Dear Members of the MES Forum

SUBMISSION ON THE APPLICATIONS FOR, AND DECISIONS ON, POSTPONEMENT/SUSPENSION OF MES COMPLIANCE TIMEFRAMES INCLUDING THE RELATED APPEALS AND APPLICATIONS FOR ISSUANCE OF PROVISIONAL AELS, TO THE MES NECA FORUM

Introduction

1. We write to you on behalf of our clients groundWork and Earthlife Africa (“our clients”).

2. We refer to the call made in the correspondence from the National Environmental Consultative and Advisory Forum (“MES Forum” or “the Forum”) under section 3A of the National Environmental Management Act, 1998 (NEMA) dated 25 October 2022 for the submission of written comments and representations in relation to the applications for postponement/suspension of Minimum Emission Standards (MES) compliance timeframes, including the related appeals, the applications for the issuance of Provisional Atmospheric Emission Licences (PAELs) and regarding this process, by 30 November 2022. This date was extended to 31 January 2023. We hereby duly make this written submission on behalf of our clients.
3. In this submission we address the following:

3.1. We provide a summary of our clients’ appeal of the Decisions made by the National Air Quality Officer (NAQO) in 2021 in relation to some of Eskom’s coal power stations, as well as our submissions to the Forum to date. In doing so, we again set out the legal requirements applicable to postponement and suspension applications for compliance in the List of Activities which result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage, Government Notice 893 (Government Gazette 37054) of 22 November 2013, as amended (“List of Activities”) under the National Environmental Management: Air Quality Act, 2004 (AQA) (with accompanying Minimum Emission Standards (MES));

3.2. We use this opportunity to comment on and respond to new information which has been made available since the above appeal, namely Eskom’s Appeal of the 2021 NAQO Decisions (“Eskom’s Appeal”) and its “Updated MES Application”, as well as a number of relevant reports, including recommendations from an expert panel on Eskom’s compliance with sulphur dioxide (SO2) standards. We reserve our clients’ right to submit a formal and detailed response to Eskom’s Appeal and its updated MES Application at a later stage. In relying on expert reports referenced below and attached, we emphasise the relevant health impacts of Eskom’s air emissions as well as the current state of Eskom’s emissions and MES exceedances. These are relevant considerations, which ought to have a bearing on the work and recommendations of the Forum, as we explain in more detail below. We also trust that these additional submissions will be brought to the attention of the Department of Forestry, Fisheries and Environment (DFFE), whose mandate it is to monitor and regulate air quality and, to an extent, air emissions in South Africa; and

3.3. We endeavour to respond to some of the direct questions dated 19 December 2022 provided to us by the Forum and referred to as issues raised during the Forum’s public consultation process, by “participants in those meetings as well as by the relevant emitters and the appellant/s”. Our responses to these questions are attached to this submission as Annexure A.

4. This submission is set out as follows:

4.1. Background;
4.2. Applicable legal requirements;
4.3. The section 3A consultative process;
4.4. Summary of our appeal submissions;
4.5. Additional submissions to the Forum and DFFE on new and/or relevant reports and information
   4.5.1. Eskom’s Emission Standard Exceedances and Compliance Track Record;
   4.5.1.2. Eskom’s underestimated and underreported emission exceedances;
   4.5.2. The Extent and Impacts of Eskom’s Air Emissions;
   4.5.2.1. Eskom’s Facilities’ Emission Intensity;
   4.5.2.2. The Health Impacts of Eskom’s Non-Compliance with Emission Standards;
   4.5.2.3. The DFFE’s Highveld Health Study;
   4.5.3. Feasibility for Eskom to Abate SO2 Emissions: SO2 Panel Report Findings and Recommendations;
   4.5.4. groundWork and Earthlife Africa’s preliminary response to Eskom’s appeal and “Updated MES Application”.
4.6. Our Responses to Questions Received by the Forum; and
4.7. Conclusion
Background

5. We, on behalf of our clients, have appealed the following Decisions by the National Air Quality Officer (NAQO), which have a bearing on the application and interpretation of the List of Activities:

5.1. On 15 September 2020, on behalf of Vaal Environmental Justice Alliance (VEJA) and groundWork, we submitted an appeal in relation to the NAQO’s Decision on Arcelor Mittal’s (AMSA) postponement application (“the AMSA appeal”). As previously stated to the Forum (in our letter of 8 September 2022), these written submissions will be limited to the Eskom Appeal due to the litigation in relation to the AMSA appeal and the pending appeal decision expected on 15 February 2023.

5.2. On 9 February 2022, we submitted an appeal on behalf of groundWork and Earthlife Africa in relation to the NAQO Decisions of 30 October 2021 on 9 of Eskom’s facilities – namely Camden, Hendrina, Arnot, Komati, Grootvlei, Kriel, Majuba, Grootvlei and Tutuka (“our Eskom appeal” or “our appeal”).

6. Neither of the appeals has yet been decided.¹

7. In addition to our clients’ own appeals of NAQO Decisions, we note that Eskom has appealed a number of the NAQO Decisions of 2021, refusing Eskom’s requested postponements and alternative emission standards for a number of pollutants at various of its facilities. It is predominantly this appeal and Eskom’s attempts to avoid compliance with health-based standards that our clients take issue with.

8. On 12 May 2022, notice was given by the Minister of Forestry, Fisheries and the Environment (“the Minister”) of the intention to establish a National Environmental Consultative and Advisory Forum in terms of section 3A of the NEMA to advise the Minister on matters arising from the applications for suspension and postponement of compliance with the MES and the applications for the issuance of Provisional Atmospheric Emission Licences.² On 18 August 2022, further notice was given by the Minister establishing the MES Forum for a period of 12 months.³ According to this notice, the purpose of the MES Forum is to conduct an extensive consultative process with key interested and affected parties and to assess, interrogate, and review the relevant research in respect of the non-compliance with the MES and the issuance of Atmospheric Emissions Licences (AELs).

9. On 8 September 2022, we wrote to the Forum setting out minimum conditions for our clients to engage with the Forum. Some of these are repeated at paragraph 24 below. In that letter, we also advised that our engagements with the Forum and submissions would focus on the Eskom appeals – it being our understanding that the AMSA appeal is subject to review proceedings, and following a settlement agreement, that appeal is due to be decided by the Minister in February 2023. As stated above, this submission focuses predominantly on Eskom.

10. We and our clients have been engaging with the Forum since its establishment. On 9 September 2022, we met with the Forum and raised concerns regarding the long timelines envisaged for the completion of the Report of the Forum as well as issues regarding the transparency of the Forum as discussed in further detail below. We and our clients attended a further meeting with the Forum on 9 November 2022 and also participated in a number of the Public Consultations which took place from 14 to 24 November 2022. Our stance has always been clear that insofar as Eskom’s compliance with MES is concerned, the law is clear on Eskom’s legal obligations in relation to the applicable standards (as set out below), and compliance with the law is not negotiable.

¹ Those decisions ought to have been taken, in terms of Eskom’s appeal, by 25 May 2022, and in terms of AMSA’s appeal, the decision was due on 1 February 2021, based on the timeframes provided for in the Appeal Regulations under NEMA.
² Government Gazette No 46355.
³ Government Gazette No 4676.
11. This process is taking place against a backdrop of long delays and a history of non-compliance from Eskom. It now finds itself in a conundrum of its own making, and communities should not have to pay the price of that. Nor should it lie with our clients to provide solutions to Eskom’s self-made crisis. It is unacceptable that people’s lives, health and rights are prejudiced on a daily basis in a constitutional democracy where clean energy alternatives are readily available.

12. Eskom was not only aware of the MES provisions at least from April 2010, but it was aware several years before that, that mandatory emission limits would come into effect.

**The Applicable Legal Requirements**

13. The s3A process through which the MES Forum is established must be governed by other applicable provisions of NEMA such as the section 2 principles, as well as the NEMA: Air Quality Act, 2004 (AQA) and the Constitution of the Republic of South Africa, 1996 (“the Constitution”).

14. According to section 49(a) of the AQA, in order to determine whether an applicant is a “fit and proper person” for purposes of granting an atmospheric emission licence – one of the factors a licensing authority must consider is whether such person has contravened or failed to comply with the AQA, or any other legislation applicable to air quality. Notably Eskom has a history of contraventions of the AQA (as submitted in more detail below) and would, we submit, not qualify as fit and proper persons for purposes of being given a licence to emit air pollutants under the AQA.

15. The 2017 National Air Quality Framework (“2017 Framework” or “the Framework”) is the “national Framework for achieving the objectives of [the AQA]” and it “binds all organs of state in all spheres of government”. We maintain our position that Eskom may not lawfully apply for postponements, suspensions, or alternative emission limits, unless and until the ambient air quality within the area where a power station is located, is compliant with the National Ambient Air Quality Standards (NAAQS). This is required by paragraph 5.4.3.4 of the Framework. This is not the case for a number of the Eskom facilities in question; and for this reason alone, we submit that an application should be summarily rejected.

16. We reiterate that the legal position as set out in the AQA, the 2017 Framework - which is binding on all organs of state - and the List of Activities (with accompanying MES), is clear and unambiguous. The requirements under these laws are set out in detail in our appeal submissions. To summarise, the legal requirements are as follows:

16.1. Existing plants had to comply with more lenient standards by 1 April 2015 and they had to adhere to stricter new plant standards by 1 April 2020 (“2020 MES”), subject to successful applications to postpone or suspend compliance where the explicit criteria for these applications have been satisfied;

16.2. in limited circumstances, including demonstration of compliance with existing plant standards and national ambient air quality standards, only one postponement, per pollutant, is permitted for the 2020 MES, and such postponement may not extend beyond 5 years (i.e., all plants must meet the 2020 MES by 31 March 2025 – unless a valid suspension in terms of paragraph 11B of the List of Activities has been granted);

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4 Section 2 contains principles for environmental management, to which any organ of state must adhere in all decision-making and when exercising other functions, including and decision-making on appeal and flowing from this process.
5 See paragraph 1.3 of the 2017 Framework.
6 Ibid.
7 See section 7(4) of the AQA.
16.3. Emitters may not lawfully apply to postpone their compliance with the MES, or apply to suspend MES compliance, unless and until the ambient air quality within the three-priority air-shed areas where their power stations are located are in compliance with the NAAQS, Government Notice 1210 (Government Gazette 32816) of 24 December 2009, under the National Environmental Management: Air Quality Act, 2004 (AQA).

16.4. A facility that will be decommissioned by 31 March 2030, may apply for a once-off suspension of compliance with new plant MES, provided the application is accompanied by a detailed decommissioning schedule;8

16.5. Paragraph 11D of the List of Activities makes it clear that alternative emission limits that are weaker than the existing plant MES, may not be considered, let alone granted; and

16.6. An application for an alternative limit to a new plant standard must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards, and there must be compliance with the NAAQS in the area for pollutant or pollutants applied for.9

17. The law is patently clear that alternative emission limits that are weaker than the existing plant MES, may not be granted.

18. The High Court judgment in the case of Groundwork Trust and Another v Minister of Environmental Affairs and Others [2022] ZAGPPHC 208 (referred to as the “Deadly Air case”), confirms that the Constitutional right to an environment not harmful to health or wellbeing is a right that is realisable here and now. The judgment recognises the health implications of air pollution in the Highveld Priority Area:

“It is commonly accepted that the air pollution in the Highveld Priority Area is responsible for premature deaths, decreased lung function, deterioration of the lungs and heart, and the development of diseases such as asthma, emphysema, bronchitis, tuberculosis and cancer. It is also acknowledged that children and the elderly, especially with existing conditions such as asthma, are particularly vulnerable to the high concentrations of air pollution in the Highveld Priority Area.”10 (Emphasis added)

19. The judgment also acknowledges that “the enduring and unsafe levels of air pollution in the Highveld Priority Area are an ongoing violation of the section 24(a) constitutional rights of residents. This violation necessarily violates other constitutional rights, including the rights to dignity, life, bodily integrity and the right to have children’s interests considered paramount in every matter concerning the child.”11 (Emphasis added)

20. The High Court has thus confirmed that government is in breach of peoples’ section 24 rights in the Highveld – a breach which it must take urgent steps to remedy. In addition, as held in the judgment, the air pollution also affects other constitutional rights.

21. Eskom power stations - are responsible for the “lion’s share” of air pollution in the region.12 As an organ of state, significant emitter and a major source of air pollution in South Africa, Eskom is legally required, at all times, to limit its emissions to help ensure compliance with the NAAQS and reduce its impacts on public health. It is worth

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8 Para 11B of the List of Activities.
9 Para 12A(b) and (c)(i) of the List of Activities.
10 Deadly Air judgment at para 70.
11 Deadly Air judgment at para 76.
12 Air quality impacts and health effects due to large stationary source emissions in and around South Africa’s Mpumalanga Highveld Priority Area (HPA) by Dr. H. Andrew Gray et. See page 2 of the Report which states: “[Eskom’s] 14 facilities are responsible for the lion’s share of air pollution”.

pointing out that these laws – the AQA, including the MES and the NAAQS – were put into place to protect public health and Constitutional rights. Therefore, sufficient emphasis must be placed on the detrimental effects of non-compliance on residents and as a result, the health costs stemming from the issue and their effects on the national fiscus. Above all, this is a public health issue.

22. In addition to the leniency that emitters have been granted, it is also important to note that South Africa’s ambient air quality standards are in fact notoriously weak and not aligned with the World Health Organization (WHO) Guidelines. South Africa’s NAAQS are much weaker than those set out in the WHO 2005 Air Quality Guidelines, and very much weaker than the revised WHO Guidelines published in September 2021. South Africa’s MES are also much weaker even than those in other developing countries. We submit that it should not be contentious – that stronger MES are required in air quality priority areas in order to protect human health.

23. Based on the above legal framework, and irrespective of the process and consultations conducted by the Forum, we submit that the Minister has limited flexibility in terms of the decisions she can make on these appeals. In her decision-making, the Minister remains limited to the provisions of NEMA; AQA; the List of Activities and the Constitution. The law is clear and explicit. In terms of the List of Activities, all existing facilities must comply with new plant standards by 2025 (following a once-off 5-year postponement if granted). Those which are unable to comply must decommission by 2030. In any event, and in addition to the List of Activities, the Minister is bound by her Constitutional mandate and duty to ensure that air pollution in the Highveld is reduced and NAAQS complied with. Ultimately the potential outcomes for the appeals before the Minister are somewhat limited, despite the section 3A process being undertaken here, and the Minister’s wide appeal discretion under section 43 of NEMA.

The section 3A consultative process

24. It is against this context, and the above legal requirements, that we reiterate our submission as set out in our letter to the Forum dated 8 September 2022, that this process must be conducted with the following minimum requirements:

24.1. Transparency: Stakeholders must have access to all relevant records and documentation. In addition, we submit that we are concerned that not all meetings of the Forum have been publicly accessible. We urge the Forum to reconsider and remedy this – at least through making all minutes of meetings publicly available.

24.2. Clear and strict timeframes: There is still a lack of clarity regarding when exactly the process will be finalised. The latest update on timing was the meeting held between CER and the MES Forum on 9 November 2022. The Chairperson of the Forum stated that the Forum has requested an extension to complete the report by the end of July 2023. While we understand the extensive work that the Forum must undertake in a limited period of time, we must emphasise that we would not condone this process extending beyond July 2023, or any longer than absolutely necessary, given the ongoing rights infringements and harm caused by pollution from the facilities in question.

24.3. The applicable legal requirements and appeal processes cannot be forfeited or prejudiced. Our clients as appellants and as interested and affected parties have a right to be notified of Eskom’s appeal; provided with the appeal and an opportunity to respond to it – according to regulation 4(1) of the NEMA Appeal Regulations. To date this formal notification process and response opportunity have not been provided by Eskom or the Department to our clients or to other interested parties – although we have been given access to Eskom’s appeal by the Forum. It is unclear when the timeframe to reply to Eskom’s appeal begins to run – in light of the absence of any formal notice of Eskom’s appeal to interested and affected parties as required by the Appeal Regulations and in light of the appeal being held in abeyance. We will, in any event, seek to address the appeal in these submissions to a limited extent, while reserving our clients’ rights to respond formally and more fully in due course. The status, process and timeframes going forward for
Eskom's current and latest updated MES application are ambiguous. We have written to the Department on behalf of our clients regarding these issues and have not yet received a response.

Our Eskom Appeal Submissions

25. As mentioned above, the appeal submitted on behalf our clients, groundWork and Earthlife Africa, relates to the NAQO’s Decisions of October 2021 on 9 of Eskom’s facilities – namely Camden, Hendrina, Arnot, Komati, Grootvlei, Kriel, Majuba, Grootvlei and Tutuka (“our appeal”). We attach a copy of our appeal marked Annexure B for your ease of reference. Rather than repeating the appeal submissions in detail, we simply confirm that our clients have appealed the following aspects of the NAQO’s October 2021 Decisions:

25.1. The Decision to grant Majuba power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1300mg/Nm3. This is unlawful and in violation of section 11D of the List of Activities as the limit granted to Majuba is even weaker than the existing plant standard for NOx, which is 1100mg. Section 11D states that no postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with MES for existing plant standards. The NAQO’s legal position is further unlawful as well as contrary to section 24 of the Constitution, as well as the 2017 Framework,\(^{13}\) owing to Majuba’s location within the HPA.

25.2. The Decision to grant Kendal and Tutuka power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1100mg/Nm3. This Decision is unlawful. Kendal and Tutuka power stations are also located in the HPA. This fact alone bars the NAQO from authorising postponement applications for Kendal power station, in accordance with 5.4.3.4 of the 2017 Framework.

25.3. The Decision to grant suspension of compliance for Camden, Hendrina, Arnot, Komati, Grootvlei, and Kriel power stations without detailed and clear decommissioning schedules accompanying the applications. This is unlawful as section 11B of the List of Activities states that an application for suspension must be accompanied by a clear decommissioning schedule, further that no such application shall be accepted by the National Air Quality Officer after 31 March 2019. This is reinforced in the 2017 Framework, in relation to an application for a once-off suspension of compliance timeframes with new plant MES, but it goes further, requiring that an Eskom power station must provide a “clear decommissioning schedule”.\(^{14}\) Eskom’s Summary Motivation Report submitted in relation to these stations does not satisfy the legal requirements of a “clear and detailed decommissioning schedule”. We submit that Eskom ought not to have been granted a suspension of the compliance timeframes in the first case — however since they have been granted these suspensions in any event, the NAQO ought to have required that Eskom comply with existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest in terms of the List of Activities and the 2017 Framework.

25.4. An additional and compounding ground of appeal is the major contribution of the cumulative emission load from these nine stations to the high concentration of harmful air pollution in the HPA. Along with the criteria that the area in which a station is located must be in compliance with the NAAQS, paragraph 5.4.3.4 of the 2017 Framework also requires Eskom to demonstrate that its emissions are not causing direct adverse impacts on the surrounding environment. We submit that, based on the documentation available to I&APs for comment, Eskom was unable to satisfy this specific requirement in its applications.

26. Our clients maintain their stance that the NAQO’s decisions to grant postponement of compliance to the Majuba, Kendal, and Tutuka “midlife” power stations, and suspensions of compliance to the six “old” stations in the

\(^{13}\) Para 5.4.3.4 of the 2017 Framework.

\(^{14}\) Ibid.
absence of detailed and clear decommissioning schedules, are contrary to, inter alia, the amended List of Activities, the 2017 Framework, NEMA, and the Constitution.

**Additional Submissions to the Forum and DFFE on New Reports and Information**

27. As mentioned above, we used this opportunity to highlight any new and relevant information for the Forum and its deliberations. We therefore urge the Forum and the DFFE to give due regard to the sections that follow.

**Eskom’s Emission Standard Exceedances and Compliance Track Record**

28. Below we set out relevant information regarding pollutant emissions from Eskom’s facilities in 2021-22. This information is relevant for the Forum as it demonstrates the extent of Eskom’s high emissions and inability to comply with even its postponed weak Atmospheric Emission Licence (AEL) standards. This is relevant for considerations on granting any requested postponements or suspensions and in relation to granting, and/or revising, Eskom PAELs for a number of its facilities.

29. The List of Activities and Framework state that in order to be granted a postponement or suspension “an application must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards”.

As stated above, in order to be granted (and consequently hold) an atmospheric emission licence under section 49(a) of the AQA a licence—holder cannot have contravened or failed to comply with the AQA, or any other legislation applicable to air quality. The findings of the latest National Environmental Compliance and Enforcement Report are therefore relevant in this regard, as are the findings set out in Annexure C — referenced below and attached.

**National Environmental Compliance and Enforcement Report (NECER) 2021/22 Report**

30. This NECER covers the period from April 2021 to March 2022 and it sets out the measures being taken by the environmental compliance and enforcement sector with information related to specific compliance and enforcement activities being taken in respect of a certain sectors or facilities.

31. The Report notes that a joint site inspection was conducted at Eskom’s Matla Power Station by the Environmental Management Inspectors (EMIs) from the DFFE, as well as from the Mpumalanga Provincial Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) and Nkangala District Municipality on 26 to 27 October 2021. The following issues relating to air emissions and air quality compliance were identified:

31.1. Non-compliance with the conditions of the AEL; and
31.2. Failure to comply with the duty of care as a result of PM emissions frequently exceeding the Minimum Emission Standards (MES).

