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Date:
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Ref: ENV13-L206

Dear MEC Phosa and Mr Zimbwa

REQUEST FOR VARIATION OF KRIEL POWER STATION'S ATMOSPHERIC EMISSION LICENCE

The letter sent to Honourable MEC Phosa on 28 August 2013, providing information on the current state of compliance of Kriel, Duvha and Matla Power Stations with their respective Atmospheric Emission Licences ("AEL"), the emission reduction interventions which are planned for the three power stations, and Eskom's intention to submit applications for variation of the Atmospheric Emission Licences in order to bring Eskom into compliance with the law has reference.

Eskom hereby requests that you vary the Atmospheric Emission Licence (number 17/4/AEL/MP312/11/09) issued to Kriel Power Station ("Kriel") on 6 June 2013, in terms of section 46 of the National Environmental Management: Air Quality Act, 39 of 2004 ("the AQA"). The circumstances under which Eskom's power stations are currently operating are far from normal, and so we request additional leniency at Kriel until particulate emissions have been reduced to the extent that Kriel can comply with the emission limits. The units will be brought into compliance between 2018 and 2023, when fabric filter plants are retrofitted.

We assume that both the Mpumalanga Department of Economic Development, Environment and Tourism and the Nkangala District Municipality will be dealing with this variation request, since Nkangala District Municipality is Kriel's Licencing Authority, and this variation request follows on from the appeal and request for amendment of Kriel's Atmospheric Emission Licence and our previous engagements with the Honourable MEC.

Eskom will be submitting a separate application for postponement of the compliance timeframes for the Minimum Emission Standards by December 2013, accompanied by a further request for variation of the AEL for the postponement period, which will address the emission limits applicable from April 2015 onwards.

This variation request is of the type listed in section 46(2)(d) of the AQA: ‘the amendment of a condition or requirement’. Eskom is of the opinion that the variation can be justified in terms of section 46(1)(c) of the AQA, which states that a licencing authority may vary a licence “if it is necessary or desirable to accommodate demands brought about by impacts on socio-economic circumstances, and it is in the public interest to meet those demands.”

Eskom hereby requests that the following four conditions be varied:

Condition 1. Section 7.2: Maximum release rate for particulate matter until 1 April 2015

The maximum release rate for particulate matter from the period ‘immediately’ to 1 April 2015 is currently stipulated to be 125 mg/Nm³. Eskom requests that the maximum (daily) release rate for particulate matter until 1 April 2015 be changed to 350 mg/Nm³, except for 4 days in the month when a maximum daily release rate of 550 mg/Nm³ is applicable.

Kriel was commissioned between 1976 and 1979, with electrostatic precipitators installed to control particulate matter emissions. Environmental requirements at the time were much less stringent than they are today. Subsequent to commissioning, the following actions have already been taken to reduce particulate emissions at Kriel Power Station:

- Flue gas conditioning plants, also called SO₃ plants, were installed on all six units at Kriel in 1988 to improve the performance of the electrostatic precipitators. As a result, relative particulate emissions reduced from 2.7 kg/MWh to 0.25 kg/MWh (Figure 1).
- The SO₃ plants were refurbished in 2009/10.
- Static discharged electrodes have been added to the electrostatic precipitators to improve performance and overall reliability
- The dust handling plants, which convey the ash from the hoppers to the ash dam, have been refurbished.
- The electrostatic precipitators for all units were refurbished between 2011 and 2013. The electrostatic precipitators are maintained on an ongoing basis, when there is opportunity through planned and unplanned outages.

