# ESKOM

# APPLICATION FOR SUSPENSION OF THE NEW PLANT MINIMUM EMISSIONS STANDARDS COMPLIANCE TIMEFRAMES FOR THE PORT REX 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 lying in coal-fired power stations. Just under 6% of Eskom's totalled installed capacity is contributed from gas turbine generated power stations, predominantly located on the Western and Eastern Cape. These Gas power stations form part of the Peaking electricity generation fleet. Peaking power stations operate during peak periods or during times when demand is higher than that which the base load power stations (that operate continuously) can supply. One such peaking power station is the Port Rex Gas Power Station (hereafter referred to as "Port Rex"), which lies 200m from Buffalo River, in East London in the Eastern Cape Province. The last of Port Rex's generating units was commissioned in the late 1970's.

In terms of the Integrated Resource Plan and the Eskom Consistent Data Set, 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, as well as guided by the Integrated Resource Plan (IRP). Port Rex is intending to decommission its units by 2026, no later than 2030.

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 NEMAQA[1]. 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; and 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. Eskom has however applied and received a condonation for the late submission of a suspension application for Port Rex until November 2019. A postponement of certain limits was granted to Port Rex in 2015 however with the amendment of the MES regulations in October 2018 it is necessary to submit this further application.

Port Rex already achieves the new plant MES limit of 500 mg/Nm$^3$ for Sulphur dioxide ($SO_2$). Port Rex complies with the existing plant standards for nitrogen oxide ($NO_X$, 1100 mg/Nm$^3$) and Particulate Matter (PM, 75 mg/Nm$^3$). However, Eskom's Port Rex Power Station will not be able to comply with the 2025 'new plant' MES for nitrogen oxides ($NO_x$) of 250 mg/Nm$^3$ and particulate matter (50 mg/Nm$^3$). In 2015 Port Rex received postponement to the 2020 new plant limit for NOx with an approved alternative limit of 600 mg/Nm$^3$ from 2020 to 2025. Eskom is applying to the National Air Quality Officer for a suspension of the 2025 New Plant MES for NOx and PM, and requesting approval of a continued alternative emission limit of 600 mg/Nm$^3$ for NOx and an alternative limit of 75 mg/Nm$^3$ for PM, until decommissioning in 2026, no later than 2030. The emission limits are normalised to 15% $O_2$ on a dry basis.

The purpose of this document is to present an application for the suspension of the requirement to meet the 2025 compliance date and propose an alternative limit for PM and NOx for Port Rex as required in terms of GNR 1207. The document has been structured to present the application for suspension and the emission limits to which Port Rex could be held and which could then be included in the Atmospheric Emission Licence (AEL). The legal basis for the suspension is then presented, including the requirements that must be met in

[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

making such an application. Finally, the reasons for the application for suspension and alternative limits are presented.

## 2 PORT REX'S REQUESTED EMISSION LIMITS

The current approved limits listed in Table 1 are as in the NAQO approval to the postponement request received in 2015 (EC/EX-PR/20140227) as well as in Port Rex's AEL (ref: ECBE 000603)[2]. The alternative emission limits that are *requested* for Port Rex during normal operating conditions based on a suspension of the new plant limits for $NO_x$ and PM are also shown in Table 1:

**Table 1: Current and requested alternative emission limits for Port Rex**

| | **Current Limit (from AEL/MES)** | | | **Requested Alternative Emission Limits*** *273 K, 101.3 kPa, dry and 15% $O_2$** | | |
|---|---|---|---|---|---|---|
| | **Limit value ($mg/Nm^3$)** | **Averaging period** | **Date to be achieved by** | **Limit value ($mg/Nm^3$)** | **Averaging period** | **Date to be achieved by** |
| Particulate Matter | 100 | Daily | 20/09/2019 | ***75*** | Daily | *By 1 April 2020 until decommissioning ** * |
| Sulphur Dioxide | 3500 | Daily | 20/09/2019 | ***500*** | Daily | *By 1 April 2020 until decommissioning** * |
| Nitrogen Oxides | 1100 | Daily | 20/09/2019 | ***600*** | Daily | *By 1 April 2020 until decommissioning ** * |

*** the anticipated decommissioning date is 2026, but no later than 2030*

****The requested alternate emission limits above are in $mg/Nm^3$ at 273 K, 101.3 kPa, dry and 15% $O_2$.*

In summary, the application submitted for Port Rex is:

(i) Suspension of the new plant MES PM standard (50 $mg/Nm^3$) from 2020 with approval of alternative limit of 75$mg/Nm^3$, until station decommissioning which will be no later than 2030 (currently anticipated by 2026).