32. In terms of Eskom’s Kusile Power Station, the Report states that a site inspection was conducted by DFFE EMIs, as well as from the DARDLEA, the Department of Water and Sanitation (DWS) and Nkangala District Municipality on 17 and 18 August 2021. The following issues were identified:

32.1. Non-compliances to conditions of the AEL, water management licence, environmental authorisation and water use licences; and

15 Para 12A(b) of the List of Activities and Para 5.4.3.4 of the 2017 Framework.
17 NECER Report, page 1.
18 Ibid at page 53.
32.2. failure to comply with duty in respect of waste management as a result of spillages of waste, poor waste management practices and improper waste storage.\textsuperscript{19}

33. To further demonstrate the extent of Eskom’s track record of AEL non-compliance, it is also important to note that in 2020, summons was issued against Eskom’s Kendal Power station notifying it of the decision by the Senior Public Prosecutor to pursue a criminal prosecution against it in respect of air pollution. This includes a charge of supplying false and misleading information in reports prepared by management at Kendal to an Air Quality Officer. This is a criminal offence listed in Section 51(1)(g) of the AQA. To our knowledge, these criminal proceedings are pending.

34. The above demonstrates that time and time again, Eskom has been unable to comply with the law, bringing into question whether it should even have licence to operate a number of its facilities – let alone be granted postponements or suspensions for compliance with MES. Arguably, this is not an entity which, but for some lenience on emission standards, would be able to operate in compliance with the law.

35. In terms of this NECER Report, Particulate Matter (PM) was the most reported pollutant at 29\% overall reported incidents in the 2021/2022 financial year. The Report states that “the high record of particulate matter as a pollutant in 2021/2022 can be attributed to numerous plant failures reported by the country’s power generation sector.”\textsuperscript{20}

36. The report also provides the statistics from the Pollution Hotline according to which air pollution is the category with the highest number of complaints. Further, in the breakdown of pollution complaints by province, Mpumalanga is reported as having had the highest number of reported incidents at a total of 103 incidents during this period of review.\textsuperscript{21} The Report states that “the high volume of incidents recorded for Mpumalanga province can be attributed to the Power generation plants within the province and also the number of fuel theft from the Multi product pipelines laying across the province”.\textsuperscript{22} In addition, power generation is the top sector at 47\% amongst the sectors reporting incidents in this period of review.\textsuperscript{23}

37. Although Eskom is not specifically mentioned as the responsible polluter in this regard, it can be assumed that this is the case due to Eskom’s coal plants being the only power generator in the Highveld Priority Area (HPA).\textsuperscript{24} The Report also specifically states that the power generation sector has the highest number of reported incidents.

**Eskom’s underestimated and underreported emission exceedances**

38. In addition to non-compliances, Eskom has a staggering track record of exceedances of limits in its AELs – a number of which go unreported and underestimated.

39. A 2019 report by air pollution expert, Dr Ranajit Sahu, demonstrated that for the period April 2016 through December 2017, 14 operating coal fired power stations reported 3 217 exceedances of applicable daily AEL limits for PM, sulfur oxides (SO2), and oxides of nitrogen (NOx). The two most frequent exceedances occurred at Lethabo (PM and NOx), Matla (NOx), Matimba (SO2), Kriel (PM), Duvha (PM), and Kendal (PM).\textsuperscript{25}

\textsuperscript{19} Ibid at page 52.
\textsuperscript{20} Ibid at page 95.
\textsuperscript{21} Ibid at page 94
\textsuperscript{22} Ibid at page 94
\textsuperscript{23} Ibid at page 96
\textsuperscript{24} Air quality impacts and health effects due to large stationary source emissions in and around South Africa’s Mpumalanga Highveld Priority Area (HPA) by Dr. H. Andrew Gray et. See page 2 of the Report which states: “[Eskom’s] 14 facilities are responsible for the lion’s share of air pollution”.
40. **Annexure C** to these written submissions presents numbers of exceedances of AEL limits for PM, SOx and NOx from April 2021 through March 2022, and compares these to numbers of exceedances from April 2016 through March 2017. All exceedances were counted regardless of Grace, Contravention or Section 30 categorisation. This report also contains calculations of emission intensity\textsuperscript{26}, which is the amount of pollution emitted per unit of energy produced, for PM, Sulphur Oxides (Sox) and (NOx) - the three main pollutants which are the subject of this submission and the appeals - by dividing tons of pollutants emitted per month and by gigawatts of energy produced for April 2021 through March 2022.\textsuperscript{27}

41. The report finds as follows:

41.1. Eskom’s 15 power stations reported 2 309 exceedances of AEL limits between April 2021 and March 2022. Most of these exceedances were for PM (2003 exceedances by 13 stations) followed by NOx (194 exceedances by 6 stations) and SOx (112 exceedances by 3 stations).

41.2. Regarding PM exceedances, the worst offenders, with over 100 exceedances per year, were Lethabo, Kendal, Matla, Kriel, Tutuka, and Matimba.

41.3. When it comes to SOx exceedances, most power stations did not exceed their AEL limits for SOx in 2021-2022. In 2021-22, three Eskom power stations exceeded their AEL limits for SOx a combined total of 112 times. The worst offender was Kusile, with 103 exceedances (Kusile was not operating in 2016-17).

41.4. With respect to NOx, in 2021-2022, 6 Eskom power stations exceeded NOx limits a combined total of 194 times. The worst offender by far was Camden, with 117 exceedances. However, this is an overall improvement from 2016-2017, when 7 out of 14 stations exceeded AEL limits for NOx.

**The Extent and Impacts of Eskom’s Air Emissions**

42. There is an undeniable link between exposure to the harmful pollutants emitted by Eskom and the development of respiratory and other illnesses amongst residents of Priority Areas. Further, the effects of the air pollution also have economic implications due to the public health costs. This is seen in various studies done including the SO2 Panel Report and the HPA Health Assessment and the modelling discussed below.

43. Dr Mike Holland assessed the health impacts and associated economic costs of emissions from Eskom’s coal plants in 2017.\textsuperscript{28} His assessment, which focused on the role of PM2.5 in the atmosphere following release of pollutants, such as SO2 and NOx, estimated that the following impacts are attributable to Eskom’s emissions: 2 239 deaths per year; 157 from lung cancer; 1 110 from ischaemic heart disease; 73 from chronic obstructive pulmonary disease; 719 from strokes; and 180 from lower respiratory infection; 2 781 cases of chronic bronchitis per year in adults; 9 533 cases of bronchitis per year in children aged 6 to 12; 2 379 hospital admissions per year; 3 972 902 days of restricted activity per year; 94 680 days of asthma symptoms per year in children aged 5 to 19; and 996 628 lost working days per year.

44. We reiterate Eskom’s cumulative contribution to the formation of PM2.5 in parts of the HPA.

45. The findings of the SO2 Panel Report – set out below at paragraphs 57-68 are further testament to the dangerous effects of SO2 on human health. It is not only the health impacts from exposure to SO2 that are at issue here, but the contribution to secondary PM2.5 as a result of the cumulative SO2 and NOx emissions from the coal power stations. A significant component of the PM2.5 load in the HPA is formed by Eskom’s coal-fired power stations.

\textsuperscript{26}Emission intensity: (grams of pollutant per kilowatt-hour, equivalent to tons of pollutant per gigawatt-hour). The higher the emission intensity value, the more polluting the facility per electricity output.

\textsuperscript{27}Tons per gigawatt hour is equivalent to grams per kilowatt hour.

\textsuperscript{28}Health impacts of coal fired power plants in South Africa, Dr Mike Holland (EMRC).
Eskom’s Emission Intensity

46. The Annexure C report, referred to and attached above looks at the emission Intensity of Eskom Coal-Fired Power Stations between April 2021 and March 2022. It finds:

46.1. From April 2021 to March 2022, Eskom’s coal-fired power stations had an average PM emission intensity of 0.33 g/kWh, which is over 3 times greater than the Chinese fleet average (as of 2015) of 0.09 g/kWh. Tutuka, Matla, Lethabo, Kriel, Komati, Kendal, Hendrina, Matimba, Arnot, Camden, Grootvlei and Medupi have PM emissions greater than the 2015 Chinese average.

46.2. Regarding SOx, in 2021-22, Eskom’s coal-fired power stations emitted an average of 9.50 grams of SOx per kilowatt hour, with stations ranging from 3 to 30 times more SOx per unit of energy than China’s 2015 fleet average of less than 0.49g/kWh. Matimba and Medupi, located in Limpopo (in the Waterberg-Bojanala Priority Area), are among the highest emitters of SOx per unit of energy.

46.3. When it comes to NOx, Eskom’s coal-fired power stations emitted an average of 4.29 g NOx/kWh. In the United States, the average emission intensity of coal fired power plants for NOx has been less than 1.00 g/kWh since 2009. In China, the national average emission intensity of NOx from coal power stations was 0.36 g/kWh in 2016. Eskom’s coal power stations have much higher NOx emission intensity than the US or Chinese averages.

46.4. Komati had the highest NOx emission intensity but was decommissioned in October 2022. However, many other stations, including Hendrina, Camden, Duvha, Majuba, Tutuka, Lethabo, Kusile, Matla and Arnot emit NOX at an intensity more than 11 times that of China’s power plants.

47. The above reveals even further the unacceptable levels of air pollution due to Eskom’s coal fired power stations, especially in comparison to other countries – including countries notorious for highly polluting industries, like China.

The Health Impacts of Eskom’s Non-compliance with MES

48. A report by the Centre for Research on Energy and Clean Air (“CREA report”) (Annexure D) to these submissions) projects emissions, air quality impacts and the resulting health and economic impacts of air pollution from Eskom’s coal power plant fleet under different scenarios of compliance with the MES. Below are its key findings:

48.1. Full compliance with the MES would reduce emissions of SO2 by 60%, PM by 50%, NOx by 20% and mercury by 40%, compared with a scenario of no improvements in emission control technology.

48.2. Eskom’s proposed retrofit plan would bring the fleet into compliance with the MES for PM and realise the associated emissions reductions by 2030, five years after the deadline. However, the plan would only reduce SO2 by 13%, NOx by 11% and Hg by 3%, compared with a scenario of no improvements in emission control technology. The small reductions in SO2 emissions are the main concern, as SO2 is the pollutant with by far the largest health impacts from Eskom’s power plants, due to the formation of secondary PM2.5.

29 Malgorzata Wiatros-Motyka, An overview of HELE technology deployment in the coal power plant fleets of China, EU, Japan and USA, IEA Clean Coal Centre (2016) at 17-18.
30 J. de Gouw et al., Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology, Earth’s Future (2014), at Figure 4.
32 CREA report at page 4.
33 Ibid.
48.3. Notably, Eskom’s retrofit plan (“ERP 2022”) only realises one quarter of the health benefits associated with compliance with the MES, due to the dismal failure to address SO2 emissions.34

48.4. Under Eskom’s planned retirement schedule and emission control retrofits, emissions from the company’s power plants would be responsible for a projected 79 500 air pollution-related deaths from 2025 until end-of-life.35 On a cumulative basis until the end-of-life of the power plants, compliance would avoid a projected 34 400 deaths from air pollution and economic costs of R620 billion (USD 41.7 billion).36

48.5. In addition, full compliance with the MES at all plants that are scheduled to operate beyond 2030 would avoid a projected 2 300 deaths per year from air pollution and economic costs of R42 billion (USD 2.9 billion) per year.37

48.6. Other avoided health impacts would include 140 000 asthma emergency room visits, 5 900 new cases of asthma in children, 57 000 preterm births, 35.0 million days of work absence, and 50 000 years lived with disability.38

48.7. Requiring the application of best available control technology at all plants, instead of the current MES, by 2030, would avoid 57 000 deaths from air pollution and economic costs of R1,000 billion (USD 68.0 billion) compared to the Eskom plan, ERP 2022.39

49. Importantly, the health costs of Eskom’s noncompliance with MES would be unacceptably high. In recommending full compliance with the legal standards, 34 400 lives could be saved. The CREA report demonstrates the magnitude of the health impacts of non-compliance and the associated costs. It also shows the deficiencies in the Eskom’s retrofit plan 2022, particularly from a health perspective.

**Highveld Health Study: Final Integrated Report: (medical and household survey and HHRA and Human Health Impacts) (“Highveld Health Study”)**

50. This is a report commissioned by the DFFE, which seeks to provide a baseline assessment of the current health status of the population in the HPA in relation to air quality and public health, in order to assist the Department in making an informed decision on air quality management in the HPA.40 This is government’s own assessment and findings on the health impacts of air pollution for people living in the Highveld, where the majority contributor to that pollution is Eskom’s coal power facilities.

51. We first received a copy of this report from the Forum on 11 November 2022.

52. The health impact assessment estimated a 5 125 decrease in PM10 attributable mortality if annual PM10 NAAQS were met. In the PM2.5 analysis, it was estimated that if PM2.5 annual NAAQS were met, there would be a 4 881 decrease in PM2.5 attributable mortality. The Report notes: “It is essential to meet improve air quality to meet NAAQIS and to save lives.”41 We also wish to draw the link between SO2 and Secondary PM2.5 in light of Eskom’s failure to abate SO2 emissions, the SO2 Panel report (discussed further below) states that from the perspective of

34 Ibid at page 2.
35 Ibid.
36 Ibid.
37 Ibid.
38 Ibid.
39 Ibid.
40 Highveld Health Study report, page 2.
41 Ibid at page 44.
population exposure and public health, regional-level exposure to secondary PM2.5 pollution is the dominant impact of SO2 emissions.\textsuperscript{42}

53. The Health Study confirmed that lung function\textsuperscript{43} showed a decrease after exposure to PM10, PM2.5, SO2, CO and NOx. These effects were observed in just days following exposure to pollution. The effects of some pollutants were observed on the same day as the exposure. It is beyond dispute that there is a relationship between short-term exposure to air pollutants and short-term impacts on lung function. In this regard, the Report recommends the improvement of air quality to improve the health of children in the HPA.\textsuperscript{44}

54. While the Highveld Health Study concerns itself with ambient air quality more generally (as opposed to specific facility emissions from Eskom), Eskom’s coal power facilities are responsible for the lion’s share of the air pollution in the Highveld. The health impacts of Eskom’s pollution specifically are further highlighted by the CREA report referenced above and the SO2 Panel Report discussed below.

55. The assessment looked at all sources of air pollution as well as lifestyle factors in its assessment. We reiterate that regardless of the presence of these other sources and factors, industry is the main cause of air pollution in the HPA. Therefore, MES compliance is crucial in order to improve the air quality and essentially secure the health and well-being of the residents. At this juncture we again refer to the judgment in the Deadly Air case (referenced at paragraph 18 above) and the declaratory order against the Minister confirming, and undisputed, that air pollution levels in the Highveld are in breach of peoples’ constitutional right to an environment not harmful to health and wellbeing. It is the Minister’s imperative to take whatever steps are at her disposal to rectify this.

56. In light of these findings, it is clear that compliance with the MES will go a long way in improving the health of people in the HPA. The assessment draws the clear link between air pollution and health in the HPA.

Feasibility for Eskom to Abate SO2 Emissions: SO2 Panel Report Findings and Recommendations

57. In 2018, an expert panel (“the SO2 Panel”) was appointed to provide strategic and technical guidance towards effective management of sulphur dioxide (SO2) from old and existing power generation plants. Despite numerous requests by the CER to obtain a copy of the panel’s recommendations (“the SO2 Report”), the report has not been made available by the DFFE. On request to the Forum, it was provided to CER on 11 November 2022. This is our and our clients’ first time engaging with the Panel’s findings. We set out here some comments on the report. Again, and as above, the report findings bear relevance to the work and considerations of the Forum. For that reason, we address some of the report in this submission.

58. This SO2 Report looks at the health impacts of SO2 emissions and acknowledges the adverse effects of SO2. It states: “around the world, SO2 is known to have major impacts on human health that cannot be ignored. South Africa’s dire inequality and inequity means that the vulnerable and indigent communities are most affected by SO2.”\textsuperscript{45} It recognises that even in instances when SO2 levels meet the NAAQS, adverse respiratory health impacts related to SO2 exposure occur, especially among children. From epidemiological studies focused on the HPA and the Vaal Triangle Airshed Priority Area (VTAPA) specifically, there are health impacts in these regions due to exposure to air pollution and SO2.\textsuperscript{46} This further reinforces the fact that South Africa’s NAAQS are in fact very weak and not in line with the WHO Guidelines.

\textsuperscript{42} SO2 Report, page 9.
\textsuperscript{43} As measured by Forced Expiratory Volume at One Second (FEV\textsubscript{1}).
\textsuperscript{44} Health Study report, page 45.
\textsuperscript{45} SO2 Report, page 8.
\textsuperscript{46} Ibid.
59. The SO2 Panel considered a number of technologies that are available to reduce SO2 emissions from listed activities, each with its own advantages and disadvantages. The Report concludes that meeting an MES of 500mg/Nm\(^3\) SO\(_2\) at plants burning coal requires a reduction of about 85% in flue gas SO\(_2\) concentrations.\(^{47}\) The technologies the Panel considered are:

59.1. Wet flue gas desulphurisation (“Wet FGD”) – the Report states “in South Africa, the wet limestone full oxidation process is the most considered option for an MES of 500 mg/Nm\(^3\) or lower, as these systems have a high efficiency (typically >90%) for SO\(_2\) removal and make efficient use of the calcium (Ca) content of the lime”\(^{48}\)

59.2. Semi-dry absorption;

59.3. Dry sorbent injection (DSI); and

59.4. A number of developing technologies such as New Integrated Desulphurization (NID), Circulating Dry Scrubbing (CDS, also CFB scrubbing), SNOX™ and ReACT. SDA and CDS have substantially lower water demand and capital costs than Wet FGD.

60. The Panel considered the potential costs of retrofitting as well as the economic costs of SO\(_2\) emissions estimated from previous studies. In this regard, SO\(_2\) emissions from Eskom facilities alone are associated with external costs of 11-35 billion Rand per year according to different studies. The SO2 Panel is of the view that compliance with the MES would significantly reduce these costs and, as a side benefit, the costs associated with mercury emissions. The Report states that considering the wide range of methodological choices, there is no major dispute between the different studies done to date on the health costs of SO\(_2\) emissions, or the economic benefits of compliance with the SO\(_2\) MES. They are all in fairly good agreement.\(^{49}\)

61. The final recommendations derived from the analysis use the cost of available and proven technologies to assess the economics of applying the MES values of 250, 500 and 1000 mg/Nm\(^3\). The panel undertook a health impact-based Cost-Benefit Analysis which accounts for the benefits associated with mitigating the health impacts of emissions as well as the costs involved in the mitigation. It found that in both of the scenarios it considered, it is economically beneficial from the national point of view and technically feasible for Eskom plants with less than 5 years of remaining lifetime (i.e. Duvha and Matla) to meet the 1000 mg/Nm\(^3\) limit.\(^{50}\)

62. The SO2 Report looked at health costs for prioritisation and states that respiratory conditions\(^{51}\) are “highly prevalent” in South Africa and associated with environmental exposures.\(^{52}\)

63. The impacts of accelerated retirements were also considered. The SO2 Panel is of the view that accelerated retirement of older facilities can substantially reduce the capital costs of bringing Eskom’s fleet to compliance. The report found that in both its scenarios (Precautionary Principle\(^{53}\) and No regrets\(^{54}\)), it is economically beneficial from the national point of view and technically feasible for Eskom plants with less than 5 years of remaining lifespan (i.e. Duvha and Matla) to meet the 1000 mg/Nm\(^3\) limit.

\(^{47}\) Ibid at page 9.

\(^{48}\) Ibid.

\(^{49}\) Ibid at page 11.

\(^{50}\) Ibid at page 30.

\(^{51}\) Such as asthma, chronic obstructive pulmonary disease, and cardiovascular diseases such as hypertension, cardiomyopathies and coronary vascular diseases, together with malignant diseases, particularly cancers of the lung, stomach and breast.

\(^{52}\) SO2 report, page 28.

\(^{53}\) The SO2 Report states that the Precautionary Principle is a an approach which errs on the side of maximizing expected benefits to the society (i.e. choosing the strictest emission limits that are likely to have positive economic value) (page 25 of the SO2 Report).

