

Submission on Delta Electricity's application for an exemption to the applicable limit on emissions of nitrogen oxide for the Vales Point Power Station. (POEO license 761)

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Doctors for the Environment Australia (DEA) is an independent, self-funded, non-government organisation of medical doctors in all Australian states and territories.

DEA's work is based on the premise that humans need a future with clean air and water, healthy soils capable of producing nutritious food, a stable climate, and a complex, diverse and interconnected humanity whose needs are met in a sustainable way. We are therefore interested in environmental protection and restoration to promote human health and social stability.

DEA's work is supported by a distinguished Advisory Committee of scientific experts whose knowledge of medical and public health issues is fully contemporary. Our members work across all specialties in community, hospital, and private practices.

POEO license 761

Doctors for the Environment Australia are concerned by the extremely generous license conditions allowing NSW power stations to pollute at much higher levels than similar facilities overseas.

We oppose the granting of a nitrogen dioxide licence exemption to Vales Point.

The POEO Clean Air regulation 2010, part 35, is specifically about phasing out Group 2 in January 2012 and no convincing arguments have been presented as to why this should not occur. The intention of the regulation is to prevent old plant from continuing to pollute at levels set many decades ago, while newer plant meet stricter standards. A five-year exemption is to allow plants time to upgrade, not to allow them to have continuous rolling exemptions to evade the phase out provisions.

The current application is accompanied by an analysis of air pollution impacts that is inadequate in several ways.

- It examines local air pollution in the vicinity of the power station but does not examine pollution across the Greater Metropolitan Region where the plant is located.
- It models dispersion of gases and particles from the stack but not secondary particle formation.
- It reviews literature on health impacts of power station fine particle pollution in Sydney but ignores the mortality outcomes documented in these studies.

The health damage from nitrogen dioxide pollution is from both acute (1 day) and chronic (annual) exposures, with the chronic exposure being the most important to causing both child asthma from direct exposure, and chronic health effects including mortality from secondary particle exposure. The health damage is proportional to the annual pollution load, not to the peak concentration in any one-hour period of measurement. The regulatory approach taken in NSW is flawed because peak concentration values as specified in the regulations may not be proportional to the average values that impact health. The emissions intensity of Vales Point is compared to modern power stations built this century in table 1. This clearly shows that Vales Point is polluting more than twice as much per MWh as a modern power station and more than 5 times what would be allowed in the USA.

The NSW regulations however set a maximum value not to be exceeded. The argument that the NO₂ concentration at Vales Point is within regulations 98% of the time is irrelevant. Control measures to limit peak values will also bring down average values, so benefits will be seen all year, not just during the 2% of time that there are current exceedances.

Table 1: Pollution intensity, National Pollutant Inventory. Kg NO_x released per Megawatt hour of production in 2016-17 for Vales Point compared to Australian power stations commissioned or upgraded this century, and for comparison the 2012 rule for the USA. ⁽¹⁾

	Year commissioned	2016-17 NO2 Kg/MWh
Vales Point	1978	2.58
Kogan Ck	2007	1.20
Millmeran	2003	1.04
Callide C	2001	1.07
Eraring	1982 upgraded-2012	1.24
US rule 2012		0.45

To grant a further licence exemption is not consistent with the principles of ecologically sustainable development as set out in the Protection of the Environment Administration Act 1991, which requires an assessment of the risk weighted consequences of various options. This must include a calculation of the human health burden from the various options for future operation of the power station. How many deaths will be caused by the air pollution from Vales Point if Low NOx burners are installed? How many if Selective Catalytic Reduction is required? How many under business as usual? How many children will have asthma under each option? These consequences of the various options have not been presented so have not been considered.

Quantifying the health impacts from coal fired electricity in NSW

Neither the proponent nor the EPA have estimated the health burden from the current operations of Vales Point power station. As this important question has not been addressed, Doctors for the Environment Australia is offering some estimates based available current evidence and published research.

Particles

While NSW power stations all have effective fabric filters to stop fine particle pollution, none have the NO₂ and SO₂ controls required by regulations in the countries we usually compare ourselves to in Europe, North America or North Asia. Pollution from the five coal fired power stations in NSW causes a substantial mortality burden, estimated by various sources as causing 45, 279 or 477 deaths per year.^(2,3,4) The National Pollutant Inventory shows that Vales Point in 2017 emitted 18.7% of the NOx and 9.9% of the SO₂ of the entire NSW coal fired electricity sector. The estimate by Broome et al from Health Protection NSW includes an economic analysis. Complete removal of particles formed from power station NOx in NSW would give a health benefit with Net Present Value (NPV) of \$1.8 billion, and for particles from power station SO₂ this would have NPV of \$660 million.⁽¹⁾ Broome points out that this figure is conservative as it does not include direct toxicities of the gases.

Pollutants from the two Lake Macquarie power stations have larger health impacts than from the three others (Bayswater, Liddell, Mt Piper) due to substantial local populations and weather patterns that carry secondary particles to Sydney as documented by Crawford from ANSTO using meteorological back tracking.⁽⁵⁾ The precise degree to which the health harm from the central coast power stations exceeds their share of the released pollutants has not been determined and the NSW government should commission independent research to examine this important question.

If health damage were simply in proportion to the tonnes of pollutants released, the current value of mortality gains from removing NOx from Vales Point would be \$336 million and from removing SO₂ would be \$65 million. Stronger NOx controls are highly likely to be cost effective from a societal perspective.

