

ESKOM

APPLICATION FOR ALTERNATIVE LIMITS IN TERMS OF THE MINIMUM EMISSIONS STANDARD FOR THE MEDUPI POWER STATION

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LIST OF ACRONYMS

AIR	Atmospheric Impact Report
AEL	Atmospheric Emission License
APPA	Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)
AQMP	Air Quality Management Plan
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DOE	Department of Energy
EIA	Environmental Impact Assessment
ERP	Emission Reduction Plan
ESP	Electrostatic Precipitator
FGC	Flue Gas Conditioning
FGD	Flue Gas desulphurisation
GNR	Government Notice No.
HFPS	High Frequency Power Supply
FGD	Flue gas desulphurisation
GNR	Government Notice No.
IRP	Integrated Recourse Plan
IRR	Issues and Response Report
LNB	Low NO _x Burner
LPG	Liquid Petroleum Gas
NAAQS	National Ambient Air Quality Standards
NAQO	National Air Quality Officer
NEMAQA	National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NERSA	National Electricity Regulator of South Africa
NO	Nitrogen oxide
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen (NO _x = NO + NO ₂)
PM	Particulate Matter
PM ₁₀	Particulate Matter with a diameter of less than 10 µm
PM _{2.5}	Particulate Matter with a diameter of less than 2.5 µm
RTS	Return to Service
SO ₂	Sulphur dioxide
TSP	Total Suspended Particulates
µm	1 µm = 10 ⁻⁶ m
WHO	World Health Organisation

1 INTRODUCTION

Eskom, as South Africa's public electricity utility, generates, transmits and distributes electricity throughout South Africa. The utility also supplies electricity to neighbouring countries including Namibia, Botswana, Zambia, Zimbabwe and Mozambique. Eskom's principal generation technology is pulverised coal with approximately 90% of its current generating capacity is from coal-fired power stations. One of the 15 power stations is the Medupi Power Station (hereafter referred to as "Medupi"), which is situated near Lephalale, Limpopo Province. Medupi is the joint largest of Eskom's existing fleet (Kusile is a similar size) with an anticipated capacity of 4 800 MW. Medupi sources its coal from the nearby Grootegeluk Coal Mine (Exxaro).

In terms of the Integrated Resource Plan and the Eskom Consistent Data Set, coal power stations will generally be decommissioned at 50 years. The exact date of decommissioning is determined by current and future demand, the performance of other electricity generating plants and the cost of generation. Medupi is a new station with construction activities commencing in May 2007 and the power station will have full installed capacity by 2020. It is intended to decommission the station by approximately 2070.

In terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA), all of Eskom's coal and liquid fuel-fired power stations are required to meet the Minimum Emission Standards (MES) contained in GNR 1207 on 31 October 2018 ("GNR 1207") which was promulgated in terms of Section 21 of the NEMAQA¹. GNR 1207 provides arrangements in respect of inter alia: a once off postponement with the compliance of minimum emissions for new plant for five years from the date of issue, no once off postponement will be valid beyond 31 March 2025; a once off suspension for plants being decommissioned by 31 March 2030; the National Air Quality Officer may grant an alternate emission limit or emission load if certain conditions are met. The application for any of these requests must be submitted by 31 March 2019. A MES postponement decision was issued to Medupi in 2015 and again in 2018 in respect of compliance to the MES SO₂ limit. With the amendment of the MES regulations in October 2018 it is necessary to submit this application for alternative limits for SO₂. Eskom has applied and received a condonation for the late submission of an application for Medupi until November 2019.

Medupi already achieves the 50 mg/Nm³ Particulate Matter (PM₁₀) for 'new' MES limits and the meets the "new" plant standards for nitrogen oxide (NO_x - 750 mg/Nm³), as such no changes in terms of either of these pollutants is requested.