\(^{54}\) The SO2 Report states that the “No regrets” approach errs side of setting limits that maximize economic net benefits, and only require actions where there is a very high confidence of positive economic value even if it turns out that costs have been underestimated or benefits have been overestimated (page 25 of the SO2 report).
64. The Report concludes that “it is technologically feasible and economically beneficial” for all plants that will be operational after-2030 to meet an MES of 1000 mg/Nm$^3$ or lower. It is technologically and economically justifiable for most plants to meet either 250 mg/Nm$^3$ or 500 mg/Nm$^3$. The results of the CBA show that the highest economic benefits are achieved when plants included in this study meet MES limits of 1000 mg/Nm$^3$ and lower. For most plants, limits of 500 mg/Nm$^3$ and 250mg/Nm$^3$ provide the highest benefits.\textsuperscript{55} Notably, the recommendations of the panel in this Report are not technologically prescriptive.\textsuperscript{56}

65. Evidently, there are available technologies to reduce SO2 emissions. It is technologically feasible and (as shown by the CBA and the macro-economic analysis) economically beneficial for all plants that will be running post-2030 to meet an MES of 1000 mg/Nm$^3$ or lower. Furthermore, it is technologically and economically beneficial for most plants to meet the lower MES of either 250 mg/Nm$^3$ or 500 mg/Nm$^3$. The recommended MES is dependent upon the remaining lifetime of the plant, with a more stringent MES favoured for plants operating beyond mid-2030s.\textsuperscript{57}

66. Delaying compliance increases the economic costs incurred due to SO2 emissions with little effect on the cost of compliance, as most of the cost is a once-off investment cost. Therefore, the earlier the plants comply, the larger the net benefits to the society. Although the cost of compliance is borne by the plant operators while the benefits accrue to society at large, the analysis performed by this panel finds that there are multiple options for the Department to implement MES that will lead to positive societal benefits, including improved public health and positive net impact on GDP and employment.\textsuperscript{58}

67. According to the Panel, the scenario which sets emission limits consistent with the application of best available technology (“BAT scenario”), taken as 250mg/Nm$^3$, on all sources by 2030 on all plants, delivers a 92% reduction in SO2 emissions. This would require a 14.6% increase in the electricity tariff. The Maximum social benefit option, which sets emission limits consistent with the application of BAT, delivers 85% reduction in public health costs and requires a 13% increase in the electricity tariff.\textsuperscript{59}

“The impact of this increase in the tariff on the costs of production across sectors averages the minimum of 0.91% and the maximum of 2.15%. The manufacturing sector in particular, which is dominated by the minerals-energy complex, will experience the largest cost increases, which are between the minimum of 4.99% and the maximum of 14.3%. These increases are not likely to be passed on to consumers given the competitive pressures faced by firms that operate in the MEC sub-sectors, and also because much of the output that is produced by these sub-sectors is destined for global markets, which are also highly competitive.”\textsuperscript{60}(Emphasis added)

68. Furthermore, the Report concludes that the economy-wide net benefits are estimated to range between the minimum of R153.81 billion and the maximum of R384.64 billion. Ultimately, there are positive net benefits to the introduction of the FGD technology. The report further concludes that if the National Energy Regulator of South Africa (NERSA) does not grant Eskom permission to raise the tariffs in order to meet the costs of the FGD technology, then Eskom will have three options. The first option is to issue debt that is not backed up by prospective cash-flows, which is not sustainable. The second option is to fund the technology directly from the National Revenue Fund, which would require a special line item in the national budget. The third option is to shift the funding to coal suppliers, since coal is the source of the SO2. The last option is a combination of the three options.\textsuperscript{61}

\textsuperscript{55} SO2 Report, page 32.
\textsuperscript{56} Ibid at page 27.
\textsuperscript{57} Ibid at page 45.
\textsuperscript{58} Ibid.
\textsuperscript{59} Ibid at page 58.
\textsuperscript{60} Ibid at page 65.
\textsuperscript{61} Ibid.
69. According to the National NEMA Appeal Regulations, 2014 (“Appeal Regulations”), Interested and Affected Parties (I&APs) have a right to be notified of appeals. At the outset, we wish to emphasise that Eskom and the DFFE failed to provide us and our clients with Eskom’s appeal documents despite numerous requests. As stated above, on 8 and 9 November 2022 respectively, we received Eskom’s Appeal documents and “Updated MES application” through the MES Forum.

70. Regulation 5 of the Appeal Regulations also states that an I&AP may respond to an appeal within 20 days from the date of receipt of the appeal submission. We intend to exercise this right of reply on behalf our clients. The Minister’s notice of 12 May 2022, which establishes the MES Forum, places Eskom’s appeal in abeyance, and we presume that this extends to the timeframes under Regulation 5 as well. As such, we require clarity as to when and how our clients should exercise their right of reply to Eskom’s appeal.

71. Further, we are not yet clear on the effect of Eskom’s “Updated Minimum Emission Standards Application” on Eskom’s appeal and the 2021 NAQO Decisions, nor have we been formally notified of this application or provided with an opportunity to comment as per section 12 of the MES notice, which refers to the public participation process set out in terms of the NEMA and Regulations 41 to 44 of the Environmental Impact Assessment Regulations for public comment processes. In any event, we note that the timeframes for the lawful submission of postponement and suspension applications have now long passed. As such, Eskom cannot permissibly bring any further postponement or suspension applications. The List of Activities and the 2017 Framework are very clear in this regard.

72. On 18 November 2022, we wrote to the Department on behalf of our clients seeking clarity on the above and the applicable timelines and are yet to receive a response. In any event, as mentioned we intend to formally respond to Eskom’s appeal, and to its Updated MES Application (to the extent that the DFFE is even willing and able to consider it – we submit that it is not).

73. The below is a preliminary and brief submission and response to Eskom’s appeal and “Updated” MES application.

74. Our clients’ rights to formally respond to and oppose both the Eskom Appeal and the Updated MES Application are fully reserved.

**Eskom’s Appeal**

**Our Preliminary Comments on the Substance of Eskom’s Appeal**

75. Eskom seeks to appeal the NAQO Decisions on their postponement applications for Matla, Duvha, Matimba, Medupi and Lethabo power stations which were all refused by the NAQO in their entirety. They also seek to appeal...
the NAQO’s Decisions on its postponement applications for Majuba, Tutuka, Kendal which were all partially granted in Eskom’s favour. With regards to Kriel – we wish to note that Eskom applied for a suspension of compliance and not a postponement as erroneously stated in its Appeal. The Kriel suspension was partially granted.

76. **We wish to emphasise that we support the NAQO’s Decisions to refuse Eskom’s requested postponements as above.** In participating in this NEMA section 3A Forum process we predominantly want to ensure that the 2021 NAQO Decisions are not set aside or recommended to be set aside – these decisions being aligned with the legal position in the List of Activities.

77. Eskom submits that the meaning of sustainable development and a just energy transition are in dispute and the NAQO has adopted a “**strict interpretation of the MES that is allegedly based on the protection of the environment as a sole consideration**”.\(^67\) Eskom relies on the definition of “environment” in the NEMA but blatantly disregards the fact that the definition includes “the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being” (emphasis added).\(^68\) In addition, we submit that the predominant consideration is the fact that the NEMA is the overarching environmental legislation which implements section 24 of the Constitution,\(^69\) including the environmental management principles in section 2 of NEMA (the “NEMA Principles”), to which any organ of state must adhere in all decision-making and when exercising other functions.

78. Eskom submits that the NAQO’s Decisions are at odds with the NEMA Principles, and the Decisions are specifically at odds with sections 2(2) and 2(3) of the NEMA which contemplate that people and their needs must be at the forefront of environmental management and that development must be socially, environmentally and economically sustainable. It argues, *inter alia*, that the NAQO’s Decisions failed to place people and their needs at the forefront of environmental management in that, the NAQO neglected to consider the fact that her Decisions would result in the closure of power stations and an associated 16 000 to 30 000 MW of supply to the national grid.\(^70\)

79. While we acknowledge the alleged possible economic and social consequences of MES compliance, we emphasise that the consideration of people’s needs also requires consideration of the impacts of such decisions on human health in circumstances also where human rights are violated as a result of unacceptable levels of air pollution, directly related to noncompliance with MES. People should not have to choose between jobs and their health or electricity and health – all are crucial. We cannot accept the long-spun narrative of a trade-off between competing interests and rights. Eskom has known that it must comply with the MES for a long time. Eskom was consulted in the development of the MES. Further, the feasibility of cleaner energy technology alternatives has always been available, and Eskom should have looked into this much earlier. People cannot pay for Eskom’s failure to plan with their lives and well-being. The AQA itself recognises that “the quality of ambient air in many areas of the Republic

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\(^64\) Eskom’s request for postponements from existing plant standards (1400 mg/Nm3 monthly from 1 April 2020) was partially granted from 1 April 2020 to 31 March 2025 with the emission limit of 1300 mg/Nm3 in respect of NOx. In respect of SO2, postponement from existing plant standards (3500 mg/Nm3 from 1 April 2020 until 31 March 2025) was permitted at a level of 3200 mg/Nm3 in terms of an existing postponement. The postponement from new plant standards from 1 April 2025 until decommissioning was refused.

\(^65\) Eskom’s request for a postponement from NOx new plant standards (1200 mg/Nm3 from 1 April 2020 until 31 March 2026) was partially granted (1100 mg/Nm3 from 1 April 2020 to 31 March 2025). Postponements in respect of PM and SO2 were refused.

\(^66\) Eskom’s request for a postponement from NOx new plant standards (1100 mg/Nm3 from 1 April 2020 until 31 March 2026 and 750 mg/Nm3 monthly thereafter) was partially granted (1100 mg/Nm3 from 1 April 2020 to 31 March 2025). Postponements in respect of PM and SO2 were refused.

\(^67\) Para 3.5 of Eskom’s Appeal Submissions.

\(^68\) Section 1 of the NEMA.

\(^69\) Section 2(1) of the NEMA.

\(^70\) Para 3.10.1 of Eskom’s Appeal Submissions.
is not conducive to a healthy environment for the people living in those areas let alone promoting their social and economic advancement” and “the burden of health impacts associated with polluted ambient air falls most heavily on the poor”. We maintain our clients’ stance that the issue in question relates to compliance with the law, and that this is not negotiable.

80. Our position is that a Just Transition is one which recognises that the current climate crisis is an acute health emergency with far-reaching effects on both human health and the environments that sustain that health. The climate crisis and the health of citizens are interlinked and have many of the same solutions. Providing clean energy to everyone who needs it will dramatically improve the climate, as well as human health and the economy. The health system is already in crisis and needs radical proactive change to be able to cope with current public health challenges, as well as the current and anticipated damages induced by slow onset and rapid climate change events. A Just Transition calls for the internalising the health costs of coal and other fossil fuels to the polluters’ accounts. This is also in line with the concept of environmental justice, which is mentioned in the NEMA Principles which have been heavily quoted in Eskom’s Appeal. We submit that “economic activity that sacrifices people’s health can never be labelled as sustainable or justifiable”. Therefore, Eskom must bear the cost of compliance.

81. We reiterate that this is also about compliance with the law – laws adopted by Parliament and regulations promulgated by the Minister. Compliance with the law is not negotiable. Prior to promulgation, these laws and MES were negotiated over many years together with polluting industry. Since then, not only has industry been granted enormous leniency in relation to these laws, but it has succeeded in significantly weakening some of them.

82. We further note the following submissions from Eskom’s Appeal:

82.1. Eskom will continue with PM reduction projects at Duvha, Kendal, Kriel, Lethabo, Matla, and Tutuka power stations.
82.2. In the MES application, Eskom also indicated NOx projects would be undertaken at Majuba, Tutuka, Matla and Lethabo.
82.3. Eskom’s Just Energy Transition (JET) strategy proposes the shutdown of Tutuka by 2030, and as such, Eskom would request suspension of the new plant limits for Tutuka until decommissioning rather than planning to implement additional NOx, PM and SO2 projects to obtain compliance with new plant standards.
82.4. Eskom submits that the implementation of the JET strategy will see an accelerated closure of existing coal-fired stations, with 22 Gigawatts to be closed between 2022 and 2035. This will reduce Carbon Dioxide (CO2) emission by 50% by 2035 and PM, NOx and SO2 by 58%, 46% and 66%, respectively.
82.5. In respect of SO2, Kusile (Eskom’s newest station) is being constructed with FGD to ensure compliance with the MES standards from initial operations. Eskom has also committed to retrofit FGD at its new Medupi station, and work for this is underway.

83. In respect of the remainder of the coal-fired power plant fleet that was developed prior to the MES, which will be decommissioned within the next 25 years, or as soon as other energy sources can replace the baseload capacity that coal currently provides, Eskom submits that installing FGD is impracticable, unsustainable and will severely affect the country’s fiscus. We note the alleged financial concerns expressed by Eskom regarding the

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71 Preamble to the AQA.
72 LAC Just Transition Open Agenda at Just Transition Open Agenda – Life After Coal/Impilo Ngaphandle Kwamalahle.
73 Ibid.
74 Para 3.10.15 of Eskom’s Appeal Submissions.
75 Ibid.
76 Ibid.
78 Ibid at para 3.10.19.
79 Ibid at para 3.10.20.
implementation of the present NAQO Decision and its alleged impact on tariffs. We also note Eskom’s concern over FGD and water use.

84. Eskom submits that it has conducted studies, which indicate the financially unfavourable nature of flue-gas desulphurisation from a cost-benefit perspective. In this regard, we would like to point the Forum to the findings of the SO2 Panel Report discussed above (at paragraphs 57-68), which sets out a number of scenarios and options available to Eskom and similar polluters.

Eskom’ First Ground of Appeal: Decisions unlawful, irrational and unreasonable – relevant considerations were not considered

85. Eskom submits that multiple units at the coal-fired stations will not be able to operate in compliance with the limits imposed in the NAQO Decision. As a result of lost capacity, South Africa will experience Stage 8 load-shedding for every hour that the units are down and 30GW shutdown by 2025, resulting in Stage 15 load-shedding.

86. Eskom submits that the installation of FGD will result in the emission of CO2 and water scarcity. It argues that increased emissions of CO2 will place Eskom and South Africa in breach of the country’s international climate change commitments and will subject Eskom (and the country) to increased tax in terms of the Carbon Tax Act. Eskom avers that this was a relevant consideration that ought to have been considered by the NAQO. Failure to consider these relevant considerations and consequences of the Decisions renders the Decisions unlawful. Further, it is impossible to construct FGD for Eskom’s fleet of facilities by 2025.

87. Eskom further submits that the scenario options considered in the development of its Eskom 2035 Plan “do not revolve around whether there is emissions compliance or not – they revolve around the timing of the achievement of a reduction in various levels of emissions.” In this regard, we submit that Eskom is deliberately misdirecting itself, compliance with the MES is a legal issue and complying with the law is something that cannot be negotiated or evaded. It appears that throughout its Appeal, Eskom adopts the narrative that the environment is being considered above all factors but fails to address or even acknowledge the human health impacts of its non-compliance, or the very clear legal requirements that leave very little room to decision-makers for discretion. Again, Eskom has known about these requirements for more than a decade.

88. Eskom submits that in paragraph 30.2.4 of the Minister’s answering affidavit in the Deadly Air case, the Minister states that the MES "do not entail a risk-free standard because factors of cost and technical feasibility also have to be taken into account. The overriding consideration is that of an acceptable margin of safety." Eskom interprets this to indicate that even on the Minister/DFFE’s own version, cost and technical feasibility play a role in relation to the MES and that the NAQO’s Decision is not in line with the Minister’s approach as set out in the court papers. Eskom further submits that the Reasons for the Decisions neglected to consider the acceptable margin of safety, which the NAQO is required to consider. We dispute Eskom’s approach here and submit that in relation to human health, there are no safe levels of exposure to several pollutants. Applying a margin of safety as a determining factor (although we again submit that the law is quite clear here on the requirements) this is even more reason to refuse Eskom’s Appeal, in considering the thousands of lives that could be saved in enforcing the NAAQS (and by consequence the MES), by the DFFE’s own admission.

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80 Ibid at para 3.10.21.
81 Ibid.
82 Ibid at para 3.10.12.
83 Ibid at para 4.4.
84 Ibid at para 4.25.
85 Ibid.
Second Ground of Appeal: Decisions unlawful, irrational and unreasonable – failure to give adequate consideration to the Atmospheric Impact Report, fact that ambient air quality generally complies with the applicable National Ambient Air Quality Standards and acceptable margin of safety

89. Eskom submits that compliance with the ambient air quality standards in the Highveld and Vaal priority areas with respect to NO2 and SO2 are variable and, in general, there is compliance with the NAAQS. In the Waterberg-Bojanala Priority Area, there is compliance with the NAAQS for PM, NOx and SO2.86 Furthermore, implementing the Eskom JET programme will see a reduction of some 50% of Eskom’s CO2 emissions by 2035.87

90. In this regard, we wish to direct the Forum to our submissions at paragraphs 38-47 above, along with the Deadly Air judgment and countless reports by the National Air Quality Officer (the State of the Air Reports), which paint a dire picture for NAAQS compliance within the priority areas, particularly the HPA.88

Third Ground of Appeal: Decisions unlawful – conditions imposed are irrational

91. Eskom submits that the Decisions, although partial or negative, nevertheless impose conditions requiring offset programmes to be implemented and reporting requirements. Eskom submits that in circumstances where the Postponement Applications were refused, it is inappropriate and unlawful to attach binding conditions to adverse Decisions.89 This is clear from regulation 13(b) of the MES, which provides that the NAQO may refuse the application with written reasons. The regulation does not empower the NAQO to impose conditions in a negative Decision.

92. At this stage, we do not wish to respond to this ground, but reserve our clients’ rights to do so. Our position on offsets is in any event clarified at paragraph 14 of the attached Annexure A.

Point in limine: Conciliation

93. Eskom submits that section 17(1) of the NEMA is applicable to the circumstances of this appeal and that it is consequently appropriate for the Minister to refer the matter for conciliation before reaching a decision on the appeal. In the alternative, Eskom submits that section 17(2) of NEMA is applicable and hereby requests the Minister to appoint a facilitator to call and conduct meetings of interested and affected parties (including relevant organs of state) with the purpose of reaching an agreement and to refer the present difference or disagreement, to conciliation.90 Should the Minister reject Eskom’s request for the matter to be referred to conciliation, it requests the Minister to set aside the NAQO Decisions and substitute them with decisions that grant the postponement applications.91

94. Eskom claims that the difference or disagreement lies in the point that NAQO has misconstrued the DFFE’s mandate as the DFFE is required to consider sustainable development in environmental management and when making decisions. Therefore, this constitutes a “disagreement” concerning the exercise of the NAQO, DFFE and Minister’s functions which may significantly affect the environment. Alternatively, Eskom submits, there is disagreement regarding the protection of the environment in an appeal before the Minister. It submits that the disagreement is worthy of the Minister appointing a facilitator to call and conduct meetings of interested and affected parties.92

95. We submit that Eskom’s point in limine has no merit. The NAQO’s mandate is very clearly set out in the List of Activities. The NAQO exercised her discretion to decide on postponement and suspension applications – as she

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86 Ibid at para 5.1.
87 Ibid.
88 PowerPoint Presentation (dffe.gov.za)
89 Eskom’s Appeal Submissions at paras 6.1 and 6.2.
90 Ibid at paras 3.2 and 3.3.
91 Ibid at para 7.4.
92 Ibid at para 3.11.
was required and entitled to do – applying the very clear provisions and requirements for granting postponements as set out in the regulations. Eskom’s applications did not satisfy the legal requirements set out in the List of Activities for the granting of postponements for MES compliance. This is not a question of a disagreement between parties or of the NAQO exercising powers beyond her mandate.

96. In terms of section 1(a)(ii) of the Promotion of Administrative Justice Act, 2000 (PAJA), the powers to exercise administrative action are derived from the law and only extend insofar as the legislation allows. Therefore, we submit that granting any of these applications for coal-fired power stations in contravention of the requirements of the List of Activities and in the HPA or any other priority area, is ultra vires the Constitution, the AQA, the List of Activities, the 2017 Framework, and the provisions of NEMA, due to the reasons as set out above. Further, based on our submissions above and below, we maintain that the direct adverse impacts on the surrounding environment and communities caused by Eskom’s emissions in the HPA is unlawful.

Eskom’s “Updated” Minimum Emission Standards (MES) Application

97. As mentioned above the status of this application and its effect on Eskom’s Appeal above remains ambiguous and unclarified by Eskom and the DFFE. We have received no communication about this application, nor have we seen any necessary accompanying atmospheric impact reports. From this application, it appears that Eskom has adopted a revised Emission Reduction Plan (ERP 2022) which forms the basis for the revised or “Updated “MES application”.

98. At this stage we and our clients will not engage with this updated application. As noted above, the List of Activities is quite clear on the timeframes for making such applications, and such timeframes have long expired. Thus, it is not permissible for Eskom to bring such an application at this stage.

99. If the DFFE intends to entertain this application, we insist that the application public participation processes are followed. We and our clients then intend to formally respond in detail to this application.

Our Responses to Questions Received by the Forum

100. On 19 December 2022, we received through the MES Forum, a list of questions addressed to the CER reflecting the issues raised during the MES Forum public consultations that took place in November 2022. We submit that it is not our clients’ responsibility to provide solutions on behalf of Eskom and the Minister, particularly not at this stage and after more than a decade of highlighting our concerns to Eskom and the government. In any event, Annexure A to these submissions contain our clients’ views on the issues.

Conclusion

101. We would like to emphasise that the health of people should be a major determining factor in the recommendations to be made by the Forum in light of section 24 of the Constitution – which is the basis for the environmental legal framework. Further, other Constitutional rights of residents are also affected – including their rights to life, dignity as well as the rights of children in terms of section 28 of the Constitution.

102. In the Deadly Air case the High Court held that the section 24 rights to an environment that is not harmful to the health and wellbeing is immediately realisable. We reiterate that the legal quagmire in which Eskom finds itself is almost entirely self-inflicted and residents should not have to bear the brunt of that through the health impacts of the pollution. Because of the MES non-compliance, constitutional rights are being breached in circumstances where Eskom and other industries are contributing to a public health crisis, causing billions in health costs, and contributing to death and illness.

93 These are required by para 5.4.3.4 of the 2017 Framework and para 12A(c) of the List of Activities.
103. Importantly, there is an option of transitioning to cleaner alternatives to avoid these harms and rights infringements. We and our clients acknowledge and understand the complexity of the situation. But when it comes to human rights and human lives – the deaths of vulnerable people including children and the elderly is simply too high a price to pay for electricity – particularly when feasible, affordable alternatives are available.

104. Eskom and the government need to do much more and much faster to deploy clean renewable electricity alternatives to enable these polluting facilities to come offline. We need to see more being done to facilitate a consultative and inclusive just transition.

105. In summary, we reiterate the following submissions:

105.1. There are cleaner energy options and various SO2 emission reduction strategies available to Eskom;
105.2. The magnitude of the health impacts of non-compliance and the associated costs necessitate MES compliance by Eskom;
105.3. We recognise the complex issues that make up the Just Transition to renewable energy, however it is unacceptable to pit human lives against access to energy and the economy. Compliance with the MES is most importantly, a public health issue; and
105.4. The law is clear on what is required and there is very limited flexibility available to the Minister on decisions that can be made in regard to these appeals.

106. This submission is endorsed by the Alternative Information and Development Centre (AIDC); Just Share and the Federation for a Sustainable Environment (FSE).

