New South Wales EPA

Berrima Cement Works Alternative Fuels

Submission Review

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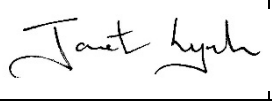
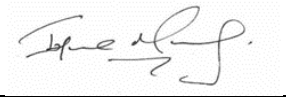
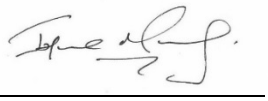
		Signature			
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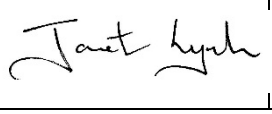
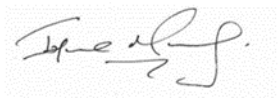
		Signature			
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1 Scope and Introduction

In August-September 2015 Arup were commissioned by NSW Department of Planning and Environment and NSW Environmental Protection Agency (EPA) to compare a proposal to increase use of solid waste derived fuels at Berrima Cement Works, New Berrima, NSW with requirements of the NSW EPA Energy from Waste Policy Statement, 2015, relevant EU legislation and best practice.

Following the public exhibition period, additional information was requested from the proponent Boral Cement Ltd (Boral).by Department of Planning and Environment to address the submissions received. The Response for Submissions Report prepared by Boral addresses the submission made by Planning and Environment and NSW EPA which was prepared by Arup as part of their response report.

This report provides a review of the Response for Submissions with respect to the Arup report and provides comment and recommendations for draft conditions of consent to address any outstanding issues we consider remain.

2 Response received from Boral

2.1 SWDF Sampling

Arup Recommendation:

In relation to the SWDF Specification proposals for SWDF sampling the capacity of the sampling container and the maximum particle size should be reviewed and a means developed for obtaining a representative sample.

Key text in Boral Response to Submissions:

It has been proposed in the EA to sample waste derived fuels in accordance with the European standard EN15442:2011 "Solid Recovered Fuels - Methods of sampling". This standard describes the methodology for calculating the minimum sample size and minimum increment size for SRF (RDF). The calculation for the minimum increment size is based on the top nominal size and bulk density of the given material. These parameters have to be determined through characterisation of SRF products from different suppliers as material becomes available. The capacity of the sampling container to be used at Berrima will therefore be set at the appropriate size dictated by the standard.

Comments:

Recommend the inclusion of the following condition in the granted licence:

"Wastes used as fuels will be sampled in accordance with European standard *"EN15442:2011 Solid Recovered Fuels - Methods of sampling"."*

2.2 Pre-Qualification of SWDF Suppliers

Arup Recommendation:

A methodology should be developed for pre-qualifying suppliers of SWDF to ensure that contracts for supply of alternative fuels are placed only with suppliers that have the appropriate technical expertise, quality assurance systems, identifiable sources of waste, etc.

Key text in Boral Response to Submissions:

Suppliers of SWDF will be contractually required to have in place appropriate and auditable quality control/quality assurance procedures to ensure that limits on contaminants stipulated in the SWDF specifications are met.

Prior to the receipt of any SWDF Boral will prepare operational procedures including weighing, checking and handling of incoming waste fuels. This will be part of the QA/QC system. A quarantine area will be designated in the storage shed. Daily visual inspection of the unloading area will be undertaken and any material not meeting the visual inspection criteria will be quarantined in the designated area for further assessment. Upon assessment, any waste that cannot

be used as fuel will be returned to the supplier, or disposed of at a licensed waste facility.

Comments:

The Proponent's response does not include proposals to develop a methodology for pre-qualification of SWDF suppliers in relation to technical expertise, quality assurance systems or identifiable sources of waste. In order to meet the requirements of the NSW EPA Energy from Waste Policy Statement, Section 4 Energy Recovery Facilities – Resource Recovery Criteria, it is the responsibility of the Energy from Waste facility to:

- promote the source separation of waste where technically and economically achievable
- drive the use of best practice material recovery processes
- ensure only the residual from bona-fide resource recovery operations are eligible for use as a feedstock for an energy recovery facility.

Furthermore, Energy recovery facilities may only receive feedstock from waste processing facilities or collection systems that meet the criteria outlined in Table 1 of the Policy.

Therefore we consider it appropriate that Boral should prepare a methodology for pre-qualifying suppliers of SWDF. We therefore recommend that a methodology is prepared and submitted in advance of approval.

A methodology shall be developed for pre-qualifying suppliers of SWDF to ensure that contracts for supply of alternative fuels are placed only with suppliers that have the appropriate technical expertise, quality assurance systems, identifiable sources of waste and other criteria as appropriate. No SWDF will be accepted at the facility until such time as the methodology is implemented.