In terms of sulphur dioxide (SO₂) Eskom has a present postponement decision granting a monthly limit of 3500 mg/Nm³ until 31 May 2025. From 1 April 2025 Eskom is required to comply with a limit of 500 mg/Nm³. Eskom has committed to installing FGD at Medupi and this will help in the reduction of SO₂ emissions. Previous planning indicated that FGD would be installed at Medupi 6 years after completion of each unit thus between 2021 and 2026. Unfortunately, there have been significant delays in implementation of the project and it is now anticipated that FGD will be installed between 2028 and 2030. Eskom thus requests an alternate limit of 4000 mg/Nm³ monthly from 2020 until installation of FGD in 2030, and thereafter a monthly limit of 1000 mg/Nm³ is requested until decommissioning of the station.

The purpose of this document is to present an application for an alternative limit to the SO₂ new plant limit in terms of GNR 1207. The document has been structured to present Eskom's atmospheric emissions reduction plan including the current decommissioning of units, the decommissioning plan and its influence on Eskom's emissions. Based on this application, emission limits, to which Medupi could be held and which could then be included in the Atmospheric Emission Licence (AEL), are proposed. The legal basis for the application is

¹ GNR 893 amended the "original: MES regulations GNR 893 which were promulgated on 22 November 2013 in terms of Section 21 of the NEMAQA

presented, including the requirements that must be met in making such an application. Finally, the reasons for the application are presented.

2 ESKOM'S EMISSION REDUCTION PLAN

Eskom considers that it is not practically feasible or beneficial for South Africa (when considering the full implications of compliance and planned decommissioning) to comply fully with the 'new plant' MES by the stipulated timeframes. This is elaborated on in the sections below. As a result, Eskom proposes to adopt a phased and prioritised approach to compliance with the MES. Highest emitting stations will be retrofitted first. Reduction of Particulate Matter (PM) emissions has been prioritised, as PM is considered to be the ambient pollutant of greatest concern in South Africa. In addition, Eskom proposes to reduce NO_x emissions at the three highest emitting stations. Kusile Power Station will be commissioned with abatement technology to achieve the new plant standards. Medupi is commissioned with abatement technology which can meet PM and NO_x new plant standards and will be retrofitted with flue-gas desulphurisation (FGD) to support achieving the new plant SO₂ limit over time. The installation of FGD at Medupi could decrease its SO₂ emissions by more than 85%. There are six power stations which will be decommissioned before 2030, an additional two by 2035 and the remaining existing plants (excluding Majuba, Medupi and Kusile) by 2044.

Emission reduction interventions to achieve compliance with the new plant emission limit are planned for the following stations:

- Particulate Matter emission reduction: Tutuka, Kriel, Matla and Duvha Units 4-6, Kendal and Lethabo;
- NO_x emission reduction: at Matla, Majuba, Tutuka, Camden; and
- SO₂ emission reduction: at Medupi and a pilot study which will assess possible alternate technologies at Matimba and Kendal.

Currently the Integrated Resource Plan 2019 is based on a general 50-year life for all coal fired power stations however the actual shut down and decommissioning dates of power stations are determined based on economic, technical and environmental criteria. For consistency in the Eskom postponement applications the decommissioning dates as defined in the in the Eskom Consistent Data set (Eskom 36-623 rev 3) for planning have been used. To date, twelve (12) units between Grootvlei, Hendrina and Komati have been shut down prior to the 50 year life and put into extended storage and two into extended inoperability (at Eskom's most costly and oldest plants). The shutting down of these power plants reduces the cumulative emission load and pollution in Mpumalanga. The emissions load will continuously decrease ensuring that health impacts from Eskom's power stations will not increase.

The retrofits listed above are over and above the emission abatement technology which is already installed at Eskom's power stations, which is:

- Electrostatic Precipitators (ESPs) at Matimba, Kendal, Lethabo, Matla, Kriel, Tutuka, Komati 3 of the 6 units at Duvha. In addition SO₃ injection plants have also been installed at those stations with ESPs, except Tutuka, to improve the efficacy of the same;
- Fabric Filter Plants (FFPs) at Majuba, Arnot, Hendrina, Camden, Grootvlei, Medupi, Kusile and 3 units at Duvha;
- Boilers with Low NO_x design at Kendal and Matimba;
- Low NO_x Burners (LNBS) at Medupi, Kusile, Ankerlig, Gourikwa, and some units at Camden; and
- Flue gas desulphurisation (FGD) at Kusile.

