



PRESIDENTIAL
CLIMATE COMMISSION
TOWARDS A JUST TRANSITION

**PCC logic on statement about
the relationship of coal
availability and the NDC**

The statement being factchecked

Regular breakdowns of the coal-fired power plants, that supply just less than 80% of South Africa's electricity, mean that less carbon dioxide is being pumped into the atmosphere and daily rotational cuts of more than 10 hours a day are further limiting emissions from factories.

"It's unintentional," Crispian Olver, the executive director of South Africa's Presidential Climate Commission, said in an interview in Johannesburg on Monday. "We reckon we are well within the range" of meeting the 2030 target, he said."

With the clarification that:

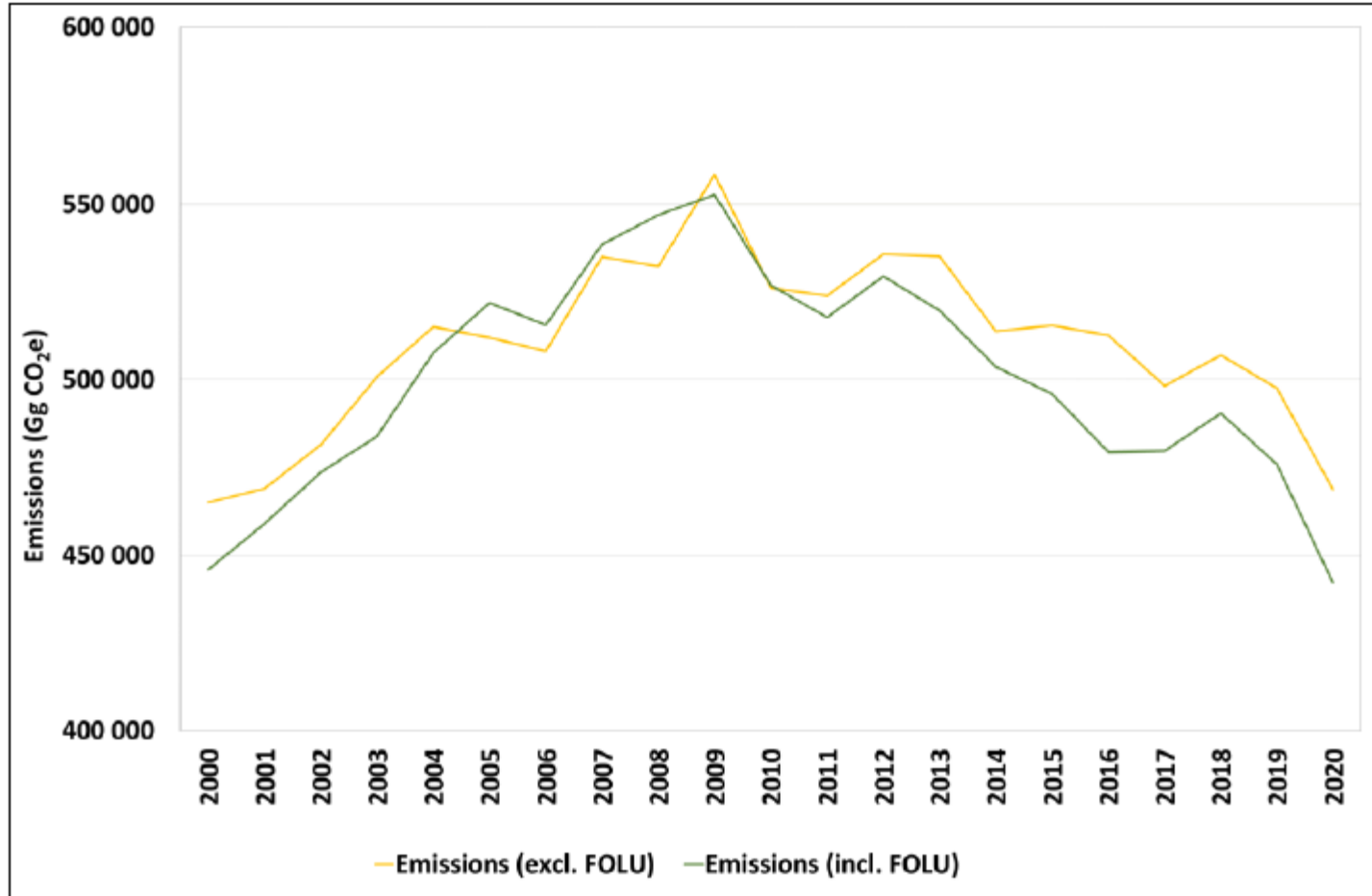
The statement made in the media briefing was that the emissions were **most likely** within the NDC range, due to low EAF's and load shedding. The Bloomberg article did not include the highlighted caveat nor did we specify which NDC target range (2025 or 2030).