107. Please contact us should you have any queries in relation to these comments.

Yours faithfully

CENTRE FOR ENVIRONMENTAL RIGHTS

per:

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Questions emanating from the Public Consultation Process of the MES NECA Forum

1. It may not be possible, for technical reasons, to retrofit all the power stations (PS) with the necessary MES abatement equipment and as a result, some PS may need to be shut down should the MES regulations be applied strictly. The impact of the possible shut down of the PS will result in job losses in certain areas in the Mpumalanga/Waterberg region.

Has the CER considered the socio-economic impact on these communities should the PS shutdown and how any adverse impact can be mitigated?

The CER and its clients have been engaging for a number of years with communities neighbouring coal plants including on the socio-economic impacts of these plants while operating; and currently they are involved in a number of engagements around the proposed closures of a number of Eskom coal plants. We are well aware of the negative consequences for workers that come with the closure of coal plants. In this regard the following points are made:

- A well-managed, planned and transparent transition is what is needed to mitigate job losses. This is an urgent imperative on government, as well as on Eskom. The Komati worker skilling programme and training centre is an example of an initiative for a managed transition to in-demand skills used in renewable energy (RE) projects. Noting however, that reskilling and expanding employment opportunities will need to go beyond the energy sector alone. Utility scale RE used in the mining sector could also be able to provide more secure career pathways.

- Continued running of polluting coal plants in noncompliance with the law and to the detriment to surrounding communities is arguably not the most sensible route to creating employment. Communities should not have to choose between their health and employment.

- Independent modeling of the externalised health costs associated with the operation of coal power plants should be included in any debate about the socio-economic impact on these communities - Dr Mike Holland quantified health costs
from PM2.5 emissions from Eskom alone to be USD 2.3 billion (in the region of ZAR 40 Billion) annually


- Although we recognise that there are socio-economic implications related to the closure of the coal plants, it is also imperative that Eskom and industry comply with health standards that protect communities and are essential for guaranteeing the constitutional right to a safe and healthy environment. Eskom and the government have had 15 years to comply. Their negligence and inaction should not be rewarded by allowing them to further harm communities.
- It is worth also pointing out the adverse socio-economic impacts of coal plants that continue to operate in non-compliance with emission standards. In this respect, we are referring to the external costs associated with Eskom’s air pollution, which are borne by people living in the vicinity of the power stations, and by the government. We refer to the following reports:
  - In terms of a report by the Centre for Research on Energy and Clean Air (“the CREA Report”) (Annexure D to the NECA Forum submission), full compliance with the MES at all plants that are scheduled to operate beyond 2030 would avoid a projected 2 300 deaths per year from air pollution and economic costs of R42 billion (USD2.9 billion) per year, starting from 2025. In addition, on a cumulative basis until the end-of-life of the power plants, compliance would avoid a projected 34 400 deaths from air pollution and economic costs of R620 billion (USD 41.7 billion).
  - The SO2 Panel Report (referred to in paragraphs 57-68 of the NECA Forum submission), which considered a number of studies on the costs of Eskom’s air pollution. It states that:

    “SO2 emissions from Eskom facilities alone are associated with external costs of **11-35 billion Rand per year** according to different studies (Table 2). **Compliance with the MES would considerably reduce these costs** as well as the costs associated with mercury emissions as a side benefit. Considering the wide range of methodological choices, the different studies done to date on the health costs of SO2 emissions, or the economic
benefits of compliance with the SO2 MES, are in fairly good agreement."
(SO2 Report, page 11)

- The recommendations of the SO2 Report are not technologically prescriptive but consider different scenarios and options that Eskom can consider in order to reduce SO2 emissions. According to the Panel, the scenario which sets emission limits consistent with the application of best available technology ("BAT scenario"), taken as 250mg/Nm³, on all sources by 2030 on all plants, delivers a 92% reduction in SO2 emissions. (SO2 Panel Report, page 38)
- Additionally, health impacts have a major ripple effect on livelihoods, education, and other socio-economic rights.
- We wish to emphasise that Eskom and the government have been aware that they must comply for almost 15 years and should have, long ago, taken steps to mitigate the socio-economic impacts of their coal plants and any consequent or necessary closures.

2. The shutdown of the PS that are in breach of the MES will reduce the amount of electricity generated in SA. Further, the installation of abatement equipment to reduce emissions reduces the net amount of electricity fed into the grid because the abatement equipment has parasitic loads. The parasitic loads can amount to 3-4% of a PS’ capacity in the case of SOX removal. This reduction will have direct and indirect implications on SA and the Mpumalanga/Waterberg regions (e.g. jobs, economic growth, etc.).

How does the CER propose these be addressed and mitigated?

The CER is not an expert in pollution removal technologies or related waste disposal, but we can refer the Forum to relevant experts if needed. We refer to our comments in response to point one above and reiterate them here. We also again refer to the report of recommendations made by the government appointed SO2 panel, which lists one of the disadvantages of Wet FGD as a parasitic power use of 1-2% of the rated output of the boiler (SO2 Panel Report, p.13) (contrary to what is implied in the question above). As stated above, the Report looks at a number of abatement technologies that can be used to reduce SO2 emissions.
In any event it is inappropriate for us or our clients to propose solutions to a problem Eskom has created and perpetuated for itself - a problem it has known about (with our clients' warning) since 2010. Eskom should utilise the opportunity to bring clean renewable energy alternatives online urgently.

3. The removal of SOX requires water, lime (or equivalent depending on the technology choice) and it produces gypsum (or equivalent depending on the technology choice). How has the CER factored in the impact of:

3.1. increased water consumption and water supply to the PS;

3.2. the sourcing and trucking of lime feed and gypsum waste; and

3.3. the environmental impact of the requirements set out in 3.1 and 3.2 above.

The CER is not an expert in pollution removal technologies or related waste disposal, but we can refer the Forum to relevant experts if needed. We also refer again to the findings of the SO2 Report. It is important to point out that there are technologies to abate SO2 that use fundamentally less water. It is well established that reduction of air pollution at coal plants through pollution control technologies comes with other environmental risks to water, soil and climate, but that does not negate the legal and moral obligation to reduce air pollution. The International Energy Association’s Clean Coal Centre’s Technology Roadmap for HELE Coal Power Plant (2021) on SO2 removal technologies discusses low water SO2 removal options. As this report is behind a paywall, we include a relevant excerpt here:

“In addition to its high capital cost, major disadvantages of wet FGD are its high water consumption rate, which can represent 10–15% of the total evaporative water loss from a water-cooled coal power plant, and the need to treat water effluent, which can contain toxic species. Other desulphurisation technologies have therefore tended to focus on reducing water consumption and are often known as semi-dry or dry FGD (Carpenter, 2012). Widely deployed in the USA since the 1970s, spray-dry scrubbers inject an atomised lime slurry into a reactor vessel; the water is evaporated by the flue gas heat, while the dried sorbent reacts with SO2 and is captured in a particulate control device (usually a fabric filter).

Circulating dry scrubbers (CDS), such as GE’s NID or Megtec’s Turbosorb technology, separately inject water and a hydrated lime sorbent, and are able to circulate and reuse the
sorbent. Their principal advantage over the spray dryer is the flexibility in independently adjusting water and sorbent injection rates, allowing sorbent consumption and desulphurisation performance to be optimised at various levels of plant load and SO2 concentration.

Semi-dry technologies offer lower removal rates than wet FGD at around 90-95%, but have the major advantages of around 60% lower water consumption, zero liquid effluent, and lower Capex. They are also well suited to capturing mercury and other trace metals as they feature a particulate control device at the end of the process chain which can remove any remaining solids. In contrast, any metals emitted from a wet FGD can continue unabated to the stack unless secondary particulate controls (such as a wet ESP) are present. Semi-dry scrubbers tend to be deployed on retrofits to small and medium-size units (~250 MW), but can also be deployed in a modular fashion to treat larger plant. While very high sulphur loadings and removal rates may favour the economics of wet FGD, circulating dry scrubbers have been shown to be capable of meeting EU emission limits (180 mg/m3), and are also widely used in more arid parts of China (Cichocka-Marszałek, 2020). Semi-dry technologies may prove a vital tool in the deployment of FGD in other coal-dependent regions with low water availability, including parts of India and Africa.

Dry sorbent injection (DSI) is a truly low-water method in which hydrated lime or a sodium-based sorbent (such as trona) is injected into the flue gas. Owing to its low capital but high operating cost, this technology is more suited to small units and those which have insufficient remaining lifetime to justify additional capital investment, or in lowering SO2 levels which are only marginally over regulated levels. DSI can also play an important role in SO3 removal, reducing the risk of sulphuric acid condensation at low flue gas temperature and thus optimising plant efficiency and flexibility, as well as eliminating the undesirable ‘blue plume’ of condensing SO3 which can breach regulations on the opacity of stack emissions. R&D in DSI has led to the development of advanced, high-reactivity forms of hydrated lime” (Licata, 2020). Reference: Toby Lockwood, A Technology Roadmap For High Efficiency Low Emissions Coal Power Plant, CCC/309, IEA Clean Coal Centre/ Institute for Sustainable Carbon (2021) at page 48-49.

4. Please provide any additional critique to ESKOM’s CBA done in 2019 (additional critique that was not already provided in the documents supplied).
As the Forum has noted, CER engaged qualified experts to analyse this issue in 2019. If the Forum is interested in additional or updated critiques, it may consider engaging experts directly. We can provide contact information if requested.

5. Does the CER have an updated CBA to the one the CER commissioned in 2019? Some assumptions may have changed since it was done 3 years ago. There have been technology improvements, the PS fleet is older, the quantity of emissions and AAQs have changed, updates to the Values of a Statistical Life, the socio-economic landscape, and electricity supply deficit and CoUE. The Forum requests that these assumptions be undated because it will be undertaking an independent CBA.

Please refer to the CREA Report, Annexure D to the NECA Forum submission, to which these responses are also annexed.

6. It is reported that ± 3 jobs will be created for every coal related job that will be lost in the JET. Does the CER agree with these figures? What is the CER’s view?

This is not within the CER nor our clients’ scope of expertise or available resources as attorneys and civil society organisations advocating for a safe and healthy environment for the people of South Africa according to the South African Constitution and laws.

In any event, it is inevitable that coal is on its way out. It is too costly and too harmful to health and climate change. It is our responsibility both as environmental justice organisations and as attorneys on behalf of our community clients to defend their rights, their health and their wellbeing from coal pollution.

As above, CER and its Life After Coal campaign partners sometimes engage qualified experts to analyse policy initiatives, but we do not conduct such analysis in-house. We can refer you to relevant experts and reports on just transition and employment dynamics.

“Caring for the Coal Workforce” is Priority Area 3.1 of the Just Energy Transition Partnership, (see p. 194), which cites the following relevant reports, which may be of interest in relation to this question:


7. In which locations does the CER believe those new jobs will be created in the JET. How many jobs (as a factor of the jobs lost) will be created in:

7.1. HPA and WBPA;

7.2. Elsewhere in SA; and

7.3. Outside SA.

This is not within the CER nor our clients’ realm of expertise or available resources. Please refer to no. 6 above.

8. Please could the CER quantify what will be the change in HPA and WBPA’s unemployment when the MES regulations are applied as per CER’s appeals (i.e. in [XX] % change). Please could the CER provide some details for the reasons for the change in unemployment.

This is not within the CER nor our clients’ realm of expertise or available resources. Please refer to our more detailed response to no. 6 above which is also applicable here.

9. What is the CER’s view of the timeline for the new jobs to be created once the coal related jobs have been lost?

This is not within the CER nor our clients’ realm of expertise or available resources. Please refer to our more detailed response to no. 6 above which is also applicable here. Macroeconomic and regional economic diversification plans would indicate which sectors
are growing and will offer new jobs. This should also be outlined in the Just Transition Implementation Plan and these plans are not yet available.

10. Will there be any time lag between the jobs lost, and the new jobs being created? If yes, how many months/years does the CER estimate it will be? How does the CER propose to reduce any time lag or mitigate any adverse impact caused by the time lag?

This is not within the CER nor our clients’ realm of expertise or available resources. Please refer to our more detailed response to no. 6 above which is also applicable here.

11. Please could the CER provide an estimate of the jobs that will be lost in the coal sector when a PS is shut down. Please could this be provided for each PS and each portion of the coal value chain (coal mining, coal logistics, ...). Please could the estimate include direct, indirect and induced job losses be provided.

This is not within the CER nor our clients’ realm of expertise or available resources. Please refer to our more detailed response to no. 6 above which is also applicable here. Our view is that if the Just Transition is managed, jobs do not need to be lost and workers could retire naturally or transition to alternative, decent jobs. Jobs lost are determined by energy transition pathways and plans, which ought to be mapped out timeously at various stages e.g., decommissioning pathways determined in the IRP or in an Energy Skills Development Plan.

12. Please could the CER indicate what forms of re-skilling will be required for the coal-sector employees to get the new jobs. How much time will be required to re-skills those employees? Could the re-skilling start before the coal powered PS is retired and the coal mine closes? What can be done to facilitate re-skilling while the employees are still employed?

Again, this is not within the CER nor our clients’ realm of expertise or available resources. Please refer to our more detailed response to no. 6 above which is also applicable here. The Just Transition Implementation Plan should outline detailed plans for a diversified economy and identify sectors requiring skilled workers. Reskilling should start long before coal-powered PS are retired as is similarly required by Social and Labour Plans in the coal mining sector. To determine reskilling requirements existing skills need to be defined and
career and employment pathways need to be identified. (Note that research indicates information regarding existing skills is not readily available) Partnerships need to be established with the Sector Education and Training Authorities (SETA's) and institutions of learning to assist with reskilling costs as well as with potential employers to assist with the transition.

13. Emissions released at ground level may impact the AAQ in close proximity. Emissions that are released at altitude above the inversion layer will be dispersed over a wider area at a lower concentration and may impact the AAQ at a further distance. Has this been given consideration by the CER?

Again, CER and our Life After Coal partners are not ourselves technical experts in air quality modelling. Nevertheless, we and our clients are well aware of these dynamics. Stack height, topography and meteorological conditions are standard components of air pollution dispersion modeling by the experts we have commissioned to provide relevant analyses, including Dr. H. A. Gray’s 2019 report Air Quality Impacts And Health Effects Due To Large Stationary Source Emissions In And Around South Africa’s Mpumalanga Highveld Priority Area (HPA) (“the Gray Report”) and 2020 report Analysis Of Air Quality Impacts And Health Effects Due To Kendal Power Station’s Emissions Between January 2018 And October 2019.

This does not change the general findings on ambient air quality and predominant emission sources within polluted areas like the HPA. The Gray Report (Available at https://cer.org.za/wp-content/uploads/2019/06/Andy-Gray-Report.pdf) points to coal as the dominant source of air pollution in the area, accounting for the majority of exceedances of the various ambient pollution limits (daily and hourly).

In the Gray Report, Dr Gray modelled 2016 pollution from 12 Eskom coal-fired power stations and Sasol’s coal-to-liquids plant in the HPA and the Natref oil refinery in Sasolburg. His report confirms that “Cumulative emissions from these 14 facilities created acute exposures in 2016 that exceeded the World Health Organization’s guidelines for daily or hourly averages for all pollutants.” The exceedances were significant. “The highest 24-hour average exposure of PM$_{2.5}$ was 45 μg/m$^3$, nearly twice the World Health Organization guideline of 25 μg/m$^3$. These conditions occurred around (Eskom’s) Kendal, Kriel, and Duvha power stations. The highest 24-hour average exposure of SO$_2$ was
241.4 μg/m³, over 1200% of the World Health Organization standard of 20 μg/m³. The highest NO₂ one-hour average was 2020 μg/m³, over 1000% of the one-hour average standard of 200 μg/m³.”

Dr Gray modelled pollution at 120 “sensitive sites”, mainly schools and hospitals, where he found pollutants accumulating from Eskom plants. “All of the 120 sensitive sites (primarily schools and hospitals) analyzed in the model exceeded the World Health Organization’s 24-hour average SO₂ guideline (20 μg/m³) in 2016 due to emissions from the 14 facilities. The modeled average peak 24-hour SO₂ concentration across all 120 sensitive sites was 66.4 μg/m³ in 2016, with a maximum of 178 μg/m³ at Duvha Primary School.”

According to Dr Gray, any attempt to clean the Highveld air had to focus on the 12 Eskom plants, Sasol’s Secunda plant, and the nearby NatRef refinery. “The 14 facilities are responsible for the lion’s share of air pollution allowed by national air quality limits. In 2016, emissions from the 14 facilities accounted for 92% of the daily ambient SO₂ limit, 85% of the hourly ambient SO₂ limit, 82% of the hourly ambient NO₂ limit, and 68% of the daily ambient PM2.5 limit…. These levels of contribution indicate that ambient air quality standards cannot be achieved without reducing pollution from these sources.” The government’s own reports support this, showing that power generation and opencast coal mining are by far the biggest contributors of SO₂, PM₁₀, and NOₓ emissions in the HPA.

Additionally in the 2022 State of Air Report and Air Quality Management (AQM) Highlights presented by the National Air Quality Officer at the 16th Air Quality Governance Lekgotla, from 3-5 October 2022 (https://www.dffe.gov.za/sites/default/files/docs/2022airqualitylek gotlapresentations_stateofair.pdf) the HPA Annual and Monthly Average Trends 2008-2021 for PM2.5 and PM10 indicate a strong regional effect of particulate matter pollution at all monitoring stations.

14. An overall improvement in AAQ can be achieved through the use of offsets. Such offsets can be a better way to improve AAQ because they are more cost effective and an offset mechanism would be in the interests of SA and its citizens. Please comment on the CER’ view in relation to offsets.

We fundamentally disagree that the overall improvement in ambient air quality can be achieved through the use of offsets. The continued noncompliance with AAQS in priority
areas such as the Highveld is a case in point. We do not object to measures being taken to supply households with cleaner energy sources, but this can in no way replace current regulatory and legal requirements. Reducing indoor pollution from cooking and heating should be done in addition to, not instead of, reducing outdoor air pollution.

Science shows there is no pollution concentration below which health harms do not occur, meaning there is no safe level of exposure to air pollutants. In any event there is no legislative framework for offsets. There are a number of potentially significant risks associated with the use of air quality offsets that could, amongst others, result in ongoing non-compliance and exceedances of air quality standards to the detriment of the public as a whole. Key risks include: uncertainty about the potential effectiveness of the proposed measures and how to measure this; inequities in the use of offsets; time lags before offsets are achieved; in the air quality context, offsets are not “like for like”, which means that there is a material risk that the pollutants that are cheapest to address will be targeted by polluters, rather than those pollutants which pose the most harm. Plus, there is limited capacity for compliance monitoring and enforcement.

Offsetting air pollution by reducing some sources of emissions while failing to reduce others fails to protect the rights and health of all the people of South Africa, as vulnerable communities living closest to the power stations, coal mines and trucking routes will continue to be severely harmed by these sources (whether or not some of them have gas stoves in their homes to reduce indoor fuel burning). Eskom’s continued reliance on the contribution of other less significant (by percentage) sources of emissions - which must, of course be reduced and, where possible, eliminated through other appropriate policy and legal means - however, constitutes a muddying of the immediate issue of compliance with the law and should be dismissed. The fact of the matter remains that the law must be complied with.

15. Any other information regarding offsets which CER believes could be relevant for the Forum’s deliberations.

We refer to our submission above at paragraph 14.

16. We would be grateful if we could be supplied with any information, including reports or studies which, in your view, may assist the work of the forum.
We note that a number of relevant reports, including the above referenced Gray Report, the SO2 report and the Highveld Health report, are already listed in section 3.2 of the Terms of Reference attached to the Notice of Intention to Establish the NECA Forum of 12 May 2022 (GN NO. 2076; GG 46355). Kindly advise if the Forum requires access to any of those reports. For the Forum’s ease of reference, we provide links to the following reports and information:

- DFFE and the Presidency’s Socio-Economic Impact Assessment System: the Initial Impact Assessment of the Priority Area Air Quality Management Plan Regulations, which identifies industry non-compliance as a primary cause for noncompliance with ambient air quality standards in the Highveld. It acknowledges that “there is a chance to save thousands of lives if annual PM NAAQS are met, and furthermore recommended that it is essential to meet (sic) improve air quality to meet NAAQS and to save lives” (not listed in the Terms of Reference of the Forum). At https://lifeaftercoal.org.za/wp-content/uploads/2021/04/Impact-Assessment-Implementation-Regulations.pdf


- All relevant information pertaining to the Deadly Air litigation, including the court papers: https://lifeaftercoal.org.za/about/deadly-air#:~:text=Air%20pollution%20from%20coal%20on,encourage%20a%20coal%20phase%20out (not listed in the Terms of Reference of the Forum)


- The Life After Coal Campaign, Just Transition Open Agenda (not listed in the Terms of Reference of the Forum) at: https://lifeaftercoal.org.za/about/just-transition/open-agenda#:~:text=The%20agenda%20is%20open%20as,race%2C%20gender%20and%20environmental%20justice.
INTRODUCTION

1. This is an appeal to the Honourable Minister of the Department of Forestry, Fisheries and Environment (DFFE) in terms of section 43(1) of the National Environmental Management Act (NEMA), read together with Regulation 3(1) of the National Appeal Regulations, 2014 (the “Appeal Regulations”) and the Guideline on the Administration of Appeals, 2015 (the “Appeal Guidelines”), in respect of a number of the National Air Quality Officer’s decisions on Eskom’s applications for postponement of compliance and suspension of compliance with the Minimum Emission Standards (MES), and/or weaker alternative limits, for its fleet of coal-fired power stations. These decisions are all dated 30 October 2021 (the “decisions”).