Eskom applied and was granted a first round of postponements between 2014 and 2015. Since then Eskom has updated its emission reduction plan to include the enhancement of existing particulate matter abatement technology currently installed at Kendal and Lethabo Power Stations.

Implementing the emission reduction plan and installing more efficient emission control technology will reduce Eskom's emissions. The decommissioning of the older stations and an increased use of the newer less emitting Medupi, Kusile and renewables, will also result in a substantial decrease in Eskom's and South Africa's emissions over time. For example it is projected that compared to a 2020 baseline that by 2035 Eskom's relative PM emissions will reduce by 58%, SO₂ by 66% and NO_x by 46%.

The level of SO₂ emissions from power stations is directly related to the sulphur content of the coal burnt. The Waterberg coal which supplies Medupi has a high sulphur content which results in SO₂ emission spikes above the daily limits, Eskom has investigated and is implementing various methods to reduce the sulphur content of the coal received such a careful management of stockpiles. Ultimately, however the only effective method to support compliance to the SO₂ MES would be the implementation of FGD. Eskom has committed to the installation of FGD at Medupi and this will be completed by 2030 and reduce emission by 85%. Eskom does not believe that the installation of FGD technology to reduce SO₂ emissions at its stations beyond Kusile and Medupi is warranted as explained in this application.

Eskom's proposed atmospheric emission reduction plan is estimated to cost R 67 billion over the next 10 years. The costs have been included in the latest Multi Year Price Determination tariff application and whilst Eskom's full application was not approved by NERSA it remains Eskom's intent to implement the plan described above. Eskom will continue to engage with NERSA through the prescribed processes so that Eskom can recover these costs through the tariff.

The retrofit schedule and projected emission reduction above clearly illustrates Eskom has been and remains committed to implementing emission reduction technologies to improve air quality in South Africa. Though there are delays in the implementation of the retrofit plan Eskom remains committed to ensuring these planned technology installations are completed.

A detailed discussion on Eskom's emission reduction plan is provided in the Eskom Summary Document (Annexure 3).

3 MEDUPI REQUESTED EMISSION LIMITS

The current limits listed in Table 1 are as in Medupi's Provisional AEL (ref: 12/4/12L-W2/A4 issued by the Limpopo Department of Economic Development, Environment and Tourism on 24 July 2019) as well as the postponement application decision granted by the National Air Quality Officer (DEA) in 2018 (LP/ES-MT/WDM/20170825). The alternative emission limits that requested for Medupi during normal operating conditions based on the postponement of the new plant limits for SO₂ are also shown in Table 1.

Table 1: Current and requested limits for Medupi

Point source SV0002, 0011,0012, 0013,0014 and 0015	Current Limit (from AEL/MES)			Requested Emission Limits***		
	Limit value (mg/Nm ³)	Averaging period	Date to be achieved by	Limit value (mg/Nm ³)	Averaging period	Date to be achieved by
Sulphur Dioxide	3500	Monthly*	1 April 2015	4000	Monthly	1 April 2020
				1000	Monthly	1 April 2030
Nitrogen Oxides	750	Daily	1 April 2015	No change		
Particulate Matter	50	Daily	1 April 2015	No change		

***The requested alternate emission limits above are in mg/Nm³ at 273 K, 101.3 kPa, dry and 10% O₂.

* Limit as per 2018 MES application grant (LP/ES-MT/WDM/20170825)

In summary, the application submitted for Medupi is:

- (i) An alternative monthly SO₂ limit of 4000 mg/Nm³ from 1 April 2020 until 31 March 2030
- (ii) An alternative monthly SO₂ limit of 1000 mg/Nm³ from 1 April 2030 until decommissioning

Medupi will comply with new plant standard for PM and NO₂ and no change in respect of these pollutants is requested.

In terms of the existing license and postponement decisions, it is understood that the previously granted postponements of the SO₂ limit will remain in place until 2025 as a minimum (compliance to a monthly limit of 3 500 mg/Nm³).

Based on the techno-economics and cost benefits assessment (Annexure 1 and 2) any additional measures other than what was committed to above and the emission limits requested are not financially viable.

It is requested that the alternative limits only apply during normal working conditions, and not during start-up or shut-down, upset conditions and maintenance periods.

