LIFE AFTER COAL
IMPILO NGAPHANDLE KWAMALAHLE

THE MYTH OF "CLEAN COAL"

WHY COAL CAN ONLY EVER BE DIRTY

South Africa is the biggest coal producer in Africa. Over the past 10 years alone, we have produced an average of **254 million tons of coal per year.** 70 million tons of the coal we produce is exported: the rest is used locally.

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'Sasol's coal-to-liquid fuel plant, Secunda. Image: James Oatway

Introduction

As a major coal producer, South Africa, particularly its power utility, Eskom, has become overly-dependent on coal, which, for a long time, was a cheap source of power generated mainly for industry. However, due to the irrefutable environmental, health, and climate change impacts, and the rapidly-increasing costs associated with the use of fossil fuels, coal-fired power generation is not sustainable. The phasing-out of coal is occurring on a global scale and it is gaining momentum.[1]


Eskom's Kriel and Matla coal-fired power stations, Mpumalanga. Image: James Oatway

The signs of an inevitable phase out of coal use and the need for a transition to a renewable energy mix on a low-carbon trajectory are also starting to show domestically – for example, the number of direct employees in the coal mining industry has declined from about 89 000 in 2011/12 to about 82 000 in 2017, while Eskom's coal consumption has declined from 132.7 million tonnes in 2007/8 to 115.5 million tonnes in 2017/18. This is primarily caused by declining sales, largely driven by rising electricity tariffs, which has encouraged energy efficiency and the use of renewables in factories, commercial properties and households.

Despite these realities, there is a growing narrative from proponents with vested commercial interests in the survival of the coal industry, both in South Africa and internationally, that "clean coal" technology is the lifeline that will allow governments and industry to continue to depend on coal as a sustainable energy generation option. There is no such thing as "clean coal". This report presents an overview of the coal cycle (mining, production, supply, and waste disposal) to demonstrate that "clean coal" is, in fact, impossible. There are no solutions to neutralise all - or even most - of the dire environmental, health, and climate change impacts caused by coal. This is especially so in the context of significantly cleaner and cheaper alternative energy sources - such as wind and solar power - that are available in such abundance in our country.

In demonstrating that "clean coal" is a myth, this report provides an explanation of what makes coal 'dirty'; why the technologies promoted by "clean coal" proponents can never be a solution; and distinguishes between the types of emission reduction technologies that are currently available to comply with South Africa's existing air pollution laws.

[1] For example, see https://endcoal.org/wp-content/uploads/2018/03/BoomAndBust_2018_r6.pdf; http://geopoliticsofrenewables.org/report

What makes coal 'dirty'?

1) Mining and processing of coal

South Africa's coal deposits are shallow, making their exploitation suitable for opencast and shallow underground mining, with a high degree of mechanisation; about 50% of the mines are opencast, and 50% are underground. The processes associated with either method of mining are inherently dirty, with serious environmental and health implications. These include:

- **Loss of arable land –** both opencast and underground mining methods result in the collapse of the surface, and the collection of pools of highly-contaminated acidic water, along with the loss of arable land;
- **Pollution from the spontaneous combustion of discard coal stockpiles**;
- **Dust emissions generated by coal mining operations -** several aspects of coal mining generate dust emissions; including blasting, materials handling, and transport of the coal on mine haul roads – with transportation being by far the largest dust source.[2] Coal mining is the largest source of dust (PM_{10}) emissions in the Highveld Priority Area, for example.[3] These dust emissions, including dangerous particles, are inhaled by surrounding communities;
- **Water pollution and acid mine drainage** - the blasting and crushing processes produce fine material with a high surface area, exposing sulphur-bearing components of the ore to air and water, resulting in the formation of dilute sulphuric acid. The acidic (low-pH) water solubilises a range of toxic metals, creating a highly-polluted effluent, referred to as 'acid mine drainage'. Water runoff from unlined discard coal dumps produces, over time, further quantities of highly-polluted and acidic water. This impact has not been quantified, but it is estimated that the external cost of coal power generation, related to acid mine drainage, could be as high as R0.38/kWh (2009 ZAR);[4] and
- **Very high levels of water consumption** – this, in circumstances where South Africa is a water-scarce country. This particular impact is explained in more detail below.