2.3 Test Programme for Alternative/ Waste Fuels

Arup Recommendation:

The Environment Protection Licence should include the following requirement:

> *"The licensee shall prepare to the satisfaction of the EPA a test programme for the co-incineration of each alternative fuel. This programme shall be submitted to the EPA prior to implementation.*
>
> *This test programme, following agreement with the EPA, shall be implemented and a report on its implementation shall be submitted to the Agency within one month of completion.*
>
> *The test programme shall as a minimum:*
>
> *a) Verify the residence time, the minimum temperature and the oxygen content of the exhaust gas which will be achieved during normal operation and under the most unfavourable operating conditions anticipated.*

b) Establish all criteria for operation, control and management of the abatement equipment to ensure compliance with the emission limit values specified in this licence.

c) Assess the performance of any monitors on the abatement system and establish a maintenance and calibration programme for each monitor.

d) Establish criteria for the control of all alternative fue1 input including the maximum flow and maximum calorific value.

e) Confirm that all measurement equipment of devices (including thermocouples) used for the purpose of establishing compliance with this licence have been subjected, in situ, to normal operating temperatures to prove their operation under such conditions.

A report on each test programme shall be submitted to the EPA within one month of completion.

Co-incineration of alternative fuels shall not be permitted (outside of the agreed test programme) until such time as the EPA has indicated in writing that it is satisfied with the results of the test programme for an individual alternative fuel."

Key text in Boral Response to Submissions:

Boral Cement Berrima will prepare a test program for the staged commissioning of non-standard fuel. A report will be prepared after the commissioning including the total quantity of waste derived fuels used, dates and times when commissioning commenced, results of stack emission testing during commissioning and results for testing of the fuel used.

- *Following commissioning of the SWDF storage and feeding system, Boral proposes to carry out a testing program that:*
- *Will be completed within 3 months;*
- *Includes 720 hours of continuous monitoring data in accordance with the NSW Energy from Waste Policy 2014, under stable conditions using SWDF;*
- *Includes a round of independent testing of all relevant emission species;*
- *Documents process conditions and data collected in accordance with the NSW Energy from Waste Policy 2014;*
- *Samples and characterises fuels used in accordance with the relevant EU standards and NSW Energy from Waste Policy 2014; and*
- *Provides a written report to the EPA and DP&E on the results of the testing program within 3 months of the end of the testing period.*

Boral proposes to continue to use waste derived fuels following the completion of the test period while a the report is being compiled and assessed by the EPA provided stack emission levels remain below permit levels. If emission levels are

exceeded during the report development and assessment period Boral would stop the use of waste derived fuels until written permission to continue is received from the EPA.

Comments:

The Boral proposal does not comply with the licence condition recommended by Arup in September 2015.

The proposal does not mention agreeing the test programme in advance with the EPA. Given the unknown source(s) of the SWDF being proposed to be used at the facility we consider that it would be appropriate for Boral to agree a test programme in advance of any trials of the new waste stream. It is our understanding that the SWDF will need to be prepared to have a maximum particle size and moisture content to be fed into the precalciner. Therefore, having an understanding of the suppliers of the SWDF, how it is being prepared, and the operational criteria the plant will perform to during the trials in advance will allow the EPA to consider its suitability and seek amendments in advance of any actual trials taking place.

The proposal includes a three month submission period to the EPA. We have no objection to the increased time to submission of the test report provided that wastes would not be used as fuel outside the test programme time until written agreement is reached with the EPA.

Compliance with sections a-e in the suggested condition above is not addressed in the Boral Proposal.

We therefore recommend that the condition as previously drafted is retained with the change of time for submission of the test programme report.

"The licensee shall prepare to the satisfaction of the EPA a test programme for the co-incineration of each alternative fuel. This programme shall be submitted to the EPA prior to implementation.
This test programme, following agreement with the EPA, shall be implemented and a report on its implementation shall be submitted to the Agency within one month of completion.
The test programme shall as a minimum:
a) Verify the residence time, the minimum temperature and the oxygen content of the exhaust gas which will be achieved during normal operation and under the most unfavourable operating conditions anticipated.
b) Establish all criteria for operation, control and management of the abatement equipment to ensure compliance with the emission limit values specified in this licence.
c) Assess the performance of any monitors on the abatement system and establish a maintenance and calibration programme for each monitor.
d) Establish criteria for the control of all alternative fue1 input including the maximum flow and maximum calorific value.
e) Confirm that all measurement equipment of devices (including thermocouples) used for the purpose of establishing compliance with this licence have been subjected, in situ, to normal operating temperatures to prove their operation under such conditions.
A report on each test programme shall be submitted to the EPA within three months of completion.
Co-incineration of alternative fuels shall not be permitted (outside of the agreed test programme) until such time as the EPA has indicated in writing that it is satisfied with the results of the test programme for an individual alternative fuel."