The statement was based on the original modelling work we had done for the NDC and the assumptions that went into this about EAFs. As you are aware, the actual data in the emissions inventory is only issued two years after the fact, so we will have to wait a year or two for factual confirmation.

Our Summary Opinion

- There is a time lag in emissions inventory data. What we know is that for 2020 the economy emitted 450 Mt CO₂e of which 184 Mt CO₂e was from coal.
- If SA maintains its emissions at this level it puts us firmly within the NDC range intended for 2025 (viz., 398-510 Mt) and just above the desired 2030 range (viz., 350-420 Mt).
- Eskom's CO₂e emissions are linked to fleet size, energy mix and EAF. Some recent changes to Eskom's energy mix include connection of Medupi and Kusile, which are not yet operating at full capacity, and the closure of Komati. A moderate amount of renewables has also been added over the years which can, for short periods, contribute up to a 22% share of this mix. As more renewable energy is added to the mix over the years, a greater share of electricity is expected to arise from renewable sources which, together with closing coal power stations, affects the expected emissions profile of Eskom. There has been a consistently downward trend in EAFs, from 65% EAF in 2020 to 55% in 2022.
- Eskom's annual reports indicate that their CO₂ emissions declined from 213,2 Mt in 2020 to 207,3 Mt in 2022 (NB this is all CO₂ emissions, not just from coal).
- A review of modelling shows that using the 450 Mt start in 2020 and transitioning to 2025 with 55% EAF would result in 440 Mt of emissions, versus 470 Mt at 65% EAF. Both figures are within the NDC range.
- Allowing for the planned changes in energy mix by 2030 mix and assuming a 55% EAF would take us to 405 Mt, versus 430 Mt at 65% EAF. The former is within the NDC range, the latter is just above.
- Accordingly, while the statement being fact checked is correct, it is speculative since we don't yet have the present emission values. There are many variables at play which are subject to uncertainty. While there are dire economic impacts of reduced EAF, load factors and loadshedding, we don't want this to be the reason we meet emissions targets.

National Emissions



The latest DFFE National Inventory places 2020 emissions (most recent data point) just below 450 Mt CO₂e per year, recognising the fact that these are post COVID emissions. However, there are not strong indications that emissions have increased since then, with Eskom's 2022 Sustainability Report (https://www.eskom.co.za/wp-content/uploads/2022/12/2022_sustainability_report.pdf – reference slide at end) listing 2022's emissions as 207 Mt CO₂e, down from 213 Mt CO₂e in 2020.