The emission limits proposed in this application are informed by plant design, plant operations, coal quality and the existing regulatory requirements. Eskom reserves its rights to amend its application subject to any change in the legislated emission limits. Practically a changed emission limit may allow Eskom to review its technology choices or plant operations which could result in substantial cost and resource savings and reduced environmental impacts which would be advantageous for Eskom and South Africa and warrant a revised MES application.

4 LEGAL BASIS FOR DECISION-MAKING

4.1 Regulatory Requirements

In terms of Section 14(1) of the NEMAQA, the Minister of Environmental Affairs ("Minister") must designate an officer in the Department of Environmental Affairs (DEA) as the National Air Quality Officer. In this regard, Dr Thuli Khumalo has been designated by the Minister as the current National Air Quality Officer. Section 14(4)(b) of the NEMAQA provides that the National Air Quality Officer may delegate a power or assign a duty to an official in the service of his/her administration. It is our understanding that no such delegation has been made

for the area of jurisdiction in which the power station is located. Accordingly, Eskom submits this Application to the National Air Quality Officer (NAQO).

In terms of Paragraph (12)(a) – (c) of GNR 893 of 22 November 2013 (the Regulations) as amended by GNR 1207 of October 2018, the application must include:

1. An air pollution impact assessment compiled in accordance with the regulations prescribing the format of an Atmospheric Impact Report (AIR) (as contemplated in Section 30 of the NEMAQA), by a person registered as a professional engineer or as a professional natural scientist in the appropriate category;
2. A detailed justification and reasons for the Application; and
3. A concluded public participation process undertaken as specified in the National Environmental Management Act and the Environmental Impact Assessment (EIA) Regulations made under section 24(5) of the afore mentioned Act.

In respect of these requirements we have attached –

1. As Annexure A, a copy of the AIR prepared in respect of Medupi for the 2017 Postponement application. The AIR provides, *inter alia*, an assessment of how ambient air quality is likely to be affected by Matimba's and Medupi's requested emission limits by utilising, *inter alia*, atmospheric dispersion modelling. Eskom has appointed properly qualified consultants to prepare and updated AIR and will provide this to the NAQO when completed (anticipated to be May 2020). Eskom believes the status of air quality around the station now is substantively similar to that in 2017 and as such the information presented is appropriate for decision making purposes.
2. Detailed justifications and reasons for the Application (see Section 5 below).
3. A comprehensive report on the public participation process followed, and associated documentation for the overall Eskom 2019 Application process (Annexure 4.1 and 4.2). The issues raised in the overall report will be a reflection of the issues relevant to Medupi, however, Eskom has also provided a copy of the public participation report prepared for the 2017 Matimba and Medupi postponement applications as these issues are also relevant (Annexure B). Eskom will complete a full public participation process for Medupi based on the updated AIR and a public participation report will be provided to the NAQA when this is available (anticipated May 2020).

4.2 Changes in Regulatory Framework

In October 2018 the 2017 National Framework for Air Quality Management in the Republic of South Africa and the Amendment to Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of NEMAQA were published. While Eskom and the independent consultants appointed to complete the AIR have made every effort to provide complete information, Eskom reserves the right to supplement the information if it deems appropriate or if requested to do so by the NAQO.

There was, prior to October 2018, no requirement for Eskom to complete an immediate application for Medupi as the station had a valid postponement decision until 2025. Eskom was unable to complete an application by the deadline of March 2019 and as such requested approval for the late submission of an application in March 2019. Approval to submit an application by November 2019 was granted to Eskom in October 2019 by the Minister of Environment, Forestry and Fisheries. Eskom has complied with this request and, as mentioned above, undertakes to submit an updated AIR and Public Participation report when these are available. It is Eskom's opinion that information submitted with this application does provide sufficient substantive information for the NAQO to make a decision in respect of this application.

4.3 The Need to Amend the Variation Requests

In terms of timing, Eskom is required to submit an AEL variation request parallel to this application. The variation request is prepared based on the assumption that this application is granted by the NAQO. If the

NAQO decision is substantially different from that applied for, Eskom reserves its right to amend its variation request. Eskom will complete the variation request for the Medupi application during the planned public participation exercise.

