

# Editorial

## South Africa's electricity disaster is an air quality disaster, too

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South Africa's electricity supply constraints were declared a State of Disaster on 9 February 2023, coinciding with the 102<sup>nd</sup> consecutive day of power cuts, euphemistically called 'load shedding'. Load shedding dates back to late 2007, but increased more than fourfold in 2022 relative to 2021, occurring on 43% of hours in the year (Pierce and le Roux, 2023).

Eskom, the national electricity utility, is the highest profile emitter of air pollution in South Africa (Eurididou et al., 2022), but other sources of air pollution increase when coal-fired power stations are down. Generators running on diesel or petrol are fired up by businesses and higher-income households during load shedding. In many lower-income residential areas, load shedding is exacerbated by the tripping of overloaded distribution networks and the slow response time of the utilities that de-prioritise restoration in municipalities with dubious payment histories. Such communities, in which large proportions of households already use dirty fuels (e.g. wood, coal, paraffin) to meet some of their energy needs, now become even more reliant on these. The use of these fuels greatly contributes to poor ambient and indoor air quality (e.g., Pauw et al., 2022; Walton et al., 2021; Wernecke et al., 2021; Wernecke et al., 2015; Hersey et al., 2015; Naidoo et al., 2014; Moletsane et al., 2021). These generator and residential burning emissions are of course released in very close proximity to people, have a high inhalation intake fraction and represent an increased health risk to humans and the environment. Thus, during load shedding, the air pollution from energy generation shifts to local sources which can lead to short-term peaks in ambient pollution.

Returning to the power stations, the shortage and more recently low availability of generating capacity have long been grounds to keep coal-fired units running with emissions above the licence limits. Since 2008, Eskom's power stations have been applying to the licensing authorities for short-term exemptions from some emission limits to allow them to continue operating in the event of an equipment malfunction or breakdown. The lack of sufficient capacity and shortage of funds integral to the electricity crisis then formed the main justification for Eskom's

applications for postponement and then the suspension of the Minimum Emission Standards. Now in 2023, none of Eskom's coal-fired power stations are fully compliant with the emission limits that came into effect in 2020 and were first gazetted in 2010. Power stations are emitting SO<sub>2</sub> at levels 3-6 times higher than the Minimum Emission Standards limit.

The declaration of the State of Disaster means that even the more lenient emission limits and controls that have not been waived due to exemptions and postponements are no longer in effect. The Electricity National State of Disaster regulations published on 28 February 2023 allow the Minister to exclude 'repairs ... and existing generation ... facilities from the provisions of the National Environmental Management Act, or any specific environmental management Act ... for the duration of the national state of disaster' (paragraph 5(1)(i)). While the relaxing of environmental controls no doubt has the potential to assist with short-term improvements in plant availability and consequently electricity supply, the neglect permitted will probably lead to longer-term declines in the state of the plant, which is in direct conflict with one of the stated objectives of the State of Disaster to 'protect property', and will increase air pollution in the region. It is critical that this relaxation is only temporary.

The current inoperation of units 1-3 at Kusile Power Station, Eskom's newest and "cleanest" coal-fired station, illustrates how running a unit too hard can contribute to a plant failure that can result in a much longer outage time and much greater cost of repairs than would have been the case had the unit been taken down when problems were first detected. The three units at Kusile have been out of commission since 23 October 2022, when the flue duct exiting unit 1's flue gas desulphurization (FGD) plant to the stack failed and at the same time compromised the flue ducts for units 2 and 3 (Creamer, 2023). Eskom intends to build temporary stacks that will bypass the FGD and operate the three units using these flues for a year or so while the permanent flues and chimney are repaired. These stacks are likely to be considerably shorter than the existing 220-metre stacks at

Kusile. The combination of the SO<sub>2</sub> emissions that are an order of magnitude higher without the FGD and the shorter stacks resulting in poorer dispersion will greatly increase ambient SO<sub>2</sub> concentrations in the vicinity of the power station. This is an area with already unacceptably high SO<sub>2</sub> concentrations, as was pointed out in the Air Quality Impact Assessment conducted prior to the construction of Kusile (Thomas and Scorgie, 2006).

So where to from here? It seems the only thing worse than having an electricity supply dominated by coal generation (80% in 2022; Pierce and le Roux, 2023) is having coal-fired power stations that do not supply electricity and perform badly. The availability of Eskom's fleet has declined from around 85% in 2008 (Eskom, 2011) to 58% in 2022 due to 30% of the fleet being on unplanned outages during the last year (Pierce and le Roux, 2023). Relative particulate (ash) emissions, a good indication of the performance of the abatement technology, more than doubled between 2008 (0.21 kg/MWh sent out) and 2020 (0.47 kg/MWh sent out), although they declined again by 2022 to 0.34 kg/MWhSO (Eskom, 2022; 2011). Prioritising production over the integrity of the plant for the last 15 years is one of the reasons that the coal-fired fleet is so unreliable today, and the State of Disaster will only exacerbate this practice. It is very well established that air pollution leads to thousands of premature deaths in South Africa a year (Altieri and Keen, 2019; Marais et al., 2019; Langerman and Pauw, 2018). The cost of the emissions from both residential energy use and Eskom's power stations cannot be ignored. While South Africa still depends on a fleet of coal-fired power stations, it is crucial it be properly maintained and responsibly operated to avoid exacerbating the already poor air quality in the Highveld.

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