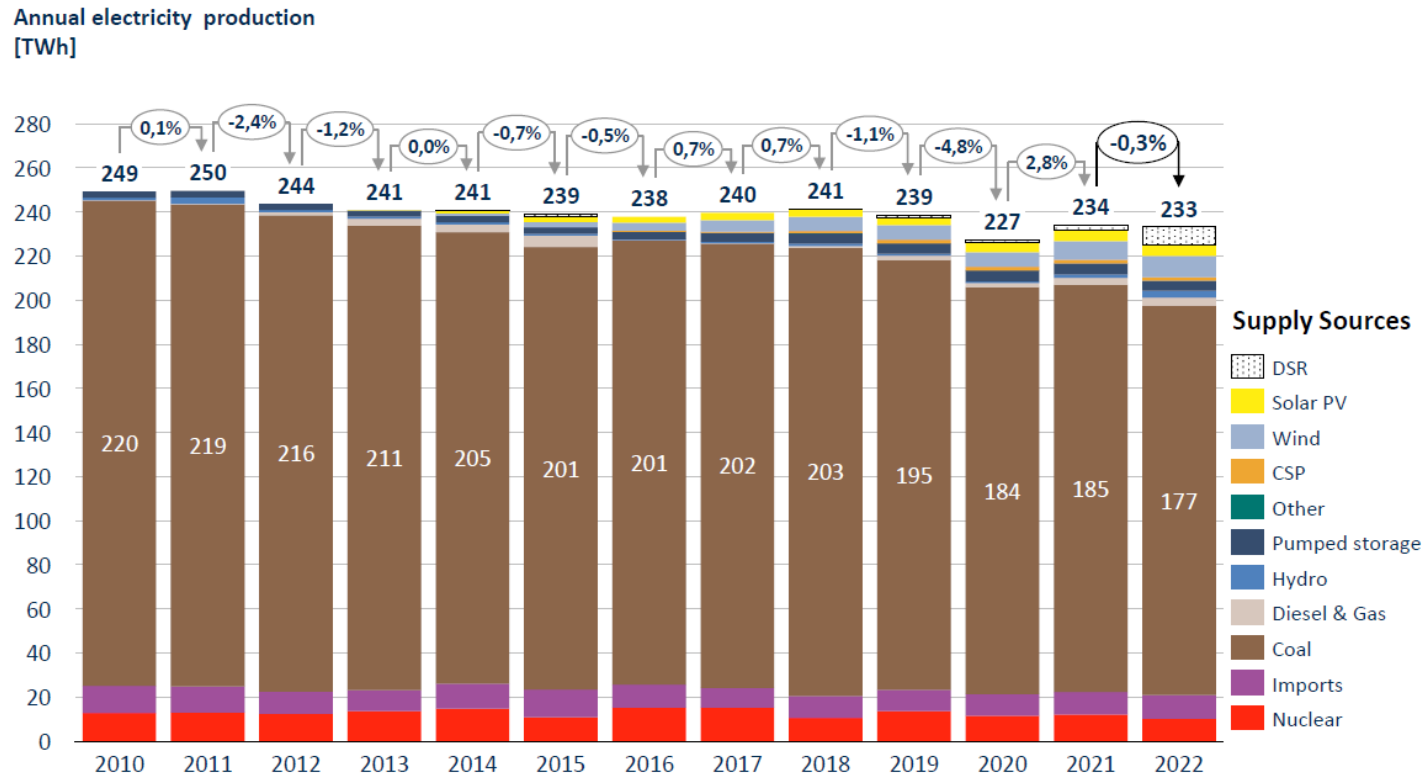
The decline in emissions from 2018 to 2022 will be due to a compounding effect of decarbonisation efforts, load shedding, economic stagnation and the impacts of COVID on the economy.

<https://www.dffe.gov.za/sites/default/files/reports/8nationalgreenhousegasreport2022.pdf>

Coal Emissions

Production in 2022 was constrained with diesel running extensively and significant increase in DSR (loadshedding)

