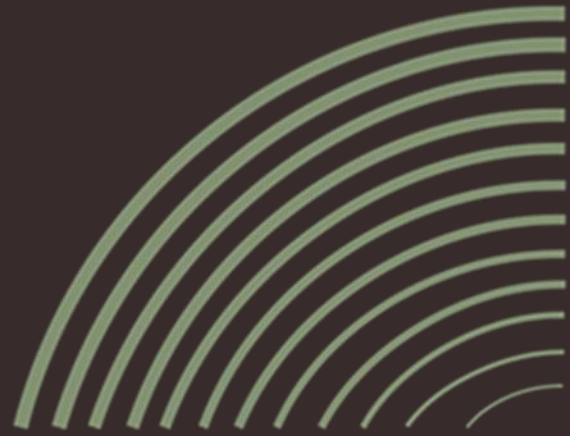
*Hunter Jobs Alliance, Former NSW State Secretary,
Electrical Trades Union (ETU)*

Address from Cory Wright

NSW State Secretary, Australian Manufacturing Workers Union (AMWU), Hunter Jobs Alliance

Starting to empty coal-ash dams

Dr Ingrid Schraner
Co-Founder Wilco Envirotech



re.
source

Wilco Envirotech REGENERATING COMMUNITIES
& THEIR ENVIRONMENTS

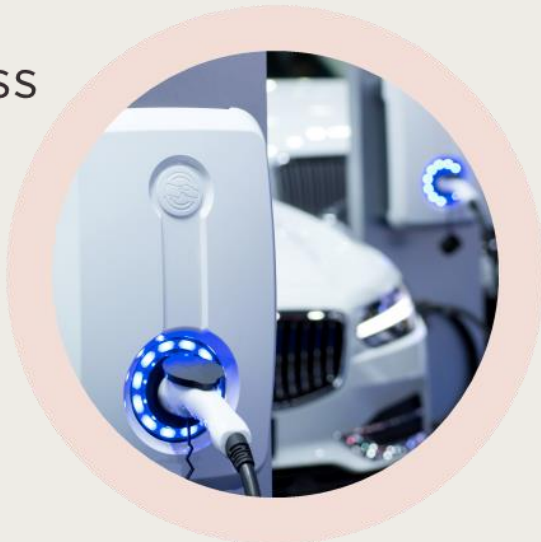
CONCEPT PACK

from the 2022 Accenture Venture Studio
a part of WWF Australia's *Innovate 2 Regenerate* Challenge

HOW IT WORKS

Our Process

We use a novel combination of established chemical processes and existing equipment from the mining and chemical industries to empty coal-ash dams across Australia and manufacture environmentally safe products.



We work with coal-fired power stations to build advanced chemical manufacturing plants and structural lightweight aggregate factories.

The sale of valuable minerals will fund the processing of potentially hazardous elements into environmentally safe products, serving well-established markets with large growth potential.

WHAT WE CAN PRODUCE



7,900 tonnes/year titanium dioxide recovered (major use: pigments) ~14% of income

12 tonnes/year of germanium dioxide recovered (used in photovoltaics, LEDs, transistors etc.) ~6% of income



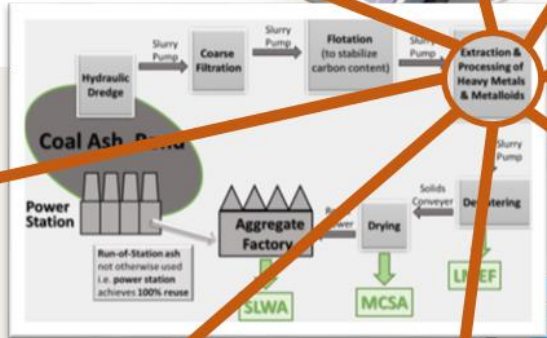
15,000 tonnes/year potassium chloride recovered (fertiliser) ~2% of income



Metal alloy mix (high-performance alloys like 316 stainless steel) ~5% of income



250,000 tonnes/year alumina extracted (~22% of alumina used at Tomago) expected to be just ~54% of income



