
Briefing note, April 2023

Potential health impacts of bypassing SO₂ controls at Kusile

Lauri Myllyvirta, lead analyst

After a technical failure at the Kusile power station, Eskom is applying for a permission to operate three units at the plant to operate without sulphur dioxide (SO₂) control devices Flue Gas Desulfurization (FGDs), using “temporary” stacks, in a gross breach of its current Atmospheric Emission License (AEL) conditions. This briefing note assesses the potential health impacts of accepting Eskom’s application.

Resulting excess emissions

Eskom’s application covers the period until March 31, 2025. The company says it could complete the construction of “temporary” stacks that would allow the bypassing of the FGD in 9–11 months, with different units commissioned in November–December 2023. Therefore, I assumed that the duration of the bypass would be from December 1, 2023 to March 31, 2025.

In its motivation for the application, Eskom says the plant could provide 2,100 MW to the grid during this period. While this would be an exceptionally high rate of utilisation for an Eskom power station, given the rated capacity of the three units of 2,160 MW, I modelled the impacts assuming that Eskom can deliver on this promise. If the utilisation of the plant turned out to be lower, the health impacts would correspondingly be smaller, but so would any benefits of allowing the plant to operate in breach of its current emission licence limits.

Emissions during “normal operation” of the plant with the FGD were taken from Eskom Atmospheric Emission Licence (AEL) reports, except for mercury which is not reported by

Eskom and was taken from CREA (2023) [report](#) “Health impacts of Eskom’s non-compliance with minimum emissions standards”¹.

SO₂ emissions during operation without FGD were calculated as:

[coal consumption] x [coal sulphur content] x 2 kgSO₂/kgS.

The increase in mercury emissions was calculated based on the UNEP (2017) default mercury capture efficiencies² for a coal power plant burning bituminous coal with fabric filters, with and without FGD.

For all pollutants, the effect of the high utilisation rate envisioned by Eskom was taken into account by scaling the emissions by the ratio of the envisioned output (2,100 MW) to the average output during the base period.

The base period used for all calculations is August 2021 to July 2022.

The bypass would result in an estimated 6-fold increase in SO₂ emissions from the plant, based on the reported emissions at Kusile, and the reported average sulphur content of the coal. It would also increase mercury emissions by approximately 40%, as the FGD captures toxic mercury from the flue gases as a side benefit.

The total excess SO₂ emissions resulting from the exemption, compared with normal operation at the same utilisation, would be a projected 280,000 tonnes, while excess mercury emissions would amount to 7,200 kg (Table 1). The excess SO₂ emissions correspond to almost 20 years worth of emissions from the normal operation of the plant.

Resulting health impacts

The resulting health impacts from these excess emissions were assessed following the methodology and data in CREA (2023). The health impacts would include a projected 930

¹ <https://energyandcleanair.org/publication/health-impacts-of-eskoms-non-compliance-with-minimum-emissions-standards/>

² United Nations Environment Programme (UNEP) (2023). Toolkit for Identification and Quantification of Mercury Releases. Reference Report and Guideline for Inventory Level 2. Version 1.7, February 2023. UN Environment Chemicals Branch, Geneva, Switzerland.

<https://wedocs.unep.org/bitstream/handle/20.500.11822/30684/HgTlktRef.pdf?sequence=1&isAllowed=y>

air pollution-related deaths (95% confidence interval: 570–1380), whereas operating normally with the FGD operational, the plant would be responsible for an estimated 250 deaths (140–440) (Table 2). The deaths are attributed to increased risk of stroke, ischemic heart disease, lung cancer, chronic obstructive pulmonary disease and lower respiratory infections.

In other words, the variation of the AEL requested by Eskom would result in a projected 670 excess deaths from air pollution (430–950), compared with the operation of the plant in accordance with the AEL. Other excess health impacts in the FGD bypass scenario would include a projected 3,000 asthma emergency room visits, 1,400 preterm births, 720,000 days of work absence and 900 years lived with disability due to chronic obstructive pulmonary disease, diabetes and stroke (Table 3).

The societal costs associated with the health impacts would be a projected R16.8 bln (R10.3–24.4 bln).

In addition, given Eskom's track record, there is a very real possibility the repairs to the plants required to operate the FGD are not completed by the end of the period for which Eskom has now requested an exemption from the plant's current AEL. In this case, the operation of the plant without any SO₂ control equipment could continue longer, resulting in even larger impacts. Naturally, this would require a new application for an exemption from the AEL.

Table 1: Emissions in the different scenarios.

scenario	SO ₂ (t)	Hg (kg)	NOx (t)	PM (t)
high utilisation with FGD	55,679	16,914	56,566	1,333
high utilisation, no FGD	337,615	24,163		

Table 2: Deaths and total economic costs of health impacts in the FGD bypass scenario, compared with the normal operation of the plant at the same utilisation.

scenario	air pollution-related deaths			economic costs, Rbillion		
	central estimate	95% CI: low	95% CI: high	central estimate	95% CI: low	95% CI: high
high utilisation with FGD	254	144	436	4,426	2,518	7,398
high utilisation, no FGD	928	574	1,384	6,766	0,293	4,461

Table 3: Excess non-fatal health impacts in the FGD bypass scenario.

outcome	pollutant	central	95% CI:	95% CI:
		estimate	low	high
asthma emergency room visits	PM2.5	3,012	1,767	4,244
low birthweight births	PM2.5	1,076	334	1,868
preterm births	PM2.5	1,374	665	1,459
work absence (sick leave days)	PM2.5	717,419	610,314	823,807
years lived with disability, chronic obstructive pulmonary disease	PM2.5	453	255	630

years lived with disability, diabetes	PM2.5	395	88	893
years lived with disability, stroke	PM2.5	101	39	161