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13 November 2009

John Marshall
Executive Engineer
Macquarie Generation
34 Griffiths Road
LAMBTON NSW 2299

Re: Bayswater B Power Station (Concept Plan Application MP 09_0118) – Submissions Report. Response to Independent Expert Review

Dear Mr Marshall,

Katestone Environmental has reviewed the Independent Expert Review of Bayswater B Power Station Expansion Air Quality Impact Assessment undertaken by Heggies. The issues in relation to air quality have been reproduced below and a response has been prepared.

Heggies Recommendation 1 – Selection of site representative meteorology:

The reviewers would like confirmation as to whether and how MacGen selected the three representative years for use in dispersion modelling. The impression is given that although a statistical exercise was performed on a significant dataset; the final selection of meteorology was based on the subjectivity of the client.

Katestone Response:

The selection of multiple periods to model ensured that all conditions experienced at the proposed Bayswater B site were considered in the assessment. This includes selection of average periods, odd periods and periods where abnormal events occur. The process by which the final three periods were selected for the assessment occurred in the following stages:

- Stage 1: Probability distribution frequency (PDF) analysis of the wind speed and wind direction for all periods within the data set provided (15 years).
- Stage 2: Regression analysis to compare the wind speed and wind direction observations for each period compared against the data set average.
- Stage 3: Comparison of the PDF and regression analysis results from each site in order to select the periods that show the best representation of average (or normal), odd (or non-normal) and peak conditions.
- Stage 4: Investigation into pollution concentrations for each of the selected periods compared against the analysis of the whole data set, ensuring that peak pollution events occur within the selected periods.
- Stage 5: Final selection resulted in five representative periods for potential use in the dispersion modelling assessment.
- Stage 6: Discussion with local personnel (Macquarie generation staff) to ensure final periods selected did not include any unusual events such as excessive drought or

bushfires and that the Power Stations were operating normally (i.e Power Stations were not shut down for maintenance).

The periods identified in Stage 5 were:

- March 1999 – February 2000 (normal)
- March 2000 – February 2001 (normal)
- March 2001 – February 2002 (normal)
- March 2006 – February 2007 (non-normal)
- March 2007 – February 2008 (non-normal)

Of these periods all represented a wide range of meteorological conditions. The non-normal years are simply years where the distribution of wind directions and speeds are different. The R^2 regressions of individual years to the mean tends to be 0.97 or higher indicating little difference between the 'normal' years, with the 'non-normal' years being between 0.85 – 0.90. This shows there is not a large difference in wind conditions over the 15 years. However, some attempt has been made to discern some changes in the overall meteorological conditions during this time.

The final selection needed to incorporate at least one non-normal period and two normal. From the five possible periods to model March 2006 – February 2007 was ruled out due to significant drought conditions prevalent for that period as well as low data recovery rates for some of the ambient monitoring stations. Therefore March 2007 – February 2008 was selected to represent a non-normal period. From the three normal periods, March 2000-February 2001 was selected as this was the period coinciding with the period modelled in the model validation study. The final period, March 1999 – February 2000 was chosen as the highest number of exceedences of the 1-hour average SO_2 criteria were recorded at Lake Liddell for this period.

Heggies Recommendation 2 – TAPM Meteorological Modelling:

Please include further details on the TAPM meteorological modelling carried out as part of this assessment. Also, please clarify whether observational data from any or all of Mount Arthur North, Lake Liddell or Ravensworth has been included in the TAPM runs to "nudge' the model predictions to obtain a more realistic meteorological dataset for the region.

Katestone Response:

The TAPM meteorological modelling used for the impact assessment of Bayswater B Power Station did not include local observational data to "nudge" the model predictions. The reasons for not including the data are as follows:

- TAPM performed well without local data assimilation (or "nudging") particularly for the upper level wind stations
- The quality of data available varies between years with significant periods of missing observations

Given the good performance of TAPM at simulating the local meteorological conditions and the varied quality and availability of data for assimilation the justification to not included local data assimilation in the model is valid.

Heggies Recommendation 3- Emissions:

It is recommended that for the coal-fired option, the use of manufacturer's specifications or emission factors be used in preference to the use of LBL conditions emission limits not yet imposed. For the gas-fired option, it is recommended that manufacturer's specifications be sought in preference to US EPA AP-42 emissions factors.

If the proponent wishes to use the emission concentration limits specified in the Clean Air Regulations (2002), then further discussion is required as to how these concentration limits will be met in practice.

Katestone Response:

The air quality assessment has been conducted based on a combination of manufacturer's specifications, POEO (Clean Air) Regulation limits, emission factors derived from existing operating power stations and expected coal quality.

Manufacturer's typical specifications are normally available for oxides of nitrogen, solid particles and carbon monoxide emissions from a coal-fired power station. Manufacturer's typical specifications are normally available for oxides of nitrogen and carbon monoxide emissions from a gas-turbine. Whilst there are a significant number of other air pollutants for which DECCW has specified regulatory limits for power stations, manufacturers are unlikely to provide performance guarantees for these pollutants because they are either unlikely to be produced in power stations due to the nature of combustion and the fuels, because they are dependent on the levels of the contaminants in the fuel (eg. fluorine, chloride or heavy metals) or a combination of both (eg. dioxins, furans or volatile organic compounds).

Where manufacturer's typical specifications were not available, either the POEO (Clean Air) Regulation limits were used or emission factors. Table 1 and Table 2 show the emission limits (or standards of concentration) that were used to calculate emission rates.

The proponent will obtain manufacturer's typical specifications for the plant and equipment that will be installed. For other air pollutants, the proponent will determine appropriate emission limits based on the air quality assessment conducted, any future assessment required to secure Project Approval and in negotiation with the DECCW.