2. In terms of Section 21 of the National Environmental Management: Air Quality Act, 2004 (AQA), the List of Activities came into force on 1 April 2010 and prescribes MES for various polluting activities, including for pollutants emitted from Eskom’s solid-fuel (coal) combustion installations.
3. The purpose of the MES and the List of Activities is — as the full title of the List of Activities suggests — to control and reduce the emission of harmful pollutants which may have a significant detrimental impact on the environment, including health, social, and economic conditions, among others. Subject to its proper implementation and enforcement, the MES in the List of Activities is referenced as a reasonable legislative measure to give effect to section 24(a) and (b) of the Constitution of the Republic of South Africa, 1996 (the “Constitution”).

4. This Appeal is lodged with the Appeal & Legal Review Directorate to dispute the following decisions issued by the First Respondent:

   4.1. the 5-year postponement of compliance granted to Majuba power station for the nitrogen oxide (NO\textsubscript{x}) new plant standard from 1 April 2020 to 31 March 2025 and directing it to comply with a limit of 1300mg/Nm\textsuperscript{3} that is above the existing plant standard of 1100 mg/Nm\textsuperscript{3};

   4.2. the 5-year postponement of compliance granted to Kendal power station for the NO\textsubscript{x} new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with the existing plant limit of 1100mg/Nm\textsuperscript{3};

   4.3. the 5-year postponement of compliance granted to Tutuka power station for the NO\textsubscript{x} new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with the existing plant limit of 1100mg/Nm\textsuperscript{3}; and

   4.4. the suspension of compliance granted to Camden, Hendrina, Arnot, Komati, Grootvlei and Kriel power stations without detailed and clear decommissioning schedules per station, as required by the List of Activities.

5. At the outset, for the benefit of the Minister as the appeal authority, as well as any other relevant DFFE officials, we attach a summary table as “Annexure A1” which presents the application outcome per Eskom power station, along with the scheduled end-of-life dates, among other relevant information. The fleet of coal-fired power stations have been separated into four basic categories — ‘old stations’; ‘older stations’; ‘mid-life’ stations; and ‘new build’ stations, namely Medupi and Kusile power stations.
6. In this appeal we address the following aspects in turn:

   A. The Parties;
   B. Request for Condonation;
   C. Background;
   D. The Relevant Legal Framework;
   E. Grounds of Appeal; and
   F. Conclusion and Relief Sought.

A. THE PARTIES

7. The First Appellant is groundWork Trust ("groundwork"), a non-profit environmental justice campaigning organisation working primarily in South Africa, in the areas of Climate & Energy Justice, Coal, Environmental Health, Waste, Environmental Justice Education and Environmental Justice Information. groundWork has its offices at 8 Gough Street, Pietermaritzburg, KwaZulu-Natal, South Africa.

8. The Second Appellant is Earthlife Africa, a non-profit organisation that seeks a better life for all people without exploiting other people or degrading their environment, by encouraging and supporting individuals, businesses and industries to reduce pollution, minimise waste and protect our natural resources.

9. The First and Second Appellants are jointly referred to as the “Appellants”.

10. The First Respondent is the National Air Quality Officer (NAQO), the designated authority responsible for the decisions in question.

11. The Second Respondent is Eskom Holdings SOC Ltd.

B. REQUEST FOR CONDONATION

12. The Appeal is lodged in terms of section 43(1) of NEMA, which provides that “any person may appeal to the Minister against the decision taken by any person acting under a power delegated by the Minister under [NEMA] or a specific
environmental management act", read with the Appeal Regulations, which provide for the submission of an appeal within 20-days from the date that the notification of the decision was sent to the registered interested and affected parties (I&APs) by the Applicant.

13. Section 12 in the Appeal Guidelines, read with section 47C of NEMA, permits the application for condonation or the extension of time periods for a belated appeal or responding statement. In deciding a request for condonation or the extension of a time period, the Minister will consider the following factors:

13.1 whether good cause is shown to extend a time period;
13.2 the extent of the period requested, or the degree of lateness;
13.3 the factual basis of the motivation for the request and the explanation thereof;
13.4 whether factors outside of the control of the requesting party have played a role;
13.5 potential prejudice in granting or refusing the request to any of the parties;
13.6 whether it is in the interest of justice to grant or refuse the request; and
13.7 prospects of success on the merits.

14. We refer to the letter from the Centre for Environmental Rights addressed to the Appeals & Legal Review Directorate, dated 21 January 2021, attached as “Annexure A2”. This letter, on behalf of the Appellants, served to place the factual chronology on record, as well as concerns regarding the timing and manner in which the First Respondent’s decisions have been shared with I&APs and that the Second Respondent’s appeal has been withheld from I&APs. This factual chronology is as follows:

14.1 the First Respondent’s decisions, dated 30 October 2021, were communicated to the Second Respondent on 4 November 2021;
14.2 section 4 of the Appeal Guidelines required the Second Respondent to notify the registered I&APs of the outcome of the decision within 12 days of receipt – by 16 November 2021;

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¹ GN R 993 GG 38303 of 8 December 2014.
14.3 instead, registered I&APs only received the decisions on 14 December 2021 — almost a month later — and a day after the Second Respondent reportedly filed its appeal against the decisions;

14.4 at the time of receiving the decisions, a number of staff members from Earthlife Africa, groundWork, and CER, who have knowledge and expertise relevant to this matter, had already taken leave just prior to the offices of all three organisations closing on 15 December 2021 for the public holiday period;

14.5 staff members from the groundWork and CER started returning from leave on the 12th of January 2022, onwards. Staff from Earthlife Africa only returned to the office on the 17th of January 2022 (as is typical for this time of year when most organisations and institutions country-wide close for the festive season and summer holiday); and

14.6 despite regulation 4 of the Appeal Regulations, a copy of this appeal submission has still not been distributed to registered I&APs to consider the prospect of filing a responding statement and the time and resources this would demand.

15. We reiterate that this a matter of public interest and importance with far-reaching implications for constitutional rights, including people’s health, and our constitutional value system in general. It warrants a careful techno-legal assessment of the decisions, amounting to 68 pages, surrounding factors, and consideration of the LAC’s resource constraints. The consequence is that because of the timing of the publication of the decisions on the eve of the public holiday period — which were before the First Respondent for over a year — and the fact that the I&APs have not had sight of the Second Respondent’s appeal, the Appellants were not provided with a reasonable period to duly consider the decisions and the prospect of an appeal and to resolve a way forward by 25 January 2022 – the adjusted appeal deadline.

16. In the time since our and our clients’ return from the public holiday period we have endeavoured to consider the decisions, take instructions, and prepare this appeal as swiftly as possible. We maintain that filing this appeal 15 calendar days after the adjusted deadline, in the circumstances, is not an unreasonable delay.
17. We submit that there would be no prejudice upon either Respondent if this condonation request is granted, as the enforcement of the First Respondent's decisions is suspended pending the outcome of the Second Respondent's appeal. The administrative timeframes for both appeals would run concurrently, as I&AP's will have 20 days to file responding statements in reply to either/both appeals.

18. We submit that there are strong prospects of success on the merits of this appeal, especially the 5-year postponement of compliance granted to Majuba, Kendal, Tutuka power stations. In fact, we submit that the alternative NOx limit granted to Majuba — that is weaker than the existing plant limit — appears to be a patent error, considering the First Respondent's reasons in relation to the Majuba power station application and reasons for rejecting applications at other coal-fired power stations.

19. We further submit that due to the nature of these applications and the circumstances outlined above, good cause has been shown for the late filing of this appeal. Overall, the interests of justice favour the Minister's consideration of the grounds of appeal, as set out below, and accordingly, we request that condonation be granted.

C. BACKGROUND

20. During the course of the period 2018 – 2020, Eskom applied for a combination of 5-year postponements of compliance, suspensions of compliance, and alternative (weaker) limits in relation to the MES compliance timeframes, ultimately covering 14 of its coal-fired power stations (the “applications”), in addition to applications for its liquid-fuel stations.
21. The Life After Coal (LAC) Campaign — comprising the Appellants and the Centre for Environmental Rights (CER) — submitted detailed written objections to all of Eskom’s applications, namely:

21.1. submissions on the background information document (bid) for Eskom’s second postponement application in respect of the 2015 MES for Tutuka power station, submitted in February 2018;

21.2. submissions on Eskom’s bid and application for suspension of compliance, postponement of compliance, and/or alternative weaker limits for 10 of its coal-fired power stations (Lethabo, Majuba, Camden, Kriel, Matla, Kendal, Duvha, Arnot, Hendrina and Komati), submitted in September 2018 and February 2019, respectively;

21.3. objections to Eskom’s application for a once-off suspension of compliance with the new plant MES and variation request for the Grootvlei power station, submitted in July 2020; and

21.4. objections to Eskom’s applications for alternative weaker limits to the MES for the Medupi and Matimba power stations submitted November 2019 and in August 2020.

22. We reiterate and stand by all of the above-mentioned submissions and the expert analysis underpinning the various submissions. The Appellants central objections are set out in the February 2019 submissions, attached as “Annexure A3”, for ease of reference.4

23. Based on email correspondence between CER and Second Respondent/it’s Environmental Assessment Practitioner in July and August 2019, the Appellants understand that the Department requested “additional information” to support

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3 Life After Coal campaign, a joint campaign by the Centre for Environmental Rights (CER), groundWork (gW), and Earthlife Africa Johannesburg (ELA) that aims to: discourage the development of new coal-fired power stations and mines; reduce emissions from existing coal infrastructure and encourage a coal phase-out; and enable a just transition to sustainable energy systems for the people. CER, gW, ELA, are registered interested and affected parties (I&APs) in relation to Eskom’s applications for suspension of compliance, postponement of compliance, and/or alternative limits.

4 To avoid overburdening this appeal submission, Annexures 1 – 3 to the 2019 objections are accessible here under ‘Eskom’s 2018 applications to delay compliance with the Minimum Emission Standards for 14 Power Stations’; https://cer.org.za/programmes/pollution-climate-change/key-correspondence.
Eskom’s applications covering 11 of its coal-fired power stations (Tutuka, Lethabo, Majuba, Camden, Kriel, Matla, Kendal, Duvha, Arnot, Hendrina and Komati) and that Eskom was in the process of generating the information required. No further details were provided regarding the nature of, or level of detail in, this additional information, and, to the extent that the Appellants are aware, this additional information was not shared with I&APs for consideration and comment. The Appellants invite the Second Respondent to demonstrate otherwise.

24. In a follow up email received from the Second Respondent in September 2020, it was confirmed that Eskom had submitted all “outstanding information” to the Department by 31 August 2020, as required. This included the “additional technical information” in respect the Eskom power stations located in the Highveld, and for Medupi and Matimba power stations, situated in the Limpopo province. We reiterate that we and our clients have still not had sight of this additional technical information, and request that it be made available to I&APs.

25. This email correspondence is attached as “Annexure A4”.

26. Over a year later, on 30 October 2021, the First Respondent issued decisions in response to each of Eskom’s applications covering 14 coal-fired power stations, as well as Eskom’s liquid-fuel power stations. By and large, the Appellants accept the decisions, in accordance with the List of Activities, as amended, the AQA, NEMA, and the Constitution. As set out above, this appeal is limited to the decisions concerning Eskom’s Kendal, Tutuka, Majuba, Camden, Hendrina, Arnot, Komati, Grootvlei, and Kriel power stations.

27. At this point in this submission, it is necessary to both emphasise and record that it is crucial that all relevant information is provided, at every stage of the application process, to facilitate transparent, informed, and fair public participation, as required by AQA, NEMA, and the Environmental Impact Assessment Regulations, 2014 (the “EIA Regulations”). Access to all relevant information to allow meaningful public participation is also essential in order to give effect to the right to administrative action that is lawful, reasonable and procedurally fair, as provided for in the Promotion of Access to Information Act, 2000, and section 33 of the Constitution.
28. In this regard, is it unacceptable that the additional technical information that the Second Respondent submitted in relation to the majority of its applications was not shared with registered I&AP’s, with an opportunity to provide written comments to ensure that all relevant information was before the First Respondent for due consideration and response. Omitting to inform all registered I&APs of the First Respondent’s request for further supporting information, and omitting to share the additional technical information as submitted, is plainly inconsistent with the AQA, the List of Activities, the 2017 Framework, NEMA, the EIA Regulations, and the Constitution.

D. RELEVANT LEGAL FRAMEWORK

The Constitution and National Environmental Management Principles

29. Section 24 of the Constitution of the Republic of South Africa, 1996, guarantees everyone the right to an environment not harmful to health or well-being, and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

30. As the Constitution is the supreme law, any law or conduct deemed to be inconsistent with it is invalid, and the obligations imposed by it must be fulfilled. All law and conduct must be measured against, and give effect to, the environmental rights in section 24 of the Constitution, consistent with an open and democratic society based on human dignity, equality, and freedom.

31. The overarching environmental legislation which implements section 24 of the Constitution is NEMA, including the environmental management principles in section 2 of NEMA (the “NEMA Principles”), to which any organ of state must

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5 Section 2 of the Constitution.
6 Section 2(1) of NEMA.
adhere in all decision-making and when exercising other functions. Some of these *binding directive principles* are as follows (our emphasis):

a. the environment is held in public trust for the people, the beneficial use of environmental resources *must serve the public interest and the environment must be protected as the people's common heritage* ("public trust doctrine");

b. a risk-averse and cautious approach must applied, which takes into account the limits of current knowledge about the consequences of decisions and actions ("precautionary principle");

c. *negative impacts on the environment and on people's environmental rights must be anticipated and prevented*, and where they cannot be altogether prevented, must be minimised and remedied ("preventive principle");

d. pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied ("preventive principle");

e. *environmental justice must be pursued* so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons;

f. *responsibility for the environmental health and safety consequences* of a policy, programme, project, product, process, service or activity *exists throughout its lifecycle*;

g. sensitive, vulnerable, highly dynamic or stressed ecosystems...require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure;

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7 Section 2(4)(n) of NEMA.
8 Section 2(4)(a)(vii) of NEMA.
9 Section 2(4)(a)(viii) of NEMA.
10 Section 2(4)(c) of NEMA.
11 Section 2(4)(e) of NEMA.
12 Section 2(4)(r) of NEMA.
h. the cost of remedying the pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment ("polluter pays’ principle");\textsuperscript{13}

i. use and exploitation of non-renewable natural resources must be responsible and equitable, and take into account the consequences of the depletion of the resource;\textsuperscript{14} and

j. the participation of all interested and affected parties in environmental governance must be promoted.\textsuperscript{15}

\textit{National Environmental Management: Air Quality Act, 2004}

32. Enacted in 2005 to give effect to section 24 of the Constitution and the NEMA Principles, the AQA aims to ensure that air pollution is not harmful to human health or well-being, and to enhance the air quality in South Africa.\textsuperscript{16} The AQA provides that its interpretation and application must be guided by the NEMA Principles.

33. Accordingly, the NAQO, licensing authorities, and Eskom (an organ of state) must adhere to the NEMA Principles and legal provisions of the AQA in its decision-making and exercise of designated functions – including the consideration of Eskom’s applications to further delay and/or completely avoid compliance with air pollution laws that primarily exist to protect people’s health and well-being.

34. In terms of section 9 of the AQA, National Ambient Air Quality Standards (\textit{NAAQS}) have been set for eight pollutants (nitrogen dioxide (NO\textsubscript{2}), ozone (O\textsubscript{3}), sulphur dioxide (SO\textsubscript{2}), CO (carbon monoxide), benzene (C\textsubscript{6}H\textsubscript{6}), lead (Pb), PM\textsubscript{10} (particles with aerodynamic diameter less than ten micron metres) and PM\textsubscript{2.5} (particles with aerodynamic diameter less than two-and-a-half micron metres). The NAAQS are intended to be health-based, and “\textit{broadly accepted as a proxy for air that it not

\textsuperscript{13} Section2(4)(p) of NEMA.
\textsuperscript{14} Section2(4)(a)(v) of NEMA.
\textsuperscript{15} Section 2(4)(f) of NEMA.
\textsuperscript{16} Section 2 of the AQA.
harmful to health and well-being”, or “to objectively define what quality of ambient air South Africans agree is not harmful to their health and well-being”.

35. In terms of section 18 of the AQA, three air-shed priority areas have been declared on the basis that NAAQS are being or may be exceeded in the area, or any other situation exists which is causing, or may cause, a significant negative impact on air quality in the area, and this requires specific air quality management action to rectify the situation. The Vaal Triangle Priority Air-shed Priority Area (VTAPA) was declared in 2006, the Highveld Priority Area (HPA) in 2007, and Waterberg-Bojanala Priority Area (WBPA) declared in 2012. All three priority areas are home to Eskom coal-fired power stations, 12 of which are situated in the HPA. Despite this priority status, the HPA, VTAPA, and WBPA were in non-compliance with the NAAQS at the time that these applications were submitted, and it is evident that this state of non-compliance is ongoing.

36. Importantly the Preamble to the AQA appropriately frames the factual and regulatory setting for the implementation and enforcement of the statutory tools provided in the AQA. It is necessary to extract and the paste the entire Preamble below, as this ought to have been front of mind of the First Respondent in arriving at this set of decisions, as, we submit, it should be for the Minister as the appeal authority:

“WHEREAS the quality of ambient air in many areas of the Republic is not conducive to a healthy environment for the people living in those areas let alone promoting their social and economic advancement;

And whereas the burden of health impacts associated with polluted ambient air falls most heavily on the poor;

And whereas air pollution carries a high social, economic and environmental cost that is seldom borne by the polluter;

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17 Section 5.2.3.4 of the 2017 National Framework.
18 Section 5.4.3.2 of the 2017 National Framework.
19 Notwithstanding gaps in the monitoring data, this is based on the 2020 State of the Air Report, and a sample review of monthly monitoring reports between August 2021 – August 2020 for the VTAPA, HPA, and WBPA, respectively. No monthly monitoring reports appear to be available on SAAQIS for the three priority areas covering the months of September 2021 – January 2022.
And whereas atmospheric emissions of ozone-depleting substances, greenhouse gases and other substances have deleterious effects on the environment both locally and globally;

And whereas everyone has the constitutional right to an environment that is not harmful to their health or well-being;

And whereas everyone has the constitutional right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—

(a) prevent pollution and ecological degradation;
(b) promote conservation; and
(c) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development;

And whereas minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices is key to ensuring that air quality is improved;

And whereas additional legislation is necessary to strengthen the Government’s strategies for the protection of the environment and, more specifically, the enhancement of the quality of ambient air, in order to secure an environment that is not harmful to the health or well-being of people.”

National Framework for Air Quality Management

37. The AQA provides for a National Framework for Air Quality Management to achieve the objects of the AQA. The current iteration is the 2017 National Framework for Air Quality Management (the “2017 Framework”), which was published in October 2018. It aims to achieve the objectives of the AQA and provides various norms and standards to control emissions, manage and monitor air quality, and provide

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mechanisms, systems, and procedures to attain compliance with the National Ambient Air Quality Standards (NAAQS). The 2017 Framework forms part of the definition of “this Act” in the AQA, and “binds all organs of state in all spheres of government”. The AQA requires that an organ of state “give effect to the national framework when exercising a power or performing a duty in terms of the [AQA] or any other legislation regulating air quality management”.

38. Paragraph 5.4.3.4 of the 2017 Framework provides that: “given the potential economic implications of emission standards, and mindful that emission standard setting in South Africa was not based on comprehensive sector-based CBA (at least not for the initial group of Listed Activities), provision is made for specific industries to apply for possible extensions to compliance time frames for new plant standards. A proponent of a Listed Activity will be allowed to apply for a postponement or suspension of the compliance date and such an application will be considered based on the following conditions being met:

a. an application is accompanied by a completed Atmospheric Impact Report (as contemplated in Section 30 of the AQA); and demonstration that the industry’s air emissions are not causing direct adverse impacts on the surrounding environment;
b. the application is accompanied by a concluded public participation process undertaken as specified in the NEMA Environmental Impact Assessment Regulations;
c. the application is submitted to the National Department on or before 31 March 2019;
d. ambient air quality in the area is in compliance with the applicable National Ambient Air Quality Standards; and
e. other requirements as may be specified by the National Air Quality Officer” (our emphasis).

22 Section 7(1) of the AQA.
23 Section 1(1) of the AQA.
24 Section 7(3)(a) of the AQA.
25 Section 7(4) of the AQA.
26 Please refer generally to page 60 to 61.
39. Paragraph 5.4.3.4 of the 2017 Framework thus stipulates that an application to postpone or suspend compliance with MES may be considered, **provided NAAQS are in compliance and the air emissions are not causing direct adverse impacts on the surrounding environment, among other explicit criteria.** This phrasing is peremptory and allows for no discretion on the part of the decision-maker.

40. Paragraph 5.4.3.4 of the 2017 Framework also provides that:

   a. **Existing facilities may apply for a once-off postponement of compliance timeframes for new plant standards.** A postponement if granted will be for a period not exceeding 5 years and no postponement would be valid beyond 31 March 2025;

   b. **Existing facilities that will be decommissioned by 2030** may apply for a once-off suspension of compliance timeframes with new plant standards for a period not beyond 2030. An application must be accompanied by a clear decommissioning schedule and no such application shall be accepted after 31 March 2019;

   c. **Existing facilities that will be granted a suspension of compliance timeframes** shall comply with existing plant standards during the suspension period until they are decommissioned; and

   d. **No postponement of compliance timeframes or a suspension of compliance timeframes shall be granted** for existing plant standards.

   e. An existing facility may submit an application regarding a new plant standard to the National Air Quality Officer for consideration, if **the facility is in compliance with other emission limits but cannot comply with a particular pollutant or pollutants.** An application must **demonstrate previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards.** The National Air Quality Officer, after consultation with the Licensing Authority, **may grant an alternative emission limit or emission load provided there is compliance with the national ambient air quality standards in the area for pollutant or pollutants**
applied for; or the Atmospheric Impact Report does not show increased health risk where there is no ambient air quality standard.”