(ii) Suspension of compliance from the new plant MES $NO_x$ standard (250 $mg/Nm^3$) from 2025 as per the 2015 postponement decision and with approval of alternative limit 600$mg/Nm^3$ from 2020, until station decommissioning which will be no later than 2030 (currently anticipated by 2026).

It is further requested that the proposed alternative limits only apply during normal working conditions, and not during start-up or shut-down periods and the emission limits are represented in $mg/Nm^3$ (273 K, 101.3 kPa, dry and 15% $O_2$).

In terms of the existing license and NAQO approval to the previous postponement requests, Port Rex has to comply with a 600$mg/Nm^3$ $NO_x$ limit until 1 April 2025. It is therefore understood that this previously granted postponement of limits will remain in place until 2025 as a minimum and thereafter until decommissioning based on this request for suspension. Any other variations or amendments to the AEL are also considered to be unaffected by this application.

Based on the remaining life of the Port Rex power station, the techno-economics and cost benefits assessment any additional measures other than what was committed to above and the new plant emission limits requested are not financially viable.

2 The 2019 AEL does not reflect the 2015 Postponement decision but this is included in this discussion for completeness and correctness.

## 3 LEGAL BASIS FOR DECISION-MAKING

### 3.1 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 Port Rex for the 2014 Postponement application. The AIR provides, inter alia, an assessment of how ambient air quality is likely to be affected by Port Rex's requested emission limits by utilising, inter alia, atmospheric dispersion modelling. Eskom has appointed properly qualified consultants to prepare an 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 2014 and as such the information presented is appropriate for decision making purposes.
2. Detailed justifications and reasons for the Application (see Section 4 below) and,
3. A comprehensive report on the public participation process followed, and associated documentation (Annexure 4.1 and 4.2). The public participation report deals with the overall Eskom 2019 application process. The issues raised in the overall report will be a reflection of the issues relevant to Port Rex as Port Rex was included in the initial consultation on the Eskom 2019 application. Eskom will initiate a further round of public participation which will be completed based on the updated AIR and a supplementary public participation report will be provided to the NAQA when this is available (anticipated May 2020).

### 3.2 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 Port Rex as the station had a valid postponement decision until 2025. Eskom was unable to complete a further 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 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 the application submitted.

### 3.3 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 Port Rex application during the planned public participation exercise.

## 4 REASONS FOR APPLYING FOR SUSPENSION

As mentioned above, the Application must be accompanied by reasons. Such reasons are set out below and include the fact that Port Rex operates to a very limited extent (very low load factor) and that emissions from the station will not result in non-compliance with National Ambient Air Quality Standards (NAAQS). The financial costs of compliance and the limited remaining life of the plant are also significant considerations.

It is Eskom's view that the benefit of compliance to the MES at Port Rex and across the Eskom fleet does not justify the non-financial and financial costs of compliance (see Annexure 2 Summary report of Eskom's MES Applications for a discussion of the costs and impacts of compliance across the Eskom fleet). 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.

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.

### 4.1 Load factor

Port Rex is a peaking station, which is only used infrequently and in emergencies – generally a few hours a day. The load factor is given in the table below. The load factor represents a ratio of the actual energy produced over a reference period, divided by the nominal energy for the same period (if the load factor is 100% then the energy output was at its maximum). The average load factor for each engine at Port Rexper year from 2016 to 2018 is given in the table below. It can be seen that each engine operated with an average low load factor of 0.04%. This is less than one day a year.

**Table 2: Average load factor of each unit at Port Rex from 2016 to 2018**

| Year | Average load factor of each engine |
|---|---|
| **2016/17** | 0% |
| **2017/18** | 0% |
| **2018/19** | 0.12% |
| **Overall average** | 0.04% |

### 4.2 Remaining Power Station Life and cost of compliance

In order to meet the MES new plant NOx limits it would be necessary to:

- Modify the combustion system to allow water injection - estimated to cost between R15 mill to R20mill
- Implement high temperature selective catalyst reduction - estimated to cost between R50mill to R100mill

If compliance to the new plant limit for particulates were to be obtained it would in all likelihood require the conversion of the present diesel-burning plant to gas combustion. This conversion would be very expensive from a capital investment perspective and would increase operational expenses.