Nitrogen dioxide direct effects

Nitrogen dioxide is a respiratory irritant for which the health effects were reviewed by the US EPA Integrated Science Assessment 2016⁽⁶⁾. That review found that there was strong and consistent evidence of health

effects and concluded that short term exposure had a causal association with respiratory effects, and that long term exposure was likely to be causally associated with respiratory effects. This is a change from the previous ISA of 2008 and has material bearing on the current license review.

Australian work commissioned to inform the review of the National Environment Protection Measure, the Australian Child Health and Air Pollution Study (Knibbs 2018)⁽⁷⁾ found substantial associations between NO₂ exposure and asthma in a sample of 2400 primary school children across 12 Australian cities. Importantly these effects were found with average exposure of 8.8 ppb, well below the current NEPM standard of 15 ppb. That work showed a linear relationship right down to very low levels, supporting the assertion that there is no threshold level below which NO₂ does not have an effect on asthma in children. This supports the argument that meeting the national air quality standards does not fully protect against health effects, and that there are strong scientific grounds to attribute child asthma to NO₂ exposure even in locations where national standards are met. The arguments for health effects at very low levels of exposure are reflected in the recently released WHO air quality standards that lower the limit for acceptable annual NO₂ exposure down to 5 ppb- being one third of Australia’s new NEPM value.

National Pollutant Inventory data for 2018/19 show that the two Lake Macquarie power stations emit substantial amounts of NO₂; Vales Point emits 21,000 tonnes and Eraring 23,000 tonnes. The ground level concentration of NO₂ from the five NSW coal fired power stations has been modelled by Lauri Myllyvirta, Andreas Anhäuser, and Aidan Farrow at the University of Exeter using CALPUFF, the NSW EPA preferred atmospheric dispersion model. This showed average ground level power station derived NO₂ of 2.5 ppb in Lake Macquarie and 2.21 ppb in both Central Coast and Cessnock LGAs. These three LGAs have the highest power station NO₂ of all LGAs in the state.

The effects of NO₂ on the prevalence of child asthma has been examined in a meta-analysis by Khreis et al 2017 showing an increase of 9.79% per extra 4ppb of NO₂.⁽⁸⁾ This is not about acute NO₂ exposure causing asthma attacks (which also occurs), but about the development of asthma sensitivity in children who would not otherwise have had it. It is due to long term exposure, so nothing to do with whether the one-hour standard is exceeded.

The NSW health survey includes questions that establish the 12-month period prevalence of asthma in children aged 2-14 years, allowing estimation of the total number of children in each LGA that have asthma from all causes. Using the appropriate formula gives the numbers in the following table.

Table2: Childhood asthma prevalence due to ground level NO₂ from the five remaining NSW coal fired power stations, showing results for the 7 most impacted NSW local government areas (LGAs). Confidence interval (CI) based on the concentration response function.

LGA	Power station NO ₂ ppb, annual average.	Asthma prevalence ages 2-14	Power station attributable cases	95% CI	Proportion of all asthma attributable to power station NO ₂
Lake Macquarie	2.50	5649	321	132-439	6%
Central Coast	2.21	6649	335	138-459	5%
Cessnock	2.21	1767	89	37-122	5%
Muswellbrook	2.07	565	27	11-37	5%
Maitland	1.81	2623	109	45-149	4%
Newcastle	1.62	4052	150	62-207	4%

Singleton	1.55	759	27	11-37	4%
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The power station NO₂ results in table 2 are from all five NSW power stations combined, but NO₂ values decline rapidly with distance. There would be very small contributions to Lake Macquarie NO₂ from power stations at Lithgow or Muswellbrook. Therefore, the local childhood asthma burden attributable to power station NO₂ in Lake Macquarie and Central Coast is nearly all due to the two local power stations, approximately half each due to Vales Point and to Eraring.

Table 2 shows the substantial asthma burden created by locating power stations in heavily populated areas, and despite releasing similar amounts of NO₂, the Upper Hunter power stations cause a much smaller number of children to have asthma.

This asthma burden is due to long term exposure, as reflected in annual average values. There is also an acute effect of asthma attacks triggered by short term exposure.

License conditions

The operators of Vales Point power station have been given special exemptions in 2012 and again in 2017 from the POEO group 5 license conditions that would impose a stack limit of 800 mg/m³. Since that time the Integrated Science Assessment has found that there is sufficient evidence of causality that long term NO₂ exposure causes asthma in children. It is estimated that NO₂ from Vales Point contributes to asthma in approximately 300 children in the adjoining local government areas. This adverse human health impact is sufficient grounds for the NSW government to deny the operators of Vales Point a further exemption to standard group 5 license conditions.

Coal fired power stations around the world are fitted with low NO_x furnaces and post combustion scrubbers to meet much stricter environmental standards than apply in NSW. For instance, the European rules require existing power stations to meet average values no greater than 150mg/m³ by 2021 and new plant to meet 85 mg/m³. In Japan, the average emission limit is 57 mg/m³. The NSW standards are lagging way behind industry best practice, and this is resulting in unacceptable health impacts to the community.

The current requirement for a license exemption is an opportunity to improve the health of current and future generations of children in NSW and bring this old power station one step closer toward environmental best practice.

Summary:

The current application for yet another license exemption must be refused on the grounds that

1. the air quality assessment presented by the proponent is grossly inadequate
2. the health effects from air pollution under the various available pollution control options have not been considered
3. there is a substantial burden of asthma for local children from direct NO₂ exposure
4. there is a substantial mortality burden due to secondary particle exposure across the GMR
5. the application does not meet the principles of ecologically sustainable development as specified under the Protection of the Environment Administration Act 1991.

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