41. In short, the following is made clear in the 2017 Framework:

a. postponements of the 2015 MES are no longer permitted – all facilities must now, as a minimum, meet the 2015 MES;
b. in limited circumstances, including demonstration of compliance with existing plant standards and NAAQS, only one postponement, per pollutant, is permitted for the 2020 MES, and such postponement may not extend beyond 5 years (i.e. all plants must meet the 2020 MES by 31 March 2025);
c. in limited circumstances, including demonstration of compliance with existing plant standards and NAAQS, along with a clear decommissioning schedule, facilities to be decommissioned by 31 March 2030 may receive a once-off suspension of compliance with the 2020 MES, no later than 31 March 2030; and
d. a facility may apply for an alternative emission limit or emission load, provided it demonstrates compliance with the NAAQS and demonstrates previous reduction in emissions of the said pollutant or pollutants, and direct investments implemented towards compliance with the relevant new plant standards.

42. In light of the above, we reiterate that the 2017 Framework is the “national Framework for achieving the objectives of [the AQA]”\(^\text{27}\) and it “binds all organs of state in all spheres of government”.\(^\text{28}\) Eskom may not lawfully apply for postponements, suspensions, or alternative emission limits, unless and until the ambient air quality within air-shed priority areas where a power station is located, is compliant with the NAAQS. As explained below, this is not the case; and for this reason alone an application should be summarily rejected.

\(^{27}\) See paragraph 1.3 of the 2017 Framework.
\(^{28}\) Ibid.
**List of Activities and MES**

43. In an effort to control atmospheric emissions “which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions, or cultural heritage”, the Minister published the List of Activities, as well as, MES,\(^{29}\) pursuant to section 21 of the AQA. The MES also serve as the primary tool to reduce point source pollution toward achieving compliance with NAAQS in a priority air-shed.

44. The List of Activities came into force on 1 April 2010 and prescribes MES for various polluting activities, including solid fuel combustion installations such as Eskom’s coal-fired power stations, for particulate matter (PM), sulphur dioxide (SO\(_2\)), and NO\(_x\) for both ‘new plants’ and ‘existing plants’. Existing plants, including Medupi power station, had to comply with more lenient standards by 1 April 2015 and they have to adhere to stricter new plant standards by 1 April 2020, subject to successful applications to postpone or suspend compliance where the explicit criteria for these applications have been satisfied.

45. In essence, since the List of Activities was published on 31 March 2010, older plants (although, as indicated, this includes Medupi) were given a transitioning lead period of 5 years to come into compliance with a more lenient 2015 standard, and then a further period of 5 years to come into compliance with a stricter standard by April 2020. Eskom was not only aware of this provision at least from April 2010, but it was aware several years before that that mandatory emission limits would come into force, requiring “minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices. . .to ensur[e] that air quality is improved”.

46. The applicable existing and new plant MES are set out below:

<table>
<thead>
<tr>
<th>Pollutant Name</th>
<th>Limit Value (mg/NM(^3))</th>
<th>Date to be achieved by</th>
<th>Average period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Matter (PM)</td>
<td>100</td>
<td>1 April 2015</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>1 April 2020</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3500</td>
<td>1 April 2015</td>
<td>Daily</td>
</tr>
</tbody>
</table>

\(^{29}\) GG No. 37054 Government Notice 893, dated 22 November 2013.
47. Like the 2017 Framework, the List of Activities has also been revised on a few occasions. The most recent amendments to the List of Activities were published in November 2018, and March 2020. The amended List of Activities provides as follows in relation to applications for postponement and suspension of MES compliance, and alternative emission limit applications:

“(11) As contemplated in the paragraph 5.4.3.5 of the National Framework for Air Quality Management in the republic of South Africa, published in terms of Section 7 of this Act, an application may be made to the National Air Quality Officer for the postponement of the compliance timeframes …”

“(11A) An existing plant may apply to the National Air Quality Officer for a once-off postponement with the compliance timeframes for minimum emission standards for new plant as contemplated in paragraph (10). A once off postponement with the compliance timeframes for minimum emission standards for new plant may not exceed a period of five years from the date of issue. No once-off postponement with the compliance time frames will be valid beyond March 2025.”

“(11B) An existing plant to be decommissioned by 31 March 2030 may apply to the National Air Quality Officer before 31 March 2019 for a once-off suspension of compliance timeframes with minimum emission standards for new plant. Such an application must be accompanied by a detailed decommissioning schedule. No such application shall be accepted the National Air Quality Officer after 31 March 2019.”

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32 Paragraph 11 of the List of Activities.
33 Paragraph 11A of the List of Activities.
34 Paragraph 11B of the List of Activities.
“(11C) An existing plant that has been granted a once-off suspension of the compliance timeframes as contemplated in paragraph (11B) must comply with minimum emission standards for existing plant from the date of granting of the application and during the period of suspension until decommissioning”\(^{35}\)

“(11D) No postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with minimum emission standards for existing plant”\(^{36}\)

“(12A)(a) An existing plant may submit an application regarding a new plant standard to the National Air Quality Officer for consideration if the plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants.”\(^{37}\)

“(12A)(b) An application must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards.”\(^{38}\)

“(12A)(c) The National Air Quality Officer, after consultation with the Licensing Authority, may grant an alternative emission limit or emission load if:

(i) there is material compliance with the national ambient air quality standards in the area for pollutant or pollutants applied for; or

(ii) the Atmospheric Impact Report does not show a material increased health risk where there is no ambient air quality standard.”\(^{39}\)

48. In summary, we emphasise that the following key points are patently clear:

48.1. as an organ of state, significant emitter and a major source of air pollution in South Africa, Eskom is legally required, at all times, to limit its emissions to help ensure NAAQS compliance and reduce its impacts on public health.

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\(^{35}\) Paragraph 11C of the List of Activities.

\(^{36}\) Paragraph 11D of the List of Activities.

\(^{37}\) Paragraph 12A(a) of the List of Activities.

\(^{38}\) Paragraph 12A(b) of the List of Activities.

\(^{39}\) Paragraph 12A(c) of the List of Activities.
48.2. in limited circumstances, including demonstration of compliance with existing plant standards and NAAQS, only one postponement, per pollutant, is permitted for the 2020 MES, and such postponement may not extend beyond 5 years (i.e. all plants must meet the 2020 MES by 31 March 2025;

48.3. Eskom may not lawfully apply to postpone its compliance with the MES, or apply to suspend MES compliance, unless and until the ambient air quality within the three priority air-shed areas where their power stations are located are in compliance with the NAAQS – this is not the case;

48.4. an Eskom power station that will be decommissioned by 31 March 2030, may apply for a once-off suspension of compliance with new plant MES, provided the application is accompanied by a detailed decommissioning schedule;

48.5. alternative emission limits that are weaker than the existing plant MES, may not be considered, let alone granted; and

48.6. an application for an alternative limit must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards, and there must be [material] compliance with the NAAQS in the area for pollutant or pollutants applied for.

49. Based on the above legal framework, several aspects in a number of the First Respondent’s decisions must be dismissed as unlawful and therefore set aside by the Minister as the appeal authority. Before turning to the grounds of appeal where it is demonstrated that the First Respondent has, with respect, erred in a number of the decisions issued, we highlight a part of the concluding paragraph in the First Respondent’s cover letter that accompanied the decisions, also dated 30 October 2021:

“The Minimum Emission Standards (MES) were first published in 2010 and Eskom has made minimal effort to fully comply with the standards.”

50. We submit that, in addition to assessing the following grounds of appeal against the applicable legal framework, this excerpt should be understood as the overriding
epilogue for the Second Respondent’s approach to the MES over the past decade.
The legal quagmire in which Eskom finds itself is almost entirely self-inflicted.

E. GROUNDS OF APPEAL

i. The decision to grant Majuba power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1300mg/Nm³ is unlawful

51. The First Respondent’s decision denied Eskom’s request for an alternative limit of 1400mg/Nm³ from 1 April 2020 for the Majuba power station. It further denied Eskom’s request for postponement beyond 31 March 2025. We do not dispute these decisions. However, the NAQO authorised Eskom’s request to postpone compliance with new plants standards from 1 April 2020 to 31 March 2025 with a limit of 1300mg/Nm³. This is even weaker than the existing plants standard for NOx, which is 1100mg.

52. Allowing Eskom to emit at levels that undermine the existing plant standards is a blatant violation of Section 11D of the amended List of Activities. Section 11D of the List of Activities makes it clear that no postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with MES for existing plant standards. The First Respondent’s decision allows for an untenable position that would entitle any emitter to apply for and be granted an emission limit that is weaker than the already lenient standards for existing plants, notwithstanding the explicit intention in the Listed Activities and the MES — that the existing plant standards must be the bare minimum limit. The NAQO’s decision renders redundant the already weak MES. It is a deliberate weakening, and therefore contravention, of the applicable laws that were put in place to protect public health and wellbeing. The NAQO’s legal position is unlawful as well as contrary to section 24 of the Constitution.

53. It is also determinative that the Majuba power station is situated in the HPA, where after more than 14 years since the declaration, air quality in the HPA has not improved, and remains non-compliant with the NAAQS. Air quality monitoring data publicly available on the South African Air Quality Information System (SAAQIS) website shows that air quality in the HPA continues to be extremely poor and unsafe for its residents.
54. As contemplated in terms of paragraph 5.4.3.4 of the 2017 Framework, only in such cases where the areas in which the power stations are based are in compliance with NAAQS — which the HPA, is not — can postponement of compliance, suspension of compliance, or alternative limit applications even be considered. In terms of section 1(a)(ii) of PAJA, the powers to exercise administrative action are derived from the law and only extend insofar as the legislation allows. Therefore, we submit that granting any of these applications for coal-fired power stations in the HPA or any other priority area is ultra vires the Constitution, the AQA, the amended List of Activities, the 2017 Framework, and the provisions of NEMA.

55. Moreover, with reference to the table provided in Annexure A1, Majuba power station is categorised as a ‘mid-life’ station with a scheduled end-of-life of 2046. Although the Appellants oppose the running of this station to its end-of-life toward compliance with South African’s increasing Nationally Determined Contribution, and Constitutional obligations, to limiting global warming to 1.5 C, Majuba power station should be fully compliant with the new plant MES for all three pollutants, by this stage of the MES compliance timeframe.

\[ii. \text{The decision to grant Kendal power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1100mg/Nm}^3 \text{ is unlawful.}\]

56. The First Respondent authorised Eskom’s request to postpone compliance with the NOx new plant standard at Kendal power station from 1 April 2020 to 31 March 2025 with a limit of 1100mg/Nm³. This would allow Eskom to only have to comply with the existing plant standard. This decision is unlawful.

57. As is the case with Majuba power station, Kendal power station is also located in the HPA. This alone bars the NAQO from authorising postponement applications for Kendal power station, in accordance with 5.4.3.4 of the 2017 Framework.

58. In addition, Eskom’s reasons for its application, many of which, we submit, are specious and insincere,\(^{40}\) do not reasonably explain why, despite over 10 years of notice, it delayed in taking meaningful steps to comply with the MES, especially at a

\(^{40}\) The LAC February 2019 objections to Eskom’s bid and application for suspension of compliance, postponement of compliance, and/or alternative weaker limits for 10 of its coal-fired power stations (including Kendal) challenge many of Eskom’s stated reasons.
‘midlife’ power station with a scheduled end-of-life date of 2039. This failure runs contrary to the 2017 Framework’s requirement that Eskom provide “a detailed justification and reasons for the application”.  

59. Save for the recent amendments in November 2018, and increase of the SO₂ new plant limit in 2020, the MES in respect of solid fuel coal-fired power stations have not changed since 2010. The process of putting together the List of Activities commenced in about 2004 and over an approximate 5-year period, a multi-stakeholder process was convened to determine and set appropriate MES for the List of Activities. Eskom was integral to this process. Eskom knew of the impending emissions limits and inevitable compliance action during the mid-2000’s, giving it many years’ advance warning that it would need to make the necessary plans and investments to come into compliance with MES.

60. Aside from the impending obligations of the MES (at the time), Eskom had knowledge of the direct health impacts of its coal-fired power stations, based on the 2006 studies referred to in LAC’s February 2019 submissions; these provided sufficient reason for Eskom to ensure that it was implementing the necessary abatement measures to effectively mitigate the impacts of its coal-fired power stations, in compliance with its section 28 NEMA duty of care. Indeed, as an organ of state, it had and continues to have, a duty to respect, protect, promote and fulfill the rights in the Constitution; in particular, but not limited to, section 24. In other words, Eskom was legally compelled to act well before the MES were even published in 2010.

61. In summary, Eskom provides no reasonable explanation as to why it has waited more than 8 years since the List of Activities came into force, or more than 3 years from when the 2015 postponement application was granted, to begin – and/or adequately progress and plan for - the abatement equipment installations which would allow it to comply with the new plant MES at Kendal power station, as well as Majuba and Tutuka (addressed below) power stations.

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41 Section (12)(b).
42 Section 7 of the Constitution.
iii. The decision to grant Tutuka power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1100mg/Nm³ is unlawful.

62. Similarly, Tutuka power station is also a ‘midlife’ station with a scheduled end of life date of 2035, and Tutuka power station is also located in the HPA. We reiterate the above submissions in this regard.

iv. The decision to grant suspension of compliance for Camden, Hendrina, Arnot, Komati, Grootvlei, and Kriel power stations without detailed and clear decommissioning schedules accompanying the applications is unlawful.

63. As already mentioned above, Eskom as an organ of state and a significant emitter is bound by the 2017 Framework, the List of Activities, AQA, NEMA, and the Constitution.

64. Paragraph 11B of the List of Activities provides that “an existing plant to be decommissioned by 31 March 2030 may apply to the National Air Quality Officer before 31 March 2019 for a once-off suspension of compliance timeframes with minimum emission standards for new plant. Such an application must be accompanied by a detailed decommissioning schedule. No such application shall be accepted the National Air Quality Officer after 31 March 2019”.

65. This explicit requirement is not only re-enforced in the 2017 Framework, in relation to an application for a once-off suspension of compliance timeframes with new plant MES, but it goes further, requiring that an Eskom power station must provide a “clear decommissioning schedule”. If an existing facility is granted a suspension of the compliance timeframes — which we submit Eskom ought not to have been granted — it is required by the List of Activities and the 2017 Framework to comply with existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest.

66. The First Respondent granted Eskom’s application for the suspension of compliance until decommissioning by 2030 for six coal-fired power stations namely: Hendrina; Arnot; Camden; Komati; Grootvlei; and Kriel – the ‘old’ stations, per Annexure A1.
67. We refer to Eskom’s Summary Motivation Report, in particular Figure 1 in the report, which presents the “decommissioning dates” per Eskom power station. We submit that as legally required by the List of Activities and the 2017 Framework, it is not a “detailed” or “clear” decommissioning schedule. It is our firm stance that it is not permissible for the First Respondent, with the licensing authorities, to consider the suspension applications in the absence of clear detailed decommissioning schedules stations, let alone grant the applications. This is unlawful and the suspension of compliance decisions must be set side. We submit that Eskom’s decommissioning dates do not constitute a “detailed” or a “clear” decommissioning schedule per station for the following reasons:

67.1. The decommissioning information in Figure 1 and/or the explanatory text around it should specify the commencement dates/planned commencement dates, in addition to the key actions and timelines to enable the decommissioning of at least the 6 stations included in the suspension application.

67.2. As a minimum, Figure 1 and/or the explanatory text around it ought to specify the commencement date/planned commencement date of the necessary regulatory requirements to authorise the decommissioning process, including, *inter alia*:

67.2.1. as a Listed Activity, the closure of an existing Eskom coal-fired power station must conduct a basic impact assessment in accordance with the amended EIA Regulations, 2014. This should include details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts, particularly the coal ash dumps; and

67.2.2. considering the social impact of decommissioning an Eskom power station, and Eskom’s duties as an organ of state, we submit that it is both necessary and appropriate that an inclusive and transparent social and labour closure plan is developed for the decommissioning process. This should account for, among other critical issues, the redeployment of staff employed at the station.
67.3. The processes identified above require both lead-time and budget – Eskom’s decommissioning table addresses neither. The Hendrina power station was supposed to commence with decommissioning from 2018 and Camden power station from the beginning of 2020, yet there appears to be no decommissioning schedule, plan, or financial resources allocated to these processes. In fact, we note with extreme concern in Annexure A1, that the decommissioning dates for both Hendrina power station and Camden power station have reportedly been pushed out; Camden by as much as 5 years.

67.4. In addition, we submit that Eskom ought to have provided a detailed and clear decommissioning schedule that at least reflects the plans and process referred to above, under the following conditions before or at the time of its application for suspension:

67.4.1. the clear detailed decommissioning schedule should have been made available for public comment as part of this application process and ought to be available every 6 months through to 2030 for the purposes of progress monitoring; and

67.4.2. the five oldest plants that have reached their schedule end of life dates, namely: Komati; Arnot; Hendrina; Camden; and Grootvlei ought to have provided evidence of decommissioning arrangements, as required by law or otherwise, a;

67.5. We therefore submit that the decommissioning table in Figure 1 does not satisfy the List of Activities and 2017 Framework requirements for a detailed and clear decommissioning schedule. Notwithstanding the NAAQS non-compliance requirement and the anticipated health impacts attributed to Eskom’s ‘old’ power stations, the suspension applications should be dismissed on this basis.
67.6. We further submit that the condition that decommissioning schedules must be submitted a year from the date of issue of the decisions — by 30 October 2022 — does not cure the invalidity of the First Respondent’s decisions, when the List Activities and the 2017 Framework require clear and detailed decommissioning schedules to be submitted as a pre-requisite for the suspension applications to be considered in the first instance. The granting of the suspension of compliance to the six ‘old’ stations is unlawful and should be set aside.

v. The direct adverse impacts on the surrounding environment caused by Eskom’s emissions in the HPA is unlawful.

68. We submit that the above grounds of appeal in relation to the postponements granted to Majuba, Kendal, and Tutuka power stations, and the suspension of compliance granted to the six ‘old’ stations, provide a sufficient basis to set aside these decisions, in terms of the List of Activities and the 2017 Framework.

69. An additional and compounding ground of appeal is the major contribution of the cumulative emission load from these nine stations to the high concentration of harmful air pollution in the HPA. Along with the criteria that the area in which a station is located must be in compliance with NAAQS, paragraph 5.4.3.4 in the 2017 Framework also requires Eskom to demonstrate that its emissions are not causing direct adverse impacts on the surrounding environment. We submit that, based on the documentation available to I&APs for comment, Eskom was unable to satisfy this specific requirement in its applications.

70. We refer to section B in the February 2019 submissions — Impact on ambient air quality in the Highveld Priority Area (HPA) and Vaal Triangle Airshed Priority Area (VTAPA) — paragraphs 41-46, in particular. Without detracting from the rest of the except from the Second Respondent’s Summary Motivation Report set out under paragraph 41, we repeat the following segments:

“The general conclusions of the analysis indicate that the quality of air will be in compliance with NO2 National Air Quality Standards (NAAQS), but noncompliance with the daily and annual SO2 standards in several areas
across the Highveld. Daily and annual average PM10 and PM2.5 concentrations could be in noncompliance and for extended periods of time. The effect of the above is that PM ambient levels currently result in increased health risk for a large part of the Highveld.”

Dispersion modelling results based on individual and combined power station emissions, excluding all other sources; indicate a negligible contribution to PM pollution. In addition the diurnal pattern in PM concentrations based on monitored ambient data clearly indicate a morning and early evening peaks, typical of low level source contributions. However, a combination of SO2 and NOx emissions from all the Highveld power stations is predicted to form a significant component of the PM2.5 load especially over Emalahleni area, which is in noncompliance with PM standards, is a cause for concern.”

In addition, the combined SO2 emissions from all Eskom power stations are predicted to contribute a significant amount to the pollution in and around the Emalahleni and Middelburg areas and even extending south towards Komati Power Station. However analysis indicates that the non-compliance is not only due to Eskom Power Stations but a function of a multitude of sources in the Highveld.”

71. Firstly, we reiterate that Eskom’s reliance on the contribution of other less significant (by percentage) sources of emissions - which must, of course be reduced and, where possible, eliminated through other appropriate policy and legal means - is, however, an obfuscation of the immediate issue of compliance with the law and should be dismissed.

72. Secondly, in light of the severe health impacts associated with PM$_{2.5}$, we reiterate that Eskom’s cumulative contribution to the formation of PM$_{2.5}$ in parts of the HPA — largely caused by the nine power stations, which are the subjects of this appeal — is fatal to Eskom’s applications. This not only has direct adverse impacts on the environment, but, it is also acknowledged in the above excerpt that the effect of this accumulation will be an increasing health risk for the residents across a large part of the Highveld. This will more than likely only sustain the state of non-compliance
with NAAQS in the HPA, in particular, and the continued breach of section 24 of the Constitution. If these adverse, and unacceptable, impacts on the environment and public health were duly considered by the First Respondent, the only reasonable and rational conclusion would be to dismiss these applications as unlawful.

73. Thirdly, it is due to the cumulative health impacts of secondary PM$_{2.5}$, among other reasons, that we are gravely concerned about and oppose the First Respondent’s decisions to maintain the weaker SO$_2$ limits from April 2020 to 31 March 2025 for all of the ‘midlife’ stations – Majuba, Kendal, Tutuka, Lethabo (located in the VTAPA) and Matimba (located in the WBPA), as well as Duvha and Matla power stations. As we have illustrated in the February 2019 submissions, Eskom’s coal-fired power plants are the major source of SO$_2$ pollution in the HPA. It is not only the health impacts from exposure to SO$_2$ that are at issue here, but the contribution to secondary PM$_{2.5}$ as a result of the cumulative SO$_2$ and NOx emissions from the power stations.