The emission limits will be achieved by:

- Operating and maintaining plant and equipment in a proper and efficient manner, in accordance with the manufacturer's requirements to meet the manufacturer's specifications
- Using the fuels as specified in the approval documents and ensuring that the fuels are of high quality and low contaminant levels

Historical sampling and analysis of air pollutants in the stacks of the Bayswater and Liddell Power Stations demonstrate that concentrations of heavy metals, fluorine, chloride, sulfur trioxide, dioxins and furans and other air pollutants are very low compared with the POEO (Clean Air) Regulation.

Table 1 Emission concentrations and rates of criteria air pollutants for the proposed Bayswater B USCPC Coal-fired Power Station based on total emission from twin flue stack

Pollutant	Standard of concentration[1] (mg/m³)
Oxides of nitrogen (as NO_2)	500
Solid particles (assume all PM_{10})	50
Carbon monoxide	125
Fluorine	50
Chloride	200
Hydrogen chloride	100
Dioxins and furans	0.1 ng/m³
Table note: [1] Reference conditions for Group 6 Activities in accordance with NSW Clean Air Regulation – Dry, 273 K. 101.3 kPa, 7% O_2. Dioxins and furans referenced to 11% O_2.	

Table 2 Emission concentration limits from electricity generating plant, as specified in the Clean Air Regulation (2002)

Air impurity	Gas-fired standard of concentration (mg/m³)
Oxides of nitrogen (as NO_2)	70
Carbon monoxide	125
Table note: Reference conditions for Group 6 Activities All air impurities for gas burning – Dry, 273 K. 101.3 kPa, 15% O_2	

Heggies Recommendations 4 – Impact Assessment:

- *It is considered that a more robust approach to the assessment of cumulative impacts would involve the following scenarios:*
    - *An existing operations scenario, incorporating emissions from the major SO2 and NO2 and HF sources in the local region - at minimum Bayswater, Liddell and Redbank power stations.*
    - *Future operation scenarios, including emission sources incorporated within the previous scenario.*
- *Please provide details as to why the chemical transformation of NOX to NO2 was not performed using TAPM*
- *Please confirm the approach with respect to the assessment of CO background concentrations*
- *It is recommended that the Proponent undertake a cumulative assessment of PM10 for the region surrounding the proposal.*

Katestone Response:

The impact assessment for Bayswater B did not include a modelled background for the existing power stations for the following reasons:

- A substantial data set of monitoring data is available for the region covering all population centres. This data set provides a good representation of potential impacts in the area for all meteorological conditions experienced at the site for 15 years.

- The monitoring date set includes all local sources of air pollution and not just the power stations (e.g. traffic and spontaneous combustion from local open cut mines)
- Representation of a full range of emission rates and loads from the existing power stations is complex and difficult to define
- Lack of monitoring stations to the west is not critical as the distance to the sensitive receptors are significant and impacts have been shown in the assessment to be well below levels predicted at the monitoring stations. The frequency of winds likely to transport the power station plumes into the south to westerly sector is very low.

Should further assessment of the background air quality be required this can be undertaken as part of the project approval.

Redbank Power Station was not explicitly included in the Bayswater B air quality impact assessment. We believe that modelling the impact from Redbank Power Station would not change the outcome of the study for the following reasons:

- The assessment of background air quality using monitoring data rather than modelling has included the incremental impact from all sources in the region, including Redbank Power Station.
- NPI emissions for Redbank for 2007 reporting year indicate 11,000 kg of fluoride compounds emitted from the power station. This compares to a total of 415,300 kg emitted from Bayswater and Liddell for the same reporting period. This indicates that Redbank is less than 3% of the emissions of Bayswater and Liddell and given the significant distance from the sensitive receptors the change in predicted HF impacts would be minor.

TAPM-GRS was not used to estimate the NO_2 concentrations in the region due to the addition of the Bayswater B Power Station for the following reasons:

- Inspection of the monitoring data at al monitoring sites indicates that sources other than the power stations have a significant contribution to the high concentrations of NO_x recorded (particularly at night).
- A detailed emissions inventory would be required to adequately assess NO_2 impacts using the TAPM-GRS model, which was not available in the time available to undertake the assessment.

No background for CO was included in the assessment of Bayswater B Power Station, as the contribution from the power station is very minor and extremely unlikely to result in any significant impact or exceedence.

A cumulative assessment of PM_{10} was not undertaken for the air quality assessment of Bayswater B Power Station. The maximum 24-hour average PM_{10} concentration predicted at any sensitive receptor due to the addition of Bayswater B was 3.54 $\mu g/m^3$. Given the conservative assumption that 100% of all solid particulates emitted from the Bayswater B Power Station are in the PM_{10} fraction, the very small increment when compared to the air quality criteria of 50 $\mu g/m^3$ and the magnitude of other sources of dust in the region, the considerable additional work required to undertake a cumulative assessment was not considered warranted.

Recommendation 5 – Inter-regional Air Quality Impact Assessment:

It is recommended that for the sake of completeness, an assessment of the impact of the proposed gas fired Bayswater B configuration is undertaken.

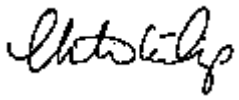
Katestone Response:

In the time available to respond to the submissions it was not possible to undertake a additional study for inter-regional transport. Should further assessment of regional air quality be required this can be undertaken as part of the project approval.

General Comment – regarding coal handling

An assessment of on-site dust generating activities due to coal handling and storage were not undertaken as part of the air quality assessment for Bayswater B power station. Given the significant distance from the Bayswater B site to the closest sensitive receptors, the additional on site coal handling for Bayswater B power station is unlikely to cause any issues. Good environmental management of coal storage and handling areas should be addressed in the site environmental management plan.

Yours sincerely,



Christine Killip – Managing Director