The three units at Port Rex were commissioned in 1976. They are thus now almost 43 years old. Port Rex's decommissioning planned date is anticipated to be by 2026, and no later than 2030. Port Rex has a postponement from the PM and NOx new plant limit until 2025.

Given the limited remaining life of the station the financial viability of the modifications required to meet the full MES compliance requirements are not considered appropriate.

### 4.3 Impact on Ambient Air Quality

#### *4.3.1 Nitrogen dioxide*

Based on the 2014 modelling predicted ambient $NO_2$ concentrations (using a dispersion model) were seen to be compliant with the $NO_2$ NAAQS for current emissions, but potentially non-compliant for Eskom's requested emission limit, if Port Rex is run continuously at this limit. The potential non-compliance derives from the fact that Port Rex was modelled as if it operated permanently, whereas in actual fact the station operates for less than 2% of the time. It is also clear from the modelling that the NAAQS hourly limit value is not exceeded every time Port Rex operates even under maximum emissions and, given that Port Rex has operated for less than a day a year and that the NAAQS allows 88 hourly exceedances of the limit value in a year, the risk of non-compliance with the NAAQS is very low indeed, and the associated risk to human health and the environment, negligible.

The air quality impact of the station in terms of $NO_x$, $SO_x$ and PM will be further assessed in the updated AIR estimated to be completed by May 2020. It is anticipated that given the very limited operating hours of the station the risk of non-compliance with the NAAQS is very low, and the associated risk to human health and the environment would be negligible.

## 5 ESKOM'S EMISSION REDUCTION PLAN

Eskom has committed to implementing a range of initiatives to reduce the impact of its power station emissions and while this plan is not directly relevant to Port Rex given the location of the station it is described below to provide context to this application and illustrate Eskom's commitment to compliance with the MES (see Annexure 3 for more detail).

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 NOx new plant standards and will be retrofitted with flue-gas desulphurisation (FGD) to support compliance to the new plant SO2 limit over time. 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
- $SO_2$ emission reduction: at Medupi and a pilot study which will confirm the appropriate technology for Matimba and Kendal.

Currently the Integrated Resource Plan 2019 is based on a general 50-year life for all 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 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 $SO_3$ 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, Matimba 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 (including Grootvlei) and an increased use of the newer less emitting Medupi, Kusile and the renewable IPPs, 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%, $SO_2$ by 66% and $NO_x$ by 46%.

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 the degree of execution is also largely dependent on the NERSA determination.

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).

## 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. The public participation process followed for this application has increased the number of public meetings to include communities in the vicinity of the power stations. The public participation report (Annexure 4.1 and 4.2) deals with the overall Eskom 2019 application process. The issues raised in the overall report will be a reflection of the issues relevant to Port Rex as Port Rex was included in the initial consultation on the Eskom 2019 application. Eskom will initiate a further round of public participation specific to Port Rex when the updated AIR is available and a supplementary 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 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 deterioration in air quality in low income areas.

Eskom has undertaken several feasibility and pilot studies (2011 – 2018) in KwaZamokuhle, a township near Hendrina Power Station to identify and test potential offset interventions. Based on the results of the studies conducted to date, it was concluded that ambient air quality in the affected communities could be improved by replacing household's coal stoves with a hybrid gas electricity stoves and a LPG heater together with retrofitting the houses with a ceiling to insulate the houses.

No specific need for offsets has been identified for Port Rex based on the studies completed to date.

## 8 CONCLUSIONS

Eskom is committed to ensuring that it manages and operates its 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.

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. Port Rex Power Station already complies with the existing and new plant limits for $SO_2$, and with the existing plant limit for NOx and PM. Eskom contends that compliance with the new plant NOx and PM MES at Port Rex is not warranted because Port Rex's operations do not result in non-compliance with ambient air quality standards. Port Rex is only used in emergency situations (each unit is used on average for less than one day a year). Further, the costs of any retrofit are inappropriate considering that Port Rex will be decommissioned by no later than 2030 (currently planned for 2026).

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 (anticipated to be completed by May 2020).

Eskom believes given the motivation presented above in terms of Port Rex, its decommissioning schedule as well as Eskom's complete emission reduction plan and its implications, that the application for the suspension is appropriate and in line with the relevant Constitutional, regulatory and policy requirements and as such the application should be approved by the NAQO.