Historical annual electricity production per supply source in TWh



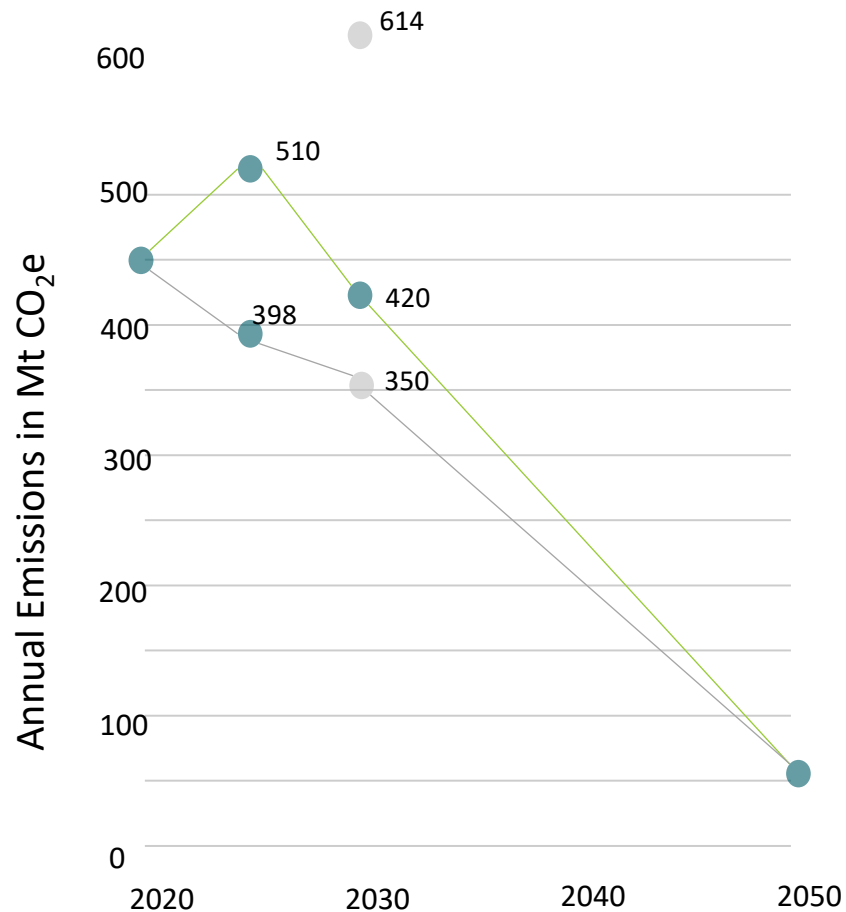
Like our national emissions, coal output has also been declining since 2010 (image, left).

CSIR statistics show that declining production from coal has led to a drop of 36 TWh between 2010 and 2020, or roughly 36 Mt CO₂e (using a *coal* emissions factor of 1 MtCO₂e/TWh, which is very close to the actual value [N.B: coal, not grid, emissions factor]), and a drop of roughly 43 Mt CO₂e between 2010 and 2022.

These are meaningful reductions in emissions and impactful on achieving NDC targets. National emissions in 2010 were roughly 570 Mt.

Note that changes in coal output since 2010 were not entirely due to either deterioration or improvement of EAF since other factors were also at play (the 1,000MW Komati station was retired during this time and the large Medupi and Kusile stations were built).

NDC Windows of 2025 and 2030



Our national emissions of 450 Mt CO₂e in 2020 puts us firmly within the NDC range intended for 2025 (viz., 398-510 Mt) and just above the desired 2030 range (viz., 350-420 Mt).

