ESKOM

APPLICATION FOR EXEMPTION FROM THE MINIMUM EMISSIONS STANDARDS FOR THE KRIEL POWER STATION

DATE: 28 October 2013

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AIR	Atmospheric Impact Report
AEL	Atmospheric Emission License
APPA	Atmospheric Pollution Prevention Act (Act No. 45 of 1965)
AQMP	Air Quality Management Plan
DEA	Department of Environmental Affairs
ESP	Electrostatic precipitator
NAAQS	National ambient air quality standards
NEM:AQA	National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
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
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 lying in coal-fired power stations. One such power station is the Kriel Power Station (hereafter referred to as "Kriel"), which is close to Kriel town in the Nkangala District of the Mpumalanga Province. The last of Kriel's generating units was commissioned in 1979. Kriel is a wet-cooled coal-fired power station in Eskom's fleet.

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 promulgated in terms of section 21(3)(a) of the NEMAQA ("MES") under GNR 248 on 31 March 2010 ("GNR 248"). GNR 248 does provide for transitional arrangements in respect of the requirement for existing plants to meet the MES and provides that less stringent limits must be achieved by existing plants by 1 April 2015, and the more stringent 'new plant' limits must be achieved by existing plants by 1 April 2020. Kriel already achieves the 3500 mg/Nm^3 Sulphur dioxide (SO_2) limit (MES for 'existing plant'). However, due to water resource, financial and electricity supply capacity constraints (presented in more detail in this document and supporting Annexures), Eskom's Kriel Power Station will not be able to comply with the 'new plant' MES for SO_2. Moreover, plans are underway to reduce Particulate Matter (PM) and Nitrogen oxides (NOx) emissions from Kriel so that Kriel will comply with the existing and new plant limits. However, the emission reductions will only be fully realised by April 2025. The maximum 5-year grace period that can be applied for in terms of section 6 of GNR 248 is insufficient, and so an exemption is required from the NOx and PM existing plant limits, until the retrofits are completed. (Table 1).

Table 1: Minimum Emission Standards for Category 1: Combustion Installations, sub-category 1,1: Solid Fuel Combustion Installations, for which Eskom is applying for exemption for the Kriel Power Station[1].

Description:	Solid fuels combustion installations used primarily for steam raising or electricity generation.		
Application:	All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under normal conditions of 10% 0_2, 273 Kelvin and 101,3 kPa.**
Common name	**Chemical symbol**		
Particulate matter	N/A	Existing	100
Sulphur dioxide	SO_2	New	500
Nitrogen oxides	NOx	Existing	1100

The purpose of this document is to present an application for exemption from certain MES for Kriel (Table1). The document has been structured to present firstly Eskom's atmospheric emissions reduction plan, then to propose alternative emission limits to which Kriel could be held and which could then be included in the Atmospheric Emission Licence (AEL). The legal basis for applying for exemption is then presented, including the requirements

[1] Note that an application for postponement of the 'new plant' MES has also been submitted for PM and NO_x

that must be met in making such an application. Finally, the reasons for the application for exemption are presented together with a description of the public participation process conducted in support of the application.

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) to comply fully with the MES by the 2015 and 2020 timeframes stipulated. This is elaborated on in the sections below. As a result, Eskom prefers 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 four highest emitting stations. Kusile Power Station will achieve the SO_2 new plant limit immediately once commissioned, and flue-gas desulphurisation will be retrofitted at Medupi 6 years after each unit is commissioned, so that the new plant SO_2 limit will also be achieved at Medupi over time.

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

- Particulate Matter emission reduction: Fabric filter plant retrofits at Grootvlei Units 2-4; Tutuka, Kriel, Matla and Duvha Units 4-6;
- NO_x emission reduction: Low NO_x burner retrofits at Matla, Kriel, Majuba, Tutuka; and,
- SO_2 emission reduction: Flue-gas desulphurisation retrofit at Medupi.

The planned retrofit schedule is depicted in Figure 1. The decommissioning dates for a 50-year and a 60-year power station life are shaded grey. Currently the Integrated Resource Plan is based on a 50-year life for all power stations, but there is a possibility that the life of some of the power stations could be extended to 60 years.

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 at Matimba, Kendal, Lethabo, 3 of the 6 units at Duvha, Matla, Kriel, Tutuka, Komati, 3 of the 6 units at Grootvlei;
- Fabric filter plants at Majuba, Arnot, Hendrina, Camden, 3 units at Duvha, 3 units at Grootvlei, Medupi, Kusile;
- Boilers with low NO_x design at Kendal and Matimba;
- Low NO_x burners at Medupi, Kusile, Ankerlig, Gourikwa; and,
- Flue-gas desulphurisation at Kusile.