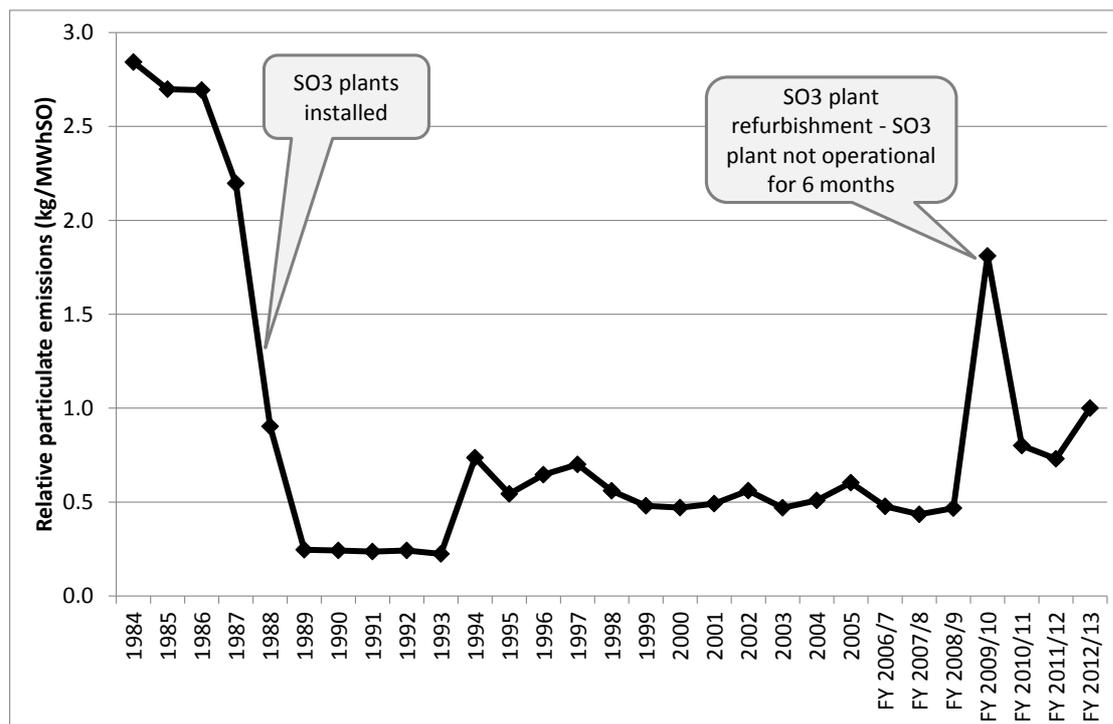


Figure 1: Relative particulate emissions (kg ash emitted per megawatt hour) from 1984 to present

As outlined above, Eskom has been striving to reduce emissions. Unfortunately, the emission reductions that were anticipated at Kriel as a result of all the refurbishments were not realized. One of the reasons for this is the deteriorating coal quality – 12% more coal needs to be burnt to generate the same amount of electricity now than in 1984 (Figure 2). Coal quality has deteriorated because the better coal in the mines that supply Kriel was mined out first. It is not possible to source better quality coal from other mines in Mpumalanga as many other power stations are in greater need of this coal, which is in short supply. The increase in ash and the concomitant higher gas flow rates reduce the efficiency of the electrostatic precipitator. Furthermore, the dust handling plant is over-burdened. There are ash backlogs at times, which results in reduced reliability and availability of the dust handling plant.