2.4 Co-incineration of SWDF

Arup Recommendation:

With regard to operational procedures Boral should provide details of their operations procedures when co-firing using SWDF.

Key text in Boral Response to Submissions:

Boral will develop operational procedures for co-firing SWDF to ensure that requirements of the NSW EPA Energy from Waste Policy are met in regard to raising gas from the process to a minimum temperature of 850°C for a minimum of two seconds. Operational procedures will include interlocks in the Berrima process control system.

Comments:

Boral have committed to developing operational procedures that will ensure that the NSW EPA Energy from Waste Policy are met.

We would recommend that any NSW EPA site auditing includes reviews of operational procedures and performance assessment against the requirements of the Policy.

2.5 Particulates

Arup Recommendation:

In relation to particulate matter a view should be taken on how long should be allowed for existing industry to achieve much more stringent emission limits and the approval should take this into account.

Key text in Boral Response to Submissions:

In the Official Journal of the European Union published on 9 April 2013, the Commission Implementing Decision establishing the best available techniques (BAT), made conclusions for the production of cement, lime and magnesium oxide. Chapter 1.5.1 titled "Description of techniques for the cement industry dust emission" includes electrostatic precipitators and fabric filters as BAT for the control of particulate emissions from cement kilns. Kiln 6 already uses both techniques to control dust emissions from the stack.

(BAT) conclusions for the production of cement, lime and magnesium oxide. Chapter 1.5.1 titled "Description of techniques for the cement industry dust emission" includes electrostatic precipitators and fabric filters as BAT for the control of particulate emissions from cement kilns. The Berrima cement kiln already uses both systems to control dust emissions from the kiln stack.

As the level of particulate emissions is expected to be similar for both kiln operation using standard fuels and waste derived fuels it is proposed that the

same emission limit of 50mg/m3 at 10% O2, dry basis reported on a 24 hour average basis is adopted for all Kiln 6 operations (with or without waste derived fuels). This represents a significant reduction in the current plant emission limit for non-standard fuels of 95mg/m3.

It is noted however that current emission limits for standard fuels for pollutants other than particulates should remain unchanged.

Comments:

Boral does not state in its submission that it will maintain dust ELVs below 30 mg/Nm^3.

However the Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide, 2013 notes that both electrostatic precipitators and fabric filters have a very high dedusting capacity and are able to achieve limit values, when properly maintained, of 10-20 mg/Nm^3.

The current licence limit for particulate matter is 30 mg/Nm^3. The IED proposes a limit of 20 mg/Nm^3 for existing cement kilns. In the long term the proposed limit of 30 mg/Nm^3 and eventually 20 mg/Nm^3 should be imposed.

2.6 NO_X

Arup Recommendation:

In relation to nitrogen oxides a view should be taken on the time that should be allowed for existing industry to achieve much more stringent emission limits and the approval should take this into account.

Key text in Boral Response to Submissions:

Boral has reviewed the financial and technical feasibility of using SNCR or SCR (Ammonia injection) for the purposes of NOx reduction in Kiln 6. The review concluded that while technically feasible, the costs of these control methods is prohibitive and would make the use of waste derived fuels at Berrima financially unviable. The use of SNCR for example, which is the most common form of post combustion NOx reduction equipment used in Europe, would require a high level of capital investment (circa $1.4 million) for storage, pumping and control systems. The ongoing cost of Ammonia reagent and additional power consumption for operation of the system is also very high. These costs have been estimated to be $4 million to $5 million per year at Berrima. The Ammonia reagent price is high as a result of international commodity pricing (Ammonia is processed mainly from natural gas) and is of relatively small scale in the supply network in Australia.

In addition to financial considerations it is also noted that the need to transport and handle relatively large volumes of Ammonia reagent (typically 25% NH3 solution) would increase the safety risk on site.

