



Natural Resources and the Environment

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17 April 2007

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Dear Ashlea

REVIEW OF THE AIR QUALITY ASSESSMENT FOR THE ADDITIONAL UNIT FOR THE OCGT POWER PLANT AT MOSSEL BAY

Thank you for the opportunity to review the specialist air quality assessment for the proposed expansion at the OCGT power plant at Mossel Bay.

A thorough review of the study has however been impeded by the lack of key information that was not provided, although requested via email on 31 March and 1 April 2007. These are the terms of reference for the specialist study and the model results presented as isopleths concentration maps (Appendix A of the report).

My review is based on the information provided, i.e. Airshed Planning Professionals (Pty) Ltd report APP/07/SHA-01 Rev 0.0 excluding Appendix A.

My report is attached. Please don't hesitate to contact me if further discussion is required.

Sincerely

Dr Mark Zunckel
CSIR: Research Group for Air Quality and Climate Change

Reviewer report

Air Quality Assessment for the Open Cycle Gas Turbine (OCGT) Power Plant's Additional Units in Mossel Bay, by Airshed Planning Professionals (Pty) Ltd:
Report No.: APP/07/SHA-01 Rev0.0

Two important pieces of information concerning this report were not made available to the reviewer, namely:

- The original terms of reference for the appointment,
- Model results presented as isopleth maps over the study area (Appendix A)

This review is therefore based only the information that has been provided, i.e. The Airshed Planning Professionals (Pty) Ltd report APP/07/SHA-01 Rev 0.0, excluding Appendix A.

Structure and general impression:

The report is well written, the language is good and it is well structured. These make the report easy to read and the logic easy to follow.

Terms of reference:

If the assumption that the terms of reference listed in Section 1.1 of the report fully represent the terms of reference for the appointment is valid, then it is fair to say that the study adequately meets all of the objectives. However, there are some specific issues that need to be addressed. These are detailed here:

Specific comments on the report:

Methodology:

Emissions data: It is stated in the report that the emissions data have been supplied by the developer, Eskom. The consultants need to provide some measure of comparison of the supplied data with international norms and standards for similar plants and a description of how the emissions relate to the OCGT process.

Paragraph 1.3 second sentence, the 3 in Section 3 has been omitted.

Section 2:

The discussion here is on PM10 and PM2.5, NO_x and SO₂. Are these the only pollutants of concern? This report needs a discussion on the OCGT process to support the assessment of these three pollutants only. See earlier comment on process and emissions.

Section 4:

Suggest consistency with the way wind direction is written, use either the abbreviations or write out in full, with a preference for the latter.

The discussion should also mention of the relative high frequency of southwesterly winds by day, although these may not be important from a dispersion and impact point of view.

Figure 4-2: It is extremely difficult to read information from the figure. Suggest that data is rather tabulated.

Table 4-3: This table needs to be referenced.

Section 4.2 states the no ambient data for NO_x, CO or PM₁₀ were available. It is not clear from this whether monitoring is undertaken for these parameters and the data are not available, or whether monitoring is not undertaken hence there are no data.

Section 4.2.1: The averaging period, i.e. *annual average* should be added to the text preceding *SO₂ concentrations*.

Section 4.3 requires an introductory paragraph discussing sources in the area, stating that PetroSA and the OCGT power plant are the only significant sources; hence only emissions from these are included in the assessment. Information on the composition of the gas will also be useful, either here or earlier when elaborating on the OCGT process.

In Section 4.3.2 the assumption is made that the turbines will only operate for two and six hours per day. As a peaking station it is possible that the operational times were selected to coincide with the time of peak demand. Here the reviewer is speculating. The authors need to provide some justification for their assumption, i.e. how realistic is this assumption.

Section 4.4: The choice of the ISC3 model is appropriate and the advantages and disadvantages of this model have been well described. Here it is important to note the models inability to perform well in winds below 1 m/s, particularly considering the relatively high frequency of these winds, especially at night coinciding with the assumed hours of operation of the OCGT.

Section 4.4.1 states how the daytime and night-time mixing heights were calculate, but these data are not presented. Tabulate information on the daily and seasonal ranges of mixing height is recommended as it will add value.