The proposed retrofits will reduce emission of relative PM by 67%; relative NO_x by 29% and relative SO_2 by 30% (assuming that Medupi and Kusile are fully operational, as they will be once all these retrofits have been realised, and that power station decommissioning starts according to the 50-year life plan; Figure 2 to Figure 4).

		Years															Decommissioning dates	
	Retrofits	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**50-year life**	**60-year life**
Medupi	FGD																2064-	2074-
Majuba	LNB																2046-2051	2056-2061
Kendal	None																2038-2043	2048-2053
Matimba	None																2037-2041	2047-2051
Lethabo	None																2035-2040	2045-2050
Tutuka	FFP																2035-2040	2045-2050
	LNB																	
Duvha	FFP (U4-6)																2030-2034	2040-2044
Matla	FFP															D	2029-2033	2039-2043
	LNB															D		
Kriel	FFP												D	D	D	D	2026-2029	2036-2039
	LNB												D	D	D	D		
Arnot	None							D	D	D	D	D	D	D	D	D	2021-2029	2031-2035
Hendrina	None						D	D	D	D	D	D	D				2020-2026	2030-2036
Camden	None							D	D	D							2020-2023	
Grootvlei	FFP (U2-4)											D	D	D	D		2025-2028	
Komati	None										D	D	D	D	D		2024-2028	

Flue-gas desulphurisation (FGD) retrofit
Low NO_x Burner (LNB) retrofits
Fabric filter plant (FFP) retrofits
Decommissioning dates: 50 year life and current plan for RTS

Figure 1: Planned emission abatement retrofits and power station decommissioning dates to illustrate Eskom's overall atmospheric emissions reduction plan.