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[2] R J Thompson and A T Visser, Mine Dust Road Fugitive Dust Emission and Exposure Characterisation (2001). http://mineravia.com/yahoo_site_admin/assets/docs/Dust_emission_and_exposure__mine_roads.8224449.pdf

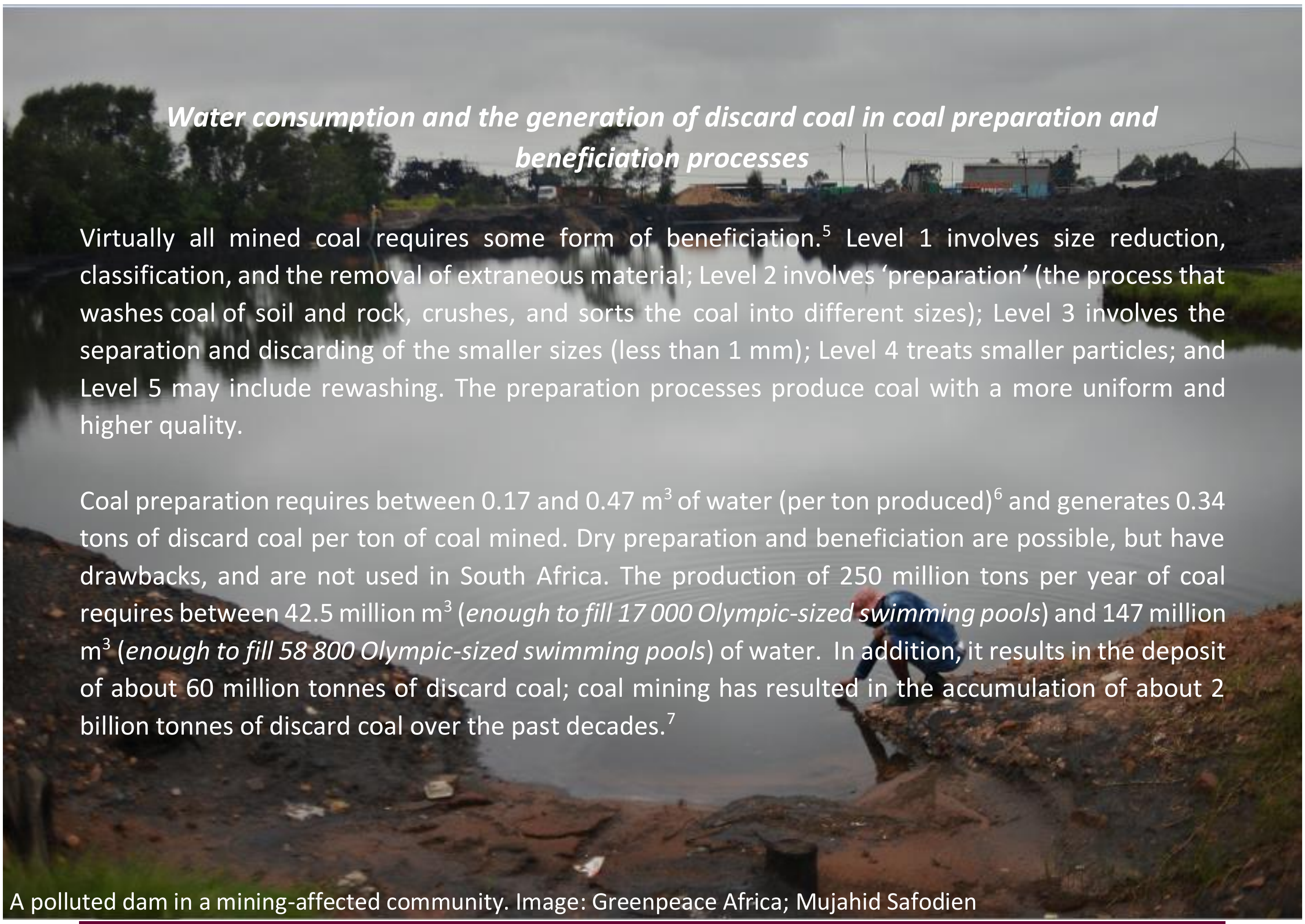
[3] See Table 5 on page 19 of the Highveld Priority Area Air Quality Management Plan (2011), declared in terms of section 18 and 19 of the National Environmental Management: Air Quality Act 39 of 2004. http://www.saaqis.org.za/documents/HIGHVELD%20PRIORITY%20AREA%20AQMP.pdf