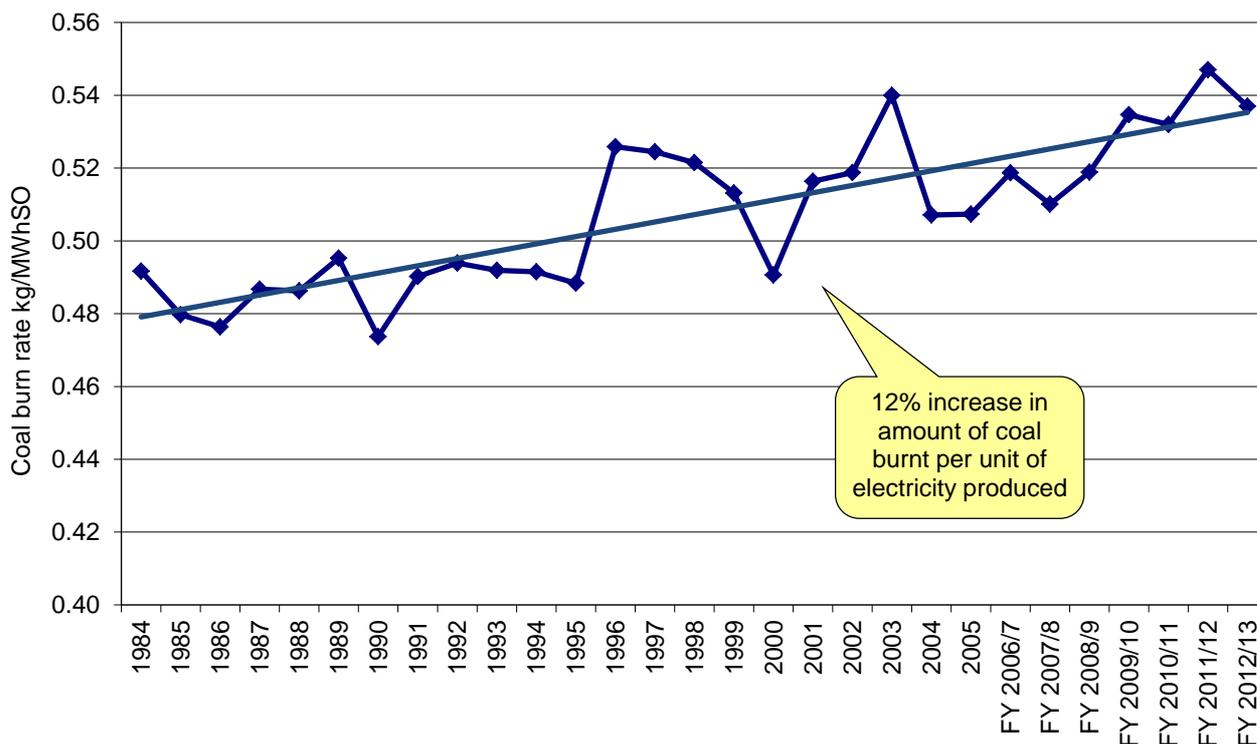


Figure 2: Coal burn rate (kg coal burnt per megawatt hour) from 1984 to present

The aging plant is another significant reason for the poorer than expected emissions performance at Kriel. The units are between 34 and 37 years old, and thus are not nearly as efficient as they used to be.

Given the current design base and the technology installed at Kriel, it is not possible for Kriel to achieve lower emissions than it is at the moment.

Future emission reductions

Eskom recognizes the importance of reducing emissions and is committed to employ measures to achieve that.

A fabric filter plant retrofit is planned for Kriel Power Station. This retrofit, once completed, is anticipated to reduce particulate emissions to below **50 mg/Nm³**, the level which is stipulated in the AEL as a target to be reached in 2020. Kriel's fabric filter plant retrofit is one of the highest priority fabric filter plant retrofits in Eskom's fleet. The date of commencement of the retrofit is tentatively planned for 2018, although it is subject to planning approvals and funding availability. Thereafter, one unit per year will be retrofitted. The (nominal) cost of the fabric filter plant retrofit and dust handling plant upgrade for all six units (including financing costs and interest during construction) is estimated to be R9.1 billion.

The fabric filter plant retrofit cannot be executed before 2018 because of the detailed project planning and long project lead times required for a project of this nature. The relevant timetable would be as follows:

- Basic design and review and approval: 12 months
- Public Finance Management Act (PFMA) approval: 4 months
- Contract award: 11 months
- Lead time from placement of contract to commencement of construction: 18 months

Kriel is therefore on course to meet the milestones required of it, as quickly as it is able to in light of its structure, of the work required on its facilities and of the processes involved.

Implications of compliance

Emissions at Kriel are currently highly erratic, as a result of the unreliability of many of the plant components. Nevertheless, it is expected that the only way Kriel can comply with an emission limit of 125 mg/Nm³, on average, is by shutting down three of the six units, and by running the other three units at a load loss of 100-200 MW. This equates to a loss of generating capacity of around 2000 MW. The partial shut-down of Kriel will almost certainly result in load shedding, of up to around 1.3 million households (based on average household electricity consumption of 1100 kWh per month). Economist Dawie Roodt in an article in Fin24 on 14 February 2008 estimated that the load-shedding at the start of 2008 cost South Africa R1.9 billion per day. Eskom is extremely reluctant to be forced into another such power crisis because of the huge damage that will be done to the South African economy. We are of the view that such extensive load shedding is not in the interest of the Republic, the economy and the public. It will also affect health and emergency services and put lives at risk. The impact of load shedding is highly significant and should not be underestimated. The negative impact of load shedding on the health, social and economic conditions of the public strongly militates against this option.