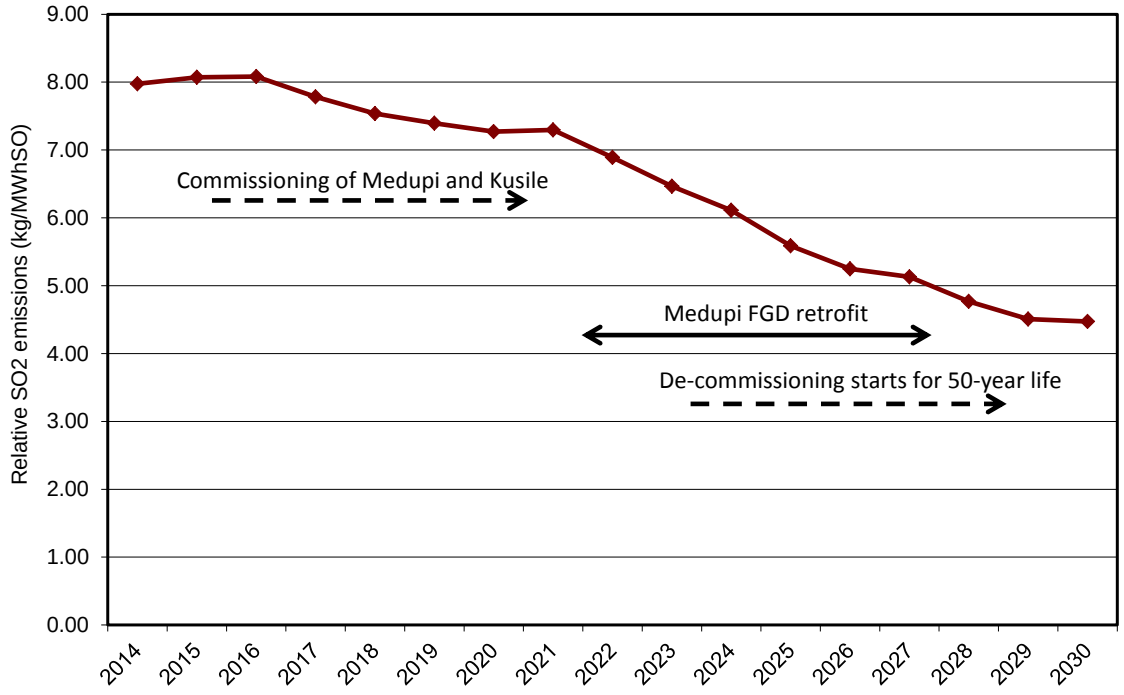

Figure 2: Planned reduction in relative SO_2 emissions

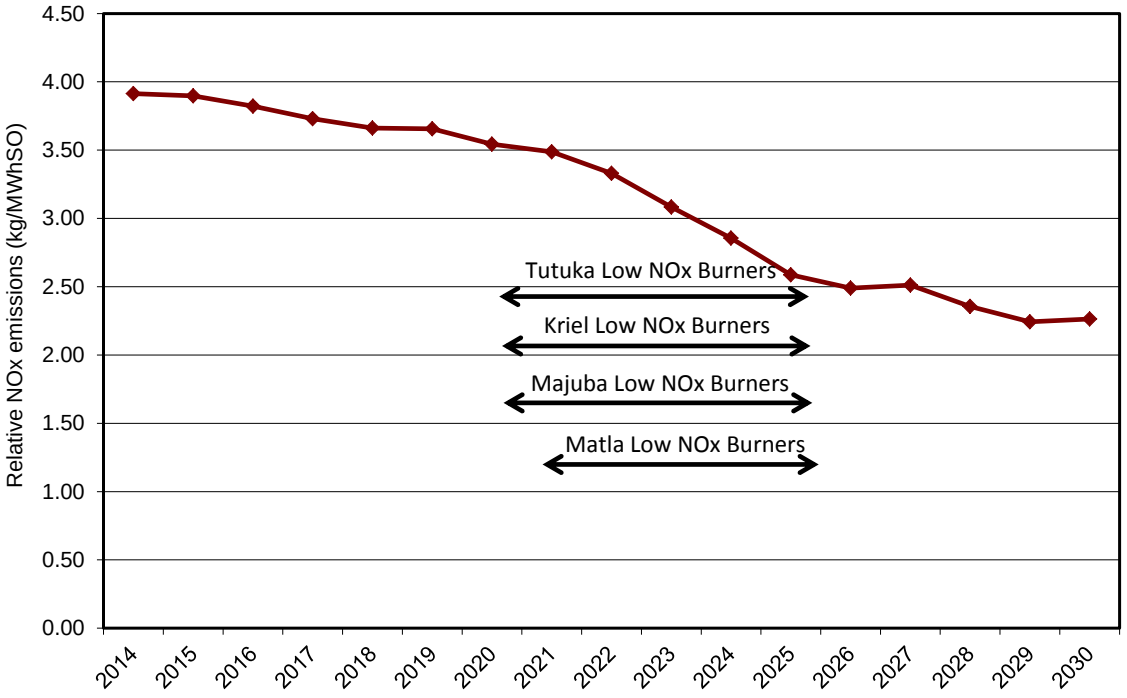

Figure 3: Planned reduction in relative NO_x emissions

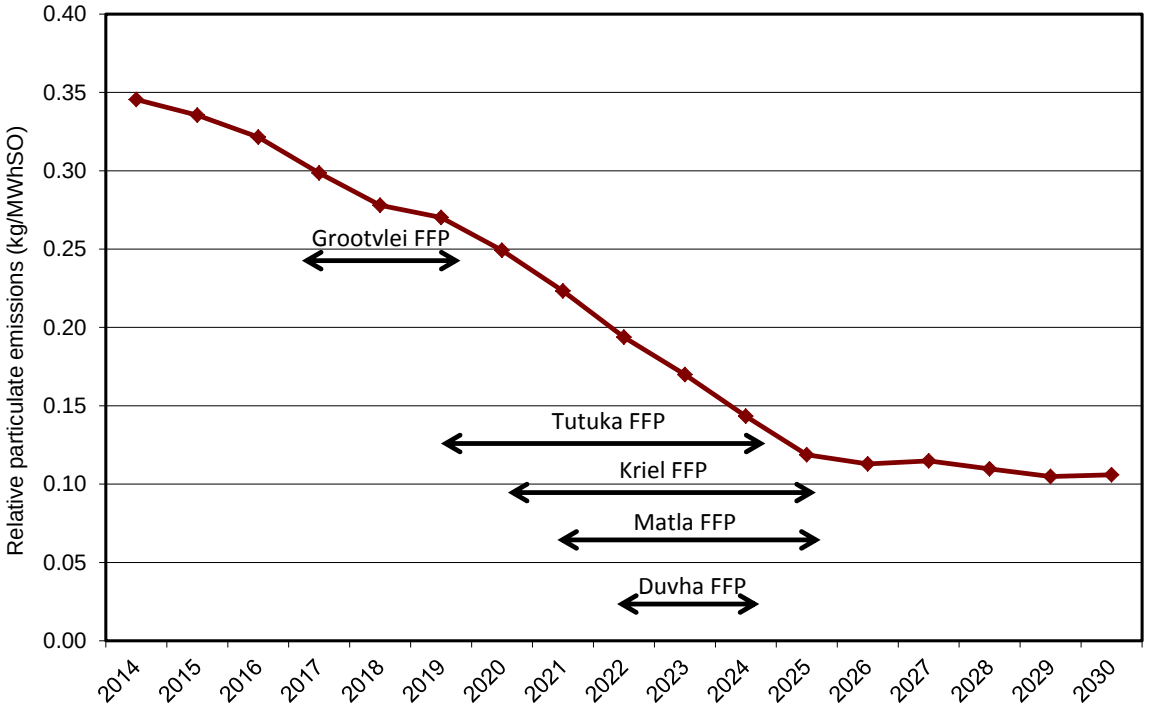

Figure 4: Planned reduction in relative particulate matter emissions

Table 2: Eskom's compliance with the MES before and after the implementation of their emissions reduction plan. C means 'compliant', N means 'non-compliant' and the blocks with a thick border show where compliance is achieved after the retrofitting.

	BEFORE RETROFITTING						AFTER RETROFITTING					
	Particulate matter		Sulphur dioxide		Oxides of nitrogen		Particulate matter		Sulphur dioxide		Oxides of nitrogen	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
Kusile	C	C	C	C	C	C	C	C	C	C	C	C
Medupi	C	C	N	N	C	C	C	C	C	C	C	C
Majuba	C	C	C	N	N	N	C	C	C	N	C	C
Kendal	C	N	C	N	C	C	C	N	C	N	C	C
Matimba	C	N	N	N	C	C	C	N	N	N	C	C
Lethabo	C	N	C	N	C	N	C	N	C	N	C	N
Tutuka	N	N	C	N	N	N	C	C	C	N	C	C
Duvha (1-3)	C	C	C	N	C	N	C	C	C	N	C	N
Duvha (4-6)	N	N	C	N	C	N	C	C	C	N	C	N
Matla	N	N	C	N	N	N	C	C	C	N	C	C
Kriel	N	N	C	N	N	N	C	C	C	N	C	C
Arnot	C	C	C	N	N	N	C	C	C	N	N	N
Hendrina	C	C	N	N	N	N	C	C	N	N	N	N
Camden	C	N	N	N	N	N	C	N	N	N	N	N
Grootvlei	N	N	N	N	N	N	C	C	N	N	N	N
Komati	C	N	C	N	N	N	C	N	C	N	N	N
Ankerlig	C	C	C	C	C	C	C	C	C	C	C	C
Gourikwa	C	C	C	C	C	C	C	C	C	C	C	C
Acacia	C	C	C	C	C	N	C	C	C	C	C	N
Port Rex	C	C	C	C	C	N	C	C	C	C	C	N

3 PROPOSED ALTERNATIVE EMISSION LIMITS

The current limits listed in Table 3 are as in Kriel's Atmospheric Emissions Licence 17/4/AEL/MP312/11/09. The alternative emission limits that are requested for Kriel during normal operating conditions, are:

Table 3: Current and proposed alternative emission limits for Kriel.

	Current limits (from AEL)		Requested limits	
	Limit value	Averaging period	Limit value	Averaging period
Particulate Matter	125*	Daily	From now until 31 March 2025: 400 From 1 April 2025: 50	Daily
Sulphur dioxide	4000	Daily	From now until decommissioning: 2800	Daily
Nitrogen oxide	1700	Daily	From now until 31 March 2025: 1600 From 1 April 2025: 750	Daily

**May be exceeded for up to 90 hours per stack per month.*

The emission limits requested above are in mg/Nm^3 at 273 K, 101.3 kPa, dry and 10% O_2. It is requested that the more lenient limits above be effective until the FFP and de-NOx retrofits are completed by 31 March 2025, and that thereafter the new plant emission limits become applicable. It should be noted that Kriel has two combined

stacks, i.e. three units flow into each stack. So although a successive reduction in PM and NOx emissions will be realised once the retrofits start, the stack will only be able to comply with the new plant emission limit once all units feeding into the stack have been retrofitted. Furthermore, it is requested that the proposed alternative limits only apply during normal working conditions, and not during start-up or shut-down periods. In addition, it is requested that the limit only apply for 94% of the time during normal operation (i.e. for 29 of the 31 days in a month). If the proposed alternative emissions limits are made to apply for 100% of the time, too much redundancy has to be built into the power station which is simply not cost-effective or practicable.