5 REASONS FOR APPLYING ALTERNATIVE LIMITS

As mentioned above, the application must be accompanied by reasons. The reasons for the application relate primarily to why additional time is required for implementation of the FGD and why a monthly rather than a daily SO₂ limit is requested prior to completion of the FGD.

For a discussion on the cost of full MES compliance (including FGD) and additional reasons for the overall Eskom application process, see Annexure 2 - the Summary report of Eskom's MES Applications (March 2019). As set out in the Constitution of the Republic of South Africa, there is the need to recognise the interrelationship between the environment and development. There is a need to protect the environment, while simultaneously recognising the need for social and economic development. There is the need therefore to maintain the balance in the attainment of sustainable development.

5.1 FGD project delays

It was planned to install FGD at Medupi six years after each unit is commissioned (so the first unit, Unit 6, which was commissioned in 2015, would be retrofitted in 2021 with complete instillation being completed by 2025). The FGD project delivery time frame has been extended due to various factors including: extended and time consuming governance, funding and commercial processes; environmental licencing requirements especially the need for separate gypsum and ash disposal facilities; plant process issues at Medupi; lessons learnt in terms of more realistic project schedules and ensuring critical hold points. It is presently planned to have FGD at Medupi operational between 2028 and 2030.

5.2 Coal quality

Monitoring at the station has shown that a daily SO₂ emission limit of 3500 mg/Nm³ is exceeded sporadically at Medupi when batches of high Sulphur coal are received. The root cause of the high SO₂ emissions experienced is the high Sulphur content in the coal supplied to the station by the Exxaro Grootegeluk Coal Mine. The high Sulphur content is an inherent property of the coal available in the Waterberg coal seams. In the short- to medium-term, there is no simple remedy to the situation and all potential solutions bring along with them huge operational, environmental and financial implications. Load losses, coal beneficiation practices, alterations to existing coal contracts and options to source coal from other mines are all options that have been looked into to find potential solutions but have proven not to be feasible. Current initiatives Eskom is working on to better manage the quality of coal which is fed into the plant include: implementing an online analyser on the feed conveyor to better manage coal quality within the coal stockyard; establishing a high level reclaimer to allow recovery from lower quality stockpiles; and engaging with the mine to enable direct feeding of lower sulphur coal directly to the plant during periods of high SO₂ emissions. Given the difficulties in managing coal quality a monthly rather than a daily SO₂ limit is requested to provide the station more flexibility in supporting compliance to the limit.

5.3 Medupi Impact on Ambient Air Quality

Ambient air quality data from Medupi monitoring site were analyzed for the period 01 January 2016 – 31 December 2018. The results show that the daily PM₁₀ standard was marginally exceeded in 2018. However, both PM₁₀ and PM_{2.5} were within compliance with such a standard in both 2016 and 2017. In addition, both SO₂ and NO₂ were well within compliance with the national standard in the entire period of analysis. Medupi monitoring site is located approximately 4.4 km south-southwest of Medupi Power Station.

5.3.1 Particulate Matter

For the period 01 January 2016 – 31 December 2018, PM₁₀ concentrations were in non-compliance with the daily standard in 2018. No exceedances of the daily PM_{2.5} standard were recorded during the period of analysis, including in 2018. Analysis of the diurnal variations in the concentrations of both PM₁₀ and PM_{2.5} revealed clear early-morning and late-evening peaks associated with low-level sources. There are several potential sources of particulate emissions in the vicinity of the monitoring site such as mining activities.

5.3.2 Nitrogen Oxides

Diurnal variations in the concentrations of NO₂ at Medupi monitoring station show that both low-level and elevated sources contribute to ambient concentrations of this pollutant, with a more pronounced peak in the late morning, which is associated with elevated sources. However, no exceedances of the NO₂ standards were recorded at Medupi ambient air quality monitoring station during the period of analysis.