Section 4.4.3 refers to Appendix A showing isopleth plots of pollutant concentrations, making comparison to various guidelines. Appendix A was not made available to the reviewer. As a result comment cannot be made on the dispersion of pollutants relative to the areas surrounding PetroSa and the OCGT power plant.

The summarised information in Table 4-7 and 4-8 indicates that predicted concentrations of all pollutants from the OCGT are well below guidelines in all cases. However, the maximum concentration of NO_x from PetroSA and from the two sources together is 85% of the guideline value. The authors need to evaluate this prediction in the light of the uncertainties associated with the modelling in light wind conditions. Without seeing the associated isopleth maps it is impossible to ascertain where this maximum occurs, or whether there are similar concentrations elsewhere in the modelling domain. The authors need to state where the maximum occurs and provide detail on other similar concentrations, if any. Information on the frequency of the high concentrations needs to be provided. The same holds true for the assessment of the additional units.

General:

1. A statement of confidence in the assessment needs to be made by the authors as well as an indication of the significance of the impacts, if any. SO₂ data are available and have been presented. A comparison of the modelled SO₂ concentration with the monitored data will provide an indication of model performance and will provide a measure of confidence in the predictions. It is recommended that such a comparison is made.

2. It is assumed that the terms of reference listed in Section 1.1 agree with the terms of the appointment. If this is so, it needs to be said that the terms of appointment for an air quality assessment are lacking. Emissions of pollutants to the atmosphere have potential health and climate change impacts. The terms of reference for the study make no mention of the potential health effects of the emissions, nor any reference to the potential greenhouse emissions from the plant. The omissions of these two issues from the terms of appointment is considered to be an oversight.

18 April 2007

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Dear Ashlea

REVIEW OF THE AIR QUALITY ASSESSMENT FOR THE ADDITIONAL UNIT FOR THE OCGT POWER PLANT AT MOSSEL BAY

In follow up to my letter and review dated 17 April 1007, thank you for sending through the CD with a revised version of the Mossel Bay OCGT report APP/07/SHA-01 Rev 1.0 and model output represented as pollution concentration maps (Appendix A). This has allowed me to complete the review.

The comments made in my earlier review that were specific to the isopleth concentration plots are revisited in the attached report. This report should be seen as an addendum to my earlier review report as the remainder of the comments are still valid.

Please don't hesitate to contact me if further discussion is required.

Sincerely



Dr Mark Zunckel
CSIR: Research Group for Air Quality and Climate Change

Reviewer report

Air Quality Assessment for the Open Cycle Gas Turbine (OCGT) Power Plant's Additional Units in Mossel Bay, by Airshed Planning Professionals (Pty) Ltd:
Report No.: APP/07/SHA-01 Rev1.0

Terms of reference:

The terms of reference are somewhat extended from Rev 0.0 of this report. If it can be assumed that the terms of reference listed in Section 1.1 of the report fully represent the terms of reference for the appointment, then it is fair to say that the study adequately meets all of the objectives.

Specific comments relating to model results:

Section 4:

The summarised information in Table 4-7 and 4-8 indicates that predicted concentrations of all pollutants from the OCGT are well below guidelines in all cases. This is borne out by the model results shown in Appendix A.

The maximum concentration of NO_x from PetroSA and from the two sources together is 85% of the guideline value for both emission scenarios. This peak is isolated and occurs well within the industrial area. The authors need to state this and comment on the risk associated with this in terms of ambient air quality standards. The authors need to evaluate this prediction in the light of the uncertainties associated with the modelling in light wind conditions. Information on the frequency of the high concentrations needs to be provided. The same holds true for the assessment of the additional units.

14 May 2007

Ashlea Strong
Senior Environmental Scientist
Bohlweki Environmental

Dear Ashlea

FURTHER REVIEW OF THE ATLANTIS AND MOSSEL BAY OCGT AIR QUALITY ASSESSMENTS

Following my review of the air quality assessment for the proposed OCGT capacity expansion projects at Atlantis and Mossel Bay, this letter refers to your email request of 25 April 2007 for additional inputs following a request from the Western Cape Department of Environmental Affairs and Development Planning (DEADP). The issues raised by DEADP and my response to these are included below:

DEADP Issue 1: Check anomalies of emission factors.