4 LEGAL BASIS FOR THE EXEMPTION APPLICATION

Section 59(1) read with section 59(2) of the NEMAQA entitles any person or organ of state to apply in writing for an ***"exemption from the application of a provision of this Act to the Minister"***, except from a provision contained in sections 9, 22 or 25 of the NEMAQA. The NEMAQA defines "this Act" so as to include, *inter alia*, any regulation made in terms of the NEMAQA and any other subordinate legislation issued in terms of the NEMAQA. Eskom herewith submits this application ("Application") in terms of section 59(1) of the NEMAQA in respect of Kriel Power Station from the MES as stipulated in GNR 248, in respect of the MES cited in Table 1. It is very important to note that the application is only for exemption from the specific limits published in terms of section 21 of NEMAQA, and not from an emissions limit *per se*, or indeed the requirement for an AEL.

During the stakeholder engagement process, stakeholders questioned why Eskom was applying for exemption and not for postponement, on the basis that postponement appears to be, legally, the clearer option. Eskom's response is that power stations have typically a 50-60 year lifespan, and there are 19 coal- and liquid fuel-fired power stations in the fleet. Managing individual power stations within this context on a 5-year planning horizon is simply not possible (section 6 of GNR 248 makes provision for a 5-year postponement). Eskom needs to make decisions that apply to the fleet as a whole and the risk associated with applying for postponement for each station every 5 years would be unmanageable. Moreover, the time from project inception until execution of an emission reduction retrofit is completed is typically around 10 years for a 6-unit power station. In addition a probable interpretation of section 6 (3) of GNR 240 is that postponement can only be applied for once, and compliance by April 2025 is not possible. Eskom believes strongly that it is entitled to apply for exemption and indeed that the Minister of Water and Environmental Affairs ("Minister") can grant exemption within the auspices of the Act.

Eskom will also submit a request for variation of the AEL to the Licencing Authority, which in the case of Kriel. In terms of section 59(5) of the NEMAQA, the Minister may delegate her functions, specifically her authority to grant exemption, to the MEC responsible for air quality in a province or to a metropolitan or district municipality. It is understood that the Minister has not made any delegations in terms of section 59(5) of the NEMAQA in so far as section 59 of the NEMAQA pertains to Eskom's Kriel Power Station and accordingly, Eskom hereby submits this Application for exemption from the MES, to the Honourable Minister.

5 REASONS FOR APPLYING FOR EXEMPTION

In terms of section 59(2) of the NEMAQA, the Application must be accompanied by reasons. Such reasons are set out below and include the fact that emissions from Kriel do not result in non-compliance with ambient air quality standards, together with a suite of undesired environmental consequences of compliance with the MES including associated water demands, transport impacts and increases in waste and Carbon dioxide (CO_2) production. These undesired consequences together with the financial costs of compliance (such as an electricity tariff increase) must be weighed up against the benefits that will accrue as a result of compliance with the MES.

It is Eskom's view that the benefit of compliance does not justify the non-financial and financial costs of compliance.

None of these reasons should be seen as exclusive (i.e. it is not one reason alone that prevents compliance) but rather all in combination. Before presenting these various reasons, the reader is referred to Annexure A, in which various information is presented on the Kriel Power Station, and then to Annexure B in which the technology options available to Eskom for compliance with the MES are detailed. In Annexure B it is made clear that wet and semi-dry Flue-Gas Desulphurisation (FGD) are the only viable options that would see the MES for SO_2 being met at Kriel Power Station. Unless otherwise stated in the application, all the reasons presented below (other than financial cost) are presented in respect of retrofitting wet or semi-dry FGD at Kriel.

5.1 Water availability

Both wet and semi-dry FGD are critically dependant on the availability of large quantities of water being available at the power stations where FGD is deployed. The reader is referred to Annexure F, which is an independently prepared summary of the availability of water in the various catchments and sub-catchments in which the coal-fired powers stations operate. The reader is reminded that the water demands of FGD increase the water required by a wet-cooled power station like Kriel by some 1.2 times (around 40 million m^3/annum without FGD, to more than 47 million cubic metres per annum with wet FGD). The Kriel Power Station is a wet-cooled power station, which means that it already uses large quantities of water. The effect of FGD will exacerbate this water consumption. There is currently no additional water available to operate FGD at Eskom's power stations. Additional water will only become available when the second phase of the Lesotho Highlands project has been completed, which is currently scheduled for 2021. The argument is also not just one of having water available in the catchment, it is also one of determining whether FGD is a judicious use of what is an extremely scarce resource in South Africa in the face of multiple competing demands for that same resource. More than 98% of South Africa's available water has already been allocated.