[4] K Pretorius, Coal Mining and Combustion - Internalising the cost for a fair climate change debate (2009). Rivonia: Federation for a Sustainable Environment.

Water consumption and the generation of discard coal in coal preparation and beneficiation processes

Virtually all mined coal requires some form of beneficiation.[5] Level 1 involves size reduction, classification, and the removal of extraneous material; Level 2 involves 'preparation' (the process that washes coal of soil and rock, crushes, and sorts the coal into different sizes); Level 3 involves the separation and discarding of the smaller sizes (less than 1 mm); Level 4 treats smaller particles; and Level 5 may include rewashing. The preparation processes produce coal with a more uniform and higher quality.

Coal preparation requires between 0.17 and 0.47 m^3 of water (per ton produced)[6] and generates 0.34 tons of discard coal per ton of coal mined. Dry preparation and beneficiation are possible, but have drawbacks, and are not used in South Africa. The production of 250 million tons per year of coal requires between 42.5 million m^3 (*enough to fill 17 000 Olympic-sized swimming pools*) and 147 million m^3 (*enough to fill 58 800 Olympic-sized swimming pools*) of water. In addition, it results in the deposit of about 60 million tonnes of discard coal; coal mining has resulted in the accumulation of about 2 billion tonnes of discard coal over the past decades.[7]



A polluted dam in a mining-affected community. Image: Greenpeace Africa; Mujahid Safodien

There are no methods that can avoid all or even most of the detrimental impacts of the mining and processing of coal, and none will be available for the foreseeable future.

[5] J Bergh et al, Techno-economic impact of optimized low-grade thermal coal export production through beneficiation modelling (2013).

[6] B Martin and R Fischer, The energy-water nexus: energy demands on water resources (2012). Resources Report 5 (EMG Water and Climate Change Research Series. Cape Town: Environmental Monitoring Group (EMG).

[7] As at 2001, the cumulative total of discard coal was 1.12 billion tonnes. National Inventory Discard and Duff Coal at www.energy.gov.za/Coal/coal_discard_report.pdf). At a ratio of 0.24 tonnes discard per tonne of coal produced, the cumulative total of discard coal through to 2017 is about 2 billion tonnes.

2) Combustion of coal

Water consumption: In 2017, Eskom consumed approximately 307 million m^3 of water (*enough to fill 122 800 Olympic-sized swimming pools*) for power generation, amounting to 10 m^3 of water (*125 bathtubs*) per second. Water use in coal power generation is dominated by the cooling process and excludes the water used and polluted to produce or beneficiate the coal. This is summarised in the tables below:

Table 1: Estimated water use in energy production[8]

Energy Production Stage	Water use litres/MWh	Reference
Pre-generation, mining and washing	183-226	Martin and Fischer (2012)
Generation, wet cooling	1420	Eskom (2013b)
Generation, dry cooling	100	Eskom (2013c)
Generation, indirect dry cooling	80	Martin and Fischer (2012)
Generation, indirect wet cooling	1380	Martin and Fischer (2012)

Table 2: Water volumes, water cost, and treatment costs for the Eskom power stations (2017)[9]

Station	Water Volumes (Million m^3)	Water Cost (R million)	Water Cost (R/m^3)[10]	Water Treatment Costs (R million)[11]
Matla	37.5	253	6.7	35
Lethabo	37.0	30	0.8	40
Tutuka	34.2	205	6.0	86
Kriel	34.2	305	8.9	39
Arnot	25.5	134	5.3	40
Camden	17.9	116	6.5	7
Hendrina	19.5	122	6.2	17
Majuba	22.1	72	3.3	35
Duvha	22.0	79	3.6	13
Komati	15.1	101	6.7	19
Kendal	5.7	72	12.6	38
Grootvlei	9.0	29	3.2	24
Medupi	4.4	219	49.2	3