The emissions data was provided by Eskom for the Atlantis and Mossel Bay study is different. It is not possible to compare the emissions from the studies one-on-one due to a differences between the two: There are currently 5 stacks at Atlantis power station, with the addition of 4 new stacks. There are currently 3 stacks at the Mossel Bay power station, with the addition of 3 new stacks. Even if emissions per turbine were similar, it would be expected that the modeled ambient concentrations in the two areas would be different. The methodology employed is different (inclusion of vehicle and tank emissions for the Atlantis study and inclusion of PetroSA emissions for the Mossel Bay study) and different dispersion models have been used in each case. In addition the difference in topography and the prevailing meteorology play a role in the dispersion and the estimated modeled concentrations at each site.

Anomalies of emission factors used for the Atlantis study have not been detected. It is considered appropriate that the US-EPA emission factor for heavy construction be used in light that no detailed information for construction activities are available. This emission factor is also suitable as it considers emissions for overall construction over scattered geographic areas and emissions are conservatively high.

The emission factors for vehicles and VOCs which are based on the COPERT III and the US-EPA Tanks (v. 4.09) model respectively is considered to be appropriate for use in this study.

DEADP Issue 2: Give clear and concise direction as to the anticipated emission and compliance with the new proposed DEAT ambient air quality standards.

Cumulative impacts have been addressed adequately in both studies. The anticipated emission rates from the Atlantis and Mossel Bay power plants have been adequately modeled based on emissions information provided by Eskom. The specialists are commended for including a variety

of other sources in the area. In the case of Mossel Bay, emissions from PetroSA have been included in the simulation. The Atlantis study has considered emissions from vehicles and tanks on site. Emission rates for other industries in the area were excluded due to a lack of source data. Sufficient and appropriate meteorological data has been sourced and used for both studies - eight surface meteorological stations for the Atlantis study and the local PetroSA weather station for the Mossel Bay study.

Both studies have compared modeled ambient concentrations against the new proposed DEAT ambient air quality standards as outlined in SANS 1929 (2005). In addition to this they have also made comparisons against a wide range of other international guidelines and standards such as the WHO, World Bank and EC. It is evident that ambient concentrations in general comply with all standards and guidelines except for the maximum 1hr NO_x and annual average diesel particulates in the Atlantis study. The modeled exceedances of diesel particulates is mainly due to vehicle related emissions and not necessarily related to emissions from the power plant directly.

DEADP Issue 3: Guidance is given as to the future monitoring of pollutants and locations.

The establishment of a monitoring network is not a trivial task and monitoring needs to be conducted to satisfy a specific need. With the need clearly articulated a siting exercise is recommended. It is therefore not possible for this reviewer to recommend on future monitoring needs and locations. With that said, monitoring of pollutants is really only considered necessary where ambient concentrations are expected to be sufficiently high to result in risk to human health or the environment, or for model verification. In the Atlantis study it is established that only NO_x is an issue as exceedances are predicted to occur at 3 locations. However, these exceedances only occur three times per year, probably due to adverse meteorological dispersion conditions and should not necessitate NO_x monitoring in these areas. The current NO₂ monitor run by Eskom should provide an indication of the baseline conditions and a change in the levels once the plant is in full operation.

DEADP Issue 4: Establish how similar plants operate internationally, what the best international practices are and compliance with ambient air quality standards (i.e. EU standards).

This is not a simple task as there is a variety of technologies available for plants of this nature. Furthermore different plants use different fuels and processes. Climatic conditions and local siting factors also vary. Considering the time constraints imposed on this review it is not possible to fully address issue. OCGT technology is an accepted technology and the low NO_x burning abatement technology is also an accepted approach. Importantly is to ensure through the atmospheric emission licensing process that the operational and maintenance aspects meet accepted operating procedures, similar to those in Europe.

I trust that my comments are beneficial to DEADP and that they address the issues that were raised.

Sincerely

Mark Zunckel
CSIR: Natural Resources and the Environment