5.3.3 Sulphur Dioxide

The hourly average SO₂ concentrations frequently exceeded the limit value at the Medupi monitoring site. However, such exceedances were within the permissible number of exceedances in each of the years considered in the analysis. This is also the case for the daily SO₂ concentrations. Previous atmospheric dispersion modeling studies have shown that after the full commissioning and prior to FGD retrofit, emissions from Medupi Power Station would result in exceedance of the daily limit value for SO₂ in some small areas in the Waterberg-Bojanala Priority Area. These studies have also shown that emissions from both Matimba and Medupi Power Stations would lead to non-compliance with hourly and daily standards for SO₂ in some areas in the Waterberg-Bojanala Priority Area. However, after the implementation of the FGD at Medupi, such studies show that emissions from these power stations would no longer lead to non-compliances with standards for SO₂.

5.3.4 The Waterberg-Bojanala Priority Area

Medupi is situated within the Waterberg-Bojanala Priority Area (WBPA) and Eskom has and is implementing substantial financial investment into its power stations in the region to promote acceptable air quality in the area. Medupi is being constructed to meet PM and NO_x limits and will be retrofitted with FGD to support meeting SO₂ MES limits.

6 PUBLIC PARTICIPATION

The requirement that the public participation process for this application partially follows the process specified in the NEMA Environmental Impact Assessment (EIA) Regulations. Eskom supports and aligns its public participation process with the requirements as stipulated within the NEMA EIA Regulations. For this application Eskom has provided the public participation report completed for the overall 2019 MES application as the issues raised in the overall report will be a reflection of the issues relevant to Medupi (Annexure 4.1 and 4.2). Eskom has also provided a copy of the public participation report prepared for the 2017 Medupi and Medupi postponement applications as these issues are also relevant (Appendix B). Eskom will complete a full public participation process for Medupi based on the updated AIR and a public participation report will be provided to the NAQA when this is available (anticipated May 2020).

An AEL variation request, which will be submitted, will be subject to a public participation process that meets the requirements of Section 46 of NEMAQA.

7 EMISSION OFFSETS

Eskom is willing to implement emission offsets in areas where power stations impact significantly on ambient air quality, and where there is non-compliance with ambient air quality standards, as a condition of an approved postponement. Eskom has however done various studies on the potential for offsets in area impacted by Matimba and Medupi and has been unable to identify an effective offset solution. In the Highveld, where household coal burning is a significant pollution source, interventions targeted at reducing this source have been developed. In communities around the Limpopo stations household coal burning is not a major pollution source. Source apportionment work done shows local low level source such as quarries are responsible for local PM exceedances and these are not associated with Eskom stack emissions. Eskom is working with Provincial and local authorities on educational and other targeted environmental, and emission awareness initiatives and remains committed to doing this going forward.

8 CONCLUSION

Eskom is committed to ensuring that it manages and operates its coal-fired power stations in such a manner that risks to the environment and human health are minimised. As set out in the Constitution of the Republic of South Africa, there is the need to recognise the interrelationship between the environment and development. There is a need to protect the environment, while simultaneously recognising the need for social and economic development. There is the need therefore to maintain the balance in the attainment of sustainable development.

Medupi does comply with PM and NO₂ new plant emission limits. Eskom has further committed to implement FGD at the station by 2030 at a cost of in the region of approximately R 29 billion (real/overnight).

The Eskom Emission Reduction Plan will lead to a reduction in total emissions from several power stations specifically particulate emissions. Further six power stations will be decommissioned by 2030 reducing the total load of all emissions produced.

The impact of Medupi's emissions on ambient air quality in respect of SO₂ have been comprehensively assessed previously and as part of the 2017 postponement application and an updated AIR will be provided by May 2020. Ambient air quality data from Medupi monitoring site were analyzed for the period 01 January 2016 – 31 December 2018. SO₂ was well within compliance with the national standard in the entire period of analysis.

Eskom has complied with the requirement to submit this application by November 2019 but intends to supplement the application with an updated AIR and public participation report.

Eskom believes given the motivation presented above in terms of Medupi already complying with the new plant emission standards for PM and NO_x and its commitment to install FGD, the limited air quality impact of its operations, Eskom's complete emission reduction plan and its implications and the specific detail in respect of Medupi, that the application for alternative limits is appropriate and in line with the relevant Constitutional, regulatory and policy requirements and as such the application should be approved by the NAQO.