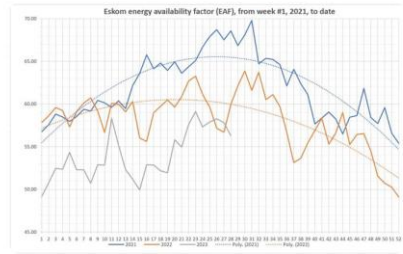
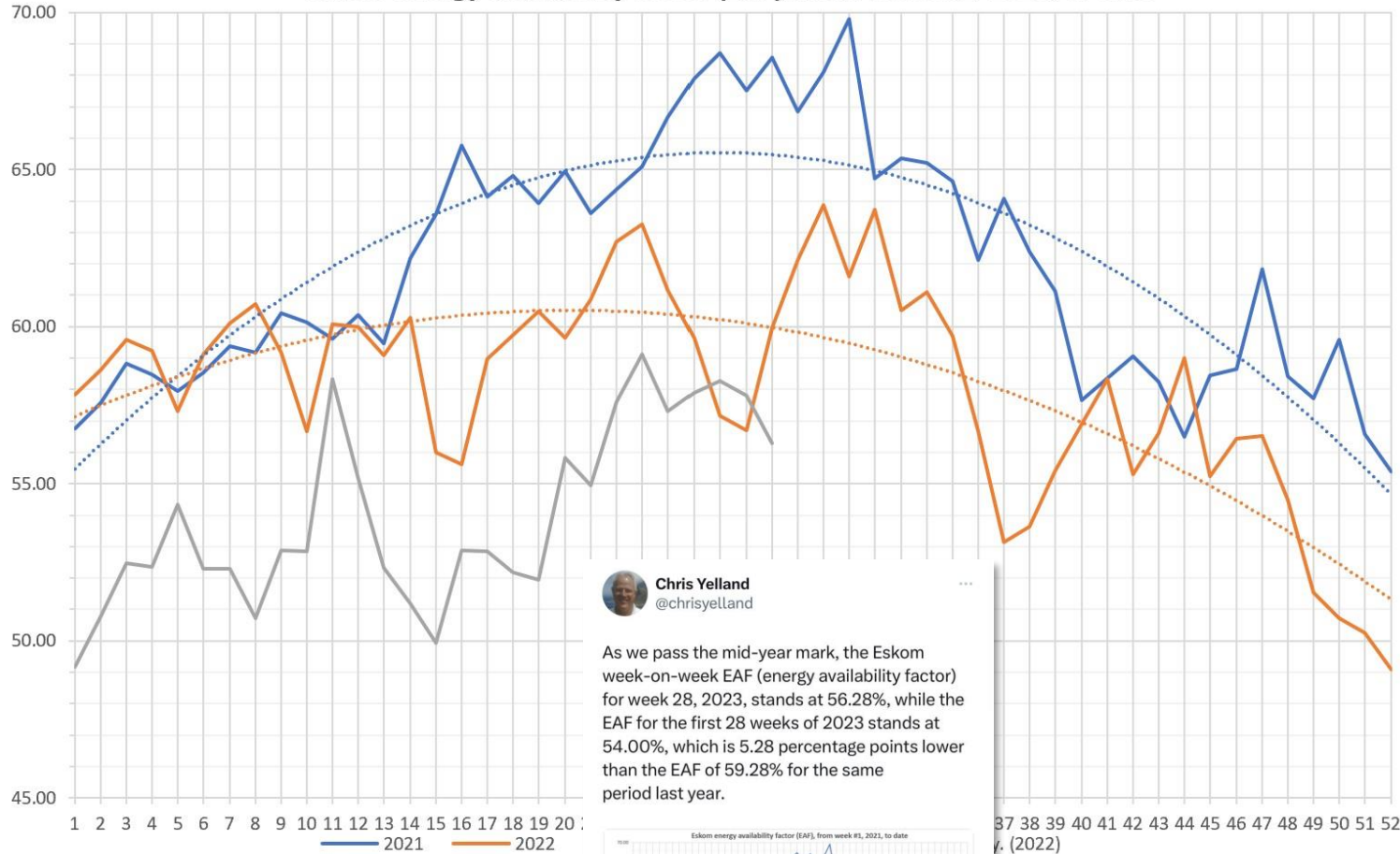
The question is then, has a poor EAF, load factors, and load shedding influenced this position in achieving our 2025 targets, and will this result in further reductions, influencing achievement of our 2030 goals?

This is tricky to demonstrate conclusively and is dependent on several factors:

- Will load shedding trigger an accelerated economic decline and therefore additional emission reductions, as historical data seems to indicate?
- Will energy planning focus on fossil fuels or prioritise cleaner sources of energy?
- Will coal plants be decommissioned as scheduled as envisaged in the JET-IP and/or IRP?
- Will efforts to improve EAF and load factors at coal fired power plants be successful?