5.2 Sorbent consumption and waste production

FGD at Kriel would require between 200 000 and 300 000 tons of sorbent per annum. The tonnage of limestone required for wet FGD is approximately 1.3 times that of lime required for semi-dry FGD. The main source of sorbent is the Northern Cape, so the sorbent would need to be transported over hundreds of kilometres, preferably by rail or otherwise by road. The transport of the sorbent would result in environmental impacts, notably greenhouse gas emissions, and fugitive dust emissions. An increase in truck traffic would also result in an increase in driver mortalities, as has been observed in association with coal transport in Mpumalanga. New mines would also need to be opened to supply sorbent to all Eskom's power stations, and this would also have significant environmental impacts, including a potential deterioration in water quality and an increase in fugitive dust emissions.

Each ton of sorbent produces around 2 tons of by-product (gypsum). If a high quality limestone is used, a high quality gypsum can be produced by wet FGD, and this could be taken up by the market for e.g. wallboard production. Lower grade gypsum can also be used for agricultural purposes. However, indications are that there is only demand from the market for gypsum from about two power stations. Furthermore, there are limited supplies of high quality sorbent in South Africa, so it is likely that most gypsum or by-product would need to be disposed of, in which case it would need to be managed carefully to ensure that there are no impacts on groundwater or air quality (from fugitive dust emissions).

5.3 CO_2 production

The wet FGD process also directly produces CO_2 as a by-product, through the reaction:

$$SO_2 + CaCO_3 \rightarrow CaSO_4 + CO_2$$

Kriel is expected to produce an additional approximately 130 000 tons of CO_2 per annum if wet FGD is installed (Semi-dry FGD, which typically uses lime as a sorbent, does not produce CO_2 directly in the FGD process, but the CO_2 is produced instead through the manufacture of lime from limestone). In addition, the electricity output of Kriel would be reduced by around 1% due to the additional auxiliary power requirements of the FGD, and correspondingly the relative CO_2 emissions would increase by 1%. If wet FGD is installed on every power station in Eskom's fleet, this would result in an additional 4 million tons of CO_2 emitted per annum directly from the FGD process.

5.4 Direct financial costs

For commercial reasons it is not possible to present the costs of compliance with the MES per individual power station, but suffice to say that a FGD retrofit at Kriel, which is the only way of consistently achieving the new plant SO_2 emission limit, would cost many billions of rands for both wet and semi-dry FGD, with wet FGD being more expensive. In addition, the annual operating costs of FGD are expected to be several hundred million rands per annum. A fabric filter plant retrofit and do-NOx retrofit will also each cost several billion rand. Eskom is currently planning to retrofit FFP and de-NOx technology at Kriel, but the funding has not been approved yet. As shown in Table 4 the total capital costs of compliance with the MES have been estimated at around R200 billion and the annual operating costs at R6 billion per annum. The reader is also referred to Annexure E in which an independent assessment has been conducted of the costs of FGD and NO_x retrofits proposed by Eskom to ensure that these costs have not been exaggerated. It can be seen from that assessment that the costs presented here are deemed to be an accurate presentation. It also needs to be noted that the financial costs presented exclude financing costs, which cannot be determined accurately enough at this stage and as such have been excluded from this presentation. The effect of financing costs would obviously serve to increase the financial costs of compliance with the MES.

As demonstrated in Annexure E, the only way in which Eskom can finance the retrofitting would be through the electricity tariff (what Eskom charges for the electricity that it generates). That tariff is applied for by Eskom, but decided on by the National Electricity Regulator of South Africa (NERSA). Earlier this year, Eskom's application of a 16% increase per annum over the next 5 years, and NERSA's decision to grant only 8% was highly publicised. Eskom must decide on all of its capital and operating expenses within the tariff decided by NERSA, and has no other means of financing its capital and operating expenses unless it draws money directly from the National Treasury, which would obviously be undesirable. The costs presented above have been estimated to translate into an additional 7 to 20% increase in the tariff, over and above the 'normal' tariff increase. In announcing the 8% tariff increase earlier this year, NERSA chairperson Cecilia Khuzwayo said, "our challenge ... has been and still remains regulating the energy sector in the manner that balances the interests of energy producers on one hand and consumers on the other hand."

5.5 Impact on ambient air quality

It is common cause that the MES serve to ensure that there is compliance with the National Ambient Air Quality Standards (NAAQS). It is also common cause that there are many areas in South Africa in which NAAQS are not met consistently, exposing people and the environment to pollutants at concentrations that are above those considered to be protective of human health. As an emitter of atmospheric emissions there can be no denying that Eskom contributes to the manifestation of elevated air pollutant concentrations in the vicinity of their power stations. The question that arises is, what are the ambient air quality implications if Kriel is granted exemption

from certain MES limits? The reader is referred to Annexure C in which an Atmospheric Impact Report ("AIR") is presented in respect of Kriel. The AIR provides, *inter alia*, an assessment of how ambient air quality is likely to be affected by Kriel not meeting the MES utilising, *inter alia*, atmospheric dispersion modelling.