[8] A Madhlopa et al, Renewable energy choices and water requirements in South Africa (2013). Energy Research Centre: University of Cape Town.
[9] Eskom Revenue Application 2018/19.
[10] 1 m^3 = 1 kl.
[11] The water treatment costs referred to in this column relate to the power stations cost of treating raw water prior to its use in the boiler plants. This does not include the estimated cost of treating acid mine drainage from coal mines that supply Eskom's power stations.

Kusile	2.05	40	19.5	2
Matimba	4.3	54	12.6	31

Air pollution: also in 2017, Eskom's coal-fired power stations generated 200 893 GWh of power, emitting the following types and quantities of pollutants:

Table 3: Eskom's coal plant air emissions, 2016/17[12]

Pollutant	2016/17 emissions	Specific emissions (tons pollutant/GWh)
CO_2	211.1 million tons	1051
SO_2	1.766 million tons	8.79
NO_x	0.885 million tons	4.26
PM_{10}	65 130 tons	0.32
N_2O	2782 tons	0.0138

Table 4: Resource utilisation

Resource	2016/17 consumption	Specific consumption
Coal	114 million tons	567 tons per GWh
Water	307.3 million m^3	1530 m3 per GWh
Ash landfilled	32.6 million tons	162 tons per GWh

Fine Particulate Matter ($PM_{2.5}$) pollution from Eskom's coal-fired power stations alone is responsible for the equivalent deaths of more than 2,200 South Africans every year, and causes thousands of cases of bronchitis and asthma in adults and children annually.[13]

The annual CO_2e emissions generated by Eskom's coal-fired power stations (emissions factor of 1.00kg CO_2e /kWh) was 215.6 million tons of CO_2e in 2015, or 40% of South Africa's total CO_2e emissions (529.82 million tons of CO_2e in 2015).[14]

If "clean coal" could be applied to the production of electricity using coal-fired power stations, it should mean the avoidance of *all* the impacts associated with the burning of coal, or at least a very substantial reduction of the consumption of resources and impacts of the combustion process. This is not the case.

[12] Eskom Integrated Report, 2017 available at http://www.eskom.co.za/IR2017/Documents/Eskom_integrated_report_2017.pdf

[13] Dr M Holland, Health impacts of coal fired power plants in South Africa, available at https://cer.org.za/wp-content/uploads/2017/04/Annexure-Health-impacts-of-coal-fired-generation-in-South-Africa-310317.pdf

[14] See South Africa's 2nd Biennial Update Report (2014-2016) to the UNFCCC available at https://www.unfccc.int/files/national_reports/nonannex_i_parties/biennial_update_reports/application/pdf/south_africa_2nd_bur.pdf

Why "clean coal" technologies are not a solution

The following technologies are generally relied on by "clean coal" proponents, but even combined, these will not provide the substantial reduction that is urgently needed to avoid the compounding impacts on human health and the environment. Instead, these technologies would generate harmful environmental impacts of their own.

1) High Efficiency, Low Emissions (HELE) plants

High Efficiency plants are designed with 'Supercritical' or 'Ultra-supercritical' boiler plants. These terms refer to the design temperature and pressure of the boiler systems - supercritical and ultra-supercritical boilers operate at temperatures and pressures higher than the critical temperature.[15] These boilers are able to operate with significantly-higher energy efficiencies compared with the efficiencies of subcritical plants. High Efficiency, Low Emissions (HELE) coal power plants are therefore not a new technology, but represent incremental improvements on the best of existing coal plant designs.

The current Eskom fleet, excluding the partly-commissioned Medupi and Kusile plants, operate at 'subcritical' pressures, at an average efficiency of about 31%. This means that only about 31% of the energy in the coal burnt is converted into electricity. The majority of the energy generated is discharged to the atmosphere as hot gas.

