Loy Yang B Power Station Emission Monitoring Class 3 Indicators Program Report

March 2022

Loy Yang B Power Station

Powering alintaenergy

Contents

1. INTRODUCTION

1.1 Scope of work

Loy Yang B Power Station (LYB) operates under licence 3987 issued by the Victorian Environment Protection Authority (EPA). The most recent amendment of this licence was issued on 5 May 2021and included a new condition, LI_DA4.4, which states that LYB:

> *...must establish and implement a program for a 12-month period to monitor the discharge to air, at discharge point(s) 1 to 4, of all Class 3 indicators listed in Schedule A of State Environment Protection Policy (Air Quality Management) likely to be emitted from your premises, as agreed in writing with EPA. The results of this program must be made available to EPA on request and must be published to the publicly accessible website required by condition LI_DA4.4 by 31 March 2022.*

Further to this, EPA issued supporting information at the time which stated in relation to this condition:

> *EPA expects licence holder to engage with EPA when developing the monitoring program and seek the necessary approval. Refer to the State Environment Protection Policy (Air Quality Management), and EPA publications 440 & 1322.9. You must review literature and historical records (bores test, stack tests, ash samples etc.)—in the context of the list of Class 3 indicators listed in Schedule A of State Environment Protection Policy (Air Quality Management)—to support your decision on which class 3 indicators to monitor and at what frequency and seek EPA approval before implementing the program.*
>
> (*Refer to EPA publications 440 & 1322.9).*

Following discussions with EPA, a proposed emissions monitoring program to facilitate compliance with this condition was submitted to EPA on 12 May 2021. On 31 May 2021, LYB was advised by EPA that the scope of the proposed program was appropriate but advised that four additional compounds should be included in the program. These additional compounds were then incorporated into the monitoring program.

2. BACKGROUND

2.1 Class 3 indicators

Class 3 indicators are a category of pollutant described in the State Environment Protection Policy (Air Quality Management) (SEPP (AQM)) as:

> *Class 3 indicators: extremely hazardous substances that are carcinogenic, mutagenic, teratogenic, highly toxic or highly persistent, and which may threaten the beneficial uses of the air environment*

A list of all Class 3 indicators can be found in Schedule A of the SEPP(AQM)[1]. This list was developed to encompass all industries, and as a result not all indicators are relevant to brown coal fired power station emissions. The Class 3 indicators selected for the monitoring program are shown in Table 1.

[1] From 1 July 1 202,1 State Environment Protection Policies (SEPP's) were replaced with other subordinate legislative instruments in support of the new EPA Act 2017. A list of Class 3 indicators now referred to as Air Pollution Assessment Criteria, APACs can be found in EPA Publication 1961 Guideline for Assessing and Minimising Air Pollution in Victoria, Table 3 – Table of health-based APACs.

2.2 Class 3 indicator production and control

Class 3 indicators are produced as a result of the combustion of brown coal via three main mechanisms; liberation of inorganic elements/compounds present in the coal, combustion by-products, and synthesis of new substances within the boiler from combustion by-products.

The key controls from limiting the production of these indicators are boiler operation and Electrostatic Dust Precipitators (EDPs).

Boiler operational factors which affect the production and emission of Class 3 indicators include coal consumption, coal quality, combustion temperature and combustion residence time. These factors are also important for plant thermal efficiency. Operating the boiler at optimum efficiency (burning the least amount of fuel per unit of energy produced) will minimise emissions of indicators associated with coal consumption, and this is standard practice at LYB.

Several of the Class 3 indicators produced in a coal fired boiler are present primarily in the solid material remaining after combustion, known as ash. Ash particles produced from burning coal within the boiler are removed from the combustion gases through two mechanisms, the boiler hearth and the EDPs. Heavier ash particles produced in the boiler fall to the boiler hearth where they are mixed with water and pumped to the ash ponds. Ash disposed of via the hearth is known as bottom ash. Lighter ash particles produced, known as fly ash, are entrained in the boiler combustion gas flow passing through the EDPs where most of these particles are removed prior to discharge through the main stack to atmosphere. EDPs are the principal dust collection equipment which control pollution by imparting a negative charge on dust particles then removing them from the gas flow using large positively charged collector plates to which the particles adhere. The collector plates are periodically rapped to remove accumulated dust, which falls to a hopper and is then combined with water and pumped to the ash ponds. EDPs at LYB have a design collection efficiency of 99.5%.

2.3 Historic assessment of Class 3 indicators

A significant body of work has been performed by HRL relating to the emissions of SEPP(AQM) Class 3 indicators from Victorian brown coal fired power stations. This includes studies performed for all Latrobe Valley brown coal fired generators and industry and research associations. These studies were used as the basis for determining which of the Class 3 indicators would be included in this monitoring program required by Condition LI_DA4.4 of LYB's EPA licence.

3. CONDITION LI_DA4.4 EMISSIONS MONITORING PROGRAM

This emissions monitoring program was developed to monitor Class 3 indicators likely to be emitted from LYB. The test program was performed on discharge points 1 and 2 (Units 1 and 2 boiler discharges, respectively). Discharge points 3 and 4 (coal handling plant wet scrubbers) do not emit combustion by-products and have been found to make no significant contribution to station particle emissions, so therefore were assessed as not making a significant contribution to Class 3 indicator emissions.

This program performed four sets of tests for Class 3 metals and two sets of tests for the other Class 3 indicators on five days over a six-month period. A stack emissions testing specialist, Ektimo Pty Ltd, was engaged to perform the testing. Details of methods used, and NATA accreditation status can be found in Table 1.