Eskom Generation Fleet EAF

Eskom energy availability factor (EAF), from week #1, 2021, to date



10:15 - 2023/07/21 from Earth · 15,1K Views

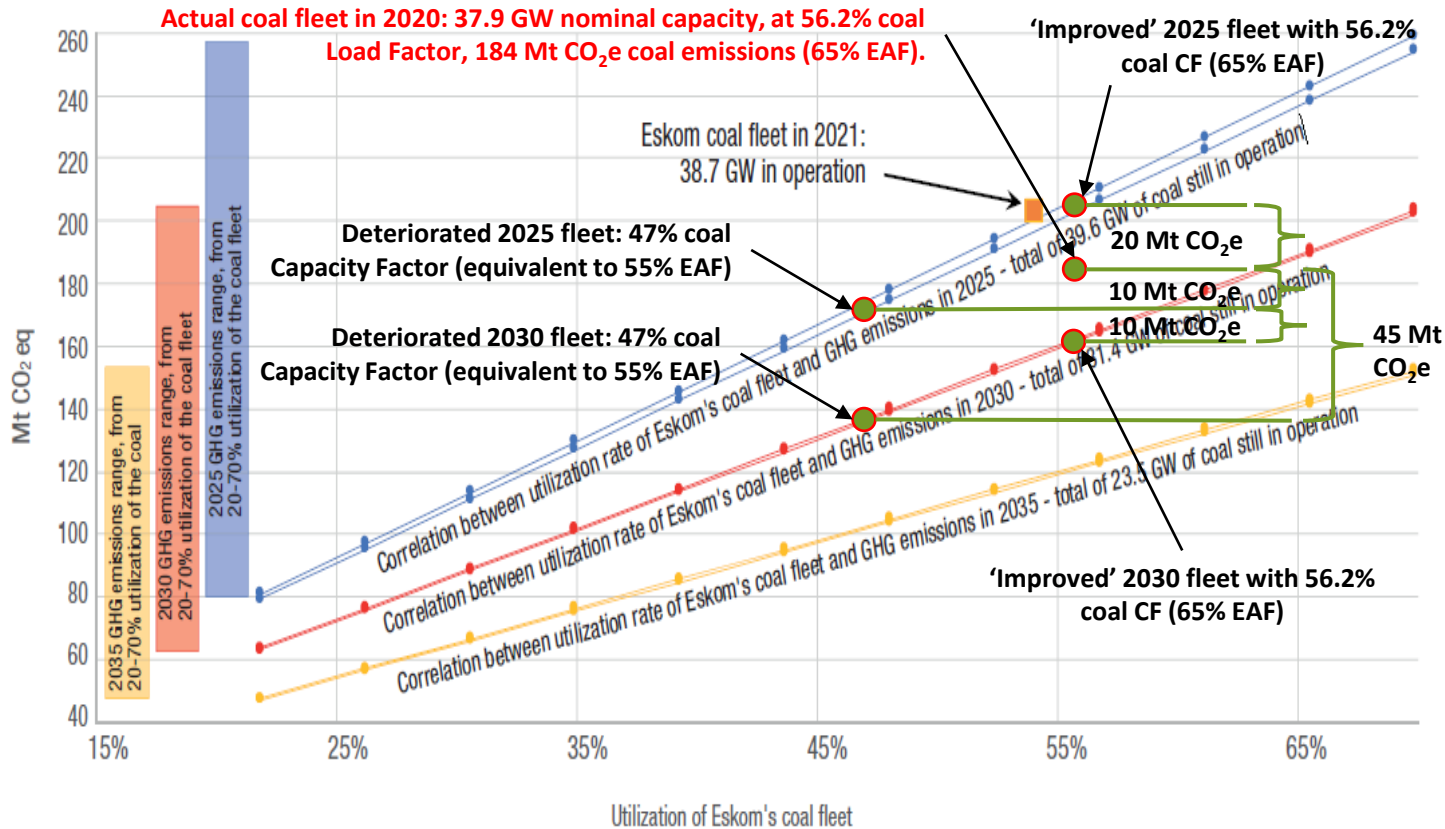
If we compare government's current target of 65% EAF to our actual achievement of 55% (see image, left), we can infer the impact on emissions of not having coal power to meet available demand.

Simply put, the impact of our deteriorating coal power at the points of the two NDC windows (2025 and 2030) can be estimated by considering:

- As reference, our actual 2020 economy: emitted 450 Mt CO₂e of which 184 Mt CO₂e was from coal, and Eskom had a 65% EAF (CSIR).
- In 2025: estimated impact of deteriorated (i.e., current) coal power availability on emissions by assuming the intended 2025 mix runs at 55% EAF versus an 'improved' coal fleet contributing to 65% EAF.
- In 2030: estimated impact of deteriorated (i.e., current) coal power availability on emissions by assuming the intended 2030 mix runs at 55% EAF versus an 'improved' coal fleet contributing to 65% EAF.

Impact of Coal Load Factor and Fleet Size on Emissions

Figure 20. Correlation between the average load factor of Eskom's coal fleet and GHG emissions from the fleet.