Implication of higher emissions

In order to determine the impact of higher emissions from Kriel on ambient air quality, an atmospheric dispersion model, CALPUFF, has been run. Emissions from Matla Power Station were also modelled so that the cumulative impact of emissions from both power stations was considered. CALPUFF is a recommended regulatory dispersion model in terms of the National Environmental Management: Air Quality Act (39/224): Draft regulations regarding air dispersion modelling (General Notice 1035, 14 December 2012).

It was assumed that particulate matter emissions from Kriel Power Station averaged 350 mg/Nm³, except for 4 days in the month when particulate matter emissions averaged 550 mg/Nm³. Particulate emissions from Matla Power Station were assumed to be 175 mg/Nm³, except for 90 days in the year when emissions on the one stack were assumed to be 450 mg/Nm³, and emissions from one of the units on the other stack were assumed to be 750 mg/Nm³ (the other two units still had emissions of 175 mg/Nm³).

The model output predicts that there is no non-compliance with ambient air quality standards as a result of emissions at these levels. Over the course of an entire year, the maximum daily ground-level concentration is predicted to be 92.3 µg.m⁻³ (Figure 3), which is below the PM10 ambient daily limit of 120 µg.m⁻³. Moreover the annual average concentration as a result of emissions from Kriel and Matla Power Stations was predicted to be 2.7 µg.m⁻³ (Figure 4), which is well below the annual ambient PM10 limit of 50 µg.m⁻³.

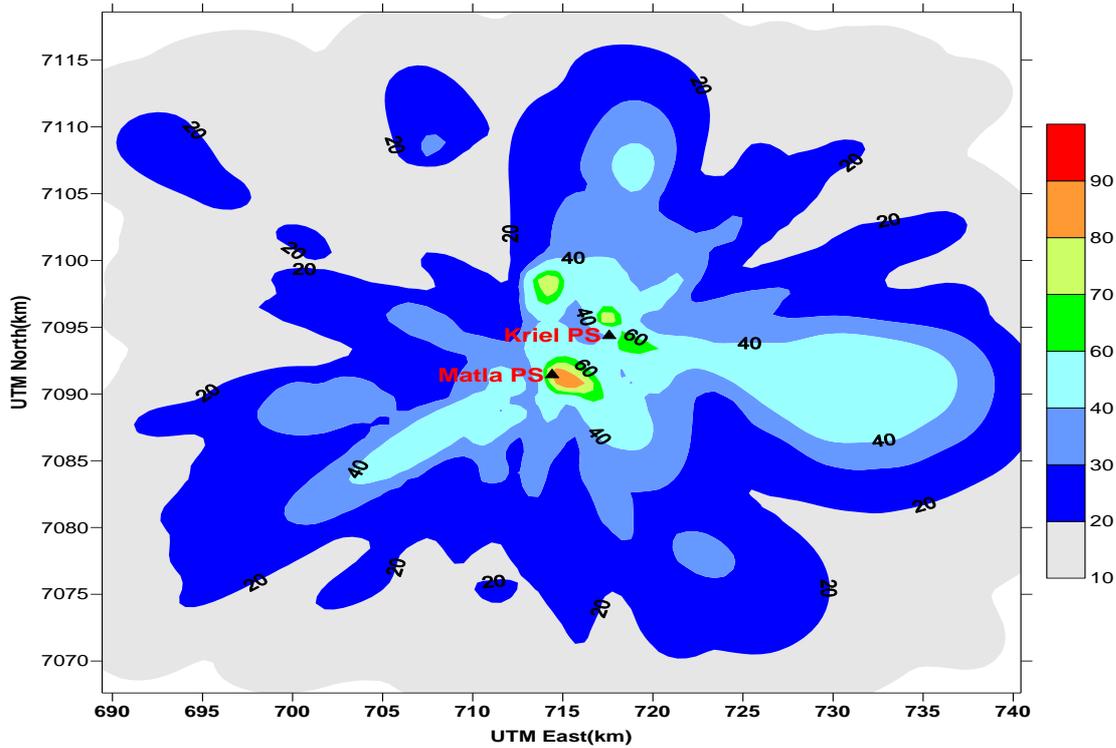


Figure 3: Highest daily ground-level PM10 concentrations resulting from emissions from Kriel and Matla Power Stations as simulated by the CALPUFF dispersion modelling suite.