A power industry specialist consultant, HRL Technology Group, was engaged to prepare a detailed report on the program results. The report was prepared after reviewing historic testing results, stack emissions dispersion modelling, coal quality and operational information.

Table 1. Summary of Test Methods utilised for Class 3 indicators (courtesy HRL)

Parameter	Sampling Method	Analysis Method	Method Detection Limit	Uncertainty (Note 3)	NATA Accredited	
					Sampling	Analysis
Sample plane criteria	AS 4323.1	N/A	-	N/A	Yes	N/A
Moisture	USEPA Method 4	USEPA Method 4	0.4 Vol%	8%	Yes	Yes
Oxygen	USEPA Method 3A	USEPA Method 3A	0.1%	13%	Yes	Yes
Flow rate, temperature and velocity	ISO 10780	N/A	Location specific	8%, 2% & 7%	Yes	N/A
Acrolein (Aldehydes and ketones)	Ektimo Method 330	Ektimo Method 330	0.2 mg/m³	16%	Yes	Yes
Volatile Organic Compounds (VOCs): • Acrylonitrile • Alpha chlorinated toluenes and benzoyl chloride • Benzene • 1,2-dichloroethane (ethylene dichloride) • Trichloroethylene	Vic EPA 4230	Ektimo Method 344	0.5 mg/m³	19%	Yes	Yes
Total (gaseous & particulate) metals (Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, P, Se, Ag, Zn)	USEPA 29	NMI NT2.47, NT247.244, NT2.52	Analyte specific	15%	Yes	Yes
Hexavalent Chromium (Cr (VI))	CARB 425	Inorg-024 (Envirolabs)	0.003 mg/m³	16%	Yes	Yes
Speciated VOCs: • 1,3-butadiene • Vinyl chloride	Ektimo Method 200	Ektimo Method 345b	3 mg/m³	Not specified	Yes	Yes
Dioxins and furans (PCDD's and PCDF's)	USEPA 0023A	NMI AUTL_MET-02 (NMI)	Analyte specific	16%	Yes	Yes
Polycyclic Aromatic Hydrocarbons (PAH's)	USEPA SW-846 0010	NGCMS 11.27 (NMI)	Analyte specific	21%	Yes	Yes
Respirable crystalline silica (RCS) (inhaled in the form of quartz or crystobalite) (measured as PM2.5) (Note 2)	USEPA 201A (Note 2)	SafeWork NSW inhouse WCA.220 (WorkSafe)	0.0005 mg/m³ (Note 1)	16%	No (Note 2)	Yes

Notes:

1. Detection limit based on WorkSafe detection limit for workplace samples.
2. Respirable crystalline silica (RCS) is typically sampled from ambient air in a workplace, rather from flue gas stacks operating at temperatures exceeding 160°C. The service provider proposed a method [i.e. USEPA Method 201A] to collect a sample of PM2.5, to be analysed for RCS by a reputable laboratory. While the service provider is NATA accredited for the sampling method, RCS is not specifically listed in the method. Furthermore, USEPA Method 201A typically utilises a quartz filter; however, this is not preferable for collecting a sample to be analysed for silica. Hence, a modified sample filter was used.
3. Uncertainties cited in this table are estimated by the specialist sampling and testing service provider, using typical values and are calculated at the 95% confidence level (coverage factor = 2).

4. CONDITION LI_DA4.4 MONITORING PROGRAM RESULTS

Results of the monitoring program are shown in Table 2.

Table 2. Test results

Class 3 Indicator	Units	Result 1 04/06/2021	Result 2 04/06/2021	Result 28/10/2021	Result 29/10/2021	Result 16/12/2021	Result 17/12/2021
Polycyclic aromatic hydrocarbons (as BaP) *	mg/m³			0.00001			0.000013
Dioxins and furans (as TCDD I-TEQ) *	mg/m³			0.0000000084			0.000000002
Respirable crystalline silica - alpha quartz	mg/m³			<0.03			0.14
Respirable crystalline silica - cristobalite	mg/m³			<0.03			<0.02
Arsenic	mg/m³	0.00095	0.00077		0.0012	0.00068	
Beryllium	mg/m³	0.0002	<0.0004		<0.0006	<0.0005	
Cadmium	mg/m³	<0.0002	<0.0002		<0.0004	0.00025	
Nickel	mg/m³	0.009	0.010		0.0023	0.0041	
Hexavalent Chromium	mg/m³				<0.004	<0.0005	
Acrolein	mg/m³				<0.007		<0.008
Acrylonitrile	mg/m³				<0.2		<0.1
Alpha chlorinated toluenes - benzyl chloride	mg/m³				<0.2		<0.1
Benzene	mg/m³				0.012		<0.007
Epichlorohydrin	mg/m³				<0.2		<0.1
1,2 - dichloroethane	mg/m³				<0.006		<0.1
Trichloroethylene	mg/m³				<0.2		<0.1
1,3 - butadiene	mg/m³				<0.005		<0.07
Vinyl chloride	mg/m³				<0.006		<0.09

*Middle Bound – Includes values reported below detection as equal to half the detection limit.

The symbol (<) denotes that the measured concentration of the Class 3 indicator is lower than the method detection limit

5. CONCLUSIONS

As per new licence condition LI_DA4.4, a monitoring plan was established and implemented to monitor SEPP(AQM) Class 3 emissions likely to be emitted from LYB. The results of this monitoring program were found to be consistent with previous testing performed for Class 3 Indicators.