Source: JETP-IP Secretariat, 2022

Data provided by the JET-IP allow us to estimate these points.

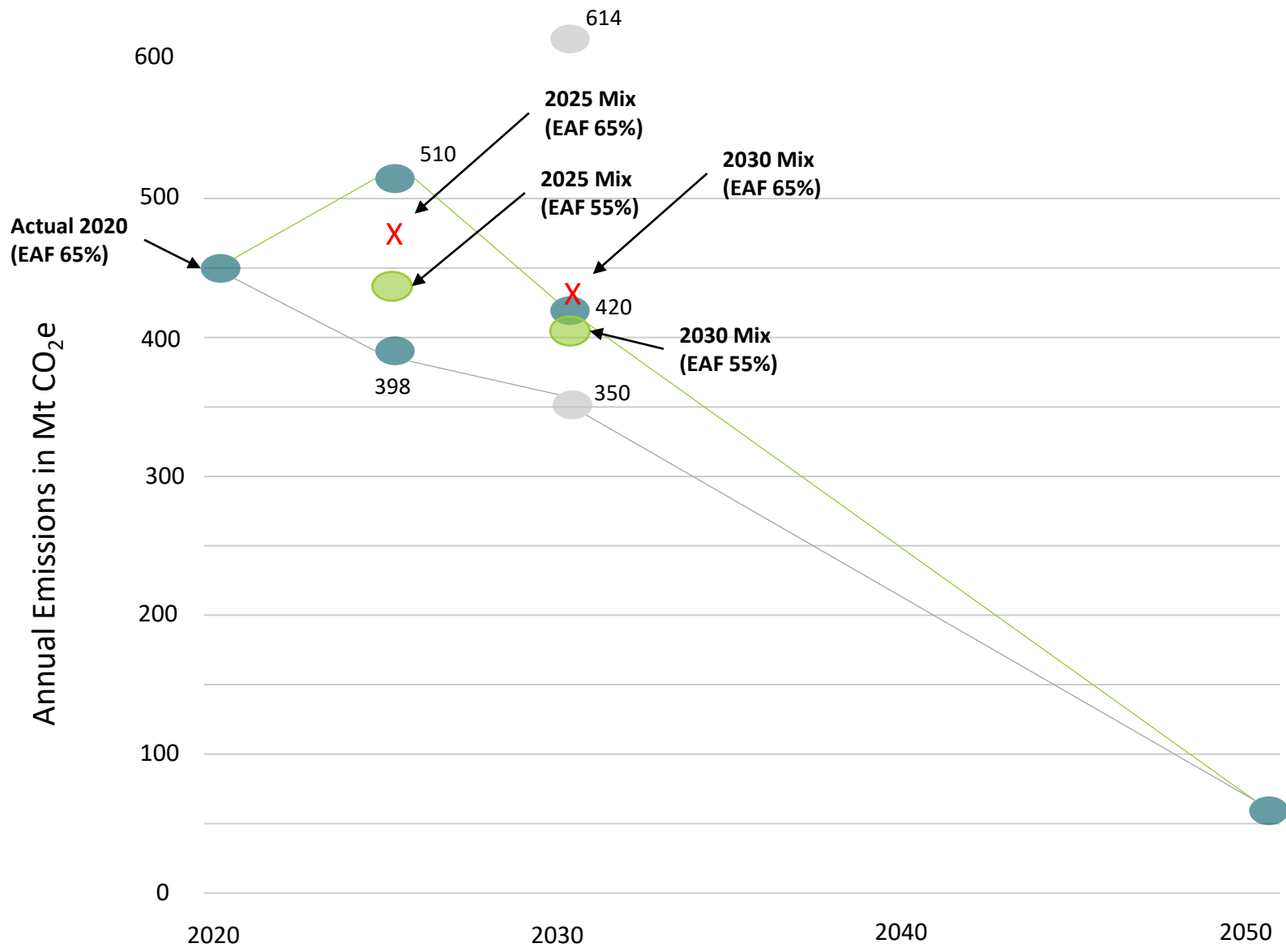
We know coal power produced 184 MT CO₂e emissions in 2020 (illustrated, left).