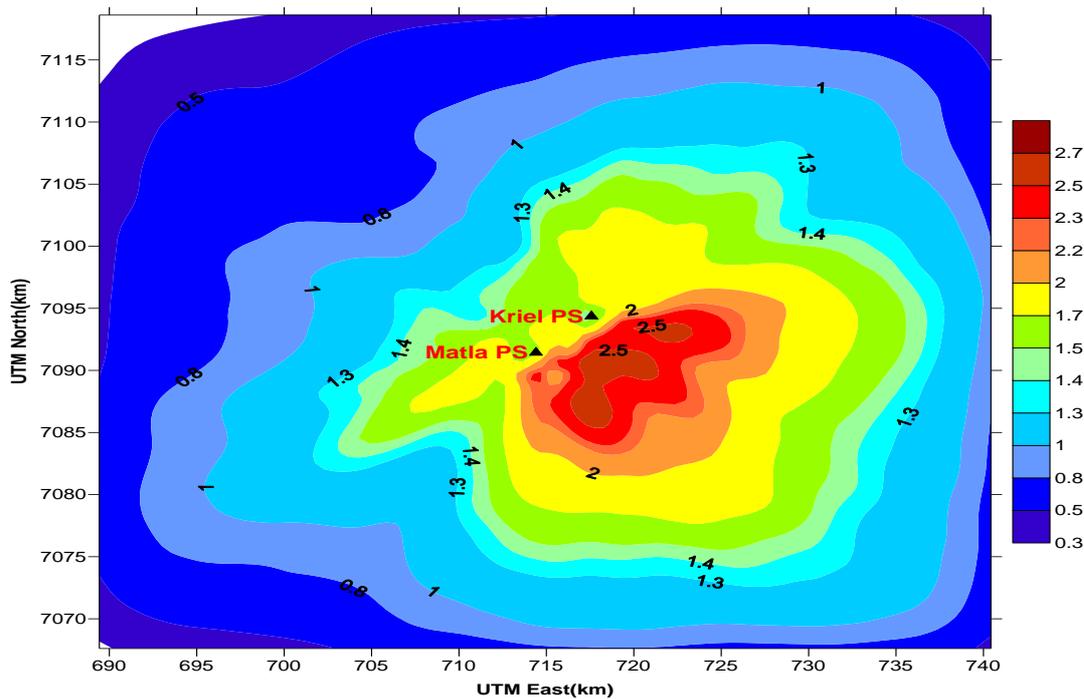


Figure 4: Annual average ground-level PM10 concentrations resulting from emissions from Kriel and Matla Power Stations as simulated by the CALPUFF dispersion modelling suite.

Therefore, the maximum (daily) release rate for particulate matter requested here will ensure that emissions from Kriel do not result in non-compliance with ambient air quality standards.

Condition 2. 7.3.2 Maintenance and shutdown conditions

Condition 7.3.2 in Kriel's AEL states that 'normal maintenance and shut-down conditions shall not exceed a period of forty-eight hours'.

It is requested that this condition be amended to: *'Normal maintenance conditions shall not exceed a period of 37 days a year, per stack. Shut down conditions shall not exceed the timeframes stipulated in 7.3.3 and 7.3.4. The Licencing Authority is to be notified prior to maintenance being conducted which will result in the emission limit applicable to normal working conditions being exceeded for more than 48 hours'*.

Currently, there is a discrepancy between the start-up time stipulated in condition 7.3.2, and that stipulated in condition 7.3.3 and 7.3.4. The requested amendment will resolve this discrepancy, and is in line with paragraph 2.8 in the Decision on the Appeals.

Given the constrained electricity supply situation and the fact that Kriel Power Station is an old power station and needs large amounts of maintenance, it is requested that an allowance be made that maintenance can be done for up to 10% of the time per year (37 days), per stack. It is not possible to shut down power stations when planned maintenance, which would push emissions over the limit, needs to be done. This planned maintenance can last for up to 2-3 weeks per episode. A typical example would be a planned refurbishment of the SO₃ plant, or a leak on the sulphur tank, which requires the SO₃ plant to be taken down. The emission limit cannot be achieved without an SO₃ plant in operation, but emissions are by no means uncontrolled, as the electrostatic precipitator would remain in service. In an ideal world, half the station should be shut down in such circumstances, but this is not possible without causing load shedding. Leaks on SO₃ plants are a huge safety risk. There has already been a fatality at Lethabo Power Station due to a fire on the SO₃ plant, and Eskom is anxious to avoid similar safety incidents in future.