5.5.1 Sulphur dioxide

The dispersion modelling study to assess the implication of these requests reveals that predicted SO_2 concentrations resulting from current emissions from Kriel Power Station comply with the NAAQS. Although somewhat higher than for current emissions, the predicted ambient concentrations for the requested emission limits are also below the respective NAAQS. There is a risk of non-compliance with short-term ambient SO_2 standards if SO_2 emissions are consistently at the requested emission limit, but the emission limit is a conservative value, and actual SO_2 emissions should be 30-40% below the requested limit. An assessment of monitored ambient air quality data at the Kriel Village and Elandsfontein monitoring stations reveals a relatively high SO_2 loading and exceedances of the hourly (Elandsfontein, Kriel Village) and the daily (Kriel Village) limit value for SO_2 are evident in the date record for 2011 and 2012. Exceedances of the ten-minute average limit value are likely to have occurred during some of the previous years. However, there is currently compliance with the SO_2 NAAQS, and since SO_2 emissions are expected to stay relatively constant in future, this should not change. The implication is that Eskom's requested emission limits for SO_2 for Kriel Power Station may result in non-compliance with the NAAQS the maximum impact zone, but since emissions are expected to be similar to current levels and 30-40% below the requested emission limit, this will probably not materialise. The ambient results also suggest that the cumulative impact of emissions from Kriel and Matla does not currently and will not in future result in non-compliance with ambient SO_2 standards.

5.5.2 Particulate matter (PM_{10})

The dispersion modelling study to assess the implication of the requested PM emission limit for Kriel reveals that predicted ambient PM_{10}, concentrations resulting from current emissions from Kriel Power Station comply with the NAAQS. Although somewhat higher than for current emissions, the predicted ambient concentrations for the requested emission limits are also below the respective NAAQS. Ambient daily PM_{10} concentrations indicate sustained high loading and non-compliance with both the daily and annual average NAAQS. Analysis of diurnal data shows that the Kriel Power Station does not contribute significantly to ambient PM_{10} levels and that the exceedances derive from ground level emissions such as domestic fuel use. Current and future PM emissions from the power stations contribute only marginally to the measured ambient concentrations.

5.5.3 Nitrogen dioxide (NO_2)

The dispersion modelling study to assess the implication of these requests reveals that predicted ambient NO_2 concentrations resulting from current emissions from Kriel Power Station comply with the NAAQS. Although somewhat higher than for current emissions, the predicted ambient concentrations for the requested emission limits are also below the respective NAAQS. NO_2 exceedances of the hourly NO_2 limit values are evident at Elandsfontein and Kriel Village, but there is generally compliance with the NO_2 NAAQS. Current and future NO_x emissions from the power stations contribute only marginally to the measured ambient concentrations.

5.6 Remaining life of the power station

Kriel Power Station is scheduled to be decommissioned between 2026 and 2029. It certainly does not make sense to start retrofitting FGD at Kriel from 2022 onwards (when water becomes available), given the short remaining life of the power station.

5.7 Cost benefit

Considering that SO_2 emissions from Kriel do not result in non-compliance with ambient SO_2 standards, the benefit of spending many billions of randson retrofitting FGD, and spending several hundred million rand per annum operating the FGD is questionable, especially considering the short remaining life of the power station.

5.8 Summary

The implications of Eskom's prioritised plan for emission reduction are summarised in Table 4 together with how these implications will change if full compliance with the MES were to be achieved.

Table 4: Implications of Eskom's prioritised plan for emission reduction, compared with the implications of full compliance with Minimum Emission Standards

Implications	Full compliance with Minimum Emission Standards	Eskom's emission reduction plan
Water consumption increase	20% (67 million m^3/annum)*	2% (8 million m^3/annum)
CAPEX cost (2013 overnight costs, excluding interest and interest during construction)	Approx R200 billion**	R46 billion**
Annual OPEX costs (2013 costs)	Approx R6 billion**	R900 million**
Tariff increase	7 to 20 % pa	2,8 to 3,7 % pa
Auxiliary power consumption increase	2 255 GWh/year*	180 GWh/year
CO_2 emission increase (direct emissions from the FGD process only)	1-4 million tons/annum	400 000 tons/annum
Increase in coal consumption due to low NO_x burner retrofits	970 000 tons/annum	670 000 tons/annum
Waste (FGD by-product) production	9.5 million tons/annum*	1.7 million tons/annum

**Assuming that wet FGD is installed on the 5 newest stations excluding Kusile, and semi-dry FGD is installed on the rest of the coal-fired fleet*
***Costs are 2012 real (overnight) costs, excluding financing costs*

6 PUBLIC PARTICIPATION

Although public participation is at the Minister's discretion and not prescriptive in terms of section 59 of the NEMAQA, Eskom is of the view that stakeholder consultation is a key component of the Application. The public participation process has fulfilled the requirements of section 59 (3) of NEMAQA. Notice of the exemption application will be published in The Sunday Times, The City Press and Rapport, all of which are national newspapers.