Other elements recovered for sale ~4% of income

144 tonnes/year of lithium hydroxide recovered (batteries) ~6% of income

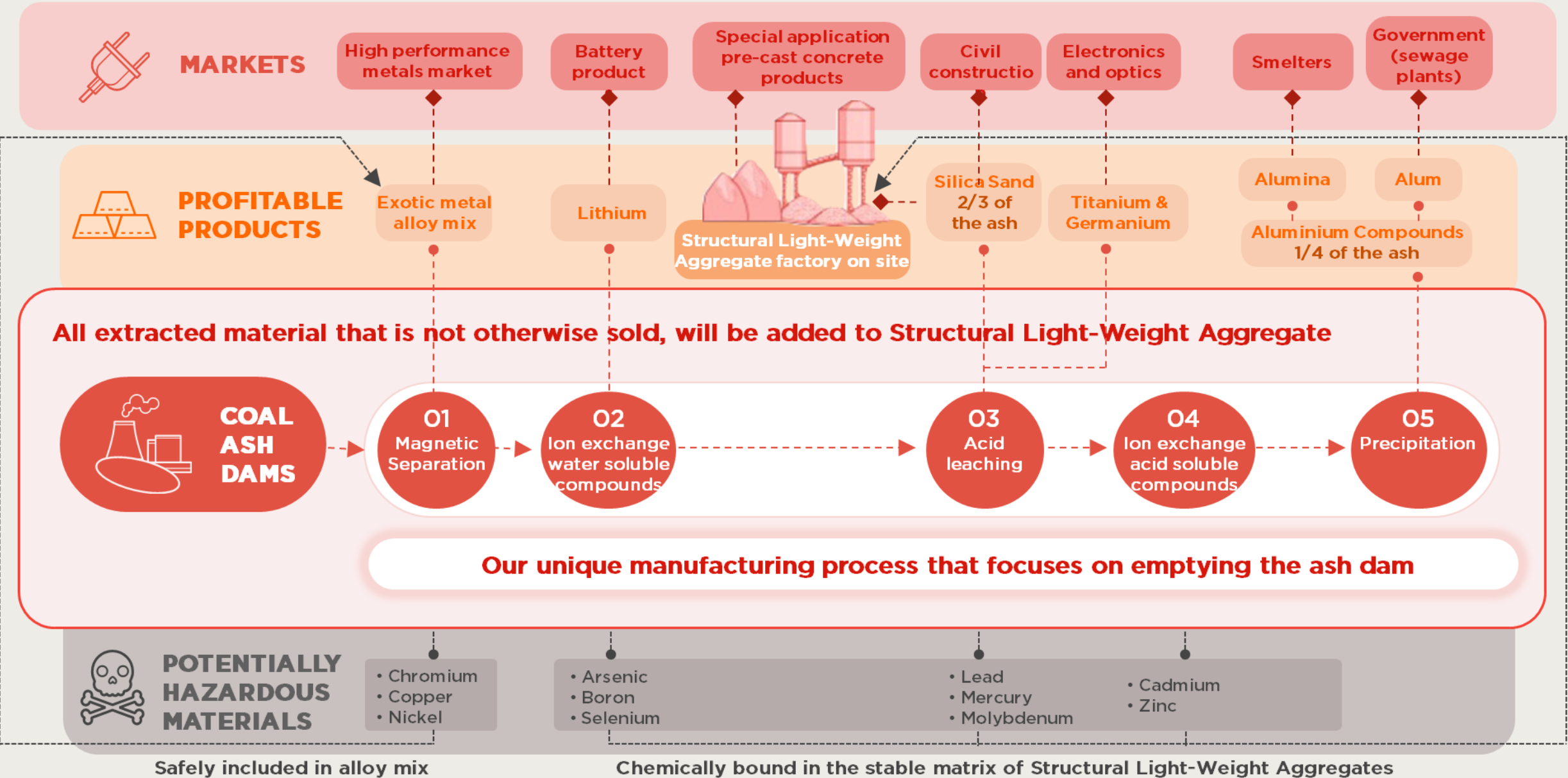


675,000 tonnes/year silica (sand) produced & manufactured into LMEF & SLWA ~9% of income



OUR PATENTED PROCESS

How we turn industrial waste into a palette of valuable & safe products, emptying the entire dam.