HELE plants are put forward as the answer to greenhouse gas (GHG) emissions and pollution caused by coal-fired power plants.[16] These are defined as ultra-supercritical plants, which are more efficient in energy terms using less coal per unit of power produced, and are equipped with state-of-the-art pollution controls. However, this description applies to the power production phase only.

An example of a pollution control technology to reduce SO_2 emissions from the coal-fired power generation process is flue gas desulphurisation (FGD). Using *wet* FGD – a mixture of limestone (powder) and water – CO_2 emissions per unit of power sent out increase by 1-2%, depending on the sulphur content of the coal. *Dry* and *semi-dry* FGD processes require lime or hydrated lime because a greater reactivity is required, and the sorbent-to-SO_2 ratio is significantly higher compared to wet FGD. At temperatures below 900°C, no CO_2 is released and there is no increase in CO_2 emissions due to the FGD process itself. But both lime and hydrated lime are produced by the process of calcining (heating) limestone, which releases CO_2. Dry or semi-dry FGD processes using lime or hydrated lime as sorbents will result in an overall increase in CO_2 emissions, probably by 2-3%, if the lifecycle of the process is considered.

Despite HELE features, CO_2 emissions still remain high, achieving at best a reduction of about 20% per kWh; and pollutant (PM, SO_2, and NOx) emissions also remain significant. HELE plants, especially the installation of the Low Emission technologies, require a substantial increase in capital and operating costs, in a situation where coal power is already more expensive than available wind and solar power technologies.[17]

[15] The 'critical point' of water pressure and temperature refers to the temperature and pressure above which water cannot exist as a liquid. In water, the critical point occurs at around 374°C and 22 MPa.
[16] According to the International Energy Agency (IEA), China currently has the world's most efficient ultra-supercritical coal plant, with an efficiency of 48%.
[17] L Myllyvirta, How much do ultra-supercritical coal plants really reduce air pollution? Available at https://energypost.eu/how-much-do-ultra-supercritical-coal-plants-really-reduce-air-pollution/

2) Circulating Fluidised Bed (CFB) combustion systems

CFB systems can use lower quality coal, including discard coal. If lime is injected directly into the furnace to control SO_2 emissions, the amount of solid waste generated is significantly higher compared to pulverised fuel boilers (used by most of Eskom's stations).

Using direct lime injection requires no additional water for the FGD process. However, the direct injection lime (sorbent) process requires a considerably-higher ratio of sorbent per tonne of SO_2 captured, and lime costs are therefore considerably higher compared with the wet FGD process, while SO_2 removal is less efficient. Combined spent sorbent plus ash volumes are consequently considerably higher than for the wet FGD process.


Aerial view of coal mining operation and coal stockpiles, Mpumalanga. Image: James Oatway

For example, figures from the proposed Thabametsi Independent Power Producer (IPP) station show that, for every 1000 tons of coal burnt, this CFB plant would discharge 660 tons of ash and spent sorbent as waste. GHG emissions are significantly higher at 1,23 kg CO_2eq per kWh due to high Nitrous Oxide (N_2O) emissions.[18]

If discard coal is used, the relative amount of ash and sorbent to be dumped will increase due to the higher ash content of discard coal. Eskom's coal-fired power stations already landfill 33 million tons of ash. If we add this to discard coal, a total of 93 million tons of solid waste would be deposited per year.

With 60 million tons of discard coal accumulating every year, CFB technology cannot solve the discard coal problem. The use of discard coal in this way will also result in: air pollution; an increase in water used to wash the discard coal; and an increase in the total ash and sorbent to be dumped because of the higher ash content. This coal ash contains toxic chemicals such as arsenic, lead, mercury, and chromium, which can cause, among other things, cancer, organ failure, and brain damage.