The process included the preparation of a Background Information Document (BID) that detailed the proposed applications for the Kriel and other coal and liquid fuel fired power stations. The BID was made available in the public domain, during which time public meetings were arranged at various venues in which Eskom's power stations operate. In the case of this application for Kriel, public meetings were held in Emalahleni on 2 July and Standerton on 3 July 2013, during which time the BID was presented and opportunity provided for questions and comments to be raised by participating stakeholders. It is clear from the comments received that stakeholders have severe reservations about this application being granted. These reservations stem from a concern that air quality will never be improved in South Africa unless emissions from large industrial sources, such as Eskom, are curtailed. It is presented here in response, that compliance with the MES is unlikely to result in a significant improvement in air quality as has been illustrated in the AIR, but will result in a significant financial cost that will make electricity (the provision of which is potentially one of the ways in which air quality could be improved) significantly more expensive.

There is also a strong argument that coal-fired power stations should be decommissioned and replaced with renewable forms of energy generation. Eskom agrees fully that renewable energy will have to play an increasingly

significant role in the provision of energy to South Africa into the future, but does not agree that it is as simple, as implied in the comments received from stakeholders, as immediately starting to replace fossil fuel based energy generation with renewable forms of energy. Sufficient baseload generation is required to ensure that South Africa has a continuous supply of energy. In addition it must also be remembered that the Integrated Resource Plan (IRP) that is developed by the Department of Energy (DOE) determines the electricity supply mix. Although Eskom actively participates in the development of the IRP, the utility has no mandate whatsoever to operate outside of the dictates of the IRP.

This application together with the various Annexures and supporting documentation is also being made available for public review for a period of 45 days. Additional public meetings have been arranged in that time including a meeting in Emalahleni on 7 November and Standerton on 8 November 2013. The various comments made on this application and the supporting documentation will be contained in an issues-response report included in Annexure D. Responses to these various issues and comments will also be included.

7 EMISSION OFFSETS

Eskom is willing to implement emission offsets as a condition of an approved exemption. Eskom is of the view that in many cases household emission offsets are a more effective way of reducing human exposure to harmful levels of air pollution, than is retrofitting power stations with emission abatement technology. Emission retrofits at power stations also increase the cost of electricity, which may make electricity unaffordable for more people, resulting in an increase in the domestic use of fuels and a deterioration in air quality in low income areas.

Eskom has already completed a pre-feasibility study, and identified that the following offsets are likely to be most favourably received by households and other stakeholders:

- Retrofits of thermal insulation in houses;
- Install ceilings in houses;
- Replace existing coal/wood burning stoves with more efficient, low emission stoves;
- Supply LPG stoves and heaters and an LPG subsidy; and,
- Increase the free basic electricity subsidy.

Eskom plans to embark on a pilot study in the winter of 2014 (subject to the approval of the required funding), where these interventions will be implemented in a few households to test their effectiveness in improving air quality. Eskom is unfortunately not in a position to commit to offset projects where success is not yet assured, but is willing to commit to a plan of action, and to engage with relevant authorities and other stakeholders in this regard.

8 CONCLUDING COMMENTS

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. Eskom's requested emission limits for SO_2 for Kriel Power Station may result in non-compliance with the NAAQS the maximum impact zone, but since emissions are expected to be similar to current levels and 30-40% below the requested emission limit, this will probably not materialise. The ambient results also suggest that the cumulative impact of emissions from Kriel and Matla does not currently and will not in future result in non-compliance with ambient SO_2 standards. The financial costs of compliance with the MES will translate into an increase in the electricity tariff. Exemption is also requested from the new plant NOx and PM MES until April 2025. Eskom plans to install FFPs and de-NOx technology to reduce emissions to within compliance with the new plant MES, but this cannot be achieved by April 2020, Kriel Power Station contributes marginally to the measured concentrations of PM_{10}, and there is compliance with the ambient

NO_2 standard everywhere in the vicinity of Kriel Power Station. If air quality is to be improved in surrounding residential areas then interventions should be geared towards limiting low-level (surface) emission sources of especially PM_{10}.