74. Eskom’s significant contribution to the PM$_{2.5}$ load in parts of the HPA for another and the resultant severe health impacts is simply untenable in light of the purpose and requirements of MES and the 2017 Framework, read with the Constitution. We emphasise once more that these ‘mid-life’ stations, in particular, have had ample time to transition into compliance with the new plant MES for the remainder of their operating lives and their cumulative emissions above the MES should not be condoned any longer.

F. CONCLUSION AND RELIEF SOUGHT

75. The First Respondent’s decisions grant postponement of compliance decisions to the Majuba, Kendal, and Tutuka ‘midlife’ power stations, and suspensions of compliance to the six ‘old’ stations in the absence of detailed and clear decommissioning schedules, are contrary to, _inter alia_, the amended List of Activities, the 2017 Framework, NEMA, and the Constitution.

76. For all of aforementioned reasons, the Appellants submit that good cause has been shown for the late filing of this appeal to be condoned, and that the specified decisions issued by the First Respondent are unlawful and should be set aside.
DATED at Pietermaritzburg on this the 8th day of FEBRUARY 2022.

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Eskom Power Station Exceedances of Air Emission Licence Limits and Emission Intensity from April 2021 to March 2022

Prepared by Jessica Lawrence
January 26, 2023

Eskom’s coal-fired power stations publish monthly and annual emissions reports, available at https://www.eskom.co.za/dataportal/emissions/ael/.

This document presents numbers of exceedances of Air Emission Licence limits for Particulate Matter (PM), Sulphur Oxides (SOx), and Nitrogen Oxides (NOx) from April 2021 through March 2022, and compares these to numbers of exceedances from April 2016 through March 2017. The only missing reports were Grootvlei’s reports of August and September 2021. All exceedances were counted regardless of Grace, Contravention or Section 30 categorisation. It is not a tally of contraventions of law.

This document also calculates emission intensity for PM, SOx and NOx of Eskom power stations by dividing tons of pollutants emitted per month by gigawatts of energy produced for April 2021 through March 2022. Monthly energy production was missing in 9 of Tutuka’s monthly reports (June 2021-February 2022) and all of Kriel’s monthly reports. Emissions intensity was calculated for 3 months of Tutuka operations. Kriel’s emission intensity was estimated from its 3 year average energy production from its 30-year average from https://www.eskom.co.za/eskom-divisions/gx/coal-fired-power-stations/.

I. Exceedances of Air Emission Licence limits

1. Eskom’s 15 power stations reported 2,309 exceedances of Air Emission Licence limits for PM, SOx and NOx between April 2021 and March 2022.
2. Most of these exceedances were for PM (2003 exceedances by 13 stations) followed by NOx (194 exceedances by 6 stations) and SOx (112 exceedances by 3 stations).
3. Overall exceedances increased by 81% compared to 5 years ago.

PM Exceedances

1. 13 power stations exceeded their Air Emissions Licences for Particulate Matter 2003 times.
2. Worst offenders (over 100 exceedances per year) were Lethabo, Kendal, Matla, Kriel, Tutuka, and Matimba.
3. Lethabo, Kendal, Matla, Kriel, Tutuka, Matimba and Medupi reported more PM exceedances in 2021-22 than in 2016-2017. Matla, Tutuka and Matimba had the highest increase in PM exceedances.
4. The power stations reported 14 times more PM exceedances in 2021-22 than in 2016-17, an increase of 1290%.

<table>
<thead>
<tr>
<th>Power Station</th>
<th>Total PM AEL exceedances April 2021- March 2022</th>
<th>Total AEL exceedances April 2016- March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lethabo</td>
<td>411</td>
<td>315</td>
</tr>
<tr>
<td>Kendal</td>
<td>368</td>
<td>213</td>
</tr>
<tr>
<td>Matla</td>
<td>341</td>
<td>83</td>
</tr>
</tbody>
</table>
SOx exceedances

1. Most power stations did not exceed their Air Emissions Licence limits for SOx in 2021-2022.
2. This is an improvement from 2016-2017, when 9 out of 14 stations exceeded their SOx limit every month. SOx exceedances decreased by 79% compared to 5 years ago.
3. In 2021-22, three Eskom power stations exceeded their Air Emissions License limits for SOx a combined total of 112 times.
4. The worst offender in 2021-2022 was Kusile, with 103 exceedances. (Kusile was not operating in 2016-17.)
NOx Exceedances

1. In 2021-2022, most power stations did not exceed their Air Emissions Licence limits for NOx.
2. Six Eskom power stations exceeded NOx limits a combined total of 194 times. The worst offender by far was Camden, with 117 exceedances.
3. This is an overall improvement from 2016-17, when 7 out of 14 stations exceeded AEL limits for NOx. NOx exceedances decreased by 67% compared to 5 years ago.

<table>
<thead>
<tr>
<th>Power Station</th>
<th>Total Daily NOx exceedances April 2021-March 2022</th>
<th>Total Daily NOx exceedances April 2016-March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camden</td>
<td>117</td>
<td>44</td>
</tr>
<tr>
<td>Lethabo</td>
<td>38</td>
<td>136</td>
</tr>
<tr>
<td>Matla</td>
<td>24</td>
<td>328</td>
</tr>
<tr>
<td>Komati</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Matimba</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Kusile</td>
<td>1</td>
<td>Not operational</td>
</tr>
<tr>
<td>Medupi</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kendal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tutuka</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Kriel</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Duvha</td>
<td>0</td>
<td>52</td>
</tr>
<tr>
<td>Grootvlei</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hendrina</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Arnot</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Majuba</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>194</td>
<td>589</td>
</tr>
</tbody>
</table>

(Red = increase compared to 2016-17)
II. Emission Intensity

Emission intensity is the amount of pollution emitted per unit of energy produced (grams of pollutant per kilowatt-hour, equivalent to tons of pollutant per gigawatt-hour). The higher the emission intensity value, the more polluting the facility per electricity output.

Table 1. PM emission intensity of Eskom Power Stations monthly average April 2021 to March 2022

<table>
<thead>
<tr>
<th>Power Station</th>
<th>PM emissions intensity (g/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutuka (3654 MW)</td>
<td>1.88</td>
</tr>
<tr>
<td>Matla (3600 MW)</td>
<td>0.58</td>
</tr>
<tr>
<td>Lethabo (3708 MW)</td>
<td>0.47</td>
</tr>
<tr>
<td>Kriel (3000 MW)</td>
<td>0.34</td>
</tr>
<tr>
<td>Komati (990 MW)</td>
<td>0.28</td>
</tr>
<tr>
<td>Kriel (3000 MW)</td>
<td>0.34</td>
</tr>
<tr>
<td>Kendal (4116 MW)</td>
<td>0.27</td>
</tr>
<tr>
<td>Hendrina (1893 MW)</td>
<td>0.22</td>
</tr>
<tr>
<td>Matimba (3990 MW)</td>
<td>0.17</td>
</tr>
<tr>
<td>Arnot (2352 MW)</td>
<td>0.15</td>
</tr>
<tr>
<td>Camden (1561 MW)</td>
<td>0.14</td>
</tr>
<tr>
<td>Grootvlei (1180 MW)</td>
<td>0.11</td>
</tr>
<tr>
<td>Medupi (4800 MW)</td>
<td>0.10</td>
</tr>
<tr>
<td>Duvha (3450 MW)</td>
<td>0.06</td>
</tr>
<tr>
<td>Majuba (4110 MW)</td>
<td>0.06</td>
</tr>
<tr>
<td>Kusile (4800 MW)</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.33</strong></td>
</tr>
</tbody>
</table>
1. From April 2021 to March 2022, Eskom’s coal-fired power stations had an average PM emission intensity of 0.33 g/kWh, over 3 times greater than the Chinese fleet average (as of 2015) of 0.09 g/kWh. ¹
2. Tutuka, Matla, Lethabo, Kriel, Komati, Kendal, Hendrina, Matimba, Arnot, Camden, Grootvlei and Medupi have PM emissions greater than the 2015 Chinese average.
3. Only Duvha, Majuba and Kusile have PM emission intensity lower than the 2015 Chinese average.

Table 2. SOx emission intensity April 2021 to March 2022 monthly average

<table>
<thead>
<tr>
<th>Power Station</th>
<th>SOx emissions intensity (g/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matimba (3990 MW)</td>
<td>14.61</td>
</tr>
<tr>
<td>Tutuka (3654 MW)</td>
<td>13.97</td>
</tr>
<tr>
<td>Medupi (4800 MW)</td>
<td>13.67</td>
</tr>
<tr>
<td>Hendrina (1893 MW)</td>
<td>11.67</td>
</tr>
<tr>
<td>Camden (1561 MW)</td>
<td>11.67</td>
</tr>
<tr>
<td>Duvha (3450 MW)</td>
<td>11.19</td>
</tr>
<tr>
<td>Majuba (4110 MW)</td>
<td>10.41</td>
</tr>
<tr>
<td>Matla (3600 MW)</td>
<td>10.34</td>
</tr>
<tr>
<td>Lethabo (3708 MW)</td>
<td>9.98</td>
</tr>
<tr>
<td>Komati (990 MW)</td>
<td>9.50</td>
</tr>
<tr>
<td>Grootvlei (1180 MW)</td>
<td>8.33</td>
</tr>
<tr>
<td>Kendal (4116 MW)</td>
<td>5.39</td>
</tr>
<tr>
<td>Kriel (3000 MW)</td>
<td>5.22</td>
</tr>
<tr>
<td>Arnot (2352MW)</td>
<td>5.00</td>
</tr>
<tr>
<td>Kusile (4800 MW)</td>
<td>1.58</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>9.50</strong></td>
</tr>
</tbody>
</table>

1. In 2021-22, Eskom’s coal-fired power station emitted an average of 9.50 grams SOx per kilowatt hour, with stations ranging from 3 to 30 times more SOx per unit of energy than China’s 2015 fleet average of less than 0.49g/kWh. ²
2. Matimba and Medupi Limpopo Province are among the highest emitters of SOx per unit of energy.


² Id.
3. A proposed new power station new Lephalale, close to Medupi and Matimba, would likely have similar challenges due to the high sulfur content of coal in the region. Effective control of SOx emissions requires technologies that significantly reduce the efficiency of the power station.

Table 3. NOx emission intensity April 2021 to March 2022 monthly average

<table>
<thead>
<tr>
<th>Power Station</th>
<th>NOx emission intensity (g/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Komati (990 MW)</td>
<td>8.36</td>
</tr>
<tr>
<td>Hendrina (1893 MW)</td>
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</tr>
<tr>
<td>Camden (1561 MW)</td>
<td>5.94</td>
</tr>
<tr>
<td>Duvha (3450 MW)</td>
<td>5.52</td>
</tr>
<tr>
<td>Majuba (4110 MW)</td>
<td>5.23</td>
</tr>
<tr>
<td>Tutuka (3654 MW)</td>
<td>4.87</td>
</tr>
<tr>
<td>Lethabo (3708 MW)</td>
<td>4.59</td>
</tr>
<tr>
<td>Kusile (4800 MW)</td>
<td>4.40</td>
</tr>
<tr>
<td>Matla (3600 MW)</td>
<td>4.36</td>
</tr>
<tr>
<td>Arnot (2352 MW)</td>
<td>4.20</td>
</tr>
<tr>
<td>Matimba (3990 MW)</td>
<td>2.58</td>
</tr>
<tr>
<td>Kriel (3000 MW)</td>
<td>2.56</td>
</tr>
<tr>
<td>Grootvlei (1180 MW)</td>
<td>2.32</td>
</tr>
<tr>
<td>Kendal (4116 MW)</td>
<td>1.79</td>
</tr>
<tr>
<td>Medupi (4800 MW)</td>
<td>1.62</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>4.29</strong></td>
</tr>
</tbody>
</table>

1. Eskom’s coal-fired power stations emitted an average of 4.29 g NOx/kWh. In the United States, the average emission intensity of coal fired power plants for NOx has been less than 1.00 g/kWh since 2009. In China, the national average emission intensity of NOx from coal power stations was 0.36 g/kWh in 2016. Eskom’s coal power stations have much higher NOx emission intensity than the US or Chinese averages.

2. The station with the highest NOx emission intensity, Komati, was decommissioned in October 2022, but many other stations, including Hendrina, Camden, Duvha, Majuba, Tutuka, Lethabo, Kusile, Matla and Arnot emit NOX at an intensity more than 11 times that of China’s power plants. Even Medupi, with the lowest NOx emission intensity, emits 4.5 times more NOx per unit of energy than China’s average.

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3. J. de Gouw et al., Reduced Emissions of CO2, NOx and SO2 from U.S. Power Plants Due to the Switch from Coal to Natural Gas with Combined Cycle Technology, Earth’s Future (2014), at Figure 4, [https://www.researchgate.net/publication/260305932_Reduced_Emissions_of_CO2_NOx_and_SO2_from_US_Power_Plants_Due_to_the_Switch_from_Coal_to_Natural_Gas_with_Combined_Cycle_Technology](https://www.researchgate.net/publication/260305932_Reduced_Emissions_of_CO2_NOx_and_SO2_from_US_Power_Plants_Due_to_the_Switch_from_Coal_to_Natural_Gas_with_Combined_Cycle_Technology).

Health impacts of Eskom’s non-compliance with minimum emissions standards

Lauri Myllyvirta, lead analyst
Jamie Kelly, air quality analyst

CREA is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions to air pollution.
Health impacts of Eskom’s non-compliance with minimum emissions standards

Key findings

- Under Eskom’s planned retirement schedule and emission control retrofits, emissions from the company’s power plants would be responsible for a projected 79,500 air pollution-related deaths from 2025 until end-of-life (95% confidence interval 48,200–122,000).
- Full compliance with the MES at all plants that are scheduled to operate beyond 2030 would avoid a projected 2,300 deaths per year from air pollution (95% confidence interval: 1,500 – 3,400) and economic costs of R42 billion (USD2.9 billion) per year (95% confidence interval: R26 – 60bn), starting from 2025.
- Eskom’s retrofit plan only realizes one quarter of the health benefits associated with compliance with the MES, due to the almost complete failure to address SO$_2$ emissions.
- On a cumulative basis until the end-of-life of the power plants, compliance would avoid a projected 34,400 deaths from air pollution (95% confidence interval: 21,600 – 49,300) and economic costs of R620 bn (USD 41.7 bn; 95% confidence interval: R390 – 870). Other avoided health impacts would include 140,000 asthma emergency room visits, 5,900 new cases of asthma in children, 57,000 preterm births, 35.0 million days of work absence, and 50,000 years lived with disability.
- If the compliance deadline was delayed to 2030 instead of 2025, compliance with the emission limits would still avoid a projected 26,400 deaths from air pollution (95% confidence interval: 16,600 – 37,700) and economic costs of R470bn (USD 32.0 bn; 95% confidence interval: R300 – 660bn).
- Requiring the application of best available control technology at all plants, instead of the current MES, by 2030, would avoid 57,000 deaths from air pollution (95% confidence interval: 37,700 – 76,400) and economic costs of R870bn (USD 60.8 bn; 95% confidence interval: R530 – 1,230bn).

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1 USD = 14.79 R; 2021 average exchange rate.
confidence interval: 34,800 – 86,500) and economic costs of R1,000bn (USD 68.0 bn (95% confidence interval: R610 – 1,500bn) compared to the Eskom plan.

Introduction

South Africa’s Minimum Emissions Standards (MES) for combustion installations were issued in 2010, with a phased introduction where existing sources had to meet a more lenient set of standards by 2015 and a more stringent set of standards by 2020. Most importantly, these standards would require, for the first time, coal-burning facilities to install sulphur dioxide emissions controls.

After the issuance of the standards, South Africa’s largest emitter Eskom failed to initiate the required planning and implementation of the emission control retrofits, and government authorities failed to monitor Eskom’s actions, leading to an impossible situation where there was no more enough time to retrofit the fleet.

Because of this, Eskom was granted postponements to the standards until 2025. For plants planned to retire by 2030, compliance with the standards was suspended. While the postponements were time-limited, Eskom made it clear that it did not intend to comply even after the deadlines ran out. In 2020, the emission limit for SO$_2$ was further weakened from 500 to 1,000 mg/Nm$^3$, potentially enabling the standards to be met using emission technology with lower investment costs.

Compliance with the MES, even after the weakening, would result in major reductions in air pollutant emissions. However, in comparison to best international practice, the MES are highly lenient. For example, the European Union now requires old coal-fired power plants to limit SO$_2$ in flue gases to an annual average of 95 mg/Nm$^3$, less than one tenth of the limit value in South Africa.

As a result of the failure to act on its SO$_2$ emissions, Eskom has become the largest power sector emitter of SO$_2$ in the world (Myllyvirta, 2021). Other major emitters, particularly Chinese utilities, have carried out major retrofit programs and successfully reduced their SO$_2$ emissions.
Results

Emissions

We project emissions, air quality impacts and the resulting health and economic impacts of air pollution from Eskom’s coal power plant fleet under four different scenarios of compliance with the MES. The first one being the “compliance scenario” which assumes that Eskom meets its legal obligations and complies with the MES by 2025 at all stations that have not received a suspension. The “delayed compliance” scenario assumes that it takes until 2030 to achieve compliance. The “Eskom plan” scenario follows Eskom’s proposed plant retrofits which see all plants except Medupi and Kusile operate until end-of-life in breach of the emissions limits, particularly for SO\textsubscript{2}. Finally, the “Best Available Technology” (BAT) scenario assumes that compliance with the MES is delayed until 2030, but the emission limits are tightened to align with best international practice.

Full compliance with the MES would reduce Eskom’s emissions of SO\textsubscript{2} by 60%, PM by 50%, NO\textsubscript{x} by 20% and mercury (Hg) by 40%, compared with a scenario of no improvements in emission control technology (Figure 1). Mercury is not regulated under the MES, but compliance would significantly affect the emissions of this toxic pollutant regardless, as the installation of SO\textsubscript{2} controls captures mercury from the flue gases as a side benefit.

Eskom’s proposed retrofit plan would bring the fleet into compliance with the MES for PM and realize the associated emissions reductions by 2030, five years after the deadline. However, the plan would only reduce SO\textsubscript{2} by 13%, NO\textsubscript{x} by 11% and Hg by 3%, compared with a scenario of no improvements in emission control technology. The small reductions in SO\textsubscript{2} emissions are the main concern, as SO\textsubscript{2} is the pollutant with by far the largest health impacts from Eskom’s power plants, due to the formation of secondary PM\textsubscript{2.5}.

Requiring Best Available Technology at all the power plants would reduce SO\textsubscript{2} by 93%, PM by 78%, NO\textsubscript{x} by 80%, and mercury by 90%.
Air quality and mercury fallout

The results of our air quality simulations are shown below for the different pollutants and mercury (Figures 2, 3, 4 and 5). The compliance scenario realizes very significant improvements in air quality across Mpumalanga, Limpopo and Gauteng, as well as in neighboring provinces by 2026. The delayed compliance scenario achieves these improvements by 2031. The BAT scenario leads to much larger improvements, with air pollutant concentrations attributed to Eskom emissions falling to a fraction of current emissions.

Figure 1. Projected emissions by scenario.
Figure 2. PM$_{2.5}$ concentrations attributed to Eskom emissions in 2031 in different scenarios.
Figure 3. $SO_2$ concentrations attributed to Eskom emissions in 2031 in different scenarios.
Figure 4. NO$_2$ concentrations attributed to Eskom emissions in 2031 in different scenarios.
Figure 5. Annual total mercury deposition attributed to Eskom emissions in 2031 under different scenarios.
Health and economic impacts

Given the very large geographical area and population affected by the emissions, changes in Eskom’s emissions have major public health implications. Figure 6 and Tables 1–4 show the projected number of deaths attributed to Eskom’s emissions under different scenarios, as well as other health impacts and the associated economic costs.

The reductions in annual health impacts in the “no improvements” scenario reflect solely the effect of emissions reductions due to planned plant retirements, with the assumption that the generation output of the retired plants is replaced with clean energy rather than made up for by increased generation at other coal-fired power stations. Comparison between the “Eskom plan” and “no improvements” scenarios shows that the effect of the planned retrofits is a relatively modest 15% reduction in annual health impacts, with the installation of the FGD at Medupi being by far the most impactful measure.

The compliance scenario sees annual health impacts approximately halve after 2025 with MES compliance, avoiding a projected 1,900 deaths and economic costs of R33.3bn (USD 2.3bn) per year. In the “delayed compliance” scenario this effect is only realised by 2031, at which point the two scenarios converge.

The BAT scenario entails a more than 90% reduction in the health impacts of Eskom emissions by 2031, avoiding an estimated 1,400 deaths and economic costs of R25bn (USD 1.7 bn) per year compared with MES compliance.