[18] https://cer.org.za/news/media-release-thabametsi-climate-impact-assessment-reveals-staggering-greenhouse-gas-emissions

3) CO_2 disposal using 'Carbon Capture and Storage (CCS)

There are several technologies, both developed and experimental, that may fall under the description of carbon capture and storage/sequestration (CCS) and carbon capture and utilisation (CCU). CCS technology involves the capture, injection, and permanent storage of CO_2 emissions (only) from coal power plants, and consists of the following basic stages:

1. The 'capture' of diluted CO_2 in the stack gas through absorption. This process is ***at best*** 90% efficient based on current technologies; so 10% of the CO_2 would still be released into the atmosphere; there is also an energy penalty[19] associated with the capture process ranging between 10-20%;[20]
2. Desorption to recover more-or-less pure CO_2;
3. Compression and liquifaction of the more-or-less pure CO_2 into a supercritical state;
4. Transport (via road, sea, or purpose-built pipeline) of the CO_2 in liquid form to a 'suitable' storage facility (depleted oil/gas field or deep saline aquifer);
5. Injection of the liquid CO_2 into the storage facility (>800 metres below ground); and
6. Underground (>800 metres) storage and monitoring of the CO_2, at least for several hundred years.

The biggest unresolved problem with CCS is that of the secure long-term storage of massive quantities of CO_2. Leakage rates should be less than 1% per thousand years. Other unresolved questions include who would take responsibility for maintaining the storage facility (including liability in the event of a leakage incident), CCS's high capital costs, and the long lead-time – possibly decades, if ever – before the technology could potentially be proven at the required scale.

The feasibility and viability of CCS technology has not yet been demonstrated in South Africa. CCS development and implementation is managed by the South African Centre for Carbon Capture and Storage (SACCCS).[21] At present, SACCCS is planning a Pilot Carbon Dioxide Storage Project (PCSP) involving the injection, storage, and monitoring of 10,000 – 50,000 tons of CO_2 in "South African conditions"; to attempt to demonstrate that CCS can be actually be implemented using South African geological formations. SACCCS is investigating the Zululand Basin in KwaZulu-Natal and the Algoa Basin in the Eastern Cape as possible areas to site the PCSP.[22] The scale of this pilot project should be compared to Eskom's *annual* CO_2 emissions of more than 210 million tonnes: 4200 times the size of the proposed pilot system.

Therefore, the fact is that CCS in South Africa is yet to be applied at even a pilot level, never mind the large-scale commercial deployment that would be required to *urgently* address the quantity of CO_2 emissions from Eskom's fleet of coal-fired power-stations.[23]

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[19] The energy required to capture the CO_2 and compress it for transportation is drawn from the power plant, therefore reducing the electricity output (making the plant less efficient).
[20] See for example https://www.sciencedirect.com/science/article/abs/pii/S036054421630216X.
[21] https://www.sacccs.org.za/About-Us/
[22] https://www.sacccs.org.za/PCSP/
[23] The only existing Eskom coal-fired power station that is 'capture ready'; in theory, is Kusile power station, based in the Mpumalanga Province. http://www.eskom.co.za/news/Pages/Mar3.aspx

There is no guarantee that the PCSP will be successful and it is noteworthy that if either of these identified coastal basins prove to be effective storage sites, the bulk of Eskom's fleet of coal-fired power stations (12 of 15) are situated in the Mpumalanga Highveld, with two in Limpopo Province, and one in the Vaal Triangle, a far distance from the two identified possible storage sites. Full-scale CCS facilities would have to be tens of thousands of times larger than the pilot system. Consequently, in the South African context, CCS is not a viable response to reduce CO_2 emissions and to contribute to achieving South Africa's international climate change obligations.

Pollution control technologies installed at existing Eskom coal-fired power stations

As explained above, state-of-the-art pollution controls are an essential component of a HELE plant. A distinction must, however, be drawn between the technologies referred to by those in support of the "clean coal" concept and the suite of pollution control/reduction technologies required to comply with South Africa's air pollution laws. These include the list of activities which result in atmospheric emissions believed to have or that may have a "*significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage*". The list of activities is prescribed in terms of the National Environmental Management: Air Quality Act of 2004, and accompanied by "minimum emission standards" (MES) in respect of a substance or mixture of substances resulting from the operation of the listed activities.[24]