HOW IT WORKS

Our Impact

A facility that processes one million tonnes of coal-ash and employs some 330 people - in jobs that have comparable occupational and remuneration characteristics to the jobs in coal-fired power stations.



With 5% of the commercial profits we will fund a not-for-profit organisation that will enable local communities to develop, manage and own projects with a focus on First Nations, youth and women-led projects.

OUR REGENERATION PLATFORM

OUR COMPANY AND PROCESS

Our focus on supporting the regeneration of communities and their environments

OUR NOT-FOR-PROFIT ORGANISATION

A replicable model for mainstream businesses to be part of the circularity of wealth with limited risks and fully community controlled projects.

WHERE WE PROVIDE IMPACT

Environment

A novel manufacturing process that empties the whole ash dam and re-uses all components of the ash, setting the highest standards for modern chemical manufacturing.



Communities

Enable First Nations, youth and women groups to identify, develop, manage and own their projects, so that they can regenerate themselves and their environments.



Youth & their organisations



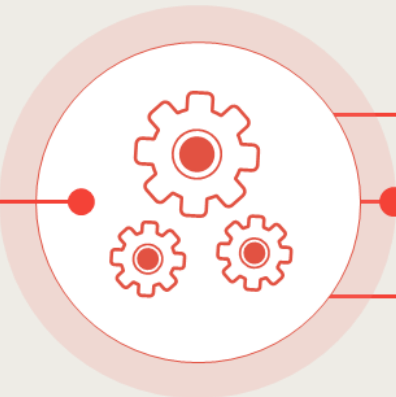
Women & their organisations



First Nations People & their organisations

Keeping a Skilled Workforce

Creating local jobs that make use of the skilled workforce at power stations, invest in apprenticeships and research & development, collaborate with the local university and TAFE colleges - be the place where people want to work.



CAPCITY BUILDING

PROJECT SUBMISSION

FUNDING

5% of profits given back to enable communities around us to regenerate themselves and their environments

DISTINGUISHING FEATURES



We are a regenerative business

We give back more than we take – through a model that empowers communities to be in control, without putting undue risks on our business.

We re.source a not-for-profit organisation that enables communities to formulate their priorities, develop their projects, and successfully manage and own them.



We care about our environment

We developed a novel process to extract all of the potentially hazardous material and all the material that can become a re.source for others – until all the coal-ash has been safely used up and the local communities can regenerate their environments.



We create good jobs for our communities

Half of a power station's workforce used to be local trades people. We re.source our workforce from here, locally – slightly shifting together from electrical to chemical engineering, but with the same high-quality and high-remuneration jobs.



We are building circular economies

We use power station waste as our key re.source, together with their workforce.

We support modern manufacturing industries, from local lithium battery production to greener aluminium smelting, from solar panel production to specialist precast concrete products.

And we circulate the wealth created, together with our local communities.

NEXT STEPS

- ❑ **Awaiting result of grant application** (BCSD Fund, Regional NSW):
 - Testing of ash in dams, independent lab testing of patented process
 - Detailed market analysis for products to be manufactured
 - Business case according to NSW Government guidelines
- ❑ **Planning for small-scale operating plant** (FY 2023-24, ~\$2m)
 - Design work for the small-scale factory, including all necessary approvals
 - Building an Alliance of businesses behind **re.source** & its Regeneration Platform
- ❑ **Building the small-scale operating plant** (2nd half 2024, \$10-20m)
 - Demonstrate scalability & mitigate process risk
 - Fine-tune processes & equipment, address issues as they arise
- ❑ **Operating the small-scale operating plant** (calendar 2025)
 - Iron out operational & process issues, confirm redundancies needed
 - Confirm & expand off-take arrangements for products produced
 - Finalise commercial arrangements within Alliance, raise funding through IPO
- ❑ **Full-scale operating plant** (from 2026, \$500m - \$1b)

INTERMISSION

Questions & discussion

Thank you