Condition 3. Continuous emission monitoring

There are numerous contradictory requirements for continuous emission monitoring in Kriel's AEL:

- i) Condition 7.2.7 requires that all units are to be fitted with continuous emission monitoring for PM, SO₂ and NO_x by 2015.
- ii) Section 7.4 stipulates that annual sampling of SO₂ and NO_x must be done for Units 1-6, while continuous emission monitoring must be done for PM
- iii) Condition 7.4.2 stipulates that gaseous emission monitoring systems are to be verified during 2011. Reporting is to commence once verification is complete, by latest 1 April 2012.

Monitoring can only be conducted on each stack, and not on each unit at Kriel Power Station. Kriel Power Station has six units, which feed into two combined stacks (three units into each stack). It is thus not possible to monitor emissions from each unit separately, but rather Units 1-3 need to be monitored with one monitoring system in one stack, and Units 4-6 need to be monitored with one monitoring system in the other stack.

PM emissions are already continuously monitored for both stacks, and SO₂ and NO_x emissions are monitored continuously for Units 1-3. Continuous emission monitoring and reporting for SO₂ and NO_x emissions will commence for Units 4-6 by 2015. As such, we request that the conditions referred to above be amended as follows, in order to resolve the contradictions:

- i) Condition 7.2.7: Please change to *'All stacks are to be fitted with continuous emission monitoring for PM, SO₂ and NO_x by 2015.'*
- ii) Table in section 7.4: Please remove the requirement for annual sampling of SO₂ and NO_x emissions for all units. There is continuous emission monitoring and reporting for SO₂ and NO_x on Units 1-3 (north stack). This will provide a very good indication of what emissions from the whole station are, until continuous emission monitoring commences for Units 4-6 in 2015. SO₂ and NO_x emissions are also calculated for the entire station based on mass balance and coal qualities for SO₂, and a station-specific emission factor for NO_x.
- iii) Condition 7.4.2: Please amend to: *'Continuous emission monitoring and reporting of SO₂ and NO_x emissions is required with immediate effect for Units 1-3 (North Stack). Continuous emission monitoring and reporting of SO₂ and NO_x emissions for Units 4-6 (South Stack) is to commence in 2015.'*

Condition 4. Deadline for investigation into emissions during start-up, maintenance and shut-down conditions

Condition 7.3.4 in Kriel's AEL requires that the Licence Holder undertakes an investigation to measure, monitor and report on emissions during start-up, maintenance and shut-down conditions on receipt of the Atmospheric Emission Licence, and section 7.7 stipulates that this investigation should be completed by 31 July 2013 (or 1 year after first issue of the AEL, whichever happens first).

It is requested that the date for the completion of this investigation into emissions during start-up, shut-down and maintenance conditions be changed to 31 October 2014.

As you are aware, Eskom initially appealed the AEL in July 2012 in terms of section 43 of the NEMA. A response to the appeal was received on 27 May 2013. Because of the uncertainty surrounding the appeal against Kriel's AEL, the process to put in place a contract for the measurement of emissions during start-up and maintenance conditions was not initiated. This process has now been initiated, but it is anticipated that the results of the investigation can only be submitted by end October 2014, since several months are required each for approval of the contract, and contractor lead time. Then the measurements need to be scheduled to coincide with a planned start-up linked to an outage. It will then take the contractor about a month to analyse the results and issue the report.

Public participation

Since this variation request is for the authorization of an increase in atmospheric emissions over what was previously allowed by the AEL, steps will be taken to bring the request to the relevant organs of state, interested persons and the public, as required in terms of section 46 (3) and section 46 (4) of the Air Quality Act. These steps will include publication of a notice in two local newspapers, namely Witbank News and Ridge Times, and letters will be sent to all Interested and Affected Parties. Proof of publication of the newspaper notices will be submitted once the notices have been published.

Conclusion

Eskom submits that this variation request is in the public interest, and will ensure that the demands on Kriel, as contained in the AEL as it currently stands, are modified in such a way as to result in a minimal impact on socio-economic circumstances.

We would appreciate your prompt consideration of this request. We are available to provide more information or make oral representation on this variation request at your convenience.

Yours sincerely

Deidre Herbst
ESKOM ENVIRONMENTAL MANAGER