In 2025, the recommended generation mix with deteriorated coal power stations (i.e., 55% EAF) would produce 175 Mt CO₂e, whereas an improved 2025 fleet would produce around 205 MT CO₂e. In other words, in 2025 we should be about 30 MT CO₂e lower with a 55% EAF fleet than with a 65% EAF fleet.

Note: 2025 emissions would be 10Mt lower than 2020 value with 55% EAF, and 20Mt higher than 2020 value with 65% EAF.

If we pursue the recommended 2030 generation mix, we should observe a 45 Mt reduction from 2020 at 55% EAF, and 20 Mt reduction from 2020 with 65% EAF.

Capacity factor = load factor



Using the 450 Mt start in 2020 and transitioning to 2025 with 55% EAF would result in 440 Mt of emissions, versus 470 Mt at 65% EAF.

Transitioning to a 2030 mix at 55% EAF would take us to 405 Mt, versus 430 Mt at 65% EAF.

We would however restate that this was a speculative statement meant to communicate that the key point is we do not want to meet our NDC targets because of the collapse of our economy. We want to meet it in a deliberate and planned manner.

We have made a number of assumptions in these calculations to illustrate that the statement is not inaccurate. But we would shy away from saying it is definitive.

We do believe our assumptions are conservative, but data points are estimated from best available data (including the relationships between 55% EAF and capacity factor).

Data from Eskom 2022 annual report referred to earlier.

Measure and unit	Target 2025	Target 2023	Target 2022	Target met?	Actual 2022	Actual 2021	Actual 2020
Relative particulate emissions, kg/MWh sent out ^{5C}	0.28	0.30	0.31	■	0.34	0.38	0.47
Specific water consumption, ℓ/kWh sent out ^{5C, 1}	1.25	1.39	1.33	■	1.45	1.42	1.42
Net raw water consumption, Mℓ	n/a	n/a	n/a	n/a	283 610	270 736	286 553
Red data bird mortalities (no targets set, but tolerance levels to ensure continual improvement)	243	270	300	■	241	359	392
Environmental legal contraventions (no targets set, but tolerance levels to ensure continual improvement)	14	17	18	■	65	81	59
Environmental legal contraventions reported as a result of significant failure of business systems, number ²	1	1	1	■	7	7	5
Carbon dioxide (CO ₂), Mt ³	n/a	n/a	n/a	n/a	207.2	206.8	213.2
Sulphur dioxide (SO ₂), kt ³	n/a	n/a	n/a	n/a	1 671	1 604	1 721
Nitrous oxide (N ₂ O), t ⁴	n/a	n/a	n/a	n/a	1 561	1 527	2 826
Nitrogen oxide (NO _x as NO ₂), kt ⁴	n/a	n/a	n/a	n/a	822	804	851
Particulate emissions, kt	n/a	n/a	n/a	n/a	66.65	71.35	94.92

1. Relative particulate emissions values and specific water consumption include Medupi Units 2, 3, 4, 5 and 6 and Kusile Units 1 and 2, but exclude units synchronised but not yet in commercial operation. Units are only included one year after achieving commercial operation. Therefore, Kusile Unit 3, as well as Medupi Unit 1, are still excluded.
2. Particulate emissions reported at certain coal-fired power stations, specifically Kendal and Kriel, exceeded the range of the station's particulate emission monitors for periods during the year. This may have resulted in an understatement of particulate matter emissions. However, the extent of the understatement and its impact on the materiality of final figures cannot be quantified.
3. Specific cases of environmental legal contravention incidents that are considered to be of very high significance in terms of their impact on the environment and/or on Eskom in that they have a material business impact and illustrate a significant failure of business systems recorded as incidents as a result of a significant failure of business systems.
4. Emission figures are calculated based on coal characteristics and power station design parameters using coal analysis and coal burnt tonnages. Figures include coal-fired and gas turbine power stations and oil consumed during power station start-ups. For carbon dioxide emissions, it also includes the underground coal gasification plant.
5. N₂O and NO_x reported as NO₂ are calculated using average station-specific emission factors (measured intermittently) and tonnages of coal burnt.
6. No target is set for net raw water consumption or emission volumes. Therefore, the target for these measures is shown as not applicable.