The first list of activities were published in March 2010, after a consultative multi-stakeholder process convened over a number of years. Sasol and Eskom were active and vocal participants in this process. Although Eskom's coal-fired power stations emit and contribute to the formation of a number of other pollutants, the list of activities contain MES for three pollutants – PM, SO_2 and NOx – structured to require existing plants to meet certain limits by 1 April 2015 ("existing plant MES"), and stricter MES ("new plant MES") by 1 April 2020. Although these are called "new plant" standards, they are substantially weaker even than emission standards in other developing countries - for example, our 2015 standards for SO_2 are about 18 times weaker than China's and 6 times weaker than India's. Even our "new plant" standards are more than 14 times weaker than in China and 5 times weaker than India's.[25]

As far back as setting the initial list of activities (in 2006-9), the following technologies, among others, were acknowledged as Best Available Techniques to control the identified pollutants:

- **Particulate Matter (typically fly ash from the combustion process):** control measures include electrostatic precipitators (ESPs), fabric filter plants (FFPs) or flue gas conditioning (FGC).
- **Nitrous Oxide:** low NOx burners.
- **Sulphur Dioxide:** flue gas desulphurisation, described above.

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[24] The listed activities notice includes the permissible amount, volume, emission rate or concentration of that substance or mixture of substances that may be emitted; and the manner in which measurements of such emissions must be carried out.

[25] Comparisons and ratios are approximate due to differences between jurisdictions with respect to: a) the reference oxygen content (e.g., the SA MES reference value is 10% oxygen; the EU and China reference value is 6% oxygen); b) the averaging period (e.g., the SA MES are based on daily averages; shorter averaging periods may apply in other jurisdictions); and c) applicable boiler size. Due to these factors, the calculated ratios are generally conservative or understated.

Despite South Africa's comparatively weak standards and the long lead time to prepare for and ensure compliance with the MES, Eskom and Sasol have rather sought to apply for wide-ranging postponements of compliance with the MES since 2013. At the date of this report, the majority of Eskom and Sasol's postponement applications have been granted.[26] Eskom's latest application to delay compliance with the MES, which was commenced in August 2018 and remains pending, coincided with an amendment to the MES published in November 2018. Among other amendments, it allows: 1. *existing plants* to apply, by 31 March 2019, for a once-off postponement of compliance timeframes for *new plant* MES (for a period not exceeding 5 years and not valid beyond 31 March 2025), provided such plants: comply with other MES; demonstrate a previous reduction in emissions of the pollutant/s for which postponement is sought and measures and direct investments are implemented towards compliance with the relevant new plant MES; 2. the National Air Quality Officer can grant an alternative emission limit/load if there is material compliance with the national ambient air quality standards in the area for the relevant pollutant/s; and 3. existing facilities that will be decommissioned by 31 March 2030 can apply, by 31 March 2019, for a once-off suspension of compliance timeframes with new plant MES for a period not beyond 31 March 2030. In its November 2018 application, Eskom has applied for combination of all three options, for various pollutants, across 10 of its coal-fired power stations.

With the exception of Kusile power station (which is compliant), the current and planned abatement retrofits as illustrated in the table below, are largely insufficient to comply with either the existing plant MES or the new plant MES.

[26] Eskom applied for and received multiple postponements of compliance with the MES in February 2015. It has also made two other subsequent applications for postponement – for its Medupi, Matimba, and Tutuka stations. The application for postponement of compliance with the SO_2 existing plant MES at Medupi and Matimba was granted in October 2018 and the postponement application for Tutuka for existing plant and new plant MES was submitted to the National Air Quality Officer for consideration in November 2018.