Although SNCR and SCR are not considered viable for use at Berrima, the site has employed a number of other best practice techniques. These techniques are recognised as best practice in the EU Best Available Techniques document 2013/163/EU and include:

- *Low NOx burner - A modern low NOx kiln burner is installed to fire the Kiln 6;*
- *Process optimisation - High level process control (Fuzzy logic) is used to provide maximum optimisation of combustion conditions; and*
- *Staged combustion - The modern precalciner design installed for Kiln 6 2QQuses a controlled tertiary air supply to provide staged combustion in a fuel in the precalciner vessel. This creates a localised reducing zone (high CO concentration) in the calciner which reduces NOx generated in the kiln. It is also proposed to combust the solid waste derived fuels in the precalciner vessel and experience of this approach, backed by computational fluid dynamics studies, suggests that burning fuel in this way could also help reduce NOx emissions.*

The adoption of the above NOx reduction techniques has resulted in the ground level NOx levels surrounding the Berrima plant remaining well below the relevant health limits. This was demonstrated in the dispersion modelling study presented in the EA. The imposition of further high levels of capital and operating costs associated with the installation of SNCR or SCR NOx control measures would negate any savings made by using SWDF's and is therefore not justified.

Comments:

The proponent have reviewed the application of SCR and SNCR at Berrima and concludes that these NOx abatement technologies are not viable for Berrima on economic grounds.

We acknowledge that the proponent is applying alternative NOx reduction techniques and ground level concentrations have been modelled to demonstrate that they are not of a risk to human health.

We acknowledge that a reduction of NOx to 500mg/Nm^3 without the application of SCR/SNCR is not possible. Therefore, we accept that a limit of 1000mg/Nm^3 is unavoidable. We recommend that the NSW EPA periodically requests Boral to review the financially viability of installing SCR/SNCR in order to potentially reduce the NOx limit in the future.

2.7 VOCs

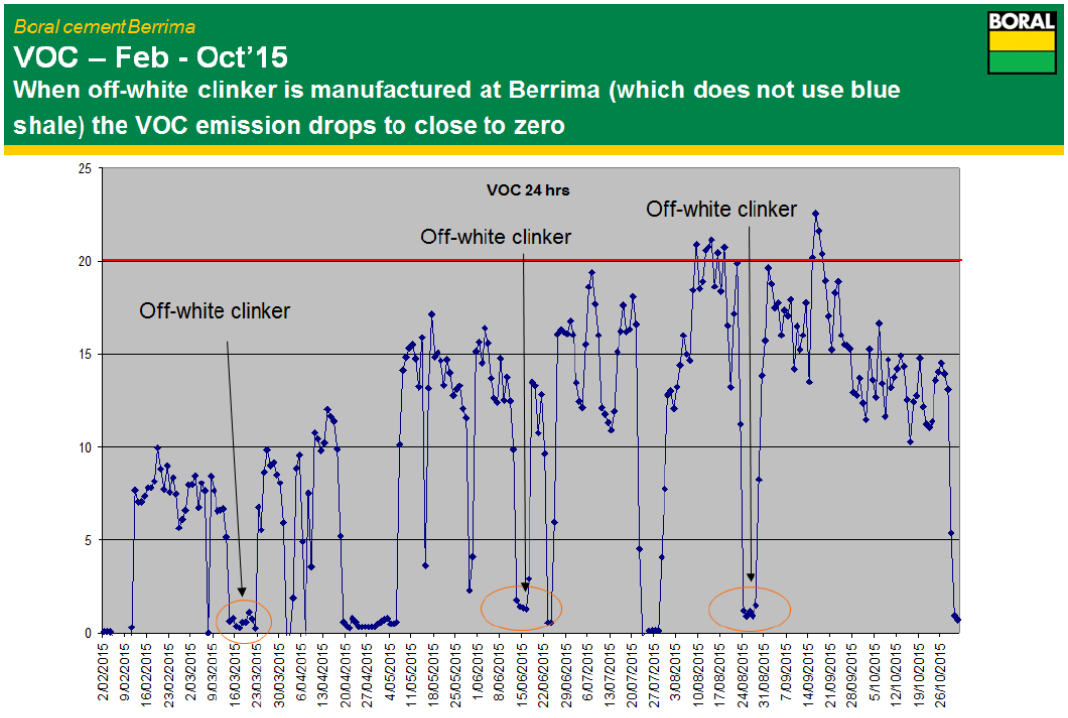
Arup Recommendation:

The emission limit value for VOCs (20 ppm) should remain unless the applicant demonstrates that it is physically impossible due to the nature of the raw materials, to achieve this limit, in which case the higher limit sought (40 ppm) could be granted.