The upward slope of the impacts during periods of constant emissions reflects the effect of population growth and epidemiological changes (increased incidence of chronic diseases due to population ageing).
Figure 6. Annual deaths and cumulative deaths attributed to Eskom emissions by scenario.
Table 1. *Projected health impacts avoided in 2031 through compliance with the MES, compared with Eskom’s plan.*

<table>
<thead>
<tr>
<th>Outcome and cause</th>
<th>Pollutant</th>
<th>central estimate</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>deaths</td>
<td>all</td>
<td>2,010</td>
<td>1,270</td>
</tr>
<tr>
<td><strong>of which due to:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chronic obstructive pulmonary disease</td>
<td>PM$_{2.5}$</td>
<td>125</td>
<td>77</td>
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<tr>
<td>diabetes</td>
<td>PM$_{2.5}$</td>
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<td>42</td>
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<tr>
<td>ischaemic heart disease</td>
<td>PM$_{2.5}$</td>
<td>140</td>
<td>95</td>
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<td>lower respiratory infections</td>
<td>PM$_{2.5}$</td>
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<tr>
<td>lung cancer</td>
<td>PM$_{2.5}$</td>
<td>85</td>
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<tr>
<td>stroke</td>
<td>PM$_{2.5}$</td>
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<td><strong>all causes</strong></td>
<td>NO$_2$</td>
<td>133</td>
<td>64</td>
</tr>
<tr>
<td><strong>all causes</strong></td>
<td>SO$_2$</td>
<td>935</td>
<td>621</td>
</tr>
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<td>deaths of children under 5 due to lower respiratory infections</td>
<td>PM$_{2.5}$</td>
<td>36</td>
<td>23</td>
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<td>asthma emergency room visits</td>
<td>PM$_{2.5}$</td>
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<td>new cases of asthma in children</td>
<td>NO$_2$</td>
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<td>preterm births</td>
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<td>1.71</td>
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<td>years lived with disability due to</td>
<td>chronic obstructive pulmonary disease</td>
<td>PM$_{2.5}$</td>
<td>1,300</td>
</tr>
<tr>
<td>diabetes</td>
<td>PM$_{2.5}$</td>
<td>1,210</td>
<td>304</td>
</tr>
<tr>
<td>stroke</td>
<td>PM$_{2.5}$</td>
<td>291</td>
<td>110</td>
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<tr>
<td>total economic cost, bln R</td>
<td>all</td>
<td>33.3</td>
<td>20.8</td>
</tr>
</tbody>
</table>
Table 2. *Projected deaths and total economic costs attributed to air pollution from Eskom power plants by scenario in 2031 (after the commissioning of Medupi FGD).*

<table>
<thead>
<tr>
<th>Outcome and scenario</th>
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<th>95% confidence interval</th>
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<tbody>
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<tr>
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<tr>
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<tr>
<td>no improvements</td>
<td>75.6</td>
<td>46</td>
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</table>
Table 3. Projected cumulative health impacts avoided from 2025 until the end-of-life of Eskom’s coal fleet through compliance with the MES, compared with Eskom’s plan.

<table>
<thead>
<tr>
<th>Outcome and cause</th>
<th>Pollutant</th>
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<th>95% confidence interval</th>
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<th>high</th>
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<td>all</td>
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<td>49,300</td>
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<td>of which due to:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chronic obstructive pulmonary disease</td>
<td>$PM_{2.5}$</td>
<td>2,210</td>
<td></td>
<td>1,350</td>
<td>2,960</td>
</tr>
<tr>
<td>diabetes</td>
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<td>2,330</td>
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<td>747</td>
<td>3,800</td>
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<td>1,680</td>
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<td>lower respiratory infections</td>
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<td>4,370</td>
<td>8,050</td>
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<td>stroke</td>
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<td>891</td>
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<td>asthma emergency room visits</td>
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<td>new cases of asthma in children</td>
<td>$NO_2$</td>
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<td></td>
<td>1,150</td>
<td>14,100</td>
</tr>
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<td>preterm births</td>
<td>$PM_{2.5}$</td>
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<td>27,900</td>
<td>60,900</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>chronic obstructive pulmonary disease</td>
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<td>12,900</td>
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<td>1,940</td>
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<tr>
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<td>all</td>
<td>617</td>
<td></td>
<td>385</td>
<td>868</td>
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</table>
Table 4. Projected cumulative deaths and total economic costs attributed to air pollution from Eskom power plants by scenario from 2022 until the end-of-life of Eskom’s coal fleet.

<table>
<thead>
<tr>
<th>Outcome and scenario</th>
<th>central estimate</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>deaths</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAT</td>
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<td>13,400</td>
</tr>
<tr>
<td>compliance</td>
<td>45,100</td>
<td>26,600</td>
</tr>
<tr>
<td>delayed compliance</td>
<td>53,100</td>
<td>31,600</td>
</tr>
<tr>
<td>Eskom plan</td>
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<td>48,200</td>
</tr>
<tr>
<td>no improvements</td>
<td>107,000</td>
<td>65,600</td>
</tr>
<tr>
<td>total economic cost, bln R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAT</td>
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<tr>
<td>compliance</td>
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<td>Eskom plan</td>
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<td>847</td>
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<tr>
<td>no improvements</td>
<td>1,890</td>
<td>1,150</td>
</tr>
</tbody>
</table>
Methodology

Emissions projections

Monthly emissions — reported by Eskom for each station — are used as the basis for the current emissions for each major air pollutant for the FY 2021–2022 (Eskom, 2023). Using the monthly emissions values allows us to take into account the seasonal variations in plant operation.

Since Eskom does not report mercury emissions from its power plants, we took mercury emissions per tonne of coal burned for each power plant from Scott (2011), and updated the emissions estimates to coal use in FY 2021–22. For Medupi and Kusile, which were not included in that study, we used coal mercury content for nearby power plants from Scott (2011), and calculated the emissions based on the methodology of the UNEP (2017) Mercury Toolkit. The calculation uses the formula

\[ E = CC \times MC \times (1 - CE), \]

where \( CC \) is the coal consumption of the power plant in tonnes, \( MC \) is the mercury content of the coal, and \( CE \) is the mercury control efficiency, based on the type of air pollutant control technology in the power plant as reported in UNEP (2017) Mercury Toolkit.

We projected the air pollutant emissions from Eskom’s coal-fired power plants under five different scenarios:

- **Compliance**: The compliance scenario assumes that Eskom meets its legal obligations and complies with the MES by 2025 at all stations that have not received a suspension. The exception is Tutuka, which Eskom now plans to retire by 2030; we assume that Tutuka’s compliance would be suspended although current regulation does not provide for this.
- **Delayed compliance**: all plants which are not scheduled to retire by 2030 reach compliance with the MES by 2030, except for Medupi and Lethabo which complete the retrofits by 2031 and 2032, respectively, per Eskom’s schedule.
- **Eskom plan**: emission control improvements under Eskom’s plan (Table 5) are fully implemented. This implies that all plants except Medupi and Kusile operate until end-of-life in breach of the MES emissions limits, particularly for SO\(_2\).
BAT: compliance with the MES is delayed until 2030, but the emission limits are tightened to align with the use of best available control technology. The definition of best available technology (BAT) was based on the BAT-aligned emission levels in the EU BAT Reference Document. These limits are legally binding and are currently being met in a large number of old coal power plants, making them a valid basis for assigning BAT in South Africa.

- No improvement: emissions from each plant unit remain at 2021-22 levels until end-of-life.

Assumptions on plant retirements follow Eskom’s plan under all the scenarios.

Table 5. Emission limit compliance, planned emission control retrofits and retirement dates indicated by Eskom.

Emissions under the MES compliance were projected based on the following logic:

- For SO₂, we identified the highest monthly average flue gas concentration (FGC) in 2021–2022 for each plant, and assumed that the SO₂ control equipment needed to meet the MES will have to have sufficient control efficiency to bring this highest
value into compliance with the MES limit (1,000mg/Nm$^3$). Annual emissions under compliance with the emission limit value (ELV) where then calculated as:

$$E_C = E_{FY22} \times \frac{ELV_{max(FGC)}}{mean(FGC)}$$

where $E_{FY22}$ denotes actual emissions in FY2021–22.

- For NO$_x$, we calculated the average NO$_x$ flue gas concentrations for those plants that are in compliance with their current Atmospheric Emission License emission limits, per Eskom's own assessment (Table 5). For each plant, we compared this average FGC to the plant's emission limit value, to calculate how much below the limit average FGCs are for compliant plants. We calculated the average of these ratios (R) and applied this ratio to the MES limit (750mg/Nm$^3$):

$$E_C = E_{FY22} \times \frac{ELV \times R_{mean(FGC)}}{mean(FGC)}$$

- For PM, we calculated the average flue gas concentration in those power plants that are currently in compliance with the PM MES, per Eskom's own assessment ($FGC_c$), and applied this average flue gas concentration to all plants that are currently not in compliance.

$$E_C = E_{FY22} \times \frac{FGC_c}{mean(FGC)}$$

- For mercury, we projected the increase in capture efficiency resulting from adding SO$_2$ controls to the power plants using default capture rates for different emission control systems in the UNEP (2017) Mercury toolkit.

The speciation of mercury in the flue gases of the power plants was based on Zhang et al. (2016).

As the EU BAT-aligned emission levels are given on an annual average basis, we calculated the average flue gas concentrations in FY 2021–22 for each power plant and scaled the emissions down by the ratio of the BAT level to the current flue gas concentration.

The operating rates of each power plant are assumed to stay constant over time. This is a potentially conservative assumption, as operating rates would seem likely to increase
substantially in the 2030s when a large number of older existing units retire. This would result in higher emissions from the remaining units.

The power plants were modeled as buoyant point sources, taking into account the stack height and thermal plume rise from the stacks. The stack characteristics were collected from Eskom Atmospheric Impact Reports for the suspension of minimum emission standards at the power plants (DFFE 2019).

**Atmospheric modeling**

We simulate air pollutant concentrations using the CALPUFF air dispersion model, version 7 (Exponent, 2015). CALPUFF is a widely-used industry standard model for long-range air quality impacts of point sources. The model has been evaluated extensively by the US Environmental Protection Agency, is open-source, and fully documented. CALPUFF calculates the atmospheric transport, dispersion, chemical transformation and deposition of the pollutants, and the resulting incremental ground-level concentrations attributed to the studied emissions sources. Chemical transformations of SO$_2$ and NO$_2$ to PM$_{2.5}$ are calculated using the ISORROPIA chemistry module in CALPUFF.

Background concentrations of oxidants (ozone, ammonia, hydrogen peroxide) are taken from a global atmospheric chemistry model. Meteorological input data are generated from the Weather Research Forecasting (WRF) model (Skamarock et al., 2008), version 4.2.2. WRF was set up with 33 vertical levels and 3 nested grids. The mother nest has a grid resolution of 15 km, and spans approximately 1,600 km in both the north-south and east-west directions. The inner nests both have a grid resolution of 5 km, spanning around 300 km in both the north-south and east-west directions, and one is centred over the Lephalale (Limpopo) town and the other is centred over the town of Leandra (Mpumalanga), which is nearly 100 km east of Johannesburg. Mother and inner domains use a two-way nesting technique which ensures dynamical interaction between them. WRF simulations use initial and lateral boundary conditions from NCEP (National Centers for Environmental Prediction) CFRS (Climate Forecast System Reanalysis) dataset of NOAA (National Oceanic and Atmospheric Administration) producing three-dimensional, hourly meteorological data covering the full calendar year 2021.

The power plants were modeled as buoyant point sources, taking into account the stack height and thermal plume rise from the stacks. The stack characteristics were obtained
from Eskom Atmospheric Impact Reports for the suspension of minimum emission standards at the power plants (DFFE 2019).

CALPUFF simulations were run separately for each of the 15 power stations. Annual pollutant concentrations were then projected using the POSTUTIL facility in CALPUFF, which allows emissions inputs to be scaled, results from different simulations to be summed up and the nitrogen chemistry to be re-run to account for the interaction between the different plumes. This approach allowed the air pollutant concentrations to be projected for different scenarios and calculation years at a manageable computational cost.

**Health and Economic Impact Assessment**

CREA has developed a detailed globally implementable health impact assessment framework based on latest science. This framework includes as complete a set of health outcomes as possible without obvious overlaps.

The emphasis is on outcomes for which incidence data are available at the national level from global datasets and outcomes that have a high relevance for health care costs and labour productivity. These health endpoints were selected and quantified in a way that enables economic valuation, adjusted by levels of economic output and income in different jurisdictions.

For each evaluated health outcome, we have selected a concentration-response relationship that has already been used to quantify the health burden of air pollution at the global level in peer-reviewed literature. This indicates the evidence is mature enough to be applied across geographies and exposure levels. The calculation of health impacts follows a standard epidemiological calculation:

$$\Delta \text{cases} = \text{Pop} \times \sum_{\text{age}} \left[ \text{Frac}_{\text{age}} \times \text{Incidence}_{\text{age}} \times \frac{\text{RR}_{\text{conc,age}} - 1}{\text{RR}_{\text{conc,age}}} \right],$$

where $\text{Pop}$ is the total population in the grid location, $\text{age}$ is the analyzed age group (in the case of age-dependent concentration-response functions, a 5-year age segment; in other cases, the total age range to which the function is applicable), $\text{Frac}_{\text{age}}$ is the fraction of the population belonging to the analyzed age group, $\text{Incidence}$ is the baseline incidence of the analyzed health condition, and $c$ is the pollutant concentration, with $c_{\text{base}}$ referring to the baseline concentration (current ambient concentration). $\text{RR}_{(c, \text{age})}$ is the function giving the
risk ratio of the analyzed health outcome at the given concentration for the given age group compared with clean air. In the case of a log-linear, non-age specific concentration-response function, the RR function becomes: \( RR(c) = \frac{RR_0}{c_0} \cdot c \cdot e^{-\Delta c_0 / w} \), when \( c > c_0 \), 1 otherwise, where \( RR_0 \) is the risk ratio found in epidemiological research, \( \Delta c_0 \) is the concentration change that \( RR_0 \) refers to, and \( c_0 \) is the assumed no-harm concentration (in general, the lowest concentration found in study data).

Data on total population and population age structure were taken from Global Burden of Disease results for 2019 (IHME 2020). The spatial distribution of population within the country, as projected for 2020, was based on the Gridded Population of the World v4 (CIESIN 2018).

Following the update of the WHO Air Quality Guidelines in 2021, which now recognize health harm from NO\(_2\) at low concentrations, we use the mortality risk function for NO\(_2\) based on the findings of Huangfu & Atkinson (2020), and include impacts down to 4.5 \( \mu g/m^3 \), the lowest concentration level in studies that found increased mortality risk (Table 6).

Adult deaths and disabilities were estimated using the Global Burden of Disease (IHME 2020) risk functions.

Deaths of small children (under 5 years old) from lower respiratory infections linked to PM\(_{2.5}\) pollution were assessed using the Global Burden of Disease risk function for lower respiratory diseases (IHME 2020). For all mortality results, cause-specific data were taken from the Global Burden of Disease project results for 2019 (IHME 2020).

Health impact modelling projects the effects of pollutant exposure during the study year. Some health impacts are immediate, such as exacerbation of asthma symptoms and lost working days, whereas other chronic impacts may have a latency of several years. Concentration-response relationships for emergency room visits for asthma and work absences were based on studies that evaluated daily variations in pollutant concentrations and health outcomes; these relationships were applied to changes in annual average concentrations.

The annual average baseline concentrations of PM\(_{2.5}\) and NO\(_2\) were taken from van Donkelaar et al. (2016) and Larkin et al. (2017), respectively. Since the no-harm
concentration for SO₂ is very low and the risk function is linear with respect to the background concentration, there was no need for data on SO₂ background concentrations.

The development of the health impacts into the future took into account projected changes in population, population age structure and mortality by age group, based on the UNPD (2019) World Population Prospects Medium Variant. This factors in the expected reduction in baseline infant mortality and increase in deaths from chronic diseases in older adults as a part of the population and epidemiological transitions and improvements in health care.
Table 6. *Input parameters and data used in estimating physical health impacts.*

<table>
<thead>
<tr>
<th>Age group</th>
<th>Effect</th>
<th>Pollutant</th>
<th>Concentration-response function</th>
<th>Concentration change</th>
<th>No-risk threshold</th>
<th>Reference 1</th>
<th>Reference 2</th>
<th>Incidence data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-18</td>
<td>New asthma cases</td>
<td>NO₂</td>
<td>1.26 (1.10 - 1.37)</td>
<td>10 ppb</td>
<td>2 ppb</td>
<td>Khreis et al. 2017</td>
<td>Achakulwisut et al. 2019</td>
<td></td>
</tr>
<tr>
<td>0-17</td>
<td>Asthma emergency room visits</td>
<td>PM₂.₅</td>
<td>1.025 (1.013, 1.037)</td>
<td>10 µg/m³</td>
<td>6 µg/m³</td>
<td>Zheng et al. 2015</td>
<td>Anenberg et al. 2018</td>
<td></td>
</tr>
<tr>
<td>18-99</td>
<td>Asthma emergency room visits</td>
<td>PM₂.₅</td>
<td>1.023 (1.015, 1.031)</td>
<td>10 µg/m³</td>
<td>6 µg/m³</td>
<td>Zheng et al. 2015</td>
<td>Anenberg et al. 2018</td>
<td></td>
</tr>
<tr>
<td>Newborn</td>
<td>Preterm birth</td>
<td>PM₂.₅</td>
<td>1.15 (1.07, 1.16)</td>
<td>10 µg/m³</td>
<td>8.8 µg/m³</td>
<td>Sapkota et al. 2012</td>
<td>Chawanpaiboon et al. 2019</td>
<td></td>
</tr>
<tr>
<td>20-65</td>
<td>Work absence</td>
<td>PM₂.₅</td>
<td>1.046 (1.039-1.053)</td>
<td>10 µg/m³</td>
<td>N/A</td>
<td>WHO 2013</td>
<td>EEA 2014</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>Deaths from lower respiratory infections</td>
<td>PM₂.₅</td>
<td>IHME 2020</td>
<td>5.8 µg/m³</td>
<td>IHME 2020</td>
<td>IHME 2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-99</td>
<td>Deaths from non-communicable diseases and lower respiratory infections</td>
<td>PM₂.₅</td>
<td>IHME 2020</td>
<td>2.4 µg/m³</td>
<td>IHME 2020</td>
<td>IHME 2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-99</td>
<td>Disability caused by diabetes, stroke and chronic respiratory disease</td>
<td>PM₂.₅</td>
<td>IHME 2020</td>
<td>2.4 µg/m³</td>
<td>IHME 2020</td>
<td>IHME 2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-99</td>
<td>Premature deaths</td>
<td>NO₂</td>
<td>1.02 (1.01-1.04)</td>
<td>10 µg/m³</td>
<td>4.5 µg/m³</td>
<td>Huangfu &amp; Atkinson 2020; NRT from Stieb et al. 2021</td>
<td>IHME 2020</td>
<td></td>
</tr>
<tr>
<td>25-99</td>
<td>Premature deaths</td>
<td>SO₂</td>
<td>1.02 (1.01-1.03)</td>
<td>5 ppb</td>
<td>0.02 ppb</td>
<td>Krewski et al 2009</td>
<td>IHME 2020</td>
<td></td>
</tr>
</tbody>
</table>

Numeric values in the column “Concentration-response function” refer to odds ratio corresponding to the increase in concentrations given in the column “concentration change.” Literature references indicate the use of a non-linear concentration-response function. No-harm threshold refers to a concentration below which the health impact is not quantified, generally because the studies on which the function is based did not include people with lower exposure levels. Data on concentration-response relationships do not exist for all geographies, so a global risk model is applied to all cities. Incidence data are generally unavailable at the city level so national averages have to be applied.
Economic Valuation

Air pollution both increases the risk of developing respiratory and cardiovascular diseases, and increases complications and deaths from them, significantly lowering the quality of life and economic productivity of people affected and increasing healthcare costs. Economic losses as a result of air pollution were calculated using the methods outlined in Myllyvirta (2020). The valuation of deaths was updated to the values derived by Viscusi and Masterman (2017) which are based on labour market data, and pay particular attention to applicability in middle- and low-income countries. The valuation of different health outcomes used in the study is shown in Table 7.

The Global Burden of Disease project has quantified the degree of disability caused by each disease into a “disability weight” that can be used to compare the costs of different illnesses. The economic cost of disability and reduced quality of life caused by these diseases and disabilities are assessed based on disability weights, combined with the economic valuation of disability used by the UK environmental regulator DEFRA (Birchby et al., 2019), and adjusted by GNI PPP for South Africa (Table 7). The deaths of young children are valued at twice the valuation of adult deaths, following the recommendations in OECD (2012).

The valuation of future health impacts is based on the premise that the long-term social discount rate is equal to long-term GDP growth rate, and the economic loss associated with different health impacts is proportional to the GDP, resulting in a constant present value of health impacts over time.
Table 7. Input parameters and data used to estimate economic costs of health impacts.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Valuation at world average GDP/GNI per capita, 2017 international dollars</th>
<th>Valuation in South Africa, current USD</th>
<th>Valuation in South Africa, current ZAR</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>work absence (sick leave days)</td>
<td>85</td>
<td>35</td>
<td>514</td>
<td>EEA 2014</td>
</tr>
<tr>
<td>number of children suffering from asthma due to pollution exposure (increased prevalence)</td>
<td>1,077</td>
<td>438</td>
<td>6,486</td>
<td>Brandt et al. 2012</td>
</tr>
<tr>
<td>deaths</td>
<td>2,637,000</td>
<td>1,069,000</td>
<td>15,810,000</td>
<td>Viscusi &amp; Masterman 2017</td>
</tr>
<tr>
<td>deaths of children under 5</td>
<td>5,273,000</td>
<td>2,138,000</td>
<td>31,630,000</td>
<td>OECD 2012</td>
</tr>
<tr>
<td>asthma emergency room visits</td>
<td>232</td>
<td>95</td>
<td>1,399</td>
<td>Brandt et al. 2012</td>
</tr>
<tr>
<td>preterm births</td>
<td>107,700</td>
<td>43,850</td>
<td>648,500</td>
<td>Trasande et al. 2016</td>
</tr>
<tr>
<td>years lived with disability</td>
<td>28,480</td>
<td>11,550</td>
<td>170,800</td>
<td>Birchby et al. 2019</td>
</tr>
</tbody>
</table>
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