Table 5: Emission abatement retrofits and decommissioning dates across Eskom's fleet of coal-fired power stations[27]

	Technology already installed	Pollutant to be abated	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	50-year life
Kusile	FFP,LNB and FGD	N/A																
Medupi	FFP, LNB	SO_2																2064-
Majuba	FFP	NOx																2046-51
Kendal	ESP + FGC	PM																2038-43
Kendal	ESP + FGC	SO_2																2038-43
Matimba	ESP + FGC	SO_2																2037-41
Matimba	ESP + FGC	PM																2037-41
Lethabo	ESP + FGC	PM																2035-40
Tutuka	ESP	PM																2035-40
Tutuka	ESP	NOx																2035-40
Duvha (4 & 6)	FFP(1-3); ESP(U4-6)	PM																2030-34
Matla	ESP + FGC	PM																2029-33
Matla	None for NOx	NOx															D	2029-33
Kriel	ESP + FGC	PM												D	D	D	D	2026-29
Arnot	FFP	N/A							D					Dx2	D		Dx2	2021-29
Hendrina	FFP	N/A				SDx2	SD	D	D	D	D	D	D	D				2018-22
Camden	FFP	NOx						D	D	D	D							2020-23*
Grootvlei	FFP (U1,5,6); ESP+FGC (U 2,3,4)	N/A				SD	SDx2	SD	SD	SD				D	D	D		2018-20
Komati	ESP + FGC	N/A				SD	SDx2	SD	SD	SD		D	D	D	D	D		2024-28

*Possible delay of decommissioning

Legend	
Completed projects	
Future projects	
Decommissioning	D
Investment approval dates	
Shut down for reserve storage	SD
Previous commitment	

Abbreviations:
CFB-FGD = Circulating Fluidised Bed – Flue Gas Desulphurisation to reduce SO_2
ESP = Electrostatic Precipitator to reduce PM
FFP = Fabric Filter Plant to reduce PM
FGC = Flue Gas Conditioning to reduce SO_2

This distinction between current emission control technologies available to operators of listed activities and the three technologies relied on by "clean coal" proponents is important because, although related, compliance with the MES is a separate issue. The former involves an attempt by increasingly-outdated industries to remain relevant and appear to be sustainable by claiming they will implement various technologies; at a time when the electricity sector is transitioning to cleaner and more affordable generation technologies, such as wind and solar. Compliance with MES relates to standards that are mandatory and technologies that are readily-available to existing operations in order to comply with the rule of law (and atmospheric emission licences). In circumstances where Eskom, for example, does not allocate the necessary finances to comply with the MES, it will certainly not do so for any of the more costly "clean coal" technologies described above.

[27] Eskom's application for suspension, alternative limits, and/or postponement of compliance with the MES, November 2018. Summary Motivation Document is available at http://www.naledzi.co.za/assets/documents/019dd09e24d4c389c3210ca8204e09f3.pdf

Conclusion

There is no such thing as "clean coal". This is clear based on this report's investigation of the coal cycle, demonstrating the extent and severity of the various impacts associated with the mining, beneficiation, and combustion of coal. There are no solutions which are able to completely mitigate coal's enormous resource consumption and harm to health and the environment. These technologies only exacerbate such external impacts and, if viable at all, result in a substantial increase in capital and operating costs, compared to readily-available, much more flexible and much less harmful wind and solar power technologies.

A coal phase-out to enable a just transition to a sustainable energy system for the people of South Africa is of paramount importance and cannot be delayed by the false promise of "clean coal" technologies. Continued reliance and re-investment into expensive, unnecessary, and outdated infrastructure will ultimately be to the detriment of South Africa, coal-affected communities, coal workers, and the unemployed. The October 2018 special report launched by the Intergovernmental Panel on Climate Change, tells us that, to achieve a global 1.5 degree Celsius temperature increase target, we need to reduce CO_2 emissions by almost half (45%) in 2030 and to almost zero by 2050.[28] Any prospect of South Africa achieving this trajectory is largely dependent on Eskom actively planning, together with its workers, for a just transition to socially-owned renewable energy projects and a substantial reduction in CO_2 emissions. To do otherwise will risk stranding the workforce, along with redundant coal-fired power plants. "Clean coal" is not and will never be the way forward; it is simply a myth.

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[28] https://www.ipcc.ch/sr15/

This report was produced by Life After Coal/Impilo Ngaphandle Kwamalahle – a joint campaign by **Earthlife Africa Johannesburg**, **groundWork**, and the **Centre for Environmental Rights**. We aim 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.

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