Key text in Boral Response to Submissions:

In respect of VOCs, Boral provided information in the EA (Section 4.5.2 and Figure 7) to demonstrate that VOC emissions at Berrima are derived from the use of blue shale (one of the raw materials required for manufacturing grey clinker) and are therefore not related to combustion. Further evidence is shown in Figure 3 which demonstrates that when off-white clinker is manufactured in Kiln 6 (where blue shale is not used) the VOC emission drops down close to zero. The graph also demonstrates that VOC emissions vary over time due to natural variation of blue shale within on-site shale pit resource. At times a 20ppm VOC limit will therefore be exceeded even when not using alternative SWDF. It is therefore physically impossible for Berrima to comply with a continuous VOC limit of 20ppm. It is noted that the NSW Energy from Waste Policy states (in footnote 2 pg. 6) that "an existing facility may apply to the EPA for an alternative NOx and VOCs emission standard in accordance with clause 36 of the Protection of the Environment Operation (Clean Air) Regulation 2010. In view of the above, Boral is proposing to set a practical VOC emission limit of 40ppm, on a 24 hour basis, expressed as non-methane hydrocarbon.

Figure 3 VOC off-white clinker emissions



Areas highlighted show VOC reduced to almost 0 when Off-white clinker is produced as no blue shale is used. This shows that the VOC are derived from the use of blue shale (one of its raw materials required for manufacturing grey clinker) and are therefore not related to combustion

Comments:

Based on the information provided by Boral we recommend that the 40ppm VOC limit is implemented at Boral.

2.8 Feedstocks and Reference Facilities

Arup Recommendation:

Before the acceptance of SWDF commences, it is recommended that the proponent provides information of reference facilities treating similar type waste streams, of a similar range, and within a similar jurisdiction to that that is proposed.

Key text in Boral Response to Submissions:

In Australia, the most relevant reference facility treating similar type waste streams with similar technology and in a similar jurisdiction is Adelaide Brighton Limited's (ABL) Birkenhead cement facility in Adelaide. The Birkenhead facility operates a 1.3 million tpa dry process kiln with pre-calciner and four stages preheater, which is a similar technology to that used on Kiln 6 at Berrima. Process gas filtration occurs through two Electrostatic Precipitators while Berrima uses 1 electrostatic precipitator and one bag filter, which is a more modern filtration technology.

ABL has successfully utilised a waste derived fuel known as Processed Engineered Fuel (PEF) over a number of years to partially replace natural gas as fuel at Birkenhead. PEF is a waste derived fuel from commercial and industrial (C&I) and construction and demolition (C&D) wastes that would have traditionally gone to landfill. The RDF proposed for use at Berrima would be similar to the PEF used by ABL. The ABL waste derived fuel plant was commissioned in 2006 with an annual average use of 75,000 tpa of PEF. The PEF manufacturing plant was upgraded in 2014 supplying PEF to ABL in excess of 90,000 tpa. The volume of waste derived fuel used at Birkenhead is therefore similar to that proposed by Boral in Kiln 6.

Comments:

The ABL facility is considered an appropriate reference facility, as it is a similar technology, treating similar waste streams, of a similar range in a similar jurisdiction.

The Response provided by Boral in Section 2.2.1 includes the alternative fuel specification of both the SITA ResourceCo facility (manufacturing the PEF) and the ABL plant. A comparison table including Borals proposed fuel specification would have been beneficial in this section.

2.9 Storage and Stockpiling of SWDF

Arup Recommendation:

In order to inform the local community of the possible magnitude of external stockpiles, Boral should consider what is the maximum operational stockpile of RDF required for normal operations and what proportion of RDF will be received in 1m3 bales for external storage.

Boral should then consider the visual impact of external stockpiling on the local community.

Key text in Boral Response to Submissions:

Under normal operation, SWDF will be delivered in loose form in covered trucks. This material will be transferred directly into an enclosed storage shed with a nominal capacity of 3600m^3 which should provide for 2 to 3 days of storage of SWDF for the plant. No loose SWDF will be stored outside the storage shed.

Delivery of RDF in baled form would normally only take place when there are periods of extended kiln downtime for maintenance or repair. In these situations wrapped baled material would be stored on a hardstand area adjacent to the SWDF storage shed. The area assigned to the storage of bales on site is approximately 30mx25m in area which can accommodate around 2000 bales or approximately 1600 tonnes of baled RDF. The height of the stored bales would be less than 5 metres. At this height and location, the stored bales would not be visible at any residential receiver.

Comments:

This response is considered acceptable and it is recommended that site layout plans (plans and elevations) are updated to identify the position of the bale storage area.